Agenda

Township of Wilkins
Planning Commission Meeting
April 19, 2023

Join Zoom Meeting
https://us02web.zoom.us/j/83574514014

1. Call to Order
2. Public Comments
3. Approval of the minutes of the Planning Commission meeting of February 15, 2023.
4. Benderson Commercial Retail Development – 3475 William Penn Highway
5. Modwash Expansion – 3474 William Penn Highway
6. Next meeting date: May 17, 2023.
7. Adjournment

TOWNSHIP OF WILKINS PLANNING COMMISSION MEETING
February 15, 2023

The Planning Commission meeting was brought to order by Ms. Greco at 7:00 p.m. The purpose of the meeting was to approve the minutes of the January 18, 2023 meeting, and continue to discuss amendments to the Planned Residential Ordinance (Ordinance 1095), further defining required perimeter buffer plantings.

The following members were present: Mr. Mark Wolfgang, Dr. Donald Hoffman (via Zoom), Mr. Rodrick Campbell (via Zoom), Mr. Richard DeRiso (via Zoom) and Ms. Erin Greco.

Also in attendance: Rebecca Vargo, Township Manager, Tim Saunders, Code Enforcement Officer, John Stranahan, Solicitor, and Lori Morgan, Engineer (via Zoom).

The following items were presented:

1) Wilkins Township Planning Commission Meeting Minutes of January 18, 2023.
2) Draft ordinance amending Ordinance 1095, Planned Residential Developments.
3) Copy of a sample ordinance establishing buffer zones provided by Mr. Wolfgang.
4) Tree Species for Parks and Open Spaces in Allegheny County publication of Tree Pittsburgh, updated Spring 2021.

PUBLIC COMMENTS – AGENDA ITEMS:

There were no public comments.

APPROVAL OF MINUTES:

The minutes of the Planning Commission meeting of January 18, 2023 were presented for approval. It was **MOVED CAMPBELL – GRECO** to approve the minutes of the regular meeting of the Planning Commission of January 18, 2023. All in favor and so ordered.

PRD ORDINANCE AMENDMENT – PERIMETER BUFFER:

Mrs. Vargo reviewed the changes made to the draft amending ordinance based upon the discussion at the January meeting. The Board agreed in January to retain the perimeter setbacks that are provided in Section 6, Paragraph C, Table 1 of Ordinance 1095. The focus then shifted to the type and number of trees located within the perimeter buffer. Based upon the discussion at the January meeting, this is now defined in the amending ordinance under Section 2, Paragraph 3 (a) and (b). Other changes to the ordinance included adding the substance from the sample ordinance provided by Mark Wolfgang into this amendment. This included adding Table 2, which graphically depicts a buffer zone between a residential and commercial lot as well as the language beginning at Paragraph 4, providing for exceptions from buffer zones and Paragraph 5, which defines plant materials. Paragraphs 6 and 7 are retained from the existing Ordinance 1095.

In reviewing the latest rendition of the amending ordinance, Mr. Wolfgang commented that it is not clear what the appendix is. Paragraph 5(c) indicates that there is an Appendix, but it is not identified. It was agreed that the appendix will be identified in

Paragraph 5. The appendix is the Tree Pittsburgh "Tree Species for Parks & Open Spaces in Allegheny County, " updated Spring 2021.

Mr. Wolfgang also pointed out that the ordinance requires the establishment of an irrigation system (Paragraph 5(i). These types of requirements are being eliminated, in light of sustainability, and he recommended that this paragraph be eliminated. He agreed that watering in the first season, to establish the planting, should be required. It was also noted by Ms. Greco that Paragraph 5(b) provides requirements to replace withered and dying trees. It may be more appropriate to discuss watering requirements here and eliminate paragraph 5(i) altogether. The members of the Planning Commission agreed.

Based upon these two changes, it was **MOVED WOLFGANG-CAMPBELL** to recommend that the Board of Commissioners adopt the amendment to Ordinance 1095 (Planned Residential Developments), as provided herein. All in favor and so ordered.

NEXT MEETING:

The next meeting of the Planning Commission is scheduled for March 15, 2023. There is currently no new business before the Planning Commission. Unless that changes, there will not be a meeting in March.

ADJOURNMENT:

It was MOVED **GRECO-WOLFGANG** to adjourn the meeting. The meeting was adjourned at 7:21 PM. All in favor and so ordered.

Respectfully Submitted,

Rebecca Vargo

Rebecca Vargo,
Secretary

Morris Knowles
& ASSOCIATES, Inc.
A HAMMONTREE COMPANY
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626

Phone (724) 468-4622
Fax (724) 468-8940
www.morrisknowles.com

April 5, 2023 MKA FILE NO. 1856.21

WILKINS TOWNSHIP
110 PEFFER ROAD
TURTLE CREEK, PA 15145

Attn: Rebecca Vargo

Regarding: Modwash Expansion
3474 William Penn Highway
Wilkins Township, Allegheny County

Dear Ms. Vargo;

On behalf of Hutton Pittsburgh (William Penn) ST LLC Morris Knowles and Associates is pleased to submit the following Subdivision/Land Development information for a proposed expansion of the existing Modwash facility at 3474 William Penn Highway.

The following documents have been included with this submission:

- One (1) Township Application
- One (1) Property Deed
- Twelve (12) land development plans
- Twelve (12) Subdivision plan
- Two (2) copies of the Stormwater Report
- One (1) $700.00 check made payable to "Wilkins Township" for Land Development Application Fee

If you have any questions, please feel free to contact me.

Sincerely,

MORRIS KNOWLES & ASSOCIATES, INC.
Consulting Engineers and Land Surveyors

Mark M. Zimmerman, PE
Vice President

ALLEGHENY COUNTY

SUBDIVISION AND LAND DEVELOPMENT REVIEW APPLICATION

MPC §502(b) County Advisory Review

COUNTY REVIEW REQUIRED: Municipality has adopted a subdivision and land development ordinance

Complete and submit with plans and other information M-F, 8:30 AM - 4:00 PM to:
ACED Planning Division, One Chatham Center, Suite 900, 112 Washington Place, Pittsburgh, PA 15219

For questions, help, or additional information please email ACEDPlanning@alleghenycounty.us

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Part 1: General Information

Property Owner: HUTTON PITTSBURGH (WILLIAM PENN) ST LLC

Contact Name: Devin Baker Phone: 423-599-2037
Email Address: dbaker@hutton.build
Mailing Address: 736 Cherry Street, Chattanooga, TN 37402

Name of Applicant: Same as Property Owner

Contact Name: Phone:
Email Address:
Mailing Address:

Plan Preparer: Morris Knowles & Associates

Contact Name: Mark M. Zimmerman Phone: 724-980-3680
Email Address: mmzimmerman@morrisknowles.com
Mailing Address: 443 Athena Drive, Delmont, PA 15626

Application Status: ☐ **Preliminary Plan** ☒ **Final Plan**

Application Type:

- ☒ Plat Adj./Lot Consolidation
- ☒ Minor Subdivision/Site Development
- ☐ Major Subdivision/Site Development

Part 2: Location Information

Project Name: Modwash Site Expansion

Municipality: Wilkins Township

Revised August 2021

ALLEGHENY COUNTY

Address/Location of Project: 3474 William Penn Highway
Pittsburgh, PA 15235

Tax Map Parcel(s) #:
542-F-130
542-F-138

Part 3: Zoning Information

Zoning:

Existing: C-1

Proposed: _____ (if applicable)

Variances Requested: ☐ Yes ☒ No (if yes, please attached description of all variances requested or approved)

Conditional Use: ☐ Yes ☒ No

Special Exception: ☐ Yes ☒ No

Part 4: Project Information

Total Plan Area: 3.902 (acres)

_____ (square feet)

Total Acreage to be Developed: 0.20

Total Impervious Area (Sq. Ft.): 5,760

Total Building Area (Sq. Ft.): Existing

Phasing:

Is the development proposed to be constructed in phases? ☐ Yes ☒ No

If Yes, a phasing plan and a schedule of the projected dates that the final application for each phase will be filed must be provided.

Proposed Utilities:

	Water	Sewer
Public:	☒	☒
Onsite:	☐	☐

Street Information:

Ownership (check any that apply):

☐ State ☒ Local
☐ County ☐ Private

Lineal feet of new streets: 0

Part 5: Notification to Others

As applicable, the following agencies have been notified about the proposed subdivision or site development:

- ☐ County Health Department
  Date: _____
- ☐ County Public Works
  Date: _____
- ☐ County Conservation District
  Date: _____
- ☐ PennDOT
  Date: _____
- ☐ PA DEP
  Date: _____
- ☐ Other: _____
  Date: _____

The applicant declares the following:

- ☒ He/she is the owner of the property in question; OR
- ☐ He/she is the authorized agent for the owner of record to the property for which the application is made; OR
- ☐ He/she is a beneficial land owner as defined by the PA Municipalities Planning Code (MPC). If this box is checked, a copy of the agreement recorded with the ACDRE authorizing the applicant to subdivide or develop the property must be provided.

I/We hereby submit the enclosed land development application to the Allegheny County Department of Economic Development for review and consideration in accordance with the PA Municipalities Planning Code (Act 247 of 1968, as amended) and Art. III §780-302 of the Allegheny County Subdivision and Land Development Ordinance:

_____ _____

Signature of Applicant Date

Revised August 2021

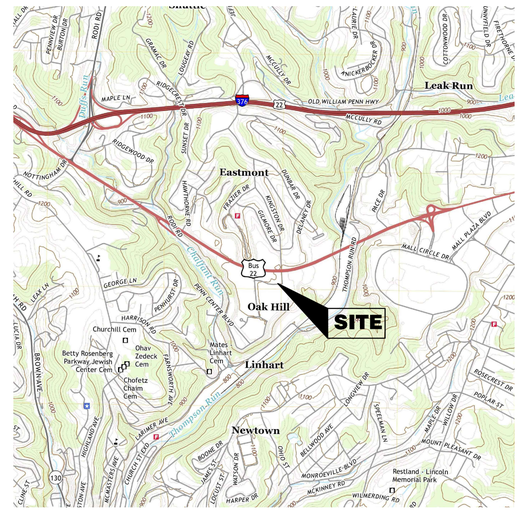
MODWASH WILKINS TOWNSHIP
PRELIMINARY/FINAL LAND DEVELOPMENT PLAN

WILLIAM PENN HIGHWAY(RT. 22), WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

APRIL, 2023

GENERAL NOTES:

1. CONTRACTORS SHALL NOT SCALE THESE DRAWINGS FOR CONSTRUCTION OR BIDDING PURPOSES. IN THE EVENT OF OMISSIONS OF NECESSARY DIMENSIONS OR INFORMATION, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OR ENGINEER. FIGURED AND CALCULATED DIMENSIONS TAKE PRECEDENCE OVER SCALED MEASUREMENTS. DETAILED DRAWINGS AND LARGER SCALE DRAWINGS TAKE PRECEDENCE OVER SMALLER SCALED DRAWINGS.
2. ALL PLAN DETAILS AND WALL SECTIONS ARE CONSIDERED "TYPICAL" INDUSTRY DETAILS UNLESS NOTED OTHERWISE AS SITE SPECIFIC.
3. TRAFFIC SHALL BE MAINTAINED ON ALL ADJOINING STREETS AND DRIVES AT ALL TIMES. TRAFFIC CONTROL SHALL BE MAINTAINED IN ACCORDANCE WITH PENNDOT'S REQUIREMENTS.
4. CONTRACTOR SHALL VERIFY THE LOCATION AND INVERT ELEVATION OF ALL EXISTING UTILITIES WITH PROPOSED CONNECTIONS PRIOR TO CONSTRUCTION AND GRADING OF THE SITE. THE ENGINEER SHALL BE IMMEDIATELY NOTIFIED OF ANY DESIGN CONFLICTS.
5. ALL MATERIALS AND WORKMANSHIP INVOLVED IN THIS SITE WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION, INCLUDING SUPPLEMENTS, OF THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS PUB. FORM 408, UNLESS OTHERWISE NOTED.
6. A PENNDOT HIGHWAY OCCUPANCY PERMIT, PURSUANT TO SECTION 420 OF THE ACT OF JUNE 1, 1945 (P.L. 1242 NO. 428), KNOWN AS THE "STATE HIGHWAY LAW" IS REQUIRED FOR DRIVEWAY ACCESS TO ANY STATE ROADWAY.
7. A FINAL EROSION AND SEDIMENTATION CONTROL PLAN AND PERMIT PURSUANT TO THE RULES AND REGULATIONS OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (TITLE 25, PART 1, SUBPART C, ARTICLE II, CHAPTER 102 OF THE PENNSYLVANIA CODE) IS REQUIRED BEFORE ANY EARTH MOVING ACTIVITIES ON THE PROPOSED LOTS IS ALLOWED.
8. ALL PROPOSED ACCESSIBLE FACILITIES ARE TO BE CONSTRUCTED TO CURRENT ADA REQUIREMENTS AND STANDARDS.
9. ALL PROPOSED ON-SITE LIGHTING SHALL BE DIRECTED INWARD AND DOWNWARD AWAY FROM RESIDENTIAL PROPERTIES AND ALL STREET RIGHT-OF-WAYS.
10. LAND DEVELOPMENT PLAN APPROVAL DOES NOT RELIEVE THE OWNER FROM ALL APPLICABLE SIGN REGULATIONS. ALL PROPOSED ON-SITE SIGNAGE SHALL CONFORM TO THE MUNICIPAL ZONING ORDINANCES.
11. CONTRACTOR IS RESPONSIBLE FOR VERIFYING QUANTITIES, INCLUDING EARTHWORK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNER AND ENGINEER DURING THE BIDDING PROCESS OF ANY QUANTITY DISCREPANCIES IN THE BID DOCUMENTS. ONCE THE CONSTRUCTION CONTRACT IS ISSUED, THE CONTRACTOR ACKNOWLEDGES THE CONTRACT PRICE COVERS ALL LABOR, MATERIALS AND INCIDENTALS TO SUBSTANTIALLY COMPLETE THE PROJECT ACCORDING TO THE CONSTRUCTION PLANS.



LOCATION MAP
SCALE: 1"=2000'
USGS QUADRANGLE MAP
BRADDOCK, PA

INDEX OF SHEETS

TITLE SHEET	C000
EXISTING CONDITIONS/DEMOLITION PLAN	C100
SITE PLAN	C200
GRADING PLAN	C300
LANDSCAPE PLAN	C500
GENERAL DETAILS	C600
EROSION AND SEDIMENT CONTROL TITLE SHEET	C700
EROSION AND SEDIMENT CONTROL PLAN	C701
EROSION AND SEDIMENT CONTROL PLAN DETAILS	C702

UTILITY COMPANIES

SANITARY

WILKINS TOWNSHIP
110 Peffer Road
Turtle Creek, PA 15145
412-824-6650

GAS

PEOPLES NATURAL GAS
1315 Gringo Road
Aliquippa, PA 15001
412-244-2626

WATER

WILKINS PENN-JOINT
WATER AUTHORITY
2200 Robinson Blvd
Pittsburgh, PA 15221
412-243-5837

TELEPHONE/FIBER OPTICS

VERIZON
3828 William Penn Highway
Monroeville, PA 15146
412-856-2300

ELECTRICITY

DUQUESNE LIGHT
469 Hershey Road
Penn Hills, PA 15235
Lisa McCann
412-824-0032

CABLE

COMCAST
2300 Eldo Road
Monroeville, PA 15146
Dan Heinz
daniel_heinz@cable.comcast.com

PREPARED FOR:

HUTTON ST 17, LLC

736 CHERRY STREET
CHATTANOOGA, TN 37402
ATTN - DEVIN BAKER
PHONE - 423-599-2037

PREPARED BY:

Morris Knowles & Associates, Inc.
Consulting Engineers & Land Surveyors
443 ATHENA DRIVE DELMONT, PA 15626
TELEPHONE: (724) 468-4622 FAX: (724) 468-8940

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THE GENERAL CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES INVOLVED IN THE SITE NO MORE TEN DAYS AND NO LESS THAN THREE DAYS IN ADVANCE OF EXCAVATION (PA ACT 287 OF 1974 AMENDED BY ACT 50 OF 2018). PA STATE LAW REQUIRES 3 WORKING DAYS NOTICE

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARK M. ZIMMERMAN
ENGINEER
P.E. 079175

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REVISION BY: DATE: DESCRIPTION:
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REVISION BY: DATE: DESCRIPTION:

DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: SEPT 2018
PROJ. NO.: 1856.21

SCALE:
N.T.S.

Morris Knowles & Associates, Inc.
A Hammontree Company
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622
Fax: (724) 468-8940
info@morrisknowles.com www.morrisknowles.com

SHEET NAME
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C000

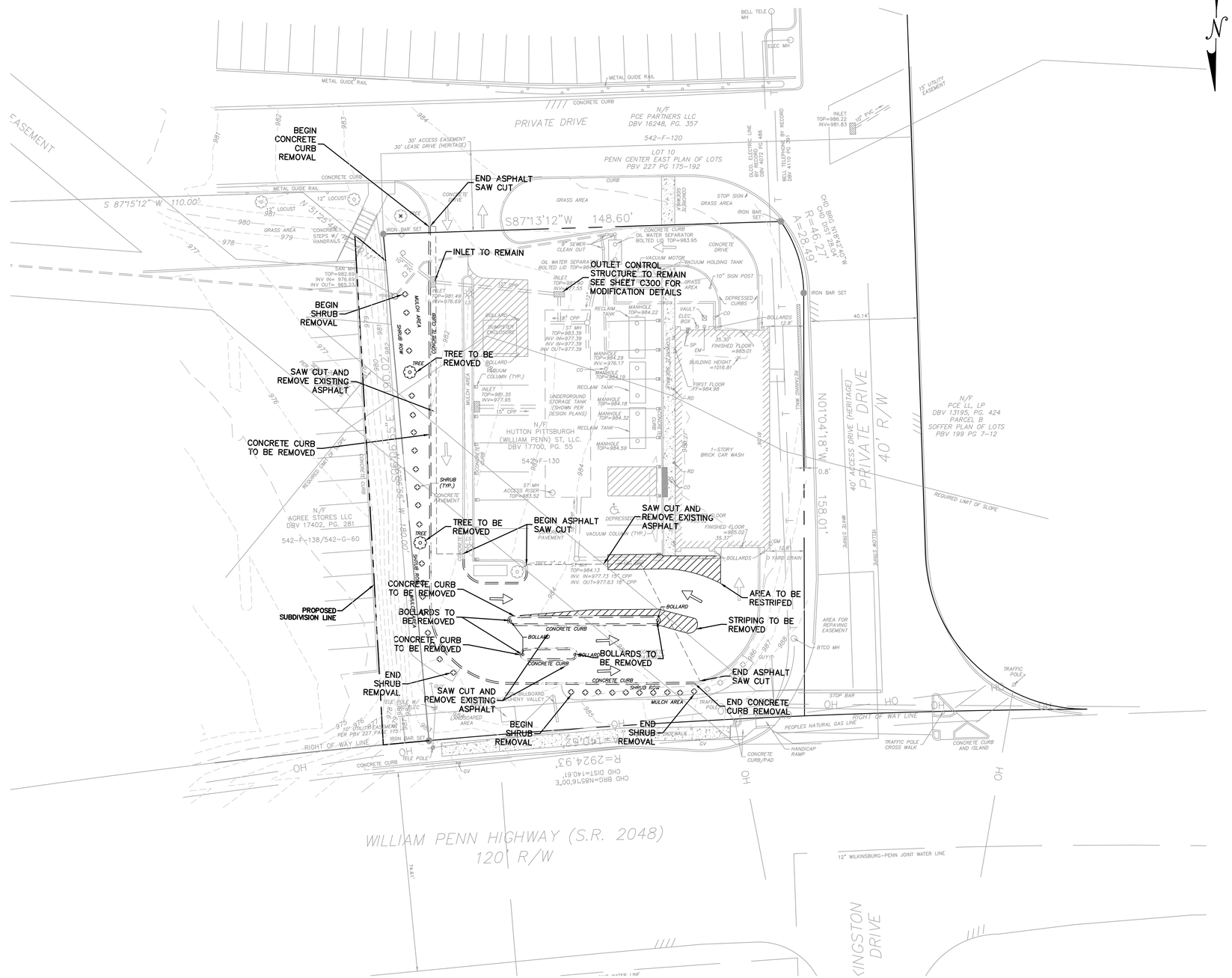
DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Modwash.dwg
LAST SAVED: Apr 05, 2023 - 11:52am - ejmyer

NOTE:

1. THE SUBJECT PROPERTIES ARE NOT LOCATED WITHIN A 100 YEAR FLOOD PLAIN ACCORDING TO FEMA FLOOD MAP NUMBER 42003C0391H, LAST REVISED SEPTEMBER 26, 2014.

DEMOLITION NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FOR DEMOLITION WORK.
2. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITY CONNECTIONS PRIOR TO CONSTRUCTION/DEMOLITION AT THIS SITE. THE CONTRACTOR SHALL ALSO COORDINATE ALL UTILITY CONNECTIONS WITH LOCAL PROVIDERS.
3. ALL EXISTING PAVEMENT, CURB AND SIDEWALK TO BE REMOVED SHALL BE SAW CUT AS SHOWN ON PLANS.
4. CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF ALL DRIVES, WALKS, EXISTING PAVEMENT AND CURBING WITHIN THE LIMITS AS SHOWN. ALL DEBRIS IS TO BE HAULED OFF-SITE TO AN APPROVED LANDFILL.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE ROADWAYS AND ASSOCIATED STRUCTURES AND SHALL MAKE REPAIRS AS NECESSARY TO THE SATISFACTION OF THE MUNICIPALITY OF WILKINS TOWNSHIP. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ADEQUATE SIGNS AND WARNING DEVICES TO INFORM AND PROTECT THE PUBLIC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF TRAFFIC THROUGH THE CONSTRUCTION PERIOD.



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LEGEND

SAN	– SANITARY
ST	– STORM
MH	– MANHOLE
TOP	– TOP OF CASTING
INV	– INVERT / FLOW LINE
WV	– WATER VALVE
GV	– GAS VALVE
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S.R.	– STATE ROUTE
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—OH—	– OVERHEAD WIRES
- - 908 - -	– EXISTING CONTOURS
	– EXISTING INLET
	– EXISTING MANHOLE
= = = = = =	– EXISTING SEWER
—X—X—	– FENCE

GRAPHIC SCALE
0' 10' 20' 40'
SCALE: 1" = 20'

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

THE LOCATION OF EXISTING UTILITIES WERE TAKEN FROM RECORDS AND MARKING PROVIDED BY OTHERS AND OBSERVED EVIDENCE. THE LOCATIONS SHOWN MAY BE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS, SIZES AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL EXERCISE CARE TO AVOID DAMAGE TO ALL EXISTING UTILITIES.

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prepared for
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SHEET NO.
C100

DWG. DATE: P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Modwash.dwg
LAST SAVE: Apr 05, 2023 - 11:50am gzimmer

SITE NOTE:

1. THE CONTRACTOR SHALL INSTALL ALL PAVEMENT MARKINGS AS SHOWN ON THE PLANS.
2. NO WETLANDS EXIST WITHIN THE PROJECT BOUNDARY.
3. MINE OPENINGS ARE NOT ANTICIPATED. IF MINE SPOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL EITHER REWORK THE MATERIAL PER GEOTECHNICAL ENGINEERS RECOMMENDATIONS OR REMOVE THE MATERIAL TO A PERMITTED AREA.
4. NO SIGNIFICANT CULTURAL OR SENSITIVE ENVIRONEMENTAL FEATURES EXIST WITHIN THE PROJECT BOUNDARY. NO FURTHER ENVIRONMENTAL STUDIES WILL BE NECESSARY.
5. NO WATER RESOURCES EXIST WITHIN THE PROJECT BOUNDARY.

ZONING INFORMATION

LOCATION: 3474 WILLIAM PENN HIGHWAY		
ZONE: C-1 COMMERICAL		
USE: CAR WASH		
ITEM	REQUIREMENTS	PROPOSED
MINIMUM FRONT SETBACK	50 FEET	63 FEET
MINIMUM SIDE SETBACK	0 FEET	6 FEET
MINIMUM REAR SETBACK	30 FEET	40 FEET
MAXIMUM BUILDING HEIGHT	35 FEET	35 FEET
MAXIMUM COVERAGE	N/A	65 PERCENT

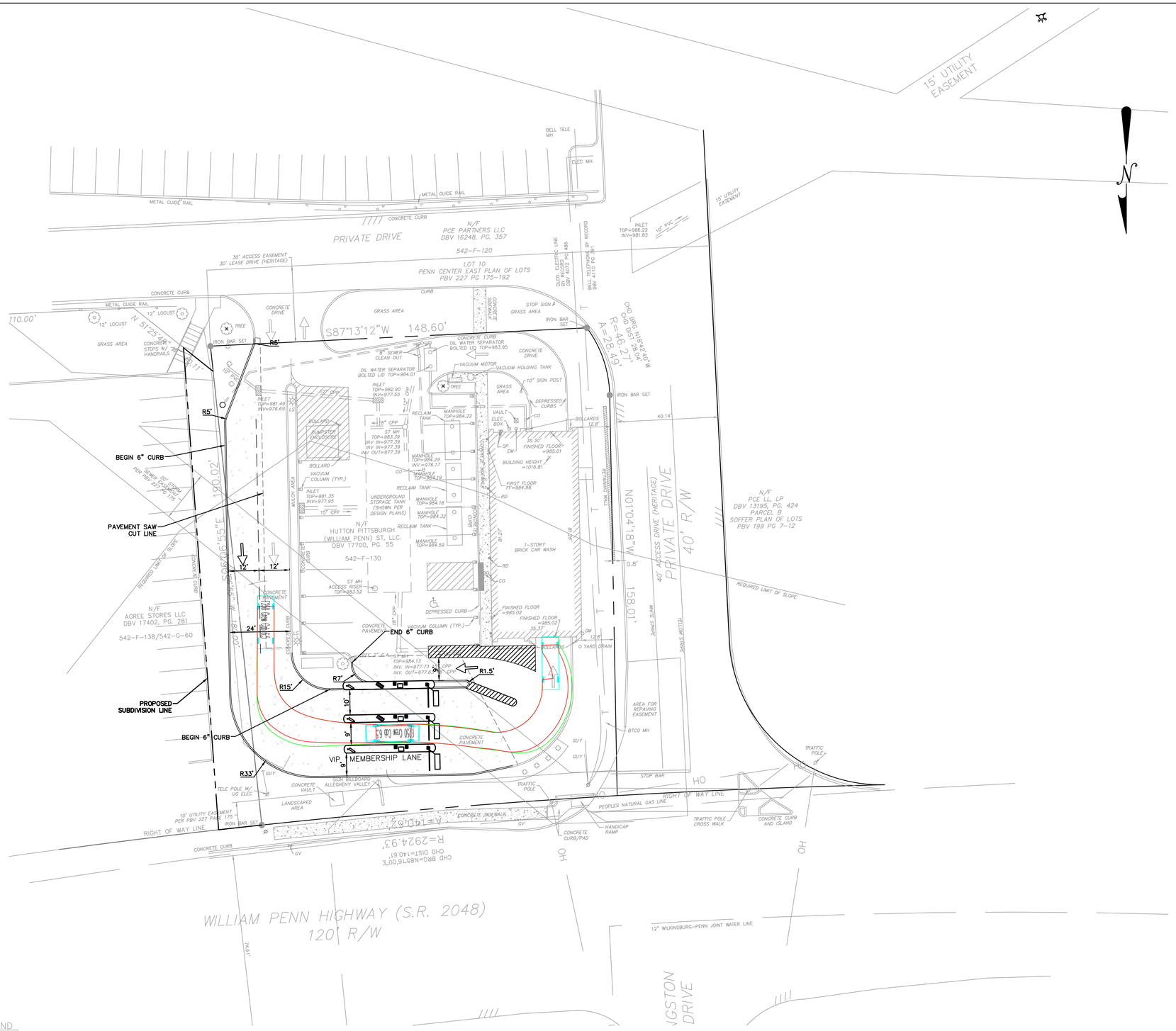
PARKING INFORMATION

REQUIREMENT DESCRIPTION:
1 FOR EACH 300 SQUARE FEET OF GROSS FLOOR AREA OF THE BUILDING OR LOT AREA DEVOTED TO SUCH USE, WHICHEVER IS GREATER. FOR ESTABLISHMENTS WITH DRIVE-THROUGH LANES, THE LANE SHALL ACCOMMODATE FOUR CARS STACKED WITHIN THE LANE.

ITEM	REQUIREMENTS	PROPOSED
PARKING SPACES:	2,838/300=10	15
LOADING SPACE:	N/A	0

PAVEMENT LEGEND

STANDARD DUTY CONCRETE
5" PORTLAND CEMENT CONCRETE
4" AGGREGATE BASE



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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARK M. ZIMMERMAN
ENGINEER
P.E. 079175

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REVISION BY:	DATE:	DESCRIPTION:

DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: APRIL 2023
PROJ. NO.: 1856.21

SCALE:
1"=20'

Morris Knowles & Associates, Inc.
(A Hammontree Company)
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-8922
Fax: (724) 468-8940
info@morrisknowles.com www.morrisknowles.com

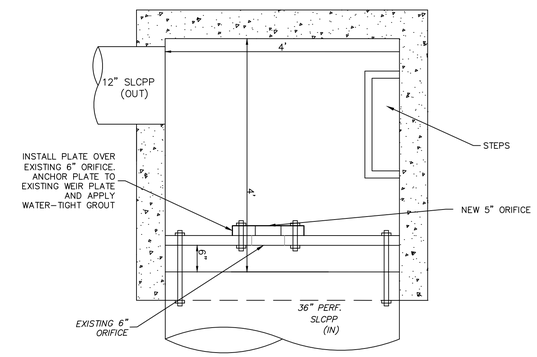
SITE PLAN
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C200

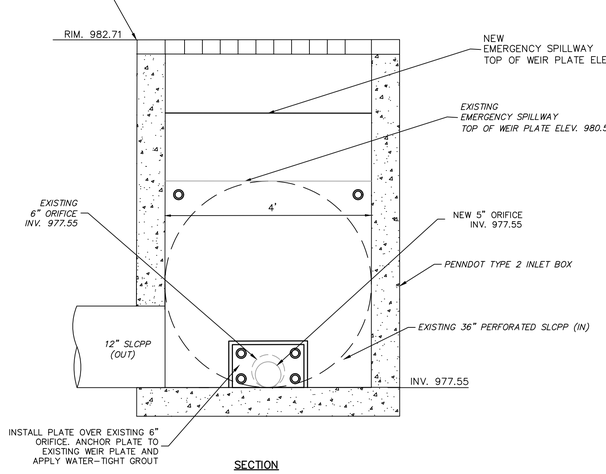
DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Modwash.dwg
LAST SAVE: Apr 05, 2023 - 11:50am tjohner

GRADING NOTES:

1. THE CONTRACTOR SHALL COMPACT ALL FILL MATERIALS OUTSIDE OF PROPOSED BUILDING AREAS, PLACED IN LIFTS, AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY, AS DETERMINED BY ASTM D-1557 (MODIFIED PROCTOR) OR 95% BY ASTM-D698 (STANDARD PROCTOR). PLACE FILL IN EIGHT-INCH LIFTS AND COMPACT WITH AN IMPACT-TYPE ROLLER (I.E. SHEEPSFOOT ROLLER). PROVIDE FOR INSPECTION OF ALL FILL AS IT IS PLACED FOR PROPER DENSITY BY A GEOTECHNICAL TESTING FIRM.
2. THE CONTRACTOR SHALL COMPACT ALL FILL MATERIALS WITHIN PROPOSED BUILDING AREAS, PLACED IN LIFTS, AND COMPACTED TO 95% OF MAXIMUM DRY DENSITY, AS DETERMINED BY ASTM D-1557 (MODIFIED PROCTOR) OR 100% BY ASTM-D698 (STANDARD PROCTOR). PLACE FILL IN EIGHT-INCH LIFTS AND COMPACT WITH AN IMPACT-TYPE ROLLER (I.E. SHEEPSFOOT ROLLER). PROVIDE FOR INSPECTION OF ALL FILL AS IT IS PLACED FOR PROPER DENSITY BY A GEOTECHNICAL TESTING FIRM.
3. ALL CUT AND FILL OPERATIONS SHALL FOLLOW THE "PENNSYLVANIA HANDBOOK OF BEST MANAGEMENT PRACTICES" FOR DEVELOPING AREAS.
4. THE CONTRACTOR SHALL NOT EXCEED A MAXIMUM GRADE BREAK OF 8% IN THE PROPOSED DRIVEWAYS.
5. THE CONTRACTOR SHALL CONTROL DUST ON THE SITE IN ACCORDANCE WITH PA DEP REQUIREMENTS.
6. IF THE CONTRACTOR DISCOVERS CONTAMINATED SOIL ON THE SITE DURING CONSTRUCTION ACTIVITIES, THEN THE SOILS SHALL BE CLEANED AND DISPOSED OF AT AN APPROVED LANDFILL IN ACCORDANCE WITH PADEP RULES, REGULATIONS AND REQUIREMENTS.
7. HANDICAPPED SPACES AND ACCESS ISLES MAXIMUM SLOPE IS 2% IN ALL DIRECTIONS.



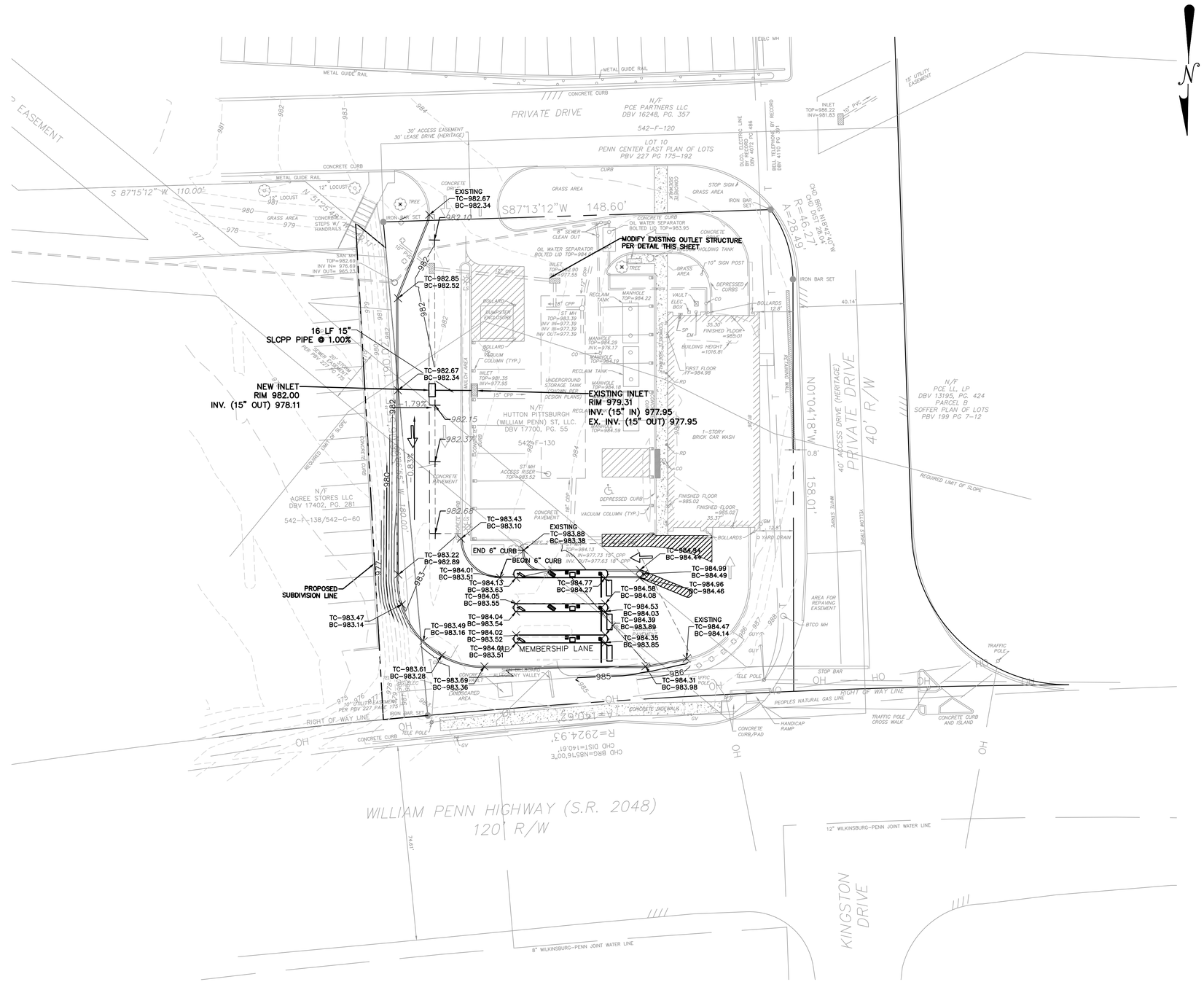
PLAN



SECTION

UNDERGROUND DETENTION POND OUTLET STRUCTURE

NO SCALE



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LEGEND

SAN	– SANITARY	—G—	– GAS LINE
ST	– STORM	—W—	– WATER LINE
MH	– MANHOLE	—T—	– SUBSURFACE TELEPHONE LINE
TOP	– TOP OF CASTING	—E—	– SUBSURFACE ELECTRIC LINE
INV	– INVERT / FLOW LINE	—OH—	– OVERHEAD WIRES
WV	– WATER VALVE	– – 908 – –	– EXISTING CONTOURS
GV	– GAS VALVE		– EXISTING INLET
GM	– GAS METER		– EXISTING MANHOLE
EM	– ELECTRIC METER		– EXISTING SEWER
S.R.	– STATE ROUTE	—X—X—	– FENCE
TELE	– TELEPHONE		
RCP	– REINFORCED CONCRETE PIPE		
CPP	– CORRUGATED PLASTIC PIPE		

GRAPHIC SCALE

0' 10' 20' 40'

SCALE: 1" = 20'

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GRADING PLAN
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C300

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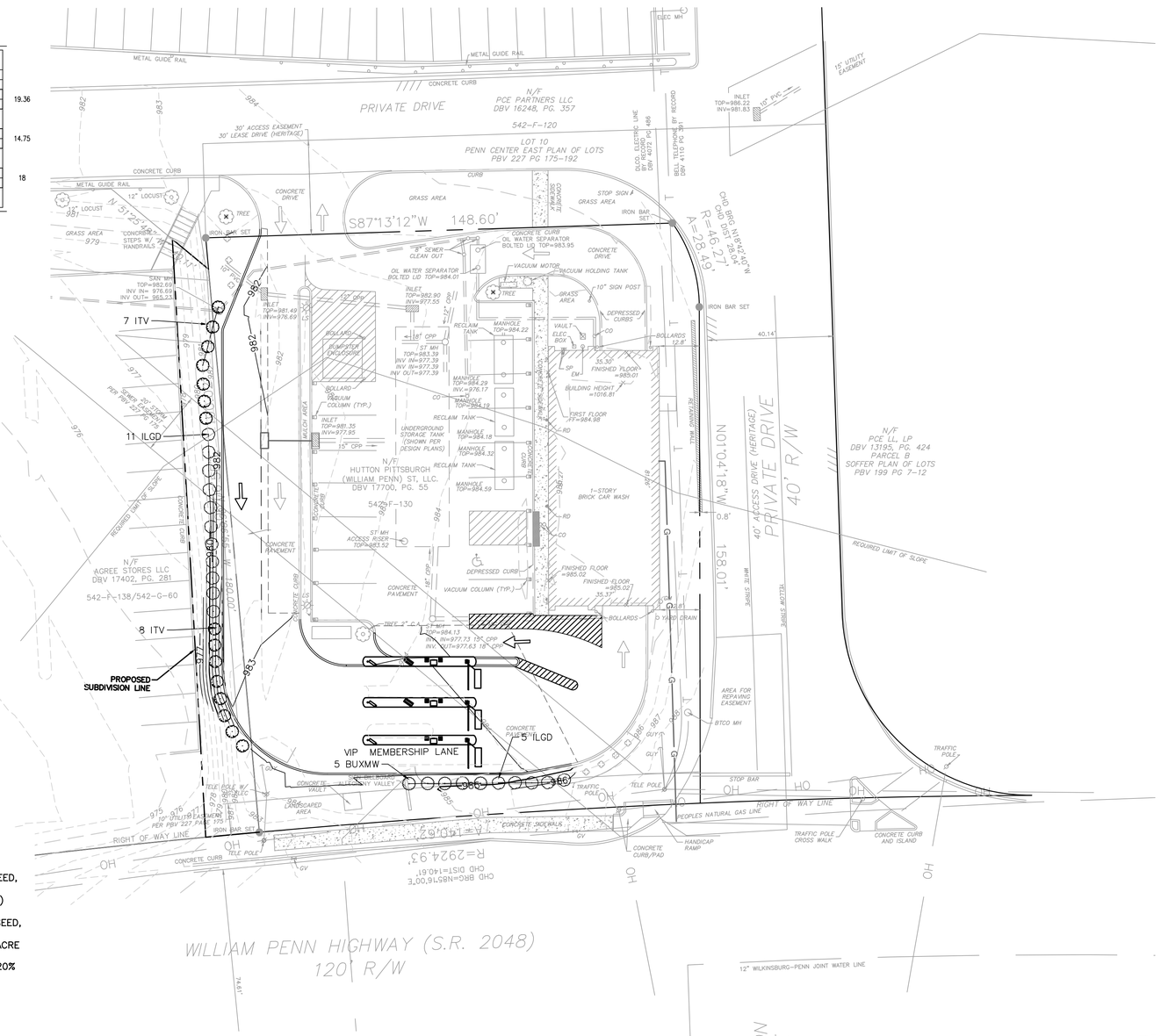
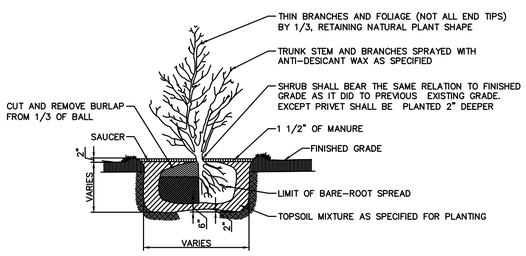
LANDSCAPING NOTES:

1. ALL PLANTING BEDS SHALL RECEIVE 3" DOUBLE SHREDDED BARK MULCH.
2. ALL PLANTING BEDS SHALL BE BACKFILLED WITH 6" DEPTH CLEAN TOPSOIL FREE OF BUILDING DEBRIS, CRUSHED ROCK, MORTAR MIX, ETC.
3. REPAIR/RESEED ALL DISTURBED AREAS WITH SPECIFIED SEED MIXTURES.
4. SEED ALL 2:1 OR STEEPER SLOPES WITH BIRDSFOOT TREFOIL AND TALL FESCUE MIX.
5. ALL DISTURBED AREAS LESS 2:1 SLOPE SHALL BE SEEDED WITH LAWN SEEDING MIXTURE.
6. ALL LAWN AREAS SHALL BE BACKFILLED WITH 6" DEPTH CLEAN TOPSOIL FREE OF BUILDING DEBRIS, CRUSHED ROCK, MORTAR MIX, ETC.
7. ALONG SIDEWALKS, FOUNDATIONS AND CURBINGS, UNDER-RUN FROM CONCRETE FORMS SHALL BE BROKEN AWAY AND REMOVED.
8. PRIOR TO CONSTRUCTION, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE IN THE FIELD THE LOCATIONS OF ALL EXISTING UTILITIES.
9. ALL PLANT MATERIALS SHALL BE OF SPECIMEN QUALITY AND COMPLY WITH THE AMERICAN STANDARD FOR NURSERY STOCK (MOST CURRENT EDITION),
10. ALL PLANT MATERIAL TO BE RE-USED SHALL BE TAGGED BY OWNER. ALL EXISTING PLANT MATERIAL TO BE RE-USED SHALL BE STORED AS SHOWN ON PLAN PRIOR TO PLANTING DURING CONSTRUCTION.
11. TREE TRUNKS AND EXPOSED ROOTS DAMAGED DURING EQUIPMENT OPERATIONS SHALL BE TREATED IN ACCORDANCE WITH ARBORICULTURAL STANDARDS. DAMAGED TREE LIMBS SHALL BE CUT BACK TO THE NEXT LATERAL BRANCH OR PARENT STEM AT THE BRANCH COLLAR.
12. ALL PLANTS SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN AS SPECIFIED. NO CONTAINER GROWN STOCK WILL BE ACCEPTED IF IT IS ROOT BOUND. ALL ROOT WRAPPING MATERIAL MADE OF SYNTHETICS OR PLASTICS SHALL BE REMOVED AT TIME OF PLANTING.
13. THE OWNER RESERVES THE RIGHT TO REJECT ANY AND ALL PLANT MATERIAL DEEMED NOT ACCEPTABLE.
14. ALL PLANTS AND STAKES SHALL BE SET PLUMB UNLESS OTHERWISE SPECIFIED.
15. REMOVE BURLAP, ROPES, WIRE, AND OTHER NON-BIODEGRADABLE MATERIALS FROM THE ROOT BALLS AFTER FINAL POSITIONING.
16. SPADE CUT ALL BED EDGES AND MULCHED RINGS ARE TO BE SPADE CUT TO A DEPTH OF 6", CUT AT 90° TO THE FINISHED GRADE AND THEN BACK TOWARD THE PLANT BED AT 45°.
17. TOPSOIL SHALL BE FROM A NATURALLY WELL DRAINED SITE WHERE SOIL OCCURS AT A DEPTH OF AT LEAST 4". TOPSOIL SHOULD HAVE A pH OF 5.5 TO 7 WITH 4 PERCENT ORGANIC MATERIAL MINIMUM AND BE FREE OF STONES 1" DIAMETER OR LARGER, ROOTS, PLANTS, CLAY LUMPS AND OTHER MATERIALS HARMFUL TO PLANT GROWTH.
18. ALL PLANTS SHALL BE WATERED THOROUGHLY TWICE DURING THE FIRST 24-HOUR PERIOD AFTER PLANTING. ALL PLANTS SHALL THEN BE WATERED WEEKLY, IF NECESSARY, DURING THE FIRST GROWING SEASON.
19. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING ALL DEAD PLANT MATERIAL FROM NATURAL CAUSES INSTALLED PURSUANT TO THESE REQUIREMENTS FOR A PERIOD OF ONE (1) YEAR AFTER THE INSTALLATION DATE. IT SHALL BE THE RESPONSIBILITY OF THE OWNER/APPLICANT TO ASSURE THE CONTINUED GROWTH OF ALL REQUIRED LANDSCAPING AND/OR TO REPLACE THE SAME IN THE EVENT OF FROST, VANDALISM, DISEASE, OR OTHER REASONS FOR DISCONTINUED GROWTH OF THE REQUIRED TREES, SHRUBS, AND BRUSHES. IT IS THE OWNER'S RESPONSIBILITY FOR ALL FUTURE MAINTENANCE. NO PERSON SHALL REMOVE ANY LANDSCAPING (i.e. TREES, SHRUBS, OR BRUSHES) AFTER THE SAME HAS BEEN PLANTED UNLESS THE SAME ARE REPLACED WITH AN EQUIVALENT TREE, SHRUB, OR BUSH.
20. PERMANENT SEEDING SHALL BE REQUIRED FOR ALL DISTURBED SLOPE AREAS WITHIN FOURTEEN (14) DAYS OF COMPLETION OF GRADING OPERATIONS, WEATHER PERMITTING.
21. THE CONTRACTOR SHALL NOT PLANT SHRUBS IN AREAS UNDERLAIN BY SHALLOW DEPTH TO ROCK.
22. AFTER PLANTS ARE ESTABLISHED, ALL PLANT STAKING SHALL BE REMOVED.

PLANTING SCHEDULE

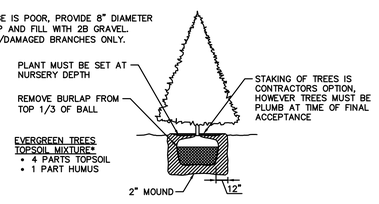
LEGEND	KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE / COND	REMARKS	HEIGHT / SPREAD	
	BUXMW	5	Buxus microphylla 'Wintergreen'	Wintergreen Littleleaf Boxwood	No.3 Cont.	Evergreen	4'-5' / 3'-4'	19.36
	ITV	15	Itea virginica	Virginia Sweetspire	24" / No.3 Cont.	Deciduous Frag White Flw	3'-5' / 4'-6'	14.75
	ILGD	16	3 'Densa'	Densa Compact Inkberry	24" / B & B	Evergreen	3'-4' / 4-5'	18





SHRUB PLANTING DETAIL
N.T.S.

NOTES:
- WHERE DRAINAGE IS POOR, PROVIDE 8" DIAMETER HOLE 12" DEEP AND FILL WITH 2B GRAVEL.
- PRUNE BROKEN/DAMAGED BRANCHES ONLY.



EVERGREEN TREE PLANTING
N.T.S.

PERMANENT STABILIZATION

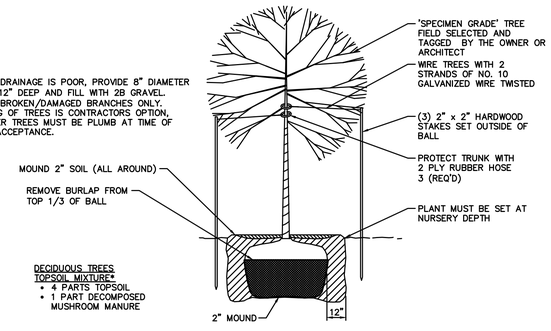
SPECIES :
- POA PRATENSIS (KENTUCKY BLUEGRASS) 90% PURE LIVE SEED, APPLICATION RATE 50LBS/AC
- FESTUCA RUBRA VAR. 'PENNLAWN" (PENNLAWN RED FESCUE) 98% PURE LIVE SEED, APPLICATION RATE 30LBS/AC
- LOLIUM PERENNE (PERENNIAL RYEGRASS) 98% PURE LIVE SEED, APPLICATION RATE 20LBS/AC

FERTILIZER: COMMERCIAL FERTILIZER, 10-20-20, 1,000 LBS./ACRE
LIMING: 4,000 LBS./ACRE
MULCH: WHEAT OR OAT STRAW WELL CURED TO LESS THAN 20% MOISTURE BY WEIGHT, 5,800 POUNDS PER ACRE
SEEDING DATES: SPRING – MARCH TO MAY 30,
FALL – SEPTEMBER 1 TO OCTOBER 15

PERMANENT-STEEP SLOPE

SPECIES: BIRDSFOOT TREFOIL AND TALL FESCUE MIX
% PURE LIVE SEED: 99%
APPLICATION RATE: 10 AND 50 LBS/ACRE. RESPECTIVELY
FERTILIZER TYPE: COMMERCIAL FERTILIZER 5-10-10
FERTILIZER APPL. RATE: (PER TESTING) 30 LBS/ACRE
LIMING RATE: 1 TONS/ACRE MULCH TYPE: HAY & STRAW
MULCHING RATE: 3 TONS/ACRE
ANCHORING MATERIAL: NONASPHALTIC MATERIAL
ANCHORING METHOD: SPRAY
RATE OF ANCHORING MATERIAL APPL.: 1000 GAL/SQ.YD.
SEEDING DATES: APRIL-SEPT.

NOTES:
- WHERE DRAINAGE IS POOR, PROVIDE 8" DIAMETER HOLE 12" DEEP AND FILL WITH 2B GRAVEL.
- PRUNE BROKEN/DAMAGED BRANCHES ONLY.
- STAKING OF TREES IS CONTRACTORS OPTION, HOWEVER TREES MUST BE PLUMB AT TIME OF FINAL ACCEPTANCE.



DECIDUOUS TREE PLANTING
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—OH— – OVERHEAD WIRES
– – 908 – – – EXISTING CONTOURS
– EXISTING INLET
– EXISTING MANHOLE
= = = = = = – EXISTING SEWER
—X—X— – FENCE

GRAPHIC SCALE
0' 10' 20' 40'
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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
MARK M. ZIMMERMAN
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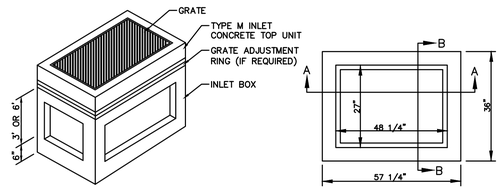
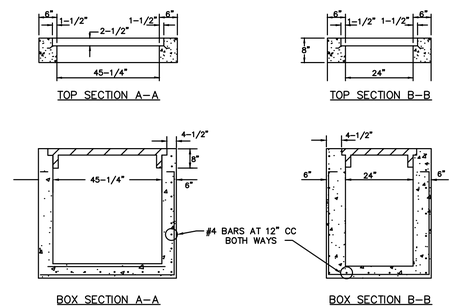


PENNDOT TYPE 'M' INLET

PLAN VIEW



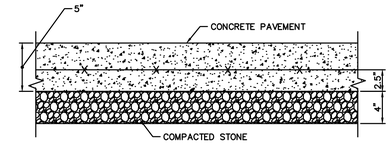
TOP SECTION A-A

TOP SECTION B-B

BOX SECTION A-A

BOX SECTION B-B

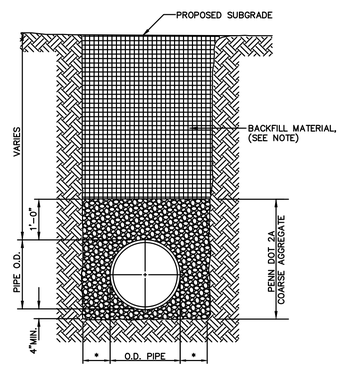
TYPE "M" INLET
N.T.S.



NOTES:

1. CONCRETE SHALL BE PENNDOT CLASS A CONCRETE.
2. REINFORCEMENT SHALL BE WWF6X6.
3. COMPACTED STONE SHALL BE 2A STONE.
4. IF SUBGRADE MATERIALS ARE UNSUITABLE, CONTRACTOR SHALL EXCAVATE TO SUITABLE MATERIAL, FILL AND COMPACT TO PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
5. CONTRACTOR SHALL INSTALL AND COMPACT SUBBASE ACCORDING TO PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
6. CONTRACTOR SHALL COMPACT THE SUBGRADE TO AT LEAST 95% OF THE MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D-1557. THE SUBGRADE SHALL BE IN A STABLE, NON-YIELDING CONDITION AT THE TIME OF PAVING.

STANDARD DUTY CONCRETE PAVEMENT
N.T.S.



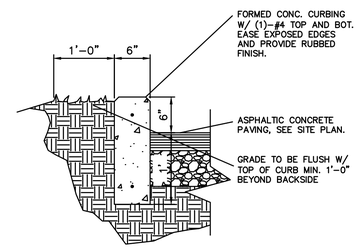
PLASTIC PIPE

O.D. – OUTSIDE PIPE DIAMETER
* 12" IN PENNDOT R.O.W.
8" MIN. IN ALL OTHER CONDITIONS

STORM SEWER STANDARD TRENCHING
N.T.S.

BACKFILL:
ALL STREET, SIDEWALK AND PARKING AREA CROSSINGS SHALL BE BACKFILLED TO SUBGRADE WITH AASHTO #57 AGGREGATE, GRAVEL OR STONE FOR SEWERS AND 2A LIMESTONE FOR ALL OTHER UTILITIES.

IN ALL OTHER TRENCH AREAS; BACKFILL FROM THE SPRINGLINE TO (1) ONE FOOT ABOVE THE TOP OF PIPE, TO BE SELECTED MATERIAL (SELECTED MATERIAL IS FINELY DIVIDED MATERIAL FREE OF DEBRIS, ORGANIC MATERIAL AND STONES.), TAMPED IN (4) FOUR INCH LAYERS; THEN THE REMAINING BACKFILL FROM THE TRENCH MAY BE PLACED. IF UNSUITABLE BACKFILL IS DETERMINED TO BE PRESENT BY THE OWNER REPRESENTATIVE, IMPORTED BACKFILL WILL BE REQUIRED.



PROVIDE CONTROL JOINTS AT 10'-0" O.C. (25% SLAB THICKNESS)

CONCRETE STRAIGHT CURB SECTION
N.T.S.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

THE LOCATION OF EXISTING UTILITIES WERE TAKEN FROM RECORDS AND MARKING PROVIDED BY OTHERS AND OBSERVED EVIDENCE. THE LOCATIONS SHOWN MAY BE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS, SIZES AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL EXERCISE CARE TO AVOID DAMAGE TO ALL EXISTING UTILITIES.

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARK M. ZIMMERMAN
ENGINEER
P.E. 079175

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DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: APRIL 2023
PROJ. NO.: 1856.21

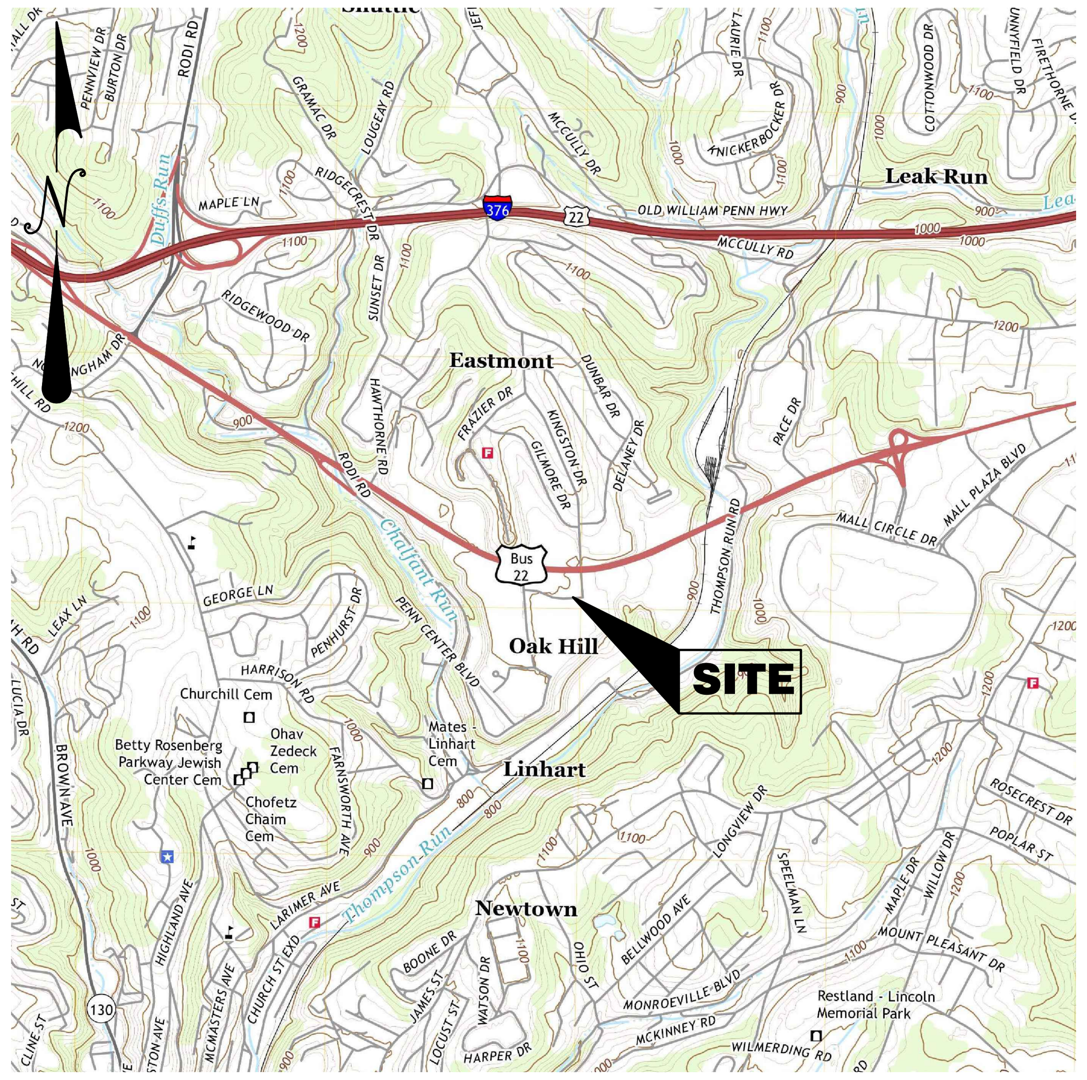
SCALE:
N.T.S.

Morris Knowles (A Associates, Inc.)
Consulting Engineers and Land Surveyors
443 Athens Drive
Delmont, PA 15626
Telephone: (724) 468-8822
Fax: (724) 468-8840
info@morrisknowles.com www.morrisknowles.com

GENERAL DETAILS
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C600

DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Modwash.c.dwg
LAST SAVED: Apr 05, 2023 - 11:12pm jjunker



LOCATION MAP
SCALE: 1"=2000'
USGS QUADRANGLE MAP
BRADDOCK, PA

MODWASH - WILKINS TOWNSHIP

EROSION AND SEDIMENTATION CONTROL PLAN
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA
APRIL 2023

SHEET NO.	TITLE
C700	EROSION AND SEDIMENTATION CONTROL TITLE
C701	EROSION & SEDIMENTATION CONTROL PLAN
C702	EROSION & SEDIMENTATION CONTROL DETAILS

DEVELOPER:
HUTTON ST 17, LLC
736 CHERRY STREET
CHATTANOOGA, TN 37402
PHONE NO.: 423-599-2037
REP.: DEVIN BAKER

CHAPTER 93 RECEIVING WATER COURSE:

1. THE RECEIVING WATER COURSE IS THOMPSON RUN WHICH IS DESIGNATED AS A WARM WATER FISHES (WWF), BY THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, CHAPTER 93.

UNDERGROUND DETENTION CONSTRUCTION SEQUENCES:

UNDERGROUND DETENTION POND CONSTRUCTION SEQUENCE:
STAGE 1: INSTALLATION OF UNDERGROUND DETENTION FACILITIES
A. WHEN SITE IS STABILIZED WITH UNIFORM 70% PERENNIAL VEGETATIVE COVER OVER PROJECT AREA, INSTALL STORMWATER MANAGEMENT FACILITIES.

STAGE 2: INSTALL UNDERGROUND DETENTION FACILITY #1 PER DETAIL AND SPECIFICATIONS. CONTRACTOR SHALL PREVENT COMPACTION WITHIN INFILTRATION AREA TO THE GREATEST EXTENT POSSIBLE. IN THE EVENT OF COMPACTION, WITHIN THE INFILTRATION ZONE, THE CONTRACTOR SHALL SCARIFY THE SOIL TO PROMOTE INFILTRATION.

A. INSTALL NON-WOVEN GEOTEXTILE ALONG BOTTOM OF INFILTRATION AREA.
B. INSTALL OUTLET STRUCTURE AND WEIR PLATES ACCORDING TO THE PLAN SHEET C801.
C. INSTALL AND CONNECT PERFORATED HDPE PIPES TO OUTLET STRUCTURES. BACKFILL WITH 2B STONE PER SPECIFICATIONS ON C801.
D. CONNECT STORMSEWER PIPING TO THE UNDERGROUND DETENTION FACILITY
E. **THE CRITICAL STAGE IN WHICH LICENSED PROFESSIONAL OR DESIGNEE MUST BE ON-SITE IS PRIOR TO THE STONE BEDDING IS LAID, INSTALLATION OF PERFORATED HDPE PIPES AND OUTLET STRUCTURE, AND BACKILLING OF PERFORATED HDPE PIPES**

LANDSCAPE RESTORATION SEQUENCE:
A. PERMANENT SEEDING SHALL BE ERNST SEED MIX ERNMX-181 NATIVE STEEP SLOPE MIX OR EQUIVALENT.
B. DISTURBED AREA TO BE RE-PLANTED WITH VEGETATION AS SHOWN ON PLAN.

NOTES:
THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY ENGINEER. CONTRACTOR AND/OR OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT WRITTEN CONSENT OF ENGINEER. ALL UTILITIES SHOWN ON PLANS ARE IN APPROXIMATE LOCATIONS, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO GAIN EXACT LOCATIONS AND DEPTH OF ALL UTILITIES PRIOR TO ANY CONSTRUCTION.

CONSTRUCTION SEQUENCE:

THE ENTIRE SITE CANNOT BE CLEARED AND GRUBBED AT ONE TIME. ONLY AREAS FOR WHICH THE SPECIFIED EROSION AND SEDIMENTATION CONTROL HAS BEEN INSTALLED CAN BE CLEARED AND GRUBBED OR DISTURBED.

STAGE 1: INSTALL INLET PROTECTION ON STORM SEWER INLETS
A. CLEAN INLETS TO ENSURE PROPER STORMWATER FLOW THROUGH INLETS.
B. INSTALL INLET PROTECTION.

STAGE 2: INSTALL 12" COMPOST FILTER SOCK
A. INSTALL 24" COMPOST FILTER SOCK PER PLAN ON C701.

STAGE 3: CLEAR SITE
A. CLEAR SITE, CUT TRUNKS INTO TIMBER OR FIREWOOD AND CHIP BRANCHES ETC. LIMIT ADVANCED CLEARING AND GRUBBING AS MUCH AS POSSIBLE TO REDUCE THE AMOUNT OF AREA DISTURBED AT ANY ONE TIME. RECYCLING OF MATERIALS SHALL BE DONE WHERE POSSIBLE.
B. THE ENTIRE SITE CANNOT BE CLEARED AND GRUBBED AT ONE TIME. ONLY AREAS FOR WHICH THE SPECIFIED EROSION AND SEDIMENTATION CONTROL HAS BEEN INSTALLED CAN BE CLEARED AND GRUBBED OR DISTURBED.

STAGE 4: EXCAVATION
A. UPON COMPLETION OF THE INLET PROTECTION, COMPOST FILTER SOCK, AND INSTALLATION OF ALL PERIMETER CONTROLS, THE CONTRACTOR SHALL BEGIN EARTHMOVING ACTIVITIES.
B. EXCAVATE SITE TO DESIGN GRADE. APPLY TEMPORARY STABILIZATION TO EMBANKMENTS AND FINISH GRADE AREAS IN CUT OR FILL.
C. PLACE EROSION CONTROL BLANKET AS NOTED ON PLANS AFTER MATERIAL IS PLACED AND PROPERLY COMPACTED.
D. ALL WATER PUMPED FROM WORK AREAS SHALL BE TREATED FOR SEDIMENT REMOVAL PRIOR TO DISCHARGING TO A SURFACE WATER.
E. AS SOON AS DISTURBED AREA REACHES FINAL GRADE, AREAS MUST BE STABILIZED.
F. NO MORE THAN 15,000 SQUARE FEET OF DISTURBED AREA SHALL REACH FINAL GRADE BEFORE INITIATING SEED AND MULCHING OPERATIONS.
G. FILL SLOPES SHALL BE STABILIZED IN 15 FOOT VERTICAL INCREMENTS.

STAGE 5: INSTALL PROPOSED STORM SEWER SYSTEM
A. INSTALL STORM SEWER SYSTEM FROM LOWEST TO HIGHEST ELEVATION AND ADHERE TO UTILITY TRENCH GUIDELINES.
B. INSTALL INLET PROTECTION ON ALL INLETS UNTIL THE ENTIRE SITE HAS BEEN STABILIZED.

STAGE 6: INSTALL PAVEMENT
A. INSTALL CONCRETE WASHOUT AS INDICATED ON PLAN SHEET C701.
B. INSTALL PAVEMENT AT DRIVEWAYS AND PARKING LOT.

STAGE 7: INSTALL LANDSCAPING
A. INSTALL LANDSCAPING PLANTS AND PROVISIONS.

STAGE 8: SEED AND MULCH
A. SEED/MULCH ALL DISTURBED AREAS WITH SPECIFIED SEEDING MIXTURE. ALL E & S CONTROL FACILITIES SHALL BE MAINTAINED AND KEPT FUNCTIONAL UNTIL SITE STABILIZATION IS COMPLETE.

STAGE 9: SITE STABILIZATION
A. WHEN SITE IS STABILIZED WITH UNIFORM 70% PERENNIAL VEGETATIVE COVER OVER PROJECT AREA, REMOVE EROSION AND SEDIMENTATION CONTROLS.

EROSION AND SEDIMENTATION CONTROL PLAN NOTES:

1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN. A COPY OF THE APPROVED DRAWINGS (STAMPED, SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE REVIEWING AGENCY SHALL BE NOTIFIED OF ANY CHANGES TO THE APPROVED PLAN PRIOR TO IMPLEMENTATION OF THOSE CHANGES. THE REVIEWING AGENCY MAY REQUIRE A WRITTEN SUBMITTAL OF THOSE CHANGES FOR REVIEW AND APPROVAL AT ITS DISCRETION.
2. AT LEAST 7 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, THE LANDOWNER, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE PCSM PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON-SITE PRECONSTRUCTION MEETING.
3. AT LEAST 3 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS. DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE LOCAL CONSERVATION DISTRICT OR BY THE DEPARTMENT PRIOR TO IMPLEMENTATION.
5. AREAS TO BE FILLED ARE TO BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL.
6. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. GENERAL SITE CLEARING, GRUBBING AND TOPSOIL STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE E&S BMPS SPECIFIED BY THE BMP SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.
7. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS. THESE AREAS MUST BE CLEARLY MARKED AND FENCED OFF BEFORE CLEARING AND GRUBBING OPERATIONS BEGIN.
8. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED AT THE LOCATION(S) SHOWN ON THE PLAN MAP(S) IN THE AMOUNT NECESSARY TO COMPLETE THE FINISH GRADING OF ALL EXPOSED AREAS THAT ARE TO BE STABILIZED BY VEGETATION. EACH STOCKPILE SHALL BE PROTECTED IN THE MANNER SHOWN ON THE PLAN DRAWINGS. STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SLOPES SHALL BE 2H:1V OR FLATTER.
9. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LOCAL CONSERVATION DISTRICT AND/OR THE REGIONAL OFFICE OF THE DEPARTMENT.
10. ALL BUILDING MATERIALS AND WASTES SHALL BE REMOVED FROM THE SITE AND RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET. SEQ., 271.1, AND 287.1 ET. SEQ. NO BUILDING MATERIALS OR WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED, OR DISCHARGED AT THE SITE.
11. ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED.
12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CLEAN FILL. FORM FP-001 MUST BE RETAINED BY THE PROPERTY OWNER FOR ANY FILL MATERIAL AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE BUT QUALIFYING AS CLEAN FILL DUE TO ANALYTICAL TESTING.
13. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE PROCEDURE DESCRIBED IN THIS PLAN, OVER UNDISTURBED VEGETATED AREAS.
14. VEHICLES AND EQUIPMENT MAY ENTER DIRECTLY ONTO KINGSTON DRIVE & WILLIAM PENN HIGHWAY (RT. 22).
15. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS SHALL BE MAINTAINED PROPERLY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF THE E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
16. A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION. INSPECTIONS SHALL BE LOGGED ON THE MOST CURRENT DEP FORM 3150-FM-BWEW0083 AND KEPT ON SITE AT ALL TIMES.
17. SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED OF IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.
18. ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS.
19. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES - 6 TO 12 INCHES ON COMPACTED SOILS - PRIOR TO PLACEMENT OF TOPSOIL. AREAS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING AND MULCHING. FILL OUTSLOPES SHALL HAVE A MINIMUM 2 INCHES OF TOPSOIL.
20. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
21. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
22. FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
23. FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.
24. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
25. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATIONS FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
26. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE. CUT SLOPES IN COMPETENT BEDROCK AND ROCK FILLS NEED NOT BE VEGETATED. SEEDED AREAS WITHIN 50 FEET OF A SURFACE WATER, OR AS OTHERWISE SHOWN ON THE PLAN DRAWINGS, SHALL BE BLANKETED ACCORDING TO THE STANDARDS OF THIS PLAN.
27. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF A PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS. DURING NON-GERMINATEING MONTHS, MULCH OR PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.
28. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.
29. E&S BMPS SHALL REMAIN FUNCTIONAL AS SUCH UNTIL ALL AREAS TRIBUTARY TO THEM ARE PERMANENTLY STABILIZED OR UNTIL THEY ARE REPLACED BY ANOTHER BMP APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.
30. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT FOR AN INSPECTION PRIOR TO REMOVAL CONVERSION OF THE E&S BMPS.
31. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS SHALL BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID REVEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSIONS ARE TO BE DONE ONLY DURING THE GERMINATING SEASON.
32. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT TO SCHEDULE A FINAL INSPECTION.
33. FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES BEING INSTITUTED BY THE DEPARTMENT AS DEFINED IN SECTION 602 OF THE PENNSYLVANIA CLEAN STREAMS LAW. THE CLEAN STREAMS LAW PROVIDES PROVIDES FOR UP TO $10,000 PER DAY IN CIVIL PENALTIES, UP TO $10,000 IN SUMMARY CRIMINAL PENALTIES, AND UP TO $25,000 IN MISDEMEANOR CRIMINAL PENALTIES FOR EACH VIOLATION.
34. CONCRETE WASH WATER SHALL BE HANDLED IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS. IN NO CASE SHALL IT BE ALLOWED TO ENTER ANY SURFACE WATERS OR GROUNDWATER SYSTEMS.
35. ALL CHANNELS SHALL BE KEPT FREE OF OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO FILL, ROCKS, LEAVES, WOODY DEBRIS, ACCUMULATED SEDIMENT, EXCESS VEGETATION, AND CONSTRUCTION MATERIAL/WASTES.
36. UNDERGROUND UTILITIES CUTTING THROUGH ANY ACTIVE CHANNEL SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL RESTORED TO ITS ORIGINAL CROSS-SECTION AND PROTECTIVE LINING. ANY BASE FLOW WITHIN THE CHANNEL SHALL BE CONVEYED PAST THE WORK AREA IN THE MANNER DESCRIBED IN THIS PLAN UNTIL SUCH RESTORATION IS COMPLETE.
37. CHANNELS HAVING RIPRAP, RENO MATTRESS, OR GABION LININGS MUST BE SUFFICIENTLY OVER-EXCAVATED SO THAT THE DESIGN DIMENSIONS WILL BE PROVIDED AFTER PLACEMENT OF THE PROTECTIVE LINING.
38. SEDIMENT BASINS AND/OR TRAPS SHALL BE KEPT FREE OF ALL CONSTRUCTION WASTE, WASH WATER, AND OTHER DEBRIS HAVING POTENTIAL TO CLOG THE BASIN-TRAP OUTLET STRUCTURES AND/OR POLLUTE THE SURFACE WATERS.
39. SEDIMENT BASINS SHALL BE PROTECTED FROM UNAUTHORIZED ACTS BY THIRD PARTIES.
40. ANY DAMAGE THAT OCCURS IN WHOLE OR IN PART AS A RESULT OF BASIN OR TRAP DISCHARGE SHALL BE IMMEDIATELY REPAIRED BY THE PERMITTEE IN A PERMANENT MANNER SATISFACTORY TO THE MUNICIPALITY, LOCAL CONSERVATION DISTRICT, AND THE OWNER OF THE DAMAGED PROPERTY.
41. UPON REQUEST, THE APPLICANT OR HIS CONTRACTOR SHALL PROVIDE AN AS-BUILT (RECORD DRAWING) FOR ANY SEDIMENT BASIN OR TRAP TO THE MUNICIPAL INSPECTOR, LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.
42. EROSION CONTROL BLANKETING SHALL BE INSTALLED ON ALL SLOPES 3H:1V OR STEEPER WITHIN 50 FEET OF A SURFACE WATER AND ON ALL OTHER DISTURBED AREAS SPECIFIED ON THE PLAN MAPS AND/OR DETAIL SHEETS.
43. FILL MATERIAL FOR EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS.
44. NO WETLANDS EXIST WITHIN THE PROJECT BOUNDARY.
45. MINE OPENINGS ARE NOT ANTICIPATED. IF MINE SPOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL EITHER REWORK THE MATERIAL PER GEOTECHNICAL ENGINEERS RECOMMENDATIONS OR REMOVE THE MATERIAL TO A PERMITTED AREA.
46. NO SIGNIFICANT CULTURAL OR SENSITIVE ENVIRONEMENTAL FEATURES EXIST WITHIN THE PROJECT BOUNDARY. NO FURTHER ENVIRONMENTAL STUDIES WILL BE NECESSARY.
47. NO WATER RESOURCES EXIST WITHIN THE PROJECT BOUNDARY.

EROSION AND SEDIMENT CONTROL FACILITIES MAINTENANCE SCHEDULE

1. ALL EROSION AND SEDIMENT CONTROLS SHALL BE MAINTAINED UNTIL A UNIFORM 70% PERENNIAL VEGETATIVE COVER IS ESTABLISHED.

ROCK CONSTRUCTION ENTRANCE

1. THE ROCK CONSTRUCTION ENTRANCES ARE TO BE INSPECTED AT THE END OF EACH WORKING DAY AND REPAIRED IMMEDIATELY.
2. THE THICKNESS OF THE ROCK CONSTRUCTION ENTRANCE SHALL BE CONSTANTLY MAINTAINED AT 8".
3. A ROCK STOCKPILE IS TO BE READILY AVAILABLE ON THE SITE AT ALL TIMES FOR IMMEDIATE REPAIR.

COMPOST FILTER SOCK

1. THE COMPOST FILTER SOCK CONTROLS SHALL BE INSPECTED WEEKLY AND AFTER EACH STORM (RUNOFF) EVENT AND REPAIRED IMMEDIATELY.
2. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN DEPOSITS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK.
3. SILT DEPOSITS SHALL BE TAKEN TO THE TOPSOIL STOCKPILE AREA. THE SILT SHALL THEN BE SPREAD OVER STOCKPILE, SEEDED AND MULCHED.
4. ALL UNDERCUTTING OR EROSION OF THE COMPOST FILTER SOCK TOE ANCHOR SHALL BE REPAIRED IMMEDIATELY.
5. ANY COMPOST FILTER SOCK SECTION WHICH HAS BEEN UNDERMINED OR TOPPED SHALL BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET.

VEGETATION

1. THE CONTRACTOR SHALL INSPECT VEGETATED AREAS WEEKLY AND AFTER EACH STORM (RUNOFF) EVENT.
2. THE CONTRACTOR SHALL INSPECT THE SITE FOR RILLS OR GULLIES ON CUT OR FILL SLOPES. THE CONTRACTOR SHALL FILL RILLS AND GULLIES, REGRADE DISTURBED AREAS TO PROVIDE A UNIFORM SLOPE, THEN RESEED/MULCH AND REPAIR/REPLACE MATS TO ORIGINAL SPECIFICATIONS.
3. THE REPAIRS SHALL BE MADE WITHIN 2 DAYS OF DISCOVERING PROBLEM.

PUMPED WATER FILTERING DEVICE

1. THE CONTRACTOR SHALL INSPECT FILTER BAGS DAILY AND AFTER EACH STORM (RUNOFF) EVENT TO ENSURE THEY ARE WORKING PROPERLY.
2. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.
3. ALL SEDIMENT REMOVED FROM THE FILTER BAGS SHALL BE TAKEN TO THE TOPSOIL STOCKPILE, SPREAD, SEEDED AND MULCHED.

COMPOST SOCK WASHOUT FACILITY

1. A SUITABLE IMPERVIOUS GEOMEMBRANE SHALL BE PLACED AT THE LOCATION OF THE WASHOUT PRIOR TO INSTALLING THE SOCKS.
2. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING WASHOUTS SHOULD BE DEACTIVATED AND REPAIRED OR REPLACED.
3. ACCUMULATED MATERIALS SHOULD BE REMOVED WHEN THEY REACH 75% CAPACITY.
4. PLASTIC LINERS SHOULD BE REPLACED WITH EACH CLEANING OF THE WASHOUT FACILITY.

GENERAL NOTES:

1. THE GENERAL CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES INVOLVED IN THE SITE NO MORE THAN TEN DAYS AND NO LESS THAN THREE DAYS IN ADVANCE OF EXCAVATION (PA ACT 287 OF 1974 AMENDED BY ACT 121 OF 2008).
2. TRAFFIC SHALL BE MAINTAINED ON ALL ADJOINING STREETS AND DRIVES AT ALL TIMES. TRAFFIC CONTROL SHALL BE MAINTAINED IN ACCORDANCE WITH PENNDOT'S REQUIREMENTS.
3. CONTRACTOR SHALL USE ASPHALT WEDGE CURBS, UNLESS NOTED, OUTSIDE OF THE PUBLIC RIGHT-OF-WAY.
4. CONTRACTOR SHALL VERIFY THE LOCATION AND INVERT ELEVATION OF ALL EXISTING UTILITIES WITH PROPOSED CONNECTIONS PRIOR TO CONSTRUCTION AND GRADING OF THE SITE.
5. THE CONTRACTOR SHALL INSTALL ALL PAVEMENT MARKINGS AS SHOWN ON THE PLANS.

GRADING NOTES:

1. THE CONTRACTOR SHALL REMOVE ALL EXISTING ASPHALT PAVEMENT AND CONCRETE SLABS FROM THE SITE.
2. THE CONTRACTOR SHALL PROOF ROLL THE SITE TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER AND REMOVE ANY SOFT MATERIAL PRIOR TO THE IMPORTING OF ANY FILL MATERIAL.
3. THE CONTRACTOR SHALL REPLACE ALL CURB SECTIONS, SIDEWALKS, AND PAVEMENT, WHICH HAS BEEN CUT AND DISTURBED WITHIN THE RIGHT-OF-WAY WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION'S STANDARD MATERIALS.
4. THE CONTRACTOR SHALL ADJUST TO GRADE ALL WATER AND GAS VALVES.
5. THE CONTRACTOR SHALL COMPACT ALL FILL MATERIALS OUTSIDE OF PROPOSED BUILDING AREAS, PLACED IN LIFTS, AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY, AS DETERMINED BY ASTM D-1557 (MODIFIED PROCTOR) OR 95% BY ASTM-D698 (STANDARD PROCTOR). PLACE FILL IN EIGHT-INCH LIFTS AND COMPACT WITH AN IMPACT-TYPE ROLLER (I.E. SHEEPSFOOT ROLLER). PROVIDE FOR INSPECTION OF ALL FILL AS IT IS PLACED FOR PROPER DENSITY BY A GEOTECHNICAL TESTING FIRM.
6. THE CONTRACTOR SHALL COMPACT ALL FILL MATERIALS WITHIN PROPOSED BUILDING AREAS, PLACED IN LIFTS, AND COMPACTED TO 95% OF MAXIMUM DRY DENSITY, AS DETERMINED BY ASTM D-1557 (MODIFIED PROCTOR) OR 100% BY ASTM-D698 (STANDARD PROCTOR). PLACE FILL IN EIGHT-INCH LIFTS AND COMPACT WITH AN IMPACT-TYPE ROLLER (I.E. SHEEPSFOOT ROLLER). PROVIDE FOR INSPECTION OF ALL FILL AS IT IS PLACED FOR PROPER DENSITY BY A GEOTECHNICAL TESTING FIRM.
7. ALL CUT AND FILL OPERATIONS SHALL FOLLOW THE "PENNSYLVANIA HANDBOOK OF BEST MANAGEMENT PRACTICES FOR DEVELOPING AREAS."
8. THE CONTRACTOR SHALL USE PENNDOT'S LATEST REFERENCES OF PUBLICATION 408/2000 AND ROADWAY CONSTRUCTION STANDARDS.

SITE STABILIZATION INSTALLATION AND MAINTENANCE (TEMPORARY AND PERMANENT)

1. TILL SOIL TO DEPTH OF 2". REMOVE ALL OBJECTS 2" OR LARGER.
2. BLEND COMMERCIAL FERTILIZER INTO THE SOIL TO A DEPTH OF 2". FERTILIZER MAY BE BLENDED DURING TILLING.
3. SOW REQUIRED SEED MIXTURE UNIFORMLY ON THE PREPARED AREA BY HYDRAULIC SEEDING EQUIPMENT, HAND SEEDING, OR ANY OTHER APPROPRIATE METHOD.
4. AFTER SEEDING ROLL TOPSOILED AREAS THAT ARE TO BE MOWED. USE A ROLLER WEIGHING NOT MORE THAN 65 LBS./FT. WIDTH.
5. FOR PERMANENT SITE STABILIZATION APPLY SLOW RELEASE NITROGEN FERTILIZER TO THE SURFACE OF SEEDED AREAS.
6. PLACE MULCH IMMEDIATELY AFTER SEEDING OR WITHIN 48 HOURS AFTER SEEDING IS COMPLETED. PLACE HAY & STRAW UNIFORMLY, IN A CONTINUOUS BLANKET AT THE MINIMUM RATE SPECIFIED ABOVE. AN ACCEPTABLE MECHANICAL BLOWER MAY BE USED TO APPLY MULCH. MACHINES WHICH CUT MULCH INTO SHORT PIECES WILL NOT BE PERMITTED.
8. MAINTENANCE - SATISFACTORILY MAINTAIN GRASS AREAS WITHIN GRADING LIMITS, UNTIL THE ENTIRE PROJECT HAS BEEN COMPLETED. MOW, AS INDICATED AND WHEN DIRECTED. CONTROL PROHIBITED AND NOXIOUS WEED GROWTH BY HERBICIDE SPRAYING OR CUTTING. AFTER THE SEEDING AND SOIL SUPPLEMENT WORK ON A SLOPE HAS BEEN SATISFACTORILY COMPLETED, IF A SLOPE FAILURE OCCURS, ONE WHICH REQUIRES REDRESSING, EXCAVATION, OR ESTABLISHMENT OF A NEW SLOPE, REAPPLY SOIL SUPPLEMENTS, THEN RESEED, AS SPECIFIED FOR THE ORIGINAL TREATMENT.
9. A SITE WILL BE CONSIDERED TO BE PERMANENTLY STABILIZED WHEN ALL PERMANENT CONTROL MEASURES AND FACILITIES HAVE BEEN COMPLETED AND ARE OPERATIONAL, TEMPORARY CONTROL MEASURES AND FACILITIES REMOVED, AND UNIFORM 70% PERENNIAL VEGETATION COVER IS ESTABLISHED TO THE POINT WHERE THE SURFACE SOIL IS CAPABLE OF RESISTING EROSION DURING RUNOFF EVENTS. THE STANDARD FOR THIS VEGETATIVE COVER WILL BE A UNIFORM COVERAGE OR DENSITY OF 70% ACROSS THE DISTURBED AREA.
10. THE CONTRACTOR SHALL MAINTAIN THE SITE PER THE PROVISIONS OF THIS PLAN UNTIL PERMANENT STABILIZATION IS ESTABLISHED.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

THE LOCATION OF EXISTING UTILITIES WERE TAKEN FROM RECORDS AND MARKING PROVIDED BY OTHERS AND OBSERVED EVIDENCE. THE LOCATIONS SHOWN MAY BE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS, SIZES AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL EXERCISE CARE TO AVOID DAMAGE TO ALL EXISTING UTILITIES.

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARK M. ZIMMERMAN
ENGINEER
PE 079175

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DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: APRIL 2023
PROJ. NO.: 1856.21

SCALE:
N.T.S.

Morris Knowles & Associates, Inc.
(A Hammontree Company)
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622
Fax: (724) 468-8940
info@morrisknowles.com www.morrisknowles.com

EROSION AND SEDIMENTATION CONTROL TITLE SHEET
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C700

DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Modwash.a.dwg
LAST SAVE: Apr 05, 2023 - 11:53am gjvarner

LEGEND:

- (S) SEEDING & MULCHING
- (IP) INLET PROTECTION
- (CFS 12) 12" COMPOST FILTER SOCK
- (RCE) ROCK CONSTRUCTION ENTRANCE
- (CW) COMPOST FILTER SOCK CONCRETE WASHOUT
- (ECB) EROSION CONTROL BLANKET

SOIL MAP UNIT LEGEND	
MAP UNIT SYMBOL	MAP UNIT NAME
UWB	URBAN LAND–WHARTON COMPLEX, GENTLY SLOPING

CALL BEFORE YOU DIG
IN PENNSYLVANIA
1–800–242–1776
DESIGN SN: 20181990650

THE GENERAL CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES INVOLVED IN THE SITE NO MORE TEN DAYS AND NO LESS THAN THREE DAYS IN ADVANCE OF EXCAVATION (PA ACT 287 OF 1974 AMENDED BY ACT 50 OF 2018). PA STATE LAW REQUIRES 3 WORKING DAYS NOTICE

Know what's below
Call before you dig

LEGEND

SAN	– SANITARY	—G—	– GAS LINE
ST	– STORM	—W—	– WATER LINE
MH	– MANHOLE	—T—	– SUBSURFACE TELEPHONE LINE
TOP	– TOP OF CASTING	—E—	– SUBSURFACE ELECTRIC LINE
INV	– INVERT / FLOW LINE	—OH—	– OVERHEAD WIRES
WV	– WATER VALVE	– – 908 – –	– EXISTING CONTOURS
GV	– GAS VALVE		– EXISTING INLET
GM	– GAS METER		– EXISTING MANHOLE
EM	– ELECTRIC METER	= = = = = =	– EXISTING SEWER
S.R.	– STATE ROUTE	—X——X—	– FENCE
TELE	– TELEPHONE		
RCP	– REINFORCED CONCRETE PIPE		
CPP	– CORRUGATED PLASTIC PIPE		

GRAPHIC SCALE
0' 10' 20' 40'
SCALE: 1" = 20'

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARK M. ZIMMERMAN
ENGINEER
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SCALE:
1"=20'

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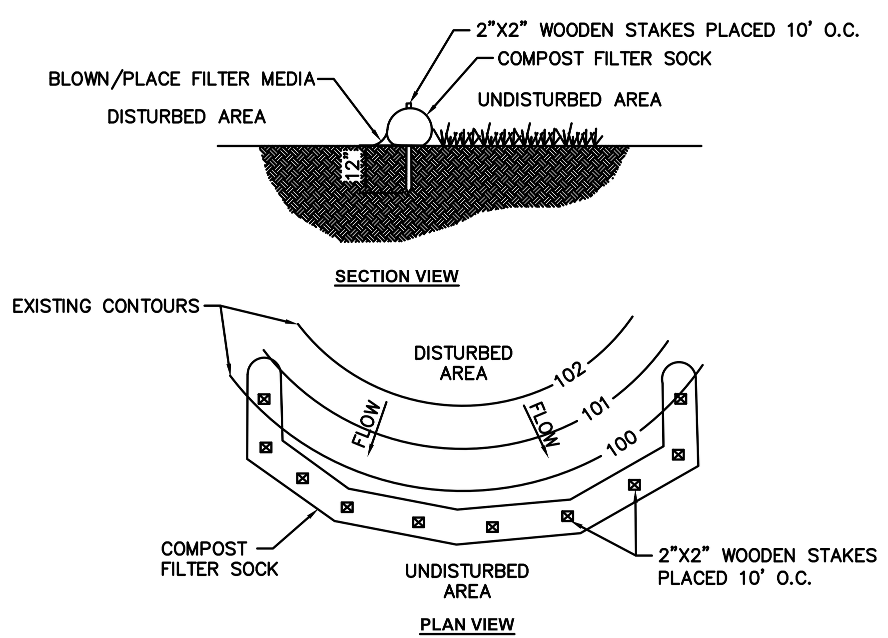
EROSION AND SEDIMENTATION CONTROL PLAN
MODWASH - WILKINS TOWNSHIP

prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C701

DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 – Wilkins Twp\CAD\1856.21 – Wilkins Twp Modwash c.dwg
LAST SAVE: Apr 05, 2023 – 11:15am dpenner



NOTES:

Sock fabric shall meet standards of Table 4.1. Compost shall meet the standards of Table 4.2.

Compost filter sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up slope at 45 degrees to the main sock alignment (Figure 4.1). Maximum slope length above any sock shall not exceed that shown on Figure 4.2. Stakes may be installed immediately downslope of the sock if so specified by the manufacturer.

Traffic shall not be permitted to cross filter socks.

Accumulated sediment shall be removed when it reaches half the aboveground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.

Biodegradable filter socks shall be replaced after 6 months: photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer's recommendations.

Upon stabilization of the area tributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

STANDARD CONSTRUCTION DETAIL #4-1
COMPOST FILTER SOCK
N.T.S.

TABLE 4.1
COMPOST SOCK FABRIC MINIMUM SPECIFICATIONS

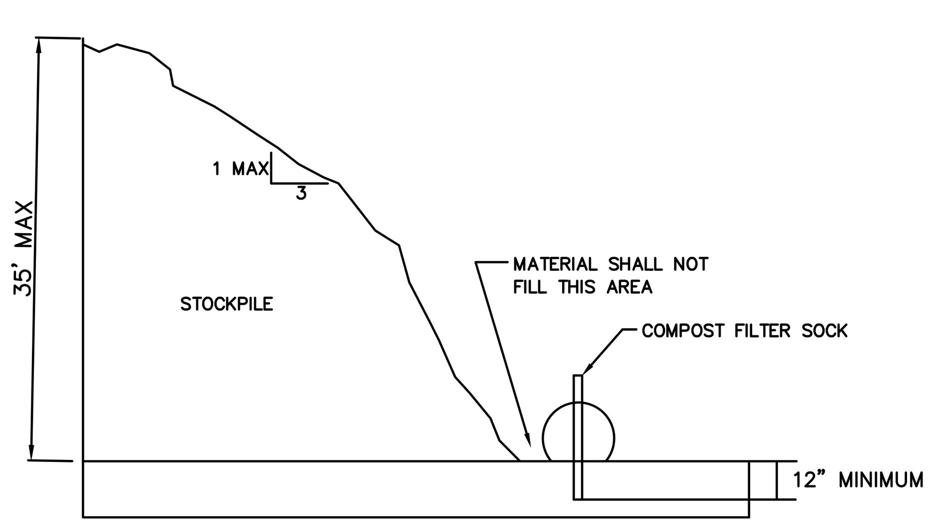
MATERIAL TYPE	3 MIL HDPE	5 MIL HDPE	5 MIL HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 PSI	26 PSI	44 PSI	202 PSI
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G-155)	23% AT 1000 HR	23% AT 1000 HR		100% AT 1000 HR	100% AT 1000 HR
MINIMAL FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS

TWO-PLY SYSTEMS	
INNER CONTAINMENT NETTING	HDPE BIAXIAL NET
	CONTINUOUSLY WOUND
	FUSION-WELDED JUNCTURES
	3/4" X 3/4" MAX. APERTURE SIZE
OUTER FILTRATION MESH	COOMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH)
	3/16" MAX. APERTURE SIZE
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.	

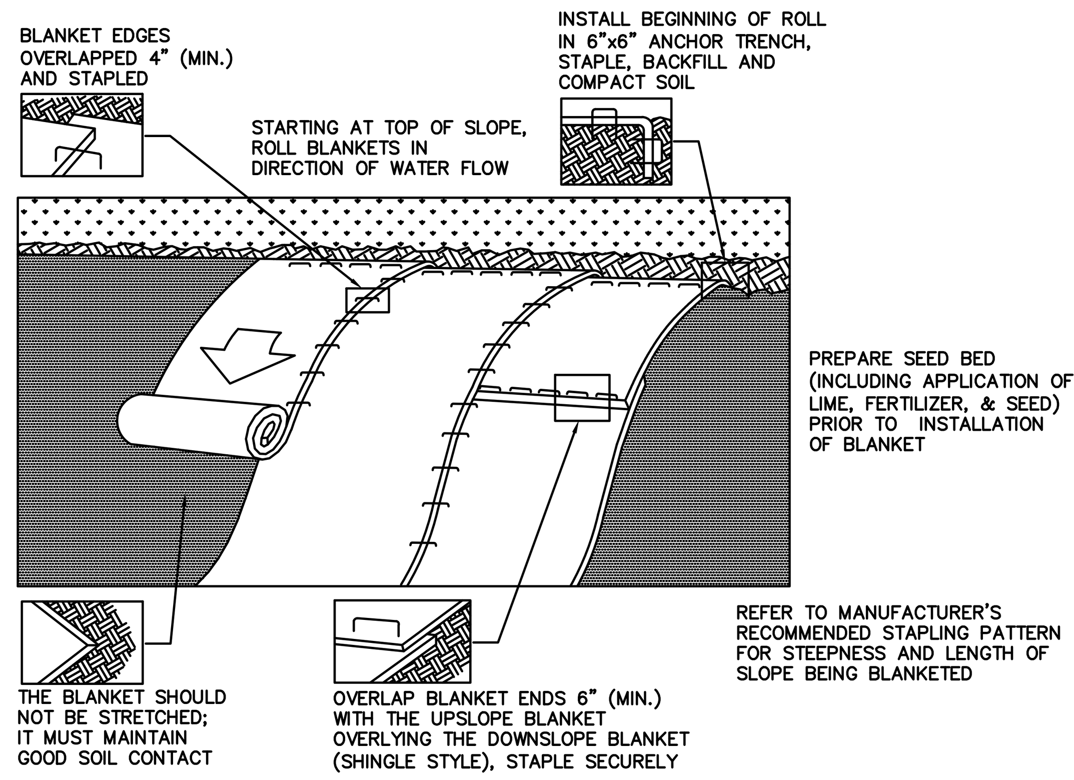
FILTREXX & JMD

TABLE 4.2
COMPOST STANDARDS

ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (MMHOS/CM) MAXIMUM



SOIL STOCKPILE DETAIL
N.T.S.



NOTES:

Seed and soil amendments shall be applied according to the rates in the plan drawings prior to installing the blanket.

Provide anchor trench at toe of slope in similar fashion as at top of slope.

Slope surface shall be free of rocks, clods, sticks, and grass.

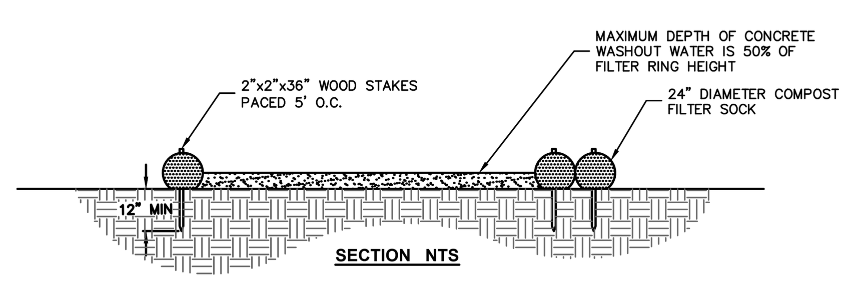
Blanket shall have good continuous contact with underlying soil throughout entire length. Lay blanket loosely and stake or staple to maintain direct contact with soil. Do not stretch blanket.

The blanket shall be stapled in accordance with the manufacturer's recommendations.

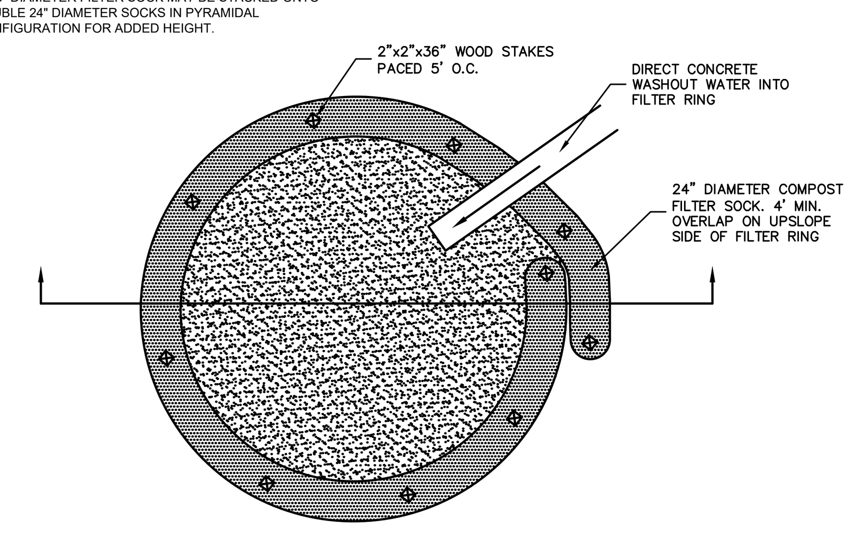
Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 70% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 4 calendar days.

STANDARD CONSTRUCTION DETAIL #11-1
EROSION CONTROL BLANKET INSTALLATION
N.T.S.

FIGURE 3.18
TYPICAL COMPOST SOCK WASHOUT INSTALLATION



NOTES:
1. INSTALL ON FLAT GRADE FOR OPTIMUM PERFORMANCE
2. 18" DIAMETER FILTER SOCK MAY BE STACKED ONTO DOUBLE 24" DIAMETER SOCKS IN PYRAMIDAL CONFIGURATION FOR ADDED HEIGHT.



A SUITABLE IMPERIOUS GEOMEMBRANE SHALL BE PLACED AT THE LOCATION OF THE WASHOUT PRIOR TO INSTALLING THE SOCKS.
ADAPTED FROM FILTREXX

COMPOST FILTER SOCK CONCRETE WASHOUT
N.T.S.

A. LIMIT ADVANCE CLEARING AND GRUBBING OPERATIONS TO A DISTANCE EQUAL TO TWO TIMES THE LENGTH OF PIPE INSTALLATION THAT CAN BE COMPLETED IN ONE DAY.
B. WORK CREWS AND EQUIPMENT FOR TRENCHING, PLACEMENT OF PIPE, PLUG CONSTRUCTION AND BACKFILLING WILL BE SELF CONTAINED AND SEPARATE FROM CLEARING AND GRUBBING AND SITE RESTORATION AND STABILIZATION OPERATIONS.
C. LIMIT DAILY TRENCH EXCAVATION TO THE LENGTH OF PIPE PLACEMENT, PLUG INSTALLATION AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY.
D. TRENCH PLUGS WILL BE SPACED IN ACCORDANCE WITH THE TABLE BELOW:

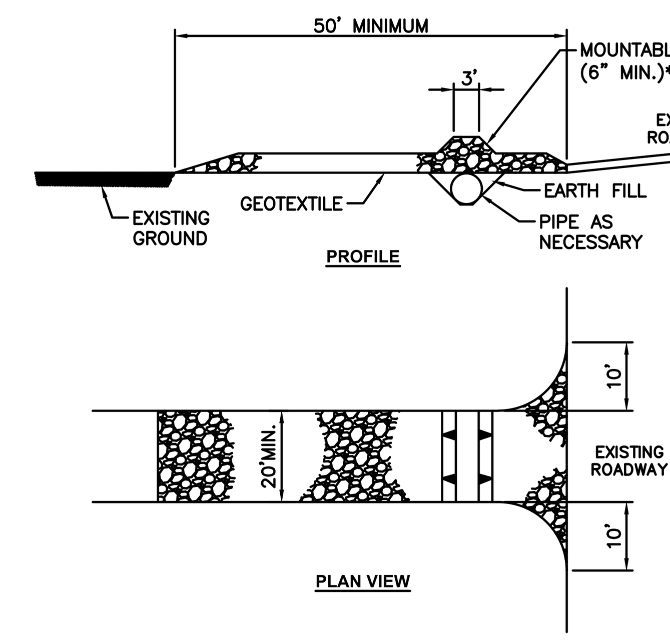
TRENCH SLOPE %	LENGTH (FEET)	PLUG MATERIAL
0 – 5	----	NONE
5 – 15	500	EARTH FILLED SACKS
15 – 25	300	EARTH FILLED SACKS
25 – 35	200	EARTH FILLED SACKS
35 – 100	100	EARTH FILLED SACKS
OVER 100	50	CEMENT FILLED BAGS (WETTED)

E. WATER WHICH ACCUMULATES IN AN OPEN TRENCH WILL BE COMPLETELY REMOVED BY PUMPING ACCORDING TO LOCAL CONSERVATION DISTRICT REGULATIONS PRIOR TO PIPE PLACEMENT OR BACKFILLING.
F. ON THE DAY FOLLOWING PIPE PLACEMENT AND TRENCH BACKFILLING, THE DISTURBED AREA WILL BE GRADED TO FINAL CONTOURS AND APPROPRIATE TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROL MEASURES/FACILITIES WILL BE INSTALLED. SEEDING AND MULCHING OF ALL DISTURBED AREAS WILL BE DONE AT THE END OF EACH WEEK.

WILL REMAIN IN EFFECT WITH THE FOLLOWING EXCEPTIONS:
1. DAILY BACKFILLING OF THE TRENCH MAY BE DELAYED FOR SIX DAYS.
2. IF DAILY BACKFILLING IS DELAYED, THE DISTURBED AREA WILL BE GRADED TO FINAL CONTOURS

FOR UTILITIES THAT REQUIRE TESTING BEFORE THE TRENCH IS BACKFILLED, ALL OF THE ABOVE ITEMS APPROPRIATE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES/FACILITIES WILL BE INSTALLED AND THE AREAS SEEDED AND MULCHED WITHIN THE NEXT TWO DAYS.

UTILITY TRENCH EXCAVATING GUIDELINES



* MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

NOTES:

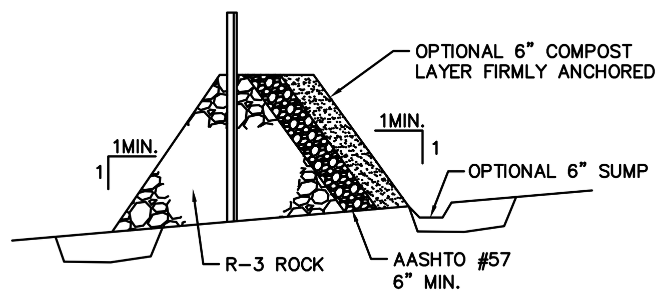
Remove topsoil prior to installation of rock construction entrance. Extend rock over full width of entrance.

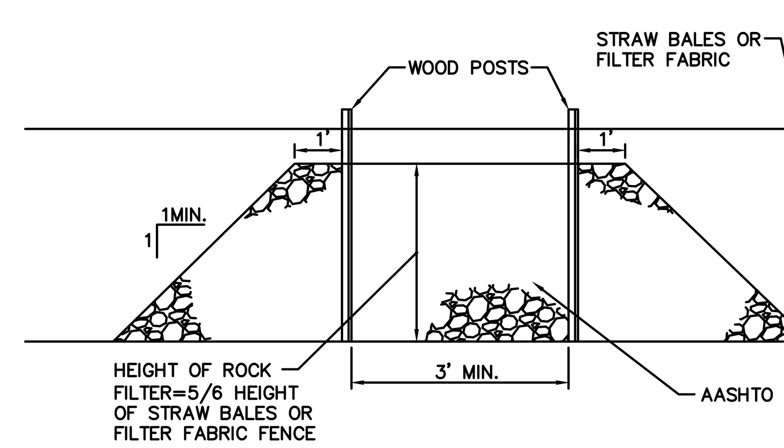
Runoff shall be diverted from roadway to a suitable sediment removal bmp prior to entering rock construction entrance.

Mountable berm shall be installed wherever optional culvert pipe is used and proper pipe cover as specified manufacturer is not otherwise provided. Pipe shall be sized appropriately for size of ditch being crossed.

MAINTENANCE: Rock Construction Entrance thickness shall be constantly maintained to the specified dimensions by adding rock. A stockpile shall be maintained on site for this purpose. At the end of each construction day, all sediment deposited on paved roadways shall be removed and returned to the construction site immediately. If excessive amounts of sediment are being deposited on roadway, extent length of rock construction entrance by 50 foot increments until condition is alleviated or install wash rack. Washing the roadway or sweeping the deposits into roadway ditches, sewers, culverts, or other drainage courses is not acceptable.

STANDARD CONSTRUCTION DETAIL #3-1
ROCK CONSTRUCTION ENTRANCE
N.T.S.



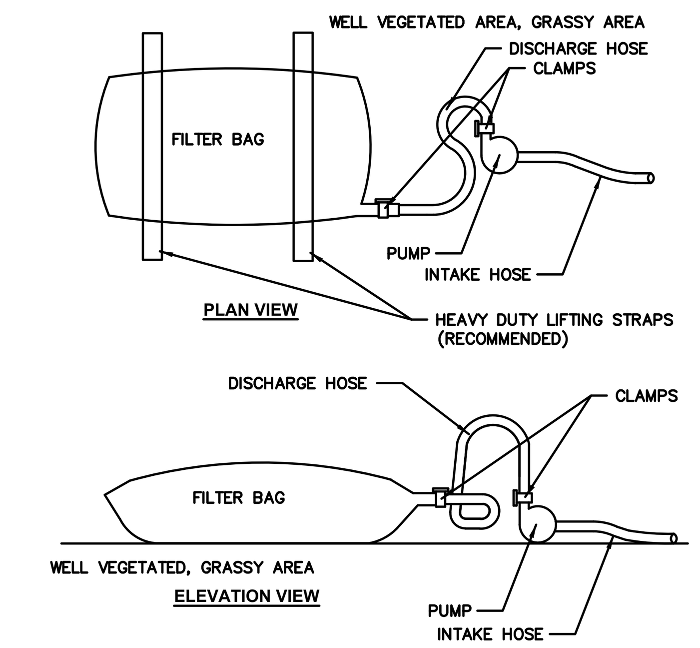


NOTES:

A rock filter outlet shall be installed where failure of a silt fence or straw bale barrier has occurred due to concentrated flow. Anchored compost layer shall be used on upslope face in HQ and EV watersheds.

Sediment shall be removed when accumulations reach 1/3 the height of the outlet.

STANDARD CONSTRUCTION DETAIL #4-6
ROCK FILTER OUTLET
N.T.S.



NOTES:

Low volume filter bags shall be made from non-woven geotextile material sewn with high strength,double stitched "J" type seams. They shall be capable trapping particles larger than 150 microns. High volume filter bags shall be made from woven geotextiles that meet the following standards:

Property	Test Method	Minimum Standard
Avg. wide width strenght	ASTM D-4884	60 lb/in
Grab tensile	ASTM D-4632	250 lb
Puncture	ASTM D-4833	110 lb
Mullen burst	ASTM D-3786	350 psi
UV resistance	ASTM D-4355	70%
AOS % retained	ASTM D-4751	80 sieve

A suitable means of accessing the bag with machinery required for disposal purposes shall be provided. Filter bags shall be replaced when they become 1/2 full of sediment. Spare bags shall be kept available for replacement of those that have failed or are filled. Bags shall be placed on straps to facilitate removal unless bags come with lifting straps already attached.

Bags shall be located in well-vegetated (grassy) area, and discharge onto stable, erosion resistant areas. Where this is not possible, a geotextile underlayment and flow path shall be provided. Bags may be placed on filter stone to increase discharge capacity. Bags shall not be placed on slopes greater than 5%. For slopes exceeding 5%, clean rock or other non-erodible and non-polluting material may be placed under the bag to reduce slope steepness.

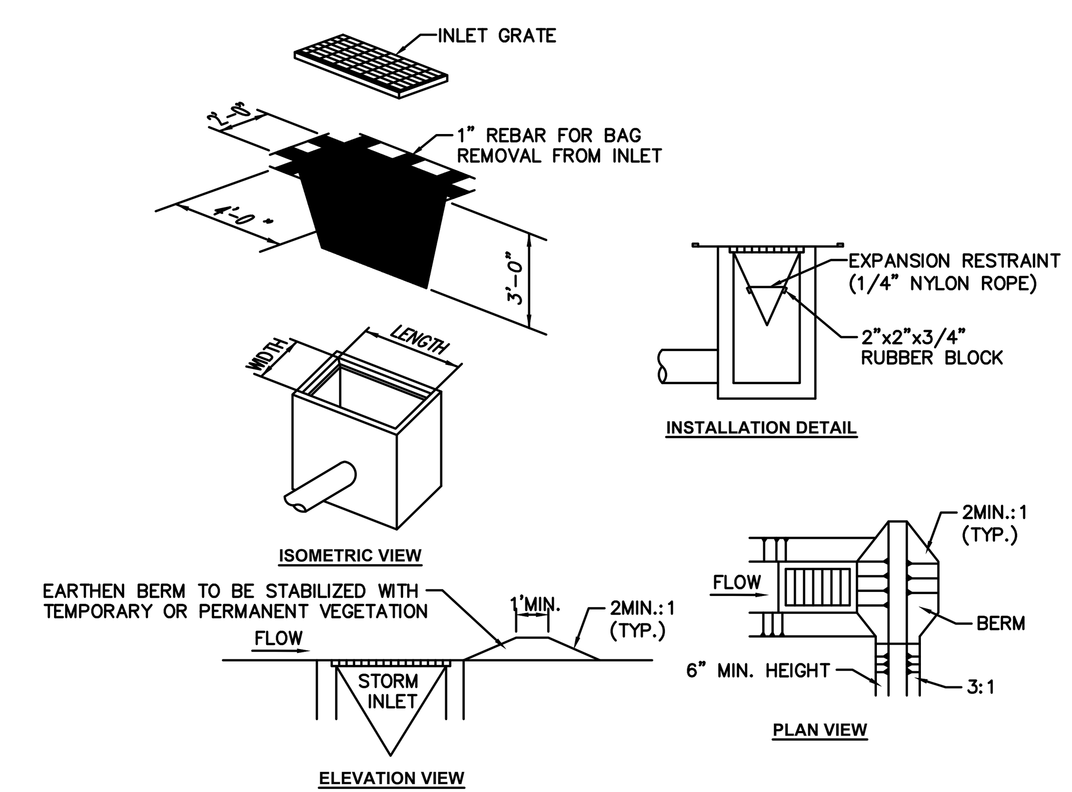
No downslope sediment barrier is required for most installations. Compost berm or compost filter sock shall be installed below bags located in HQ or EV watersheds, within 50 feet of any receiving surface water or where grassy area is not available.

The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped. A piece of PVC pipe is recommended for this purpose.

The pumping rate shall be no greater than 750 gpm or 1/2 the maximum specified by the manufacturer, whichever is less. Pump intakes shall be floating and screened.

Filter bags shall be inspected daily. If any problem is detected, pumping shall cease immediately and not resume until the problem is corrected.

STANDARD CONSTRUCTION DETAIL #3-16
PUMPED WATER FILTER BAG
N.T.S.



NOTES:

Maximum drainage area = 1/2 acre.

Inlet protection shall not be required for inlet tributary to sediment basin or trap. Berms shall be required for all installations.

Rolled earthen berm shall be maintained until roadway is stoned. Road subbase berm shall be maintained until roadway is paved. Earthen berm in channel shall be maintained until permanent stabilization is completed or remain permanently.

At a minimum, the fabric shall have a minimum grab tensile strength of 120 lbs, a minimum burst strength of 200 psi, and a minimum trapezoidal tear strength of 50 lbs. Filter bags shall be capable of trapping all particles not passing a No. 40 Sieve.

Inlet filter bags shall be inspected on a weekly basis and after each runoff event. Bags shall be emptied and rinsed or replaced when half full or when flow capacity has been reduced so as to cause flooding or bypassing of the inlet. Damaged or clogged bags shall be replaced. A supply shall be maintained on site for replacement of bags. All needed repairs shall be initiated immediately after the inspection. Dispose of accumulated sediment as well as all used bags according to the plan notes.

DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.

STANDARD CONSTRUCTION DETAIL #4-16
FILTER BAG INLET PROTECTION – TYPE M INLET
N.T.S.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

THE LOCATION OF EXISTING UTILITIES WERE TAKEN FROM RECORDS AND MARKING PROVIDED BY OTHERS AND OBSERVED EVIDENCE. THE LOCATIONS SHOWN MAY BE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS, SIZES AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL EXERCISE CARE TO AVOID DAMAGE TO ALL EXISTING UTILITIES.

© 2023 MORRIS KNOWLES & ASSOCIATES, INC. (A HAMMONTREE COMPANY) – THESE DRAWINGS SHALL NOT BE USED BY ANY PERSON, FIRM OR CORPORATION WITHOUT SPECIFIC WRITTEN PERMISSION FROM MORRIS KNOWLES & ASSOCIATES, INC. THESE PLANS ARE NOT TO BE REPRODUCED, CHANGED OR MANIPULATED IN ANY FORM OR MANNER WHATSOEVER, NOR ARE THEY TO BE ASSIGNED TO ANY THIRD PARTY WITHOUT PERMISSION AND CONSENT OF MORRIS KNOWLES & ASSOCIATES, INC.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
MARK M. ZIMMERMAN
ENGINEER P.E. 079175

REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:

DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: APRIL 2023
PROJ. NO.: 1856.21

SCALE: N.T.S.

Morris Knowles & Associates, Inc.
(A Hammontree Company)
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622
Fax: (724) 468-8940
info@morrisknowles.com www.morrisknowles.com

EROSION AND SEDIMENTATION CONTROL DETAILS
MODWASH - WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
C702

60 2019 00021840

Allegheny County
Jerry Tyskiewicz
Department of Real Estate
Pittsburgh, PA 15219

Instrument Number: 2019-21840 **BK-DE VL-17700 PG-55**

Recorded On: July 22, 2019 **As-Deed**

Parties: STANDARD BANK PA S B

To HUTTON PGH STREET L L C **# of Pages: 7**

Comment:

********** **THIS IS NOT A BILL** **********

Deed	**166.75**
	0
	0
Total:	**166.75**

Realty Transfer Stamp

Affidavit Attached-No Stamp Num-T86321
WILKINS TP
Ward-99-NO WARD

Value 1,060,000.00

Commonwealth of Pennsylvania	10,600.00
Munic-Wilkins Twp	5,300.00
School District-Woodland Hills	5,300.00
Munic-Penalty	0.00
Munic-Interest	0.00
School-Penalty	0.00
School-Interest	0.00
	21,200.00

Department of Real Estate Stamp

Certified On/By-> 07-22-2019 / Scott Stickman

0542F00130000000

I hereby certify that the within and foregoing was recorded in the Department of Real Estate in Allegheny County, PA

****DO NOT REMOVE-THIS PAGE IS PART OF THE RECORDED DOCUMENT****

File Information:

Document Number: 2019-21840
Receipt Number: 3612947
Recorded Date/Time: July 22, 2019 01:00:01P
Book-Vol/Pg: BK-DE VL-17700 PG-55
User / Station: M Ward-Davis - Cash Station 25

Record and Return To:

CHICAGO TITLE INS CO
WILL CALL
PITTSBURGH PA 15219

Jerry Tyskiewicz

Jerry Tyskiewicz, Director
Rich Fitzgerald, County Executive

5

FILE: _____

Chicago Title Insurance Company
603 Stanwix Street
Two Gateway Center--19th Floor
Pittsburgh, PA 15222
FILE: 180697PIT

Will Call

2

376745 DRE Certified
02-Jul-2019 12:52P\Int By: Scott Stickman

THIS DEED

MADE the 21st day of June, 2019

BETWEEN

Standard Bank PaSB, successor by merger to Allegheny Valley Bank of Pittsburgh, a Pennsylvania financial institution
(hereinafter called "Grantor")

AND

Hutton Pittsburgh (William Penn) ST, LLC, a Pennsylvania limited liability company
(hereinafter called "Grantee")

WITNESSETH, that the said Grantor in consideration of One Million Sixty Thousand and No/100 Dollars ($1,060,000.00), paid to the Grantor by the Grantee, receipt of which is hereby acknowledged, does grant, bargain, sell and convey to the said Grantee, its successors and assigns, all of the Grantor's right, title and interest in and to the following property:

> ***ALL*** that certain lot or piece of ground situate in the Township of Wilkins, County of Allegheny and Commonwealth of Pennsylvania, and bounded and described as more fully set forth on Exhibit A attached hereto.
>
> ***UNDER AND SUBJECT TO*** coal and mining rights and all rights and privileges incident to the mining of coal heretofore conveyed, excepted or reserved by instruments of record; the right of surface, lateral or subjacent support; or any surface subsidence; oil and gas and minerals and all rights incident to the extraction or development of oil and gas or minerals heretofore conveyed, leased, excepted or reserved by instruments of record; and all easements, rights of way and restrictions as contained in prior instruments of record and/or as installed or located on the premises and all other matters of record appearing prior hereto, as set forth on Exhibit B attached hereto and incorporated by this reference.

with the appurtenances thereto: ***TO HAVE AND TO HOLD*** the same to and for the use of the said Grantee, its successors and assigns forever, and the Grantor for its successors and assigns hereby covenants and agrees that it will specially warrant title to the property hereby conveyed.

180697PIT

NOTICE--THIS DOCUMENT MAY NOT/~~DOES NOT~~ SELL, CONVEY, TRANSFER, INCLUDE OR INSURE THE TITLE TO THE COAL AND RIGHT OF SUPPORT UNDERNEATH THE SURFACE LAND DESCRIBED OR REFERRED TO HEREIN, AND THE OWNER OR OWNERS OF SUCH COAL MAY HAVE/~~HAVE~~ THE COMPLETE LEGAL RIGHT TO REMOVE ALL OF SUCH COAL AND, IN THAT CONNECTION DAMAGE MAY RESULT TO THE SURFACE OF THE LAND AND ANY HOUSE, BUILDING OR OTHER STRUCTURE ON OR IN SUCH LAND, THE INCLUSION OF THIS NOTICE DOES NOT ENLARGE, RESTRICT OR MODIFY ANY LEGAL RIGHTS OR ESTATES OTHERWISE CREATED, TRANSFERRED, EXCEPTED OR RESERVED BY THIS INSTRUMENT. [This notice is set forth in the manner provided in Section 1 of the Act of July 17, 1957, P. L. 984, as amended, and is not intended as notice of unrecorded instruments, if any.]

WITNESS the hand and seal of the said Grantor.

ATTEST:

Standard Bank PaSB

By: Andrew W. Hasley
Name: President
Title:

State of PA)
) ss:
County of Allegheny)

On this, the 21st day of June, 2019, before me, the undersigned officer, personally appeared Andrew W. Hasley, who acknowledged himself/herself to be the President of Standard Bank PASB, and that he/she as such President, being authorized to do so, executed the foregoing Deed for the purposes therein contained by signing the name of the banking association by himself/herself as such President.

In Witness Whereof, I hereunto set my hand and official seal.

My commission expires:

Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Joan L. Schmitt, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires May 13, 2020
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

NOTICE **THE UNDERSIGNED, AS EVIDENCED BY THE SIGNATURE(S) TO THIS NOTICE AND THE ACCEPTANCE AND RECORDING OF THIS DEED, (IS, ARE) FULLY COGNIZANT OF THE FACT THAT THE UNDERSIGNED MAY NOT BE OBTAINING THE RIGHT OF PROTECTION AGAINST SUBSIDENCE, AS TO THE PROPERTY HEREIN CONVEYED, RESULTING FROM COAL MINING OPERATIONS AND THAT THE PURCHASED PROPERTY, HEREIN CONVEYED, MAY BE PROTECTED FROM DAMAGE DUE TO MINE SUBSIDENCE BY A PRIVATE CONTRACT WITH THE OWNERS OF THE ECONOMIC INTEREST IN THE COAL. THIS NOTICE IS INSERTED HEREIN TO COMPLY WITH THE BITUMINOUS MINE SUBSIDENCE AND LAND CONSERVATION ACT OF 1966, AS AMENDED 1980, OCT. 10, P.L. 874, NO. 156 §1.**

WITNESS:

BY: _____ COO & CFO HUTTON
Grantee

CERTIFICATE OF RESIDENCE

I do hereby certify:

(1) that the TAX BILL ADDRESS of the within named Grantee/s is:

Origin Bank
Name/Mortgage Company

_____
In Care Of (if required)
1063 Highland Colony Parkway
Address
Ridgeland, MS 39157
City, State and Zip Code

(2) that the OWNER MAILING ADDRESS of the within named Grantee/s is:

_____
In Care Of (if required)
736 Cherry Street
Address
Chattanooga, TN 37402
City, State and Zip Code

Exhibit A
Legal Description

Parcel 1 (Fee Simple)

All that certain lot or piece of ground situated in the Township of Wilkins, County of Allegheny, Commonwealth of Pennsylvania, being all of Lot 13 in Penn Center East Plan of Lots of record in the Department of Real Estate of Allegheny County, in Plan Book Volume 227, pages 175 to 192.

Being Tax Parcel Block 542-F, Lot 130.

Being the same property which PCE Partners LLC conveyed to Allegheny Valley Bank of Pittsburgh, by deed dated September 26, 2016 and recorded in Deed Book Volume 16558, page 304.

Allegheny Valley Bank of Pittsburgh was merged into Standard Bank PASB effective April 7, 2017.

Parcel 2 (Easement Parcel)

Together with those appurtenant easements set forth in Easement Agreement between PCE Partners LLC and Allegheny Valley Bank of Pittsburgh on September 23, 2016 and recorded October 3, 2016 in Deed Book Volume 16558, page 313.

Exhibit B

Permitted Exceptions

1. Real estate taxes for the current and prior tax years which may be hereafter assessed, not yet due and payable. School District real estate taxes for 2019, not yet due and payable.
2. Easement Agreement between PCE Partners LLC and Allegheny Valley Bank of Pittsburgh dated September 23, 2016 and recorded October 3, 2016 in Deed Book Volume 16558, page 313, Allegheny County Records.
3. The following matters set forth in Penn Center East Plan of Lots Plan Book Volume 227, page 175:
   a. All marginal notations appearing on the plan.
   b. 20 foot wide storm sewer easement crossing the land as shown on ALTA/NSPS Land Title Survey made by Morris Knowles & Associates, Inc. for Hutton Pittsburgh (William Penn) ST, LLC dated August 10, 2018, last revised June 19, 2019, Drawing No. D-26560 (the "Survey").
4. The following Right of Ways:
   a. From Benjamin Thorpe et al. to The Bell Telephone Company of Pennsylvania, dated March 9, 1964 and recorded in Deed Book Volume 4110, page 391. Shown on the Survey.
   b. From Benjamin Thorpe et ux. Et al. to Duquesne Light Company, dated April 15, 1964 and recorded in Deed Book Volume 4072, page 486. Shown on the Survey.
   c. From Charles Loevner et al. to The Bell Telephone Company of Pennsylvania, dated August 31, 1962 and recorded in Deed Book Volume 4027, page 481.
   d. From Joseph Soffer and Violet Soffer to The Bell Telephone Company of Pennsylvania, dated October 7, 1968 and recorded in Deed Book Volume 4662, page 74.
   e. From Joseph Soffer and Violet Soffer to Duquesne Light Company, dated March 4, 1997 and recorded in Deed Book Volume 9922, page 417.
   f. From Joseph Soffer and Violet Soffer to Duquesne Light Company, dated June 20, 1996 and recorded in Deed Book Volume 9766, page 397.
   g. To Bell Telephone Company of Pennsylvania by instrument dated August 29, 1967 and recorded in Deed Book Volume 4419, page 685.
   h. To Duquesne Light Company by instrument dated May 15, 1975 and recorded in Deed Book Volume 5523, page 214.
   i. From Joseph Soffer et ux to Peoples Natural Gas Company, dated March 27, 1980 and recorded in Deed Book Volume 6249, page 879.

j. From Joseph Soffer et ux to Duquesne Light Company, dated April 17, 1985 and recorded in Deed Book Volume 7324, page 596.

k. From Joseph Soffer et ux to Township of Wilkins, recorded in Deed Book Volume 7530, page 509.

5. Terms and conditions of Highway Occupancy Permit issued by Commonwealth of Pennsylvania Department of Transportation to Hutton ST 17, LLC issued January 14, 2019 and recorded January 18, 2019 in Deed Book Volume 17495, page 560. Shown on Survey.

6. Required limit of slope as set forth on Commonwealth of Pennsylvania Department of Highways, Drawings for Construction and Condemnation of Right of Way, Route No. 187, Section 9, in Allegheny County Project No. F-165(6), dated June 15, 1954 and recorded in State Highway Plan Book Volume 14, page 53. Shown on Survey.

7. The following matters shown on Survey:

   a. Encroachment of existing building over required limit of slope line.

Allegheny County
Jerry Tyskiewicz
Department of Real Estate
Pittsburgh, PA 15219

**** Electronically Filed Document ****

****DO NOT REMOVE-THIS PAGE IS PART OF THE RECORDED DOCUMENT****

Document Number: 2018-33076
Recorded As: ERX-DEED
Recorded On: October 23, 2018
Recorded At: 11:26:17 am
Number of Pages: 7
Book-VI/Pg: Bk-DE VI-17402 Pg-281
Recording Fee: $166.75
Parties:
P C E PARTNERS L L C
AGREE STORES L L C
Receipt Number: 3494749
Processed By: Maureen Ward-Davis

Department of Real Estate Stamp

NOTE-

0542F00138000000
0542G00060000000

Realty Transfer Stamp

Consideration Amt: $6293000.00
Tax Code : WILKINS TP
Tax Amount: $125860.00
Ward :
99-NO WARD
Stamp Num: T61937
Blk/Lot: 0542F00138000000
Affidavit: No
Exempt: No

Commonwealth of Pennsylvania	$62930.00
Munic-Wilkins Twp	$31465.00
School District-Woodland Hills	$31465.00
Munic-Penalty	$0
Munic-Interest	$0
School-Penalty	$0
School-Interest	$0

I hereby certify that the within and foregoing was recorded in the Department of Real Estate's Office in Allegheny County, PA

****DO NOT REMOVE-THIS PAGE IS PART OF THE RECORDED DOCUMENT****

Jerry Tyskiewicz, Director
Rich Fitzgerald, County Executive

Doc-33076

344287

DRE Certified
23-Oct-2018 11:17A\Int By: B G

When Recorded Return To:
First American Title Insurance Company
National Commercial Services
310 Grant Street, Suite 1601
Pittsburgh, PA 15219
File No: NCS 825889A

SPECIAL WARRANTY DEED

Made the 8th day of October, 2018,

and made effective as of the 22 day of Oct., 2018,

between

PCE PARTNERS LLC,
a Delaware limited liability company (the "Grantor"),

and

AGREE STORES, LLC,
a Delaware liability company (the "Grantee").

WITNESSETH, that the Grantor, in consideration of the sum of Six Million Two Hundred Ninety-Three Thousand and No/100 Dollars ($6,293,000.00), the receipt of which is hereby acknowledged, and intending to be legally bound, does hereby grant, bargain, sell, convey, and transfer to the Grantee, its successors and assigns:

ALL THAT CERTAIN lot or piece of land situate in Wilkins Township, County of Alleghany and Commonwealth of Pennsylvania, being more fully described in Exhibit A attached hereto and made a part hereof (the "Property").

BEING a portion of the same property which PCE LL, LP, a Delaware limited partnership, granted and conveyed to PCE Partners LLC, a Delaware limited liability company, the Grantor herein, by Special Warranty Deed dated December 8, 2015 and made effective December 16, 2015, recorded as Deed Book Volume 16248, Page 357 in the Recorder's Office of Allegheny County.

TOGETHER with the improvements located thereon and all appurtenances, easements, privileges, tenements, hereditaments thereto belonging or in any way appertaining thereto.

SUBJECT TO only those matters described on Exhibit B attached hereto.

TO HAVE AND TO HOLD the same to and for the use of the Grantee, its successors and assigns forever, and the Grantor, for itself and its successors and assigns, hereby covenants and agrees that it will **WARRANT SPECIALLY** title to the Property hereby conveyed.

NOTICE – THIS DOCUMENT MAY NOT/DOES NOT SELL, CONVEY, TRANSFER, INCLUDE OR INSURE THE TITLE TO THE COAL AND RIGHT OF SUPPORT UNDERNEATH THE SURFACE LAND DESCRIBED OR REFERRED TO HEREIN, AND THE OWNER OR OWNERS OF SUCH COAL MAY HAVE/HAVE THE COMPLETE LEGAL RIGHT TO REMOVE ALL OF SUCH COAL AND, IN THAT CONNECTION, DAMAGE MAY RESULT TO THE SURFACE OF THE LAND AND ANY HOUSE, BUILDING OR OTHER STRUCTURE ON OR IN SUCH LAND. THE INCLUSION OF THIS NOTICE DOES NOT ENLARGE, RESTRICT OR MODIFY ANY LEGAL RIGHTS OR ESTATES OTHERWISE CREATED, TRANSFERRED, EXCEPTED OR RESERVED BY THIS INSTRUMENT. This notice is set forth in the manner provided in Section 1 of the Act of July 17, 1957, P.L. 984, as amended, and is not intended as notice of unrecorded instruments, if any.

825889BH

IN WITNESS WHEREOF, the Grantor has caused this Special Warranty Deed to be executed by its authorized officer on the date first written above.

PCE PARTNERS LLC,
a Delaware limited liability company

By: _____
Name: Marc R. Wilkow
Title: Manager

STATE OF Illinois)
) ss:
COUNTY OF Cook)

On this, the 8th day of October, 2018, before me, a Notary Public, the undersigned officer, personally appeared Marc R. Wilkow, who acknowledged himself to be the Manager of PCE Partners LLC, a Delaware limited liability company, and that he as such Manager, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the limited liability company by himself as such Manager.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

My Commission Expires: Sept. 8, 2021

JUSTIN TSATSA
Official Seal
Notary Public – State of Illinois
My Commission Expires Sep 8, 2021

NOTICE THE UNDERSIGNED, AS EVIDENCED BY THE SIGNATURE(S) TO THIS NOTICE AND THE ACCEPTANCE AND RECORDING OF THIS DEED, (IS, ARE) FULLY COGNIZANT OF THE FACT THAT THE UNDERSIGNED MAY NOT BE OBTAINING THE RIGHT OF PROTECTION AGAINST SUBSIDENCE, AS TO THE PROPERTY HEREIN CONVEYED, RESULTING FROM COAL MINING OPERATIONS AND THAT THE PURCHASED PROPERTY, HEREIN CONVEYED, MAY BE PROTECTED FROM DAMAGE DUE TO MINE SUBSIDENCE BY A PRIVATE CONTRACT WITH THE OWNERS OF THE ECONOMIC INTEREST IN THE COAL. THIS NOTICE IS INSERTED HEREIN TO COMPLY WITH THE BITUMINOUS MINE SUBSIDENCE AND LAND CONSERVATION ACT OF 1966, AS AMENDED 1980, OCT. 10, P.L. 874, NO. 156, § 1.

AGREE STORES, LLC,
a Delaware limited liability company

By: _____
Name: Danielle Spehar
Title: Authorized Representative

CERTIFICATE OF RESIDENCE

I hereby certify that the **Tax Bill Address** of the within named grantee is:

Agree Stores, LLC
Attn: Laith Hermiz
70 East Long Lake
Bloomfield Hills, Michigan 48304

I do hereby certify that the **Owner Mailing Address** of the within named grantee is:

Agree Stores, LLC
Attn: Laith Hermiz
70 East Long Lake
Bloomfield Hills, Michigan 48304

_____
Grantee/Agent for Grantee

EXHIBIT A

LEGAL DESCRIPTION

All that certain lot or piece of ground situated in the Township of Wilkins, County of Allegheny and Commonwealth of Pennsylvania being all of Lot No. 1 in the Revised Soffer Plan of Lots of record in the Recorder's Office of Allegheny County in Plan Book Volume 201, pages 125-130.

Being designated as Block 542-F, Lot 138 and Block 542-G, Lot 60.

EXHIBIT B

PERMITTED EXCEPTIONS

1. General real estate taxes not yet due or payable.

2. Rights of tenants in possession, as tenants only, under unrecorded leases.

3. Coal and mining rights and all rights related thereto.

4. Oil, gas and mineral interests and all rights incident thereto now or previously conveyed, transferred, leased, excepted or reserved.

5. Subject to all matters shown on the Plan as recorded in the Recorder's Office of Allegheny County, Pennsylvania in Plan Book Volume 201 Pages 125 to 130.

6. Right of Way 60 feet wide, for passage and utilities as set forth in Deed Book Volume 3629 Page 480.

7. Rights granted to Duquesne Light Company as set forth in Deed Book Volume 9863 Page 272.

8. Street Opening Agreement by and between Carlyle Land Co., Ltd. and Duquesne Light Company as set forth in Deed Book Volume 9863 Page 289.

9. Subject to all matters shown on the Plan as recorded in the Recorder's Office of Allegheny County, Pennsylvania in Plan Book Volume 292 Page 155, and Plan Book Volume 296 Page 46.

10. Easement Agreement by and between PCE Partners LLC and Allegheny Valley Bank of Pittsburgh as set forth in Deed Book Volume 16558 Page 313.

11. Declaration of Easements, Covenants, and Restrictions as set forth in Deed Book Volume 16714 Page 482, as amended by First Amendment to Declaration of Easements, Covenants, and Restrictions recorded as Document Number 336335, as further amended by Second Amendment to Declaration of Easements, Covenants, and Restrictions recorded as Document Number 340962, as further amended by Third Amendment to Declaration of Easements, Covenants, and Restrictions recorded immediately prior hereto.

12. Declaration of Easement as set forth in Deed Book Volume 16714 Page 542.

13. Declaration of Restrictions as set forth in Deed Book Volume 16714 Page 561.

14. Terms and conditions of Lease to Texas Roadhouse Holdings LLC as evidenced by a Memorandum thereof recorded in Deed Book Volume 16868 Page 122, re-recorded in Deed Book Volume 16877 Page 470.

15. Any exceptions that would be disclosed by an accurate survey of the Property.

POST CONSTRUCTION
STORMWATER MANAGEMENT REPORT
(MKA FILE NO.: 1856.21)

For:

ModWash – Wilkins Township

3474 William Penn Highway
Wilkins Township
Allegheny County

April 2023

Prepared By:

Morris Knowles & Associates, Inc.
Consulting Engineers and Land Surveyors
443 Athena Dr.
Delmont, PA 15626
Phone: (724) 468-4622
Fax: (724) 468-8940

ENGINEERS CERTIFICATION

Morris Knowles & Associates, Inc.

I, Mark M. Zimmerman, P.E., do hereby certify to the best of my knowledge, information, and belief that the information contained in the accompanying plans, specifications, and report for the Zips Car Wash Moon Township Development on Carnot Road, Moon Township, PA has been prepared in accordance with accepted engineering practice and are true and correct.

_____

Mark M. Zimmerman, P.E., CPESC, CPSWQ
Morris Knowles and Associates

Table of Contents

Stormwater Management Narrative	Section 1
Pre- vs. Post Development Calculations	Section 2
Soils Map and Location Map	Section 3
Drainage Maps	Section 4

Stormwater Management Narrative

Section 1

Overview

The project site is located at 3474 William Penn Highway, Wilkins Township, Allegheny County, PA. Runoff from the site flows overland in a south east direction to an inlet in the back of the property near the Private Drive. The storm system drains to Thompson Run which has a PA Code Chapter 93 Designation of Warm Water Fishes (WWF). The proposed improvements and stormwater system will limit the post development flows to less than the pre-development flows. No riparian buffers or riparian forest buffers exist within or near the project area. Thompson Run is currently impaired by abandoned mine drainage caused by pH and metals. There are no anticipated or known geologic formations that could cause pollution. However, compost filter sock and utility trenching guidelines will be followed to minimize any impacts. If unsuitable soil conditions are encountered during construction, the contractor shall contact the local conservation district and engineer prior to removal of material from the site. The site will be redeveloped into a car wash with associated parking and infrastructure. Proposed access to the car wash will be on the south side of the site off of the Private Drive.

Site Characteristics

A. The site in the past was a commercial development
B. The site is presently a commercial development
C. The proposed project will contain an automatic car wash with vacuum parking areas.

Stormwater Drainage Maps

Stormwater Drainage Maps are enclosed within the appropriate section for which they represent. These can be found in Section 4 of this report.

Pre & Post Development Conditions:

The existing site conditions include a developed property with a circular bank building and associated parking areas. The site is covered in gently sloping Urban Land-Wharton Complex (UWB). Runoff from the site sheet flows to an inlet in the south east corner of the parking lot. The proposed site will discharge stormwater runoff into the same point of interest with a decrease in total site discharge. Existing and proposed calculations for the disturbed areas have been conducted and included in Section 2 of this report and summarized in the table below. The stormwater management BMP was designed to maintain and protect the physical, biological, and chemical qualities of the receiving stream.

The disturbed areas of the proposed conditions will discharge to a new underground storm pipe system that discharges to the existing inlet in the south east corner of the site. Per Wilkins Township's ordinances, post-development peak flow rates for the 2-, 5-, 10-,

25-, 50-, 100-year 24-hour storm events must be 50% less than the pre-development peak flow rates. The following table lists the peak flow rates for each storm event:

Pre-Post Calculations

	Pre-Developed Flow (cfs)	50% of Pre-Developed Flow (cfs)	Post-Routed Flow (cfs)	Undetained Area (cfs)	Total Post-Developed Flow (cfs)
2 Year	**2.10**	**1.05**	**0.84**	**0.23**	**1.00**
5 Year	**2.67**	**1.34**	**0.96**	**0.30**	**1.17**
10 Year	**3.16**	**1.58**	**1.06**	**0.35**	**1.30**
25 Year	**3.65**	**1.83**	**1.16**	**0.40**	**1.44**
50 Year	**3.97**	**1.98**	**1.25**	**0.44**	**1.52**
100 Year	**4.30**	**2.15**	**1.94**	**0.47**	**2.14**

Underground Detention Facility

Stormwater piping within a rock trench will serve the site to limit post development flows to the existing point source discharge. The stormwater facility will consist of 36" perforated SLCPP pipe and an outlet structure. The outlet structure will utilize a weir plate with an orifice hole to restrict post-development flows. The post-development drainage area includes buildings, parking and grassy areas. The stormwater facility will outlet into a proposed storm sewer pipe that will then discharge to the existing point source. The facility was sized to meet stormwater rate requirements. Please refer to Section 2 of this report for further information.

Methodology

The enclosed stormwater routing calculations for the pre-post development runoff calculations were computed using Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2016 version 10.5 by Autodesk, Inc. IDF curves were created using the NOAA Atlas 14 Version 3 Data found in Appendix A of the PennDOT Stormwater Manual Publication 584. The site was designed in accordance with Wilkins Township Stormwater Management Ordinance.

Estimated Time of Construction

Start Date: June 2023
End Date: September 2023

Maintenance Program

During construction, all compost filter sock and erosion and sedimentation control facilities will be inspected, as needed, to insure all systems are functioning properly. Compost filter sock will be replaced, as needed. The contractor will be responsible for replacement and repair.

During construction, all construction entrances to the site will be protected by gravel beds. The system will thereafter be inspected each month by the Owner. If the system shows any signs of failure or improper operation at any time, the Owner will replace and/or repair the affected areas.

Inspection of the Stormwater Management System will include:

Inspection shall be done of the entire stormwater management facility by the owner after every storm event exceeding one inch of rainfall and at least once every three months. This inspection will include:

1. Inspection of inlet boxes and storm sewers for accumulations of debris and/or sediment.

2. Maintenance of the facilities shall include vegetation cutting and/or removal along with routine maintenance as determined by the Engineer.

3. The Owner shall contact the Engineer if any signs of failure have been found during the monthly inspection.

4. A record of the inspections should be kept by the Owner for review by the Municipality.

Plan Preparer Record of Training and Experience in Post Construction Stormwater Management Methods and Techniques

Name of Plan Preparer: Mark M. Zimmerman P.E., CPESC, CPSWQ

Formal Education:

Name of College or Technical Institute: Pennsylvania State University
Curriculum or Program: Structural Design and Construction Engineering Tech.
Dates of Attendance: From: 8/1998 To: 8/2002
Degree Received: Bachelor of Science

Other Training:

Name of Training:	Certified Professional in Erosion Sedimentation Control (CPESC)	Certified Professional in Stormwater Water Quality (CPSWQ)
Presented By:	EnviroCert International	EnviroCert International
Date:	December 2012	January 2016

Employment History:

Current Employer: Morris Knowles & Associates, Inc.
Telephone: 724-468-4622

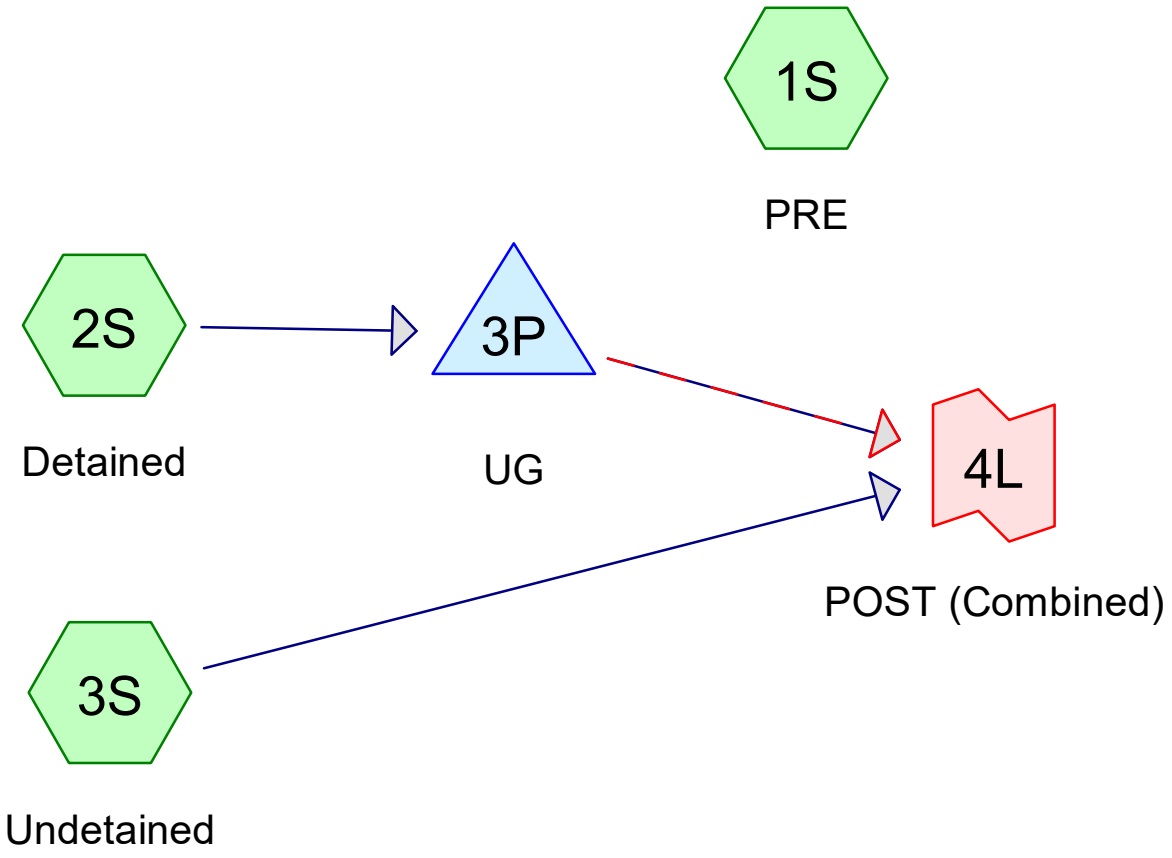
Former Emplyer: EADs Group
Telephone: 412-541-1580

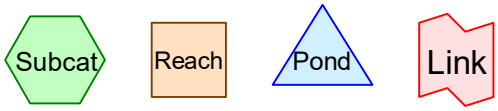
Recent PCSM Plans Prepared:

Name of Project:	Fletcher Sales	Pep Boys	Nevilleside PRD
County:	Westmoreland	Westmoreland	Allegheny
Municipality:	Delmont	North Huntingdon	Collier
Permit Number:	PAI056513005	E&S #8363	PAG02-00-02-12-016
Approving Agency:	Westmoreland CD	Westmoreland CD	Allegheny CD

Stormwater Management
Pre- vs. Post Development Calculations

Section 2





Routing Diagram for 1856.21 Wilkins Twp Zips_additional pay lane
Prepared by {enter your company name here}, Printed 4/5/2023
HydroCAD® 10.10-6a s/n 11650 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type II 24-hr		Default	24.00	1	2.70	2
2	5-Year	Type II 24-hr		Default	24.00	1	3.40	2
3	10-Year	Type II 24-hr		Default	24.00	1	4.00	2
4	25-Year	Type II 24-hr		Default	24.00	1	4.60	2
5	50-Year	Type II 24-hr		Default	24.00	1	5.00	2
6	100-Year	Type II 24-hr		Default	24.00	1	5.40	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
6,098	78	Meadow, non-grazed, HSG D (1S, 2S)
45,738	98	Paved parking, HSG D (1S, 2S, 3S)
51,836	**96**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
51,836	HSG D	1S, 2S, 3S
0	Other	
51,836		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchmen Numbers
0	0	0	6,098	0	6,098	Meadow, non-grazed	
0	0	0	45,738	0	45,738	Paved parking	
0	**0**	**0**	**51,836**	**0**	**51,836**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	3P	977.50	976.60	45.0	0.0200	0.012	0.0	12.0	0.0

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>2.23"
Tc=5.0 min CN=97 Runoff=2.097 cfs 4,455 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>2.03"
Tc=5.0 min CN=95 Runoff=2.106 cfs 4,273 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>2.34"
Tc=5.0 min CN=98 Runoff=0.233 cfs 509 cf

Pond 3P: UG Peak Elev=979.34' Storage=1,104 cf Inflow=2.106 cfs 4,273 cf
Primary=0.840 cfs 4,254 cf Secondary=0.000 cfs 0 cf Outflow=0.840 cfs 4,254 cf

Link 4L: POST (Combined) Inflow=1.003 cfs 4,764 cf
Primary=1.003 cfs 4,764 cf

Total Runoff Area = 51,836 sf Runoff Volume = 9,237 cf Average Runoff Depth = 2.14"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

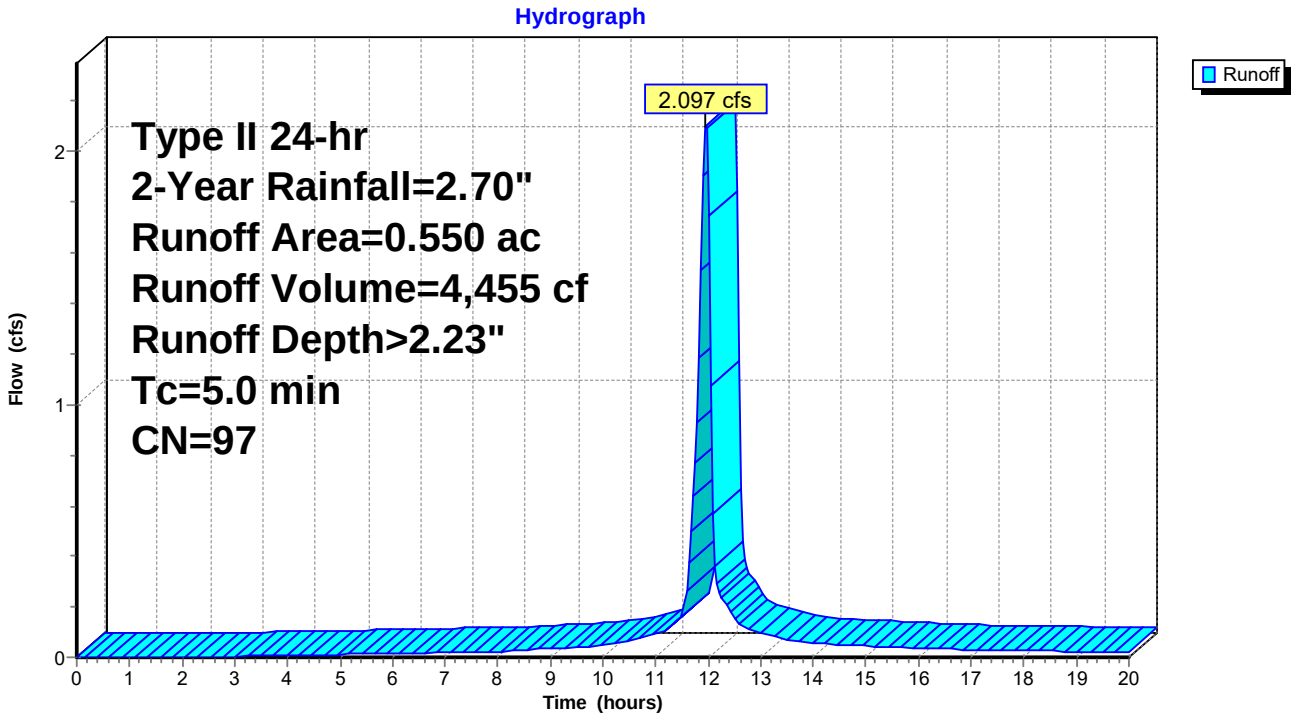
Runoff = 2.097 cfs @ 11.95 hrs, Volume= 4,455 cf, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-Year Rainfall=2.70"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.60	0.34	0.079
0.20	0.01	0.00	0.000	11.00	0.63	0.37	0.090
0.40	0.01	0.00	0.000	11.20	0.68	0.41	0.111
0.60	0.02	0.00	0.000	11.40	0.73	0.46	0.138
0.80	0.02	0.00	0.000	11.60	0.83	0.55	0.260
1.00	0.03	0.00	0.000	11.80	1.16	0.86	**0.932**
1.20	0.03	0.00	0.000	12.00	1.79	1.47	**1.744**
1.40	0.04	0.00	0.000	12.20	1.89	1.56	0.259
1.60	0.05	0.00	0.000	12.40	1.96	1.63	0.187
1.80	0.05	0.00	0.000	12.60	2.01	1.68	0.128
2.00	0.06	0.00	0.000	12.80	2.05	1.72	0.111
2.20	0.07	0.00	0.000	13.00	2.08	1.75	0.096
2.40	0.07	0.00	0.001	13.20	2.12	1.79	0.085
2.60	0.08	0.00	0.002	13.40	2.14	1.81	0.077
2.80	0.09	0.00	0.002	13.60	2.17	1.84	0.069
3.00	0.09	0.00	0.003	13.80	2.19	1.86	0.063
3.20	0.10	0.00	0.004	14.00	2.21	1.88	0.057
3.40	0.11	0.01	0.005	14.20	2.23	1.90	0.053
3.60	0.11	0.01	0.005	14.40	2.25	1.92	0.051
3.80	0.12	0.01	0.006	14.60	2.27	1.94	0.049
4.00	0.13	0.01	0.007	14.80	2.29	1.95	0.047
4.20	0.14	0.01	0.007	15.00	2.30	1.97	0.045
4.40	0.15	0.02	0.008	15.20	2.32	1.99	0.043
4.60	0.15	0.02	0.009	15.40	2.34	2.00	0.041
4.80	0.16	0.02	0.010	15.60	2.35	2.02	0.039
5.00	0.17	0.03	0.010	15.80	2.36	2.03	0.037
5.20	0.18	0.03	0.011	16.00	2.38	2.04	0.035
5.40	0.19	0.04	0.012	16.20	2.39	2.05	0.034
5.60	0.20	0.04	0.013	16.40	2.40	2.07	0.033
5.80	0.21	0.05	0.014	16.60	2.41	2.08	0.032
6.00	0.22	0.05	0.015	16.80	2.42	2.09	0.031
6.20	0.23	0.06	0.015	17.00	2.43	2.10	0.031
6.40	0.24	0.06	0.016	17.20	2.45	2.11	0.030
6.60	0.25	0.07	0.017	17.40	2.46	2.12	0.029
6.80	0.26	0.08	0.018	17.60	2.47	2.13	0.028
7.00	0.27	0.08	0.019	17.80	2.48	2.14	0.028
7.20	0.28	0.09	0.020	18.00	2.49	2.15	0.027
7.40	0.29	0.10	0.020	18.20	2.50	2.16	0.026
7.60	0.30	0.10	0.021	18.40	2.51	2.17	0.025
7.80	0.31	0.11	0.022	18.60	2.51	2.18	0.025
8.00	0.32	0.12	0.023	18.80	2.52	2.19	0.024
8.20	0.34	0.13	0.025	19.00	2.53	2.20	0.023
8.40	0.35	0.14	0.027	19.20	2.54	2.20	0.022
8.60	0.36	0.15	0.030	19.40	2.55	2.21	0.022
8.80	0.38	0.16	0.033	19.60	2.56	2.22	0.021
9.00	0.40	0.17	0.036	19.80	2.56	2.23	0.020
9.20	0.41	0.19	0.037	20.00	**2.57**	**2.23**	0.020
9.40	0.43	0.20	0.038				
9.60	0.45	0.22	0.039				
9.80	0.47	0.23	0.043				
10.00	0.49	0.25	0.048				
10.20	0.51	0.27	0.053				
10.40	0.54	0.29	0.060				
10.60	0.57	0.31	0.068				

Summary for Subcatchment 2S: Detained

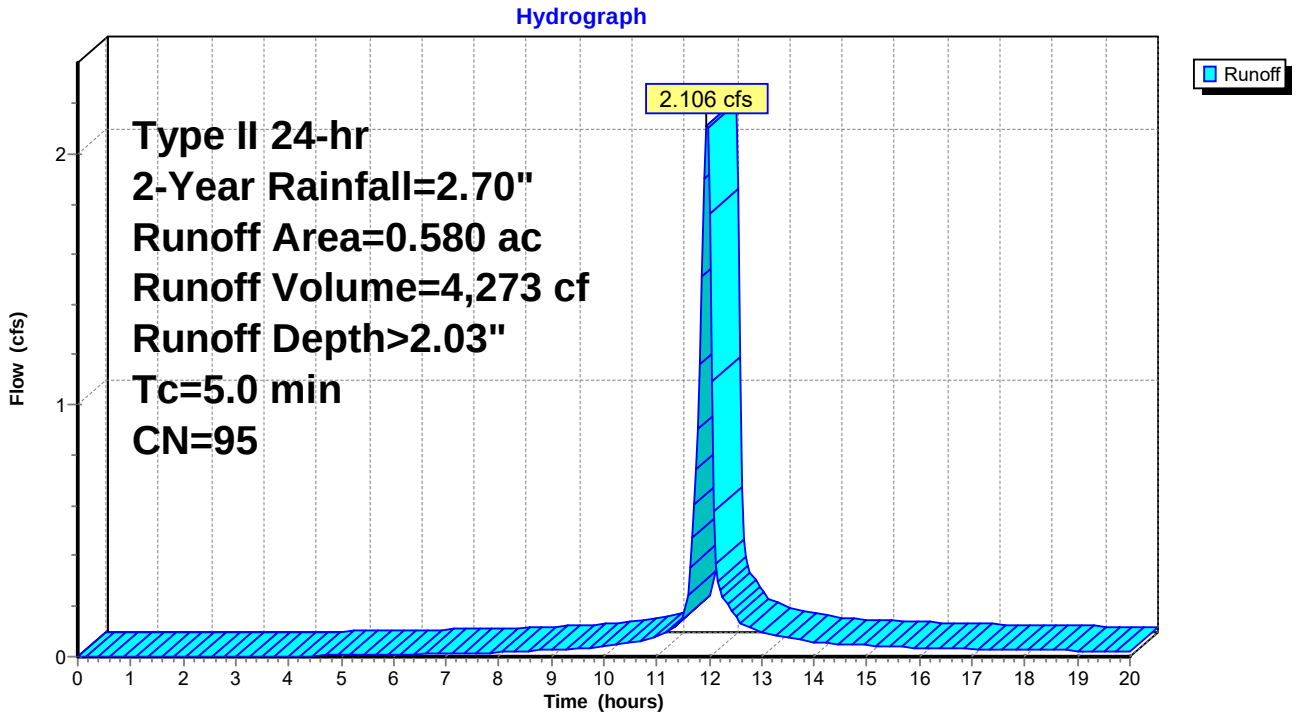
Runoff = 2.106 cfs @ 11.96 hrs, Volume= 4,273 cf, Depth> 2.03"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-Year Rainfall=2.70"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.60	0.24	0.070
0.20	0.01	0.00	0.000	11.00	0.63	0.27	0.081
0.40	0.01	0.00	0.000	11.20	0.68	0.30	0.101
0.60	0.02	0.00	0.000	11.40	0.73	0.34	0.127
0.80	0.02	0.00	0.000	11.60	0.83	0.42	0.244
1.00	0.03	0.00	0.000	11.80	1.16	0.71	**0.904**
1.20	0.03	0.00	0.000	12.00	1.79	1.28	**1.762**
1.40	0.04	0.00	0.000	12.20	1.89	1.37	0.265
1.60	0.05	0.00	0.000	12.40	1.96	1.44	0.191
1.80	0.05	0.00	0.000	12.60	2.01	1.49	0.131
2.00	0.06	0.00	0.000	12.80	2.05	1.53	0.114
2.20	0.07	0.00	0.000	13.00	2.08	1.56	0.098
2.40	0.07	0.00	0.000	13.20	2.12	1.59	0.087
2.60	0.08	0.00	0.000	13.40	2.14	1.62	0.079
2.80	0.09	0.00	0.000	13.60	2.17	1.65	0.071
3.00	0.09	0.00	0.000	13.80	2.19	1.67	0.064
3.20	0.10	0.00	0.000	14.00	2.21	1.69	0.058
3.40	0.11	0.00	0.000	14.20	2.23	1.71	0.055
3.60	0.11	0.00	0.001	14.40	2.25	1.72	0.053
3.80	0.12	0.00	0.001	14.60	2.27	1.74	0.051
4.00	0.13	0.00	0.002	14.80	2.29	1.76	0.049
4.20	0.14	0.00	0.002	15.00	2.30	1.77	0.046
4.40	0.15	0.00	0.003	15.20	2.32	1.79	0.044
4.60	0.15	0.00	0.004	15.40	2.34	1.80	0.042
4.80	0.16	0.01	0.004	15.60	2.35	1.82	0.040
5.00	0.17	0.01	0.005	15.80	2.36	1.83	0.038
5.20	0.18	0.01	0.006	16.00	2.38	1.84	0.036
5.40	0.19	0.01	0.006	16.20	2.39	1.86	0.035
5.60	0.20	0.01	0.007	16.40	2.40	1.87	0.034
5.80	0.21	0.02	0.008	16.60	2.41	1.88	0.033
6.00	0.22	0.02	0.009	16.80	2.42	1.89	0.032
6.20	0.23	0.02	0.010	17.00	2.43	1.90	0.032
6.40	0.24	0.03	0.010	17.20	2.45	1.91	0.031
6.60	0.25	0.03	0.011	17.40	2.46	1.92	0.030
6.80	0.26	0.03	0.012	17.60	2.47	1.93	0.029
7.00	0.27	0.04	0.013	17.80	2.48	1.94	0.029
7.20	0.28	0.04	0.014	18.00	2.49	1.95	0.028
7.40	0.29	0.05	0.014	18.20	2.50	1.96	0.027
7.60	0.30	0.05	0.015	18.40	2.51	1.97	0.026
7.80	0.31	0.06	0.016	18.60	2.51	1.98	0.026
8.00	0.32	0.06	0.017	18.80	2.52	1.99	0.025
8.20	0.34	0.07	0.019	19.00	2.53	1.99	0.024
8.40	0.35	0.08	0.021	19.20	2.54	2.00	0.023
8.60	0.36	0.09	0.023	19.40	2.55	2.01	0.022
8.80	0.38	0.09	0.026	19.60	2.56	2.02	0.022
9.00	0.40	0.10	0.029	19.80	2.56	2.02	0.021
9.20	0.41	0.11	0.030	20.00	**2.57**	**2.03**	0.020
9.40	0.43	0.12	0.031				
9.60	0.45	0.14	0.032				
9.80	0.47	0.15	0.036				
10.00	0.49	0.16	0.040				
10.20	0.51	0.18	0.046				
10.40	0.54	0.19	0.052				
10.60	0.57	0.21	0.059				

Summary for Subcatchment 3S: Undetained

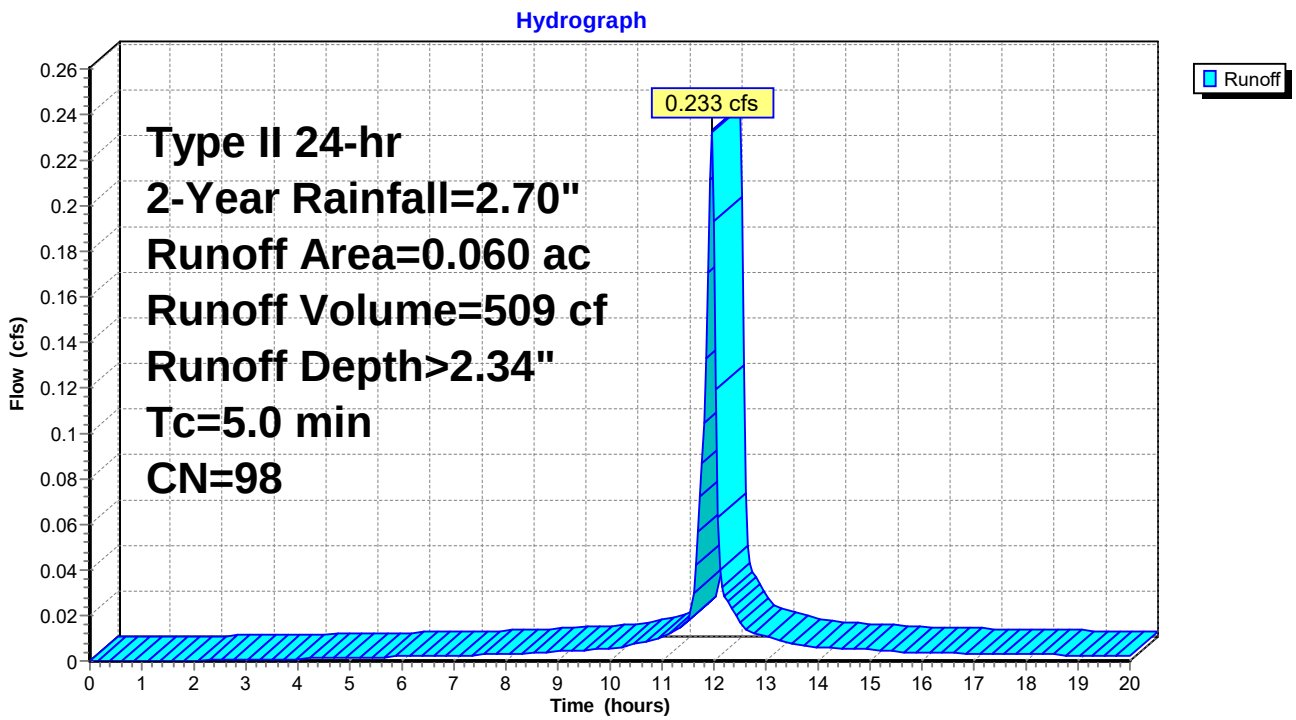
Runoff = 0.233 cfs @ 11.95 hrs, Volume= 509 cf, Depth> 2.34"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-Year Rainfall=2.70"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.60	0.41	0.009
0.20	0.01	0.00	0.000	11.00	0.63	0.44	0.010
0.40	0.01	0.00	0.000	11.20	0.68	0.48	0.013
0.60	0.02	0.00	0.000	11.40	0.73	0.53	0.016
0.80	0.02	0.00	0.000	11.60	0.83	0.63	0.030
1.00	0.03	0.00	0.000	11.80	1.16	0.95	**0.105**
1.20	0.03	0.00	0.000	12.00	1.79	1.57	**0.193**
1.40	0.04	0.00	0.000	12.20	1.89	1.66	0.029
1.60	0.05	0.00	0.000	12.40	1.96	1.73	0.021
1.80	0.05	0.00	0.000	12.60	2.01	1.78	0.014
2.00	0.06	0.00	0.000	12.80	2.05	1.82	0.012
2.20	0.07	0.00	0.000	13.00	2.08	1.86	0.011
2.40	0.07	0.00	0.000	13.20	2.12	1.89	0.009
2.60	0.08	0.01	0.001	13.40	2.14	1.92	0.008
2.80	0.09	0.01	0.001	13.60	2.17	1.94	0.008
3.00	0.09	0.01	0.001	13.80	2.19	1.97	0.007
3.20	0.10	0.01	0.001	14.00	2.21	1.99	0.006
3.40	0.11	0.02	0.001	14.20	2.23	2.01	0.006
3.60	0.11	0.02	0.001	14.40	2.25	2.02	0.006
3.80	0.12	0.02	0.001	14.60	2.27	2.04	0.005
4.00	0.13	0.03	0.001	14.80	2.29	2.06	0.005
4.20	0.14	0.03	0.001	15.00	2.30	2.08	0.005
4.40	0.15	0.04	0.001	15.20	2.32	2.09	0.005
4.60	0.15	0.04	0.001	15.40	2.34	2.11	0.005
4.80	0.16	0.04	0.002	15.60	2.35	2.12	0.004
5.00	0.17	0.05	0.002	15.80	2.36	2.13	0.004
5.20	0.18	0.06	0.002	16.00	2.38	2.15	0.004
5.40	0.19	0.06	0.002	16.20	2.39	2.16	0.004
5.60	0.20	0.07	0.002	16.40	2.40	2.17	0.004
5.80	0.21	0.07	0.002	16.60	2.41	2.18	0.004
6.00	0.22	0.08	0.002	16.80	2.42	2.19	0.003
6.20	0.23	0.09	0.002	17.00	2.43	2.21	0.003
6.40	0.24	0.10	0.002	17.20	2.45	2.22	0.003
6.60	0.25	0.10	0.002	17.40	2.46	2.23	0.003
6.80	0.26	0.11	0.002	17.60	2.47	2.24	0.003
7.00	0.27	0.12	0.002	17.80	2.48	2.25	0.003
7.20	0.28	0.13	0.003	18.00	2.49	2.26	0.003
7.40	0.29	0.14	0.003	18.20	2.50	2.27	0.003
7.60	0.30	0.15	0.003	18.40	2.51	2.28	0.003
7.80	0.31	0.15	0.003	18.60	2.51	2.29	0.003
8.00	0.32	0.16	0.003	18.80	2.52	2.29	0.003
8.20	0.34	0.17	0.003	19.00	2.53	2.30	0.003
8.40	0.35	0.19	0.003	19.20	2.54	2.31	0.002
8.60	0.36	0.20	0.004	19.40	2.55	2.32	0.002
8.80	0.38	0.21	0.004	19.60	2.56	2.33	0.002
9.00	0.40	0.23	0.004	19.80	2.56	2.33	0.002
9.20	0.41	0.24	0.005	20.00	**2.57**	**2.34**	0.002
9.40	0.43	0.26	0.005				
9.60	0.45	0.27	0.005				
9.80	0.47	0.29	0.005				
10.00	0.49	0.31	0.006				
10.20	0.51	0.33	0.006				
10.40	0.54	0.35	0.007				
10.60	0.57	0.38	0.008				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 2.03" for 2-Year event
Inflow = 2.106 cfs @ 11.96 hrs, Volume= 4,273 cf
Outflow = 0.840 cfs @ 12.06 hrs, Volume= 4,254 cf, Atten= 60%, Lag= 6.3 min
Primary = 0.840 cfs @ 12.06 hrs, Volume= 4,254 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 979.34' @ 12.06 hrs Surf.Area= 1,190 sf Storage= 1,104 cf

Plug-Flow detention time= 15.4 min calculated for 4,246 cf (99% of inflow)
Center-of-Mass det. time= 13.5 min (761.8 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.836 cfs @ 12.06 hrs HW=979.33' (Free Discharge)
└─**1=Culvert** (Passes 0.836 cfs of 3.443 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.836 cfs @ 6.13 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.000 cfs)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

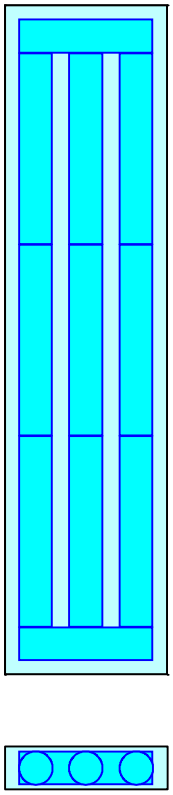
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

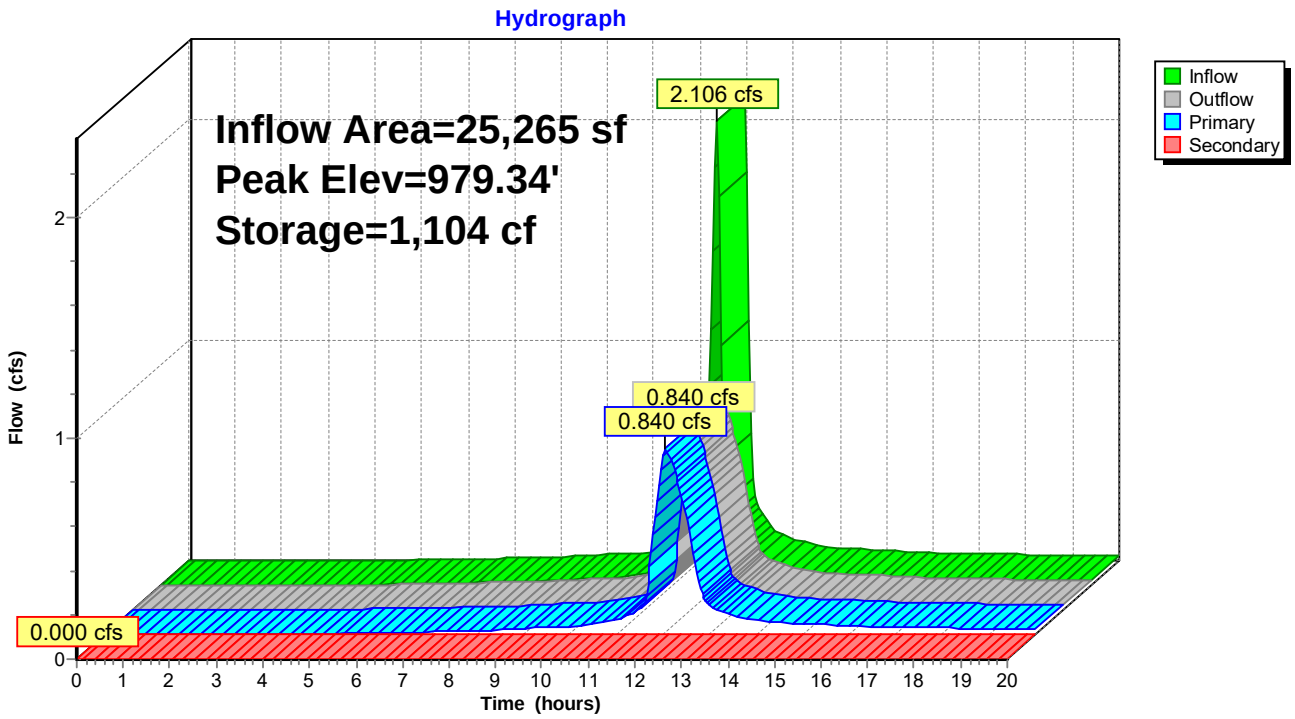
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=979.34'
Storage=1,104 cf
2.106 cfs
0.840 cfs
0.840 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Hydrograph for Pond 3P: UG

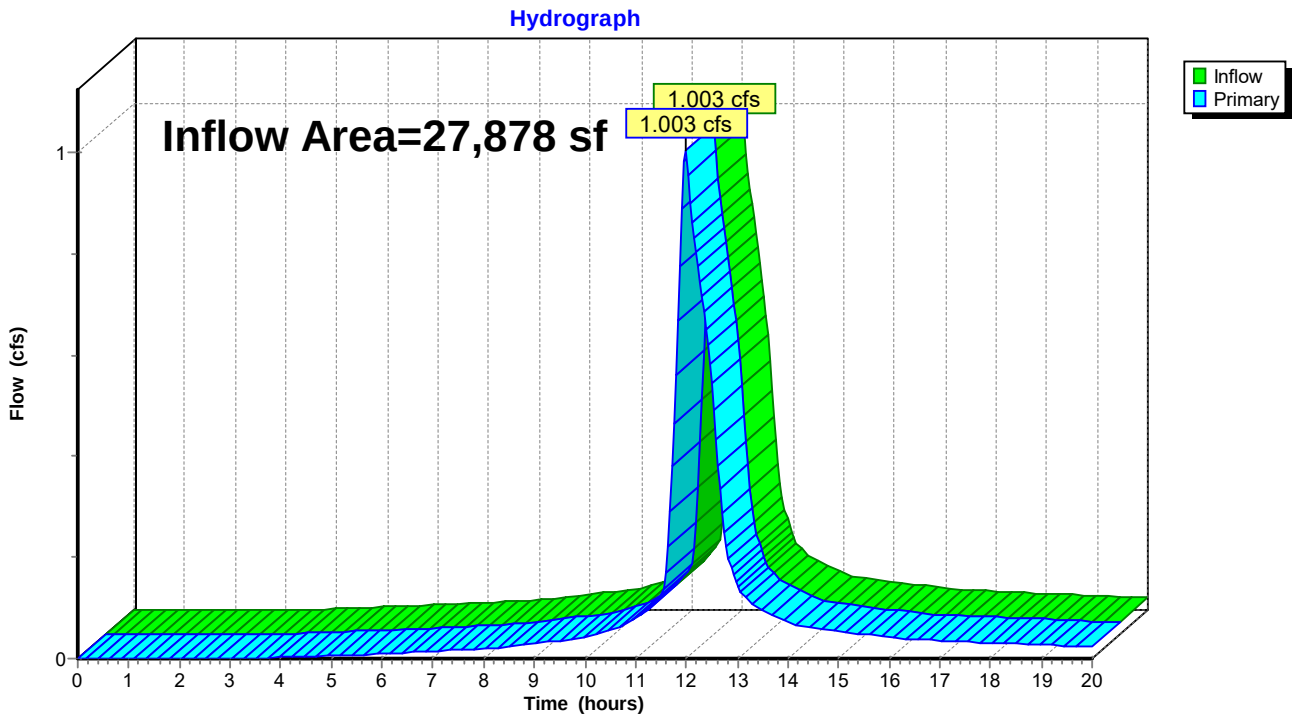
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.000	0	977.50	0.000	0.000	0.000
2.40	0.000	0	977.50	0.000	0.000	0.000
2.80	0.000	0	977.50	0.000	0.000	0.000
3.20	0.000	0	977.50	0.000	0.000	0.000
3.60	0.001	0	977.50	0.000	0.000	0.000
4.00	0.002	1	977.50	0.001	0.001	0.000
4.40	0.003	2	977.50	0.002	0.002	0.000
4.80	0.004	3	977.51	0.003	0.003	0.000
5.20	0.006	4	977.51	0.005	0.005	0.000
5.60	0.007	5	977.51	0.006	0.006	0.000
6.00	0.009	7	977.51	0.008	0.008	0.000
6.40	0.010	8	977.52	0.009	0.009	0.000
6.80	0.012	10	977.52	0.011	0.011	0.000
7.20	0.014	11	977.52	0.013	0.013	0.000
7.60	0.015	13	977.53	0.014	0.014	0.000
8.00	0.017	14	977.53	0.016	0.016	0.000
8.40	0.021	16	977.53	0.019	0.019	0.000
8.80	0.026	20	977.54	0.023	0.023	0.000
9.20	0.030	24	977.55	0.028	0.028	0.000
9.60	0.032	27	977.56	0.031	0.031	0.000
10.00	0.040	31	977.57	0.036	0.036	0.000
10.40	0.052	40	977.58	0.045	0.045	0.000
10.80	0.070	52	977.61	0.059	0.059	0.000
11.20	0.101	71	977.65	0.081	0.081	0.000
11.60	**0.244**	117	977.75	0.140	0.140	0.000
12.00	**1.762**	**1,006**	**979.22**	**0.808**	**0.808**	0.000
12.40	0.191	**557**	**978.63**	**0.630**	**0.630**	0.000
12.80	0.114	154	977.82	0.209	0.209	0.000
13.20	0.087	94	977.70	0.107	0.107	0.000
13.60	0.071	72	977.65	0.082	0.082	0.000
14.00	0.058	58	977.62	0.067	0.067	0.000
14.40	0.053	50	977.60	0.057	0.057	0.000
14.80	0.049	45	977.59	0.051	0.051	0.000
15.20	0.044	41	977.59	0.047	0.047	0.000
15.60	0.040	37	977.58	0.043	0.043	0.000
16.00	0.036	34	977.57	0.038	0.038	0.000
16.40	0.034	31	977.56	0.035	0.035	0.000
16.80	0.032	29	977.56	0.033	0.033	0.000
17.20	0.031	28	977.56	0.032	0.032	0.000
17.60	0.029	26	977.56	0.030	0.030	0.000
18.00	0.028	25	977.55	0.029	0.029	0.000
18.40	0.026	24	977.55	0.027	0.027	0.000
18.80	0.025	22	977.55	0.026	0.026	0.000
19.20	0.023	21	977.54	0.024	0.024	0.000
19.60	0.022	20	977.54	0.023	0.023	0.000
20.00	0.020	18	977.54	0.021	0.021	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 2.05" for 2-Year event
Inflow = 1.003 cfs @ 11.99 hrs, Volume= 4,764 cf
Primary = 1.003 cfs @ 11.99 hrs, Volume= 4,764 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.068	0.00	0.068
0.20	0.000	0.00	0.000	11.00	0.079	0.00	0.079
0.40	0.000	0.00	0.000	11.20	0.094	0.00	0.094
0.60	0.000	0.00	0.000	11.40	0.117	0.00	0.117
0.80	0.000	0.00	0.000	11.60	0.169	0.00	0.169
1.00	0.000	0.00	0.000	11.80	0.560	0.00	0.560
1.20	0.000	0.00	0.000	12.00	**1.001**	0.00	**1.001**
1.40	0.000	0.00	0.000	12.20	0.801	0.00	0.801
1.60	0.000	0.00	0.000	12.40	0.651	0.00	0.651
1.80	0.000	0.00	0.000	12.60	0.431	0.00	0.431
2.00	0.000	0.00	0.000	12.80	0.221	0.00	0.221
2.20	0.000	0.00	0.000	13.00	0.142	0.00	0.142
2.40	0.000	0.00	0.000	13.20	0.117	0.00	0.117
2.60	0.001	0.00	0.001	13.40	0.102	0.00	0.102
2.80	0.001	0.00	0.001	13.60	0.090	0.00	0.090
3.00	0.001	0.00	0.001	13.80	0.081	0.00	0.081
3.20	0.001	0.00	0.001	14.00	0.073	0.00	0.073
3.40	0.001	0.00	0.001	14.20	0.067	0.00	0.067
3.60	0.001	0.00	0.001	14.40	0.062	0.00	0.062
3.80	0.002	0.00	0.002	14.60	0.059	0.00	0.059
4.00	0.002	0.00	0.002	14.80	0.057	0.00	0.057
4.20	0.003	0.00	0.003	15.00	0.054	0.00	0.054
4.40	0.004	0.00	0.004	15.20	0.052	0.00	0.052
4.60	0.004	0.00	0.004	15.40	0.049	0.00	0.049
4.80	0.005	0.00	0.005	15.60	0.047	0.00	0.047
5.00	0.006	0.00	0.006	15.80	0.045	0.00	0.045
5.20	0.007	0.00	0.007	16.00	0.042	0.00	0.042
5.40	0.007	0.00	0.007	16.20	0.040	0.00	0.040
5.60	0.008	0.00	0.008	16.40	0.039	0.00	0.039
5.80	0.009	0.00	0.009	16.60	0.038	0.00	0.038
6.00	0.010	0.00	0.010	16.80	0.037	0.00	0.037
6.20	0.011	0.00	0.011	17.00	0.036	0.00	0.036
6.40	0.012	0.00	0.012	17.20	0.035	0.00	0.035
6.60	0.012	0.00	0.012	17.40	0.034	0.00	0.034
6.80	0.013	0.00	0.013	17.60	0.033	0.00	0.033
7.00	0.014	0.00	0.014	17.80	0.032	0.00	0.032
7.20	0.015	0.00	0.015	18.00	0.032	0.00	0.032
7.40	0.016	0.00	0.016	18.20	0.031	0.00	0.031
7.60	0.017	0.00	0.017	18.40	0.030	0.00	0.030
7.80	0.018	0.00	0.018	18.60	0.029	0.00	0.029
8.00	0.019	0.00	0.019	18.80	0.028	0.00	0.028
8.20	0.020	0.00	0.020	19.00	0.027	0.00	0.027
8.40	0.022	0.00	0.022	19.20	0.027	0.00	0.027
8.60	0.025	0.00	0.025	19.40	0.026	0.00	0.026
8.80	0.027	0.00	0.027	19.60	0.025	0.00	0.025
9.00	0.030	0.00	0.030	19.80	0.024	0.00	0.024
9.20	0.032	0.00	0.032	20.00	0.023	0.00	0.023
9.40	0.034	0.00	0.034				
9.60	0.035	0.00	0.035				
9.80	0.038	0.00	0.038				
10.00	0.042	0.00	0.042				
10.20	0.046	0.00	0.046				
10.40	0.052	0.00	0.052				
10.60	0.059	0.00	0.059				

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=97 Runoff=2.671 cfs 5,771 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>2.68"
Tc=5.0 min CN=95 Runoff=2.722 cfs 5,639 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>3.00"
Tc=5.0 min CN=98 Runoff=0.295 cfs 654 cf

Pond 3P: UG Peak Elev=979.86' Storage=1,531 cf Inflow=2.722 cfs 5,639 cf
Primary=0.963 cfs 5,616 cf Secondary=0.000 cfs 0 cf Outflow=0.963 cfs 5,616 cf

Link 4L: POST (Combined) Inflow=1.169 cfs 6,270 cf
Primary=1.169 cfs 6,270 cf

Total Runoff Area = 51,836 sf Runoff Volume = 12,064 cf Average Runoff Depth = 2.79"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

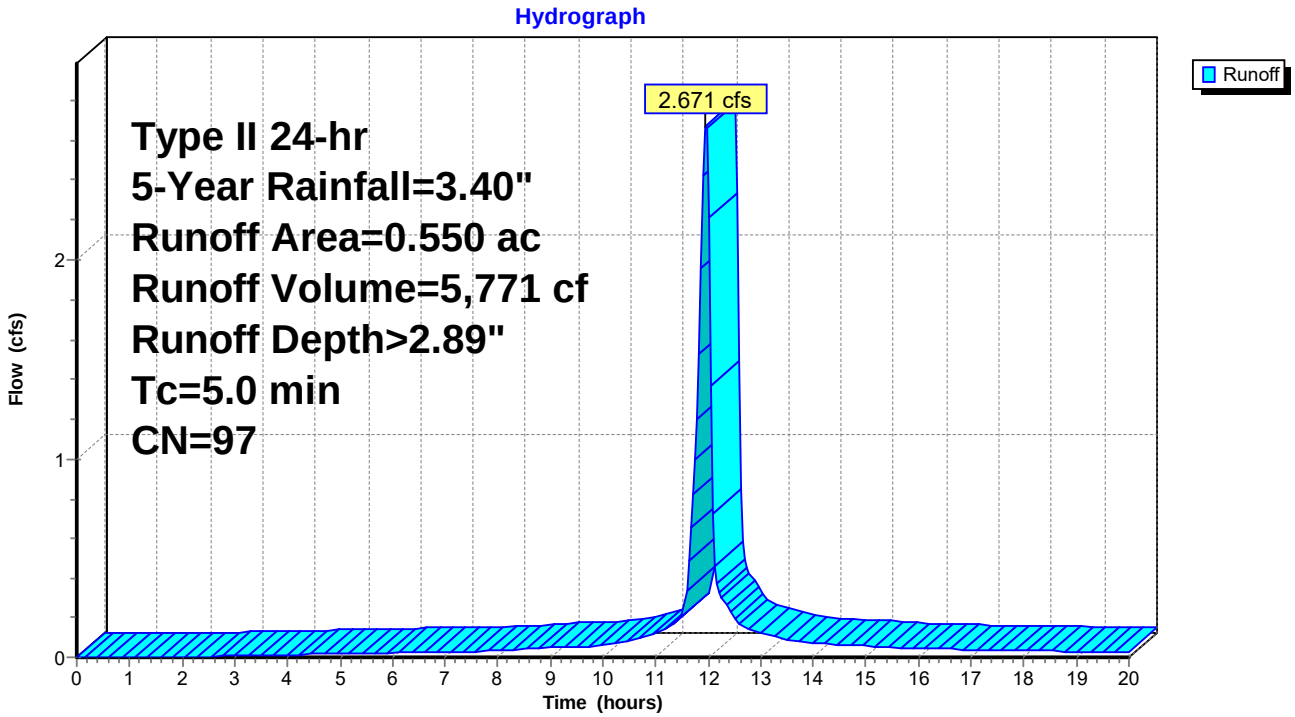
Runoff = 2.671 cfs @ 11.95 hrs, Volume= 5,771 cf, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 5-Year Rainfall=3.40"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.75	0.48	0.104
0.20	0.01	0.00	0.000	11.00	0.80	0.52	0.118
0.40	0.01	0.00	0.000	11.20	0.85	0.57	0.145
0.60	0.02	0.00	0.000	11.40	0.92	0.63	0.180
0.80	0.03	0.00	0.000	11.60	1.04	0.75	0.337
1.00	0.04	0.00	0.000	11.80	1.46	1.15	**1.197**
1.20	0.04	0.00	0.000	12.00	2.25	1.92	**2.218**
1.40	0.05	0.00	0.000	12.20	2.38	2.04	0.329
1.60	0.06	0.00	0.000	12.40	2.47	2.13	0.237
1.80	0.07	0.00	0.000	12.60	2.53	2.19	0.162
2.00	0.07	0.00	0.001	12.80	2.58	2.24	0.140
2.20	0.08	0.00	0.002	13.00	2.62	2.29	0.121
2.40	0.09	0.00	0.003	13.20	2.66	2.33	0.107
2.60	0.10	0.00	0.005	13.40	2.70	2.36	0.097
2.80	0.11	0.01	0.006	13.60	2.73	2.39	0.087
3.00	0.12	0.01	0.007	13.80	2.76	2.42	0.079
3.20	0.13	0.01	0.007	14.00	2.79	2.45	0.072
3.40	0.14	0.01	0.008	14.20	2.81	2.47	0.067
3.60	0.14	0.02	0.009	14.40	2.84	2.50	0.065
3.80	0.15	0.02	0.010	14.60	2.86	2.52	0.062
4.00	0.16	0.03	0.011	14.80	2.88	2.54	0.060
4.20	0.17	0.03	0.012	15.00	2.90	2.56	0.057
4.40	0.18	0.03	0.013	15.20	2.92	2.58	0.054
4.60	0.19	0.04	0.014	15.40	2.94	2.60	0.052
4.80	0.20	0.04	0.015	15.60	2.96	2.62	0.049
5.00	0.21	0.05	0.016	15.80	2.98	2.63	0.047
5.20	0.23	0.06	0.017	16.00	2.99	2.65	0.044
5.40	0.24	0.06	0.018	16.20	3.01	2.67	0.042
5.60	0.25	0.07	0.019	16.40	3.02	2.68	0.041
5.80	0.26	0.08	0.020	16.60	3.04	2.70	0.041
6.00	0.27	0.09	0.022	16.80	3.05	2.71	0.040
6.20	0.28	0.09	0.023	17.00	3.07	2.72	0.039
6.40	0.30	0.10	0.024	17.20	3.08	2.74	0.038
6.60	0.31	0.11	0.025	17.40	3.09	2.75	0.037
6.80	0.32	0.12	0.026	17.60	3.11	2.76	0.036
7.00	0.34	0.13	0.027	17.80	3.12	2.78	0.035
7.20	0.35	0.14	0.028	18.00	3.13	2.79	0.034
7.40	0.36	0.15	0.029	18.20	3.14	2.80	0.033
7.60	0.38	0.16	0.030	18.40	3.16	2.81	0.032
7.80	0.39	0.17	0.031	18.60	3.17	2.82	0.031
8.00	0.41	0.18	0.032	18.80	3.18	2.83	0.030
8.20	0.42	0.20	0.034	19.00	3.19	2.85	0.029
8.40	0.44	0.21	0.038	19.20	3.20	2.86	0.028
8.60	0.46	0.22	0.041	19.40	3.21	2.87	0.027
8.80	0.48	0.24	0.045	19.60	3.22	2.87	0.027
9.00	0.50	0.26	0.049	19.80	3.23	2.88	0.026
9.20	0.52	0.27	0.050	20.00	**3.24**	**2.89**	0.025
9.40	0.54	0.29	0.051				
9.60	0.57	0.31	0.052				
9.80	0.59	0.33	0.058				
10.00	0.62	0.36	0.063				
10.20	0.64	0.38	0.071				
10.40	0.68	0.41	0.080				
10.60	0.71	0.44	0.089				

Summary for Subcatchment 2S: Detained

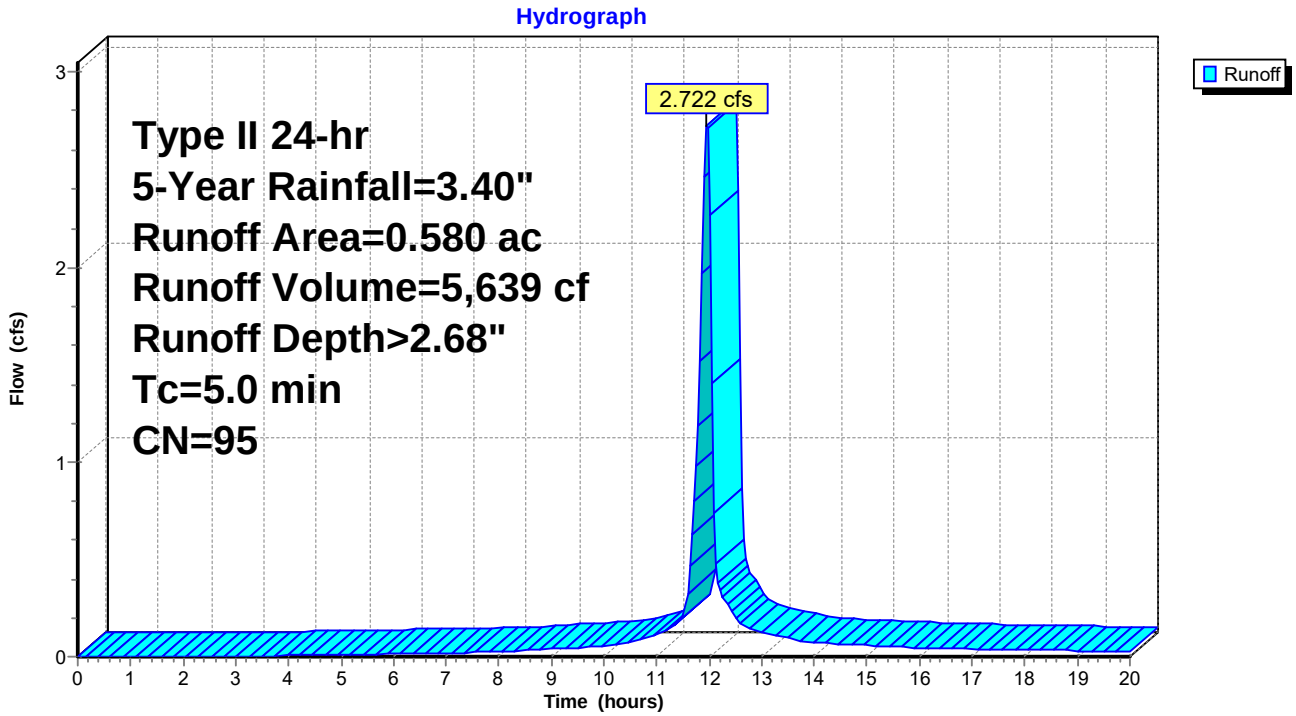
Runoff = 2.722 cfs @ 11.95 hrs, Volume= 5,639 cf, Depth> 2.68"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 5-Year Rainfall=3.40"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.75	0.36	0.096
0.20	0.01	0.00	0.000	11.00	0.80	0.39	0.111
0.40	0.01	0.00	0.000	11.20	0.85	0.44	0.137
0.60	0.02	0.00	0.000	11.40	0.92	0.50	0.172
0.80	0.03	0.00	0.000	11.60	1.04	0.60	0.326
1.00	0.04	0.00	0.000	11.80	1.46	0.98	**1.189**
1.20	0.04	0.00	0.000	12.00	2.25	1.73	**2.270**
1.40	0.05	0.00	0.000	12.20	2.38	1.84	0.339
1.60	0.06	0.00	0.000	12.40	2.47	1.93	0.245
1.80	0.07	0.00	0.000	12.60	2.53	1.99	0.168
2.00	0.07	0.00	0.000	12.80	2.58	2.04	0.145
2.20	0.08	0.00	0.000	13.00	2.62	2.08	0.125
2.40	0.09	0.00	0.000	13.20	2.66	2.12	0.111
2.60	0.10	0.00	0.000	13.40	2.70	2.16	0.100
2.80	0.11	0.00	0.000	13.60	2.73	2.19	0.090
3.00	0.12	0.00	0.001	13.80	2.76	2.22	0.082
3.20	0.13	0.00	0.002	14.00	2.79	2.24	0.075
3.40	0.14	0.00	0.002	14.20	2.81	2.27	0.070
3.60	0.14	0.00	0.003	14.40	2.84	2.29	0.067
3.80	0.15	0.00	0.004	14.60	2.86	2.31	0.065
4.00	0.16	0.01	0.005	14.80	2.88	2.33	0.062
4.20	0.17	0.01	0.006	15.00	2.90	2.35	0.059
4.40	0.18	0.01	0.007	15.20	2.92	2.37	0.057
4.60	0.19	0.01	0.008	15.40	2.94	2.39	0.054
4.80	0.20	0.02	0.009	15.60	2.96	2.41	0.051
5.00	0.21	0.02	0.010	15.80	2.98	2.43	0.048
5.20	0.23	0.02	0.011	16.00	2.99	2.44	0.046
5.40	0.24	0.03	0.012	16.20	3.01	2.46	0.044
5.60	0.25	0.03	0.013	16.40	3.02	2.47	0.043
5.80	0.26	0.04	0.014	16.60	3.04	2.49	0.042
6.00	0.27	0.04	0.015	16.80	3.05	2.50	0.041
6.20	0.28	0.05	0.016	17.00	3.07	2.51	0.040
6.40	0.30	0.05	0.017	17.20	3.08	2.53	0.039
6.60	0.31	0.06	0.018	17.40	3.09	2.54	0.038
6.80	0.32	0.06	0.019	17.60	3.11	2.55	0.037
7.00	0.34	0.07	0.020	17.80	3.12	2.57	0.036
7.20	0.35	0.08	0.021	18.00	3.13	2.58	0.035
7.40	0.36	0.09	0.022	18.20	3.14	2.59	0.034
7.60	0.38	0.09	0.023	18.40	3.16	2.60	0.033
7.80	0.39	0.10	0.025	18.60	3.17	2.61	0.032
8.00	0.41	0.11	0.026	18.80	3.18	2.62	0.032
8.20	0.42	0.12	0.028	19.00	3.19	2.63	0.031
8.40	0.44	0.13	0.031	19.20	3.20	2.64	0.030
8.60	0.46	0.14	0.034	19.40	3.21	2.65	0.029
8.80	0.48	0.16	0.038	19.60	3.22	2.66	0.028
9.00	0.50	0.17	0.041	19.80	3.23	2.67	0.027
9.20	0.52	0.18	0.043	20.00	**3.24**	**2.68**	0.026
9.40	0.54	0.20	0.044				
9.60	0.57	0.21	0.046				
9.80	0.59	0.23	0.051				
10.00	0.62	0.25	0.057				
10.20	0.64	0.27	0.064				
10.40	0.68	0.30	0.073				
10.60	0.71	0.32	0.082				

Summary for Subcatchment 3S: Undetained

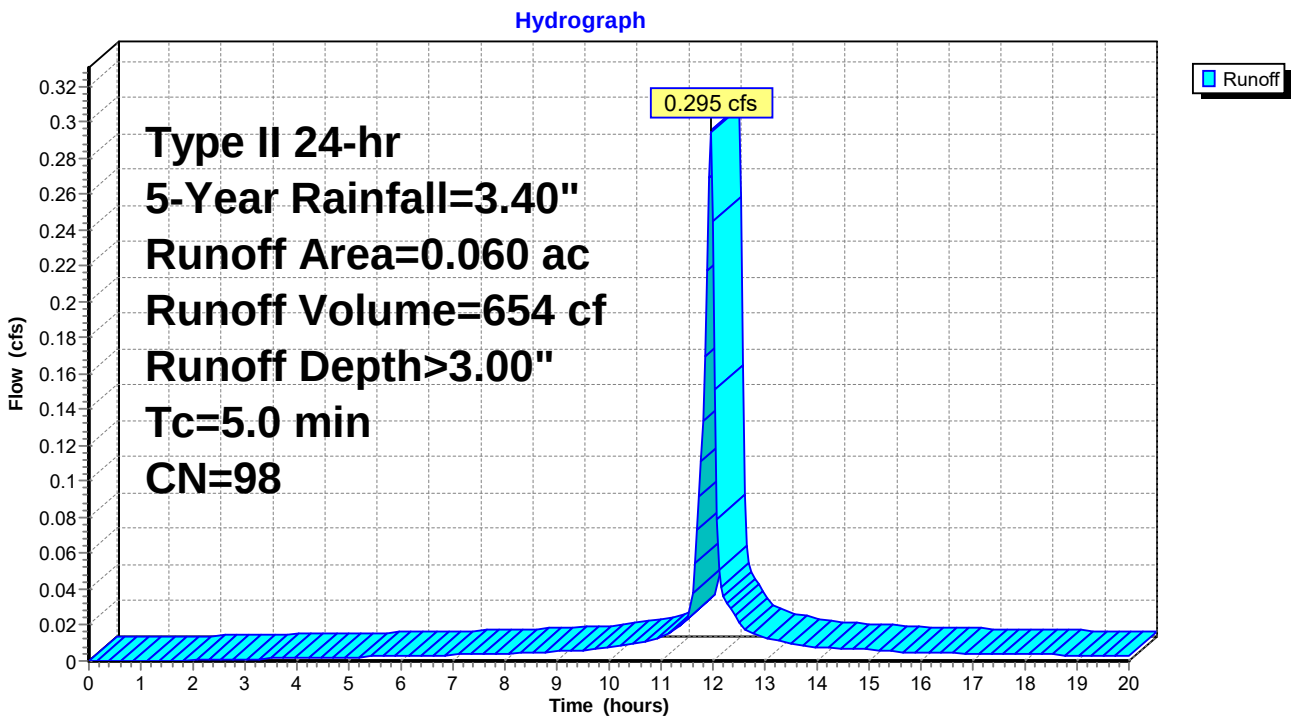
Runoff = 0.295 cfs @ 11.95 hrs, Volume= 654 cf, Depth> 3.00"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 5-Year Rainfall=3.40"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.75	0.55	0.012
0.20	0.01	0.00	0.000	11.00	0.80	0.60	0.014
0.40	0.01	0.00	0.000	11.20	0.85	0.65	0.017
0.60	0.02	0.00	0.000	11.40	0.92	0.72	0.020
0.80	0.03	0.00	0.000	11.60	1.04	0.83	0.038
1.00	0.04	0.00	0.000	11.80	1.46	1.25	**0.133**
1.20	0.04	0.00	0.000	12.00	2.25	2.03	**0.244**
1.40	0.05	0.00	0.000	12.20	2.38	2.15	0.036
1.60	0.06	0.00	0.000	12.40	2.47	2.24	0.026
1.80	0.07	0.00	0.000	12.60	2.53	2.30	0.018
2.00	0.07	0.00	0.001	12.80	2.58	2.35	0.015
2.20	0.08	0.01	0.001	13.00	2.62	2.39	0.013
2.40	0.09	0.01	0.001	13.20	2.66	2.43	0.012
2.60	0.10	0.01	0.001	13.40	2.70	2.47	0.011
2.80	0.11	0.02	0.001	13.60	2.73	2.50	0.010
3.00	0.12	0.02	0.001	13.80	2.76	2.53	0.009
3.20	0.13	0.03	0.001	14.00	2.79	2.56	0.008
3.40	0.14	0.03	0.001	14.20	2.81	2.58	0.007
3.60	0.14	0.03	0.002	14.40	2.84	2.61	0.007
3.80	0.15	0.04	0.002	14.60	2.86	2.63	0.007
4.00	0.16	0.05	0.002	14.80	2.88	2.65	0.007
4.20	0.17	0.05	0.002	15.00	2.90	2.67	0.006
4.40	0.18	0.06	0.002	15.20	2.92	2.69	0.006
4.60	0.19	0.06	0.002	15.40	2.94	2.71	0.006
4.80	0.20	0.07	0.002	15.60	2.96	2.73	0.005
5.00	0.21	0.08	0.002	15.80	2.98	2.74	0.005
5.20	0.23	0.09	0.002	16.00	2.99	2.76	0.005
5.40	0.24	0.10	0.003	16.20	3.01	2.78	0.005
5.60	0.25	0.10	0.003	16.40	3.02	2.79	0.005
5.80	0.26	0.11	0.003	16.60	3.04	2.81	0.004
6.00	0.27	0.12	0.003	16.80	3.05	2.82	0.004
6.20	0.28	0.13	0.003	17.00	3.07	2.83	0.004
6.40	0.30	0.14	0.003	17.20	3.08	2.85	0.004
6.60	0.31	0.15	0.003	17.40	3.09	2.86	0.004
6.80	0.32	0.16	0.003	17.60	3.11	2.87	0.004
7.00	0.34	0.18	0.003	17.80	3.12	2.89	0.004
7.20	0.35	0.19	0.003	18.00	3.13	2.90	0.004
7.40	0.36	0.20	0.004	18.20	3.14	2.91	0.004
7.60	0.38	0.21	0.004	18.40	3.16	2.92	0.004
7.80	0.39	0.22	0.004	18.60	3.17	2.93	0.003
8.00	0.41	0.24	0.004	18.80	3.18	2.95	0.003
8.20	0.42	0.25	0.004	19.00	3.19	2.96	0.003
8.40	0.44	0.26	0.005	19.20	3.20	2.97	0.003
8.60	0.46	0.28	0.005	19.40	3.21	2.98	0.003
8.80	0.48	0.30	0.005	19.60	3.22	2.99	0.003
9.00	0.50	0.32	0.006	19.80	3.23	3.00	0.003
9.20	0.52	0.34	0.006	20.00	**3.24**	**3.00**	0.003
9.40	0.54	0.36	0.006				
9.60	0.57	0.38	0.006				
9.80	0.59	0.40	0.007				
10.00	0.62	0.42	0.007				
10.20	0.64	0.45	0.008				
10.40	0.68	0.48	0.009				
10.60	0.71	0.51	0.010				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 2.68" for 5-Year event
Inflow = 2.722 cfs @ 11.95 hrs, Volume= 5,639 cf
Outflow = 0.963 cfs @ 12.07 hrs, Volume= 5,616 cf, Atten= 65%, Lag= 6.9 min
Primary = 0.963 cfs @ 12.07 hrs, Volume= 5,616 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 979.86' @ 12.07 hrs Surf.Area= 1,190 sf Storage= 1,531 cf

Plug-Flow detention time= 16.9 min calculated for 5,605 cf (99% of inflow)
Center-of-Mass det. time= 15.0 min (756.8 - 741.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.961 cfs @ 12.07 hrs HW=979.85' (Free Discharge)
└─**1=Culvert** (Passes 0.961 cfs of 4.062 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.961 cfs @ 7.05 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.000 cfs)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

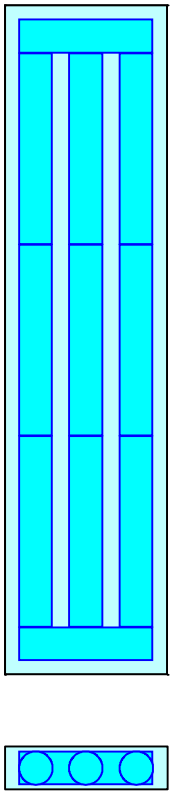
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

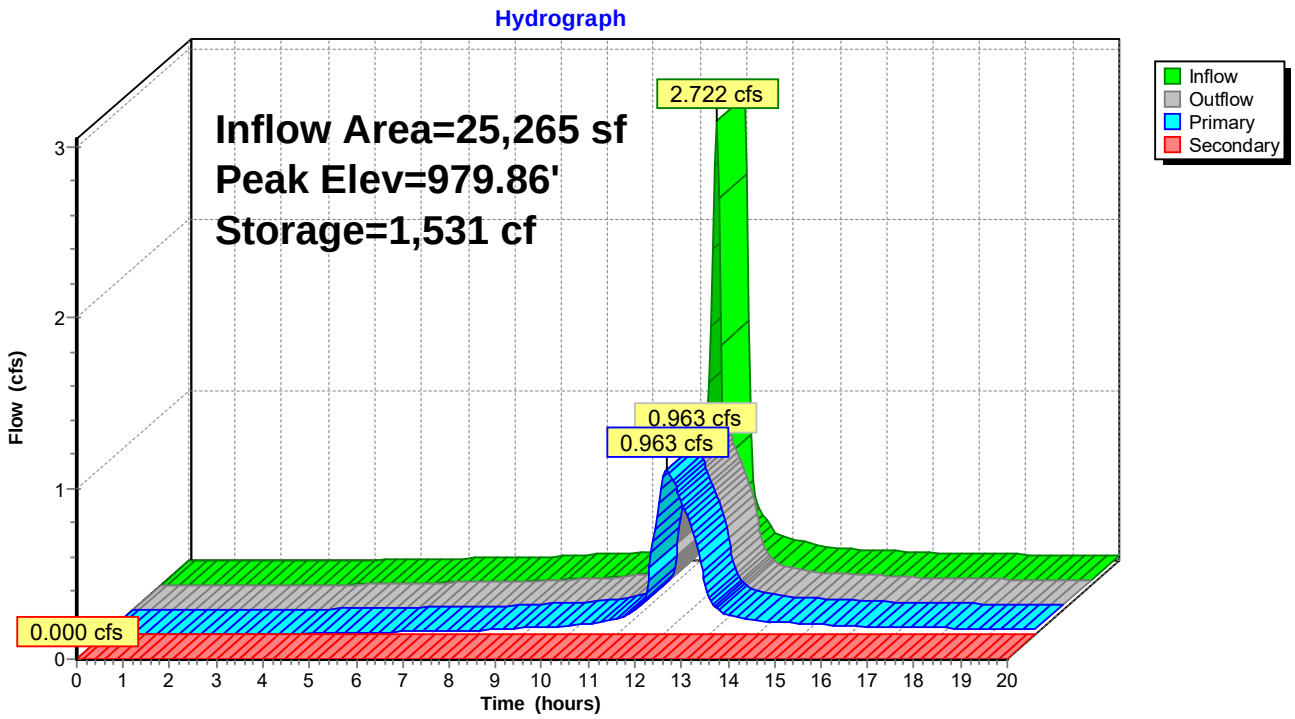
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=979.86'
Storage=1,531 cf
2.722 cfs
0.963 cfs
0.963 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Hydrograph for Pond 3P: UG

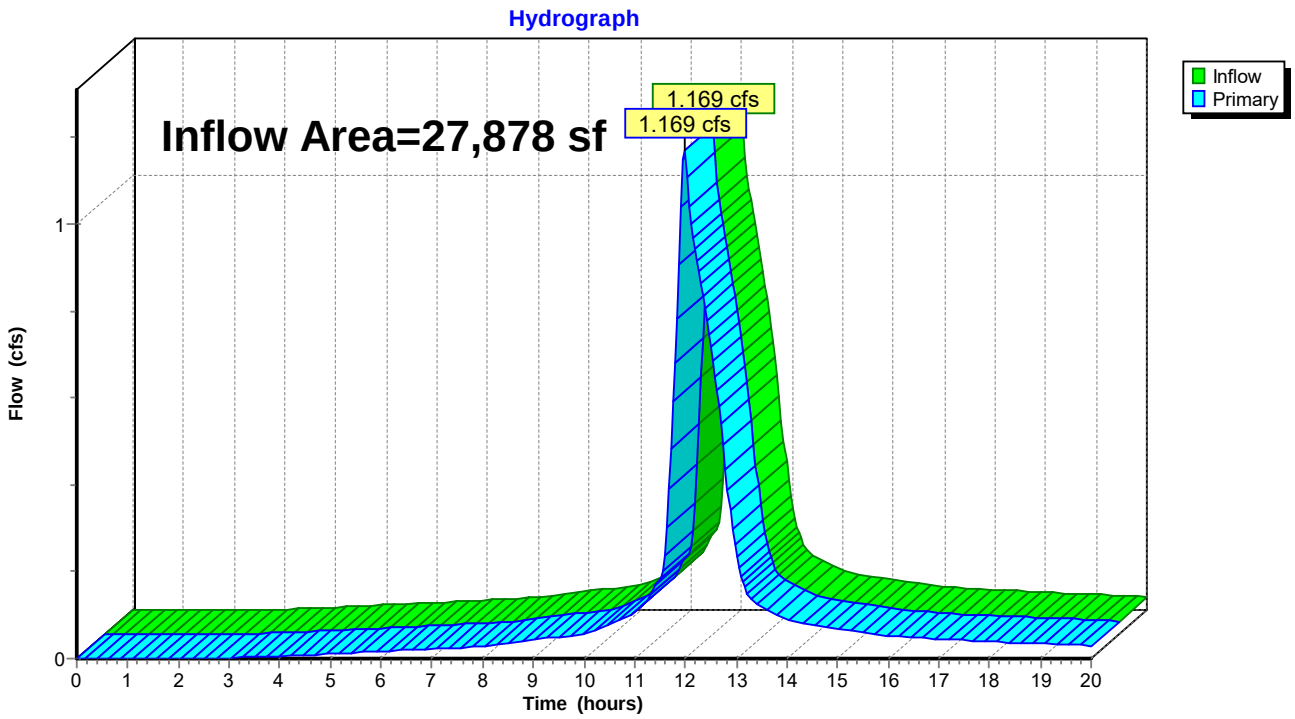
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.000	0	977.50	0.000	0.000	0.000
2.40	0.000	0	977.50	0.000	0.000	0.000
2.80	0.000	0	977.50	0.000	0.000	0.000
3.20	0.002	1	977.50	0.001	0.001	0.000
3.60	0.003	2	977.50	0.002	0.002	0.000
4.00	0.005	3	977.51	0.004	0.004	0.000
4.40	0.007	5	977.51	0.006	0.006	0.000
4.80	0.009	7	977.51	0.007	0.007	0.000
5.20	0.011	8	977.52	0.009	0.009	0.000
5.60	0.013	10	977.52	0.011	0.011	0.000
6.00	0.015	12	977.52	0.013	0.013	0.000
6.40	0.017	14	977.53	0.016	0.016	0.000
6.80	0.019	16	977.53	0.018	0.018	0.000
7.20	0.021	17	977.54	0.020	0.020	0.000
7.60	0.023	19	977.54	0.022	0.022	0.000
8.00	0.026	21	977.54	0.024	0.024	0.000
8.40	0.031	25	977.55	0.028	0.028	0.000
8.80	0.038	30	977.56	0.034	0.034	0.000
9.20	0.043	35	977.57	0.040	0.040	0.000
9.60	0.046	38	977.58	0.044	0.044	0.000
10.00	0.057	45	977.59	0.051	0.051	0.000
10.40	0.073	56	977.62	0.063	0.063	0.000
10.80	0.096	72	977.65	0.082	0.082	0.000
11.20	0.137	97	977.70	0.111	0.111	0.000
11.60	**0.326**	149	977.81	0.200	0.200	0.000
12.00	**2.270**	**1,384**	**979.68**	**0.922**	**0.922**	0.000
12.40	0.245	**925**	**979.12**	**0.781**	**0.781**	0.000
12.80	0.145	286	978.12	0.419	0.419	0.000
13.20	0.111	118	977.75	0.143	0.143	0.000
13.60	0.090	92	977.69	0.104	0.104	0.000
14.00	0.075	74	977.66	0.085	0.085	0.000
14.40	0.067	63	977.63	0.072	0.072	0.000
14.80	0.062	57	977.62	0.066	0.066	0.000
15.20	0.057	52	977.61	0.060	0.060	0.000
15.60	0.051	48	977.60	0.054	0.054	0.000
16.00	0.046	43	977.59	0.049	0.049	0.000
16.40	0.043	39	977.58	0.045	0.045	0.000
16.80	0.041	37	977.58	0.042	0.042	0.000
17.20	0.039	35	977.57	0.040	0.040	0.000
17.60	0.037	34	977.57	0.038	0.038	0.000
18.00	0.035	32	977.57	0.037	0.037	0.000
18.40	0.033	30	977.56	0.035	0.035	0.000
18.80	0.032	29	977.56	0.033	0.033	0.000
19.20	0.030	27	977.56	0.031	0.031	0.000
19.60	0.028	25	977.55	0.029	0.029	0.000
20.00	0.026	24	977.55	0.027	0.027	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 2.70" for 5-Year event
Inflow = 1.169 cfs @ 11.99 hrs, Volume= 6,270 cf
Primary = 1.169 cfs @ 11.99 hrs, Volume= 6,270 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.094	0.00	0.094
0.20	0.000	0.00	0.000	11.00	0.108	0.00	0.108
0.40	0.000	0.00	0.000	11.20	0.128	0.00	0.128
0.60	0.000	0.00	0.000	11.40	0.163	0.00	0.163
0.80	0.000	0.00	0.000	11.60	0.238	0.00	0.238
1.00	0.000	0.00	0.000	11.80	0.682	0.00	0.682
1.20	0.000	0.00	0.000	12.00	**1.167**	0.00	**1.167**
1.40	0.000	0.00	0.000	12.20	0.942	0.00	0.942
1.60	0.000	0.00	0.000	12.40	0.807	0.00	0.807
1.80	0.000	0.00	0.000	12.60	0.650	0.00	0.650
2.00	0.001	0.00	0.001	12.80	0.435	0.00	0.435
2.20	0.001	0.00	0.001	13.00	0.233	0.00	0.233
2.40	0.001	0.00	0.001	13.20	0.155	0.00	0.155
2.60	0.001	0.00	0.001	13.40	0.128	0.00	0.128
2.80	0.001	0.00	0.001	13.60	0.114	0.00	0.114
3.00	0.001	0.00	0.001	13.80	0.103	0.00	0.103
3.20	0.002	0.00	0.002	14.00	0.093	0.00	0.093
3.40	0.003	0.00	0.003	14.20	0.085	0.00	0.085
3.60	0.004	0.00	0.004	14.40	0.079	0.00	0.079
3.80	0.005	0.00	0.005	14.60	0.075	0.00	0.075
4.00	0.006	0.00	0.006	14.80	0.072	0.00	0.072
4.20	0.007	0.00	0.007	15.00	0.069	0.00	0.069
4.40	0.008	0.00	0.008	15.20	0.066	0.00	0.066
4.60	0.009	0.00	0.009	15.40	0.063	0.00	0.063
4.80	0.010	0.00	0.010	15.60	0.060	0.00	0.060
5.00	0.011	0.00	0.011	15.80	0.057	0.00	0.057
5.20	0.012	0.00	0.012	16.00	0.054	0.00	0.054
5.40	0.013	0.00	0.013	16.20	0.051	0.00	0.051
5.60	0.014	0.00	0.014	16.40	0.049	0.00	0.049
5.80	0.015	0.00	0.015	16.60	0.048	0.00	0.048
6.00	0.016	0.00	0.016	16.80	0.047	0.00	0.047
6.20	0.017	0.00	0.017	17.00	0.046	0.00	0.046
6.40	0.019	0.00	0.019	17.20	0.045	0.00	0.045
6.60	0.020	0.00	0.020	17.40	0.043	0.00	0.043
6.80	0.021	0.00	0.021	17.60	0.042	0.00	0.042
7.00	0.022	0.00	0.022	17.80	0.041	0.00	0.041
7.20	0.023	0.00	0.023	18.00	0.040	0.00	0.040
7.40	0.025	0.00	0.025	18.20	0.039	0.00	0.039
7.60	0.026	0.00	0.026	18.40	0.038	0.00	0.038
7.80	0.027	0.00	0.027	18.60	0.037	0.00	0.037
8.00	0.028	0.00	0.028	18.80	0.036	0.00	0.036
8.20	0.030	0.00	0.030	19.00	0.035	0.00	0.035
8.40	0.033	0.00	0.033	19.20	0.034	0.00	0.034
8.60	0.036	0.00	0.036	19.40	0.033	0.00	0.033
8.80	0.039	0.00	0.039	19.60	0.032	0.00	0.032
9.00	0.043	0.00	0.043	19.80	0.031	0.00	0.031
9.20	0.046	0.00	0.046	20.00	0.030	0.00	0.030
9.40	0.048	0.00	0.048				
9.60	0.050	0.00	0.050				
9.80	0.053	0.00	0.053				
10.00	0.058	0.00	0.058				
10.20	0.065	0.00	0.065				
10.40	0.073	0.00	0.073				
10.60	0.082	0.00	0.082				

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>3.46"
Tc=5.0 min CN=97 Runoff=3.160 cfs 6,903 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>3.24"
Tc=5.0 min CN=95 Runoff=3.246 cfs 6,819 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>3.57"
Tc=5.0 min CN=98 Runoff=0.348 cfs 778 cf

Pond 3P: UG Peak Elev=980.33' Storage=1,917 cf Inflow=3.246 cfs 6,819 cf
Primary=1.063 cfs 6,792 cf Secondary=0.000 cfs 0 cf Outflow=1.063 cfs 6,792 cf

Link 4L: POST (Combined) Inflow=1.304 cfs 7,569 cf
Primary=1.304 cfs 7,569 cf

Total Runoff Area = 51,836 sf Runoff Volume = 14,500 cf Average Runoff Depth = 3.36"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

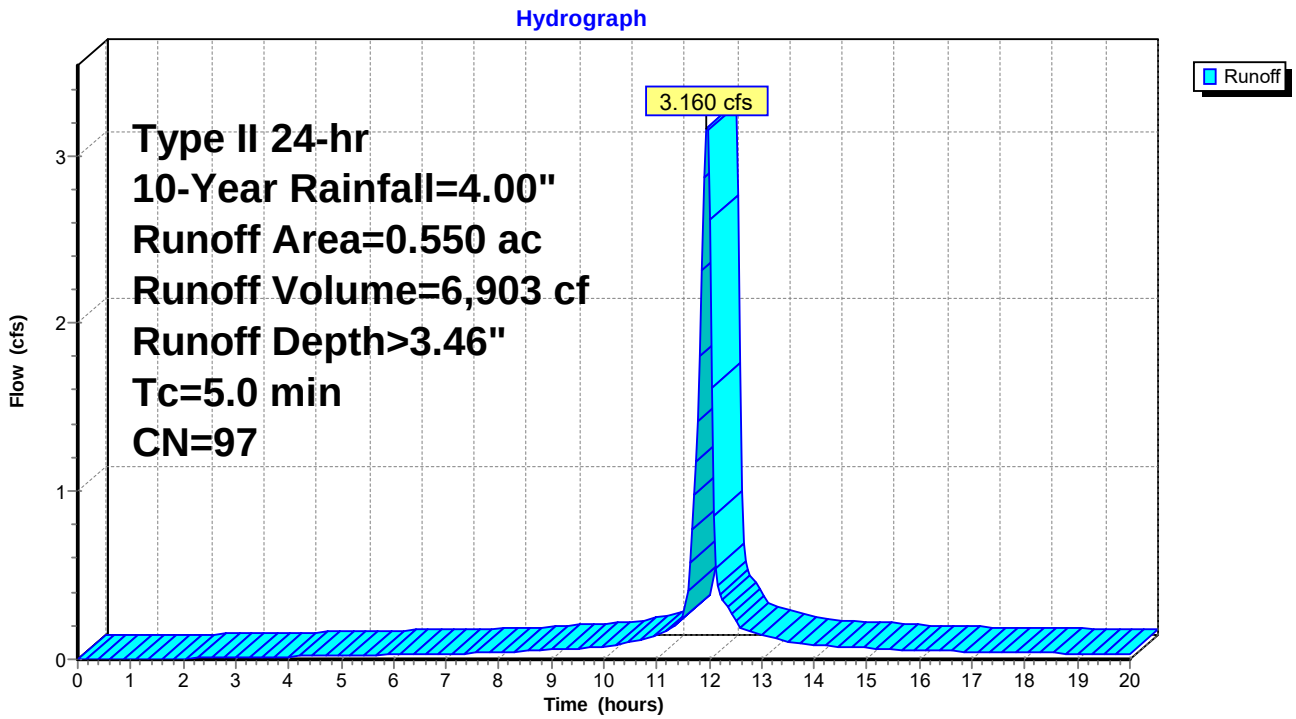
Runoff = 3.160 cfs @ 11.95 hrs, Volume= 6,903 cf, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-Year Rainfall=4.00"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.89	0.60	0.125
0.20	0.01	0.00	0.000	11.00	0.94	0.65	0.142
0.40	0.02	0.00	0.000	11.20	1.01	0.71	0.174
0.60	0.02	0.00	0.000	11.40	1.09	0.79	0.216
0.80	0.03	0.00	0.000	11.60	1.23	0.92	0.403
1.00	0.04	0.00	0.000	11.80	1.72	1.40	**1.423**
1.20	0.05	0.00	0.000	12.00	2.65	2.31	**2.622**
1.40	0.06	0.00	0.000	12.20	2.79	2.45	0.389
1.60	0.07	0.00	0.001	12.40	2.90	2.56	0.280
1.80	0.08	0.00	0.002	12.60	2.97	2.63	0.191
2.00	0.09	0.00	0.003	12.80	3.04	2.69	0.166
2.20	0.10	0.00	0.005	13.00	3.09	2.75	0.143
2.40	0.11	0.01	0.006	13.20	3.13	2.79	0.127
2.60	0.12	0.01	0.007	13.40	3.18	2.83	0.114
2.80	0.13	0.01	0.009	13.60	3.21	2.87	0.103
3.00	0.14	0.02	0.010	13.80	3.25	2.91	0.094
3.20	0.15	0.02	0.011	14.00	3.28	2.94	0.085
3.40	0.16	0.02	0.012	14.20	3.31	2.96	0.080
3.60	0.17	0.03	0.013	14.40	3.34	2.99	0.076
3.80	0.18	0.03	0.014	14.60	3.36	3.02	0.073
4.00	0.19	0.04	0.015	14.80	3.39	3.04	0.070
4.20	0.20	0.04	0.016	15.00	3.41	3.07	0.067
4.40	0.22	0.05	0.018	15.20	3.44	3.09	0.064
4.60	0.23	0.06	0.019	15.40	3.46	3.11	0.061
4.80	0.24	0.06	0.020	15.60	3.48	3.14	0.058
5.00	0.25	0.07	0.021	15.80	3.50	3.16	0.055
5.20	0.26	0.08	0.023	16.00	3.52	3.17	0.052
5.40	0.28	0.09	0.024	16.20	3.54	3.19	0.050
5.60	0.29	0.10	0.025	16.40	3.56	3.21	0.049
5.80	0.31	0.11	0.026	16.60	3.57	3.23	0.048
6.00	0.32	0.12	0.028	16.80	3.59	3.24	0.047
6.20	0.33	0.13	0.029	17.00	3.61	3.26	0.046
6.40	0.35	0.14	0.030	17.20	3.62	3.28	0.045
6.60	0.36	0.15	0.031	17.40	3.64	3.29	0.043
6.80	0.38	0.16	0.032	17.60	3.65	3.31	0.042
7.00	0.40	0.17	0.034	17.80	3.67	3.32	0.041
7.20	0.41	0.19	0.035	18.00	3.68	3.34	0.040
7.40	0.43	0.20	0.036	18.20	3.70	3.35	0.039
7.60	0.45	0.21	0.037	18.40	3.71	3.37	0.038
7.80	0.46	0.23	0.038	18.60	3.73	3.38	0.037
8.00	0.48	0.24	0.040	18.80	3.74	3.39	0.036
8.20	0.50	0.26	0.042	19.00	3.75	3.40	0.035
8.40	0.52	0.27	0.047	19.20	3.76	3.42	0.034
8.60	0.54	0.29	0.051	19.40	3.77	3.43	0.032
8.80	0.56	0.31	0.055	19.60	3.79	3.44	0.031
9.00	0.59	0.33	0.060	19.80	3.80	3.45	0.030
9.20	0.61	0.35	0.062	20.00	**3.81**	**3.46**	0.029
9.40	0.64	0.38	0.062				
9.60	0.67	0.40	0.064				
9.80	0.69	0.42	0.070				
10.00	0.72	0.45	0.077				
10.20	0.76	0.48	0.086				
10.40	0.80	0.52	0.096				
10.60	0.84	0.55	0.108				

Summary for Subcatchment 2S: Detained

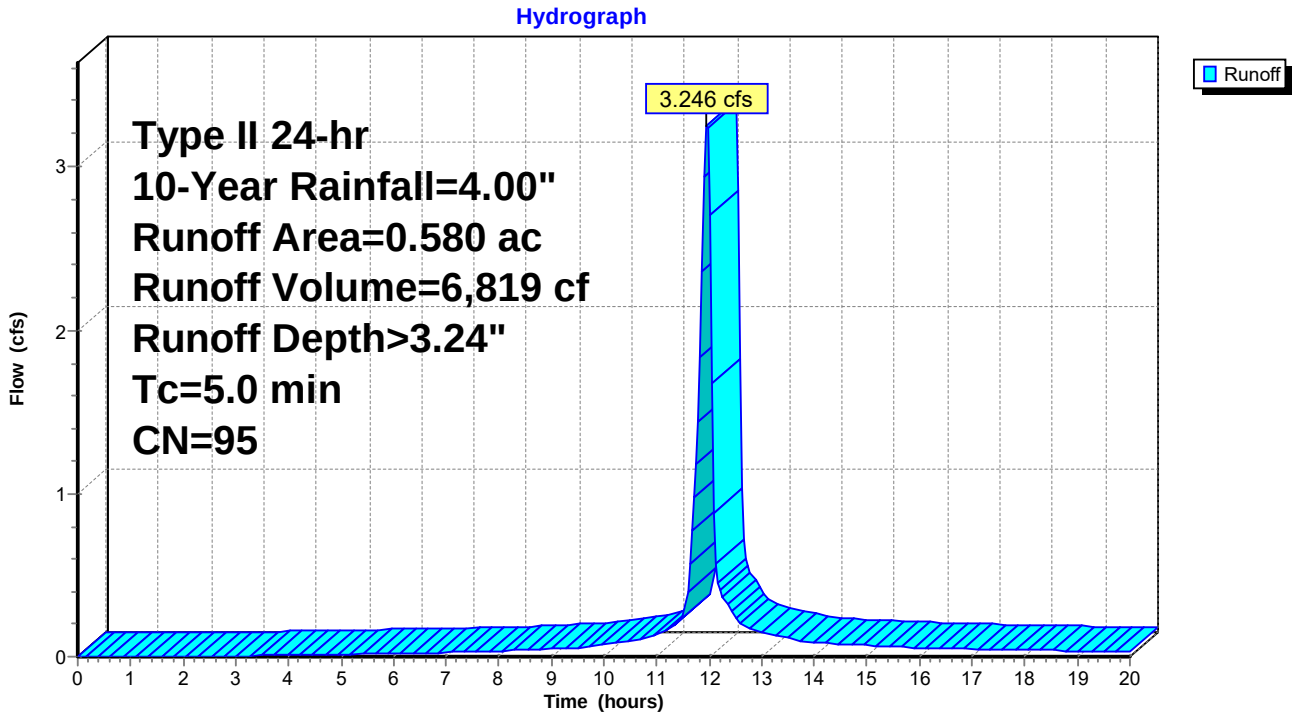
Runoff = 3.246 cfs @ 11.95 hrs, Volume= 6,819 cf, Depth> 3.24"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-Year Rainfall=4.00"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.89	0.47	0.119
0.20	0.01	0.00	0.000	11.00	0.94	0.51	0.136
0.40	0.02	0.00	0.000	11.20	1.01	0.57	0.168
0.60	0.02	0.00	0.000	11.40	1.09	0.64	0.210
0.80	0.03	0.00	0.000	11.60	1.23	0.76	0.397
1.00	0.04	0.00	0.000	11.80	1.72	1.22	**1.432**
1.20	0.05	0.00	0.000	12.00	2.65	2.11	**2.703**
1.40	0.06	0.00	0.000	12.20	2.79	2.25	0.403
1.60	0.07	0.00	0.000	12.40	2.90	2.35	0.290
1.80	0.08	0.00	0.000	12.60	2.97	2.42	0.199
2.00	0.09	0.00	0.000	12.80	3.04	2.48	0.172
2.20	0.10	0.00	0.000	13.00	3.09	2.54	0.149
2.40	0.11	0.00	0.000	13.20	3.13	2.58	0.132
2.60	0.12	0.00	0.001	13.40	3.18	2.62	0.119
2.80	0.13	0.00	0.002	13.60	3.21	2.66	0.107
3.00	0.14	0.00	0.003	13.80	3.25	2.69	0.097
3.20	0.15	0.00	0.004	14.00	3.28	2.72	0.088
3.40	0.16	0.00	0.005	14.20	3.31	2.75	0.083
3.60	0.17	0.01	0.006	14.40	3.34	2.78	0.080
3.80	0.18	0.01	0.007	14.60	3.36	2.81	0.076
4.00	0.19	0.01	0.008	14.80	3.39	2.83	0.073
4.20	0.20	0.02	0.009	15.00	3.41	2.85	0.070
4.40	0.22	0.02	0.010	15.20	3.44	2.88	0.067
4.60	0.23	0.02	0.012	15.40	3.46	2.90	0.064
4.80	0.24	0.03	0.013	15.60	3.48	2.92	0.060
5.00	0.25	0.03	0.014	15.80	3.50	2.94	0.057
5.20	0.26	0.04	0.015	16.00	3.52	2.96	0.054
5.40	0.28	0.04	0.017	16.20	3.54	2.98	0.052
5.60	0.29	0.05	0.018	16.40	3.56	2.99	0.051
5.80	0.31	0.06	0.019	16.60	3.57	3.01	0.050
6.00	0.32	0.06	0.020	16.80	3.59	3.03	0.049
6.20	0.33	0.07	0.022	17.00	3.61	3.04	0.048
6.40	0.35	0.08	0.023	17.20	3.62	3.06	0.046
6.60	0.36	0.09	0.024	17.40	3.64	3.08	0.045
6.80	0.38	0.09	0.026	17.60	3.65	3.09	0.044
7.00	0.40	0.10	0.027	17.80	3.67	3.11	0.043
7.20	0.41	0.11	0.028	18.00	3.68	3.12	0.042
7.40	0.43	0.12	0.029	18.20	3.70	3.13	0.041
7.60	0.45	0.13	0.031	18.40	3.71	3.15	0.040
7.80	0.46	0.14	0.032	18.60	3.73	3.16	0.038
8.00	0.48	0.16	0.033	18.80	3.74	3.17	0.037
8.20	0.50	0.17	0.036	19.00	3.75	3.19	0.036
8.40	0.52	0.18	0.040	19.20	3.76	3.20	0.035
8.60	0.54	0.20	0.044	19.40	3.77	3.21	0.034
8.80	0.56	0.21	0.048	19.60	3.79	3.22	0.033
9.00	0.59	0.23	0.053	19.80	3.80	3.23	0.032
9.20	0.61	0.25	0.055	20.00	**3.81**	**3.24**	0.030
9.40	0.64	0.27	0.056				
9.60	0.67	0.29	0.058				
9.80	0.69	0.31	0.064				
10.00	0.72	0.33	0.071				
10.20	0.76	0.36	0.080				
10.40	0.80	0.39	0.090				
10.60	0.84	0.43	0.102				

Summary for Subcatchment 3S: Undetained

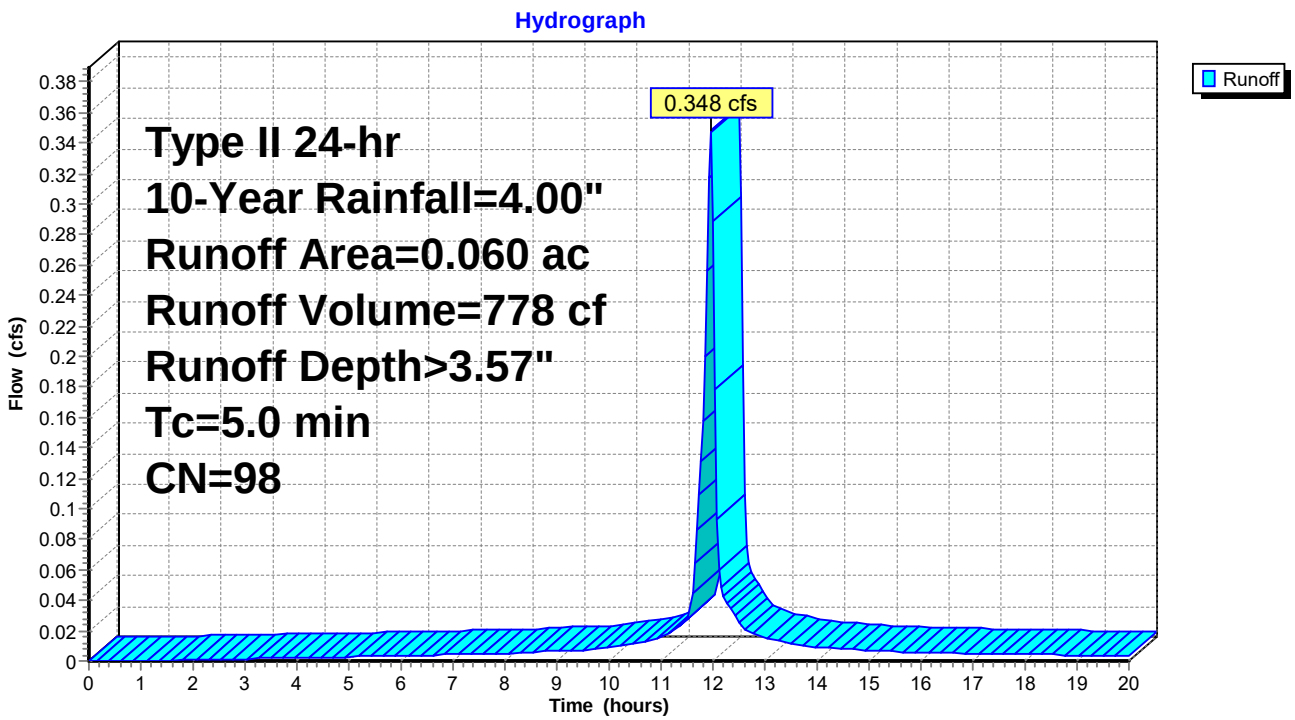
Runoff = 0.348 cfs @ 11.95 hrs, Volume= 778 cf, Depth> 3.57"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-Year Rainfall=4.00"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	0.89	0.68	0.014
0.20	0.01	0.00	0.000	11.00	0.94	0.73	0.016
0.40	0.02	0.00	0.000	11.20	1.01	0.80	0.020
0.60	0.02	0.00	0.000	11.40	1.09	0.87	0.024
0.80	0.03	0.00	0.000	11.60	1.23	1.01	0.045
1.00	0.04	0.00	0.000	11.80	1.72	1.50	**0.158**
1.20	0.05	0.00	0.000	12.00	2.65	2.42	**0.288**
1.40	0.06	0.00	0.000	12.20	2.79	2.56	0.043
1.60	0.07	0.00	0.001	12.40	2.90	2.67	0.031
1.80	0.08	0.01	0.001	12.60	2.97	2.74	0.021
2.00	0.09	0.01	0.001	12.80	3.04	2.80	0.018
2.20	0.10	0.01	0.001	13.00	3.09	2.86	0.016
2.40	0.11	0.02	0.001	13.20	3.13	2.90	0.014
2.60	0.12	0.02	0.001	13.40	3.18	2.94	0.013
2.80	0.13	0.03	0.002	13.60	3.21	2.98	0.011
3.00	0.14	0.03	0.002	13.80	3.25	3.02	0.010
3.20	0.15	0.04	0.002	14.00	3.28	3.05	0.009
3.40	0.16	0.04	0.002	14.20	3.31	3.08	0.009
3.60	0.17	0.05	0.002	14.40	3.34	3.10	0.008
3.80	0.18	0.06	0.002	14.60	3.36	3.13	0.008
4.00	0.19	0.06	0.002	14.80	3.39	3.16	0.008
4.20	0.20	0.07	0.002	15.00	3.41	3.18	0.007
4.40	0.22	0.08	0.002	15.20	3.44	3.20	0.007
4.60	0.23	0.09	0.003	15.40	3.46	3.23	0.007
4.80	0.24	0.10	0.003	15.60	3.48	3.25	0.006
5.00	0.25	0.11	0.003	15.80	3.50	3.27	0.006
5.20	0.26	0.12	0.003	16.00	3.52	3.29	0.006
5.40	0.28	0.13	0.003	16.20	3.54	3.30	0.005
5.60	0.29	0.14	0.003	16.40	3.56	3.32	0.005
5.80	0.31	0.15	0.003	16.60	3.57	3.34	0.005
6.00	0.32	0.16	0.004	16.80	3.59	3.36	0.005
6.20	0.33	0.17	0.004	17.00	3.61	3.37	0.005
6.40	0.35	0.19	0.004	17.20	3.62	3.39	0.005
6.60	0.36	0.20	0.004	17.40	3.64	3.41	0.005
6.80	0.38	0.21	0.004	17.60	3.65	3.42	0.005
7.00	0.40	0.23	0.004	17.80	3.67	3.44	0.005
7.20	0.41	0.24	0.004	18.00	3.68	3.45	0.004
7.40	0.43	0.25	0.004	18.20	3.70	3.46	0.004
7.60	0.45	0.27	0.005	18.40	3.71	3.48	0.004
7.80	0.46	0.28	0.005	18.60	3.73	3.49	0.004
8.00	0.48	0.30	0.005	18.80	3.74	3.50	0.004
8.20	0.50	0.32	0.005	19.00	3.75	3.52	0.004
8.40	0.52	0.33	0.006	19.20	3.76	3.53	0.004
8.60	0.54	0.35	0.006	19.40	3.77	3.54	0.004
8.80	0.56	0.38	0.007	19.60	3.79	3.55	0.003
9.00	0.59	0.40	0.007	19.80	3.80	3.56	0.003
9.20	0.61	0.42	0.007	20.00	**3.81**	**3.57**	0.003
9.40	0.64	0.45	0.007				
9.60	0.67	0.47	0.007				
9.80	0.69	0.50	0.008				
10.00	0.72	0.53	0.009				
10.20	0.76	0.56	0.010				
10.40	0.80	0.59	0.011				
10.60	0.84	0.63	0.012				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 3.24" for 10-Year event
Inflow = 3.246 cfs @ 11.95 hrs, Volume= 6,819 cf
Outflow = 1.063 cfs @ 12.08 hrs, Volume= 6,792 cf, Atten= 67%, Lag= 7.3 min
Primary = 1.063 cfs @ 12.08 hrs, Volume= 6,792 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 980.33' @ 12.08 hrs Surf.Area= 1,190 sf Storage= 1,917 cf

Plug-Flow detention time= 18.2 min calculated for 6,778 cf (99% of inflow)
Center-of-Mass det. time= 16.4 min (753.7 - 737.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.062 cfs @ 12.08 hrs HW=980.32' (Free Discharge)
└─**1=Culvert** (Passes 1.062 cfs of 4.552 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.062 cfs @ 7.79 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.000 cfs)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

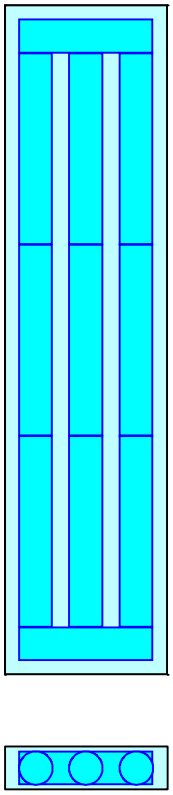
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

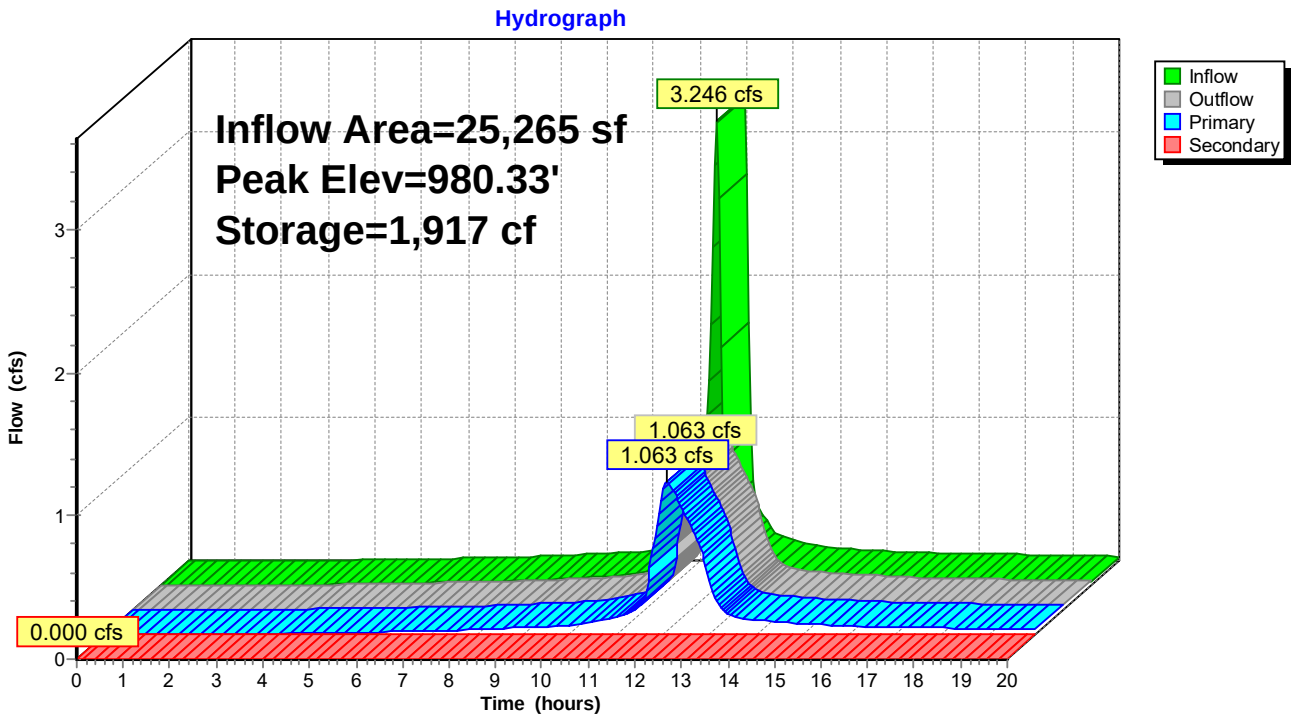
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=980.33'
Storage=1,917 cf
3.246 cfs
1.063 cfs
1.063 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Hydrograph for Pond 3P: UG

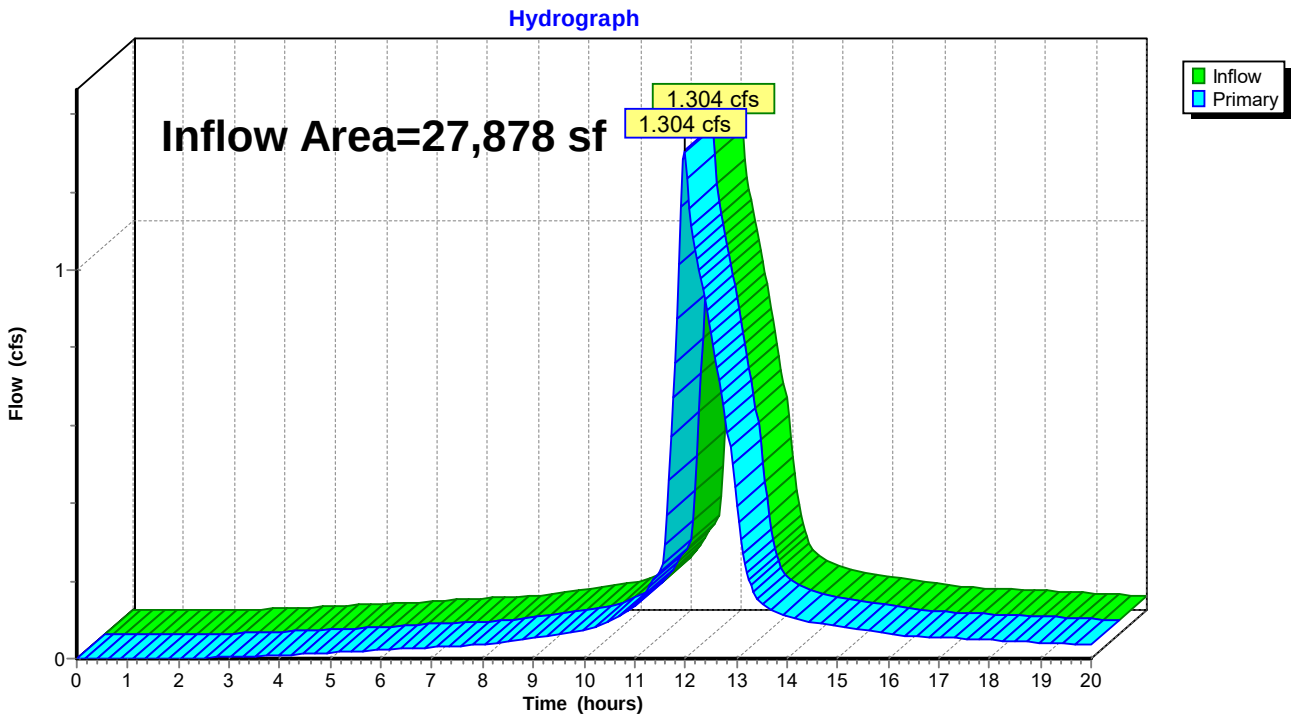
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.000	0	977.50	0.000	0.000	0.000
2.40	0.000	0	977.50	0.000	0.000	0.000
2.80	0.002	1	977.50	0.001	0.001	0.000
3.20	0.004	3	977.51	0.003	0.003	0.000
3.60	0.006	4	977.51	0.005	0.005	0.000
4.00	0.008	6	977.51	0.007	0.007	0.000
4.40	0.010	8	977.52	0.009	0.009	0.000
4.80	0.013	10	977.52	0.011	0.011	0.000
5.20	0.015	12	977.53	0.014	0.014	0.000
5.60	0.018	14	977.53	0.016	0.016	0.000
6.00	0.020	16	977.53	0.019	0.019	0.000
6.40	0.023	19	977.54	0.021	0.021	0.000
6.80	0.026	21	977.54	0.024	0.024	0.000
7.20	0.028	23	977.55	0.027	0.027	0.000
7.60	0.031	26	977.55	0.029	0.029	0.000
8.00	0.033	28	977.56	0.032	0.032	0.000
8.40	0.040	32	977.57	0.036	0.036	0.000
8.80	0.048	38	977.58	0.044	0.044	0.000
9.20	0.055	45	977.59	0.051	0.051	0.000
9.60	0.058	49	977.60	0.055	0.055	0.000
10.00	0.071	56	977.62	0.064	0.064	0.000
10.40	0.090	69	977.65	0.079	0.079	0.000
10.80	0.119	89	977.69	0.101	0.101	0.000
11.20	0.168	118	977.75	0.142	0.142	0.000
11.60	**0.397**	174	977.86	0.246	0.246	0.000
12.00	**2.703**	**1,720**	**980.09**	**1.012**	**1.012**	0.000
12.40	0.290	**1,269**	**979.54**	**0.890**	**0.890**	0.000
12.80	0.172	495	978.54	0.598	0.598	0.000
13.20	0.132	152	977.82	0.205	0.205	0.000
13.60	0.107	106	977.72	0.121	0.121	0.000
14.00	0.088	88	977.68	0.100	0.100	0.000
14.40	0.080	75	977.66	0.086	0.086	0.000
14.80	0.073	68	977.64	0.078	0.078	0.000
15.20	0.067	62	977.63	0.071	0.071	0.000
15.60	0.060	56	977.62	0.064	0.064	0.000
16.00	0.054	51	977.61	0.058	0.058	0.000
16.40	0.051	46	977.60	0.053	0.053	0.000
16.80	0.049	44	977.59	0.050	0.050	0.000
17.20	0.046	42	977.59	0.048	0.048	0.000
17.60	0.044	40	977.58	0.046	0.046	0.000
18.00	0.042	38	977.58	0.043	0.043	0.000
18.40	0.040	36	977.58	0.041	0.041	0.000
18.80	0.037	34	977.57	0.039	0.039	0.000
19.20	0.035	32	977.57	0.036	0.036	0.000
19.60	0.033	30	977.56	0.034	0.034	0.000
20.00	0.030	28	977.56	0.032	0.032	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 3.26" for 10-Year event
Inflow = 1.304 cfs @ 11.99 hrs, Volume= 7,569 cf
Primary = 1.304 cfs @ 11.99 hrs, Volume= 7,569 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.116	0.00	0.116
0.20	0.000	0.00	0.000	11.00	0.133	0.00	0.133
0.40	0.000	0.00	0.000	11.20	0.162	0.00	0.162
0.60	0.000	0.00	0.000	11.40	0.205	0.00	0.205
0.80	0.000	0.00	0.000	11.60	0.291	0.00	0.291
1.00	0.000	0.00	0.000	11.80	0.762	0.00	0.762
1.20	0.000	0.00	0.000	12.00	**1.301**	0.00	**1.301**
1.40	0.000	0.00	0.000	12.20	1.052	0.00	1.052
1.60	0.001	0.00	0.001	12.40	0.920	0.00	0.920
1.80	0.001	0.00	0.001	12.60	0.775	0.00	0.775
2.00	0.001	0.00	0.001	12.80	0.616	0.00	0.616
2.20	0.001	0.00	0.001	13.00	0.391	0.00	0.391
2.40	0.001	0.00	0.001	13.20	0.219	0.00	0.219
2.60	0.002	0.00	0.002	13.40	0.157	0.00	0.157
2.80	0.002	0.00	0.002	13.60	0.133	0.00	0.133
3.00	0.004	0.00	0.004	13.80	0.120	0.00	0.120
3.20	0.005	0.00	0.005	14.00	0.109	0.00	0.109
3.40	0.006	0.00	0.006	14.20	0.100	0.00	0.100
3.60	0.007	0.00	0.007	14.40	0.094	0.00	0.094
3.80	0.008	0.00	0.008	14.60	0.089	0.00	0.089
4.00	0.009	0.00	0.009	14.80	0.085	0.00	0.085
4.20	0.010	0.00	0.010	15.00	0.082	0.00	0.082
4.40	0.012	0.00	0.012	15.20	0.078	0.00	0.078
4.60	0.013	0.00	0.013	15.40	0.074	0.00	0.074
4.80	0.014	0.00	0.014	15.60	0.071	0.00	0.071
5.00	0.015	0.00	0.015	15.80	0.067	0.00	0.067
5.20	0.017	0.00	0.017	16.00	0.064	0.00	0.064
5.40	0.018	0.00	0.018	16.20	0.061	0.00	0.061
5.60	0.020	0.00	0.020	16.40	0.058	0.00	0.058
5.80	0.021	0.00	0.021	16.60	0.057	0.00	0.057
6.00	0.022	0.00	0.022	16.80	0.055	0.00	0.055
6.20	0.024	0.00	0.024	17.00	0.054	0.00	0.054
6.40	0.025	0.00	0.025	17.20	0.053	0.00	0.053
6.60	0.027	0.00	0.027	17.40	0.051	0.00	0.051
6.80	0.028	0.00	0.028	17.60	0.050	0.00	0.050
7.00	0.029	0.00	0.029	17.80	0.049	0.00	0.049
7.20	0.031	0.00	0.031	18.00	0.048	0.00	0.048
7.40	0.032	0.00	0.032	18.20	0.046	0.00	0.046
7.60	0.034	0.00	0.034	18.40	0.045	0.00	0.045
7.80	0.035	0.00	0.035	18.60	0.044	0.00	0.044
8.00	0.037	0.00	0.037	18.80	0.043	0.00	0.043
8.20	0.039	0.00	0.039	19.00	0.041	0.00	0.041
8.40	0.042	0.00	0.042	19.20	0.040	0.00	0.040
8.60	0.046	0.00	0.046	19.40	0.039	0.00	0.039
8.80	0.050	0.00	0.050	19.60	0.038	0.00	0.038
9.00	0.055	0.00	0.055	19.80	0.036	0.00	0.036
9.20	0.059	0.00	0.059	20.00	0.035	0.00	0.035
9.40	0.061	0.00	0.061				
9.60	0.063	0.00	0.063				
9.80	0.067	0.00	0.067				
10.00	0.073	0.00	0.073				
10.20	0.081	0.00	0.081				
10.40	0.090	0.00	0.090				
10.60	0.101	0.00	0.101				

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>4.03"
Tc=5.0 min CN=97 Runoff=3.649 cfs 8,037 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>3.80"
Tc=5.0 min CN=95 Runoff=3.768 cfs 8,005 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>4.14"
Tc=5.0 min CN=98 Runoff=0.401 cfs 902 cf

Pond 3P: UG Peak Elev=980.85' Storage=2,311 cf Inflow=3.768 cfs 8,005 cf
Primary=1.164 cfs 7,973 cf Secondary=0.000 cfs 0 cf Outflow=1.164 cfs 7,973 cf

Link 4L: POST (Combined) Inflow=1.436 cfs 8,874 cf
Primary=1.436 cfs 8,874 cf

Total Runoff Area = 51,836 sf Runoff Volume = 16,943 cf Average Runoff Depth = 3.92"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

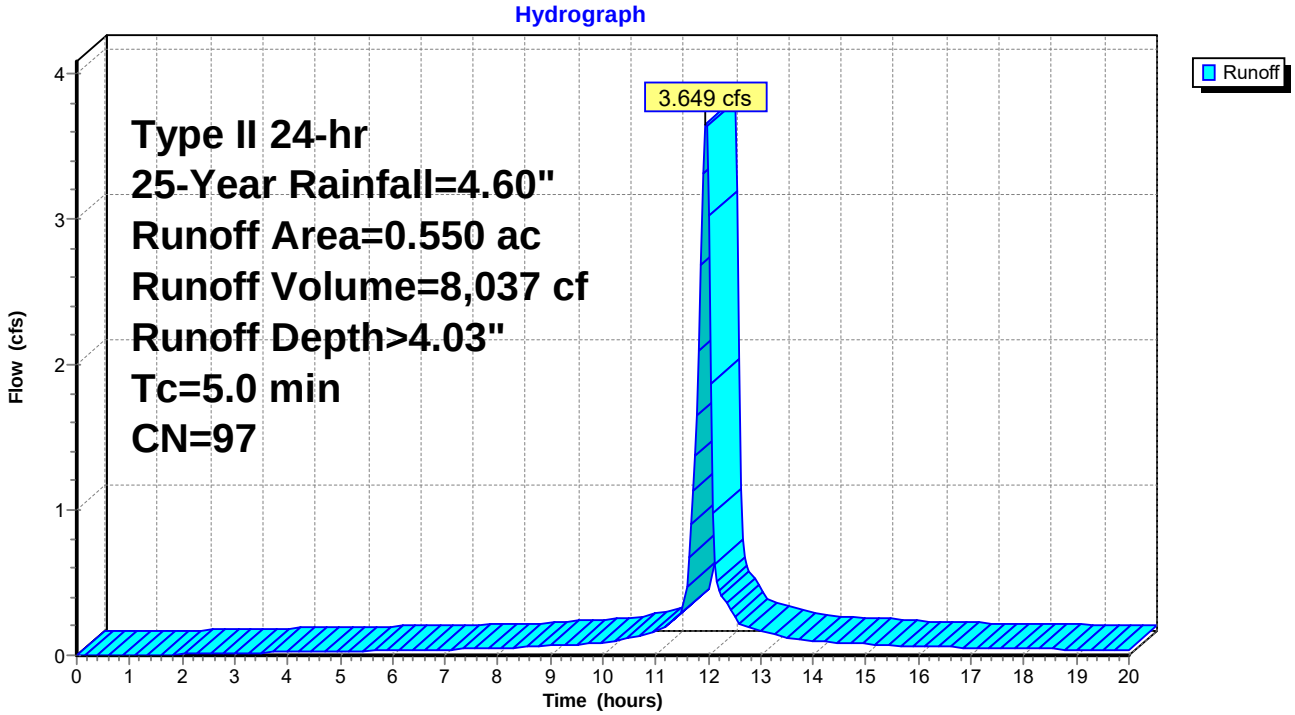
Runoff = 3.649 cfs @ 11.95 hrs, Volume= 8,037 cf, Depth> 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-Year Rainfall=4.60"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.02	0.72	0.146
0.20	0.01	0.00	0.000	11.00	1.08	0.78	0.166
0.40	0.02	0.00	0.000	11.20	1.16	0.85	0.203
0.60	0.03	0.00	0.000	11.40	1.25	0.94	0.251
0.80	0.04	0.00	0.000	11.60	1.41	1.10	0.468
1.00	0.05	0.00	0.000	11.80	1.98	1.65	**1.648**
1.20	0.06	0.00	0.000	12.00	3.05	2.71	**3.025**
1.40	0.07	0.00	0.001	12.20	3.21	2.87	0.448
1.60	0.08	0.00	0.002	12.40	3.34	2.99	0.323
1.80	0.09	0.00	0.004	12.60	3.42	3.07	0.221
2.00	0.10	0.00	0.006	12.80	3.49	3.14	0.191
2.20	0.11	0.01	0.008	13.00	3.55	3.21	0.165
2.40	0.12	0.01	0.009	13.20	3.60	3.26	0.146
2.60	0.14	0.01	0.011	13.40	3.65	3.31	0.132
2.80	0.15	0.02	0.012	13.60	3.70	3.35	0.118
3.00	0.16	0.02	0.013	13.80	3.74	3.39	0.108
3.20	0.17	0.03	0.015	14.00	3.77	3.42	0.098
3.40	0.18	0.03	0.016	14.20	3.81	3.46	0.092
3.60	0.20	0.04	0.017	14.40	3.84	3.49	0.088
3.80	0.21	0.05	0.019	14.60	3.87	3.52	0.085
4.00	0.22	0.05	0.020	14.80	3.90	3.55	0.081
4.20	0.23	0.06	0.021	15.00	3.93	3.58	0.077
4.40	0.25	0.07	0.022	15.20	3.95	3.60	0.074
4.60	0.26	0.08	0.024	15.40	3.98	3.63	0.070
4.80	0.28	0.09	0.025	15.60	4.00	3.65	0.067
5.00	0.29	0.10	0.027	15.80	4.03	3.68	0.063
5.20	0.30	0.11	0.028	16.00	4.05	3.70	0.060
5.40	0.32	0.12	0.030	16.20	4.07	3.72	0.058
5.60	0.34	0.13	0.031	16.40	4.09	3.74	0.056
5.80	0.35	0.14	0.032	16.60	4.11	3.76	0.055
6.00	0.37	0.15	0.034	16.80	4.13	3.78	0.054
6.20	0.38	0.16	0.035	17.00	4.15	3.80	0.053
6.40	0.40	0.18	0.037	17.20	4.17	3.82	0.051
6.60	0.42	0.19	0.038	17.40	4.18	3.84	0.050
6.80	0.44	0.21	0.039	17.60	4.20	3.85	0.049
7.00	0.46	0.22	0.041	17.80	4.22	3.87	0.047
7.20	0.47	0.24	0.042	18.00	4.24	3.89	0.046
7.40	0.49	0.25	0.043	18.20	4.25	3.90	0.045
7.60	0.51	0.27	0.045	18.40	4.27	3.92	0.044
7.80	0.53	0.28	0.046	18.60	4.28	3.93	0.042
8.00	0.55	0.30	0.047	18.80	4.30	3.95	0.041
8.20	0.57	0.32	0.051	19.00	4.31	3.96	0.040
8.40	0.60	0.34	0.056	19.20	4.33	3.98	0.039
8.60	0.62	0.36	0.060	19.40	4.34	3.99	0.037
8.80	0.65	0.38	0.065	19.60	4.35	4.00	0.036
9.00	0.68	0.41	0.071	19.80	4.37	4.02	0.035
9.20	0.71	0.43	0.073	20.00	**4.38**	**4.03**	0.034
9.40	0.74	0.46	0.073				
9.60	0.76	0.49	0.075				
9.80	0.80	0.52	0.083				
10.00	0.83	0.55	0.091				
10.20	0.87	0.59	0.101				
10.40	0.92	0.63	0.113				
10.60	0.96	0.67	0.126				

Summary for Subcatchment 2S: Detained

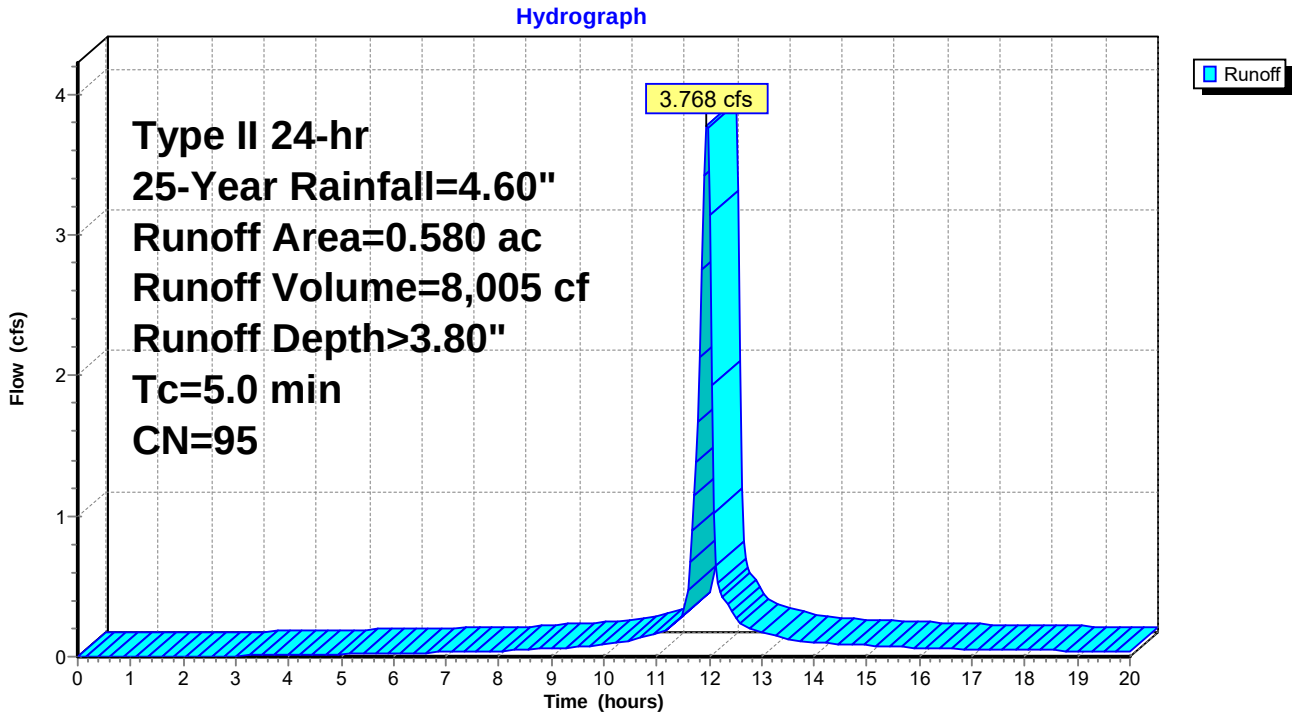
Runoff = 3.768 cfs @ 11.95 hrs, Volume= 8,005 cf, Depth> 3.80"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-Year Rainfall=4.60"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.02	0.58	0.141
0.20	0.01	0.00	0.000	11.00	1.08	0.63	0.162
0.40	0.02	0.00	0.000	11.20	1.16	0.70	0.199
0.60	0.03	0.00	0.000	11.40	1.25	0.78	0.248
0.80	0.04	0.00	0.000	11.60	1.41	0.93	0.467
1.00	0.05	0.00	0.000	11.80	1.98	1.47	**1.674**
1.20	0.06	0.00	0.000	12.00	3.05	2.50	**3.133**
1.40	0.07	0.00	0.000	12.20	3.21	2.66	0.466
1.60	0.08	0.00	0.000	12.40	3.34	2.78	0.336
1.80	0.09	0.00	0.000	12.60	3.42	2.86	0.230
2.00	0.10	0.00	0.000	12.80	3.49	2.93	0.199
2.20	0.11	0.00	0.000	13.00	3.55	2.99	0.172
2.40	0.12	0.00	0.002	13.20	3.60	3.04	0.152
2.60	0.14	0.00	0.003	13.40	3.65	3.09	0.137
2.80	0.15	0.00	0.004	13.60	3.70	3.13	0.123
3.00	0.16	0.00	0.006	13.80	3.74	3.17	0.113
3.20	0.17	0.01	0.007	14.00	3.77	3.21	0.102
3.40	0.18	0.01	0.008	14.20	3.81	3.24	0.096
3.60	0.20	0.01	0.009	14.40	3.84	3.27	0.092
3.80	0.21	0.02	0.011	14.60	3.87	3.30	0.088
4.00	0.22	0.02	0.012	14.80	3.90	3.33	0.085
4.20	0.23	0.03	0.013	15.00	3.93	3.36	0.081
4.40	0.25	0.03	0.015	15.20	3.95	3.38	0.077
4.60	0.26	0.04	0.016	15.40	3.98	3.41	0.074
4.80	0.28	0.04	0.017	15.60	4.00	3.43	0.070
5.00	0.29	0.05	0.019	15.80	4.03	3.46	0.066
5.20	0.30	0.05	0.020	16.00	4.05	3.48	0.062
5.40	0.32	0.06	0.022	16.20	4.07	3.50	0.060
5.60	0.34	0.07	0.023	16.40	4.09	3.52	0.059
5.80	0.35	0.08	0.025	16.60	4.11	3.54	0.058
6.00	0.37	0.09	0.026	16.80	4.13	3.56	0.056
6.20	0.38	0.10	0.028	17.00	4.15	3.58	0.055
6.40	0.40	0.11	0.029	17.20	4.17	3.60	0.054
6.60	0.42	0.12	0.031	17.40	4.18	3.61	0.052
6.80	0.44	0.13	0.032	17.60	4.20	3.63	0.051
7.00	0.46	0.14	0.034	17.80	4.22	3.65	0.050
7.20	0.47	0.15	0.035	18.00	4.24	3.66	0.048
7.40	0.49	0.16	0.037	18.20	4.25	3.68	0.047
7.60	0.51	0.18	0.038	18.40	4.27	3.70	0.046
7.80	0.53	0.19	0.040	18.60	4.28	3.71	0.044
8.00	0.55	0.21	0.041	18.80	4.30	3.73	0.043
8.20	0.57	0.22	0.045	19.00	4.31	3.74	0.042
8.40	0.60	0.24	0.049	19.20	4.33	3.75	0.040
8.60	0.62	0.26	0.054	19.40	4.34	3.77	0.039
8.80	0.65	0.28	0.059	19.60	4.35	3.78	0.038
9.00	0.68	0.30	0.064	19.80	4.37	3.79	0.036
9.20	0.71	0.32	0.067	20.00	**4.38**	**3.81**	0.035
9.40	0.74	0.34	0.068				
9.60	0.76	0.37	0.070				
9.80	0.80	0.39	0.077				
10.00	0.83	0.42	0.085				
10.20	0.87	0.45	0.096				
10.40	0.92	0.49	0.108				
10.60	0.96	0.53	0.121				

Summary for Subcatchment 3S: Undetained

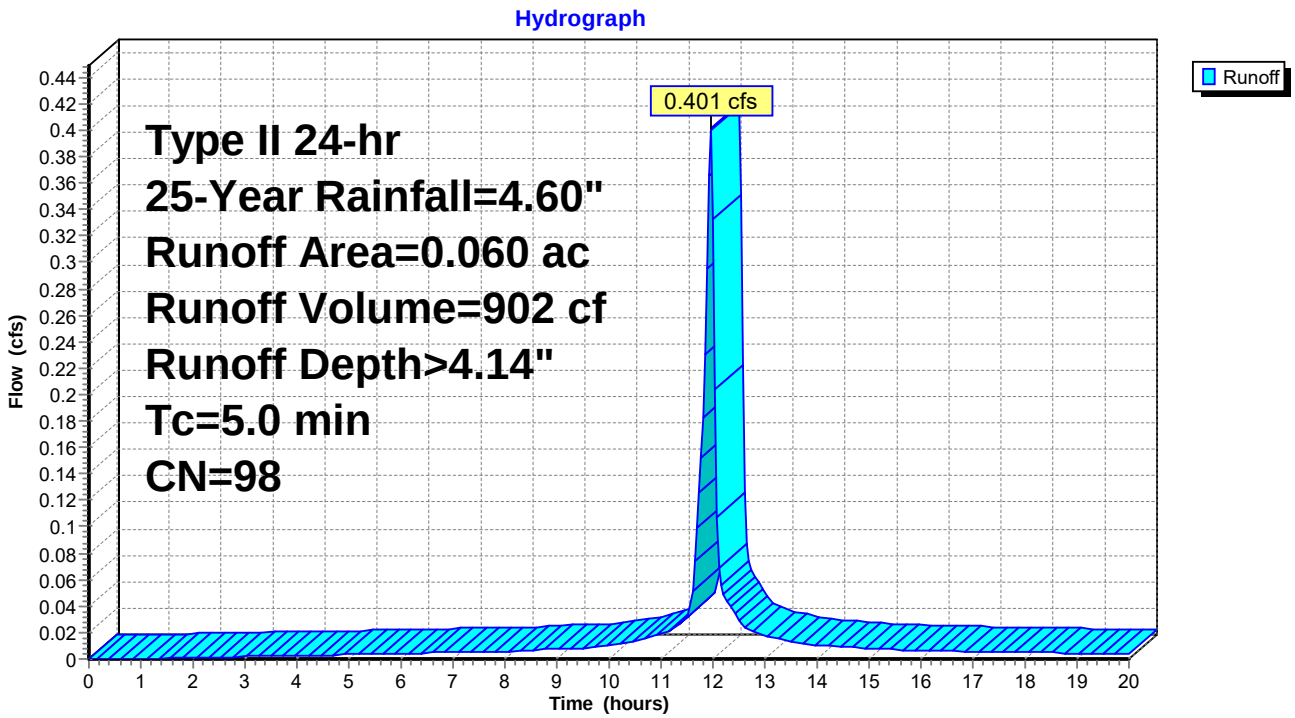
Runoff = 0.401 cfs @ 11.95 hrs, Volume= 902 cf, Depth> 4.14"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-Year Rainfall=4.60"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.02	0.81	0.016
0.20	0.01	0.00	0.000	11.00	1.08	0.87	0.019
0.40	0.02	0.00	0.000	11.20	1.16	0.94	0.023
0.60	0.03	0.00	0.000	11.40	1.25	1.03	0.028
0.80	0.04	0.00	0.000	11.60	1.41	1.19	0.052
1.00	0.05	0.00	0.000	11.80	1.98	1.76	**0.182**
1.20	0.06	0.00	0.000	12.00	3.05	2.82	**0.332**
1.40	0.07	0.00	0.001	12.20	3.21	2.98	0.049
1.60	0.08	0.01	0.001	12.40	3.34	3.10	0.035
1.80	0.09	0.01	0.001	12.60	3.42	3.19	0.024
2.00	0.10	0.01	0.001	12.80	3.49	3.26	0.021
2.20	0.11	0.02	0.001	13.00	3.55	3.32	0.018
2.40	0.12	0.02	0.002	13.20	3.60	3.37	0.016
2.60	0.14	0.03	0.002	13.40	3.65	3.42	0.014
2.80	0.15	0.04	0.002	13.60	3.70	3.46	0.013
3.00	0.16	0.04	0.002	13.80	3.74	3.50	0.012
3.20	0.17	0.05	0.002	14.00	3.77	3.54	0.011
3.40	0.18	0.06	0.002	14.20	3.81	3.57	0.010
3.60	0.20	0.07	0.003	14.40	3.84	3.60	0.010
3.80	0.21	0.08	0.003	14.60	3.87	3.63	0.009
4.00	0.22	0.08	0.003	14.80	3.90	3.66	0.009
4.20	0.23	0.09	0.003	15.00	3.93	3.69	0.008
4.40	0.25	0.10	0.003	15.20	3.95	3.72	0.008
4.60	0.26	0.11	0.003	15.40	3.98	3.74	0.008
4.80	0.28	0.13	0.003	15.60	4.00	3.77	0.007
5.00	0.29	0.14	0.003	15.80	4.03	3.79	0.007
5.20	0.30	0.15	0.004	16.00	4.05	3.81	0.007
5.40	0.32	0.16	0.004	16.20	4.07	3.83	0.006
5.60	0.34	0.17	0.004	16.40	4.09	3.85	0.006
5.80	0.35	0.19	0.004	16.60	4.11	3.87	0.006
6.00	0.37	0.20	0.004	16.80	4.13	3.89	0.006
6.20	0.38	0.22	0.004	17.00	4.15	3.91	0.006
6.40	0.40	0.23	0.004	17.20	4.17	3.93	0.006
6.60	0.42	0.25	0.005	17.40	4.18	3.95	0.005
6.80	0.44	0.26	0.005	17.60	4.20	3.97	0.005
7.00	0.46	0.28	0.005	17.80	4.22	3.98	0.005
7.20	0.47	0.29	0.005	18.00	4.24	4.00	0.005
7.40	0.49	0.31	0.005	18.20	4.25	4.02	0.005
7.60	0.51	0.33	0.005	18.40	4.27	4.03	0.005
7.80	0.53	0.35	0.005	18.60	4.28	4.05	0.005
8.00	0.55	0.37	0.006	18.80	4.30	4.06	0.004
8.20	0.57	0.38	0.006	19.00	4.31	4.08	0.004
8.40	0.60	0.41	0.007	19.20	4.33	4.09	0.004
8.60	0.62	0.43	0.007	19.40	4.34	4.11	0.004
8.80	0.65	0.45	0.008	19.60	4.35	4.12	0.004
9.00	0.68	0.48	0.008	19.80	4.37	4.13	0.004
9.20	0.71	0.51	0.008	20.00	**4.38**	**4.14**	0.004
9.40	0.74	0.54	0.008				
9.60	0.76	0.56	0.009				
9.80	0.80	0.60	0.009				
10.00	0.83	0.63	0.010				
10.20	0.87	0.67	0.011				
10.40	0.92	0.71	0.013				
10.60	0.96	0.76	0.014				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 3.80" for 25-Year event
Inflow = 3.768 cfs @ 11.95 hrs, Volume= 8,005 cf
Outflow = 1.164 cfs @ 12.08 hrs, Volume= 7,973 cf, Atten= 69%, Lag= 7.6 min
Primary = 1.164 cfs @ 12.08 hrs, Volume= 7,973 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 980.85' @ 12.08 hrs Surf.Area= 1,190 sf Storage= 2,311 cf

Plug-Flow detention time= 19.4 min calculated for 7,973 cf (100% of inflow)
Center-of-Mass det. time= 17.6 min (751.3 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.164 cfs @ 12.08 hrs HW=980.85' (Free Discharge)
└─**1=Culvert** (Passes 1.164 cfs of 5.041 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.164 cfs @ 8.54 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.000 cfs)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

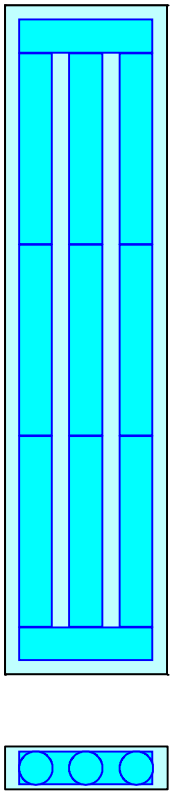
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

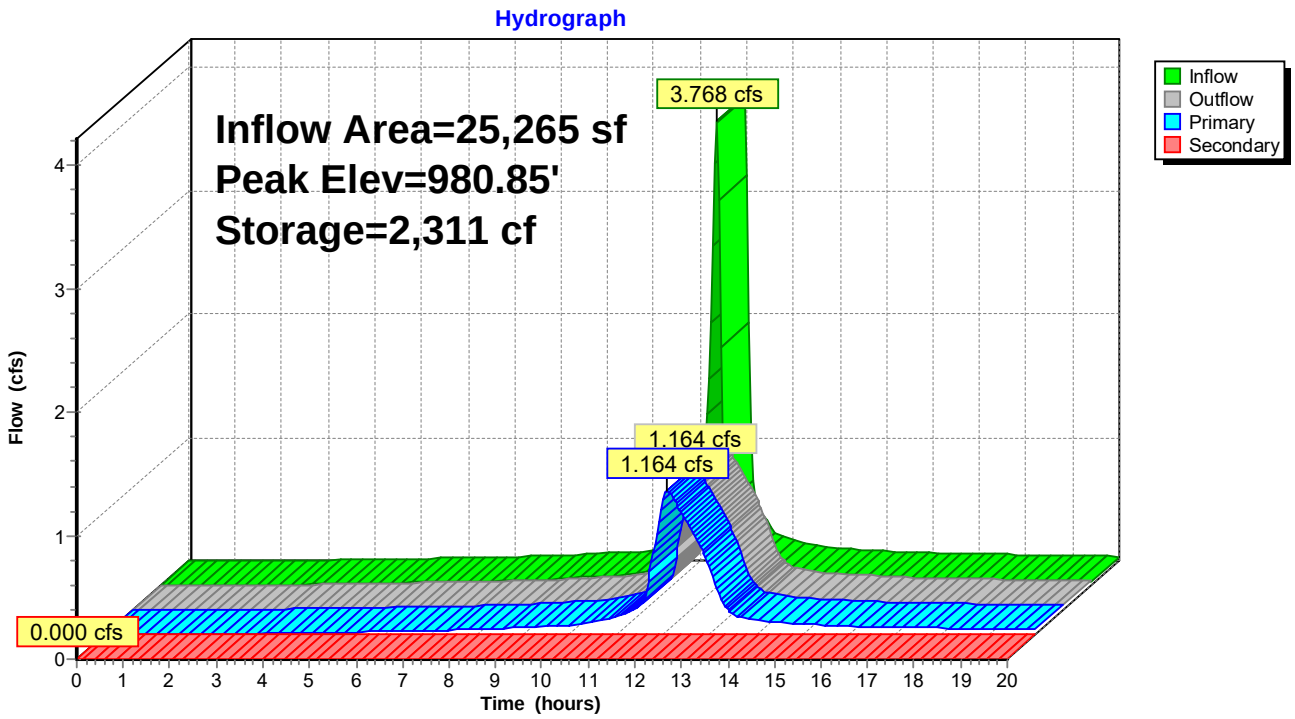
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=980.85'
Storage=2,311 cf
3.768 cfs
1.164 cfs
1.164 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Hydrograph for Pond 3P: UG

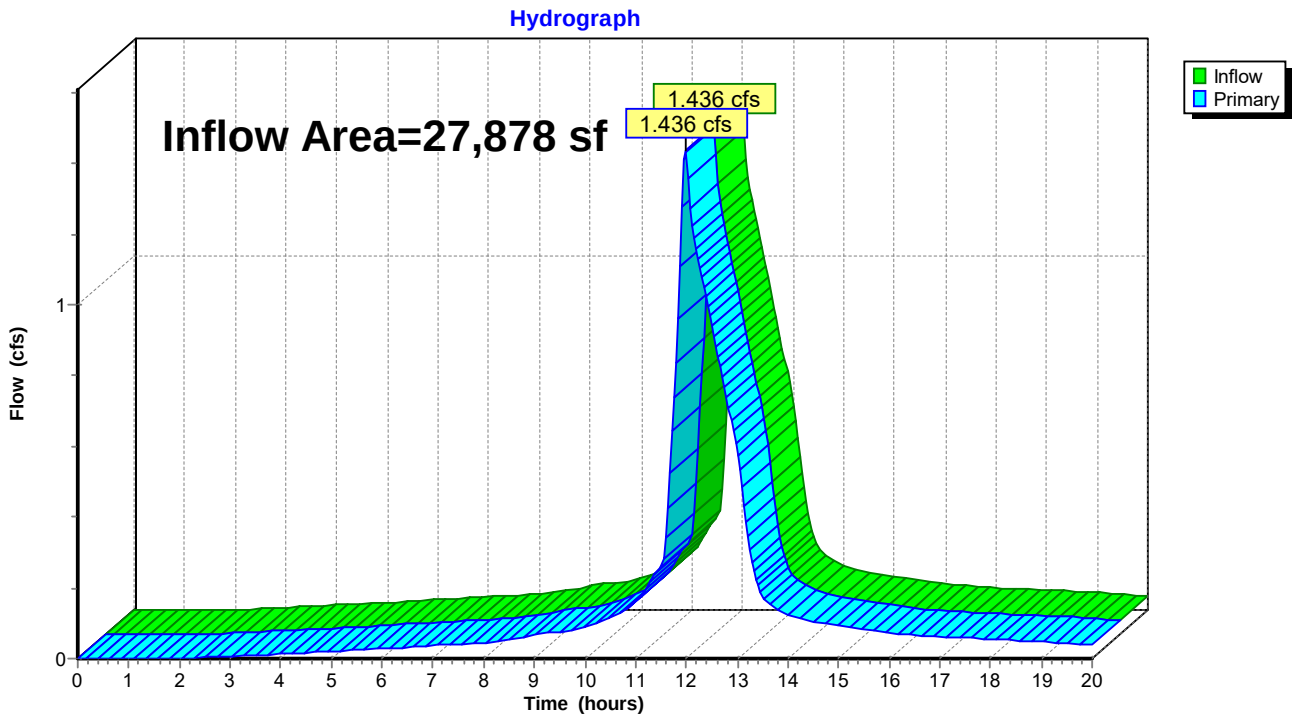
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.000	0	977.50	0.000	0.000	0.000
2.40	0.002	1	977.50	0.001	0.001	0.000
2.80	0.004	2	977.51	0.003	0.003	0.000
3.20	0.007	5	977.51	0.005	0.005	0.000
3.60	0.009	7	977.51	0.008	0.008	0.000
4.00	0.012	9	977.52	0.010	0.010	0.000
4.40	0.015	11	977.52	0.013	0.013	0.000
4.80	0.017	14	977.53	0.016	0.016	0.000
5.20	0.020	16	977.53	0.019	0.019	0.000
5.60	0.023	19	977.54	0.022	0.022	0.000
6.00	0.026	21	977.55	0.024	0.024	0.000
6.40	0.029	24	977.55	0.027	0.027	0.000
6.80	0.032	27	977.56	0.030	0.030	0.000
7.20	0.035	29	977.56	0.033	0.033	0.000
7.60	0.038	32	977.57	0.036	0.036	0.000
8.00	0.041	35	977.57	0.039	0.039	0.000
8.40	0.049	39	977.58	0.045	0.045	0.000
8.80	0.059	47	977.60	0.053	0.053	0.000
9.20	0.067	55	977.62	0.063	0.063	0.000
9.60	0.070	59	977.62	0.067	0.067	0.000
10.00	0.085	68	977.64	0.077	0.077	0.000
10.40	0.108	83	977.67	0.095	0.095	0.000
10.80	0.141	106	977.72	0.121	0.121	0.000
11.20	0.199	134	977.78	0.172	0.172	0.000
11.60	**0.467**	197	977.91	0.290	0.290	0.000
12.00	**3.133**	**2,062**	**980.51**	**1.100**	**1.100**	0.000
12.40	0.336	**1,626**	**979.97**	**0.988**	**0.988**	0.000
12.80	0.199	748	978.89	0.715	0.715	0.000
13.20	0.152	220	977.96	0.331	0.331	0.000
13.60	0.123	120	977.75	0.145	0.145	0.000
14.00	0.102	100	977.71	0.114	0.114	0.000
14.40	0.092	86	977.68	0.099	0.099	0.000
14.80	0.085	78	977.66	0.090	0.090	0.000
15.20	0.077	72	977.65	0.082	0.082	0.000
15.60	0.070	65	977.64	0.074	0.074	0.000
16.00	0.062	59	977.62	0.067	0.067	0.000
16.40	0.059	54	977.61	0.061	0.061	0.000
16.80	0.056	51	977.61	0.058	0.058	0.000
17.20	0.054	48	977.60	0.055	0.055	0.000
17.60	0.051	46	977.60	0.053	0.053	0.000
18.00	0.048	44	977.59	0.050	0.050	0.000
18.40	0.046	41	977.59	0.047	0.047	0.000
18.80	0.043	39	977.58	0.045	0.045	0.000
19.20	0.040	37	977.58	0.042	0.042	0.000
19.60	0.038	34	977.57	0.039	0.039	0.000
20.00	0.035	32	977.57	0.037	0.037	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 3.82" for 25-Year event
Inflow = 1.436 cfs @ 11.99 hrs, Volume= 8,874 cf
Primary = 1.436 cfs @ 11.99 hrs, Volume= 8,874 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.137	0.00	0.137
0.20	0.000	0.00	0.000	11.00	0.163	0.00	0.163
0.40	0.000	0.00	0.000	11.20	0.195	0.00	0.195
0.60	0.000	0.00	0.000	11.40	0.242	0.00	0.242
0.80	0.000	0.00	0.000	11.60	0.342	0.00	0.342
1.00	0.000	0.00	0.000	11.80	0.835	0.00	0.835
1.20	0.000	0.00	0.000	12.00	**1.432**	0.00	**1.432**
1.40	0.001	0.00	0.001	12.20	1.157	0.00	1.157
1.60	0.001	0.00	0.001	12.40	1.023	0.00	1.023
1.80	0.001	0.00	0.001	12.60	0.881	0.00	0.881
2.00	0.001	0.00	0.001	12.80	0.736	0.00	0.736
2.20	0.002	0.00	0.002	13.00	0.573	0.00	0.573
2.40	0.002	0.00	0.002	13.20	0.347	0.00	0.347
2.60	0.003	0.00	0.003	13.40	0.207	0.00	0.207
2.80	0.005	0.00	0.005	13.60	0.158	0.00	0.158
3.00	0.006	0.00	0.006	13.80	0.136	0.00	0.136
3.20	0.008	0.00	0.008	14.00	0.125	0.00	0.125
3.40	0.009	0.00	0.009	14.20	0.115	0.00	0.115
3.60	0.010	0.00	0.010	14.40	0.108	0.00	0.108
3.80	0.012	0.00	0.012	14.60	0.103	0.00	0.103
4.00	0.013	0.00	0.013	14.80	0.098	0.00	0.098
4.20	0.015	0.00	0.015	15.00	0.094	0.00	0.094
4.40	0.016	0.00	0.016	15.20	0.090	0.00	0.090
4.60	0.018	0.00	0.018	15.40	0.086	0.00	0.086
4.80	0.019	0.00	0.019	15.60	0.082	0.00	0.082
5.00	0.021	0.00	0.021	15.80	0.078	0.00	0.078
5.20	0.022	0.00	0.022	16.00	0.073	0.00	0.073
5.40	0.024	0.00	0.024	16.20	0.070	0.00	0.070
5.60	0.025	0.00	0.025	16.40	0.067	0.00	0.067
5.80	0.027	0.00	0.027	16.60	0.066	0.00	0.066
6.00	0.029	0.00	0.029	16.80	0.064	0.00	0.064
6.20	0.030	0.00	0.030	17.00	0.062	0.00	0.062
6.40	0.032	0.00	0.032	17.20	0.061	0.00	0.061
6.60	0.034	0.00	0.034	17.40	0.059	0.00	0.059
6.80	0.035	0.00	0.035	17.60	0.058	0.00	0.058
7.00	0.037	0.00	0.037	17.80	0.056	0.00	0.056
7.20	0.039	0.00	0.039	18.00	0.055	0.00	0.055
7.40	0.040	0.00	0.040	18.20	0.054	0.00	0.054
7.60	0.042	0.00	0.042	18.40	0.052	0.00	0.052
7.80	0.043	0.00	0.043	18.60	0.051	0.00	0.051
8.00	0.045	0.00	0.045	18.80	0.049	0.00	0.049
8.20	0.047	0.00	0.047	19.00	0.048	0.00	0.048
8.40	0.051	0.00	0.051	19.20	0.046	0.00	0.046
8.60	0.056	0.00	0.056	19.40	0.045	0.00	0.045
8.80	0.061	0.00	0.061	19.60	0.043	0.00	0.043
9.00	0.066	0.00	0.066	19.80	0.042	0.00	0.042
9.20	0.071	0.00	0.071	20.00	0.040	0.00	0.040
9.40	0.074	0.00	0.074				
9.60	0.076	0.00	0.076				
9.80	0.080	0.00	0.080				
10.00	0.087	0.00	0.087				
10.20	0.096	0.00	0.096				
10.40	0.108	0.00	0.108				
10.60	0.121	0.00	0.121				

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>4.40"
Tc=5.0 min CN=97 Runoff=3.973 cfs 8,793 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>4.18"
Tc=5.0 min CN=95 Runoff=4.114 cfs 8,797 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>4.52"
Tc=5.0 min CN=98 Runoff=0.436 cfs 984 cf

Pond 3P: UG Peak Elev=981.32' Storage=2,574 cf Inflow=4.114 cfs 8,797 cf
Primary=1.248 cfs 8,762 cf Secondary=0.000 cfs 0 cf Outflow=1.248 cfs 8,762 cf

Link 4L: POST (Combined) Inflow=1.523 cfs 9,746 cf
Primary=1.523 cfs 9,746 cf

Total Runoff Area = 51,836 sf Runoff Volume = 18,574 cf Average Runoff Depth = 4.30"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

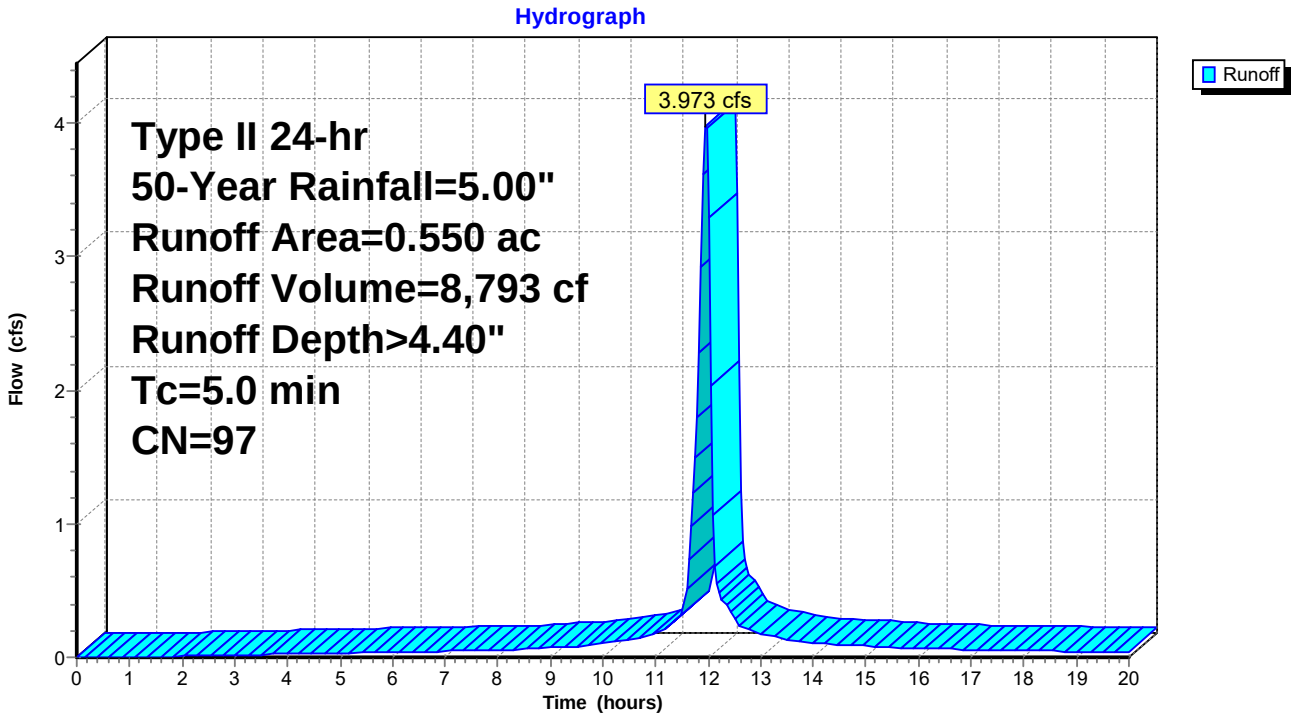
Runoff = 3.973 cfs @ 11.95 hrs, Volume= 8,793 cf, Depth> 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 50-Year Rainfall=5.00"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.11	0.81	0.160
0.20	0.01	0.00	0.000	11.00	1.18	0.87	0.182
0.40	0.02	0.00	0.000	11.20	1.26	0.95	0.222
0.60	0.03	0.00	0.000	11.40	1.36	1.05	0.274
0.80	0.04	0.00	0.000	11.60	1.53	1.22	0.511
1.00	0.05	0.00	0.000	11.80	2.15	1.82	**1.797**
1.20	0.06	0.00	0.000	12.00	3.31	2.97	**3.293**
1.40	0.07	0.00	0.002	12.20	3.49	3.15	0.488
1.60	0.09	0.00	0.004	12.40	3.63	3.28	0.351
1.80	0.10	0.00	0.006	12.60	3.72	3.37	0.240
2.00	0.11	0.01	0.008	12.80	3.79	3.45	0.208
2.20	0.12	0.01	0.009	13.00	3.86	3.51	0.179
2.40	0.13	0.01	0.011	13.20	3.92	3.57	0.159
2.60	0.15	0.02	0.013	13.40	3.97	3.62	0.143
2.80	0.16	0.02	0.014	13.60	4.02	3.67	0.129
3.00	0.17	0.03	0.016	13.80	4.06	3.71	0.117
3.20	0.19	0.04	0.017	14.00	4.10	3.75	0.106
3.40	0.20	0.04	0.019	14.20	4.14	3.79	0.100
3.60	0.21	0.05	0.020	14.40	4.17	3.82	0.096
3.80	0.23	0.06	0.021	14.60	4.20	3.86	0.092
4.00	0.24	0.07	0.023	14.80	4.24	3.89	0.088
4.20	0.25	0.07	0.024	15.00	4.27	3.92	0.084
4.40	0.27	0.08	0.026	15.20	4.30	3.95	0.080
4.60	0.28	0.09	0.027	15.40	4.32	3.97	0.077
4.80	0.30	0.10	0.029	15.60	4.35	4.00	0.073
5.00	0.32	0.11	0.030	15.80	4.38	4.03	0.069
5.20	0.33	0.13	0.032	16.00	4.40	4.05	0.065
5.40	0.35	0.14	0.033	16.20	4.42	4.07	0.063
5.60	0.36	0.15	0.035	16.40	4.45	4.09	0.061
5.80	0.38	0.16	0.036	16.60	4.47	4.12	0.060
6.00	0.40	0.18	0.038	16.80	4.49	4.14	0.059
6.20	0.42	0.19	0.039	17.00	4.51	4.16	0.057
6.40	0.44	0.21	0.041	17.20	4.53	4.18	0.056
6.60	0.46	0.22	0.042	17.40	4.55	4.20	0.054
6.80	0.48	0.24	0.044	17.60	4.57	4.22	0.053
7.00	0.50	0.25	0.045	17.80	4.59	4.24	0.052
7.20	0.52	0.27	0.047	18.00	4.61	4.25	0.050
7.40	0.54	0.29	0.048	18.20	4.62	4.27	0.049
7.60	0.56	0.30	0.050	18.40	4.64	4.29	0.047
7.80	0.58	0.32	0.051	18.60	4.66	4.31	0.046
8.00	0.60	0.34	0.052	18.80	4.67	4.32	0.045
8.20	0.62	0.36	0.056	19.00	4.69	4.34	0.043
8.40	0.65	0.38	0.061	19.20	4.70	4.35	0.042
8.60	0.68	0.41	0.067	19.40	4.72	4.37	0.041
8.80	0.70	0.43	0.072	19.60	4.73	4.38	0.039
9.00	0.74	0.46	0.078	19.80	4.75	4.39	0.038
9.20	0.77	0.49	0.080	20.00	**4.76**	**4.41**	0.036
9.40	0.80	0.52	0.081				
9.60	0.83	0.55	0.082				
9.80	0.87	0.58	0.091				
10.00	0.91	0.62	0.100				
10.20	0.95	0.66	0.111				
10.40	0.99	0.70	0.124				
10.60	1.05	0.75	0.138				

Summary for Subcatchment 2S: Detained

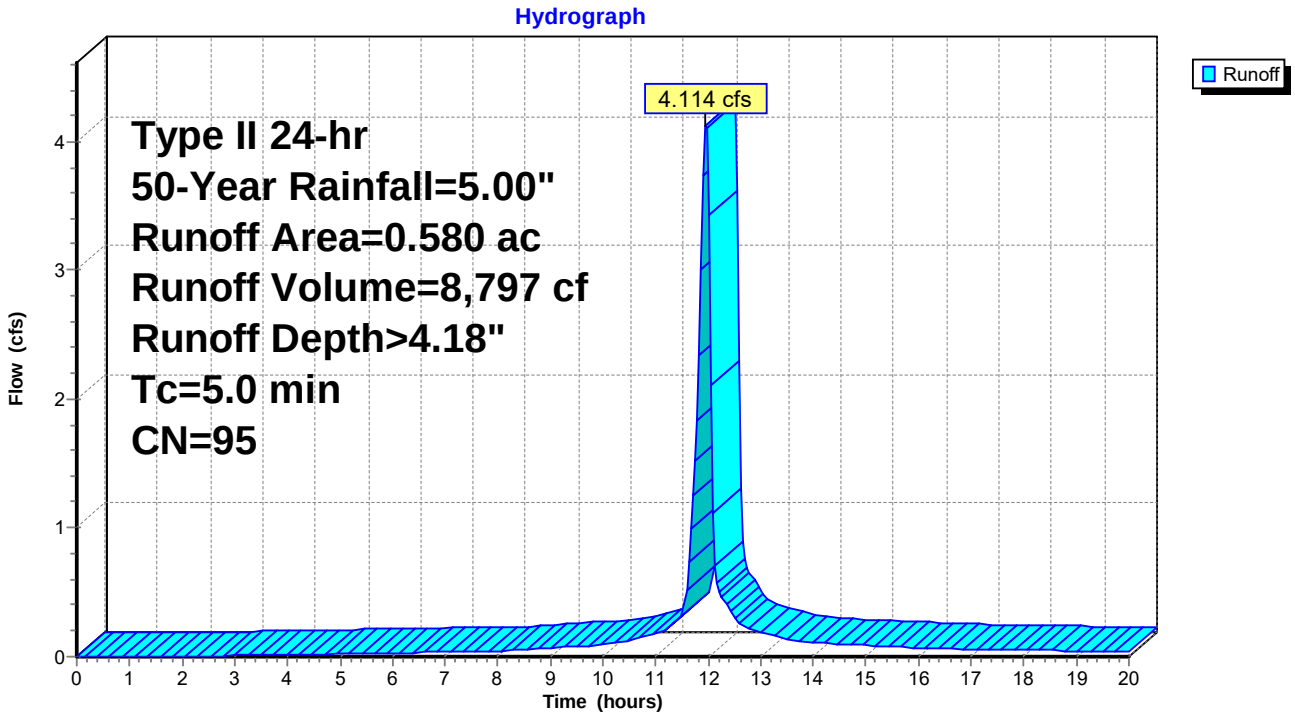
Runoff = 4.114 cfs @ 11.95 hrs, Volume= 8,797 cf, Depth> 4.18"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 50-Year Rainfall=5.00"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.11	0.66	0.156
0.20	0.01	0.00	0.000	11.00	1.18	0.72	0.179
0.40	0.02	0.00	0.000	11.20	1.26	0.79	0.220
0.60	0.03	0.00	0.000	11.40	1.36	0.88	0.274
0.80	0.04	0.00	0.000	11.60	1.53	1.04	0.514
1.00	0.05	0.00	0.000	11.80	2.15	1.63	**1.834**
1.20	0.06	0.00	0.000	12.00	3.31	2.76	**3.419**
1.40	0.07	0.00	0.000	12.20	3.49	2.93	0.508
1.60	0.09	0.00	0.000	12.40	3.63	3.06	0.366
1.80	0.10	0.00	0.000	12.60	3.72	3.15	0.251
2.00	0.11	0.00	0.000	12.80	3.79	3.23	0.217
2.20	0.12	0.00	0.002	13.00	3.86	3.29	0.187
2.40	0.13	0.00	0.003	13.20	3.92	3.35	0.166
2.60	0.15	0.00	0.005	13.40	3.97	3.40	0.150
2.80	0.16	0.01	0.006	13.60	4.02	3.45	0.134
3.00	0.17	0.01	0.008	13.80	4.06	3.49	0.123
3.20	0.19	0.01	0.009	14.00	4.10	3.53	0.111
3.40	0.20	0.01	0.010	14.20	4.14	3.57	0.104
3.60	0.21	0.02	0.012	14.40	4.17	3.60	0.100
3.80	0.23	0.02	0.013	14.60	4.20	3.63	0.096
4.00	0.24	0.03	0.014	14.80	4.24	3.66	0.092
4.20	0.25	0.03	0.016	15.00	4.27	3.70	0.088
4.40	0.27	0.04	0.017	15.20	4.30	3.72	0.084
4.60	0.28	0.05	0.019	15.40	4.32	3.75	0.080
4.80	0.30	0.05	0.021	15.60	4.35	3.78	0.076
5.00	0.32	0.06	0.022	15.80	4.38	3.80	0.072
5.20	0.33	0.07	0.024	16.00	4.40	3.83	0.068
5.40	0.35	0.08	0.025	16.20	4.42	3.85	0.066
5.60	0.36	0.09	0.027	16.40	4.45	3.87	0.064
5.80	0.38	0.10	0.029	16.60	4.47	3.89	0.063
6.00	0.40	0.11	0.030	16.80	4.49	3.91	0.061
6.20	0.42	0.12	0.032	17.00	4.51	3.93	0.060
6.40	0.44	0.13	0.034	17.20	4.53	3.95	0.058
6.60	0.46	0.14	0.035	17.40	4.55	3.97	0.057
6.80	0.48	0.15	0.037	17.60	4.57	3.99	0.056
7.00	0.50	0.17	0.039	17.80	4.59	4.01	0.054
7.20	0.52	0.18	0.040	18.00	4.61	4.03	0.053
7.40	0.54	0.19	0.042	18.20	4.62	4.05	0.051
7.60	0.56	0.21	0.043	18.40	4.64	4.06	0.050
7.80	0.58	0.22	0.045	18.60	4.66	4.08	0.048
8.00	0.60	0.24	0.047	18.80	4.67	4.10	0.047
8.20	0.62	0.26	0.050	19.00	4.69	4.11	0.045
8.40	0.65	0.28	0.056	19.20	4.70	4.13	0.044
8.60	0.68	0.30	0.061	19.40	4.72	4.14	0.043
8.80	0.70	0.32	0.066	19.60	4.73	4.16	0.041
9.00	0.74	0.34	0.072	19.80	4.75	4.17	0.040
9.20	0.77	0.37	0.075	20.00	**4.76**	**4.18**	0.038
9.40	0.80	0.39	0.076				
9.60	0.83	0.42	0.078				
9.80	0.87	0.45	0.086				
10.00	0.91	0.48	0.095				
10.20	0.95	0.52	0.107				
10.40	0.99	0.56	0.120				
10.60	1.05	0.60	0.135				

Summary for Subcatchment 3S: Undetained

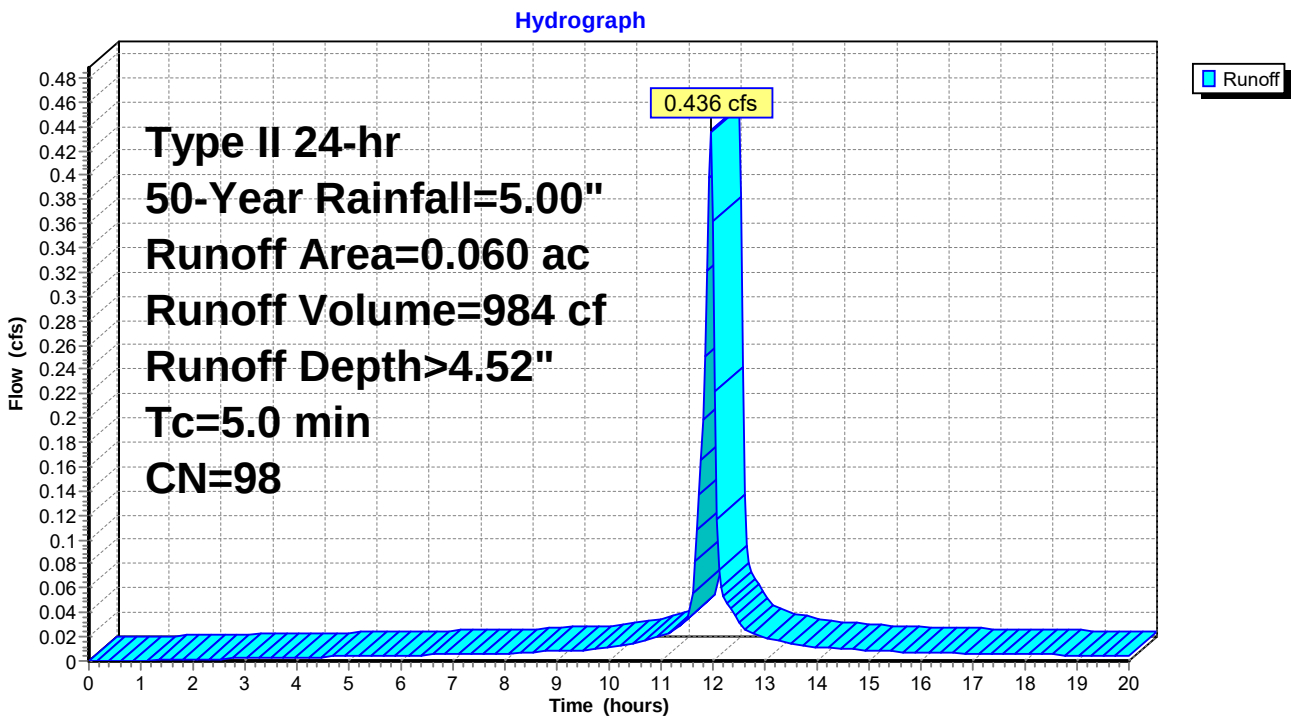
Runoff = 0.436 cfs @ 11.95 hrs, Volume= 984 cf, Depth> 4.52"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 50-Year Rainfall=5.00"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.11	0.89	0.018
0.20	0.01	0.00	0.000	11.00	1.18	0.96	0.020
0.40	0.02	0.00	0.000	11.20	1.26	1.04	0.025
0.60	0.03	0.00	0.000	11.40	1.36	1.14	0.031
0.80	0.04	0.00	0.000	11.60	1.53	1.31	0.057
1.00	0.05	0.00	0.000	11.80	2.15	1.93	**0.198**
1.20	0.06	0.00	0.001	12.00	3.31	3.08	**0.361**
1.40	0.07	0.00	0.001	12.20	3.49	3.26	0.053
1.60	0.09	0.01	0.001	12.40	3.63	3.39	0.038
1.80	0.10	0.01	0.001	12.60	3.72	3.48	0.026
2.00	0.11	0.02	0.002	12.80	3.79	3.56	0.023
2.20	0.12	0.02	0.002	13.00	3.86	3.63	0.020
2.40	0.13	0.03	0.002	13.20	3.92	3.68	0.017
2.60	0.15	0.04	0.002	13.40	3.97	3.74	0.016
2.80	0.16	0.04	0.002	13.60	4.02	3.78	0.014
3.00	0.17	0.05	0.002	13.80	4.06	3.83	0.013
3.20	0.19	0.06	0.003	14.00	4.10	3.86	0.012
3.40	0.20	0.07	0.003	14.20	4.14	3.90	0.011
3.60	0.21	0.08	0.003	14.40	4.17	3.94	0.010
3.80	0.23	0.09	0.003	14.60	4.20	3.97	0.010
4.00	0.24	0.10	0.003	14.80	4.24	4.00	0.010
4.20	0.25	0.11	0.003	15.00	4.27	4.03	0.009
4.40	0.27	0.12	0.003	15.20	4.30	4.06	0.009
4.60	0.28	0.13	0.004	15.40	4.32	4.09	0.008
4.80	0.30	0.14	0.004	15.60	4.35	4.12	0.008
5.00	0.32	0.16	0.004	15.80	4.38	4.14	0.008
5.20	0.33	0.17	0.004	16.00	4.40	4.16	0.007
5.40	0.35	0.18	0.004	16.20	4.42	4.19	0.007
5.60	0.36	0.20	0.004	16.40	4.45	4.21	0.007
5.80	0.38	0.21	0.005	16.60	4.47	4.23	0.007
6.00	0.40	0.23	0.005	16.80	4.49	4.25	0.006
6.20	0.42	0.24	0.005	17.00	4.51	4.27	0.006
6.40	0.44	0.26	0.005	17.20	4.53	4.29	0.006
6.60	0.46	0.28	0.005	17.40	4.55	4.31	0.006
6.80	0.48	0.30	0.005	17.60	4.57	4.33	0.006
7.00	0.50	0.31	0.005	17.80	4.59	4.35	0.006
7.20	0.52	0.33	0.006	18.00	4.61	4.37	0.005
7.40	0.54	0.35	0.006	18.20	4.62	4.39	0.005
7.60	0.56	0.37	0.006	18.40	4.64	4.40	0.005
7.80	0.58	0.39	0.006	18.60	4.66	4.42	0.005
8.00	0.60	0.41	0.006	18.80	4.67	4.44	0.005
8.20	0.62	0.43	0.007	19.00	4.69	4.45	0.005
8.40	0.65	0.45	0.007	19.20	4.70	4.47	0.005
8.60	0.68	0.48	0.008	19.40	4.72	4.48	0.004
8.80	0.70	0.51	0.008	19.60	4.73	4.50	0.004
9.00	0.74	0.54	0.009	19.80	4.75	4.51	0.004
9.20	0.77	0.57	0.009	20.00	**4.76**	**4.52**	0.004
9.40	0.80	0.60	0.009				
9.60	0.83	0.63	0.009				
9.80	0.87	0.66	0.010				
10.00	0.91	0.70	0.011				
10.20	0.95	0.74	0.013				
10.40	0.99	0.79	0.014				
10.60	1.05	0.84	0.016				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 4.18" for 50-Year event
Inflow = 4.114 cfs @ 11.95 hrs, Volume= 8,797 cf
Outflow = 1.248 cfs @ 12.08 hrs, Volume= 8,762 cf, Atten= 70%, Lag= 7.6 min
Primary = 1.248 cfs @ 12.08 hrs, Volume= 8,762 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 981.32' @ 12.08 hrs Surf.Area= 1,190 sf Storage= 2,574 cf

Plug-Flow detention time= 20.2 min calculated for 8,762 cf (100% of inflow)
Center-of-Mass det. time= 18.3 min (749.9 - 731.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.248 cfs @ 12.08 hrs HW=981.32' (Free Discharge)
└─**1=Culvert** (Passes 1.248 cfs of 5.441 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.248 cfs @ 9.15 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.000 cfs)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

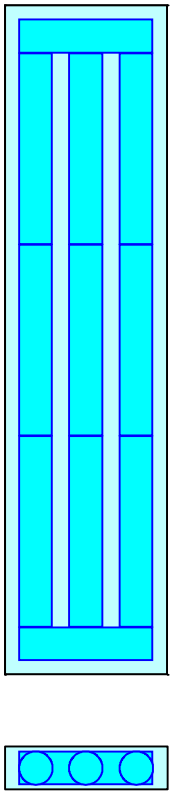
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

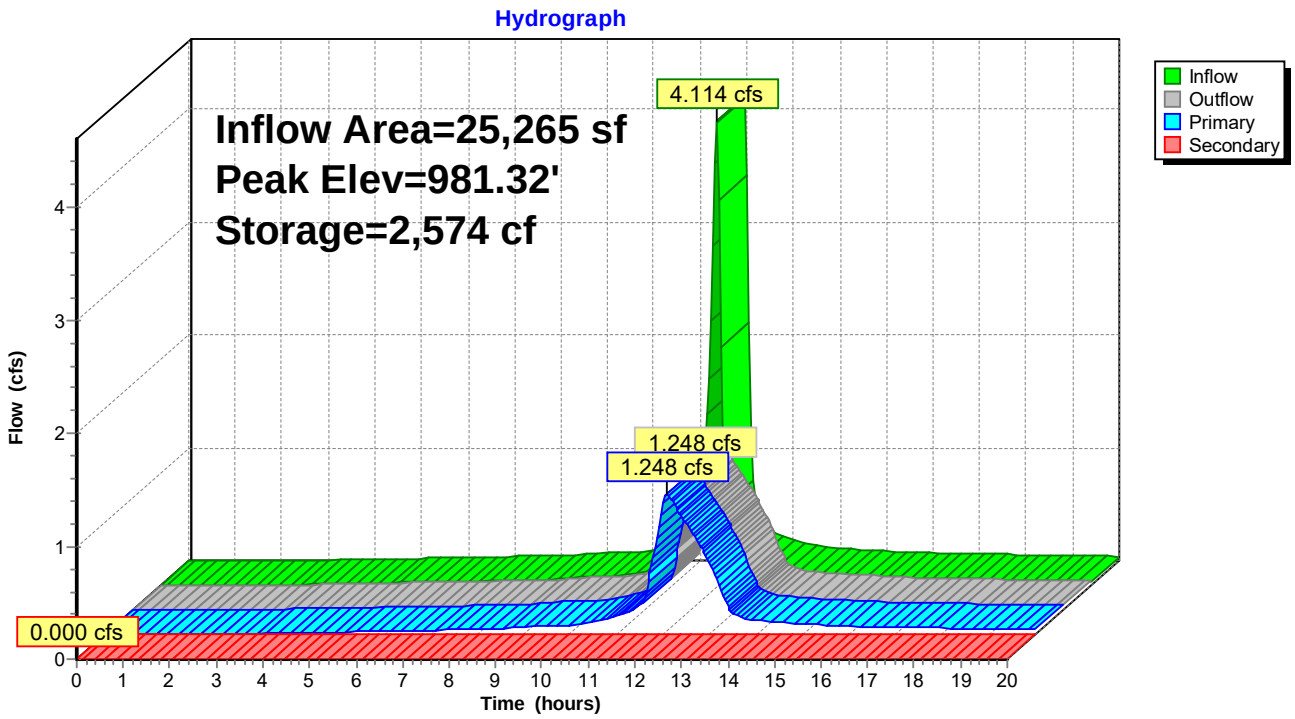
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=981.32'
Storage=2,574 cf
4.114 cfs
1.248 cfs
1.248 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Hydrograph for Pond 3P: UG

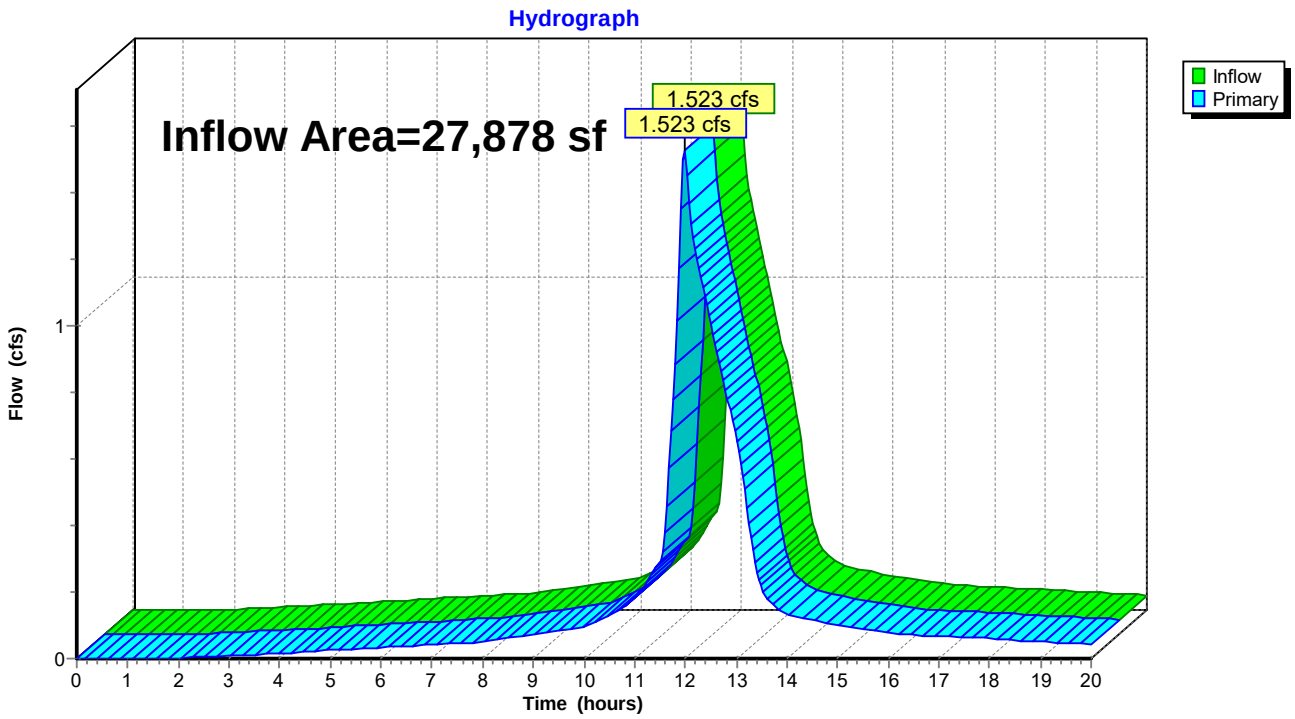
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.000	0	977.50	0.000	0.000	0.000
2.40	0.003	1	977.50	0.002	0.002	0.000
2.80	0.006	4	977.51	0.004	0.004	0.000
3.20	0.009	6	977.51	0.007	0.007	0.000
3.60	0.012	9	977.52	0.010	0.010	0.000
4.00	0.014	11	977.52	0.013	0.013	0.000
4.40	0.017	14	977.53	0.016	0.016	0.000
4.80	0.021	16	977.53	0.019	0.019	0.000
5.20	0.024	19	977.54	0.022	0.022	0.000
5.60	0.027	22	977.55	0.025	0.025	0.000
6.00	0.030	25	977.55	0.028	0.028	0.000
6.40	0.034	28	977.56	0.032	0.032	0.000
6.80	0.037	31	977.56	0.035	0.035	0.000
7.20	0.040	33	977.57	0.038	0.038	0.000
7.60	0.043	36	977.58	0.041	0.041	0.000
8.00	0.047	39	977.58	0.045	0.045	0.000
8.40	0.056	44	977.59	0.050	0.050	0.000
8.80	0.066	53	977.61	0.060	0.060	0.000
9.20	0.075	61	977.63	0.070	0.070	0.000
9.60	0.078	66	977.64	0.075	0.075	0.000
10.00	0.095	75	977.66	0.086	0.086	0.000
10.40	0.120	92	977.69	0.105	0.105	0.000
10.80	0.156	116	977.74	0.139	0.139	0.000
11.20	0.220	144	977.80	0.191	0.191	0.000
11.60	**0.514**	213	977.95	0.319	0.319	0.000
12.00	**3.419**	**2,293**	**980.83**	**1.159**	**1.159**	0.000
12.40	0.366	**1,863**	**980.26**	**1.049**	**1.049**	0.000
12.80	0.217	927	979.12	0.781	0.781	0.000
13.20	0.166	297	978.15	0.434	0.434	0.000
13.60	0.134	131	977.78	0.167	0.167	0.000
14.00	0.111	107	977.72	0.122	0.122	0.000
14.40	0.100	94	977.70	0.107	0.107	0.000
14.80	0.092	85	977.68	0.097	0.097	0.000
15.20	0.084	78	977.66	0.089	0.089	0.000
15.60	0.076	71	977.65	0.081	0.081	0.000
16.00	0.068	64	977.63	0.073	0.073	0.000
16.40	0.064	58	977.62	0.067	0.067	0.000
16.80	0.061	55	977.62	0.063	0.063	0.000
17.20	0.058	53	977.61	0.060	0.060	0.000
17.60	0.056	50	977.61	0.057	0.057	0.000
18.00	0.053	48	977.60	0.054	0.054	0.000
18.40	0.050	45	977.59	0.051	0.051	0.000
18.80	0.047	43	977.59	0.049	0.049	0.000
19.20	0.044	40	977.58	0.046	0.046	0.000
19.60	0.041	38	977.58	0.043	0.043	0.000
20.00	0.038	35	977.57	0.040	0.040	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 4.20" for 50-Year event
Inflow = 1.523 cfs @ 11.99 hrs, Volume= 9,746 cf
Primary = 1.523 cfs @ 11.99 hrs, Volume= 9,746 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.157	0.00	0.157
0.20	0.000	0.00	0.000	11.00	0.182	0.00	0.182
0.40	0.000	0.00	0.000	11.20	0.216	0.00	0.216
0.60	0.000	0.00	0.000	11.40	0.267	0.00	0.267
0.80	0.000	0.00	0.000	11.60	0.376	0.00	0.376
1.00	0.000	0.00	0.000	11.80	0.881	0.00	0.881
1.20	0.001	0.00	0.001	12.00	**1.520**	0.00	**1.520**
1.40	0.001	0.00	0.001	12.20	1.228	0.00	1.228
1.60	0.001	0.00	0.001	12.40	1.087	0.00	1.087
1.80	0.001	0.00	0.001	12.60	0.945	0.00	0.945
2.00	0.002	0.00	0.002	12.80	0.804	0.00	0.804
2.20	0.002	0.00	0.002	13.00	0.652	0.00	0.652
2.40	0.004	0.00	0.004	13.20	0.452	0.00	0.452
2.60	0.005	0.00	0.005	13.40	0.259	0.00	0.259
2.80	0.007	0.00	0.007	13.60	0.181	0.00	0.181
3.00	0.008	0.00	0.008	13.80	0.150	0.00	0.150
3.20	0.010	0.00	0.010	14.00	0.134	0.00	0.134
3.40	0.011	0.00	0.011	14.20	0.124	0.00	0.124
3.60	0.013	0.00	0.013	14.40	0.117	0.00	0.117
3.80	0.014	0.00	0.014	14.60	0.112	0.00	0.112
4.00	0.016	0.00	0.016	14.80	0.107	0.00	0.107
4.20	0.017	0.00	0.017	15.00	0.102	0.00	0.102
4.40	0.019	0.00	0.019	15.20	0.098	0.00	0.098
4.60	0.021	0.00	0.021	15.40	0.093	0.00	0.093
4.80	0.022	0.00	0.022	15.60	0.089	0.00	0.089
5.00	0.024	0.00	0.024	15.80	0.084	0.00	0.084
5.20	0.026	0.00	0.026	16.00	0.080	0.00	0.080
5.40	0.028	0.00	0.028	16.20	0.076	0.00	0.076
5.60	0.029	0.00	0.029	16.40	0.073	0.00	0.073
5.80	0.031	0.00	0.031	16.60	0.071	0.00	0.071
6.00	0.033	0.00	0.033	16.80	0.070	0.00	0.070
6.20	0.035	0.00	0.035	17.00	0.068	0.00	0.068
6.40	0.037	0.00	0.037	17.20	0.066	0.00	0.066
6.60	0.038	0.00	0.038	17.40	0.065	0.00	0.065
6.80	0.040	0.00	0.040	17.60	0.063	0.00	0.063
7.00	0.042	0.00	0.042	17.80	0.061	0.00	0.061
7.20	0.044	0.00	0.044	18.00	0.060	0.00	0.060
7.40	0.046	0.00	0.046	18.20	0.058	0.00	0.058
7.60	0.047	0.00	0.047	18.40	0.057	0.00	0.057
7.80	0.049	0.00	0.049	18.60	0.055	0.00	0.055
8.00	0.051	0.00	0.051	18.80	0.053	0.00	0.053
8.20	0.053	0.00	0.053	19.00	0.052	0.00	0.052
8.40	0.058	0.00	0.058	19.20	0.050	0.00	0.050
8.60	0.063	0.00	0.063	19.40	0.049	0.00	0.049
8.80	0.068	0.00	0.068	19.60	0.047	0.00	0.047
9.00	0.074	0.00	0.074	19.80	0.046	0.00	0.046
9.20	0.079	0.00	0.079	20.00	0.044	0.00	0.044
9.40	0.082	0.00	0.082				
9.60	0.084	0.00	0.084				
9.80	0.090	0.00	0.090				
10.00	0.097	0.00	0.097				
10.20	0.107	0.00	0.107				
10.40	0.119	0.00	0.119				
10.60	0.133	0.00	0.133				

Time span=0.00-20.00 hrs, dt=0.04 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE Runoff Area=0.550 ac 92.73% Impervious Runoff Depth>4.78"
Tc=5.0 min CN=97 Runoff=4.298 cfs 9,550 cf

Subcatchment 2S: Detained Runoff Area=0.580 ac 82.76% Impervious Runoff Depth>4.56"
Tc=5.0 min CN=95 Runoff=4.460 cfs 9,590 cf

Subcatchment 3S: Undetained Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>4.90"
Tc=5.0 min CN=98 Runoff=0.471 cfs 1,067 cf

Pond 3P: UG Peak Elev=981.74' Storage=2,757 cf Inflow=4.460 cfs 9,590 cf
Primary=1.939 cfs 9,552 cf Secondary=0.000 cfs 0 cf Outflow=1.939 cfs 9,552 cf

Link 4L: POST (Combined) Inflow=2.145 cfs 10,620 cf
Primary=2.145 cfs 10,620 cf

Total Runoff Area = 51,836 sf Runoff Volume = 20,207 cf Average Runoff Depth = 4.68"
11.76% Pervious = 6,098 sf 88.24% Impervious = 45,738 sf

Summary for Subcatchment 1S: PRE

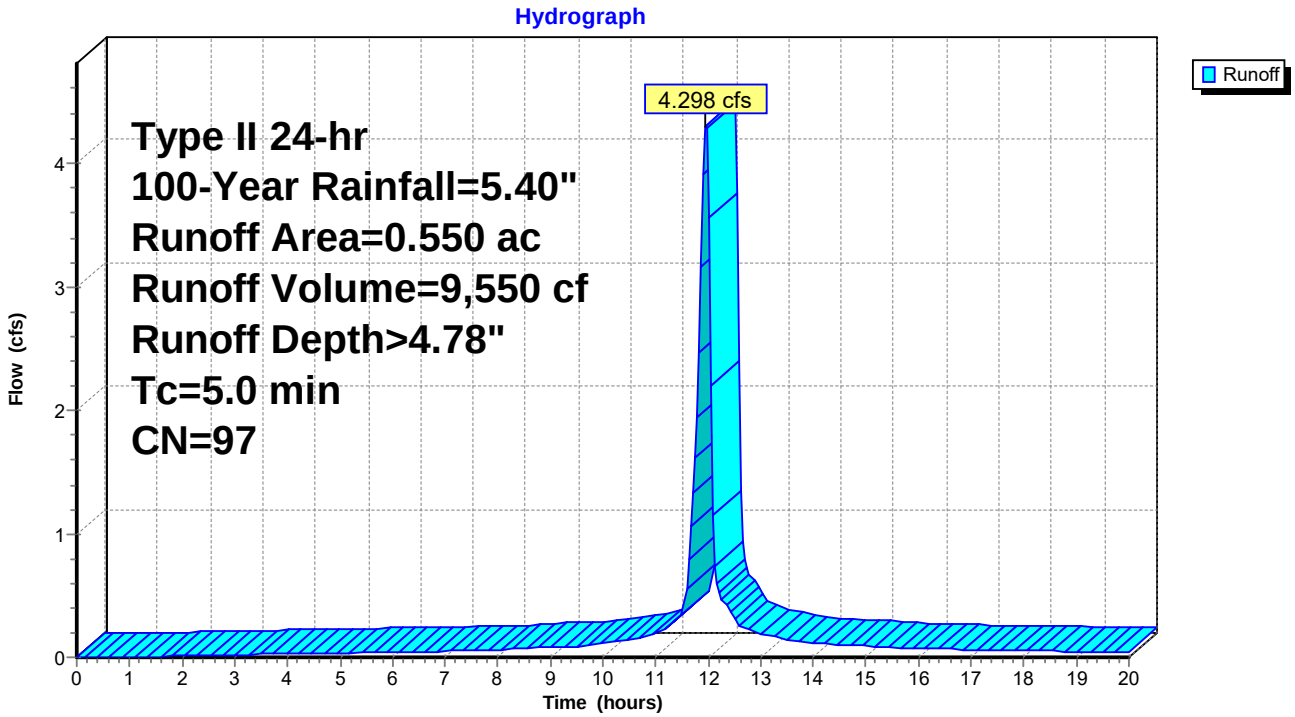
Runoff = 4.298 cfs @ 11.95 hrs, Volume= 9,550 cf, Depth> 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-Year Rainfall=5.40"

Area (ac)	CN	Description
0.510	98	Paved parking, HSG D
0.040	78	Meadow, non-grazed, HSG D
0.550	97	Weighted Average
0.040		7.27% Pervious Area
0.510		92.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: PRE



Hydrograph for Subcatchment 1S: PRE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.20	0.89	0.174
0.20	0.01	0.00	0.000	11.00	1.27	0.96	0.197
0.40	0.02	0.00	0.000	11.20	1.36	1.05	0.241
0.60	0.03	0.00	0.000	11.40	1.47	1.15	0.298
0.80	0.04	0.00	0.000	11.60	1.66	1.34	0.555
1.00	0.06	0.00	0.000	11.80	2.33	1.99	**1.947**
1.20	0.07	0.00	0.001	12.00	3.58	3.23	**3.561**
1.40	0.08	0.00	0.003	12.20	3.77	3.43	0.527
1.60	0.09	0.00	0.005	12.40	3.92	3.57	0.379
1.80	0.11	0.01	0.007	12.60	4.01	3.67	0.260
2.00	0.12	0.01	0.010	12.80	4.10	3.75	0.225
2.20	0.13	0.01	0.012	13.00	4.17	3.82	0.194
2.40	0.15	0.02	0.013	13.20	4.23	3.88	0.172
2.60	0.16	0.02	0.015	13.40	4.29	3.94	0.155
2.80	0.17	0.03	0.017	13.60	4.34	3.99	0.139
3.00	0.19	0.04	0.019	13.80	4.39	4.04	0.127
3.20	0.20	0.04	0.020	14.00	4.43	4.08	0.115
3.40	0.21	0.05	0.022	14.20	4.47	4.12	0.108
3.60	0.23	0.06	0.023	14.40	4.50	4.15	0.104
3.80	0.24	0.07	0.024	14.60	4.54	4.19	0.099
4.00	0.26	0.08	0.026	14.80	4.58	4.22	0.095
4.20	0.27	0.09	0.027	15.00	4.61	4.26	0.091
4.40	0.29	0.10	0.029	15.20	4.64	4.29	0.087
4.60	0.31	0.11	0.031	15.40	4.67	4.32	0.083
4.80	0.32	0.12	0.032	15.60	4.70	4.35	0.079
5.00	0.34	0.13	0.034	15.80	4.73	4.37	0.074
5.20	0.36	0.14	0.036	16.00	4.75	4.40	0.070
5.40	0.38	0.16	0.037	16.20	4.78	4.42	0.068
5.60	0.39	0.17	0.039	16.40	4.80	4.45	0.066
5.80	0.41	0.19	0.041	16.60	4.82	4.47	0.065
6.00	0.43	0.20	0.042	16.80	4.85	4.49	0.063
6.20	0.45	0.22	0.044	17.00	4.87	4.52	0.062
6.40	0.47	0.23	0.045	17.20	4.89	4.54	0.060
6.60	0.49	0.25	0.047	17.40	4.91	4.56	0.059
6.80	0.51	0.27	0.048	17.60	4.93	4.58	0.057
7.00	0.53	0.29	0.050	17.80	4.95	4.60	0.056
7.20	0.56	0.30	0.051	18.00	4.97	4.62	0.054
7.40	0.58	0.32	0.053	18.20	4.99	4.64	0.053
7.60	0.60	0.34	0.054	18.40	5.01	4.66	0.051
7.80	0.62	0.36	0.056	18.60	5.03	4.68	0.050
8.00	0.65	0.38	0.057	18.80	5.05	4.69	0.048
8.20	0.67	0.41	0.062	19.00	5.06	4.71	0.047
8.40	0.70	0.43	0.067	19.20	5.08	4.73	0.045
8.60	0.73	0.46	0.073	19.40	5.10	4.74	0.044
8.80	0.76	0.48	0.079	19.60	5.11	4.76	0.042
9.00	0.79	0.51	0.085	19.80	5.13	4.77	0.041
9.20	0.83	0.55	0.088	20.00	**5.14**	**4.79**	0.039
9.40	0.86	0.58	0.088				
9.60	0.90	0.61	0.090				
9.80	0.94	0.65	0.099				
10.00	0.98	0.68	0.108				
10.20	1.02	0.73	0.121				
10.40	1.07	0.78	0.135				
10.60	1.13	0.83	0.151				

Summary for Subcatchment 2S: Detained

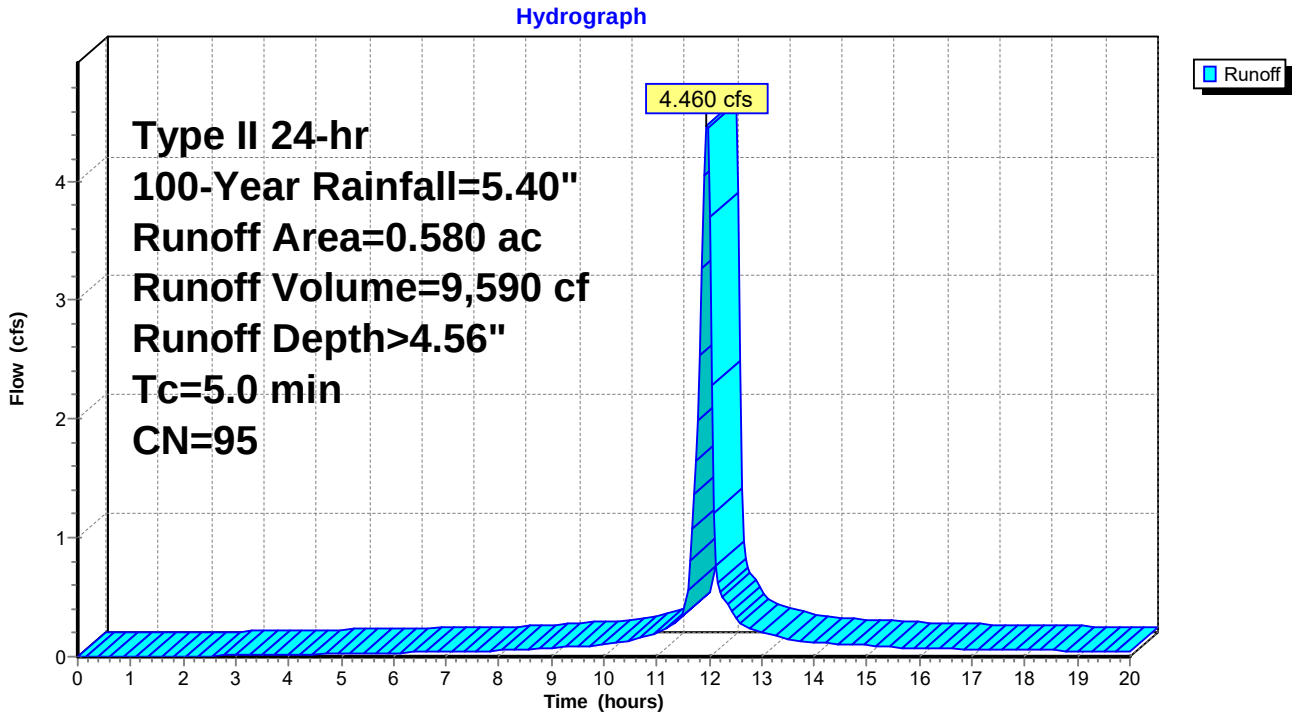
Runoff = 4.460 cfs @ 11.95 hrs, Volume= 9,590 cf, Depth> 4.56"
Routed to Pond 3P : UG

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-Year Rainfall=5.40"

Area (ac)	CN	Description
0.100	78	Meadow, non-grazed, HSG D
0.480	98	Paved parking, HSG D
0.580	95	Weighted Average
0.100		17.24% Pervious Area
0.480		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Detained



Hydrograph for Subcatchment 2S: Detained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.20	0.74	0.171
0.20	0.01	0.00	0.000	11.00	1.27	0.80	0.196
0.40	0.02	0.00	0.000	11.20	1.36	0.88	0.241
0.60	0.03	0.00	0.000	11.40	1.47	0.98	0.299
0.80	0.04	0.00	0.000	11.60	1.66	1.16	0.560
1.00	0.06	0.00	0.000	11.80	2.33	1.80	**1.994**
1.20	0.07	0.00	0.000	12.00	3.58	3.02	**3.705**
1.40	0.08	0.00	0.000	12.20	3.77	3.21	0.550
1.60	0.09	0.00	0.000	12.40	3.92	3.35	0.396
1.80	0.11	0.00	0.000	12.60	4.01	3.45	0.271
2.00	0.12	0.00	0.001	12.80	4.10	3.53	0.235
2.20	0.13	0.00	0.003	13.00	4.17	3.60	0.203
2.40	0.15	0.00	0.005	13.20	4.23	3.66	0.179
2.60	0.16	0.00	0.006	13.40	4.29	3.72	0.162
2.80	0.17	0.01	0.008	13.60	4.34	3.77	0.145
3.00	0.19	0.01	0.010	13.80	4.39	3.81	0.133
3.20	0.20	0.01	0.011	14.00	4.43	3.85	0.120
3.40	0.21	0.02	0.013	14.20	4.47	3.89	0.113
3.60	0.23	0.02	0.014	14.40	4.50	3.93	0.108
3.80	0.24	0.03	0.016	14.60	4.54	3.97	0.104
4.00	0.26	0.03	0.017	14.80	4.58	4.00	0.100
4.20	0.27	0.04	0.019	15.00	4.61	4.03	0.095
4.40	0.29	0.05	0.020	15.20	4.64	4.06	0.091
4.60	0.31	0.06	0.022	15.40	4.67	4.09	0.087
4.80	0.32	0.06	0.024	15.60	4.70	4.12	0.082
5.00	0.34	0.07	0.026	15.80	4.73	4.15	0.078
5.20	0.36	0.08	0.027	16.00	4.75	4.17	0.074
5.40	0.38	0.09	0.029	16.20	4.78	4.20	0.071
5.60	0.39	0.10	0.031	16.40	4.80	4.22	0.069
5.80	0.41	0.11	0.033	16.60	4.82	4.25	0.068
6.00	0.43	0.13	0.035	16.80	4.85	4.27	0.066
6.20	0.45	0.14	0.036	17.00	4.87	4.29	0.065
6.40	0.47	0.15	0.038	17.20	4.89	4.31	0.063
6.60	0.49	0.16	0.040	17.40	4.91	4.33	0.062
6.80	0.51	0.18	0.042	17.60	4.93	4.35	0.060
7.00	0.53	0.19	0.043	17.80	4.95	4.37	0.058
7.20	0.56	0.21	0.045	18.00	4.97	4.39	0.057
7.40	0.58	0.22	0.047	18.20	4.99	4.41	0.055
7.60	0.60	0.24	0.049	18.40	5.01	4.43	0.054
7.80	0.62	0.26	0.050	18.60	5.03	4.45	0.052
8.00	0.65	0.28	0.052	18.80	5.05	4.47	0.051
8.20	0.67	0.29	0.056	19.00	5.06	4.48	0.049
8.40	0.70	0.32	0.062	19.20	5.08	4.50	0.048
8.60	0.73	0.34	0.068	19.40	5.10	4.51	0.046
8.80	0.76	0.36	0.074	19.60	5.11	4.53	0.044
9.00	0.79	0.39	0.080	19.80	5.13	4.54	0.043
9.20	0.83	0.42	0.083	20.00	**5.14**	**4.56**	0.041
9.40	0.86	0.45	0.084				
9.60	0.90	0.48	0.086				
9.80	0.94	0.51	0.095				
10.00	0.98	0.54	0.105				
10.20	1.02	0.58	0.117				
10.40	1.07	0.63	0.132				
10.60	1.13	0.68	0.148				

Summary for Subcatchment 3S: Undetained

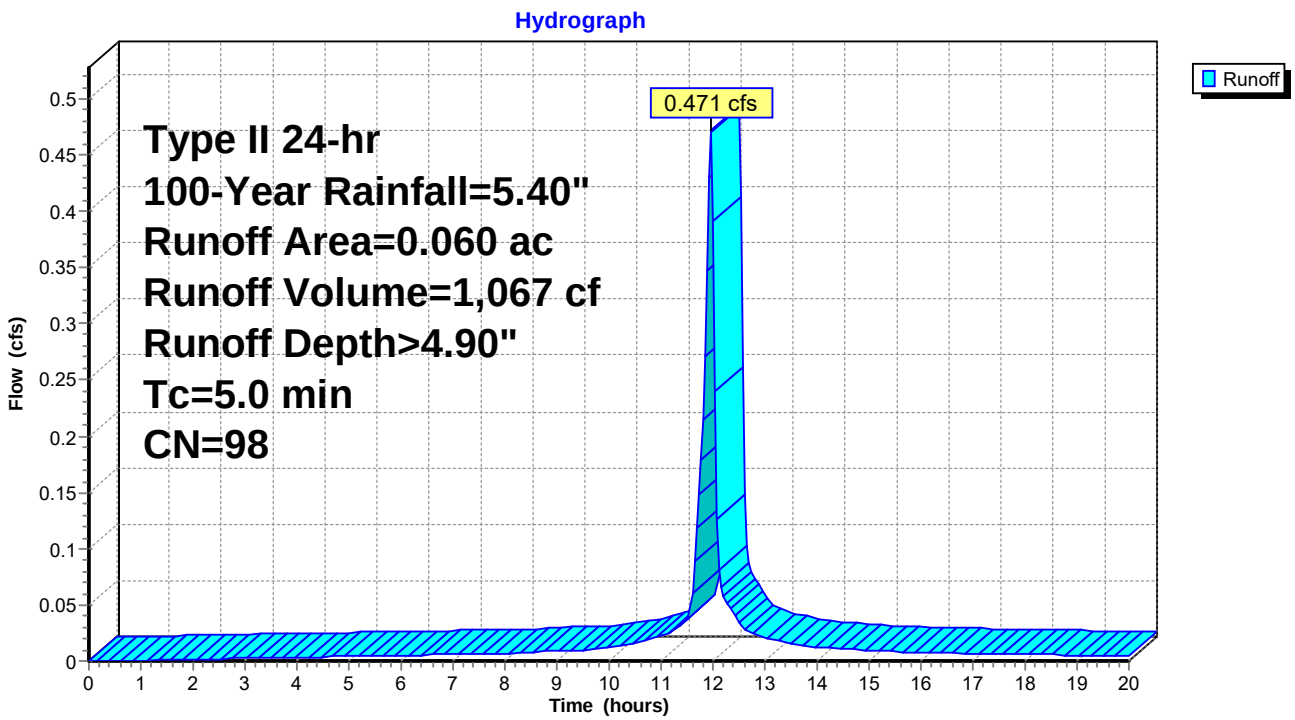
Runoff = 0.471 cfs @ 11.95 hrs, Volume= 1,067 cf, Depth> 4.90"
Routed to Link 4L : POST (Combined)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-Year Rainfall=5.40"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
0.060		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Undetained



Hydrograph for Subcatchment 3S: Undetained

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.000	10.80	1.20	0.98	0.019
0.20	0.01	0.00	0.000	11.00	1.27	1.05	0.022
0.40	0.02	0.00	0.000	11.20	1.36	1.14	0.027
0.60	0.03	0.00	0.000	11.40	1.47	1.25	0.033
0.80	0.04	0.00	0.000	11.60	1.66	1.43	0.061
1.00	0.06	0.00	0.000	11.80	2.33	2.10	**0.214**
1.20	0.07	0.00	0.001	12.00	3.58	3.35	**0.390**
1.40	0.08	0.01	0.001	12.20	3.77	3.54	0.058
1.60	0.09	0.01	0.001	12.40	3.92	3.68	0.042
1.80	0.11	0.02	0.002	12.60	4.01	3.78	0.028
2.00	0.12	0.02	0.002	12.80	4.10	3.86	0.025
2.20	0.13	0.03	0.002	13.00	4.17	3.93	0.021
2.40	0.15	0.04	0.002	13.20	4.23	4.00	0.019
2.60	0.16	0.04	0.002	13.40	4.29	4.05	0.017
2.80	0.17	0.05	0.003	13.60	4.34	4.10	0.015
3.00	0.19	0.06	0.003	13.80	4.39	4.15	0.014
3.20	0.20	0.07	0.003	14.00	4.43	4.19	0.013
3.40	0.21	0.08	0.003	14.20	4.47	4.23	0.012
3.60	0.23	0.09	0.003	14.40	4.50	4.27	0.011
3.80	0.24	0.10	0.003	14.60	4.54	4.31	0.011
4.00	0.26	0.11	0.003	14.80	4.58	4.34	0.010
4.20	0.27	0.12	0.004	15.00	4.61	4.37	0.010
4.40	0.29	0.14	0.004	15.20	4.64	4.40	0.010
4.60	0.31	0.15	0.004	15.40	4.67	4.43	0.009
4.80	0.32	0.16	0.004	15.60	4.70	4.46	0.009
5.00	0.34	0.18	0.004	15.80	4.73	4.49	0.008
5.20	0.36	0.19	0.004	16.00	4.75	4.52	0.008
5.40	0.38	0.21	0.005	16.20	4.78	4.54	0.007
5.60	0.39	0.22	0.005	16.40	4.80	4.56	0.007
5.80	0.41	0.24	0.005	16.60	4.82	4.59	0.007
6.00	0.43	0.26	0.005	16.80	4.85	4.61	0.007
6.20	0.45	0.27	0.005	17.00	4.87	4.63	0.007
6.40	0.47	0.29	0.005	17.20	4.89	4.65	0.007
6.60	0.49	0.31	0.006	17.40	4.91	4.68	0.006
6.80	0.51	0.33	0.006	17.60	4.93	4.70	0.006
7.00	0.53	0.35	0.006	17.80	4.95	4.72	0.006
7.20	0.56	0.37	0.006	18.00	4.97	4.74	0.006
7.40	0.58	0.39	0.006	18.20	4.99	4.76	0.006
7.60	0.60	0.41	0.006	18.40	5.01	4.77	0.006
7.80	0.62	0.43	0.007	18.60	5.03	4.79	0.005
8.00	0.65	0.45	0.007	18.80	5.05	4.81	0.005
8.20	0.67	0.48	0.007	19.00	5.06	4.83	0.005
8.40	0.70	0.50	0.008	19.20	5.08	4.84	0.005
8.60	0.73	0.53	0.008	19.40	5.10	4.86	0.005
8.80	0.76	0.56	0.009	19.60	5.11	4.87	0.005
9.00	0.79	0.59	0.010	19.80	5.13	4.89	0.004
9.20	0.83	0.63	0.010	20.00	**5.14**	**4.90**	0.004
9.40	0.86	0.66	0.010				
9.60	0.90	0.69	0.010				
9.80	0.94	0.73	0.011				
10.00	0.98	0.77	0.012				
10.20	1.02	0.81	0.014				
10.40	1.07	0.86	0.015				
10.60	1.13	0.92	0.017				

Summary for Pond 3P: UG

Inflow Area = 25,265 sf, 82.76% Impervious, Inflow Depth > 4.56" for 100-Year event
Inflow = 4.460 cfs @ 11.95 hrs, Volume= 9,590 cf
Outflow = 1.939 cfs @ 12.05 hrs, Volume= 9,552 cf, Atten= 57%, Lag= 6.0 min
Primary = 1.939 cfs @ 12.05 hrs, Volume= 9,552 cf
Routed to Link 4L : POST (Combined)
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 4L : POST (Combined)

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs
Peak Elev= 981.74' @ 12.06 hrs Surf.Area= 1,190 sf Storage= 2,757 cf

Plug-Flow detention time= 20.1 min calculated for 9,533 cf (99% of inflow)
Center-of-Mass det. time= 18.3 min (748.0 - 729.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	977.50'	1,405 cf	**17.00'W x 70.00'L x 4.50'H Field A** 5,355 cf Overall - 1,843 cf Embedded = 3,512 cf x 40.0% Voids
#2A	978.00'	1,477 cf	**ADS N-12 36"** x 9 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 9 Chambers in 3 Rows 14.00' Header x 7.10 sf x 2 = 198.8 cf Inside
		2,882 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	977.50'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 977.50' / 976.60' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	977.50'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	981.50'	**2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	982.50'	**2.0" x 4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.789 cfs @ 12.05 hrs HW=981.68' (Free Discharge)
└─**1=Culvert** (Passes 1.789 cfs of 5.725 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.308 cfs @ 9.59 fps)
  ├─**3=Orifice/Grate** (Controls 0.000 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.481 cfs @ 1.38 fps)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=977.50' (Free Discharge)
└─**5=Orifice/Grate** (Controls 0.000 cfs)

Pond 3P: UG - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

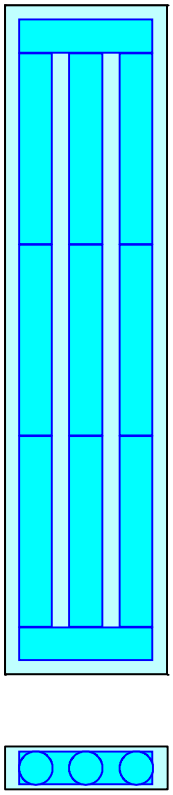
3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length
3 Rows x 42.0" Wide + 21.0" Spacing x 2 + 18.0" Side Stone x 2 = 17.00' Base Width
6.0" Stone Base + 42.0" Chamber Height + 6.0" Stone Cover = 4.50' Field Height

9 Chambers x 142.0 cf + 14.00' Header x 7.10 sf x 2 = 1,476.8 cf Chamber Storage
9 Chambers x 177.2 cf + 14.00' Header x 8.86 sf x 2 = 1,843.1 cf Displacement

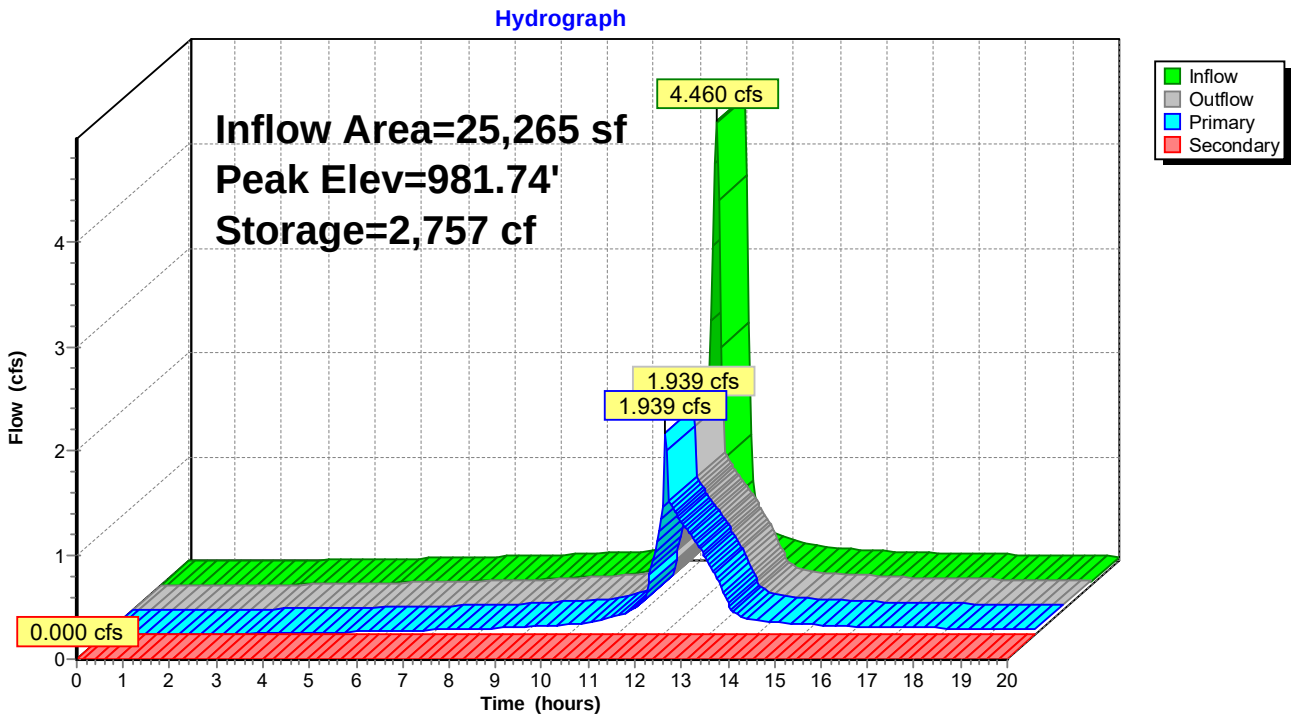
5,355.0 cf Field - 1,843.1 cf Chambers = 3,511.9 cf Stone x 40.0% Voids = 1,404.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,881.6 cf = 0.066 af
Overall Storage Efficiency = 53.8%
Overall System Size = 70.00' x 17.00' x 4.50'

9 Chambers
198.3 cy Field
130.1 cy Stone



Pond 3P: UG


Hydrograph
Inflow Area=25,265 sf
Peak Elev=981.74'
Storage=2,757 cf
4.460 cfs
1.939 cfs
1.939 cfs
0.000 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Hydrograph for Pond 3P: UG

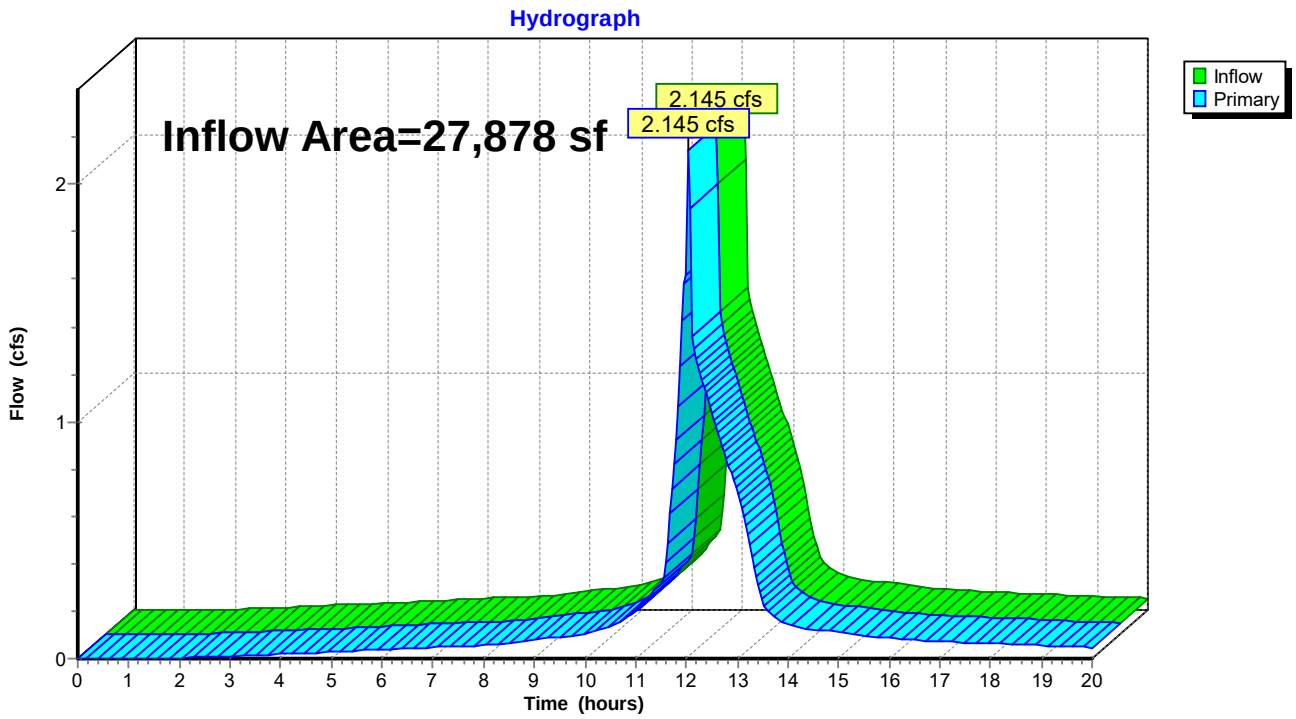
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.000	0	977.50	0.000	0.000	**0.000**
0.40	0.000	0	977.50	0.000	0.000	0.000
0.80	0.000	0	977.50	0.000	0.000	0.000
1.20	0.000	0	977.50	0.000	0.000	0.000
1.60	0.000	0	977.50	0.000	0.000	0.000
2.00	0.001	0	977.50	0.000	0.000	0.000
2.40	0.005	2	977.51	0.003	0.003	0.000
2.80	0.008	5	977.51	0.006	0.006	0.000
3.20	0.011	8	977.52	0.009	0.009	0.000
3.60	0.014	11	977.52	0.012	0.012	0.000
4.00	0.017	13	977.53	0.015	0.015	0.000
4.40	0.020	16	977.53	0.018	0.018	0.000
4.80	0.024	19	977.54	0.022	0.022	0.000
5.20	0.027	22	977.55	0.025	0.025	0.000
5.60	0.031	25	977.55	0.029	0.029	0.000
6.00	0.035	28	977.56	0.032	0.032	0.000
6.40	0.038	31	977.57	0.036	0.036	0.000
6.80	0.042	35	977.57	0.039	0.039	0.000
7.20	0.045	38	977.58	0.043	0.043	0.000
7.60	0.049	41	977.59	0.046	0.046	0.000
8.00	0.052	44	977.59	0.050	0.050	0.000
8.40	0.062	49	977.60	0.056	0.056	0.000
8.80	0.074	58	977.62	0.067	0.067	0.000
9.20	0.083	68	977.64	0.078	0.078	0.000
9.60	0.086	73	977.65	0.083	0.083	0.000
10.00	0.105	83	977.67	0.095	0.095	0.000
10.40	0.132	102	977.71	0.116	0.116	0.000
10.80	0.171	125	977.76	0.154	0.154	0.000
11.20	0.241	154	977.82	0.209	0.209	0.000
11.60	**0.560**	229	977.98	0.343	0.343	0.000
12.00	**3.705**	**2,526**	**981.20**	**1.227**	**1.227**	0.000
12.40	0.396	**1,983**	**980.41**	**1.080**	**1.080**	0.000
12.80	0.235	1,033	979.26	0.817	0.817	0.000
13.20	0.179	361	978.31	0.509	0.509	0.000
13.60	0.145	143	977.80	0.189	0.189	0.000
14.00	0.120	113	977.74	0.132	0.132	0.000
14.40	0.108	101	977.71	0.115	0.115	0.000
14.80	0.100	92	977.69	0.105	0.105	0.000
15.20	0.091	84	977.68	0.096	0.096	0.000
15.60	0.082	77	977.66	0.088	0.088	0.000
16.00	0.074	69	977.65	0.079	0.079	0.000
16.40	0.069	63	977.63	0.072	0.072	0.000
16.80	0.066	60	977.63	0.068	0.068	0.000
17.20	0.063	57	977.62	0.065	0.065	0.000
17.60	0.060	54	977.61	0.062	0.062	0.000
18.00	0.057	51	977.61	0.059	0.059	0.000
18.40	0.054	49	977.60	0.056	0.056	0.000
18.80	0.051	46	977.60	0.053	0.053	0.000
19.20	0.048	43	977.59	0.049	0.049	0.000
19.60	0.044	41	977.59	0.046	0.046	0.000
20.00	0.041	38	977.58	0.043	0.043	0.000

Summary for Link 4L: POST (Combined)

Inflow Area = 27,878 sf, 84.38% Impervious, Inflow Depth > 4.57" for 100-Year event
Inflow = 2.145 cfs @ 12.05 hrs, Volume= 10,620 cf
Primary = 2.145 cfs @ 12.05 hrs, Volume= 10,620 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.04 hrs

Link 4L: POST (Combined)



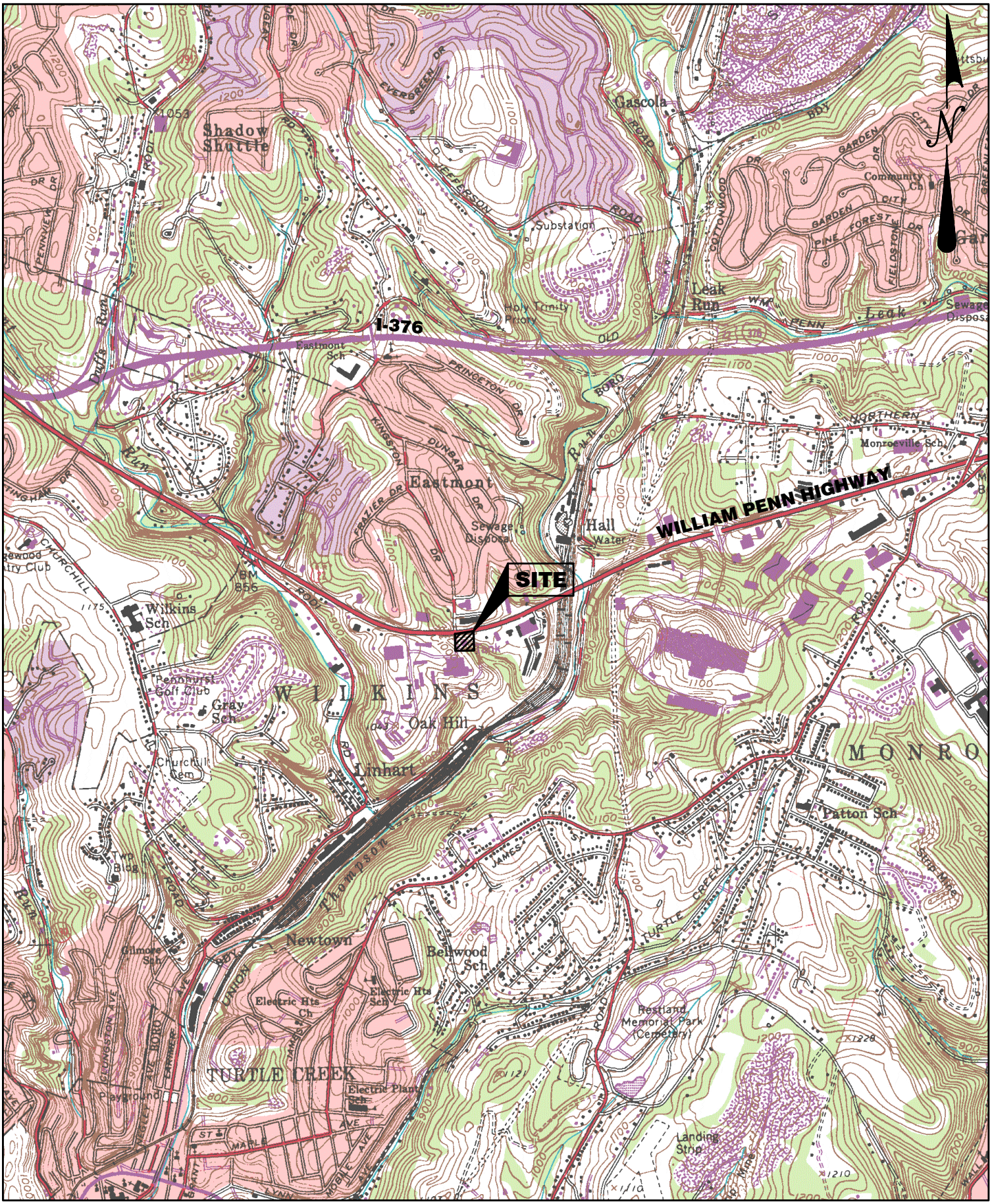
Hydrograph for Link 4L: POST (Combined)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.000	**0.00**	0.000	10.80	0.174	0.00	0.174
0.20	0.000	0.00	0.000	11.00	0.200	0.00	0.200
0.40	0.000	0.00	0.000	11.20	0.236	0.00	0.236
0.60	0.000	0.00	0.000	11.40	0.291	0.00	0.291
0.80	0.000	0.00	0.000	11.60	0.404	0.00	0.404
1.00	0.000	0.00	0.000	11.80	0.926	0.00	0.926
1.20	0.001	0.00	0.001	12.00	**1.617**	0.00	**1.617**
1.40	0.001	0.00	0.001	12.20	**1.266**	0.00	**1.266**
1.60	0.001	0.00	0.001	12.40	1.121	0.00	1.121
1.80	0.002	0.00	0.002	12.60	0.979	0.00	0.979
2.00	0.002	0.00	0.002	12.80	0.841	0.00	0.841
2.20	0.003	0.00	0.003	13.00	0.696	0.00	0.696
2.40	0.005	0.00	0.005	13.20	0.528	0.00	0.528
2.60	0.007	0.00	0.007	13.40	0.311	0.00	0.311
2.80	0.009	0.00	0.009	13.60	0.204	0.00	0.204
3.00	0.010	0.00	0.010	13.80	0.165	0.00	0.165
3.20	0.012	0.00	0.012	14.00	0.144	0.00	0.144
3.40	0.014	0.00	0.014	14.20	0.133	0.00	0.133
3.60	0.016	0.00	0.016	14.40	0.126	0.00	0.126
3.80	0.017	0.00	0.017	14.60	0.121	0.00	0.121
4.00	0.019	0.00	0.019	14.80	0.116	0.00	0.116
4.20	0.021	0.00	0.021	15.00	0.111	0.00	0.111
4.40	0.022	0.00	0.022	15.20	0.106	0.00	0.106
4.60	0.024	0.00	0.024	15.40	0.101	0.00	0.101
4.80	0.026	0.00	0.026	15.60	0.096	0.00	0.096
5.00	0.028	0.00	0.028	15.80	0.091	0.00	0.091
5.20	0.030	0.00	0.030	16.00	0.087	0.00	0.087
5.40	0.032	0.00	0.032	16.20	0.082	0.00	0.082
5.60	0.034	0.00	0.034	16.40	0.079	0.00	0.079
5.80	0.036	0.00	0.036	16.60	0.077	0.00	0.077
6.00	0.038	0.00	0.038	16.80	0.075	0.00	0.075
6.20	0.039	0.00	0.039	17.00	0.073	0.00	0.073
6.40	0.041	0.00	0.041	17.20	0.072	0.00	0.072
6.60	0.043	0.00	0.043	17.40	0.070	0.00	0.070
6.80	0.045	0.00	0.045	17.60	0.068	0.00	0.068
7.00	0.047	0.00	0.047	17.80	0.066	0.00	0.066
7.20	0.049	0.00	0.049	18.00	0.065	0.00	0.065
7.40	0.051	0.00	0.051	18.20	0.063	0.00	0.063
7.60	0.053	0.00	0.053	18.40	0.061	0.00	0.061
7.80	0.055	0.00	0.055	18.60	0.060	0.00	0.060
8.00	0.057	0.00	0.057	18.80	0.058	0.00	0.058
8.20	0.059	0.00	0.059	19.00	0.056	0.00	0.056
8.40	0.064	0.00	0.064	19.20	0.054	0.00	0.054
8.60	0.070	0.00	0.070	19.40	0.053	0.00	0.053
8.80	0.076	0.00	0.076	19.60	0.051	0.00	0.051
9.00	0.082	0.00	0.082	19.80	0.049	0.00	0.049
9.20	0.088	0.00	0.088	20.00	0.047	0.00	0.047
9.40	0.091	0.00	0.091				
9.60	0.093	0.00	0.093				
9.80	0.099	0.00	0.099				
10.00	0.107	0.00	0.107				
10.20	0.118	0.00	0.118				
10.40	0.131	0.00	0.131				
10.60	0.149	0.00	0.149				

Soil and Location Maps

Section 3

P:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Zip-Location Map.dwg
Aug 22, 2018 - 9:37am mmkc



DESIGNED BY:	MMZ
REVIEWED BY:	MMZ
DRAWN BY:	MMZ
DATE:	AUGUST 2018
SCALE:	1"=2000'
PROJ. NO.:	1856.21

USGS LOCATION MAP (BRADDOCK, PA)
ZIPS CAR WASH
prepared for
HUTTON ST 17, LLC
situated
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

Morris Knowles
& Associates, Inc.
(A Hammontree Company)
Consulting Engineers and Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622
Fax: (724) 468-5940
info@morrisknowles.com www.morrisknowles.com

Map Scale: 1:441 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Allegheny County, Pennsylvania
Survey Area Data: Version 12, Oct 27, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 5, 2014—Aug 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

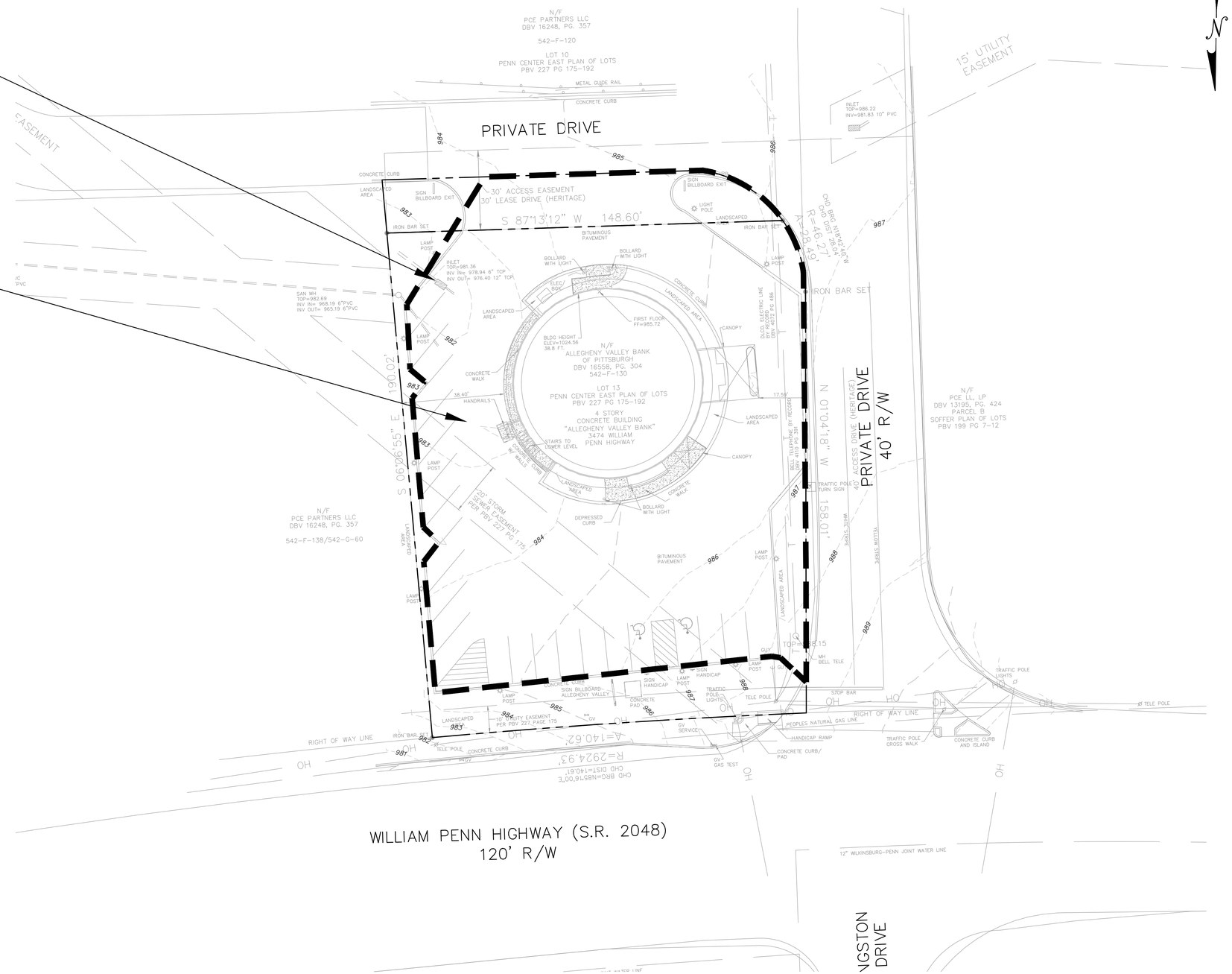
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UWB	Urban land-Wharton complex, gently sloping	0.9	100.0%
Totals for Area of Interest		**0.9**	**100.0%**

Drainage Maps

Section 4

POINT OF INTEREST

TOTAL TO POINT OF INTEREST (0.55 AC)
0.51 AC = IMPERVIOUS (C = 0.90)
0.04 AC = MEADOWS (C = 0.30)
Tc 5 MIN



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IN PENNSYLVANIA
1-800-242-1776
DESIGN SN: 20181990650

Know what's below
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THE GENERAL CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES INVOLVED IN THE SITE NO MORE TEN DAYS AND NO LESS THAN THREE DAYS IN ADVANCE OF EXCAVATION (PA ACT 287 OF 1974 AMENDED BY ACT 50 OF 2018). PA STATE LAW REQUIRES 3 WORKING DAYS NOTICE

LEGEND

SAN	– SANITARY	—G—	– GAS LINE
ST	– STORM	—W—	– WATER LINE
MH	– MANHOLE	—T—	– SUBSURFACE TELEPHONE LINE
TOP	– TOP OF CASTING	—E—	– SUBSURFACE ELECTRIC LINE
INV	– INVERT / FLOW LINE	—OH—	– OVERHEAD WIRES
WV	– WATER VALVE	- - 908 - -	– EXISTING CONTOURS
GV	– GAS VALVE		– EXISTING INLET
GM	– GAS METER		– EXISTING MANHOLE
EM	– ELECTRIC METER		– EXISTING SEWER
S.R.	– STATE ROUTE	—X—X—	– FENCE
TELE	– TELEPHONE		
RCP	– REINFORCED CONCRETE PIPE		
CPP	– CORRUGATED PLASTIC PIPE		

GRAPHIC SCALE
0' 10' 20' 40'
SCALE: 1" = 20'

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ANY CHANGES IN DESIGN PLANS UNLESS WRITTEN CONSENT IS GIVEN BY THE ENGINEER. THE CONTRACTOR AND/OR THE OWNER WILL BE HELD RESPONSIBLE FOR ANY FIELD MODIFICATIONS MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND NECESSARY APPROVALS BY PERMITTING AGENCIES.

THE LOCATION OF EXISTING UTILITIES WERE TAKEN FROM RECORDS AND MARKING PROVIDED BY OTHERS AND OBSERVED EVIDENCE. THE LOCATIONS SHOWN MAY BE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS, SIZES AND DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL EXERCISE CARE TO AVOID DAMAGE TO ALL EXISTING UTILITIES.

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REVISION BY: ___ DATE: ___ DESCRIPTION: ___
REVISION BY: ___ DATE: ___ DESCRIPTION: ___
REVISION BY: ___ DATE: ___ DESCRIPTION: ___
REVISION BY: ___ DATE: ___ DESCRIPTION: ___
REVISION BY: ___ DATE: ___ DESCRIPTION: ___
REVISION BY: ___ DATE: ___ DESCRIPTION: ___

DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: AUGUST 2018
PROJ. NO.: 1856.21

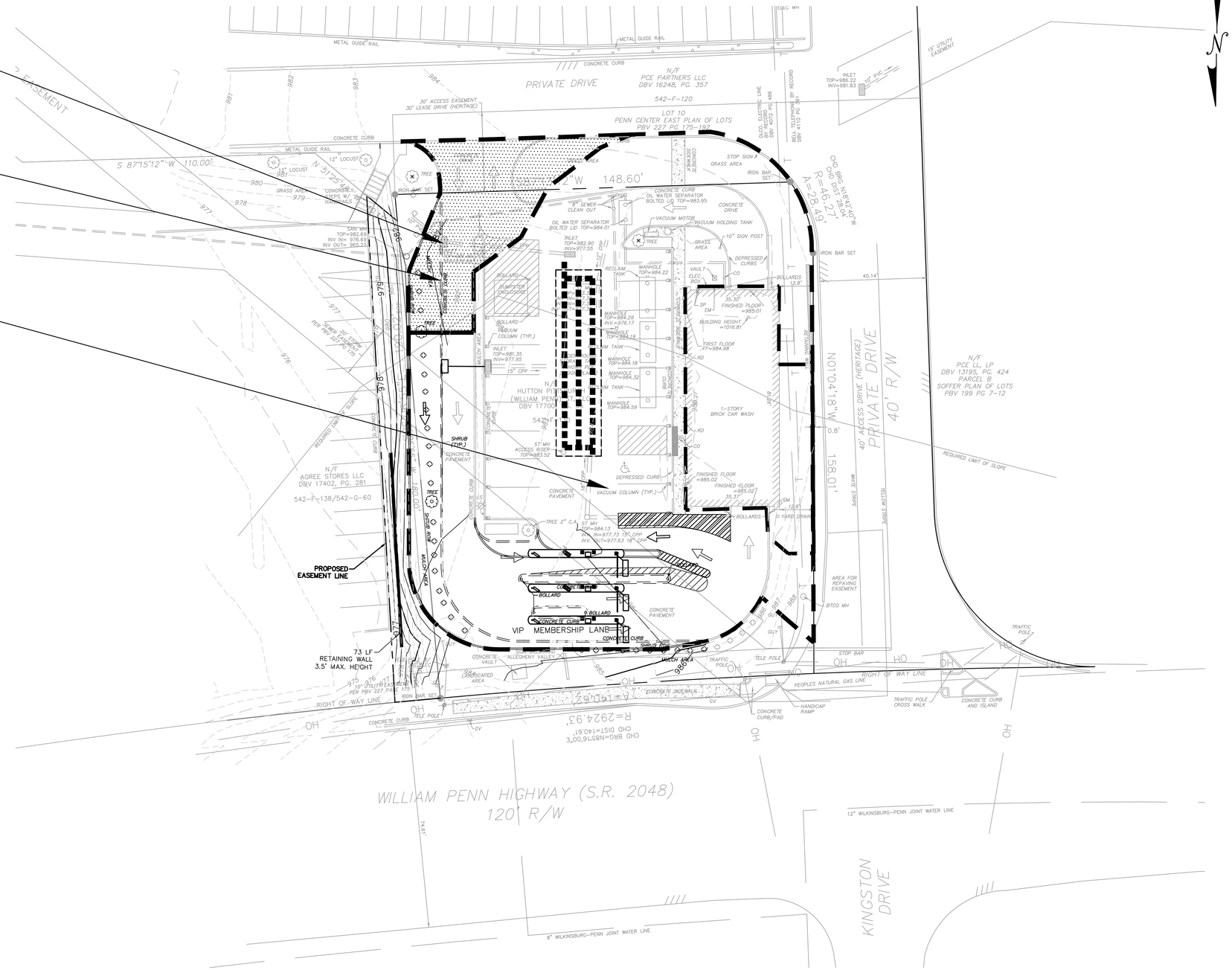
SCALE:
1"=20'

Morris Knowles & Associates, Inc.
(A Hammontree Company)
Consulting Engineers and Land Surveyors
445 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-8622
Fax: (724) 468-8940
info@morrisknowles.com www.morrisknowles.com

PRE-DEVELOPMENT DRAINAGE AREA MAP
ZIPS CAR WASH WILKINS TOWNSHIP
prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
E-DA

DWG. PATH: K:\Clients\1856 Hutton Development\1856.21 - Wilkins Twp\CAD\1856.21 - Wilkins Twp Zip.dwg
LAST SAVE: Aug 30, 2018 - 10:30am emccoole



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LEGEND

SAN – SANITARY	—G— – GAS LINE
ST – STORM	—W— – WATER LINE
MH – MANHOLE	—T— – SUBSURFACE TELEPHONE LINE
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WV – WATER VALVE	– – 908 – – – EXISTING CONTOURS
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GM – GAS METER	○ – EXISTING MANHOLE
EM – ELECTRIC METER	= = = = = = – EXISTING SEWER
S.R. – STATE ROUTE	—X——X— – FENCE
TELE – TELEPHONE	
RCP – REINFORCED CONCRETE PIPE	
CPP – CORRUGATED PLASTIC PIPE	

GRAPHIC SCALE
0' 10' 20' 40'
SCALE: 1" = 20'

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REVISION BY:	DATE:	DESCRIPTION:
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REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:
REVISION BY:	DATE:	DESCRIPTION:

DESIGNED BY: EMD
REVIEWED BY: MMZ
DRAWN BY: JJS
DATE: SEPT 2018
PROJ. NO.: 1856.21

SCALE:
1"=20'

Morris Knowles & Associates, Inc.
A Hammontree Company
Consulting Engineers and Land Surveyors
443 Athens Drive
Belmont, PA 15024
Telephone: (724) 488-8622
Fax: (724) 488-8940
info@morrisknowles.com www.morrisknowles.com

POST-DEVELOPMENT DRAINAGE AREA MAP
ZIPS CAR WASH WILKINS TOWNSHIP

prepared for
HUTTON ST 17, LLC
situated in
WILKINS TOWNSHIP, ALLEGHENY COUNTY, PA

SHEET NO.
P-DA

DWG. PATH: P:\Clients\1856 Hutton Development\1856.21 – Wilkins Twp\CADD\1856.21 – Wilkins Twp Mixed-use.dwg
LAST SAVE: Apr 03, 2022 8:28am gbarner

UWB – Urban Land-Wharton Complex

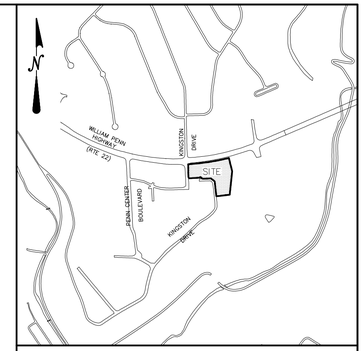
Limitations	Resolution
Cutbanks Cave	Use trench boxes and shoring during trenching activities.
Corrosive to Concrete/Steel	Add limestone or sulfur to modify soil Ph accordingly.
Droughty	N/A
Easily Erodible	Immediately stabilize exposed soils.
Flooding	N/A
Depth to Saturated Zone/High Water Table	N/A
Hydric/Hydric Inclusions	N/A
Low Strength/Landside Prone	Excavate potential low strength soils, place soil in appropriate lifts and compaction.
Slow Percolation	Add organics to promote good percolation or excavate and replace soils.
Piping	Use trench boxes and shoring during trenching activities for utility installation.
Poor Source of Topsoil	Import good quality topsoil as necessary for final stabilizations.
Frost Action	Construct items below frost line applicable to area of work.
Shrink-Swell	N/A
Potential Sinkhole	N/A
Ponding	N/A
Wetness	N/A

NOTE: USE BLUE INK FOR SEALS & SIGNATURES

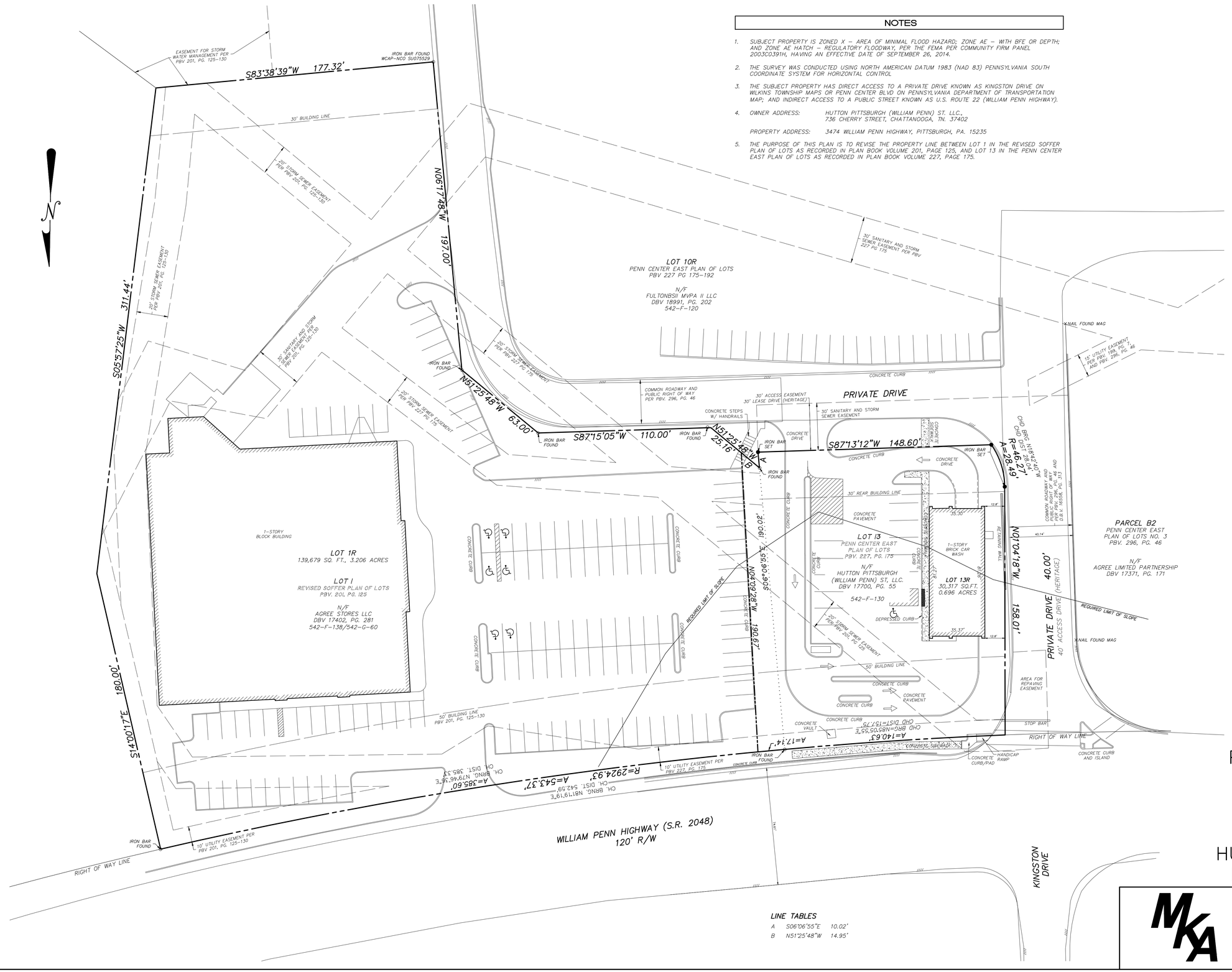
NOTES

1. SUBJECT PROPERTY IS ZONED X – AREA OF MINIMAL FLOOD HAZARD; ZONE AE – WITH BFE OR DEPTH; AND ZONE AE HATCH – REGULATORY FLOODWAY, PER THE FEMA PER COMMUNITY FIRM PANEL 2003C0391H, HAVING AN EFFECTIVE DATE OF SEPTEMBER 26, 2014.
2. THE SURVEY WAS CONDUCTED USING NORTH AMERICAN DATUM 1983 (NAD 83) PENNSYLVANIA SOUTH COORDINATE SYSTEM FOR HORIZONTAL CONTROL
3. THE SUBJECT PROPERTY HAS DIRECT ACCESS TO A PRIVATE DRIVE KNOWN AS KINGSTON DRIVE ON WILKINS TOWNSHIP MAPS OR PENN CENTER BLVD ON PENNSYLVANIA DEPARTMENT OF TRANSPORTATION MAP; AND INDIRECT ACCESS TO A PUBLIC STREET KNOWN AS U.S. ROUTE 22 (WILLIAM PENN HIGHWAY).
4. OWNER ADDRESS: HUTTON PITTSBURGH (WILLIAM PENN) ST. LLC., 736 CHERRY STREET, CHATTANOOGA, TN. 37402

   PROPERTY ADDRESS: 3474 WILLIAM PENN HIGHWAY, PITTSBURGH, PA. 15235
5. THE PURPOSE OF THIS PLAN IS TO REVISE THE PROPERTY LINE BETWEEN LOT 1 IN THE REVISED SOFFER PLAN OF LOTS AS RECORDED IN PLAN BOOK VOLUME 201, PAGE 125, AND LOT 13 IN THE PENN CENTER EAST PLAN OF LOTS AS RECORDED IN PLAN BOOK VOLUME 227, PAGE 175.



VICINITY MAP
NOT TO SCALE



AREA TABLES

ORIGINAL:

LOT 1	142,269 SQ. FT.	3.266 ACRES
LOT 13	27,727 SQ. FT.	0.636 ACRES
TOTAL AREA	169,996 SQ. FT.	3.902 ACRES

NEW:

LOT 1R	139,679 SQ. FT.	3.206 ACRES
LOT 13R	30,317 SQ. FT.	0.696 ACRES
TOTAL AREA	169,996 SQ. FT.	3.902 ACRES

LINE TABLES

A	S06°06'55"E	10.02'
B	N51°25'48"W	14.95'

PENN CENTER EAST PLAN OF LOTS NO. 4

BEING A LOT LINE REVISION OF LOT 1 IN THE REVISED SOFFER PLAN OF LOTS AS RECORDED IN PLAN BOOK VOLUME 201, PAGE 125 THROUGH 130.

SITUATE IN

TOWNSHIP OF WILKINS, ALLEGHENY COUNTY, PA

MADE FOR

HUTTON (WILLIAM PENN) PITTSBURGH ST, LLC.

Morris Knowles & Associates, Inc.
Consulting Engineers – Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622

CHECKED BY: T.A.L.
DRAWN BY: C.L.C.
FBK PG.
SU-4995-0005
DATE: 03/31/23
DWG. NO.: D-26762
SCALE: 1" = 30'

DWG. PATH: P:\SURVEY\Projects\SU-4900-4999 Survey Jobs\SU-4995 3474 Wm Penn Highway\-05 Subdivision Plan\Cad\SU-4995-05 Subdivision Plan.dwg
LAST SAVE: Apr 05, 2023 - 12:04pm clcramer

NOTE: USE BLUE INK FOR SEALS & SIGNATURES

OWNER'S ADOPTION

HUTTON PITTSBURGH (WILLIAM PENN) ST, LLC., A LIMITED LIABILITY COMPANY FORMED IN THE COMMONWEALTH OF PENNSYLVANIA, OWNER OF THE LAND SHOWN ON THE PENN CENTER EAST PLAN OF LOTS NO. 4, HEREBY ADOPTS THIS PLAN AS ITS PLAN OF LOTS AND IRREVOCABLY DEDICATED ALL STREETS AND OTHER PROPERTY IDENTIFIED FOR DEDICATION ON THE PLAN TO THE TOWNSHIP OF WILKINS. THIS ADOPTION AND DEDICATION SHALL BE BINDING UPON THE COMPANY AND UPON ITS SUCCESSORS AND ASSIGNS.

IN WITNESS OF WHICH, TO THIS WE SET OUR HAND AND SEAL THIS _____ DAY OF _____, 20____.

ATTEST:

HUTTON PITTSBURGH (WILLIAM PENN) ST, LLC.

_____
NOTARY PUBLIC

_____
PRINTED NAME OF SIGNATORY

_____
PRINTED TITLE OF SIGNATORY

NOTARY

STATE OF PENNSYLVANIA)
COUNTY OF ALLEGHENY) SS

BEFORE ME, THE UNDERSIGNED NOTARY PUBLIC IN AND FOR THE COMMONWEALTH OF PENNSYLVANIA AND COUNTY OF ALLEGHENY, PERSONALLY APPEARED _____, THE _____, OF HUTTON PITTSBURGH (WILLIAM PENN) ST, LLC., WHO ACKNOWLEDGED THE FOREGOING ADOPTION AND DEDICATION TO BE THE ACT OF THE COMPANY.

WITNESS MY HAND AND NOTARIAL SEAL THIS _____ DAY OF _____, 20____.

MY COMMISSION EXPIRES ON _____ DAY OF _____, 20____.

_____
NOTARY PUBLIC

CERTIFICATION OF TITLE W/ MORTGAGE

I HEREBY CERTIFY THAT THE TITLE TO THE PROPERTY CONTAINED IN THE PENN CENTER EAST PLAN OF LOTS NO. 4, IS IN THE NAME OF HUTTON PITTSBURGH (WILLIAM PENN) ST, LLC.. AND IS RECORDED IN DEED BOOK VOLUME 17700, PAGE 55.

WITNESS

OWNER

_____, MORTGAGEE OF THE PROPERTY CONTAINED IN THE PENN CENTER EAST PLAN OF LOTS NO. 4 CONSENTS TO THE RECORDING OF SAID PLAN AND TO THE DEDICATIONS AND ALL OTHER MATTERS APPEARING ON THE PLAN.

WITNESS

NAME, TITLE, AND MORTGAGEE

DEPARTMENT OF REAL ESTATE

STATE OF PENNSYLVANIA)
COUNTY OF ALLEGHENY) SS

RECORDED IN THE OFFICE OF THE DEPARTMENT OF REAL ESTATE OF THE COUNTY OF ALLEGHENY, COMMONWEALTH OF PENNSYLVANIA, IN PLAN BOOK VOLUME _____ PAGE(S) _____.

GIVEN UNDER MY HAND AND SEAL THIS _____ DAY OF _____, 20____.

_____
DEPARTMENT OF REAL ESTATE

OWNER'S ADOPTION

AGREE STORES LLC, A LIMITED LIABILITY COMPANY FORMED IN THE COMMONWEALTH OF PENNSYLVANIA, OWNER OF THE LAND SHOWN ON THE PENN CENTER EAST PLAN OF LOTS NO. 4, HEREBY ADOPTS THIS PLAN AS ITS PLAN OF LOTS AND IRREVOCABLY DEDICATED ALL STREETS AND OTHER PROPERTY IDENTIFIED FOR DEDICATION ON THE PLAN TO THE TOWNSHIP OF WILKINS. THIS ADOPTION AND DEDICATION SHALL BE BINDING UPON THE COMPANY AND UPON ITS SUCCESSORS AND ASSIGNS.

IN WITNESS OF WHICH, TO THIS WE SET OUR HAND AND SEAL THIS _____ DAY OF _____, 20____.

ATTEST:

AGREE STORES LLC

_____
NOTARY PUBLIC

_____
PRINTED NAME OF SIGNATORY

_____
PRINTED TITLE OF SIGNATORY

NOTARY

STATE OF PENNSYLVANIA)
COUNTY OF ALLEGHENY) SS

BEFORE ME, THE UNDERSIGNED NOTARY PUBLIC IN AND FOR THE COMMONWEALTH OF PENNSYLVANIA AND COUNTY OF ALLEGHENY, PERSONALLY APPEARED _____, THE _____, OF AGREE STORES LLC, WHO ACKNOWLEDGED THE FOREGOING ADOPTION AND DEDICATION TO BE THE ACT OF THE COMPANY.

WITNESS MY HAND AND NOTARIAL SEAL THIS _____ DAY OF _____, 20____.

MY COMMISSION EXPIRES ON _____ DAY OF _____, 20____.

_____
NOTARY PUBLIC

CERTIFICATION OF TITLE W/ MORTGAGE

I HEREBY CERTIFY THAT THE TITLE TO THE PROPERTY CONTAINED IN THE PENN CENTER EAST PLAN OF LOTS NO. 4, IS IN THE NAME OF AGREE STORES LLC,. AND IS RECORDED IN DEED BOOK VOLUME 17402, PAGE 281.

WITNESS

OWNER

_____, MORTGAGEE OF THE PROPERTY CONTAINED IN THE PENN CENTER EAST PLAN OF LOTS NO. 4 CONSENTS TO THE RECORDING OF SAID PLAN AND TO THE DEDICATIONS AND ALL OTHER MATTERS APPEARING ON THE PLAN.

WITNESS

NAME, TITLE, AND MORTGAGEE

SURVEYORS CERTIFICATE

I, TROY A. LEIGHTY A PROFESSIONAL LAND SURVEYOR OF THE COMMONWEALTH OF PENNSYLVANIA, DO HEREBY CERTIFY, TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT THIS PLAN CORRECTLY REPRESENTS THE LOTS, LANDS, STREETS AND HIGHWAYS AS SURVEYED AND PLOTTED BY ME FOR THE OWNERS OR AGENTS.

DATE

TROY A. LEIGHTY, P.L.S.
SU-075579

TOWNSHIP ENGINEER

I, _____, A REGISTERED PROFESSIONAL ENGINEER FOR THE TOWNSHIP OF WILKINS DO HEREBY CERTIFY THAT THIS SUBDIVISION PLAN MEETS ALL THE ENGINEERING REQUIREMENTS OF THE TOWNSHIP SUBDIVISION AND ZONING ORDINANCE, EXCEPT AS DEPARTURES HAVE BEEN AUTHORIZED BY THE APPROVAL AUTHORITY.

DATE

NAME

REGISTRATION NUMBER

BOARD OF COMMISSIONERS APPROVAL

THE BOARD OF COMMISSIONERS OF THE TOWNSHIP OF WILKINS GIVES NOTICE THAT, IN APPROVING THIS PLAN FOR RECORDING, THE TOWNSHIP OF WILKINS ASSUMES NO OBLIGATIONS TO ACCEPT THE DEDICATION OF ANY STREETS, LAND, OR PUBLIC FACILITIES AND HAS NO OBLIGATION TO IMPROVE OR MAINTAIN SUCH STREETS, LAND OR FACILITIES.

SECRETARY OR MANAGER

PRESIDENT

THE TOWNSHIP OF WILKINS AGREES NOT TO ISSUE BUILDING PERMITS UNTIL THE "PLANNING MODULE FOR LAND DEVELOPMENT" HAS BEEN APPROVED IN ACCORDANCE WITH THE REQUIREMENTS OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION.

DATE

AUTHORIZED MUNICIPAL OFFICIAL

REVIEWED BY THE PLANNING COMMISSION OF THE TOWNSHIP OF WILKINS, THIS _____ DAY OF _____, 20____.

SECRETARY

CHAIRPERSON

APPROVED BY THE BOARD OF COMMISSIONERS OF THE TOWNSHIP OF WILKINS, BY RESOLUTION, THIS _____ DAY OF _____, 20____.

SECRETARY

PRESIDENT

DEP. OF ECONOMIC DEVELOPMENT

REVIEWED BY THE ALLEGHENY COUNTY DEPARTMENT OF ECONOMIC DEVELOPMENT ON THIS _____ DAY OF _____, 20____.

DIRECTOR

NOTARY | SURVEYOR | TOWNSHIP OF WILKINS ENGINEER | TOWNSHIP OF WILKINS BOARD OF COMMISSIONERS | TOWNSHIP OF WILKINS PLANNING COMMISSION | DEPARTMENT OF ECONOMIC DEVELOPMENT | DEPARTMENT OF REAL ESTATE

PENN CENTER EAST PLAN OF LOTS NO. 4

BEING A LOT LINE REVISION OF LOT 1 IN THE REVISED SOFFER PLAN OF LOTS AS RECORDED IN PLAN BOOK VOLUME 201, PAGE 125 THROUGH 130.

SITUATE IN

TOWNSHIP OF WILKINS,
ALLEGHENY COUNTY, PA

MADE FOR

HUTTON (WILLIAM PENN)
PITTSBURGH ST, LLC.

Morris Knowles
& Associates, Inc.
Consulting Engineers – Land Surveyors
443 Athena Drive
Delmont, PA 15626
Telephone: (724) 468-4622

CHECKED BY: T.A.L.
DRAWN BY: C.L.C.
FBK PG.
SU-4995-0005
DATE: 03/31/23
DWG. NO.: D-26762
SCALE: 1" = 30'

DWG. PATH: P:\SURVEY\Projects\SU-4900-4999 Survey Jobs\SU-4995 3474 Wm Penn Highway\-05 Subdivision Plan\Cad\SU-4995-05 Subdivision Plan.dwg
LAST SAVE: Apr 05, 2023 - 12:04pm clcramer

BENDERSON DEVELOPMENT
570 DELAWARE AVENUE
BUFFALO, NEW YORK 14202
716.886.0211.P : : 716.886.1026.F

March 14, 2023

Township of Wilkins
Irene J. Pohl Municipal Building
1110 Peffer Road
Turtle Creek, PA 15145-1192

Attn: Rebecca Bradley, Manager

RE: Land Development Application
3475 William Penn Highway (BDP# 2669)

Dear Ms. Bradly:

In connection with the above-referenced property, enclosed please find our application materials seeking approval of our land development application.

The Subject Property is located on the north side of William Penn Highway and is currently improved with a Pep Boys and associated parking areas. The Subject Property maintains a single driveway onto William Penn Highway which is controlled by a traffic signal.

The project involved the development of the following:

- A proposed 17,745 s.f. commercial building with drive-thru lanes located on both the east and west side of the proposed building;
- A 4,997 s.f. fast food restaurant with a drive-thru;
- A proposed Chase Bank ATM;
- The addition of a right in-only drive-way from William Penn Highway; and
- A redevelopment of the parking areas with new asphalt, curbing, lighting, drainage and utilities.

The proposed architecture of the buildings is attractive, and the development will represent a significant improvement to the Subject Property and the surrounding area. We look forward to working with the Township on this project. If you require any further information, please do not hesitate to contact me at 716-878-9626 or by e-mail at JamesBoglioli@Benderson.com

Thank you,
BENDERSON DEVELOPMENT COMPANY, LLC

James A. Boglioli

James A. Boglioli

COUNTY OF ALLEGHENY

RICH FITZGERALD
COUNTY EXECUTIVE

February 17, 2022

Subdivision and Land Development Advisory Reviews by Allegheny County

Dear Municipal Partner:

The Planning Division of Allegheny County Economic Development (ACED) has prepared this letter as a reminder of the procedures necessary for subdivision and land development reviews by Allegheny County, in order to improve the efficiency of those reviews. We hope you find this information helpful in organizing your municipality's submittals to ACED in the future.

Your municipality has adopted its own subdivision and land development ordinance (SALDO). In municipalities that have done so the Pennsylvania Municipalities Planning Code (MPC), Article V, Section 502(b), requires that all applications for subdivision and land development be forwarded to the County Planning Agency for an advisory review. In Allegheny County, ACED is the designated County Planning Agency.

The MPC also states that a municipality may not approve a plan until a County review is received, or until 30 days has passed from the date it was forwarded to the County. All applications for advisory review must be forwarded to ACED ***by the municipality***, and not by the landowner, developer, surveyor, or other party. Applications may be delivered through the mail, or by hand to our office, although the preferred means is by mail.

For an application, the following items – and only the following items – should be submitted:

Subdivisions:

- County review application form, completed by the applicant (a copy of this form is provided with this letter)
- Plat, prepared according to the standards of the municipal SALDO and the requirements of the Allegheny County Department of Real Estate provided in Appendices 1 – 4 of the Allegheny County SALDO
- Project narrative
- Evidence of the notification of public services providers, including all utilities (for major subdivisions only)

Land Developments:

- County review application form, completed by the applicant (a copy of this form is provided with this letter)
- Site plan, prepared according to the standards of the municipal SALDO
- Project narrative
- Traffic and circulation plan

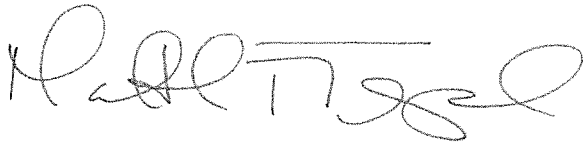
LANCE CHIMKA, DIRECTOR
DEPARTMENT OF ECONOMIC DEVELOPMENT
ONE CHATHAM CENTER • SUITE 900 • 112 WASHINGTON PLACE • PITTSBURGH, PA 15219
PHONE (412) 350-1000 • WWW.ALLEGHENYCOUNTY.US/ECONOMIC/

- Utilities plan
- Landscape plan
- Photometric plan
- Grading plan
- Phasing schedule, if applicable
- Evidence of the notification of public service providers, including all utilities

Do not send reduced-size plans. Plans must be submitted at their original size and drawing scale. There is no need to re-submit revised plans for review.

If you have questions regarding subdivision or land development plan review, you may contact William McLain at William.McLain@AlleghenyCounty.US or 412-350-1361.

Sincerely,



Matthew T. Trepal, AICP
Manager, Planning Division

ALLEGHENY COUNTY

SUBDIVISION AND LAND DEVELOPMENT REVIEW APPLICATION

MPC §502(b) County Advisory Review

COUNTY REVIEW REQUIRED: Municipality has adopted a subdivision and land development ordinance

Complete and submit with plans and other information M-F, 8:30 AM - 4:00 PM to:
ACED Planning Division, One Chatham Center, Suite 900, 112 Washington Place, Pittsburgh, PA 15219

For questions, help, or additional information please email ACEDPlanning@alleghenycounty.us

---

Part 1: General Information

Property Owner: WMI/MPI Business Trust

Contact Name: James A. Boglioli Phone: 716-878-9626
Email Address: jmb@benderson.com
Mailing Address: 570 Delaware Avenue
Buffalo, New York 14202

Name of Applicant: Benderson Development Company, LLC

Contact Name: James A. Boglioli Phone:
Email Address: jmb@benderson.com
Mailing Address: 570 Delaware Avenue
Buffalo, New York 14202

Plan Preparer: Red Swing Group

Contact Name: Jake Wielnad, PE Phone: 724-325-1215
Email Address: j.wieland@redswinggroup.com
Mailing Address: 4314 Old William Penn Highway, Suite 101
Monroeville, PA 15146

Application Status: ☒ **Preliminary Plan** ☐ **Final Plan**

Application Type:

- ☐ Plat Adj./Lot Consolidation
- ☐ Minor Subdivision/Site Development
- ☒ Major Subdivision/Site Development

Part 2: Location Information

Project Name: Commercial Retail

Municipality: Wilkens Township

Revised August 2021

ALLEGHENY COUNTY

Address/Location of Project: 3475 William Penn Highway
Pittsburgh, PA 15146

Tax Map Parcel(s) #:

542-C, Lot 250 | 542-C, Lot 250-A

Part 3: Zoning Information

Zoning:

Existing: C -Commercial

Proposed: N/A (if applicable)

Variances Requested: ☐ Yes ☐ No (if yes, please attached description of all variances requested or approved)

Conditional Use: ☐ Yes ☐ No

Special Exception: ☐ Yes ☐ No

Part 4: Project Information

Total Plan Area: 9.590+/- (acres)

417,762 (square feet)

Total Acreage to be Developed: 4.28 +/-

Total Impervious Area (Sq. Ft.): 186,046

Total Building Area (Sq. Ft.): 22,742

Phasing:

Is the development proposed to be constructed in phases? ☐ Yes ☒ No

If Yes, a phasing plan and a schedule of the projected dates that the final application for each phase will be filed must be provided.

Proposed Utilities:

	Water	Sewer
Public:	☒	☒
Onsite:	☐	☐

Street Information:

Ownership (check any that apply):

☒ State ☐ Local
☐ County ☐ Private

Lineal feet of new streets: N/A

Part 5: Notification to Others

As applicable, the following agencies have been notified about the proposed subdivision or site development:

- ☐ County Health Department
  Date: _____
- ☐ County Public Works
  Date: _____
- ☐ County Conservation District
  Date: _____
- ☐ PennDOT
  Date: _____
- ☐ PA DEP
  Date: _____
- ☐ Other: _____
  Date: _____

The applicant declares the following:

- ☐ He/she is the owner of the property in question; OR
- ☒ He/she is the authorized agent for the owner of record to the property for which the application is made; OR
- ☐ He/she is a beneficial land owner as defined by the PA Municipalities Planning Code (MPC). If this box is checked, a copy of the agreement recorded with the ACDRE authorizing the applicant to subdivide or develop the property must be provided.

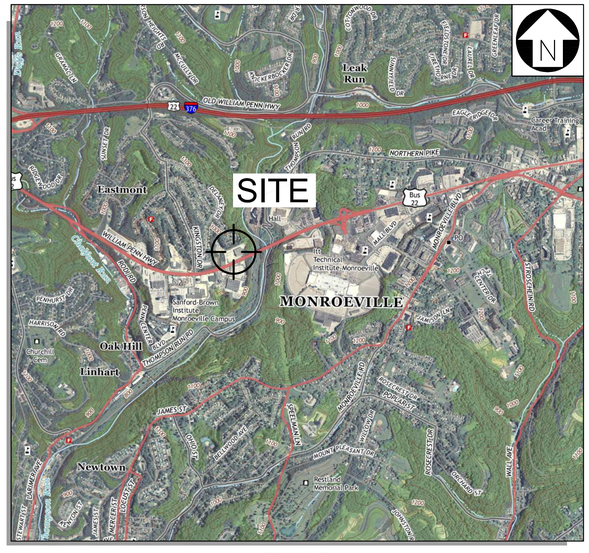
I/We hereby submit the enclosed land development application to the Allegheny County Department of Economic Development for review and consideration in accordance with the PA Municipalities Planning Code (Act 247 of 1968, as amended) and Art. III §780-302 of the Allegheny County Subdivision and Land Development Ordinance:

_____ _____

Signature of Applicant Date

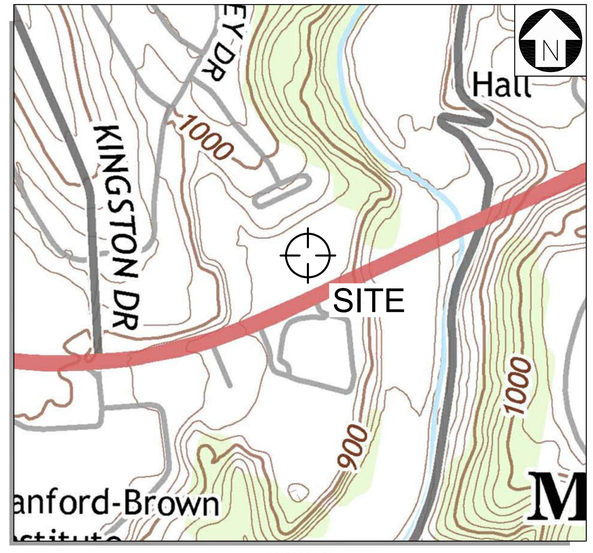
Revised August 2021

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL



BRADDOCK, PA
2013 USGS VICINITY MAP

USGS VICINITY MAP
SCALE: 1"=2000'



BRADDOCK, PA
2013 USGS QUADRANGLE

LOCAL MAP
SCALE: 1"=400'

NUMBER	INDEX OF SHEETS	REV.	DATE
C100	TITLE SHEET	0	03/13/2023
C101	GENERAL NOTES	0	03/13/2023
C102	EXISTING CONDITIONS PLAN	0	03/13/2023
C103	DEMOLITION PLAN	0	03/13/2023
C200	SITE PLAN	0	03/13/2023
C201	PARKING TABULATION PLAN	0	03/13/2023
C202	FIRE TRUCK ROUTING PLAN	0	03/13/2023
C203	DELIVERY TRUCK ROUTING PLAN	0	03/13/2023
C250	SITE DETAILS 1 OF 2	0	03/13/2023
C251	SITE DETAILS 2 OF 2	0	03/13/2023
C300	GRADING PLAN	0	03/13/2023
C400	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN	0	03/13/2023
C450	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 1 OF 4	0	03/13/2023
C451	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 2 OF 4	0	03/13/2023
C452	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 3 OF 4	0	03/13/2023
C453	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 4 OF 4	0	03/13/2023
C500	UTILITY PLAN	0	03/13/2023
C550	UTILITY DETAILS	0	03/13/2023
C600	EROSION AND SEDIMENTATION CONTROL PLAN	0	03/13/2023
C650	EROSION AND SEDIMENTATION CONTROL NOTES	0	03/13/2023
C651	EROSION AND SEDIMENTATION CONTROL DETAILS	0	03/13/2023
C652	EROSION AND SEDIMENTATION CONTROL DETAILS	0	03/13/2023
C700	LIGHTING PLAN	0	03/13/2023
C750	LIGHTING DETAILS	0	03/13/2023
C800	LANDSCAPE PLAN	0	03/13/2023
C850	LANDSCAPE DETAILS	0	03/13/2023

OWNER
WML/MPL BUSINESS TRUST
7978 COOPER CREEK BLVD., SUITE 100
UNIVERSITY PARK, FL 34201
PHONE: (941) 359-8303

PARCEL 542-C, LOT 250
DBV 10137, PAGE 617

PARCEL 542-C, LOT 250-A
DBV 10137, PAGE 617

DEVELOPER
BENDERSON DEVELOPMENT COMPANY, LLC
570 DELAWARE AVENUE.
BUFFALO, NY 14202
CONTACT: MATTHEW OATES, P.E.
PHONE: (716) 878-9397

ENGINEER AND SURVEYOR
RED SWING CONSULTING SERVICES, LLC
4314 OLD WILLIAM PENN HIGHWAY, SUITE 101
MONROEVILLE, PA 15146
PHONE: (724) 325-1215
CONTACT: JAKE WIELAND, P.E.

☑ REVIEW
☐ APPROVAL
☐ PERMITTING
☐ CONSTRUCTION

RECOMMENDATION

RECOMMENDED BY THE WILKINS TOWNSHIP PLANNING COMMISSION THIS _____ DAY OF _____, 20_____.

AUTHORIZED SIGNATURE: _____

APPROVAL

APPROVED BY THE WILKINS TOWNSHIP BOARD OF COMMISSIONERS THIS _____ DAY OF _____, 20_____.

AUTHORIZED SIGNATURE: _____

GENERAL NOTE
THESE DRAWINGS MAY NOT SHOW ALL UNDERGROUND PIPING AND UTILITIES. THE CONTRACTOR SHALL EXERCISE EXTREME CARE DURING EXCAVATION AND OTHER CONSTRUCTION ACTIVITIES.

DO NOT SCALE DRAWINGS
CONTRACTOR SHALL VERIFY PLANS, EXISTING DIMENSIONS, AND CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

811 Know what's below. Call before you dig.

C:\Users\jwieland\AppData\Local\Temp\AcPublish_9624\22-1050 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 10:59am

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

RED SWING GROUP
ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JACOB WIELAND
ENGINEER
No. PE084705
3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
TITLE SHEET

SHEET NO.
C100

STANDARD GENERAL NOTES:

1. THE CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE REQUIRED TO ASSUME SOLE RESPONSIBILITY FOR JOB SAFETY OF PERSONS AND PROPERTY.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN PERMITS NECESSARY TO PERFORM THE WORK SHOWN IN THESE PLANS FROM THE APPROPRIATE AGENCIES.
3. CONTRACTOR IS REQUIRED TO COMPLY WITH APPLICABLE CODES, ORDINANCES, RESOLUTIONS, POLICIES, AND PROCEDURES, IN GENERAL.
4. CONTRACTOR SHALL COMPLY WITH OSHA REGULATIONS.
5. CONTRACTOR SHALL PROVIDE LIGHTS, SIGNS, BARRICADES, FLAGGERS OR OTHER DEVICES NECESSARY TO PROVIDE SAFETY.
6. THE CONTRACTOR SHALL RESTORE PUBLIC OR PRIVATE PROPERTY DAMAGED OR REMOVED TO IT'S ORIGINAL CONDITION, AS DETERMINED BY THE OWNER OR OWNER'S REPRESENTATIVE.
7. THE CONTRACTOR SHALL REMOVE SUBSURFACE OBSTRUCTIONS OR ABANDONED UTILITY LINES WITHIN THE DEMOLITION AREA AS PART OF THIS PROJECT.
8. WARNING: THE PLANS SHOW SOME KNOWN SUBSURFACE STRUCTURES, ABOVE GROUND STRUCTURES AND/OR UTILITIES BELIEVED TO EXIST IN THE LOCATIONS INDICATED. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THE EXACT LOCATIONS OF SUCH PIPELINES, SUBSURFACE STRUCTURES AND/OR UTILITIES, AND TO PROCEED WITH GREAT CARE IN EXECUTING WORK. 72 HOURS BEFORE YOU DIG, DRILL OR BLAST, CALL 1-800-242-1776.
9. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A NEAT AND ORDERLY SITE, YARD AND GROUNDS. REMOVE AND PROPERLY DISPOSE, OFF SITE, RUBBISH, WASTE MATERIALS, LITTER, AND OTHER FOREIGN SUBSTANCES. REMOVE PETROCHEMICAL SPILLS, STAINS AND OTHER FOREIGN DEPOSITS. RAKE GROUNDS TO A SMOOTH EVEN-TEXTURED SURFACE.
10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO EXAMINE PLAN SHEETS AND SPECIFICATIONS AND COORDINATE HIS WORK WITH OTHER CONTRACTORS TO ENSURE THAT WORK PROGRESSION IS NOT INTERRUPTED.
11. THE CONTRACTOR IS INSTRUCTED TO COOPERATE WITH OTHER CONTRACTORS PERFORMING WORK ON THE JOB SITE DURING THE PERFORMANCE OF THIS CONTRACT.
12. THE CONTRACTOR IS REQUIRED TO HAVE COPIES OF PERMITS AND PLANS ON SITE DURING CONSTRUCTION.
13. CONTRACTOR SHALL VERIFY PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.
14. THE OWNER OR THE OWNER'S REPRESENTATIVE SHALL BE NOTIFIED IN WRITING OF CONDITIONS THAT VARY FROM THOSE SHOWN ON THE PLANS. THE CONTRACTORS WORK SHALL NOT VARY FROM THE PLANS WITHOUT THE EXPRESSED WRITTEN APPROVAL OF THE OWNER OR THE OWNER'S REPRESENTATIVE.
15. THE CONTRACTOR SHALL PROTECT EXISTING PROPERTY LINE MONUMENTATION. ANY MONUMENTATION DISTURBED OR DESTROYED, AS JUDGED BY THE OWNER OR THE OWNER'S REPRESENTATIVE, SHALL BE REPLACED AT THE CONTRACTORS EXPENSE UNDER THE SUPERVISION OF A LICENSED LAND SURVEYOR.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING AND THE MAINTENANCE OF SURFACE DRAINAGE DURING THE COURSE OF WORK.
17. THE CONTRACTOR SHALL TAKE EFFECTIVE ACTION TO PREVENT THE FORMATION OF AN AIRBORNE DUST NUISANCE AND SHALL BE RESPONSIBLE FOR ANY DAMAGE RESULTING FROM FAILURE TO DO SO.
18. EXCAVATIONS SHALL BE ADEQUATELY SHORED, BRACED, AND SHEETED SO THAT THE EARTH WILL NOT SLIDE OR SETTLE AND SO THAT EXISTING IMPROVEMENTS WILL BE PROTECTED FROM DAMAGE. WHERE THE EXCAVATION FOR A CONDUIT TRENCH AND/OR STRUCTURE IS FOUR FEET OR MORE IN DEPTH, ADEQUATE METHODS FOR PROTECTION OF WORKERS IS REQUIRED.
19. STATIONING HEREIN IS ALONG STREET CENTERLINE UNLESS OTHERWISE SHOWN OR INDICATED.
20. RETURN RADII AND CURB DATA ARE MEASURED TO BACK OF WEDGE CURB, AND TO THE FRONT FACE OF CONCRETE CURB UNLESS OTHERWISE NOTED.
21. UTILITY WORK INVOLVING CONNECTIONS TO EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER OR THE OWNER'S REPRESENTATIVE AND THE UTILITY OWNER. NOTIFY THE OWNER OR THE OWNER'S REPRESENTATIVE AND THE UTILITY OWNER BEFORE EACH AND EVERY CONNECTION TO THE EXISTING SYSTEM IS MADE.
22. EXISTING UTILITIES AND IMPROVEMENTS THAT BECOME DAMAGED DURING CONSTRUCTION SHALL BE COMPLETELY RESTORED TO THE SATISFACTION OF THE LOCAL ENGINEER, AT THE CONTRACTOR'S SOLE EXPENSE.
23. LENGTHS AND PERCENT SLOPE OF SANITARY SEWERS AND STORM DRAINS, AS WELL AS POTENTIAL CONFLICTS MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTING SUCH ENTITIES.
24. IF ARCHEOLOGICAL MATERIALS ARE UNCOVERED DURING GRADING, TRENCHING OR OTHER EXCAVATION, EARTHWORK SHALL BE STOPPED UNTIL A PROFESSIONAL ARCHEOLOGIST HAS HAD AN OPPORTUNITY TO EVALUATE THE SIGNIFICANCE OF THE FIND AND SUGGEST APPROPRIATE MITIGATION MEASURES, IF THEY ARE DEEMED NECESSARY.
25. CONTRACTOR SHALL PROVIDE TRAFFIC MAINTENANCE AND PROTECTION AS PER PADOT PUBLICATION 203.

GENERAL NOTES:

A. IF TOPOGRAPHIC BOUNDARY SURVEY, INCLUDING PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, SITE TOPOGRAPHY WITH SPOT ELEVATIONS, OUTSTANDING PHYSICAL FEATURES AND EXISTING STRUCTURE LOCATIONS WAS COMPLETED BY OTHERS. RED SWING CONSULTING SERVICES, LLC WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS OR OMISSIONS RESULTING FROM SURVEY INACCURACIES.

B. PHASES OF SITE WORK FOR THIS PROJECT SHALL MEET OR EXCEED THE OWNER/DEVELOPER SITE WORK SPECIFICATIONS.

C. CONTRACTOR SHALL BE RESPONSIBLE FOR RAZING AND REMOVAL OF THE EXISTING STRUCTURES, RELATED UTILITIES, PAVING, UNDERGROUND STORAGE TANKS AND OTHER EXISTING IMPROVEMENTS AS NOTED.

D. CONTRACTOR IS TO REMOVE AND DISPOSE OF DEBRIS, RUBBISH AND OTHER MATERIALS RESULTING FROM PREVIOUS AND CURRENT DEMOLITION OPERATIONS. DISPOSAL WILL BE IN ACCORDANCE WITH LOCAL, STATE AND/OR FEDERAL REGULATIONS GOVERNING SUCH OPERATIONS.

E. THE GENERAL CONTRACTOR WILL BE HELD SOLELY RESPONSIBLE FOR AND SHALL TAKE ALL PRECAUTIONS NECESSARY TO AVOID PROPERTY DAMAGE TO ADJACENT PROPERTIES DURING THE CONSTRUCTION PHASES OF THIS PROJECT.

F. SAFETY NOTICE TO CONTRACTOR: IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. CONSTRUCTION OBSERVATION BY THE ENGINEER OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES, IN, ON OR NEAR THE CONSTRUCTION SITE.

G. CONSTRUCTION IN STATE HIGHWAY DEPARTMENT RIGHT-OF-WAY SHALL BE COORDINATED WITH THE PENNSYLVANIA D.O.T. OFFICE.

MANAGEMENT OF FILL DUE DILIGENCE
DEP DOC.# 258-2182-773

ENVIRONMENTAL DUE DILIGENCE - INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF OWNERSHIP AND USE HISTORY OF PROPERTY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS.

CLEAN FILL - UNCONTAMINATED, NONWATER-SOLUBLE, NONDECOMPOSIBLE INERT SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND RECOGNIZABLE AS SUCH. (25 PA. CODE §§ 271.101 AND 287.101) THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED.

SITE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE TECHNICAL GUIDANCE AS PUT FORTH IN THE MANAGEMENT OF FILL DOCUMENT #258-2182-773 (LATEST REV.), IN ORDER TO DETERMINE IF THE FILL TO BE USED CLASSIFIES AS CLEAN OR REGULATED FILL AND HOW THAT FILL CAN BE USED.

GENERAL UTILITY NOTES:

1. LENGTHS AND PERCENT SLOPE OF SANITARY SEWERS AND STORM DRAINS, AS WELL AS POTENTIAL CONFLICTS MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTING SUCH ENTITIES.
2. UTILITIES SHALL BE INSTALLED, DISCONNECTED, AND/OR RELOCATED IN ACCORDANCE WITH THE CODES AND SPECIFICATIONS OF THAT UTILITY AUTHORITY.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR FEES ASSOCIATED WITH INSTALLATION AND INSPECTION OF UTILITY UNLESS OTHER ARRANGEMENTS ARE MADE WITH OWNER.
4. CONTRACTOR SHALL COORDINATE WITH APPROPRIATE UTILITY COMPANIES PRIOR TO LOCATION, RELOCATION, REMOVAL AND/OR INSTALLATION OF SITE UTILITIES.
5. PLUMBING CONTRACTOR SHALL CONTACT LOCAL HEALTH DEPARTMENT CONCERNING FILING OF UTILITY PLAN, AND PAYMENT OF FEES RELATED TO WATER AND SANITARY SEWER LINE CONSTRUCTION.
6. CONTRACTOR SHALL ADJUST FRAMES AND GRATES FOR EXISTING INLETS, MANHOLES, AND VALVES TO REMAIN.
7. UTILITY LINES REQUIRING TESTING SHALL BE TESTED IN ACCORDANCE WITH THE UTILITY COMPANY CODES AND SPECIFICATIONS.
8. CONTRACTOR SHALL REFER TO OTHER PLANS WITHIN THIS CONSTRUCTION SET FOR OTHER PERTINENT INFORMATION.
9. UTILITY WORK INVOLVING CONNECTIONS TO EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER OR THE OWNER'S REPRESENTATIVE AND THE UTILITY OWNER. NOTIFY THE OWNER OR THE OWNER'S REPRESENTATIVE AND THE UTILITY OWNER BEFORE EACH AND EVERY CONNECTION TO THE EXISTING SYSTEM IS MADE.
10. EXISTING UTILITIES AND IMPROVEMENTS THAT BECOME DAMAGED DURING CONSTRUCTION SHALL BE COMPLETELY RESTORED TO THE SATISFACTION OF THE UTILITY COMPANY, AT THE CONTRACTOR'S SOLE EXPENSE.

CONTACT LIST:

ENGINEER AND SURVEYOR
RED SWING CONSULTING SERVICES, LLC
4314 OLD WILLIAM PENN HIGHWAY, SUITE 101
MONROEVILLE, PA 15146
CONTACT: JAKE WIELAND, P.E.
PHONE: (724) 325-1215

DEVELOPER
BENDERSON DEVELOPMENT COMPANY, LLC
570 DELAWARE AVENUE.
BUFFALO, NY 14202
CONTACT: MATTHEW OATES
PHONE: 716-878-9397

GAS SERVICE
PEOPLES GAS COMPANY
375 NORTH SHORE DR.
PITTSBURGH, PA 15212
CONTACT: MICHAEL DENNY
EMAIL: michael.denny@peoples-gas.com

WATER SERVICE
WILKINSBURG PENN JOINT WATER AUTHORITY
2200 ROBINSON BLVD
WILKINSBURG, PA 15221
CONTACT: BRIAN BIANCHI
EMAIL: bbianchi@wpjwa.com

SANITARY SEWER
TOWNSHIP OF WILKINS
110 PEFFER ROAD
TURTLE CREEK, PA 15145
CONTACT: SCOTT MATTHEWS
EMAIL: smatthews@wilkinstownship.com
PHONE: 412-824-6650 EXT. 22

ELECTRIC SERVICE
DUQUESNE LIGHT COMPANY
2645 NEW BEAVER AVE
PITTSBURGH, PA 15233
CONTACT: KYLIE PARISON
EMAIL: kparison@duqlight.com

TELEPHONE SERVICE
VERIZON PENNSYLVANIA, LLC
1026 HAY ST
PITTSBURGH, PA 15221
CONTACT: DEBORAH BARUM
EMAIL: deborah.d.delia@verizon.com

CABLE
COMCAST
2300 ELDO RD.
MONROEVILLE, PA 15146
CONTACT: KEVIN MYERS
EMAIL: kevin_myers@cable.comcast.com

RED SWING GROUP
ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY,
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER JACOB WIELAND No. PE084705 3/13/2023

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BENDERSON DEVELOPMENT COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
GENERAL NOTES

SHEET NO.
C101

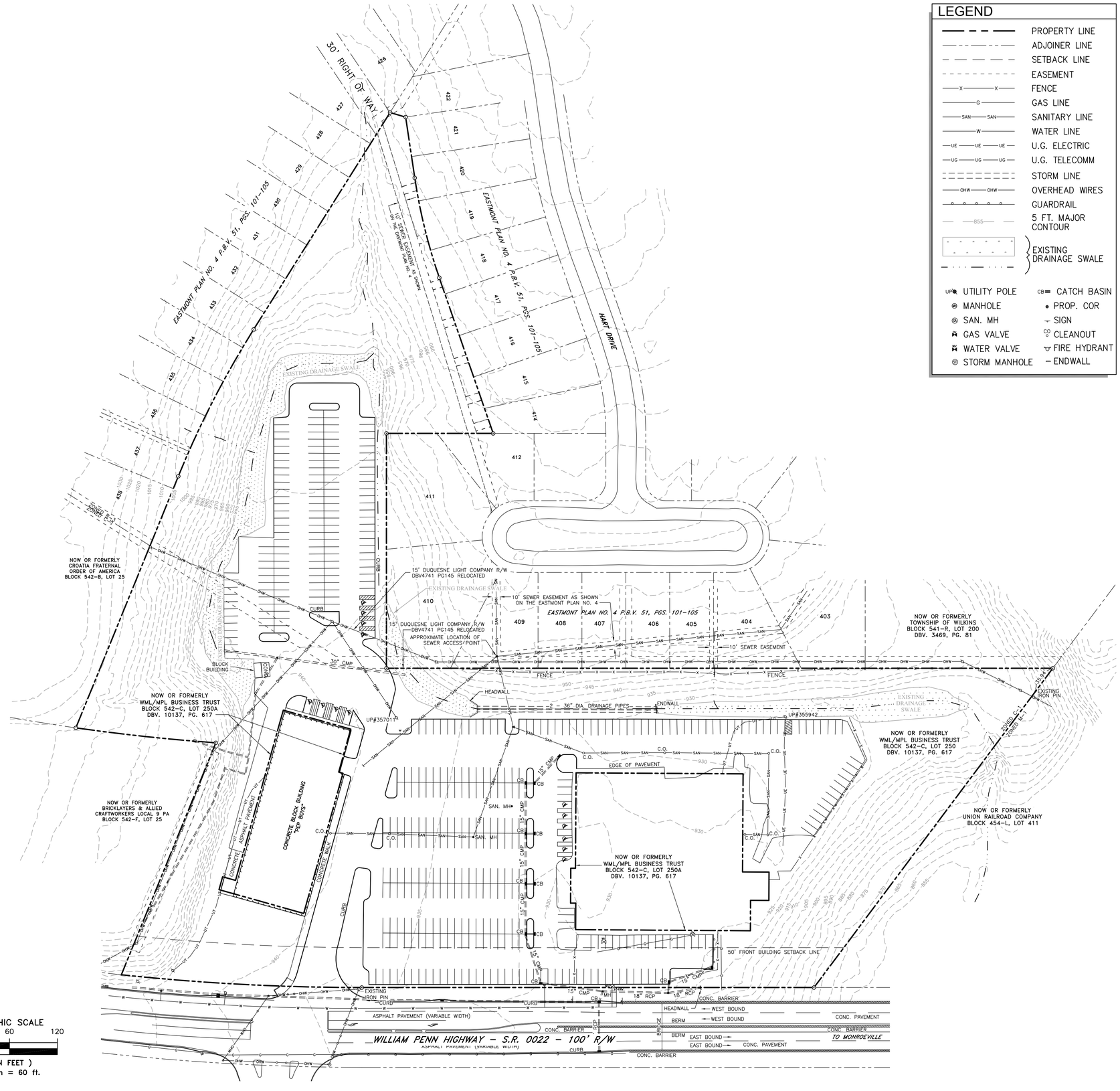
C:\Users\jwieland\AppData\Local\Temp\AcPublish_9824\22-1050 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 10:59am

NOTES

1. EXISTING CONDITIONS AND UTILITIES DERIVED FROM SURVEY DATA PROVIDED BY DEGLAU SURVEYORS, DATED NOVEMBER 23, 2015. SUPPLEMENTARY SURVEY DATA AND TOPOGRAPHY PROVIDED BY RED SWING GROUP, DATED JUNE 5, 2022.
2. SUPPLEMENTAL TOPOGRAPHY INFORMATION DERIVED FROM PENNSYLVANIA WESTERN LIDAR 2020 TILE 41001390PAS_NE DOWNLOADED FROM https://pasda.maps.arcgis.com.
3. SUPPLEMENTAL UTILITY INFORMATION DERIVED FROM A BOUNDARY AND TOPOGRAPHIC SURVEY PERFORMED BY ALL LAND SERVICES, INC., DRAWING NO. 12–046, NO DATE PROVIDED. SANITARY SEWER SUPPLEMENTED WITH DIGITIZED MAPS RECEIVED THROUGH PA DESIGN ONE CALL. UNDERGROUND UTILITY INFORMATION SHOWN IS APPROXIMATE AND TO BE FIELD VERIFIED BY CONTRACTOR.

LEGEND

- PROPERTY LINE
- ADJOINER LINE
- SETBACK LINE
- EASEMENT
- FENCE
- GAS LINE
- SANITARY LINE
- WATER LINE
- U.G. ELECTRIC
- U.G. TELECOMM
- STORM LINE
- OVERHEAD WIRES
- GUARDRAIL
- 5 FT. MAJOR CONTOUR
- EXISTING DRAINAGE SWALE
- UTILITY POLE
- CATCH BASIN
- MANHOLE
- PROP. COR
- SAN. MH
- SIGN
- GAS VALVE
- CLEANOUT
- WATER VALVE
- FIRE HYDRANT
- STORM MANHOLE
- ENDWALL



PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

Know what's **below.** **Call** before you dig.

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1–800–242–1776

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GRAPHIC SCALE
0 30 60 120
(IN FEET)
1 inch = 60 ft.

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RED SWING GROUP
ENGINEERS & SURVEYORS
4444 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WELAND ENGINEER No. PE084705 3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

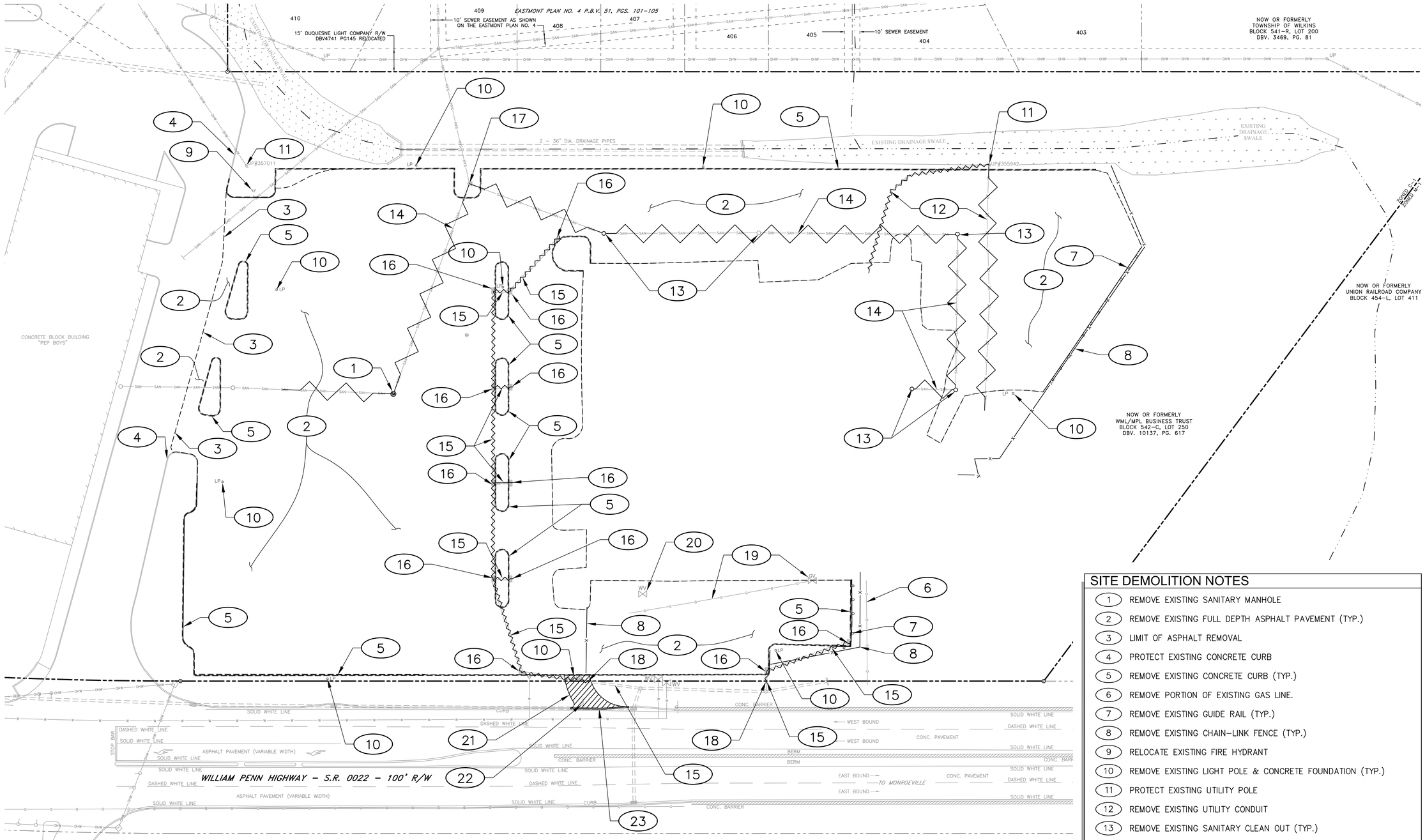
MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
EXISTING CONDITIONS

SHEET NO.
C102

C:\Users\jweland\AppData\Local\Temp\AcPublish_08242\22-1029 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 10:56am



LEGEND

- PROPERTY LINE
- ADJOINER LINE
- EASEMENT
- FENCE
- GAS LINE
- SANITARY LINE
- WATER LINE
- U.G. ELECTRIC
- U.G. TELECOMM
- STORM LINE
- OVERHEAD WIRES
- UTILITY POLE
- MANHOLE
- SAN. MH
- GAS VALVE
- WATER VALVE
- CATCH BASIN
- PROP. COR
- SIGN
- LIGHT POLE
- EXISTING DRAINAGE SWALE
- EXISTING FENCE TO BE REMOVED
- EXISTING ASPHALT TO BE REMOVED
- EXISTING GUARDRAIL TO BE REMOVED
- EXISTING UTILITY LINE TO BE REMOVED
- EXISTING CURB TO BE REMOVED
- STRIP GRASS TO ACCOMMODATE PROPOSED DRIVEWAY

SITE DEMOLITION NOTES

1. REMOVE EXISTING SANITARY MANHOLE
2. REMOVE EXISTING FULL DEPTH ASPHALT PAVEMENT (TYP.)
3. LIMIT OF ASPHALT REMOVAL
4. PROTECT EXISTING CONCRETE CURB
5. REMOVE EXISTING CONCRETE CURB (TYP.)
6. REMOVE PORTION OF EXISTING GAS LINE.
7. REMOVE EXISTING GUIDE RAIL (TYP.)
8. REMOVE EXISTING CHAIN-LINK FENCE (TYP.)
9. RELOCATE EXISTING FIRE HYDRANT
10. REMOVE EXISTING LIGHT POLE & CONCRETE FOUNDATION (TYP.)
11. PROTECT EXISTING UTILITY POLE
12. REMOVE EXISTING UTILITY CONDUIT
13. REMOVE EXISTING SANITARY CLEAN OUT (TYP.)
14. REMOVE EXISTING SANITARY PIPE (TYP.)
15. REMOVE EXISTING STORM PIPE (TYP.)
16. REMOVE EXISTING STORM INLET (TYP.)
17. EXISTING SANITARY LIFT STATION, TO BE RELOCATED
18. CAP EXISTING STORM LINE AT PROPERTY LINE
19. CONTRACTOR TO VERIFY GAS LINE AND VALVE BEFORE REMOVAL
20. CONTRACTOR TO VERIFY WATER VALVE BEFORE REMOVAL
21. STRIP GRASS FOR DRIVEWAY PLACEMENT
22. RELOCATE EXISTING SIGN TO ACCOMMODATE NEW DRIVEWAY ENTRANCE
23. REMOVE EXISTING CURB TO ACCOMMODATE NEW DRIVEWAY ENTRANCE

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
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STOP CALL
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1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
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RED SWING GROUP
ENGINEERS & SURVEYORS
4444 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
DEMOLITION PLAN

SHEET NO.
C103

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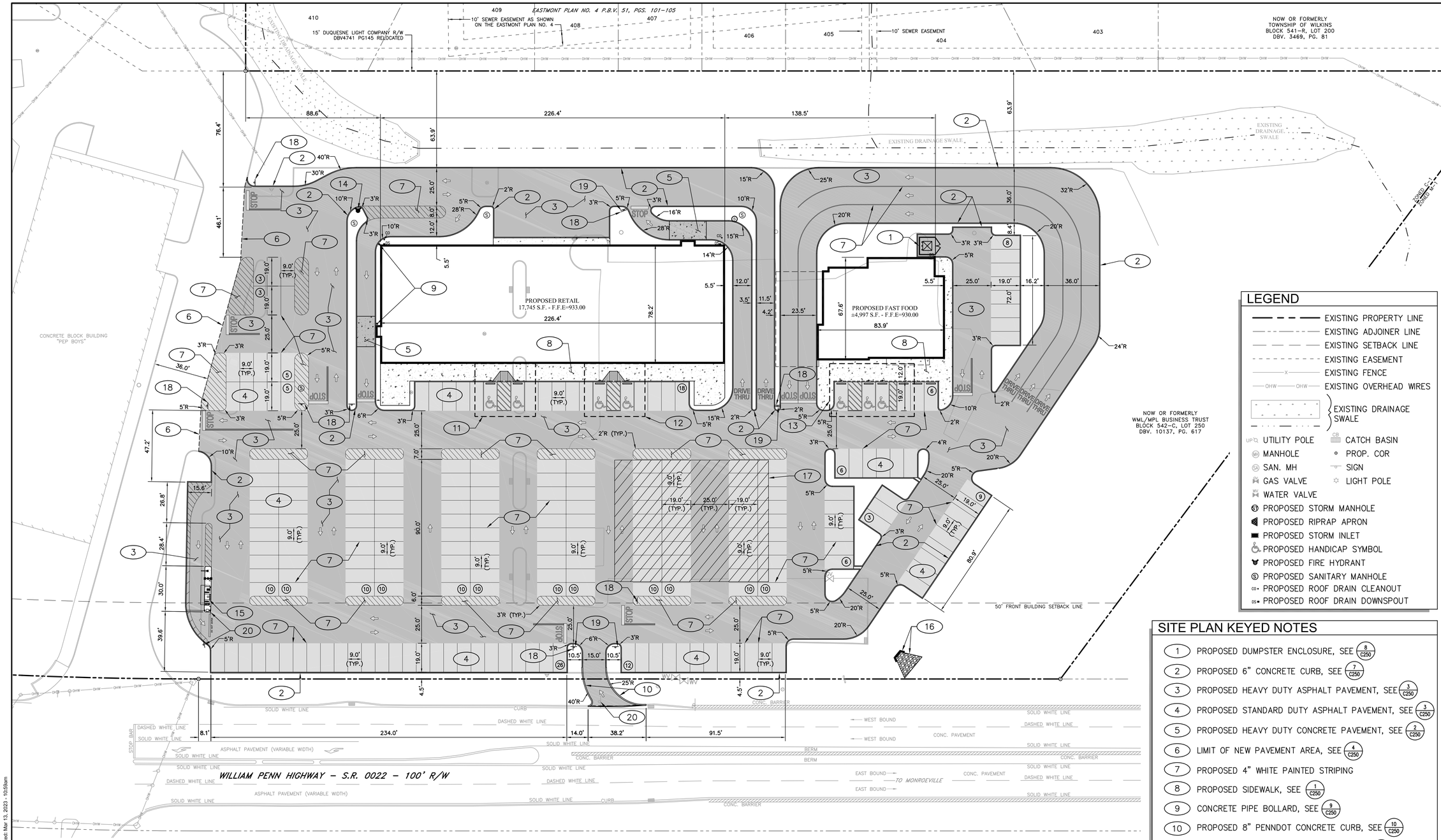

LEGEND

- EXISTING PROPERTY LINE
- EXISTING ADJOINER LINE
- EXISTING SETBACK LINE
- EXISTING EASEMENT
- EXISTING FENCE
- EXISTING OVERHEAD WIRES
- EXISTING DRAINAGE SWALE
- UTILITY POLE
- CATCH BASIN
- MANHOLE
- PROP. COR
- SAN. MH
- SIGN
- GAS VALVE
- LIGHT POLE
- WATER VALVE
- PROPOSED STORM MANHOLE
- PROPOSED RIPRAP APRON
- PROPOSED STORM INLET
- PROPOSED HANDICAP SYMBOL
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY MANHOLE
- PROPOSED ROOF DRAIN CLEANOUT
- PROPOSED ROOF DRAIN DOWNSPOUT

SITE PLAN KEYED NOTES

1. PROPOSED DUMPSTER ENCLOSURE, SEE 8/C250
2. PROPOSED 6" CONCRETE CURB, SEE 7/C250
3. PROPOSED HEAVY DUTY ASPHALT PAVEMENT, SEE 3/C250
4. PROPOSED STANDARD DUTY ASPHALT PAVEMENT, SEE 3/C250
5. PROPOSED HEAVY DUTY CONCRETE PAVEMENT, SEE 2/C250
6. LIMIT OF NEW PAVEMENT AREA, SEE 4/C250
7. PROPOSED 4" WHITE PAINTED STRIPING
8. PROPOSED SIDEWALK, SEE 1/C250
9. CONCRETE PIPE BOLLARD, SEE 9/C250
10. PROPOSED 8" PENNDOT CONCRETE CURB, SEE 10/C250
11. PROPOSED ADA ACCESSIBLE AREA 'A', SEE 1/C251
12. PROPOSED ADA ACCESSIBLE AREA 'B', SEE 2/C251
13. PROPOSED ADA ACCESSIBLE AREA 'C', SEE 3/C251
14. PROPOSED FIRE HYDRANT
15. PROPOSED ATM (BY OTHERS)
16. PROPOSED PIPE ENDWALL AND RIPRAP APRON
17. PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM
18. PROPOSED "STOP" SIGN
19. PROPOSED "DO NOT ENTER" SIGN
20. RELOCATE EXISTING SIGN TO ACCOMMODATE DRIVEWAY

NOTES

1. THE BUILDING FOOTPRINT AND SITE LAYOUT BASED ON A CAD FILES TITLED "RETAIL" BY BENDERSON DEVELOPMENT COMPANY DATED NOVEMBER 9TH, 2022.
2. SITE PLAN KEYED NOTES RELATED TO ADA ACCESSIBLE PARKING AND PARKING FEATURES ARE REFERENCED ON SHEET C251 FOR CLARITY.

811 Know what's below. Call before you dig.

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PERFORMED BY RED SWING GROUP JUNE 6th, 2022

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1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

PAVEMENT LEGEND

- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- HEAVY DUTY CONCRETE PAVEMENT
- CONCRETE SIDEWALK

LOT INFORMATION

	REQUIRED	PROVIDED
MINIMUM LOT	15,000 FT²	417,762 FT² OR 9.590 ACS.
MINIMUM LOT WIDTH	50 FT	>50 FT
MINIMUM DEPTH FRONT YARD	50 FT	>50 FT
MINIMUM DEPTH REAR YARD	30 FT	64 FT
MINIMUM DEPTH SIDE YARD	0 FT	0 FT
MINIMUM SIDE/REAR YARD ABUTTING ANY LOT IN ANY R DISTRICT FOR OFF-STREET PARKING SPACES AND ACCESS DRIVES FOR NONRESIDENTIAL	20 FT	*13.5± FT
FOR ANY BUSINESS USES	70 FT	>70 FT (MIN)
MINIMUM DISTANCE OF ANY VEHICULAR ENTRANCES OR EXITS FROM A RESIDENTIAL LOT LINE	250 FT	115 FT DRIVE THRU ENTRANCE
MAXIMUM HEIGHT OF STRUCTURE	35 FT	1 STORY

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ENGINEERS & SURVEYORS
4445 WILLIAM PENN HWY.
SUITE 101
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BENDERSON DEVELOPMENT COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE: SITE PLAN

SHEET NO. C200

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

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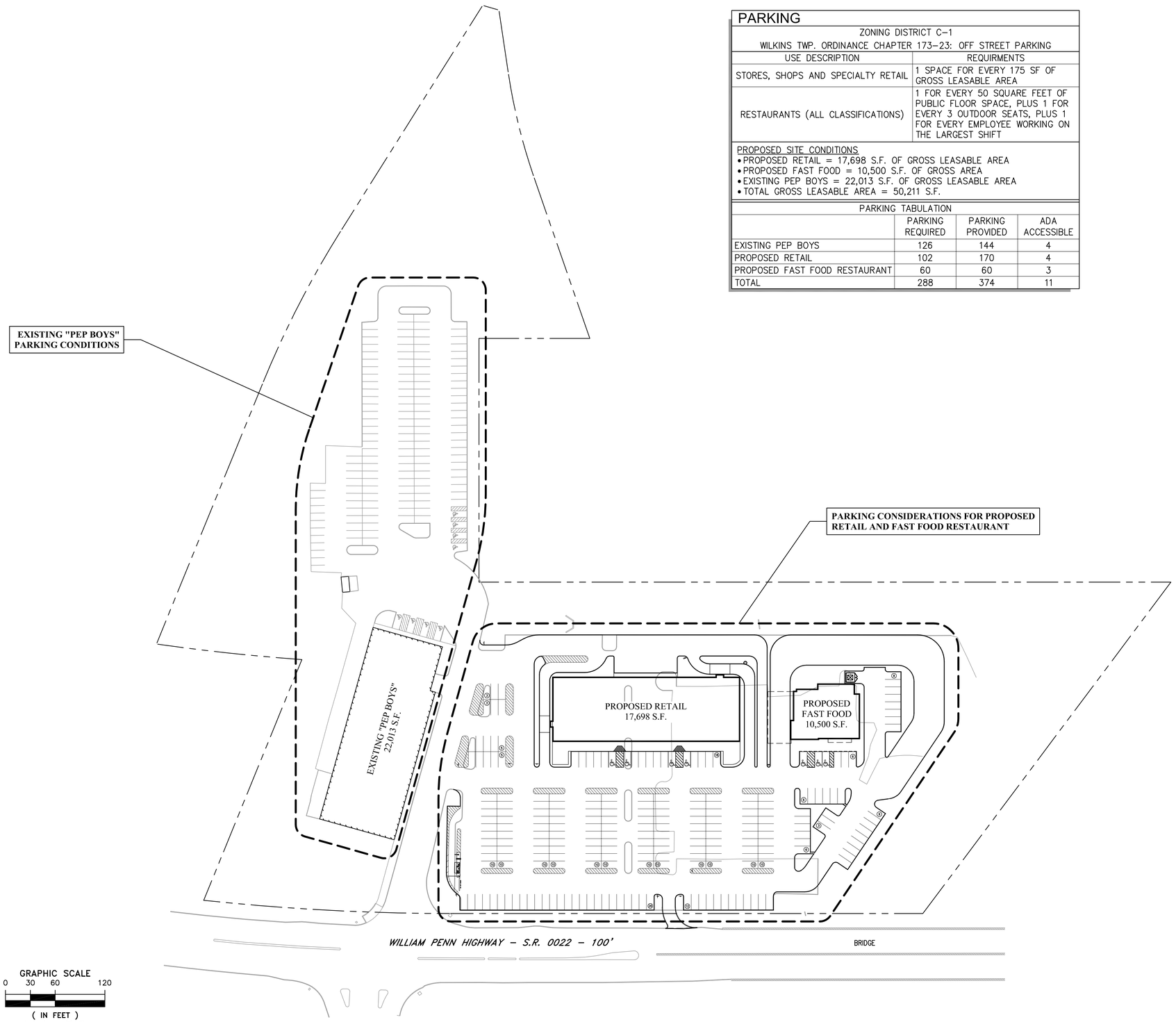

PARKING

ZONING DISTRICT C–1

WILKINS TWP. ORDINANCE CHAPTER 173–23: OFF STREET PARKING

USE DESCRIPTION	REQUIRMENTS
STORES, SHOPS AND SPECIALTY RETAIL	1 SPACE FOR EVERY 175 SF OF GROSS LEASABLE AREA
RESTAURANTS (ALL CLASSIFICATIONS)	1 FOR EVERY 50 SQUARE FEET OF PUBLIC FLOOR SPACE, PLUS 1 FOR EVERY 3 OUTDOOR SEATS, PLUS 1 FOR EVERY EMPLOYEE WORKING ON THE LARGEST SHIFT

PROPOSED SITE CONDITIONS

- PROPOSED RETAIL = 17,698 S.F. OF GROSS LEASABLE AREA
- PROPOSED FAST FOOD = 10,500 S.F. OF GROSS AREA
- EXISTING PEP BOYS = 22,013 S.F. OF GROSS LEASABLE AREA
- TOTAL GROSS LEASABLE AREA = 50,211 S.F.

PARKING TABULATION

	PARKING REQUIRED	PARKING PROVIDED	ADA ACCESSIBLE
EXISTING PEP BOYS	126	144	4
PROPOSED RETAIL	102	170	4
PROPOSED FAST FOOD RESTAURANT	60	60	3
TOTAL	288	374	11

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RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JACOB WIELAND
ENGINEER
No. PE084705
3/13/2023

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WILKINS TOWNSHIP, PENNSYLVANIA, 15235
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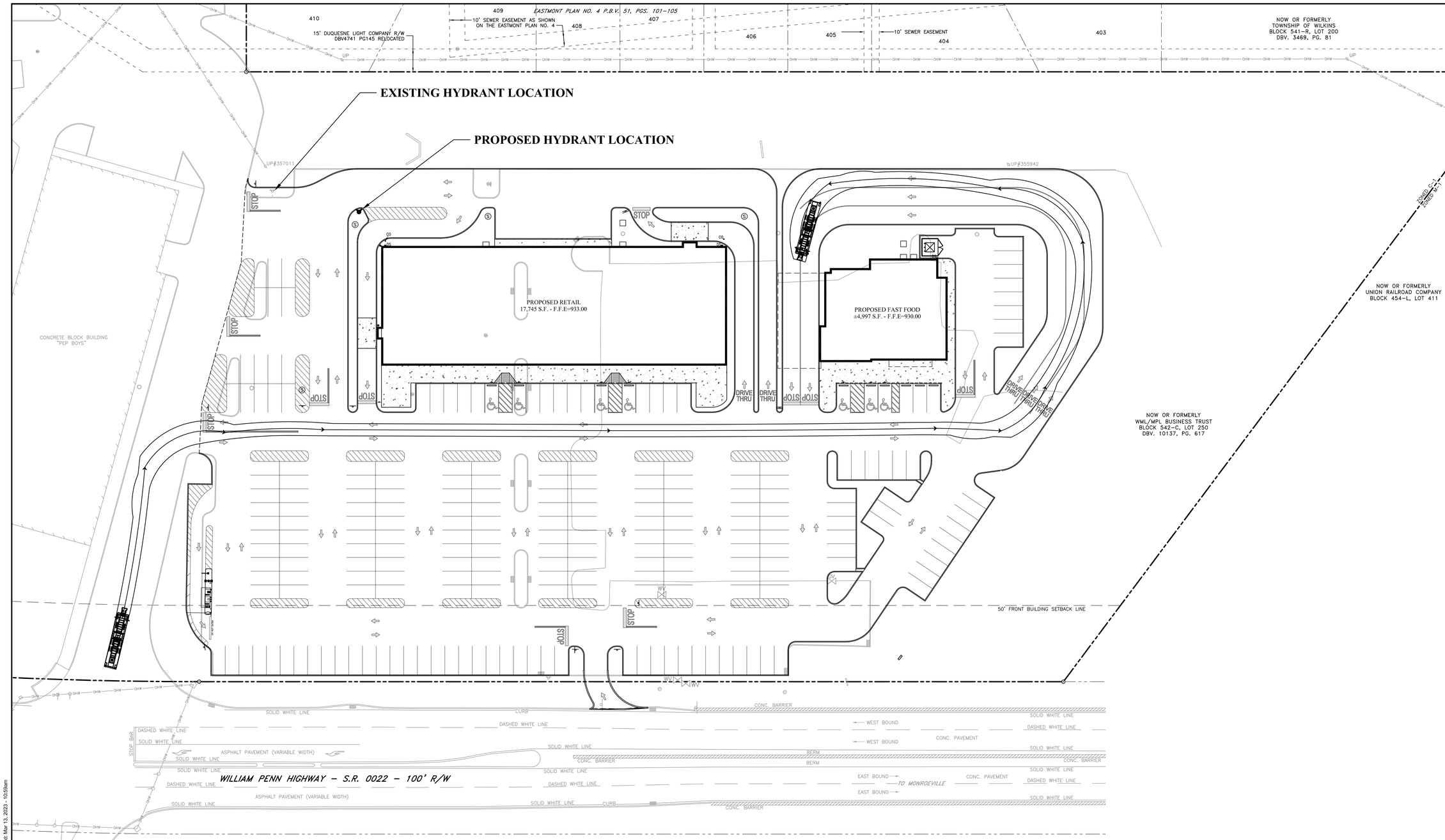
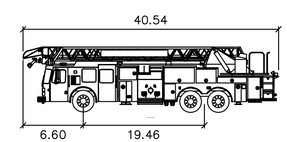
CHECKED BY: JOW

SHEET TITLE:
PARKING TABULATION PLAN

SHEET NO.
C201





PBF 105' Aerial Ladder Pierce Arrow XT

feet

Width	: 8.00
Track	: 8.00
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

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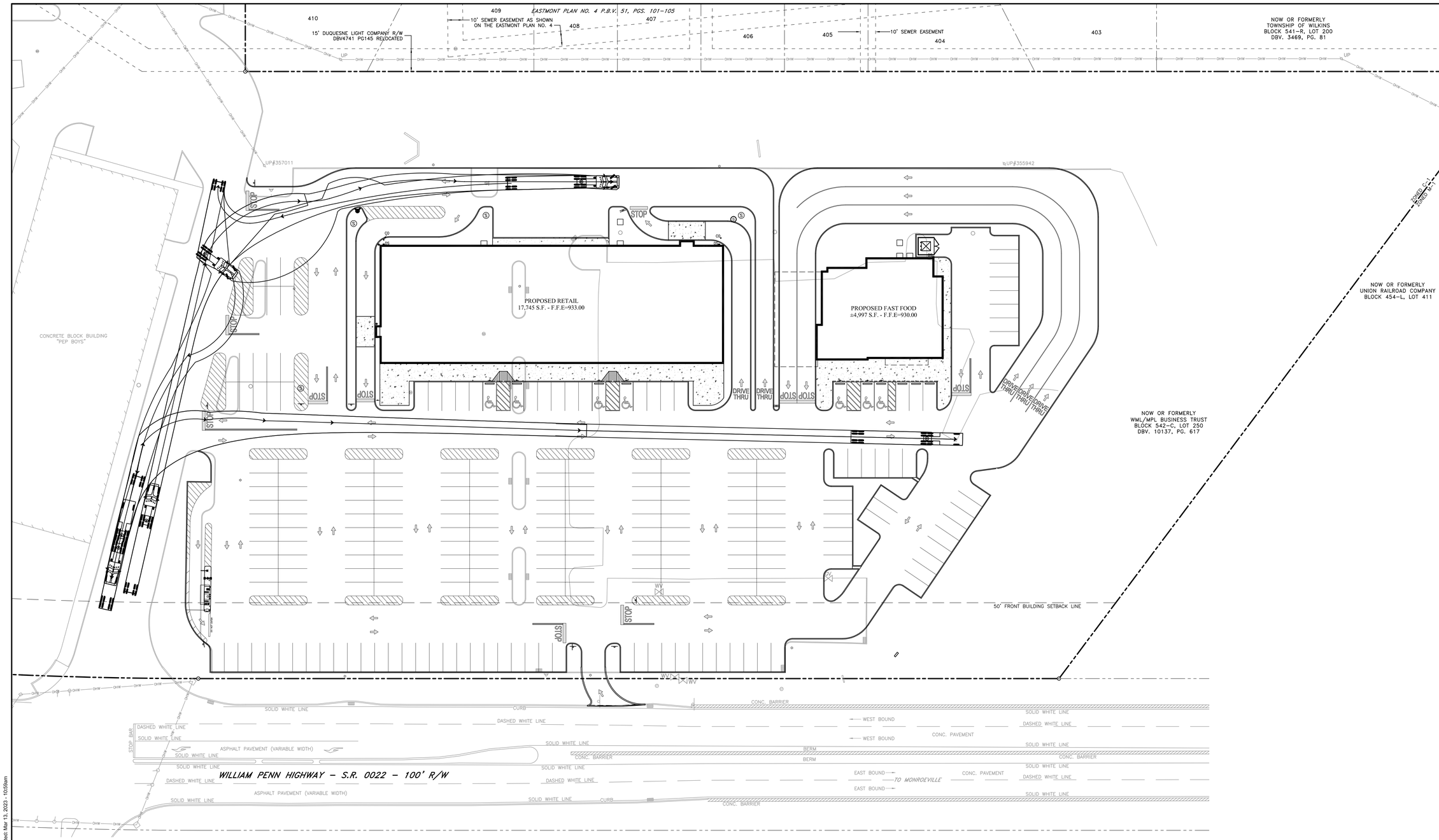
DRAWN BY: JLG
CHECKED BY: JOW

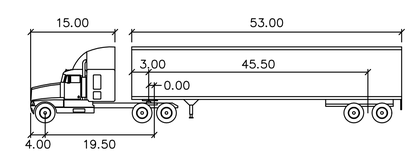
SHEET TITLE:

FIRE TRUCK ROUTING PLAN

SHEET NO.

C202





WB-67

	feet		
Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

C:\Users\jwieland\AppData\Local\Temp\AcPublish_9624\22-1050 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 10:58am

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JACOB WIELAND
ENGINEER
No. PE084705
3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

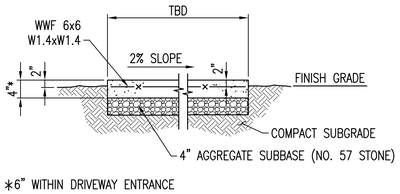
PROJ NO:	22-1029
SCALE:	AS SHOWN
DATE:	03/13/2023
DESIGNED BY:	ICB
DRAWN BY:	JLG
CHECKED BY:	JOW

SHEET TITLE:

DELIVERY TRUCK ROUTING PLAN

SHEET NO.

C203

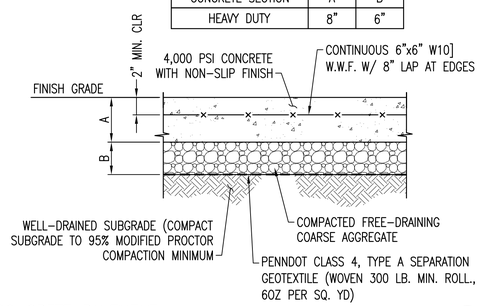


NOTE:
PROVIDE TRANSVERSE GROOVE JOINTS @ 5'-0" OC (MAX) AND EXPANSION JOINTS @ 20'-0" OC (MAX) AND WHERE ABUTTING CURBS, STRUCTURES, AND EXISTING CONCRETE PAVEMENT.

TYPICAL SIDEWALK (1)
NOT TO SCALE

DIMENSION & TYPE

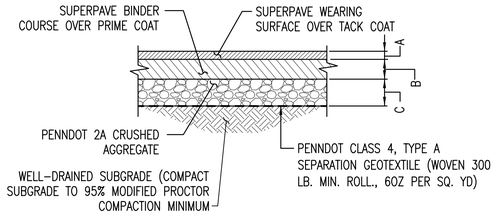
CONCRETE SECTION	A	B
HEAVY DUTY	8"	6"



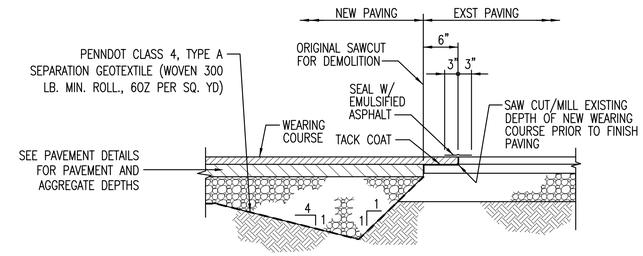
CONCRETE PAVEMENT (2)
NOT TO SCALE

DIMENSION & TYPE

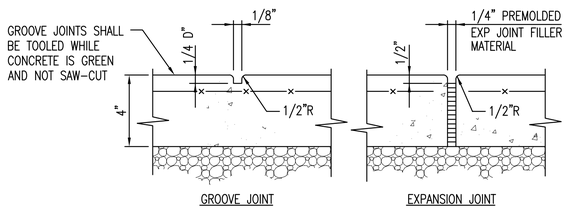
ASPHALT SECTION	A	B	C
STANDARD DUTY	1-1/2"	2-1/2"	6"
HEAVY DUTY	1-1/2"	3-1/2"	9"



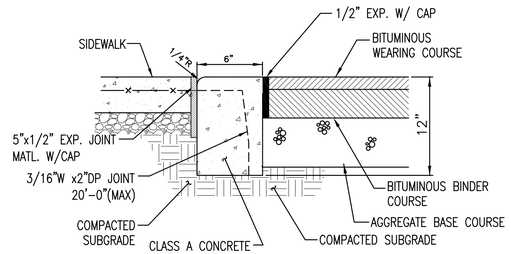
BITUMINOUS ASPHALT PAVEMENT (3)
NOT TO SCALE



NEW/EXISTING PAVEMENT JOINT (4)
NOT TO SCALE

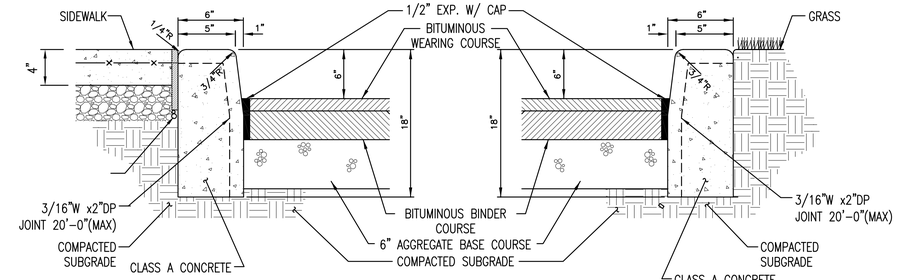


CONCRETE SIDEWALK JOINTS (5)
NOT TO SCALE



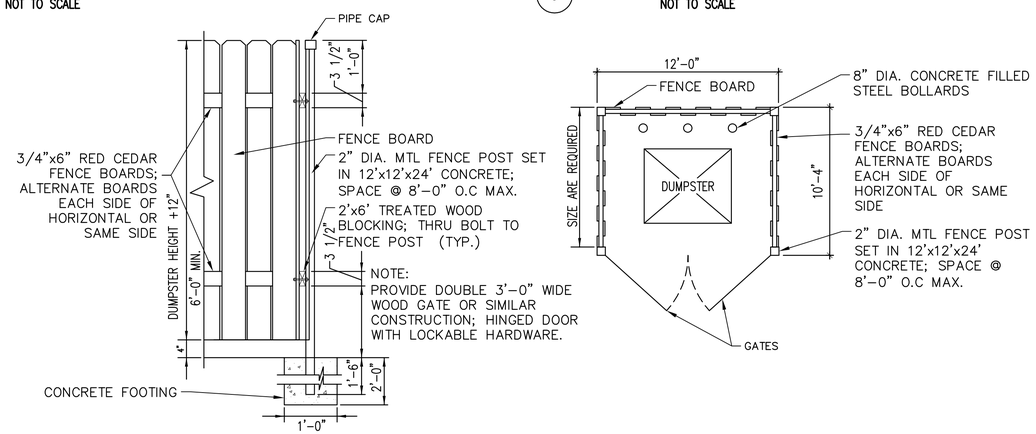
NOTE:
PROVIDE 3/4" PREMOLDED EXPANSION JOINT FILLER MATERIAL @ ALL INTERSECTIONS AND @ STOP OF EACH PLACEMENT

FLUSH CURB DETAIL (6)
NOT TO SCALE

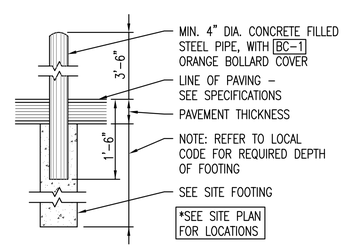


NOTE:
PROVIDE 3/4" PREMOLDED EXPANSION JOINT FILLER MATERIAL @ ALL INTERSECTIONS AND @ STOP OF EACH PLACEMENT

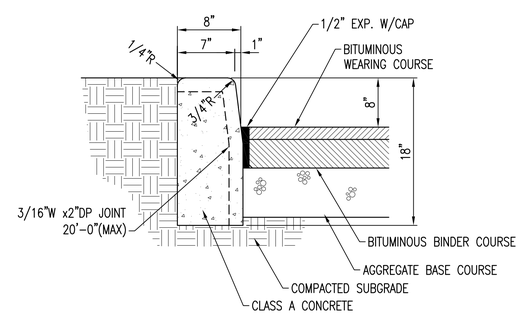
6" CONCRETE CURB DETAIL (7)
NOT TO SCALE



DUMPSTER PLAN (8)
NOT TO SCALE



BOLLARD DETAIL (9)
NOT TO SCALE



NOTE: PROVIDE 3/4" PREMOLDED EXPANSION JOINT FILLER MATERIAL @ ALL INTERSECTIONS AND @ STOP OF EACH PLACEMENT

PENNDOT 8" CONCRETE CURB (RC-64M) (10)
NOT TO SCALE

RED SWING GROUP
ENGINEERS & SURVEYORS
4444 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WELAND ENGINEER No. PE084705 3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
SITE DETAILS
SHEET 1 OF 2

SHEET NO.
C250

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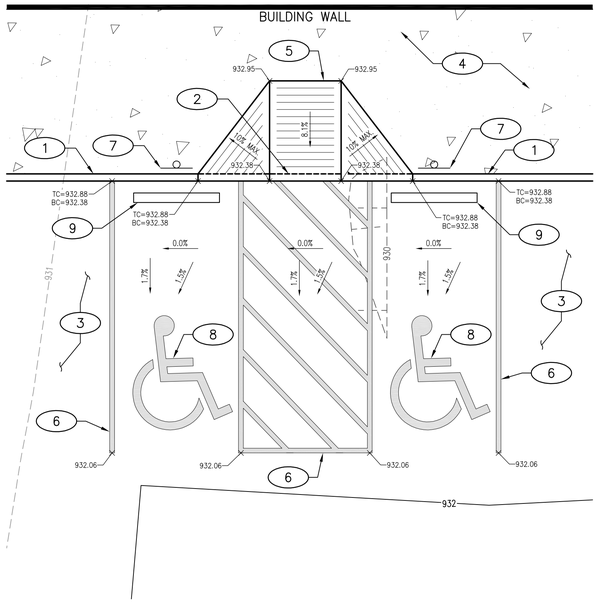
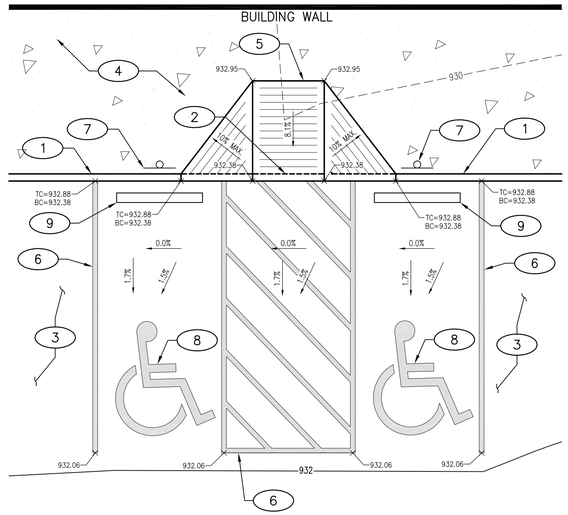
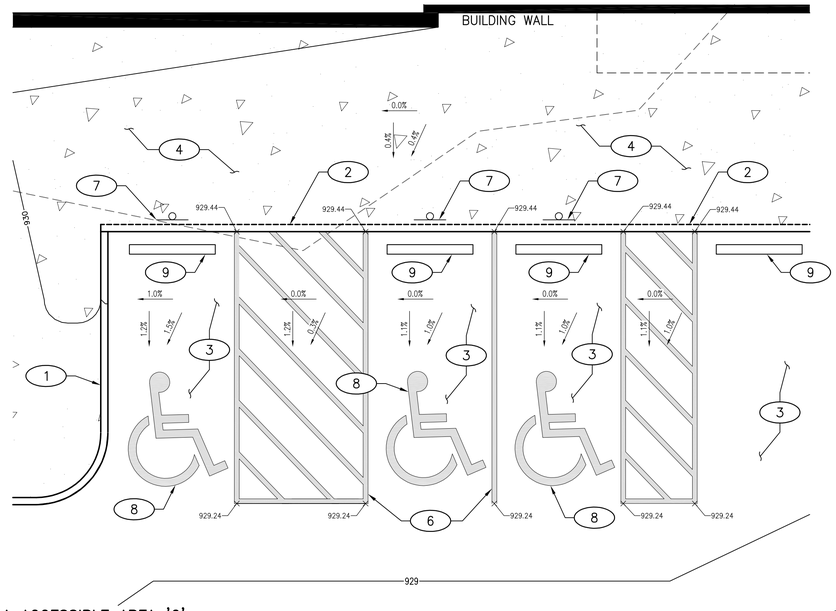


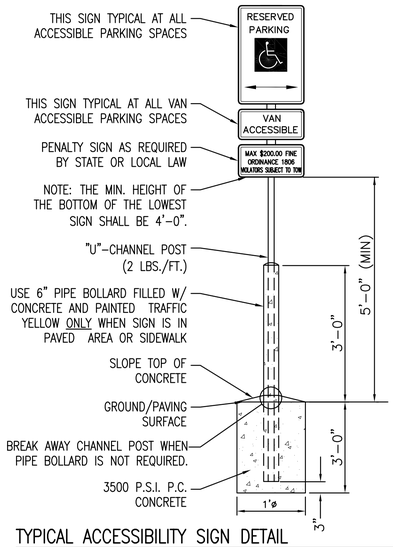
ADA ACCESSIBLE AREA 'A' (1)
SCALE: 1"=5'



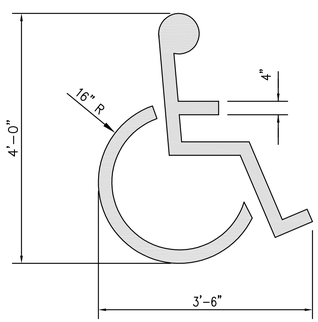
ADA ACCESSIBLE AREA 'B' (2)
SCALE: 1"=5'



ADA ACCESSIBLE AREA 'C' (3)
SCALE: 1"=5'

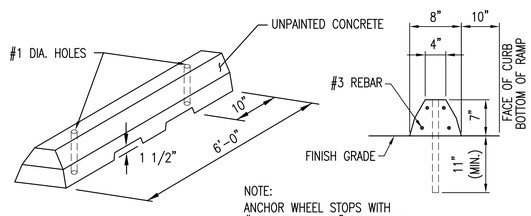


TYPICAL ACCESSIBILITY SIGN DETAIL (4)
NOT TO SCALE



NOTES:
PROVIDE 2 COATS OF BLUE PAINT, ALLOWING 1 WEEK MINIMUM BETWEEN COATS.

PAINTED ACCESSIBLE SYMBOL (5)
NOT TO SCALE



NOTE:
ANCHOR WHEEL STOPS WITH #6 RE-BAR – 18" MIN. LENGTH.

PRECAST CONCRETE WHEEL STOP (6)
NOT TO SCALE

ADA ENLARGMENT KEYED NOTES

1. PROPOSED 6" CONCRETE CURB. SEE 7/C250
2. PROPOSED FLUSH CURB, SEE 6/C250
3. PROPOSED ASPHALT PAVEMENT AREA, SEE 3/C250
4. PROPOSED CONCRETE SIDEWALK. SEE 1/C250
5. PROPOSED CONCRETE RAMP
6. PROPOSED 4" BLUE PAINTED STRIPING
7. PROPOSED ACCESSIBLE PARKING SIGN, SEE 4/C251
8. PROPOSED ACCESSIBLE PARKING SYMBOL, SEE 5/C251
9. PROPOSED CONCRETE WHEEL STOP, SEE 6/C251

LEGEND

- PROPOSED CONCRETE SIDEWALK
- PROPOSED 6" CONCRETE CURB
- PROPOSED 6" FLUSH CURB
- PROPOSED 4" PAINTED STRIPING
- 931 / 930 — EXISTING MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- 931 / 930 — PROPOSED MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- 2.0% — PROPOSED GROUND SLOPE (NEGATIVE=POINTING DOWN GRADIENT)
- TC=936.01 BC=935.51 — PROPOSED SPOT ELEVATION

TC=TOP OF CURB
BC=BOTTOM OF CURB

RED SWING GROUP
ENGINEERS & SURVEYORS
4144 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WELAND ENGINEER No. PE084705 — 3/13/2023

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COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
SITE DETAILS
SHEET 2 OF 2

SHEET NO.
C251

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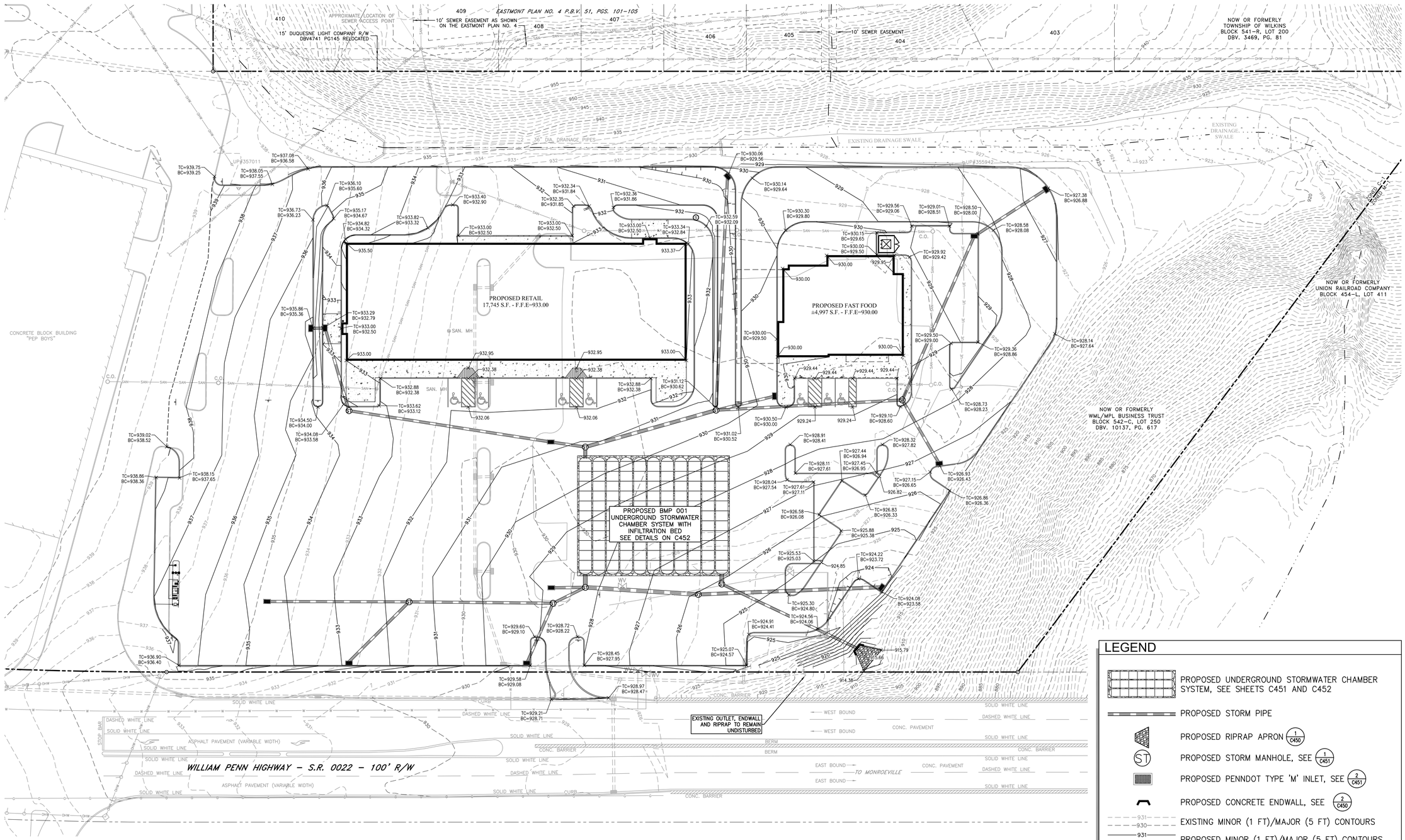

LEGEND

- PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM, SEE SHEETS C451 AND C452
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON (1/C450)
- PROPOSED STORM MANHOLE, SEE (1/C451)
- PROPOSED PENNDOT TYPE 'M' INLET, SEE (2/C451)
- PROPOSED CONCRETE ENDWALL, SEE (2/C450)
- EXISTING MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- PROPOSED MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- EXISTING PROPERTY LINE
- EXISTING ADJOINER LINE
- EXISTING SETBACK LINE
- EXISTING EASEMENT
- EXISTING FENCE
- UTILITY POLE
- CATCH BASIN
- GAS VALVE
- MANHOLE
- PROP. COR
- WATER VALVE
- SAN. MH
- SIGN
- LIGHT POLE
- EXISTING DRAINAGE SWALE
- TC=936.01 BC=935.51 PROPOSED SPOT ELEVATION

TC=TOP OF CURB
BC=BOTTOM OF CURB

CUT/FILL TABLE

2,510 CU YD CUT

3,680 CU YD FILL

1,170 CU YD FILL

NOTES:

1. CUT/FILL QUANTITIES DO NOT INCLUDE CALCULATIONS OF MATERIAL DISPLACED BY STORMWATER MANAGEMENT SYSTEMS, UTILITIES AND TRENCHING, PAVING AND SUBBASE, BUILDING FOUNDATIONS, ETC. QUANTITY PROVIDED IS THE DIFFERENCE BETWEEN EXISTING GRADE AND FINAL GRADE ONLY.
2. SIDEWALKS IN ROUTE FROM ACCESSIBLE PARKING AREA(S) TO ENTRANCE(S) SHALL BE CONSTRUCTED IN ACCORDANCE WITH ADA STANDARDS.

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
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ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
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MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

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3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

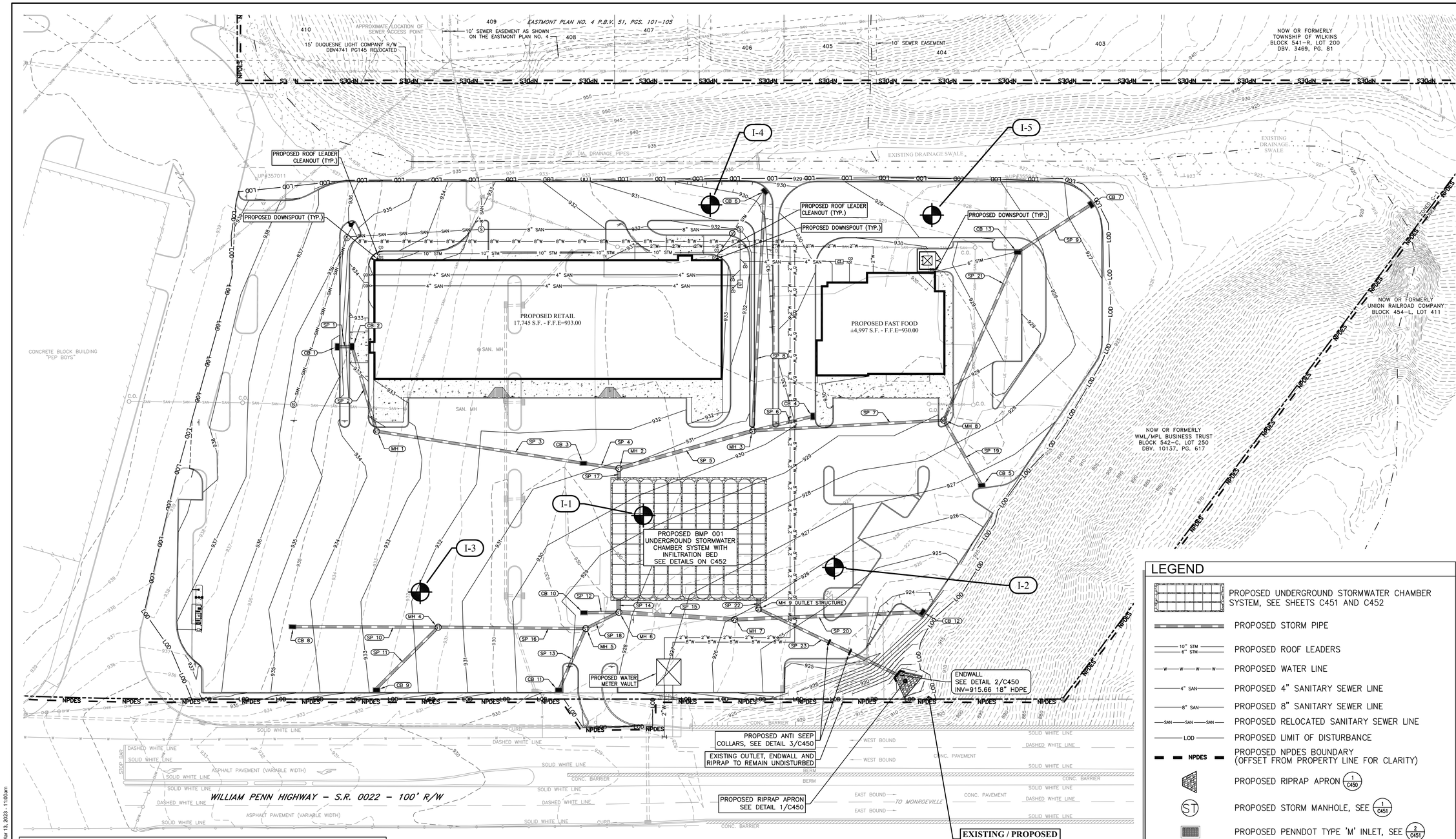
REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
GRADING PLAN

SHEET NO.
C300



THE WILKINS TOWNSHIP MUNICIPAL ENGINEER, ON THIS DATE (DATE OF SIGNATURE), HAS REVIEWED AND HEREBY CERTIFIES THAT THE SWM SITE PLAN MEETS ALL DESIGN STANDARDS AND CRITERIA OF MUNICIPAL ORDINANCE NO. 1029

SIGNATURE: _____ DATE: _____

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PERFORMED BY RED SWING GROUP JUNE 6th, 2022

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1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

INFILTRATION TEST TABLE

I-1 INFILTRATION TEST LOCATION

DESCRIPTION	NORTHING	EASTING	DEPTH	DEPTH ELEV.
I-1	406659.34	1396468.33	13.0	919
I-2	406677.42	1396595.59	9.0	918
I-3	406556.28	1396354.96	6.0	926
* I-4	406861.87	1396428.35	NO TEST	
** I-5	406912.66	1396563.18	NO TEST	

*LIMITING ZONE OF BEDROCK WAS ENCOUNTERED PRIOR TO THE INFILTRATION DEPTH.

**LIMITING ZONE OF GROUNDWATER AND BEDROCK WAS ENCOUNTERED PRIOR TO INFILTRATION DEPTH.

MATERIAL RECYCLING AND DISPOSAL NOTES

1) THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE OR DISPOSE OF BUILDING MATERIALS AND CONSTRUCTION WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA CODE 260.1 ET SEQ., 271.1 ET SEQ. AND 287.1 ET SEQ. NO BUILDING MATERIALS, WASTES, OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED OR DISCHARGED AT THE SITE. THE FOLLOWING DEFINE WHAT SHOULD BE CONSIDERED 'CONSTRUCTION WASTE' AND 'CLEAN FILL':

A. CONSTRUCTION WASTE – INCLUDES BUT IS NOT LIMITED TO, EXCESS SOIL MATERIALS, BUILDING MATERIALS, CONCRETE WASH WATER, SANITARY WASTES, ETC. THAT COULD ADVERSELY IMPACT WATER QUALITY.

B. CLEAN FILL – UNCONTAMINATED, NON-WATER-SOLUBLE, NON-DECOMPOSABLE, INERT, SOLID MATERIAL. THIS INCLUDES SOIL, ROCK, STONE DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK, OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. IT DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE SURFACE WATERS UNLESS OTHERWISE AUTHORIZED, MILLED ASPHALT, OR ASPHALT THAT HAS BEEN PROCESSED FOR RE-USE.

2) PARTIES RESPONSIBLE FOR THE EXCAVATION OF SITE MATERIALS OR THE IMPORT OF FILL MATERIALS ARE RESPONSIBLE TO ENSURE THAT 'ENVIRONMENTAL DUE DILIGENCE' IN THE DETERMINATION OF CLEAN FILL MATERIAL IS EITHER REMOVED FROM THE SITE OR USED AS FILL FOR THE SITE. MATERIAL IDENTIFIED AS HAZARDOUS MUST BE DISPOSED IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL GUIDELINES AND REGULATIONS.

A. ENVIRONMENTAL DUE DILIGENCE – INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF OWNERSHIP AND USE HISTORY OF PROPERTY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS.

3) BEFORE DISPOSING OF SOIL OR RECEIVING BORROW FOR THE SITE, THE OPERATOR MUST ASSURE THAT EACH SPOIL OR BORROW AREA HAS AN ESCP APPROVED BY THE LOCAL CONSERVATION DISTRICT OF THE DEP, AND WHICH IS BEING IMPLEMENTED AND MAINTAINED ACCORDING TO CHAPTER 102 REGULATIONS. THE OPERATOR SHALL ALSO NOTIFY THE LOCAL CONSERVATION DISTRICT IN WRITING OF RECEIVING SPOIL AND BORROW AREAS WHEN THEY HAVE BEEN IDENTIFIED.

4) REMOVE DEMOLITION MATERIALS TO A SUITABLE DISPOSAL SITE IN A RESPONSIBLE MANNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF EXCESS MATERIAL OFF-SITE TO AN APPROVED FACILITY (AS PER NOTE 8, AND SEE NOTE 7 FOR THE DEFINITION OF CONSTRUCTION WASTES).

LEGEND

- PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM, SEE SHEETS C451 AND C452
- PROPOSED STORM PIPE
- 10" STM / 6" STM — PROPOSED ROOF LEADERS
- W — PROPOSED WATER LINE
- 4" SAN — PROPOSED 4" SANITARY SEWER LINE
- 8" SAN — PROPOSED 8" SANITARY SEWER LINE
- SAN — PROPOSED RELOCATED SANITARY SEWER LINE
- LOD — PROPOSED LIMIT OF DISTURBANCE
- NPDES — PROPOSED NPDES BOUNDARY (OFFSET FROM PROPERTY LINE FOR CLARITY)
- PROPOSED RIPRAP APRON (1/C450)
- ST — PROPOSED STORM MANHOLE, SEE (1/C451)
- PROPOSED PENNDOT TYPE 'M' INLET, SEE (2/C451)
- PROPOSED CONCRETE ENDWALL, SEE (2/C450)
- 931 — EXISTING MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- 931 / 930 — PROPOSED MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- EXISTING DRAINAGE SWALE
- EXISTING STORM PIPE
- X — EXISTING FENCE
- PROPERTY LINE
- ADJOINING PROPERTY LINE

NOTE: ALL PROPOSED INLETS SHALL HAVE TRASH GUARD INSERTS INSTALLED

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

SHEET NO.
C400

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CONSTRUCTION SQUENCE (BMPS ONLY)

UNDERGROUND STORMWATER CHAMBER SYSTEM CONSTRUCTION SEQUENCE:

1. INSTALL THE ENDWALL AND RIPRAP APRON AT THE PROPOSED DISCHARGE POINT FOR THE SITE AS SHOWN ON THE PLANS AND DETAILS.
2. COMMENCE CONSTRUCTION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM.

2A. THE PIPE AND AFORMENTIONED ENDWALL LEADING AWAY FROM THE CHAMBER SYSTEM OUTLET STRUCTURE SHALL BE INSTALLED ACCORDING TO THE PROJECT PLANS AND DETAILS.

2B. EXCAVATE TO THE BOTTOM OF THE SYSTEM SPECIFIED IN THE PROJECT PLANS AND DETAILS. COMPLETE THE FINAL CUT TO SUBGRADE IN THE EXCAVATION USING AN EXCAVATOR WITH A SMOOTH EDGED BUCKET TO AVOID DISTURBING THE SUBGRADE SOILS. REMOVE UNSUITABLE MATERIALS INCLUDING BUT NOT LIMITED TO OLD FOUNDATIONS, LARGE COBBLES/BOULDERS, CONSTRUCTION DEBRIS LEFT FROM DEMOLITION OF FORMER STRUCTURES, ORGANIC MATERIAL, ETC.

2C. PLACE PROPOSED GEOTEXTILE FABRIC IN BOTTOM OF EXCAVATION IN A MANNER THAT WILL ALLOW THE SIDES AND BOTTOM OF THE SYSTEM TO BE ENCAPSULATED ONCE CONSTRUCTED IN ACCORDANCE WITH PROJECT DETAILS TAKING CARE TO AVOID COMPACTION OF SUBGRADE SOILS.

2D. BACKFILL EXCAVATIONS WITH SPECIFIED DRAINAGE AGGREGATE TO THE ELEVATION OF THE INVERT OF THE UNDERGROUND CHAMBER SYSTEM, INLET PIPES, AND OUTLET PIPE. INSTALL CHAMBERS AND THE PIPES IN ACCORDANCE WITH PROJECT PLANS, DETAILS, AND MANUFACTURER'S INSTRUCTIONS. THE ENGINEER OR THEIR REPRESENTATIVE SHALL BE ALLOWED TO INSPECT THE OUTLET STRUCTURE AND OUTLET PIPE DURING THIS CRITICAL STAGE.

2E. INSTALL THE OUTLET STRUCTURE AS NECESSARY WHILE CONTINUING TO BACKFILL THE EXCAVATION. ENCAPSULATE THE CHAMBER SYSTEM SIDES AND BOTTOM IN THE SPECIFIED FABRIC PRIOR TO CONTINUING BACKFILLING.

IMPORTANT: THE INSTALLATION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM OUTLET STRUCTURE/PIPE IS A CRITICAL STAGE OF THE STORMWATER MANAGEMENT PLAN. THE CONTRACTOR SHALL CONTACT THE PROJECT ENGINEER ONE WEEK PRIOR TO EXPECTED OUTLET CONSTRUCTION SO THAT THE INSTALLATION CAN BE OBSERVED.

3. EXISTING ONSITE PAVEMENT SCHEDULED FOR DEMOLITION CAN BE REMOVED AND PROCESSED TO BE USED AS SITE FILL OR HAULED OFF SITE TO A PADEP APPROVED AND PERMITTED FACILITY.
4. COMMENCE INSTALLING SITE STORM PIPES AND STRUCTURES ENSURING NO WATER ENTERS THE STRUCTURES UNTIL AREAS TRIBUTARY TO THE STRUCTURES ARE STABILIZED. STORM PIPES AND STRUCTURES SHALL BE INSTALLED STARTING FROM THE DOWN GRADIENT END AND WORKING IN AN UP–GRADIENT MANNER. INSTALL FILTER INLET PROTECTION IN NEW INLETS AS THEY ARE INSTALLED. LIMIT DAILY TRENCH EXCAVATION AND STORM LINE INSTALLATION TO THE LENGTH OF PIPE PLACEMENT, BEDDING, AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING). TRENCH SPOILS SHALL BE USED UP–GRADIENT OF UTILITY TRENCH AS A TEMPORARY BERM TO DIVERT UPHILL RUNOFF FROM EXCAVATIONS.

IMPORTANT: STORMWATER RUNOFF IS NOT TO BE DIRECTED TO UNPROTECTED STORMWATER CONVEYANCE SYSTEMS UNTIL THE SITE IS AT FINAL GRADE AND STABILIZED.

UTILITY TRENCH CONSTRUCTION SEQUENCE:

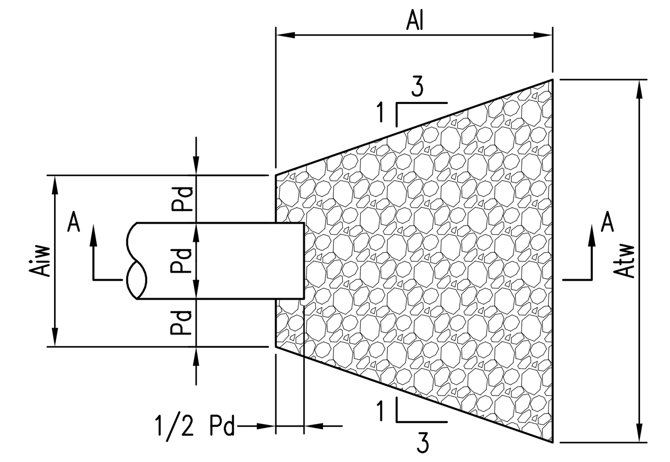
EXPOSED TRENCH EXCAVATIONS HAVE HIGH POTENTIAL FOR ACCELERATED EROSION AND SEDIMENT POLLUTION. SINCE THESE EXCAVATIONS ARE TYPICALLY LOCATED AT LOWER ELEVATIONS ALONG OR ACROSS EARTH DISTURBANCE SITES, OPEN TRENCHES SERVE TO CONCENTRATE SEDIMENT–LADEN RUNOFF AND CONVEY IT TO SITE BOUNDARIES OR WATERWAYS. AN EFFECTIVE MEASURE TO REDUCE EROSION AND SEDIMENTATION DURING UTILITY CONSTRUCTION IS TO LIMIT THE SPECIFIC SCHEDULE AND SCOPE OF WORK ACTIVITIES AS FOLLOWS DURING CONSTRUCTION:

1. LIMIT ADVANCE CLEARING AND GRUBBING OPERATIONS TO A DISTANCE OF TWO TIMES THE LENGTH OF PIPE INSTALLATION THAT CAN BE COMPLETED IN ONE DAY (WEATHER PERMITTING).
2. WORK CREWS AND EQUIPMENT FOR TRENCHING, PLACEMENT OF PIPE, PLUG CONSTRUCTION AND BACKFILLING WILL BE SELF–CONTAINED AND SEPARATE FROM CLEARING AND GRUBBING, SITE RESTORATION AND STABILIZATION OPERATIONS.
3. LIMIT DAILY TRENCH EXCAVATION TO THE LENGTH OF PIPE PLACEMENT, PLUG INSTALLATION AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING).
4. TRENCH PLUGS WILL BE SPACED AND CONSTRUCTED IN ACCORDANCE WITH THE TRENCH PLUG DETAIL ON THE PLAN SHEETS.
5. WATER THAT ACCUMULATES IN THE OPEN TRENCH WILL BE COMPLETELY REMOVED BY PUMPING WATER TO A CONTROL FACILITY OR FILTER BAG FOR THE REMOVAL OF SEDIMENT. WHEN THE FILTER BAG IS ½–FULL IT SHOULD BE REPLACED. ACCUMULATED SEDIMENT SHALL BE MIXED WITH SOIL AND PROPERLY DISPOSED OF ON THE SITE IF POSSIBLE OR DISPOSED OF AT AN OFFSITE AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF EXCESS MATERIAL OFF–SITE AT A DEP APPROVED FACILITY. OFFSITE DUMPING FACILITIES SHALL HAVE AN APPROVED EROSION & SEDIMENT CONTROL PLAN.
6. ON THE DAY FOLLOWING PIPE PLACEMENT AND TRENCH BACKFILLING, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, AND THE APPROPRIATE TEMPORARY EROSION CONTROL MEASURE OR FACILITY WILL BE INSTALLED. SEEDING AND MULCHING OF DISTURBED AREAS WILL BE PERFORMED AT THE END OF EACH WORK WEEK.

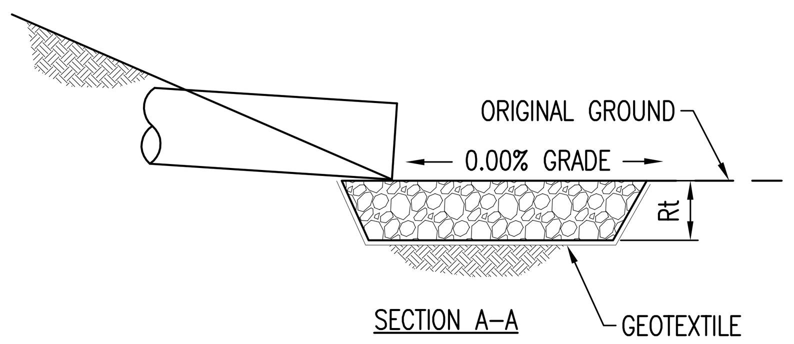
EXCEPTIONS:

IN CERTAIN SITUATIONS, TRENCHES CANNOT BE BACKFILLED UNTIL THE PIPE IS HYDROSTATICALLY TESTED, OR ANCHORS AND OTHER PERMANENT FEATURES ARE INSTALLED. IN THESE SITUATIONS, THE REQUIREMENTS LISTED ABOVE WILL REMAIN IN EFFECT WITH THE FOLLOWING EXCEPTIONS:

1. DAILY BACKFILLING OF THE TRENCH MAY BE DELAYED FOR SIX DAYS. PRESSURE TESTING AND THE COMPLETE BACKFILLING OF THE OPEN TRENCH MUST BE COMPLETED BY THE SEVENTH WORKING DAY.
2. IF DAILY BACKFILLING IS DELAYED, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, APPROPRIATE TEMPORARY EROSION CONTROLS WILL BE INSTALLED, AND THE AREAS SEEDED AND MULCHED WITHIN THE NEXT TWO CALENDAR DAYS.



PLAN VIEW



SECTION A–A

DESCRIPTION	PIPE DIA Pd (IN)	RIPRAP APRON SIZE R–_	THICK. Rt (IN)	LENGTH Al (FT)	INITIAL WIDTH Aiw (FT)	TERMINAL WIDTH Atw (FT)
DISCHARGE POINT 001	18	R–5	27	13	5	18

NOTES:

APRON SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTH SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNEL.

APRON SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIPRAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.

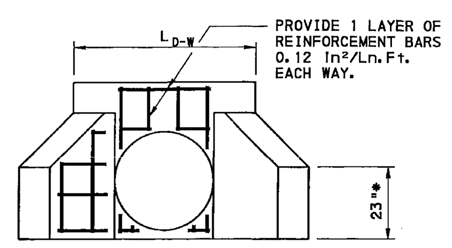
EXTEND RIPRAP ON BACK SIDE OF APRON TO AT LEAST 1/2 DEPTH OF PIPE ON BOTH SIDES TO PREVENT SCOUR AROUND THE PIPE.

STANDARD CONSTRUCTION DETAIL #9–2

RIPRAP APRON

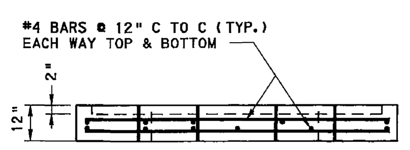
NOT TO SCALE

1

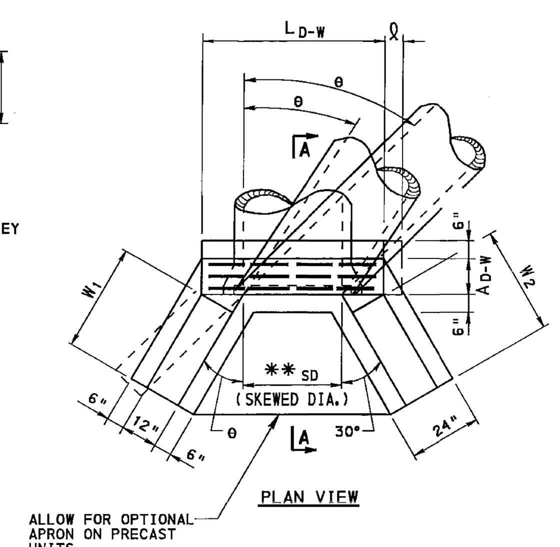


FRONT ELEVATION VIEW
HEAD & WINGWALL SECTION FOR TYPE D–W

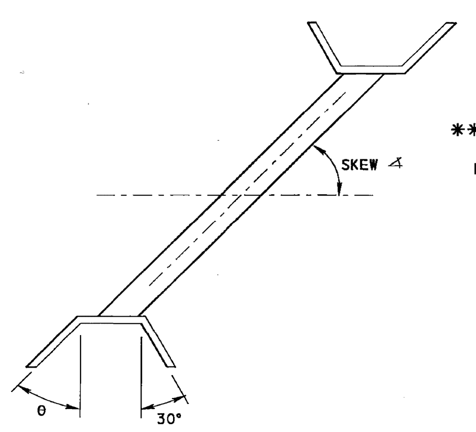
*23" FOR CONCRETE PLACEMENT WITH DEPRESSED KEY
21" FOR MONOLITHIC CONCRETE PLACEMENT



FRONT ELEVATION VIEW
BASE SECTION FOR TYPE D–W



PLAN VIEW



$$**SD = \frac{D_{D-W}}{\cos\theta} = \frac{D_{D-W}}{\sin \text{SKEW} ∡}$$

$$L_{D-W} = SD + 2.3'$$

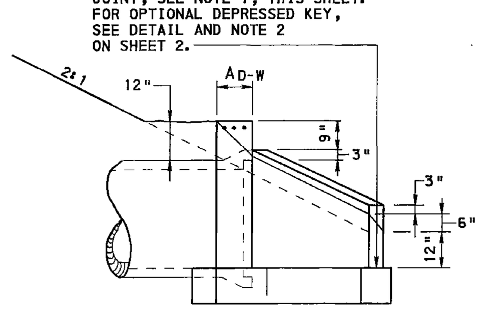
$$W_1 = \frac{2D_{D-W} - 2.0'}{\cos\theta} \quad \text{FOR 2:1 SLOPE}$$

$$W_1 = \frac{X}{\cos\theta}\left(D_{D-W} - 0.5 - \frac{1.0}{X}\right)$$ (FOR VARIABLE SLOPE WHEN X EQUALS HORIZONTAL DIMENSION OF THE SLOPE DESIGNATION.)

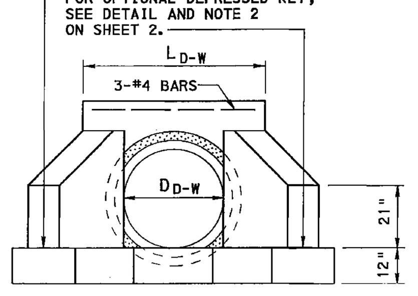
PIPE DIAMETER	L_D
18" AND 21"	5'
24" AND 27"	7'
30" AND 33"	9'
36" AND 39"	10'
42" AND 45"	11'
48" AND 51"	12'

NOTE

1. FOR OPTIONAL CONSTRUCTION JOINT WITHOUT A DEPRESSED KEY, APPLY EPOXY BONDING COMPOUND AT THE LOCATION INDICATED TO ENSURE ADEQUATE BOND WITH THE BASE SECTION OF THE ENDWALL (NEW CONCRETE). CAST THE HEADWALL SECTION OF THE ENDWALL ON TOP OF THE BASE SECTION OF THE ENDWALL.



SECTION A–A



FRONT ELEVATION VIEW

TYPE D–W ENDWALL
(SEE TABLE A FOR DIMENSIONS NOT INDICATED.)

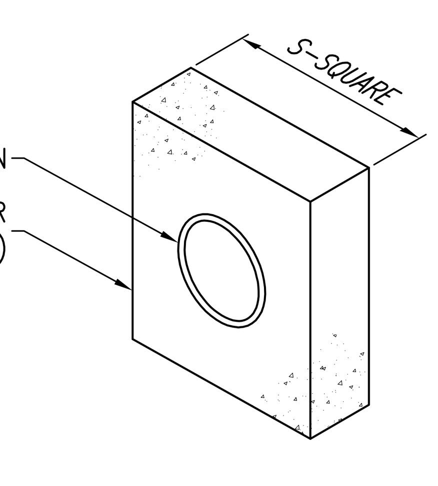
TABLE A
2 : 1 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW ∡ = 90° TO 60° θ = 30°			SKEW ∡ = 55° θ = 35°			SKEW ∡ = 50° θ = 40°			SKEW ∡ = 45° θ = 45°			SKEW ∡ = 40° θ = 50°			SKEW ∡ = 30° θ = 60°			SKEW ∡ = 20° θ = 70°			SKEW ∡ = 10° θ = 80°				
D_{D-W} (IN.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	W_2 (FT.)	A_{D-W} (IN.)
36	5.8	0	4.6	6.0	0.33	4.9	6.2	0.5	5.2	6.5	0.67	5.7	7.0	0.75	6.2	8.3	1.33	8.0	11.1	1.75	11.7	19.6	5.0	23.0	4.6	12
42	6.9	0	5.8	6.6	0.33	6.1	6.9	0.5	6.5	7.3	0.67	7.1	7.8	0.75	7.8	9.3	1.33	10.0	12.5	1.75	14.6	22.5	5.0	28.8	5.8	12
48	6.9	0	6.9	7.2	0.33	7.3	7.5	0.5	7.8	8.0	0.67	8.5	8.5	0.75	9.4	10.3	1.33	12.0	14.0	1.75	17.5	25.3	5.0	34.6	6.9	12
54	7.5	0	8.0	7.8	0.33	8.5	8.2	0.5	9.1	8.7	0.67	9.9	9.3	0.75	10.9	11.3	1.33	14.0	15.5	1.75	20.5	28.2	5.0	40.3	8.0	12
60	8.1	0	9.2	8.4	0.33	9.8	8.8	0.5	10.4	9.4	0.67	11.3	10.1	0.75	12.5	12.3	1.33	16.0	16.9	1.75	23.4	31.1	5.0	46.0	9.2	15
72	9.2	0	11.5	9.6	0.33	12.2	10.1	0.5	13.0	10.8	0.67	14.1	11.7	0.75	15.6	14.3	1.33	20.0	19.8	1.75	29.2	36.9	5.0	57.6	11.5	15

CONCRETE PENNDOT TYPE D–W ENDWALL (PUBLICATION RC–31M)

NOT TO SCALE

2



OUTLET STRUCTURE	PIPE SIZE (IN)	S (FT)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
1	18	5	2	48	15

NOTES:

ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT.

COLLAR SIZE AND SPACING SHALL BE AS INDICATED WITHIN TABLE.

STANDARD CONSTRUCTION DETAIL #7–16

CONCRETE ANTI–SEEP COLLAR

NOT TO SCALE

3

PIPE TABLE

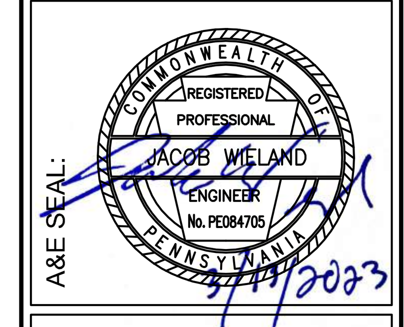
NAME	SIZE	LENGTH	SLOPE	MATERIAL
SP 1	15"	10'	22.24%	HDPE
SP 2	15"	57'	1.70%	HDPE
SP 3	15"	136'	1.00%	HDPE
SP 4	15"	23'	1.02%	HDPE
SP 5	24"	90'	0.66%	HDPE
SP 6	15"	40'	1.00%	HDPE
SP 7	15"	124'	0.74%	HDPE
SP 8	15"	156'	3.25%	HDPE
SP 9	15"	57'	0.50%	HDPE
SP 10	15"	95'	3.14%	HDPE
SP 11	15"	56'	3.11%	HDPE
SP 12	15"	23'	5.08%	HDPE
SP 13	15"	44'	1.00%	HDPE
SP 14	30"	9'	0.30%	HDPE
SP 15	24"	75'	0.96%	HDPE
SP 16	15"	96'	2.35%	HDPE
SP 17	24"	8'	0.41%	HDPE
SP 18	15"	24'	12.43%	HDPE
SP 19	15"	49'	1.00%	HDPE
SP 20	24"	122'	0.26%	HDPE
SP 21	15"	119'	0.50%	HDPE
SP 22	30"	7'	0.00%	HDPE
SP 23	18"	100'	1.85%	HDPE

STRUCTURE TABLE

STRUCTURE NAME	RIM ELEV.	ELEV. PIPES (IN)	ELEV. PIPES (OUT)	SUMP DEPTH
CB 1 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	934.90'		SP 1 – INV=930.46'	0.00'
CB 2 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	932.76'	SP 1 – INV=928.31'	SP 2 – INV=928.21'	0.00'
CB 3 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	931.23'	SP 3 – INV=925.78'	SP 4 – INV=925.68'	0.00'
CB 4 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.63'		SP 6 – INV=925.18'	0.00'
CB 5 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	926.47'		SP 19 – INV=922.22'	0.00'
CB 6 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.64'		SP 8 – INV=925.04'	0.00'
CB 7 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	926.43'		SP 9 – INV=921.98'	0.00'
CB 8 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	934.47'		SP 10 – INV=929.87'	0.00'
CB 9 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	932.85'		SP 11 – INV=928.25'	0.00'
CB 10 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	928.89'		SP 12 – INV=924.39'	0.00'
CB 11 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.15'		SP 13 – INV=924.50'	0.00'
CB 12 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	923.59'		SP 20 – INV=920.18'	0.00'
CB 13 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	928.07'	SP 9 – INV=921.70'	SP 21 – INV=921.60'	0.00'
MH 1 48" MANHOLE SEE DETAIL 1/C451	933.65'	SP 2 – INV=927.24'	SP 3 – INV=927.14'	0.00'
MH 2 60" MANHOLE SEE DETAIL 1/C451	930.83'	SP 4 – INV=925.44' SP 5 – INV=918.63'	SP 17 – INV=918.53'	2.00'
MH 3 48" MANHOLE SEE DETAIL 1/C451	930.55'	SP 6 – INV=924.78' SP 8 – INV=919.98' SP 7 – INV=919.98'	SP 5 – INV=919.23'	0.00'
MH 4 48" MANHOLE SEE DETAIL 1/C451	931.50'	SP 10 – INV=926.90' SP 11 – INV=926.50'	SP 16 – INV=926.40'	0.00'
MH 5 48" MANHOLE SEE DETAIL 1/C451	928.77'	SP 13 – INV=924.07' SP 16 – INV=924.15'	SP 18 – INV=923.97'	0.00'
MH 6 60" MANHOLE SEE DETAIL 1/C451	928.26'	SP 18 – INV=921.00' SP 12 – INV=923.24' SP 15 – INV=919.03'	SP 14 – INV=918.53'	2.00'
MH 7 48" MANHOLE SEE DETAIL 1/C451	925.94'	SP 20 – INV=919.86'	SP 15 – INV=919.76'	0.00'
MH 8 48" MANHOLE SEE DETAIL 1/C451	929.01'	SP 21 – INV=921.00' SP 19 – INV=921.73'	SP 7 – INV=920.90'	0.00'
MH 9 OUTLET STRUCTURE 72" MANHOLE SEE DETAIL 1/C451	925.90'	SP 22 – INV=918.50'	SP 23 – INV=917.50'	0.00'

RED SWING GROUP
ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:



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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 1 OF 4

SHEET NO.
C450

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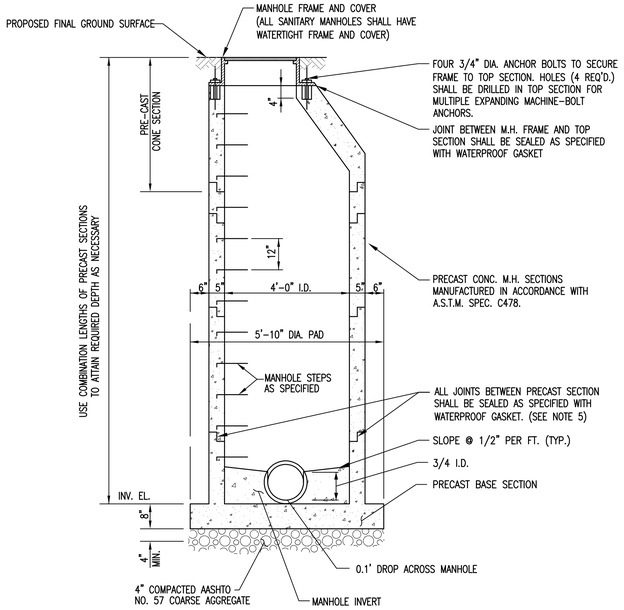
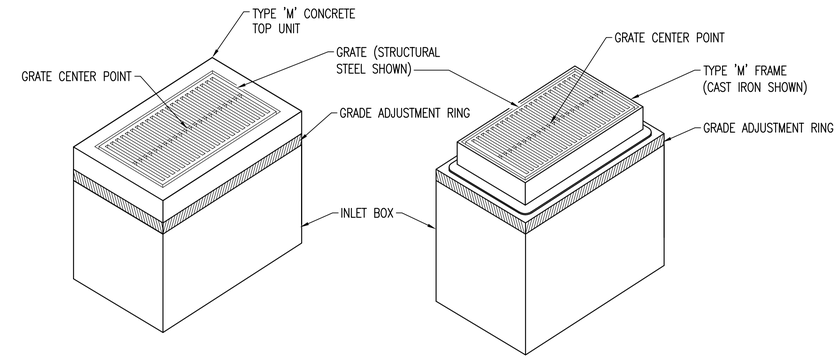


1. USE PRECAST CONCRETE GRADE ADJUSTMENT RINGS BETWEEN TOP SECTION AND FRAME TO RAISE MANHOLE TOP HEIGHT IF NECESSARY.
2. USE ANCHOR BOLTS AND WATERPROOF GASKET AS SPECIFIED.
3. EACH SECTION TO BE SUPPLIED WITH LIFTING HOLES WHICH ARE TO BE GROUTED WITH WATERPROOF GROUT.
4. SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.
5. MAXIMUM RISER HEIGHT SHALL BE LIMITED TO 1 FOOT.
6. JOINTS SHALL BE SEALED AT BOTH THE TOP AND BOTTOM LIPS OF THE JOINT.

MANHOLE DIAMETER BASED ON MAXIMUM PIPE SIZE			
MANHOLE DIAMETER	IF STRAIGHT THRU PIPE	IF 90° ANGLE PIPE	IF 180° ANGLE PIPE
48"	24"	18"	24"
60"	33"	27"	33"
72"	36"	33"	36"
84"	48"	36"	48"
96"	54"	42"	54"

STANDARD PRECAST MANHOLE (1)
NOT TO SCALE

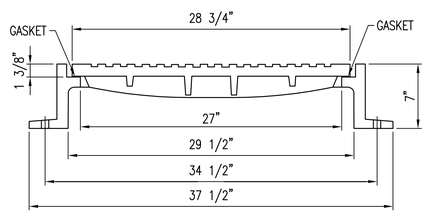


TYPE M INLET

NOTES:
1. CONSTRUCT IN ACCORDANCE WITH PADOT PUBLICATION 408, SECTIONS 605, 606 AND 714.
2. SUBMIT SHOP DRAWINGS FOR OWNER REVIEW.

PENNDOT TYPE 'M' INLET (RC-34M) (2)
NOT TO SCALE

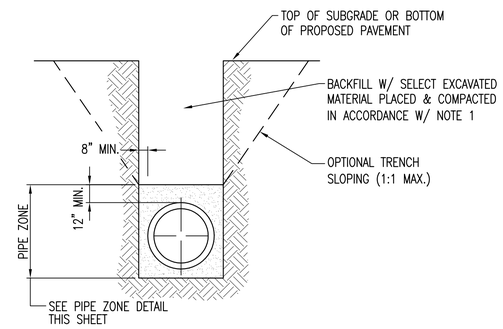
NOTE:
CONTRACTOR MAY SUBSTITUTE MANHOLE FRAME AND COVER BY OTHER MANUFACTURERS WHICH ARE ACCEPTABLE TO THE MUNICIPALITY AND ARE SIMILAR IN DIMENSIONS AND WEIGHT.



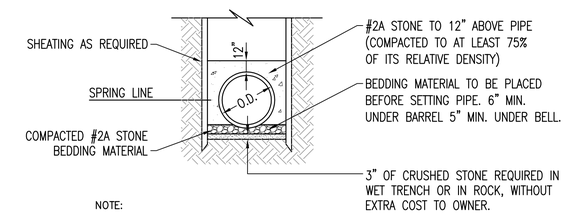
TYPE:
MANHOLE FRAME, SOLID LID DETAIL (NEENAH R-1753-A, EAST JORDAN IRON WORKS, EQUIVALENT) (SELF-SEALING)

*HEAVY DUTY
TOTAL WEIGHT 455 POUNDS
WITH 4-7/8" ANCHOR BOLT HOLES

MANHOLE LID (3)
NOT TO SCALE

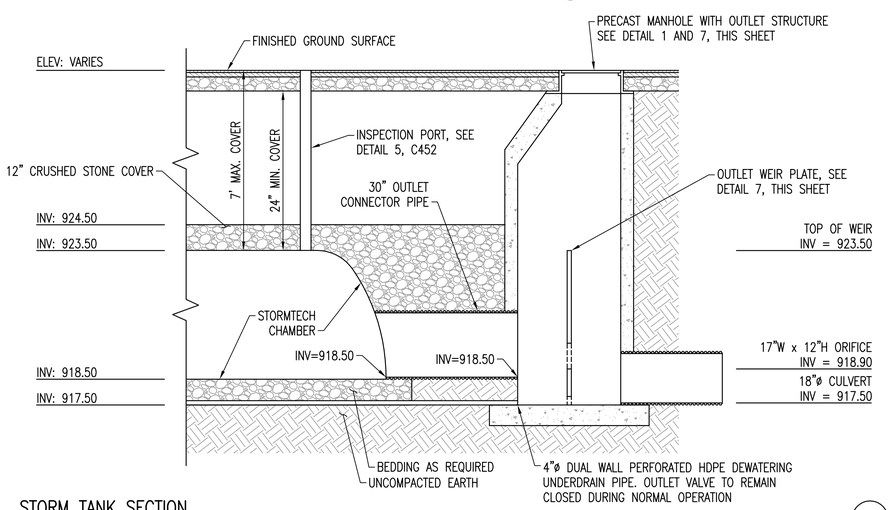


TRENCH SECTION FOR STORM PIPE (4)
NOT TO SCALE

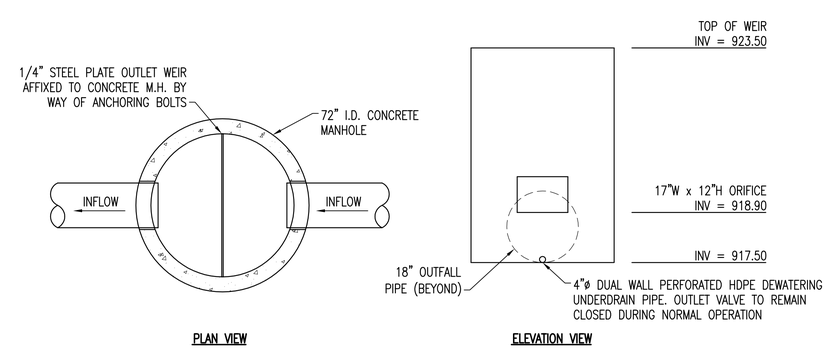


NOTE:
1) THE TRENCH WALL SHALL BE SUBSTANTIALLY VERTICAL IN THE PIPE ZONE. MAXIMUM TRENCH WIDTH SHALL BE OD + 24 INCHES AND MINIMUM TRENCH WIDTH SHALL BE OD + 16 INCHES.

PIPE ZONE FOR STORM PIPE (5)
NOT TO SCALE



STORM TANK SECTION (6)
NOT TO SCALE



NOTES:
WEIR PLATE AND MOUNTING HARDWARE SHALL BE GALVANIZED TO PREVENT CORROSION.

WEIR PLATE DETAIL (7)
NOT TO SCALE

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JACOB WELAND
ENGINEER
No. PE084705
3/13/2023

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POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 2 OF 4

SHEET NO.
C451

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IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

ADS
Advanced Drainage Systems, Inc.

SiteASSIST®
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/IN/IN. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418 AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

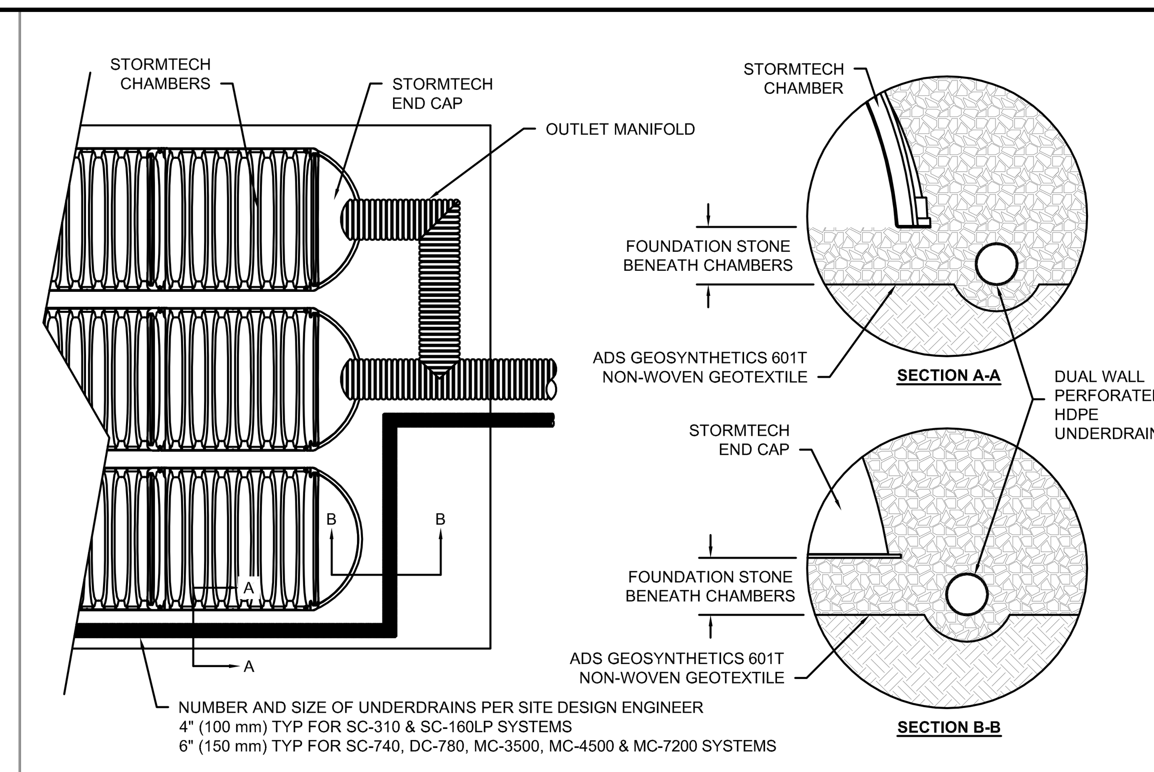
1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

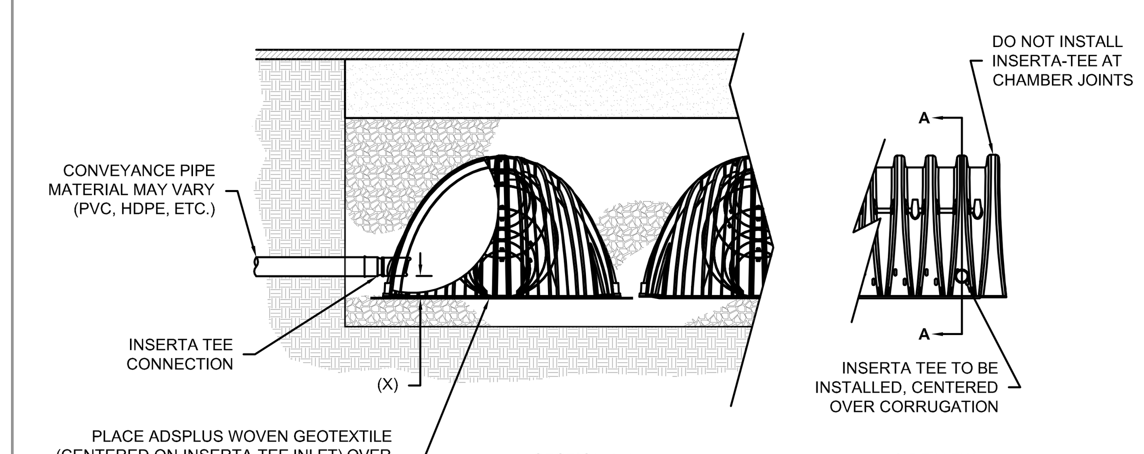
1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



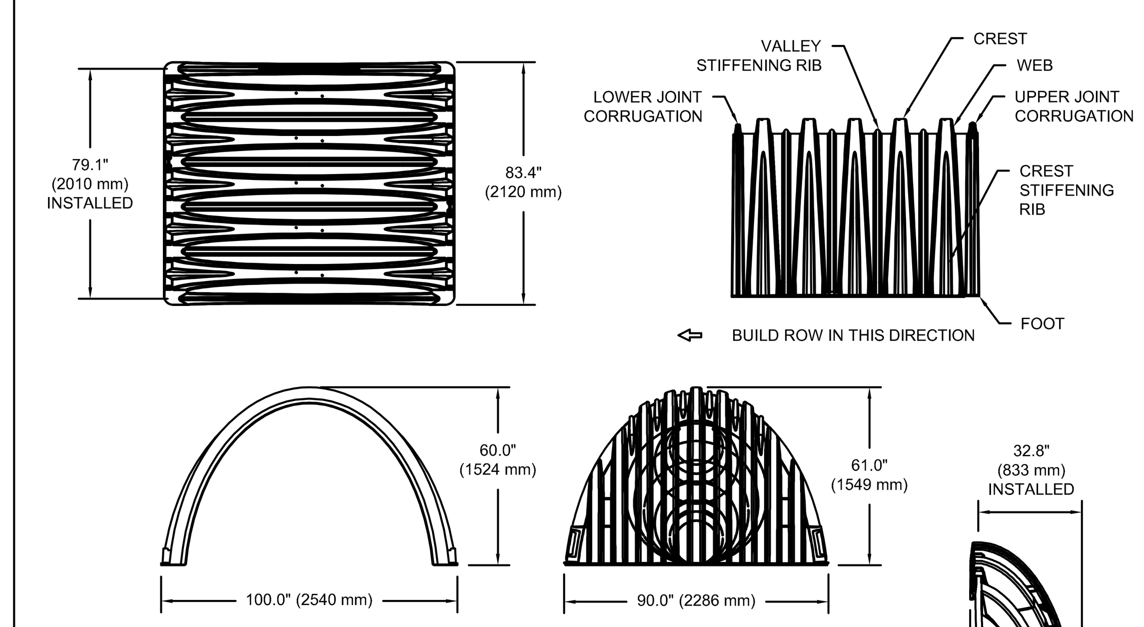
1 UNDERDRAIN DETAIL



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
MC-7200	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

2 INSERTA-TEE SIDE INLET DETAIL



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

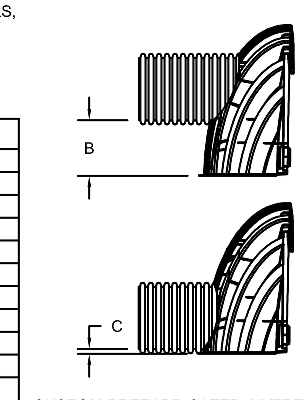
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

3 MC-7200 TECHNICAL SPECIFICATIONS

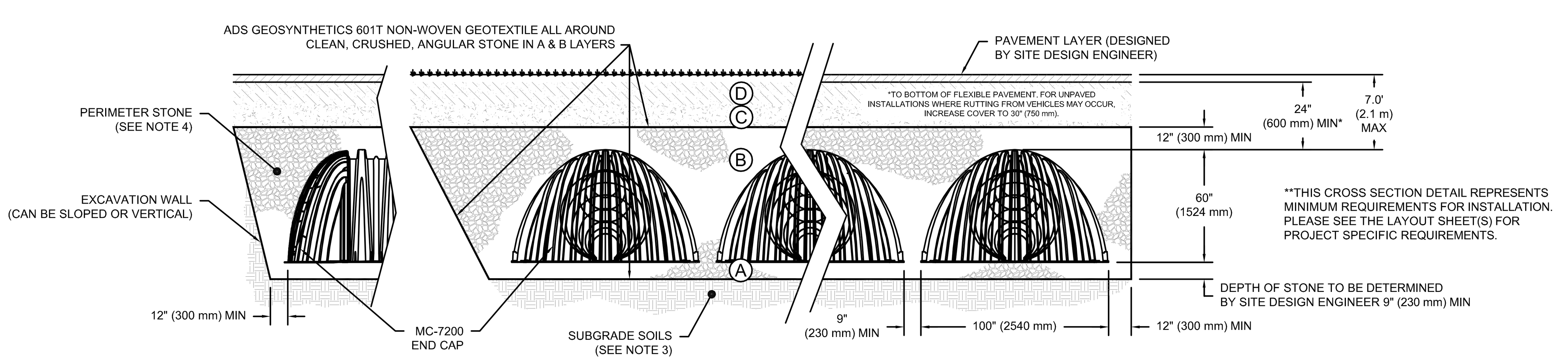
MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS	POTENTIAL REMEDIES (to be performed within 24hrs or as soon as practical)
Stormwater Chamber System	Quarterly within the 1st year of operation *(Annually Thereafter)*	Sediment level buildup	Remove and properly dispose of sediment as necessary per manufacturer's recommendations.
		Clogging of inlet/outlet structure	Clear inlet/outlet structures of debris.
		Excessive leaf litter	Clean and remove as necessary.
Vegetation	Once a week and after every runoff event	Sediment at toe of slope	Check for toe of slope diversion and install if needed.
		Rills and gullies forming	Fill rills and re-grade gullied slopes.
		Bare soil patches	Reseed, fertilize, and mulch bare areas.
Storm Sewers	After every runoff event	Sediment buildup reducing flow capacity	Remove accumulated sediment and/or debris.
		Flooding around or below inlet	Remove accumulated debris from inlet grate.

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



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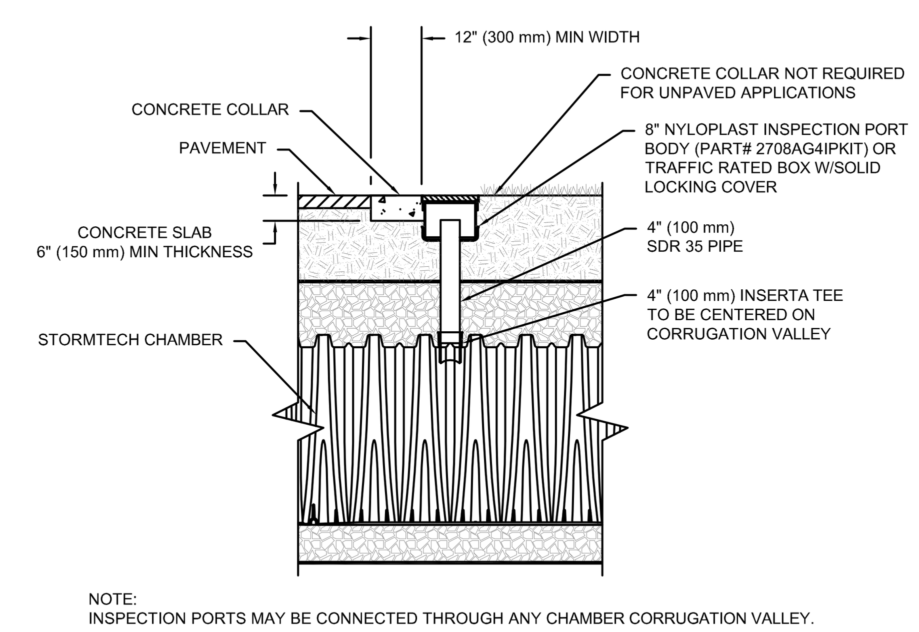
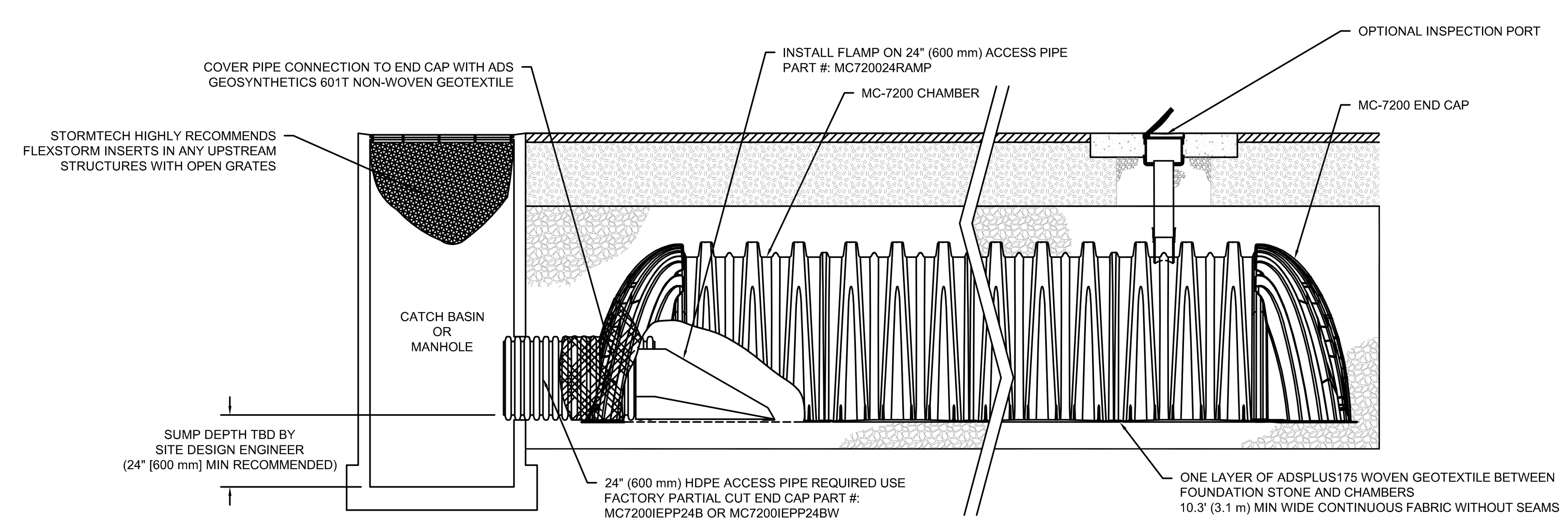
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

4 MC-7200 CROSS SECTION DETAIL



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

5 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)



MC-7200 ISOLATOR ROW PLUS DETAIL
NTS

RED SWING GROUP
ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY, SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
JACOB WIELAND
No. PE084705
3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

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MARK	DATE	DESCRIPTION
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PROJ NO: 22-1029
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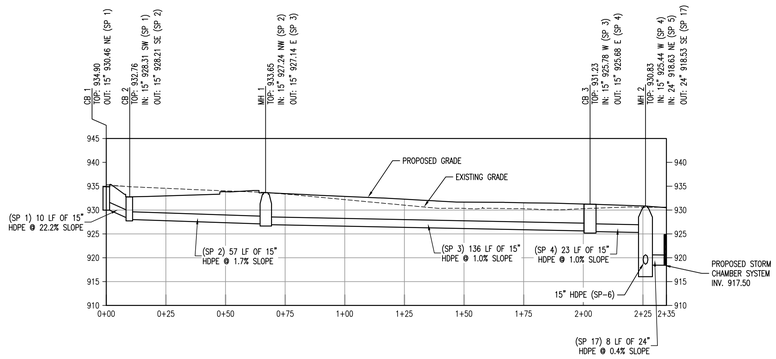
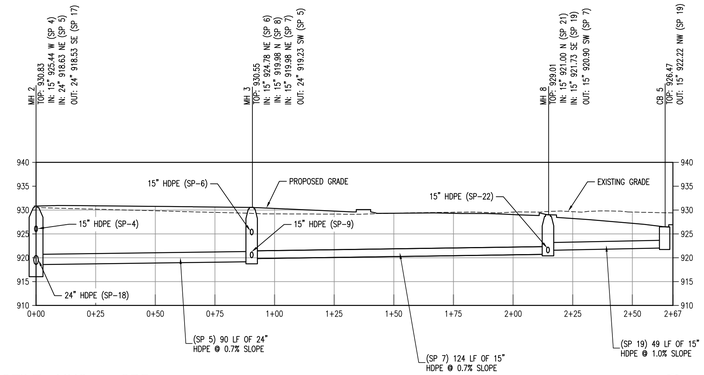
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 3 OF 4

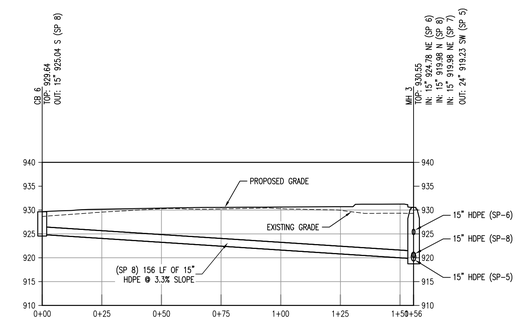
SHEET NO.
C452



PROFILE: CB1 – STORM TANK (1)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'



PROFILE: MH2 – CB5 (2)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'



PROFILE: CB6 – MH3 (3)
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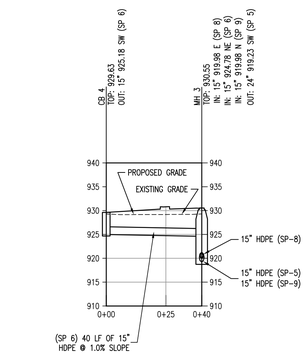

PROFILE: CB4 – MH3 (4)
HORIZONTAL SCALE: 1"=30'
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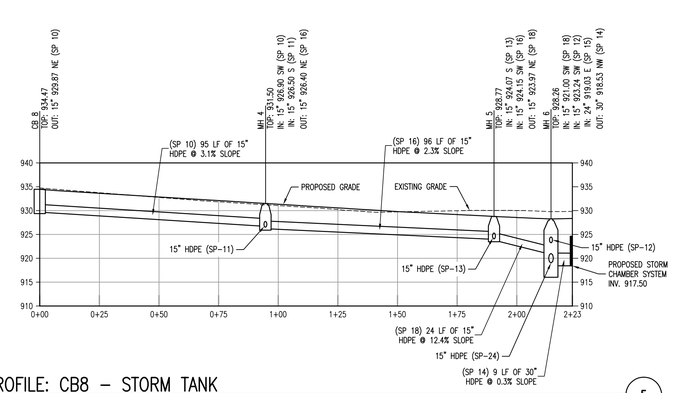

PROFILE: CB8 – STORM TANK (5)
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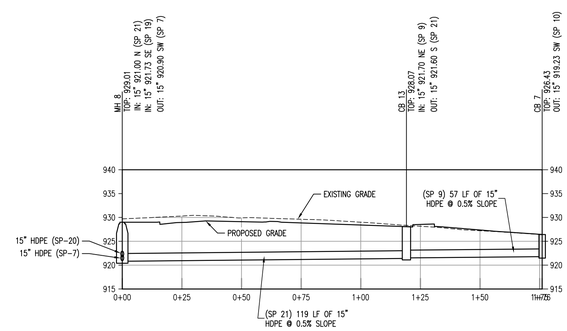
VERTICAL SCALE: 1"=15'



PROFILE: MH8 – CB7 (6)
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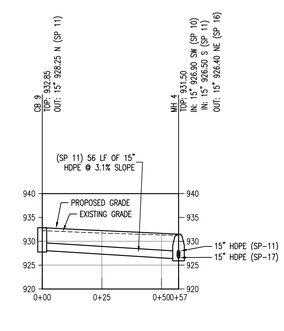
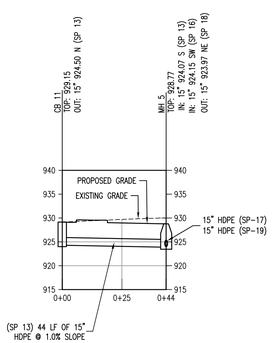
VERTICAL SCALE: 1"=15'



PROFILE: CB9 – MH4 (7)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'



PROFILE: CB11 – MH5 (8)
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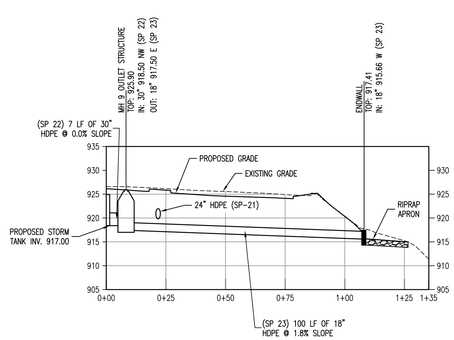
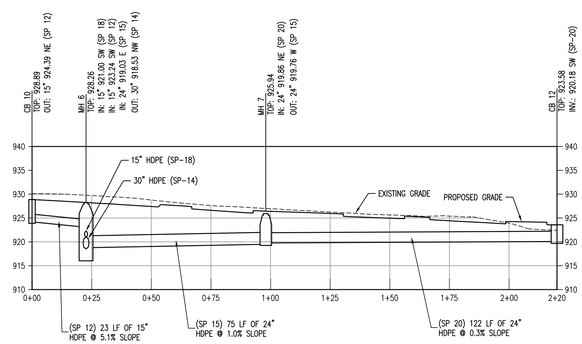
VERTICAL SCALE: 1"=15'



PROFILE: STORM TANK – DISCHARGE POINT 001 (9)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'



PROFILE: CB10 – CB12 (10)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

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ENGINEER
No. PE084705
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SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 4 OF 4

SHEET NO.
C453

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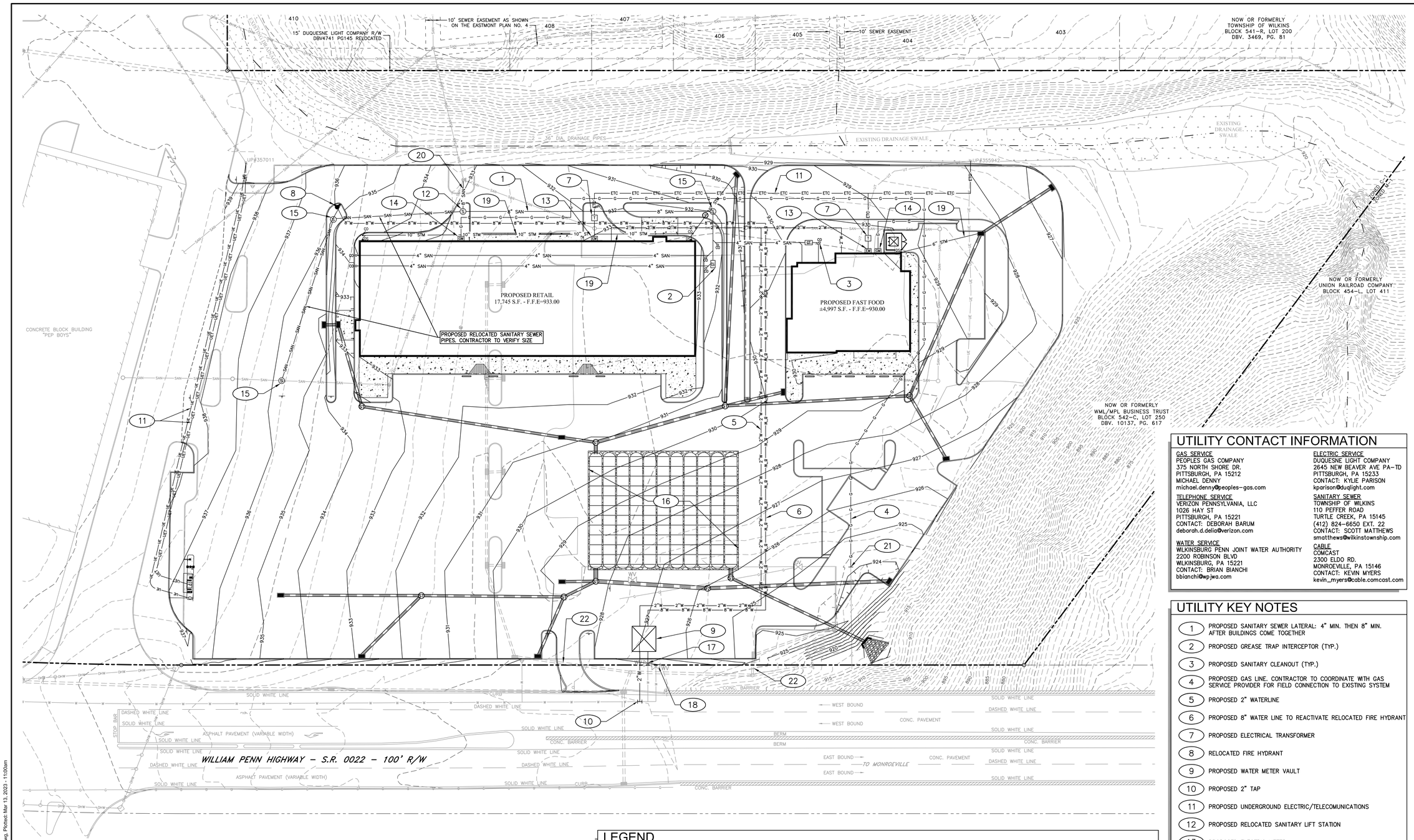

UTILITY CONTACT INFORMATION

GAS SERVICE
PEOPLES GAS COMPANY
375 NORTH SHORE DR.
PITTSBURGH, PA 15212
MICHAEL DENNY
michael.denny@peoples-gas.com

TELEPHONE SERVICE
VERIZON PENNSYLVANIA, LLC
1026 HAY ST
PITTSBURGH, PA 15221
CONTACT: DEBORAH BARUM
deborah.d.delia@verizon.com

WATER SERVICE
WILKINSBURG PENN JOINT WATER AUTHORITY
2200 ROBINSON BLVD
WILKINSBURG, PA 15221
CONTACT: BRIAN BIANCHI
bbianchi@wpjwa.com

ELECTRIC SERVICE
DUQUESNE LIGHT COMPANY
2645 NEW BEAVER AVE PA-TD
PITTSBURGH, PA 15233
CONTACT: KYLIE PARISON
kparison@duqlight.com

SANITARY SEWER
TOWNSHIP OF WILKINS
110 PEFFER ROAD
TURTLE CREEK, PA 15145
(412) 824-6650 EXT. 22
CONTACT: SCOTT MATTHEWS
smatthews@wilkinstownship.com

CABLE
COMCAST
2300 ELDO RD.
MONROEVILLE, PA 15146
CONTACT: KEVIN MYERS
kevin_myers@cable.comcast.com

UTILITY KEY NOTES

1. PROPOSED SANITARY SEWER LATERAL: 4" MIN. THEN 8" MIN. AFTER BUILDINGS COME TOGETHER
2. PROPOSED GREASE TRAP INTERCEPTOR (TYP.)
3. PROPOSED SANITARY CLEANOUT (TYP.)
4. PROPOSED GAS LINE. CONTRACTOR TO COORDINATE WITH GAS SERVICE PROVIDER FOR FIELD CONNECTION TO EXISTING SYSTEM
5. PROPOSED 2" WATERLINE
6. PROPOSED 8" WATER LINE TO REACTIVATE RELOCATED FIRE HYDRANT
7. PROPOSED ELECTRICAL TRANSFORMER
8. RELOCATED FIRE HYDRANT
9. PROPOSED WATER METER VAULT
10. PROPOSED 2" TAP
11. PROPOSED UNDERGROUND ELECTRIC/TELECOMUNICATIONS
12. PROPOSED RELOCATED SANITARY LIFT STATION
13. PROPOSED ELECTRIC METER
14. PROPOSED GAS METER
15. PROPOSED SANITARY SEWER MANHOLE
16. PROPOSED UNDERGROUND STORMWATER STORAGE SYSTEM WITH INFILTRATION BED
17. EXISTING 8" TAP AT VALVE
18. EXISTING BLOW-OFF VALVE
19. PROPOSED ROOF DRAIN
20. PROPOSED EXTENSION OF FORCED MAIN
21. PROPOSED GAS SERVICE CONNECTION
22. CAP EXISTING STORM SEWER

LEGEND

- PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM
- PROPOSED STORM PIPE
- PROPOSED RIPRAP
- PROPOSED STORM MANHOLE
- PROPOSED PENNDOT TYPE 'M' INLET
- PROPOSED CONCRETE ENDWALL
- PROPOSED CLEANOUT
- PROPOSED GREASE TRAP INTERCEPTOR
- PROPOSED SANITARY MANHOLE
- PROPOSED ELECTRIC TRANSFORMER
- PROPOSED GAS METER
- EXISTING GAS LINE
- EXISTING WATER LINE
- EXISTING SANITARY SEWER
- EXISTING ELECTRIC
- EXISTING MINOR (1 FT)
- EXISTING MAJOR (5 FT)
- EXISTING DRAINAGE SWALE
- PROPOSED ELECTRIC METER
- PROPOSED ROOF LEADER CLEANOUT
- PROPOSED ROOF DRAIN DOWNSPOUT
- PROPOSED ROOF DRAIN
- PROPOSED 4" SANITARY SEWER
- PROPOSED 8" SANITARY SEWER
- PROPOSED RELOCATED SEWER LINE
- PROPOSED UNDERGROUND ELECTRIC, TELEPHONE AND CABLE
- PROPOSED GAS LINE
- PROPOSED WATER LINE
- PROPOSED UNDERGROUND ELECTRIC AND TELECOMMUNICATIONS
- PROPOSED MINOR (1 FT)
- PROPOSED MAJOR (5 FT)
- EXISTING STORM PIPE
- EXISTING FENCE
- PROPERTY LINE
- ADJOINING PROPERTY LINE

Know what's **below.** **Call** before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

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GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

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ENGINEERS & SURVEYORS
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SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

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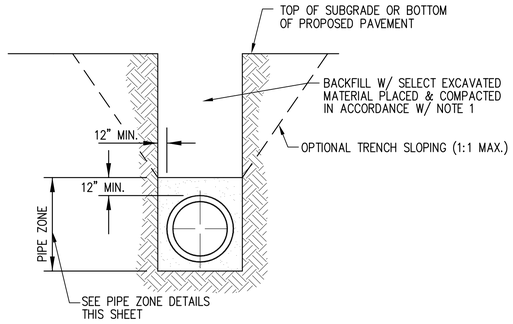
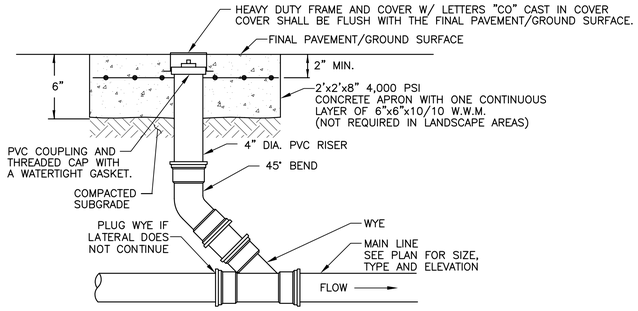
SHEET TITLE:
UTILITY PLAN

SHEET NO.
C500



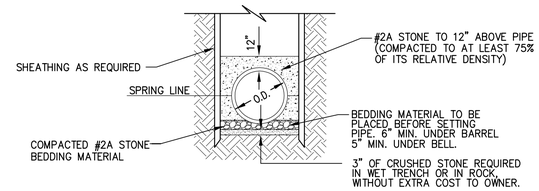
NOTE:
1) THE TRENCH WALL SHALL BE SUBSTANTIALLY VERTICAL IN THE PIPE ZONE. MAXIMUM TRENCH WIDTH SHALL BE OD + 24 INCHES AND MINIMUM TRENCH WIDTH SHALL BE OD + 16 INCHES.

TRENCH SECTION – STORM & SANITARY (1)
NOT TO SCALE

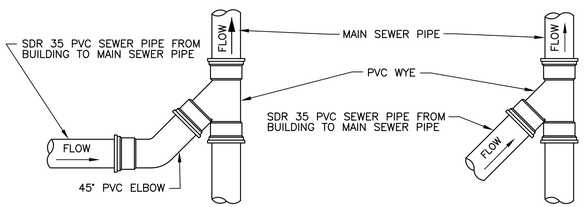


NOTES:
1. THIS DETAIL APPLIES TO STORM AND SANITARY SEWER CLEANOUTS WITH APPROPRIATE CHANGES TO WYE AND PIPE SIZES, AND PIPE MATERIALS.
2. ALL PVC PIPE AND FITTINGS SHALL BE MINIMUM SDR 35 WITH RUBBER GASKETED JOINTS.

TYPICAL CLEANOUT (2)
NOT TO SCALE

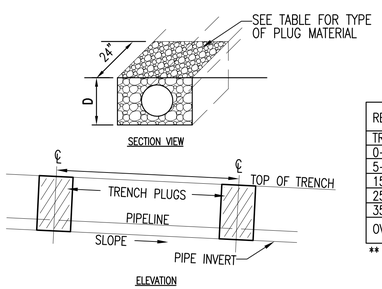


PIPE ZONE DETAIL – STORM & SANITARY (3)
NOT TO SCALE



NOTES:
1. THESE DETAILS APPLY TO STORM AND SANITARY SEWER CONNECTIONS WITH APPROPRIATE CHANGES TO WYE AND PIPE SIZES, AND PIPE MATERIALS.
2. ALL PVC PIPE AND FITTINGS SHALL BE MINIMUM SDR 35 WITH RUBBER GASKETED JOINTS.

TYPICAL WYE CONNECTION (4)
NOT TO SCALE



REQUIRED SPACING (L) AND MATERIAL FOR TRENCH PLUGS		
TRENCH SLOPE (%)	L (FEET)	PLUG MATERIAL
0–5	--	NONE
5–15	500	EARTH FILLED SACKS **
15–25	300	EARTH FILLED SACKS **
25–35	200	EARTH FILLED SACKS **
35–100	100	EARTH FILLED SACKS **
OVER 100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

** TOPSOIL MAY NOT BE USED TO FILL SACKS.

NOTES

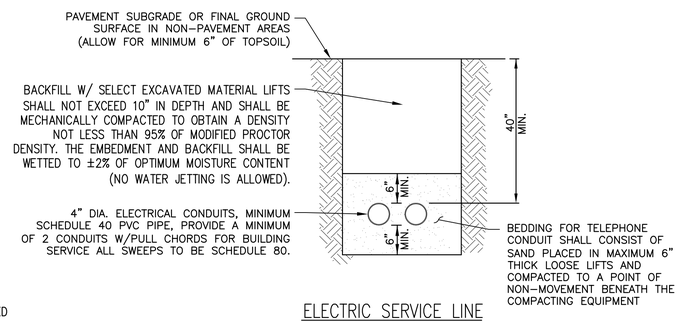
1. PIPELINES WITH JOINTS THAT ALLOW A MANUFACTURED LENGTH OF PIPE TO BE PLACED IN THE TRENCH WITH THE PIPE JOINT ASSEMBLED/MADE IN THE TRENCH REQUIRE AN OPEN PIPELINE TRENCH THAT IS ONLY SLIGHTLY LONGER THAN THE LENGTH OF PIPE BEING INSTALLED. THE TOTAL LENGTH OF EXCAVATED TRENCH OPEN AT ANY ONE TIME SHOULD NOT BE GREATER THAN THE TOTAL LENGTH OF PIPELINE/UTILITY LINE THAT CAN BE PLACED IN THE TRENCH AND BACK–FILLED IN ONE WORKING DAY. NO MORE THAN 50 LINEAL FEET OF OPEN TRENCH SHOULD EXIST WHEN PIPELINE/UTILITY LINE INSTALLATION CEASES AT THE END OF THE WORKDAY. SOIL SUPPLEMENTS, SEED AND MULCH SHOULD BE APPLIED WITHIN SEVEN DAYS AFTER THE PIPELINE/UTILITY LINE IS INSTALLED.

2. WATER WHICH ACCUMULATES IN THE OPEN TRENCH IS TO BE COMPLETELY REMOVED BY PUMPING, WITH THE USE OF FILTER BAGS; BEFORE PIPE PLACEMENT AND/OR BACKFILLING BEGINS.

UTILITY EXCAVATION TRENCH PLUGS (5)
NOT TO SCALE

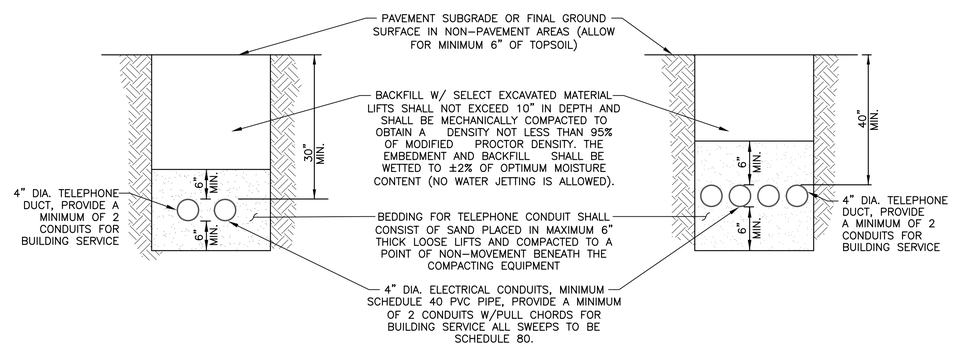
TRENCHING NOTES:

1. LIFTS SHALL NOT EXCEED 10" IN DEPTH AND SHALL BE MECHANICALLY COMPACTED TO OBTAIN A DENSITY NOT LESS THAN 95% OF MODIFIED PROCTOR DENSITY. THE EMBEDMENT AND BACKFILL SHALL BE WETTED TO ±2% OF OPTIMUM MOISTURE CONTENT (NO WATER JETTING IS ALLOWED).
2. THE TRENCH WALL SHALL BE SUBSTANTIALLY VERTICAL IN THE PIPE ZONE. MAXIMUM TRENCH WIDTH (W) SHALL BE O.D. + 24" AND MINIMUM TRENCH SHALL BE O.D. + 16".
3. NO ROCK WILL BE PERMITTED IN BACKFILL IN THE ZONE FROM BOTTOM OF TRENCH TO 2' ABOVE THE PIPE NOR IN THE TOP 18" OF TRENCH BACKFILL AT THE GROUND SURFACE. ROCK MAY BE PLACED ELSEWHERE IN THE BACKFILL PROVIDED THE SIZE OF PIECES IN THE LARGEST DIMENSION DOES NOT EXCEED 12".
4. SLOPING OF THE TRENCH SIDES ABOVE THE PIPE ZONE WILL BE ALLOWED



ELECTRIC SERVICE LINE

D = INSIDE DIAMETER
O.D. = OUTSIDE DIAMETER



TELEPHONE SERVICE LINE

COMBINED ELECTRIC AND TELEPHONE SERVICE LINE

D = INSIDE DIAMETER
O.D. = OUTSIDE DIAMETER

CONDUIT TRENCHING DETAIL (6)
NOT TO SCALE

RED SWING GROUP
ENGINEERS & SURVEYORS
4455 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

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WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

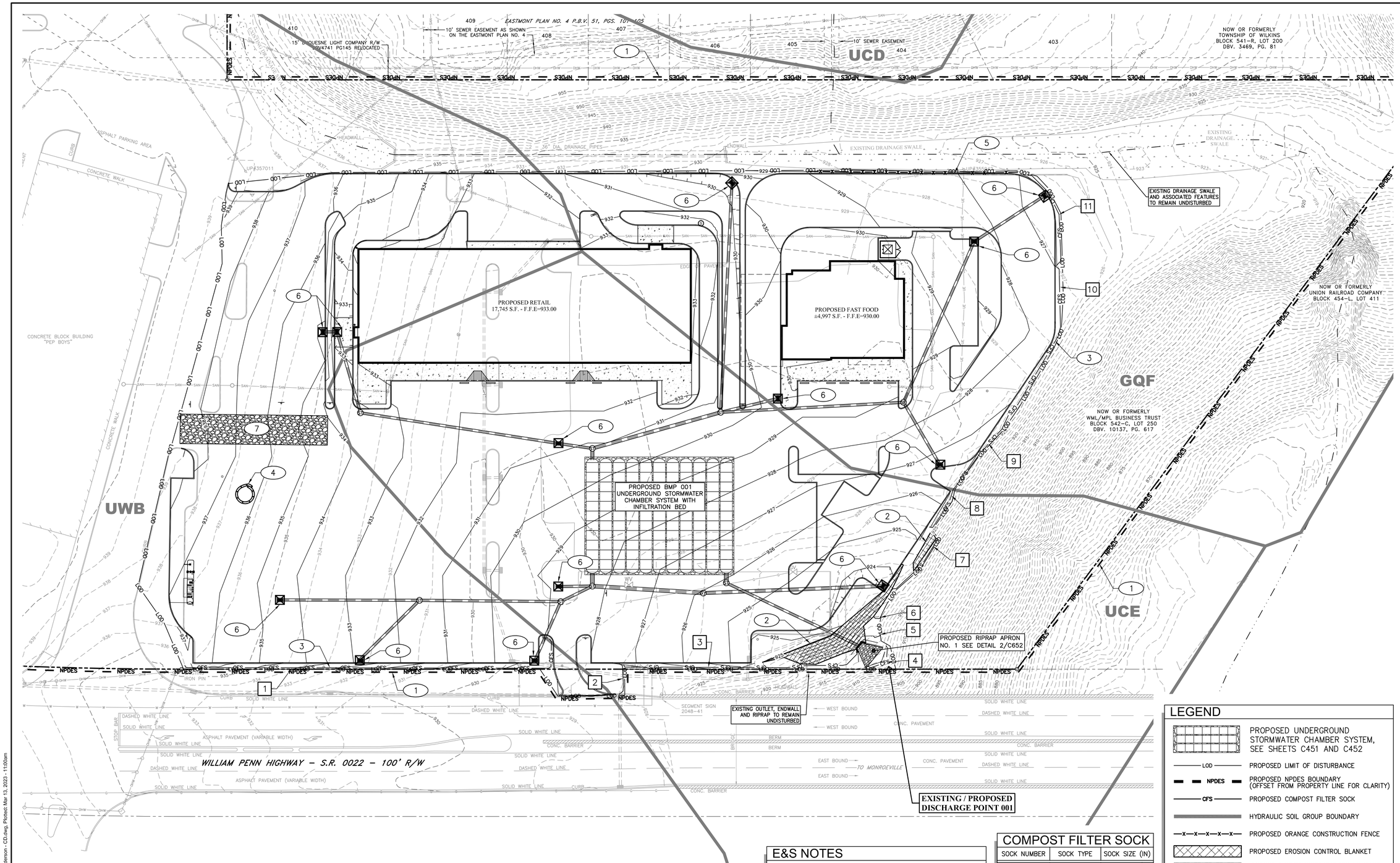
MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
UTILITY DETAILS

SHEET NO.
C550

C:\Users\jweland\AppData\Local\Temp\AcPublish_982422\1050 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 11:00am



E&S NOTES

1. PROPOSED NPDES BOUNDARY
2. PROPOSED EROSION CONTROL BLANKET, SEE 4/C651
3. PROPOSED COMPOST FILTER SOCK (TYP.) SEE 1&2/C651
4. PROPOSED CONCRETE WASHOUT AREA. SEE 3/C651
5. PROPOSED ORANGE CONSTRUCTION FENCE, SEE 1/C651
6. PROPOSED INLET PROTECTION, SEE 6/C651
7. PROPOSED ROCK CONSTRUCTION ENTRANCE, SEE 3/C652

COMPOST FILTER SOCK

SOCK NUMBER	SOCK TYPE	SOCK SIZE (IN)
1	J-HOOK CFS	12"
2	REGULAR CSF	12"
3	J-HOOK CFS	18"
4	REGULAR CSF	12"
5	REGULAR CSF	12"
6	J-HOOK CFS	12"
7	REGULAR CSF	12"
8	REGULAR CSF	12"
9	REGULAR CSF	12"
10	REGULAR CSF	12"
11	REGULAR CSF	12"

LEGEND

- PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM, SEE SHEETS C451 AND C452
- LOD — PROPOSED LIMIT OF DISTURBANCE
- NPDES — PROPOSED NPDES BOUNDARY (OFFSET FROM PROPERTY LINE FOR CLARITY)
- CFS — PROPOSED COMPOST FILTER SOCK
- HYDRAULIC SOIL GROUP BOUNDARY
- X—X—X—X—X — PROPOSED ORANGE CONSTRUCTION FENCE
- PROPOSED EROSION CONTROL BLANKET
- PROPOSED ROCK CONSTRUCTION ENTRANCE (AS NEEDED)
- PROPOSED INLET PROTECTION
- PROPOSED CONCRETE WASHOUT AREA
- EXISTING DRAINAGE SWALE
- 931 / 930 — EXISTING MINOR/MAJOR CONTOURS
- 931 / 930 — PROPOSED MINOR/MAJOR CONTOURS

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

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RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 — 3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
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SHEET TITLE:
EROSION AND SEDIMENTATION CONTROL PLAN

SHEET NO.
C600

GENERAL SEEDING SPECIFICATIONS

THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION RECOMMENDS USING THE PENN STATE "EROSION CONTROL AND CONSERVATION PLANTINGS ON NONCROPLAND" MANUAL AS A REFERENCE FOR SELECTION OF SPECIES, SEED SPECIFICATIONS, MIXTURES, LIMING AND FERTILIZING, TIME OF SEEDING, AND SEEDING METHODS. SPECIFICATIONS FOR THESE ITEMS MAY ALSO BE OBTAINED FROM THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408, SECTION 804 OR BY CONTACTING THE APPLICABLE COUNTY CONSERVATION DISTRICT.

VEGETATED AREAS WILL BE CONSIDERED PERMANENTLY STABILIZED WHEN A UNIFORM 70% VEGETATIVE COVER OF EROSION RESISTANT PERENNIAL SPECIES IS ACHIEVED, OR THE DISTURBED AREA IS COVERED WITH AN ACCEPTABLE BEST MANAGEMENT PRACTICE ("BMP") WHICH PERMANENTLY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION. UNTIL SUCH TIME AS THIS STANDARD IS ACHIEVED, INTERIM STABILIZATION MEASURES AND TEMPORARY EROSION AND SEDIMENT CONTROL BMPs THAT ARE USED TO TREAT PROJECT RUNOFF MAY NOT BE REMOVED.

TEMPORARY SEEDING SPECIFICATIONS

PRELIMINARY PREPARATION: ALL AREAS THAT WILL BE SEEDED MUST BE LOOSENED USING MECHANICAL MEANS. SOIL MUST BE LOOSENED TO A DEPTH OF AT LEAST TWO-INCHES.

LIME AND FERTILIZER: APPLY 1 TON OF AGRICULTURAL GRADE LIMESTONE PER ACRE AND FERTILIZER AS INDICATED BY THE SOIL TEST. IN THE ABSENCE OF A SOIL TEST, APPLY AGRICULTURAL GRADE LIMESTONE AT A RATE OF 1 TON PER ACRE, AND APPLY FERTILIZER AT 500 POUNDS OF 10-10-10 FERTILIZER PER ACRE (E.G., 166.67 POUNDS NITROGEN (N), 166.67 POUNDS PHOSPHOROUS (P_2O_5), AND 166.67 POUNDS POTASSIUM (K_2O) PER ACRE. WORK LIME AND FERTILIZER INTO SOIL WHERE POSSIBLE. LIME AND FERTILIZER DATA WAS OBTAINED FROM THE PADEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, TABLE 11.2.

SEED: ALL SEED MUST BEAR A GUARANTEED STATEMENT OF ANALYSIS AND MUST BE PROPORTIONED BY WEIGHT WITH THE MINIMUM PURITY, READY GERMINATION, AND TOTAL GERMINATION OUTLINED BELOW. SEED DATA WAS OBTAINED FROM THE PADEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, TABLES 11.3 AND 11.4.

SPECIES	PURITY (%)	READY GERMINATION (%)	TOTAL GERMINATION (%)	PURE LIVE SEED SEEDING RATE (LBS/ACRE)
SPRING-SUMMER				
SPRING OATS, OR	98	85	85	64
ANNUAL RYEGRASS	95	85	85	10
SUMMER-FALL				
ANNUAL RYEGRASS, OR	95	85	85	10
WINTER RYE, OR	98	85	85	90
WINTER WHEAT	98	85	85	112

1- PURE LIVE SEED (PLS) IS THE PRODUCT OF THE PERCENTAGE OF PURE SEED TIMES PERCENTAGE GERMINATION DIVIDED BY 100. FOR EXAMPLE, TO SECURE THE ACTUAL PLANTING RATE FOR ANNUAL RYEGRASS, DIVIDE THE PLS SEEDING RATE OF 10 LBS/ACRE BY THE PLS AS SHOWN ON THE SEED TAG. THUS, IF THE PLS CONTENT OF A GIVEN SEEDLOT IS 60%, DIVIDE 10 PLS (LBS/ACRE) BY 0.60 TO OBTAIN 16.7 LBS OF SEED REQUIRED TO PLANT ONE ACRE. ALL MIXTURES IN THIS TABLE ARE SHOWN IN TERMS OF PLS, LBS/ACRE.

MULCH: ALL SEEDED AREAS MUST BE IMMEDIATELY MULCHED TO PROMOTE ADEQUATE VEGETATIVE COVER. USE CLEAN OAT OR WHEAT STRAW, FREE OF WEEDS, NOT CHOPPED OR FINELY BROKEN. THE STRAW MUST BE FREE FROM MATURE SEED-BEARING STALKS OR ROOTS OF PROHIBITED OR NOXIOUS WEEDS AS DEFINED BY THE PENNSYLVANIA SEED ACT OF 1947.

APPLY MULCH AT A RATE OF 3 TONS PER ACRE (I.E., 140 POUNDS PER 1,000 SQUARE FEET OR 1,240 POUNDS PER 1,000 SQUARE YARDS). THE MULCH MUST BE ANCHORED IMMEDIATELY AFTER APPLICATION. A TRACTOR-DRAWN IMPLEMENT MAY BE USED TO ANCHOR THE MULCH INTO THE SOIL. THIS METHOD IS LIMITED TO SLOPES SHALLOWER THAN OR EQUAL TO 3:1 AND THE EQUIPMENT MUST BE OPERATED ON THE CONTOUR.

PERMANENT SEEDING SPECIFICATIONS

PRELIMINARY PREPARATION: GRADE AS NECESSARY TO BRING SUBGRADE TO A TRUE, SMOOTH SLOPE PARALLEL TO AND SIX INCHES BELOW FINISH GRADE (I.E., 8 INCHES FOR BASIN EMBANKMENTS WHEN APPLICABLE). PLACE TOPSOIL OVER SPECIFIED AREAS. TOPSOIL SHOULD BE AT A GREATER THICKNESS (I.E., GENERALLY 6 TO 8 INCHES) THAN THE FINISHED GRADE TO ALLOW FOR SETTLEMENT AND LIGHT ROLLING. THE FINAL COVER MUST CONFORM TO THE PROPOSED LINES, GRADES AND ELEVATIONS.

LIME AND FERTILIZER: APPLY AGRICULTURAL-GRADE LIMESTONE AND FERTILIZER AS PER THE RECOMMENDATIONS INDICATED BY THE SOIL TEST. IN THE ABSENCE OF A SOIL TEST, APPLY AGRICULTURAL GRADE LIMESTONE AT A RATE OF 6 TONS PER ACRE, AND APPLY 1,000 POUNDS OF 10-20-20 FERTILIZER (E.G., 250 POUNDS NITROGEN (N), 500 POUNDS PHOSPHORUS (P_2O_5), AND 500 POUNDS POTASSIUM (K_2O) PER ACRE.) WORK LIME AND FERTILIZER INTO SOIL WHERE POSSIBLE. LIME AND FERTILIZER DATA WAS OBTAINED FROM THE PADEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, TABLE 11.2.

THE FERTILIZER AND LIMESTONE MUST BE THOROUGHLY INCORPORATED INTO THE SOIL BY MECHANICAL MEANS (E.G., ROTOTILLING) TO A MINIMUM DEPTH OF 4 INCHES.

THE ENTIRE SURFACE MUST THEN BE REGRADED AND ROLLED. ALL AREAS THAT WILL BE SEEDED MUST BE LOOSENED USING MECHANICAL MEANS. SOIL MUST BE LOOSENED TO A DEPTH OF AT LEAST TWO INCHES.

SEED: SEEDING MUST BE CONDUCTED AS TWO SEPARATE OPERATIONS. THE FIRST SEEDING OPERATION MUST BE COMPLETED PRIOR TO STARTING THE SECOND SEEDING OPERATION. THE SECOND SEEDING MUST BE CONDUCTED IMMEDIATELY AFTER THE FIRST SEEDING AND AT RIGHT ANGLES TO THE FIRST SEEDING. THE SEEDS MUST BE LIGHTLY RAKED INTO THE SOIL.

ALL SEED MUST BEAR A GUARANTEED STATEMENT OF ANALYSIS AND MUST BE 100% PROPORTION BY WEIGHT WITH THE MINIMUM PURITY, READY GERMINATION, AND TOTAL GERMINATION OUTLINED BELOW. SEED DATA WAS OBTAINED FROM THE PADEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, TABLES 11.3 AND 11.4.

SPECIES	PURITY (%)	READY GERMINATION (%)	TOTAL GERMINATION (%)	PURE LIVE SEED[1] SEEDING RATE (LBS/ACRE)
SPRING-SUMMER				
REDTOP	92	80	80	3
BIG BLUESTEM[2]	95	80	80	60
ANNUAL RYEGRASS	95	85	85	10
SUMMER-FALL				
REDTOP	92	80	80	3
BIG BLUESTEM[2]	95	80	80	60
WINTER RYE	98	85	85	10

1- PURE LIVE SEED (PLS) IS THE PRODUCT OF THE PERCENTAGE OF PURE SEED TIMES PERCENTAGE GERMINATION DIVIDED BY 100. FOR EXAMPLE, TO SECURE THE ACTUAL PLANTING RATE FOR REDTOP, DIVIDE THE PLS SEEDING RATE OF 3 LBS/ACRE BY THE PLS SHOWN ON THE SEED TAG. THUS, IF THE PLS CONTENT OF A GIVEN SEEDLOT IS 60%, DIVIDE 3 PLS BY 0.60 TO OBTAIN 5.0 LBS OF SEED REQUIRED TO PLANT ONE ACRE. ALL MIXTURES IN THIS TABLE ARE SHOWN IN TERMS OF PLS, LBS/ACRE.

2- ALTERNATIVES: BIG BLUESTEM (ANDROPOGON GERARDII), LITTLE BLUESTEM (SCHIZACHYRIUM SCOPARIUM), INDIANGRASS (SORGASTRUM NUTANS) AND SWITCHGRASS (PANICUM VIRGATUM).

MULCH: ALL SEEDED AREAS MUST BE IMMEDIATELY MULCHED TO PROMOTE ADEQUATE VEGETATIVE COVER. USE CLEAN OAT OR WHEAT STRAW, FREE OF WEEDS, NOT CHOPPED OR FINELY BROKEN. THE STRAW MUST BE FREE FROM MATURE SEED-BEARING STALKS OR ROOTS OF PROHIBITED OR NOXIOUS WEEDS AS DEFINED BY THE PENNSYLVANIA SEED ACT OF 1947.

APPLY MULCH AT A RATE OF 3 TONS PER ACRE (I.E., 140 POUNDS PER 1,000 SQUARE FEET OR 1,240 POUNDS PER 1,000 SQUARE YARDS). THE MULCH MUST BE ANCHORED IMMEDIATELY AFTER APPLICATION. A TRACTOR-DRAWN IMPLEMENT MAY BE USED TO ANCHOR THE MULCH INTO THE SOIL. THIS METHOD IS LIMITED TO SLOPES SHALLOWER THAN OR EQUAL TO 3:1 AND THE EQUIPMENT MUST BE OPERATED ON THE CONTOUR.

STEEP SLOPE SEEDING SPECIFICATIONS

STEEP SLOPE SEEDING MIXTURE (FOR USE ON GRADES AT 3:1 OR GREATER SLOPES): ALL SLOPES GREATER THAN 3:1 SHALL BE COVERED WITH AN EROSION CONTROL BLANKET IN ADDITION TO RECEIVING A GRASS SEEDING MIXTURE.

WHEN CONDITIONS PERMIT, THE FOLLOWING SEEDING MIXTURE CAN BE UTILIZED ON STEEP SLOPES. SEED DATA WAS OBTAINED FROM THE PADEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, TABLES 11.4 AND 11.5.

SPECIES	PURITY (%)	READY GERMINATION (%)	TOTAL GERMINATION (%)	PURE LIVE SEED[1] SEEDING RATE (LBS/ACRE)
ANNUAL RYEGRASS	95	85	85	10
BIRDSFOOT TREFOIL	98	60	80	6
BIG BLUESTEM[2]	95	80	80	30

1- PURE LIVE SEED (PLS) IS THE PRODUCT OF THE PERCENTAGE OF PURE SEED TIMES PERCENTAGE GERMINATION DIVIDED BY 100. FOR EXAMPLE, TO SECURE THE ACTUAL PLANTING RATE FOR ANNUAL RYEGRASS, DIVIDE THE PLS SEEDING RATE OF 10 LBS/ACRE BY THE PLS AS SHOWN ON THE SEED TAG. THUS, IF THE PLS CONTENT OF A GIVEN SEEDLOT IS 60%, DIVIDE 10 PLS (LBS/ACRE) BY 0.60 TO OBTAIN 16.7 LBS OF SEED REQUIRED TO PLANT ONE ACRE. ALL MIXTURES IN THIS TABLE ARE SHOWN IN TERMS OF PLS, LBS/ACRE.

2- ALTERNATIVES: BIG BLUESTEM (ANDROPOGON GERARDII), LITTLE BLUESTEM (SCHIZACHYRIUM SCOPARIUM), INDIANGRASS (SORGASTRUM NUTANS) AND SWITCHGRASS (PANICUM VIRGATUM).

FURTHER NOTES

EROSION AND SEDIMENTATION CONTROLS MUST BE CONSTRUCTED, STABILIZED, AND FUNCTIONAL BEFORE SITE DISTURBANCE WITHIN THE CONTRIBUTORY DRAINAGE AREAS OF THOSE CONTROLS.

AFTER FINAL SITE STABILIZATION IS ACHIEVED, TEMPORARY EROSION AND SEDIMENTATION CONTROLS MUST BE REMOVED. AREAS DISTURBED DURING REMOVAL OF THE CONTROLS MUST BE IMMEDIATELY STABILIZED. FINAL STABILIZATION IS DEFINED AS THE ACHIEVEMENT OF A MINIMUM UNIFORM 70% VEGETATIVE COVER OF EROSION RESISTANT PERENNIAL SPECIES HAS BEEN ACHIEVED ON ALL CONTRIBUTORY DRAINAGE AREAS.

SEDIMENT MUST BE REMOVED FROM INLET PROTECTION AFTER EACH RUNOFF EVENT.

ANY DISTURBED AREA ON WHICH ACTIVITY HAS CEASED AND WHICH WILL REMAIN EXPOSED FOR MORE THAN 4 DAYS MUST BE TEMPORARILY STABILIZED. DISTURBED AREAS THAT ARE EITHER AT FINISHED GRADE OR WILL NOT BE DISTURBED WITHIN ONE YEAR MUST BE STABILIZED IN ACCORDANCE WITH PERMANENT SEEDING SPECIFICATIONS.

CONSTRUCTION SEQUENCE

1. AT LEAST SEVEN (7) DAYS BEFORE STARTING EARTH DISTURBANCE ACTIVITIES, THE OPERATOR SHALL INVITE CONTRACTORS INVOLVED IN PROPOSED EARTH DISTURBANCE ACTIVITIES, THE LANDOWNER, APPROPRIATE MUNICIPAL OFFICIALS, AND A REPRESENTATIVE OF THE LOCAL CONSERVATION DISTRICT TO SCHEDULE AN ON-SITE PRECONSTRUCTION MEETING.
2. AT LEAST 3 DAYS BEFORE STARTING EARTH DISTURBANCE ACTIVITIES, CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM, INC. AT 1-800-242-1776 FOR BURIED UTILITY LOCATIONS.
3. STAKE OUT THE LIMIT OF DISTURBANCE FOR THE ACTIVE PORTION OF THE PROJECT.
4. INSTALL ROCK CONSTRUCTION ENTRANCE AS NEEDED. ALTERNATIVELY, A FODS STABILIZED CONSTRUCTION ENTRANCE (OR SIMILAR PADEP APPROVED DEVICE) MAY BE USED FOR ABOVE EXISTING PAVEMENT APPLICATIONS WITH APPROVAL FROM ENGINEER.
5. INSTALL COMPOST FILTER SOCK PROTECTION AND ORANGE CONSTRUCTION FENCE AS SHOWN ON THE PLAN.
6. INSTALL INLET PROTECTION AROUND EXISTING SITE INLETS.
7. PROCEED WITH SITE TOPSOIL STRIPPING AND GRUBBING OPERATIONS IN THE AREA ALONG THE PROPOSED CURB LINE TO THE EAST.
8. PROCEED WITH SITE DEMOLITION AND HAUL-OFF OPERATIONS.
9. AS THE BUILDING PAD AREA IS CLEARED, BEGIN SITEWORK ACTIVITIES TO BRING THE AREA ALONG THE PROPOSED CURB LINE TO THE EAST TO ROUGH GRADE ELEVATIONS PER GEOTECHNICAL RECOMMENDATIONS. FOR THIS PROPOSED PERVIOUS AREA, FILL SLOPE STABILIZATION SHOULD OCCUR IN 15 TO 25 FOOT VERTICAL INCREMENTS. NO MORE THAN 15,000 SQ FT OF DISTURBED AREA WHICH IS TO BE STABILIZED BY VEGETATION SHOULD REACH FINAL GRADE BEFORE INITIATING SEEDING AND MULCHING. DISTURBED SLOPES GREATER THAN 3:1 MUST BE COVERED WITH EROSION CONTROL BLANKETS AS SPECIFIED.
10. INSTALL CONCRETE WASHOUT FACILITY
11. INSTALL PUMPED WATER FILTER BAG (AS NEEDED).
12. BUILDING CONSTRUCTION MAY COMMENCE AFTER BUILDING AREAS REACH FINAL GRADE ELEVATIONS AND THE CONCRETE WASHOUT FACILITY IS INSTALLED.

IMPORTANT: OPEN FOUNDATION AREAS MUST BE PROTECTED FROM ACCUMULATING STORMWATER RUNOFF. STORMWATER THAT ACCUMULATES IN OPEN FOUNDATION AREAS MUST BE REMOVED VIA A PUMP AND FILTER BAG.

UNDERGROUND STORMWATER CHAMBER SYSTEM CONSTRUCTION SEQUENCE:

13. INSTALL THE ENDWALL AND RIPRAP APRON AT THE PROPOSED DISCHARGE POINT FOR THE SITE AS SHOWN ON THE PLANS AND DETAILS.
14. COMMENCE CONSTRUCTION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM.

14A. THE PIPE AND AFOREMENTIONED ENDWALL LEADING AWAY FROM THE CHAMBER SYSTEM OUTLET STRUCTURE SHALL BE INSTALLED ACCORDING TO THE PROJECT PLANS AND DETAILS.

14B. EXCAVATE TO THE BOTTOM OF THE SYSTEM SPECIFIED IN THE PROJECT PLANS AND DETAILS. COMPLETE THE FINAL CUT TO SUBGRADE IN THE EXCAVATION USING AN EXCAVATOR WITH A SMOOTH EDGED BUCKET TO AVOID DISTURBING THE SUBGRADE SOILS. REMOVE UNSUITABLE MATERIALS INCLUDING BUT NOT LIMITED TO OLD FOUNDATIONS, LARGE COBBLES/BOULDERS, CONSTRUCTION DEBRIS LEFT FROM DEMOLITION OF FORMER STRUCTURES, ORGANIC MATERIAL, ETC.

14C. PLACE PROPOSED GEOTEXTILE FABRIC IN BOTTOM OF EXCAVATION IN A MANNER THAT WILL ALLOW THE SIDES AND BOTTOM OF THE SYSTEM TO BE ENCAPSULATED ONCE CONSTRUCTED IN ACCORDANCE WITH PROJECT DETAILS TAKING CARE TO AVOID COMPACTION OF SUBGRADE SOILS.

14D. BACKFILL EXCAVATIONS WITH SPECIFIED DRAINAGE AGGREGATE TO THE ELEVATION OF THE INVERT OF THE UNDERGROUND CHAMBER SYSTEM, INLET PIPES, AND OUTLET PIPE. INSTALL CHAMBERS AND THE PIPES IN ACCORDANCE WITH PROJECT PLANS, DETAILS, AND MANUFACTURER'S INSTRUCTIONS. THE ENGINEER OR THEIR REPRESENTATIVE SHALL BE ALLOWED TO INSPECT THE OUTLET STRUCTURE AND OUTLET PIPE DURING THIS CRITICAL STAGE.

14E. INSTALL THE OUTLET STRUCTURE AS NECESSARY WHILE CONTINUING TO BACKFILL THE EXCAVATION. ENCAPSULATE THE CHAMBER SYSTEM SIDES AND BOTTOM IN THE SPECIFIED FABRIC PRIOR TO CONTINUING BACKFILLING.

IMPORTANT: THE INSTALLATION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM OUTLET STRUCTURE/PIPE IS A CRITICAL STAGE OF THE STORMWATER MANAGEMENT PLAN. THE CONTRACTOR SHALL CONTACT THE PROJECT ENGINEER ONE WEEK PRIOR TO EXPECTED OUTLET CONSTRUCTION SO THAT THE INSTALLATION CAN BE OBSERVED.

15. EXISTING ONSITE PAVEMENT SCHEDULED FOR DEMOLITION CAN BE REMOVED AND PROCESSED TO BE USED AS SITE FILL OR HAULED OFF SITE TO A PADEP APPROVED AND PERMITTED FACILITY.
16. COMMENCE INSTALLING SITE STORM PIPES AND STRUCTURES ENSURING NO WATER ENTERS THE STRUCTURES UNTIL AREAS TRIBUTARY TO THE STRUCTURES ARE STABILIZED. STORM PIPES AND STRUCTURES SHALL BE INSTALLED STARTING FROM THE DOWN GRADIENT END AND WORKING IN AN UP-GRADIENT MANNER. INSTALL FILTER INLET PROTECTION IN NEW INLETS AS THEY ARE INSTALLED. LIMIT DAILY TRENCH EXCAVATION AND STORM LINE INSTALLATION TO THE LENGTH OF PIPE PLACEMENT, BEDDING, AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING). TRENCH SPOILS SHALL BE USED UP-GRADIENT OF UTILITY TRENCH AS A TEMPORARY BERM TO DIVERT UPHILL RUNOFF FROM EXCAVATIONS.

IMPORTANT: STORMWATER RUNOFF IS NOT TO BE DIRECTED TO UNPROTECTED STORMWATER CONVEYANCE SYSTEMS UNTIL THE SITE IS AT FINAL GRADE AND STABILIZED.

17. INSTALL, AND IF APPLICABLE REROUTE, SANITARY SEWER LATERALS. LIMIT DAILY TRENCH EXCAVATION AND SANITARY LINE INSTALLATION TO THE LENGTH OF PIPE PLACEMENT, BEDDING, AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING).

IMPORTANT: WHEN REROUTING THE WESTERN-MOST SANITARY LATERAL, CONTRACTOR TO COORDINATE WITH THE PEP BOYS® LOCATION WHAT TIME IS MOST PRACTICAL TO COMMENCE WORK.

18. INSTALL BUILDING UTILITY SERVICE LINES AND CONDUITS. LIMIT DAILY TRENCH EXCAVATION AND UTILITY LINE INSTALLATION TO THE LENGTH OF PIPE PLACEMENT, BEDDING, AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING). EXISTING PAVEMENT AND/OR SIDEWALKS IN PATH OF UTILITY TRENCHING SHALL BE SAW-CUT AND/OR CONCRETE PANELS REMOVED TO NEAREST JOINT INSOFAR AS POSSIBLE.
19. FINE GRADE AREAS IN PREPARATION FOR PERMANENT SURFACING.
20. POUR AND APPROPRIATELY TOOL CONCRETE CURBING AND SIDEWALKS.
21. PLACE NEW CONCRETE/PAVEMENT SURFACES AND INSTALL SITE FEATURES. REMAINING AREAS SHALL RECEIVE PERMANENT SEEDING/PLANTING IN ACCORDANCE WITH THE LANDSCAPE PLAN, AND SEEDED AREAS ARE TO BE MULCHED PER PROJECT DETAILS.

THE SITE WILL BE CONSIDERED STABILIZED AND RESTORED WHEN A MINIMUM UNIFORM 70% VEGETATIVE COVER OF EROSION RESISTANT PERENNIAL SPECIES IS ACHIEVED IN PROPOSED LANDSCAPED/VEGETATED AREAS AND REMAINING AREAS ARE PAVED PER PROJECT PLANS.

22. WHEN SITE WORK IS COMPLETE AND AREAS ARE STABILIZED, REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL BMPS.

22A. COMPOST FILTER SOCK SHALL HAVE ITS STAKES REMOVED, THE MESH CUT OPEN, AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

22B. REMOVE AND DISPOSE OF CONCRETE WASHOUT FACILITY AND INLET FILTER PROTECTION IN ACCORDANCE WITH E&S GUIDELINES.

DISTURBANCE CAUSED AS A RESULT OF EROSION AND SEDIMENT CONTROL BMP REMOVAL SHALL BE IMMEDIATELY VEGETATED AND STABILIZED.

UTILITY TRENCH CONSTRUCTION SEQUENCE:

EXPOSED TRENCH EXCAVATIONS HAVE HIGH POTENTIAL FOR ACCELERATED EROSION AND SEDIMENT POLLUTION. SINCE THESE EXCAVATIONS ARE TYPICALLY LOCATED AT LOWER ELEVATIONS ALONG OR ACROSS EARTH DISTURBANCE SITES, OPEN TRENCHES SERVE TO CONCENTRATE SEDIMENT-LADEN RUNOFF AND CONVEY IT TO SITE BOUNDARIES OR WATERWAYS. AN EFFECTIVE MEASURE TO REDUCE EROSION AND SEDIMENTATION DURING UTILITY CONSTRUCTION IS TO LIMIT THE SPECIFIC SCHEDULE AND SCOPE OF WORK ACTIVITIES AS FOLLOWS DURING CONSTRUCTION:

1. LIMIT ADVANCE CLEARING AND GRUBBING OPERATIONS TO A DISTANCE OF TWO TIMES THE LENGTH OF PIPE INSTALLATION THAT CAN BE COMPLETED IN ONE DAY (WEATHER PERMITTING).
2. WORK CREWS AND EQUIPMENT FOR TRENCHING, PLACEMENT OF PIPE, PLUG CONSTRUCTION AND BACKFILLING WILL BE SELF-CONTAINED AND SEPARATE FROM CLEARING AND GRUBBING, SITE RESTORATION AND STABILIZATION OPERATIONS.
3. LIMIT DAILY TRENCH EXCAVATION TO THE LENGTH OF PIPE PLACEMENT, PLUG INSTALLATION AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING).
4. TRENCH PLUGS WILL BE SPACED AND CONSTRUCTED IN ACCORDANCE WITH THE TRENCH PLUG DETAIL ON THE PLAN SHEETS.
5. WATER THAT ACCUMULATES IN THE OPEN TRENCH WILL BE COMPLETELY REMOVED BY PUMPING WATER TO A CONTROL FACILITY OR FILTER BAG FOR THE REMOVAL OF SEDIMENT. WHEN THE FILTER BAG IS ½-FULL IT SHOULD BE REPLACED. ACCUMULATED SEDIMENT SHALL BE MIXED WITH SOIL AND PROPERLY DISPOSED OF ON THE SITE IF POSSIBLE OR DISPOSED OF AT AN OFFSITE AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF EXCESS MATERIAL OFF-SITE AT A DEP APPROVED FACILITY. OFFSITE DUMPING FACILITIES SHALL HAVE AN APPROVED EROSION & SEDIMENT CONTROL PLAN.
6. ON THE DAY FOLLOWING PIPE PLACEMENT AND TRENCH BACKFILLING, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, AND THE APPROPRIATE TEMPORARY EROSION CONTROL MEASURE OR FACILITY WILL BE INSTALLED. SEEDING AND MULCHING OF DISTURBED AREAS WILL BE PERFORMED AT THE END OF EACH WORK WEEK.

EXCEPTIONS:

IN CERTAIN SITUATIONS, TRENCHES CANNOT BE BACKFILLED UNTIL THE PIPE IS HYDROSTATICALLY TESTED, OR ANCHORS AND OTHER PERMANENT FEATURES ARE INSTALLED. IN THESE SITUATIONS, THE REQUIREMENTS LISTED ABOVE WILL REMAIN IN EFFECT WITH THE FOLLOWING EXCEPTIONS:

1. DAILY BACKFILLING OF THE TRENCH MAY BE DELAYED FOR SIX DAYS. PRESSURE TESTING AND THE COMPLETE BACKFILLING OF THE OPEN TRENCH MUST BE COMPLETED BY THE SEVENTH WORKING DAY.
2. IF DAILY BACKFILLING IS DELAYED, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, APPROPRIATE TEMPORARY EROSION CONTROLS WILL BE INSTALLED, AND THE AREAS SEEDED AND MULCHED WITHIN THE NEXT TWO CALENDAR DAYS.

ONSITE SEDIMENT CONTROL PLAN MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS	POSSIBLE REMEDIES (TO BE PERFORMED WITHIN 24 HOURS OR AS SOON AS SAFELY PRACTICAL.)
VEGETATION	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT AT TOE OF SLOPE	CHECK FOR TOE OF SLOPE DIVERSION AND INSTALL IF NEEDED.
		RILLS AND GULLIES FORMING	FILL RILLS AND REGRADE GULLIED SLOPES.
		BARE SOIL PATCHES	RESEED, FERTILIZE AND MULCH BARE AREAS.
COMPOST FILTER SOCK	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	RUNOFF ESCAPING AROUND BARRIER	SECURELY ANCHOR WITH PROPER STAPLES. EXTEND BARRIER AS NEEDED.
		SEDIMENT LEVEL BUILDUP	REMOVE SEDIMENT WHEN LEVEL REACHES HALF (1/2) OR MORE THE HEIGHT OF THE BARRIER.
INLET PROTECTION	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT BUILD-UP REDUCING FLOW CAPACITY	ONCE FULL OF SEDIMENT (I.E. SEDIMENT LEVEL TO TOP OF MAT OR VISIBLE WITHIN TOP OF MAT), INLET FILTER SHALL BE CLEANED PER DETAIL
		MISSING MATERIAL	REPAIR OR REPLACE PROTECTION MATERIALS AS NEEDED.
		FLOODING AROUND OR BELOW INLET	REMOVE ACCUMULATED SEDIMENT; OR CONVERT SEDIMENT BARRIER TO AN EXCAVATED SEDIMENT TRAP; OR REROUTE RUNOFF TO A MORE SUITABLE OUTLET SUCH AS A SEDIMENT TRAP.
("SILT SACK" - ONLY)		WATER BY-PASSING INLET AND GRATE	REMOVE "SILT SACK" AND REMOVE SILT OR REPLACE WITH NEW "SILT SACK" OR INSTALL BLOCK AND GRAVEL PROTECTION.
PUMPED WATER FILTER BAG	DAILY AND AFTER EACH USE	BAG IS HALF FULL	REPLACE BAG.
		BAG IS CLOGGED OR FLOW IS REDUCED	REPLACE BAG.
CONCRETE WASHOUT AREA	DAILY AND AFTER EACH RUNOFF EVENT	WASHOUT IS DAMAGED OR LEAKING	DEACTIVATE THE WASHOUT AND REPAIR OR REPLACE IT IMMEDIATELY FOR FUTURE USE.
		ACCUMULATED MATERIALS EXCEED 50% OF CAPACITY	REMOVE ACCUMULATED MATERIALS AND REPLACE PLASTIC LINERS.
EROSION CONTROL BLANKET	WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL 70% VEGETATIVE COVERAGE IS ESTABLISHED.	DAMAGED OR DISPLACED BLANKETS	DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS
ROCK CONSTRUCTION ENTRANCE	DAILY AND AFTER EACH RUNOFF EVENT	LOST AND/OR DISLODGED STONES	REPLACE MISSING STONES SO AS TO MAINTAIN SPECIFIED DIMENSIONS.
		SEDIMENT DEPOSITED IN PAVED ROADWAYS	AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE RETURNED TO THE CONSTRUCTION SITE.

EROSION AND SEDIMENTATION CONTROL NOTES

EROSION AND SEDIMENTATION CONTROL NOTES:

1) A COPY OF THE APPROVED EROSION AND SEDIMENTATION CONTROL PLANS, NOTES, AND DETAILS DRAWINGS (STAMPED/SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES.

2) ALL EARTH DISTURBANCE ACTIVITIES SHALL GENERALLY PROCEED IN ACCORDANCE WITH THE CONSTRUCTION SEQUENCE PROVIDED. BEFORE IMPLEMENTING ANY REVISIONS TO THE APPROVED ESCP OR REVISIONS TO OTHER PLANS THAT MAY AFFECT OR IMPACT THE EFFECTIVENESS OF THE APPROVED E&S CONTROL PLAN, THE OPERATOR MUST RECEIVE APPROVAL OF THE REVISIONS FROM THE LOCAL CONSERVATION DISTRICT OR DEP.

3) IN ADDITION TO THE PERMIT APPLICANT, INDIVIDUALS OR PARTIES WANTING TO CONDUCT INTRUSIVE EARTH DISTURBANCE ACTIVITIES ARE REQUIRED TO BE ADDED TO THE NPDES PERMIT AS A CO-PERMITTEE (IF NPDES APPLICABLE).

4) AT LEAST THREE (3) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INC. AT 1-800-242-1776 FOR BURIED UTILITIES LOCATION.

5) AT LEAST SEVEN (7) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, THE OPERATOR SHALL INVITE ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES, THE LANDOWNER, ALL APPROPRIATE MUNICIPAL OFFICIALS, AND A REPRESENTATIVE OF THE LOCAL CONSERVATION DISTRICT TO SCHEDULE AN ON-SITE PRE-CONSTRUCTION MEETING.

6) IMPORTANT: IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BMPS TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LOCAL CONSERVATION DISTRICT AND/OR THE REGIONAL PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (PADEP) OFFICE.

7) THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE OR DISPOSE OF ALL BUILDING MATERIALS AND CONSTRUCTION WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA CODE 260.1 ET SEQ., 271.1 ET SEQ. AND 287.1 ET SEQ. NO BUILDING MATERIALS, WASTES, OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED OR DISCHARGED AT THE SITE. THE FOLLOWING DEFINE WHAT SHOULD BE CONSIDERED "CONSTRUCTION WASTE" AND "CLEAN FILL":

A. CONSTRUCTION WASTE - INCLUDES BUT IS NOT LIMITED TO, EXCESS SOIL MATERIALS, BUILDING MATERIALS, CONCRETE WASH WATER, SANITARY WASTES, ETC. THAT COULD ADVERSELY IMPACT WATER QUALITY.

B. CLEAN FILL - UNCONTAMINATED, NON-WATER-SOLUBLE, NON-DECOMPOSABLE, INERT, SOLID MATERIAL. THIS INCLUDES SOIL, ROCK, STONE DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK, OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. IT DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE SURFACE WATERS UNLESS OTHERWISE AUTHORIZED, MILLED ASPHALT, OR ASPHALT THAT HAS BEEN PROCESSED FOR RE-USE.

8) ALL PARTIES RESPONSIBLE FOR THE EXCAVATION OF SITE MATERIALS OR THE IMPORT OF FILL MATERIALS ARE RESPONSIBLE TO ENSURE THAT "ENVIRONMENTAL DUE DILIGENCE" IN THE DETERMINATION OF CLEAN FILL MATERIAL IS EITHER REMOVED FROM THE SITE OR USED AS FILL FOR THE SITE. ANY MATERIAL IDENTIFIED AS HAZARDOUS MUST BE DISPOSED IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL GUIDELINES AND REGULATIONS.

A. ENVIRONMENTAL DUE DILIGENCE - INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF OWNERSHIP AND USE HISTORY OF PROPERTY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS.

9) BEFORE DISPOSING OF SOIL OR RECEIVING BORROW FOR THE SITE, THE OPERATOR MUST ASSURE THAT EACH SPOIL OR BORROW AREA HAS AN ESCP APPROVED BY THE LOCAL CONSERVATION DISTRICT OF THE DEP, AND WHICH IS BEING IMPLEMENTED AND MAINTAINED ACCORDING TO CHAPTER 102 REGULATIONS. THE OPERATOR SHALL ALSO NOTIFY THE LOCAL CONSERVATION DISTRICT IN WRITING OF ALL RECEIVING SPOIL AND BORROW AREAS WHEN THEY HAVE BEEN IDENTIFIED.

10) THE ROCK CONSTRUCTION ENTRANCE WILL BE THE ONLY ENTRANCE USED BY CONSTRUCTION VEHICLES. NO CONSTRUCTION VEHICLES SHALL BE PERMITTED TO ENTER AREAS OUTSIDE OF THE LIMIT OF DISTURBANCE BOUNDARIES AS SHOWN ON THE E&S PLAN DRAWING.

11) THE CONTRACTOR SHALL TAKE ALL APPROPRIATE ACTIONS NECESSARY TO PREVENT TRUCKS FROM DEPOSITING SEDIMENT ON THE PUBLIC STREETS. SEDIMENT TRACKED ONTO PUBLIC ROADWAYS OR SIDEWALKS SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED OF IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.

12) REMOVE ALL DEMOLITION MATERIALS TO A SUITABLE DISPOSAL SITE IN A RESPONSIBLE MANNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF ALL EXCESS MATERIAL OFF-SITE TO AN APPROVED FACILITY (AS PER NOTE 8, AND SEE NOTE 7 FOR THE DEFINITION OF CONSTRUCTION WASTES).

13) CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO BE WITHIN THE IDENTIFIED DISTURBANCE LIMITS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF ALL EXCESS MATERIAL OFF-SITE TO AN APPROVED FACILITY (AS PER NOTE 8 AND SEE NOTE 7 FOR THE DEFINITION OF CONSTRUCTION WASTES).

14) IMPORTANT: STORMWATER RUNOFF IS NOT TO BE DIRECTED TO UNPROTECTED STORMWATER MANAGEMENT SYSTEMS, STORMWATER CONVEYANCE SYSTEMS, OR INFILTRATION BED AREAS UNTIL THE SITE IS AT FINAL GRADE AND STABILIZED.

15) STOCKPILE HEIGHTS MUST NOT EXCEED 35 FEET. STOCKPILE SIDE SLOPES MUST BE 2H:1V MAXIMUM.

16) DURING UTILITY LINE CONSTRUCTION, EXCAVATE UTILITY LINE TRENCHES ONLY AS REQUIRED. LIMIT ADVANCE EXCAVATION TO A DISTANCE EQUAL TO TWO TIMES THE LENGTH OF PIPE INSTALLATION THAT CAN BE COMPLETED IN ONE DAY. LIMIT DAILY TRENCH EXCAVATION TO THE LENGTH OF PIPE PLACEMENT, PLUG INSTALLATION AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY. TRENCH PLUGS, AS SHOWN ON THE DRAWINGS, ARE TO BE INSTALLED PER PADEP CHAPTER 102 REQUIREMENTS. WATER, WHICH ACCUMULATES IN THE OPEN TRENCH, WILL BE COMPLETELY REMOVED BY PUMPING INTO A FILTER BAG IN ACCORDANCE WITH PADEP CHAPTER 102 REQUIREMENTS. ON THE DAY FOLLOWING PIPE PLACEMENT AND TRENCH BACKFILLING, THE DISTURBED AREA WILL BE GRADED TO FINAL GRADE, AND SEEDED AND MULCHED PER THE PERMANENT SEEDING SCHEDULE.

17) FILTREXX SILTSOXX™, INLETSOXX™, RUNOFF DIVERSION SOXX™, AND ANY OTHER FILTREXX BMPS EMPLOYED AS PART OF THE ESCP FOR THE PROJECT MUST FOLLOW THE MANUFACTURER'S DISPOSAL/RECYCLING INSTRUCTIONS FOR EACH SPECIFIC BMP UTILIZED THROUGHOUT THE PROJECT'S CONSTRUCTION AND EARTHMOVING OPERATIONS.

18) DURING FOUNDATION CONSTRUCTION, PUMP WATER ACCUMULATED IN OPEN TRENCHES INTO FILTER BAGS IN ACCORDANCE WITH PADEP CHAPTER 102 REQUIREMENTS. REFER TO DETAIL. WHEN THE FILTER BAG IS ½-FULL IT SHOULD BE REPLACED. ANY ACCUMULATED SEDIMENTATION WILL BE MIXED WITH SOIL AND PROPERLY DISPOSED OF ON THE SITE IF POSSIBLE OR DISPOSED OF AT AN OFFSITE AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF ALL EXCESS MATERIAL OFF-SITE TO AN APPROVED FACILITY (AS PER NOTE 8).

19) IMPORTANT: A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED, AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THAT THEY WERE CORRECTED, SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.

20) ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN ACCORDANCE WITH NOTE 8.

21) ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED UPON REACHING FINAL GRADE. CUT SLOPES IN COMPETENT BEDROCK AND ROCK FILLS NEED NOT BE VEGETATED.

22) AREAS WHICH ARE TO RECEIVE TOPSOIL SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 4 INCHES PRIOR TO PLACEMENT OF TOPSOIL. AREAS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING AND MULCHING. FILL OUTSLOPES SHALL HAVE A MINIMUM OF 2 INCHES OF TOPSOIL.

23) UNTIL THE SITE IS STABILIZED, ALL E&S BMPS MUST BE MAINTAINED PROPERLY. MAINTENANCE MUST INCLUDE INSPECTIONS OF ALL E&S BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGARDING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.

24) UPON COMPLETION OF ANY EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY, THE SITE SHALL BE IMMEDIATELY SEEDED, MULCHED OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION. DURING NON-GERMINATING MONTHS, MULCH OR PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.

25) EROSION AND SEDIMENTATION CONTROL BMPS SHALL BE IMPLEMENTED AND MAINTAINED UNTIL PERMANENT STABILIZATION OF ALL TRIBUTARY AREAS HAS BEEN ACHIEVED. FOR AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OF AN ACTIVITY TO BE CONSIDERED PERMANENTLY STABILIZED, THE DISTURBED AREAS SHALL BE COVERED BY ONE OF THE FOLLOWING:

A. A MINIMUM UNIFORM 70% VEGETATIVE COVER OF EROSION RESISTANT PERENNIAL SPECIES HAS BEEN ACHIEVED.

B. AN ACCEPTABLE BMP THAT PERMANENTLY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION.

26) AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY E&S BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS MUST BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID RE-VEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSION SHOULD BE DONE ONLY DURING GERMINATING SEASON.

27) UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT TO SCHEDULE A FINAL INSPECTION.

28) IMPORTANT: FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES INSTITUTED BY THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION AS DEFINED IN SECTION 602 OF THE PENNSYLVANIA CLEAN STREAMS LAW. THE CLEAN STREAMS LAW PROVIDES FOR UP TO $10,000 PER DAY IN CIVIL PENALTIES, UP TO $10,000 IN SUMMARY CRIMINAL PENALTIES, AND UP TO $25,000 IN MISDEMEANOR CRIMINAL PENALTIES FOR EACH VIOLATION.

FILL PLACEMENT NOTES:

1) ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.

2) ALL FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 8 INCHES IN THICKNESS.

3) FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.

4) FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.

5) FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES

MAINTENANCE PROGRAM

MAINTENANCE OF TEMPORARY CONTROLS:
MAINTAIN TEMPORARY CONTROL MEASURES THROUGHOUT THE PROJECT PERIOD AS OUTLINED IN THE "MAINTENANCE SCHEDULE" SHOWN ON THE EROSION AND SEDIMENTATION CONTROL PLANS AND NARRATIVE.

IT SHALL BE THE RESPONSIBILITY OF THE PERMITTEE TO PERFORM INSPECTIONS OF ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL MEASURES TO ENSURE THAT THEY ARE WORKING PROPERLY. THESE INSPECTIONS MUST BE CONDUCTED WEEKLY, AND DURING OR IMMEDIATELY AFTER EVERY RUNOFF EVENT. THE INSPECTION WILL INCLUDE, BUT NOT BE LIMITED TO:

1) INSPECT ALL CONTROLS AND REPAIR OR REPLACE AS NEEDED.
2) INSPECT ALL SLOPES FOR SIGNS OF EROSION AND/OR SEDIMENTATION, AND REPAIR AS NEEDED.

AN ADEQUATE SUPPLY OF ADDITIONAL EROSION/SEDIMENTATION CONTROL MATERIALS (E.G., STRAW BALES, EROSION NETTING, PLASTIC COVERING, WIRE MESH, SAND AND BURLAP, SANDBAGS, ROCKS AND GRAVEL) MUST BE STOCKPILED ON-SITE. THESE SUPPLIES MUST BE USED FOR EMERGENCY REPAIRS TO/OR REPAIRS OF EXISTING SOIL EROSION AND SEDIMENTATION CONTROLS.

MAINTENANCE OF PERMANENT CONTROLS:
THE OWNER/DEVELOPER WILL MAINTAIN PERMANENT CONTROL FACILITIES.

CLEANING FREQUENCY AND ULTIMATE DISPOSAL OF WASTE:
CLEANING FREQUENCIES ARE SPECIFIED WITHIN THE MAINTENANCE SCHEDULE. SILT AND SEDIMENT REMOVED FROM ALL CONTROL MEASURES SHOULD BE MIXED WITH SOIL DURING EARTHWORK AND PROPERLY DISPOSED OF ON-SITE.

RED SWING GROUP
ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY, SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — JACOB WIELAND — No. PE084705 — 3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE WORKING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE: EROSION AND SEDIMENTATION CONTROL NOTES

SHEET NO. C650

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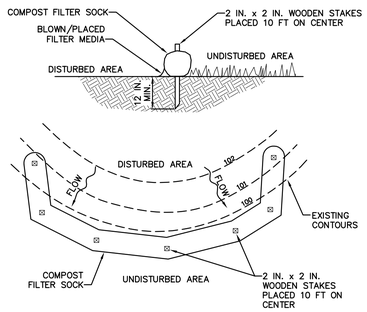

NOTES:

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.

COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

STANDARD CONSTRUCTION DETAIL #4-1

TABLE 4.1

Compost Sock Fabric Minimum Specifications

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photo-degradable	Photo-degradable	Bio-degradable	Photo-degradable	Photo-degradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years
Two-ply systems					
Inner Containment Netting		HDPE biaxial net			
		Continuously wound			
		Fusion-welded junctures			
Outer Filtration Mesh		3/4" x 3/4" Max. aperture size			
		Composite Polypropylene Fabric (Woven layer and non-woven fleece mechanically fused via needle punch)			
		3/16" Max. aperture size			
Sock fabrics composed of burlap may be used on projects lasting 6 months or less.					

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TABLE 4.2

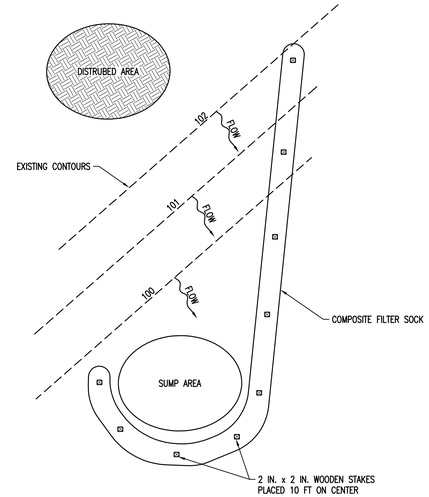
Compost Standards

Organic Matter Content	25% - 100% (dry weight basis)
Organic Portion	Fibrous and elongated
pH	5.5 - 8.5
Moisture Content	30% - 60%
Particle Size	30% - 50% pass through 3/8" sieve
Soluble Salt Concentration	5.0 dS/m (mmhos/cm) Maximum

Filtrexx

COMPOST FILTER SOCK (1)

NOT TO SCALE



NOTES:
A COMPOST FILTER SOCK J-HOOK IS WHEN A COMPOST FILTER SOCK IS TURNED TO CREATE A J-SHAPE, WITH THE J-HOOK USUALLY BEING AT THE DOWNSLOPE END OF A DIVERSION.

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.

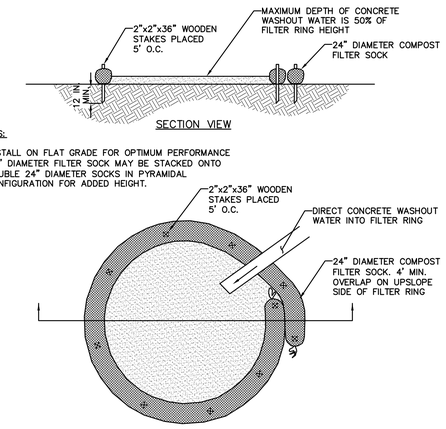
COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

J-HOOK COMPOST FILTER SOCK (2)

NOT TO SCALE



NOTES:

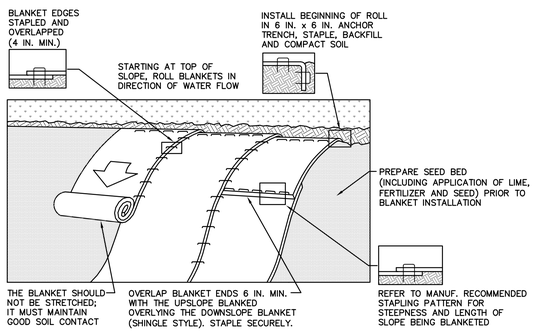
1. INSTALL ON FLAT GRADE FOR OPTIMUM PERFORMANCE
2. 18" DIAMETER FILTER SOCK MAY BE STACKED ONTO DOUBLE 24" DIAMETER SOCKS IN PYRAMIDAL CONFIGURATION FOR ADDED HEIGHT.

A SUITABLE IMPERVIOUS GEOMEMBRANE SHALL BE PLACED AT THE LOCATION OF THE WASHOUT PRIOR TO INSTALLING THE SOCKS.

ADAPTED FROM FILTREXX

CONCRETE WASHOUT DETAIL (3)

NOT TO SCALE



NOTES:

SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.

PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.

SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.

BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.

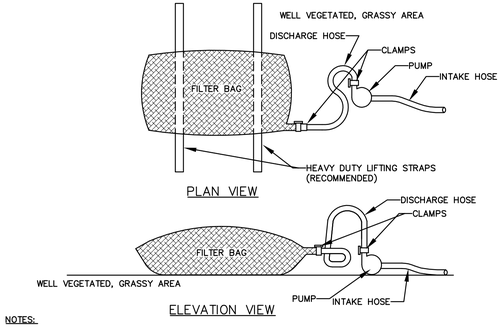
THE BLANKET SHALL BE STAPLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.

STANDARD CONSTRUCTION DETAIL #11-1

EROSION CONTROL BLANKET INSTALLATION (4)

NOT TO SCALE



NOTES:

LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS SHALL BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D-4884	60 LB/IN
GRAB TENSILE	ASTM D-4632	205 LB
PUNCTURE	ASTM D-4833	110 LB
MULLEN BURST	ASTM D-3786	350 PSI
UV RESISTANCE	ASTM D-4355	70%
AOS % RETAINED	ASTM D-4751	80 SIEVE

A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES SHALL BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME 1/2 FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS SHALL BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.

BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.

NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.

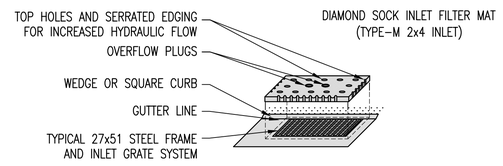
THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.

THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.

FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

PUMPED WATER FILTER BAG (5)

NOT TO SCALE



1. BEFORE COVERING, MAKE SURE GRATE AND SURROUNDING AREA ARE FREE OF ANY DEBRIS OR GRIT SO MAGNETIC BOTTOM CAN FULLY CONTACT GRATE.
2. LAY IFM OVER GRADE. SLIGHTLY ADJUST TO FIND SNUGGEST CONTACT OF MAGNETIC BOTTOM.
3. REMOVE AT LEAST ONE RED OVERFLOW PLUG IF GRATE IS AT LOW POINT OF STREET. IN THE EVENT OF FLOODING, PULL THE SECOND PLUG TO DE-WATER THE STREET.
4. THOROUGHLY CLEAN OFF SEDIMENT, LEAVES, AND OTHER DEBRIS AFTER EVERY RAIN EVENT.
5. ONCE FULL OF SEDIMENT, IFM SHOULD BE SWAPPED OUT FOR CLEANING USING A GARDEN HOSE OR POWER WASHER.
6. IF UNIT IS RUN OVER AFTER AND BEGINNING TO COMPRESS IT SHOULD BE DISCARDED.
7. IN SNOWY REGIONS IFM MAY BE SCRAPED OFF BY PLOW TRUCKS - USE PRODUCT ACCORDINGLY.
8. FILTERING FIBER IS COMPOSTABLE COCONUT COIR; , MAGNETICS ARE RUBBER WITH FERROUS OXIDE.
9. CALL MKB COMPANY AT (888) 587-0777 TO FIND THE REGIONAL DISTRIBUTOR IN YOUR AREA.

INLET FILTER PROTECTION (6)

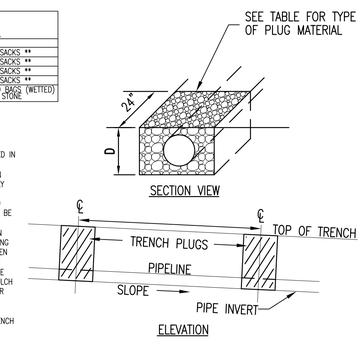
NOT TO SCALE

REQUIRED SPACING (L) AND MATERIAL FOR TRENCH PLUGS

TRENCH SLOPE (%)	L (FEET)	PLUG MATERIAL
0-5	--	NONE
5-15	500	EARTH FILLED SACKS **
15-25	300	EARTH FILLED SACKS **
25-35	200	EARTH FILLED SACKS **
35-100	100	EARTH FILLED SACKS **
OVER 100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

** TOPSOIL MAY NOT BE USED TO FILL SACKS.

1. PIPELINES WITH JOINTS THAT ALLOW A MANUFACTURED LENGTH OF PIPE TO BE PLACED IN THE TRENCH WITH THE PIPE JOINT ASSEMBLED/MADE IN THE TRENCH REQUIRE AN OPEN PIPELINE TRENCH THAT IS ONLY SLIGHTLY LONGER THAN THE LENGTH OF PIPE BEING INSTALLED. THE TOTAL LENGTH OF EXCAVATED TRENCH OPEN AT ANY ONE TIME SHOULD NOT BE GREATER THAN THE TOTAL LENGTH OF PIPELINE/UTILITY LINE THAT CAN BE PLACED IN THE TRENCH AND BACK-FILLED IN ONE WORKING DAY. NO MORE THAN 50 LINEAL FEET OF OPEN TRENCH SHOULD EXIST WHEN PIPELINE/UTILITY LINE INSTALLATION CEASES AT THE END OF THE WORKDAY. SOIL SUPPLEMENTS, SEED AND MULCH SHOULD BE APPLIED WITHIN SEVEN DAYS AFTER THE PIPELINE/UTILITY LINE IS INSTALLED.
2. WATER WHICH ACCUMULATES IN THE OPEN TRENCH IS TO BE COMPLETELY REMOVED BY PUMPING, WITH THE USE OF FILTER BAGS; BEFORE PIPE PLACEMENT AND/OR BACKFILLING BEGINS.



UTILITY EXCAVATION TRENCH PLUGS (7)

NOT TO SCALE

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

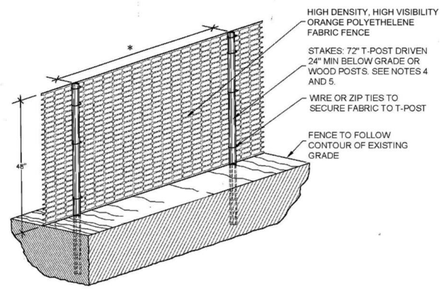
REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
EROSION AND SEDIMENTATION CONTROL DETAILS

SHEET NO.
C651



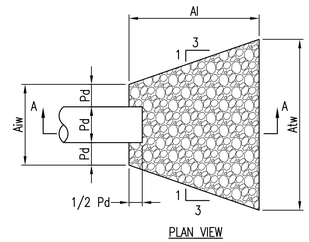
* 20' MAXIMUM SPACING

NOTES:

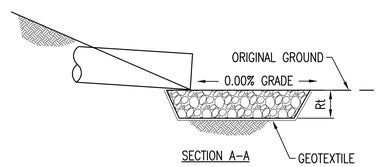
1. PRESERVATION FENCE (AGENCY DISCRETION) SHALL BE USED IN LOCATIONS IDENTIFIED SOLEY BY THE ENGINEER AND IS NOT INTENDED FOR THE CONVENIENCE OF THE CONTRACTOR.
2. PLACE FENCE OUTSIDE THE DRIP LINE OF TREES.
3. FENCE FABRIC TO BE FASTENED SECURELY TO POSTS USING WIRE OR PLASTIC ZIP TIES.
4. WHEN USING WOOD POSTS THE POSTS SHALL BE OF HARDWOOD WITH A WEDGE OR PENCIL TIP AT ONE END, 72" MIN. LENGTH, AND 2" X 2" NOMINAL CROSS SECTION. USE ONE 2" GALVANIZED WIRE STAPLE TO ATTACH FABRIC TO WOOD POSTS.
5. METAL T-POST SHALL HAVE A MINIMUM WEIGHT OF 0.85 LB/FT OF LENGTH.

ORANGE CONSTRUCTION FENCE (1)

NOT TO SCALE



PLAN VIEW



SECTION A–A

DESCRIPTION	PIPE DIA Pd (IN)	RIPRAP APRON				
		SIZE R–_	THICK. Rt (IN)	LENGTH Al (FT)	INITIAL WIDTH Aiw (FT)	TERMINAL WIDTH Atw (FT)
DISCHARGE POINT 001	18	R–5	27	13	5	18

NOTES:

APRON SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTH SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNEL.

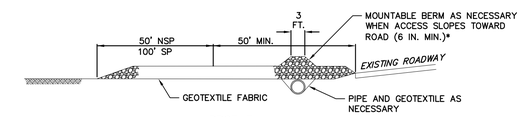
APRON SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIPRAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.

EXTEND RIPRAP ON BACK SIDE OF APRON TO AT LEAST 1/2 DEPTH OF PIPE ON BOTH SIDES TO PREVENT SCOUR AROUND THE PIPE.

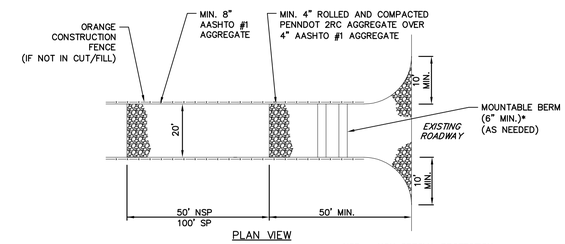
STANDARD CONSTRUCTION DETAIL #9–2

RIPRAP APRON (2)

NOT TO SCALE



PROFILE



PLAN VIEW

NSP – NON SPECIAL PROTECTION WATERSHED
SP – SPECIAL PROTECTION WATERSHED

* MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

ROCK CONSTRUCTION ENTRANCE (3)

NOT TO SCALE

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4444 WILLIAM PENN HWY.
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DATE: 03/13/2023
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DRAWN BY: JLG
CHECKED BY: JOW

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EROSION AND SEDIMENTATION CONTROL DETAILS

SHEET NO.

C652

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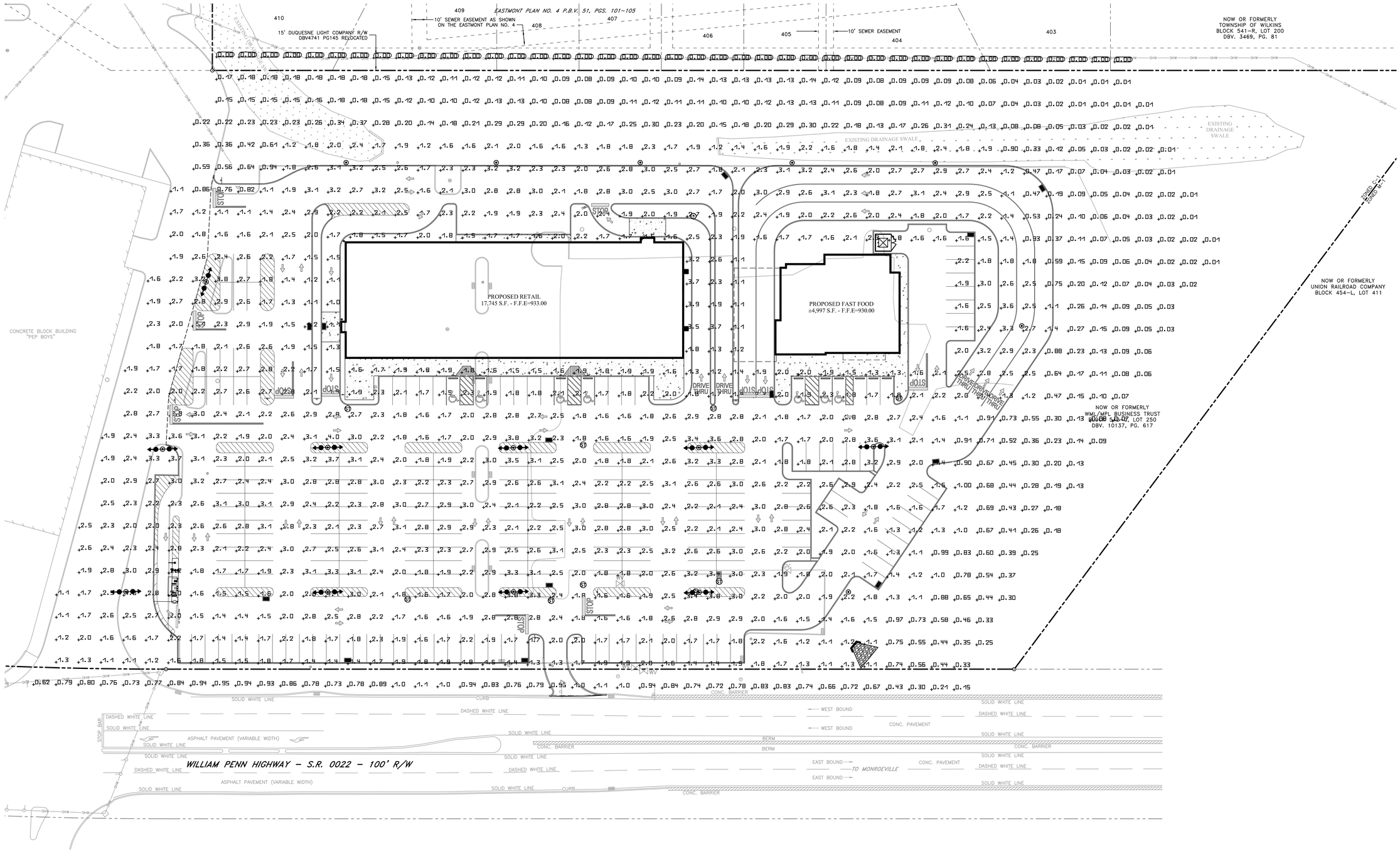

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

Know what's below. Call before you dig.

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

LEGEND

- ■ C-WP-D-TR SERIES LED WALL PACK
- OSQ LED AREA/FLOOD LIGHT
- ⊙ TYPICAL LOT LIGHT BASE

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SCALE: AS SHOWN
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SHEET TITLE:
LIGHTING PLAN

SHEET NO.
C700

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OSQ Series

OSQ™ LED Area/Flood Luminaire featuring Cree TrueWhite® Technology – Medium & Large

Rev. Date: V5 09/14/2021

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. The 6L lumen package is a suitable upgrade for HID applications up to 250 Watt, and the 11L lumen package is a suitable upgrade for HID applications up to 400 Watt. The 22L lumen package is a suitable upgrade for HID applications up to 750 Watts, and the 30L lumen package is a suitable upgrade for HID applications up to 1000 Watts.

Applications: Parking lots, walkways, campuses, car dealerships, office complexes, tunnels, underpasses, and internal roadways

Performance Summary

Utilizes Cree TrueWhite® Technology on 5000K Luminaires

NanoOptic® Precision Delivery Grid™ optic

Assembled in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: 4,000 - 30,000

Efficacy: Up to 173 LPW

CRI: Minimum 70 CRI (3000K, 4000K & 5700K); 90 CRI (5000K)

CCT: 3000K, 4000K, 5000K, 5700K

Limited Warranty†: 10 years on luminaire; 10 years on Colorfast DeltaGuard® finish; up to 5 years for Synapse® accessories; 1 year on luminaire accessories

†See http://creelighting.com/warranty for warranty terms. For Synapse accessories, consult Synapse spec sheets for details on warranty terms.

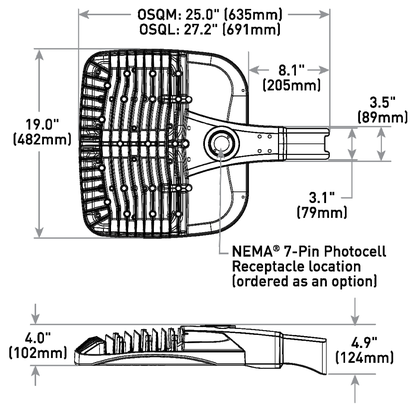
Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-ML-B-AA-BK + **Luminaire:** OSQM-B-4L-30K7-2M-UL-NM-BK

Mount (Luminaire must be ordered separately)*	
OSQ-	
OSQ-ML-B-AA Adjustable Arm **OSQ-ML-B-DA** Direct Arm **OSQ-ML-B-TSP** Transportation Mount (stainless steel; do not specify color) **OSQ-ML-B-TM** Trunnion Mount	**Color Options:** **SV** Silver **BK** Black **BZ** Bronze **WH** White

* Reference EPA and pole configuration suitability data beginning on page 10

OSQ-ML-B-DA Mount



Luminaire	Weight
OSQM	28.9 lbs. (13.1kg)
OSQL	32.4 lbs. (14.7kg)

Note: Refer to page 11 for fixture mounting drill pattern. For additional mounts, refer to drawings beginning on page 19

Luminaire (Mount must be ordered separately)

OSQ		B								
Family	**Size**	**Series**	**Lumen Package†**	**CCT/CRI**	**Optic**	**Voltage**	**Mount**	**Color Options**	**Controls****	**Options**
OSQ	**M** Medium **L** Large	**B**	**Medium** **4L** 4,000 Lumens **6L** 6,000 Lumens **9L** 9,000 Lumens **11L** 11,000 Lumens **16L** 16,000 Lumens **Large** **22L** 22,000 Lumens **30L** 30,000 Lumens	**30K7** 3000K, 70 CRI **40K7** 4000K, 70 CRI **50K9** 5000K, 90 CRI **57K7** 5700K, 70 CRI	**Asymmetric** **2M*** Type II Medium **3M*** Type III Medium **4M*** Type IV Medium **Symmetric** **5M** Type V Medium **5N** Type V Narrow **5Q** Type V Square **N3** Narrow Flood **33** NEMA® 3x3 **44** NEMA® 4x4 **55** NEMA® 5x5 **66** NEMA® 6x6 **75** NEMA® 7x5	**UL** Universal 120-277V **UH** Universal 347-480V - Not available with 4L or 6L lumen packages	**NM** No Mount - Must specify mount from table above - Mount ships separately	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**PML Programmable Multi-Level, up to 40' Mounting Height** - Refer to PML spec sheet for details - Intended for downlight applications at 0° tilt **PML2 Programmable Multi-Level, 10-30' Mounting Height** - Refer to PML spec sheet for details - Intended for downlight applications at 0° tilt **Q9/Q8/Q7/Q6/Q5/Q4/Q3/Q2/Q1 Field Adjustable Output** - Must select Q9, Q8, Q7, Q6, Q5, Q4, Q3, Q2, or Q1 - Offers full range adjustability - Refer to pages 12-18 for power and lumen values - Not available with PML or PML2 options **X8/X7/X6/X5/X4/X3/X2/X1 Locked Lumen Output** - Must select add X8, X7, X6, X5, X4, X3, X2, or X1 - Not available with 22L or 30L lumen packages - Not available with PML or PML2 options - Lumen output is permanently locked to the setting selected - Refer to pages 12-18 for power and lumen values	**20KV 20kV/10kA Surge Suppression** - Replaces standard 10kV surge protection **F Fuse** - Compatible with 120V, 277V or 347V (phase to neutral) - Consult factory if fusing is required for 208V, 240V or 480V (phase to phase) - Refer to PML spec sheet for availability with PML options - When code dictates fusing, use time delay fuse **R NEMA® 7-Pin Photocell Receptacle** - 7-pin receptacle per ANSI C136.41 - Intended for downlight applications with maximum 45° tilt - Factory connected 0-10V dim leads - 18" (457mm) seven-conductor cord exits luminaire - Requires photocell or shorting cap by others **RL Rotate Left** - LED and optic are rotated to the left - Refer to RR/RL configuration diagram on page 19 for optic directionality - Not for use with symmetric optics **RR Rotate Right** - LED and optic are rotated to the right - Refer to RR/RL configuration diagram on page 19 for optic directionality - Not for use with symmetric optics

† Lumen Package codes identify approximate light output only. Actual lumen output levels vary by CCT and optic selection. Refer to Initial Delivered Lumen tables for specific lumen values
* Available with Backlight Shield when ordered with field-installed accessory (see table above)
** Luminaire comes standard with 0-10V dimming

US: creelighting.com (800) 236-6800
Canada: creelighting-canada.com (800) 473-1234

CREE LIGHTING

C-WP-D-TR Series

Traditional-Style LED Wall Pack with Glass Lens

Replaces up to 400W PSMH

C-LITE LED LIGHTING

PACK UP THIS ONE

Our dimmable cULus Listed Traditional-Style LED Wall Pack has a glass lens, delivers up to 23,400 lumens, is available in 4000K and 5000K, and comes with a 5-year limited warranty. It also features four ½" NPS tapped conduit knockouts for flexibility with mounting options.

PRODUCT SPECIFICATIONS

OVERVIEW

- Max. Delivered Lumens: Up to 23,400 Lumens
- CRI: ≥ 80 **(4L, 6L, 9L & 14L),** ≥ 70 **(18L & 23L)**
- CCT: 4000K or 5000K
- Input Power: 30W **(4L)**, 45W **(6L)**, 67W **(9L)**, 106W **(14L)**, 136W **(18L)**, 166W **(23L)**
- Estimated L_{70} Lifetime @ 25°C: > 100,000 Hours
- Power Factor: > 0.9 at full load
- Total Harmonic Distortion: <20% at full load
- Limited Warranty: 5-Year*
- Replaces: 100W PSMH **(4L)**, 150W PSMH **(6L)**, 250W MH **(9L)**, 320W PSMH **(14L)**, 400W MH **(18L)**, 400W PSMH **(23L)**

FEATURES	RECOMMENDED USE	INPUT VOLTAGE
• Borosilicate prismatic glass lens • 0-10V Dimming to 10% • Extremely efficient with over 130LPW on every fixture • Easy installation • FCC Part 15, Subpart B, Class A limits for conducted and radiated emissions	• Entryways • General Area Lighting • Perimeter Lighting • Storage Facilities	• Universal (120V - 277V)

CA RESIDENTS WARNING: Cancer and Reproductive Harm – www.p65warnings.ca.gov

CERTIFICATIONS:

Rev. Date: V2 12/01/2021

For informational purposes only. Content is subject to change. *See creelighting.com/resources/warranties

RED SWING GROUP
ENGINEERS & SURVEYORS
4644 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER JACOB WIELAND No. PE084705 5/19/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE: LIGHTING DETAILS

SHEET NO. C750

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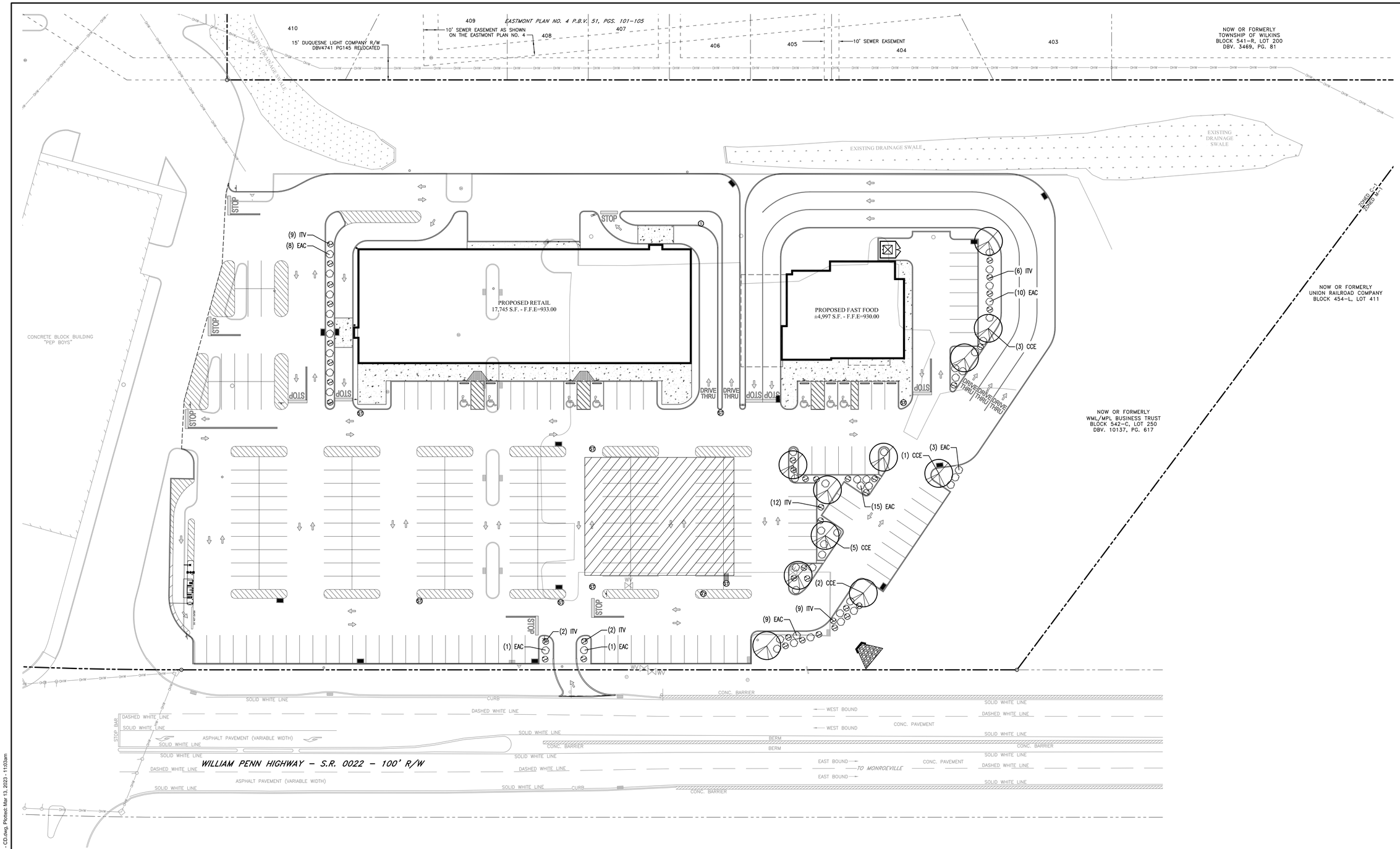

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REGISTERED PROFESSIONAL
JACOB WIELAND
ENGINEER
No. PE084705

3/13/2023

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DATE: 03/13/2023
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DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:

LANDSCAPE PLAN

SHEET NO.

C800

PLANTING SCHEDULE

KEY	SYMBOL	QTY	BOTANICAL / COMMON NAME	SPACING	SIZE	ROOT TYPE
CCE		11	CERCIS CANADENSIS / EASTERN REDBUD	AS SHOWN / 50' O.C.	2" CALIPER MIN. AT 1'	B&B/CONT
EAC		47	EUONYMUS ALATU 'COMPACTA' / DWARF BURNING BUSH	AS SHOWN	30" HEIGHT	B&B
ITV		40	ITEA VIRGINICA / VIRGINIA SWEETSPIRE	AS SHOWN	3 GALLON	CONT.

*NOTE: CONTRACTOR SHALL OVER EXCAVATE ALL LANDSCAPE AREAS TO A DEPTH OF 24" AND REPLACE WITH CLEAN TOPSOIL.

Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

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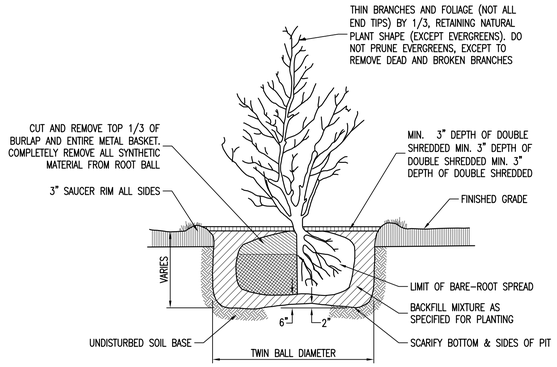
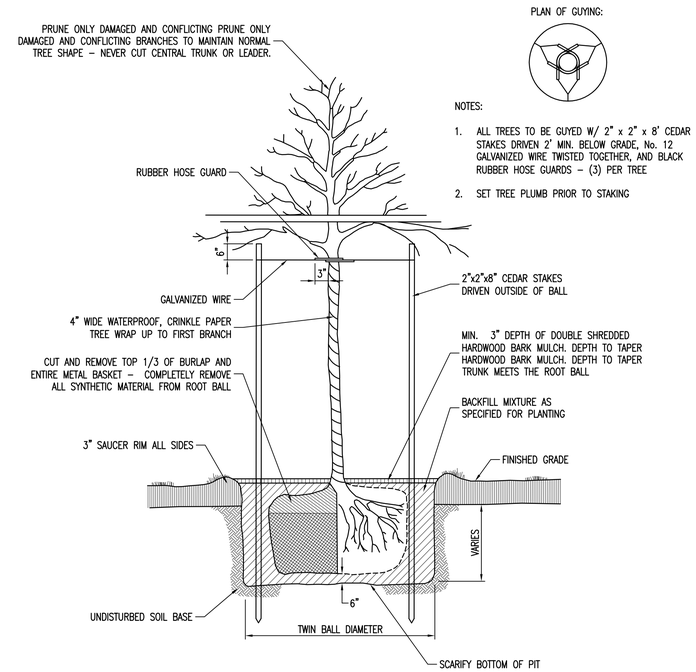


TYPICAL SHRUB PLANTING DETAIL (1)
NOT TO SCALE



NOTES:

1. ALL TREES TO BE GUYED W/ 2" x 2" x 8' CEDAR STAKES DRIVEN 2' MIN. BELOW GRADE, No. 12 GALVANIZED WIRE TWISTED TOGETHER, AND BLACK RUBBER HOSE GUARDS – (3) PER TREE
2. SET TREE PLUMB PRIOR TO STAKING

TYPICAL TREE PLANTING DETAIL (2)
NOT TO SCALE

LANDSCAPE NOTES

1. ALL PLANTS MUST BE HEALTHY, VIGOROUS, AND FREE OF PESTS AND DISEASE.
2. THE CONTRACTOR SHALL COMPLETELY GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE (1) YEAR, BEGINNING ON THE DATE OF TOTAL ACCEPTANCE. THE CONTRACTOR SHALL PROMPTLY MAKE ALL REPLACEMENTS BEFORE THE END OF THE GUARANTEE PERIOD.
3. THE QUANTITIES INDICATED ON THE DRAWINGS ARE PROVIDED FOR THE BENEFIT OF THE CONTRACTOR BUT SHOULD NOT BE ASSUMED TO BE CORRECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR OWN QUANTITY CALCULATIONS AND SHALL ASSUME ALL LIABILITY ASSOCIATED WITH THOSE QUANTITIES OR ANY RELATED CONTRACT DOCUMENTS AND/OR PRICE QUOTATIONS. PLANT LIST QUANTITIES ARE PROVIDED FOR CONVENIENCE. IN THE EVENT OF QUANTITY DISCREPANCIES THE DRAWING SHALL TAKE PRECEDENCE.
4. REMOVE ALL VEGETATIVE GROWTH FROM THE PLANT BED AREAS AND LOOSEN SOIL TO A DEPTH OF 24". IF UNSUITABLE MATERIAL IS ENCOUNTERED, CONTRACTOR SHALL EXCAVATE THE PLANT BED AREA TO A DEPTH OF 24", REMOVE ANY UNSUITABLE MATERIAL AND REPLACE WITH CLEAN TOPSOIL. UNIFORMLY SPREAD 4" PEAT MOSS OVER THE ENTIRE BED AND BLEND THOROUGHLY TO A DEPTH OF 8". REMOVE ANY ROCKS OR UNDESIRABLE MATERIAL LARGER THAN 2" ENCOUNTERED.
5. ALL PLANT MATERIAL PROVIDED SHALL BE TRUE TO THE BOTANICAL NAMES AND THE MINIMUM SIZES (HEIGHT, SPREAD) INDICATED ON THE PLANT SCHEDULE. ALL PLANT MATERIAL SHALL COMPLY WITH THE 'AMERICAN STANDARD FOR NURSERY STOCK' (MOST CURRENT EDITION) AND WITH THE OWNER'S APPROVAL.
6. CAREFULLY SET PLANT MATERIAL IN THE PLANT BEDS UPRIGHT, PLUMB, AND FACED TO GIVE THE BEST APPEARANCE OR RELATIONSHIP TO THE MOST IMPORTANT VANTAGE POINT. SET PLANT MATERIAL AT FINISH GRADE.
7. ALL PLANT BEDS SHALL RECEIVE A 3" LAYER OF DOUBLE SHREDDED HARDWOOD BARK MULCH WITH WEED BARRIER.
8. CAREFULLY AND SKILLFULLY PRUNE EXISTING TREES ON SITE TO REMOVE DEAD BRANCHES TO THE NEAREST HEALTHY BRANCH CROTCH. FIELD LOCATE PROPOSED LIGHT FIXTURES SO AS NOT TO INTERFERE WITH EXISTING TREES TO REMAIN. PRUNE EXISTING TREES TO ALLOW FOR MAXIMUM FOOT CANDLES FROM PROPOSED LIGHT FIXTURES WITHOUT CREATING AN UNNATURAL SHAPE, TYP.

RED SWING GROUP
ENGINEERS & SURVEYORS
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SUITE 101
MONROEVILLE, PA 15146
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A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
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JACOB WIELAND
ENGINEER
No. PE084705
3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
LANDSCAPE DETAILS

SHEET NO.
C850

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P14_SE_08.24.2022

DISCLAIMER:
THIS PANORAMA IS FOR THE PROTOTYPICAL TEMPLATE AND MAY NOT REPRESENT SITE SPECIFIC CHANGES.

EXTERIOR FINISHES

BR-A
BRICK VENEER
COLOR: DARK BROWN
SIZE: MODULAR

BR-B
BRICK VENEER
COLOR: LIGHT BROWN
SIZE: MODULAR

SC-1
STUCCO SYSTEM
COLOR: WHITE
FINISH: SAND MEDIUM

SC-2
STUCCO SYSTEM
COLOR: BROWN
FINISH: SAND MEDIUM

EC-1
PREFINISHED METAL COPING
COLOR: MIDNIGHT BRONZE

PT-113
EXTERIOR PAINT
COLOR: DARK BRONZE
FINISH: SEMI-GLOSS

ST-1
STOREFRONT
COLOR: DARK BRONZE

PERSPECTIVE VIEW

PERSPECTIVE VIEW

PERSPECTIVE VIEW

PERSPECTIVE VIEW

PROJECT DATA

Prototype Edition:	SE
Exterior Finish Type:	TOWER BRICK
Wall Framing Type:	METAL STUD
Kitchen Type:	CENTERLINE
Water Filtration Type:	TYPE A
Drive-Thru:	YES
Industrialized Construction:	YES
Number of Parking Spaces:	#
Number of Accessible Parking Spaces:	#
Cross Parking:	YES
Menu Board - Interior:	YES
Menu Board - Interior - Count:	6
Menu Board - Interior - Type:	DIGITAL
Menu Board - Walk-up:	N/A
Menu Board - Walk-up - Count:	N/A
Menu Board - Walk-up - Type:	N/A
Menu Board - Order Point:	YES
Menu Board - Order Point - Count:	4
Menu Board - Order Point - Type:	DIGITAL
Planned Classification:	BASE
Playground	NO
Landscaping Type	STANDARD
LEED Rating	NOT CERTIFIED
Drive Thru Stack Count:	#
Drive Thru Bypass Lane:	YES
Drive Thru Number of Fulfillment Lanes:	#
Drive Thru Number of Pickup Lanes:	#
Drive Thru Number of Order Point Pylons:	#
Drive Thru Number of Pickup Windows:	#
Drive Thru Door:	YES
Square Footage:	4865
Seat Count - Interior:	74
Seat Count - Exterior:	28
Canopy Type - Order Point:	DOUBLE
Canopy Type - Meal Delivery:	DOUBLE
Number of Registers:	3

DESIGN APPROVAL

SUP SD DD CD

NOT APPROVED - REVISE AND RESUBMIT

APPROVED AS NOTED - REVISE AND RESUBMIT

APPROVED FOR DESIGN INTENT

INITIAL: DATE:

PROJECT NOTES

ATTACHED CANOPY SCHEDULE

Mark	Description	Count	Overall Width	Overall Depth	Tie Back Mounting (Offset From Top)	Integral Lighting
C1-C	Exterior Canopy	11	6'-4"	1'-0"	0"	No
C4-B	Exterior Canopy	2	5'-4"	4'-0"	2'-4"	Yes
C4-L	Exterior Canopy	1	28'-0"	4'-0"	2'-4"	Yes
C5-A	Exterior Canopy	1	13'-4"	5'-0"	2'-4"	Yes
Grand total		15				

PERSPECTIVE VIEW

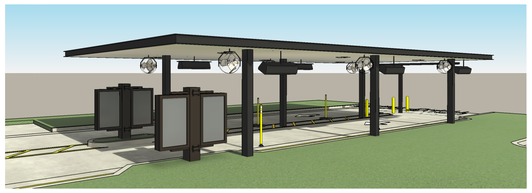
REF. ENCLOSURE FINISHES

EC-1
PREFINISHED METAL COPING
COLOR: MIDNIGHT BRONZE

BR-A
BRICK VENEER
COLOR: DARK BROWN
SIZE: MODULAR

EXTERIOR ELEVATION

EXTERIOR ELEVATION



PERSPECTIVE VIEW

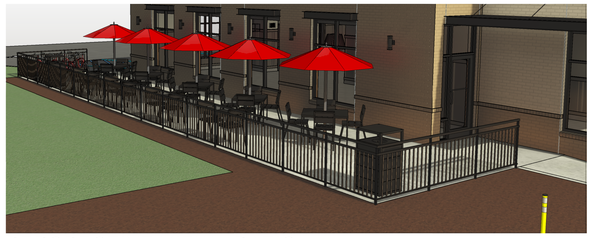
OP CANOPY FINISHES

CP-1
PREFINISHED METAL
COLOR: DARK BRONZE

CP-2
METAL DECKING
COLOR: WHITE

EXTERIOR ELEVATION

EXTERIOR ELEVATION

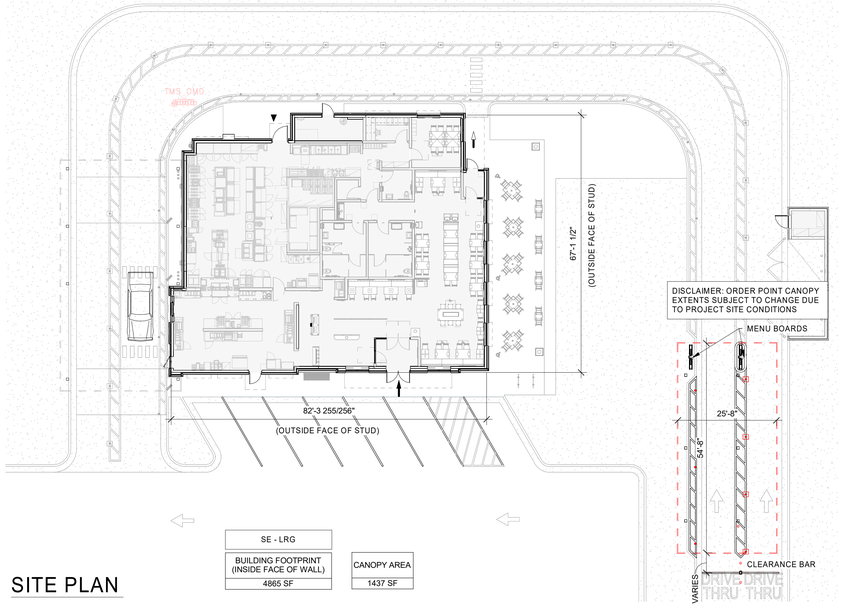


PERSPECTIVE VIEW - PATIO

PATIO SEATING SCHEDULE

Mark	Type	Count	Manufacturer	Model	Width	Depth	Height	Material	Finish
1	Patio Chair	28	Benchmark Design Group	WENDOVER CHAIR					
2	Patio Table - 4 Top	2	Benchmark Design Group	TAB3055-3636-AAL-WJ-UH-BDT	3'-0"	3'-0"	2'-5 1/4"	Aluminim - Dark Bronze	RAL 49/66220 (C34 Bronze One Coat)
3	Patio Table - 4 Top - ADA	3	Benchmark Design Group	TAB3055-3644-AAL-WJ-UH-BDT	3'-8"	3'-0"	2'-5 1/4"	Aluminim - Dark Bronze	RAL 49/66220 (C34 Bronze One Coat)
4	Patio Table - 2 Top	4	Benchmark Design Group	TAB3055-2424-AAL-WJ-BDT	2'-0"	2'-0"	2'-5 1/4"	Aluminim - Dark Bronze	RAL 49/66220 (C34 Bronze One Coat)
5	Patio Umbrella	5	Tuuci	OCEAN MASTER PARASOL					
6	Trash Receptacle	2	Benchmark Design Group	CFA-AL-2444	2'-0"	2'-0"	3'-11"	Dark Bronze	RAL 49/66220 (C34 Bronze One Coat)
7	Entrance Bench - 80"	2	Benchmark Design Group	Wendover Bench - 4131	6'-8"	2'-0"	3'-0"	Aluminum - Dark Bronze	#34 Fine Textured Bronze 449/96511
8	Bike Rack - Surface Mount	2	Belson Outdoors	ORN-2-SF-P	3'-4"	2 3/8"	2'-9"	Steel	Black Powder Coated

DINING PATIO PLAN



SITE PLAN

SE - LRG	
BUILDING FOOTPRINT (INSIDE FACE OF WALL)	CANOPY AREA
4865 SF	1437 SF

Chick-fil-A
5200 Buffington Road
Atlanta, Georgia
30349-2998

SITE ADAPT LOGO AND ADDRESS

PROTOTYPICAL SET

NOT FOR REGULATORY APPROVAL, BIDDING, OR CONSTRUCTION

CHICK-FIL-A
Project Name

Street Address
City, GA 00000

FSR#00000

BUILDING TYPE / SIZE: P14 SE LRG
RELEASE: 22.08
PRINTED FOR

PROJECT STATUS

REVISION SCHEDULE

NO. DATE DESCRIPTION

CONSULTANT PROJECT # ####
DATE MM/DD/YY
DRAWN BY Author

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SHEET
DESIGN OVERVIEW

SHEET NUMBER
X-900

8/23/2022 9:25:18 AM Autodesk Docs://00_CFA_FSR_Templates/00000_NewStore_SE_ARC.rvt
XX-SE-00000-X-900-DESIGN OVERVIEW

SOUTH - BLDG 1

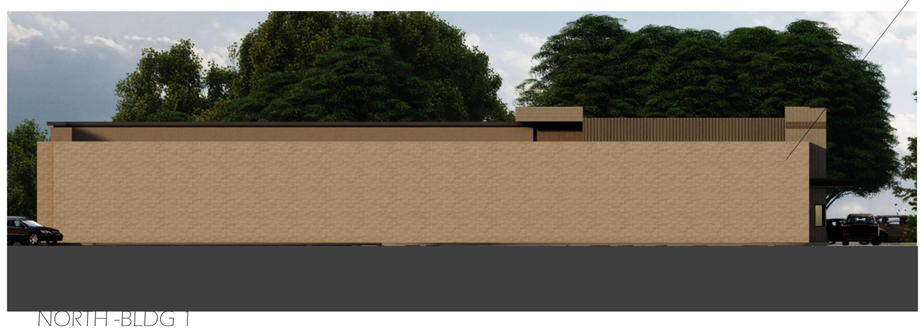
SOUTH - BLDG 2

EAST- BLDG 1

CULTURED STONE
WOOD RAINSCREEN
METAL PANEL CORNICE
FABRIC AWNINGS
ALUMINUM STOREFRONT
ARCHITECTURAL BRICK
ARCHITECTRUAL SPLITFACE CMU

EAST - BLDG 2

ARCHITECTURAL BRICK
WOOD SIDING
DECORATIVE METAL SIDING
ARCHITECTURAL BRICK
CULTURED STONE
ALUMINUM STOREFRONT

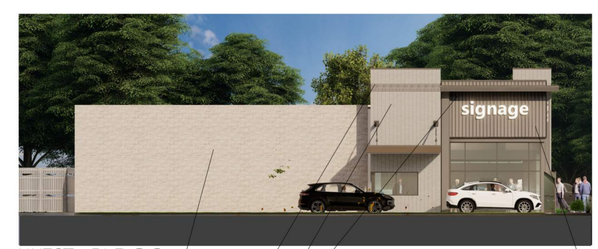


NORTH -BLDG 1

NORTH - BLDG 2

WEST - BLDG 1

WOOD RAINSCREEN
METAL PANEL CORNICE
ALUMINUM STOREFRONT
ARCHITECTURAL BRICK



WEST - BLDG 2

DECORATIVE METAL SIDING
METAL PANEL CORNICE
ARCHITECTIRAL BRICK
BRICK ACCENT
ARCHITECTURAL SPLIT FACE CMU

BENDERSON
DEVELOPMENT

RETAIL SHELLS
WILKiNS TOWNSHIP, PA
3.7.23

March 28, 2023

TPD# BEND.00008

Est. 1989

TRAFFIC PLANNING AND DESIGN, INC.

Transportation Impact Study

3475 William Penn Highway Retail Development

Wilkins Township, Allegheny County

For Submission To:

Wilkins Township & PennDOT District 11-0

3475 WILLIAM PENN HIGHWAY
RETAIL DEVELOPMENT
TRANSPORTATION IMPACT STUDY

FOR SUBMISSION TO:

Wilkins Township, Allegheny County, PA
& PennDOT District 11-0

Prepared For:
Benderson Development Company
570 Delaware Ave.
Buffalo, New York 14202

Phone: (716) 886-0211
Fax: (716) 886-1026

March 28, 2023

TPD # BEND.00008

Est. 1989
TRAFFIC PLANNING AND DESIGN, INC.

Prepared By:
Traffic Planning and Design, Inc.
1370 Washington Pike, Suite 515
Pittsburgh, PA 15017

Phone: (717) 234-1430
Fax: (717) 234-4490
E-mail: TPD@TrafficPD.com
Website: www.trafficpd.com

Michael J. Mudry, P.E., PTOE
Regional Manager
Pennsylvania License Number PE-056646-E

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TECHNICAL APPENDICES

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Appendix B: Existing Roadway Conditions
Appendix C: Turning Movement Counts
Appendix D: Trip Generation and Distribution Calculations
Appendix E: Volume Development Worksheets
Appendix F: Capacity & Queue Analysis Printouts
Appendix G: Traffic Signal Permit Plans
Appendix H: Turn Lane Warrant Analysis

EXECUTIVE SUMMARY

The purpose of this study is to examine the potential traffic impact associated with the proposed 3475 William Penn Highway retail development on the roadway network in Wilkins Township, Allegheny County, PA. Based on this evaluation, the following conclusions were reached:

1. The project scope and the extent of the study area were confirmed with representatives of PennDOT and Township staff during the TIS scoping process, with a TIS scoping meeting occurring on October 17, 2022. The study area intersections included in this TIS are as follows:
    - William Penn Highway (S.R. 2048) and Penn Center Boulevard/commercial driveway;
    - William Penn Highway (S.R. 2048) and Kingston Drive/commercial driveway;
    - William Penn Highway (.R. 2048) and Home Depot driveway/Pep Boys driveway.
2. The project site is located on the northeast corner of the intersection of William Penn Highway (S.R. 2048) & the existing Pep Boys driveway. Subsequent to the TIS scoping process, the proposed site plan has been updated and is now proposed to consist of a total of 22,695 square feet of commercial/retail space. The 22,695 square feet of commercial/retail space is anticipated to comprise of the following components:
    - 11,398 square feet of retail/commercial space;
    - a 4,997 square foot fast food restaurant with a drive-through window;
    - a 3,800 square foot restaurant with a drive-through window;
    - a 2,500 square foot coffee/donut shop with a drive-through window;
    - One (1) standalone drive-through ATM machine.
3. Access to the site is proposed via the existing Pep Boys full-access (private) driveway to William Penn Highway (S.R. 2048), and one (1) partial access (westbound right-in only) driveway from William Penn Highway (S.R. 2048), located approximately 340 feet east of the existing Pep Boys full-access driveway.
4. The proposed driveway location sight distances will exceed PennDOT's Desirable and Safe Stopping Sight Distance (SSSD) criteria.
5. Upon full build-out, the proposed development is expected to generate 238 new vehicle-trips during the weekday A.M. peak hour, 160 new vehicle-trips during the weekday P.M. peak hour and 343 new vehicle-trips during the Saturday midday peak hour.
6. Capacity analyses were conducted to determine the quality of operation (LOS) at the study area intersections for the 2023 existing, 2024 and 2029 base (no-build), and 2024 and 2029 projected (build) conditions. The capacity analyses were conducted in accordance with the standards contained in *Appendix A - Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits* of *PennDOT Publication 282*, dated September 2022.
7. The intersection of William Penn Highway (S.R. 2048) and Pep Boys/Home Depot driveway is forecasted to operate at an overall intersection level of service (ILOS) of B under 2024 and 2029 projected conditions with full build-out of the development and the implementation of the recommended improvements.

8. Under the 2024 and 2029 projected (build) conditions, with implementation of the recommended improvements, the study area intersections will operate with an overall intersection level of service (ILOS) similar to the 2024 and 2029 base (no-build) conditions. All overall intersection delays fall within PennDOT's allowable 10-second variance between no-build and build condition scenarios, except at the intersection of William Penn Highway (S.R. 2048) and Pep Boys/Home Depot Driveway. At the intersection of William Penn Highway (S.R. 2048) and Pep Boys/Home Depot Driveway, the overall intersection level of service is projected to decrease from LOS A to LOS B, with an overall intersection delay increase of 12.9 seconds during the weekday A.M. peak hour, 7.0 seconds during the weekday P.M. peak hour, and 11.4 seconds during the Saturday midday peak hour. The overall intersection levels of service are within acceptable ranges and increases in delay are minimal, which according to PennDOT's TIS guidelines, are considered a marginal LOS degradation. Marginal degradation is defined as a drop in overall intersection level of service within a LOS B to LOS D for urban areas. A level of service degradation can be expected at the intersection since the commercial property is currently vacant, but once facilitated a large box-store commercial development.

9. Traffic Planning and Design Inc. (TPD) recommends the following roadway improvements as outlined at the study area intersections:

William Penn Highway (S.R. 2048) & Pep Boys driveway/Home Depot driveway

- Restripe the existing eastbound left turn lane on William Penn Highway (S.R. 2048) to provide 200 feet of vehicle storage, not including taper.
- Optimize traffic signal timing splits.

William Penn Highway (S.R. 2048) & Proposed Right-In Only Driveway

- Design the site access as a partial-movement (right-in only) medium-volume driveway providing one (1) lane ingress.

As part of PennDOT's HOP process, the applicant will coordinate and fund the implementation of the recommended roadway improvements. Preliminary construction costs have not been determined at this time.

10. Levels of Service (LOS) for the study area intersections have been summarized in matrix form. **Table I** details the overall intersection LOS for each study area intersection.

TABLE I
OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY

Intersection	Time Period	Existing	Opening Year 2024			Horizon Year 2029			Meets LOS Requirements?
			Base	Projected	Projected[1]	Base	Projected	Projected[1]	
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway	AM	B (19.9)	B (19.9)	B (19.7)	--	C (20.0)	B (19.9)	--	Yes
	PM	C (23.2)	C (23.3)	C (23.5)	--	C (23.7)	C (23.9)	--	Yes
	SAT	C (21.6)	C (21.8)	C (22.5)	--	C (22.2)	C (23.0)	--	Yes
William Penn Highway (S.R. 2048) & Kingston Drive/Driveway	AM	C (25.9)	C (26.0)	C (25.9)	--	C (26.3)	C (26.3)	--	Yes
	PM	C (25.5)	C (25.5)	C (25.5)	--	C (25.9)	C (26.0)	--	Yes
	SAT	C (28.0)	C (28.4)	C (23.0)	--	C (28.8)	C (23.4)	--	Yes
William Penn Highway (S.R. 2048) & Home Depot Driveway/Pep Boys Driveway	AM	A (3.3)	A (3.6)	B (16.8)	B (16.7)	A (3.6)	B (16.6)	B (16.5)	No[2]
	PM	A (4.3)	A (5.2)	B (12.1)	B (12.2)	A (5.2)	B (12.1)	B (12.2)	Yes
	SAT	A (5.9)	A (6.7)	B (18.2)	B (18.1)	A (6.8)	B (18.4)	B (18.4)	No[2]

Base = No-Build scenario Projected = Build scenario with development

[1] Projected condition with recommended improvements.

[2]Marginal degradation per to PennDOT's TIS guidelines. The overall intersection LOS are within acceptable ranges and increases in delay are minimal.

INTRODUCTION

Traffic Planning and Design, Inc. (TPD) has completed a Transportation Impact Study (TIS) for the proposed 3475 William Penn Highway retail development in Wilkins Township, Allegheny County, Pennsylvania. As shown in **Figure 1**, the project site is located on the northern side of William Penn Highway (S.R. 2048), northeast of the intersection with the existing Pep Boys Driveway. At full build-out, the proposed development is planned to consist of a total of 22,695 square feet of commercial/retail space, comprising of the following components:

- 11,398 square feet of retail/commercial space;
- a 4,997 square foot fast food restaurant with a drive-through window;
- a 3,800 square foot restaurant with a drive-through window;
- a 2,500 square foot coffee/donut shop with a drive-through window;
- One (1) standalone drive-through ATM machine.

Access to the site is proposed via the existing Pep Boys full-access (private) driveway to William Penn Highway (S.R. 2048) and one (1) partial access (westbound right-in only) driveway to William Penn Highway (S.R. 2048), located approximately 340 feet east of the existing Pep Boys full-access driveway. A site plan of the proposed development is provided in **Figure 2**.

This report has been prepared in accordance with PennDOT's *Policies and Procedures for Transportation Impact Studies*, found in PennDOT's Publication 282, Appendix A, dated September 2022. The project scope and the extent of the study area were confirmed with representatives of PennDOT and Wilkins Township during the TIS scoping meeting process, with a TIS scoping meeting occurring on Monday, October 17, 2022. All relevant correspondence pertaining to this project has been included in **Appendix A**.

EXISTING ROADWAY NETWORK

A field review of the existing roadway system in the study area was conducted. The existing roadway characteristics within the study area are summarized in **Table 1**. Photographs of the study area intersections are included in **Appendix B**.

TABLE 1
ROADWAY CHARACTERISTICS WITHIN STUDY AREA

Roadway	Ownership	Functional Classification/ Roadway Type	Predominant Directional Orientation	Average Daily Traffic[1]	Posted Speed Limit
William Penn Highway	State (S.R. 2048)	Urban Principal Arterial	East-West	29,232	40 mph
Penn Center Boulevard	Township	Local	North-South	--	20 mph
Kingston Drive	Township	Local	North-South	3,094	20 mph

[1]*Average Daily Traffic Volume (ADT) data obtained from PennDOT's Traffic Information Repository (TIRe) website.*

Land Use Context

In Section 1.2 of the Design Manual, Part 2, there is guidance pertaining to defining the land use context(s) for a given area. Based upon review of this information, the land uses surrounding the proposed site best fits the Suburban Center designation, as described below:

> **Suburban Center,** *"Often a mixed use, cohesive collection of land uses that may include residential, office, retail, and restaurant uses where commercial uses serve surrounding neighborhoods. These areas are typically designed to be accessible by car, and may include large parking areas and garages. They are less accommodating to pedestrians than town centers, and opportunities to cross the primary roadway can be limited. On-street parking may or may not be provided."*

Roadway Type

In Section 1.2 of the Design Manual, Part 2, there is guidance pertaining to defining the transportation context(s) for a given area. Comparing the existing condition roadway characteristics to the various options presented in Table 1.2, the study area roadways best fit the following categories, as described below:

> ***Regional Arterial***, traffic volumes of 10,000 to 40,000 vehicles per day, intersection spacing of 660 to 1,320 feet, a desired operating speed of 30-55 mph, and a description as follows: *"Roadways in this category would be considered "Principal Arterial" in traditional functional classification."*
>
> » William Penn Highway (S.R. 2048)
>
> ***Local Road***, traffic volumes of <3,000 vehicles per day, intersection spacing of 000 to 660 feet, a desired operating speed of 20-30 mph.
>
> » Kingston Drive
> » Penn Center Boulevard

Pedestrian Facilities

Pedestrian accommodations are currently present at the signalized intersection of William Penn Highway (S.R. 2048) and Pep Boys/Home Depot driveways, with pedestrian crossings located on the north, south and west legs of the intersection, and will be maintained as part of the proposed development. However, pedestrian sidewalks are not present along William Penn Highway (S.R. 2048) within the vicinity of the site or study area. Pedestrian sidewalks are anticipated to be provided on site.

Mass Transit Facilities

The greater Pittsburgh area is provided with public transportation by Pittsburgh Regional Transit (PRT) Port Authority. Public transportation is available along William Penn Highway (S.R. 2048) via Route 67 and Route P67 with transit stops located on the northeast and southwest corners of the intersection with the existing Pep Boys/Home Depot Driveways.

Crash Data Investigation

Crash data were obtained from PennDOT for the study area intersections. PennDOT defines a reportable crash as follows, "A reportable (crash) is one in which an injury or fatality occurs or if at least one of the vehicles involved requires towing from the scene." Reportable crashes were tabulated for the five-year time period beginning 1/1/2017 and ending 12/31/2021. For a given intersection, PennDOT considers a crash occurrence of 5 reportable, correctable crashes over a continuous twelve-month period during the past five years to be a threshold value, above which the intersection design should be reviewed to examine if corrective measures can be taken to enhance safety. In accordance with typical PennDOT policy the crash data investigation was provided for review under separate cover.

EXISTING TRAFFIC CONDITIONS

Manual Traffic Counts

Manual traffic counts were conducted on 15-minute intervals during the weekday morning (7:00 to 9:00 A.M.), weekday evening (4:00 to 6:00 P.M.) and Saturday midday (11:00 A.M. to 1:00 P.M.) peak periods. Data pertaining to heavy vehicles, pedestrians, bicycles, and transit vehicles were observed during the manual counts. Peak hours and count dates for the study area intersections are identified in **Table 2**.

TABLE 2
TRAFFIC COUNT INFORMATION

Intersection	Date of Traffic Counts	Time Period	Intersection Peak Hour[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/ Commercial Driveway	Thursday, January 19, 2023	Weekday A.M.	7:45 to 8:45 A.M.
		Weekday P.M.	4:30 to 5:30 P.M.
	Saturday, January 21, 2023	Saturday Midday	12:30 to 1:30 P.M.
William Penn Highway (S.R. 2048) & Kingston Drive/ Commercial Driveway	Thursday, January 19, 2023	Weekday A.M.	8:00 to 9:00 A.M.
		Weekday P.M.	4:30 to 5:30 P.M.
	Saturday, January 21, 2023	Saturday Midday	12:15 to 1:15 P.M.
William Penn Highway (S.R. 2048) & Home Depot / Pep Boys Driveways	Thursday, January 19, 2023	Weekday A.M.	8:00 to 9:00 A.M.
		Weekday P.M.	4:30 to 5:30 P.M.
	Saturday, January 21, 2023	Saturday Midday	12:30 to 1:30 P.M.

The 2023 existing conditions traffic volumes for the weekday A.M., weekday P.M., and midday Saturday peak hours are illustrated in **Figure 3**. Manual traffic count data sheets are provided in **Appendix C**.

Average Daily Traffic

The traffic volume map contained on the PennDOT Traffic Information Repository (TIRe) website was reviewed to determine the Average Daily Traffic (ADT) for a typical weekday along the roadways in the vicinity of the proposed site. The available ADT information from the TIRe website is summarized in **Table 1.**

BASE (NO-BUILD) CONDITIONS

Annual Background Growth

A background growth factor was developed based on growth rates obtained from the Southwest Pennsylvania Commission (SPC). A background growth rate of 0.50% per year is recommended for Wilkins Township, Allegheny County. As directed by SPC, the background growth rate was applied linearly to the 2023 traffic data, yielding an overall growth percentage of **0.50%** for the 2024 base (no-build) condition (0.50% grown for 1 year) and **3.00%** for the 2029 base (no-build) condition (0.50% grown for 6 years).

Nearby Proposed Development

Base (no-build) traffic conditions were calculated to include traffic volumes from a proposed development, which, though not operating under existing conditions, may be operating by the opening year (2024) and

design year (2029) of the proposed 3475 William Penn Highway retail development. As discussed during the TIS scoping meeting, a car dealership is proposed for the vacant parcel located on the southwest corner of the intersection of William Penn Highway (S.R. 2048) and Pep Boys/Home Depot driveways. Through coordination with Township staff and the proposed car dealership developer, it was determined that a 19,725 square foot car dealership for new and used vehicle sales is proposed. Access to the development is proposed via one (1) full access driveway to the existing Home Depot Driveway and one (1) left turn restricted driveway to/from William Penn Highway (S.R. 2048). The following provides a brief description of the background development site trips and trip distributions.

Trip generation for the proposed car dealership development was based on rates and equations obtained from the *Trip Generation Manual*, Eleventh Edition, 2021, an Institute of Transportation Engineers (ITE) Informational Report. Land Use 840, Automobile Sales – New, from *Trip Generation* was used to calculate the number of vehicular trips the development will generate during the weekday A.M. peak hour, weekday P.M. peak hour, and Saturday midday peak hour. **Table 3** shows the rates/equations and directional percentages for the analyzed time periods.

TABLE 3
ITE TRIP GENERATION DATA – BACKGROUND DEVELOPMENT

Land Use	ITE #	Size (X)	Time Period	Equations/ Rates	Directional Splits		Pass-By Trip %
					Enter %	Exit %	
Automobile Sales - New	840	19,725 s.f.	A.M. Peak Hour	T=1.86*(X)	73%	27%	--
			P.M. Peak Hour	T=1.81*(X)+20.91	40%	60%	--
			Saturday Peak Hour	T=8.56*(X)-95.19	50%	50%	--

T = number of site-generated vehicular trips
X = independent variable (square feet s.f.)

The calculated trip generation for the proposed background development is shown in **Table 4.**

TABLE 4
TRIP GENERATION SUMMARY

Condition	Primary (New) Site Trips		
	Total	Enter	Exit
ITE Land Use 840 – Automobile Sales – New 19,725 s.f.			
Weekday A.M. Peak	37	27	10
Weekday P.M. Peak	57	23	34
Saturday Peak	74	37	37

The forecasted site trips for the proposed background development summarized in **Table 4** were distribution based on the trip distribution developed for this study as detailed later in this report.

The background development trips are illustrated in **Figure 4**.

The additional traffic volumes due to background growth and background developments were added to the existing traffic data to produce 2024 and 2029 base (no-build) condition traffic volumes. Base condition

volumes for the weekday A.M., weekday P.M. and Saturday midday peak hours are illustrated in **Figure 5** for the 2024 opening year conditions and **Figure 6** for the 2029 horizon year conditions. Trip generation calculations and distributions for the background development are provided in **Appendix D**.

PROPOSED SITE ACCESS

The proposed site will be served by the existing Pep Boys full-access (private) driveway to William Penn Highway (S.R. 2048) and one (1) partial access (westbound right-in only) driveway to William Penn Highway (S.R. 2048), located approximately 340 feet east of the existing Pep Boys full-access driveway.

Sight Distance Analysis

A sight distance analysis was prepared for the proposed site driveways. In general, recommended safe sight distances depend upon the posted speed limit and roadway grades. The existing sight distances at the proposed driveways were measured in accordance with PennDOT Publication 282 Highway Occupancy Permit Operations Manual and compared to PennDOT's desirable sight distance standard, which is identified in 67 PA Code Chapter 441.8(h), "Access to and Occupancy of Highways by Driveways and Local Roads." In addition, measured sight distances at the proposed driveways were compared to PennDOT's safe stopping sight distance standard, which is calculated by the following equation:

$$\mathbf{SSSD = 1.47VT + V^2/[30(f \pm g)]}$$

SSSD = safe stopping sight distance (acceptable sight distance)
V = Vehicle Speed
T = Perception Reaction Time of Driver (2.5 seconds)
f = Coefficient of Friction for Wet Pavements
g = Percent of Roadway Grade Divided by 100

Tables 5 show the measured, desirable, acceptable (SSSD), and required sight distances at the site driveways for vehicles entering and exiting the site.

TABLE 5
SIGHT DISTANCE ANALYSIS
EXISTING PEP BOYS DRIVEWAY TO WILLIAM PENN HIGHWAY (S.R. 2048)

Movement	Direction	Speed	Grade[1]	Sight Distances (feet)		
				DES	SSSD	EXIST
William Penn Highway (S.R. 2048) & Pep Boys Driveway[2]						
Exiting Movements	To the left	40 mph	3%	538	299	**600+**
	To the right		-6%	460	352	**600+**
Entering Left Turns	Approaching same direction	40 mph	-6%	--	352	**600+**
	Approaching opposite direction	40 mph	3%	395	299	**600+**

DES = PennDOT Desirable Sight Distance
SSSD = PennDOT Acceptable Sight Distance
EXIST = Existing (measured) Sight Distance

1 = Roadway Grade Approaching Driveway
2 = Intersection Controlled by Traffic Signal.

As shown in **Tables 5** above, the measured sight distances at the existing Pep Boys driveway exceed PennDOT's desirable sight distance requirements. It should be noted the existing Pep Boys driveway is currently controlled by a traffic signal. Sight distance measurements are provided in **Appendix B**.

TRIP GENERATION

The trip generation rates for the proposed development were obtained from the *Trip Generation Manual*, Eleventh Edition, 2021, an Institute of Transportation Engineers (ITE) Informational Report. The statistics in Trip Generation Manual are empirical data based on more than 6,500 trip generation studies. The data are categorized by Land Use Codes, with total vehicular trips for a given land use estimated using an independent variable and statistically generated rates or equations.

For the proposed development, the following land uses were selected to calculate the number of site-generated trips during the average weekday, weekday A.M., weekday P.M. and Saturday midday peak hours:

- Land Use 822 (Strip Retail Plaza (<40K), for the proposed 11,398 square feet of retail space;
- Land Use 912 (Drive-In Bank), for the proposed one (1) standalone drive-through ATM machine;
- Land Use 934 (Fast Food Restaurant with Drive Through), for the proposed 3,800 square foot restaurant with a drive-through window to be located on the end of the strip retail building, and for the propose standalone 4,997 square foot fast food restaurant with a drive-through window;
- Land Use 937 (Coffee/Donut Shop with Drive Through), for the proposed 2,500 square foot coffee/donut shop with a drive-through window to be located on the end of the strip retail building.

Table 6 shows the rates/equations and directional percentages for the analyzed time periods.

TABLE 6
ITE TRIP GENERATION DATA

Land Use	ITE #	Size (X)	Time Period	Equations/ Rates	Directional Splits		Pass-By Trip %
					Enter %	Exit %	
Strip Retail Plaza (<40K)	822	11,398 s.f.	Average Weekday	T=42.2*(X)+229.68	50%	50%	
			A.M. Peak Hour	T=2.36*(X)	60%	40%	30%[1]
			P.M. Peak Hour	Ln(T)=0.71*Ln(X)+2.72	50%	50%	40%
			Saturday Peak Hour	T=6.57*(X)	51%	49%	31%
Drive-In Bank	912	1 Lane	Average Weekday	T=125.03*(X)	50%	50%	
			A.M. Peak Hour	T=8.71*(X)-0.75	61%	39%	29%
			P.M. Peak Hour	T=27.07*(X)	49%	51%	35%
			Saturday Peak Hour	T=27.67*(X)	49%	51%	38%
Fast Food w/ Drive Thru	934	3,800 s.f. & 4,997 s.f.	Average Weekday	T=467.48*(X)	50%	50%	
			A.M. Peak Hour	T=44.61*(X)	51%	49%	50%
			P.M. Peak Hour	T=33.03*(X)	52%	48%	55%
			Saturday Peak Hour	T=55.25*(X)	51%	49%	45%[2]
Coffee/Donut Shop w/Drive Thru	937	2,500 s.f.	Average Weekday	T=533.57*(X)	50%	50%	
			A.M. Peak Hour	T=85.88*(X)	51%	49%	90%[3]
			P.M. Peak Hour	T=38.99*(X)	50%	50%	98%[3]
			Saturday Peak Hour	T=87.91*(X)	50%	50%	84%[3]

T = number of site-generated vehicular trips
X = independent variable (ksf, thousand square feet of gross leasable area)
[1] ITE does not provide pass-by rate data for Land Use 822 (Strip Retail Plaza <40KSF); therefore, pass-by rate data from Land Use 821 (Shopping Plaza 40-150ksf) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 821 (Shopping Plaza 40-150 ksf) during the weekday AM peak hour; therefore, it was assumed that the weekday AM peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.
[2] ITE does not provide pass-by rate data for Land Use 934 (Fast Food Restaurant with Drive-Through) for the Saturday peak hour; therefore, it was assumed that the Saturday peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate
[3] ITE does not provide pass-by rate data for Land Use 937 (Coffee/Donut Shop with Drive-Through Window); therefore, pass-by rate data from Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) for the Saturday midday peak hour; therefore, it was assumed that the weekday midday peak hour pass-by rate would reflect the Saturday midday peak hour pass-by rates.

Internal Trips

For mixed-use developments, the *Trip Generation* manual recommends applying an interaction factor to the site trip generation to determine the quantity of "external trips" (trips from external roadways) and "internal capture trips" (trips between the various uses onsite that do not utilize the external roadways, in this case between the retail stores and restaurants and vice versa). Internal capture for the proposed development was calculated in accordance with current ITE recommendations.

Pass-By Trips

According to the *Trip Generation* manual, not all the trips generated by the proposed development will be new to the surrounding area. A distinction was made between "new" trips, which are trips made to/from the study area for the express purpose of visiting the site, "pass-by" trips, which are trips made to the site by traffic passing the retail center on the adjacent roadways en route to another destination. The pass-by trips do not add any additional traffic to the study area intersections but will result in shifts in turning movements at the site driveway intersections.

The calculated trip generation for the proposed development is shown in **Table 7**. For the purposes of this study, TPD assumed the site would be constructed by the opening year of 2024.

TABLE 7
TRIP GENERATION SUMMARY

Land Use	Size (X)	Total Trips	Int. Trips	External Trips			Pass-By Trips			New Trips		
				Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Weekday A.M. Peak Hour												
Strip Retail Plaza (<40K)	11,398 s.f.	27	4	23	14	9	7	4	3	16	10	6
Drive-In Bank	1 Lane	8	0	8	5	3	2	1	1	6	4	2
Fast Food w/ Drive Thru	8,797 s.f.	392	2	390	198	192	195	99	96	195	99	96
Coffee/Donut Shop	2,500 s.f.	215	2	213	108	105	192	97	95	21	11	10
Total	--	**642**	**8**	**634**	**325**	**309**	**396**	**201**	**195**	**238**	**124**	**114**
Weekday P.M. Peak Hour												
Strip Retail Plaza (<40K)	11,398 s.f.	85	34	51	21	30	20	10	10	31	11	20
Drive-In Bank	1 Lane	27	10	17	7	10	6	3	3	11	4	7
Fast Food w/ Drive Thru	8,797 s.f.	291	33	258	139	119	142	74	68	116	65	51
Coffee/Donut Shop	2,500 s.f.	97	11	86	45	41	84	44	40	2	1	1
Total	--	**500**	**88**	**412**	**212**	**200**	**252**	**131**	**121**	**160**	**81**	**79**
Saturday Midday Peak Hour												
Strip Retail Plaza (<40K)	11,398 s.f.	75	19	56	27	29	17	9	8	39	18	21
Drive-In Bank	1 Lane	28	7	21	10	11	8	4	4	13	6	7
Fast Food w/ Drive Thru	8,797 s.f.	486	18	468	240	228	211	108	103	257	132	125
Coffee/Donut Shop	2,500 s.f.	220	8	212	107	105	178	89	89	34	18	16
Total	--	**809**	**52**	**757**	**384**	**373**	**414**	**210**	**204**	**343**	**174**	**169**
Average Weekday												
Strip Retail Plaza (<40K)	11,398 s.f.	711	--	711	356	355	--	--	--	711	356	355
Drive-In Bank	1 Lane	125	--	125	62	63	--	--	--	125	62	63
Fast Food w/ Drive Thru	8,797 s.f.	4,112	--	4,112	2,056	2,056	--	--	--	4,112	2,056	2,056
Coffee/Donut Shop	2,500 s.f.	1,334	--	1,334	667	667	--	--	--	1,334	667	667
Total	--	**6,282**	--	**6,282**	**3,141**	**3,141**	--	--	--	**6,282**	**3,141**	**3,141**

Int. = Internal Capture Trips
X = Independent Variable (ksf, thousand square feet)

Based on the trip generation analysis summarized in **Table 7**, the development will generate approximately 238 new trips during the weekday A.M. peak hour, 160 new trips during the weekday P.M. peak hour, and 343 new trips during the Saturday midday peak hour at full build out. Details of the trip generation calculations are included in **Appendix D.**

TRIP DISTRIBUTION

New (Primary) Trips

The distribution of trips generated by the proposed development was based on the local road network, the existing traffic patterns, the proposed use of the site, and the site driveway locations. The new trips for the proposed development were distributed to the local roadway network based on the percentages shown in **Table 8**.

TABLE 8
TRIP DISTRIBUTION PERCENTAGES – New Trips

Direction - To/From	Assignment (To/From)	Distribution Percentage
East	via William Penn Highway (S.R. 2048)	44%
West	via William Penn Highway (S.R. 2048)	42%
North	via Kingston Drive	5%
South	via Penn Center Boulevard	9%

The distribution percentages for the primary (new) site-generated trips are illustrated on **Figure 7** and the forecasted primary trips for the proposed development during the weekday A.M., P.M., and midday Saturday peak hours are shown in **Figures 9-11**, respectively.

Pass-By Trips

Pass-by trips were established based on the existing traffic patterns in the vicinity of the site and the location and configuration of the site driveways. The pass-by trips for the proposed development were distributed to the local roadway network based on the percentages illustrated in **Figure 8**. Pass-by trip assignments for the weekday A.M., P.M., and midday Saturday peak hours are shown in **Figures 9-11**, respectively.

PROJECTED (BUILD) CONDITION TRAFFIC VOLUMES

The site-generated trips for the proposed development were added to the 2024 and 2029 base (no-build) condition traffic volumes to develop 2024 and 2029 projected (build) condition traffic volumes.

Projected condition traffic volumes for the opening year of 2024 for the weekday A.M., P.M., and Saturday midday peak hours are shown in **Figure 13**. Projected condition traffic volumes for the design year of 2029 for the weekday A.M., P.M., and Saturday midday peak hours are shown in **Figure 14**. Traffic volume development worksheets are contained in **Appendix E**.

DRIVEWAY CLASSIFICATION

Driveways intersecting state roads are classified in the Pennsylvania Code, Title 67, Chapter 441. Low volume driveways are used by 25 to 750 vehicles per day. A medium volume driveway is used by 750 to 1500 vehicles per day. High volume driveways are used by more than 1500 vehicles per day. Based on the anticipated site trip generation and the assignment of site traffic, the classifications of the site driveway intersecting state road (William Penn Highway S.R. 2048) are listed in **Table 9.**

TABLE 9
DRIVEWAY CLASSIFICATIONS

State Road	Driveway	Weekday Trips	Weekday Vehicles	Driveway Type
William Penn Highway (S.R. 2048)	Full Movement	6,282	3,141	High Volume

Note: A "trip" equals an entering or a exiting vehicle. Therefore, weekday vehicles = weekday trips/2.

LEVELS OF SERVICE FOR AN INTERSECTION

For analysis of intersections, level of service is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS criteria is stated in terms of control delay per vehicle for a one-hour analysis period. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The criteria are shown in **Table 10**. Delay, as it relates to level of service, is a complex measure and is dependent upon a number of variables. For signalized intersections, these variables include the quality of vehicle progression, the cycle length, the green time ratio, and the volume/capacity ratio for the lane group in question. For unsignalized intersections, delay is related to the availability of gaps in the flow of traffic on the major street and the driver's discretion in selecting an appropriate gap for a particular movement from the minor street (straight across, left or right turn).

TABLE 10
LEVEL OF SERVICE CRITERIA
UNSIGNALIZED AND SIGNALIZED INTERSECTIONS[1]

Level of Service	Control Delay Per Vehicle (Seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10 and < 20	> 10 and < 15
C	> 20 and < 35	> 15 and < 25
D	> 35 and < 55	> 25 and < 35
E	> 55 and < 80	> 35 and < 50
F	> 80 or v/c > 1.0	> 50 or v/c > 1.0

[1] *Obtained from the Transportation Research Board's Highway Capacity Manual 6th Edition*

CAPACITY ANALYSIS METHODOLOGY

Capacity analyses were conducted for the weekday A.M., P.M., and Saturday midday peak hours at the study area intersections. These analyses were conducted according to the methodologies contained in the *Highway Capacity Manual 6th Edition* (HCM) *Synchro* version 11.1, build 2, revision 9 software, a CUBIC/Trafficware product.

The following conditions were analyzed, as applicable:

- Existing conditions;
- 2024 Base conditions (Build-out year without development);
- 2024 Projected conditions (Build-out year with development);
- 2029 Base conditions (Design year without development);
- 2029 Projected conditions (Design year with development).

The capacity analysis worksheets are included in **Appendix F**. The PennDOT-approved signal plans are included in **Appendix G**.

The following items should be noted with respect to the capacity analyses:

- The traffic signals at the study intersections are part of a traffic adaptive system along William Penn Highway (S.R. 2048). As such, real-world signal timings are constantly changing based on traffic data recorded by the video detectors along the corridor. To emulate the adaptive operations at these intersections, existing signal timings were obtained from PennDOT which determined that the system on average is running a 150 second cycle length during the weekday A.M. and Saturday midday peak hours and a 175 second cycle length during the weekday P.M. peak hours. Then utilizing the permit plans, the signal phasing were coded at each study intersection. Due to the nature of the adaptive signals, the signal timing splits were optimized at the study intersections for existing and base (without development) conditions. In order to identify the impact of the proposed development, the optimized timings from the base (without development) conditions were maintained for the projected (with development) conditions. If further signal timing optimization was needed due to the impact of the proposed development, the optimized timings were applied to the projected (with development) with recommended improvements conditions.

PennDOT's Transportation Impact Study Guidelines outlined in PennDOT's *Policies and Procedures for Transportation Impact Studies*, found in PennDOT's Publication 282, Appendix A, dated September 2022 contain the following criteria regarding levels of service:

- Page 32 of the Guidelines state that if evaluation of the With Development Horizon Year Scenario to the Without Development Horizon Year Scenario indicates that the overall intersection level of service has dropped, the applicant will be required to mitigate the level of service if the increase in overall intersection delay is greater than 10-seconds. If the overall intersection delay increase is less than or equal to 10-seconds, mitigation of the intersection will not be required. If the intersection level of service meets the level of service requirements, applicants may still be required to provide mitigation to address critical lanes or approaches. For locations where the level of service of the design horizon year without the development is LOS F and with development, the delay increases more than 10 seconds, the remedies shall provide an estimated delay which will be no worse than the delay for the design year without the development.
- Page 33 of the Guidelines state that for mitigation scenarios, applicants are expected to mitigate the overall intersection LOS to the original Without Development LOS; the 10-second delay variance is not applied to mitigation scenarios. Applicants may be required to address available storage and queue lengths at critical movements or approaches even if the overall LOS requirements are met.
- Page 34 of the Guidelines state that if signalization is the preferred alternative for mitigation, overall intersection LOS C in rural areas and LOS D in urban areas is acceptable.
- Page 35 of the Guidelines states new signalized or unsignalized intersections established to serve as access to the development shall be designed to operate at minimum LOS C for rural areas, and minimum LOS D for urban areas.

LEVELS OF SERVICE IN THE STUDY AREA

Levels of service (LOS) at the study area intersections are shown in **Tables 11, 12, and 13** for the weekday A.M. P.M., and Saturday midday peak hours. Per PennDOT standards, the signal timings at the signalized study area intersections have been optimized under base conditions and projected conditions.

TABLE 11
LEVEL OF SERVICE DELAY (SECONDS) SUMMARY

Intersection	Movement	Weekday A.M. Peak Hour						
		Existing Condition	Opening Year 2024			Design Year 2029		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/ Commercial Driveway	EB L	E (78.1)	E (78.1)	E (78.1)	---	E (77.9)	E (77.9)	---
	EB T	A (8.4)	A (8.5)	A (9.0)	---	A (8.8)	A (9.4)	---
	EB R	A (7.3)	A (7.4)	A (7.7)	---	A (7.6)	A (7.9)	---
	EB Approach	*B (14.2)*	*B (14.1)*	*B (14.3)*	---	*B (14.4)*	*B (14.5)*	---
	WB L	E (71.8)	E (71.8)	E (70.8)	---	E (71.5)	E (70.6)	---
	WB T/R	A (0.1)	A (0.1)	A (0.2)	---	A (0.2)	A (0.2)	---
	WB Approach	*B (13.1)*	*B (13.0)*	*B (12.8)*	---	*B (13.1)*	*B (12.9)*	---
	NB L/T	E (64.6)	E (64.6)	E (64.5)	---	E (64.3)	E (64.3)	---
	NB R	E (58.2)	E (58.4)	E (59.0)	---	E (58.1)	E (58.7)	---
	NB Approach	*E (63.7)*	*E (63.6)*	*E (63.3)*	---	*E (63.3)*	*E (63.0)*	---
	SB L/T	*E (70.9)*	*E (70.9)*	*E (70.9)*	---	*E (70.9)*	*E (70.9)*	---
	ILOS	**B (19.9)**	**B (19.9)**	**B (19.7)**	---	**C (20.0)**	**B (19.9)**	---
William Penn Highway (S.R. 2048) with Kingston Drive/Commercial Driveway	EB L	E (75.3)	E (75.3)	E (75.3)	---	E (75.3)	E (75.3)	---
	EB T	C (29.7)	C (30.0)	C (31.3)	---	C (30.5)	C (31.8)	---
	EB Approach	*C (30.8)*	*C (31.1)*	*C (32.3)*	---	*C (31.7)*	*C (32.9)*	---
	WB L	E (66.2)	E (66.2)	E (66.2)	---	E (66.9)	E (66.8)	---
	WB T/R	A (0.4)	A (0.4)	A (0.5)	---	A (0.4)	A (0.5)	---
	WB Approach	*B (10.5)*	*B (10.4)*	*A (9.5)*	---	*B (10.5)*	*A (9.7)*	---
	NB L/T	E (70.2)	E (70.2)	E (70.2)	---	E (70.2)	E (70.2)	---
	NB R	E (58.9)	E (58.9)	E (58.9)	---	E (58.7)	E (58.7)	---
	NB Approach	*E (65.0)*	*E (65.0)*	*E (65.0)*	---	*E (64.7)*	*E (64.7)*	---
	SB L/T/R	*E (68.7)*	*E (68.7)*	*E (68.5)*	---	*E (68.6)*	*E (68.4)*	---
	ILOS	**C (25.9)**	**C (26.0)**	**C (25.9)**	---	**C (26.3)**	**C (26.3)**	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway	EB L	A (2.2)	A (2.4)	A (5.4)	A (5.4)	A (2.4)	A (5.5)	A (5.5)
	EB T/R	A (0.2)	A (0.2)	A (0.2)	A (0.2)	A (0.2)	A (0.2)	A (0.2)
	EB Approach	*A (0.2)*	*A (0.2)*	*A (1.4)*	*A (1.4)*	*A (0.2)*	*A (1.4)*	*A (1.4)*
	WB L	A (1.5)	A (1.6)	A (5.5)	A (5.6)	A (1.6)	A (5.6)	A (5.6)
	WB T/R	A (2.3)	A (2.5)	A (8.6)	A (8.7)	A (2.5)	A (8.7)	A (8.8)
	WB Approach	*A (2.3)*	*A (2.4)*	*A (8.3)*	*A (8.4)*	*A (2.5)*	*A (8.4)*	*A (8.5)*
	NB L/T	E (72.5)	E (72.0)	E (70.8)	E (70.7)	E (71.9)	E (70.7)	E (70.7)
	SB L	E (69.1)	E (68.3)	E (60.3)	E (60.3)	E (68.2)	E (60.2)	E (60.2)
	SB T/R	A (0.0)	A (0.0)	E (62.6)	E (61.7)	A (0.0)	E (62.5)	E (61.6)
	SB Approach	*E (69.1)*	*E (68.3)*	*E (61.4)*	*E (60.9)*	*E (68.2)*	*E (61.3)*	*E (60.8)*
	ILOS	**A (3.3)**	**A (3.6)**	**B (16.8)**	**B (16.7)**	**A (3.6)**	**B (16.6)**	**B (16.5)**

Base = No-Build scenario
Projected = Build scenario
ILOS = Overall Intersection Level of Service; Unsignalized ILOS calculated in accordance with Figure 5 of Policies and Procedures for Transportation Impact Studies.
[1]= Projected conditions with implementation of recommended improvements

TABLE 12
LEVEL OF SERVICE DELAY (SECONDS) SUMMARY

Intersection	Movement	Weekday P.M. Peak Hour						
		Existing Condition	Opening Year 2024			Design Year 2029		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway	EB L	F (89.0)	F (89.0)	F (89.0)	---	F (88.8)	F (88.8)	---
	EB T	B (18.2)	B (18.6)	B (19.4)	---	B (19.5)	C (20.3)	---
	EB R	B (13.1)	B (13.3)	B (13.6)	---	B (13.8)	B (14.1)	---
	EB Approach	*C (23.1)*	*C (23.4)*	*C (23.9)*	---	*C (24.2)*	*C (24.8)*	---
	WB L	F (82.5)	F (82.1)	F (81.4)	---	F (81.7)	F (81.7)	---
	WB T/R	A (0.6)	A (0.6)	A (0.6)	---	A (0.6)	A (0.6)	---
	WB Approach	*A (8.1)*	*A (8.2)*	*A (8.3)*	---	*A (8.2)*	*A (8.4)*	---
	NB L/T	E (65.4)	E (65.3)	E (65.3)	---	E (64.8)	E (64.7)	---
	NB R	E (56.5)	E (56.6)	E (56.9)	---	E (56.0)	E (56.2)	---
	NB Approach	*E (63.3)*	*E (63.2)*	*E (63.1)*	---	*E (62.6)*	*E (62.5)*	---
	SB L/T	*F (81.5)*	*F (81.6)*	*F (81.6)*	---	*F (81.6)*	*F (81.6)*	---
	ILOS	**C (23.2)**	**C (23.3)**	**C (23.5)**	---	**C (23.7)**	**C (23.9)**	---
William Penn Highway (S.R. 2048) with Kingston Drive/Driveway	EB L	F (86.1)	F (86.1)	F (86.0)	---	F (85.9)	F (85.8)	---
	EB T	C (28.5)	C (28.8)	C (29.6)	---	C (29.7)	C (30.5)	---
	EB Approach	*C (32.1)*	*C (32.3)*	*C (32.9)*	---	*C (33.1)*	*C (33.7)*	---
	WB L	E (78.7)	E (78.7)	E (78.5)	---	E (79.6)	E (79.4)	---
	WB T/R	A (1.3)	A (1.3)	A (1.4)	---	A (1.4)	A (1.5)	---
	WB Approach	*A (7.6)*	*A (7.5)*	*A (7.4)*	---	*A (7.7)*	*A (7.5)*	---
	NB L/T	E (79.5)	E (79.3)	E (79.3)	---	E (79.1)	E (79.1)	---
	NB R	E (67.3)	E (67.3)	E (67.3)	---	E (66.9)	E (66.9)	---
	NB Approach	*E (73.3)*	*E (73.2)*	*E (73.2)*	---	*E (72.7)*	*E (72.7)*	---
	SB L/T/R	*E (78.4)*	*E (78.4)*	*E (78.3)*	---	*E (78.3)*	*E (78.2)*	---
	ILOS	**C (25.5)**	**C (25.5)**	**C (25.5)**	---	**C (25.9)**	**C (26.0)**	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway	EB L	A (3.4)	A (4.0)	A (7.1)	A (7.1)	A (4.0)	A (7.4)	A (7.4)
	EB T/R	A (0.4)	A (0.4)	A (0.4)	A (0.4)	A (0.4)	A (0.4)	A (0.4)
	EB Approach	*A (0.4)*	*A (0.4)*	*A (1.0)*	*A (1.0)*	*A (0.4)*	*A (1.0)*	*A (1.0)*
	WB L	A (2.5)	A (3.0)	A (5.4)	A (5.4)	A (3.0)	A (5.5)	A (5.5)
	WB T/R	A (4.6)	A (5.3)	B (10.4)	B (10.4)	A (5.4)	B (10.6)	B (10.7)
	WB Approach	*A (4.5)*	*A (5.2)*	*B (10.1)*	*B (10.2)*	*A (5.3)*	*B (10.4)*	*B (10.5)*
	NB L/T	F (81.8)	F (80.7)	F (80.8)	F (80.7)	F (80.6)	F (80.7)	F (80.6)
	SB L	E (77.4)	E (75.2)	E (71.2)	E (71.2)	E (74.9)	E (70.9)	E (70.9)
	SB T/R	E (77.3)	E (75.0)	E (70.4)	E (70.4)	E (74.8)	E (70.1)	E (70.1)
	SB Approach	*E (77.4)*	*E (75.1)*	*E (70.8)*	*E (70.8)*	*E (74.9)*	*E (70.5)*	*E (70.5)*
	ILOS	**A (4.3)**	**A (5.2)**	**B (12.1)**	**B (12.2)**	**A (5.2)**	**B (12.1)**	**B (12.2)**

Base = No-Build scenario
Projected = Build scenario
ILOS = Overall Intersection Level of Service; Unsignalized ILOS calculated in accordance with Figure 5 of Policies and Procedures for Transportation Impact Studies.
[1]= Projected conditions with implementation of recommended improvements

TABLE 13
LEVEL OF SERVICE DELAY (SECONDS) SUMMARY

Intersection	Movement	Midday Saturday Peak Hour						
		Existing Condition	Opening Year 2024			Design Year 2029		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway	EB L	E (76.5)	E (76.5)	E (76.5)	---	E (76.4)	E (76.4)	---
	EB T	B (16.4)	B (16.8)	B (18.3)	---	B (17.6)	B (19.2)	---
	EB R	B (11.3)	B (11.5)	B (12.1)	---	B (11.9)	B (12.5)	---
	EB Approach	*B (20.0)*	*C (20.3)*	*C (21.5)*	---	*C (21.0)*	*C (22.2)*	---
	WB L	E (72.3)	E (72.8)	E (74.5)	---	E (73.1)	E (74.8)	---
	WB T/R	A (4.4)	A (4.4)	A (4.6)	---	A (4.8)	A (5.0)	---
	WB Approach	*B (12.6)*	*B (12.8)*	*B (13.5)*	---	*B (13.1)*	*B (13.8)*	---
	NB L/T	E (57.6)	E (57.5)	E (57.4)	---	E (57.1)	E (57.0)	---
	NB R	D (53.2)	D (53.2)	D (53.8)	---	D (52.8)	D (53.4)	---
	NB Approach	*E (56.3)*	*E (56.2)*	*E (56.1)*	---	*E (55.7)*	*E (55.7)*	---
	SB L/T	*E (69.3)*	*E (69.3)*	*E (69.3)*	---	*E (69.2)*	*E (69.2)*	---
	ILOS	**C (21.6)**	**C (21.8)**	**C (22.5)**	---	**C (22.2)**	**C (23.0)**	---
William Penn Highway (S.R. 2048) with Kingston Drive/Driveway	EB L	E (75.9)	E (75.8)	E (74.8)	---	E (75.7)	E (74.7)	---
	EB T	D (38.6)	D (39.0)	C (27.7)	---	D (39.7)	C (28.3)	---
	EB Approach	*D (39.9)*	*D (40.2)*	*C (29.2)*	---	*D (40.9)*	*C (29.8)*	---
	WB L	F (107.2)	F (114.1)	F (111.9)	---	F (118.2)	F (115.5)	---
	WB T/R	A (1.1)	A (1.2)	A (1.3)	---	A (1.2)	A (1.4)	---
	WB Approach	*B (10.3)*	*B (10.8)*	*B (10.1)*	---	*B (11.1)*	*B (10.4)*	---
	NB L/T	E (68.3)	E (68.2)	E (68.2)	---	E (68.1)	E (68.1)	---
	NB R	E (58.0)	E (58.1)	E (58.1)	---	E (58.0)	E (58.0)	---
	NB Approach	*E (62.5)*	*E (62.5)*	*E (62.5)*	---	*E (62.3)*	*E (62.3)*	---
	SB L/T/R	*E (68.9)*	*E (68.8)*	*E (68.6)*	---	*E (68.7)*	*E (68.5)*	---
	ILOS	**C (28.0)**	**C (28.4)**	**C (23.0)**	---	**C (28.8)**	**C (23.4)**	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway	EB L	A (4.9)	A (5.6)	B (13.8)	B (15.3)	A (5.8)	B (14.6)	B (16.0)
	EB T/R	A (0.4)	A (0.4)	A (0.5)	A (0.6)	A (0.4)	A (0.5)	A (0.6)
	EB Approach	*A (0.4)*	*A (0.4)*	*A (2.5)*	*A (2.7)*	*A (0.5)*	*A (2.5)*	*A (2.8)*
	WB L	A (3.5)	A (4.0)	A (8.8)	B (11.0)	A (4.1)	A (8.8)	B (11.1)
	WB T/R	A (6.4)	A (7.3)	B (17.1)	C (21.2)	A (7.5)	B (17.4)	C (21.8)
	WB Approach	*A (6.1)*	*A (7.0)*	*B (16.4)*	*C (20.4)*	*A (7.2)*	*B (16.7)*	*C (20.9)*
	NB L/T	E (69.1)	E (67.9)	F (101.2)	E (68.1)	E (67.8)	F (103.9)	E (68.3)
	SB L	E (62.8)	E (60.6)	D (54.2)	D (50.4)	E (60.4)	D (54.2)	D (50.2)
	SB T/R	E (62.8)	E (60.6)	E (57.5)	D (51.9)	E (60.4)	E (57.5)	D (51.7)
	SB Approach	*E (62.8)*	*E (60.6)*	*E (55.9)*	*D (51.2)*	*E (60.4)*	*E (55.9)*	*D (51.0)*
	ILOS	**A (5.9)**	**A (6.7)**	**B (18.2)**	**B (18.1)**	**A (6.8)**	**B (18.4)**	**B (18.2)**

Base = No-Build scenario
Projected = Build scenario
ILOS = Overall Intersection Level of Service; Unsignalized ILOS calculated in accordance with Figure 5 of Policies and Procedures for Transportation Impact Studies.
[1]= Projected conditions with implementation of recommended improvements

As shown in **Tables 11, 12 and 13**, under 2029 projected conditions with the development of the proposed site, the study area intersections will operate at the same overall intersection level of service (ILOS) as under 2029 base conditions, during the weekday A.M., P.M. and midday Saturday peak hours. At the intersection

of William Penn Highway (S.R. 2048) and the Home Depot Driveway/Pep Boys Driveway, the overall intersection level of service is projected to decrease from LOS A to LOS B, with an overall intersection delay increase of 12.9 seconds during the weekday A.M. peak hour, 7.0 seconds during the weekday P.M. peak hour, and 11.4 seconds during the Saturday midday peak hours. The overall intersection levels of service are within acceptable ranges and increases in delay are minimal, which according to PennDOT's TIS guidelines, are considered a marginal LOS degradation. Marginal degradation is defined as a drop in the overall intersection LOS within a LOS B to LOS D for urban areas. A LOS degradation can be expected at the intersection since the commercial property is currently vacant, but once facilitated a large box-store commercial development.

95TH PERCENTILE QUEUE ANALYSIS

Queue analyses were conducted at the study area intersections using *Synchro 11* software. For this analysis, the 95th percentile queue is defined as the queue length that is exceeded in 5% of the signal cycles. As an example, for a signal with a 90-second cycle, this means that the 95th percentile queue length will be exceeded during 2 of the 40 signal cycles that occur during the peak hour. The queue analysis results are summarized in **Tables 14, 15 and 16** for the weekday A.M., P.M., and midday Saturday peak hours, respectively.

TABLE 14
95TH PERCENTILE QUEUE SUMMARY
A.M. PEAK HOUR

Approach	Existing ***(Proposed)*** Storage	2023 Existing	Opening Year 2024			Horizon Year 2029		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway								
EB L	205′	119′	119′	119′	---	122′	122′	---
EB T	1,000′+	235′	211′	235′	---	220′	245′	---
EB R	60′	60′	59′	60′	---	62′	64′	---
WB L	250′	168′	154′	168′	---	160′	170′	---
WB T/R	720′	78′	72′	78′	---	74′	81′	---
NB L/T	225′	161′	161′	161′	---	166′	166′	---
NB R	225′	24′	12′	24′	---	12′	26′	---
SB L/T	275′	96′	96′	96′	---	96′	96′	---
SB R	125′	46′	46′	46′	---	47′	47′	---
William Penn Highway (S.R. 2048) with Kingston Drive/Driveway								
EB L	185′	49′	50′	49′	---	53′	52′	---
EB T	720′	271′	275′	306′	---	285′	316′	---
EB R	200′	0′	0′	0′	---	0′	0′	---
WB L	185′	166′	166′	164′	---	171′	169′	---
WB T/R	875′	111′	114′	137′	---	116′	141′	---
NB L/T	175′	55′	55′	55′	---	55′	55′	---
NB R	175′	19′	19′	19′	---	21′	20′	---
SB L/T/R	520′	168′	169′	179′	---	172′	182′	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway								
EB L	125′ ***(200′)***	0′	0′	29′	50′	0′	32′	50′
EB T/R	875′	36′	38′	37′	98′	40′	38′	102′
WB L	160′	12′	16′	25′	32′	17′	25′	32′
WB T/R	1,000′+	105′	110′	146′	183′	114′	151′	189′
NB L/T	220′	81′	90′	88′	81′	91′	89′	82′
NB R	120′	0′	0′	0′	0′	0′	0′	0′
SB L	260′	14′	13′	282′	240′	13′	282′	240′
SB T/R	325′	0′	0′	0′	0′	0′	0′	0′

Base = No-Build scenario
Projected = Build scenario
[1]= Projected conditions with implementation of recommended improvements

TABLE 15
95TH PERCENTILE QUEUE SUMMARY
P.M. PEAK HOUR

Approach	Existing ***(Proposed)*** Storage	2023 Existing	Opening Year 2027			Horizon Year 2032		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway								
EB L	205′	171′	171′	171′	---	176′	176′	---
EB T	1,000′+	555′	567′	597′	---	595′	625′	---
EB R	60′	56′	56′	56′	---	60′	60′	---
WB L	250′	189′	194′	202′	---	198′	209′	---
WB T/R	720′	153′	150′	152′	---	153′	160′	---
NB L/T	225′	321′	322′	322′	---	328′	328′	---
NB R	225′	54′	54′	56′	---	54′	55′	---
SB L/T	275′	156′	156′	156′	---	159′	159′	---
SB R	125′	51′	51′	51′	---	50′	50′	---
William Penn Highway (S.R. 2048) with Kingston Drive/Driveway								
EB L	185′	143′	143′	143′	---	147′	144′	---
EB T	720′	83′	88′	92′	---	90′	94′	---
EB R	200′	0′	0′	0′	---	0′	0′	---
WB L	185′	186′	185′	185′	---	189′	188′	---
WB T/R	875′	256′	261′	290′	---	266′	296′	---
NB L/T	175′	130′	130′	130′	---	134′	134′	---
NB R	175′	47′	47′	47′	---	47′	46′	---
SB L/T/R	520′	236′	238′	245′	---	243′	249′	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway								
EB L	125′ ***(200′)***	1′	1′	24′	27′	1′	24′	26′
EB T/R	875′	104′	111′	328′	142′	115′	325′	146′
WB L	160′	14′	19′	28′	28′	20′	29′	29′
WB T/R	1,000′+	273′	301′	402′	430′	315′	420′	447′
NB L/T	220′	127′	155′	146′	146′	159′	150′	150′
NB R	120′	4′	10′	9′	0′	11′	10′	0′
SB L	260′	15′	15′	191′	191′	14′	191′	191′
SB T/R	325′	0′	0′	18′	0′	0′	23′	0′

Base = No-Build scenario
Projected = Build scenario
[1]= Projected conditions with implementation of recommended improvements

TABLE 16
95TH PERCENTILE QUEUE SUMMARY
SATURDAY PEAK HOUR

Approach	Existing *(Proposed)* Storage	2023 Existing	Opening Year 2027			Horizon Year 2032		
			Base	Projected	Projected[1]	Base	Projected	Projected[1]
William Penn Highway (S.R. 2048) & Penn Center Boulevard/Driveway								
EB L	205′	135′	135′	135′	---	138′	138′	---
EB T	1,000′+	510′	525′	576′	---	552′	605′	---
EB R	60′	33′	33′	33′	---	35′	35′	---
WB L	250′	212′	217′	238′	---	221′	241′	---
WB T/R	720′	141′	145′	146′	---	149′	148′	---
NB L/T	225′	212′	213′	213′	---	218′	218′	---
NB R	225′	49′	50′	54′	---	50′	53′	---
SB L/T	275′	151′	151′	151′	---	155′	155′	---
SB R	125′	51′	51′	51′	---	51′	51′	---
William Penn Highway (S.R. 2048) with Kingston Drive/Driveway								
EB L	185′	79′	77′	74′	---	77′	73′	---
EB T	720′	77′	78′	84′	---	81′	86′	---
EB R	200′	0′	0′	0′	---	0′	0′	---
WB L	185′	249′	254′	242′	---	261′	249′	---
WB T/R	875′	198′	187′	254′	---	191′	259′	---
NB L/T	175′	98′	98′	98′	---	99′	99′	---
NB R	175′	44′	44′	43′	---	44′	43′	---
SB L/T/R	520′	171′	175′	187′	---	179′	190′	---
William Penn Highway (S.R. 2048) with Home Depot Driveway/Pep Boys Driveway								
EB L	125′ ***(200′)***	0′	0′	138′	193′	0′	160′	200′
EB T/R	875′	94′	117′	107′	224′	121′	111′	250′
WB L	160′	33′	43′	45′	58′	44′	46′	59′
WB T/R	1,000′+	356′	387′	392′	614′	406′	408′	644′
NB L/T	220′	167′	194′	272′	221′	195′	273′	222′
NB R	120′	13′	0′	0′	0′	0′	0′	0′
SB L	260′	7′	7′	332′	259′	7′	333′	259′
SB T/R	325′	0′	0′	112′	19′	0′	118′	21′

Base = No-Build scenario
Projected = Build scenario
[1]= Projected conditions with implementation of recommended improvements

As shown in **Tables 15, 16, and 17,** adequate queue storage will be provided for the turn lanes in 2029 with construction and full build-out of the proposed retail development. Queue analysis worksheets are included with the capacity analysis worksheets provided in **Appendix F**.

AUXILIARY TURN LANE ANALYSIS

TPD evaluated auxiliary turn lane warrants at the site driveway intersections for full build-out of the development. The warrant analysis was conducted according to the methodologies contained in Chapter 11 of PennDOT's *Publication 46* utilizing the posted speed limits.

Table 17 summarizes the results of the auxiliary turn lane analysis at the site access intersection.

TABLE 17
AUXILIARY TURN LANE ANALYSIS SUMMARY

Intersection	Auxiliary Lane	Warrant Satisfied?	Required Lane Length	Proposed Lane Length
William Penn Highway (S.R. 2048) and proposed partial access (right-in only) site driveway	WB Right Turn Lane	Yes	175'	N/A[1]
William Penn Highway (S.R 2048) and Pep Boys/Home Depot Driveway	WB Right Turn Lane	No	--	--

[1]Warranted turn lane cannot be accommodated due to an existing structure (bridge).

As shown in **Table 17**, a right turn lane is warranted at the proposed partial access (right-in only) site driveway. However, due to an existing structure (bridge) a right turn lane cannot be accommodated. Review of the crash data identified that no crashes occurred in the westbound direction on William Penn Highway (S.R. 2048) in the previous five (5) years. In accordance with typical PennDOT policy the crash data investigation was provided for review under separate cover. The turn lane warrant analysis worksheets are included in **Appendix H**.

RECOMMENDATIONS

The recommendations and conclusions for this Transportation Impact Study are identified in the Executive Summary.

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FIGURE 1

SITE LOCATION

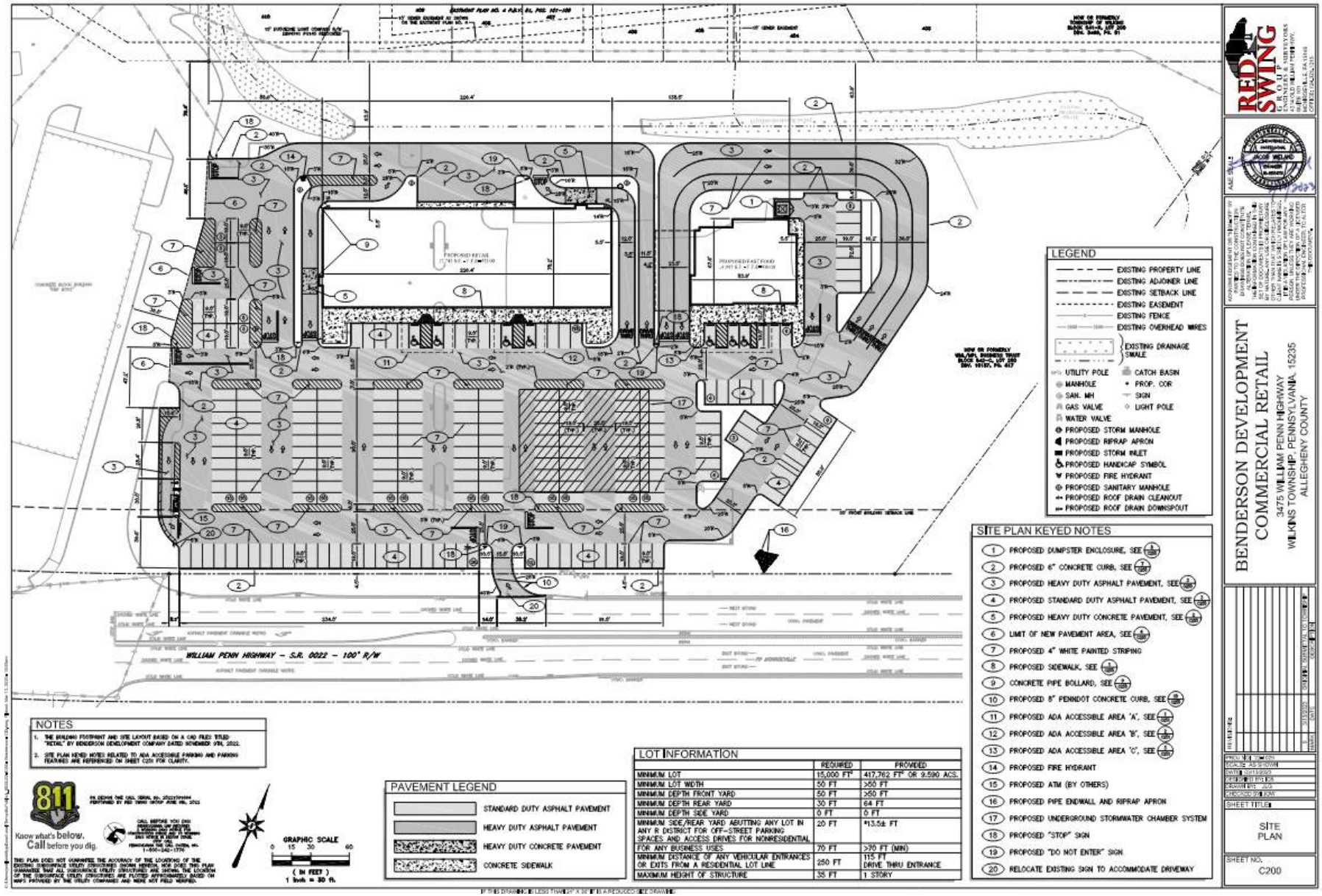

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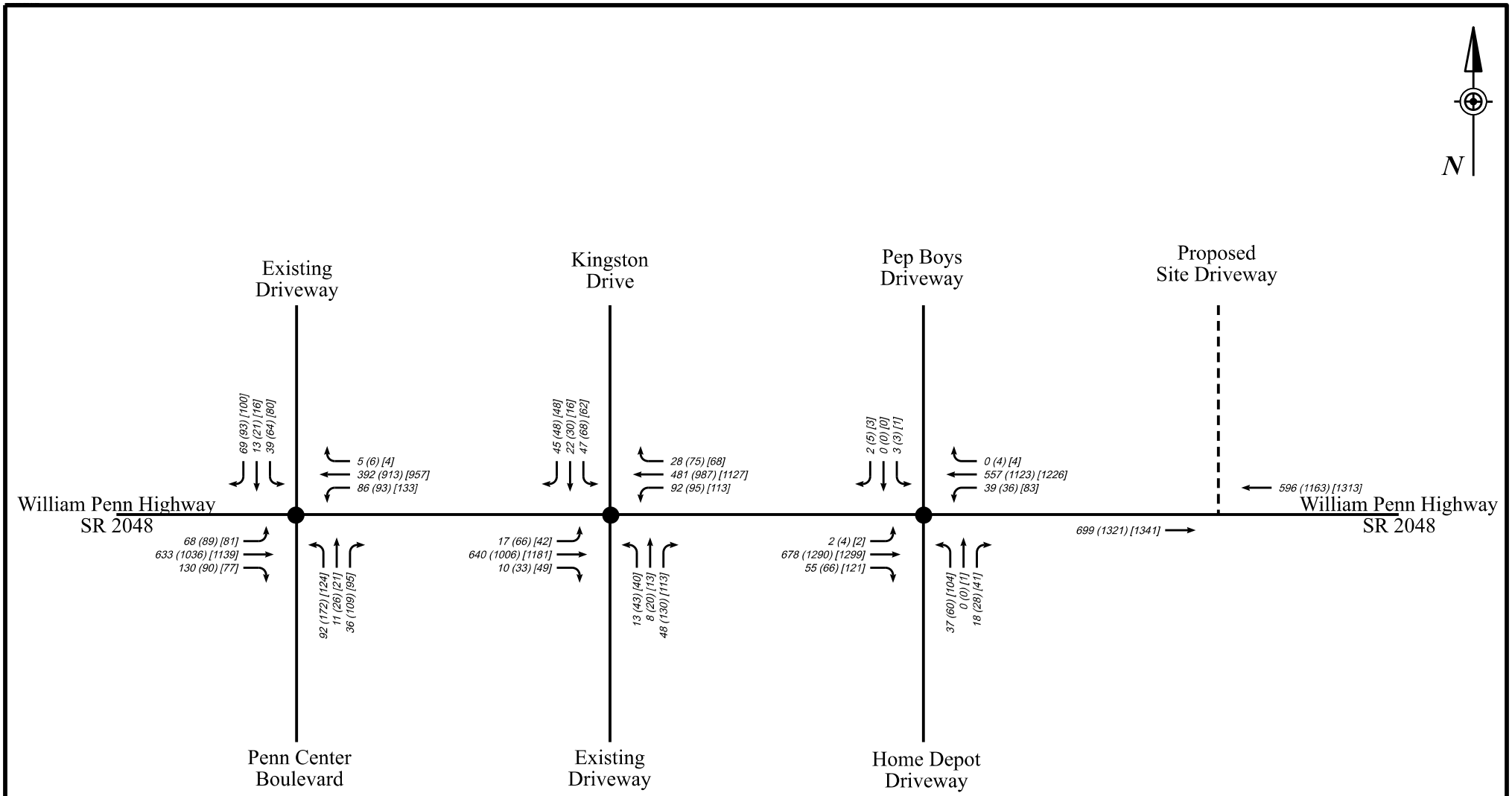
FIGURE 2

PROPOSED SITE PLAN



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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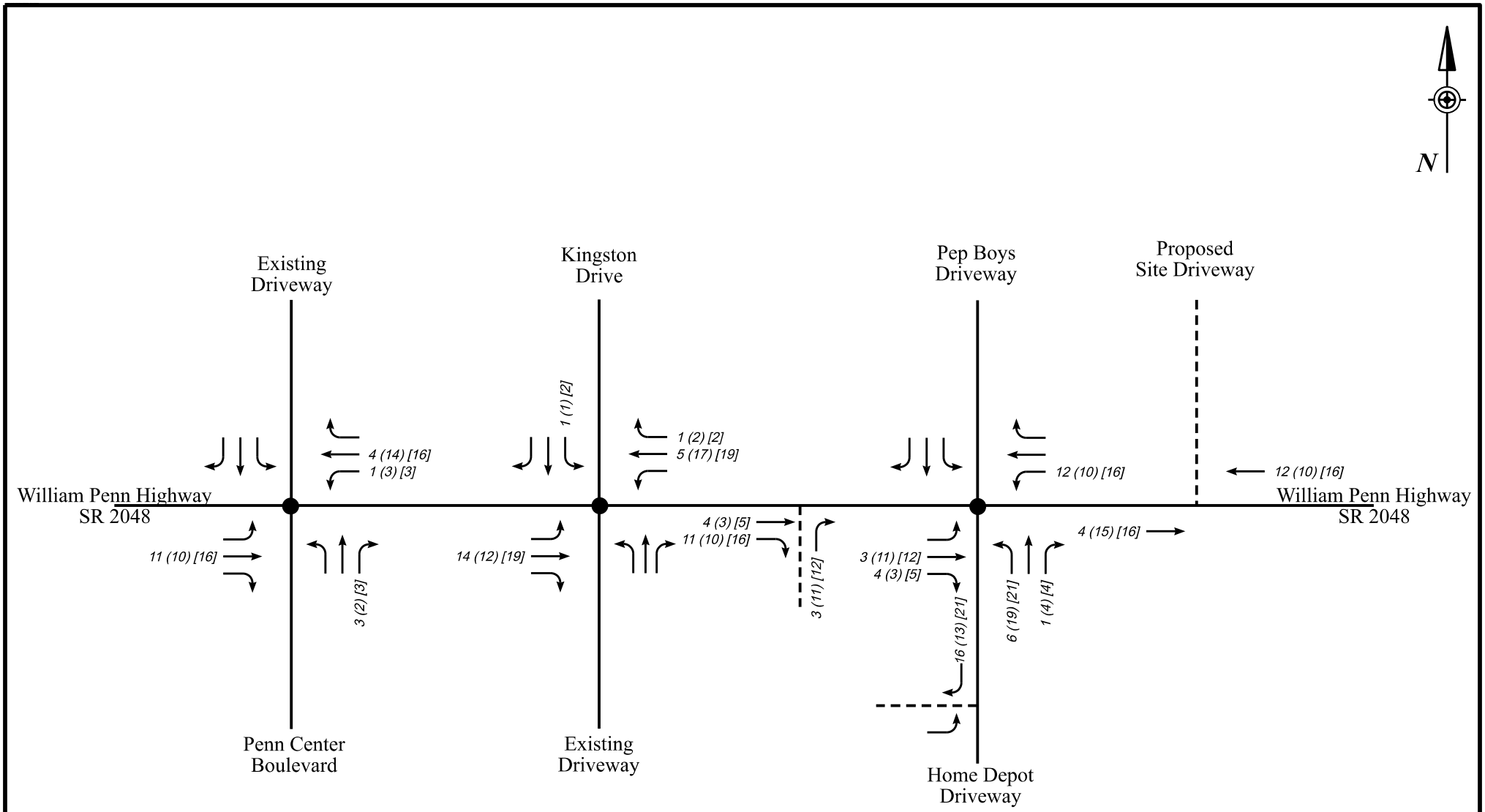
FIGURE 3

2023 EXISTING CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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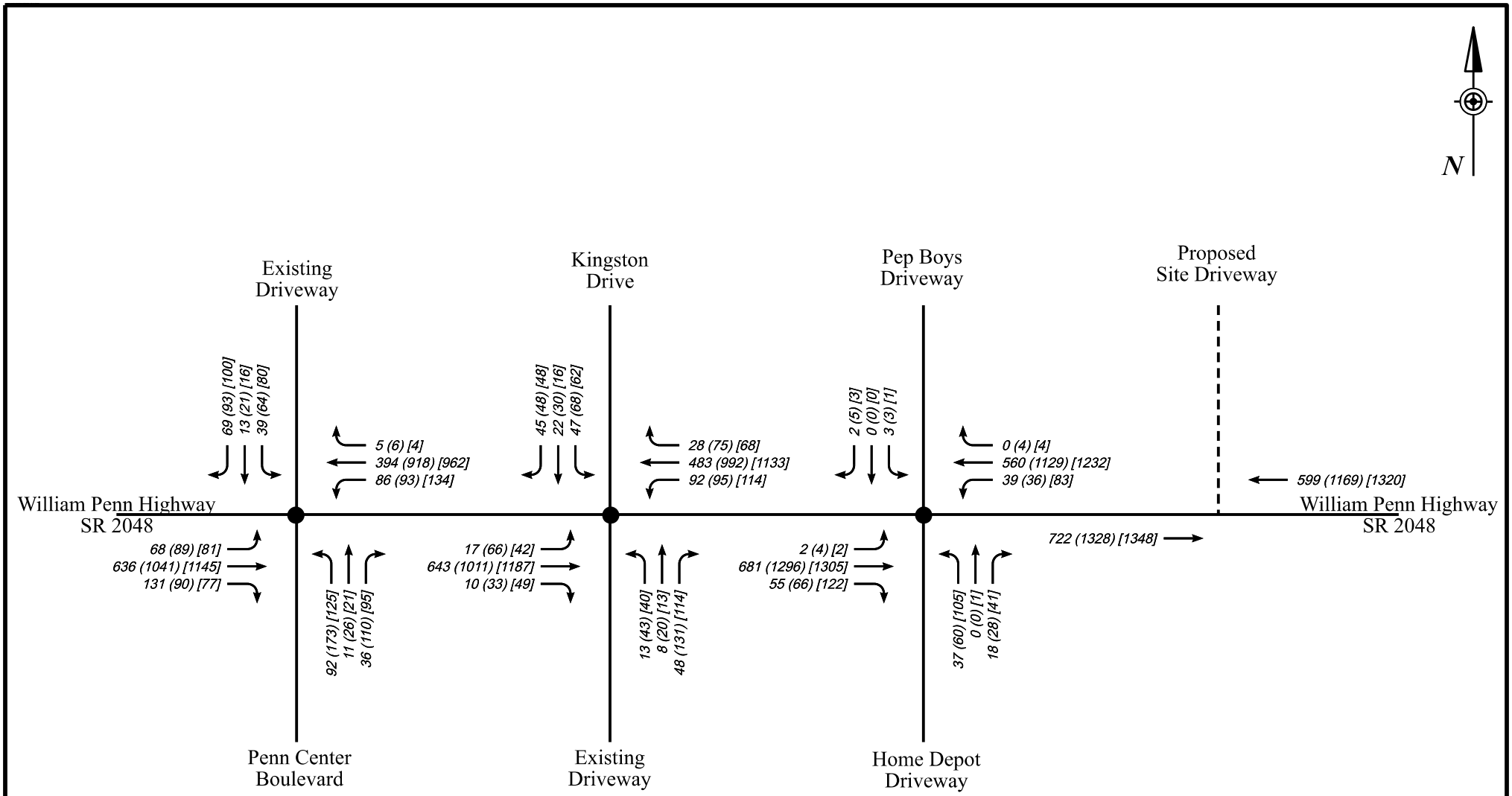
FIGURE 4

BACKGROUND DEVELOPMENT
PEAK HOUR TRIPS
AM (PM) [SAT]



KEY:

- **STOP CONTROLLED**
- **SIGNALIZED INTERSECTION**
- **PROPOSED DRIVEWAY**

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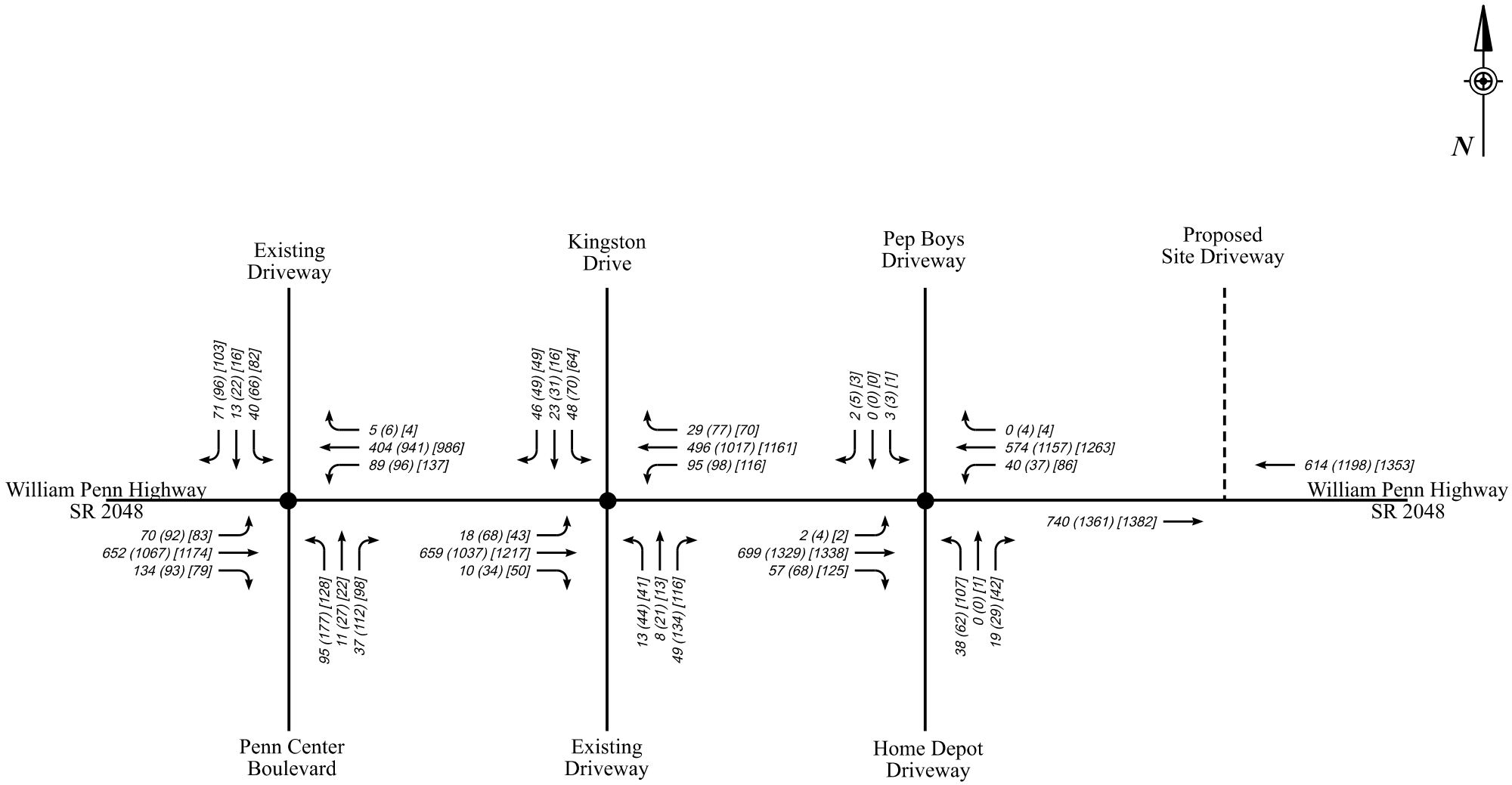
FIGURE 5

2024 BASE (NO-BUILD) CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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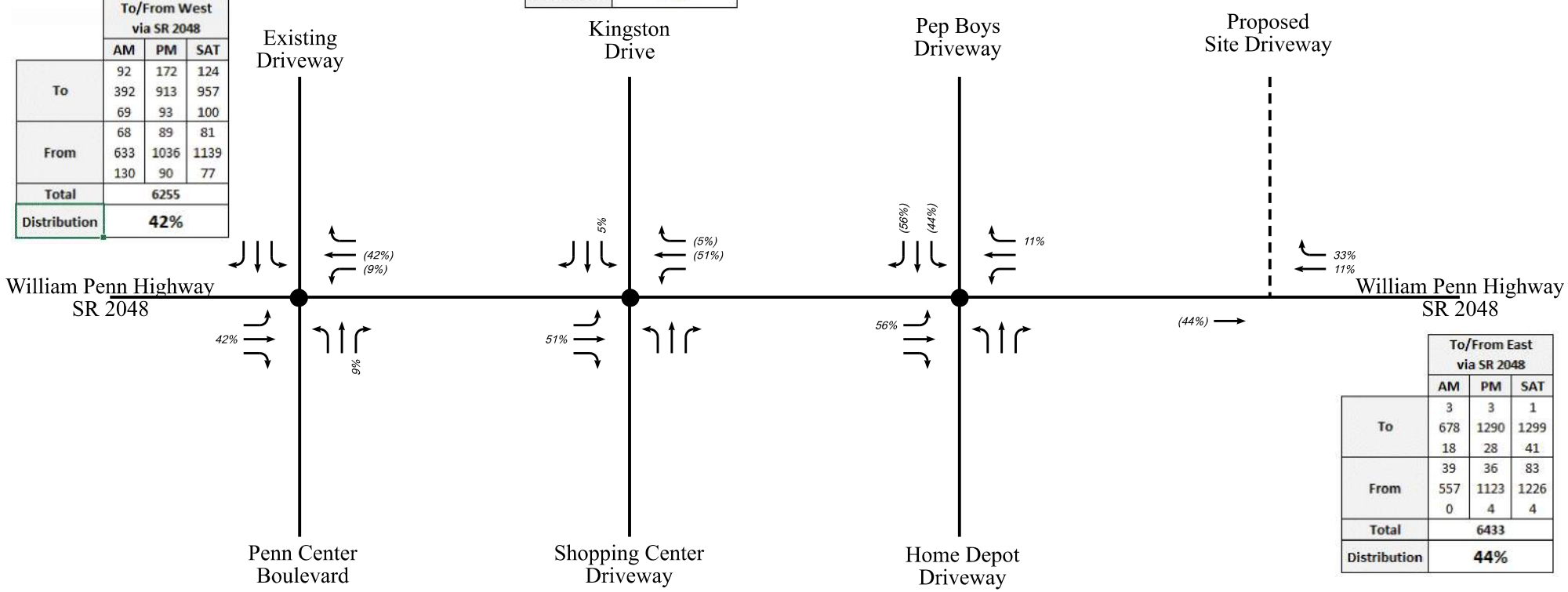
FIGURE 6

2029 BASE (NO-BUILD) CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]

	To/From North via Kingston Dr		
	AM	PM	SAT
To	17	66	42
	8	20	13
	28	75	68
From	47	68	62
	22	30	16
	45	48	48
Total	723		
Distribution	5%		

	To/From West via SR 2048		
	AM	PM	SAT
To	92	172	124
	392	913	957
	69	93	100
From	68	89	81
	633	1036	1139
	130	90	77
Total	6255		
Distribution	42%		



	To/From East via SR 2048		
	AM	PM	SAT
To	3	3	1
	678	1290	1299
	18	28	41
From	39	36	83
	557	1123	1226
	0	4	4
Total	6433		
Distribution	44%		

	To/From South via Penn Center		
	AM	PM	SAT
To	130	90	77
	13	21	16
	86	93	133
From	92	172	124
	11	26	21
	36	109	95
Total	1345		
Distribution	9%		

KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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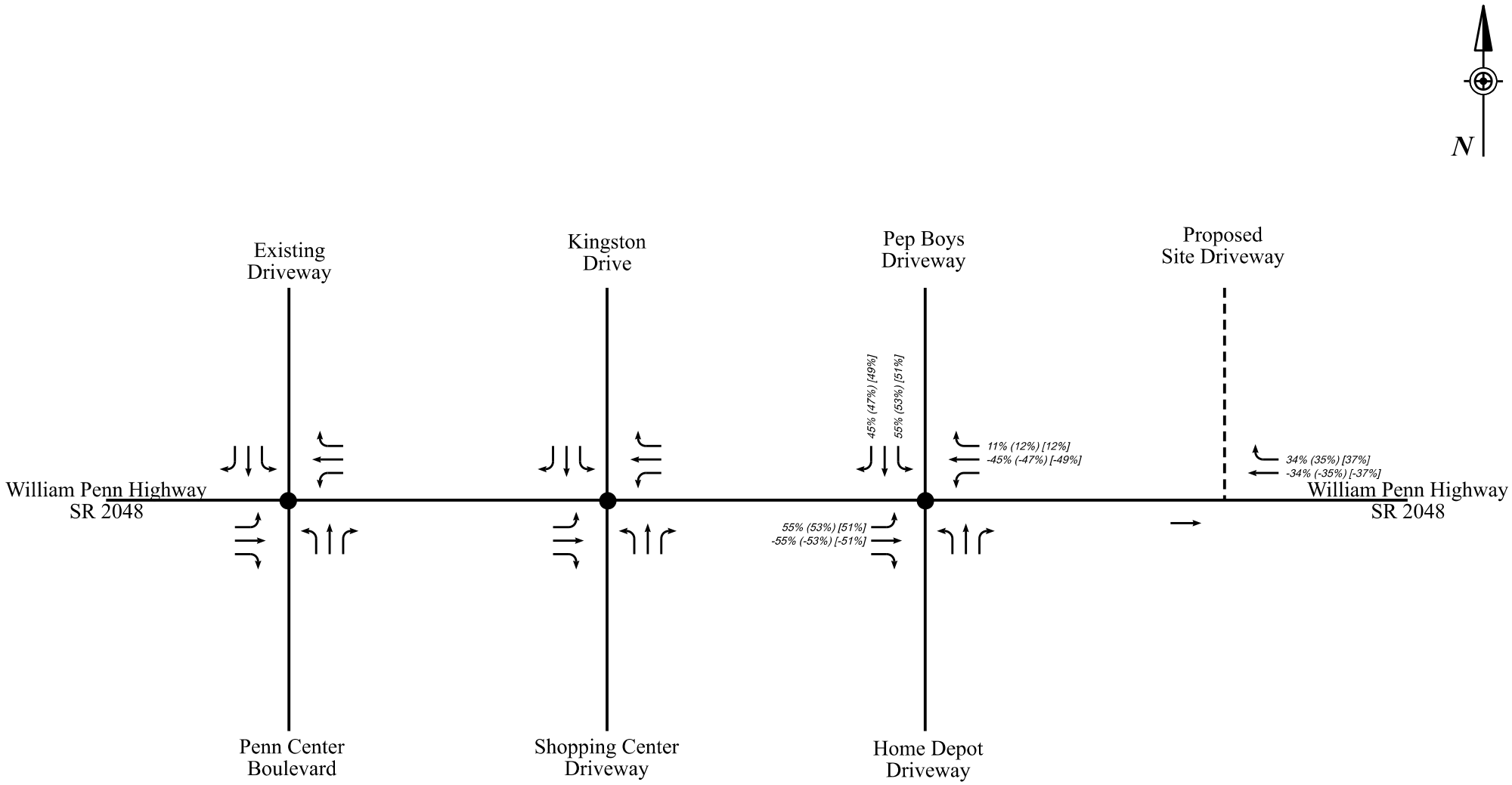
FIGURE 7

PRIMARY (NEW) TRIP DISTRIBUTION PERCENTAGES
ARRIVAL % (DEPARTURE %)



KEY:

● **SIGNALIZED INTERSECTION**

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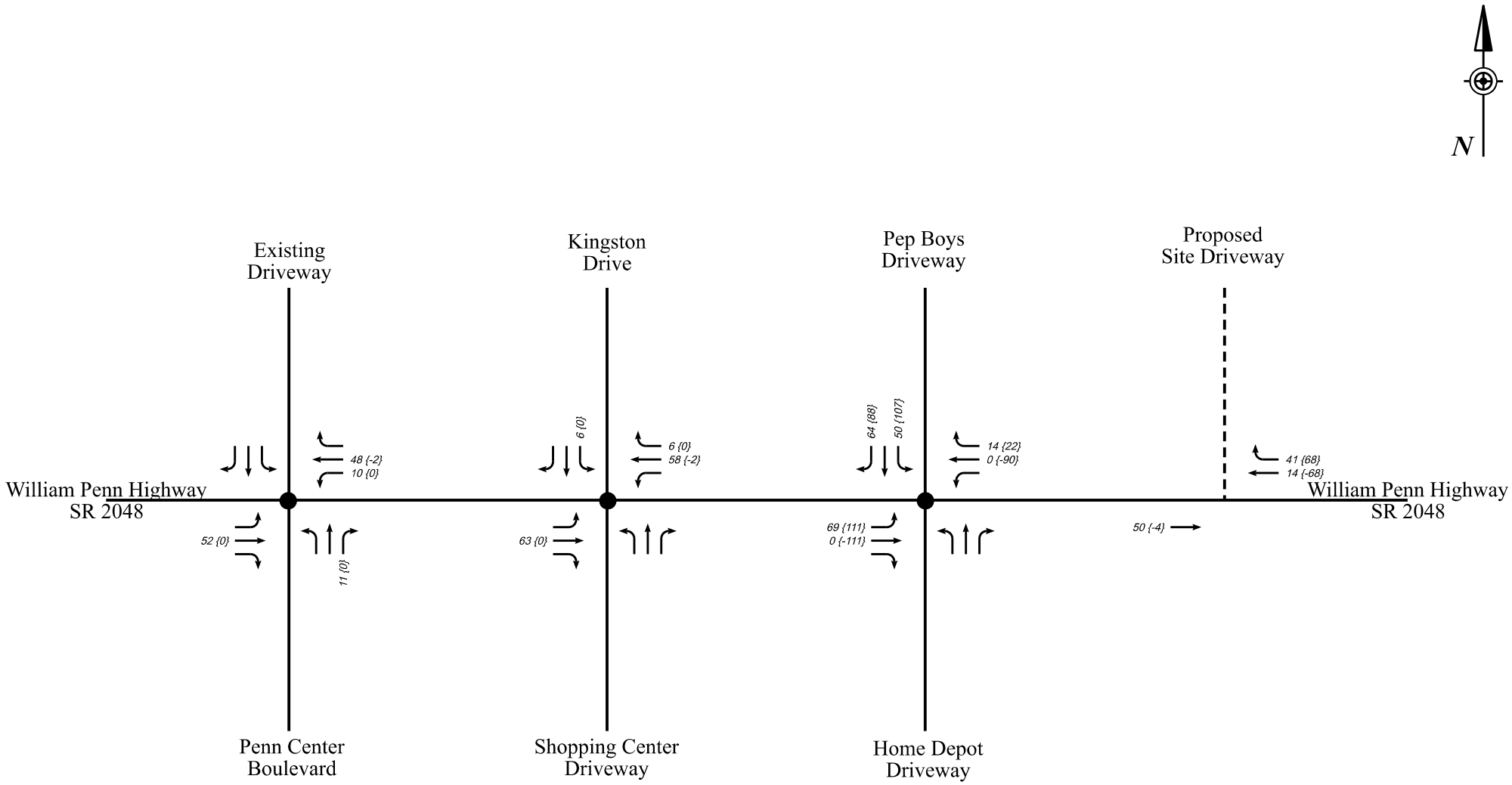
FIGURE 8

PASS-BY TRIP DISTRIBUTION PERCENTAGES
AM (PM) [SAT]



KEY:

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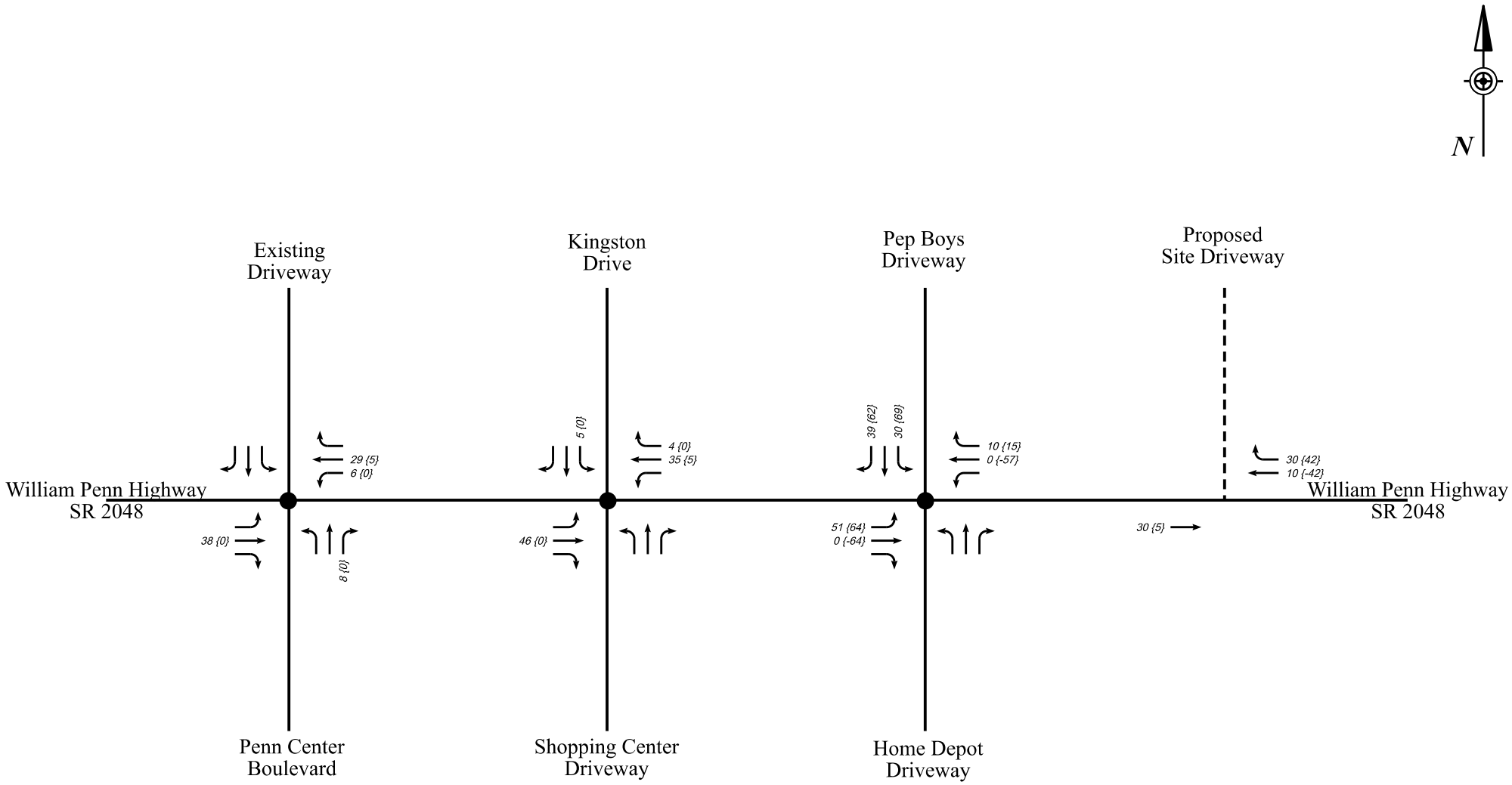
FIGURE 9

PROPOSED AM PEAK HOUR TRIPS
PRIMARY {PASS-BY}



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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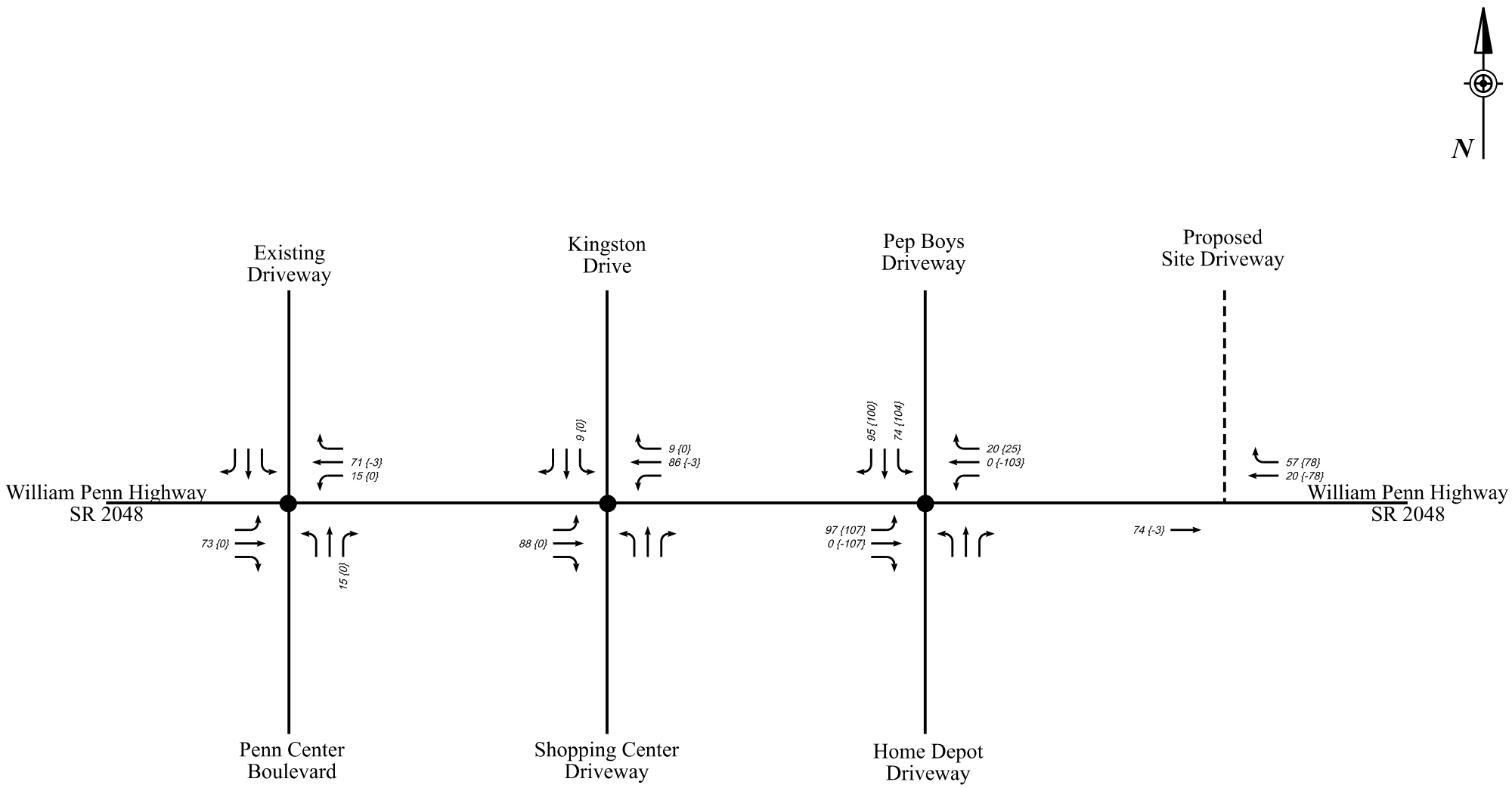
FIGURE 10

PROPOSED PM PEAK HOUR TRIPS
PRIMARY {PASS-BY}



KEY:

● **SIGNALIZED INTERSECTION**

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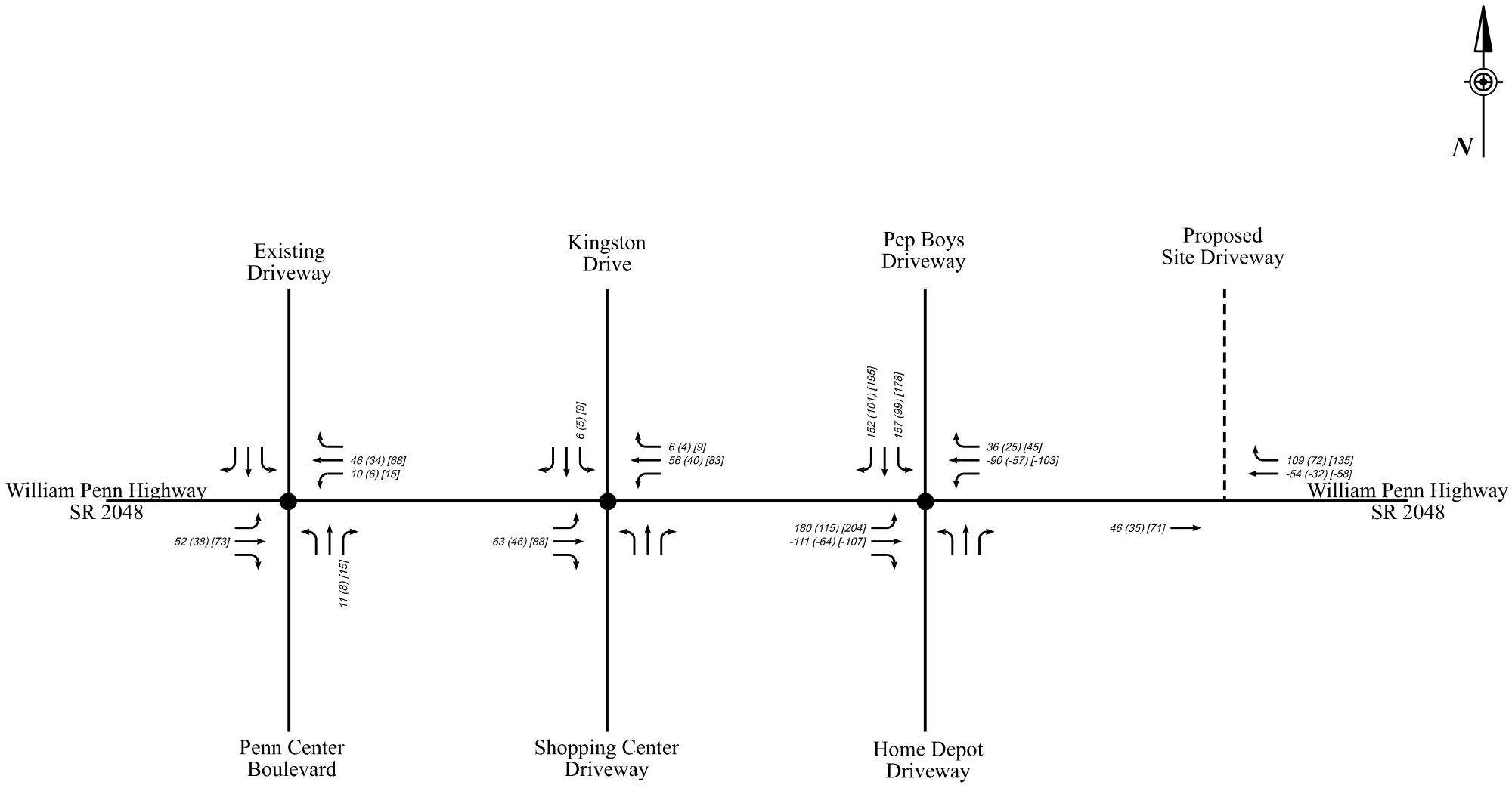
FIGURE 11

PROPOSED SATURDAY PEAK HOUR TRIPS
PRIMARY {PASS-BY}



KEY:

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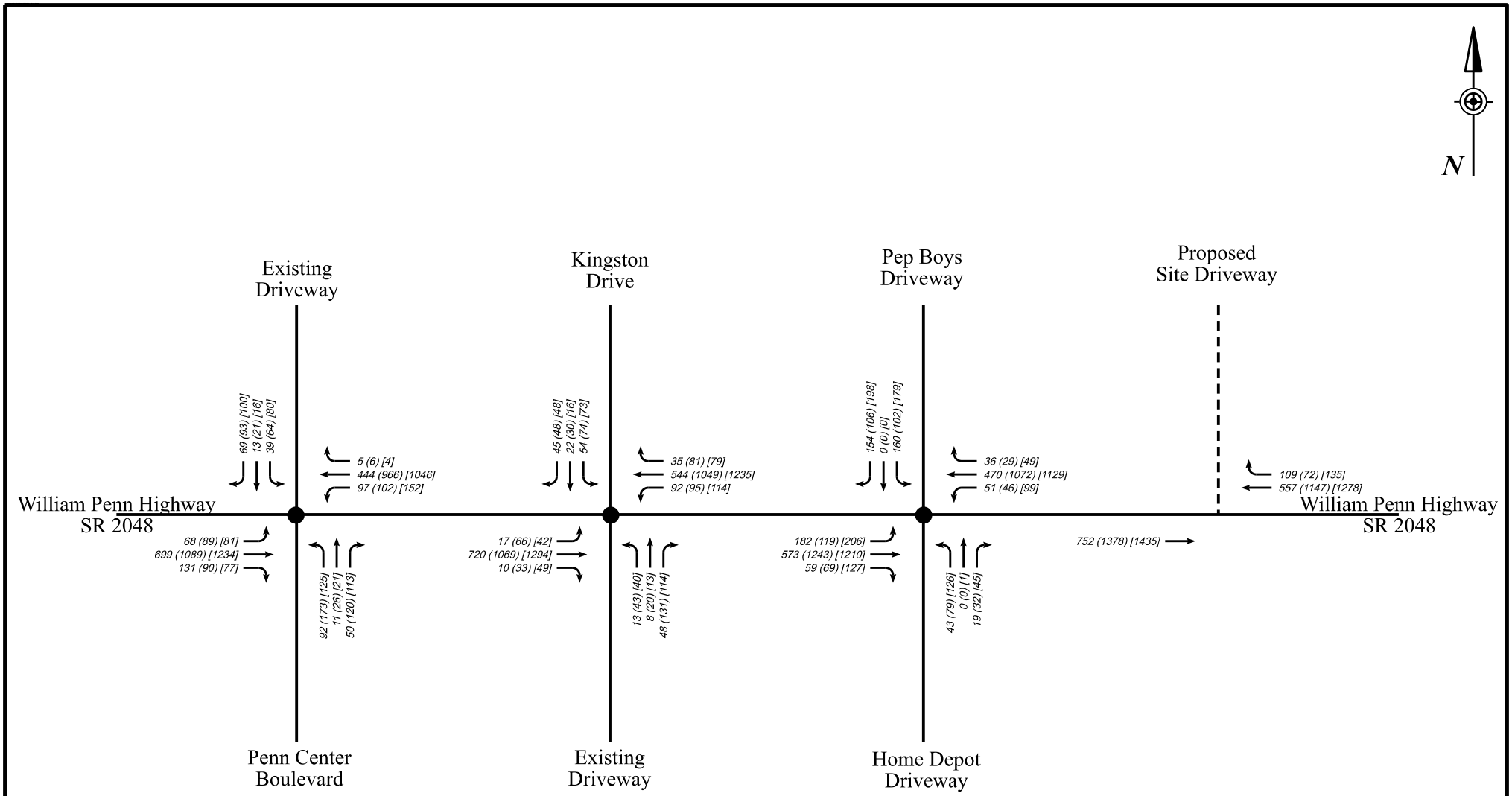
FIGURE 12

TOTAL DEVELOPMENT TRIPS
AM (PM) [SAT]



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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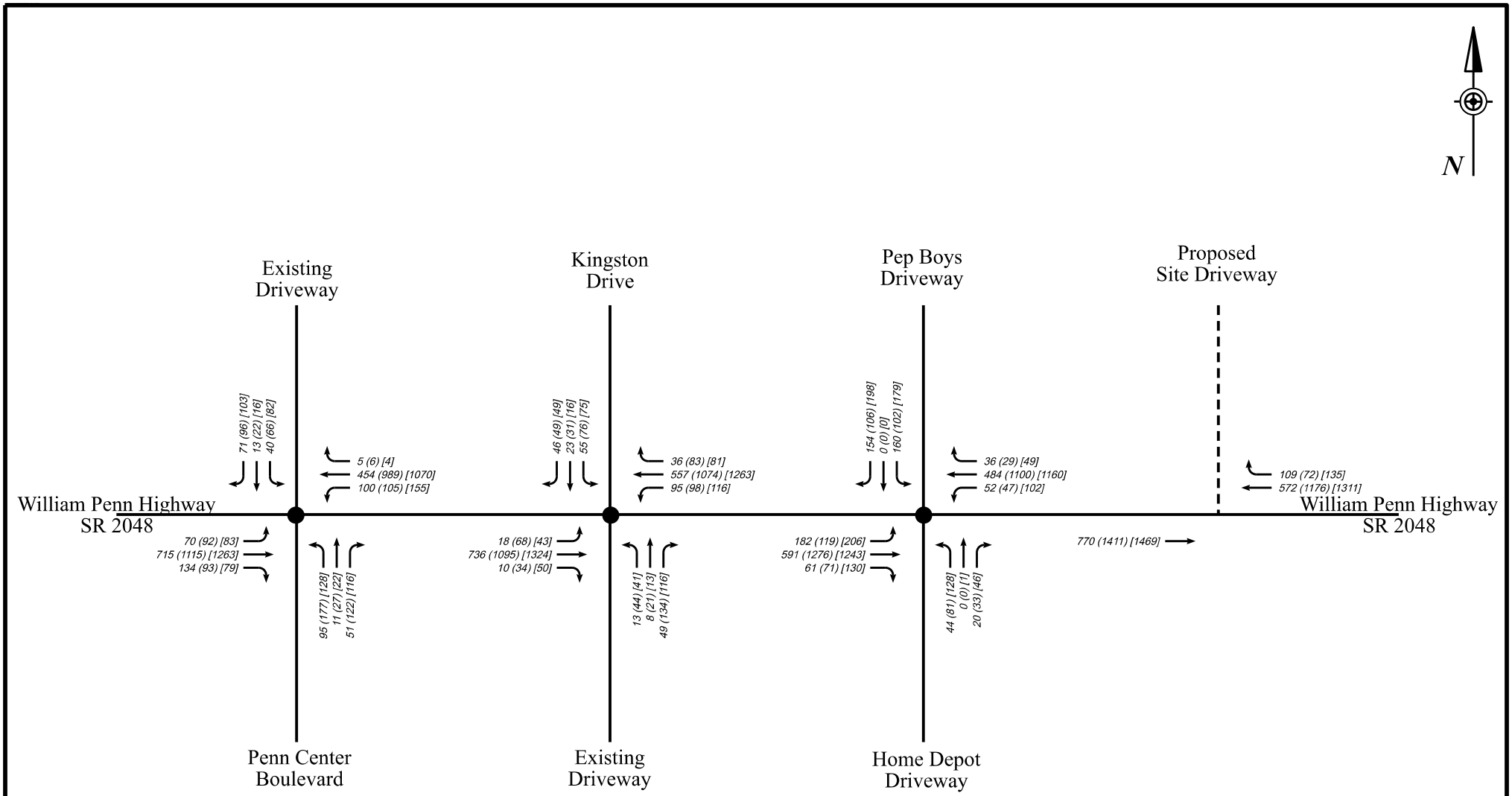
FIGURE 13

2024 PROJECTED (BUILD) CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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FIGURE 14

2029 PROJECTED (BUILD) CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]

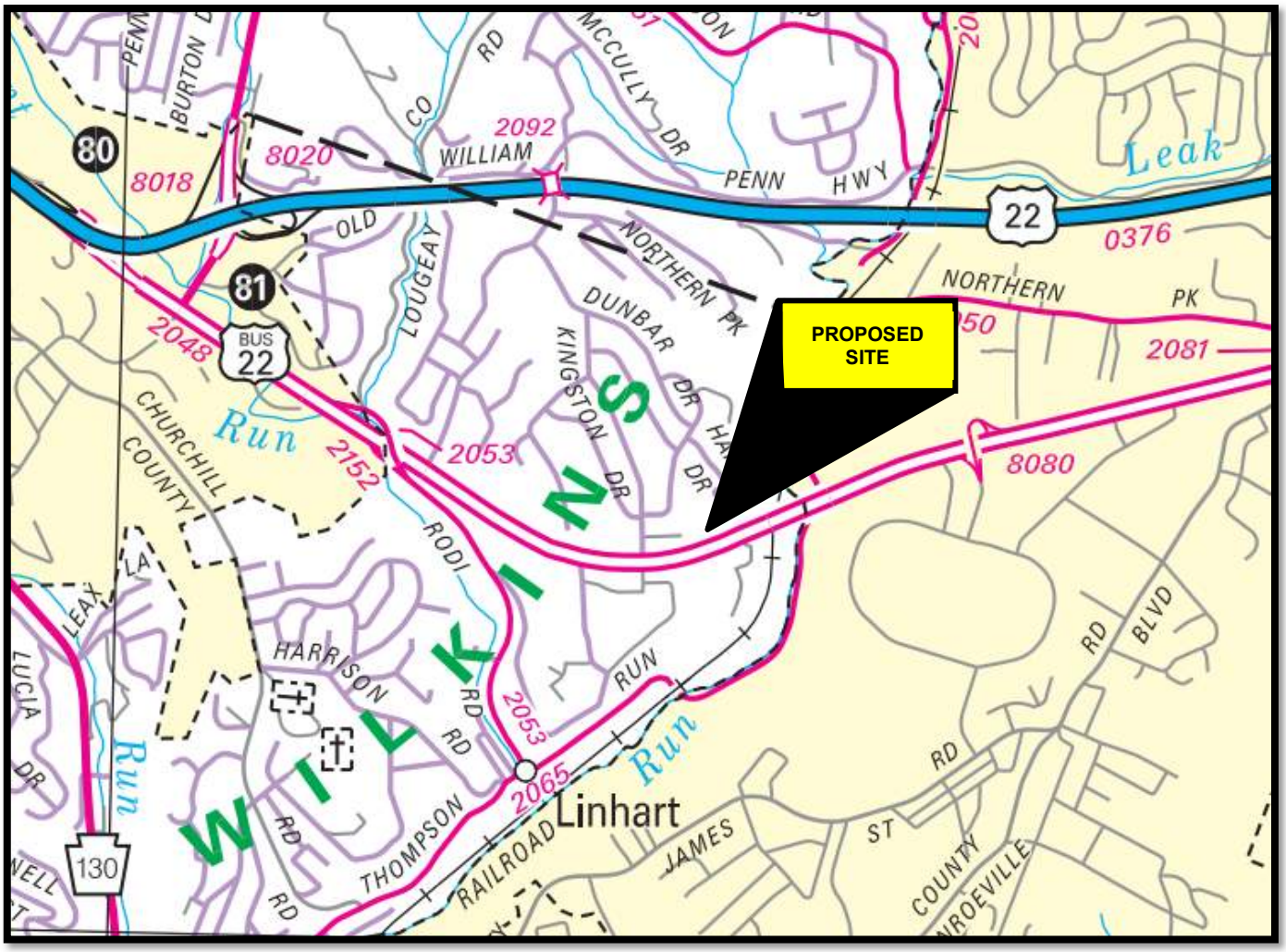
Appendix A:
Project Correspondence

TRANSPORTATION IMPACT STUDY (TIS)
SCOPING MEETING APPLICATION

Scoping Meeting Date:	**TBD** TIS Scoping Meeting: 10/17/2022 at 10AM
Applicant	**Benderson Development**
	(3475 William Penn Highway – Commercial Retail)
Applicant's Consultant:	**TPD – Melissa Southern, E.I.T.**
	msouthern@trafficpd.com
Applicant's Primary Contact:	**Matt Oates, P.E., Benderson Development**

1. *LOCATION OF PROPOSED DEVELOPMENT:*
   - PennDOT Engineering District: **11-0 (Allegheny County)**
   - Municipality: **Wilkins Township**
   - State Route (SR): **William Penn Highway/Business Route 22 (SR 2048)**
   - Segment: **0041**
   - Offset: **0928**

SITE LOCATION MAP



2. *DESCRIPTION OF PROPOSED DEVELOPMENT:*

- Proposed Site Access:

  Access to the 3475 William Penn Highway (Commercial/Retail) Development is proposed via:

  - **The existing Pep Boys full-access (private) driveway to William Penn Highway (SR 2048). The Pep Boys driveway is controlled by an existing traffic signal (Permit No. 1-127-02).**
  - **One (1) partial access (westbound right-in only) driveway on SR 2048 (William Penn Highway), east of the existing Pep Boys full-access driveway.**

- Existing Land Use:

  - **The site is currently vacant, but once accommodated the former Circuit City retail development. It should be noted that trip credits for the existing establishment were not applied.**

  As shown in the site location map above, the site is located along the northern side of William Penn Highway (SR 2048), on the northeast corner of the signalized intersection of William Penn Highway (SR 2048) and Pep Boys/Home Depot driveways.

- Proposed Land Use:

  - **The site will provide a total of 28,198 square feet of commercial/retail space. For trip generation purposes, the retail space is anticipated to include the following components:**
    - **21,898 square feet of retail space (LU 822: Strip Retail Plaza (<40 KSF))**
    - **One (1) standalone drive-through ATM machine (LU 912: Drive-In Bank);**
    - **3,800 square foot restaurant with a drive-through window (LU 934: Fast Food Restaurant with Drive-Through Window);**
    - **2,500 square foot coffee/donut shop with a drive-through window (LU 937: Coffee/Donut Shop with Drive-Through Window);**

  The Site Plan is attached.

- Community Linkages (access to neighboring properties, cross easements, pedestrian and transit accommodations): **The proposed development will utilize Pep Boys access to William Penn Highway (SR 2048). Pedestrian sidewalks are anticipated to be provided on site. Pedestrian accommodations are currently present at the signalized intersection of William Penn Highway (SR 2048) and Pep Boys/Home Depot driveways, with pedestrian crossing located on the north, south, and west legs of the intersection.**

- Transit Review (Current routes/stops): **Pittsburgh Regional Transit (PRT) Port Authority provides services via Route 67 and P67 along SR 2048 (William Penn Highway). Transit stops are located on the northeast and southwest corners of the intersection of William Penn Highway (SR 2048) and Pep Boys/Home Depot driveways.**

3. *DEVELOPMENT SCHEDULE AND STAGING:*
   - **Anticipated Opening Date: 2024**
   - **Full Build-out Date: 2024**
   - **Proposed Development Schedule/Staging: None**

4. *TRIP GENERATION:*

   Trip generation for the proposed development will be based on:

   ☒ ITE Trip Generation Manual
   ☐ Other independent surveys

The trip generation data for this analysis were obtained from *Trip Generation*, *11th Edition, 2021*, an Institute of Transportation Engineers (ITE) Informational Report. For the proposed 3475 William Penn Highway Commercial/Retail development, the following land uses were selected to calculate the number of site-generated trips during the average weekday, weekday A.M., weekday P.M., and Saturday peak hours:

- **LU 822: Strip Retail Plaza (<40 KSF), for the proposed 21,898 square feet of retail space;**
- **LU 912: Drive-In Bank, for the proposed one (1) standalone drive-through ATM machine;**
- **LU 934: Fast Food Restaurant with Drive-Through, for the proposed 3,800 square foot restaurant with a drive-through window;**
- **LU 937: Coffee/Donut Shop with Drive-Through Window for the proposed 2,500 square foot coffee/donut shop with a drive-through window.**

Based on the information provided in the manual *Trip Generation*, not all of the trips generated by the site will be "new" to the nearby roadway system. In addition to the "new trips" generated by the development, there will be "internal (capture) trips", which are trips made internally between on-site uses that do not access the external roadway, and there will be "pass-by trips", which are trips that are drawn from the passing traffic stream and do not add trips to the adjacent roadways. For internal trips, the methodology outlined in NCHRP Report 684 was utilized. For pass-by trips, pass-by percentages were utilized as specified in ITE's *Trip Generation Manual*, 11th Edition, 2021. It should be noted that pass-by trip percentages were applied to the total site traffic after reduction of internal (capture) trips.

Table 1 shows the rates/equations, directional percentages, and pass-by rates for the analyzed time periods.

TABLE 1:
ITE TRIP GENERATION DATA

Land Use	ITE #	Size (X)	Time Period	Equation/Rate	Directional Splits	
					Enter %	Pass-By %
Strip Retail Plaza (<40K)	822	21.898 ksf	Average Weekday	T = 42.20(X)+229.68	50%	--
			Weekday A.M. Peak Hour	T = 2.36(X)	60%	30%[1]
			Weekday P.M. Peak Hour	Ln(T) = 0.71(X)+2.72	50%	40%
			Saturday Peak Hour	T = 6.57(X)	51%	31%
Drive-In Bank	912	1 Lane	Average Weekday	T = 125.03(X)	50%	--
			Weekday A.M. Peak Hour	T = 8.71(X)-0.75	61%	29%
			Weekday P.M. Peak Hour	T = 27.07(X)	49%	35%
			Saturday Peak Hour	T = 27.67(X)	49%	38%
Fast Food Restaurant With Drive Through Window	934	3.800 ksf	Average Weekday	T = 467.48(X)	50%	--
			Weekday A.M. Peak Hour	T = 44.61(X)	51%	50%
			Weekday P.M. Peak Hour	T = 33.03(X)	52%	55%
			Saturday Peak Hour	T = 55.25(X)	51%	45%[2]
Coffee/Donut Shop with Drive Through Window	937	2.500 ksf	Average Weekday	T = 533.57(X)	50%	--
			Weekday A.M. Peak Hour	T = 85.88(X)	51%	90%[3]
			Weekday P.M. Peak Hour	T = 38.99(X)	50%	98%[3]
			Saturday Peak Hour	T = 87.91(X)	50%	84%[3]

[1] ITE does not provide pass-by rate data for Land Use 822 (Strip Retail Plaza <40KSF); therefore, pass-by rate data from Land Use 821 (Shopping Plaza 40-150ksf) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 821 (Shopping Plaza 40-150 ksf) during the weekday AM peak hour; therefore, it was assumed that the weekday AM peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

[2] ITE does not provide pass-by rate data for Land Use 934 (Fast Food Restaurant with Drive-Through) for the Saturday peak hour; therefore, it was assumed that the Saturday peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

[3] ITE does not provide pass-by rate data for Land Use 937 (Coffee/Donut Shop with Drive-Through Window); therefore, pass-by rate data from Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) for the Saturday midday peak hour; therefore, it was assumed that the weekday midday peak hour pass-by rate would reflect the Saturday midday peak hour pass-by rates.

The calculated trip generation for the proposed development is shown in Table 2. Detailed trip generation calculation are attached.

TABLE 2
TRIP GENERATION SUMMARY

Land Use	Size (X)	Total Trips	Int. Trips	External Trips			Pass-By Trips			New Trips		
				Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Average Weekday Daily												
Strip Retail Plaza (<40K)	21,898 sf	1,154	--	1,154	577	577	--	--	--	1,154	577	577
Drive-In Bank	1 lane	125	--	125	62	63	--	--	--	125	62	63
F. Food Rest. w/ Drive Thru	3,800 sf	1,776	--	1,776	888	888	--	--	--	1,776	888	888
Coffee/D. Shop w/ Drive Thru	2,500 sf	1,334	--	1,334	667	667	--	--	--	1,334	667	667
Total	--	**4,389**	--	**4,389**	**2,194**	**2,195**	--	--	--	**4,389**	**2,194**	**2,195**
Weekday A.M. Peak Hour												
Strip Retail Plaza (<40K)	21,898 sf	52	6	46	28	18	14	8	6	32	20	12
Drive-In Bank	1 lane	8	0	8	5	3	2	1	1	6	4	2
F. Food Rest. w/ Drive Thru	3,800 sf	170	2	168	85	83	84	43	41	84	42	42
Coffee/D. Shop w/ Drive Thru	2,500 sf	215	4	211	107	104	190	96	94	21	11	10
Total	--	**445**	**12**	**433**	**225**	**208**	**290**	**148**	**142**	**143**	**77**	**66**
Weekday P.M. Peak Hour												
Strip Retail Plaza (<40K)	21,898 sf	136	54	82	34	48	33	0	33	49	34	15
Drive-In Bank	1 lane	27	11	16	6	10	6	3	3	10	3	7
F. Food Rest. w/ Drive Thru	3,800 sf	126	38	88	50	38	48	25	23	40	25	15
Coffee/D. Shop w/ Drive Thru	2,500 sf	97	27	70	39	31	69	38	31	1	1	0
Total	--	**386**	**130**	**256**	**129**	**127**	**156**	**66**	**90**	**100**	**63**	**37**
Saturday Midday Peak Hour												
Strip Retail Plaza (<40K)	21,898 sf	144	36	108	52	56	33	17	16	75	35	40
Drive-In Bank	1 lane	28	7	21	10	11	8	4	4	13	6	7
F. Food Rest. w/ Drive Thru	3,800 sf	210	21	189	98	91	85	43	42	104	55	49
Coffee/D. Shop w/ Drive Thru	2,500 sf	220	22	198	101	97	166	83	83	32	18	14
Total	--	**602**	**86**	**516**	**261**	**255**	**292**	**147**	**145**	**224**	**114**	**110**

5. *ESTIMATED DAILY TRIP GENERATION/DRIVEWAY CLASSIFICATION:*
   a. Estimated Daily Trip Generation of Proposed Development: **4,389 trips per day.**
   b. Driveway Classification Based on Trip Generation: **High-Volume driveway.**

6. *TRANSPORTATION IMPACT STUDY REQUIRED?*
   - ☐ No
   - ☒ Yes, based on:
     - ☒ 3,000 or more vehicle trips/day generated
     - ☒ During any one-hour time period, 100 or more new (added) vehicle trips generated entering or exiting development.
     - ☐ Other considerations as described below:

7. *TRAFFIC IMPACT ASSESSMENT REQUIRED?* ☒ No ☐ Yes

(If a TIS is required, the following sections of this checklist will be discussed at the TIS Scoping Meeting. The applicant may provide preliminary information.)

8. *TIS STUDY AREA:*
   a. Roadway and Study Intersections:
      1. **William Penn Highway (SR 2048) & Pep Boys/Home Depot Driveway**
      2. **William Penn Highway (SR 2048) & Kingston Drive**
      3. **William Penn Highway (SR 2048) & Penn Center Boulevard**
      4. **William Penn Highway (SR 2048) & Proposed Right-In Only Driveway**

   b. Land Use Context (Refer to PennDOT Design Manual, Part 1X, Appendix B): **Suburban Center**
   c. Known Congestion Areas: **Congestion known to occur along William Penn Highway (SR 2048)**
   d. Known Safety Concerns: **None to TPDs knowledge at this time.**
   e. Known Environmental Constraints: **An existing bridge structure on William Penn Highway (SR 2048) is located east of the site.**
   f. Pedestrian/Bike Review (Community Centers, Parks, Schools, etc.): **See Item 2 Above**
   g. Transit Review (Current routes/stops): **See Item 2 Above**

9. *STUDY AREA TYPE:*
   Urban ☒ Rural ☐

10. *TIS ANALYSIS PERIOD AND TIMES:*
    a. **2022 Existing Conditions**
    b. **2024 Opening Year Without Development (No-Build) Conditions**
    c. **2024 Opening Year With Development (Build) Conditions**
    d. **2029 Horizon Year Without Development (No-Build) Conditions**
    e. **2029 Horizon Year With Development (Build) Conditions**
    f. **Weekday AM (7-9 AM), Weekday PM (4-6 PM) and Saturday Midday (11AM-2PM) Peak Hours**

11. *TRAFFIC ADJUSTMENT FACTORS:*
    a. Seasonal Adjustment: **N/A**
    b. Annual Base Traffic Growth: **Growth Rate to be obtained from the Southwestern Pennsylvania Commission (SPC), utilizing SPC's LRP Cycle 11 Forecast (Year 2020-2045).**
    c. Pass-By Trips: **See ITE Trip Generation Data for Proposed Uses in Table 1 Above**
    d. Captured Trips for Multi-Use Sites: **See ITE Trip Generation Data for Proposed Uses in Table 2 Above**
    e. Modal Split Reductions: **N/A**
    f. Other Reductions: **N/A**

12. *OTHER PROJECTS WITHIN STUDY AREA TO BE ADDED TO BASE TRAFFIC:* **To be verified with PennDOT and Wilkins Township during the TIS scoping process.**

13. *TRIP DISTRIBUTION AND ASSIGNMENT:* **The forecasted new (primary) site generated traffic will be distributed through the study area roadway network based on existing travel patterns determined from the manual turning movement counts to be completed. The forecasted pass-by site generated traffic will be distributed based on review of existing peak hour through volumes along William Penn Highway (SR 2048).**

14. *APPROVAL OF DATA COLLECTION ELEMENTS AND METHODOLOGIES:*
    - **Count Times:**
        1. **Weekday AM: 7-9 AM (during a typical weekday: Tuesday, Wednesday, or Thursday);**
        2. **Weekday PM: 4-6 PM (during a typical weekday: Tuesday, Wednesday, or Thursday);**
        3. **Saturday Midday: 11AM-2PM**
    - **Count Locations:**
        - **William Penn Highway (SR 2048) & Pep Boys/Home Depot Driveway (existing signalized)**
        - **William Penn Highway (SR 2048) & Kingston Drive (existing signalized)**
        - **William Penn Highway (SR 2048) & Penn Center Boulevard (existing signalized)**
    - **Data collected to include passenger vehicles, heavy vehicles, buses, bicycles, pedestrians at crossing locations, right turns on red, and u-turns.**
    - **Counts are anticipated be completed while local school districts are in session.**

15. *CAPACITY/LOS ANALYSIS:*
    a. **To be completed at the study intersections:**
        1. **William Penn Highway (SR 2048) & Pep Boys/Home Depot Driveway**
        2. **William Penn Highway (SR 2048) & Kingston Drive**
        3. **William Penn Highway (SR 2048) & Penn Center Boulevard**
        4. **William Penn Highway (SR 2048) & Proposed Right-In Only Driveway**

    b. **To be completed for the weekday AM, weekday PM, and Saturday midday peak hours for the proposed analysis conditions:**
        - **2022 Existing Conditions**
        - **2024 Opening Year without Development (No-Build) Conditions**
        - **2024 Opening Year with Development (Build) Conditions**
        - **2029 Horizon Year without Development (No-Build) Conditions**
        - **2029 Horizon Year with Development (Build) Conditions**

    c. **The analysis will be completed using the Synchro 11 software, reporting the HCM 6th Edition levels of service/delays.**

    d. **The results will be summarized in tabular format.**

16. *ROADWAY IMPROVEMENTS/MODIFICATIONS BY OTHERS TO BE INCLUDED:* **To be verified with PennDOT and Wilkins Township during the TIS scoping process. Per PennDOT One Map, William Penn Highway (SR 2048) is in the "In-Development" stage for mill and overage, mountable curb, guide rail, and drainage from I-376 in Churchill to SR 48. This improvement will not impact the analyses to be completed for this study.**

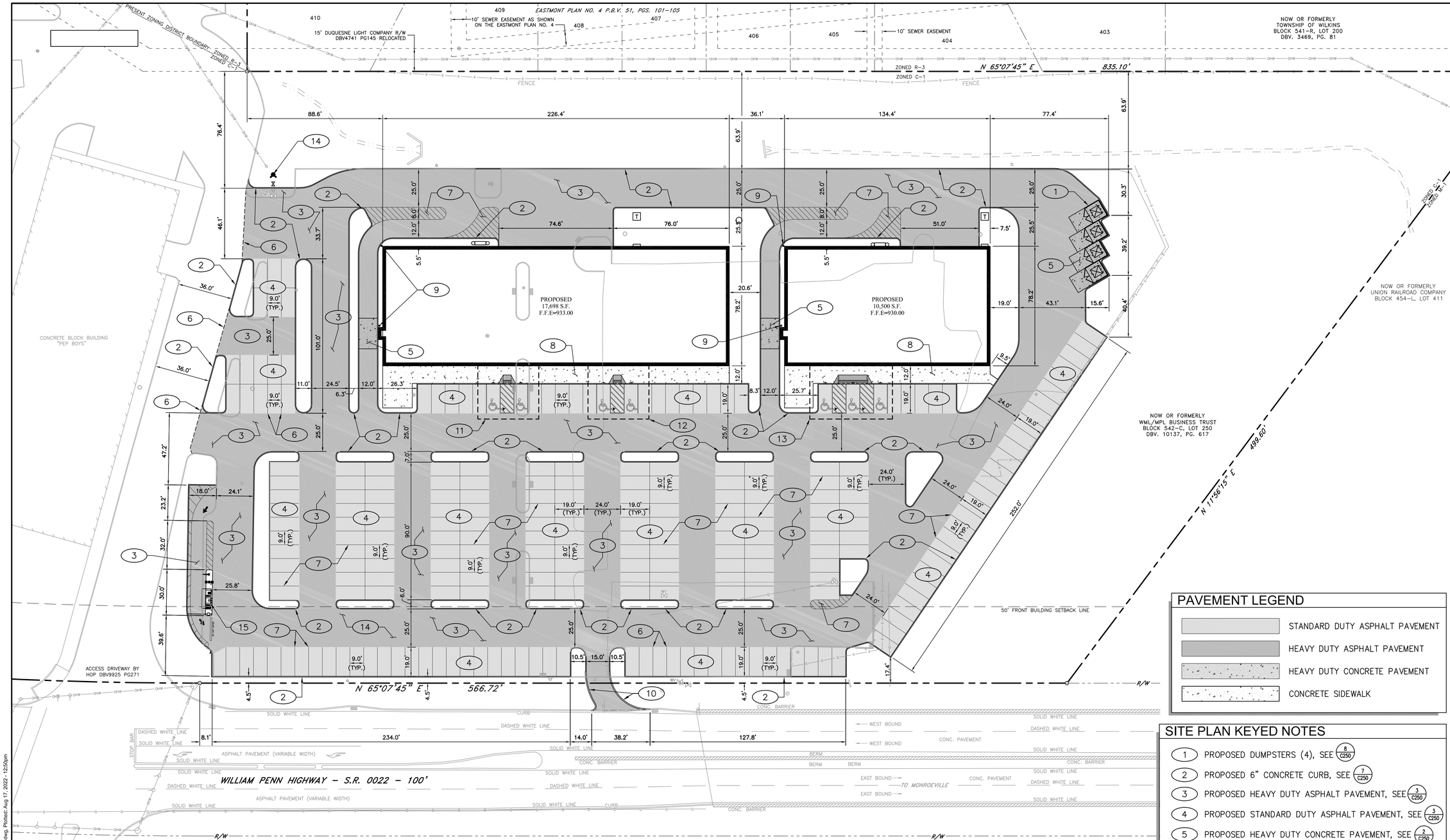
17. *OTHER NEEDED ANALYSES:*
    a. Sight Distance Analysis: **A sight distance analysis will be performed at the proposed site accesses, as applicable.**
    b. Signal Warrant Analysis: **N/A**
    c. Required Signal Phasing/Timing Modifications: **As necessary, TPD will make recommendations for traffic signal timing and/or phasing modifications based on the results of the analysis and per PennDOT Publication 149 & Publication 46.**
    d. Traffic Signal Corridor/Network Analysis: **If modifications to the existing signals in the study area are proposed that may impact all signals within the corridor (such as changes in cycle lengths), TPD understands that an evaluation of the traffic signal corridor/network may be required.**
    e. Analysis of the Need for Turning Lanes: **TPD will analyze auxiliary right turn lane warrants at the proposed site access locations under build conditions. The warrant analysis methodology contained within Chapter 11 of PennDOT's Publication 46 will be utilized for this analysis.**
    f. Turning Lane Lengths: **TPD will analyze auxiliary turn lane lengths at the proposed site access location under build conditions. The analysis methodology contained within Chapter 11 of PennDOT's Publication 46, as well as 95th percentile queue lengths, will be considered for evaluation of turning lane lengths.**
    g. Left Turn Signal Phasing Analysis: **TPD will analyze left turn signal phasing only where signal phasing changes are proposed at existing signalized intersections per PennDOT Publication 149 & Publication 46.**
    h. Queuing Analysis: **TPD will provide 95th percentile (Synchro) queue lengths for all approaches at all study intersections during all time periods, conditions, and peak hours analyzed. The results will be summarized in tabular format.**
    i. Gap Studies: **N/A**
    j. Crash Analysis: **Crash data will be obtained for the preceding five (5) years through PennDOT's Pennsylvania Crash Information Tool (PCIT) for the study intersections.**
    k. Weaving Analysis: **N/A**
    l. Other Required Studies: **N/A**

18. *ADDITIONAL COMMENTS OR RECOMMENDATIONS RELATIVE TO THE SCOPE OF THE TIS:* **N/A**

Melissa D. Grotthouse	**09/28/2022**
Signature of Applicant's Engineer	Date
Edward M Miller	10/26/2022
Signature of District Traffic PennDOT Representative	Date
[illegible]	10/26/2022
Signature of District Permit PennDOT Representative	Date
Rebecca Vargo, Twp Manager	10/21/2022
Signature of Municipal Traffic Representative	Date

Attachment

Site Plan



PAVEMENT LEGEND

- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- HEAVY DUTY CONCRETE PAVEMENT
- CONCRETE SIDEWALK

SITE PLAN KEYED NOTES

1. PROPOSED DUMPSTERS (4), SEE 8/C250
2. PROPOSED 6" CONCRETE CURB, SEE 7/C250
3. PROPOSED HEAVY DUTY ASPHALT PAVEMENT, SEE 3/C250
4. PROPOSED STANDARD DUTY ASPHALT PAVEMENT, SEE 3/C250
5. PROPOSED HEAVY DUTY CONCRETE PAVEMENT, SEE 2/C250
6. LIMIT OF NEW PAVEMENT AREA, SEE 4/C250
7. PROPOSED 4" WHITE PAINTED STRIPING
8. PROPOSED SIDEWALK, SEE 1/C250
9. CONCRETE PIPE BOLLARD, SEE 9/C250
10. PROPOSED 8" PENNDOT CONCRETE CURB PER RC-64M SPECIFICATIONS
11. PROPOSED ADA ACCESSIBLE AREA 'A', SEE 1/C251
12. PROPOSED ADA ACCESSIBLE AREA 'B', SEE 2/C251
13. PROPOSED ADA ACCESSIBLE AREA 'C', SEE 3/C251
14. PROPOSED FIRE HYDRANT
15. PROPOSED ATM (BY OTHERS)

NOTES

1. THE CURRENT ARCHITECTURAL FOOTPRINT AND SITE LAYOUT BY BENDERSON DEVELOPMENT COMPANY IS BASED ON A DRAWING TITLED "RETAIL", DATED FEBRUARY 8, 2022.
2. SITE PLAN KEYED NOTES RELATED TO ADA ACCESSIBLE PARKING AND PARKING FEATURES ARE REFERENCED ON SHEET C251 FOR CLARITY.

LOT INFORMATION

	REQUIRED	PROVIDED
MINIMUM LOT AREA	15,000 FT²	417,762 FT² OR 9.590 Acs.
MINIMUM LOT WIDTH	50 FT	>50 FT
MINIMUM DEPTH FRONT YARD	50 FT	>50 FT
MINIMUM DEPTH REAR YARD	30 FT	>30 FT
MINIMUM DEPTH SIDE YARD	0 FT	
MINIMUM SIDE/REAR YARD ABUTTING ANY LOT IN ANY R DISTRICT FOR OFF-STREET PARKING SPACES AND ACCESS DRIVES FOR NONRESIDENTIAL USES	20 FT (13.5' PER EXISTING VARIANCE)	13.5' (MIN)
FOR ANY BUSINESS USES	70 FT	>70 FT (MIN)
MINIMUM DISTANCE OF ANY VEHICULAR ENTRANCES OR EXITS FROM A RESIDENTIAL LOT LINE	250 FT (124' PER EXISTING VARIANCE)	206.1 FT
MAXIMUM HEIGHT OF STRUCTURE	35 FT	<35 FT (2 STORIES)

PROPERTY INFORMATION

SITE ADDRESS:	3475 WILLIAM PENN HIGHWAY WILKINS TOWNSHIP, PA 15235
COUNTY	ALLEGHENY
LOT/BLOCK:	542-C-250, 542-C-250 542-C-250, 542-C-250-A
TOTAL LOT AREA:	TOTAL LOT AREA:
ZONING DISTRICT:	'C' COMMERCIAL

PARKING CALCULATIONS

ORDINANCE 173-23: OFF STREET PARKING (STORES, SHOPS AND SPECIALTY RETAIL)

RETAIL PARKING REQUIRED:
1 SPACE FOR EVERY 175 S.F. OF GROSS LEASABLE FLOOR AREA

PARKING REQUIRED = 162 SPACES
PARKING PROVIDED = 243 SPACES

NUMBER OF ADA REQUIRED SPACES BASED ON MUNICIPAL PARKING REQUIREMENT OF 162 SPACES REQUIRED FOR LOTS WITH 26-50 SPACES: 7 ACCESSIBLE SPACES

PROVIDED ADA ACCESSIBLE PARKING: 7 SPACES

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

R:\22-1050 - Benderson - Wilkins Twp\30_Design (DWG)\22-1050 - Benderson - 75 Percent LD.dwg Plotted: Aug 17, 2022 - 12:50pm

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 FOREST DR. WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: DRAFT

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
A	8/17/2022	75% PLAN

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 8/17/2022
DESIGNED BY:
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
SITE PLAN

SHEET NO.
C200

Attachment

Trip Generation Calculations

Weekday Daily Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	21.898	Strip Retail Plaza (<40K)	822	*T = a*(X)+b*	42.20	229.68	50%	**1154**	577	577	**0**	0	0	**1154**	577	577	*0%*	**0**	0	0	**1154**	577	577
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	125.03		50%	**125**	62	63	**0**	0	0	**125**	62	63	*0%*	**0**	0	0	**125**	62	63
Restaurant	Restaurant w/ Drive Thru	3.800	Fast Food w/ Drive Thru	934	*Rate*	467.48		50%	**1776**	888	888	**0**	0	0	**1776**	888	888	*0%*	**0**	0	0	**1776**	888	888
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	533.57		50%	**1334**	667	667	**0**	0	0	**1334**	667	667	*0%*	**0**	0	0	**1334**	667	667
Weekday Daily Total									**4389**	2194	2195	**0**	0	0	**4389**	2194	2195		**0**	0	0	**4389**	2194	2195

New Trips = External Trips - PassBy Trips

AM Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	21.898	Strip Retail Plaza (<40K)	822	*Rate*	2.36		60%	**52**	31	21	**6**	3	3	**46**	28	18	*30%*	**14**	8	6	**32**	20	12
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*T=a*(X)+b*	8.71	-0.75	61%	**8**	5	3	**0**	0	0	**8**	5	3	*29%*	**2**	1	1	**6**	4	2
Restaurant	Restaurant w/ Drive Thru	3.800	Fast Food w/ Drive Thru	934	*Rate*	44.61		51%	**170**	86	84	**2**	1	1	**168**	85	83	*50%*	**84**	43	41	**84**	42	42
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	85.88		51%	**215**	109	106	**4**	2	2	**211**	107	104	*90%*	**190**	96	94	**21**	11	10
Weekday AM Peak Hour Total									**445**	231	214	**12**	6	6	**433**	225	208		**290**	148	142	**143**	77	66

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By % New Trips = External Trips - PassBy Trips

PM Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	21.898	Strip Retail Plaza (<40K)	822	*Ln(T) = a*Ln(X) +b*	0.71	2.72	50%	**136**	68	68	**54**	34	20	**82**	34	48	*40%*	**33**	0	33	**49**	34	15
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	27.07		49%	**27**	13	14	**11**	7	4	**16**	6	10	*35%*	**6**	3	3	**10**	3	7
Restaurant	Restaurant w/ Drive Thru	3.800	Fast Food w/ Drive Thru	934	*Rate*	33.03		52%	**126**	65	61	**38**	15	23	**88**	50	38	*55%*	**48**	25	23	**40**	25	15
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	38.99		50%	**97**	48	49	**27**	9	18	**70**	39	31	*98%*	**69**	38	31	**1**	1	0
Weekday PM Peak Hour Totals									**386**	194	192	**130**	65	65	**256**	129	127		**156**	66	90	**100**	63	37

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By % New Trips = External Trips - PassBy Trips

Saturday Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	21.898	Strip Retail Plaza (<40K)	822	*Rate*	6.57		51%	**144**	73	71	**36**	21	15	**108**	52	56	*31%*	**33**	17	16	**75**	35	40
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	27.67		49%	**28**	14	14	**7**	4	3	**21**	10	11	*38%*	**8**	4	4	**13**	6	7
Restaurant	Restaurant w/ Drive Thru	3.800	Fast Food w/ Drive Thru	934	*Rate*	55.25		51%	**210**	107	103	**21**	9	12	**189**	98	91	*45%*	**85**	43	42	**104**	55	49
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	87.91		50%	**220**	110	110	**22**	9	13	**198**	101	97	*84%*	**166**	83	83	**32**	18	14
Saturday Peak Hour Total									**602**	304	298	**86**	43	43	**516**	261	255		**292**	147	145	**224**	114	110

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By %

Note: ITE does not provide pass-by rate data for Land Use 822 (Strip Retail Plaza <40KSF); therefore, pass-by rate data from Land Use 821 (Shopping Plaza 40-150ksf) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 821 (Shopping Plaza 40-150 ksf) during the weekday AM peak hour; therefore, it was assumed that the weekday AM peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

Note: ITE does not provide pass-by rate data for Land Use 934 (Fast Food Restaurant with Drive-Through) for the Saturday peak hour; therefore, it was assumed that the Saturday peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

Note: ITE does not provide pass-by rate data for Land Use 937 (Coffee/Donut Shop with Drive-Through Window); therefore, pass-by rate data from Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) for the Saturday midday peak hour; therefore, it was assumed that the weekday midday peak hour pass-by rate would reflect the Saturday midday peak hour pass-by rate.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	9/23/2022
Analysis Year:	Projected (Build)	**Checked By:**	PL
Analysis Period:	**AM Street Peak Hour**	**Date:**	9/28/2022

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	21,898	sf	60	36	24
Restaurant	934+937	6,300	sf	385	195	190
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				445	231	214

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		3	0	0	0
Restaurant	0	3		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	445	231	214
Internal Capture Percentage	3%	3%	3%
External Vehicle-Trips[5]	433	225	208
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	13%
Restaurant	2%	2%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

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Project Name:	3475 William Penn Highway Development
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	36	36	1.00	24	24
Restaurant	1.00	195	195	1.00	190	190
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	7		3	0	3	0
Restaurant	59	27		0	8	6
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		12	45	0	0	0
Retail	0		98	0	0	0
Restaurant	0	3		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	6	39	0		0
Hotel	0	1	12	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	3	33	36	33	0	0
Restaurant	3	192	195	192	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	3	21	24	21	0	0
Restaurant	3	187	190	187	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	9/23/2022
Analysis Year:	Projected (Build)	**Checked By:**	PL
Analysis Period:	**PM Street Peak Hour**	**Date:**	9/28/2022

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	21,898	sf	163	81	82
Restaurant	934+937	6,300	sf	223	113	110
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				386	194	192

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		24	0	0	0
Restaurant	0	41		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	386	194	192
Internal Capture Percentage	34%	34%	34%
External Vehicle-Trips[5]	256	129	127
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	51%	29%
Restaurant	21%	37%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	3475 William Penn Highway Development
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	81	81	1.00	82	82
Restaurant	1.00	113	113	1.00	110	110
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	2		24	3	21	4
Restaurant	3	45		9	20	8
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	2	0	0	0
Retail	0		33	0	0	0
Restaurant	0	41		0	0	0
Cinema/Entertainment	0	3	3		0	0
Residential	0	8	16	0		0
Hotel	0	2	6	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	41	40	81	40	0	0
Restaurant	24	89	113	89	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	24	58	82	58	0	0
Restaurant	41	69	110	69	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	9/23/2022
Analysis Year:	Projected (Build)	**Checked By:**	PL
Analysis Period:	**Saturday Midday Peak Hour**	**Date:**	9/28/2022

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	21,898	sf	172	87	85
Restaurant	934+937	6,300	sf	430	217	213
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				602	304	298

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		18	0	0	0
Restaurant	0	25		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	602	304	298
Internal Capture Percentage	14%	14%	14%
External Vehicle-Trips[5]	516	261	255
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	29%	21%
Restaurant	8%	12%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	3475 William Penn Highway Development
Analysis Period:	**Saturday Midday Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	87	87	1.00	85	85
Restaurant	1.00	217	217	1.00	213	213
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	13		18	2	17	2
Restaurant	36	59		9	23	11
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		17	27	0	0	0
Retail	0		86	0	0	0
Restaurant	0	25		0	0	0
Cinema/Entertainment	0	2	3		0	0
Residential	0	12	37	0		0
Hotel	0	3	12	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	25	62	87	62	0	0
Restaurant	18	199	217	199	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	18	67	85	67	0	0
Restaurant	25	188	213	188	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Strip Retail Plaza (<40k)
(822)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday**

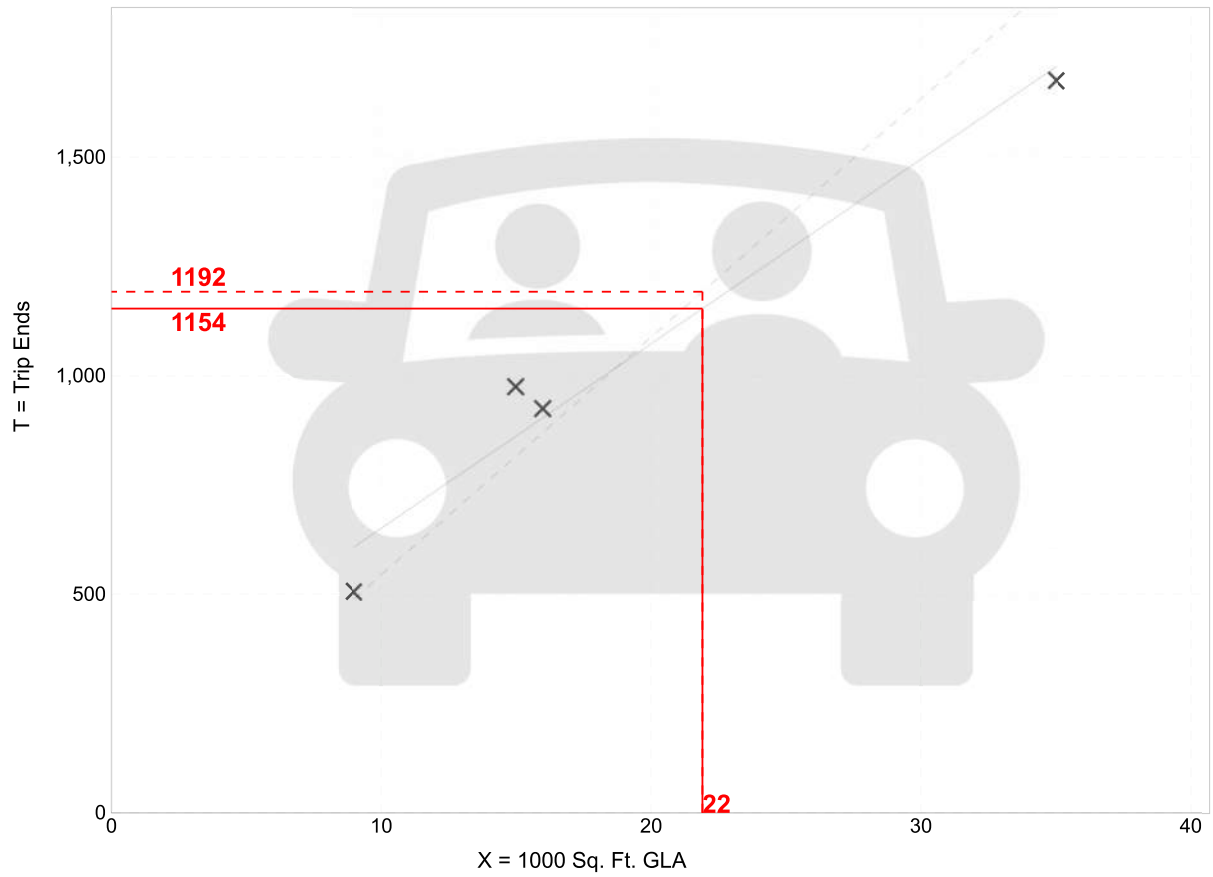
Setting/Location: **General Urban/Suburban**
Number of Studies: 4
Avg. 1000 Sq. Ft. GLA: 19
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
54.45	47.86 - 65.07	7.81

Data Plot and Equation

Caution – Small Sample Size



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: T = 42.20(X) + 229.68 **R^2= 0.96**

Strip Retail Plaza (<40k)
(822)

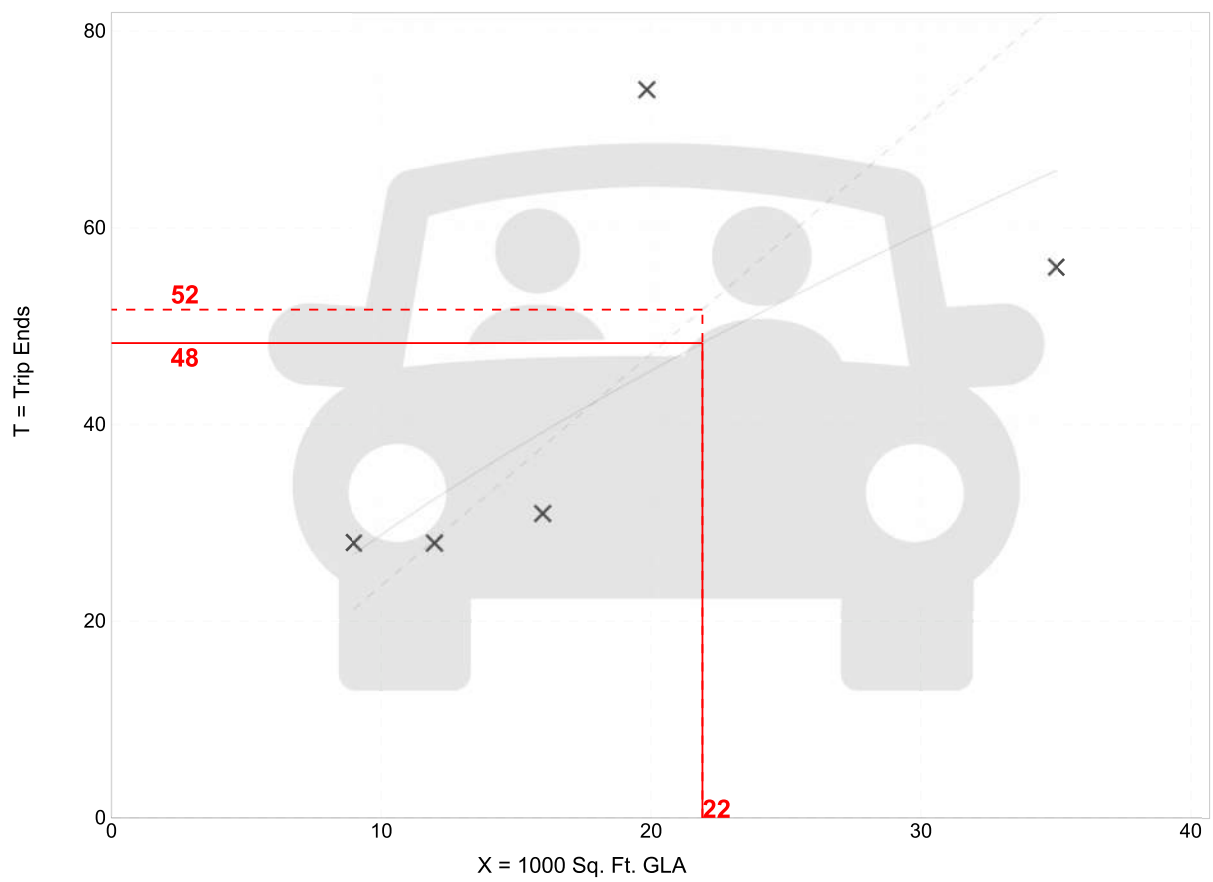
Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	5
Avg. 1000 Sq. Ft. GLA:	18
Directional Distribution:	60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.36	1.60 - 3.73	0.94

Data Plot and Equation

Caution – Small Sample Size



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: Ln(T) = 0.66 Ln(X) + 1.84 **R^2= 0.57**

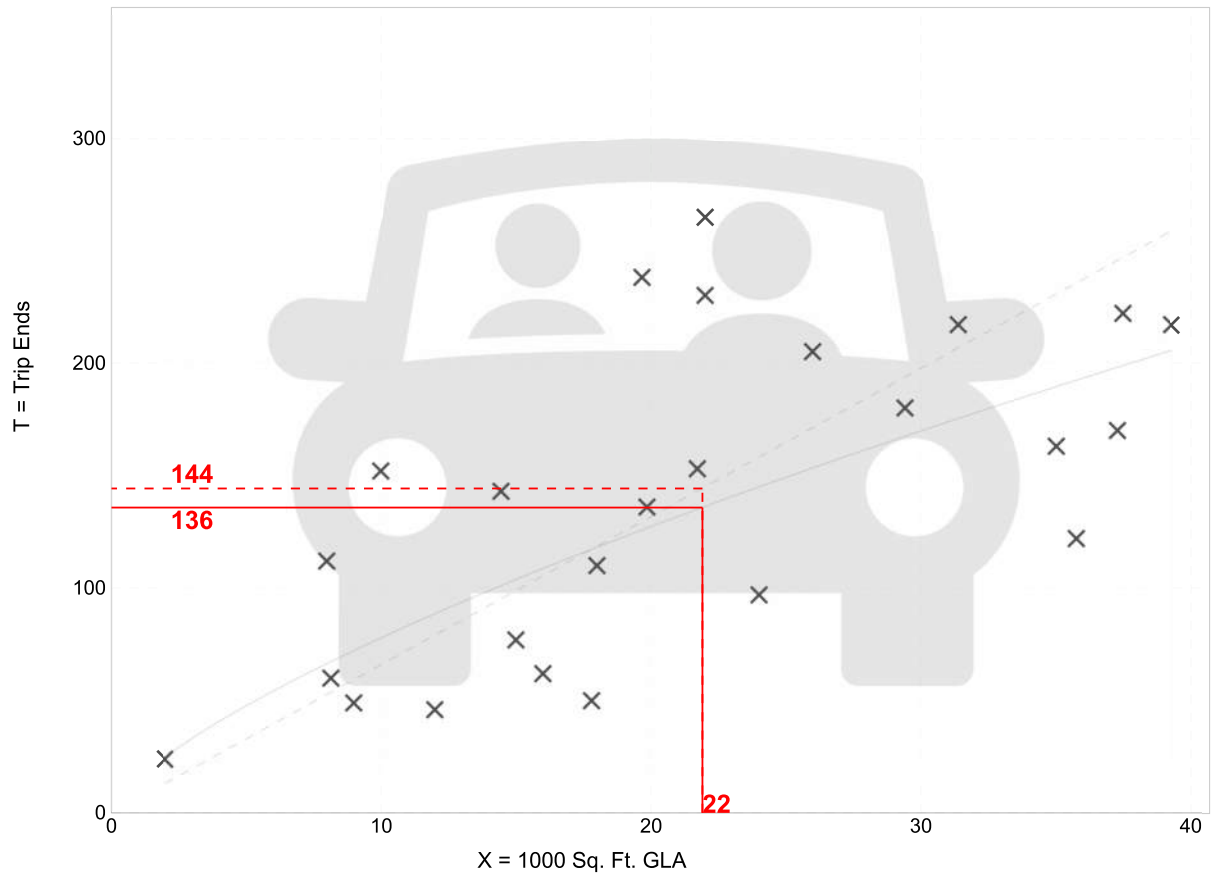
Strip Retail Plaza (<40k)
(822)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	25
Avg. 1000 Sq. Ft. GLA:	21
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.59	2.81 - 15.20	2.94

Data Plot and Equation



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: Ln(T) = 0.71 Ln(X) + 2.72 **R^2= 0.56**

Strip Retail Plaza (<40k)
(822)

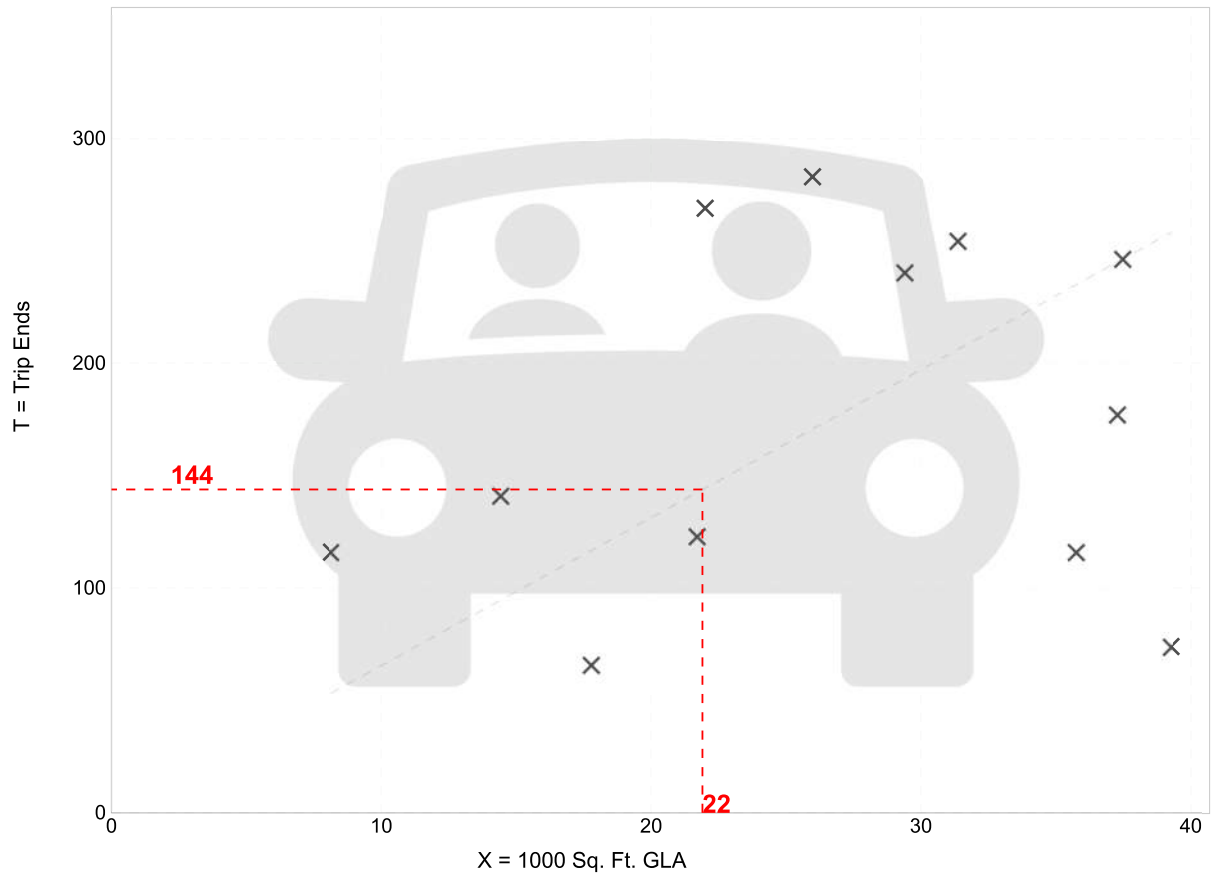
Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Saturday, Peak Hour of Generator**

Setting/Location: **General Urban/Suburban**
Number of Studies: 12
Avg. 1000 Sq. Ft. GLA: 27
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.57	1.88 - 14.23	3.45

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	821								
Land Use	Shopping Plaza (40 - 150k)								
Setting	General Urban/Suburban								
Time Period	Weekday PM Peak Period								
# Data Sites	15								
Average Pass-By Rate	40%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GLA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
45	Florida	1992	844	56	24	20	44	—	30
50	Florida	1992	555	41	41	18	59	—	30
52	Florida	1995	665	42	33	25	58	—	30
53	Florida	1993	162	59	—	—	41	—	30
57.23	Kentucky	1993	247	31	53	16	69	2659	34
60	Florida	1995	1583	40	38	22	60	—	30
69.4	Kentucky	1993	109	25	42	33	75	1559	34
77	Florida	1992	365	46	—	—	54	—	30
78	Florida	1991	702	55	23	22	45	—	30
82	Florida	1992	336	34	—	—	66	—	30
92.857	Kentucky	1993	133	22	50	28	78	3555	34
100.888	Kentucky	1993	281	28	50	22	72	2111	34
121.54	Kentucky	1993	210	53	30	17	47	2636	34
144	New Jersey	1990	176	32	44	24	68	—	24
146.8	Kentucky	1993	—	36	39	25	64	—	34

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	821								
Land Use	Shopping Plaza (40 - 150k)								
Setting	General Urban/Suburban								
Time Period	Saturday Midday								
# Data Sites	1								
Average Pass-By Rate	31%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adjacent Street	
GLA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Daily Volume	Source
144	New Jersey	1990	264	31	47	22	69	63362	24

Drive-in Bank
(912)

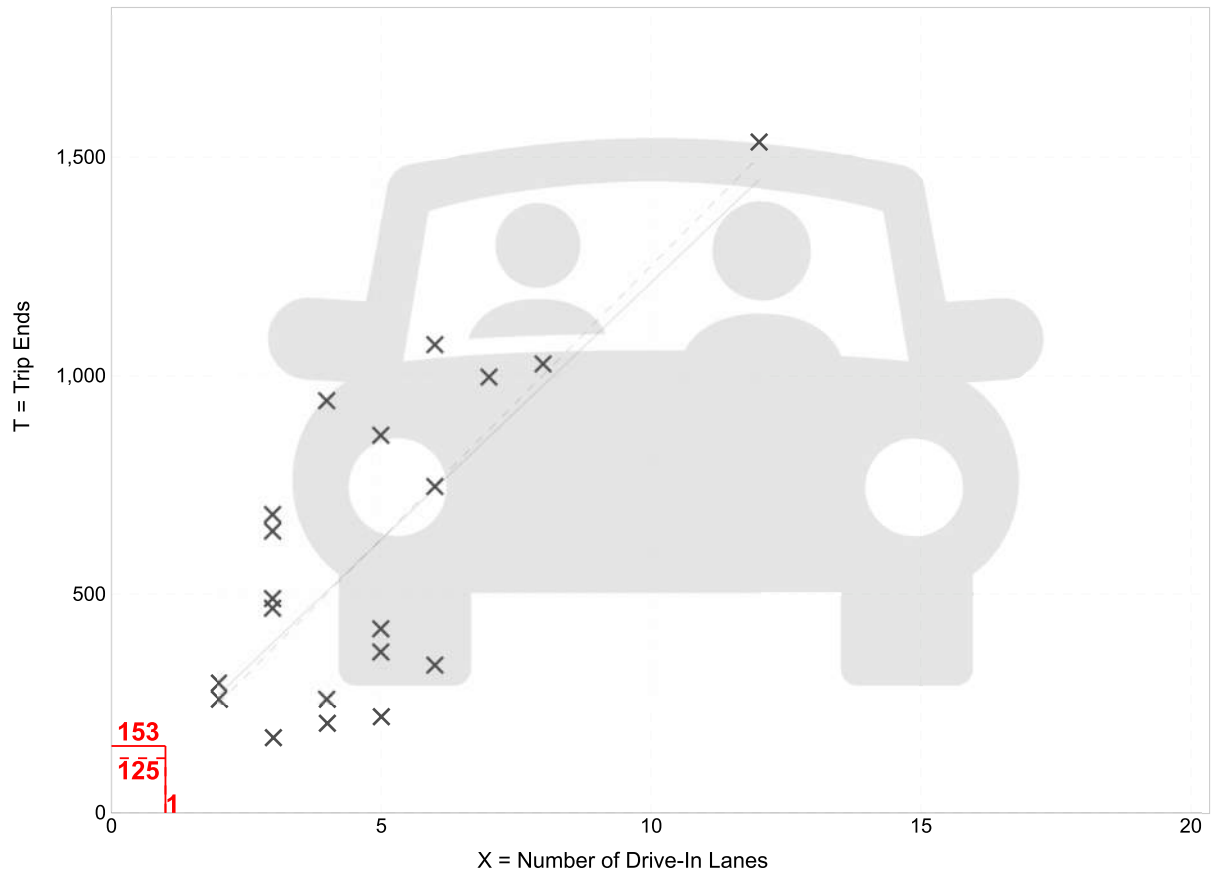
Vehicle Trip Ends vs: **Drive-In Lanes**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 20
Avg. Num. of Drive-In Lanes: 5
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
125.03	44.00 - 235.50	55.01

Data Plot and Equation



Fitted Curve Equation: T = 117.68(X) + 35.30

R^2= 0.55

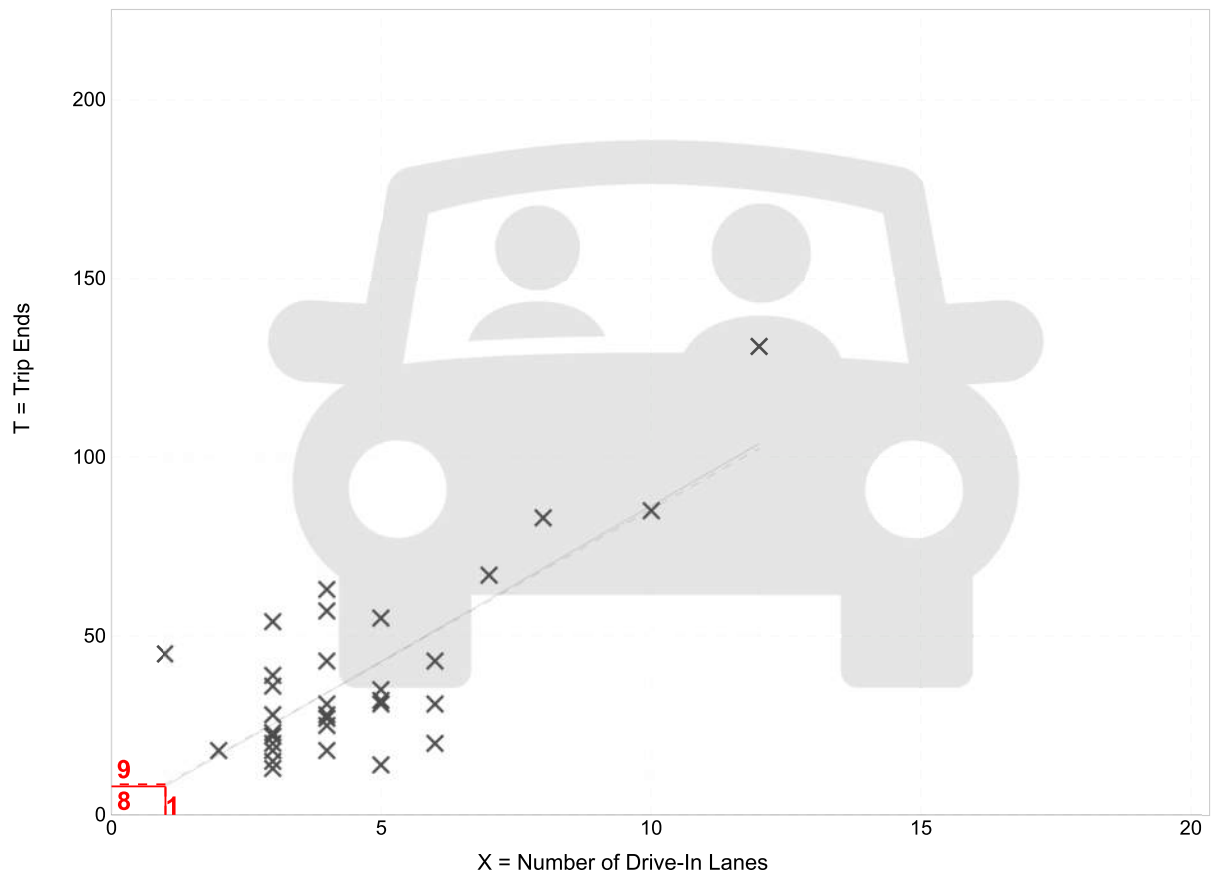
Drive-in Bank
(912)

Vehicle Trip Ends vs:	**Drive-In Lanes**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	36
Avg. Num. of Drive-In Lanes:	4
Directional Distribution:	61% entering, 39% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
8.54	2.80 - 45.00	4.37

Data Plot and Equation



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: T = 8.71(X) - 0.75 **R^2= 0.59**

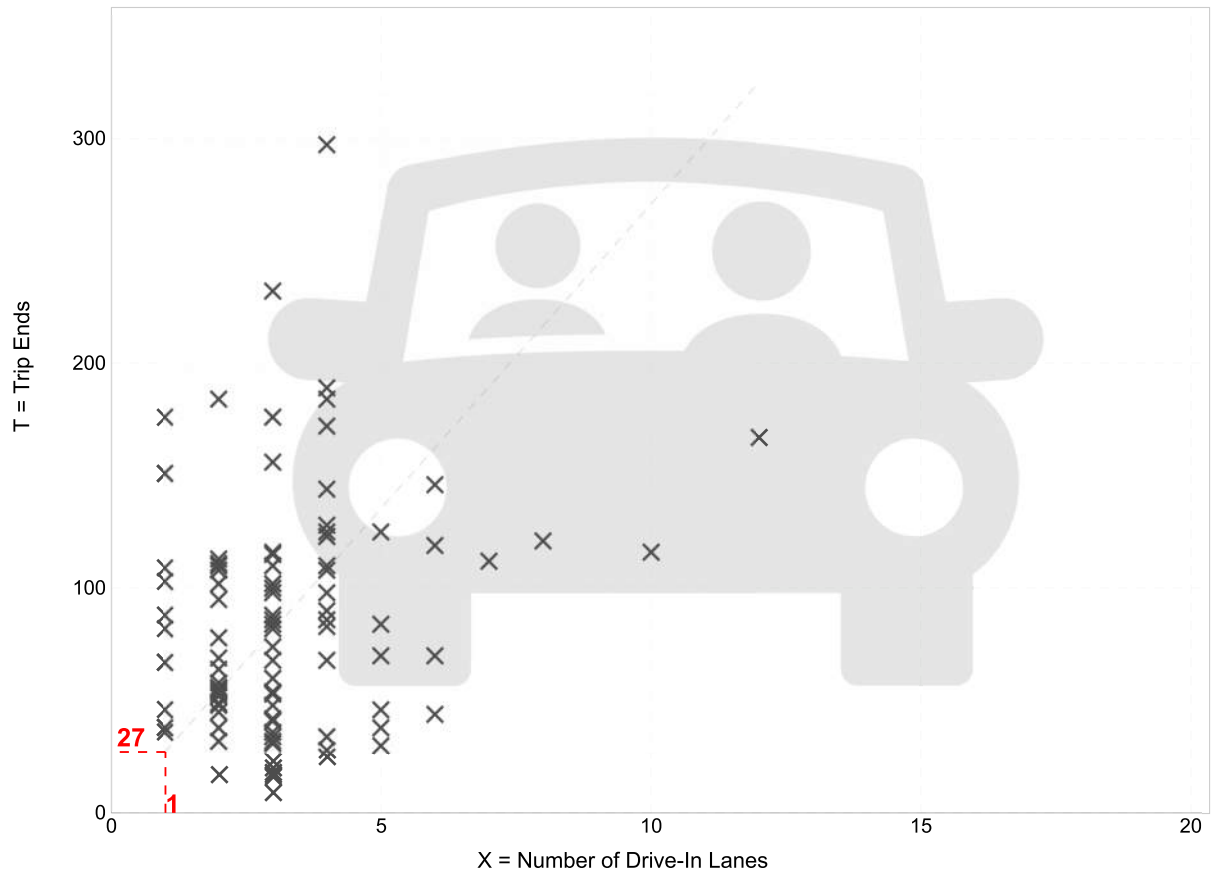
Drive-in Bank
(912)

Vehicle Trip Ends vs:	**Drive-In Lanes**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	109
Avg. Num. of Drive-In Lanes:	3
Directional Distribution:	49% entering, 51% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
27.07	3.00 - 176.00	22.13

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Drive-in Bank
(912)

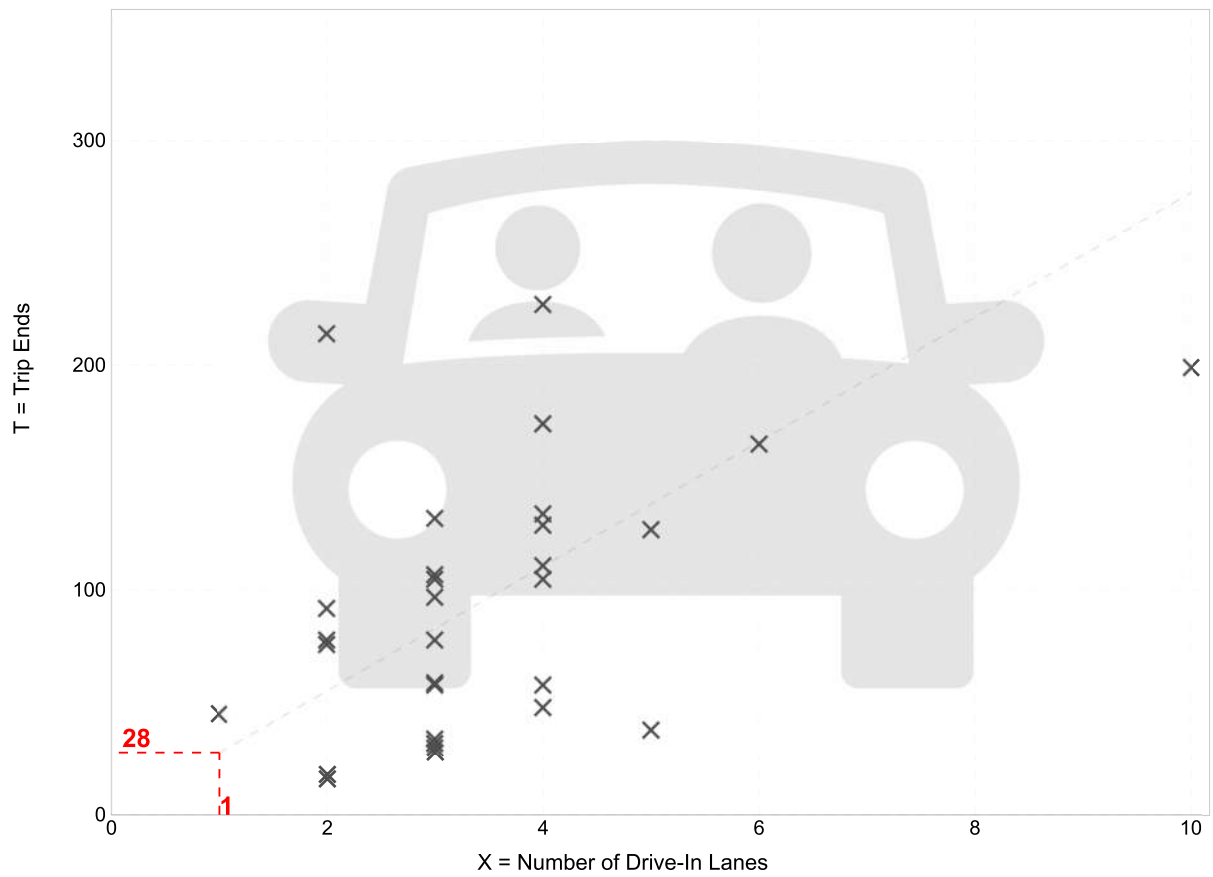
Vehicle Trip Ends vs: **Drive-In Lanes**
On a: **Saturday, Peak Hour of Generator**

Setting/Location: **General Urban/Suburban**
Number of Studies: 31
Avg. Num. of Drive-In Lanes: 3
Directional Distribution: 49% entering, 51% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
27.67	7.60 - 107.00	17.13

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	912								
Land Use	Drive-In Bank								
Setting	General Urban/Suburban								
Time Period	Weekday AM Peak Period								
# Data Sites	8								
Average Pass-By Rate	29%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GFA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
3.8	Pennsylvania	2005	11	27	—	—	73	—	19
3.8	Pennsylvania	2005	9	24	—	—	76	—	19
3.8	Pennsylvania	2005	22	34	—	—	66	—	19
3.8	Pennsylvania	2005	30	27	—	—	73	—	19
3.8	Pennsylvania	2005	34	40	—	—	60	—	19
3.8	Pennsylvania	2005	7	27	—	—	73	—	19
3.8	Pennsylvania	2005	15	16	—	—	84	—	19
3.8	Pennsylvania	2005	27	36	—	—	64	—	19

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	912								
Land Use	Drive-In Bank								
Setting	General Urban/Suburban								
Time Period	Weekday PM Peak Period								
# Data Sites	19								
Average Pass-By Rate	35%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GFA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
2.7	Washington	2007	—	26	66	8	74	—	11
2.8	Washington	2007	—	21	55	24	79	—	11
3.3	Kentucky	1993	—	48	22	30	52	2570	34
3.4	Kentucky	1993	—	64	22	14	36	2266	34
3.4	Kentucky	1993	75	57	11	32	43	1955	34
3.5	Kentucky	1993	53	47	32	21	53	2785	2
3.6	Washington	2007	—	42	50	8	58	—	11
3.6	Washington	2007	—	29	—	—	71	—	11
3.8	Pennsylvania	2005	56	43	—	—	57	—	19
3.8	Pennsylvania	2005	38	41	—	—	59	—	19
3.8	Pennsylvania	2005	14	24	—	—	76	—	19
3.8	Pennsylvania	2005	63	29	—	—	71	—	19
3.8	Pennsylvania	2005	70	29	—	—	71	—	19
3.8	Pennsylvania	2005	29	27	—	—	73	—	19
3.8	Pennsylvania	2005	41	25	—	—	75	—	19
3.8	Pennsylvania	2005	37	31	—	—	69	—	19
3.8	Pennsylvania	2005	19	29	—	—	71	—	19
3.8	Pennsylvania	2005	34	21	—	—	79	—	19
3.8	Pennsylvania	2005	36	29	—	—	71	—	19

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	912								
Land Use	Drive-In Bank								
Setting	General Urban/Suburban								
Time Period	Saturday Midday								
# Data Sites	5								
Average Pass-By Rate	38%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GFA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
3.8	Pennsylvania	2005	63	33	—	—	67	—	19
3.8	Pennsylvania	2005	103	77	—	—	23	—	19
3.8	Pennsylvania	2005	34	37	—	—	63	—	19
3.8	Pennsylvania	2005	53	33	—	—	67	—	19
3.8	Pennsylvania	2005	25	12	—	—	88	—	19

Fast-Food Restaurant with Drive-Through Window
(934)

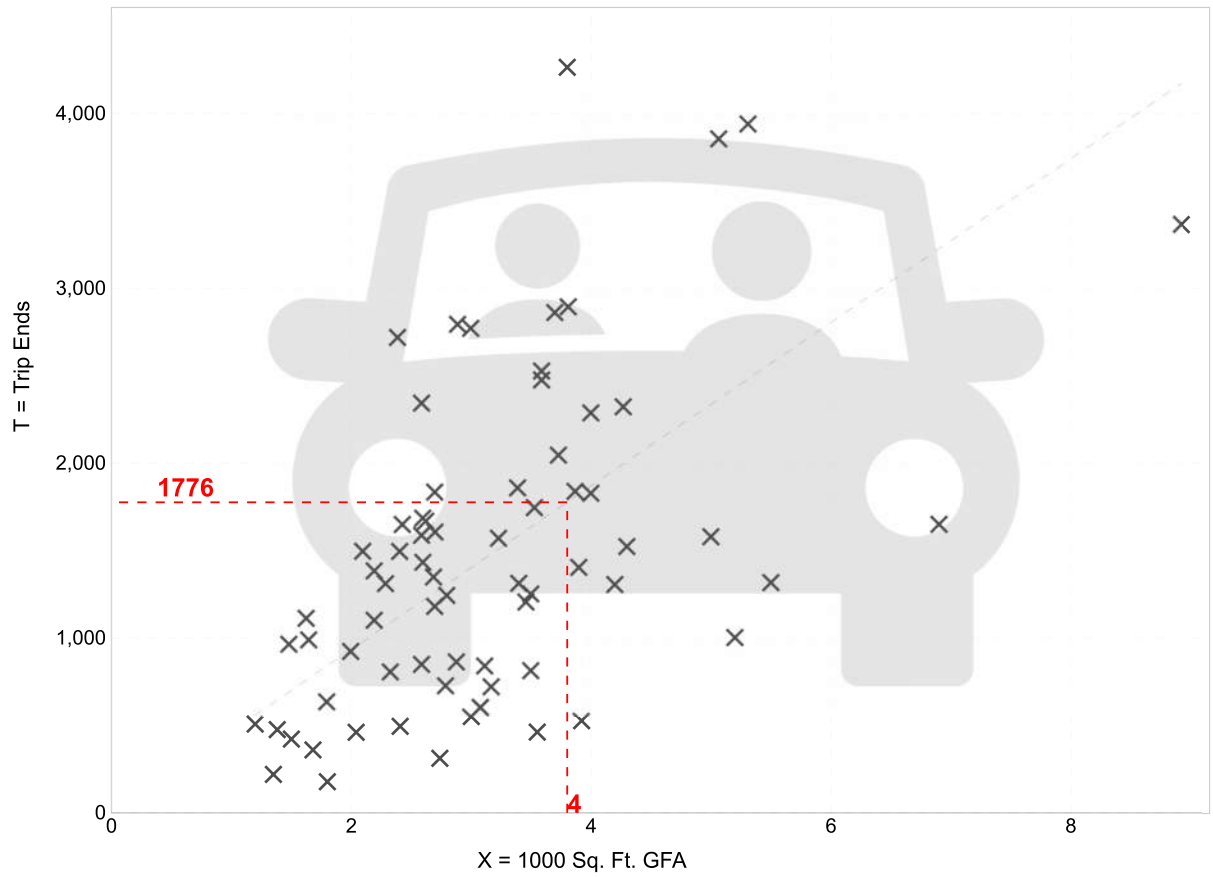
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 71
Avg. 1000 Sq. Ft. GFA: 3
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
467.48	98.89 - 1137.66	238.62

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

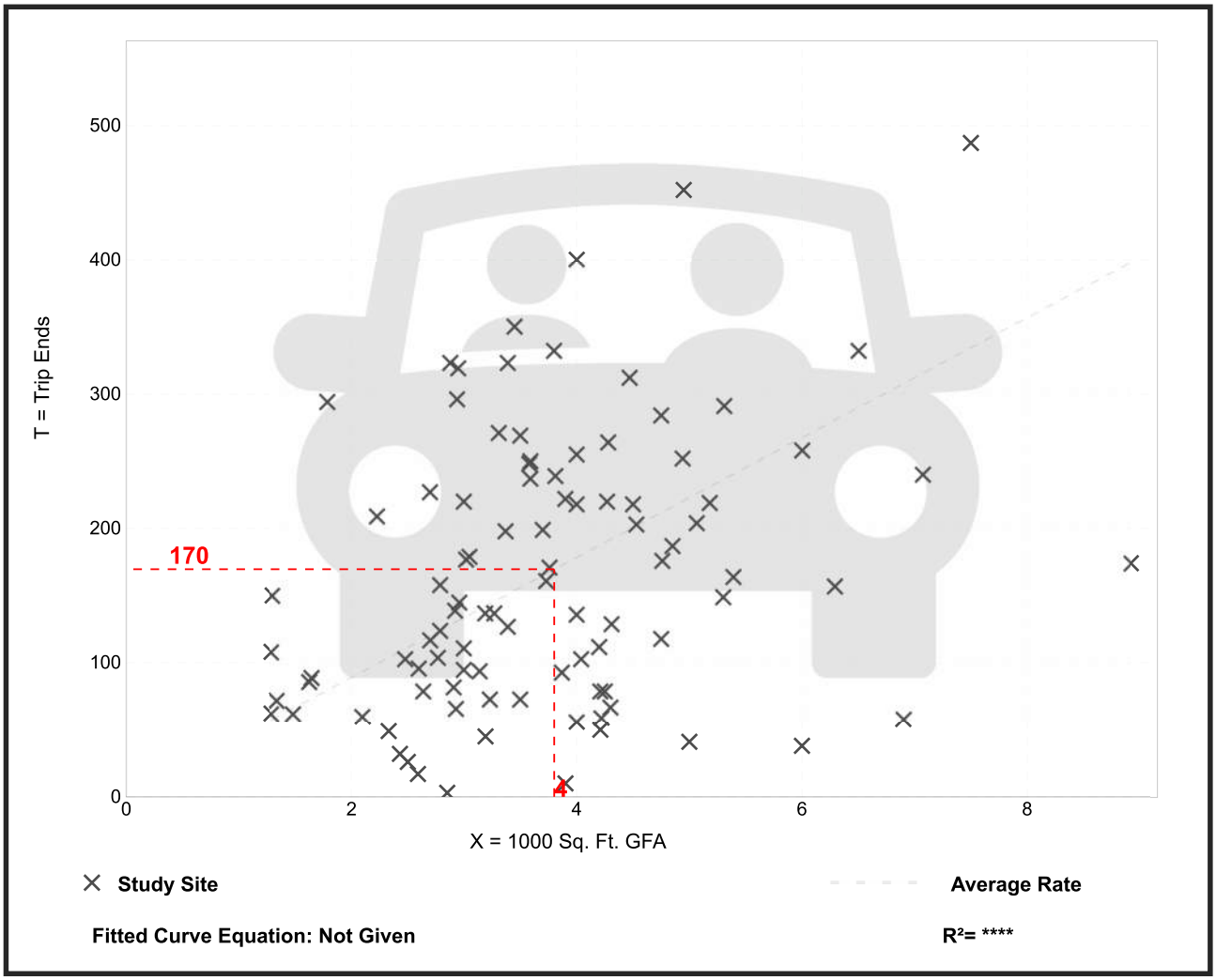
Fast-Food Restaurant with Drive-Through Window
(934)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	96
Avg. 1000 Sq. Ft. GFA:	4
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
44.61	1.05 - 164.25	27.14

Data Plot and Equation



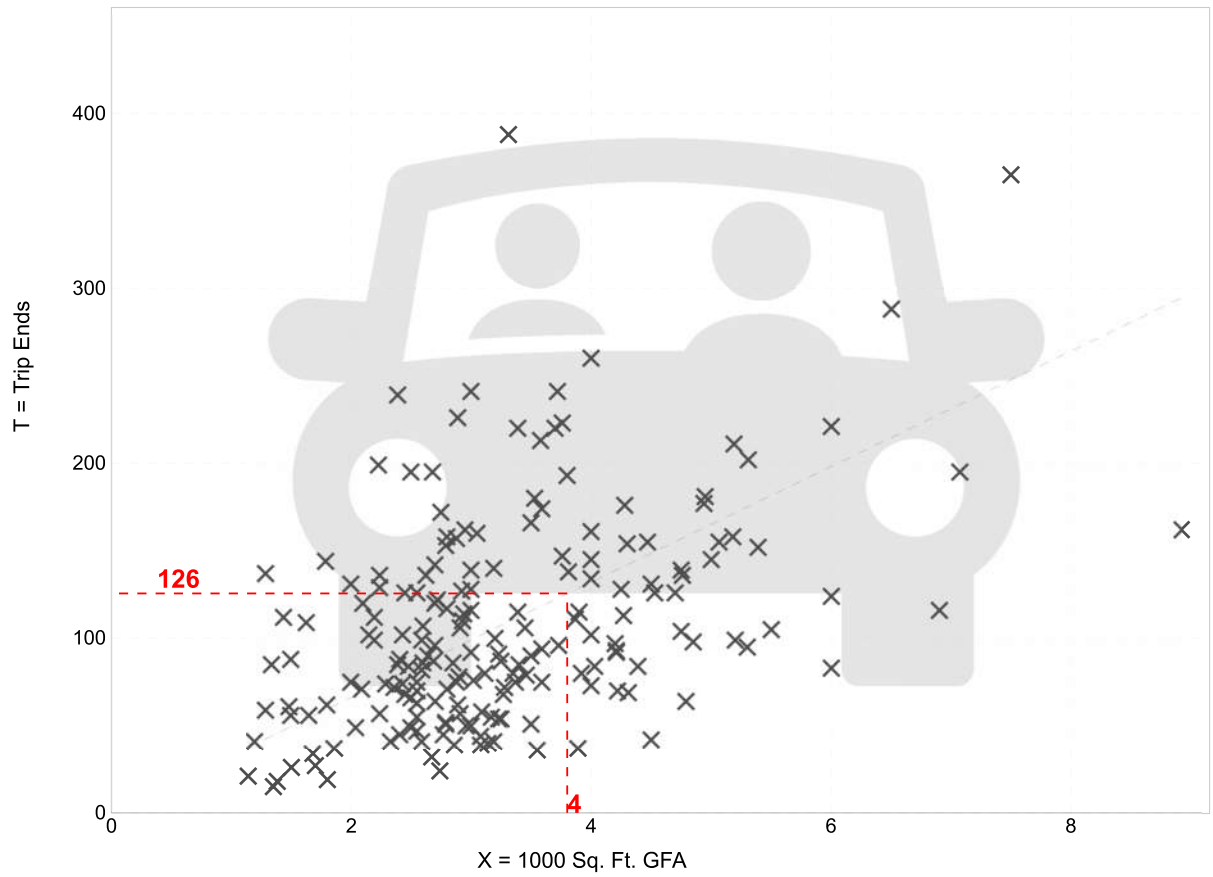
Fast-Food Restaurant with Drive-Through Window
(934)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. 1000 Sq. Ft. GFA:	3
Directional Distribution:	52% entering, 48% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
33.03	8.77 - 117.22	17.59

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Fast-Food Restaurant with Drive-Through Window
(934)

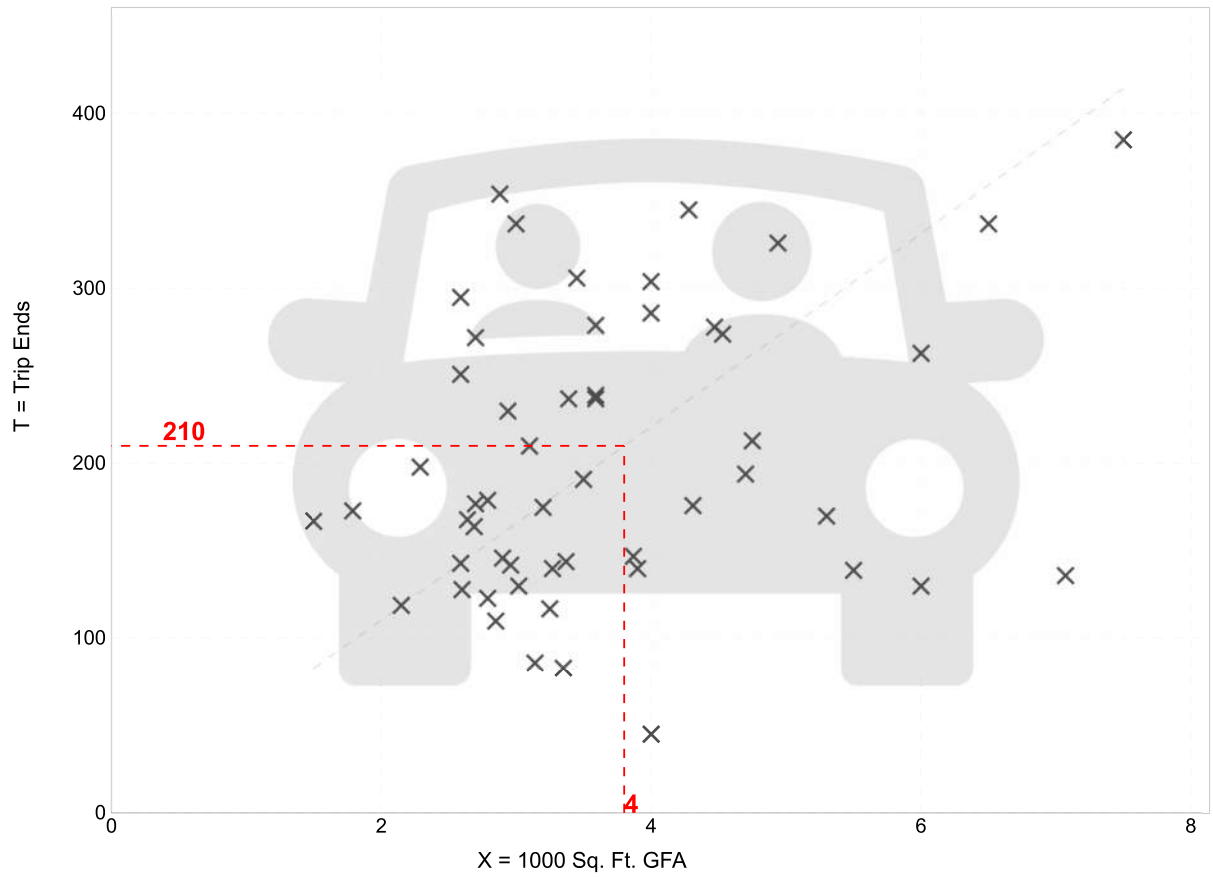
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Saturday, Peak Hour of Generator**

Setting/Location: **General Urban/Suburban**
Number of Studies: 53
Avg. 1000 Sq. Ft. GFA: 4
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
55.25	11.25 - 122.92	24.62

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	934								
Land Use	Fast-Food Restaurant with Drive-Through Window								
Setting	General Urban/Suburban								
Time Period	Weekday AM Peak Period								
# Data Sites	5								
Average Pass-By Rate	50%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GFA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
1.4	Kentucky	1993	—	62	22	16	38	1407	2
3	Kentucky	1993	—	43	14	43	57	2903	2
3.3	--	1996	—	68	—	—	32	—	21
3.6	Kentucky	1993	—	32	47	21	68	437	2
4.2	Indiana	1993	—	46	23	31	54	1049	2

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	934								
Land Use	Fast-Food Restaurant with Drive-Through Window								
Setting	General Urban/Suburban								
Time Period	Weekday PM Peak Period								
# Data Sites	11								
Average Pass-By Rate	55%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
GFA (000)	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
1.3	Kentucky	1993	—	68	22	10	32	2055	2
1.9	Kentucky	1993	33	67	24	9	33	2447	2
2.8	Florida	1995	47	66	—	—	34	—	30
2.9	Florida	1996	271	41	41	18	59	—	30
3	Kentucky	1993	—	31	31	38	69	4250	2
3.1	Florida	1995	28	71	—	—	29	—	30
3.1	Florida	1996	29	38	—	—	62	—	30
3.2	Florida	1996	202	40	39	21	60	—	30
3.3	—	1996	—	62	—	—	38	—	21
4.2	Indiana	1993	—	56	25	19	44	1632	2
4.3	Florida	1994	304	62	—	—	38	—	30

Coffee/Donut Shop with Drive-Through Window
(937)

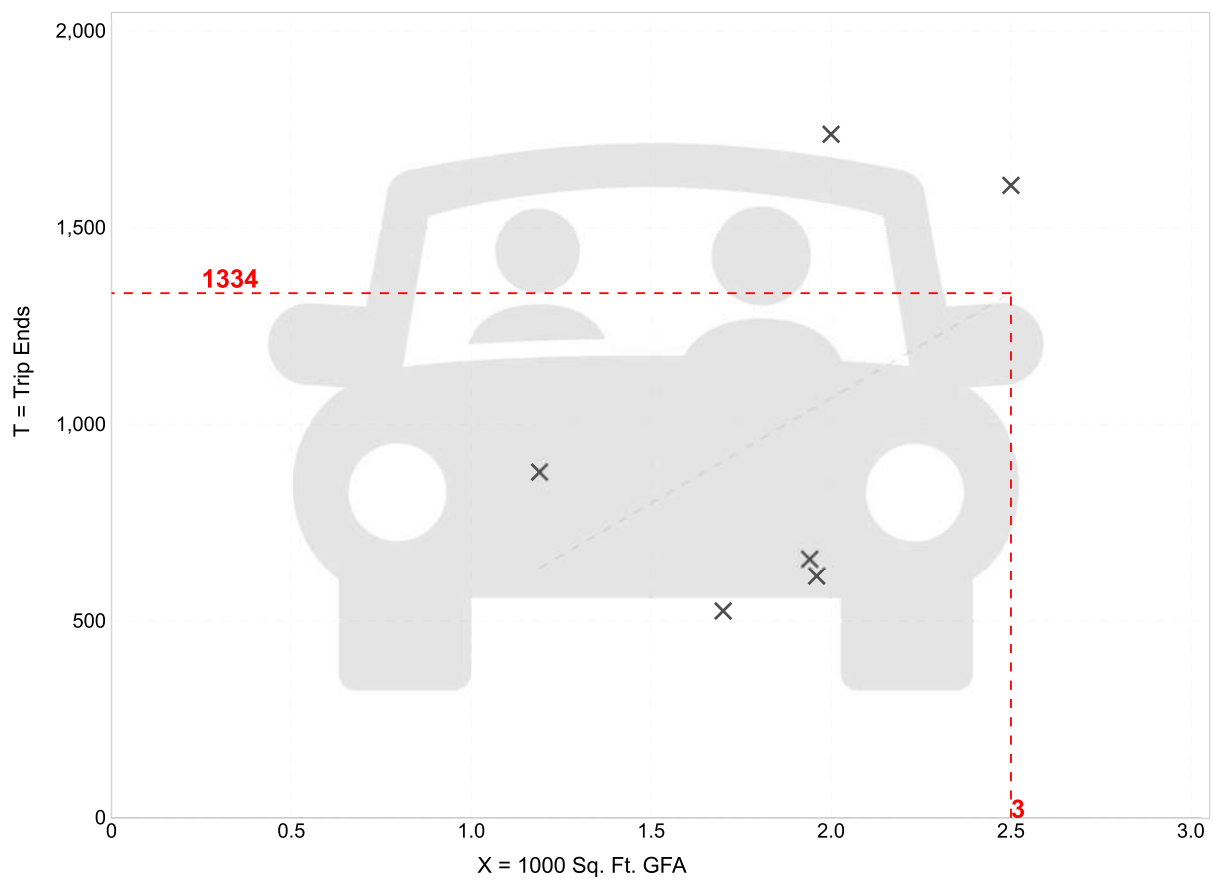
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 6
Avg. 1000 Sq. Ft. GFA: 2
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
533.57	309.41 - 869.00	243.65

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

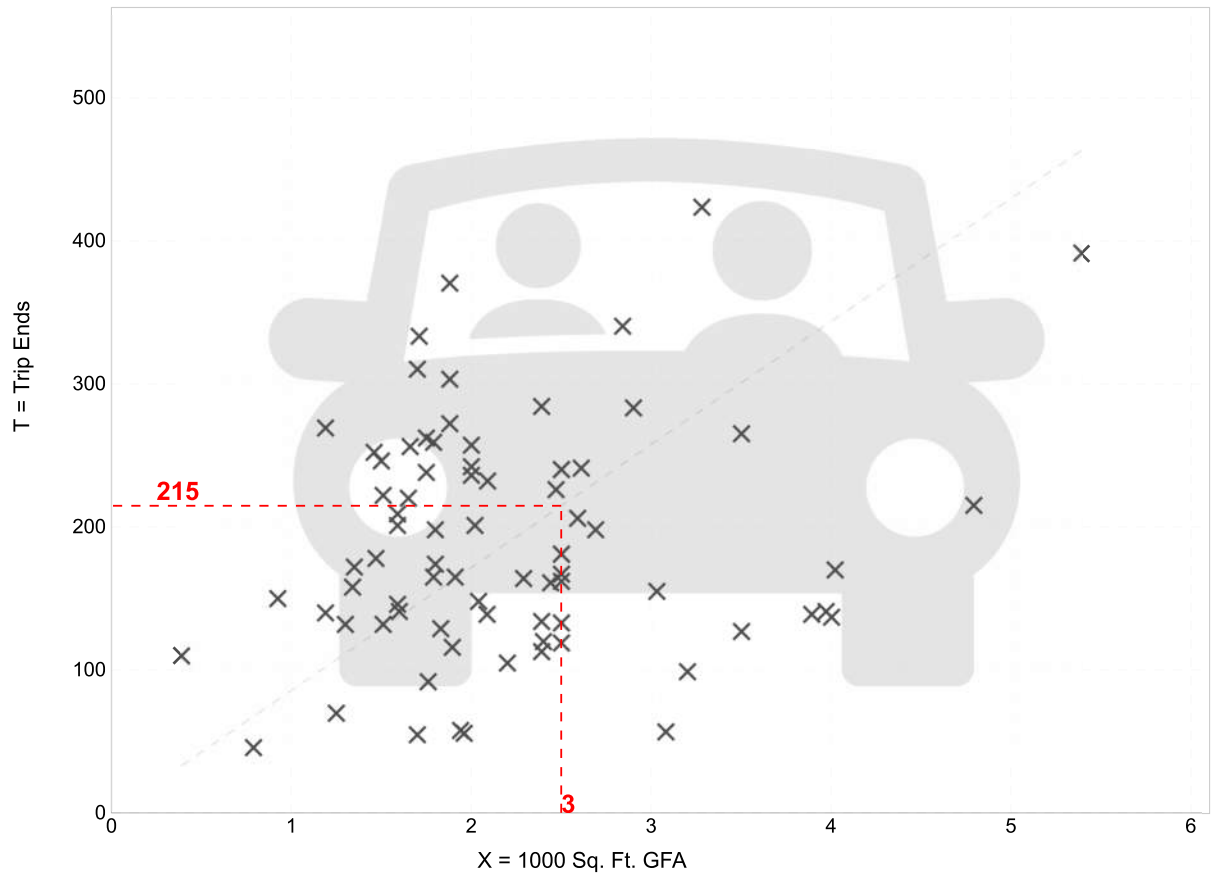
Coffee/Donut Shop with Drive-Through Window
(937)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	78
Avg. 1000 Sq. Ft. GFA:	2
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
85.88	18.51 - 282.05	44.92

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

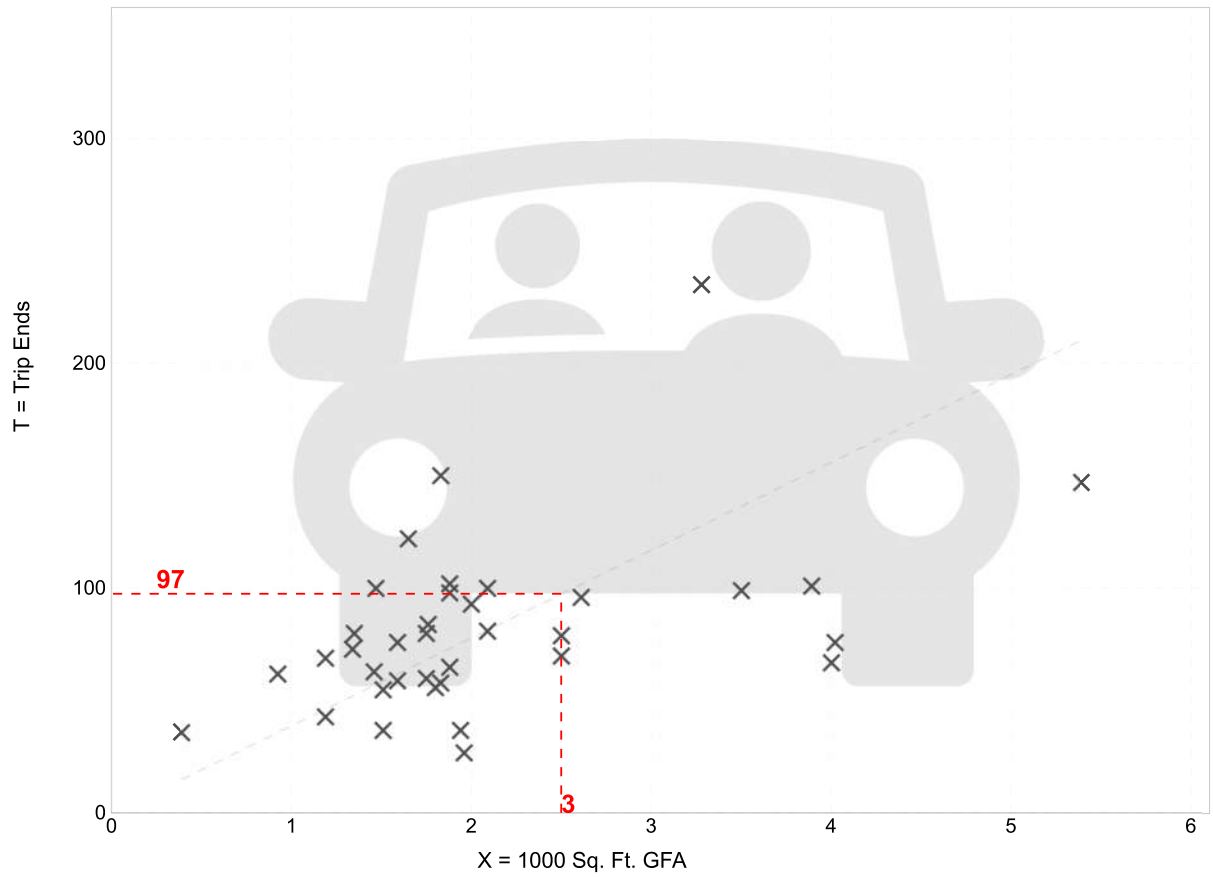
Coffee/Donut Shop with Drive-Through Window
(937)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	36
Avg. 1000 Sq. Ft. GFA:	2
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
38.99	13.78 - 92.31	17.79

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Coffee/Donut Shop with Drive-Through Window
(937)

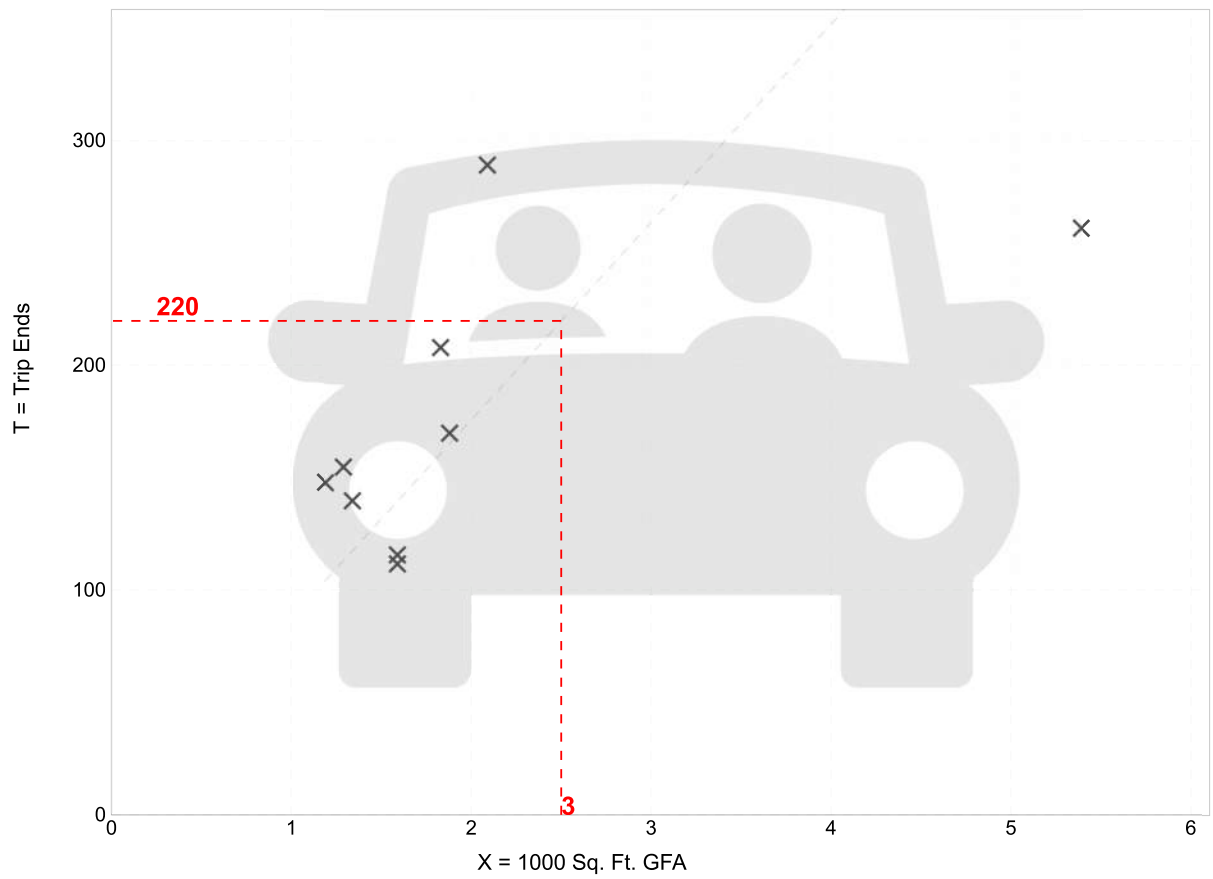
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Saturday, Peak Hour of Generator**

Setting/Location: **General Urban/Suburban**
Number of Studies: 9
Avg. 1000 Sq. Ft. GFA: 2
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
87.91	48.42 - 138.28	34.34

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	938								
Land Use	Coffee/Donut Shop with Drive-Through Window and No Indoor Seating								
Setting	General Urban/Suburban								
Time Period	Weekday AM Peak Period								
# Data Sites	3								
Average Pass-By Rate	90%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
Drive-Through Lanes	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
1	Washington	1997	—	83	—	—	17	—	18
1	Oregon	1998	—	95	—	—	5	—	18
1	Washington	1998	—	92	—	—	8	—	18

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	938								
Land Use	Coffee/Donut Shop with Drive-Through Window and No Indoor Seating								
Setting	General Urban/Suburban								
Time Period	Weekday PM Peak Period								
# Data Sites	2								
Average Pass-By Rate	98%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
Drive-Through Lanes	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
1	Washington	1997	—	100	—	—	0	—	18
1	Oregon	1998	—	95	—	—	5	—	18

Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual* , 11th Edition

Land Use Code	938								
Land Use	Coffee/Donut Shop with Drive-Through Window and No Indoor Seating								
Setting	General Urban/Suburban								
Time Period	Weekday Midday								
# Data Sites	3								
Average Pass-By Rate	84%								
	Pass-By Characteristics for Individual Sites								
	State or	Survey		Pass-By	Non-Pass-By Trips			Adj Street Peak	
Drive-Through Lanes	Province	Year	# Interviews	Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
1	Washington	1997	—	73	—	—	27	—	18
1	Oregon	1998	—	100	—	—	0	—	18
1	Washington	1998	—	78	—	—	22	—	18

Southern, Melissa

From: Hiffman, Dan <dan@hiffman.com>
Sent: Friday, January 20, 2023 8:44 AM
To: Southern, Melissa
Subject: RE: Request for Information - Lidl Site (William Penn Highway, Wilkins Township, Allegheny County, PA)

CAUTION: External email - do not click links or open attachments unless you recognize the sender and know the content is safe.

Melissa,
My apologies, my client's engineer sent me a response to your 1/3 email on 1/4, below for reference.

Dan Hiffman
Vice President
Retail Services

NAI Hiffman | Hiffman National
One Oakbrook Terrace, Suite 400
Oakbrook Terrace, IL 60181

Direct: 630 693 0655
Mobile: 630 965 2712
Main: 630 932 1234

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From: Litvin, Jared <Jared.Litvin@kimley-horn.com>
Sent: Wednesday, January 4, 2023 9:41 AM
To: Moldovan, Bill <Bill.Moldovan@kimley-horn.com>; Hiffman, Dan <dan@hiffman.com>; John Crane (cranezoo@aol.com) <cranezoo@aol.com>; Joseph M. Olen <JOlen@BurkeLaw.com>; Douglas E. Wambach (dwambach@burkelaw.com) <dwambach@burkelaw.com>; Simon Yu (simon_yu@simon-arch.com) <simon_yu@simon-arch.com>
Subject: RE: Request for Information - Lidl Site (William Penn Highway, Wilkins Township, Allegheny County, PA)

EXTERNAL EMAIL – Open attachments and Links with CAUTION

Dan,

Our responses to the questions are below (in red). It is worth mentioning to Melissa that we are in the process of doing our own traffic study and that their numbers could come up completely different than ours. With ours being underway, they should wait on our trip generation and distribution to be completed and we can provide her with the information.

- Is the proposed car dealership for new vehicle sales only, used vehicle sales only, or a combination of new and used vehicle sales? *(This information will be used to determine which land use type is selected for trip generation purposes.)*
  Combination

- Could you provide the square footage of gross floor area of the proposed car dealership? *(This information will be used to calculate the site trips for the proposed car dealership.)*
  19,725 SF

- Could you provide the proposed number of driveway(s) to the dealership and which roadways they will intersect (William Penn Highway? Home Depot Drive?)? *(This information will be used to distributed the calculated site trips to/from the proposed car dealership.)*
  One onto William Penn Directly, one into Home Depot's existing driveway.

- Will the driveway(s) operate as full-movement or partial-movement (such as right-in/right-out only)? *(This information will be used to distributed the calculated site trips to/from the proposed car dealership.)*
  The new driveway to William Penn will be left turn restricted.

Lastly since I have everyone on the chain, we need to perform an interview with the property owner (LIDL) to finalize the Phase I study. The regulations are changing next month and will change/add to the work that has been done to this point if we do not get this in ahead of time. If anyone could please provide us with a contact that we would be able to facilitate that interview with it will be much appreciated. This is very important to keep this project moving.

Thanks again.

From: Hiffman, Dan <dan@hiffman.com>
Sent: Friday, January 20, 2023 7:15 AM
To: John Crane (cranezoo@aol.com) <cranezoo@aol.com>; Joseph M. Olen <JOlen@BurkeLaw.com>; Douglas E. Wambach (dwambach@burkelaw.com) <dwambach@burkelaw.com>; Simon Yu (simon_yu@simon-arch.com) <simon_yu@simon-arch.com>; Bill Moldovan (Bill.Moldovan@kimley-horn.com) <bill.moldovan@kimley-horn.com>; Litvin, Jared <Jared.Litvin@kimley-horn.com>; Damian Gabrus <dgabrus@hawkauto.com>; 'Bryan Ergler' <bryan.ergler@hawkauto.com>
Subject: RE: Request for Information - Lidl Site (William Penn Highway, Wilkins Township, Allegheny County, PA)

Team,
Please see the email below from Mellissa Southern of Traffic Planning and Design, Inc ("TPD"), which requests information on the proposed developed on the LIDL site.
A nearby proposed development (I believe it is for the Benderson site at the NEC of intersection) has engaged TPD to complete a traffic study.
Please advise.

Dan Hiffman

Vice President
Retail Services

NAI Hiffman | Hiffman National
One Oakbrook Terrace, Suite 400
Oakbrook Terrace, IL 60181

Direct: 630 693 0655
Mobile: 630 965 2712
Main: 630 932 1234

hiffman.com

From: Southern, Melissa <msouthern@trafficpd.com>
Sent: Friday, January 20, 2023 6:53 AM
To: Hiffman, Dan <dan@hiffman.com>
Subject: RE: Request for Information - Lidl Site (William Penn Highway, Wilkins Township, Allegheny County, PA)

> You don't often get email from msouthern@trafficpd.com. Learn why this is important

EXTERNAL EMAIL – Open attachments and Links with CAUTION

Hi Dan.

I'm following up to see if you are able to provide the information requested in the email below for the proposed development at the Lidl site (southwest corner of William Penn Highway (SR 2048)/Home Depot Dr) in Wilkins Township, Allegheny County, Pennsylvania.

Please feel free to email/call with questions and/or information.

Thanks,
Melissa

Melissa Southern, E.I.T., *Project Manager*

TRAFFIC PLANNING AND DESIGN, INC.
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O:412.765.3717 | www.TrafficPD.com |

From: Southern, Melissa
Sent: Tuesday, January 3, 2023 10:03 AM
To: dan@hiffman.com
Subject: Request for Information - Lidl Site (William Penn Highway, Wilkins Township, Allegheny County, PA)

Good Morning Dan,

Rebecca Vargo (Wilkins Township Manager) provided me your contact information in order to request details about a proposed car dealership to be located at the Lidl site (southwest corner of William Penn Highway (SR 2048)/Home Depot Dr) in Wilkins Township, Allegheny County, Pennsylvania.

Traffic Planning and Design, Inc. (TPD) has been retained by a developer to complete a traffic study for a proposed retail/commercial development to be located on William Penn Highway near the proposed car dealership site. During our scope of study discussions, Wilkins Township identified that a car dealership is proposed at the Lidl site and our study would need to account for/incorporate traffic to be generated by the proposed car dealership development.

Rebecca identified that a traffic study was not completed for the car dealership and asked me to reach out to you for the development details. In order for us to incorporate the car dealership development traffic into our study, would you be able to provide the following information about the development/site:

- Is the proposed car dealership for new vehicle sales only, used vehicle sales only, or a combination of new and used vehicle sales? *(This information will be used to determine which land use type is selected for trip generation purposes.)*

- Could you provide the square footage of gross floor area of the proposed car dealership? *(This information will be used to calculate the site trips for the proposed car dealership.)*

- Could you provide the proposed number of driveway(s) to the dealership and which roadways they will intersect (William Penn Highway? Home Depot Drive?)? *(This information will be used to distributed the calculated site trips to/from the proposed car dealership.)*

- Will the driveway(s) operate as full-movement or partial-movement (such as right-in/right-out only)? *(This information will be used to distributed the calculated site trips to/from the proposed car dealership.)*

Thank you very much for your assistance with this request. Please feel free to contact me if you have any questions on this request or would like to discuss further.

Thanks, and Happy New Year!
Melissa Southern

Southern, Melissa

From: Dan Bernazzoli <dbern@spcregion.org>
Sent: Monday, February 6, 2023 1:47 PM
To: Timko, Jeremy
Cc: Data
Subject: RE: Growth Rate
Attachments: 2023DAB009_SPCDataRequestEvalForm_020623.pdf

CAUTION: External email - do not click links or open attachments unless you recognize the sender and know the content is safe.

Jeremy -

The traffic growth rate for Wilkins Twp. (ALCO) = 0.50% /year.
--This is a background "linear" traffic growth rate (not compounded), and is from SPC's LRP Cycle 11 Forecast (Years 2020 to 2045).

***About the attached .pdf file:**
In order to help us monitor and improve our response to data requests, please open the attached .pdf file and take a few minutes to complete the evaluation questions on Page 2, Section 2, save it to your computer, and return the completed form via email to Data@spcregion.org.

Please contact us if you need anything else.
Thanks

Dan Bernazzoli
Data Analyst
Southwestern Pennsylvania Commission
Two Chatham Center – Suite 500
112 Washington Place
Pittsburgh, PA 15219-3451

Voice: 412-391-5590 Ext. 346
Fax: 412-391-9160
dbern@spcregion.org
www.spcregion.org

From: Timko, Jeremy [jtimko@trafficpd.com]
Sent: Monday, February 06, 2023 12:17 PM
To: Dan Bernazzoli
Subject: Growth Rate

Hi Dan,

It's been a while since I last requested a growth rate, hope you have been well.

I'm now with Traffic Planning and Design, Inc. (TPD) and we have been retained to prepare a traffic impact study in Wilkins Township, Allegheny County. Would you be able to provide us the latest growth rate for Wilkins Township so we can apply it to our traffic volume projections?

Thanks for your help!

Jeremy Timko, E.I.T., *Transportation Planning Specialist*

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Southern, Melissa

From: Fedio, Daniel <dafedio@pa.gov>
Sent: Monday, February 6, 2023 1:58 PM
To: Southern, Melissa; Miller, Ed M.
Cc: Mudry, Michael; Timko, Jeremy
Subject: RE: [External] RE: TIS in Wilkins Township
Attachments: Period Length - Weekend.jpg; Period Length - Weekday.jpg; Kingston - Weekday PM Splits.jpg; Kingston - Weekday AM Splits.jpg; Kingston - Weekend Midday Splits.jpg

The communication at those intersections is not very reliable and it's difficult to get the information off there. I was only able to pull from the Kingston intersection, the Period Length applies to all 3 intersections though.

With the adaptive system, there are no specific split times so the graphs provide the min, max, and average green times during that time period. The average for the left turns is usually lower because the adaptive system will reservice left turns with unused time, which ends up being very short.

Dan Fedio | Civil Engineer Traffic
PA Department of Transportation | Engineering District 11-0
Traffic Engineering Unit
45 Thoms Run Road | Bridgeville PA 15017
Phone: (412) 429-4983 | Fax: (412) 429-4978
http://www.penndot.pa.gov | dafedio@pa.gov

From: Southern, Melissa <msouthern@trafficpd.com>
Sent: Monday, February 6, 2023 10:11 AM
To: Miller, Ed M. <edmille@pa.gov>; Fedio, Daniel <dafedio@pa.gov>
Cc: Mudry, Michael <mmudry@trafficpd.com>; Timko, Jeremy <jtimko@trafficpd.com>
Subject: [External] RE: TIS in Wilkins Township

ATTENTION: *This email message is from an external sender. Do not open links or attachments from unknown senders. To report suspicious email, use the Report Phishing button in Outlook.*

Hi Dan,

We are moving ahead with the analyses for the 3475 William Penn Highway commercial/retail development TIS and wanted to see if you could provide us the cycle length & split information for the typical peak hour (weekday AM, weekday PM, & mid-day Saturday) at following intersections located within the William Penn Highway (SR 2048) adaptive system:

- William Penn Highway (SR 2048) & Home Depot/Pep Boys Driveway (permit no. 1-127-02)
- William Penn Highway (SR 2048) & Kingston Drive (permit no. 1-127-06)
- William Penn Highway (SR 2048) & Penn Center Boulevard (permit no. 1-127-04)

We recently completed traffic counts on Thursday, January 19, 2023 & Saturday, January 21, 2023.

Let me know if you have any question or need anything additional to process our request for the data.

Thank you very much in advance for your help obtaining this info, and have a great week!

Melissa

Melissa Southern, E.I.T., *Project Manager*

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O: 412.765.3717 | www.TrafficPD.com |

From: Miller, Ed M. <edmille@pa.gov>
Sent: Monday, October 17, 2022 10:35 AM
To: Fedio, Daniel <dafedio@pa.gov>
Cc: Mudry, Michael <mmudry@trafficpd.com>; Southern, Melissa <msouthern@trafficpd.com>
Subject: TIS in Wilkins Township

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Dan:
We had a TIS Meeting this morning for a proposed development off 2048 next to the Pep Boys Development. TPD will be doing the study.

Their study intersections include:

1. Pep Boys
2. Kingston
3. Penn Centre

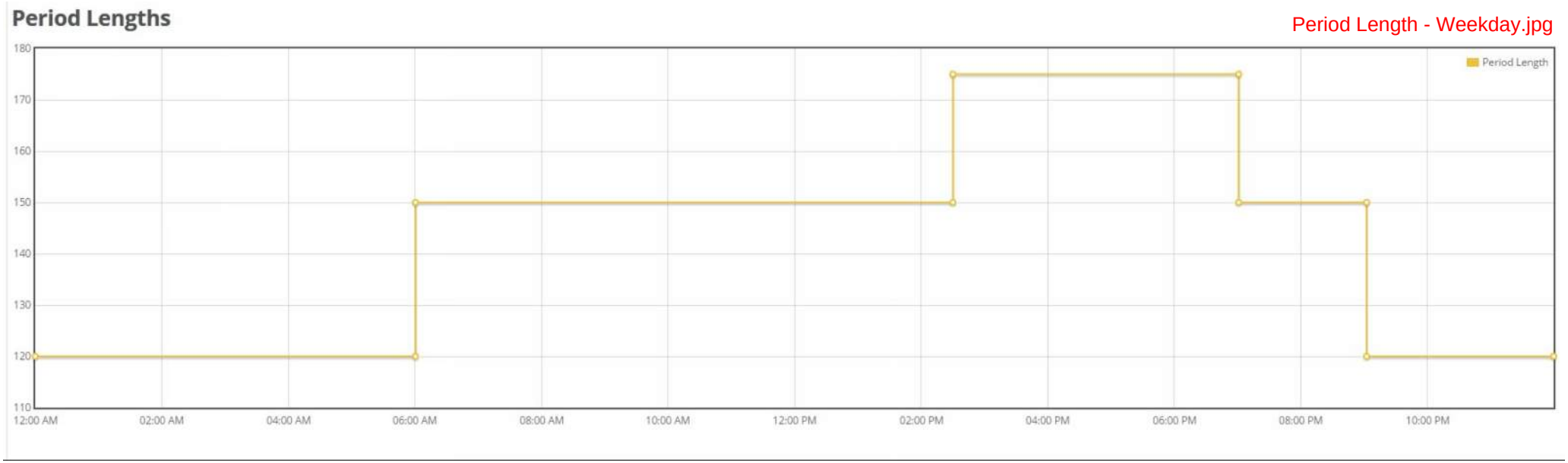
From the adaptive system, can you pull off the typical peak (AM/PM/Mid Day Saturday) cycle lengths and splits for these intersections and share with Mike and Melissa?

No hurry as we just had the meeting and they haven't even done their counts yet. I just wanted to reach out to you while it was fresh in my mind.

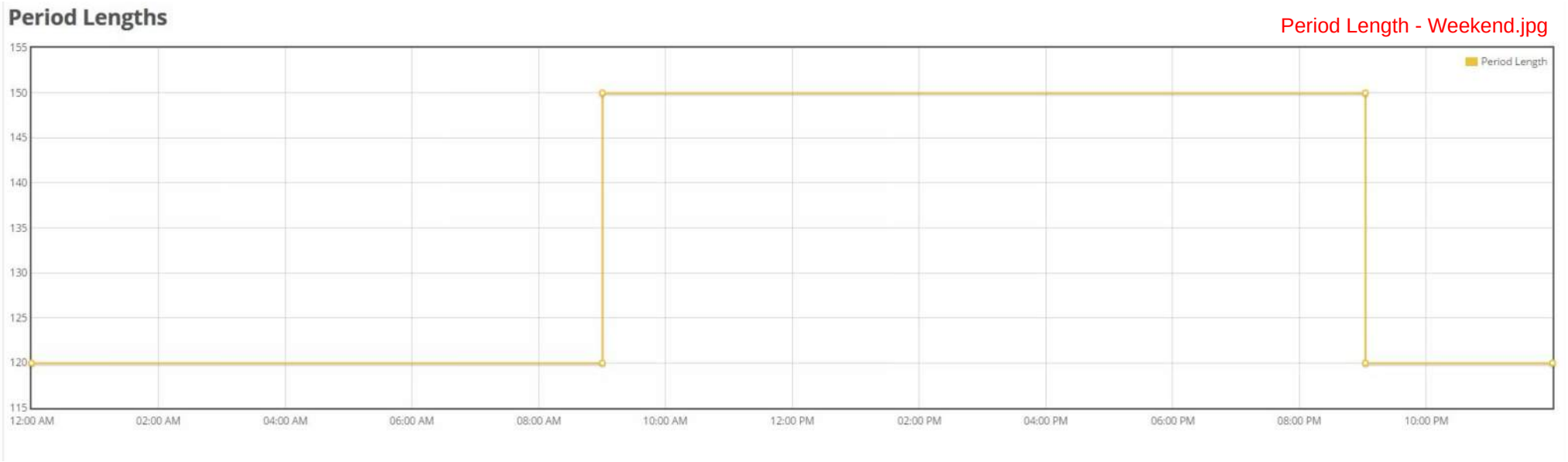
Thanks,
Ed

Edward M. Miller, P.E., PTOE |Traffic Signals Supervisor
PA Department of Transportation
Engineering District 11-0|Traffic Engineering Unit
45 Thoms Run Road | Bridgeville PA 15017
Phone: 412.429.4970 | Fax: 412.429.4978
penndot.gov | edmille@pa.gov

Period Length - Weekday.jpg



Period Length - Weekend.jpg



Reports Statistics

Kingston - Weekday AM Splits.jpg

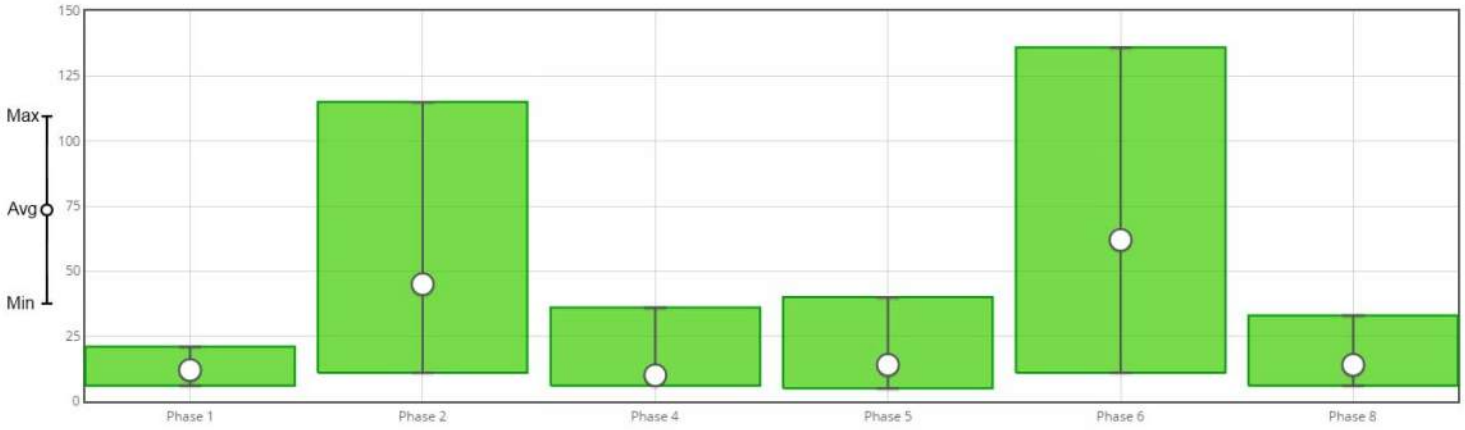
Start Date/Time: 02/02/2023 07:00 am

End Date/Time: 02/02/2023 09:00 am

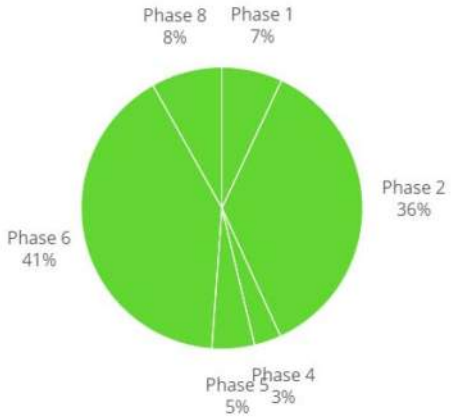
LOAD STATISTICS | DOWNLOAD STATISTICS

VEHICLE GRAPHS | PHASE VOLUME PLAYBACK | SPLITS | PEDESTRIAN GRAPHS | PERIOD GRAPH | COUNT TOTALS | PROCESSOR GRAPHS

Green Splits by Phase, Min / Average / Max



Green Splits by Phase, Percent



Reports Statistics

Kingston - Weekday PM Splits.jpg

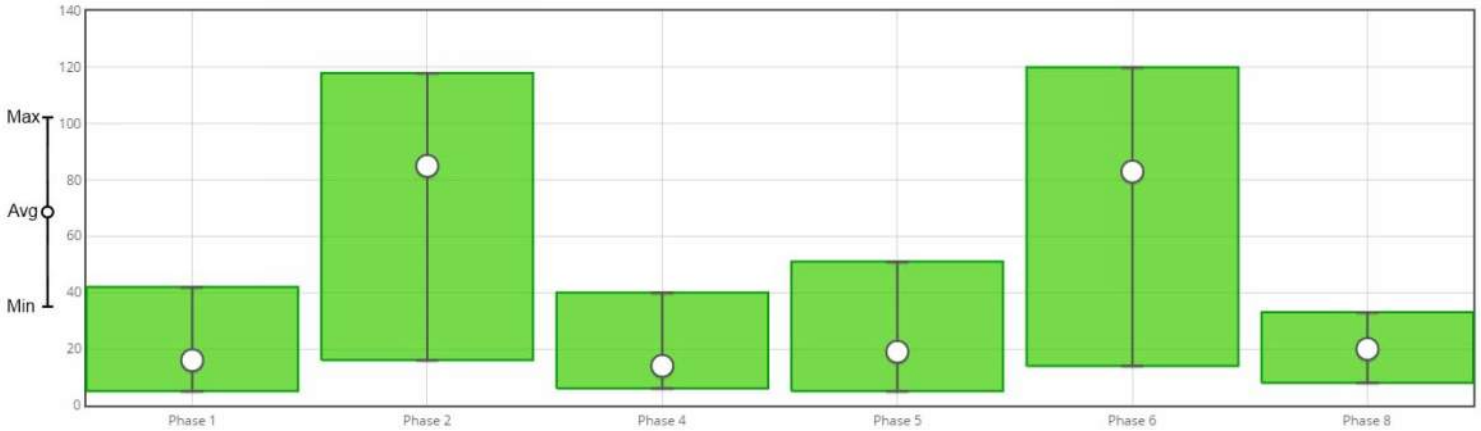
Start Date/Time: 02/02/2023 04:00 pm

End Date/Time: 02/02/2023 06:00 pm

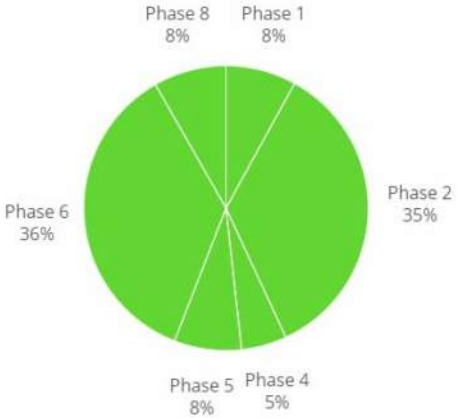
LOAD STATISTICS | DOWNLOAD STATISTICS

VEHICLE GRAPHS | PHASE VOLUME PLAYBACK | SPLITS | PEDESTRIAN GRAPHS | PERIOD GRAPH | COUNT TOTALS | PROCESSOR GRAPHS

Green Splits by Phase, Min / Average / Max



Green Splits by Phase, Percent



Reports Statistics

Kingston - Weekend Midday Splits.jpg

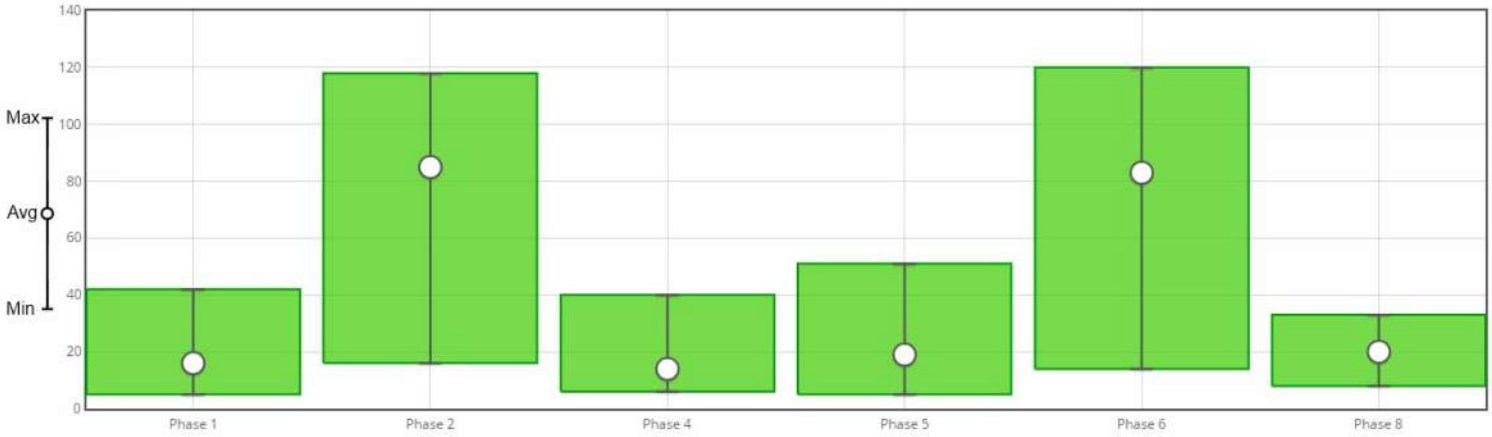
Start Date/Time: 02/02/2023 04:00 pm

End Date/Time: 02/02/2023 06:00 pm

LOAD STATISTICS | DOWNLOAD STATISTICS

VEHICLE GRAPHS | PHASE VOLUME PLAYBACK | SPLITS | PEDESTRIAN GRAPHS | PERIOD GRAPH | COUNT TOTALS | PROCESSOR GRAPHS

Green Splits by Phase, Min / Average / Max



Green Splits by Phase, Percent

Appendix B:
Existing Roadway Conditions

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Southbound Driveway**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Southbound Driveway**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Northbound Penn Center Boulevard**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Northbound Penn Center Boulevard**
Approach / Departure: Approach
Distance: 200 feet

Job #: BEND.00008 Date Taken: 02/10/2023 Intersection Of: William Penn Hwy(SR 2048)&Kingston Dr./Driveway

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Job #: BEND.00008 Date Taken: 02/10/2023 Intersection Of: William Penn Hwy(SR 2048)&Kingston Dr./Driveway

Direction / Road: **Southbound Kingston Drive**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Southbound Kingston Drive**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Job #: BEND.00008 Date Taken: 02/10/2023 Intersection Of: William Penn Hwy(SR 2048)&Kingston Dr./Driveway

Direction / Road: **Northbound Driveway**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Northbound Driveway**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Eastbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Southbound Pep Boys Driveway**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Southbound Pep Boys Driveway**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Westbound William Penn Highway (SR 2048)**
Approach / Departure: Approach
Distance: 200 feet

Direction / Road: **Northbound Home Depot Driveway**
Approach / Departure: Approach
Distance: 50 feet

Direction / Road: **Northbound Home Depot Driveway**
Approach / Departure: Approach
Distance: 200 feet

M-950S
(03-04)
PENNDOT

DRIVEWAY SIGHT DISTANCE MEASUREMENTS

(FOR LOCAL ROADS, USE PENNDOT PUB 70)

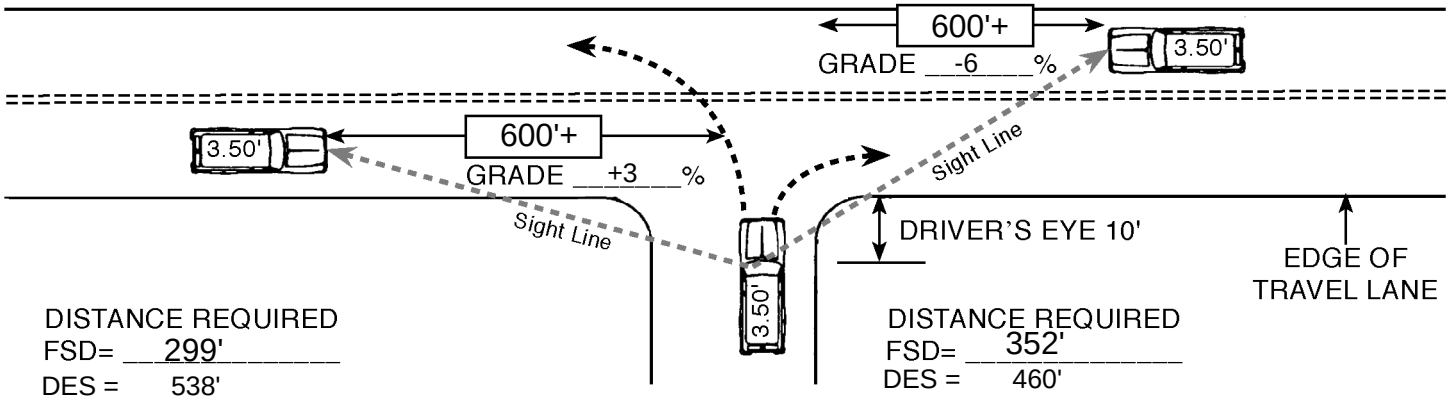
APPLICANT_____ APPLICATION NO._____

S.R.__2048__ SEG.__0041__ OFFSET__0928__ LEGAL SPEED LIMIT__40 mph__

MEASURED BY__JRT__ DATE __02/10/2023__

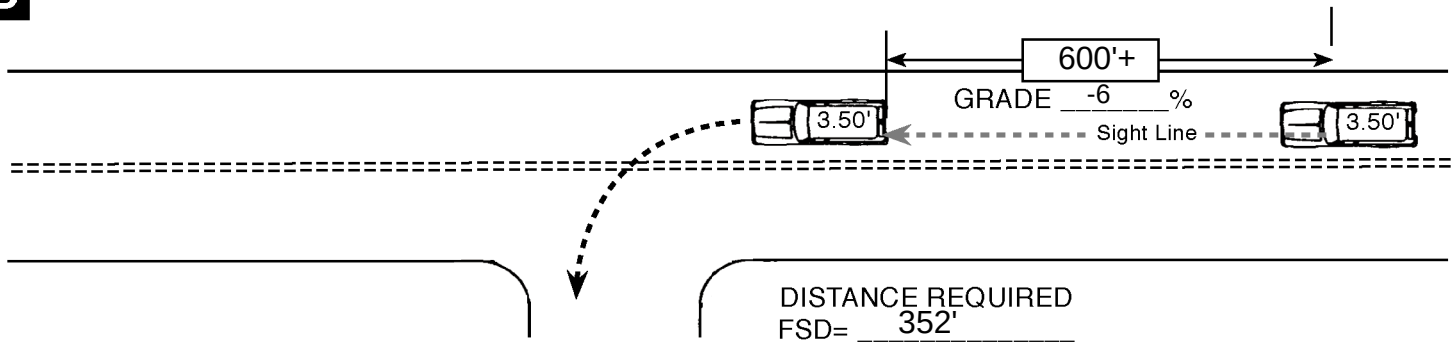
FOR DEPARTMENT USE ONLY: Safe-Running Speed _____ 85th Percentile Speed _____

A



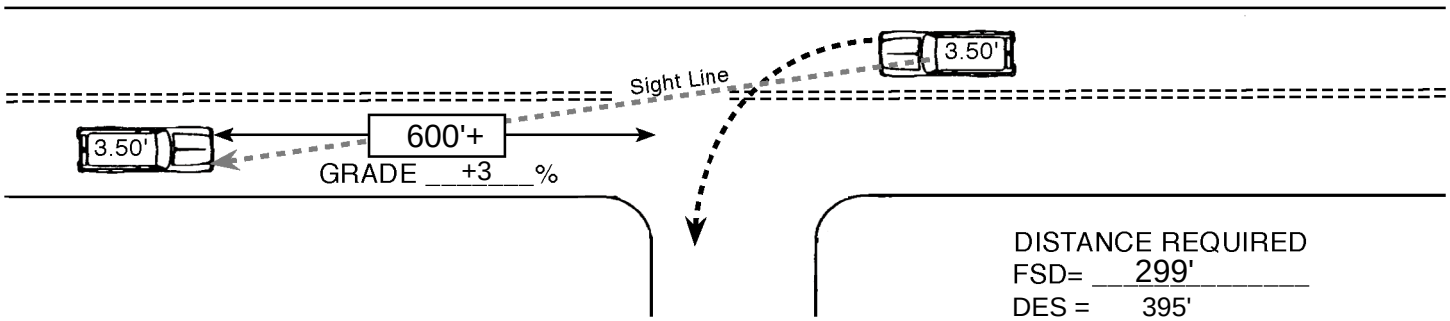
THE MAXIMUM LENGTH OF ROADWAY ALONG WHICH A DRIVER AT A DRIVEWAY LOCATION CAN CONTINUOUSLY SEE ANOTHER VEHICLE APPROACHING ON THE ROADWAY.

B



THE MAXIMUM LENGTH OF ROADWAY ALONG WHICH A DRIVER ON THE ROADWAY CAN CONTINUOUSLY SEE THE REAR OF A VEHICLE WHICH IS LOCATED IN THE DRIVER'S TRAVEL LANE AND WHICH IS POSITIONED TO MAKE A LEFT TURN INTO A DRIVEWAY.

C



THE MAXIMUM LENGTH OF ROADWAY ALONG WHICH A DRIVER OF A VEHICLE INTENDING TO MAKE A LEFT TURN INTO A DRIVEWAY CAN CONTINUOUSLY SEE A VEHICLE APPROACHING FROM THE OPPOSITE DIRECTION.

FORMULA SIGHT DISTANCE TABLE

Speed (V) (Miles Per Hour)	Average Grade (G) (Percent)										
	Use plus grades when approaching vehicle is travelling upgrade.										
	0.0	+1.0	+2.0	+3.0	+4.0	+5.0	+6.0	+7.0	+8.0	+9.0	+10.0
25	147	145	144	143	142	140	139	138	137	136	135
30	196	194	191	189	187	185	183	182	180	178	177
35	249	245	242	239	236	233	231	228	226	224	221
40	314	309	304	299	295	291	287	284	280	277	274
45	383	376	370	364	358	353	348	343	339	334	330
50	462	453	444	436	429	422	415	409	403	397	392
55	538	527	517	508	499	490	482	475	468	461	454
	Use negative grades when approaching vehicle is travelling downgrade.										
	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-6.0	-7.0	-8.0	-9.0	-10.0
25	147	148	150	151	153	155	157	159	161	164	166
30	196	199	201	204	207	210	214	217	221	226	230
35	249	252	256	260	265	269	275	280	286	292	299
40	314	319	325	331	338	345	352	360	369	379	389
45	383	390	398	406	415	425	435	447	459	472	487
50	462	471	481	492	504	517	531	546	563	581	600
55	538	550	562	576	590	606	622	641	661	682	706

Appendix C:
Turning Movement Counts

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Thursday, January 19, 2023
Location: 40.430052, -79.812127

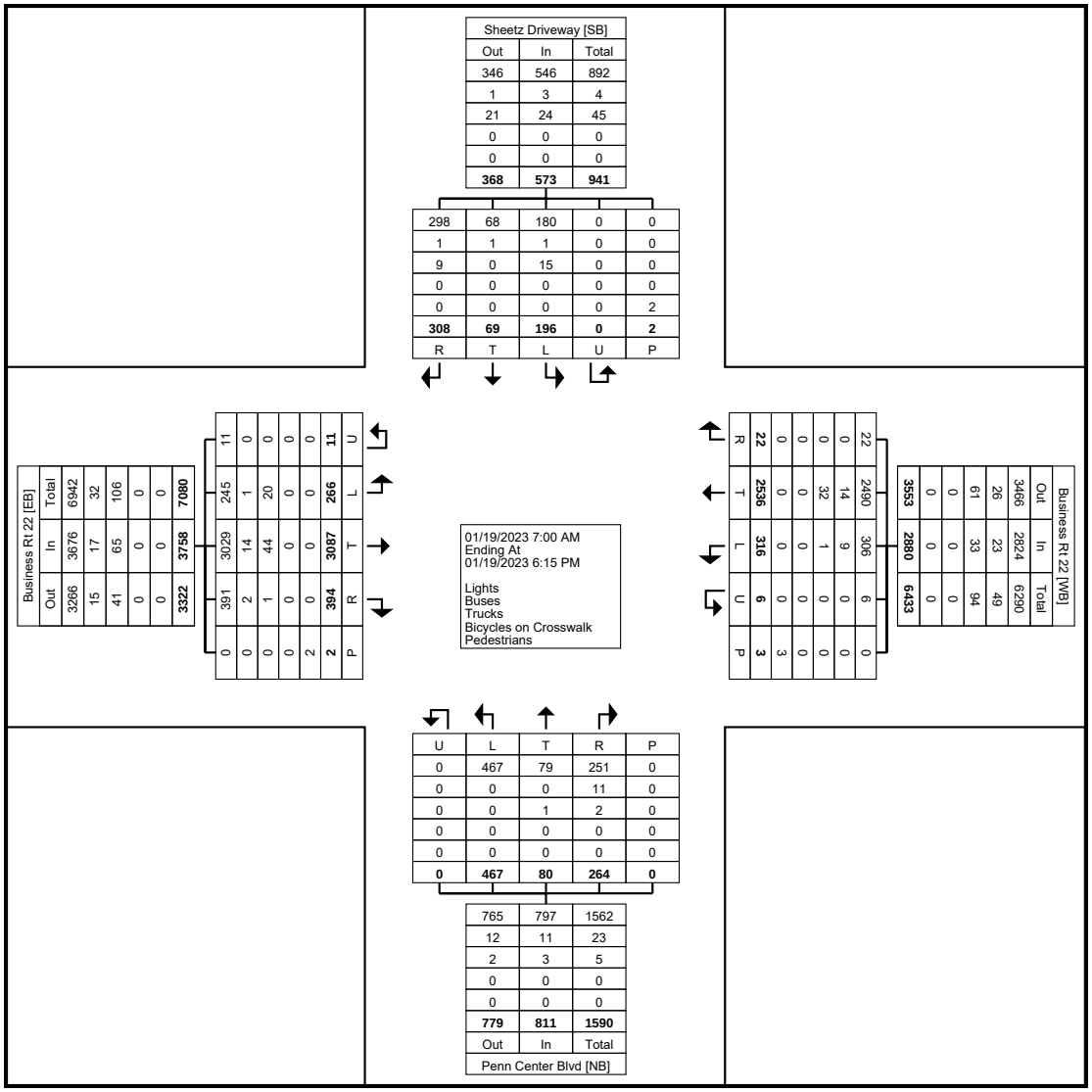
www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Business Route 22 & Penn Center Blvd
Site Code:
Start Date: 01/19/2023
Page No: 1

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Penn Center Blvd Northbound							Sheetz Driveway Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
7:00 AM	14	113	14	2	0	0	143	19	81	0	0	0	0	100	12	3	0	5	0	0	20	9	2	2	13	0	0	26	289
7:15 AM	11	113	13	9	0	1	146	14	94	3	0	0	0	111	12	3	3	2	0	0	20	10	5	6	16	0	0	37	314
7:30 AM	10	123	21	5	1	0	160	13	91	0	0	0	0	104	24	7	3	0	0	0	34	4	5	5	13	0	0	27	325
7:45 AM	25	182	16	7	0	0	230	28	80	1	0	1	0	110	18	4	3	4	0	0	29	17	2	5	16	0	0	40	409
Hourly Total	60	531	64	23	1	1	679	74	346	4	0	1	0	425	66	17	9	11	0	0	103	40	14	18	58	0	0	130	1337
8:00 AM	11	149	35	4	0	0	199	19	90	1	0	0	0	110	23	1	3	1	0	0	28	10	2	4	6	0	0	22	359
8:15 AM	18	149	30	9	1	0	207	19	96	2	0	0	0	117	33	1	4	7	0	0	45	6	4	2	17	0	0	29	398
8:30 AM	10	153	25	4	3	0	195	18	126	1	0	1	0	146	18	5	7	7	0	0	37	6	5	2	17	0	0	30	408
8:45 AM	12	162	25	8	1	0	208	21	95	0	0	0	0	116	26	4	3	8	0	0	41	10	8	2	10	0	0	30	395
Hourly Total	51	613	115	25	5	0	809	77	407	4	0	1	0	489	100	11	17	23	0	0	151	32	19	10	50	0	0	111	1560
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	12	221	14	3	0	0	250	22	221	1	0	1	0	245	32	2	9	17	0	0	60	16	1	4	14	0	0	35	590
4:15 PM	14	234	13	3	0	0	264	21	210	2	0	0	0	233	40	10	25	6	0	0	81	11	6	7	12	0	0	36	614
4:30 PM	22	271	17	4	1	1	315	25	217	1	0	2	0	245	43	8	18	9	0	0	78	10	3	7	13	0	1	33	671
4:45 PM	17	278	22	1	1	0	319	17	210	2	0	0	0	229	32	4	15	12	0	0	63	11	6	9	11	0	1	37	648
Hourly Total	65	1004	66	11	2	1	1148	85	858	6	0	3	0	952	147	24	67	44	0	0	282	48	16	27	50	0	2	141	2523
5:00 PM	28	258	24	2	0	0	312	24	250	2	1	0	1	277	54	7	14	16	0	0	91	21	6	15	9	0	0	51	731
5:15 PM	20	229	19	1	0	0	269	24	236	0	0	1	1	261	43	7	13	12	0	0	75	22	6	17	12	0	0	57	662
5:30 PM	18	237	17	4	0	0	276	12	217	5	0	0	1	234	32	8	14	7	0	0	61	16	7	13	12	0	0	48	619
5:45 PM	24	215	19	4	3	0	265	20	222	0	0	0	0	242	25	6	11	6	0	0	48	17	1	5	12	0	0	35	590
Hourly Total	90	939	79	11	3	0	1122	80	925	7	1	1	3	1014	154	28	52	41	0	0	275	76	20	50	45	0	0	191	2602
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	266	3087	324	70	11	2	3758	316	2536	21	1	6	3	2880	467	80	145	119	0	0	811	196	69	105	203	0	2	573	8022
Approach %	7.1	82.1	8.6	1.9	0.3	-	-	11.0	88.1	0.7	0.0	0.2	-	-	57.6	9.9	17.9	14.7	0.0	-	-	34.2	12.0	18.3	35.4	0.0	-	-	-
Total %	3.3	38.5	4.0	0.9	0.1	-	46.8	3.9	31.6	0.3	0.0	0.1	-	35.9	5.8	1.0	1.8	1.5	0.0	-	10.1	2.4	0.9	1.3	2.5	0.0	-	7.1	-
Lights	245	3029	321	70	11	-	3676	306	2490	21	1	6	-	2824	467	79	134	117	0	-	797	180	68	102	196	0	-	546	7843
% Lights	92.1	98.1	99.1	100.0	100.0	-	97.8	96.8	98.2	100.0	100.0	100.0	-	98.1	100.0	98.8	92.4	98.3	-	-	98.3	91.8	98.6	97.1	96.6	-	-	95.3	97.8
Buses	1	14	2	0	0	-	17	9	14	0	0	0	-	23	0	0	10	1	0	-	11	1	1	0	1	0	-	3	54
% Buses	0.4	0.5	0.6	0.0	0.0	-	0.5	2.8	0.6	0.0	0.0	0.0	-	0.8	0.0	0.0	6.9	0.8	-	-	1.4	0.5	1.4	0.0	0.5	-	-	0.5	0.7
Trucks	20	44	1	0	0	-	65	1	32	0	0	0	-	33	0	1	1	1	0	-	3	15	0	3	6	0	-	24	125
% Trucks	7.5	1.4	0.3	0.0	0.0	-	1.7	0.3	1.3	0.0	0.0	0.0	-	1.1	0.0	1.3	0.7	0.8	-	-	0.4	7.7	0.0	2.9	3.0	-	-	4.2	1.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	2	-	-	-	-	-	-	3	-	-	-	-	-	-	0	-	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Turning Movement Data Plot

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Thursday, January 19, 2023
Location: 40.430052, -79.812127

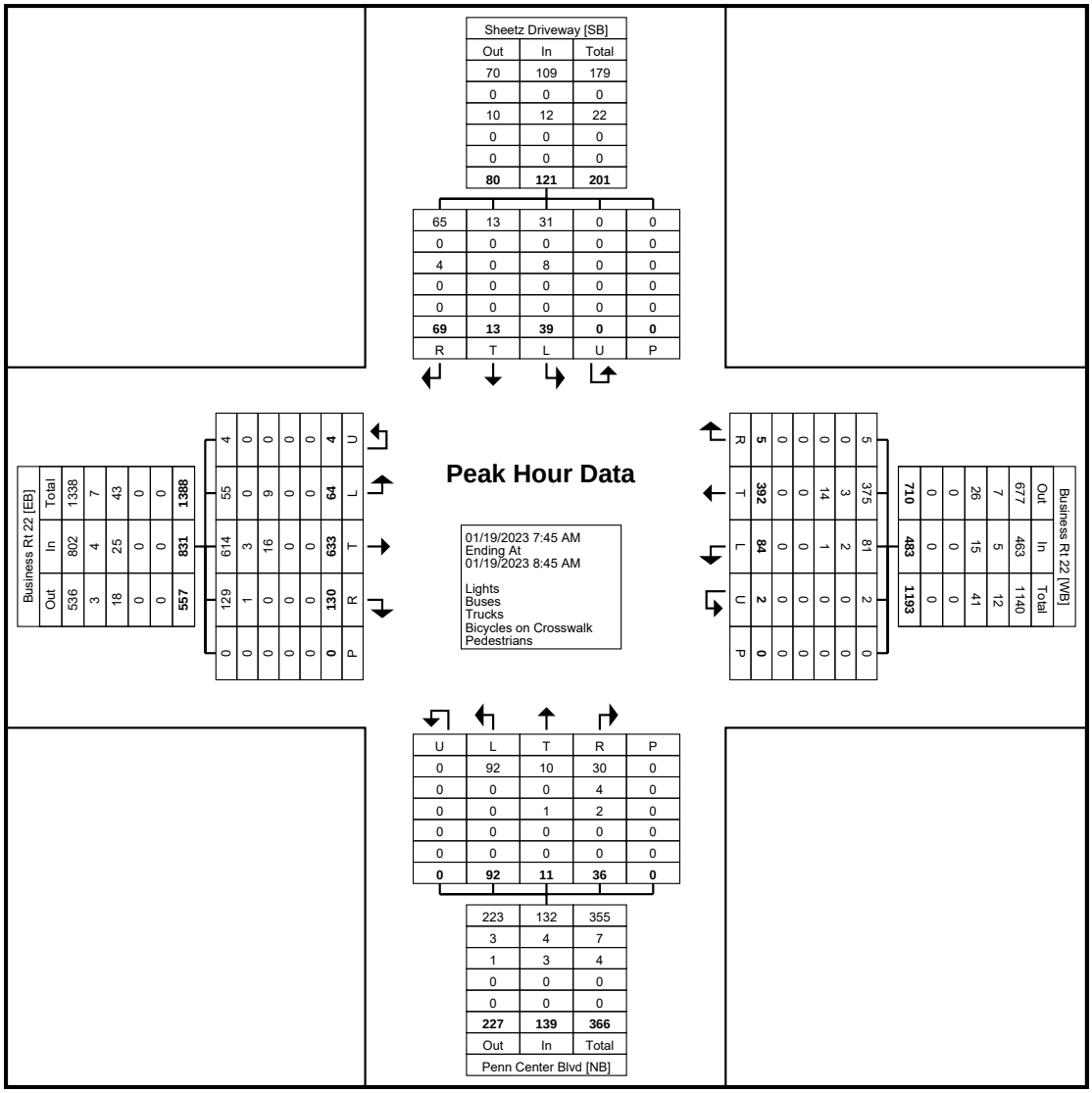
www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Business Route 22 & Penn Center Blvd
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Penn Center Blvd Northbound							Sheetz Driveway Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
7:45 AM	25	182	16	7	0	0	230	28	80	1	0	1	0	110	18	4	3	4	0	0	29	17	2	5	16	0	0	40	409
8:00 AM	11	149	35	4	0	0	199	19	90	1	0	0	0	110	23	1	3	1	0	0	28	10	2	4	6	0	0	22	359
8:15 AM	18	149	30	9	1	0	207	19	96	2	0	0	0	117	33	1	4	7	0	0	45	6	4	2	17	0	0	29	398
8:30 AM	10	153	25	4	3	0	195	18	126	1	0	1	0	146	18	5	7	7	0	0	37	6	5	2	17	0	0	30	408
Total	64	633	106	24	4	0	831	84	392	5	0	2	0	483	92	11	17	19	0	0	139	39	13	13	56	0	0	121	1574
Approach %	7.7	76.2	12.8	2.9	0.5	-	-	17.4	81.2	1.0	0.0	0.4	-	-	66.2	7.9	12.2	13.7	0.0	-	-	32.2	10.7	10.7	46.3	0.0	-	-	-
Total %	4.1	40.2	6.7	1.5	0.3	-	52.8	5.3	24.9	0.3	0.0	0.1	-	30.7	5.8	0.7	1.1	1.2	0.0	-	8.8	2.5	0.8	0.8	3.6	0.0	-	7.7	-
PHF	0.640	0.870	0.757	0.667	0.333	-	0.903	0.750	0.778	0.625	0.000	0.500	-	0.827	0.697	0.550	0.607	0.679	0.000	-	0.772	0.574	0.650	0.650	0.824	0.000	-	0.756	0.962
Lights	55	614	105	24	4	-	802	81	375	5	0	2	-	463	92	10	12	18	0	-	132	31	13	13	52	0	-	109	1506
% Lights	85.9	97.0	99.1	100.0	100.0	-	96.5	96.4	95.7	100.0	-	100.0	-	95.9	100.0	90.9	70.6	94.7	-	-	95.0	79.5	100.0	100.0	92.9	-	-	90.1	95.7
Buses	0	3	1	0	0	-	4	2	3	0	0	0	-	5	0	0	4	0	0	-	4	0	0	0	0	0	-	0	13
% Buses	0.0	0.5	0.9	0.0	0.0	-	0.5	2.4	0.8	0.0	-	0.0	-	1.0	0.0	0.0	23.5	0.0	-	-	2.9	0.0	0.0	0.0	0.0	-	-	0.0	0.8
Trucks	9	16	0	0	0	-	25	1	14	0	0	0	-	15	0	1	1	1	0	-	3	8	0	0	4	0	-	12	55
% Trucks	14.1	2.5	0.0	0.0	0.0	-	3.0	1.2	3.6	0.0	-	0.0	-	3.1	0.0	9.1	5.9	5.3	-	-	2.2	20.5	0.0	0.0	7.1	-	-	9.9	3.5
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (7:45 AM)

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Thursday, January 19, 2023
Location: 40.430052, -79.812127

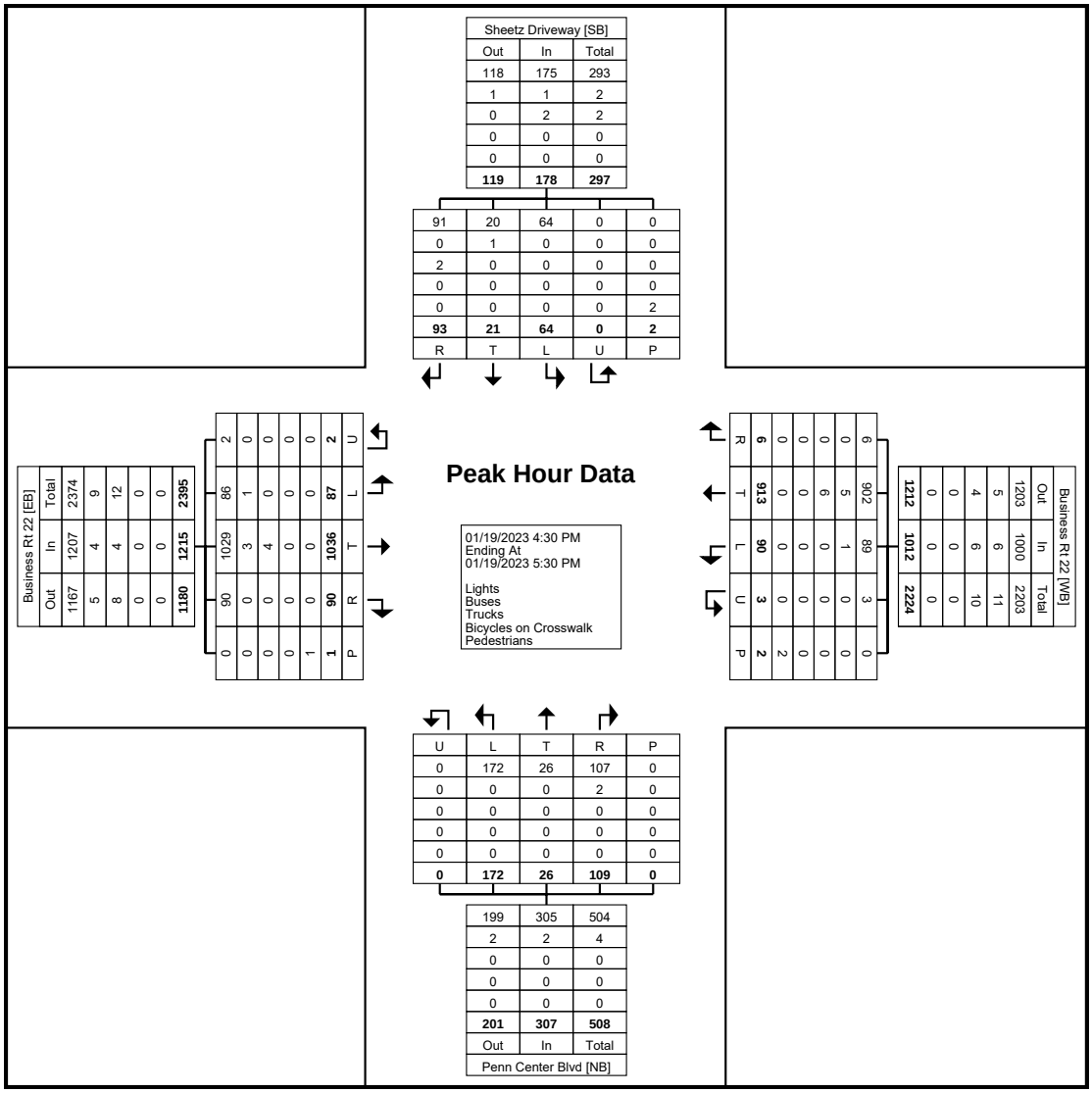
www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Business Route 22 & Penn Center Blvd
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Penn Center Blvd Northbound							Sheetz Driveway Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
4:30 PM	22	271	17	4	1	1	315	25	217	1	0	2	0	245	43	8	18	9	0	0	78	10	3	7	13	0	1	33	671
4:45 PM	17	278	22	1	1	0	319	17	210	2	0	0	0	229	32	4	15	12	0	0	63	11	6	9	11	0	1	37	648
5:00 PM	28	258	24	2	0	0	312	24	250	2	1	0	1	277	54	7	14	16	0	0	91	21	6	15	9	0	0	51	731
5:15 PM	20	229	19	1	0	0	269	24	236	0	0	1	1	261	43	7	13	12	0	0	75	22	6	17	12	0	0	57	662
Total	87	1036	82	8	2	1	1215	90	913	5	1	3	2	1012	172	26	60	49	0	0	307	64	21	48	45	0	2	178	2712
Approach %	7.2	85.3	6.7	0.7	0.2	-	-	8.9	90.2	0.5	0.1	0.3	-	-	56.0	8.5	19.5	16.0	0.0	-	-	36.0	11.8	27.0	25.3	0.0	-	-	-
Total %	3.2	38.2	3.0	0.3	0.1	-	44.8	3.3	33.7	0.2	0.0	0.1	-	37.3	6.3	1.0	2.2	1.8	0.0	-	11.3	2.4	0.8	1.8	1.7	0.0	-	6.6	-
PHF	0.777	0.932	0.854	0.500	0.500	-	0.952	0.900	0.913	0.625	0.250	0.375	-	0.913	0.796	0.813	0.833	0.766	0.000	-	0.843	0.727	0.875	0.706	0.865	0.000	-	0.781	0.927
Lights	86	1029	82	8	2	-	1207	89	902	5	1	3	-	1000	172	26	59	48	0	-	305	64	20	46	45	0	-	175	2687
% Lights	98.9	99.3	100.0	100.0	100.0	-	99.3	98.9	98.8	100.0	100.0	100.0	-	98.8	100.0	100.0	98.3	98.0	-	-	99.3	100.0	95.2	95.8	100.0	-	-	98.3	99.1
Buses	1	3	0	0	0	-	4	1	5	0	0	0	-	6	0	0	1	1	0	-	2	0	1	0	0	0	-	1	13
% Buses	1.1	0.3	0.0	0.0	0.0	-	0.3	1.1	0.5	0.0	0.0	0.0	-	0.6	0.0	0.0	1.7	2.0	-	-	0.7	0.0	4.8	0.0	0.0	-	-	0.6	0.5
Trucks	0	4	0	0	0	-	4	0	6	0	0	0	-	6	0	0	0	0	0	-	0	0	0	2	0	0	-	2	12
% Trucks	0.0	0.4	0.0	0.0	0.0	-	0.3	0.0	0.7	0.0	0.0	0.0	-	0.6	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	4.2	0.0	-	-	1.1	0.4
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	0	-	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Turning Movement Peak Hour Data Plot (4:30 PM)

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Saturday, January 21, 2023
Location: 40.430004, -79.812058

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Business Route 22 & Penn Center Blvd (Sat)
Site Code:
Start Date: 01/21/2023
Page No: 1

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Penn Center Blvd Northbound							Sheetz Driveway Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
11:00 AM	17	253	13	5	0	0	288	27	180	3	0	0	0	210	25	5	3	11	0	0	44	15	2	15	3	0	0	35	577
11:15 AM	12	289	18	8	1	0	328	14	210	3	0	0	0	227	25	4	2	6	0	0	37	11	3	13	11	0	0	38	630
11:30 AM	14	302	14	4	0	0	334	24	222	4	0	0	0	250	28	2	9	10	0	0	49	10	4	10	9	0	0	33	666
11:45 AM	6	310	18	3	0	0	337	18	212	3	0	0	1	233	31	4	10	18	0	0	63	21	1	10	7	0	1	39	672
Hourly Total	49	1154	63	20	1	0	1287	83	824	13	0	0	1	920	109	15	24	45	0	0	193	57	10	48	30	0	1	145	2545
12:00 PM	20	282	22	2	1	0	327	31	220	3	0	0	0	254	34	4	20	3	0	0	61	18	5	8	10	0	0	41	683
12:15 PM	21	331	13	1	0	0	366	26	213	0	0	0	0	239	28	3	8	3	0	0	42	7	2	4	13	0	0	26	673
12:30 PM	22	298	9	0	2	0	331	38	239	0	0	0	1	277	32	3	16	9	0	0	60	21	2	7	19	0	0	49	717
12:45 PM	14	289	22	3	0	0	328	34	245	1	0	1	0	281	26	7	26	7	0	0	66	24	2	13	12	0	0	51	726
Hourly Total	77	1200	66	6	3	0	1352	129	917	4	0	1	1	1051	120	17	70	22	0	0	229	70	11	32	54	0	0	167	2799
1:00 PM	20	291	26	3	0	0	340	26	231	0	0	2	0	259	31	5	15	6	0	0	57	15	2	9	18	0	0	44	700
1:15 PM	21	261	10	4	2	0	298	30	242	1	2	2	0	277	35	6	7	9	0	0	57	20	10	6	16	0	0	52	684
1:30 PM	18	226	14	11	0	0	269	31	237	2	0	0	0	270	39	4	5	19	0	0	67	25	3	6	27	0	0	61	667
1:45 PM	22	316	15	7	1	0	361	30	222	2	0	0	0	254	33	2	5	15	0	0	55	13	3	4	33	0	0	53	723
Hourly Total	81	1094	65	25	3	0	1268	117	932	5	2	4	0	1060	138	17	32	49	0	0	236	73	18	25	94	0	0	210	2774
2:00 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3
Grand Total	207	3448	194	51	7	0	3907	329	2675	22	2	5	2	3033	367	49	126	116	0	0	658	200	40	105	178	0	1	523	8121
Approach %	5.3	88.3	5.0	1.3	0.2	-	-	10.8	88.2	0.7	0.1	0.2	-	-	55.8	7.4	19.1	17.6	0.0	-	-	38.2	7.6	20.1	34.0	0.0	-	-	-
Total %	2.5	42.5	2.4	0.6	0.1	-	48.1	4.1	32.9	0.3	0.0	0.1	-	37.3	4.5	0.6	1.6	1.4	0.0	-	8.1	2.5	0.5	1.3	2.2	0.0	-	6.4	-
Lights	206	3430	192	51	7	-	3886	325	2656	22	2	5	-	3010	366	48	125	114	0	-	653	199	40	104	178	0	-	521	8070
% Lights	99.5	99.5	99.0	100.0	100.0	-	99.5	98.8	99.3	100.0	100.0	100.0	-	99.2	99.7	98.0	99.2	98.3	-	-	99.2	99.5	100.0	99.0	100.0	-	-	99.6	99.4
Buses	0	0	0	0	0	-	0	3	2	0	0	0	-	5	0	0	0	2	0	-	2	1	0	0	0	0	-	1	8
% Buses	0.0	0.0	0.0	0.0	0.0	-	0.0	0.9	0.1	0.0	0.0	0.0	-	0.2	0.0	0.0	0.0	1.7	-	-	0.3	0.5	0.0	0.0	0.0	-	-	0.2	0.1
Trucks	1	18	2	0	0	-	21	1	17	0	0	0	-	18	1	1	1	0	0	-	3	0	0	1	0	0	-	1	43
% Trucks	0.5	0.5	1.0	0.0	0.0	-	0.5	0.3	0.6	0.0	0.0	0.0	-	0.6	0.3	2.0	0.8	0.0	-	-	0.5	0.0	0.0	1.0	0.0	-	-	0.2	0.5
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	2	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Saturday, January 21, 2023
Location: 40.430004, -79.812058

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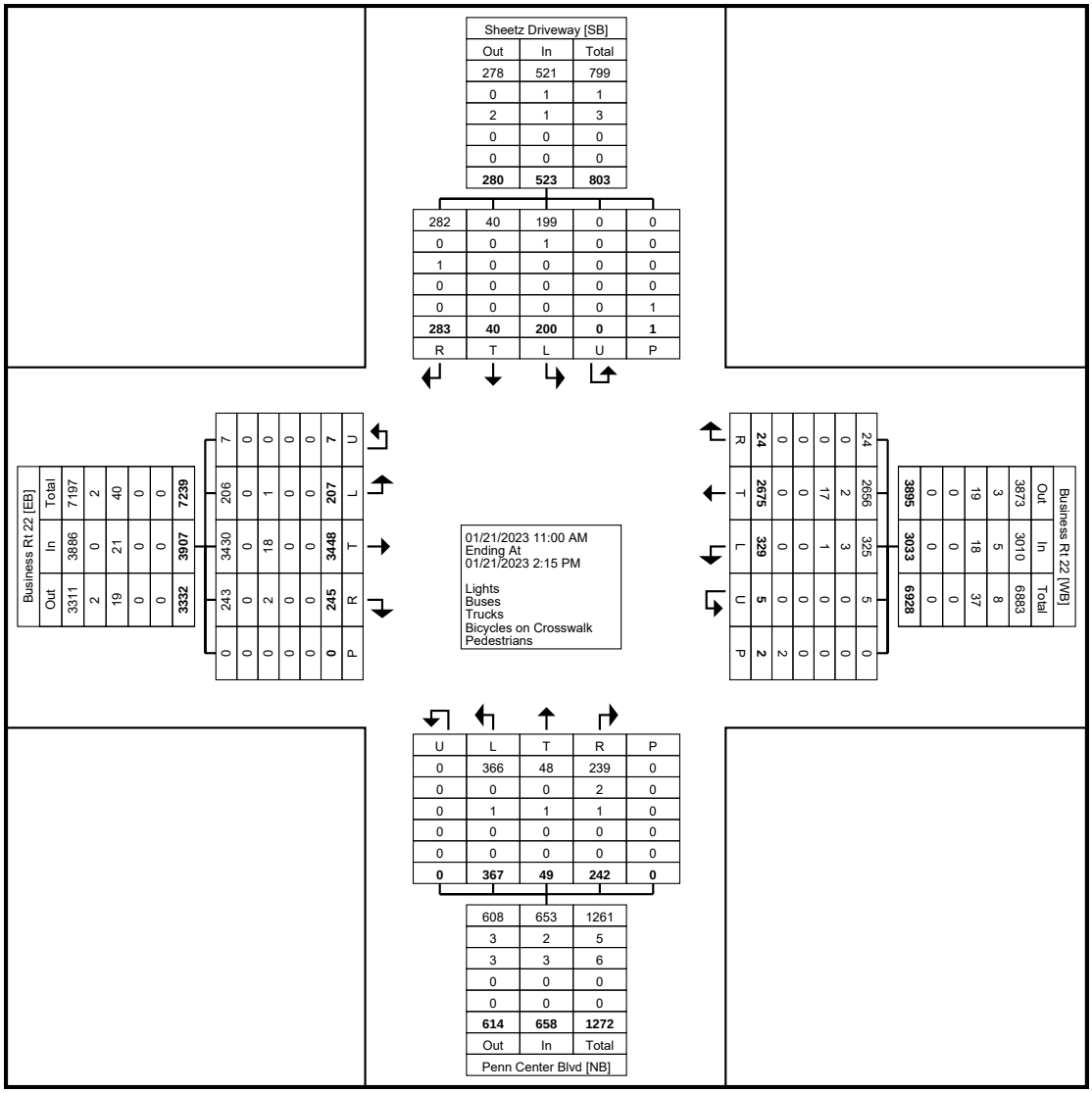
Start Date: 01/21/2023
Page No: 2



Turning Movement Data Plot

Allegheny County, PA
Business Rt 22 & Penn Center Blvd
Saturday, January 21, 2023
Location: 40.430004, -79.812058

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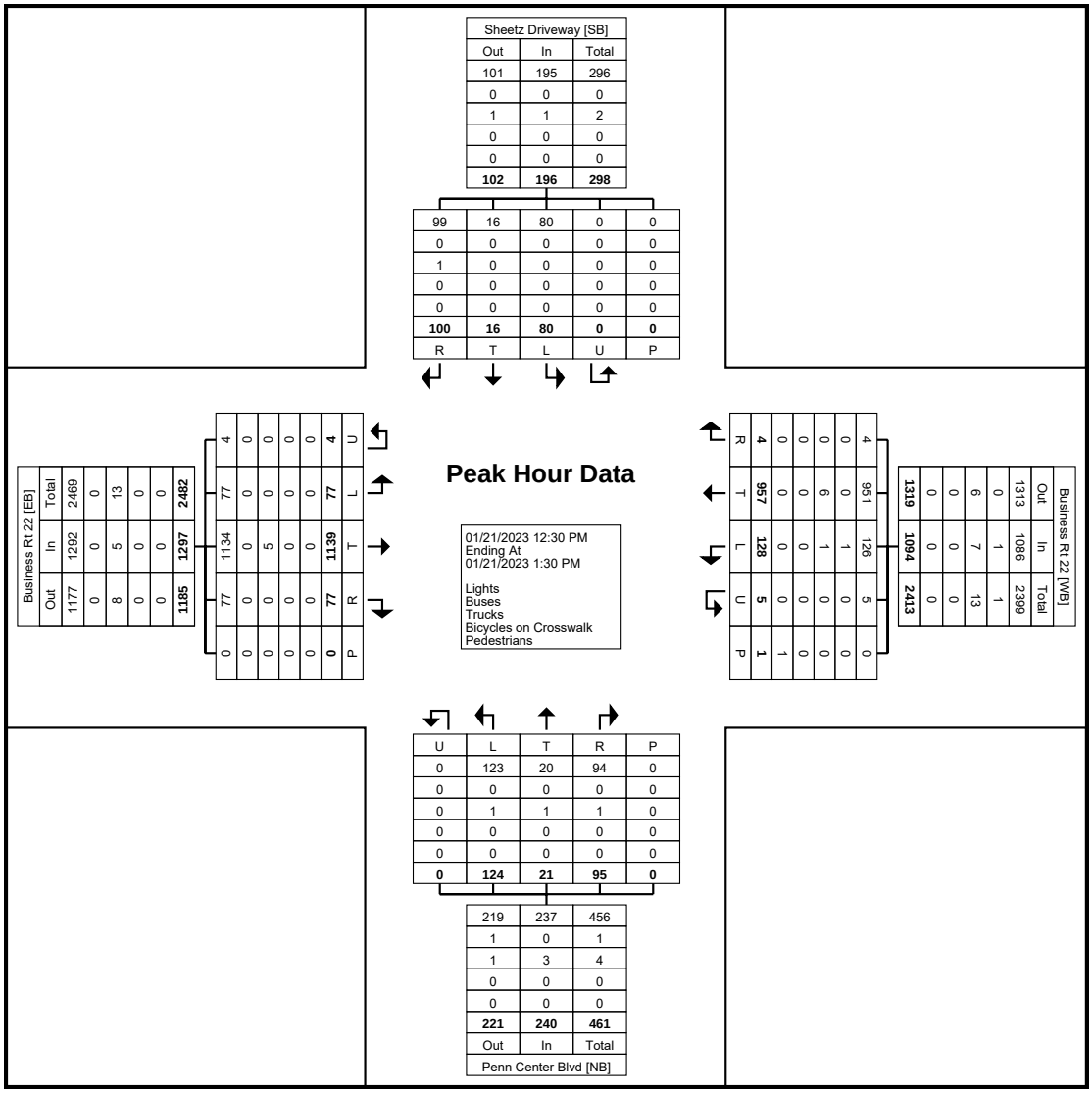
Site Code:
Start Date: 01/21/2023
Page No: 3

Turning Movement Peak Hour Data (12:30 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Penn Center Blvd Northbound							Sheetz Driveway Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
12:30 PM	22	298	9	0	2	0	331	38	239	0	0	0	1	277	32	3	16	9	0	0	60	21	2	7	19	0	0	49	717
12:45 PM	14	289	22	3	0	0	328	34	245	1	0	1	0	281	26	7	26	7	0	0	66	24	2	13	12	0	0	51	726
1:00 PM	20	291	26	3	0	0	340	26	231	0	0	2	0	259	31	5	15	6	0	0	57	15	2	9	18	0	0	44	700
1:15 PM	21	261	10	4	2	0	298	30	242	1	2	2	0	277	35	6	7	9	0	0	57	20	10	6	16	0	0	52	684
Total	77	1139	67	10	4	0	1297	128	957	2	2	5	1	1094	124	21	64	31	0	0	240	80	16	35	65	0	0	196	2827
Approach %	5.9	87.8	5.2	0.8	0.3	-	-	11.7	87.5	0.2	0.2	0.5	-	-	51.7	8.8	26.7	12.9	0.0	-	-	40.8	8.2	17.9	33.2	0.0	-	-	-
Total %	2.7	40.3	2.4	0.4	0.1	-	45.9	4.5	33.9	0.1	0.1	0.2	-	38.7	4.4	0.7	2.3	1.1	0.0	-	8.5	2.8	0.6	1.2	2.3	0.0	-	6.9	-
PHF	0.875	0.956	0.644	0.625	0.500	-	0.954	0.842	0.977	0.500	0.250	0.625	-	0.973	0.886	0.750	0.615	0.861	0.000	-	0.909	0.833	0.400	0.673	0.855	0.000	-	0.942	0.973
Lights	77	1134	67	10	4	-	1292	126	951	2	2	5	-	1086	123	20	63	31	0	-	237	80	16	34	65	0	-	195	2810
% Lights	100.0	99.6	100.0	100.0	100.0	-	99.6	98.4	99.4	100.0	100.0	100.0	-	99.3	99.2	95.2	98.4	100.0	-	-	98.8	100.0	100.0	97.1	100.0	-	-	99.5	99.4
Buses	0	0	0	0	0	-	0	1	0	0	0	0	-	1	0	0	0	0	0	-	0	0	0	0	0	0	-	0	1
% Buses	0.0	0.0	0.0	0.0	0.0	-	0.0	0.8	0.0	0.0	0.0	0.0	-	0.1	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Trucks	0	5	0	0	0	-	5	1	6	0	0	0	-	7	1	1	1	0	0	-	3	0	0	1	0	0	-	1	16
% Trucks	0.0	0.4	0.0	0.0	0.0	-	0.4	0.8	0.6	0.0	0.0	0.0	-	0.6	0.8	4.8	1.6	0.0	-	-	1.3	0.0	0.0	2.9	0.0	-	-	0.5	0.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (12:30 PM)

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Allegheny County, PA
Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023
Page No: 1

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Kingston Dr Northbound							Kingston Dr Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
7:00 AM	9	110	2	0	1	0	122	11	112	6	0	0	0	129	0	0	4	7	0	0	11	5	6	7	6	0	0	24	286
7:15 AM	8	114	1	0	0	0	123	17	99	2	0	0	0	118	1	0	4	8	0	0	13	11	3	12	4	0	0	30	284
7:30 AM	1	120	4	0	0	0	125	22	95	1	0	0	0	118	0	3	3	14	0	0	20	5	6	16	5	0	0	32	295
7:45 AM	5	191	1	1	0	1	198	24	111	1	0	0	0	136	2	0	3	6	0	0	11	13	4	7	0	0	0	24	369
Hourly Total	23	535	8	1	1	1	568	74	417	10	0	0	0	501	3	3	14	35	0	0	55	34	19	42	15	0	0	110	1234
8:00 AM	3	159	2	0	0	0	164	11	114	7	0	0	0	132	2	3	2	9	0	0	16	13	2	6	4	0	0	25	337
8:15 AM	6	154	3	0	0	1	163	25	117	8	0	0	0	150	4	2	5	8	0	0	19	6	4	9	4	0	0	23	355
8:30 AM	3	150	1	2	0	0	156	24	133	5	2	0	0	164	4	1	5	7	0	0	17	11	9	7	2	0	0	29	366
8:45 AM	5	177	2	0	0	2	184	32	117	6	0	0	0	155	3	2	7	5	0	0	17	17	7	13	0	0	0	37	393
Hourly Total	17	640	8	2	0	3	667	92	481	26	2	0	0	601	13	8	19	29	0	0	69	47	22	35	10	0	0	114	1451
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	11	252	4	0	0	0	267	28	262	17	1	0	0	308	6	4	14	20	0	0	44	11	4	11	2	0	0	28	647
4:15 PM	8	262	5	0	0	1	275	18	234	20	0	0	0	272	12	4	14	19	0	0	49	13	2	6	2	0	0	23	619
4:30 PM	21	257	13	0	0	1	291	28	253	15	0	0	0	296	6	7	19	15	0	0	47	14	3	5	1	0	0	23	657
4:45 PM	13	275	7	0	0	1	295	21	239	16	0	0	0	276	9	1	8	12	0	0	30	21	8	14	1	0	0	44	645
Hourly Total	53	1046	29	0	0	3	1128	95	988	68	1	0	0	1152	33	16	55	66	0	0	170	59	17	36	6	0	0	118	2568
5:00 PM	21	242	7	1	1	1	272	29	251	18	0	0	0	298	9	7	29	23	0	0	68	22	7	7	1	0	0	37	675
5:15 PM	9	232	5	0	1	2	247	17	244	25	1	0	0	287	19	5	11	13	0	0	48	11	12	16	3	0	1	42	624
5:30 PM	9	193	9	4	1	2	216	26	257	17	0	0	0	300	14	2	21	21	0	0	58	18	7	6	1	0	0	32	606
5:45 PM	16	180	12	0	1	0	209	30	248	27	0	0	0	305	8	1	9	25	0	0	43	14	2	7	5	0	0	28	585
Hourly Total	55	847	33	5	4	5	944	102	1000	87	1	0	0	1190	50	15	70	82	0	0	217	65	28	36	10	0	1	139	2490
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	148	3068	78	8	5	12	3307	363	2886	191	4	0	0	3444	99	42	158	212	0	0	511	205	86	149	41	0	1	481	7743
Approach %	4.5	92.8	2.4	0.2	0.2	-	-	10.5	83.8	5.5	0.1	0.0	-	-	19.4	8.2	30.9	41.5	0.0	-	-	42.6	17.9	31.0	8.5	0.0	-	-	-
Total %	1.9	39.6	1.0	0.1	0.1	-	42.7	4.7	37.3	2.5	0.1	0.0	-	44.5	1.3	0.5	2.0	2.7	0.0	-	6.6	2.6	1.1	1.9	0.5	0.0	-	6.2	-
Lights	145	2987	78	8	5	-	3223	361	2833	190	4	0	-	3388	98	40	156	209	0	-	503	203	84	139	40	0	-	466	7580
% Lights	98.0	97.4	100.0	100.0	100.0	-	97.5	99.4	98.2	99.5	100.0	-	-	98.4	99.0	95.2	98.7	98.6	-	-	98.4	99.0	97.7	93.3	97.6	-	-	96.9	97.9
Buses	3	19	0	0	0	-	22	0	13	0	0	0	-	13	0	2	1	2	0	-	5	1	2	6	1	0	-	10	50
% Buses	2.0	0.6	0.0	0.0	0.0	-	0.7	0.0	0.5	0.0	0.0	-	-	0.4	0.0	4.8	0.6	0.9	-	-	1.0	0.5	2.3	4.0	2.4	-	-	2.1	0.6
Trucks	0	62	0	0	0	-	62	2	40	1	0	0	-	43	1	0	1	1	0	-	3	1	0	4	0	0	-	5	113
% Trucks	0.0	2.0	0.0	0.0	0.0	-	1.9	0.6	1.4	0.5	0.0	-	-	1.2	1.0	0.0	0.6	0.5	-	-	0.6	0.5	0.0	2.7	0.0	-	-	1.0	1.5
Bicycles on Crosswalk	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	11	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	91.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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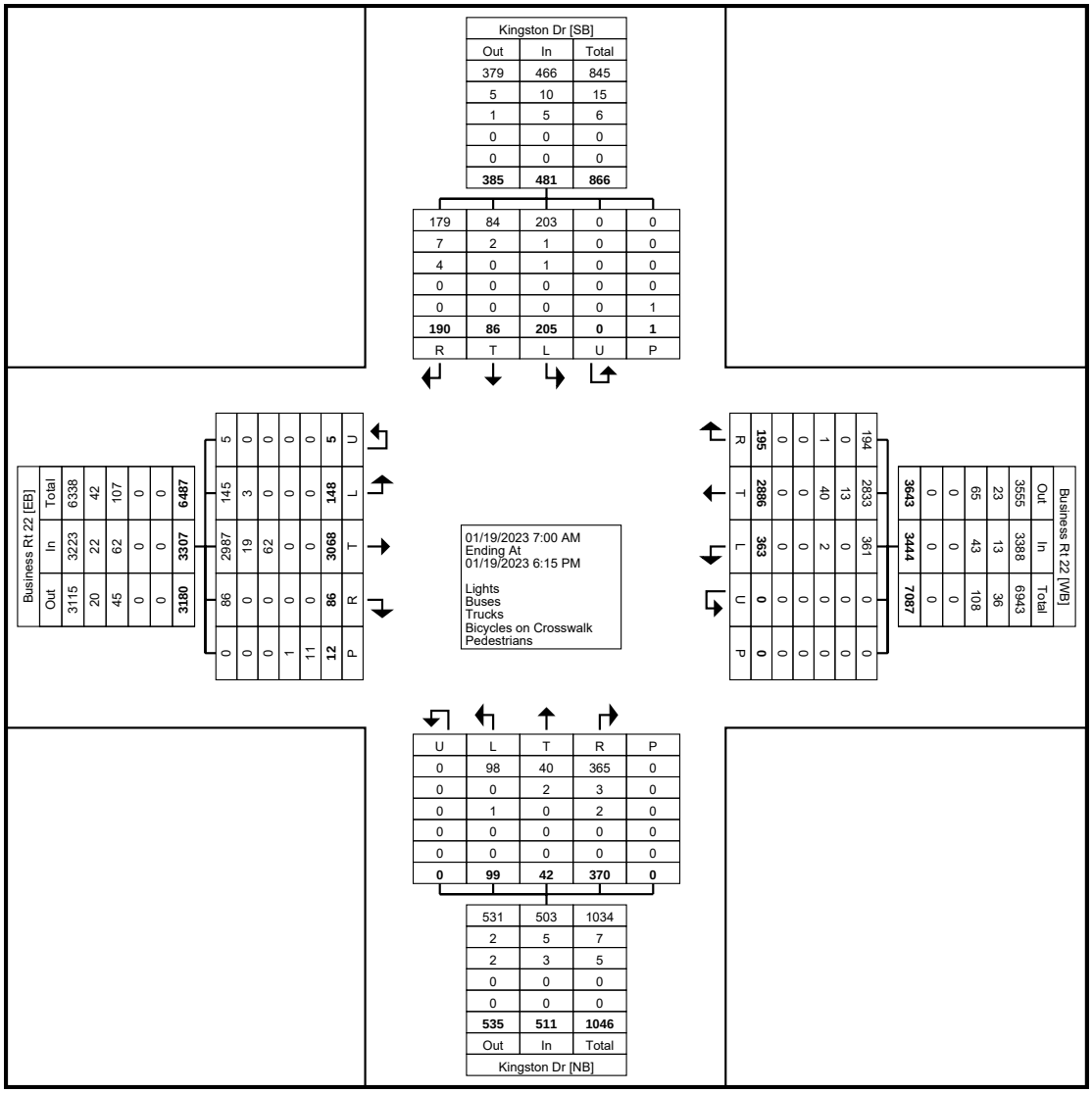
Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023
Page No: 2



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Allegheny County, PA
Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

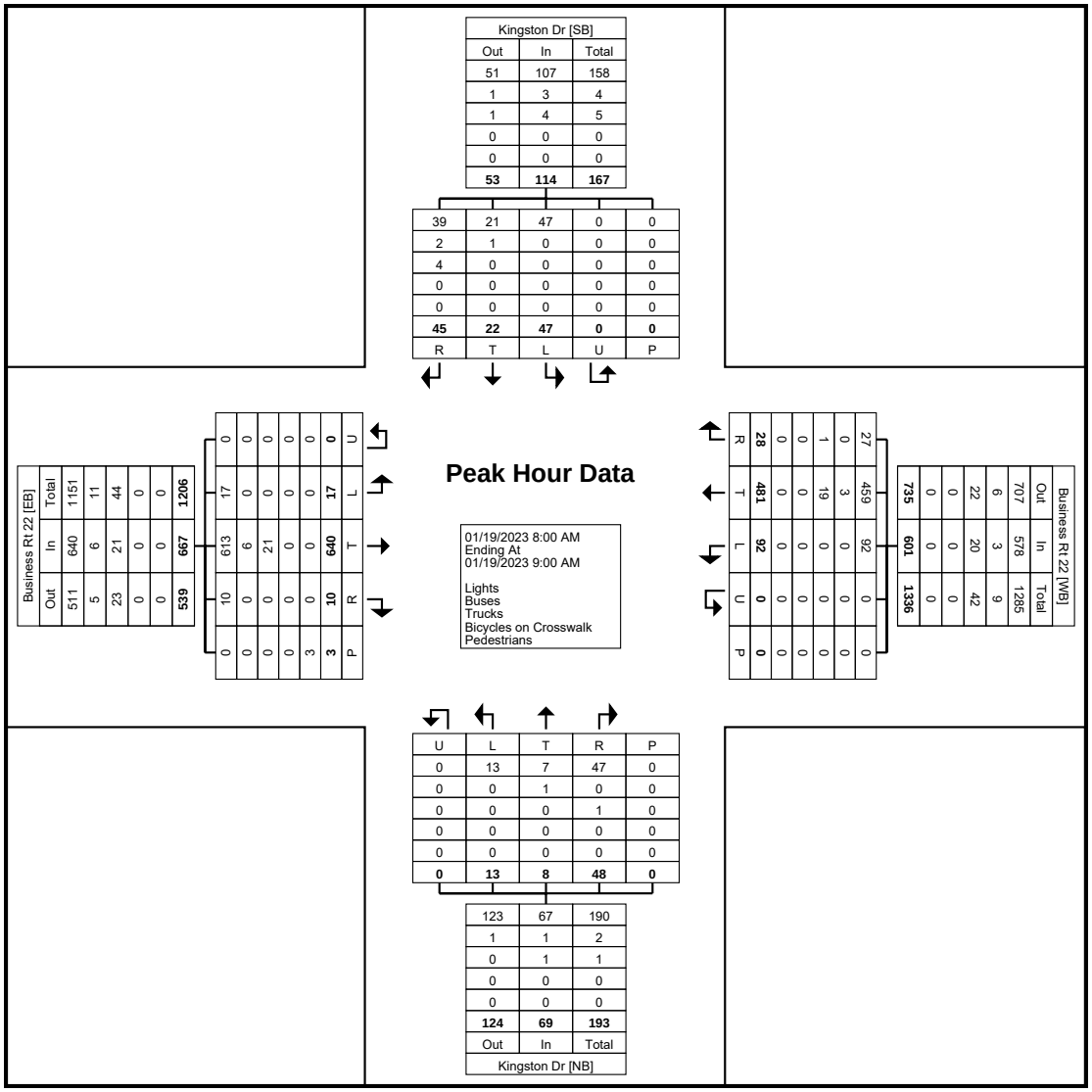
Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Kingston Dr Northbound							Kingston Dr Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
8:00 AM	3	159	2	0	0	0	164	11	114	7	0	0	0	132	2	3	2	9	0	0	16	13	2	6	4	0	0	25	337
8:15 AM	6	154	3	0	0	1	163	25	117	8	0	0	0	150	4	2	5	8	0	0	19	6	4	9	4	0	0	23	355
8:30 AM	3	150	1	2	0	0	156	24	133	5	2	0	0	164	4	1	5	7	0	0	17	11	9	7	2	0	0	29	366
8:45 AM	5	177	2	0	0	2	184	32	117	6	0	0	0	155	3	2	7	5	0	0	17	17	7	13	0	0	0	37	393
Total	17	640	8	2	0	3	667	92	481	26	2	0	0	601	13	8	19	29	0	0	69	47	22	35	10	0	0	114	1451
Approach %	2.5	96.0	1.2	0.3	0.0	-	-	15.3	80.0	4.3	0.3	0.0	-	-	18.8	11.6	27.5	42.0	0.0	-	-	41.2	19.3	30.7	8.8	0.0	-	-	-
Total %	1.2	44.1	0.6	0.1	0.0	-	46.0	6.3	33.1	1.8	0.1	0.0	-	41.4	0.9	0.6	1.3	2.0	0.0	-	4.8	3.2	1.5	2.4	0.7	0.0	-	7.9	-
PHF	0.708	0.904	0.667	0.250	0.000	-	0.906	0.719	0.904	0.813	0.250	0.000	-	0.916	0.813	0.667	0.679	0.806	0.000	-	0.908	0.691	0.611	0.673	0.625	0.000	-	0.770	0.923
Lights	17	613	8	2	0	-	640	92	459	25	2	0	-	578	13	7	19	28	0	-	67	47	21	29	10	0	-	107	1392
% Lights	100.0	95.8	100.0	100.0	-	-	96.0	100.0	95.4	96.2	100.0	-	-	96.2	100.0	87.5	100.0	96.6	-	-	97.1	100.0	95.5	82.9	100.0	-	-	93.9	95.9
Buses	0	6	0	0	0	-	6	0	3	0	0	0	-	3	0	1	0	0	0	-	1	0	1	2	0	0	-	3	13
% Buses	0.0	0.9	0.0	0.0	-	-	0.9	0.0	0.6	0.0	0.0	-	-	0.5	0.0	12.5	0.0	0.0	-	-	1.4	0.0	4.5	5.7	0.0	-	-	2.6	0.9
Trucks	0	21	0	0	0	-	21	0	19	1	0	0	-	20	0	0	0	1	0	-	1	0	0	4	0	0	-	4	46
% Trucks	0.0	3.3	0.0	0.0	-	-	3.1	0.0	4.0	3.8	0.0	-	-	3.3	0.0	0.0	0.0	3.4	-	-	1.4	0.0	0.0	11.4	0.0	-	-	3.5	3.2
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	3	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Allegheny County, PA
Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023
Page No: 4



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Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

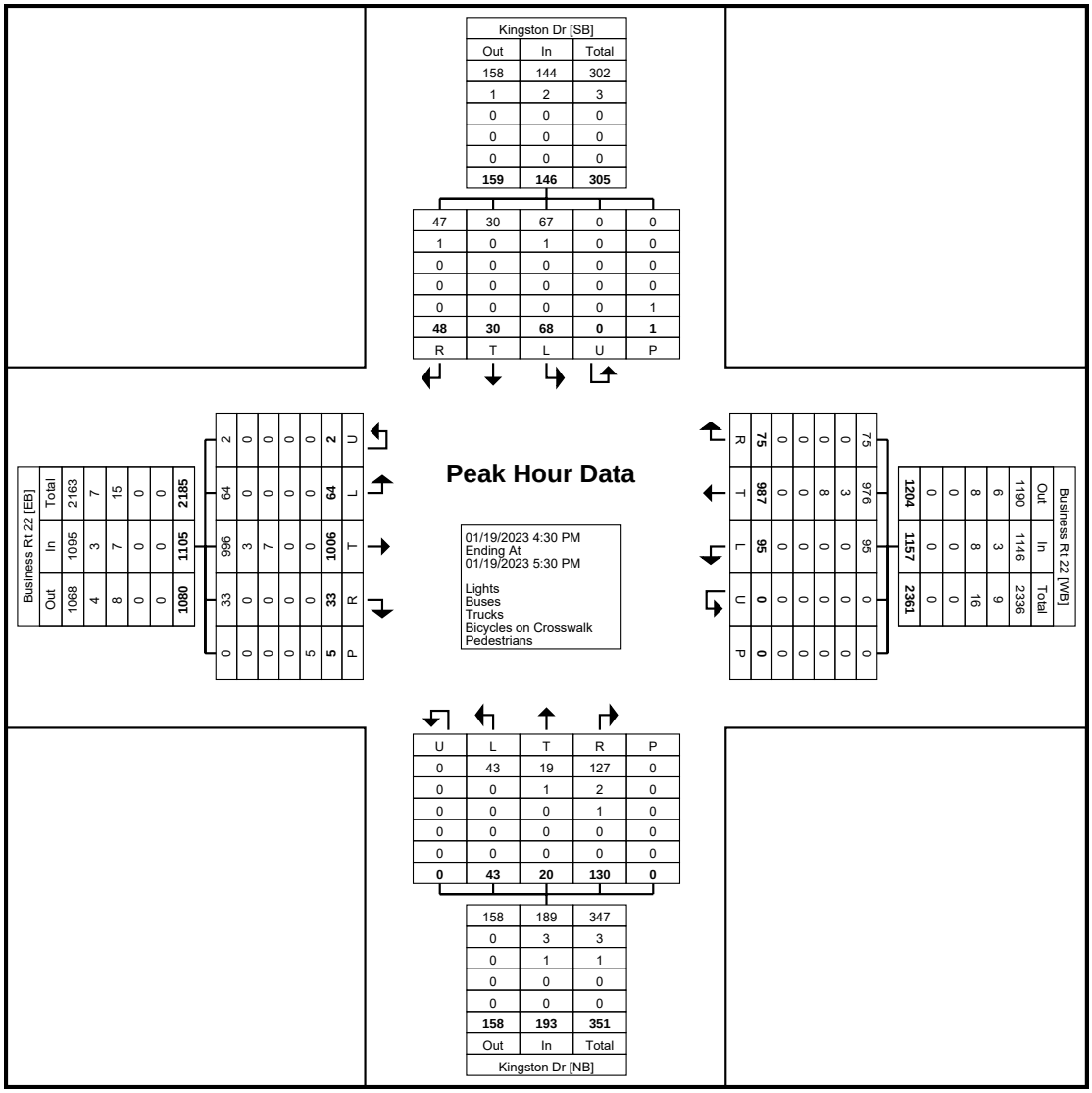
Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Kingston Dr Northbound							Kingston Dr Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
4:30 PM	21	257	13	0	0	1	291	28	253	15	0	0	0	296	6	7	19	15	0	0	47	14	3	5	1	0	0	23	657
4:45 PM	13	275	7	0	0	1	295	21	239	16	0	0	0	276	9	1	8	12	0	0	30	21	8	14	1	0	0	44	645
5:00 PM	21	242	7	1	1	1	272	29	251	18	0	0	0	298	9	7	29	23	0	0	68	22	7	7	1	0	0	37	675
5:15 PM	9	232	5	0	1	2	247	17	244	25	1	0	0	287	19	5	11	13	0	0	48	11	12	16	3	0	1	42	624
Total	64	1006	32	1	2	5	1105	95	987	74	1	0	0	1157	43	20	67	63	0	0	193	68	30	42	6	0	1	146	2601
Approach %	5.8	91.0	2.9	0.1	0.2	-	-	8.2	85.3	6.4	0.1	0.0	-	-	22.3	10.4	34.7	32.6	0.0	-	-	46.6	20.5	28.8	4.1	0.0	-	-	-
Total %	2.5	38.7	1.2	0.0	0.1	-	42.5	3.7	37.9	2.8	0.0	0.0	-	44.5	1.7	0.8	2.6	2.4	0.0	-	7.4	2.6	1.2	1.6	0.2	0.0	-	5.6	-
PHF	0.762	0.915	0.615	0.250	0.500	-	0.936	0.819	0.975	0.740	0.250	0.000	-	0.971	0.566	0.714	0.578	0.685	0.000	-	0.710	0.773	0.625	0.656	0.500	0.000	-	0.830	0.963
Lights	64	996	32	1	2	-	1095	95	976	74	1	0	-	1146	43	19	65	62	0	-	189	67	30	41	6	0	-	144	2574
% Lights	100.0	99.0	100.0	100.0	100.0	-	99.1	100.0	98.9	100.0	100.0	-	-	99.0	100.0	95.0	97.0	98.4	-	-	97.9	98.5	100.0	97.6	100.0	-	-	98.6	99.0
Buses	0	3	0	0	0	-	3	0	3	0	0	0	-	3	0	1	1	1	0	-	3	1	0	1	0	0	-	2	11
% Buses	0.0	0.3	0.0	0.0	0.0	-	0.3	0.0	0.3	0.0	0.0	-	-	0.3	0.0	5.0	1.5	1.6	-	-	1.6	1.5	0.0	2.4	0.0	-	-	1.4	0.4
Trucks	0	7	0	0	0	-	7	0	8	0	0	0	-	8	0	0	1	0	0	-	1	0	0	0	0	0	-	0	16
% Trucks	0.0	0.7	0.0	0.0	0.0	-	0.6	0.0	0.8	0.0	0.0	-	-	0.7	0.0	0.0	1.5	0.0	-	-	0.5	0.0	0.0	0.0	0.0	-	-	0.0	0.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	5	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Allegheny County, PA
Business Rt 22 & Kingston Dr
Thursday, January 19, 2023
Location: 40.429922, -79.809328

Count Name: Business Route 22 & Kingson Dr
Site Code:
Start Date: 01/19/2023
Page No: 6



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Business Rt 22 & Kingston Dr
Saturday, January 21, 2023
Location: 40.429873, -79.809337

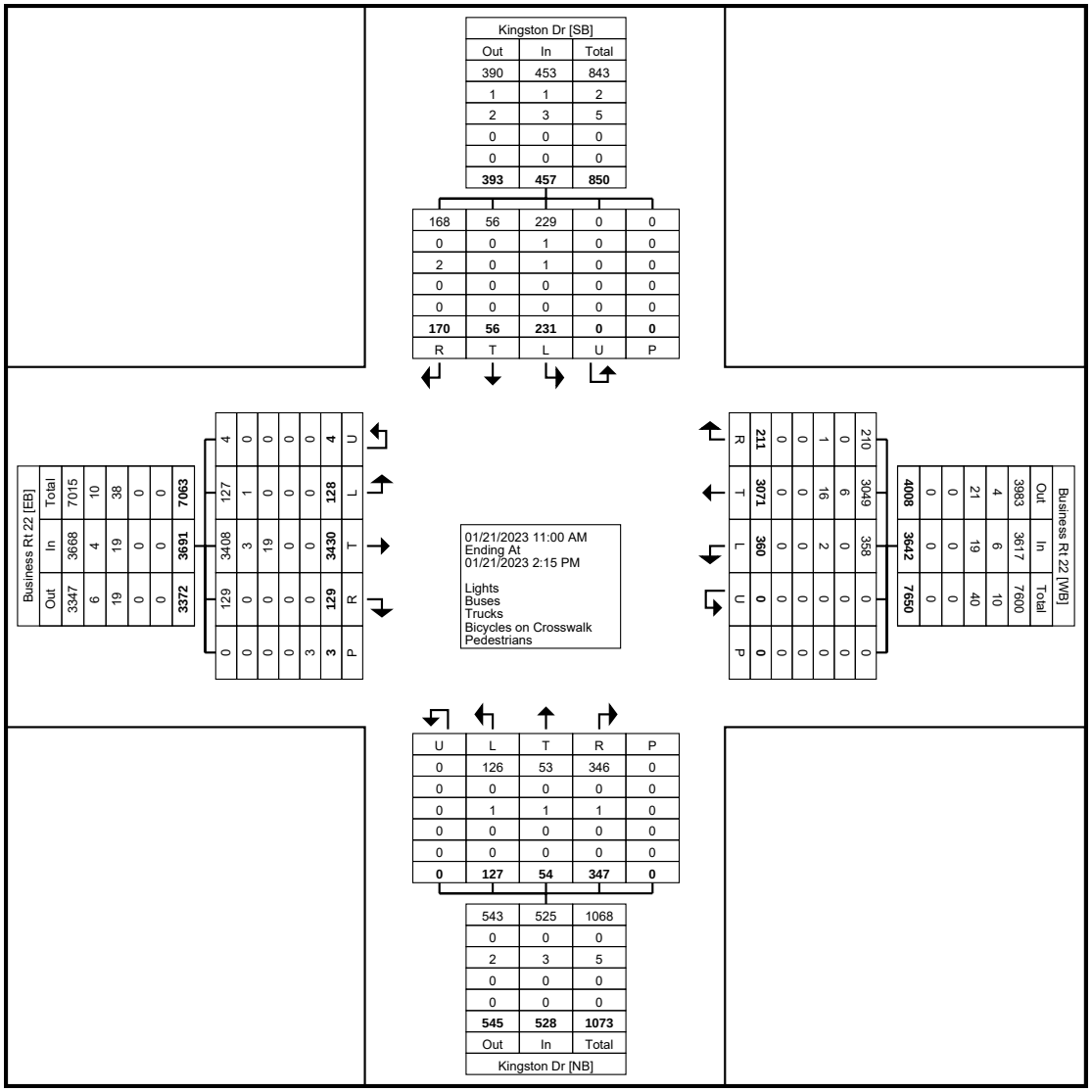
Count Name: Business Route 22 & Kingston Dr (Sat)
Site Code:
Start Date: 01/21/2023

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Kingston Dr Northbound							Kingston Dr Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
11:00 AM	5	264	7	1	0	0	277	32	210	11	0	0	0	253	9	6	10	18	0	0	43	18	3	11	2	0	0	34	607
11:15 AM	5	281	11	1	0	0	298	24	214	13	0	0	0	251	15	5	6	13	0	0	39	17	5	9	1	0	0	32	620
11:30 AM	13	290	9	2	0	0	314	34	246	21	0	0	0	301	13	5	12	20	0	0	50	21	5	21	0	0	0	47	712
11:45 AM	17	306	8	1	0	0	332	29	215	15	0	0	0	259	9	1	7	20	0	0	37	19	3	7	1	0	0	30	658
Hourly Total	40	1141	35	5	0	0	1221	119	885	60	0	0	0	1064	46	17	35	71	0	0	169	75	16	48	4	0	0	143	2597
12:00 PM	16	290	6	1	1	0	314	28	252	17	2	0	0	299	13	7	18	9	0	0	47	21	10	9	4	0	0	44	704
12:15 PM	13	311	6	3	0	0	333	32	262	14	0	0	0	308	7	4	11	15	0	0	37	18	7	9	3	0	0	37	715
12:30 PM	9	289	10	4	1	2	313	25	286	24	0	0	0	335	11	3	20	7	0	0	41	14	3	8	7	0	0	32	721
12:45 PM	7	295	12	2	0	1	316	26	305	13	0	0	0	344	10	2	16	8	0	0	36	13	3	4	7	0	0	27	723
Hourly Total	45	1185	34	10	2	3	1276	111	1105	68	2	0	0	1286	41	16	65	39	0	0	161	66	23	30	21	0	0	140	2863
1:00 PM	11	286	8	4	1	0	310	30	274	17	0	0	0	321	12	4	21	15	0	0	52	17	3	10	0	0	0	30	713
1:15 PM	11	264	9	2	0	0	286	37	260	21	0	0	0	318	9	7	12	20	0	0	48	22	5	9	6	0	0	42	694
1:30 PM	10	245	8	0	1	0	264	29	279	21	0	0	0	329	8	4	21	15	0	0	48	30	4	23	6	0	0	63	704
1:45 PM	11	309	13	1	0	0	334	34	268	20	2	0	0	324	11	6	19	14	0	0	50	21	5	13	0	0	0	39	747
Hourly Total	43	1104	38	7	2	0	1194	130	1081	79	2	0	0	1292	40	21	73	64	0	0	198	90	17	55	12	0	0	174	2858
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	128	3430	107	22	4	3	3691	360	3071	207	4	0	0	3642	127	54	173	174	0	0	528	231	56	133	37	0	0	457	8318
Approach %	3.5	92.9	2.9	0.6	0.1	-	-	9.9	84.3	5.7	0.1	0.0	-	-	24.1	10.2	32.8	33.0	0.0	-	-	50.5	12.3	29.1	8.1	0.0	-	-	-
Total %	1.5	41.2	1.3	0.3	0.0	-	44.4	4.3	36.9	2.5	0.0	0.0	-	43.8	1.5	0.6	2.1	2.1	0.0	-	6.3	2.8	0.7	1.6	0.4	0.0	-	5.5	-
Lights	127	3408	107	22	4	-	3668	358	3049	206	4	0	-	3617	126	53	172	174	0	-	525	229	56	132	36	0	-	453	8263
% Lights	99.2	99.4	100.0	100.0	100.0	-	99.4	99.4	99.3	99.5	100.0	-	-	99.3	99.2	98.1	99.4	100.0	-	-	99.4	99.1	100.0	99.2	97.3	-	-	99.1	99.3
Buses	1	3	0	0	0	-	4	0	6	0	0	0	-	6	0	0	0	0	0	-	0	1	0	0	0	0	-	1	11
% Buses	0.8	0.1	0.0	0.0	0.0	-	0.1	0.0	0.2	0.0	0.0	-	-	0.2	0.0	0.0	0.0	0.0	-	-	0.0	0.4	0.0	0.0	0.0	-	-	0.2	0.1
Trucks	0	19	0	0	0	-	19	2	16	1	0	0	-	19	1	1	1	0	0	-	3	1	0	1	1	0	-	3	44
% Trucks	0.0	0.6	0.0	0.0	0.0	-	0.5	0.6	0.5	0.5	0.0	-	-	0.5	0.8	1.9	0.6	0.0	-	-	0.6	0.4	0.0	0.8	2.7	-	-	0.7	0.5
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	3	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Allegheny County, PA
Business Rt 22 & Kingston Dr
Saturday, January 21, 2023
Location: 40.429873, -79.809337

Count Name: Business Route 22 & Kingston Dr (Sat)
Site Code:
Start Date: 01/21/2023
Page No: 2



Turning Movement Data Plot

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Allegheny County, PA
Business Rt 22 & Kingston Dr
Saturday, January 21, 2023
Location: 40.429873, -79.809337

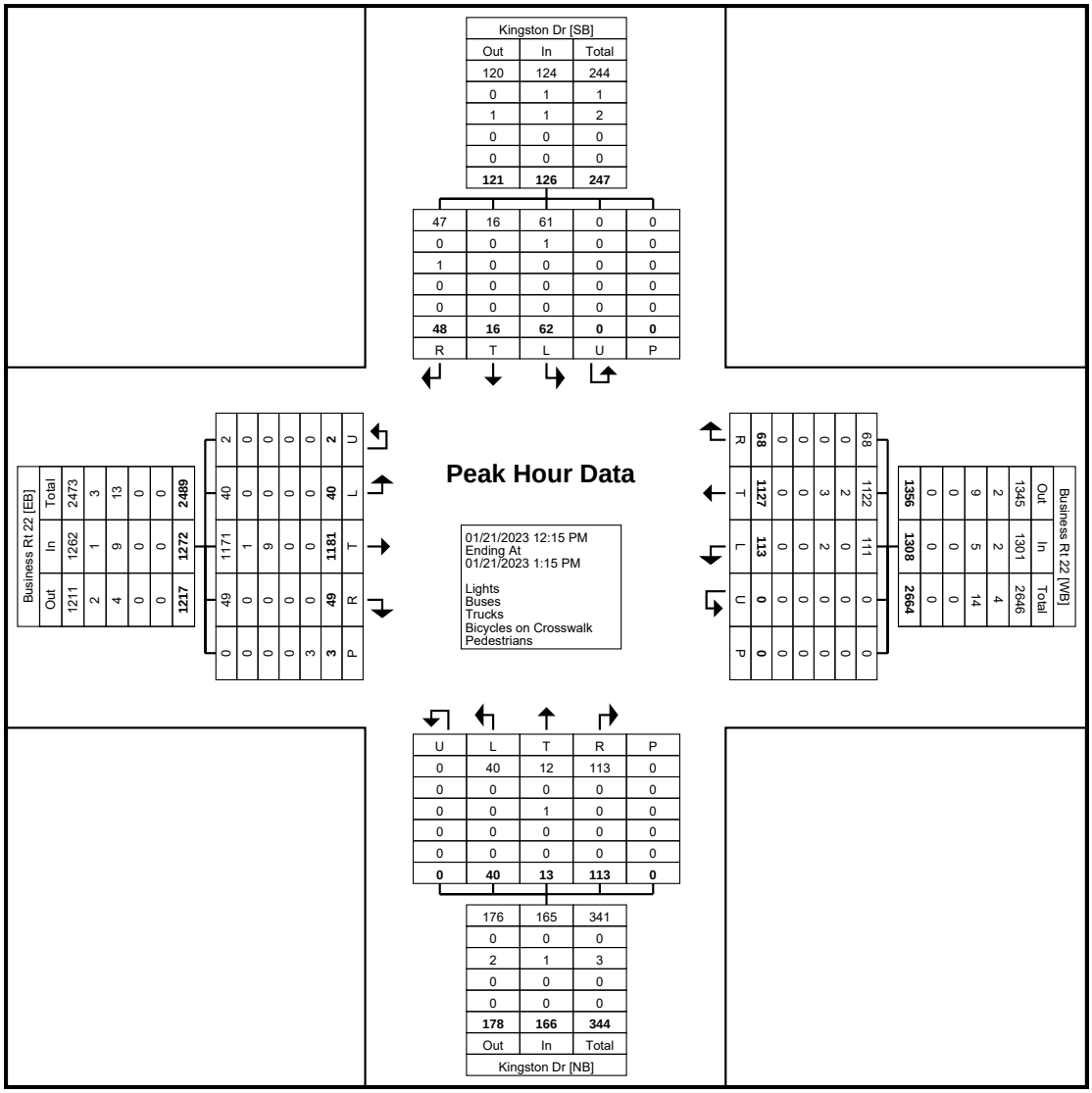
Count Name: Business Route 22 & Kingston Dr (Sat)
Site Code:
Start Date: 01/21/2023

Turning Movement Peak Hour Data (12:15 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Kingston Dr Northbound							Kingston Dr Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
12:15 PM	13	311	6	3	0	0	333	32	262	14	0	0	0	308	7	4	11	15	0	0	37	18	7	9	3	0	0	37	715
12:30 PM	9	289	10	4	1	2	313	25	286	24	0	0	0	335	11	3	20	7	0	0	41	14	3	8	7	0	0	32	721
12:45 PM	7	295	12	2	0	1	316	26	305	13	0	0	0	344	10	2	16	8	0	0	36	13	3	4	7	0	0	27	723
1:00 PM	11	286	8	4	1	0	310	30	274	17	0	0	0	321	12	4	21	15	0	0	52	17	3	10	0	0	0	30	713
Total	40	1181	36	13	2	3	1272	113	1127	68	0	0	0	1308	40	13	68	45	0	0	166	62	16	31	17	0	0	126	2872
Approach %	3.1	92.8	2.8	1.0	0.2	-	-	8.6	86.2	5.2	0.0	0.0	-	-	24.1	7.8	41.0	27.1	0.0	-	-	49.2	12.7	24.6	13.5	0.0	-	-	-
Total %	1.4	41.1	1.3	0.5	0.1	-	44.3	3.9	39.2	2.4	0.0	0.0	-	45.5	1.4	0.5	2.4	1.6	0.0	-	5.8	2.2	0.6	1.1	0.6	0.0	-	4.4	-
PHF	0.769	0.949	0.750	0.813	0.500	-	0.955	0.883	0.924	0.708	0.000	0.000	-	0.951	0.833	0.813	0.810	0.750	0.000	-	0.798	0.861	0.571	0.775	0.607	0.000	-	0.851	0.993
Lights	40	1171	36	13	2	-	1262	111	1122	68	0	0	-	1301	40	12	68	45	0	-	165	61	16	31	16	0	-	124	2852
% Lights	100.0	99.2	100.0	100.0	100.0	-	99.2	98.2	99.6	100.0	-	-	-	99.5	100.0	92.3	100.0	100.0	-	-	99.4	98.4	100.0	100.0	94.1	-	-	98.4	99.3
Buses	0	1	0	0	0	-	1	0	2	0	0	0	-	2	0	0	0	0	0	-	0	1	0	0	0	0	-	1	4
% Buses	0.0	0.1	0.0	0.0	0.0	-	0.1	0.0	0.2	0.0	-	-	-	0.2	0.0	0.0	0.0	0.0	-	-	0.0	1.6	0.0	0.0	0.0	-	-	0.8	0.1
Trucks	0	9	0	0	0	-	9	2	3	0	0	0	-	5	0	1	0	0	0	-	1	0	0	0	1	0	-	1	16
% Trucks	0.0	0.8	0.0	0.0	0.0	-	0.7	1.8	0.3	0.0	-	-	-	0.4	0.0	7.7	0.0	0.0	-	-	0.6	0.0	0.0	0.0	5.9	-	-	0.8	0.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	3	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Allegheny County, PA
Business Rt 22 & Kingston Dr
Saturday, January 21, 2023
Location: 40.429873, -79.809337

Count Name: Business Route 22 & Kingston Dr (Sat)
Site Code:
Start Date: 01/21/2023
Page No: 4



Turning Movement Peak Hour Data Plot (12:15 PM)

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Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

Count Name: Business Route 22 & Home Depot/Pep Boys
Site Code:
Start Date: 01/19/2023
Page No: 1

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Home Depot Northbound							Pep Boys. Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
7:00 AM	0	120	4	0	0	0	124	0	132	0	0	0	0	132	5	0	0	0	0	0	5	0	0	0	0	0	0	0	261
7:15 AM	1	126	5	0	0	0	132	3	122	0	0	1	0	126	3	0	0	0	0	0	3	0	0	0	1	0	0	1	262
7:30 AM	1	133	9	1	0	0	144	6	121	0	0	0	0	127	4	0	1	1	0	0	6	0	0	0	0	0	0	0	277
7:45 AM	3	193	10	2	0	0	208	7	126	0	0	0	0	133	9	0	0	1	0	0	10	0	0	0	0	0	0	0	351
Hourly Total	5	572	28	3	0	0	608	16	501	0	0	1	0	518	21	0	1	2	0	0	24	0	0	0	1	0	0	1	1151
8:00 AM	0	166	9	4	0	0	179	7	118	0	0	0	0	125	5	0	2	0	0	0	7	0	0	0	0	0	0	0	311
8:15 AM	0	168	12	1	0	0	181	8	147	0	0	0	0	155	9	0	1	2	0	0	12	0	0	0	1	0	0	1	349
8:30 AM	2	140	17	1	0	0	160	10	157	0	0	0	0	167	10	0	1	5	0	0	16	2	0	0	0	0	0	2	345
8:45 AM	0	204	9	2	0	0	215	14	135	0	0	0	0	149	13	0	2	5	0	0	20	1	0	0	1	0	0	2	386
Hourly Total	2	678	47	8	0	0	735	39	557	0	0	0	0	596	37	0	6	12	0	0	55	3	0	0	2	0	0	5	1391
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	306	11	0	0	0	317	11	301	0	0	0	0	312	23	0	3	2	0	1	28	0	0	0	0	0	0	0	657
4:15 PM	1	273	17	0	0	0	291	18	256	1	0	0	0	275	16	0	1	4	0	0	21	0	0	0	1	0	0	1	588
4:30 PM	0	309	11	1	0	0	321	11	292	1	0	1	0	305	16	0	2	6	0	0	24	0	0	1	0	0	0	1	651
4:45 PM	0	305	17	2	1	1	325	5	254	1	0	0	0	260	15	0	2	2	0	1	19	0	0	0	1	0	0	1	605
Hourly Total	1	1193	56	3	1	1	1254	45	1103	3	0	1	0	1152	70	0	8	14	0	2	92	0	0	1	2	0	0	3	2501
5:00 PM	0	363	17	2	0	0	382	8	287	0	0	0	0	295	13	0	2	3	0	0	18	1	0	0	1	0	0	2	697
5:15 PM	2	313	14	2	1	0	332	11	290	2	0	0	0	303	16	0	2	9	0	0	27	2	0	0	2	0	1	4	666
5:30 PM	0	255	6	0	0	0	261	10	283	0	0	1	0	294	13	0	1	3	0	0	17	1	0	0	2	0	1	3	575
5:45 PM	0	291	10	3	0	1	304	8	293	0	0	0	0	301	8	0	1	1	0	0	10	0	0	0	1	0	0	1	616
Hourly Total	2	1222	47	7	1	1	1279	37	1153	2	0	1	0	1193	50	0	6	16	0	0	72	4	0	0	6	0	2	10	2554
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	10	3665	178	21	2	2	3876	137	3314	5	0	3	0	3459	178	0	21	44	0	2	243	7	0	1	11	0	2	19	7597
Approach %	0.3	94.6	4.6	0.5	0.1	-	-	4.0	95.8	0.1	0.0	0.1	-	-	73.3	0.0	8.6	18.1	0.0	-	-	36.8	0.0	5.3	57.9	0.0	-	-	-
Total %	0.1	48.2	2.3	0.3	0.0	-	51.0	1.8	43.6	0.1	0.0	0.0	-	45.5	2.3	0.0	0.3	0.6	0.0	-	3.2	0.1	0.0	0.0	0.1	0.0	-	0.3	-
Lights	10	3586	172	21	2	-	3791	132	3264	4	0	3	-	3403	170	0	18	43	0	-	231	6	0	1	11	0	-	18	7443
% Lights	100.0	97.8	96.6	100.0	100.0	-	97.8	96.4	98.5	80.0	-	100.0	-	98.4	95.5	-	85.7	97.7	-	-	95.1	85.7	-	100.0	100.0	-	-	94.7	98.0
Buses	0	22	0	0	0	-	22	0	14	0	0	0	-	14	0	0	0	0	0	-	0	0	0	0	0	0	-	0	36
% Buses	0.0	0.6	0.0	0.0	0.0	-	0.6	0.0	0.4	0.0	-	0.0	-	0.4	0.0	-	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.5
Trucks	0	57	6	0	0	-	63	5	36	1	0	0	-	42	8	0	3	1	0	-	12	1	0	0	0	0	-	1	118
% Trucks	0.0	1.6	3.4	0.0	0.0	-	1.6	3.6	1.1	20.0	-	0.0	-	1.2	4.5	-	14.3	2.3	-	-	4.9	14.3	-	0.0	0.0	-	-	5.3	1.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	2	-	-	-	-	-	-	0	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-

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Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

Count Name: Business Route 22 & Home Depot/Pep Boys
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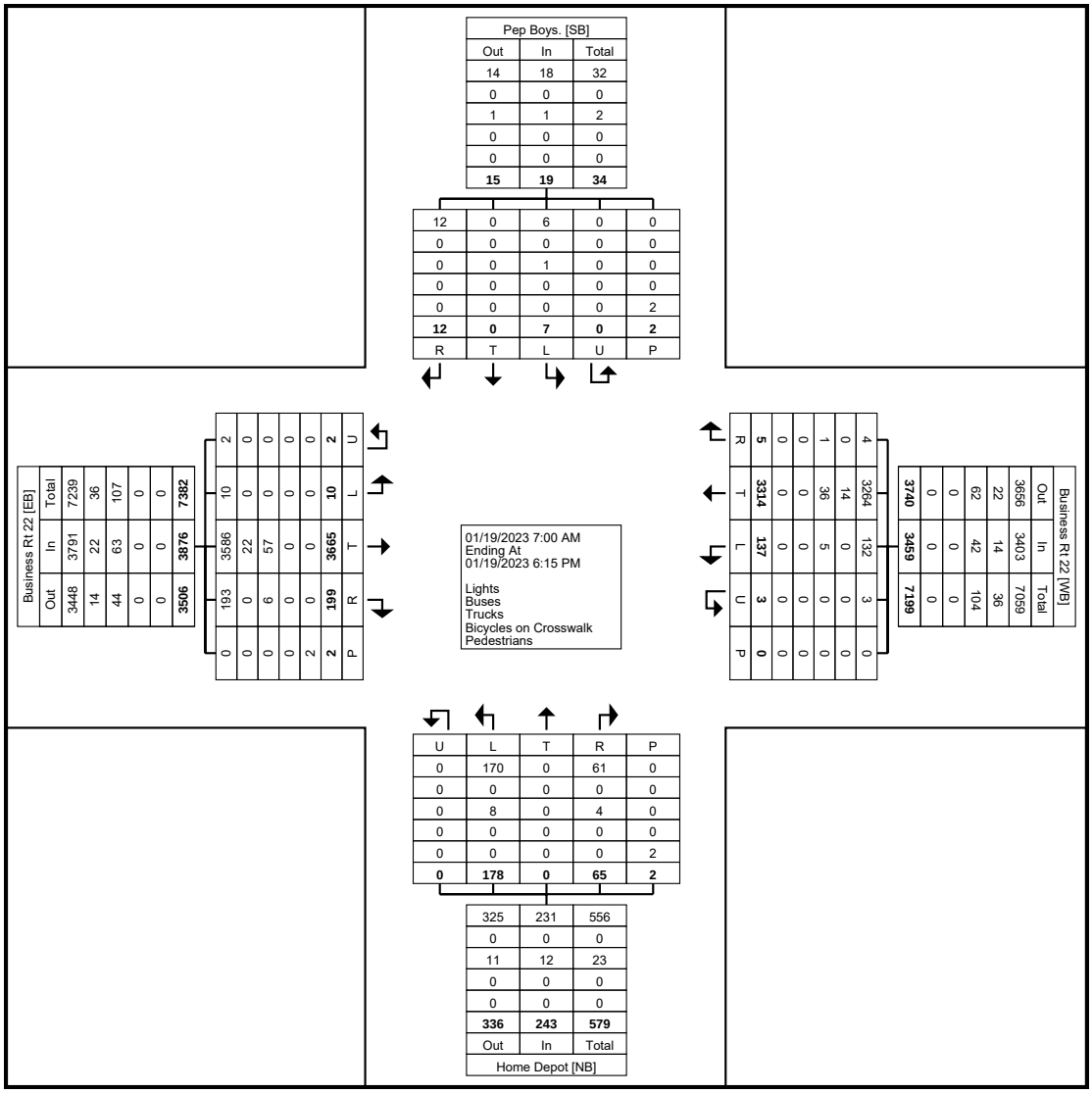

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Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

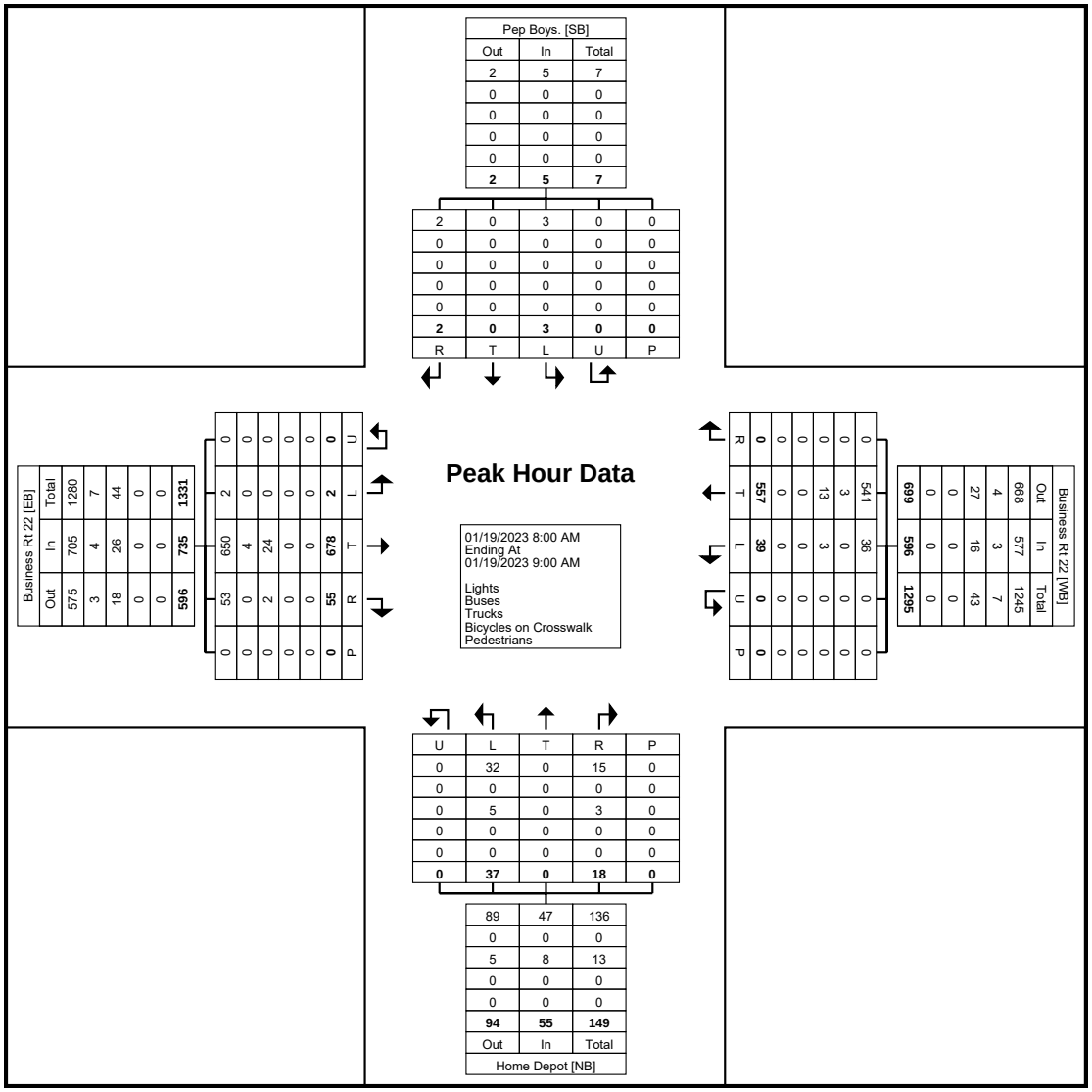
Count Name: Business Route 22 & Home Depot/Pep Boys
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Home Depot Northbound							Pep Boys. Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
8:00 AM	0	166	9	4	0	0	179	7	118	0	0	0	0	125	5	0	2	0	0	0	7	0	0	0	0	0	0	0	311
8:15 AM	0	168	12	1	0	0	181	8	147	0	0	0	0	155	9	0	1	2	0	0	12	0	0	0	1	0	0	1	349
8:30 AM	2	140	17	1	0	0	160	10	157	0	0	0	0	167	10	0	1	5	0	0	16	2	0	0	0	0	0	2	345
8:45 AM	0	204	9	2	0	0	215	14	135	0	0	0	0	149	13	0	2	5	0	0	20	1	0	0	1	0	0	2	386
Total	2	678	47	8	0	0	735	39	557	0	0	0	0	596	37	0	6	12	0	0	55	3	0	0	2	0	0	5	1391
Approach %	0.3	92.2	6.4	1.1	0.0	-	-	6.5	93.5	0.0	0.0	0.0	-	-	67.3	0.0	10.9	21.8	0.0	-	-	60.0	0.0	0.0	40.0	0.0	-	-	-
Total %	0.1	48.7	3.4	0.6	0.0	-	52.8	2.8	40.0	0.0	0.0	0.0	-	42.8	2.7	0.0	0.4	0.9	0.0	-	4.0	0.2	0.0	0.0	0.1	0.0	-	0.4	-
PHF	0.250	0.831	0.691	0.500	0.000	-	0.855	0.696	0.887	0.000	0.000	0.000	-	0.892	0.712	0.000	0.750	0.600	0.000	-	0.688	0.375	0.000	0.000	0.500	0.000	-	0.625	0.901
Lights	2	650	45	8	0	-	705	36	541	0	0	0	-	577	32	0	4	11	0	-	47	3	0	0	2	0	-	5	1334
% Lights	100.0	95.9	95.7	100.0	-	-	95.9	92.3	97.1	-	-	-	-	96.8	86.5	-	66.7	91.7	-	-	85.5	100.0	-	-	100.0	-	-	100.0	95.9
Buses	0	4	0	0	0	-	4	0	3	0	0	0	-	3	0	0	0	0	0	-	0	0	0	0	0	0	-	0	7
% Buses	0.0	0.6	0.0	0.0	-	-	0.5	0.0	0.5	-	-	-	-	0.5	0.0	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	-	-	0.0	0.5
Trucks	0	24	2	0	0	-	26	3	13	0	0	0	-	16	5	0	2	1	0	-	8	0	0	0	0	0	-	0	50
% Trucks	0.0	3.5	4.3	0.0	-	-	3.5	7.7	2.3	-	-	-	-	2.7	13.5	-	33.3	8.3	-	-	14.5	0.0	-	-	0.0	-	-	0.0	3.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

Count Name: Business Route 22 & Home Depot/Pep Boys
Site Code:
Start Date: 01/19/2023



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Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

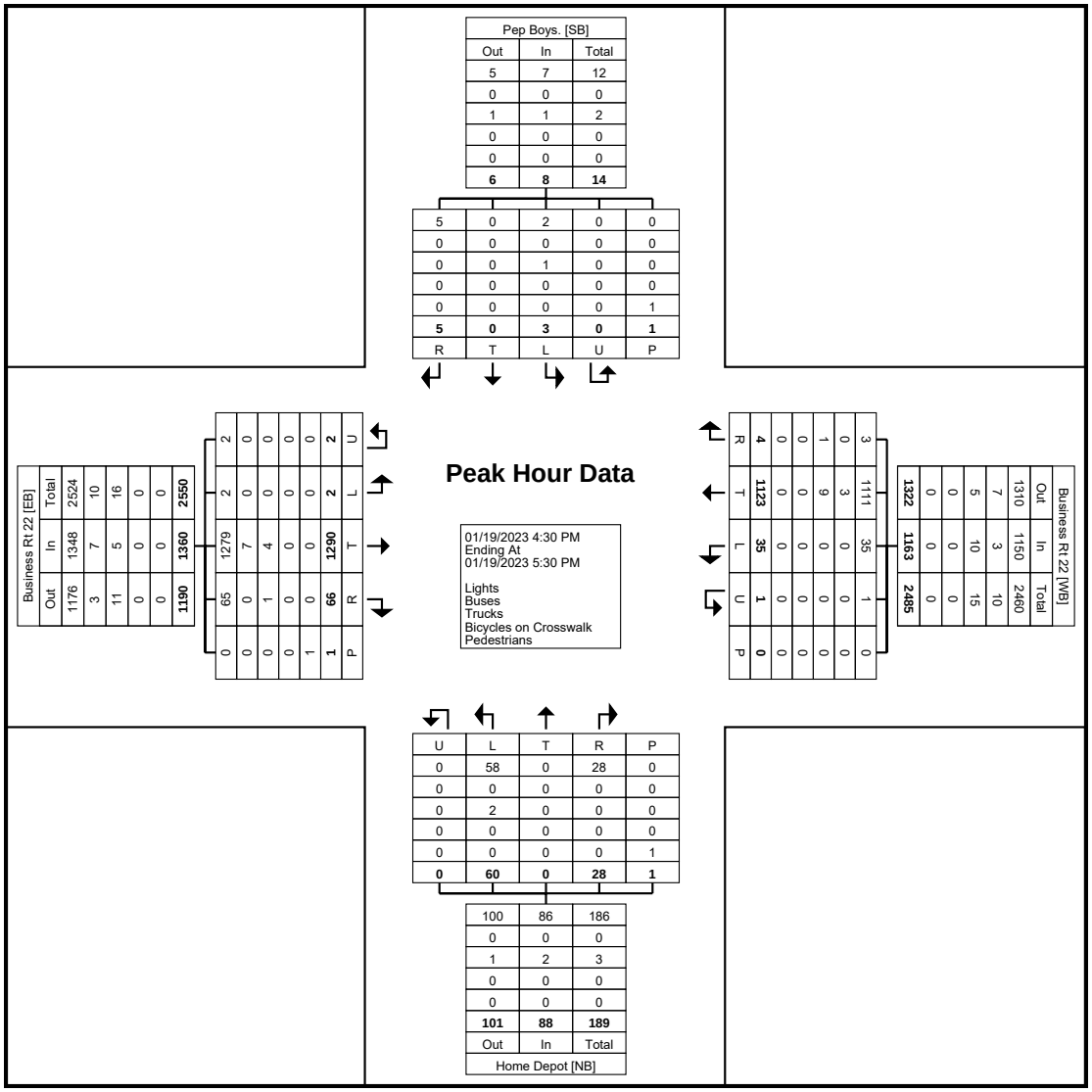
Count Name: Business Route 22 & Home Depot/Pep Boys
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Home Depot Northbound							Pep Boys. Southbound							
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Int. Total
4:30 PM	0	309	11	1	0	0	321	11	292	1	0	1	0	305	16	0	2	6	0	0	24	0	0	1	0	0	0	1	651
4:45 PM	0	305	17	2	1	1	325	5	254	1	0	0	0	260	15	0	2	2	0	1	19	0	0	0	1	0	0	1	605
5:00 PM	0	363	17	2	0	0	382	8	287	0	0	0	0	295	13	0	2	3	0	0	18	1	0	0	1	0	0	2	697
5:15 PM	2	313	14	2	1	0	332	11	290	2	0	0	0	303	16	0	2	9	0	0	27	2	0	0	2	0	1	4	666
Total	2	1290	59	7	2	1	1360	35	1123	4	0	1	0	1163	60	0	8	20	0	1	88	3	0	1	4	0	1	8	2619
Approach %	0.1	94.9	4.3	0.5	0.1	-	-	3.0	96.6	0.3	0.0	0.1	-	-	68.2	0.0	9.1	22.7	0.0	-	-	37.5	0.0	12.5	50.0	0.0	-	-	-
Total %	0.1	49.3	2.3	0.3	0.1	-	51.9	1.3	42.9	0.2	0.0	0.0	-	44.4	2.3	0.0	0.3	0.8	0.0	-	3.4	0.1	0.0	0.0	0.2	0.0	-	0.3	-
PHF	0.250	0.888	0.868	0.875	0.500	-	0.890	0.795	0.961	0.500	0.000	0.250	-	0.953	0.938	0.000	1.000	0.556	0.000	-	0.815	0.375	0.000	0.250	0.500	0.000	-	0.500	0.939
Lights	2	1279	58	7	2	-	1348	35	1111	3	0	1	-	1150	58	0	8	20	0	-	86	2	0	1	4	0	-	7	2591
% Lights	100.0	99.1	98.3	100.0	100.0	-	99.1	100.0	98.9	75.0	-	100.0	-	98.9	96.7	-	100.0	100.0	-	-	97.7	66.7	-	100.0	100.0	-	-	87.5	98.9
Buses	0	7	0	0	0	-	7	0	3	0	0	0	-	3	0	0	0	0	0	-	0	0	0	0	0	0	-	0	10
% Buses	0.0	0.5	0.0	0.0	0.0	-	0.5	0.0	0.3	0.0	-	0.0	-	0.3	0.0	-	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.4
Trucks	0	4	1	0	0	-	5	0	9	1	0	0	-	10	2	0	0	0	0	-	2	1	0	0	0	0	-	1	18
% Trucks	0.0	0.3	1.7	0.0	0.0	-	0.4	0.0	0.8	25.0	-	0.0	-	0.9	3.3	-	0.0	0.0	-	-	2.3	33.3	-	0.0	0.0	-	-	12.5	0.7
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-

Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Thursday, January 19, 2023
Location: 40.430503, -79.80606

Count Name: Business Route 22 & Home Depot/Pep Boys
Site Code:
Start Date: 01/19/2023
Page No: 6



Turning Movement Peak Hour Data Plot (4:30 PM)

Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Saturday, January 21, 2023
Location: 40.430533, -79.806018

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Count Name: Business Route 22 & Home Depot/Pep Boys (Sat)
Site Code:
Start Date: 01/21/2023
Page No: 1

Turning Movement Data

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Home Depot Northbound							Pep Boys Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
11:00 AM	0	270	28	4	0	0	302	13	225	0	0	0	0	238	22	0	2	6	0	0	30	0	0	1	1	0	0	2	572
11:15 AM	2	280	31	4	0	0	317	21	240	0	0	0	0	261	23	0	6	4	0	0	33	1	0	0	0	0	0	1	612
11:30 AM	1	315	26	0	0	0	342	26	275	0	0	0	0	301	23	0	8	3	0	0	34	1	0	0	1	0	0	2	679
11:45 AM	2	332	24	0	0	0	358	18	238	1	0	0	0	257	26	0	8	7	0	0	41	1	0	1	0	0	0	2	658
Hourly Total	5	1197	109	8	0	0	1319	78	978	1	0	0	0	1057	94	0	24	20	0	0	138	3	0	2	2	0	0	7	2521
12:00 PM	1	328	28	2	1	0	360	16	282	2	0	1	0	301	14	0	3	2	0	0	19	3	0	0	1	0	0	4	684
12:15 PM	1	313	34	1	1	0	350	22	274	3	0	0	0	299	25	0	1	7	0	0	33	2	0	2	0	0	0	4	686
12:30 PM	1	346	30	2	0	0	379	14	300	1	0	1	0	316	31	0	5	3	0	0	39	0	0	0	0	0	0	0	734
12:45 PM	0	322	32	1	0	0	355	31	323	1	0	0	0	355	27	0	4	6	0	0	37	1	0	1	0	0	0	2	749
Hourly Total	3	1309	124	6	2	0	1444	83	1179	7	0	2	0	1271	97	0	13	18	0	0	128	6	0	3	1	0	0	10	2853
1:00 PM	0	325	22	0	0	0	347	19	294	0	0	0	0	313	20	1	4	8	0	0	33	0	0	0	2	0	0	2	695
1:15 PM	1	306	32	2	0	0	341	18	309	2	0	0	0	329	26	0	0	11	0	0	37	0	0	0	0	0	0	0	707
1:30 PM	2	296	20	2	0	0	320	19	301	0	0	0	0	320	21	0	2	7	0	0	30	0	0	0	0	0	0	0	670
1:45 PM	0	315	34	1	0	0	350	12	319	1	0	0	0	332	21	1	4	3	0	0	29	1	0	0	2	0	0	3	714
Hourly Total	3	1242	108	5	0	0	1358	68	1223	3	0	0	0	1294	88	2	10	29	0	0	129	1	0	0	4	0	0	5	2786
2:00 PM	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Grand Total	11	3751	341	19	2	0	4124	229	3380	11	0	2	0	3622	279	2	47	67	0	0	395	10	0	5	7	0	0	22	8163
Approach %	0.3	91.0	8.3	0.5	0.0	-	-	6.3	93.3	0.3	0.0	0.1	-	-	70.6	0.5	11.9	17.0	0.0	-	-	45.5	0.0	22.7	31.8	0.0	-	-	-
Total %	0.1	46.0	4.2	0.2	0.0	-	50.5	2.8	41.4	0.1	0.0	0.0	-	44.4	3.4	0.0	0.6	0.8	0.0	-	4.8	0.1	0.0	0.1	0.1	0.0	-	0.3	-
Lights	11	3731	340	19	2	-	4103	228	3358	11	0	2	-	3599	276	2	47	66	0	-	391	10	0	5	7	0	-	22	8115
% Lights	100.0	99.5	99.7	100.0	100.0	-	99.5	99.6	99.3	100.0	-	100.0	-	99.4	98.9	100.0	100.0	98.5	-	-	99.0	100.0	-	100.0	100.0	-	-	100.0	99.4
Buses	0	3	0	0	0	-	3	0	6	0	0	0	-	6	0	0	0	0	0	-	0	0	0	0	0	0	-	0	9
% Buses	0.0	0.1	0.0	0.0	0.0	-	0.1	0.0	0.2	0.0	-	0.0	-	0.2	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.1
Trucks	0	17	1	0	0	-	18	1	16	0	0	0	-	17	3	0	0	1	0	-	4	0	0	0	0	0	-	0	39
% Trucks	0.0	0.5	0.3	0.0	0.0	-	0.4	0.4	0.5	0.0	-	0.0	-	0.5	1.1	0.0	0.0	1.5	-	-	1.0	0.0	-	0.0	0.0	-	-	0.0	0.5
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Saturday, January 21, 2023
Location: 40.430533, -79.806018

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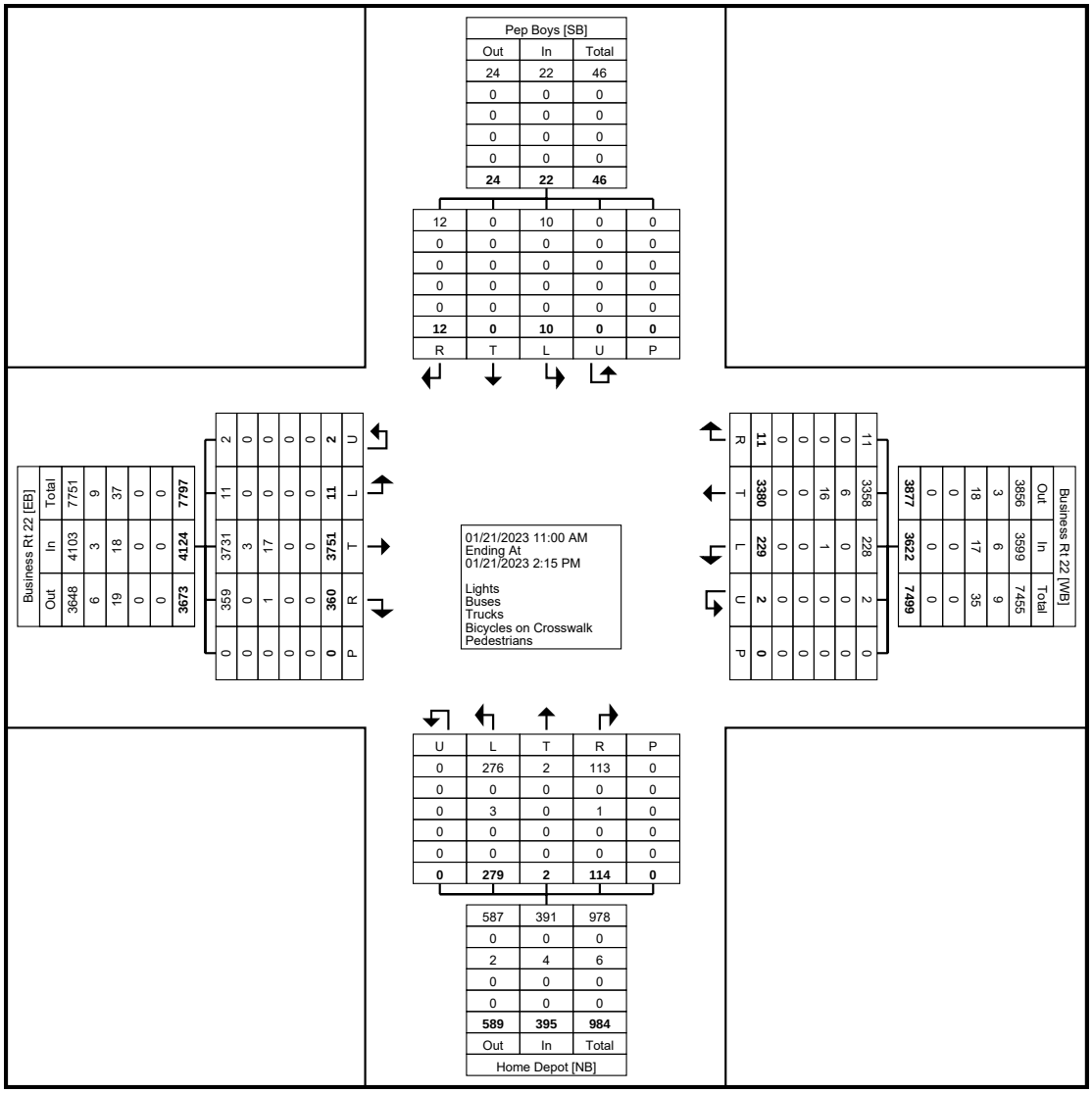
Site Code:
Start Date: 01/21/2023
Page No: 2



Turning Movement Data Plot

Allegheny County, PA
Business Rt 22 & Home Depot/Pep Boys
Saturday, January 21, 2023
Location: 40.430533, -79.806018

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Count Name: Business Route 22 & Home Depot/Pep Boys (Sat)
Site Code:
Start Date: 01/21/2023
Page No: 3

Turning Movement Peak Hour Data (12:30 PM)

Start Time	Business Rt 22 Eastbound							Business Rt 22 Westbound							Home Depot Northbound							Pep Boys Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
12:30 PM	1	346	30	2	0	0	379	14	300	1	0	1	0	316	31	0	5	3	0	0	39	0	0	0	0	0	0	0	734
12:45 PM	0	322	32	1	0	0	355	31	323	1	0	0	0	355	27	0	4	6	0	0	37	1	0	1	0	0	0	2	749
1:00 PM	0	325	22	0	0	0	347	19	294	0	0	0	0	313	20	1	4	8	0	0	33	0	0	0	2	0	0	2	695
1:15 PM	1	306	32	2	0	0	341	18	309	2	0	0	0	329	26	0	0	11	0	0	37	0	0	0	0	0	0	0	707
Total	2	1299	116	5	0	0	1422	82	1226	4	0	1	0	1313	104	1	13	28	0	0	146	1	0	1	2	0	0	4	2885
Approach %	0.1	91.4	8.2	0.4	0.0	-	-	6.2	93.4	0.3	0.0	0.1	-	-	71.2	0.7	8.9	19.2	0.0	-	-	25.0	0.0	25.0	50.0	0.0	-	-	-
Total %	0.1	45.0	4.0	0.2	0.0	-	49.3	2.8	42.5	0.1	0.0	0.0	-	45.5	3.6	0.0	0.5	1.0	0.0	-	5.1	0.0	0.0	0.0	0.1	0.0	-	0.1	-
PHF	0.500	0.939	0.906	0.625	0.000	-	0.938	0.661	0.949	0.500	0.000	0.250	-	0.925	0.839	0.250	0.650	0.636	0.000	-	0.936	0.250	0.000	0.250	0.250	0.000	-	0.500	0.963
Lights	2	1293	116	5	0	-	1416	82	1218	4	0	1	-	1305	104	1	13	27	0	-	145	1	0	1	2	0	-	4	2870
% Lights	100.0	99.5	100.0	100.0	-	-	99.6	100.0	99.3	100.0	-	100.0	-	99.4	100.0	100.0	100.0	96.4	-	-	99.3	100.0	-	100.0	100.0	-	-	100.0	99.5
Buses	0	0	0	0	0	-	0	0	1	0	0	0	-	1	0	0	0	0	0	-	0	0	0	0	0	0	-	0	1
% Buses	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	-	0.0	-	0.1	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
Trucks	0	6	0	0	0	-	6	0	7	0	0	0	-	7	0	0	0	1	0	-	1	0	0	0	0	0	-	0	14
% Trucks	0.0	0.5	0.0	0.0	-	-	0.4	0.0	0.6	0.0	-	0.0	-	0.5	0.0	0.0	0.0	3.6	-	-	0.7	0.0	-	0.0	0.0	-	-	0.0	0.5
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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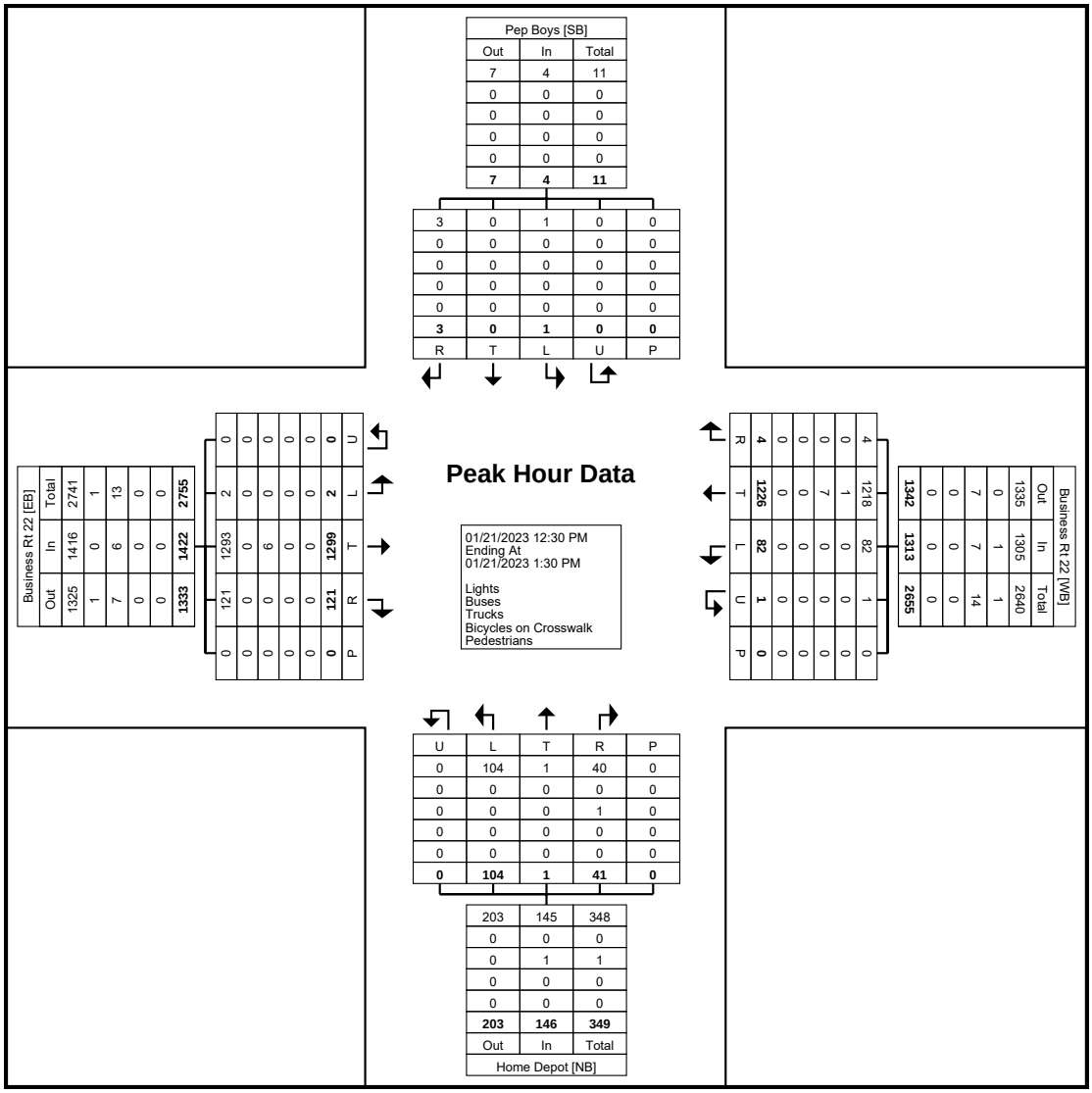


Turning Movement Peak Hour Data Plot (12:30 PM)

Appendix D:
Trip Generation and Distribution Calculations

3475 William Penn Highway Development Trip Generation and Distribution Calculations

Weekday Daily Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	11.398	Strip Retail Plaza (<40K)	822	*T = a*(X)+b*	42.20	229.68	50%	**711**	356	355	**0**	0	0	**711**	356	355	*0%*	**0**	0	0	**711**	356	355
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	125.03		50%	**125**	62	63	**0**	0	0	**125**	62	63	*0%*	**0**	0	0	**125**	62	63
Restaurant	2 Restaurants w/ Drive Thru	8.797	Fast Food w/ Drive Thru	934	*Rate*	467.48		50%	**4112**	2056	2056	**0**	0	0	**4112**	2056	2056	*0%*	**0**	0	0	**4112**	2056	2056
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	533.57		50%	**1334**	667	667	**0**	0	0	**1334**	667	667	*0%*	**0**	0	0	**1334**	667	667
Weekday Daily Total									**6282**	3141	3141	**0**	0	0	**6282**	3141	3141		**0**	0	0	**6282**	3141	3141

New Trips = External Trips - PassBy Trips

AM Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	11.398	Strip Retail Plaza (<40K)	822	*Rate*	2.36		60%	**27**	16	11	**4**	2	2	**23**	14	9	*30%*	**7**	4	3	**16**	10	6
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*T=a*(X)+b*	8.71	-0.75	61%	**8**	5	3	**0**	0	0	**8**	5	3	*29%*	**2**	1	1	**6**	4	2
Restaurant	2 Restaurants w/ Drive Thru	8.797	Fast Food w/ Drive Thru	934	*Rate*	44.61		51%	**392**	199	193	**2**	1	1	**390**	198	192	*50%*	**195**	99	96	**195**	99	96
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	85.88		51%	**215**	109	106	**2**	1	1	**213**	108	105	*90%*	**192**	97	95	**21**	11	10
Weekday AM Peak Hour Total									**642**	329	313	**8**	4	4	**634**	325	309		**396**	201	195	**238**	124	114

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By % New Trips = External Trips - PassBy Trips

PM Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	11.398	Strip Retail Plaza (<40K)	822	*Ln(T) = a*Ln(X) +b*	0.71	2.72	50%	**85**	43	42	**34**	22	12	**51**	21	30	*40%*	**20**	10	10	**31**	11	20
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	27.07		49%	**27**	13	14	**10**	6	4	**17**	7	10	*35%*	**6**	3	3	**11**	4	7
Restaurant	2 Restaurants w/ Drive Thru	8.797	Fast Food w/ Drive Thru	934	*Rate*	33.03		52%	**291**	151	140	**33**	12	21	**258**	139	119	*55%*	**142**	74	68	**116**	65	51
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	38.99		50%	**97**	49	48	**11**	4	7	**86**	45	41	*98%*	**84**	44	40	**2**	1	1
Weekday PM Peak Hour Totals									**500**	256	244	**88**	44	44	**412**	212	200		**252**	131	121	**160**	81	79

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By % New Trips = External Trips - PassBy Trips

Saturday Peak Hour Trip Generation - 3475 William Penn Highway - Commercial/Retail Development

Development		Size	Land Use	ITE #	Equation	A	B	% Entering	Base Vehicle Total Trips			Internal Trips			External Vehicle Trips			Pass-By %	Pass-By Trips			New Trips		
									Trips	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting		Trips	Entering	Exiting	Trips	Entering	Exiting
Retail	Retail Plaza	11.398	Strip Retail Plaza (<40K)	822	*Rate*	6.57		51%	**75**	38	37	**19**	11	8	**56**	27	29	*31%*	**17**	9	8	**39**	18	21
Retail	Standalone Drive-Thru ATM	1.000	Drive-In Bank	912	*Rate*	27.67		49%	**28**	14	14	**7**	4	3	**21**	10	11	*38%*	**8**	4	4	**13**	6	7
Restaurant	2 Restaurants w/ Drive Thru	8.797	Fast Food w/ Drive Thru	934	*Rate*	55.25		51%	**486**	248	238	**18**	8	10	**468**	240	228	*45%*	**211**	108	103	**257**	132	125
Restaurant	Coffee/Donut Shop w/Drive Thru	2.500	Coffee/Donut Shop w/Drive Thru	937	*Rate*	87.91		50%	**220**	110	110	**8**	3	5	**212**	107	105	*84%*	**178**	89	89	**34**	18	16
Saturday Peak Hour Total									**809**	410	399	**52**	26	26	**757**	384	373		**414**	210	204	**343**	174	169

Internal Trips per NCHRP Report 684. External Trips = Total Trips - Internal Trips Pass-By Trips = External Trips * Pass-By % New Trips = External Trips - PassBy Trips

Note: ITE does not provide pass-by rate data for Land Use 822 (Strip Retail Plaza <40KSF); therefore, pass-by rate data from Land Use 821 (Shopping Plaza 40-150ksf) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 821 (Shopping Plaza 40-150 ksf) during the weekday AM peak hour; therefore, it was assumed that the weekday AM peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

Note: ITE does not provide pass-by rate data for Land Use 934 (Fast Food Restaurant with Drive-Through) for the Saturday peak hour; therefore, it was assumed that the Saturday peak hour pass-by rate would reflect 10% less than the Weekday PM peak hour pass-by rate.

Note: ITE does not provide pass-by rate data for Land Use 937 (Coffee/Donut Shop with Drive-Through Window); therefore, pass-by rate data from Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) was utilized. In addition, ITE does not provide pass-by rate data for Land Use 938 (Coffee/Donut Shop with Drive-Through and No Indoor Seating) for the Saturday midday peak hour; therefore, it was assumed that the weekday midday peak hour pass-by rate would reflect the Saturday midday peak hour pass-by rate.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	rev 1/12/2023
Analysis Year:	Projected (Build)	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	12,398	sf	35	21	14
Restaurant	934+934+937	11,297	sf	607	308	299
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				642	329	313

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		2	0	0	0
Restaurant	0	2		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	642	329	313
Internal Capture Percentage	1%	1%	1%
External Vehicle-Trips[5]	634	325	309
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	14%
Restaurant	1%	1%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	3475 William Penn Highway Development
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	21	21	1.00	14	14
Restaurant	1.00	308	308	1.00	299	299
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		2	0	2	0
Restaurant	93	42		0	12	9
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		7	71	0	0	0
Retail	0		154	0	0	0
Restaurant	0	2		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	4	62	0		0
Hotel	0	1	18	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	2	19	21	19	0	0
Restaurant	2	306	308	306	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	2	12	14	12	0	0
Restaurant	2	297	299	297	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	rev 1/12/2023
Analysis Year:	Projected (Build)	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	12,398	sf	112	56	56
Restaurant	934+934+937	11,297	sf	388	200	188
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				500	256	244

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		16	0	0	0
Restaurant	0	28		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	500	256	244
Internal Capture Percentage	18%	17%	18%
External Vehicle-Trips[5]	412	212	200
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	50%	29%
Restaurant	8%	15%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).
[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
[6]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	3475 William Penn Highway Development
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0		1.00	0	0
Retail	1.00	56	56		1.00	56	56
Restaurant	1.00	200	200		1.00	188	188
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	0	0		1.00	0	0
Hotel	1.00	0	0		1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	1		16	2	15	3
Restaurant	6	77		15	34	13
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		4	4	0	0	0
Retail	0		58	0	0	0
Restaurant	0	28		0	0	0
Cinema/Entertainment	0	2	6		0	0
Residential	0	6	28	0		0
Hotel	0	1	10	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0		0	0	0
Retail	28	28	56		28	0	0
Restaurant	16	184	200		184	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	0	0	0		0	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0		0	0	0
Retail	16	40	56		40	0	0
Restaurant	28	160	188		160	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	0	0	0		0	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	3475 William Penn Highway Development	**Organization:**	Traffic Planning and Design, Inc. (TPD)
Project Location:	Wilkins Twp, Allegheny Co.	**Performed By:**	M. Southern
Scenario Description:		**Date:**	rev 1/12/2023
Analysis Year:	Projected (Build)	**Checked By:**	
Analysis Period:	**Saturday Midday Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	822+912	12,398	sf	103	52	51
Restaurant	934+934+937	11,297	sf	706	358	348
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
				809	410	399

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		11	0	0	0
Restaurant	0	15		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	809	410	399
Internal Capture Percentage	6%	6%	7%
External Vehicle-Trips[5]	757	384	373
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	29%	22%
Restaurant	3%	4%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	3475 William Penn Highway Development
Analysis Period:	**Saturday Midday Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	52	52	1.00	51	51
Restaurant	1.00	358	358	1.00	348	348
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	8		11	1	10	1
Restaurant	59	96		14	38	17
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	45	0	0	0
Retail	0		141	0	0	0
Restaurant	0	15		0	0	0
Cinema/Entertainment	0	1	5		0	0
Residential	0	7	61	0		0
Hotel	0	2	20	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	15	37	52	37	0	0
Restaurant	11	347	358	347	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	11	40	51	40	0	0
Restaurant	15	333	348	333	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

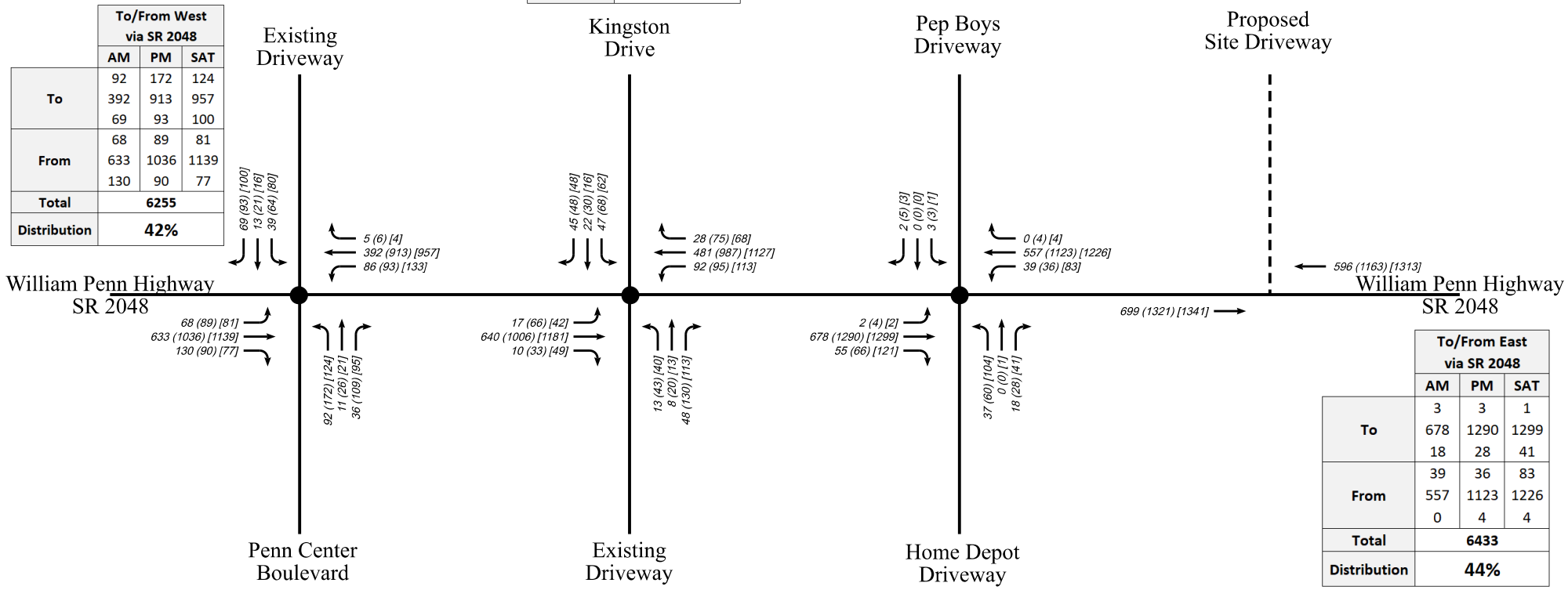
[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

	To/From North via Kingston Dr		
	AM	PM	SAT
To	17	66	42
	8	20	13
	28	75	68
From	47	68	62
	22	30	16
	45	48	48
Total	723		
Distribution	5%		



	To/From West via SR 2048		
	AM	PM	SAT
To	92	172	124
	392	913	957
	69	93	100
From	68	89	81
	633	1036	1139
	130	90	77
Total	6255		
Distribution	42%		

	To/From East via SR 2048		
	AM	PM	SAT
To	3	3	1
	678	1290	1299
	18	28	41
From	39	36	83
	557	1123	1226
	0	4	4
Total	6433		
Distribution	44%		

	To/From South via Penn Center		
	AM	PM	SAT
To	130	90	77
	13	21	16
	86	93	133
From	92	172	124
	11	26	21
	36	109	95
Total	1345		
Distribution	9%		

KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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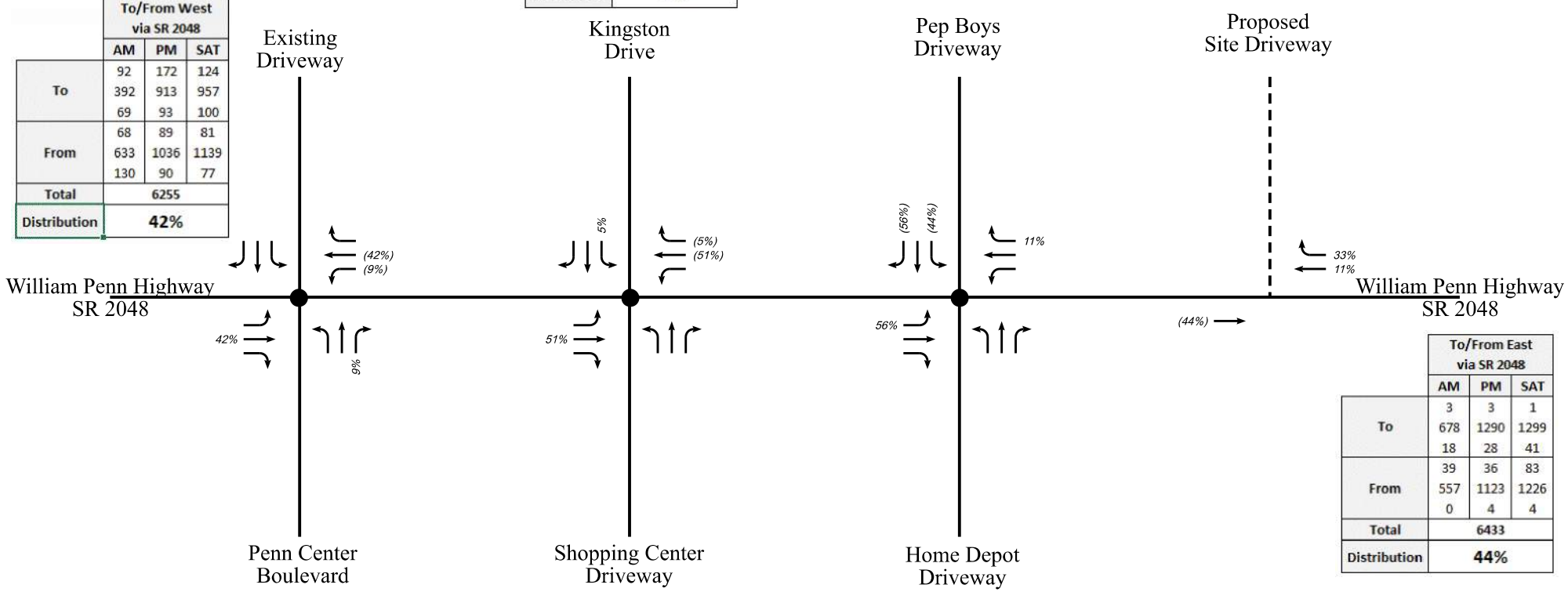
FIGURE 3

2023 EXISTING CONDITION
PEAK HOUR TRAFFIC VOLUMES
AM (PM) [SAT]

	To/From North via Kingston Dr		
	AM	PM	SAT
To	17	66	42
	8	20	13
	28	75	68
From	47	68	62
	22	30	16
	45	48	48
Total	723		
Distribution	5%		

	To/From West via SR 2048		
	AM	PM	SAT
To	92	172	124
	392	913	957
	69	93	100
From	68	89	81
	633	1036	1139
	130	90	77
Total	6255		
Distribution	42%		



	To/From East via SR 2048		
	AM	PM	SAT
To	3	3	1
	678	1290	1299
	18	28	41
From	39	36	83
	557	1123	1226
	0	4	4
Total	6433		
Distribution	44%		

	To/From South via Penn Center		
	AM	PM	SAT
To	130	90	77
	13	21	16
	86	93	133
From	92	172	124
	11	26	21
	36	109	95
Total	1345		
Distribution	9%		

KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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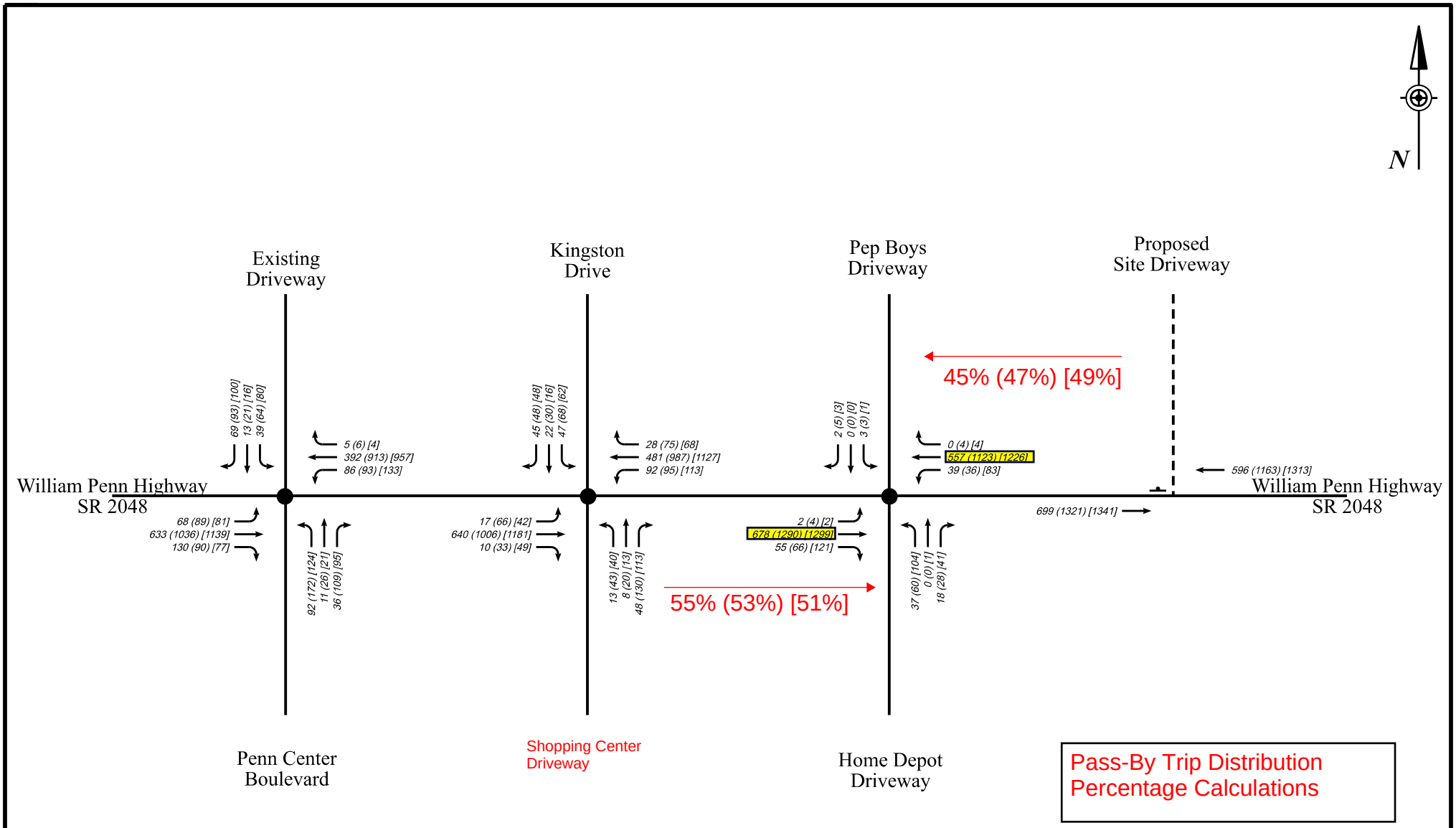
FIGURE 7

PRIMARY (NEW) TRIP DISTRIBUTION PERCENTAGES
ARRIVAL % (DEPARTURE %)



Pass-By Trip Distribution Percentage Calculations

KEY:

- **STOP CONTROLLED**
- **SIGNALIZED INTERSECTION**
- **PROPOSED DRIVEWAY**

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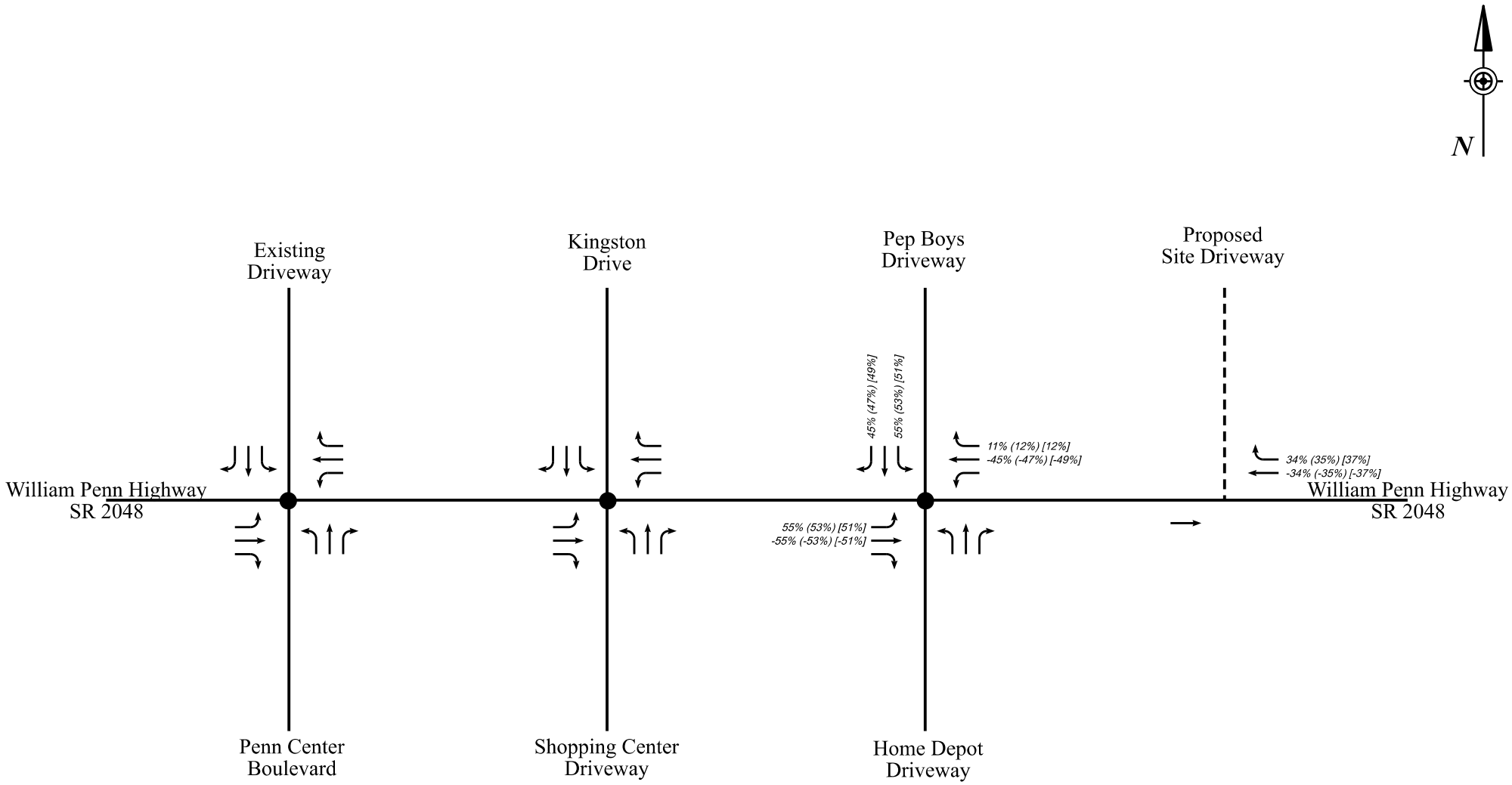
FIGURE 3

EXISTING YEAR 2023
PEAK HOUR VOLUMES



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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FIGURE 8

PASS-BY TRIP DISTRIBUTION PERCENTAGES
AM (PM) [SAT]

Background Development Trip Generation and Distribution Calculations

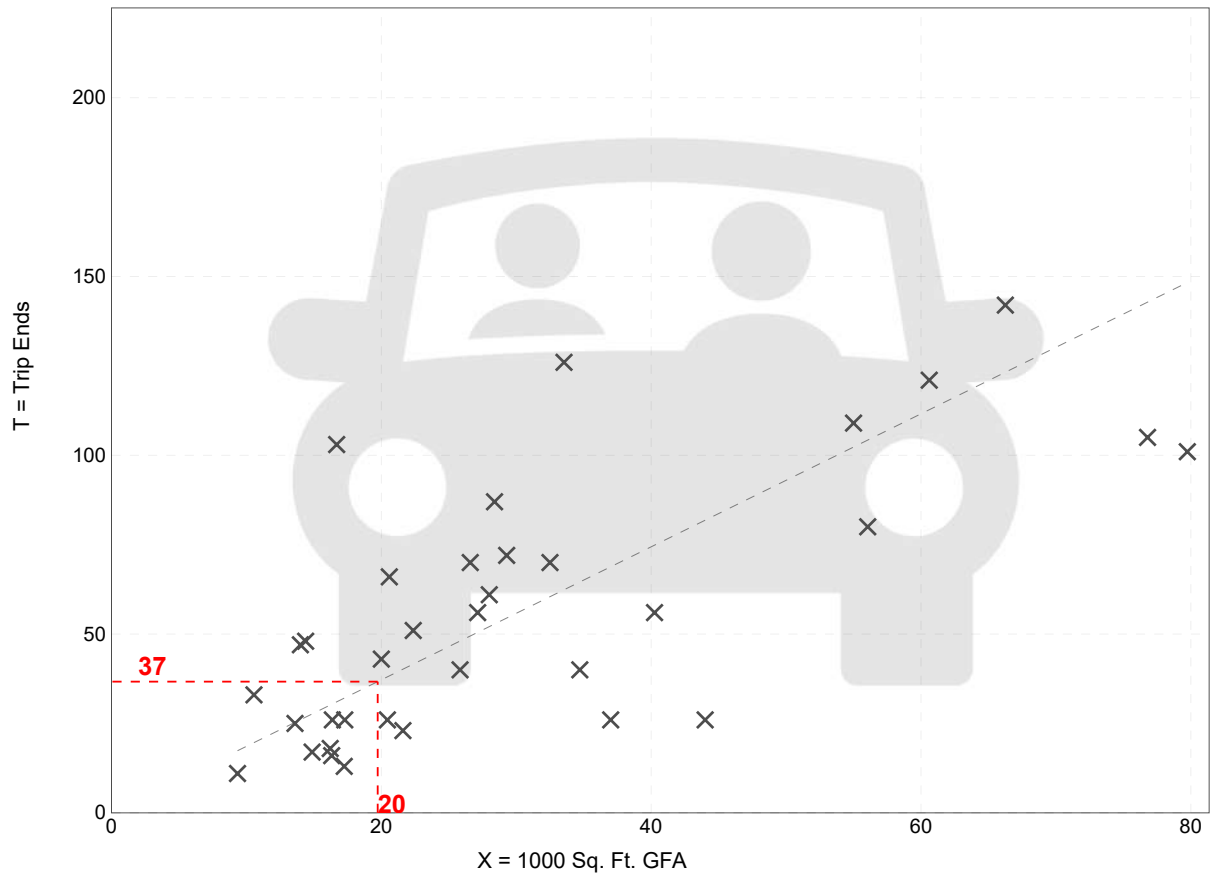
Automobile Sales (New)
(840)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	35
Avg. 1000 Sq. Ft. GFA:	30
Directional Distribution:	73% entering, 27% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.86	0.59 - 6.17	0.94

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

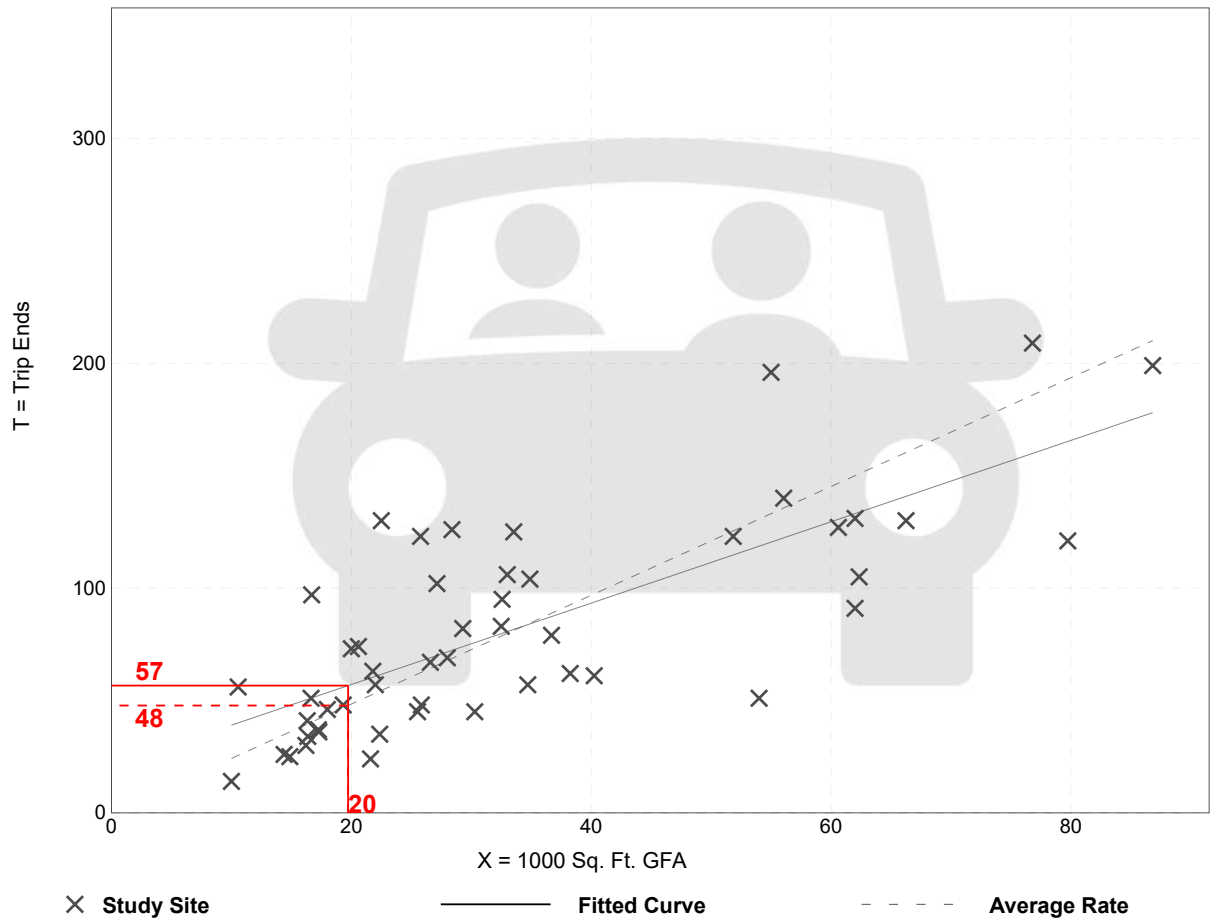
Automobile Sales (New)
(840)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. 1000 Sq. Ft. GFA:	34
Directional Distribution:	40% entering, 60% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
2.42	0.94 - 5.81	0.98

Data Plot and Equation



Fitted Curve Equation: T = 1.81(X) + 20.91

R^2= 0.57

Automobile Sales (New)
(840)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Saturday, Peak Hour of Generator**

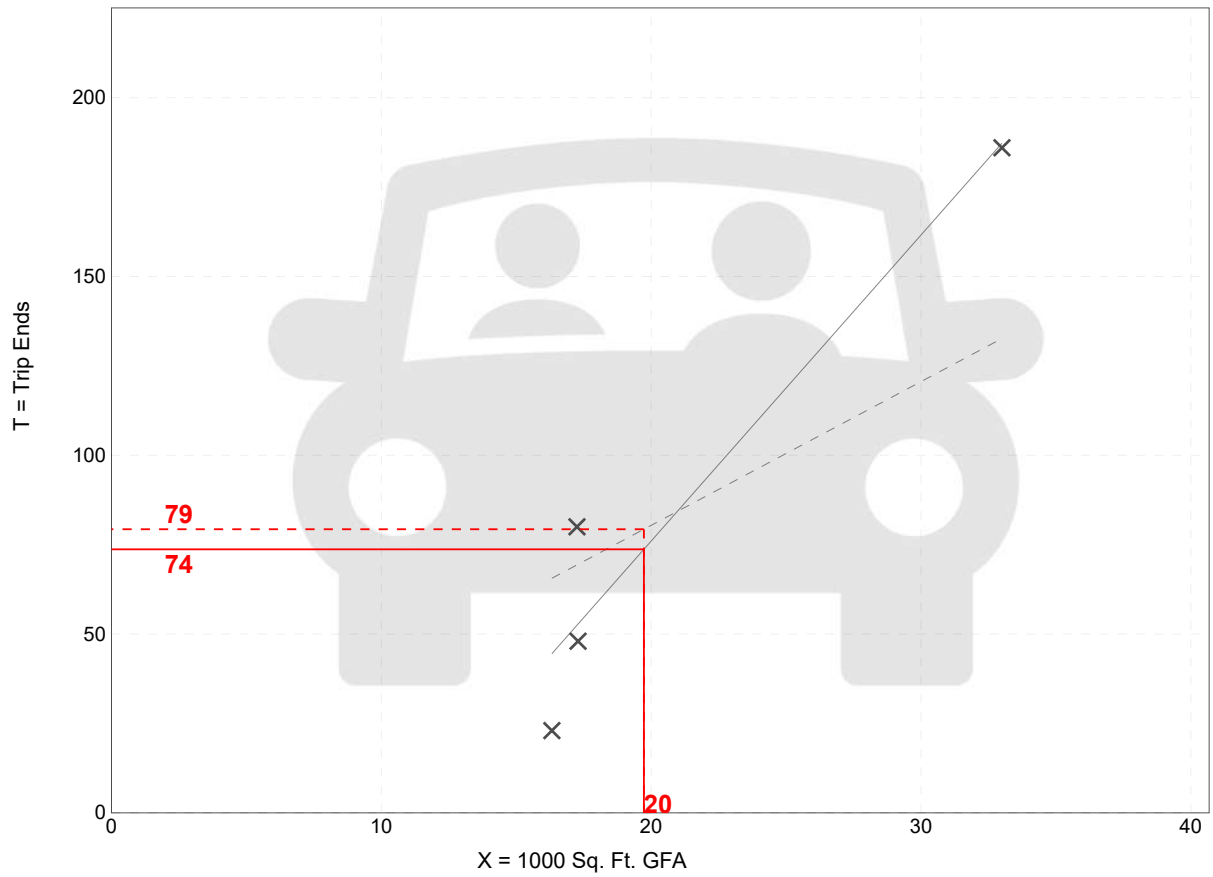
Setting/Location: **General Urban/Suburban**
Number of Studies: 4
Avg. 1000 Sq. Ft. GFA: 21
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
4.02	1.41 - 5.64	1.92

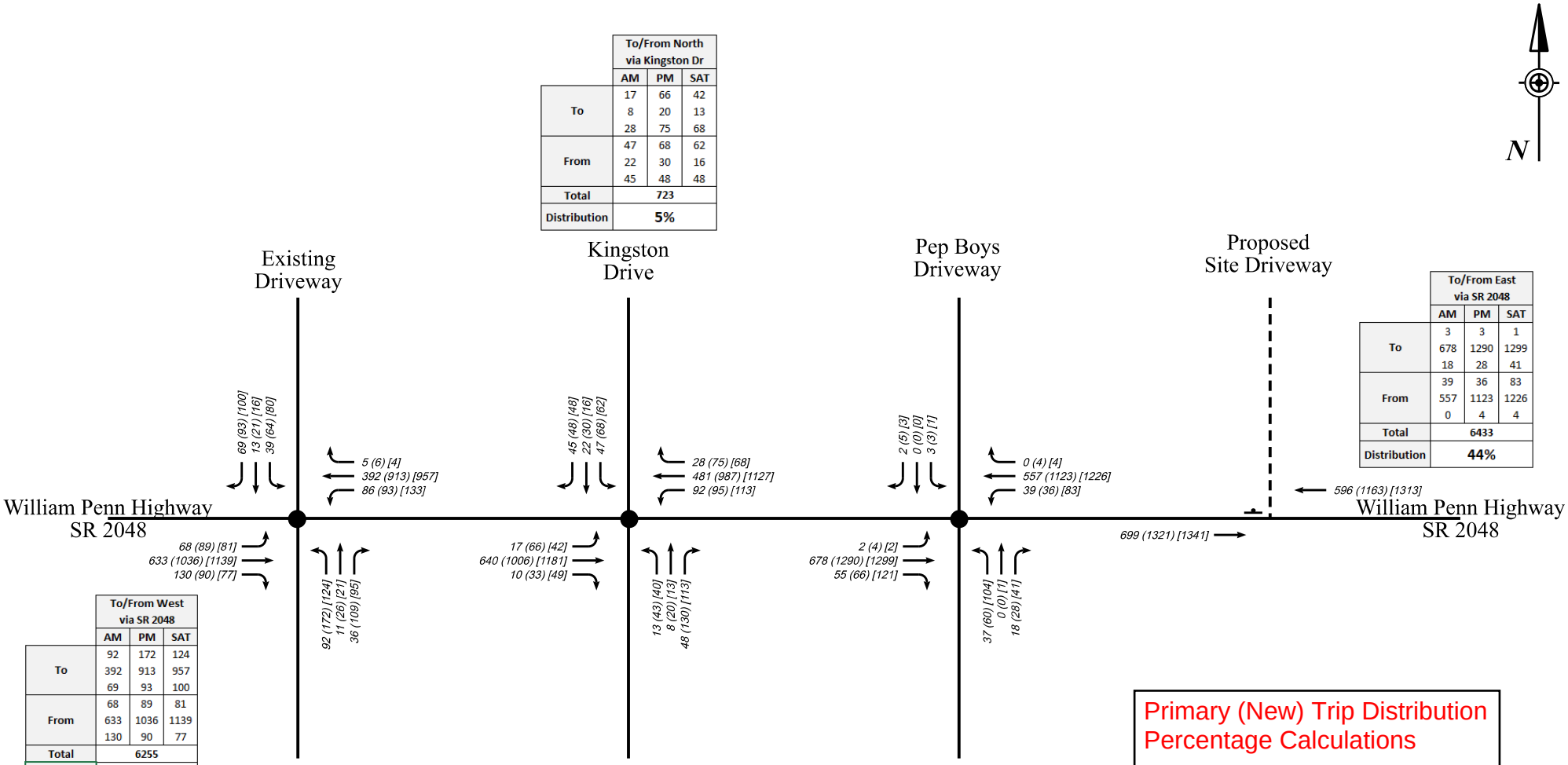
Data Plot and Equation

Caution – Small Sample Size



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: T = 8.56(X) - 95.19 **R^2= 0.92**



	To/From North via Kingston Dr		
	AM	PM	SAT
To	17	66	42
	8	20	13
	28	75	68
From	47	68	62
	22	30	16
	45	48	48
Total	723		
Distribution	5%		

	To/From East via SR 2048		
	AM	PM	SAT
To	3	3	1
	678	1290	1299
	18	28	41
From	39	36	83
	557	1123	1226
	0	4	4
Total	6433		
Distribution	44%		

	To/From West via SR 2048		
	AM	PM	SAT
To	92	172	124
	392	913	957
	69	93	100
From	68	89	81
	633	1036	1139
	130	90	77
Total	6255		
Distribution	42%		

	To/From South via Penn Center		
	AM	PM	SAT
To	130	90	77
	13	21	16
	86	93	133
From	92	172	124
	11	26	21
	36	109	95
Total	1345		
Distribution	9%		

Primary (New) Trip Distribution Percentage Calculations

KEY:

- **STOP CONTROLLED**
- **SIGNALIZED INTERSECTION**
- **PROPOSED DRIVEWAY**

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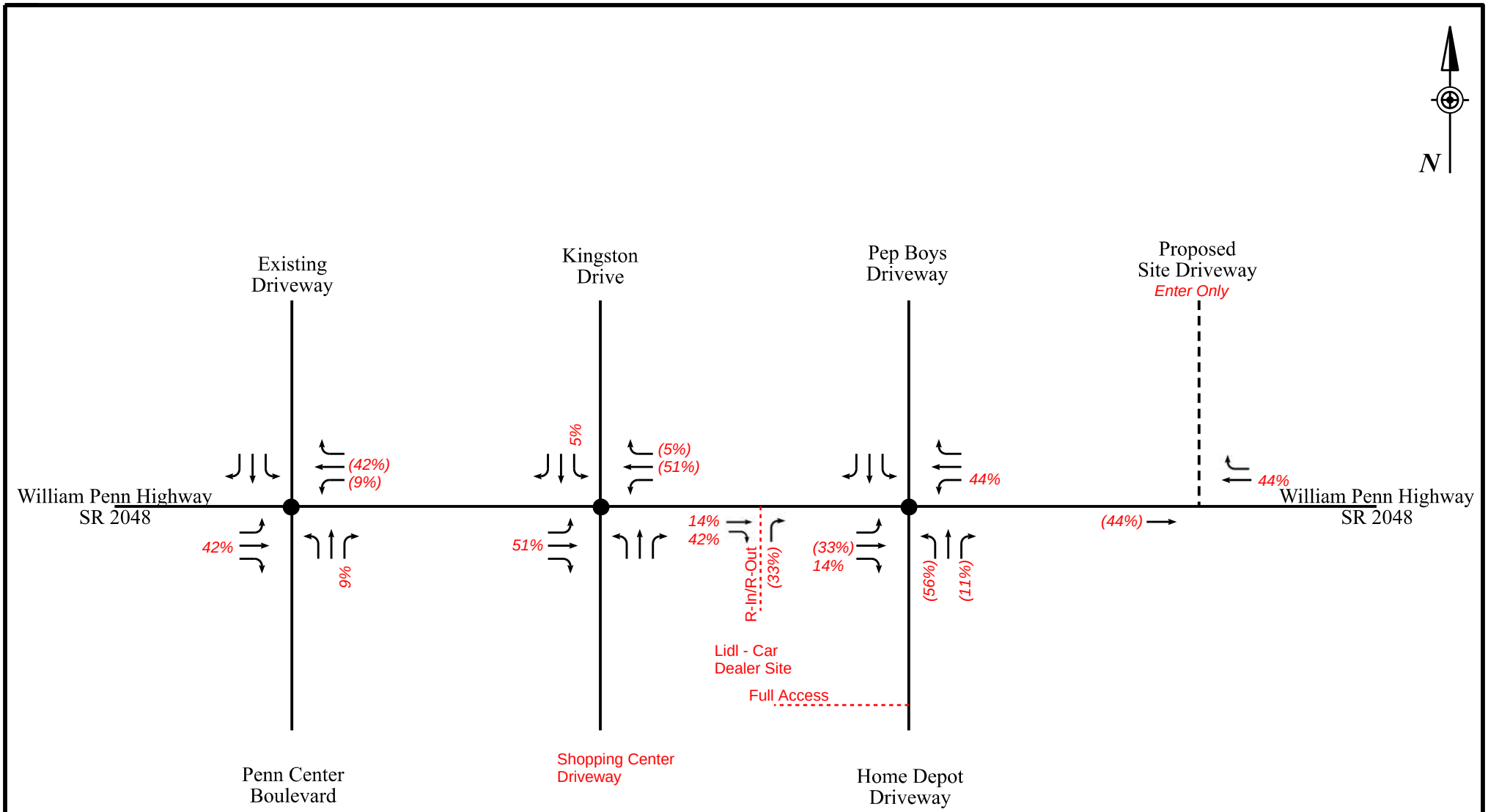
FIGURE 3

EXISTING YEAR 2023
PEAK HOUR VOLUMES



KEY:

- **STOP CONTROLLED**
- **SIGNALIZED INTERSECTION**
- **PROPOSED DRIVEWAY**

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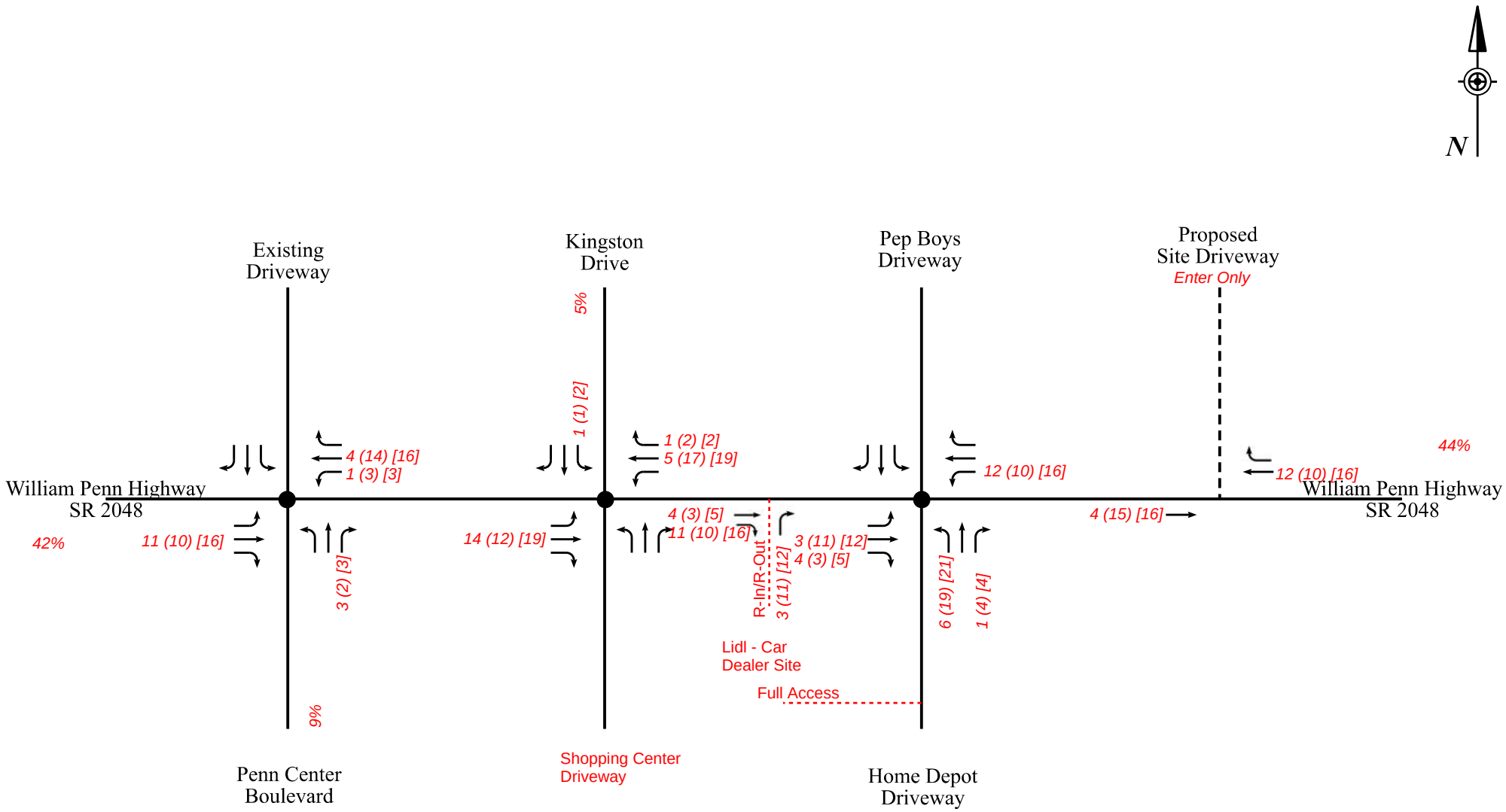
FIGURE

Primary (New) Trip Distribution Percentages
Background Development (Lidl - Car Dealership)
Arrival % (Departure %)



Trip Gen:

AM = 27 in/10 out
PM = 23 in/34 out
SAT = 37 in/37 out

KEY:

- **STOP CONTROLLED**
- **SIGNALIZED INTERSECTION**
- **PROPOSED DRIVEWAY**

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FIGURE

Primary (New) Trips
Background Development (Lidl - Car Dealership)
AM (PM [SAT])

Appendix E:
Volume Development Worksheets

TPD# BEND.00008
3/27/2023
Traffic Volumes Worksheet

Intersection:	**William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway**								
Synchro Node:	**1**	**Adjacent intersections:**	**West**		**East**	**2**	**North**		**South**

Time Period: Weekday A.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**68**	**633**	**130**	**86**	**392**	**5**	**92**	**11**	**36**	**39**	**13**	**69**	**1574**
2023 Count Heavy Vehicles	9	19	1	3	17	0	0	1	6	8	0	4	68
													0
Balancing													0
2023 Existing Volumes (Balanced)	**68**	**633**	**130**	**86**	**392**	**5**	**92**	**11**	**36**	**39**	**13**	**69**	**1574**
Car Dealership (Background Trips)		11		1	4				3				19
													0
Car Dealership (Background Trips) Total	**0**	**11**	**0**	**1**	**4**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	19
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**11**	**0**	**1**	**4**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**19**
Base Growth (0.5% linear over 1 yrs)	0	3	1	0	2	0	0	0	0	0	0	0	6
2024 Base Volumes	**68**	**647**	**131**	**87**	**398**	**5**	**92**	**11**	**39**	**39**	**13**	**69**	**1599**
Primary (New) Site Trips		52		10	48				11				121
Pass-By Site Trips					-2								-2
Total Site Trip Distribution	**0**	**52**	**0**	**10**	**46**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**119**
2024 Projected Volumes	**68**	**699**	**131**	**97**	**444**	**5**	**92**	**11**	**50**	**39**	**13**	**69**	**1718**
Base Growth (0.5% linear over 6 yrs)	2	19	4	3	12	0	3	0	1	1	0	2	47
2029 Base Volumes	**70**	**663**	**134**	**90**	**408**	**5**	**95**	**11**	**40**	**40**	**13**	**71**	**1640**
2029 Projected Volumes	**70**	**715**	**134**	**100**	**454**	**5**	**95**	**11**	**51**	**40**	**13**	**71**	**1759**

Existing (Count) Heavy Vehicles %	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%	**PHF**
													0.96

Time Period: Weekday P.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**89**	**1036**	**90**	**93**	**913**	**6**	**172**	**26**	**109**	**64**	**21**	**93**	**2712**
2023 Count Heavy Vehicles	1	7	0	1	11	0	0	0	2	0	1	2	25
Balancing													0
2023 Existing Volumes (Balanced)	**89**	**1036**	**90**	**93**	**913**	**6**	**172**	**26**	**109**	**64**	**21**	**93**	**2712**
Car Dealership (Background Trips)		10		3	14				2				29
													0
Car Dealership (Background Trips) Total	**0**	**10**	**0**	**3**	**14**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	29
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**10**	**0**	**3**	**14**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**29**
Base Growth (0.5% linear over 1 yrs)	0	5	0	0	5	0	1	0	1	0	0	0	12
2024 Base Volumes	**89**	**1051**	**90**	**96**	**932**	**6**	**173**	**26**	**112**	**64**	**21**	**93**	**2753**
Primary (New) Site Trips		38		6	29				8				81
Pass-By Site Trips					5								5
Total Site Trip Distribution	**0**	**38**	**0**	**6**	**34**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**86**
2024 Projected Volumes	**89**	**1089**	**90**	**102**	**966**	**6**	**173**	**26**	**120**	**64**	**21**	**93**	**2839**
Base Growth (0.5% linear over 6 yrs)	3	31	3	3	28	0	5	1	3	2	1	3	83
2029 Base Volumes	**92**	**1077**	**93**	**99**	**955**	**6**	**177**	**27**	**114**	**66**	**22**	**96**	**2824**
2029 Projected Volumes	**92**	**1115**	**93**	**105**	**989**	**6**	**177**	**27**	**122**	**66**	**22**	**96**	**2910**

Existing (Count) Heavy Vehicles %	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%	**PHF**
													0.93

Time Period: Saturday Midday Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**81**	**1139**	**77**	**133**	**957**	**4**	**124**	**21**	**95**	**80**	**16**	**100**	**2827**
2023 Count Heavy Vehicles	0	5	0	2	6	0	1	1	1	0	0	1	17
Balancing													0
2023 Existing Volumes (Balanced)	**81**	**1139**	**77**	**133**	**957**	**4**	**124**	**21**	**95**	**80**	**16**	**100**	**2827**
Car Dealership (Background Trips)		16		3	16				3				38
													0
Car Dealership (Background Trips) Total	**0**	**16**	**0**	**3**	**16**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	38
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**16**	**0**	**3**	**16**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**38**
Base Growth (0.5% linear over 1 yrs)	0	6	0	1	5	0	1	0	0	0	0	0	13
2024 Base Volumes	**81**	**1161**	**77**	**137**	**978**	**4**	**125**	**21**	**98**	**80**	**16**	**100**	**2878**
Primary (New) Site Trips		73		15	71				15				174
Pass-By Site Trips					-3								-3
Total Site Trip Distribution	**0**	**73**	**0**	**15**	**68**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**171**
2024 Projected Volumes	**81**	**1234**	**77**	**152**	**1046**	**4**	**125**	**21**	**113**	**80**	**16**	**100**	**3049**
Base Growth (0.5% linear over 6 yrs)	2	35	2	4	29	0	4	1	3	2	0	3	85
2029 Base Volumes	**83**	**1190**	**79**	**140**	**1002**	**4**	**128**	**22**	**101**	**82**	**16**	**103**	**2950**
2029 Projected Volumes	**83**	**1263**	**79**	**155**	**1070**	**4**	**128**	**22**	**116**	**82**	**16**	**103**	**3121**

Existing (Count) Heavy Vehicles %	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%	**PHF**
													0.97

TPD# BEND.00008
3/27/2023
Traffic Volumes Worksheet

Intersection:	**William Penn Highway (SR 2048) & Kingston Drive/Driveway**									
Synchro Node:	**2**	**Adjacent intersections:**	**West**	**1**	**East**	**3**	**North**		**South**	

Time Period: Weekday A.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**17**	**640**	**10**	**92**	**481**	**28**	**13**	**8**	**48**	**47**	**22**	**45**	**1451**
2023 Count Heavy Vehicles	0	27	0	0	22	1	0	1	1	0	1	6	59
													0
Balancing								0					0
2023 Existing Volumes (Balanced)	**17**	**640**	**10**	**92**	**481**	**28**	**13**	**8**	**48**	**47**	**22**	**45**	**1451**
Car Dealership (Background Trips)		14			5	1				1			21
													0
Car Dealership (Background Trips) Total	**0**	**14**	**0**	**0**	**5**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	21
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**14**	**0**	**0**	**5**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**21**
Base Growth (0.5% linear over 1 yrs)	0	3	0	0	2	0	0	0	0	0	0	0	5
2024 Base Volumes	**17**	**657**	**10**	**92**	**488**	**29**	**13**	**8**	**48**	**48**	**22**	**45**	**1477**
Primary (New) Site Trips		63			58	6				6			133
Pass-By Site Trips					-2								-2
Total Site Trip Distribution	**0**	**63**	**0**	**0**	**56**	**6**	**0**	**0**	**0**	**6**	**0**	**0**	**131**
2024 Projected Volumes	**17**	**720**	**10**	**92**	**544**	**35**	**13**	**8**	**48**	**54**	**22**	**45**	**1608**
Base Growth (0.5% linear over 6 yrs)	1	19	0	3	15	1	0	0	1	1	1	1	43
2029 Base Volumes	**18**	**673**	**10**	**95**	**501**	**30**	**13**	**8**	**49**	**49**	**23**	**46**	**1515**
2029 Projected Volumes	**18**	**736**	**10**	**95**	**557**	**36**	**13**	**8**	**49**	**55**	**23**	**46**	**1646**

Existing (Count) Heavy Vehicles %	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%	**PHF**
													0.92

Time Period: Weekday P.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**66**	**1006**	**33**	**95**	**987**	**75**	**43**	**20**	**130**	**68**	**30**	**48**	**2601**
2023 Count Heavy Vehicles	0	10	0	0	11	0	0	1	3	1	0	1	27
Balancing													0
2023 Existing Volumes (Balanced)	**66**	**1006**	**33**	**95**	**987**	**75**	**43**	**20**	**130**	**68**	**30**	**48**	**2601**
Car Dealership (Background Trips)		12			17	2				1			32
													0
Car Dealership (Background Trips) Total	**0**	**12**	**0**	**0**	**17**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	32
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**12**	**0**	**0**	**17**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**32**
Base Growth (0.5% linear over 1 yrs)	0	5	0	0	5	0	0	0	1	0	0	0	11
2024 Base Volumes	**66**	**1023**	**33**	**95**	**1009**	**77**	**43**	**20**	**131**	**69**	**30**	**48**	**2644**
Primary (New) Site Trips		46			35	4				5			90
Pass-By Site Trips					5								5
Total Site Trip Distribution	**0**	**46**	**0**	**0**	**40**	**4**	**0**	**0**	**0**	**5**	**0**	**0**	**95**
2024 Projected Volumes	**66**	**1069**	**33**	**95**	**1049**	**81**	**43**	**20**	**131**	**74**	**30**	**48**	**2739**
Base Growth (0.5% linear over 6 yrs)	2	31	1	3	30	2	1	1	4	2	1	1	79
2029 Base Volumes	**68**	**1049**	**34**	**98**	**1034**	**79**	**44**	**21**	**134**	**71**	**31**	**49**	**2712**
2029 Projected Volumes	**68**	**1095**	**34**	**98**	**1074**	**83**	**44**	**21**	**134**	**76**	**31**	**49**	**2807**

Existing (Count) Heavy Vehicles %	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%	**PHF**
													0.96

Time Period: Saturday Midday Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**42**	**1181**	**49**	**113**	**1127**	**68**	**40**	**13**	**113**	**62**	**16**	**48**	**2872**
2023 Count Heavy Vehicles	0	10	0	2	5	0	0	1	0	1	0	1	20
Balancing													0
2023 Existing Volumes (Balanced)	**42**	**1181**	**49**	**113**	**1127**	**68**	**40**	**13**	**113**	**62**	**16**	**48**	**2872**
Car Dealership (Background Trips)		19			19	2				2			42
													0
Car Dealership (Background Trips) Total	**0**	**19**	**0**	**0**	**19**	**2**	**0**	**0**	**0**	**2**	**0**	**0**	42
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**19**	**0**	**0**	**19**	**2**	**0**	**0**	**0**	**2**	**0**	**0**	**42**
Base Growth (0.5% linear over 1 yrs)	0	6	0	1	6	0	0	0	1	0	0	0	14
2024 Base Volumes	**42**	**1206**	**49**	**114**	**1152**	**70**	**40**	**13**	**114**	**64**	**16**	**48**	**2928**
Primary (New) Site Trips		88			86	9				9			192
Pass-By Site Trips					-3								-3
Total Site Trip Distribution	**0**	**88**	**0**	**0**	**83**	**9**	**0**	**0**	**0**	**9**	**0**	**0**	**189**
2024 Projected Volumes	**42**	**1294**	**49**	**114**	**1235**	**79**	**40**	**13**	**114**	**73**	**16**	**48**	**3117**
Base Growth (0.5% linear over 6 yrs)	1	36	1	3	34	2	1	0	3	2	0	1	84
2029 Base Volumes	**43**	**1236**	**50**	**116**	**1180**	**72**	**41**	**13**	**116**	**66**	**16**	**49**	**2998**
2029 Projected Volumes	**43**	**1324**	**50**	**116**	**1263**	**81**	**41**	**13**	**116**	**75**	**16**	**49**	**3187**

Existing (Count) Heavy Vehicles %	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%	**PHF**
													0.99

TPD# BEND.00008
3/27/2023
Traffic Volumes Worksheet

Intersection:	**William Penn Highway (SR 2048) & Home Depot / Pep Boys Driveways**									
Synchro Node:	**3**	**Adjacent intersections:**	**West**	**2**	**East**	**4**	**North**		**South**	

Time Period: Weekday A.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**2**	**678**	**55**	**39**	**557**	**0**	**37**	**0**	**18**	**3**	**0**	**2**	**1391**
2023 Count Heavy Vehicles	0	28	2	3	16	0	5	0	3	0	0	0	57
													0
Balancing													0
2023 Existing Volumes (Balanced)	**2**	**678**	**55**	**39**	**557**	**0**	**37**	**0**	**18**	**3**	**0**	**2**	**1391**
Car Dealership (Background Trips)		3	4	12			6		1				26
													0
Car Dealership (Background Trips) Total	**0**	**3**	**4**	**12**	**0**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	26
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**3**	**4**	**12**	**0**	**0**	**6**	**0**	**1**	**0**	**0**	**0**	**26**
Base Growth (0.5% linear over 1 yrs)	0	3	0	0	3	0	0	0	0	0	0	0	6
2024 Base Volumes	**2**	**684**	**59**	**51**	**560**	**0**	**43**	**0**	**19**	**3**	**0**	**2**	**1423**
Primary (New) Site Trips	69					14				50		64	197
Pass-By Site Trips	111	-111			-90	22				107		88	127
Total Site Trip Distribution	**180**	**-111**	**0**	**0**	**-90**	**36**	**0**	**0**	**0**	**157**	**0**	**152**	**324**
2024 Projected Volumes	**182**	**573**	**59**	**51**	**470**	**36**	**43**	**0**	**19**	**160**	**0**	**154**	**1747**
Base Growth (0.5% linear over 6 yrs)	0	21	2	1	17	0	1	0	1	0	0	0	43
2029 Base Volumes	**2**	**702**	**61**	**52**	**574**	**0**	**44**	**0**	**20**	**3**	**0**	**2**	**1460**
2029 Projected Volumes	**182**	**591**	**61**	**52**	**484**	**36**	**44**	**0**	**20**	**160**	**0**	**154**	**1784**

Existing (Count) Heavy Vehicles %	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%	**PHF**
													0.90

Time Period: Weekday P.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**4**	**1290**	**66**	**36**	**1123**	**4**	**60**	**0**	**28**	**3**	**0**	**5**	**2619**
2023 Count Heavy Vehicles	0	11	1	0	12	1	2	0	0	1	0	0	28
Balancing													0
2023 Existing Volumes (Balanced)	**4**	**1290**	**66**	**36**	**1123**	**4**	**60**	**0**	**28**	**3**	**0**	**5**	**2619**
Car Dealership (Background Trips)		11	3	10			19		4				47
													0
Car Dealership (Background Trips) Total	**0**	**11**	**3**	**10**	**0**	**0**	**19**	**0**	**4**	**0**	**0**	**0**	47
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**11**	**3**	**10**	**0**	**0**	**19**	**0**	**4**	**0**	**0**	**0**	**47**
Base Growth (0.5% linear over 1 yrs)	0	6	0	0	6	0	0	0	0	0	0	0	12
2024 Base Volumes	**4**	**1307**	**69**	**46**	**1129**	**4**	**79**	**0**	**32**	**3**	**0**	**5**	**2678**
Primary (New) Site Trips	51					10				30		39	130
Pass-By Site Trips	64	-64			-57	15				69		62	89
Total Site Trip Distribution	**115**	**-64**	**0**	**0**	**-57**	**25**	**0**	**0**	**0**	**99**	**0**	**101**	**219**
2024 Projected Volumes	**119**	**1243**	**69**	**46**	**1072**	**29**	**79**	**0**	**32**	**102**	**0**	**106**	**2897**
Base Growth (0.5% linear over 6 yrs)	0	39	2	1	34	0	2	0	1	0	0	0	79
2029 Base Volumes	**4**	**1340**	**71**	**47**	**1157**	**4**	**81**	**0**	**33**	**3**	**0**	**5**	**2745**
2029 Projected Volumes	**119**	**1276**	**71**	**47**	**1100**	**29**	**81**	**0**	**33**	**102**	**0**	**106**	**2964**

Existing (Count) Heavy Vehicles %	0%	1%	2%	0%	1%	25%	3%	0%	0%	33%	0%	0%	**PHF**
													0.94

Time Period: Saturday Midday Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes	**2**	**1299**	**121**	**83**	**1226**	**4**	**104**	**1**	**41**	**1**	**0**	**3**	**2885**
2023 Count Heavy Vehicles	0	6	0	0	8	0	0	0	1	0	0	0	15
Balancing													0
2023 Existing Volumes (Balanced)	**2**	**1299**	**121**	**83**	**1226**	**4**	**104**	**1**	**41**	**1**	**0**	**3**	**2885**
Car Dealership (Background Trips)		12	5	16			21		4				58
													0
Car Dealership (Background Trips) Total	**0**	**12**	**5**	**16**	**0**	**0**	**21**	**0**	**4**	**0**	**0**	**0**	58
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**12**	**5**	**16**	**0**	**0**	**21**	**0**	**4**	**0**	**0**	**0**	**58**
Base Growth (0.5% linear over 1 yrs)	0	6	1	0	6	0	1	0	0	0	0	0	14
2024 Base Volumes	**2**	**1317**	**127**	**99**	**1232**	**4**	**126**	**1**	**45**	**1**	**0**	**3**	**2957**
Primary (New) Site Trips	97					20				74		95	286
Pass-By Site Trips	107	-107			-103	25				104		100	126
Total Site Trip Distribution	**204**	**-107**	**0**	**0**	**-103**	**45**	**0**	**0**	**0**	**178**	**0**	**195**	**412**
2024 Projected Volumes	**206**	**1210**	**127**	**99**	**1129**	**49**	**126**	**1**	**45**	**179**	**0**	**198**	**3369**
Base Growth (0.5% linear over 6 yrs)	0	39	4	3	37	0	3	0	1	0	0	0	87
2029 Base Volumes	**2**	**1350**	**130**	**102**	**1263**	**4**	**128**	**1**	**46**	**1**	**0**	**3**	**3030**
2029 Projected Volumes	**206**	**1243**	**130**	**102**	**1160**	**49**	**128**	**1**	**46**	**179**	**0**	**198**	**3442**

Existing (Count) Heavy Vehicles %	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	0%	0%	**PHF**
													0.96

TPD# BEND.00008
3/27/2023
Traffic Volumes Worksheet

Intersection:	**William Penn Highway (SR 2048) & Proposed Site Driveway**									
Synchro Node:	**4**	**Adjacent intersections:**	**West**	**3**	**East**		**North**		**South**	

Time Period: Weekday A.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes		**699**			**596**								**1295**
2023 Count Heavy Vehicles		31			19								50
													0
Balancing													0
2023 Existing Volumes (Balanced)	**0**	**699**	**0**	**0**	**596**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1295**
Car Dealership (Background Trips)		4			12								16
													0
Car Dealership (Background Trips) Total	**0**	**4**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	16
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**4**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**
Base Growth (0.5% linear over 1 yrs)	0	3	0	0	3	0	0	0	0	0	0	0	6
2024 Base Volumes	**0**	**706**	**0**	**0**	**611**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1317**
Primary (New) Site Trips		50			14	41							105
Pass-By Site Trips		-4			-68	68							-4
Total Site Trip Distribution	**0**	**46**	**0**	**0**	**-54**	**109**	**0**	**0**	**0**	**0**	**0**	**0**	**101**
2024 Projected Volumes	**0**	**752**	**0**	**0**	**557**	**109**	**0**	**0**	**0**	**0**	**0**	**0**	**1418**
Base Growth (0.5% linear over 6 yrs)	0	21	0	0	18	0	0	0	0	0	0	0	39
2029 Base Volumes	**0**	**724**	**0**	**0**	**626**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1350**
2029 Projected Volumes	**0**	**770**	**0**	**0**	**572**	**109**	**0**	**0**	**0**	**0**	**0**	**0**	**1451**

Existing (Count) Heavy Vehicles %	0%	4%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	**PHF**

Time Period: Weekday P.M. Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes		**1321**			**1163**								**2484**
2023 Count Heavy Vehicles		12			13								25
Balancing													0
2023 Existing Volumes (Balanced)	**0**	**1321**	**0**	**0**	**1163**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2484**
Car Dealership (Background Trips)		15			10								25
													0
Car Dealership (Background Trips) Total	**0**	**15**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	25
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**15**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**
Base Growth (0.5% linear over 1 yrs)	0	7	0	0	6	0	0	0	0	0	0	0	13
2024 Base Volumes	**0**	**1343**	**0**	**0**	**1179**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2522**
Primary (New) Site Trips		30			10	30							70
Pass-By Site Trips		5			-42	42							5
Total Site Trip Distribution	**0**	**35**	**0**	**0**	**-32**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**75**
2024 Projected Volumes	**0**	**1378**	**0**	**0**	**1147**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**2597**
Base Growth (0.5% linear over 6 yrs)	0	40	0	0	35	0	0	0	0	0	0	0	75
2029 Base Volumes	**0**	**1376**	**0**	**0**	**1208**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2584**
2029 Projected Volumes	**0**	**1411**	**0**	**0**	**1176**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**2659**

Existing (Count) Heavy Vehicles %	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	**PHF**

Time Period: Saturday Midday Peak Hour

	Eastbound			Westbound			Northbound			Southbound			Intersection
	left	thru	right	left	thru	right	left	thru	right	left	thru	right	Volume
2023 Count Volumes		**1341**			**1313**								**2654**
2023 Count Heavy Vehicles		7			8								15
Balancing													0
2023 Existing Volumes (Balanced)	**0**	**1341**	**0**	**0**	**1313**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2654**
Car Dealership (Background Trips)		16			16								32
													0
Car Dealership (Background Trips) Total	**0**	**16**	**0**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	32
													0
													0
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Total Background Trips	**0**	**16**	**0**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**32**
Base Growth (0.5% linear over 1 yrs)	0	7	0	0	7	0	0	0	0	0	0	0	14
2024 Base Volumes	**0**	**1364**	**0**	**0**	**1336**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2700**
Primary (New) Site Trips		74			20	57							151
Pass-By Site Trips		-3			-78	78							-3
Total Site Trip Distribution	**0**	**71**	**0**	**0**	**-58**	**135**	**0**	**0**	**0**	**0**	**0**	**0**	**148**
2024 Projected Volumes	**0**	**1435**	**0**	**0**	**1278**	**135**	**0**	**0**	**0**	**0**	**0**	**0**	**2848**
Base Growth (0.5% linear over 6 yrs)	0	41	0	0	40	0	0	0	0	0	0	0	81
2029 Base Volumes	**0**	**1398**	**0**	**0**	**1369**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2767**
2029 Projected Volumes	**0**	**1469**	**0**	**0**	**1311**	**135**	**0**	**0**	**0**	**0**	**0**	**0**	**2915**

Existing (Count) Heavy Vehicles %	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	**PHF**

Appendix F:
Capacity & Queue Analysis Printouts

2023 Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	633	130	86	392	5	92	11	36	39	13	69
Future Volume (vph)	68	633	130	86	392	5	92	11	36	39	13	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.957			0.964	
Satd. Flow (prot)	1506	3304	1507	1677	3317	0	0	1802	1380	0	1478	1473
Flt Permitted	0.950			0.950				0.709			0.600	
Satd. Flow (perm)	1506	3304	1507	1677	3317	0	0	1335	1380	0	920	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		1				70			72
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%
Adj. Flow (vph)	71	659	135	90	408	5	96	11	38	41	14	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	659	135	90	413	0	0	107	38	0	55	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												

2023 Existing
Timing Plan: AM Peak

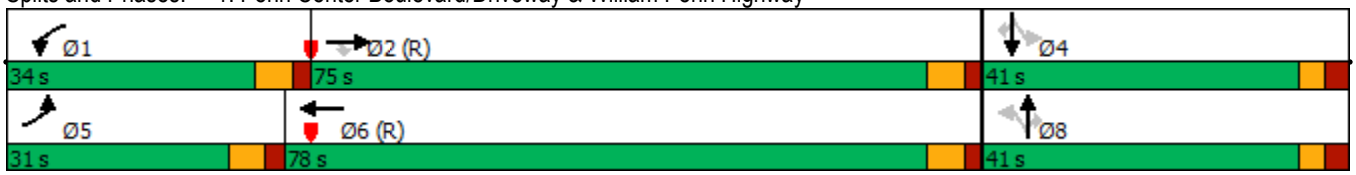
1: William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	31.3	31.3	13.3	31.3		23.9	23.9	23.9	23.9	23.9	23.9
Total Split (s)	31.0	75.0	75.0	34.0	78.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	20.7%	50.0%	50.0%	22.7%	52.0%		27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
Maximum Green (s)	24.7	68.7	68.7	27.7	71.7		35.1	35.1	35.1	35.1	35.1	35.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Act Effct Green (s)	13.5	101.5	101.5	14.5	102.5			18.5	18.5		18.5	18.5
Actuated g/C Ratio	0.09	0.68	0.68	0.10	0.68			0.12	0.12		0.12	0.12
v/c Ratio	0.53	0.29	0.13	0.56	0.18			0.65	0.16		0.49	0.30
Control Delay	78.1	11.2	5.8	82.4	7.4			80.2	3.4		74.3	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	78.1	11.2	5.8	82.4	7.4			80.2	3.4		74.3	14.4
LOS	E	B	A	F	A			F	A		E	B
Approach Delay		15.9			20.9			60.0			40.3	
Approach LOS		B			C			E			D	
Queue Length 50th (ft)	68	127	21	89	52			101	0		51	0
Queue Length 95th (ft)	119	205	59	152	71			161	7		96	46
Internal Link Dist (ft)		1513			711			922			274	
Turn Bay Length (ft)	205		60	250								125
Base Capacity (vph)	258	2236	1041	320	2267			321	385		221	409
Starvation Cap Reductn	0	0	0	0	0			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.28	0.29	0.13	0.28	0.18			0.33	0.10		0.25	0.18

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 100 (67%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 23.2 — Intersection LOS: C
Intersection Capacity Utilization 50.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	633	130	86	392	5	92	11	36	39	13	69
Future Volume (veh/h)	68	633	130	86	392	5	92	11	36	39	13	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1784	1934	1964	1832	1817	1876	1900	1767	1648	1589	1900	1811
Adj Flow Rate, veh/h	71	659	110	90	408	0	96	11	18	41	14	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	13	3	1	3	4	0	0	9	17	21	0	6
Cap, veh/h	100	2575	1166	121	2455		199	18	177	94	27	
Arrive On Green	0.06	0.70	0.70	0.14	1.00	0.00	0.12	0.13	0.13	0.12	0.13	0.00
Sat Flow, veh/h	1699	3674	1664	1745	3543	0	1216	139	1397	414	214	1535
Grp Volume(v), veh/h	71	659	110	90	408	0	107	0	18	55	0	0
Grp Sat Flow(s),veh/h/ln	1699	1837	1664	1745	1726	0	1356	0	1397	628	0	1535
Q Serve(g_s), s	6.2	9.8	3.2	7.4	0.0	0.0	0.0	0.0	1.7	4.5	0.0	0.0
Cycle Q Clear(g_c), s	6.2	9.8	3.2	7.4	0.0	0.0	11.3	0.0	1.7	15.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.90		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	100	2575	1166	121	2455		208	0	177	117	0	
V/C Ratio(X)	0.71	0.26	0.09	0.74	0.17		0.51	0.00	0.10	0.47	0.00	
Avail Cap(c_a), veh/h	291	2575	1166	334	2455		363	0	336	289	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	69.3	8.2	7.2	63.3	0.0	0.0	62.6	0.0	58.0	68.0	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.2	0.2	8.5	0.1	0.0	2.0	0.0	0.3	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	3.7	1.1	3.4	0.0	0.0	4.1	0.0	0.6	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.1	8.4	7.3	71.8	0.1	0.0	64.6	0.0	58.2	70.9	0.0	0.0
LnGrp LOS	E	A	A	E	A		E	A	E	E	A	
Approach Vol, veh/h		840			498			125			55	
Approach Delay, s/veh		14.2			13.1			63.7			70.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.7	110.4		23.9	14.2	112.0		23.9
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 28	* 69		35.1	* 25	* 72		35.1
Max Q Clear Time (g_c+I1), s	9.4	11.8		17.9	8.2	2.0		13.3
Green Ext Time (p_c), s	0.2	20.7		0.1	0.1	13.6		0.4

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	640	10	92	481	28	13	8	48	47	22	45
Future Volume (vph)	17	640	10	92	481	28	13	8	48	47	22	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.992				0.850		0.947	
Flt Protected	0.950			0.950				0.970			0.980	
Satd. Flow (prot)	1702	3506	1577	1668	3378	0	0	1629	1470	0	1701	0
Flt Permitted	0.950			0.950				0.970			0.980	
Satd. Flow (perm)	1702	3506	1577	1668	3378	0	0	1625	1470	0	1701	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		4				68		20	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%
Adj. Flow (vph)	18	696	11	100	523	30	14	9	52	51	24	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	696	11	100	553	0	0	23	52	0	124	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.5	47.6	47.6	22.0	57.1		40.2	40.2	22.0	40.2	40.2	
Total Split (%)	8.3%	31.7%	31.7%	14.7%	38.1%		26.8%	26.8%	14.7%	26.8%	26.8%	
Maximum Green (s)	7.0	41.4	41.4	16.5	50.9		34.0	34.0	16.5	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.1	100.6	100.6	13.9	111.7			6.7	18.7		13.1	
Actuated g/C Ratio	0.05	0.67	0.67	0.09	0.74			0.04	0.12		0.09	
v/c Ratio	0.23	0.30	0.01	0.65	0.22			0.32	0.21		0.75	
Control Delay	109.2	7.7	0.0	91.8	6.9			80.3	6.1		80.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	109.2	7.7	0.0	91.8	6.9			80.3	6.1		80.8	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		10.1			19.9			28.9			80.8	
Approach LOS		B			B			C			F	
Queue Length 50th (ft)	17	181	0	97	82			22	0		101	
Queue Length 95th (ft)	49	271	0	166	111			55	19		168	
Internal Link Dist (ft)		711			850			273			926	
Turn Bay Length (ft)	185		200	185					175			
Base Capacity (vph)	90	2352	1106	194	2516			380	276		412	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.20	0.30	0.01	0.52	0.22			0.06	0.19		0.30	

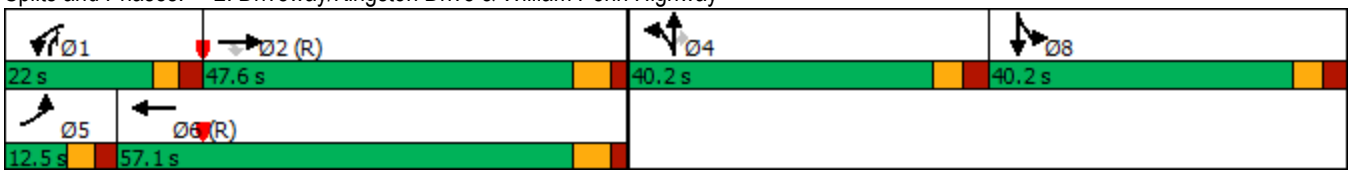
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 20.6 Intersection LOS: C

Intersection Capacity Utilization 49.9%	ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	640	10	92	481	28	13	8	48	47	22	45
Future Volume (veh/h)	17	640	10	92	481	28	13	8	48	47	22	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1919	1979	1876	1802	1817	1894	1701	1864	2136	2061	1941
Adj Flow Rate, veh/h	18	696	0	100	523	28	14	9	20	51	24	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	0	5	4	0	13	2	0	5	13
Cap, veh/h	46	2402		131	2340	125	47	30	188	75	35	56
Arrive On Green	0.01	0.22	0.00	0.15	1.00	1.00	0.04	0.05	0.05	0.08	0.09	0.08
Sat Flow, veh/h	1884	3645	1677	1787	3306	177	1005	646	1550	855	402	637
Grp Volume(v), veh/h	18	696	0	100	270	281	23	0	20	113	0	0
Grp Sat Flow(s),veh/h/ln	1884	1823	1677	1787	1712	1771	1651	0	1550	1895	0	0
Q Serve(g_s), s	1.4	23.9	0.0	8.1	0.0	0.0	2.0	0.0	1.7	8.7	0.0	0.0
Cycle Q Clear(g_c), s	1.4	23.9	0.0	8.1	0.0	0.0	2.0	0.0	1.7	8.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.10	0.61		1.00	0.45		0.34
Lane Grp Cap(c), veh/h	46	2402		131	1212	1253	77	0	188	165	0	0
V/C Ratio(X)	0.39	0.29		0.76	0.22	0.22	0.30	0.00	0.11	0.68	0.00	0.00
Avail Cap(c_a), veh/h	101	2402		208	1212	1253	385	0	477	442	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.00	0.99	0.99	0.99	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.3	29.4	0.0	62.8	0.0	0.0	69.4	0.0	58.9	66.9	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.3	0.0	3.4	0.4	0.4	0.8	0.0	0.1	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	11.8	0.0	3.6	0.1	0.1	0.9	0.0	0.7	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.3	29.7	0.0	66.2	0.4	0.4	70.2	0.0	58.9	68.7	0.0	0.0
LnGrp LOS	E	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		714			651			43			113	
Approach Delay, s/veh		30.8			10.5			65.0			68.7	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.5	104.0		12.2	8.1	111.4		18.3
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	16.5	41.4		* 34	7.0	50.9		34.0
Max Q Clear Time (g_c+I1), s	10.1	25.9		4.0	3.4	2.0		10.7
Green Ext Time (p_c), s	0.1	12.0		0.0	0.0	22.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	678	55	39	557	0	37	0	18	3	0	2
Future Volume (vph)	2	678	55	39	557	0	37	0	18	3	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989							0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3536	0	1536	3567	0	0	1546	1580	1718	1647	0
Flt Permitted	0.417			0.324				0.757		0.730		
Satd. Flow (perm)	762	3536	0	524	3567	0	0	1232	1580	1320	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10							70		393	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	2	753	61	43	619	0	41	0	20	3	0	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	814	0	43	619	0	0	41	20	3	2	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

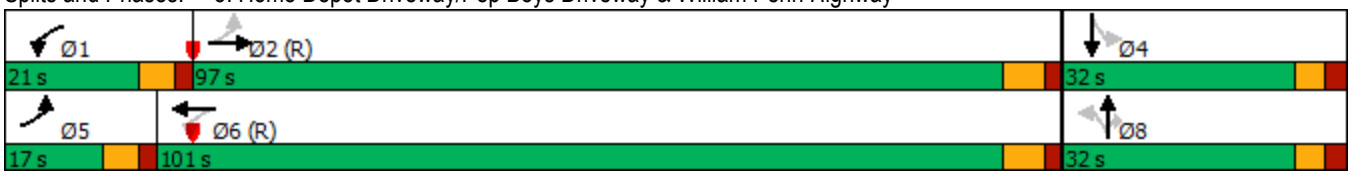
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	17.0	97.0		21.0	101.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	11.3%	64.7%		14.0%	67.3%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	11.0	90.4		15.0	94.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	127.3	123.0		130.8	130.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.85	0.82		0.87	0.87			0.07	0.07	0.07	0.07	
v/c Ratio	0.00	0.28		0.09	0.20			0.48	0.11	0.03	0.00	
Control Delay	0.5	1.5		2.2	2.7			83.6	1.3	63.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	0.5	1.5		2.2	2.7			83.6	1.3	63.0	0.0	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		1.5			2.7			56.6			37.8	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	0	30		5	41			39	0	3	0	
Queue Length 95th (ft)	m0	36		12	105			81	0	14	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	746	2902		567	3090			221	341	237	618	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.00	0.28		0.08	0.20			0.19	0.06	0.01	0.00	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 4.3 Intersection LOS: A
Intersection Capacity Utilization 46.4% ICU Level of Service A
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	678	55	39	557	0	37	0	18	3	0	2
Future Volume (veh/h)	2	678	55	39	557	0	37	0	18	3	0	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2076	2159	1728	1875	1921	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	2	753	0	43	619	0	41	0	0	3	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	4	4	8	3	0	14	0	17	0	0	0
Cap, veh/h	814	3237		643	3012	0	109	0		123	84	0
Arrive On Green	0.02	1.00	0.00	0.03	0.85	0.00	0.03	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	2034	4048	0	1646	3656	0	1500	0	1519	1559	2057	0
Grp Volume(v), veh/h	2	753	0	43	619	0	41	0	0	3	0	0
Grp Sat Flow(s),veh/h/ln	2034	1972	0	1646	1781	0	1500	0	1519	1559	2057	0
Q Serve(g_s), s	0.0	0.0	0.0	0.6	4.9	0.0	4.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.6	4.9	0.0	4.1	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	814	3237		643	3012	0	99	0		123	84	0
V/C Ratio(X)	0.00	0.23		0.07	0.21	0.00	0.41	0.00		0.02	0.00	0.00
Avail Cap(c_a), veh/h	958	3237		762	3012	0	308	0		340	370	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	2.2	0.0	0.0	1.5	2.2	0.0	71.4	0.0	0.0	69.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.2	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.1	1.2	0.0	1.6	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	2.2	0.2	0.0	1.5	2.3	0.0	72.5	0.0	0.0	69.1	0.0	0.0
LnGrp LOS	A	A		A	A	A	E	A		E	A	A
Approach Vol, veh/h		755			662			41			3	
Approach Delay, s/veh		0.2			2.3			72.5			69.1	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.2	128.7		11.1	6.4	132.5		11.1
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	15.0	90.4		26.0	11.0	94.4		26.0
Max Q Clear Time (g_c+I1), s	2.6	2.0		2.2	2.0	6.9		6.1
Green Ext Time (p_c), s	0.0	32.7		0.0	0.0	24.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	3.3
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

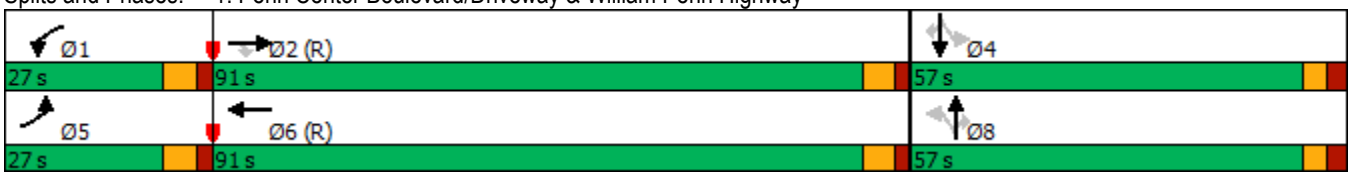
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	1036	90	93	913	6	172	26	109	64	21	93
Future Volume (vph)	89	1036	90	93	913	6	172	26	109	64	21	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00	0.99		1.00	0.99
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.958			0.964	
Satd. Flow (prot)	1685	3369	1522	1710	3417	0	0	1820	1583	0	1688	1531
Flt Permitted	0.950			0.950				0.641			0.419	
Satd. Flow (perm)	1682	3369	1522	1710	3417	0	0	1217	1560	0	733	1510
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			57						117			100
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)	2					2	1		2	2		1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%
Adj. Flow (vph)	96	1114	97	100	982	6	185	28	117	69	23	100
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	1114	97	100	988	0	0	213	117	0	92	100
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	27.0	91.0	91.0	27.0	91.0		57.0	57.0	57.0	57.0	57.0	57.0
Total Split (%)	15.4%	52.0%	52.0%	15.4%	52.0%		32.6%	32.6%	32.6%	32.6%	32.6%	32.6%
Maximum Green (s)	20.7	84.7	84.7	20.7	84.7		51.1	51.1	51.1	51.1	51.1	51.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	16.3	107.0	107.0	16.5	107.2			36.0	36.0		36.0	36.0
Actuated g/C Ratio	0.09	0.61	0.61	0.09	0.61			0.21	0.21		0.21	0.21
v/c Ratio	0.62	0.54	0.10	0.62	0.47			0.85	0.28		0.61	0.26
Control Delay	92.4	22.8	8.3	107.5	11.3			94.7	9.3		78.8	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	92.4	22.8	8.3	107.5	11.4			94.7	9.3		78.8	9.7
LOS	F	C	A	F	B			F	A		E	A
Approach Delay		26.8			20.2			64.4			42.8	
Approach LOS		C			C			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 142 (81%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 29.7 Intersection LOS: C
Intersection Capacity Utilization 65.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	89	1036	90	93	913	6	172	26	109	64	21	93
Future Volume (veh/h)	89	1036	90	93	913	6	172	26	109	64	21	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1964	1964	1979	1862	1862	1876	1900	1900	1870	1900	1826	1870
Adj Flow Rate, veh/h	96	1114	88	100	982	0	185	28	64	69	23	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	1	0	0	0	2	0	5	2
Cap, veh/h	127	2332	1046	127	2225		312	41	339	115	34	
Arrive On Green	0.07	0.62	0.62	0.14	1.00	0.00	0.21	0.21	0.21	0.21	0.21	0.00
Sat Flow, veh/h	1870	3731	1674	1773	3630	0	1277	193	1581	370	157	1585
Grp Volume(v), veh/h	96	1114	88	100	982	0	213	0	64	92	0	0
Grp Sat Flow(s),veh/h/ln	1870	1865	1674	1773	1769	0	1471	0	1581	527	0	1585
Q Serve(g_s), s	8.8	27.9	3.6	9.5	0.0	0.0	0.0	0.0	5.8	10.7	0.0	0.0
Cycle Q Clear(g_c), s	8.8	27.9	3.6	9.5	0.0	0.0	23.4	0.0	5.8	34.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.87		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	127	2332	1046	127	2225		346	0	339	146	0	
V/C Ratio(X)	0.76	0.48	0.08	0.78	0.44		0.62	0.00	0.19	0.63	0.00	
Avail Cap(c_a), veh/h	232	2332	1046	220	2225		467	0	471	260	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.87	0.87	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	80.1	17.5	13.0	73.6	0.0	0.0	63.6	0.0	56.3	77.1	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.7	0.2	8.8	0.6	0.0	1.8	0.0	0.3	4.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	12.1	1.4	4.4	0.2	0.0	9.1	0.0	2.4	4.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.0	18.2	13.1	82.5	0.6	0.0	65.4	0.0	56.5	81.5	0.0	0.0
LnGrp LOS	F	B	B	F	A		E	A	E	F	A	
Approach Vol, veh/h		1298			1082			277			92	
Approach Delay, s/veh		23.1			8.1			63.3			81.5	
Approach LOS		C			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	17.9	114.7		42.4	17.2	115.4		42.4
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 21	* 85		51.1	* 21	* 85		51.1
Max Q Clear Time (g_c+I1), s	11.5	29.9		36.1	10.8	2.0		25.4
Green Ext Time (p_c), s	0.1	39.7		0.2	0.1	46.4		1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

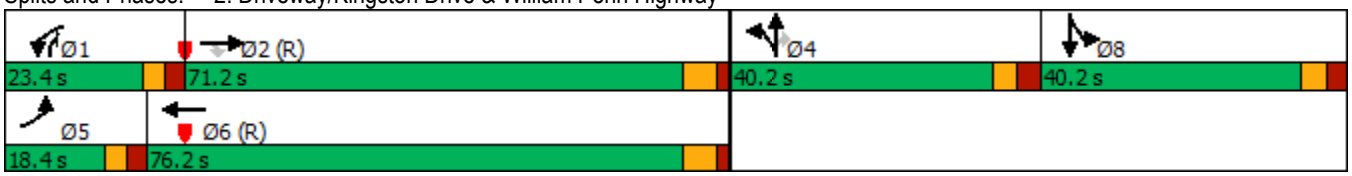
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	1006	33	95	987	75	43	20	130	68	30	48
Future Volume (vph)	66	1006	33	95	987	75	43	20	130	68	30	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			0.99	
Frt			0.850		0.989				0.850		0.956	
Flt Protected	0.950			0.950				0.967			0.977	
Satd. Flow (prot)	1702	3610	1577	1668	3496	0	0	1680	1470	0	1796	0
Flt Permitted	0.950			0.950				0.967			0.977	
Satd. Flow (perm)	1700	3610	1577	1668	3496	0	0	1672	1470	0	1796	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			93		5				135		13	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)	1					1	5					5
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%
Adj. Flow (vph)	69	1048	34	99	1028	78	45	21	135	71	31	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	1048	34	99	1106	0	0	66	135	0	152	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	36.2	36.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	18.4	71.2	71.2	23.4	76.2		40.2	40.2	23.4	40.2	40.2	
Total Split (%)	10.5%	40.7%	40.7%	13.4%	43.5%		23.0%	23.0%	13.4%	23.0%	23.0%	
Maximum Green (s)	12.9	65.0	65.0	17.9	70.0		34.0	34.0	17.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	11.7	111.4	111.4	15.2	114.9			10.7	26.7		17.5	
Actuated g/C Ratio	0.07	0.64	0.64	0.09	0.66			0.06	0.15		0.10	
v/c Ratio	0.61	0.46	0.03	0.68	0.48			0.65	0.40		0.80	
Control Delay	126.7	5.1	0.1	107.0	14.0			106.7	8.9		97.8	
Queue Delay	0.0	0.1	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	126.7	5.1	0.1	107.0	14.0			106.7	8.9		97.8	
LOS	F	A	A	F	B			F	A		F	
Approach Delay		12.3			21.7			41.0			97.8	
Approach LOS		B			C			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 63.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	1006	33	95	987	75	43	20	130	68	30	48
Future Volume (veh/h)	66	1006	33	95	987	75	43	20	130	68	30	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1876	1862	1876	1894	1820	1864	2121	2136	2106
Adj Flow Rate, veh/h	69	1048	0	99	1028	77	45	21	69	71	31	44
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	0	1	0	0	5	2	1	0	2
Cap, veh/h	98	2383		126	2192	164	89	41	226	98	43	61
Arrive On Green	0.03	0.43	0.00	0.14	1.00	1.00	0.07	0.07	0.07	0.10	0.10	0.10
Sat Flow, veh/h	1884	3731	1677	1787	3335	250	1200	560	1548	958	418	594
Grp Volume(v), veh/h	69	1048	0	99	545	560	66	0	69	146	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1787	1769	1816	1760	0	1548	1970	0	0
Q Serve(g_s), s	6.3	34.6	0.0	9.4	0.0	0.0	6.3	0.0	7.0	12.6	0.0	0.0
Cycle Q Clear(g_c), s	6.3	34.6	0.0	9.4	0.0	0.0	6.3	0.0	7.0	12.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.14	0.68		1.00	0.49		0.30
Lane Grp Cap(c), veh/h	98	2383		126	1163	1194	130	0	226	201	0	0
V/C Ratio(X)	0.71	0.44		0.79	0.47	0.47	0.51	0.00	0.31	0.73	0.00	0.00
Avail Cap(c_a), veh/h	150	2383		193	1163	1194	352	0	421	394	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.85	0.85	0.00	0.93	0.93	0.93	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	83.1	28.0	0.0	73.9	0.0	0.0	78.3	0.0	67.1	76.6	0.0	0.0
Incr Delay (d2), s/veh	3.0	0.5	0.0	4.8	1.3	1.2	1.1	0.0	0.3	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	16.7	0.0	4.2	0.4	0.4	3.0	0.0	2.8	6.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.1	28.5	0.0	78.7	1.3	1.2	79.5	0.0	67.3	78.4	0.0	0.0
LnGrp LOS	F	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1117			1204			135			146	
Approach Delay, s/veh		32.1			7.6			73.3			78.4	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	16.8	117.0		18.1	13.6	120.2		23.1
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	17.9	65.0		* 34	12.9	70.0		34.0
Max Q Clear Time (g_c+I1), s	11.4	36.6		9.0	8.3	2.0		14.6
Green Ext Time (p_c), s	0.1	25.3		0.0	0.0	56.3		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

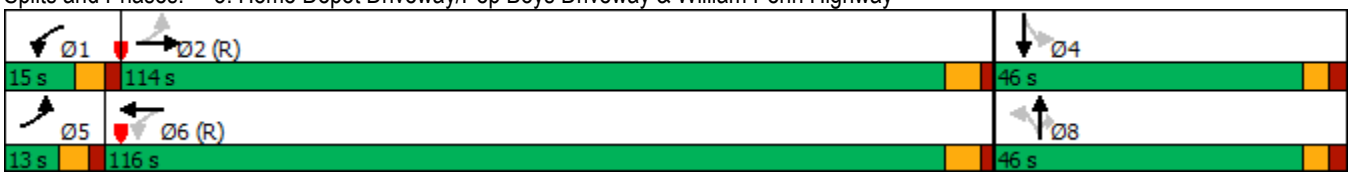
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1290	66	36	1123	4	60	0	28	3	0	5
Future Volume (vph)	4	1290	66	36	1123	4	60	0	28	3	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.993			0.999				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3650	0	1659	3631	0	0	1711	1849	1292	1625	0
Flt Permitted	0.222			0.155				0.754		0.715		
Satd. Flow (perm)	405	3650	0	271	3631	0	0	1356	1824	971	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5							60		147	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	2%	0%	1%	25%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	4	1372	70	38	1195	4	64	0	30	3	0	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	1442	0	38	1199	0	0	64	30	3	5	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	13.0	114.0		15.0	116.0		46.0	46.0	46.0	46.0	46.0	
Total Split (%)	7.4%	65.1%		8.6%	66.3%		26.3%	26.3%	26.3%	26.3%	26.3%	
Maximum Green (s)	7.0	107.4		9.0	109.4		40.0	40.0	40.0	40.0	40.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	145.1	140.5		149.2	147.4			12.8	12.8	12.8	12.8	
Actuated g/C Ratio	0.83	0.80		0.85	0.84			0.07	0.07	0.07	0.07	
v/c Ratio	0.01	0.49		0.14	0.39			0.65	0.16	0.04	0.02	
Control Delay	1.2	2.9		3.4	4.3			106.6	2.7	73.3	0.2	
Queue Delay	0.0	0.1		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	1.2	3.0		3.4	4.3			106.6	2.7	73.3	0.2	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		3.0			4.2			73.5			27.6	
Approach LOS		A			A			E			C	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 63.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	1290	66	36	1123	4	60	0	28	3	0	5
Future Volume (veh/h)	4	1290	66	36	1123	4	60	0	28	3	0	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2121	2190	1847	1905	1536	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	4	1372	0	38	1195	4	64	0	0	3	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	1	2	0	1	25	3	0	0	33	0	0
Cap, veh/h	449	3260		400	3065	10	131	0		126	0	105
Arrive On Green	0.01	1.00	0.00	0.02	0.83	0.83	0.06	0.00	0.00	0.06	0.00	0.06
Sat Flow, veh/h	2034	4136	0	1759	3701	12	1478	0	1744	1180	0	1735
Grp Volume(v), veh/h	4	1372	0	38	584	615	64	0	0	3	0	1
Grp Sat Flow(s),veh/h/ln	2034	2015	0	1759	1810	1903	1478	0	1744	1180	0	1735
Q Serve(g_s), s	0.1	0.0	0.0	0.6	14.3	14.3	7.4	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.0	0.6	14.3	14.3	7.5	0.0	0.0	0.3	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	449	3260		400	1499	1576	131	0		126	0	105
V/C Ratio(X)	0.01	0.42		0.10	0.39	0.39	0.49	0.00		0.02	0.00	0.01
Avail Cap(c_a), veh/h	520	3260		448	1499	1576	381	0		324	0	397
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.4	0.0	0.0	2.5	3.8	3.8	80.8	0.0	0.0	77.4	0.0	77.3
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.8	0.7	1.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.2	4.7	4.9	2.9	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	3.4	0.4	0.0	2.5	4.6	4.5	81.8	0.0	0.0	77.4	0.0	77.3
LnGrp LOS	A	A		A	A	A	F	A		E	A	E
Approach Vol, veh/h		1376			1237			64			4	
Approach Delay, s/veh		0.4			4.5			81.8			77.4	
Approach LOS		A			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.2	148.2		16.6	6.9	151.5		16.6
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	9.0	107.4		40.0	7.0	109.4		40.0
Max Q Clear Time (g_c+I1), s	2.6	2.0		2.3	2.1	16.3		9.5
Green Ext Time (p_c), s	0.0	81.6		0.0	0.0	63.8		0.1

Intersection Summary	
HCM 6th Ctrl Delay	4.3
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

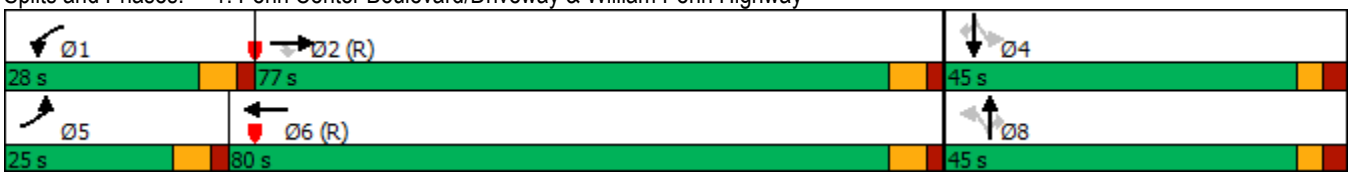
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	1139	77	133	957	4	124	21	95	80	16	100
Future Volume (vph)	81	1139	77	133	957	4	124	21	95	80	16	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99		1.00	
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.959			0.960	
Satd. Flow (prot)	1702	3403	1522	1694	3417	0	0	1794	1599	0	1702	1546
Flt Permitted	0.950			0.950				0.624			0.486	
Satd. Flow (perm)	1702	3403	1522	1694	3417	0	0	1167	1578	0	861	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67						98			103
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%
Adj. Flow (vph)	84	1174	79	137	987	4	128	22	98	82	16	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	1174	79	137	991	0	0	150	98	0	98	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	25.0	77.0	77.0	28.0	80.0		45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	16.7%	51.3%	51.3%	18.7%	53.3%		30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Maximum Green (s)	18.7	70.7	70.7	21.7	73.7		39.1	39.1	39.1	39.1	39.1	39.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	13.8	91.9	91.9	18.0	96.2			24.5	24.5		24.5	24.5
Actuated g/C Ratio	0.09	0.61	0.61	0.12	0.64			0.16	0.16		0.16	0.16
v/c Ratio	0.54	0.56	0.08	0.67	0.45			0.79	0.29		0.70	0.30
Control Delay	76.9	20.1	4.9	88.5	9.2			86.3	10.6		83.1	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	76.9	20.1	4.9	88.5	9.2			86.3	10.6		83.1	10.7
LOS	E	C	A	F	A			F	B		F	B
Approach Delay		22.8			18.9			56.4			46.0	
Approach LOS		C			B			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 113 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 25.7 — Intersection LOS: C
Intersection Capacity Utilization 67.0% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1263	79	155	1070	4	128	22	116	82	16	103
Future Volume (veh/h)	83	1263	79	155	1070	4	128	22	116	82	16	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1979	1979	1847	1862	1876	1885	1826	1885	1900	1900	1885
Adj Flow Rate, veh/h	86	1302	71	160	1103	0	132	23	88	85	16	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	2	1	0	1	5	1	0	0	1
Cap, veh/h	121	2267	1011	193	2295		288	42	293	149	25	
Arrive On Green	0.06	0.60	0.60	0.15	0.86	0.00	0.18	0.18	0.18	0.18	0.18	0.00
Sat Flow, veh/h	1884	3759	1677	1759	3630	0	1325	231	1595	568	134	1598
Grp Volume(v), veh/h	86	1302	71	160	1103	0	155	0	88	101	0	0
Grp Sat Flow(s),veh/h/ln	1884	1880	1677	1759	1769	0	1556	0	1595	702	0	1598
Q Serve(g_s), s	6.7	31.6	2.6	13.3	11.0	0.0	0.0	0.0	7.1	10.3	0.0	0.0
Cycle Q Clear(g_c), s	6.7	31.6	2.6	13.3	11.0	0.0	13.5	0.0	7.1	23.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.85		1.00	0.84		1.00
Lane Grp Cap(c), veh/h	121	2267	1011	193	2295		320	0	293	169	0	
V/C Ratio(X)	0.71	0.57	0.07	0.83	0.48		0.48	0.00	0.30	0.60	0.00	
Avail Cap(c_a), veh/h	247	2267	1011	266	2295		448	0	437	292	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	68.9	18.1	12.3	62.7	4.4	0.0	55.8	0.0	52.9	65.8	0.0	0.0
Incr Delay (d2), s/veh	7.6	1.1	0.1	12.1	0.6	0.0	1.1	0.0	0.6	3.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	13.5	1.0	6.3	3.0	0.0	5.6	0.0	3.0	4.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.4	19.2	12.5	74.8	5.0	0.0	57.0	0.0	53.4	69.2	0.0	0.0
LnGrp LOS	E	B	B	E	A		E	A	D	E	A	
Approach Vol, veh/h		1459			1263			243			101	
Approach Delay, s/veh		22.2			13.8			55.7			69.2	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.8	95.7		32.5	14.9	102.6		32.5
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 22	* 70		40.1	* 19	* 73		40.1
Max Q Clear Time (g_c+I1), s	15.3	33.6		25.8	8.7	13.0		15.5
Green Ext Time (p_c), s	0.2	31.6		0.2	0.1	42.9		0.8

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

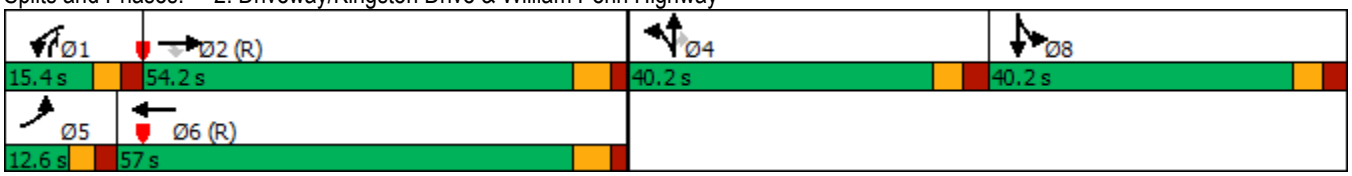
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1181	49	113	1127	68	40	13	113	62	16	48
Future Volume (vph)	42	1181	49	113	1127	68	40	13	113	62	16	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	13	13	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.949	
Flt Protected	0.950			0.950				0.964			0.976	
Satd. Flow (prot)	1702	3610	1577	1635	3660	0	0	1668	1500	0	1771	0
Flt Permitted	0.950			0.950				0.964			0.976	
Satd. Flow (perm)	1702	3610	1577	1635	3660	0	0	1664	1500	0	1771	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		4				114		19	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%
Adj. Flow (vph)	42	1193	49	114	1138	69	40	13	114	63	16	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	1193	49	114	1207	0	0	53	114	0	127	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	0.97	0.97	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.6	54.2	54.2	15.4	57.0		40.2	40.2	15.4	40.2	40.2	
Total Split (%)	8.4%	36.1%	36.1%	10.3%	38.0%		26.8%	26.8%	10.3%	26.8%	26.8%	
Maximum Green (s)	7.1	48.0	48.0	9.9	50.8		34.0	34.0	9.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.6	99.3	99.3	10.9	104.7			8.9	19.1		13.1	
Actuated g/C Ratio	0.05	0.66	0.66	0.07	0.70			0.06	0.13		0.09	
v/c Ratio	0.49	0.50	0.05	0.97	0.47			0.54	0.39		0.74	
Control Delay	108.5	4.3	0.1	144.7	9.1			87.7	10.0		80.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	108.5	4.3	0.1	144.7	9.1			87.7	10.0		80.4	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		7.5			20.8			34.6			80.4	
Approach LOS		A			C			C			F	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 18.3 Intersection LOS: B
Intersection Capacity Utilization 66.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	1181	49	113	1127	68	40	13	113	62	16	48
Future Volume (veh/h)	42	1181	49	113	1127	68	40	13	113	62	16	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1847	1952	1952	1894	1776	1894	2106	2136	2106
Adj Flow Rate, veh/h	42	1193	0	114	1138	69	40	13	69	63	16	31
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	1	0	2	0	0	0	8	0	2	0	2
Cap, veh/h	68	2388		128	2403	146	90	29	227	94	24	46
Arrive On Green	0.01	0.21	0.00	0.15	1.00	1.00	0.06	0.07	0.07	0.08	0.08	0.08
Sat Flow, veh/h	1884	3731	1677	1759	3551	215	1291	420	1584	1129	287	556
Grp Volume(v), veh/h	42	1193	0	114	594	613	53	0	69	110	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1759	1854	1913	1711	0	1584	1972	0	0
Q Serve(g_s), s	3.3	42.3	0.0	9.5	0.0	0.0	4.5	0.0	5.9	8.1	0.0	0.0
Cycle Q Clear(g_c), s	3.3	42.3	0.0	9.5	0.0	0.0	4.5	0.0	5.9	8.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.75		1.00	0.57		0.28
Lane Grp Cap(c), veh/h	68	2388		128	1255	1294	119	0	227	165	0	0
V/C Ratio(X)	0.62	0.50		0.89	0.47	0.47	0.44	0.00	0.30	0.67	0.00	0.00
Avail Cap(c_a), veh/h	102	2388		128	1255	1294	399	0	486	460	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.00	0.89	0.89	0.89	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.1	38.0	0.0	63.5	0.0	0.0	67.4	0.0	57.7	67.1	0.0	0.0
Incr Delay (d2), s/veh	2.8	0.6	0.0	43.7	1.1	1.1	1.0	0.0	0.3	1.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	21.4	0.0	5.5	0.4	0.4	2.0	0.0	2.4	4.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.9	38.6	0.0	107.2	1.1	1.1	68.3	0.0	58.0	68.9	0.0	0.0
LnGrp LOS	E	D		F	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1235			1321			122			110	
Approach Delay, s/veh		39.9			10.3			62.5			68.9	
Approach LOS		D			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.4	101.2		15.7	9.9	106.7		17.7
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	9.9	48.0		* 34	7.1	50.8		34.0
Max Q Clear Time (g_c+I1), s	11.5	44.3		7.9	5.3	2.0		10.1
Green Ext Time (p_c), s	0.0	3.6		0.0	0.0	44.2		0.0

Intersection Summary	
HCM 6th Ctrl Delay	28.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1299	121	83	1226	4	104	1	41	1	0	3
Future Volume (vph)	2	1299	121	83	1226	4	104	1	41	1	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987							0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1735	3670	0	1659	3521	0	0	1768	1812	1718	1647	0
Flt Permitted	0.197			0.130				0.727		0.579		
Satd. Flow (perm)	360	3670	0	227	3521	0	0	1349	1812	1047	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12							70		152	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	2	1353	126	86	1277	4	108	1	43	1	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	1479	0	86	1281	0	0	109	43	1	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	13.0	100.0		18.0	105.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	8.7%	66.7%		12.0%	70.0%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	7.0	93.4		12.0	98.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	114.1	108.5		120.8	118.6			16.6	16.6	16.6	16.6	
Actuated g/C Ratio	0.76	0.72		0.81	0.79			0.11	0.11	0.11	0.11	
v/c Ratio	0.01	0.56		0.36	0.46			0.73	0.16	0.01	0.01	
Control Delay	1.0	2.9		7.5	6.7			90.6	4.8	55.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	1.0	2.9		7.5	6.7			90.6	4.8	55.0	0.0	
LOS	A	A		A	A			F	A	D	A	
Approach Delay		2.9			6.8			66.3			13.8	
Approach LOS		A			A			E			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 72.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1299	121	83	1226	4	104	1	41	1	0	3
Future Volume (veh/h)	2	1299	121	83	1226	4	104	1	41	1	0	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2136	2221	1847	1832	1921	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	2	1353	0	86	1277	4	108	1	0	1	0	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	1	0	0	0	2	0	0	0
Cap, veh/h	383	3077		407	2805	9	174	1		210	0	149
Arrive On Green	0.01	1.00	0.00	0.03	0.79	0.79	0.09	0.09	0.00	0.09	0.00	0.09
Sat Flow, veh/h	2034	4165	0	1759	3560	11	1479	14	1717	1558	0	1743
Grp Volume(v), veh/h	2	1353	0	86	624	657	109	0	0	1	0	1
Grp Sat Flow(s),veh/h/ln	2034	2029	0	1759	1741	1830	1492	0	1717	1558	0	1743
Q Serve(g_s), s	0.0	0.0	0.0	1.6	17.8	17.8	10.7	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	1.6	17.8	17.8	10.8	0.0	0.0	0.1	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	383	3077		407	1371	1442	175	0		210	0	149
V/C Ratio(X)	0.01	0.44		0.21	0.46	0.46	0.62	0.00		0.00	0.00	0.01
Avail Cap(c_a), veh/h	473	3077		490	1371	1442	307	0		347	0	302
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.9	0.0	0.0	3.4	5.3	5.3	67.7	0.0	0.0	62.8	0.0	62.8
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.1	1.1	1.0	1.3	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.5	5.8	6.1	4.2	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.9	0.4	0.0	3.5	6.4	6.3	69.1	0.0	0.0	62.8	0.0	62.8
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		1355			1367			109			2	
Approach Delay, s/veh		0.4			6.1			69.1			62.8	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.9	120.3		18.8	6.4	124.8		18.8
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	12.0	93.4		26.0	7.0	98.4		26.0
Max Q Clear Time (g_c+I1), s	3.6	2.0		2.1	2.0	19.8		12.8
Green Ext Time (p_c), s	0.1	72.0		0.0	0.0	60.7		0.1

Intersection Summary	
HCM 6th Ctrl Delay	5.9
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2024 Base (No-Build) Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	647	131	87	398	5	92	11	39	39	13	69
Future Volume (vph)	68	647	131	87	398	5	92	11	39	39	13	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.957			0.964	
Satd. Flow (prot)	1506	3304	1507	1677	3317	0	0	1802	1380	0	1478	1473
Flt Permitted	0.950			0.950				0.709			0.600	
Satd. Flow (perm)	1506	3304	1507	1677	3317	0	0	1335	1380	0	920	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		1				70			72
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%
Adj. Flow (vph)	71	674	136	91	415	5	96	11	41	41	14	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	674	136	91	420	0	0	107	41	0	55	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												

2024 Base (No--Build)
Timing Plan: AM Peak

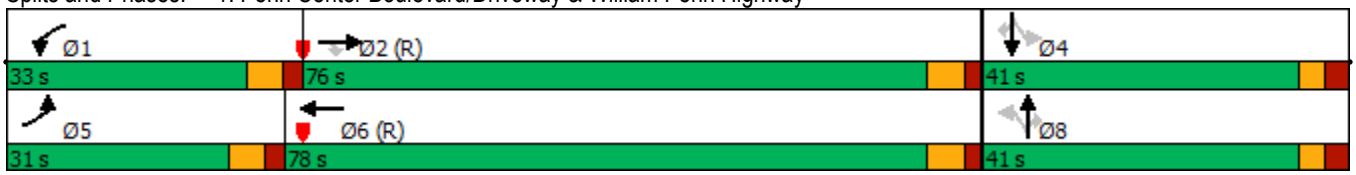
1: William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	31.3	31.3	13.3	31.3		23.9	23.9	23.9	23.9	23.9	23.9
Total Split (s)	31.0	76.0	76.0	33.0	78.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	20.7%	50.7%	50.7%	22.0%	52.0%		27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
Maximum Green (s)	24.7	69.7	69.7	26.7	71.7		35.1	35.1	35.1	35.1	35.1	35.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Act Effct Green (s)	13.5	101.4	101.4	14.6	102.5			18.5	18.5		18.5	18.5
Actuated g/C Ratio	0.09	0.68	0.68	0.10	0.68			0.12	0.12		0.12	0.12
v/c Ratio	0.53	0.30	0.13	0.56	0.19			0.65	0.18		0.49	0.30
Control Delay	78.1	11.3	5.9	82.9	7.3			80.2	4.5		74.3	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	78.1	11.3	5.9	82.9	7.3			80.2	4.5		74.3	14.4
LOS	E	B	A	F	A			F	A		E	B
Approach Delay		15.9			20.8			59.2			40.3	
Approach LOS		B			C			E			D	
Queue Length 50th (ft)	68	132	21	90	52			101	0		51	0
Queue Length 95th (ft)	119	211	59	154	72			161	12		96	46
Internal Link Dist (ft)		1513			711			922			274	
Turn Bay Length (ft)	205		60	250								125
Base Capacity (vph)	258	2234	1040	309	2267			321	385		221	409
Starvation Cap Reductn	0	0	0	0	0			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.28	0.30	0.13	0.29	0.19			0.33	0.11		0.25	0.18

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 100 (67%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 23.1 — Intersection LOS: C
Intersection Capacity Utilization 50.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	647	131	87	398	5	92	11	39	39	13	69
Future Volume (veh/h)	68	647	131	87	398	5	92	11	39	39	13	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1784	1934	1964	1832	1817	1876	1900	1767	1648	1589	1900	1811
Adj Flow Rate, veh/h	71	674	111	91	415	0	96	11	21	41	14	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	13	3	1	3	4	0	0	9	17	21	0	6
Cap, veh/h	100	2573	1165	122	2455		199	18	177	94	27	
Arrive On Green	0.06	0.70	0.70	0.14	1.00	0.00	0.12	0.13	0.13	0.12	0.13	0.00
Sat Flow, veh/h	1699	3674	1664	1745	3543	0	1216	139	1397	414	214	1535
Grp Volume(v), veh/h	71	674	111	91	415	0	107	0	21	55	0	0
Grp Sat Flow(s),veh/h/ln	1699	1837	1664	1745	1726	0	1356	0	1397	627	0	1535
Q Serve(g_s), s	6.2	10.1	3.2	7.5	0.0	0.0	0.0	0.0	2.0	4.6	0.0	0.0
Cycle Q Clear(g_c), s	6.2	10.1	3.2	7.5	0.0	0.0	11.3	0.0	2.0	15.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.90		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	100	2573	1165	122	2455		208	0	177	117	0	
V/C Ratio(X)	0.71	0.26	0.10	0.75	0.17		0.51	0.00	0.12	0.47	0.00	
Avail Cap(c_a), veh/h	291	2573	1165	322	2455		363	0	336	288	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	69.3	8.3	7.2	63.2	0.0	0.0	62.6	0.0	58.1	68.0	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.2	0.2	8.5	0.1	0.0	2.0	0.0	0.3	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	3.9	1.1	3.4	0.0	0.0	4.1	0.0	0.7	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.1	8.5	7.4	71.8	0.1	0.0	64.6	0.0	58.4	70.9	0.0	0.0
LnGrp LOS	E	A	A	E	A		E	A	E	E	A	
Approach Vol, veh/h		856			506			128			55	
Approach Delay, s/veh		14.1			13.0			63.6			70.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.8	110.3		23.9	14.2	112.0		23.9
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 27	* 70		35.1	* 25	* 72		35.1
Max Q Clear Time (g_c+I1), s	9.5	12.1		17.9	8.2	2.0		13.3
Green Ext Time (p_c), s	0.2	21.5		0.1	0.1	13.8		0.4

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	657	10	92	488	29	13	8	48	48	22	45
Future Volume (vph)	17	657	10	92	488	29	13	8	48	48	22	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.947	
Flt Protected	0.950			0.950				0.970			0.980	
Satd. Flow (prot)	1702	3506	1577	1668	3375	0	0	1629	1470	0	1702	0
Flt Permitted	0.950			0.950				0.970			0.980	
Satd. Flow (perm)	1702	3506	1577	1668	3375	0	0	1625	1470	0	1702	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		4				68		20	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%
Adj. Flow (vph)	18	714	11	100	530	32	14	9	52	52	24	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	714	11	100	562	0	0	23	52	0	125	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

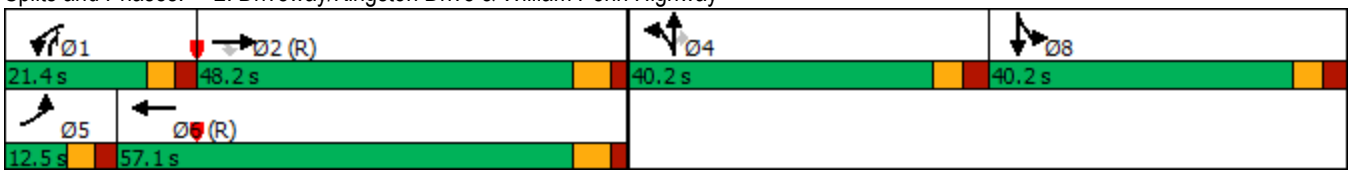
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.5	48.2	48.2	21.4	57.1		40.2	40.2	21.4	40.2	40.2	
Total Split (%)	8.3%	32.1%	32.1%	14.3%	38.1%		26.8%	26.8%	14.3%	26.8%	26.8%	
Maximum Green (s)	7.0	42.0	42.0	15.9	50.9		34.0	34.0	15.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.1	100.7	100.7	13.8	111.6			6.7	18.5		13.2	
Actuated g/C Ratio	0.05	0.67	0.67	0.09	0.74			0.04	0.12		0.09	
v/c Ratio	0.23	0.30	0.01	0.65	0.22			0.32	0.22		0.74	
Control Delay	109.3	7.5	0.0	92.4	6.9			80.3	6.2		80.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	109.3	7.5	0.0	92.4	6.9			80.3	6.2		80.8	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		9.9			19.8			28.9			80.8	
Approach LOS		A			B			C			F	
Queue Length 50th (ft)	18	187	0	97	85			22	0		102	
Queue Length 95th (ft)	50	275	0	166	114			55	19		169	
Internal Link Dist (ft)		711			850			273			926	
Turn Bay Length (ft)	185		200	185					175			
Base Capacity (vph)	90	2352	1106	187	2512			380	270		412	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.20	0.30	0.01	0.53	0.22			0.06	0.19		0.30	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 20.4	Intersection LOS: C

Intersection Capacity Utilization 50.5%	ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	657	10	92	488	29	13	8	48	48	22	45
Future Volume (veh/h)	17	657	10	92	488	29	13	8	48	48	22	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1919	1979	1876	1802	1817	1894	1701	1864	2136	2061	1941
Adj Flow Rate, veh/h	18	714	0	100	530	30	14	9	20	52	24	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	0	5	4	0	13	2	0	5	13
Cap, veh/h	46	2401		131	2331	132	47	30	188	76	35	55
Arrive On Green	0.01	0.22	0.00	0.15	1.00	1.00	0.04	0.05	0.05	0.08	0.09	0.08
Sat Flow, veh/h	1884	3645	1677	1787	3295	186	1005	646	1550	865	399	632
Grp Volume(v), veh/h	18	714	0	100	275	285	23	0	20	114	0	0
Grp Sat Flow(s),veh/h/ln	1884	1823	1677	1787	1712	1769	1651	0	1550	1896	0	0
Q Serve(g_s), s	1.4	24.6	0.0	8.1	0.0	0.0	2.0	0.0	1.7	8.8	0.0	0.0
Cycle Q Clear(g_c), s	1.4	24.6	0.0	8.1	0.0	0.0	2.0	0.0	1.7	8.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.61		1.00	0.46		0.33
Lane Grp Cap(c), veh/h	46	2401		131	1211	1251	77	0	188	166	0	0
V/C Ratio(X)	0.39	0.30		0.77	0.23	0.23	0.30	0.00	0.11	0.69	0.00	0.00
Avail Cap(c_a), veh/h	101	2401		201	1211	1251	385	0	477	442	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.00	0.99	0.99	0.99	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.3	29.7	0.0	62.8	0.0	0.0	69.4	0.0	58.9	66.8	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.3	0.0	3.5	0.4	0.4	0.8	0.0	0.1	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	12.1	0.0	3.6	0.1	0.1	0.9	0.0	0.7	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.3	30.0	0.0	66.2	0.4	0.4	70.2	0.0	58.9	68.7	0.0	0.0
LnGrp LOS	E	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		732			660			43			114	
Approach Delay, s/veh		31.1			10.4			65.0			68.7	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.5	104.0		12.2	8.1	111.3		18.3
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	15.9	42.0		* 34	7.0	50.9		34.0
Max Q Clear Time (g_c+I1), s	10.1	26.6		4.0	3.4	2.0		10.8
Green Ext Time (p_c), s	0.1	12.2		0.0	0.0	23.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	684	59	51	560	0	43	0	19	3	0	2
Future Volume (vph)	2	684	59	51	560	0	43	0	19	3	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988							0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3532	0	1536	3567	0	0	1546	1580	1718	1647	0
Flt Permitted	0.416			0.318				0.757		0.726		
Satd. Flow (perm)	760	3532	0	514	3567	0	0	1232	1580	1313	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11							70		392	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	2	760	66	57	622	0	48	0	21	3	0	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	826	0	57	622	0	0	48	21	3	2	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

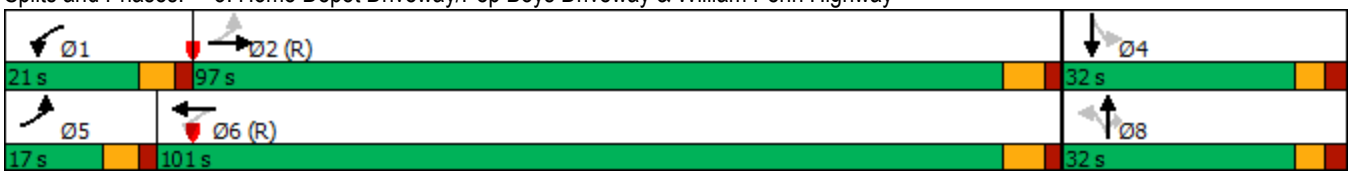
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	17.0	97.0		21.0	101.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	11.3%	64.7%		14.0%	67.3%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	11.0	90.4		15.0	94.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	126.3	122.0		130.2	129.2			11.3	11.3	11.3	11.3	
Actuated g/C Ratio	0.84	0.81		0.87	0.86			0.08	0.08	0.08	0.08	
v/c Ratio	0.00	0.29		0.12	0.20			0.52	0.11	0.03	0.00	
Control Delay	0.5	1.6		2.4	2.9			84.7	1.3	61.7	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	0.5	1.6		2.4	2.9			84.7	1.3	61.7	0.0	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		1.6			2.9			59.3			37.0	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	0	30		6	44			46	0	3	0	
Queue Length 95th (ft)	m0	38		16	110			90	0	13	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	740	2875		557	3072			221	341	236	617	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.00	0.29		0.10	0.20			0.22	0.06	0.01	0.00	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 4.8 Intersection LOS: A
Intersection Capacity Utilization 47.0% ICU Level of Service A
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	684	59	51	560	0	43	0	19	3	0	2
Future Volume (veh/h)	2	684	59	51	560	0	43	0	19	3	0	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2076	2159	1728	1875	1921	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	2	760	0	57	622	0	48	0	0	3	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	4	4	8	3	0	14	0	17	0	0	0
Cap, veh/h	806	3205		638	2992	0	118	0		133	96	0
Arrive On Green	0.02	1.00	0.00	0.04	0.84	0.00	0.04	0.00	0.00	0.05	0.00	0.00
Sat Flow, veh/h	2034	4048	0	1646	3656	0	1500	0	1519	1559	2057	0
Grp Volume(v), veh/h	2	760	0	57	622	0	48	0	0	3	0	0
Grp Sat Flow(s),veh/h/ln	2034	1972	0	1646	1781	0	1500	0	1519	1559	2057	0
Q Serve(g_s), s	0.0	0.0	0.0	0.8	5.1	0.0	4.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.8	5.1	0.0	4.8	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	806	3205		638	2992	0	108	0		133	96	0
V/C Ratio(X)	0.00	0.24		0.09	0.21	0.00	0.44	0.00		0.02	0.00	0.00
Avail Cap(c_a), veh/h	949	3205		753	2992	0	308	0		341	370	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	2.4	0.0	0.0	1.6	2.3	0.0	70.9	0.0	0.0	68.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.2	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.2	1.3	0.0	1.9	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	2.4	0.2	0.0	1.6	2.5	0.0	72.0	0.0	0.0	68.3	0.0	0.0
LnGrp LOS	A	A		A	A	A	E	A		E	A	A
Approach Vol, veh/h		762			679			48			3	
Approach Delay, s/veh		0.2			2.4			72.0			68.3	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	127.5		12.0	6.4	131.6		12.0
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	15.0	90.4		26.0	11.0	94.4		26.0
Max Q Clear Time (g_c+I1), s	2.8	2.0		2.2	2.0	7.1		6.8
Green Ext Time (p_c), s	0.0	33.1		0.0	0.0	24.6		0.0

Intersection Summary	
HCM 6th Ctrl Delay	3.6
HCM 6th LOS	A

Notes

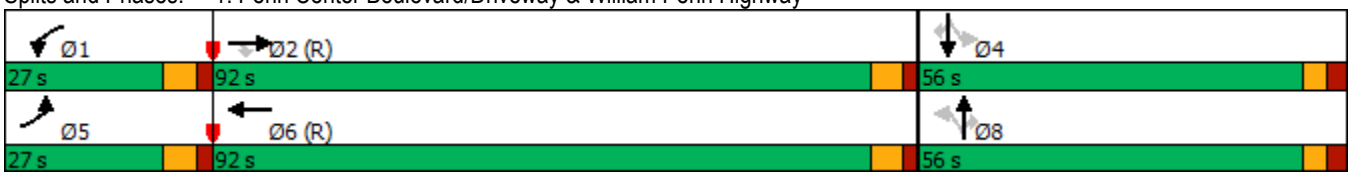
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	1051	90	96	932	6	173	26	112	64	21	93
Future Volume (vph)	89	1051	90	96	932	6	173	26	112	64	21	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00	0.99		1.00	0.99
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.958			0.964	
Satd. Flow (prot)	1685	3369	1522	1710	3417	0	0	1820	1583	0	1688	1531
Flt Permitted	0.950			0.950				0.641			0.420	
Satd. Flow (perm)	1682	3369	1522	1710	3417	0	0	1217	1560	0	735	1510
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			57						120			100
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)	2					2	1		2	2		1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%
Adj. Flow (vph)	96	1130	97	103	1002	6	186	28	120	69	23	100
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	1130	97	103	1008	0	0	214	120	0	92	100
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	27.0	92.0	92.0	27.0	92.0		56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	15.4%	52.6%	52.6%	15.4%	52.6%		32.0%	32.0%	32.0%	32.0%	32.0%	32.0%
Maximum Green (s)	20.7	85.7	85.7	20.7	85.7		50.1	50.1	50.1	50.1	50.1	50.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	16.3	106.6	106.6	16.7	107.1			36.2	36.2		36.2	36.2
Actuated g/C Ratio	0.09	0.61	0.61	0.10	0.61			0.21	0.21		0.21	0.21
v/c Ratio	0.62	0.55	0.10	0.63	0.48			0.85	0.29		0.61	0.26
Control Delay	92.4	23.2	8.4	108.8	11.1			94.5	9.2		78.4	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	92.4	23.2	8.4	108.8	11.1			94.5	9.2		78.4	9.7
LOS	F	C	A	F	B			F	A		E	A
Approach Delay		27.1			20.2			63.9			42.6	
Approach LOS		C			C			E			D	

Intersection Summary	
Area Type:	Other
Cycle Length: 175	
Actuated Cycle Length: 175	
Offset: 142 (81%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 29.7	Intersection LOS: C
Intersection Capacity Utilization 65.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	89	1051	90	96	932	6	173	26	112	64	21	93
Future Volume (veh/h)	89	1051	90	96	932	6	173	26	112	64	21	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1964	1964	1979	1862	1862	1876	1900	1900	1870	1900	1826	1870
Adj Flow Rate, veh/h	96	1130	88	103	1002	0	186	28	67	69	23	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	1	0	0	0	2	0	5	2
Cap, veh/h	127	2323	1042	131	2223		313	41	340	115	34	
Arrive On Green	0.07	0.62	0.62	0.15	1.00	0.00	0.21	0.22	0.22	0.21	0.22	0.00
Sat Flow, veh/h	1870	3731	1674	1773	3630	0	1278	192	1581	368	156	1585
Grp Volume(v), veh/h	96	1130	88	103	1002	0	214	0	67	92	0	0
Grp Sat Flow(s),veh/h/ln	1870	1865	1674	1773	1769	0	1470	0	1581	524	0	1585
Q Serve(g_s), s	8.8	28.7	3.7	9.8	0.0	0.0	0.0	0.0	6.1	10.7	0.0	0.0
Cycle Q Clear(g_c), s	8.8	28.7	3.7	9.8	0.0	0.0	23.5	0.0	6.1	34.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.87		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	127	2323	1042	131	2223		346	0	340	146	0	
V/C Ratio(X)	0.76	0.49	0.08	0.79	0.45		0.62	0.00	0.20	0.63	0.00	
Avail Cap(c_a), veh/h	232	2323	1042	220	2223		458	0	462	251	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	80.1	17.9	13.2	73.3	0.0	0.0	63.5	0.0	56.3	77.1	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.7	0.2	8.8	0.6	0.0	1.8	0.0	0.3	4.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	12.4	1.4	4.5	0.2	0.0	9.2	0.0	2.5	4.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.0	18.6	13.3	82.1	0.6	0.0	65.3	0.0	56.6	81.6	0.0	0.0
LnGrp LOS	F	B	B	F	A		E	A	E	F	A	
Approach Vol, veh/h		1314			1105			281			92	
Approach Delay, s/veh		23.4			8.2			63.2			81.6	
Approach LOS		C			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	18.2	114.3		42.6	17.2	115.3		42.6
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 21	* 86		50.1	* 21	* 86		50.1
Max Q Clear Time (g_c+I1), s	11.8	30.7		36.2	10.8	2.0		25.5
Green Ext Time (p_c), s	0.2	40.3		0.2	0.1	48.0		1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

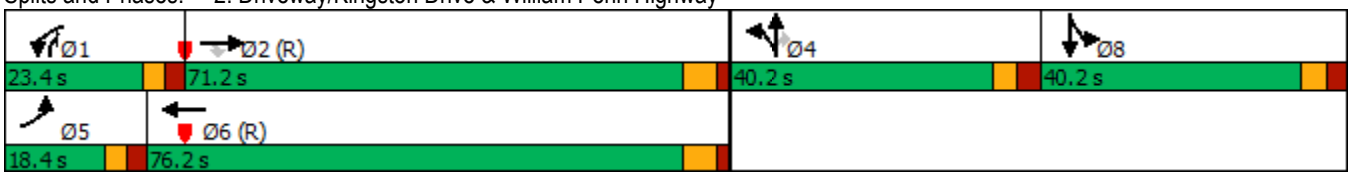
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	1023	33	95	1009	77	43	20	131	69	30	48
Future Volume (vph)	66	1023	33	95	1009	77	43	20	131	69	30	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			0.99	
Frt			0.850		0.989				0.850		0.956	
Flt Protected	0.950			0.950				0.967			0.977	
Satd. Flow (prot)	1702	3610	1577	1668	3496	0	0	1680	1470	0	1796	0
Flt Permitted	0.950			0.950				0.967			0.977	
Satd. Flow (perm)	1700	3610	1577	1668	3496	0	0	1672	1470	0	1796	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			93		5				136		12	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)	1					1	5					5
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%
Adj. Flow (vph)	69	1066	34	99	1051	80	45	21	136	72	31	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	1066	34	99	1131	0	0	66	136	0	153	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	36.2	36.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	18.4	71.2	71.2	23.4	76.2		40.2	40.2	23.4	40.2	40.2	
Total Split (%)	10.5%	40.7%	40.7%	13.4%	43.5%		23.0%	23.0%	13.4%	23.0%	23.0%	
Maximum Green (s)	12.9	65.0	65.0	17.9	70.0		34.0	34.0	17.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	11.7	111.3	111.3	15.2	114.8			10.7	26.7		17.7	
Actuated g/C Ratio	0.07	0.64	0.64	0.09	0.66			0.06	0.15		0.10	
v/c Ratio	0.61	0.46	0.03	0.68	0.49			0.65	0.40		0.80	
Control Delay	125.3	5.3	0.1	107.7	13.9			106.7	8.9		98.2	
Queue Delay	0.0	0.1	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	125.3	5.4	0.1	107.7	13.9			106.7	8.9		98.2	
LOS	F	A	A	F	B			F	A		F	
Approach Delay		12.3			21.5			40.8			98.2	
Approach LOS		B			C			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 23.3 Intersection LOS: C
Intersection Capacity Utilization 64.1% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	1023	33	95	1009	77	43	20	131	69	30	48
Future Volume (veh/h)	66	1023	33	95	1009	77	43	20	131	69	30	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1876	1862	1876	1894	1820	1864	2121	2136	2106
Adj Flow Rate, veh/h	69	1066	0	99	1051	79	45	21	70	72	31	44
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	0	1	0	0	5	2	1	0	2
Cap, veh/h	98	2379		126	2189	164	89	42	226	99	43	60
Arrive On Green	0.03	0.43	0.00	0.14	1.00	1.00	0.07	0.07	0.07	0.10	0.10	0.10
Sat Flow, veh/h	1884	3731	1677	1787	3334	251	1200	560	1548	965	416	590
Grp Volume(v), veh/h	69	1066	0	99	557	573	66	0	70	147	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1787	1769	1816	1760	0	1548	1971	0	0
Q Serve(g_s), s	6.3	35.4	0.0	9.4	0.0	0.0	6.3	0.0	7.1	12.7	0.0	0.0
Cycle Q Clear(g_c), s	6.3	35.4	0.0	9.4	0.0	0.0	6.3	0.0	7.1	12.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.14	0.68		1.00	0.49		0.30
Lane Grp Cap(c), veh/h	98	2379		126	1161	1192	131	0	226	202	0	0
V/C Ratio(X)	0.71	0.45		0.79	0.48	0.48	0.50	0.00	0.31	0.73	0.00	0.00
Avail Cap(c_a), veh/h	150	2379		193	1161	1192	352	0	421	394	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.00	0.92	0.92	0.92	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	83.1	28.3	0.0	73.9	0.0	0.0	78.2	0.0	67.0	76.5	0.0	0.0
Incr Delay (d2), s/veh	2.9	0.5	0.0	4.8	1.3	1.3	1.1	0.0	0.3	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	17.0	0.0	4.2	0.4	0.4	3.0	0.0	2.9	6.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.1	28.8	0.0	78.7	1.3	1.3	79.3	0.0	67.3	78.4	0.0	0.0
LnGrp LOS	F	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1135			1229			136			147	
Approach Delay, s/veh		32.3			7.5			73.2			78.4	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	16.8	116.8		18.2	13.6	120.1		23.1
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	17.9	65.0		* 34	12.9	70.0		34.0
Max Q Clear Time (g_c+I1), s	11.4	37.4		9.1	8.3	2.0		14.7
Green Ext Time (p_c), s	0.1	24.8		0.0	0.0	57.2		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1307	69	46	1129	4	79	0	32	3	0	5
Future Volume (vph)	4	1307	69	46	1129	4	79	0	32	3	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.993							0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3650	0	1659	3635	0	0	1711	1849	1292	1625	0
Flt Permitted	0.218			0.147				0.754		0.620		
Satd. Flow (perm)	398	3650	0	257	3635	0	0	1356	1824	842	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5							60		143	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	2%	0%	1%	25%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	4	1390	73	49	1201	4	84	0	34	3	0	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	1463	0	49	1205	0	0	84	34	3	5	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

2024 Base (No-Build)
Timing Plan: PM Peak

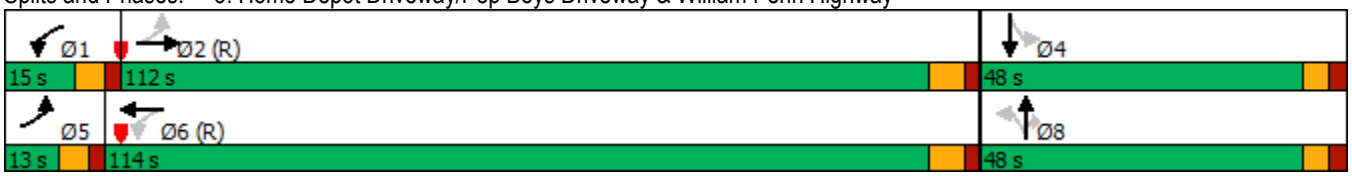
3: William Penn Highway (SR 2048) & Home Depot Driveway/Pep Boys Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	13.0	112.0		15.0	114.0		48.0	48.0	48.0	48.0	48.0	
Total Split (%)	7.4%	64.0%		8.6%	65.1%		27.4%	27.4%	27.4%	27.4%	27.4%	
Maximum Green (s)	7.0	105.4		9.0	107.4		42.0	42.0	42.0	42.0	42.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	142.3	137.7		146.7	144.8			15.4	15.4	15.4	15.4	
Actuated g/C Ratio	0.81	0.79		0.84	0.83			0.09	0.09	0.09	0.09	
v/c Ratio	0.01	0.51		0.19	0.40			0.71	0.16	0.04	0.02	
Control Delay	1.5	3.2		4.4	5.0			106.5	4.7	70.3	0.2	
Queue Delay	0.0	0.1		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	1.5	3.3		4.4	5.0			106.5	4.7	70.3	0.2	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		3.3			5.0			77.2			26.5	
Approach LOS		A			A			E			C	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 7.2 — Intersection LOS: A
Intersection Capacity Utilization 64.0% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	1307	69	46	1129	4	79	0	32	3	0	5
Future Volume (veh/h)	4	1307	69	46	1129	4	79	0	32	3	0	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2121	2190	1847	1905	1536	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	4	1390	0	49	1201	4	84	0	0	3	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	1	2	0	1	25	3	0	0	33	0	0
Cap, veh/h	436	3198		391	3014	10	151	0		146	0	129
Arrive On Green	0.01	1.00	0.00	0.03	0.81	0.81	0.07	0.00	0.00	0.07	0.00	0.07
Sat Flow, veh/h	2034	4136	0	1759	3701	12	1482	0	1744	1181	0	1736
Grp Volume(v), veh/h	4	1390	0	49	587	618	84	0	0	3	0	1
Grp Sat Flow(s),veh/h/ln	2034	2015	0	1759	1810	1903	1482	0	1744	1181	0	1736
Q Serve(g_s), s	0.1	0.0	0.0	0.9	15.6	15.6	9.7	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.0	0.9	15.6	15.6	9.8	0.0	0.0	0.3	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	436	3198		391	1474	1550	151	0		146	0	129
V/C Ratio(X)	0.01	0.43		0.13	0.40	0.40	0.56	0.00		0.02	0.00	0.01
Avail Cap(c_a), veh/h	507	3198		436	1474	1550	398	0		341	0	417
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.9	0.0	0.0	2.9	4.5	4.5	79.6	0.0	0.0	75.1	0.0	75.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.1	0.8	0.8	1.2	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.3	5.3	5.5	3.8	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.0	0.4	0.0	3.0	5.3	5.2	80.7	0.0	0.0	75.2	0.0	75.0
LnGrp LOS	A	A		A	A	A	F	A		E	A	E
Approach Vol, veh/h		1394			1254			84			4	
Approach Delay, s/veh		0.4			5.2			80.7			75.1	
Approach LOS		A			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	145.5		19.0	6.9	149.1		19.0
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	9.0	105.4		42.0	7.0	107.4		42.0
Max Q Clear Time (g_c+I1), s	2.9	2.0		2.3	2.1	17.6		11.8
Green Ext Time (p_c), s	0.0	81.4		0.0	0.0	62.7		0.1

Intersection Summary	
HCM 6th Ctrl Delay	5.2
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

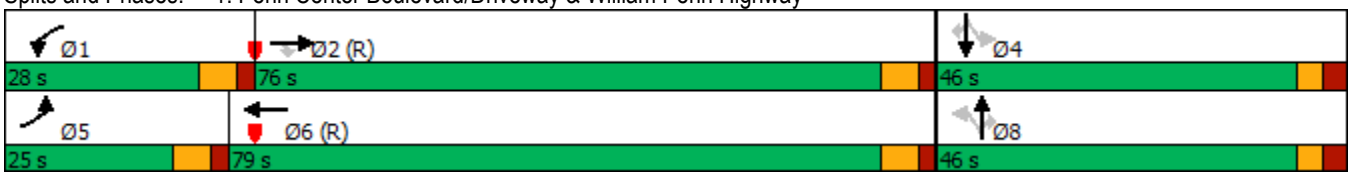
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	1161	77	137	978	4	125	21	98	80	16	100
Future Volume (vph)	81	1161	77	137	978	4	125	21	98	80	16	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99		1.00	
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.959			0.960	
Satd. Flow (prot)	1702	3403	1522	1694	3417	0	0	1794	1599	0	1702	1546
Flt Permitted	0.950			0.950				0.625			0.484	
Satd. Flow (perm)	1702	3403	1522	1694	3417	0	0	1169	1578	0	858	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67						101			103
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%
Adj. Flow (vph)	84	1197	79	141	1008	4	129	22	101	82	16	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	1197	79	141	1012	0	0	151	101	0	98	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	25.0	76.0	76.0	28.0	79.0		46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	16.7%	50.7%	50.7%	18.7%	52.7%		30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Maximum Green (s)	18.7	69.7	69.7	21.7	72.7		40.1	40.1	40.1	40.1	40.1	40.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	13.8	91.6	91.6	18.3	96.1			24.6	24.6		24.6	24.6
Actuated g/C Ratio	0.09	0.61	0.61	0.12	0.64			0.16	0.16		0.16	0.16
v/c Ratio	0.54	0.58	0.08	0.68	0.46			0.79	0.29		0.70	0.30
Control Delay	76.9	20.6	4.9	88.5	9.3			86.2	10.6		82.9	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	76.9	20.6	4.9	88.5	9.3			86.2	10.6		82.9	10.7
LOS	E	C	A	F	A			F	B		F	B
Approach Delay		23.2			19.0			55.9			45.9	
Approach LOS		C			B			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 113 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 25.9 Intersection LOS: C
Intersection Capacity Utilization 67.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	81	1161	77	137	978	4	125	21	98	80	16	100
Future Volume (veh/h)	81	1161	77	137	978	4	125	21	98	80	16	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1979	1979	1847	1862	1876	1885	1826	1885	1900	1900	1885
Adj Flow Rate, veh/h	84	1197	69	141	1008	0	129	22	69	82	16	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	2	1	0	1	5	1	0	0	1
Cap, veh/h	118	2325	1037	174	2316		281	40	286	146	25	
Arrive On Green	0.06	0.62	0.62	0.13	0.87	0.00	0.17	0.18	0.18	0.17	0.18	0.00
Sat Flow, veh/h	1884	3759	1677	1759	3630	0	1322	225	1595	569	140	1598
Grp Volume(v), veh/h	84	1197	69	141	1008	0	151	0	69	98	0	0
Grp Sat Flow(s),veh/h/ln	1884	1880	1677	1759	1769	0	1548	0	1595	708	0	1598
Q Serve(g_s), s	6.6	26.7	2.5	11.7	8.9	0.0	0.0	0.0	5.6	9.8	0.0	0.0
Cycle Q Clear(g_c), s	6.6	26.7	2.5	11.7	8.9	0.0	13.3	0.0	5.6	23.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.85		1.00	0.84		1.00
Lane Grp Cap(c), veh/h	118	2325	1037	174	2316		311	0	286	166	0	
V/C Ratio(X)	0.71	0.51	0.07	0.81	0.44		0.48	0.00	0.24	0.59	0.00	
Avail Cap(c_a), veh/h	247	2325	1037	266	2316		446	0	437	298	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.87	0.87	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	68.9	16.0	11.4	63.7	3.9	0.0	56.4	0.0	52.8	66.0	0.0	0.0
Incr Delay (d2), s/veh	7.6	0.8	0.1	9.0	0.5	0.0	1.2	0.0	0.4	3.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	11.3	0.9	5.5	2.5	0.0	5.5	0.0	2.3	3.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.5	16.8	11.5	72.8	4.4	0.0	57.5	0.0	53.2	69.3	0.0	0.0
LnGrp LOS	E	B	B	E	A		E	A	D	E	A	
Approach Vol, veh/h		1350			1149			220			98	
Approach Delay, s/veh		20.3			12.8			56.2			69.3	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.2	98.1		31.8	14.7	103.5		31.8
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 22	* 70		40.1	* 19	* 73		40.1
Max Q Clear Time (g_c+I1), s	13.7	28.7		25.1	8.6	10.9		15.3
Green Ext Time (p_c), s	0.2	33.5		0.2	0.1	40.1		0.8

Intersection Summary	
HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

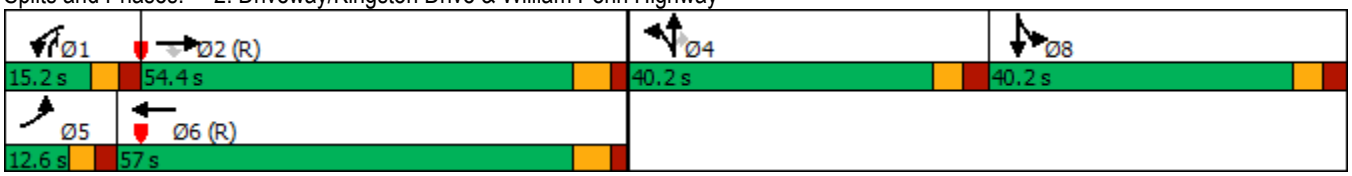
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Future Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	13	13	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.950	
Flt Protected	0.950			0.950				0.964			0.975	
Satd. Flow (prot)	1702	3610	1577	1635	3660	0	0	1668	1500	0	1771	0
Flt Permitted	0.950			0.950				0.964			0.975	
Satd. Flow (perm)	1702	3610	1577	1635	3660	0	0	1664	1500	0	1771	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		4				115		19	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%
Adj. Flow (vph)	42	1218	49	115	1164	71	40	13	115	65	16	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	1218	49	115	1235	0	0	53	115	0	129	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	0.97	0.97	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.6	54.4	54.4	15.2	57.0		40.2	40.2	15.2	40.2	40.2	
Total Split (%)	8.4%	36.3%	36.3%	10.1%	38.0%		26.8%	26.8%	10.1%	26.8%	26.8%	
Maximum Green (s)	7.1	48.2	48.2	9.7	50.8		34.0	34.0	9.7	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.6	99.3	99.3	10.7	104.5			8.9	18.9		13.2	
Actuated g/C Ratio	0.05	0.66	0.66	0.07	0.70			0.06	0.13		0.09	
v/c Ratio	0.49	0.51	0.05	0.99	0.48			0.54	0.40		0.75	
Control Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
LOS	F	A	A	F	A			F	B		F	
Approach Delay		7.6			21.2			34.6			80.9	
Approach LOS		A			C			C			F	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	1206	49	114	1152	70	40	13	114	64	16	48
Future Volume (veh/h)	42	1206	49	114	1152	70	40	13	114	64	16	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1847	1952	1952	1894	1776	1894	2106	2136	2106
Adj Flow Rate, veh/h	42	1218	0	115	1164	71	40	13	70	65	16	31
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	1	0	2	0	0	0	8	0	2	0	2
Cap, veh/h	68	2387		125	2397	146	91	29	226	97	24	46
Arrive On Green	0.01	0.21	0.00	0.14	1.00	1.00	0.06	0.07	0.07	0.08	0.08	0.08
Sat Flow, veh/h	1884	3731	1677	1759	3550	216	1291	420	1585	1145	282	546
Grp Volume(v), veh/h	42	1218	0	115	607	628	53	0	70	112	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1759	1854	1913	1711	0	1585	1973	0	0
Q Serve(g_s), s	3.3	43.3	0.0	9.7	0.0	0.0	4.5	0.0	6.0	8.3	0.0	0.0
Cycle Q Clear(g_c), s	3.3	43.3	0.0	9.7	0.0	0.0	4.5	0.0	6.0	8.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.75		1.00	0.58		0.28
Lane Grp Cap(c), veh/h	68	2387		125	1252	1291	120	0	226	167	0	0
V/C Ratio(X)	0.62	0.51		0.92	0.49	0.49	0.44	0.00	0.31	0.67	0.00	0.00
Avail Cap(c_a), veh/h	102	2387		125	1252	1291	399	0	484	460	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.00	0.88	0.88	0.88	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.1	38.4	0.0	63.9	0.0	0.0	67.3	0.0	57.8	67.1	0.0	0.0
Incr Delay (d2), s/veh	2.7	0.6	0.0	50.2	1.2	1.2	0.9	0.0	0.3	1.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	21.9	0.0	5.7	0.4	0.4	2.0	0.0	2.4	4.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.8	39.0	0.0	114.1	1.2	1.2	68.2	0.0	58.1	68.8	0.0	0.0
LnGrp LOS	E	D		F	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1260			1350			123			112	
Approach Delay, s/veh		40.2			10.8			62.5			68.8	
Approach LOS		D			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.2	101.2		15.7	9.9	106.5		17.9
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	9.7	48.2		* 34	7.1	50.8		34.0
Max Q Clear Time (g_c+I1), s	11.7	45.3		8.0	5.3	2.0		10.3
Green Ext Time (p_c), s	0.0	2.8		0.0	0.0	44.6		0.0

Intersection Summary	
HCM 6th Ctrl Delay	28.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

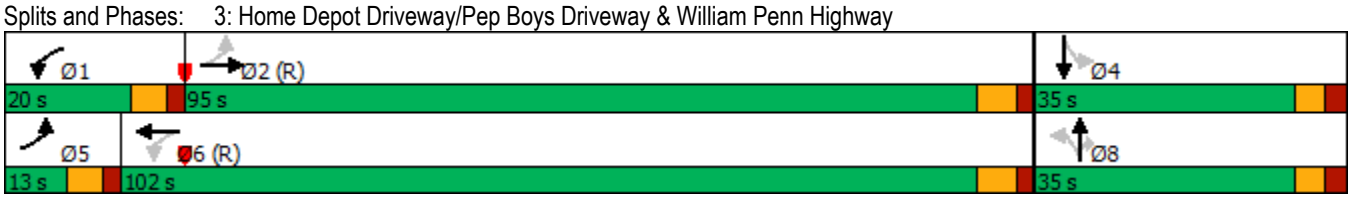
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1317	127	99	1232	4	126	1	45	1	0	3
Future Volume (vph)	2	1317	127	99	1232	4	126	1	45	1	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987							0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1735	3670	0	1659	3521	0	0	1768	1812	1718	1647	0
Flt Permitted	0.193			0.119				0.726		0.519		
Satd. Flow (perm)	353	3670	0	208	3521	0	0	1347	1812	939	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12							113		148	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	2	1372	132	103	1283	4	131	1	47	1	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	1504	0	103	1287	0	0	132	47	1	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	13.0	95.0		20.0	102.0		35.0	35.0	35.0	35.0	35.0	
Total Split (%)	8.7%	63.3%		13.3%	68.0%		23.3%	23.3%	23.3%	23.3%	23.3%	
Maximum Green (s)	7.0	88.4		14.0	95.4		29.0	29.0	29.0	29.0	29.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	110.7	105.1		118.8	116.1			19.1	19.1	19.1	19.1	
Actuated g/C Ratio	0.74	0.70		0.79	0.77			0.13	0.13	0.13	0.13	
v/c Ratio	0.01	0.58		0.44	0.47			0.77	0.14	0.01	0.01	
Control Delay	2.0	4.0		10.0	7.8			90.0	0.9	53.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	2.0	4.0		10.0	7.8			90.0	0.9	53.0	0.0	
LOS	A	A		B	A			F	A	D	A	
Approach Delay		4.0			8.0			66.6			13.3	
Approach LOS		A			A			E			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 9.5	Intersection LOS: A
Intersection Capacity Utilization 75.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1317	127	99	1232	4	126	1	45	1	0	3
Future Volume (veh/h)	2	1317	127	99	1232	4	126	1	45	1	0	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2136	2221	1847	1832	1921	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	2	1372	0	103	1283	4	131	1	0	1	0	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	1	0	0	0	2	0	0	0
Cap, veh/h	369	3011		396	2748	9	198	1		241	0	177
Arrive On Green	0.01	1.00	0.00	0.03	0.77	0.77	0.10	0.10	0.00	0.10	0.00	0.10
Sat Flow, veh/h	2034	4165	0	1759	3560	11	1482	11	1717	1558	0	1743
Grp Volume(v), veh/h	2	1372	0	103	627	660	132	0	0	1	0	1
Grp Sat Flow(s),veh/h/ln	2034	2029	0	1759	1741	1830	1493	0	1717	1558	0	1743
Q Serve(g_s), s	0.0	0.0	0.0	2.1	19.3	19.3	13.0	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.1	19.3	19.3	13.1	0.0	0.0	0.1	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	369	3011		396	1344	1413	199	0		241	0	177
V/C Ratio(X)	0.01	0.46		0.26	0.47	0.47	0.66	0.00		0.00	0.00	0.01
Avail Cap(c_a), veh/h	458	3011		502	1344	1413	337	0		384	0	337
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.86	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.6	0.0	0.0	3.9	6.1	6.1	66.5	0.0	0.0	60.6	0.0	60.6
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.1	1.2	1.1	1.4	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.7	6.5	6.8	5.1	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.6	0.4	0.0	4.0	7.3	7.2	67.9	0.0	0.0	60.6	0.0	60.6
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		1374			1390			132			2	
Approach Delay, s/veh		0.4			7.0			67.9			60.6	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.9	117.9		21.2	6.4	122.4		21.2
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	14.0	88.4		29.0	7.0	95.4		29.0
Max Q Clear Time (g_c+I1), s	4.1	2.0		2.1	2.0	21.3		15.1
Green Ext Time (p_c), s	0.1	69.7		0.0	0.0	58.3		0.2

Intersection Summary	
HCM 6th Ctrl Delay	6.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2029 Base (No-Build) Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	663	134	90	408	5	95	11	40	40	13	71
Future Volume (vph)	70	663	134	90	408	5	95	11	40	40	13	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.957			0.964	
Satd. Flow (prot)	1506	3304	1507	1677	3317	0	0	1802	1380	0	1477	1473
Flt Permitted	0.950			0.950				0.707			0.590	
Satd. Flow (perm)	1506	3304	1507	1677	3317	0	0	1331	1380	0	904	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		1				70			74
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%
Adj. Flow (vph)	73	691	140	94	425	5	99	11	42	42	14	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	691	140	94	430	0	0	110	42	0	56	74
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												

2029 Base (No-Build)
Timing Plan: AM Peak

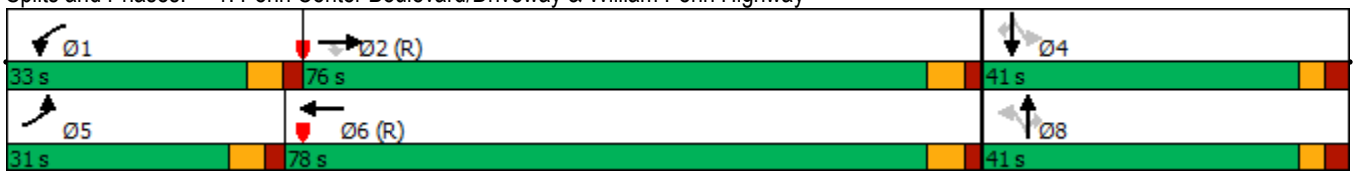
1: William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	31.3	31.3	13.3	31.3		23.9	23.9	23.9	23.9	23.9	23.9
Total Split (s)	31.0	76.0	76.0	33.0	78.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	20.7%	50.7%	50.7%	22.0%	52.0%		27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
Maximum Green (s)	24.7	69.7	69.7	26.7	71.7		35.1	35.1	35.1	35.1	35.1	35.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Act Effct Green (s)	13.7	100.9	100.9	14.8	102.0			18.8	18.8		18.8	18.8
Actuated g/C Ratio	0.09	0.67	0.67	0.10	0.68			0.13	0.13		0.13	0.13
v/c Ratio	0.53	0.31	0.14	0.57	0.19			0.66	0.18		0.50	0.30
Control Delay	78.2	11.7	6.1	83.7	7.5			80.2	4.9		74.5	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	78.2	11.7	6.1	83.7	7.5			80.2	4.9		74.5	14.1
LOS	E	B	A	F	A			F	A		E	B
Approach Delay		16.2			21.1			59.4			40.1	
Approach LOS		B			C			E			D	
Queue Length 50th (ft)	69	137	23	93	53			104	0		52	0
Queue Length 95th (ft)	122	220	62	160	74			166	12		96	47
Internal Link Dist (ft)		1513			711			922			274	
Turn Bay Length (ft)	205		60	250								125
Base Capacity (vph)	258	2222	1035	309	2255			320	385		217	410
Starvation Cap Reductn	0	0	0	0	0			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.28	0.31	0.14	0.30	0.19			0.34	0.11		0.26	0.18

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 100 (67%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 23.4 — Intersection LOS: C
Intersection Capacity Utilization 51.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	663	134	90	408	5	95	11	40	40	13	71
Future Volume (veh/h)	70	663	134	90	408	5	95	11	40	40	13	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1784	1934	1964	1832	1817	1876	1900	1767	1648	1589	1900	1811
Adj Flow Rate, veh/h	73	691	115	94	425	0	99	11	22	42	14	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	13	3	1	3	4	0	0	9	17	21	0	6
Cap, veh/h	103	2557	1158	125	2442		204	18	180	96	27	
Arrive On Green	0.06	0.70	0.70	0.14	1.00	0.00	0.12	0.13	0.13	0.12	0.13	0.00
Sat Flow, veh/h	1699	3674	1664	1745	3543	0	1225	136	1397	415	207	1535
Grp Volume(v), veh/h	73	691	115	94	425	0	110	0	22	56	0	0
Grp Sat Flow(s),veh/h/ln	1699	1837	1664	1745	1726	0	1361	0	1397	622	0	1535
Q Serve(g_s), s	6.3	10.6	3.4	7.8	0.0	0.0	0.0	0.0	2.1	4.7	0.0	0.0
Cycle Q Clear(g_c), s	6.3	10.6	3.4	7.8	0.0	0.0	11.6	0.0	2.1	16.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.90		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	103	2557	1158	125	2442		212	0	180	118	0	
V/C Ratio(X)	0.71	0.27	0.10	0.75	0.17		0.52	0.00	0.12	0.47	0.00	
Avail Cap(c_a), veh/h	291	2557	1158	322	2442		364	0	336	285	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	69.2	8.5	7.5	62.9	0.0	0.0	62.4	0.0	57.8	68.0	0.0	0.0
Incr Delay (d2), s/veh	8.7	0.3	0.2	8.5	0.2	0.0	2.0	0.0	0.3	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	4.1	1.2	3.5	0.1	0.0	4.2	0.0	0.8	2.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	8.8	7.6	71.5	0.2	0.0	64.3	0.0	58.1	70.9	0.0	0.0
LnGrp LOS	E	A	A	E	A		E	A	E	E	A	
Approach Vol, veh/h		879			519			132			56	
Approach Delay, s/veh		14.4			13.1			63.3			70.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	16.1	109.7		24.3	14.4	111.4		24.3
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 27	* 70		35.1	* 25	* 72		35.1
Max Q Clear Time (g_c+I1), s	9.8	12.6		18.3	8.3	2.0		13.6
Green Ext Time (p_c), s	0.2	22.1		0.1	0.1	14.3		0.4

Intersection Summary	
HCM 6th Ctrl Delay	20.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	673	10	95	501	30	13	8	49	49	23	46
Future Volume (vph)	18	673	10	95	501	30	13	8	49	49	23	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.947	
Flt Protected	0.950			0.950				0.970			0.980	
Satd. Flow (prot)	1702	3506	1577	1668	3375	0	0	1629	1470	0	1702	0
Flt Permitted	0.950			0.950				0.970			0.980	
Satd. Flow (perm)	1702	3506	1577	1668	3375	0	0	1625	1470	0	1702	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		4				68		20	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%
Adj. Flow (vph)	20	732	11	103	545	33	14	9	53	53	25	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	732	11	103	578	0	0	23	53	0	128	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.5	48.2	48.2	21.4	57.1		40.2	40.2	21.4	40.2	40.2	
Total Split (%)	8.3%	32.1%	32.1%	14.3%	38.1%		26.8%	26.8%	14.3%	26.8%	26.8%	
Maximum Green (s)	7.0	42.0	42.0	15.9	50.9		34.0	34.0	15.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.1	100.2	100.2	14.0	111.3			6.7	18.7		13.5	
Actuated g/C Ratio	0.05	0.67	0.67	0.09	0.74			0.04	0.12		0.09	
v/c Ratio	0.25	0.31	0.01	0.66	0.23			0.32	0.22		0.75	
Control Delay	110.4	7.6	0.0	93.2	7.0			80.3	6.5		80.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	110.4	7.6	0.0	93.2	7.0			80.3	6.5		80.8	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		10.2			20.0			28.8			80.8	
Approach LOS		B			C			C			F	
Queue Length 50th (ft)	20	195	0	100	92			22	0		105	
Queue Length 95th (ft)	53	285	0	171	116			55	21		172	
Internal Link Dist (ft)		711			850			273			926	
Turn Bay Length (ft)	185		200	185					175			
Base Capacity (vph)	90	2341	1102	187	2505			380	270		412	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.22	0.31	0.01	0.55	0.23			0.06	0.20		0.31	

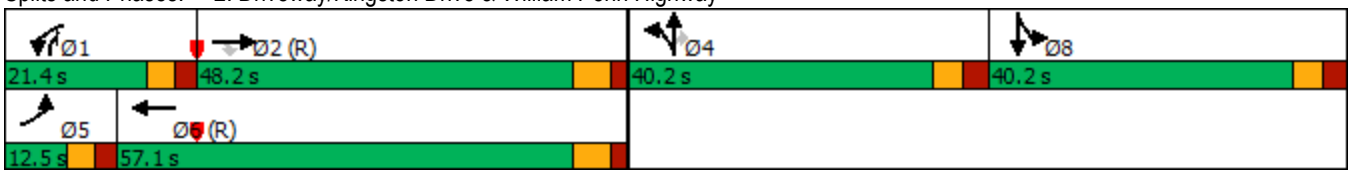
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 20.6 Intersection LOS: C

Intersection Capacity Utilization 51.2%	ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	673	10	95	501	30	13	8	49	49	23	46
Future Volume (veh/h)	18	673	10	95	501	30	13	8	49	49	23	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1919	1979	1876	1802	1817	1894	1701	1864	2136	2061	1941
Adj Flow Rate, veh/h	20	732	0	103	545	31	14	9	21	53	25	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	0	5	4	0	13	2	0	5	13
Cap, veh/h	48	2388		134	2320	132	47	30	191	77	36	56
Arrive On Green	0.01	0.22	0.00	0.15	1.00	1.00	0.04	0.05	0.05	0.08	0.09	0.08
Sat Flow, veh/h	1884	3645	1677	1787	3294	187	1005	646	1550	859	405	632
Grp Volume(v), veh/h	20	732	0	103	283	293	23	0	21	117	0	0
Grp Sat Flow(s),veh/h/ln	1884	1823	1677	1787	1712	1769	1651	0	1550	1896	0	0
Q Serve(g_s), s	1.6	25.3	0.0	8.3	0.0	0.0	2.0	0.0	1.8	9.0	0.0	0.0
Cycle Q Clear(g_c), s	1.6	25.3	0.0	8.3	0.0	0.0	2.0	0.0	1.8	9.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.61		1.00	0.45		0.33
Lane Grp Cap(c), veh/h	48	2388		134	1206	1246	78	0	191	169	0	0
V/C Ratio(X)	0.42	0.31		0.77	0.23	0.24	0.30	0.00	0.11	0.69	0.00	0.00
Avail Cap(c_a), veh/h	101	2388		201	1206	1246	385	0	480	442	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.00	0.99	0.99	0.99	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.3	30.2	0.0	62.5	0.0	0.0	69.4	0.0	58.6	66.7	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.3	0.0	4.3	0.5	0.4	0.8	0.0	0.1	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	12.5	0.0	3.7	0.2	0.2	0.9	0.0	0.7	4.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.3	30.5	0.0	66.9	0.5	0.4	70.2	0.0	58.7	68.6	0.0	0.0
LnGrp LOS	E	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		752			679			44			117	
Approach Delay, s/veh		31.7			10.5			64.7			68.6	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.7	103.5		12.2	8.3	110.9		18.6
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	15.9	42.0		* 34	7.0	50.9		34.0
Max Q Clear Time (g_c+I1), s	10.3	27.3		4.0	3.6	2.0		11.0
Green Ext Time (p_c), s	0.1	11.8		0.0	0.0	23.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	702	61	52	574	0	44	0	20	3	0	2
Future Volume (vph)	2	702	61	52	574	0	44	0	20	3	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988							0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3532	0	1536	3567	0	0	1546	1580	1718	1647	0
Flt Permitted	0.410			0.311				0.757		0.725		
Satd. Flow (perm)	749	3532	0	503	3567	0	0	1232	1580	1311	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11							70		383	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	2	780	68	58	638	0	49	0	22	3	0	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	848	0	58	638	0	0	49	22	3	2	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

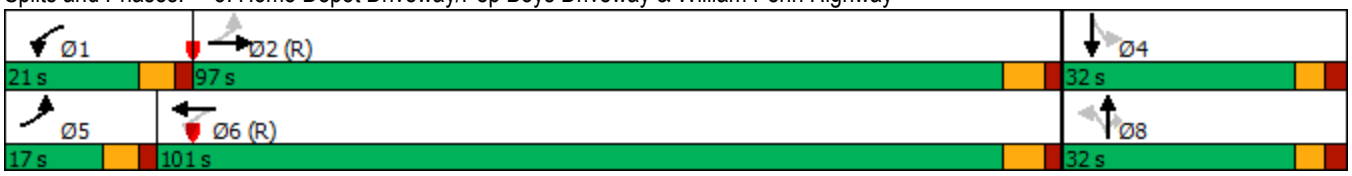
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	17.0	97.0		21.0	101.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	11.3%	64.7%		14.0%	67.3%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	11.0	90.4		15.0	94.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	126.2	121.9		130.1	129.1			11.5	11.5	11.4	11.4	
Actuated g/C Ratio	0.84	0.81		0.87	0.86			0.08	0.08	0.08	0.08	
v/c Ratio	0.00	0.30		0.12	0.21			0.52	0.12	0.03	0.00	
Control Delay	0.5	1.6		2.5	2.9			84.9	1.3	61.7	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	0.5	1.6		2.5	2.9			84.9	1.3	61.7	0.0	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		1.6			2.9			59.0			37.0	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	0	31		7	45			47	0	3	0	
Queue Length 95th (ft)	m0	40		17	114			91	0	13	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	731	2873		548	3069			221	341	235	610	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.00	0.30		0.11	0.21			0.22	0.06	0.01	0.00	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 4.8 Intersection LOS: A
Intersection Capacity Utilization 47.6% ICU Level of Service A
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	702	61	52	574	0	44	0	20	3	0	2
Future Volume (veh/h)	2	702	61	52	574	0	44	0	20	3	0	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2076	2159	1728	1875	1921	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	2	780	0	58	638	0	49	0	0	3	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	4	4	8	3	0	14	0	17	0	0	0
Cap, veh/h	793	3201		628	2989	0	119	0		135	98	0
Arrive On Green	0.02	1.00	0.00	0.04	0.84	0.00	0.04	0.00	0.00	0.05	0.00	0.00
Sat Flow, veh/h	2034	4048	0	1646	3656	0	1500	0	1519	1559	2057	0
Grp Volume(v), veh/h	2	780	0	58	638	0	49	0	0	3	0	0
Grp Sat Flow(s),veh/h/ln	2034	1972	0	1646	1781	0	1500	0	1519	1559	2057	0
Q Serve(g_s), s	0.0	0.0	0.0	0.8	5.3	0.0	4.9	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.8	5.3	0.0	4.9	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	793	3201		628	2989	0	109	0		135	98	0
V/C Ratio(X)	0.00	0.24		0.09	0.21	0.00	0.45	0.00		0.02	0.00	0.00
Avail Cap(c_a), veh/h	937	3201		743	2989	0	308	0		342	370	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	2.4	0.0	0.0	1.6	2.4	0.0	70.9	0.0	0.0	68.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.2	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.2	1.4	0.0	1.9	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	2.4	0.2	0.0	1.6	2.5	0.0	71.9	0.0	0.0	68.2	0.0	0.0
LnGrp LOS	A	A		A	A	A	E	A		E	A	A
Approach Vol, veh/h		782			696			49			3	
Approach Delay, s/veh		0.2			2.5			71.9			68.2	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	127.3		12.1	6.4	131.5		12.1
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	15.0	90.4		26.0	11.0	94.4		26.0
Max Q Clear Time (g_c+I1), s	2.8	2.0		2.2	2.0	7.3		6.9
Green Ext Time (p_c), s	0.0	34.4		0.0	0.0	25.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	3.6
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

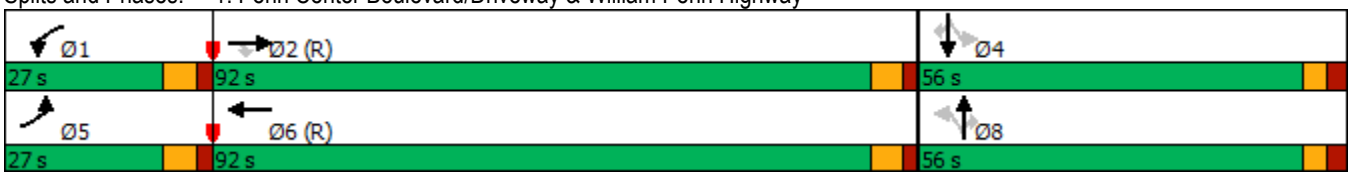
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1077	93	99	955	6	177	27	114	66	22	96
Future Volume (vph)	92	1077	93	99	955	6	177	27	114	66	22	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00	0.99		1.00	0.99
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.958			0.964	
Satd. Flow (prot)	1685	3369	1522	1710	3417	0	0	1820	1583	0	1688	1531
Flt Permitted	0.950			0.950				0.636			0.415	
Satd. Flow (perm)	1682	3369	1522	1710	3417	0	0	1207	1560	0	726	1510
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			57						123			103
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)	2					2	1		2	2		1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%
Adj. Flow (vph)	99	1158	100	106	1027	6	190	29	123	71	24	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	1158	100	106	1033	0	0	219	123	0	95	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	27.0	92.0	92.0	27.0	92.0		56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	15.4%	52.6%	52.6%	15.4%	52.6%		32.0%	32.0%	32.0%	32.0%	32.0%	32.0%
Maximum Green (s)	20.7	85.7	85.7	20.7	85.7		50.1	50.1	50.1	50.1	50.1	50.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	16.5	105.6	105.6	16.9	106.0			37.0	37.0		37.0	37.0
Actuated g/C Ratio	0.09	0.60	0.60	0.10	0.61			0.21	0.21		0.21	0.21
v/c Ratio	0.63	0.57	0.11	0.64	0.50			0.86	0.29		0.62	0.26
Control Delay	92.9	24.2	8.8	109.5	11.3			94.8	8.8		78.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	92.9	24.2	8.8	109.5	11.4			94.8	8.8		78.6	9.4
LOS	F	C	A	F	B			F	A		E	A
Approach Delay		28.1			20.5			63.9			42.6	
Approach LOS		C			C			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 142 (81%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 30.2 Intersection LOS: C
Intersection Capacity Utilization 67.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	1077	93	99	955	6	177	27	114	66	22	96
Future Volume (veh/h)	92	1077	93	99	955	6	177	27	114	66	22	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1964	1964	1979	1862	1862	1876	1900	1900	1870	1900	1826	1870
Adj Flow Rate, veh/h	99	1158	91	106	1027	0	190	29	70	71	24	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	1	0	0	0	2	0	5	2
Cap, veh/h	130	2298	1031	134	2199		319	43	348	117	34	
Arrive On Green	0.07	0.62	0.62	0.15	1.00	0.00	0.21	0.22	0.22	0.21	0.22	0.00
Sat Flow, veh/h	1870	3731	1674	1773	3630	0	1272	194	1581	366	157	1585
Grp Volume(v), veh/h	99	1158	91	106	1027	0	219	0	70	95	0	0
Grp Sat Flow(s),veh/h/ln	1870	1865	1674	1773	1769	0	1467	0	1581	523	0	1585
Q Serve(g_s), s	9.1	30.3	3.9	10.1	0.0	0.0	0.0	0.0	6.3	11.1	0.0	0.0
Cycle Q Clear(g_c), s	9.1	30.3	3.9	10.1	0.0	0.0	24.1	0.0	6.3	35.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.87		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	130	2298	1031	134	2199		353	0	348	148	0	
V/C Ratio(X)	0.76	0.50	0.09	0.79	0.47		0.62	0.00	0.20	0.64	0.00	
Avail Cap(c_a), veh/h	232	2298	1031	220	2199		458	0	462	246	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	80.0	18.7	13.6	73.0	0.0	0.0	63.0	0.0	55.7	77.0	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.8	0.2	8.7	0.6	0.0	1.8	0.0	0.3	4.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	13.1	1.5	4.6	0.2	0.0	9.4	0.0	2.6	4.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.8	19.5	13.8	81.7	0.6	0.0	64.8	0.0	56.0	81.6	0.0	0.0
LnGrp LOS	F	B	B	F	A		E	A	E	F	A	
Approach Vol, veh/h		1348			1133			289			95	
Approach Delay, s/veh		24.2			8.2			62.6			81.6	
Approach LOS		C			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	18.5	113.1		43.4	17.5	114.1		43.4
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 21	* 86		50.1	* 21	* 86		50.1
Max Q Clear Time (g_c+I1), s	12.1	32.3		37.2	11.1	2.0		26.1
Green Ext Time (p_c), s	0.2	40.3		0.2	0.2	49.5		1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

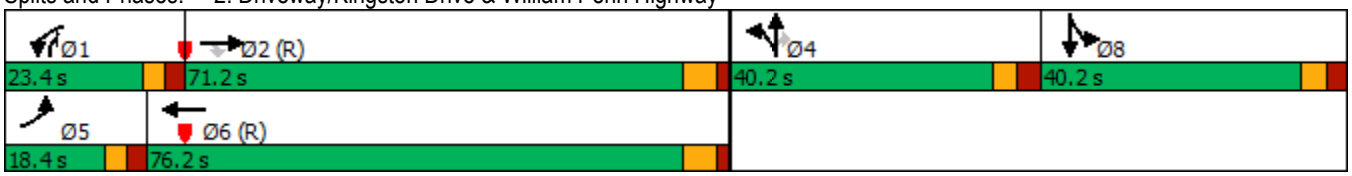
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	1049	34	98	1034	79	44	21	134	71	31	49
Future Volume (vph)	68	1049	34	98	1034	79	44	21	134	71	31	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			0.99	
Frt			0.850		0.989				0.850		0.956	
Flt Protected	0.950			0.950				0.967			0.977	
Satd. Flow (prot)	1702	3610	1577	1668	3496	0	0	1679	1470	0	1796	0
Flt Permitted	0.950			0.950				0.967			0.977	
Satd. Flow (perm)	1700	3610	1577	1668	3496	0	0	1672	1470	0	1796	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			93		5				140		12	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)	1					1	5					5
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%
Adj. Flow (vph)	71	1093	35	102	1077	82	46	22	140	74	32	51
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	1093	35	102	1159	0	0	68	140	0	157	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	36.2	36.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	18.4	71.2	71.2	23.4	76.2		40.2	40.2	23.4	40.2	40.2	
Total Split (%)	10.5%	40.7%	40.7%	13.4%	43.5%		23.0%	23.0%	13.4%	23.0%	23.0%	
Maximum Green (s)	12.9	65.0	65.0	17.9	70.0		34.0	34.0	17.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	11.8	110.5	110.5	15.4	114.1			10.9	27.1		18.1	
Actuated g/C Ratio	0.07	0.63	0.63	0.09	0.65			0.06	0.15		0.10	
v/c Ratio	0.62	0.48	0.03	0.69	0.51			0.65	0.41		0.80	
Control Delay	125.8	5.4	0.1	108.3	14.4			106.9	8.7		98.2	
Queue Delay	0.0	0.1	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	125.8	5.5	0.1	108.3	14.4			106.9	8.7		98.2	
LOS	F	A	A	F	B			F	A		F	
Approach Delay		12.5			22.0			40.8			98.2	
Approach LOS		B			C			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 23.6 Intersection LOS: C
Intersection Capacity Utilization 65.1% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	1049	34	98	1034	79	44	21	134	71	31	49
Future Volume (veh/h)	68	1049	34	98	1034	79	44	21	134	71	31	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1876	1862	1876	1894	1820	1864	2121	2136	2106
Adj Flow Rate, veh/h	71	1093	0	102	1077	81	46	22	74	74	32	45
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	0	1	0	0	5	2	1	0	2
Cap, veh/h	100	2359		129	2172	163	91	43	232	101	44	61
Arrive On Green	0.04	0.42	0.00	0.14	1.00	1.00	0.07	0.08	0.08	0.10	0.10	0.10
Sat Flow, veh/h	1884	3731	1677	1787	3334	251	1191	570	1549	966	418	587
Grp Volume(v), veh/h	71	1093	0	102	571	587	68	0	74	151	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1787	1769	1816	1760	0	1549	1971	0	0
Q Serve(g_s), s	6.5	36.8	0.0	9.6	0.0	0.0	6.5	0.0	7.5	13.0	0.0	0.0
Cycle Q Clear(g_c), s	6.5	36.8	0.0	9.6	0.0	0.0	6.5	0.0	7.5	13.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.14	0.68		1.00	0.49		0.30
Lane Grp Cap(c), veh/h	100	2359		129	1152	1183	134	0	232	206	0	0
V/C Ratio(X)	0.71	0.46		0.79	0.50	0.50	0.51	0.00	0.32	0.73	0.00	0.00
Avail Cap(c_a), veh/h	150	2359		193	1152	1183	352	0	424	394	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.00	0.92	0.92	0.92	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	83.1	29.1	0.0	73.6	0.0	0.0	78.0	0.0	66.6	76.4	0.0	0.0
Incr Delay (d2), s/veh	2.8	0.5	0.0	6.1	1.4	1.4	1.1	0.0	0.3	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	17.7	0.0	4.4	0.4	0.5	3.0	0.0	3.0	6.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.9	29.7	0.0	79.6	1.4	1.4	79.1	0.0	66.9	78.3	0.0	0.0
LnGrp LOS	F	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1164			1260			142			151	
Approach Delay, s/veh		33.1			7.7			72.7			78.3	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	17.1	115.9		18.6	13.8	119.2		23.5
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	17.9	65.0		* 34	12.9	70.0		34.0
Max Q Clear Time (g_c+I1), s	11.6	38.8		9.5	8.5	2.0		15.0
Green Ext Time (p_c), s	0.1	23.9		0.0	0.0	58.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

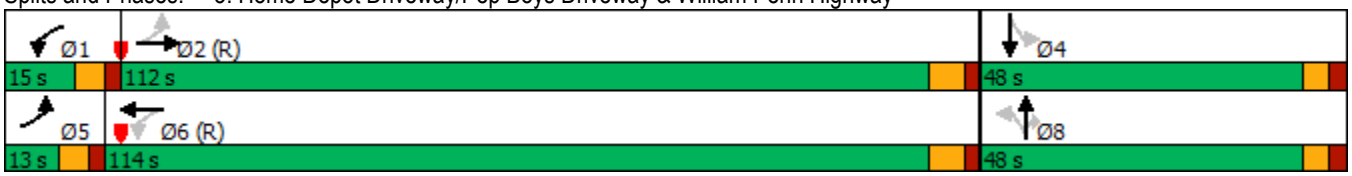
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1340	71	47	1157	4	81	0	33	3	0	5
Future Volume (vph)	4	1340	71	47	1157	4	81	0	33	3	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.992							0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3646	0	1659	3635	0	0	1711	1849	1292	1625	0
Flt Permitted	0.210			0.139				0.754		0.612		
Satd. Flow (perm)	384	3646	0	243	3635	0	0	1356	1824	831	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5							60		138	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	2%	0%	1%	25%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	4	1426	76	50	1231	4	86	0	35	3	0	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	1502	0	50	1235	0	0	86	35	3	5	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	13.0	112.0		15.0	114.0		48.0	48.0	48.0	48.0	48.0	
Total Split (%)	7.4%	64.0%		8.6%	65.1%		27.4%	27.4%	27.4%	27.4%	27.4%	
Maximum Green (s)	7.0	105.4		9.0	107.4		42.0	42.0	42.0	42.0	42.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	142.0	137.4		146.5	144.5			15.7	15.7	15.7	15.7	
Actuated g/C Ratio	0.81	0.79		0.84	0.83			0.09	0.09	0.09	0.09	
v/c Ratio	0.01	0.52		0.20	0.41			0.71	0.16	0.04	0.02	
Control Delay	1.5	3.3		4.6	5.2			106.3	5.0	70.0	0.2	
Queue Delay	0.0	0.1		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	1.5	3.4		4.6	5.2			106.3	5.0	70.0	0.2	
LOS	A	A		A	A			F	A	E	A	
Approach Delay		3.4			5.2			77.0			26.4	
Approach LOS		A			A			E			C	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 7.3 — Intersection LOS: A
Intersection Capacity Utilization 64.9% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	1340	71	47	1157	4	81	0	33	3	0	5
Future Volume (veh/h)	4	1340	71	47	1157	4	81	0	33	3	0	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2121	2190	1847	1905	1536	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	4	1426	0	50	1231	4	86	0	0	3	0	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	1	2	0	1	25	3	0	0	33	0	0
Cap, veh/h	422	3192		381	3010	10	153	0		148	0	131
Arrive On Green	0.01	1.00	0.00	0.03	0.81	0.81	0.08	0.00	0.00	0.08	0.00	0.08
Sat Flow, veh/h	2034	4136	0	1759	3701	12	1482	0	1744	1181	0	1737
Grp Volume(v), veh/h	4	1426	0	50	602	633	86	0	0	3	0	1
Grp Sat Flow(s),veh/h/ln	2034	2015	0	1759	1810	1903	1482	0	1744	1181	0	1737
Q Serve(g_s), s	0.1	0.0	0.0	0.9	16.3	16.3	9.9	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.0	0.9	16.3	16.3	10.0	0.0	0.0	0.3	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	422	3192		381	1472	1548	153	0		148	0	131
V/C Ratio(X)	0.01	0.45		0.13	0.41	0.41	0.56	0.00		0.02	0.00	0.01
Avail Cap(c_a), veh/h	493	3192		425	1472	1548	399	0		342	0	417
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.0	0.0	0.0	3.0	4.6	4.6	79.4	0.0	0.0	74.9	0.0	74.8
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.1	0.8	0.8	1.2	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.3	5.5	5.8	3.9	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.0	0.4	0.0	3.0	5.4	5.4	80.6	0.0	0.0	74.9	0.0	74.8
LnGrp LOS	A	A		A	A	A	F	A		E	A	E
Approach Vol, veh/h		1430			1285			86			4	
Approach Delay, s/veh		0.4			5.3			80.6			74.9	
Approach LOS		A			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	145.2		19.2	6.9	148.9		19.2
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	9.0	105.4		42.0	7.0	107.4		42.0
Max Q Clear Time (g_c+I1), s	2.9	2.0		2.3	2.1	18.3		12.0
Green Ext Time (p_c), s	0.0	83.4		0.0	0.0	64.2		0.1

Intersection Summary	
HCM 6th Ctrl Delay	5.2
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

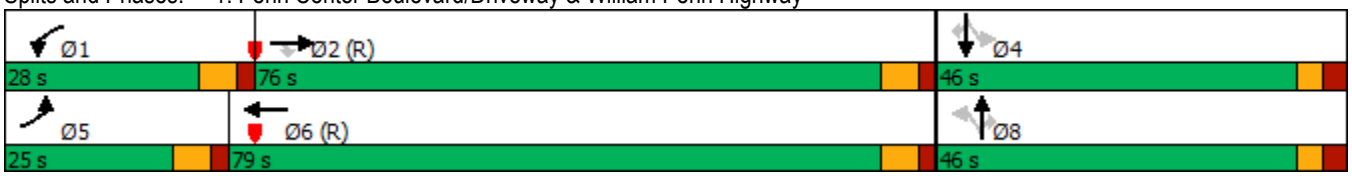
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	1190	79	140	1002	4	128	22	101	82	16	103
Future Volume (vph)	83	1190	79	140	1002	4	128	22	101	82	16	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99		1.00	
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.959			0.960	
Satd. Flow (prot)	1702	3403	1522	1694	3417	0	0	1794	1599	0	1702	1546
Flt Permitted	0.950			0.950				0.620			0.478	
Satd. Flow (perm)	1702	3403	1522	1694	3417	0	0	1160	1578	0	847	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67						104			106
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%
Adj. Flow (vph)	86	1227	81	144	1033	4	132	23	104	85	16	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	1227	81	144	1037	0	0	155	104	0	101	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	25.0	76.0	76.0	28.0	79.0		46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	16.7%	50.7%	50.7%	18.7%	52.7%		30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Maximum Green (s)	18.7	69.7	69.7	21.7	72.7		40.1	40.1	40.1	40.1	40.1	40.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	14.0	90.8	90.8	18.5	95.3			25.2	25.2		25.2	25.2
Actuated g/C Ratio	0.09	0.61	0.61	0.12	0.64			0.17	0.17		0.17	0.17
v/c Ratio	0.54	0.60	0.09	0.69	0.48			0.79	0.30		0.71	0.30
Control Delay	76.9	21.5	5.2	88.5	9.6			86.5	10.3		83.8	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	76.9	21.5	5.2	88.5	9.6			86.5	10.3		83.8	10.4
LOS	E	C	A	F	A			F	B		F	B
Approach Delay		24.0			19.2			55.9			46.2	
Approach LOS		C			B			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 113 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 26.4 Intersection LOS: C
Intersection Capacity Utilization 69.1% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1190	79	140	1002	4	128	22	101	82	16	103
Future Volume (veh/h)	83	1190	79	140	1002	4	128	22	101	82	16	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1979	1979	1847	1862	1876	1885	1826	1885	1900	1900	1885
Adj Flow Rate, veh/h	86	1227	71	144	1033	0	132	23	72	85	16	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	2	1	0	1	5	1	0	0	1
Cap, veh/h	121	2303	1027	177	2297		287	42	292	149	25	
Arrive On Green	0.06	0.61	0.61	0.13	0.86	0.00	0.18	0.18	0.18	0.18	0.18	0.00
Sat Flow, veh/h	1884	3759	1677	1759	3630	0	1325	231	1595	572	135	1598
Grp Volume(v), veh/h	86	1227	71	144	1033	0	155	0	72	101	0	0
Grp Sat Flow(s),veh/h/ln	1884	1880	1677	1759	1769	0	1556	0	1595	707	0	1598
Q Serve(g_s), s	6.7	28.2	2.6	11.9	9.8	0.0	0.0	0.0	5.8	10.2	0.0	0.0
Cycle Q Clear(g_c), s	6.7	28.2	2.6	11.9	9.8	0.0	13.5	0.0	5.8	23.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.85		1.00	0.84		1.00
Lane Grp Cap(c), veh/h	121	2303	1027	177	2297		319	0	292	169	0	
V/C Ratio(X)	0.71	0.53	0.07	0.81	0.45		0.49	0.00	0.25	0.60	0.00	
Avail Cap(c_a), veh/h	247	2303	1027	266	2297		448	0	437	295	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	68.9	16.7	11.8	63.6	4.2	0.0	55.9	0.0	52.4	65.9	0.0	0.0
Incr Delay (d2), s/veh	7.6	0.9	0.1	9.5	0.5	0.0	1.1	0.0	0.4	3.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	12.0	1.0	5.6	2.7	0.0	5.6	0.0	2.4	4.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.4	17.6	11.9	73.1	4.8	0.0	57.1	0.0	52.8	69.2	0.0	0.0
LnGrp LOS	E	B	B	E	A		E	A	D	E	A	
Approach Vol, veh/h		1384			1177			227			101	
Approach Delay, s/veh		21.0			13.1			55.7			69.2	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.4	97.2		32.4	14.9	102.7		32.4
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 22	* 70		40.1	* 19	* 73		40.1
Max Q Clear Time (g_c+I1), s	13.9	30.2		25.7	8.7	11.8		15.5
Green Ext Time (p_c), s	0.2	33.1		0.2	0.1	40.8		0.8

Intersection Summary	
HCM 6th Ctrl Delay	22.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

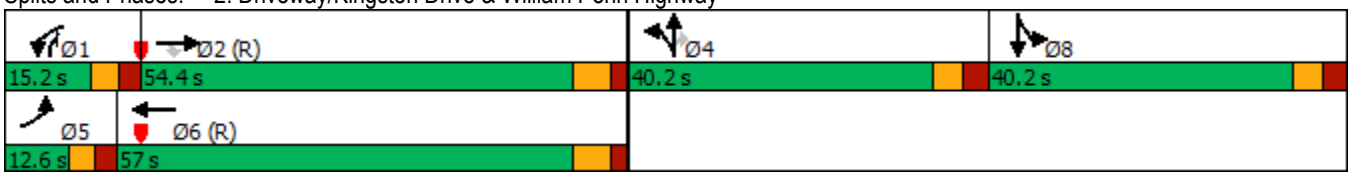
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Future Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	13	13	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.950	
Flt Protected	0.950			0.950				0.964			0.975	
Satd. Flow (prot)	1702	3610	1577	1635	3660	0	0	1668	1500	0	1771	0
Flt Permitted	0.950			0.950				0.964			0.975	
Satd. Flow (perm)	1702	3610	1577	1635	3660	0	0	1664	1500	0	1771	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		4				115		19	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%
Adj. Flow (vph)	42	1218	49	115	1164	71	40	13	115	65	16	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	1218	49	115	1235	0	0	53	115	0	129	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	0.97	0.97	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.6	54.4	54.4	15.2	57.0		40.2	40.2	15.2	40.2	40.2	
Total Split (%)	8.4%	36.3%	36.3%	10.1%	38.0%		26.8%	26.8%	10.1%	26.8%	26.8%	
Maximum Green (s)	7.1	48.2	48.2	9.7	50.8		34.0	34.0	9.7	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.6	99.3	99.3	10.7	104.5			8.9	18.9		13.2	
Actuated g/C Ratio	0.05	0.66	0.66	0.07	0.70			0.06	0.13		0.09	
v/c Ratio	0.49	0.51	0.05	0.99	0.48			0.54	0.40		0.75	
Control Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
LOS	F	A	A	F	A			F	B		F	
Approach Delay		7.6			21.2			34.6			80.9	
Approach LOS		A			C			C			F	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	1236	50	116	1180	72	41	13	116	66	16	49
Future Volume (veh/h)	43	1236	50	116	1180	72	41	13	116	66	16	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1847	1952	1952	1894	1776	1894	2106	2136	2106
Adj Flow Rate, veh/h	43	1248	0	117	1192	73	41	13	72	67	16	32
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	1	0	2	0	0	0	8	0	2	0	2
Cap, veh/h	69	2378		125	2385	146	93	29	228	99	24	47
Arrive On Green	0.01	0.21	0.00	0.14	1.00	1.00	0.06	0.07	0.07	0.08	0.09	0.08
Sat Flow, veh/h	1884	3731	1677	1759	3549	217	1299	412	1585	1149	274	549
Grp Volume(v), veh/h	43	1248	0	117	622	643	54	0	72	115	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1759	1854	1912	1711	0	1585	1972	0	0
Q Serve(g_s), s	3.4	44.5	0.0	9.9	0.0	0.0	4.6	0.0	6.1	8.5	0.0	0.0
Cycle Q Clear(g_c), s	3.4	44.5	0.0	9.9	0.0	0.0	4.6	0.0	6.1	8.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.76		1.00	0.58		0.28
Lane Grp Cap(c), veh/h	69	2378		125	1246	1285	122	0	228	170	0	0
V/C Ratio(X)	0.62	0.52		0.93	0.50	0.50	0.44	0.00	0.32	0.68	0.00	0.00
Avail Cap(c_a), veh/h	102	2378		125	1246	1285	399	0	484	460	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.00	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.1	39.1	0.0	63.9	0.0	0.0	67.2	0.0	57.7	67.0	0.0	0.0
Incr Delay (d2), s/veh	2.7	0.7	0.0	54.2	1.2	1.2	0.9	0.0	0.3	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	22.6	0.0	6.0	0.4	0.4	2.1	0.0	2.5	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.7	39.7	0.0	118.2	1.2	1.2	68.1	0.0	58.0	68.7	0.0	0.0
LnGrp LOS	E	D		F	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1291			1382			126			115	
Approach Delay, s/veh		40.9			11.1			62.3			68.7	
Approach LOS		D			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.2	100.8		15.9	10.0	106.0		18.1
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	9.7	48.2		* 34	7.1	50.8		34.0
Max Q Clear Time (g_c+I1), s	11.9	46.5		8.1	5.4	2.0		10.5
Green Ext Time (p_c), s	0.0	1.6		0.0	0.0	45.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1350	130	102	1263	4	128	1	46	1	0	3
Future Volume (vph)	2	1350	130	102	1263	4	128	1	46	1	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987							0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1735	3670	0	1659	3521	0	0	1768	1812	1718	1647	0
Flt Permitted	0.186			0.111				0.726		0.515		
Satd. Flow (perm)	340	3670	0	194	3521	0	0	1347	1812	932	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12							113		143	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	2	1406	135	106	1316	4	133	1	48	1	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	1541	0	106	1320	0	0	134	48	1	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	13.0	95.0		20.0	102.0		35.0	35.0	35.0	35.0	35.0	
Total Split (%)	8.7%	63.3%		13.3%	68.0%		23.3%	23.3%	23.3%	23.3%	23.3%	
Maximum Green (s)	7.0	88.4		14.0	95.4		29.0	29.0	29.0	29.0	29.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	110.0	104.4		118.6	115.8			19.4	19.4	19.4	19.4	
Actuated g/C Ratio	0.73	0.70		0.79	0.77			0.13	0.13	0.13	0.13	
v/c Ratio	0.01	0.60		0.46	0.49			0.77	0.14	0.01	0.01	
Control Delay	2.0	4.2		10.9	8.0			89.9	0.9	52.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	2.0	4.2		10.9	8.0			89.9	0.9	52.0	0.0	
LOS	A	A		B	A			F	A	D	A	
Approach Delay		4.2			8.3			66.4			13.0	
Approach LOS		A			A			E			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 9.6	Intersection LOS: A
Intersection Capacity Utilization 76.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1350	130	102	1263	4	128	1	46	1	0	3
Future Volume (veh/h)	2	1350	130	102	1263	4	128	1	46	1	0	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2136	2221	1847	1832	1921	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	2	1406	0	106	1316	4	133	1	0	1	0	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	1	0	0	0	2	0	0	0
Cap, veh/h	356	3005		386	2744	8	200	1		243	0	179
Arrive On Green	0.01	1.00	0.00	0.03	0.77	0.77	0.10	0.10	0.00	0.10	0.00	0.10
Sat Flow, veh/h	2034	4165	0	1759	3560	11	1482	11	1717	1558	0	1743
Grp Volume(v), veh/h	2	1406	0	106	643	677	134	0	0	1	0	1
Grp Sat Flow(s),veh/h/ln	2034	2029	0	1759	1741	1830	1493	0	1717	1558	0	1743
Q Serve(g_s), s	0.0	0.0	0.0	2.1	20.2	20.2	13.2	0.0	0.0	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.1	20.2	20.2	13.3	0.0	0.0	0.1	0.0	0.1
Prop In Lane	1.00		0.00	1.00		0.01	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	356	3005		386	1341	1411	201	0		243	0	179
V/C Ratio(X)	0.01	0.47		0.27	0.48	0.48	0.67	0.00		0.00	0.00	0.01
Avail Cap(c_a), veh/h	445	3005		492	1341	1411	337	0		385	0	337
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.85	0.85	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.8	0.0	0.0	4.0	6.3	6.3	66.4	0.0	0.0	60.4	0.0	60.4
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.1	1.2	1.2	1.4	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.7	6.8	7.1	5.2	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.8	0.4	0.0	4.1	7.5	7.4	67.8	0.0	0.0	60.4	0.0	60.4
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		1408			1426			134			2	
Approach Delay, s/veh		0.5			7.2			67.8			60.4	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.9	117.7		21.4	6.4	122.2		21.4
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	14.0	88.4		29.0	7.0	95.4		29.0
Max Q Clear Time (g_c+I1), s	4.1	2.0		2.1	2.0	22.2		15.3
Green Ext Time (p_c), s	0.1	71.1		0.0	0.0	59.0		0.2

Intersection Summary	
HCM 6th Ctrl Delay	6.8
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2024 Projected (Build) Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	699	131	97	444	5	92	11	50	39	13	69
Future Volume (vph)	68	699	131	97	444	5	92	11	50	39	13	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.957			0.964	
Satd. Flow (prot)	1506	3304	1507	1677	3317	0	0	1802	1380	0	1478	1473
Flt Permitted	0.950			0.950				0.709			0.600	
Satd. Flow (perm)	1506	3304	1507	1677	3317	0	0	1335	1380	0	920	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		1				70			72
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%
Adj. Flow (vph)	71	728	136	101	463	5	96	11	52	41	14	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	728	136	101	468	0	0	107	52	0	55	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												

2024 Projected (Build)
Timing Plan: AM Peak

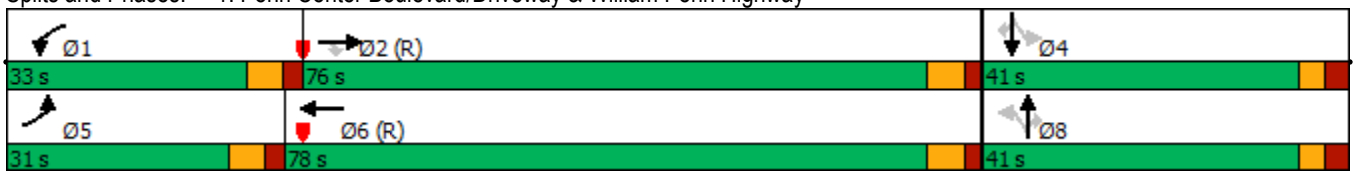
1: William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	31.3	31.3	13.3	31.3		23.9	23.9	23.9	23.9	23.9	23.9
Total Split (s)	31.0	76.0	76.0	33.0	78.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	20.7%	50.7%	50.7%	22.0%	52.0%		27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
Maximum Green (s)	24.7	69.7	69.7	26.7	71.7		35.1	35.1	35.1	35.1	35.1	35.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Act Effct Green (s)	13.5	100.6	100.6	15.5	102.5			18.5	18.5		18.5	18.5
Actuated g/C Ratio	0.09	0.67	0.67	0.10	0.68			0.12	0.12		0.12	0.12
v/c Ratio	0.53	0.33	0.13	0.59	0.21			0.65	0.23		0.49	0.30
Control Delay	78.1	12.0	6.1	78.4	7.4			80.2	7.9		74.3	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	78.1	12.0	6.1	78.4	7.4			80.2	7.9		74.3	14.4
LOS	E	B	A	E	A			F	A		E	B
Approach Delay		16.2			20.0			56.5			40.3	
Approach LOS		B			C			E			D	
Queue Length 50th (ft)	68	148	22	100	58			101	0		51	0
Queue Length 95th (ft)	119	235	60	168	78			161	24		96	46
Internal Link Dist (ft)		1513			711			922			274	
Turn Bay Length (ft)	205		60	250								125
Base Capacity (vph)	258	2215	1032	309	2267			321	385		221	409
Starvation Cap Reductn	0	0	0	0	0			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.28	0.33	0.13	0.33	0.21			0.33	0.14		0.25	0.18

Intersection Summary

Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 100 (67%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 22.7	Intersection LOS: C
Intersection Capacity Utilization 51.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	699	131	97	444	5	92	11	50	39	13	69
Future Volume (veh/h)	68	699	131	97	444	5	92	11	50	39	13	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1784	1934	1964	1832	1817	1876	1900	1767	1648	1589	1900	1811
Adj Flow Rate, veh/h	71	728	111	101	462	0	96	11	32	41	14	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	13	3	1	3	4	0	0	9	17	21	0	6
Cap, veh/h	100	2550	1155	133	2454		200	18	177	94	27	
Arrive On Green	0.06	0.69	0.69	0.15	1.00	0.00	0.12	0.13	0.13	0.12	0.13	0.00
Sat Flow, veh/h	1699	3674	1664	1745	3543	0	1216	139	1397	412	213	1535
Grp Volume(v), veh/h	71	728	111	101	462	0	107	0	32	55	0	0
Grp Sat Flow(s),veh/h/ln	1699	1837	1664	1745	1726	0	1356	0	1397	625	0	1535
Q Serve(g_s), s	6.2	11.3	3.3	8.3	0.0	0.0	0.0	0.0	3.1	4.6	0.0	0.0
Cycle Q Clear(g_c), s	6.2	11.3	3.3	8.3	0.0	0.0	11.3	0.0	3.1	15.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.90		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	100	2550	1155	133	2454		208	0	177	117	0	
V/C Ratio(X)	0.71	0.29	0.10	0.76	0.19		0.51	0.00	0.18	0.47	0.00	
Avail Cap(c_a), veh/h	291	2550	1155	322	2454		363	0	336	286	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	69.3	8.8	7.5	62.3	0.0	0.0	62.6	0.0	58.5	68.0	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.3	0.2	8.5	0.2	0.0	2.0	0.0	0.5	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	4.4	1.2	3.8	0.1	0.0	4.1	0.0	1.1	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.1	9.0	7.7	70.8	0.2	0.0	64.5	0.0	59.0	70.9	0.0	0.0
LnGrp LOS	E	A	A	E	A		E	A	E	E	A	
Approach Vol, veh/h		910			563			139			55	
Approach Delay, s/veh		14.3			12.8			63.3			70.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	16.7	109.4		23.9	14.2	111.9		23.9
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 27	* 70		35.1	* 25	* 72		35.1
Max Q Clear Time (g_c+I1), s	10.3	13.3		17.9	8.2	2.0		13.3
Green Ext Time (p_c), s	0.2	23.8		0.1	0.1	15.8		0.4

Intersection Summary	
HCM 6th Ctrl Delay	19.7
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	720	10	92	544	35	13	8	48	54	22	45
Future Volume (vph)	17	720	10	92	544	35	13	8	48	54	22	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.950	
Flt Protected	0.950			0.950				0.970			0.978	
Satd. Flow (prot)	1702	3506	1577	1668	3375	0	0	1629	1470	0	1709	0
Flt Permitted	0.950			0.950				0.970			0.978	
Satd. Flow (perm)	1702	3506	1577	1668	3375	0	0	1625	1470	0	1709	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		5				68		18	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%
Adj. Flow (vph)	18	783	11	100	591	38	14	9	52	59	24	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	783	11	100	629	0	0	23	52	0	132	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

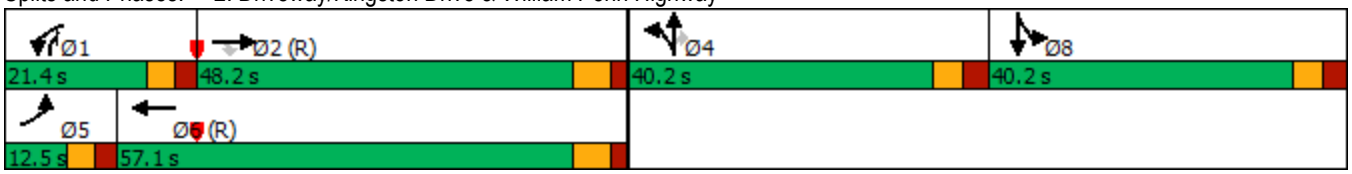
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.5	48.2	48.2	21.4	57.1		40.2	40.2	21.4	40.2	40.2	
Total Split (%)	8.3%	32.1%	32.1%	14.3%	38.1%		26.8%	26.8%	14.3%	26.8%	26.8%	
Maximum Green (s)	7.0	42.0	42.0	15.9	50.9		34.0	34.0	15.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.1	99.9	99.9	13.8	110.8			6.7	18.5		14.0	
Actuated g/C Ratio	0.05	0.67	0.67	0.09	0.74			0.04	0.12		0.09	
v/c Ratio	0.23	0.34	0.01	0.65	0.25			0.32	0.22		0.75	
Control Delay	110.4	7.7	0.0	86.7	7.3			80.3	6.1		81.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	110.4	7.7	0.0	86.7	7.3			80.3	6.1		81.9	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		9.9			18.2			28.9			81.9	
Approach LOS		A			B			C			F	
Queue Length 50th (ft)	18	212	0	98	99			22	0		111	
Queue Length 95th (ft)	49	306	m0	164	137			55	19		179	
Internal Link Dist (ft)		711			850			273			926	
Turn Bay Length (ft)	185		200	185					175			
Base Capacity (vph)	90	2334	1099	187	2495			380	270		412	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.20	0.34	0.01	0.53	0.25			0.06	0.19		0.32	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 19.6 Intersection LOS: B

Intersection Capacity Utilization 52.5%	ICU Level of Service A
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	720	10	92	544	35	13	8	48	54	22	45
Future Volume (veh/h)	17	720	10	92	544	35	13	8	48	54	22	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1919	1979	1876	1802	1817	1894	1701	1864	2136	2061	1941
Adj Flow Rate, veh/h	18	783	0	100	591	36	14	9	20	59	24	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	0	5	4	0	13	2	0	5	13
Cap, veh/h	46	2388		131	2309	140	47	30	188	84	34	54
Arrive On Green	0.01	0.22	0.00	0.15	1.00	1.00	0.04	0.05	0.05	0.08	0.09	0.08
Sat Flow, veh/h	1884	3645	1677	1787	3279	199	1005	646	1550	926	377	597
Grp Volume(v), veh/h	18	783	0	100	308	319	23	0	20	121	0	0
Grp Sat Flow(s),veh/h/ln	1884	1823	1677	1787	1712	1766	1651	0	1550	1900	0	0
Q Serve(g_s), s	1.4	27.2	0.0	8.1	0.0	0.0	2.0	0.0	1.7	9.3	0.0	0.0
Cycle Q Clear(g_c), s	1.4	27.2	0.0	8.1	0.0	0.0	2.0	0.0	1.7	9.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.61		1.00	0.49		0.31
Lane Grp Cap(c), veh/h	46	2388		131	1205	1244	77	0	188	173	0	0
V/C Ratio(X)	0.39	0.33		0.77	0.26	0.26	0.30	0.00	0.11	0.70	0.00	0.00
Avail Cap(c_a), veh/h	101	2388		201	1205	1244	385	0	477	443	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.00	0.98	0.98	0.98	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.3	30.9	0.0	62.8	0.0	0.0	69.4	0.0	58.9	66.6	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.4	0.0	3.4	0.5	0.5	0.8	0.0	0.1	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	13.4	0.0	3.6	0.2	0.2	0.9	0.0	0.7	4.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.3	31.3	0.0	66.2	0.5	0.5	70.2	0.0	58.9	68.5	0.0	0.0
LnGrp LOS	E	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		801			727			43			121	
Approach Delay, s/veh		32.3			9.5			65.0			68.5	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.5	103.5		12.2	8.1	110.8		18.9
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	15.9	42.0		* 34	7.0	50.9		34.0
Max Q Clear Time (g_c+I1), s	10.1	29.2		4.0	3.4	2.0		11.3
Green Ext Time (p_c), s	0.1	10.8		0.0	0.0	26.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

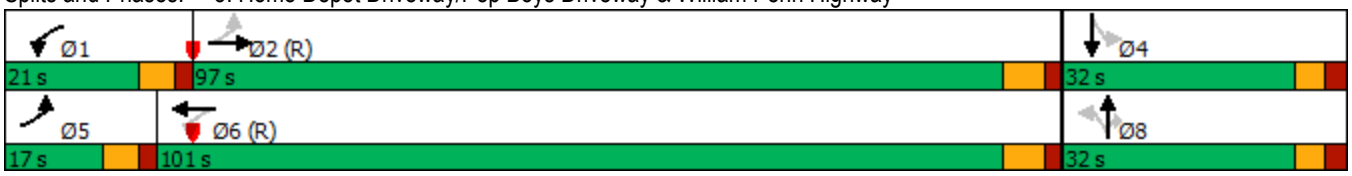
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	573	59	51	470	36	43	0	19	160	0	154
Future Volume (vph)	182	573	59	51	470	36	43	0	19	160	0	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.989				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3525	0	1536	3535	0	0	1546	1580	1718	1647	0
Flt Permitted	0.407			0.376				0.427		0.726		
Satd. Flow (perm)	743	3525	0	608	3535	0	0	695	1580	1313	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			10				70		455	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	202	637	66	57	522	40	48	0	21	178	0	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	202	703	0	57	562	0	0	48	21	178	171	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	17.0	97.0		21.0	101.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	11.3%	64.7%		14.0%	67.3%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	11.0	90.4		15.0	94.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	114.8	105.6		108.0	100.4			24.0	24.0	24.0	24.0	
Actuated g/C Ratio	0.77	0.70		0.72	0.67			0.16	0.16	0.16	0.16	
v/c Ratio	0.32	0.28		0.12	0.24			0.43	0.07	0.85	0.27	
Control Delay	3.9	3.7		5.3	10.4			68.4	0.4	93.5	1.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	3.9	3.7		5.3	10.4			68.4	0.4	93.5	1.0	
LOS	A	A		A	B			E	A	F	A	
Approach Delay		3.7			9.9			47.7			48.2	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	15	28		13	111			42	0	168	0	
Queue Length 95th (ft)	29	37		25	146			88	0	#282	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	652	2485		567	2368			125	341	236	669	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.31	0.28		0.10	0.24			0.38	0.06	0.75	0.26	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 15.2 Intersection LOS: B
Intersection Capacity Utilization 55.1% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	573	59	51	470	36	43	0	19	160	0	154
Future Volume (veh/h)	182	573	59	51	470	36	43	0	19	160	0	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2076	2159	1728	1875	1921	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	202	637	0	57	522	40	48	0	0	178	0	169
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	4	4	8	3	0	14	0	17	0	0	0
Cap, veh/h	771	2802		618	2337	179	116	0		331	0	259
Arrive On Green	0.10	1.00	0.00	0.04	0.70	0.69	0.14	0.00	0.00	0.15	0.00	0.14
Sat Flow, veh/h	2034	4048	0	1646	3353	256	456	0	1519	1559	0	1743
Grp Volume(v), veh/h	202	637	0	57	277	285	48	0	0	178	0	169
Grp Sat Flow(s),veh/h/ln	2034	1972	0	1646	1781	1828	456	0	1519	1559	0	1743
Q Serve(g_s), s	4.4	0.0	0.0	1.4	8.4	8.4	5.5	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	4.4	0.0	0.0	1.4	8.4	8.4	19.3	0.0	0.0	12.8	0.0	13.7
Prop In Lane	1.00		0.00	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	771	2802		618	1241	1274	113	0		331	0	259
V/C Ratio(X)	0.26	0.23		0.09	0.22	0.22	0.43	0.00		0.54	0.00	0.65
Avail Cap(c_a), veh/h	831	2802		733	1241	1274	153	0		380	0	314
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.3	0.0	0.0	5.5	8.2	8.2	69.8	0.0	0.0	59.8	0.0	60.7
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.0	0.4	0.4	0.9	0.0	0.0	0.5	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.1	0.0	0.5	3.2	3.3	1.9	0.0	0.0	6.5	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.4	0.2	0.0	5.5	8.6	8.6	70.8	0.0	0.0	60.3	0.0	62.6
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		839			619			48			347	
Approach Delay, s/veh		1.4			8.3			70.8			61.4	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.5	112.2		27.3	12.6	110.1		27.3				
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0				
Max Green Setting (Gmax), s	15.0	90.4		26.0	11.0	94.4		26.0				
Max Q Clear Time (g_c+I1), s	3.4	2.0		15.7	6.4	10.4		21.3				
Green Ext Time (p_c), s	0.0	25.6		0.5	0.1	20.2		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			16.8
HCM 6th LOS			B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

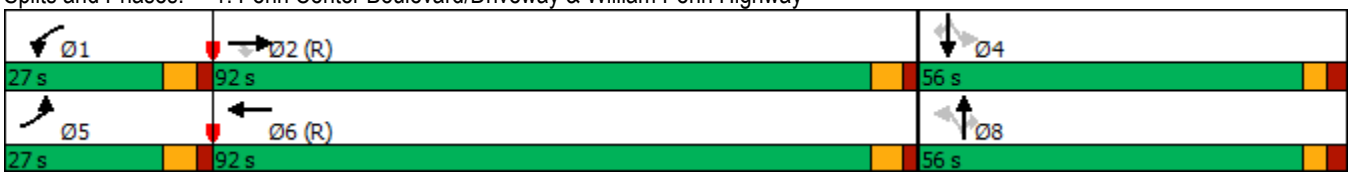
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	1089	90	102	966	6	173	26	120	64	21	93
Future Volume (vph)	89	1089	90	102	966	6	173	26	120	64	21	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00	0.99		1.00	0.99
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.958			0.964	
Satd. Flow (prot)	1685	3369	1522	1710	3417	0	0	1820	1583	0	1688	1531
Flt Permitted	0.950			0.950				0.641			0.420	
Satd. Flow (perm)	1682	3369	1522	1710	3417	0	0	1217	1560	0	735	1510
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			57						129			100
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)	2					2	1		2	2		1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%
Adj. Flow (vph)	96	1171	97	110	1039	6	186	28	129	69	23	100
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	1171	97	110	1045	0	0	214	129	0	92	100
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	27.0	92.0	92.0	27.0	92.0		56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	15.4%	52.6%	52.6%	15.4%	52.6%		32.0%	32.0%	32.0%	32.0%	32.0%	32.0%
Maximum Green (s)	20.7	85.7	85.7	20.7	85.7		50.1	50.1	50.1	50.1	50.1	50.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	16.3	106.1	106.1	17.2	107.1			36.2	36.2		36.2	36.2
Actuated g/C Ratio	0.09	0.61	0.61	0.10	0.61			0.21	0.21		0.21	0.21
v/c Ratio	0.62	0.57	0.10	0.65	0.50			0.85	0.30		0.61	0.26
Control Delay	92.4	24.0	8.5	104.5	11.0			94.5	9.0		78.4	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	92.4	24.0	8.5	104.5	11.1			94.5	9.0		78.4	9.7
LOS	F	C	A	F	B			F	A		E	A
Approach Delay		27.7			20.0			62.4			42.6	
Approach LOS		C			B			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 142 (81%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 29.6 Intersection LOS: C
Intersection Capacity Utilization 67.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	89	1089	90	102	966	6	173	26	120	64	21	93
Future Volume (veh/h)	89	1089	90	102	966	6	173	26	120	64	21	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1964	1964	1979	1862	1862	1876	1900	1900	1870	1900	1826	1870
Adj Flow Rate, veh/h	96	1171	88	110	1039	0	186	28	76	69	23	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	1	0	0	0	2	0	5	2
Cap, veh/h	127	2307	1035	137	2221		314	41	341	115	34	
Arrive On Green	0.07	0.62	0.62	0.16	1.00	0.00	0.21	0.22	0.22	0.21	0.22	0.00
Sat Flow, veh/h	1870	3731	1674	1773	3630	0	1278	192	1581	367	156	1585
Grp Volume(v), veh/h	96	1171	88	110	1039	0	214	0	76	92	0	0
Grp Sat Flow(s),veh/h/ln	1870	1865	1674	1773	1769	0	1470	0	1581	523	0	1585
Q Serve(g_s), s	8.8	30.6	3.7	10.5	0.0	0.0	0.0	0.0	6.9	10.7	0.0	0.0
Cycle Q Clear(g_c), s	8.8	30.6	3.7	10.5	0.0	0.0	23.5	0.0	6.9	34.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.87		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	127	2307	1035	137	2221		347	0	341	146	0	
V/C Ratio(X)	0.76	0.51	0.09	0.80	0.47		0.62	0.00	0.22	0.63	0.00	
Avail Cap(c_a), veh/h	232	2307	1035	220	2221		458	0	462	250	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	80.1	18.6	13.5	72.6	0.0	0.0	63.5	0.0	56.6	77.1	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.8	0.2	8.8	0.6	0.0	1.8	0.0	0.3	4.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	13.2	1.5	4.8	0.2	0.0	9.2	0.0	2.9	4.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.0	19.4	13.6	81.4	0.6	0.0	65.3	0.0	56.9	81.6	0.0	0.0
LnGrp LOS	F	B	B	F	A		E	A	E	F	A	
Approach Vol, veh/h		1355			1149			290			92	
Approach Delay, s/veh		23.9			8.3			63.1			81.6	
Approach LOS		C			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	18.9	113.5		42.6	17.2	115.2		42.6
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 21	* 86		50.1	* 21	* 86		50.1
Max Q Clear Time (g_c+I1), s	12.5	32.6		36.3	10.8	2.0		25.5
Green Ext Time (p_c), s	0.2	40.6		0.2	0.1	50.3		1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

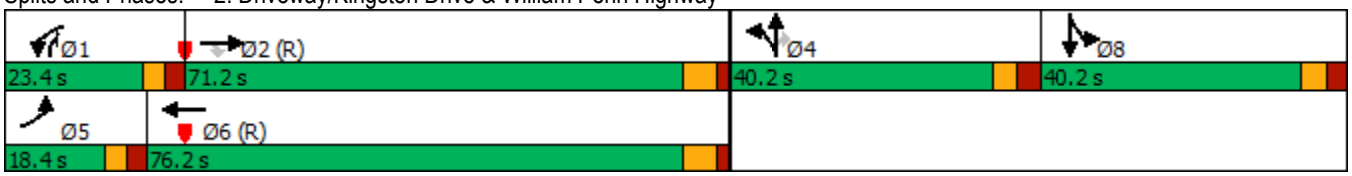
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	1069	33	95	1049	81	43	20	131	74	30	48
Future Volume (vph)	66	1069	33	95	1049	81	43	20	131	74	30	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			0.99	
Frt			0.850		0.989				0.850		0.957	
Flt Protected	0.950			0.950				0.967			0.976	
Satd. Flow (prot)	1702	3610	1577	1668	3496	0	0	1680	1470	0	1796	0
Flt Permitted	0.950			0.950				0.967			0.976	
Satd. Flow (perm)	1700	3610	1577	1668	3496	0	0	1672	1470	0	1796	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			93		5				136		12	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)	1					1	5					5
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%
Adj. Flow (vph)	69	1114	34	99	1093	84	45	21	136	77	31	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	1114	34	99	1177	0	0	66	136	0	158	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	36.2	36.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	18.4	71.2	71.2	23.4	76.2		40.2	40.2	23.4	40.2	40.2	
Total Split (%)	10.5%	40.7%	40.7%	13.4%	43.5%		23.0%	23.0%	13.4%	23.0%	23.0%	
Maximum Green (s)	12.9	65.0	65.0	17.9	70.0		34.0	34.0	17.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	11.7	110.8	110.8	15.2	114.3			10.7	26.7		18.2	
Actuated g/C Ratio	0.07	0.63	0.63	0.09	0.65			0.06	0.15		0.10	
v/c Ratio	0.61	0.49	0.03	0.68	0.52			0.65	0.40		0.80	
Control Delay	125.6	5.4	0.1	101.4	14.0			106.7	8.8		98.2	
Queue Delay	0.0	0.1	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	125.6	5.5	0.1	101.4	14.0			106.7	8.8		98.2	
LOS	F	A	A	F	B			F	A		F	
Approach Delay		12.1			20.8			40.8			98.2	
Approach LOS		B			C			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 22.8 Intersection LOS: C
Intersection Capacity Utilization 65.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	1069	33	95	1049	81	43	20	131	74	30	48
Future Volume (veh/h)	66	1069	33	95	1049	81	43	20	131	74	30	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1876	1862	1876	1894	1820	1864	2121	2136	2106
Adj Flow Rate, veh/h	69	1114	0	99	1093	83	45	21	70	77	31	44
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	0	1	0	0	5	2	1	0	2
Cap, veh/h	98	2372		126	2180	165	89	42	226	105	42	60
Arrive On Green	0.03	0.43	0.00	0.14	1.00	1.00	0.07	0.07	0.07	0.10	0.10	0.10
Sat Flow, veh/h	1884	3731	1677	1787	3332	253	1200	560	1548	999	402	571
Grp Volume(v), veh/h	69	1114	0	99	580	596	66	0	70	152	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1787	1769	1816	1760	0	1548	1973	0	0
Q Serve(g_s), s	6.3	37.5	0.0	9.4	0.0	0.0	6.3	0.0	7.1	13.1	0.0	0.0
Cycle Q Clear(g_c), s	6.3	37.5	0.0	9.4	0.0	0.0	6.3	0.0	7.1	13.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.14	0.68		1.00	0.51		0.29
Lane Grp Cap(c), veh/h	98	2372		126	1157	1188	131	0	226	207	0	0
V/C Ratio(X)	0.71	0.47		0.79	0.50	0.50	0.50	0.00	0.31	0.74	0.00	0.00
Avail Cap(c_a), veh/h	150	2372		193	1157	1188	352	0	421	395	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.00	0.89	0.89	0.89	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	83.1	29.1	0.0	73.9	0.0	0.0	78.2	0.0	67.0	76.4	0.0	0.0
Incr Delay (d2), s/veh	2.9	0.6	0.0	4.6	1.4	1.3	1.1	0.0	0.3	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	18.1	0.0	4.2	0.4	0.4	3.0	0.0	2.9	6.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.0	29.6	0.0	78.5	1.4	1.3	79.3	0.0	67.3	78.3	0.0	0.0
LnGrp LOS	F	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1183			1275			136			152	
Approach Delay, s/veh		32.9			7.4			73.2			78.3	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	16.8	116.4		18.2	13.6	119.7		23.5
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	17.9	65.0		* 34	12.9	70.0		34.0
Max Q Clear Time (g_c+I1), s	11.4	39.5		9.1	8.3	2.0		15.1
Green Ext Time (p_c), s	0.1	23.4		0.0	0.0	58.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

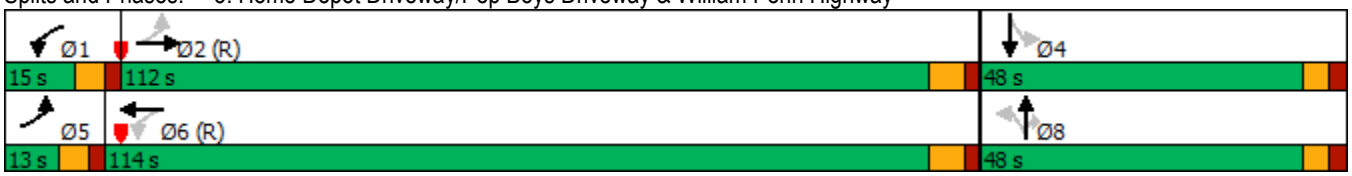
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	1243	69	46	1072	29	79	0	32	102	0	106
Future Volume (vph)	119	1243	69	46	1072	29	79	0	32	102	0	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.992			0.996				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3646	0	1659	3620	0	0	1711	1849	1292	1625	0
Flt Permitted	0.201			0.154				0.572		0.664		
Satd. Flow (perm)	360	3646	0	269	3620	0	0	1029	1824	902	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			3				60		154	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	1%	2%	0%	1%	2%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	127	1322	73	49	1140	31	84	0	34	109	0	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	1395	0	49	1171	0	0	84	34	109	113	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	13.0	112.0		15.0	114.0		48.0	48.0	48.0	48.0	48.0	
Total Split (%)	7.4%	64.0%		8.6%	65.1%		27.4%	27.4%	27.4%	27.4%	27.4%	
Maximum Green (s)	7.0	105.4		9.0	107.4		42.0	42.0	42.0	42.0	42.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	134.0	127.9		131.5	125.0			24.8	24.8	24.8	24.8	
Actuated g/C Ratio	0.77	0.73		0.75	0.71			0.14	0.14	0.14	0.14	
v/c Ratio	0.39	0.52		0.20	0.45			0.58	0.11	0.86	0.31	
Control Delay	6.0	6.7		7.1	12.1			84.0	3.3	120.0	4.3	
Queue Delay	0.0	0.1		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	6.0	6.8		7.1	12.1			84.0	3.3	120.0	4.3	
LOS	A	A		A	B			F	A	F	A	
Approach Delay		6.7			11.9			60.8			61.1	
Approach LOS		A			B			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 69.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	1243	69	46	1072	29	79	0	32	102	0	106
Future Volume (veh/h)	119	1243	69	46	1072	29	79	0	32	102	0	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2121	2190	1847	1905	1890	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	127	1322	0	49	1140	31	84	0	0	109	0	109
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	2	0	1	2	3	0	0	33	0	0
Cap, veh/h	425	2953		386	2629	71	146	0		237	0	235
Arrive On Green	0.06	1.00	0.00	0.03	0.73	0.73	0.14	0.00	0.00	0.14	0.00	0.14
Sat Flow, veh/h	2006	4136	0	1759	3600	98	776	0	1744	1182	0	1740
Grp Volume(v), veh/h	127	1322	0	49	573	598	84	0	0	109	0	109
Grp Sat Flow(s),veh/h/ln	2006	2015	0	1759	1810	1888	776	0	1744	1182	0	1740
Q Serve(g_s), s	3.0	0.0	0.0	1.2	21.9	21.9	10.7	0.0	0.0	0.0	0.0	10.1
Cycle Q Clear(g_c), s	3.0	0.0	0.0	1.2	21.9	21.9	20.8	0.0	0.0	12.0	0.0	10.1
Prop In Lane	1.00		0.00	1.00		0.05	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	425	2953		386	1322	1378	146	0		237	0	235
V/C Ratio(X)	0.30	0.45		0.13	0.43	0.43	0.58	0.00		0.46	0.00	0.46
Avail Cap(c_a), veh/h	448	2953		431	1322	1378	288	0		361	0	418
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.0	0.0	0.0	5.4	9.3	9.3	79.4	0.0	0.0	70.6	0.0	69.8
Incr Delay (d2), s/veh	0.1	0.4	0.0	0.1	1.0	1.0	1.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.2	0.0	0.4	8.6	8.9	3.8	0.0	0.0	4.7	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.1	0.4	0.0	5.4	10.4	10.3	80.8	0.0	0.0	71.2	0.0	70.4
LnGrp LOS	A	A		A	B	B	F	A		E	A	E
Approach Vol, veh/h		1449			1220			84			218	
Approach Delay, s/veh		1.0			10.1			80.8			70.8	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.5	134.8		29.6	11.0	134.4		29.6				
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0				
Max Green Setting (Gmax), s	9.0	105.4		42.0	7.0	107.4		42.0				
Max Q Clear Time (g_c+I1), s	3.2	2.0		14.0	5.0	23.9		22.8				
Green Ext Time (p_c), s	0.0	77.3		0.5	0.0	57.6		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

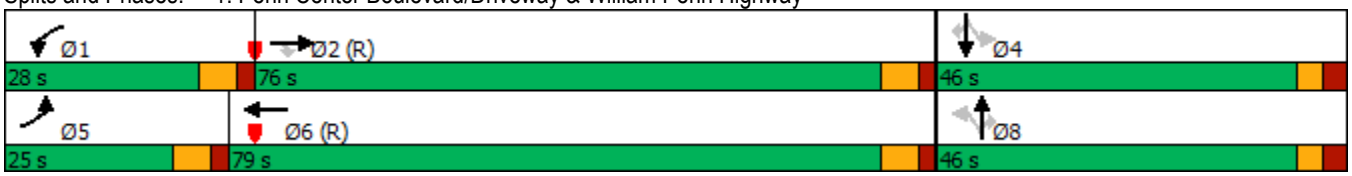
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	1234	77	152	1046	4	125	21	113	80	16	100
Future Volume (vph)	81	1234	77	152	1046	4	125	21	113	80	16	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99		1.00	
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.959			0.960	
Satd. Flow (prot)	1702	3403	1522	1694	3417	0	0	1794	1599	0	1702	1546
Flt Permitted	0.950			0.950				0.625			0.484	
Satd. Flow (perm)	1702	3403	1522	1694	3417	0	0	1169	1578	0	858	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67						116			103
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%
Adj. Flow (vph)	84	1272	79	157	1078	4	129	22	116	82	16	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	1272	79	157	1082	0	0	151	116	0	98	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	25.0	76.0	76.0	28.0	79.0		46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	16.7%	50.7%	50.7%	18.7%	52.7%		30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Maximum Green (s)	18.7	69.7	69.7	21.7	72.7		40.1	40.1	40.1	40.1	40.1	40.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	13.8	90.6	90.6	19.3	96.1			24.6	24.6		24.6	24.6
Actuated g/C Ratio	0.09	0.60	0.60	0.13	0.64			0.16	0.16		0.16	0.16
v/c Ratio	0.54	0.62	0.08	0.72	0.49			0.79	0.33		0.70	0.30
Control Delay	76.9	22.1	5.0	86.2	9.1			86.2	10.4		82.9	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	76.9	22.1	5.0	86.2	9.1			86.2	10.4		82.9	10.7
LOS	E	C	A	F	A			F	B		F	B
Approach Delay		24.4			18.9			53.2			45.9	
Approach LOS		C			B			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 113 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 26.0 Intersection LOS: C
Intersection Capacity Utilization 70.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	81	1234	77	152	1046	4	125	21	113	80	16	100
Future Volume (veh/h)	81	1234	77	152	1046	4	125	21	113	80	16	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1979	1979	1847	1862	1876	1885	1826	1885	1900	1900	1885
Adj Flow Rate, veh/h	84	1272	69	157	1078	0	129	22	84	82	16	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	2	1	0	1	5	1	0	0	1
Cap, veh/h	118	2288	1021	190	2313		282	41	287	146	25	
Arrive On Green	0.06	0.61	0.61	0.14	0.87	0.00	0.17	0.18	0.18	0.17	0.18	0.00
Sat Flow, veh/h	1884	3759	1677	1759	3630	0	1322	225	1595	565	139	1598
Grp Volume(v), veh/h	84	1272	69	157	1078	0	151	0	84	98	0	0
Grp Sat Flow(s),veh/h/ln	1884	1880	1677	1759	1769	0	1548	0	1595	703	0	1598
Q Serve(g_s), s	6.6	30.0	2.5	13.0	10.0	0.0	0.0	0.0	6.8	9.9	0.0	0.0
Cycle Q Clear(g_c), s	6.6	30.0	2.5	13.0	10.0	0.0	13.2	0.0	6.8	23.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.85		1.00	0.84		1.00
Lane Grp Cap(c), veh/h	118	2288	1021	190	2313		313	0	287	166	0	
V/C Ratio(X)	0.71	0.56	0.07	0.83	0.47		0.48	0.00	0.29	0.59	0.00	
Avail Cap(c_a), veh/h	247	2288	1021	266	2313		446	0	437	296	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.84	0.84	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	68.9	17.4	12.0	62.8	4.0	0.0	56.3	0.0	53.3	66.0	0.0	0.0
Incr Delay (d2), s/veh	7.6	1.0	0.1	11.7	0.6	0.0	1.2	0.0	0.6	3.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	12.7	1.0	6.2	2.7	0.0	5.5	0.0	2.8	3.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.5	18.3	12.1	74.5	4.6	0.0	57.4	0.0	53.8	69.3	0.0	0.0
LnGrp LOS	E	B	B	E	A		E	A	D	E	A	
Approach Vol, veh/h		1425			1235			235			98	
Approach Delay, s/veh		21.5			13.5			56.1			69.3	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.5	96.6		31.9	14.7	103.4		31.9
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 22	* 70		40.1	* 19	* 73		40.1
Max Q Clear Time (g_c+I1), s	15.0	32.0		25.2	8.6	12.0		15.2
Green Ext Time (p_c), s	0.2	32.4		0.2	0.1	42.5		0.8

Intersection Summary	
HCM 6th Ctrl Delay	22.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

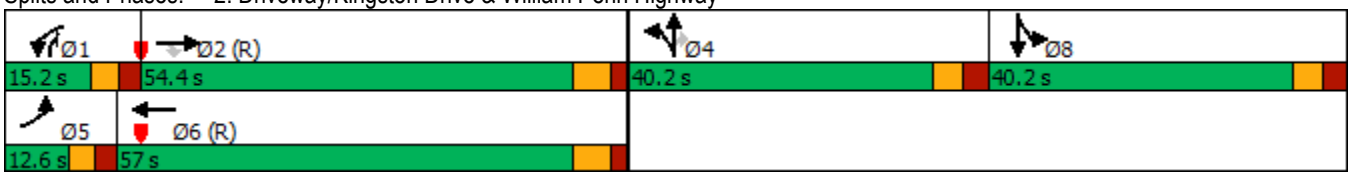
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Future Volume (vph)	42	1206	49	114	1152	70	40	13	114	64	16	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	13	13	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.950	
Flt Protected	0.950			0.950				0.964			0.975	
Satd. Flow (prot)	1702	3610	1577	1635	3660	0	0	1668	1500	0	1771	0
Flt Permitted	0.950			0.950				0.964			0.975	
Satd. Flow (perm)	1702	3610	1577	1635	3660	0	0	1664	1500	0	1771	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		4				115		19	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%
Adj. Flow (vph)	42	1218	49	115	1164	71	40	13	115	65	16	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	1218	49	115	1235	0	0	53	115	0	129	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	0.97	0.97	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.6	54.4	54.4	15.2	57.0		40.2	40.2	15.2	40.2	40.2	
Total Split (%)	8.4%	36.3%	36.3%	10.1%	38.0%		26.8%	26.8%	10.1%	26.8%	26.8%	
Maximum Green (s)	7.1	48.2	48.2	9.7	50.8		34.0	34.0	9.7	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.6	99.3	99.3	10.7	104.5			8.9	18.9		13.2	
Actuated g/C Ratio	0.05	0.66	0.66	0.07	0.70			0.06	0.13		0.09	
v/c Ratio	0.49	0.51	0.05	0.99	0.48			0.54	0.40		0.75	
Control Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	109.4	4.4	0.1	152.4	9.0			87.7	10.1		80.9	
LOS	F	A	A	F	A			F	B		F	
Approach Delay		7.6			21.2			34.6			80.9	
Approach LOS		A			C			C			F	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	1294	49	114	1235	79	40	13	114	73	16	48
Future Volume (veh/h)	42	1294	49	114	1235	79	40	13	114	73	16	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1847	1952	1952	1894	1776	1894	2106	2136	2106
Adj Flow Rate, veh/h	42	1307	0	115	1247	80	40	13	70	74	16	31
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	1	0	2	0	0	0	8	0	2	0	2
Cap, veh/h	68	2372		125	2374	152	91	29	226	107	23	45
Arrive On Green	0.02	0.43	0.00	0.14	1.00	1.00	0.06	0.07	0.07	0.08	0.09	0.08
Sat Flow, veh/h	1884	3731	1677	1759	3538	227	1291	420	1585	1209	262	507
Grp Volume(v), veh/h	42	1307	0	115	653	674	53	0	70	121	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1759	1854	1911	1711	0	1585	1978	0	0
Q Serve(g_s), s	3.3	39.4	0.0	9.7	0.0	0.0	4.5	0.0	6.0	8.9	0.0	0.0
Cycle Q Clear(g_c), s	3.3	39.4	0.0	9.7	0.0	0.0	4.5	0.0	6.0	8.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.12	0.75		1.00	0.61		0.26
Lane Grp Cap(c), veh/h	68	2372		125	1244	1282	120	0	226	175	0	0
V/C Ratio(X)	0.62	0.55		0.92	0.52	0.53	0.44	0.00	0.31	0.69	0.00	0.00
Avail Cap(c_a), veh/h	102	2372		125	1244	1282	399	0	484	461	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.77	0.00	0.82	0.82	0.82	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	72.2	27.0	0.0	63.9	0.0	0.0	67.3	0.0	57.8	66.8	0.0	0.0
Incr Delay (d2), s/veh	2.6	0.7	0.0	48.0	1.3	1.3	0.9	0.0	0.3	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	18.8	0.0	5.7	0.4	0.5	2.0	0.0	2.4	4.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	27.7	0.0	111.9	1.3	1.3	68.2	0.0	58.1	68.6	0.0	0.0
LnGrp LOS	E	C		F	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1349			1442			123			121	
Approach Delay, s/veh		29.2			10.1			62.5			68.6	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.2	100.6		15.7	9.9	105.9		18.5
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	9.7	48.2		* 34	7.1	50.8		34.0
Max Q Clear Time (g_c+I1), s	11.7	41.4		8.0	5.3	2.0		10.9
Green Ext Time (p_c), s	0.0	6.7		0.0	0.0	45.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

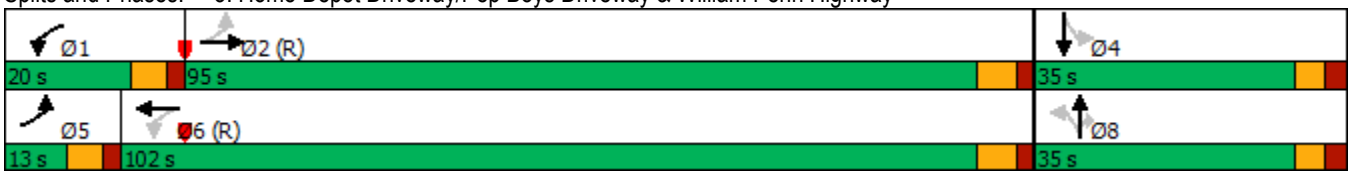
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	1210	127	99	1129	49	126	1	45	179	0	198
Future Volume (vph)	206	1210	127	99	1129	49	126	1	45	179	0	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.994				0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1701	3666	0	1659	3498	0	0	1768	1812	1718	1647	0
Flt Permitted	0.173			0.131				0.384		0.586		
Satd. Flow (perm)	310	3666	0	229	3498	0	0	712	1812	1060	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			6				113		166	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	215	1260	132	103	1176	51	131	1	47	186	0	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	215	1392	0	103	1227	0	0	132	47	186	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	13.0	95.0		20.0	102.0		35.0	35.0	35.0	35.0	35.0	
Total Split (%)	8.7%	63.3%		13.3%	68.0%		23.3%	23.3%	23.3%	23.3%	23.3%	
Maximum Green (s)	7.0	88.4		14.0	95.4		29.0	29.0	29.0	29.0	29.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	103.5	95.9		104.1	96.2			28.2	28.2	28.2	28.2	
Actuated g/C Ratio	0.69	0.64		0.69	0.64			0.19	0.19	0.19	0.19	
v/c Ratio	0.77	0.59		0.45	0.55			0.99	0.11	0.94	0.46	
Control Delay	35.0	5.8		12.5	16.0			135.0	0.5	108.6	16.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	35.0	5.9		12.5	16.0			135.0	0.5	108.6	16.1	
LOS	C	A		B	B			F	A	F	B	
Approach Delay		9.8			15.8			99.7			60.0	
Approach LOS		A			B			F			E	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 22.2 Intersection LOS: C
Intersection Capacity Utilization 84.0% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	1210	127	99	1129	49	126	1	45	179	0	198
Future Volume (veh/h)	206	1210	127	99	1129	49	126	1	45	179	0	198
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2136	2221	1847	1832	1890	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	215	1260	0	103	1176	51	131	1	0	186	0	204
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	0	0	1	2	0	0	2	0	0	0
Cap, veh/h	368	2633		384	2162	94	155	1		427	0	337
Arrive On Green	0.09	1.00	0.00	0.03	0.64	0.64	0.19	0.19	0.00	0.19	0.00	0.19
Sat Flow, veh/h	2006	4165	0	1759	3399	147	555	4	1717	1558	0	1743
Grp Volume(v), veh/h	215	1260	0	103	602	625	132	0	0	186	0	204
Grp Sat Flow(s),veh/h/ln	2006	2029	0	1759	1741	1806	559	0	1717	1558	0	1743
Q Serve(g_s), s	6.2	0.0	0.0	3.1	28.9	28.9	13.0	0.0	0.0	0.0	0.0	16.0
Cycle Q Clear(g_c), s	6.2	0.0	0.0	3.1	28.9	28.9	29.0	0.0	0.0	12.7	0.0	16.0
Prop In Lane	1.00		0.00	1.00		0.08	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	368	2633		384	1107	1148	156	0		427	0	337
V/C Ratio(X)	0.58	0.48		0.27	0.54	0.54	0.85	0.00		0.44	0.00	0.61
Avail Cap(c_a), veh/h	368	2633		489	1107	1148	156	0		427	0	337
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.5	0.0	0.0	8.7	15.2	15.2	69.7	0.0	0.0	53.9	0.0	55.3
Incr Delay (d2), s/veh	1.3	0.5	0.0	0.1	1.9	1.9	31.5	0.0	0.0	0.3	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.2	0.0	1.2	11.5	11.9	6.5	0.0	0.0	6.4	0.0	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.8	0.5	0.0	8.8	17.1	17.1	101.2	0.0	0.0	54.2	0.0	57.5
LnGrp LOS	B	A		A	B	B	F	A		D	A	E
Approach Vol, veh/h		1475			1330			132			390	
Approach Delay, s/veh		2.5			16.4			101.2			55.9	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.1	103.9		35.0	13.0	102.0		35.0
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	14.0	88.4		29.0	7.0	95.4		29.0
Max Q Clear Time (g_c+I1), s	5.1	2.0		18.0	8.2	30.9		31.0
Green Ext Time (p_c), s	0.1	64.3		0.6	0.0	50.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2024 Projected (Build) with Improvements Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	573	59	51	470	36	43	0	19	160	0	154
Future Volume (vph)	182	573	59	51	470	36	43	0	19	160	0	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.989				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1735	3525	0	1536	3535	0	0	1546	1580	1718	1647	0
Flt Permitted	0.401			0.375				0.451		0.726		
Satd. Flow (perm)	732	3525	0	607	3535	0	0	734	1580	1313	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			6				113		452	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	4%	4%	8%	3%	0%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	202	637	66	57	522	40	48	0	21	178	0	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	202	703	0	57	562	0	0	48	21	178	171	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

2024 Projected (Build) with Improvements
Timing Plan: AM Peak

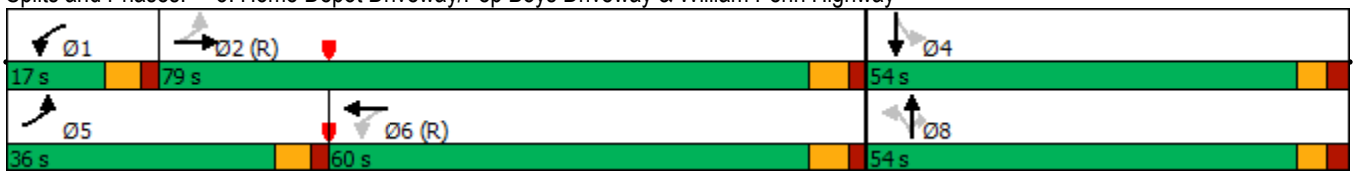
3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	36.0	79.0		17.0	60.0		54.0	54.0	54.0	54.0	54.0	
Total Split (%)	24.0%	52.7%		11.3%	40.0%		36.0%	36.0%	36.0%	36.0%	36.0%	
Maximum Green (s)	30.0	72.4		11.0	53.4		48.0	48.0	48.0	48.0	48.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	112.9	103.3		105.3	97.6			26.2	26.2	26.2	26.2	
Actuated g/C Ratio	0.75	0.69		0.70	0.65			0.17	0.17	0.17	0.17	
v/c Ratio	0.32	0.29		0.12	0.24			0.38	0.06	0.78	0.26	
Control Delay	6.5	6.5		6.6	12.3			60.8	0.3	80.6	1.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	6.5	6.5		6.6	12.3			60.8	0.3	80.6	1.0	
LOS	A	A		A	B			E	A	F	A	
Approach Delay		6.5			11.7			42.4			41.6	
Approach LOS		A			B			D			D	
Queue Length 50th (ft)	32	63		12	111			42	0	169	0	
Queue Length 95th (ft)	50	98		32	183			81	0	240	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	762	2430		520	2301			239	592	428	842	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.27	0.29		0.11	0.24			0.20	0.04	0.42	0.20	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 15.8 — Intersection LOS: B
Intersection Capacity Utilization 55.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	573	59	51	470	36	43	0	19	160	0	154
Future Volume (veh/h)	182	573	59	51	470	36	43	0	19	160	0	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2136	2076	2159	1728	1875	1921	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	202	637	0	57	522	40	48	0	0	178	0	169
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	4	4	8	3	0	14	0	17	0	0	0
Cap, veh/h	772	2801		617	2332	178	116	0		332	0	260
Arrive On Green	0.10	1.00	0.00	0.04	0.70	0.69	0.14	0.00	0.00	0.15	0.00	0.14
Sat Flow, veh/h	2034	4048	0	1646	3353	256	458	0	1519	1559	0	1743
Grp Volume(v), veh/h	202	637	0	57	277	285	48	0	0	178	0	169
Grp Sat Flow(s),veh/h/ln	2034	1972	0	1646	1781	1828	458	0	1519	1559	0	1743
Q Serve(g_s), s	4.4	0.0	0.0	1.4	8.4	8.5	5.5	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	4.4	0.0	0.0	1.4	8.4	8.5	19.3	0.0	0.0	12.8	0.0	13.7
Prop In Lane	1.00		0.00	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	772	2801		617	1238	1271	113	0		332	0	260
V/C Ratio(X)	0.26	0.23		0.09	0.22	0.22	0.42	0.00		0.54	0.00	0.65
Avail Cap(c_a), veh/h	1087	2801		688	1238	1271	342	0		609	0	570
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.3	0.0	0.0	5.6	8.2	8.3	69.8	0.0	0.0	59.8	0.0	60.6
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.0	0.4	0.4	0.9	0.0	0.0	0.5	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.1	0.0	0.5	3.2	3.3	1.9	0.0	0.0	6.5	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.4	0.2	0.0	5.6	8.7	8.7	70.7	0.0	0.0	60.3	0.0	61.7
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		839			619			48			347	
Approach Delay, s/veh		1.4			8.4			70.7			60.9	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	112.1		27.3	12.8	109.9		27.3
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	11.0	72.4		48.0	30.0	53.4		48.0
Max Q Clear Time (g_c+I1), s	3.4	2.0		15.7	6.4	10.5		21.3
Green Ext Time (p_c), s	0.0	24.0		0.7	0.3	16.4		0.1

Intersection Summary			
HCM 6th Ctrl Delay			16.7
HCM 6th LOS			B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	1243	69	46	1072	29	79	0	32	102	0	106
Future Volume (vph)	119	1243	69	46	1072	29	79	0	32	102	0	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.992			0.996				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3646	0	1659	3620	0	0	1711	1849	1292	1625	0
Flt Permitted	0.198			0.156				0.572		0.664		
Satd. Flow (perm)	355	3646	0	272	3620	0	0	1029	1824	902	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			2				97		195	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	1%	2%	0%	1%	2%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	127	1322	73	49	1140	31	84	0	34	109	0	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	1395	0	49	1171	0	0	84	34	109	113	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	26.0	108.0		15.0	97.0		52.0	52.0	52.0	52.0	52.0	
Total Split (%)	14.9%	61.7%		8.6%	55.4%		29.7%	29.7%	29.7%	29.7%	29.7%	
Maximum Green (s)	20.0	101.4		9.0	90.4		46.0	46.0	46.0	46.0	46.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	135.2	127.9		130.3	123.8			24.8	24.8	24.8	24.8	
Actuated g/C Ratio	0.77	0.73		0.74	0.71			0.14	0.14	0.14	0.14	
v/c Ratio	0.38	0.52		0.20	0.46			0.58	0.10	0.86	0.28	
Control Delay	5.4	4.1		7.2	12.8			83.9	0.6	120.0	1.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	5.4	4.1		7.2	12.8			83.9	0.6	120.0	1.8	
LOS	A	A		A	B			F	A	F	A	
Approach Delay		4.2			12.6			59.9			59.8	
Approach LOS		A			B			E			E	
Queue Length 50th (ft)	13	97		11	283			92	0	124	0	
Queue Length 95th (ft)	27	142		28	430			146	0	191	0	
Internal Link Dist (ft)		850			252			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	434	2666		278	2561			270	550	237	570	
Starvation Cap Reductn	0	83		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.29	0.54		0.18	0.46			0.31	0.06	0.46	0.20	

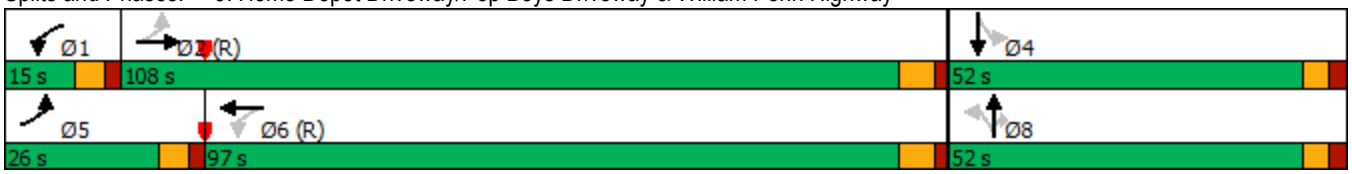
Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 13.7 Intersection LOS: B

Intersection Capacity Utilization 69.2% ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	1243	69	46	1072	29	79	0	32	102	0	106
Future Volume (veh/h)	119	1243	69	46	1072	29	79	0	32	102	0	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2121	2190	1847	1905	1890	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	127	1322	0	49	1140	31	84	0	0	109	0	109
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	2	0	1	2	3	0	0	33	0	0
Cap, veh/h	426	2953		386	2626	71	146	0		237	0	235
Arrive On Green	0.06	1.00	0.00	0.03	0.73	0.73	0.14	0.00	0.00	0.14	0.00	0.14
Sat Flow, veh/h	2006	4136	0	1759	3600	98	776	0	1744	1182	0	1740
Grp Volume(v), veh/h	127	1322	0	49	573	598	84	0	0	109	0	109
Grp Sat Flow(s),veh/h/ln	2006	2015	0	1759	1810	1888	776	0	1744	1182	0	1740
Q Serve(g_s), s	3.0	0.0	0.0	1.2	21.9	22.0	10.7	0.0	0.0	0.0	0.0	10.1
Cycle Q Clear(g_c), s	3.0	0.0	0.0	1.2	21.9	22.0	20.8	0.0	0.0	12.0	0.0	10.1
Prop In Lane	1.00		0.00	1.00		0.05	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	2953		386	1320	1377	146	0		237	0	235
V/C Ratio(X)	0.30	0.45		0.13	0.43	0.43	0.58	0.00		0.46	0.00	0.46
Avail Cap(c_a), veh/h	596	2953		431	1320	1377	319	0		388	0	457
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.0	0.0	0.0	5.4	9.4	9.4	79.4	0.0	0.0	70.6	0.0	69.8
Incr Delay (d2), s/veh	0.1	0.4	0.0	0.1	1.0	1.0	1.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.2	0.0	0.4	8.6	9.0	3.8	0.0	0.0	4.7	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.1	0.4	0.0	5.4	10.4	10.4	80.7	0.0	0.0	71.2	0.0	70.4
LnGrp LOS	A	A		A	B	B	F	A		E	A	E
Approach Vol, veh/h		1449			1220			84			218	
Approach Delay, s/veh		1.0			10.2			80.7			70.8	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.5	134.8		29.6	11.1	134.2		29.6				
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0				
Max Green Setting (Gmax), s	9.0	101.4		46.0	20.0	90.4		46.0				
Max Q Clear Time (g_c+I1), s	3.2	2.0		14.0	5.0	24.0		22.8				
Green Ext Time (p_c), s	0.0	75.1		0.5	0.2	48.9		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	12.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	1210	127	99	1129	49	126	1	45	179	0	198
Future Volume (vph)	206	1210	127	99	1129	49	126	1	45	179	0	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.994				0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1701	3666	0	1659	3498	0	0	1768	1812	1718	1647	0
Flt Permitted	0.144			0.140				0.391		0.589		
Satd. Flow (perm)	258	3666	0	245	3498	0	0	725	1812	1065	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			4				113		265	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	215	1260	132	103	1176	51	131	1	47	186	0	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	215	1392	0	103	1227	0	0	132	47	186	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	31.0	86.0		19.0	74.0		45.0	45.0	45.0	45.0	45.0	
Total Split (%)	20.7%	57.3%		12.7%	49.3%		30.0%	30.0%	30.0%	30.0%	30.0%	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	107.9	94.7		95.9	87.5			28.9	28.9	28.9	28.9	
Actuated g/C Ratio	0.72	0.63		0.64	0.58			0.19	0.19	0.19	0.19	
v/c Ratio	0.65	0.60		0.45	0.60			0.95	0.11	0.91	0.39	
Control Delay	37.0	10.3		15.3	24.1			121.7	0.5	100.9	3.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	37.0	10.3		15.3	24.1			121.7	0.5	100.9	3.4	
LOS	D	B		B	C			F	A	F	A	
Approach Delay		13.9			23.4			89.9			49.7	
Approach LOS		B			C			F			D	
Queue Length 50th (ft)	80	172		27	388			129	0	180	0	
Queue Length 95th (ft)	193	224		58	614			#221	0	259	19	
Internal Link Dist (ft)		850			248			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	428	2317		287	2041			188	554	276	624	
Starvation Cap Reductn	0	56		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.50	0.62		0.36	0.60			0.70	0.08	0.67	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 25.4 Intersection LOS: C
Intersection Capacity Utilization 84.0% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	1210	127	99	1129	49	126	1	45	179	0	198
Future Volume (veh/h)	206	1210	127	99	1129	49	126	1	45	179	0	198
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2136	2221	1847	1832	1890	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	215	1260	0	103	1176	51	131	1	0	186	0	204
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	0	0	1	2	0	0	2	0	0	0
Cap, veh/h	362	2509		370	2022	88	195	1		476	0	386
Arrive On Green	0.12	1.00	0.00	0.04	0.59	0.59	0.22	0.22	0.00	0.22	0.00	0.22
Sat Flow, veh/h	2006	4165	0	1759	3399	147	663	5	1717	1558	0	1743
Grp Volume(v), veh/h	215	1260	0	103	602	625	132	0	0	186	0	204
Grp Sat Flow(s),veh/h/ln	2006	2029	0	1759	1741	1806	668	0	1717	1558	0	1743
Q Serve(g_s), s	6.6	0.0	0.0	3.4	32.1	32.2	15.6	0.0	0.0	0.0	0.0	15.5
Cycle Q Clear(g_c), s	6.6	0.0	0.0	3.4	32.1	32.2	31.1	0.0	0.0	12.2	0.0	15.5
Prop In Lane	1.00		0.00	1.00		0.08	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	362	2509		370	1036	1074	196	0		476	0	386
V/C Ratio(X)	0.59	0.50		0.28	0.58	0.58	0.67	0.00		0.39	0.00	0.53
Avail Cap(c_a), veh/h	577	2509		459	1036	1074	244	0		536	0	453
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	0.0	10.8	18.8	18.8	65.2	0.0	0.0	50.2	0.0	51.5
Incr Delay (d2), s/veh	0.5	0.6	0.0	0.2	2.4	2.3	2.9	0.0	0.0	0.2	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.2	0.0	1.3	13.1	13.6	5.2	0.0	0.0	6.1	0.0	6.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.3	0.6	0.0	11.0	21.2	21.1	68.1	0.0	0.0	50.4	0.0	51.9
LnGrp LOS	B	A		B	C	C	E	A		D	A	D
Approach Vol, veh/h		1475			1330			132			390	
Approach Delay, s/veh		2.7			20.4			68.1			51.2	
Approach LOS		A			C			E			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.4	99.3		39.2	14.9	95.8		39.2
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	13.0	79.4		39.0	25.0	67.4		39.0
Max Q Clear Time (g_c+I1), s	5.4	2.0		17.5	8.6	34.2		33.1
Green Ext Time (p_c), s	0.1	59.2		0.8	0.3	28.6		0.1

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2029 Projected (Build) Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	715	134	100	454	5	95	11	51	40	13	71
Future Volume (vph)	70	715	134	100	454	5	95	11	51	40	13	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.957			0.964	
Satd. Flow (prot)	1506	3304	1507	1677	3317	0	0	1802	1380	0	1477	1473
Flt Permitted	0.950			0.950				0.707			0.590	
Satd. Flow (perm)	1506	3304	1507	1677	3317	0	0	1331	1380	0	904	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		1				70			74
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	13%	3%	1%	3%	4%	0%	0%	9%	17%	21%	0%	6%
Adj. Flow (vph)	73	745	140	104	473	5	99	11	53	42	14	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	745	140	104	478	0	0	110	53	0	56	74
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												

2029 Projected (Build)
Timing Plan: AM Peak

1: William Penn Highway (SR 2048) & Penn Center Boulevard/Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	31.3	31.3	13.3	31.3		23.9	23.9	23.9	23.9	23.9	23.9
Total Split (s)	31.0	76.0	76.0	33.0	78.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	20.7%	50.7%	50.7%	22.0%	52.0%		27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
Maximum Green (s)	24.7	69.7	69.7	26.7	71.7		35.1	35.1	35.1	35.1	35.1	35.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Act Effct Green (s)	13.7	100.0	100.0	15.7	102.0			18.8	18.8		18.8	18.8
Actuated g/C Ratio	0.09	0.67	0.67	0.10	0.68			0.13	0.13		0.13	0.13
v/c Ratio	0.53	0.34	0.14	0.59	0.21			0.66	0.23		0.50	0.30
Control Delay	78.2	12.4	6.3	78.7	7.6			80.2	8.4		74.5	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	78.2	12.4	6.3	78.7	7.6			80.2	8.4		74.5	14.1
LOS	E	B	A	E	A			F	A		E	B
Approach Delay		16.5			20.3			56.8			40.1	
Approach LOS		B			C			E			D	
Queue Length 50th (ft)	69	154	24	104	59			104	0		52	0
Queue Length 95th (ft)	122	245	64	170	81			166	26		96	47
Internal Link Dist (ft)		1513			711			922			274	
Turn Bay Length (ft)	205		60	250								125
Base Capacity (vph)	258	2202	1026	309	2255			320	385		217	410
Starvation Cap Reductn	0	0	0	0	0			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.28	0.34	0.14	0.34	0.21			0.34	0.14		0.26	0.18

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 100 (67%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

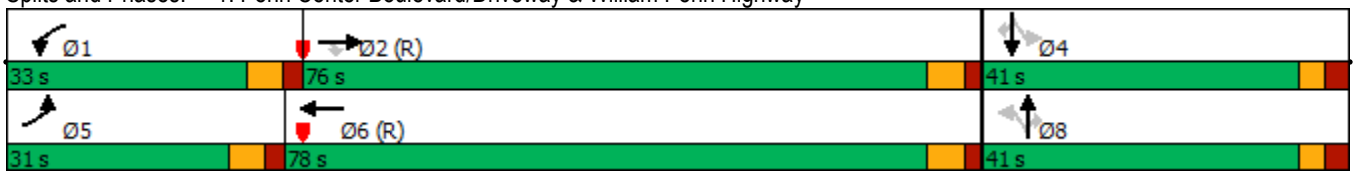
Maximum v/c Ratio: 0.66

Intersection Signal Delay: 23.0 — Intersection LOS: C

Intersection Capacity Utilization 51.8% — ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	715	134	100	454	5	95	11	51	40	13	71
Future Volume (veh/h)	70	715	134	100	454	5	95	11	51	40	13	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1784	1934	1964	1832	1817	1876	1900	1767	1648	1589	1900	1811
Adj Flow Rate, veh/h	73	745	115	104	473	0	99	11	33	42	14	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	13	3	1	3	4	0	0	9	17	21	0	6
Cap, veh/h	103	2534	1148	136	2441		204	18	181	95	27	
Arrive On Green	0.06	0.69	0.69	0.16	1.00	0.00	0.12	0.13	0.13	0.12	0.13	0.00
Sat Flow, veh/h	1699	3674	1664	1745	3543	0	1225	136	1397	413	207	1535
Grp Volume(v), veh/h	73	745	115	104	473	0	110	0	33	56	0	0
Grp Sat Flow(s),veh/h/ln	1699	1837	1664	1745	1726	0	1361	0	1397	620	0	1535
Q Serve(g_s), s	6.3	11.8	3.5	8.6	0.0	0.0	0.0	0.0	3.2	4.7	0.0	0.0
Cycle Q Clear(g_c), s	6.3	11.8	3.5	8.6	0.0	0.0	11.6	0.0	3.2	16.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.90		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	103	2534	1148	136	2441		212	0	181	118	0	
V/C Ratio(X)	0.71	0.29	0.10	0.77	0.19		0.52	0.00	0.18	0.47	0.00	
Avail Cap(c_a), veh/h	291	2534	1148	322	2441		364	0	336	283	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	69.2	9.1	7.8	62.0	0.0	0.0	62.3	0.0	58.2	68.0	0.0	0.0
Incr Delay (d2), s/veh	8.7	0.3	0.2	8.5	0.2	0.0	1.9	0.0	0.5	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	4.6	1.2	3.9	0.1	0.0	4.2	0.0	1.2	2.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	9.4	7.9	70.6	0.2	0.0	64.3	0.0	58.7	70.9	0.0	0.0
LnGrp LOS	E	A	A	E	A		E	A	E	E	A	
Approach Vol, veh/h		933			577			143			56	
Approach Delay, s/veh		14.5			12.9			63.0			70.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	17.0	108.7		24.3	14.4	111.3		24.3
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 27	* 70		35.1	* 25	* 72		35.1
Max Q Clear Time (g_c+I1), s	10.6	13.8		18.3	8.3	2.0		13.6
Green Ext Time (p_c), s	0.2	24.4		0.1	0.1	16.3		0.4

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	736	10	95	557	36	13	8	49	55	23	46
Future Volume (vph)	18	736	10	95	557	36	13	8	49	55	23	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.950	
Flt Protected	0.950			0.950				0.970			0.978	
Satd. Flow (prot)	1702	3506	1577	1668	3375	0	0	1629	1470	0	1709	0
Flt Permitted	0.950			0.950				0.970			0.978	
Satd. Flow (perm)	1702	3506	1577	1668	3375	0	0	1625	1470	0	1709	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		5				68		18	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	0%	5%	4%	0%	13%	2%	0%	5%	13%
Adj. Flow (vph)	20	800	11	103	605	39	14	9	53	60	25	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	800	11	103	644	0	0	23	53	0	135	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

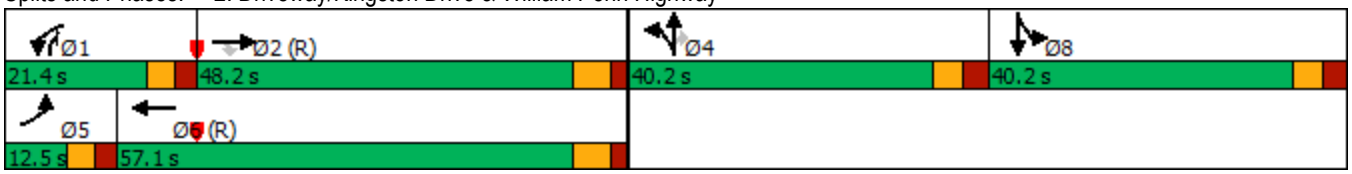
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.5	48.2	48.2	21.4	57.1		40.2	40.2	21.4	40.2	40.2	
Total Split (%)	8.3%	32.1%	32.1%	14.3%	38.1%		26.8%	26.8%	14.3%	26.8%	26.8%	
Maximum Green (s)	7.0	42.0	42.0	15.9	50.9		34.0	34.0	15.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.1	99.4	99.4	14.0	110.6			6.7	18.7		14.2	
Actuated g/C Ratio	0.05	0.66	0.66	0.09	0.74			0.04	0.12		0.09	
v/c Ratio	0.25	0.34	0.01	0.66	0.26			0.32	0.22		0.76	
Control Delay	111.0	7.8	0.0	87.1	7.4			80.3	6.4		82.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	111.0	7.8	0.0	87.1	7.4			80.3	6.4		82.2	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		10.2			18.4			28.8			82.2	
Approach LOS		B			B			C			F	
Queue Length 50th (ft)	20	220	0	101	103			22	0		114	
Queue Length 95th (ft)	52	316	m0	169	141			55	20		182	
Internal Link Dist (ft)		711			850			273			926	
Turn Bay Length (ft)	185		200	185					175			
Base Capacity (vph)	90	2324	1095	187	2488			380	270		412	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.22	0.34	0.01	0.55	0.26			0.06	0.20		0.33	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 19.8 Intersection LOS: B

Intersection Capacity Utilization 53.3%	ICU Level of Service A
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	736	10	95	557	36	13	8	49	55	23	46
Future Volume (veh/h)	18	736	10	95	557	36	13	8	49	55	23	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1919	1979	1876	1802	1817	1894	1701	1864	2136	2061	1941
Adj Flow Rate, veh/h	20	800	0	103	605	37	14	9	21	60	25	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	0	5	4	0	13	2	0	5	13
Cap, veh/h	48	2376		134	2298	140	47	30	191	85	35	55
Arrive On Green	0.01	0.22	0.00	0.15	1.00	1.00	0.04	0.05	0.05	0.09	0.09	0.09
Sat Flow, veh/h	1884	3645	1677	1787	3278	200	1005	646	1550	919	383	598
Grp Volume(v), veh/h	20	800	0	103	316	326	23	0	21	124	0	0
Grp Sat Flow(s),veh/h/ln	1884	1823	1677	1787	1712	1766	1651	0	1550	1900	0	0
Q Serve(g_s), s	1.6	27.9	0.0	8.3	0.0	0.0	2.0	0.0	1.8	9.5	0.0	0.0
Cycle Q Clear(g_c), s	1.6	27.9	0.0	8.3	0.0	0.0	2.0	0.0	1.8	9.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.11	0.61		1.00	0.48		0.31
Lane Grp Cap(c), veh/h	48	2376		134	1200	1238	78	0	191	176	0	0
V/C Ratio(X)	0.42	0.34		0.77	0.26	0.26	0.30	0.00	0.11	0.71	0.00	0.00
Avail Cap(c_a), veh/h	101	2376		201	1200	1238	385	0	480	443	0	0
HCM Platoon Ratio	0.33	0.33	0.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.00	0.98	0.98	0.98	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.3	31.4	0.0	62.5	0.0	0.0	69.4	0.0	58.6	66.5	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.4	0.0	4.3	0.5	0.5	0.8	0.0	0.1	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	13.8	0.0	3.7	0.2	0.2	0.9	0.0	0.7	4.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.3	31.8	0.0	66.8	0.5	0.5	70.2	0.0	58.7	68.4	0.0	0.0
LnGrp LOS	E	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		820			745			44			124	
Approach Delay, s/veh		32.9			9.7			64.7			68.4	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.7	103.0		12.2	8.3	110.4		19.1
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	15.9	42.0		* 34	7.0	50.9		34.0
Max Q Clear Time (g_c+I1), s	10.3	29.9		4.0	3.6	2.0		11.5
Green Ext Time (p_c), s	0.1	10.4		0.0	0.0	26.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

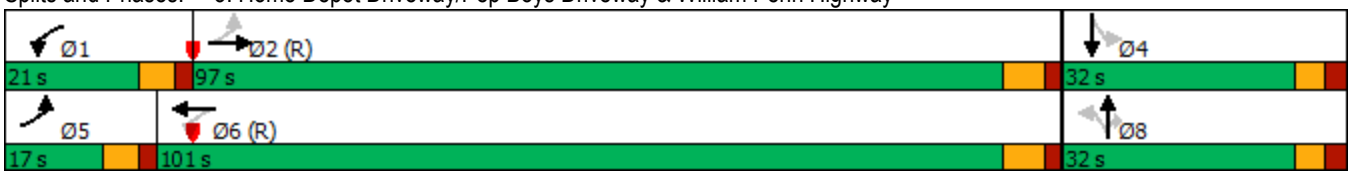
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	591	61	52	484	36	44	0	20	160	0	154
Future Volume (vph)	182	591	61	52	484	36	44	0	20	160	0	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.990				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3525	0	1536	3534	0	0	1546	1580	1718	1647	0
Flt Permitted	0.399			0.366				0.427		0.725		
Satd. Flow (perm)	714	3525	0	592	3534	0	0	695	1580	1311	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			10				70		444	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	4%	4%	8%	3%	2%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	202	657	68	58	538	40	49	0	22	178	0	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	202	725	0	58	578	0	0	49	22	178	171	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	17.0	97.0		21.0	101.0		32.0	32.0	32.0	32.0	32.0	
Total Split (%)	11.3%	64.7%		14.0%	67.3%		21.3%	21.3%	21.3%	21.3%	21.3%	
Maximum Green (s)	11.0	90.4		15.0	94.4		26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	114.8	105.6		107.9	100.3			24.0	24.0	24.0	24.0	
Actuated g/C Ratio	0.77	0.70		0.72	0.67			0.16	0.16	0.16	0.16	
v/c Ratio	0.33	0.29		0.12	0.24			0.44	0.07	0.85	0.27	
Control Delay	4.1	3.6		5.4	10.5			69.0	0.5	93.8	1.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	4.1	3.6		5.4	10.5			69.0	0.5	93.8	1.0	
LOS	A	A		A	B			E	A	F	A	
Approach Delay		3.7			10.0			47.7			48.3	
Approach LOS		A			B			D			D	
Queue Length 50th (ft)	16	30		13	115			43	0	168	0	
Queue Length 95th (ft)	32	38		25	151			89	0	#282	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	629	2484		557	2365			125	341	235	660	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.32	0.29		0.10	0.24			0.39	0.06	0.76	0.26	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 15.2 Intersection LOS: B
Intersection Capacity Utilization 55.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	591	61	52	484	36	44	0	20	160	0	154
Future Volume (veh/h)	182	591	61	52	484	36	44	0	20	160	0	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2076	2159	1728	1875	1890	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	202	657	0	58	538	40	49	0	0	178	0	169
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	4	4	8	3	2	14	0	17	0	0	0
Cap, veh/h	750	2799		608	2338	173	117	0		332	0	260
Arrive On Green	0.10	1.00	0.00	0.04	0.70	0.69	0.14	0.00	0.00	0.15	0.00	0.14
Sat Flow, veh/h	2006	4048	0	1646	3361	249	460	0	1519	1559	0	1743
Grp Volume(v), veh/h	202	657	0	58	285	293	49	0	0	178	0	169
Grp Sat Flow(s),veh/h/ln	2006	1972	0	1646	1781	1830	460	0	1519	1559	0	1743
Q Serve(g_s), s	4.5	0.0	0.0	1.5	8.7	8.7	5.6	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	4.5	0.0	0.0	1.5	8.7	8.7	19.4	0.0	0.0	12.8	0.0	13.7
Prop In Lane	1.00		0.00	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	750	2799		608	1239	1273	114	0		332	0	260
V/C Ratio(X)	0.27	0.23		0.10	0.23	0.23	0.43	0.00		0.54	0.00	0.65
Avail Cap(c_a), veh/h	808	2799		723	1239	1273	153	0		380	0	314
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.4	0.0	0.0	5.6	8.3	8.3	69.8	0.0	0.0	59.7	0.0	60.6
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.0	0.4	0.4	1.0	0.0	0.0	0.5	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.1	0.0	0.5	3.3	3.4	1.9	0.0	0.0	6.5	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.5	0.2	0.0	5.6	8.7	8.7	70.7	0.0	0.0	60.2	0.0	62.5
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		859			636			49			347	
Approach Delay, s/veh		1.4			8.4			70.7			61.3	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	112.1		27.4	12.7	109.9		27.4
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	15.0	90.4		26.0	11.0	94.4		26.0
Max Q Clear Time (g_c+I1), s	3.5	2.0		15.7	6.5	10.7		21.4
Green Ext Time (p_c), s	0.0	26.7		0.5	0.1	20.9		0.0

Intersection Summary			
HCM 6th Ctrl Delay			16.6
HCM 6th LOS			B

Notes

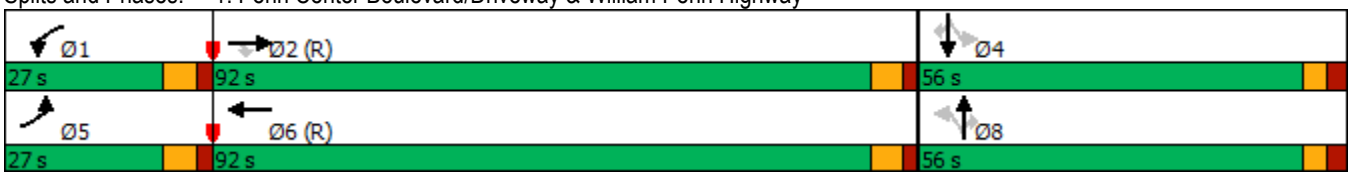
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1115	93	105	989	6	177	27	122	66	22	96
Future Volume (vph)	92	1115	93	105	989	6	177	27	122	66	22	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00	0.99		1.00	0.99
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.958			0.964	
Satd. Flow (prot)	1685	3369	1522	1710	3417	0	0	1820	1583	0	1688	1531
Flt Permitted	0.950			0.950				0.636			0.415	
Satd. Flow (perm)	1682	3369	1522	1710	3417	0	0	1207	1560	0	726	1510
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			57						131			103
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)	2					2	1		2	2		1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	0%	1%	1%	0%	0%	0%	2%	0%	5%	2%
Adj. Flow (vph)	99	1199	100	113	1063	6	190	29	131	71	24	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	1199	100	113	1069	0	0	219	131	0	95	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	13.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	27.0	92.0	92.0	27.0	92.0		56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	15.4%	52.6%	52.6%	15.4%	52.6%		32.0%	32.0%	32.0%	32.0%	32.0%	32.0%
Maximum Green (s)	20.7	85.7	85.7	20.7	85.7		50.1	50.1	50.1	50.1	50.1	50.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	16.5	105.0	105.0	17.4	106.0			37.0	37.0		37.0	37.0
Actuated g/C Ratio	0.09	0.60	0.60	0.10	0.61			0.21	0.21		0.21	0.21
v/c Ratio	0.63	0.59	0.11	0.66	0.52			0.86	0.30		0.62	0.26
Control Delay	92.9	25.1	8.9	105.3	11.5			94.8	8.8		78.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	92.9	25.1	8.9	105.3	11.5			94.8	8.8		78.6	9.4
LOS	F	C	A	F	B			F	A		E	A
Approach Delay		28.8			20.5			62.6			42.6	
Approach LOS		C			C			E			D	

Intersection Summary	
Area Type:	Other
Cycle Length: 175	
Actuated Cycle Length: 175	
Offset: 142 (81%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 30.3	Intersection LOS: C
Intersection Capacity Utilization 68.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	1115	93	105	989	6	177	27	122	66	22	96
Future Volume (veh/h)	92	1115	93	105	989	6	177	27	122	66	22	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1964	1964	1979	1862	1862	1876	1900	1900	1870	1900	1826	1870
Adj Flow Rate, veh/h	99	1199	91	113	1063	0	190	29	78	71	24	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	1	0	0	0	2	0	5	2
Cap, veh/h	130	2282	1024	140	2198		319	43	349	116	34	
Arrive On Green	0.07	0.61	0.61	0.16	1.00	0.00	0.21	0.22	0.22	0.21	0.22	0.00
Sat Flow, veh/h	1870	3731	1674	1773	3630	0	1272	194	1581	365	156	1585
Grp Volume(v), veh/h	99	1199	91	113	1063	0	219	0	78	95	0	0
Grp Sat Flow(s),veh/h/ln	1870	1865	1674	1773	1769	0	1467	0	1581	521	0	1585
Q Serve(g_s), s	9.1	32.2	3.9	10.8	0.0	0.0	0.0	0.0	7.1	11.1	0.0	0.0
Cycle Q Clear(g_c), s	9.1	32.2	3.9	10.8	0.0	0.0	24.1	0.0	7.1	35.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.87		1.00	0.75		1.00
Lane Grp Cap(c), veh/h	130	2282	1024	140	2198		353	0	349	148	0	
V/C Ratio(X)	0.76	0.53	0.09	0.80	0.48		0.62	0.00	0.22	0.64	0.00	
Avail Cap(c_a), veh/h	232	2282	1024	220	2198		458	0	462	245	0	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	80.0	19.4	14.0	72.3	0.0	0.0	63.0	0.0	55.9	77.0	0.0	0.0
Incr Delay (d2), s/veh	8.8	0.9	0.2	9.4	0.6	0.0	1.8	0.0	0.3	4.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	14.0	1.5	4.9	0.2	0.0	9.4	0.0	2.9	4.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.8	20.3	14.1	81.7	0.6	0.0	64.7	0.0	56.2	81.6	0.0	0.0
LnGrp LOS	F	C	B	F	A		E	A	E	F	A	
Approach Vol, veh/h		1389			1176			297			95	
Approach Delay, s/veh		24.8			8.4			62.5			81.6	
Approach LOS		C			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	19.2	112.3		43.5	17.5	114.1		43.5
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 21	* 86		50.1	* 21	* 86		50.1
Max Q Clear Time (g_c+I1), s	12.8	34.2		37.2	11.1	2.0		26.1
Green Ext Time (p_c), s	0.2	40.4		0.2	0.2	51.8		1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

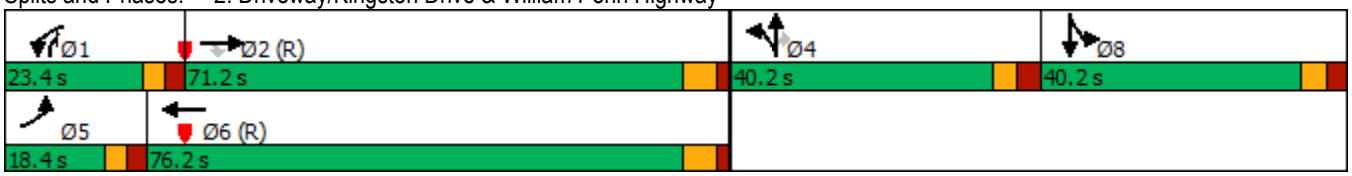
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	1095	34	98	1074	83	44	21	134	76	31	49
Future Volume (vph)	68	1095	34	98	1074	83	44	21	134	76	31	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	12	12	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			0.99	
Frt			0.850		0.989				0.850		0.957	
Flt Protected	0.950			0.950				0.967			0.976	
Satd. Flow (prot)	1702	3610	1577	1668	3496	0	0	1679	1470	0	1797	0
Flt Permitted	0.950			0.950				0.967			0.976	
Satd. Flow (perm)	1700	3610	1577	1668	3496	0	0	1672	1470	0	1797	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			93		5				140		12	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)	1					1	5					5
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	5%	2%	1%	0%	2%
Adj. Flow (vph)	71	1141	35	102	1119	86	46	22	140	79	32	51
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	1141	35	102	1205	0	0	68	140	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	1.01	1.01	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	36.2	36.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	18.4	71.2	71.2	23.4	76.2		40.2	40.2	23.4	40.2	40.2	
Total Split (%)	10.5%	40.7%	40.7%	13.4%	43.5%		23.0%	23.0%	13.4%	23.0%	23.0%	
Maximum Green (s)	12.9	65.0	65.0	17.9	70.0		34.0	34.0	17.9	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	11.8	110.0	110.0	15.4	113.6			10.9	27.1		18.6	
Actuated g/C Ratio	0.07	0.63	0.63	0.09	0.65			0.06	0.15		0.11	
v/c Ratio	0.62	0.50	0.03	0.69	0.53			0.65	0.41		0.81	
Control Delay	125.0	5.5	0.1	102.0	14.3			106.9	8.7		98.0	
Queue Delay	0.0	0.1	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	125.0	5.6	0.1	102.0	14.4			106.9	8.7		98.0	
LOS	F	A	A	F	B			F	A		F	
Approach Delay		12.2			21.2			40.8			98.0	
Approach LOS		B			C			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 23.0 Intersection LOS: C
Intersection Capacity Utilization 66.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	1095	34	98	1074	83	44	21	134	76	31	49
Future Volume (veh/h)	68	1095	34	98	1074	83	44	21	134	76	31	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1876	1862	1876	1894	1820	1864	2121	2136	2106
Adj Flow Rate, veh/h	71	1141	0	102	1119	85	46	22	74	79	32	45
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	0	1	0	0	5	2	1	0	2
Cap, veh/h	100	2351		129	2163	164	91	43	232	106	43	61
Arrive On Green	0.04	0.42	0.00	0.14	1.00	1.00	0.07	0.08	0.08	0.10	0.11	0.10
Sat Flow, veh/h	1884	3731	1677	1787	3332	253	1191	570	1549	999	405	569
Grp Volume(v), veh/h	71	1141	0	102	594	610	68	0	74	156	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1787	1769	1816	1760	0	1549	1973	0	0
Q Serve(g_s), s	6.5	38.9	0.0	9.6	0.0	0.0	6.5	0.0	7.5	13.4	0.0	0.0
Cycle Q Clear(g_c), s	6.5	38.9	0.0	9.6	0.0	0.0	6.5	0.0	7.5	13.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.14	0.68		1.00	0.51		0.29
Lane Grp Cap(c), veh/h	100	2351		129	1148	1179	134	0	232	210	0	0
V/C Ratio(X)	0.71	0.49		0.79	0.52	0.52	0.51	0.00	0.32	0.74	0.00	0.00
Avail Cap(c_a), veh/h	150	2351		193	1148	1179	352	0	424	395	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.00	0.88	0.88	0.88	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	83.1	29.9	0.0	73.6	0.0	0.0	78.0	0.0	66.6	76.3	0.0	0.0
Incr Delay (d2), s/veh	2.8	0.6	0.0	5.8	1.5	1.4	1.1	0.0	0.3	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	18.8	0.0	4.4	0.5	0.5	3.0	0.0	3.0	7.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.8	30.5	0.0	79.4	1.5	1.4	79.1	0.0	66.9	78.2	0.0	0.0
LnGrp LOS	F	C		E	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1212			1306			142			156	
Approach Delay, s/veh		33.7			7.5			72.7			78.2	
Approach LOS		C			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	17.1	115.5		18.6	13.8	118.8		23.8
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	17.9	65.0		* 34	12.9	70.0		34.0
Max Q Clear Time (g_c+I1), s	11.6	40.9		9.5	8.5	2.0		15.4
Green Ext Time (p_c), s	0.1	22.4		0.0	0.0	59.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	1276	71	47	1100	29	81	0	33	102	0	106
Future Volume (vph)	119	1276	71	47	1100	29	81	0	33	102	0	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.992			0.996				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3646	0	1659	3620	0	0	1711	1849	1292	1625	0
Flt Permitted	0.193			0.146				0.573		0.658		
Satd. Flow (perm)	346	3646	0	255	3620	0	0	1031	1824	894	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			3				60		149	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	1%	2%	0%	1%	2%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	127	1357	76	50	1170	31	86	0	35	109	0	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	1433	0	50	1201	0	0	86	35	109	113	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

2029 Projected (Build)
Timing Plan: PM Peak

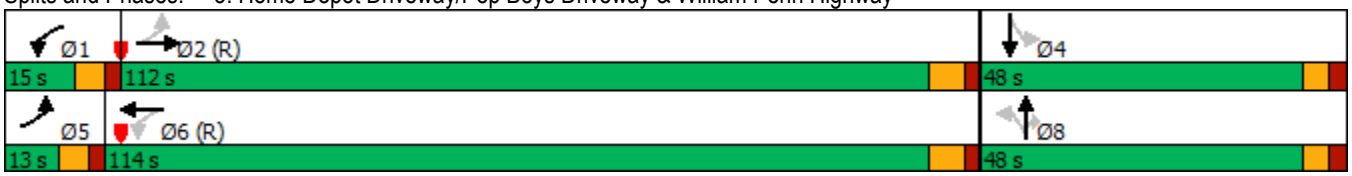
3: William Penn Highway (SR 2048) & Home Depot Driveway/Pep Boys Driveway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	13.0	112.0		15.0	114.0		48.0	48.0	48.0	48.0	48.0	
Total Split (%)	7.4%	64.0%		8.6%	65.1%		27.4%	27.4%	27.4%	27.4%	27.4%	
Maximum Green (s)	7.0	105.4		9.0	107.4		42.0	42.0	42.0	42.0	42.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	133.9	127.8		131.4	124.9			24.9	24.9	24.9	24.9	
Actuated g/C Ratio	0.77	0.73		0.75	0.71			0.14	0.14	0.14	0.14	
v/c Ratio	0.40	0.54		0.21	0.46			0.59	0.11	0.86	0.31	
Control Delay	6.3	6.5		7.4	12.3			84.4	3.6	121.1	4.9	
Queue Delay	0.0	0.1		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	6.3	6.6		7.4	12.3			84.4	3.6	121.1	4.9	
LOS	A	A		A	B			F	A	F	A	
Approach Delay		6.6			12.1			61.0			62.0	
Approach LOS		A			B			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 14.8 — Intersection LOS: B
Intersection Capacity Utilization 70.2% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	1276	71	47	1100	29	81	0	33	102	0	106
Future Volume (veh/h)	119	1276	71	47	1100	29	81	0	33	102	0	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2121	2190	1847	1905	1890	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	127	1357	0	50	1170	31	86	0	0	109	0	109
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	2	0	1	2	3	0	0	33	0	0
Cap, veh/h	412	2947		376	2626	70	148	0		239	0	237
Arrive On Green	0.06	1.00	0.00	0.03	0.73	0.73	0.14	0.00	0.00	0.14	0.00	0.14
Sat Flow, veh/h	2006	4136	0	1759	3603	95	782	0	1744	1182	0	1740
Grp Volume(v), veh/h	127	1357	0	50	588	613	86	0	0	109	0	109
Grp Sat Flow(s),veh/h/ln	2006	2015	0	1759	1810	1888	782	0	1744	1182	0	1740
Q Serve(g_s), s	3.0	0.0	0.0	1.3	22.8	22.8	10.9	0.0	0.0	0.0	0.0	10.1
Cycle Q Clear(g_c), s	3.0	0.0	0.0	1.3	22.8	22.8	21.0	0.0	0.0	12.0	0.0	10.1
Prop In Lane	1.00		0.00	1.00		0.05	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	412	2947		376	1319	1376	148	0		239	0	237
V/C Ratio(X)	0.31	0.46		0.13	0.45	0.45	0.58	0.00		0.46	0.00	0.46
Avail Cap(c_a), veh/h	435	2947		420	1319	1376	288	0		361	0	418
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.86	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.2	0.0	0.0	5.4	9.5	9.5	79.3	0.0	0.0	70.4	0.0	69.6
Incr Delay (d2), s/veh	0.1	0.4	0.0	0.1	1.1	1.0	1.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.2	0.0	0.4	9.0	9.3	3.9	0.0	0.0	4.7	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.4	0.4	0.0	5.5	10.6	10.6	80.7	0.0	0.0	70.9	0.0	70.1
LnGrp LOS	A	A		A	B	B	F	A		E	A	E
Approach Vol, veh/h		1484			1251			86			218	
Approach Delay, s/veh		1.0			10.4			80.7			70.5	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	134.6		29.9	11.0	134.1		29.9
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	9.0	105.4		42.0	7.0	107.4		42.0
Max Q Clear Time (g_c+I1), s	3.3	2.0		14.0	5.0	24.8		23.0
Green Ext Time (p_c), s	0.0	79.5		0.5	0.0	58.9		0.1

Intersection Summary	
HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

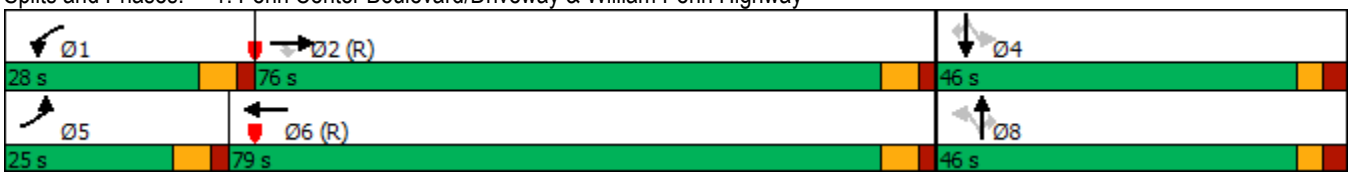
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	1263	79	155	1070	4	128	22	116	82	16	103
Future Volume (vph)	83	1263	79	155	1070	4	128	22	116	82	16	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	11	11	11	12	12	12	10	10	11
Grade (%)		-2%			2%			0%			0%	
Storage Length (ft)	205		60	250		0	0		0	0		125
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99		1.00	
Frt			0.850		0.999				0.850			0.850
Flt Protected	0.950			0.950				0.959			0.960	
Satd. Flow (prot)	1702	3403	1522	1694	3417	0	0	1794	1599	0	1702	1546
Flt Permitted	0.950			0.950				0.620			0.478	
Satd. Flow (perm)	1702	3403	1522	1694	3417	0	0	1160	1578	0	847	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67						120			106
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1593			791			1002			354	
Travel Time (s)		27.2			13.5			27.3			9.7	
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	5%	1%	0%	0%	1%
Adj. Flow (vph)	86	1302	81	160	1103	4	132	23	120	85	16	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	1302	81	160	1107	0	0	155	120	0	101	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	1.08	1.08	1.06	1.06	1.06	1.00	1.00	1.00	1.09	1.09	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	0
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	0
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	0
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.3	36.3	36.3	13.3	36.3		44.9	44.9	44.9	44.9	44.9	44.9
Total Split (s)	25.0	76.0	76.0	28.0	79.0		46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	16.7%	50.7%	50.7%	18.7%	52.7%		30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Maximum Green (s)	18.7	69.7	69.7	21.7	72.7		40.1	40.1	40.1	40.1	40.1	40.1
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1		2.9	2.9	2.9	2.9	2.9	2.9
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.3	5.3	5.3	5.3	5.3			4.9	4.9		4.9	4.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0	6.0	3.0	6.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	5.0	5.0	0.2	5.0		0.2	0.2	0.2	0.2	0.2	0.2
Time Before Reduce (s)	0.0	25.0	25.0	0.0	25.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	None
Walk Time (s)		13.0	13.0		13.0		16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)		17.0	17.0		17.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)		0	0		0		0	0	0	0	0	0
Act Effct Green (s)	14.0	89.8	89.8	19.4	95.3			25.2	25.2		25.2	25.2
Actuated g/C Ratio	0.09	0.60	0.60	0.13	0.64			0.17	0.17		0.17	0.17
v/c Ratio	0.54	0.64	0.09	0.73	0.51			0.79	0.33		0.71	0.30
Control Delay	76.9	23.1	5.3	86.6	9.3			86.5	10.1		83.8	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.1			0.0	0.0		0.0	0.0
Total Delay	76.9	23.1	5.3	86.6	9.4			86.5	10.1		83.8	10.4
LOS	E	C	A	F	A			F	B		F	B
Approach Delay		25.3			19.1			53.2			46.2	
Approach LOS		C			B			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 113 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 26.6 Intersection LOS: C
Intersection Capacity Utilization 71.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Penn Center Boulevard/Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1263	79	155	1070	4	128	22	116	82	16	103
Future Volume (veh/h)	83	1263	79	155	1070	4	128	22	116	82	16	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1979	1979	1847	1862	1876	1885	1826	1885	1900	1900	1885
Adj Flow Rate, veh/h	86	1302	71	160	1103	0	132	23	88	85	16	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	2	1	0	1	5	1	0	0	1
Cap, veh/h	121	2267	1011	193	2295		288	42	293	149	25	
Arrive On Green	0.06	0.60	0.60	0.15	0.86	0.00	0.18	0.18	0.18	0.18	0.18	0.00
Sat Flow, veh/h	1884	3759	1677	1759	3630	0	1325	231	1595	568	134	1598
Grp Volume(v), veh/h	86	1302	71	160	1103	0	155	0	88	101	0	0
Grp Sat Flow(s),veh/h/ln	1884	1880	1677	1759	1769	0	1556	0	1595	702	0	1598
Q Serve(g_s), s	6.7	31.6	2.6	13.3	11.0	0.0	0.0	0.0	7.1	10.3	0.0	0.0
Cycle Q Clear(g_c), s	6.7	31.6	2.6	13.3	11.0	0.0	13.5	0.0	7.1	23.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.85		1.00	0.84		1.00
Lane Grp Cap(c), veh/h	121	2267	1011	193	2295		320	0	293	169	0	
V/C Ratio(X)	0.71	0.57	0.07	0.83	0.48		0.48	0.00	0.30	0.60	0.00	
Avail Cap(c_a), veh/h	247	2267	1011	266	2295		448	0	437	292	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	68.9	18.1	12.3	62.7	4.4	0.0	55.8	0.0	52.9	65.8	0.0	0.0
Incr Delay (d2), s/veh	7.6	1.1	0.1	12.1	0.6	0.0	1.1	0.0	0.6	3.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	13.5	1.0	6.3	3.0	0.0	5.6	0.0	3.0	4.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.4	19.2	12.5	74.8	5.0	0.0	57.0	0.0	53.4	69.2	0.0	0.0
LnGrp LOS	E	B	B	E	A		E	A	D	E	A	
Approach Vol, veh/h		1459			1263			243			101	
Approach Delay, s/veh		22.2			13.8			55.7			69.2	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	21.8	95.7		32.5	14.9	102.6		32.5
Change Period (Y+Rc), s	* 6.3	* 6.3		5.9	* 6.3	* 6.3		5.9
Max Green Setting (Gmax), s	* 22	* 70		40.1	* 19	* 73		40.1
Max Q Clear Time (g_c+I1), s	15.3	33.6		25.8	8.7	13.0		15.5
Green Ext Time (p_c), s	0.2	31.6		0.2	0.1	42.9		0.8

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

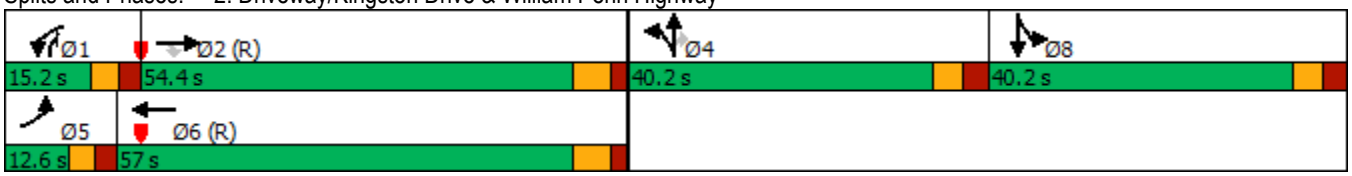
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	1324	50	116	1263	81	41	13	116	75	16	49
Future Volume (vph)	43	1324	50	116	1263	81	41	13	116	75	16	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	11	10	13	13	10	10	10	12	12	12
Grade (%)		-2%			2%			1%			-6%	
Storage Length (ft)	185		200	185		0	0		175	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			0.99	
Frt			0.850		0.991				0.850		0.953	
Flt Protected	0.950			0.950				0.963			0.974	
Satd. Flow (prot)	1702	3610	1577	1635	3660	0	0	1667	1500	0	1775	0
Flt Permitted	0.950			0.950				0.963			0.974	
Satd. Flow (perm)	1702	3610	1577	1635	3660	0	0	1663	1500	0	1775	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		5				117		17	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		791			930			353			1006	
Travel Time (s)		13.5			15.9			9.6			27.4	
Confl. Peds. (#/hr)							3					3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	1%	0%	2%	0%	0%	0%	8%	0%	2%	0%	2%
Adj. Flow (vph)	43	1337	51	117	1276	82	41	13	117	76	16	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	1337	51	117	1358	0	0	54	117	0	141	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.08	0.99	1.03	1.11	0.97	0.97	1.10	1.10	1.10	0.96	0.96	0.96
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	1	1		1	1	1	1	1	
Detector Template							Left			Left		
Leading Detector (ft)	35	250	0	35	250		20	35	35	20	35	
Trailing Detector (ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Position(ft)	-5	244	0	-5	244		0	-5	-5	0	-5	
Detector 1 Size(ft)	40	6	20	40	6		20	40	40	20	40	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2		1	6		4	4	1	8	8	
Permitted Phases			2						4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	12.5	33.2	33.2	12.5	33.2		40.2	40.2	12.5	40.2	40.2	
Total Split (s)	12.6	54.4	54.4	15.2	57.0		40.2	40.2	15.2	40.2	40.2	
Total Split (%)	8.4%	36.3%	36.3%	10.1%	38.0%		26.8%	26.8%	10.1%	26.8%	26.8%	
Maximum Green (s)	7.1	48.2	48.2	9.7	50.8		34.0	34.0	9.7	34.0	34.0	
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2		3.3	3.3	3.0	3.3	3.3	
All-Red Time (s)	2.5	2.0	2.0	2.5	2.0		2.9	2.9	2.5	2.9	2.9	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0			-1.0	-1.0		-1.0	
Total Lost Time (s)	4.5	5.2	5.2	4.5	5.2			5.2	4.5		5.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	8.0	8.0	2.0	8.0		0.2	0.2	2.0	0.2	0.2	
Minimum Gap (s)	0.2	5.6	5.6	0.2	5.6		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0	10.0	0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0	15.0	0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None	None	None	None	
Walk Time (s)		12.0	12.0		12.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)		15.0	15.0		15.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	7.6	98.1	98.1	10.7	103.3			8.9	19.0		14.4	
Actuated g/C Ratio	0.05	0.65	0.65	0.07	0.69			0.06	0.13		0.10	
v/c Ratio	0.50	0.57	0.05	1.01	0.54			0.55	0.40		0.76	
Control Delay	108.0	4.5	0.1	147.5	9.7			87.9	9.9		82.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	108.0	4.5	0.1	147.5	9.7			87.9	9.9		82.3	
LOS	F	A	A	F	A			F	A		F	
Approach Delay		7.5			20.6			34.6			82.3	
Approach LOS		A			C			C			F	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 71.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Driveway/Kingston Drive & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	1324	50	116	1263	81	41	13	116	75	16	49
Future Volume (veh/h)	43	1324	50	116	1263	81	41	13	116	75	16	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1979	1964	1979	1847	1952	1952	1894	1776	1894	2106	2136	2106
Adj Flow Rate, veh/h	43	1337	0	117	1276	82	41	13	72	76	16	32
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	1	0	2	0	0	0	8	0	2	0	2
Cap, veh/h	69	2362		125	2362	152	93	29	228	109	23	46
Arrive On Green	0.02	0.42	0.00	0.14	1.00	1.00	0.06	0.07	0.07	0.08	0.09	0.08
Sat Flow, veh/h	1884	3731	1677	1759	3538	227	1299	412	1585	1212	255	510
Grp Volume(v), veh/h	43	1337	0	117	668	690	54	0	72	124	0	0
Grp Sat Flow(s),veh/h/ln	1884	1865	1677	1759	1854	1911	1711	0	1585	1977	0	0
Q Serve(g_s), s	3.4	40.7	0.0	9.9	0.0	0.0	4.6	0.0	6.1	9.2	0.0	0.0
Cycle Q Clear(g_c), s	3.4	40.7	0.0	9.9	0.0	0.0	4.6	0.0	6.1	9.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.12	0.76		1.00	0.61		0.26
Lane Grp Cap(c), veh/h	69	2362		125	1238	1276	122	0	228	178	0	0
V/C Ratio(X)	0.62	0.57		0.93	0.54	0.54	0.44	0.00	0.32	0.70	0.00	0.00
Avail Cap(c_a), veh/h	102	2362		125	1238	1276	399	0	484	461	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.00	0.80	0.80	0.80	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	72.1	27.6	0.0	63.9	0.0	0.0	67.2	0.0	57.7	66.7	0.0	0.0
Incr Delay (d2), s/veh	2.6	0.8	0.0	51.5	1.4	1.3	0.9	0.0	0.3	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	19.4	0.0	5.9	0.5	0.5	2.1	0.0	2.5	4.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.7	28.3	0.0	115.5	1.4	1.3	68.1	0.0	58.0	68.5	0.0	0.0
LnGrp LOS	E	C		F	A	A	E	A	E	E	A	A
Approach Vol, veh/h		1380			1475			126			124	
Approach Delay, s/veh		29.8			10.4			62.3			68.5	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.2	100.2		15.9	10.0	105.4		18.7
Change Period (Y+Rc), s	5.5	6.2		* 6.2	5.5	6.2		6.2
Max Green Setting (Gmax), s	9.7	48.2		* 34	7.1	50.8		34.0
Max Q Clear Time (g_c+I1), s	11.9	42.7		8.1	5.4	2.0		11.2
Green Ext Time (p_c), s	0.0	5.4		0.0	0.0	46.2		0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	1243	130	102	1160	49	128	1	46	179	0	198
Future Volume (vph)	206	1243	130	102	1160	49	128	1	46	179	0	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.994				0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1701	3666	0	1659	3498	0	0	1768	1812	1718	1647	0
Flt Permitted	0.164			0.122				0.388		0.583		
Satd. Flow (perm)	294	3666	0	213	3498	0	0	720	1812	1055	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			5				113		160	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	215	1295	135	106	1208	51	133	1	48	186	0	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	215	1430	0	106	1259	0	0	134	48	186	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	13.0	95.0		20.0	102.0		35.0	35.0	35.0	35.0	35.0	
Total Split (%)	8.7%	63.3%		13.3%	68.0%		23.3%	23.3%	23.3%	23.3%	23.3%	
Maximum Green (s)	7.0	88.4		14.0	95.4		29.0	29.0	29.0	29.0	29.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	102.9	95.3		103.8	95.8			28.6	28.6	28.6	28.6	
Actuated g/C Ratio	0.69	0.64		0.69	0.64			0.19	0.19	0.19	0.19	
v/c Ratio	0.81	0.61		0.48	0.56			0.98	0.11	0.93	0.47	
Control Delay	40.2	6.1		13.7	16.5			130.1	0.5	106.2	17.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	40.2	6.2		13.7	16.5			130.1	0.5	106.2	17.4	
LOS	D	A		B	B			F	A	F	B	
Approach Delay		10.6			16.3			95.9			59.6	
Approach LOS		B			B			F			E	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 22.5 Intersection LOS: C
Intersection Capacity Utilization 84.9% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	1243	130	102	1160	49	128	1	46	179	0	198
Future Volume (veh/h)	206	1243	130	102	1160	49	128	1	46	179	0	198
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2136	2221	1847	1832	1890	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	215	1295	0	106	1208	51	133	1	0	186	0	204
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	0	0	1	2	0	0	2	0	0	0
Cap, veh/h	358	2630		376	2164	91	155	1		427	0	337
Arrive On Green	0.09	1.00	0.00	0.03	0.64	0.64	0.19	0.19	0.00	0.19	0.00	0.19
Sat Flow, veh/h	2006	4165	0	1759	3403	144	555	4	1717	1558	0	1743
Grp Volume(v), veh/h	215	1295	0	106	617	642	134	0	0	186	0	204
Grp Sat Flow(s),veh/h/ln	2006	2029	0	1759	1741	1806	559	0	1717	1558	0	1743
Q Serve(g_s), s	6.2	0.0	0.0	3.2	30.0	30.1	13.0	0.0	0.0	0.0	0.0	16.0
Cycle Q Clear(g_c), s	6.2	0.0	0.0	3.2	30.0	30.1	29.0	0.0	0.0	12.7	0.0	16.0
Prop In Lane	1.00		0.00	1.00		0.08	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	358	2630		376	1107	1149	156	0		427	0	337
V/C Ratio(X)	0.60	0.49		0.28	0.56	0.56	0.86	0.00		0.44	0.00	0.61
Avail Cap(c_a), veh/h	358	2630		480	1107	1149	156	0		427	0	337
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.0	0.0	0.0	8.7	15.4	15.4	69.8	0.0	0.0	53.9	0.0	55.3
Incr Delay (d2), s/veh	1.6	0.5	0.0	0.2	2.0	2.0	34.1	0.0	0.0	0.3	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.2	0.0	1.2	11.9	12.4	6.7	0.0	0.0	6.4	0.0	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.6	0.5	0.0	8.8	17.4	17.4	103.9	0.0	0.0	54.2	0.0	57.5
LnGrp LOS	B	A		A	B	B	F	A		D	A	E
Approach Vol, veh/h		1510			1365			134			390	
Approach Delay, s/veh		2.5			16.7			103.9			55.9	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.2	103.8		35.0	13.0	102.0		35.0
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	14.0	88.4		29.0	7.0	95.4		29.0
Max Q Clear Time (g_c+I1), s	5.2	2.0		18.0	8.2	32.1		31.0
Green Ext Time (p_c), s	0.1	66.1		0.6	0.0	50.4		0.0

Intersection Summary	
HCM 6th Ctrl Delay	18.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

2029 Projected (Build) with Improvements Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	591	61	52	484	36	44	0	20	160	0	154
Future Volume (vph)	182	591	61	52	484	36	44	0	20	160	0	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		225	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.990				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3525	0	1536	3534	0	0	1546	1580	1718	1647	0
Flt Permitted	0.393			0.366				0.451		0.725		
Satd. Flow (perm)	704	3525	0	592	3534	0	0	734	1580	1311	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			6				113		445	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			317			318			447	
Travel Time (s)		15.9			5.4			8.7			12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	4%	4%	8%	3%	2%	14%	0%	17%	0%	0%	0%
Adj. Flow (vph)	202	657	68	58	538	40	49	0	22	178	0	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	202	725	0	58	578	0	0	49	22	178	171	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

2029 Projected (Build) with Improvements
Timing Plan: AM Peak

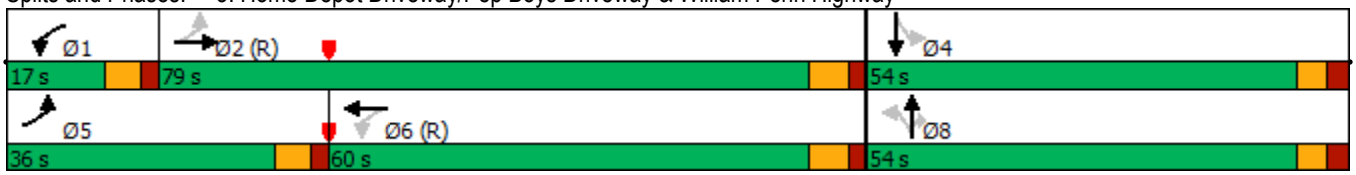
3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	36.0	79.0		17.0	60.0		54.0	54.0	54.0	54.0	54.0	
Total Split (%)	24.0%	52.7%		11.3%	40.0%		36.0%	36.0%	36.0%	36.0%	36.0%	
Maximum Green (s)	30.0	72.4		11.0	53.4		48.0	48.0	48.0	48.0	48.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	112.9	103.2		105.2	97.4			26.2	26.2	26.2	26.2	
Actuated g/C Ratio	0.75	0.69		0.70	0.65			0.17	0.17	0.17	0.17	
v/c Ratio	0.34	0.30		0.13	0.25			0.38	0.06	0.78	0.26	
Control Delay	6.8	6.6		6.7	12.4			61.1	0.3	80.7	1.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	6.8	6.6		6.7	12.4			61.1	0.3	80.7	1.0	
LOS	A	A		A	B			E	A	F	A	
Approach Delay		6.6			11.9			42.2			41.6	
Approach LOS		A			B			D			D	
Queue Length 50th (ft)	32	65		13	115			43	0	169	0	
Queue Length 95th (ft)	50	102		32	189			82	0	240	0	
Internal Link Dist (ft)		850			237			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	740	2427		509	2297			239	592	428	837	
Starvation Cap Reductn	0	0		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.27	0.30		0.11	0.25			0.21	0.04	0.42	0.20	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 124 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 15.7 — Intersection LOS: B
Intersection Capacity Utilization 55.5% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	591	61	52	484	36	44	0	20	160	0	154
Future Volume (veh/h)	182	591	61	52	484	36	44	0	20	160	0	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2076	2159	1728	1875	1890	1769	1979	1792	2057	2057	2057
Adj Flow Rate, veh/h	202	657	0	58	538	40	49	0	0	178	0	169
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	4	4	8	3	2	14	0	17	0	0	0
Cap, veh/h	751	2798		607	2333	173	117	0		333	0	261
Arrive On Green	0.10	1.00	0.00	0.04	0.69	0.69	0.14	0.00	0.00	0.15	0.00	0.14
Sat Flow, veh/h	2006	4048	0	1646	3361	249	463	0	1519	1559	0	1743
Grp Volume(v), veh/h	202	657	0	58	285	293	49	0	0	178	0	169
Grp Sat Flow(s),veh/h/ln	2006	1972	0	1646	1781	1830	463	0	1519	1559	0	1743
Q Serve(g_s), s	4.5	0.0	0.0	1.5	8.7	8.8	5.6	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	4.5	0.0	0.0	1.5	8.7	8.8	19.4	0.0	0.0	12.7	0.0	13.7
Prop In Lane	1.00		0.00	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	751	2798		607	1236	1270	114	0		333	0	261
V/C Ratio(X)	0.27	0.23		0.10	0.23	0.23	0.43	0.00		0.53	0.00	0.65
Avail Cap(c_a), veh/h	1060	2798		678	1236	1270	342	0		609	0	570
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.95	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.4	0.0	0.0	5.6	8.4	8.4	69.7	0.0	0.0	59.7	0.0	60.5
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.0	0.4	0.4	0.9	0.0	0.0	0.5	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.1	0.0	0.5	3.3	3.4	1.9	0.0	0.0	6.5	0.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.5	0.2	0.0	5.6	8.8	8.8	70.7	0.0	0.0	60.2	0.0	61.6
LnGrp LOS	A	A		A	A	A	E	A		E	A	E
Approach Vol, veh/h		859			636			49			347	
Approach Delay, s/veh		1.4			8.5			70.7			60.8	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	112.0		27.4	12.8	109.7		27.4
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	11.0	72.4		48.0	30.0	53.4		48.0
Max Q Clear Time (g_c+I1), s	3.5	2.0		15.7	6.5	10.8		21.4
Green Ext Time (p_c), s	0.0	25.1		0.7	0.3	16.9		0.1

Intersection Summary	
HCM 6th Ctrl Delay	16.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	1276	71	47	1100	29	81	0	33	102	0	106
Future Volume (vph)	119	1276	71	47	1100	29	81	0	33	102	0	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	13	13	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00	0.99	1.00	0.99	
Frt		0.992			0.996				0.850		0.850	
Flt Protected	0.950			0.950				0.950		0.950		
Satd. Flow (prot)	1701	3646	0	1659	3620	0	0	1711	1849	1292	1625	0
Flt Permitted	0.190			0.147				0.573		0.658		
Satd. Flow (perm)	340	3646	0	257	3620	0	0	1031	1824	894	1625	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			2				97		191	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			332			318			447	
Travel Time (s)		15.9			5.7			8.7			12.2	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	1%	2%	0%	1%	2%	3%	0%	0%	33%	0%	0%
Adj. Flow (vph)	127	1357	76	50	1170	31	86	0	35	109	0	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	1433	0	50	1201	0	0	86	35	109	113	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	0.98	0.98	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		44.0	44.0	44.0	44.0	44.0	
Total Split (s)	26.0	108.0		15.0	97.0		52.0	52.0	52.0	52.0	52.0	
Total Split (%)	14.9%	61.7%		8.6%	55.4%		29.7%	29.7%	29.7%	29.7%	29.7%	
Maximum Green (s)	20.0	101.4		9.0	90.4		46.0	46.0	46.0	46.0	46.0	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	6.0		2.0	6.0		2.0	2.0	2.0	2.0	2.0	
Minimum Gap (s)	0.2	3.0		0.2	3.0		0.2	0.2	0.2	0.2	0.2	
Time Before Reduce (s)	0.0	10.0		0.0	10.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	15.0		0.0	15.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)		13.0			13.0		16.0	16.0	16.0	16.0	16.0	
Flash Dont Walk (s)		15.0			15.0		22.0	22.0	22.0	22.0	22.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	135.1	127.8		130.2	123.7			24.9	24.9	24.9	24.9	
Actuated g/C Ratio	0.77	0.73		0.74	0.71			0.14	0.14	0.14	0.14	
v/c Ratio	0.39	0.54		0.21	0.47			0.59	0.10	0.86	0.29	
Control Delay	5.8	4.1		7.5	13.1			84.6	0.6	121.2	1.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	5.8	4.1		7.5	13.1			84.6	0.6	121.2	1.8	
LOS	A	A		A	B			F	A	F	A	
Approach Delay		4.3			12.8			60.3			60.4	
Approach LOS		A			B			E			E	
Queue Length 50th (ft)	13	101		11	295			94	0	124	0	
Queue Length 95th (ft)	26	146		29	447			150	0	191	0	
Internal Link Dist (ft)		850			252			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	423	2664		268	2560			271	550	234	567	
Starvation Cap Reductn	0	64		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.30	0.55		0.19	0.47			0.32	0.06	0.47	0.20	

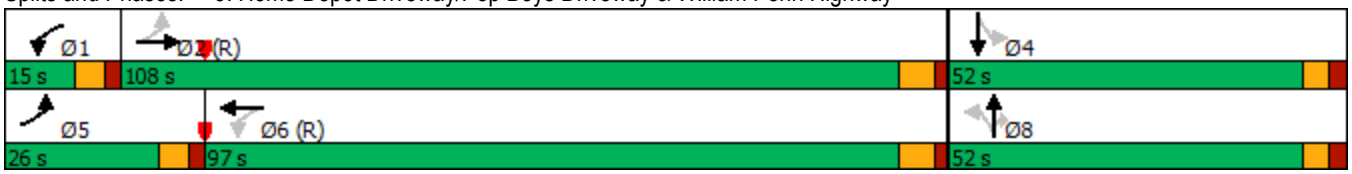
Intersection Summary

Area Type: Other
Cycle Length: 175
Actuated Cycle Length: 175
Offset: 169 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 13.8 Intersection LOS: B

Intersection Capacity Utilization 70.2%	ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	1276	71	47	1100	29	81	0	33	102	0	106
Future Volume (veh/h)	119	1276	71	47	1100	29	81	0	33	102	0	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2121	2190	1847	1905	1890	1934	1979	2058	1562	2057	2057
Adj Flow Rate, veh/h	127	1357	0	50	1170	31	86	0	0	109	0	109
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	1	2	0	1	2	3	0	0	33	0	0
Cap, veh/h	413	2947		375	2623	69	148	0		239	0	237
Arrive On Green	0.06	1.00	0.00	0.03	0.73	0.73	0.14	0.00	0.00	0.14	0.00	0.14
Sat Flow, veh/h	2006	4136	0	1759	3603	95	783	0	1744	1182	0	1740
Grp Volume(v), veh/h	127	1357	0	50	588	613	86	0	0	109	0	109
Grp Sat Flow(s),veh/h/ln	2006	2015	0	1759	1810	1888	783	0	1744	1182	0	1740
Q Serve(g_s), s	3.0	0.0	0.0	1.3	22.9	22.9	10.9	0.0	0.0	0.0	0.0	10.1
Cycle Q Clear(g_c), s	3.0	0.0	0.0	1.3	22.9	22.9	21.0	0.0	0.0	12.0	0.0	10.1
Prop In Lane	1.00		0.00	1.00		0.05	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	413	2947		375	1318	1375	148	0		239	0	237
V/C Ratio(X)	0.31	0.46		0.13	0.45	0.45	0.58	0.00		0.46	0.00	0.46
Avail Cap(c_a), veh/h	584	2947		420	1318	1375	319	0		388	0	457
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.86	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.2	0.0	0.0	5.4	9.6	9.6	79.3	0.0	0.0	70.4	0.0	69.6
Incr Delay (d2), s/veh	0.1	0.4	0.0	0.1	1.1	1.1	1.3	0.0	0.0	0.5	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.2	0.0	0.4	9.0	9.4	3.9	0.0	0.0	4.7	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.4	0.4	0.0	5.5	10.7	10.6	80.6	0.0	0.0	70.9	0.0	70.1
LnGrp LOS	A	A		A	B	B	F	A		E	A	E
Approach Vol, veh/h		1484			1251			86			218	
Approach Delay, s/veh		1.0			10.5			80.6			70.5	
Approach LOS		A			B			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	134.6		29.9	11.1	134.0		29.9
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	9.0	101.4		46.0	20.0	90.4		46.0
Max Q Clear Time (g_c+I1), s	3.3	2.0		14.0	5.0	24.9		23.0
Green Ext Time (p_c), s	0.0	77.1		0.5	0.2	49.6		0.1

Intersection Summary	
HCM 6th Ctrl Delay	12.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	1243	130	102	1160	49	128	1	46	179	0	198
Future Volume (vph)	206	1243	130	102	1160	49	128	1	46	179	0	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	14	10	12	14	11	11	16	10	12	12
Grade (%)		-6%			3%			-2%			-4%	
Storage Length (ft)	150		0	160		0	0		120	150		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.994				0.850		0.850	
Flt Protected	0.950			0.950				0.953		0.950		
Satd. Flow (prot)	1701	3666	0	1659	3498	0	0	1768	1812	1718	1647	0
Flt Permitted	0.135			0.130				0.392		0.585		
Satd. Flow (perm)	242	3666	0	227	3498	0	0	727	1812	1058	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			4				113		262	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		930			328			318			447	
Travel Time (s)		15.9			5.6			8.7			12.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	215	1295	135	106	1208	51	133	1	48	186	0	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	215	1430	0	106	1259	0	0	134	48	186	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.05	0.96	0.88	1.11	1.02	0.94	1.03	1.03	0.84	1.07	0.97	0.97
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	0	1	1	
Detector Template							Left					
Leading Detector (ft)	35	250		35	250		20	35	0	35	35	
Trailing Detector (ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Position(ft)	-5	244		-5	244		0	-5	0	-5	-5	
Detector 1 Size(ft)	40	6		40	6		20	40	20	40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		8	8	8	4	4	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	13.0	34.6		13.0	34.6		13.0	13.0	13.0	13.0	13.0	
Total Split (s)	31.0	86.0		19.0	74.0		45.0	45.0	45.0	45.0	45.0	
Total Split (%)	20.7%	57.3%		12.7%	49.3%		30.0%	30.0%	30.0%	30.0%	30.0%	
Yellow Time (s)	4.0	4.6		4.0	4.6		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.7	2.7	2.7	2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.6		6.0	6.6			6.0	6.0	6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	107.9	94.1		95.6	86.7			29.0	29.0	29.0	29.0	
Actuated g/C Ratio	0.72	0.63		0.64	0.58			0.19	0.19	0.19	0.19	
v/c Ratio	0.66	0.62		0.48	0.62			0.96	0.11	0.91	0.39	
Control Delay	39.3	11.0		16.6	25.1			123.6	0.5	101.5	3.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	39.3	11.0		16.6	25.1			123.6	0.5	101.5	3.5	
LOS	D	B		B	C			F	A	F	A	
Approach Delay		14.7			24.5			91.1			50.0	
Approach LOS		B			C			F			D	
Queue Length 50th (ft)	88	177		28	411			131	0	180	0	
Queue Length 95th (ft)	200	250		59	644			#222	0	259	21	
Internal Link Dist (ft)		850			248			238			367	
Turn Bay Length (ft)	150			160					120	150		
Base Capacity (vph)	418	2304		275	2023			189	554	275	622	
Starvation Cap Reductn	0	52		0	0			0	0	0	0	
Spillback Cap Reductn	0	0		0	0			0	0	0	0	
Storage Cap Reductn	0	0		0	0			0	0	0	0	
Reduced v/c Ratio	0.51	0.63		0.39	0.62			0.71	0.09	0.68	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 121 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 84.9% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Home Depot Driveway/Pep Boys Driveway & William Penn Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	1243	130	102	1160	49	128	1	46	179	0	198
Future Volume (veh/h)	206	1243	130	102	1160	49	128	1	46	179	0	198
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2106	2136	2221	1847	1832	1890	1979	1979	2027	2057	2057	2057
Adj Flow Rate, veh/h	215	1295	0	106	1208	51	133	1	0	186	0	204
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	0	0	0	1	2	0	0	2	0	0	0
Cap, veh/h	351	2500		363	2020	85	197	1		479	0	389
Arrive On Green	0.12	1.00	0.00	0.04	0.59	0.59	0.22	0.22	0.00	0.22	0.00	0.22
Sat Flow, veh/h	2006	4165	0	1759	3403	144	667	5	1717	1558	0	1743
Grp Volume(v), veh/h	215	1295	0	106	617	642	134	0	0	186	0	204
Grp Sat Flow(s),veh/h/ln	2006	2029	0	1759	1741	1806	672	0	1717	1558	0	1743
Q Serve(g_s), s	6.6	0.0	0.0	3.6	33.5	33.6	15.9	0.0	0.0	0.0	0.0	15.4
Cycle Q Clear(g_c), s	6.6	0.0	0.0	3.6	33.5	33.6	31.3	0.0	0.0	12.2	0.0	15.4
Prop In Lane	1.00		0.00	1.00		0.08	0.99		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	351	2500		363	1033	1072	198	0		479	0	389
V/C Ratio(X)	0.61	0.52		0.29	0.60	0.60	0.68	0.00		0.39	0.00	0.53
Avail Cap(c_a), veh/h	566	2500		450	1033	1072	244	0		537	0	453
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.5	0.0	0.0	10.9	19.2	19.2	65.1	0.0	0.0	50.0	0.0	51.3
Incr Delay (d2), s/veh	0.5	0.6	0.0	0.2	2.6	2.5	3.2	0.0	0.0	0.2	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.2	0.0	1.4	13.7	14.2	5.3	0.0	0.0	6.1	0.0	6.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.0	0.6	0.0	11.1	21.8	21.7	68.3	0.0	0.0	50.2	0.0	51.7
LnGrp LOS	B	A		B	C	C	E	A		D	A	D
Approach Vol, veh/h		1510			1365			134			390	
Approach Delay, s/veh		2.8			20.9			68.3			51.0	
Approach LOS		A			C			E			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.6	99.0		39.4	15.0	95.6		39.4
Change Period (Y+Rc), s	6.0	6.6		6.0	6.0	6.6		6.0
Max Green Setting (Gmax), s	13.0	79.4		39.0	25.0	67.4		39.0
Max Q Clear Time (g_c+I1), s	5.6	2.0		17.4	8.6	35.6		33.3
Green Ext Time (p_c), s	0.1	60.7		0.8	0.3	27.9		0.1

Intersection Summary	
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

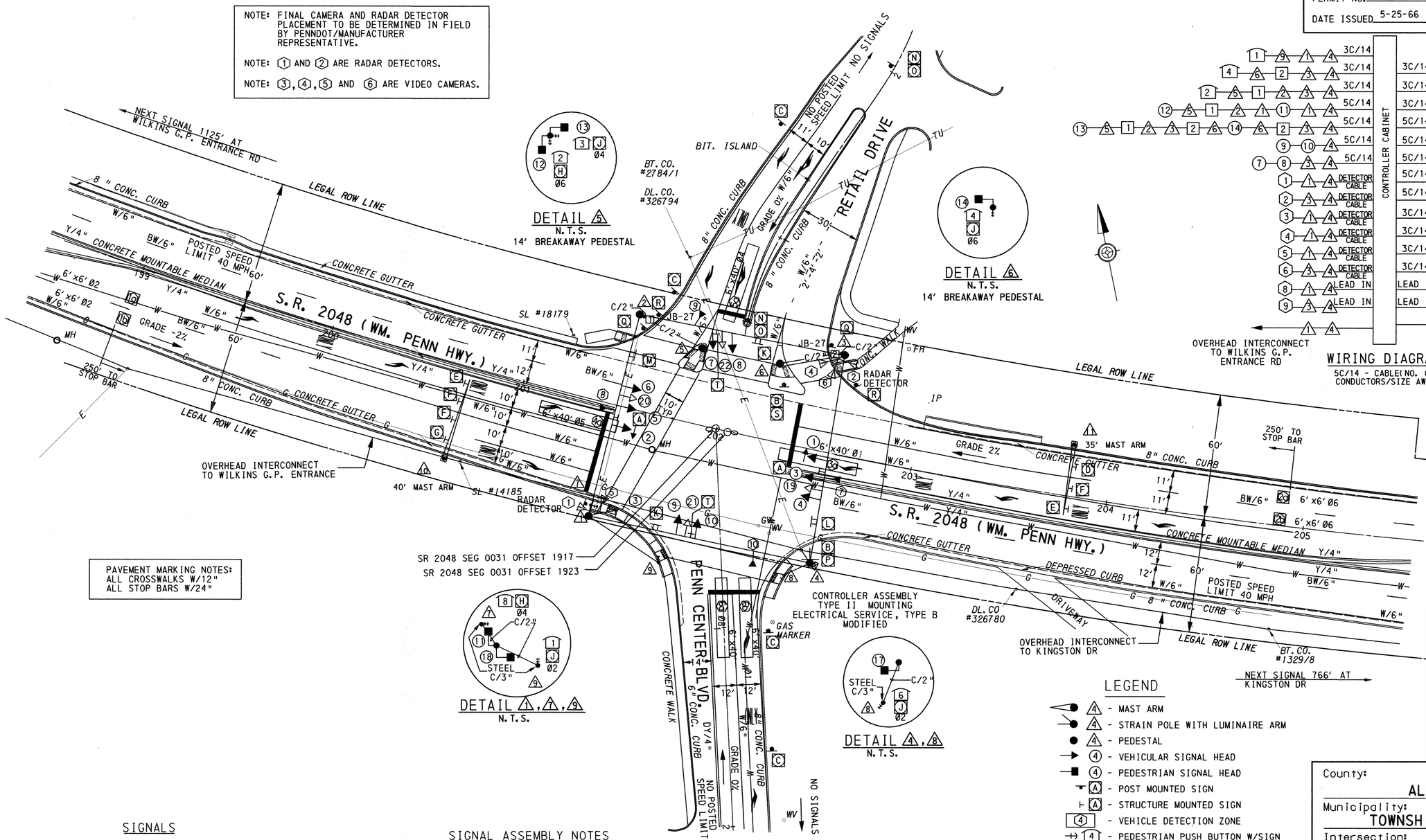
Appendix G:
Traffic Signal Permit Plans

PERMIT NO. 1-127-04 SHEET 2 OF 3
DATE ISSUED 5-25-66 DATE REVISED 2-15-12

NOTE: FINAL CAMERA AND RADAR DETECTOR PLACEMENT TO BE DETERMINED IN FIELD BY PENNDOT/MANUFACTURER REPRESENTATIVE.

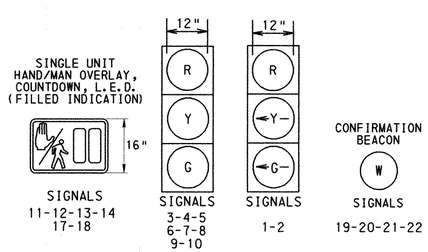
NOTE: (1) AND (2) ARE RADAR DETECTORS.

NOTE: (3),(4),(5) AND (6) ARE VIDEO CAMERAS.



PAVEMENT MARKING NOTES:
ALL CROSSWALKS W/12"
ALL STOP BARS W/24"

SIGNALS



SIGNAL ASSEMBLY NOTES

1. ALL VEHICULAR SIGNALS EQUIPPED WITH TUNNEL VISORS.
2. VEHICULAR SIGNALS 1,2,3,4,5,6 EQUIPPED WITH METALLIC BACKPLATES.
3. MAX./MIN. MOUNTING HEIGHT OF OVERHEAD SIGNALS - 18'/17'
4. MAX./MIN. MOUNTING HEIGHT OF PEDESTRIAN SIGNALS - 15'/10'
5. ALL PEDESTRIAN SIGNALS L.E.D. MAN/HAND.
6. ALL VEHICULAR INDICATIONS LED TYPE.
7. FINAL PLACEMENT OF ALL SIGNAL HEADS WILL BE DETERMINED BY A REPRESENTATIVE OF THE DISTRICT TRAFFIC UNIT PRIOR TO SIGNAL TURN-ON.
8. ALL PEDESTRIAN PUSH BUTTONS ADA COMPLIANT.
9. LASH SIGNAL WIRE TO SPAN. NO CABLE TIES PERMITTED.
10. PROVIDE AIRCRAFT TYPE STRANDED CABLE FOR MOUNTING ALL SIGNAL AND SIGN BRACKET ASSEMBLIES TO MAST ARMS.

LEGEND

- MAST ARM
- STRAIN POLE WITH LUMINAIRE ARM
- PEDESTAL
- VEHICULAR SIGNAL HEAD
- PEDESTRIAN SIGNAL HEAD
- POST MOUNTED SIGN
- STRUCTURE MOUNTED SIGN
- VEHICLE DETECTION ZONE
- PEDESTRIAN PUSH BUTTON W/SIGN
- JUNCTION BOX
- C/2" - CONDUIT/SIZE
- CONTROLLER ASSEMBLY
- W/4" - SOLID WHITE LINE/WIDTH
- BW/4" - BROKEN WHITE LINE/WIDTH
- Y/4" - SOLID YELLOW LINE/WIDTH
- BY/4" - BROKEN YELLOW LINE/WIDTH
- DY/4" - DOUBLE SOLID YELLOW LINE/WIDTH
- VIDEO CAMERA/RADAR DETECTOR
- PREEMPTION CONFIRMATION BEACON
- PREEMPTION DETECTOR

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER MARK C. SZEWCOW 050343-E

County: ALLEGHENY

Municipality: TOWNSHIP OF WILKINS

Intersection: WILLIAM PENN HWY (SR 2048), PENN CENTER BLVD. AND RETAIL DRIVE

Approved and Accepted: Rebecca Bradley 01/25/12
Municipal Representative Date

Recommended: 2/15/12
District Traffic Engineer Date

FVC Scale 0 25 50 75

1-127-04

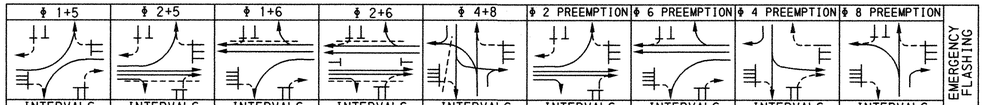
PLOTTED: 1/17/2012

FILE NAME: P:\nalac00\08069\Signal\William Penn Hwy at Center-West pa.dgn

PERMIT NO. 1-127-04 SHEET 3 OF 3
DATE ISSUED 5-25-66 DATE REVISED 2-15-12

PHASING DIAGRAM

CONTROLLER TYPE 170 WITH MANUAL CORD



	φ 1+5	φ 2+5	φ 1+6	φ 2+6	φ 4+8	φ 2 PREEMPTION	φ 6 PREEMPTION	φ 4 PREEMPTION	φ 8 PREEMPTION	EMERGENCY FLASHING
	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	
SIGNALS	1 2 3	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	
1	←G-A①R①	←G-←G-A⑤R⑥	R R R R	R R R R	R R R R	SELECTIVE CLEARANCE ←G-A R R	SELECTIVE CLEARANCE R R R	SELECTIVE CLEARANCE R R R	SELECTIVE CLEARANCE R R R	OFF
2	←G-A②R②	R R R R	←G-←G-A⑥R⑤	R R R R	R R R R		←G-A R R	R R R	R R R	OFF
3-4	R R R	G G Y③R③	R R R R	G G Y④R④	R R R R		G Y R	R R R	R R R	Y
5-6	R R R	R R R R	G G Y③R③	G G Y⑤R⑤	R R R R		R R R	R R R	R R R	Y
7-8	R R R	R R R R	R R R R	R R R R	G G Y R		R R R	G Y R	G Y R	R
9-10	R R R	R R R R	R R R R	R R R R	G G Y R		R R R	R R R	R R R	R
11-12 *	DW DW DW	DW DW DW DW	DW DW DW DW	DW DW DW DW	W FD DW DW		DW DW DW	DW DW DW	DW DW DW	OFF
13-14 *	DW DW DW	DW DW DW DW	W FD DW DW	W FD DW DW	DW DW DW DW		DW DW DW	DW DW DW	DW DW DW	OFF
17-18 *	DW DW DW	W FD DW DW	DW DW DW DW	W FD DW DW	DW DW DW DW		DW DW DW	DW DW DW	DW DW DW	OFF
19	OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF FO ON OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF
20	OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF FO ON OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF
21	OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF FO ON OFF	OFF OFF OFF OFF	OFF
22	OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF FO ON OFF	OFF
FIXED	4.2 2.1	4.2 2.1	4.2 2.1	4.2 2.1	3 2.9	** 4.2 2.1	** 4.2 2.1	** 3 2.9	** 3 2.9	
MINIMUM	5	5	5	25	5	10	10	10	10	
SEC./ACT.				2.1						
PASSAGE	3	3	3	6	3					
MAX. INITIAL				25						
BEFORE RED.				25						
TO REDUCE				10						
MIN. GAP				5						
MAX. I	30	20	30	70	35	**	**	**	**	
MAX. II	30	20	30	70	35	**	**	**	**	
PEDESTRIAN *		⑦	⑦	13 17	16 23					
MEMORY	L	L	L	MN	L					

*UPON PEDESTRIAN ACTUATION, OTHERWISE "DON'T WALK" AT ALL TIMES
**DURATION OF EMERGENCY VEHICLE ACTIVATION OR A MAXIMUM 60 SECONDS

MAX I: ALL OTHER TIMES
MAX II: BETWEEN 7:00 AM AND 9:00 PM

MEMORY INCLUDES
MN - MINIMUM RECALL
MX - MAXIMUM RECALL
PR - PEDESTRIAN RECALL
L - LOCKING
NL - NON LOCKING

PHASING NOTES

1. ←G- IF FOLLOWED BY I 2+5φ
2. ←G- IF FOLLOWED BY I 1+6φ
3. G IF FOLLOWED BY I 2+6φ
4. G IF FOLLOWED BY I 2+5φ
5. G IF FOLLOWED BY I 1+6φ
6. ←G- IF FOLLOWED BY I 1+5φ
7. TIMINGS AS SHOWN IN I 2+6φ INTERVALS 1 & 2 MAY TIME OUT IN THIS PHASE OR BE COMPLETED IN φ 2+6.

INTERCONNECT NOTE:

CONTROLLER TO BE INTERCONNECTED WITH ADJACENT SIGNAL CONTROLLERS ALONG WILLIAM PENN HWY (SR 2048) TO PROVIDE A PROGRESSIVE MOVEMENT OF TRAFFIC ALONG WILLIAM PENN HWY. SUPERVISED BY A MASTER CONTROLLER AT KINGSTON DR AND WILLIAM PENN HIGHWAY.

INTERCONNECT WITH THE FOLLOWING INTERSECTIONS ALONG S.R. 2048:
1. HOME DEPOT/CIRCUIT CITY DRIVEWAY
2. KINGSTON DRIVE
3. WILKINS G.P. ENTRANCE ROAD
4. RODI ROAD

SIGNS

PLAN SYMBOL	SERIES DESIGNATION	SIZE W x H	DESCRIPTION	QUANTITY
A	R10-10L	30"X36"	LEFT TURN SIGNAL	2
B	R9-3A	24"X24"	NO PEDESTRIAN CROSSING	2
C	R3-8A(LS-R)	30"X30"	LANE USE CONTROL	4
D	R3-5R	30"X36"	THROUGH RIGHT	1
E	R3-5L	30"X36"	LEFT TURN	2
F	R3-5S	30"X36"	STRAIGHT THROUGH	3
G	R3-5R	30"X36"	RIGHT TURN	1
H	R10-3ER	9"X14"	PUSH BUTTON FOR WALK SIGNAL WITH COUNTDOWN TIMER →	2
J	R10-3EL	9"X14"	PUSH BUTTON FOR WALK SIGNAL WITH COUNTDOWN TIMER ←	4
* K	D3-4	90"X16"	Wm Penn Hwy	2
* L	D3-5	90"X28"	Penn Center Blvd →	1
* M	D3-5	90"X28"	Penn Center ← Blvd	1
N	R4-7	24"X30"	KEEP RIGHT SIGN	2
O	OM1-3	18"X18"	OBJECT MARKER	2
P	R9-3BR	18"X12"	USE CROSSWALK →	1
Q	R1-2	36"X36"	YIELD	2
R	R1-5L	18"X18"	YIELD HERE TO PEDESTRIAN	2
S	R9-3BL	18"X12"	USE CROSSWALK ←	1
T	R10-12	30"X36"	LEFT TURN YIELD ON GREEN	2

* WHITE LEGEND AND BORDER ON GREEN BACKGROUND.
STREET SIGNS LOCATED ON THE TRAFFIC SIGNAL POLES.

COORDINATION PLAN

EVENT	TIME	PLAN	OFT	DAY OF WEEK S 1	M 2	T 3	W 4	T 5	F 6	S 7	CYCLE	FORCE OFFS #1	#2	#3	#4	#5	#6	#7	#8
0																			
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
A																			
B																			
C																			
D																			
E																			
F																			

PLAN...9(DIAL)
E...(FREE)
F...(FLASH)
OFFSET(OFT)A...C

EMERGENCY PREEMPTION NOTES:

EMERGENCY VEHICLE PREEMPTION MAY OCCUR DURING ANY INTERVAL OF THE NORMAL CONTROLLER OPERATION. DEPENDING ON THE DIRECTION OF TRAVEL OF THE EMERGENCY VEHICLE, ONE OF THE FOLLOWING SHALL BE DISPLAYED: EMERGENCY PREEMPT PHASE 2, 6, 4 OR 8. THE SYSTEM SHALL PROVIDE SERVICE ON FIRST-COME, FIRST SERVE BASIS. ONCE THE FIRST PRIORITY VEHICLE CALLS THE SYSTEM, IT SHALL PREVENT OTHER PREEMPTIVE VEHICLES FROM ENTERING CALLS UNTIL THE FIRST EMERGENCY VEHICLE RELEASES CONTROL AND CLEARS THE INTERSECTION. UPON ACTIVATION BY AN EMERGENCY VEHICLE:

1.) IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF A NON-PREEMPTIVE VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TERMINATE THE INTERVAL IMMEDIATELY AND PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

2.) IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF THE PREEMPTION PHASE, AND UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL REMAIN IN THAT INTERVAL.

3.) UPON ACTIVATION BY AN EMERGENCY VEHICLE ANY WALK INDICATION SHALL TERMINATE IMMEDIATELY AND PROCEED NORMALY THROUGH THE FLASHING DON'T WALK AND ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION.

4.) ANY FLASHING DON'T WALK INDICATION SHALL TIMEOUT NORMALLY, FOLLOWED BY THE ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

5.) IF THE CONTROLLER OPERATION IS IN THE YELLOW, YELLOW ARROW OR ALL RED INTERVAL OF ANY VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TIME OUT THOSE INTERVALS NORMALLY AND PROCEED TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

6.) THE PREEMPTION PHASE GREEN INTERVAL SHALL BE 10 SECONDS AND THEN EXTEND FOR THE LENGTH OF THE PREEMPTION ACTUATION OR A MAXIMUM OF 60 SECONDS.

7.) UPON TERMINATION OF THE PREEMPTION PHASE THE CONTROLLER SHALL PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS TO NORMAL TIME OF DAY AND "PHASE NEXT" OPERATION.

8.) IF PREEMPTION OCCURS DURING CONFLICT/TIME CLOCK FLASH, THE TRAFFIC SIGNAL SHALL CONTINUE FLASHING.

9.) PREEMPT TO COORDINATION: USED WHEN EMERGENCY PREEMPTION IS ACTIVATED DURING COORDINATION. OPERATION TO ALLOW THE NEXT PERMISSIVE PHASE IN THE COORDINATION CYCLE TO BE SERVICED FOLLOWING PREEMPTION.

WHEN A CALL IS RECEIVED THE FAIL SAFE INDICATION SHALL BE ACTIVATED FOLLOWING THE SELECTIVE CLEARANCE INTERVALS AND FLASH AT A RATE OF NOT LESS THAN 50 NOR MORE THAN 60 TIMES PER MINUTE.

GENERAL NOTES

INSTALL, OPERATE AND MAINTAIN THIS TRAFFIC SIGNAL IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

THE PERMITTEE INSTALLS AND MAINTAINS ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING WHICH ARE CONSIDERED PART OF THE PERMIT, UNLESS OTHERWISE INDICATED. THE DEPARTMENT MAINTAINS THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS.

INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR THE EDGE OF THE SHOULDER. ALSO, INSTALL SUPPORT POLES FOR OVERHEAD SIGNALS WITH A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

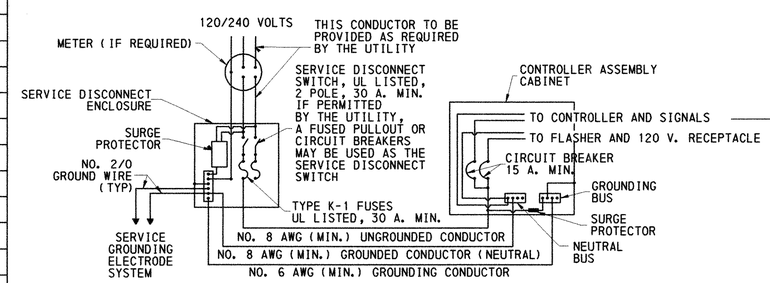
INSTALL SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY WITH THE BOTTOMS NOT LESS THAN 17 FEET NOR MORE THAN 18 FEET ABOVE THE ROADWAY.

INSTALL POST MOUNTED SIGNAL HEADS WITH BOTTOMS NOT LESS THAN 10 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

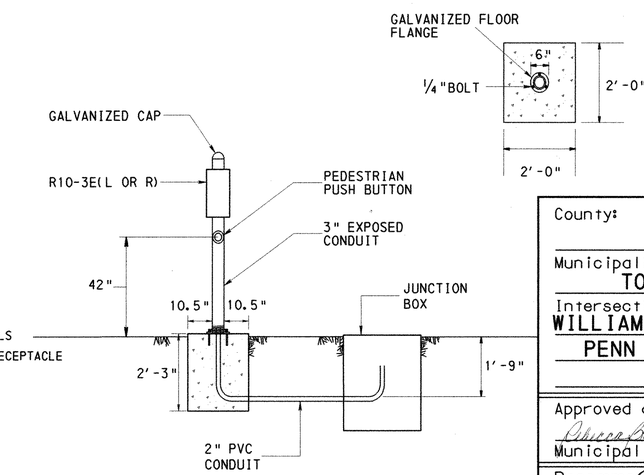
INSTALL SIGNAL HEADS WITH A MINIMUM HORIZONTAL DISTANCE OF 8 FEET BETWEEN THE HEADS AS MEASURED AT RIGHT ANGLES TO THE APPROACH.

IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE MUST OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.



ELECTRICAL DETAIL
N.T.S.



POLE 7, 8 & 9 DETAIL
N.T.S.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
MARK C. SZEWCOW
050343-E

County: ALLEGHENY
Municipality: TOWNSHIP OF WILKINS
Intersection: WILLIAM PENN HWY (SR 2048), PENN CENTER BLVD. AND RETAIL DRIVE

Approved and Accepted: Municipal Representative — 01/25/12 Date
Recommended: District Traffic Engineer — 2/15/12 Date

FRC Scale 0 25 50 75

1-127-04

PLOTTED: 1/17/2012

FILE NAME: P:\naiac00\08069\Signal\William Penn Hwy at Center-West pa.dgn

PERMIT NO. 1-127-06 SHEET 2 OF 3

DATE ISSUED 05/09/1957 DATE REVISED 06/29/2010

SIGNS

SIGN	STANDARD	DESCRIPTION	SIZE W X H	QTY.
A	R10-10L	LEFT TURN SIGNAL	30"X36"	2
B	R10-10R	RIGHT TURN SIGNAL	30"X36"	1
C	R3-5L	LEFT TURN ONLY	30"X36"	2
D	R3-5S	STRAIGHT THROUGH ONLY	30"X36"	3
E	R3-5R	RIGHT TURN ONLY	30"X36"	2
F	R3-6SR	OPTIONAL RIGHT TURN SIGN	30"X36"	1
G	R3-6SL	OPTIONAL LEFT TURN SIGN	30"X36"	1
H	R1-2	YIELD	36"X36"	1
J	R10-4BR	EDUCATIONAL PUSH BUTTON WALK SIGNAL	9"X12"	4
K	R10-4BL	EDUCATIONAL PUSH BUTTON WALK SIGNAL	9"X12"	4
L	D3-4*	Wm. Penn Hwy.	90"X16"	2
M	D3-4*	Kingston Dr →	96"X16"	1
N	D3-4*	← Kingston Dr	96"X16"	1
P	R3-9-3	BEGIN	24"X12"	2
R	R2-10	END	24"X12"	2
S	R3-9B	CENTER LANE LEFT TURN ONLY	24"X36"	4
-		LEFT ARROW (WHITE MKG.)		4
-		RIGHT ARROW (WHITE MKG.)		2
-		ONLY (WHITE LEGEND)		6
-		STOP BAR (WHITE MKG.)	24"	122 LF
-		CROSSWALK (WHITE MKG.)	8"	555 LF

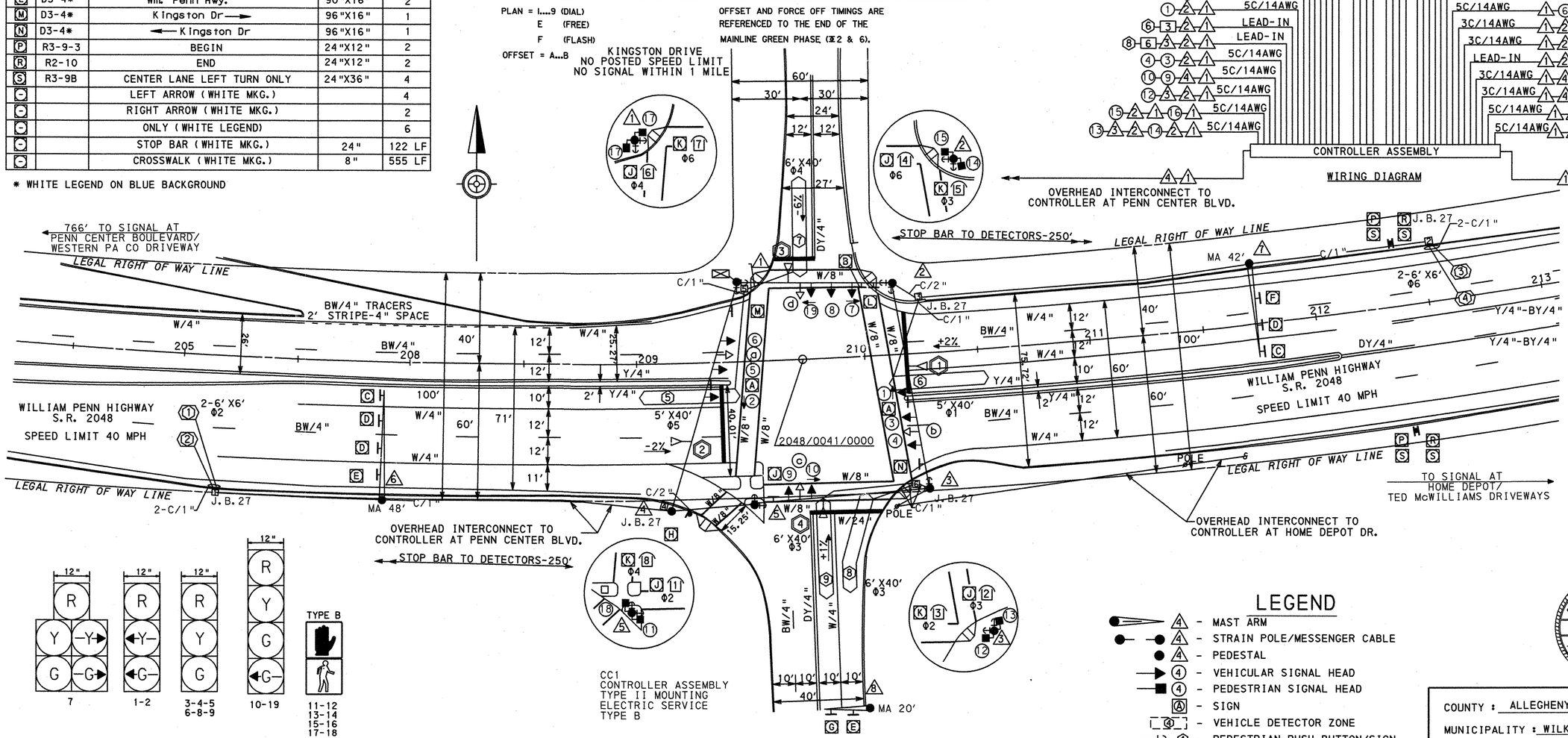
* WHITE LEGEND ON BLUE BACKGROUND

COORDINATION PLAN

EVENT	TIME	PLAN	OFFSET	DAY OF WEEK 1	2	3	4	5	6	7	CYCLE	FORCE OFF (SECONDS) Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
0	2400	F	-	X	X	X	X	X	X	X									
1	0600	E	A=1	X	X	X	X	X	X	X	90	49	0	13	36	62	0		
2	0700	1	A=138		X	X	X	X	X	X	150	66	0	22	47	79	0		
3	0900	3	A=116		X	X	X	X	X	X	120	52	0	16	38	65	0		
4	1500	2	A		X	X	X	X	X	X									
5	1800	E	A	X	X	X	X	X	X	X									
6	2000	E	A		X	X	X	X	X	X									
7																			
8																			
9																			
A																			
B																			
C																			
D																			
E																			
F																			

PLAN = 1...9 (DIAL)
E (FREE)
F (FLASH)
OFFSET = A...B

OFFSET AND FORCE OFF TIMINGS ARE REFERENCED TO THE END OF THE MAINLINE GREEN PHASE (Ø2 & 6).



On Signals 1,2,3, 4,5, 6,9 & 10 install 2" Retro Reflective border yellow border onto existing back plates.

SIGNAL ASSEMBLY NOTES

1. ALL VEHICULAR SIGNALS EQUIPPED WITH TUNNEL VISORS.
2. VEHICULAR SIGNALS 1-2-3-4-5-6-9-10 EQUIPPED WITH BACKPLATES.
3. MINIMUM MOUNTING HEIGHT OF OVERHEAD SIGNALS 17'; MAXIMUM 18'.
4. MINIMUM MOUNTING HEIGHT OF POST MOUNTED SIGNALS 10'; MAXIMUM 15'.
5. ALL VEHICULAR AND PEDESTRIAN INDICATIONS L.E.D.
6. FINAL SIGNAL HEAD PLACEMENT WILL BE DETERMINED BY A REPRESENTATIVE OF THE DISTRICT TRAFFIC UNIT PRIOR TO SIGNAL BEING TURNED ON.

LEGEND

- MAST ARM
- STRAIN POLE/MESSENGER CABLE
- PEDESTAL
- VEHICULAR SIGNAL HEAD
- PEDESTRIAN SIGNAL HEAD
- SIGN
- VEHICLE DETECTOR ZONE
- PEDESTRIAN PUSH BUTTON/SIGN
- CONTROLLER ASSEMBLY
- JUNCTION BOX
- PEDESTRIAN PUSH BUTTON
- C/4" — CONDUIT/SIZE
- W/4" - SOLID WHITE LINE/WIDTH
- BW/4" - BROKEN WHITE LINE/WIDTH
- Y/4" - SOLID YELLOW LINE/WIDTH
- DY/4" - DOUBLE SOLID YELLOW LINE/WIDTH
- SPREAD SPECTRUM ANTENNA
- CONFIRMATION LIGHT
- EMERGENCY VEHICLE PRE-EMPTION DETECTOR

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
TODD MICHAEL KRAVITS
ENGINEER
PE-039886-E

COUNTY : ALLEGHENY

MUNICIPALITY : WILKINS TOWNSHIP

INTERSECTION : WILLIAM PENN HIGHWAY (S.R. 2048) AND KINGSTON DRIVE

ACCEPTED AND APPROVED :
MUNICIPAL REPRESENTATIVE — DATE June 17, 2010

RECOMMENDED
DISTRICT TRAFFIC ENGINEER — DATE 6/29/10

SCALE : 0 25 50 75

1-127-06

27-FEB-2009 09:52

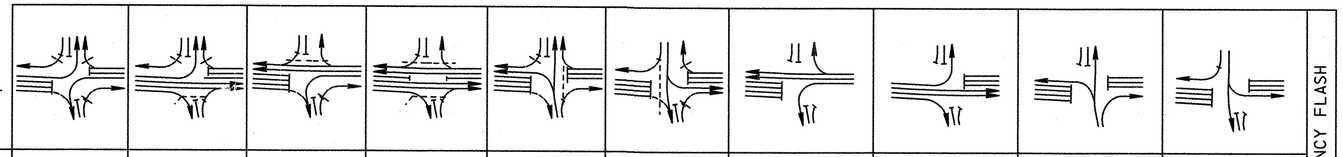
OPERATOR:
FILE NAME: L:\tr1\signals\SR 2048 Wm Penn Hgwypermit.dgn

PERMIT NO. 1-127-06 SHEET 3 OF 3

DATE ISSUED 05/09/1957 DATE REVISED 06/29/2010

PHASING DIAGRAM

TYPE 170 WITH MANUAL CORD



PHASE	1+5				2+5				1+6				2+6				3				4				PREEMPT 1+6				PREEMPT 2+5				PREEMPT 3				PREEMPT 4				EMERGENCY FLASH
	INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				
SIGNALS	1	2	3		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1	G	Y①	R①		G	G	Y②	R②	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R	R		G	Y	R		R	R	R		R	R	R	OFF
2	G	Y②	R②		R	R	R	R	G	G	Y②	R②	R	R	R	R	R	R	R	R	R	R	R	R		G	Y	R		R	R	R		R	R	R		R	R	R	OFF
3-4	R	R	R		G	G	Y④	R④	R	R	R	R	G	G	Y⑤	R⑤	R	R	R	R	R	R	R	R		R	R	R		G	Y	R		R	R	R		R	R	R	Y
5-6	R	R	R		R	R	R	R	G	G	Y④	R④	G	G	Y⑥	R⑥	R	R	R	R	R	R	R	R		G	Y	R		R	R	R		R	R	R		R	R	R	Y
7	G	Y⑦	R⑦		R	R	R	R	G	G	Y⑧	R⑧	R	R	R	R	G	G	Y⑨	R⑨	R	R	R	R		R	R	R		R	R	R		G	Y	R		R	R	R	R
8	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	R	R	R	R		R	R	R		R	R	R		G	Y	R		R	R	R	R
9	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R		R	R	R		R	R	R		R	R	R		G	Y	R	R
10	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R		R	R	R		R	R	R		R	R	R		G	Y	R	R
19	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	R	R	R	R		R	R	R		R	R	R		G	Y	R		R	R	R	R
11-12	DW	DW	DW		W	FD	DW	DW	DW	DW	DW	DW	W	FD	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
13-14	DW	DW	DW		DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FD	DW	DW	DW	DW	DW	DW		FD	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
15-16	DW	DW	DW		DW	DW	DW	DW	W	FD	DW	DW	W	FD	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
17-18	DW	DW	DW		DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FD	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
a	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF	OFF
b	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF	OFF
c	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF	OFF
d	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF	OFF
FIXED		3	2.5				4.2	2			3.8	2			4.2	2			3	2.8			3.	32.9		**	3.8	2		**	4.2	2		**	3	2.8		**	3.	32.9	
MIN. INIT.	5				5				5				10				5				5					10				10				10				10			
SEC. /ACT													2.1																												
MAX. INIT.													10				2.4				2.3																				
PASSAGE	2				2				2				28.9																												
TO REDUCE													10																												
BEFORE RED.													15																												
MIN. GAP													5.6																												
MAX I	25				25				25				50				35				35																				
MAX II																																									
PEDESTRIAN*					③				③				12	15			15	19			15	19																			
MEMORY	L				L				L				MN				L				NL																				

SELECTIVE CLEARANCE

* UPON PEDESTRIAN ACTUATION ONLY, OTHERWISE DON'T WALK AT ALL TIMES

EMERGENCY VEHICLE PREEMPTION MAY OCCUR DURING ANY INTERVAL OF THE NORMAL CONTROLLER OPERATION. DEPENDING ON THE DIRECTION OF TRAVEL OF THE EMERGENCY VEHICLE, ONE OF THE FOLLOWING SHALL BE DISPLAYED: EMERGENCY PREEMPT PHASE 1+6, 2+5, 3 OR 4. THE SYSTEM SHALL PROVIDE SERVICE ON FIRST-COME FIRST SERVE BASIS. ONCE THE FIRST PRIORITY VEHICLE CALLS THE SYSTEM, IT SHALL PREVENT OTHER PREEMPTIVE VEHICLES FROM ENTERING CALLS UNTIL THE FIRST EMERGENCY VEHICLE RELEASES CONTROL AND CLEARS THE INTERSECTION.

UPON ACTIVATION BY AN EMERGENCY VEHICLE:

1. IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF A NON-PREEMPTIVE VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TERMINATE THE INTERVAL IMMEDIATELY AND PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

2. IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF THE PREEMPTION PHASE, AND UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL REMAIN IN THAT INTERVAL.

3. UPON ACTIVATION BY AN EMERGENCY VEHICLE, ANY WALK INDICATION SHALL TERMINATE IMMEDIATELY AND PROCEED NORMALLY THROUGH THE FLASHING DON'T WALK AND ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION.

4. ANY FLASHING DON'T WALK INDICATION SHALL TIMEOUT NORMALLY, FOLLOWED BY THE ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

5. IF THE CONTROLLER OPERATION IS IN THE YELLOW, YELLOW ARROW OR ALL RED INTERVAL OF ANY VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TIME OUT THOSE INTERVALS NORMALLY AND PROCEED TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

6. THE PREEMPTION PHASE GREEN INTERVAL SHALL BE 10 SECONDS AND THEN EXTEND FOR THE LENGTH OF THE PREEMPTION ACTUATION OR A MAXIMUM OF 60 SECONDS.

7. UPON TERMINATION OF THE PREEMPTION PHASE THE CONTROLLER SHALL PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS TO NORMAL TIME OF DAY AND "PHASE NEXT" OPERATION.

8. IF PREEMPTION OCCURS DURING CONFLICT/TIME CLOCK FLASH, THE TRAFFIC SIGNAL SHALL CONTINUE FLASHING.

9. PREEMPT TO COORDINATION: USED WHEN EMERGENCY PREEMPTION IS ACTIVATED DURING COORDINATION. OPERATION TO ALLOW THE NEXT PERMISSIVE PHASE IN THE COORDINATION CYCLE TO BE SERVICED FOLLOWING PREEMPTION.

WHEN A CALL IS RECEIVED THE FAIL SAFE INDICATION SHALL BE ACTIVATED FOLLOWING THE SELECTIVE CLEARANCE INTERVALS AND FLASH AT A RATE OF NO LESS THAN 50 NOR MORE THAN 60 TIMES PER MINUTE.

MEMORY NOTES

MN - MINIMUM RECALL
MX - MAXIMUM RECALL
PR - PEDESTRIAN RECALL
L - LOCKING
NL - NON-LOCKING
RW - REST WALK

PHASING NOTES

1. G IF FOLLOWED BY Φ2+5
2. G IF FOLLOWED BY Φ1+5
3. G IF FOLLOWED BY Φ1+6
4. G IF FOLLOWED BY Φ2+6
5. G IF FOLLOWED BY Φ2+5
6. G IF FOLLOWED BY Φ1+5
7. G IF FOLLOWED BY Φ1+6 OR Φ3
8. G IF FOLLOWED BY Φ1+5 OR Φ3
9. Y G IF FOLLOWED BY Φ1+5 OR Φ1+6
10. G IF FOLLOWED BY Φ1+5 OR Φ1+6
11. TIMING WILL BE AS SHOWN IN PHASE 2+6. INTERVALS 1 & 2 MAY TIME OUT IN THIS PHASE OR MAY BE COMPLETED IN PHASE 2+6.

CONTROLLER INTERCONNECTED WITH CONTROLLERS ALONG WILLIAM PENN HIGHWAY (S.R. 2048) TO PROVIDE A PRGRESSIVE MOVEMENT OF TRAFFIC ALONG WILLIAM PENN HIGHWAY. THE MASTER CONTROLLER IS LOCATED AT THIS INTERSECTION

GENERAL NOTES

INSTALL, OPERATE AND MAINTAIN THIS TRAFFIC SIGNAL IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

THE PERMITTEE INSTALLS AND MAINTAINS ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING WHICH ARE CONSIDERED PART OF THE PERMIT, UNLESS OTHERWISE INDICATED. THE DEPARTMENT MAINTAINS THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS.

INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. ALSO, INSTALL SUPPORT POLES FOR OVERHEAD SIGNALS WITH A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

INSTALL SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY WITH THE BOTTOMS NOT LESS THAN 17 FEET NOR MORE THAN 18 FEET ABOVE THE ROADWAY.

INSTALL POST MOUNTED SIGNAL HEADS WITH BOTTOMS NOT LESS THAN 10 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

INSTALL SIGNAL HEADS WITH A MINIMUM HORIZONTAL DISTANCE OF 8 FEET BETWEEN THE HEADS AS MEASURED AT RIGHT ANGLES TO THE APPROACH.

IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE MUST OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
TODD MICHAEL KRAVITS
ENGINEER
PE-039886-E

COUNTY : ALLEGHENY

MUNICIPALITY : WILKINS TOWNSHIP

INTERSECTION : WILLIAM PENN HIGHWAY (S.R. 2048) AND KINGSTON DRIVE

ACCEPTED AND APPROVED
MUNICIPAL REPRESENTATIVE — DATE June 17, 2010

RECOMMENDED:
DISTRICT TRAFFIC ENGINEER — DATE 6/24/10

SCALE : 0 25 50 75

1-127-06

27-FEB-2009 09:52

OPERATOR:
FILE NAME: L:\trl\signals\SR 2048 Wm Penn Hgwypermit.dgn

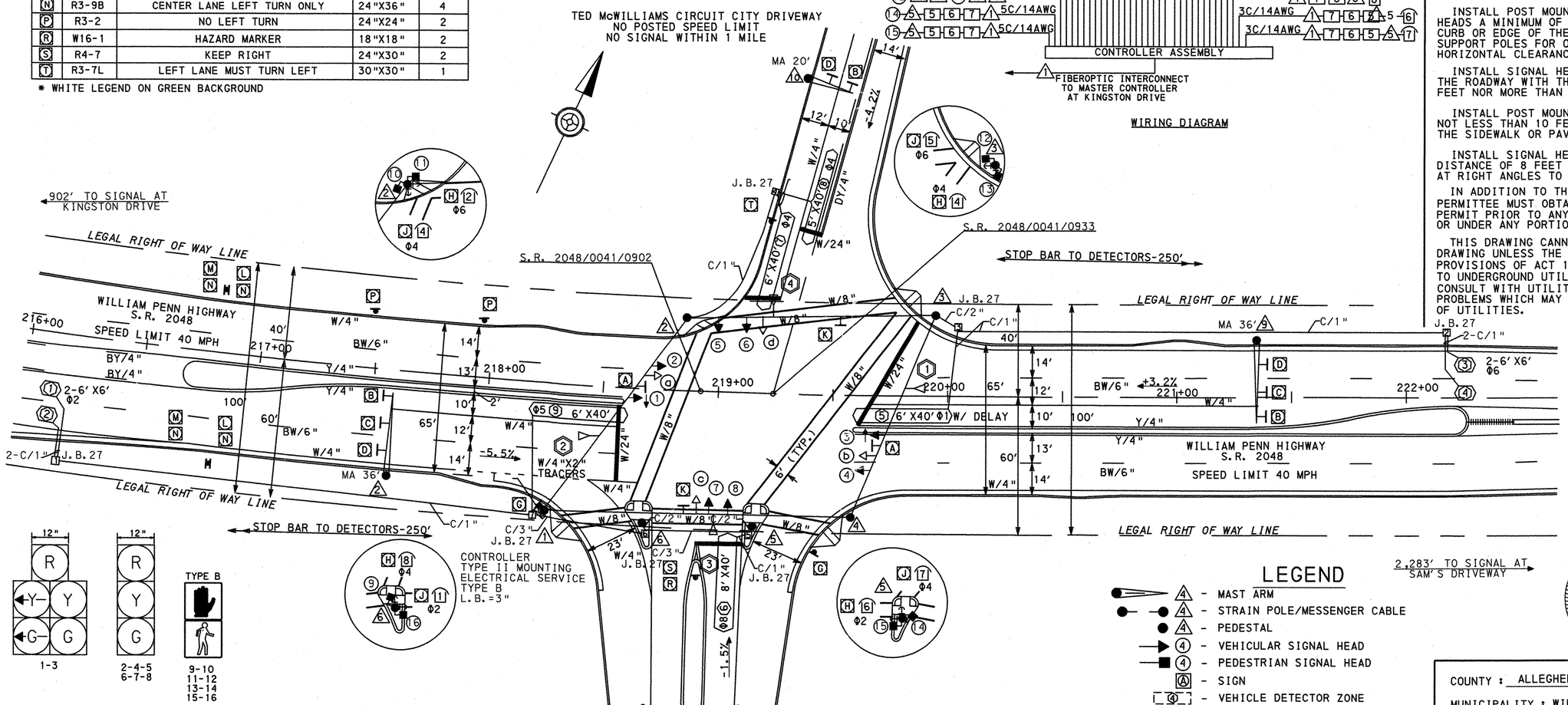
PERMIT NO. 1-127-02 SHEET 2 OF 3

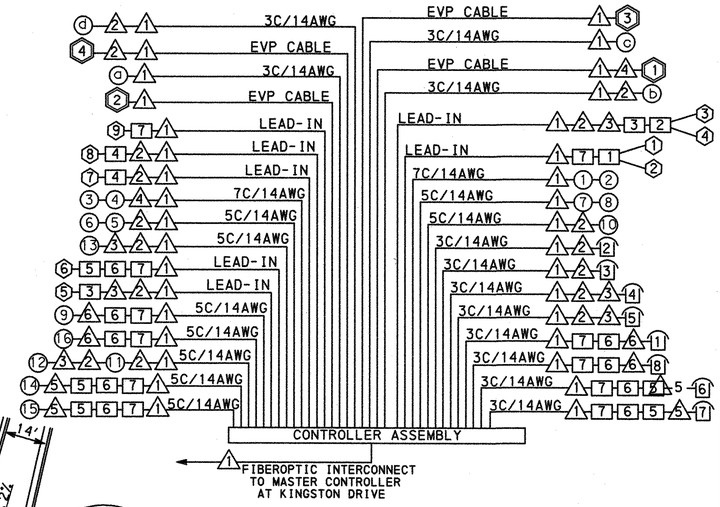
DATE ISSUED 11/08/1995 DATE REVISED 6/29/2010

SIGNS

SIGN	STANDARD	DESCRIPTION	SIZE W X H	QTY.
A	R10-12	LEFT TURN YIELD ON GREEN ●	30"X36"	2
B	R3-5L	LEFT TURN ONLY	30"X36"	3
C	R3-5S	STRAIGHT THROUGH ONLY	30"X36"	2
D	R3-6SR	OPTIONAL RIGHT TURN SIGN	30"X36"	3
E	R3-6SL	OPTIONAL LEFT TURN SIGN	30"X36"	1
F	R3-5R	RIGHT TURN ONLY	30"X36"	1
G	R1-2	YIELD	36"X36"	2
H	R10-4BL	EDUCATIONAL PUSH BUTTON WALK SIGNAL	9"X12"	4
J	R10-4BR	EDUCATIONAL PUSH BUTTON WALK SIGNAL	9"X12"	4
K	D3-4*	WM PENN HWY	84"X16"	2
L	R3-9-3	BEGIN	24"X12"	2
M	R2-10	END	24"X12"	2
N	R3-9B	CENTER LANE LEFT TURN ONLY	24"X36"	4
P	R3-2	NO LEFT TURN	24"X24"	2
R	W16-1	HAZARD MARKER	18"X18"	2
S	R4-7	KEEP RIGHT	24"X30"	2
T	R3-7L	LEFT LANE MUST TURN LEFT	30"X30"	1

* WHITE LEGEND ON GREEN BACKGROUND





WIRING DIAGRAM

GENERAL NOTES

INSTALL, OPERATE AND MAINTAIN THIS TRAFFIC SIGNAL IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

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INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. ALSO, INSTALL SUPPORT POLES FOR OVERHEAD SIGNALS WITH A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

INSTALL SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY WITH THE BOTTOMS NOT LESS THAN 17 FEET NOR MORE THAN 18 FEET ABOVE THE ROADWAY.

INSTALL POST MOUNTED SIGNAL HEADS WITH BOTTOMS NOT LESS THAN 10 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

INSTALL SIGNAL HEADS WITH A MINIMUM HORIZONTAL DISTANCE OF 8 FEET BETWEEN THE HEADS AS MEASURED AT RIGHT ANGLES TO THE APPROACH.

IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE MUST OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

SIGNAL ASSEMBLY NOTES

1. ALL VEHICULAR SIGNALS EQUIPPED WITH TUNNEL VISORS.
2. VEHICULAR SIGNALS 1-2-3-4 EQUIPPED WITH BACKPLATES.
3. MINIMUM MOUNTING HEIGHT OF OVERHEAD SIGNALS 17'; MAXIMUM 18'.
4. MINIMUM MOUNTING HEIGHT OF POST MOUNTED SIGNALS 10'; MAXIMUM 15'.
5. ALL VEHICULAR AND PEDESTRIAN INDICATIONS L.E.D.
6. FINAL SIGNAL HEAD PLACEMENT WILL BE DETERMINED BY A REPRESENTATIVE OF THE DISTRICT TRAFFIC UNIT PRIOR TO SIGNAL BEING TURNED ON.

CONTSTRUCTION NOTES

1. ALL JUNCTION BOXES TO BE TYPE JB-27 (STEEL).
2. SIGNAL POLES 5 & 6 TO BE OF BREAKAWAY DESIGN.
3. LOOP DETECTORS 5, 7, & 8 TO HAVE AN 8 SECOND DELAY
4. INSTALL CURB RAMPS PER RC-67, DATED MARCH 24, 1994.

LEGEND

- MAST ARM
- STRAIN POLE/MESSENGER CABLE
- PEDESTAL
- VEHICULAR SIGNAL HEAD
- PEDESTRIAN SIGNAL HEAD
- SIGN
- VEHICLE DETECTOR ZONE
- PEDESTRIAN PUSH BUTTON/SIGN
- CONTROLLER ASSEMBLY
- JUNCTION BOX
- PEDESTRIAN PUSH BUTTON
- C/4" - CONDUIT/SIZE
- W/4" - SOLID WHITE LINE/WIDTH
- BW/4" - BROKEN WHITE LINE/WIDTH
- Y/4" - SOLID YELLOW LINE/WIDTH
- DY/4" - DOUBLE SOLID YELLOW LINE/WIDTH
- SPREAD SPECTRUM ANTENNA
- CONFIRMATION LIGHT
- EMERGENCY VEHICLE PRE-EMPTION DETECTOR

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL TODD MICHAEL KRAVITS ENGINEER PE-039886-E

COUNTY : ALLEGHENY

MUNICIPALITY : WILKINS TOWNSHIP

INTERSECTION : WILLIAM PENN HIGHWAY (S.R. 2048) & HOME DEPOT/TED McWILLIAMS CIRCUIT CITY DRIVEWAYS

ACCEPTED AND APPROVED : June 17, 2010
MUNICIPAL REPRESENTATIVE DATE

RECOMMENDED : 6/29/10
DISTRICT TRAFFIC ENGINEER DATE

SCALE : 0 25 50 75

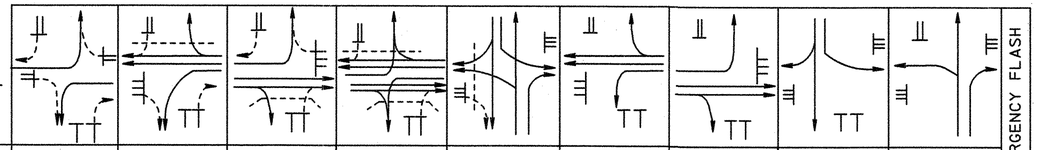
1-127-02

27-FEB-2009 09:53

OPERATOR:
FILE NAME: L:\tr1\signals\SR 2048 Wm Penn Hgwypermit.dgn

S.S.A. W/V.D. 2-8

TYPE 170 WITH MANUAL CORD



PHASE	1+5			1+6				2+5				2+6				4+8				PREEMPT 1+6				PREEMPT 2+5				PREEMPT 4				PREEMPT 8				EMERGENCY FLASH
	INTERVALS			INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				INTERVALS				
SIGNALS	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1	R/G	R①/Y	R①	C/G	C/G	Y②	R②	R	R	R	R	G	G	Y	R	R	R	R	R	SELECTIVE CLEARANCE	C/G	Y	R	SELECTIVE CLEARANCE	R	R	R	SELECTIVE CLEARANCE	R	R	R	SELECTIVE CLEARANCE	R	R	R	OFF
2	R	R	R	G	G	Y③	R③	R	R	R	R	G	G	Y	R	R	R	R	R		G	Y	R		R	R	R		R	R	R		R	R	R	Y
3	R/G	R⑤/Y	R⑤	R	R	R	R	C/G	C/G	Y②	R②	G	G	Y	R	R	R	R	R		C/G	Y	R		R	R	R		R	R	R		R	R	R	OFF
4	R	R	R	R	R	R	R	G	G	Y③	R③	G	G	Y	R	R	R	R	R		R	R	R		G	Y	R		R	R	R		R	R	R	Y
5-6	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R		R	R	R		R	R	R		R	R	R		G	Y	R	R
7-8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R		R	R	R		R	R	R		G	Y	R		R	R	R	R
9-10-13-14	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FD	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
11-12	DW	DW	DW	W	FD	DW	DW	DW	DW	DW	DW	W	FD	DW	DW	DW	DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
15-16	DW	DW	DW	DW	DW	DW	DW	W	FD	DW	DW	W	FD	DW	DW	DW	DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW		DW	DW	DW	OFF
a	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF	OFF
b	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF	OFF
c	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF		OFF	OFF	OFF	OFF
d	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		OFF	OFF	OFF		ON	OFF	OFF	OFF
FIXED		4	2			3.7	2			4.6	2			4.6	2			3.3	2.7		** 3.7	2			** 4.6	2			** 3.3	2.7			** 3.3	2.7		
MIN. INIT.	5			5				5				10				5					10				10				10				10			
SEC./ACT												2.1																								
MAX. INIT.												30																								
PASSAGE	2			2				2				6				2																				
TO REDUCE												10																								
BEFORE RED.												15																								
MIN. GAP												3																								
MAX I	15			15				15				60				30																				
MAX II																																				
PEDESTRIAN*				③				③				13	15			16	22																			
MEMORY	NL			NL				NL				MN				NL																				

CONTROLLER EQUIPPED WITH FIBEROPTIC INTERCONNECT WOTH ADJACENT CONTROLLERS A;ONG S.R. 2048 AT KINGSTON DRIVE AND PENN CENTER BLVD. TO PROVIDE A PROGRESSIVE MOVEMENT OF TRAFFIC, SUPERVISED BY THE MASTER CONTROLLER AT KINGSTON DRIVE AND S.R. 2048 (WM PENN HWY).

PHASING NOTES

1. R/G IF FOLLOWED BY Φ1+6
2. G/Y IF FOLLOWED BY Φ2+6
3. G IF FOLLOWED BY Φ2+6
4. G IF FOLLOWED BY Φ1+6
5. R/G IF FOLLOWED BY Φ2+5
6. G IF FOLLOWED BY Φ2+5
7. TIMING WILL BE AS SHOWN IN PHASE 2+6. IT MAY TIME OUT IN THIS PHASE OR BE BE COMPLETED IN PHASE 2+6

SIGNALS TO FLASH FROM 12:00 A.M. TO 6:00 A.M.

MEMORY NOTES

MN - MINIMUM RECALL
MX - MAXIMUM RECALL
PR - PEDESTRIAN RECALL
L - LOCKING
NL - NON-LOCKING
RW - REST WALK

EVENT	TIME	PLAN	OFFSET	DAY OF WEEK S	M	T	W	T	F	S	CYCLE	COORDINATION PLAN FORCE OFF (SECONDS) Φ1	Φ2	Φ3	Φ4	Φ5	Φ6	Φ7	Φ8
0	2400	F	-	X	X	X	X	X	X	X									
1	0600	E	A=22	X	X	X	X	X	X	X	90	38	0		12		0		
2	0700	1	A=55		X	X	X	X	X	X	120	45	0		22	58	0		
3	0900	3	A=30	X	X	X	X	X	X	X	110	41	0		20	52	0		
4	1500	2	A		X	X	X	X	X										
5	1800	E	A	X						X									
6	2000	E	A		X	X	X	X	X										
7																			
8																			
9																			
A																			
B																			
C																			
D																			
E																			
F																			

PLAN = 1....9
E (FREE)
F (FLASH)
OFFSET = A...B

OFFSET AND FORCE OFF TIMINGS ARE REFERENCED TO THE END OF THE MAINLINE GREEN PHASE (Φ2 & 6).

EMERGENCY VEHICLE PREEMPTION MAY OCCUR DURING ANY INTERVAL OF THE NORMAL CONTROLLER OPERATION. DEPENDING ON THE DIRECTION OF TRAVEL OF THE EMERGENCY VEHICLE, ONE OF THE FOLLOWING SHALL BE DISPLAYED: EMERGENCY PREEMPT PHASE 1+6, 2+5, 4 OR 8. THE SYSTEM SHALL PROVIDE SERVICE ON FIRST-COME FIRST SERVE BASIS. ONCE THE FIRST PRIORITY VEHICLE CALLS THE SYSTEM, IT SHALL PREVENT OTHER PREEMPTIVE VEHICLES FROM ENTERING CALLS UNTIL THE FIRST EMERGENCY VEHICLE RELEASES CONTROL AND CLEARS THE INTERSECTION.

UPON ACTIVATION BY AN EMERGENCY VEHICLE:

1. IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF A NON-PREEMPTIVE VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TERMINATE THE INTERVAL IMMEDIATELY AND PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

2. IF THE CONTROLLER OPERATION IS IN INTERVAL 1 OF THE PREEMPTION PHASE, AND UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL REMAIN IN THAT INTERVAL.

3. UPON ACTIVATION BY AN EMERGENCY VEHICLE, ANY WALK INDICATION SHALL TERMINATE IMMEDIATELY AND PROCEED NORMALLY THROUGH THE FLASHING DON'T WALK AND ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION.

4. ANY FLASHING DON'T WALK INDICATION SHALL TIMEOUT NORMALLY, FOLLOWED BY THE ALL RED INTERVAL BEFORE PROCEEDING TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

5. IF THE CONTROLLER OPERATION IS IN THE YELLOW, YELLOW ARROW OR ALL RED INTERVAL OF ANY VEHICLE PHASE, UPON ACTIVATION BY AN EMERGENCY VEHICLE, THE CONTROLLER SHALL TIME OUT THOSE INTERVALS NORMALLY AND PROCEED TO THE APPROPRIATE EMERGENCY VEHICLE PREEMPTION PHASE.

6. THE PREEMPTION PHASE GREEN INTERVAL SHALL BE 10 SECONDS AND THEN EXTEND FOR THE LENGTH OF THE PREEMPTION ACTUATION OR A MAXIMUM OF 60 SECONDS.

7. UPON TERMINATION OF THE PREEMPTION PHASE THE CONTROLLER SHALL PROCEED NORMALLY THROUGH THE YELLOW AND ALL RED INTERVALS TO NORMAL TIME OF DAY AND "PHASE NEXT" OPERATION.

8. IF PREEMPTION OCCURS DURING CONFLICT/TIME CLOCK FLASH, THE TRAFFIC SIGNAL SHALL CONTINUE FLASHING.

9. PREEMPT TO COORDINATION: USED WHEN EMERGENCY PREEMPTION IS ACTIVATED DURING COORDINATION. OPERATION TO ALLOW THE NEXT PERMISSIVE PHASE IN THE COORDINATION CYCLE TO BE SERVICED FOLLOWING PREEMPTION.

WHEN A CALL IS RECEIVED THE FAIL SAFE INDICATION SHALL BE ACTIVATED FOLLOWING THE SELECTIVE CLEARANCE INTERVALS AND FLASH AT A RATE OF NO LESS THAN 50 NOR MORE THAN 60 TIMES PER MINUTE.

PERMIT NO. 1-127-02 SHEET 3 OF 3

DATE ISSUED 11/08/1995 DATE REVISED 6/29/2010

GENERAL NOTES

INSTALL, OPERATE AND MAINTAIN THIS TRAFFIC SIGNAL IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

THE PERMITTEE INSTALLS AND MAINTAINS ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING WHICH ARE CONSIDERED PART OF THE PERMIT, UNLESS OTHERWISE INDICATED. THE DEPARTMENT MAINTAINS THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS.

INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. ALSO, INSTALL SUPPORT POLES FOR OVERHEAD SIGNALS WITH A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

INSTALL SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY WITH THE BOTTOMS NOT LESS THAN 17 FEET NOR MORE THAN 18 FEET ABOVE THE ROADWAY.

INSTALL POST MOUNTED SIGNAL HEADS WITH BOTTOMS NOT LESS THAN 10 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

INSTALL SIGNAL HEADS WITH A MINIMUM HORIZONTAL DISTANCE OF 8 FEET BETWEEN THE HEADS AS MEASURED AT RIGHT ANGLES TO THE APPROACH.

IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE MUST OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
TODD MICHAEL KRAVITS
ENGINEER
PE-039886-E

COUNTY : ALLEGHENY

MUNICIPALITY : WILKINS TOWNSHIP

INTERSECTION : WILLIAM PENN HIGHWAY (S.R. 2048) & HOME DEPOT/TED McWILLIAMS CIRCUIT CITY DRIVEWAYS

ACCEPTED AND APPROVED :
MUNICIPAL REPRESENTATIVE — DATE June 17 2010.

RECOMMENDED :
DISTRICT TRAFFIC ENGINEER — DATE 6/29/10

SCALE : 0 25 50 75

1-127-02

27-FEB-2009 09:53

OPERATOR:
FILE NAME: L:\tri\signals\SR 2048 Wm Penn Hgwypermit.dgn

Appendix H:
Turn Lane Warrant Analysis

Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Wilkins Township	**Analysis Date:**	2/13/2023
County:	Allegheny County	**Conducted By:**	JRT
PennDOT Engineering District:	11	**Checked By:**	MDS
		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with Pep Boys Driveway

Analysis Period:	2029 Build	**Number of Approach Lanes:**	2
Design Hour:	AM Peak Hour	**Undivided or Divided Highway:**	Divided
Intersection Control:	Signalized		
Posted Speed Limit (MPH):	40		**Type of Analysis**
Type of Terrain:	Rolling	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	52	8.0%	N/A
	Through	-	484	3.0%	506
	Right	-	36	2.0%	38

Advancing Volume:	544
Right Turn Volume:	38

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **No**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Signalized
Design Hour Volume of Turning Lane:	38
Cycles Per Hour (Assumed):	60
Cycles Per Hour (If Known):	

Average # of Vehicles/Cycle: N/A

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

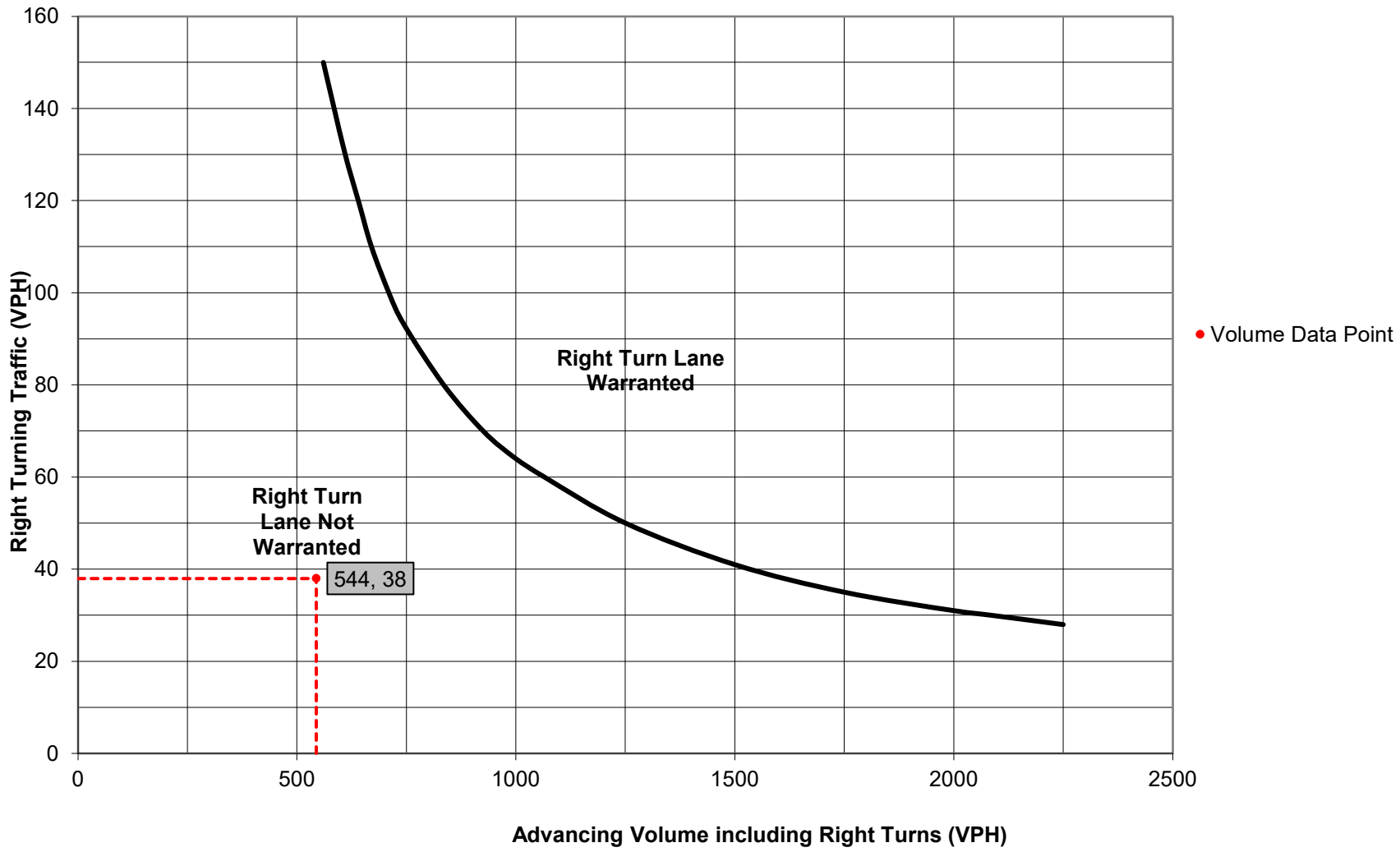
Right Turn Lane Storage Length, Condition A:	**N/A**	**Feet**
Condition B:	**N/A**	**Feet**
Condition C:	**N/A**	**Feet**
Required Right Turn Lane Storage Length:	**N/A**	**Feet**

Additional Findings:

N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Wilkins Township	Analysis Date:	2/13/2023
County:	Allegheny County	Conducted By:	JRT
PennDOT Engineering District:	11	Checked By:	MDS
		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with Pep Boys Driveway

Analysis Period:	2029 Build	Number of Approach Lanes:	2
Design Hour:	PM Peak Hour	Undivided or Divided Highway:	Divided
Intersection Control:	Signalized		
Posted Speed Limit (MPH):	40		Type of Analysis
Type of Terrain:	Rolling	Left or Right-Turn Lane Analysis?:	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	47	0.0%	N/A
	Through	-	1100	1.0%	1117
	Right	-	29	2.0%	30

Advancing Volume:	1147
Right Turn Volume:	30

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **No**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Signalized
Design Hour Volume of Turning Lane:	30
Cycles Per Hour (Assumed):	Known
Cycles Per Hour (If Known):	20.57

Average # of Vehicles/Cycle: N/A

PennDOT Publication 46, Exhibit 11-6

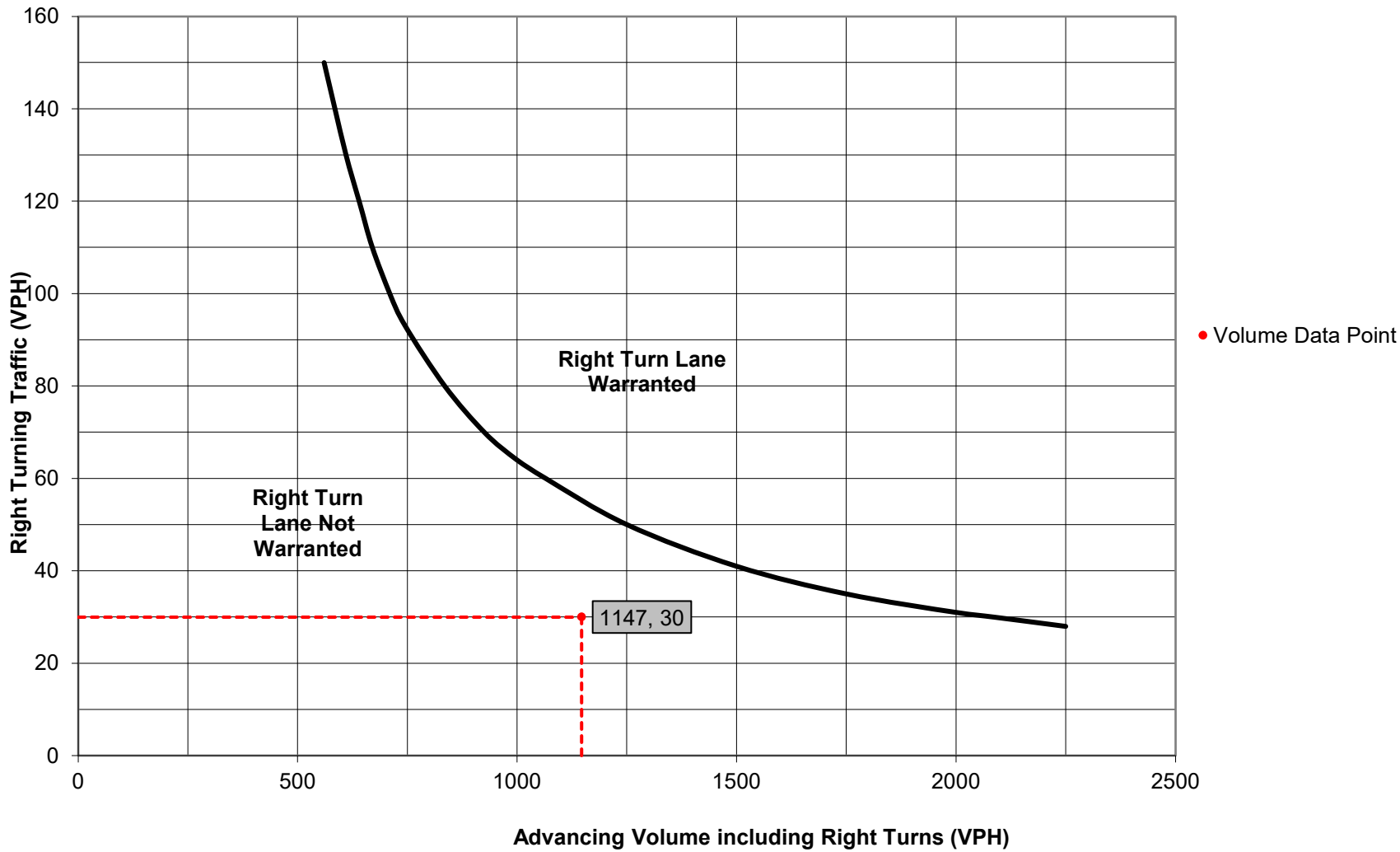
Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Right Turn Lane Storage Length, Condition A:	N/A	Feet
Condition B:	N/A	Feet
Condition C:	N/A	Feet
Required Right Turn Lane Storage Length:	N/A	Feet

Additional Findings: N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Wilkins Township	**Analysis Date:**	2/13/2023
County:	Allegheny County	**Conducted By:**	JRT
PennDOT Engineering District:	11	**Checked By:**	MDS
		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with Pep Boys Driveway

Analysis Period:	2029 Build	**Number of Approach Lanes:**	2
Design Hour:	SAT Peak Hour	**Undivided or Divided Highway:**	Divided
Intersection Control:	Signalized		
Posted Speed Limit (MPH):	40		**Type of Analysis**
Type of Terrain:	Rolling	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	102	0.0%	N/A
	Through	-	1157	1.0%	1175
	Right	-	49	2.0%	51

Advancing Volume:	1226
Right Turn Volume:	51

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **No**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Signalized
Design Hour Volume of Turning Lane:	51
Cycles Per Hour (Assumed):	Known
Cycles Per Hour (If Known):	24

Average # of Vehicles/Cycle: N/A

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

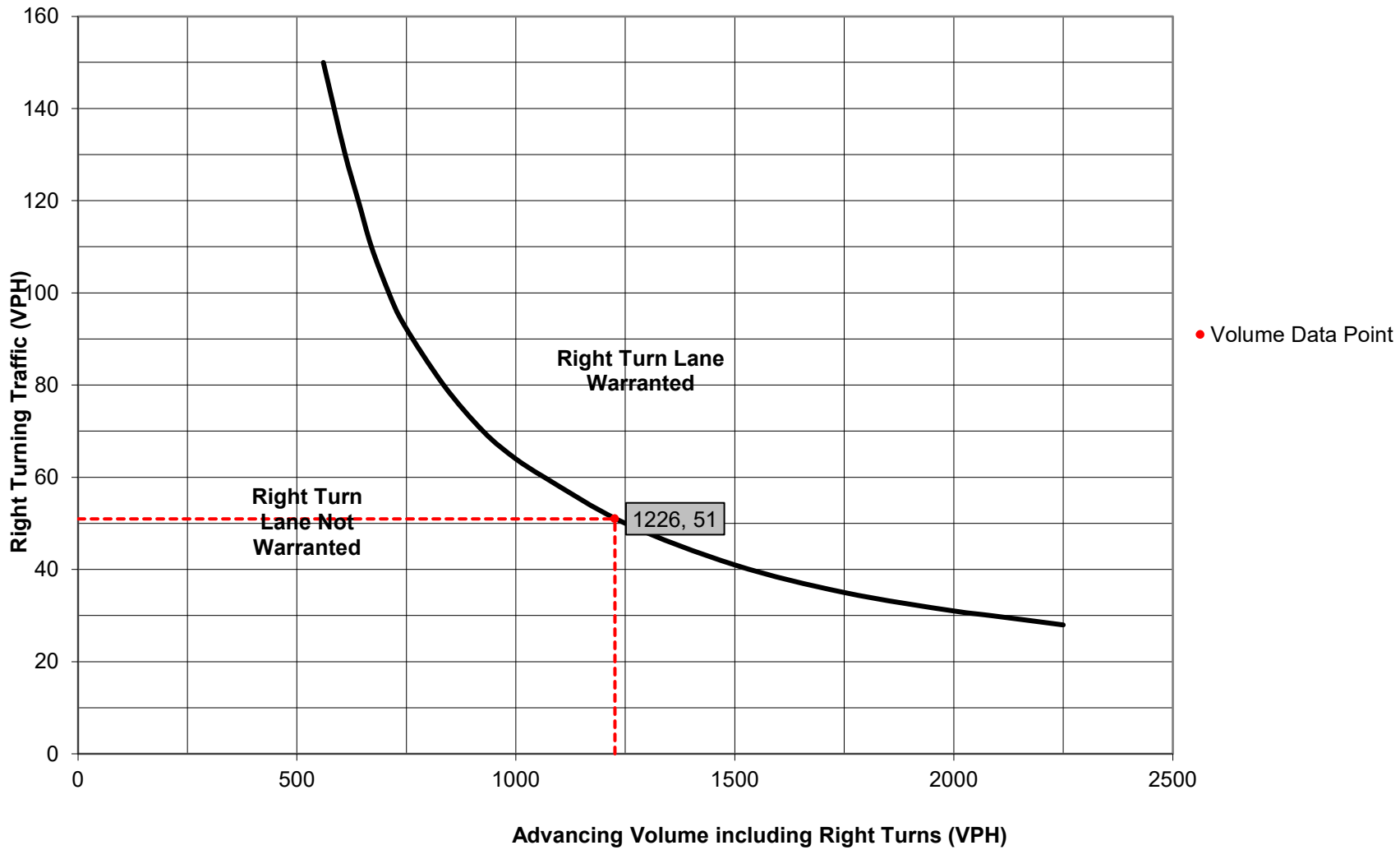
Right Turn Lane Storage Length, Condition A:	**N/A**	**Feet**
Condition B:	**N/A**	**Feet**
Condition C:	**N/A**	**Feet**
Required Right Turn Lane Storage Length:	**N/A**	**Feet**

Additional Findings:

N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



Turn Lane Warrant and Length Analysis Workbook

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Municipality:	Wilkins Township	**Analysis Date:**	2/13/2023
County:	Allegheny County	**Conducted By:**	JRT
PennDOT Engineering District:	11	**Checked By:**	MDS
		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with proposed Site Driveway

Analysis Period:	2029 Build	**Number of Approach Lanes:**	2
Design Hour:	AM Peak Hour	**Undivided or Divided Highway:**	Divided
Intersection Control:	Unsignalized		
Posted Speed Limit (MPH):	40		**Type of Analysis**
Type of Terrain:	Rolling	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No			N/A
	Through	-	572	3.0%	598
	Right	-	109	0.0%	109

Advancing Volume:	707
Right Turn Volume:	109

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **Yes**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Unsignalized
Design Hour Volume of Turning Lane:	109
Cycles Per Hour (Assumed):	60
Cycles Per Hour (If Known):	

Average # of Vehicles/Cycle: 2.0

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

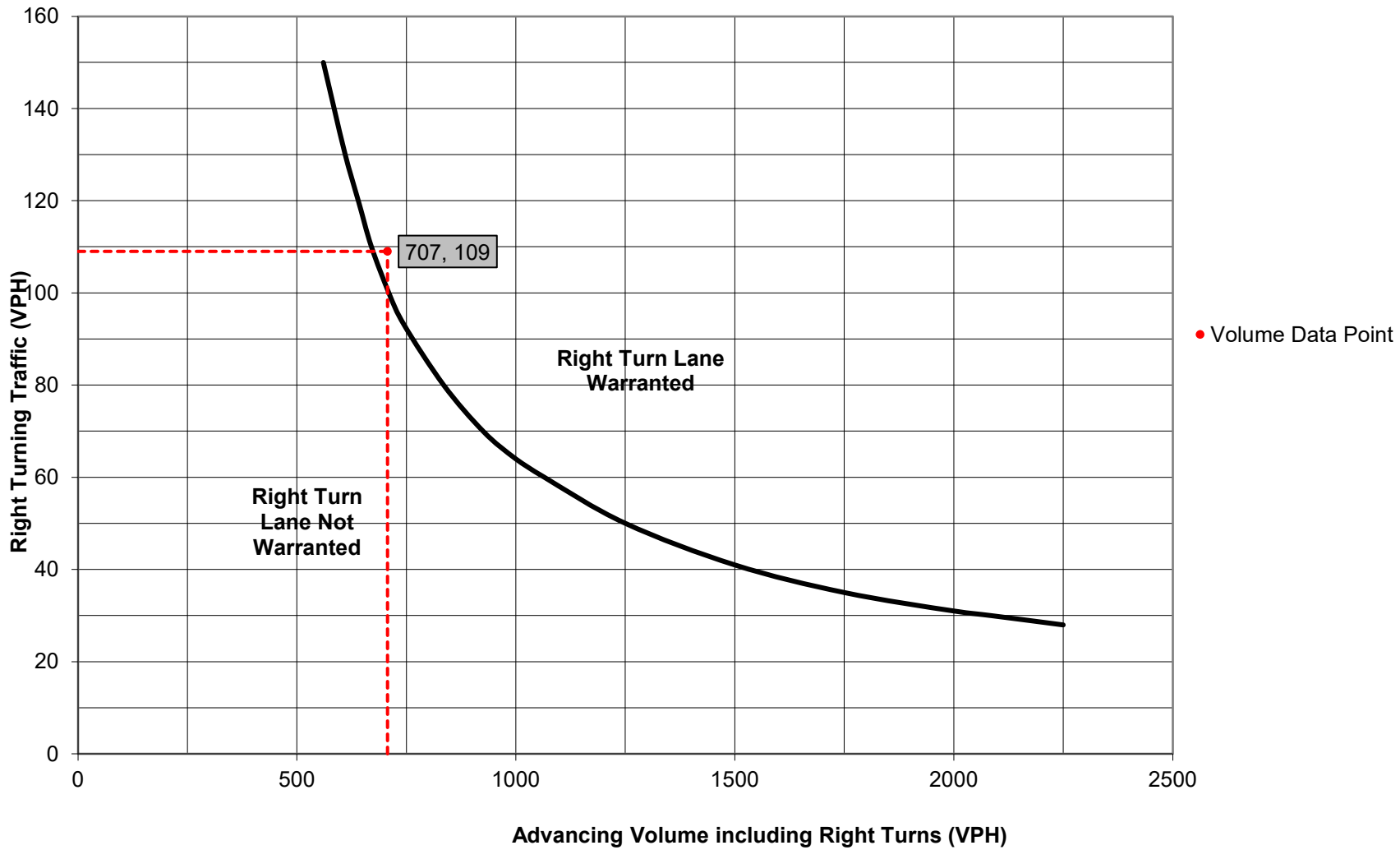
Right Turn Lane Storage Length, Condition A:	**N/A**	**Feet**
Condition B:	**N/A**	**Feet**
Condition C:	**161**	**Feet**
Required Right Turn Lane Storage Length:	**175**	**Feet**

Additional Findings:

N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



Turn Lane Warrant and Length Analysis Workbook

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		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with proposed Site Driveway

Analysis Period:	2029 Build	**Number of Approach Lanes:**	2
Design Hour:	PM Peak Hour	**Undivided or Divided Highway:**	Divided
Intersection Control:	Unsignalized		
Posted Speed Limit (MPH):	40		**Type of Analysis**
Type of Terrain:	Rolling	**Left or Right-Turn Lane Analysis?:**	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No			N/A
	Through	-	1176	1.0%	1194
	Right	-	72	2.0%	75

Advancing Volume:	1269
Right Turn Volume:	75

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **Yes**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Unsignalized
Design Hour Volume of Turning Lane:	75
Cycles Per Hour (Assumed):	60
Cycles Per Hour (If Known):	

Average # of Vehicles/Cycle: 1.0

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

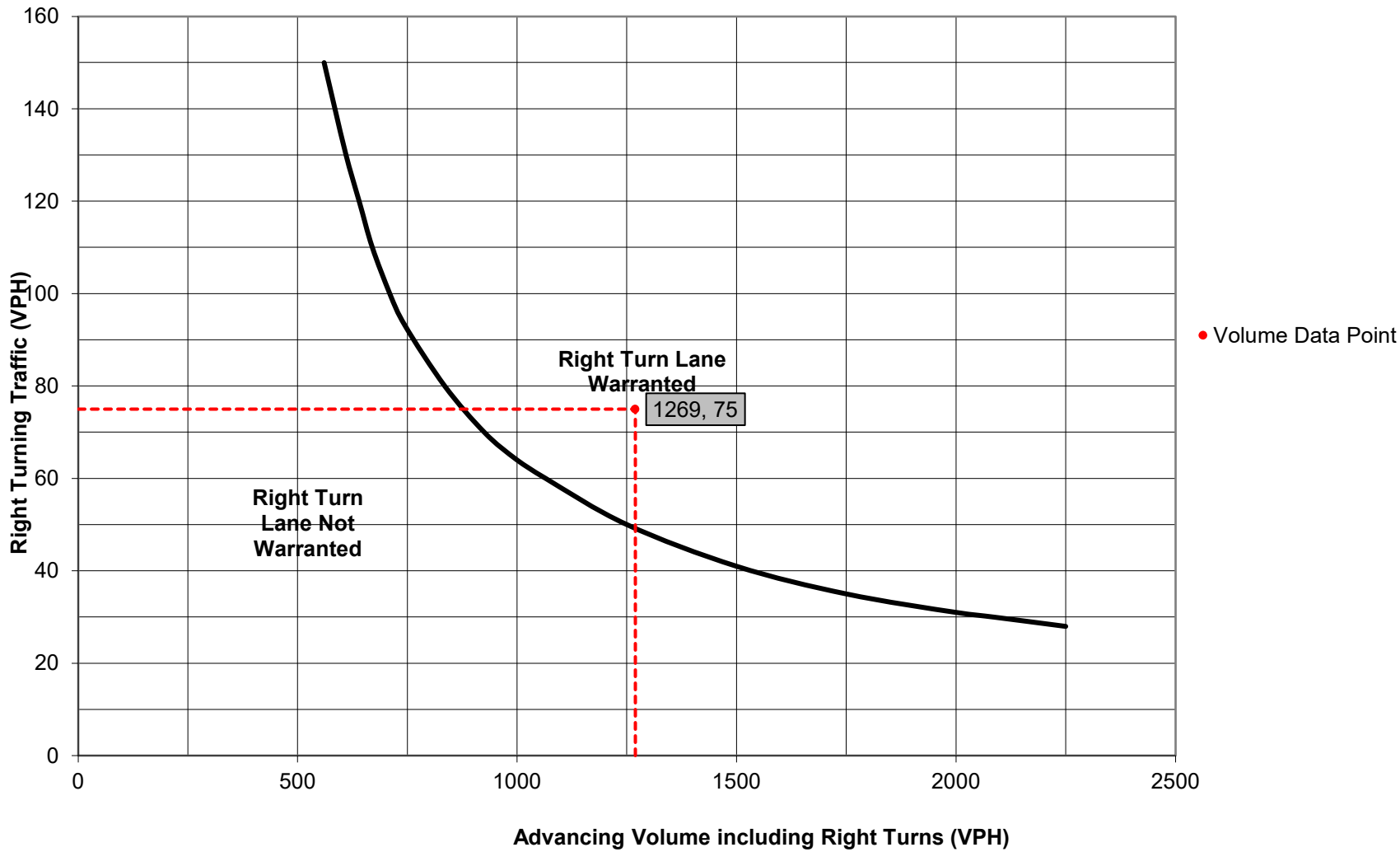
Right Turn Lane Storage Length, Condition A:	**N/A**	**Feet**
Condition B:	**75**	**Feet**
Condition C:	**N/A**	**Feet**
Required Right Turn Lane Storage Length:	**75**	**Feet**

Additional Findings:

N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



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		Agency/Company Name:	TPD

Intersection & Approach Description: William Penn Highway (S.R. 2048) with proposed Site Driveway

Analysis Period:	2029 Build	Number of Approach Lanes:	2
Design Hour:	SAT Peak Hour	Undivided or Divided Highway:	Divided
Intersection Control:	Unsignalized		
Posted Speed Limit (MPH):	40		Type of Analysis
Type of Terrain:	Rolling	Left or Right-Turn Lane Analysis?:	Right Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:	N/A
Opposing Volume:	N/A
Left Turn Volume:	N/A
% Left Turns in Advancing Volume:	N/A

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No			N/A
	Through	-	1310	1.0%	1330
	Right	-	135	2.0%	140

Advancing Volume:	1470
Right Turn Volume:	140

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: **N/A**

Warrant Met?: **N/A**

Right Turn Lane Warrant Findings

Applicable Warrant Figure: **Figure 11**

Warrant Met?: **Yes**

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Unsignalized
Design Hour Volume of Turning Lane:	140
Cycles Per Hour (Assumed):	60
Cycles Per Hour (If Known):	

Average # of Vehicles/Cycle: 2.0

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

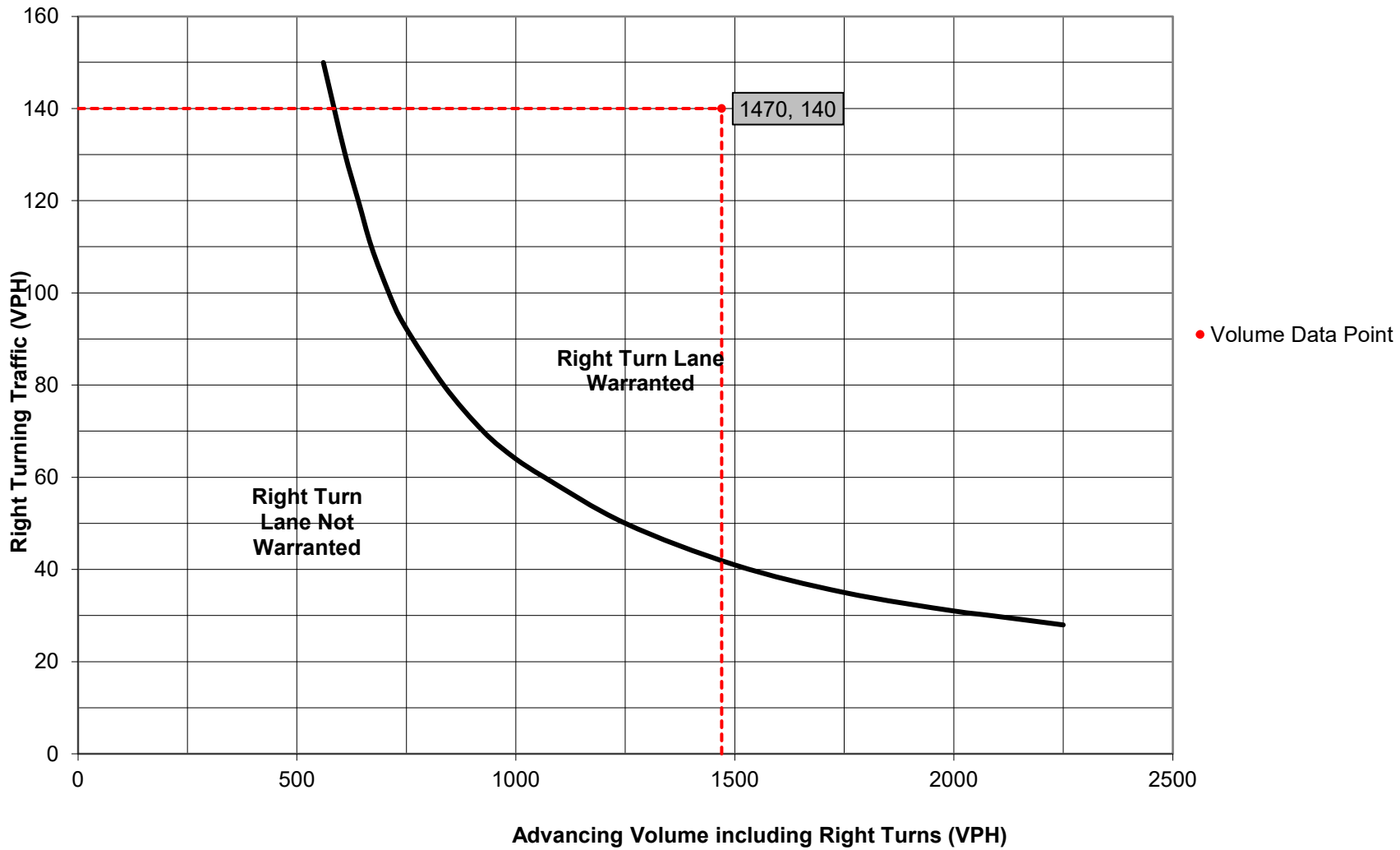
Right Turn Lane Storage Length, Condition A:	N/A	Feet
Condition B:	75	Feet
Condition C:	N/A	Feet
Required Right Turn Lane Storage Length:	75	Feet

Additional Findings:

N/A

Additional Comments / Justifications:

Figure 11. Warrant for right turn lanes on four-lane roadways (40 mph or lower speeds, unsignalized and signalized intersections)



CRASH ANALYSIS

SR 2048 (William Penn Highway)
Segment 0030/Offset 0800 through Segment 0050/Offset 0000
Segment 0031/Offset 0910 through Segment 0051/Offset 0000

Wilkins Township
Allegheny County, PA

March 28, 2023

-CONFIDENTIAL-

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Prepared for:
PennDOT District 11-0
45 Thoms Run Road
Bridgeville, PA 15017

Prepared by:
Traffic Planning and Design, Inc.
1370 Washington Pike, Suite 515
Bridgeville, PA 15017

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Crash Data Summary – (SR 2048) *1*

Corridor Crash Rate Calculations – (SR 2048) *1*

Conclusions *2*

SCHEMATIC FIGURES

FIGURE 1: CRASH LOCATION DIAGRAM

TECHNICAL APPENDICES

APPENDIX A – CRASH DATA

APPENDIX B – PENNDOT HOMOGENOUS REPORT, SUPPORTING CALCULATIONS AND DATA

INTRODUCTION

The purpose of the crash analysis is to document crash statistics over the past five years and identify potential roadway deficiencies along the study area corridor on William Penn Highway (SR 2048). The analysis includes the comparison of the number of crashes over the past five years to the statewide average for a roadway with similar characteristics. The data for the analysis was obtained from PennDOT's Bureau of Highway Safety & Traffic Engineering (Crash Records System) for the most recent five years available (2017-2021). A summary of the crash data for each roadway in the project area can be found in **Appendix A**. A crash diagram was prepared to graphically depict the crash types and locations along the analyzed corridor and is included in **Figure 1**.

CRASH SEGMENT ANALYSIS – (SR 2048)

Corridor Characteristics (SR 2048)

Total number of crashes along this segment between 1/1/2017 and 12/31/2021 = **2 Crashes**
Length = **3,150 feet (0.60 miles)**
ADT = **29,232 vehicles per day**

Crash Data Summary (SR 2048)

The crash types for the 2 crashes along the corridor are summarized as follows:

Crash Years:

- 2017 – 2 crashes;
- 2018 – 0 crashes;
- 2019 – 0 crashes;
- 2020 – 0 crashes;
- 2021 – 0 crashes.

Crash Types:

- 1 angle crash;
- 1 rear end crash.

Crash Severity:

- 0 crashes resulting in a fatality;
- 1 crash resulting in a possible injury;
- 1 crash resulting in property damage only.

Corridor Crash Rate Calculations (SR 2048)

The following equation was utilized to develop the crash rate within the corridor.

$$\text{Crashes / Million Vehicle Miles / 5 Years} = \frac{(\text{\# Crashes in past 5 years})\,(10^6)\,(5{,}280\text{ft})}{(\text{ADT})(365\text{ Days})(5\text{ years})(\text{Segment length in feet})}$$

Segment Crash Rate = 0.06 Crashes / Million Vehicle Miles

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

The crash rate for the corridor was compared to that statewide crash rate provided in the Homogenous report for roadways with similar characteristics. To find the statewide crash rate, William Penn Highway (SR 2048) was classified as urban, non-full access control, undivided roadway, 41-99 feet total width, 10,000-99,999 ADT. The Homogeneous report is included in **Appendix B**.

Statewide Average Crash Rate = 2.22 Crashes / Million Vehicle Miles

The corridor crash rate (0.06 crashes/MVM) is less than the statewide average crash rate for roadways with similar characteristics (2.22 crashes/MVM).

Conclusions:

The William Penn Highway (SR 2048) corridor crash rate (0.06 crashes/MVM) is below the statewide average crash rate (2.22 crashes/MVM). Additionally, a review of the data for the subject segment shows no discernable trends in crashes with regards to the year of the crash, the type of the crash, or the cause of the crash. The predominant causation factors for the reported crashes were driver-error (e.g., driver was distracted, running red light, etc.).

Additionally, for a given intersection, PennDOT considered a crash occurrence of five (5) reportable, correctable crashes over a continuous twelve-month period during the past five years to be a threshold value, above which the intersection design should be reviewed to examine if corrective measures can be taken to enhance safety. Based on a review of the crash data, there was not a crash occurrence of five (5) reportable, correctable crashes over a continuous twelve-month period at any of the study area intersections, and thus corrective measures are not necessary to enhance safety.

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

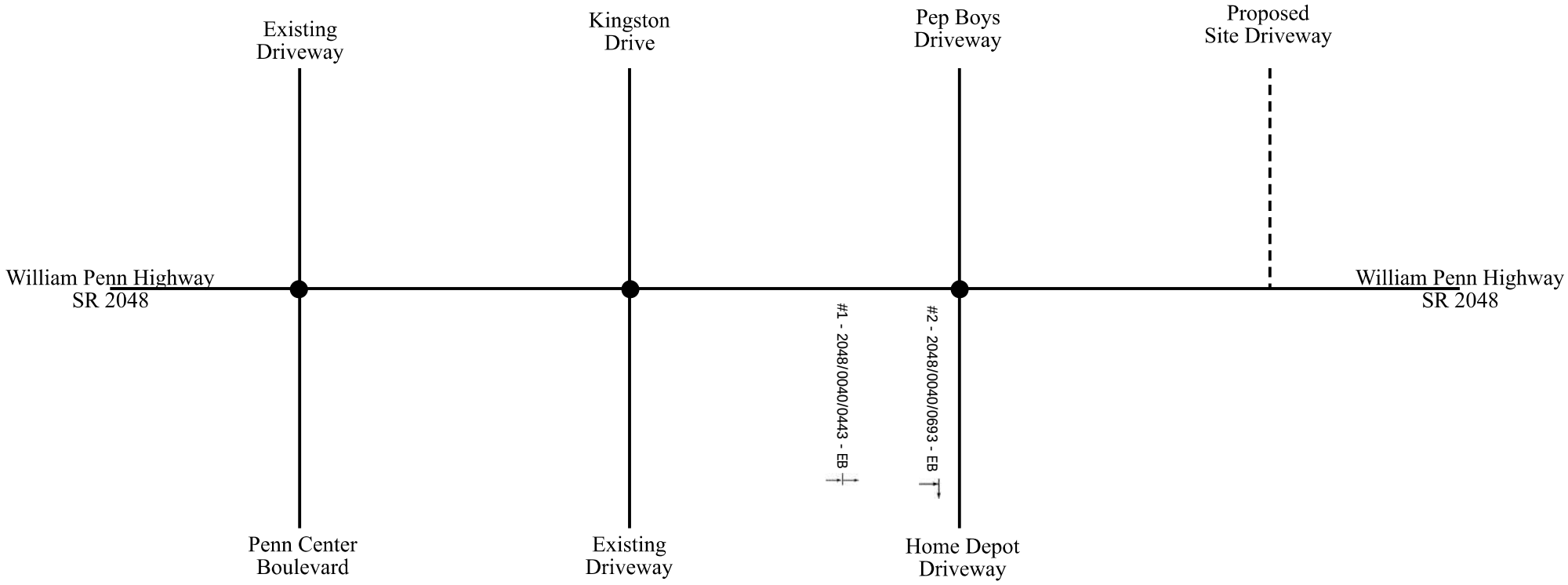
KEY

REAR-END

ANGLE

- ####/####/#### = CRASH NUMBER - SR/SEGMENT/OFFSET

N



KEY:

● **SIGNALIZED INTERSECTION**

- - - - - **PROPOSED DRIVEWAY**

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FIGURE 1

CRASH SUMMARY

Appendix A:
Crash Data

Pennsylvania Crash Information Tool

5-Year Crash Data

Date Range: 01/01/2017 to 12/31/2021

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

USER ID / QUERY ID:
b-melsouther / *0320230210522*

MONTH OF YEAR

	FEB	JUL	TOTAL
CRASHES	1	1	2
PCT	50%	50%	100%

DAY OF WEEK

	MON	FRI	TOTAL
CRASHES	1	1	2
PCT	50%	50%	100%

HOUR OF DAY

	07	16	TOTAL
CRASHES	1	1	2
PCT	50%	50%	100%

YEAR

	CRASHES	PCT
2017	2	100%
TOTAL	2	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	1	50%
REAR END	1	50%
TOTAL	2	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
POSSIBLE INJURY	1	50%
PDO	1	50%
TOTAL	2	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
SUSPECTED SERIOUS	0
SUSPECTED MINOR	0
POSSIBLE INJURY	1
UNK SEVERITY	0
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	2	50%
DRIVER WAS DISTRACTED	1	25%
RUNNING RED LIGHT	1	25%
TOTAL	4	100%

VEHICLE TYPE

	VEHICLES	PCT
SUV	2	50%
AUTOMOBILE	1	25%
VAN	1	25%
TOTAL	4	100%

ROAD CONDITION

	CRASHES	PCT
DRY	2	100%
TOTAL	2	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	2	100%
TOTAL	2	100%

WEATHER

	CRASHES	PCT
CLEAR	2	100%
TOTAL	2	100%

ENVIR/ROADWAY FACTORS

	FACTORS	PCT
GLARE	1	50%
NONE	1	50%
TOTAL	2	100%

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §407 and may not be disclosed or used in litigation without written permission from PennDOT.

NOTES:

1 Injury Severity Disclaimer

Please note that beginning January 1, 2016, PennDOT adopted the Federal standard for collecting injury severity data. The field descriptions and definitions changed from the state standard that had been in use for decades. This resulted in a substantial shift in severity levels. Therefore, comparison of the “Suspected Serious Injury”, “Suspected Minor Injury” and “Possible Injury” categories will not be consistent for crashes taking place before versus after the adoption of the new standard.

REPORT PARAMETERS:

Query ID: *0320230210522*

User ID: b-melsouther

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

Date Range: 01/01/2017 to 12/31/2021

Criteria:

This report counts the number of crashes.

Pennsylvania Crash Information Tool

5-Year Crash Data

Date Range: 01/01/2017 to 12/31/2021*

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

USER_ID / QUERY ID:
b-melsouther / *0320230210523*

CRASH SEVERITY LEVEL BY YEAR

	2017 CRASHES	ALL YEARS CRASHES
POSSIBLE INJURY	1	1
PROPERTY DMG ONLY	1	1
TOTAL	2	2

CRASH DESCRIPTION TYPES BY YEAR

	2017 CRASHES	ALL YEARS CRASHES
ANGLE	1	1
REAR END	1	1
TOTAL	2	2

PERSON INJURY SUMMARY BY YEAR

	2017 PERSONS	ALL YEARS PERSONS
FATALITIES	0	0
SUSPECTED SERIOUS INJURIES	0	0
SUSPECTED MINOR INJURIES	0	0
POSSIBLE INJURIES	1	1
UNKNOWN SEVERITY	0	0
UNKNOWN IF INJURED	0	0

*** PLEASE NOTE: Years which do not appear in the report contain zero crashes for this request.**

* Complete records of reportable crashes are available in PCIT for the following years: 2002 - 2021

* Crash information for 2022 to 2023 is incomplete at the time of this printing. As such, data for 2022 to 2023 is not included in this report.

IMPORTANT: The information contained in this document is drawn from raw data and should not be interpreted as representing an engineering judgement or determination made by the Department of Transportation as to the type and severity of accidents noted herein.

Print Date: 02/10/2023

Print Date: 02/10/2023

PCIT - PUBLIC REQUEST / PRESS INQUIRY REPORT (01-07)

NOTES:

1 Injury Severity Disclaimer

Please note that beginning January 1, 2016, PennDOT adopted the Federal standard for collecting injury severity data. The field descriptions and definitions changed from the state standard that had been in use for decades. This resulted in a substantial shift in severity levels. Therefore, comparison of the “Suspected Serious Injury”, “Suspected Minor Injury” and “Possible Injury” categories will not be consistent for crashes taking place before versus after the adoption of the new standard.

REPORT PARAMETERS:

Query ID: 0320230210523

User ID: b-melsouther

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

Date Range: 01/01/2017 to 12/31/2021

Criteria:

This report counts the number of crashes.

Pennsylvania Crash Information Tool

5-Year Crash Data

Sorted by County, Route, Segment, Offset

USER_ID / QUERY ID:
b-melsouther / *0320230210521*

Date Range: 01/01/2017 to 12/31/2021

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

	CRN	CO	DATE	DAY	TIME	LIGHTING	ROAD SURF	WEATHER	FAT	INJ	PED	VEH	MAX SEVERITY
1	2017014488	02	02/03/2017	FRI	16:40	DAYLIGHT	DRY	CLEAR	0	0	0	2	PROP DMG ONLY
	ENV RDWY FACTORS: NONE												REAR-END
	MIDB 2048/0040/0443												

VEH: 1 AUTOMOBILE TRAVELING EAST IN RIGHT LANE GOING STRAIGHT
VEH EVENTS: **HIT UNIT 02**
DVR ACTIONS: DRIVER WAS DISTRACTED

VEH: 2 VAN TRAVELING EAST IN RIGHT LANE STOPPED IN TRAFFIC LANE
VEH EVENTS: **STRUCK BY UNIT 01**
DVR ACTIONS: NO CONTRIBUTING ACTION

	CRN	CO	DATE	DAY	TIME	LIGHTING	ROAD SURF	WEATHER	FAT	INJ	PED	VEH	MAX SEVERITY
2	2017079641	02	07/03/2017	MON	07:29	DAYLIGHT	DRY	CLEAR	0	1	0	2	POSSIBLE INJURY
	ENV RDWY FACTORS: GLARE												ANGLE
	MIDB 2048/0040/0693												

VEH: 1 SUV TRAVELING EAST IN UNKNOWN GOING STRAIGHT
VEH EVENTS: **HIT UNIT 02**
DVR ACTIONS: RUNNING RED LIGHT

VEH: 2 SUV TRAVELING WEST IN OTHER FWD MOVING LANE TURNING LEFT
VEH EVENTS: **STRUCK BY UNIT 01**
DVR ACTIONS: NO CONTRIBUTING ACTION

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §407 and may not be disclosed or used in litigation without written permission from PennDOT.

5-Year Crash Data

Sorted by County, Route, Segment, Offset

NOTES:

1 Injury Severity Disclaimer
Please note that beginning January 1, 2016, PennDOT adopted the Federal standard for collecting injury severity data. The field descriptions and definitions changed from the state standard that had been in use for decades. This resulted in a substantial shift in severity levels. Therefore, comparison of the “Suspected Serious Injury”, “Suspected Minor Injury” and “Possible Injury” categories will not be consistent for crashes taking place before versus after the adoption of the new standard.

REPORT PARAMETERS:

Query ID: 0320230210521

User ID: b-melsouther

Area of Interest: (In County 02 On State Route 2048(P) Between Segment 0030 Offset 0800 and Segment 0050 Offset 0000) or (In County 02 On State Route 2048(S) Between Segment 0031 Offset 0910 and Segment 0051 Offset 0000)

Date Range: 01/01/2017 to 12/31/2021

Criteria:

This report counts the number of crashes.

Appendix B:
PennDOT Homogeneous Report, Supporting Calculations and Data

TMS Site 19116: Traffic Monitoring Report

Location Description: 0.3 mi. east of Kingston Dr.

Details

Type of Count	MANUAL CLASS
Type of Site	Portable
Schedule	1 TIME/YR
Duration	24 HRS
Frequency Cycle	03
Cycle Year	01

Location

County	ALLEGHENY (02)
Route	2048
Segment	0050
Offset	0000
Latitude	40.43127
Longitude	-79.80373

Map

Traffic Data

Date	Volume	Truck Volume	Truck %	Volume Graph
Mar 08, 2021*	13,796	420	3	
Aug 07, 2018	29,232			
Jun 03, 2015	13,873	241	1.7	
Jun 06, 2012	36,412			
Oct 24, 1995	38,667			
Dec 01, 1993	44,003			
Sep 30, 1992	35,668			

DIR: E TOTAL LEN: 4.792 MI. DIST: 11-1 SR: 2048
LEFT MUN: MONROEVILLE B RIGHT MUN: MONROEVILLE B

LEFT		RIGHT	
RAMP D RD (SR8080 SEG 0500/0000) LENGTH(AH 3825 BK 0901)	0075/0000	0074/0000	MURRAY LN (PRDR) LENGTH(AH 3228 BK 1515)
		0070/0725	RAMP FR MONROEVILLE MAL (PRDR)
RAMP C RD (SR8080 SEG 0510/0654)	0071/0640		
RAMP 8080 NB OP ID 02/8080/0500/0575	0071/0490	0070/0542 0070/0318	RAMP 8080 NB OP ID 02/8080/0500/0575 (APRA) MONROEVILLE EXPO
		0070/0177	RAMP TO MONROEVILLE MAL (BORO)
		012981 FT	1 0 00187 0 01 0251+48
1 0 00187 0 01 0250+85 012518 FT LENGTH(AH 0901 BK 0564)	0071/0000	0070/0000	MARK DR (BORO) LENGTH(AH 1515 BK 0450)
1 0 00187 0 01 0244+38 011954 FT LENGTH(AH 0564 BK 1999)	0061/0000	012531 FT 0060/0000	1 0 00187 0 01 0244+56 LENGTH(AH 0450 BK 2067)
BR.THOMPSON STRUCTURE LENGTH 8 FT BMSID 02/2048/0050/2040	0051/1929	0050/1992	BR.THOMPSON STRUCTURE LENGTH 8 FT BMSID 02/2048/0050/2040
		0050/1932	LC FROM KOHLS ENT RD (CONN)
SAMS CLUB RD (PRDR) KOHLS ENT RD (PRDR)			SAMS CLUB RD (PRDR) KOHLS ENT RD (PRDR)
	0051/1850	0050/1855	
LC FROM SAMS CLUB RD (CONN)	0051/1769		
BMSEN 02/2048/0050/0000	0051/1252	0050/1252	BMSEN 02/2048/0050/0000
		0050/0800	MONROEVILLE WILKINS T
1 0 00187 0 01 0223+89 009955 FT THOMPSON RUN ROAD BMSBG 02/2048/0050/0000 MONROEVILLE WILKINS T LENGTH(AH 1999 BK 1367)	0051/0000	010464 FT 0050/0000	1 0 00187 0 01 0223+89 THOMPSON RUN ROAD BMSBG 02/2048/0050/0000 LENGTH(AH 2067 BK 1375)
		0040/0988	LC FROM HOME DEPOT RD (CONN)
PEP BOYS (PRDR) HOME DEPOT (PRDR)			PEP BOYS (PRDR) HOME DEPOT (PRDR)
	0041/0928	0040/0943	
		0040/0873	LC TO HOME DEPOT RD (CONN)

POI

DIR: E TOTAL LEN: 4.792 MI. DIST: 11-1 SR: 2048
LEFT MUN: WILKINS T RIGHT MUN: WILKINS T

1 0 00187 0 01 0210+26 008588 FT		009089 FT	1 0 00187 0 01 0211+63
KINGSTON DR			KINGSTON DR
(TWP)			(TWP)
PLAZA EXIT RD			PLAZA EXIT RD
(PRDR)			(PRDR)
LENGTH(AH 1367 BK 2683)	0041/0000	0040/0000	LENGTH(AH 1375 BK 2575)
			LC TO PLAZA RD
		0030/2490	(CONN)
LC TO SHEETZ RD			
(CONN)	0031/1996		
SHEETZ RD			SHEETZ RD
(PRDR)			(PRDR)
PENN CTR BL			PENN CTR BL
(TWP)			(TWP)
	0031/1910	0030/1810	
LC FROM SHEETZ RD			
(CONN)	0031/1860		
LC TO SHOP N SAVE PZ	0031/0910 →	← 0030/0800	
(CONN)	0031/0853		
SHOP N SAVE PZ			SHOP N SAVE PZ
(PRDR)			(PRDR)
	0031/0748	0030/0627	
LC FROM SHOP N SAVE PZ			
(CONN)	0031/0668		
1 0 00187 0 01 0183+64 005905 FT		006514 FT	1 0 00187 0 01 0184+37
LENGTH(AH 2683 BK 0989)	0031/0000	0030/0000	LENGTH(AH 2575 BK 1112)
HAWTHORNE DR			HAWTHORNE DR
(TWP)	0021/0640	0020/0620	(TWP)
BMSEN 02/2048/0020/0000	0021/0266	0020/0266	BMSEN 02/2048/0020/0000
1 0 00187 0 01 0173+25 004916 FT		005402 FT	1 0 00187 0 01 0173+25
LR 395			LR 395
BMSBG 02/2048/0020/0000			BMSBG 02/2048/0020/0000
WILKINS			WILKINS
CHURCHILL B			CHURCHILL B
LENGTH(AH 0989 BK 3034)	0021/0000	0020/0000	LENGTH(AH 1112 BK 3067)
			SOUTH BEND LN
			(SR2152 SEG 0011/0000)
			SOUTH BEND LN
		0014/2993	(SR2152 SEG 0011/0000)
			SOUTH BEND LN
		0014/2807	(SR2152 SEG 0010/0000)
			CHALFONT RUN
			STRUCTURE LENGTH 16 FT
		0014/2361	BMSID 02/2048/0014/1156

TPD - Traffic Planning & Design

Job No: BEND.08 Computed By: _____ Date: _____
Description: 3475 William Penn Hwy Checked By: _____ Date: _____

Crash Calculator

Crashes Per Million Vehicle Mile
(For Segments)
William Penn Highway
SR 2048

Analysis Period (yr) =	5
# of Crashes* =	2
ADT =	29,232
Length (mi) =	0.60

Crashes/MVM = 0.06

* Total number of crashes within analysis Period.

Pennsylvania Department of Transportation
Center for Highway Safety
Homogenous Report for State Road Crashes in Years 2017 to 2021

AVERAGE CRASH EXPERIENCE FOR HOMOGENOUS ROADWAY ATTRIBUTES

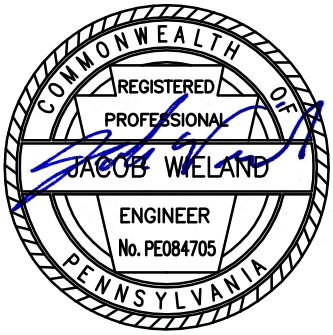
STATE ROAD

					MILLION VEHICLE MILES/5 YRS	LENGTH (MILES)	----------CRASH COUNTS BY SEVERITY---------- FATAL	SUSP SERIOUS	SUSP MINOR	POSSIBLE INJURY	-----UNKNOWN----- SEVERITY	IF INJ	PDO	CRASH TOTAL	CRASH RATE	CRASH INTENSITY
			TOTAL WIDTH	ADT RANGE												
RURAL	FAC	DIV	0 - 99 FT	0 - 20,000	38,664	2,053	174	421	3,049	656	937	286	10,879	16,402	0.42	7.99
RURAL	FAC	DIV	0 - 99 FT	20,001 - 99,999	11,454	257	54	95	850	205	247	124	2,470	4,045	0.35	15.74
RURAL	FAC	UNDIV	0 - 99 FT	0 - 99,999	694	254	12	10	92	30	31	13	231	419	0.60	1.65
RURAL	NFAC	DIV	0 - 40 FT	0 - 99,999	7,574	657	86	229	1,282	305	478	95	3,202	5,677	0.75	8.64
RURAL	NFAC	DIV	41 - 99 FT	0 - 99,999	34	3	0	2	17	8	11	2	44	84	2.47	28.00
RURAL	NFAC	UNDIV	0 - 19 FT	0 - 999	2,581	5,470	50	198	989	156	336	137	2,036	3,902	1.51	0.71
RURAL	NFAC	UNDIV	20 - 99 FT	0 - 999	8,413	9,964	244	720	3,320	646	1,148	456	7,351	13,885	1.65	1.39
RURAL	NFAC	UNDIV	0 - 19 FT	1,000 - 9,999	471	157	6	16	95	36	45	15	266	479	1.02	3.05
RURAL	NFAC	UNDIV	20 - 26 FT	1,000 - 9,999	53,781	10,149	1,054	2,637	14,418	3,407	5,106	1,363	32,688	60,673	1.13	5.98
RURAL	NFAC	UNDIV	27 - 40 FT	1,000 - 9,999	4,583	534	77	195	1,097	282	351	100	2,550	4,652	1.02	8.71
RURAL	NFAC	UNDIV	41 - 99 FT	1,000 - 9,999	394	42	9	23	112	23	44	17	276	504	1.28	12.00
RURAL	NFAC	UNDIV	0 - 21 FT	10,000 - 99,999	179	8	2	10	72	21	23	4	108	240	1.34	30.00
RURAL	NFAC	UNDIV	22 - 26 FT	10,000 - 99,999	5,158	217	65	178	1,057	316	385	77	2,303	4,381	0.85	20.19
RURAL	NFAC	UNDIV	27 - 35 FT	10,000 - 99,999	1,893	69	16	55	309	124	125	27	727	1,383	0.73	20.04
RURAL	NFAC	UNDIV	36 - 40 FT	10,000 - 99,999	1,004	41	15	25	155	49	56	16	415	731	0.73	17.83
RURAL	NFAC	UNDIV	41 - 99 FT	10,000 - 99,999	229	10	3	3	33	6	13	0	86	144	0.63	14.40
URBAN	FAC	DIV	0 - 99 FT	0 - 99,999	103,872	2,145	406	1,081	11,548	4,385	6,258	2,103	33,292	59,073	0.57	27.54
URBAN	FAC	UNDIV	0 - 99 FT	0 - 99,999	5,325	590	45	101	842	354	540	167	2,263	4,312	0.81	7.31
URBAN	NFAC	DIV	0 - 99 FT	0 - 99,999	57,037	3,028	830	2,974	20,270	11,670	14,259	2,767	43,821	96,591	1.69	31.90
URBAN	NFAC	UNDIV	0 - 19 FT	0 - 999	199	251	4	11	90	25	24	15	214	383	1.92	1.53
URBAN	NFAC	UNDIV	20 - 99 FT	0 - 999	806	738	28	78	418	130	194	71	1,195	2,114	2.62	2.86
URBAN	NFAC	UNDIV	0 - 19 FT	1,000 - 9,999	419	87	4	21	95	37	72	19	296	544	1.30	6.25
URBAN	NFAC	UNDIV	20 - 26 FT	1,000 - 9,999	38,598	4,859	466	1,924	10,990	4,444	5,914	1,338	29,906	54,982	1.42	11.32
URBAN	NFAC	UNDIV	27 - 40 FT	1,000 - 9,999	11,438	1,047	155	809	4,901	2,590	3,072	878	12,508	24,913	2.18	23.80
URBAN	NFAC	UNDIV	41 - 99 FT	1,000 - 9,999	1,717	141	33	170	1,188	642	661	190	1,891	4,775	2.78	33.87
URBAN	NFAC	UNDIV	0 - 26 FT	10,000 - 99,999	20,242	815	179	719	5,291	2,661	2,975	515	13,437	25,777	1.27	31.63
URBAN	NFAC	UNDIV	27 - 35 FT	10,000 - 99,999	10,711	416	119	465	3,525	1,987	2,406	439	8,585	17,526	1.64	42.13
URBAN	NFAC	UNDIV	36 - 40 FT	10,000 - 99,999	9,494	358	103	451	3,344	1,876	2,304	498	8,244	16,820	1.77	46.98
URBAN	NFAC	UNDIV	41 - 99 FT	10,000 - 99,999	5,911	225	123	445	2,850	1,818	2,015	446	5,442	13,139	2.22	58.40

BENDERSON DEVELOPMENT-COMMERCIAL RETAIL

POST-CONSTRUCTION STORMWATER MANAGEMENT REPORT

WILKINS TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA



MARCH 2023

PREPARED FOR:
BENDERSON DEVELOPMENT COMPANY, LLC

PREPARED BY:
RED SWING GROUP
4314 OLD WILLIAM PENN HWY, SUITE 101
MONROEVILLE, PA 15146

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1 - INTRODUCTION

Red Swing Consulting Services, LLC presents this Post Construction Stormwater Management Plan for the proposed Benderson Development – Commercial Retail project at 3475 William Penn Highway, Pittsburgh, Pennsylvania 15235. The proposed project will consist of constructing a fast-food restaurant building, a multi-commercial building, accompanying sidewalks, minor site grading for paved parking lots and driveways, installation of stormwater management facilities, installation of utility connections, and landscaping.

The total existing project area consisting primarily of parking lots, a commercial building to the west, and woods surrounding the north, east, and west sides of the property is 12.77 acres, and the proposed limit of disturbance is approximately 4.28 acres. With the project site disturbance over 1 acre, this project will require NPDES permitting through the Allegheny County Conservation District (ACCD), Erosion and Sedimentation (E&S) approval from the ACCD, and relevant development permits and approvals from Wilkins Township.

The project site is located on a portion of a previously developed lot which is primarily covered in pavement where a former building was demolished in Wilkins Township, Allegheny County, Pennsylvania. The site is located within the Braddock, PA quadrangle. A USGS Site Location Map has been included in Appendix A of this report.

This report addresses the stormwater management controls for this project and includes all calculations used for the design. The stormwater management design considers the 1-, 2-, 10-, 25-, 50-, and 100-year/24-hour storm events, as required by the Wilkins Township Stormwater Regulations and NPDES PAG-02 permit requirements.

2 - METHODOLOGY

The project was designed in accordance with the Stormwater Management Ordinance (SWMO) section of the Wilkins Township Subdivision and Land Development Ordinance (SALDO) and the Turtle Creek Act 167 Plan. A Stormwater Management (SWM) Best Management Practice (BMP) is proposed to be installed in the form of an underground stormwater chamber system with infiltration bed. It is designed for volume (via infiltration), rate, and water quality control.

Section §148-24C.3.a(1) of the SWMO requires that the post-development total runoff volume for all storms equal to or less than the 2-year/24-hour storm event not increase beyond the pre-development total runoff volume for similar storm events. §148-24C.3.a(2) states, for modeling purposes, predevelopment non-forested areas shall be considered meadow in good condition, and 20% of the existing impervious area shall be considered meadow in good condition. §148-24D.1.e(4h) states all collection/conveyance facilities shall be designed to convey the 25-yr frequency storm peak flow rate and carry it to the nearest suitable outlet.

The project site is tributary to Turtle Creek, which is classified as Warm Water Fishes (WWF), via Thompson Run (also classified as WWF) to the east of the site. Per the Act 167 plan, the peak post-construction 24-hour storm event release rates at the project site are required to be 50% of the pre-construction 24-hour storm event release rates, as Section §148-24C.4.a of the SWMO says areas covered by the Turtle Creek release rate map shall conform to its release rates.

The latest version of the Pennsylvania Department of Environmental Protection (PADEP) Post Construction Stormwater Management (PCSM) Spreadsheet was used to calculate the water quality and volume control requirements for the project site.

The groundcover CN values were analyzed for the tributary areas to the project area's discharge point.

3 - SOILS

A Custom Soil Resource Report has been generated for this site and is available within Appendix B of this report.

SOIL TYPES

Table 1 summarizes the types of soil located on site for this project.

Table 1: Soil Types

SOIL TYPE	NAME	HYDROLOGIC SOIL GROUP
GQF	Gilpin-Upshur complex, very steep	C
UB	Urban land	-*
UCD	Urban land-Culleoka complex, moderately steep	-*
UCE	Urban land-Culleoka complex, steep	-*
UWB	Urban land – Wharton complex, gently sloping	-*

*Previously developed onsite Urban soils were modeled with an HSG of D for the analyses.

HYDRIC SOILS

The UWB soil type has been identified as hydric. However, the site area that contains the UWB soil is currently, and is proposed to be, impervious pavement. There are drainage features that bypass offsite flows around the site, however they will be protected during construction and will not be impacted by the proposed development.

SOIL USE LIMITATIONS

Soil use limitations for Gilpin-Upshur complex, very steep, are listed below in Table 2. While there are usually no limitations for Urban Land soils, due to the variability of these soils, potential limitations for these soils are also listed in Table 2. Soils shall be evaluated during construction to the extent practicable to determine actual limitations. Potential limitations and corresponding resolutions are summarized in Table 2 on the following page. Potential limitations that are found to be different than those identified in the USDA soil information during construction will be handled by the excavating contractor/general

contractor in the field with appropriate construction methods. The excavating contractor/general contractor is required to have a copy of this report onsite and will therefore be aware of such potential issues prior to the commencement of construction operations.

Table 2: Resolutions to Soil Limitations

SOIL TYPE	LIMITATION	RESOLUTION
GQF & UCE	Slope	Appropriate equipment to be utilized for site grading or excavations where difficult slopes are encountered.
GQF & UCE	Depth to Bedrock	Contractor may need to utilize hard rock construction techniques where intact bedrock is encountered
GQF	Low strength	Avoid improper construction practices such as over-steepening, overloading of slopes, removal of lateral support and failure to prevent saturation.
GQF	Shrink Swell	Replace or modify expansive soils around foundations or other critical features which could be stressed by soil expansion.
GQF	Frost action	Use coarse aggregate or other material that will aid in drainage and reduce capillary action as fill under paved or other areas susceptible to frost action.
GQF	Depth to Saturated Zone	Implement a proper means to deal with water during excavation should water be encountered (i.e., pumped water filter bags).
GQF	Corrosive to Concrete/Steel	Suitable precautions should be taken to protect all underground pipes, conduits, and storage tanks.

To estimate runoff from storm rainfall, TR-20 uses the Runoff Curve Number (CN). Determination of the CN value is based on the watershed's soil and land cover conditions, which TR-20 models as hydrologic soil group (HSG), land cover type, and slope. Regarding the overall site, the CN's were obtained by reviewing soil types delineated by the USDA Natural Resources Conservation Service on their Web Soil Service. The land cover types for pre-development conditions were determined based on the existing conditions at the site prior to the construction of the proposed improvements and classified as meadow, woods, impervious surfaces, and impervious as meadow. For post-development conditions, the land cover types reflect the proposed development features. Curve numbers used in the site stormwater calculations are as follows:

- Impervious Surfaces, HSG C – 98
- Impervious Surfaces, HSG D – 98
- Impervious as Meadow, HSG C - 71
- Impervious as Meadow, HSG D – 78

- Woods, HSG C – 70
- Woods, HSG D – 77
- Meadow, HSG C – 74
- Meadow, HSG D – 80

4 – EXISTING CONDITIONS

The existing site topography generally consists of a relatively flat pavement area with a slight downward grade proceeding from west to east across the site. A building was demolished in the east central portion of the lot which is now gravel covered (modeled as impervious surface). The existing site's stormwater conveyance system ferries flow to a headwall that discharges to a rock lined channel at the southeast corner of the site. This channel is considered as Discharge Point 001 (DP 001)/Point of Interest 1 (POI 1). The discharge point is tributary to Thompson Run to the east.

Considering 20% of the existing impervious surfaces and the existing non-forested areas as meadow, the ground cover values shown in Table 3 were estimated. The portion of the drainage area that consisted of developed lots on Hart Drive to the north of the site was assumed to be 25% impervious and 75% pervious as meadow. Appendix C of this report contains the Existing Conditions Drainage Area Map and the existing conditions stormwater routing calculations.

Table 3 - Existing Drainage Area Ground Cover

Ground Cover (HSG)	EX DA Overall (SF)
Meadow (C)	8,146
Meadow (D)	12,110
Woods (C)	11,979
Woods (D)	4,051
20% Impervious as Meadow (C)	10,803
20% Impervious as Meadow (D)*	26,441
80% Impervious (C)	43,168
80% Impervious (D)*	105,633
TOTAL	222,331

*Unclassified soils within previously developed areas were modeled as "D" hydrologic soil group.

The time of concentration for the existing conditions was calculated and listed below in Table 4. If the calculated time of concentration was determined to be less than 6.0 minutes, then a minimum of 6.0 minutes for the drainage area was assumed for the pre-development model by adding the difference to the calculated value.

Table 4: Existing Time of Concentration Value

	EX DA Overall
Tc (min)	8.2

Rainfall depths for the 1-, 2-, 10-, 25-, and 100-year/24-hour storm events were obtained from the SWMO while the rainfall depth for the 50-year storm event was obtained from NOAA's National Weather Service, Hydrometeorological Design Studies Center. The calculated peak flow rates for the existing drainage area are shown in Table 5.

Table 5: Pre-Development Runoff Values

	1-YEAR	2-YEAR	10-YEAR	25-YEAR	50-YEAR	100-YEAR
Rainfall (in.)	2.00	2.50	3.61	4.31	4.45	5.71
EX POI 1 Peak Flow Rates (cfs)	**9.70**	**13.26**	**21.22**	**26.23**	**27.23**	**36.19**

5 – POST CONSTRUCTION STORMWATER MANAGEMENT

Following construction, a small increase to the site impervious area is proposed from the pre-development condition. The post-development site will generally maintain the overall drainage to the east. Most of the stormwater runoff from the proposed impervious areas will combine with runoff from a portion of the woods and developed lots to the north of the site that flows over an existing double bypass culvert. This combined runoff is directed toward the site collection and conveyance system, and treated through the underground stormwater chamber system BMP that discharges to DP 001/POI 1. Any area that is not detained by the chamber system will flow undetained towards DP 001/POI 1.

The proposed ground cover values are shown in Table 6 below. Appendix D of this report contains the Post-Development Drainage Area Map and the post-development stormwater routing calculations.

Table 6: Proposed Ground Covers

Ground Cover (HSG)	PR DA Detained (SF)	PR DA Undetained (SF)
Meadow (C)	9,104	3,790
Meadow (D)	6,665	4,530
Woods (C)	9,496	174
Woods (D)	2,134	0
Impervious (C)	51,619	0
Impervious (D)*	134,427	392
TOTAL	213,445	8,886

*Unclassified soils within previously developed areas were modeled as "D" hydrologic soil group.

The proposed times of concentration were calculated and listed below in Table 7. If the time of concentration was determined to be less than 6.0 minutes, then a minimum of 6.0 minutes for the drainage area was assumed for the post-development model.

Table 7: Proposed Time of Concentration Values

	PR DA Detained	PR DA Undetained
Tc (min)	7.2	6.0

In accordance with Section §148-24C.4.a of the SWMO, post-development peak discharge rates to the POI are proposed to be at least 50% of the pre-development discharge rates for the 1-, 2-, 10-, 25-, 50-, and 100-year/24-hour storm events. Table 8 summarizes the pre-development versus post-development release rates for the POI, while further calculations can be found in Appendix D.

Table 8: Pre- vs. Post- Construction Runoff Values

		1-YEAR	2-YEAR	10-YEAR	25-YEAR	50-YEAR	100-YEAR
PR POI 1	Pre-development peak discharge rate (cfs)	9.70	13.26	21.22	26.23	27.23	36.19
	Allowable release rate (cfs)	4.85	6.63	10.61	13.12	13.62	18.10
	Post-construction peak discharge rate without BMP (cfs)	11.95	15.61	23.69	28.75	29.76	38.82
	Net change without BMP (cfs)	2.25	2.35	2.47	2.52	2.53	2.63
	Post-construction peak discharge rate with BMP (cfs)	3.49	5.99	9.37	10.95	11.25	14.07
	Percent Reduction (%)	64	55	56	58	59	61

6 – WATER QUALITY

The underground stormwater chamber system with infiltration bed is designed as an infiltration BMP for the proposed site development. Additionally, trash guard inserts are proposed for all catch basins and a pre-filter “Isolator Row” is proposed for the chamber system. The “Isolator Row” is a row of underground chambers enveloped in woven geotextile fabric to provide enhanced suspended solids and

pollutant removal for lower (up to 2-year/24-hour) storm events while allowing larger storm events to bypass into the larger chamber system.

According to the infiltration testing performed by Construction Engineering Consultants, Inc. (CEC) dated February 9, 2023, five (5) test borings were performed on site at locations of proposed and alternative BMP footprints. A double-ring infiltrometer was used for all 5 tests. Test borings I-1 and I-2 are in the vicinity of the proposed underground stormwater chamber system with infiltration bed. An infiltration rate of 1.5 in/hr was measured for I-1, while an infiltration rate of 0.5 in/hr was measured for I-2. The average infiltration rate of 1 in/hr between the two tests had a factor of safety of 2 applied to it, resulting in a design infiltration rate of 0.5 in/hr. See Appendix F for the Infiltration Testing Report.

Per the attached DEP PCSM Volume Worksheet included within Appendix E, the difference between the pre-development and post-development 2-year/24-hour volume of runoff within the disturbed area was calculated to be 4,828 cubic feet. The lowest orifice within the chamber system's outlet structure is designed to retain an infiltrated volume of runoff of 6,011 cubic feet during the 2-year/24-hour storm event. As presented in the post-development HydroCAD report, the routed infiltration volume for the 2-year/24-hour storm event was calculated as 12,720 cubic feet. The results of the worksheet and HydroCAD model show that these factors generate enough infiltration credit to satisfy the volume requirement. Calculations for this can be found in Table 9 below.

As seen in DEP PCSM Quality Worksheet in Appendix E, the proposed BMP satisfies the calculated DEP water quality requirements based on the amount of volume routed to it from the disturbed area and infiltration credits.

Table 9: 2-Year/24-Hour Runoff Volume Summary (DEP PCSM Volume Spreadsheet)

	Volume (CF)
Pre-development 2yr/24hr Runoff Volume	27,223
Post-development 2yr/24hr Runoff Volume without BMPs	32,051
Difference 2yr/24hr Runoff Volume without BMPs	**4,828**
Tree Planting Credits	138
Structural BMP Infiltration Credits	9,652
Post-development 2yr/24hr Runoff Volume with BMPs	22,261
Difference 2yr/24hr Runoff Volume with BMP Credits	**-4,962**

7 – CONCLUSION

As seen in Sections 5 & 6 of this report, the post-development peak runoff for the 1-, 2-, 10-, 25-, 50-, and 100-year/24-hour storm events are proposed to be at least 50% less than the pre-developed peak runoff rates. There would be no increase in runoff volume for up to, and including, the 2-year/24-hour storm event. Hydraflow calculations are included in Appendix E of this report showing the 25-yr peak flow rate being conveyed through the designed stormwater collection/conveyance system. Therefore, the stormwater management design described in this report and in the PCSM plan complies with the requirements of the NPDES Permit, SWMO, and the Turtle Creek Act 167 Plan.

8 – STORMWATER FACILITY MAINTENANCE SCHEDULE

The following table outlines the stormwater facility maintenance schedule. Additional notes and details can be found on the approved project Post-Construction Stormwater Management Plans.

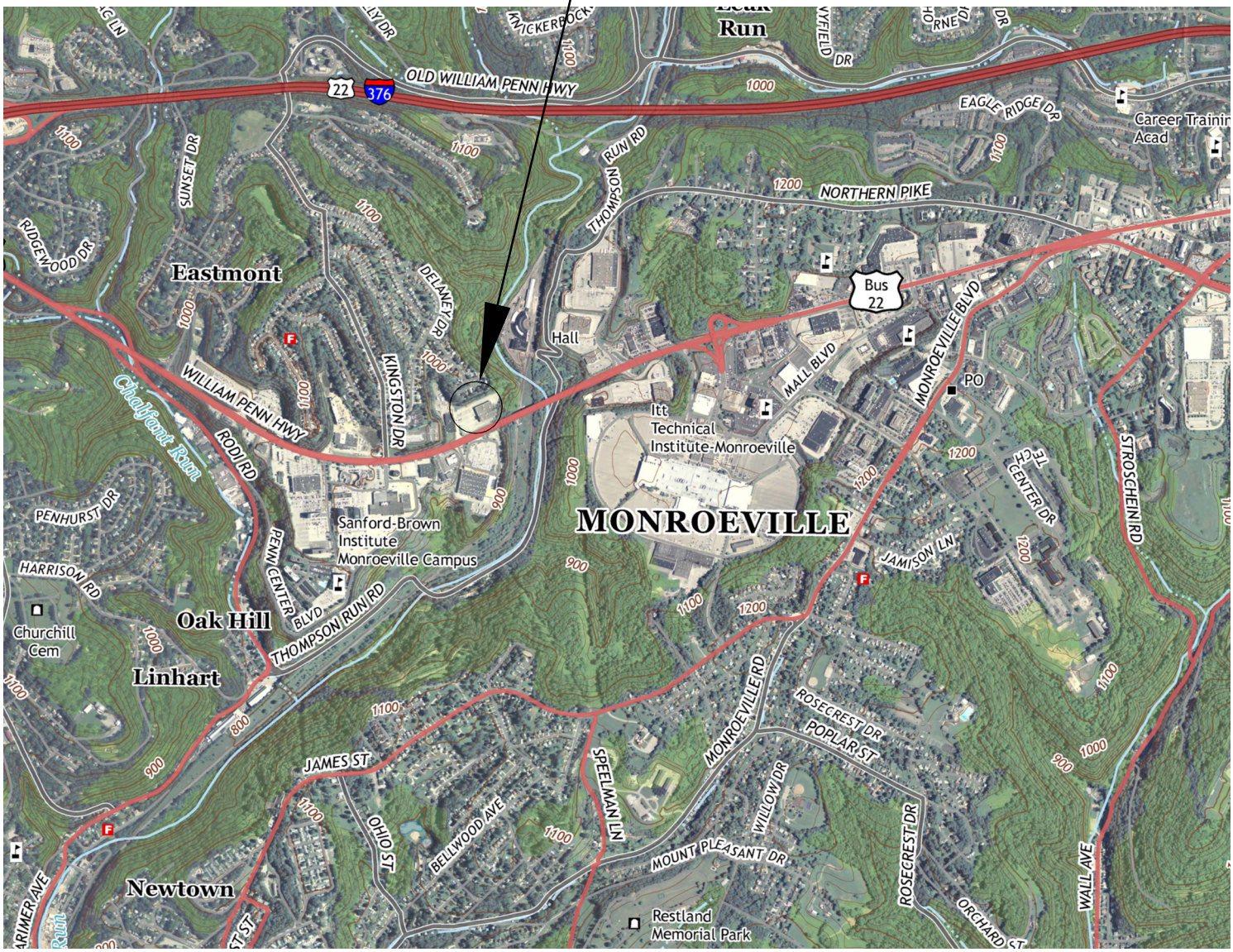
MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS	POTENTIAL REMEDIES (to be performed within 24hrs or as soon as practical)
Stormwater Chamber System	Quarterly within the 1st year of operation *(Annually Thereafter)*	Sediment level buildup	Remove and properly dispose of sediment as necessary per manufacturer's recommendations.
		Clogging of inlet/outlet structure	Clear inlet/outlet structures of debris.
		Excessive leaf litter	Clean and remove as necessary.
Vegetation	Once a week and after every runoff event	Sediment at toe of slope	Check for toe of slope diversion and install if needed.
		Rills and gullies forming	Fill rills and re-grade gullied slopes.
		Bare soil patches	Reseed, fertilize, and mulch bare areas.
Storm Sewers	After every runoff event	Sediment buildup reducing flow capacity	Remove accumulated sediment and/or debris.
		Flooding around or below inlet	Remove accumulated debris from inlet grate.

APPENDIX A

USGS TOPOGRAPHIC MAP OF SITE LOCATION

SITE LOCATION



REFERENCE:
BRADDOCK, PA - 2013 USGS QUADRANGLE

REVISIONS	
DATE	BY

BENDERSON DEVELOPMENT CO., LLC

COMMERCIAL RETAIL

USGS VICINITY MAP

RED SWING GROUP

DEVELOPMENT SERVICES/DUE DILIGENCE/ ENGINEERS/ OWNERS/ SURVEYORS

4314 OLD WILLIAM PENN HWY
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

RSG PROJECT NO: 22-1050

DATE:9/29/2022 | SCALE:1"=2000'

SHEET NO. 1 OF 1

APPENDIX B

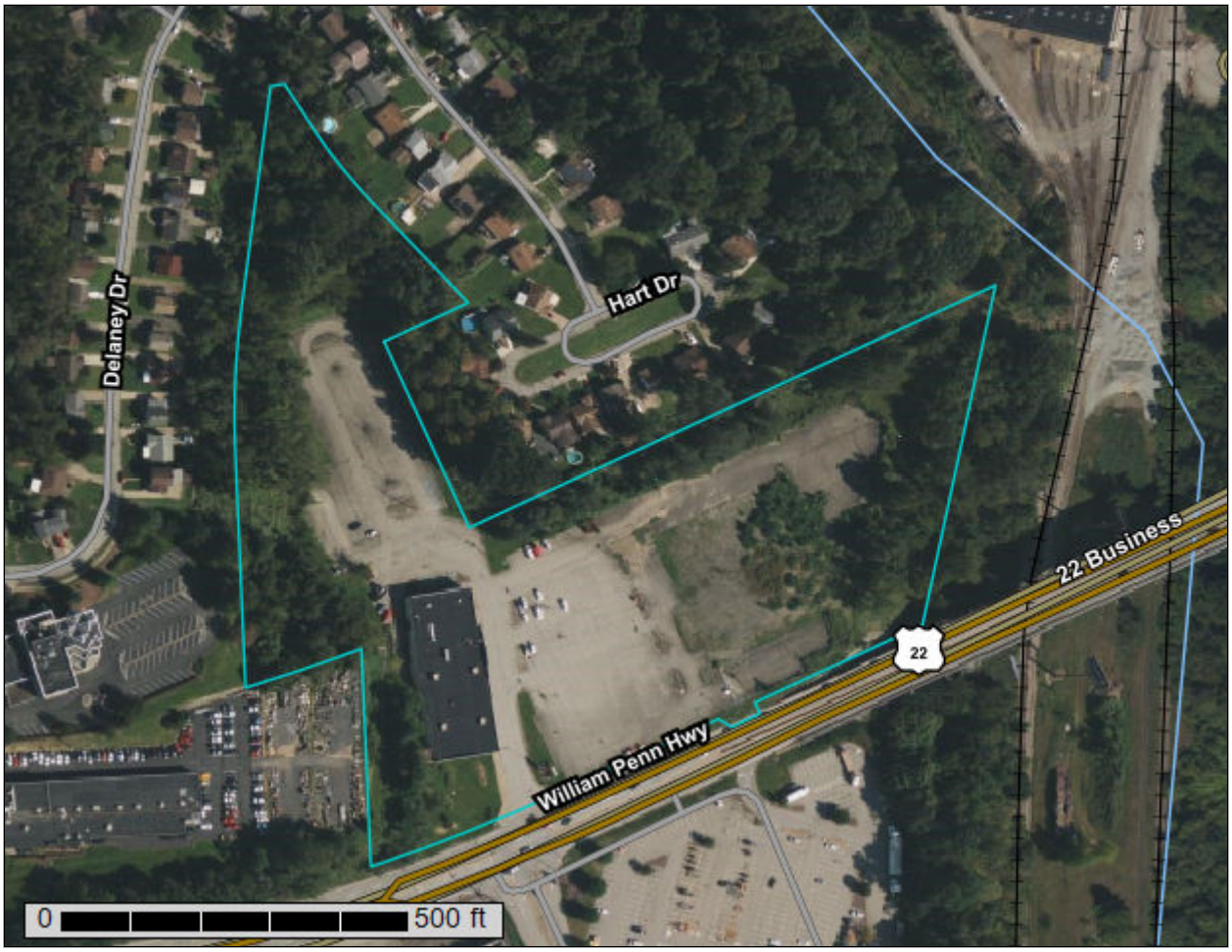
SITE SOILS REPORT

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Allegheny County, Pennsylvania



February 15, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,590 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Allegheny County, Pennsylvania
Survey Area Data: Version 18, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2021—Nov 16, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GQF	Gilpin-Upshur complex, very steep	3.6	28.0%
UB	Urban land	0.0	0.0%
UCD	Urban land-Culleoka complex, moderately steep	2.8	22.2%
UCE	Urban land-Culleoka complex, steep	2.0	15.5%
UWB	Urban land-Wharton complex, gently sloping	4.4	34.2%
Totals for Area of Interest		**12.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Allegheny County, Pennsylvania

GQF—Gilpin-Upshur complex, very steep

Map Unit Setting

National map unit symbol: 2xqvc
Elevation: 680 to 1,330 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 179 to 206 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 45 percent
Upshur and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: channery silt loam
Bt - 6 to 24 inches: channery silt loam
C - 24 to 30 inches: very channery loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F126XY004OH - Side Slope
Hydric soil rating: No

Description of Upshur

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Residuum weathered from clayey shale and/or residuum weathered from mudstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: silty clay loam
Bt1 - 6 to 9 inches: silty clay
Bt2 - 9 to 25 inches: silty clay
Bt3 - 25 to 35 inches: silty clay
BCt - 35 to 40 inches: parachannery silty clay loam
C - 40 to 50 inches: very parachannery silty clay loam
Cr - 50 to 60 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 42 to 84 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F126XY004OH - Side Slope
Hydric soil rating: No

Minor Components

Culleoka

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Weikert

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope

Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Guernsey

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Hazleton

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Wharton

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

UB—Urban land

Map Unit Setting

National map unit symbol: l5px
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Pavement, buildings and other artifically covered areas

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to densic material
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, steep

Percent of map unit: 10 percent
Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

UCD—Urban land-Culleoka complex, moderately steep

Map Unit Setting

National map unit symbol: l5pz
Elevation: 700 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 60 percent
Culleoka and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Culleoka

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 33 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F126XY004OH - Side Slope
Hydric soil rating: No

UCE—Urban land-Culleoka complex, steep

Map Unit Setting

National map unit symbol: l5q0
Elevation: 720 to 1,280 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Culleoka and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Human transported material

Typical profile

H1 - 0 to 6 inches: variable

Properties and qualities

Slope: 25 to 35 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from nonacid siltstone, fine-grained sandstone, and shale

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 27 inches: channery silt loam
H3 - 27 to 29 inches: very flaggy clay loam
H4 - 29 to 31 inches: bedrock

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F126XY004OH - Side Slope
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 5 percent

Hydric soil rating: No

UWB—Urban land-Wharton complex, gently sloping

Map Unit Setting

National map unit symbol: l5q5
Elevation: 790 to 1,500 feet
Mean annual precipitation: 35 to 51 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 115 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 75 percent
Wharton and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Human transported material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Wharton

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 42 inches: silty clay loam
H3 - 42 to 60 inches: silty clay
H4 - 60 to 73 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: 48 to 72 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F126XY003OH - Moist Ridge
Hydric soil rating: No

Minor Components

Cavode

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Armagh

Percent of map unit: 1 percent
Landform: Depressions on hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

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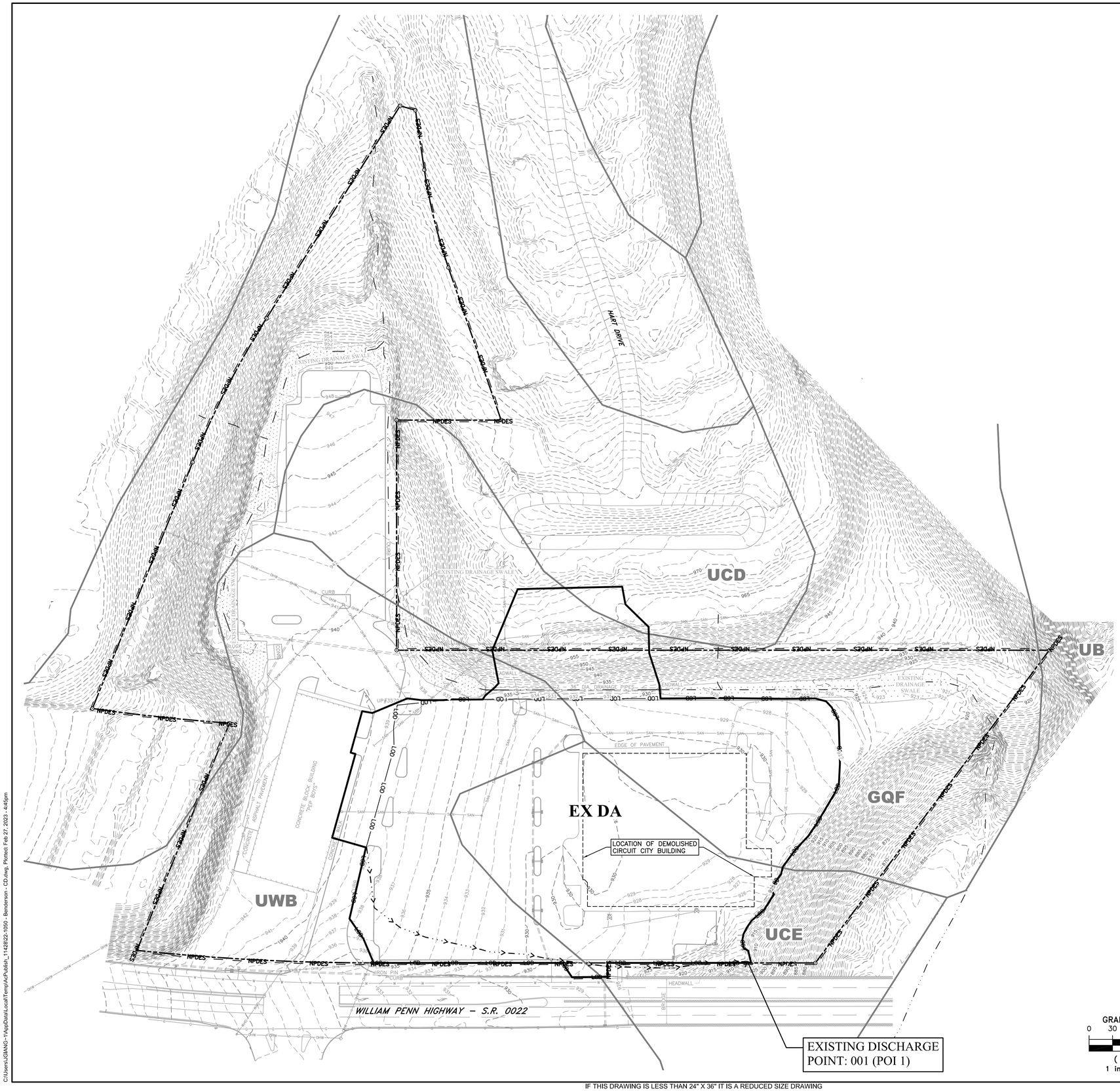
APPENDIX C

PRE-DEVELOPMENT DRAINAGE AREA MAP & CALCULATIONS

PRE-DEVELOPMENT DRAINAGE AREA MAP



SOIL TYPES TABLE

MAP UNIT SYMBOL	MAP UNIT NAME	HYDROLOGIC SOIL GROUP
GQF	GILPIN–UPSHUR COMPLEX, VERY STEEP	C
UB	URBAN LAND	D*
UCD	URBAN LAND–CULLEOKA COMPLEX, MODERATELY STEEP	D*
UCE	URBAN LAND–CULLEOKA COMPLEX, STEEP	D*
UWB	URBAN LAND–WHARTON COMPLEX, GENTLY SLOPING	D*
*URBAN SOILS MODELED WITH AN HSG OF 'D' FOR DESIGN PURPOSES		

AREA SUMMARY/LEGEND

IMPERVIOUS AREAS:

- EXISTING BUILDING
- EXISTING DRAINAGE SWALE
- EXISTING PAVEMENT
- EX DA — EXISTING DRAINAGE AREA
- 931 — EXISTING MINOR (1 FT) CONTOURS
- 930 — EXISTING MAJOR (5 FT) CONTOURS
- EXISTING PROPERTY LINE
- UB — EXISTING SOIL BOUNDARY
- EXISTING TIME OF CONCENTRATION (TC)
- LOD — LIMIT OF DISTURBANCE
- NPDES — NDPES PERMIT BOUNDARY

AREA SUMMARY:

EX DA IMPERVIOUS AREA:	186,045 SF
EX DA PERVIOUS AREA:	36,286 SF
EX DA TOTAL AREA:	222,331 SF

GRAPHIC SCALE
0 30 60 120
(IN FEET)
1 inch = 60 ft.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

Know what's **below.** **Call** before you dig.

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
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CONSTRUCTION PHASE AND 10 WORKING
DAYS NOTICE IN DESIGN STAGE.
STOP CALL
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1–800–242–1776

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ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	2/28/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 02/28/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

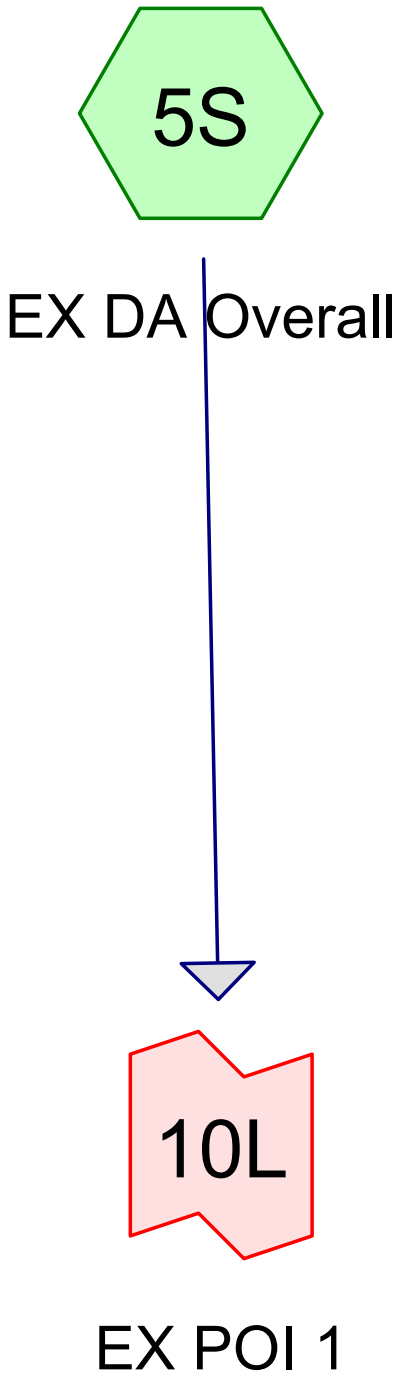
SHEET TITLE:
PRE-DEVELOPMENT DRAINAGE AREA MAP

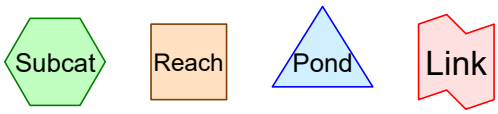
SHEET NO.
SWM1.1

C:\Users\JGANG~1\AppData\Local\Temp\AcPublish_11428\22-1029 - Benderson - CD.dwg, Plotted: Feb 27, 2023 - 4:45pm

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

PRE-DEVELOPMENT DRAINAGE AREA CALCULATIONS





Routing Diagram for 230210 - 22-1050 HydroCAD SWM
Prepared by Red Swing Group, Printed 2/28/2023
HydroCAD® 10.10-7c s/n 08318 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr Wilkins	Type II 24-hr		Default	24.00	1	2.00	2
2	2-yr Wilkins	Type II 24-hr		Default	24.00	1	2.50	2
3	10-yr Wilkins	Type II 24-hr		Default	24.00	1	3.61	2
4	25-yr Wilkins	Type II 24-hr		Default	24.00	1	4.31	2
5	50-yr NOAA	Type II 24-hr		Default	24.00	1	4.45	2
6	100-yr Wilkins	Type II 24-hr		Default	24.00	1	5.71	2

Summary for Subcatchment 5S: EX DA Overall

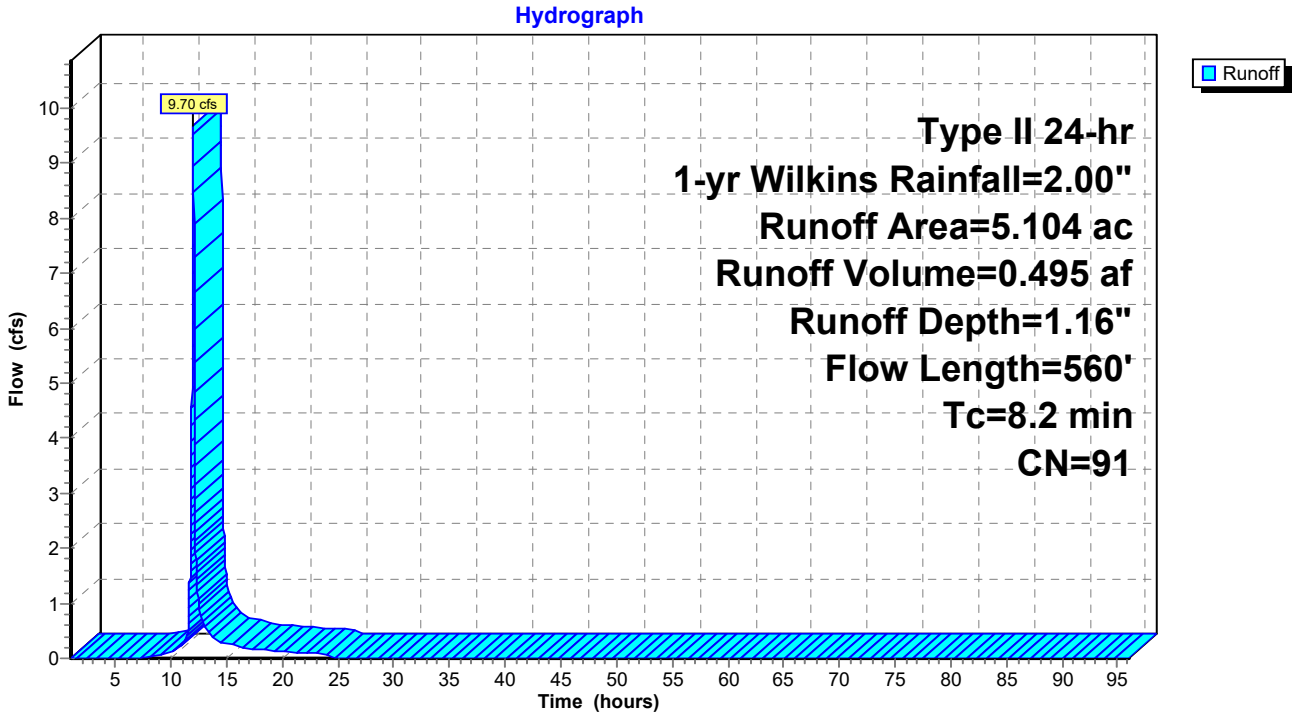
Runoff = 9.70 cfs @ 12.00 hrs, Volume= 0.495 af, Depth= 1.16"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Wilkins Rainfall=2.00"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

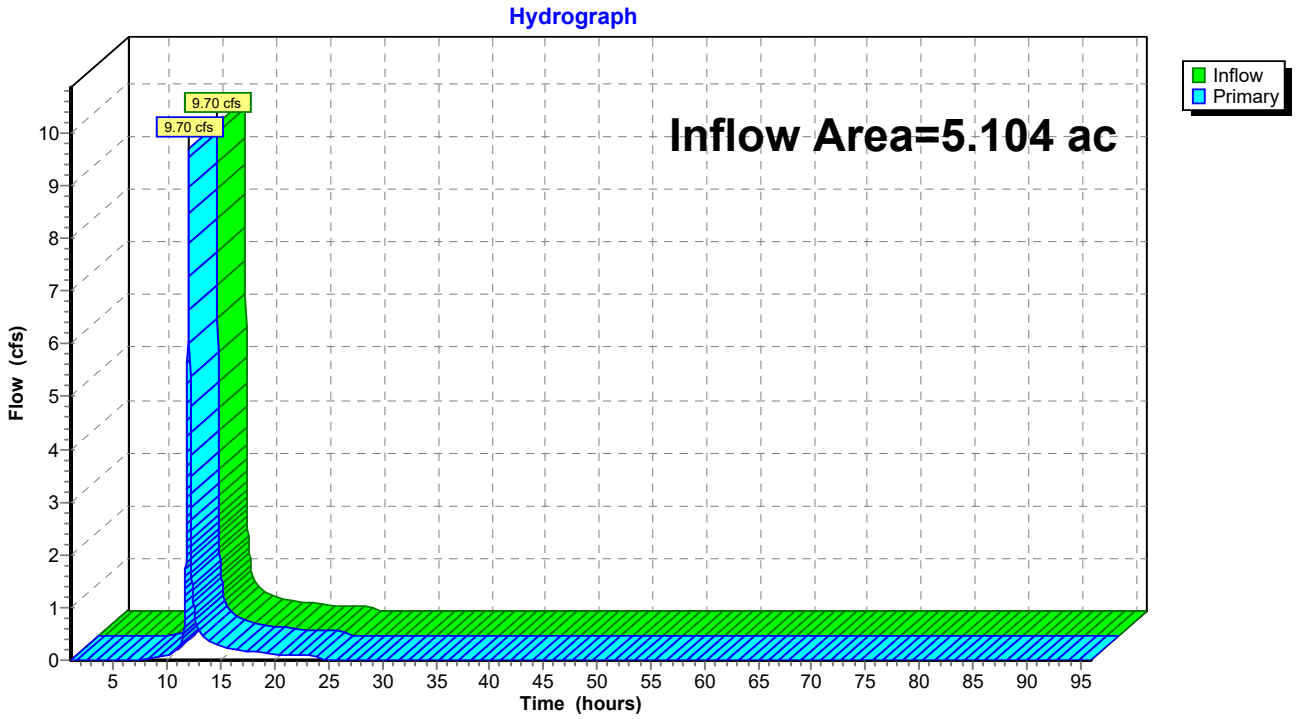


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 1.16" for 1-yr Wilkins event
Inflow = 9.70 cfs @ 12.00 hrs, Volume= 0.495 af
Primary = 9.70 cfs @ 12.00 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 10L: EX POI 1



Summary for Subcatchment 5S: EX DA Overall

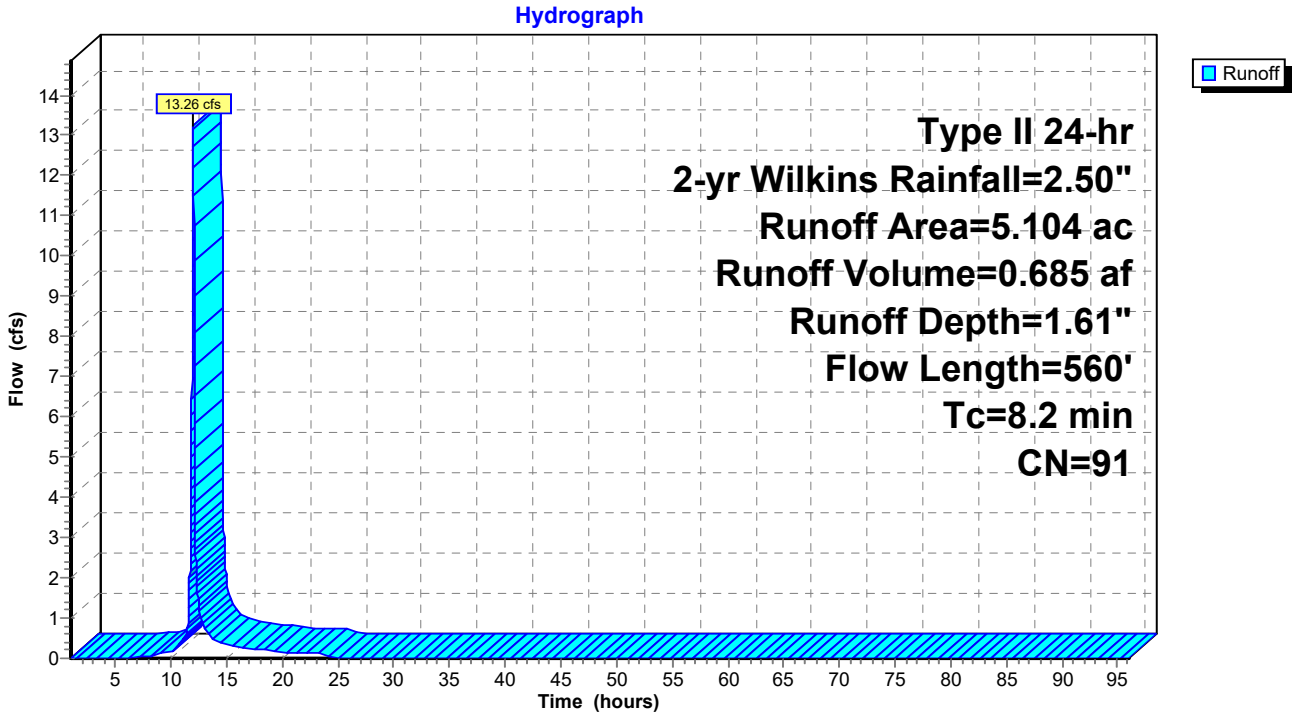
Runoff = 13.26 cfs @ 12.00 hrs, Volume= 0.685 af, Depth= 1.61"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Wilkins Rainfall=2.50"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

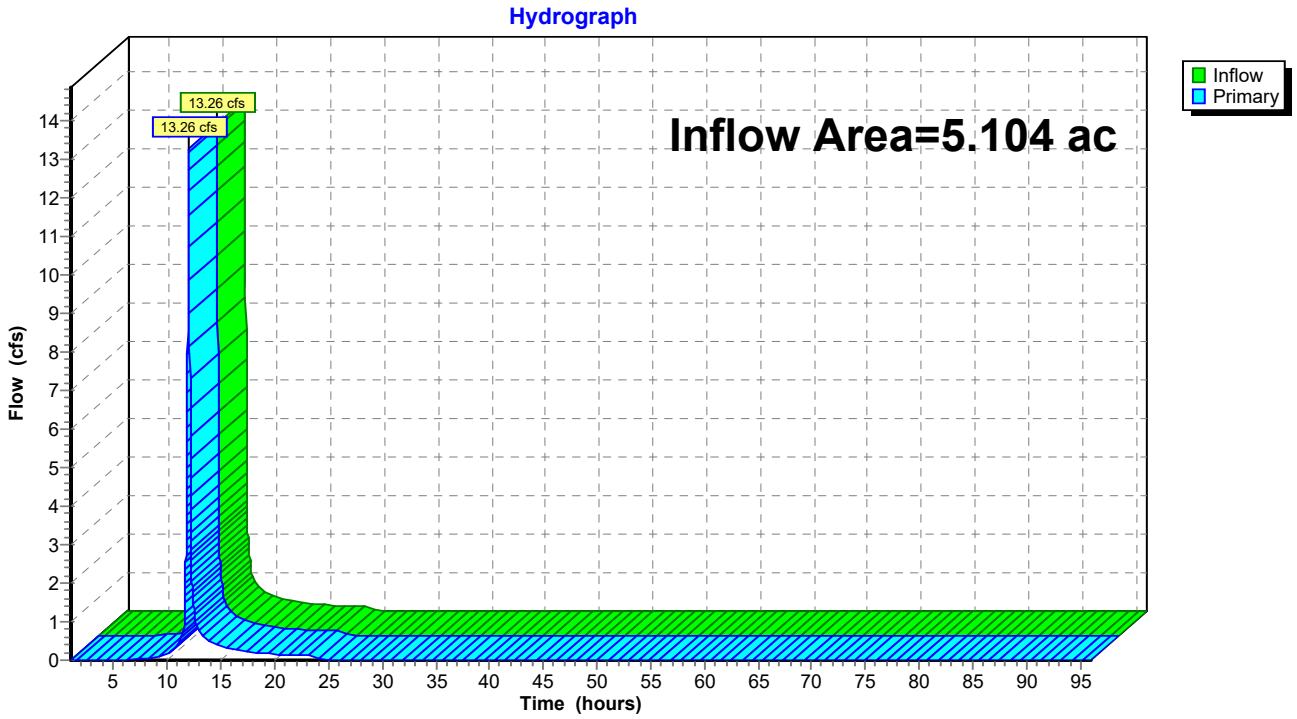


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 1.61" for 2-yr Wilkins event
Inflow = 13.26 cfs @ 12.00 hrs, Volume= 0.685 af
Primary = 13.26 cfs @ 12.00 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 10L: EX POI 1



Summary for Subcatchment 5S: EX DA Overall

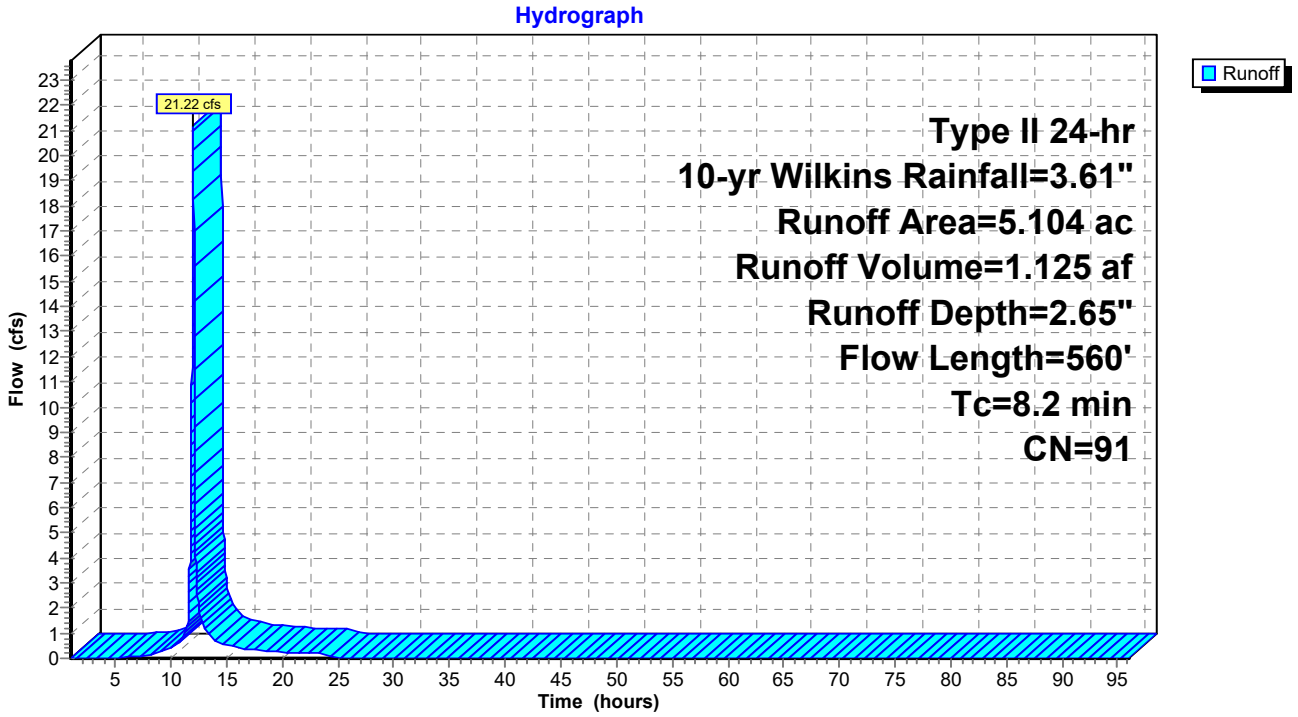
Runoff = 21.22 cfs @ 11.99 hrs, Volume= 1.125 af, Depth= 2.65"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Wilkins Rainfall=3.61"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

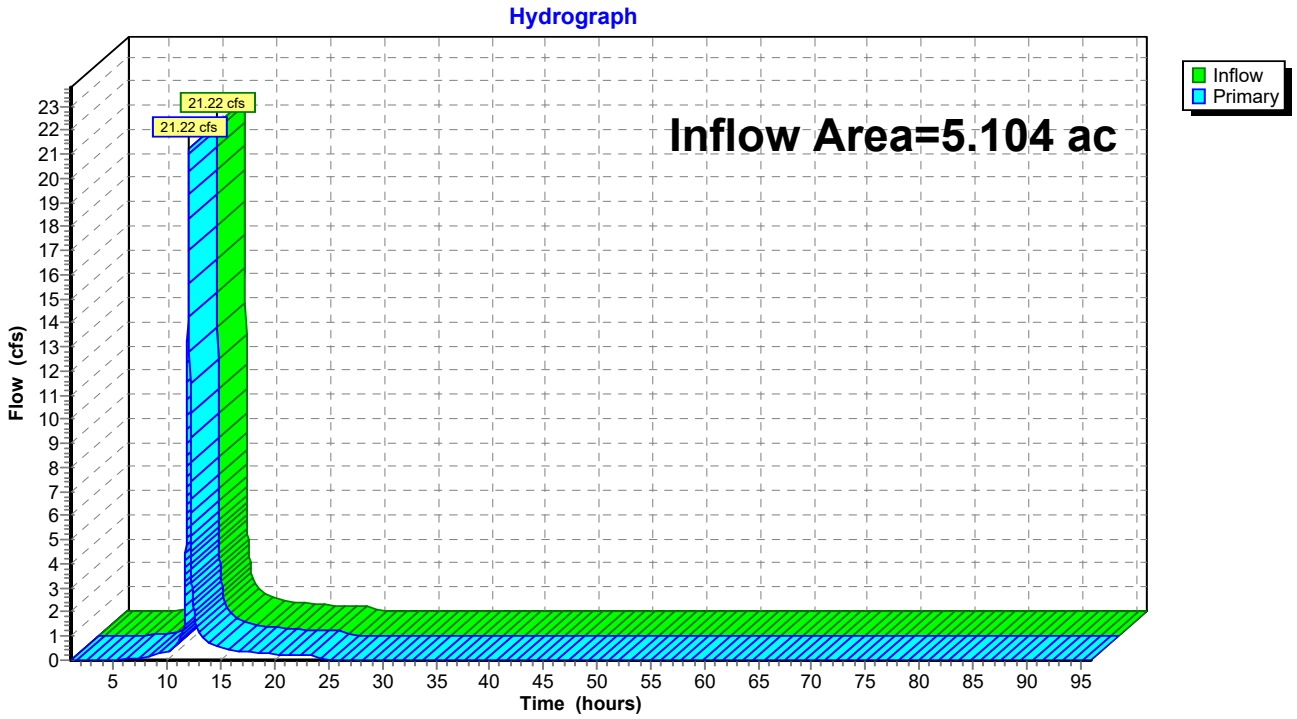


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 2.65" for 10-yr Wilkins event
Inflow = 21.22 cfs @ 11.99 hrs, Volume= 1.125 af
Primary = 21.22 cfs @ 11.99 hrs, Volume= 1.125 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 10L: EX POI 1



Summary for Subcatchment 5S: EX DA Overall

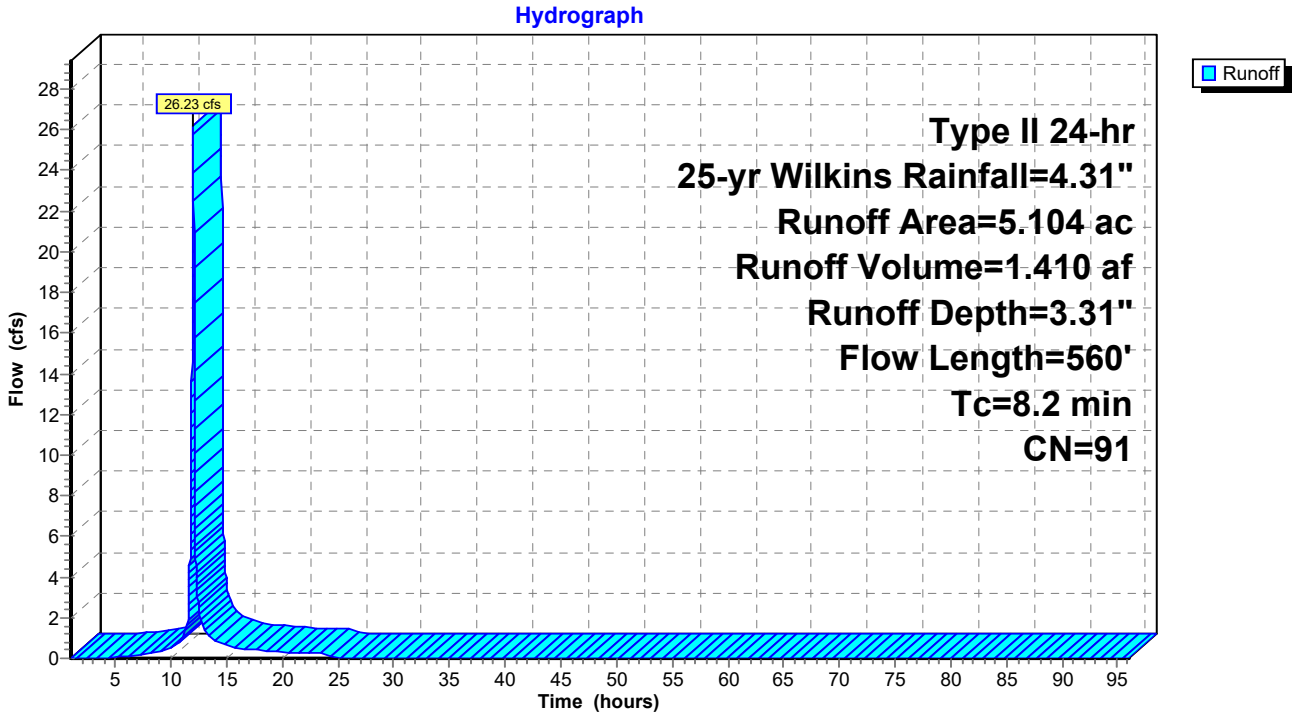
Runoff = 26.23 cfs @ 11.99 hrs, Volume= 1.410 af, Depth= 3.31"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Wilkins Rainfall=4.31"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

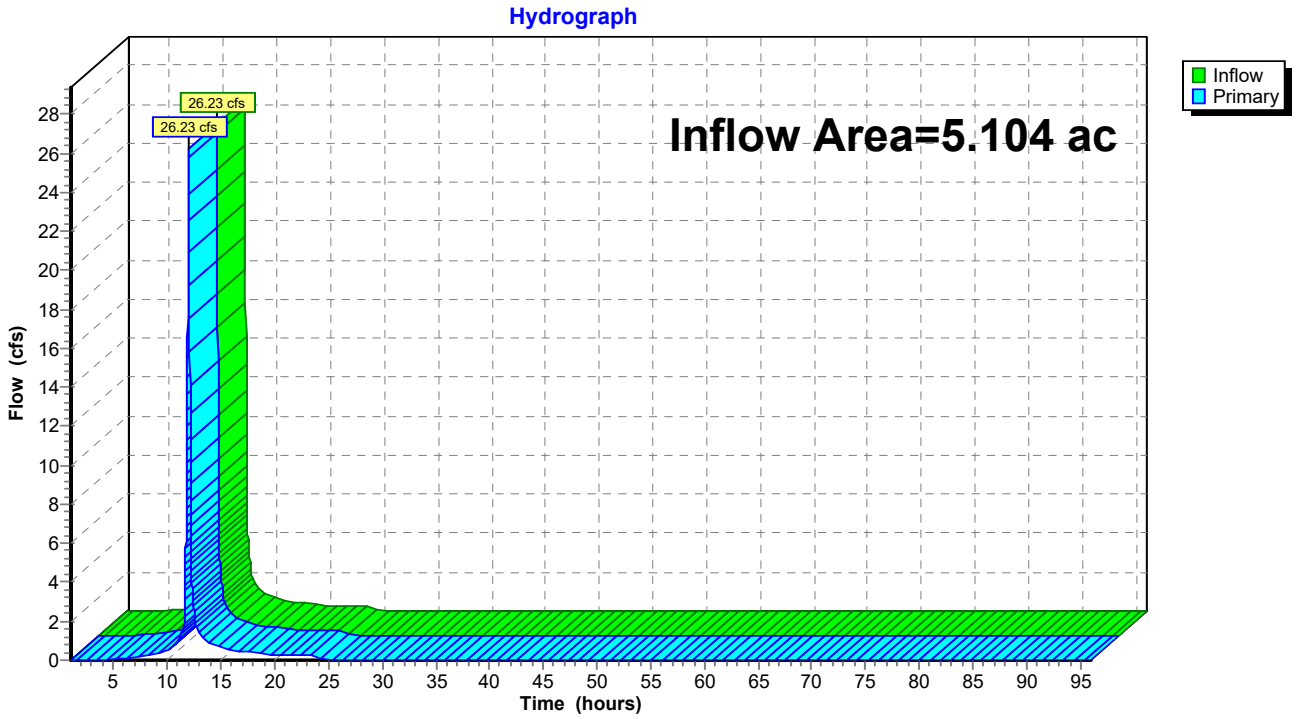


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 3.31" for 25-yr Wilkins event
Inflow = 26.23 cfs @ 11.99 hrs, Volume= 1.410 af
Primary = 26.23 cfs @ 11.99 hrs, Volume= 1.410 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 10L: EX POI 1



Summary for Subcatchment 5S: EX DA Overall

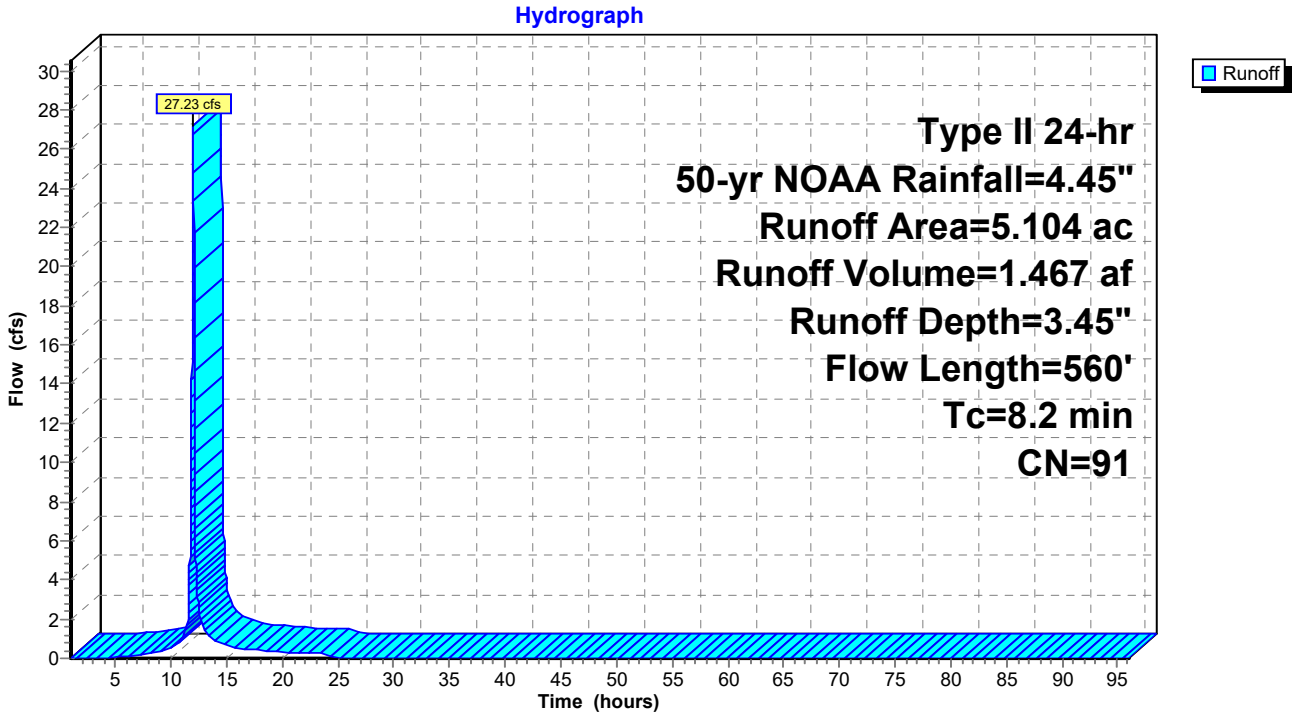
Runoff = 27.23 cfs @ 11.99 hrs, Volume= 1.467 af, Depth= 3.45"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr NOAA Rainfall=4.45"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

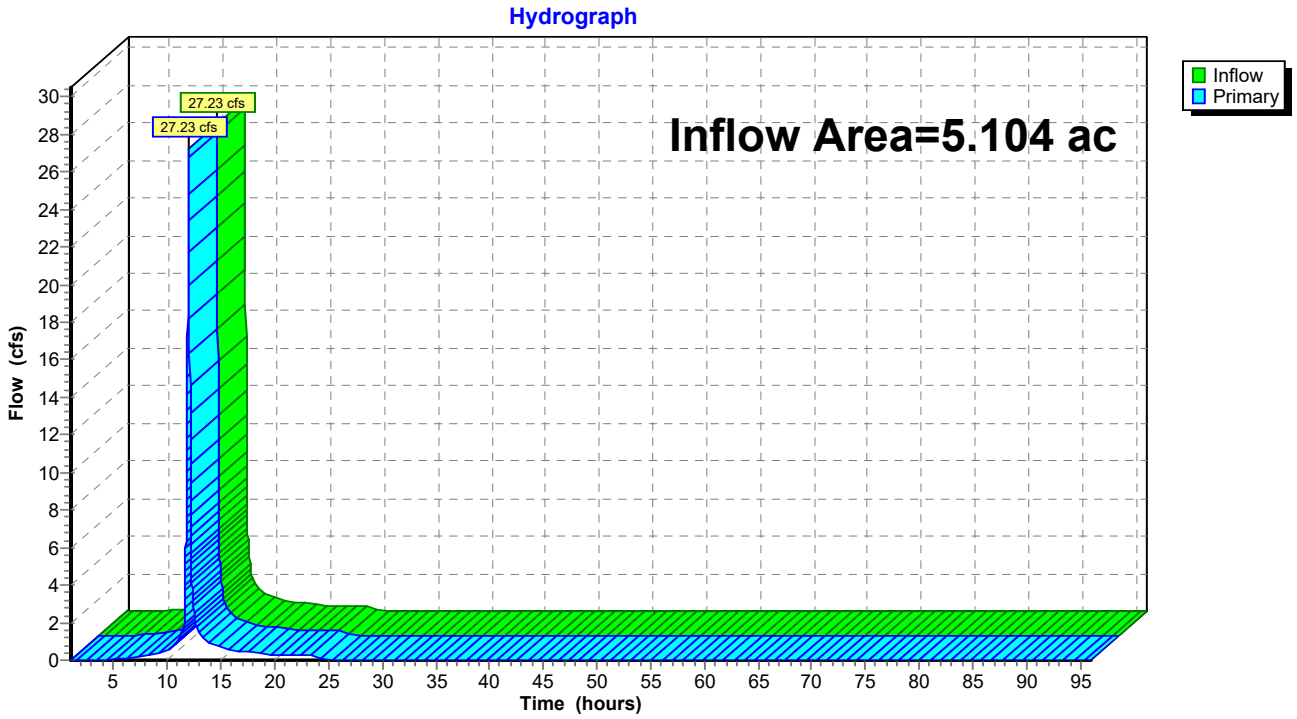


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 3.45" for 50-yr NOAA event
Inflow = 27.23 cfs @ 11.99 hrs, Volume= 1.467 af
Primary = 27.23 cfs @ 11.99 hrs, Volume= 1.467 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 10L: EX POI 1



Summary for Subcatchment 5S: EX DA Overall

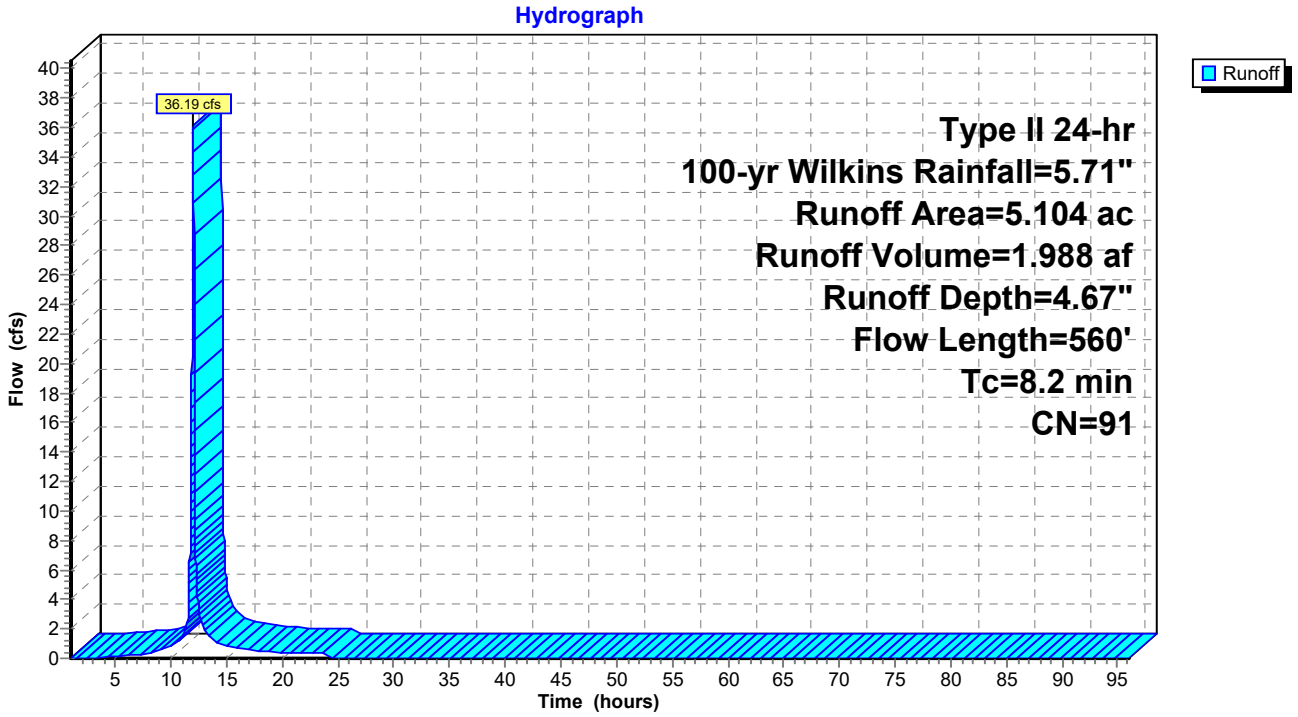
Runoff = 36.19 cfs @ 11.99 hrs, Volume= 1.988 af, Depth= 4.67"
Routed to Link 10L : EX POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Wilkins Rainfall=5.71"

	Area (ac)	CN	Description
	2.425	98	Paved parking, HSG D
	0.991	98	Paved parking, HSG C
	0.093	77	Woods, Good, HSG D
	0.275	70	Woods, Good, HSG C
	0.278	80	>75% Grass cover, Good, HSG D
	0.187	74	>75% Grass cover, Good, HSG C
*	0.607	80	20% Meadow Good Condition D
*	0.248	74	20% Meadow Good Condition C
	5.104	91	Weighted Average
	1.688		33.07% Pervious Area
	3.416		66.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Tc** Grass: Short n= 0.150 P2= 2.50"
1.2	263	0.0342	3.75		**Shallow Concentrated Flow, Tc** Paved Kv= 20.3 fps
0.2	79	0.0113	5.60	6.87	**Pipe Channel, Tc Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.2	123	0.0407	11.99	21.19	**Pipe Channel, Tc Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
0.2	45	0.0673	4.18		**Shallow Concentrated Flow, Tc** Unpaved Kv= 16.1 fps
8.2	560	Total			

Subcatchment 5S: EX DA Overall

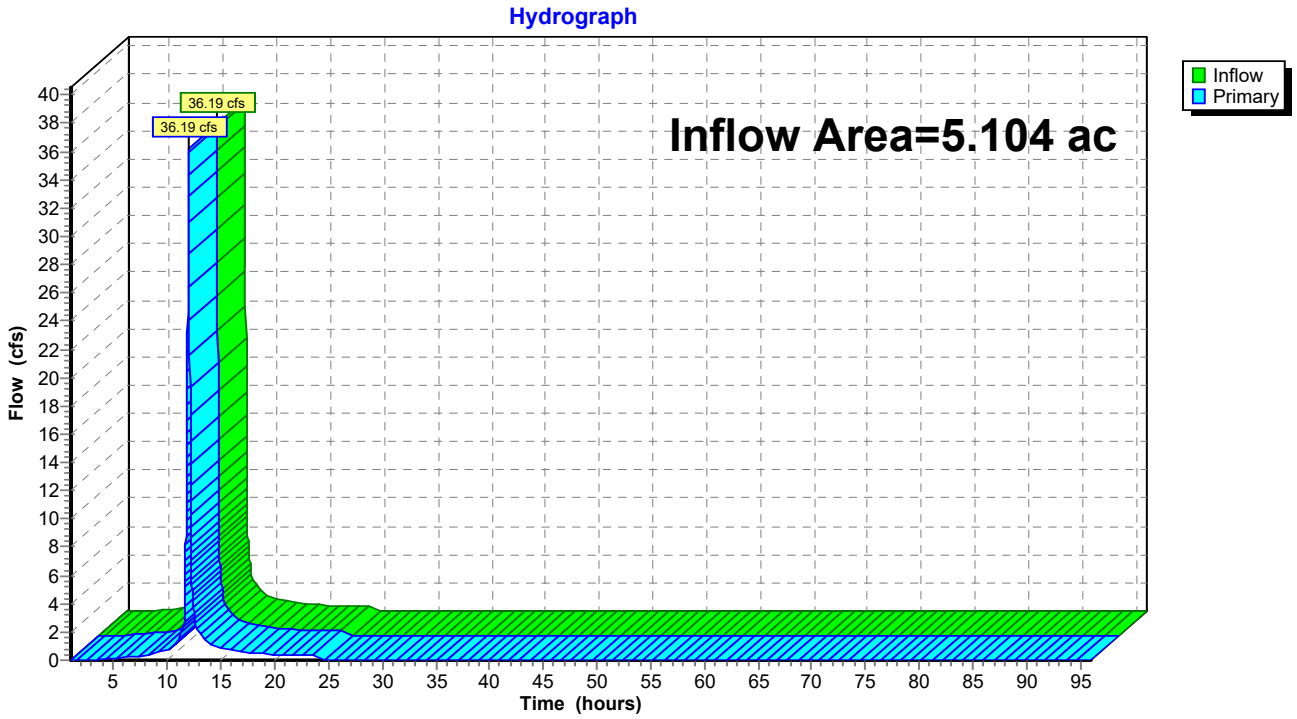


Summary for Link 10L: EX POI 1

Inflow Area = 5.104 ac, 66.93% Impervious, Inflow Depth = 4.67" for 100-yr Wilkins event
Inflow = 36.19 cfs @ 11.99 hrs, Volume= 1.988 af
Primary = 36.19 cfs @ 11.99 hrs, Volume= 1.988 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

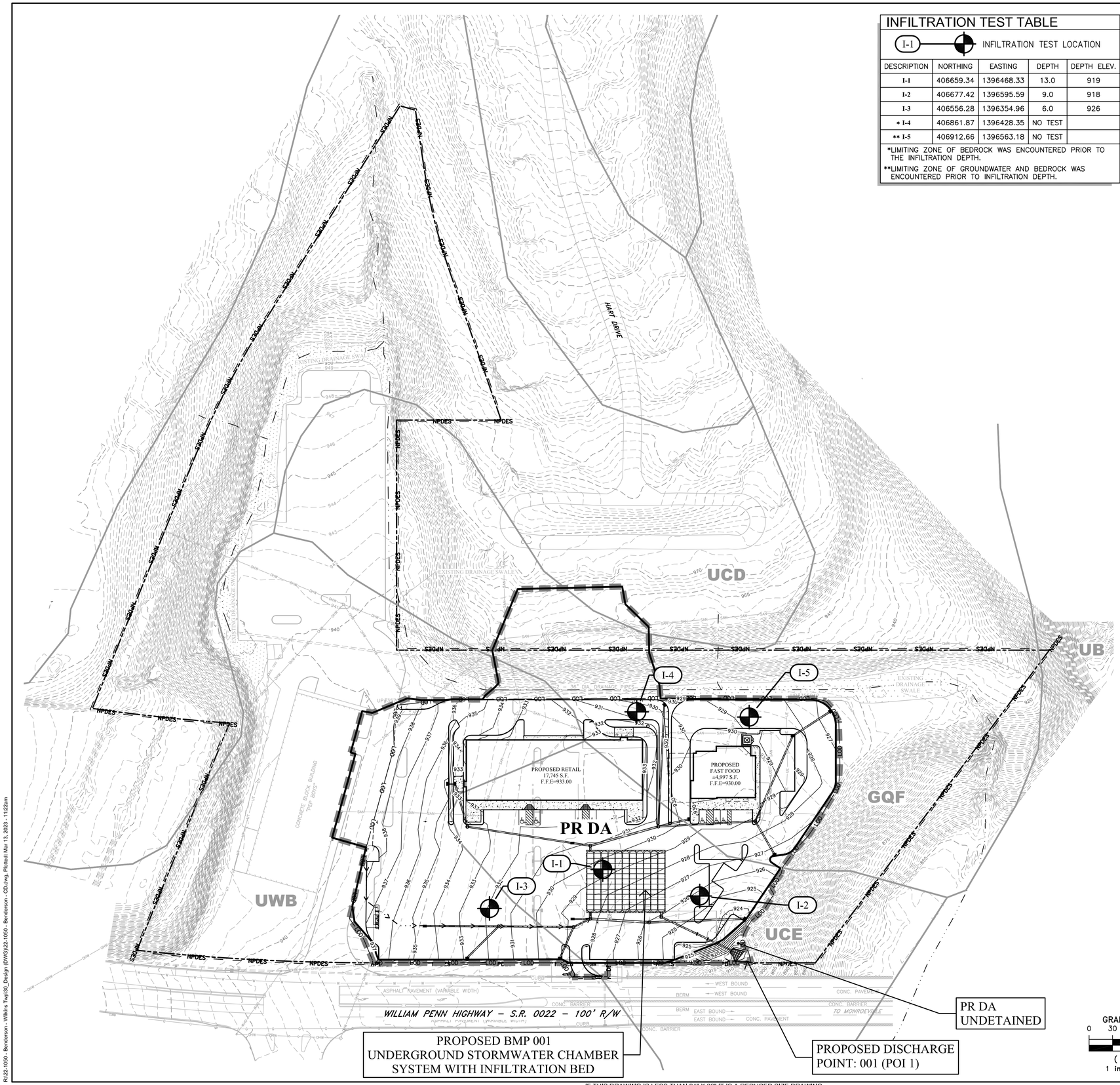
Link 10L: EX POI 1



APPENDIX D

POST-DEVELOPMENT DRAINAGE AREA MAP & CALCULATIONS

POST-DEVELOPMENT DRAINAGE AREA MAP



INFILTRATION TEST TABLE

I-1 INFILTRATION TEST LOCATION

DESCRIPTION	NORTHING	EASTING	DEPTH	DEPTH ELEV.
I-1	406659.34	1396468.33	13.0	919
I-2	406677.42	1396595.59	9.0	918
I-3	406556.28	1396354.96	6.0	926
* I-4	406861.87	1396428.35	NO TEST	
** I-5	406912.66	1396563.18	NO TEST	

*LIMITING ZONE OF BEDROCK WAS ENCOUNTERED PRIOR TO THE INFILTRATION DEPTH.

**LIMITING ZONE OF GROUNDWATER AND BEDROCK WAS ENCOUNTERED PRIOR TO INFILTRATION DEPTH.

SOIL TYPES TABLE

MAP UNIT SYMBOL	MAP UNIT NAME	HYDROLOGIC SOIL GROUP
GQF	GILPIN–UPSHUR COMPLEX, VERY STEEP	C
UB	URBAN LAND	D*
UCD	URBAN LAND–CULLEOKA COMPLEX, MODERATELY STEEP	D*
UCE	URBAN LAND–CULLEOKA COMPLEX, STEEP	D*
UWB	URBAN LAND–WHARTON COMPLEX, GENTLY SLOPING	D*

*URBAN SOILS MODELED WITH AN HSG OF 'D' FOR DESIGN PURPOSES

AREA SUMMARY/LEGEND

IMPERVIOUS AREAS:

- EXISTING BUILDING
- EXISTING DRAINAGE SWALE
- PROPOSED CONCRETE
- PROPOSED CHAMBER SYSTEM DRAINAGE AREA
- PR DA — PROPOSED OVERALL DRAINAGE AREA
- 931 / 930 — EXISTING MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- 931 / 930 — PROPOSED MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- EXISTING PROPERTY LINE
- UB — EXISTING SOIL BOUNDARY
- PROPOSED TIME OF CONCENTRATION (TC)
- LOD — LIMIT OF DISTURBANCE
- NPDES — NDPES PERMIT BOUNDARY

AREA SUMMARY:

PR DA IMPERVIOUS AREA:	186,046 SF
PR DA PERVIOUS AREA:	27,399 SF
PR DA TOTAL AREA:	213,445 SF
PR DA UNDETAINED IMPERVIOUS AREA:	392 SF
PR DA UNDETAINED PERVIOUS AREA:	8,494 SF
PR DA UNDETAINED TOTAL AREA:	8,886 SF

GRAPHIC SCALE
0 30 60 120
(IN FEET)
1 inch = 60 ft.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

Know what's below. Call before you dig.

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE WORKING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

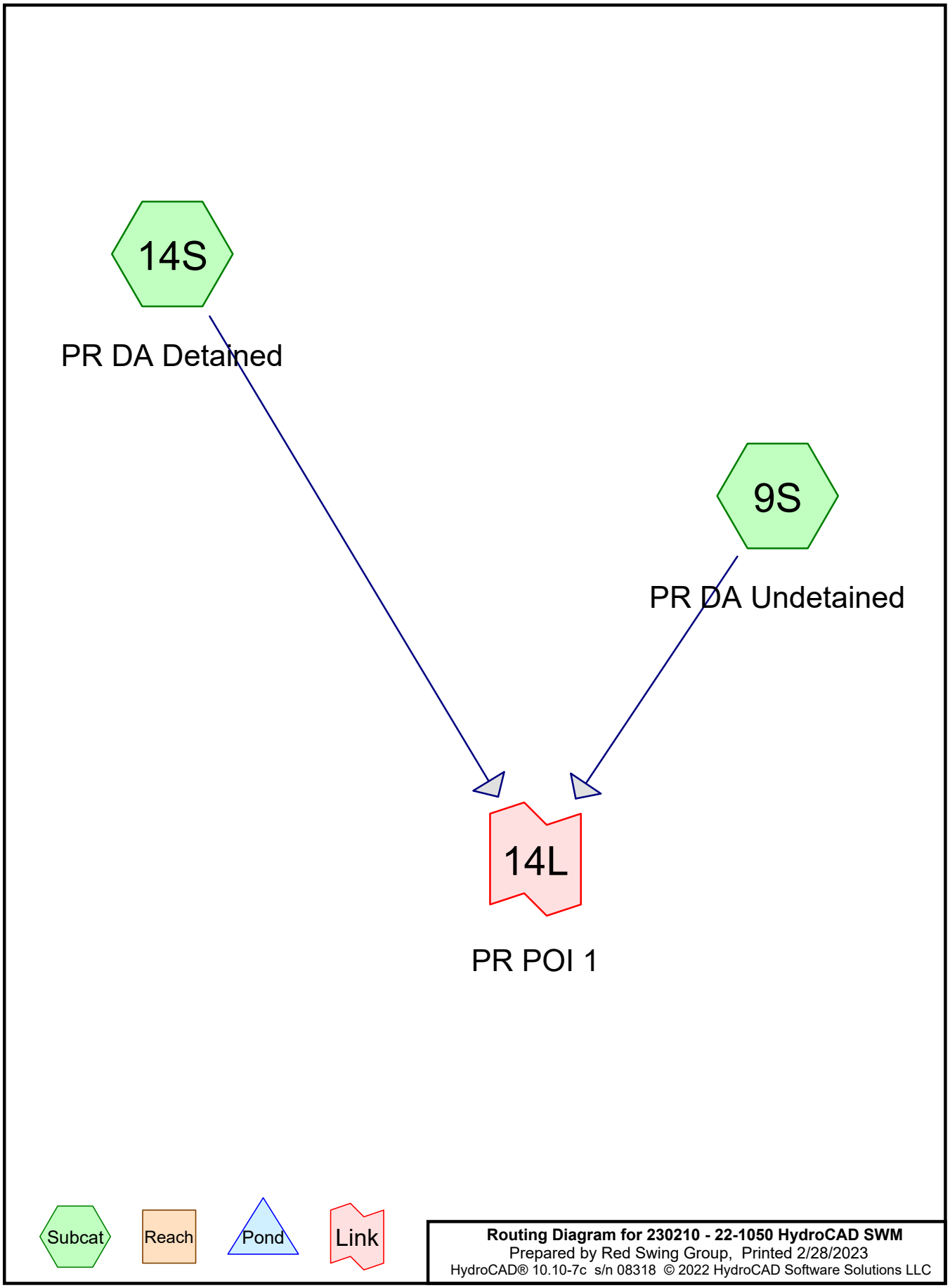
SHEET TITLE:
POST-DEVELOPMENT DRAINAGE AREA MAP

SHEET NO.
SWM1.2

R:\22-1029 - Benderson - Wilkins Twp\3D_Design (DWG)\22-1029 - Benderson - CD.dwg Plotted: Mar 13, 2023 - 11:22am

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

POST-DEVELOPMENT DRAINAGE AREA CALCULATIONS WITHOUT BMP



Routing Diagram for 230210 - 22-1050 HydroCAD SWM
Prepared by Red Swing Group, Printed 2/28/2023
HydroCAD® 10.10-7c s/n 08318 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr Wilkins	Type II 24-hr		Default	24.00	1	2.00	2
2	2-yr Wilkins	Type II 24-hr		Default	24.00	1	2.50	2
3	10-yr Wilkins	Type II 24-hr		Default	24.00	1	3.61	2
4	25-yr Wilkins	Type II 24-hr		Default	24.00	1	4.31	2
5	50-yr NOAA	Type II 24-hr		Default	24.00	1	4.45	2
6	100-yr Wilkins	Type II 24-hr		Default	24.00	1	5.71	2

Summary for Subcatchment 9S: PR DA Undetained

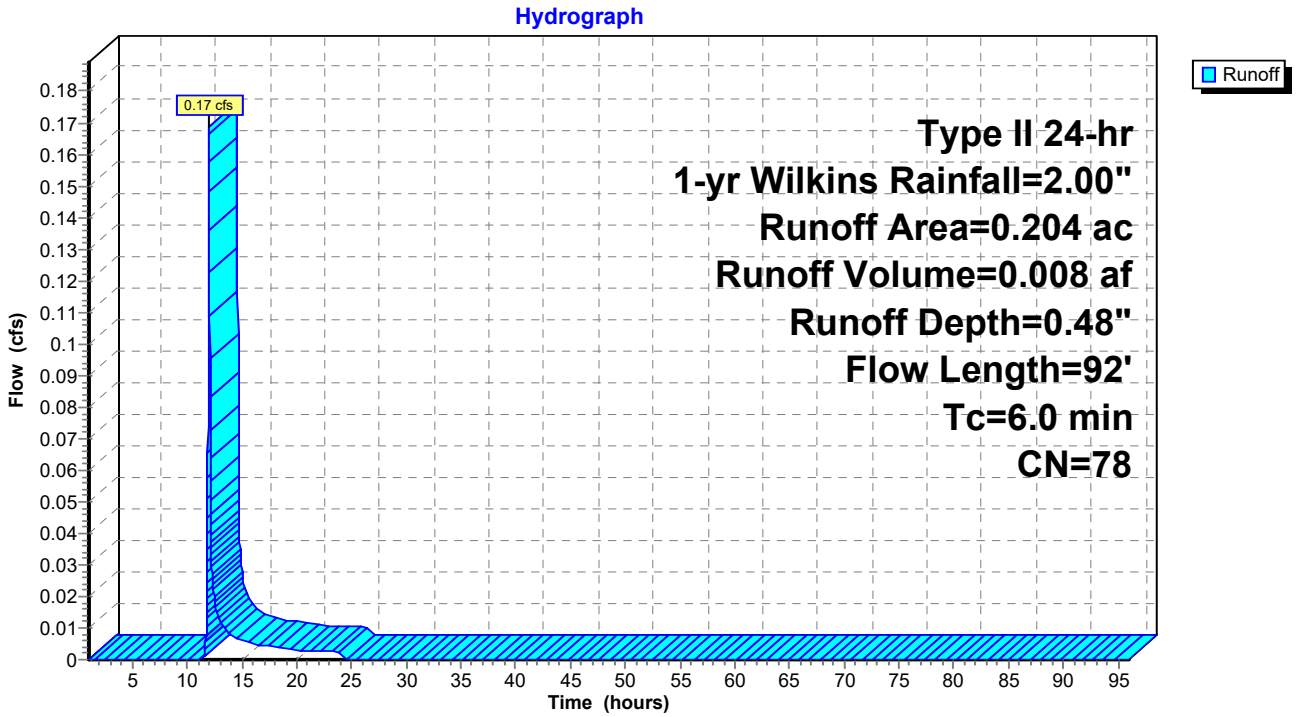
Runoff = 0.17 cfs @ 11.98 hrs, Volume= 0.008 af, Depth= 0.48"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Wilkins Rainfall=2.00"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

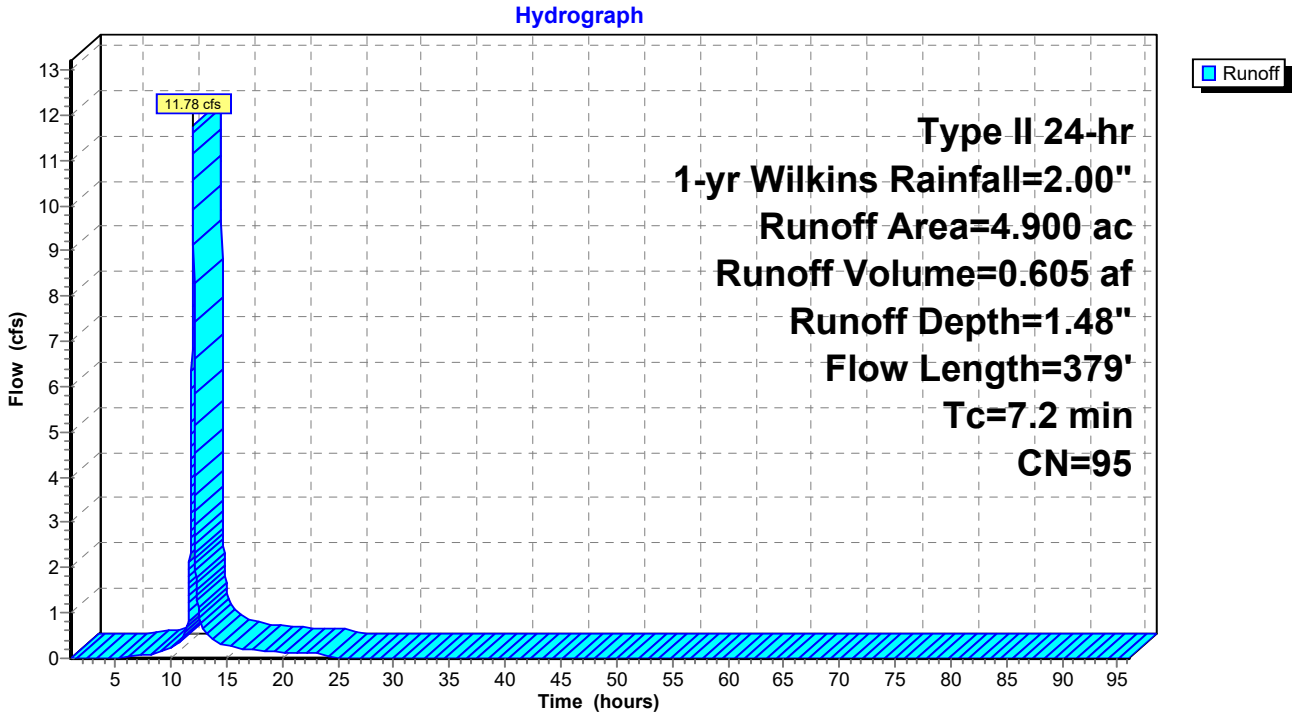
Runoff = 11.78 cfs @ 11.98 hrs, Volume= 0.605 af, Depth= 1.48"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Wilkins Rainfall=2.00"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

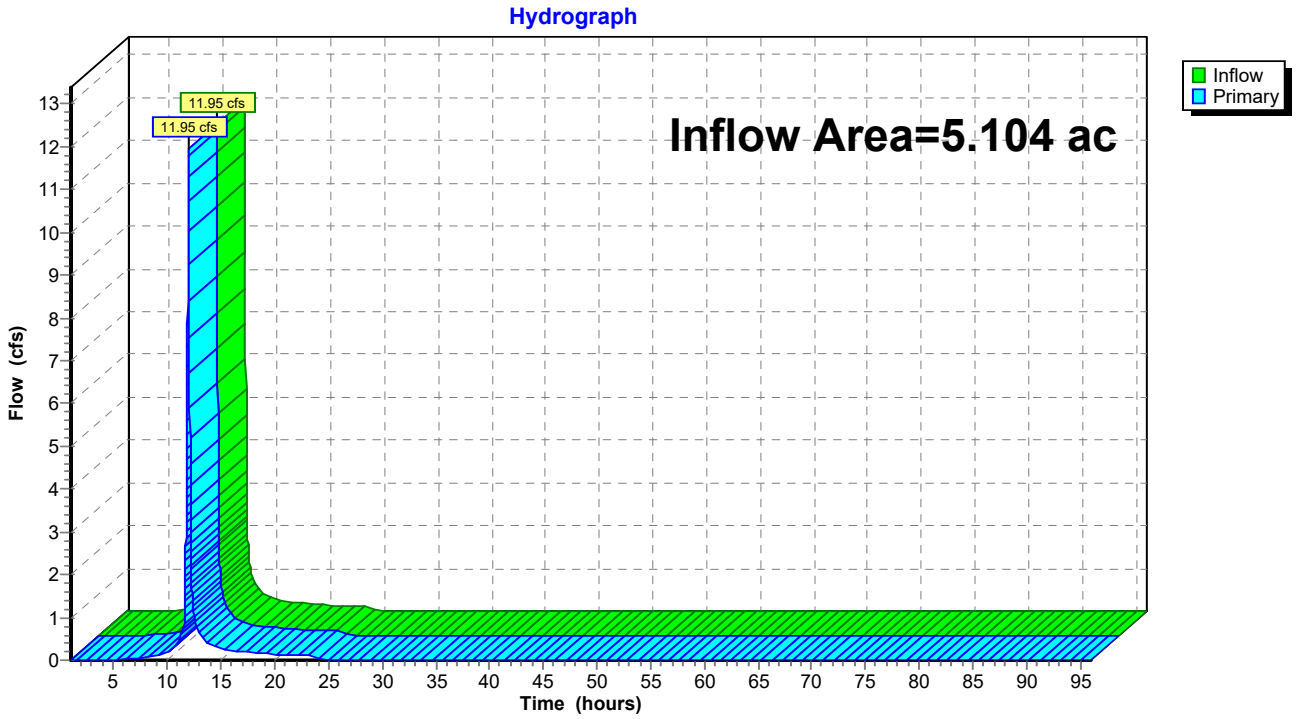


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 1.44" for 1-yr Wilkins event
Inflow = 11.95 cfs @ 11.98 hrs, Volume= 0.614 af
Primary = 11.95 cfs @ 11.98 hrs, Volume= 0.614 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

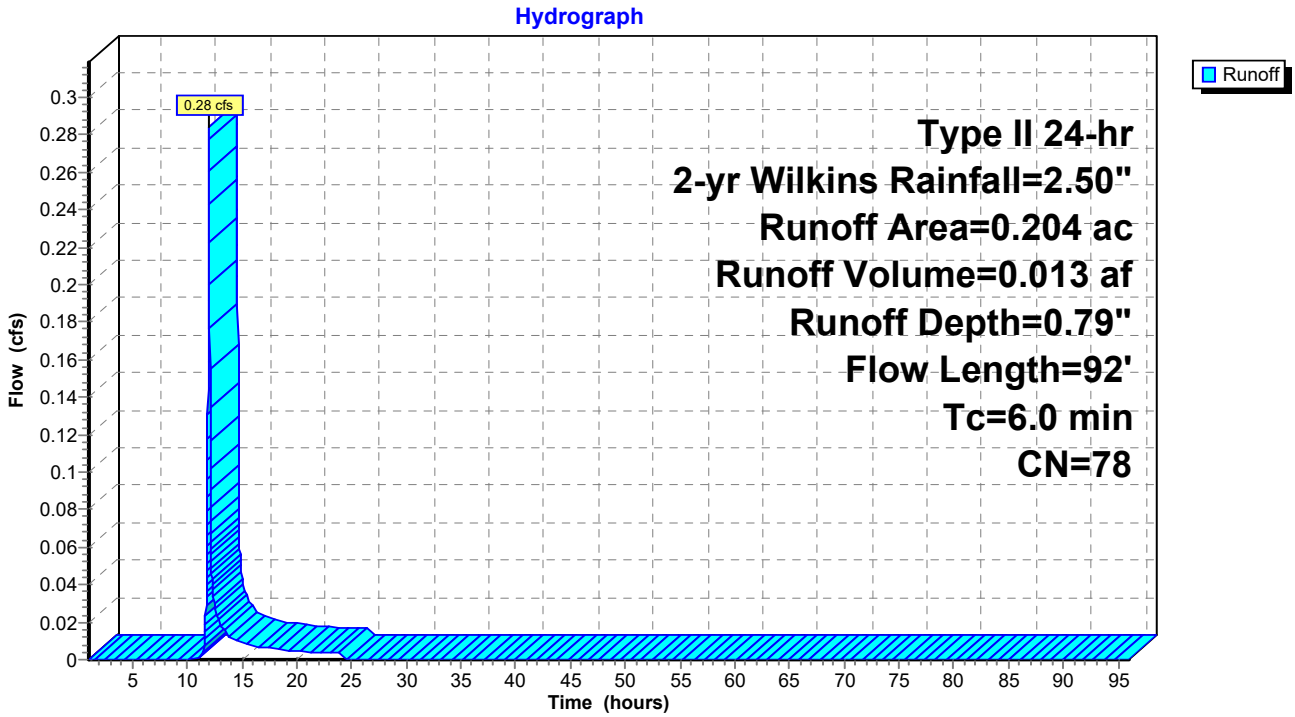
Runoff = 0.28 cfs @ 11.98 hrs, Volume= 0.013 af, Depth= 0.79"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Wilkins Rainfall=2.50"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

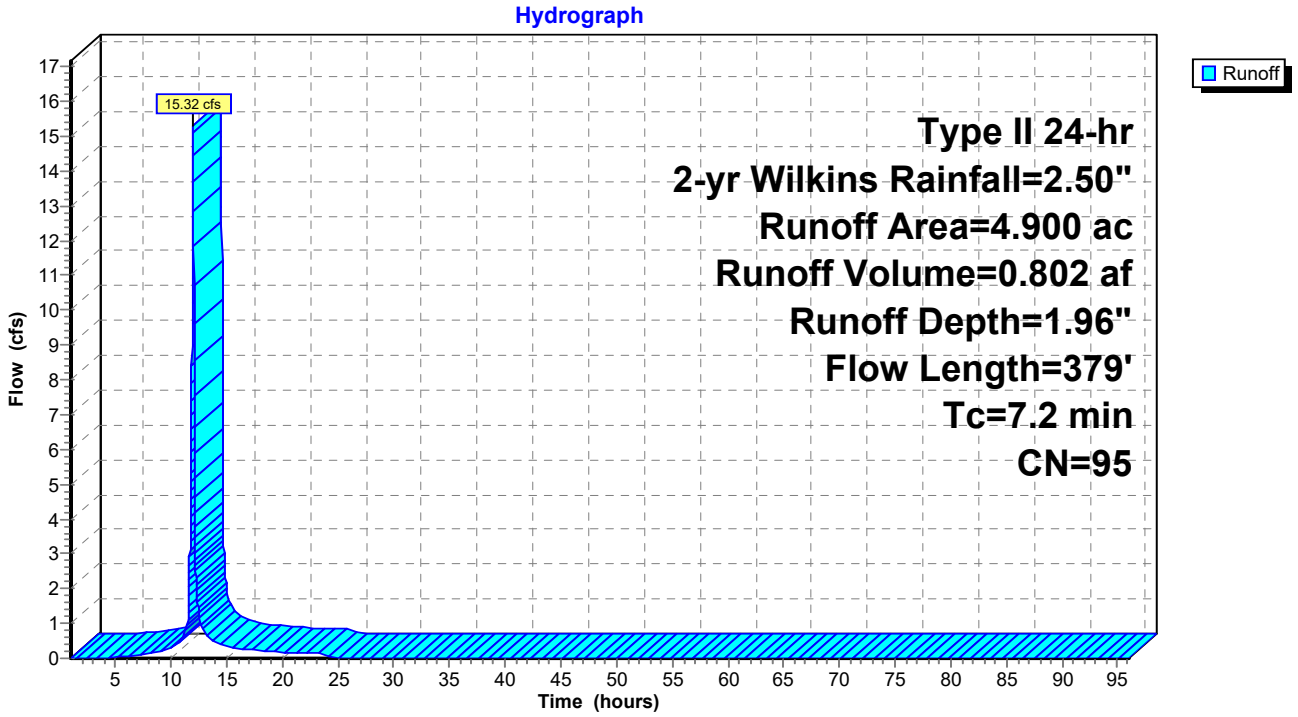
Runoff = 15.32 cfs @ 11.98 hrs, Volume= 0.802 af, Depth= 1.96"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Wilkins Rainfall=2.50"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

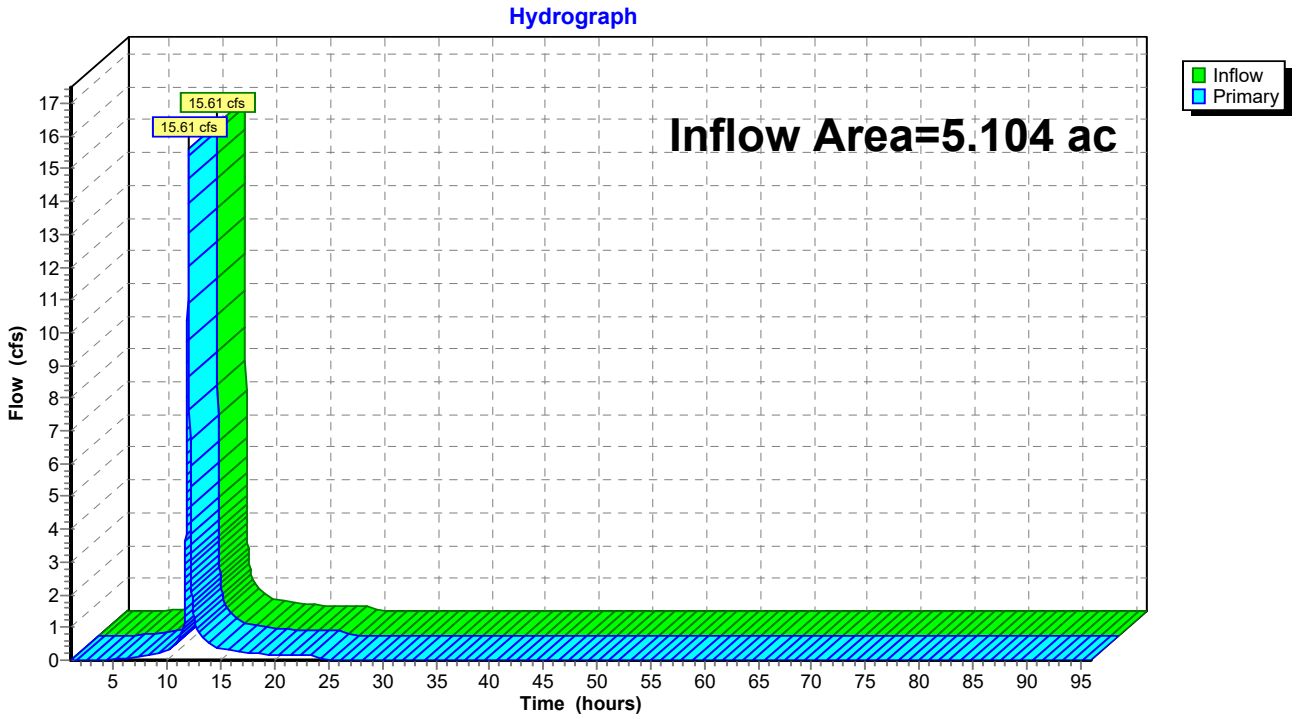


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 1.92" for 2-yr Wilkins event
Inflow = 15.61 cfs @ 11.98 hrs, Volume= 0.815 af
Primary = 15.61 cfs @ 11.98 hrs, Volume= 0.815 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

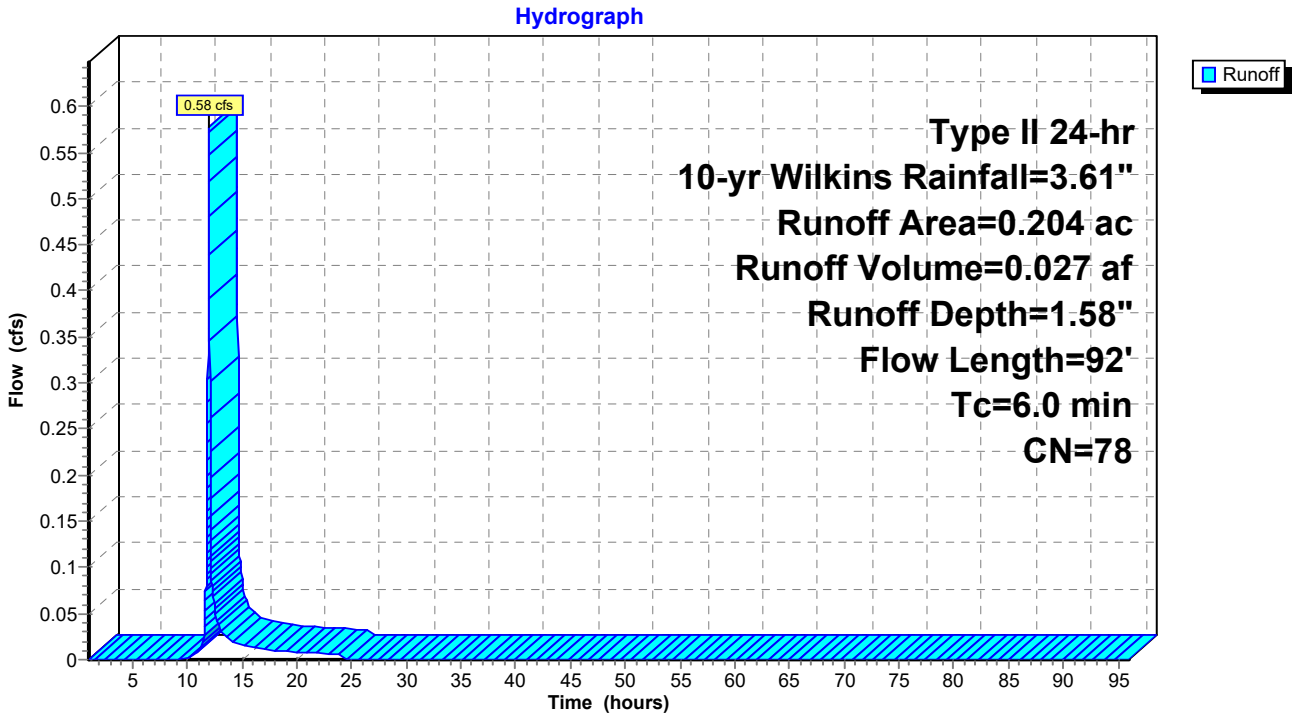
Runoff = 0.58 cfs @ 11.98 hrs, Volume= 0.027 af, Depth= 1.58"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Wilkins Rainfall=3.61"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

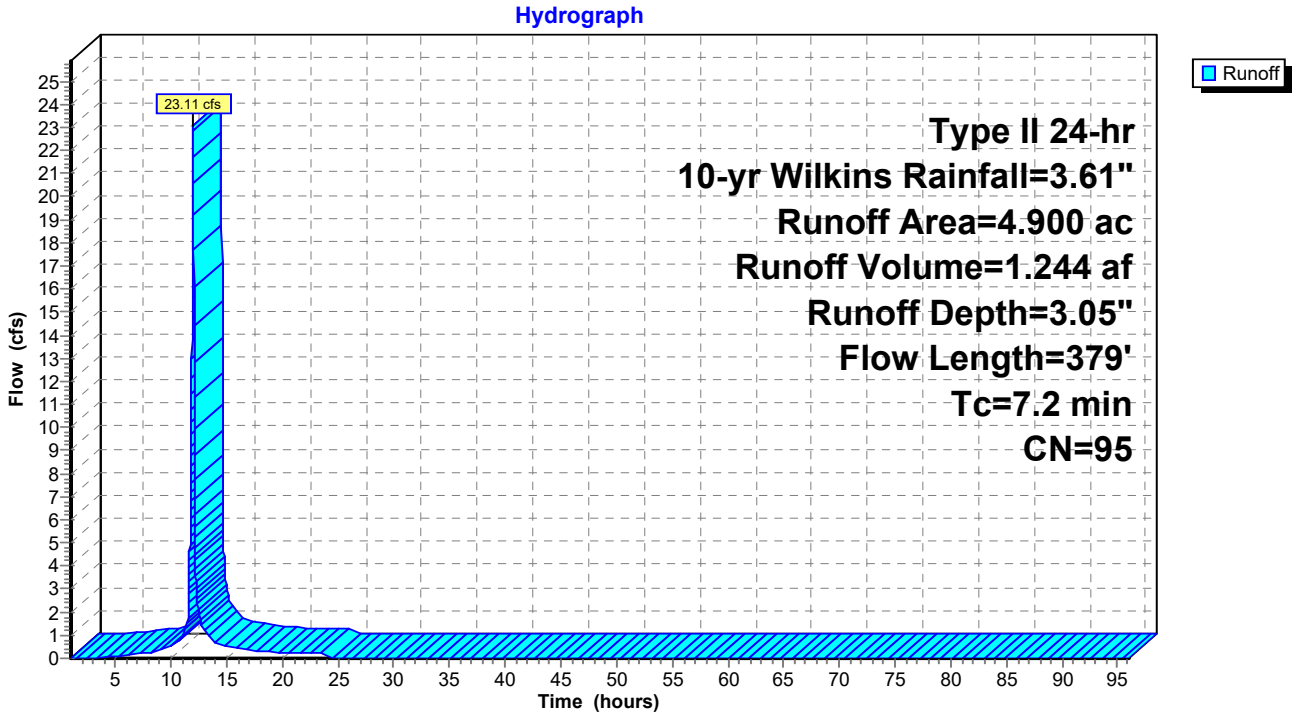
Runoff = 23.11 cfs @ 11.98 hrs, Volume= 1.244 af, Depth= 3.05"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Wilkins Rainfall=3.61"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

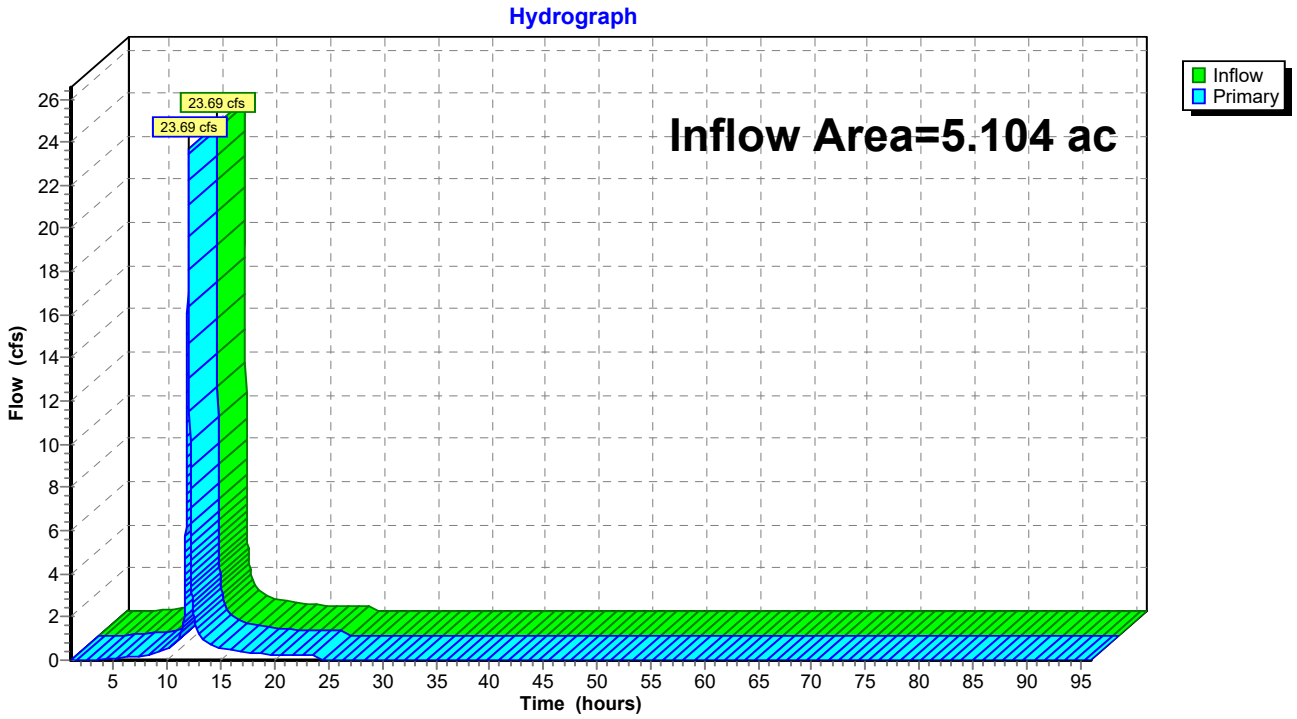


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 2.99" for 10-yr Wilkins event
Inflow = 23.69 cfs @ 11.98 hrs, Volume= 1.271 af
Primary = 23.69 cfs @ 11.98 hrs, Volume= 1.271 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

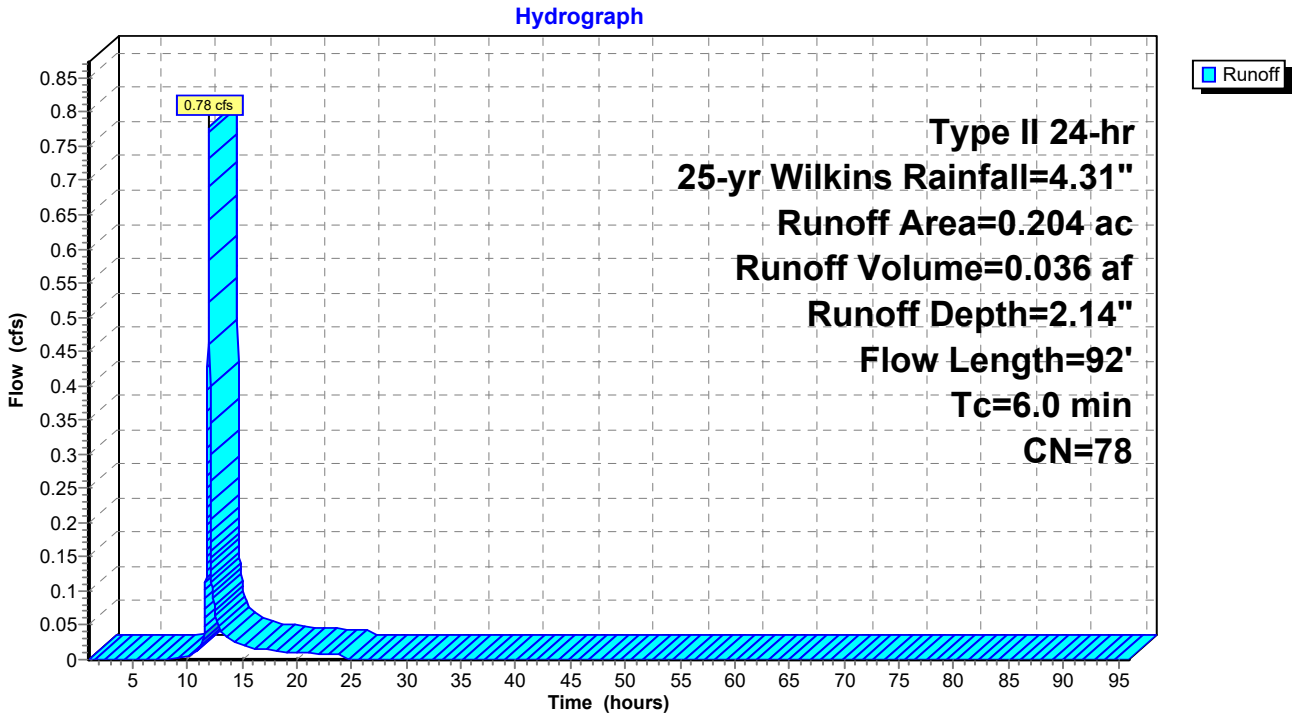
Runoff = 0.78 cfs @ 11.97 hrs, Volume= 0.036 af, Depth= 2.14"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Wilkins Rainfall=4.31"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

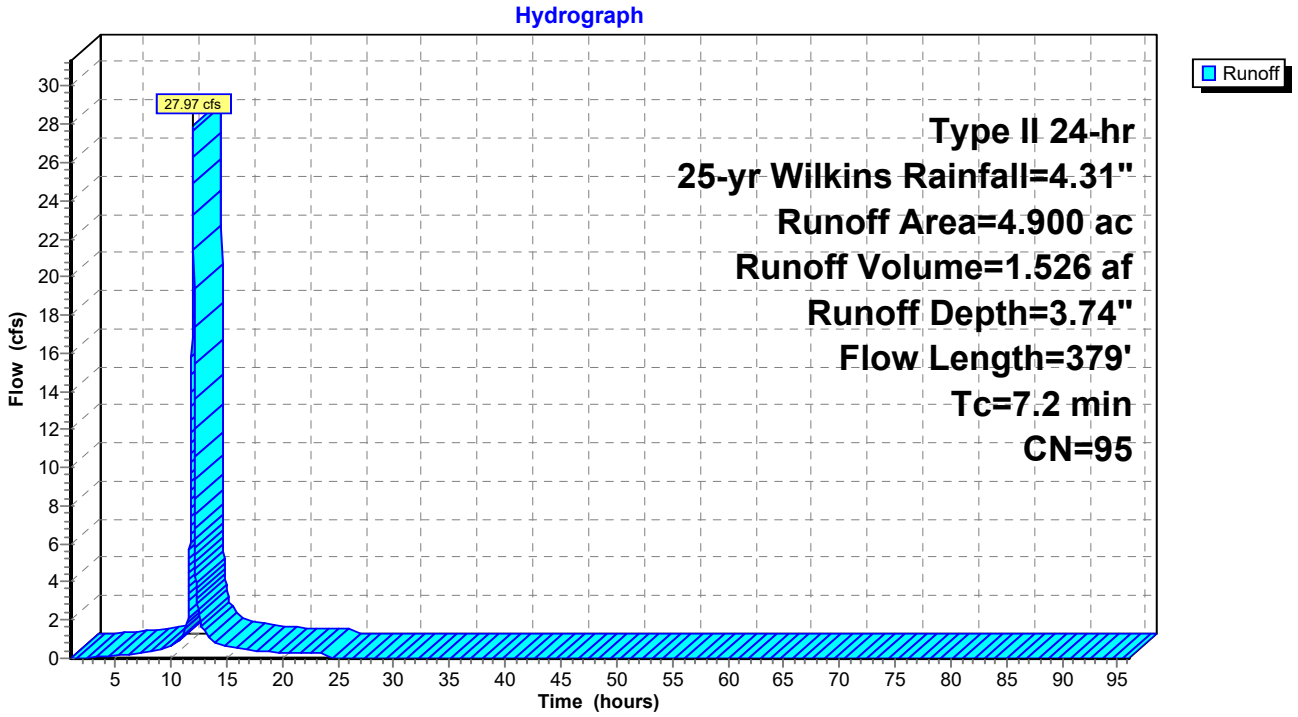
Runoff = 27.97 cfs @ 11.98 hrs, Volume= 1.526 af, Depth= 3.74"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Wilkins Rainfall=4.31"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

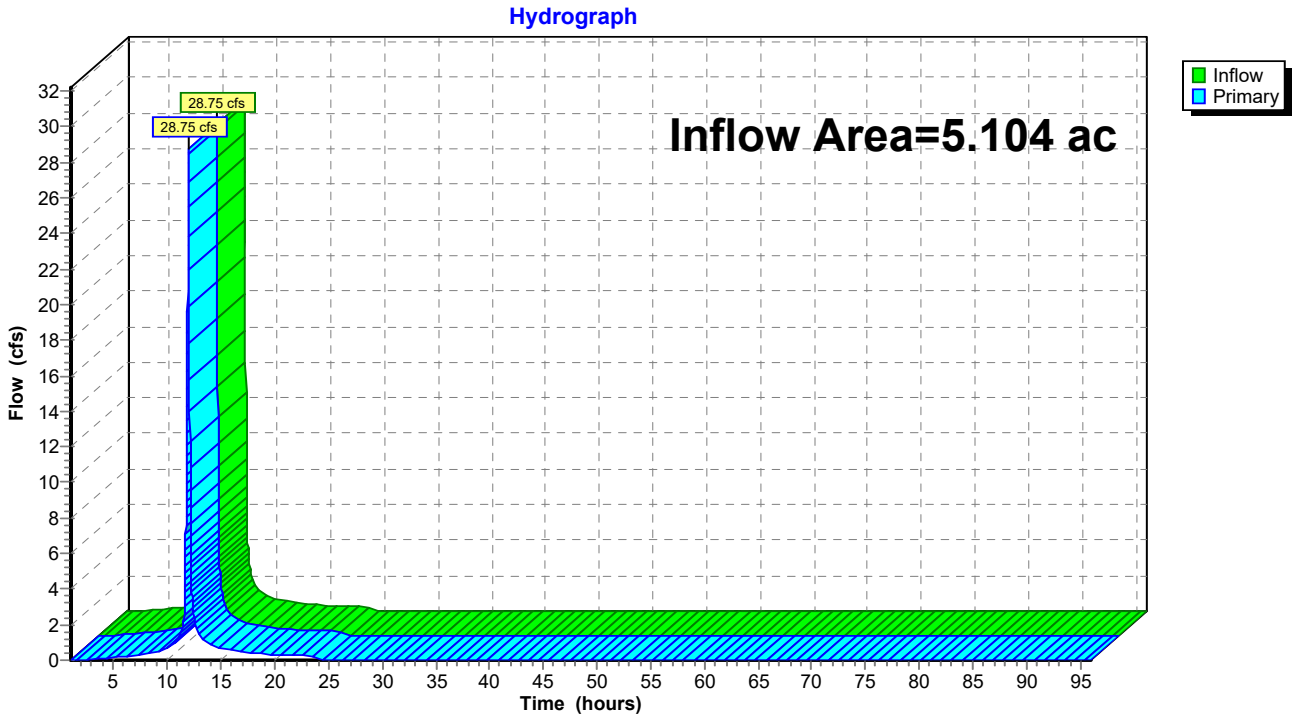


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 3.67" for 25-yr Wilkins event
Inflow = 28.75 cfs @ 11.98 hrs, Volume= 1.562 af
Primary = 28.75 cfs @ 11.98 hrs, Volume= 1.562 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

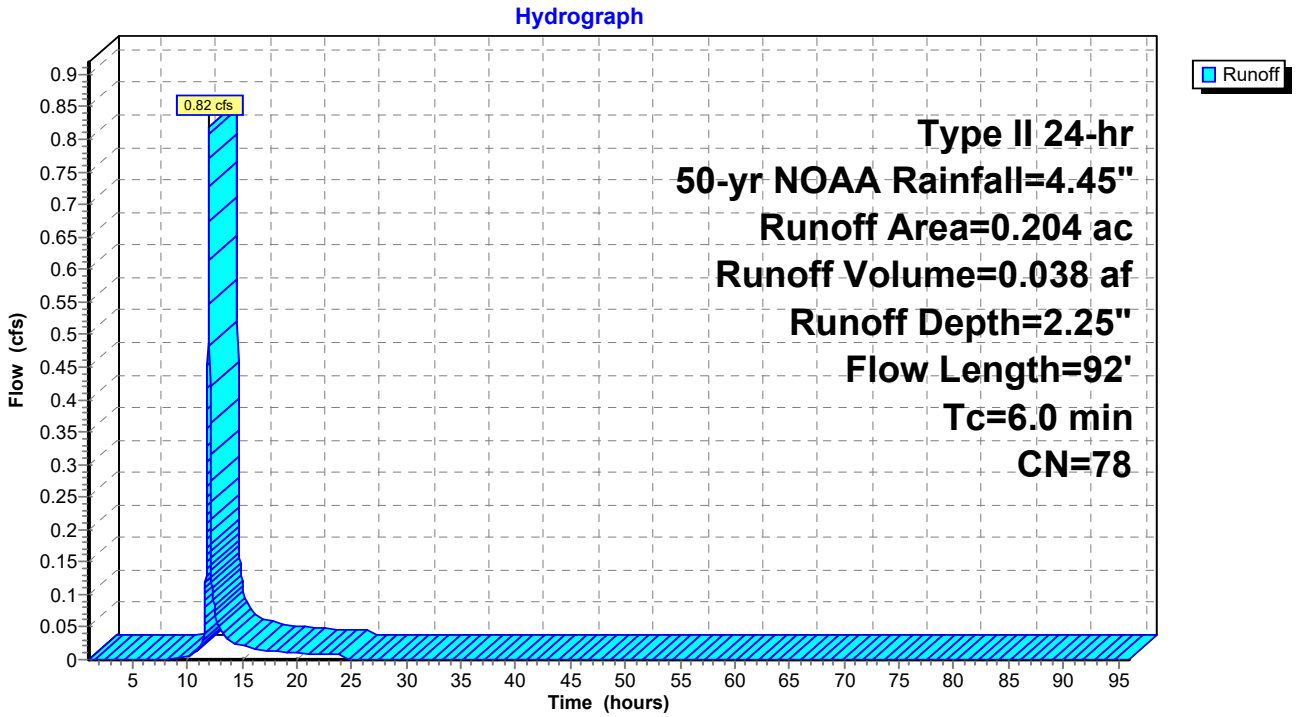
Runoff = 0.82 cfs @ 11.97 hrs, Volume= 0.038 af, Depth= 2.25"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr NOAA Rainfall=4.45"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

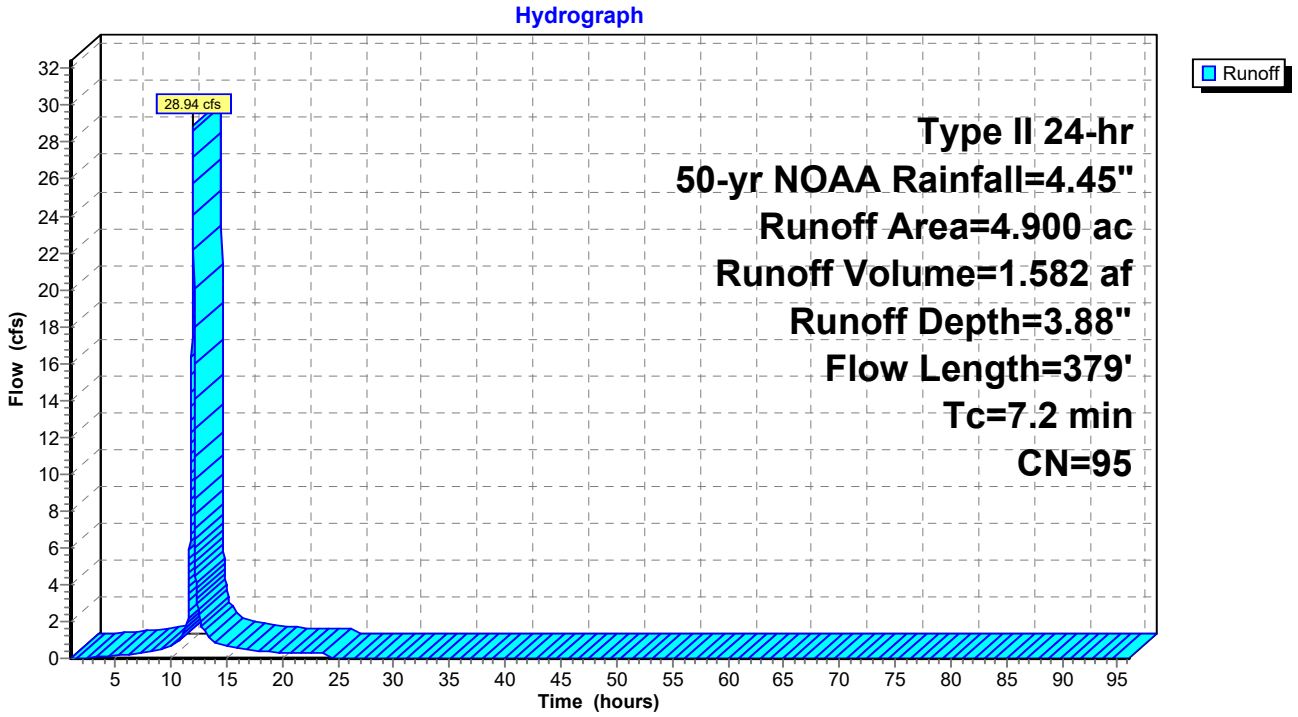
Runoff = 28.94 cfs @ 11.98 hrs, Volume= 1.582 af, Depth= 3.88"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr NOAA Rainfall=4.45"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

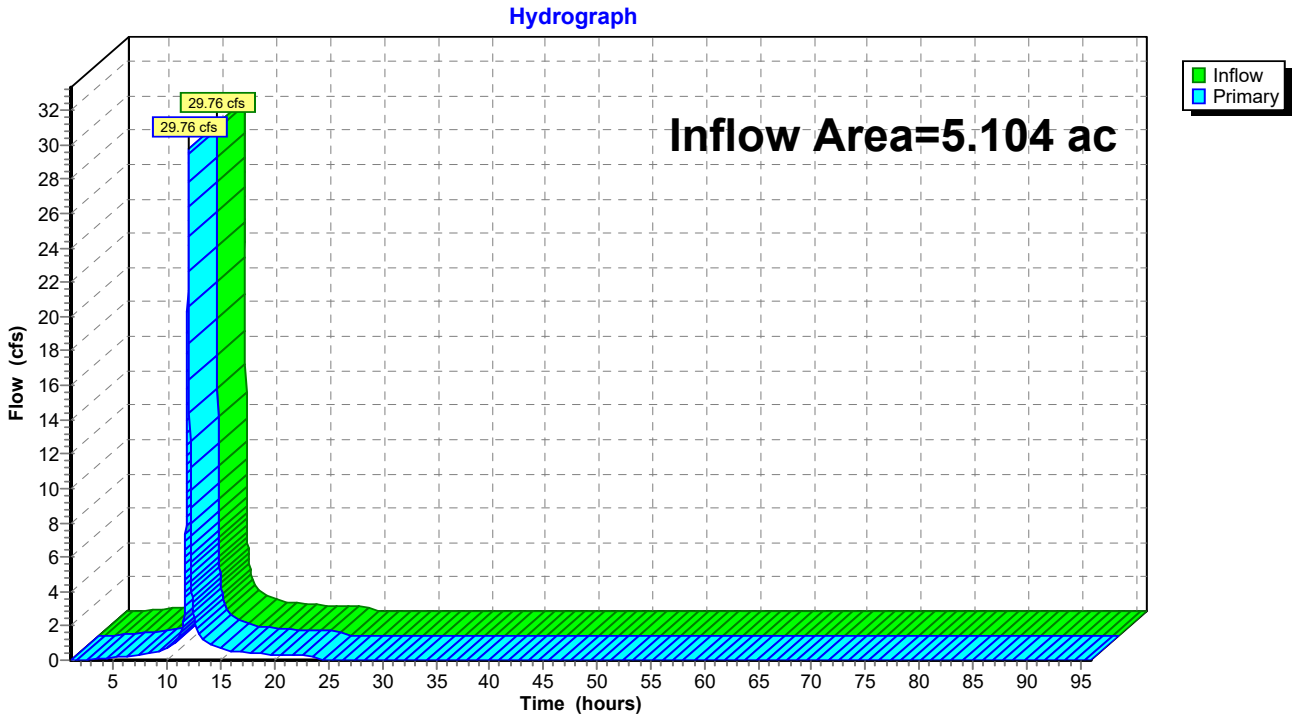


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 3.81" for 50-yr NOAA event
Inflow = 29.76 cfs @ 11.98 hrs, Volume= 1.621 af
Primary = 29.76 cfs @ 11.98 hrs, Volume= 1.621 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

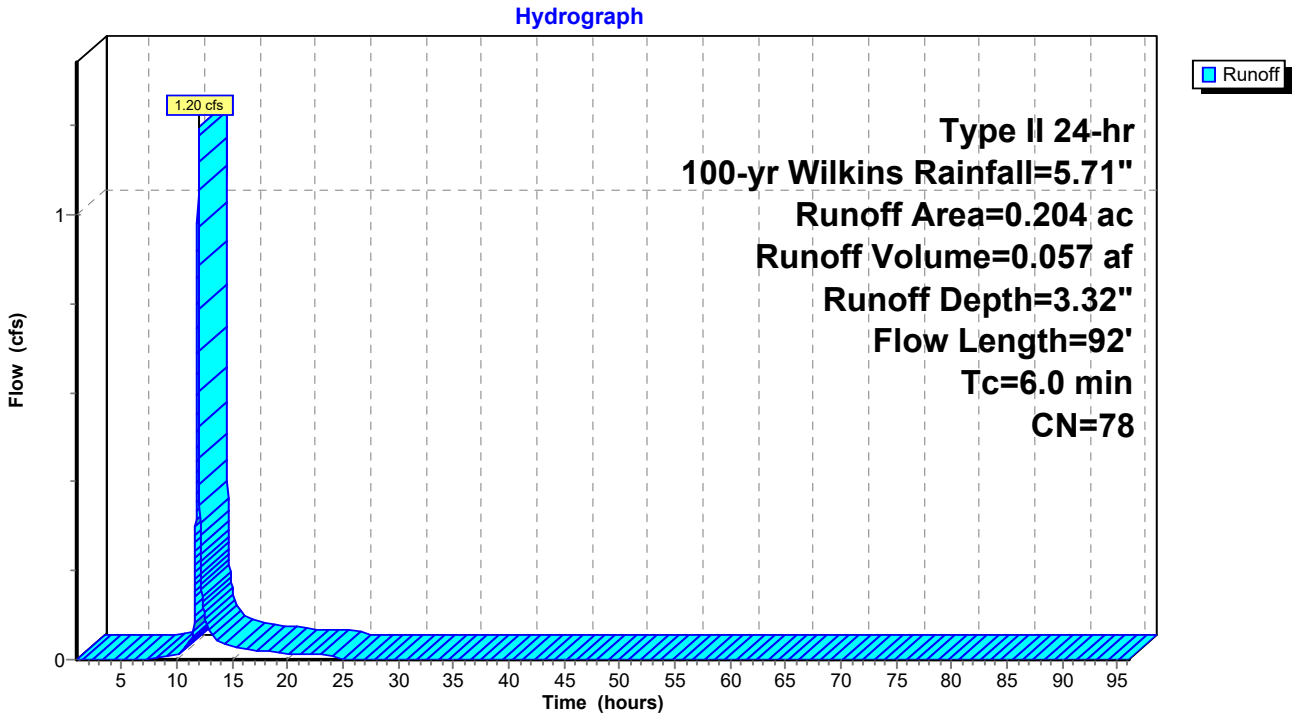
Runoff = 1.20 cfs @ 11.97 hrs, Volume= 0.057 af, Depth= 3.32"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Wilkins Rainfall=5.71"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

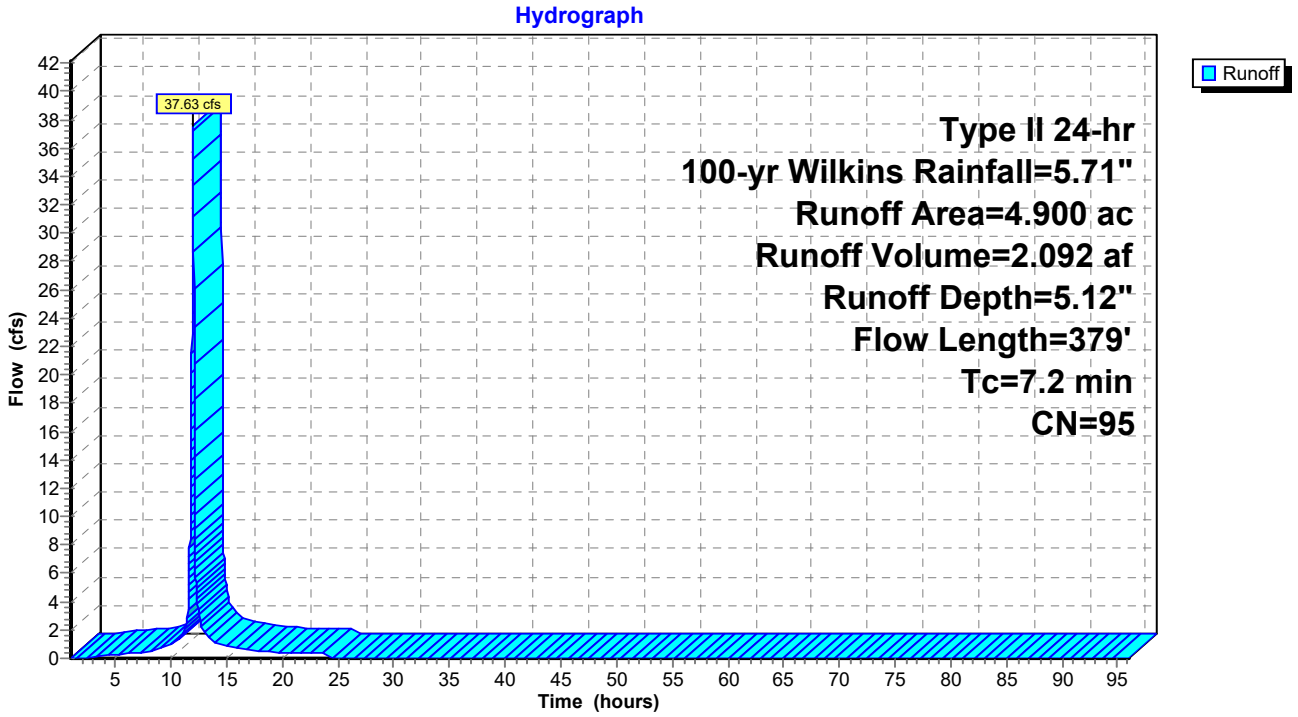
Runoff = 37.63 cfs @ 11.98 hrs, Volume= 2.092 af, Depth= 5.12"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Wilkins Rainfall=5.71"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained

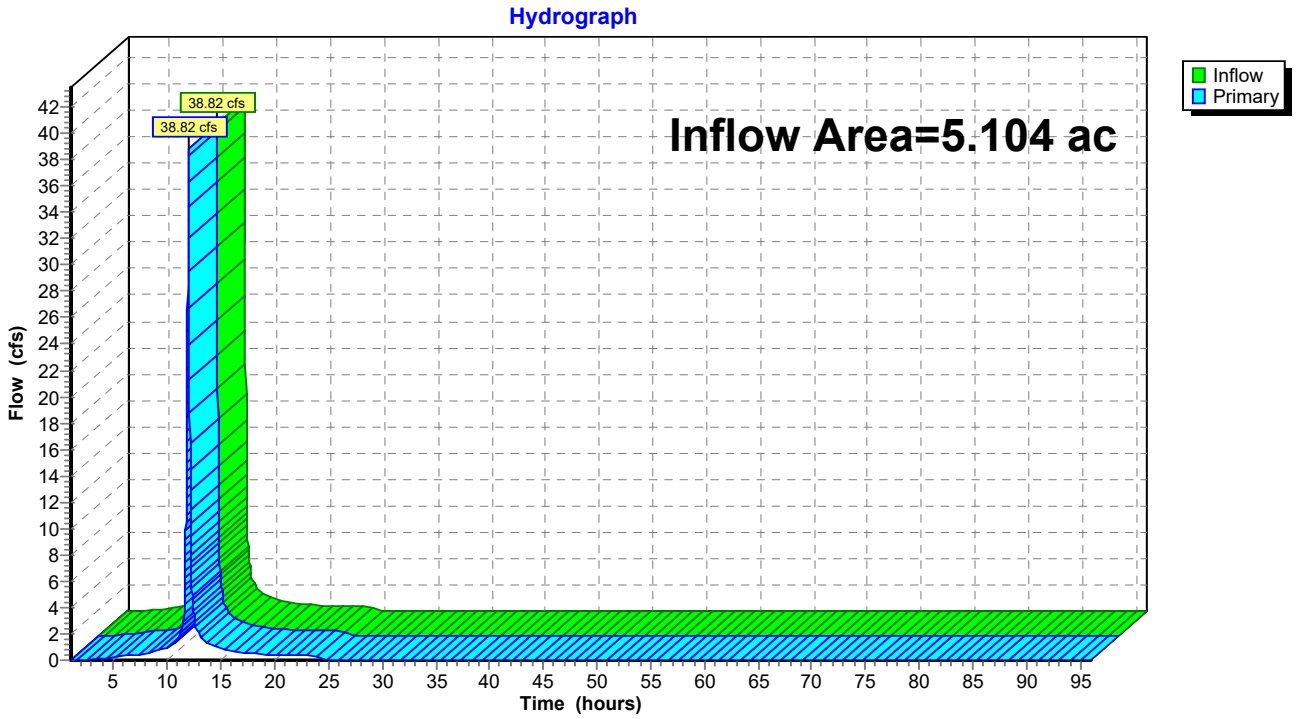


Summary for Link 14L: PR POI 1

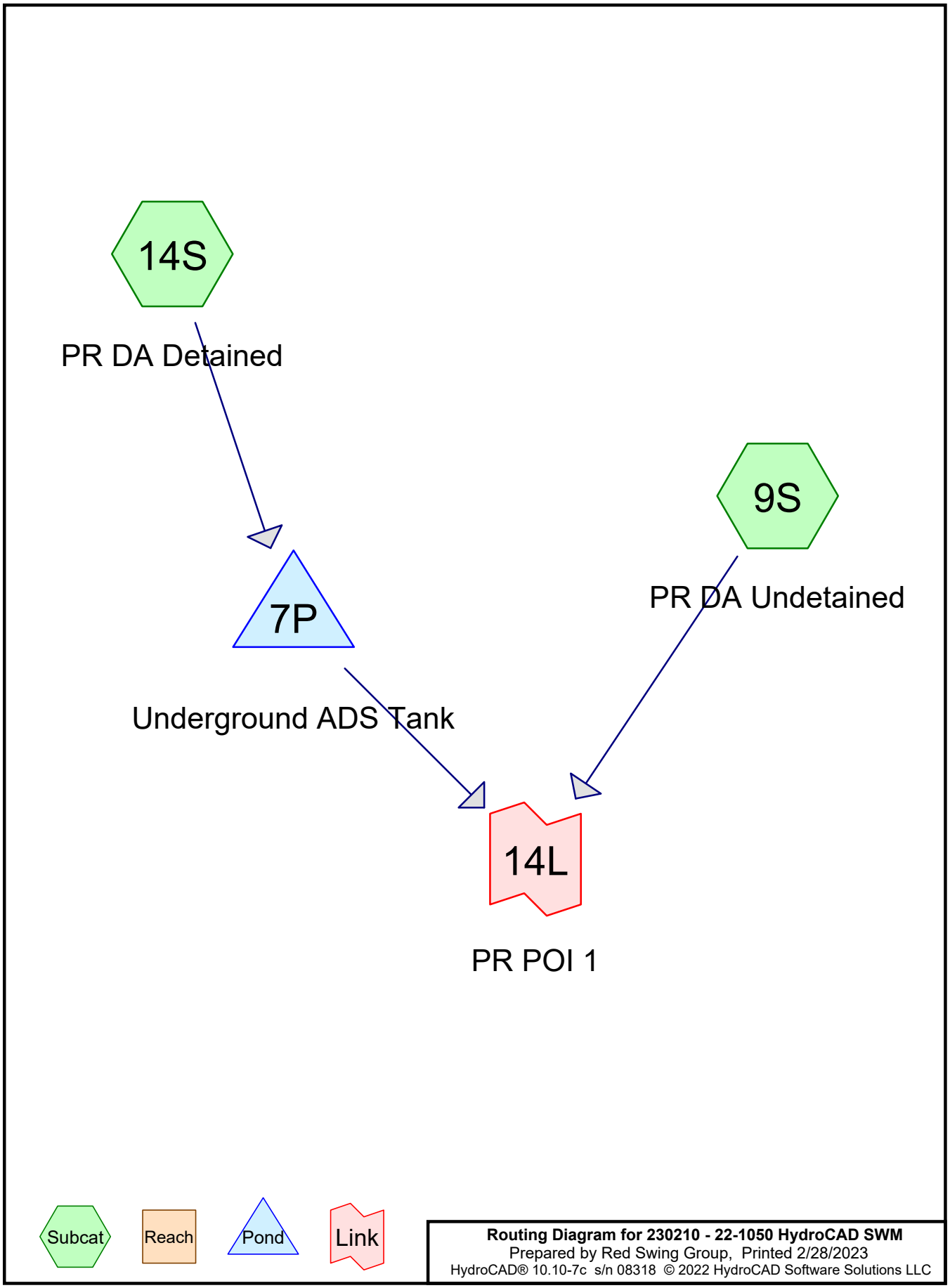
Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 5.05" for 100-yr Wilkins event
Inflow = 38.82 cfs @ 11.98 hrs, Volume= 2.149 af
Primary = 38.82 cfs @ 11.98 hrs, Volume= 2.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



POST-DEVELOPMENT DRAINAGE AREA CALCULATIONS WITH BMP


14S
PR DA Detained
9S
PR DA Undetained
7P
Underground ADS Tank
14L
PR POI 1
Subcat
Reach
Pond
Link
Routing Diagram for 230210 - 22-1050 HydroCAD SWM
Prepared by Red Swing Group, Printed 2/28/2023
HydroCAD® 10.10-7c s/n 08318 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr Wilkins	Type II 24-hr		Default	24.00	1	2.00	2
2	2-yr Wilkins	Type II 24-hr		Default	24.00	1	2.50	2
3	10-yr Wilkins	Type II 24-hr		Default	24.00	1	3.61	2
4	25-yr Wilkins	Type II 24-hr		Default	24.00	1	4.31	2
5	50-yr NOAA	Type II 24-hr		Default	24.00	1	4.45	2
6	100-yr Wilkins	Type II 24-hr		Default	24.00	1	5.71	2

Summary for Subcatchment 9S: PR DA Undetained

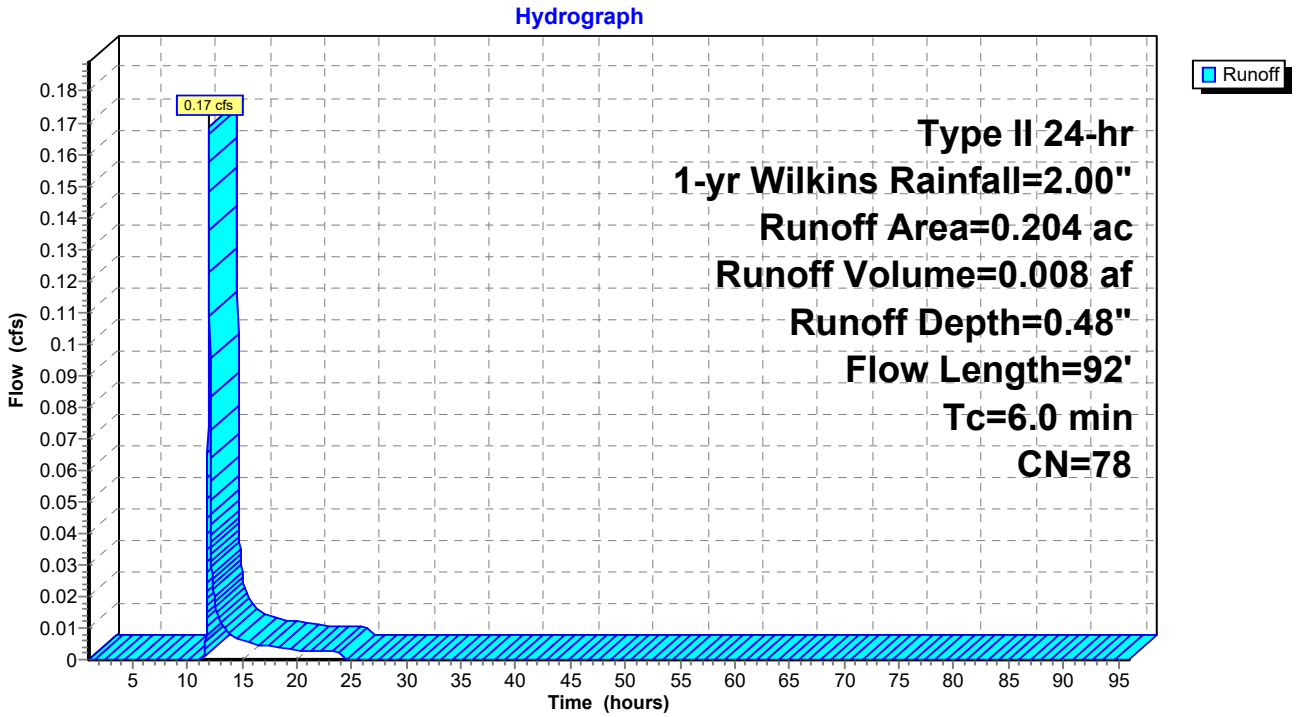
Runoff = 0.17 cfs @ 11.98 hrs, Volume= 0.008 af, Depth= 0.48"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Wilkins Rainfall=2.00"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

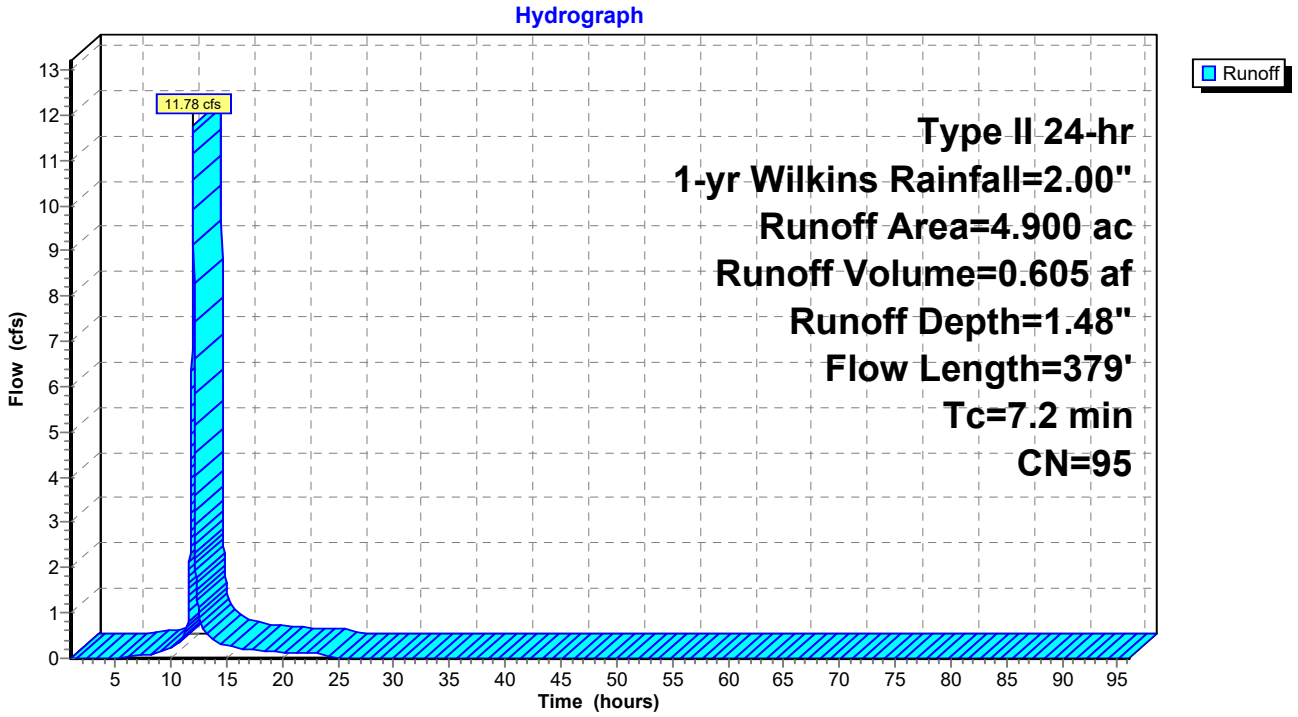
Runoff = 11.78 cfs @ 11.98 hrs, Volume= 0.605 af, Depth= 1.48"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Wilkins Rainfall=2.00"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 1.48" for 1-yr Wilkins event
Inflow = 11.78 cfs @ 11.98 hrs, Volume= 0.605 af
Outflow = 3.53 cfs @ 12.12 hrs, Volume= 0.605 af, Atten= 70%, Lag= 8.4 min
Discarded = 0.09 cfs @ 8.89 hrs, Volume= 0.272 af
Primary = 3.44 cfs @ 12.12 hrs, Volume= 0.333 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 919.73' @ 12.12 hrs Surf.Area= 8,091 sf Storage= 11,734 cf

Plug-Flow detention time= 331.1 min calculated for 0.605 af (100% of inflow)
Center-of-Mass det. time= 331.2 min (1,125.8 - 794.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

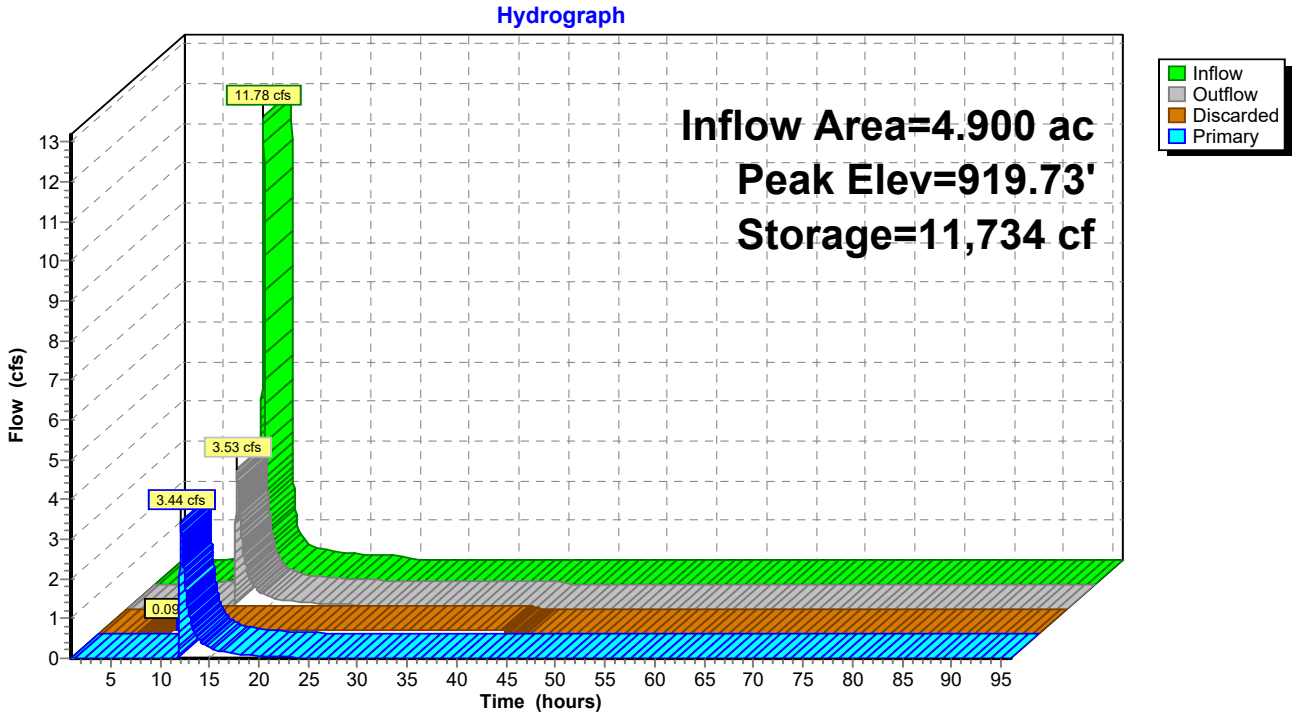
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 8.89 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.44 cfs @ 12.12 hrs HW=919.73' (Free Discharge)
└─**4=Culvert** (Passes 3.44 cfs of 10.35 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.44 cfs @ 2.92 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

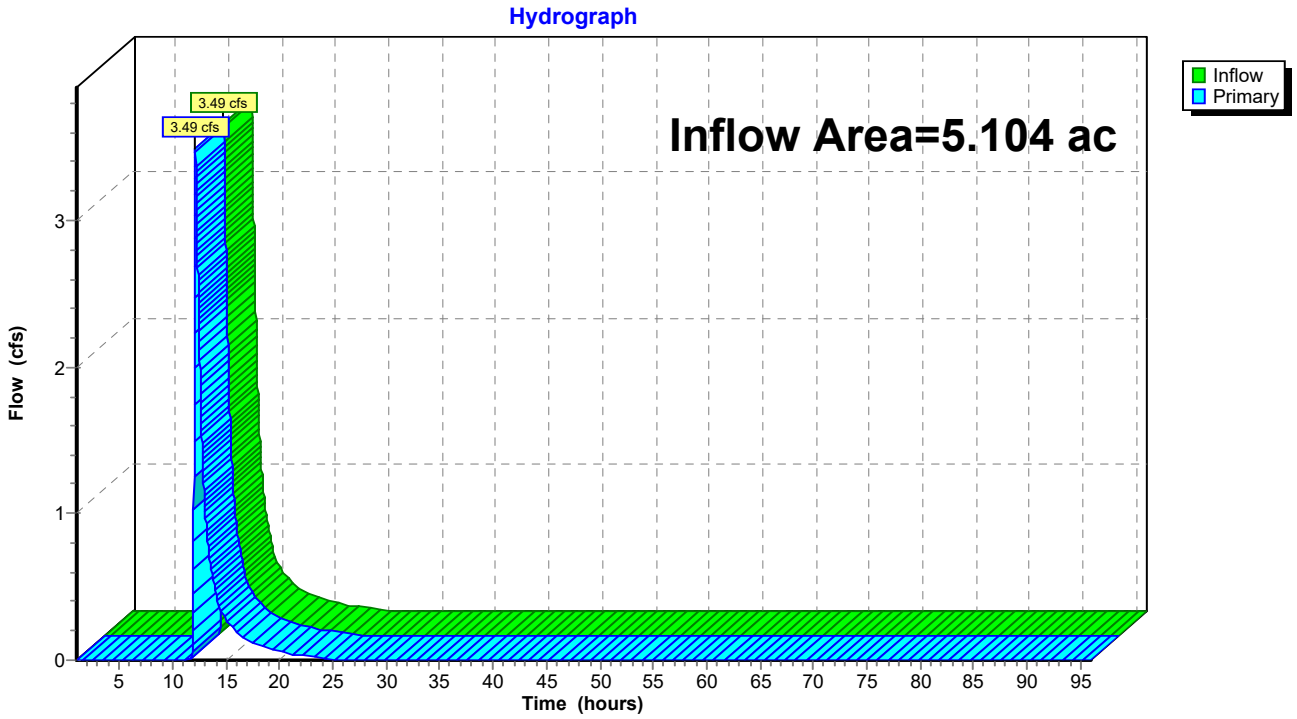


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 0.80" for 1-yr Wilkins event
Inflow = 3.49 cfs @ 12.12 hrs, Volume= 0.341 af
Primary = 3.49 cfs @ 12.12 hrs, Volume= 0.341 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

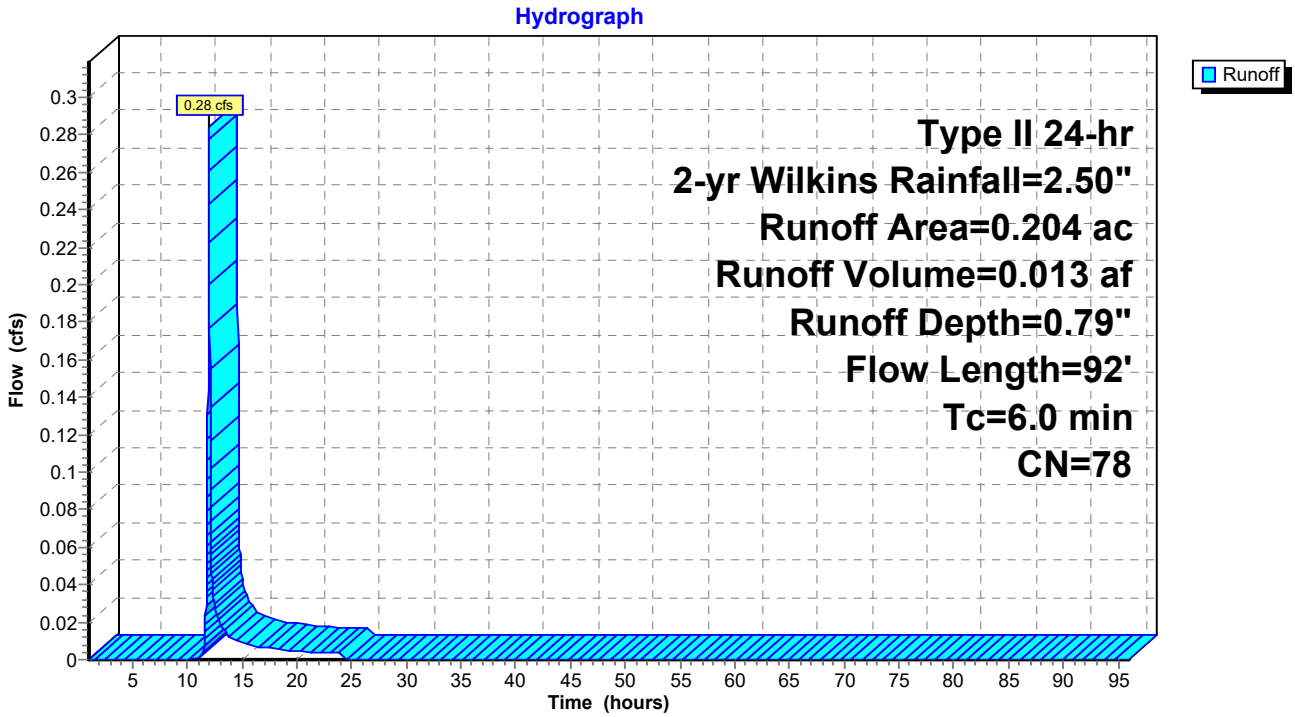
Runoff = 0.28 cfs @ 11.98 hrs, Volume= 0.013 af, Depth= 0.79"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Wilkins Rainfall=2.50"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

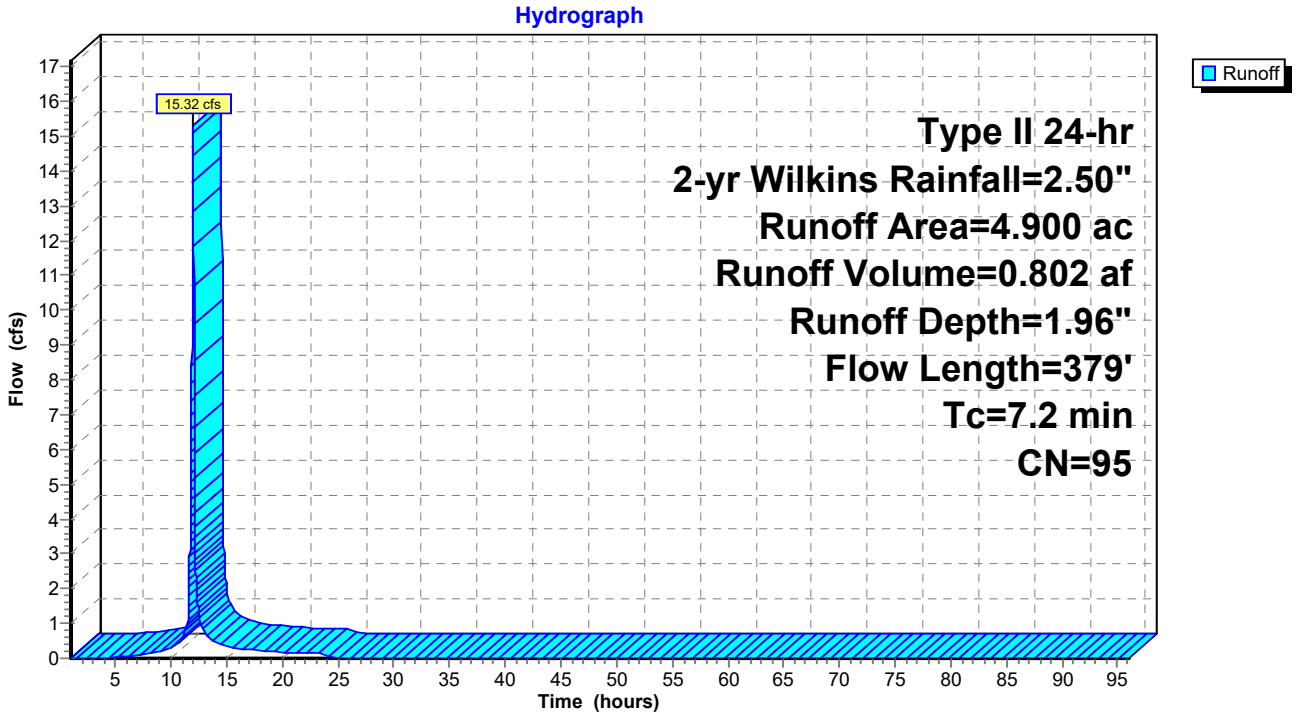
Runoff = 15.32 cfs @ 11.98 hrs, Volume= 0.802 af, Depth= 1.96"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Wilkins Rainfall=2.50"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 1.96" for 2-yr Wilkins event
Inflow = 15.32 cfs @ 11.98 hrs, Volume= 0.802 af
Outflow = 5.99 cfs @ 12.10 hrs, Volume= 0.802 af, Atten= 61%, Lag= 7.0 min
Discarded = 0.09 cfs @ 7.76 hrs, Volume= 0.284 af
Primary = 5.90 cfs @ 12.10 hrs, Volume= 0.518 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 920.18' @ 12.10 hrs Surf.Area= 8,091 sf Storage= 14,722 cf

Plug-Flow detention time= 265.1 min calculated for 0.802 af (100% of inflow)
Center-of-Mass det. time= 265.2 min (1,052.0 - 786.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

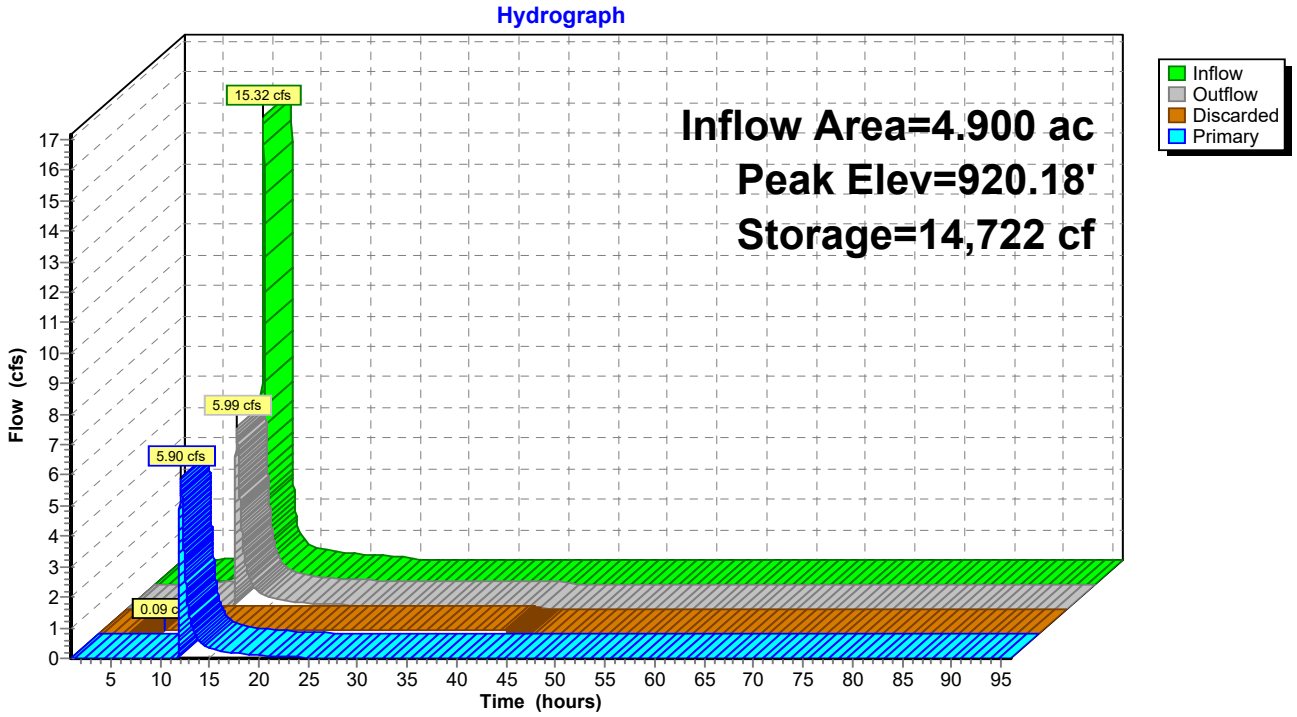
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 7.76 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=5.90 cfs @ 12.10 hrs HW=920.18' (Free Discharge)
└─**4=Culvert** (Passes 5.90 cfs of 11.81 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 5.90 cfs @ 4.16 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

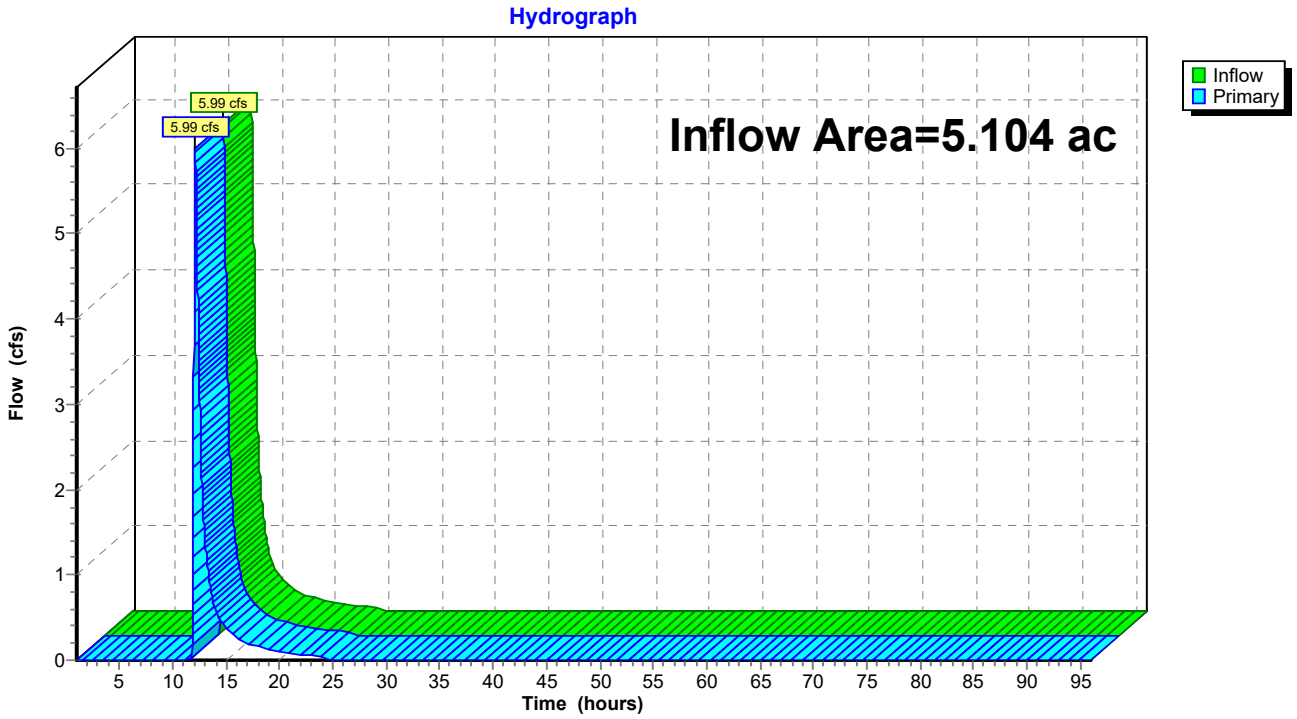


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 1.25" for 2-yr Wilkins event
Inflow = 5.99 cfs @ 12.09 hrs, Volume= 0.531 af
Primary = 5.99 cfs @ 12.09 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

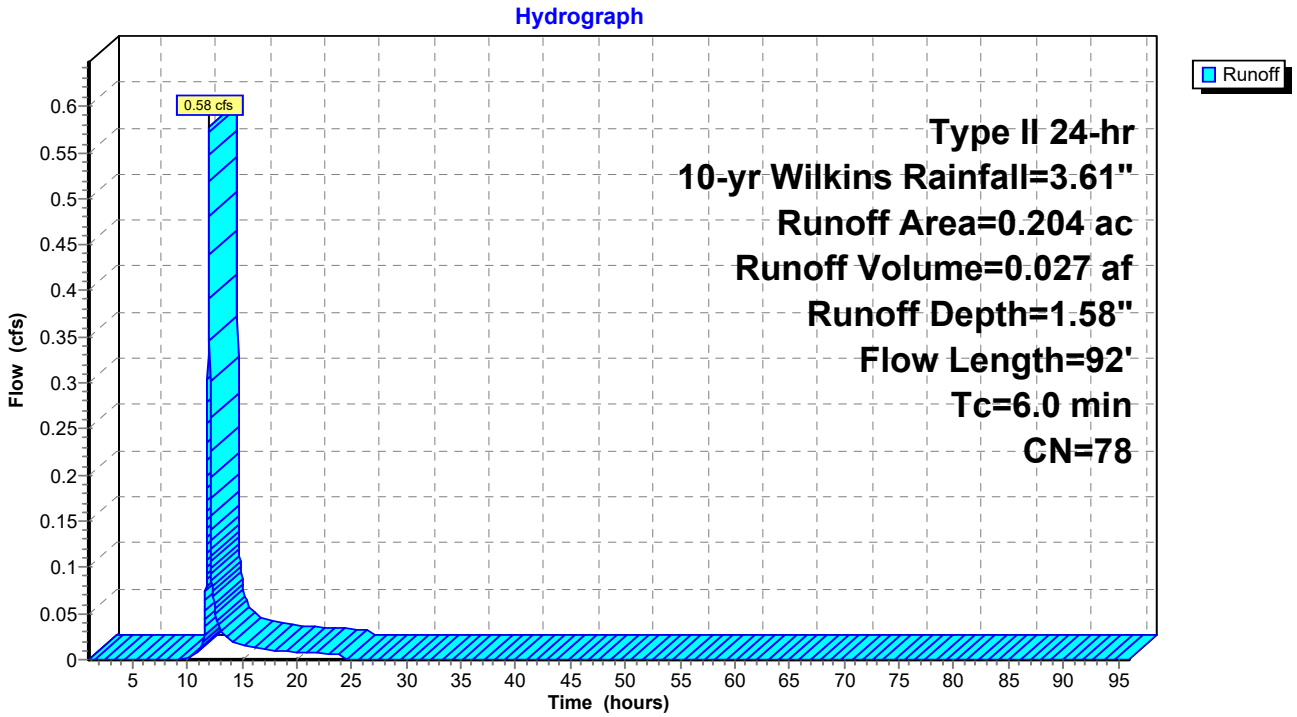
Runoff = 0.58 cfs @ 11.98 hrs, Volume= 0.027 af, Depth= 1.58"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Wilkins Rainfall=3.61"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

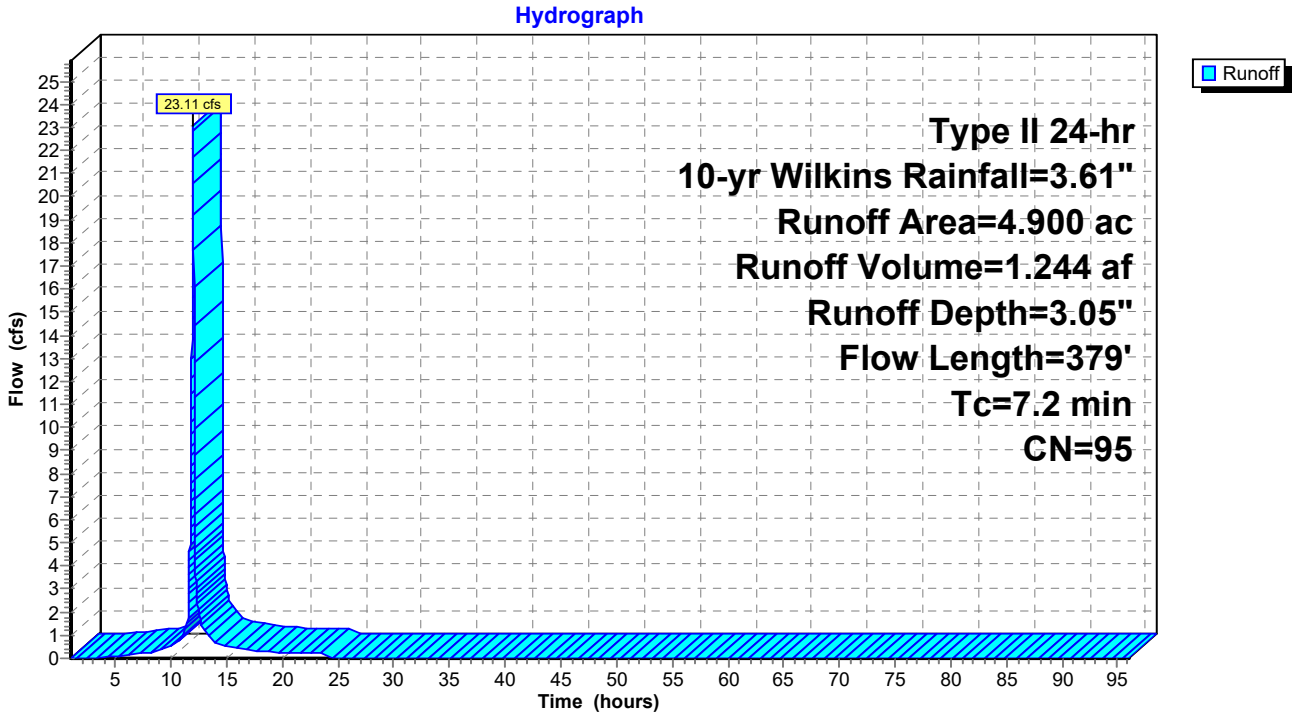
Runoff = 23.11 cfs @ 11.98 hrs, Volume= 1.244 af, Depth= 3.05"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Wilkins Rainfall=3.61"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 3.05" for 10-yr Wilkins event
Inflow = 23.11 cfs @ 11.98 hrs, Volume= 1.244 af
Outflow = 9.26 cfs @ 12.10 hrs, Volume= 1.244 af, Atten= 60%, Lag= 6.9 min
Discarded = 0.09 cfs @ 5.68 hrs, Volume= 0.300 af
Primary = 9.17 cfs @ 12.10 hrs, Volume= 0.944 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 921.22' @ 12.10 hrs Surf.Area= 8,091 sf Storage= 21,370 cf

Plug-Flow detention time= 193.3 min calculated for 1.244 af (100% of inflow)
Center-of-Mass det. time= 193.4 min (968.4 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

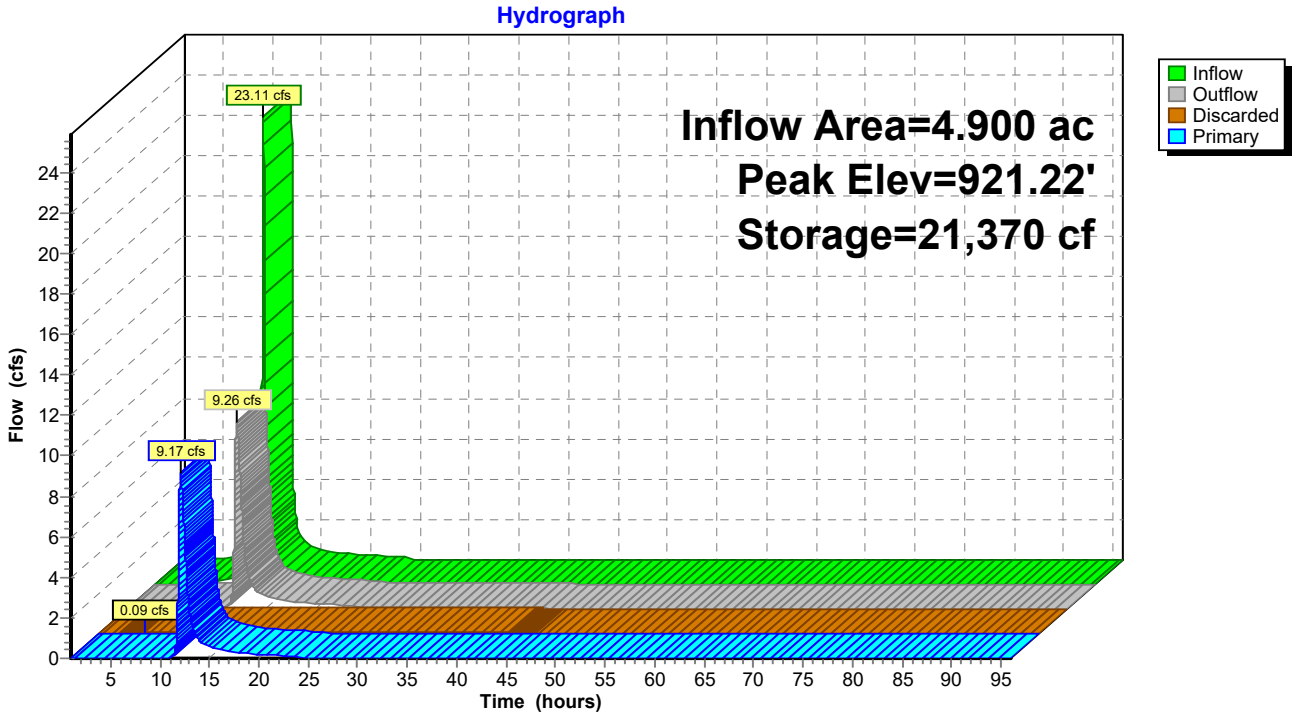
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 5.68 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=9.16 cfs @ 12.10 hrs HW=921.22' (Free Discharge)
└─**4=Culvert** (Passes 9.16 cfs of 14.65 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 9.16 cfs @ 6.47 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

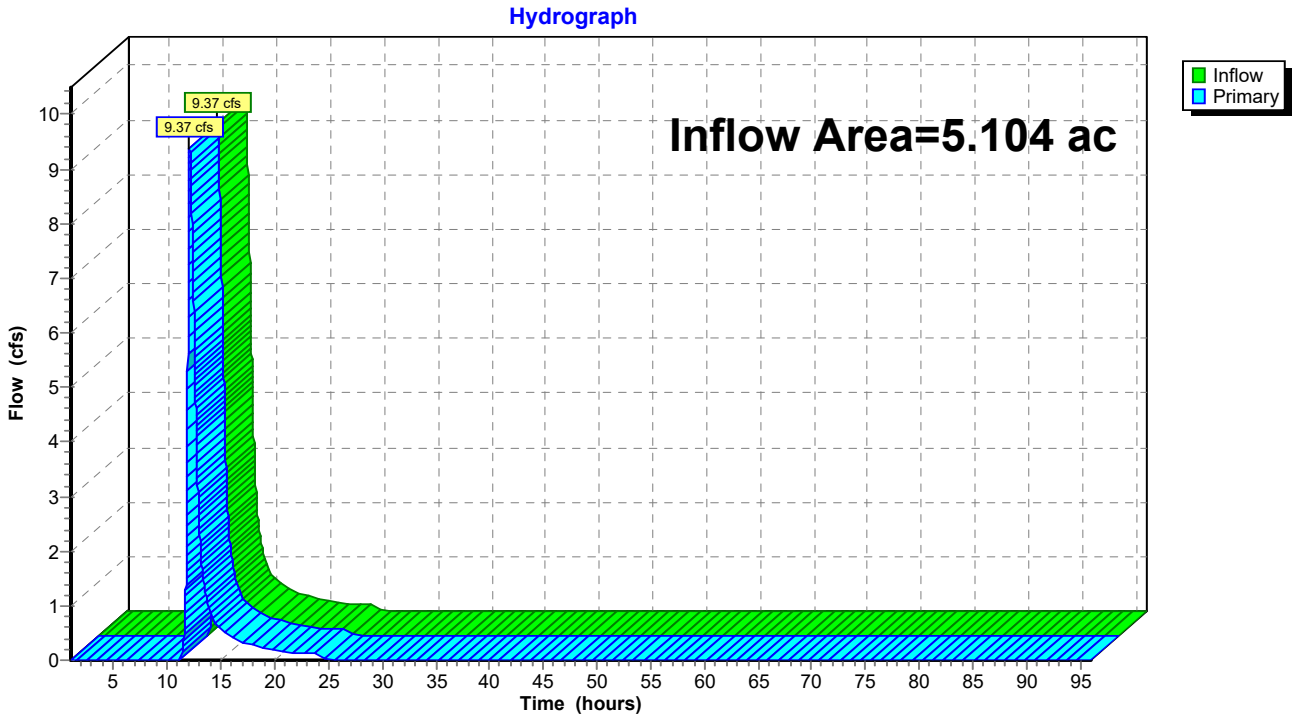


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 2.28" for 10-yr Wilkins event
Inflow = 9.37 cfs @ 12.08 hrs, Volume= 0.971 af
Primary = 9.37 cfs @ 12.08 hrs, Volume= 0.971 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

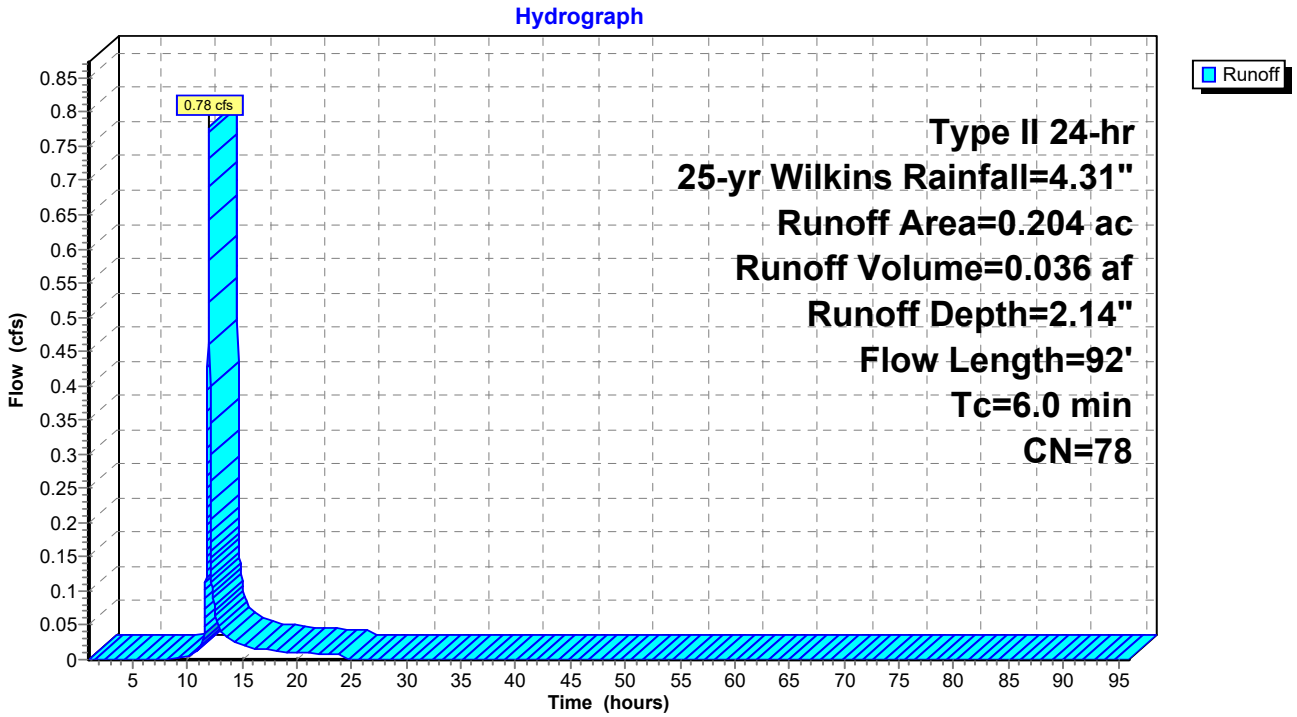
Runoff = 0.78 cfs @ 11.97 hrs, Volume= 0.036 af, Depth= 2.14"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Wilkins Rainfall=4.31"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

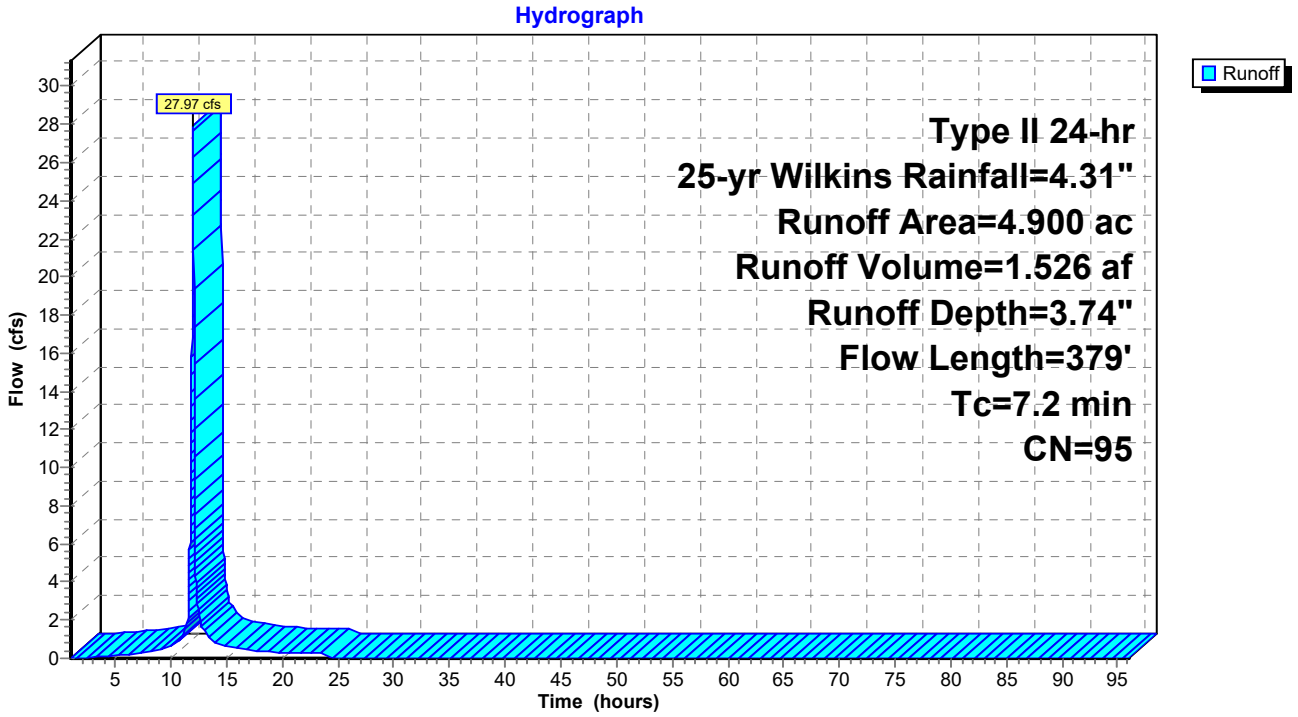
Runoff = 27.97 cfs @ 11.98 hrs, Volume= 1.526 af, Depth= 3.74"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Wilkins Rainfall=4.31"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 3.74" for 25-yr Wilkins event
Inflow = 27.97 cfs @ 11.98 hrs, Volume= 1.526 af
Outflow = 10.78 cfs @ 12.10 hrs, Volume= 1.526 af, Atten= 61%, Lag= 7.1 min
Discarded = 0.09 cfs @ 4.84 hrs, Volume= 0.306 af
Primary = 10.69 cfs @ 12.10 hrs, Volume= 1.220 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 921.86' @ 12.10 hrs Surf.Area= 8,091 sf Storage= 25,199 cf

Plug-Flow detention time= 169.2 min calculated for 1.526 af (100% of inflow)
Center-of-Mass det. time= 169.2 min (939.0 - 769.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

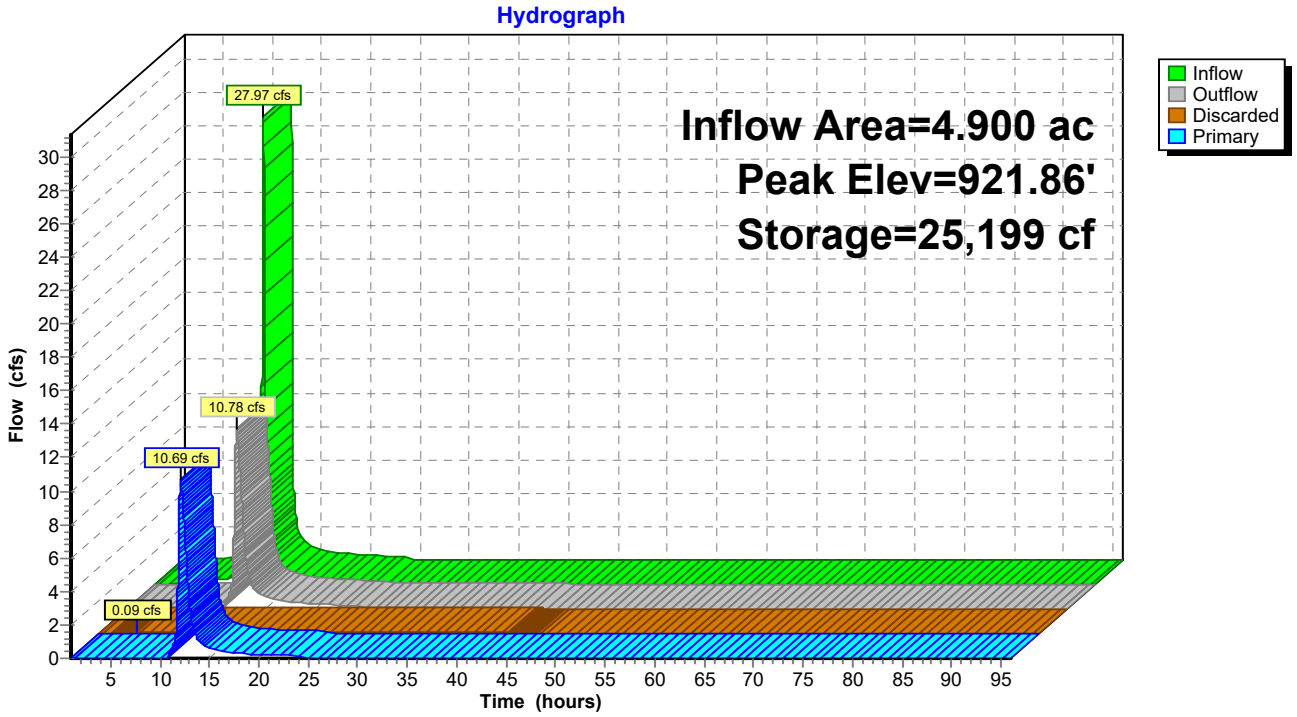
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 4.84 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=10.69 cfs @ 12.10 hrs HW=921.86' (Free Discharge)
└─**4=Culvert** (Passes 10.69 cfs of 16.18 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 10.69 cfs @ 7.55 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

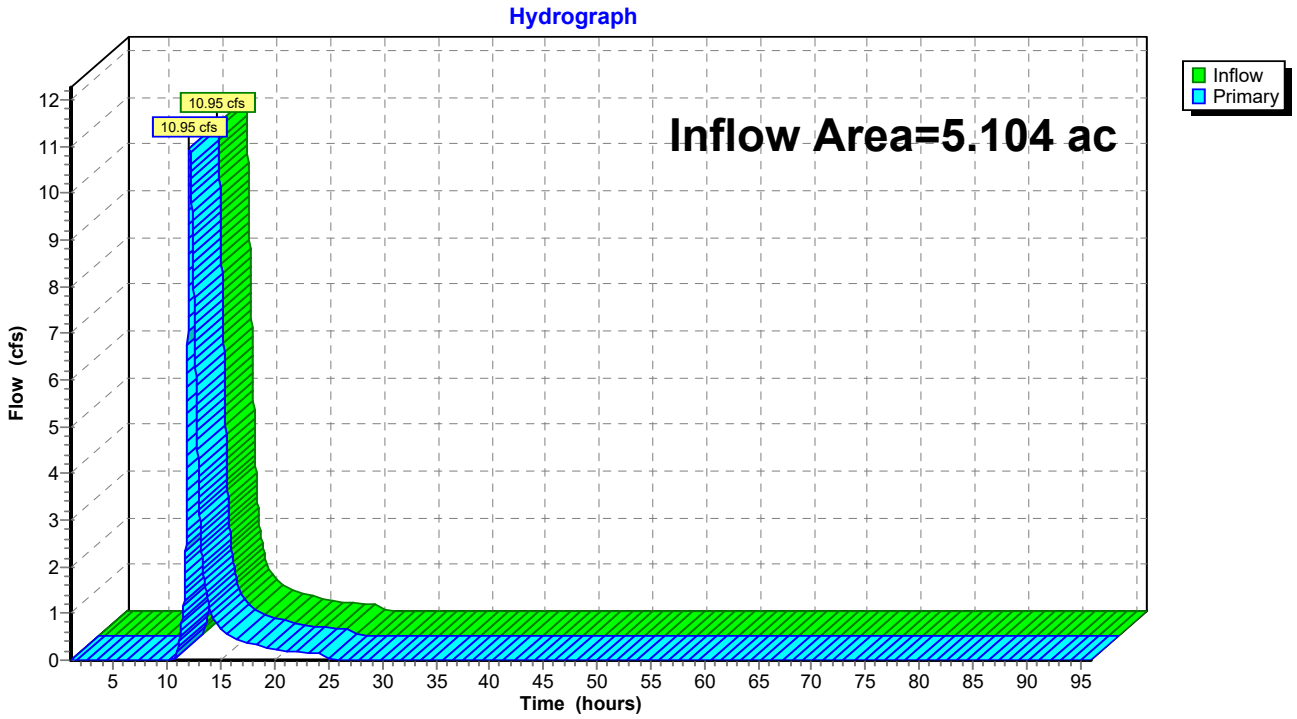


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 2.95" for 25-yr Wilkins event
Inflow = 10.95 cfs @ 12.08 hrs, Volume= 1.256 af
Primary = 10.95 cfs @ 12.08 hrs, Volume= 1.256 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

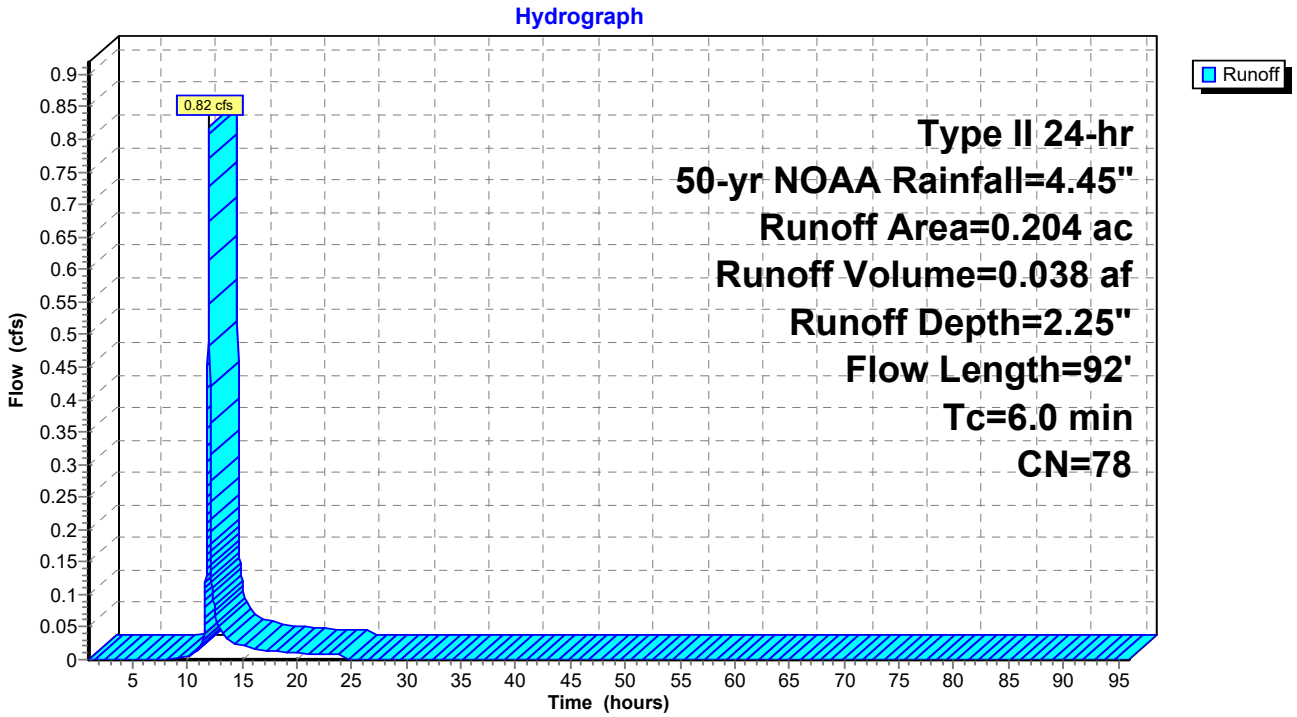
Runoff = 0.82 cfs @ 11.97 hrs, Volume= 0.038 af, Depth= 2.25"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr NOAA Rainfall=4.45"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

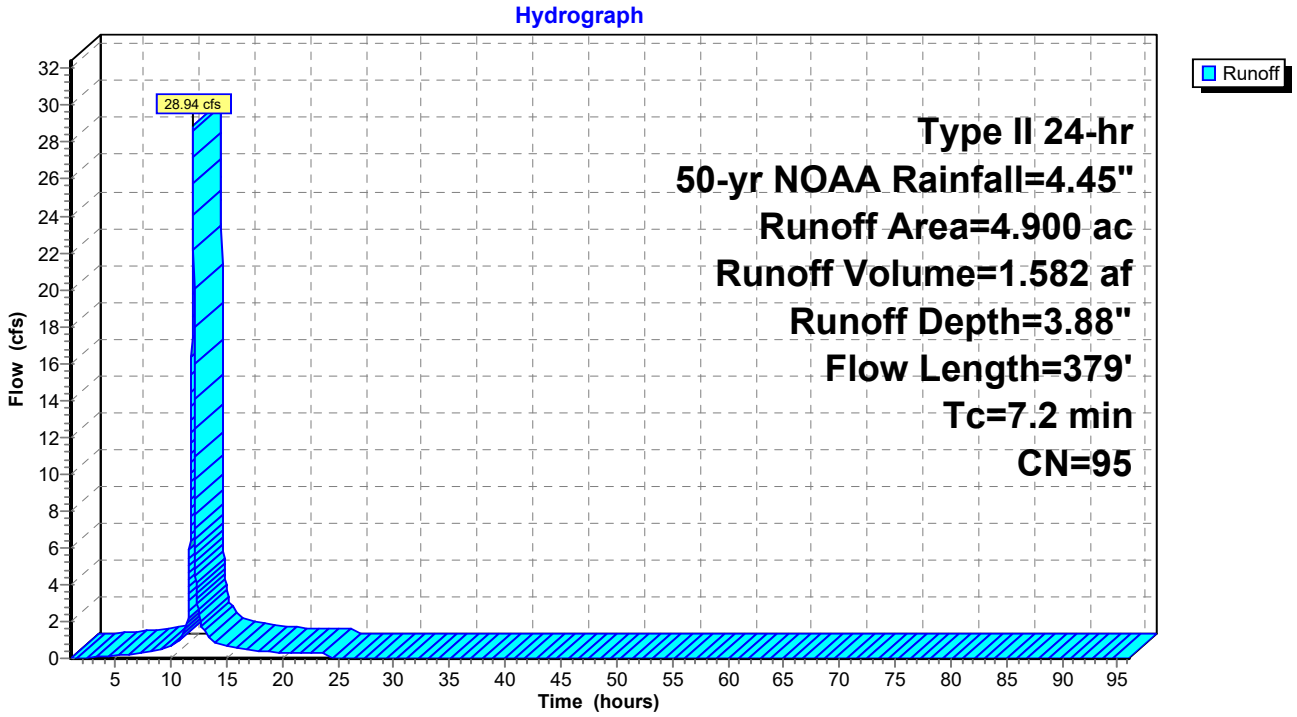
Runoff = 28.94 cfs @ 11.98 hrs, Volume= 1.582 af, Depth= 3.88"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr NOAA Rainfall=4.45"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 3.88" for 50-yr NOAA event
Inflow = 28.94 cfs @ 11.98 hrs, Volume= 1.582 af
Outflow = 11.07 cfs @ 12.10 hrs, Volume= 1.582 af, Atten= 62%, Lag= 7.1 min
Discarded = 0.09 cfs @ 4.70 hrs, Volume= 0.307 af
Primary = 10.98 cfs @ 12.10 hrs, Volume= 1.275 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 922.00' @ 12.10 hrs Surf.Area= 8,091 sf Storage= 25,943 cf

Plug-Flow detention time= 165.2 min calculated for 1.582 af (100% of inflow)
Center-of-Mass det. time= 165.3 min (934.2 - 768.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

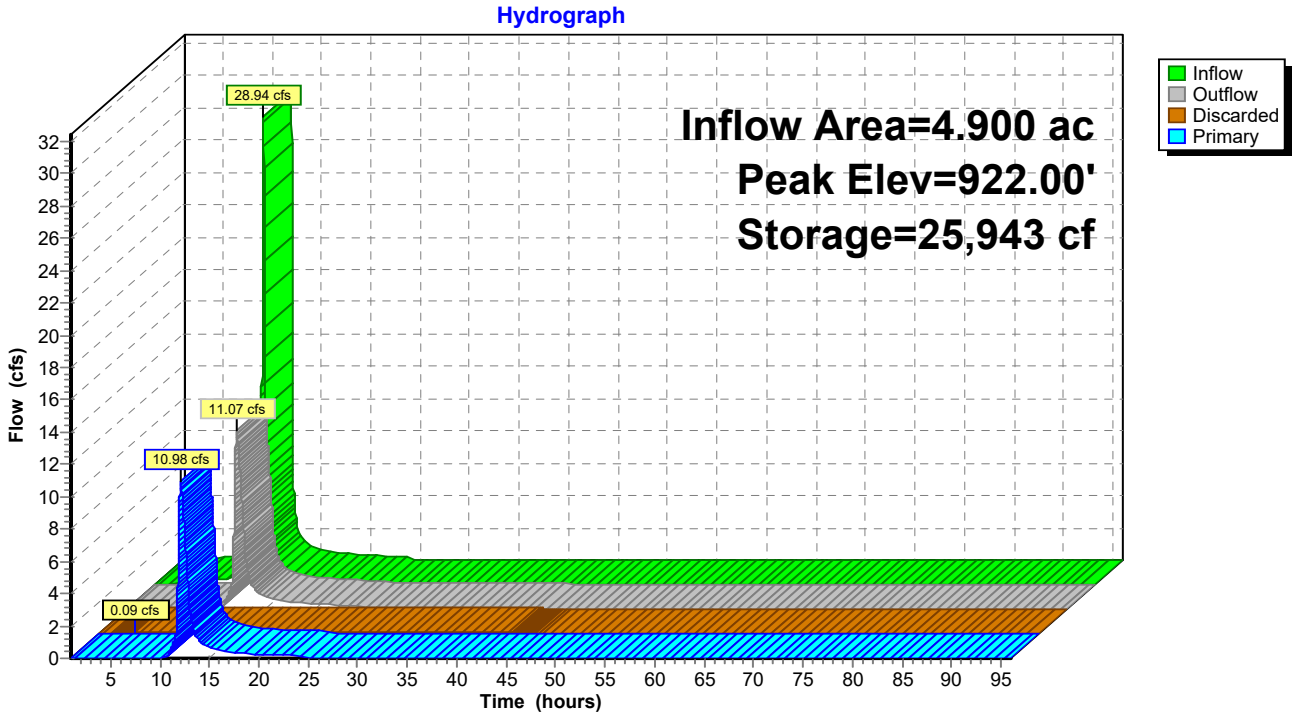
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 4.70 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=10.98 cfs @ 12.10 hrs HW=922.00' (Free Discharge)
└─**4=Culvert** (Passes 10.98 cfs of 16.47 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 10.98 cfs @ 7.75 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

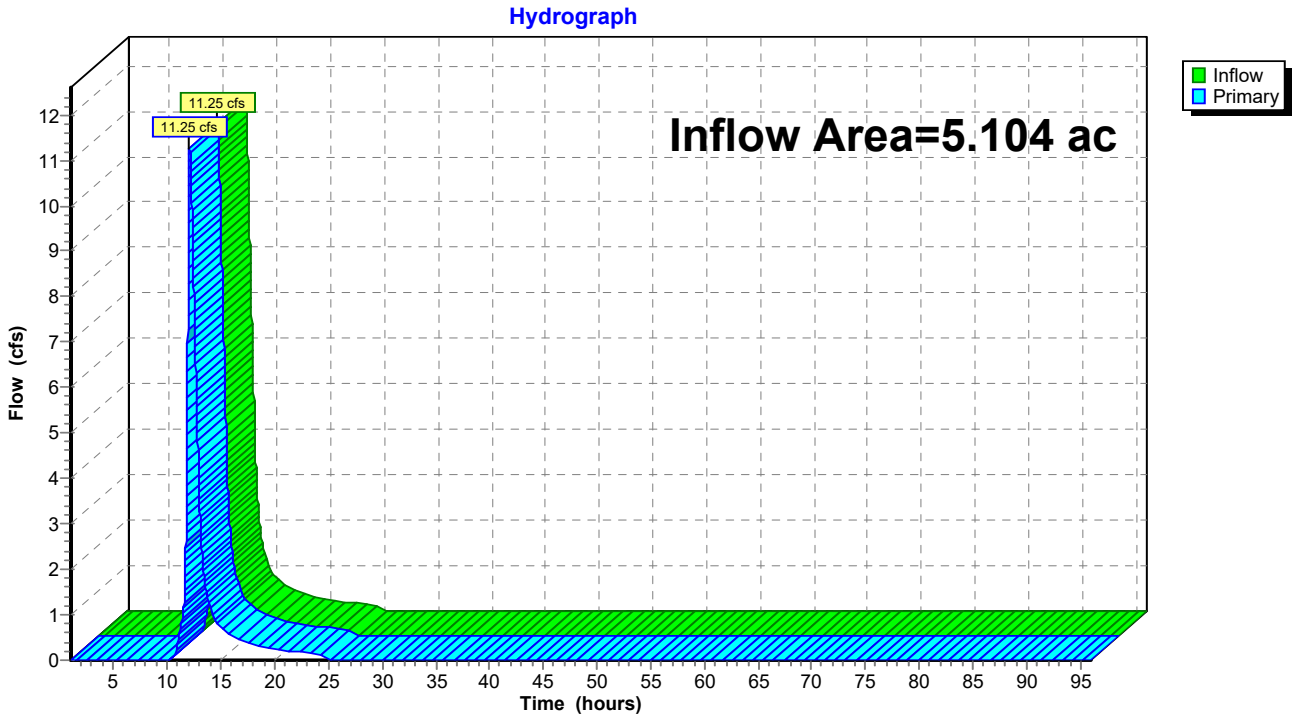


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 3.09" for 50-yr NOAA event
Inflow = 11.25 cfs @ 12.08 hrs, Volume= 1.313 af
Primary = 11.25 cfs @ 12.08 hrs, Volume= 1.313 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



Summary for Subcatchment 9S: PR DA Undetained

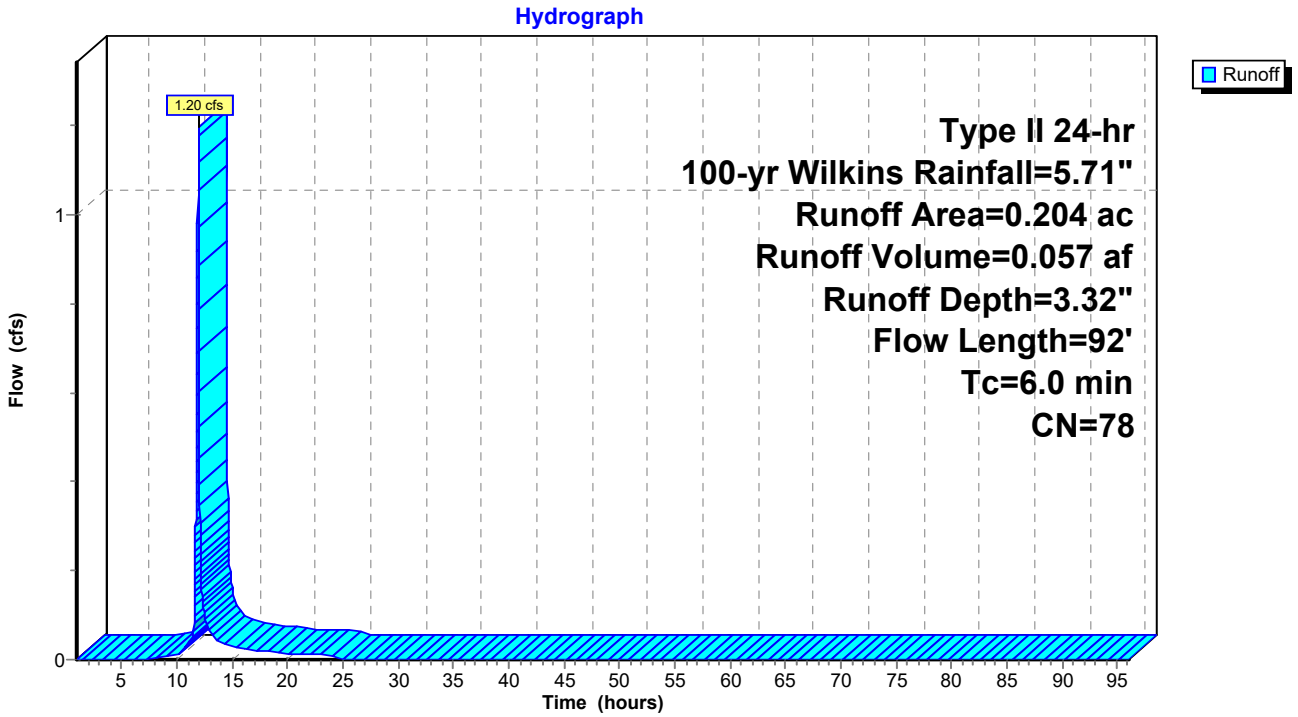
Runoff = 1.20 cfs @ 11.97 hrs, Volume= 0.057 af, Depth= 3.32"
Routed to Link 14L : PR POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Wilkins Rainfall=5.71"

Area (ac)	CN	Description
0.009	98	Paved parking, HSG D
0.004	70	Woods, Good, HSG C
0.104	80	>75% Grass cover, Good, HSG D
0.087	74	>75% Grass cover, Good, HSG C
0.204	78	Weighted Average
0.195		95.59% Pervious Area
0.009		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1500	0.29		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.2	42	0.0714	4.30		**Shallow Concentrated Flow, Shallow Grass** Unpaved Kv= 16.1 fps
3.0					**Direct Entry, Tc**
6.0	92	Total			

Subcatchment 9S: PR DA Undetained



Summary for Subcatchment 14S: PR DA Detained

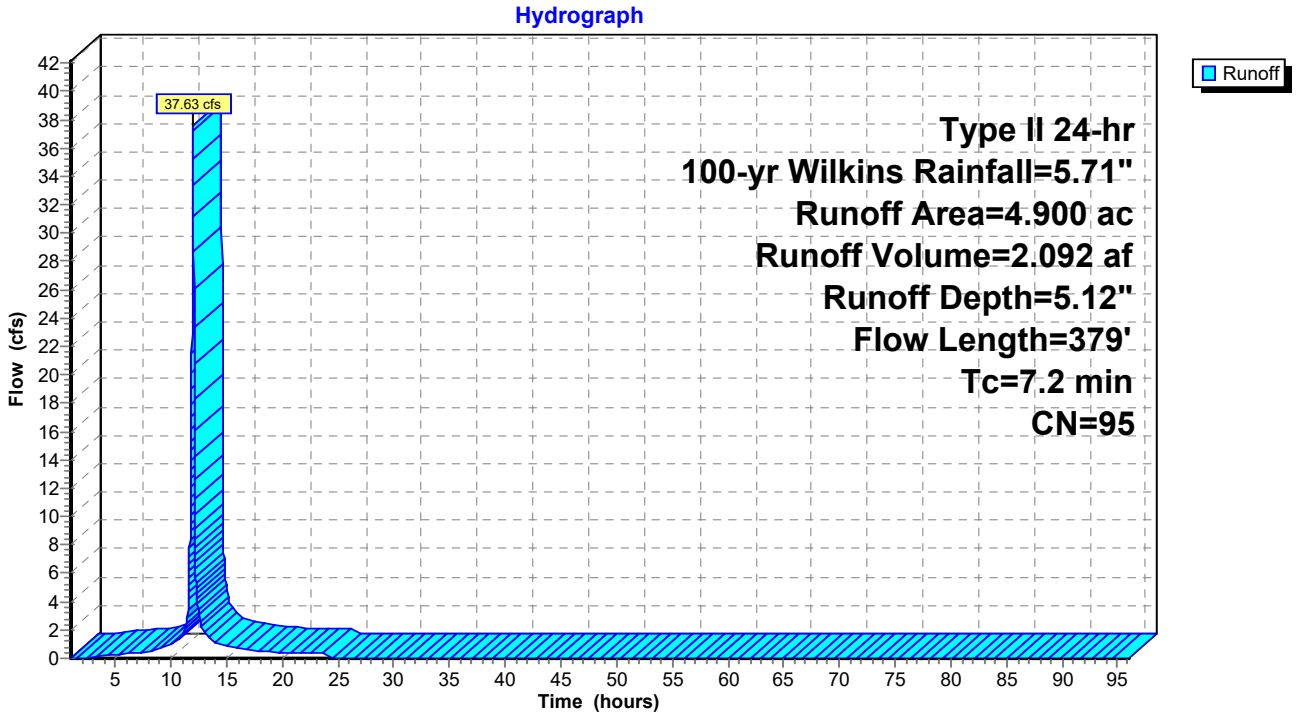
Runoff = 37.63 cfs @ 11.98 hrs, Volume= 2.092 af, Depth= 5.12"
Routed to Pond 7P : Underground ADS Tank

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Wilkins Rainfall=5.71"

Area (ac)	CN	Description
3.086	98	Paved parking, HSG D
1.185	98	Paved parking, HSG C
0.049	77	Woods, Good, HSG D
0.218	70	Woods, Good, HSG C
0.153	80	>75% Grass cover, Good, HSG D
0.209	74	>75% Grass cover, Good, HSG C
4.900	95	Weighted Average
0.629		12.84% Pervious Area
4.271		87.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0200	0.13		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 2.50"
0.1	20	0.0250	2.55		**Shallow Concentrated Flow, Sheet Grass** Unpaved Kv= 16.1 fps
0.4	86	0.0350	3.80		**Shallow Concentrated Flow, Shallow Pavement** Paved Kv= 20.3 fps
0.3	214	0.0414	10.71	13.14	**Pipe Channel, 15" Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
0.0	9	0.0030	4.58	22.47	**Pipe Channel, 30" Pipe** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.2	379	Total			

Subcatchment 14S: PR DA Detained



Summary for Pond 7P: Underground ADS Tank

Inflow Area = 4.900 ac, 87.16% Impervious, Inflow Depth = 5.12" for 100-yr Wilkins event
Inflow = 37.63 cfs @ 11.98 hrs, Volume= 2.092 af
Outflow = 13.80 cfs @ 12.10 hrs, Volume= 2.092 af, Atten= 63%, Lag= 7.3 min
Discarded = 0.09 cfs @ 3.66 hrs, Volume= 0.315 af
Primary = 13.71 cfs @ 12.10 hrs, Volume= 1.777 af
Routed to Link 14L : PR POI 1

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 923.44' @ 12.10 hrs Surf.Area= 8,091 sf Storage= 32,521 cf

Plug-Flow detention time= 139.1 min calculated for 2.092 af (100% of inflow)
Center-of-Mass det. time= 139.2 min (901.5 - 762.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	13,794 cf	**101.17'W x 79.97'L x 7.00'H Field A** 56,636 cf Overall - 22,150 cf Embedded = 34,486 cf x 40.0% Voids
#2A	918.50'	22,150 cf	**ADS_StormTech MC-7200 +Cap** x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		35,944 cf	Total Available Storage

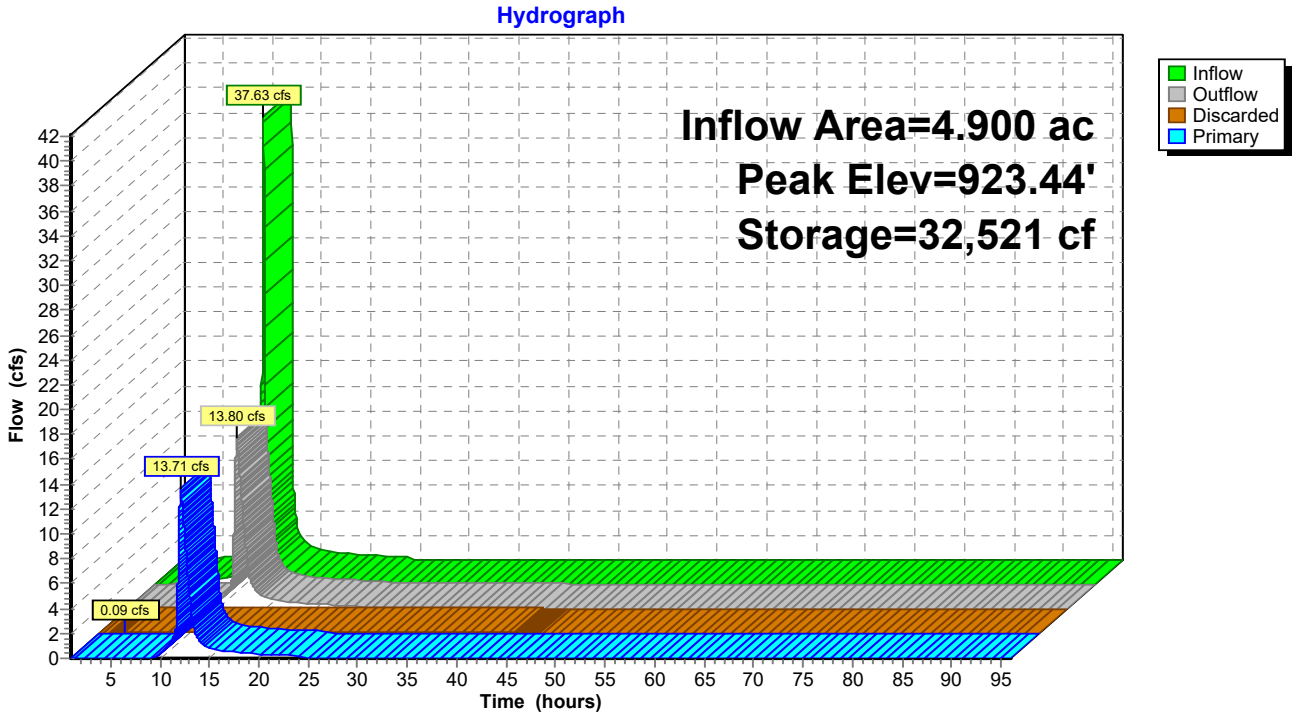
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 3.66 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=13.70 cfs @ 12.10 hrs HW=923.44' (Free Discharge)
└─**4=Culvert** (Passes 13.70 cfs of 19.39 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 13.70 cfs @ 9.67 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank

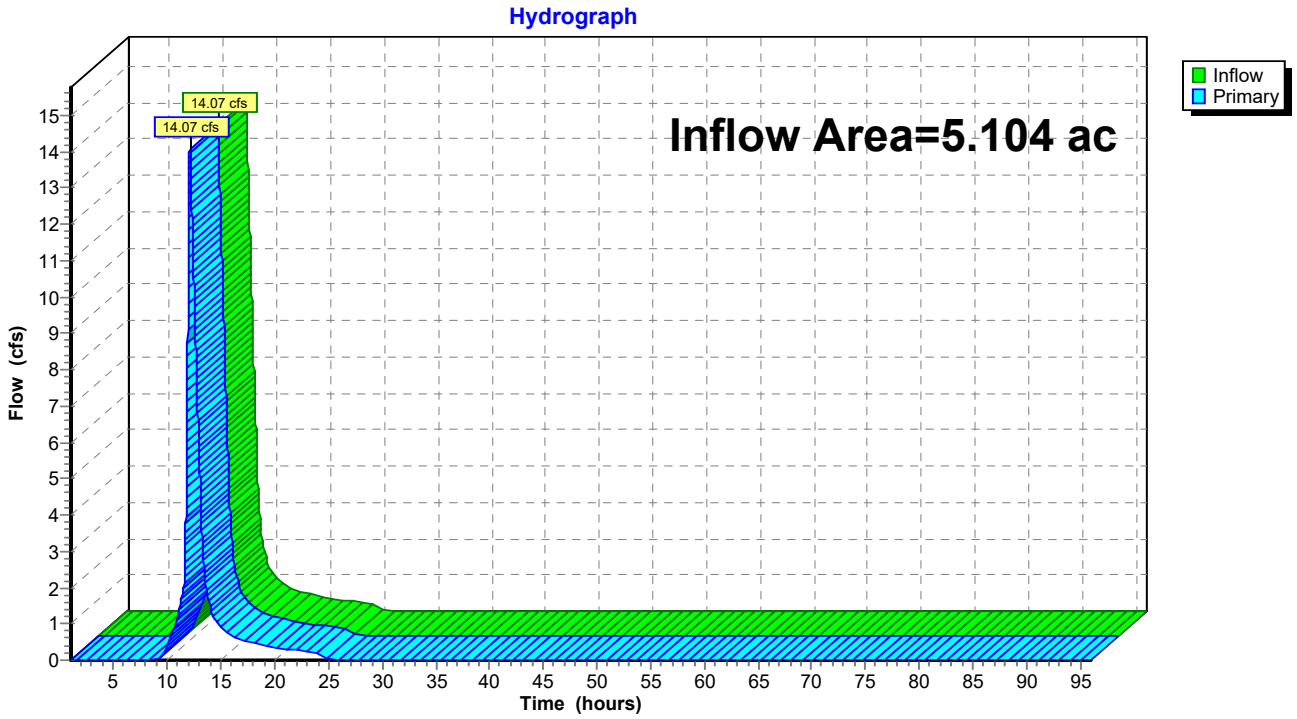


Summary for Link 14L: PR POI 1

Inflow Area = 5.104 ac, 83.86% Impervious, Inflow Depth = 4.31" for 100-yr Wilkins event
Inflow = 14.07 cfs @ 12.09 hrs, Volume= 1.834 af
Primary = 14.07 cfs @ 12.09 hrs, Volume= 1.834 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs

Link 14L: PR POI 1



APPENDIX E

STORMWATER MANAGEMENT CALCULATIONS

NPDES WORKSHEETS

General Information

Instructions | *General* | Volume | Rate | Quality

Project Name: **22-1050 - Benderson - Wilkins Township**

Application Type: **PAG-02 NOI**

County: **Allegheny**

Municipality: **Wilkins Township**

Project Type: **Redevelopment**

◉ New Project ○ Minor / Major Amendment

Area: **12.77** acres
(In Watershed)

Total Earth Disturbance: **4.28** acres
(In Watershed)

No. of Post-Construction Discharge Points: **1**

Start DP Numbering at: **001**

Discharge Point (DP) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural BMP(s)
001	4.90	4.13	3.95	4.01	Discharge to Non-Surface Waters	WWF	Yes
Undetained Areas	0.20	0.15	0.01	0.01	Discharge to Non-Surface Waters	WWF	
Totals:	**5.10**	**4.28**	**3.96**	**4.02**			

Volume Management

Project: 22-1050 - Benderson - Wilkins Township

Instructions | **General** | ***Volume*** | **Rate** | **Quality**

2-Year / 24-Hour Storm Event (NOAA Atlas 14): **2.38** inches

Alternative 2-Year / 24-Hour Storm Event **2.5** inches

Alternative Source: **Wilkins Township Ecode**

Pre-Construction Conditions: *No. Rows:* **7**

☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	2.25	D	98	0.041	2.15	17,572
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.90	C	98	0.041	2.15	7,029
Forested (Good Condition)	0.04	D	77	0.597	0.67	97
Forested (Good Condition)	0.05	C	70	0.857	0.40	72
Pervious as Meadow	0.24	D	78	0.564	0.71	620
Impervious as Meadow	0.57	D	78	0.564	0.71	1,472
Impervious as Meadow	0.23	C	71	0.817	0.43	361
TOTAL (ACRES):	**4.28**				**TOTAL (CF):**	**27,223**

Post-Construction Conditions: *No. Rows:* **4**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	2.89	D	98	0.041	2.15	22,571

Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	1.12	C	98	0.041	2.15	8,747
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.21	D	80	0.500	0.81	615
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.06	C	74	0.703	0.54	118
TOTAL (ACRES):	**4.28**				**TOTAL (CF):**	**32,051**

NET CHANGE IN VOLUME TO MANAGE (CF): **4,828**

Non-Structural BMP Volume Credits:

☑ Tree Planting Credit

Number of new deciduous trees that will be planted within disturbed area: 23 **CREDIT (CF):** **138**

Number of new evergreen trees that will be planted within disturbed area: **CREDIT (CF):**

☐ Other (attach calculations):

Structural BMP Volume Credits: *No. Structural BMPs:* **1** *Start BMP Numbering at:* **1**

DP No.	BMP No.	BMP Name	MRC?	Discharge	Incremental BMP DA (acres)	Volume Routed to BMP (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegeta-ted?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Dry Well / Seepage Pit	-	Off-Site	4.13	32,452	8,091	0.50	45	No	1.0	6,011	**9,652**	
												Totals:	**9,652**	

INFILTRATION & ET CREDITS (CF): **9,652**

NET CHANGE IN VOLUME TO MANAGE (CF): **4,828**

TOTAL CREDITS (CF): **9,790**

VOLUME REQUIREMENT SATISFIED

Water Quality

Project: 22-1050 - Benderson - Wilkins Township

PRINT

Instructions | General | Volume | Rate | *Quality*

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	2.25	D	17,572	65.0	0.29	2.05	71.32	0.32	2.25
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	0.90	C	7,029	65.0	0.29	2.05	28.53	0.13	0.90
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	0.04	D	97	45.0	0.13	1.05	0.27	0.00	0.01
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	0.05	C	72	45.0	0.13	1.05	0.20	0.00	0.00
Pervious as Meadow	Grassland/Herbaceous	0.24	D	620	48.8	0.22	2.30	1.89	0.01	0.09
Impervious as Meadow	Grassland/Herbaceous	0.57	D	1,472	48.8	0.22	2.30	4.48	0.02	0.21
Impervious as Meadow	Grassland/Herbaceous	0.23	C	361	48.8	0.22	2.30	1.10	0.00	0.05
	TOTAL (ACRES):	**4.28**					**TOTALS:**	**107.80**	**0.48**	**3.51**

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	2.89	D	22,571	65.0	0.29	2.05	91.61	0.41	2.89
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	1.12	C	8,747	65.0	0.29	2.05	35.50	0.16	1.12
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	0.21	D	615	78.0	0.25	1.25	3.00	0.01	0.05
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	0.06	C	118	78.0	0.25	1.25	0.57	0.00	0.01
	TOTAL (ACRES):	**4.28**					**TOTALS:**	**130.68**	**0.58**	**4.07**

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	**22.88**	**0.10**	**0.55**

☑ **Characterize Undetained Areas (for Untreated Stormwater)** *No. Rows:* **3**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	**0.01**	**D**	**98**	**0.041**	**2.15**	**78**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**0.1**	**D**	**80**	**0.500**	**0.81**	**293**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**0.09**	**C**	**74**	**0.703**	**0.54**	**177**

Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☐ Other (attach calculations)

Structural BMP Water Quality Credits:

☑ *Use default BMP Outflows and Median BMP Outflow Concentrations*

DP No.	BMP No.	BMP Name	MRC?	BMP DA (acres)	Vol. Routed to BMP (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	1	Dry Well / Seepage Pit	-	4.13	32,452	9,652		22,800	22.00	0.10	2.38	31.32	0.14	3.39

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):	**31.32**	**0.14**	**3.39**
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	**2.61**	**0.01**	**0.05**
NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):			
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	**33.93**	**0.15**	**3.44**
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	**107.80**	**0.48**	**3.51**

WATER QUALITY REQUIREMENT SATISFIED

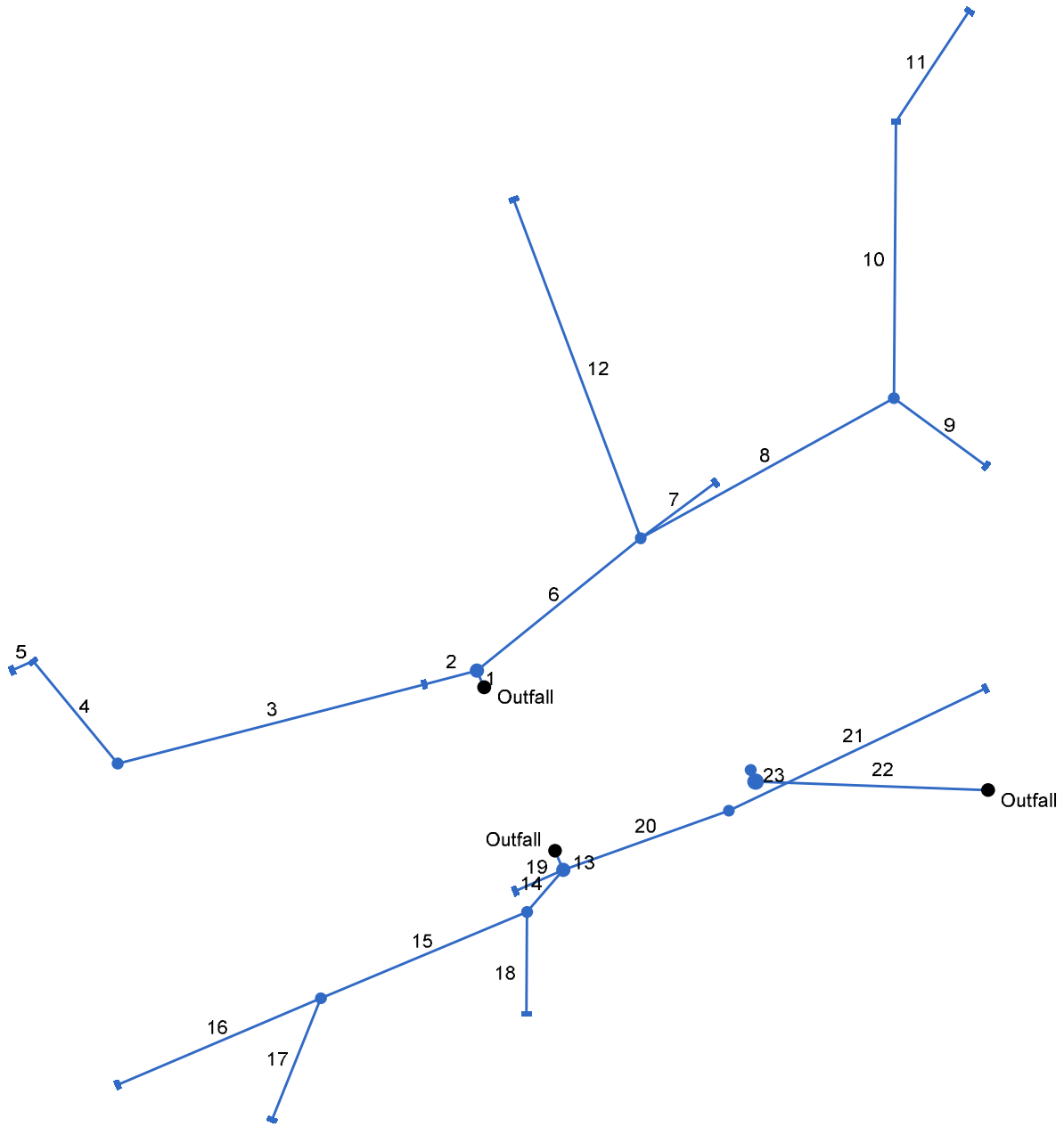
CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

Ian Booe	2/22/2023
Spreadsheet User Name	Date

25-YR HYDRAFLOW PIPE CALCULATIONS

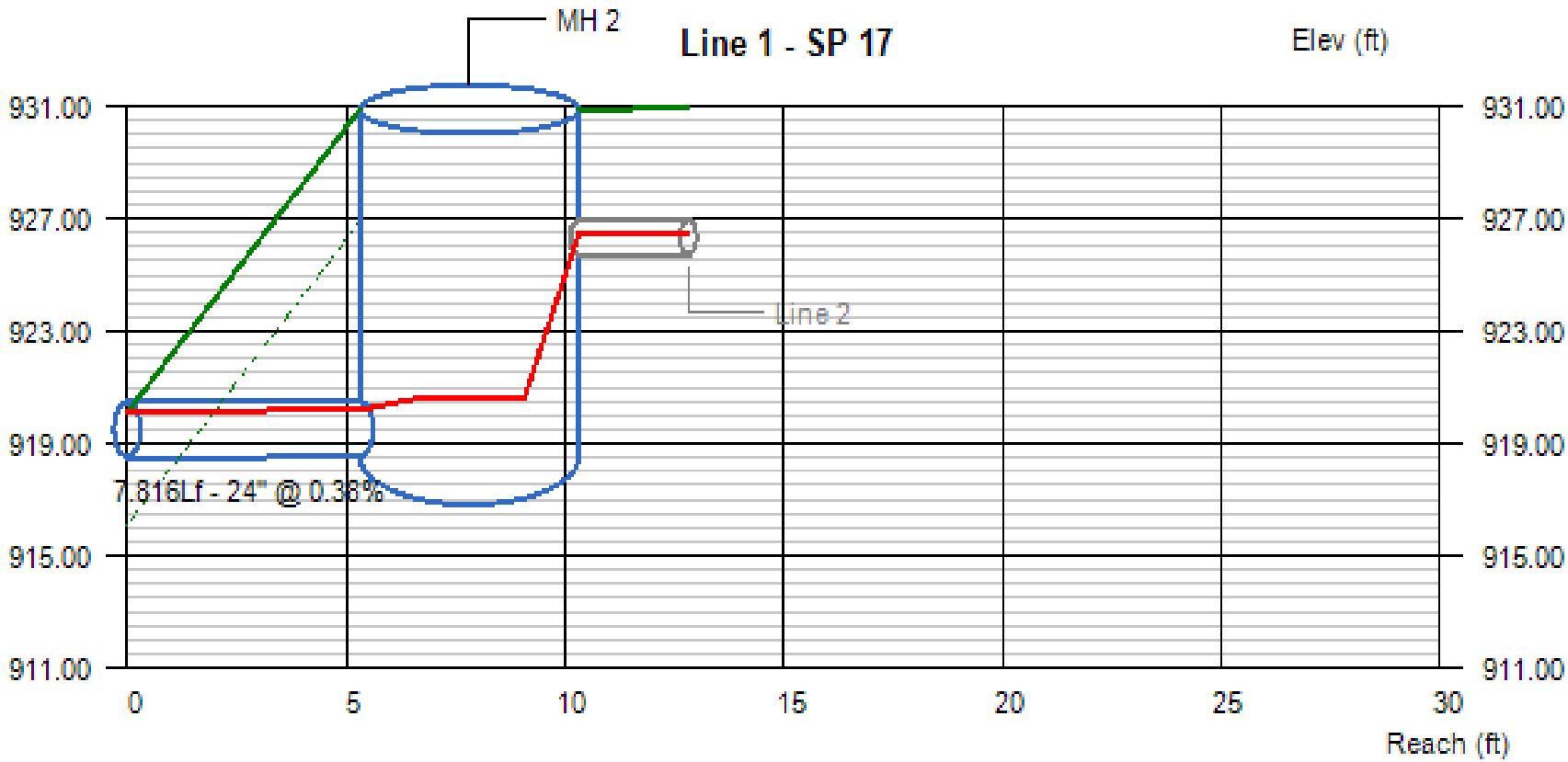
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm	Number of lines: 23	Date: 3/9/2023

Storm Sewers v2022.00

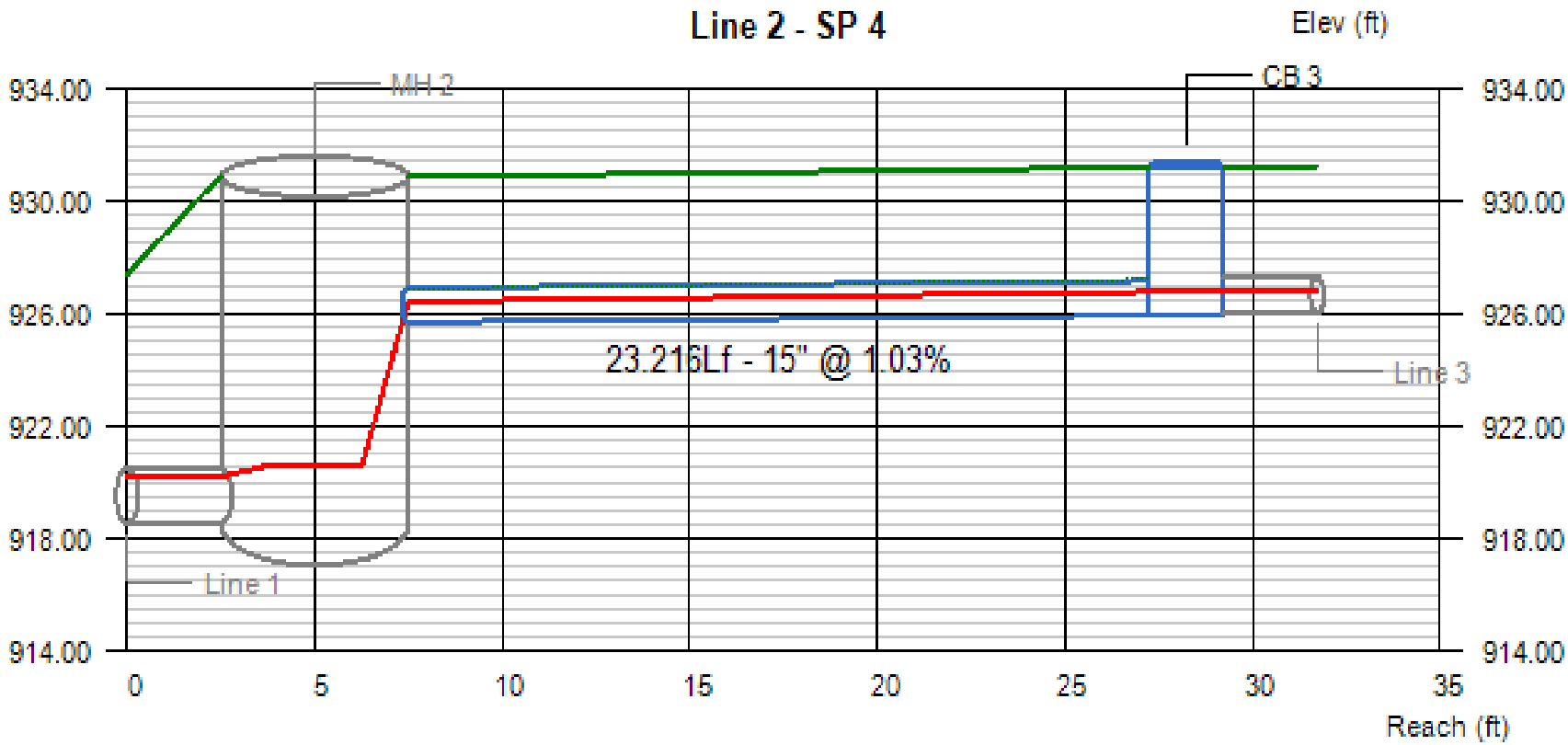
Line Profile (Line 1) - SP 17



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
1	14.17	918.50	918.53	1.66	1.66	2.06	920.16	920.19	920.59	5.09	5.09	-0.41	10.36

Project File: | No. Lines: 23 | Run Date: 2/22/2023

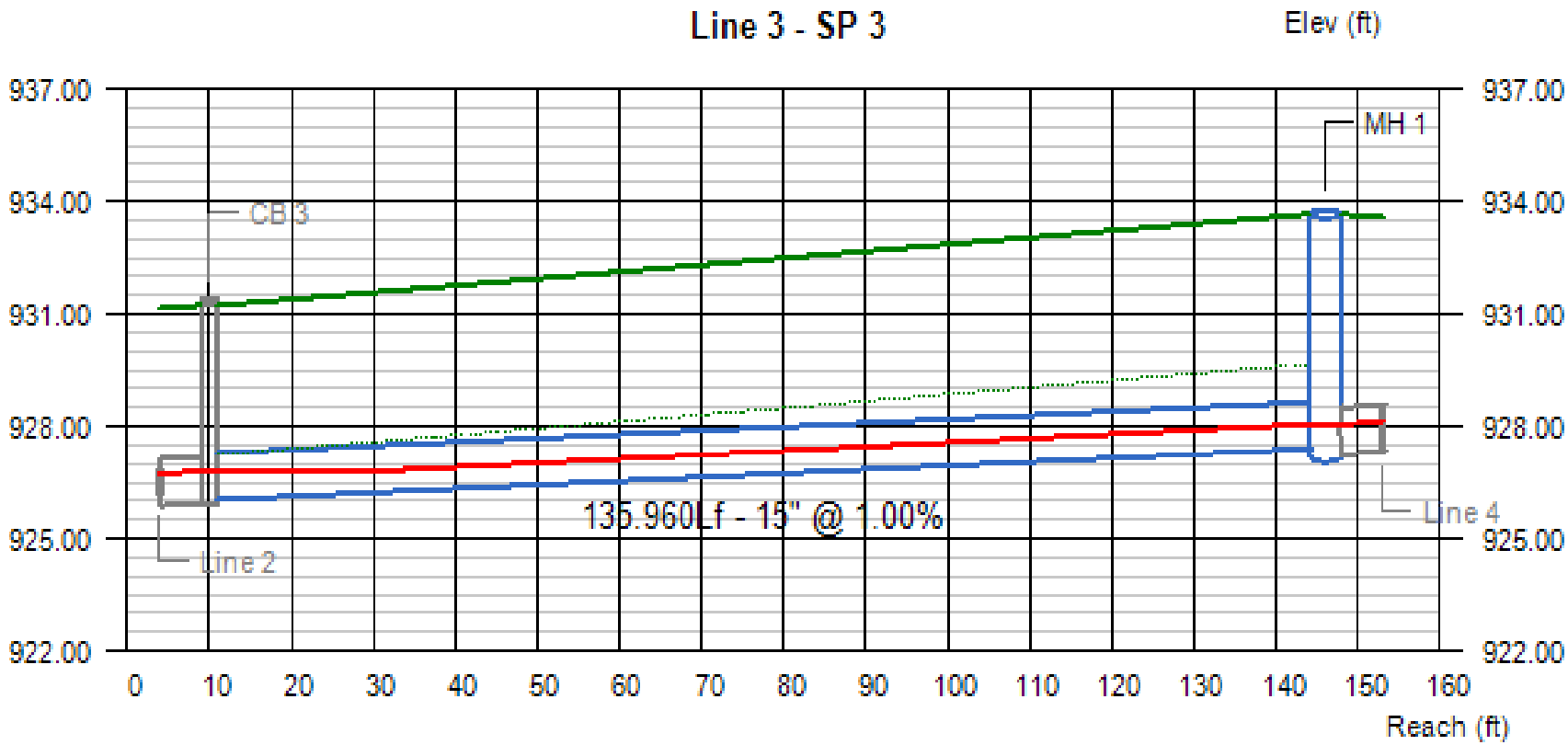
Line Profile (Line 2) - SP 4



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
2	4.52	925.69	925.93	0.76	0.86	0.86	926.45	926.79	926.79	5.77	5.02	3.95	4.05

Project File:	No. Lines: 23	Run Date: 2/22/2023

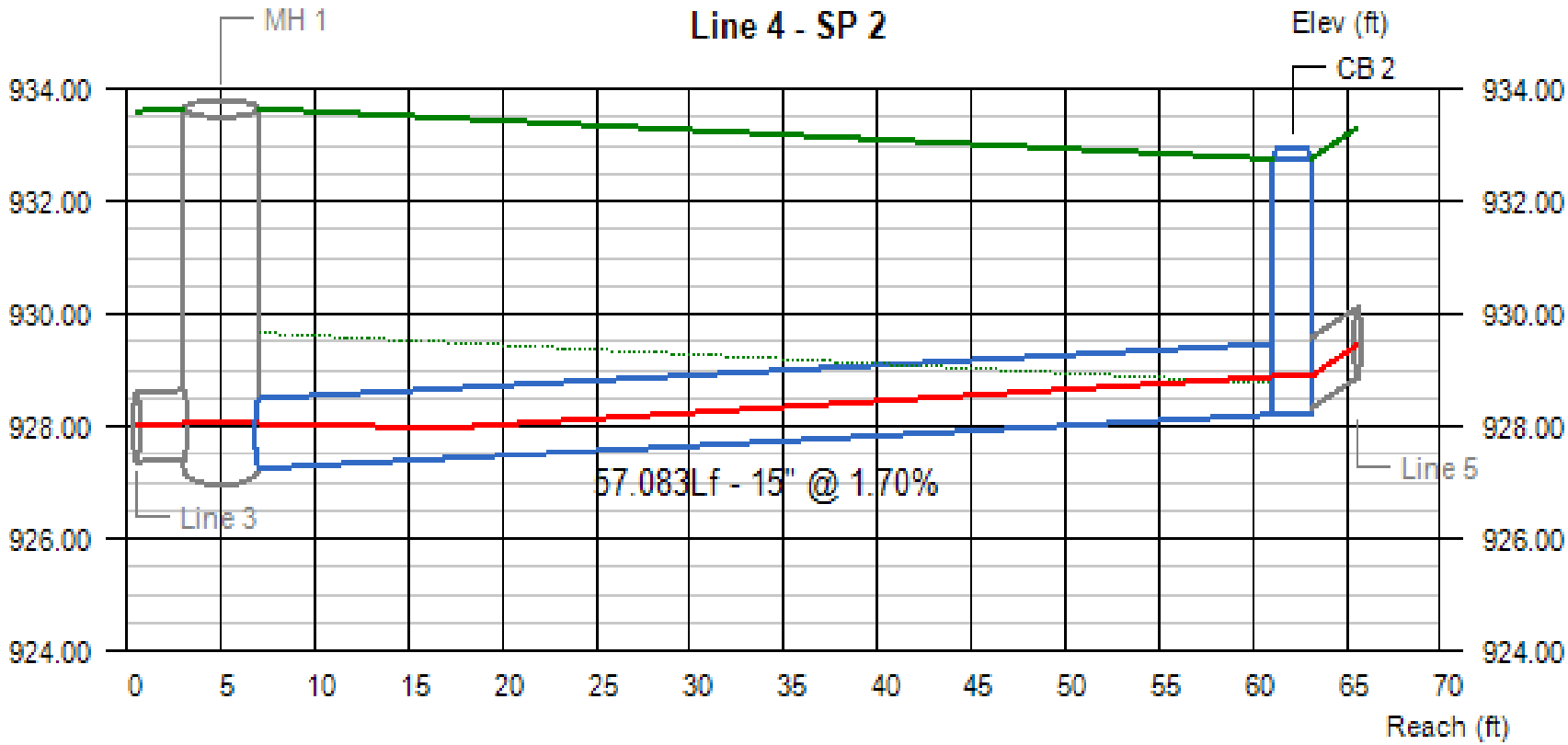
Line Profile (Line 3) - SP 3



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
3	2.73	926.03	927.39	0.76	0.66	0.66	926.79	928.05 j	928.05	3.49	4.14	3.95	5.01

Project File:	No. Lines: 23	Run Date: 2/22/2023

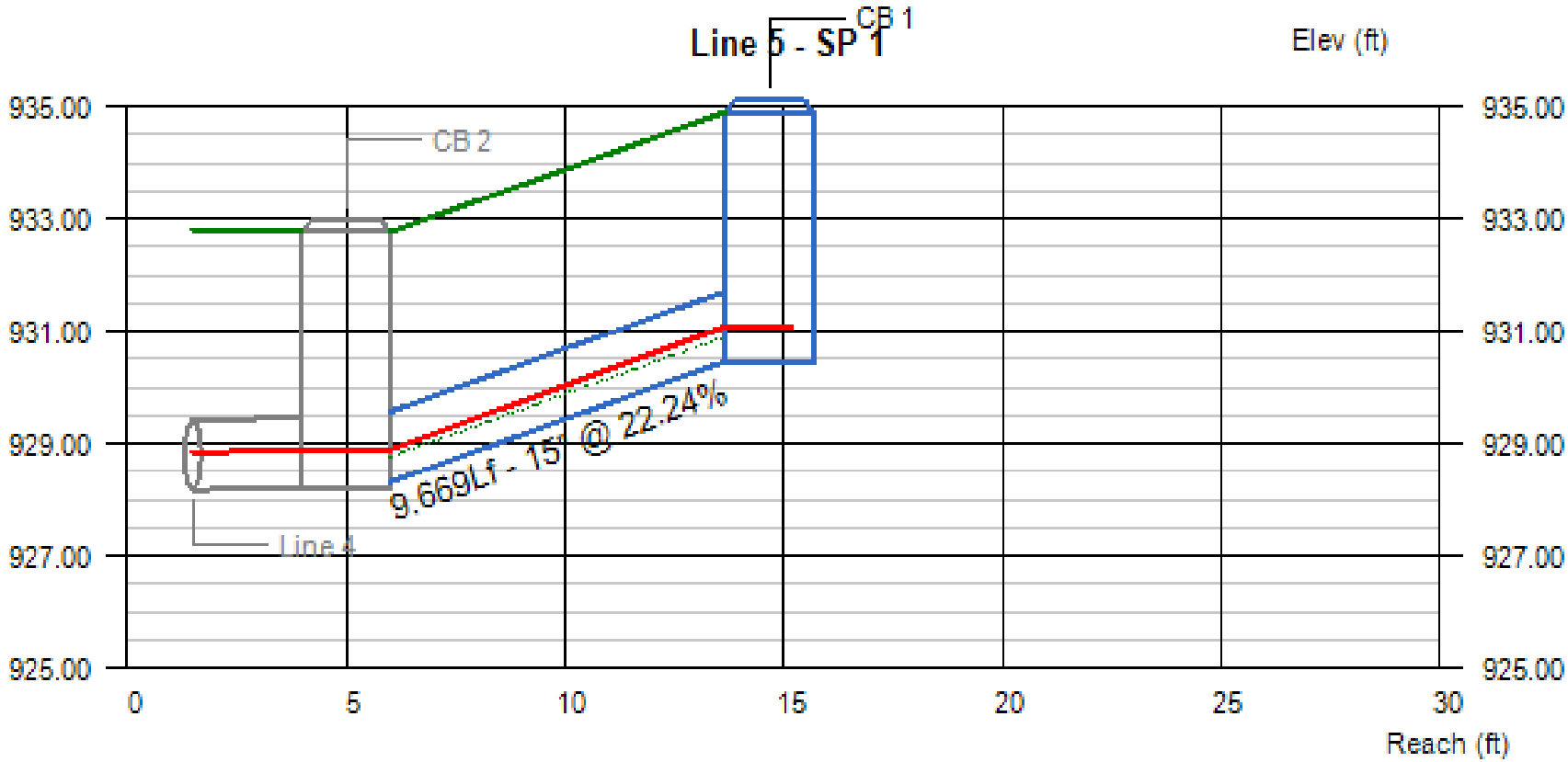
Line Profile (Line 4) - SP 2



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
4	2.80	927.24	928.21	0.81	0.67	0.67	928.05	928.88 j	928.88	3.31	4.17	5.16	3.30

Project File:	No. Lines: 23	Run Date: 2/22/2023

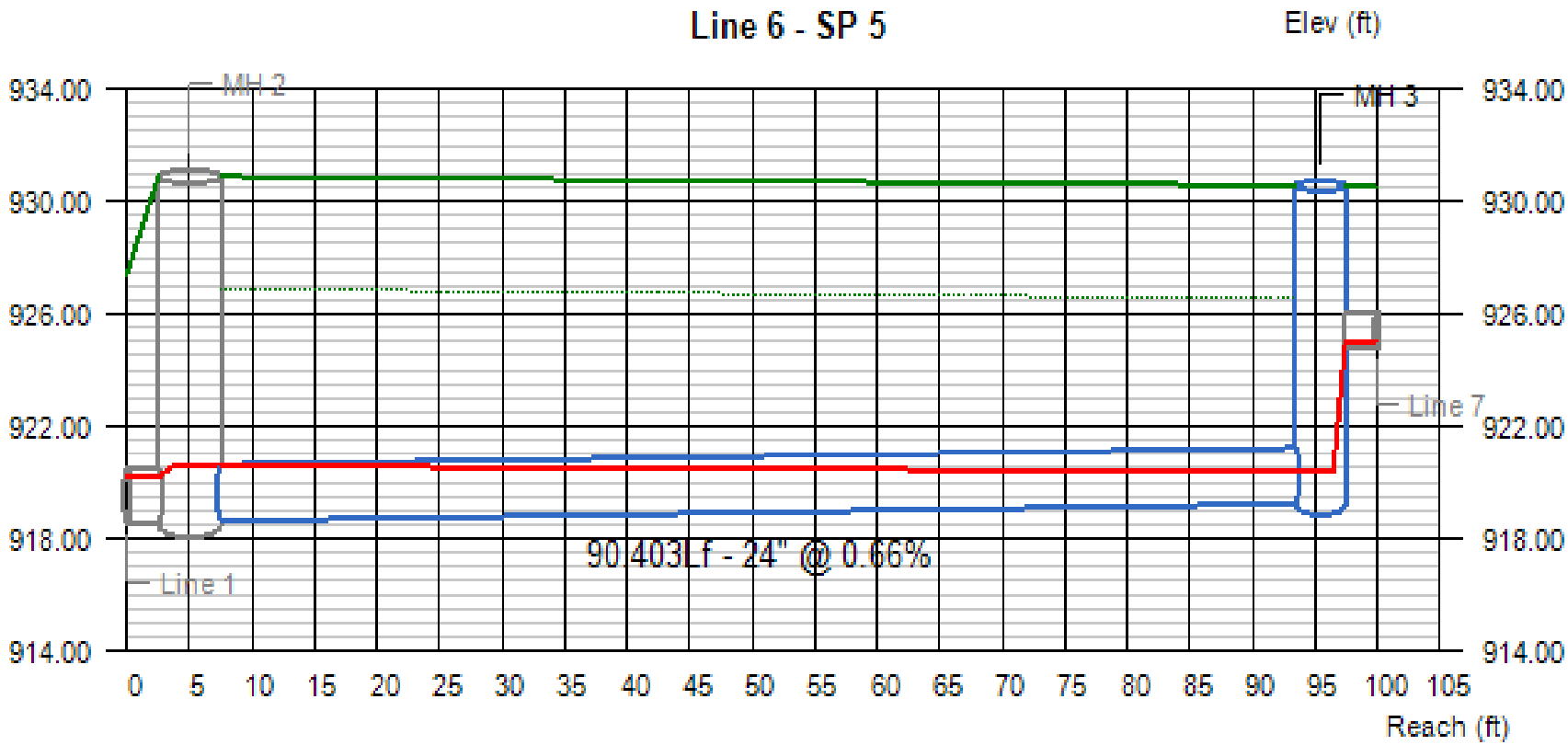
Line Profile (Line 5) - SP 1



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
5	2.43	928.31	930.46	0.57	0.62	0.62	928.88	931.08	931.08	4.45	3.97	3.20	3.19

Project File:	No. Lines: 23	Run Date: 2/22/2023

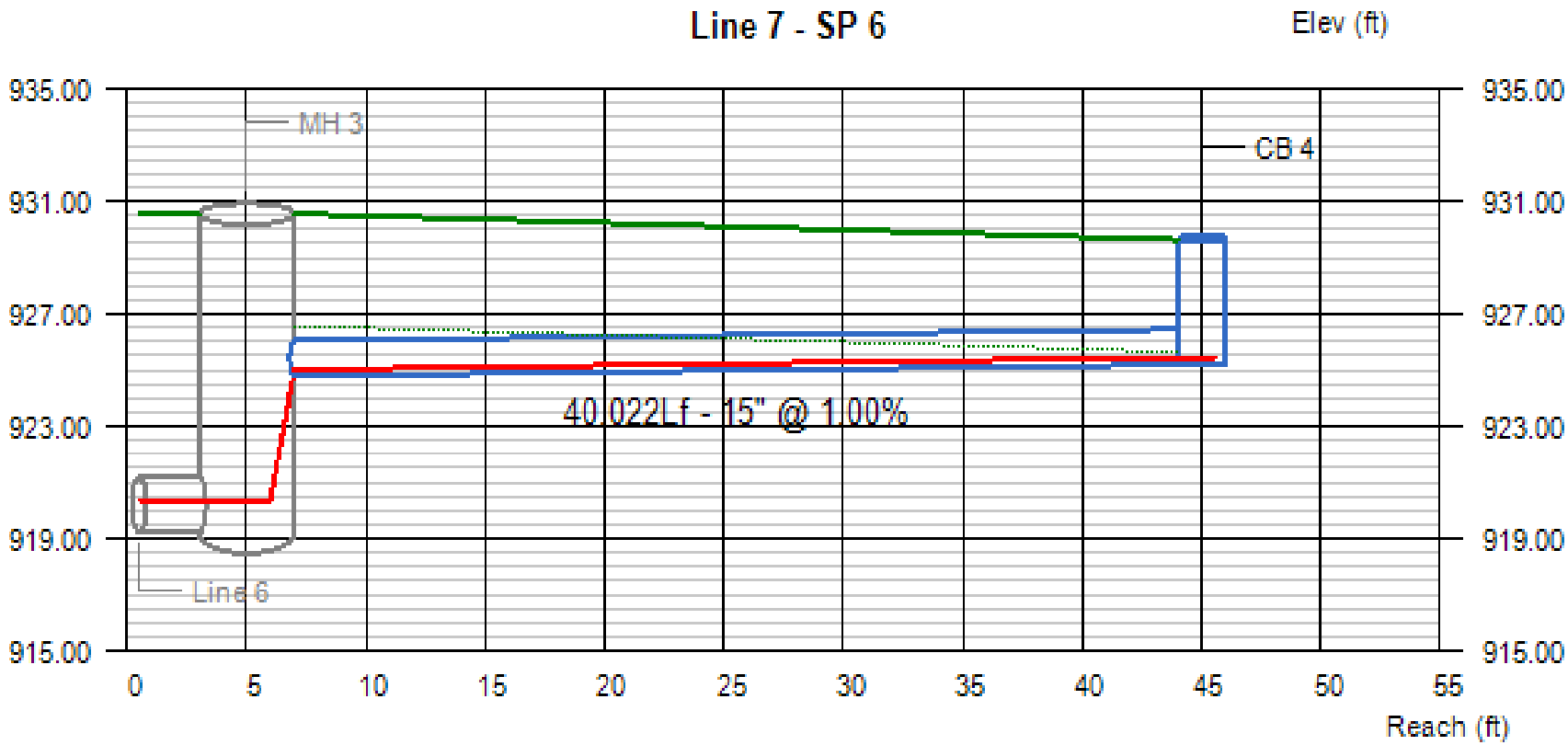
Line Profile (Line 6) - SP 5



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
6	10.09	918.63	919.23	1.96	1.14	1.14	920.59	920.37	920.37	3.23	5.48	10.26	9.32

Project File:	No. Lines: 23	Run Date: 2/22/2023

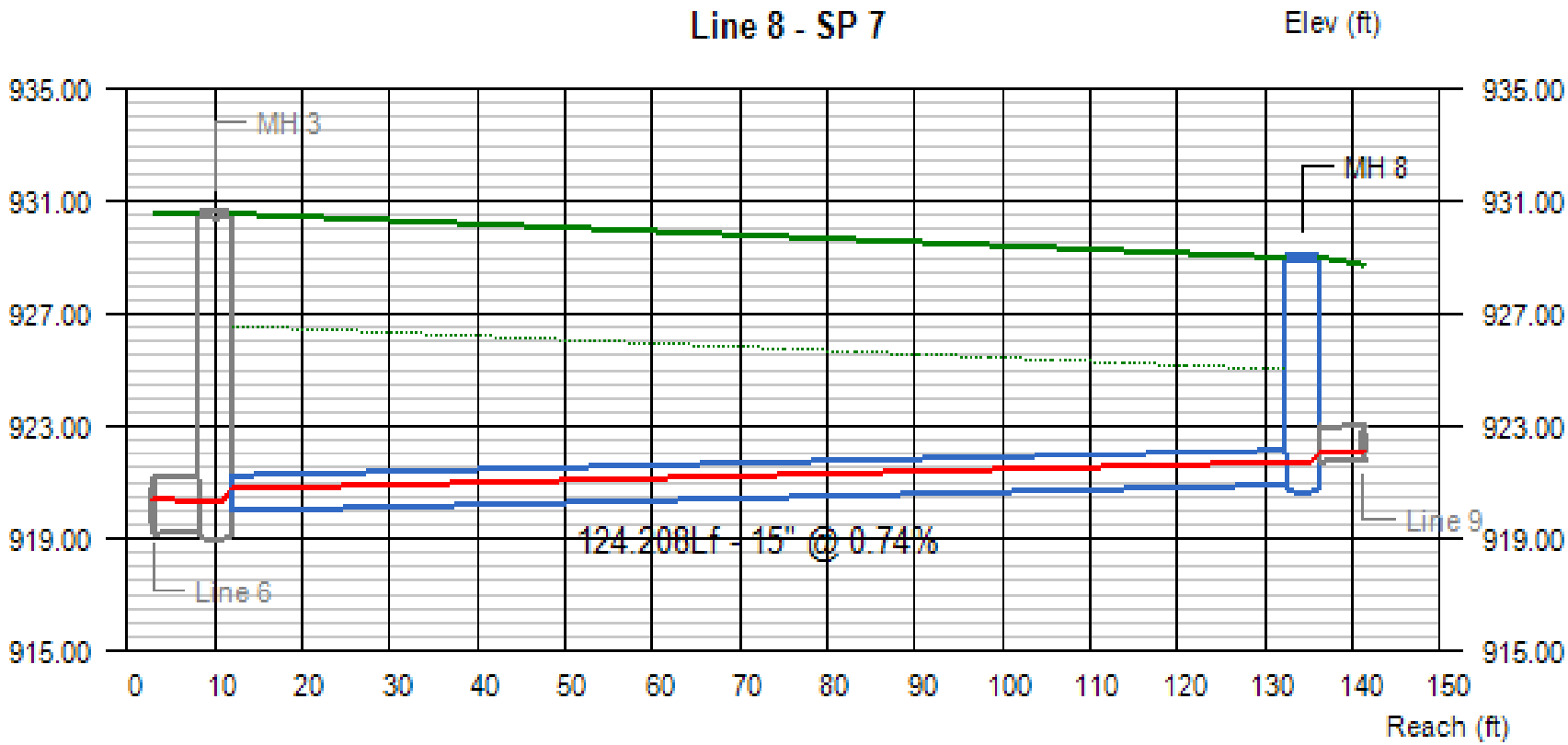
Line Profile (Line 7) - SP 6



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
7	0.45	924.78	925.18	0.22	0.26	0.26	925.00	925.44	925.44	3.01	2.42	4.52	3.20

Project File:	No. Lines: 23	Run Date: 2/22/2023

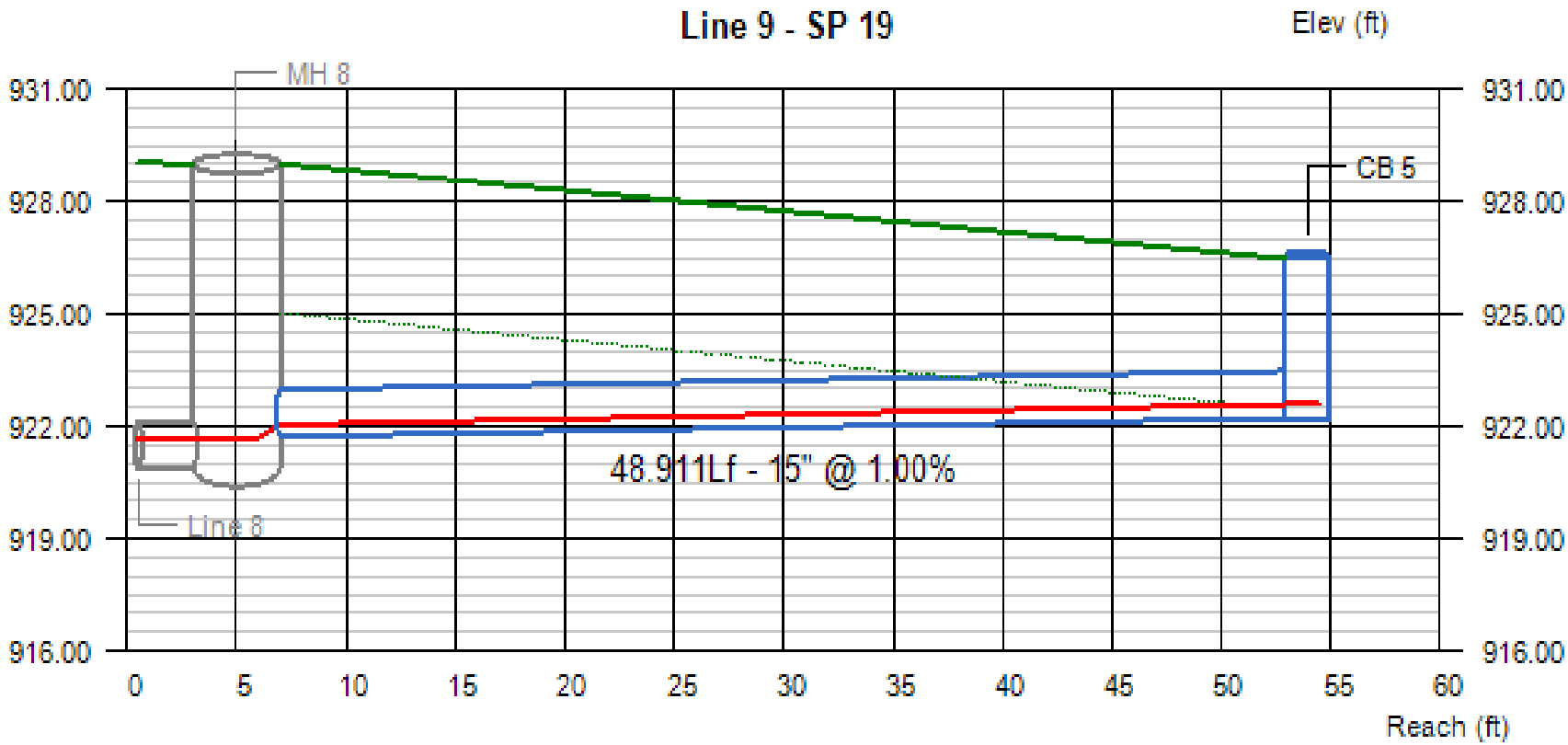
Line Profile (Line 8) - SP 7



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
8	3.97	919.98	920.90	0.78	0.81	0.81	920.76	921.71	921.71	4.92	4.75	9.32	6.86

Project File:	No. Lines: 23	Run Date: 2/22/2023

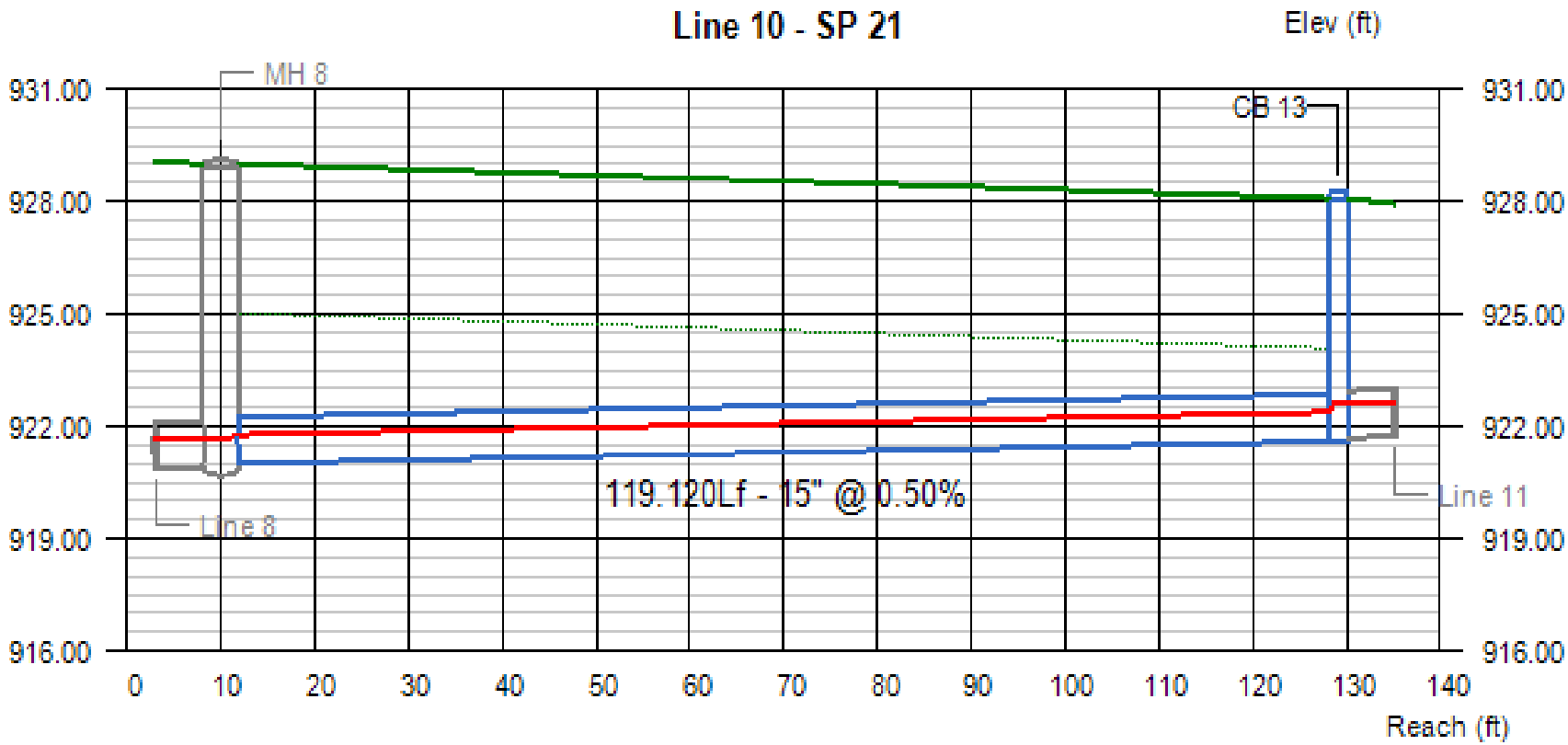
Line Profile (Line 9) - SP 19



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
9	0.89	921.73	922.22	0.31	0.37	0.37	922.04	922.59	922.59	3.70	2.94	6.03	3.00

Project File:	No. Lines: 23	Run Date: 2/22/2023

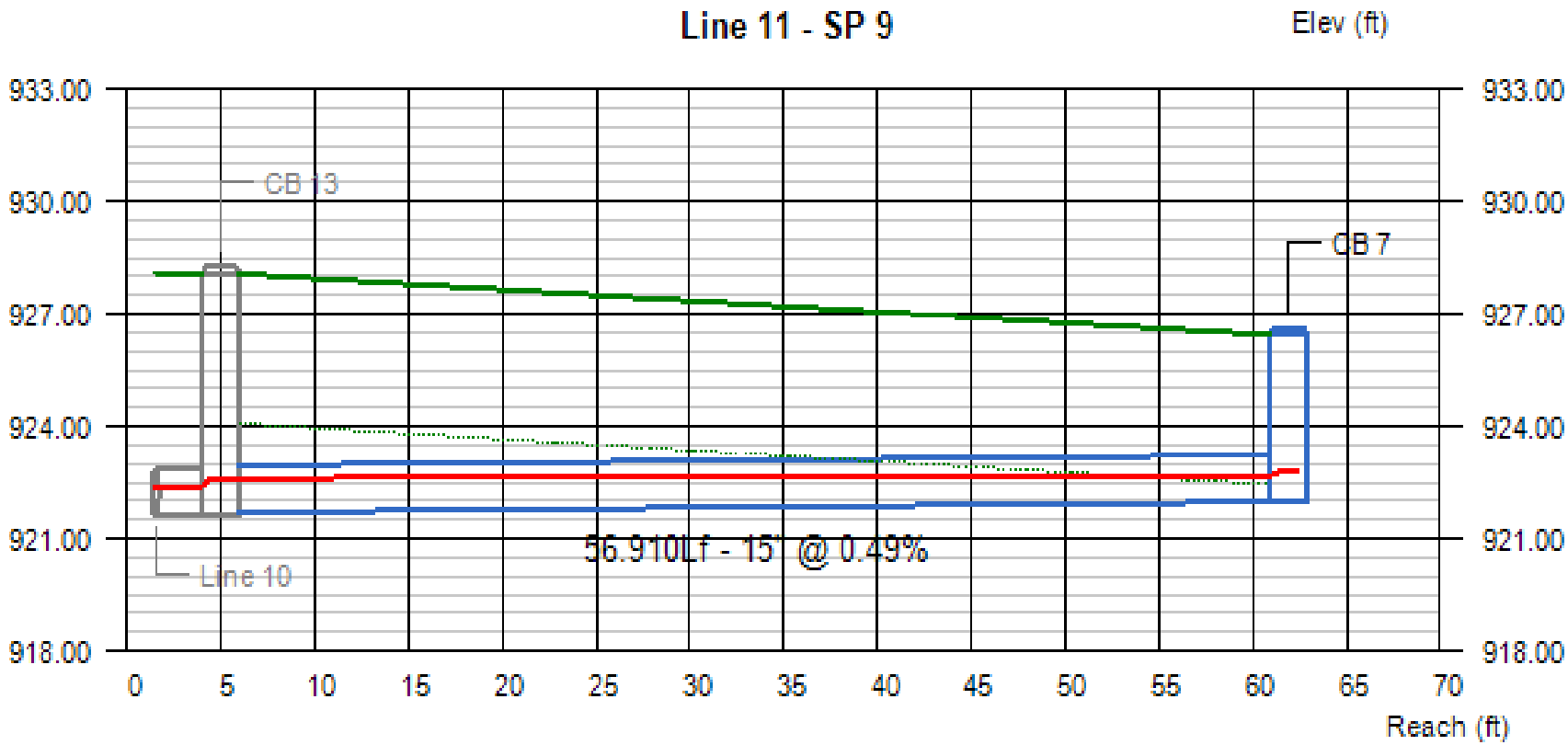
Line Profile (Line 10) - SP 21



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
10	3.27	921.00	921.60	0.78	0.78	1.01	921.78	922.38	922.61	4.06	4.06	6.76	5.22

Project File:	No. Lines: 23	Run Date: 2/22/2023

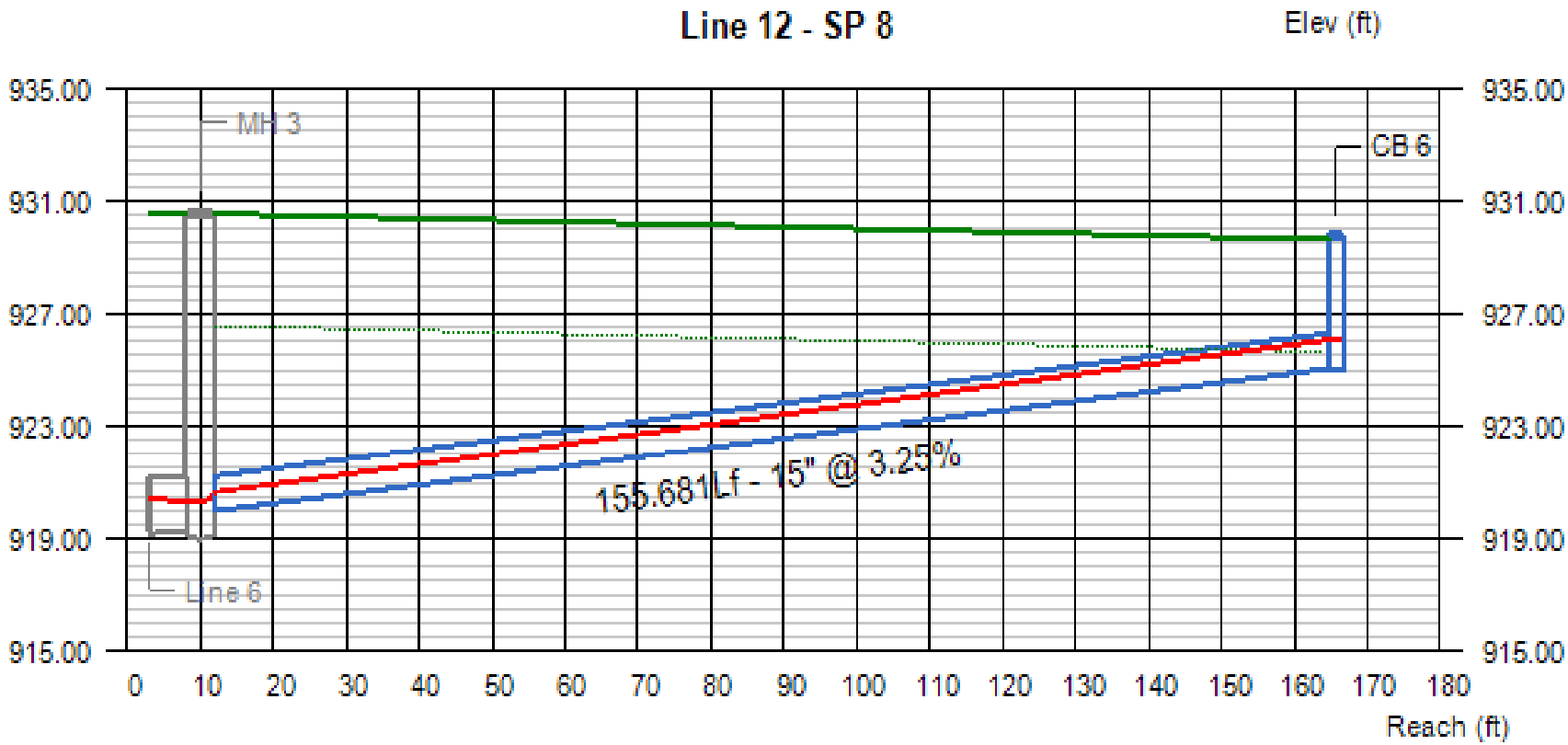
Line Profile (Line 11) - SP 9



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
11	1.92	921.70	921.98	0.91	0.68	0.80	922.61	922.66	922.78	2.00	2.82	5.12	3.20

Project File:	No. Lines: 23	Run Date: 2/22/2023

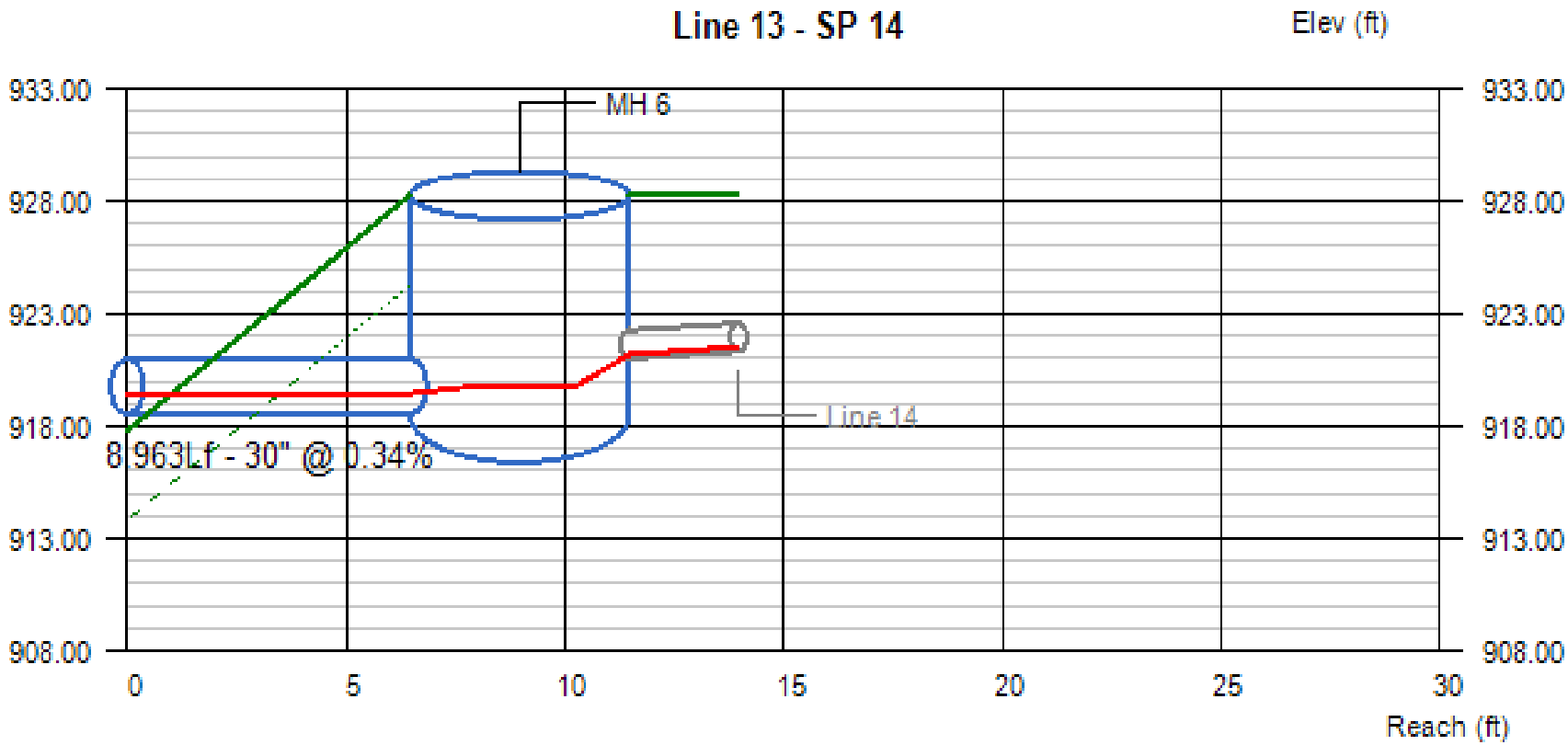
Line Profile (Line 12) - SP 8



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
12	6.51	919.98	925.04	0.67	1.03	1.03	920.65	926.07	926.07	9.75	6.03	9.32	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

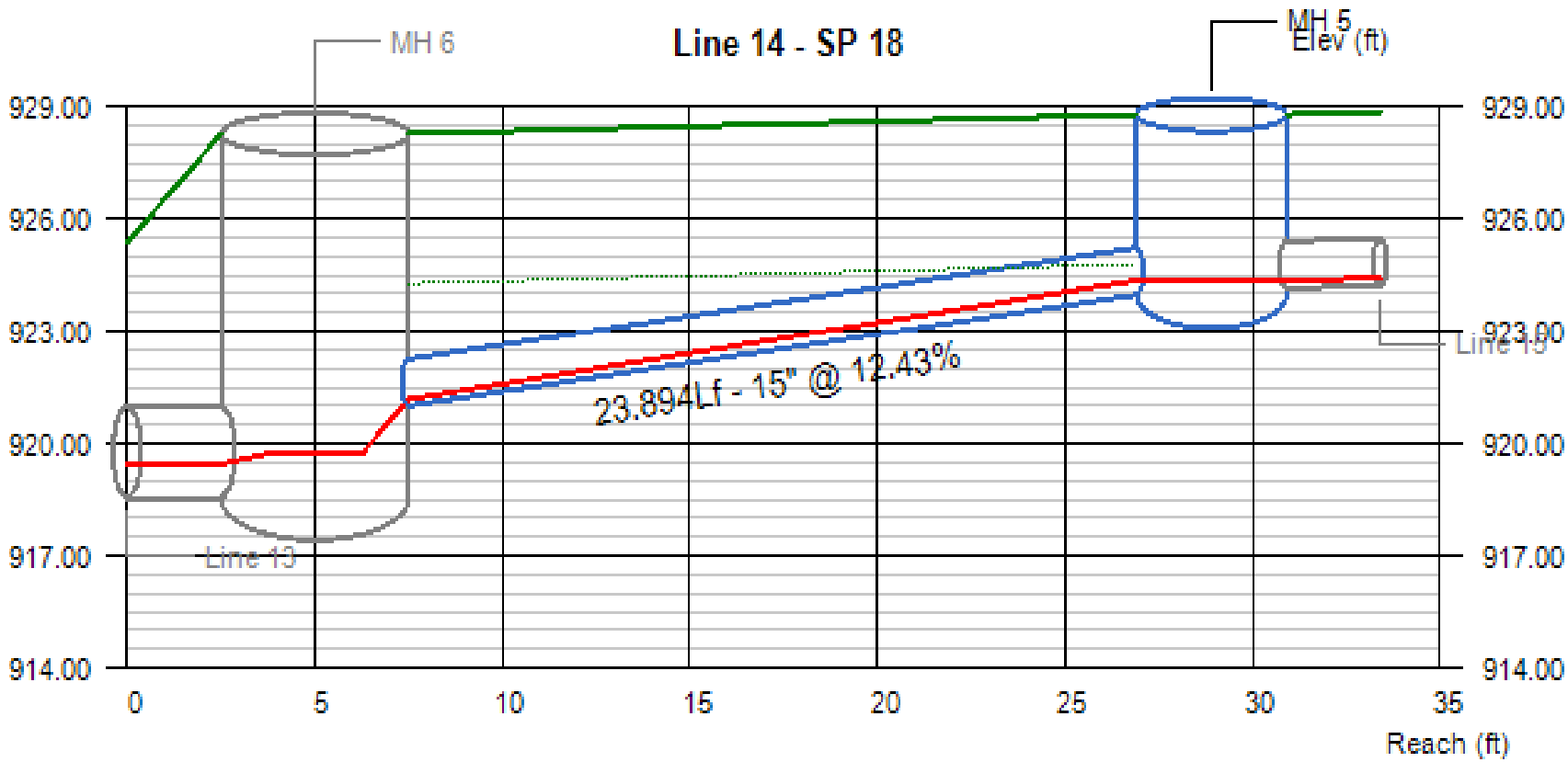
Line Profile (Line 13) - SP 14



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
13	6.97	918.50	918.53	0.93	0.93	1.20	919.43	919.46	919.73	4.20	4.20	-3.19	7.24

Project File:	No. Lines: 23	Run Date: 2/22/2023

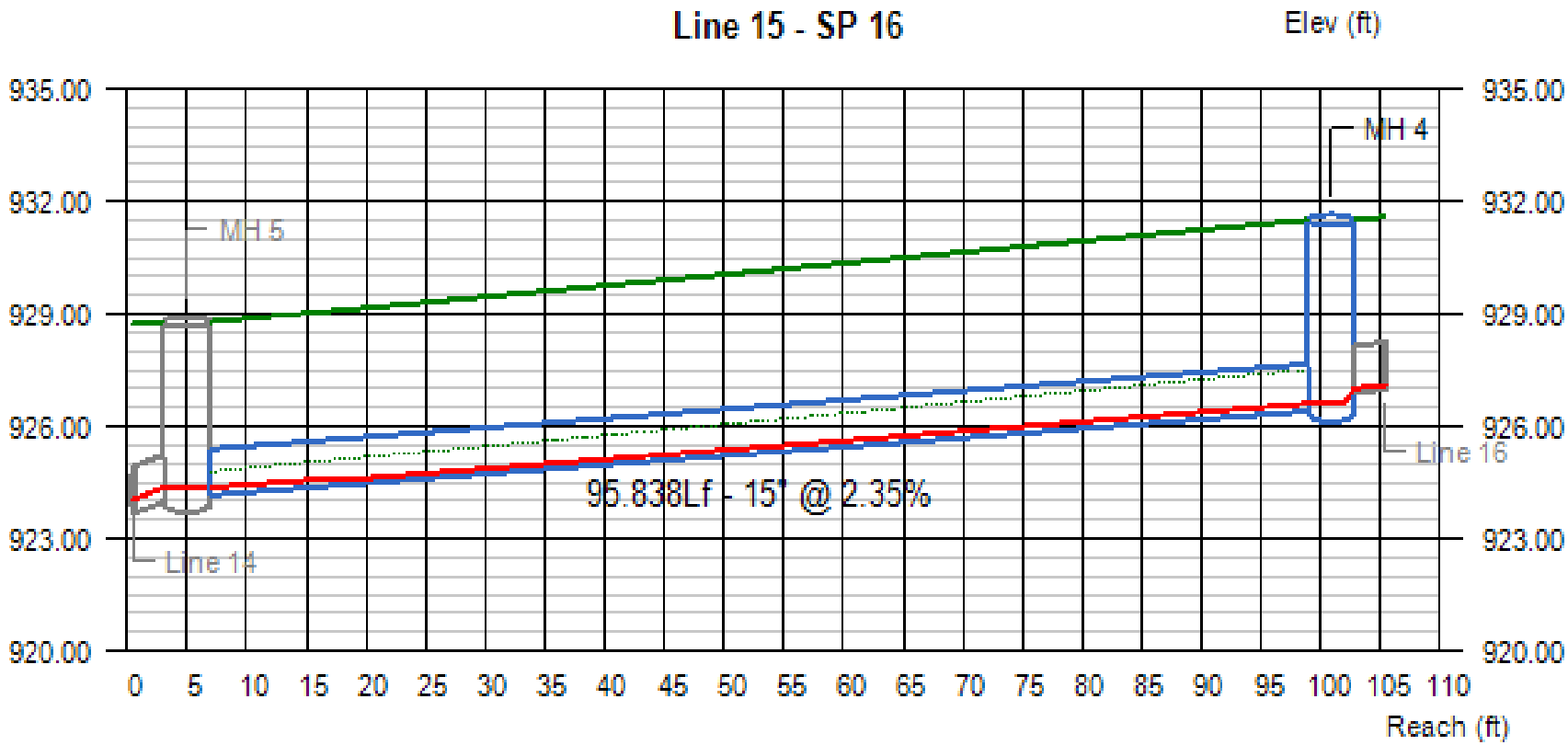
Line Profile (Line 14) - SP 18



Line #	Q (cfs)	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
		Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
14	0.98	921.00	923.97	0.18	0.39	0.39	921.18	924.36	924.36	9.23	3.01	6.02	3.56

Project File:	No. Lines: 23	Run Date: 2/22/2023

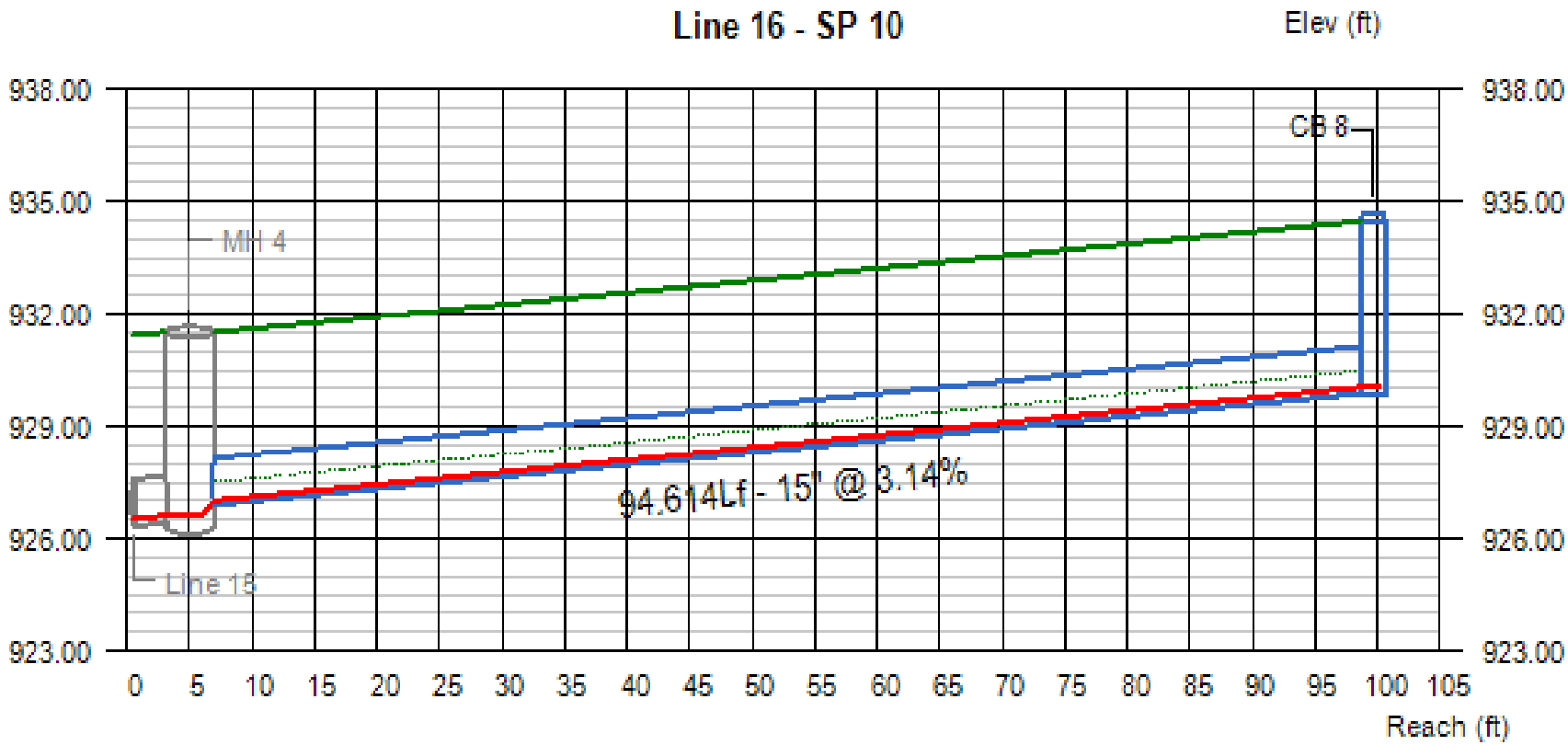
Line Profile (Line 15) - SP 16



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
15	0.28	924.15	926.40	0.21	0.21	0.21	924.36	926.61 j	926.61	2.09	2.14	3.38	3.85

Project File:	No. Lines: 23	Run Date: 2/22/2023

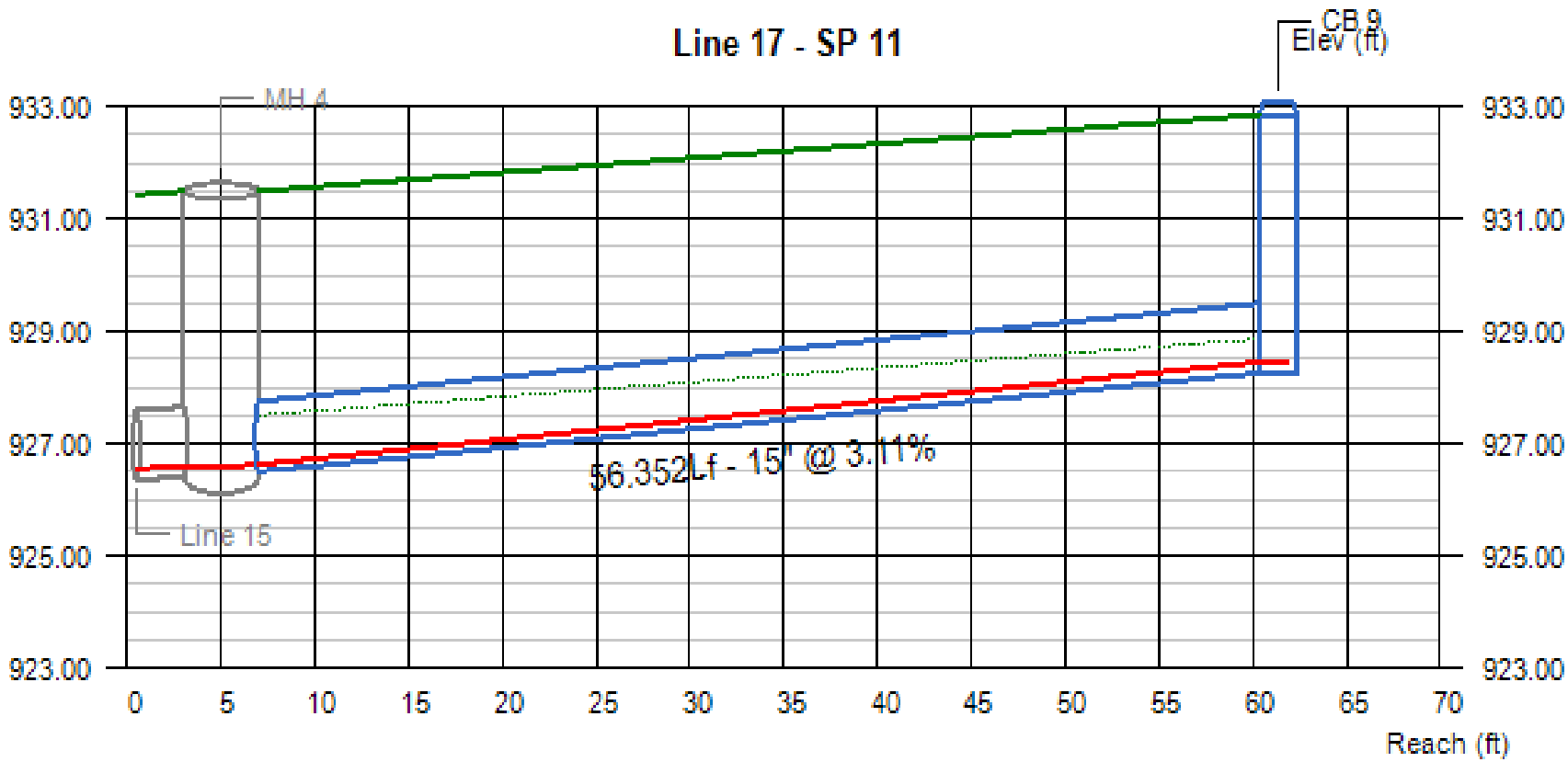
Line Profile (Line 16) - SP 10



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
16	0.18	926.90	929.87	0.11	0.17	0.17	927.01	930.04	930.04	3.45	1.91	3.35	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

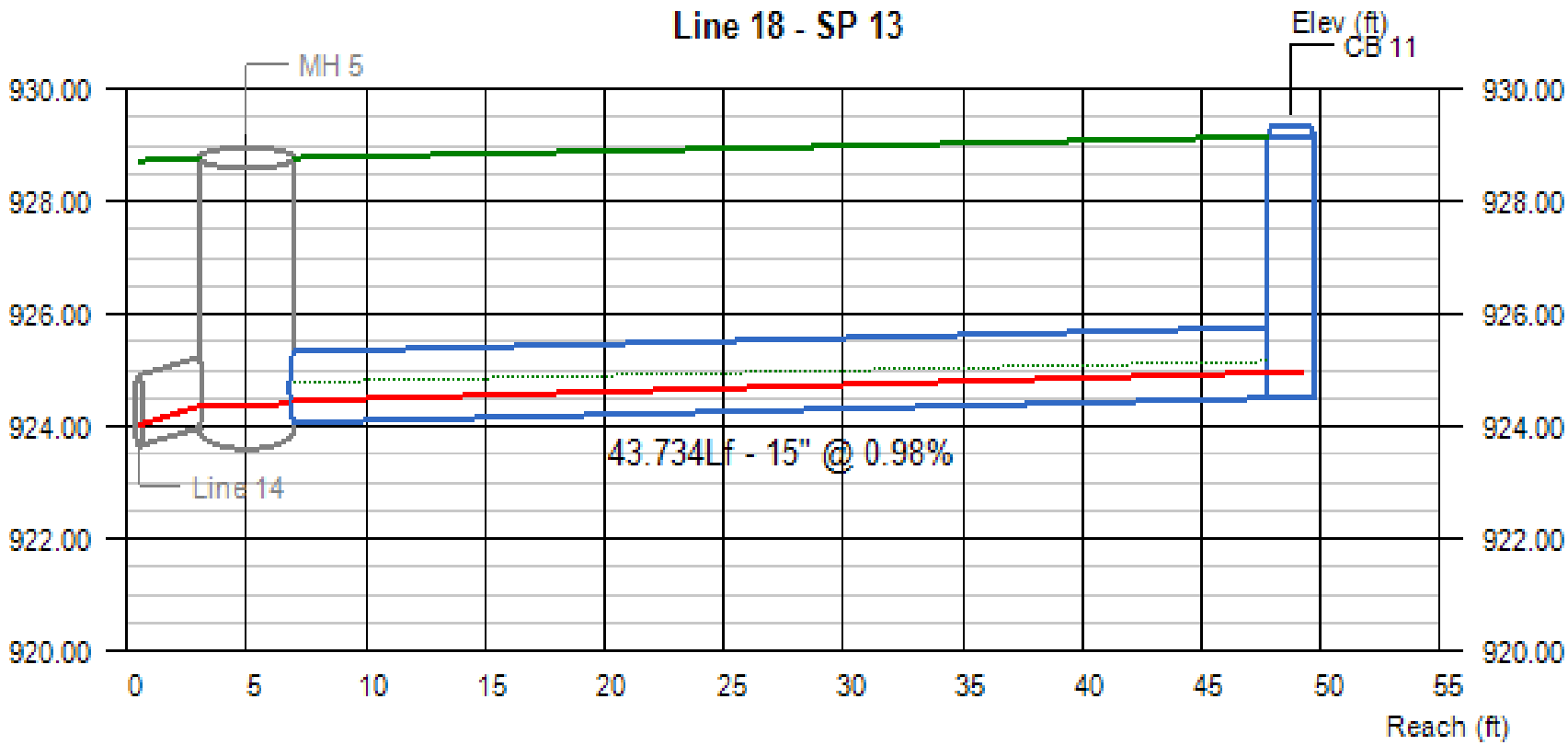
Line Profile (Line 17) - SP 11



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
17	0.26	926.50	928.25	0.13	0.20	0.20	926.63	928.45	928.45	3.80	2.09	3.75	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

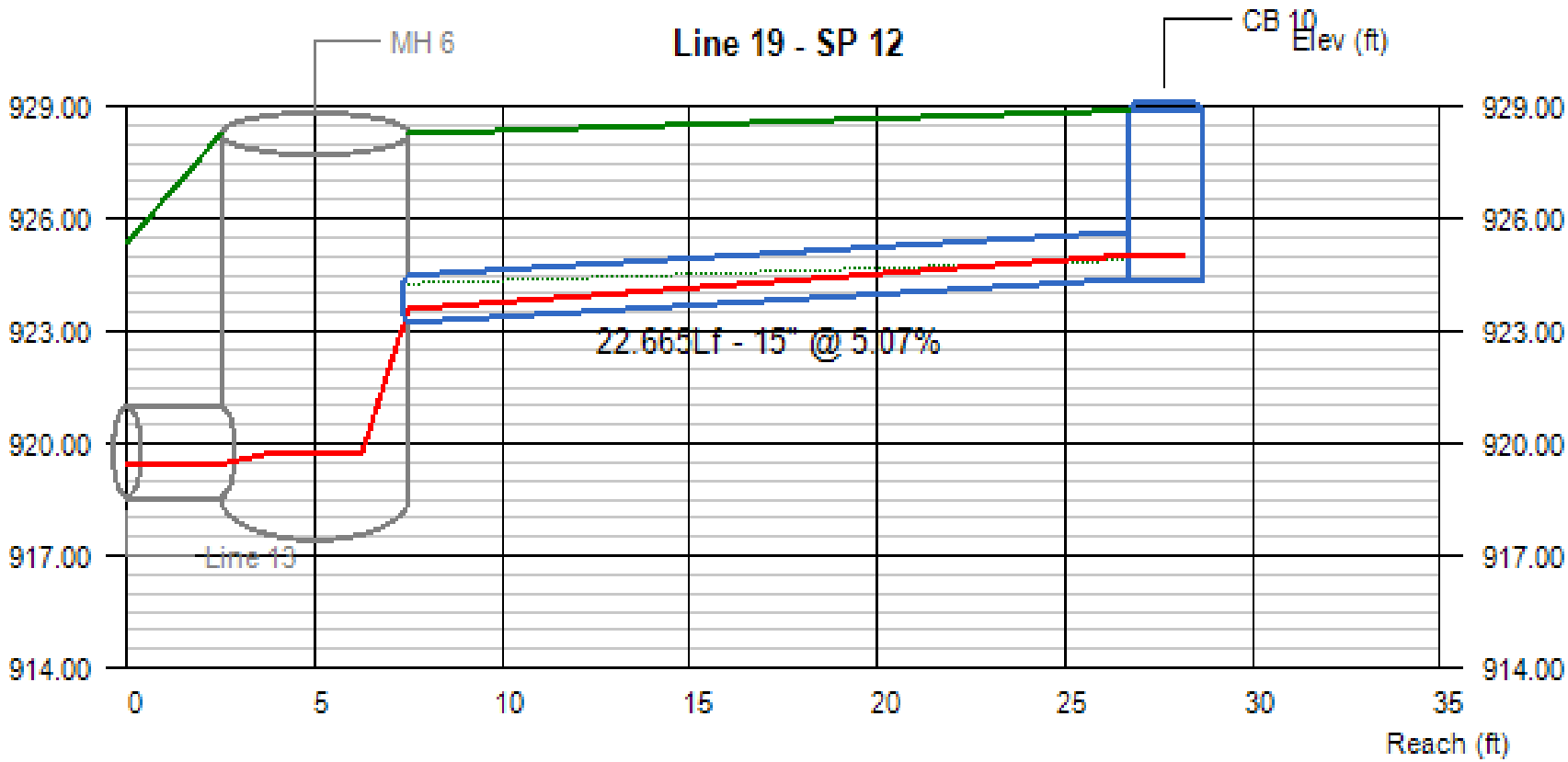
Line Profile (Line 18) - SP 13



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
18	1.31	924.07	924.50	0.38	0.45	0.45	924.45	924.95	924.95	4.10	3.28	3.46	3.40

Project File:	No. Lines: 23	Run Date: 2/22/2023

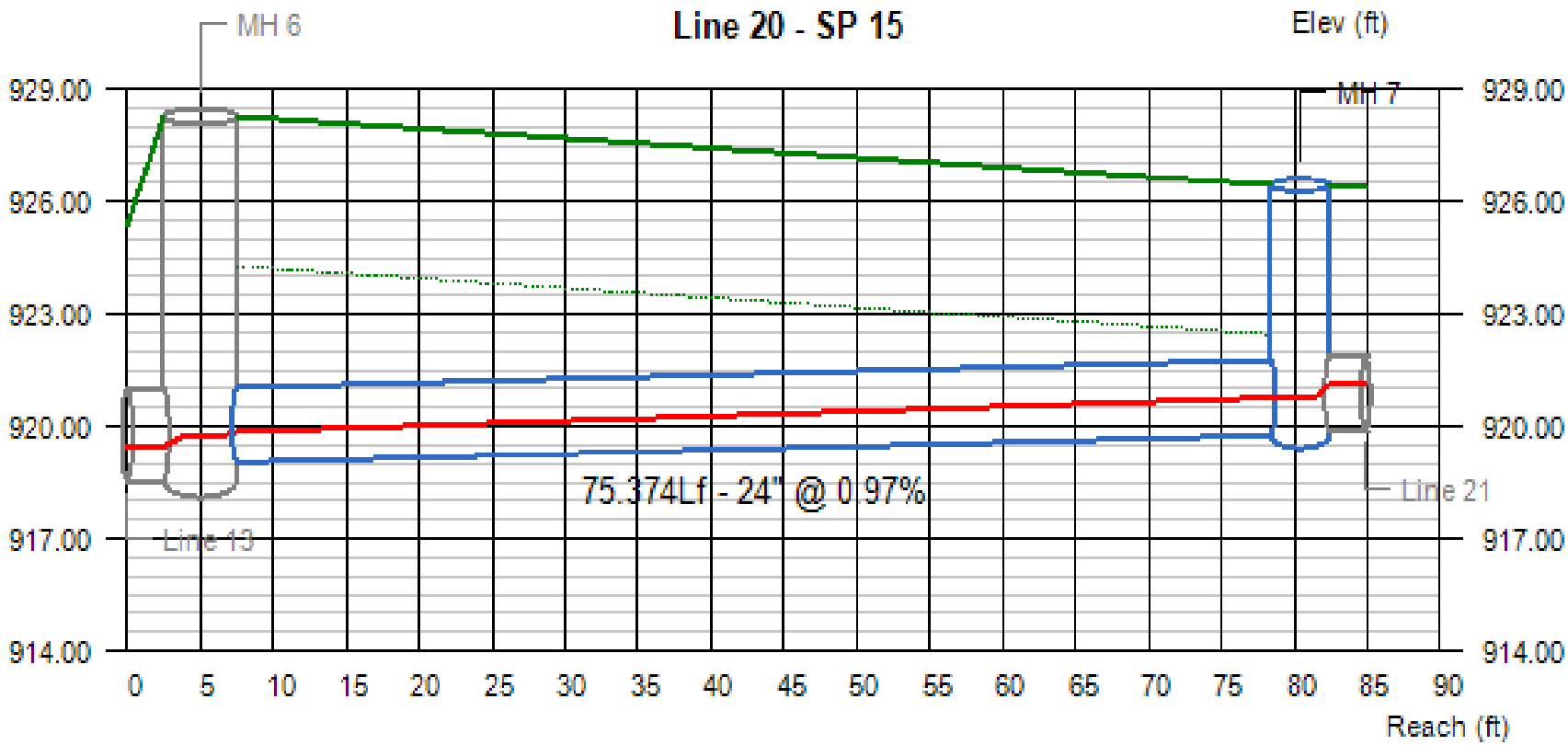
Line Profile (Line 19) - SP 12



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
19	2.53	923.24	924.39	0.35	0.64	0.64	923.59	925.03	925.03	8.88	4.03	3.78	3.25

Project File:	No. Lines: 23	Run Date: 2/22/2023

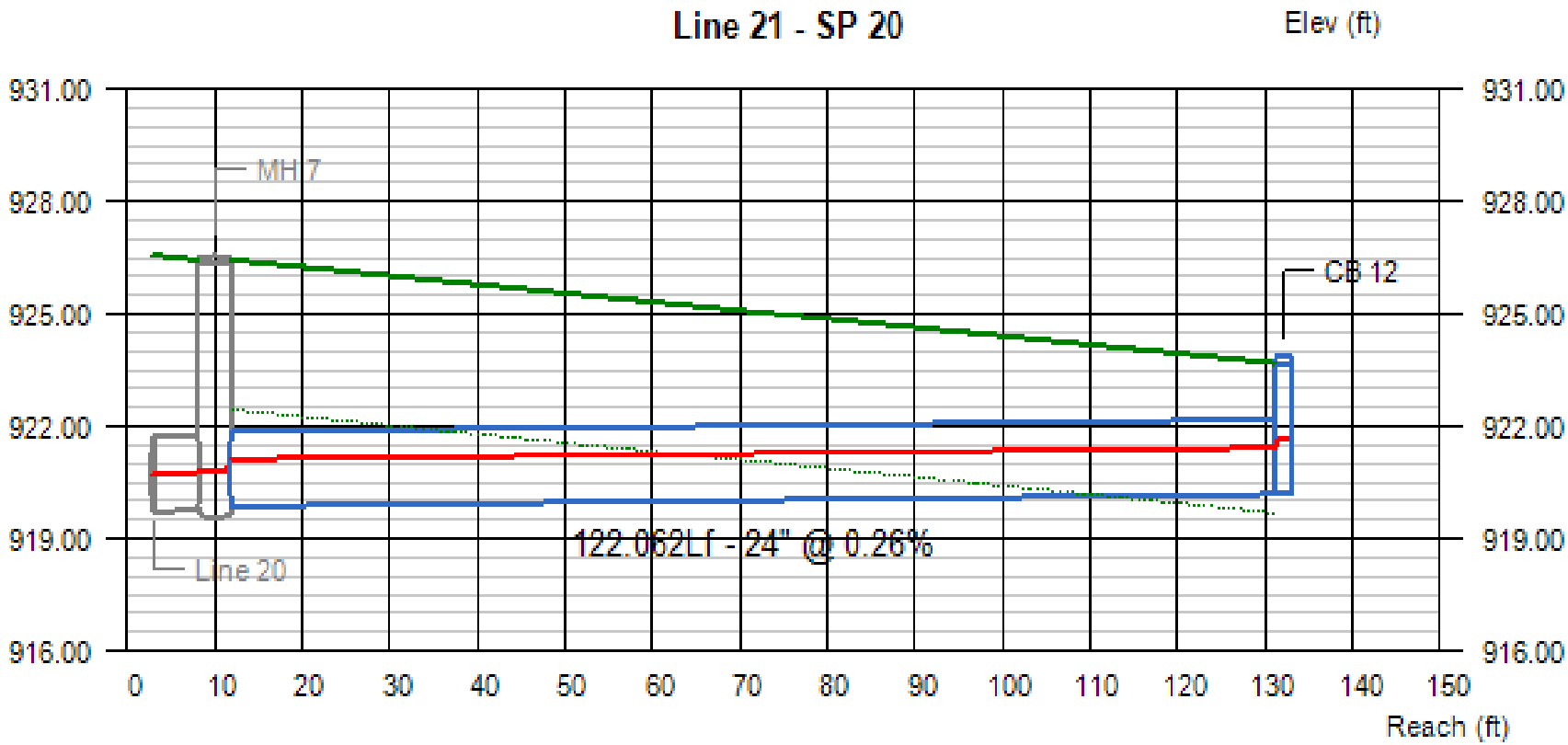
Line Profile (Line 20) - SP 15



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
20	7.95	919.03	919.76	0.83	1.00	1.00	919.86	920.76	920.76	6.49	5.04	7.24	4.68

Project File:	No. Lines: 23	Run Date: 2/22/2023

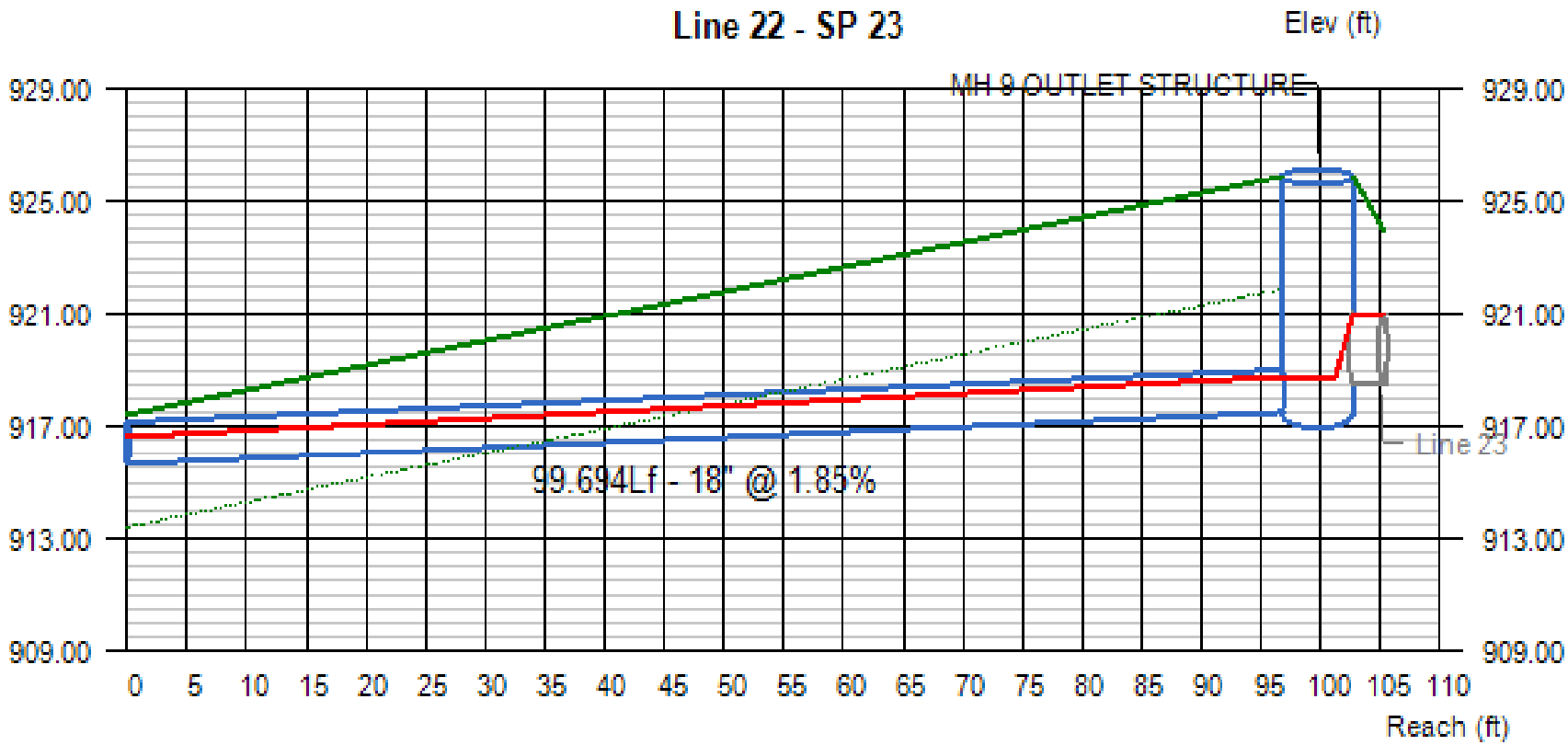
Line Profile (Line 21) - SP 20



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
21	8.30	919.86	920.18	1.25	1.25	1.50	921.11	921.43	921.68	4.01	4.01	4.58	1.50

Project File:	No. Lines: 23	Run Date: 2/22/2023

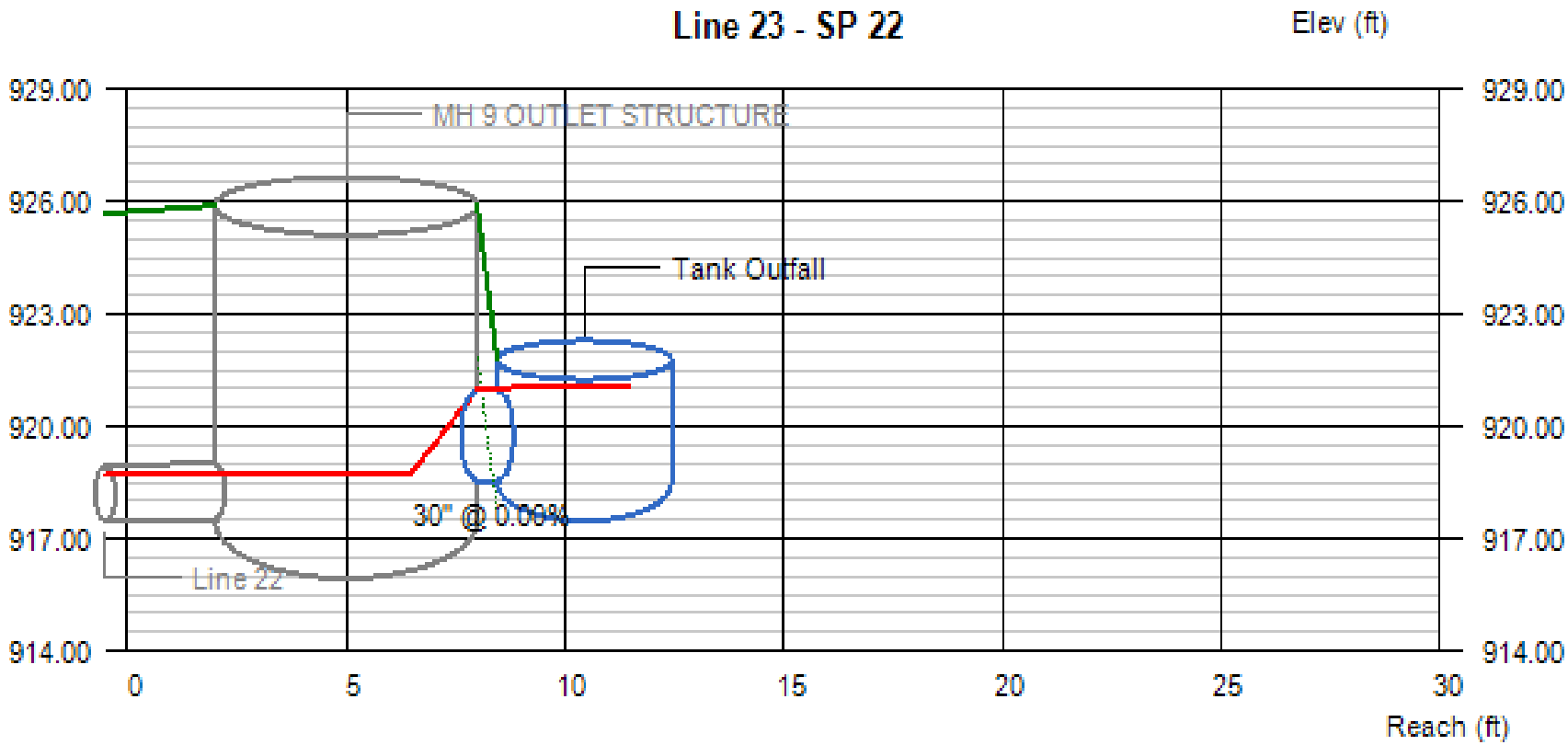
Line Profile (Line 22) - SP 23



Line #	Q (cfs)	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
		Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
22	10.69	915.66	917.50	0.97	1.25	1.25	916.63	918.75	918.75	8.86	6.77	0.25	6.88

Project File:	No. Lines: 23	Run Date: 3/9/2023

Line Profile (Line 23) - SP 22



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
23	10.69	918.50	918.50	2.50	2.50	2.58	921.00	921.00	921.08	2.18	2.18	4.88	0.76

Project File:	No. Lines: 23	Run Date: 3/9/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	7.816	-113.316	MH	0.00	0.00	0.00	0.0	918.50	0.38	918.53	24	Cir	0.013	0.99	930.89	SP 17
2	1	23.216	-81.650	Genr	0.00	0.33	0.90	5.0	925.69	1.03	925.93	15	Cir	0.013	0.50	931.23	SP 4
3	2	135.960	0.461	MH	0.00	0.00	0.00	0.0	926.03	1.00	927.39	15	Cir	0.013	0.92	933.65	SP 3
4	3	57.083	65.115	Genr	0.00	0.06	0.90	5.0	927.24	1.70	928.21	15	Cir	0.013	1.46	932.76	SP 2
5	4	9.669	-74.574	Genr	0.00	0.38	0.90	5.0	928.31	22.24	930.46	15	Cir	0.013	1.00	934.90	SP 1
6	1	90.403	74.268	MH	0.00	0.00	0.00	0.0	918.63	0.66	919.23	24	Cir	0.013	0.96	930.55	SP 5
7	6	40.022	2.241	Genr	0.00	0.07	0.90	5.0	924.78	1.00	925.18	15	Cir	0.013	1.00	929.63	SP 6
8	6	124.208	10.000	MH	0.00	0.00	0.00	0.0	919.98	0.74	920.90	15	Cir	0.013	0.93	929.01	SP 7
9	8	48.911	65.534	Genr	0.00	0.14	0.90	5.0	921.73	1.00	922.22	15	Cir	0.013	1.00	926.47	SP 19
10	8	119.120	-60.573	Genr	0.00	0.23	0.90	5.0	921.00	0.50	921.60	15	Cir	0.013	0.90	928.07	SP 21
11	10	56.910	33.132	Genr	0.00	0.30	0.90	5.0	921.70	0.49	921.98	15	Cir	0.013	1.00	926.43	SP 9
12	6	155.681	-71.435	Genr	0.00	1.39	0.66	5.0	919.98	3.25	925.04	15	Cir	0.013	1.00	929.64	SP 8
13	End	8.963	66.684	MH	0.00	0.00	0.00	0.0	918.50	0.34	918.53	30	Cir	0.013	1.00	928.27	SP 14
14	13	23.894	63.815	MH	0.00	0.00	0.00	0.0	921.00	12.43	923.97	15	Cir	0.013	0.69	928.78	SP 18
15	14	95.838	26.717	MH	0.00	0.00	0.00	0.0	924.15	2.35	926.40	15	Cir	0.013	0.75	931.50	SP 16
16	15	94.614	-0.374	Genr	0.00	0.04	0.65	5.0	926.90	3.14	929.87	15	Cir	0.013	1.00	934.47	SP 10
17	15	56.352	-45.379	Genr	0.00	0.04	0.90	5.0	926.50	3.11	928.25	15	Cir	0.013	1.00	932.85	SP 11
18	14	43.734	-40.147	Genr	0.00	0.21	0.88	5.0	924.07	0.98	924.50	15	Cir	0.013	1.00	929.15	SP 13
19	13	22.665	89.284	Genr	0.00	0.40	0.89	5.0	923.24	5.07	924.39	15	Cir	0.013	1.00	928.89	SP 12
20	13	75.374	-86.414	MH	0.00	0.00	0.00	0.0	919.03	0.97	919.76	24	Cir	0.013	0.15	926.44	SP 15
21	20	122.062	-5.841	Genr	0.00	1.33	0.88	5.0	919.86	0.26	920.18	24	Cir	0.013	1.00	923.68	SP 20
22	End	99.694	-177.910	MH	0.00	0.00	0.00	0.0	915.66	1.85	917.50	18	Cir	0.013	0.92	925.88	SP 23
23	22	5.447	64.594	MH	10.69	0.00	0.00	0.0	918.50	0.00	918.50	30	Cir	0.013	1.00	921.76	SP 22

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Date: 3/9/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH 2	Manhole	930.89	Cir	5.00	5.00	24	Cir	918.53	15 24	Cir Cir	925.69 918.63
2	CB 3	Generic	931.23	Rect	2.00	4.00	15	Cir	925.93	15	Cir	926.03
3	MH 1	Manhole	933.65	Cir	4.00	4.00	15	Cir	927.39	15	Cir	927.24
4	CB 2	Generic	932.76	Rect	2.00	4.00	15	Cir	928.21	15	Cir	928.31
5	CB 1	Generic	934.90	Rect	2.00	4.00	15	Cir	930.46			
6	MH 3	Manhole	930.55	Cir	4.00	4.00	24	Cir	919.23	15 15 15	Cir Cir Cir	924.78 919.98 919.98
7	CB 4	Generic	929.63	Rect	2.00	4.00	15	Cir	925.18			
8	MH 8	Manhole	929.01	Cir	4.00	4.00	15	Cir	920.90	15 15	Cir Cir	921.73 921.00
9	CB 5	Generic	926.47	Rect	2.00	4.00	15	Cir	922.22			
10	CB 13	Generic	928.07	Rect	2.00	4.00	15	Cir	921.60	15	Cir	921.70
11	CB 7	Generic	926.43	Rect	2.00	4.00	15	Cir	921.98			
12	CB 6	Generic	929.64	Rect	2.00	4.00	15	Cir	925.04			
13	MH 6	Manhole	928.27	Cir	5.00	5.00	30	Cir	918.53	15 15 24	Cir Cir Cir	921.00 923.24 919.03
14	MH 5	Manhole	928.78	Cir	4.00	4.00	15	Cir	923.97	15 15	Cir Cir	924.15 924.07
15	MH 4	Manhole	931.50	Cir	4.00	4.00	15	Cir	926.40	15 15	Cir Cir	926.90 926.50
16	CB 8	Generic	934.47	Rect	2.00	4.00	15	Cir	929.87			
17	CB 9	Generic	932.85	Rect	2.00	4.00	15	Cir	928.25			
18	CB 11	Generic	929.15	Rect	2.00	4.00	15	Cir	924.50			
19	CB 10	Generic	928.89	Rect	2.00	4.00	15	Cir	924.39			

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of Structures: 23 | Run Date: 3/9/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
20	MH 7	Manhole	926.44	Cir	4.00	4.00	24	Cir	919.76	24	Cir	919.86
21	CB 12	Generic	923.68	Rect	2.00	4.00	24	Cir	920.18			
22	MH 9 OUTLET STRUCTUR	Manhole	925.88	Cir	6.00	6.00	18	Cir	917.50	30	Cir	918.50
23	Tank Outfall	Manhole	921.76	Cir	4.00	4.00	30	Cir	918.50			

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of Structures: 23 | Run Date: 3/9/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	SP 17	14.17	24	Cir	7.816	918.50	918.53	0.384	920.16	920.19	0.40	920.59	End	Manhole
2	SP 4	4.52	15	Cir	23.216	925.69	925.93	1.034	926.45	926.79	n/a	926.79	1	Generic
3	SP 3	2.73	15	Cir	135.960	926.03	927.39	1.000	926.79	928.05	n/a	928.05 j	2	Manhole
4	SP 2	2.80	15	Cir	57.083	927.24	928.21	1.699	928.05	928.88	n/a	928.88 j	3	Generic
5	SP 1	2.43	15	Cir	9.669	928.31	930.46	22.237	928.88	931.08	n/a	931.08	4	Generic
6	SP 5	10.09	24	Cir	90.403	918.63	919.23	0.664	920.59	920.37	n/a	920.37	1	Manhole
7	SP 6	0.45	15	Cir	40.022	924.78	925.18	0.999	925.00	925.44	0.09	925.44	6	Generic
8	SP 7	3.97	15	Cir	124.208	919.98	920.90	0.741	920.76	921.71	n/a	921.71	6	Manhole
9	SP 19	0.89	15	Cir	48.911	921.73	922.22	1.002	922.04	922.59	n/a	922.59	8	Generic
10	SP 21	3.27	15	Cir	119.120	921.00	921.60	0.504	921.78	922.38	0.23	922.61	8	Generic
11	SP 9	1.92	15	Cir	56.910	921.70	921.98	0.492	922.61	922.66	0.12	922.78	10	Generic
12	SP 8	6.51	15	Cir	155.681	919.98	925.04	3.250	920.65	926.07	n/a	926.07	6	Generic
13	SP 14	6.97	30	Cir	8.963	918.50	918.53	0.335	919.43	919.46	0.27	919.73	End	Manhole
14	SP 18	0.98	15	Cir	23.894	921.00	923.97	12.430	921.18	924.36	n/a	924.36	13	Manhole
15	SP 16	0.28	15	Cir	95.838	924.15	926.40	2.348	924.36	926.61	n/a	926.61 j	14	Manhole
16	SP 10	0.18	15	Cir	94.614	926.90	929.87	3.139	927.01	930.04	0.06	930.04	15	Generic
17	SP 11	0.26	15	Cir	56.352	926.50	928.25	3.105	926.63	928.45	n/a	928.45	15	Generic
18	SP 13	1.31	15	Cir	43.734	924.07	924.50	0.983	924.45	924.95	n/a	924.95	14	Generic
19	SP 12	2.53	15	Cir	22.665	923.24	924.39	5.074	923.59	925.03	n/a	925.03	13	Generic
20	SP 15	7.95	24	Cir	75.374	919.03	919.76	0.968	919.86	920.76	0.06	920.76	13	Manhole
21	SP 20	8.30	24	Cir	122.062	919.86	920.18	0.262	921.11	921.43	0.25	921.68	20	Generic
22	SP 23	10.69	18	Cir	99.694	915.66	917.50	1.846	916.63	918.75	0.66	918.75	End	Manhole
23	SP 22	10.69	30	Cir	5.447	918.50	918.50	0.000	921.00*	921.00*	0.07	921.08	22	Manhole

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Run Date: 3/9/2023

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	7.816	0.00	2.90	0.00	0.00	2.28	0.0	7.4	6.2	14.17	14.02	5.09	24	0.38	918.50	918.53	920.16	920.19	920.09	930.89	SP 17
2	1	23.216	0.33	0.77	0.90	0.30	0.69	5.0	6.5	6.5	4.52	6.57	5.39	15	1.03	925.69	925.93	926.45	926.79	930.89	931.23	SP 4
3	2	135.960	0.00	0.44	0.00	0.00	0.40	0.0	5.5	6.9	2.73	6.46	3.81	15	1.00	926.03	927.39	926.79	928.05	931.23	933.65	SP 3
4	3	57.083	0.06	0.44	0.90	0.05	0.40	5.0	5.1	7.1	2.80	8.42	3.74	15	1.70	927.24	928.21	928.05	928.88	933.65	932.76	SP 2
5	4	9.669	0.38	0.38	0.90	0.34	0.34	5.0	5.0	7.1	2.43	30.45	4.21	15	22.24	928.31	930.46	928.88	931.08	932.76	934.90	SP 1
6	1	90.403	0.00	2.13	0.00	0.00	1.58	0.0	7.0	6.4	10.09	18.43	4.35	24	0.66	918.63	919.23	920.59	920.37	930.89	930.55	SP 5
7	6	40.022	0.07	0.07	0.90	0.06	0.06	5.0	5.0	7.1	0.45	6.46	2.72	15	1.00	924.78	925.18	925.00	925.44	930.55	929.63	SP 6
8	6	124.208	0.00	0.67	0.00	0.00	0.60	0.0	6.3	6.6	3.97	5.56	4.83	15	0.74	919.98	920.90	920.76	921.71	930.55	929.01	SP 7
9	8	48.911	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.1	0.89	6.46	3.32	15	1.00	921.73	922.22	922.04	922.59	929.01	926.47	SP 19
10	8	119.120	0.23	0.53	0.90	0.21	0.48	5.0	5.6	6.9	3.27	4.58	4.06	15	0.50	921.00	921.60	921.78	922.38	929.01	928.07	SP 21
11	10	56.910	0.30	0.30	0.90	0.27	0.27	5.0	5.0	7.1	1.92	4.53	2.41	15	0.49	921.70	921.98	922.61	922.66	928.07	926.43	SP 9
12	6	155.681	1.39	1.39	0.66	0.92	0.92	5.0	5.0	7.1	6.51	11.64	7.89	15	3.25	919.98	925.04	920.65	926.07	930.55	929.64	SP 8
13	End	8.963	0.00	2.02	0.00	0.00	1.77	0.0	20.4	3.9	6.97	23.74	4.20	30	0.34	918.50	918.53	919.43	919.46	917.81	928.27	SP 14
14	13	23.894	0.00	0.29	0.00	0.00	0.25	0.0	20.1	4.0	0.98	22.77	6.12	15	12.43	921.00	923.97	921.18	924.36	928.27	928.78	SP 18
15	14	95.838	0.00	0.08	0.00	0.00	0.06	0.0	15.5	4.5	0.28	9.89	2.12	15	2.35	924.15	926.40	924.36	926.61	928.78	931.50	SP 16
16	15	94.614	0.04	0.04	0.65	0.03	0.03	5.0	5.0	7.1	0.18	11.44	2.68	15	3.14	926.90	929.87	927.01	930.04	931.50	934.47	SP 10
17	15	56.352	0.04	0.04	0.90	0.04	0.04	5.0	5.0	7.1	0.26	11.38	2.94	15	3.11	926.50	928.25	926.63	928.45	931.50	932.85	SP 11
18	14	43.734	0.21	0.21	0.88	0.18	0.18	5.0	5.0	7.1	1.31	6.40	3.69	15	0.98	924.07	924.50	924.45	924.95	928.78	929.15	SP 13
19	13	22.665	0.40	0.40	0.89	0.36	0.36	5.0	5.0	7.1	2.53	14.55	6.45	15	5.07	923.24	924.39	923.59	925.03	928.27	928.89	SP 12
20	13	75.374	0.00	1.33	0.00	0.00	1.17	0.0	5.8	6.8	7.95	22.26	5.77	24	0.97	919.03	919.76	919.86	920.76	928.27	926.44	SP 15
21	20	122.062	1.33	1.33	0.88	1.17	1.17	5.0	5.0	7.1	8.30	11.58	4.01	24	0.26	919.86	920.18	921.11	921.43	926.44	923.68	SP 20
22	End	99.694	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.69	14.27	7.81	18	1.85	915.66	917.50	916.63	918.75	917.41	925.88	SP 23

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Run Date: 3/9/2023

NOTES:Intensity = 45.55 / (Inlet time + 7.50) ^ 0.74; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	5.447	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.69	0.00	2.18	30	0.00	918.50	918.50	921.00	921.00	925.88	921.76	SP 22

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm

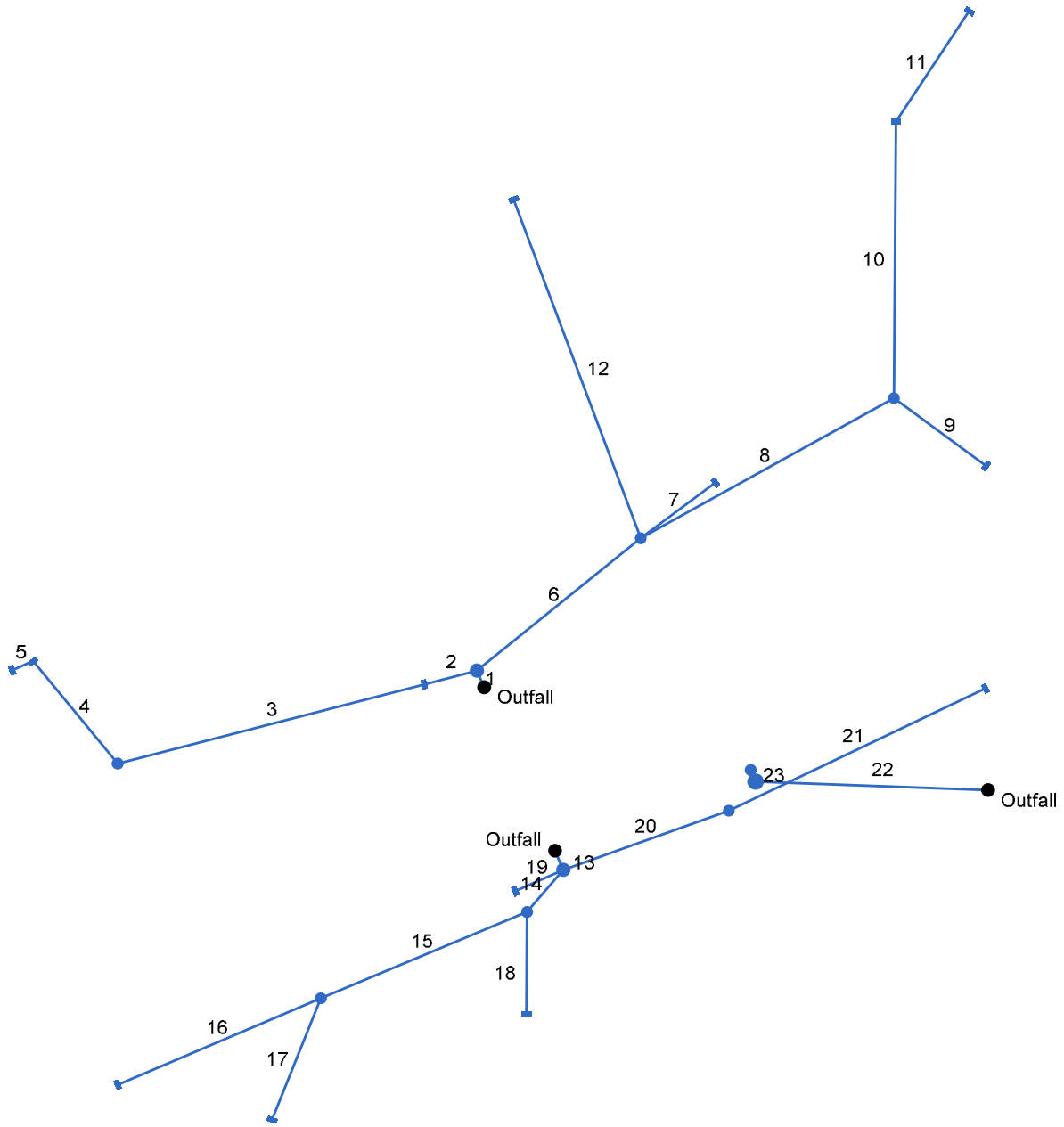
Number of lines: 23

Run Date: 3/9/2023

NOTES:Intensity = 45.55 / (Inlet time + 7.50) ^ 0.74; Return period =Yrs. 25 ; c = cir e = ellip b = box

100-YR HYDRAFLOW PIPE CALCULATIONS

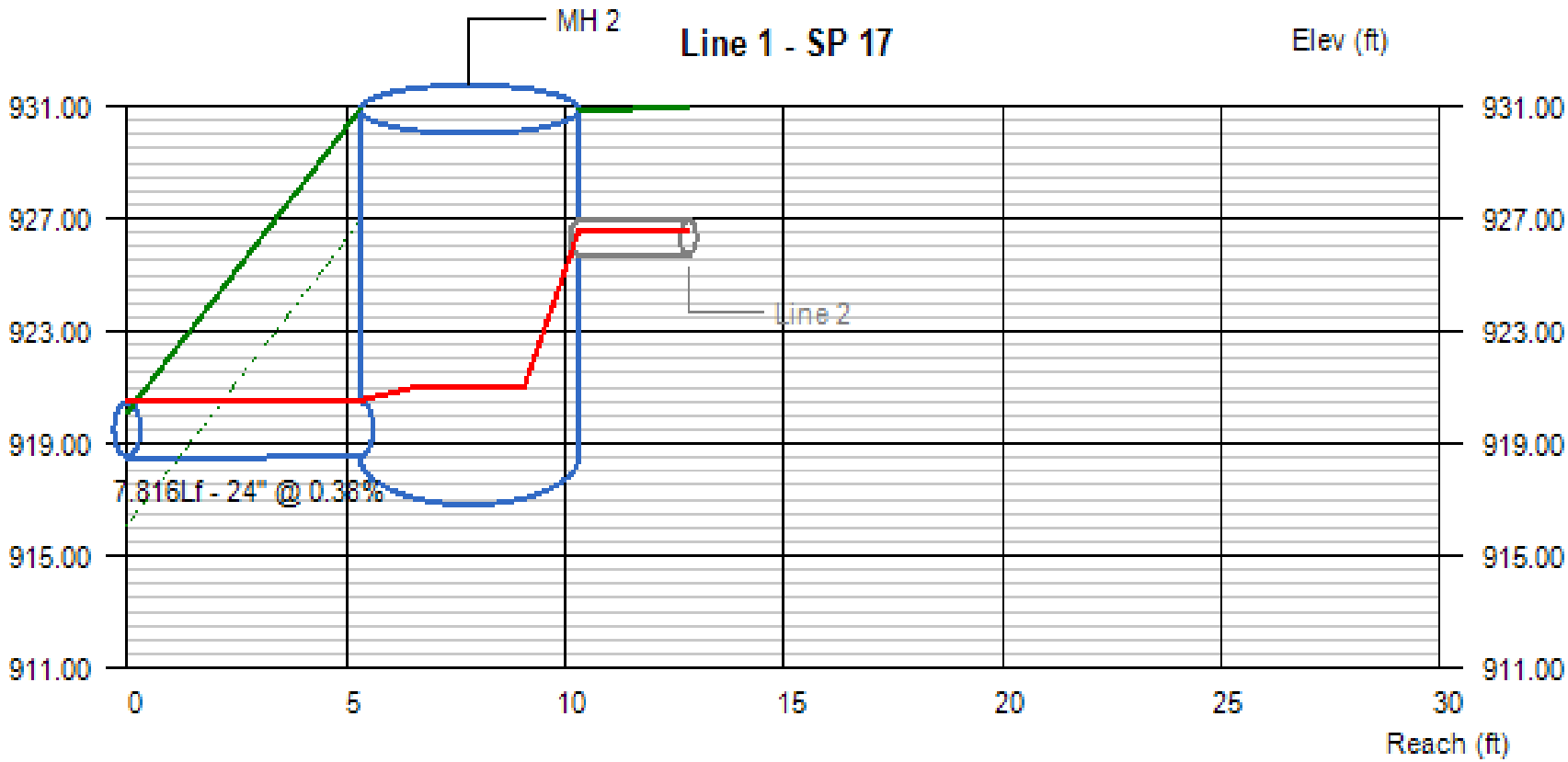
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm	Number of lines: 23	Date: 3/9/2023

Storm Sewers v2022.00

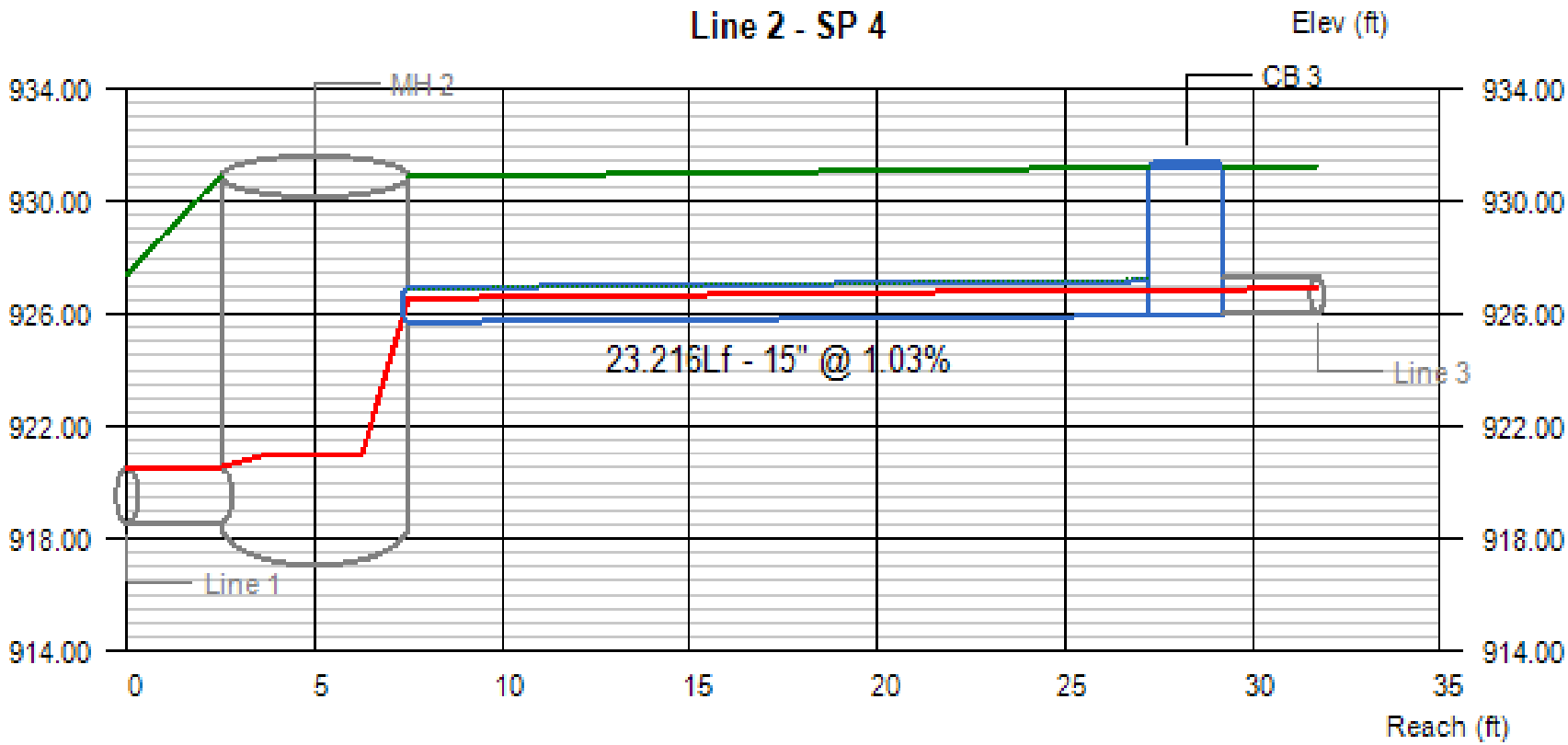
Line Profile (Line 1) - SP 17



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
1	17.20	918.50	918.53	2.00	2.00	2.46	920.50	920.53	920.99	5.48	5.48	-0.41	10.36

Project File: | No. Lines: 23 | Run Date: 2/22/2023

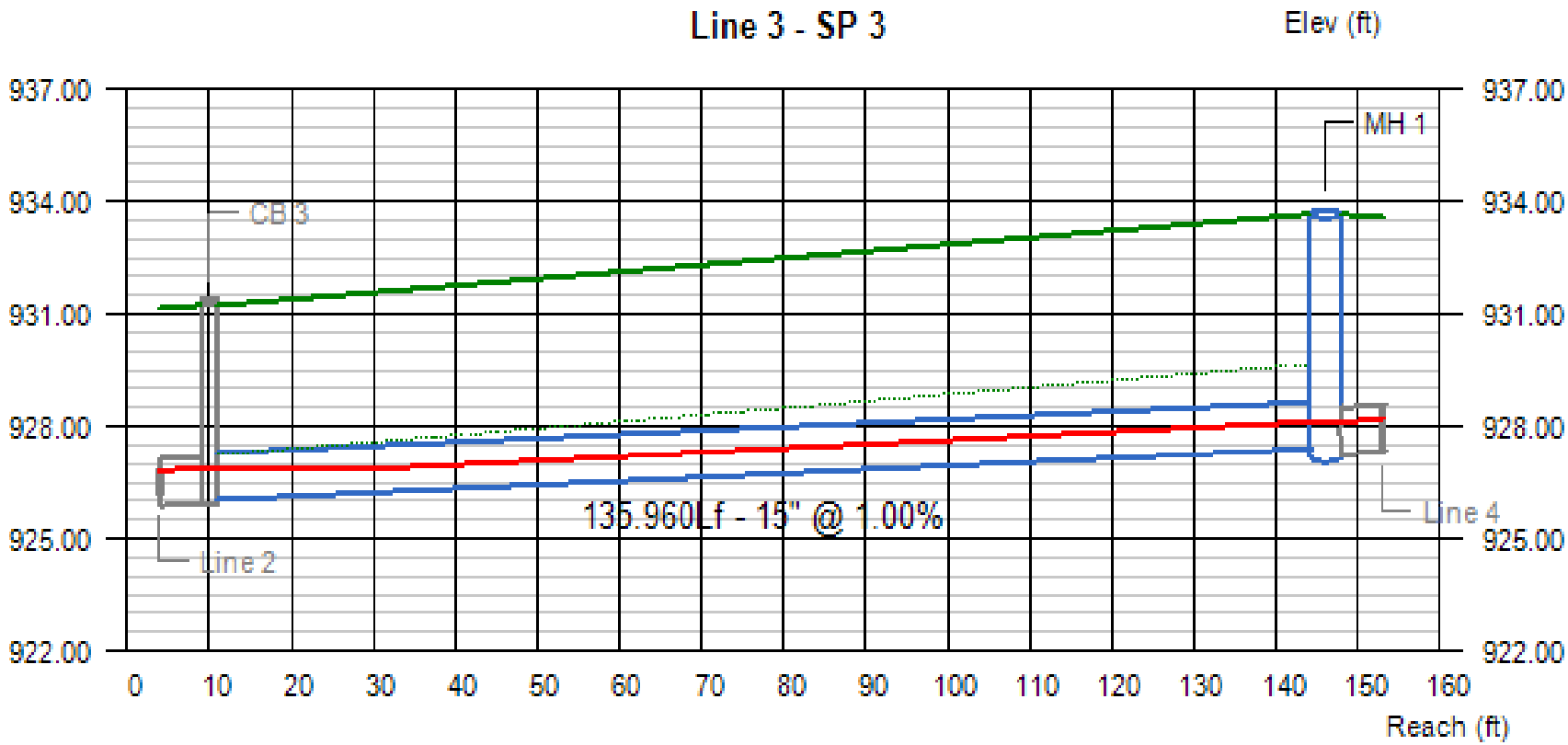
Line Profile (Line 2) - SP 4



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
2	5.46	925.69	925.93	0.87	0.95	0.95	926.56	926.88	926.88	5.98	5.48	3.95	4.05

Project File:	No. Lines: 23	Run Date: 2/22/2023

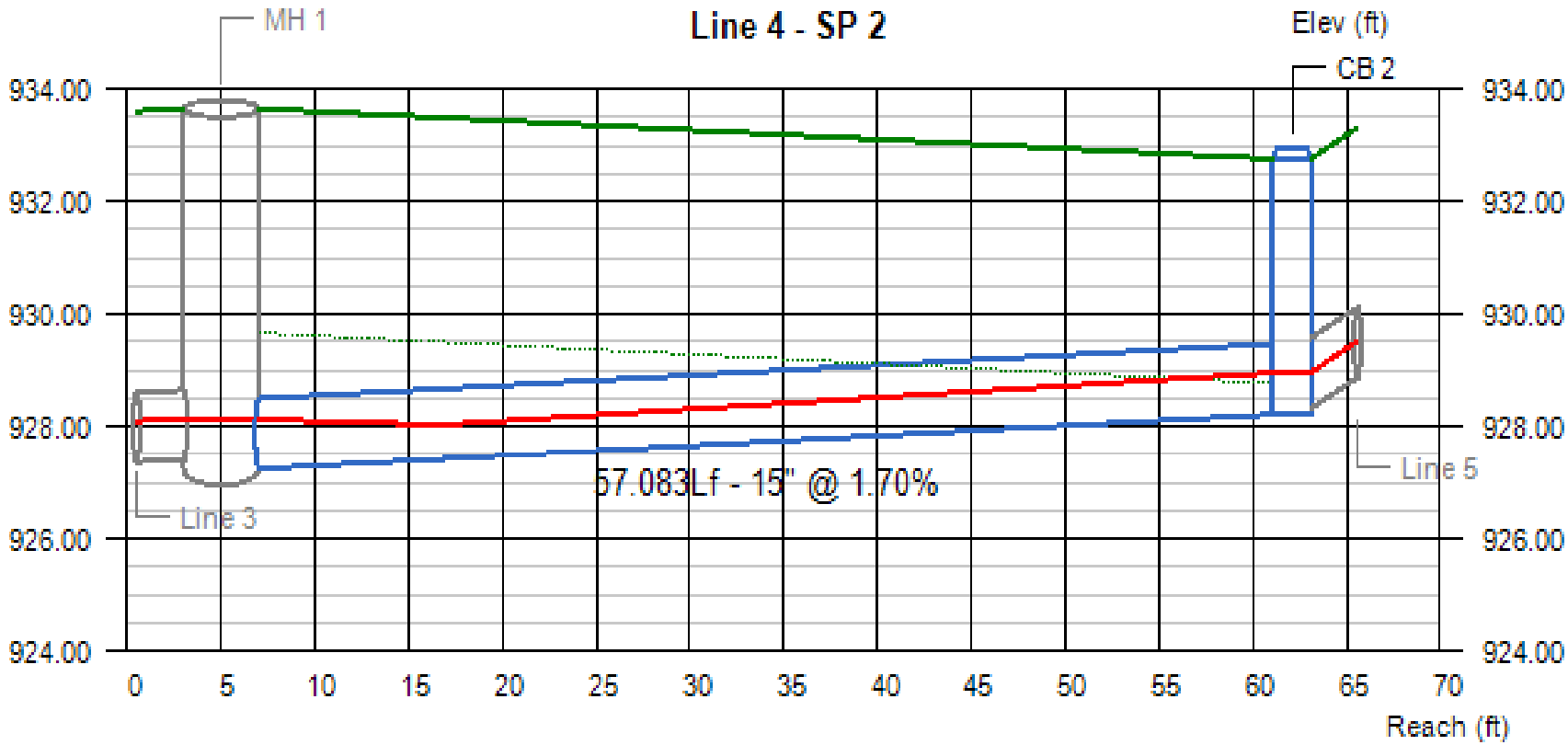
Line Profile (Line 3) - SP 3



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
3	3.28	926.03	927.39	0.85	0.73	0.73	926.88	928.12 j	928.12	3.71	4.41	3.95	5.01

Project File:	No. Lines: 23	Run Date: 2/22/2023

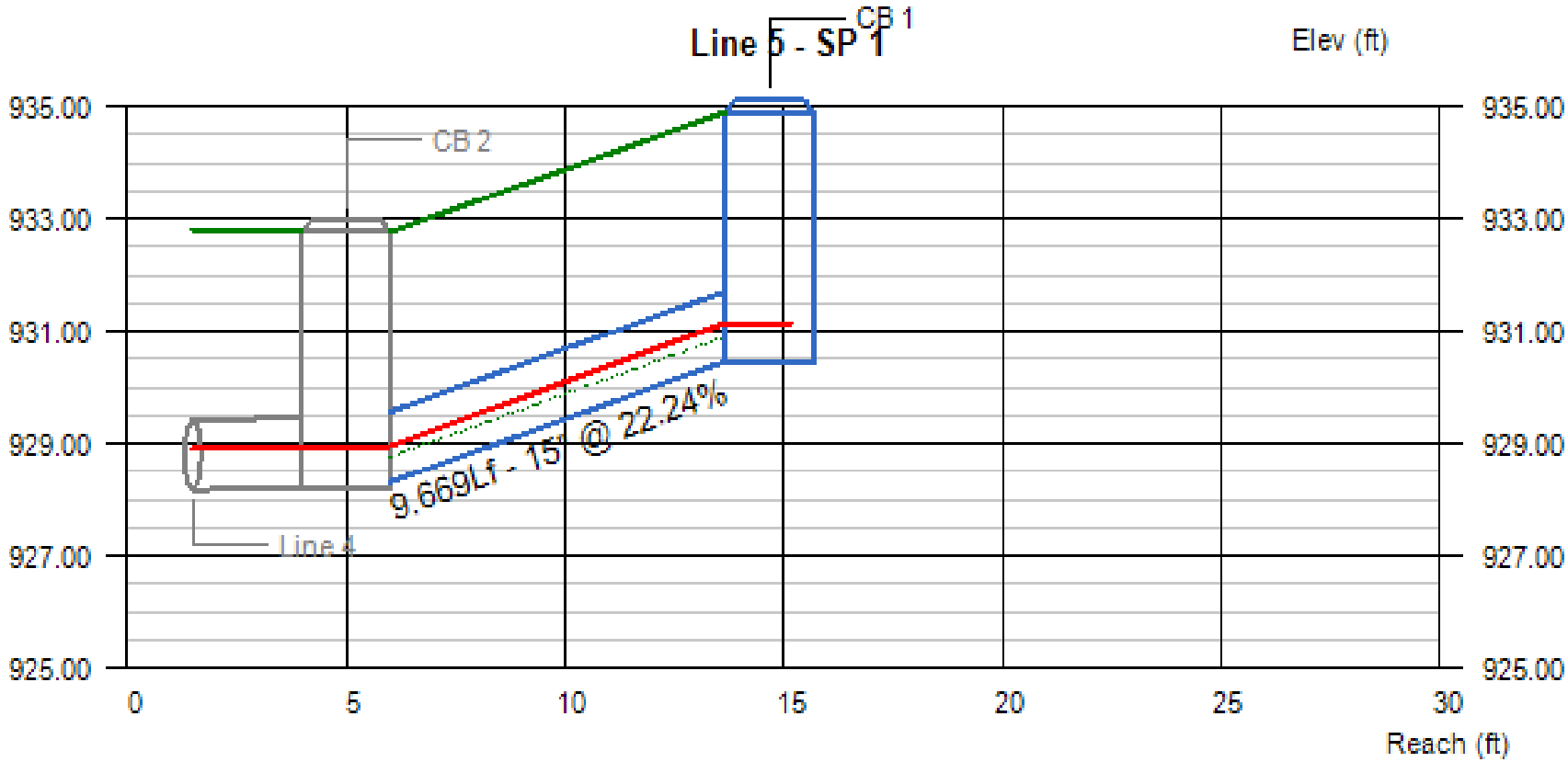
Line Profile (Line 4) - SP 2



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
4	3.35	927.24	928.21	0.88	0.74	0.74	928.12	928.95 j	928.95	3.63	4.45	5.16	3.30

Project File:	No. Lines: 23	Run Date: 2/22/2023

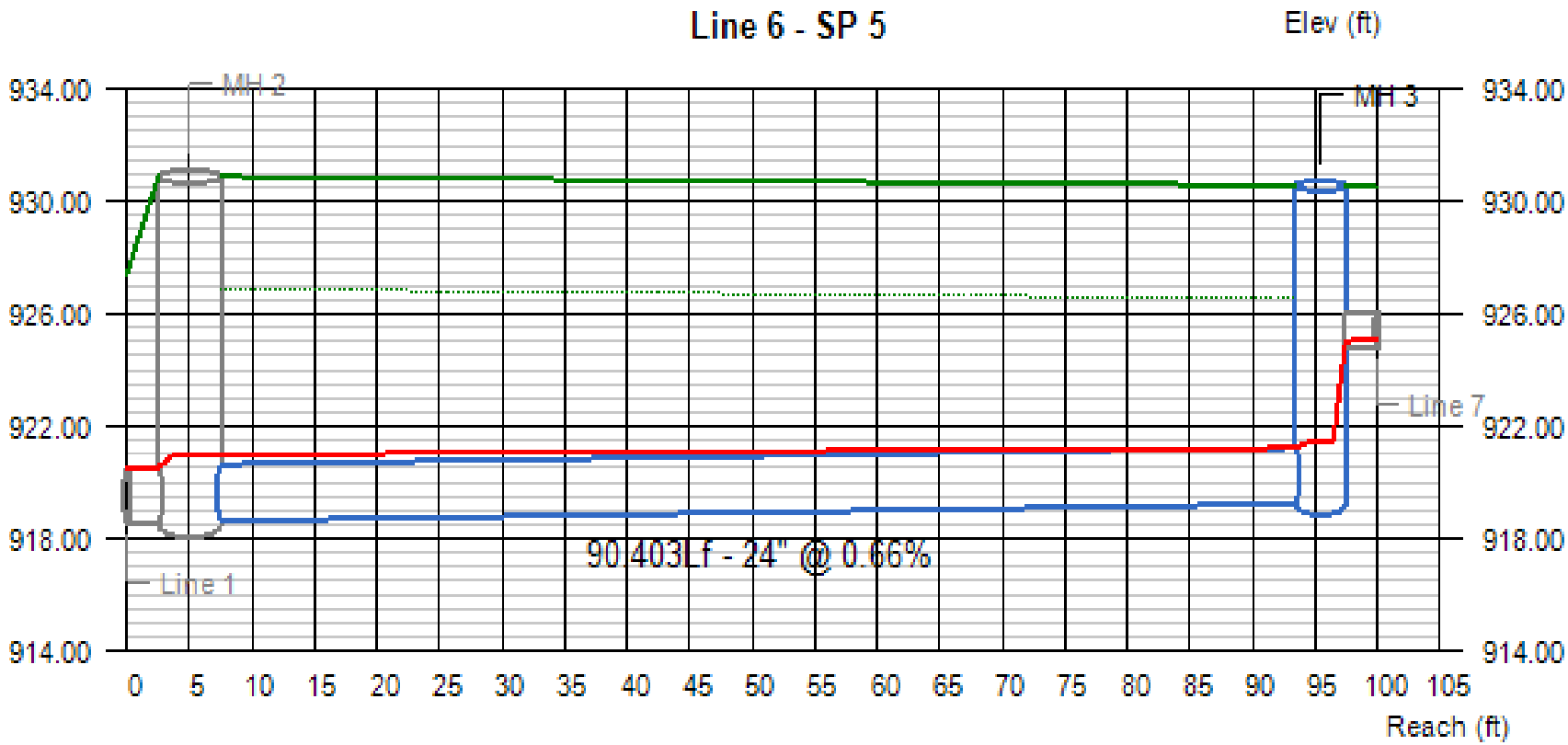
Line Profile (Line 5) - SP 1



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
5	2.90	928.31	930.46	0.64	0.68	0.68	928.95	931.14	931.14	4.62	4.22	3.20	3.19

Project File:	No. Lines: 23	Run Date: 2/22/2023

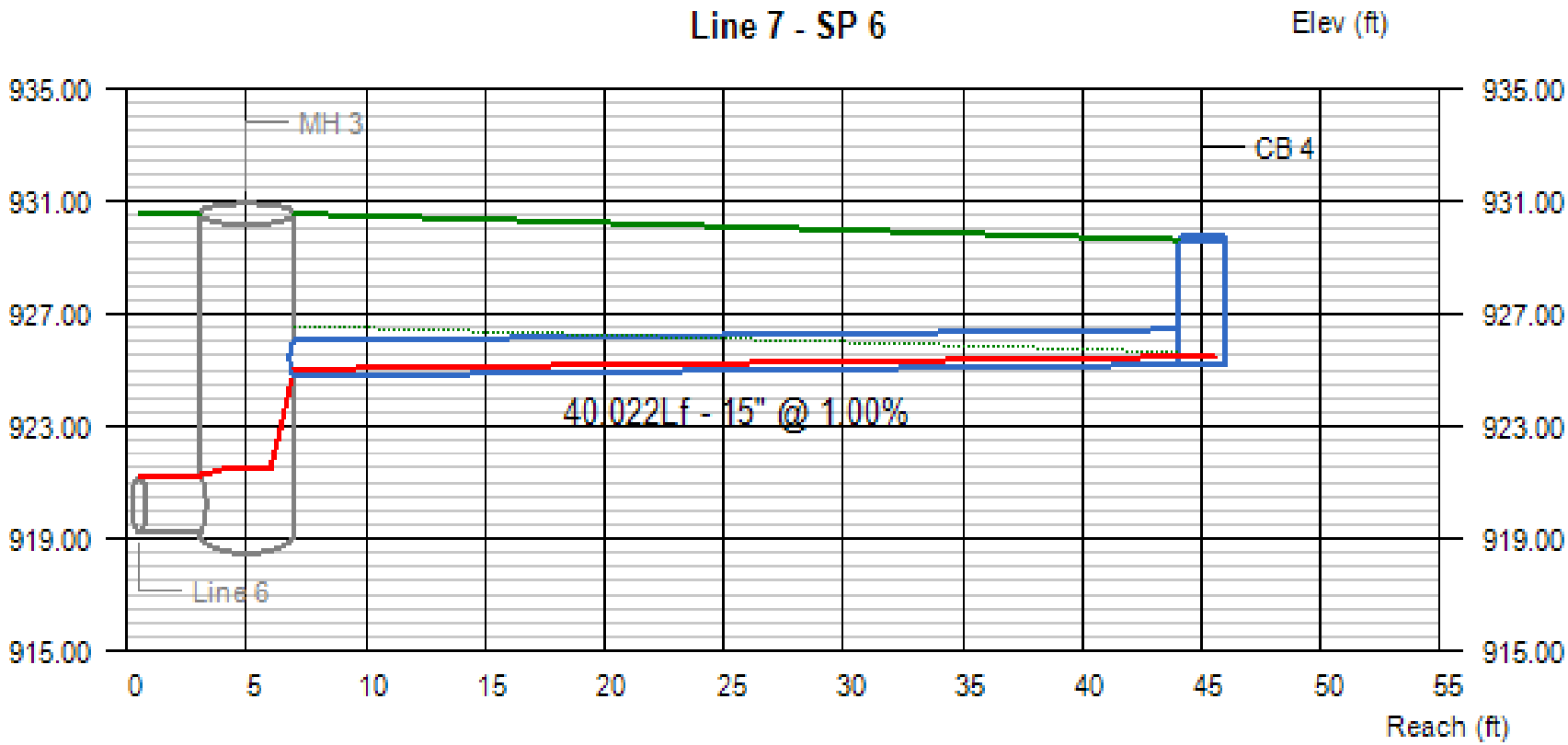
Line Profile (Line 6) - SP 5



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
6	12.22	918.63	919.23	2.00	2.00	2.22	920.99	921.23	921.45	3.89	3.89	10.26	9.32

Project File:	No. Lines: 23	Run Date: 2/22/2023

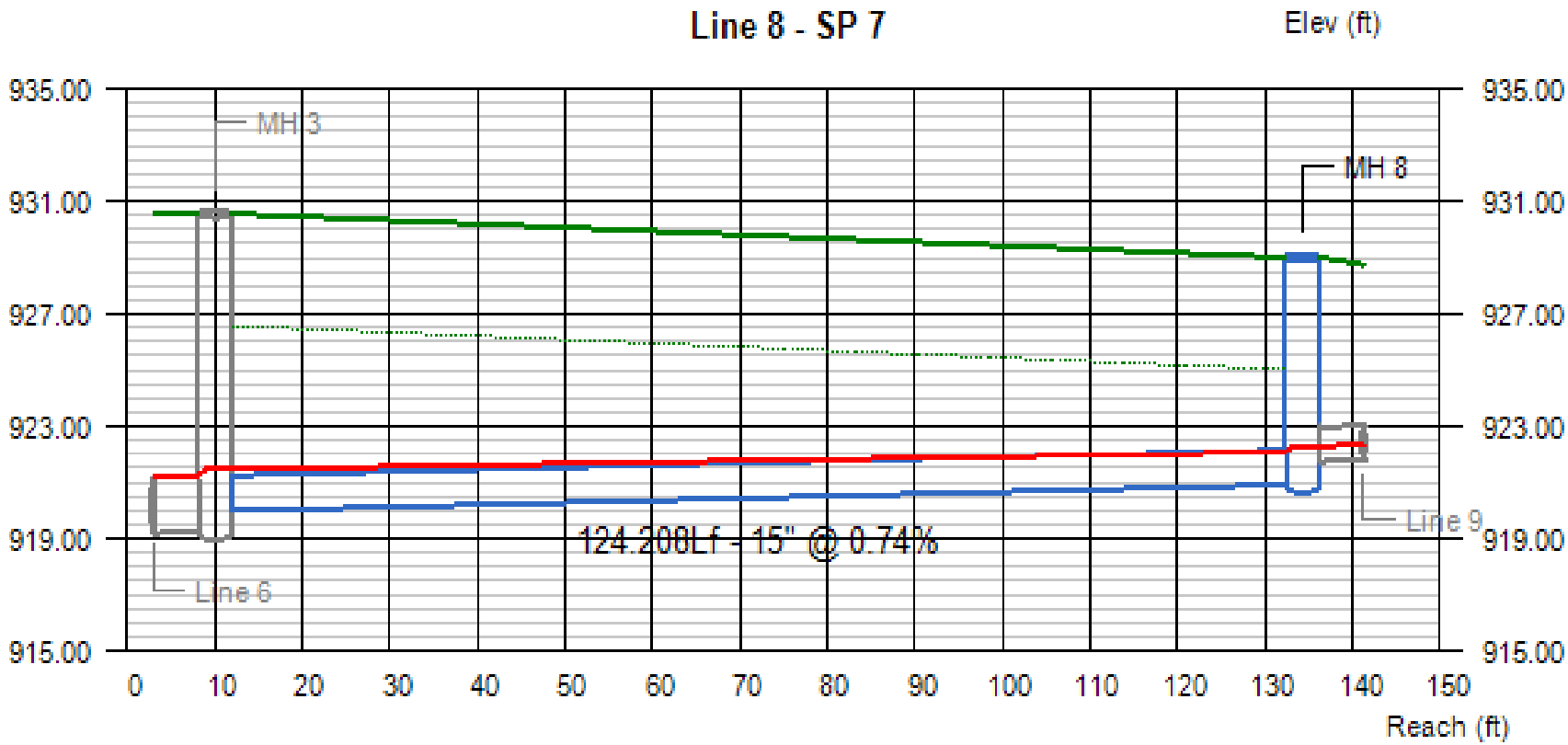
Line Profile (Line 7) - SP 6



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
7	0.53	924.78	925.18	0.24	0.28	0.28	925.02	925.46	925.46	3.18	2.54	4.52	3.20

Project File:	No. Lines: 23	Run Date: 2/22/2023

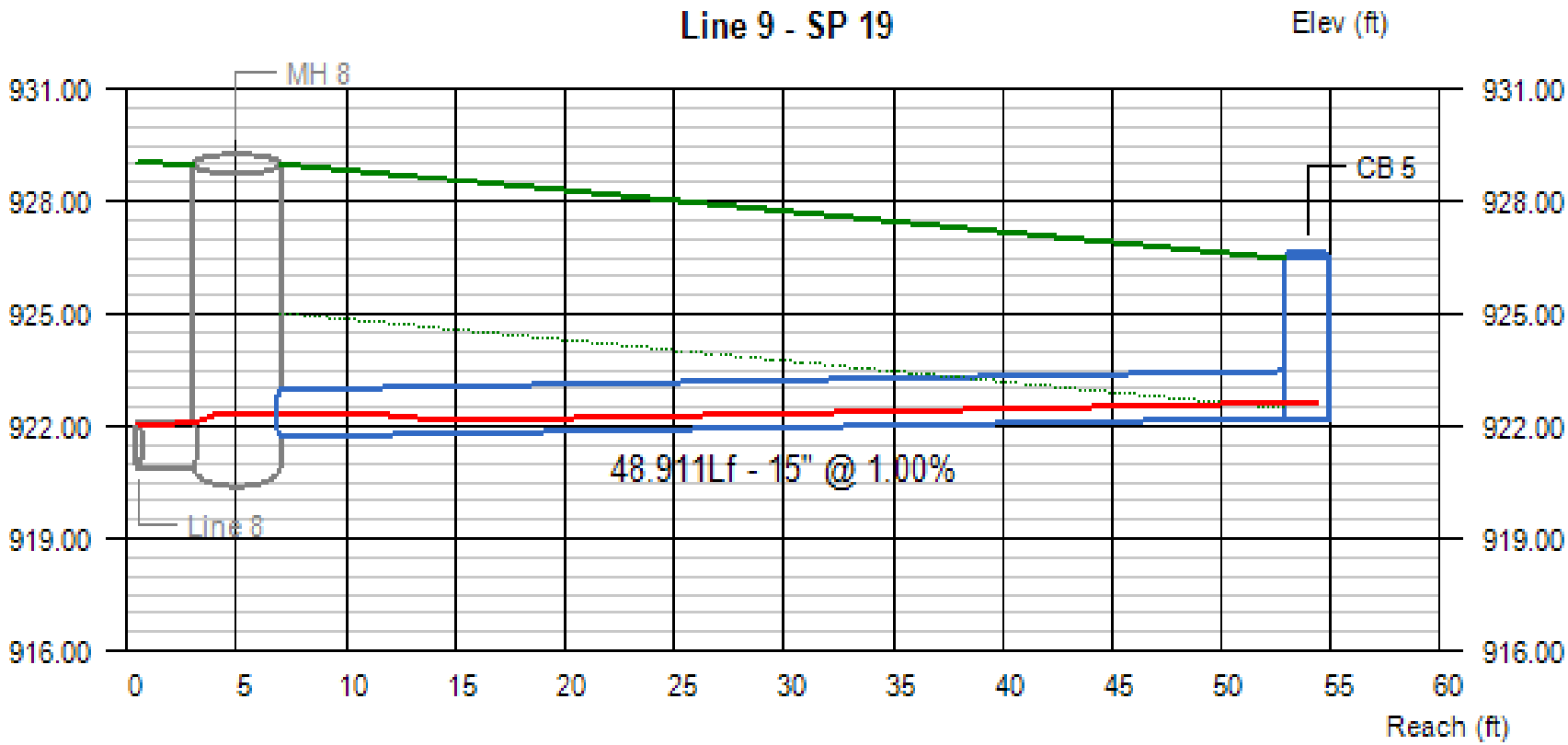
Line Profile (Line 8) - SP 7



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
8	4.79	919.98	920.90	1.25	1.18	1.41	921.45	922.08	922.31	3.90	3.99	9.32	6.86

Project File:	No. Lines: 23	Run Date: 2/22/2023

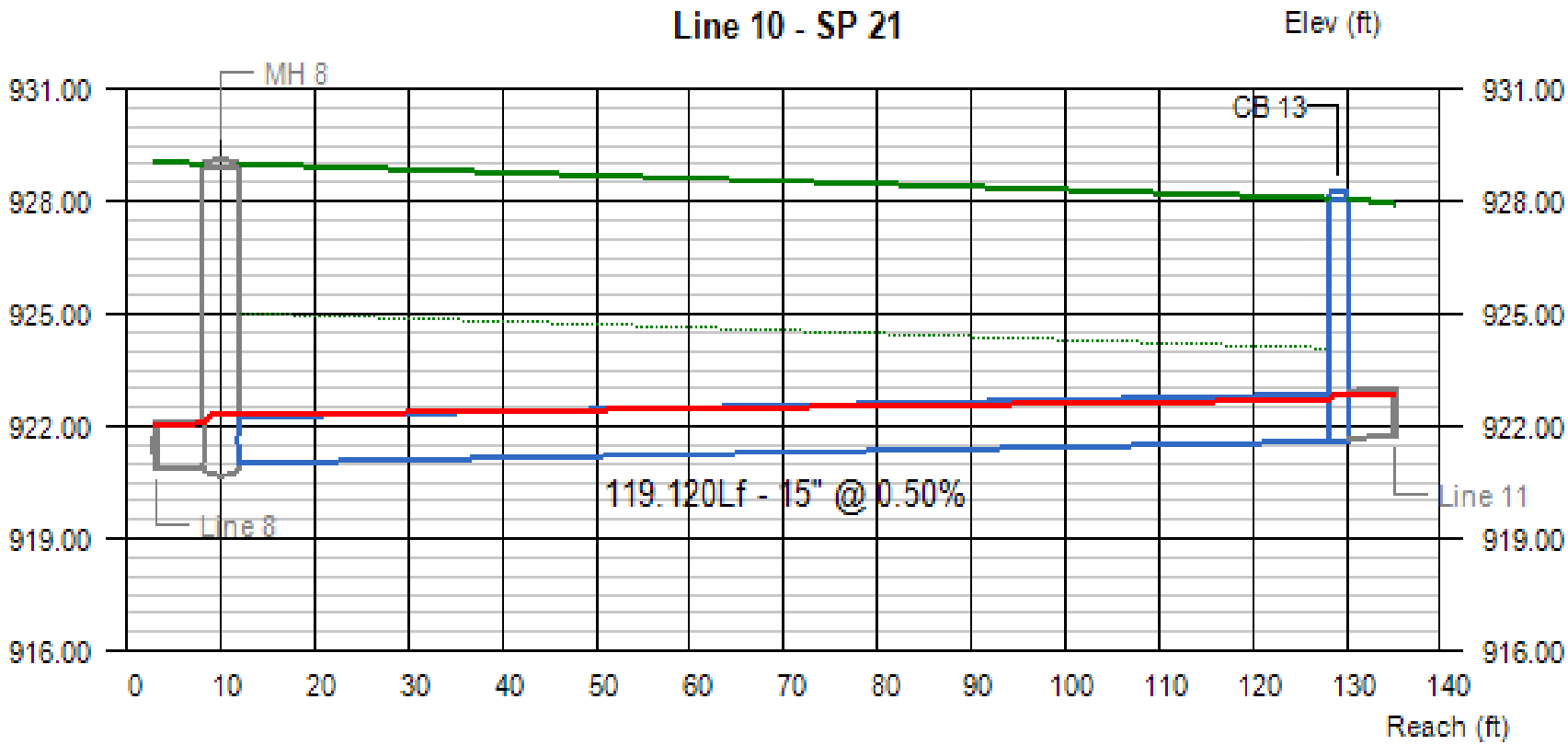
Line Profile (Line 9) - SP 19



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
9	1.07	921.73	922.22	0.58	0.41	0.41	922.31	922.63 j	922.63	1.92	3.09	6.03	3.00

Project File:	No. Lines: 23	Run Date: 2/22/2023

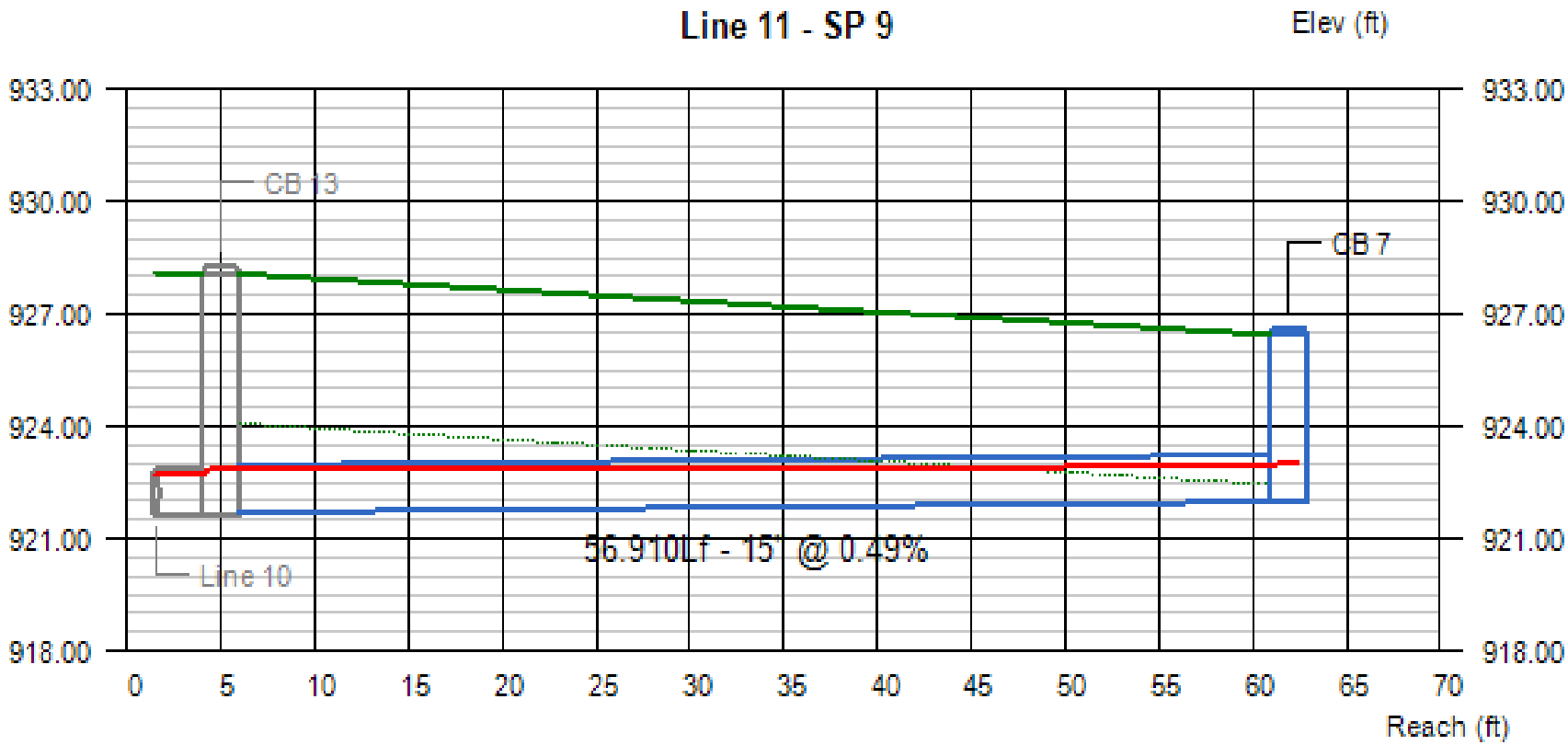
Line Profile (Line 10) - SP 21



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
10	3.93	921.00	921.60	1.25	1.10	1.27	922.31	922.70	922.87	3.20	3.42	6.76	5.22

Project File:	No. Lines: 23	Run Date: 2/22/2023

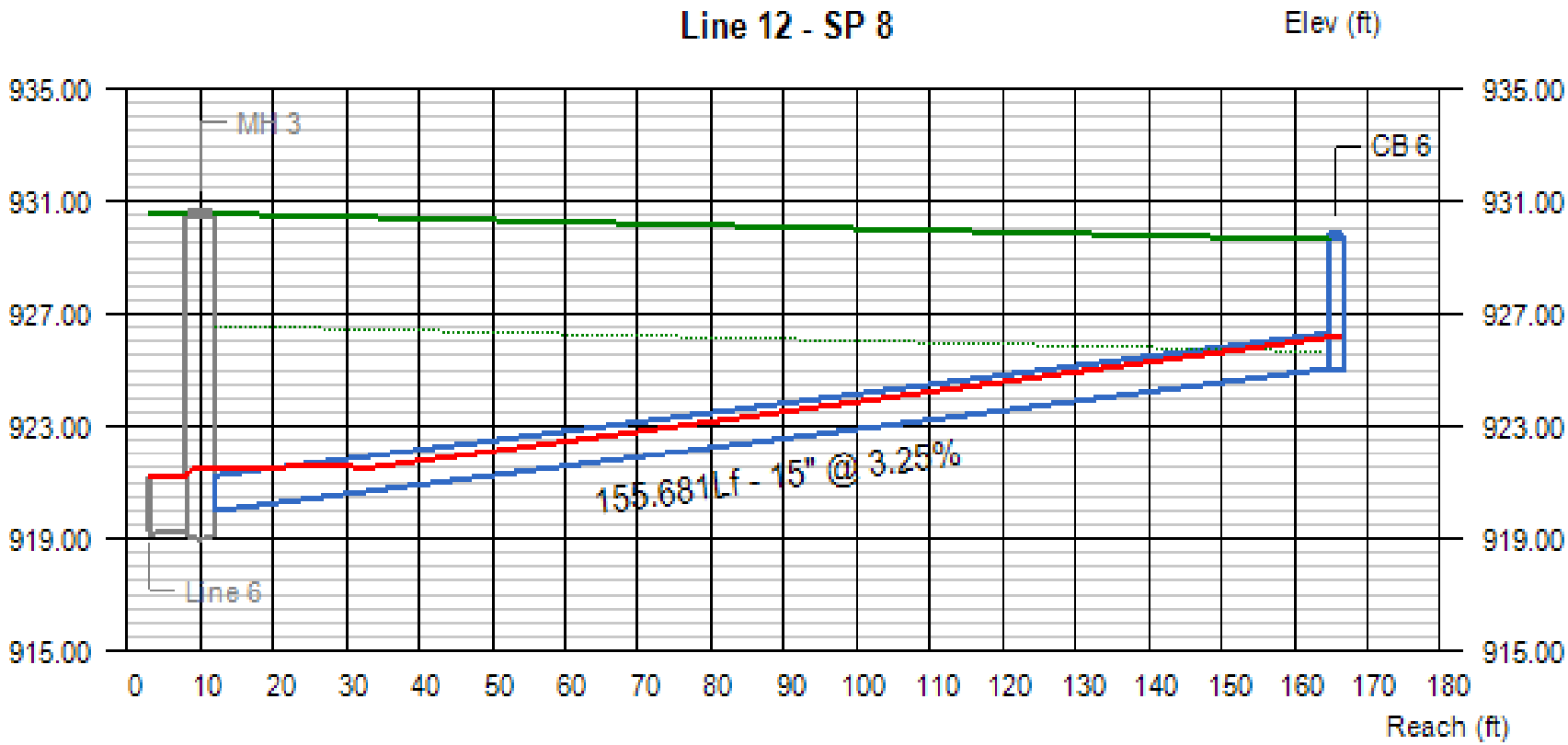
Line Profile (Line 11) - SP 9



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
11	2.29	921.70	921.98	1.17	0.94	1.02	922.87	922.92	923.00	1.92	2.32	5.12	3.20

Project File:	No. Lines: 23	Run Date: 2/22/2023

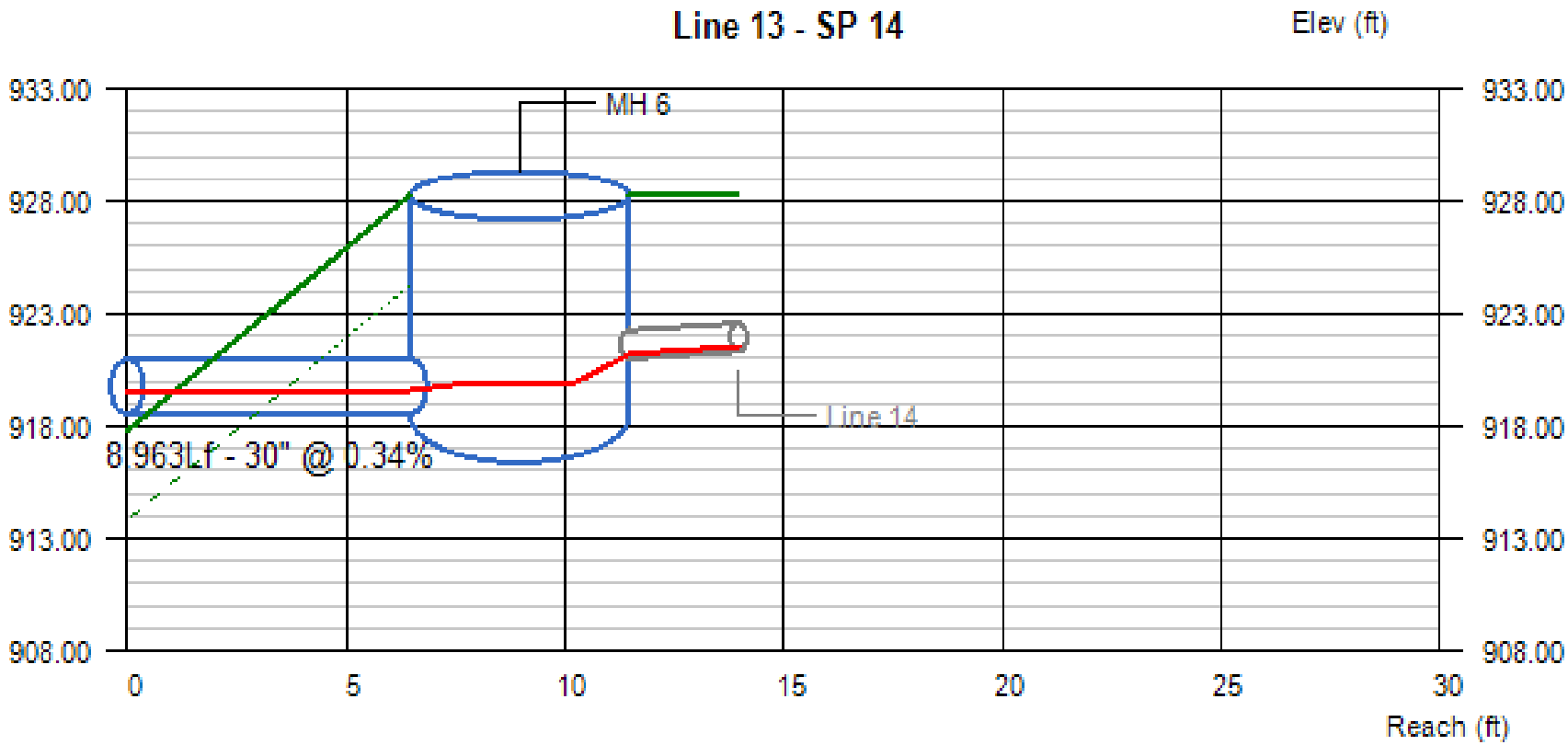
Line Profile (Line 12) - SP 8



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
12	7.79	919.98	925.04	1.25	1.10	1.10	921.45	926.14 j	926.14	6.35	6.79	9.32	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

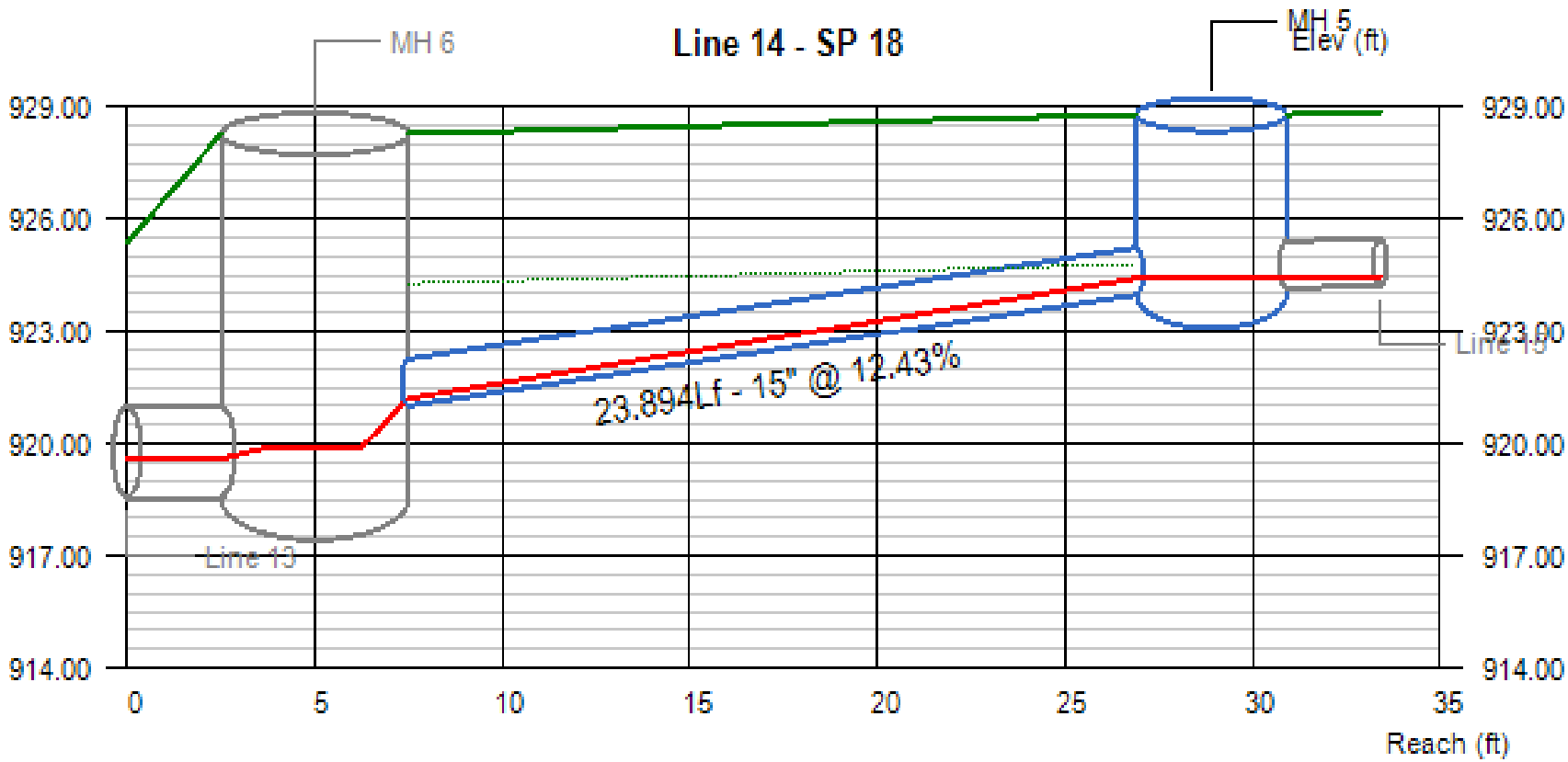
Line Profile (Line 13) - SP 14



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
13	8.91	918.50	918.53	1.06	1.06	1.37	919.56	919.59	919.90	4.49	4.49	-3.19	7.24

Project File:	No. Lines: 23	Run Date: 2/22/2023

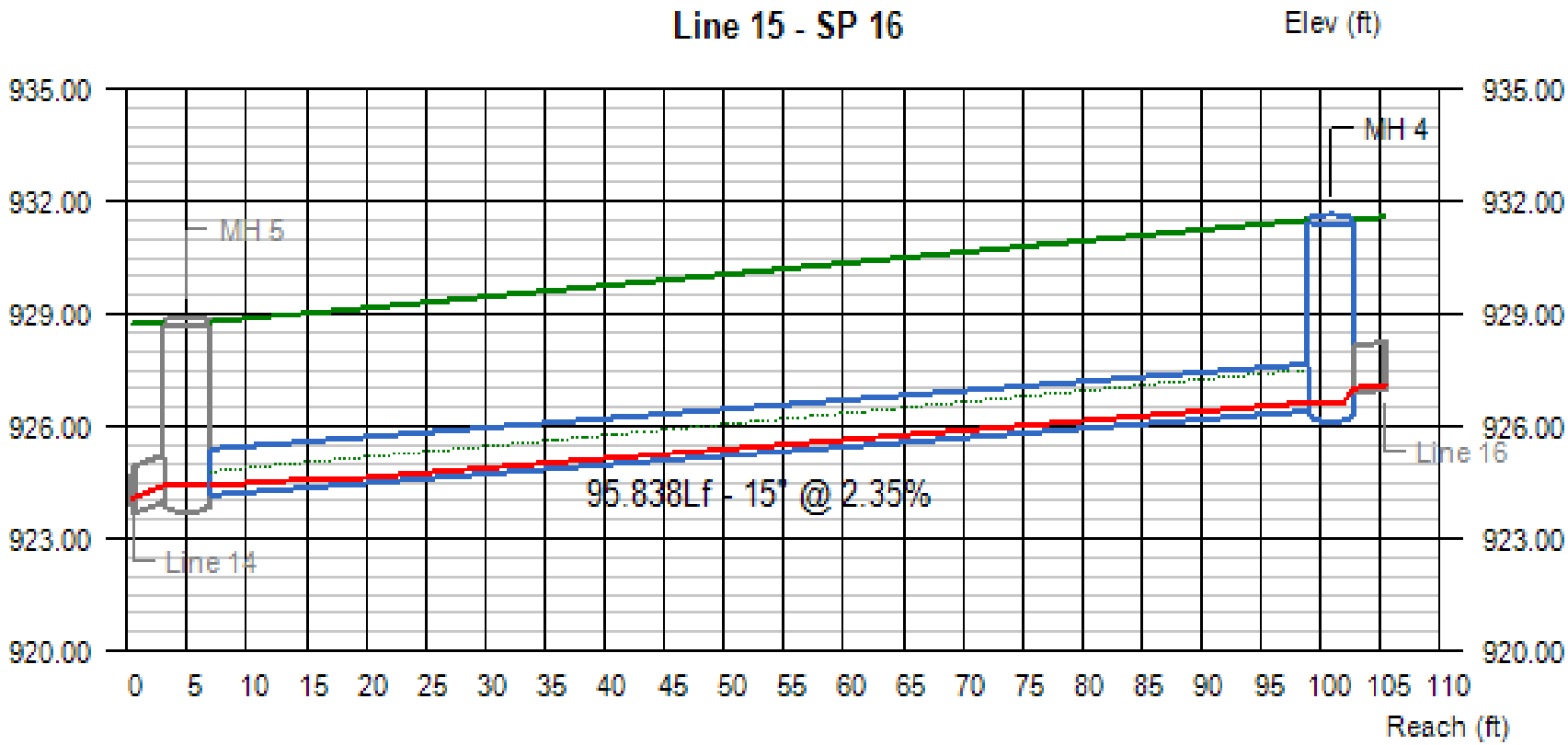
Line Profile (Line 14) - SP 18



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
14	1.25	921.00	923.97	0.20	0.44	0.44	921.20	924.41	924.41	9.93	3.23	6.02	3.56

Project File:	No. Lines: 23	Run Date: 2/22/2023

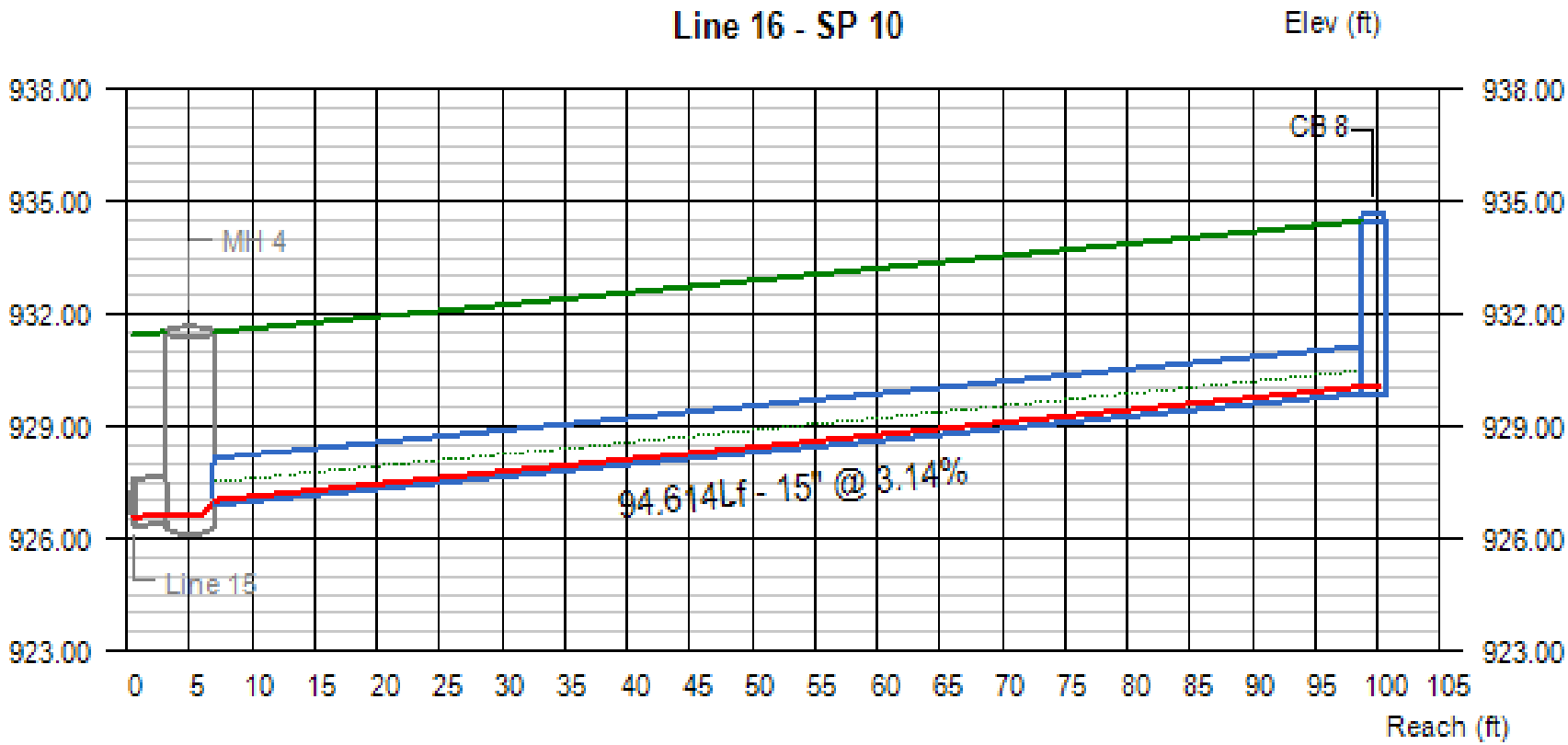
Line Profile (Line 15) - SP 16



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
15	0.35	924.15	926.40	0.26	0.23	0.23	924.41	926.63 j	926.63	1.91	2.27	3.38	3.85

Project File:	No. Lines: 23	Run Date: 2/22/2023

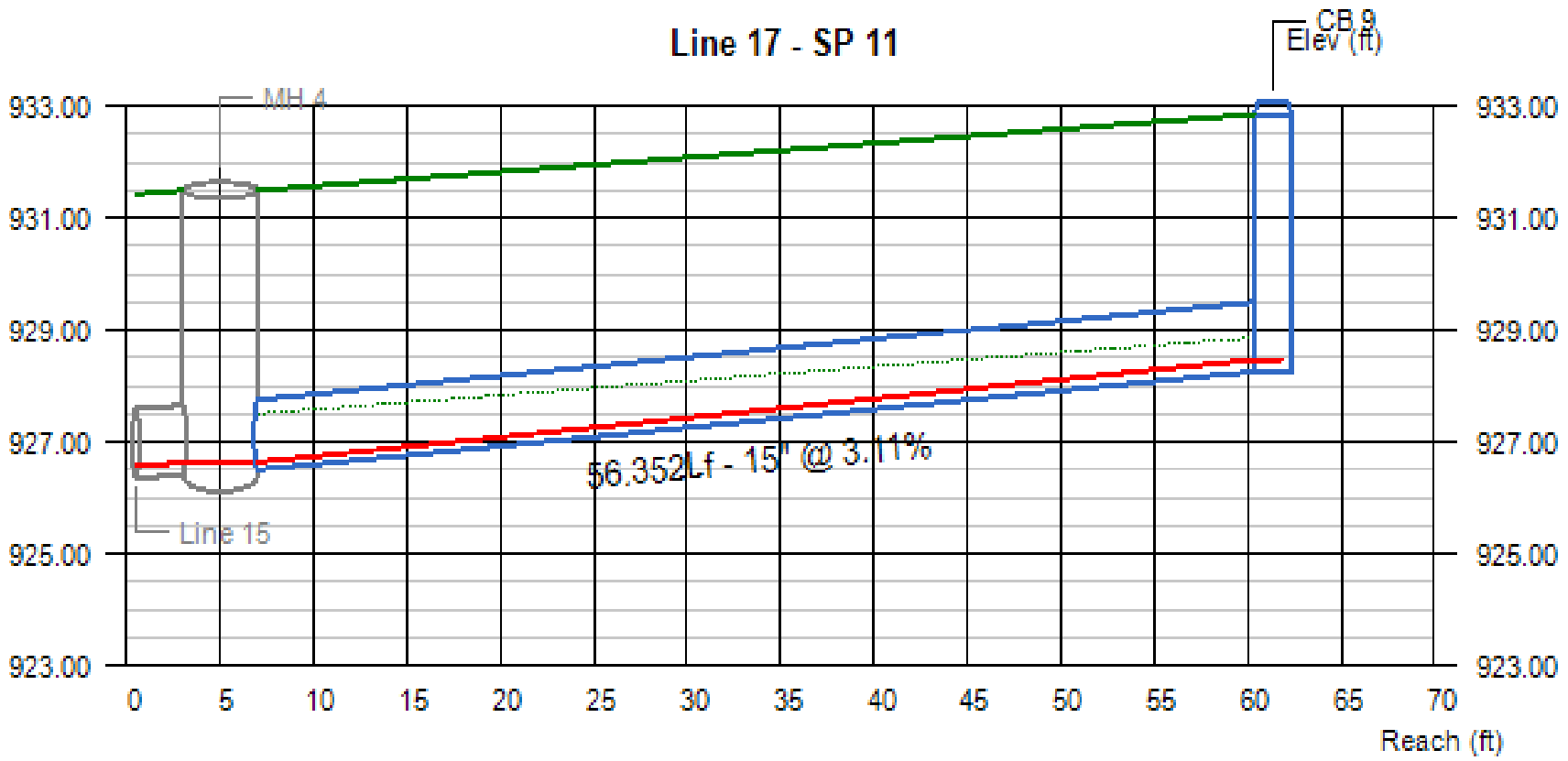
Line Profile (Line 16) - SP 10



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
16	0.22	926.90	929.87	0.12	0.18	0.18	927.02	930.05	930.05	3.65	2.01	3.35	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

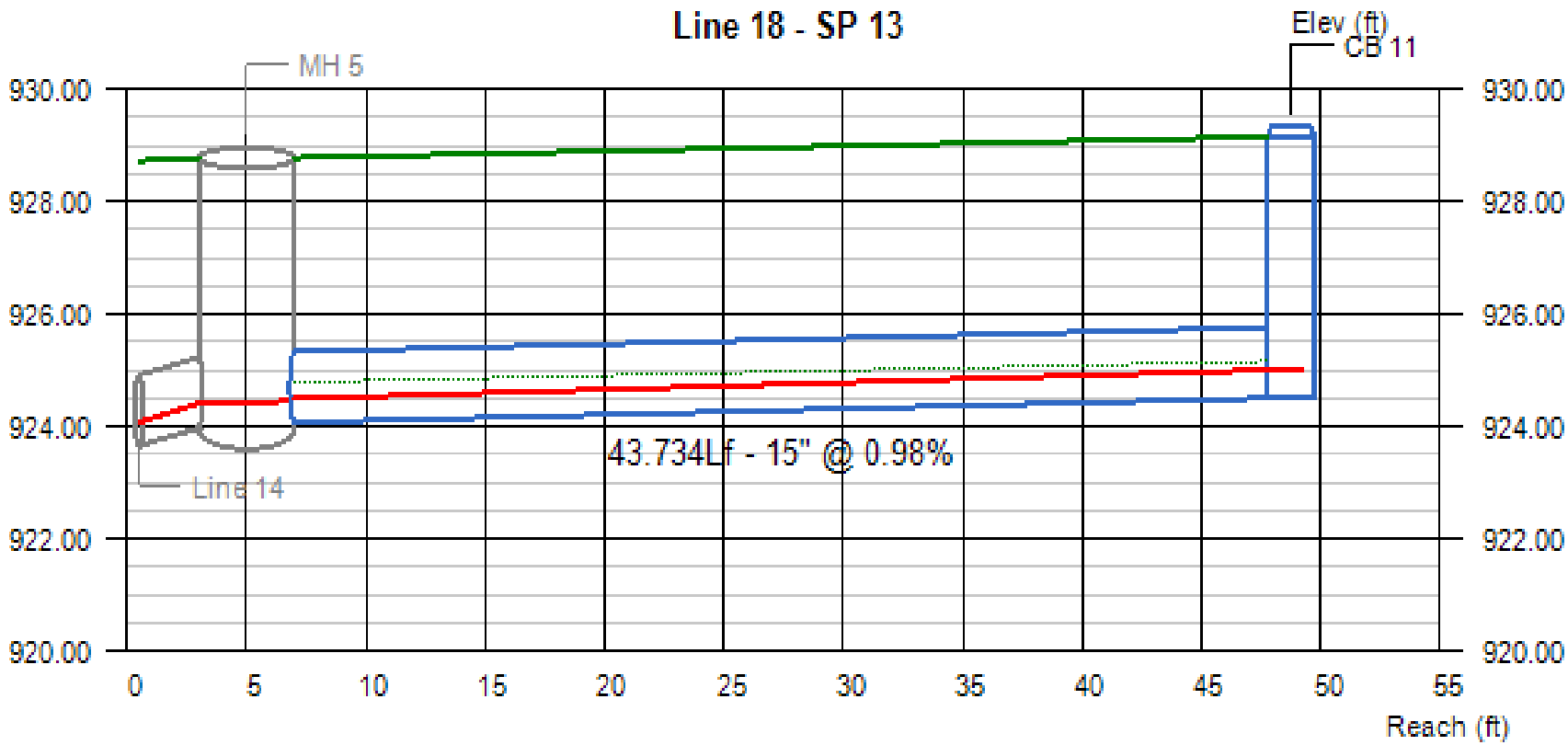
Line Profile (Line 17) - SP 11



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
17	0.31	926.50	928.25	0.14	0.21	0.21	926.64	928.46	928.46	4.00	2.19	3.75	3.35

Project File:	No. Lines: 23	Run Date: 2/22/2023

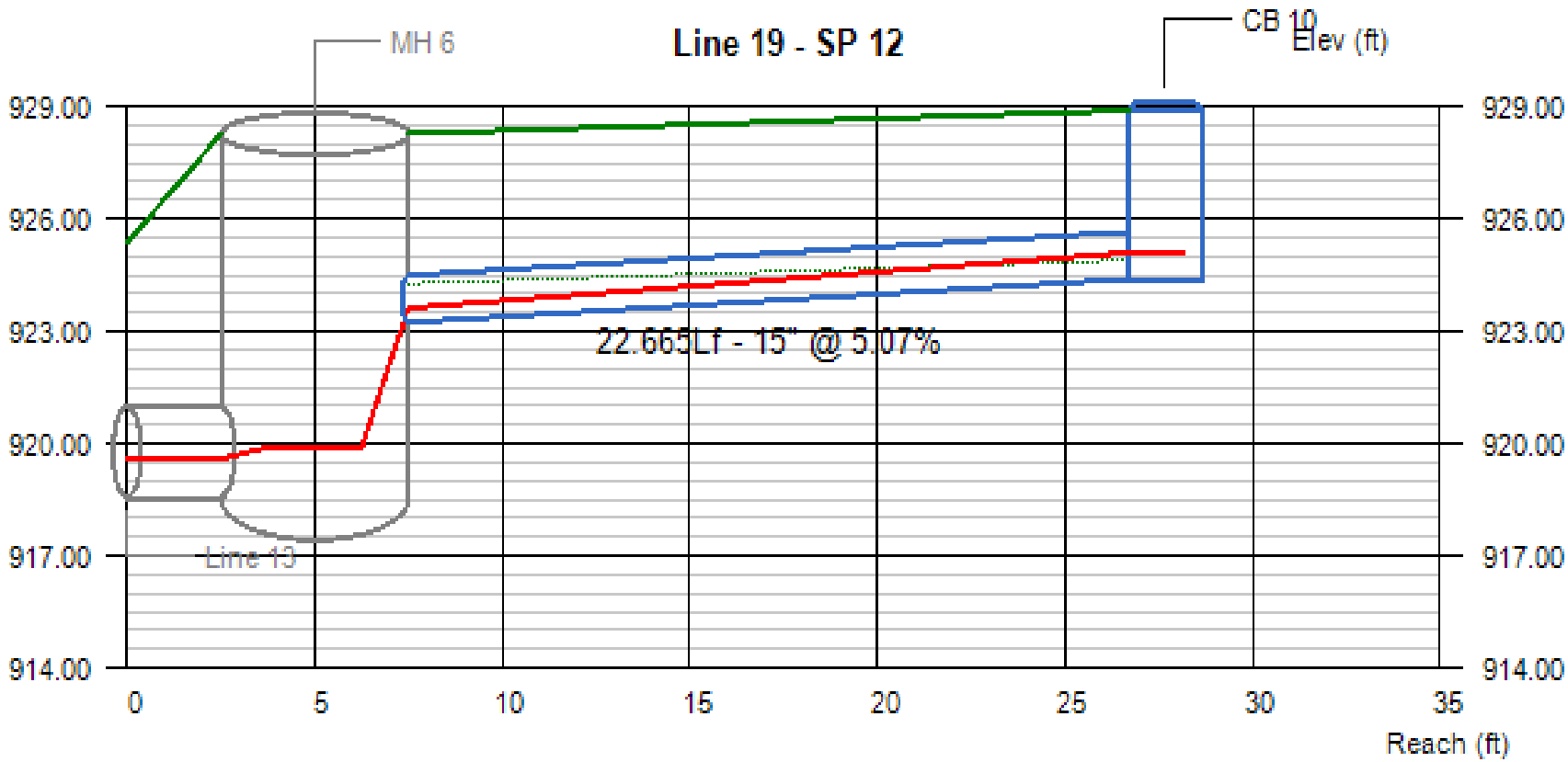
Line Profile (Line 18) - SP 13



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
18	1.57	924.07	924.50	0.42	0.50	0.50	924.49	925.00	925.00	4.31	3.46	3.46	3.40

Project File:	No. Lines: 23	Run Date: 2/22/2023

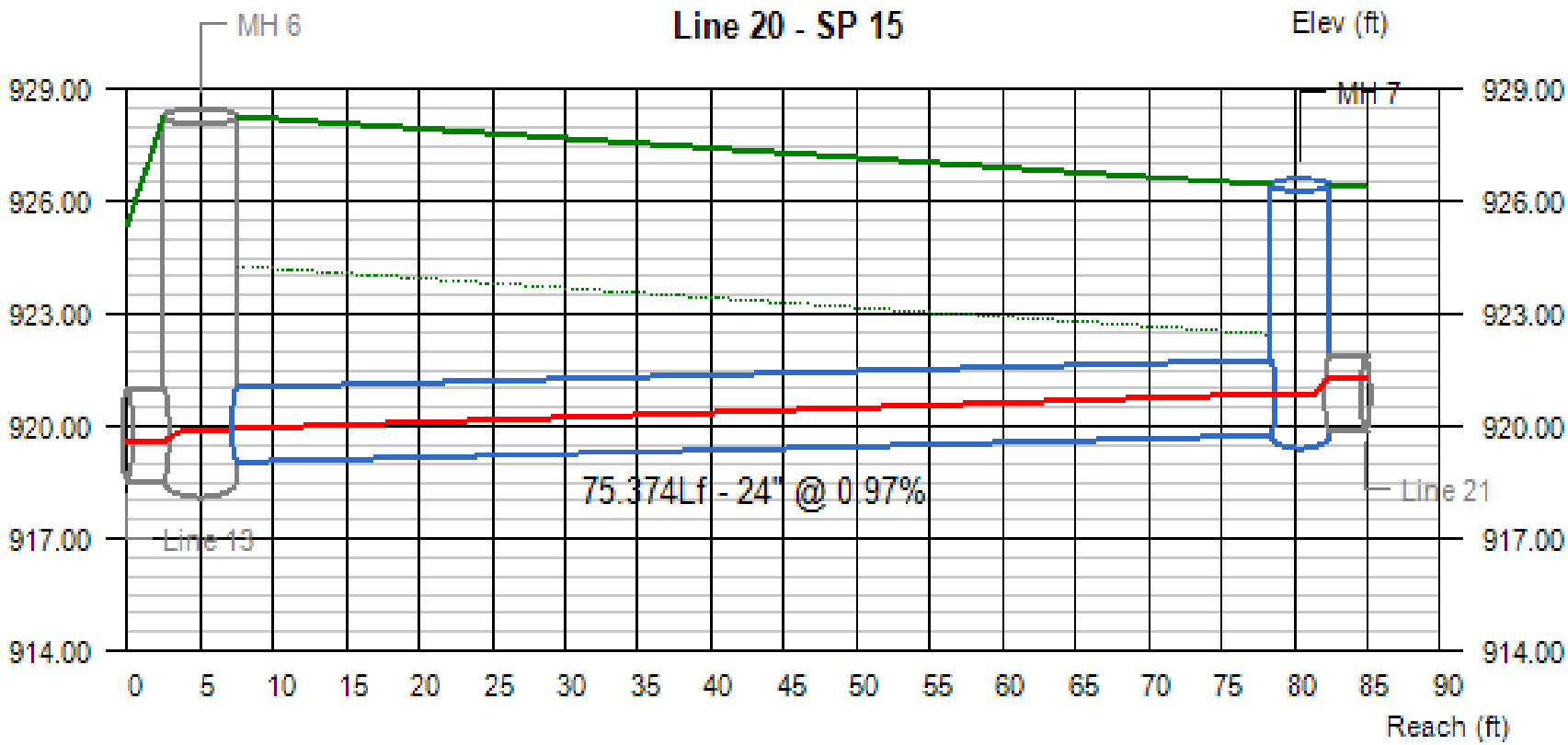
Line Profile (Line 19) - SP 12



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
19	3.02	923.24	924.39	0.39	0.70	0.70	923.63	925.09	925.09	9.35	4.28	3.78	3.25

Project File:	No. Lines: 23	Run Date: 2/22/2023

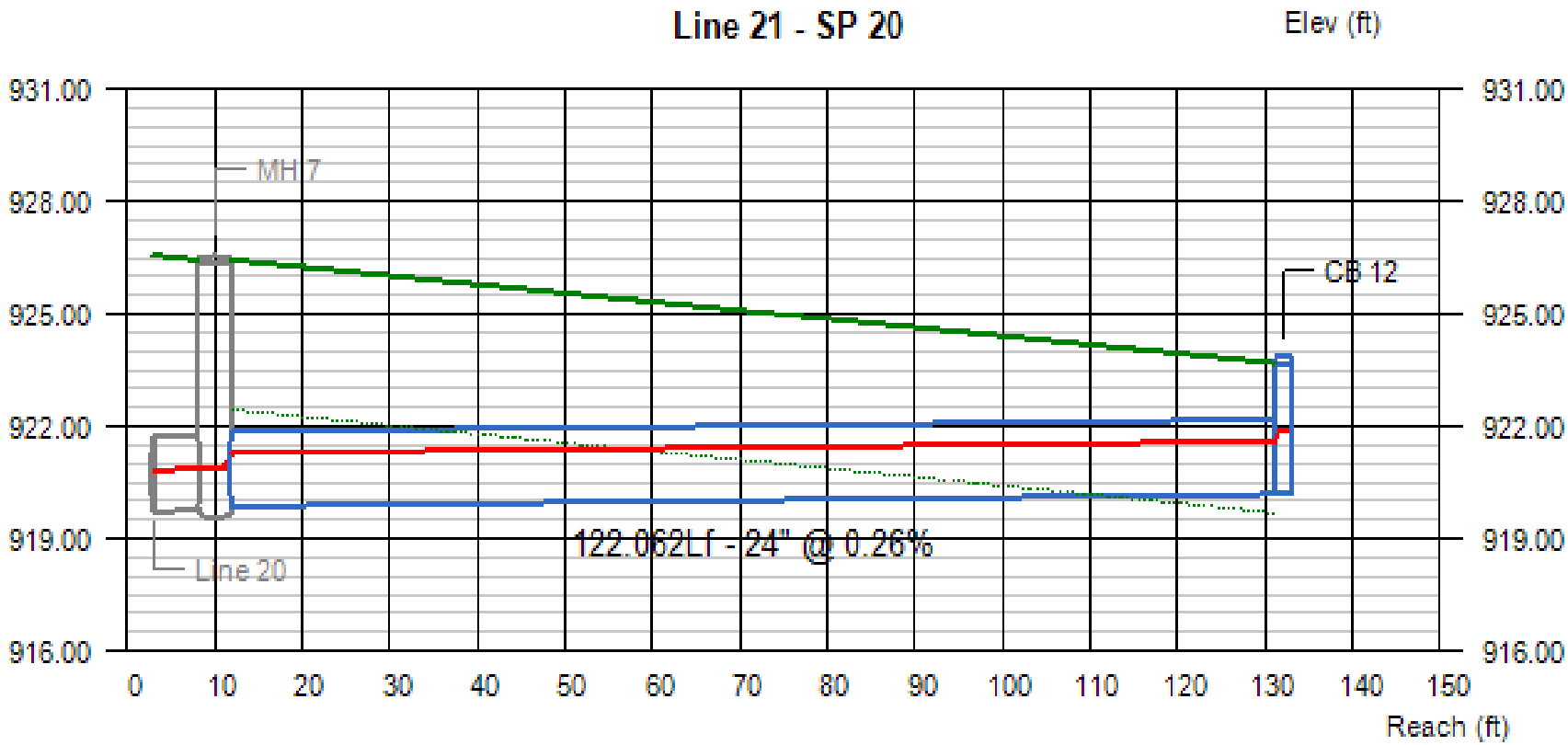
Line Profile (Line 20) - SP 15



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
20	9.56	919.03	919.76	0.92	1.10	1.10	919.95	920.86	920.86	6.81	5.37	7.24	4.68

Project File:	No. Lines: 23	Run Date: 2/22/2023

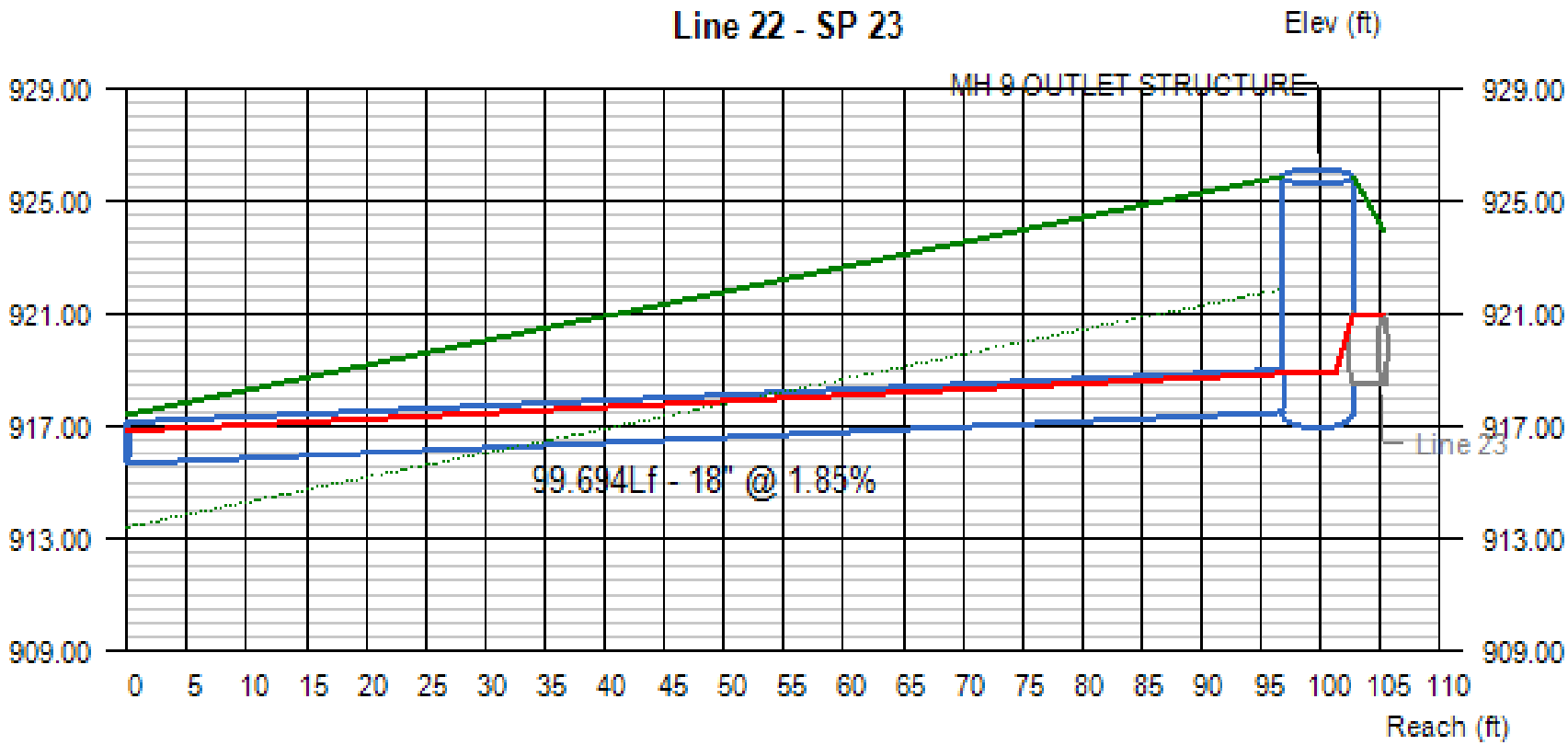
Line Profile (Line 21) - SP 20



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
21	9.94	919.86	920.18	1.43	1.43	1.69	921.29	921.61	921.87	4.14	4.14	4.58	1.50

Project File:	No. Lines: 23	Run Date: 2/22/2023

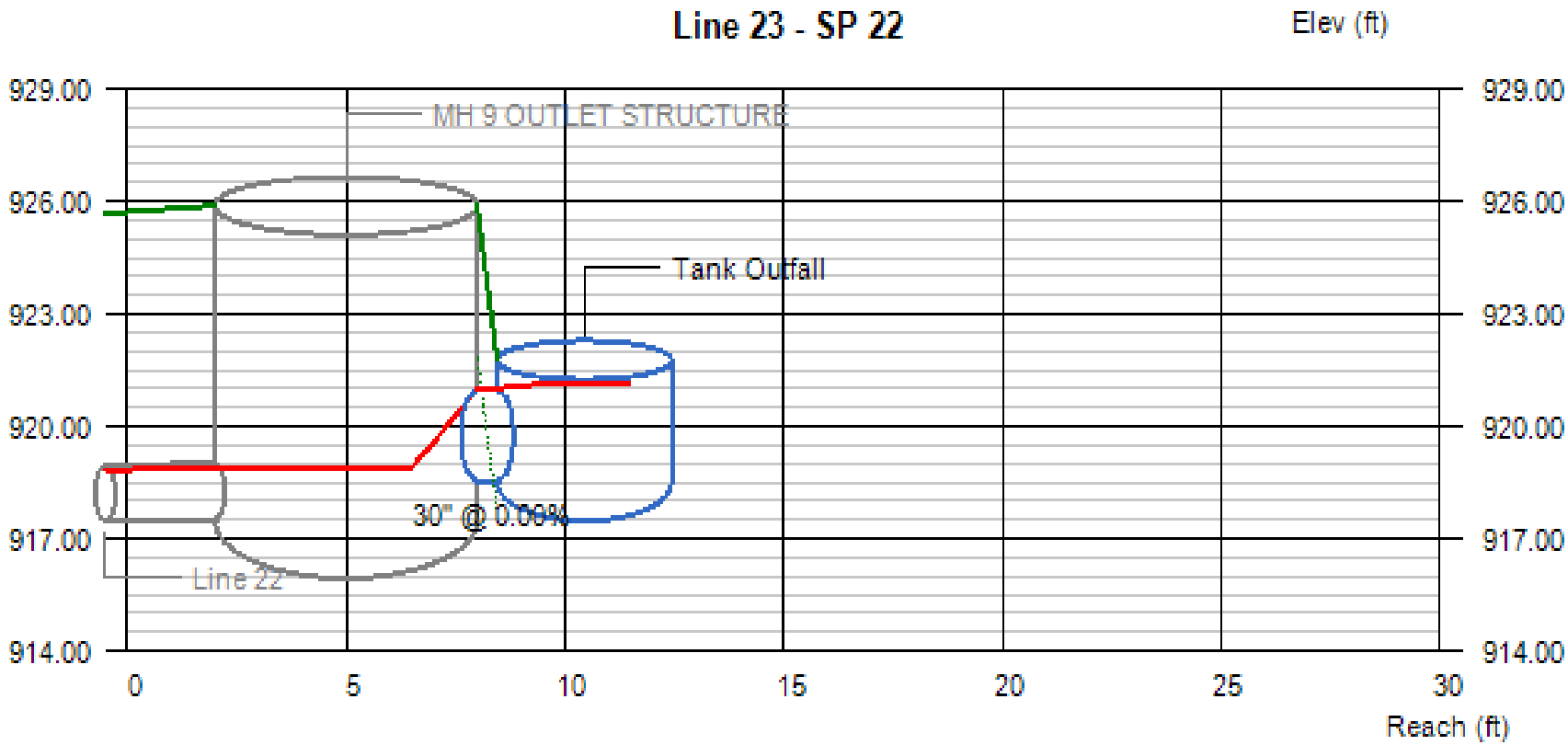
Line Profile (Line 22) - SP 23



Line #	Q (cfs)	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
		Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
22	13.71	915.66	917.50	1.18	1.37	1.37	916.84	918.87	918.87	9.19	8.09	0.25	6.88

Project File:	No. Lines: 23	Run Date: 3/9/2023

Line Profile (Line 23) - SP 22



Line #	Q (cfs)	Invert Elevation Dn (ft)	Invert Elevation Up (ft)	Depth of Flow Dn (ft)	Depth of Flow Up (ft)	Depth of Flow Hw (ft)	Hydraulic Grade Line Dn (ft)	Hydraulic Grade Line Up (ft)	Hydraulic Grade Line Jnct (ft)	Velocity Dn (ft/s)	Velocity Up (ft/s)	Cover Dn (ft)	Cover Up (ft)
23	13.71	918.50	918.50	2.50	2.50	2.63	921.00	921.01	921.13	2.79	2.79	4.88	0.76

Project File:	No. Lines: 23	Run Date: 3/9/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	7.816	-113.316	MH	0.00	0.00	0.00	0.0	918.50	0.38	918.53	24	Cir	0.013	0.99	930.89	SP 17
2	1	23.216	-81.650	Genr	0.00	0.33	0.90	5.0	925.69	1.03	925.93	15	Cir	0.013	0.50	931.23	SP 4
3	2	135.960	0.461	MH	0.00	0.00	0.00	0.0	926.03	1.00	927.39	15	Cir	0.013	0.92	933.65	SP 3
4	3	57.083	65.115	Genr	0.00	0.06	0.90	5.0	927.24	1.70	928.21	15	Cir	0.013	1.46	932.76	SP 2
5	4	9.669	-74.574	Genr	0.00	0.38	0.90	5.0	928.31	22.24	930.46	15	Cir	0.013	1.00	934.90	SP 1
6	1	90.403	74.268	MH	0.00	0.00	0.00	0.0	918.63	0.66	919.23	24	Cir	0.013	0.96	930.55	SP 5
7	6	40.022	2.241	Genr	0.00	0.07	0.90	5.0	924.78	1.00	925.18	15	Cir	0.013	1.00	929.63	SP 6
8	6	124.208	10.000	MH	0.00	0.00	0.00	0.0	919.98	0.74	920.90	15	Cir	0.013	0.93	929.01	SP 7
9	8	48.911	65.534	Genr	0.00	0.14	0.90	5.0	921.73	1.00	922.22	15	Cir	0.013	1.00	926.47	SP 19
10	8	119.120	-60.573	Genr	0.00	0.23	0.90	5.0	921.00	0.50	921.60	15	Cir	0.013	0.90	928.07	SP 21
11	10	56.910	33.132	Genr	0.00	0.30	0.90	5.0	921.70	0.49	921.98	15	Cir	0.013	1.00	926.43	SP 9
12	6	155.681	-71.435	Genr	0.00	1.39	0.66	5.0	919.98	3.25	925.04	15	Cir	0.013	1.00	929.64	SP 8
13	End	8.963	66.684	MH	0.00	0.00	0.00	0.0	918.50	0.34	918.53	30	Cir	0.013	1.00	928.27	SP 14
14	13	23.894	63.815	MH	0.00	0.00	0.00	0.0	921.00	12.43	923.97	15	Cir	0.013	0.69	928.78	SP 18
15	14	95.838	26.717	MH	0.00	0.00	0.00	0.0	924.15	2.35	926.40	15	Cir	0.013	0.75	931.50	SP 16
16	15	94.614	-0.374	Genr	0.00	0.04	0.65	5.0	926.90	3.14	929.87	15	Cir	0.013	1.00	934.47	SP 10
17	15	56.352	-45.379	Genr	0.00	0.04	0.90	5.0	926.50	3.11	928.25	15	Cir	0.013	1.00	932.85	SP 11
18	14	43.734	-40.147	Genr	0.00	0.21	0.88	5.0	924.07	0.98	924.50	15	Cir	0.013	1.00	929.15	SP 13
19	13	22.665	89.284	Genr	0.00	0.40	0.89	5.0	923.24	5.07	924.39	15	Cir	0.013	1.00	928.89	SP 12
20	13	75.374	-86.414	MH	0.00	0.00	0.00	0.0	919.03	0.97	919.76	24	Cir	0.013	0.15	926.44	SP 15
21	20	122.062	-5.841	Genr	0.00	1.33	0.88	5.0	919.86	0.26	920.18	24	Cir	0.013	1.00	923.68	SP 20
22	End	99.694	-177.910	MH	0.00	0.00	0.00	0.0	915.66	1.85	917.50	18	Cir	0.013	0.92	925.88	SP 23
23	22	5.447	64.594	MH	13.71	0.00	0.00	0.0	918.50	0.00	918.50	30	Cir	0.013	1.00	921.76	SP 22

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Date: 3/9/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH 2	Manhole	930.89	Cir	5.00	5.00	24	Cir	918.53	15 24	Cir Cir	925.69 918.63
2	CB 3	Generic	931.23	Rect	2.00	4.00	15	Cir	925.93	15	Cir	926.03
3	MH 1	Manhole	933.65	Cir	4.00	4.00	15	Cir	927.39	15	Cir	927.24
4	CB 2	Generic	932.76	Rect	2.00	4.00	15	Cir	928.21	15	Cir	928.31
5	CB 1	Generic	934.90	Rect	2.00	4.00	15	Cir	930.46			
6	MH 3	Manhole	930.55	Cir	4.00	4.00	24	Cir	919.23	15 15 15	Cir Cir Cir	924.78 919.98 919.98
7	CB 4	Generic	929.63	Rect	2.00	4.00	15	Cir	925.18			
8	MH 8	Manhole	929.01	Cir	4.00	4.00	15	Cir	920.90	15 15	Cir Cir	921.73 921.00
9	CB 5	Generic	926.47	Rect	2.00	4.00	15	Cir	922.22			
10	CB 13	Generic	928.07	Rect	2.00	4.00	15	Cir	921.60	15	Cir	921.70
11	CB 7	Generic	926.43	Rect	2.00	4.00	15	Cir	921.98			
12	CB 6	Generic	929.64	Rect	2.00	4.00	15	Cir	925.04			
13	MH 6	Manhole	928.27	Cir	5.00	5.00	30	Cir	918.53	15 15 24	Cir Cir Cir	921.00 923.24 919.03
14	MH 5	Manhole	928.78	Cir	4.00	4.00	15	Cir	923.97	15 15	Cir Cir	924.15 924.07
15	MH 4	Manhole	931.50	Cir	4.00	4.00	15	Cir	926.40	15 15	Cir Cir	926.90 926.50
16	CB 8	Generic	934.47	Rect	2.00	4.00	15	Cir	929.87			
17	CB 9	Generic	932.85	Rect	2.00	4.00	15	Cir	928.25			
18	CB 11	Generic	929.15	Rect	2.00	4.00	15	Cir	924.50			
19	CB 10	Generic	928.89	Rect	2.00	4.00	15	Cir	924.39			

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of Structures: 23 | Run Date: 3/9/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
20	MH 7	Manhole	926.44	Cir	4.00	4.00	24	Cir	919.76	24	Cir	919.86
21	CB 12	Generic	923.68	Rect	2.00	4.00	24	Cir	920.18			
22	MH 9 OUTLET STRUCTUR	Manhole	925.88	Cir	6.00	6.00	18	Cir	917.50	30	Cir	918.50
23	Tank Outfall	Manhole	921.76	Cir	4.00	4.00	30	Cir	918.50			

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of Structures: 23 | Run Date: 3/9/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	SP 17	17.20	24	Cir	7.816	918.50	918.53	0.384	920.50	920.53	0.46	920.99	End	Manhole
2	SP 4	5.46	15	Cir	23.216	925.69	925.93	1.034	926.56	926.88	0.23	926.88	1	Generic
3	SP 3	3.28	15	Cir	135.960	926.03	927.39	1.000	926.88	928.12	n/a	928.12 j	2	Manhole
4	SP 2	3.35	15	Cir	57.083	927.24	928.21	1.699	928.12	928.95	n/a	928.95 j	3	Generic
5	SP 1	2.90	15	Cir	9.669	928.31	930.46	22.237	928.95	931.14	n/a	931.14	4	Generic
6	SP 5	12.22	24	Cir	90.403	918.63	919.23	0.664	920.99	921.23	0.23	921.45	1	Manhole
7	SP 6	0.53	15	Cir	40.022	924.78	925.18	0.999	925.02	925.46	n/a	925.46	6	Generic
8	SP 7	4.79	15	Cir	124.208	919.98	920.90	0.741	921.45	922.08	0.23	922.31	6	Manhole
9	SP 19	1.07	15	Cir	48.911	921.73	922.22	1.002	922.31	922.63	n/a	922.63 j	8	Generic
10	SP 21	3.93	15	Cir	119.120	921.00	921.60	0.504	922.31	922.70	0.16	922.87	8	Generic
11	SP 9	2.29	15	Cir	56.910	921.70	921.98	0.492	922.87	922.92	0.08	923.00	10	Generic
12	SP 8	7.79	15	Cir	155.681	919.98	925.04	3.250	921.45	926.14	n/a	926.14 j	6	Generic
13	SP 14	8.91	30	Cir	8.963	918.50	918.53	0.335	919.56	919.59	0.31	919.90	End	Manhole
14	SP 18	1.25	15	Cir	23.894	921.00	923.97	12.430	921.20	924.41	0.11	924.41	13	Manhole
15	SP 16	0.35	15	Cir	95.838	924.15	926.40	2.348	924.41	926.63	n/a	926.63 j	14	Manhole
16	SP 10	0.22	15	Cir	94.614	926.90	929.87	3.139	927.02	930.05	n/a	930.05	15	Generic
17	SP 11	0.31	15	Cir	56.352	926.50	928.25	3.105	926.64	928.46	0.07	928.46	15	Generic
18	SP 13	1.57	15	Cir	43.734	924.07	924.50	0.983	924.49	925.00	n/a	925.00	14	Generic
19	SP 12	3.02	15	Cir	22.665	923.24	924.39	5.074	923.63	925.09	n/a	925.09	13	Generic
20	SP 15	9.56	24	Cir	75.374	919.03	919.76	0.968	919.95	920.86	0.07	920.86	13	Manhole
21	SP 20	9.94	24	Cir	122.062	919.86	920.18	0.262	921.29	921.61	0.27	921.87	20	Generic
22	SP 23	13.71	18	Cir	99.694	915.66	917.50	1.846	916.84	918.87	n/a	918.87	End	Manhole
23	SP 22	13.71	30	Cir	5.447	918.50	918.50	0.000	921.00*	921.01*	0.12	921.13	22	Manhole

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Run Date: 3/9/2023

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	7.816	0.00	2.90	0.00	0.00	2.28	0.0	7.0	7.6	17.20	14.02	5.48	24	0.38	918.50	918.53	920.50	920.53	920.09	930.89	SP 17
2	1	23.216	0.33	0.77	0.90	0.30	0.69	5.0	6.3	7.9	5.46	6.57	5.73	15	1.03	925.69	925.93	926.56	926.88	930.89	931.23	SP 4
3	2	135.960	0.00	0.44	0.00	0.00	0.40	0.0	5.4	8.3	3.28	6.46	4.06	15	1.00	926.03	927.39	926.88	928.12	931.23	933.65	SP 3
4	3	57.083	0.06	0.44	0.90	0.05	0.40	5.0	5.1	8.5	3.35	8.42	4.04	15	1.70	927.24	928.21	928.12	928.95	933.65	932.76	SP 2
5	4	9.669	0.38	0.38	0.90	0.34	0.34	5.0	5.0	8.5	2.90	30.45	4.42	15	22.24	928.31	930.46	928.95	931.14	932.76	934.90	SP 1
6	1	90.403	0.00	2.13	0.00	0.00	1.58	0.0	6.6	7.7	12.22	18.43	3.89	24	0.66	918.63	919.23	920.99	921.23	930.89	930.55	SP 5
7	6	40.022	0.07	0.07	0.90	0.06	0.06	5.0	5.0	8.5	0.53	6.46	2.86	15	1.00	924.78	925.18	925.02	925.46	930.55	929.63	SP 6
8	6	124.208	0.00	0.67	0.00	0.00	0.60	0.0	6.1	7.9	4.79	5.56	3.95	15	0.74	919.98	920.90	921.45	922.08	930.55	929.01	SP 7
9	8	48.911	0.14	0.14	0.90	0.13	0.13	5.0	5.0	8.5	1.07	6.46	2.50	15	1.00	921.73	922.22	922.31	922.63	929.01	926.47	SP 19
10	8	119.120	0.23	0.53	0.90	0.21	0.48	5.0	5.5	8.2	3.93	4.58	3.31	15	0.50	921.00	921.60	922.31	922.70	929.01	928.07	SP 21
11	10	56.910	0.30	0.30	0.90	0.27	0.27	5.0	5.0	8.5	2.29	4.53	2.12	15	0.49	921.70	921.98	922.87	922.92	928.07	926.43	SP 9
12	6	155.681	1.39	1.39	0.66	0.92	0.92	5.0	5.0	8.5	7.79	11.64	6.57	15	3.25	919.98	925.04	921.45	926.14	930.55	929.64	SP 8
13	End	8.963	0.00	2.02	0.00	0.00	1.77	0.0	17.9	5.0	8.91	23.74	4.49	30	0.34	918.50	918.53	919.56	919.59	917.81	928.27	SP 14
14	13	23.894	0.00	0.29	0.00	0.00	0.25	0.0	17.6	5.1	1.25	22.77	6.58	15	12.43	921.00	923.97	921.20	924.41	928.27	928.78	SP 18
15	14	95.838	0.00	0.08	0.00	0.00	0.06	0.0	13.8	5.7	0.35	9.89	2.09	15	2.35	924.15	926.40	924.41	926.63	928.78	931.50	SP 16
16	15	94.614	0.04	0.04	0.65	0.03	0.03	5.0	5.0	8.5	0.22	11.44	2.83	15	3.14	926.90	929.87	927.02	930.05	931.50	934.47	SP 10
17	15	56.352	0.04	0.04	0.90	0.04	0.04	5.0	5.0	8.5	0.31	11.38	3.10	15	3.11	926.50	928.25	926.64	928.46	931.50	932.85	SP 11
18	14	43.734	0.21	0.21	0.88	0.18	0.18	5.0	5.0	8.5	1.57	6.40	3.89	15	0.98	924.07	924.50	924.49	925.00	928.78	929.15	SP 13
19	13	22.665	0.40	0.40	0.89	0.36	0.36	5.0	5.0	8.5	3.02	14.55	6.82	15	5.07	923.24	924.39	923.63	925.09	928.27	928.89	SP 12
20	13	75.374	0.00	1.33	0.00	0.00	1.17	0.0	5.6	8.2	9.56	22.26	6.09	24	0.97	919.03	919.76	919.95	920.86	928.27	926.44	SP 15
21	20	122.062	1.33	1.33	0.88	1.17	1.17	5.0	5.0	8.5	9.94	11.58	4.14	24	0.26	919.86	920.18	921.29	921.61	926.44	923.68	SP 20
22	End	99.694	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.71	14.27	8.64	18	1.85	915.66	917.50	916.84	918.87	917.41	925.88	SP 23

Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm | Number of lines: 23 | Run Date: 3/9/2023

NOTES:Intensity = 39.09 / (Inlet time + 5.40) ^ 0.65; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	5.447	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.71	0.00	2.79	30	0.00	918.50	918.50	921.00	921.01	925.88	921.76	SP 22

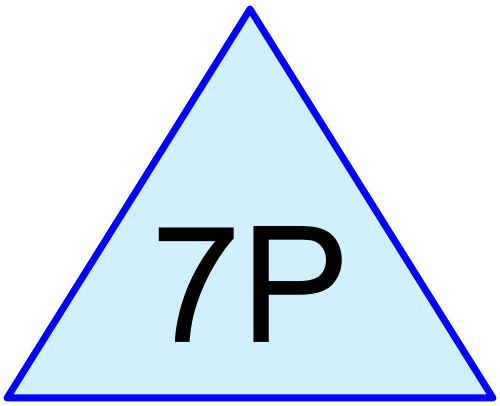
Project File: 230222 - 22-1050 - Benderson - Wilkins Township - Storm Pipes.stm

Number of lines: 23

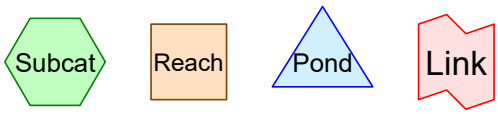
Run Date: 3/9/2023

NOTES:Intensity = 39.09 / (Inlet time + 5.40) ^ 0.65; Return period =Yrs. 100 ; c = cir e = ellip b = box

2-YR CHAMBER SYSTEM HYDROGRAPH



Underground ADS Tank



Routing Diagram for 230210 - 22-1050 HydroCAD SWM
Prepared by Red Swing Group, Printed 2/22/2023
HydroCAD® 10.10-7c s/n 08318 © 2022 HydroCAD Software Solutions LLC

Summary for Pond 7P: Underground ADS Tank

Inflow Area =	4.130 ac,	97.00% Impervious,	Inflow Depth =	2.16"	for 2-yr Wilkins event
Inflow =	13.66 cfs @	11.98 hrs,	Volume=	0.745 af	
Outflow =	5.52 cfs @	12.10 hrs,	Volume=	0.745 af,	Atten= 60%, Lag= 6.9 min
Discarded =	0.09 cfs @	6.63 hrs,	Volume=	0.292 af	
Primary =	5.42 cfs @	12.10 hrs,	Volume=	0.453 af	

32,452 CF. Volume routed to BMP from LOD.

12,720 CF. Infiltration volume routed by BMP.

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 920.07' @ 12.10 hrs Surf.Area= 0.186 ac Storage= 0.321 af

Plug-Flow detention time= 283.0 min calculated for 0.745 af (100% of inflow)
Center-of-Mass det. time= 283.1 min (1,053.3 - 770.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	917.50'	0.317 af	**101.17'W x 79.97'L x 7.00'H Field A** 1.300 af Overall - 0.508 af Embedded = 0.792 af x 40.0% Voids
#2A	918.50'	0.508 af	**ADS_StormTech MC-7200 +Cap**x 121 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 121 Chambers in 11 Rows Cap Storage= 39.5 cf x 2 x 11 rows = 869.0 cf
		0.825 af	Total Available Storage

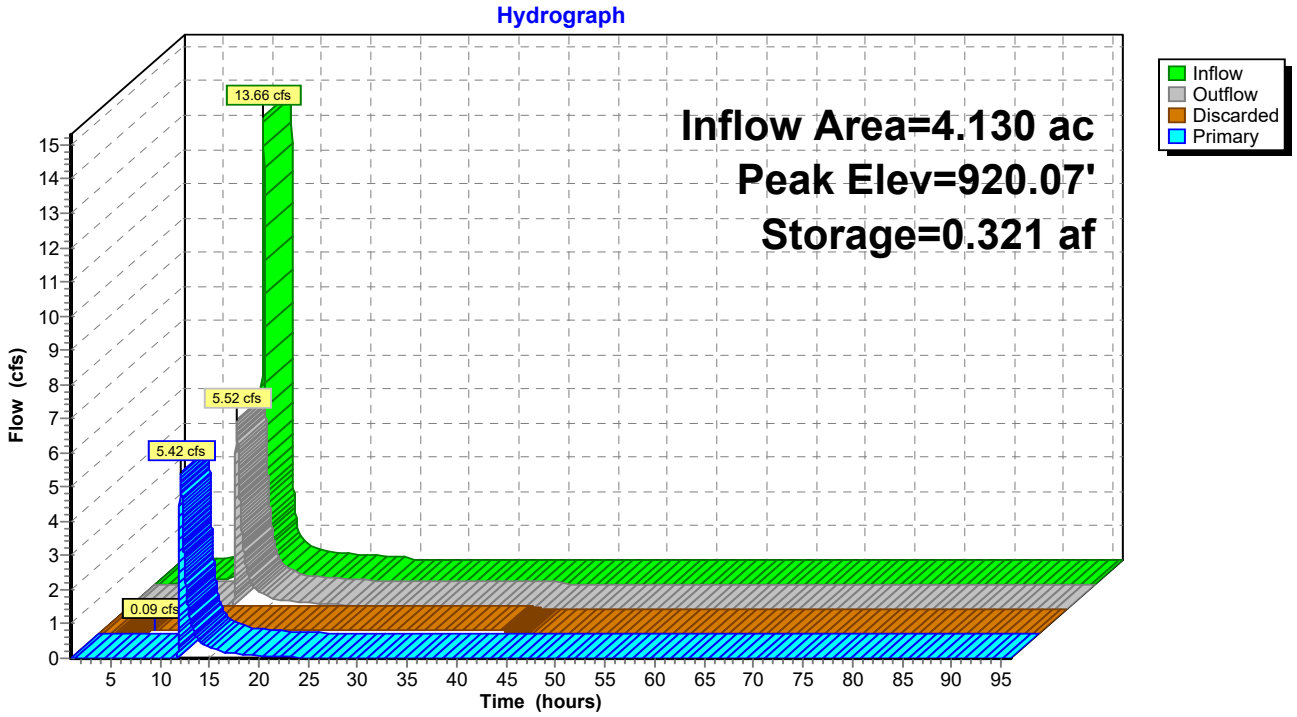
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	917.50'	**0.500 in/hr Exfiltration over Surface area**
#2	Device 4	918.90'	**17.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	923.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	917.50'	**18.0" Round Culvert** L= 99.7' Ke= 0.500 Inlet / Outlet Invert= 917.50' / 915.66' S= 0.0185 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.09 cfs @ 6.63 hrs HW=917.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=5.42 cfs @ 12.10 hrs HW=920.07' (Free Discharge)
└─**4=Culvert** (Passes 5.42 cfs of 11.47 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 5.42 cfs @ 3.83 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Underground ADS Tank



Hydrograph for Pond 7P: Underground ADS Tank

Period of Infiltration

End of Infiltration

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
1.00	0.00	0.000	917.50	0.00	0.00	0.00
3.00	0.02	0.000	917.50	0.01	0.01	0.00
5.00	0.07	0.003	917.54	0.05	**0.05**	0.00
7.00	0.12	0.006	917.58	0.09	**0.09**	0.00
9.00	0.24	0.018	917.74	0.09	0.09	0.00
11.00	**0.60**	**0.060**	**918.31**	**0.09**	0.09	**0.00**
13.00	**0.68**	**0.205**	**919.32**	**1.34**	0.09	**1.24**
15.00	0.32	0.165	919.06	0.40	0.09	0.31
17.00	0.21	0.155	919.00	0.25	0.09	0.15
19.00	0.16	0.150	918.97	0.19	0.09	0.09
21.00	0.13	0.146	918.95	0.15	0.09	0.05
23.00	0.12	0.144	918.93	0.13	0.09	0.03
25.00	0.00	0.136	918.88	0.09	0.09	0.00
27.00	0.00	0.120	918.79	0.09	0.09	0.00
29.00	0.00	0.105	918.69	0.09	0.09	0.00
31.00	0.00	0.089	918.59	0.09	0.09	0.00
33.00	0.00	0.074	918.50	0.09	0.09	0.00
35.00	0.00	0.058	918.29	0.09	0.09	0.00
37.00	0.00	0.043	918.08	0.09	0.09	0.00
39.00	0.00	0.028	917.87	0.09	0.09	0.00
41.00	0.00	0.012	917.66	0.09	0.09	0.00
43.00	0.00	0.001	917.51	0.02	0.02	0.00
45.00	0.00	0.000	917.50	0.00	0.00	0.00
47.00	0.00	0.000	917.50	0.00	0.00	0.00
49.00	0.00	0.000	917.50	0.00	0.00	0.00
51.00	0.00	0.000	917.50	0.00	0.00	0.00
53.00	0.00	0.000	917.50	0.00	0.00	0.00
55.00	0.00	0.000	917.50	0.00	0.00	0.00
57.00	0.00	0.000	917.50	0.00	0.00	0.00
59.00	0.00	0.000	917.50	0.00	0.00	0.00
61.00	0.00	0.000	917.50	0.00	0.00	0.00
63.00	0.00	0.000	917.50	0.00	0.00	0.00
65.00	0.00	0.000	917.50	0.00	0.00	0.00
67.00	0.00	0.000	917.50	0.00	0.00	0.00
69.00	0.00	0.000	917.50	0.00	0.00	0.00
71.00	0.00	0.000	917.50	0.00	0.00	0.00
73.00	0.00	0.000	917.50	0.00	0.00	0.00
75.00	0.00	0.000	917.50	0.00	0.00	0.00
77.00	0.00	0.000	917.50	0.00	0.00	0.00
79.00	0.00	0.000	917.50	0.00	0.00	0.00
81.00	0.00	0.000	917.50	0.00	0.00	0.00
83.00	0.00	0.000	917.50	0.00	0.00	0.00
85.00	0.00	0.000	917.50	0.00	0.00	0.00
87.00	0.00	0.000	917.50	0.00	0.00	0.00
89.00	0.00	0.000	917.50	0.00	0.00	0.00
91.00	0.00	0.000	917.50	0.00	0.00	0.00
93.00	0.00	0.000	917.50	0.00	0.00	0.00
95.00	0.00	0.000	917.50	0.00	0.00	0.00

Stage-Area-Storage for Pond 7P: Underground ADS Tank

Elevation (feet)	Surface (acres)	Storage (acre-feet)
917.50	**0.186**	0.000
917.60	0.186	0.007
917.70	0.186	0.015
917.80	0.186	0.022
917.90	0.186	0.030
918.00	0.186	0.037
918.10	0.186	0.045
918.20	0.186	0.052
918.30	0.186	0.059
918.40	0.186	0.067
918.50	0.186	0.074
918.60	0.186	0.090
918.70	0.186	0.106
918.80	0.186	0.122
918.90	0.186	0.138
919.00	0.186	0.154
919.10	0.186	0.170
919.20	0.186	0.186
919.30	0.186	0.202
919.40	0.186	0.218
919.50	0.186	0.233
919.60	0.186	0.249
919.70	0.186	0.265
919.80	0.186	0.280
919.90	0.186	0.296
920.00	0.186	0.311
920.10	0.186	0.326
920.20	0.186	0.342
920.30	0.186	0.357
920.40	0.186	0.372
920.50	0.186	0.387
920.60	0.186	0.401
920.70	0.186	0.416
920.80	0.186	0.431
920.90	0.186	0.445
921.00	0.186	0.460
921.10	0.186	0.474
921.20	0.186	0.488
921.30	0.186	0.502
921.40	0.186	0.516
921.50	0.186	0.530
921.60	0.186	0.543
921.70	0.186	0.557
921.80	0.186	0.570
921.90	0.186	0.583
922.00	0.186	0.596
922.10	0.186	0.609
922.20	0.186	0.621
922.30	0.186	0.633
922.40	0.186	0.645
922.50	0.186	0.657
922.60	0.186	0.668
922.70	0.186	0.679
922.80	0.186	0.690
922.90	0.186	0.700
923.00	0.186	0.710
923.10	0.186	0.719
923.20	0.186	0.727
923.30	0.186	0.735
923.40	0.186	0.743
923.50	0.186	0.751
923.60	0.186	0.758
923.70	0.186	0.766
923.80	0.186	0.773
923.90	0.186	0.781
924.00	0.186	0.788
924.10	0.186	0.795
924.20	0.186	0.803
924.30	0.186	0.810
924.40	0.186	0.818
924.50	0.186	**0.825**

6,011 CF. Storage volume retained by the BMP below the lowest orifice.

ROOF LEADER CALCULATIONS

Roof Leader - Flow Calculations

Project:	Benderson Development - Commercial Retail		
Red Swing Project #:	22-1050		
Prepared By:	ICB	Checked By:	JOW
Date:	2/13/2023	Date:	2/14/2023

Culvert No.*	Runoff Coefficient**			Total Area (ACRES)	Weighted Runoff Coefficient
	Meadow D	Woods D	Impervious		
	0.40	0.20	0.87		
1	0.00	0.00	0.39	0.39	0.87
2	0.00	0.00	0.11	0.11	0.87

*Culvert number 1 flows from the proposed retail building. Culvert number 2 flows from the proposed fast food building.

** Runoff Coefficients obtained from PWSA Manual for Developers Version 5 - 2/2013 and PA DEP E&S Manual Published March 2012

Roof Leader - 25-yr Flow Calculations

Project: Benderson Development - Commercial Retail

Red swing Project #: 22-1050

Prepared By: ICB

Date: 2/13/2023

Checked By: JOW

Date: 2/14/2023

Culvert No.	Drainage Area (AC)	Temporary (T) or Permanent (P)	Storm Duration/Time of Concentration (min)	Design Storm	Intensity (in/hr)*	Runoff Coefficient	Flow, Q=CiA (cfs)	Slope (%)	Pipe Size (in)	Full Pipe Capcity (cfs)**
1	0.39	P	6.0	25-year	6.77	0.87	2.32	2.0	10.0	3.14
2	0.11	P	6.0	25-year	6.77	0.87	0.65	6.9	6.0	1.48

*Storm event intensity derived from NOAA data.

**Calculation provided to calculate flow rate from surface. All collection/conveyance facilities shall be designed to convey the 25-year frequency strom peak flow rate.

Roof Leader - 100-yr Flow Calculations

Project: Benderson Development - Commercial Retail

Red swing Project #: 22-1050

Prepared By: ICB

Date: 2/13/2023

Checked By: JOW

Date: 2/14/2023

Culvert No.	Drainage Area (AC)	Temporary (T) or Permanent (P)	Storm Duration/Time of Concentration (min)	Design Storm	Intensity (in/hr)*	Runoff Coefficient	Flow, Q=CiA (cfs)	Slope (%)	Pipe Size (in)	Full Pipe Capcity (cfs)**
1	0.39	P	6.0	100-year	8.08	0.87	2.76	2.0	10.0	3.14
2	0.11	P	6.0	100-year	8.08	0.87	0.78	6.9	6.0	1.48

*Storm event intensity derived from NOAA data.

**Calculation provided to calculate flow rate from surface.

ANTI-SEEP COLLAR CALCULATIONS

BENDERSON DEVELOPMENT - COMMERCIAL RETAIL
PROJECT NUMBER 22-1050
ANTI-SEEP COLLAR CALCULATION
CHAMBER SYSTEM OUTLET PIPE

MADE BY:	ICB
DATE:	2/13/2023
CHECKED BY:	JOW
DATE:	2/14/2023

Length of Pipe:	99.69
Inlet Invert:	917.50
Outlet Invert:	915.66
Top of dewatering volume:	924.30
z (ft) :	2
Pipe diameter (in):	18
Number of collars to try:	2

From page 204 of the PADEP E&S Manual:

$$L_s = y\,(z+4)\left[1 + \frac{\text{pipe slope (ft/ft)}}{0.25 - \text{pipe slope}}\right]$$

Where:

y = Distance from upstream invert of principal spillway riser to top of dewatering volume

= 924.30 -917.50

= 6.8 ft

Check L>Ls:	Yes
Ls for calculation =	44
Side Dimension (S) =	5

z = Horizontal component of upstream embankment slope

= 2

p = Pipe slope

= 0.018 ft/ft

L_s= 6.80 ft (2 + 4) [1 + 0.018 / (0.25 - 0.018)]

= 44.0 ft

For a permanent basin, the increase in flow path is 15%

L_f= 44 ft x 1.15

= 50.6 ft

Minimum collar projection (V_{min}) = flow path increase/twice the number of collars

Using 2 collars:

V_{min} = (50.6 ft - 44 ft) / 2 (2)

= 1.65 ft

Check the min. and max. spacing for collars:

Min = 5 x 1.65 ft

= 8.2 ft

Max = 14 x 1.65 ft

= 23.1 ft

Space collars evenly along length of pipe in phreatic zone

Spacing = L_s /(No. of collars +1)

= 44 ft / (2 + 1)

= 15 ft

Use 2 - 5 ft by 5 ft collars, spaced at 15 ft starting at the pipe inlet

RIPRAP CALCULATIONS

TABLE 6.6
Riprap Gradation, Filter Blanket Requirements, Maximum Velocities

Percent Passing (Square Openings)						
Class, Size NO. / **Rock Size (Inches)**	**R-8**	**R-7**	**R-6**	**R-5**	**R-4**	**R-3**
42	100					
30		100				
24	15-50		100			
18		15-50		100		
15	0-15					
12		0-15	15-50		100	
9				15-50		
6			0-15		15-50	100
4				0-15		
3					0-15	15-50
2						0-15
Nominal Placement Thickness (inches)	63	45	36	27	18	9
Filter Stone[1]	AASHTO #1	AASHTO #1	AASHTO #1	AASHTO #3	AASHTO #3	AASHTO #57
V_{max} (ft/sec)	17.0	14.5	13.0	11.5	9.0	6.5

Adapted from PennDOT Pub. 408, Section 703.2(c), Table C

1 This is a general standard. Soil conditions at each site should be analyzed to determine actual filter size. A suitable woven or non-woven geotextile underlayment, used according to the manufacturer's recommendations, may be substituted for the filter stone for gradients < 10%.

TABLE 6.7
Comparison of Various Gradations of Coarse Aggregates

Total Percent Passing															
AASHTO NUMBER	**6 ½**	**4"**	**3 ½"**	**2 ½**	**2"**	**1 ½ "**	**1"**	**3/4 "**	**1/2"**	**3/8"**	**#4**	**#8**	**#16**	**#30**	**#100**
1		100	90-100	25-60		0-15		0-5							
3				100	90-100	35-70	0-15		0-5						
5						100	90-100	20-55	0-10	0-5					
57						100	90-100		25-60		0-10	0-5			
67							100	90-100		20-55	0-10	0-5			
7								100	90-100	40-70	0-15	0-5			
8									100	85-100	10-30	0-10	0-5		
10										100	75-100				10-30

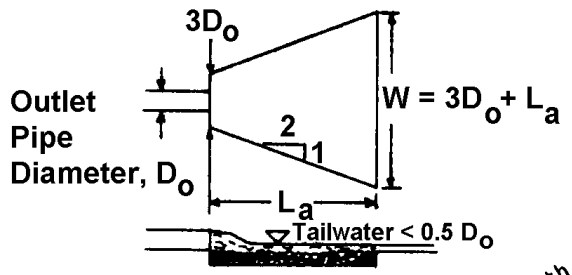
PennDOT Publication 408, Section 703.2(c), Table C

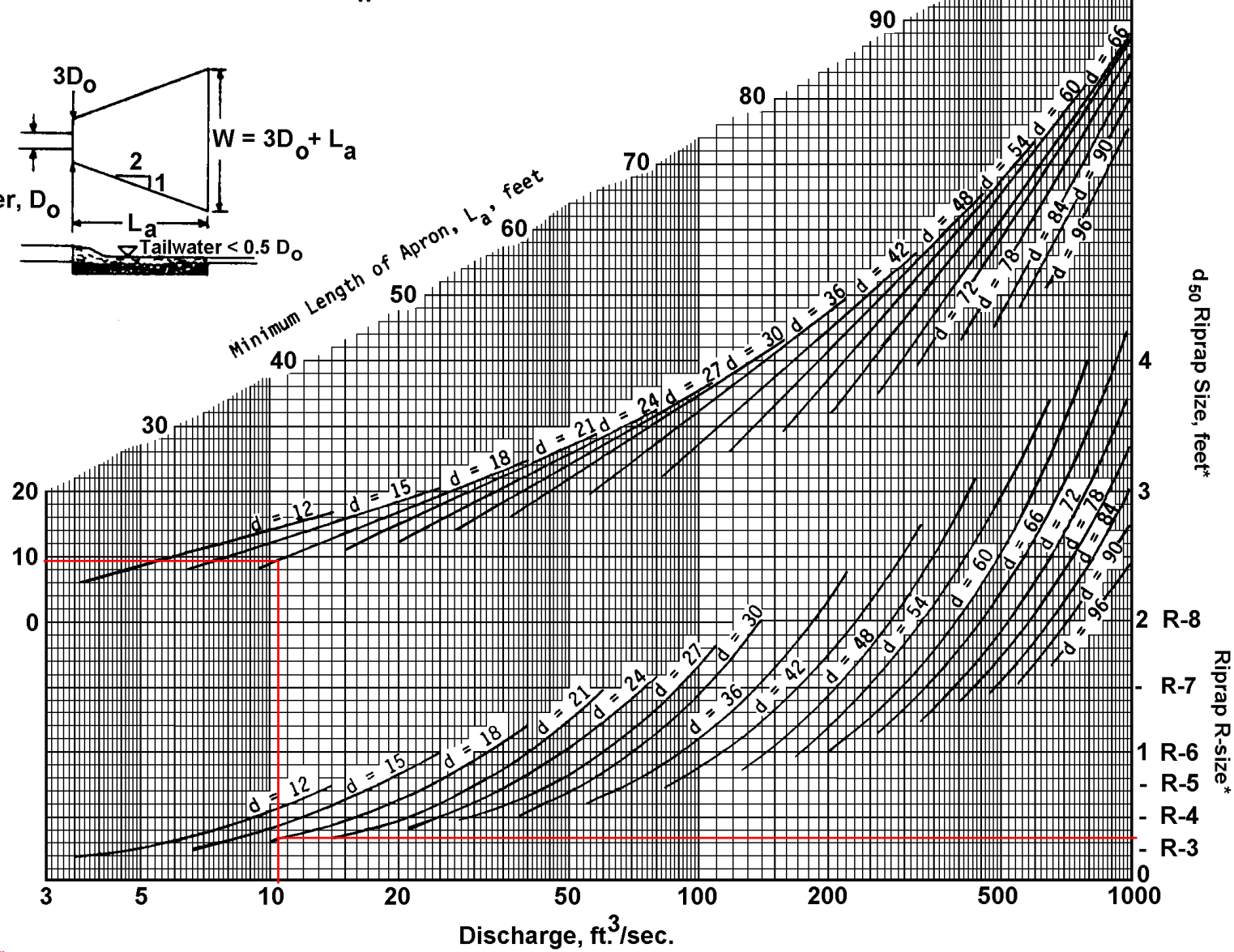
Tables 6.6 and 6.7 should be placed on the plan drawings of all sites where riprap channel linings are proposed.

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

Adapted from USDA - NRCS

DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL MINIMUM TAILWATER CONDITION (T_W < 0.5 DIAMETER)





Not to be used for Box Culverts

NOTE: Do not extrapolate

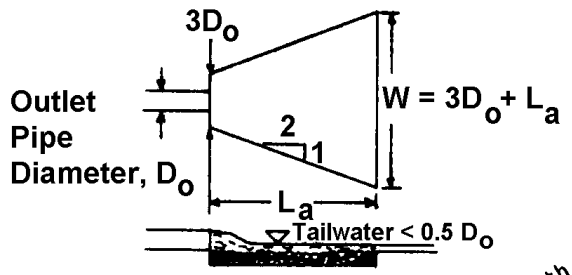
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

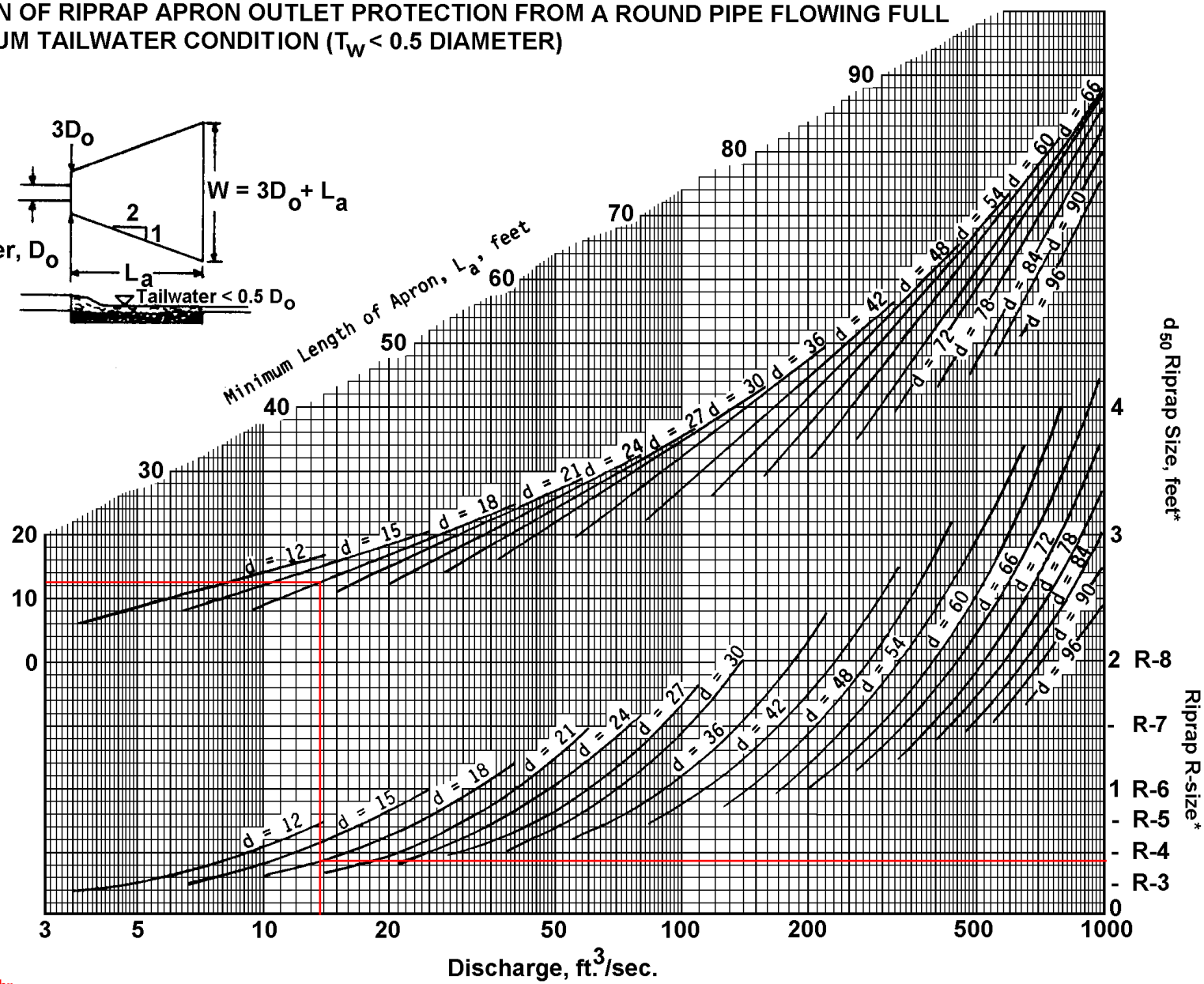
Riprap Apron Discharge Point 001 25yr/24hr
Q = 10.69 cfs Vel = 8.86 fps
Pipe Dia. => D_o = 18 in.
$3D_o$ = 5ft, L_a = 10ft, W = 15ft
USE Min R-4 Riprap V_{max}=9.0 fps

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

Adapted from USDA - NRCS

DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL MINIMUM TAILWATER CONDITION (T_W < 0.5 DIAMETER)





Not to be used for Box Culverts

NOTE: Do not extrapolate

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Riprap Apron Discharge Point 001 100yr/24hr
Q = 13.71 cfs Vel = 9.19 fps
Pipe Dia. => D_o = 18 in.
$3D_o$ = 5ft, L_a = 13ft, W = 18ft
USE Min R-5 Riprap V_{max}=11.5 fps

APPENDIX F

ARTUSO CONSTRUCTION ENGINEERING CONSULTANTS, INC. INFILTRATION TESTING REPORT, DATED FEBRUARY 9, 2023

ARTUSO
CONSTRUCTION
ENGINEERING
CONSULTANTS

February 9, 2023
CEC 175 326
J-17068

Mr. David Zuppelli
Benderson Development
570 Delaware Avenue
Buffalo, NY 14202

RE: Infiltration Test Results – 3475 William Penn Highway
Wilkins Township, Allegheny County, PA

Dear Mr. Zuppelli,

We have completed the soil testing for the planned infiltration locations at the proposed new commercial retail development at 3475 William Penn Highway in Wilkins Township, Pennsylvania. The infiltration testing was performed in five (5) test borings that were drilled to the planned infiltration depth. The test borings were designated as I-1 through I-5. Testing was performed according to the Pennsylvania Stormwater BMP Manual. A double ring infiltrometer was utilized for the testing. The infiltrometer was composed of a 4" and 6" pvc pipe that was seated at least 2" into the bottom of the boring. See the attached sketch for the test locations. Also attached is a copy of the test boring logs.

Test Boring Results

Five (5) test borings were drilled within each proposed infiltration location at the site. The five (5) borings were drilled in the existing asphalt or fill area where five (5) to six (6) inches of asphalt was encountered at I-3, I-4, and I-5. I-1 and I-2 were initiated on existing fill at the surface.

Underlying the surface materials across the site is a thin to moderately thick layer of fill soils. The fill soils are primarily composed of a brown to brownish gray silty clay with varying amounts of shale and sandstone fragments. Some asphalt and concrete fragments were also noted in portions of the fill. Sandstone boulders were encountered at a depth of eight and one-half (8.5) feet at I-1 and five and one-half (5.5) feet at I-2. The fill ranged in thickness from about two and one-half (2.5) feet to seven (7) at I-4 and I-5 to beyond the testing depth of between eight (8) and fifteen (15) feet at I-1 through I-3. The fill soils were mostly medium stiff to stiff. The fill soils were visually observed to be damp to moist for most of their depth. However, some isolated zones in the fill were wet.

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PITTSBURGH, PA 15218-2402
(412) 351-6465
CECTesting.com
EMAIL: lab@cectesting.com

Underlying the fill soils at borings I-4 and I-5 is an olive gray sandy shale bedrock. The shady shale produced split-spoon refusal at a depth of two and one-half (2.5) feet at I-4 and seven and one-half (7.5) feet at I-5. The bedrock is a limiting zone according to the PA Stormwater Manual.

Groundwater was encountered in I-5 during the drilling operations. At the completion of drilling the water accumulated to a depth of one (1) feet. The water encountered at I-5 is also a limiting zone according to the PA Stormwater Manual. Some water in the form of trapped water was also encountered within the fill soils at I-1. The trapped water was encountered at a more rocky portion of the fill around a sandstone boulders at a depth of eight (8) and twelve (12) feet.

Test Results and Conclusions

At test locations I-4 and I-5, a limiting zone of sandy shale bedrock was encountered prior to reaching the proposed infiltration depth of six (6) feet. At I-5 a limiting zone of groundwater was also encountered. No infiltration tests at these locations were performed due to the shallow bedrock and groundwater. The tests at I-1 through I-3 were completed at the proposed infiltration depths. All tests were performed in the sandy clay with sandstone fill layer. Tests were completed using a double ring infiltrometer composed of a four (4) inch inner PVC pipe and six (6) inch outer PVC pipe that were seated at least two (2) inches into the bottom of the boring. The pipes were filled with up to two (2) feet of water. Each location received a one (1) hour pre-soak, and the test interval was determined off the second half hour reading. All three (3) locations had pre-soak readings of less than two (2) inches. Therefore, all the test intervals were one-half hour. The following stabilized infiltration rates were obtained at each location. See the attached infiltration inspection report for the field test results.

Test Location	Proposed Infiltration Depth (ft)	Depth of Infiltration Test (ft)	Stabilized Infiltration Rate
I-1	13.0	13.0	1.5
I-2	9.0	9.0	0.5
I-3	6.0	6.0	2.0
I-4*	6.0	No test	
I-5**	6.0	No test	

* Limiting zone of bedrock was encountered prior to the infiltration depth.
** Limiting zone of groundwater and bedrock was encountered prior to infiltration depth.

A factor of safety of between 2 and 10 should be utilized for the final design calculations. The rates given in the table are actual test results. A copy of the field test results are attached.

A web soil survey was also performed for the site from the USDA Natural Resources Conservation Services (NRCS). A portion of the soils at the site were rated as severely limited for the site. This appears to be mostly due to the hard bedrock or water movement. The remaining soils were determined to be Urban Land and could not be rated. The test boring results confirm the ratings. The survey results are also attached to the end of this report.

Please contact me if you have questions or concerns regarding this information.

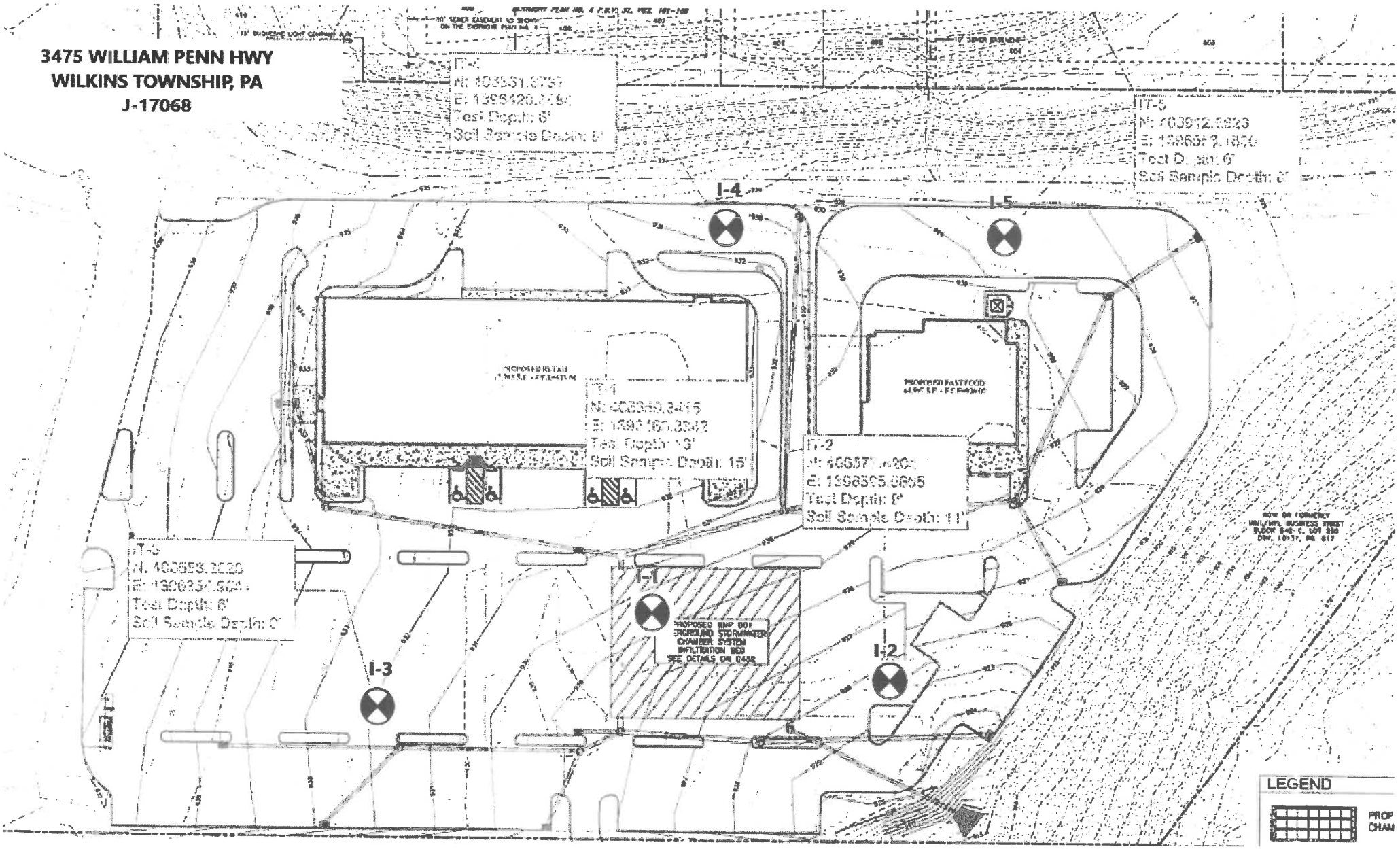
Sincerely,

Ralph Artuso, P.E.
President

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
RALPH JAMES ARTUSO
ENGINEER
038444-E

Attachments
RA//kmc
cc: File

3475 WILLIAM PENN HWY
WILKINS TOWNSHIP, PA
J-17068



CONSTRUCTION ENGINEERING CONSULTANTS, INC.
2018 Waverly Street
Pittsburgh, PA 15218
(412) 351-6465

TEST BORING LOG

BORING NO.: I-1

PROJECT: 3475 WILLIAM PENN HIGHWAY
LOCATION: WILKINS TOWNSHIP,PA
DATE STARTED: 2-2-23
DRILLER: TODD ZILKA
SURFACE ELEVATION:
WATER LEVELS:
AT COMPLETION: DRY
AT 24 HOURS: BACKFILLED

CLIENT: BENDERSON DEVELOPMENT
PROJECT NO.: J-17068
DATE COMPLETED: 2-2-23
LOGGED BY: ZMW
LOG TYPE: ENGINEER
SPOON SIZE: 2"O.D.
HLW. STEM AGR.: 6"O.D.
SHEET 1 OF 1

ELEVATION	DEPTH	LEGEND	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY (%)	SAMPLE NO.	SPOON BLOWS/6in.	THICKNESS OF SAMPLES	RQD, %	REMARKS
0.0'	0.0'			FILL: Light to brown silty clay with sandstone fragments, Medium stiff to stiff, damp to moist	100	S-1	7-6-9-14	0.0'-2.0'		
		2.5			85	S-2	9-8-6-6	2.0'-4.0'		
		5			100	S-3	4-5-3-16	4.0'-6.0'		
-7.0'	7.0'			FILL: Medium gray silty clay with sandstone and shale fragments, some sandstone boulders, stiff, damp to wet	100	S-4	14-9-7-12	6.0'-8.0'		
		7.5			100	S-5	9-50/0.3	8.0'-8.8'		Wet at 8.0' Sandstone boulder at 8.5'
		10								
-10.5'	10.5'			FILL: Dark gray to black sandy silt with slag, traces of clay, Dense, damp	100	S-6	9-26-33-37	10.0'-12.0'		
-12.0'	12.0'			FILL: Olive gray silty shale with some clay, stiff, wet to damp						Wet at 12.0'
		12.5			67	S-7	11-7-10	12.0'-13.5'		Infiltration test at 13.0'
					100	S-8	8-7-6	13.5'-15.0'		
-15.0'	15.0'	15								Bottom of boring at 15.0'

WET ZONES IN FILL APPEARS TO BE TRAPPED WATER WITHIN THE FILL.

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TEST BORING LOG

BORING NO.: I-2

PROJECT: 3475 WILLIAM PENN HIGHWAY
LOCATION: WILKINS TOWNSHIP,PA
DATE STARTED: 2-2-23
DRILLER: TODD ZILKA
SURFACE ELEVATION:
WATER LEVELS:
AT COMPLETION: DRY
AT 24 HOURS: BACKFILLED

CLIENT: BENDERSON DEVELOPMENT
PROJECT NO.: J-17068
DATE COMPLETED: 2-2-23
LOGGED BY: ZMW
LOG TYPE: ENGINEER
SPOON SIZE: 2"O.D.
HLW. STEM AGR.: 6"O.D.
SHEET 1 OF 1

ELEVATION	DEPTH	LEGEND	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY (%)	SAMPLE NO.	SPOON BLOWS/6in.	THICKNESS OF SAMPLES	RQD, %	REMARKS
0.0'	0.0'			FILL: Light to medium brown silty clay with shale and sandstone fragments, medium stiff to stif, damp to moist	85	S-1	2-5-6-7	0.0'-2.0'		
	2				100	S-2	3-4-7-5	2.0'-4.0'		
	4									
-5.0'	5.0'			FILL: Dark gray sandy silt with slag, asphalt, gravel and sanstone fragments, some boulders, Dense, damp	100	S-3	4-4-15-50/0.4	4.0'-5.9'		Sandstone boulder at 5.5'
	6				100	S-4	31-25-34	6.0'-7.5'		
	8				100	S-5	17-14-13	7.5'-9.0'		Infiltration test at 9.0'
-10.0'	10.0'			FILL: Reddish gray silty shale and sanstone with traces of clay, stiff, damp	100	S-6	12-10-17-16	9.0'-11.0'		
-11.0'	11.0'									Bottom of boring at 11.0'
	12									

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Pittsburgh, PA 15218
(412) 351-6465

TEST BORING LOG

BORING NO.: I-3

PROJECT: 3475 WILLIAM PENN HIGHWAY
CLIENT: BENDERSON DEVELOPMENT
LOCATION: WILKINS TOWNSHIP,PA
PROJECT NO.: J-17068
DATE STARTED: 2-2-23
DATE COMPLETED: 2-2-23
DRILLER: TODD ZILKA
LOGGED BY: ZMW
SURFACE ELEVATION:
LOG TYPE: ENGINEER
WATER LEVELS:
SPOON SIZE: 2"O.D.
AT COMPLETION: DRY
HLW. STEM AGR.: 6"O.D.
AT 24 HOURS: BACKIFLLED
SHEET 1 OF 1

ELEVATION	DEPTH	LEGEND	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY (%)	SAMPLE NO.	SPOON BLOWS/6in.	THICKNESS OF SAMPLES	RQD, %	REMARKS
0.0'	0.0'			PAVEMENT						
-0.4'	0.4'			FILL: Light to brown silty clay with shale and sandstone fragments, medium stiff to stiff, damp to moist						
		1.5			73	S-1	10-5-3	0.4'-1.9'		
		3			90	S-2	4-7-15-13	2.0'-4.0'		
		4.5			100	S-3	7-6-6-7	4.0'-6.0'		
		6								Infiltration test at 6.0'
		7.5			70	S-4	3-2-4-5	6.0'-8.0'		
-8.0'	8.0'									Bottom of boring at 8.0'
		9								

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Pittsburgh, PA 15218
(412) 351-6465

TEST BORING LOG

BORING NO.: I-4

PROJECT: 3475 WILLIAM PENN HIGHWAY
LOCATION: WILKINS TOWNSHIP,PA
DATE STARTED: 2-2-23
DRILLER: TODD ZILKA
SURFACE ELEVATION:
WATER LEVELS:
AT COMPLETION: DRY
AT 24 HOURS: BACKFILLED

CLIENT: BENDERSON DEVELOPMENT
PROJECT NO.: J-17068
DATE COMPLETED: 2-2-23
LOGGED BY: ZMW
LOG TYPE: ENGINEER
SPOON SIZE: 2"O.D.
HLW. STEM AGR.: 6"O.D.
SHEET 1 OF 1

ELEVATION	DEPTH	LEGEND	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY (%)	SAMPLE NO.	SPOON BLOWS/6in.	THICKNESS OF SAMPLES	RQD, %	REMARKS
0.0'	0.0'			PAVEMENT						
-0.5'	0.5'			FILL: Brown sandy clay with shale fragments, medium stiff, damp						
		1			100	S-1	6-6-4	0.5'-2.0'		
		2								
-2.5'	2.5'			SILTY SHALE: Olive gray, hard, dry	100	S-2	5-50/0.4	2.0'-2.9'		
-2.9'	2.9'	3								Bottom of boring at 2.9'
		4								
		5								
		6								

NO INFILTRATION TEST WAS PERFORMED DUE TO THE SHALLOW BEDROCK DEPTH.

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Pittsburgh, PA 15218
(412) 351-6465

TEST BORING LOG

BORING NO.: I-5

PROJECT: 3475 WILLIAM PENN HIGHWAY
CLIENT: BENDERSON DEVELOPMENT
LOCATION: WILKINS TOWNSHIP,PA
PROJECT NO.: J-17068
DATE STARTED: 2-2-23
DATE COMPLETED: 2-2-23
DRILLER: TODD ZILKA
LOGGED BY: ZMW
SURFACE ELEVATION:
LOG TYPE: ENGINEER
WATER LEVELS:
SPOON SIZE: 2"O.D.
AT COMPLETION: 1.0'
HLW. STEM AGR.: 6"O.D.
AT 24 HOURS: BACKFILLED
SHEET 1 OF 1

ELEVATION	DEPTH	LEGEND	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY (%)	SAMPLE NO.	SPOON BLOWS/6in.	THICKNESS OF SAMPLES	RQD, %	REMARKS
0.0'	0.0'			PAVEMENT						
-0.5'	0.5'			FILL: Brown silty clay with shale, asphalt, and sandstone fragments, Medium stiff to stiff, damp to wet						Water at 1.0'
		1.5			80	S-1	7-2-3	0.5'-2.0'		
		3			80	S-2	4-5-7-16	2.0'-4.0'		
		4.5			100	S-3	8-13-23-31	4.0'-6.0'		
		6								
-7.0'	7.0'			SILTY SHALE: Light brown to olive, Very stiff to hard, damp	100	S-4	22-15-30-50/4	6.0'-7.9'		
		7.5								
-7.9'	7.9'									Botttom of boring at 7.9'
		9								

NO INFILTRATION TEST WAS PERFORMED DUE TO THE SHALLOW GROUNDWATER AND BEDROCK ELEVATION.

CONSTRUCTION
ENGINEERING
CONSULTANTS, INC.

2018 WAVERLY STREET
PITTSBURGH, PA 15218
PHONE: (412)-351-6465
FAX: (412)-351-6401

INFILTRATION INSPECTION REPORT

CLIENT: Benderson Development	JOB NUMBER: J-17068
PROJECT: 3475 William Penn Highway	INSPECTOR: Z. Whisel
LOCATION: Wilkins Township, PA	DATE: 2-2-23
INSPECTION TYPE: Infiltration Test	

Interval Time	:30	:30	:30	:30				
TEST LOCATION	WATER LEVEL READING (in.)							INFILTRATION RATE (in/hr.)
I-1 @ 13.0' Pre-Soak: 3/4"	¾"	¾"	¾"	¾"				1.5
I-2 @ 9.0' Pre-Soak: 1/4"	¼"	¼"	¼"	¼"				0.5
I-3 @ 6.0' Pre-Soak: 1 ½"	1 ¼"	1 ¼"	1 ¼"	1 ¼"				2.0

Interval Time								
TEST LOCATION	WATER LEVEL READING (in.)							INFILTRATION RATE (in/hr.)

I-1, I-2, I-3 tests were performed in the site fill. Tests at I-4 and I-5 could not be performed due to shallow bedrock at I-4 and shallow groundwater and bedrock at I-5.

Infiltration Systems, Deep—Allegheny County, Pennsylvania
(3475 WILLIAM PENN HIGHWAY)

Map Scale: 1:979 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Severely limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Severely limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Severely limited

Somewhat limited

Not limited

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Allegheny County, Pennsylvania
Survey Area Data: Version 18, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2021—Nov 16, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Infiltration Systems, Deep

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
GQF	Gilpin-Upshur complex, very steep	Severely limited	Gilpin (45%)	Hard bedrock (1.00)	1.2	43.1%
				Slope (1.00)		
				Adsorptive capacity (0.25)		
				Vegetation establishment (0.07)		
			Upshur (35%)	Water movement (1.00)		
				Slope (1.00)		
				Vegetation establishment (0.50)		
				Soft bedrock (0.47)		
				Adsorptive capacity (0.25)		
			Culleoka (4%)	Hard bedrock (1.00)		
				Slope (1.00)		
				Adsorptive capacity (0.25)		
				Vegetation establishment (0.05)		
			Weikert (4%)	Hard bedrock (1.00)		
				Slope (1.00)		
				Adsorptive capacity (0.25)		
				Vegetation establishment (0.14)		
			Guernsey (4%)	Water movement (1.00)		
				Wetness (1.00)		
				Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Collapse risk, onsite investigation needed (0.50)		
				Groundwater contamination (0.50)		
			Hazleton (4%)	Slope (1.00)		
				Hard bedrock (0.67)		
				Adsorptive capacity (0.25)		
				Vegetation establishment (0.11)		
			Wharton (4%)	Wetness (1.00)		
				Slope (1.00)		
				Water movement (1.00)		
				Vegetation establishment (0.16)		
				Adsorptive capacity (0.11)		
UCE	Urban land-Culleoka complex, steep	Not rated	Urban land (80%)		1.4	50.8%
UWB	Urban land-Wharton complex, gently sloping	Not rated	Urban land (75%)		0.2	6.1%
Totals for Area of Interest					**2.8**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Severely limited	1.2	43.1%
Null or Not Rated	1.6	56.9%
Totals for Area of Interest	**2.8**	**100.0%**

Description

Deep infiltration systems are stormwater management practices that are placed 3 to 5 feet in the ground, depending on the application. These systems include rain gardens, bioretention basins, and infiltration basins. They slow the movement of stormwater to surface waters and also filter a significant portion of pollutants from the stormwater. The fundamental function of these systems is to hold the runoff generated from the first 1 inch of rainfall during a 24-hour storm preceded by 48 hours of no measurable precipitation. There should be little or no ponding at the surface. The water should infiltrate into the surrounding soil in 24 to 48 hours. Only that part of the soil between depths of 24 and 80 inches is evaluated.

The ratings are based on the soil properties that affect infiltration of the stormwater, construction and maintenance of the system, and public safety and health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect the transmission of rainwater. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the water in downslope areas. Some slopes may become unstable and move upon addition of water.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the bottom of the system. In these soils the deep infiltration system may not adequately filter the stormwater, particularly if the adsorptive capacity of the soil below the system is low. As a result, the ground water may become contaminated. In areas underlain by limestone, solution channels and subsequent subsidence may damage adjacent infrastructure. Also, areas underlain by limestone may be subject to ground-water contamination.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified infiltration system. "Not limited" indicates that the soil has features that are very favorable for the specified system. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified system.

The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified system. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified system (1.00) and the point at which the soil feature is not a limitation (0.00).

The accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer lists the map unit components. These

components are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one indicated for the map unit. The percent composition of each component in a particular map unit is shown to help the user better understand the percentage of each map unit that has the rating indicated. Other components with different ratings may occur in each map unit. The complete ratings list for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

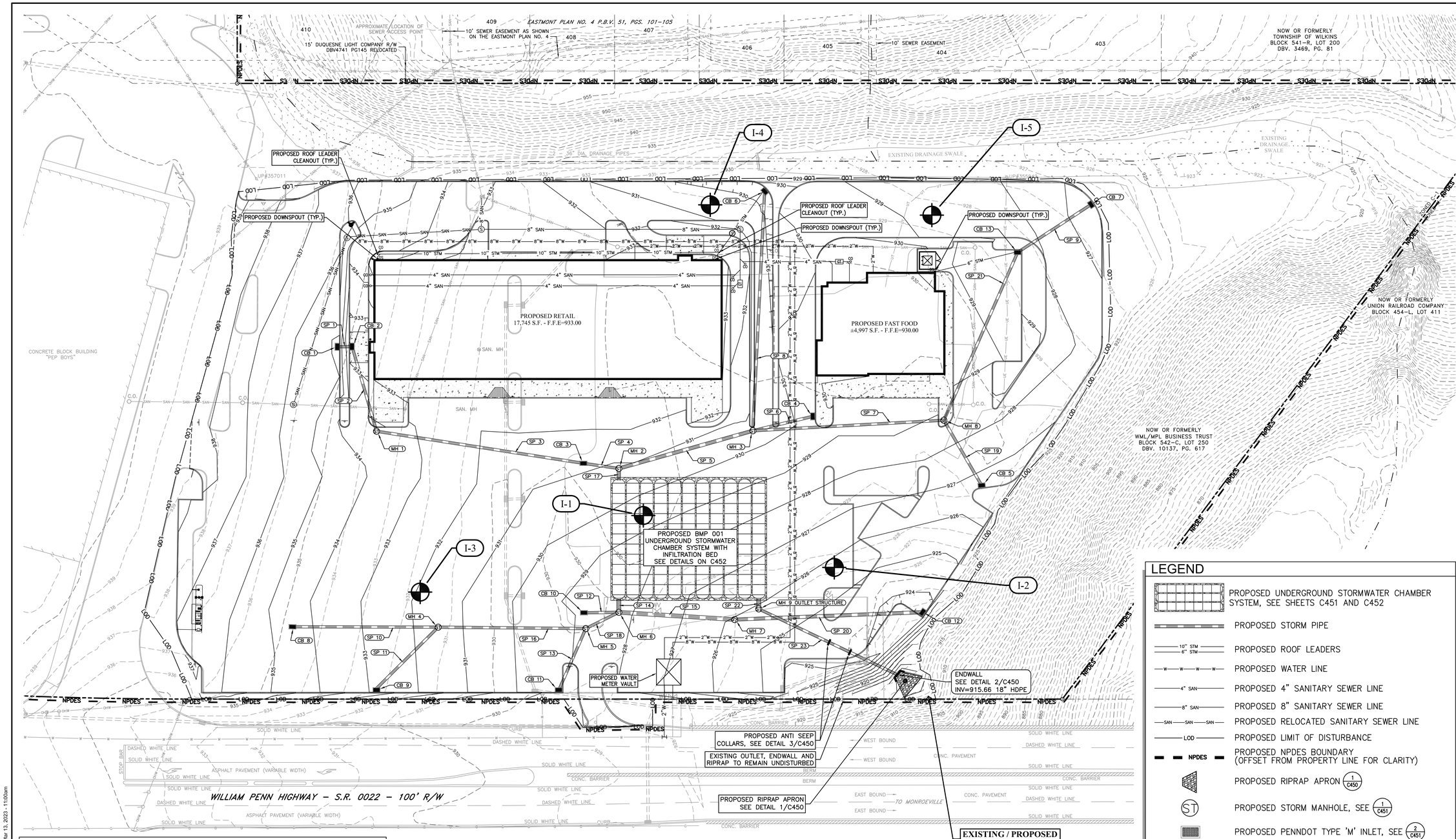
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX G

POST-CONSTRUCTION STORMWATER MANAGEMENT PLANS AND DETAILS



THE WILKINS TOWNSHIP MUNICIPAL ENGINEER, ON THIS DATE (DATE OF SIGNATURE), HAS REVIEWED AND HEREBY CERTIFIES THAT THE SWM SITE PLAN MEETS ALL DESIGN STANDARDS AND CRITERIA OF MUNICIPAL ORDINANCE NO. 1029

SIGNATURE: _____ DATE: _____

811 Know what's below. Call before you dig.

PA DESIGN ONE CALL SERIAL No. 20221591664
PERFORMED BY RED SWING GROUP JUNE 6th, 2022

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS NOTICE IN DESIGN STAGE.
STOP CALL
PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776

THIS PLAN DOES NOT GUARANTEE THE ACCURACY OF THE LOCATIONS OF THE EXISTING SUBSURFACE UTILITY STRUCTURES SHOWN HEREON, NOR DOES THIS PLAN GUARANTEE THAT ALL SUBSURFACE UTILITY STRUCTURES ARE SHOWN. THE LOCATION OF THE SUBSURFACE UTILITY STRUCTURES ARE PLOTTED APPROXIMATELY BASED ON MAPS PROVIDED BY THE UTILITY COMPANIES AND WERE NOT FIELD VERIFIED.

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

INFILTRATION TEST TABLE

I-1 INFILTRATION TEST LOCATION

DESCRIPTION	NORTHING	EASTING	DEPTH	DEPTH ELEV.
I-1	406659.34	1396468.33	13.0	919
I-2	406677.42	1396595.59	9.0	918
I-3	406556.28	1396354.96	6.0	926
* I-4	406861.87	1396428.35	NO TEST	
** I-5	406912.66	1396563.18	NO TEST	

*LIMITING ZONE OF BEDROCK WAS ENCOUNTERED PRIOR TO THE INFILTRATION DEPTH.

**LIMITING ZONE OF GROUNDWATER AND BEDROCK WAS ENCOUNTERED PRIOR TO INFILTRATION DEPTH.

MATERIAL RECYCLING AND DISPOSAL NOTES

1) THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE OR DISPOSE OF BUILDING MATERIALS AND CONSTRUCTION WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA CODE 260.1 ET SEQ., 271.1 ET SEQ. AND 287.1 ET SEQ. NO BUILDING MATERIALS, WASTES, OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED OR DISCHARGED AT THE SITE. THE FOLLOWING DEFINE WHAT SHOULD BE CONSIDERED 'CONSTRUCTION WASTE' AND 'CLEAN FILL':

A. CONSTRUCTION WASTE – INCLUDES BUT IS NOT LIMITED TO, EXCESS SOIL MATERIALS, BUILDING MATERIALS, CONCRETE WASH WATER, SANITARY WASTES, ETC. THAT COULD ADVERSELY IMPACT WATER QUALITY.

B. CLEAN FILL – UNCONTAMINATED, NON-WATER-SOLUBLE, NON-DECOMPOSABLE, INERT, SOLID MATERIAL. THIS INCLUDES SOIL, ROCK, STONE DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK, OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. IT DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE SURFACE WATERS UNLESS OTHERWISE AUTHORIZED, MILLED ASPHALT, OR ASPHALT THAT HAS BEEN PROCESSED FOR RE-USE.

2) PARTIES RESPONSIBLE FOR THE EXCAVATION OF SITE MATERIALS OR THE IMPORT OF FILL MATERIALS ARE RESPONSIBLE TO ENSURE THAT 'ENVIRONMENTAL DUE DILIGENCE' IN THE DETERMINATION OF CLEAN FILL MATERIAL IS EITHER REMOVED FROM THE SITE OR USED AS FILL FOR THE SITE. MATERIAL IDENTIFIED AS HAZARDOUS MUST BE DISPOSED IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL GUIDELINES AND REGULATIONS.

A. ENVIRONMENTAL DUE DILIGENCE – INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF OWNERSHIP AND USE HISTORY OF PROPERTY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS.

3) BEFORE DISPOSING OF SOIL OR RECEIVING BORROW FOR THE SITE, THE OPERATOR MUST ASSURE THAT EACH SPOIL OR BORROW AREA HAS AN ESCP APPROVED BY THE LOCAL CONSERVATION DISTRICT OF THE DEP, AND WHICH IS BEING IMPLEMENTED AND MAINTAINED ACCORDING TO CHAPTER 102 REGULATIONS. THE OPERATOR SHALL ALSO NOTIFY THE LOCAL CONSERVATION DISTRICT IN WRITING OF RECEIVING SPOIL AND BORROW AREAS WHEN THEY HAVE BEEN IDENTIFIED.

4) REMOVE DEMOLITION MATERIALS TO A SUITABLE DISPOSAL SITE IN A RESPONSIBLE MANNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF EXCESS MATERIAL OFF-SITE TO AN APPROVED FACILITY (AS PER NOTE 8, AND SEE NOTE 7 FOR THE DEFINITION OF CONSTRUCTION WASTES).

LEGEND

- PROPOSED UNDERGROUND STORMWATER CHAMBER SYSTEM, SEE SHEETS C451 AND C452
- PROPOSED STORM PIPE
- 10" STM / 6" STM — PROPOSED ROOF LEADERS
- W — PROPOSED WATER LINE
- 4" SAN — PROPOSED 4" SANITARY SEWER LINE
- 8" SAN — PROPOSED 8" SANITARY SEWER LINE
- SAN — PROPOSED RELOCATED SANITARY SEWER LINE
- LOD — PROPOSED LIMIT OF DISTURBANCE
- NPDES — PROPOSED NPDES BOUNDARY (OFFSET FROM PROPERTY LINE FOR CLARITY)
- PROPOSED RIPRAP APRON (1/C450)
- ST — PROPOSED STORM MANHOLE, SEE (1/C451)
- PROPOSED PENNDOT TYPE 'M' INLET, SEE (2/C451)
- PROPOSED CONCRETE ENDWALL, SEE (2/C450)
- 931 — EXISTING MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- 931 / 930 — PROPOSED MINOR (1 FT)/MAJOR (5 FT) CONTOURS
- EXISTING DRAINAGE SWALE
- EXISTING STORM PIPE
- X — EXISTING FENCE
- PROPERTY LINE
- ADJOINING PROPERTY LINE

NOTE: ALL PROPOSED INLETS SHALL HAVE TRASH GUARD INSERTS INSTALLED

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

ACKNOWLEDGEMENT OR "SIGN-OFF" BY PARTIES TO THE CONSTRUCTION DRAWINGS DOES NOT CONSTITUTE ALTERATION OF LEASE TERMS. THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CLIENT NAME IS STRICTLY PROHIBITED. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

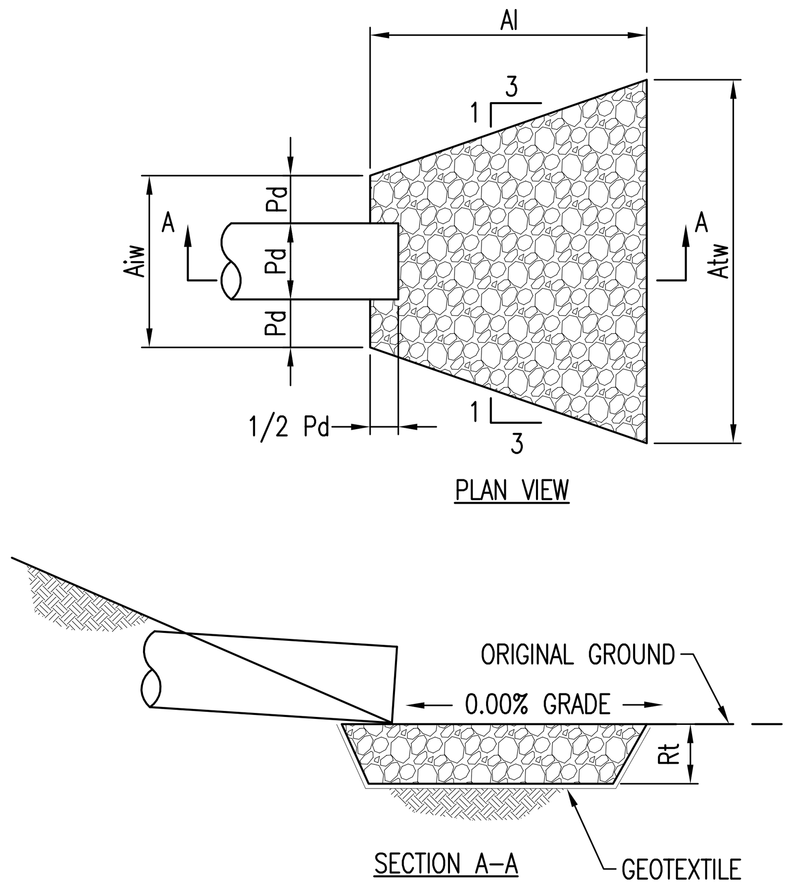
MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

SHEET NO.
C400

C:\Users\jwieland\AppData\Local\Temp\AcPublish_6824\22-1050 - Benderson - CD.dwg, Plotted: Mar 13, 2023 - 11:00am



DESCRIPTION	PIPE DIA Pd (IN)	RIPRAP APRON				
		SIZE R-_	THICK. Rt (IN)	LENGTH Al (FT)	INITIAL WIDTH Aiw (FT)	TERMINAL WIDTH Atw (FT)
DISCHARGE POINT 001	18	R-5	27	13	5	18

NOTES:

APRON SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTH SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNEL.

APRON SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIPRAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.

EXTEND RIPRAP ON BACK SIDE OF APRON TO AT LEAST 1/2 DEPTH OF PIPE ON BOTH SIDES TO PREVENT SCOUR AROUND THE PIPE.

STANDARD CONSTRUCTION DETAIL #9-2

RIPRAP APRON

NOT TO SCALE

1

CONSTRUCTION SQUENCE (BMPS ONLY)

UNDERGROUND STORMWATER CHAMBER SYSTEM CONSTRUCTION SEQUENCE:

1. INSTALL THE ENDWALL AND RIPRAP APRON AT THE PROPOSED DISCHARGE POINT FOR THE SITE AS SHOWN ON THE PLANS AND DETAILS.
2. COMMENCE CONSTRUCTION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM.

2A. THE PIPE AND AFORMENTIONED ENDWALL LEADING AWAY FROM THE CHAMBER SYSTEM OUTLET STRUCTURE SHALL BE INSTALLED ACCORDING TO THE PROJECT PLANS AND DETAILS.

2B. EXCAVATE TO THE BOTTOM OF THE SYSTEM SPECIFIED IN THE PROJECT PLANS AND DETAILS. COMPLETE THE FINAL CUT TO SUBGRADE IN THE EXCAVATION USING AN EXCAVATOR WITH A SMOOTH EDGED BUCKET TO AVOID DISTURBING THE SUBGRADE SOILS. REMOVE UNSUITABLE MATERIALS INCLUDING BUT NOT LIMITED TO OLD FOUNDATIONS, LARGE COBBLES/BOULDERS, CONSTRUCTION DEBRIS LEFT FROM DEMOLITION OF FORMER STRUCTURES, ORGANIC MATERIAL, ETC.

2C. PLACE PROPOSED GEOTEXTILE FABRIC IN BOTTOM OF EXCAVATION IN A MANNER THAT WILL ALLOW THE SIDES AND BOTTOM OF THE SYSTEM TO BE ENCAPSULATED ONCE CONSTRUCTED IN ACCORDANCE WITH PROJECT DETAILS TAKING CARE TO AVOID COMPACTION OF SUBGRADE SOILS.

2D. BACKFILL EXCAVATIONS WITH SPECIFIED DRAINAGE AGGREGATE TO THE ELEVATION OF THE INVERT OF THE UNDERGROUND CHAMBER SYSTEM, INLET PIPES, AND OUTLET PIPE. INSTALL CHAMBERS AND THE PIPES IN ACCORDANCE WITH PROJECT PLANS, DETAILS, AND MANUFACTURER'S INSTRUCTIONS. THE ENGINEER OR THEIR REPRESENTATIVE SHALL BE ALLOWED TO INSPECT THE OUTLET STRUCTURE AND OUTLET PIPE DURING THIS CRITICAL STAGE.

2E. INSTALL THE OUTLET STRUCTURE AS NECESSARY WHILE CONTINUING TO BACKFILL THE EXCAVATION. ENCAPSULATE THE CHAMBER SYSTEM SIDES AND BOTTOM IN THE SPECIFIED FABRIC PRIOR TO CONTINUING BACKFILLING.

IMPORTANT: THE INSTALLATION OF THE UNDERGROUND STORMWATER CHAMBER SYSTEM OUTLET STRUCTURE/PIPE IS A CRITICAL STAGE OF THE STORMWATER MANAGEMENT PLAN. THE CONTRACTOR SHALL CONTACT THE PROJECT ENGINEER ONE WEEK PRIOR TO EXPECTED OUTLET CONSTRUCTION SO THAT THE INSTALLATION CAN BE OBSERVED.

3. EXISTING ONSITE PAVEMENT SCHEDULED FOR DEMOLITION CAN BE REMOVED AND PROCESSED TO BE USED AS SITE FILL OR HAULED OFF SITE TO A PADEP APPROVED AND PERMITTED FACILITY.
4. COMMENCE INSTALLING SITE STORM PIPES AND STRUCTURES ENSURING NO WATER ENTERS THE STRUCTURES UNTIL AREAS TRIBUTARY TO THE STRUCTURES ARE STABILIZED. STORM PIPES AND STRUCTURES SHALL BE INSTALLED STARTING FROM THE DOWN GRADIENT END AND WORKING IN AN UP-GRADIENT MANNER. INSTALL FILTER INLET PROTECTION IN NEW INLETS AS THEY ARE INSTALLED. LIMIT DAILY TRENCH EXCAVATION AND STORM LINE INSTALLATION TO THE LENGTH OF PIPE PLACEMENT, BEDDING, AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING). TRENCH SPOILS SHALL BE USED UP-GRADIENT OF UTILITY TRENCH AS A TEMPORARY BERM TO DIVERT UPHILL RUNOFF FROM EXCAVATIONS.

IMPORTANT: STORMWATER RUNOFF IS NOT TO BE DIRECTED TO UNPROTECTED STORMWATER CONVEYANCE SYSTEMS UNTIL THE SITE IS AT FINAL GRADE AND STABILIZED.

UTILITY TRENCH CONSTRUCTION SEQUENCE:

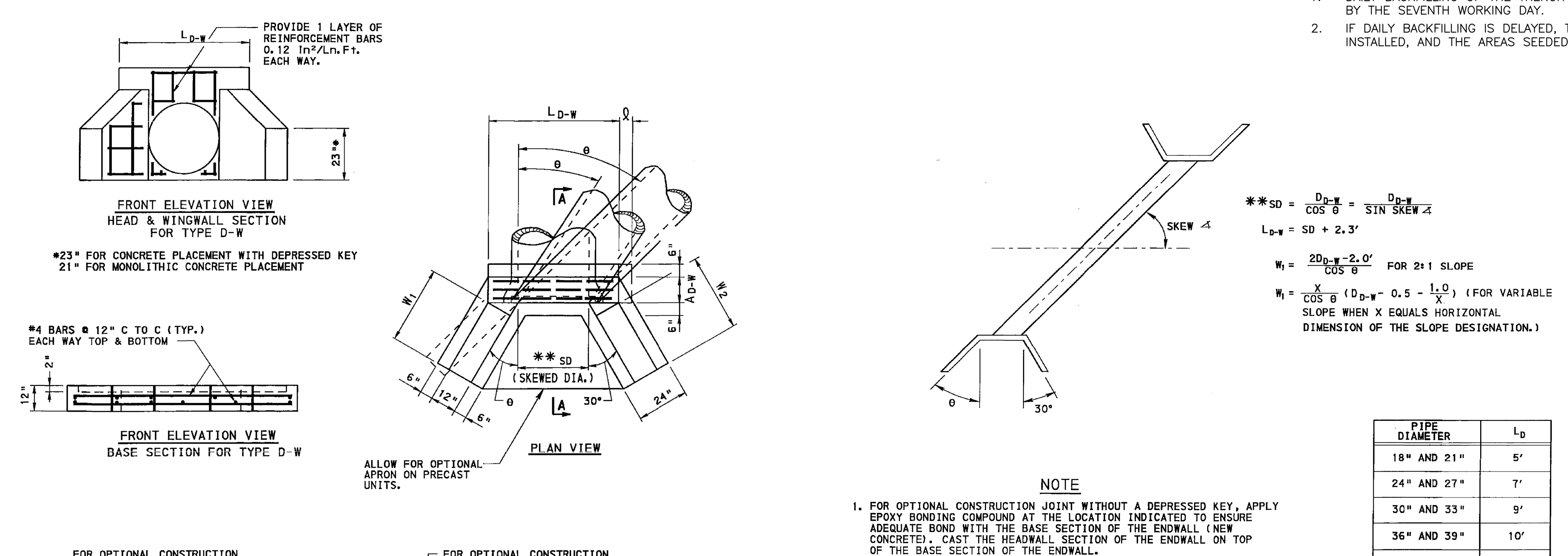
EXPOSED TRENCH EXCAVATIONS HAVE HIGH POTENTIAL FOR ACCELERATED EROSION AND SEDIMENT POLLUTION. SINCE THESE EXCAVATIONS ARE TYPICALLY LOCATED AT LOWER ELEVATIONS ALONG OR ACROSS EARTH DISTURBANCE SITES, OPEN TRENCHES SERVE TO CONCENTRATE SEDIMENT-LADEN RUNOFF AND CONVEY IT TO SITE BOUNDARIES OR WATERWAYS. AN EFFECTIVE MEASURE TO REDUCE EROSION AND SEDIMENTATION DURING UTILITY CONSTRUCTION IS TO LIMIT THE SPECIFIC SCHEDULE AND SCOPE OF WORK ACTIVITIES AS FOLLOWS DURING CONSTRUCTION:

1. LIMIT ADVANCE CLEARING AND GRUBBING OPERATIONS TO A DISTANCE OF TWO TIMES THE LENGTH OF PIPE INSTALLATION THAT CAN BE COMPLETED IN ONE DAY (WEATHER PERMITTING).
2. WORK CREWS AND EQUIPMENT FOR TRENCHING, PLACEMENT OF PIPE, PLUG CONSTRUCTION AND BACKFILLING WILL BE SELF-CONTAINED AND SEPARATE FROM CLEARING AND GRUBBING, SITE RESTORATION AND STABILIZATION OPERATIONS.
3. LIMIT DAILY TRENCH EXCAVATION TO THE LENGTH OF PIPE PLACEMENT, PLUG INSTALLATION AND BACKFILLING THAT CAN BE COMPLETED THE SAME DAY (WEATHER PERMITTING).
4. TRENCH PLUGS WILL BE SPACED AND CONSTRUCTED IN ACCORDANCE WITH THE TRENCH PLUG DETAIL ON THE PLAN SHEETS.
5. WATER THAT ACCUMULATES IN THE OPEN TRENCH WILL BE COMPLETELY REMOVED BY PUMPING WATER TO A CONTROL FACILITY OR FILTER BAG FOR THE REMOVAL OF SEDIMENT. WHEN THE FILTER BAG IS ½-FULL IT SHOULD BE REPLACED. ACCUMULATED SEDIMENT SHALL BE MIXED WITH SOIL AND PROPERLY DISPOSED OF ON THE SITE IF POSSIBLE OR DISPOSED OF AT AN OFFSITE AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF EXCESS MATERIAL OFF-SITE AT A DEP APPROVED FACILITY. OFFSITE DUMPING FACILITIES SHALL HAVE AN APPROVED EROSION & SEDIMENT CONTROL PLAN.
6. ON THE DAY FOLLOWING PIPE PLACEMENT AND TRENCH BACKFILLING, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, AND THE APPROPRIATE TEMPORARY EROSION CONTROL MEASURE OR FACILITY WILL BE INSTALLED. SEEDING AND MULCHING OF DISTURBED AREAS WILL BE PERFORMED AT THE END OF EACH WORK WEEK.

EXCEPTIONS:

IN CERTAIN SITUATIONS, TRENCHES CANNOT BE BACKFILLED UNTIL THE PIPE IS HYDROSTATICALLY TESTED, OR ANCHORS AND OTHER PERMANENT FEATURES ARE INSTALLED. IN THESE SITUATIONS, THE REQUIREMENTS LISTED ABOVE WILL REMAIN IN EFFECT WITH THE FOLLOWING EXCEPTIONS:

1. DAILY BACKFILLING OF THE TRENCH MAY BE DELAYED FOR SIX DAYS. PRESSURE TESTING AND THE COMPLETE BACKFILLING OF THE OPEN TRENCH MUST BE COMPLETED BY THE SEVENTH WORKING DAY.
2. IF DAILY BACKFILLING IS DELAYED, THE DISTURBED AREA WILL BE GRADED TO APPROXIMATE FINAL CONTOUR, APPROPRIATE TEMPORARY EROSION CONTROLS WILL BE INSTALLED, AND THE AREAS SEEDED AND MULCHED WITHIN THE NEXT TWO CALENDAR DAYS.



NOTE

1. FOR OPTIONAL CONSTRUCTION JOINT WITHOUT A DEPRESSED KEY, APPLY EPOXY BONDING COMPOUND AT THE LOCATION INDICATED TO ENSURE ADEQUATE BOND WITH THE BASE SECTION OF THE ENDWALL (NEW CONCRETE). CAST THE HEADWALL SECTION OF THE ENDWALL ON TOP OF THE BASE SECTION OF THE ENDWALL.

PIPE DIAMETER	L_0
18" AND 21"	5'
24" AND 27"	7'
30" AND 33"	9'
36" AND 39"	10'
42" AND 45"	11'
48" AND 51"	12'

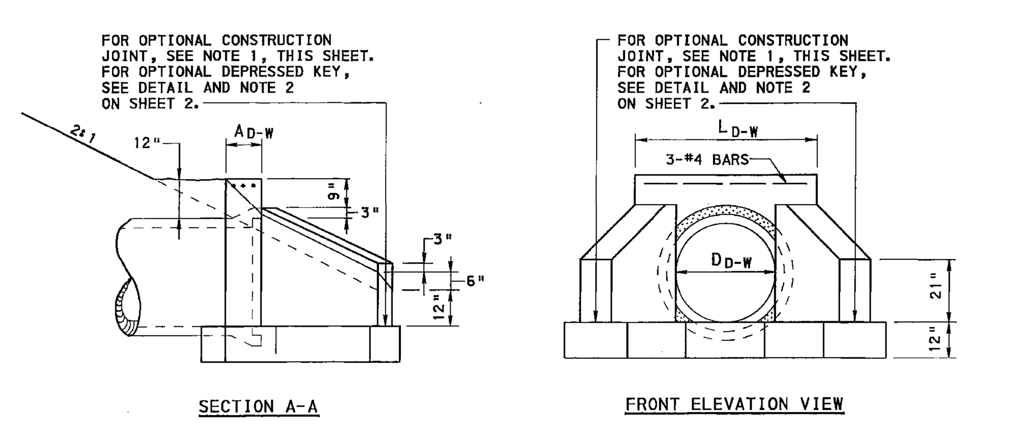


TABLE A

2 : 1 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW ∡ = 90° TO 60° θ = 30°			SKEW ∡ = 55° θ = 35°			SKEW ∡ = 50° θ = 40°			SKEW ∡ = 45° θ = 45°			SKEW ∡ = 40° θ = 50°			SKEW ∡ = 30° θ = 60°			SKEW ∡ = 20° θ = 70°			SKEW ∡ = 10° θ = 80°				
D_{D-W} (IN.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	L_{D-W} (FT.)	ℓ (FT.)	W_1 (FT.)	W_2 (FT.)	A_{D-W} (IN.)
36	5.8	0	4.6	6.0	0.33	4.9	6.2	0.5	5.2	6.5	0.67	5.7	7.0	0.75	6.2	8.3	1.33	8.0	11.1	1.75	11.7	19.6	5.0	23.0	4.6	12
42	6.9	0	5.8	6.6	0.33	6.1	6.9	0.5	6.5	7.3	0.67	7.1	7.8	0.75	7.8	9.3	1.33	10.0	12.5	1.75	14.6	22.5	5.0	28.8	5.8	12
48	6.9	0	6.9	7.2	0.33	7.3	7.5	0.5	7.8	8.0	0.67	8.5	8.5	0.75	9.4	10.3	1.33	12.0	14.0	1.75	17.5	25.3	5.0	34.6	6.9	12
54	7.5	0	8.0	7.8	0.33	8.5	8.2	0.5	9.1	8.7	0.67	9.9	9.3	0.75	10.9	11.3	1.33	14.0	15.5	1.75	20.5	28.2	5.0	40.3	8.0	12
60	8.1	0	9.2	8.4	0.33	9.8	8.8	0.5	10.4	9.4	0.67	11.3	10.1	0.75	12.5	12.3	1.33	16.0	16.9	1.75	23.4	31.1	5.0	46.0	9.2	15
72	9.2	0	11.5	9.6	0.33	12.2	10.1	0.5	13.0	10.8	0.67	14.1	11.7	0.75	15.6	14.3	1.33	20.0	19.8	1.75	29.2	36.9	5.0	57.6	11.5	15

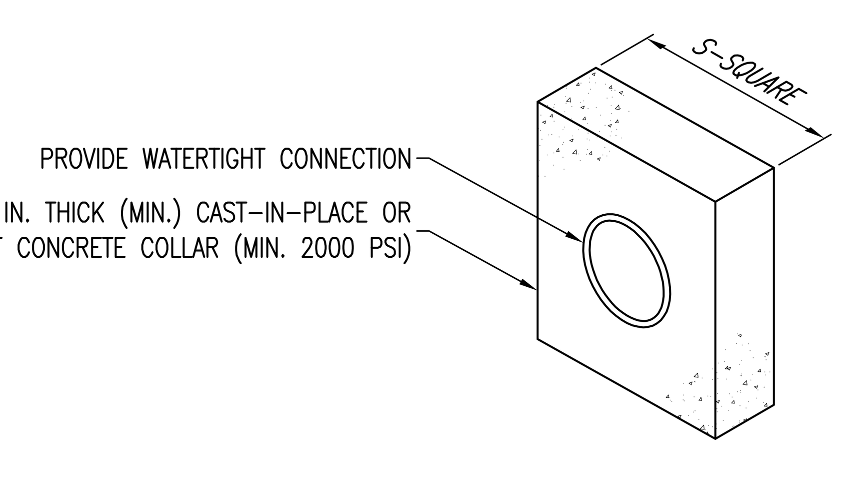
TYPE D-W ENDWALL

(SEE TABLE A FOR DIMENSIONS NOT INDICATED.)

CONCRETE PENNDOT TYPE D-W ENDWALL (PUBLICATION RC-31M)

NOT TO SCALE

2



OUTLET STRUCTURE	PIPE SIZE (IN)	S (FT)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
1	18	5	2	48	15

NOTES:

ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT.

COLLAR SIZE AND SPACING SHALL BE AS INDICATED WITHIN TABLE.

STANDARD CONSTRUCTION DETAIL #7-16

CONCRETE ANTI-SEEP COLLAR

NOT TO SCALE

3

PIPE TABLE				
NAME	SIZE	LENGTH	SLOPE	MATERIAL
SP 1	15"	10'	22.24%	HDPE
SP 2	15"	57'	1.70%	HDPE
SP 3	15"	136'	1.00%	HDPE
SP 4	15"	23'	1.02%	HDPE
SP 5	24"	90'	0.66%	HDPE
SP 6	15"	40'	1.00%	HDPE
SP 7	15"	124'	0.74%	HDPE
SP 8	15"	156'	3.25%	HDPE
SP 9	15"	57'	0.50%	HDPE
SP 10	15"	95'	3.14%	HDPE
SP 11	15"	56'	3.11%	HDPE
SP 12	15"	23'	5.08%	HDPE
SP 13	15"	44'	1.00%	HDPE
SP 14	30"	9'	0.30%	HDPE
SP 15	24"	75'	0.96%	HDPE
SP 16	15"	96'	2.35%	HDPE
SP 17	24"	8'	0.41%	HDPE
SP 18	15"	24'	12.43%	HDPE
SP 19	15"	49'	1.00%	HDPE
SP 20	24"	122'	0.26%	HDPE
SP 21	15"	119'	0.50%	HDPE
SP 22	30"	7'	0.00%	HDPE
SP 23	18"	100'	1.85%	HDPE

STRUCTURE TABLE				
STRUCTURE NAME	RIM ELEV.	ELEV. PIPES (IN)	ELEV. PIPES (OUT)	SUMP DEPTH
CB 1 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	934.90'		SP 1 – INV=930.46'	0.00'
CB 2 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	932.76'	SP 1 – INV=928.31'	SP 2 – INV=928.21'	0.00'
CB 3 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	931.23'	SP 3 – INV=925.78'	SP 4 – INV=925.68'	0.00'
CB 4 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.63'		SP 6 – INV=925.18'	0.00'
CB 5 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	926.47'		SP 19 – INV=922.22'	0.00'
CB 6 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.64'		SP 8 – INV=925.04'	0.00'
CB 7 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	926.43'		SP 9 – INV=921.98'	0.00'
CB 8 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	934.47'		SP 10 – INV=929.87'	0.00'
CB 9 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	932.85'		SP 11 – INV=928.25'	0.00'
CB 10 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	928.89'		SP 12 – INV=924.39'	0.00'
CB 11 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	929.15'		SP 13 – INV=924.50'	0.00'
CB 12 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	923.59'		SP 20 – INV=920.18'	0.00'
CB 13 PENNDOT TYPE 'M' INLET SEE DETAIL 2/C451	928.07'	SP 9 – INV=921.70'	SP 21 – INV=921.60'	0.00'
MH 1 48" MANHOLE SEE DETAIL 1/C451	933.65'	SP 2 – INV=927.24'	SP 3 – INV=927.14'	0.00'
MH 2 60" MANHOLE SEE DETAIL 1/C451	930.83'	SP 4 – INV=925.44' SP 5 – INV=918.63'	SP 17 – INV=918.53'	2.00'
MH 3 48" MANHOLE SEE DETAIL 1/C451	930.55'	SP 6 – INV=924.78' SP 8 – INV=919.98' SP 7 – INV=919.98'	SP 5 – INV=919.23'	0.00'
MH 4 48" MANHOLE SEE DETAIL 1/C451	931.50'	SP 10 – INV=926.90' SP 11 – INV=926.50'	SP 16 – INV=926.40'	0.00'
MH 5 48" MANHOLE SEE DETAIL 1/C451	928.77'	SP 13 – INV=924.07' SP 16 – INV=924.15'	SP 18 – INV=923.97'	0.00'
MH 6 60" MANHOLE SEE DETAIL 1/C451	928.26'	SP 18 – INV=921.00' SP 12 – INV=923.24' SP 15 – INV=919.03'	SP 14 – INV=918.53'	2.00'
MH 7 48" MANHOLE SEE DETAIL 1/C451	925.94'	SP 20 – INV=919.86'	SP 15 – INV=919.76'	0.00'
MH 8 48" MANHOLE SEE DETAIL 1/C451	929.01'	SP 21 – INV=921.00' SP 19 – INV=921.73'	SP 7 – INV=920.90'	0.00'
MH 9 OUTLET STRUCTURE 72" MANHOLE SEE DETAIL 1/C451	925.90'	SP 22 – INV=918.50'	SP 23 – INV=917.50'	0.00'

RED SWING GROUP ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705

3/13/2023

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BENDERSON DEVELOPMENT COMMERCIAL RETAIL

3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:

POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 1 OF 4

SHEET NO.

C450

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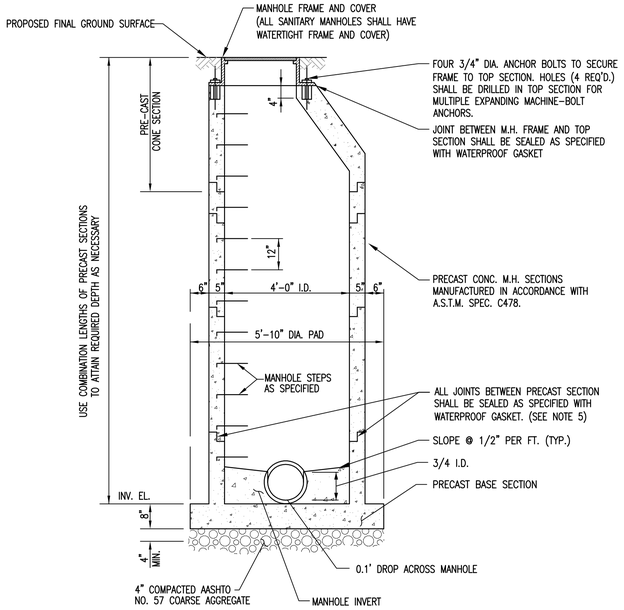
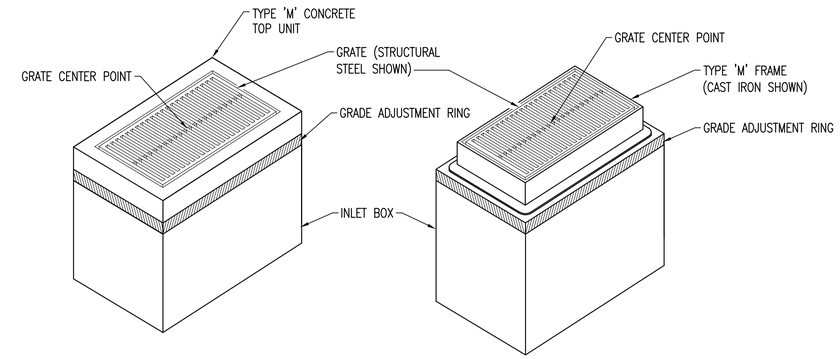


1. USE PRECAST CONCRETE GRADE ADJUSTMENT RINGS BETWEEN TOP SECTION AND FRAME TO RAISE MANHOLE TOP HEIGHT IF NECESSARY.
2. USE ANCHOR BOLTS AND WATERPROOF GASKET AS SPECIFIED.
3. EACH SECTION TO BE SUPPLIED WITH LIFTING HOLES WHICH ARE TO BE GROUTED WITH WATERPROOF GROUT.
4. SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.
5. MAXIMUM RISER HEIGHT SHALL BE LIMITED TO 1 FOOT.
6. JOINTS SHALL BE SEALED AT BOTH THE TOP AND BOTTOM LIPS OF THE JOINT.

MANHOLE DIAMETER BASED ON MAXIMUM PIPE SIZE			
MANHOLE DIAMETER	IF STRAIGHT THRU PIPE	IF 90° ANGLE PIPE	IF 180° ANGLE PIPE
48"	24"	18"	24"
60"	33"	27"	33"
72"	36"	33"	36"
84"	48"	36"	48"
96"	54"	42"	54"

STANDARD PRECAST MANHOLE (1)
NOT TO SCALE

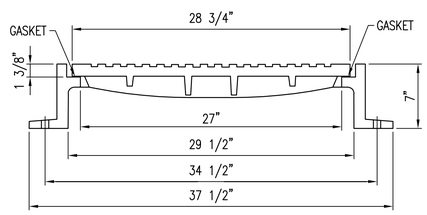


TYPE M INLET

NOTES:
1. CONSTRUCT IN ACCORDANCE WITH PADOT PUBLICATION 408, SECTIONS 605, 606 AND 714.
2. SUBMIT SHOP DRAWINGS FOR OWNER REVIEW.

PENNDOT TYPE 'M' INLET (RC-34M) (2)
NOT TO SCALE

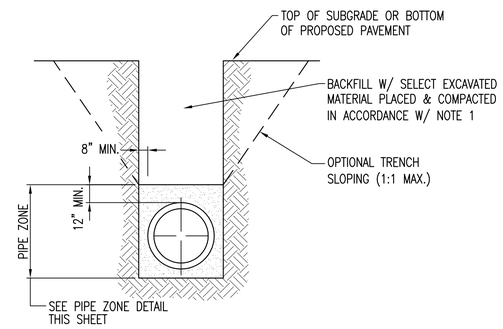
NOTE:
CONTRACTOR MAY SUBSTITUTE MANHOLE FRAME AND COVER BY OTHER MANUFACTURERS WHICH ARE ACCEPTABLE TO THE MUNICIPALITY AND ARE SIMILAR IN DIMENSIONS AND WEIGHT.



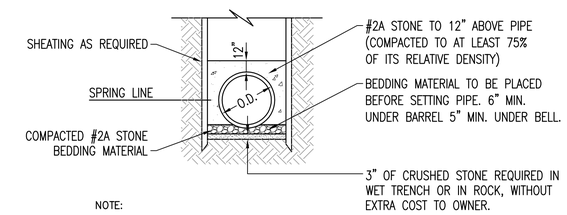
TYPE:
MANHOLE FRAME, SOLID LID DETAIL (NEENAH R-1753-A, EAST JORDAN IRON WORKS, EQUIVALENT) (SELF-SEALING)

*HEAVY DUTY
TOTAL WEIGHT 455 POUNDS
WITH 4-7/8" ANCHOR BOLT HOLES

MANHOLE LID (3)
NOT TO SCALE

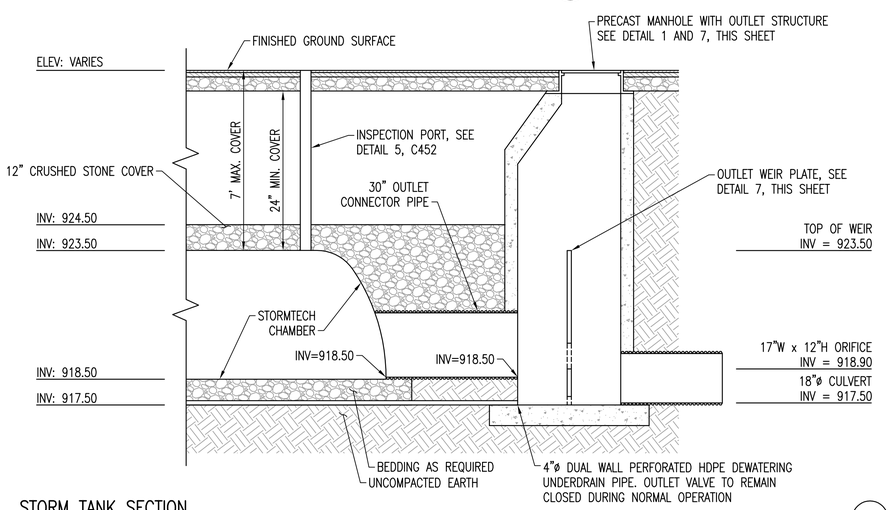


TRENCH SECTION FOR STORM PIPE (4)
NOT TO SCALE

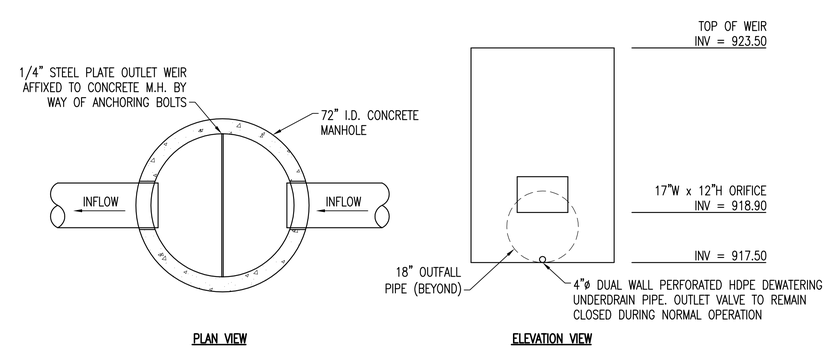


NOTE:
1) THE TRENCH WALL SHALL BE SUBSTANTIALLY VERTICAL IN THE PIPE ZONE. MAXIMUM TRENCH WIDTH SHALL BE OD + 24 INCHES AND MINIMUM TRENCH WIDTH SHALL BE OD + 16 INCHES.

PIPE ZONE FOR STORM PIPE (5)
NOT TO SCALE



STORM TANK SECTION (6)
NOT TO SCALE



NOTES:
WEIR PLATE AND MOUNTING HARDWARE SHALL BE GALVANIZED TO PREVENT CORROSION.

WEIR PLATE DETAIL (7)
NOT TO SCALE

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 OLD WILLIAM PENN HWY.
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C451

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IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

ADS Advanced Drainage Systems, Inc.

SiteASSIST® FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/IN/IN. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418 AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

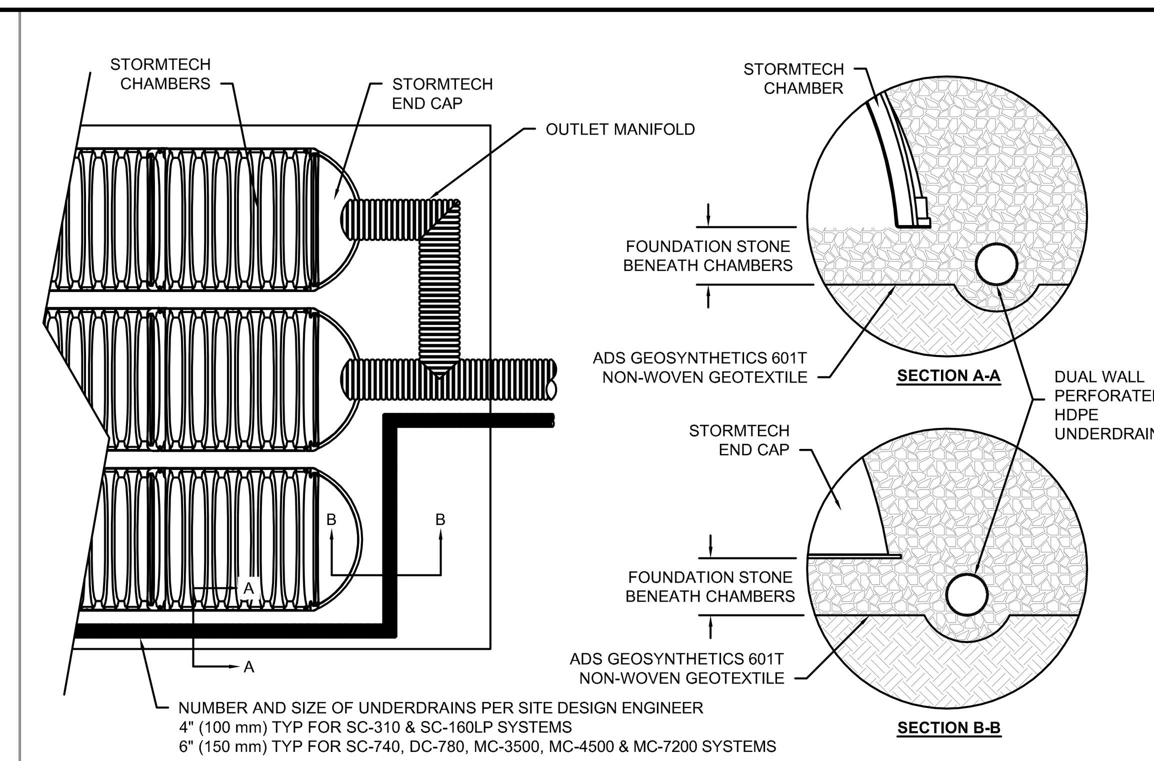
1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

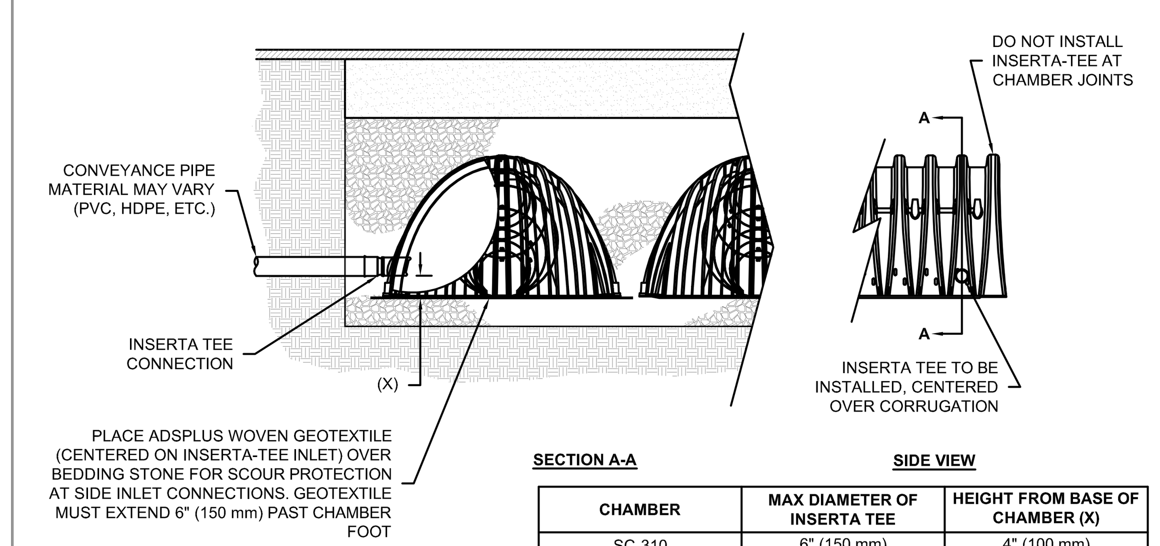
1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



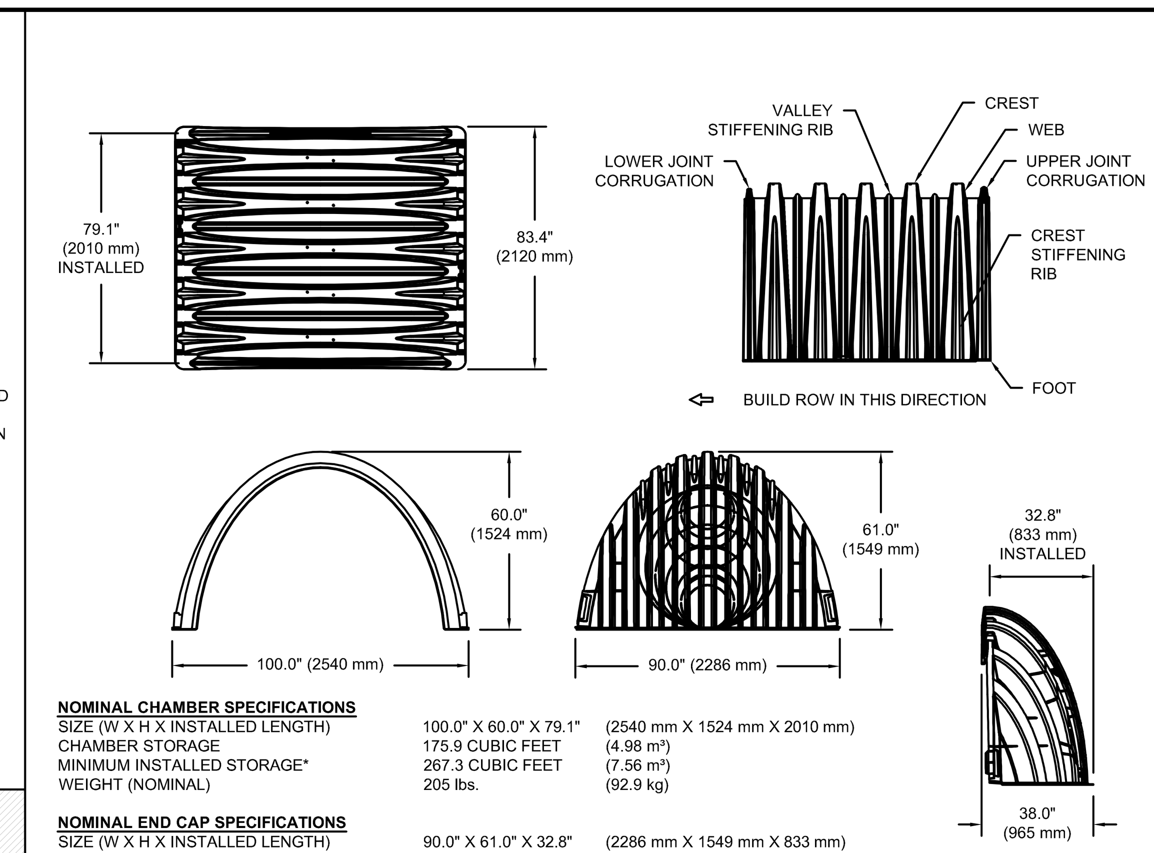
1 UNDERDRAIN DETAIL



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
MC-7200	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

2 INSERTA-TEE SIDE INLET DETAIL



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

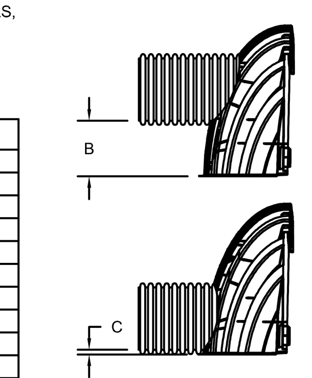
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

3 MC-7200 TECHNICAL SPECIFICATIONS

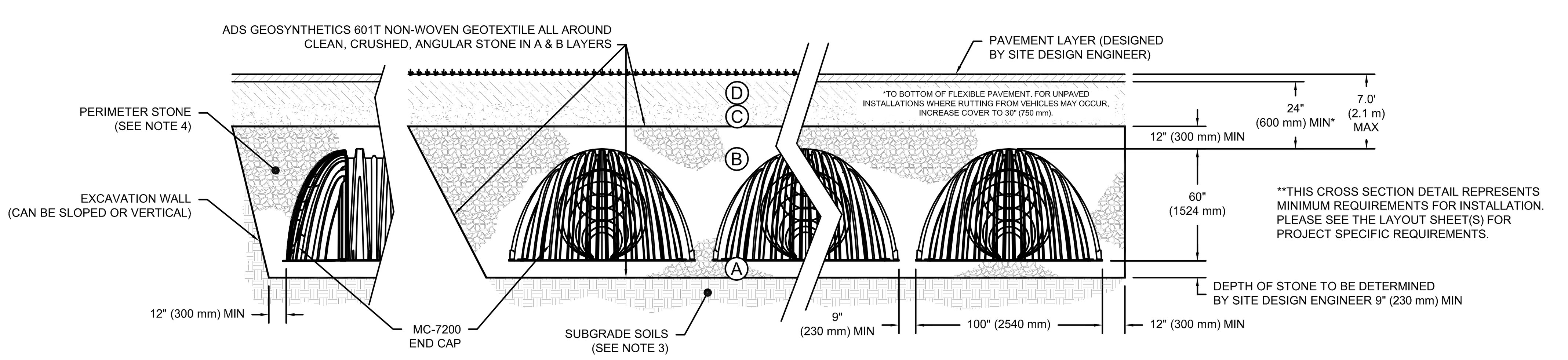
MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS	POTENTIAL REMEDIES (to be performed within 24hrs or as soon as practical)
Stormwater Chamber System	Quarterly within the 1st year of operation *(Annually Thereafter)*	Sediment level buildup	Remove and properly dispose of sediment as necessary per manufacturer's recommendations.
		Clogging of inlet/outlet structure	Clear inlet/outlet structures of debris.
		Excessive leaf litter	Clean and remove as necessary.
Vegetation	Once a week and after every runoff event	Sediment at toe of slope	Check for toe of slope diversion and install if needed.
		Rills and gullies forming	Fill rills and re-grade gullied slopes.
		Bare soil patches	Reseed, fertilize, and mulch bare areas.
Storm Sewers	After every runoff event	Sediment buildup reducing flow capacity	Remove accumulated sediment and/or debris.
		Flooding around or below inlet	Remove accumulated debris from inlet grate.

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



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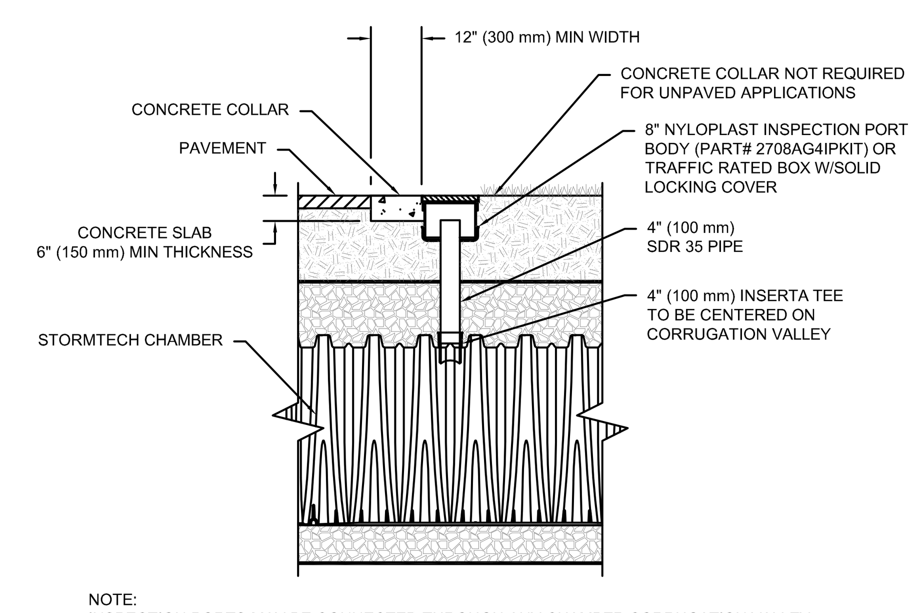
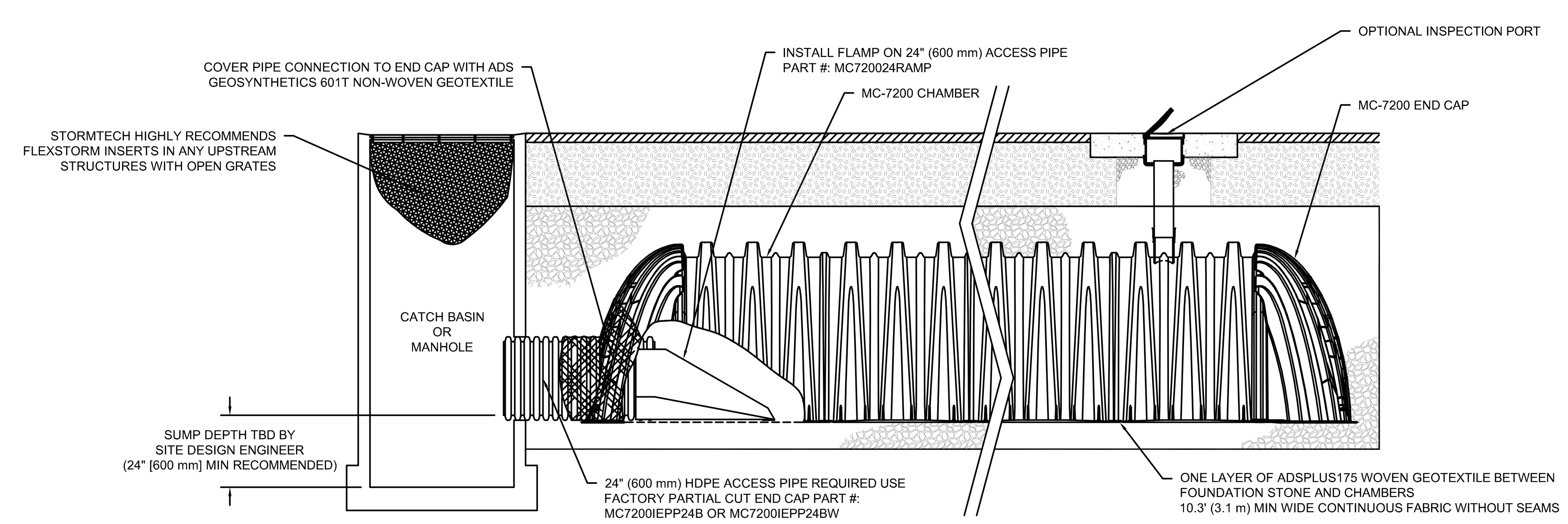
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

4 MC-7200 CROSS SECTION DETAIL



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

5 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)



MC-7200 ISOLATOR ROW PLUS DETAIL
NTS

RED SWING GROUP ENGINEERS & SURVEYORS
4314 OLD WILLIAM PENN HWY, SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JACOB WIELAND ENGINEER No. PE084705 3/13/2023

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BENDERSON DEVELOPMENT COMMERCIAL RETAIL
3475 WILLIAM PENN HIGHWAY
WILKINS TOWNSHIP, PENNSYLVANIA, 15235
ALLEGHENY COUNTY

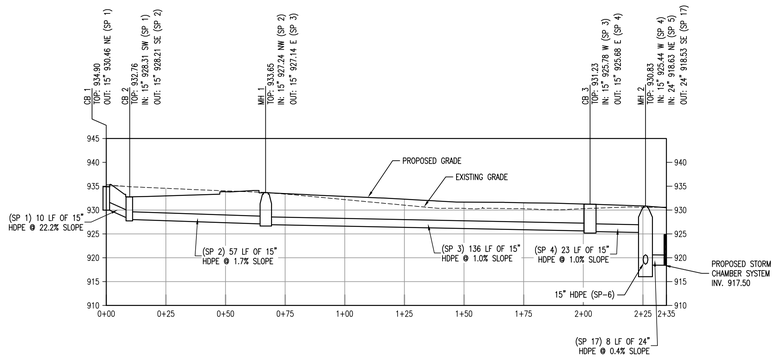
REVISIONS:

MARK	DATE	DESCRIPTION
0	3/13/2023	ORIGINAL SUBMITTAL TO TOWNSHIP

PROJ NO: 22-1029
SCALE: AS SHOWN
DATE: 03/13/2023
DESIGNED BY: ICB
DRAWN BY: JLG
CHECKED BY: JOW

SHEET TITLE:
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 3 OF 4

SHEET NO.
C452



PROFILE: CB1 – STORM TANK (1)
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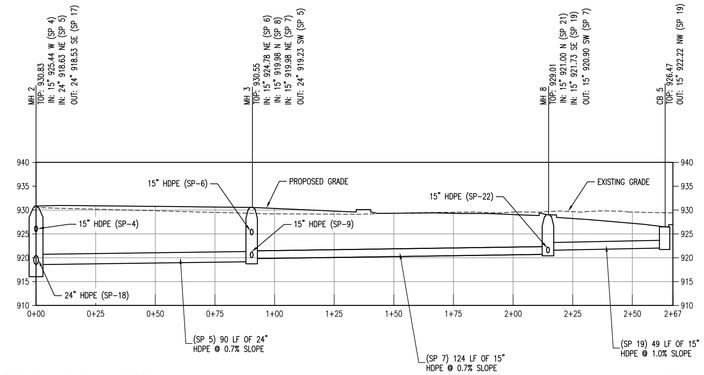

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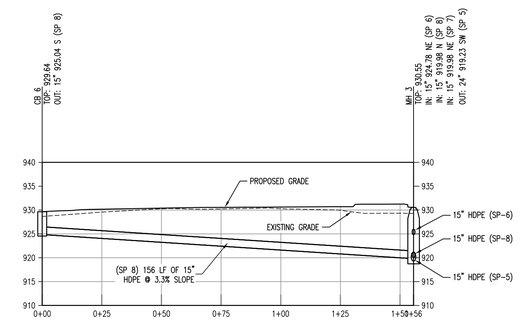

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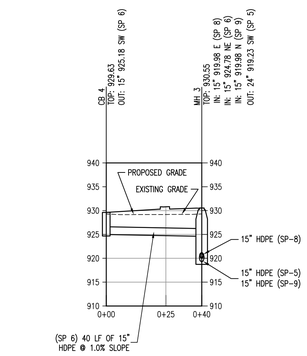

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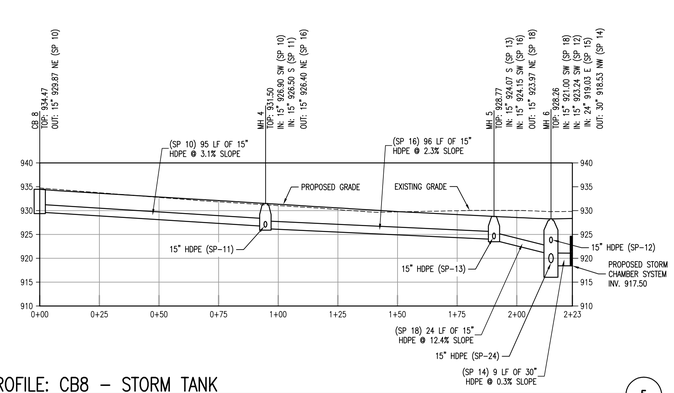

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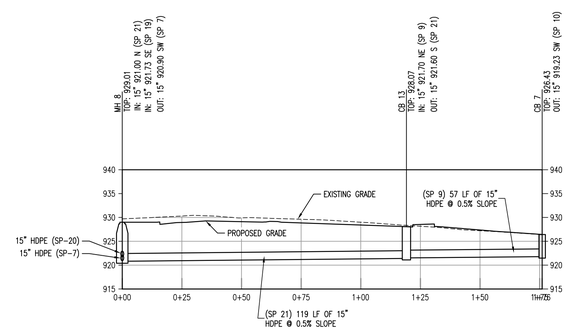

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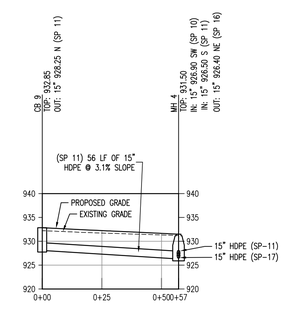

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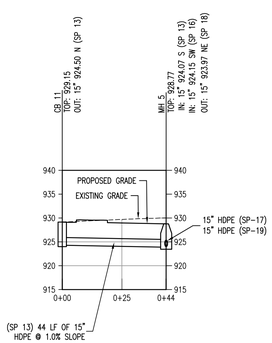

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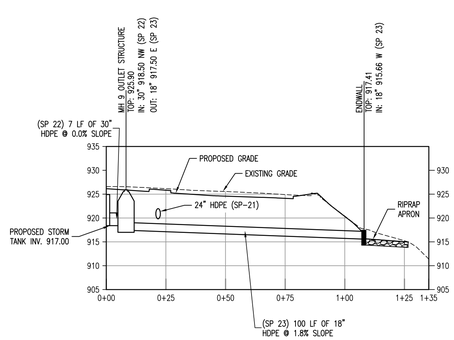

PROFILE: STORM TANK – DISCHARGE POINT 001 (9)
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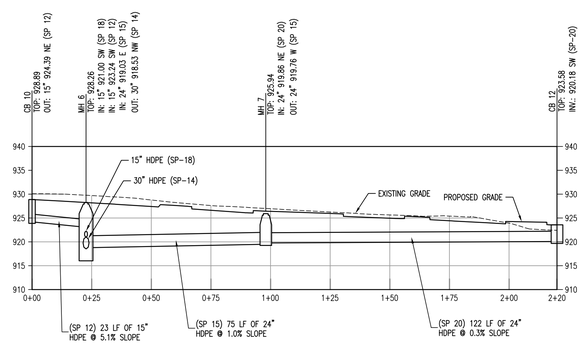

PROFILE: CB10 – CB12 (10)
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=15'

RED SWING GROUP
ENGINEERS & SURVEYORS
4244 WILLIAM PENN HWY.
SUITE 101
MONROEVILLE, PA 15146
OFFICE: 724.325.1215

A&E SEAL:
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JACOB WELAND
ENGINEER
No. PE084705
3/13/2023

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BENDERSON DEVELOPMENT
COMMERCIAL RETAIL

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REVISIONS:

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POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS 4 OF 4

SHEET NO.
C453

IF THIS DRAWING IS LESS THAN 24" X 36" IT IS A REDUCED SIZE DRAWING

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BARRON & ASSOCIATES, P.C.

10440 Main Street

Clarence, New York 14031

Tel: (716) 759-7821 www.barronandassociatespc.com Fax: (716) 759-7823

March 31, 2014 Job No: 14-523

Benderson Development Company, LLC
570 Delaware Avenue
Buffalo, New York 14202

ATTN: Mr. Matt A. Oates, P.E.

RE: Geotechnical Engineering Report
Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146
(PO # 01-305728, Property/Job # 2669J02)

Gentlemen:

This report presents the findings of the subsurface investigation program and geotechnical engineering recommendations for the above referenced project. The geographic orientation of the project site is illustrated on the U.S. Geologic Survey (USGS) site location map in Figure No. 1. The project site is illustrated in Figure No. 2, entitled "Test Boring Location Plan", which includes: approximate location of 15 current test borings (B-108; not drilled) drilled by Buffalo Drilling Company, Inc. (BDC) and 11 previous test borings that were drilled for ACA Engineering, Inc. (ACA), ground surface elevations; and additional site details.

A report was previously prepared for this site, by ACA Engineering, Inc. (ACA), ACA Project No. P10204x10, titled, “Former Circuit City Store,” and dated November 24, 2010. This previous report was prepared for Benderson Development Company, Inc. The reader may refer to this previous report relative to any citations of the boring logs, laboratory data, findings, and previous recommendations.

EXPLORATION METHODS

Sampling Method: A truck mounted Diedrich D-120 rotary drill rig was used to drill 15 current test borings to depths of approximately ten to 80 feet below the ground surface by using 2-1/4 inch and 4-1/4 inch inside diameter (ID), continuous flight hollow stem augers. Soil samples were recovered by driving a standard split-spoon sampler (2-foot long by 1-3/8 inch inside diameter) 24 inches with a 140-pound hammer falling 30 inches per blow (ASTM D1586). The number of blows from six to 18 inches of penetration is defined as the Standard Penetration Test (SPT) N-value. Auger refusal, which may infer the top of bedrock, was encountered at B-109 and B-116.

Groundwater conditions are documented in the field on the driller's logs for each test boring. The depth to groundwater is checked and measured through the hollow stem augers at the completion of the sampling efforts.

Classification: The retrieved soil samples from the test borings were initially logged in the field by the driller, and a portion of each soil sample was placed and sealed in a glass jar. Boring logs, which are included in Appendix A-2, were based upon the field logs and a second visual classification of recovered soil samples in the laboratory by a geologist. Classification of soil samples, as noted on the borings, is based on the Unified Soil Classification System (USCS) in the ASTM D2487/D2488. Refer to Appendix B entitled, "Geotechnical Reference Standards", for an explanation of the terminology that is used for soil and rock descriptions.

Laboratory Testing: Laboratory soil testing was undertaken on several retrieved split spoon samples. The overall laboratory soil-testing program consisted of the following test methods:

- Particle-size Analysis with Hydrometer — ASTM D422
- Water (Moisture) Content of Soil — ASTM D2216
- Liquid Limit, Plastic Limit, and Plasticity Index of Soils — ASTM D4318

Table No. 1 presents the tabulated results of the physical/soil index properties. The associated graphical illustrations of the data are included in Appendix C.

SITE AND SUBSURFACE CONDITIONS

General: The proposed site for development is located at 3475 William Penn Highway (U.S. Route 22) in the Township of Wilkins, Allegheny County, New York. Development will include the construction of retail shopping plaza with associated parking and roadway areas east of the existing Pep Boys building. As shown in Figure No. 2, a large stone building pad exists in the central portion of the site and represents the footprint of the former Circuit City building which has previously been demolished. The remainder of the site for development was noted to consist of asphalt paved area, landscaped grass and brushy tree lined borders. The overall site topography slopes downward from the northwest toward the southeast. Wetland buffers/areas are noted to exist to the north of the proposed development. As shown in Figure No. 3, a large portion of the south central portion of the site was filled with random fill material many years prior to the construction of the former Circuit City building. Fill depths range from 20 to greater than 60 feet with the deepest sections closest to William Penn Highway in the south. Contours representing the depths to natural soils are presented in Figure No. 3 and form a pattern typical of drainage swales which existed prior to the installation of the storm water drainage system and backfill placement.

In general, subsurface conditions are noted to consist of an asphalt pavement and subbase stone layer overlying granular and cohesive fill material atop naturally deposited cohesive soils glacial till over apparent weathered bedrock. Although not encountered at any of the current test boring locations, variable topsoil thicknesses may be expected in the landscaped areas surrounding the existing structures and asphalt.

Subsurface Soil Conditions: Beneath the asphalt pavement and subbase layer, an approximate two to 60 foot layer of cohesive fill exists, except at borings B-101, B-102, B-103, B-107 and B-109. The cohesive fill consists primarily of very stiff and moderately plastic silty clay with lesser amounts of gravel and sand. Trace to little amounts of brick, slag, construction lumber and fragmented weathered shale are also present in random pockets throughout the site. Moisture contents of retrieved samples are noted to be in primarily moist states.

Beneath the fill material and/or beneath the asphalt pavement and subbase layer, a deposit of cohesive glacial till exists and extended the full depth drilled at all of the boring locations except B-105, B-106, B-111 and B-114. The cohesive till consists of a slightly to moderately plastic silty clay with varying amounts of fine-sized to coarse-sized sand and gravel. The consistency of this cohesive till generally ranged from very stiff to hard states. Isolated pockets of till noted to be in a stiff state are also present. The moisture content of the cohesive till is primarily moist.

A zone of weathered shale bedrock is present beneath the glacial till and/or fill material at borings B-105, B-106, B-111, B-114 and between an upper and lower layer of till at B-109. This unit consists generally of dense to very dense sand to gravel sized fragments of weathered shale. Moisture contents are noted to be in a moist state. This unit is typical of a decomposing bedrock unit which has been eroding and weathering in place.

Within the glacial till and weathered shale zone, spoon refusal (i.e., N-values of 50+ to 100+) and very hard drilling conditions were typically encountered, and may also reflect a boulder/cobble condition. The ability to auger, with the drill rig, to these levels would suggest that the upper cobbles-boulders or weathered bedrock can be removed with conventional excavating equipment (e.g., backhoes, excavators, caisson/drilled pier drill rigs).

Bedrock: Auger refusal, which is generally inferred to be top of bedrock, was encountered at test borings, B-109 and B-116. The depths to the apparent bedrock surface ranged from approximately 23 to 77 feet below the ground surface. This apparent top of bedrock surface roughly parallels the ground surface topography and represents a south trending slope. Rock coring efforts would be required to confirm the bedrock type and character. Based upon regional geology, bedrock is expected to be either the shale or sandstone units of the Pennsylvanian Epoch.

Groundwater: Appreciable amounts of groundwater were encountered at only one test borings B-109 at the completion of drilling operations. The measured depth to groundwater ranged was approximately 14 feet below the ground surface (elevations of 916.0 feet) and appear to reflect a pocket of groundwater within the weathered shale bedrock.

Note that the groundwater readings were taken at completion of drilling efforts and, therefore, an adequate amount of time for the groundwater level to recharge to static conditions was probably not allowed. Fluctuations in the groundwater level may occur due to other factors than those present during field operations.

EARTHQUAKE/SEISMIC CONSIDERATIONS

Site Class Definition: For the given site conditions, the most applicable site definition is Site Class D, as listed in Table 1613.5.2 of the 2009 IBC.

Liquefaction Potential: For the project site, the design spectral response acceleration parameters S_{DS}, at 0.2 seconds, and S_{D1}, at one second, are 0.13g and 0.08g (g = 32.2 feet/sec^2), respectively, for Site Class D in this part of Allegheny County, Pennsylvania. These values have a two percent probability of being exceeded in 50 years. Based upon the above conditions and an approximate magnitude VI earthquake on the Richter Scale, the potential for liquefaction or settlement of the Site Class D soils is considered low.

FOUNDATION DESIGN AND CONSTRUCTION RECOMMENDATIONS

General: This section will present and discuss recommendations on foundation design and construction, placement of controlled fills, and subgrade and base layer requirements for concrete floor slabs, paved parking and roadway areas. At this time, the size and location of the proposed structure is unknown. This report will discuss shallow foundation and slab-on-grade recommendation for the hatched building area noted on Figure No. 4. The site area south of the noted conventional footings development area will require deep foundations with structural floor slab. Further discussion and refinement of deep foundation options, which include driven piles or drilled piers, will require a few deep test bores with deep rock cores extending to 100 feet or deeper. Foundation costs to develop the front portion of the site would be four times or more greater than convention footing and slab-on-grade costs.

For purposes of this report, top of finish floor for the proposed hatched area on Figure No. 4 is estimated as elevation 931 feet. Exterior grade will be one-half foot or more below finished floor. The maximum design bearing wall and column loads for the proposed retail facility are not expected to exceed five kips per lineal foot and 100 kips, respectively. The maximum live floor load is taken as 100 pounds per square foot.

Site Preparation and Earthwork: General site preparation will include the demolition and complete removal of any encountered foundations and floor slabs, and removing all unsuitable surficial material (i.e., asphalt pavement, concrete, brick, expansive slag, organic or topsoil layer, and construction and demolition-like fill) to a depth where firm, granular or cohesive fills or naturally occurring soils are encountered. It is recommended, particularly in the location of the proposed structure, that any slag and/or cinder/ash containing material, if encountered, should be tested to determine the expansion and corrosion characteristics prior to use on-site. Any rubble-like and brick fill, boulders, or wood fill in particular, if encountered, will require undercutting. The proposed building and asphalt/concrete paved areas are to be proofrolled with a fully loaded ten-wheel dump truck. All encountered soft and disturbed zones should be undercut and stabilized with granular fill placed in compacted lifts prior to placement of additional fill materials above. Refer to Appendix E entitled "General Earthwork Specification" for definition of fill types and gradation, recommended minimum compaction requirements for various site developments, and placement and compaction methods.

As shown in Figure No. 2, the proposed development site was occupied by a 40,000 square foot, single story structure. Since cavities (from the footings, foundation walls, basements, and tanks, as encountered) would remain, backfilling in compacted lifts with several feet of controlled select granular fill, such as a number two crusher run stone or with suitable stripped and approved on-site fill material, is required.

It is unknown if any former residential/commercial structures existed on the project building site. It is also unknown if any former footings and foundation walls may be buried at the proposed building site. Septic tank locations and the abandonment conditions or practices are normally unknown. If encountered during site development, it is recommended that the tanks should be properly removed under the applicable local and state regulations. The remaining cavities should be backfilled with select granular fill that is placed in compacted lifts.

Shallow Foundation: The recommended foundation type for the hatched building area on Figure No. 4 is shallow footings. The footings are recommended to bear at four feet or lower below existing grade and on the very stiff-hard cohesive glacial till or, alternatively, bear on an approved compacted granular fill that extends through this depth range. Footings may bear within this depth zone when firm/hard or better natural cohesive glacial till conditions are encountered and approved at a shallower depth. The central portion of the front or south wall will require undercuts extending to depths of ten feet or more.

Continuous strip and spread exterior footings would bear at a relative elevation of four feet or lower below final grade. The exterior footings are to bear on the very stiff-hard or better/thoroughly compacted natural silty clay glacial till or, alternatively, on a layers of thoroughly compacted (minimum of 95 percent of the maximum dry density by ASTM D 1557) select/approved granular fill that extends

to firm/approved and thoroughly compacted natural silty clay glacial till. Again, the central portion of the front wall will require deeper undercuts. Interior column/wall footings are also recommended to bear on the same respective glacial till conditions and elevations as the exterior footings, or on similar depths of compacted select granular fill.

Wall footings should have a minimum two-foot width and column footings should have a minimum three-foot width. Based on the above described conditions, the recommended maximum net allowable foundation bearing pressure is 2,000 pounds per square foot (psf) of footing bearing area on the natural silty clay glacial till soil. All footings for the proposed building are recommended to be designed near the same contact pressure. The recommended maximum net allowable foundation bearing pressures are based on generally accepted design methods for cohesionless and cohesive soil conditions. Based on the provisions of the above recommendations and estimated design requirements and utilization of proper construction procedures and experienced field supervision and testing personnel, total and differential settlements are estimated to be less than one inch and 3/4's inch, respectively. Refer to the engineering computations, which are included as Appendix D, for additional foundation design and construction details.

Additional Foundation Considerations: In addition to the above, the following recommendations will provide additional assurances with regard to proper foundation construction.

a) All fill placed beneath, adjacent, or above foundations must comply with the "General Earthwork Specification", included as Appendix E.

b) Backfill of foundations with approved select granular fill must be completed prior to placement of substantial superstructure loads, except for basement walls or substructure areas that may additionally require superstructure loads and possibly internal bracing.

c) The upper existing fill and natural soil materials may rut and “pump” if exposed to excessive surface water and repeated construction traffic. Proper site management and fill placement operations are needed to minimize costly undercuts and subgrade repairs prior to placement of concrete slabs and asphalt pavement. It is noted that construction during wet/rainy and/or Fall and Spring conditions may require added precautions and possibly a thicker base layer to maintain a stable subgrade condition.

d) Step footings, if utilized, should have a rise to run ratio of 1:2, with a two-foot maximum rise and a four-foot minimum run between steps or as recommended by the design structural engineer.

e) The central portion of the south or front wall is recommended to have footing depth of six feet and a minimum five foot undercut.

Stabilization of Excavations: The trench/excavation sidewall stability concerns can be addressed with the Occupational Safety and Health Act (OSHA) requirements as set forth in Subpart P of 29 CFR Part 1926, Sections 1926.650 to 1926.652. In lieu of a properly designed shoring system, side slopes of the trench excavation should be one on one (vertical to horizontal distance) or flatter in cohesive soils or one on one and one-half or flatter in the granular materials, as required by OSHA.

Water must not be allowed to accumulate or pond on exposed foundation bearing grades. Surface water and groundwater from within the excavation must be either pumped, diverted or channelized by gravity flow to effectuate the construction of the proposed foundation.

Retaining Walls: While not a unique design concern, retaining wall/loading dock structures or other substructures, if considered, must be adequately designed and constructed to support horizontal soil pressures and surface loads. The following recommendations will provide additional assurances with regard to proper design and construction of retaining walls and fixed/restrained loading dock walls.

a) Design the wall foundation based on the previously recommended maximum net allowable bearing capacity and bearing conditions.

b) Cantilever (such as, retaining) walls and fixed/restrained (such as, loading dock) walls must be adequately designed and constructed to support horizontal soil pressures and surface loads.

c) Uniformly distributed surface surcharge loads should be applied at 100 percent of the load times the appropriate lateral earth pressure coefficient to the retaining/loading dock wall. The lateral design stress on the wall is the sum of the equivalent lateral fluid pressure and other applied surface stresses and subsurface stresses (i.e., footings).

d) The recommended at rest (rigid wall), active, and passive earth pressure coefficients for select granular sandy gravel fill against an earth retaining structure/wall are 0.76, 0.24, and 2.8, respectively. The respective equivalent lateral fluid pressures are recommended to be 90, 30 and 330 psf per foot depth, which are based upon a moist, compacted unit backfill weight of 120 pcf. The at rest value would account for the average expected compaction induced stresses and/or the potential influences of hydrostatic pressure.

e) The equivalent static lateral fluid pressure on a wall from earthquake/seismic induced loading is recommended to be at least equal to the unit weight of the backfill soil for a soil that is at or near a saturated state. For unsaturated backfill soil conditions, it is recommended that an additional lateral stress to the wall will be treated as a uniformly distributed lateral load on the wall (in psf) and will be equal to eight times (for Site Class C soils) to 16 times (for Site Class E soils) the height of the wall, in feet (for a soil backfill unit weight of 120 pcf). This multiplying factor is based upon the maximum considered acceleration, that results from an earthquake with a 0.2 second spectral response for the specific site and having a two percent probability of being exceeded in 50 years.

f) Lateral stresses from surface loading (such as, trucks) would not generally be a design concern if the load is transient and the loading is at a horizontal distance from the subsurface wall that is greater than the depth of the subsurface cavity. The geotechnical engineer should be consulted once the type and magnitude of the surface loading are identified.

g) Lateral stresses from subsurface loading (such as, the proposed building footings) would generally be considered a design concern if the edge of the loaded area is at a horizontal distance from the subsurface wall that is in the range of three times the footing width for wall/continuous footings or twice the footing width for individual column footings. The geotechnical engineer should be consulted once the type and magnitude of the foundation loading are identified.

h) The recommended resisting passive earth pressure coefficient includes a factor of safety of 1.5 and would correlate to a total resistive passive pressure of about 2.6 kips for a four foot high wall.

i) The friction factor or coefficient of sliding friction for concrete footing of a retaining wall or foundation wall is recommended to be 0.35 on a silty sand interface or 0.60 if cast against a clean, sound and rough bedrock interface.

j) The minimum recommended factors of safety against overturning of a retaining wall are 1.5 for a clean/silt-free compacted granular backfill and 2.0 for a compacted cohesive backfill.

k) Long term dewatering of the foundation backfill, as is customarily applied in practice for substructure conditions (i.e., basements, recessed loading docks, retaining walls, etc.), would consist of a minimum four-inch diameter drain tile or perforated/slotted pipe with the invert placed near the footing elevation (exterior backfill side and interior basement side). These pipes would be protected by an open/uniformly graded granular backfill filter with a minimum six-inch thickness. The collected groundwater and infiltrated surface water would ultimately be conveyed by gravity drainage to a sump pit and pump or other appropriate water conveyance system.

First Floor Slab: For the most part and based on test results for similar soils/fills, the slightly to moderately plastic silty clay soil/fill may be difficult to compact in a controlled manner considering the varying plasticity and natural moisture contents that are estimated to be wet of optimum, at the time of this investigation. The excavated and approvable soil/fill types are not expected to be available in any reasonable quantities and may be expected to be suitable for re-use as general fill with the implementation of uniformly applied soil conditioning methods (i.e., drying and blending) and compaction, if additional volume of soil for wall backfill or for raising site grades is needed.

Excavated and approvable granular (that is, inorganic sand or gravel) soil/fill is not expected to be available in any quantity, except possibly for the subbase gravel beneath the existing pavement and the floor slabs-on-grade. For the most part, granular (that is, inorganic sand or gravel) soil/fill is expected to be acceptable for on-site re-use, as general/ordinary fill without substantial reworking and/or modification. On-site materials are acceptable for re-use as general fill under the following conditions: properly sorted by soil type; free of deleterious materials, debris, and oversized items; dried, blended and placed at the proper moisture conditions; approved by qualified geotechnical personnel; and complies with Appendix E entitled, "General Earthwork Specification".

These previously discussed soils or dissimilar excavated materials should not be commingled prior to their use on-site, unless designated for a green/vegetation area. General fill material is recommended to be placed on prepared and approved subgrade and in accordance with previous recommendations.

The approved subgrades will most likely consist of either the existing natural silty clay soils and/or a thoroughly compacted approved/select granular fill for the proposed first floor building. Above the approved subgrade, a minimum eight-inch select granular fill (i.e., number two crusher run stone or equal) layer is recommended as the base course for the concrete floor slab for the proposed building. The floor slab is recommended to have a minimum four-inch thickness or as determined by the design structural engineer. The floor slab reinforcement should be provided through placement of wire mesh

or plastic fibers. At the discretion of the design architect, a vapor barrier may be considered for use in the proposed structure.

At the existing site grades and based upon the presence of the underlying properties of the natural soils/fills, the recommended subgrade modulus at the top of the base layer for a concrete first floor slab bearing on an eight inch thick compacted base layer and prepared soil/fill subgrade (i.e., minimum 92 percent compaction) is recommended not to exceed 150 pounds per cubic inch (pci) with a Poisson Ratio of 0.40. Isolation of the floor slab from the footings-piers-columns and walls does appear to be warranted.

Parking and Roadway Facilities: The characteristics of the natural silty clay soils/fills and the known frost penetration in Southern Pennsylvania requires that specific attention is provided to the design and construction of paved roadway and parking areas. Depending upon the final grading plan and existing pavement thickness, individual sections of existing pavement will need to be evaluated relative to removal and reconstruction of a new pavement section or to utilizing short term/periodic treatments with thin asphalt overlays.

It is recommended that the subgrade surface is adequately graded and/or underdrains are installed to prevent water accumulation. Above the approved subgrade surface, a minimum eight-inch thick select granular layer is recommended as the base course for lightly traveled roadway and parking areas (standard duty section). However, given the moisture sensitive nature of silty clay subgrade conditions, a geotextile filter and strength fabric may be required to stabilize. Geotextile filter and strength fabric, on cohesive soil subgrades, and a minimum 12-inch thick base course are recommended for all truck routes and heavily traveled roadways (heavy duty section).

The thickness of top and binder asphalt course layers should be determined in accordance with AASHTO methods. In summary, the minimum recommended asphalt thicknesses for heavy duty section and standard duty section is three and one-half inches and three inches, respectively. The top and binder course layers are recommended to be designed and constructed in accordance with Southern Pennsylvania Department of Transportation Standard Specification.

Portland cement concrete slabs should have minimum thicknesses of five inches for the standard duty section and six inches for the heavy duty section or as determined by the design structural engineer. The maximum soil subgrade modulus at the top of the base layer for concrete slab design purposes is recommended not to exceed 150 pounds per cubic inch (pci), with a Poisson Ratio of 0.40.

Limitations, Field Inspections and Monitoring: This report is based on the preliminary information that is provided by project representatives and the subsurface conditions that were encountered at the test boring locations. As detailed in Appendix F “Limitations”, modification regarding proposed

Portland cement concrete slabs should have minimum thicknesses of five inches for the standard duty section and six inches for the heavy duty section or as determined by the design structural engineer. The maximum soil subgrade modulus at the top of the base layer for concrete slab design purposes is recommended not to exceed 150 pounds per cubic inch (pci), with a Poisson Ratio of 0.40.

Limitations, Field Inspections and Monitoring: This report is based on the preliminary information that is provided by project representatives and the subsurface conditions that were encountered at the test boring locations. As detailed in Appendix F "Limitations", modification regarding proposed building/structure location and other site developments can result in changes to provided recommendations. It is recommended that the geotechnical engineer be provided the opportunity to generally review the final detailed design and contract specifications. Required earthwork and foundation construction should be done under the supervision of experienced construction personnel and in a manner consistent with proven methods. All site work should be carefully monitored and tested by experienced geotechnical personnel to assure compliance with earthwork and foundation construction specifications.

Thank you for the opportunity to assist on this project. If questions should arise, please call the undersigned at your earliest convenience.

Very truly yours,
BARRON & ASSOCIATES, INC.
and
BUFFALO DRILLING COMPANY, INC.

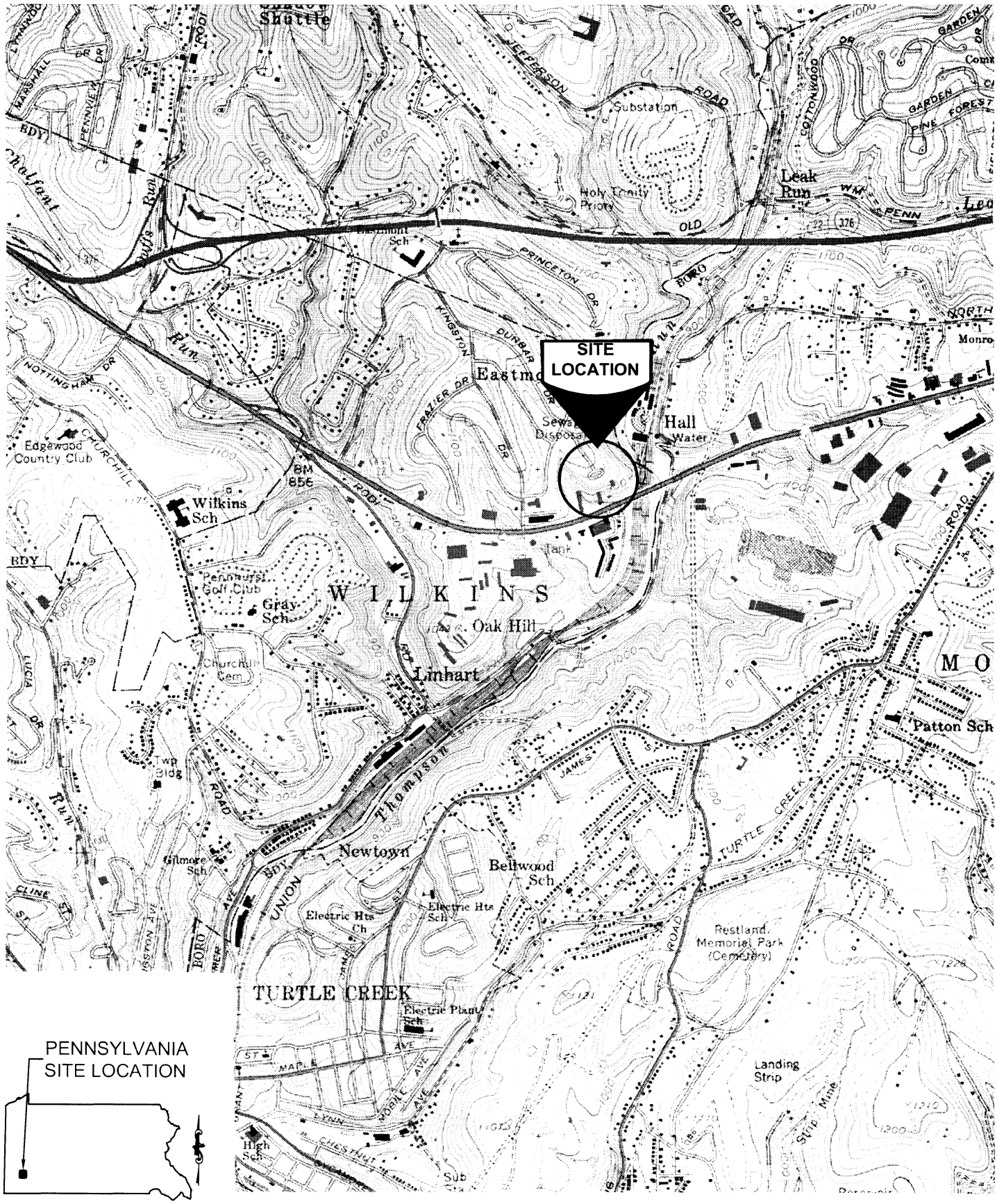
James S. Barron, P.E.
President/Geotechnical Engineer

STATE OF NEW YORK
JAMES S. BARRON
58612
LICENSED PROFESSIONAL ENGINEER

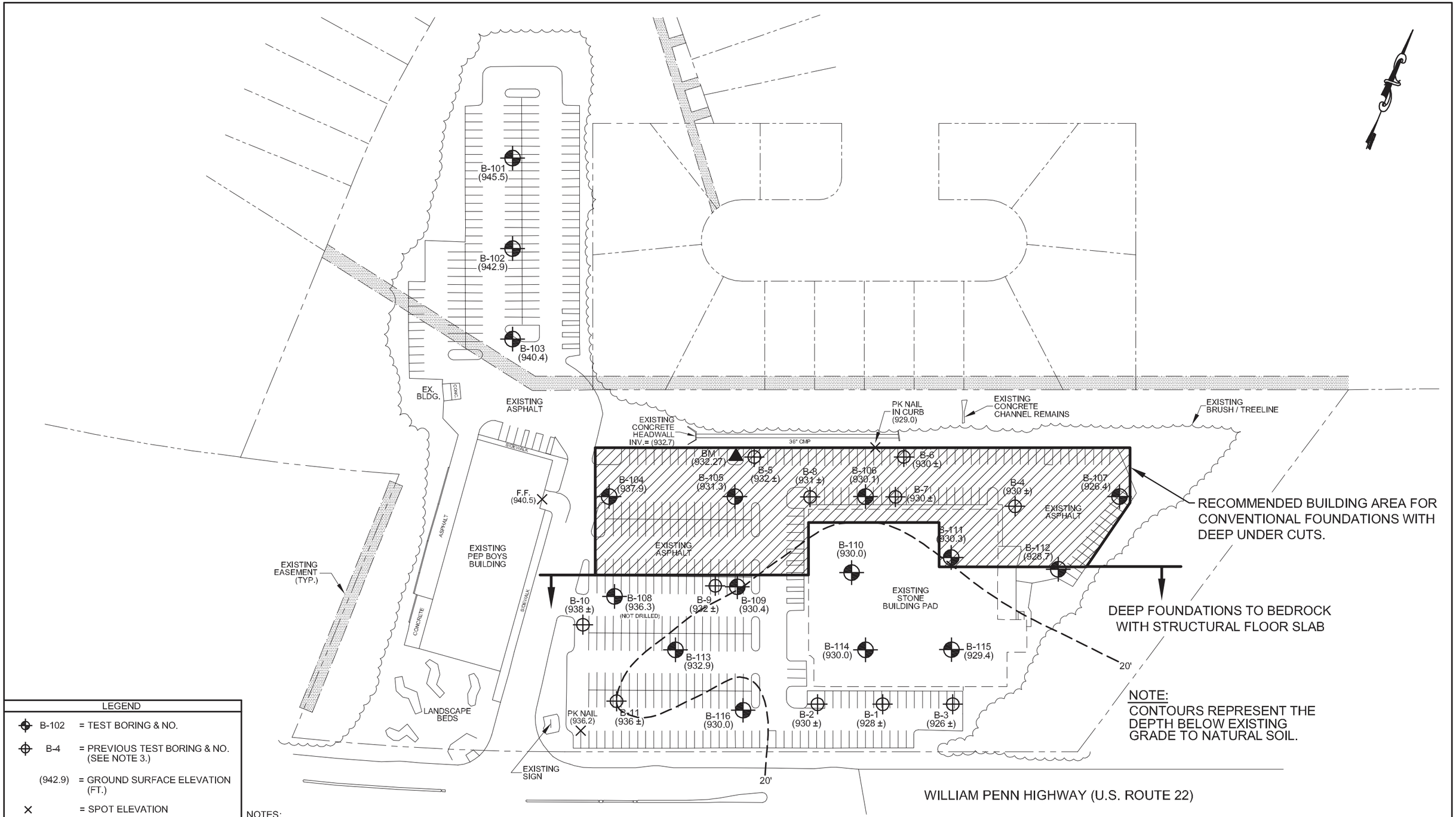
4.3.14

Andrew J. Camping
Senior Geologist/Project Manager

www.barronandassociatespc.com



BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC. 10440 MAIN ST. CLARENCE, NY 14031 (716)759-7821 FAX (716)759-7823 e-mail: INFO@BUFFALODRILLING.COM INFO@BARRONANDASSOCIATESPC.COM DRAWN: DAN KASPROWICZ	CLIENT: BENDERSON DEVELOPMENT COMPANY, LLC 570 DELAWARE AVENUE BUFFALO, NEW YORK 14202 PROJECT: PROPOSED RETAIL PLAZA 3475 WILLIAM PENN HIGHWAY (U.S. ROUTE 22) TOWNSHIP OF WILKINS, ALLEGHENY CO., PA 15146	USGS SITE LOCATION PLAN BRADDOCK, PA 1960 - PHOTO REVISED 1979 JOB No.: 14-523 / SCALE: 1" = 2000' ± DATE: 3/3/2014 / FIGURE NO. 1



LEGEND	
B-102	= TEST BORING & NO.
B-4	= PREVIOUS TEST BORING & NO. (SEE NOTE 3.)
(942.9)	= GROUND SURFACE ELEVATION (FT.)
×	= SPOT ELEVATION
▲ BM	= BENCH MARK (NORTH RIM OF MAN HOLE)
⌒	= CONTOURS TO NATURAL SOIL

NOTES:

1. BORINGS, BUILDINGS, SITE FEATURES, PROPERTY LINE LOCATIONS, AND SCALE OF DRAWING ARE APPROXIMATE.
2. BASE MAP REFERENCE AND BENCH MARK ELEVATION PROVIDED BYALL LAND SERVICES, INC., TITLED "BOUNDARY & TOPOGRAPHIC SURVEY - 3475 WILLIAM PENN HIGHWAY", JOB NO. 12-046, SHEET 01 OF 01, UNDATED.
3. PREVIOUS BORING LOCATION OBTAINED FROM A GEOTECHNICAL INVESTIGATION REPORT PREPARED BY ACA ENGINEERING, INC., TITLED "FORMER CIRCUIT CITY STORE", ACA PROJECT NO. P10204x10, DATED 11/24/10.

BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: INFO@BUFFALODRILLING.COM
INFO@BARRONANDASSOCIATESPC.COM

DRAWN: DAN KASPROWICZ

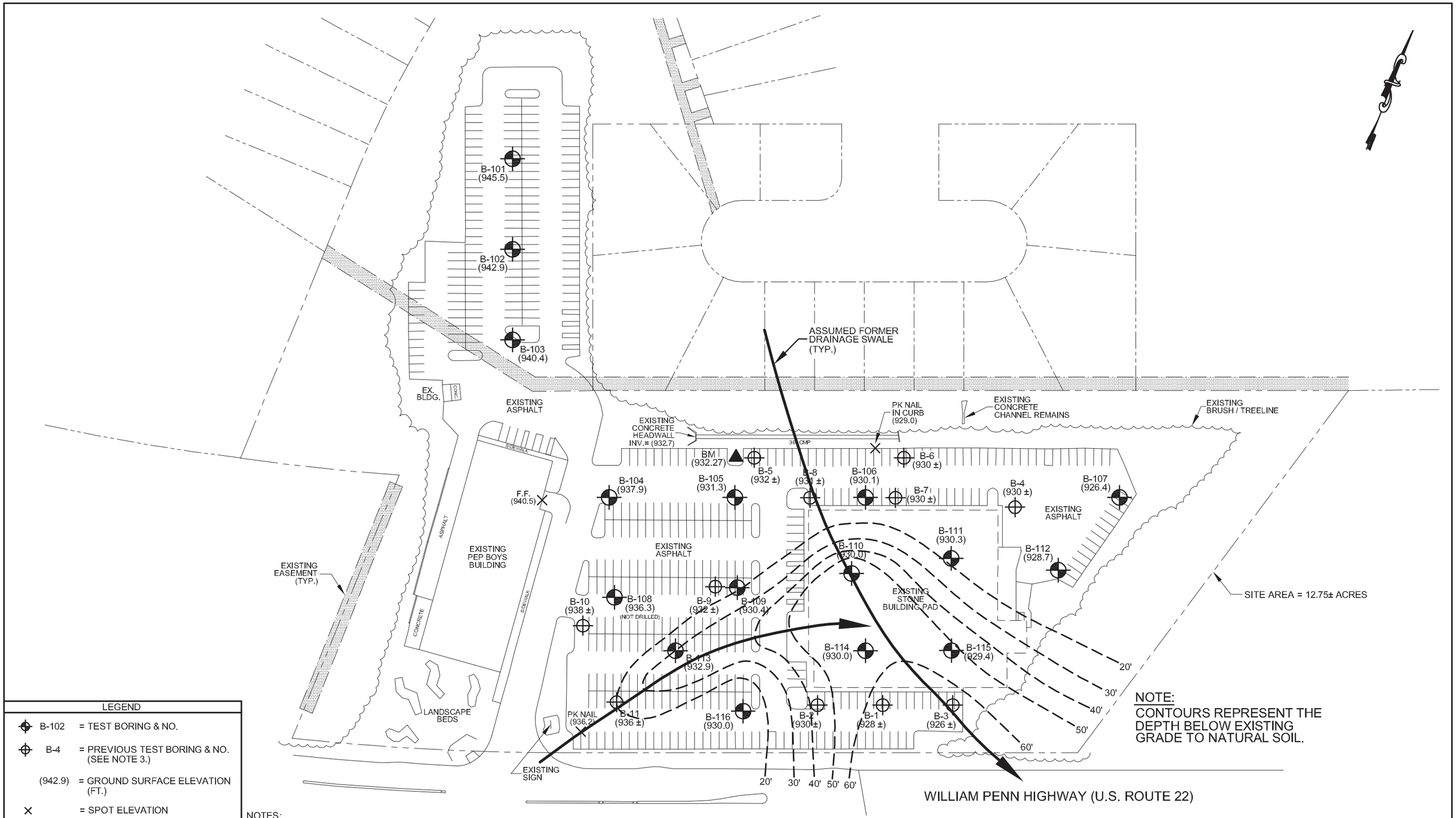
CLIENT: BENDERSON DEVELOPMENT COMPANY, LLC
570 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

PROJECT: PROPOSED RETAIL PLAZA
3475 WILLIAM PENN HIGHWAY (U.S. ROUTE 22)
TOWNSHIP OF WILKINS, ALLEGHENY CO., PA 15146

PROPOSED BUILDING LOCATION PLAN

0 50 100 200

JOB NO.: 14-523	SCALE: 1" = 100' ±
DATE: 3/26/2014	FIGURE NO. 4



NOTE:
CONTOURS REPRESENT THE DEPTH BELOW EXISTING GRADE TO NATURAL SOIL.

LEGEND	
B-102	= TEST BORING & NO.
B-4	= PREVIOUS TEST BORING & NO. (SEE NOTE 3.)
(942.9)	= GROUND SURFACE ELEVATION (FT.)
×	= SPOT ELEVATION
▲ BM	= BENCH MARK (NORTH RIM OF MAN HOLE)
	= CONTOURS TO NATURAL SOIL
	= ASSUMED FORMER SWALES

NOTES:

1. BORINGS, BUILDINGS, SITE FEATURES, PROPERTY LINE LOCATIONS, AND SCALE OF DRAWING ARE APPROXIMATE.
2. BASE MAP REFERENCE AND BENCH MARK ELEVATION PROVIDED BYALL LAND SERVICES, INC., TITLED "BOUNDARY & TOPOGRAPHIC SURVEY - 3475 WILLIAM PENN HIGHWAY", JOB NO. 12-046, SHEET 01 OF 01, UNDATED.
3. PREVIOUS BORING LOCATION OBTAINED FROM A GEOTECHNICAL INVESTIGATION REPORT PREPARED BY ACA ENGINEERING, INC., TITLED "FORMER CIRCUIT CITY STORE", ACA PROJECT NO. P10204x10, DATED 11/24/10.

BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: INFO@BUFFALODRILLING.COM
INFO@BARRONANDASSOCIATESPC.COM

DRAWN: DAN KASPROWICZ

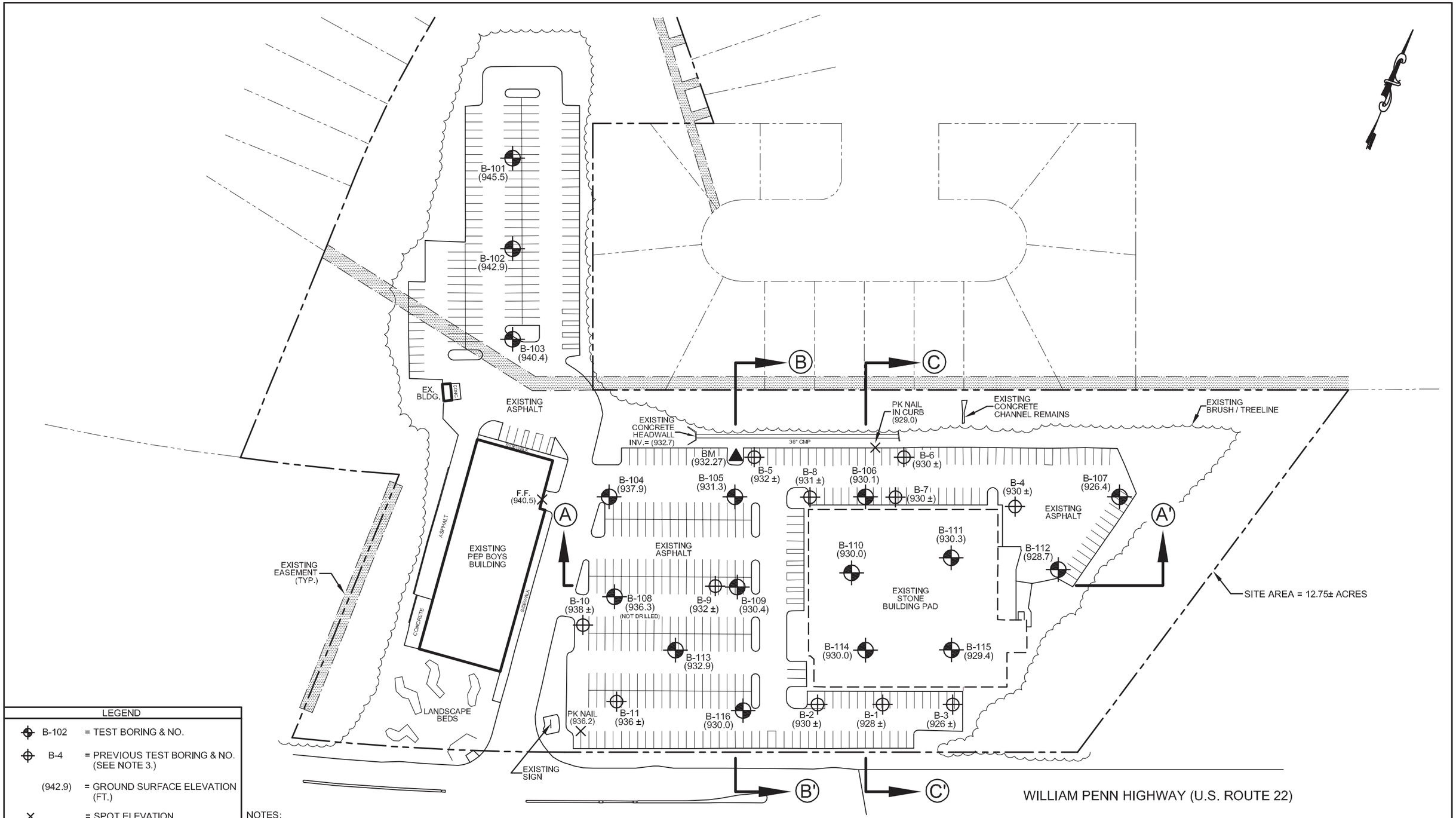
CLIENT: BENDERSON DEVELOPMENT COMPANY, LLC
570 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

PROJECT: PROPOSED RETAIL PLAZA
3475 WILLIAM PENN HIGHWAY (U.S. ROUTE 22)
TOWNSHIP OF WILKINS, ALLEGHENY CO., PA 15146

ASSUMED FORMER SWALES AND CONTOUR PLAN

0 50 100 200

JOB NO.: 14-523	SCALE: 1" = 100' ±
DATE: 3/26/2014	FIGURE NO. 3



LEGEND

B-102	= TEST BORING & NO.
B-4	= PREVIOUS TEST BORING & NO. (SEE NOTE 3.)
(942.9)	= GROUND SURFACE ELEVATION (FT.)
×	= SPOT ELEVATION
▲ BM	= BENCH MARK (NORTH RIM OF MAN HOLE)
Ⓐ Ⓐ'	= SECTION LINE & NO.

NOTES:

1. BORINGS, BUILDINGS, SITE FEATURES, PROPERTY LINE LOCATIONS, AND SCALE OF DRAWING ARE APPROXIMATE.
2. BASE MAP REFERENCE AND BENCH MARK ELEVATION PROVIDED BYALL LAND SERVICES, INC., TITLED "BOUNDARY & TOPOGRAPHIC SURVEY - 3475 WILLIAM PENN HIGHWAY", JOB NO. 12-046, SHEET 01 OF 01, UNDATED.
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BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: INFO@BUFFALODRILLING.COM
INFO@BARRONANDASSOCIATESPC.COM

DRAWN: DAN KASPROWICZ

CLIENT: BENDERSON DEVELOPMENT COMPANY, LLC
570 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

PROJECT: PROPOSED RETAIL PLAZA
3475 WILLIAM PENN HIGHWAY (U.S. ROUTE 22)
TOWNSHIP OF WILKINS, ALLEGHENY CO., PA 15146

TEST BORING LOCATION PLAN

0 50 100 200

JOB NO.: 14-523	SCALE: 1" = 100' ±
DATE: 3/26/2014	FIGURE NO. 2

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

B&A JOB NO: 14-523
CLIENT: Benderson Development Company, LLC
PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

TABLE NO. 1
LABORATORY PHYSICAL SOIL TEST RESULTS

Boring No.	Sample No.	Depth	Moisture Content ASTM D2216	Organic Matter Content ASTM D2974	Unconfined Compressive Strength ASTM D2166	Wet Density ASTM D2166	Grain Size Analysis ASTM D422				Atterberg Limits ASTM D4318			USCS Soil Classification ASTM D2487 / ASTM D2488 *
							Gravel	Sand	Silt	Clay	LL	PL	PI	
		(ft.)	(%)	(%)	(psf)	(pcf)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(-)
B-104	S-1	0.5-2	11.9	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-2	2-4	9.3	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-3	4-6	11.8	-	-	-	-	-	-	-	33	22	11	CL-Till
	S-4	6-8	11.1	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-5	8-10	14.5	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-6	10-12	11.4	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-7	15-17	16.9	-	-	-	-	-	-	-	-	-	-	CL-Till
B-107	S-1	0.5-2	3.3	-	-	-	-	-	-	-	-	-	-	SW-SM
	S-2	2-4	7.0	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-3	4-6	10.2	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-4	6-8	13.8	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-5	8-8.2	0.0	-	-	-	-	-	-	-	-	-	-	NO SAMPLE
B-110	S-1	0-2	11.5	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-2	2-2.8	8.8	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-3	4-6	11.6	-	-	-	-	-	-	-	35	23	12	CL-Fill
	S-4	6-8	10.7	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-5	8-10	6.6	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-6	10-12	12.8	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-7	14-16	6.6	-	-	-					-	-	-	W.SHALE-Fill
	S-8	19-21	4.3	-	-	-	51.9	29.2	17.2	1.7	-	-	-	W.SHALE-Fill
	S-9	24-26	6.7	-	-	-					-	-	-	W.SHALE-Fill
	S-10	29-30.3	28.9	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-11	34-36	9.6	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-12	39-41	23.8	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-13	44-44.4	10.2	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-14	49-51	5.4	-	-	-	-	-	-	-	-	-	-	CL-Fill

* Soil classification based on visual identification and soil classification of adjacent samples (as applicable).

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

B&A JOB NO: 14-523
CLIENT: Benderson Development Company, LLC
PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

TABLE NO. 1 CONT'D
LABORATORY PHYSICAL SOIL TEST RESULTS

Boring No.	Sample No.	Depth	Moisture Content ASTM D2216	Organic Matter Content ASTM D2974	Unconfined Compressive Strength ASTM D2166	Wet Density ASTM D2166	Grain Size Analysis ASTM D422				Atterberg Limits ASTM D4318			USCS Soil Classification ASTM D2487 / ASTM D2488 *
							Gravel	Sand	Silt	Clay	LL	PL	PI	
		(ft.)	(%)	(%)	(psf)	(pcf)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(-)
B-115	S-1	0-2	12.5	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-2	2-4	12.0	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-3	4-6	10.6	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-4	6-8	10.9	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-5	8-9.4	11.9	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-6	10-12	11.4	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-7	14-16	8.0	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-8	19-21	10.3	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-9	24-26	7.8	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-10	29-31	12.4	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-11	34-36	4.3	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-12	39-41	5.9	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-13	44-46	77.7	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-14	49-51	20.6	-	-	-	-	-	-	-	-	-	-	CL-Fill
	S-15	54-56	18.3	-	-	-	49.0	41.2	9.8		-	-	-	SM/GM-Fill
	S-16	59-61	23.2	-	-	-					-	-	-	SM/GM-Fill
	S-17	64-64.8	20.7	-	-	-					-	-	-	SM/GM-Fill
	S-18	69-71	17.7	-	-	-	-	-	-	-	33	22	11	CL
	S-19	74-76	17.5	-	-	-	-	-	-	-	-	-	-	CL

* Soil classification based on visual identification and soil classification of adjacent samples (as applicable).

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassiciatespc.com

APPENDIX A.1

TEST BORING LOGS AND SOIL CLASSIFICATIONS
By ACA Engineering, Inc.
Dated: November 24, 2010
ACA, Inc. Project No. P10204X10

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-1

Elevation: 928 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
							woh				
41											
42											
43				S-15	SS	42.0 - 43.5	5 24 12	1.5			Moist
44											
45											
46				S-16	SS	45.0 - 46.5	12 12 19	1.5			Dry
47											
48											
49				S-17	SS	48.0 - 49.5	9 7 9	1.5			Moist
50											
51		Brown silty CLAY with rock fragments, sand, brick fragments, coal fragments, carbonaceous shale, wood, and organics (FILL)									
52				S-18	SS	51.0 - 52.5	1 11 5	0.4			Moist
53											
54											
55				S-19	SS	54.0 - 55.5	6 8 11	1.5			Wet
56											
57											
58				S-20	SS	57.0 - 58.5	5 4 6	1.0			Wet
59											
60							3				

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 14, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 3 of 4

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

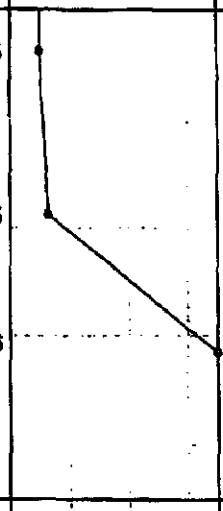
ACA Engineering, Inc.

Borehole #: B-1

Elevation: 928 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
61		Brown silty CLAY with rock fragments, sand, brick fragments, coal fragments, carbonaceous shale, wood, and organics (FILL)		S-21	SS	60.0 - 61.5	3 4 6	1.5			Wet
62											
63											
64				S-22	SS	63.0 - 64.5	5 6 7	1.5			Wet
65											
66		Highly weathered brown and red CLAYSTONE	65.5	S-23	SS	66.0 - 66.6	6 50-1"	0.6			Moist
67											
68											
69		End of Test Boring	69.0								
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											



Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 14, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 4 of 4

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-2

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
		Subbase - 5"	0.8								
1		Brown silty CLAY with rock fragments and sand (FILL)		S-1	SS	1.0 - 2.5	1 3 3	1.5			Moist
2			2.5								
3											
4				S-2	SS	3.0 - 4.5	4 5 15	1.5			Moist
5											
6											
7				S-3	SS	6.0 - 7.5	44 27 26	1.5			Dry
8											
9											
10				S-4	SS	9.0 - 10.5	3 5 8	1.5			Dry
11		Brown and gray rock fragments with sand and some clay (FILL)									
12											
13				S-5	SS	12.0 - 13.5	4 9 11	0.8			Moist
14											
15											
16				S-6	SS	15.0 - 16.5	9 6 7	1.5			Dry
17											
18											
19				S-7	SS	18.0 - 19.2	21 35 50-3"	0.8			Dry
20											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 1 of 3

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-2

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
21			20.5								
22		Brown and red silty CLAY with rock fragments and sand (FILL)		S-8	SS	21.0 - 22.5	8 21 16	1.5			Moist
23											
24											
25				S-9	SS	24.0 - 25.5	10 8 9	1.5			Moist
26										▼	0 Hrs.- 25.6'
27			26.5								
28				S-10	SS	27.0 - 27.8	1 50-4"	0.6			Moist
29		Gray silty CLAY with rock fragments, sand, and trace coal fragments (FILL)									
30											
31				S-11	SS	30.0 - 31.5	8 5 9	1.5			Moist
32											
33											
34			33.5	S-12	SS	33.0 - 34.5	woh woh 5	0.3			Moist
35											
36											
37				S-13	SS	36.0 - 37.5	13 20 22	1.5			Dry
38		Completely weathered brown sandy SHALE									
39											
40				S-14	SS	39.0 - 40.5	13 23 38	1.5			Dry

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-2

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
41							38				
42							17				
43				S-15	SS	42.0 - 43.4	29 50-5"	1.4			Dry
44			43.4								
45		Very soft to medium, very broken to broken, gray SANDSTONE RQD=0%									
46				R-1	Core	43.4 - 48.4		3.5			
47											
48											
49		End of Test Boring	48.4								
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 3 of 3

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-3

Elevation: 926 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
0		Ground Surface									
		Asphalt - 4" Subbase - 7"	0.0								
			0.9	S-1	SS	1.0 - 2.5	3 2 1	0.7			Moist
		Brown and gray silty CLAY with rock fragments, sand, and trace coal fragments (FILL)		S-2	SS	3.0 - 4.5	7 3 3	0.8			Wet
				S-3	SS	6.0 - 7.5	8 10 9	1.5			Moist
		Red silty CLAY with rock fragments and sand (FILL)	8.5	S-4	SS	9.0 - 10.5	13 7 9	1.5			Moist
			11.5	S-5	SS	12.0 - 13.5	10 19 19	0.6			Dry
		Brown and gray rock fragments with sand and some clay (FILL)		S-6	SS	15.0 - 15.1	50-1"	0.1			Dry
				S-7	SS	18.0 - 19.5	3 2 4	0.6			Dry

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-3

Elevation: 926 +/-

Engineer/Geologist: *J. Mastren-Williams*

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
21			20.5								
22				S-8	SS	21.0 - 22.5	3 3 3	1.5			Moist
23											
24											
25				S-9	SS	24.0 - 25.5	woh woh 18	0.8			Moist
26											
27		Brown and gray silty CLAY with rock fragments and sand (FILL)									
28				S-10	SS	27.0 - 28.5	woh woh 4	0.7			Dry
29											
30											
31				S-11	SS	30.0 - 31.5	5 10 10	1.5			Moist
32											
33											
34				S-12	SS	33.0 - 34.5	woh 3 49	1.1			Moist
35											
36			35.5	S-13	SS	36.0 - 36.3	50-4"	0.3			Dry
37											
38											
39											
40				S-14	SS	39.0 - 40.5	woh 16 6	1.5			Dry

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 2 of 5

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-3

Elevation: 926 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
41		Brown and gray rock fragments with sand (FILL)					6				
42											
43				S-15	SS	42.0 - 43.5	7 24 7	1.5			Dry
44											
45											
46				S-16	SS	45.0 - 46.5	2 3 12	1.5			Dry
47											
48											
49				S-17	SS	48.0 - 49.5	woh 6 4	0.3			Dry
50											
51			50.5								
52				S-18	SS	51.0 - 52.5	5 16 36	0.5			Moist
53											
54											
55				S-19	SS	54.0 - 55.5	2 3 2	0.6			Wet
56											
57											
58				S-20	SS	57.0 - 58.5	woh woh woh	0.5			Wet
59											
60				S-21	SS	60.0 - 60.3	50-4"	0.2			Wet

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

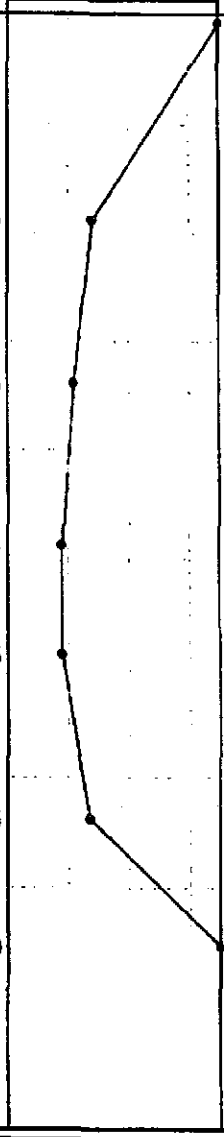
ACA Engineering, Inc.

Borehole #: B-3

Elevation: 926 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
61		Brown silty CLAY with rock fragments, sand, carbonaceous shale, brick fragments, coal fragments, and wood (FILL)		S-21			50-4"				
62											
63											
64				S-22	SS	63.0 - 64.5	11 17 11	1.0			Wet
65											
66											
67				S-23	SS	66.0 - 67.5	6 11 11	1.5			Wet
68											
69											
70				S-24	SS	69.0 - 70.5	10 10 8	1.5			Wet
71											
72				S-25	SS	71.0 - 72.5	7 10 8	1.5			Wet
73											
74											
75				S-26	SS	74.0 - 75.5	15 12 15	1.5			Wet
76											
77		Moderately weathered gray SILTSTONE	76.5	S-27	SS	77.0 - 77.1	50-1"	0.0			Dry
78											
79											
80			79.5								



Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-3

Elevation: 926 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft 10 30 50	Water Level	Remarks
81		Medium-hard, very broken to massive, gray SILTSTONE RQD=32%		R-1	Core	79.5 - 86.5		7.0			
82											
83											
84											
85											
86											
87		End of Test Boring	86.5								
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 12, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Project No: P10067x10

Project: Former Circuit City Store

Client: Benderson Development, LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-4

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
1		Subbase - 6"	0.9								
2		Brown silty CLAY with rock fragments, sand, and brick fragments (FILL)		S-1	SS	1.0 - 2.5	3 2 1	0.6			Moist
3											
4				S-2	SS	3.0 - 4.5	5 8 8	1.5			Moist
5											
6											
7				S-3	SS	6.0 - 7.5	12 30 19	1.5			Dry
8											
9		Completely to moderately weathered brown sandy SHALE	8.5								
10				S-4	SS	9.0 - 10.5	11 16 11	1.5			Dry
11											
12											
13				S-5	SS	12.0 - 13.5	6 11 29	1.5			Dry
14											
15				S-6	SS	15.0 - 15.4	50-5"	0.4			Dry
16		Very soft to medium, very broken to broken, brown sandy SHALE RQD=0%	15.4								
17											
18				R-1	Core	15.4 - 20.4		3.8			
19											
20											
21		End of Test Boring	20.4								

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 14, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 1 of 1

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-5

Elevation: 932 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
1		Subbase - 3"	0.6								
2		Brown silty CLAY with rock fragments (FILL)	1.5	S-1	SS	1.0 - 2.5	3 17 42	0.4			Dry
3				S-2	SS	3.0 - 3.2	50-2"	0.2			Dry
4											
5		Completely to moderately weathered gray shaley SANDSTONE									
6				S-3	SS	6.0 - 6.1	50-1"	0.1			Dry
7											
8											
9				S-4	SS	9.0 - 9.1	50-1"	0.1			Dry
		End of Test Boring	9.1								0 Hr.- Dry
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 8, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 1 of 1

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-6

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
1		Subbase - 4"	0.6								
2		Dark brown silty CLAY with rock fragments and trace sand (FILL)	2.5	S-1	SS	1.0 - 2.5	2 4 5	1.5			Moist
3							7				
4				S-2	SS	3.0 - 4.2	47 50-2"	1.2			0 Hr.- 3.2' Dry
5		Highly to moderately weathered gray shaley SANDSTONE									
6				S-3	SS	6.0 - 6.1	50-1"	0.1			Dry
7											
8											
9			9.1	S-4	SS	9.0 - 9.1	50-1"	0.1			Dry
10											
11		Hard, very broken to massive, gray SANDSTONE RQD=18%									
12				R-1	Core	9.1 - 14.1		5.0			
13											
14											
		End of Test Boring	14.1								
15											
16											
17											
18											
19											
20											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 8, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 1 of 1

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-7

Elevation: 930 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
		Subbase - 7"	0.9								
1–5		Brown silty CLAY with rock fragments and sand (FILL)		S-1	SS	1.0 - 2.5	2 5 6	1.5			Moist
				S-2	SS	3.0 - 4.5	5 5 9	1.5			Moist
6–8		Red silty CLAY with rock fragments (FILL)	5.5	S-3	SS	6.0 - 7.5	3 2 4	1.5			Moist
9–15		Moderately weathered gray shaley SANDSTONE	8.5	S-4	SS	9.0 - 9.2	50-2"	0.2			Dry
				S-5	SS	12.0 - 12.1	50-1"	0.1			Dry
				S-6	SS	15.0 - 15.2	50-2"	0.2			Dry
16–20		End of Test Boring	15.2								0 Hr.- Dry

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 1 of 1

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-8

Elevation: 931 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
0		Ground Surface									
		Asphalt - 4"	0.0								
1		Subbase - 5"	0.8								
2		Brown and gray silty CLAY with rock fragments (FILL)		S-1	SS	1.0 - 2.5	1 2 5	1.5			Moist
3											
4				S-2	SS	3.0 - 4.5	9 12 14	1.5		*	0 Hr.- 3.3' Moist
5											
6			5.5								
7				S-3	SS	6.0 - 7.5	6 7 7	1.5			Moist
8											
9		Red and brown silty CLAY with rock fragments and trace sand (FILL)									
10				S-4	SS	9.0 - 10.5	6 5 3	1.5			Moist
11											
12											
13				S-5	SS	12.0 - 13.5	7 3 4	1.3			Moist
14											
15		Firm brown silty CLAY with rock fragments and trace sand (CL)	14.5								
16				S-6	SS	15.0 - 16.5	3 3 4	1.5			Moist
17											
18			17.5								
19				S-7	SS	18.0 - 19.5	25 24 33	1.5			Moist
20											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 1 of 2

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-8

Elevation: 931 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft 10 30 50	Water Level	Remarks
21		Completely to highly weathered brown sandy SHALE		S-8	SS	21.0 - 22.1	35 43 50-1"	1.1			Dry
22											
23											
24				S-9	SS	24.0 - 24.4	50-5"	0.4			Dry
25			24.4								
26		Very soft to medium, very broken to broken, brown carbonaceous SHALE RQD=0%									
27				R-1	Core	24.4 - 29.4		5.0			
28											
29											
30		End of Test Boring	29.4								
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 2 of 2

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-9

Elevation: 932 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
0		Ground Surface									
		Asphalt - 4"	0.0								
1		Subbase - 4"	0.7								
2		Brown and red silty CLAY with rock fragments and trace sand (FILL)		S-1	SS	1.0 - 2.5	7 4 6	1.5			Moist
3											
4				S-2	SS	3.0 - 4.5	3 8 19	1.5			Moist
5											
6		Brown silty CLAY with rock fragments and trace sand (FILL)	5.5								
7				S-3	SS	6.0 - 7.5	10 9 12	1.5			Moist
8											
9		Brown and red silty CLAY with rock fragments and sand (FILL)	8.5								
10				S-4	SS	9.0 - 10.5	9 8 6	1.5			Moist
11											
12											
13				S-5	SS	12.0 - 13.5	4 4 2	1.5			Moist
14											
15											
16				S-6	SS	15.0 - 16.5	3 4 4	1.5			Moist
17											
18			17.5								
19				S-7	SS	18.0 - 19.5	9 5 8	1.5			Moist
20											0 Hr.- 20.1'

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 1 of 3

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-9

Elevation: 932 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
21		Dark gray silty CLAY with rock fragments, sand, and brick fragments (FILL)									
22				S-8	SS	21.0 - 22.5	5 5 4	1.5			Moist
23											
24			23.5								
25				S-9	SS	24.0 - 25.5	2 3 5	1.5			Moist
26											
27											
28				S-10	SS	27.0 - 28.5	2 2 4	1.5			Moist
29											
30											
31				S-11	SS	30.0 - 31.5	2 3 4	1.5			Moist
32											
33		Brown silty CLAY with rock fragments and sand (FILL)									
34				S-12	SS	33.0 - 34.5	3 6 7	1.5			Moist
35											
36											
37				S-13	SS	36.0 - 37.5	3 4 4	1.5			Moist
38											
39											
40				S-14	SS	39.0 - 40.5	3 4 6	0.7			Moist

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 2 of 3

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-9

Elevation: 932 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
41							6				
42											
43				S-15	SS	42.0 - 43.5	4 4 3	0.3			Moist
44											
45		Gray silty CLAY with rock fragments and sand (FILL)	44.5								
46				S-16	SS	45.0 - 46.5	10 6 10	1.0			Wet
47											
48			47.5								
49		?		S-17	SS	48.0 - 49.5	4 5 5	1.5			Wet
50											
51		Brown silty CLAY with rock fragments (FILL)									
52				S-18	SS	51.0 - 52.5	9 13 16	1.2			Wet
53											
54											
55				S-19	SS	54.0 - 55.5	13 12 13	1.5			Wet
56		Very stiff brown shaley CLAY (CL)	55.0	S-20	SS	55.5 - 57.0	20 17 9	0.6			Moist
57											
58		Completely weathered brown SHALE	58.0	S-21	SS	57.0 - 58.5	10 12 41	1.5			Moist
59			58.5								
60		End of Test Boring									

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 5, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Cloudy

Sheet: 3 of 3

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-10

Elevation: 938 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
0		Ground Surface									
		Asphalt - 4" Subbase - 6"	0.0								
1			0.9								
2		Brown silty CLAY with rock fragments and sand (FILL)		S-1	SS	1.0 - 2.5	7 5 7	1.1			Moist
3											
4				S-2	SS	3.0 - 4.5	5 13 5	1.5			Moist
5										▼	0 Hr.- 5.0'
6			5.5								
7		Completely weathered brown sandy SHALE		S-3	SS	6.0 - 7.5	4 18 32	1.5			Dry
8											
9		Moderately weathered gray SANDSTONE	8.5	S-4	SS	9.0 - 9.2	50-2"	0.2			Dry
10			9.2								
11		Hard, very broken to *broken, gray* SANDSTONE RQD=0%									
12				R-1	Core	9.2 - 14.2		5.0			
13											
14											
15		End of Test Boring	14.2								
16											
17											
18											
19											
20											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 8, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 1 of 1

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

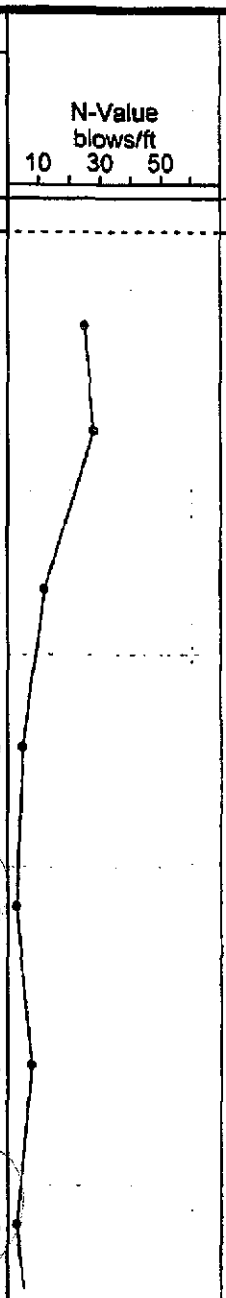
ACA Engineering, Inc.

Borehole #: B-11

Elevation: 936 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
		Ground Surface									
0		Asphalt - 4"	0.0								
1		Subbase - 3"	0.6								
2		Brown and gray rock fragments and sand, little silt and clay (FILL)		S-1	SS	1.0 - 2.5	7 10 15	1.5			Dry
3											
4				S-2	SS	3.0 - 4.5	11 13 15	1.5			Dry
5											
6		Brown silty CLAY with rock fragments and trace sand (FILL)	5.5								
7				S-3	SS	6.0 - 7.5	4 6 6	1.5			Moist
8											
9											
10				S-4	SS	9.0 - 10.5	4 3 2	0.9			Moist
11											
12											
13				S-5	SS	12.0 - 13.5	2 1 2	0.6			Moist
14											
15											
16				S-6	SS	15.0 - 16.5	3 4 4	0.4			Wet
17											
18		Gray silty CLAY with trace rock fragments, trace organics, and wood (FILL)	17.5								
19				S-7	SS	18.0 - 19.5	3 1 2	1.5			Wet
20											



Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 8, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
Fax: (412) 761-1998

Hole Size: 7"

Weather: Clear

Sheet: 1 of 2

Project No: P10204x10

Project: Former Circuit City Store

Client: Benderson Development Co., LLC

Location: Monroeville, PA

ACA Engineering, Inc.

Borehole #: B-11

Elevation: 936 +/-

Engineer/Geologist: J. Mastren-Williams

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth	Number	Type	Sample Depth	Blows/ft	Recovery	N-Value blows/ft (10 30 50)	Water Level	Remarks
21		Stiff brown and gray silty CLAY with rock fragments and trace sand (CL)	20.5	S-8	SS	21.0 - 22.5	2 4 5	1.5			Moist
22											
23											
24		Completely weathered brown sandy carbonaceous SHALE	23.5	S-9	SS	24.0 - 24.6	32 50-1"	0.6			Dry
25		End of Test Boring	24.6								0 Hr.- Dry
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

Drilled By: Test Boring Services, Inc.

Drill Method: Hollow Stem Auger

Drill Date: November 8, 2010

ACA Engineering, Inc.
40 Western Avenue
Pittsburgh, PA 15202
Phone: (412) 761-1990
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Hole Size: 7"

Weather: Clear

Sheet: 2 of 2

BORING LOG LEGEND

Symbols

- Topsoil
- Pavement / Subbase
- Fill Material
- Shale
- Water Level
- Clay (CL)
- Silt (ML)
- Claystone
- Siltstone
- Sand / Sandstone (SW, SP, SM, SC)
- Gravel/Rock Fragments (GW, GP, GM, GC)
- Limestone
- Coal

Abbreviations

SS - Split spoon sampling
S-1 - Sample number
woh - Weight of hammer
RQD - Rock quality designation
Core - Rock core sampling
R-1 - Rock core run number
0 hrs. - Time of water level reading after completion of drilling

Definitions

Rock Quality Designation (RQD)
These values are expressed in percent for each run recorded on the test boring logs. They reflect the quality and fracture spacing of the rock and are calculated as a summation of all unbroken core samples of four (4) inches or more in length divided by the total length of each coring interval.

SOIL CLASSIFICATION CHART - ASTM D2487

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVEL More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines	GW	Well graded gravel.
			GP	Poorly graded gravel.
		GRAVELS WITH FINES More than 12% fines	GM	Silty gravel.
			GC	Clayey gravel.
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS Less than 5% fines	SW	Well graded sand.
			SP	Poorly graded sand.
		SAND WITH FINES More than 12% fines	SM	Silty sand.
			SC	Clayey sand.
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit < 50	Inorganic	ML	Silt.
			CL	Lean clay.
		Organic	OL	Organic silt and organic clay of low plasticity.
	SILTS AND CLAYS Liquid Limit > 50	Inorganic	MH	Elastic silt.
			CH	Fat clay.
		Organic	OH	Organic silt and organic clay of high plasticity.
HIGHLY ORGANIC SOILS		Primarily organic matter, dark in color, and organic odor.	PT	Peat.

COMPONENT		SIZE
BOULDERS		Larger than 12"
COBBLES		12" to 3"
GRAVEL	COARSE	3" to 3/4"
	FINE	3/4" to 4.75MM (3/4" to #4 sieve)
SAND	COARSE	4.75MM to 2.0MM (#4 to #10 sieve)
	MEDIUM	2.0MM to 0.425MM (#10 to #40 sieve)
	FINE	0.425MM to 0.075MM (#40 to #200 sieve)
SILT (inorganic silt) (rock flour)		0.075MM to 0.005MM (#200 to 0.005MM) Material passing the #200 (75-µm) U.S. standard sieve that is not plastic or very slightly plastic and that exhibits little or no strength when air-dry.
CLAY (clay soil)		Smaller than 0.005MM Fine-grained soil or the fine-grained portion of soil that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when air-dry.

TERMS	RANGE
Trace	0 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassiciatespc.com

APPENDIX A.2

TEST BORING LOGS BY B&A/BDC

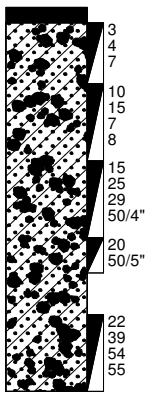
BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-101

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	945.5
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
945 – 0				Asphalt (5")
	S-1 : 0.4'- 2.0'	11	30	Brown, stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till) *(Material may have been reworked.)*
	S-2 : 2.0'- 4.0'	22	35	...grade: v. stiff
940 – 5	S-3 : 4.0'- 6.0'	54	80	...grade: hard
	S-4 : 6.0'- 6.9'	50+	80	Same as S-3
	S-5 : 8.0'- 10.0'	93	90	Same as S-3
935 – 10				Depth to Bottom of Hole: 10.0 feet
930 – 15				
925 – 20				
920 – 25				
915 – 30				
910 – 35				

Logged by: B. Smith

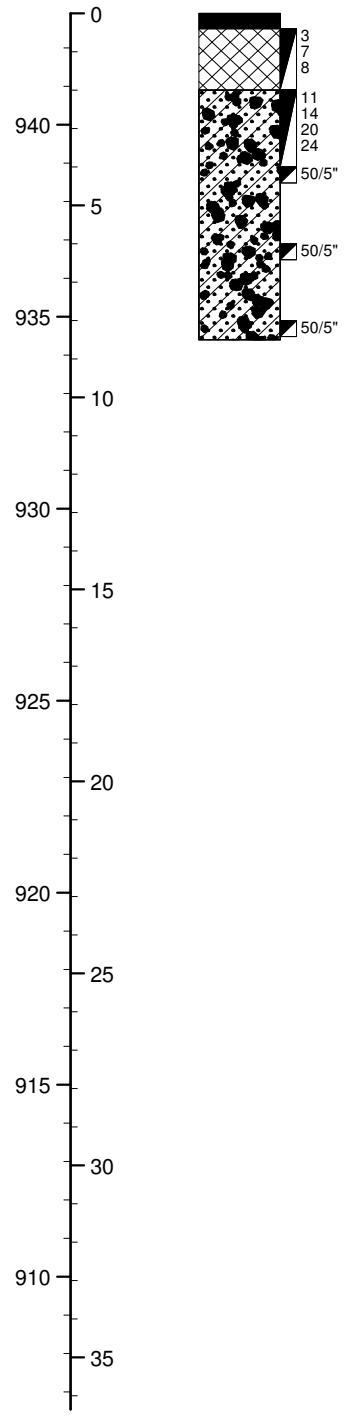
BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-102

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	942.9
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (5")
S-1 : 0.4'- 2.0'	15	40	Grayish brown, loose f/c Sand, some Gravel, little Silt, tr. Slag, moist (SW-SM-Fill)
S-2 : 2.0'- 4.0'	34	50	Brown, hard CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-3 : 4.0'- 4.4'	50+	100	Same as S-2
S-4 : 6.0'- 6.4'	50+	100	Same as S-2
S-5 : 8.0'- 8.4'	50+	100	Same as S-2

Depth to Bottom of Hole: 8.5 feet

Logged by: B. Smith

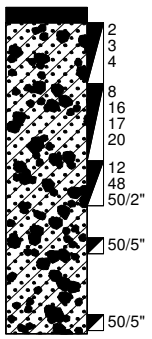
BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-103

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	940.4
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
940 – 0				Asphalt (5")
	S-1 : 0.4'- 2.0'	7	35	Brown, m. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till) *(Material may have been reworked.)*
	S-2 : 2.0'- 4.0'	33	55	...grade: hard
935 – 5	S-3 : 4.0'- 5.2'	98+	75	Same as S-2
	S-4 : 6.0'- 6.4'	50+	40	Same as S-2
	S-5 : 8.0'- 8.4'	50+	50	Same as S-2
930 – 10				Depth to Bottom of Hole: 8.5 feet
925 – 15				
920 – 20				
915 – 25				
910 – 30				
905 – 35				

Logged by: B. Smith

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

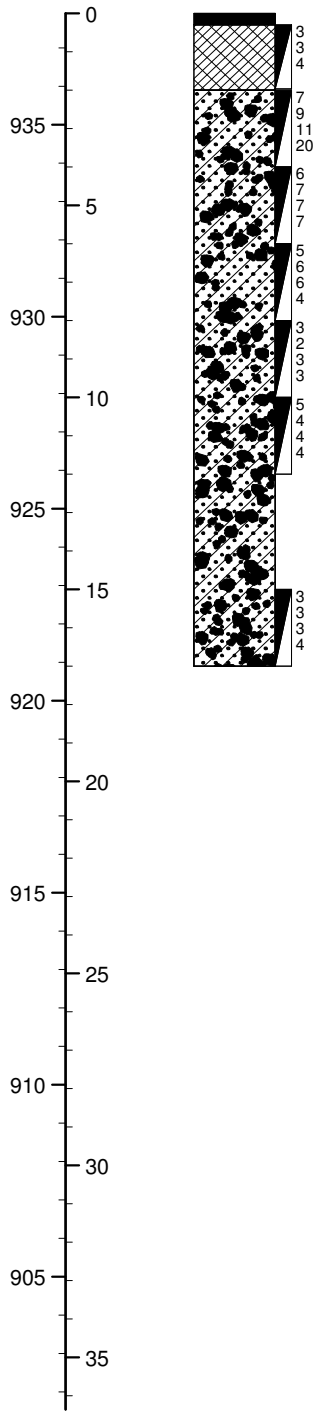
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-104

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	937.9
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None

Elevation/ Depth (feet) | Soil Symbols Sampler Symbols Field Test Data



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (4")
S-1 : 0.3'- 2.0'	7	30	Brown, m. stiff Clay, some Silt, little Gravel, little f/c Sand, tr. Slag, mod. plastic, moist (CL-Fill)
S-2 : 2.0'- 4.0'	20	75	Brown, v. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-3 : 4.0'- 6.0'	14	50	...grade: stiff
S-4 : 6.0'- 8.0'	12	30	Same as S-3
S-5 : 8.0'- 10.0'	5	30	...grade: m. stiff
S-6 : 10.0'- 12.0'	8	40	Same as S-5
S-7 : 15.0'- 17.0'	6	50	Same as S-5

Depth to Bottom of Hole: 17.0 feet

Logged by: B. Smith

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

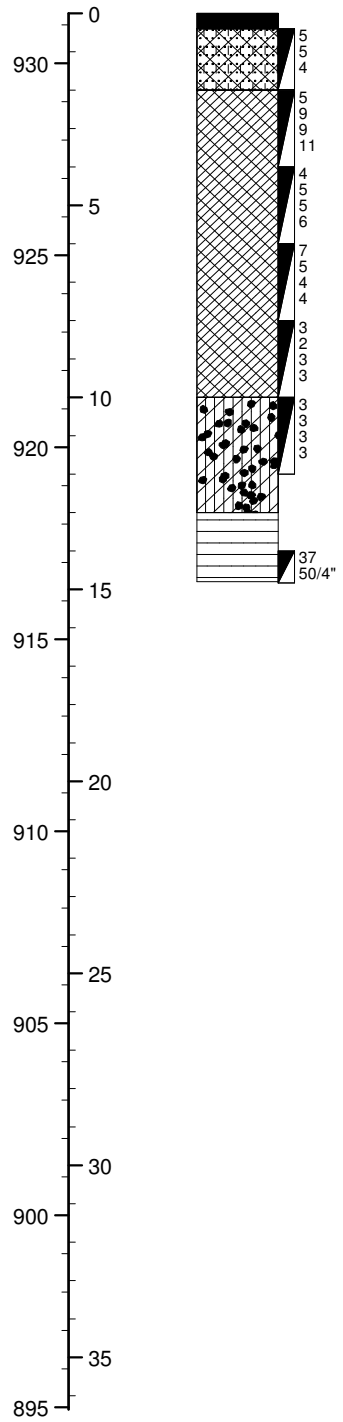
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-105

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	931.3
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None

Elevation/ Depth (feet) | Soil Symbols Sampler Symbols Field Test Data



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (5")
S-1 : 0.4'- 2.0'	9	50	Grayish brown, loose f/c Sand, some Gravel, little Silt, moist (SW-SM-Fill)
S-2 : 2.0'- 4.0'	18	75	Brown, v. stiff Clay, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Fill)
S-3 : 4.0'- 6.0'	10	50	...grade: stiff
S-4 : 6.0'- 8.0'	9	65	...grade: tr. Slag
S-5 : 8.0'- 10.0'	5	40	...grade: m. stiff
S-6 : 10.0'- 12.0'	6	40	Brown, m. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till) *(Material may have been reworked.)*
S-7 : 14.0'- 14.8'	50+	80	Gray, v. dense Sand to gravel sized WEATHERED SHALE fragments, moist (WEATHERED SHALE)

Depth to Bottom of Hole: 14.8 feet

Logged by: B. Smith

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

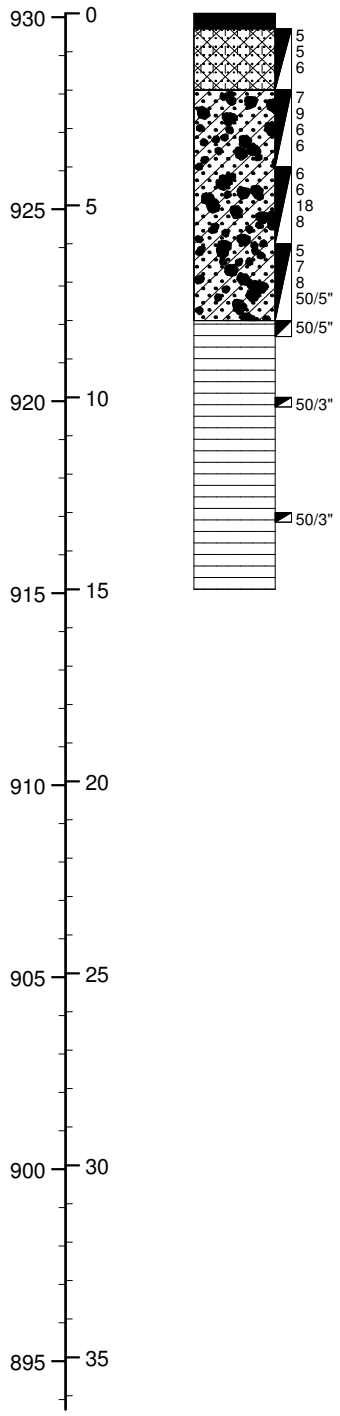
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-106

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	930.1
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None

Elevation/ Depth (feet) | Soil Symbols Sampler Symbols Field Test Data



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (5")
S-1 : 0.4'- 2.0'	11	40	Grayish brown, m. dense f/c Sand, some Gravel, little Silt, tr. Slag, moist (SW-SM-Fill)
S-2 : 2.0'- 4.0'	15	25	Brown, v. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-3 : 4.0'- 6.0'	24	55	Same as S-2
S-4 : 6.0'- 8.0'	15	50	Same as S-2
S-5 : 8.0'- 8.4'	50+	50	Gray, v. dense Sand to gravel sized WEATHERED SHALE fragments, moist (WEATHERED SHALE)
S-6 : 10.0'- 10.3'	50+	80	Same as S-5
S-7 : 13.0'- 13.3'	50+	50	Same as S-5

Depth to Bottom of Hole: 15.0 feet

Logged by: B. Smith

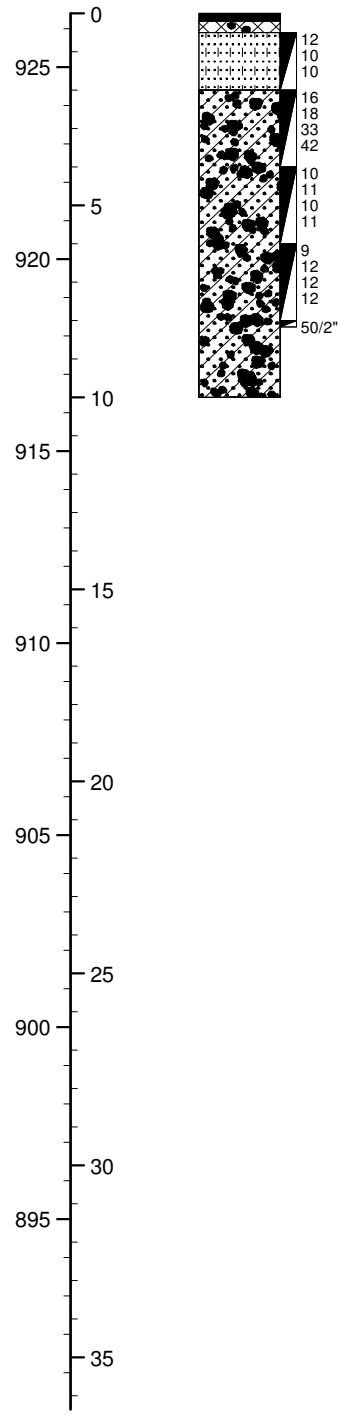
BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-107

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/7/14	**SURFACE ELEVATION (ft.):**	926.4
DATE COMPLETED:	3/7/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (3")
			Subbase Gravel (3")
S-1 : 0.5'- 2.0'	20	50	Grayish brown, m. dense f/c SAND, some Gravel, little Silt, moist (SW-SM)
S-2 : 2.0'- 4.0'	51	75	*(Material may have been reworked.)*
			Gary, hard CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-3 : 4.0'- 6.0'	21	50	...grade: v. stiff
S-4 : 6.0'- 8.0'	24	50	Same as S-3
S-5 : 8.0'- 8.2'	50+	0	...grade: hard (No Sample)

Depth to Bottom of Hole: 10.0 feet

Logged by: B. Smith

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CLARENCE, NEW YORK 14031
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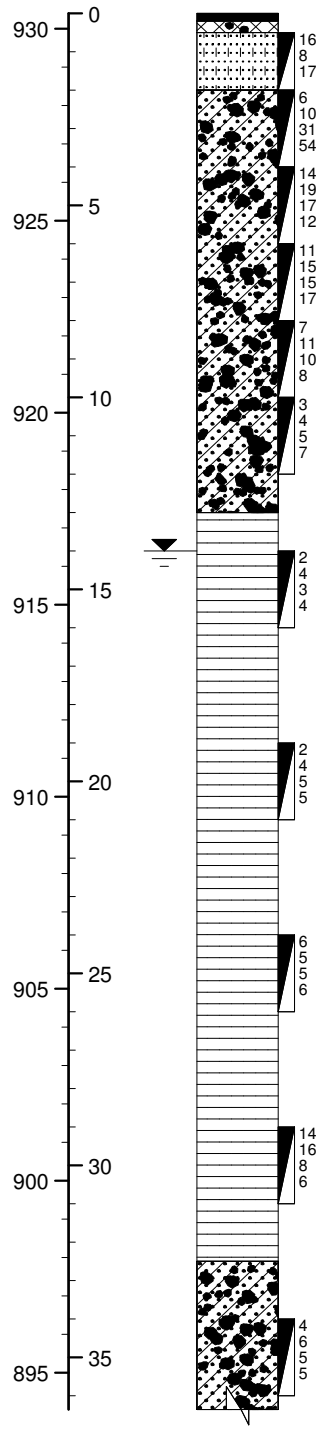
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-109

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/4/14	**SURFACE ELEVATION (ft.):**	930.4
DATE COMPLETED:	3/5/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	14.0



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (3")
			Subbase Gravel (3")
S-1 : 0.5'- 2.0'	25	35	Grayish brown, m. dense f/c SAND, some Gravel, little Silt, moist (SW-SM)
S-2 : 2.0'- 4.0'	41	75	*(Material may have been reworked.)*
			Brown, hard CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-3 : 4.0'- 6.0'	36	60	Same as S-2
S-4 : 6.0'- 8.0'	30	60	...grade: v. stiff
S-5 : 8.0'- 10.0'	21	60	Same as S-4
S-6 : 10.0'- 12.0'	9	50	...grade: stiff
S-7 : 14.0'- 16.0'	7	70	Dk. gray, loose Sand to gravel sized WEATHERED SHALE fragments, moist (WEATHERED SHALE)
S-8 : 19.0'- 21.0'	9	50	Same as S-7
S-9 : 24.0'- 26.0'	10	50	...grade: m. dense
S-10 : 29.0'- 31.0'	24	45	Same as S-9
S-11 : 34.0'- 36.0'	11	60	Brown, stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, wet (CL-Till)

Logged by: B. Smith

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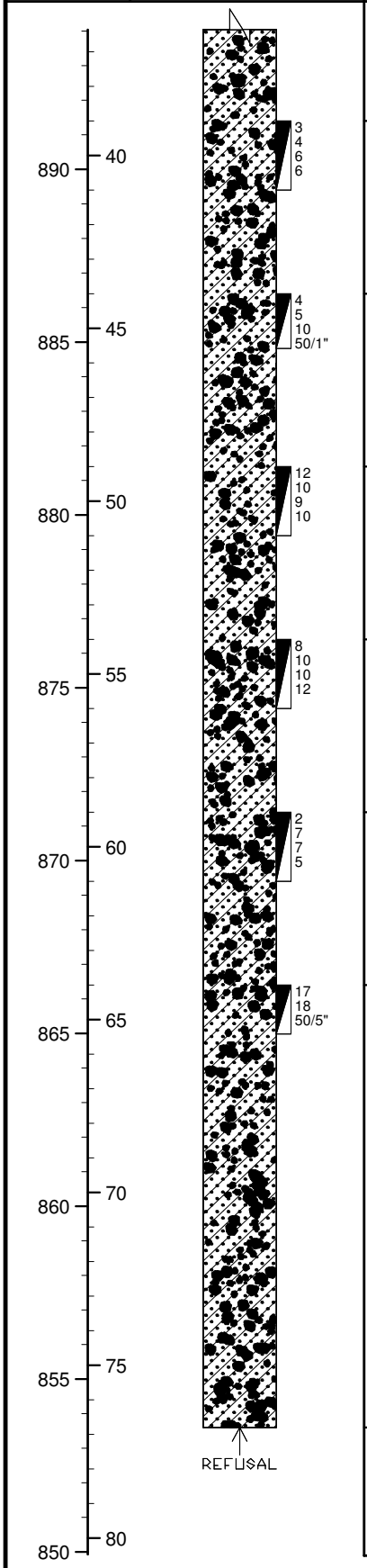
TEST BORING LOG (CONTINUATION)

JOB No.: 14-523 **BORING No.:** B-109

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
S-12 : 39.0'- 41.0'	10	50	Same as S-11
S-13 : 44.0'- 45.6'	15	50	...grade: v. stiff, moist
S-14 : 49.0'- 51.0'	19	5	Same as S-13
S-15 : 54.0'- 56.0'	20	25	...grade: wet
S-16 : 59.0'- 61.0'	14	30	...grade: stiff, tr. Gravel, tr. f/c Sand
S-17 : 64.0'- 65.4'	68+	80	...grade: hard
			Depth to Bottom of Hole: 76.8 feet

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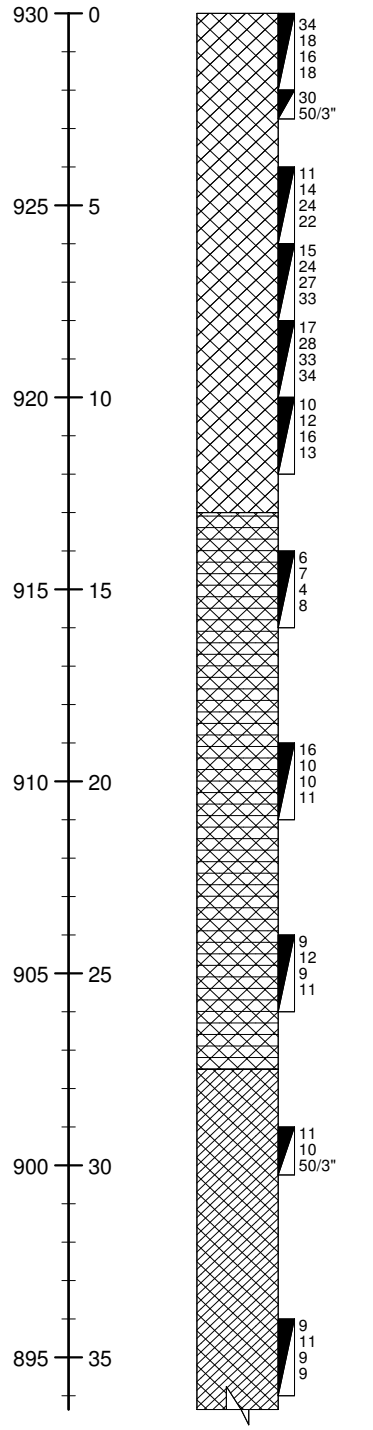
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-110

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/6/14	**SURFACE ELEVATION (ft.):**	930.0
DATE COMPLETED:	3/6/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
		S-1 : 0.0'- 2.0'	34	30	Brown, hard Clay, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Fill)
		S-2 : 2.0'- 2.8'	50+	40	Same as S-1
		S-3 : 4.0'- 6.0'	38	40	Same as S-1
		S-4 : 6.0'- 8.0'	51	30	...grade: Red/brown
		S-5 : 8.0'- 10.0'	61	35	...grade: Gray
		S-6 : 10.0'- 12.0'	28	40	...grade: v. stiff, little Slag
		S-7 : 14.0'- 16.0'	11	30	Gray, m. dense sand to gravel sized Weathered Shale fragments, moist (Weathered Shale-Fill)
		S-8 : 19.0'- 21.0'	20	45	Same as S-7
		S-9 : 24.0'- 26.0'	21	40	Same as S-7
		S-10 : 29.0'- 30.3'	60+	75	Grayish brown, hard Clay, some Silt, little f/c Sand, little Gravel, tr. Construction lumber, mod. plastic, moist (CL-Fill)
		S-11 : 34.0'- 36.0'	20	20	...grade: v. stiff

Logged by: B. Smith

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TEST BORING LOG (CONTINUATION)

JOB No.: 14-523 **BORING No.:** B-110

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
890 — 40	10 4 3 2	S-12 : 39.0'- 41.0'	7	25	...grade: m. stiff, tr. Brick
885 — 45	50/5"	S-13 : 44.0'- 44.4'	50+	50	...grade: hard
880 — 50	36 20 10 15	S-14 : 49.0'- 51.0'	30	50	...grade: v. stiff
					Depth to Bottom of Hole: 51.0 feet
875 — 55					
870 — 60					
865 — 65					
860 — 70					
855 — 75					
850 — 80					

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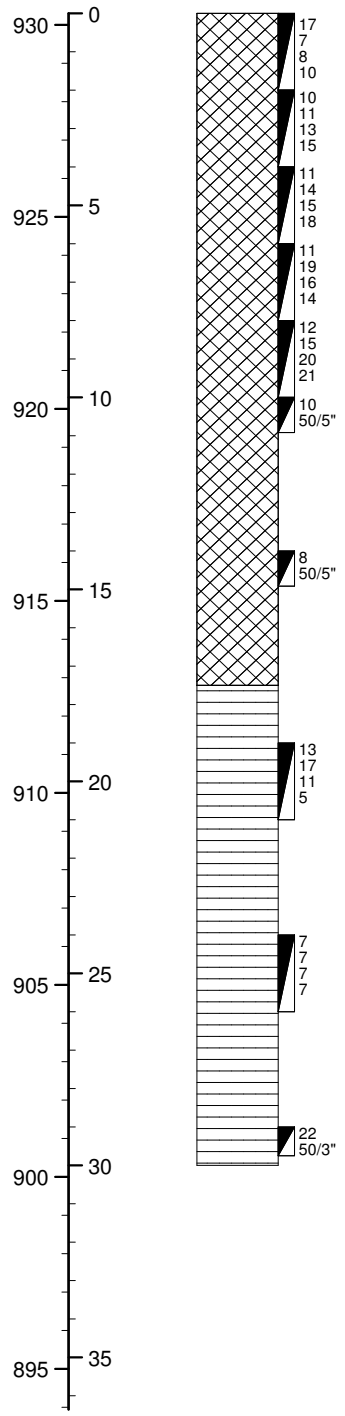
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-111

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/5/14	**SURFACE ELEVATION (ft.):**	930.3
DATE COMPLETED:	3/5/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
		S-1 : 0.0'- 2.0'	15	30	Brown, v. stiff Clay, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Fill)
		S-2 : 2.0'- 4.0'	24	50	Same as S-1
		S-3 : 4.0'- 6.0'	29	40	Same as S-1
		S-4 : 6.0'- 8.0'	35	50	...grade: hard
		S-5 : 8.0'- 10.0'	35	40	Same as S-4
		S-6 : 10.0'- 10.9'	50+	70	Same as S-4
		S-7 : 14.0'- 14.9'	50+	80	...grade: tr. Brick, tr. Slag
		S-8 : 19.0'- 21.0'	28	40	Gray, m. dense Sand to gravel sized WEATHERED SHALE fragments, moist (WEATHERED SHALE)
		S-9 : 24.0'- 26.0'	14	45	...grade: Brown
		S-10 : 29.0'- 29.8'	50+	80	...grade: v. dense
					Depth to Bottom of Hole: 30.0 feet

Logged by: B. Smith

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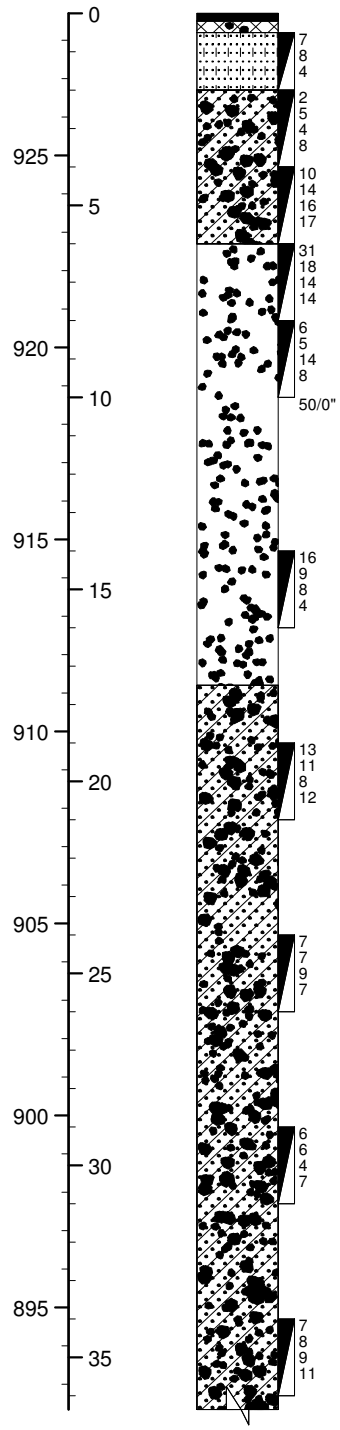
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-112

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/7/14	**SURFACE ELEVATION (ft.):**	928.7
DATE COMPLETED:	3/7/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
				Asphalt (3")
				Subbase Gravel (3")
	S-1 : 0.5'- 2.0'	12	40	Grayish brown, m. dense f/c SAND, some Gravel, little Silt, moist (SW-SM)
	S-2 : 2.0'- 4.0'	9	50	*(Material may have been reworked.)*
				Brown, stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
	S-3 : 4.0'- 6.0'	30	50	...grade: v. stiff
	S-4 : 6.0'- 8.0'	32	25	Gray, dense Sand to gravel sized ROCK fragments, tr. Silt, (GP)
	S-5 : 8.0'- 10.0'	19	30	...grade: m. dense
	S-6 : 10.0'- 10.0'	50+	0	...grade: v. dense (No Sample)
	S-7 : 14.0'- 16.0'	17	25	...grade: m. dense
	S-8 : 19.0'- 21.0'	19	30	Brown, v. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
	S-9 : 24.0'- 26.0'	16	40	Same as S-8
	S-10 : 29.0'- 31.0'	10	40	...grade: stiff
	S-11 : 34.0'- 36.0'	17	20	...grade: v. stiff

Logged by: B. Smith

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TEST BORING LOG (CONTINUATION)

JOB No.: 14-523 **BORING No.:** B-112

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
890					
40	7 9 9 12	S-12 : 39.0'- 41.0'	18	30	Same as S-11
885					
45	8 10 13 15	S-13 : 44.0'- 46.0'	23	40	Same as S-11
880					
50	8 8 11 12	S-14 : 49.0'- 51.0'	19	30	Same as S-11
					Depth to Bottom of Hole: 51.0 feet
875					
55					
870					
60					
865					
65					
860					
70					
855					
75					
850					
80					

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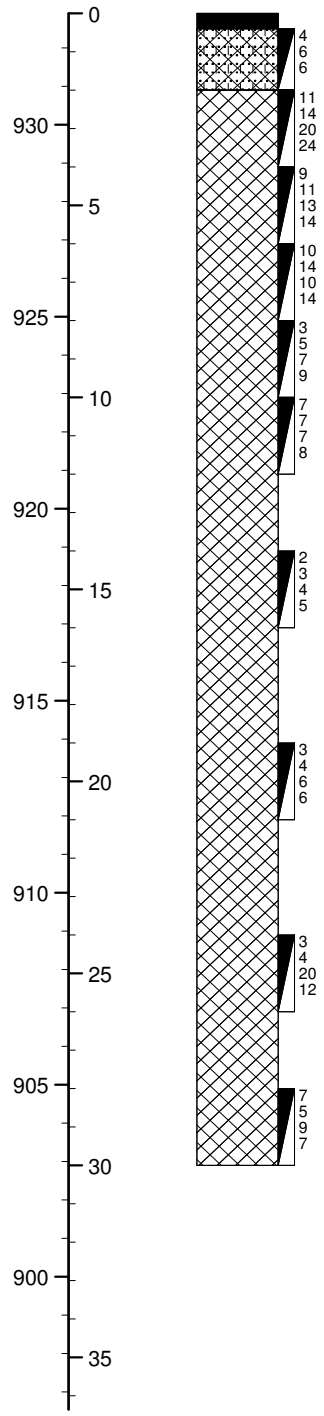
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-113

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/11/14	**SURFACE ELEVATION (ft.):**	932.9
DATE COMPLETED:	3/11/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Asphalt (5")
S-1 : 0.4'- 2.0'	12	35	Grayish brown, m. dense f/c Sand, some Gravel, little Silt, tr. Slag, moist (SW-SM-Fill)
S-2 : 2.0'- 4.0'	34	45	Dk. brown, hard Clay, some Silt, little Gravel, little f/c Sand, tr. Slag, tr. Brick, mod. plastic, moist (CL-Fill)
S-3 : 4.0'- 6.0'	24	60	...grade: v. stiff
S-4 : 6.0'- 8.0'	24	60	Same as S-3
S-5 : 8.0'- 10.0'	12	40	...grade: stiff
S-6 : 10.0'- 12.0'	14	35	Same as S-5
S-7 : 14.0'- 16.0'	7	0	...grade: m. stiff (No Sample)
S-8 : 19.0'- 21.0'	10	20	...grade: stiff
S-9 : 24.0'- 26.0'	24	40	...grade: v. stiff, little Slag
S-10 : 28.0'- 30.0'	14	50	...grade: stiff, tr. Slag
			Depth to Bottom of Hole: 30.0 feet

Logged by: B. Smith

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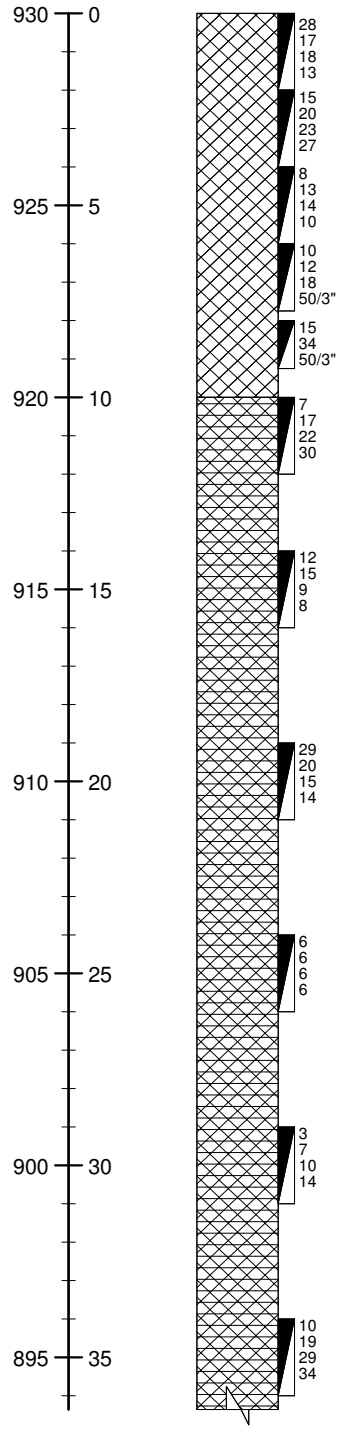
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-114

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/6/14	**SURFACE ELEVATION (ft.):**	930.0
DATE COMPLETED:	3/6/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
930 / 0		S-1 : 0.0'- 2.0'	35	60	Brown, hard Clay, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Fill)
		S-2 : 2.0'- 4.0'	43	25	Same as S-1
925 / 5		S-3 : 4.0'- 6.0'	27	40	...grade: v. stiff
		S-4 : 6.0'- 7.8'	30	35	Same as S-3
		S-5 : 8.0'- 9.3'	84+	30	...grade: hard
920 / 10		S-6 : 10.0'- 12.0'	39	80	Gray, dense sand to gravel sized Weathered Shale fragments, moist (Weathered Shale-Fill)
915 / 15		S-7 : 14.0'- 16.0'	24	40	...grade: m. dense
910 / 20		S-8 : 19.0'- 21.0'	35	75	...grade: dense
905 / 25		S-9 : 24.0'- 26.0'	12	25	...grade: stiff, tr. Brick, tr. Slag, tr. Construction lumber, tr. Clay, non-plastic
900 / 30		S-10 : 29.0'- 31.0'	17	0	...grade: v. stiff (No Sample)
895 / 35		S-11 : 34.0'- 36.0'	48	40	...grade: hard

Logged by: B. Smith

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TEST BORING LOG (CONTINUATION)

JOB No.: 14-523 **BORING No.:** B-114

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
890 — 40	8 9 10 12	S-12 : 39.0'- 41.0'	19	30	...grade: v. stiff
885 — 45	9 15 11 15	S-13 : 44.0'- 46.0'	26	35	Same as S-12
880 — 50	6 9 10 9	S-14 : 49.0'- 51.0'	19	50	Same as S-12
875 — 55	50/2"	S-15 : 54.0'- 54.2'	50+	0	...grade: hard (No Sample)
	50/5"	S-16 : 58.0'- 58.4'	50+	0	Same as S-15 (No Sample)
870 — 60					Depth to Bottom of Hole: 58.3 feet
865 — 65					
860 — 70					
855 — 75					
850 — 80					

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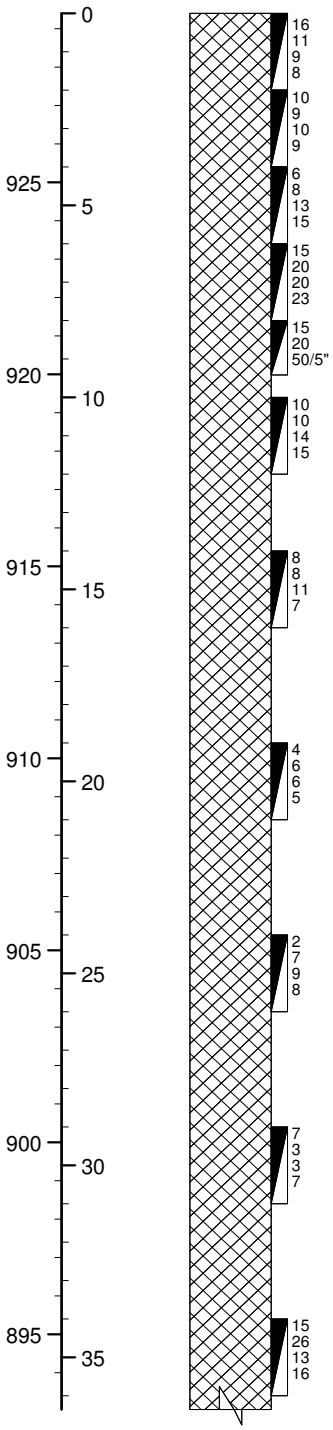
TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-115

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	4 1/4" I.D. H.S.A.
DATE STARTED:	3/5/14	**SURFACE ELEVATION (ft.):**	929.4
DATE COMPLETED:	3/5/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
S-1 : 0.0'- 2.0'	20	60	Brown, v. stiff Clay, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Fill)
S-2 : 2.0'- 4.0'	19	40	...grade: tr. Construction lumber
S-3 : 4.0'- 6.0'	21	50	Same as S-2
S-4 : 6.0'- 8.0'	40	40	...grade: hard
S-5 : 8.0'- 9.4'	70+	60	...grade: tr. Slag
S-6 : 10.0'- 12.0'	24	45	...grade: v. stiff
S-7 : 14.0'- 16.0'	19	60	Same as S-6
S-8 : 19.0'- 21.0'	12	50	...grade: stiff
S-9 : 24.0'- 26.0'	16	0	...grade: v. stiff (No Sample)
S-10 : 29.0'- 31.0'	6	45	...grade: m. stiff, and Gravel
S-11 : 34.0'- 36.0'	39	55	...grade: hard, little Gravel

Logged by: B. Smith

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CLARENCE, NEW YORK 14031
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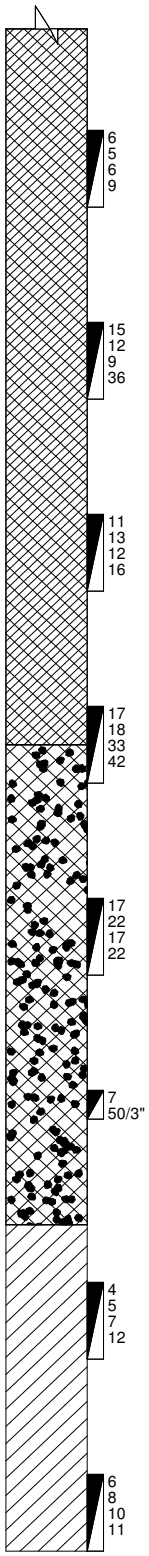
TEST BORING LOG (CONTINUATION)

JOB No.: 14-523 **BORING No.:** B-115

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146



Elevation/ Depth (feet)	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
890 – 40	S-12 : 39.0'- 41.0'	11	45	...grade: stiff
885 – 45	S-13 : 44.0'- 46.0'	21	5	...grade: v. stiff (jar was filled with construction lumber)
880 – 50	S-14 : 49.0'- 51.0'	25	20	Same as S-13
875 – 55	S-15 : 54.0'- 56.0'	51	20	...grade: hard Dk. gray, v. dense f/c Sand and Gravel, little Silt, little Brick, moist (SM/ GM-Fill)
870 – 60	S-16 : 59.0'- 61.0'	39	40	...grade: dense, some Brick
865 – 65	S-17 : 64.0'- 64.8'	50+	40	...grade: v. dense, tr. Brick, wet
860 – 70	S-18 : 69.0'- 71.0'	12	60	Brown, stiff CLAY, some Silt, tr. f/c Sand, tr. Gravel, mod. plastic, moist (CL)
855 – 75	S-19 : 74.0'- 76.0'	18	50	...grade: v. stiff
850 – 80				Depth to Bottom of Hole: 76.0 feet

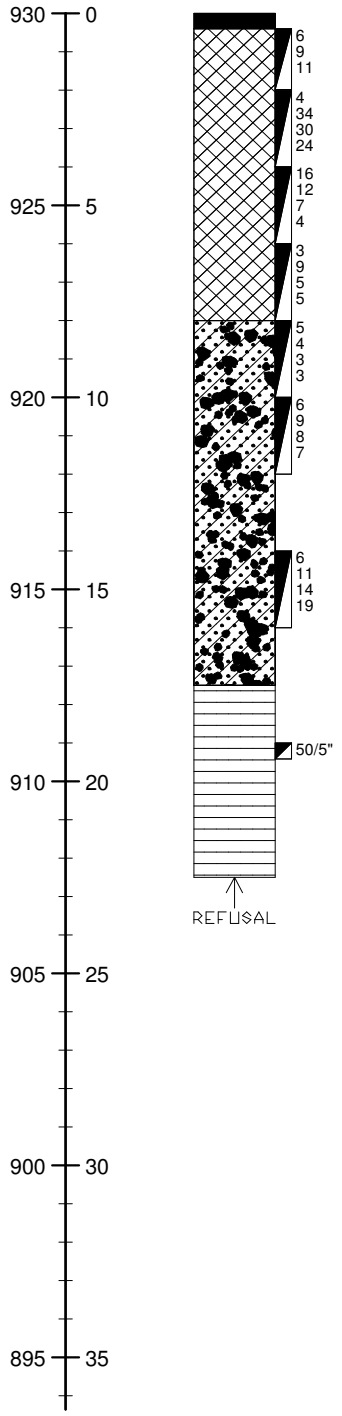
BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN STREET
CLARENCE, NEW YORK 14031
(716) 759-7821 FAX: (716) 759-7823

TEST BORING LOG

JOB No.: 14-523 **BORING No.:** B-116

PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146

DRILLER:	D. Rimbeck	**TYPE OF DRILL RIG:**	Diedrich D-120 (Truck)
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	3/12/14	**SURFACE ELEVATION (ft.):**	930.0
DATE COMPLETED:	3/12/14	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
					Asphalt (5")
		S-1 : 0.4'- 2.0'	20	50	Brown, v. stiff Clay, some Silt, little Gravel, little f/c Sand, tr. Brick, tr. Slag, mod. plastic, moist (CL-Fill)
		S-2 : 2.0'- 4.0'	64	50	...grade: hard
		S-3 : 4.0'- 6.0'	19	50	...grade: v. stiff
		S-4 : 6.0'- 8.0'	14	60	...grade: stiff
		S-5 : 8.0'- 10.0'	7	40	Brown, m. stiff CLAY, some Silt, tr. Gravel, tr. f/c Sand, mod. plastic, moist (CL-Till)
		S-6 : 10.0'- 12.0'	17	45	...grade: v. stiff
		S-7 : 14.0'- 16.0'	25	45	Same as S-6
		S-8 : 19.0'- 19.4'	50+	25	Dk. gray, v. dense Sand to gravel sized WEATHERED SHALE fragments, moist (WEATHERED SHALE)
					Depth to Bottom of Hole: 22.5 feet

Logged by: B. Smith

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BUFFALO DRILLING COMPANY. INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

APPENDIX B

GEOTECHNICAL REFERENCE STANDARDS

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY. INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

APPENDIX C

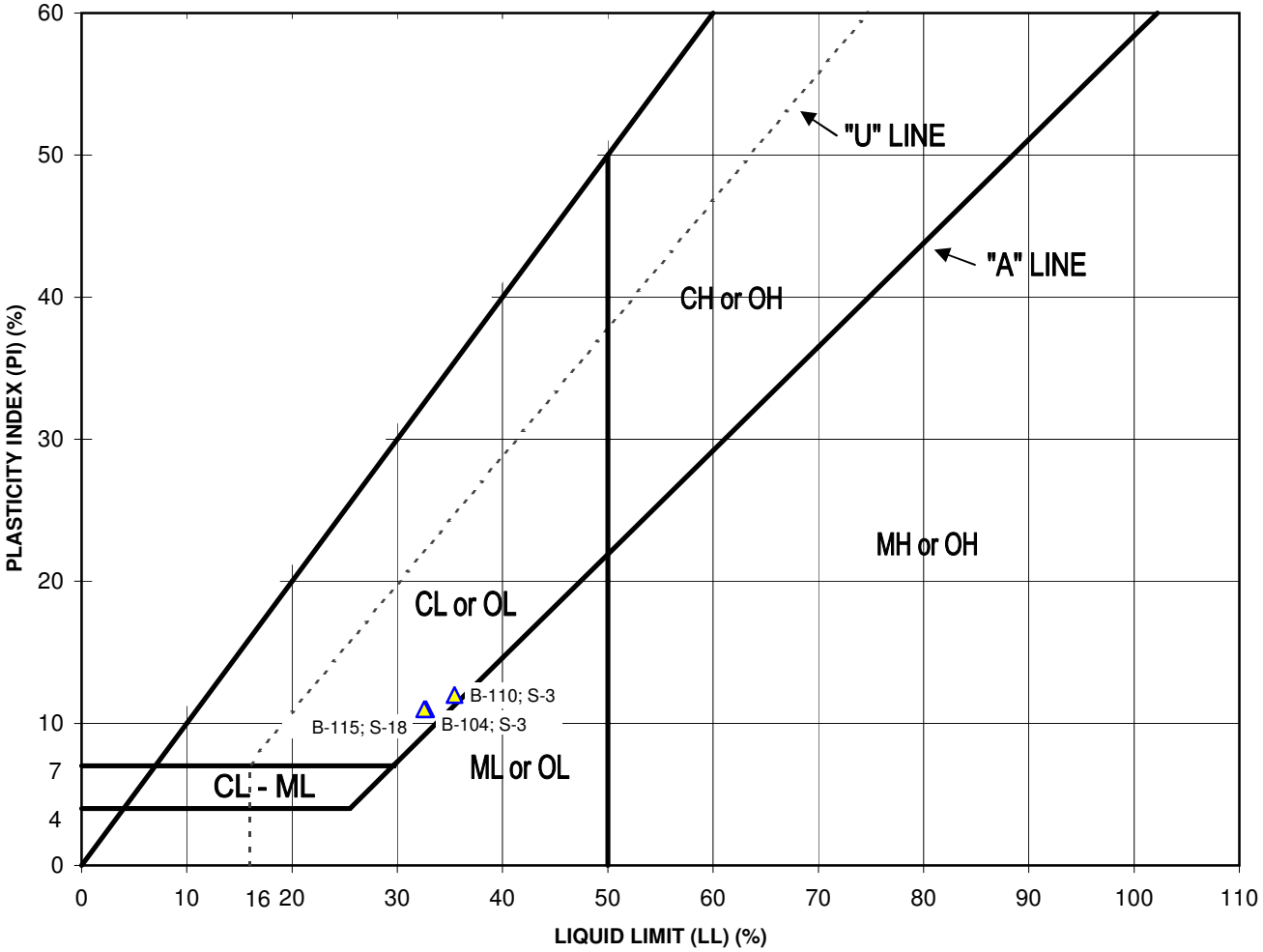
LABORATORY SOIL TEST RESULTS

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

Job No: 14-523
Project: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

Plasticity Chart

ASTM D4318 & D2487



Boring No.	Sample No.	Depth (ft.)	LL (%)	PL (%)	PI (%)
B-104	S-3	4-6	33	22	11
B-110	S-3	4-6	35	23	12
B-115	S-18	69-71	33	22	11

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10440 MAIN ST.
CLARENCE, NY 14031
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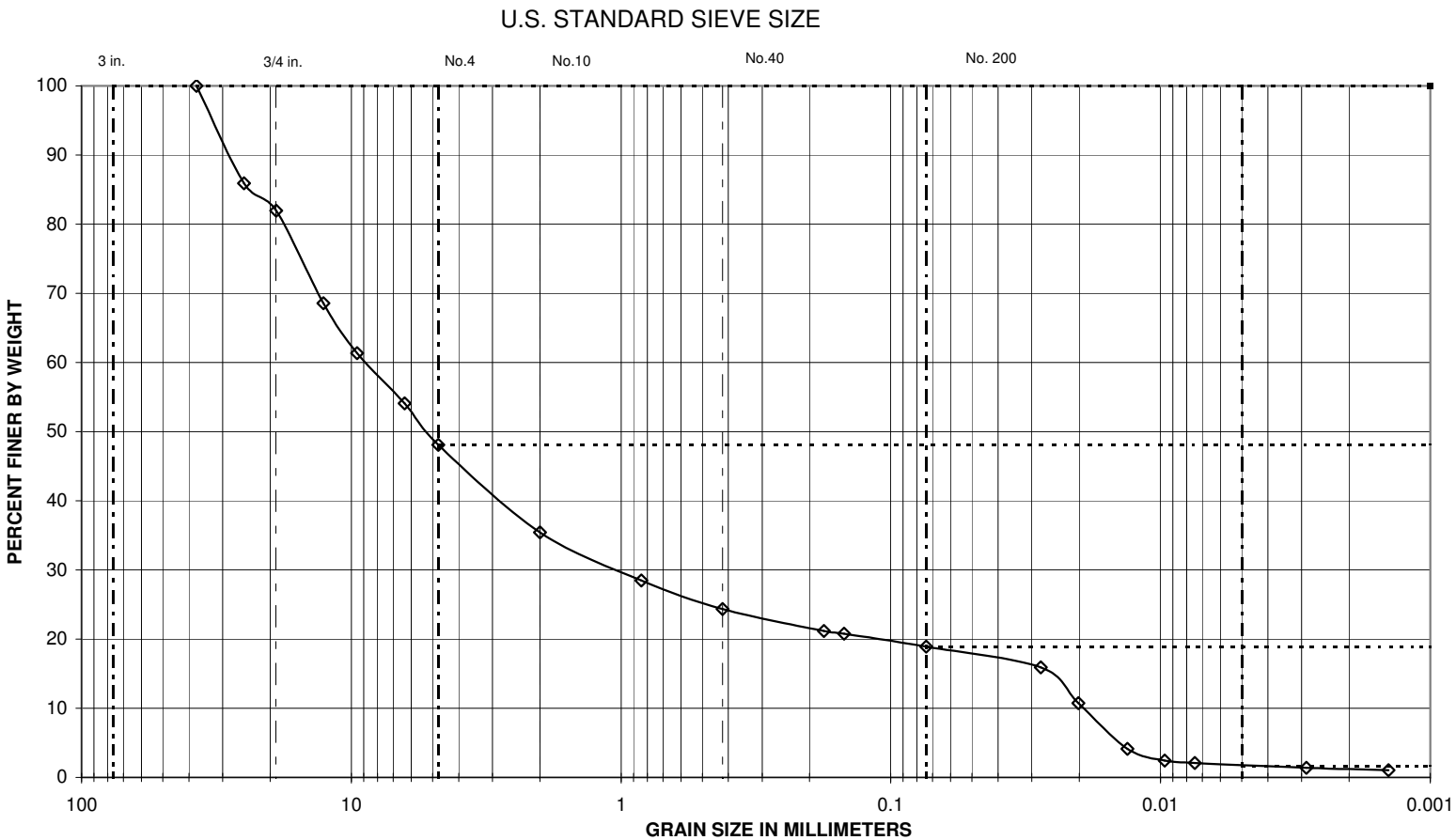
GRAIN SIZE ANALYSIS ASTM D-421/D-422

Job No: 14-523
Project: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

C_C= NA **C_U= NA** **LL= NA** **PL= NA** **PI= NA** **USCS= Weathered Shale-Fill**



51.9 % Gravel

D_{60}= 3.75

29.2 % Sand

D_{30}= 0.175

17.2 % Silt

D_{10}= 0.018

1.7 % Clay

COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

Date Tested: March 27, 2014 **Boring No.: B-110** **Sample No.: S-7 to S-9** **Depth: 14 to 26 ft.**

Note: Sample weight tested was less than required by ASTM D-422. Therefore, this grain size distribution may not accurately represent actual conditions.

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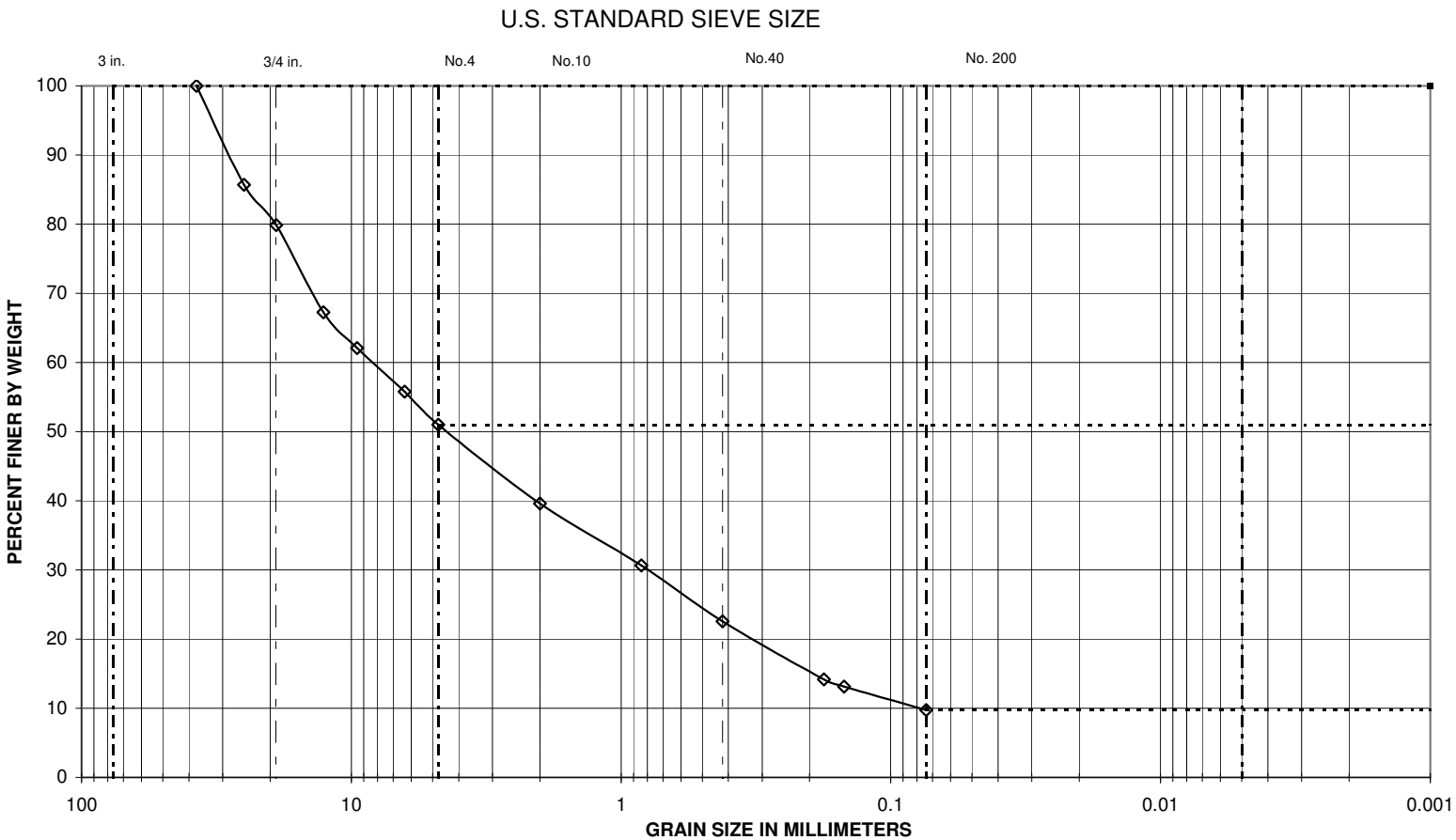
BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

GRAIN SIZE ANALYSIS ASTM D-421/D-422

Job No: 14-523
Project: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

C_C= NA **C_U= NA** **LL= NA** **PL= NA** **PI= NA** **USCS= SM/GM-Fill**



49.0 % Gravel

D_{60}= NA

41.2 % Sand

D_{30}= NA

D_{10}= NA

9.8 % Silt & Clay

COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

Date Tested: March 26, 2014 **Boring No.: B-115** **Sample No.: S-15 to S-17** **Depth: 54 to 64.8 ft.**

Note: Sample weight tested was less than required by ASTM D-422. Therefore, this grain size distribution may not accurately represent actual conditions.

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY, INC.
10440 MAIN ST.
CLARENCE, NY 14031
(716)759-7821
FAX (716)759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

DATA INPUT BY: Andrew J. Camping PAGE: of
B&A JOB NO.: 14-523
CLIENT: Benderson Development Company, LLC
PROJECT: Proposed Retail Plaza
3475 William Penn Highway (U.S. Route 22)
Township of Wilkins, Allegheny Co., PA 15146

Pa.: 2009 INTERNATIONAL BUILDING CODE (IBC), NEHREP 2003/ASCE STD. 2005-7 ACCELERATIONS at 2% IN 50 YEARS CALCULATED BY LATITUDE AND LONGITUDE

Site Latitude (○) = +40.4315

Site Longitude (○) = -78.8052

Seismic Site Class = D

Building/Structure with Shallow Foundation

S_s = 0.2 sec acceleration value for Class B (in g's)

Acceleration Values Below are S_s

LAT. = \ LONG. =	-78.8500	-78.8052	-78.8000
40.4000	0.1902		0.1902
+40.4315	0.1862	0.1858	0.1857
40.4500	0.1838		0.1831

S_1 = 1.0 sec acceleration value for Class B (in g's)

Acceleration Values Below are S_1

LAT. = \ LONG. =	-78.8500	-78.8052	-78.8000
40.4000	0.0491		0.0492
+40.4315	0.0488	0.0489	0.0489
40.4500	0.0487		0.0488

SEISMIC SITE CLASS	Site Coefficient and Design Spectral Response Acceleration Values			
	0.2 Second		1.0 Second	
	F_a	$S_{ds} = 0.6667 * F_a * S_s$	F_v	$S_{d1} = 0.6667 * F_v * S_1$
A	0.8000	0.0991 g	0.8000	0.0261 g
B	1.0000	0.1238 g	1.0000	0.0326 g
C	1.2000	0.1486 g	1.7000	0.0555 g
D	1.6000	0.1982 g	2.4000	0.0783 g
E	2.5000	0.3096 g	3.5000	0.1142 g
F	2.5000	0.3096 g	3.5000	0.1142 g

<<------- USE THESE VALUES FOR SHALLOW FOUNDATIONS

NOTE: F_a and F_v values are linearly interpolated, for the above S_s and S_s values, respectively, within the appropriate range of the mapped spectral response accelerations.
(Gridded data at 0.05 degree increments from: http://earthquake.usgs.gov/hazards/designmaps/javacalc.php)

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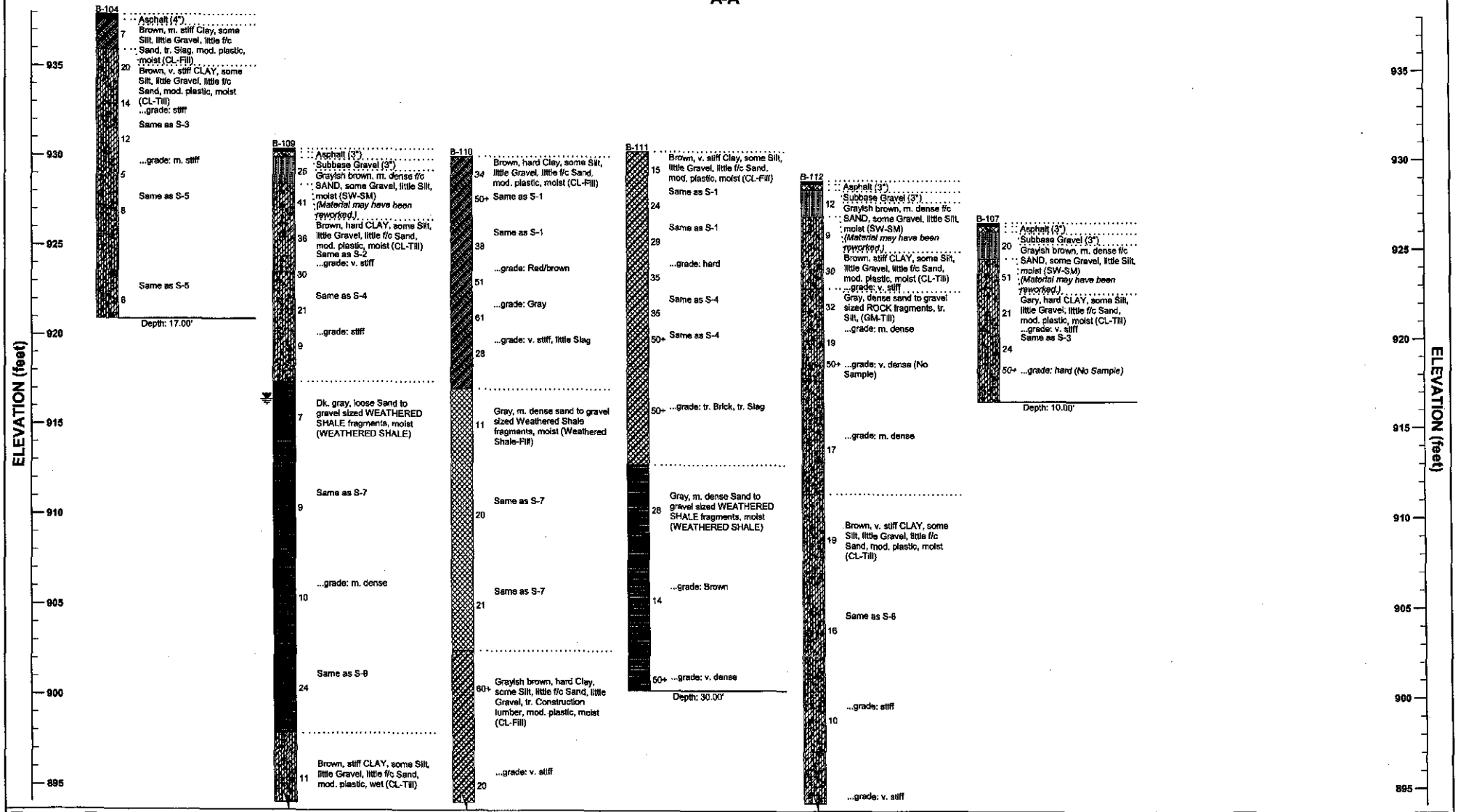
BUFFALO DRILLING COMPANY. INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

APPENDIX D

ENGINEERING COMPUTATIONS AND SCHEMATICS

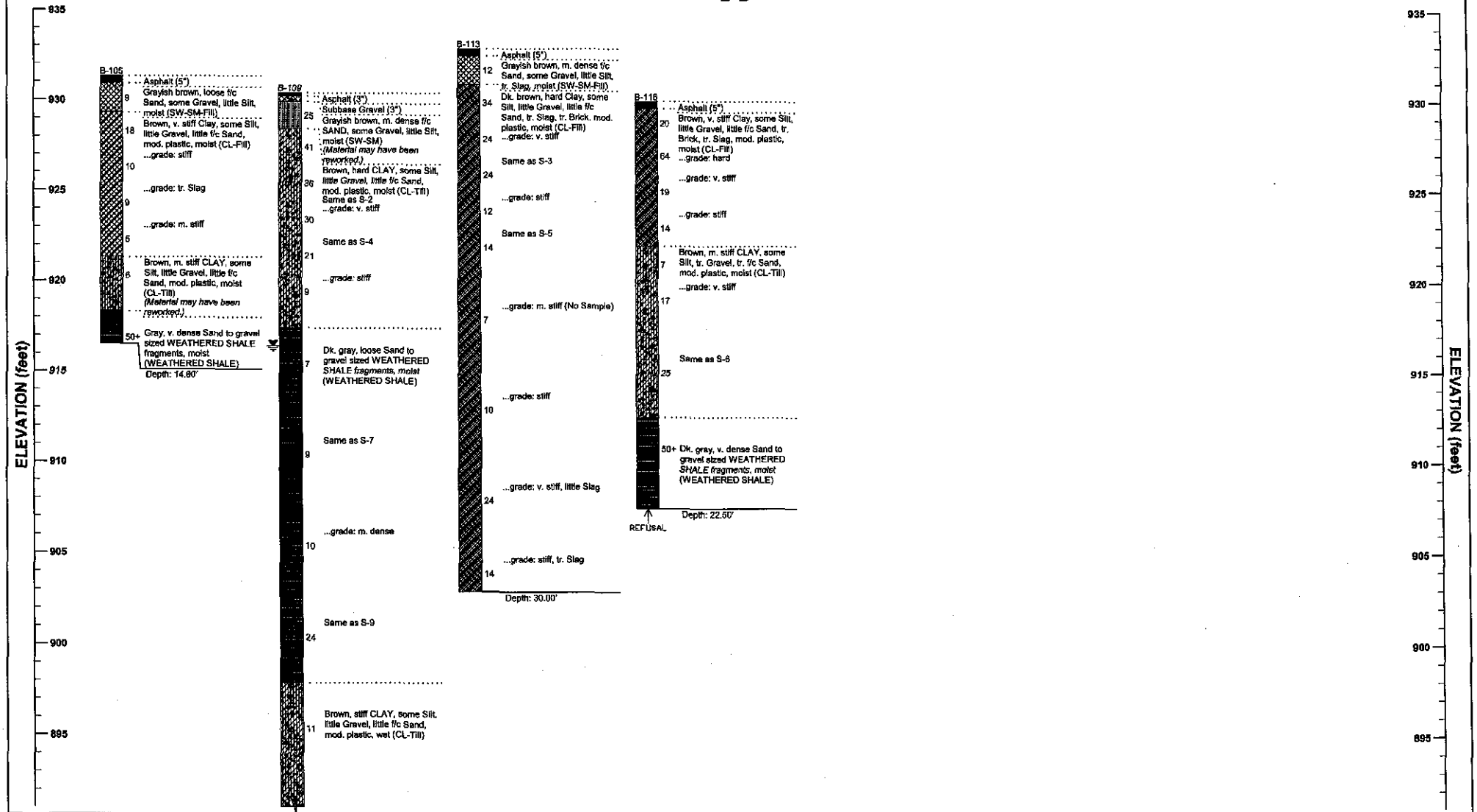
"PROFILE" OF BORINGS
A-A'



Paving | Cohesive fill | Clayey glacial till | Gravel fill | Silty sand | Weathered Shale | Fill | Glacial till | Water table at boring completion | Drill/ Bucket rejection | Boring continues

BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC. 10440 MAIN STREET, CLARENCE, NEW YORK 14031		Plotted: 3/31/2014	Job No.: 14-523
PROJECT: Proposed Retail Plaza 3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146		Page No.:	Figure No.: P-1

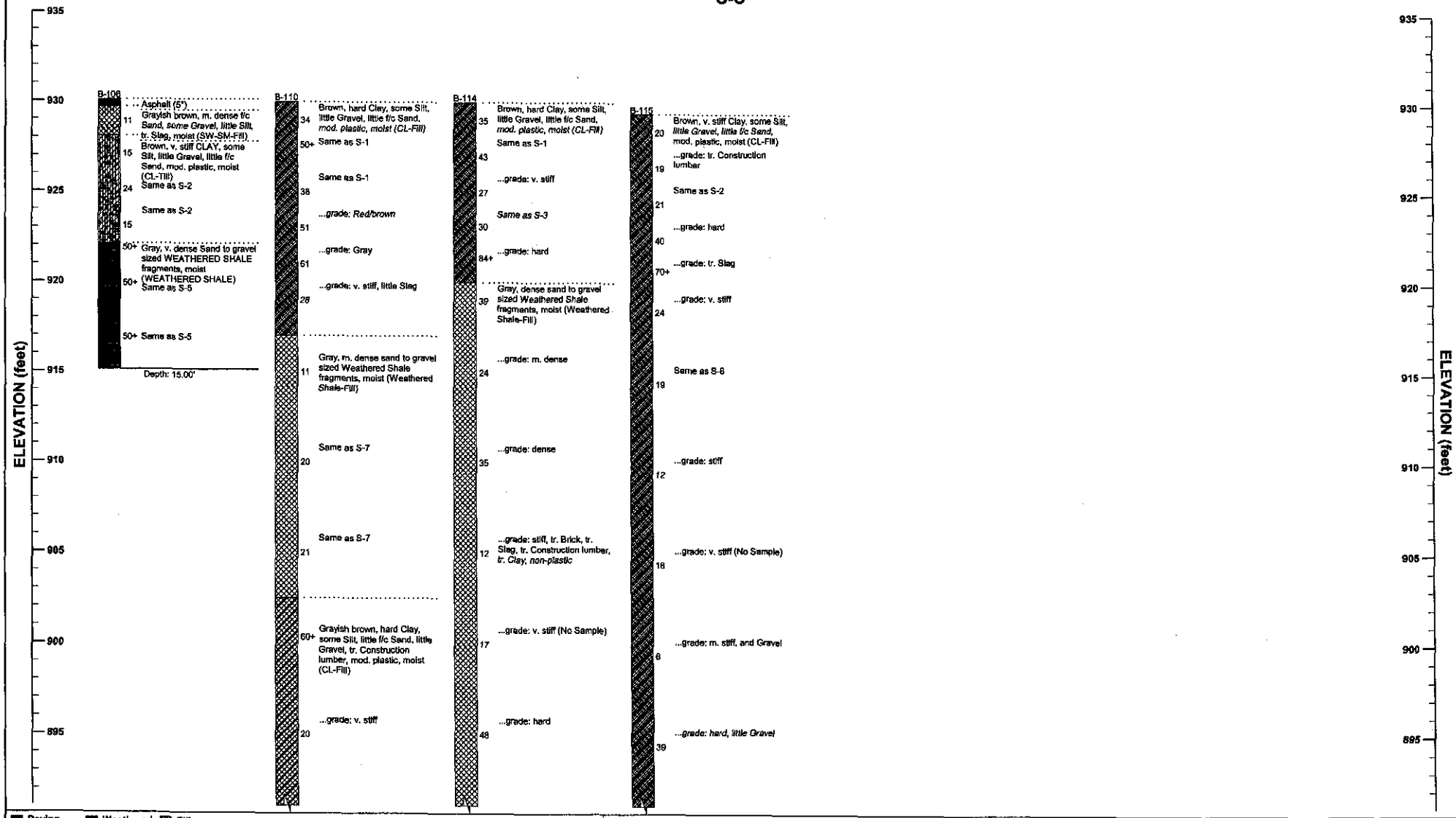
"PROFILE" OF BORINGS
B-B'



Paving | Sandy fill | Cohesive fill | Clayey glacial till | Weathered Shale | Gravel fill | Silty sand | Water table at boring completion | Drill Bucket rejection | Boring continues

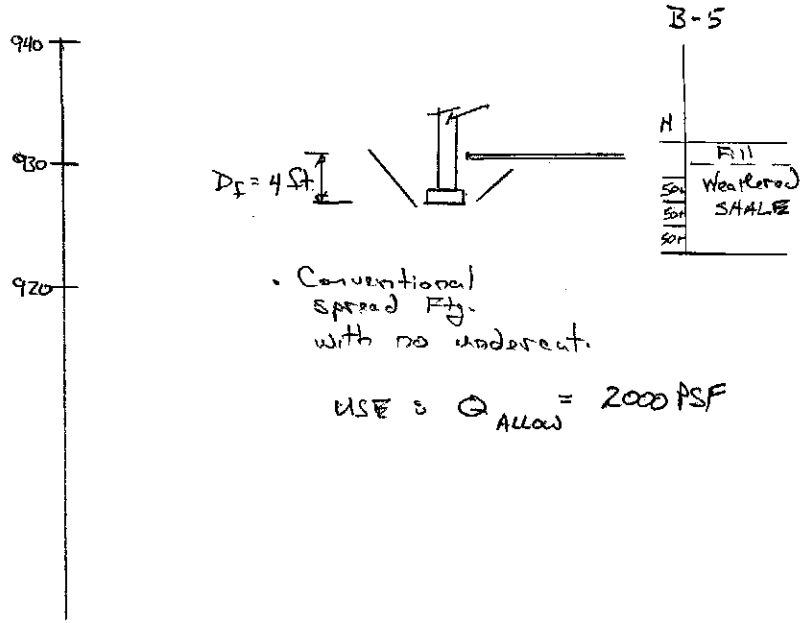
BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC. 10440 MAIN STREET, CLARENCE, NEW YORK 14031		Plotted: 3/31/2014	Job No.: 14-523
PROJECT: Proposed Retail Plaza 3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146		Page No.:	Figure No.: P-2

"PROFILE" OF BORINGS
C-C'



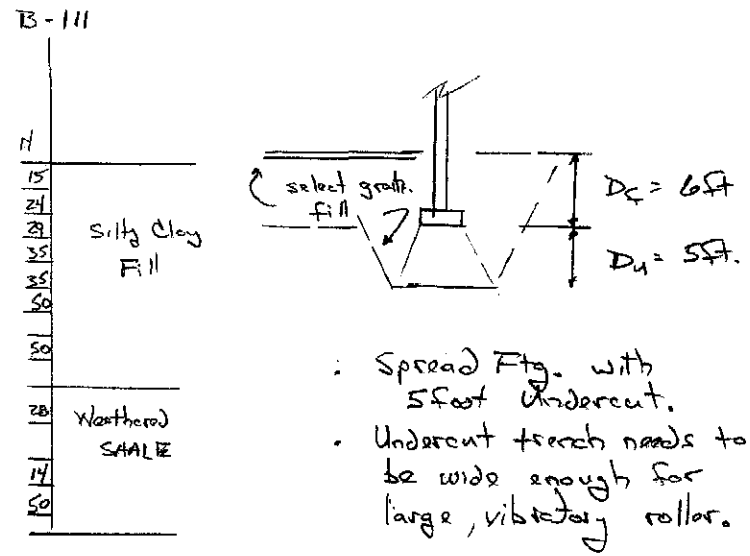
Paving
Sandy fill
Clayey glacial till
Weathered Shale
Cohesive fill
Fill
Boring continues

BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC. 10440 MAIN STREET, CLARENCE, NEW YORK 14031	Plotted: 3/31/2014	Job No.: 14-523
PROJECT: Proposed Retail Plaza 3475 William Penn Highway (U.S. Route 22), Township of Wilkins, Allegheny Co., PA 15146	Page No.:	Figure No.: P-3



- Conventional spread Ftg. with no undercut.

USE : $Q_{ALLOW} = 2000$ PSF



- Spread Ftg. with 5 foot Undercut.
- Undercut trench needs to be wide enough for large, vibratory roller.

USE : $Q_{ALLOW} = 2000$ PSF

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BUFFALO DRILLING COMPANY. INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
e-mail: info@buffalodrilling.com
info@barronandassociatespc.com

APPENDIX E

GENERAL EARTHWORK SPECIFICATION

BARRON & ASSOCIATES, P.C. &
BUFFALO DRILLING COMPANY. INC.
10440 MAIN STREET
CLARENCE, N.Y. 14031
(716) 759-7821
FAX (716) 759-7823
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info@barronandassociatespc.com

APPENDIX F

LIMITATIONS

LIMITATIONS

1. This report is based on the data that was obtained from the subsurface explorations and on the design of the proposed retail plaza submitted to the geotechnical engineer. A geotechnical engineer, who is experienced in foundation construction and earthwork, should be engaged to review the final design and specifications in order to determine whether any change in concept may have any effect on the validity of the conclusions presented herein, and whether these conclusions have, in fact, been implemented in the design and specifications.

2. The subsurface conditions, including thickness, between the exploration locations are approximate and simplified representations of the strata and transitions. There is the possibility that variations in soil and rock conditions and boundaries will be encountered during construction. In order to permit correlation between the exploratory soil data and the actual soil conditions encountered during construction and so as to assess conformance with the plans and specifications as originally contemplated, it is recommended that a geotechnical engineer, who is experienced in foundation construction and earthwork monitoring, should be retained to perform continuous construction review during the site preparation and foundation construction operations.

3. The subsurface exploration logs and subsurface conditions may aid in estimating material quality and quantities, such as topsoil/organic matter, fills, natural soils, and rock, but are not to be relied upon as the exclusive means for bid preparation purposes. It is the responsibility of the contractor to perform any additional site examinations and explorations and to prepare an accurate bid.

4. Disclaimers:

   a. In the event that any changes in the nature, design or location of the structure are planned, the conclusions that are contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing.

   b. The geotechnical engineering report has been prepared for this project by Barron & Associates, P.C. This report is for assistance in design only and is not a sufficient basis on which to prepare an accurate bid.

   c. This report has been prepared for the exclusive use of Benderson Development Company, Inc. and their designated design representatives, for specific application to the construction of a retail plaza at 3475 William Penn Highway (U.S. Route 22) in the Township of Wilkins, Pennsylvania and in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

Herbert, Rowland & Grubic, Inc.
220 West Kensinger Drive, Suite 100
Cranberry Township, PA 16066
724.779.4777
www.hrg-inc.com

Via Email

April 13, 2023

Mrs. Rebecca Vargo
Township Manager
Township of Wilkins
110 Peffer Road
Turtle Creek, Pennsylvania, 15145

Re: Benderson Development
Plan Review 01
Wilkins Township, Allegheny County, PA

Dear Mrs. Vargo:

Herbert, Rowland & Grubic, Inc. (HRG) has received the following materials related to the referenced land development project.

- **Subdivision and Land Development Application,** prepared by Benderson Development Company, LLC and dated March 14, 2023.
- **Benderson Development Plan Set (26 sheets),** prepared by Red Swing Group and dated March 13, 2023.
- **Stormwater Management Report,** prepared by Red Swing Group and dated March 2023.

As requested, we have completed a review of the submitted information with respect to the Subdivision and Land Development Ordinance (Chapter 385), Stormwater Management Ordinance (Chapter 374) and Zoning Ordinance (Chapter 450). The comments below are based on the review of the listed submitted material. The comments do not address specific requirements that other regulatory agencies such as the Pennsylvania Department of Environmental Protection (PADEP), PennDOT, or the Allegheny County Conservation District may have, although permits or approval letters from these agencies may be required as a condition of plan approval.

COMMENTS RELATED TO SUBMISSION:

1. Tract boundaries with bearings and distances should be included in the plan set [385-16.B(6)].

2. Please provide evidence to the Board of Commissioners that the land development is to be supplied by a certified public utility for water supply [385-16.B(25)].

3. Front yard setback is shown on the plan, however, the side and rear yard setbacks are missing.

4. The retail elevation sheet does not show the proposed height of the building. Please provide the maximum height to ensure it does not exceed the allowable maximum height of 35 feet.

5. Minimum side/rear yard abutting any lot in any R district for off-street parking spaces and access drives for nonresidential is 30 feet. The chart on the site plan shows 13.5 feet being provided.

6. The parking tabulation for restaurants states that one space is required for every 50 square feet of public floor space plus one for every 3 outdoor seats, plus 1 for every employee working on the largest shift. Please provide a breakdown of how 60 spaces is the required amount. Estimates of the employee count on largest shift and number of outdoor seating area will help determine the correct number of spaces.

7. A statement of the approvals and permits that will be required for the proposed development from the County and Commonwealth should be on the plans [385-16.B(33)].

8. A copy of the sewage planning module for land development approval by PA DEP [385-17B(23)].

9. The final plan shall have all storm drainage and sanitary sewer easements shown [385-17.I].

10. The final plan shall be accompanied by an updated approval of the highway occupancy permit by PennDOT [385-17.K].

11. Please submit a full Traffic Impact Study for HRG to review. Further comments are expected once received.

12. Streets shall be provided with sidewalks.

13. For all commercial and industrial subdivisions or land developments, a landscaping plan shall be provided and shall include sufficient plantings for the required open space, planting strips, screenings, formal gardens, shade trees and natural barriers [385-28E].

14. Please see buffer yard planting requirements in 450, Zoning [385-28.F].

15. An approved E&S plan shall be submitted to the Township once issued by Allegheny County Conservation District.

16. Public sewer systems. When the subdivision or land development is to be provided with a complete sanitary sewer system connected to a public sanitary sewer system, a statement of approval from the engineer of the sewerage system to which it will be connected shall be submitted to the Board of Commissioners. Where required, DEP planning module approval shall also be obtained for final plan approval [385-35].

17. Provision of system. The subdivision or land development shall be provided with a complete water supply system which shall be connected to a municipal water supply or with a community water supply approved by the engineer of the applicable water utility company and the Pennsylvania Department of Environmental Protection with satisfactory provision for the maintenance thereof [385-36].

18. Easements for utilities shall have a minimum width of 15 feet [385-38A].

19. Shade trees shall be provided as specified in 385-28E of the SALDO.

20. Sidewalks shall be required within the public right-of-way for all properties abutting arterial streets in the C Commercial District upon the transfer of ownership of property, the new development of property, a subdivision or reverse subdivision of property, or a major renovation of infrastructure located on the property. All sidewalks shall be installed in accordance with the design standards of Chapter 379, Streets and Sidewalks [450-27]. An “In-lieu-of action” may need to be requested for sidewalks along SR 22 [379-39].

21. In the PCSM report, the "Post development drainage area calculations with BMP" and "2 Year chamber system hydrograph" show different values for volume routed to the BMP (inflow area, inflow, outflow, discarded). See pages 103 & 202 of the PCSM report. The "2 Year chamber" values appear to match the DEP Spreadsheet. Verify that values match across all documents.

SUPPLEMENTAL INFORMATION TO BE PROVIDED PRIOR TO RECORDING OF THE SWM SITE PLAN [374]:

- Signed and executed Operations and Maintenance Agreement.
- Signed and executed easements for all on-site and off-site work.

OUTSTANDING ITEMS TO BE PROVIDED TO THE TOWNSHIP UPON COMPLETION AND/OR DURING FINAL LAND DEVELOPMENT APPLICATION:

- Sewage Planning Module approved by DEP.
- Approved NPDES permit by ACCD.

Due to the number of comments and size of the plan, along with information still to be provided, we reserve the right to conduct additional reviews on behalf of the Township. If you have any questions regarding these comments, please do not hesitate to call me.

Sincerely,

Herbert, Rowland & Grubic, Inc.

Robert L. Arnold, P.E.
Team Leader | Civil

RLA/JFZ/kmg
R006303.0467
project\0063\006303_0467\rcvd\3-20-23 submission\2023.04.13 benderson pr01.docx