GRANTOR'S NAME:
Terra Firma Management LLC

GRANTEE'S NAME:
State Street Homes, Inc

AFTER RECORDING RETURN TO:
Order No.: 60222001373-KM
Brandon Tyler Gill
State Street Homes, Inc
420 NW 11th Ave #909
Portland, OR 97209

```
REEL       4340   PAGE   386
MARION COUNTY
BILL BURGESS, COUNTY CLERK
06-03-2020               08:19 am.
Control Number    602911  $     91.00
Instrument  2020 00028268
```

SEND TAX STATEMENTS TO:
State Street Homes, Inc
420 NW 11th Ave #909
Portland, OR 97209

APN: R32284
Map: 083W13C 00900
5826 Battle Creek Road SE, Salem, OR 97306

SPACE ABOVE THIS LINE FOR RECORDER'S USE

STATUTORY WARRANTY DEED

Terra Firma Management LLC, an Oregon limited liability company, Grantor, conveys and warrants to **State Street Homes, Inc, an Oregon corporation**, Grantee, the following described real property, free and clear of encumbrances except as specifically set forth below, situated in the County of Marion, State of Oregon:

Beginning at a point on the East line of the C.S. Pringle Donation Land Claim No. 13, 12.49 chains North of the Southeast corner of the said claim in Township 8 South, Range 3 West of the Willamette Meridian, in the City of Salem, County of Marion and State of Oregon; thence West 18.18 chains; thence North 20°45' West 9.29 chains to the Southwest corner of land conveyed to Albert A. Agan by instrument recorded August 17, 1942, in Volume 274, Page 188, Deed Records for said County and State; thence North 82°15' East along the Southerly line of last said land 21.67 chains to the Southeast corner of said land; thence Southerly along the Easterly line of said Donation Land Claim 11.45 chains to the place of beginning.

SAVE AND EXCEPT: The tract of land conveyed to the State of Oregon, by and through its State Highway Commission, by deed Recorded August 5, 1952, in Volume 442, Page 248, Records for Marion County, Oregon.

ALSO SAVE AND EXCEPT: The tract of land disclosed in Deed to E. Marvin Johnson and Jean Camp by Deed Recorded September 9, 1971, in Volume 711, Page 575, Deed Records for Marion County, Oregon.

ALSO SAVE AND EXCEPT: That portion conveyed to the State of Oregon, by and through its Department of Transportation for road purposes, by Warranty Deed recorded June 10, 2016 as Reel 3826, Page 77, Records for Marion County, Oregon.

THE TRUE AND ACTUAL CONSIDERATION FOR THIS CONVEYANCE IS ONE MILLION TWO HUNDRED SIXTY-FIVE THOUSAND AND NO/100 DOLLARS **($1,265,000.00)**. (See ORS 93.030).

Subject to:

Rights of the public to any portion of the Land lying within the area commonly known as streets, roads and highways.

Limited access to and from the Land as set forth in Deed shown below, which provides that there shall be no right of easement or right of access to, from or across the State Highway other than as expressly provided for in said Deed:

Recording Date: August 5, 1952
Recording No.: Volume 442, Page 248

Limited access to and from the Land as set forth in Deed shown below, which provides that there shall be no right of easement or right of access to, from or across the State Highway other than as expressly provided for in said Deed:

Recording Date: June 10, 2016
Recording No.: Reel 3826, Page 77

Easement(s) for the purpose(s) shown below and rights incidental thereto as set forth in a document:

Entitled:	Warranty Deed
In favor of:	State of Oregon, by and through its Department of Transportation
Purpose:	Temporary easement rights for construction
Recording Date:	June 10, 2016
Recording No:	Reel 3826, Page 77
Affects:	Reference is hereby made to said document for full particulars

STATUTORY WARRANTY DEED
(continued)

Annexation Agreement

Recording Date: March 9, 2018
Recording No.: Reel 4053, Page 390

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

IN WITNESS WHEREOF, the undersigned have executed this document on the date(s) set forth below.

Dated: June 1, 2020

Terra Firma Management LLC

By: Clutch Investments LLC, Member

BY: ______________________
Terrence Christian Blackburn, Manager

State of Oregon
County of Marion

This instrument was acknowledged before me on June 1, 2020 by Terrence Christian Blackburn, as Manager for Clutch Investments LLC, Member of Terra Firma Management LLC.

____
Notary Public - State of Oregon

My Commission Expires: 2/22/21

OFFICIAL STAMP
KELLY J MILLER
NOTARY PUBLIC-OREGON
COMMISSION NO. 959129
MY COMMISSION EXPIRES: FEBRUARY 22, 2021

STATUTORY WARRANTY DEED

REEL: 4340 PAGE: 386

June 03, 2020, 08:19 am.

CONTROL #: 602911

State of Oregon
County of Marion

I hereby certify that the attached instrument was received and duly recorded by me in Marion County records:

FEE: $ 91.00

BILL BURGESS
COUNTY CLERK

THIS IS NOT AN INVOICE.

Fidelity National Title
Company of Oregon

PRELIMINARY REPORT

In response to the application for a policy of title insurance referenced herein Fidelity National Title Company of Oregon hereby reports that it is prepared to issue, or cause to be issued, as of the specified date, a policy or policies of title insurance describing the land and the estate or interest hereinafter set forth, insuring against loss which may be sustained by reason of any defect, lien or encumbrance not shown or referred to as an exception herein or not excluded from coverage pursuant to the printed Schedules, Conditions and Stipulations or Conditions of said policy forms.

The printed Exceptions and Exclusions from the coverage of said policy or policies are set forth in Exhibit One. Copies of the policy forms should be read. They are available from the office which issued this report.

This report (and any supplements or amendments hereto) is issued solely for the purpose of facilitating the issuance of a policy of title insurance and no liability is assumed hereby.

The policy(s) of title insurance to be issued hereunder will be policy(s) of Fidelity National Title Insurance Company, a/an Florida corporation.

Please read the exceptions shown or referred to herein and the Exceptions and Exclusions set forth in Exhibit One of this report carefully. The Exceptions and Exclusions are meant to provide you with notice of matters which are not covered under the terms of the title insurance policy and should be carefully considered.

It is important to note that this preliminary report is not a written representation as to the condition of title and may not list all liens, defects and encumbrances affecting title to the land.

This preliminary report is for the exclusive use of the parties to the contemplated transaction, and the Company does not have any liability to any third parties nor any liability until the full premium is paid and a policy is issued. Until all necessary documents are placed of record, the Company reserves the right to amend or supplement this preliminary report.

Countersigned

Randall S. [illegible] Jr.

Fidelity National Title
Company of Oregon

500 Liberty St. SE, Ste 200, Salem, OR 97301
(503)585-7219 FAX (866)423-7985

PRELIMINARY REPORT

ESCROW OFFICER: Kelly J. Miller
Kelly.Miller@fnf.com
503-385-2240

ORDER NO.: 60222008637

TITLE OFFICER: Patty Smith and Tom Skinner

TO: Fidelity National Title Company of Oregon
500 Liberty St. SE, Ste 200
Salem, OR 97301

ESCROW LICENSE NO.: 960100001
OWNER/SELLER: State Street Homes Inc.
BUYER/BORROWER:
PROPERTY ADDRESS: 5826 Battle Creek Rd SE, Salem, OR 97306

EFFECTIVE DATE: August 25, 2020, 08:00 AM

1. THE POLICY AND ENDORSEMENTS TO BE ISSUED AND THE RELATED CHARGES ARE:

	AMOUNT	PREMIUM
ALTA Owner's Policy 2006	$ TBD	$ TBD
ALTA Loan Policy 2006	$ TBD	$ TBD
OTIRO 209.10-06 - Restrictions, Encroachments, Minerals - Current Violations (ALTA 9.10-06)		$ 100.00
OTIRO 222-06 - Location (ALTA 22-06)		$ 0.00
OTIRO 208.1-06 - Environmental Protection Lien (ALTA 8.1-06)		$ 0.00
Government Lien Search		$ 40.00

2. THE ESTATE OR INTEREST IN THE LAND HEREINAFTER DESCRIBED OR REFERRED TO COVERED BY THIS REPORT IS:

   A Fee

3. TITLE TO SAID ESTATE OR INTEREST AT THE DATE HEREOF IS VESTED IN:

   State Street Homes, Inc. and Oreogn Corporation

4. THE LAND REFERRED TO IN THIS REPORT IS SITUATED IN THE CITY OF SALEM, COUNTY OF MARION, STATE OF OREGON, AND IS DESCRIBED AS FOLLOWS:

   SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

EXHIBIT "A"
Legal Description

Beginning at a point on the East line of the C.S. Pringle Donation Land Claim No. 13, 12.49 chains North of the Southeast corner of the said claim in Township 8 South, Range 3 West of Willamette Meridian, in the City of Salem, County of Marion and State of Oregon; thence West 18.18 chains; thence North 20°45 West 9.29 chains to the Southwest corner of land conveyed to Albert A. Agan by instrument recorded August 17, 1942, in Volume 274, Page 188, Deed records for said County and State; thence North 82°15' East along the Southerly line of last said land 21.67 chains to the Southeast corner of said land; thence Southerly along the Easterly line of said donation Land Claim 11.45 chains to the place of beginning.

SAVE AND EXCEPT: The tract of land conveyed to the State of Oregon, by and through its State Highway Commission, by deed recorded August 5, 1952, in Volume 442, Page 248, records for Marion County, Oregon.

ALSO SAVE AND EXCEPT: The tract of land disclosed in Deed to E. Marvin Johnson and Jean Camp by Deed recorded Spetembe 9, 1971, in Volume 711, Page 575, Deed Records for Marion County, Oregon.

ALSO SAVE AND EXCEPT: That portion conveyed to the State of Oregon by and through its Department of Transportation for road progress, by Warrenty Deed recorded June 10, 2016 as Reel 3826, Page 77, records for Marion County, Oregon.

AS OF THE DATE OF THIS REPORT, ITEMS TO BE CONSIDERED AND EXCEPTIONS TO COVERAGE IN ADDITION TO THE PRINTED EXCEPTIONS AND EXCLUSIONS IN THE POLICY FORM WOULD BE AS FOLLOWS:

GENERAL EXCEPTIONS:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.

2. Any facts, rights, interests or claims, which are not shown by the Public Records but which could be ascertained by an inspection of the Land or by making inquiry of persons in possession thereof.

3. Easements, or claims of easement, which are not shown by the Public Records; reservations or exceptions in patents or in Acts authorizing the issuance thereof; water rights, claims or title to water.

4. Any encroachment (of existing improvements located on the Land onto adjoining land or of existing improvements located on adjoining land onto the subject Land), encumbrance, violation, variation or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the subject Land.

5. Any lien or right to a lien for services, labor, material, equipment rental or workers compensation heretofore or hereafter furnished, imposed by law and not shown by the Public Records.

SPECIFIC ITEMS AND EXCEPTIONS:

6. Property taxes in an undetermined amount, which are a lien but not yet payable, including any assessments collected with taxes to be levied for the fiscal year 2020-2021.

7. Limited access to and from the Land as set forth in Deed shown below, which provides that there shall be no right of easement or right of access to, from or across the State Highway other than as expressly provided for in said Deed:

   Recording Date: August 5, 1952
   Recording No.: Volume 442, Page 248

8. Limited access to and from the Land as set forth in Deed shown below, which provides that there shall be no right of easement or right of access to, from or across the State Highway other than as expressly provided for in said Deed:

   Recording Date: June 10, 2016
   Recording No.: Reel 3826, Page 77

9. Easement(s) for the purpose(s) shown below and rights incidental thereto, as granted in a document:

   Granted to: State of Oregon, by and through its Department of Transportation
   Purpose: Temporary Easement rights for construction
   Recording Date: June 10, 2016
   Recording No: Reel 3826, Page 77

10. Annexation Agreement

   Recording Date: March 9, 2018
   Recording No: Reel 4053, Page 390

11. A deed of trust to secure an indebtedness in the amount shown below,

Amount:	$900,000.00
Dated:	June 1, 2020
Trustor/Grantor:	State Street Homes, Inc., an Oregon corporation
Trustee:	Robert A. Smejkal, Attorney at Law
Beneficiary:	Advanced Investment Corporation
Loan No.:	Not disclosed
Recording Date:	June 3, 2020
Recording No:	Reel 4340, Page 387

An assignment of the beneficial interest under said deed of trust which names:

Assignee:	CLS Investments, LLC
Loan No.:	Not Disclosed
Recording Date:	June 3, 2020
Recording No:	Reel 4340, Page 440

12. The Company will require the following documents for review prior to the issuance of any title insurance predicated upon a conveyance or encumbrance by the corporation named below:

Name of Corporation: State Street Homes, Inc., an Oregon Corporation

a) A Copy of the corporation By-laws and Articles of Incorporation

b) An original or certified copy of a resolution authorizing the transaction contemplated herein

c) If the Articles and/or By-laws require approval by a ‘parent’ organization, a copy of the Articles and By-laws of the parent

d) A current dated certificate of good standing from the proper governmental authority of the state in which the entity was created

The Company reserves the right to add additional items or make further requirements after review of the requested documentation.

13. Note: We find no Notice of Completion recorded on said Land.

14. If requested to issue an extended coverage ALTA loan policy, the following matters must be addressed:

a) The rights of tenants holding under unrecorded leases or tenancies
b) Matters disclosed by a statement as to parties in possession and as to any construction, alterations or repairs to the Land within the last 75 days. The Company must be notified in the event that any funds are to be used for construction, alterations or repairs.
c) Any facts which would be disclosed by an accurate survey of the Land

ADDITIONAL REQUIREMENTS/NOTES:

A. Note: Property taxes for the fiscal year shown below are paid in full.

Fiscal Year:	2019-2020
Amount:	$8,119.42
Levy Code:	92401000
Account No.:	R32284
Map No.:	083W13C00900

Prior to close of escrow, please contact the Tax Collector's Office to confirm all amounts owing, including current fiscal year taxes, supplemental taxes, escaped assessments and any delinquencies.

B. In addition to the standard policy exceptions, the exceptions enumerated above shall appear on the final 2006 ALTA Policy unless removed prior to issuance.

C. Note: The name(s) of the proposed insured(s) furnished with this application for title insurance is/are:

No names were furnished with the application. Please provide the name(s) of the buyers as soon as possible.

D. Notice: Please be aware that due to the conflict between federal and state laws concerning the cultivation, distribution, manufacture or sale of marijuana, the Company is not able to close or insure any transaction involving Land that is associated with these activities.

E. Note: The only conveyance(s) affecting said Land, which recorded within 24 months of the date of this report, are as follows:

Grantor:	Linda J. Scott, Trustee of the Linda J. Scott Revocable Living Trust
Grantee:	Terra Firma Management LLC, an Oregon limited liability Company
Recording Date:	January 18, 2019
Recording No:	Reel 4159, Page 457

Grantor:	Terra Firma Management LLC, an Oregon limited liability company
Grantee:	State Street Homes, Inc., an Oregon corporation
Recording Date:	June 3, 2020
Recording No:	Reel 4340, Page 386

F. Note: No utility search has been made or will be made for water, sewer or storm drainage charges unless the City/Service District claims them as liens (i.e. foreclosable) and reflects them on its lien docket as of the date of closing. Buyers should check with the appropriate city bureau or water service district and obtain a billing cutoff. Such charges must be adjusted outside of escrow.

G. THE FOLLOWING NOTICE IS REQUIRED BY STATE LAW: YOU WILL BE REVIEWING, APPROVING AND SIGNING IMPORTANT DOCUMENTS AT CLOSING. LEGAL CONSEQUENCES FOLLOW FROM THE SELECTION AND USE OF THESE DOCUMENTS. YOU MAY CONSULT AN ATTORNEY ABOUT THESE DOCUMENTS. YOU SHOULD CONSULT AN ATTORNEY IF YOU HAVE QUESTIONS OR CONCERNS ABOUT THE TRANSACTION OR ABOUT THE DOCUMENTS. IF YOU WISH TO REVIEW TRANSACTION DOCUMENTS THAT YOU HAVE NOT SEEN, PLEASE CONTACT THE ESCROW AGENT.

H. Recording Charge (Per Document) is the following:

County	First Page	Each Additional Page
Marion	$86.00	$5.00
Benton	$108.00	$5.00
Polk	$91.00	$5.00
Linn	$105.00	$5.00

Note: When possible the company will record electronically. An additional charge of $5.00 applies to each document that is recorded electronically.

Note: Please send any documents for recording to the following address:
Portland Title Group
Attn: Recorder
1433 SW 6th Ave.
Portland, OR. 97201

I. Note: Effective January 1, 2008, Oregon law (ORS 314.258) mandates withholding of Oregon income taxes from sellers who do not continue to be Oregon residents or qualify for an exemption. Please contact your Escrow Closer for further information.

J. Note: This map/plat is being furnished as an aid in locating the herein described Land in relation to adjoining streets, natural boundaries and other land. Except to the extent a policy of title insurance is expressly modified by endorsement, if any, the Company does not insure dimensions, distances or acreage shown thereon.

K. NOTE: IMPORTANT INFORMATION REGARDING PROPERTY TAX PAYMENTS:

Fiscal Year:	July 1st through June 30th
Taxes become a lien on real property, but are not yet payable:	July 1st
Taxes become certified and payable (approximately on this date):	October 15th
First one third payment of taxes is due:	November 15th
Second one third payment of taxes is due:	February 15th
Final payment of taxes is due:	May 15th

Discounts: If two thirds are paid by November 15th, a 2% discount will apply. If the full amount of the taxes are paid by November 15th, a 3% discount will apply.

Interest: Interest accrues as of the 15th of each month based on any amount that is unpaid by the due date. No interest is charged if the minimum amount is paid according to the above mentioned payment schedule.

EXHIBIT ONE

2006 AMERICAN LAND TITLE ASSOCIATION LOAN POLICY (06-17-06)
EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses that arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building and zoning) restricting, regulating, prohibiting or relating to
    (i) the occupancy, use, or enjoyment of the Land;
    (ii) the character, dimensions or location of any improvement erected on the land;
    (iii) the subdivision of land; or
    (iv) environmental protection;
    or the effect of any violation of these laws, ordinances or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.
   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.
2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.
3. Defects, liens, encumbrances, adverse claims, or other matters
   (a) created, suffered, assumed or agreed to by the Insured Claimant;
   (b) not known to the Company, not recorded in the Public Records at Date of Policy, but known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;
   (c) resulting in no loss or damage to the Insured Claimant;
   (d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 11, 13, or 14); or
   (e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Insured Mortgage.
4. Unenforceability of the lien of the Insured Mortgage because of the inability or failure of an Insured to comply with the applicable doing-business laws of the state where the Land is situated.
5. Invalidity or unenforceability in whole or in part of the lien of the Insured Mortgage that arises out of the transaction evidenced by the Insured Mortgage and is based upon usury or any consumer credit protection or truth-in-lending law.
6. Any claim, by reason of the operation of federal bankruptcy, state insolvency or similar creditors' rights laws, that the transaction creating the lien of the Insured Mortgage, is
   (a) a fraudulent conveyance or fraudulent transfer, or
   (b) a preferential transfer for any reason not stated in the Covered Risk 13(b) of this policy.
7. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the Insured Mortgage in the Public Records. This Exclusion does not modify or limit the coverage provided under Covered Risk 11(b).

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage.

SCHEDULE B - GENERAL EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) which arise by reason of:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.
2. Facts, rights, interests or claims which are not shown by the Public Records but which could be ascertained by an inspection of the Land or by making inquiry of persons in possession thereof.
3. Easements, or claims of easement, not shown by the Public Records; reservations or exceptions in patents or in Acts authorizing the issuance thereof, water rights, claims or title to water.
4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land. The term "encroachment" includes encroachments of existing improvements located on the Land onto adjoining land, and encroachments onto the Land of existing improvements located on adjoining land.
5. Any lien for services, labor or material heretofore or hereafter furnished, or for contributions due to the State of Oregon for unemployment compensation or worker's compensation, imposed by law and not shown by the Public Records.

2006 AMERICAN LAND TITLE ASSOCIATION OWNER'S POLICY (06-17-06)
EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses that arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building and zoning) restricting, regulating, prohibiting or relating to
    (i) the occupancy, use, or enjoyment of the Land;
    (ii) the character, dimensions or location of any improvement erected on the land;
    (iii) the subdivision of land; or
    (iv) environmental protection;
    or the effect of any violation of these laws, ordinances or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.
   (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.
2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.
3. Defects, liens, encumbrances, adverse claims, or other matters
   (a) created, suffered, assumed or agreed to by the Insured Claimant;
   (b) not known to the Company, not recorded in the Public Records at Date of Policy, but known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;
   (c) resulting in no loss or damage to the Insured Claimant;
   (d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 9 and 10); or
   (e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Title.
4. Any claim, by reason of the operation of federal bankruptcy, state insolvency or similar creditors' rights laws, that the transaction creating the lien of the Insured Mortgage, is
   (a) a fraudulent conveyance or fraudulent transfer, or
   (b) a preferential transfer for any reason not stated in the Covered Risk 9 of this policy.
7. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

The above policy form may be issued to afford either Standard Coverage or Extended Coverage. In addition to the above Exclusions from Coverage, the Exceptions from Coverage in a Standard Coverage policy will also include the following Exceptions from Coverage.

SCHEDULE B - GENERAL EXCEPTIONS FROM COVERAGE

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) which arise by reason of:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; proceedings by a public agency which may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.
2. Facts, rights, interests or claims which are not shown by the Public Records but which could be ascertained by an inspection of the Land or by making inquiry of persons in possession thereof.
3. Easements, or claims of easement, not shown by the Public Records; reservations or exceptions in patents or in Acts authorizing the issuance thereof, water rights, claims or title to water.
4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land. The term "encroachment" includes encroachments of existing improvements located on the Land onto adjoining land, and encroachments onto the Land of existing improvements located on adjoining land.
5. Any lien for services, labor or material heretofore or hereafter furnished, or for contributions due to the State of Oregon for unemployment compensation or worker's compensation, imposed by law and not shown by the Public Records.

WIRE SAFE™ | Inquire before you wire!

WIRE FRAUD ALERT

This Notice is not intended to provide legal or professional advice.
If you have any questions, please consult with a lawyer.

All parties to a real estate transaction are targets for wire fraud and many have lost hundreds of thousands of dollars because they simply relied on the wire instructions received via email, without further verification. **If funds are to be wired in conjunction with this real estate transaction, we strongly recommend verbal verification of wire instructions through a known, trusted phone number prior to sending funds.**

In addition, the following non-exclusive self-protection strategies are recommended to minimize exposure to possible wire fraud.

- **NEVER RELY** on emails purporting to change wire instructions. Parties to a transaction rarely change wire instructions in the course of a transaction.
- **ALWAYS VERIFY** wire instructions, specifically the ABA routing number and account number, by calling the party who sent the instructions to you. DO NOT use the phone number provided in the email containing the instructions, use phone numbers you have called before or can otherwise verify. **Obtain the number of relevant parties to the transaction as soon as an escrow account is opened.** DO NOT send an email to verify as the email address may be incorrect or the email may be intercepted by the fraudster.
- **USE COMPLEX EMAIL PASSWORDS** that employ a combination of mixed case, numbers, and symbols. Make your passwords greater than eight (8) characters. Also, change your password often and do NOT reuse the same password for other online accounts.
- **USE MULTI-FACTOR AUTHENTICATION** for email accounts. Your email provider or IT staff may have specific instructions on how to implement this feature.

For more information on wire-fraud scams or to report an incident, please refer to the following links:

Federal Bureau of Investigation:
http://www.fbi.gov

Internet Crime Complaint Center:
http://www.ic3.gov

FIDELITY NATIONAL FINANCIAL
PRIVACY NOTICE

Effective April 9, 2020

Fidelity National Financial, Inc. and its majority-owned subsidiary companies (collectively, "FNF," "our," or "we") respect and are committed to protecting your privacy. This Privacy Notice explains how we collect, use, and protect personal information, when and to whom we disclose such information, and the choices you have about the use and disclosure of that information.

A limited number of FNF subsidiaries have their own privacy notices. If a subsidiary has its own privacy notice, the privacy notice will be available on the subsidiary's website and this Privacy Notice does not apply.

<u>Collection of Personal Information</u>

FNF may collect the following categories of Personal Information:

- contact information (e.g., name, address, phone number, email address);
- demographic information (e.g., date of birth, gender, marital status);
- identity information (e.g. Social Security Number, driver's license, passport, or other government ID number);
- financial account information (e.g. loan or bank account information); and
- other personal information necessary to provide products or services to you.

We may collect Personal Information about you from:

- information we receive from you or your agent;
- information about your transactions with FNF, our affiliates, or others; and
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REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Geologic Hazards Assessment

Proposed Battle Creek and Landau

Residential Subdivision Development Site

Tax Lot No. 900

5826 Battle Creek Road SE

Salem (Marion County), Oregon

for

Clutch Industries

Project No. 1625.007.G
December 27, 2019

REDMOND GEOTECHNICAL SERVICES

December 27, 2019

Mr. Chris Anderson
Clutch Industries
360 Belmont Street NE
Salem, Oregon 97301

Dear Mr. Anderson:

Re: Geotechnical Investigation and Geologic Hazards Assessment, Proposed Battle Creek and Landau Residential Subdivision Development Site, Tax Lot No. 900, 5826 Battle Creek Road SE, Salem (Marion County), Oregon

Submitted herewith is our report entitled "Geotechnical Investigation and Geologic Hazards Assessment, Proposed Battle Creek and Landau Residential Subdivision Development Site, Tax Lot No. 900, 5826 Battle Creek Road SE, Salem (Marion County), Oregon". The scope of our services was outlined in our formal proposal to Mr. Chris Anderson of Clutch Industries dated September 2, 2019. Written authorization of our services was provided by Mr. Chris Anderson of Clutch Industries on October 7, 2019.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
12,309
OREGON
July 15, 1983
DANIEL M. REDMOND
Exp. 12-31-20

PO Box 20547 • Portland, Oregon 97294 • Fax 503/286-7176 • Phone 503/285-0598

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5826 BATTLE CREEK ROAD SE
SALEM (MARION COUNTY), OREGON

INTRODUCTION

Redmond Geotechnical Services, LLC is please to submit to you the results of our Geotechnical Investigation and Geologic Hazards Assessment at the site of the proposed Battle Creek and Landau residential subdivision development located to the east of Battle Creek Road SE and south of the intersection with Landau Street SE in Salem (Marion County), Oregon. The general location of the subject site is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation and geologic hazards assessment services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed Battle Creek and Landau residential subdivision development project.

PROJECT DESCRIPTION

We understand that present plans are to construct new single-family residential homes and various new site improvements at the subject residential subdivision site. Based on a review of the proposed site development plan(s) prepared by Westech Engineering, Inc., we understand that the proposed Battle Creek and Landau residential subdivision development will consist of the development of fifty-six (56) new single-family residential home sites (lots) ranging in size from approximately 5,000 to 10,000 square feet. Reportedly, the new single-family residential homes will be two- and/or three-story structures constructed with wood framing and raised post and beam wood floors. Support of the new single-family residential structures is anticipated to include both conventional shallow individual (column) footings and strip (continuous) footings. Structural loading information, although unavailable at this time, is anticipated to be fairly typical and light for this type of two- and/or three-story wood-frame structure and is expected to result in maximum dead plus live continuous (strip) and individual (column) footing loads on the order of about 2.0 to 3.0 kips per lineal foot (klf) and 10 to 25 kips, respectively.

Although a site grading plan is not available at this time, we understand that both cuts and fills are presently planned for the residential project. In general, both cuts and/or fills of about 5 feet or more are generally anticipated across the proposed residential lots and will generally be located along the lot perimeters and/or site boundaries. In this regard, due to the existing and/or finish grade sloping site conditions, some of the proposed new single-family residential structures and/or lots may also include the construction of a partial below grade floor(s) and/or retaining walls.

SALEM WEST QUADRANGLE
OREGON
7.5 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1 MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

SITE VICINITY MAP		
Project No. 1625.007.G	**BATTLECREEK & LANDAU SUBDIVISION SITE**	Figure No. 1

Other associated site improvements for the project will include construction of new public street improvements along Battle Creek Road SE as well as new local residential streets. Additionally, the project will include the construction of new underground utility services as well as new concrete curbs and sidewalks. Further, we understand that storm water from hard and/or impervious surfaces (i.e., roofs and pavements) will be collected for on-site treatment and possible disposal.

SCOPE OF WORK

The purpose of our geotechnical and/or geologic studies was to evaluate the overall subsurface soil and/or groundwater conditions underlying the subject site with regard to the proposed new residential development and construction at the site and any associated impacts or concerns with respect to potential slope failure at the site as well as provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation and landslide hazard study performed as a collaboration with Northwest Geological Services, Inc. (NWGS, Inc.) included the following scope of work items:

1. Review of available and relevant geologic and/or geotechnical investigation reports for the subject site and/or area.

2. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of eight (8) exploratory test pit excavations. The exploratory test pits were excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades at the approximate locations as shown on the Site Exploration Plan, Figure No. 2. Additionally, field infiltration testing was also performed within various test pits excavated across the subject site.

3. Laboratory testing to evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, gradational characteristics, Atterberg Limits and (remolded) direct shear strength tests as well as "R"-value tests.

4. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

5. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new residential structures. Recommendations include maximum design allowable contact bearing pressure(s), depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, construction and/or permanent subsurface water drainage considerations have also been prepared. Further, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation, pavement and/or floor slab subgrades.

6. Flexible pavement design and construction recommendations for the proposed new public street improvements.

SITE CONDITIONS

Site Geology

The subject site and/or area is underlain by highly weathered Basalt bedrock deposits and/or residual soils of the Columbia River Basalt formation. A more detailed description of the site geology across and/or beneath the site is presented in the Geologic Hazard Study in Appendix B.

Surface Conditions

The subject proposed new residential development property consists of one (1) rectangular to irregular shaped tax lot (TL 900) which encompass a total plan area of approximately 11.14 acres. The proposed residential development property is roughly located to the east of Battle Creek Road SE and to the south of the intersection with Landau Street SE. The southerly portion of the subject proposed residential development site is presently improved and contains an existing single-family residential home and two (2) detached wooden outbuildings while the remainder of the site is unimproved and consists of existing open farm land.

Surface vegetation across the site generally consists of a moderate growth of grass, weeds and brush as well as several small to large sized trees.

Topographically, the site is characterized as gently to moderately sloping terrain (5 to 25 percent) descending downwards from the center of the site towards the east and west with overall topographic relief estimated at about sixty (60) feet and ranges from a low about Elevation 410 feet near the northeasterly portion of the subject site to a high of about Elevation 470 near the existing residential home.

Subsurface Soil Conditions

Our understanding of the subsurface soil conditions underlying the site was developed by means of eight (8) exploratory test pits excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades on October 29, 2019 with a John Deere 200C track-mounted excavator. The location of the exploratory test pits were located in the field by marking off distances from existing and/or known site features and are shown in relation to the proposed new residential structures and/or site improvements on the Site Exploration Plan, Figure No. 2. Detailed logs of the test pit explorations, presenting conditions encountered at each location explored, are presented in the Appendix, Figure No's. A-4 through A-7.

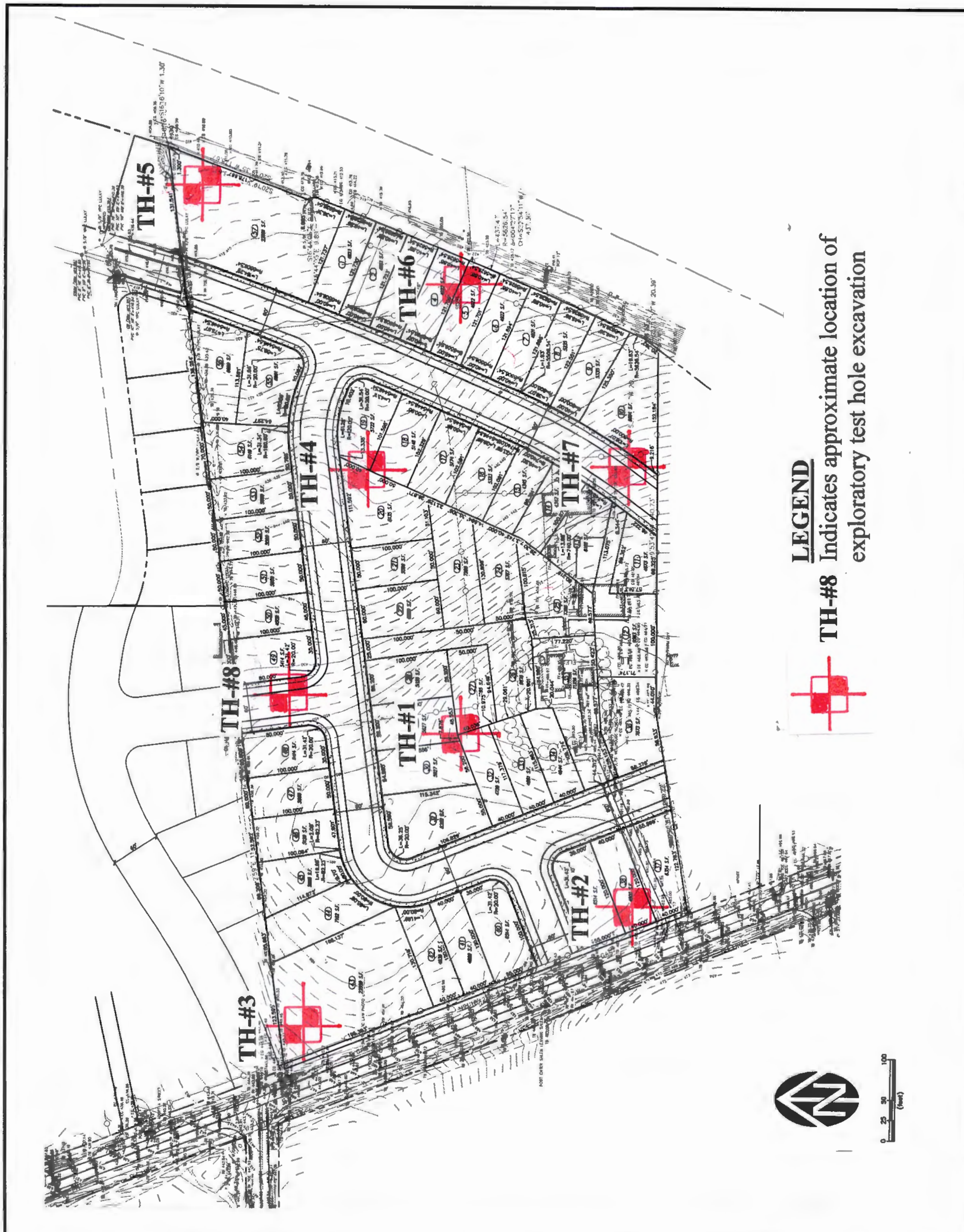
The exploratory test pit excavations were observed by staff from Redmond Geotechnical Services, LLC who logged each of the test pit explorations and obtained representative samples of the subsurface soils encountered across the site. Additionally, the elevation of the exploratory test pit excavations were referenced from the proposed Site Development Plan prepared by Project Delivery Group. and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test pit excavations were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-3.

The test pit explorations revealed that the subject site is underlain by native soil deposits comprised of highly weathered bedrock and/or residual soils composed of a surficial layer of dark brown, wet, soft, organic, sandy, clayey silt topsoil materials to depths of about 6 to 12 inches. These surficial topsoil materials were inturn underlain by medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey silt to a depth of about five (5) to six (6) feet beneath the existing site and/or surface grades. These upper clayey silt subgrade soils, which become medium stiff to stiff at a depth of about 3 to 6 feet, are best characterized by relatively low to moderate strength and moderate compressibility. These upper clayey silt subgrade soils were inturn underlain by medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy silt to highly weathered bedrock deposits the maximum depth explored of about seven (7) feet beneath the existing site and/or surface grades. These clayey, sandy silt subgrade soils and/or highly weathered bedrock deposits are best characterized by relatively moderate to high strength and low compressibility.

Groundwater

Groundwater was generally not encountered within any of the exploratory test pit explorations (TH-#1 through TH-#8) at the time of excavation to depths of at least seven (7) feet beneath existing surface grades except.

In this regard, although groundwater elevations at the site may fluctuate seasonally in accordance with rainfall conditions as well as changes in site utilization, we are generally of the opinion that the static water levels and/or surface water ponding not observed during our recent field exploration work generally reflect the potential for a high seasonal groundwater level at and/or beneath the site.



SITE EXPLORATION PLAN

Project No. 1625.007.G	**BATTLECREEK & LANDAU SUBDIVISION SITE**	Figure No. 2

INFILTRATION TESTING

We performed two (2) field infiltration tests at the site on October 29, 2019. The infiltration tests were performed in test holes TH-#3 and TH-#5 at depths of between three (3) to four (4) feet beneath the existing site and/or surface grades. The subgrade soils encountered in the infiltration test hole consisted of sandy, clayey silt. The infiltration testing was performed in general conformance with current EPA and/or the City of Salem Encased Falling Head test method which consisted of advancing a 6-inch diameter PVC pipe approximately 6 inches into the exposed soil horizon at each test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate and saturate the subgrade soils. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturating period, water was again added into the PVC pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each measurable drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing at the site, we have found that the native sandy, clayey silt subgrade soil deposits posses an ultimate infiltration rate on the order of about 0.6 to 0.8 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from various test pit excavations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, gradation analyses and Atterberg Limits as well as (remolded) direct shear strength and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-16.

SEISMICITY AND EARTHQUAKE SOURCES

The seismicity of the southwest Washington and northwest Oregon area, and hence the potential for ground shaking, is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and the relatively shallow crustal zone. Descriptions of these potential earthquake sources are presented below.

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes.

Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study by Geomatrix (1995) and/or USGS (2008) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9. This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ. However, the 2008 USGS report has assigned a probability of 0.67 for a Mw 9 earthquake and a probability of 0.33 for a Mw 8.3 earthquake. For the purpose of this study an earthquake of Mw 9.0 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range. Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The third source of seismicity that can result in ground shaking within the Vancouver and southwest Washington area is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in this area is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0), Oregon earthquakes were crustal earthquakes.

Liquefaction

Seismic induced soil liquefaction is a phenomenon in which lose, granular soils and some silty soils, located below the water table, develop high pore water pressures and lose strength due to ground vibrations induced by earthquakes. Soil liquefaction can result in lateral flow of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the ground water table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

Our review of the subsurface soil test pit logs from our exploratory field explorations (TH-#1 through TH-#8) and laboratory test results indicate that the site is generally underlain by medium stiff, sandy, clayey silt soils and/or very stiff to medium dense, highly weathered bedrock deposits to depths of at least 7.0 feet beneath existing site grades. Additionally, groundwater was generally not encountered within any of the exploratory test pit excavations (TH-#1 through TH-#8) at the site during our field exploration work to depths of at least 7.0 feet. As such, due to the medium stiff and/or cohesive nature of the sandy, clayey silt subgrade soils as well as the very stiff to medium dense nature of the underlying highly weathered bedrock deposits beneath the site, it is our opinion that the native sandy, clayey silt subgrade soil and/or highly weathered bedrock deposits located beneath the subject site have a very low potential for liquefaction during the design earthquake motions previously described.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, development of the subject site into the planned residential homes sites does not appear to present a potential geologic and/or landslide hazard provided that the site grading and development activities conform with the recommendations presented within this report. A more detailed assessment of the potential landslide hazard of the subject site is presented in the Geologic Hazard Study in Appendix B.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Marion County and Salem. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new residential structures and site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Marion County requirements for the 100-year flood levels of any nearby creeks, streams and/or drainage basins.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our opinion that the site is presently stable and suitable for the proposed new Battle Creek and Landau single-family residential development and its associated site improvements provided that the recommendations contained within this report are properly incorporated into the design and construction of the project.

The primary features of concern at the site are 1) the presence of highly moisture sensitive clayey and silty subgrade soils across the site, 2) the presence of gently to moderately sloping site conditions across the proposed new residential lots and/or home sites, The presence of the existing site improvements, and 4) the relatively low infiltration rates anticipated within the near surface clayey and silty subgrade soils.

With regard to the moisture sensitive clayey and silty subgrade soils, we are generally of the opinion that all site grading and earthwork activities be scheduled for the drier summer months which is typically June through September.

In regards to the gently to moderately sloping site conditions across the proposed new residential home sites and/or lots, we are of the opinion that site grading and/or structural fill placement should be minimized where possible and should generally limit cuts and/or fills to about five (5) feet unless approved by the Geotechnical Engineer. Additionally, where existing site slopes and/or surface grades exceed about 20 percent (1V:5H), benching and keying of all fills into the natural site slopes may be required.

With regard to the presence of the existing site improvements, we recommend that all existing site improvements which will not remain at the site be removed in their entirety from all of the planned new structural improvement areas.

In regards to the relatively low infiltration rates anticipated within the clayey and silty subgrade soils beneath the site, we generally do not recommend any storm water infiltration within structural and/or embankment fills. However, some limited storm water infiltration may be feasible within the residential lots and/or areas of the site where the existing and/or finish slope gradients are no steeper than about 20 percent (1V:5H). In this regard, we recommend that all proposed storm water detention and/or infiltration systems for the project be reviewed and approved by Redmond Geotechnical Services, LLC.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new Battle Creek and Landau residential development project.

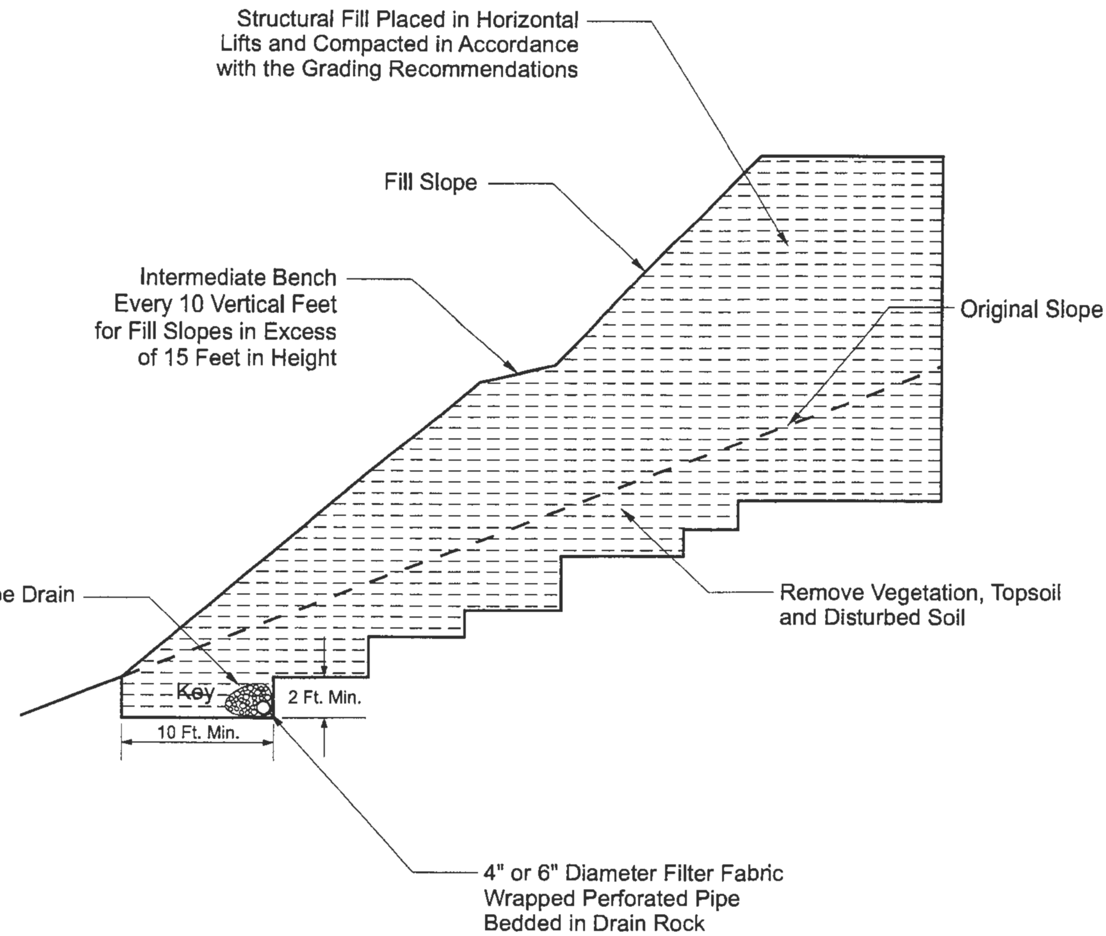
Site Preparation

As an initial step in site preparation, we recommend that the proposed new residential building sites and/or lots as well as their associated structural and/or site improvement area(s) be stripped and cleared of all existing improvements, any existing unsuitable fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, we envision that the site stripping to remove existing vegetation and topsoil materials will generally be about 6 to 12 inches. However, localized areas requiring deeper removals, such as any existing undocumented and/or unsuitable fill materials as well as old foundation remnants, will likely be encountered and should be evaluated at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site native sandy, clayey silt subgrade soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of some of the on-site native soil materials which contain significant silt and clay sized particles will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (late June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping of topsoil materials be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction. In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a woven geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock.



TYPICAL FILL SLOPE DETAIL

Project No. 1625.007.G	BATTLECREEK & LANDAU SUBDIVISION SITE	Figure No. 3

Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed within the new building and/or pavement areas should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. Additionally, all fill materials placed within about three (3) to five (5) lineal feet of the perimeter (limits) of the proposed residential structures and/or pavements should be considered structural fill. Additionally, due to the sloping site conditions, we recommend that all structural fill materials planned in areas where existing surface and/or slope gradients exceed about 20 percent (1V:5H) be properly benched and/or keyed into the native (natural) slope subgrade soils. In general, a bench width of at least eight (8) feet and a keyway depth of at least one (1) foot is recommended. However, the actual bench width and keyway depth should be determined at the time of construction by the Geotechnical Engineer. A typical fill slope detail is presented on Figure No. 3. Further, all fill slopes should be constructed with a finish slope surface gradient no steeper than about 2H:1V.

As such, settlement sensitive site and/or surface improvements (i.e., concrete curbs and sidewalks) should not be constructed until after primary consolidation and/or settlement has been completed. All aspects of the site grading, including a review of the proposed site grading plan(s), should be approved and/or monitored by a representative of Redmond Geotechnical Services, LLC.

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new residential development is suitable for support of the two- and/or three-story wood-frame structures provided that the following foundation design recommendations are followed. The following sections of this report present specific foundation design and construction recommendations for the planned new residential structures.

Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) column footings may be supported by approved native (untreated) subgrade soil materials and/or silty sand structural fill soils based on an allowable contact bearing pressure of about 2,000 pounds per square foot (psf). This recommended allowable contact bearing pressure is intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads. In general, continuous strip footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual column footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches.

Additionally, if foundation excavation and construction work is planned to be performed during wet and/or inclement weather conditions, we recommend that a 3 to 4 inch layer of compacted crushed rock be used to help protect the exposed foundation bearing surfaces until the placement of concrete.

Total and differential settlements of foundations constructed as recommended above and supported by approved native subgrade soils or by properly compacted structural fill materials are expected to be well within the tolerable limits for this type of lightly loaded wood-frame structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.30 and 0.45 for native silty subgrade soils and/or import gravel fill materials, respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 300 pounds per cubic foot (pcf). This recommended value includes a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 4 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab. However, additional moisture protection can be provided by using a 10-mil polyolefin geo-membrane sheet such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 150 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	45	35
3H:1V	65	60
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the proposed street improvements along the east side of Battle Creek Road SE as well as the proposed new street improvements for the Battle Creek and Landau residential development project was determined in accordance with the City of Salem Department of Public Works Administrative Rules Chapter 109-006 (Street Design Standards) Section 6 dated January 1, 2014.

Specifically, on October 29, 2019, samples of the subgrade soils from the existing and/or proposed public streets were collected by means of test hole excavations and/or core holes. The subgrade soils encountered in the test holes located across the proposed residential subdivision site and/or along the shoulder of the existing pavement grade of Robins Lane SE generally consisted of native and/or residual soils comprised of medium to reddish-brown, medium stiff, sandy, clayey SILT (ML).

The subgrade soil samples collected at the site were tested in the laboratory in accordance with the ASTM Vol. 4.08 Part D-2844-69 (AASHTO T-190-93) test method for the determination of the subgrade soil "R"-value and expansion pressure. The results of the "R"-value testing was then converted to an equivalent Resilient Modulus (M_{RSG}) in accordance with current AASHTO methodology. The results of the laboratory "R"-value tests revealed that the subgrade soils have an apparent "R"-value of between 24 and 28 with an average "R"-value of 26 (see Figure No's. A-13 and A-14). Using the current AASHTO methodology for converting "R"-value to Resilient Modulus (M_{RSG}), the subgrade soils have a Resilient Modulus (M_{RSG}) of about 5,291 psi which is classified a "Fair" (M_{RSG} = 5,000 psi to 10,000 psi).

In addition to the above, Dynamic Cone Penetration (DCP) tests were performed along the proposed new interior public street alignment at approximate 100-feet intervals. The results of the DCP tests found that the underlying native sandy, clayey silt subgrade soils have a DCP value of between 2 to 3 blows per 2-inches which correlates to a California Bearing Ratio (CBR) of between 5 and 12. Using current AASHTO methodology for converting CBR to Resilient Modulus (M_{RSG}), the subgrade soils have a Resilient Modulus (M_{RSG}) of between 5,842 and 10,637 psi with an average M_{RSG} of 7,150 psi which is classified as "Fair" (M_{RSG} = 5,000 psi to 10,000 psi).

Minor Arterial Streets

The following documents and/or design input parameters were used to help determine the flexible pavement section design for improvements to new and/or existing Minor Arterial Streets:

. **Street Classification:** Mino Arterial Street
. **Design Life:** 20 years
. **Serviceability:** 4.2 initial, 2.5 terminal
. **Traffic Loading Data:** 4,000,000 18-kip EAL's
. **Reliability Level:** 90%
. **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
. **Asphalt Structural Coefficient:** 0.41
. **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 4.3 was determined.

In this regard, we recommend the following flexible pavement section for the new improvements to new and/or existing Minor Arterial Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	6.0
Aggregate Base Rock	18.0

Local Residential Streets

The following documents and/or design input parameters were used to help determine the flexible pavement section design for new local residential streets:

. **Street Classification:** Local Residential Street
. **Design Life:** 25 years
. **Serviceability:** 4.2 initial, 2.5 terminal
. **Traffic Loading Data:** 100,000 18-kip EAL's
. **Reliability Level:** 90%
. **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
. **Asphalt Structural Coefficient:** 0.41
. **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 2.6 was determined.

In this regard, we recommend the following flexible pavement section for the construction of new Local Residential Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	4.0
Aggregate Base Rock	10.0

Wet Weather Grading and Soft Spot Mitigation

Construction of the proposed new public street improvements is generally recommended during dry weather. However, during wet weather grading and construction, excavation to subgrade can proceed during periods of light to moderate rainfall provided that the subgrade remains covered with aggregate. A total aggregate thickness of 8-inches may be necessary to protect the subgrade soils from heavy construction traffic. Construction traffic should not be allowed directly on the exposed subgrade but only atop a sufficient compacted base rock thickness to help mitigate subgrade pumping. If the subgrade becomes wet and pumps, no construction traffic shall be allowed on the road alignment. Positive site drainage away from the street shall be maintained if site paving will not occur before the on-set of the wet season.

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observations can either be removed and replaced with properly dried and compacted fill soils or removed and replaced with compacted crushed aggregate. However, and where approved by the Geotechnical Engineer, the soft area may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Soil Shrink-Swell and Frost Heave

The results of the laboratory "R"-value tests indicate that the native subgrade soils possess a low to moderate expansion potential. As such, the exposed subgrade soils should not be allowed to completely dry and should be moistened to near optimum moisture content (plus or minus 3 percent) at the time of the placement of the crushed aggregate base rock materials. Additionally, exposure of the subgrade soils to freezing weather may result in frost heave and softening of the subgrade. As such, all subgrade soils exposed to freezing weather should be evaluated and approved by the Geotechnical Engineer prior to the placement of the crushed aggregate base rock materials.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavation bracing for the project should be the responsibility of the excavation contractor. Permanent slopes should be constructed no steeper than about 2H to 1V unless approved by the Geotechnical Engineer.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level. If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation.

Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

We recommend that positive measures be taken to properly finish grade the site so that drainage waters from the residential structures and landscaping areas as well as adjacent properties or buildings are directed away from the new residential structures foundations and/or floor slabs. All roof drainage should be directed into conduits that carry runoff water away from the residential structures to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the proposed new residential structures.

Groundwater was not encountered at the site in any of the exploratory test pits (TH-#1 through TH-#8) at the time of excavation to depths of at least 7 feet beneath existing site grades. However, the subject property is surfaced with clayey silt subgrade soils which have relatively low infiltration rates. Additionally, groundwater elevations in the area and/or across the subject property may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall.

As such, based on our current understand of the possible site grading required to bring the subject site and/or residential lots to finish design grade(s), we are of the opinion that an underslab drainage system is not required for the proposed single-family residential structures. However, a perimeter foundation drain is recommended for any perimeter footings and/or below grade retaining walls. A typical recommended perimeter footing/retaining wall drain detail is shown on Figure No. 4.

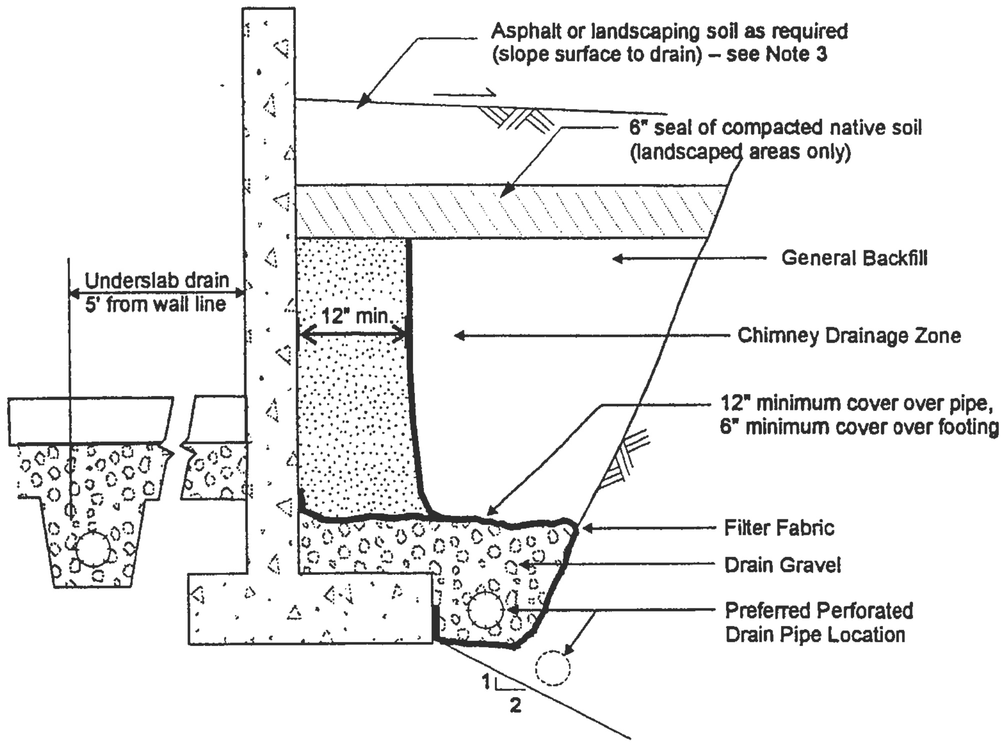
Further, due to our understanding that various surface infiltration ditches and/or swales may be utilized for the project as well as the relatively low infiltration rates of the near surface sandy, clayey silt subgrade soils anticipated within and/or near to the foundation bearing level of the proposed residential structures, we are generally of the opinion that storm water detention and/or disposal systems should not be utilized within the residential lots and/or around the proposed residential structures unless approved by the Geotechnical Engineer.

Design Infiltration Rates

Based on the results of our field infiltration testing, we recommend using the following infiltration rate to design any on-site near surface storm water infiltration and/or disposal systems for the project:

Subgrade Soil Type	Recommended Infiltration Rate
sandy, clayey SILT (ML)	0.3 to 0.4 inches per hour (in/hr)

Note: A safety factor of two (2) was used to calculate the above recommended design infiltration rate. Additionally, given the gradational variability of the on-site sandy, clayey sit subgrade soils beneath the site as well as the anticipation of some site grading for the project, it is generally recommended that field testing be performed during and/or following construction of any on-site storm water infiltration system(s) in order to confirm that the above recommended design infiltration rates are appropriate.



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.
3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed ¾" to 1½" gravel.
5. General backfill to be on-site gravels, or ¾""-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).
6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL		
Project No. 1625.007.G	BATTLECREEK & LANDAU SUBDIVISION SITE	Figure No. 4

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the latest edition (2014) of the State of Oregon Structural Specialty Code (OSSC) and/or Amendments to the 2015 International Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Oregon Structural Specialty Code and/or from the National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. We recommend Site Class "C" be used for design. Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from the 2012 IBC to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:

Table 1. Recommended Seismic Design Parameters

Site Class	S_S	S_1	Fa	Fv	S_{MS}	S_{M1}	S_{DS}	S_{D1}
C	0.907	0.429	1.037	1.371	0.941	0.588	0.627	0.392

Notes: 1. S_S and S_1 were established based on the USGS 2012 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. Fa and Fv were established based on IBC 2015 tables using the selected S_S and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new Battle Creek and Landau residential development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations. It is important that our representative meet with the contractor prior to any site grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation and stripping, structural fill placement, footing excavations and construction as well as retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new single-family residential structures and their associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or at other locations across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes. We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site inspections and constriction monitoring services for this project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection and/or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

REFERENCES

Adams, John, 1984, Active Deformation of the Pacific Northwest Continental Margin: Tectonics, v.3, no. 4, p. 449-472.

Applied Technology Council, ATC-13, 1985, Earthquake Damage Evaluation Data for California.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Atwater, B.F., 1987a, A periodic Holocene recurrence of widespread, probably coseismic Subsidence in southwestern Washington: EOS, v. 68, no. 44.

Atwater, B.F., 1987b, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, no. 4804, pp. 942-944.

Campbell, K.W., 1990, Empirical prediction of near-surface soil and soft-rock ground motion for the Diablo Canyon Power Plant site, San Luis Obispo County, California: Dames & Moore report to Lawrence Livermore National Laboratory.

Carver, G.A., and Burke, R.M., 1987, Late Holocene paleoseismicity of the southern end of the Cascadia Subduction zone [abs.]: EOS, v. 68, no. 44, p. 1240.

Chase, R.L., Tiffin, D.L., Murray, J.W., 1975, The western Canadian continental margin: In Yorath, C.J., Parker, E.R., Glass, D.J., editors, Canada's continental margins and offshore petroleum exploration: Canadian Society of Petroleum Geologists Memoir 4, p. 701-721.

Crouse, C.B., 1991a, Ground motion attenuation equations for earthquakes on the Cascadia Subduction Zone: Earthquake Spectra, v. 7, no. 2, pp. 201-236.

Crouse, C.B., 1991b, Errata to Crouse (1991a), Earthquake Spectra, v. 7, no. 3, p. 506.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes, northern Oregon central Cascadia margin: Tectonics, v. 9, p. 1-22.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes northwest Oregon [abs]: EOS, v. 68, no. 44, p. 1469.

EERI (Earthquake Engineering Research Institute), 1993, The March 25, 1993, Scotts Mill Earthquake, Western Oregon's Wake-Up Call: EERI Newsletter, Vol. 27, No. 5, May.

Geomatrix, 1995 Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, January.

Geologic Map Series (GMS-49), Map of Oregon Seismicity, 1841-1986 dated 1986.

Geologic Map of the Salem West Quadrangle, Marion County, Oregon dated 1995.

Grant, W.C., and McLaren, D.D., 1987, Evidence for Holocene Subduction earthquakes along the northern Oregon coast [abs]: EOS v. 68, no. 44, p. 1239.

Grant, W.C., Atwater, B.F., Carver, G.A., Darienzo, M.E., Nelson, A.R., Peterson, C.D., and Vick, G.S., 1989, Radiocarbon dating of late Holocene coastal subsidence above the Cascadia Subduction zone-compilation for Washington, Oregon, and northern California, [abs]: EOS Transactions of the American Geophysical Union, v. 70, p. 1331.

International Conference of Building Officials (ICBO), 1994, Uniform Building Code: 1994 Edition, Whittier, CA. 1994.

Joyner, W.B., and Boore, D.M., 1998, Measurement, characterization and prediction of strong ground motion: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 43-102.

Riddihough, R.P., 1984, Recent movements of the Juan de Fuca plate system: Journal of Geophysical Research, v. 89, no. B8, p. 6980-6994.

Youngs, R.R., Day, S.M., and Stevens, J.L., 1998, Near field ground motions on rock for large Subduction earthquakes: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 445-462.

Appendix "A"

Test Pit Logs and Laboratory Test Data

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site were explored by excavating eight (8) exploratory test pits (TH-#1 through TH-#8) on October 29, 2017. The approximate location of the test pit explorations are shown in relation to the proposed new residential lots and the associated site improvements on the Site Exploration Plan, Figure No. 2.

The test pits were excavated using track-mounted excavating equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test pits were excavated to depths ranging from about 6.0 to 7.0 feet beneath existing site grades. Detailed logs of the test pits are presented on the Log of Test Pits, Figure No's. A-4 through A-7. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-3.

The exploration program was coordinated by a field engineer who monitored the excavating and exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was not encountered in any of the exploratory test pits (TH-#1 through TH-#8) at the time of excavating to depths of at least 7.0 feet beneath existing surface grades.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, gradational characteristics, and Atterberg Limits as well as direct shear strength and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test pit explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

Two (2) Maximum Dry Density and Optimum Moisture Content tests were performed on representative samples of the on-site sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-1557. This test was conducted to help establish various engineering properties for use as structural fill. The test results are presented on Figure No. A-8.

Atterberg Limits

Two (2) Liquid Limit (LL) and Plastic Limit (PL) tests were performed on representative samples of the sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. These tests were conducted to facilitate classification of the soils and for correlation purposes. The test results appear on Figure No. A-9.

Gradation Analysis

Two (2) Gradation analyses were performed on representative samples of the subsurface soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Direct Shear Strength Test

Two (2) Direct Shear Strength tests were performed on undisturbed and/or remolded samples at a continuous rate of shearing deflection (0.02 inches per minute) in accordance with ASTM Vol. 4.08 Part D-3080-79. The test results were used to determine engineering strength properties and are shown graphically on Figure No's. A-11 and A-12.

"R"-Value Tests

Four (4) "R"-value tests were performed on a remolded subgrade soil sample in accordance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No's. A-13 and A-14.

The following figures are attached and complete the Appendix:

Figure No. A-3	Key To Exploratory Test Pit Logs
Figure No's. A-4 through A-7	Log of Test Pits/Dynamic Cone
Figure No. A-8	Maximum Dry Density
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No's. A-11 and A-12	Direct Shear Strength Test Results
Figure No's. A-13 and A-14	Results of "R"-Value Tests
Figure No's. A-15 and A-16	Field Infiltration Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE: 200, 40, 10, 4

CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT †
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH ‡	BLOWS/FOOT †
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).
‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

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KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure A-3
1625.007.G	12/27/19	

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/19

TEST PIT NO. TH-#1 ELEVATION 466'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			27.7	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#2 ELEVATION 461'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			28.3	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G BATTLECREEK & LANDAU SUBDIVI FIGURE NO. A-4

BACKHOE COMPANY: Gene S. McMurrin | BUCKET SIZE: 24 inches | DATE: 10/29/19

SOIL DESCRIPTION

TEST PIT NO. TH-#3 ELEVATION 450'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0–1.0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
1.0–6.0	X			27.9	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
6.0						Total Depth = 6.0 feet No groundwater encountered at time of exploration

TEST PIT NO. TH-#4 ELEVATION 433'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0–1.0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
1.0–6.0	X			28.8	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 6 feet
6.0–7.0	X			26.6	ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
7.0						Total Depth = 7.0 feet No groundwater encountered at time of exploration

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO. A-5

REDMOND GEOTECHNICAL SERVICES

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/19

SOIL DESCRIPTION

TEST PIT NO. TH-#5 ELEVATION 411'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			29.6	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 4 to 6 feet
5						
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#6 ELEVATION 424'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 4 to 6 feet
5						
					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO. A-6

REDMOND GEOTECHNICAL SERVICES

BACKHOE COMPANY: Gene S. McMurrin   BUCKET SIZE: 24 inches   DATE: 10/29/18

TEST PIT NO. TH-#7   ELEVATION 450'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			27.2	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5	X			27.1	ML/ RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#8   ELEVATION 452'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			29.3	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/ RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G   BATTLECREEK & LANDAU SUB   FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#1 @ 1.5'	Medium to reddish-brown, sandy, clayey SILT (ML)	104.0	28.0
TH-#7 @ 2.0'	Medium to reddish-brown, sandy, clayey SILT (ML)	102.0	30.0

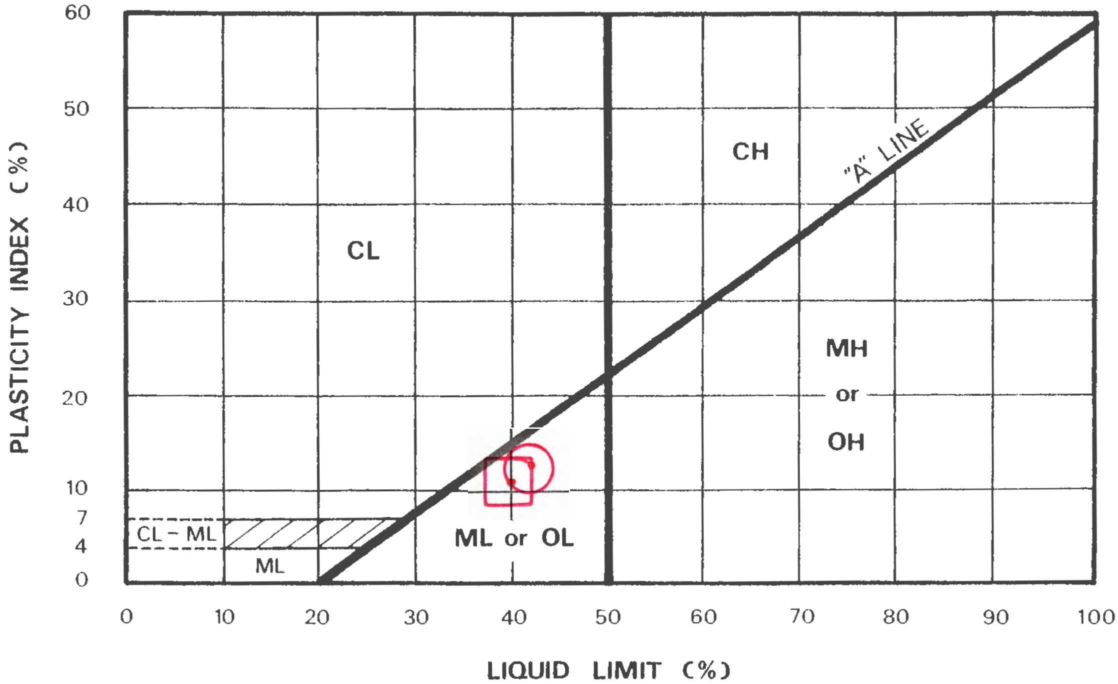
EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO.: A-8

REDMOND GEOTECHNICAL SERVICES



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
⊙	TH-#1	1.5	27.7	42.2	13.3	84.8		ML
⊡	TH-#7	2.0	27.2	40.1	10.5	87.8		ML

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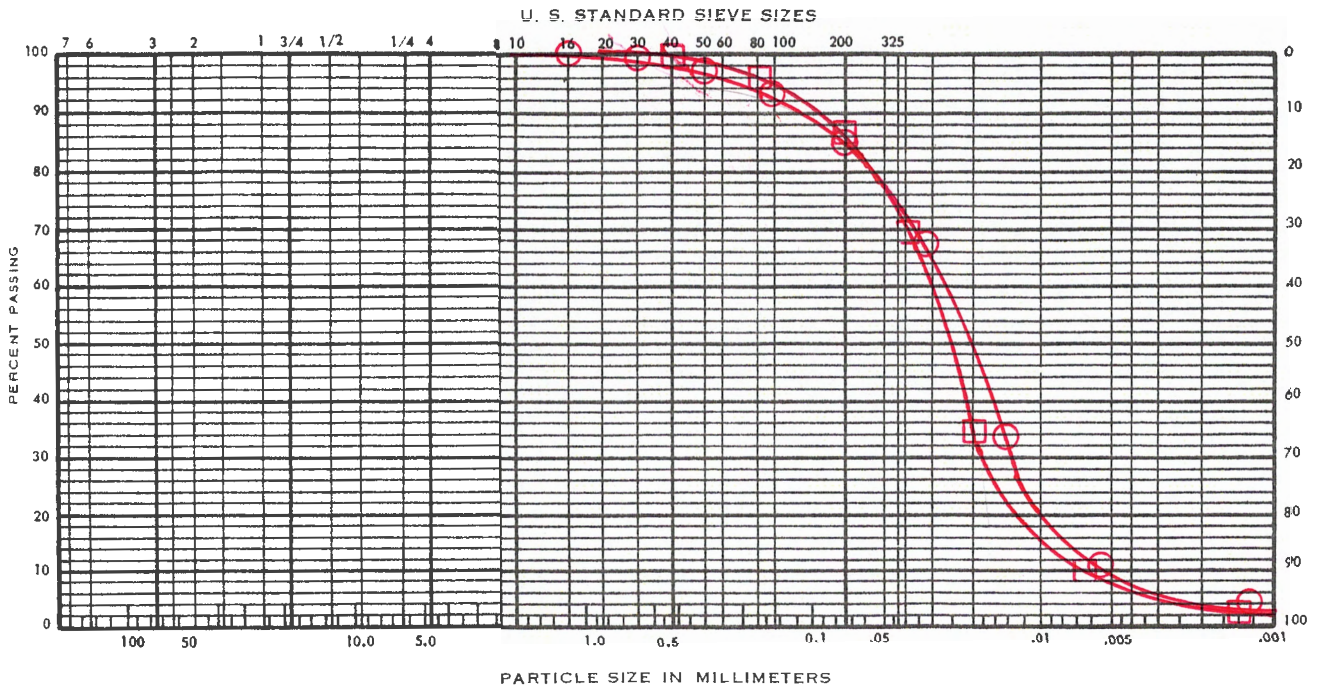
PLASTICITY CHART AND DATA

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure A-9
1625.007.G	12/27/19	

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
-○-	TH-#1	1.5		ML	Medium to reddish-brown, sandy, clayey SILT
-□-	TH-#7	2.0		ML	Medium to reddish-brown, sandy, clayey SILT

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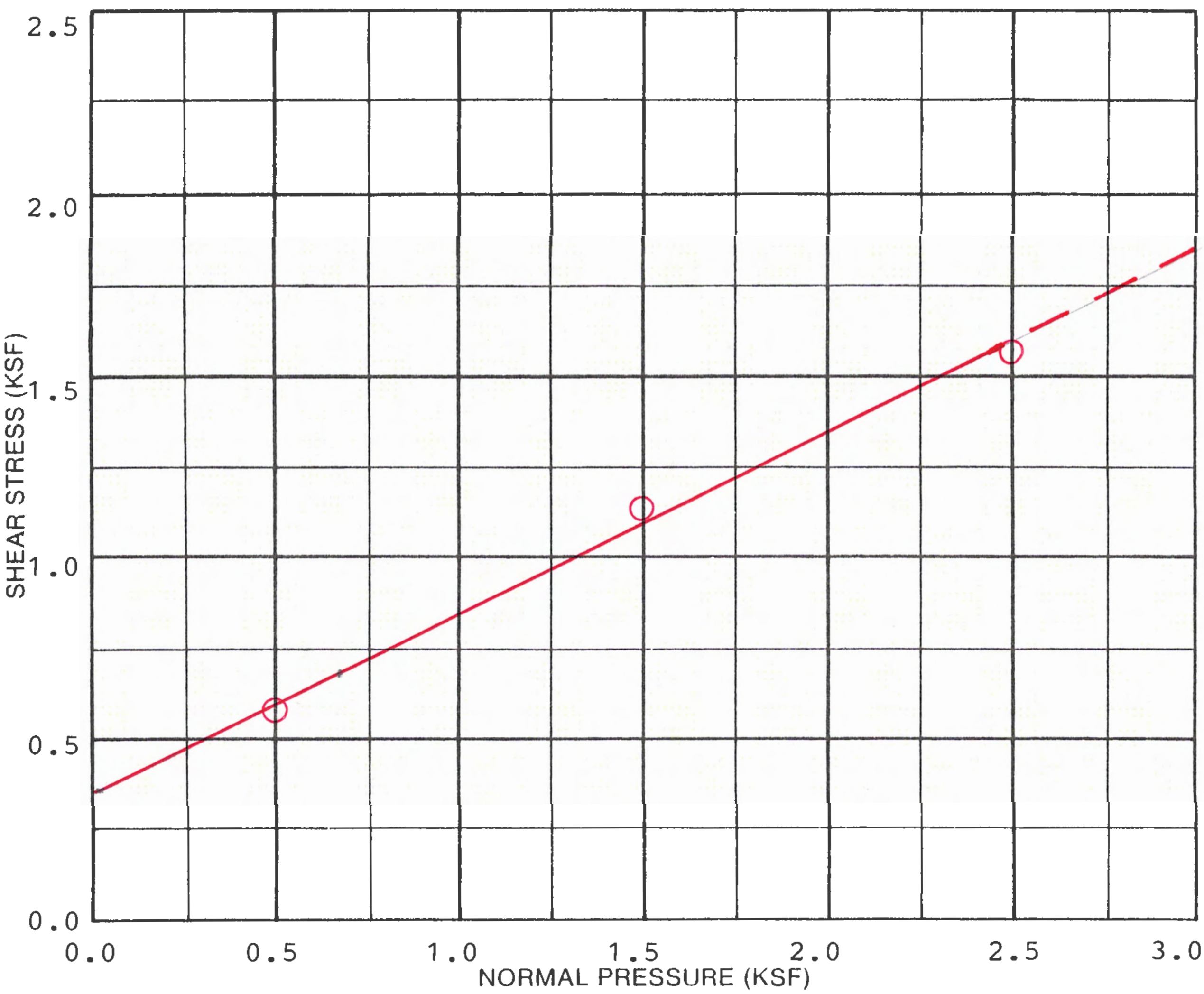
GRADATION TEST DATA

BATTLECREEK & LANDAU SUBDIVISION

Salem, Oregon

PROJECT NO.	DATE	FIGURE
1625.007.G	12/27/19	A-10



SAMPLE DATA	
DESCRIPTION:	Medium to reddish-brown sandy, clayey SILT (ML) (Remolded)
BORING NO.:	TH-#1
DEPTH (ft.): 1.5'	ELEVATION (ft):

TEST RESULTS	
APPARENT COHESION (C):	350 psf
APPARENT ANGLE OF INTERNAL FRICTION (ϕ):	25°

TEST DATA				
TEST NUMBER	1	2	3	4
NORMAL PRESSURE (KSF)	0.5	1.5	2.5	
SHEAR STRENGTH (KSF)	0.6	1.1	1.6	
INITIAL H_2O CONTENT (%)	30.0	30.0	30.0	
FINAL H_20 CONTENT (%)	31.1	27.2	23.3	
INITIAL DRY DENSITY (PCF)	90.0	90.0	90.0	
FINAL DRY DENSITY (PCF)	91.1	94.4	98.8	
STRAIN RATE:	0.02 inches per minute			

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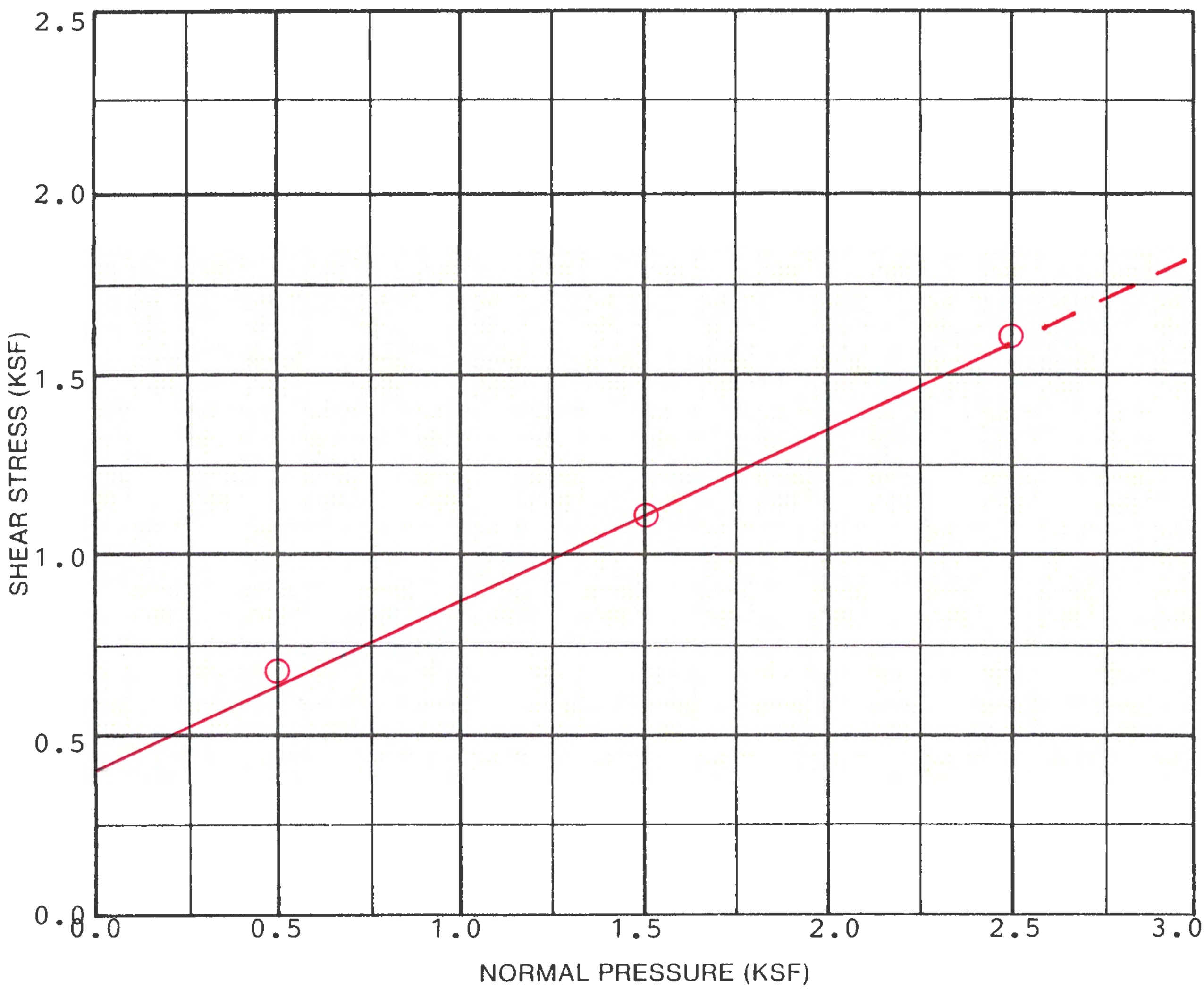
DIRECT SHEAR TEST DATA

BATTLE CREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure
1625.007.G	12/27/19	A-11



SAMPLE DATA	
DESCRIPTION: Medium to reddish-brown sandy, clayey SILT (ML) (Remolded)	
BORING NO.: TH-#7	
DEPTH (ft.): 2.0'	ELEVATION (ft):
TEST RESULTS	
APPARENT COHESION (C): 400 psf	
APPARENT ANGLE OF INTERNAL FRICTION (φ): 24°	

TEST DATA				
TEST NUMBER	1	2	3	4
NORMAL PRESSURE (KSF)	0.5	1.5	2.5	
SHEAR STRENGTH (KSF)	0.7	1.2	1.6	
INITIAL H_2O CONTENT (%)	30.0	30.0	30.0	
FINAL H_2O CONTENT (%)	31.1	25.6	20.3	
INITIAL DRY DENSITY (PCF)	90.0	90.0	90.0	
FINAL DRY DENSITY (PCF)	91.4	94.8	99.6	
STRAIN RATE: 0.02 inches per minute				

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DIRECT SHEAR TEST DATA

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure
1625.007.G	12/27/19	A-12

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#2

SAMPLE DEPTH: 2.5 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	329	431
Expansion Dial (o.ooo1")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.6	24.4	21.1
Dry Density (pcf)	93.4	98.2	102.6
Resistance Value, "R"	15	27	37
"R"-Value at 300 psi Exudation Pressure = 26			

SAMPLE LOCATION: TH-#3

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	208	326	439
Expansion Dial (0.0001")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.3	24.1	20.7
Dry Density (pcf)	94.9	99.1	103.7
Resistance Value "R"	16	27	36
"R"-Value at 300 psi Exudation Pressure = 26			

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#7

SAMPLE DEPTH: 2.5 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	211	322	438
Expansion Dial (o.ooo1”)	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	28.3	24.9	21.6
Dry Density (pcf)	93.9	97.6	101.5
Resistance Value, “R”	14	25	34
“R”-Value at 300 psi Exudation Pressure = 24			

SAMPLE LOCATION: TH-#8

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	202	321	434
Expansion Dial (0.0001”)	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.1	23.7	20.2
Dry Density (pcf)	95.3	99.4	103.9
Resistance Value “R”	15	27	36
“R”-Value at 300 psi Exudation Pressure = 28			

Division 004 Appendix C - Infiltration Testing

Location: TL 900, 5826 Battle Creek Rd SE	**Date:** October 29, 2019	**Test Hole:** TH-#3
Depth to Bottom of Hole: 4.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head
Tester's Name: Daniel M. Redmond, P.E., G.E. **Tester's Company:** Redmond Geotechnical Services, LLC		**Tester's Contact Number:** 503-285-0598

Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-4.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
9:00	0	36.00	----		Filled w/12" water
9:20	20	36.50	0.50	1.50	
9:40	20	36.90	0.40	1.20	
10:00	20	37.26	0.36	1.08	
10:20	20	37.58	0.32	0.96	
10:40	20	37.87	0.29	0.87	
11:00	20	38.14	0.27	0.81	
11:20	20	38.40	0.26	0.78	
11:40	20	38.66	0.26	0.78	

Infiltration Test Data Table

Figure No. A-15

Division 004 Appendix C - Infiltration Testing

Location: TL 900, 5826 Battle Creek Rd SE	**Date:** October 29, 2019	**Test Hole:** TH-#5
Depth to Bottom of Hole: 3.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head
Tester's Name: Daniel M. Redmond, P.E., G.E. **Tester's Company:** Redmond Geotechnical Services, LLC		**Tester's Contact Number:** 503-285-0598

Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-3.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
9:30	0	24.00	----		Filled w/12" water
9:50	20	24.35	0.35	1.05	
10:10	20	24.65	0.30	0.90	
10:30	20	24.92	0.27	0.81	
10:50	20	25.16	0.24	0.72	
11:10	20	25.38	0.22	0.66	
11:30	20	25.59	0.21	0.63	
11:50	20	25.79	0.20	0.60	
12:10	20	27.99	0.20	0.60	

Infiltration Test Data Table

Appendix "B"

Geologic Hazard Assessment

NORTHWEST GEOLOGICAL SERVICES, INC.
Consulting Geologists and Hydrogeologists
2505 N.E. 42nd Avenue, Portland, Oregon 97213-1201
503-249-1093 ngs@spiritone.com

Redmond Geotechnical Services **19 November 2019**
P. O. Box 20547
Portland, OR 97294
Attention: Dan Redmond

Geologic Hazard Assessment
5826 Battle Creek Rd SE
8S/3W - 13C TL 900
Salem, Oregon

Dear Dan:

The purpose of this letter is to present Northwest Geological Services, Inc. (NGS) Geologic Hazard Assessment for the above referenced property as per your email authorization of 16 October 2019. We understand that our services are in support of your client's effort to subdivide and develop the property for residential use.

1. Purpose and Scope of Study

The City slope hazard GIS indicates that the slopes at the site have hazard score of 2 point or less. City of Salem Planning rules indicate that subdivision of the site requires a geologic hazard assessment (cumulative score 5 points). The purpose of this letter is to meet that requirement.

For the study we conducted the following tasks:

- Reviewed State and Federal hazard studies and geologic maps of the area;
- Obtained GIS and Hazard maps from City of Salem Public Works;
- Reviewed geologic and topographic maps for the site area;
- Obtained and reviewed drillers well logs for site and nearby water wells;
- Reviewed aerial imagery (1944-2014) and LIDAR data from NOAA (2009 and 2018);
- Conducted a site reconnaissance and observed conditions in four test pits on 28 October 2019; and
- Prepared this letter.

2. Site Setting and Slopes

The subject property is in the north part of the South Salem Hills. It consists one trapezoidal, 11.16-acre lot (Figure 1) between Battle Creek Rd SE and the I-5 freeway south of Landau St SE. It is about 1/3 mile north of Battle Creek Rd's crossing of I-5 (Figures 1 and 2). The existing TL 900 residence is in the south west part of the site and accessed by a driveway from Battle Creek Rd SE. (Figures 3 and 5). Four agricultural outbuildings are clustered near the residence.

The area was originally rural agricultural (e.g. Figure 4, upper). The site was orchard and woodlot/tree farm on aerial photos taken from 1944-1977 and for decades before that. Since the site and area were converted to rural residential and hobby farms. Most lately medium and high-density residential subdivisions have expanded to just north of the site. Thus, water and sewer are available in Landon St SE (Figure 2) immediately NE of the site. Also, an existing water main follows the west side of Battle Creek Rd SE.

Figure 4 shows 1944 and 2018 aerial photos of the site and adjacent area. The 1944 photo shows the area before I-5 was built. The 2018 photo shows how the east end of the property was cut by I5. Review of other aerial photos[1] indicates that the cut for I-5 and its frontage was made before June 1955. The 1967 aerial photos show I5 constructed. Photos from the 1970s though the mid 2010s show build out of the residential subdivisions west and north of the site.

Site elevations range from 472 (msl) on the ridge at the residence down to 418 at the NE property corner and 454 near the NW corner. The steepest natural slopes are up to 20% on the east flank of the rise extending NNW-SSE in the west part of the site. Salem GIS shows two small patches of 25% slope occur just north of the residence (Figure 5). However, reconnaissance and air photo review found no difference between these patches and adjacent slopes.

3. Site Engineering Geology

According to published mapping (Foxworthy, 1970; Bella, 1981; Tolan & Beeson, 2000; Beeson & Tolan, 2001) and our geologic mapping for Marion County (NGS, 1997), most of the site is underlain by the Sentinel Bluffs flows of the Columbia River Basalt. The summit area, above about 465 - 470, are underlain by the Silver Falls flow. The basalt flows are mantled by a few feet of red-brown clayey SILT and severely weathered to decomposed basalt. The decomposed basalt is weathered to a hard to very hard red-brown clayey silt (laterite)[2]. The drillers log for the site well[3] suggests the basalt is decomposed or severely weathered to about 40 ft depth. Weathered basalt is exposed in the cut for I-5 just south of the site and for Battle Creek Rd about 1000 ft to the south.

Areas around the site and below about 400 – 420 ft were scoured by the Missoula Floods 13,000 to ~ 50,000 years ago (Waitt, 1985). However, no flood deposits appear present at the site of in the cuts along I-5.

Reconnaissance[4] confirmed the site is underlain by stiff red-brown soils derived from the Columbia River Basalt. We found smooth regular slopes, in agreement with the available LIDAR (Figures 3 and 5). Trees in the forested areas show gentle curvature typical of those

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[1] We reviewed photos and images from 1944 through 2014, see Section 7, References.

[2] Locally known as the Jory soil series.

[3] Attached following the Figures.

[4] On 29 October 2019

growing in shallow soils. Conifer tops, however, are straight and vertical. There was no evidence of flowing or standing water in the swales during our late October reconnaissance.

Four test pits were excavated at the site to confirm the depth to basalt and the nature of the overlying soils. They were located on the steeper slopes and ridges because the State and County have identified those areas as having moderate susceptibility to slope hazards (see Section 4, beyond). Figure 3 shows the locations of the test pits. Hard decomposed BASALT was found at shallow depths in all test pits (Table 1, below). Additionally, soils below about 1.5 to 2 ft were dry to slightly damp, indicating permeability is quite low.

Table 1 - Test Pit Observations

Geologic Unit	TP-1	TP-2	TP-3	TP-4
Red brown clayey SILT	0 - 3 ft	0 - 3.5	0 3 ft	0 - 3 ft
Decomposed Basalt	3 - 5 ft	3.5 - 5 ft	3 - 6 ft	3 - 6 ft
Weathered Basalt	5 - 6 ft	5 ft	-	6 ft
Total Depth	6 ft	7 ft	6 ft	7 ft

Fill is inferred to be present locally as backfill for the utilities for the existing residence and outbuildings. However, these areas are gently sloped so there should be no slope hazards associated with the those fills.

4. Government Geologic Hazards

The available geologic mapping shows no geologic hazards at the site. The nearest mapped landslides are more than a mile distant. Our mapping, the water well logs and the test pits show the site is underlain by a few feet of stiff to hard soils with weathered basalt bedrock at shallow depths. Published DOGAMI slope hazard mapping of the Salem area does not extend south and east to the site. However, geologically similar areas have been mapped as having an intermediate potential for slope failures in areas of thick soils and slopes steeper than 20%.

DOGAMI recently added potential landslide susceptibility ranking to its SLIDO web site. That ranking shows the site with a low to moderate susceptibility to landslides. Finally, the City of Salem shows the same slopes to present a level 2 or less risk on a scale of 0 to 6 (Figure 5). Small, nearby patches of level 3 risk are road cuts/fills or other manmade features.

The landslide susceptibility maps are derived from generalized digital geologic maps, evaluation of LIDAR imagery and comparison with information for existing nearby landslides. They are not mapping of actual landslides. Rather, they denote areas that should be evaluated by a qualified professional Engineering Geologist. They are similar to – but more advanced – than the City of Salem risk maps that are based mainly on slope steepness and DOGAMI landslide studies.

The site has gentle to moderate slopes. The natural slopes might look steep enough to fail during an earthquake but are underlain by stiff to hard silt and basalt bedrock. Site soils below 2.5 to 3.5 ft depth are stiff to hard, thus limiting the potential for either slope failure or lateral spreading. The City GIS map (Figure 5) shows no slopes present >25% other than the small areas associated with the man-made cuts. However, the lack of elevated risk for seismic induced slope failure does not imply a lack of seismic risk. The site is subject to the same strong ground motions from local or distant earthquakes as are similar shallow bedrock sites throughout the area. The existing natural slopes appear stable with respect to saturation. However, steep cuts into them or fills place on them may be less stable than the natural slope.

5. Conclusions and Recommendations

The site is gently to moderately sloped and has a very low susceptibility to landsliding under any natural geologic circumstance, in our opinion. In our experience, the weathered basalt is not susceptible to slope spreading or liquefaction during strong ground motions from earthquakes. The basalt bedrock is at shallow depth and is not susceptible to failure during earthquakes beneath the existing site slopes. Thus, the site does not appear to be at significant risk from slope instability. However, man-made cuts into the shallow decomposed basalt and overlying silt have occasionally created local problems.

In our opinion, development of this site as proposed (Figure 6) should not create new or exacerbate existing geologic hazards. However, we caution that any fills at the site - including utility backfill - may be subject to failure or settlement during strong ground motions unless properly placed. As noted above, cuts into the natural slopes may be less stable than the existing slope.[5] Consequently, we recommend that foundations, cuts and fills should be designed by a qualified professional using recommendations from your geo-technical investigation. Additionally, we recommend inspection of all open cuts and earthworks by a geotechnical engineer.

In our experience, the decomposed and weathered basalt have relatively low permeability. Consequently, the thin soil overlying the basalt may become fully saturated during intense precipitation or after prolonged intervals of moderate precipitation. We recommend provision be made for on site storm water retention and off-site disposal. The system should be designed by a qualified professional.

6. LIMITATIONS AND LIABILITY

We call your attention to the paragraphs on Warranty and Liability in the General Conditions (dated 1/2019) that you previously approved. Interpretations and recommendations presented herein are based on limited data and observations. Actual subsurface conditions may vary from those inferred from the limited information available to us. If site excavations for development find conditions to differ significantly from those inferred herein, you should contact us and provide an opportunity for us to review our recommendations for the site.

[5] This is particularly true of slopes underlain by interbeds in the basalt. An interbed is locally present between the Sentinel Bluffs flow and the overlying Silver Falls flow. Excavations in the upper elevations of the site should be examined by the Project Engineer for evidence of

We thank you for the opportunity to assist you with your project. Please contact me if you have questions about the report.

Yours very truly,
Northwest Geological Services, Inc.

Clive F. (Rick) Kienle, Jr.
Principal Engineering Geologist
and Vice President

NGS Reference 235.111-1

7. References

Aerial Photographs & Imagery: US Geological Survey – 1944, 10 June 1955, 19 November 1967, 3 July 1973, 18 June 1994, 23 July 2000, 29 February 2008; USDA Farm Service Agency – 17 August 2003; WAC Corp – 28 March 1990; State of Oregon – 28 June 2005, 8 July 2010; Google, Inc. – 8 July 2012.

Bela, James L., 1981, Geologic Map of the Rickreall and Salem West Quadrangles, Oregon, Oregon Dept. Geology & Mineral Industries, Geologic Map Series, GMS-18.

Beeson, M.H. and T.L. Tolan, 2001, Geologic Map of the Salem West, Oregon 7 ½ Minute Quadrangle, unpublished geologic mapping for the US Geological Survey Urban Corridors Hazards program.

Foxworthy, B. L., 1970, Hydrologic Conditions and Artificial Recharge Through a Well in the Salem heights Area of Salem, Oregon, U. S. Geological Survey Water-Supply Paper 1594F.

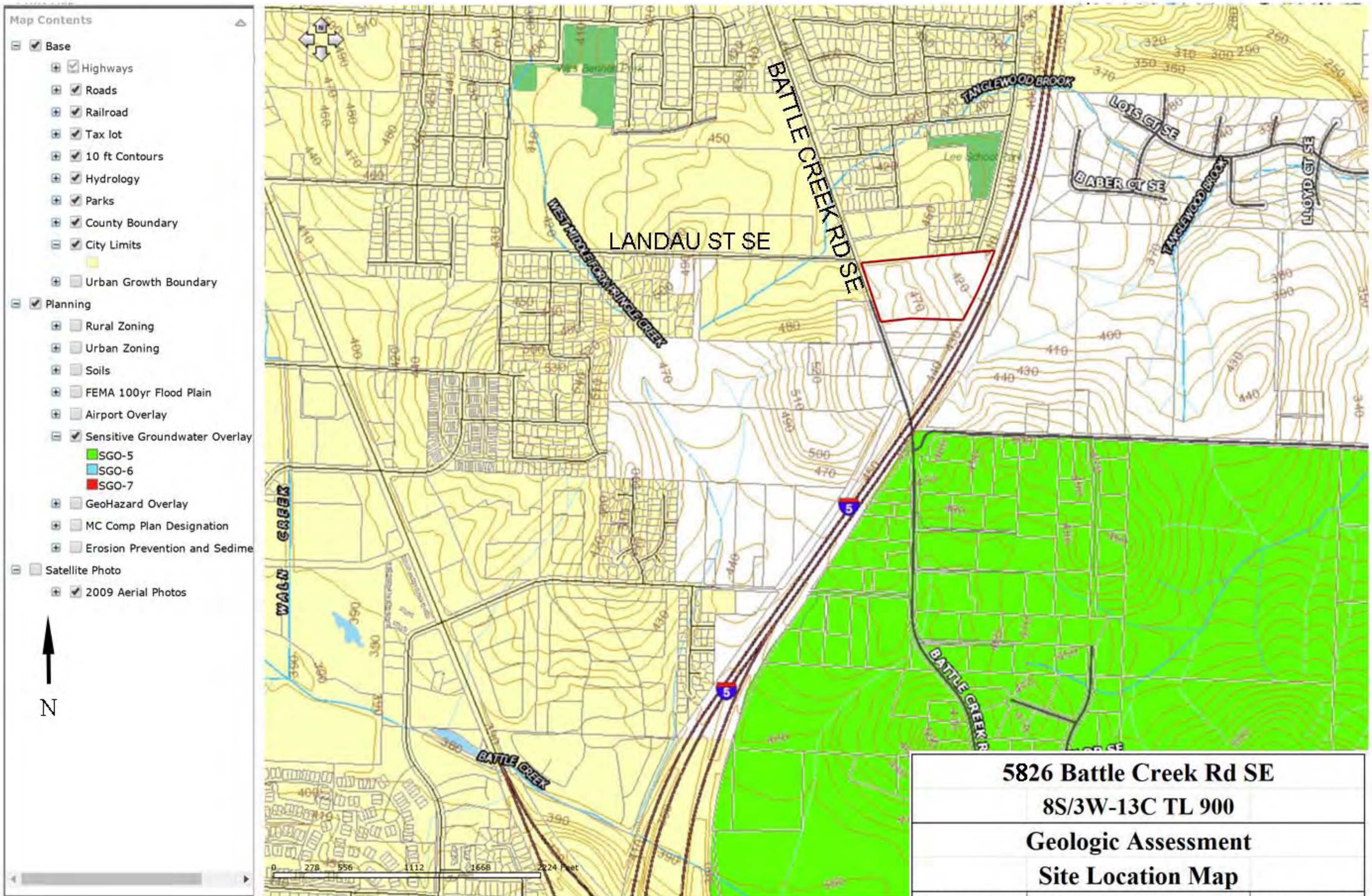
NGS, 1997, Geologic and Hydrogeologic Study of the Residential Acreage-Zoned Areas of Marion County Underlain By Columbia River basalt and Older Rocks; Northwest Geological Services, Inc. Report dated May 1997 to Marion County.

Salem, City of, undated, Slope Hazard Report Requirements.

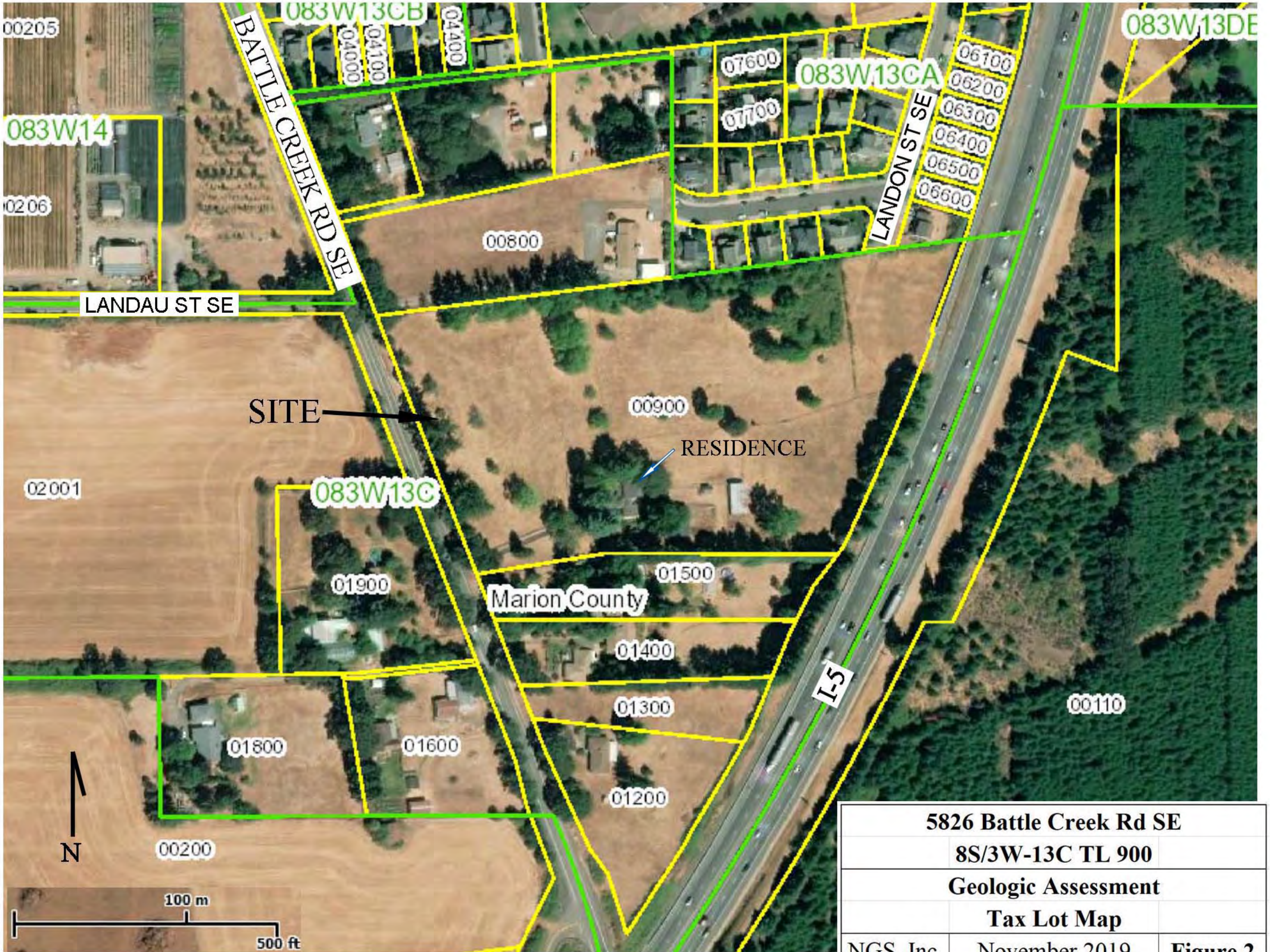
Salem, City of Planning, Hazards and LIDAR Maps dated November 2019.

Tolan. T.L. and M.H. Beeson, 2000, Geologic Map of the Salem East and Turner, Oregon, 7½ Minute Quadrangles, U.S./ Geological Survey Open-File Report 00-351.

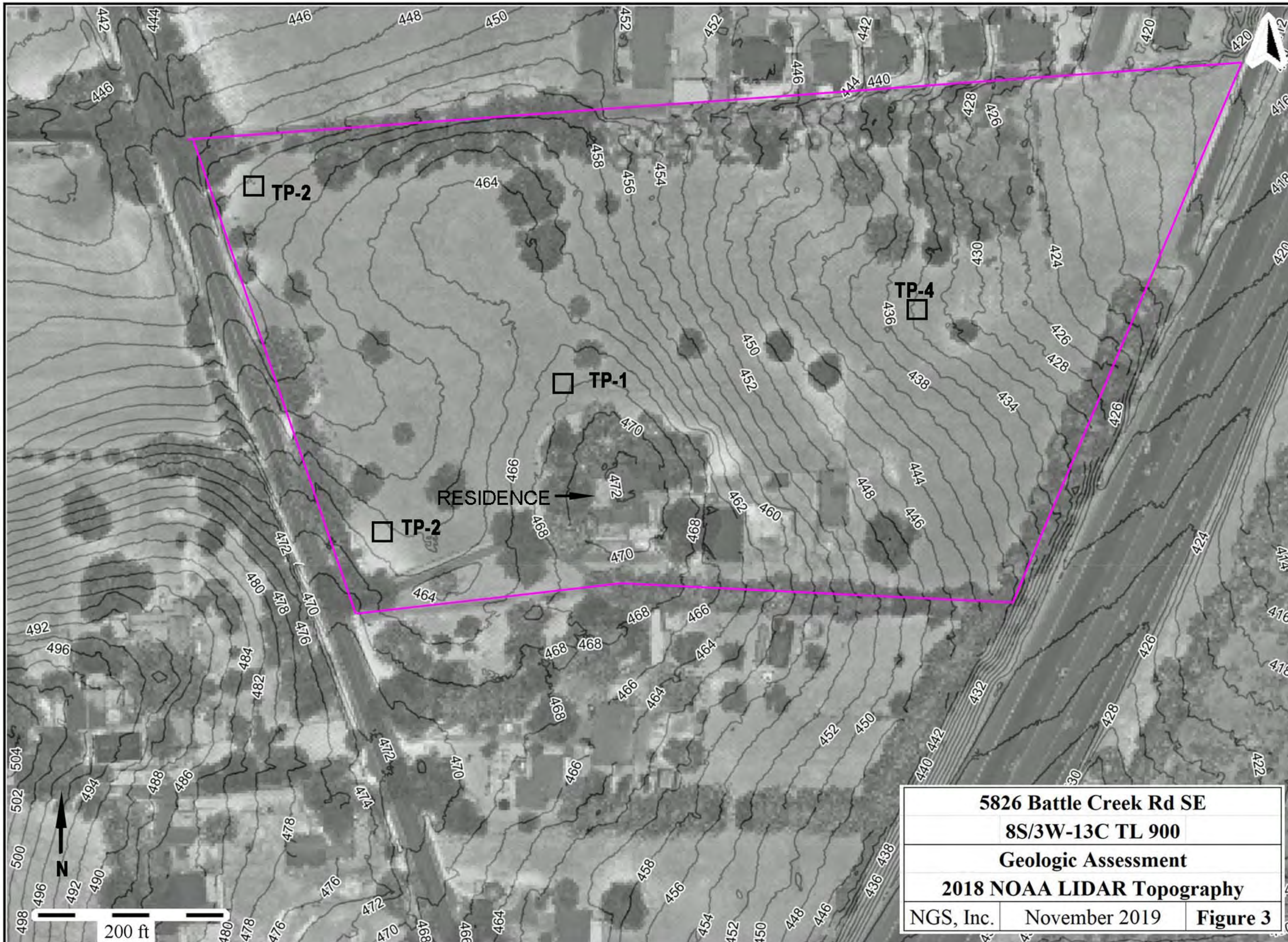
Waitt, R. B., Jr., 1985, Case for periodic, colossal jökulhlaups from Pleistocene Lake Missoula, Geol. Soc. Amer. Bull. V 96, no. 10, pp. 1271-1286.



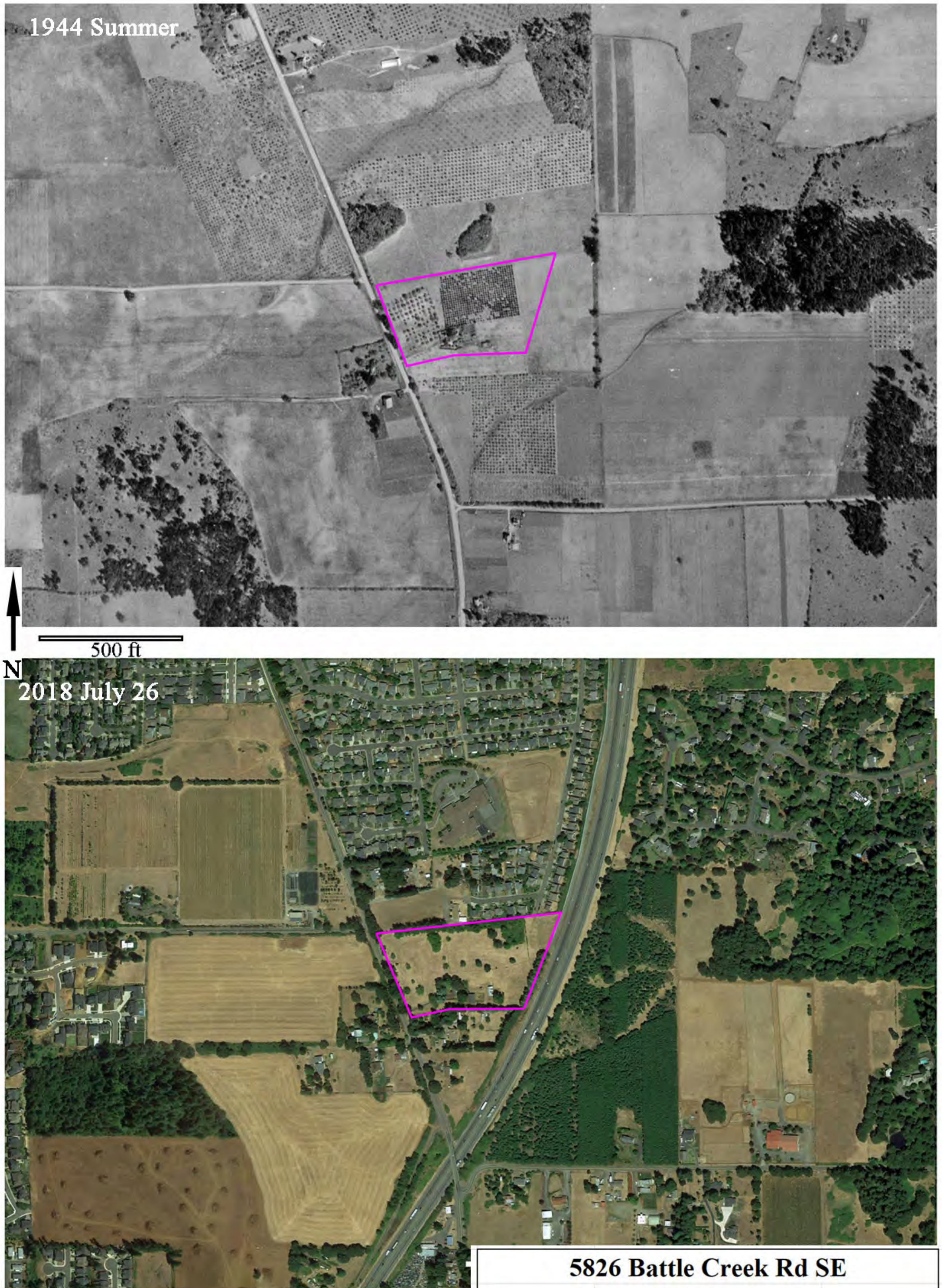
5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
Site Location Map		
NGS, Inc.	November 2019	**Figure 1**



5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
Tax Lot Map		
NGS, Inc.	November 2019	**Figure 2**


TP-2
TP-1
TP-4
TP-2
RESIDENCE
N
200 ft
5826 Battle Creek Rd SE
8S/3W-13C TL 900
Geologic Assessment
2018 NOAA LIDAR Topography
NGS, Inc.
November 2019
Figure 3

1:1610



Summer of 1944 photo from USACE
2018 from Digital Globe, cropped
and scaled by NGS, Inc.

5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
1944 & 2018 Aerial Photos		
NGS, Inc.	November 2019	**Figure 4**

Legend

Building footprint

Taxlot boundary

Contour

2 ft

10 ft

Landslide Hazards

POINTS

2

3

4

5

6

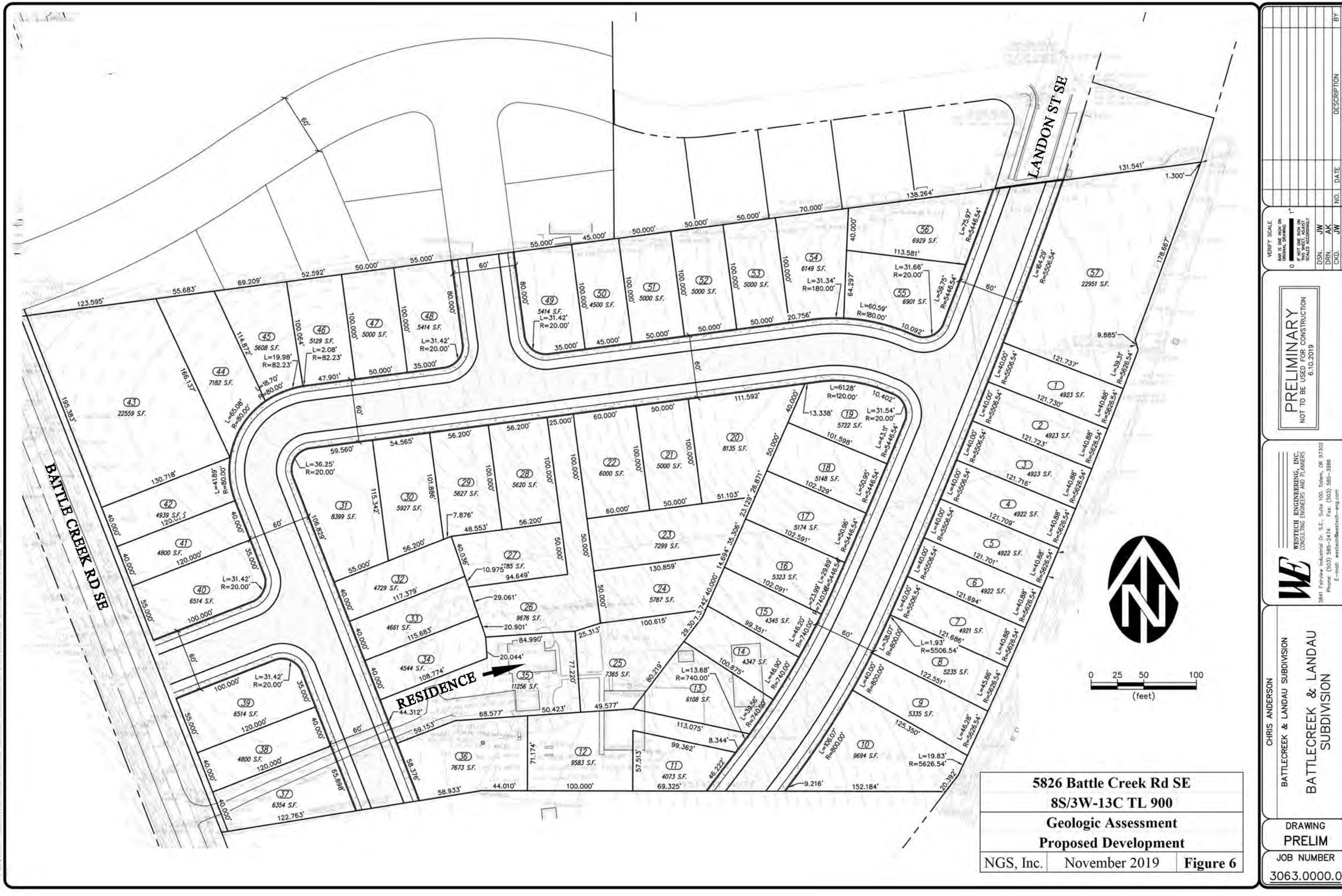
Marginalia and key were reformatted by NGS, Inc to fit 11.17 sheet.

N

NOAA 2018 LIDAR with Hillshade, 2 ft contours and hazard areas by City of Salem

CITY OF Salem AT YOUR SERVICE

5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
City Slope Hazard Map		
NGS, Inc.	November 2019	Figure 5


LANDON ST SE
BATTLE CREEK RD SE
RESIDENCE
0 25 50 100
(feet)
5826 Battle Creek Rd SE
8S/3W-13C TL 900
Geologic Assessment
Proposed Development
NGS, Inc.
November 2019
Figure 6
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION
6.10.2019
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com
CHRIS ANDERSON
BATTLECREEK & LANDAU SUBDIVISION
BATTLECREEK & LANDAU SUBDIVISION
DRAWING
PRELIM
JOB NUMBER
3063.0000.0
VERIFY SCALE
DSN. JW
DRN. AK
CKD. JW
DATE: 6.10.2019
NO. DATE DESCRIPTION BY
REVISIONS

MARION COUNTY
SUBDIVISION/CONDOMINIUM NAME REQUEST
Marion County Surveyor – 5155 Silverton Road NE, Salem, OR 97305
Fax 503-588-7970 Phone 503-588-5155

Proposed Subdivision Name* : (Please do not use the word "Subdivision" as part of the name.)

NOTE: Reserved names expire 2 years from original approval date.

Subject to consent by prior party if name was previously used in a recorded plat, as outlined in ORS 92.090(1).

Reserve at Battlecreek

Applicant Name: State Street Homes INC

Address: 1233 NW Northrup St
Portland, OR 97209

Owner/Developer: State Street Homes INC

Phone: 503-593-1529 Date: 8/20/20

Location: Is the subdivision in a city? Yes X No

City Name: Salem

Section: SW 1/4 Section 13 Township: 8S Range: 3W

Office Use Only

Date Received: ______

The Proposed Name is:

✓ Approved as Submitted ***(approval expires in 2 years)***

______ Not Approved for the following reason(s):

______ Date 8/25/2020
Marion County Surveyor

G:\SURVEY\INTERNET FILES\Word Docs for Editing PDF's\Existing Subdivision Names\SubCondoNameRequest.doc
Rev. 11/27/2015

NO.	DATE	DESCRIPTION	BY
1			

REVISIONS

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DSN. JW
DRN. AK
CKD. JW
DATE: 11/2020

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

STATE ST HOMES INC

THE RESERVE AT BATTLECREEK

EXISTING CONDITIONS

DRAWING
G-3

JOB NUMBER
3063.0000.0

From:	Daniel Thompson
To:	"glennbaly12345@gmail.com"; "tj@huggins.com"
Cc:	Josh Wells; "mark@cityhomespdx.com"
Subject:	South Gateway Neighborhood Association - Proposed Development
Date:	Thursday, August 20, 2020 8:51:50 AM
Attachments:	Vicinity Map.pdf Preliminary Street and Lot Layout.pdf

---

Glen and TJ,

We are reaching out to you on behalf of or client, Portland City Homes, who is applying for a Subdivision Application at the City of Salem for a proposed subdivision development at 5826 Battle Creek Road SE in the South Gateway Neighborhood. We are notifying you as required by SRC 300.310(b)(1). Our client is proposing a subdivision on the 11.14 acre lot with 63 lots for townhomes and single family homes. Attached are drawings for the proposed development with a vicinity map included.

Below is the contact information for our client:
Portland City Homes
Mark Wilde
503-593-1529
mark@cityhomespdx.com

Please reach out to us if you have any comments or concerns. Thank you.

Thanks,

Daniel Thompson, EIT
Westech Engineering, Inc.
3841 Fairview Industrial Drive SE, Suite 100, Salem, OR 97302
503-585-2474 ph   503-585-3986 fax   503-269-5532 cell
dthompson@westech-eng.com

From:	Daniel Thompson
To:	"robosushi@robosushi.com"; "arasmussen@modernbuildingsystems.com"
Cc:	Josh Wells; "mark@cityhomespdx.com"
Subject:	Southeast Mill Creek Association - Proposed Development
Date:	Thursday, November 19, 2020 5:45:23 PM
Attachments:	Preliminary Street and Lot Layout.pdf Vicinity Map.pdf

Cory and Alan,

We are reaching out to you on behalf of or client, Portland City Homes, who is applying for a Subdivision Application at the City of Salem for a proposed subdivision development at 5826 Battle Creek Road SE in the South Gateway Neighborhood. We are notifying you as required by SRC 300.310(b)(1), as this development is adjacent to your neighborhood association. Our client is proposing a subdivision on the 11.14 acre lot with 63 lots for townhomes and single family homes. Attached are drawings for the proposed development with a vicinity map included.

Below is the contact information for our client:
Portland City Homes
Mark Wilde
503-593-1529
mark@cityhomespdx.com

Please reach out to us if you have any comments or concerns. Thank you.

Thanks,

Daniel Thompson, EIT
Westech Engineering, Inc.
3841 Fairview Industrial Drive SE, Suite 100, Salem, OR 97302
503-585-2474 ph   503-585-3986 fax   503-269-5532 cell
dthompson@westech-eng.com

CITY OF Salem AT YOUR SERVICE

Traffic Engineering Section
Public Works Department
555 Liberty Street SE, Room 325 Telephone: 503-588-6211
Salem, Oregon 97301-3513 TTY: 503-588-6292

20-117944

Trip Generation Estimate

Street ______

Bin # ______ TGE # 2020095

Date Received 12-9-2020

Section 1 (To be completed by applicant.)

Applicant Name: State Street Homes, Inc. Telephone: 503-593-1529

Applicant Mailing Address: 1233 NW Northup St., Suite 125

Location of New Development: 5826 Battle Creek Road SE

(Please provide street address. If unknown, provide approximate address and geographical description/nearest cross streets.)

Description and Size of New Development: Subdivision; 63-Lots for Single Family Homes/Townhomes, on 11.14 AC

(e.g., 150 single-family homes, 20,000 sq. ft. office addition, 12-pump gas station, 50-student day care, additional parking, etc.)

Description and Size of Existing/Past Development, if any (note whether to remain or be removed): Vacant Lot with 4 existing structures which are to be removed.

Planning Action Involved, if any: Land Division - Subdivision
(e.g., zone change, subdivision, partition, conditional use, PUD, mobile home park, etc.)

Building Permit Involved: Yes ■ No ☐

Section 2 (To be completed by City staff.)

Proposed Use

Development Quantity: 63 lots
ITE Land Use Code: 210- SINGLE FAM RES
Trip Generation Rate/Equation: 9.44 TRIPS/LOT
Average Daily Trips: 595

ELNDT Adjustment Factors

Trip Length: 1.0 Linked Trip: 1.0
TSDC Trips: 595

Existing Use

Development Quantity: 1 SF. HOME
ITE Land Use Code: 210- S.F. HOME
Trip Generation Rate or Equation: 9.44 TRIPS/LOT
Average Daily Trips: 9

ELNDT Adjustment Factors

Trip Length: 1.0 Linked Trip: 1.0
TSDC Trips: 9

Section 3 (To be completed by City staff.)

Transportation Impact Analysis (TIA)

Net Increase in Average Daily Trips: 586
(Proposed use minus existing use.)

☐ A TIA **will** be required:

- ☐ Arterial/Collector—1000 Trip/day Threshold
- ☐ Local Street/Alley—200 Trip/day Threshold
- ☐ Other: ______

☒ A TIA **will not** be required.

Transportation Systems Development Charge

Net Increase in TSDC Trips: 586
(Proposed use minus existing use.)

☒ A TSDC **will** be required.
(Fee determined by Development Services.)

☐ A TSDC **will not** be required.

(For additional information, refer to the back of this application.)

Section 4 (To be completed by City staff.)

Remarks:

Date: 12-9-2020

cc: ☐ Chief Development Services Engineer
☐ Community Development
☐ Building Permit Application
☐ ______

By: Tony

LEK:\\PERSONAL\USERS\LEKLUKIS\PW-FORMS\PAC-FORM_08-09\PAC38.FOR 06/28/2005

CITY OF Salem AT YOUR SERVICE

Planning Division • 503-588-6173
555 Liberty St. SE / Room 305 • Salem, OR 97301-3503 • Fax 503-588-6005

PLANNING REVIEW CHECKLIST

Subject Property: 5826 Battle Creek Road SE

Reference Nos.: 20-117944-LD (Subdivision)
20-118206-NR (Tree Conservation Plan)

Applicant: Mark Wilde
State Street Homes, Inc.
1233 NW Northrup St., Suite 125
Portland, OR 97209
Phone: 503-593-1529
E-Mail: mark@cityhomespdx.com

Agent: Josh Wells
Westech Engineering, Inc.
3840 Fairview Industrial Drive SE, Suite 100
Salem, OR 97302
Phone: 503-585-2474
E-Mail: jwells@westech-eng.com

The Planning Division has conducted its completeness review of the proposed Subdivision and Tree Conservation plan for property located at 5826 Battle Creek Road SE. In order to deem the applications complete and to continue processing the applications, modifications/and or additional information is needed to address the following item(s):

Item:	Description:
Application Form	The application form needs to be revised to address the following: ▪ Number of Proposed Subdivision Lots. The application form indicates 60 proposed lots, but the tentative subdivision plan identifies 63 proposed lots. ▪ Airport Overlay Zone Height Variance. The application form needs to be revised to identify an Airport Overlay Zone Height Variance as being included with the application in addition to the subdivision.
Application Fee	The application requires payment of the following additional application fees: ▪ Subdivision Tentative Plan: **$60.00** *(Additional per lot subdivision fee of $20 per lot in excess of 5 lots. The subdivision fee originally charged was based on the number of proposed lots identified on the application form (60 lots). The subdivision however is actually for 63 lots. The additional $60 is based on the $20 per lot fee for three additional lots).* ▪ Tree Conservation Plan: **$1,245.00** *(The application fee for the required tree conservation plan was not paid at the time of application submittal).* ▪ Airport Overlay Zone Height Variance: **$334.00** *(Application fee for Airport Overlay Zone Height Variance required in conjunction with the proposed subdivision based on the property's location within the City's Airport Overlay*

Item:	Description:
	Zone)
Proof of Application Signature Authority	The subject property is owned by State Street Homes, Inc. and the application form is signed by Mark Wilde. Proof of signature authority is needed demonstrating that Mark Wilde is authorized to sign the application on behalf of State Street Homes, Inc.
List of LLC Members	The City's procedures ordinance, pursuant to SRC 300.210(a)(3), requires submittal of any information that would give rise to any potential conflict of interest under State or local ethics laws between an applicant and the Review Authority for the application. In order to fulfill this requirement for LLCs and companies, staff requires that a list of the names of the members of the LLC or company be submitted to ensure that the Planning Commission, if the application is appealed, or City Council, if the application is called-up for Council Review, can be aware of the individual members comprising the LLC or company and declare, if applicable, any potential conflicts of interest. Because the subject property is owned by State Street Homes, Inc., a list of the members of the company is needed.
Airport Overlay Zone Height Variance	Based on the requirements of the City's Airport Overlay Zone (SRC Chapter 602), an airport overlay zone height variance will be required in conjunction with the proposed subdivision. The subject property is located within the Conical Surface Area of the City's Airport Overlay Zone. The purpose of the Airport Overlay Zone is to promote air navigational safety and prevent hazards and obstructions to air navigation and flight. Within the conical surface area of the overlay zone no building, structure, object, or vegetative growth shall have a height greater than that established by a **plane sloping 20 feet outward for each one foot upward beginning at the periphery of the horizontal area, 150 feet above the airport elevation, and extending to a height of 350 feet above the airport elevation**. The elevation of the airport is 210 feet above mean sea level (MSL). Therefore, at the beginning of the conical surface area, no building, structure, or vegetative growth shall exceed a maximum 360 feet MSL. From there the maximum height in the conical surface area increases, at a slope of 1:20 for a distance of 4,000 feet, to a maximum 560 feet MSL. Based on the topography of the subject property there are portions of the land itself which already project above the maximum allowable height prescribed for the conical surface area. Because of this any homes constructed on the proposed lots will project even further into the conical surface area and not conform to the maximum height requirements of the overlay zone. Pursuant to SRC 602.025(a), no building, structure, or object shall be constructed or increased in height, and no vegetation shall be allowed to grow, to a height in excess of the height limitations set forth in the airport overlay zone **unless a variance is granted**. In order for an airport overlay zone height variance to be approved a determination must be submitted from the FAA indicating that the proposed variance will not create a hazard to air navigation. It is strongly recommended that you contact the City's Airport Administrator, John Paskell, for any questions you have about how the FAA Part 77 surfaces prescribed in the airport overlay zone will affect development of the subject

<table>
<tr><th>Item:</th><th>Description:</th></tr>
<tr><td></td><td>property. John can also help you to understand the steps you will need to take to obtain the determination from the FAA that is required as part of the airport overlay zone height variance review process. John can be reached at 503-589-2057 or JPaskell@cityofsalem.net.</td></tr>
<tr><td>Application Written Statement</td><td>A written statement is required to be submitted addressing the applicable approval criteria associated with the different applications required for the development.</td></tr>
<tr><td>Tentative Subdivision Plan</td><td>The tentative subdivision plan needs to be revised to address the following:

▪ <u>Title Block.</u> SRC 205.030(a)(1) requires the following additional information to be included on the title block of the tentative subdivision plan:
❖ The names and addresses of the owners of the property; and
❖ The Section, Township, and Range of the subject property.

▪ <u>Identification of Proposed Townhouse Lots.</u> The e-mails sent to the South Gateway Neighborhood Association and the Southeast Mill Creek Association (SEMCA) neighborhood association indicate that the subdivision will include townhomes and single-family homes. Because townhomes are allowed as a Special Use in the RS zone and must meet the Special Use standards included under SRC 700.085, the tentative subdivision plan needs to be revised to identify which lots within the subdivision will be developed with townhomes in order to ensure the subdivision complies with the special use standards which limit the number of townhomes that may be attached to three.

▪ <u>Exterior Property Dimensions.</u> In order to verify that the dimensions of the subject property match those shown in the deed and survey records, the tentative plan needs to be revised to add the exterior dimensions of the subject property.

▪ <u>Property Line Adjustment Case No. PLA10-06.</u> In 2010 a property line adjustment (Case No. PLA10-06) was approved for abutting property to the north of the subject property. Confirmation is needed whether this property line adjustment was ever officially completed because the configuration of the property approved with the property line adjustment will potentially affect the proposed stub street to the north (proposed D Street) included with the subdivision. A copy of the 2010 property line adjustment decision and the record of survey for the property lie adjustment that was subsequently recorded with Marion County is attached for your reference.

▪ <u>Minimum Lot Standards.</u>
❖ Several of the lots within the subdivision don’t currently meet RS zone lot standards (see additional comments on tentative subdivision plan). If there is no feasible way to reconfigure the lots within the subdivision to meet lot standards, the applicant will need to request adjustments with the subdivision. It is the applicant’s burden to demonstrate that any adjustment(s) requested with the subdivision meet the applicable approval criteria under SRC 250.005(d).

❖ Many of the lots shown on the proposed tentative subdivision plan are right at or a just a small amount above minimum required lot size and dimension standards. As is often the case with land divisions, the size and dimensions of lots often change slightly from the tentative plan approval to the final plat due to a more accurate survey being conducted</td></tr>
</table>

Item:	Description:
	for the final plat. Please be aware that for any lots that are currently right at or close to the minimum required lot standards they cannot be reduced below minimum required lot size and dimensions standards at the time of final plat. As such, if there is any doubt about whether the lots will be able to remain in conformance with minimum required lot standards after the survey is conducted for review and approval of the final plat, the tentative plan should be reconfigured accordingly to give those lots a sufficient size buffer to ensure they will still meet minimum lot standards at the time of final plat review. ▪ Existing and Proposed Easements. Pursuant to SRC 205.030(a)(7), the location of all existing and proposed easements need to be shown on the tentative subdivision plan. ▪ Additional Comments on Plans. Please see the additional comments included on the attached plans for additional items that needs to be addressed.
Tree Conservation Plan	The proposed tree conservation plan needs to be revised to address the following: ▪ Trees Less than 10 inches dbh: The tree conservation plan needs to be revised to show only those trees on the property which meet the definition of “tree” under SRC Chapter 808.005. Under SRC 808, only those trees which are 10 inches or greater in dbh should be shown on the tree conservation plan. ▪ Trees on Adjacent Properties. The tree conservation plan needs to be revised to show only those trees located on the subject property. The tree conservation plan should also still continue to show all of the trees within the right-of-way of Battle Creek Road along the frontage of the property, regardless of their dbh, but these trees cannot be counted towards the total number of trees included in the tree conservation plan. These trees are instead addressed through the required street tree removal permit. ▪ Identification of Trees within Battle Creek Road Right-of-Way. The tree conservation plan needs to be revised to clearly identify which existing trees are located on the subject property and which existing trees are located within the right-of-way of Battle Creek Road. In reviewing the plan it’s difficult to determine which trees are street trees and which trees are on the property due to their proximity to the existing property line. If any portion of the trunk of the tree is located within the street right-of-way it’s considered a street tree subject to the requirements of SRC Chapter 86 (Trees on City Owned Property) rather than the tree conservation plan requirements of SRC Chapter 808. ▪ Additional Plan Comments. Please see additional comments included on attached tree conservation plan for additional items that need to be addressed.
Public Works Comments	The Public Works Department reviewed the proposal for completeness and identified that following items that need to be addressed: ▪ Stormwater. The application does not provide sufficient details to identify how the site is compliant with SRC Chapter 71, specifically the requirements

Item:	Description:
	for Green Stormwater Infrastructure (GSI) pursuant to PWDS Appendix 4E. The applicant shall provide a storm drainage system that provides treatment and flow control as required by the 2014 PWDS, by one of three means: ❖ Runoff from the new and replaced impervious surfaces flows into one or more locations that have been set aside for installation of Green Stormwater Infrastructure (GSI) and the locations have a total area of at least ten percent of the total new plus replaced impervious surface area; or ❖ GSI is used to mitigate the impacts of stormwater runoff from at least 80 percent, but less than 100 percent, of the total new plus replaced impervious surfaces; or ❖ Under a design exception from the City Engineer, GSI is used to mitigate the impacts of stormwater runoff from less than 80 percent of the total new plus replaced impervious surfaces and the factor(s) limiting implementation (SRC 71.095). ▪ <u>Street Tree Removal Permit Application.</u> The submitted plans show trees proposed for removal that are located within the existing right-of-way of Battle Creek Road SE. The applicant shall submit an application for street tree removal pursuant to SRC Chapter 86 to be reviewed concurrently with the proposed subdivision. The application shall include a Reasonable Alternatives Analysis in accordance with Salem Administrative Rule 109-500 Section 2.4. ▪ <u>Additional Public Works Comments on Plans.</u> Please see the additional comments from Public Works concerning the design of the subdivision that are included on the attached plans.

Unless otherwise noted, the above information is needed in order to deem the application complete. Pursuant to SRC 300.220, the application shall be deemed complete upon receipt of:

(1) All of the missing information;

(2) Some of the missing information and written notice from the applicant that no other information will be provided; or

(3) Written notice from the applicant that none of the missing information will be provided.

Please submit this information to the City of Salem Planning Division, located on the 3rd floor of City Hall, 555 Liberty Street SE, Room 305.

For questions regarding any of the above requirements, please feel free to contact me directly by calling (503) 540-2399 or via e-mail at bbishop@cityofsalem.net.

The Salem Revised Code may be accessed online at the following location:

https://www.cityofsalem.net/Pages/salem-revised-code.aspx

Sincerely,

Bryce Bishop
Planner III

CITY OF Salem AT YOUR SERVICE
COMMUNITY DEVELOPMENT DEPARTMENT
555 Liberty St. SE / Room 305 • Salem, OR 97301-3503 • (503) 588-6173 • (503) TTY 588-6353 • (503) Fax 588-6005

May 20, 2010

Ray Baker
1345 70th Avenue SE
Salem, OR 97317

RE: Property Line Adjustment No. 10-06 for 5736 Battle Creek Road SE

REQUEST

A property line adjustment to relocate the common property line between two properties equal to a combined size of approximately 4.37 acres that will result in parcels that are approximately 0.48 acres and 3.89 acres in size, zoned RA (Residential Agriculture) and located at 5736 Battle Creek Road SE and 5696 Battle Creek Road SE (Marion County Assessor's Map and Tax Lot No.: 083W13C / 00800 and 00500).

FINDINGS

Based on conformance with the following requirements, the proposal to move the common property line between the two units of land (Attachment 2) has been found to comply with the applicable Salem Revised Code (SRC) standards, including the requirements of SRC Chapter 63.147 pertaining to Property Line Adjustments as stated below:

A. Subdivision Code Compliance

1. SRC Chapter 63.147(a) provides that:

   A property line adjustment relocates one common property line between two abutting units of land. Property line adjustments shall not be used to create an additional unit of land, and may not reduce an existing unit of land below the minimum size allowed under the zoning code. Property line adjustments shall only be used to relocate common property lines between units of land which were created through partition, subdivision, deed, or other legal instrument which has been recorded.

2. The proposed property line adjustment relocates the common property line between two abutting units of land (Attachment 2).

3. The proposed property line adjustment does not create an additional unit of land.

4. The proposed property line adjustment does not reduce an existing unit of land below the minimum size allowed under the Salem Zoning Code.

5. The applicant's site plan indicates that proposed Parcel 1 will take access to Battle Creek Road SE via a new 35-foot-wide access easement.
   The access easement meets the minimum width standards required for flag lot access easements pursuant to SRC Table 63-1. This easement was recorded with the Marion County Clerk on May 12, 2010.

B. Zoning Code Compliance

1. The subject properties are zoned RA (Residential Agriculture). Development of the properties is subject to the provisions of the RA (Residential Agriculture) zones and all other applicable provisions of the Salem Revised Code. The property line adjustment does not affect zone boundaries.
2. The adjusted parcels meet the minimum lot dimension and area requirements of the applicable zones.

C. City Department Comments

1. The Building and Safety Division reviewed the proposal and indicated no objections.

2. The Public Works Department, Traffic Engineering Section reviewed the proposal and indicated that upon development of the property, the future public street connection to Battle Creek Road SE shall align opposite Landau Street SE, and additional street connection to the north and south will be required.

CONCLUSION

Based upon the requirements of SRC 63.147, the property line adjustment requests were reviewed for compliance with applicable code criteria. The Planning Administrator certifies that the property line adjustment is in conformance with the code, providing compliance occurs with any applicable items noted above.

City Surveyor's Review of Property Line Adjustment Survey and Legal Descriptions: The applicant is required to have a field survey and legal descriptions prepared and recorded per Oregon Revised Statutes (ORS) 92.060(7). Prior to recording the survey and legal descriptions at the appropriate county, the applicant must first submit to the City of Salem Public Works Department, the survey and copies of the proposed legal descriptions for review and approval by the City Surveyor.

Please submit the survey and copy of proposed legal descriptions to the Public Works Development Services Section, located at the Permit Application Center, Room 320, City Hall, 555 Liberty Street SE, Salem, OR 97301. There is a $406.00 fee for this review. Once reviewed and approved by the City Surveyor, the surveyor of record may pick up the approved survey and legal descriptions and take them to the appropriate county for recording. Please note that it is the owner/developer's responsibility to record all necessary documentation with the appropriate county.

To expedite any future land use applications or building permits, submit a copy of the recorded survey and deed with your application(s).

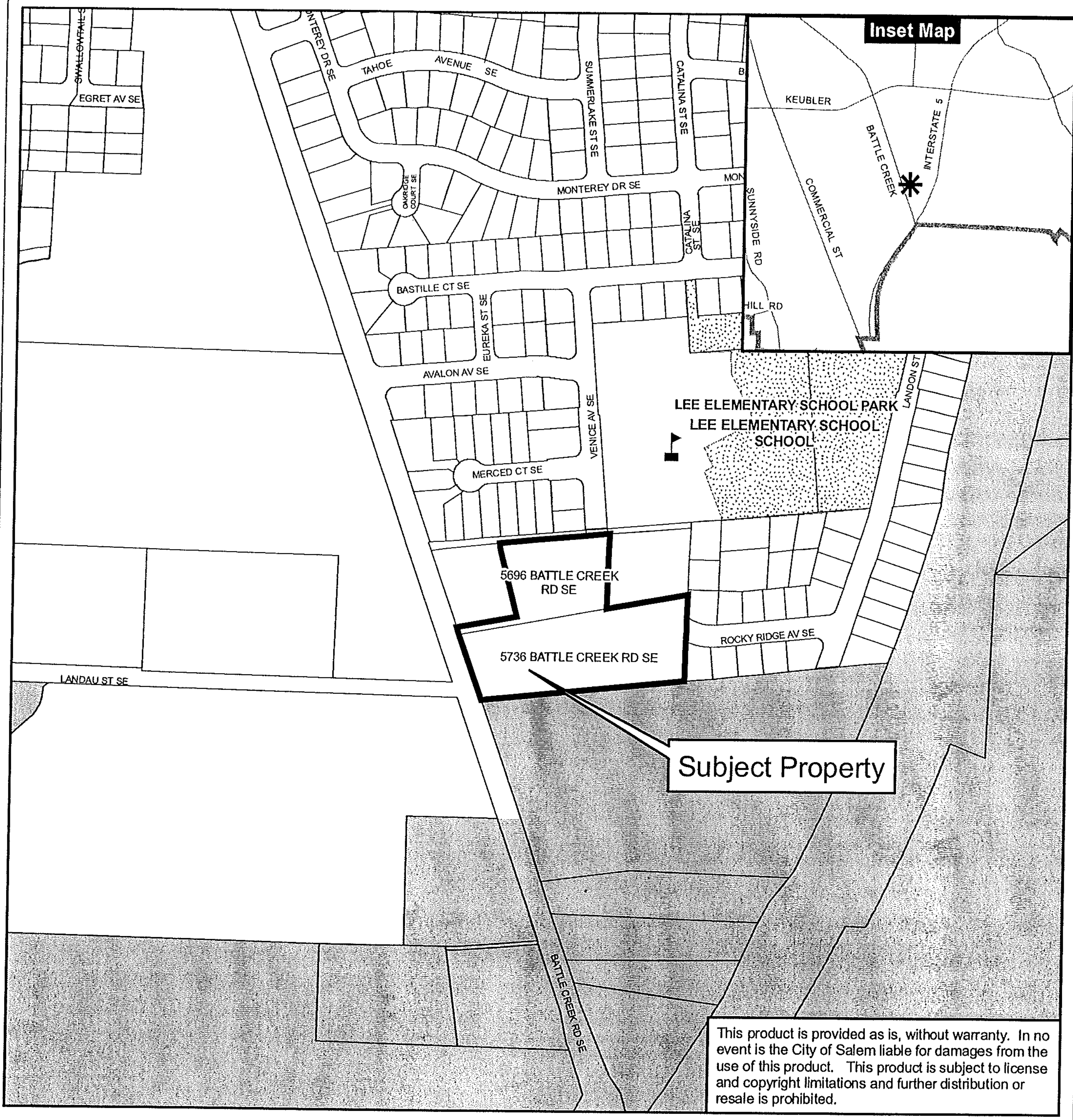
If you have any questions regarding items in this letter, please contact Bryan Colbourne at: 503-540-2363 or by email at bcolbourne@cityofsalem.net. /bc

Attachments: 1. Vicinity Map
2. Proposed Property Line Adjustment Site Plan
3. Proposed legal descriptions

cc: File
Gerry Pappe, Public Works Department

G:\CD\PLANNING\STFRPRTS\2010\PLA-PBV's\PLA10-06.bgc.doc

Vicinity Map
5696 & 5736 Battle Creek Road SE



Legend

- Outside Salem City Limits
- Urban Growth Boundary
- Taxlots
- Historic District
- Schools
- Parks

0 100 200 400 Feet

ATTACHMENT 1

CITY OF Salem AT YOUR SERVICE
Community Development Dept.

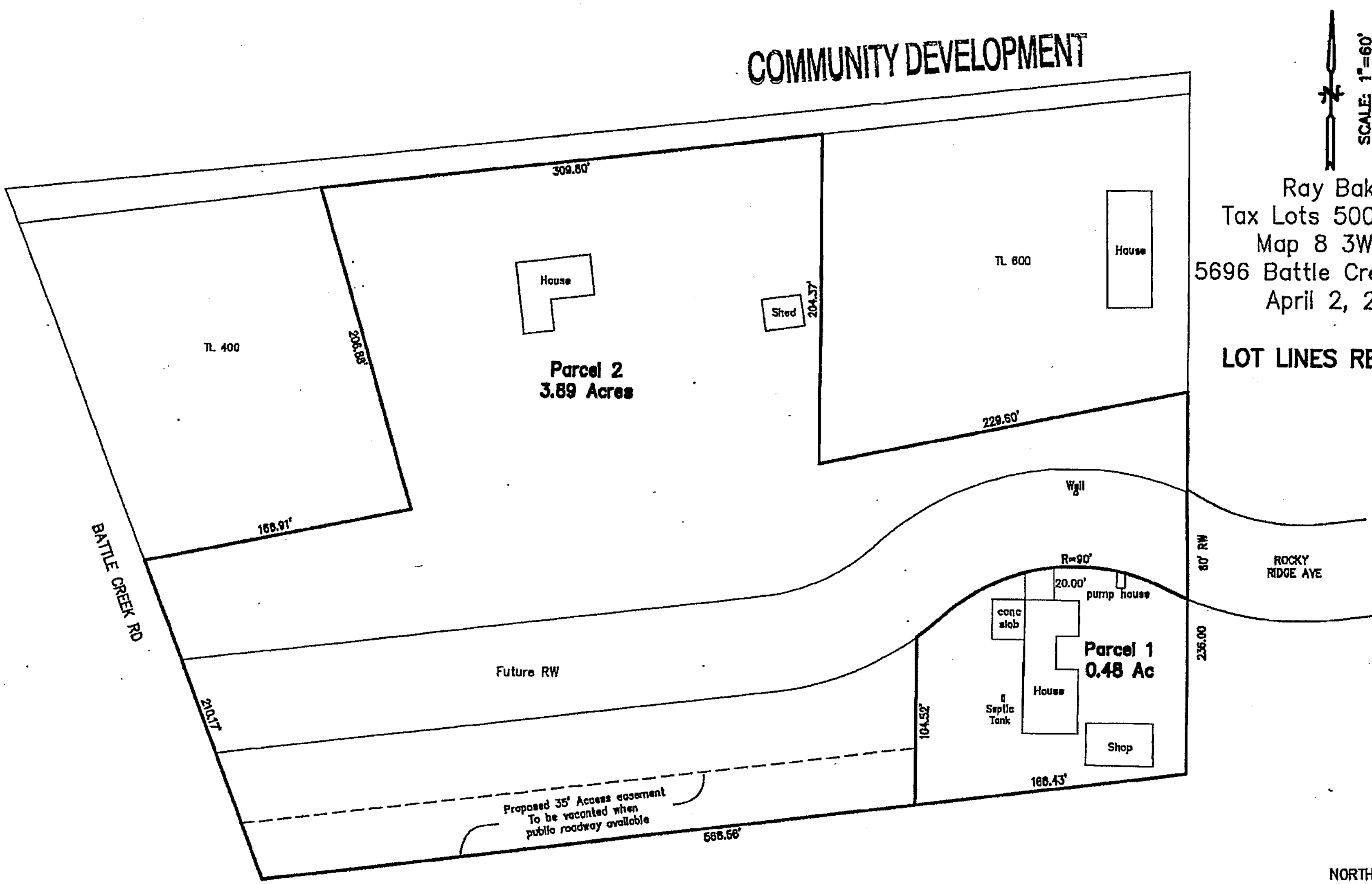
N:\CD\Proj\CP\Vicinity_Maps\5696_5736-battlecreek-rd-se.mxd - 3/23/2010 @ 7:05:52 AM

RECEIVED

APR 05 2010

COMMUNITY DEVELOPMENT

ATTACHMENT 2



Ray Baker
Tax Lots 500 &. 800
Map 8 3W 13C
5696 Battle Creek Rd SE
April 2, 2010

LOT LINES REVISED

NORTH SANTIAM PAVING CO
PO BOX 516, STAYTON,OR 97383
503-769-3436 fax 503-769-3436
email; blulay @ nspor.com
JOB 9098

PROPOSED

Lot Line Adjustment – Tax Lots 500 and 800

Legal Description of Parcel 1 – 0.48 Acres

Beginning at the northwest corner of Lot 78 Battle Creek Heights No. 2, located in Section 13, Township 8 south, Range 3 West of the Willamette Meridian, City of Salem, Marion County, Oregon;

thence South 00°05'23" West along the west line of Lot 78, 109.03 feet to the southwest corner of said Lot 78;
thence South 83°06'12" West 166.43 feet;
thence North 00°05'23" East 104.52 feet;
thence northeasterly 19.30 feet along a 180 foot radius curve to the left, (the chord which bears North 50°16'10" East 19.29 feet);
thence easterly 146.92 feet along a 120.00 foot radius curve to the right (the chord which bears North 83°16'19" East 137.91 feet);
thence South 65°03'36" East 15.14 feet to the point of beginning and containing 0.48 acres more or less.

ATTACHMENT 3

PROPOSED

Lot Line Adjustment – Tax Lots 500 and 800

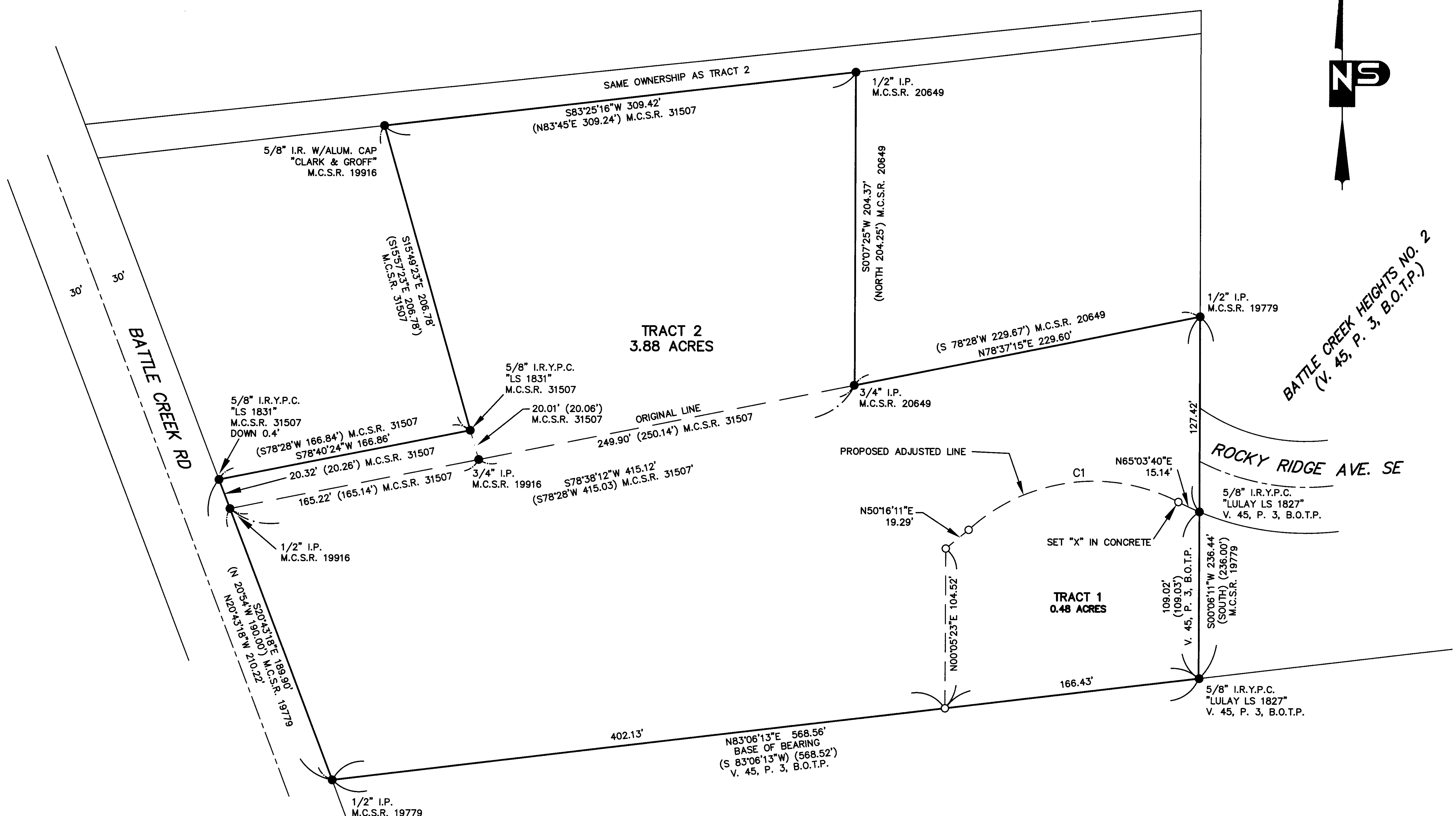
Legal Description of Parcel 2 – 3.89 Acres

Beginning at the northwest corner of Lot 78. Battle Creek Heights No. 2, located in Section 13, Township 8 south, Range 3 West of the Willamette Meridian, City of Salem, Marion County, Oregon;

thence North 00°06'52" East along the west line of said subdivision 127.41 feet to an iron pipe;
thence South 78°37'15" West 229.60 feet to an iron pipe;
thence North 00°07'25" East 204.37 feet to an iron pipe;
thence South 83°26'51" West 309.80 feet;
thence South 15°56'30" East 206.88 feet;
thence South 78°37'15" West 166.91 feet to the east right of way of Battle Creek Road;
thence South 20°43'18" East along said right of way 210.17 feet to an iron pipe;
thence North 83°06'13" East 402.13 feet to a point 166.43 feet South 83°06'13" West of the southwest corner of said Lot 78;
thence North 00°05'23" East, 104.52 feet;
thence northeasterly 19.30 feet along a 180 foot radius curve to the left, (the chord which bears North 50°16'10" East 19.29 feet);
thence easterly 146.92 feet along a 120.00 foot radius curve to the right, (the chord which bears North 83°16'13" East 137.91 feet);
thence South 65°03'36" East, 15.14 feet to the point of beginning and containing 3.89 acres more or less.

RECORD OF SURVEY

PROPERTY LINE ADJUSTMENT No. 10-6



CURVE TABLE					
CURVE #	LENGTH	RADIUS	DELTA	CHORD BRG	DIST.
C1	146.92'	120.00'	70°08'58"	N82° 16 19"E	137.91'

RECEIVED 02/14/2011 BY
MARION COUNTY SURVEYOR.
APPROVED FOR FILING ON
04/05/2019

LEGEND

- ● Found monument in good condition within 2 inches of ground surface, unless noted otherwise.
- ○ Indicates a set monument, being a 5/8-inch by 30-inch iron rod with a yellow plastic cap marked " LULAY PLS 1827 ".

( )	=	Data of record
I.P.	=	Iron Pipe
I.R.	=	Iron Rod
I.R.Y.P.C.	=	Iron Rod Yellow Plastic Cap
V.____	=	Volume________
P.____	=	Page________
B.O.T.P.	=	Book of Town Plats
M.C.S.R.	=	Marion County Survey of Record

NARRATIVE:

The purpose of this survey is to monument Property Line Adjustment No. 10-06 as approved by the City of Salem.
Basis of bearing is the south line of the property as noted on Battle Creek Heights No.2 subdivision.
All monuments on the exterior of the parcel were accepted as tied. Therefore no monuments were required to be set on the exterior boundary. The tract to the north is of the same ownership as Tract 2.
The shape of new Tract 1 used a 120 foot radius to match the proposed alignment of Rocky Ridge Avenue future extension.
There is a 35 foot wide roadway easement shown to cover the existing gravel driveway to serve the existing house on Tract 1. It is to be automatically vacated when access to public roadway is provided.
Found monuments are in good condition near the surface unless noted otherwise.

This project was canceled with no deeds recorded.
We are filling this survey to document the new monuments set.

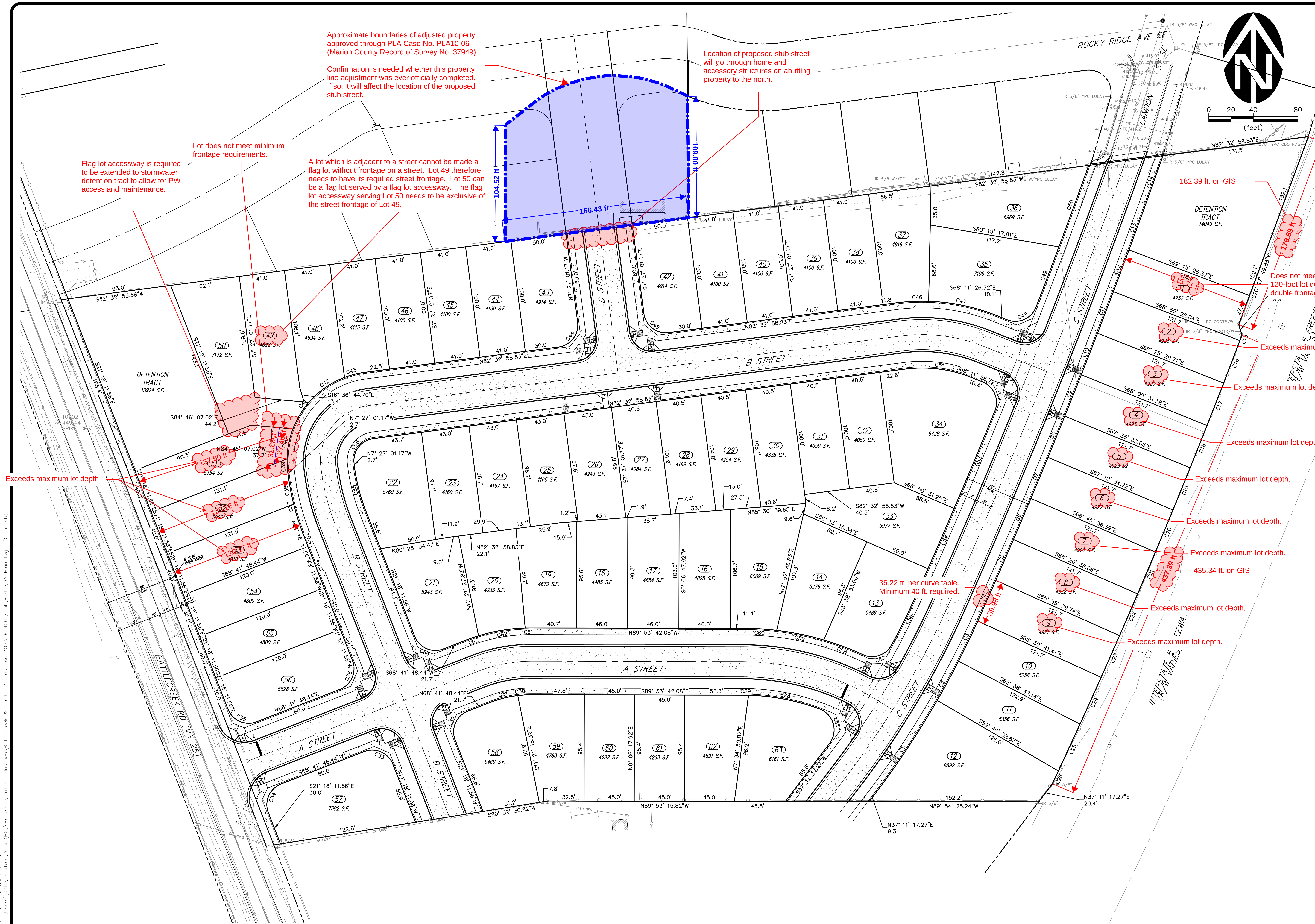
Reference Surveys
MCSR 15367, 19779, 19916, 20649, 31507;
BOTP; Vol 45 Pg 3; Battle Creek Heights No. 2;
BOTP; Vol 45 pg 156, Battle Creek Heights No.3;

REGISTERED
PROFESSIONAL
LAND SURVEYOR

OREGON
JULY 13, 1979
WILLIAM J. LULAY
1827

EXPIRES: 12/31/2012

SURVEY FOR	RAY BAKER		
LOCATION: SE 1/4 OF THE SW/14 SECTION 13 T8S, R3W, W.M.	CITY OF SALEM MARION COUNTY, OREGON		
SCALE: 1"=50'	NORTH SANTIAM PAVING CO. 41203 KINGSTON-LYONS DR. P.O. BOX 516 STAYTON, OREGON 97383 PHONE (503) 769-3436 EMAIL: BLULAY@NSPOR.COM	SHEET 1 OF 1	
DATE: 02/10/2011			
DRAWN BY:		JOB NUMBER: 9098	



11/13/2020 1:07:47 PM
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VERIFY SCALE
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DSN. JW
DRN. AK
CKD. JW
DATE: 10/2020

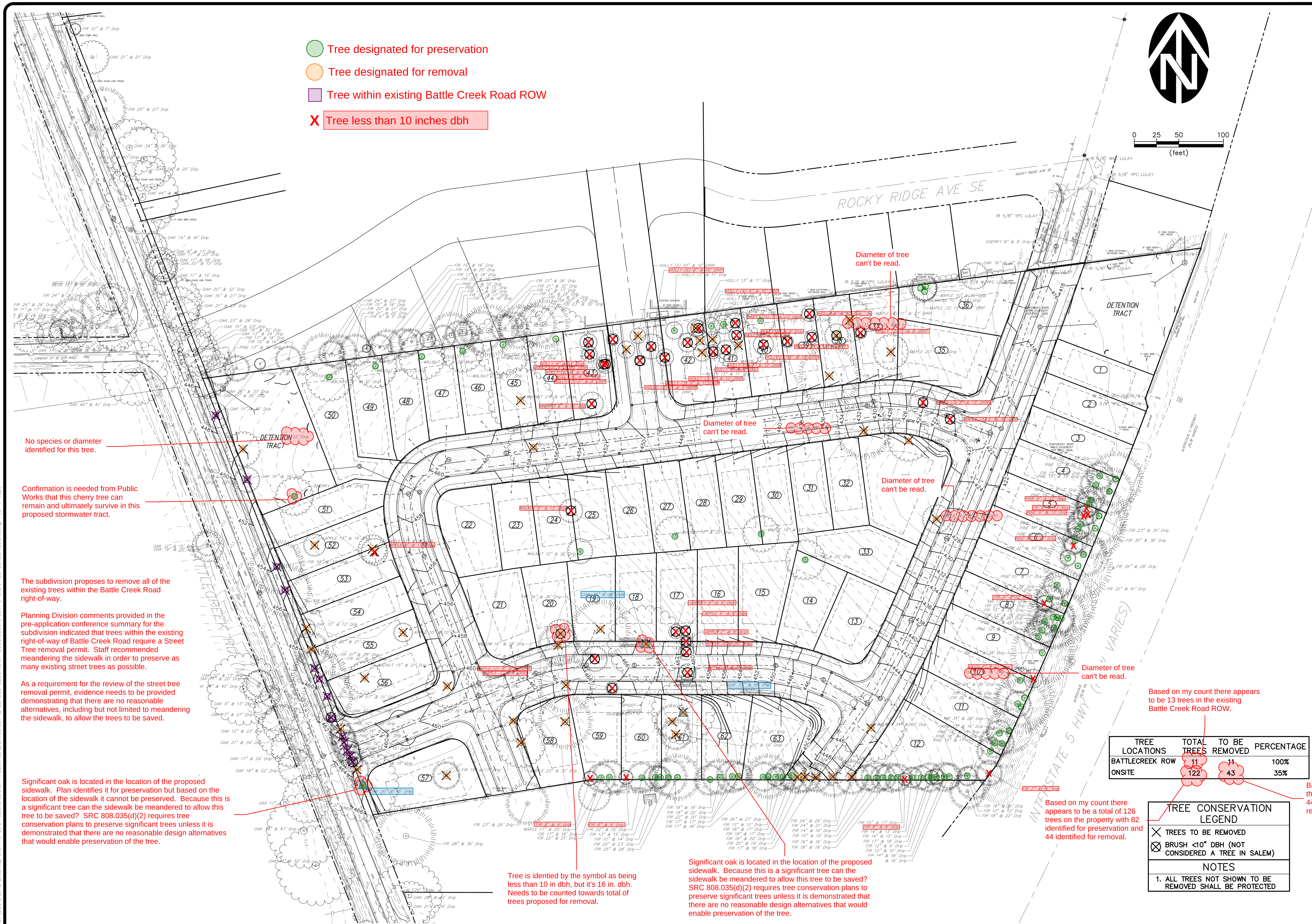
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

0A SUBDIVISION PLAN

DRAWING
G-3

JOB NUMBER
3063.0000.0



TREE LOCATIONS	TOTAL TREES	TO BE REMOVED	PERCENTAGE
BATTLECREEK ROW	11	11	100%
ONSITE	122	43	35%

TREE CONSERVATION LEGEND

- X TREES TO BE REMOVED
- ⊗ BRUSH <10" DBH (NOT CONSIDERED A TREE IN SALEM)

NOTES

1. ALL TREES NOT SHOWN TO BE REMOVED SHALL BE PROTECTED

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CKD. JW
DATE: 09/2020

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REVISIONS

...ATE ST HOMES INC
...SERVE AT BATTLECREEK
TREE CONSERVATION PLAN

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G-7

JOB NUMBER
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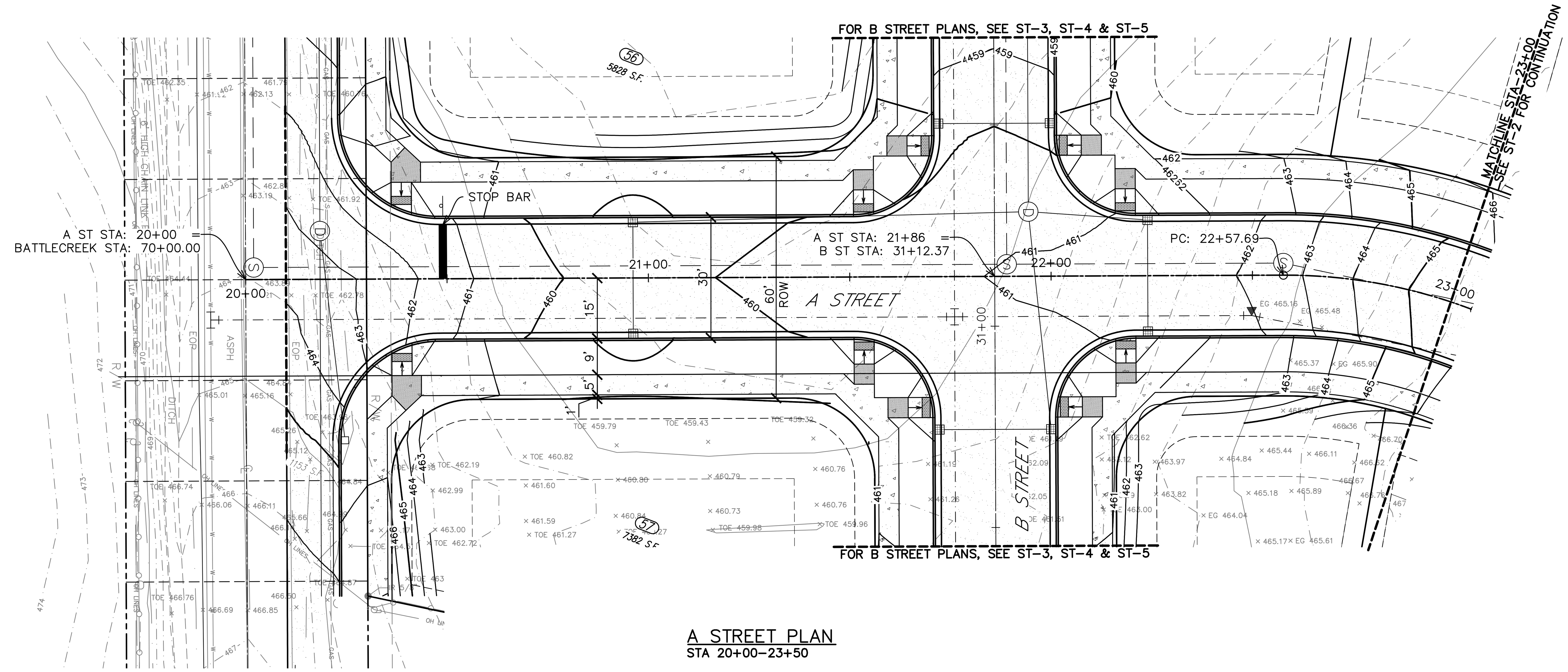
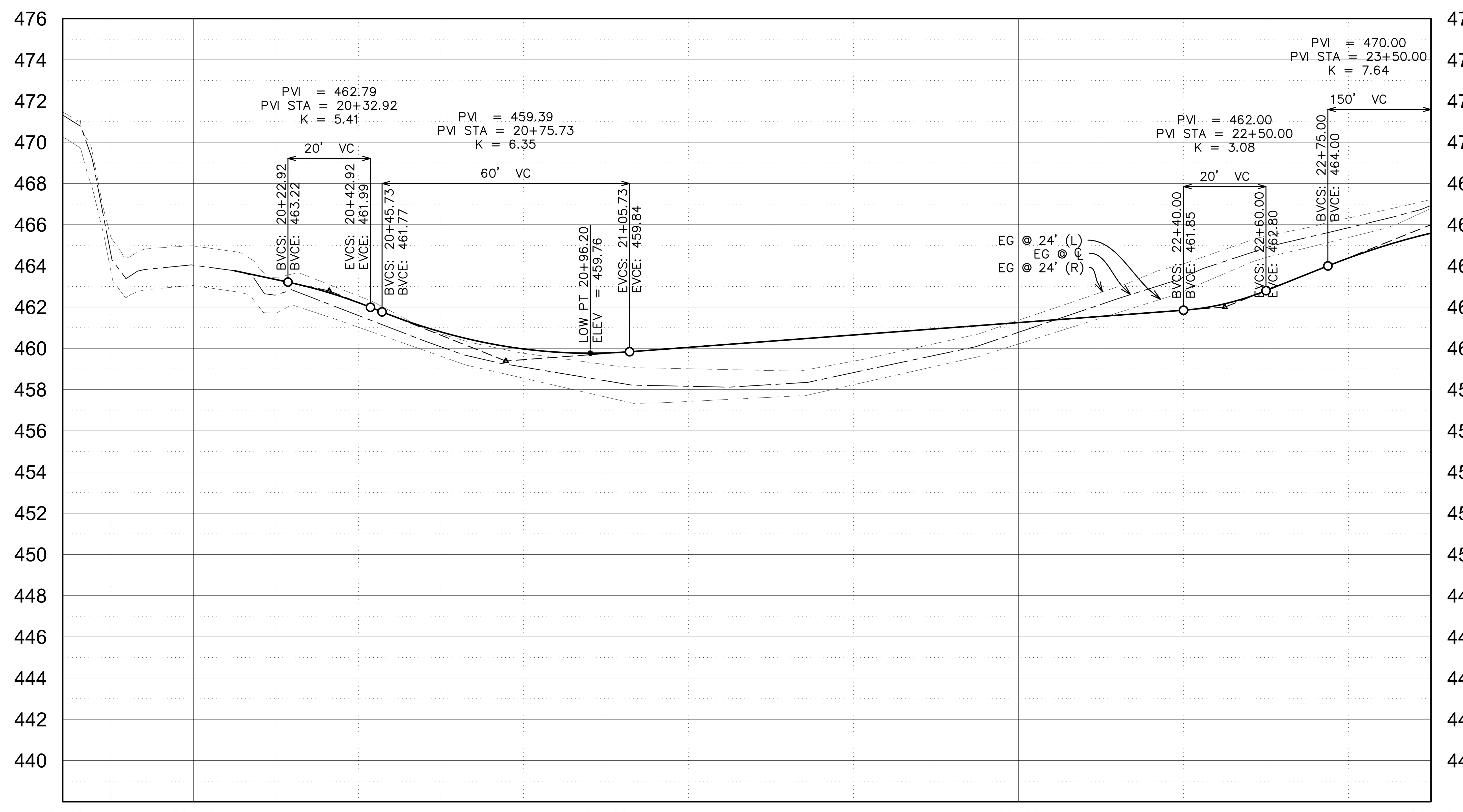


A STREET PLAN
STA 20+00–23+50

Street grades need to be indicated on street profile. Local street grade cannot exceed 12 percent.



A STREET PROFILE
STA 20+00–23+50
H: 1"=20' V: 1"=4'

0 10 20 40 (feet)

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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

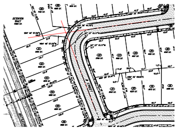
A STREET PLAN & PROFILE 20+00–23+50

DRAWING
ST-1

JOB NUMBER
3063.0000.0

20-117944-LD_5826BattleCreek_Plans.pdf Markup Summary

dwhitehu (12)



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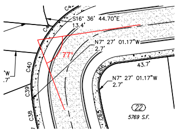

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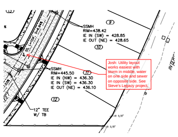

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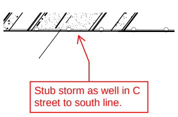
Josh: Utility layout works easiest with storm in middle, water on one side and sewer on opposite side. See Steve's Legacy project.



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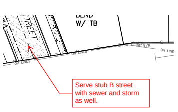
Stub storm as well in C street to south line.



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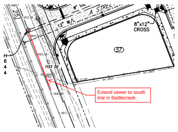
Serve stub B street with sewer and storm as well.



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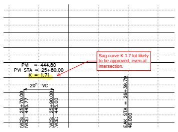
Extend sewer to south line in Battlecreek.



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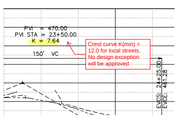
Sag curve K 1.7 lot likely to be approved, even at intersection.



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Date: 12/10/2020 4:03:59 PM
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Crest curve K(min) = 12.0 for local streets. No design exception will be approved

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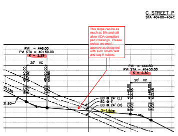

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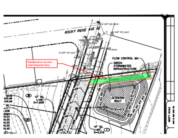
This slope can be as much as 5% and still allow ADA compliant ped crossings. Please revise, we won't approve as designed with such small crest and sag K values.



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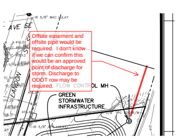
Maintenance access road required here.



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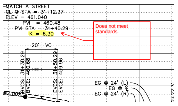
Offsite easement and offsite pipe would be required. I don't know if we can confirm this would be an approved point of discharge for storm. Discharge to ODOT row may be required.



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Date: 12/16/2020 3:17:38 PM
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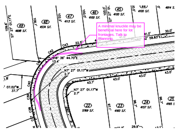
Does not meet standards.

jrscott (1)



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A minimal knuckle may be beneficial here for lot frontages. Talk to Planning.

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DRN. AK
CKD. JW
DATE: 10/2020

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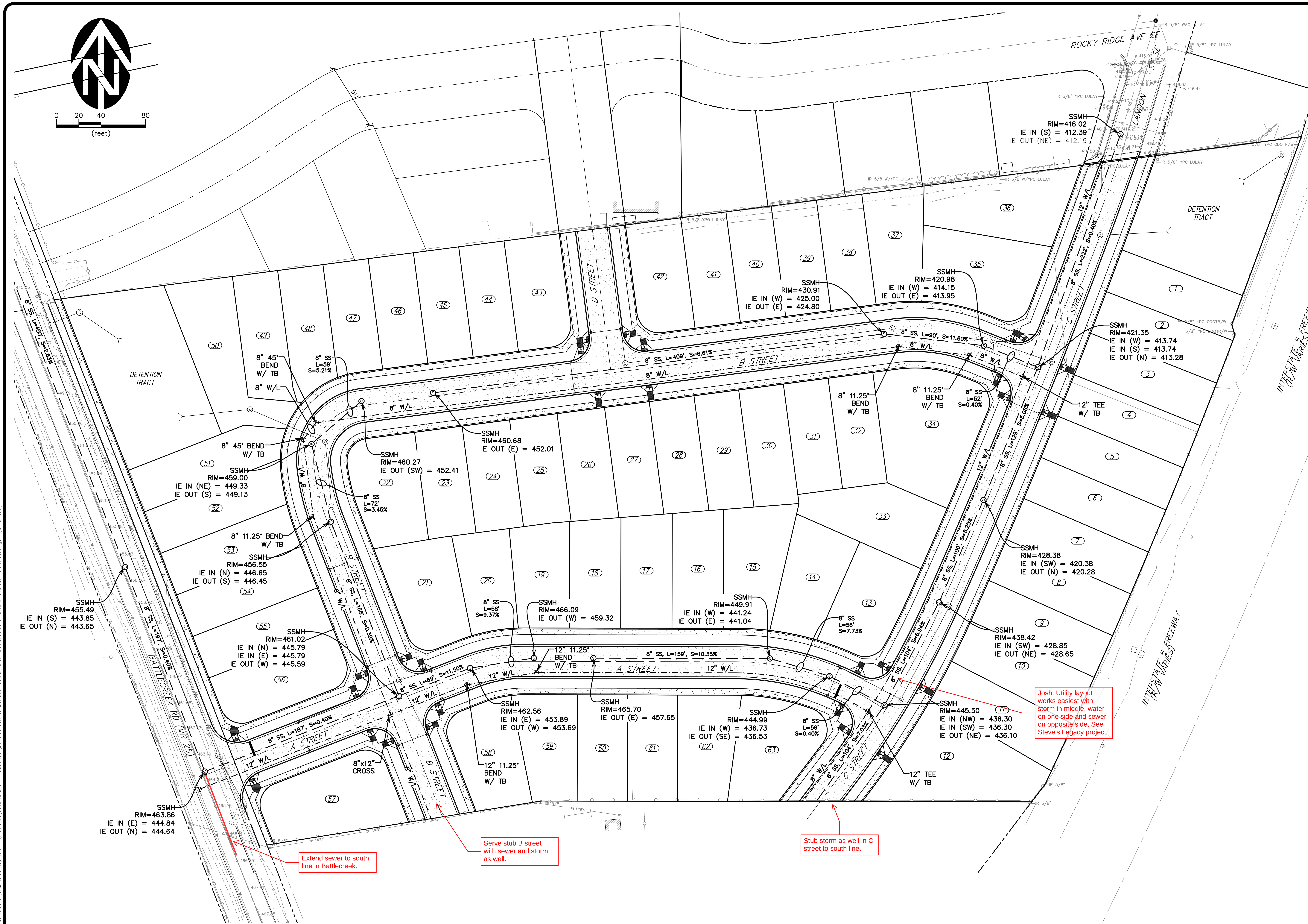
E-mail: westech@westech-eng.com

STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

OA SUBDIVISION PLAN

DRAWING
G-3

JOB NUMBER
3063.0000.0



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		REVISIONS	

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DRN. AK

CKD. JW

DATE: 10/2020

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Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

CLIENT

THE RESERVE AT BATTLECREEK

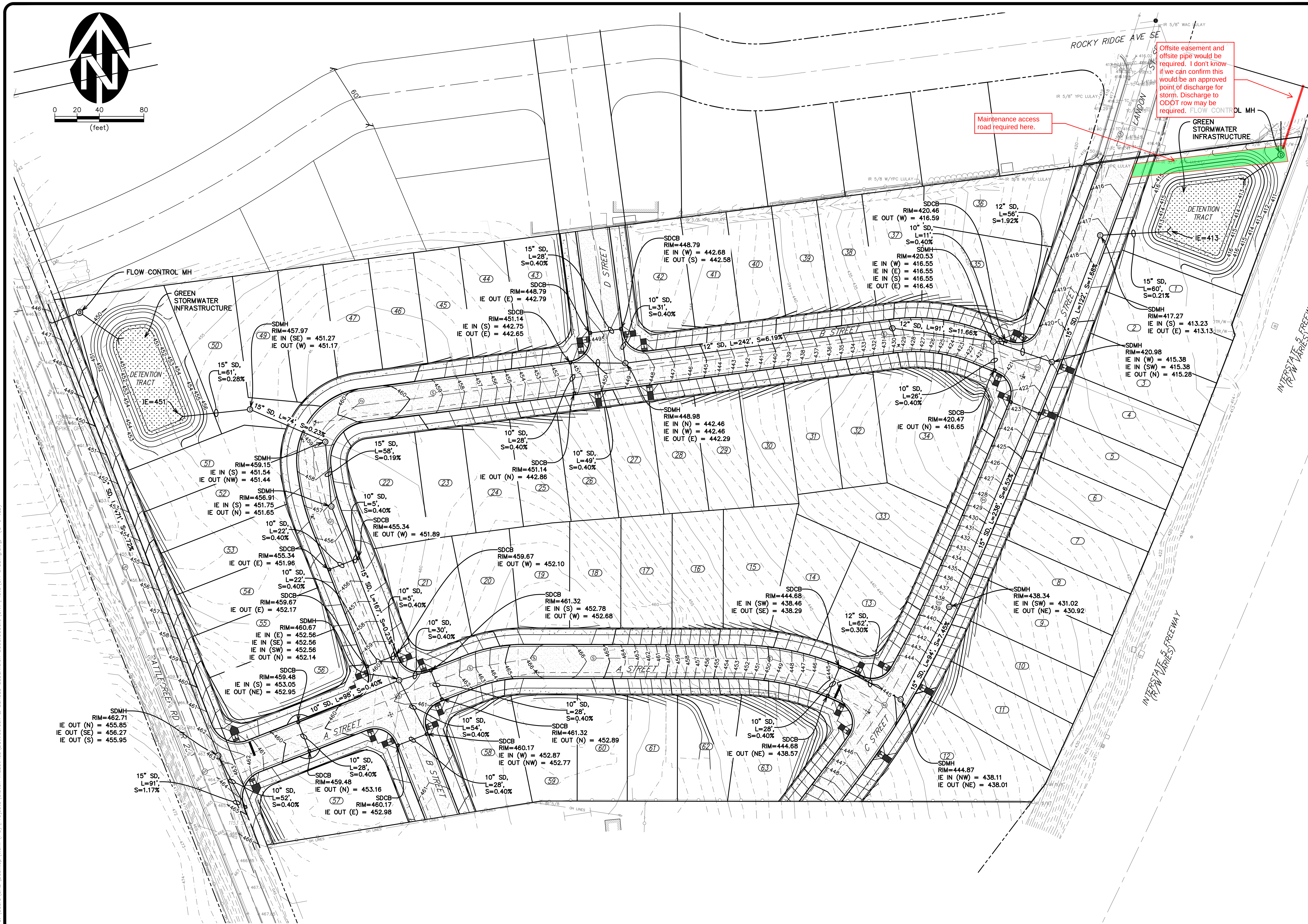
OA UTILITY PLAN

DRAWING

G-5

JOB NUMBER

3063.0000.0



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1		REVISIONS	

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DRN. AK
CKD. JW
DATE: 11/2020

WESTECH ENGINEERING, INC.
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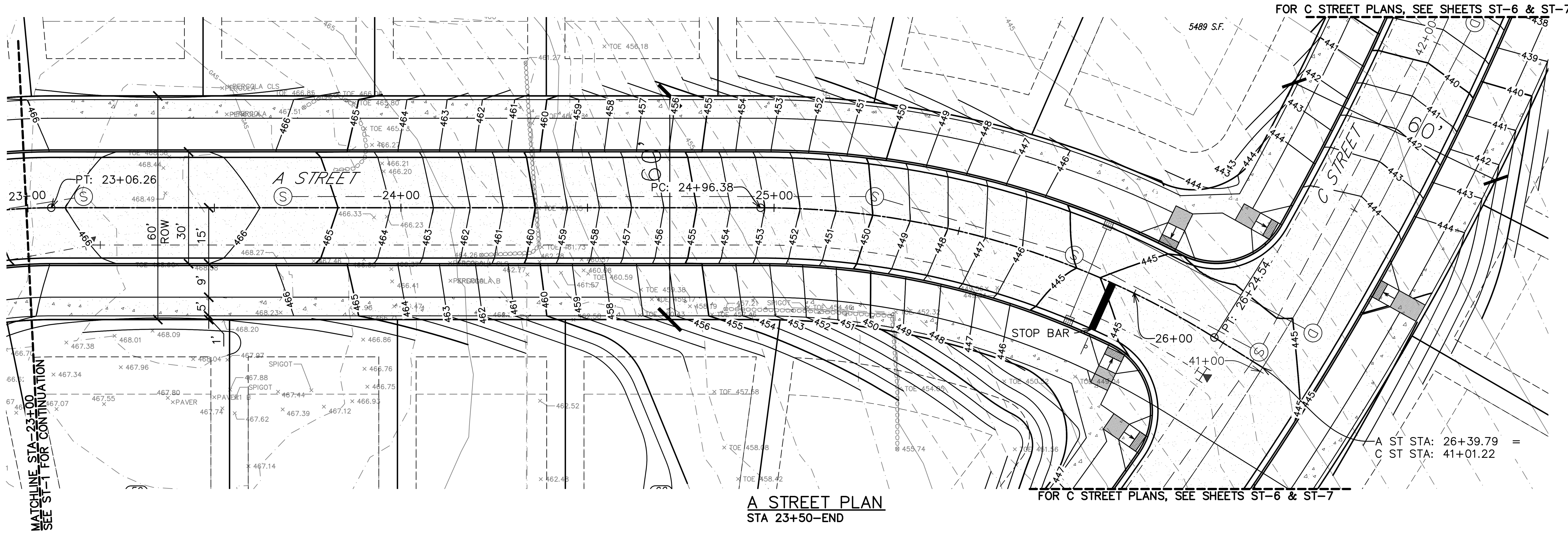
E-mail: westech@westech-eng.com

CLIENT
THE RESERVE AT BATTLECREEK

OA GRADING PLAN

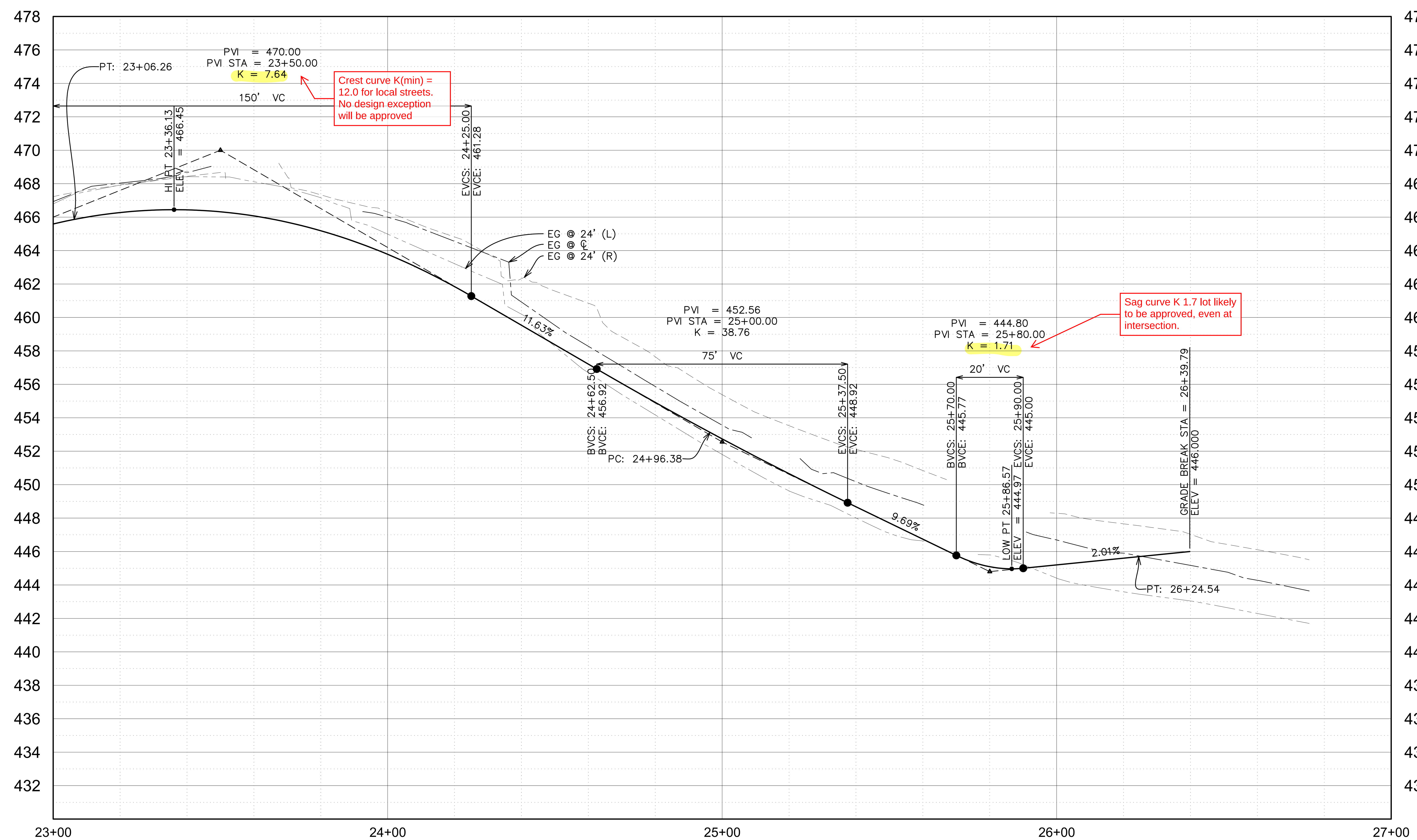
DRAWING
G-6

JOB NUMBER
3063.0000.0



A STREET PLAN

STA 23+50–END



A STREET PROFILE

STA 23+50–END

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REVISIONS

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DATE: 09/2020

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

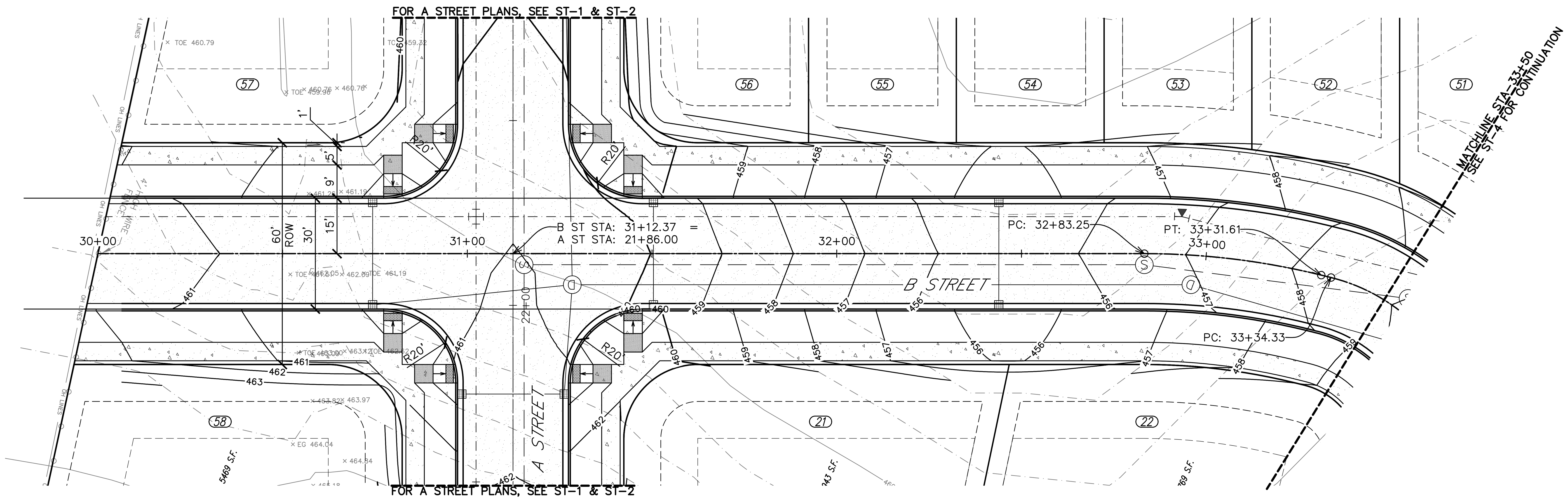
STATE ST HOMES INC

THE RESERVE AT BATTLECREEK

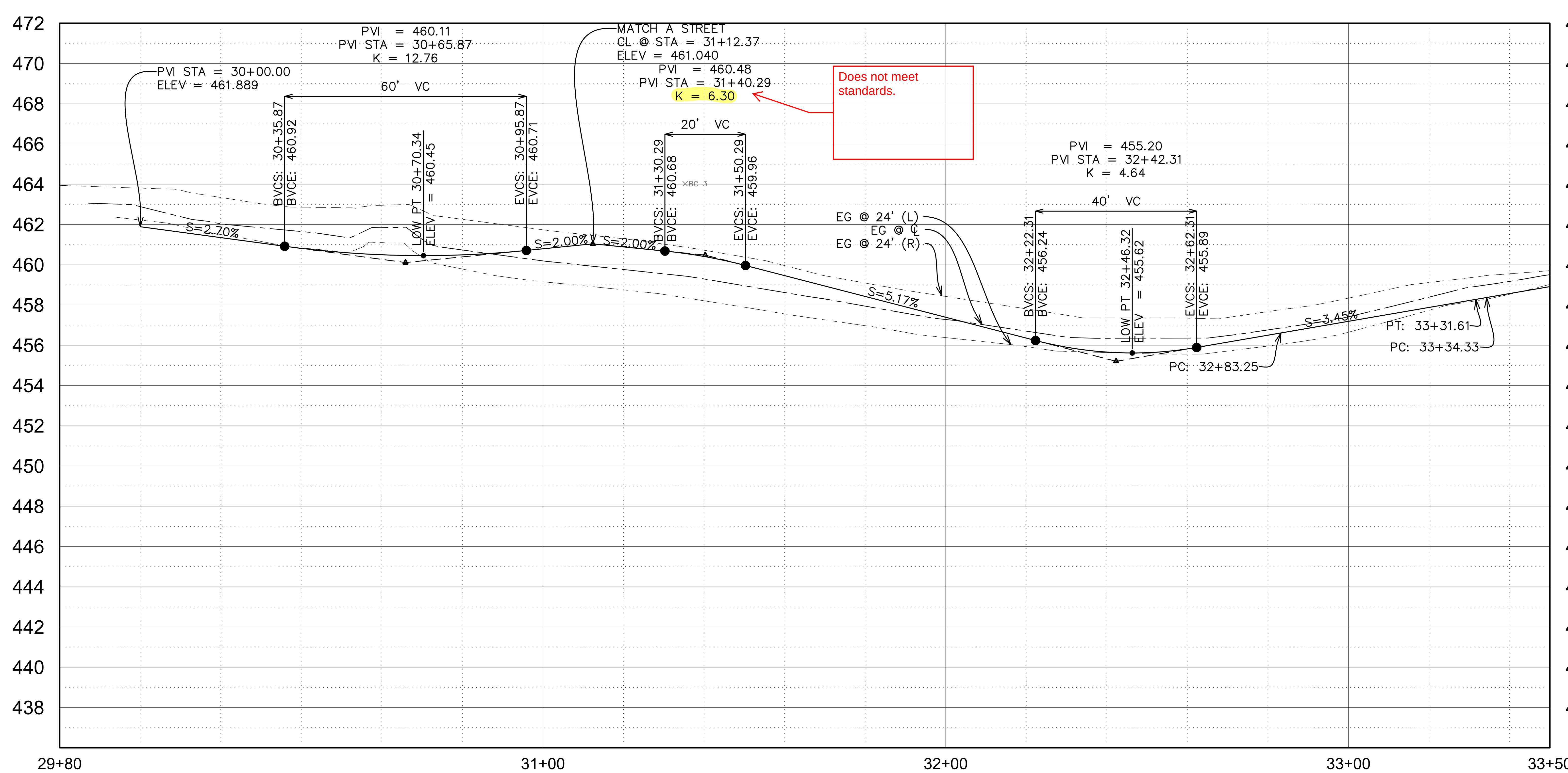
A STREET PLAN & PROFILE
23+50–END

DRAWING
ST-2

JOB NUMBER
3063.0000.0



B STREET PLAN
STA 30+00–33+50



B STREET PROFILE
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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK
B STREET PLAN & PROFILE 30+00–33+50

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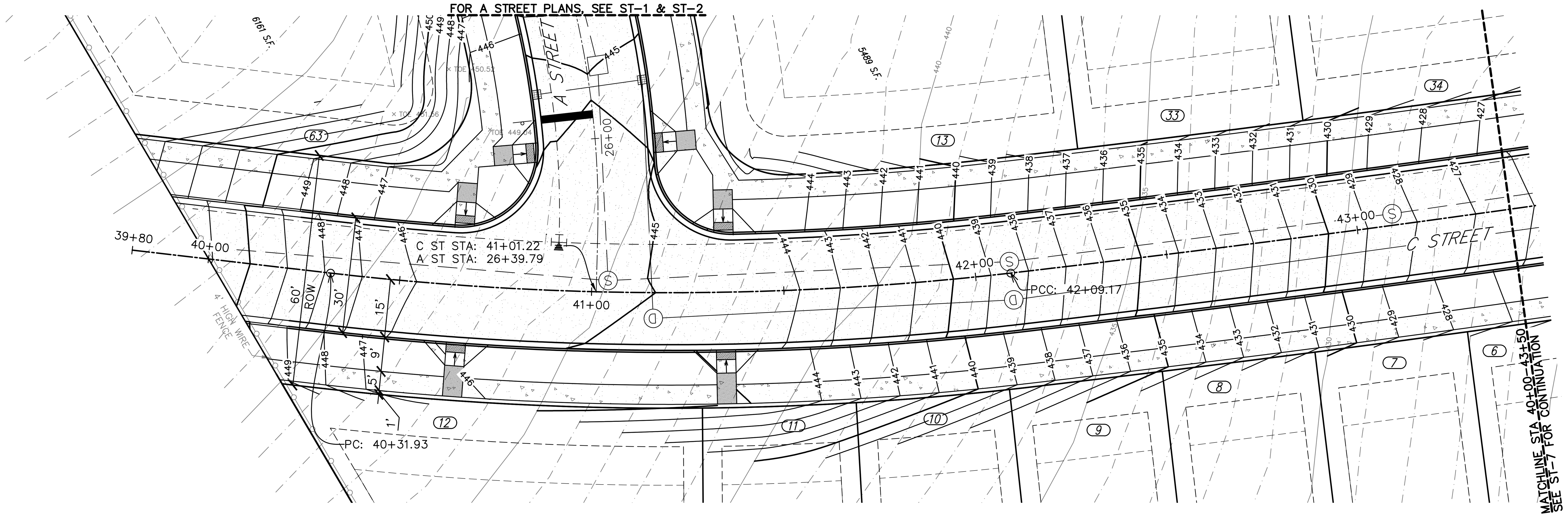
JOB NUMBER 3063.0000.0



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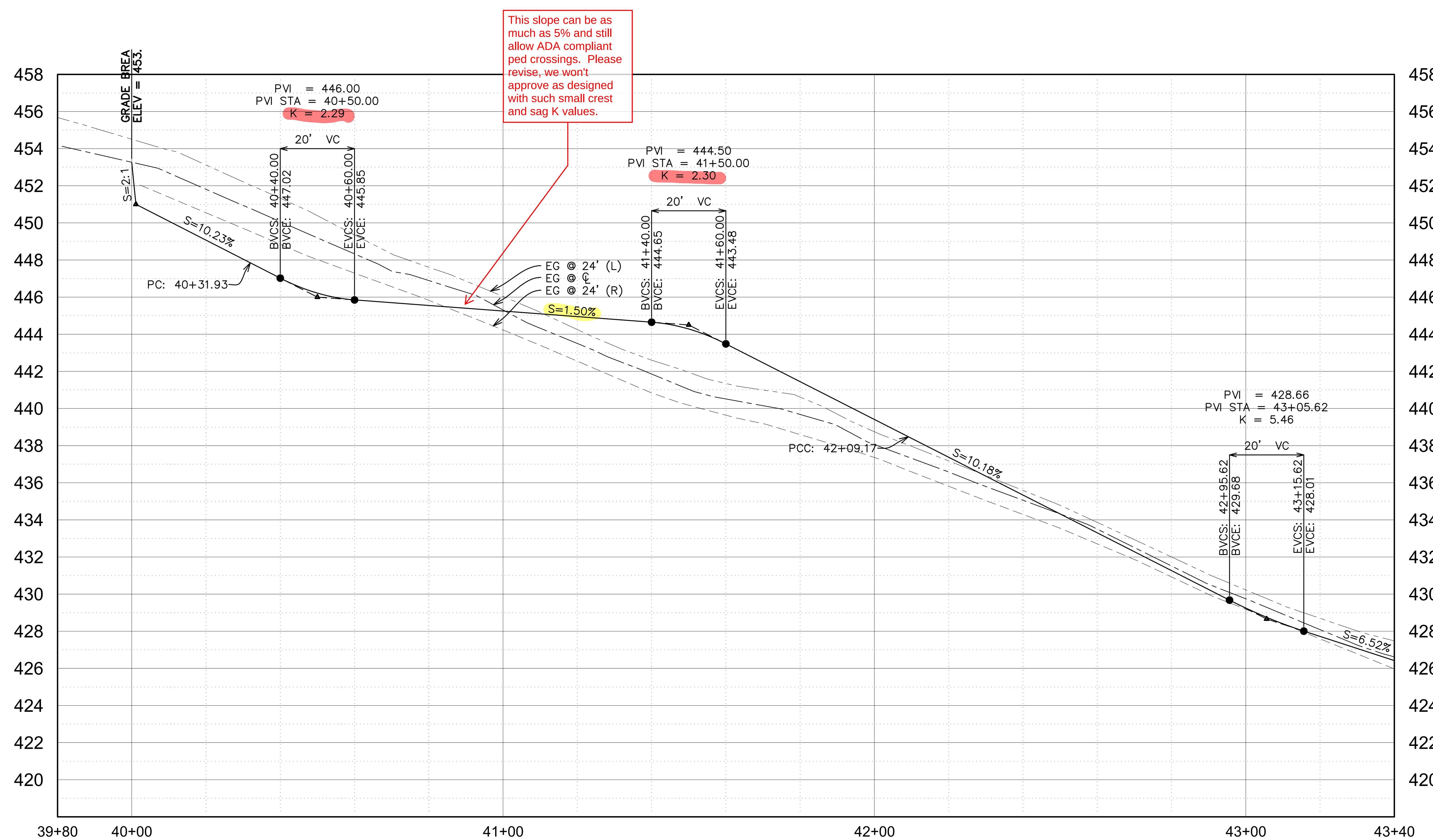
STA 40+00–43+50



C STREET PROFILE
STA 40+00–43+50
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(feet)

NO.	DATE	DESCRIPTION	BY
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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

C STREET PLAN & PROFILE 40+00–43+40

DRAWING
ST-6

JOB NUMBER
3063.0000.0

CITY OF Salem AT YOUR SERVICE

Traffic Engineering Section
Public Works Department
555 Liberty Street SE, Room 325 Telephone: 503-588-6211
Salem, Oregon 97301-3513 TTY: 503-588-6292

Trip Generation Estimate

Street ______________________

Bin # _________ TGE # ___________

Date Received ________________

Section 1 (To be completed by applicant.)

Applicant Name: State Street Homes, Inc. Telephone: 503-593-1529

Applicant Mailing Address: 1233 NW Northup St., Suite 125

Location of New Development: 5826 Battle Creek Road SE
(Please provide street address. If unknown, provide approximate address and geographical description/nearest cross streets.)

Description and Size of New Development: Subdivision; 60-Lots for Single Family Homes/Townhomes, on 11.14 AC
(e.g., 150 single-family homes, 20,000 sq. ft. office addition, 12-pump gas station, 50-student day care, additional parking, etc.)

Description and Size of Existing/Past Development, if any (note whether to remain or be removed): Vacant Lot with 4 existing structures which are to be removed.

Planning Action Involved, if any: Land Division - Subdivision
(e.g., zone change, subdivision, partition, conditional use, PUD, mobile home park, etc.)

Building Permit Involved:
Yes ■ No ☐

Section 2 (To be completed by City staff.)

Proposed Use

Development Quantity: ______________
ITE Land Use Code: ______________
Trip Generation Rate/Equation: ______________
Average Daily Trips: ______________

ELNDT Adjustment Factors

Trip Length: __________ Linked Trip: __________
TSDC Trips: ______________

Existing Use

Development Quantity: ______________
ITE Land Use Code: ______________
Trip Generation Rate or Equation: ______________
Average Daily Trips: ______________

ELNDT Adjustment Factors

Trip Length: __________ Linked Trip: __________
TSDC Trips: ______________

Section 3 (To be completed by City staff.)

Transportation Impact Analysis (TIA)

Net Increase in Average Daily Trips: ______________
(Proposed use minus existing use.)

☐ A TIA **will** be required:
- ☐ Arterial/Collector—1000 Trip/day Threshold
- ☐ Local Street/Alley—200 Trip/day Threshold
- ☐ Other: ______________

☐ A TIA **will not** be required.

Transportation Systems Development Charge

Net Increase in TSDC Trips: ______________
(Proposed use minus existing use.)

☐ A TSDC **will** be required.
(Fee determined by Development Services.)

☐ A TSDC **will not** be required.

(For additional information, refer to the back of this application.)

Section 4 (To be completed by City staff.)

Remarks: Date: ______________

cc: ☐ Chief Development Services Engineer
☐ Community Development
☐ Building Permit Application
☐ ______________ By: ______________

Information Required to Assess the Need for a Traffic Impact Analysis and Transportation Systems Development Charge

CITY OF Salem AT YOUR SERVICE

The following information is required in order to assess the need for a Traffic Impact Analysis (TIA) and to calculate the Transportation Systems Development Charge (TSDC) to be levied on a proposed new development.

TIA Determination:

The City of Salem may require that a TIA be prepared as part of the approval process for major new development. The purpose of a TIA is to estimate the traffic impacts created by a new development on the surrounding street system. Any significantly adverse traffic impacts identified in the TIA must be mitigated by the applicant.

The estimated daily traffic generation of a new development is used as the criteria for determining whether a TIA is needed. If the new development access is located on an arterial or collector and the estimated daily traffic generation is more than 1000 trips, a TIA may be required. If access is located on a local street or alley and the generated trips exceed 200, a TIA may be required. Other criteria such as site access issues, driveway restrictions, and existing facilities deficiencies may also be used, if recommended by City Traffic Engineering staff.

The City Traffic Engineer makes the determination as to whether a TIA is required. (For more information on TIA criteria, see Development Bulletin No. 19 dated January 20, 1995.) When the determination has been made, copies of the Trip Generation Estimate form are sent to Public Works Development Services Division and the applicant. If a planning action is required, a copy is also forwarded to the Community Development Department.

TSDC Analysis:

The City of Salem charges a TSDC on all new development that creates a net increase in traffic on the surrounding street system. The total charge is assessed on a per trip fee times the TSDC trips calculated for the development. For more information on the TSDC, see Council Staff Report dated October 9, 1995.

To assist in estimating the daily trips generated by a new development, please answer the questions in Section 1 of this sheet and return it to Room 325 of the Civic Center. If you have any questions, Traffic Engineering staff are available at 503-588-6211. A copy of the completed trip generation estimate will be returned to you at the address provided in Section 1.

No Land Use, Planning, or Development Approval applications requiring Trip Generation Estimates will be processed until this information has been provided and the TIA/TSDC assessment has been made by City Traffic Engineering staff.

February 9, 2021

State Street Homes
Salem, Oregon 97306

RE: State Street Homes Arborist Report

Introduction:
This recommendation is prepared for the future construction of the property at 5826 Battle Creek Rd. SE. The site on which improvements will be made is a large parcel of land which will be subdivided, bounded by Battle Creek Rd. SE on the west and Interstate 5 on the east. The north and south sides of the property abut existing residential private property. The foci for this report are two significant oak trees which will be located in the right-of-way when street improvements are made.

Tree diameters listed are the diameter at 4.5 feet above grade (Diameter at Breast Height - DBH). Please see 'Exhibit A – Tree ID and Location' for associated information, and 'Exhibit B – Arborist Data' at the end of this document for additional notes pertaining to each tree: Tree Species, Diameter Size and Health/Condition.

The study for this report evaluated the health of two trees in specific locations. Field work was performed on February 8, 2020.

Observations:
The evaluated trees are *Quercus garryana* (Oregon White Oak). This species tends to have low root damage potential.

Tree Evaluations, Recommendations and Design Implications
Tree #1 is found adjacent to Battle Creek Rd. SE and the existing paved driveway leading to the single home on the property. The DBH of this tree is 42 inches, with a canopy diameter of 70 feet. Nails have been used to attach an address plaque to the trunk, however no sap drip is evident. Limbs extend over the full width of the driveway and road. Although this is a low branching specimen (major limbs emerge approximately 6 feet from the ground), the limbs ascend sufficiently to allow unimpeded vehicular movement on both Battle Creek Rd. SE and the private driveway. The low and wide branching created a crotch that has collected debris and should be monitored for signs of decay. Moss and Licorice Ferns are abundant on the trunk and limbs, but these pose no concerns for tree health. This tree exhibits a significant number of insect induced galls. In general, this should not harm the tree, however a very heavy occurrence may lead to early leaf drop. A small amount of mistletoe is present (4-5 clusters), but is likely to spread over time as evidenced by other surrounding oaks with heavy infestation. Although mistletoe is a parasitic plant, in smaller quantities the tree should not be in danger. The presence of mistletoe should be monitored over time. If it begins to appear in large quantities, the tree may have health risks and decline in times of stress (drought, disease, damage). Pruning diseased limbs is one way to control mistletoe, however the form and balance of the tree may by compromised. Some watersprouts are present on larger limbs, but not in abundance. There is a small amount of deadwood present which shows signs of decay and bird/insect activity, however this is not uncommon for a tree of this size/age. The tree is somewhat crowded on the north-northwest side by 3 closely planted conifers,

which has somewhat limited limb extension in that direction, but nothing drastic. The smaller limbs on the crowded side intermingle and surround the conifers to some extent. This tree is in good condition.

Tree #1 – location, form

Tree #1 – location, form, powerlines, crowding

Tree #1 – location, plaque, branching, crotch, epiphytes

Tree #2 is located on the north side of the existing house in a plant bed, adjacent to large, open fields, lawn and very little paving, however it is within 10 feet of the structure. No surface roots are visible. The DBH of this tree is 43 inches, with a canopy diameter of 77 feet. This is a more upright and high branching specimen, with a high, wide reaching canopy. At least 3 major limb removals have been performed recently on the south side which appear to have been extending over the house. This has altered the form of the tree, making it rather 3-sided in its current state, but offers increase safety and protection of the structure. Moss and Licorice Ferns are present on the trunk and limbs, but these pose no concerns for tree health. This tree exhibits a smaller amount of insect induced galls than tree #1. A large amount of mistletoe is present, thus the tree should be monitored for health risks and decline in times of stress (drought, disease, damage). In this case, the pruning of diseased limbs to control spread is not recommended, as it would decimate the tree's form and structure. Minor fungal decay is present on deadwood/old cuts/old breaks within the canopy. Wood from the removed limbs was stacked nearby which exhibited fungal conks, however it is unknown if these surfaced before or after removal. The edge of the canopy on the west side is intermingling with branches from the adjacent Cedar, however they don't appear to be interfering with one another. Minor bark abrasions are present low on the trunk, but none have fully pierced the bark and caused injury to the living tissues below. This tree is in fair condition, primarily due to the high presence of mistletoe and the balance/form created by limb removal.

Tree #2 – location, form, pruning cuts, proximity

Tree #2 – location, form, pruning cuts, proximity

Tree #2 – mistletoe, form

General Recommendations:
Cut and Fill in and around existing tree roots can affect the overall health of the tree. While cut is most intrusive, as it directly eliminates an energy (food and water) source, fill can also impact feeder roots in trees. Trees are better equipped to adapt to fill than cut. If fill is required, it is recommended to keep fill materials at least 10-ft from the base of the tree and to infill either by hand or with use of heavy equipment where only the bucket enters the protected area, and the weight of the machinery stays outside the tree protection area to avoid soil compaction. No more than 30% of the tree's root zone should be impacted with cut or fill for optimal health of the tree. As a general rule of thumb, and depending upon species, tree removal is recommended if more than 30% of their critical root zones (CRZ) will be impacted to accommodate construction.

In the case of tree #1, somewhere in the ballpark of 60% of the CRZ will be affected by construction. Impact will predominantly be with fill, however it will come within a few feet of the trunk. In addition, there will be significant compaction throughout the affected zone for construction of roads and sidewalks. Although some efforts could be made to lessen the impact of the fill and compaction of the CRZ, they would come at great expense and would not necessarily assure tree survival.

Tree #2 has a large percentage of the CRZ which will be affected by construction: over 50%. However, the disturbance in this instance would be 3 feet of cut on the south side which comes very near to the trunk. This would remove a significant amount of structural and feeder roots which could compromise tree stability and survival. The remaining roots on the north side would be subject to compaction on the new home building lot.

Unless there are significant changes to the design of the roadways and utilities, or the use of unique construction methods around the CRZ of these trees, it is recommended that both native oak trees be removed.

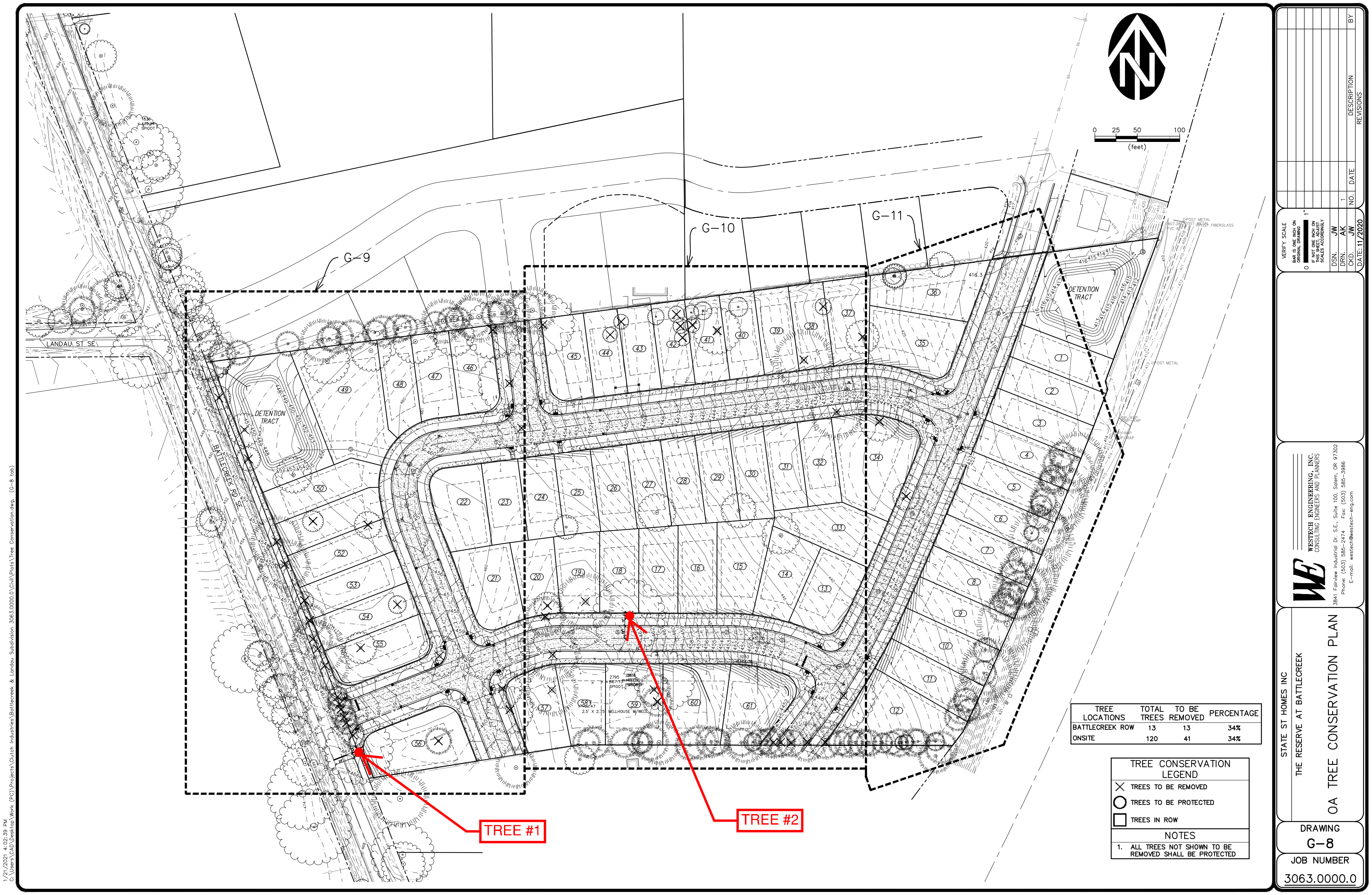
Assumptions and Limiting Conditions:

- The data given in this recommendation reflects an opinion of the conditions present on site at the time of inspection. The inspection was limited to visual examination only without excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the trees on the property may not arise in the future.
- Care has been taken to obtain all information from reliable sources. The consultant can neither guarantee nor be responsible for the accuracy and completeness of the information provided by others.
- Consultant shall not be required to give testimony or to attend court by reason of any recommendation unless subsequent contractual arrangements are made, including payment of additional fees.
- Missing pages or alteration of any recommendation invalidates entire document.
- Possession of a recommendation does not imply a right of publication without written consent of the consultant.
- Neither all nor any part of the contents of this recommendation, nor a copy thereof, shall be conveyed to the public through advertising, public relations, news, sales or other media, or for a larger database without the expressed written consent of the consultant.

Regards,

Matthew Jorgensen
ISA Certified Arborist, PN-8810A

EXHIBIT A - TREE ID AND LOCATION



TREE LOCATIONS	TOTAL TREES	TO BE REMOVED	PERCENTAGE
BATTLECREEK ROW	13	13	34%
ONSITE	120	41	34%

EXHIBIT B - ARBORIST DATA

State Street Homes 2/9/2021

Existing Trees - Inventory & Assessment

Plan ID	Genus & Species	Common Name	DBH (in)	CANOPY (ft)	Health/ Condition*	Arborist Notes	within 10' of Structure	Co-dominant Leader	Surface Roots	% Deadwood	History of Being Topped	Suckers
1	Quercus garryana	Oregon White Oak	42	70	4	mistletoe present, but in a small quantity (4-5 clusters), low major limb attachment, good attachment, presence of licorice fern on lower limbs and in crotch, debris in crotch, gall presence, some deadwood with decay, high limbs overhang the width of the street, powerlines nearby but not conflicting, branches intermingle with 3 other adjacent trees that are planted closely together, evidence of bird/insect activity on deadwood				5%		x
2	Quercus garryana	Oregon White Oak	43	77	3	3 sided due to large limb pruning on the side of the house (3 large limbs pruned recently, perhaps others in the past), close to structure, high limb attachment, good attachment, fern presence, high mistletoe presence, minor fungal decay on deadwood/old cuts/breaks, branches just mingling with adjacent cedar but don't seem to be interfering with each other, minor trunk/bark abrasions, gall presence	x					

*Condition		
5 =	very good	perfect form, little to no deadwood, all limbs have good attachments, no sign of decay
4 =	good	good form, multi-leader, but with good attachment, 10% or less large deadwood
3 =	fair	unbalanced or incomplete crown, tight limb angles, 15-20% larger deadwood
2 =	poor	Evidence of some decay, 20-30% larger deadwood, history of being topped.
1 =	very poor	Structurally unsound, extensive decay, dieback, poor form, unbalanced or greatly reduced crown.

Bylaws of State Street Homes, Inc.

1. General Provisions

1.1 Name: The name of the Corporation shall be **STATE STREET HOMES, INC.**

1.2 Place of Incorporation: The Corporation is to be incorporated in Oregon, and shall be subject to Oregon law.

1.3 Powers: The Corporation shall be empowered to engage in any lawful activities for which corporations may be organized under the laws of the State of Oregon.

1.4 Tax Status: The Corporation shall operate as an "C" Corporation, and Directors and Officers of the Corporation shall not operate the Corporation in any manner inconsistent with such status.

2. Directors

2.1 Number of Directors: The Corporation shall have three directors.

2.2 Qualifications of Directors: Directors shall be Shareholders of the Corporation.

2.3 Term and Election of Directors: Directors shall serve terms of two years, and shall be elected at each annual Shareholders' Meeting. Directors shall be elected by shareholders representing a majority of outstanding stock. In the event that no majority of shareholders can be reached in the election of new directors, incumbent directors shall continue in their positions until a successor is elected by shareholders representing a majority of outstanding stock.

2.4 Quorum: Unanimous decisions by directors shall constitute a quorum for all purposes.

2.5 Vacancies: In the event that a Director resigns, or is rendered incapable of executing his or her office due to death, incapacitation, or any other disability which would render the Director physically or mentally incompetent to serve, the remaining Directors may declare the incapacitated director's position vacant, and may appoint a replacement Director or eliminate the vacant position entirely. The replacement must be an heir to the estate of the vacant director.

2.6 Meetings: Meetings of the Board of Directors shall be held at times and places of the Board's choosing. The time and place of any meeting may be chosen by a majority vote of a quorum of board members.

2.7 Action without Meeting: Any action that may be taken by the Board of Directors at a meeting may be taken without a meeting if taken by all members of the board. Any action taken under this section shall be evidenced by one or more written consents, signed by each director, and included in the minutes or filed with the corporate records reflecting the action taken.

3. Officers

3.1 Titles of Officers: The Officers of the Corporation shall be a President, Secretary, and Treasurer.

3.2 Appointment and Removal: Officers of shall be appointed and removed by unanimous decision of the Board of Directors.

3.3 Term: Officers shall serve until dismissed by the Board of Directors.

3.4 Vacancies: In the event of a vacancy in any Officer position, the President may assume the duties of the vacant office, or may appoint a replacement. In the event that the office of the President becomes vacant, the Secretary or Treasurer shall assume the duties of the President, under agreement. Any assumption or appointment under this section shall continue until the next meeting of the Board of Directors.

3.5 President: The President, Secretary, & Treasurer shall manage the daily operations of the Corporation and is empowered to take any action that may be necessary for the daily operations.

3.6 Secretary: The Secretary shall have the responsibility for preparing minutes of the directors' and shareholders' meetings and for authenticating records of the corporation.

3.7 Treasurer: The Treasurer shall have the responsibility for providing updates on funding, investment management, disbursement of funds, and accounting of revenue.

3.8 Agency Power: Officers shall be considered agents of the Corporation for all purposes, and may bind the Corporation to any agreement that may validly be entered under the laws of the State of Oregon.

3.9 Delegation: Officers of the Corporation may delegate powers and duties to another Officer, employee, or contractor of the Corporation. Delegation of any duty shall not relieve the delegating Officer from his or her obligation to ensure that the duty is faithfully executed.

4. Indemnification

The Corporation shall indemnify its Directors and Officers to the fullest extent allowable by law.

5. Shares and Shareholders

5.1 Number: The Corporation shall be authorized to issue up to 100 shares.

5.2 Class: All shares of the Corporation shall consist of a single class, and each share shall represent an equal right to vote, to receive distributions, and to receive the net assets of the Corporation upon dissolution.

5.3 Certificates: The Corporation shall not be required to issue share certificates, but may do so upon a vote of the Board of Directors.

5.4 Transferability: Shares shall be freely transferable. The Board may impose future restrictions upon transferability of shares through amendment of the Articles of Incorporation or these Bylaws, by directing the Corporation to enter into a Shareholders' Agreement with holders of outstanding shares, or by any other method authorized by law.

5.5 Annual Meetings: The Board of Directors shall fix the time and place of the annual Shareholders' Meeting, and shall give notice of any such scheduled meeting to Shareholders no more than 60 days or less than 10 days prior to the scheduled meeting.

5.6 Special Meetings: Special meetings may be called by a vote of the Board of Directors, or by any other method allowed by law. Notice of any special meeting shall be given no more than 60 days or less than 10 days prior to the special meeting.

5.7 Quorum: A quorum shall require unanimous agreement by all officers.

6. Amendments

Amendments to these Bylaws or to the Articles of Incorporation may be made by any method consistent with the law, including unanimous vote of Directors.

7. Adoption

These Bylaws shall be adopted by the Board of Directors at its first meeting, and shall enter into effect immediately upon adoption. The Directors shall set forth their signatures below as evidence of their intent to adopt these bylaws.

ADOPTED this 12 day of June, 2020.

________________ Brandon Gill, Director

________________ Mark Wilde, Director

________________ Kosta Fassilis, Director

Meeting Minutes for State Street Homes, Inc.

June 1, 2020

Officers Hereby elect Brandon Gill as President of the Corporation

Officers Hereby elect Mark Wilde as Secretary of the corporation

Officers Hereby elect Kosta Fassilis as Treasurer of the corporation

Brandon Gill's shares of ownership to be 30 of 100

Mark Wilde's shares of ownership to be 30 of 100

Kosta Fassilis's shares of ownership to be 30 of 100

10 of 100 shares to be retained as unassigned by the company.

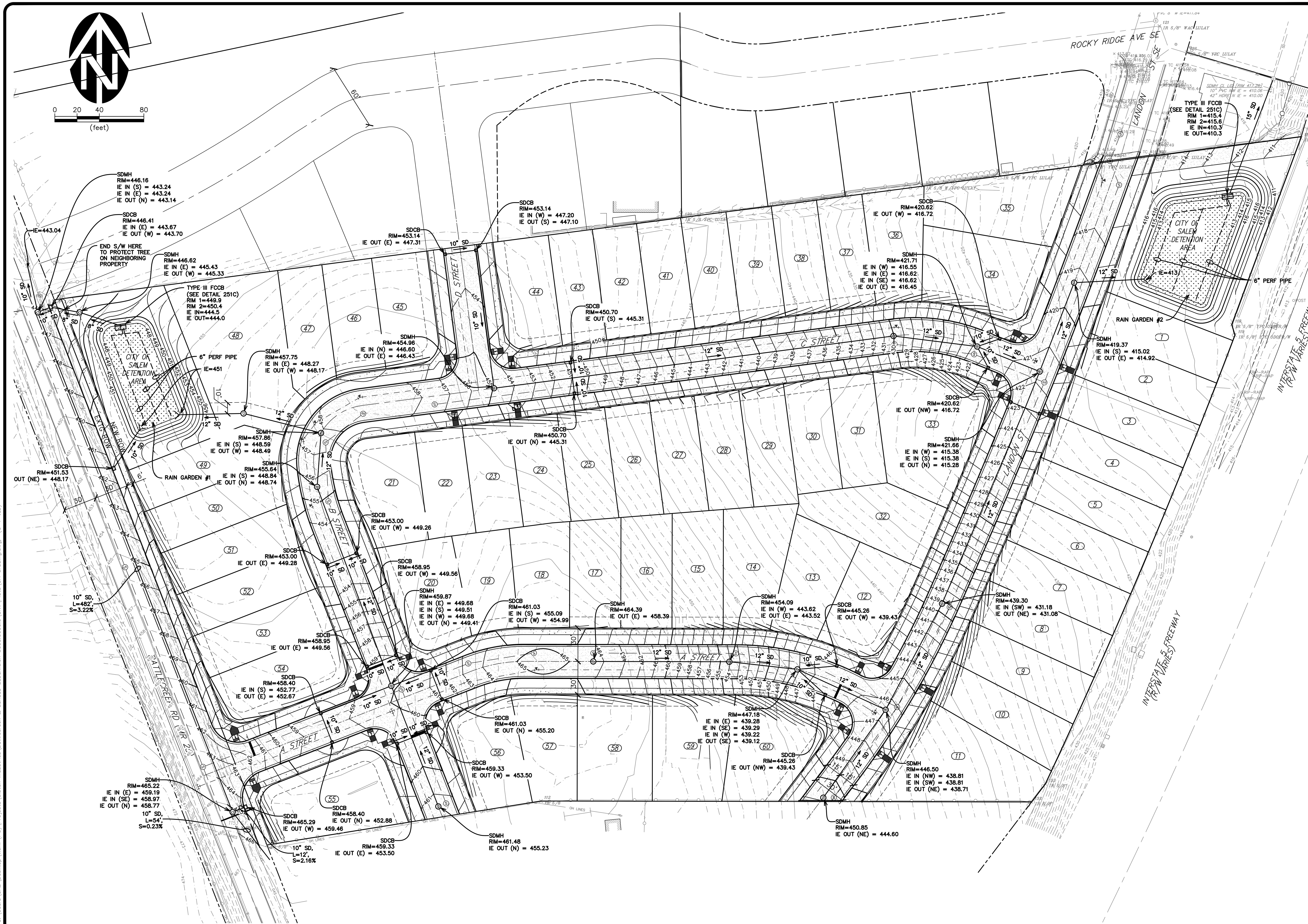
Both President, Secretary, and Treasurer have the power and ability to conduct business on behalf of the Corporation solely and individually. Including but not limited to purchase or sale of property, banking business, signing service or material contract.

Signed,

Brandon Gill ____________ date 7-4-20

Mark Wilde ____________ date 7-4-20

Kosta Fassilis ____________ date 6-1-20



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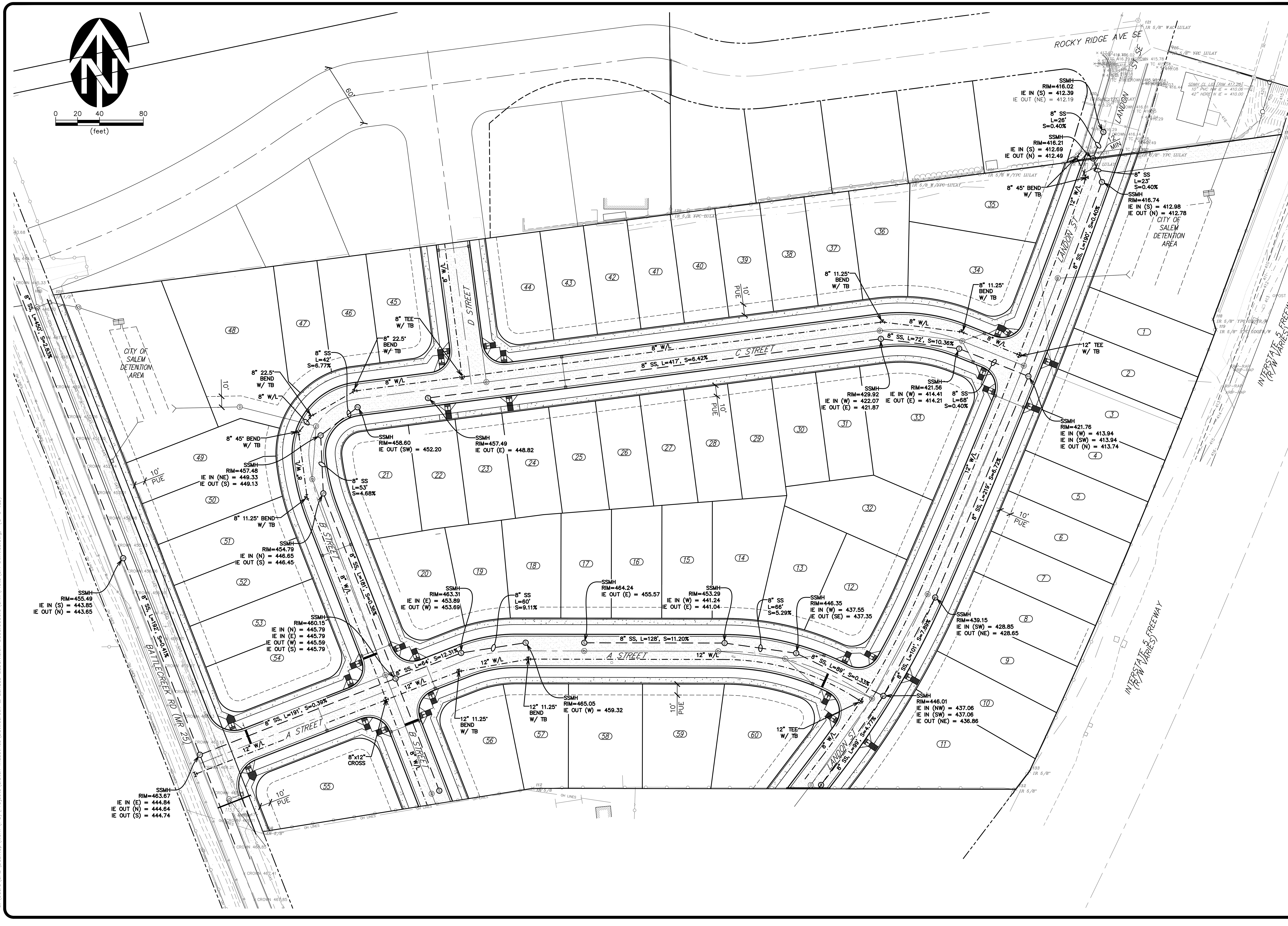
CLIENT
THE RESERVE AT BATTLECREEK

OA GRADING PLAN

DRAWING
G-7

JOB NUMBER
3063.0000.0



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OA UTILITY PLAN

DRAWING
G-6

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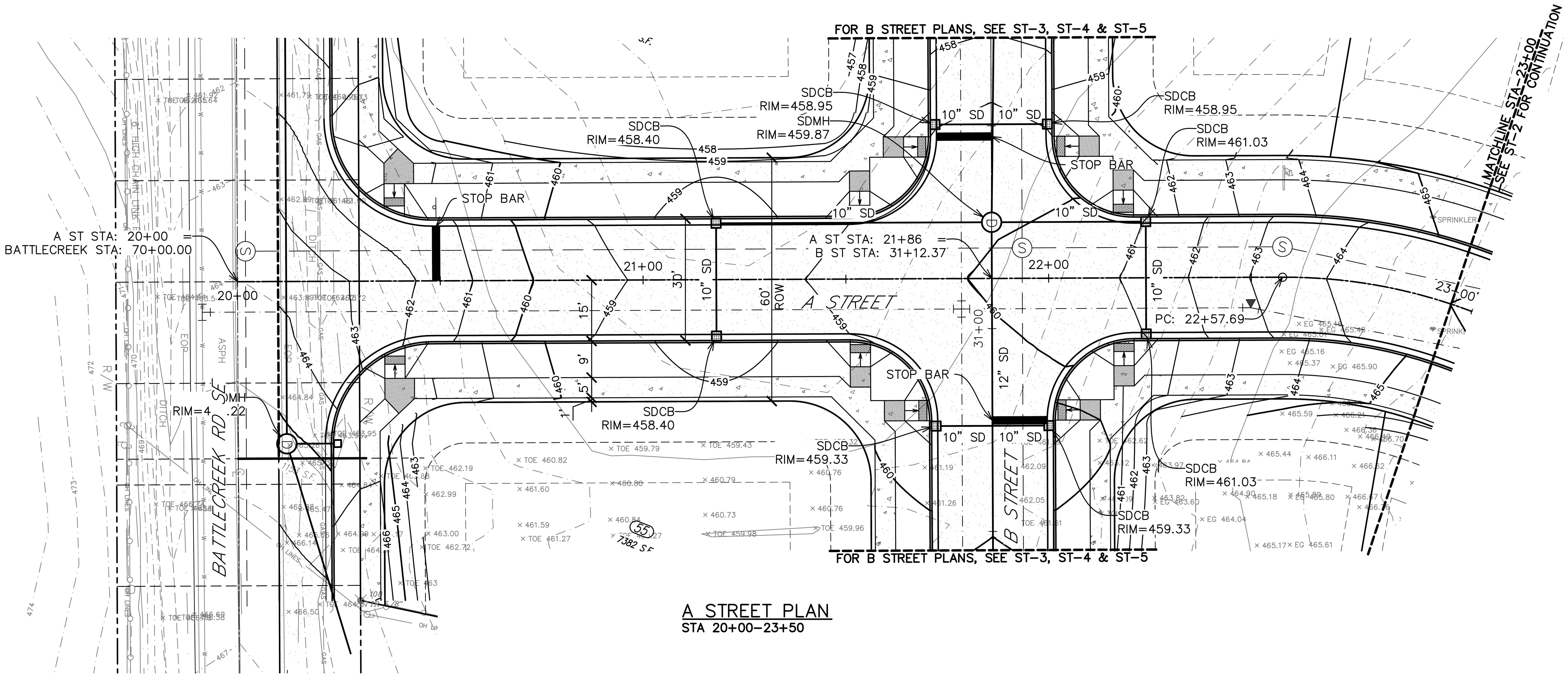

A STREET PLAN
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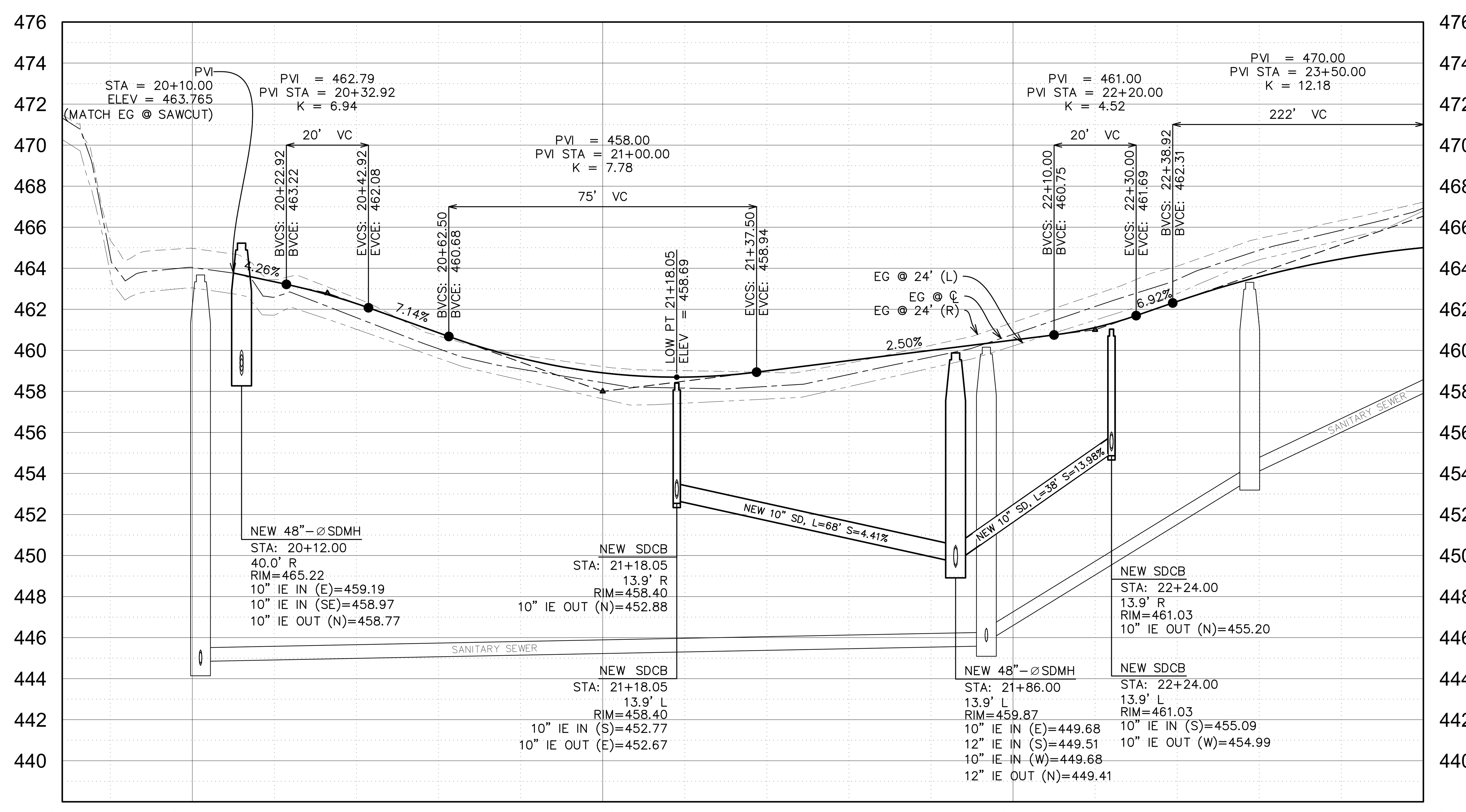

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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

A STREET PLAN & PROFILE 20+00–23+50

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JOB NUMBER
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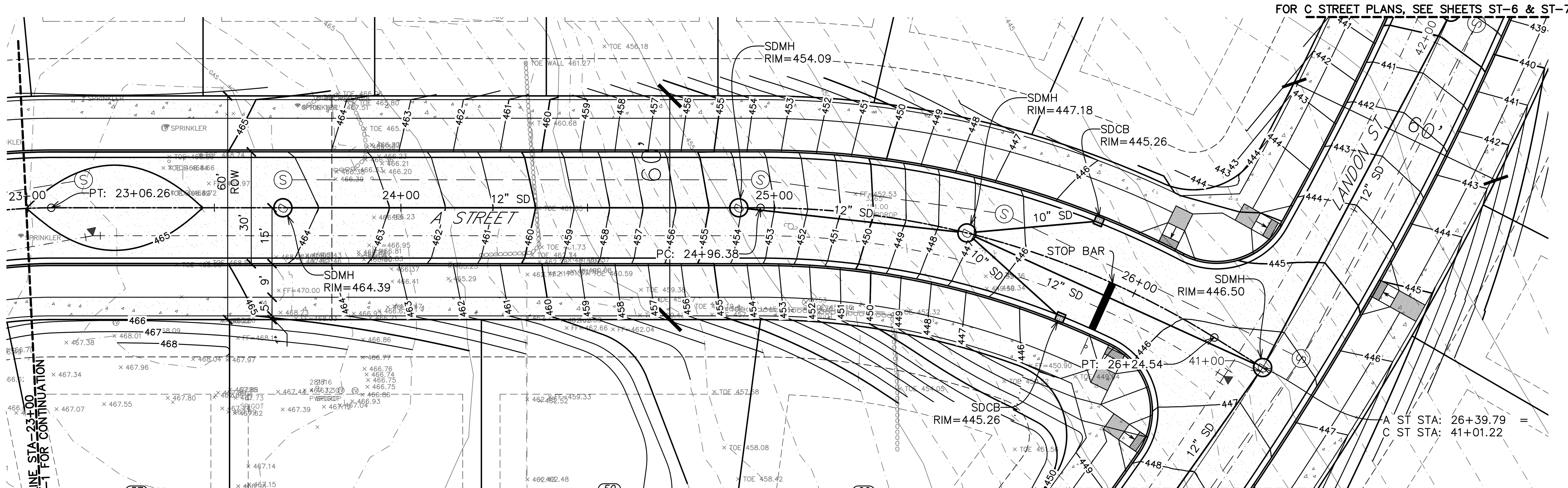
FOR C STREET PLANS, SEE SHEETS ST-6 & ST-7



FOR C STREET PLANS, SEE SHEETS ST-6 & ST-7

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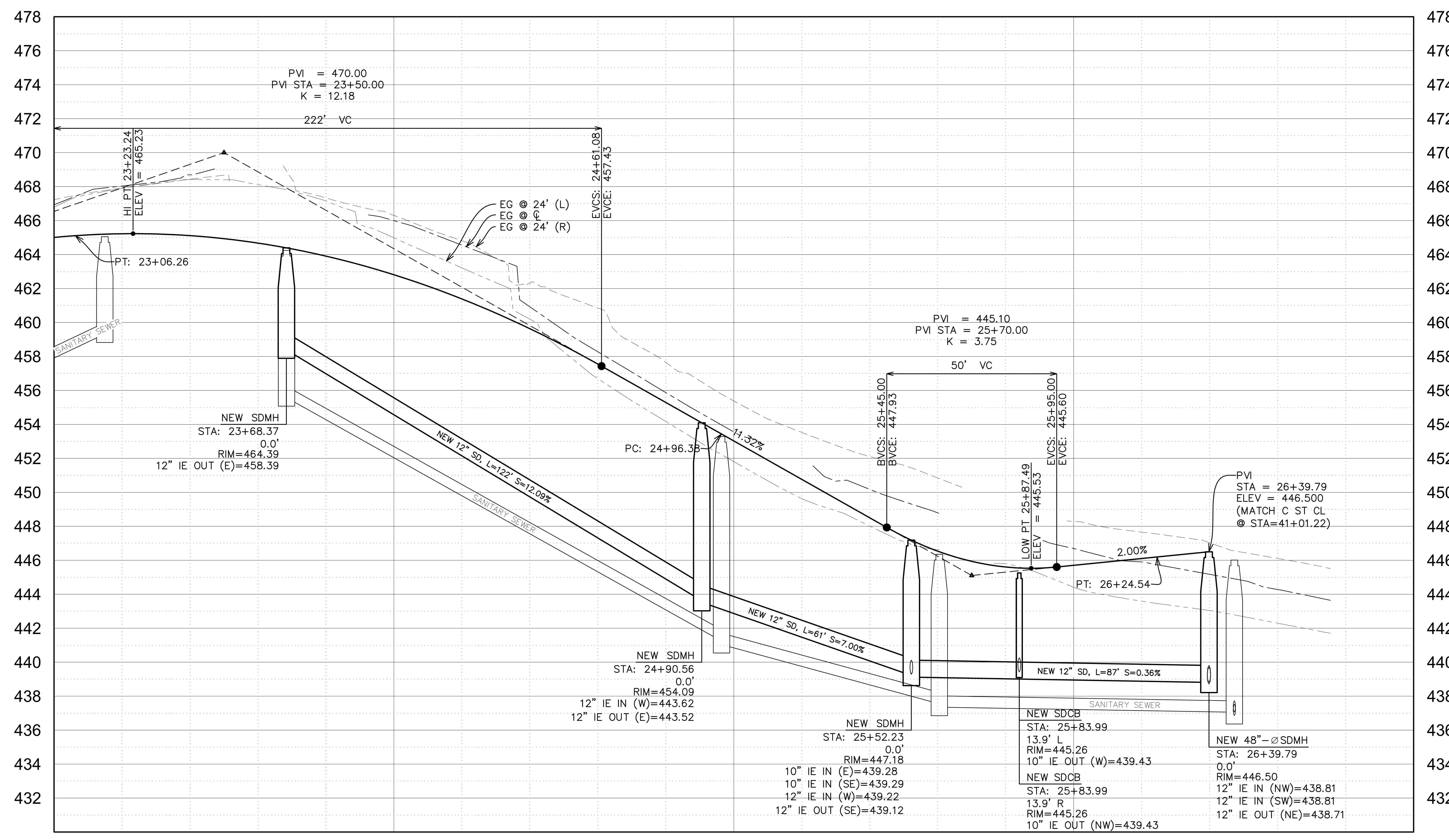
A STREET PLAN
STA 23+50–END



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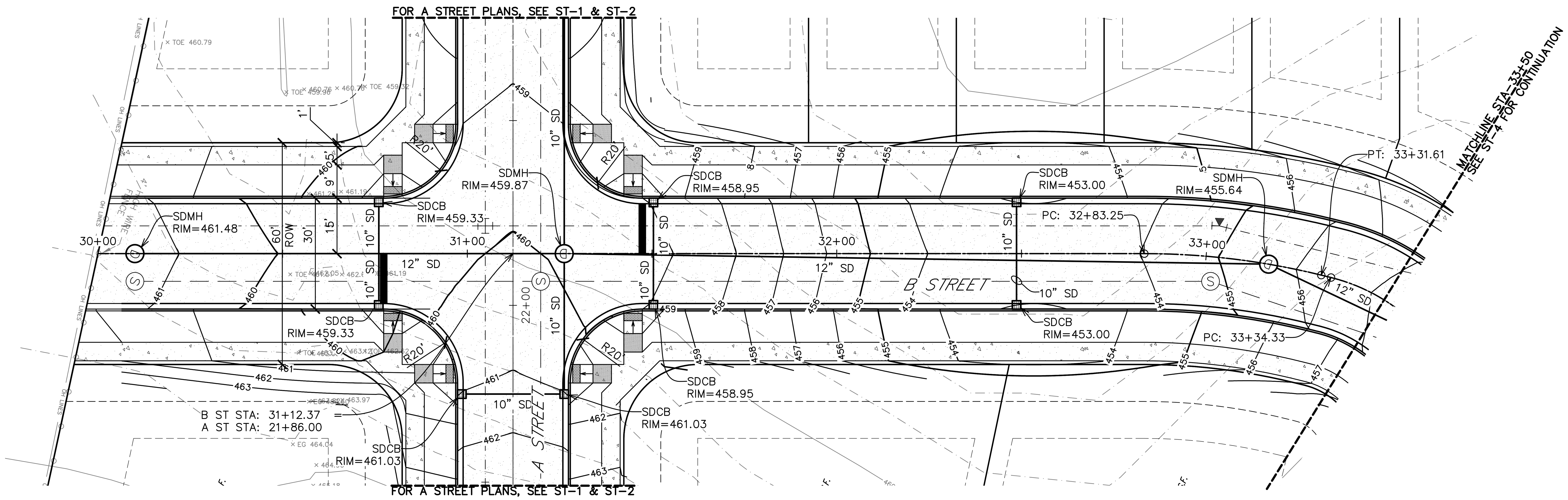

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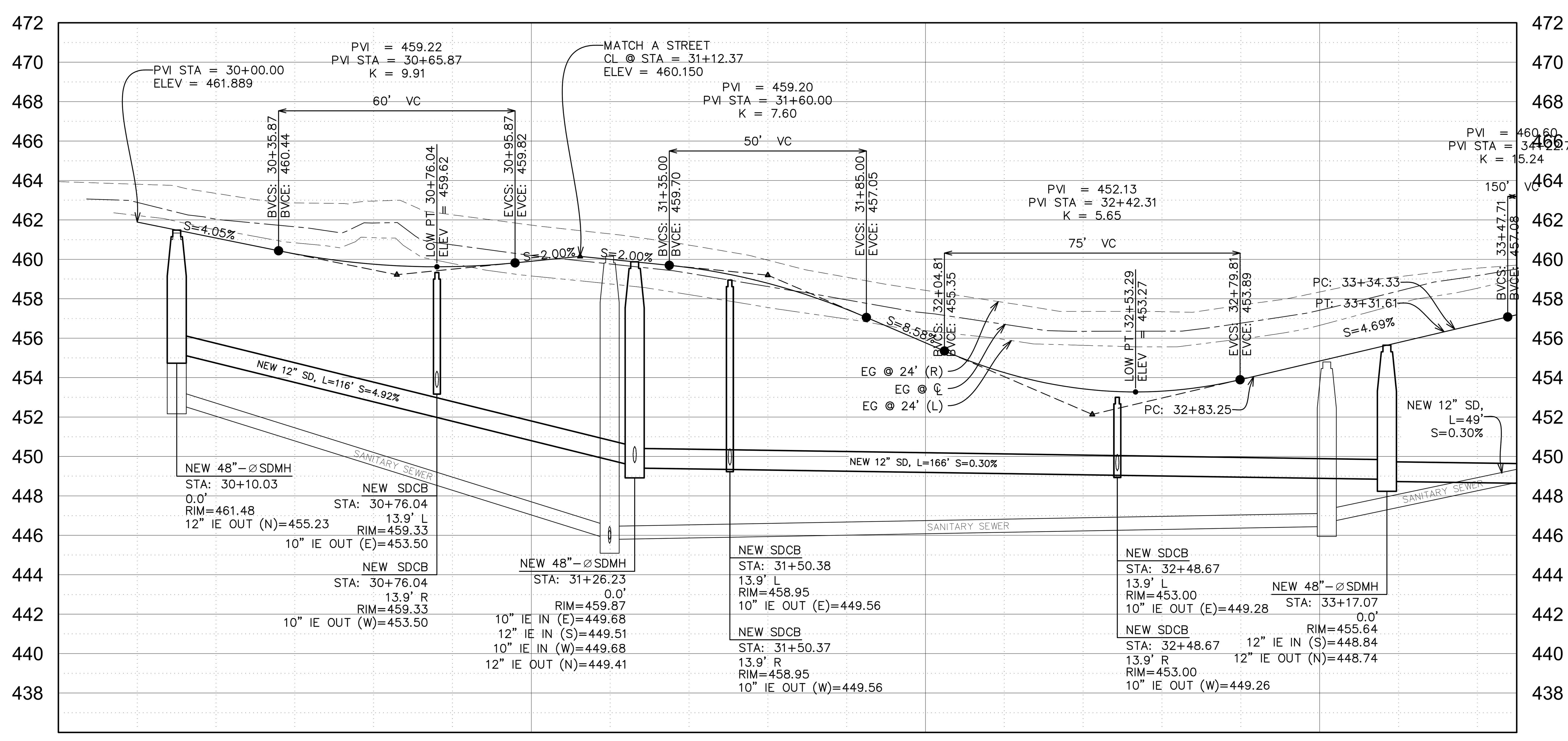

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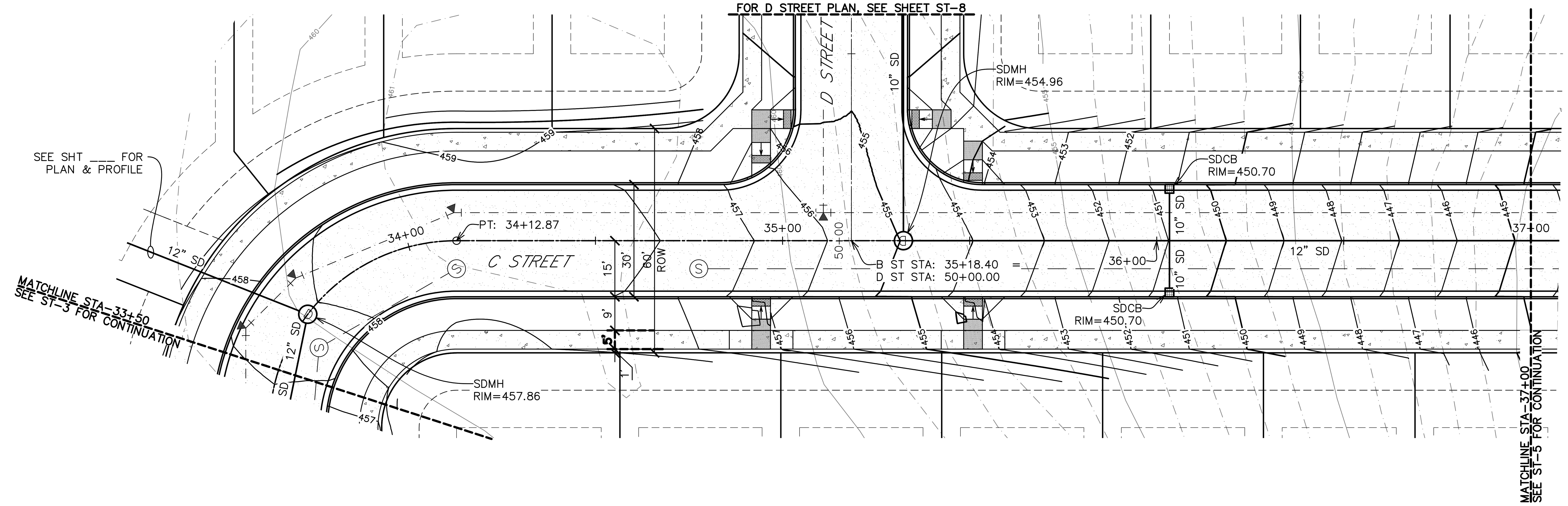

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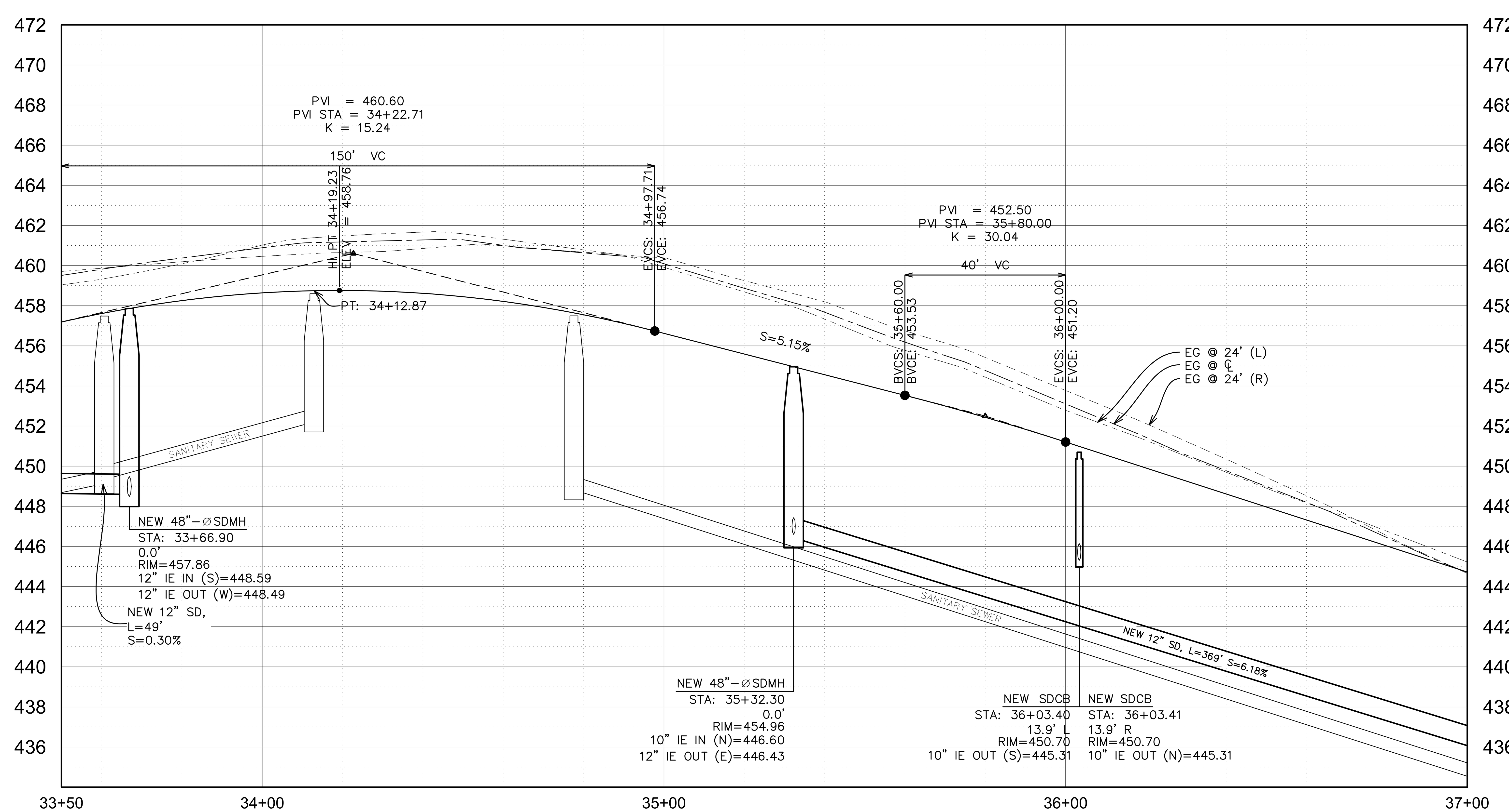

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C STREET PLAN & PROFILE 33+50–37+00

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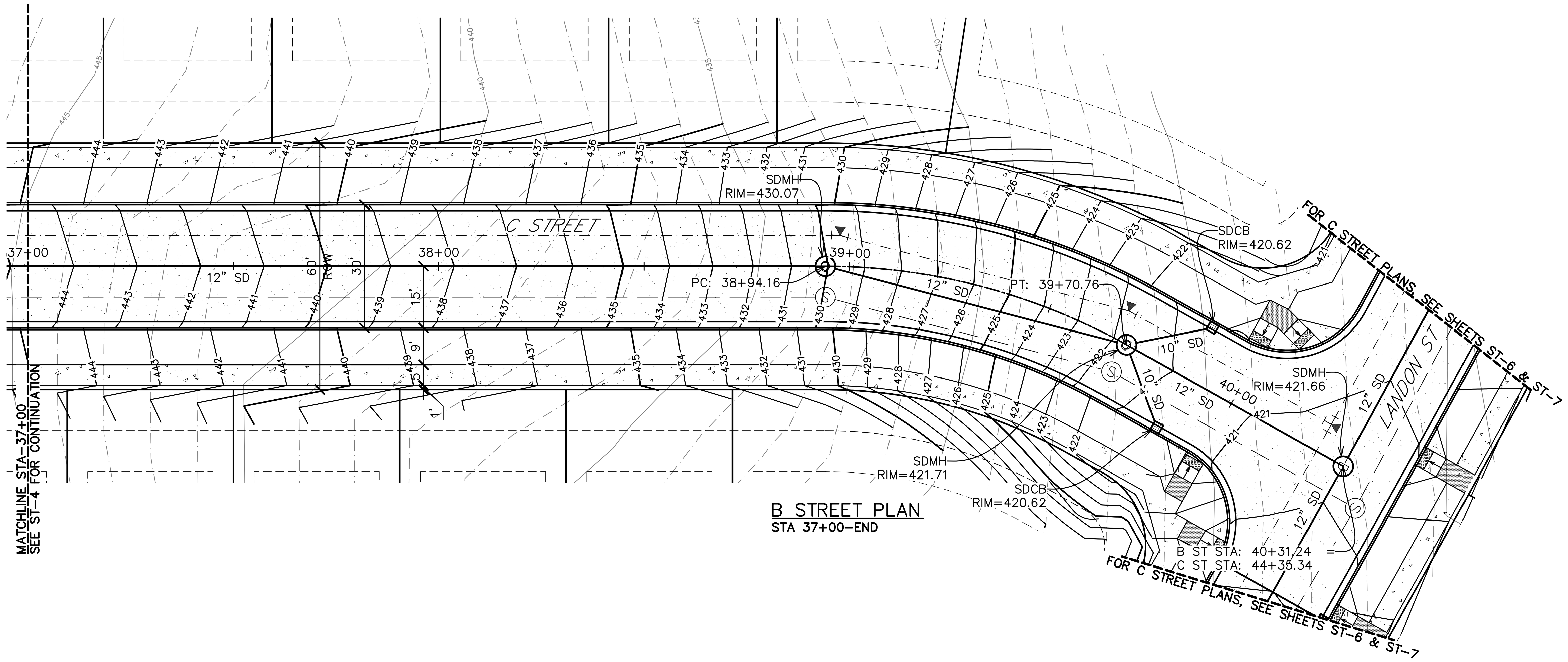

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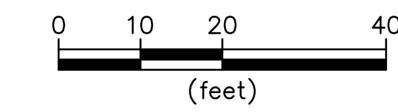

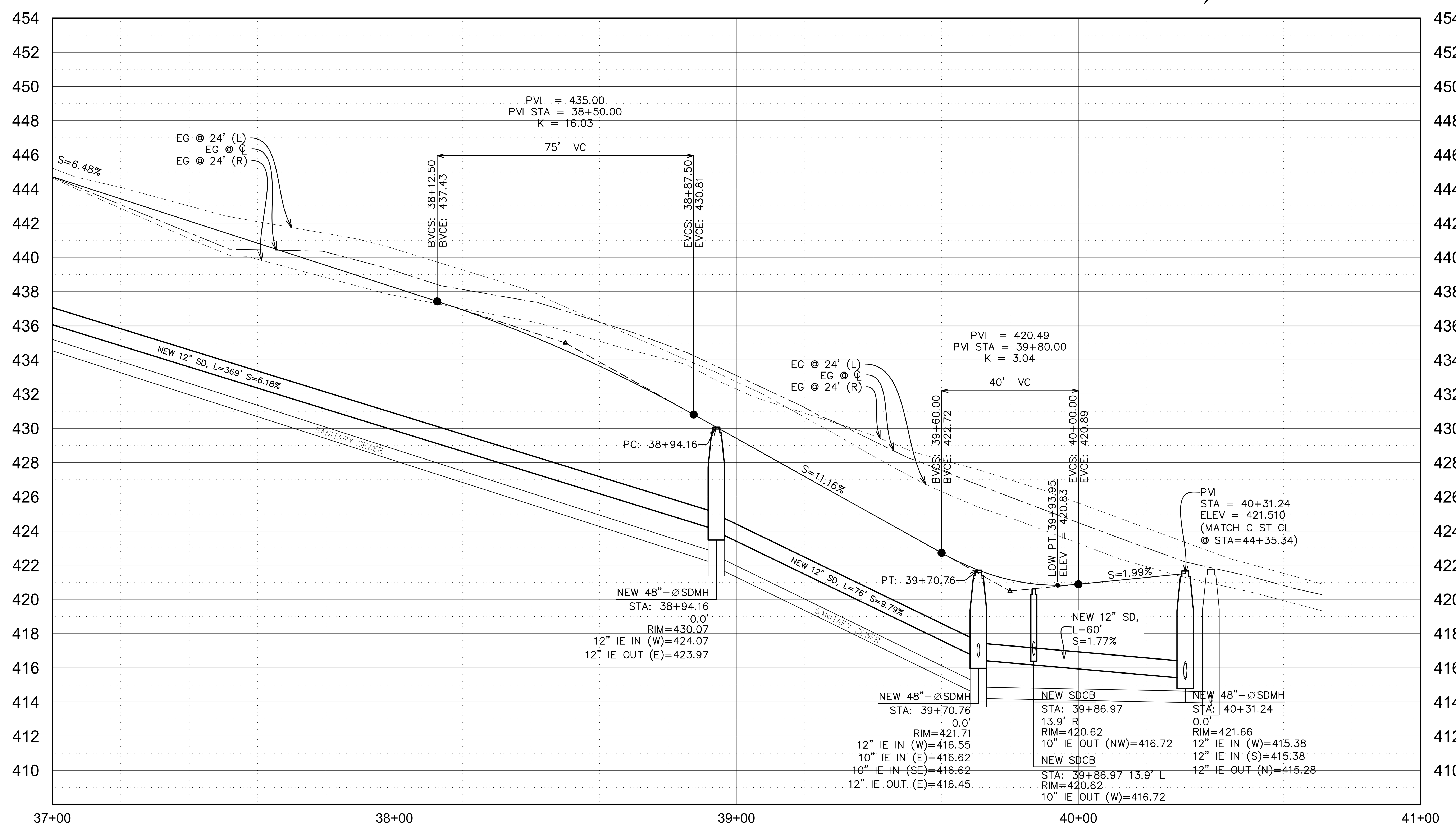

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C STREET PLAN & PROFILE
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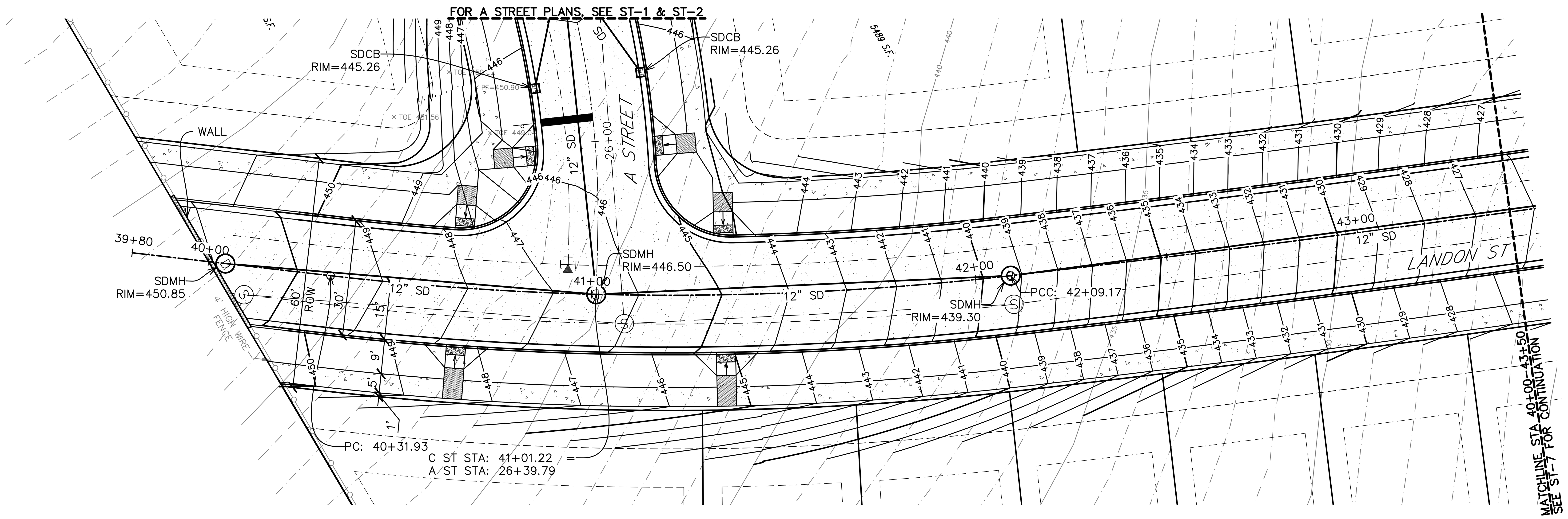

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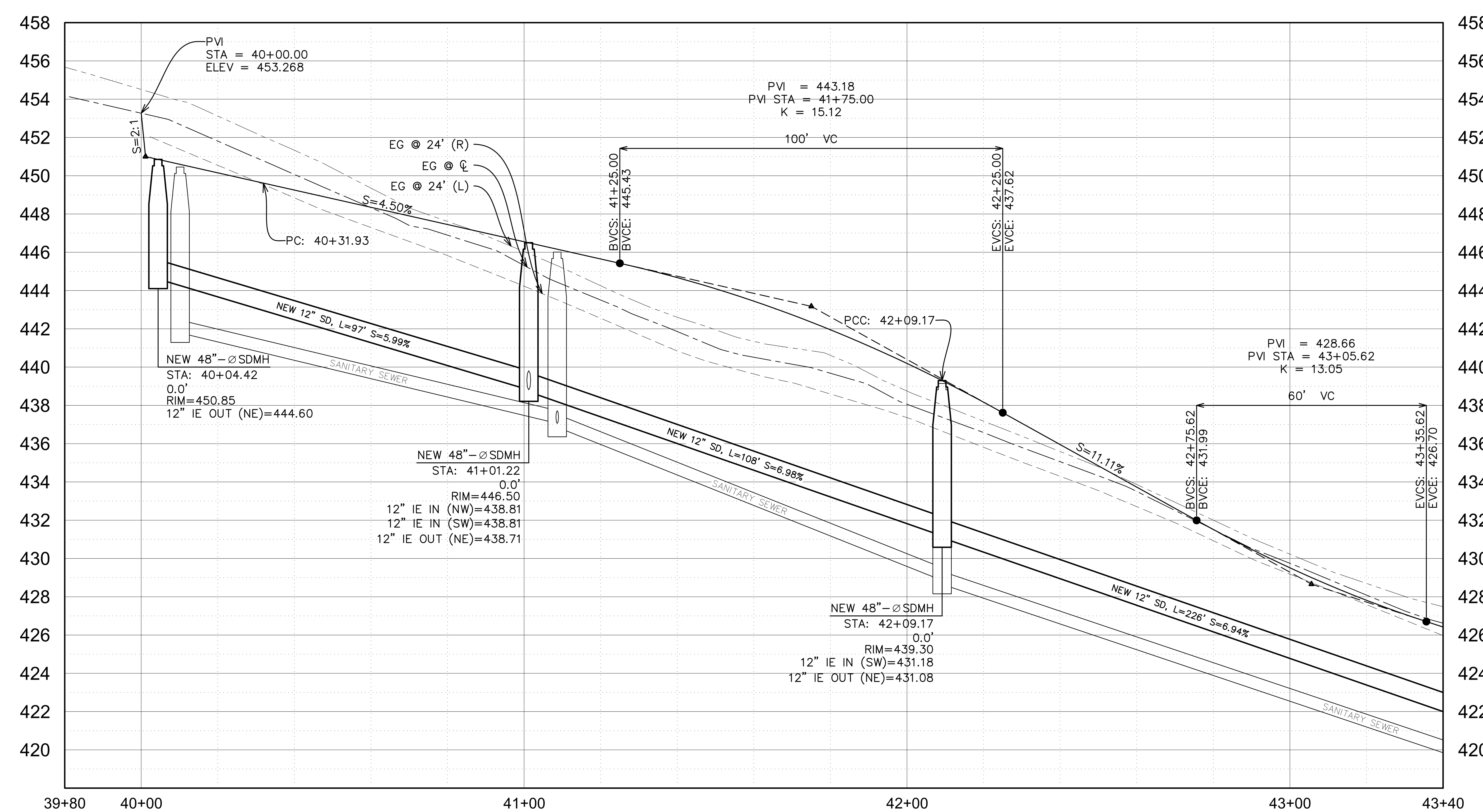

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LANDON ST PLAN & PROFILE
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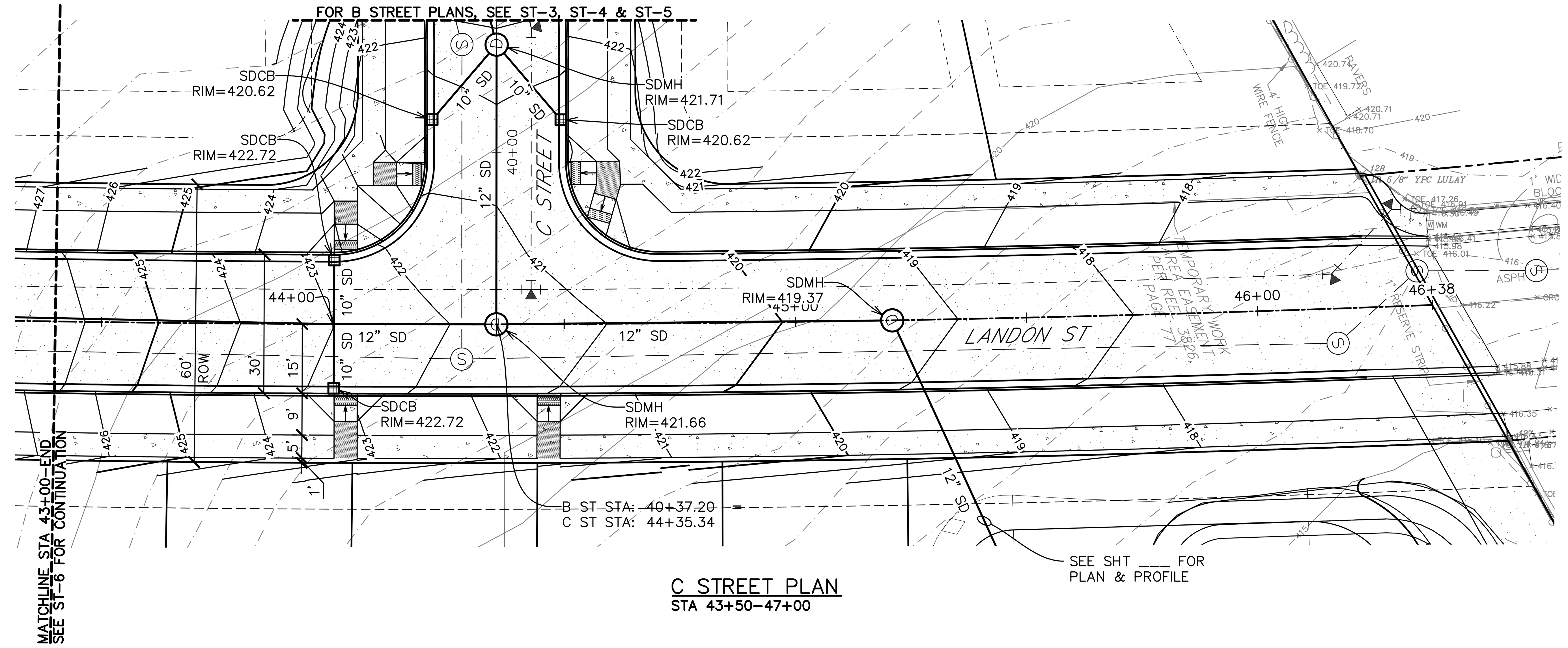

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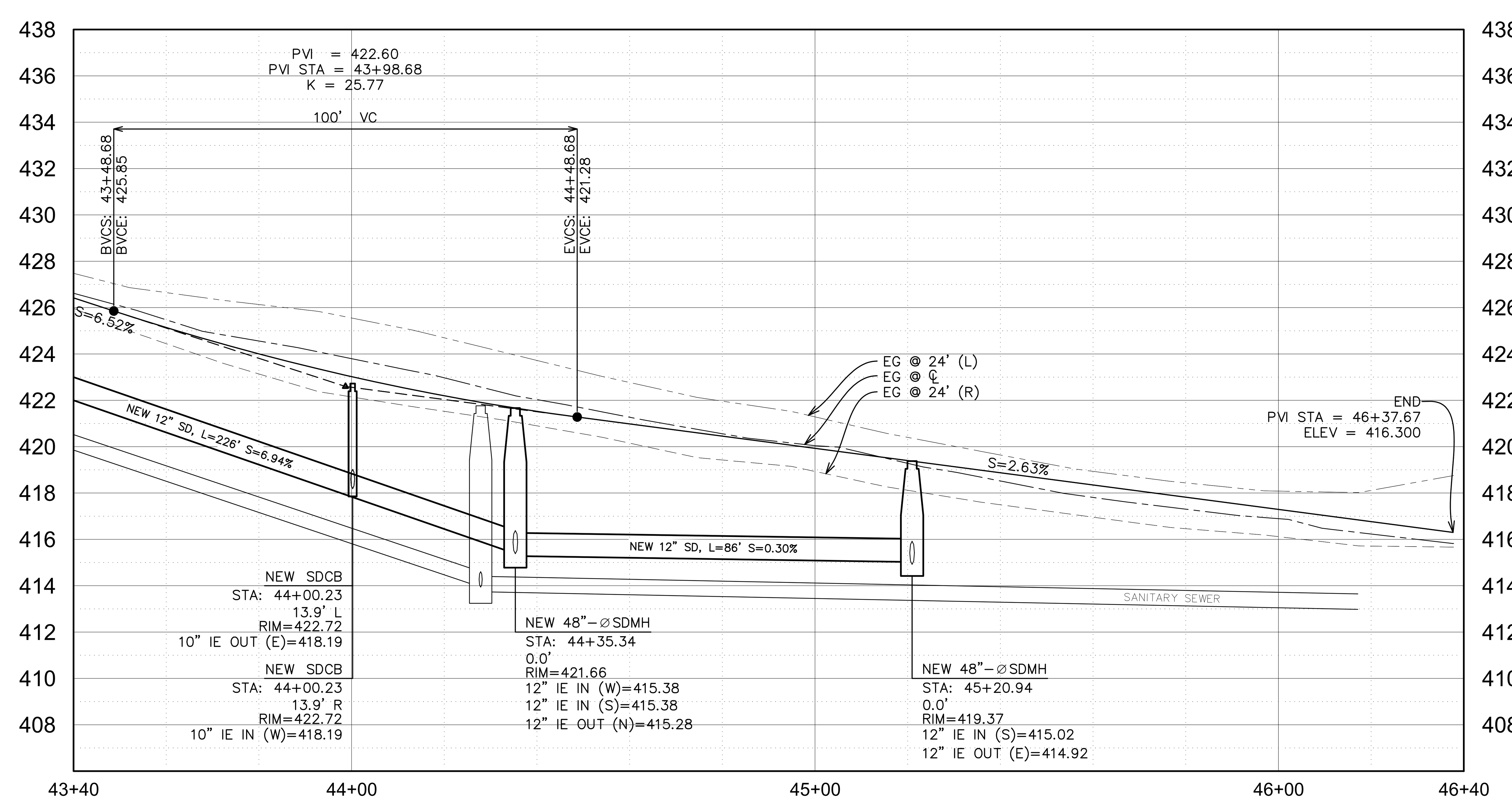

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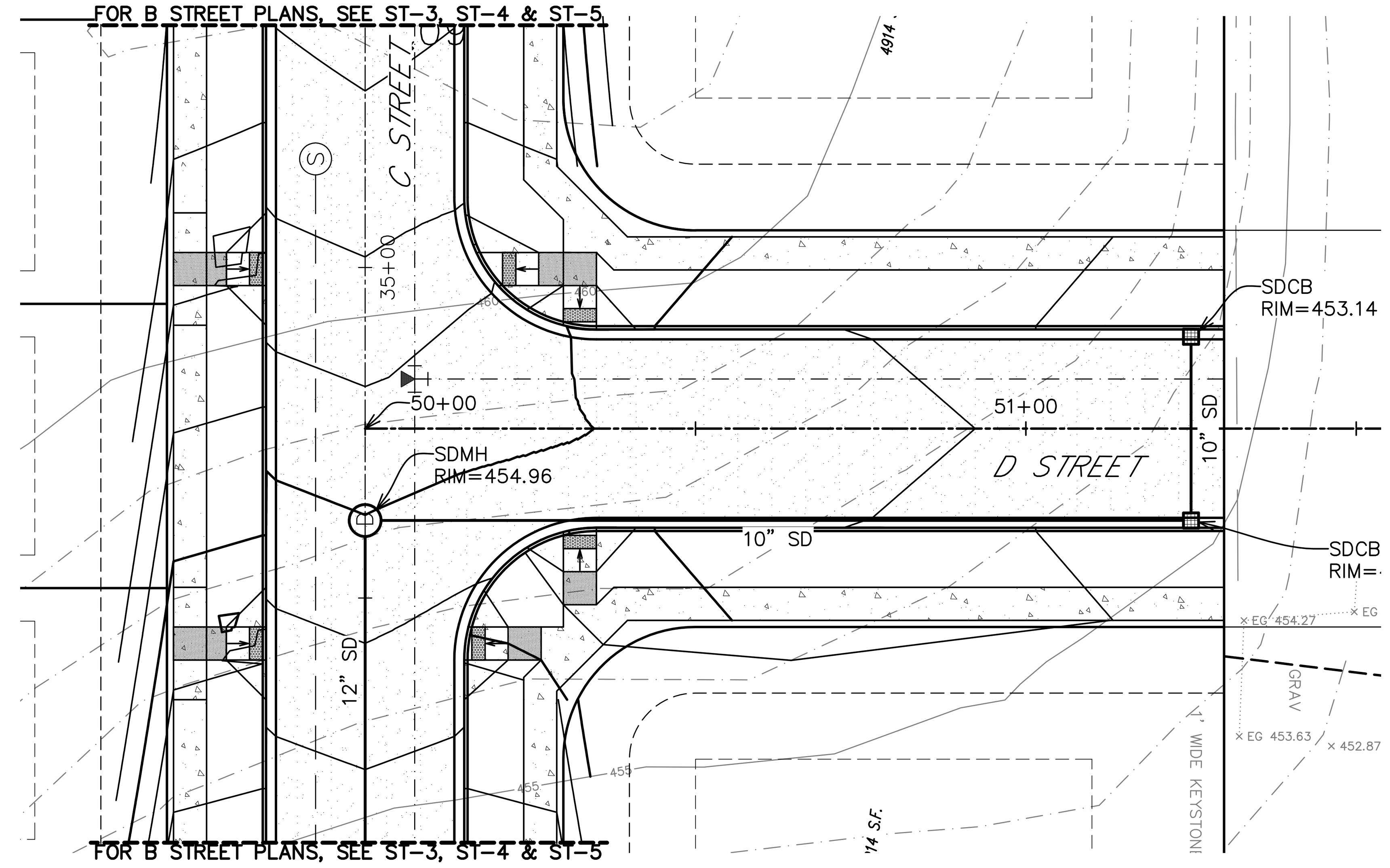

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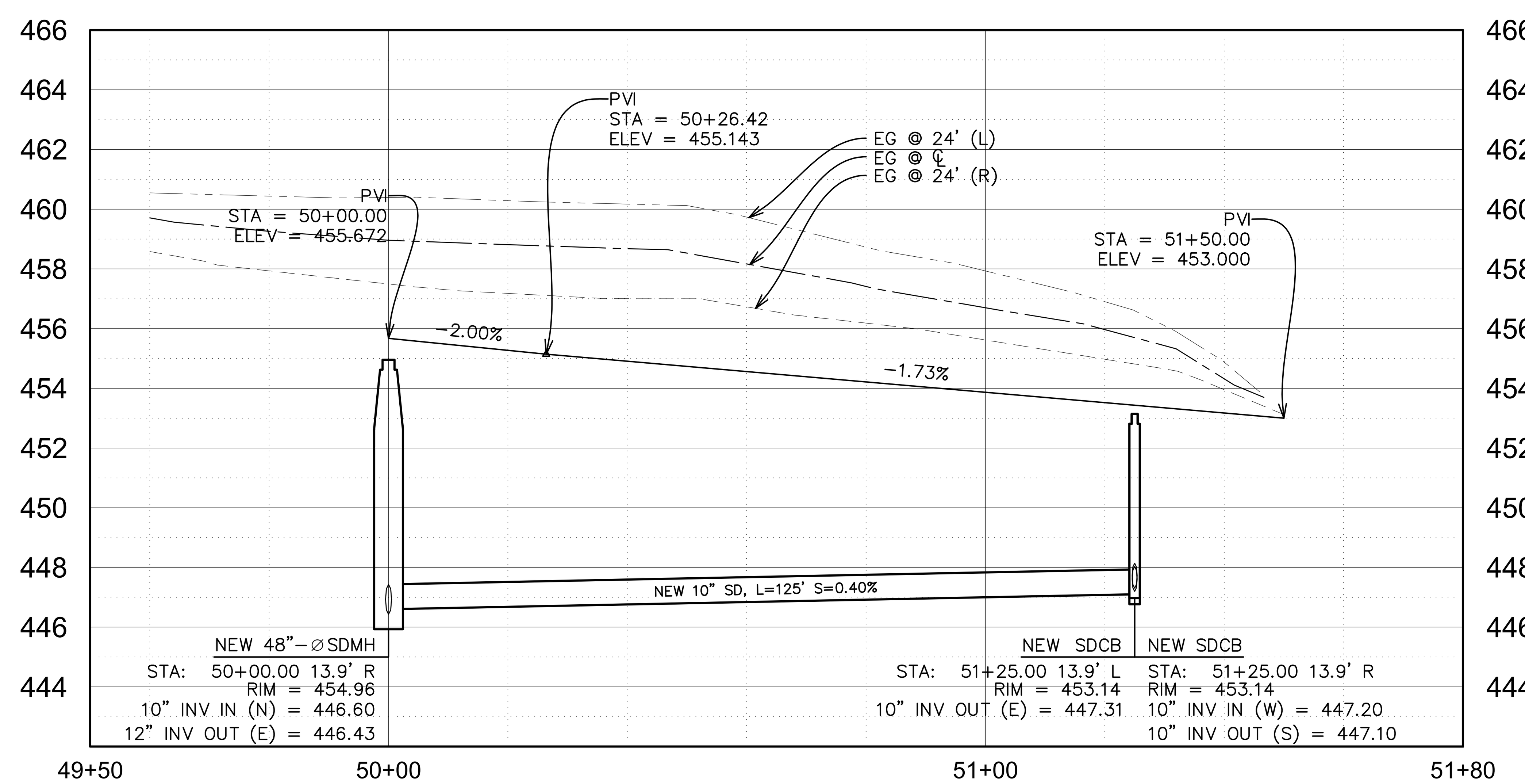

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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK

D STREET PLAN & PROFILE
50+00–END

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JOB NUMBER
3063.0000.0

STORMWATER CALCULATIONS

Prepared For:

State Street Homes, Inc.

1233 NW Northrup St., Suite 125

Portland, OR 97209

Project Location:

The Reserve at Battle Creek

5826 Battle Creek Road SE

Salem, OR 97306

Prepared By:

RENEWS: 06/30/2022

Westech Engineering, Inc.
3841 Fairview Industrial Drive SE, Suite 100
Salem, OR 97302
(503) 585-2474 FAX: (503) 585-3986

J.O. 3063.0000.0 February 2021

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APPENDICES

PROJECT OVERVIEW & DESCRIPTION

1.1 SIZE & LOCATION OF PROJECT

The proposed project is located at 5826 Battle Creek Road SE in Salem, OR. The property has a total site area of approximately 11.13 acres and is located on the southeast corner of Battle Creek Road and Landau Street intersection. Refer to the Civil Drawings for a site map of the project area.

1.2 BRIEF DESCRIPTION OF PROJECT SCOPE AND PROPOSED IMPROVEMENTS

The proposed project is to develop the residential site with sixty (60) new single-family home lots ranging in size from 4000 to 10000 square feet, associated parking, landscape, public improvements, and two rain gardens. The project includes site preparation and construction of the facilities.

1.3 DESCRIPTION OF SIZE OF WATERSHED DRAINING TO THE SITE

The 11.13-acre site and the majority of the right of way improvements are the only areas that will drain to the proposed stormwater facility. Stormwater runoff will be detained by two rain gardens, one for each basin. No additional drainage area drains to the project site.

1.4 DESCRIPTION OF THE EXISTING SITE CONDITIONS, CONSTRAINTS, TREES & NATIVE VEGETATION, SENSITIVE AREAS & WATERWAYS

The existing site is predominantly covered with grass and has some area with paved parking and gravel. There is currently one existing structure on the site that is proposed to be removed. There are several trees on the site that will be removed as a part of the development. No existing sensitive areas, waterways, etc. exist on-site. Refer to the Civil Drawings for more detail of existing conditions.

1.5 SUMMARY OF GREEN STORMWATER INFRASTRUCTURE

Per Appendix 4E of the City of Salem (COS) Design Standards, a large project will be considered to have met the maximum extent feasible (MEF) requirement when the stormwater runoff from the total amount of new plus replaced impervious surfaces flows into an area set aside for GSI that is at least 10% of the total area of the new plus replaced impervious surfaces or at least 80% of all impervious area must be treated via GSI. The design implements GSI for 100% of the impervious area and therefore meets MEF for GSI. Treatment of the stormwater runoff is provided by a vegetated swale (GSI).

1.6 REGULATORY PERMITS REQUIRED

A 1200-C permit from DEQ will be required since more than one acre is disturbed by the project. City of Salem permits are required. No other permits are required for this project.

1.7 100 YEAR STORM ESCAPE ROUTES

Emergency overflow for the 100-year storm will be provided by a 24-inch wide opening in the top of the Type-III flow control catch basin.

METHODOLOGY

2.1 DEPTH TO GROUNDWATER

Per the attached Geotechnical Report, the subgrade conditions were investigated at the site in multiple test pits that extended up to 7 feet below ground surface. Ground water was not encountered in any of the test pits.

2.2 DELINEATION OF EXISTING TREES AND NATIVE VEGETATION

The existing site is primarily covered with grass. There are several trees located on the site. Refer to the Civil Drawings in Appendix F for more details on tree removal and protection.

2.3 MAXIMUM INFILTRATION AND VEGETATIVE TREATMENT

Per the attached Geotechnical Report from December 27, 2019, native soils have relatively low permeability with a recommended infiltration rate of 0.3 to 0.4 inches per hour for the proposed stormwater facility location. An infiltration rate of 0.35 inches per hour was used for design. See Appendix C for the Geotechnical Report.

2.4 SOIL INFORMATION

The pre-developed project site contains primarily soils with a hydrologic soil rating of C. Refer to the Soils Report in Appendix B for more details. Refer to the pre-developed basin map in Appendix A for more details.

2.5 HAZARDOUS MATERIAL

The owner is not aware of any hazardous material contamination onsite.

3.1 METHODS & SOFTWARE USED

HydroCAD modeling software was used to design the stormwater facility. The Santa Barbara Unit Hydrograph Type 1A storm was used to model the design storm hydrographs. Per the City of Salem Design Standards, the design storms shown in Table 1 were used to size the facility.

Table 1| City of Salem 24-hour Design Storms

	24-Hour Rainfall Depths for Salem, OR						
Recurrence Interval, Years	2	5	10	25	50	100	WQ
24-Hour Depths, Inches	2.2	2.7	3.2	3.6	4.1	4.4	1.38

Source: City of Salem Administrative Rules Chapter 109 – Division 004 Appendix D

3.2 CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS

The predeveloped site was analyzed as one basin for stormwater runoff calculations. Refer to the Predeveloped Basin Map in Appendix A for more details.

The Predeveloped Basin was assigned a curve number of 72 corresponding to woods/grass for soil group C. The developed impervious areas were assigned a curve number of 98 which corresponds to paved/parking areas. The developed pervious areas were assigned a curve number of 74, which corresponds to greater than 75%, good-condition, grass cover for soil group C per the COS Design Standards.

For the Predeveloped Basin a time of concentration of 35.8 minutes was applied to runoff calculations. See the Pre-Developed Basin Map in Appendix A for the flow path used and refer to the HydroCAD Summaries in Appendix C for calculations.

A minimum time of concentration of 5 minutes is applied to the developed basins due to the minimum time-step used by the HydroCAD modeling software.

3.3 TREATMENT & FLOW CONTROL SIZING CALCULATIONS

The site stormwater runoff was analyzed as one basin for the predeveloped scenario and two basins for the developed scenario. General basin characteristics of pre-developed and developed conditions are listed in Table 2 below. For more detail refer to the Basin Maps in Appendix A and the Civil Drawings.

Table 2 | General Basin Characteristics

Basin ID	Source (Roof/Road/ Other)	Impervious Area (ac)	Pervious Area (ac)	Runoff (cfs)				CN[1]
				½ 2 Year (cfs)	10 Year (cfs)	25 Year (cfs)	100 Year (cfs)	
Predeveloped	Native	-	11.07	0.14	1.02	1.46	2.49	72
Developed								
Basin 1	Roof/Paving/ Landscape	2.48	0.98	0.57	2.04	2.35	2.99	91
Basin 2	Roof/Paving/ Landscape	5.39	2.37	1.23	4.44	5.12	6.51	91

[1] Curve Numbers listed are the 'Weighted Average' for all curve numbers within the basin with respect to their areas.

Two rain gardens are proposed to treat and detain the required storm events for the onsite runoff. Rain Garden 1 (RG 1) refers to the rain garden that will treat and detain runoff experienced by Basin 1 and Rain Garden 2 (RG 2) will treat and detain runoff from Basin 2.

Stormwater is released from RG 1 by exfiltration into the subsoils and a Type III Flow Control Catch Basin. See Table 3 below for a summary of facility release rates for RG 1. Refer to the Civil Drawings for details.

Table 3 | Summary of Facility Outlet Sizing and Release Rates – RG 1

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)	Infiltration Rate (in/hr)
Half 2 Year	1.2	444.7	0.02	445.11	451.0	0.35
WQ	-	-	0.04	445.94	451.0	0.35
10 Year	1.6	447.30	0.20	450.00	451.0	0.35
25 Year	-	-	0.27	450.44	451.0	0.35
100 Year[2]	24	450.40	0.56	450.55	451.0	0.35

[1] WSE = water surface elevation

[2] Flow Control provided by weir opening in Type 3 Catch Basin. See Detail 251C in COS Standard drawings for details.

RG 1 has been sized to drain the water quality storm in 53 hours from the start of the event, which is less than the required 54 hours per the COS Design Standards. See the HydroCAD Summaries in Appendix C for drain time during the water quality storm.

Stormwater is released from RG 2 by exfiltration into the subsoils and a Type III Flow Control Catch Basin. See Table 4 below for a summary of facility release rates for RG 2. Refer to the Civil Drawings for details.

Table 4 | Summary of Facility Outlet Sizing and Release Rates – RG 2

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)	Infiltration Rate (in/hr)
Half 2 Year	2.1	410.3	0.11	411.13	416.5	0.35
WQ	-	-	0.23	413.03	416.5	0.35
10 Year	3.5	412.9	0.75	415.36	416.5	0.35
25 Year	-	-	1.06	415.73	416.5	0.35
100 Year[2]	24	415.6	2.29	416.00	416.5	0.35

[1] WSE = water surface elevation

[2] Flow Control provided by weir opening in Type 3 Catch Basin. See Detail 251C in COS Standard drawings for details.

RG 2 has been sized to drain the water quality storm in 30 hours from the start of the event, which is less than the required 54 hours per the COS Design Standards. See the HydroCAD Summaries in Appendix C for drain time during the water quality storm.

A summary of the overall developed release from the site compared to the allowed release is provided in Table 5 below.

Table 5 | Summary of Developed Release Rates – RG 1 + RG 2

Outlet ID/ Storm Event	Release Rate (cfs)	Allowed Release (cfs)	Infiltration Rate (in/hr)
Half 2 Year	0.13	0.14	0.35
WQ	0.26	-	0.35
10 Year	0.93	1.02	0.35
25 Year	1.25	1.46	0.35
100 Year	2.49	2.49	0.35

As noted above the developed release from the site is less than or equal to that of the predeveloped release for all design storms.

A summary of the rain garden geometry and required drain rock is provided in Table 6 and Table 7 below. Please note that the rain garden requires drain rock with areas shown in Table 6 and Table 7 (and denoted on the Civil Drawings) to detain and control the design storms in conformance with COS standards.

Table 6 | Facility Sizing Summary – RG 1

Facility ID[1]	Facility Elevations[2] (ft)		Facility Surface Area[2] (SF)		Required Drain Rock Surface Area (SF)	Depth of Drain Rock (in)
	Top	Bottom	Top	Bottom		
RG	451.0	448.0	6,570	3,750	4,550	48

[1] All facilities are privately owned and maintained stormwater GSI facilities.
[2] The top facility elevation and corresponding square footage area refer to the top of the 3:1 slope. The bottom elevation and corresponding square footage area refer to the bottom of the 3:1 slope.

Table 7 | Facility Sizing Summary – RG 2

Facility ID[1]	Facility Elevations[2] (ft)		Facility Surface Area[2] (SF)		Required Drain Rock Surface Area (SF)	Depth of Drain Rock (in)
	Top	Bottom	Top	Bottom		
RG	416.5	413.0	9,360	5,430	6,375	48

[1] All facilities are privately owned and maintained stormwater GSI facilities.
[2] The top facility elevation and corresponding square footage area refer to the top of the 3:1 slope. The bottom elevation and corresponding square footage area refer to the bottom of the 3:1 slope.

The HydroCAD modeled release rates from the facility shown in Table 4 and Table 5 assume free-flow through the facility growing media. Release from the facility can also be controlled by the filtration capacity of the growing media. The flowrate through the growing media is calculated to verify the growing media will not be a control point:

RG 1:
During the water quality event, stormwater does not pond and has a total outflow from the facility of 0.04 cfs according to the HydroCAD modeling. The bottom surface of the rain garden is 3,750 square feet. Using the Darcy equation and an assumed growing media filtration rate of 2 inches/hour, the flowrate through the growing media is 0.17 cfs. Therefore, the growing media does not further constrain stormwater release from the facility and is not the control point.

RG 2:
During the water quality event, stormwater does not pond and has a total outflow from the facility of 0.23 cfs according to the HydroCAD modeling. The bottom surface of the rain garden is 5,430 square feet. Using the Darcy equation and an assumed growing media filtration rate of 2 inches/hour, the flowrate through the growing media is 0.25 cfs. Therefore, the growing media does not further constrain stormwater release from the facility and is not the control point.

3.4 CONVEYANCE CAPACITY CALCULATIONS

The stormwater facilities were designed to convey the developed 100-year, 24-hour storm, which has a peak flow of 0.56 cfs released from RG 1 and 2.29 cfs released from RG 2.

Stormwater runoff is conveyed from RG 1 to a new pipe running along the west side of the property adjacent to Battle Creek Road, via 8-inch pipes. See the Civil Drawings for more detail. The 8-inch pipe has a full-flow capacity of 0.86 cfs using a minimum slope of 0.5% and Manning's n of 0.013, which exceeds the peak release rates from the rain garden.

Stormwater runoff is conveyed from RG 2 to existing storm drain systems located north east of the site, via 15-inch pipes. See the Civil Drawings for more detail. The 15-inch pipes have a full-flow capacity of 3.55 cfs using a minimum slope of 0.3% and Manning's n of 0.013, which exceeds the peak release rates from the rain garden.

3.5 DOWNSTREAM ANALYSIS

A downstream analysis was conducted for the release rate of RG 2. This rain garden will be conveyed using a 15-inch pipe from the Type III Catch Basin to an existing 42-inch pipe northeast of the project site. The 42-inch detention pipe is then released by a 72-inch flow control manhole. See the downstream analysis in the HydroCAD Summaries in Appendix C for details.

Table 8 | Existing Structure Summary

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)
Half 2 Year	8.75	409.57	0.99	410.18	418.67
WQ	-	-	1.25	410.33	418.67
10 Year	12	413.20	3.50	411.96	418.67
25 Year	-	-	4.15	412.47	418.67
100 Year	-	-	7.89	-	418.67

[1] WSE = water surface elevation

Through observation, it was determined that an additional 6-inch orifice will need to be added to the structure to ensure that the overall release rate from the 72-inch flow control manhole will be less than or equal to that of the existing release rates. A summary of the adjusted structure with the added runoff from the developed site is shown in Table 9 below.

Table 9 | Adjusted Structure Summary

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)
Half 2 Year	8.75	409.57	0.99	410.18	418.67
WQ	-	-	1.25	410.33	418.67
10 Year	6	412.55	3.21	412.55	418.67
25 Year	-	-	4.10	413.14	418.67
100 Year	12	413.20	6.07	413.62	418.67

[1] WSE = water surface elevation

A summary of the overall developed release from the 72-inch flow control manhole compared to the existing release is provided in Table 10 below.

Table 10 | Existing Release vs. Adjusted/Developed Release

Outlet ID/ Storm Event	New Release Rate (cfs)	Existing Release (cfs)
Half 2 Year	0.99	0.99
WQ	1.25	1.25
10 Year	3.21	3.50
25 Year	4.10	4.15
100 Year	6.07	7.89

As noted above, the flows released from the 72-inch flow control manhole with the added 6-inch orifice are less than or equal to that of the existing release rates.

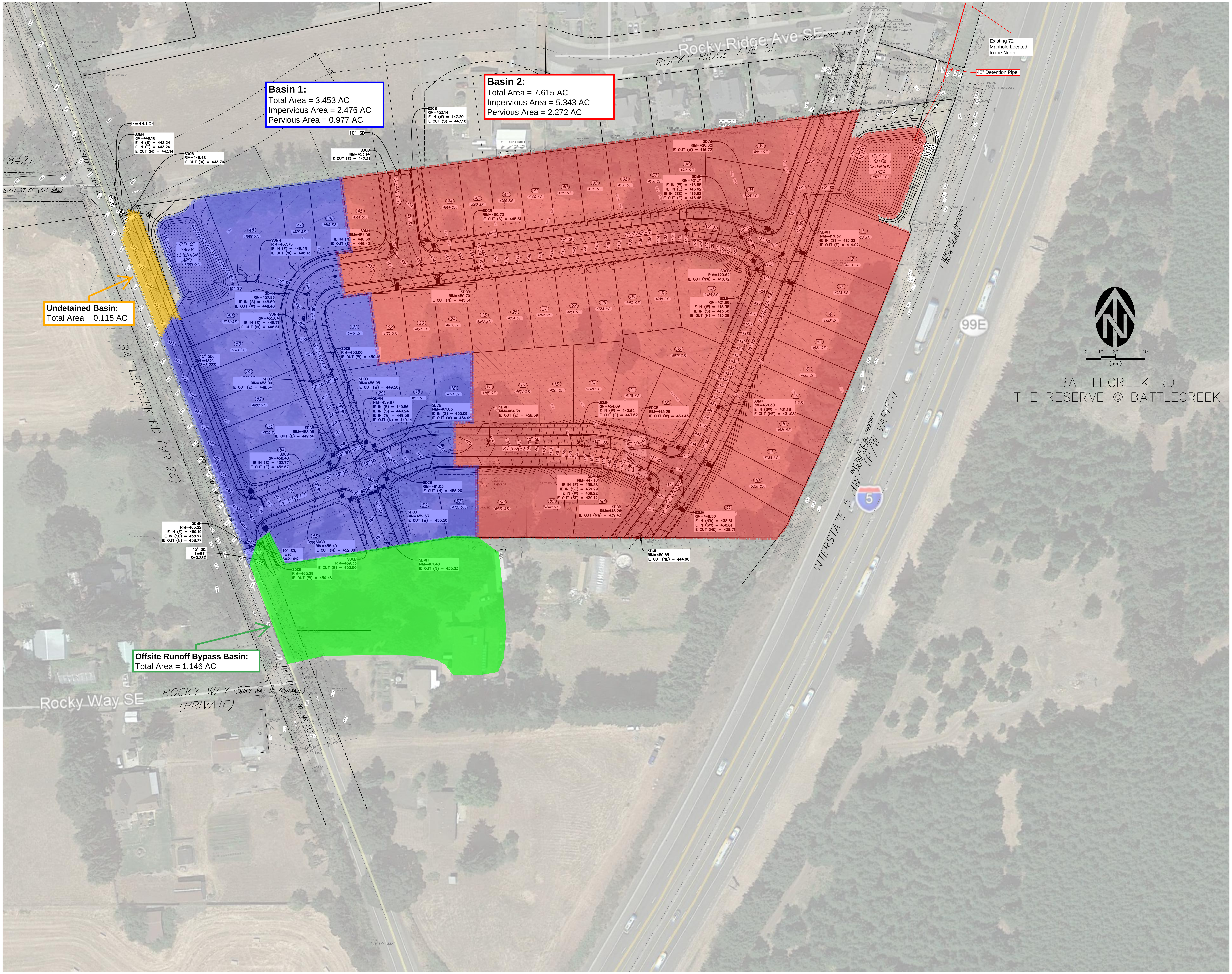
3.6 SUMMARY

The stormwater system has been designed to release half the 2-year, 24-hour, the 10-year, 24-hour, the 25-year, 24-hour, and the 100-year, 24-hour storm events at rates less than their respective pre-developed storm. The proposed design also treats the water quality storm. Therefore, the project meets the flow control and treatment requirements as set forth in Administrative Rule 109 Division 004 - Stormwater System.

APPENDIX A

BASIN MAPS

Predeveloped Basin Map
0 20 40 80
(feet)
ROCKY RIDGE AVE SE
Flow Path:
Sheet Flow Length = 300 FT
Sheet Flow Slope = 6.17%
Shallow Flow Length = 457 FT
Shallow Flow Slope = 6.67%
Flow Path
Basin 2:
Total Area = 7.615 AC
Basin 1:
Total Area = 3.453 AC
Flow Path
BATTLECREEK RD (MR 25)
Flow Path:
Sheet Flow Length = 300 FT
Sheet Flow Slope = 4.83%
Shallow Flow Length = 93 FT
Shallow Flow Slope = 2.69 %
NO.
DATE
DESCRIPTION
REVISIONS
BY
VERIFY SCALE
DSN. JW
DRN. AK
CKD. JW
DATE: 11/2020
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com
STATE ST HOMES INC
THE RESERVE AT BATTLECREEK
EXISTING CONDITIONS
DRAWING
G-3
JOB NUMBER
3063.0000.0


Basin 1:
Total Area = 3.453 AC
Impervious Area = 2.476 AC
Pervious Area = 0.977 AC
Basin 2:
Total Area = 7.615 AC
Impervious Area = 5.343 AC
Pervious Area = 2.272 AC
Undetained Basin:
Total Area = 0.115 AC
Offsite Runoff Bypass Basin:
Total Area = 1.146 AC
Existing 72" Manhole Located to the North
42" Detention Pipe
Rocky Ridge Ave SE
ROCKY RIDGE AVE SE
LANDON ST SE
BATTLECREEK RD (MR 25)
ROCKY WAY SE (PRIVATE)
Rocky Way SE
INTERSTATE 5 HWY (R/W VARIES)
99E
5
CITY OF SALEM DETENTION AREA
(feet)
BATTLECREEK RD
THE RESERVE @ BATTLECREEK

APPENDIX B

NRCS SOIL REPORT

Hydrologic Soil Group—Marion County Area, Oregon
(Hydrologic Soil Group)

Map Scale: 1:1,880 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- 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 1:20,000.

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: Marion County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

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

Date(s) aerial images were photographed: Aug 1, 2018—Aug 31, 2018

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
JoB	Jory silty clay loam, 2 to 7 percent slopes	C	0.0	0.0%
NeB	Nekia silty clay loam, 2 to 7 percent slopes	C	11.0	98.7%
SvB	Stayton silt loam, 0 to 7 percent slopes	D	0.1	1.3%
Totals for Area of Interest			**11.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Map—Marion County Area, Oregon
(Soil Map)

Map Scale: 1:1,880 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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 1:20,000.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

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

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
JoB	Jory silty clay loam, 2 to 7 percent slopes	0.0	0.0%
NeB	Nekia silty clay loam, 2 to 7 percent slopes	11.0	98.7%
SvB	Stayton silt loam, 0 to 7 percent slopes	0.1	1.3%
Totals for Area of Interest		**11.2**	**100.0%**

APPENDIX C

GEOTECHNICAL REPORT

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Geologic Hazards Assessment

Proposed Battle Creek and Landau

Residential Subdivision Development Site

Tax Lot No. 900

5826 Battle Creek Road SE

Salem (Marion County), Oregon

for

Clutch Industries

Project No. 1625.007.G
December 27, 2019

REDMOND GEOTECHNICAL SERVICES

December 27, 2019

Mr. Chris Anderson
Clutch Industries
360 Belmont Street NE
Salem, Oregon 97301

Dear Mr. Anderson:

Re: Geotechnical Investigation and Geologic Hazards Assessment, Proposed Battle Creek and Landau Residential Subdivision Development Site, Tax Lot No. 900, 5826 Battle Creek Road SE, Salem (Marion County), Oregon

Submitted herewith is our report entitled "Geotechnical Investigation and Geologic Hazards Assessment, Proposed Battle Creek and Landau Residential Subdivision Development Site, Tax Lot No. 900, 5826 Battle Creek Road SE, Salem (Marion County), Oregon". The scope of our services was outlined in our formal proposal to Mr. Chris Anderson of Clutch Industries dated September 2, 2019. Written authorization of our services was provided by Mr. Chris Anderson of Clutch Industries on October 7, 2019.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
12,309
OREGON
July 15, 1983
DANIEL M. REDMOND
Exp. 12-31-20

PO Box 20547 • Portland, Oregon 97294 • Fax 503/286-7176 • Phone 503/285-0598

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GEOTECHNICAL INVESTIGATION AND GEOLOGIC HAZARDS ASSESSMENT
PROPOSED BATTLE CREEK AND LANDAU
RESIDENTIAL SUBDIVISION DEVELOPMENT SITE
TAX LOT NO. 900
5826 BATTLE CREEK ROAD SE
SALEM (MARION COUNTY), OREGON

INTRODUCTION

Redmond Geotechnical Services, LLC is please to submit to you the results of our Geotechnical Investigation and Geologic Hazards Assessment at the site of the proposed Battle Creek and Landau residential subdivision development located to the east of Battle Creek Road SE and south of the intersection with Landau Street SE in Salem (Marion County), Oregon. The general location of the subject site is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation and geologic hazards assessment services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed Battle Creek and Landau residential subdivision development project.

PROJECT DESCRIPTION

We understand that present plans are to construct new single-family residential homes and various new site improvements at the subject residential subdivision site. Based on a review of the proposed site development plan(s) prepared by Westech Engineering, Inc., we understand that the proposed Battle Creek and Landau residential subdivision development will consist of the development of fifty-six (56) new single-family residential home sites (lots) ranging in size from approximately 5,000 to 10,000 square feet. Reportedly, the new single-family residential homes will be two- and/or three-story structures constructed with wood framing and raised post and beam wood floors. Support of the new single-family residential structures is anticipated to include both conventional shallow individual (column) footings and strip (continuous) footings. Structural loading information, although unavailable at this time, is anticipated to be fairly typical and light for this type of two- and/or three-story wood-frame structure and is expected to result in maximum dead plus live continuous (strip) and individual (column) footing loads on the order of about 2.0 to 3.0 kips per lineal foot (klf) and 10 to 25 kips, respectively.

Although a site grading plan is not available at this time, we understand that both cuts and fills are presently planned for the residential project. In general, both cuts and/or fills of about 5 feet or more are generally anticipated across the proposed residential lots and will generally be located along the lot perimeters and/or site boundaries. In this regard, due to the existing and/or finish grade sloping site conditions, some of the proposed new single-family residential structures and/or lots may also include the construction of a partial below grade floor(s) and/or retaining walls.

SALEM WEST QUADRANGLE

OREGON

7.5 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:24 000

KILOMETERS: 1 0.5 0 1 2

METERS: 1000 500 0 1000 2000

MILES: 1 0.5 0 1

FEET: 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

SITE VICINITY MAP		
Project No. 1625.007.G	**BATTLECREEK & LANDAU SUBDIVISION SITE**	Figure No. 1

Other associated site improvements for the project will include construction of new public street improvements along Battle Creek Road SE as well as new local residential streets. Additionally, the project will include the construction of new underground utility services as well as new concrete curbs and sidewalks. Further, we understand that storm water from hard and/or impervious surfaces (i.e., roofs and pavements) will be collected for on-site treatment and possible disposal.

SCOPE OF WORK

The purpose of our geotechnical and/or geologic studies was to evaluate the overall subsurface soil and/or groundwater conditions underlying the subject site with regard to the proposed new residential development and construction at the site and any associated impacts or concerns with respect to potential slope failure at the site as well as provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation and landslide hazard study performed as a collaboration with Northwest Geological Services, Inc. (NWGS, Inc.) included the following scope of work items:

1. Review of available and relevant geologic and/or geotechnical investigation reports for the subject site and/or area.

2. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of eight (8) exploratory test pit excavations. The exploratory test pits were excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades at the approximate locations as shown on the Site Exploration Plan, Figure No. 2. Additionally, field infiltration testing was also performed within various test pits excavated across the subject site.

3. Laboratory testing to evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, gradational characteristics, Atterberg Limits and (remolded) direct shear strength tests as well as "R"-value tests.

4. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

5. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new residential structures. Recommendations include maximum design allowable contact bearing pressure(s), depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, construction and/or permanent subsurface water drainage considerations have also been prepared. Further, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation, pavement and/or floor slab subgrades.

6. Flexible pavement design and construction recommendations for the proposed new public street improvements.

SITE CONDITIONS

Site Geology

The subject site and/or area is underlain by highly weathered Basalt bedrock deposits and/or residual soils of the Columbia River Basalt formation. A more detailed description of the site geology across and/or beneath the site is presented in the Geologic Hazard Study in Appendix B.

Surface Conditions

The subject proposed new residential development property consists of one (1) rectangular to irregular shaped tax lot (TL 900) which encompass a total plan area of approximately 11.14 acres. The proposed residential development property is roughly located to the east of Battle Creek Road SE and to the south of the intersection with Landau Street SE. The southerly portion of the subject proposed residential development site is presently improved and contains an existing single-family residential home and two (2) detached wooden outbuildings while the remainder of the site is unimproved and consists of existing open farm land.

Surface vegetation across the site generally consists of a moderate growth of grass, weeds and brush as well as several small to large sized trees.

Topographically, the site is characterized as gently to moderately sloping terrain (5 to 25 percent) descending downwards from the center of the site towards the east and west with overall topographic relief estimated at about sixty (60) feet and ranges from a low about Elevation 410 feet near the northeasterly portion of the subject site to a high of about Elevation 470 near the existing residential home.

Subsurface Soil Conditions

Our understanding of the subsurface soil conditions underlying the site was developed by means of eight (8) exploratory test pits excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades on October 29, 2019 with a John Deere 200C track-mounted excavator. The location of the exploratory test pits were located in the field by marking off distances from existing and/or known site features and are shown in relation to the proposed new residential structures and/or site improvements on the Site Exploration Plan, Figure No. 2. Detailed logs of the test pit explorations, presenting conditions encountered at each location explored, are presented in the Appendix, Figure No's. A-4 through A-7.

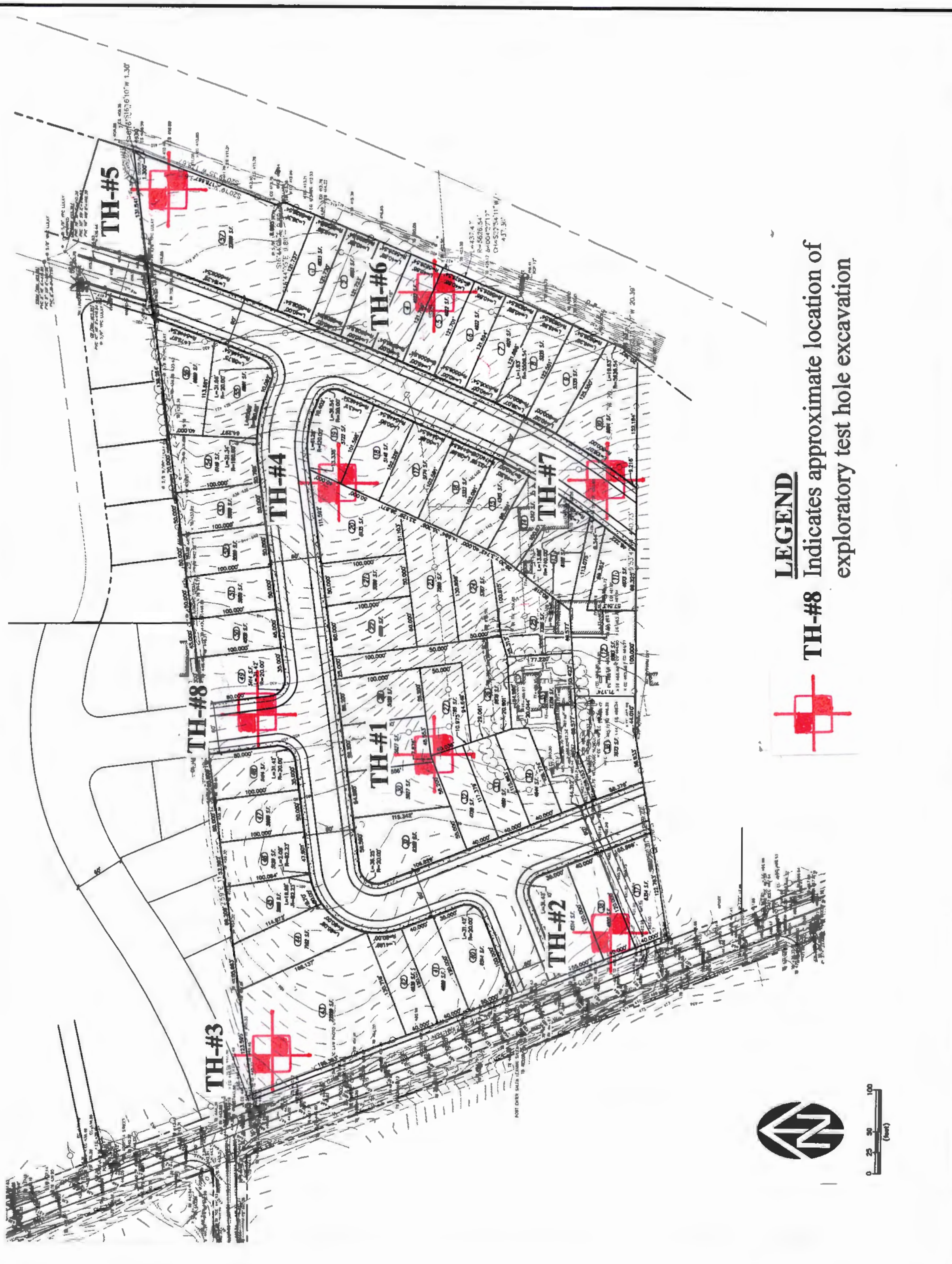
The exploratory test pit excavations were observed by staff from Redmond Geotechnical Services, LLC who logged each of the test pit explorations and obtained representative samples of the subsurface soils encountered across the site. Additionally, the elevation of the exploratory test pit excavations were referenced from the proposed Site Development Plan prepared by Project Delivery Group. and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test pit excavations were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-3.

The test pit explorations revealed that the subject site is underlain by native soil deposits comprised of highly weathered bedrock and/or residual soils composed of a surficial layer of dark brown, wet, soft, organic, sandy, clayey silt topsoil materials to depths of about 6 to 12 inches. These surficial topsoil materials were inturn underlain by medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey silt to a depth of about five (5) to six (6) feet beneath the existing site and/or surface grades. These upper clayey silt subgrade soils, which become medium stiff to stiff at a depth of about 3 to 6 feet, are best characterized by relatively low to moderate strength and moderate compressibility. These upper clayey silt subgrade soils were inturn underlain by medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy silt to highly weathered bedrock deposits the maximum depth explored of about seven (7) feet beneath the existing site and/or surface grades. These clayey, sandy silt subgrade soils and/or highly weathered bedrock deposits are best characterized by relatively moderate to high strength and low compressibility.

Groundwater

Groundwater was generally not encountered within any of the exploratory test pit explorations (TH-#1 through TH-#8) at the time of excavation to depths of at least seven (7) feet beneath existing surface grades except.

In this regard, although groundwater elevations at the site may fluctuate seasonally in accordance with rainfall conditions as well as changes in site utilization, we are generally of the opinion that the static water levels and/or surface water ponding not observed during our recent field exploration work generally reflect the potential for a high seasonal groundwater level at and/or beneath the site.



SITE EXPLORATION PLAN

Project No. 1625.007.G	**BATTLECREEK & LANDAU SUBDIVISION SITE**	Figure No. 2

INFILTRATION TESTING

We performed two (2) field infiltration tests at the site on October 29, 2019. The infiltration tests were performed in test holes TH-#3 and TH-#5 at depths of between three (3) to four (4) feet beneath the existing site and/or surface grades. The subgrade soils encountered in the infiltration test hole consisted of sandy, clayey silt. The infiltration testing was performed in general conformance with current EPA and/or the City of Salem Encased Falling Head test method which consisted of advancing a 6-inch diameter PVC pipe approximately 6 inches into the exposed soil horizon at each test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate and saturate the subgrade soils. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturating period, water was again added into the PVC pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each measurable drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing at the site, we have found that the native sandy, clayey silt subgrade soil deposits posses an ultimate infiltration rate on the order of about 0.6 to 0.8 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from various test pit excavations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, gradation analyses and Atterberg Limits as well as (remolded) direct shear strength and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-16.

SEISMICITY AND EARTHQUAKE SOURCES

The seismicity of the southwest Washington and northwest Oregon area, and hence the potential for ground shaking, is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and the relatively shallow crustal zone. Descriptions of these potential earthquake sources are presented below.

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes.

Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study by Geomatrix (1995) and/or USGS (2008) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9. This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ. However, the 2008 USGS report has assigned a probability of 0.67 for a Mw 9 earthquake and a probability of 0.33 for a Mw 8.3 earthquake. For the purpose of this study an earthquake of Mw 9.0 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range. Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The third source of seismicity that can result in ground shaking within the Vancouver and southwest Washington area is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in this area is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0), Oregon earthquakes were crustal earthquakes.

Liquefaction

Seismic induced soil liquefaction is a phenomenon in which lose, granular soils and some silty soils, located below the water table, develop high pore water pressures and lose strength due to ground vibrations induced by earthquakes. Soil liquefaction can result in lateral flow of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the ground water table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

Our review of the subsurface soil test pit logs from our exploratory field explorations (TH-#1 through TH-#8) and laboratory test results indicate that the site is generally underlain by medium stiff, sandy, clayey silt soils and/or very stiff to medium dense, highly weathered bedrock deposits to depths of at least 7.0 feet beneath existing site grades. Additionally, groundwater was generally not encountered within any of the exploratory test pit excavations (TH-#1 through TH-#8) at the site during our field exploration work to depths of at least 7.0 feet. As such, due to the medium stiff and/or cohesive nature of the sandy, clayey silt subgrade soils as well as the very stiff to medium dense nature of the underlying highly weathered bedrock deposits beneath the site, it is our opinion that the native sandy, clayey silt subgrade soil and/or highly weathered bedrock deposits located beneath the subject site have a very low potential for liquefaction during the design earthquake motions previously described.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, development of the subject site into the planned residential homes sites does not appear to present a potential geologic and/or landslide hazard provided that the site grading and development activities conform with the recommendations presented within this report. A more detailed assessment of the potential landslide hazard of the subject site is presented in the Geologic Hazard Study in Appendix B.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Marion County and Salem. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new residential structures and site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Marion County requirements for the 100-year flood levels of any nearby creeks, streams and/or drainage basins.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our opinion that the site is presently stable and suitable for the proposed new Battle Creek and Landau single-family residential development and its associated site improvements provided that the recommendations contained within this report are properly incorporated into the design and construction of the project.

The primary features of concern at the site are 1) the presence of highly moisture sensitive clayey and silty subgrade soils across the site, 2) the presence of gently to moderately sloping site conditions across the proposed new residential lots and/or home sites, The presence of the existing site improvements, and 4) the relatively low infiltration rates anticipated within the near surface clayey and silty subgrade soils.

With regard to the moisture sensitive clayey and silty subgrade soils, we are generally of the opinion that all site grading and earthwork activities be scheduled for the drier summer months which is typically June through September.

In regards to the gently to moderately sloping site conditions across the proposed new residential home sites and/or lots, we are of the opinion that site grading and/or structural fill placement should be minimized where possible and should generally limit cuts and/or fills to about five (5) feet unless approved by the Geotechnical Engineer. Additionally, where existing site slopes and/or surface grades exceed about 20 percent (1V:5H), benching and keying of all fills into the natural site slopes may be required.

With regard to the presence of the existing site improvements, we recommend that all existing site improvements which will not remain at the site be removed in their entirety from all of the planned new structural improvement areas.

In regards to the relatively low infiltration rates anticipated within the clayey and silty subgrade soils beneath the site, we generally do not recommend any storm water infiltration within structural and/or embankment fills. However, some limited storm water infiltration may be feasible within the residential lots and/or areas of the site where the existing and/or finish slope gradients are no steeper than about 20 percent (1V:5H). In this regard, we recommend that all proposed storm water detention and/or infiltration systems for the project be reviewed and approved by Redmond Geotechnical Services, LLC.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new Battle Creek and Landau residential development project.

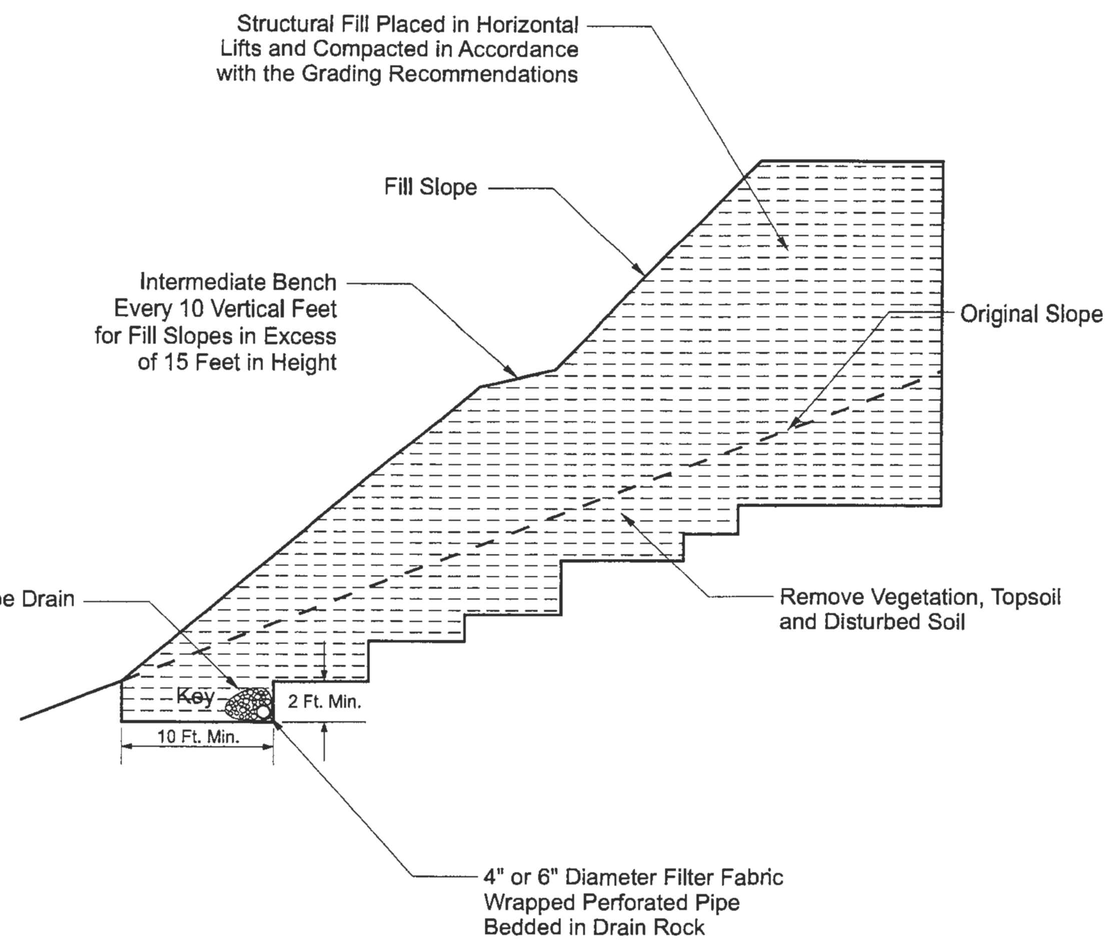
Site Preparation

As an initial step in site preparation, we recommend that the proposed new residential building sites and/or lots as well as their associated structural and/or site improvement area(s) be stripped and cleared of all existing improvements, any existing unsuitable fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, we envision that the site stripping to remove existing vegetation and topsoil materials will generally be about 6 to 12 inches. However, localized areas requiring deeper removals, such as any existing undocumented and/or unsuitable fill materials as well as old foundation remnants, will likely be encountered and should be evaluated at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site native sandy, clayey silt subgrade soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of some of the on-site native soil materials which contain significant silt and clay sized particles will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (late June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping of topsoil materials be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction. In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a woven geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock.



TYPICAL FILL SLOPE DETAIL

Project No. 1625.007.G	BATTLECREEK & LANDAU SUBDIVISION SITE	Figure No. 3

Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed within the new building and/or pavement areas should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. Additionally, all fill materials placed within about three (3) to five (5) lineal feet of the perimeter (limits) of the proposed residential structures and/or pavements should be considered structural fill. Additionally, due to the sloping site conditions, we recommend that all structural fill materials planned in areas where existing surface and/or slope gradients exceed about 20 percent (1V:5H) be properly benched and/or keyed into the native (natural) slope subgrade soils. In general, a bench width of at least eight (8) feet and a keyway depth of at least one (1) foot is recommended. However, the actual bench width and keyway depth should be determined at the time of construction by the Geotechnical Engineer. A typical fill slope detail is presented on Figure No. 3. Further, all fill slopes should be constructed with a finish slope surface gradient no steeper than about 2H:1V.

As such, settlement sensitive site and/or surface improvements (i.e., concrete curbs and sidewalks) should not be constructed until after primary consolidation and/or settlement has been completed. All aspects of the site grading, including a review of the proposed site grading plan(s), should be approved and/or monitored by a representative of Redmond Geotechnical Services, LLC.

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new residential development is suitable for support of the two- and/or three-story wood-frame structures provided that the following foundation design recommendations are followed. The following sections of this report present specific foundation design and construction recommendations for the planned new residential structures.

Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) column footings may be supported by approved native (untreated) subgrade soil materials and/or silty sand structural fill soils based on an allowable contact bearing pressure of about 2,000 pounds per square foot (psf). This recommended allowable contact bearing pressure is intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads. In general, continuous strip footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual column footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches.

Additionally, if foundation excavation and construction work is planned to be performed during wet and/or inclement weather conditions, we recommend that a 3 to 4 inch layer of compacted crushed rock be used to help protect the exposed foundation bearing surfaces until the placement of concrete.

Total and differential settlements of foundations constructed as recommended above and supported by approved native subgrade soils or by properly compacted structural fill materials are expected to be well within the tolerable limits for this type of lightly loaded wood-frame structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.30 and 0.45 for native silty subgrade soils and/or import gravel fill materials, respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 300 pounds per cubic foot (pcf). This recommended value includes a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 4 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab. However, additional moisture protection can be provided by using a 10-mil polyolefin geo-membrane sheet such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 150 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	45	35
3H:1V	65	60
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the proposed street improvements along the east side of Battle Creek Road SE as well as the proposed new street improvements for the Battle Creek and Landau residential development project was determined in accordance with the City of Salem Department of Public Works Administrative Rules Chapter 109-006 (Street Design Standards) Section 6 dated January 1, 2014.

Specifically, on October 29, 2019, samples of the subgrade soils from the existing and/or proposed public streets were collected by means of test hole excavations and/or core holes. The subgrade soils encountered in the test holes located across the proposed residential subdivision site and/or along the shoulder of the existing pavement grade of Robins Lane SE generally consisted of native and/or residual soils comprised of medium to reddish-brown, medium stiff, sandy, clayey SILT (ML).

The subgrade soil samples collected at the site were tested in the laboratory in accordance with the ASTM Vol. 4.08 Part D-2844-69 (AASHTO T-190-93) test method for the determination of the subgrade soil "R"-value and expansion pressure. The results of the "R"-value testing was then converted to an equivalent Resilient Modulus (M_{RSG}) in accordance with current AASHTO methodology. The results of the laboratory "R"-value tests revealed that the subgrade soils have an apparent "R"-value of between 24 and 28 with an average "R"-value of 26 (see Figure No's. A-13 and A-14). Using the current AASHTO methodology for converting "R"-value to Resilient Modulus (M_{RSG}), the subgrade soils have a Resilient Modulus (M_{RSG}) of about 5,291 psi which is classified a "Fair" (M_{RSG} = 5,000 psi to 10,000 psi).

In addition to the above, Dynamic Cone Penetration (DCP) tests were performed along the proposed new interior public street alignment at approximate 100-feet intervals. The results of the DCP tests found that the underlying native sandy, clayey silt subgrade soils have a DCP value of between 2 to 3 blows per 2-inches which correlates to a California Bearing Ratio (CBR) of between 5 and 12. Using current AASHTO methodology for converting CBR to Resilient Modulus (M_{RSG}), the subgrade soils have a Resilient Modulus (M_{RSG}) of between 5,842 and 10,637 psi with an average M_{RSG} of 7,150 psi which is classified as "Fair" (M_{RSG} = 5,000 psi to 10,000 psi).

<u>Minor Arterial Streets</u>

The following documents and/or design input parameters were used to help determine the flexible pavement section design for improvements to new and/or existing Minor Arterial Streets:

- **Street Classification:** Mino Arterial Street
- **Design Life:** 20 years
- **Serviceability:** 4.2 initial, 2.5 terminal
- **Traffic Loading Data:** 4,000,000 18-kip EAL's
- **Reliability Level:** 90%
- **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
- **Asphalt Structural Coefficient:** 0.41
- **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 4.3 was determined.

In this regard, we recommend the following flexible pavement section for the new improvements to new and/or existing Minor Arterial Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	6.0
Aggregate Base Rock	18.0

Local Residential Streets

The following documents and/or design input parameters were used to help determine the flexible pavement section design for new local residential streets:

- **Street Classification:** Local Residential Street
- **Design Life:** 25 years
- **Serviceability:** 4.2 initial, 2.5 terminal
- **Traffic Loading Data:** 100,000 18-kip EAL's
- **Reliability Level:** 90%
- **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
- **Asphalt Structural Coefficient:** 0.41
- **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 2.6 was determined.

In this regard, we recommend the following flexible pavement section for the construction of new Local Residential Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	4.0
Aggregate Base Rock	10.0

Wet Weather Grading and Soft Spot Mitigation

Construction of the proposed new public street improvements is generally recommended during dry weather. However, during wet weather grading and construction, excavation to subgrade can proceed during periods of light to moderate rainfall provided that the subgrade remains covered with aggregate. A total aggregate thickness of 8-inches may be necessary to protect the subgrade soils from heavy construction traffic. Construction traffic should not be allowed directly on the exposed subgrade but only atop a sufficient compacted base rock thickness to help mitigate subgrade pumping. If the subgrade becomes wet and pumps, no construction traffic shall be allowed on the road alignment. Positive site drainage away from the street shall be maintained if site paving will not occur before the on-set of the wet season.

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observations can either be removed and replaced with properly dried and compacted fill soils or removed and replaced with compacted crushed aggregate. However, and where approved by the Geotechnical Engineer, the soft area may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Soil Shrink-Swell and Frost Heave

The results of the laboratory "R"-value tests indicate that the native subgrade soils possess a low to moderate expansion potential. As such, the exposed subgrade soils should not be allowed to completely dry and should be moistened to near optimum moisture content (plus or minus 3 percent) at the time of the placement of the crushed aggregate base rock materials. Additionally, exposure of the subgrade soils to freezing weather may result in frost heave and softening of the subgrade. As such, all subgrade soils exposed to freezing weather should be evaluated and approved by the Geotechnical Engineer prior to the placement of the crushed aggregate base rock materials.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavation bracing for the project should be the responsibility of the excavation contractor. Permanent slopes should be constructed no steeper than about 2H to 1V unless approved by the Geotechnical Engineer.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level. If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation.

Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

We recommend that positive measures be taken to properly finish grade the site so that drainage waters from the residential structures and landscaping areas as well as adjacent properties or buildings are directed away from the new residential structures foundations and/or floor slabs. All roof drainage should be directed into conduits that carry runoff water away from the residential structures to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the proposed new residential structures.

Groundwater was not encountered at the site in any of the exploratory test pits (TH-#1 through TH-#8) at the time of excavation to depths of at least 7 feet beneath existing site grades. However, the subject property is surfaced with clayey silt subgrade soils which have relatively low infiltration rates. Additionally, groundwater elevations in the area and/or across the subject property may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall.

As such, based on our current understand of the possible site grading required to bring the subject site and/or residential lots to finish design grade(s), we are of the opinion that an underslab drainage system is not required for the proposed single-family residential structures. However, a perimeter foundation drain is recommended for any perimeter footings and/or below grade retaining walls. A typical recommended perimeter footing/retaining wall drain detail is shown on Figure No. 4.

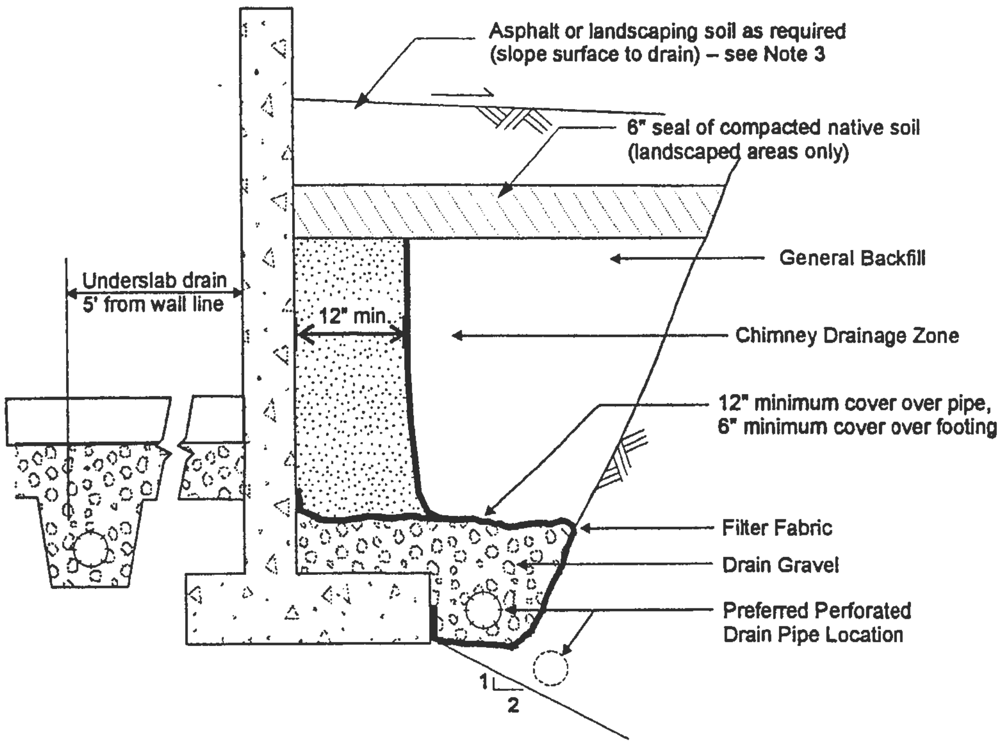
Further, due to our understanding that various surface infiltration ditches and/or swales may be utilized for the project as well as the relatively low infiltration rates of the near surface sandy, clayey silt subgrade soils anticipated within and/or near to the foundation bearing level of the proposed residential structures, we are generally of the opinion that storm water detention and/or disposal systems should not be utilized within the residential lots and/or around the proposed residential structures unless approved by the Geotechnical Engineer.

Design Infiltration Rates

Based on the results of our field infiltration testing, we recommend using the following infiltration rate to design any on-site near surface storm water infiltration and/or disposal systems for the project:

Subgrade Soil Type	Recommended Infiltration Rate
sandy, clayey SILT (ML)	0.3 to 0.4 inches per hour (in/hr)

Note: A safety factor of two (2) was used to calculate the above recommended design infiltration rate. Additionally, given the gradational variability of the on-site sandy, clayey sit subgrade soils beneath the site as well as the anticipation of some site grading for the project, it is generally recommended that field testing be performed during and/or following construction of any on-site storm water infiltration system(s) in order to confirm that the above recommended design infiltration rates are appropriate.



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.
3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed ¾" to 1½" gravel.
5. General backfill to be on-site gravels, or ¾""-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).
6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL

Project No. 1625.007.G	**BATTLECREEK & LANDAU SUBDIVISION SITE**	Figure No. 4

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the latest edition (2014) of the State of Oregon Structural Specialty Code (OSSC) and/or Amendments to the 2015 International Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Oregon Structural Specialty Code and/or from the National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. We recommend Site Class "C" be used for design. Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from the 2012 IBC to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:

Table 1. Recommended Seismic Design Parameters

Site Class	S_S	S_1	Fa	Fv	S_{MS}	S_{M1}	S_{DS}	S_{D1}
C	0.907	0.429	1.037	1.371	0.941	0.588	0.627	0.392

Notes: 1. S_S and S_1 were established based on the USGS 2012 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. Fa and Fv were established based on IBC 2015 tables using the selected S_S and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new Battle Creek and Landau residential development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations. It is important that our representative meet with the contractor prior to any site grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation and stripping, structural fill placement, footing excavations and construction as well as retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new single-family residential structures and their associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or at other locations across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes. We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site inspections and constriction monitoring services for this project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection and/or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

REFERENCES

Adams, John, 1984, Active Deformation of the Pacific Northwest Continental Margin: Tectonics, v.3, no. 4, p. 449-472.

Applied Technology Council, ATC-13, 1985, Earthquake Damage Evaluation Data for California.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Atwater, B.F., 1987a, A periodic Holocene recurrence of widespread, probably coseismic Subsidence in southwestern Washington: EOS, v. 68, no. 44.

Atwater, B.F., 1987b, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, no. 4804, pp. 942-944.

Campbell, K.W., 1990, Empirical prediction of near-surface soil and soft-rock ground motion for the Diablo Canyon Power Plant site, San Luis Obispo County, California: Dames & Moore report to Lawrence Livermore National Laboratory.

Carver, G.A., and Burke, R.M., 1987, Late Holocene paleoseismicity of the southern end of the Cascadia Subduction zone [abs.]: EOS, v. 68, no. 44, p. 1240.

Chase, R.L., Tiffin, D.L., Murray, J.W., 1975, The western Canadian continental margin: In Yorath, C.J., Parker, E.R., Glass, D.J., editors, Canada's continental margins and offshore petroleum exploration: Canadian Society of Petroleum Geologists Memoir 4, p. 701-721.

Crouse, C.B., 1991a, Ground motion attenuation equations for earthquakes on the Cascadia Subduction Zone: Earthquake Spectra, v. 7, no. 2, pp. 201-236.

Crouse, C.B., 1991b, Errata to Crouse (1991a), Earthquake Spectra, v. 7, no. 3, p. 506.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes, northern Oregon central Cascadia margin: Tectonics, v. 9, p. 1-22.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes northwest Oregon [abs]: EOS, v. 68, no. 44, p. 1469.

EERI (Earthquake Engineering Research Institute), 1993, The March 25, 1993, Scotts Mill Earthquake, Western Oregon's Wake-Up Call: EERI Newsletter, Vol. 27, No. 5, May.

Geomatrix, 1995 Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, January.

Geologic Map Series (GMS-49), Map of Oregon Seismicity, 1841-1986 dated 1986.

Geologic Map of the Salem West Quadrangle, Marion County, Oregon dated 1995.

Grant, W.C., and McLaren, D.D., 1987, Evidence for Holocene Subduction earthquakes along the northern Oregon coast [abs]: EOS v. 68, no. 44, p. 1239.

Grant, W.C., Atwater, B.F., Carver, G.A., Darienzo, M.E., Nelson, A.R., Peterson, C.D., and Vick, G.S., 1989, Radiocarbon dating of late Holocene coastal subsidence above the Cascadia Subduction zone-compilation for Washington, Oregon, and northern California, [abs]: EOS Transactions of the American Geophysical Union, v. 70, p. 1331.

International Conference of Building Officials (ICBO), 1994, Uniform Building Code: 1994 Edition, Whittier, CA. 1994.

Joyner, W.B., and Boore, D.M., 1998, Measurement, characterization and prediction of strong ground motion: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 43-102.

Riddihough, R.P., 1984, Recent movements of the Juan de Fuca plate system: Journal of Geophysical Research, v. 89, no. B8, p. 6980-6994.

Youngs, R.R., Day, S.M., and Stevens, J.L., 1998, Near field ground motions on rock for large Subduction earthquakes: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 445-462.

Appendix "A"

Test Pit Logs and Laboratory Test Data

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site were explored by excavating eight (8) exploratory test pits (TH-#1 through TH-#8) on October 29, 2017. The approximate location of the test pit explorations are shown in relation to the proposed new residential lots and the associated site improvements on the Site Exploration Plan, Figure No. 2.

The test pits were excavated using track-mounted excavating equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test pits were excavated to depths ranging from about 6.0 to 7.0 feet beneath existing site grades. Detailed logs of the test pits are presented on the Log of Test Pits, Figure No's. A-4 through A-7. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-3.

The exploration program was coordinated by a field engineer who monitored the excavating and exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was not encountered in any of the exploratory test pits (TH-#1 through TH-#8) at the time of excavating to depths of at least 7.0 feet beneath existing surface grades.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, gradational characteristics, and Atterberg Limits as well as direct shear strength and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test pit explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

Two (2) Maximum Dry Density and Optimum Moisture Content tests were performed on representative samples of the on-site sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-1557. This test was conducted to help establish various engineering properties for use as structural fill. The test results are presented on Figure No. A-8.

Atterberg Limits

Two (2) Liquid Limit (LL) and Plastic Limit (PL) tests were performed on representative samples of the sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. These tests were conducted to facilitate classification of the soils and for correlation purposes. The test results appear on Figure No. A-9.

Gradation Analysis

Two (2) Gradation analyses were performed on representative samples of the subsurface soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Direct Shear Strength Test

Two (2) Direct Shear Strength tests were performed on undisturbed and/or remolded samples at a continuous rate of shearing deflection (0.02 inches per minute) in accordance with ASTM Vol. 4.08 Part D-3080-79. The test results were used to determine engineering strength properties and are shown graphically on Figure No's. A-11 and A-12.

"R"-Value Tests

Four (4) "R"-value tests were performed on a remolded subgrade soil sample in accordance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No's. A-13 and A-14.

The following figures are attached and complete the Appendix:

Figure No. A-3	Key To Exploratory Test Pit Logs
Figure No's. A-4 through A-7	Log of Test Pits/Dynamic Cone
Figure No. A-8	Maximum Dry Density
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No's. A-11 and A-12	Direct Shear Strength Test Results
Figure No's. A-13 and A-14	Results of "R"-Value Tests
Figure No's. A-15 and A-16	Field Infiltration Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

	U.S. STANDARD SERIES SIEVE 200	40	10	4	CLEAR SQUARE SIEVE OPENINGS 3/4"	3"	12"
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT †
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH ‡	BLOWS/FOOT †
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

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KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure A-3
1625.007.G	12/27/19	

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/19

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION TEST PIT NO. TH-#1 ELEVATION 466'±
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			27.7	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#2 ELEVATION 461'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			28.3	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUBDIVI | FIGURE NO. A-4

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/19

TEST PIT NO. TH-#3 ELEVATION 450'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			27.9	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5						
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#4 ELEVATION 433'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			28.8	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 6 feet
5						
	X			26.6	ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO. A-5

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/19

TEST PIT NO. TH-#5 ELEVATION 411'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			29.6	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 4 to 6 feet
5						
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#6 ELEVATION 424'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 4 to 6 feet
5						
					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO. A-6

BACKHOE COMPANY: Gene S. McMurrin BUCKET SIZE: 24 inches DATE: 10/29/18

TEST PIT NO. TH-#7 ELEVATION 450'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			27.2	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5	X			27.1	ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#8 ELEVATION 452'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			29.3	ML	Medium to reddish-brown, very moist, soft to medium stiff, sandy, clayey SILT Becomes medium stiff to stiff at 3 to 5 feet
5					ML/RK	Medium to orangish-brown, very moist, very stiff to medium dense, clayey, sandy SILT to highly weathered Bedrock
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO. A-7

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MAXIMUM DENSITY TEST RESULTS

SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#1 @ 1.5'	Medium to reddish-brown, sandy, clayey SILT (ML)	104.0	28.0
TH-#7 @ 2.0'	Medium to reddish-brown, sandy, clayey SILT (ML)	102.0	30.0

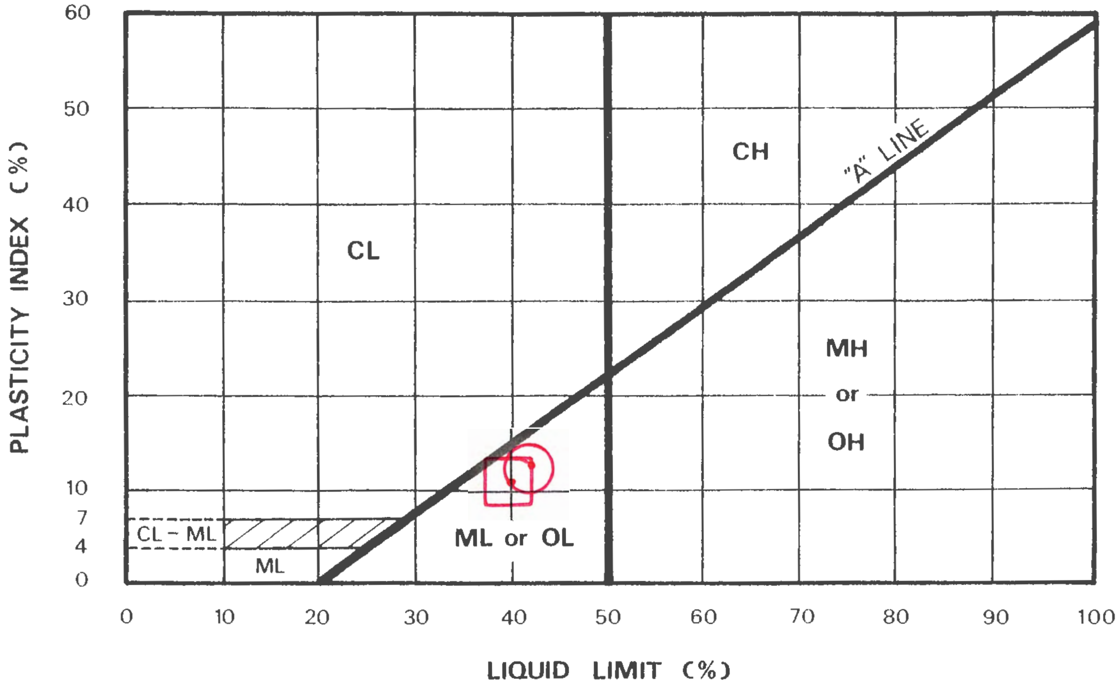
EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: 1625.007.G | BATTLECREEK & LANDAU SUB | FIGURE NO.: A-8

REDMOND GEOTECHNICAL SERVICES



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
⊙	TH-#1	1.5	27.7	42.2	13.3	84.8		ML
⊡	TH-#7	2.0	27.2	40.1	10.5	87.8		ML

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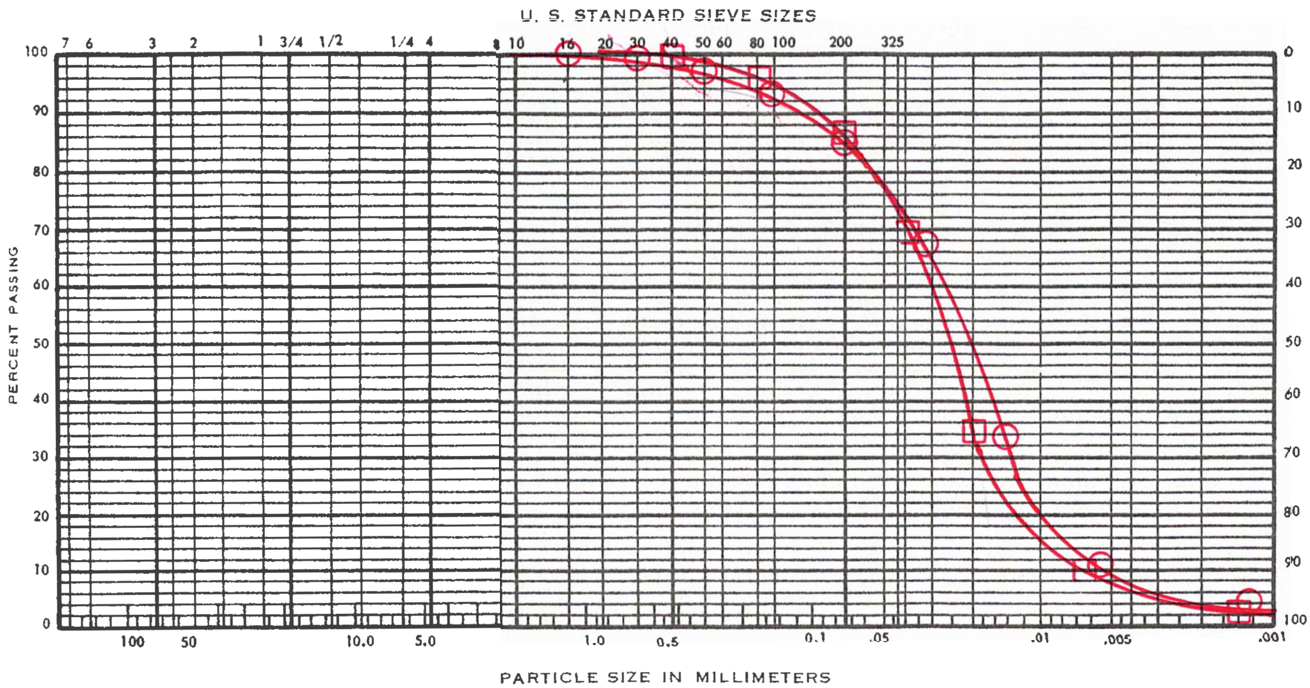
PLASTICITY CHART AND DATA

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure A-9
1625.007.G	12/27/19	

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
—○—	TH-#1	1.5		ML	Medium to reddish-brown, sandy, clayey SILT
—□—	TH-#7	2.0		ML	Medium to reddish-brown, sandy, clayey SILT

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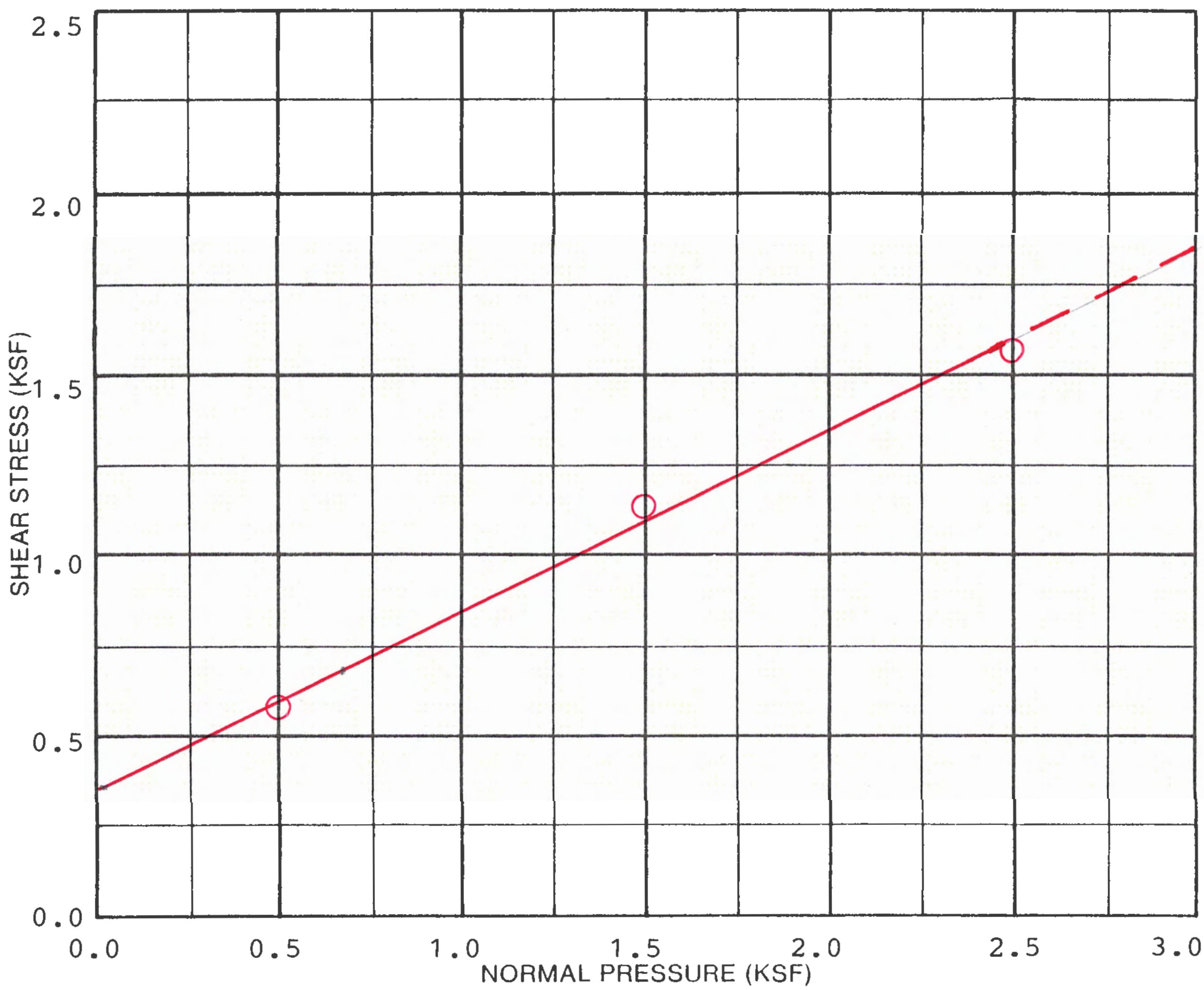
GRADATION TEST DATA

BATTLECREEK & LANDAU SUBDIVISION

Salem, Oregon

PROJECT NO.	DATE	FIGURE
1625.007.G	12/27/19	A-10



SAMPLE DATA	
DESCRIPTION:	Medium to reddish-brown sandy, clayey SILT (ML) (Remolded)
BORING NO.:	TH-#1
DEPTH (ft.): 1.5'	ELEVATION (ft):

TEST RESULTS	
APPARENT COHESION (C):	350 psf
APPARENT ANGLE OF INTERNAL FRICTION (ϕ):	25°

TEST DATA				
TEST NUMBER	1	2	3	4
NORMAL PRESSURE (KSF)	0.5	1.5	2.5	
SHEAR STRENGTH (KSF)	0.6	1.1	1.6	
INITIAL H_2O CONTENT (%)	30.0	30.0	30.0	
FINAL H_2O CONTENT (%)	31.1	27.2	23.3	
INITIAL DRY DENSITY (PCF)	90.0	90.0	90.0	
FINAL DRY DENSITY (PCF)	91.1	94.4	98.8	
STRAIN RATE:	0.02 inches per minute			

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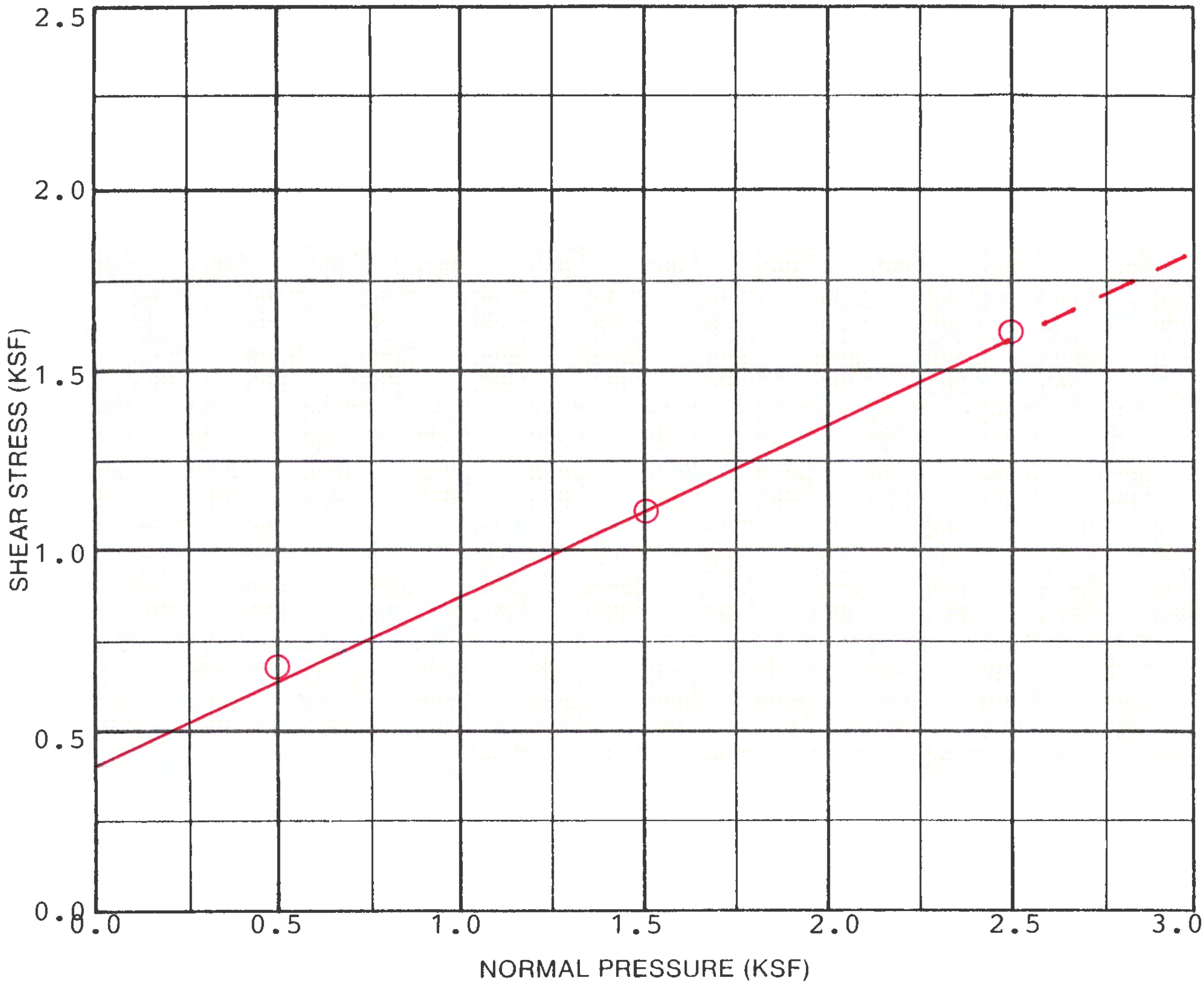
DIRECT SHEAR TEST DATA

BATTLE CREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure
1625.007.G	12/27/19	A-11



SAMPLE DATA	
DESCRIPTION: Medium to reddish-brown sandy, clayey SILT (ML) (Remolded)	
BORING NO.: TH-#7	
DEPTH (ft.): 2.0'	ELEVATION (ft):
TEST RESULTS	
APPARENT COHESION (C): 400 psf	
APPARENT ANGLE OF INTERNAL FRICTION (ϕ): 24°	

TEST DATA				
TEST NUMBER	1	2	3	4
NORMAL PRESSURE (KSF)	0.5	1.5	2.5	
SHEAR STRENGTH (KSF)	0.7	1.2	1.6	
INITIAL H_2O CONTENT (%)	30.0	30.0	30.0	
FINAL H_2O CONTENT (%)	31.1	25.6	20.3	
INITIAL DRY DENSITY (PCF)	90.0	90.0	90.0	
FINAL DRY DENSITY (PCF)	91.4	94.8	99.6	
STRAIN RATE: 0.02 inches per minute				

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DIRECT SHEAR TEST DATA

BATTLECREEK & LANDAU SUBDIVISION
Salem, Oregon

PROJECT NO.	DATE	Figure
1625.007.G	12/27/19	A-12

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#2

SAMPLE DEPTH: 2.5 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	329	431
Expansion Dial (o.ooo1")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.6	24.4	21.1
Dry Density (pcf)	93.4	98.2	102.6
Resistance Value, "R"	15	27	37
"R"-Value at 300 psi Exudation Pressure = 26			

SAMPLE LOCATION: TH-#3

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	208	326	439
Expansion Dial (0.0001")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.3	24.1	20.7
Dry Density (pcf)	94.9	99.1	103.7
Resistance Value "R"	16	27	36
"R"-Value at 300 psi Exudation Pressure = 26			

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#7

SAMPLE DEPTH: 2.5 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	211	322	438
Expansion Dial (o.ooo1")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	28.3	24.9	21.6
Dry Density (pcf)	93.9	97.6	101.5
Resistance Value, "R"	14	25	34
"R"-Value at 300 psi Exudation Pressure = 24			

SAMPLE LOCATION: TH-#8

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	202	321	434
Expansion Dial (0.0001")	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	27.1	23.7	20.2
Dry Density (pcf)	95.3	99.4	103.9
Resistance Value "R"	15	27	36
"R"-Value at 300 psi Exudation Pressure = 28			

Division 004 Appendix C - Infiltration Testing

Location: TL 900, 5826 Battle Creek Rd SE	**Date:** October 29, 2019	**Test Hole:** TH-#3
Depth to Bottom of Hole: 4.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head
Tester's Name: Daniel M. Redmond, P.E., G.E. **Tester's Company:** Redmond Geotechnical Services, LLC		**Tester's Contact Number:** 503-285-0598

Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-4.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
9:00	0	36.00	----		Filled w/12" water
9:20	20	36.50	0.50	1.50	
9:40	20	36.90	0.40	1.20	
10:00	20	37.26	0.36	1.08	
10:20	20	37.58	0.32	0.96	
10:40	20	37.87	0.29	0.87	
11:00	20	38.14	0.27	0.81	
11:20	20	38.40	0.26	0.78	
11:40	20	38.66	0.26	0.78	

Infiltration Test Data Table

Division 004 Appendix C - Infiltration Testing

Location: TL 900, 5826 Battle Creek Rd SE	**Date:** October 29, 2019	**Test Hole:** TH-#5
Depth to Bottom of Hole: 3.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head
Tester's Name: Daniel M. Redmond, P.E., G.E. **Tester's Company:** Redmond Geotechnical Services, LLC **Tester's Contact Number:** 503-285-0598		

Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-3.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
9:30	0	24.00	----		Filled w/12" water
9:50	20	24.35	0.35	1.05	
10:10	20	24.65	0.30	0.90	
10:30	20	24.92	0.27	0.81	
10:50	20	25.16	0.24	0.72	
11:10	20	25.38	0.22	0.66	
11:30	20	25.59	0.21	0.63	
11:50	20	25.79	0.20	0.60	
12:10	20	27.99	0.20	0.60	

Infiltration Test Data Table

Figure No. A-16

Appendix "B"

Geologic Hazard Assessment

NORTHWEST GEOLOGICAL SERVICES, INC.
Consulting Geologists and Hydrogeologists
2505 N.E. 42nd Avenue, Portland, Oregon 97213-1201
503-249-1093 ngs@spiritone.com

Redmond Geotechnical Services **19 November 2019**
P. O. Box 20547
Portland, OR 97294
Attention: Dan Redmond

Geologic Hazard Assessment
5826 Battle Creek Rd SE
8S/3W - 13C TL 900
Salem, Oregon

Dear Dan:

The purpose of this letter is to present Northwest Geological Services, Inc. (NGS) Geologic Hazard Assessment for the above referenced property as per your email authorization of 16 October 2019. We understand that our services are in support of your client's effort to subdivide and develop the property for residential use.

1. Purpose and Scope of Study

The City slope hazard GIS indicates that the slopes at the site have hazard score of 2 point or less. City of Salem Planning rules indicate that subdivision of the site requires a geologic hazard assessment (cumulative score 5 points). The purpose of this letter is to meet that requirement.

For the study we conducted the following tasks:

- Reviewed State and Federal hazard studies and geologic maps of the area;
- Obtained GIS and Hazard maps from City of Salem Public Works;
- Reviewed geologic and topographic maps for the site area;
- Obtained and reviewed drillers well logs for site and nearby water wells;
- Reviewed aerial imagery (1944-2014) and LIDAR data from NOAA (2009 and 2018);
- Conducted a site reconnaissance and observed conditions in four test pits on 28 October 2019; and
- Prepared this letter.

2. Site Setting and Slopes

The subject property is in the north part of the South Salem Hills. It consists one trapezoidal, 11.16-acre lot (Figure 1) between Battle Creek Rd SE and the I-5 freeway south of Landau St SE. It is about 1/3 mile north of Battle Creek Rd's crossing of I-5 (Figures 1 and 2). The existing TL 900 residence is in the south west part of the site and accessed by a driveway from Battle Creek Rd SE. (Figures 3 and 5). Four agricultural outbuildings are clustered near the residence.

The area was originally rural agricultural (e.g. Figure 4, upper). The site was orchard and woodlot/tree farm on aerial photos taken from 1944-1977 and for decades before that. Since the site and area were converted to rural residential and hobby farms. Most lately medium and high-density residential subdivisions have expanded to just north of the site. Thus, water and sewer are available in Landon St SE (Figure 2) immediately NE of the site. Also, an existing water main follows the west side of Battle Creek Rd SE.

Figure 4 shows 1944 and 2018 aerial photos of the site and adjacent area. The 1944 photo shows the area before I-5 was built. The 2018 photo shows how the east end of the property was cut by I5. Review of other aerial photos[1] indicates that the cut for I-5 and its frontage was made before June 1955. The 1967 aerial photos show I5 constructed. Photos from the 1970s though the mid 2010s show build out of the residential subdivisions west and north of the site.

Site elevations range from 472 (msl) on the ridge at the residence down to 418 at the NE property corner and 454 near the NW corner. The steepest natural slopes are up to 20% on the east flank of the rise extending NNW-SSE in the west part of the site. Salem GIS shows two small patches of 25% slope occur just north of the residence (Figure 5). However, reconnaissance and air photo review found no difference between these patches and adjacent slopes.

3. Site Engineering Geology

According to published mapping (Foxworthy, 1970; Bella, 1981; Tolan & Beeson, 2000; Beeson & Tolan, 2001) and our geologic mapping for Marion County (NGS, 1997), most of the site is underlain by the Sentinel Bluffs flows of the Columbia River Basalt. The summit area, above about 465 - 470, are underlain by the Silver Falls flow. The basalt flows are mantled by a few feet of red-brown clayey SILT and severely weathered to decomposed basalt. The decomposed basalt is weathered to a hard to very hard red-brown clayey silt (laterite)[2]. The drillers log for the site well[3] suggests the basalt is decomposed or severely weathered to about 40 ft depth. Weathered basalt is exposed in the cut for I-5 just south of the site and for Battle Creek Rd about 1000 ft to the south.

Areas around the site and below about 400 – 420 ft were scoured by the Missoula Floods 13,000 to ~ 50,000 years ago (Waitt, 1985). However, no flood deposits appear present at the site of in the cuts along I-5.

Reconnaissance[4] confirmed the site is underlain by stiff red-brown soils derived from the Columbia River Basalt. We found smooth regular slopes, in agreement with the available LIDAR (Figures 3 and 5). Trees in the forested areas show gentle curvature typical of those

[1] We reviewed photos and images from 1944 through 2014, see Section 7, References.

[2] Locally known as the Jory soil series.

[3] Attached following the Figures.

[4] On 29 October 2019

growing in shallow soils. Conifer tops, however, are straight and vertical. There was no evidence of flowing or standing water in the swales during our late October reconnaissance.

Four test pits were excavated at the site to confirm the depth to basalt and the nature of the overlying soils. They were located on the steeper slopes and ridges because the State and County have identified those areas as having moderate susceptibility to slope hazards (see Section 4, beyond). Figure 3 shows the locations of the test pits. Hard decomposed BASALT was found at shallow depths in all test pits (Table 1, below). Additionally, soils below about 1.5 to 2 ft were dry to slightly damp, indicating permeability is quite low.

Table 1 - Test Pit Observations

Geologic Unit	TP-1	TP-2	TP-3	TP-4
Red brown clayey SILT	0 - 3 ft	0 - 3.5	0 3 ft	0 - 3 ft
Decomposed Basalt	3 - 5 ft	3.5 - 5 ft	3 - 6 ft	3 - 6 ft
Weathered Basalt	5 - 6 ft	5 ft	-	6 ft
Total Depth	6 ft	7 ft	6 ft	7 ft

Fill is inferred to be present locally as backfill for the utilities for the existing residence and outbuildings. However, these areas are gently sloped so there should be no slope hazards associated with the those fills.

4. Government Geologic Hazards

The available geologic mapping shows no geologic hazards at the site. The nearest mapped landslides are more than a mile distant. Our mapping, the water well logs and the test pits show the site is underlain by a few feet of stiff to hard soils with weathered basalt bedrock at shallow depths. Published DOGAMI slope hazard mapping of the Salem area does not extend south and east to the site. However, geologically similar areas have been mapped as having an intermediate potential for slope failures in areas of thick soils and slopes steeper than 20%.

DOGAMI recently added potential landslide susceptibility ranking to its SLIDO web site. That ranking shows the site with a low to moderate susceptibility to landslides. Finally, the City of Salem shows the same slopes to present a level 2 or less risk on a scale of 0 to 6 (Figure 5). Small, nearby patches of level 3 risk are road cuts/fills or other manmade features.

The landslide susceptibility maps are derived from generalized digital geologic maps, evaluation of LIDAR imagery and comparison with information for existing nearby landslides. They are not mapping of actual landslides. Rather, they denote areas that should be evaluated by a qualified professional Engineering Geologist. They are similar to – but more advanced – than the City of Salem risk maps that are based mainly on slope steepness and DOGAMI landslide studies.

The site has gentle to moderate slopes. The natural slopes might look steep enough to fail during an earthquake but are underlain by stiff to hard silt and basalt bedrock. Site soils below 2.5 to 3.5 ft depth are stiff to hard, thus limiting the potential for either slope failure or lateral spreading. The City GIS map (Figure 5) shows no slopes present >25% other than the small areas associated with the man-made cuts. However, the lack of elevated risk for seismic induced slope failure does not imply a lack of seismic risk. The site is subject to the same strong ground motions from local or distant earthquakes as are similar shallow bedrock sites throughout the area. The existing natural slopes appear stable with respect to saturation. However, steep cuts into them or fills place on them may be less stable than the natural slope.

5. Conclusions and Recommendations

The site is gently to moderately sloped and has a very low susceptibility to landsliding under any natural geologic circumstance, in our opinion. In our experience, the weathered basalt is not susceptible to slope spreading or liquefaction during strong ground motions from earthquakes. The basalt bedrock is at shallow depth and is not susceptible to failure during earthquakes beneath the existing site slopes. Thus, the site does not appear to be at significant risk from slope instability. However, man-made cuts into the shallow decomposed basalt and overlying silt have occasionally created local problems.

In our opinion, development of this site as proposed (Figure 6) should not create new or exacerbate existing geologic hazards. However, we caution that any fills at the site - including utility backfill - may be subject to failure or settlement during strong ground motions unless properly placed. As noted above, cuts into the natural slopes may be less stable than the existing slope.[5] Consequently, we recommend that foundations, cuts and fills should be designed by a qualified professional using recommendations from your geo-technical investigation. Additionally, we recommend inspection of all open cuts and earthworks by a geotechnical engineer.

In our experience, the decomposed and weathered basalt have relatively low permeability. Consequently, the thin soil overlying the basalt may become fully saturated during intense precipitation or after prolonged intervals of moderate precipitation. We recommend provision be made for on site storm water retention and off-site disposal. The system should be designed by a qualified professional.

6. LIMITATIONS AND LIABILITY

We call your attention to the paragraphs on Warranty and Liability in the General Conditions (dated 1/2019) that you previously approved. Interpretations and recommendations presented herein are based on limited data and observations. Actual subsurface conditions may vary from those inferred from the limited information available to us. If site excavations for development find conditions to differ significantly from those inferred herein, you should contact us and provide an opportunity for us to review our recommendations for the site.

[5] This is particularly true of slopes underlain by interbeds in the basalt. An interbed is locally present between the Sentinel Bluffs flow and the overlying Silver Falls flow. Excavations in the upper elevations of the site should be examined by the Project Engineer for evidence of

We thank you for the opportunity to assist you with your project. Please contact me if you have questions about the report.

Yours very truly,
Northwest Geological Services, Inc.

Clive F. (Rick) Kienle, Jr.
Principal Engineering Geologist
and Vice President

NGS Reference 235.111-1

7. References

Aerial Photographs & Imagery: US Geological Survey – 1944, 10 June 1955, 19 November 1967, 3 July 1973, 18 June 1994, 23 July 2000, 29 February 2008; USDA Farm Service Agency – 17 August 2003; WAC Corp – 28 March 1990; State of Oregon – 28 June 2005, 8 July 2010; Google, Inc. – 8 July 2012.

Bela, James L., 1981, Geologic Map of the Rickreall and Salem West Quadrangles, Oregon, Oregon Dept. Geology & Mineral Industries, Geologic Map Series, GMS-18.

Beeson, M.H. and T.L. Tolan, 2001, Geologic Map of the Salem West, Oregon 7 ½ Minute Quadrangle, unpublished geologic mapping for the US Geological Survey Urban Corridors Hazards program.

Foxworthy, B. L., 1970, Hydrologic Conditions and Artificial Recharge Through a Well in the Salem heights Area of Salem, Oregon, U. S. Geological Survey Water-Supply Paper 1594F.

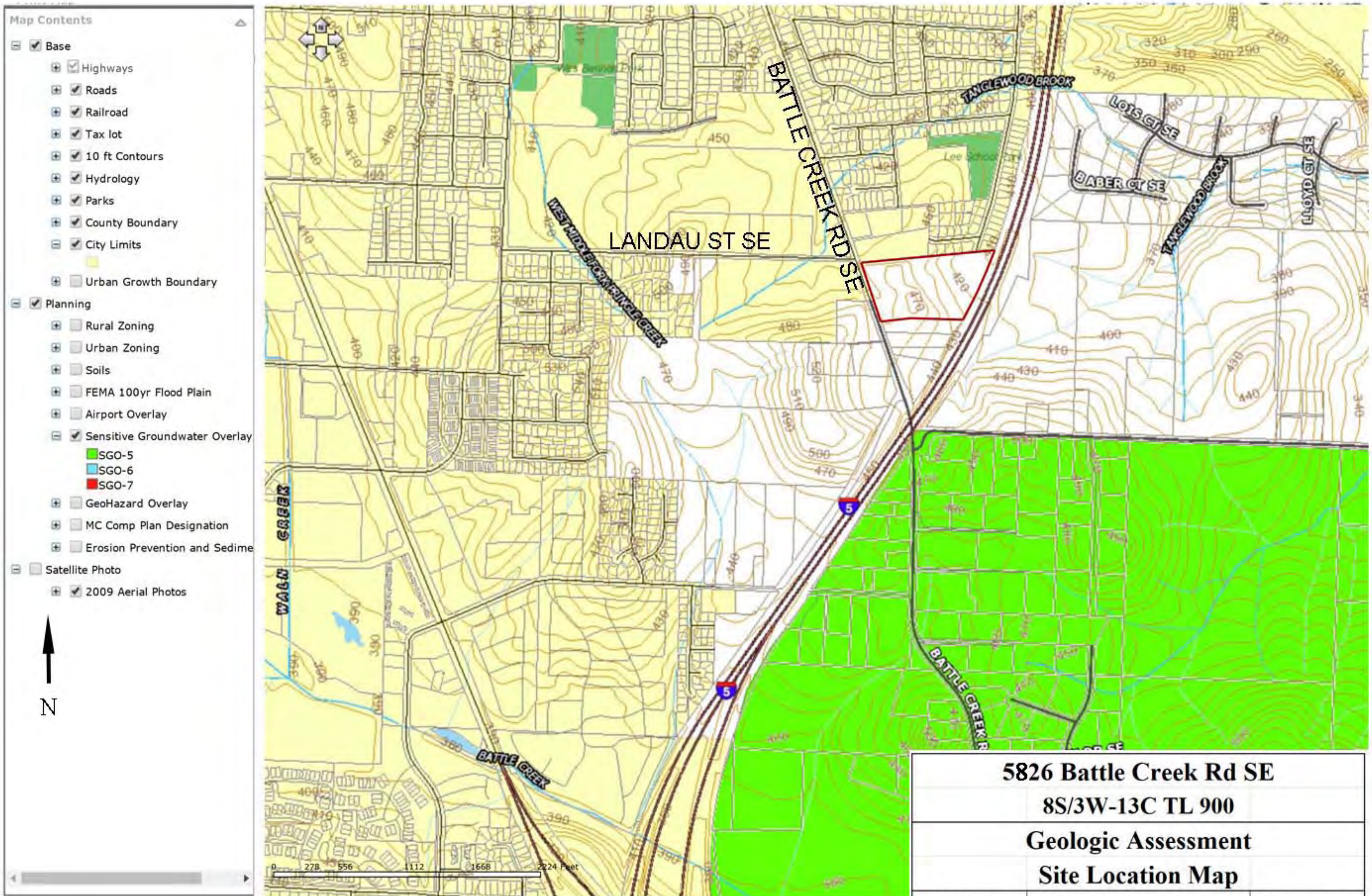
NGS, 1997, Geologic and Hydrogeologic Study of the Residential Acreage-Zoned Areas of Marion County Underlain By Columbia River basalt and Older Rocks; Northwest Geological Services, Inc. Report dated May 1997 to Marion County.

Salem, City of, undated, Slope Hazard Report Requirements.

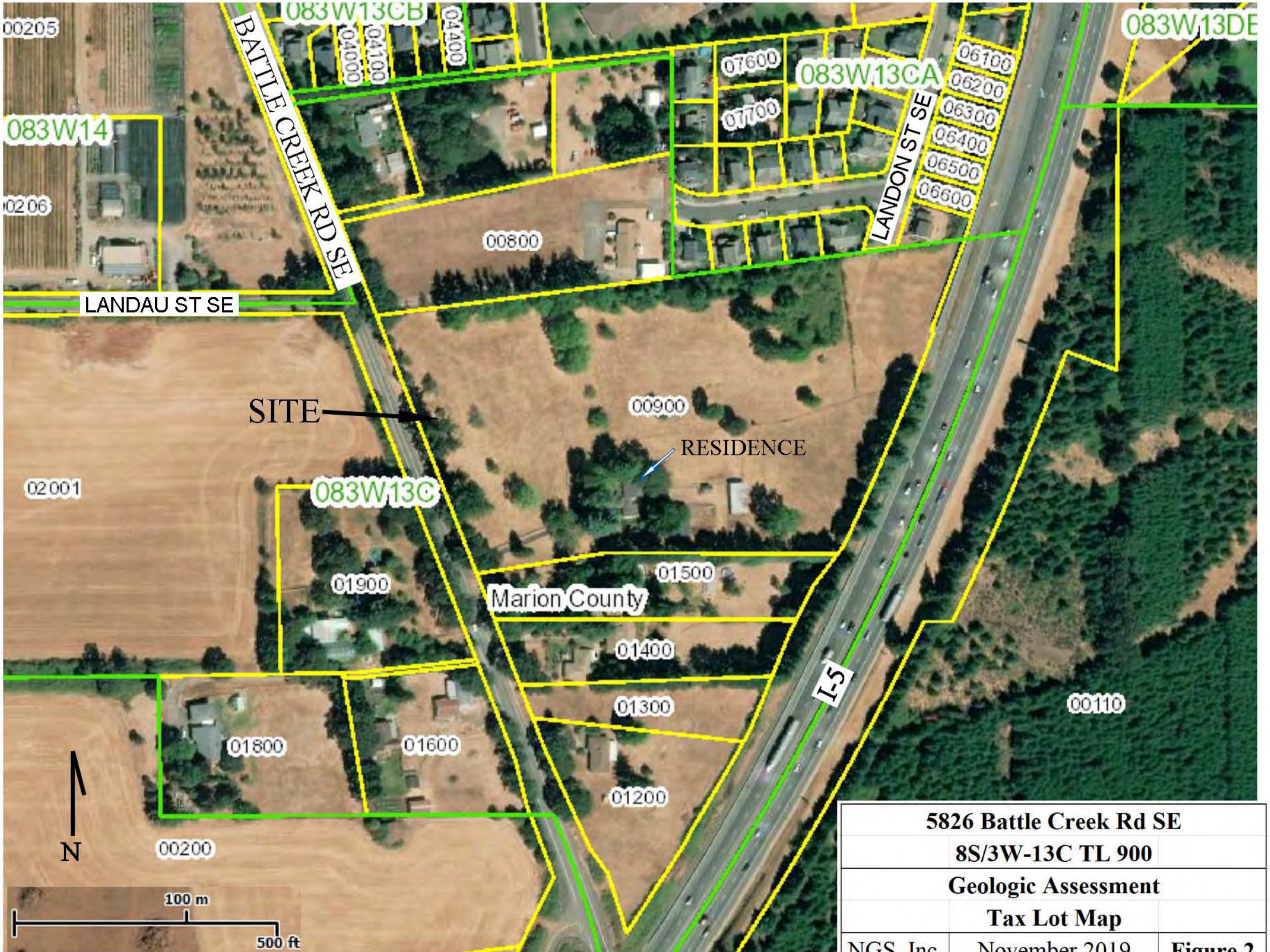
Salem, City of Planning, Hazards and LIDAR Maps dated November 2019.

Tolan. T.L. and M.H. Beeson, 2000, Geologic Map of the Salem East and Turner, Oregon, 7½ Minute Quadrangles, U.S./ Geological Survey Open-File Report 00-351.

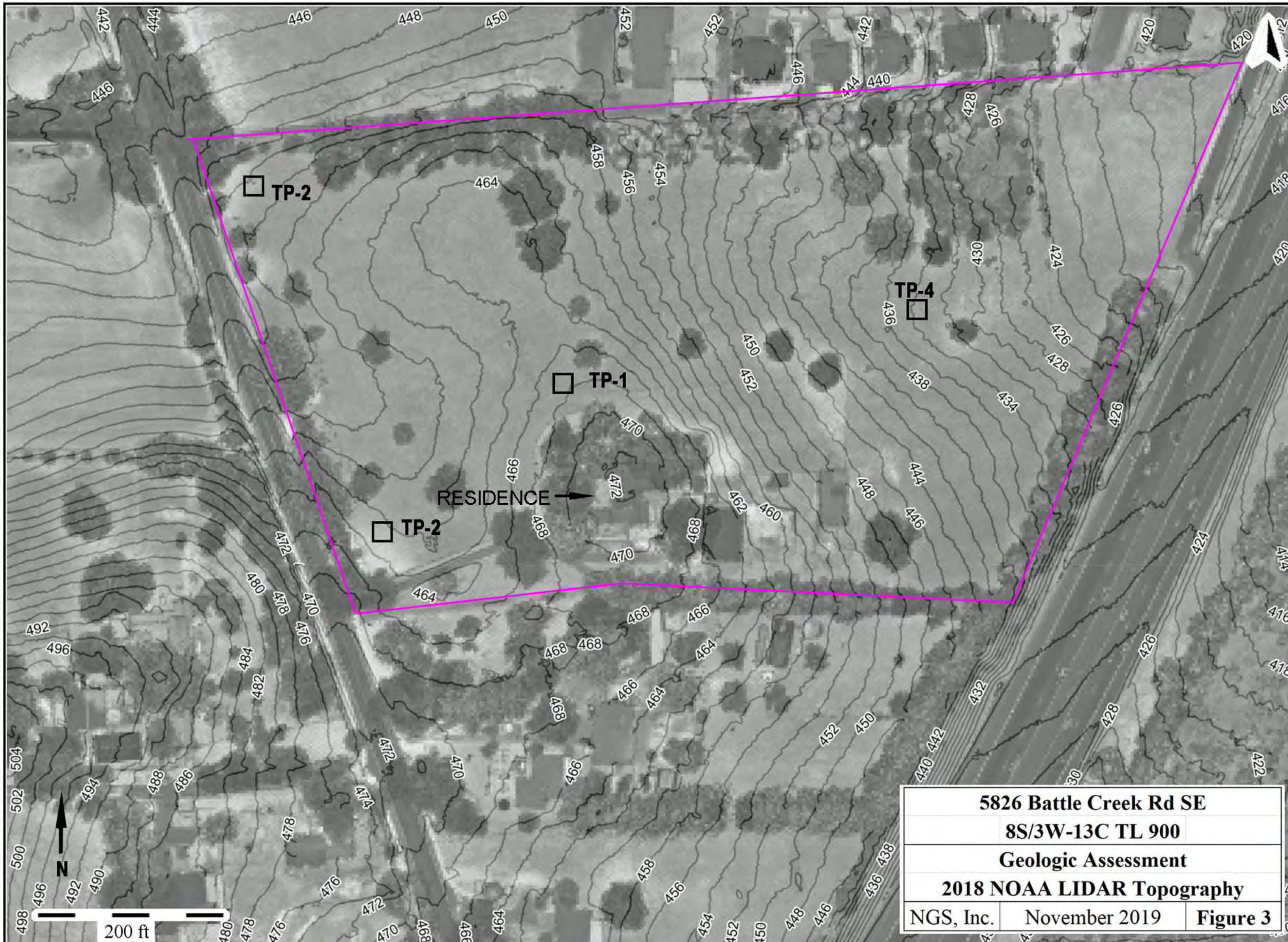
Waitt, R. B., Jr., 1985, Case for periodic, colossal jökulhlaups from Pleistocene Lake Missoula, Geol. Soc. Amer. Bull. V 96, no. 10, pp. 1271-1286.



5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
Site Location Map		
NGS, Inc.	November 2019	Figure 1



5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
Tax Lot Map		
NGS, Inc.	November 2019	**Figure 2**



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Printed with TatukGIS Viewer visit www.TatukGIS.com

Summer of 1944 photo from USACE
2018 from Digital Globe, cropped
and scaled by NGS, Inc.

5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
1944 & 2018 Aerial Photos		
NGS, Inc.	November 2019	**Figure 4**

Legend

Building footprint

Taxlot boundary

Contour

2 ft

10 ft

Landslide Hazards

POINTS

2

3

4

5

6

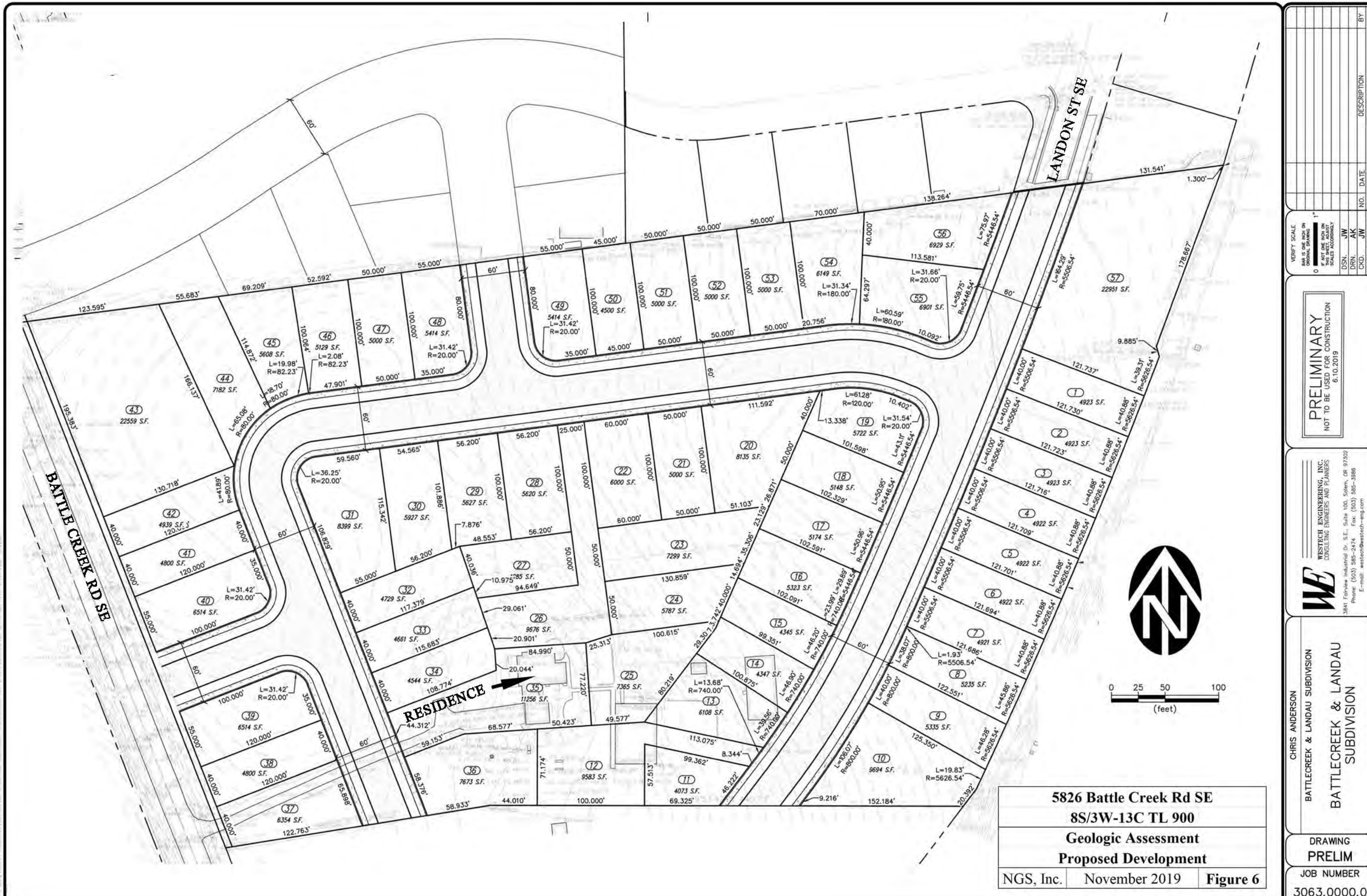
Marginalia and key were reformatted by NGS, Inc to fit 11.17 sheet.

N

NOAA 2018 LIDAR with Hillshade, 2 ft contours and hazard areas by City of Salem

CITY OF Salem AT YOUR SERVICE

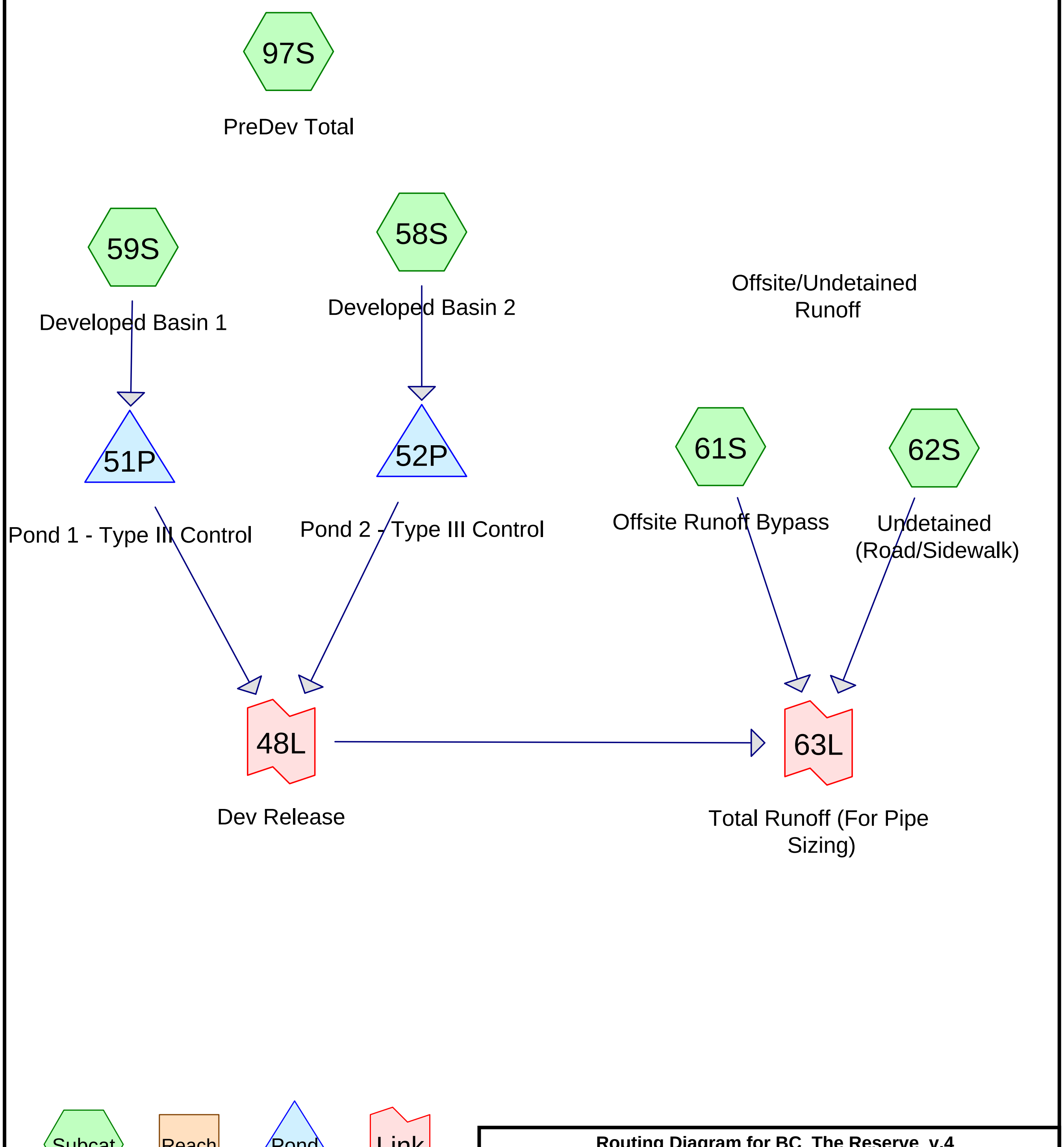
5826 Battle Creek Rd SE		
8S/3W-13C TL 900		
Geologic Assessment		
City Slope Hazard Map		
NGS, Inc.	November 2019	Figure 5



BATTLE CREEK RD SE
LANDON ST SE
RESIDENCE
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION
6.10.2019
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com
CHRIS ANDERSON
BATTLECREEK & LANDAU SUBDIVISION
BATTLECREEK & LANDAU SUBDIVISION
DRAWING
PRELIM
JOB NUMBER
3063.0000.0
DSN. JW
DRN. AK
CKD. JW
DATE: 6.10.2019
NO. DATE DESCRIPTION BY
REVISIONS
VERIFY SCALE
0 25 50 100
(feet)
5826 Battle Creek Rd SE
8S/3W-13C TL 900
Geologic Assessment
Proposed Development
NGS, Inc.
November 2019
Figure 6

APPENDIX D

HYDROCAD SUMMARIES



Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021
HydroCAD® 10.00-24 s/n 07289 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 97S: PreDev Total

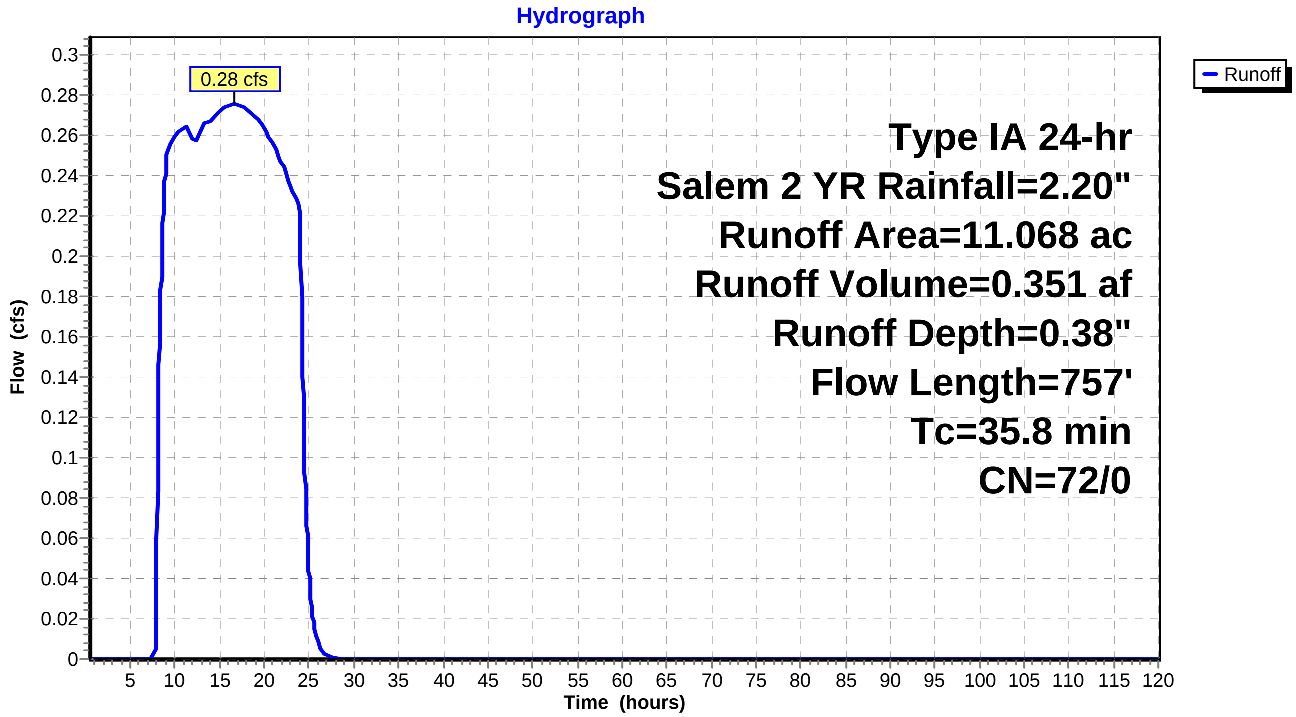
Runoff = 0.28 cfs @ 16.63 hrs, Volume= 0.351 af, Depth= 0.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

Area (ac)	CN	Description
11.068	72	Woods/grass comb., Good, HSG C
11.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 97S: PreDev Total



Summary for Subcatchment 97S: PreDev Total

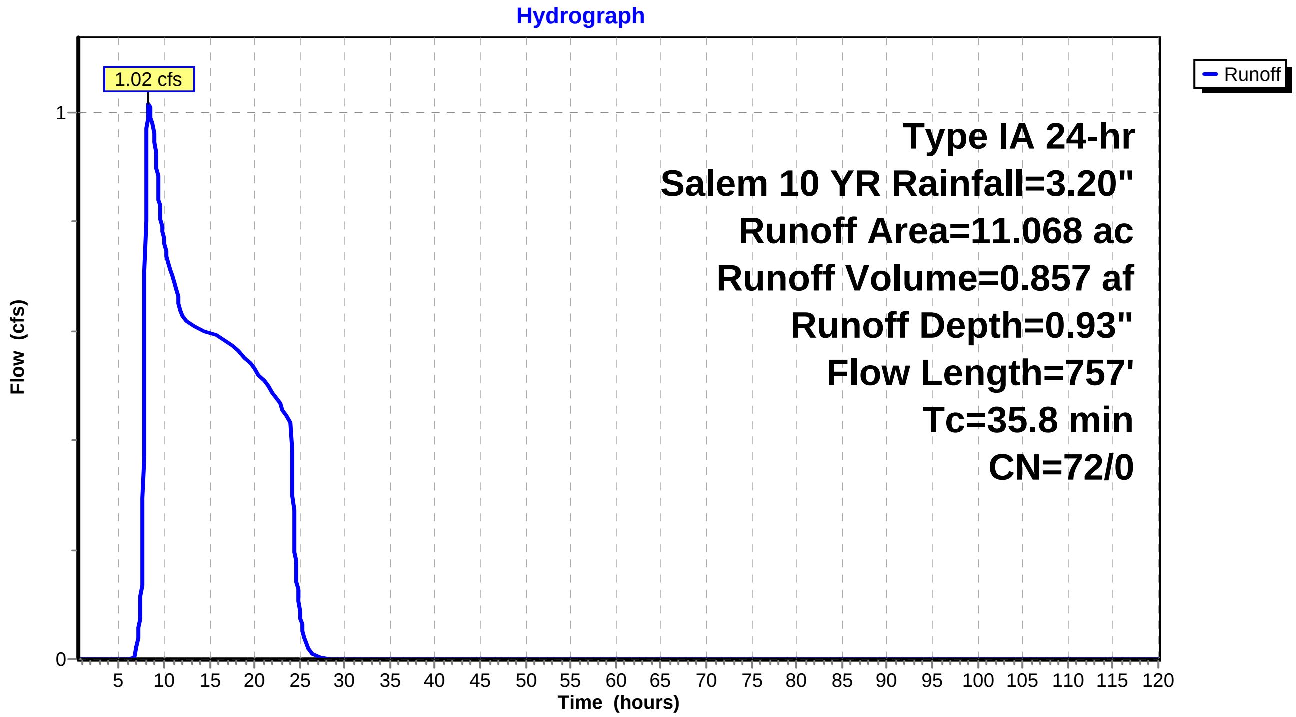
Runoff = 1.02 cfs @ 8.31 hrs, Volume= 0.857 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
11.068	72	Woods/grass comb., Good, HSG C
11.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 97S: PreDev Total



Summary for Subcatchment 97S: PreDev Total

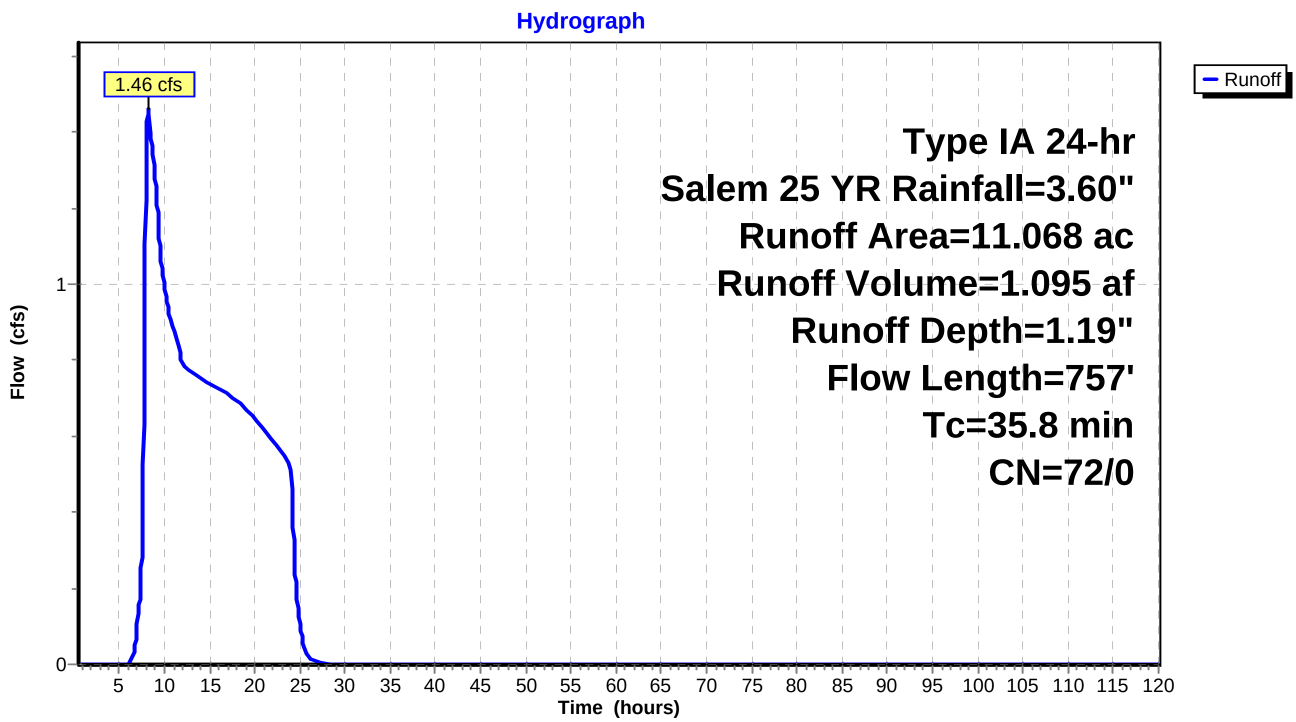
Runoff = 1.46 cfs @ 8.25 hrs, Volume= 1.095 af, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
11.068	72	Woods/grass comb., Good, HSG C
11.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 97S: PreDev Total



Summary for Subcatchment 97S: PreDev Total

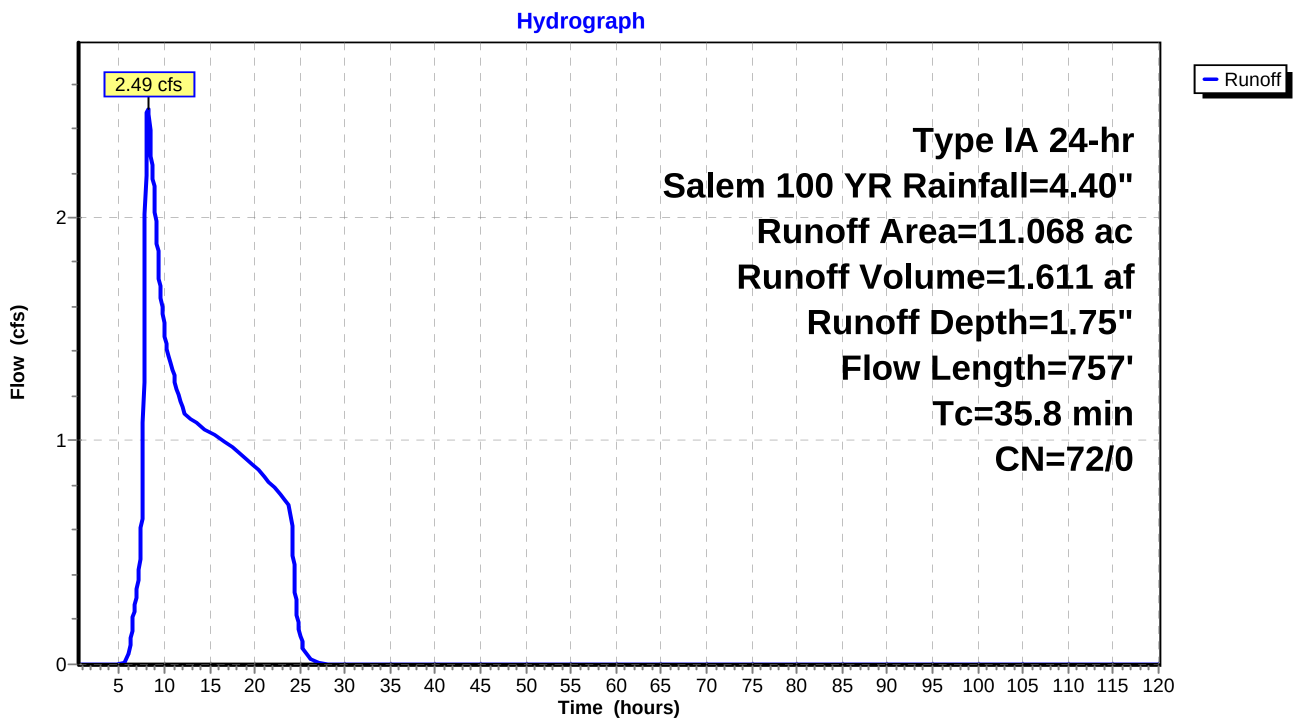
Runoff = 2.49 cfs @ 8.18 hrs, Volume= 1.611 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
11.068	72	Woods/grass comb., Good, HSG C
11.068		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 97S: PreDev Total



Summary for Subcatchment 59S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

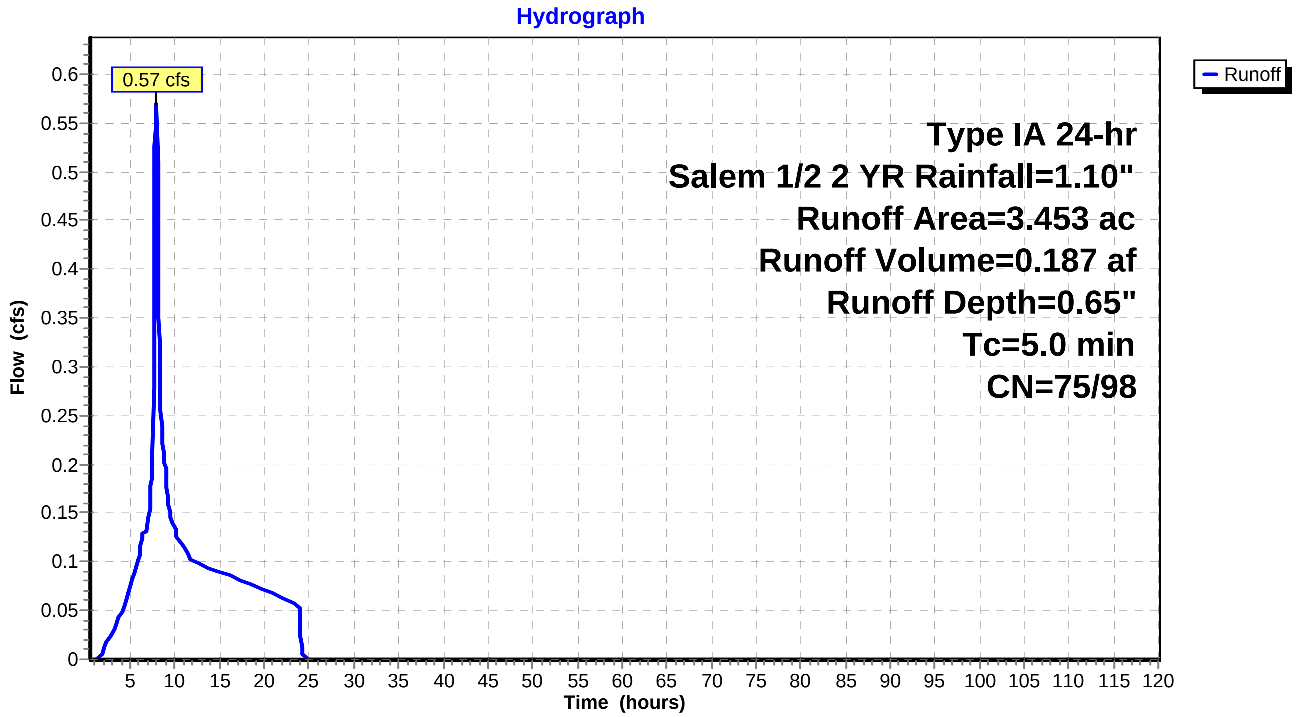
Runoff = 0.57 cfs @ 7.92 hrs, Volume= 0.187 af, Depth= 0.65"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 59S: Developed Basin 1



Summary for Subcatchment 58S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

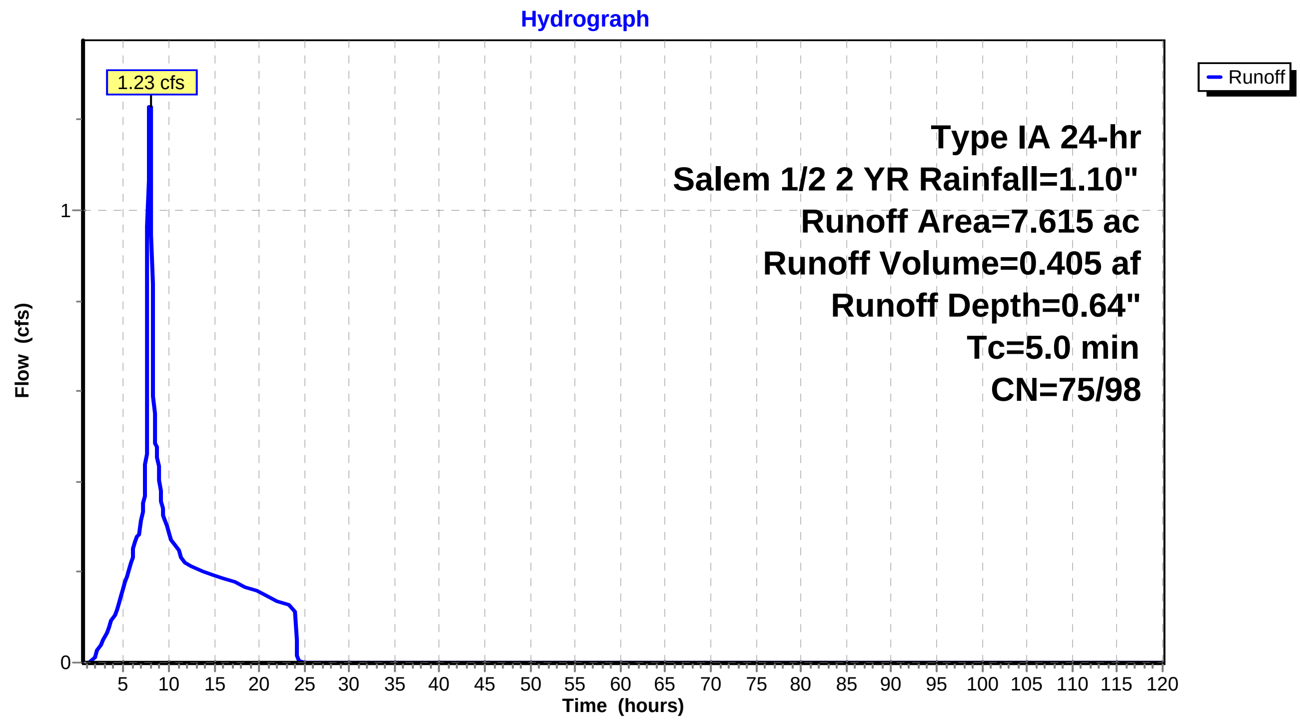
Runoff = 1.23 cfs @ 7.92 hrs, Volume= 0.405 af, Depth= 0.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 58S: Developed Basin 2



Summary for Subcatchment 59S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

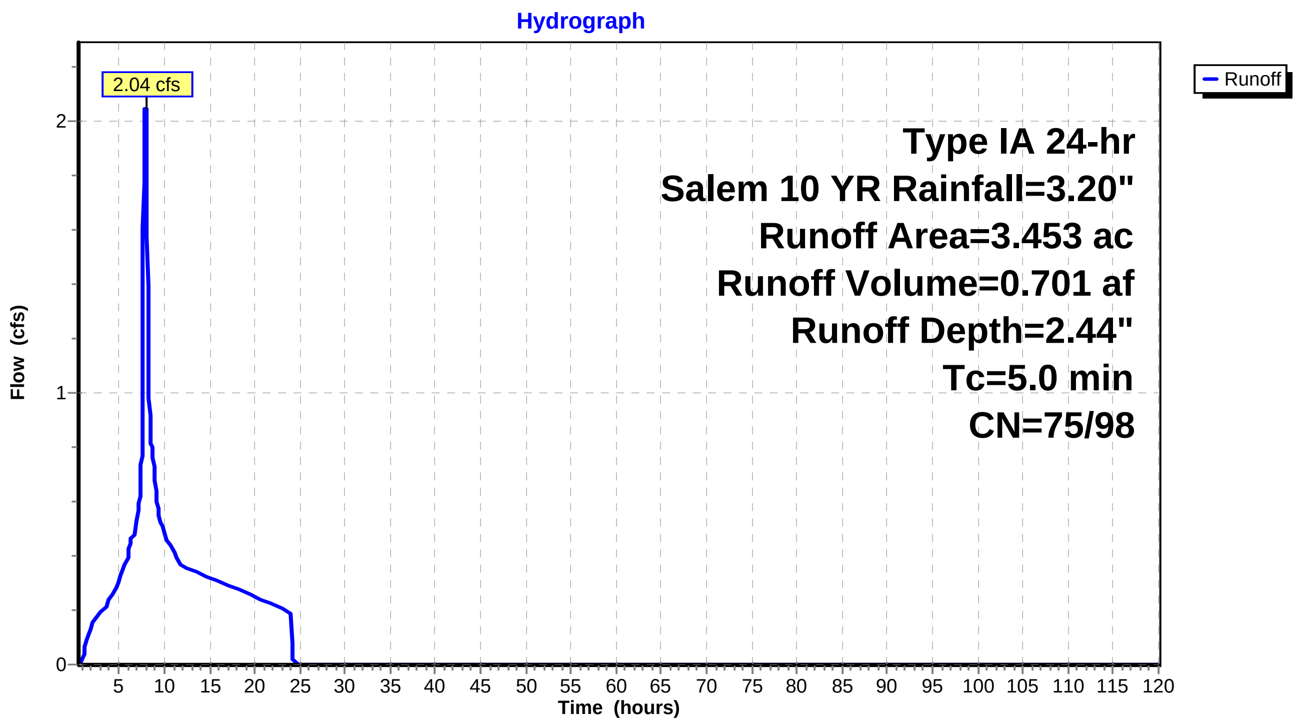
Runoff = 2.04 cfs @ 7.92 hrs, Volume= 0.701 af, Depth= 2.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 59S: Developed Basin 1



Summary for Subcatchment 58S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

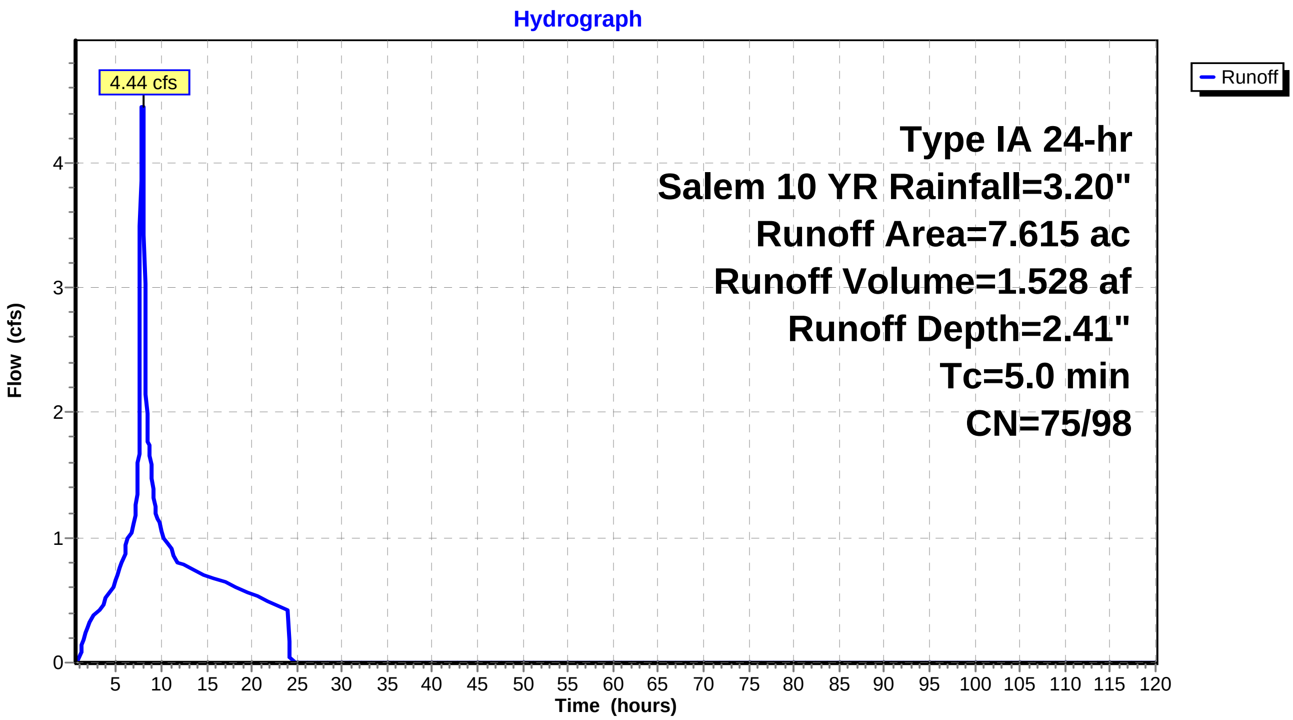
Runoff = 4.44 cfs @ 7.92 hrs, Volume= 1.528 af, Depth= 2.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 58S: Developed Basin 2



Summary for Subcatchment 59S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

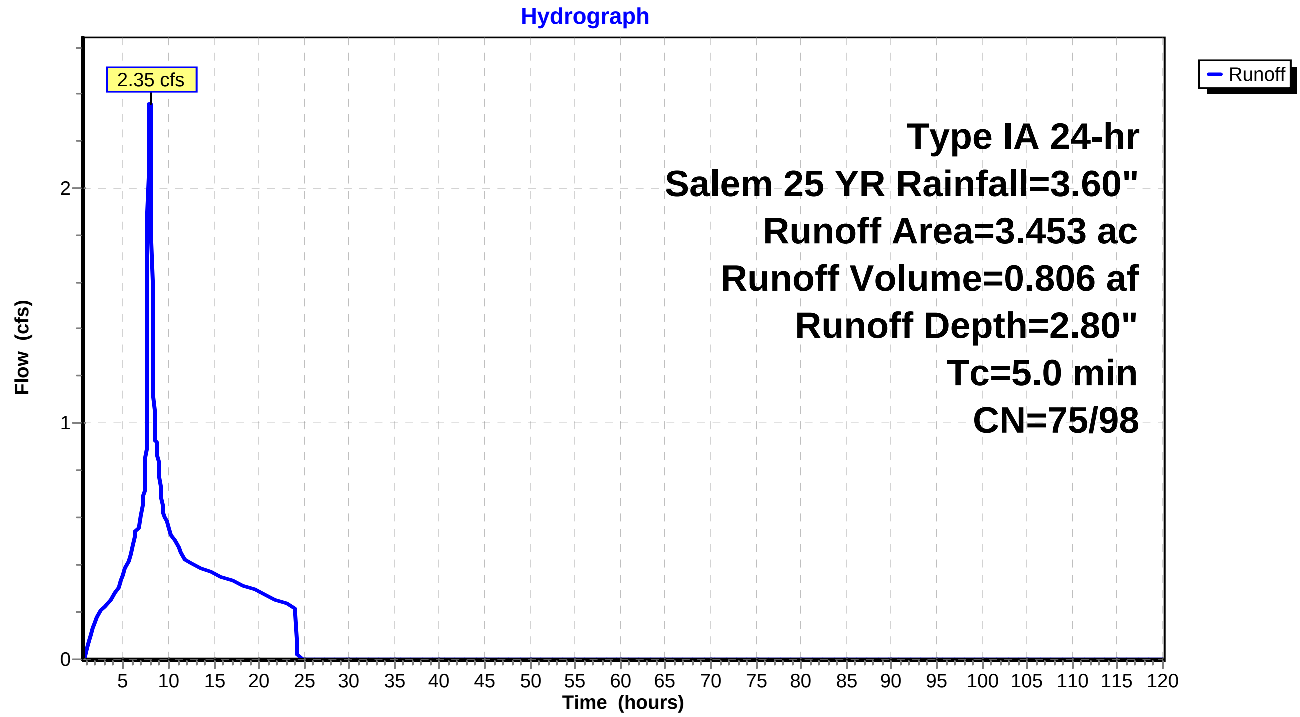
Runoff = 2.35 cfs @ 7.92 hrs, Volume= 0.806 af, Depth= 2.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 59S: Developed Basin 1



Summary for Subcatchment 58S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

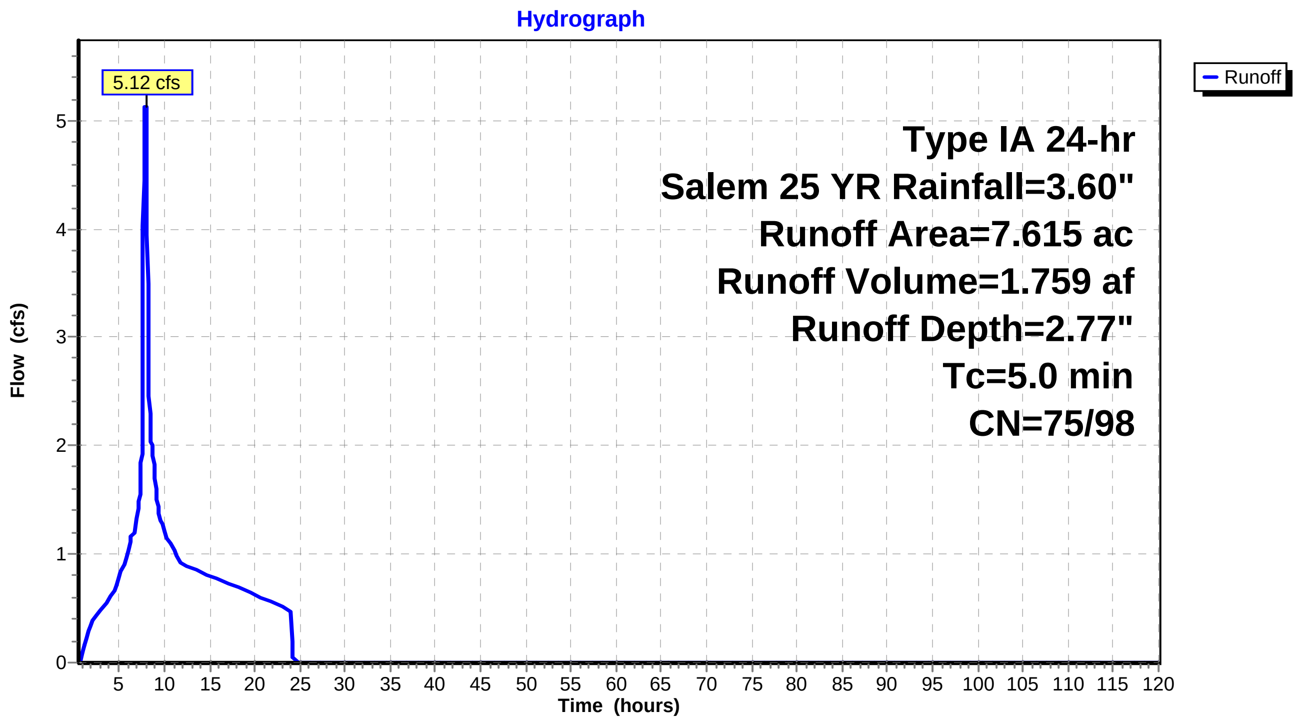
Runoff = 5.12 cfs @ 7.92 hrs, Volume= 1.759 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 58S: Developed Basin 2



Summary for Subcatchment 59S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

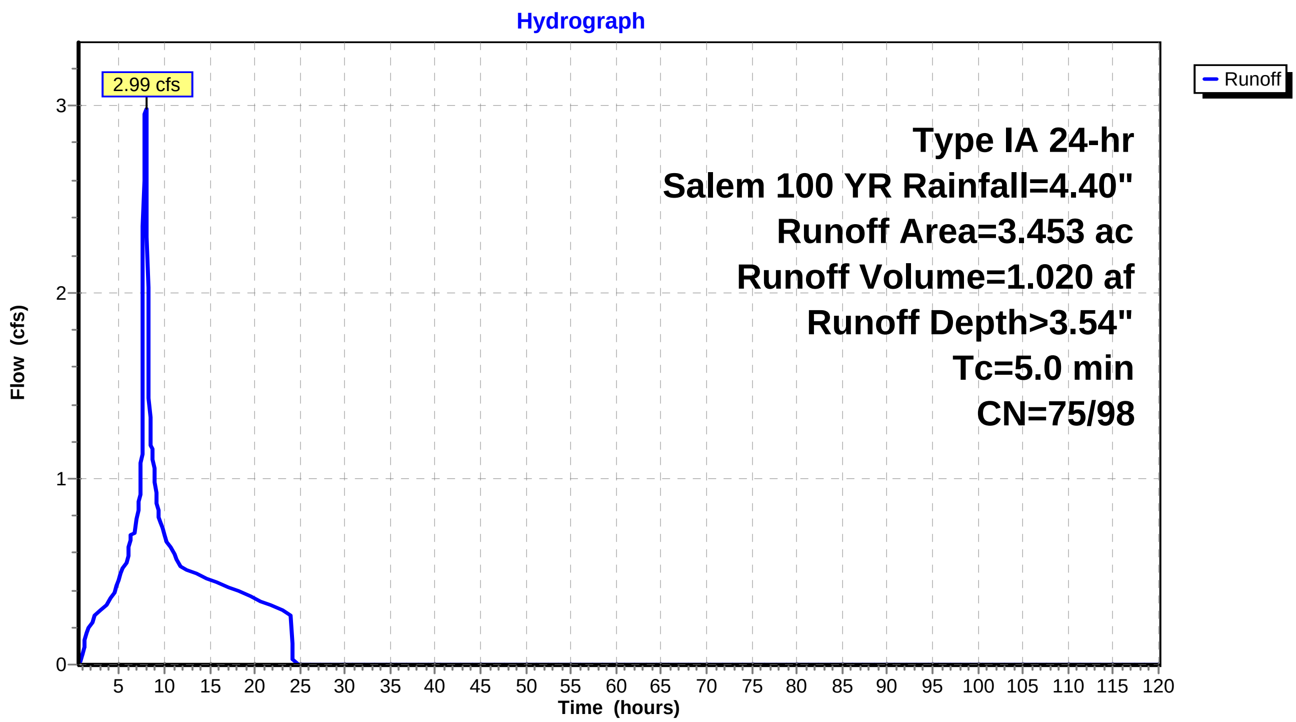
Runoff = 2.99 cfs @ 7.91 hrs, Volume= 1.020 af, Depth> 3.54"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 59S: Developed Basin 1



Summary for Subcatchment 58S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

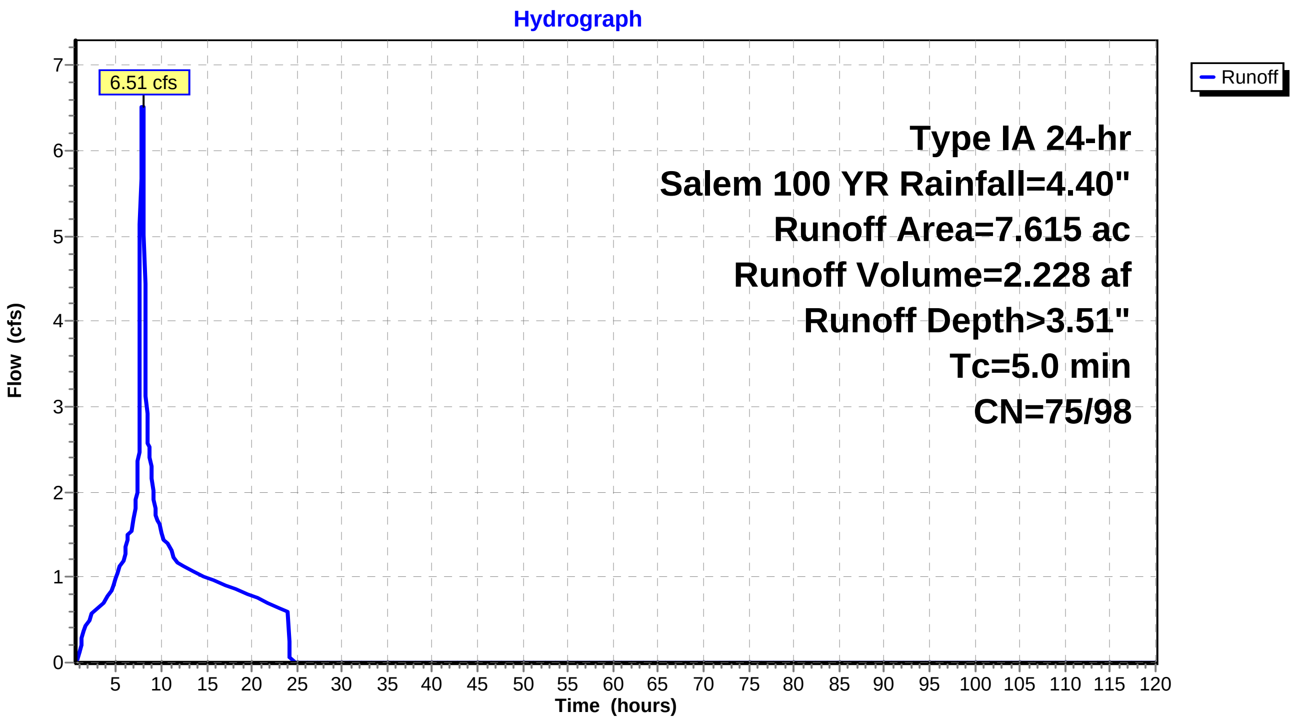
Runoff = 6.51 cfs @ 7.91 hrs, Volume= 2.228 af, Depth> 3.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 58S: Developed Basin 2



Summary for Subcatchment 59S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

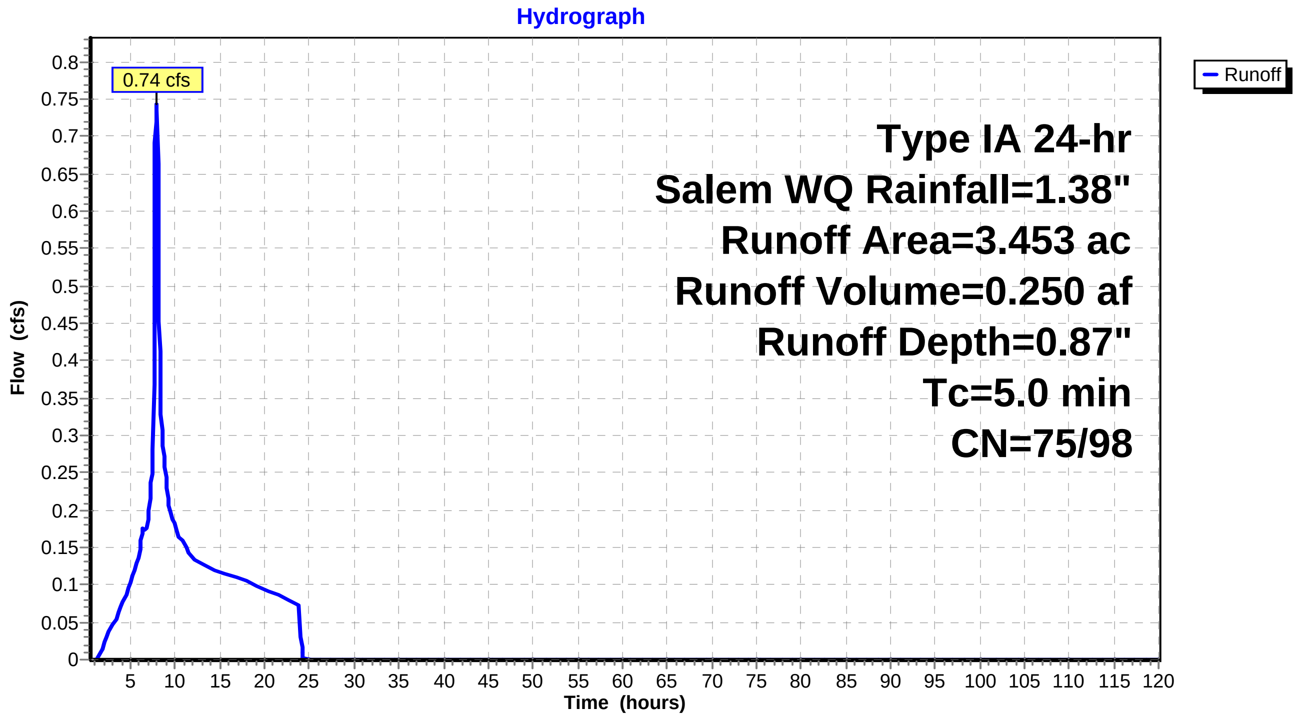
Runoff = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af, Depth= 0.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 59S: Developed Basin 1



Summary for Subcatchment 58S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

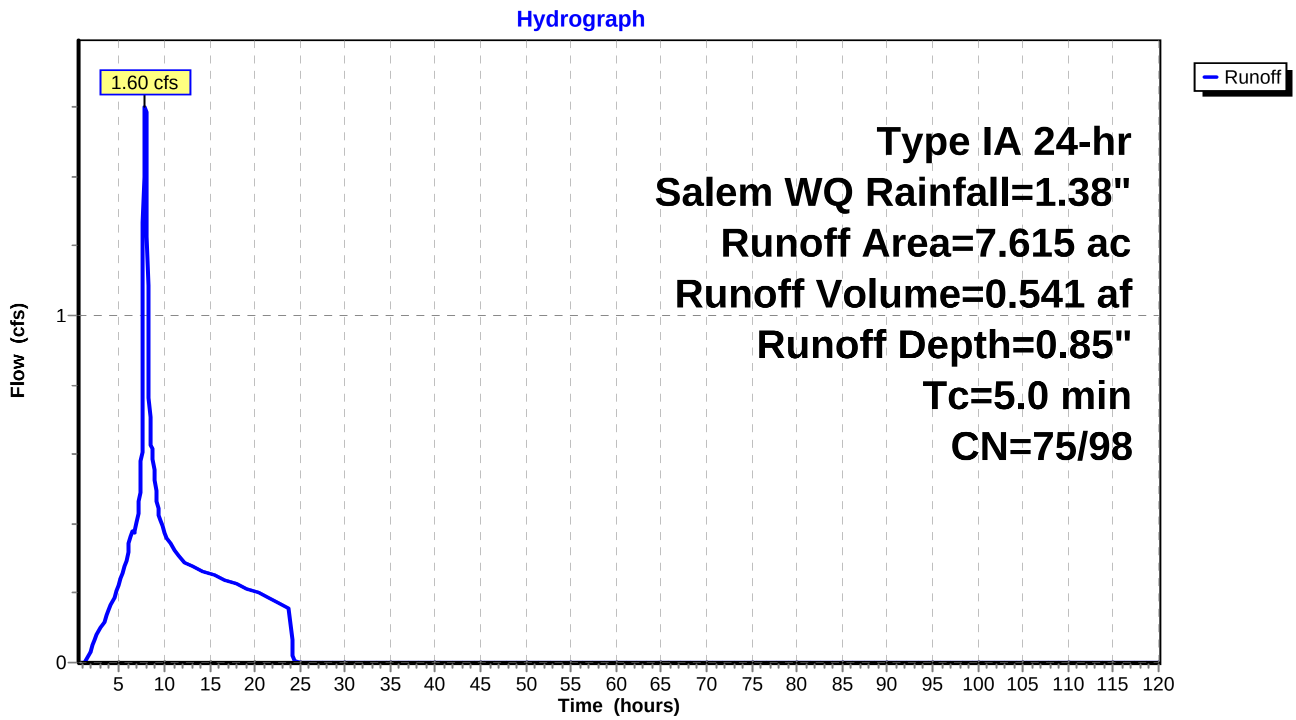
Runoff = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af, Depth= 0.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 58S: Developed Basin 2



Summary for Pond 51P: Pond 1 - Type III Control

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth = 0.65" for Salem 1/2 2 YR event
Inflow = 0.57 cfs @ 7.92 hrs, Volume= 0.187 af
Outflow = 0.06 cfs @ 22.94 hrs, Volume= 0.187 af, Atten= 90%, Lag= 901.5 min
Discarded = 0.04 cfs @ 4.50 hrs, Volume= 0.168 af
Primary = 0.02 cfs @ 22.94 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 445.11' @ 22.94 hrs Surf.Area= 4,550 sf Storage= 4,752 cf

Plug-Flow detention time= 1,075.8 min calculated for 0.187 af (100% of inflow)
Center-of-Mass det. time= 1,075.5 min (1,792.9 - 717.5)

Volume	Invert	Avail.Storage	Storage Description
#1	442.50'	22,394 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

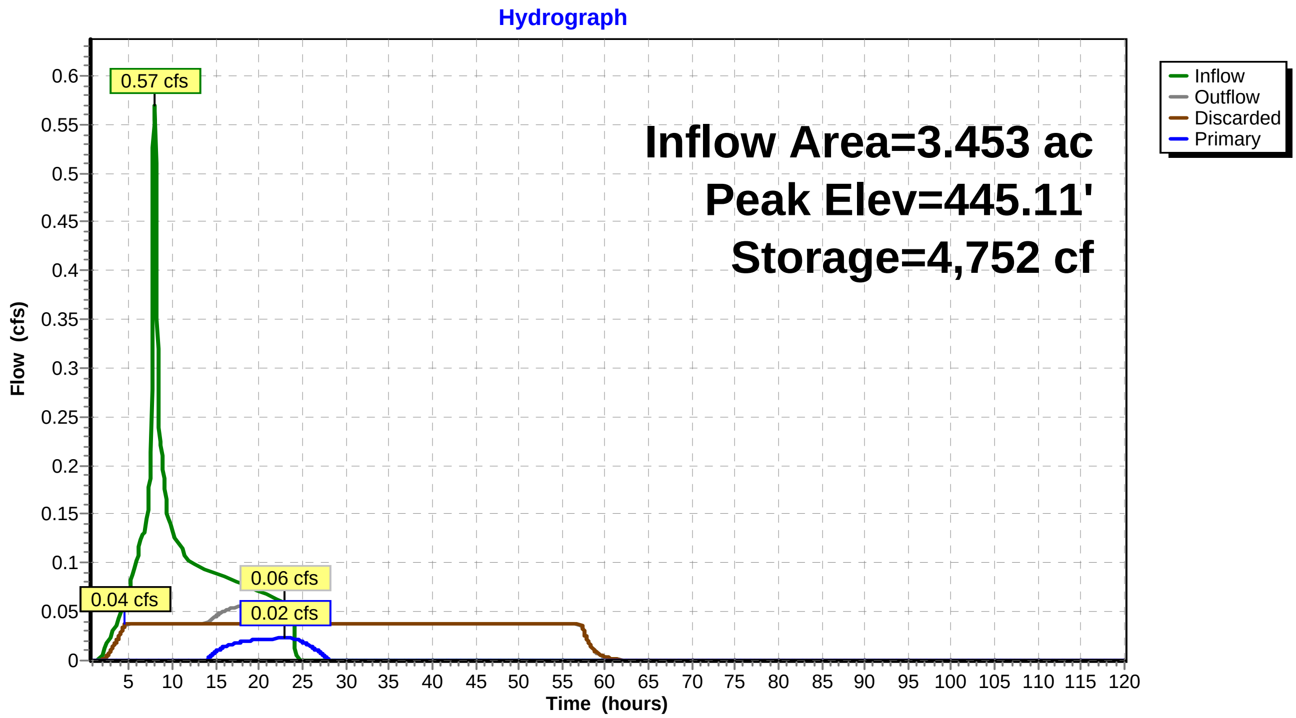
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
442.50	4,550	0.0	0	0	4,550
446.50	4,550	40.0	7,280	7,280	5,506
448.00	3,750	0.1	6	7,286	6,377
449.00	4,550	100.0	4,144	11,430	7,208
450.00	5,420	100.0	4,979	16,408	8,114
451.00	6,570	100.0	5,986	22,394	9,296

Device	Routing	Invert	Outlet Devices
#1	Discarded	442.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	444.70'	**1.2" Vert. Orifice/Grate** C= 0.600
#3	Primary	447.30'	**1.6" Vert. Orifice/Grate** C= 0.600
#4	Primary	450.40'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 4.50 hrs HW=442.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.02 cfs @ 22.94 hrs HW=445.11' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 2.89 fps)
├─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 51P: Pond 1 - Type III Control



Summary for Pond 52P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 0.64" for Salem 1/2 2 YR event
Inflow = 1.23 cfs @ 7.92 hrs, Volume= 0.405 af
Outflow = 0.16 cfs @ 19.69 hrs, Volume= 0.405 af, Atten= 87%, Lag= 706.7 min
Discarded = 0.05 cfs @ 3.85 hrs, Volume= 0.274 af
Primary = 0.11 cfs @ 19.69 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 411.13' @ 19.69 hrs Surf.Area= 6,375 sf Storage= 9,268 cf

Plug-Flow detention time= 1,076.9 min calculated for 0.405 af (100% of inflow)
Center-of-Mass det. time= 1,077.6 min (1,795.8 - 718.1)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

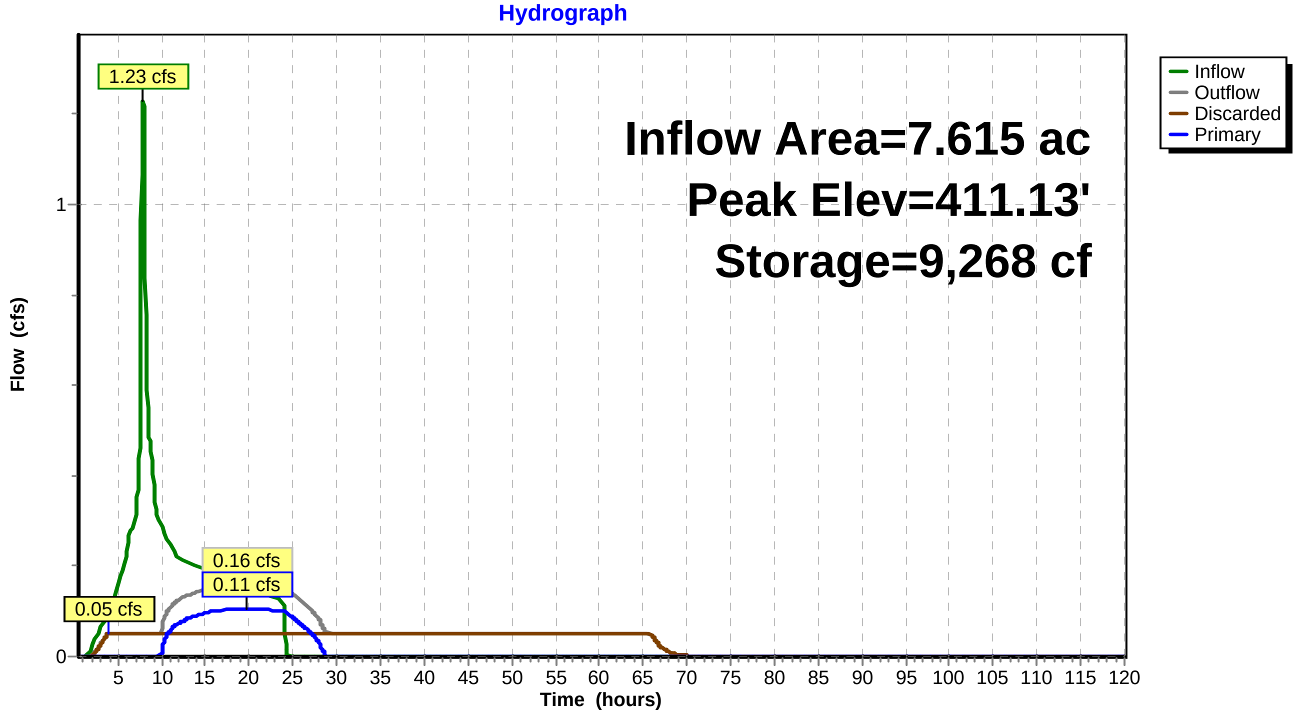
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 3.85 hrs HW=407.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.11 cfs @ 19.69 hrs HW=411.13' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.11 cfs @ 4.40 fps)
├─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 52P: Pond 2 - Type III Control



Summary for Pond 51P: Pond 1 - Type III Control

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth = 2.44" for Salem 10 YR event
Inflow = 2.04 cfs @ 7.92 hrs, Volume= 0.701 af
Outflow = 0.24 cfs @ 20.72 hrs, Volume= 0.701 af, Atten= 88%, Lag= 768.2 min
Discarded = 0.04 cfs @ 20.72 hrs, Volume= 0.249 af
Primary = 0.20 cfs @ 20.72 hrs, Volume= 0.452 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 450.00' @ 20.72 hrs Surf.Area= 5,419 sf Storage= 16,401 cf

Plug-Flow detention time= 1,049.1 min calculated for 0.701 af (100% of inflow)
Center-of-Mass det. time= 1,050.1 min (1,740.8 - 690.7)

Volume	Invert	Avail.Storage	Storage Description
#1	442.50'	22,394 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

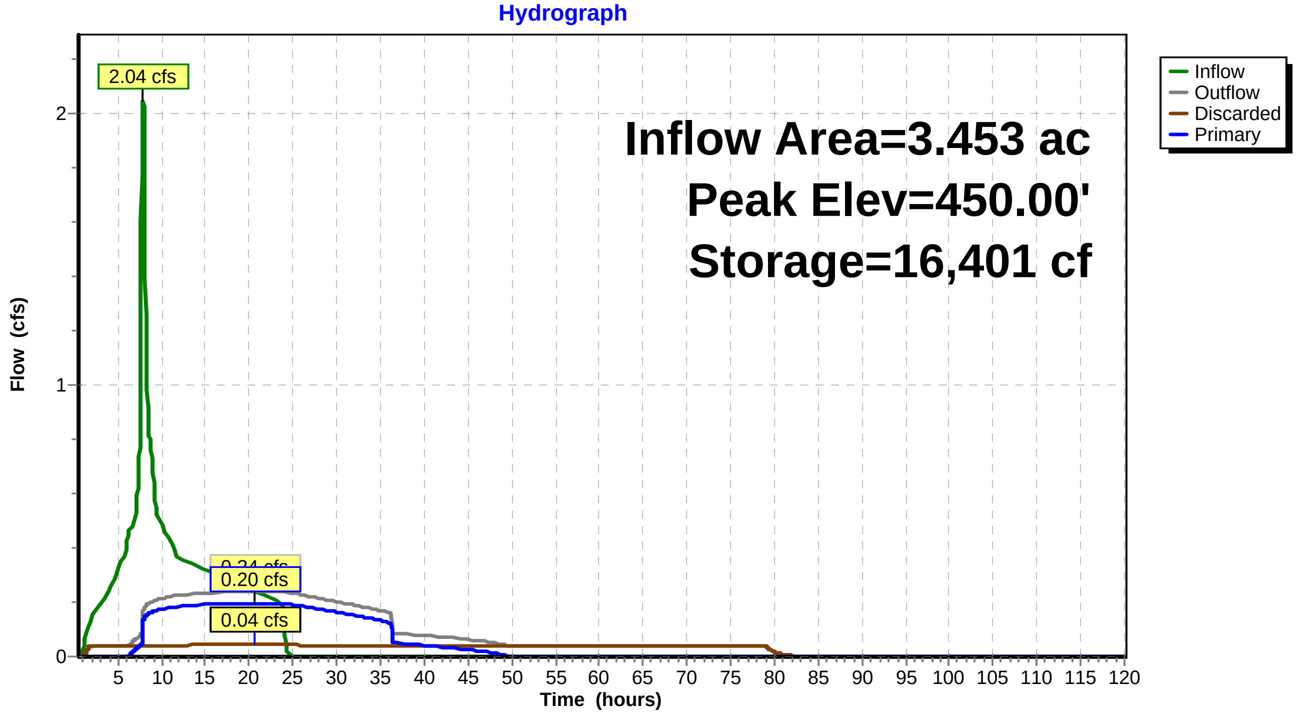
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
442.50	4,550	0.0	0	0	4,550
446.50	4,550	40.0	7,280	7,280	5,506
448.00	3,750	0.1	6	7,286	6,377
449.00	4,550	100.0	4,144	11,430	7,208
450.00	5,420	100.0	4,979	16,408	8,114
451.00	6,570	100.0	5,986	22,394	9,296

Device	Routing	Invert	Outlet Devices
#1	Discarded	442.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	444.70'	**1.2" Vert. Orifice/Grate** C= 0.600
#3	Primary	447.30'	**1.6" Vert. Orifice/Grate** C= 0.600
#4	Primary	450.40'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 20.72 hrs HW=450.00' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.20 cfs @ 20.72 hrs HW=450.00' (Free Discharge)
├—**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 11.03 fps)
├—**3=Orifice/Grate** (Orifice Controls 0.11 cfs @ 7.81 fps)
└—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 51P: Pond 1 - Type III Control



Summary for Pond 52P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 2.41" for Salem 10 YR event
Inflow = 4.44 cfs @ 7.92 hrs, Volume= 1.528 af
Outflow = 0.81 cfs @ 11.67 hrs, Volume= 1.528 af, Atten= 82%, Lag= 224.8 min
Discarded = 0.06 cfs @ 11.67 hrs, Volume= 0.322 af
Primary = 0.75 cfs @ 11.67 hrs, Volume= 1.206 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 415.36' @ 11.67 hrs Surf.Area= 7,730 sf Storage= 25,681 cf

Plug-Flow detention time= 609.6 min calculated for 1.528 af (100% of inflow)
Center-of-Mass det. time= 609.3 min (1,301.6 - 692.3)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

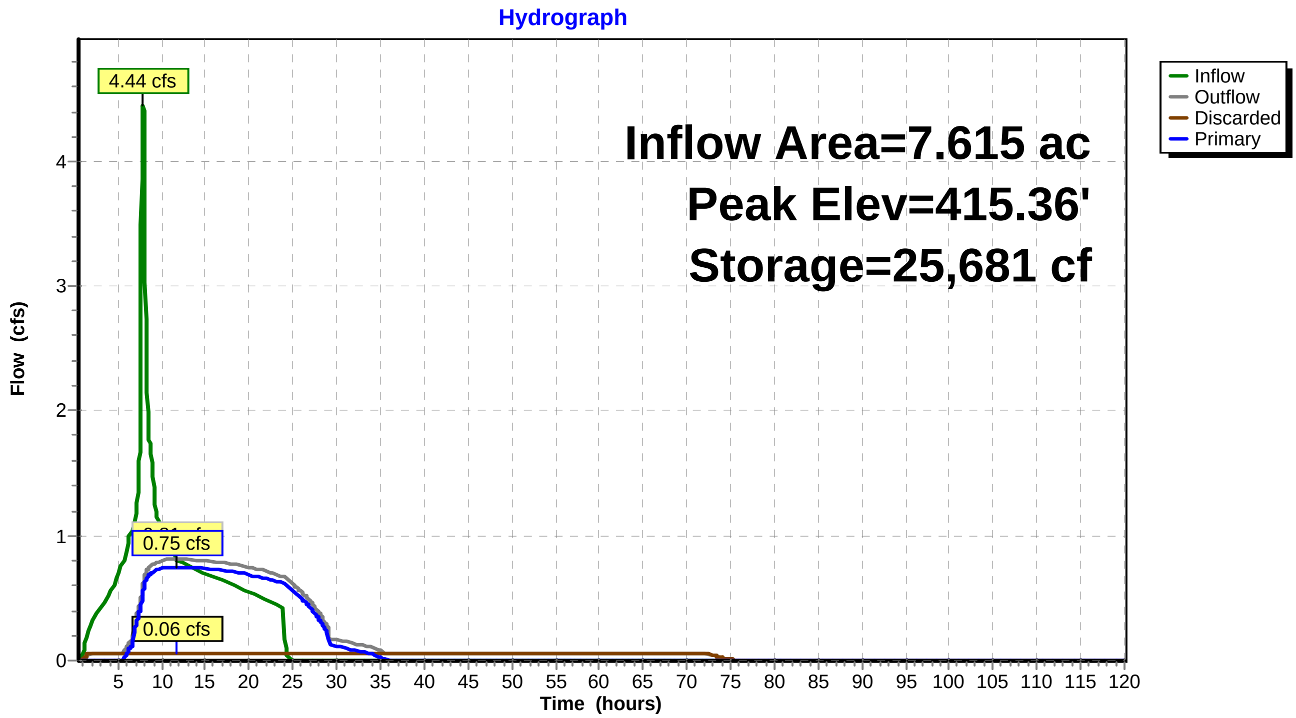
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 11.67 hrs HW=415.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.75 cfs @ 11.67 hrs HW=415.36' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 10.83 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.49 cfs @ 7.32 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 52P: Pond 2 - Type III Control



Summary for Pond 51P: Pond 1 - Type III Control

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth = 2.80" for Salem 25 YR event
Inflow = 2.35 cfs @ 7.92 hrs, Volume= 0.806 af
Outflow = 0.32 cfs @ 17.82 hrs, Volume= 0.806 af, Atten= 86%, Lag= 594.0 min
Discarded = 0.05 cfs @ 17.82 hrs, Volume= 0.265 af
Primary = 0.27 cfs @ 17.82 hrs, Volume= 0.542 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 450.44' @ 17.82 hrs Surf.Area= 5,913 sf Storage= 18,904 cf

Plug-Flow detention time= 1,067.7 min calculated for 0.806 af (100% of inflow)
Center-of-Mass det. time= 1,068.8 min (1,756.9 - 688.1)

Volume	Invert	Avail.Storage	Storage Description
#1	442.50'	22,394 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

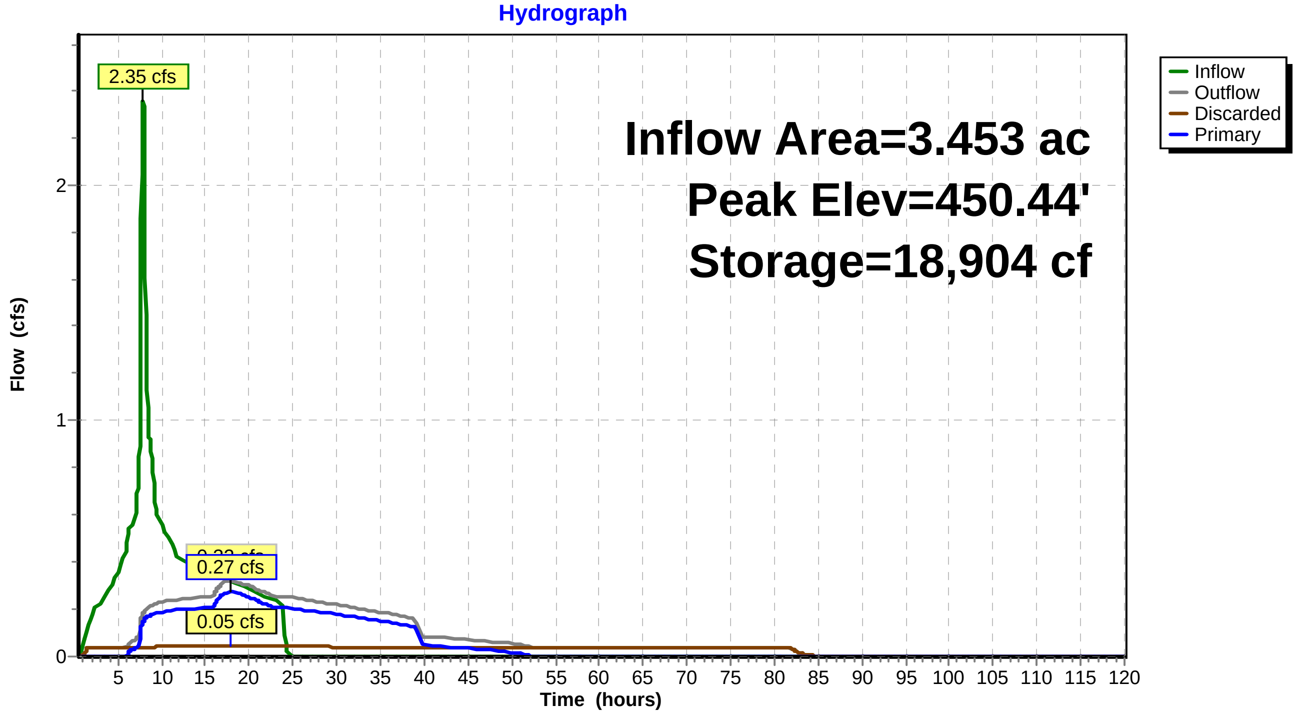
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
442.50	4,550	0.0	0	0	4,550
446.50	4,550	40.0	7,280	7,280	5,506
448.00	3,750	0.1	6	7,286	6,377
449.00	4,550	100.0	4,144	11,430	7,208
450.00	5,420	100.0	4,979	16,408	8,114
451.00	6,570	100.0	5,986	22,394	9,296

Device	Routing	Invert	Outlet Devices
#1	Discarded	442.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	444.70'	**1.2" Vert. Orifice/Grate** C= 0.600
#3	Primary	447.30'	**1.6" Vert. Orifice/Grate** C= 0.600
#4	Primary	450.40'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 17.82 hrs HW=450.44' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.25 cfs @ 17.82 hrs HW=450.44' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 11.49 fps)
├**3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 8.44 fps)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.56 fps)

Pond 51P: Pond 1 - Type III Control



Summary for Pond 52P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 2.77" for Salem 25 YR event
Inflow = 5.12 cfs @ 7.92 hrs, Volume= 1.759 af
Outflow = 1.12 cfs @ 10.38 hrs, Volume= 1.759 af, Atten= 78%, Lag= 148.0 min
Discarded = 0.07 cfs @ 10.38 hrs, Volume= 0.333 af
Primary = 1.06 cfs @ 10.38 hrs, Volume= 1.426 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 415.73' @ 10.38 hrs Surf.Area= 8,114 sf Storage= 28,575 cf

Plug-Flow detention time= 591.4 min calculated for 1.758 af (100% of inflow)
Center-of-Mass det. time= 592.5 min (1,282.2 - 689.7)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

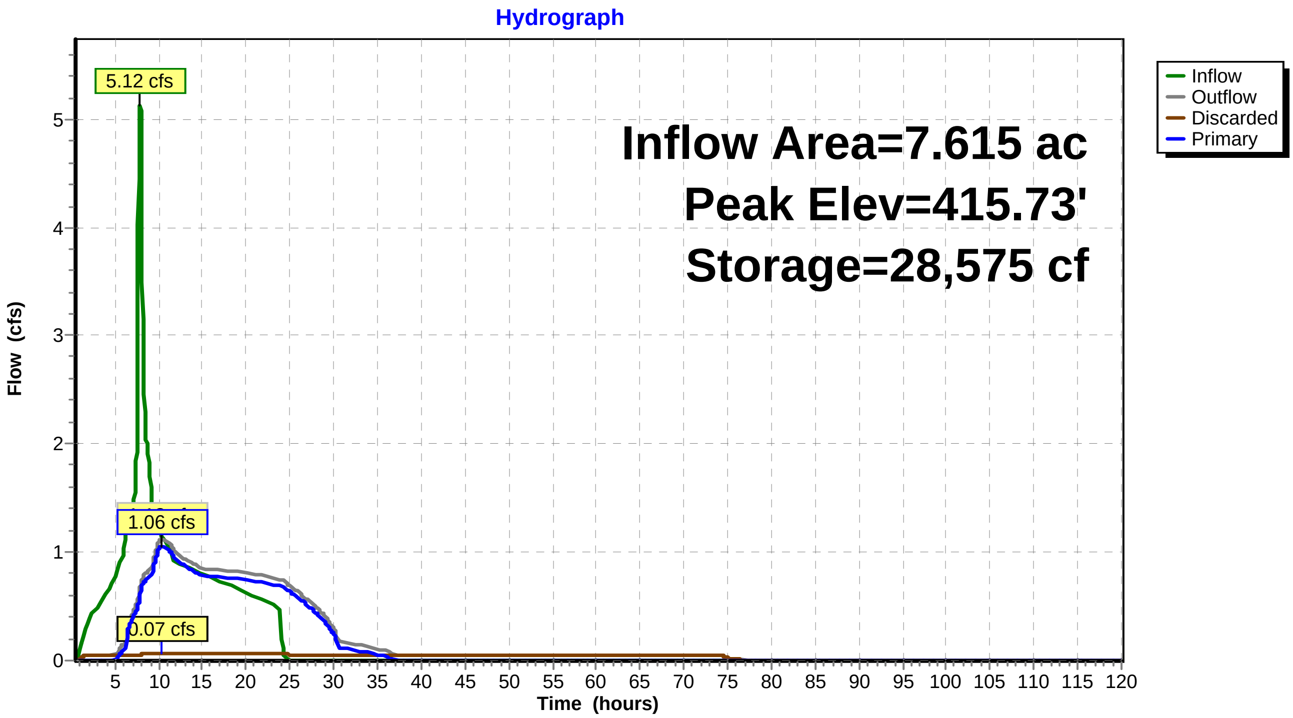
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 10.38 hrs HW=415.73' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.04 cfs @ 10.38 hrs HW=415.73' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 11.21 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.53 cfs @ 7.88 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.99 fps)

Pond 52P: Pond 2 - Type III Control



Summary for Pond 51P: Pond 1 - Type III Control

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth > 3.54" for Salem 100 YR event
Inflow = 2.99 cfs @ 7.91 hrs, Volume= 1.020 af
Outflow = 0.61 cfs @ 11.03 hrs, Volume= 1.020 af, Atten= 80%, Lag= 187.3 min
Discarded = 0.05 cfs @ 11.03 hrs, Volume= 0.269 af
Primary = 0.56 cfs @ 11.03 hrs, Volume= 0.751 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 450.55' @ 11.03 hrs Surf.Area= 6,044 sf Storage= 19,584 cf

Plug-Flow detention time= 890.4 min calculated for 1.019 af (100% of inflow)
Center-of-Mass det. time= 891.6 min (1,575.4 - 683.8)

Volume	Invert	Avail.Storage	Storage Description
#1	442.50'	22,394 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

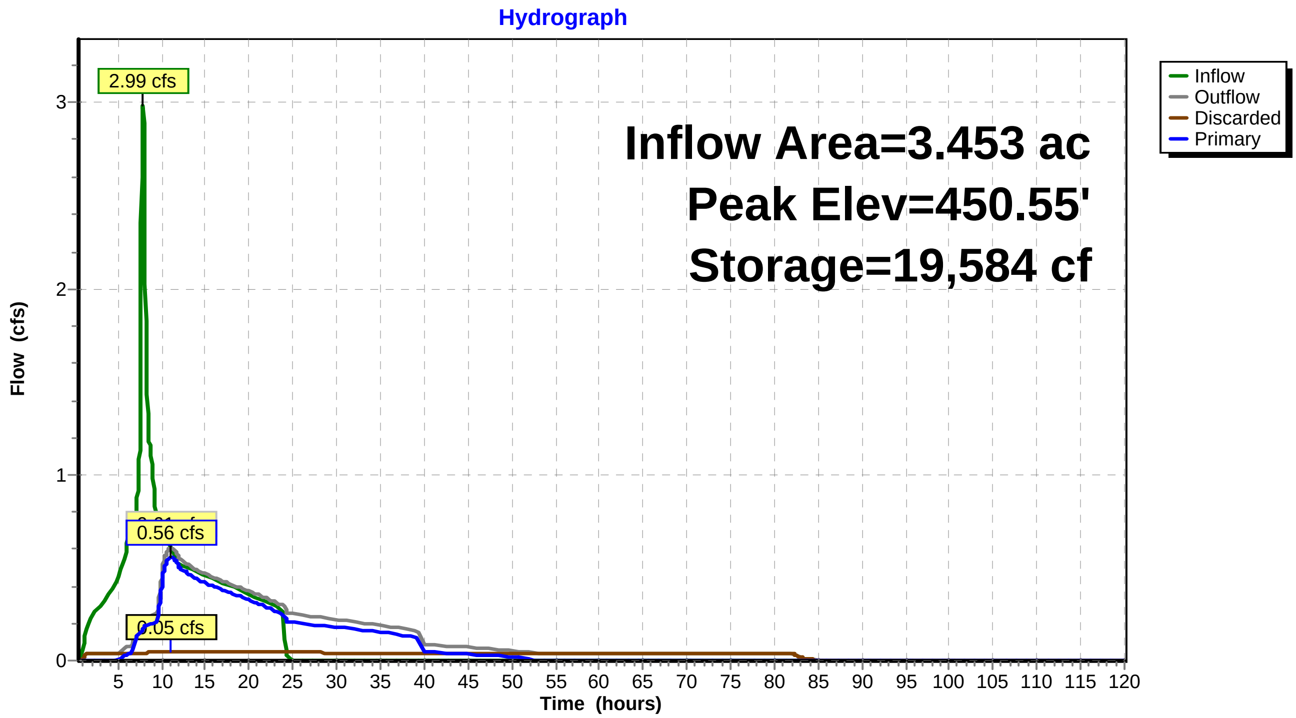
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
442.50	4,550	0.0	0	0	4,550
446.50	4,550	40.0	7,280	7,280	5,506
448.00	3,750	0.1	6	7,286	6,377
449.00	4,550	100.0	4,144	11,430	7,208
450.00	5,420	100.0	4,979	16,408	8,114
451.00	6,570	100.0	5,986	22,394	9,296

Device	Routing	Invert	Outlet Devices
#1	Discarded	442.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	444.70'	**1.2" Vert. Orifice/Grate** C= 0.600
#3	Primary	447.30'	**1.6" Vert. Orifice/Grate** C= 0.600
#4	Primary	450.40'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 11.03 hrs HW=450.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.55 cfs @ 11.03 hrs HW=450.55' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 11.60 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 8.60 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 0.34 cfs @ 1.10 fps)

Pond 51P: Pond 1 - Type III Control



Summary for Pond 52P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth > 3.51" for Salem 100 YR event
Inflow = 6.51 cfs @ 7.91 hrs, Volume= 2.228 af
Outflow = 2.36 cfs @ 8.81 hrs, Volume= 2.227 af, Atten= 64%, Lag= 53.7 min
Discarded = 0.07 cfs @ 8.81 hrs, Volume= 0.343 af
Primary = 2.29 cfs @ 8.81 hrs, Volume= 1.885 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 416.00' @ 8.81 hrs Surf.Area= 8,408 sf Storage= 30,828 cf

Plug-Flow detention time= 511.7 min calculated for 2.227 af (100% of inflow)
Center-of-Mass det. time= 511.3 min (1,196.7 - 685.4)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

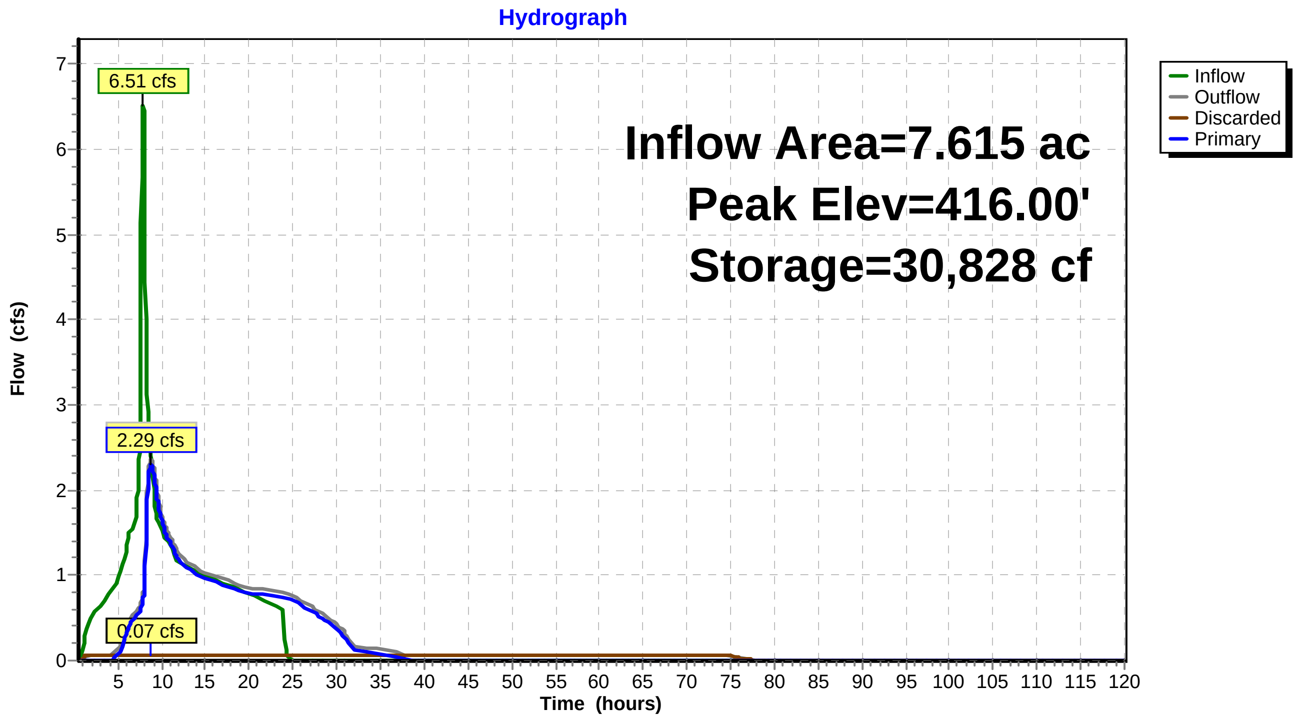
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 8.81 hrs HW=416.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.29 cfs @ 8.81 hrs HW=416.00' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.28 cfs @ 11.49 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.55 cfs @ 8.27 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.46 cfs @ 1.84 fps)

Pond 52P: Pond 2 - Type III Control



Summary for Pond 51P: Pond 1 - Type III Control

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth = 0.87" for Salem WQ event
Inflow = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af
Outflow = 0.08 cfs @ 22.96 hrs, Volume= 0.250 af, Atten= 89%, Lag= 902.9 min
Discarded = 0.04 cfs @ 3.65 hrs, Volume= 0.188 af
Primary = 0.04 cfs @ 22.96 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 445.94' @ 22.96 hrs Surf.Area= 4,550 sf Storage= 6,269 cf

Plug-Flow detention time= 1,121.2 min calculated for 0.250 af (100% of inflow)
Center-of-Mass det. time= 1,120.9 min (1,831.8 - 710.9)

Volume	Invert	Avail.Storage	Storage Description
#1	442.50'	22,394 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

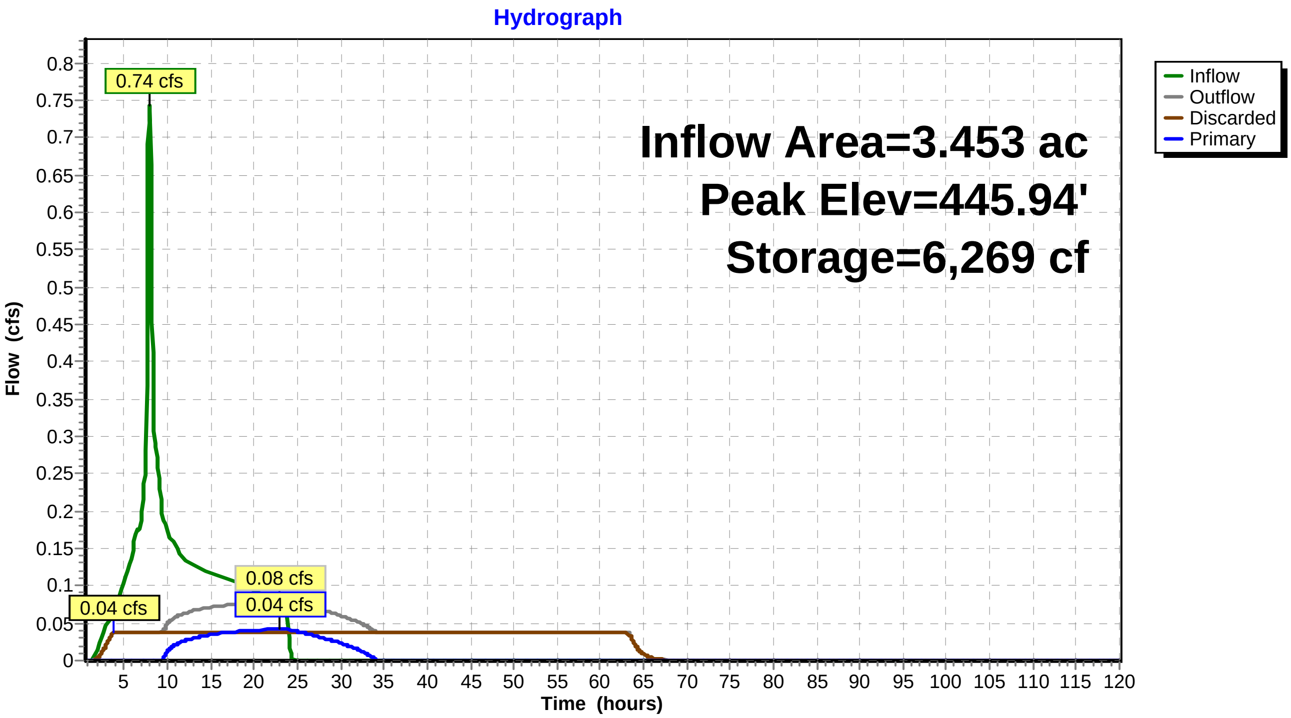
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
442.50	4,550	0.0	0	0	4,550
446.50	4,550	40.0	7,280	7,280	5,506
448.00	3,750	0.1	6	7,286	6,377
449.00	4,550	100.0	4,144	11,430	7,208
450.00	5,420	100.0	4,979	16,408	8,114
451.00	6,570	100.0	5,986	22,394	9,296

Device	Routing	Invert	Outlet Devices
#1	Discarded	442.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	444.70'	**1.2" Vert. Orifice/Grate** C= 0.600
#3	Primary	447.30'	**1.6" Vert. Orifice/Grate** C= 0.600
#4	Primary	450.40'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 3.65 hrs HW=442.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.04 cfs @ 22.96 hrs HW=445.94' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 5.26 fps)
├─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 51P: Pond 1 - Type III Control



Summary for Pond 52P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 0.85" for Salem WQ event
Inflow = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af
Outflow = 0.28 cfs @ 13.34 hrs, Volume= 0.541 af, Atten= 83%, Lag= 326.0 min
Discarded = 0.05 cfs @ 3.10 hrs, Volume= 0.285 af
Primary = 0.23 cfs @ 13.34 hrs, Volume= 0.257 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 413.03' @ 13.34 hrs Surf.Area= 5,453 sf Storage= 10,347 cf

Plug-Flow detention time= 920.8 min calculated for 0.541 af (100% of inflow)
Center-of-Mass det. time= 921.8 min (1,633.7 - 711.9)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

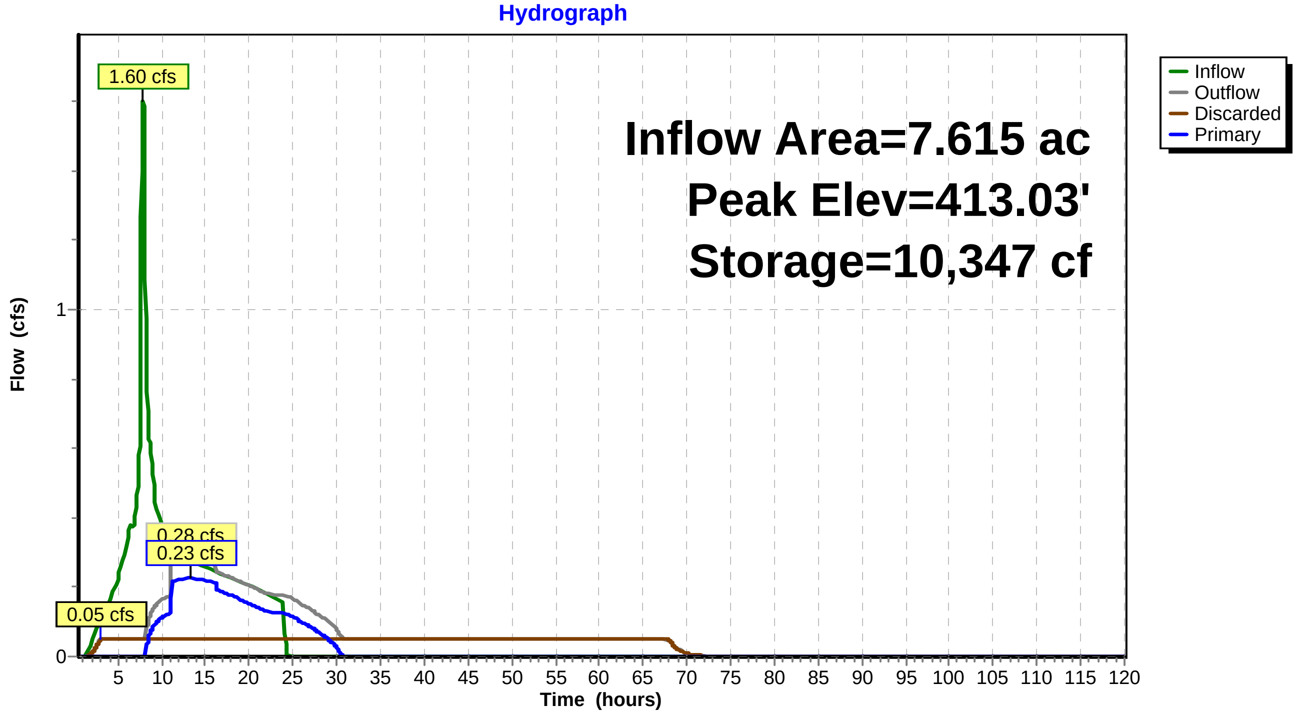
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 3.10 hrs HW=407.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.22 cfs @ 13.34 hrs HW=413.03' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 7.95 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.21 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 52P: Pond 2 - Type III Control

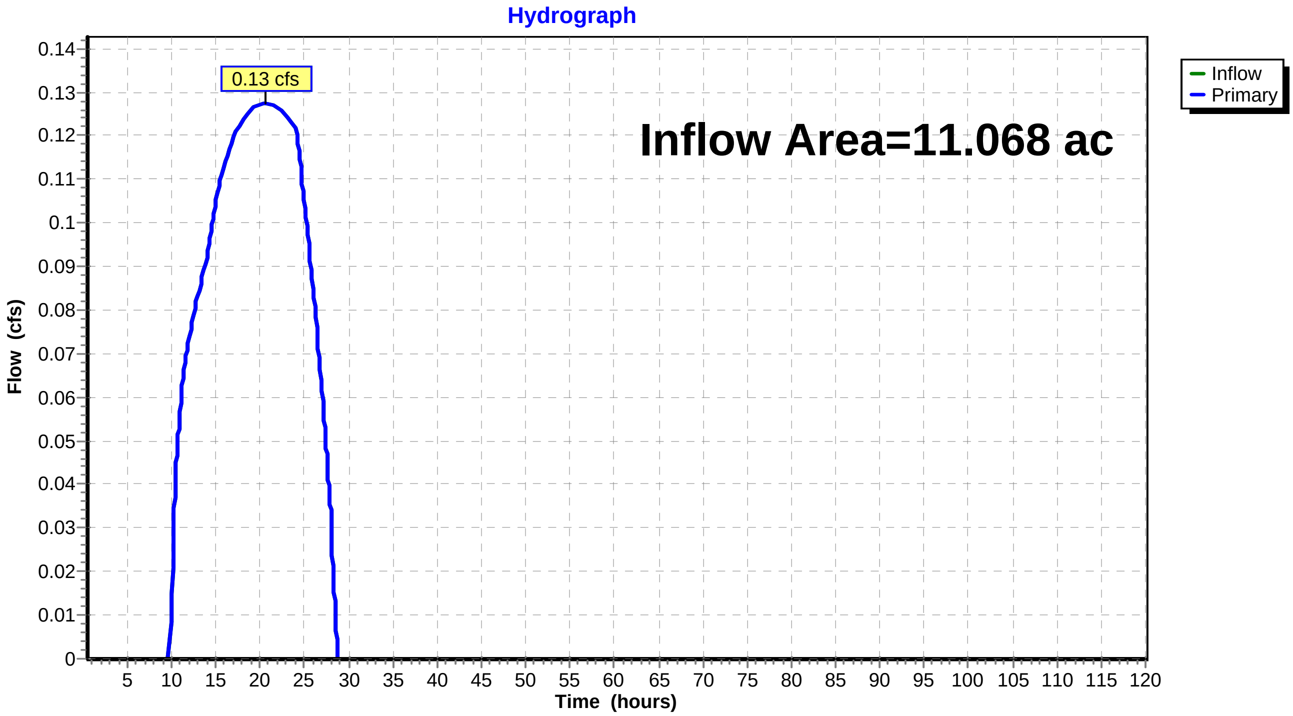


Summary for Link 48L: Dev Release

Inflow Area =	11.068 ac, 70.65% Impervious, Inflow Depth = 0.16"	for Salem 1/2 2 YR event	
Inflow =	0.13 cfs @ 20.60 hrs, Volume=	0.150 af	
Primary =	0.13 cfs @ 20.60 hrs, Volume=	0.150 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 48L: Dev Release

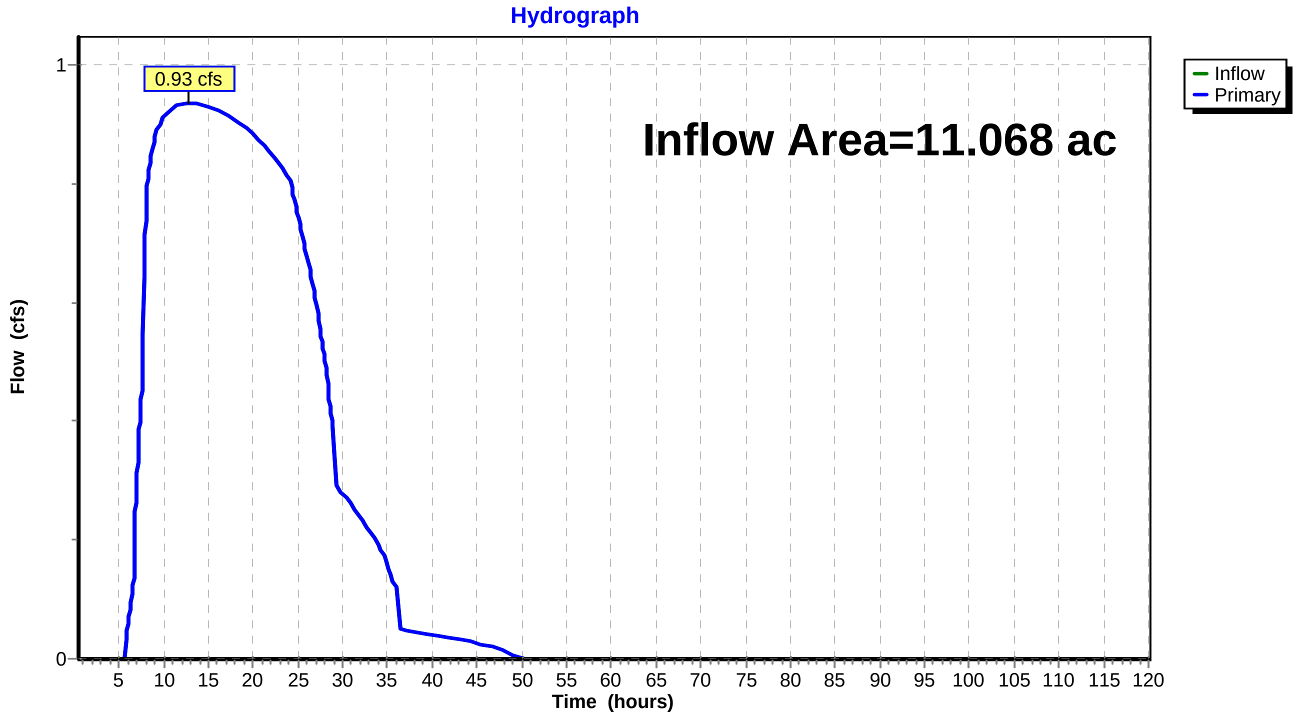


Summary for Link 48L: Dev Release

Inflow Area =	11.068 ac, 70.65% Impervious, Inflow Depth = 1.80" for Salem 10 YR event		
Inflow =	0.93 cfs @ 12.71 hrs, Volume=	1.658 af	
Primary =	0.93 cfs @ 12.71 hrs, Volume=	1.658 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 48L: Dev Release

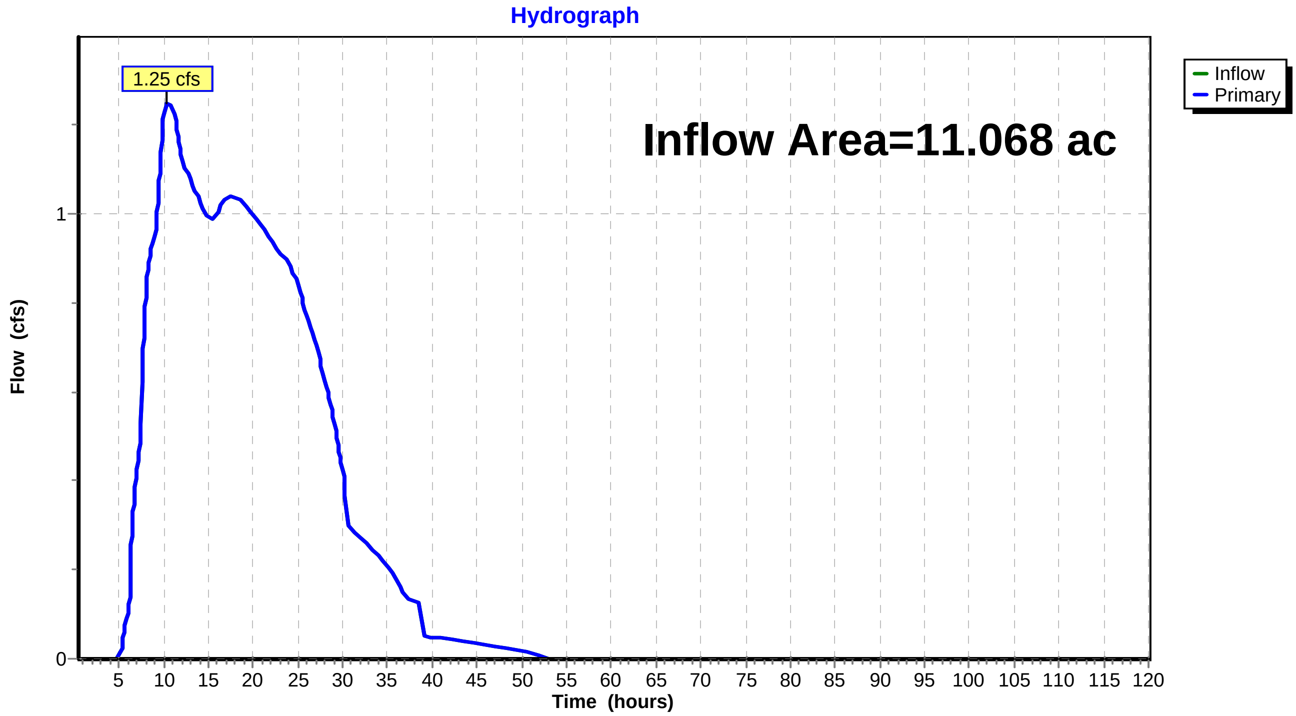


Summary for Link 48L: Dev Release

Inflow Area = 11.068 ac, 70.65% Impervious, Inflow Depth = 2.13" for Salem 25 YR event
Inflow = 1.25 cfs @ 10.41 hrs, Volume= 1.967 af
Primary = 1.25 cfs @ 10.41 hrs, Volume= 1.967 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 48L: Dev Release

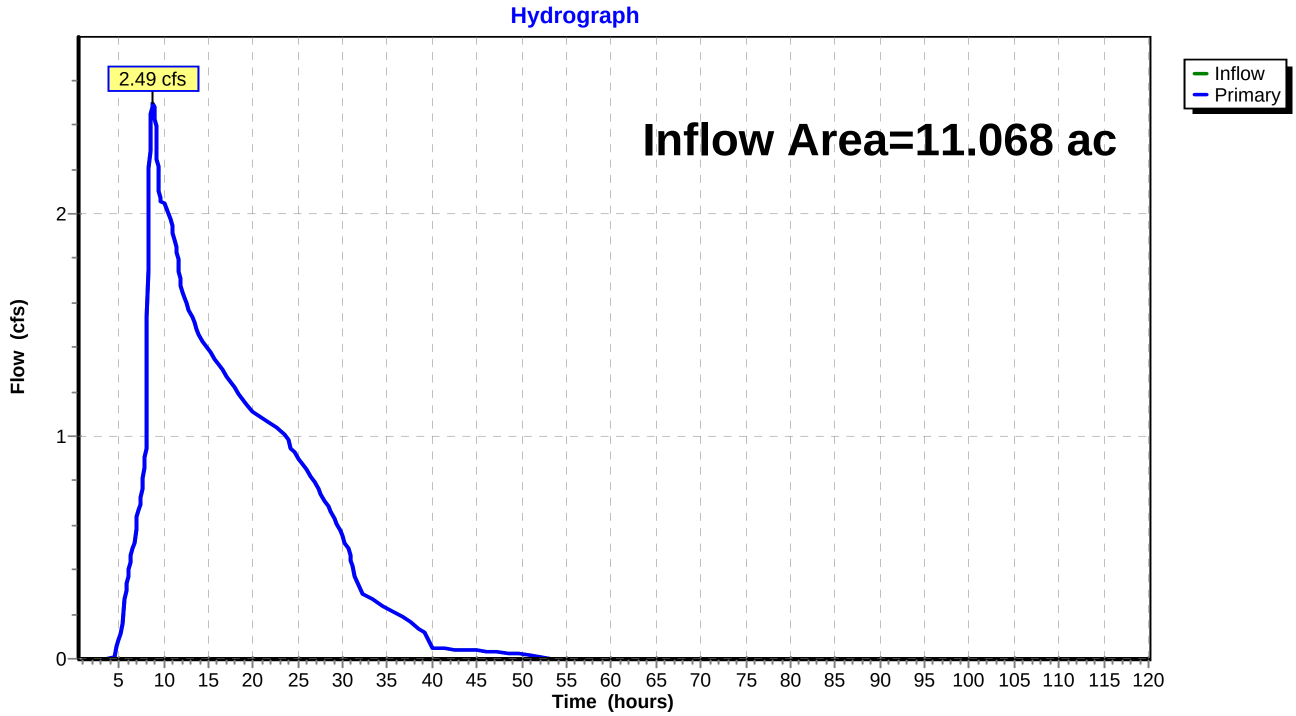


Summary for Link 48L: Dev Release

Inflow Area = 11.068 ac, 70.65% Impervious, Inflow Depth = 2.86" for Salem 100 YR event
Inflow = 2.49 cfs @ 8.81 hrs, Volume= 2.635 af
Primary = 2.49 cfs @ 8.81 hrs, Volume= 2.635 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 48L: Dev Release

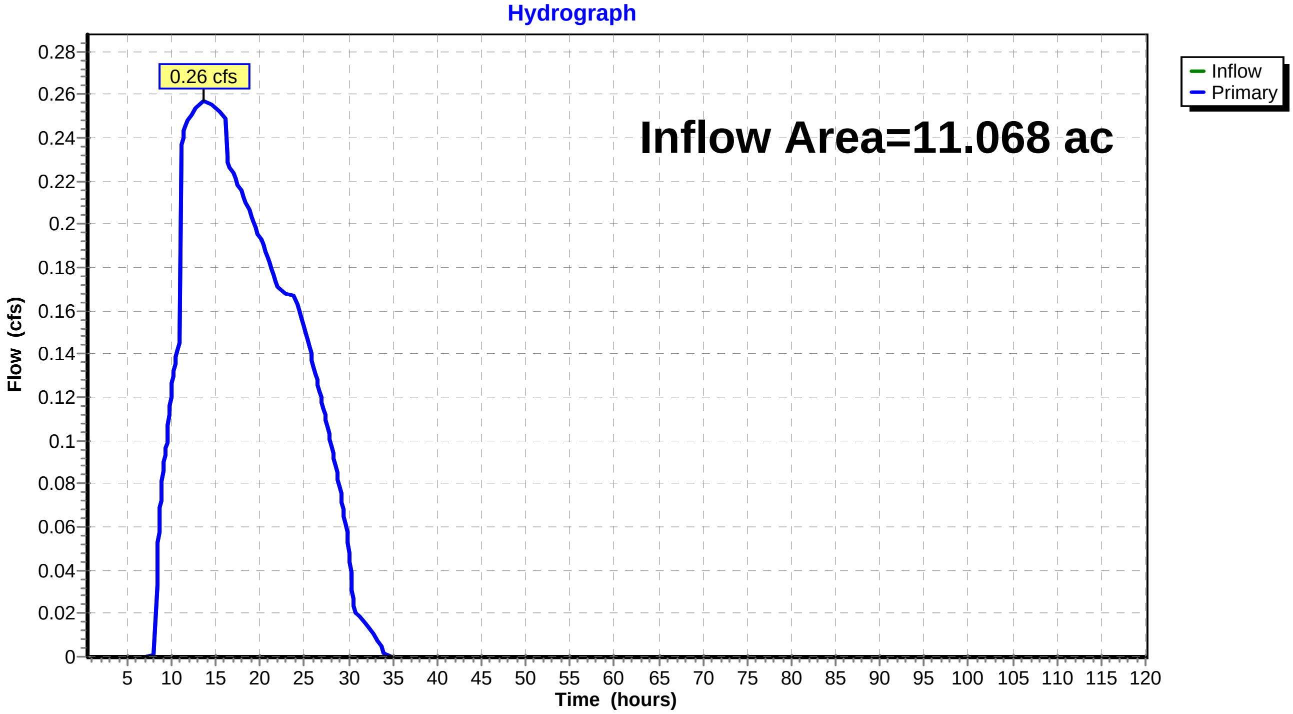


Summary for Link 48L: Dev Release

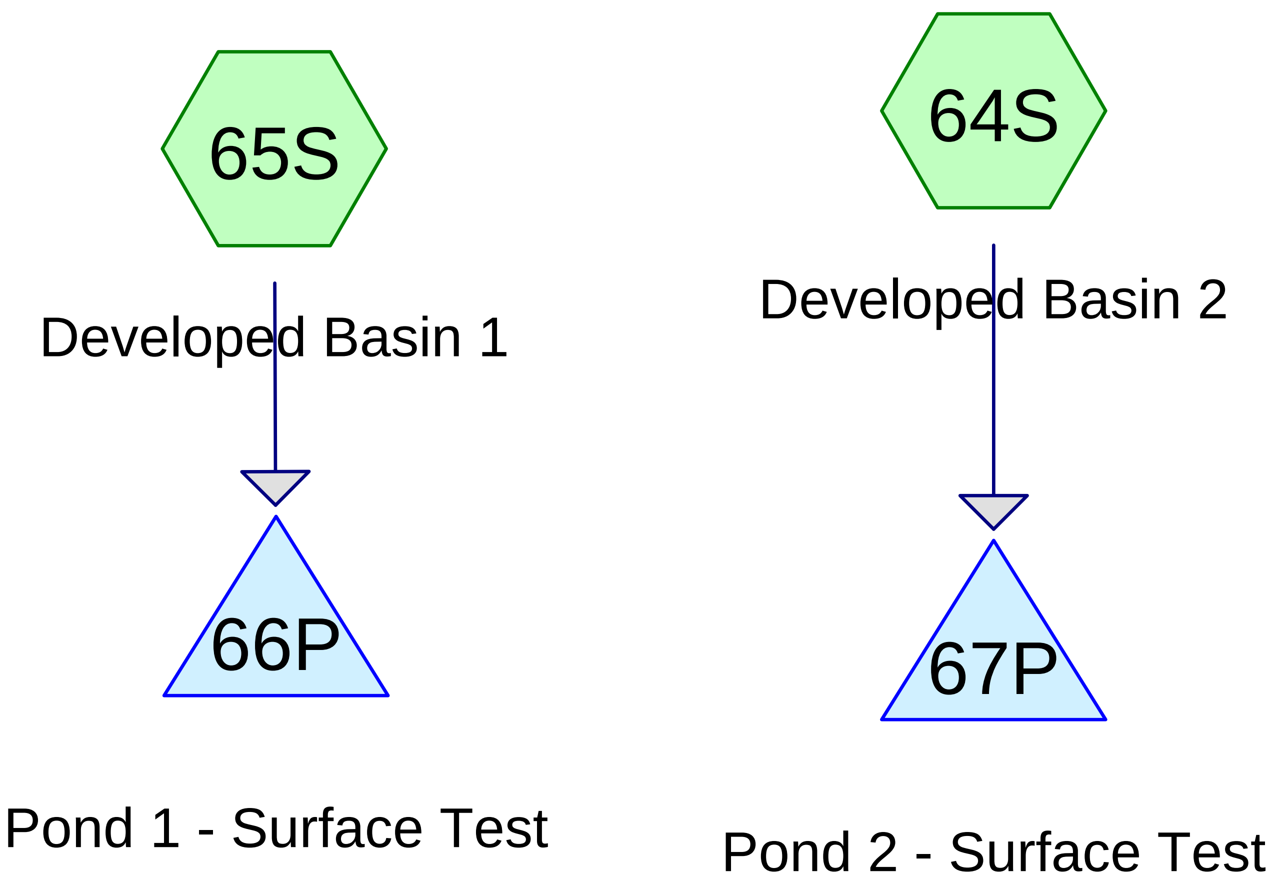
Inflow Area = 11.068 ac, 70.65% Impervious, Inflow Depth = 0.35" for Salem WQ event
Inflow = 0.26 cfs @ 13.55 hrs, Volume= 0.318 af
Primary = 0.26 cfs @ 13.55 hrs, Volume= 0.318 af, Atten= 0%, Lag= 0.0 min

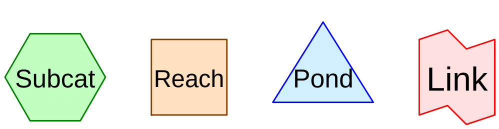
Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 48L: Dev Release



Surface Test





Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021

Summary for Subcatchment 65S: Developed Basin 1

[49] Hint: Tc<2dt may require smaller dt

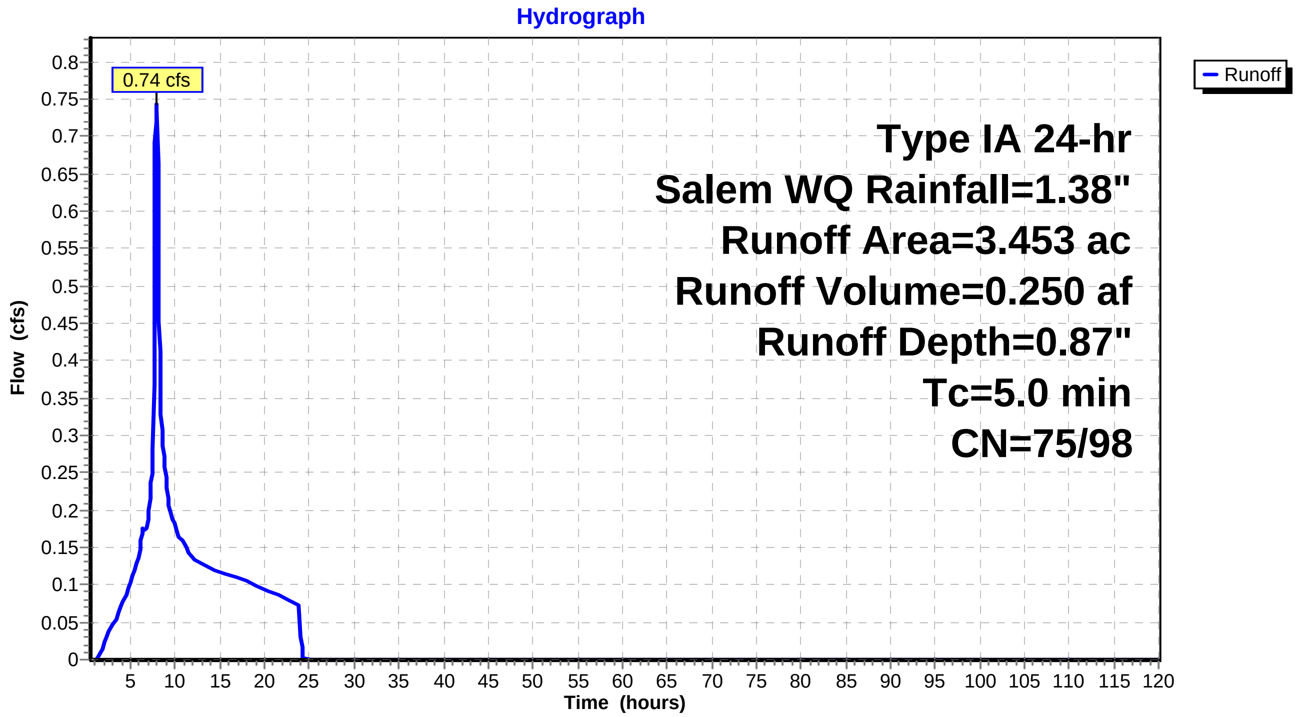
Runoff = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af, Depth= 0.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
1.142	98	Paved parking, HSG C
0.259	74	>75% Grass cover, Good, HSG C
2.052	90	1/8 acre lots, 65% imp, HSG C
3.453	91	Weighted Average
0.977		28.30% Pervious Area
2.476		71.70% Impervious Area

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

Subcatchment 65S: Developed Basin 1



Summary for Subcatchment 64S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

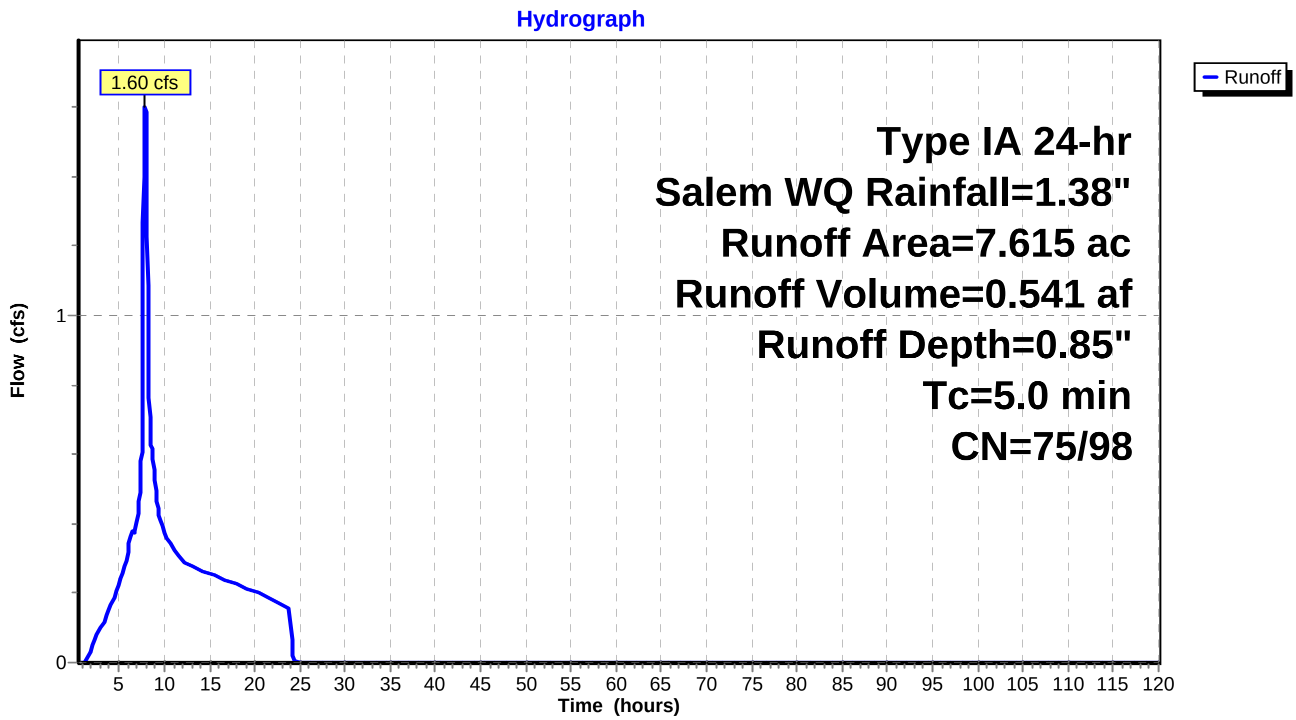
Runoff = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af, Depth= 0.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 64S: Developed Basin 2



Summary for Pond 66P: Pond 1 - Surface Test

Inflow Area = 3.453 ac, 71.70% Impervious, Inflow Depth = 0.87" for Salem WQ event
Inflow = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af
Outflow = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.74 cfs @ 7.91 hrs, Volume= 0.250 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 446.53' @ 7.91 hrs Surf.Area= 4,534 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.250 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (710.9 - 710.9)

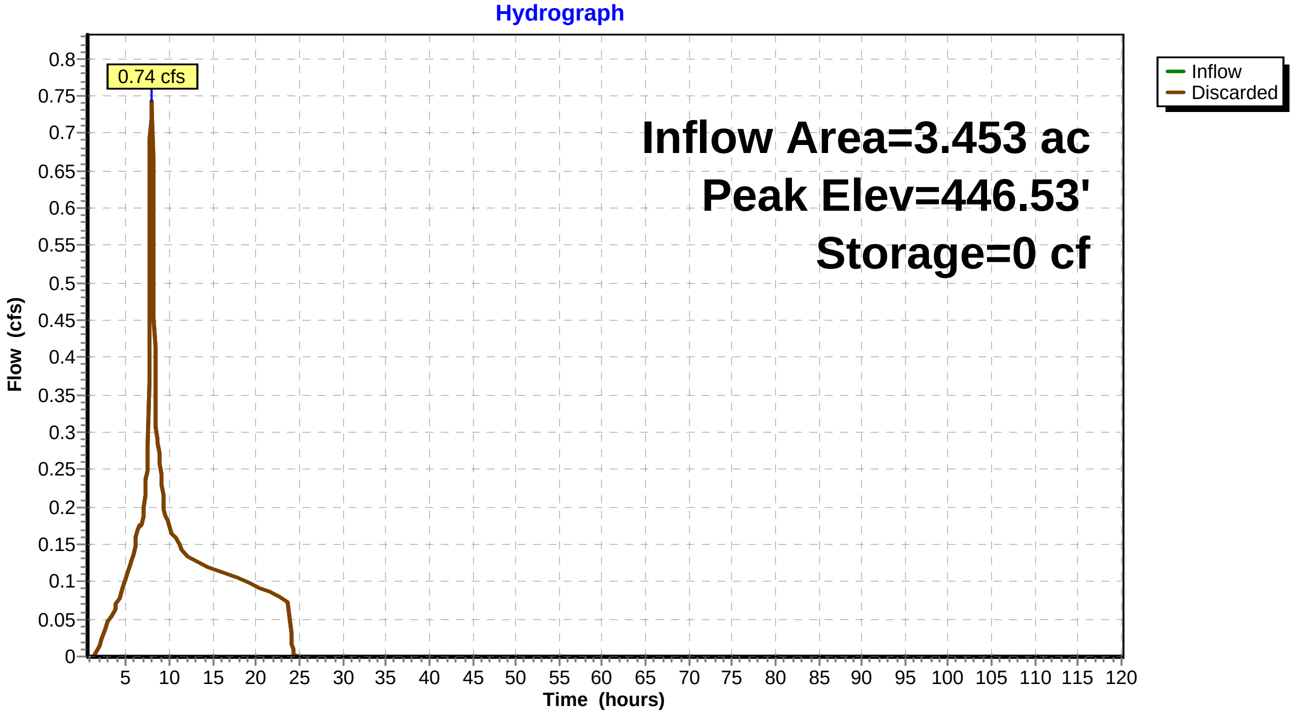
Volume	Invert	Avail.Storage	Storage Description
#1	446.50'	15,114 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
446.50	4,550	0.0	0	0	4,550
448.00	3,750	0.1	6	6	5,420
449.00	4,550	100.0	4,144	4,150	6,252
450.00	5,420	100.0	4,979	9,128	7,157
451.00	6,570	100.0	5,986	15,114	8,339

Device	Routing	Invert	Outlet Devices
#1	Discarded	446.50'	**2.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 446.49'

Discarded OutFlow Max=0.82 cfs @ 7.91 hrs HW=446.53' (Free Discharge)
└─**1=Exfiltration** (Controls 0.82 cfs)

Pond 66P: Pond 1 - Surface Test



Summary for Pond 67P: Pond 2 - Surface Test

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 0.85" for Salem WQ event
Inflow = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af
Outflow = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af, Atten= 0%, Lag= 0.0 min
Discarded = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 411.55' @ 7.91 hrs Surf.Area= 6,345 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.541 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (711.9 - 711.9)

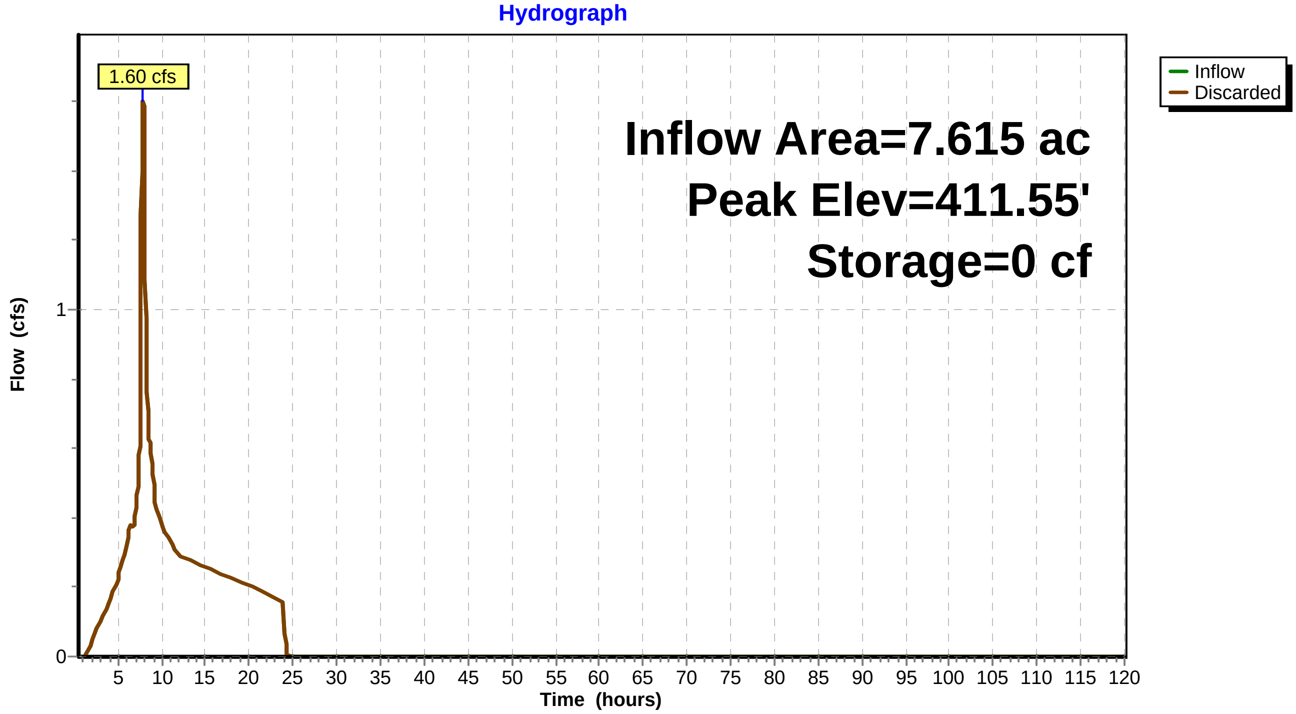
Volume	Invert	Avail.Storage	Storage Description
#1	411.50'	25,086 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

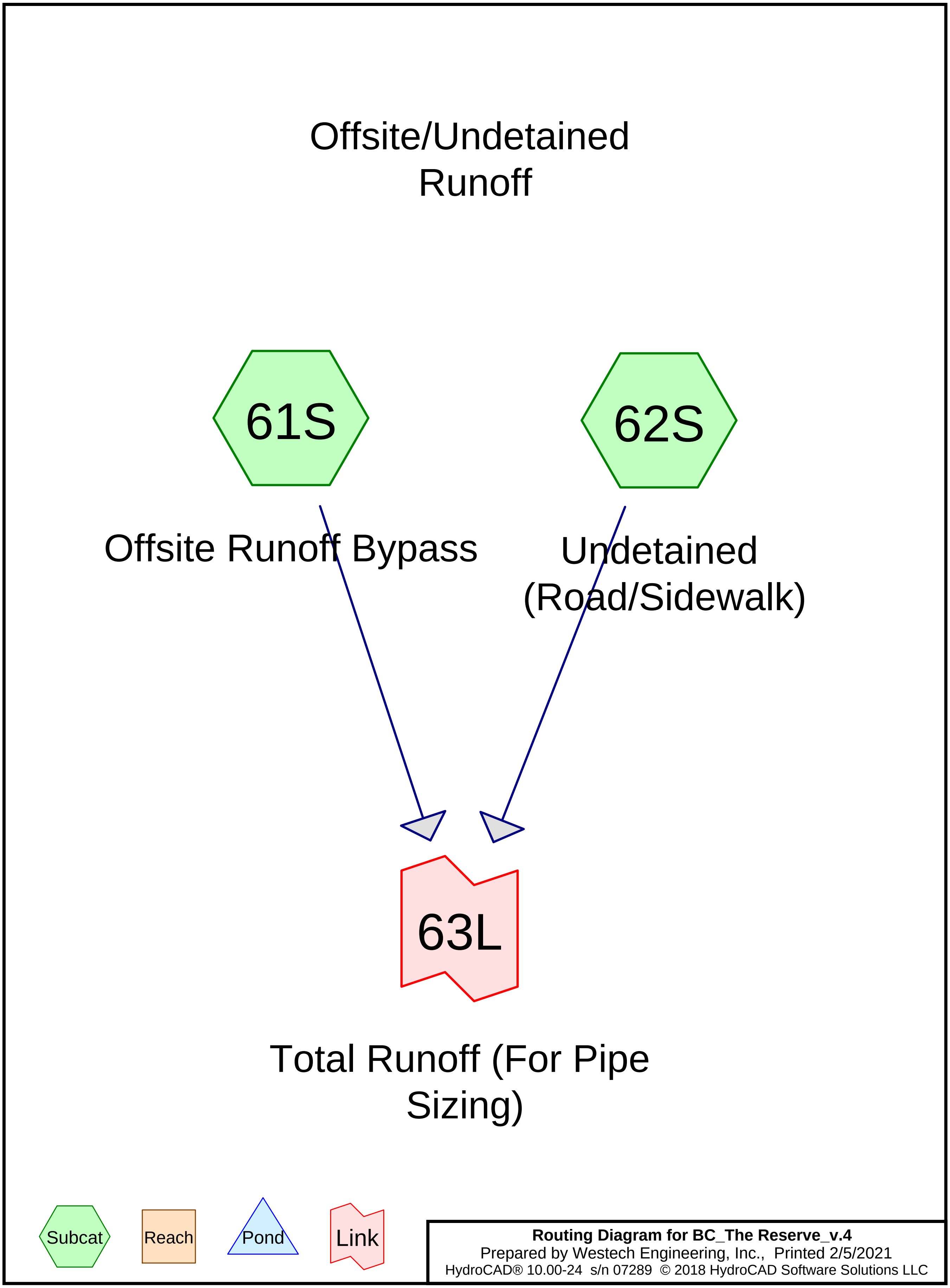
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
411.50	6,375	0.0	0	0	6,375
413.00	5,430	0.1	9	9	7,404
414.00	6,375	100.0	5,896	5,905	8,388
415.00	7,360	100.0	6,862	12,767	9,416
416.00	8,410	100.0	7,879	20,646	10,512
416.50	9,360	100.0	4,440	25,086	11,476

Device	Routing	Invert	Outlet Devices
#1	Discarded	411.50'	**2.000 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 411.49'

Discarded OutFlow Max=1.63 cfs @ 7.91 hrs HW=411.55' (Free Discharge)
└─**1=Exfiltration** (Controls 1.63 cfs)

Pond 67P: Pond 2 - Surface Test





Routing Diagram for BC_The Reserve_v.4
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Summary for Subcatchment 61S: Offsite Runoff Bypass

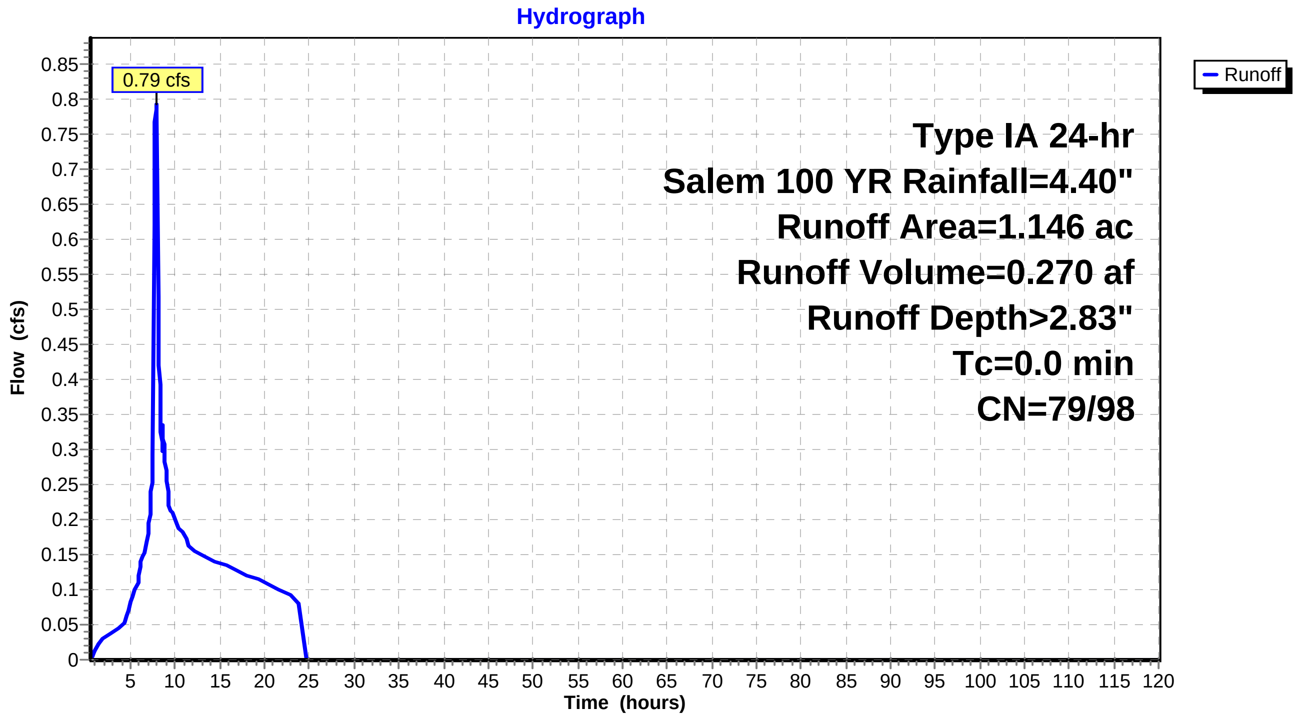
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.79 cfs @ 7.87 hrs, Volume= 0.270 af, Depth> 2.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
0.326	98	Unconnected pavement, HSG C
0.820	79	50-75% Grass cover, Fair, HSG C
1.146	84	Weighted Average
0.820		71.55% Pervious Area
0.326		28.45% Impervious Area

Subcatchment 61S: Offsite Runoff Bypass



Summary for Subcatchment 62S: Undetained (Road/Sidewalk)

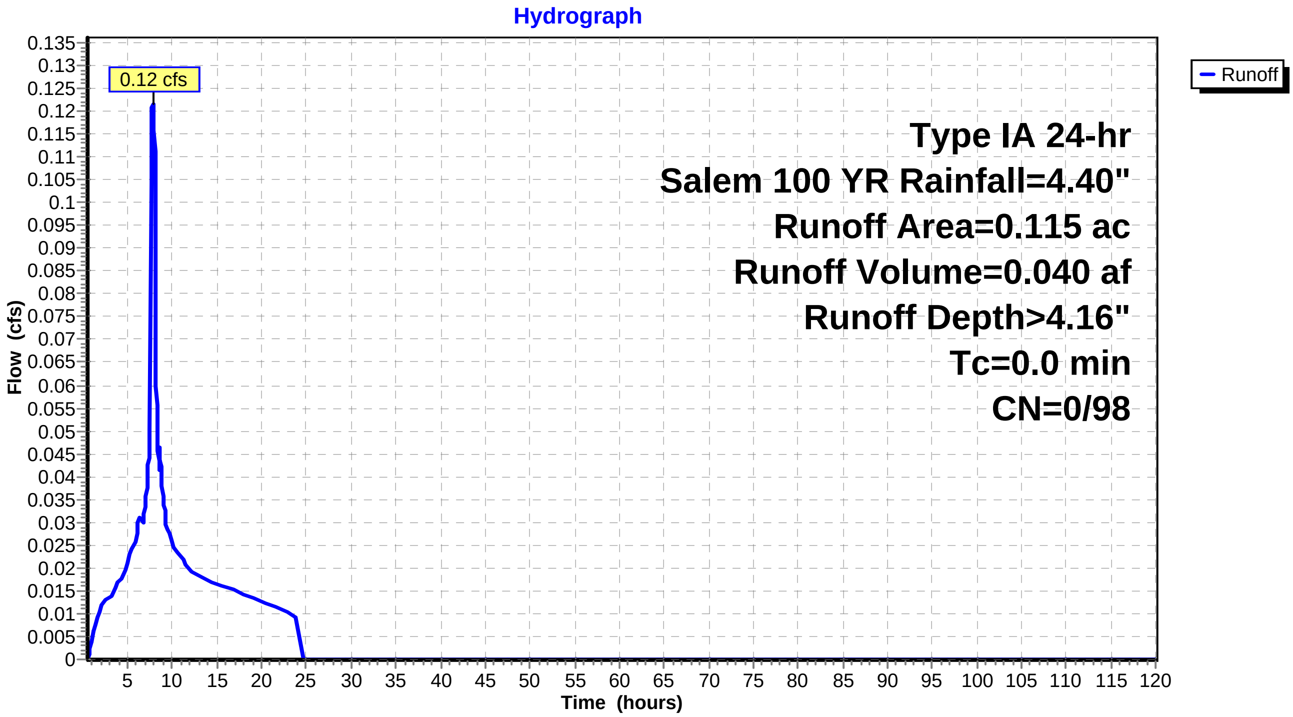
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.12 cfs @ 7.80 hrs, Volume= 0.040 af, Depth> 4.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
0.115	98	Paved parking, HSG C
0.115		100.00% Impervious Area

Subcatchment 62S: Undetained (Road/Sidewalk)

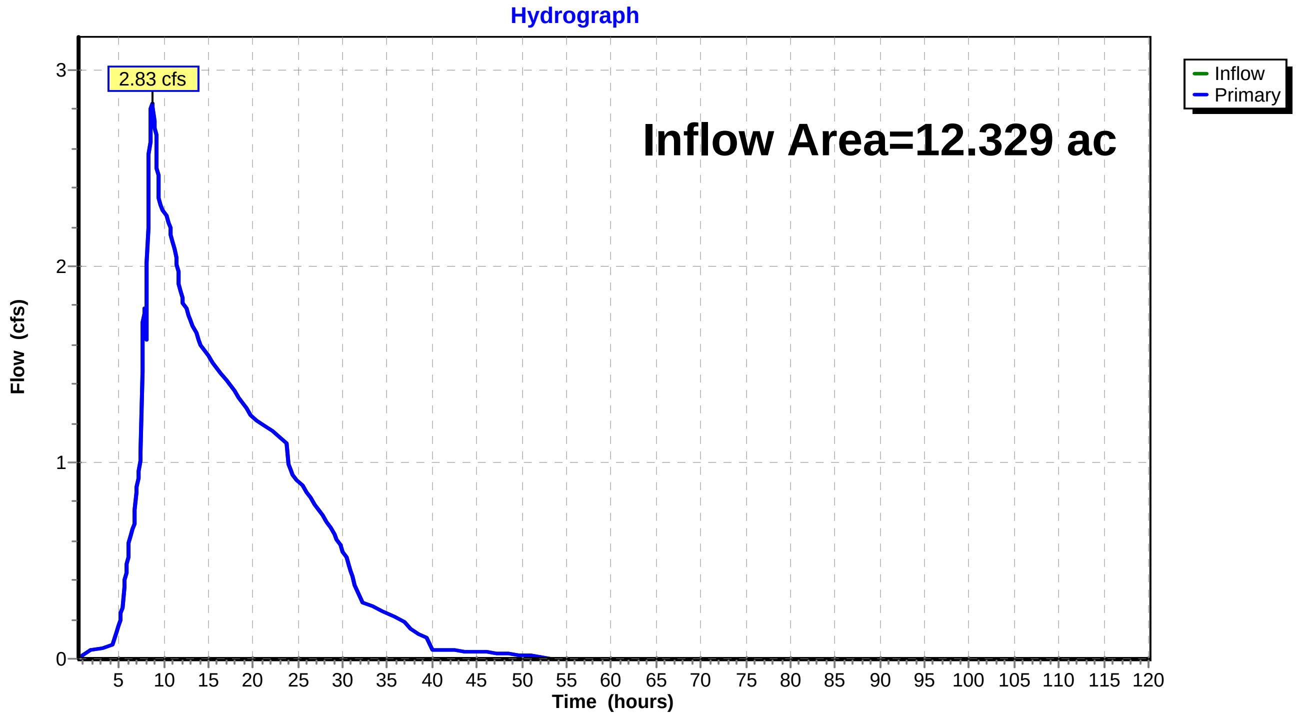


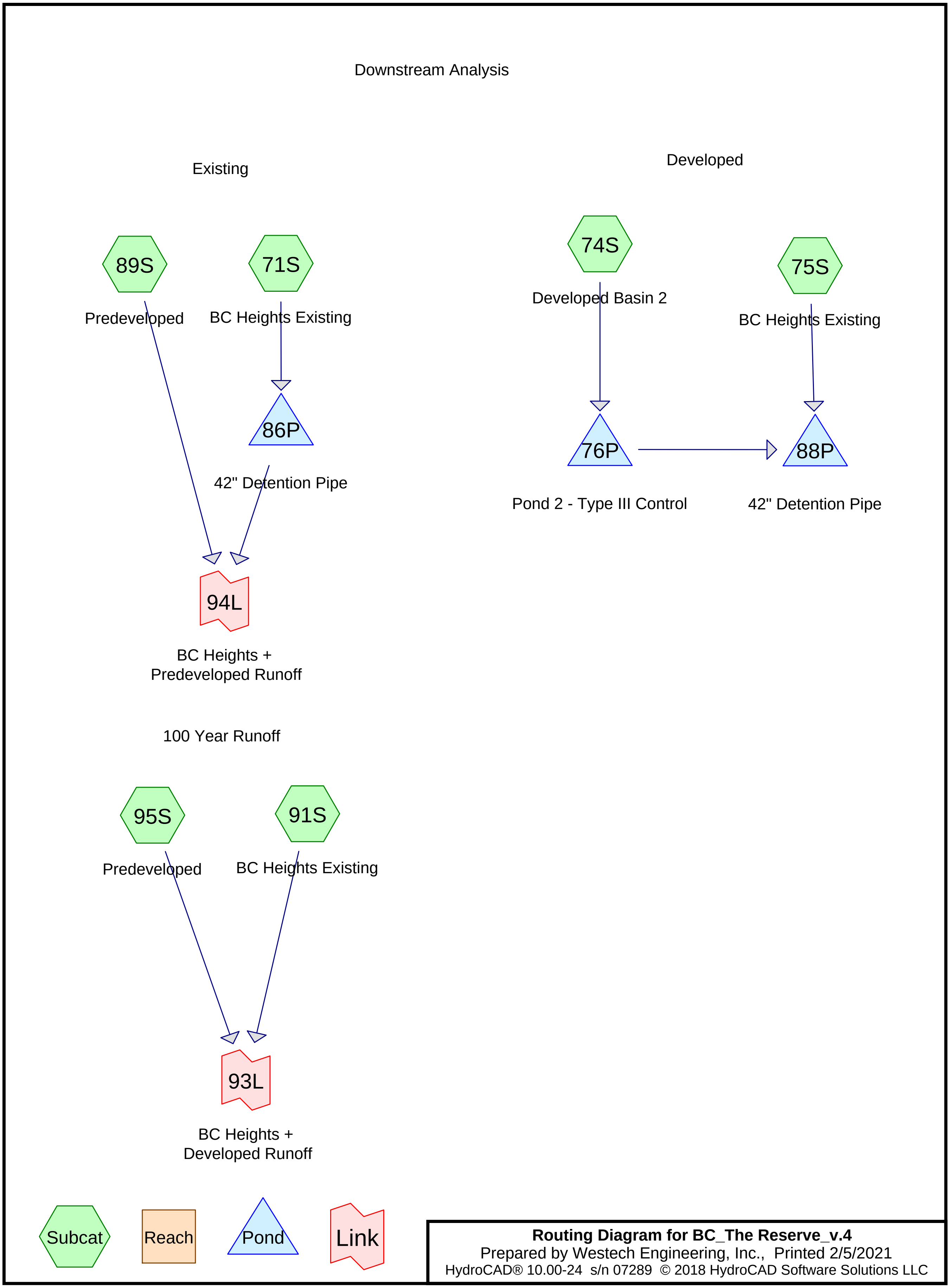
Summary for Link 63L: Total Runoff (For Pipe Sizing)

Inflow Area =	12.329 ac,	67.00% Impervious,	Inflow Depth > 2.87"	for Salem 100 YR event
Inflow =	2.83 cfs @	8.76 hrs, Volume=	2.945 af	
Primary =	2.83 cfs @	8.76 hrs, Volume=	2.945 af, Atten= 0%, Lag= 0.0 min	

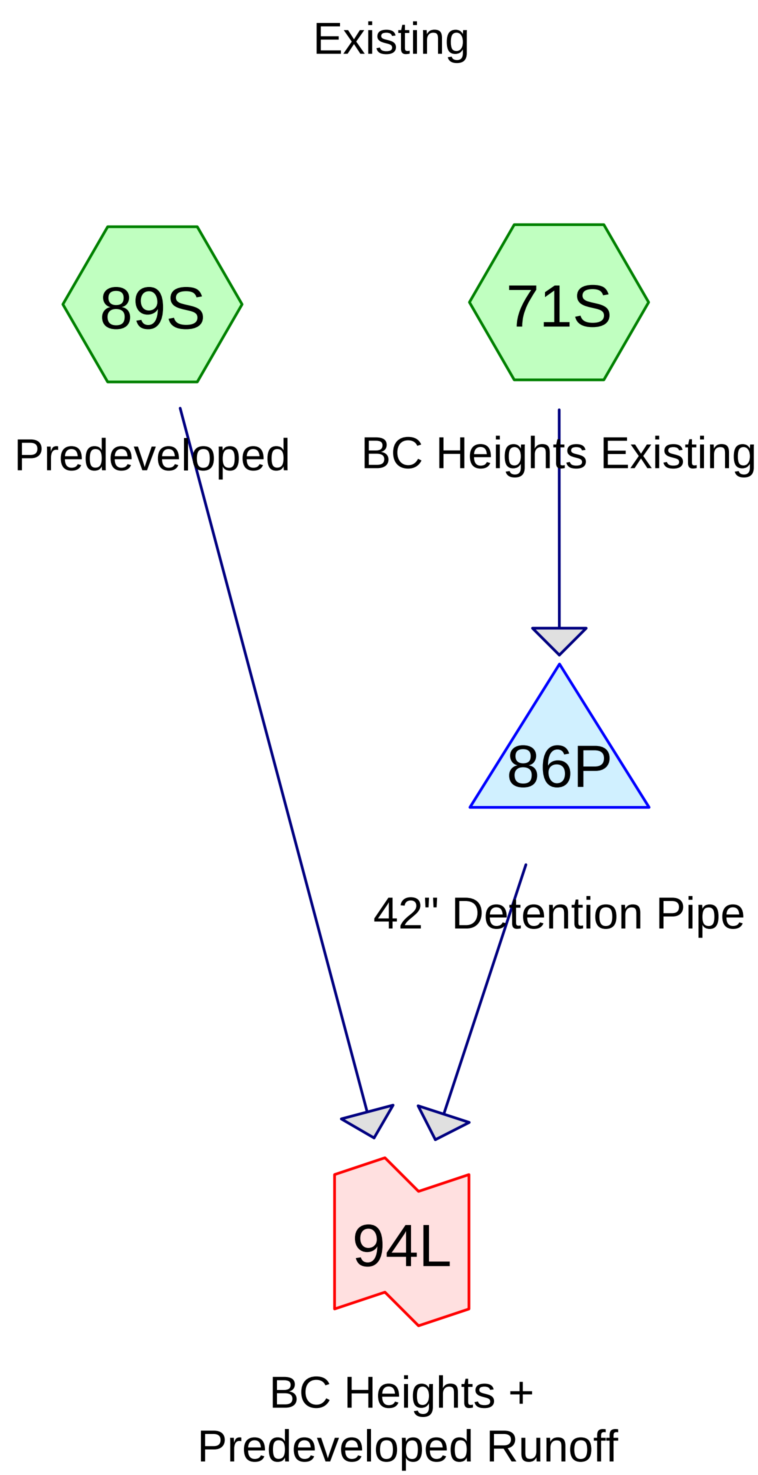
Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

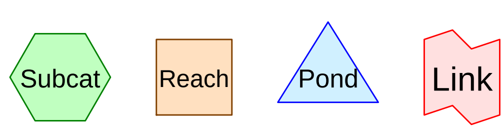
Link 63L: Total Runoff (For Pipe Sizing)





Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021





Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021

Summary for Subcatchment 71S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

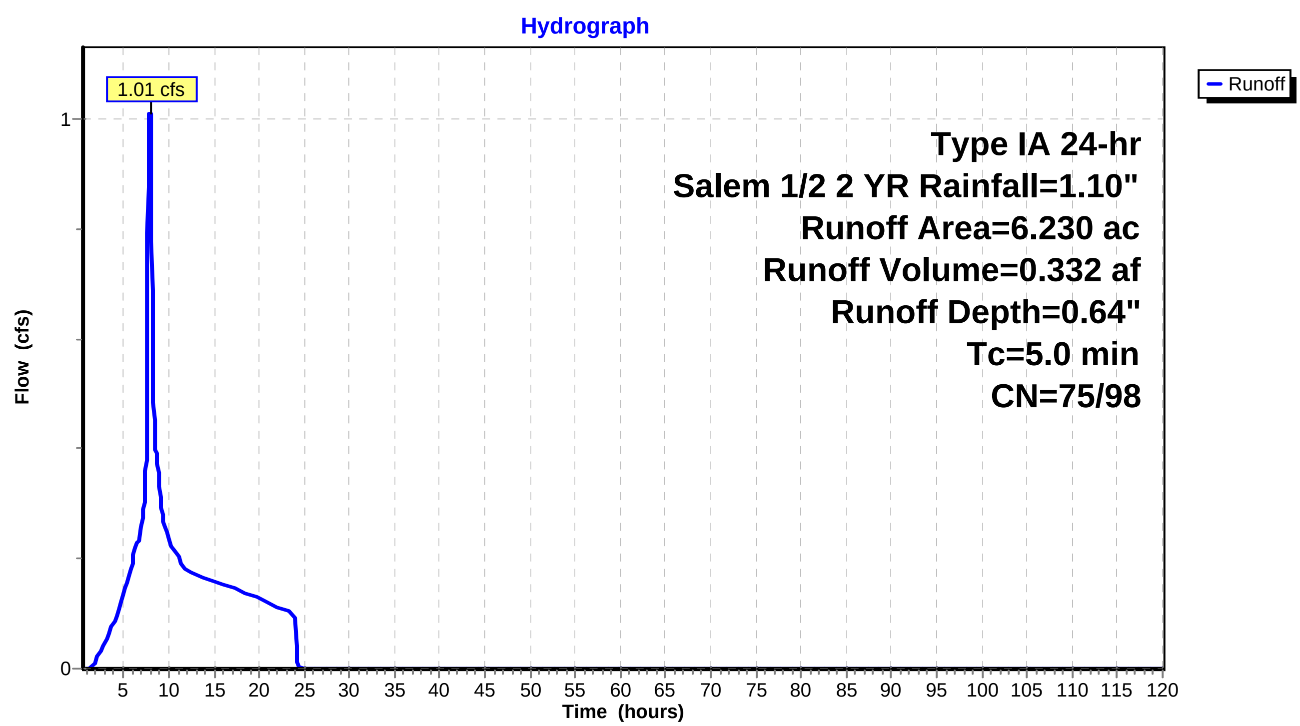
Runoff = 1.01 cfs @ 7.92 hrs, Volume= 0.332 af, Depth= 0.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 71S: BC Heights Existing



Summary for Subcatchment 89S: Predeveloped

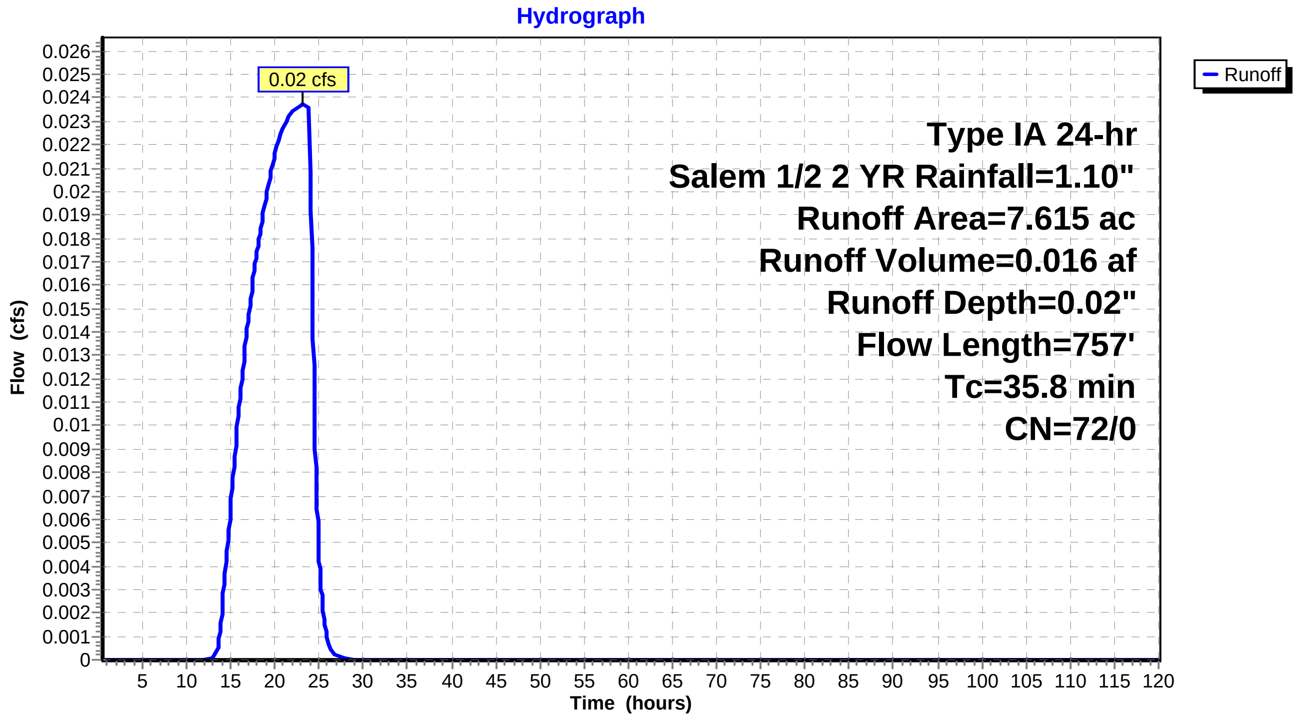
Runoff = 0.02 cfs @ 23.13 hrs, Volume= 0.016 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
7.615	72	Woods/grass comb., Good, HSG C
7.615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 89S: Predeveloped



Summary for Pond 86P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage

Inflow Area =	6.230 ac,	70.37% Impervious,	Inflow Depth = 0.64"	for Salem 1/2 2 YR event
Inflow =	1.01 cfs @	7.92 hrs, Volume=	0.332 af	
Outflow =	0.99 cfs @	7.99 hrs, Volume=	0.332 af,	Atten= 2%, Lag= 4.4 min
Primary =	0.99 cfs @	7.99 hrs, Volume=	0.332 af	

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 410.18' @ 7.99 hrs Surf.Area= 0.018 ac Storage= 0.005 af

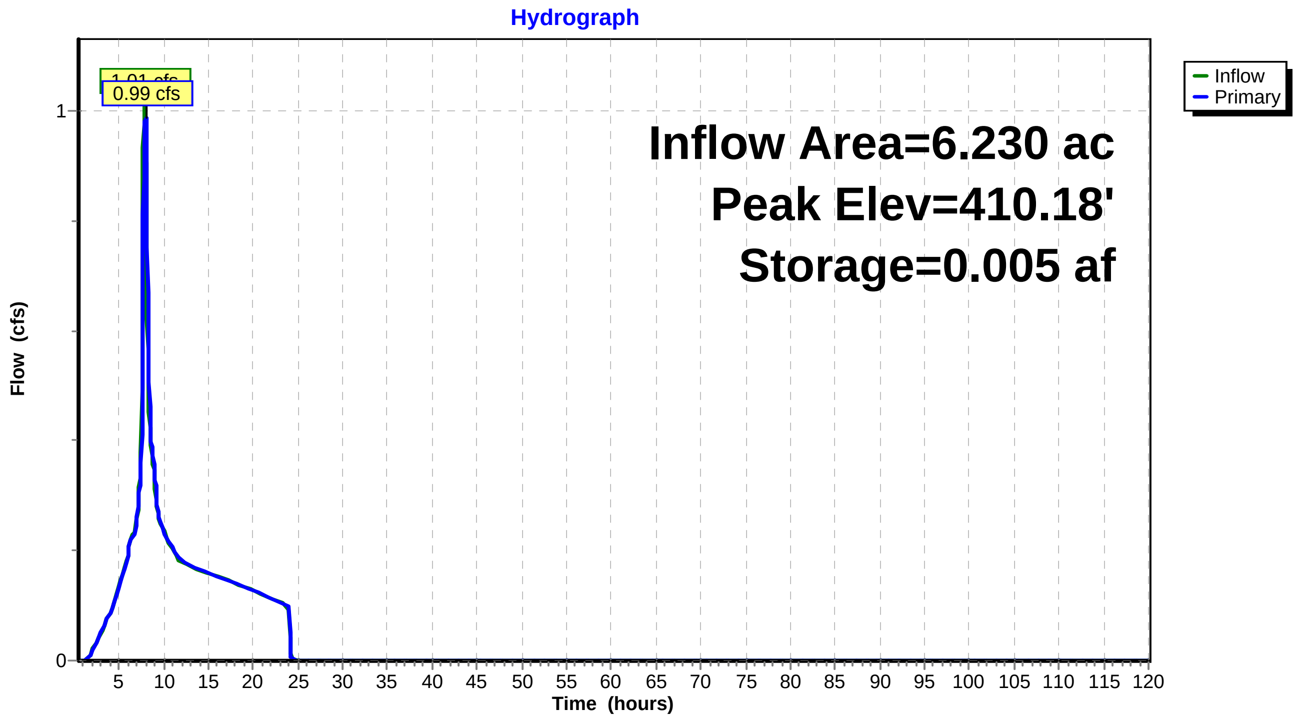
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.3 min (719.4 - 718.0)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 7.99 hrs HW=410.18' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.99 cfs @ 2.66 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 86P: 42" Detention Pipe

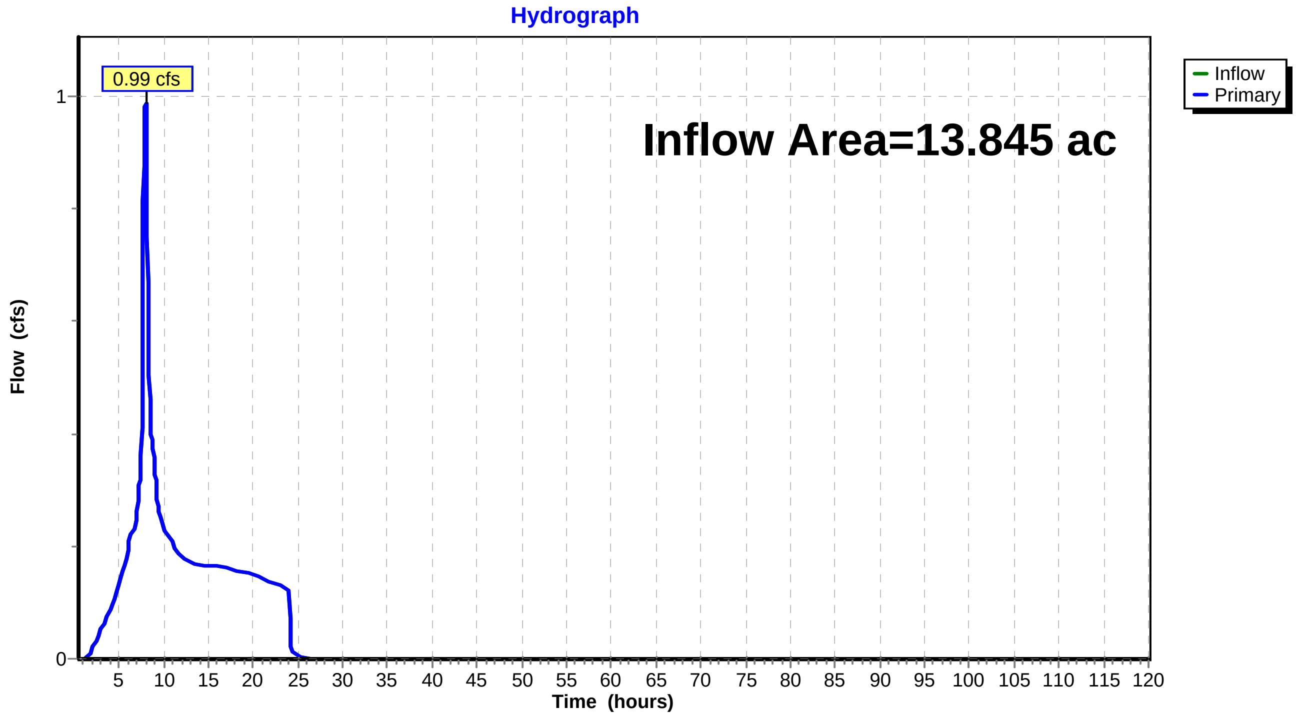


Summary for Link 94L: BC Heights + Predeveloped Runoff

Inflow Area =	13.845 ac,	31.67% Impervious,	Inflow Depth = 0.30"	for Salem 1/2 2 YR event	
Inflow =	0.99 cfs @	7.99 hrs,	Volume=	0.348 af	
Primary =	0.99 cfs @	7.99 hrs,	Volume=	0.348 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 94L: BC Heights + Predeveloped Runoff



Summary for Subcatchment 71S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

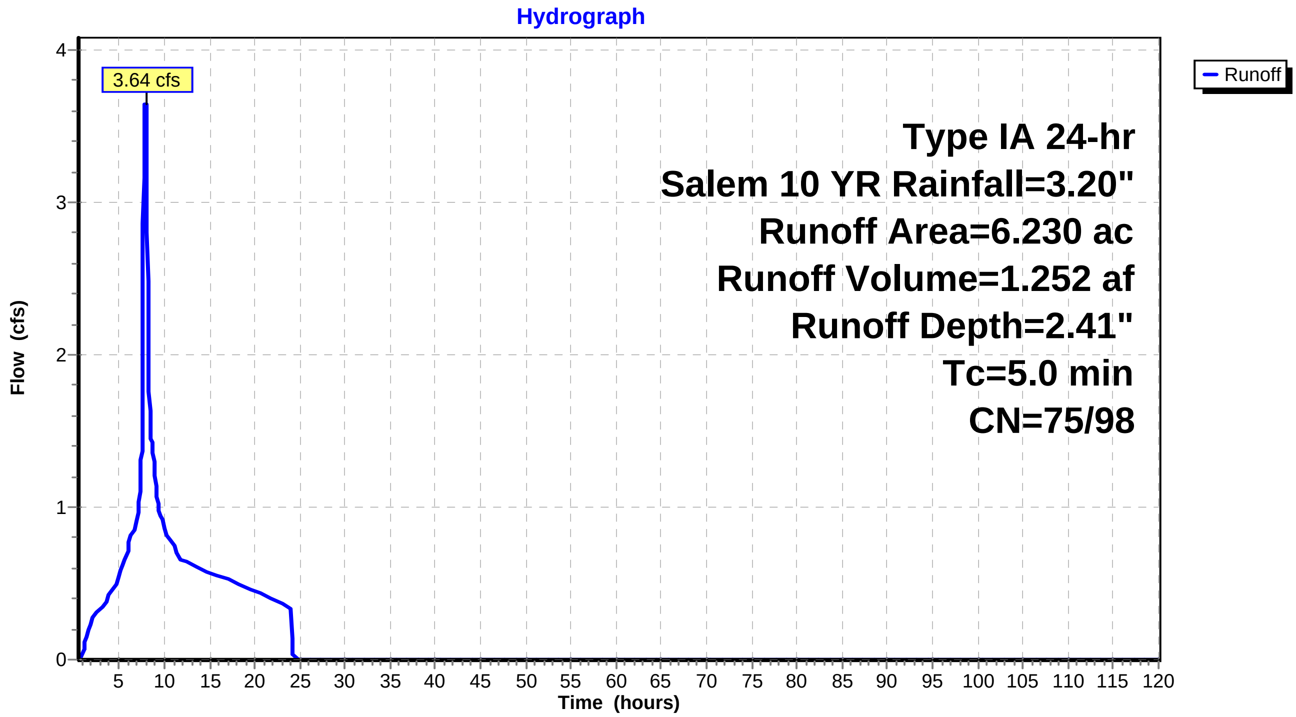
Runoff = 3.64 cfs @ 7.92 hrs, Volume= 1.252 af, Depth= 2.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 71S: BC Heights Existing



Summary for Subcatchment 89S: Predeveloped

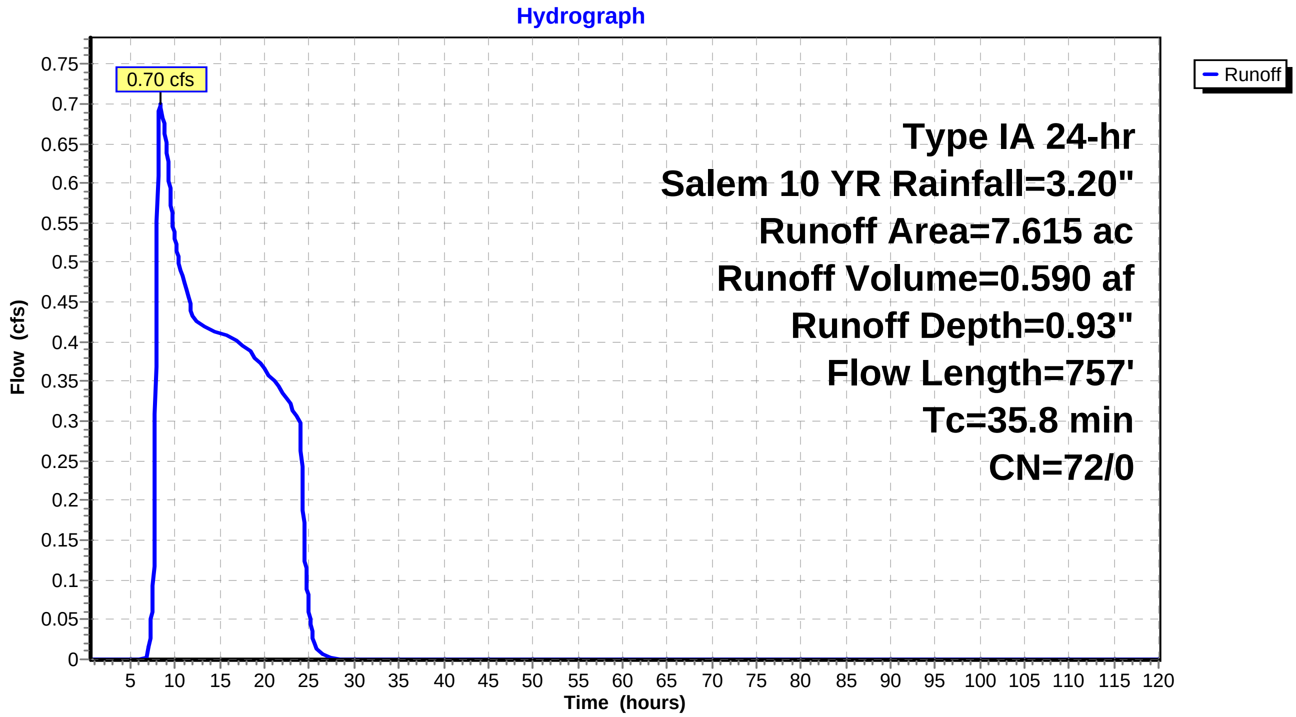
Runoff = 0.70 cfs @ 8.31 hrs, Volume= 0.590 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
7.615	72	Woods/grass comb., Good, HSG C
7.615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 89S: Predeveloped



Summary for Pond 86P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 6.230 ac, 70.37% Impervious, Inflow Depth = 2.41" for Salem 10 YR event
Inflow = 3.64 cfs @ 7.92 hrs, Volume= 1.252 af
Outflow = 2.83 cfs @ 8.10 hrs, Volume= 1.252 af, Atten= 22%, Lag= 11.1 min
Primary = 2.83 cfs @ 8.10 hrs, Volume= 1.252 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 411.96' @ 8.10 hrs Surf.Area= 0.029 ac Storage= 0.052 af

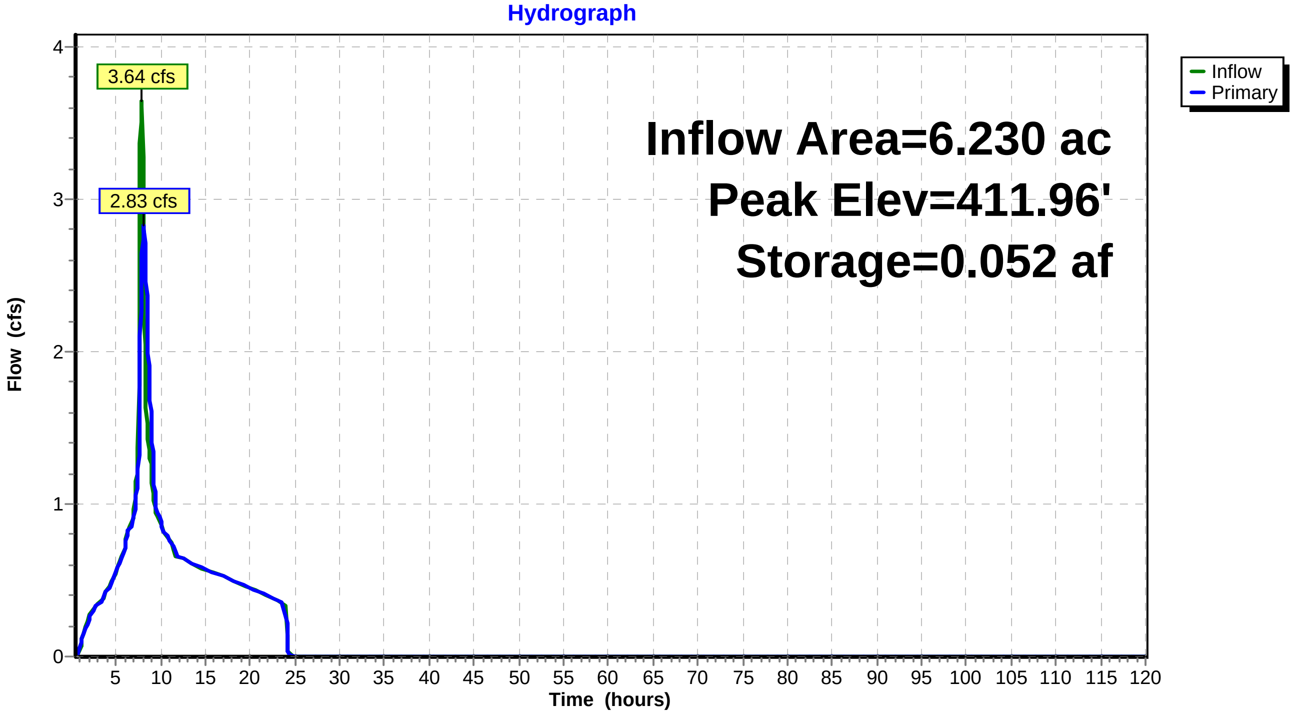
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.1 min (696.1 - 692.0)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.83 cfs @ 8.10 hrs HW=411.95' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 2.83 cfs @ 6.85 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

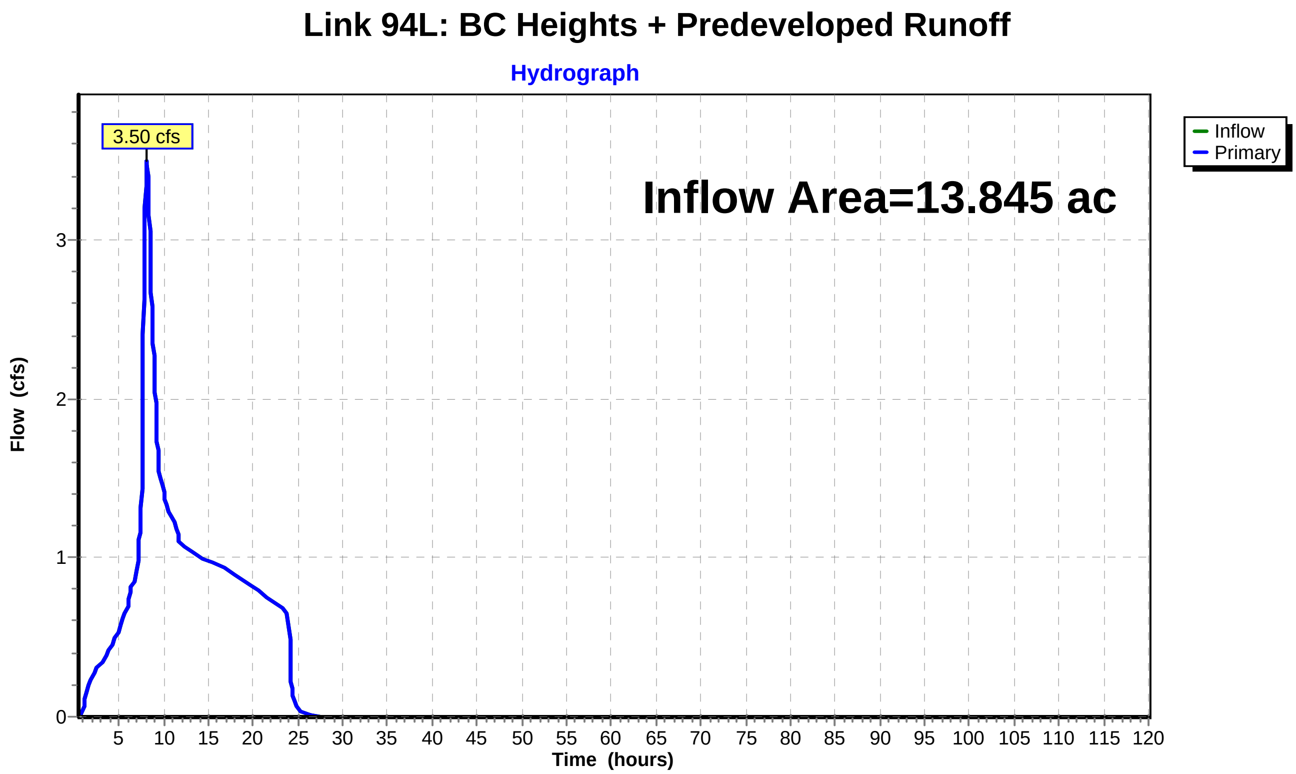
Pond 86P: 42" Detention Pipe



Summary for Link 94L: BC Heights + Predeveloped Runoff

Inflow Area =	13.845 ac,	31.67% Impervious,	Inflow Depth = 1.60"	for Salem 10 YR event	
Inflow =	3.50 cfs @	8.12 hrs,	Volume=	1.842 af	
Primary =	3.50 cfs @	8.12 hrs,	Volume=	1.842 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs



Summary for Subcatchment 71S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

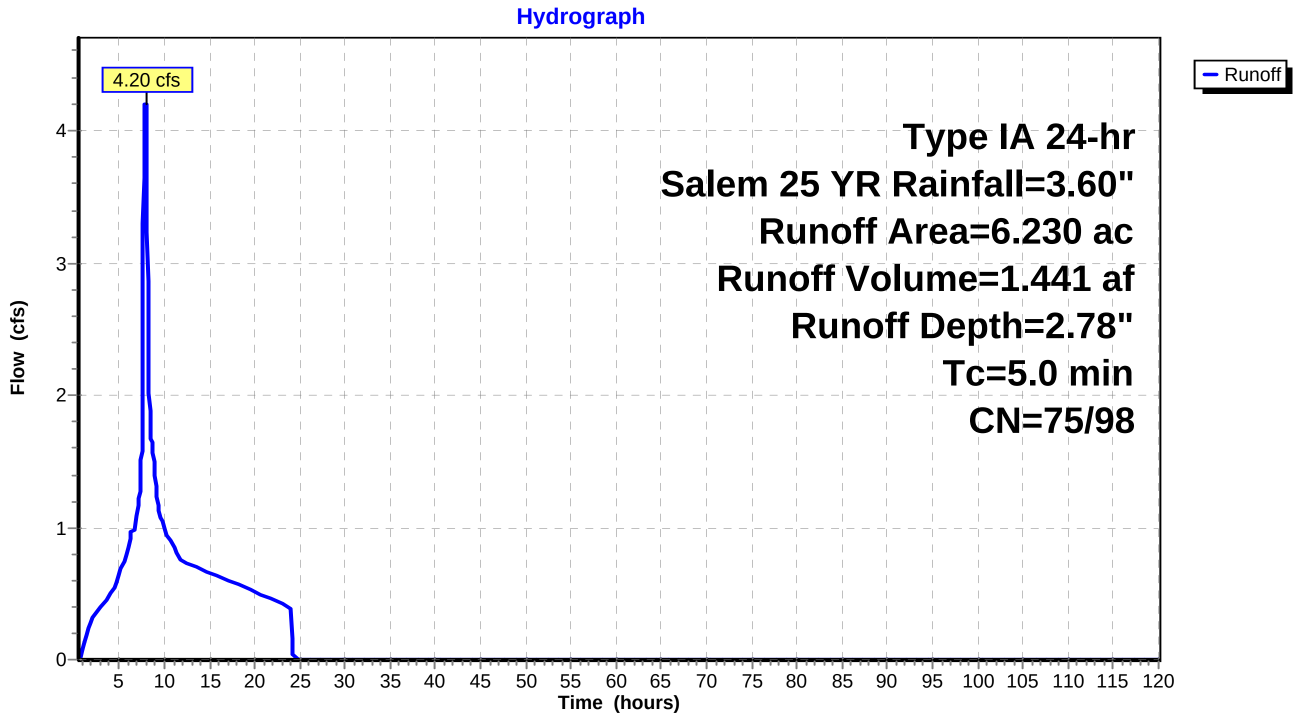
Runoff = 4.20 cfs @ 7.92 hrs, Volume= 1.441 af, Depth= 2.78"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 71S: BC Heights Existing



Summary for Subcatchment 89S: Predeveloped

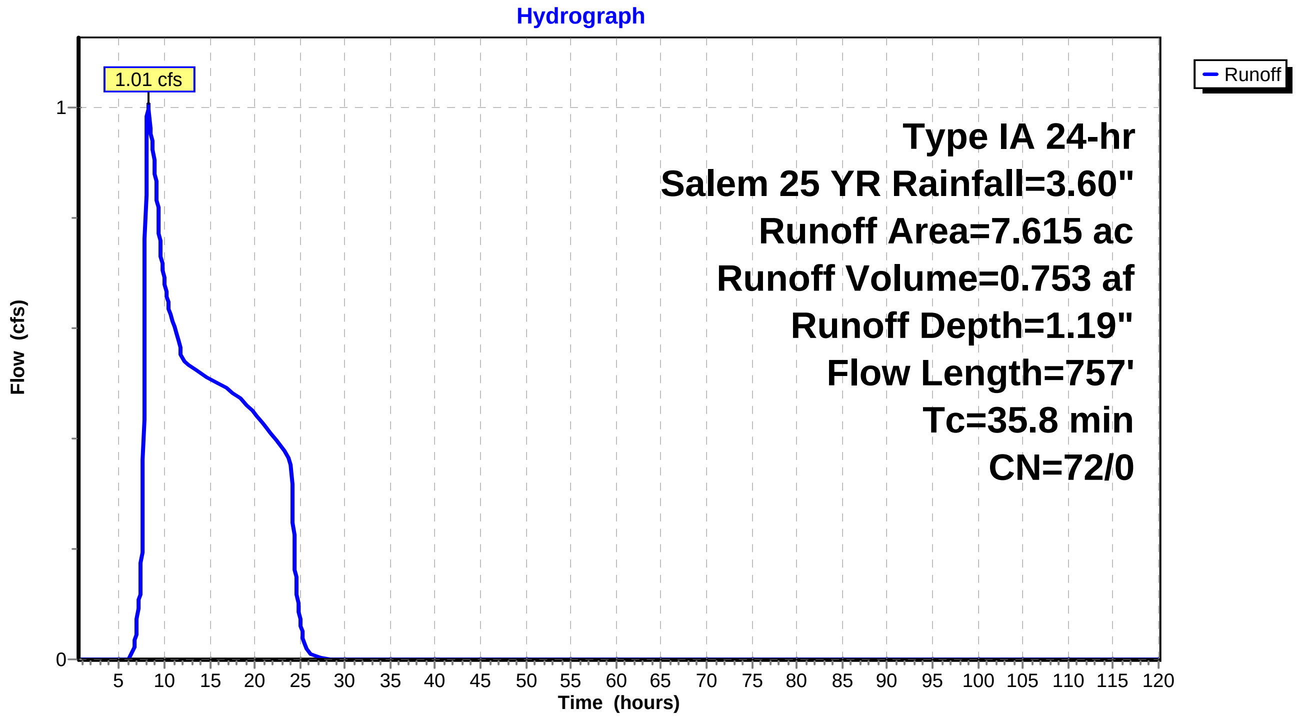
Runoff = 1.01 cfs @ 8.25 hrs, Volume= 0.753 af, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
7.615	72	Woods/grass comb., Good, HSG C
7.615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 89S: Predeveloped



Summary for Pond 86P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 6.230 ac, 70.37% Impervious, Inflow Depth = 2.78" for Salem 25 YR event
Inflow = 4.20 cfs @ 7.92 hrs, Volume= 1.441 af
Outflow = 3.17 cfs @ 8.11 hrs, Volume= 1.441 af, Atten= 25%, Lag= 11.8 min
Primary = 3.17 cfs @ 8.11 hrs, Volume= 1.441 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 412.47' @ 8.11 hrs Surf.Area= 0.026 ac Storage= 0.067 af

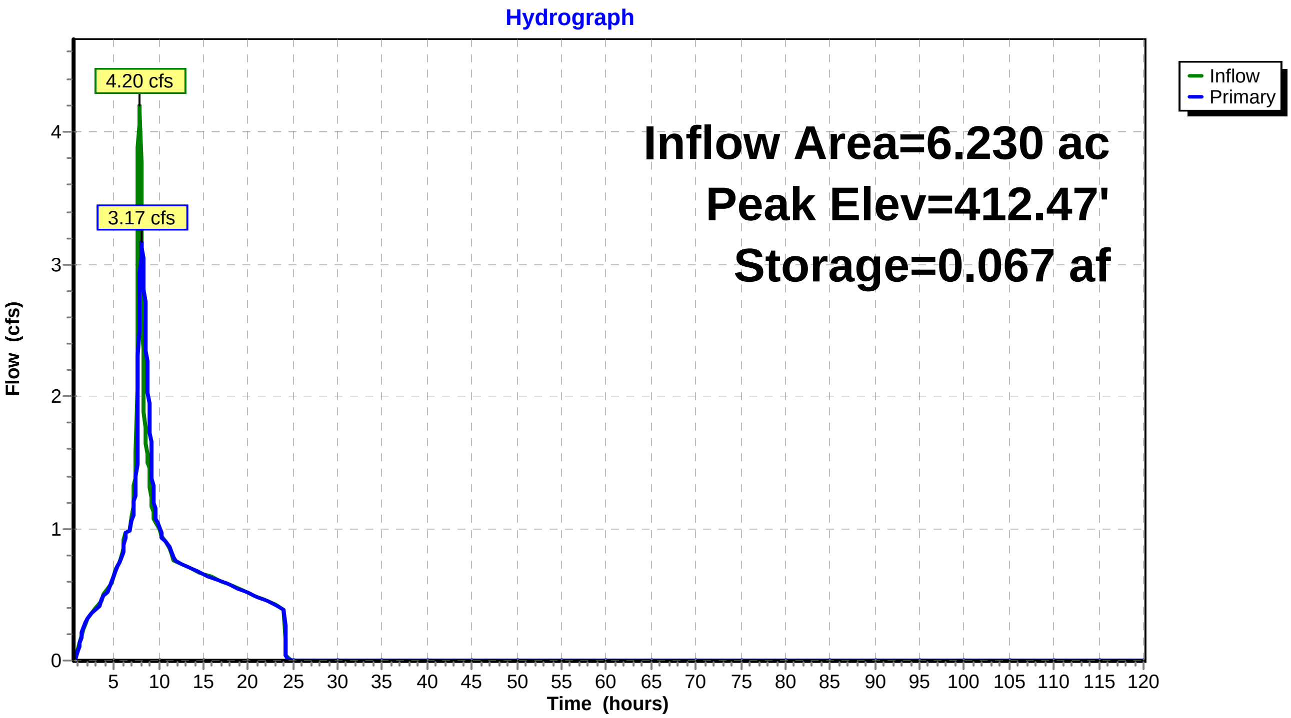
Plug-Flow detention time= 4.7 min calculated for 1.441 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (694.2 - 689.5)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.16 cfs @ 8.11 hrs HW=412.46' (Free Discharge)
1=Orifice/Grate (Orifice Controls 3.16 cfs @ 7.66 fps)
2=Orifice/Grate (Controls 0.00 cfs)

Pond 86P: 42" Detention Pipe

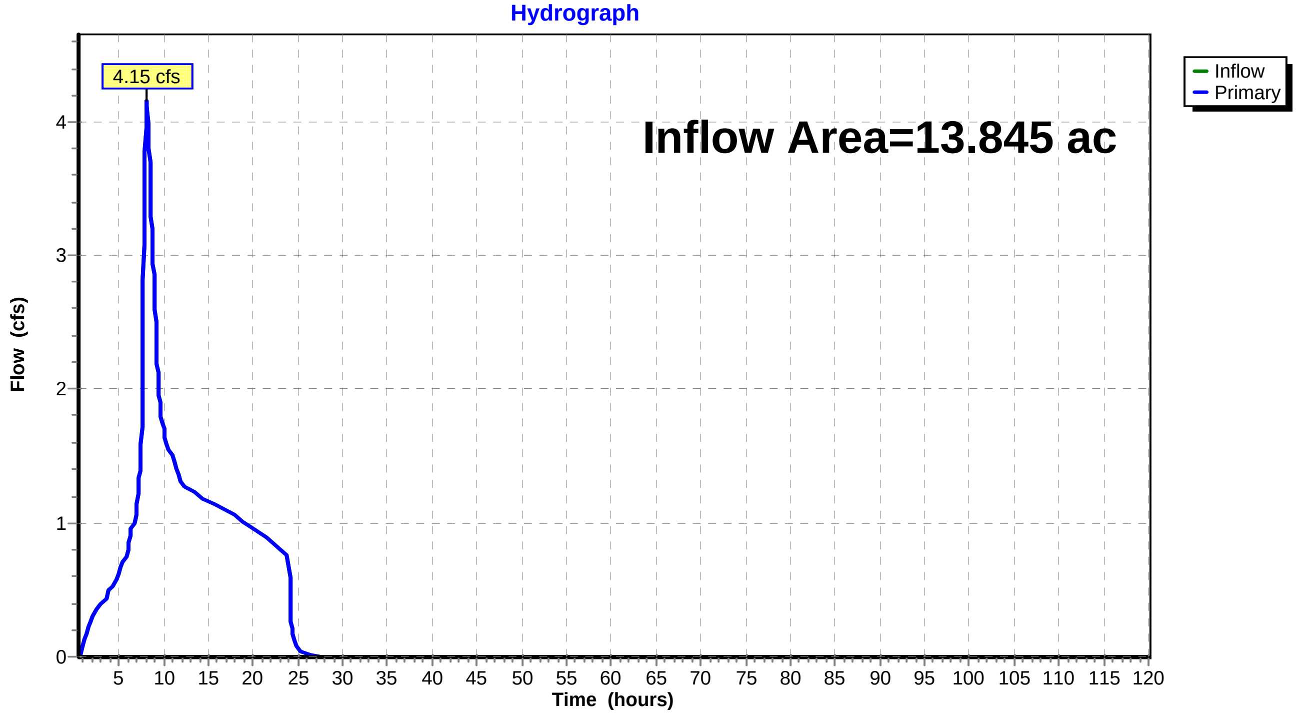


Summary for Link 94L: BC Heights + Predeveloped Runoff

Inflow Area =	13.845 ac, 31.67% Impervious,	Inflow Depth = 1.90"		for Salem 25 YR event
Inflow =	4.15 cfs @	8.13 hrs, Volume=	2.194 af	
Primary =	4.15 cfs @	8.13 hrs, Volume=	2.194 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 94L: BC Heights + Predeveloped Runoff



Summary for Subcatchment 71S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

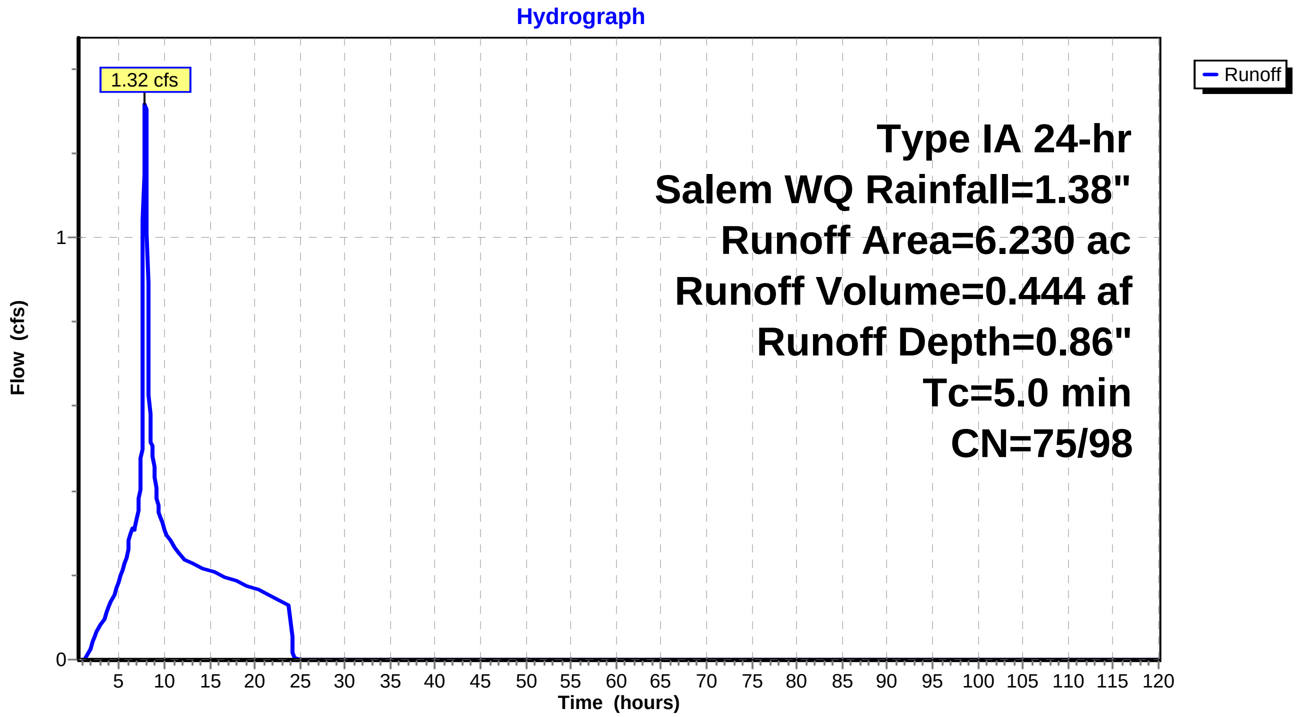
Runoff = 1.32 cfs @ 7.91 hrs, Volume= 0.444 af, Depth= 0.86"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 71S: BC Heights Existing



Summary for Subcatchment 89S: Predeveloped

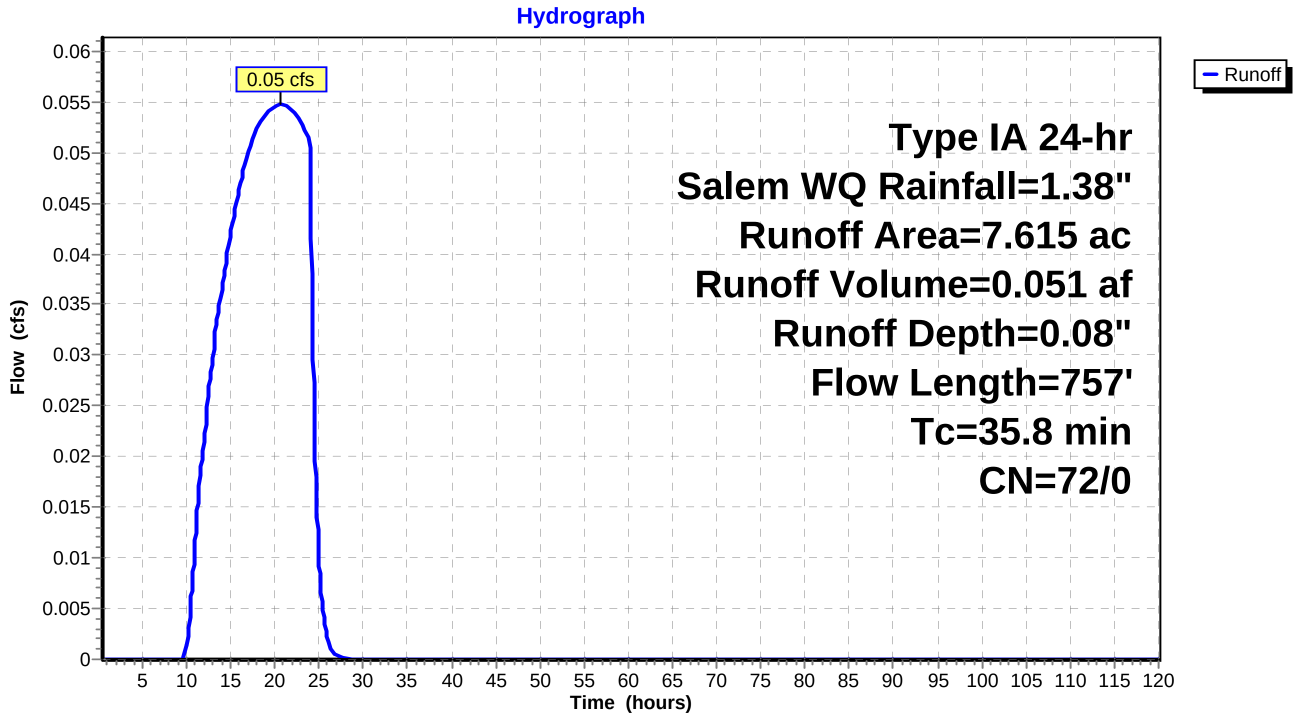
Runoff = 0.05 cfs @ 20.53 hrs, Volume= 0.051 af, Depth= 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
7.615	72	Woods/grass comb., Good, HSG C
7.615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 89S: Predeveloped



Summary for Pond 86P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 6.230 ac, 70.37% Impervious, Inflow Depth = 0.86" for Salem WQ event
Inflow = 1.32 cfs @ 7.91 hrs, Volume= 0.444 af
Outflow = 1.25 cfs @ 8.01 hrs, Volume= 0.444 af, Atten= 5%, Lag= 6.2 min
Primary = 1.25 cfs @ 8.01 hrs, Volume= 0.444 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 410.33' @ 8.01 hrs Surf.Area= 0.021 ac Storage= 0.007 af

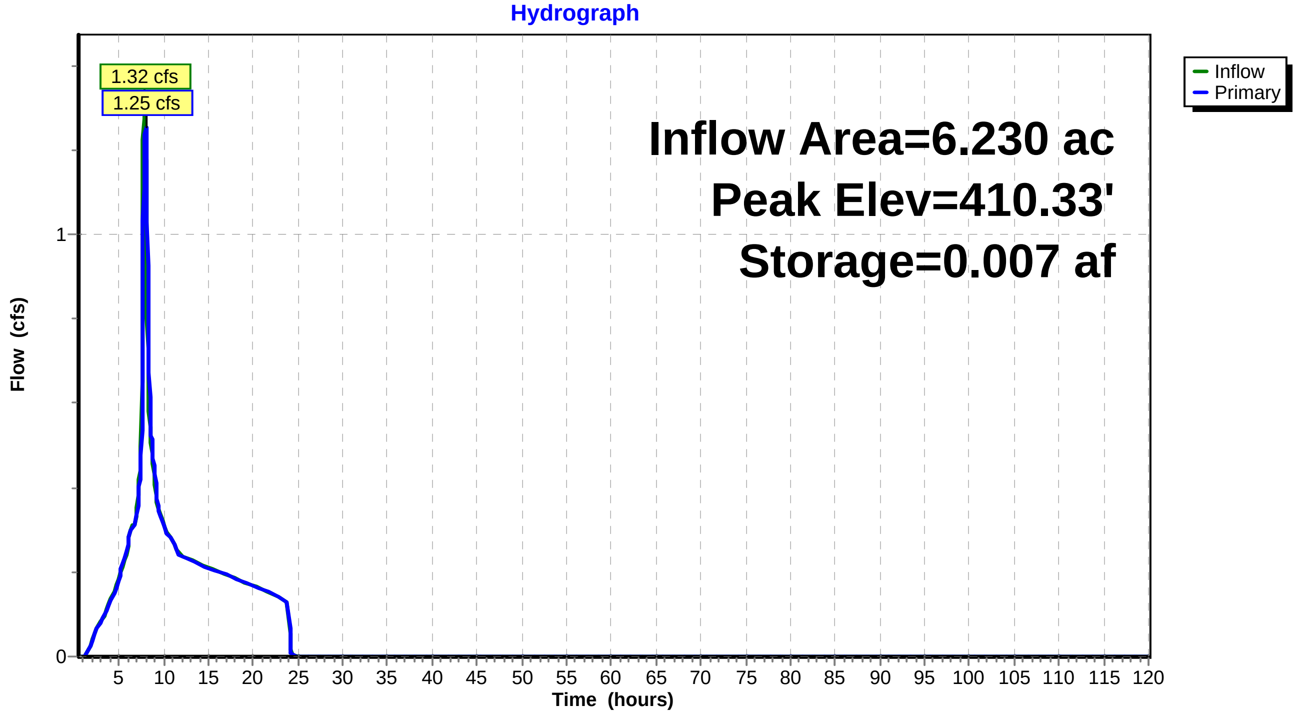
Plug-Flow detention time= 1.6 min calculated for 0.444 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (713.4 - 711.8)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.25 cfs @ 8.01 hrs HW=410.33' (Free Discharge)
—**1=Orifice/Grate** (Orifice Controls 1.25 cfs @ 3.03 fps)
—**2=Orifice/Grate** (Controls 0.00 cfs)

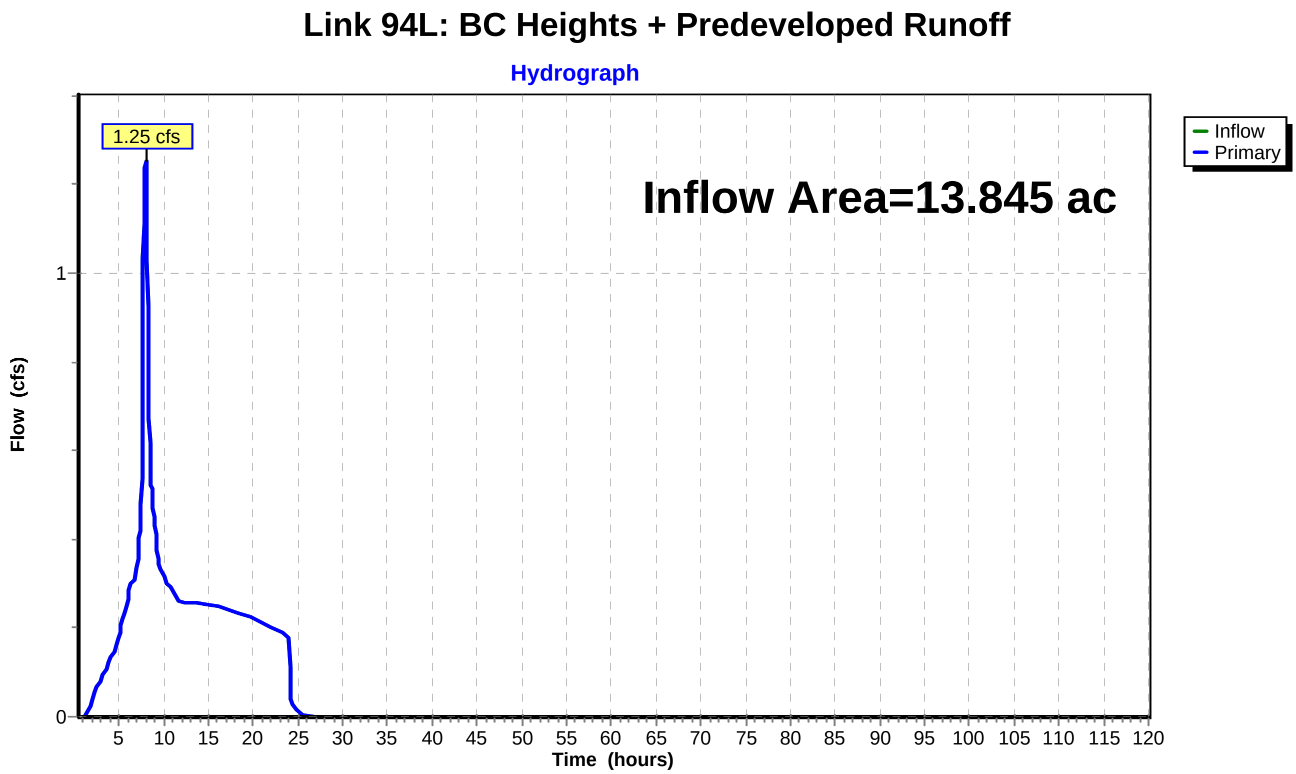
Pond 86P: 42" Detention Pipe

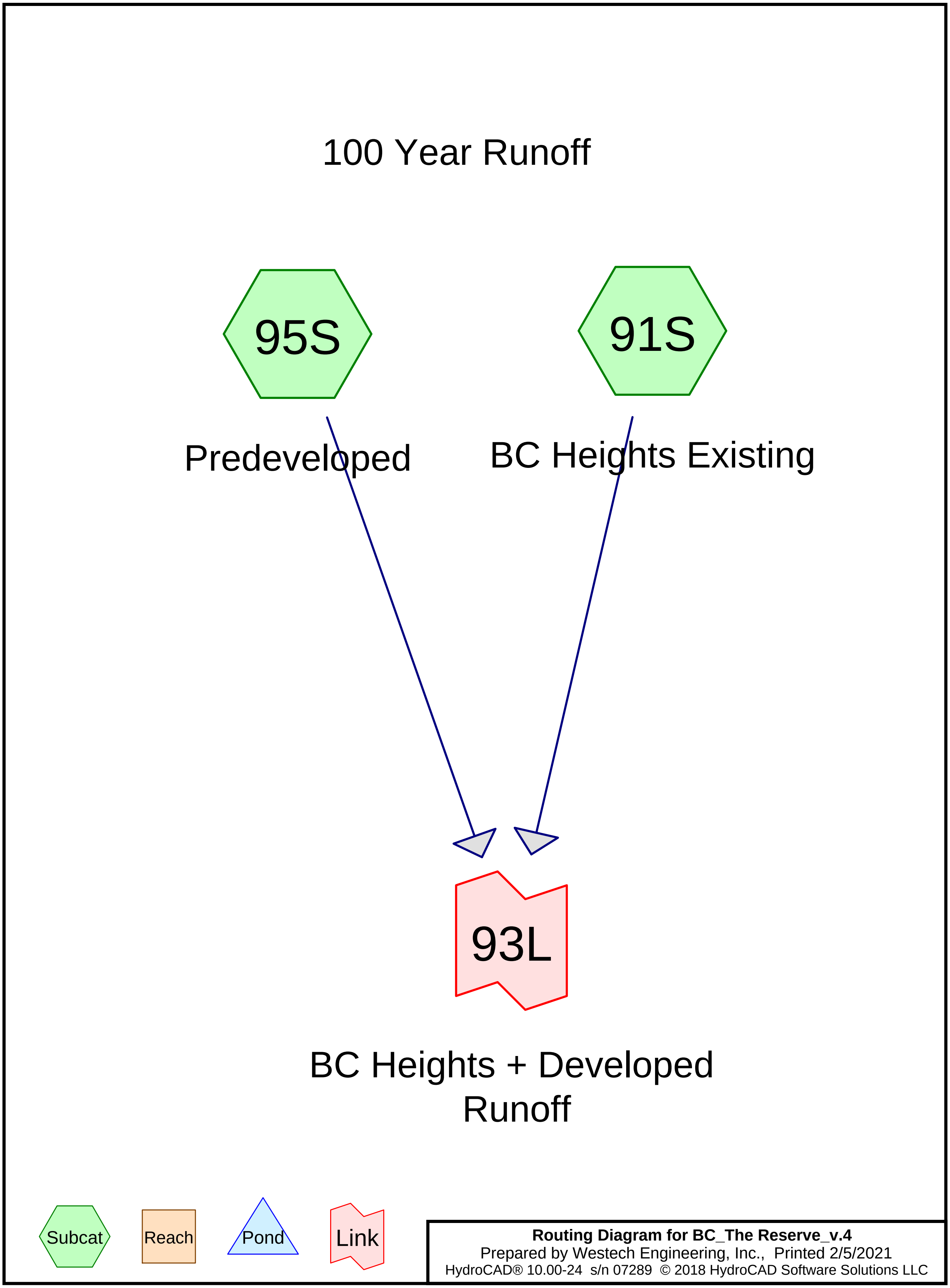


Summary for Link 94L: BC Heights + Predeveloped Runoff

Inflow Area = 13.845 ac, 31.67% Impervious, Inflow Depth = 0.43" for Salem WQ event
Inflow = 1.25 cfs @ 8.01 hrs, Volume= 0.495 af
Primary = 1.25 cfs @ 8.01 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs





Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021
HydroCAD® 10.00-24 s/n 07289 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 91S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

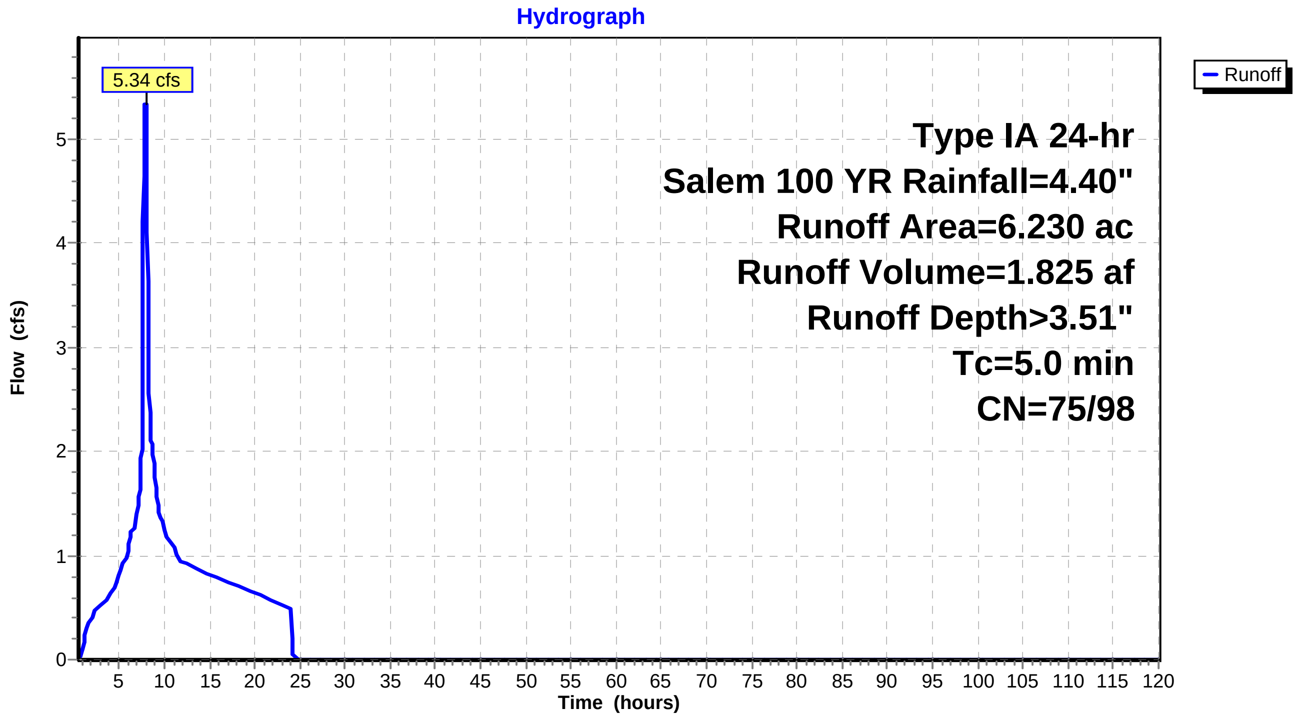
Runoff = 5.34 cfs @ 7.91 hrs, Volume= 1.825 af, Depth> 3.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 91S: BC Heights Existing



Summary for Subcatchment 95S: Predeveloped

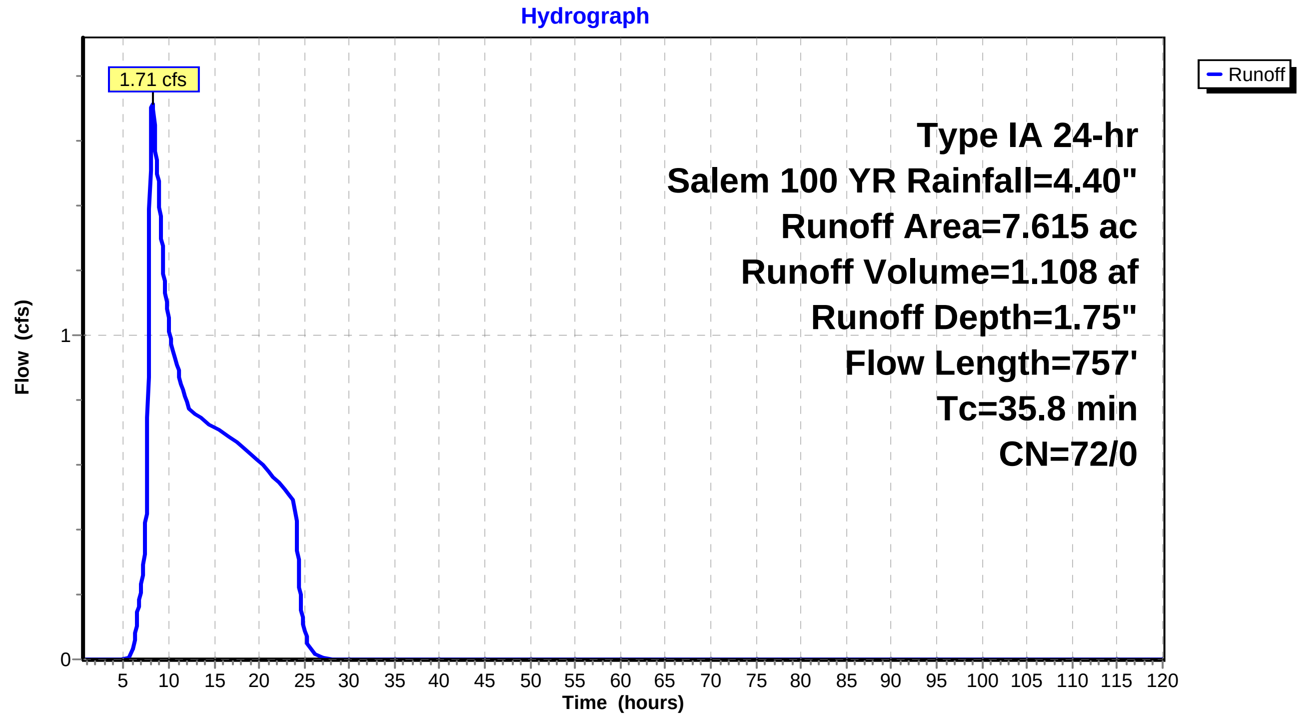
Runoff = 1.71 cfs @ 8.18 hrs, Volume= 1.108 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
7.615	72	Woods/grass comb., Good, HSG C
7.615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	300	0.0617	0.16		**Sheet Flow,** n= 0.300 P2= 2.20"
4.2	457	0.0667	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	757	Total			

Subcatchment 95S: Predeveloped

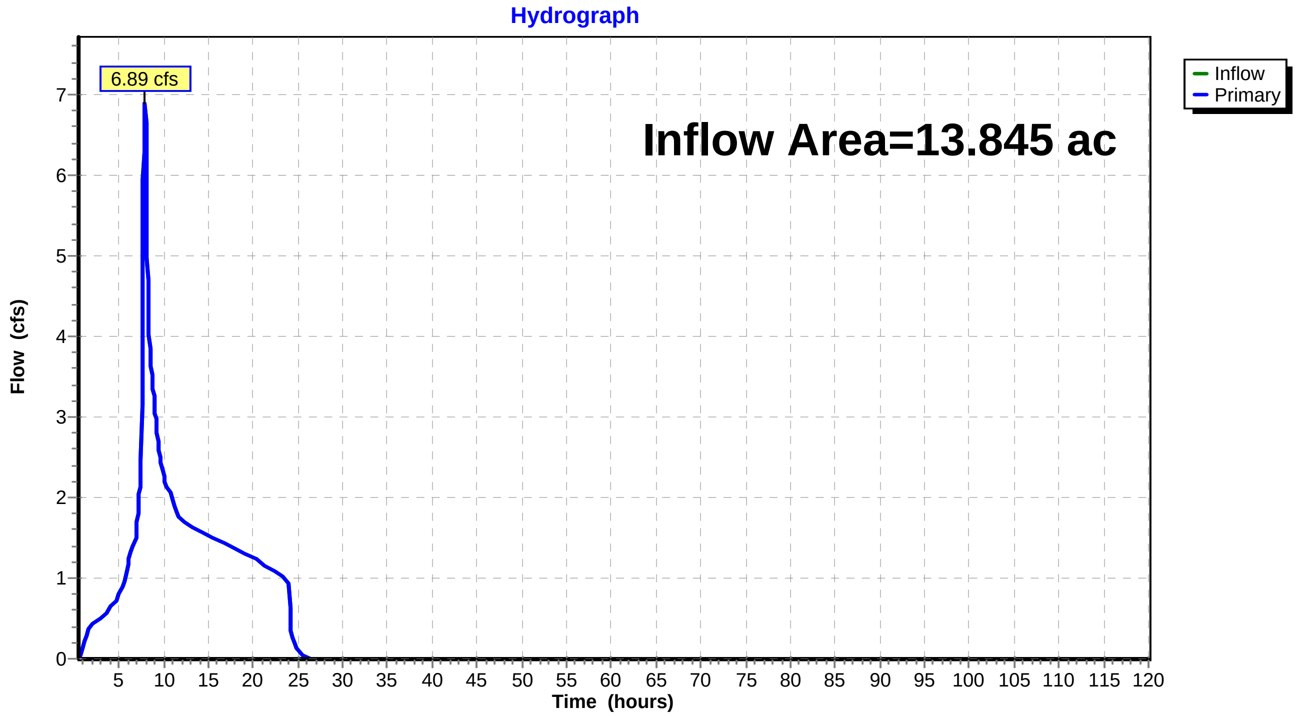


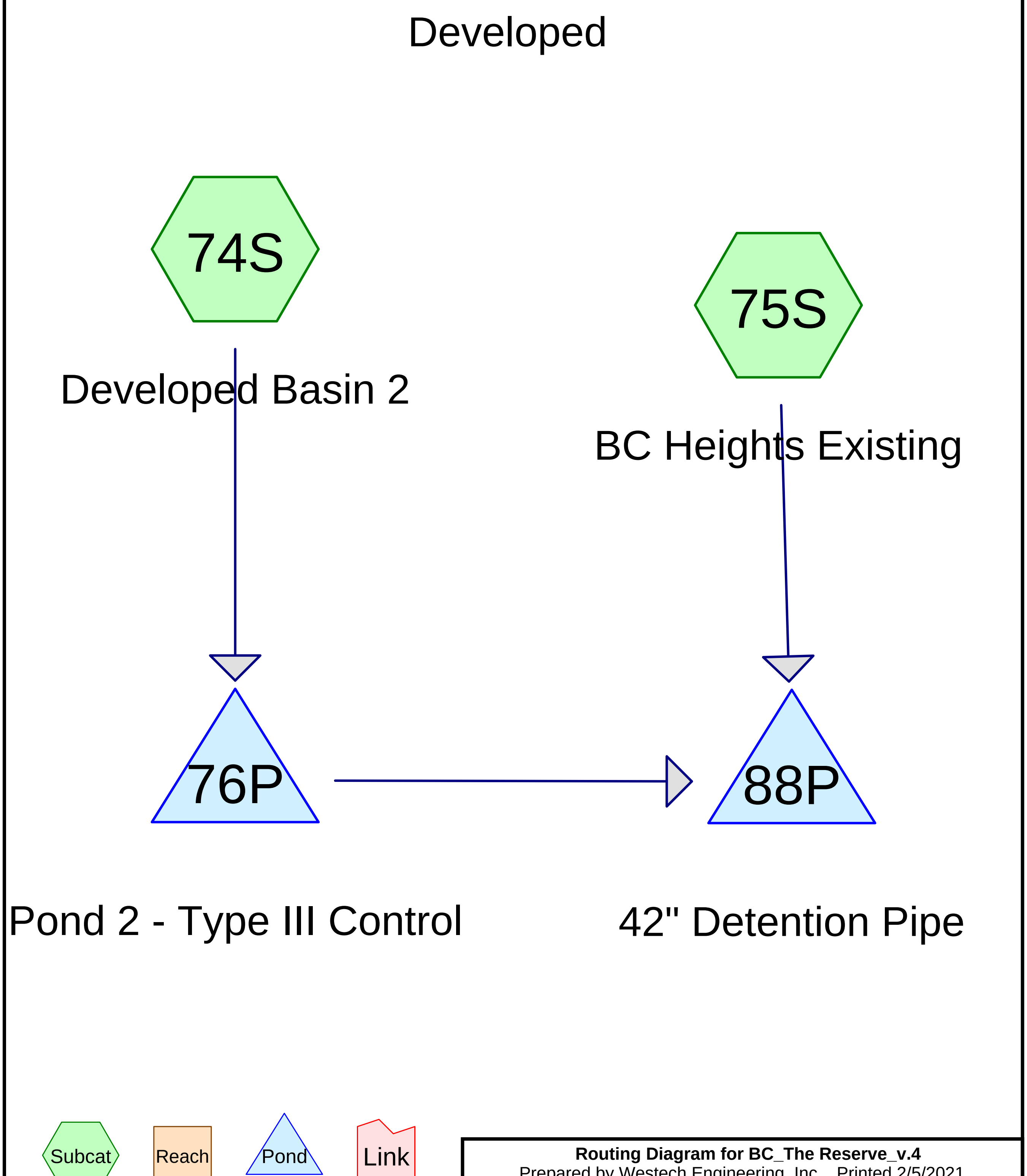
Summary for Link 93L: BC Heights + Developed Runoff

Inflow Area = 13.845 ac, 31.67% Impervious, Inflow Depth > 2.54" for Salem 100 YR event
Inflow = 6.89 cfs @ 7.98 hrs, Volume= 2.933 af
Primary = 6.89 cfs @ 7.98 hrs, Volume= 2.933 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs

Link 93L: BC Heights + Developed Runoff





Routing Diagram for BC_The Reserve_v.4
Prepared by Westech Engineering, Inc., Printed 2/5/2021

Summary for Subcatchment 74S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

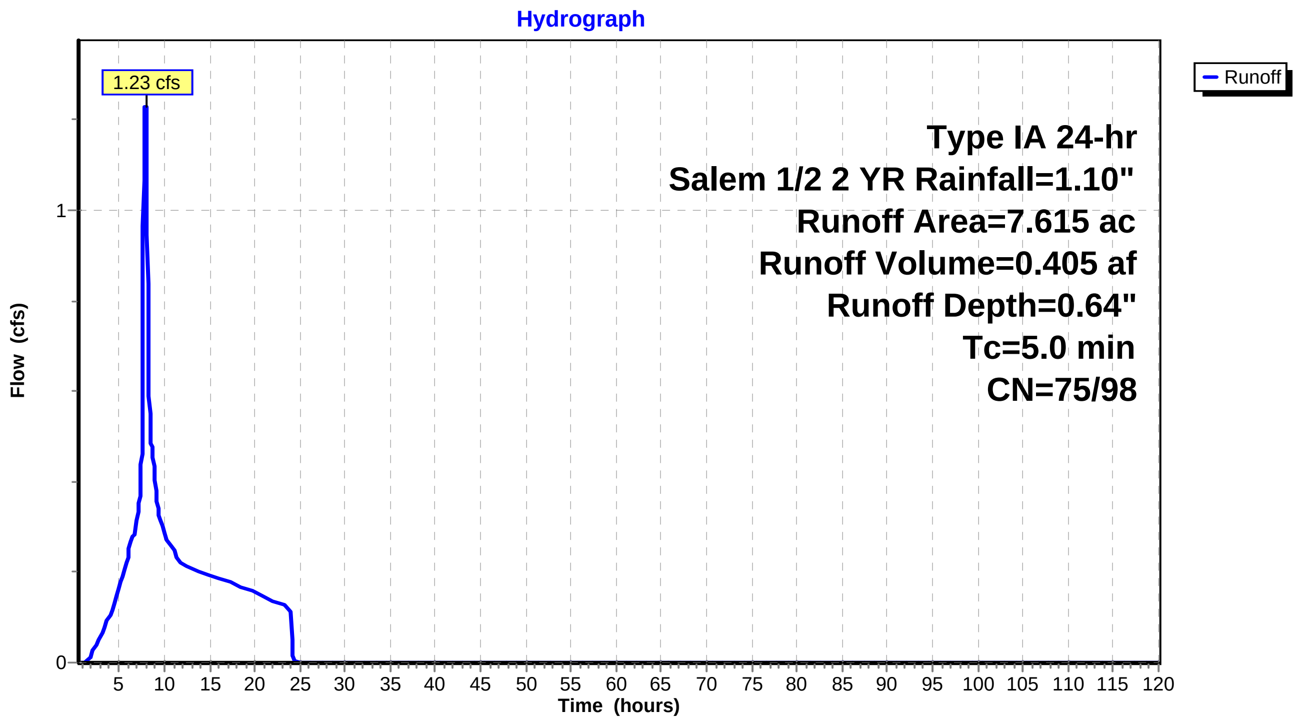
Runoff = 1.23 cfs @ 7.92 hrs, Volume= 0.405 af, Depth= 0.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 74S: Developed Basin 2



Summary for Subcatchment 75S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

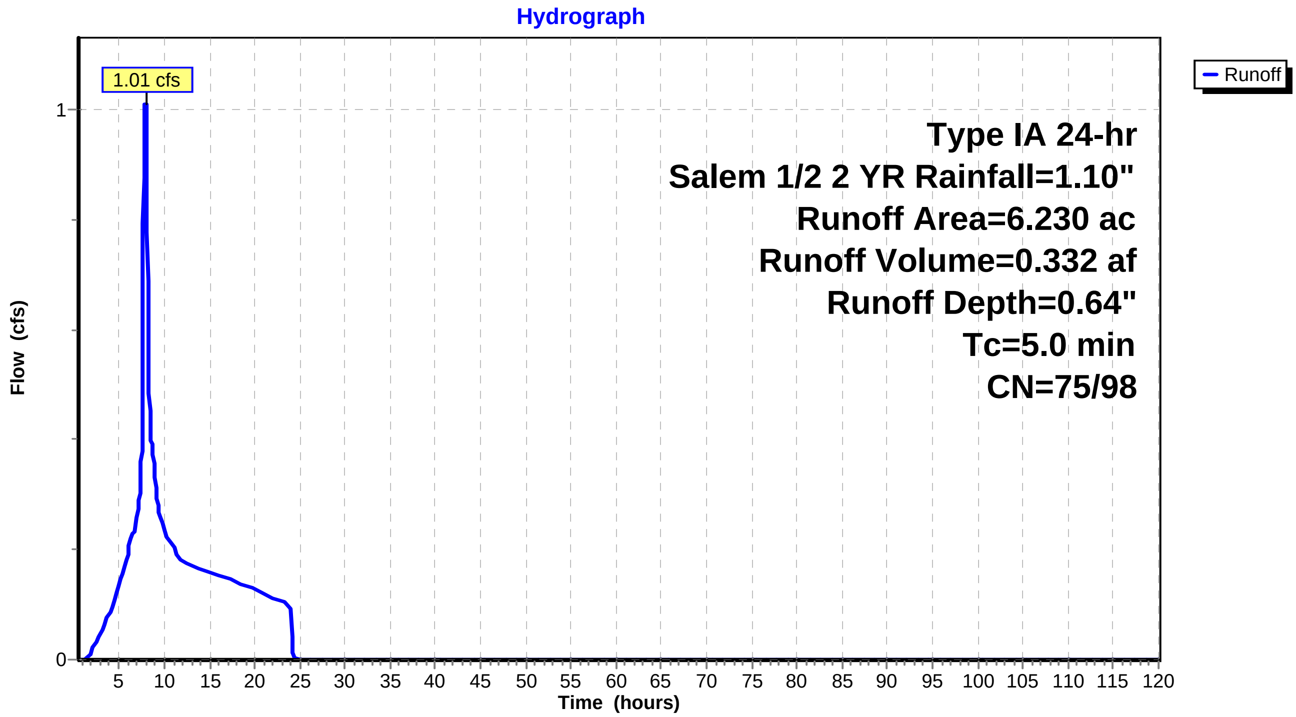
Runoff = 1.01 cfs @ 7.92 hrs, Volume= 0.332 af, Depth= 0.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 75S: BC Heights Existing



Summary for Pond 76P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 0.64" for Salem 1/2 2 YR event
Inflow = 1.23 cfs @ 7.92 hrs, Volume= 0.405 af
Outflow = 0.16 cfs @ 19.69 hrs, Volume= 0.405 af, Atten= 87%, Lag= 706.7 min
Discarded = 0.05 cfs @ 3.85 hrs, Volume= 0.274 af
Primary = 0.11 cfs @ 19.69 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 411.13' @ 19.69 hrs Surf.Area= 6,375 sf Storage= 9,268 cf

Plug-Flow detention time= 1,076.9 min calculated for 0.405 af (100% of inflow)
Center-of-Mass det. time= 1,077.6 min (1,795.8 - 718.1)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

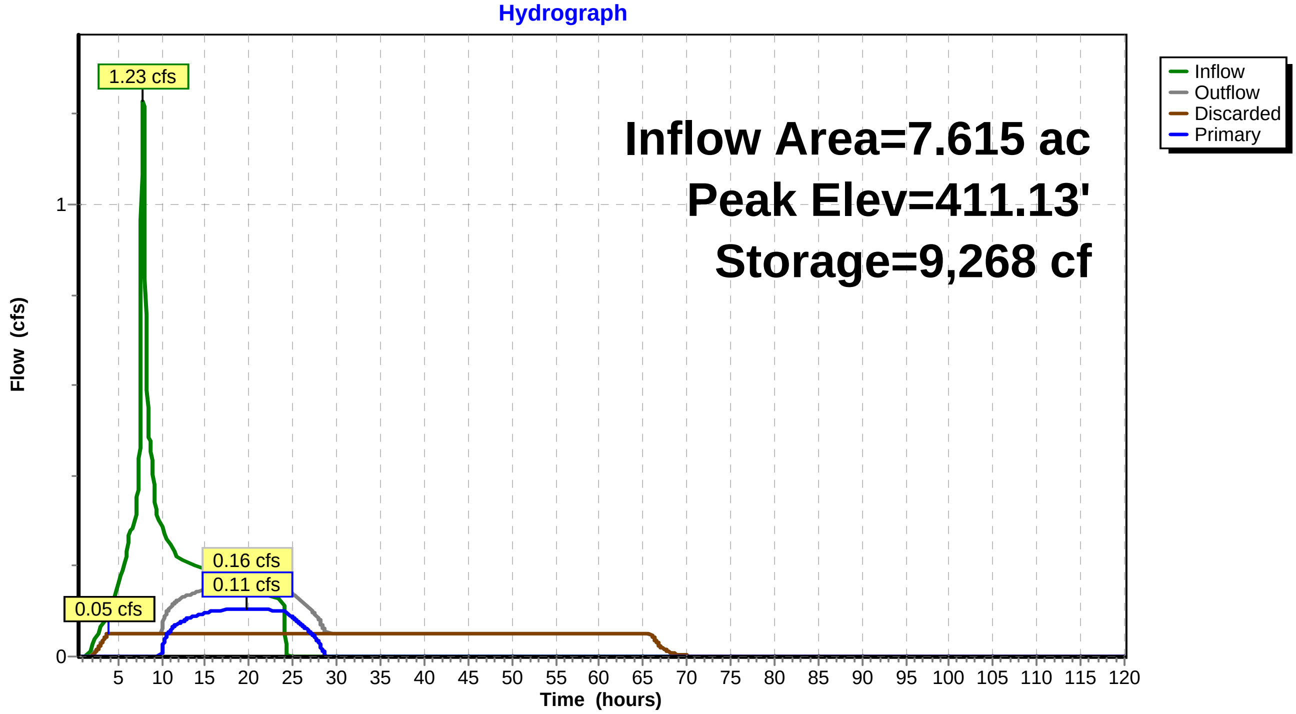
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 3.85 hrs HW=407.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.11 cfs @ 19.69 hrs HW=411.13' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.11 cfs @ 4.40 fps)
├─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 76P: Pond 2 - Type III Control



Summary for Pond 88P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage

Inflow Area =	13.845 ac, 70.26% Impervious,	Inflow Depth = 0.40"	for Salem 1/2 2 YR event	
Inflow =	1.01 cfs @	7.92 hrs, Volume=	0.463 af	
Outflow =	0.99 cfs @	7.99 hrs, Volume=	0.463 af,	Atten= 2%, Lag= 4.4 min
Primary =	0.99 cfs @	7.99 hrs, Volume=	0.463 af	

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 410.18' @ 7.99 hrs Surf.Area= 0.018 ac Storage= 0.005 af

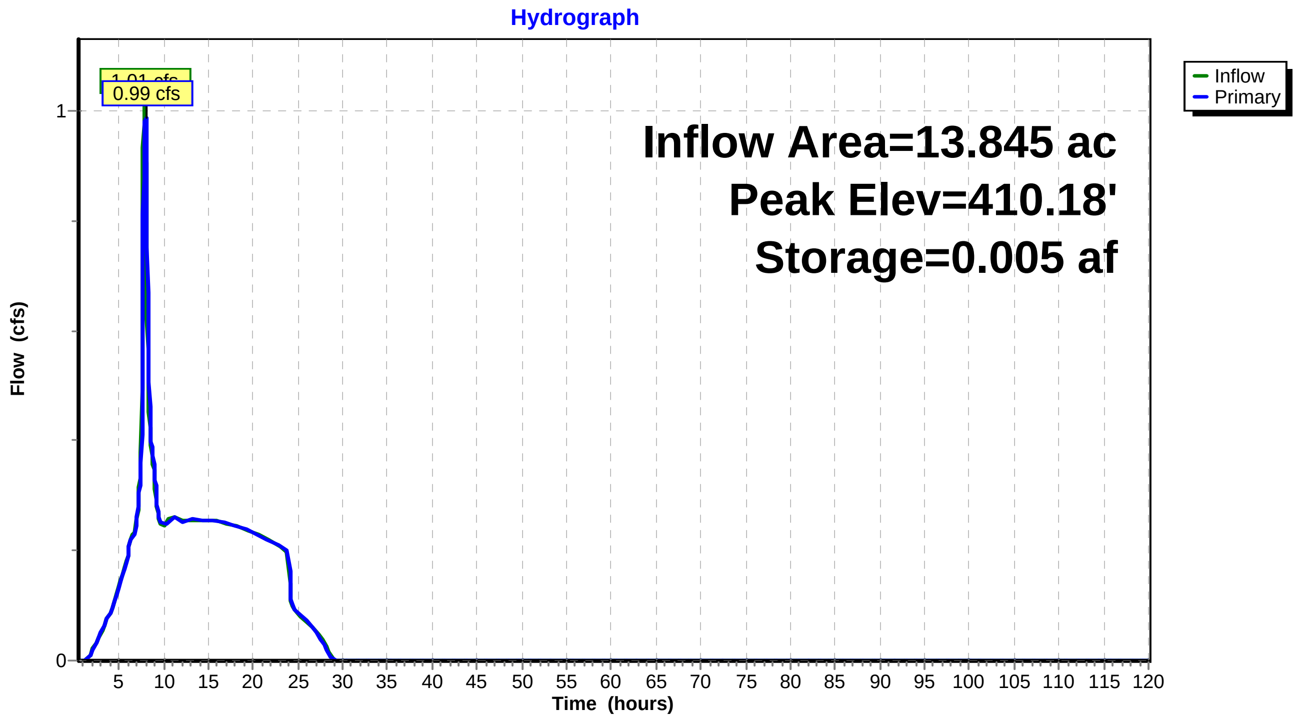
Plug-Flow detention time= 1.4 min calculated for 0.463 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (840.4 - 838.9)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	412.55'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 7.99 hrs HW=410.18' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.99 cfs @ 2.66 fps)
2=Orifice/Grate (Controls 0.00 cfs)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 88P: 42" Detention Pipe



Summary for Subcatchment 74S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

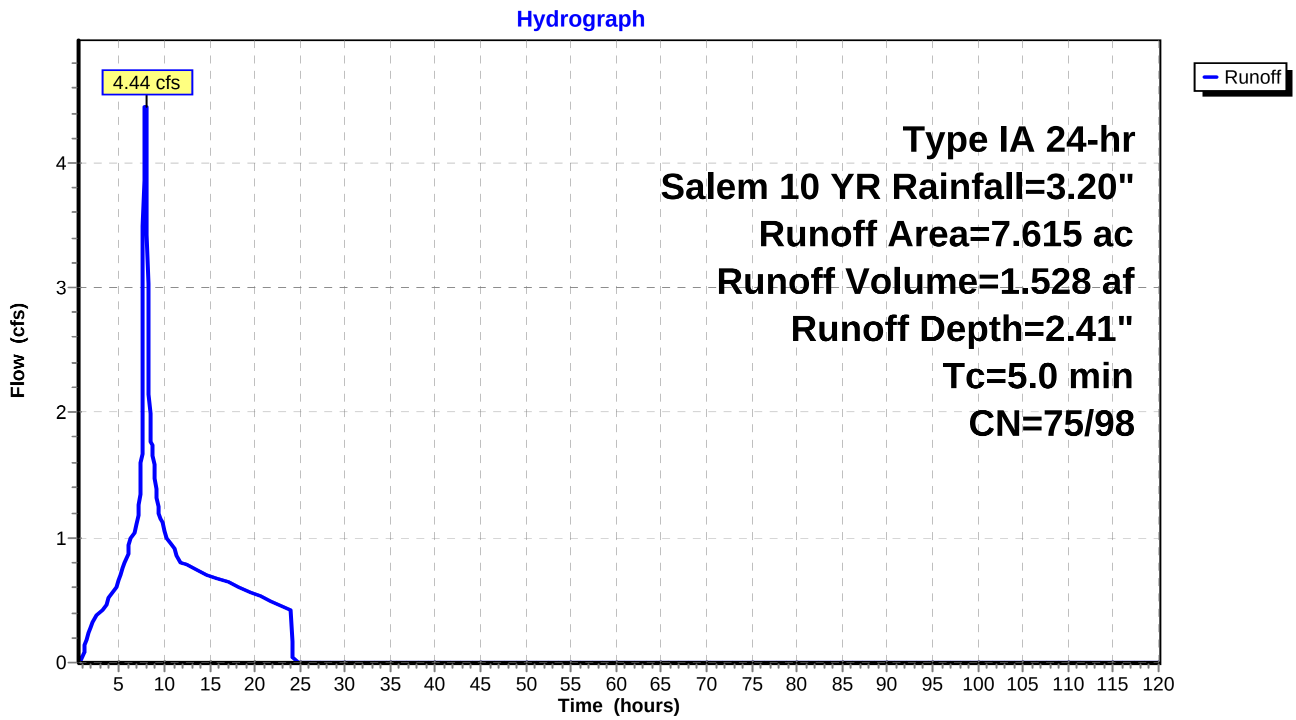
Runoff = 4.44 cfs @ 7.92 hrs, Volume= 1.528 af, Depth= 2.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 74S: Developed Basin 2



Summary for Subcatchment 75S: BC Heights Existing

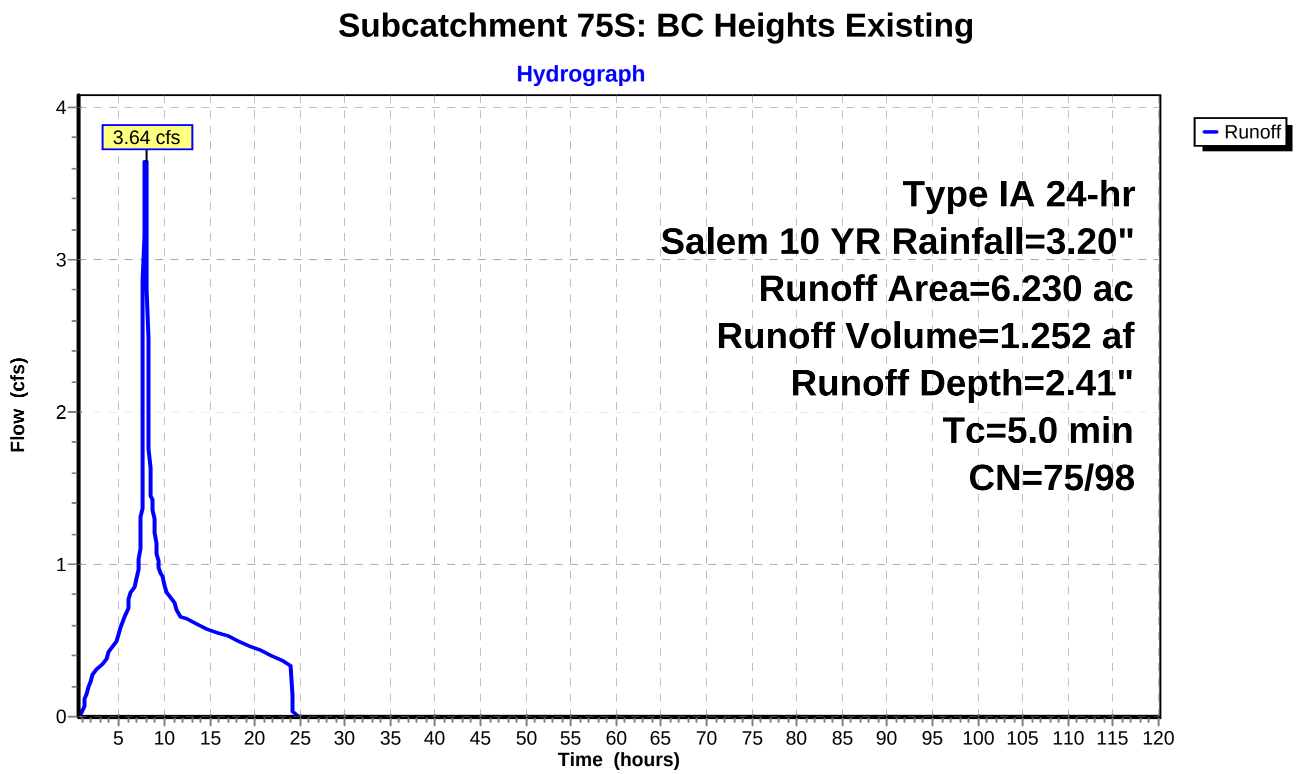
[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.64 cfs @ 7.92 hrs, Volume= 1.252 af, Depth= 2.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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



Summary for Pond 76P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 2.41" for Salem 10 YR event
Inflow = 4.44 cfs @ 7.92 hrs, Volume= 1.528 af
Outflow = 0.81 cfs @ 11.67 hrs, Volume= 1.528 af, Atten= 82%, Lag= 224.8 min
Discarded = 0.06 cfs @ 11.67 hrs, Volume= 0.322 af
Primary = 0.75 cfs @ 11.67 hrs, Volume= 1.206 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 415.36' @ 11.67 hrs Surf.Area= 7,730 sf Storage= 25,681 cf

Plug-Flow detention time= 609.6 min calculated for 1.528 af (100% of inflow)
Center-of-Mass det. time= 609.3 min (1,301.6 - 692.3)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

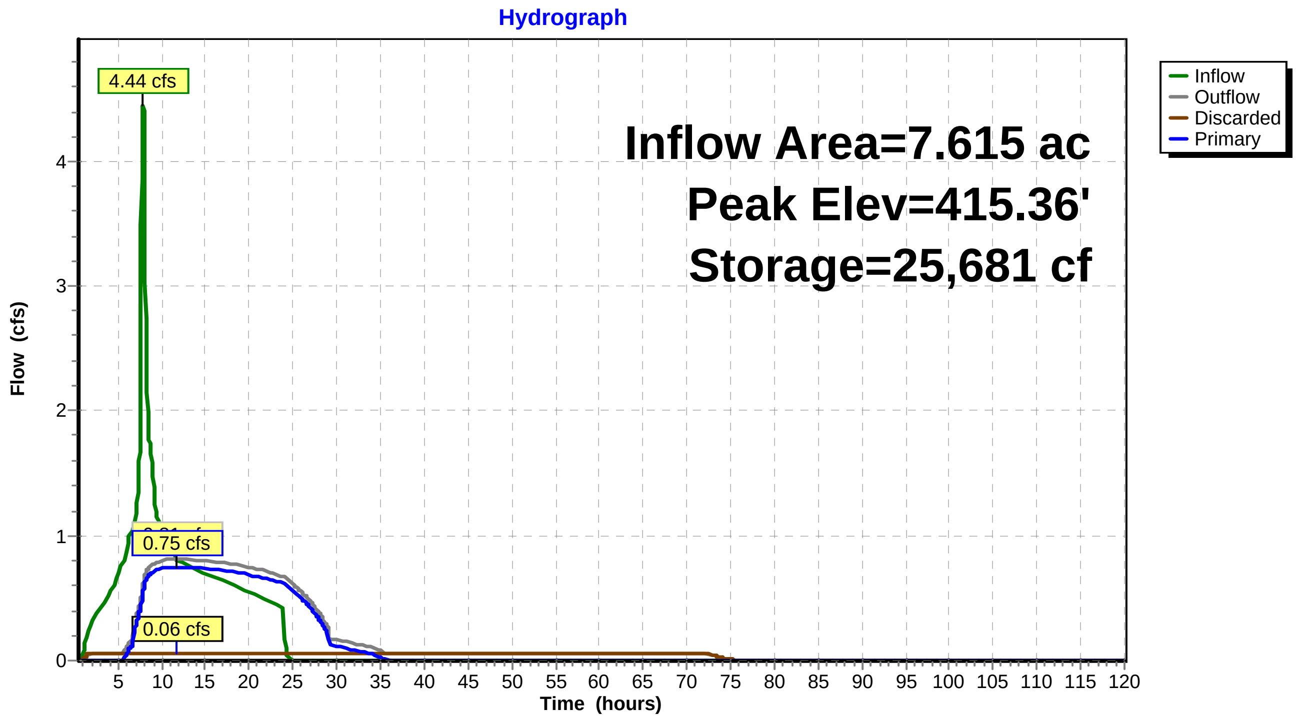
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 11.67 hrs HW=415.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.75 cfs @ 11.67 hrs HW=415.36' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 10.83 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.49 cfs @ 7.32 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 76P: Pond 2 - Type III Control



Summary for Pond 88P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 76P Primary device # 2 by 2.25'

Inflow Area = 13.845 ac, 70.26% Impervious, Inflow Depth = 2.13" for Salem 10 YR event
Inflow = 4.21 cfs @ 7.94 hrs, Volume= 2.458 af
Outflow = 3.21 cfs @ 8.14 hrs, Volume= 2.458 af, Atten= 24%, Lag= 11.9 min
Primary = 3.21 cfs @ 8.14 hrs, Volume= 2.458 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 412.55' @ 8.14 hrs Surf.Area= 0.025 ac Storage= 0.069 af

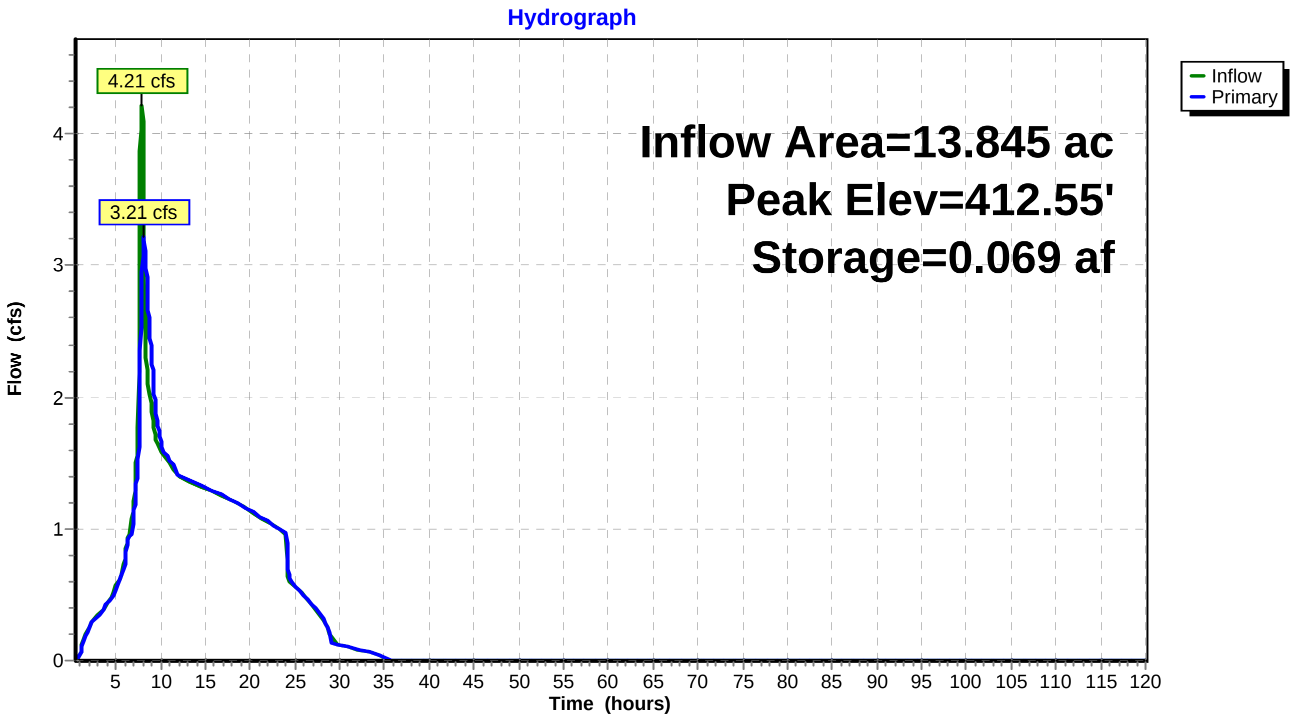
Plug-Flow detention time= 5.3 min calculated for 2.457 af (100% of inflow)
Center-of-Mass det. time= 5.3 min (876.5 - 871.2)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	412.55'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.21 cfs @ 8.14 hrs HW=412.54' (Free Discharge)
1=Orifice/Grate (Orifice Controls 3.21 cfs @ 7.78 fps)
2=Orifice/Grate (Controls 0.00 cfs)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 88P: 42" Detention Pipe



Summary for Subcatchment 74S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

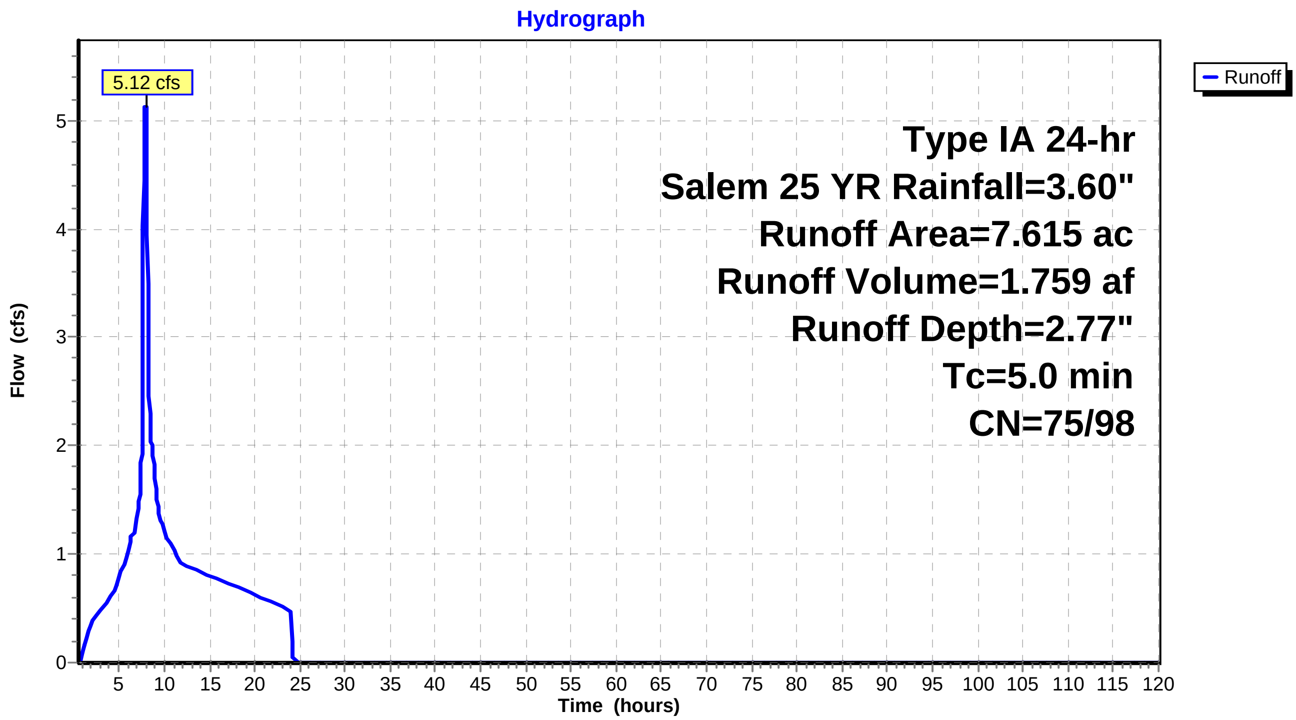
Runoff = 5.12 cfs @ 7.92 hrs, Volume= 1.759 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 74S: Developed Basin 2



Summary for Subcatchment 75S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

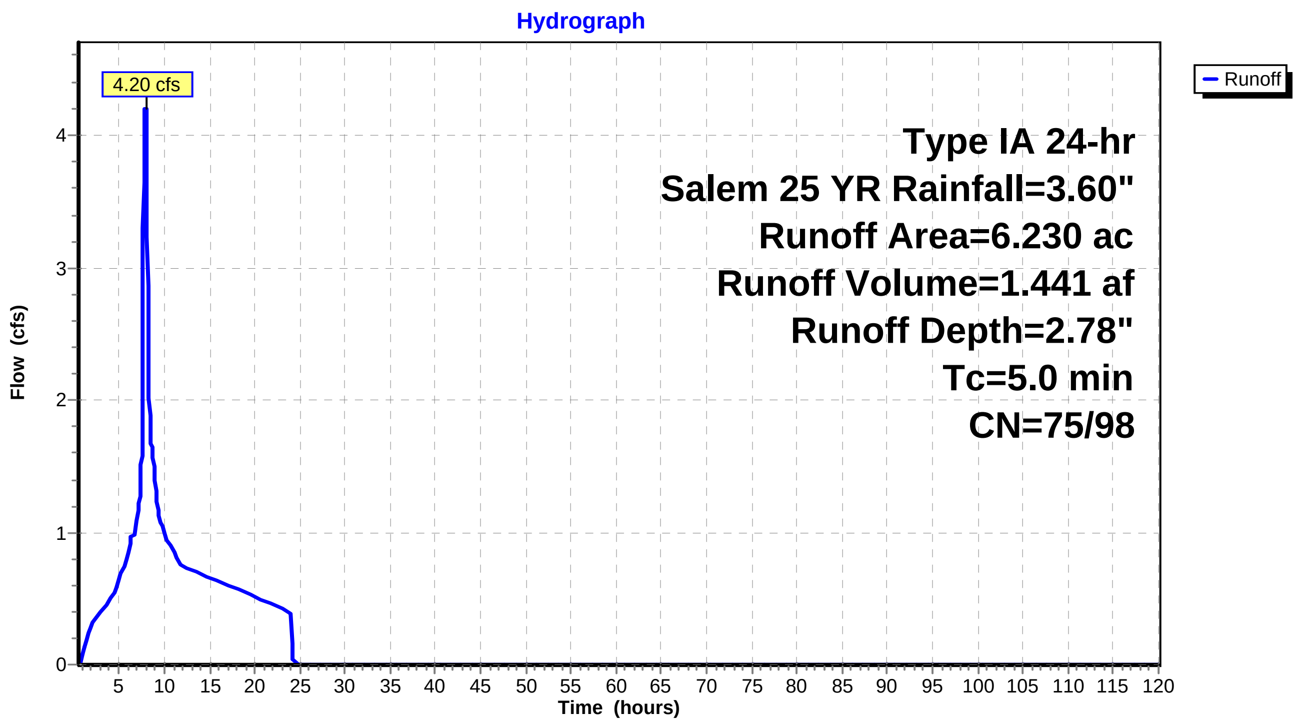
Runoff = 4.20 cfs @ 7.92 hrs, Volume= 1.441 af, Depth= 2.78"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 75S: BC Heights Existing



Summary for Pond 76P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 2.77" for Salem 25 YR event
Inflow = 5.12 cfs @ 7.92 hrs, Volume= 1.759 af
Outflow = 1.12 cfs @ 10.38 hrs, Volume= 1.759 af, Atten= 78%, Lag= 148.0 min
Discarded = 0.07 cfs @ 10.38 hrs, Volume= 0.333 af
Primary = 1.06 cfs @ 10.38 hrs, Volume= 1.426 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 415.73' @ 10.38 hrs Surf.Area= 8,114 sf Storage= 28,575 cf

Plug-Flow detention time= 591.4 min calculated for 1.758 af (100% of inflow)
Center-of-Mass det. time= 592.5 min (1,282.2 - 689.7)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

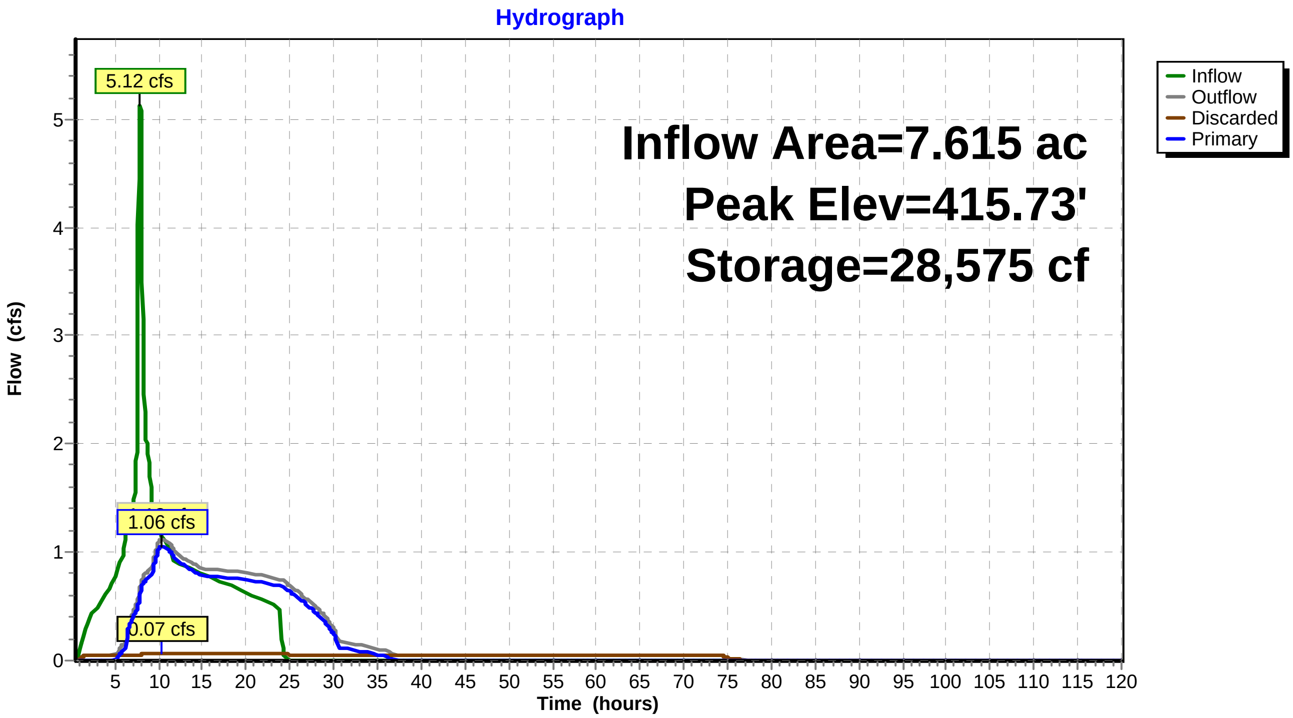
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 10.38 hrs HW=415.73' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.04 cfs @ 10.38 hrs HW=415.73' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 11.21 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.53 cfs @ 7.88 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.99 fps)

Pond 76P: Pond 2 - Type III Control



Summary for Pond 88P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 76P Primary device # 2 by 2.83'
[79] Warning: Submerged Pond 76P Primary device # 3 by 0.23'

Inflow Area = 13.845 ac, 70.26% Impervious, Inflow Depth = 2.48" for Salem 25 YR event
Inflow = 4.83 cfs @ 7.93 hrs, Volume= 2.867 af
Outflow = 4.10 cfs @ 8.09 hrs, Volume= 2.867 af, Atten= 15%, Lag= 9.3 min
Primary = 4.10 cfs @ 8.09 hrs, Volume= 2.867 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 413.14' @ 8.09 hrs Surf.Area= 0.014 ac Storage= 0.080 af

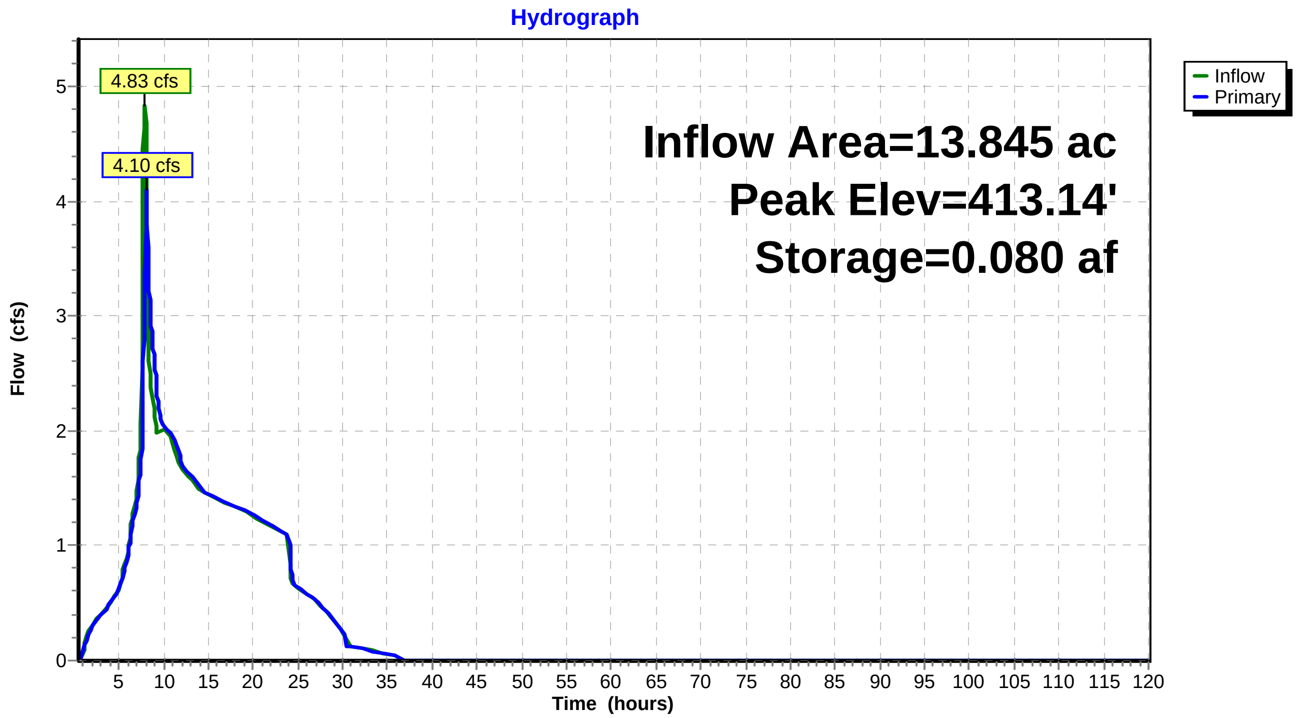
Plug-Flow detention time= 6.2 min calculated for 2.865 af (100% of inflow)
Center-of-Mass det. time= 6.2 min (880.1 - 873.9)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	412.55'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.09 cfs @ 8.09 hrs HW=413.13' (Free Discharge)
1=Orifice/Grate (Orifice Controls 3.55 cfs @ 8.60 fps)
2=Orifice/Grate (Orifice Controls 0.54 cfs @ 2.75 fps)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 88P: 42" Detention Pipe



Summary for Subcatchment 74S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

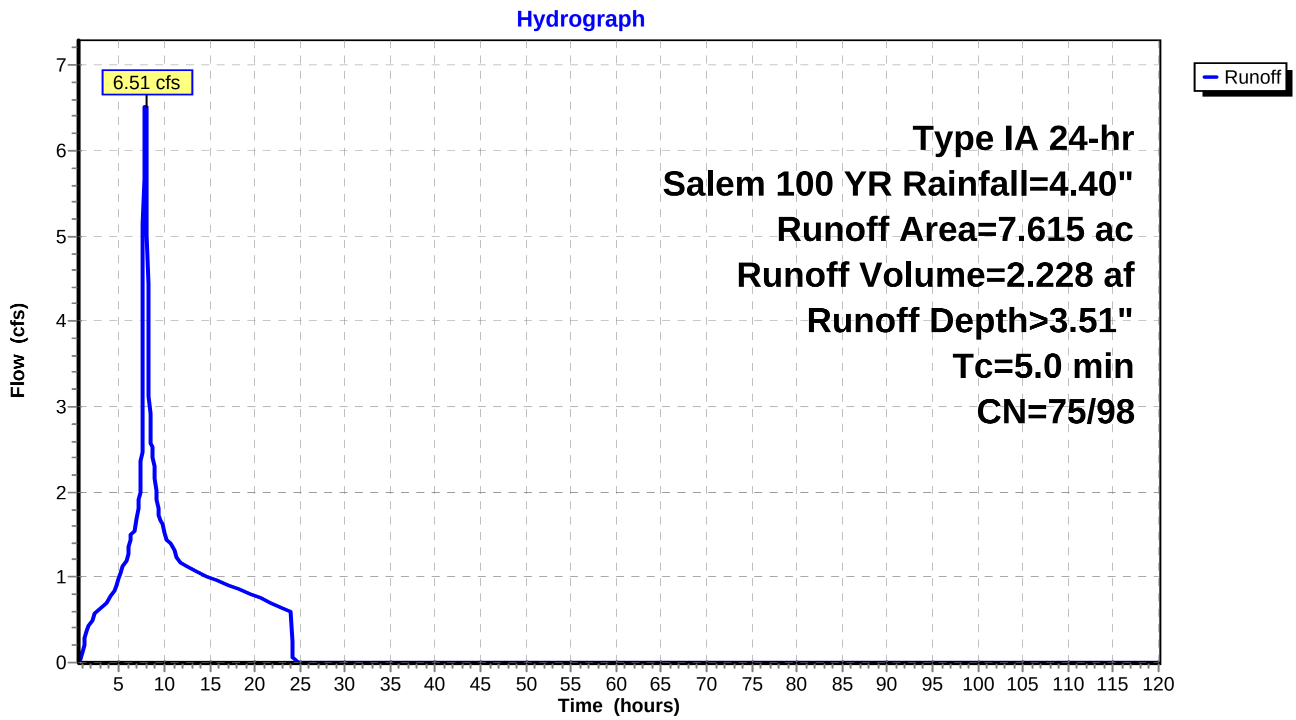
Runoff = 6.51 cfs @ 7.91 hrs, Volume= 2.228 af, Depth> 3.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 74S: Developed Basin 2



Summary for Subcatchment 75S: BC Heights Existing

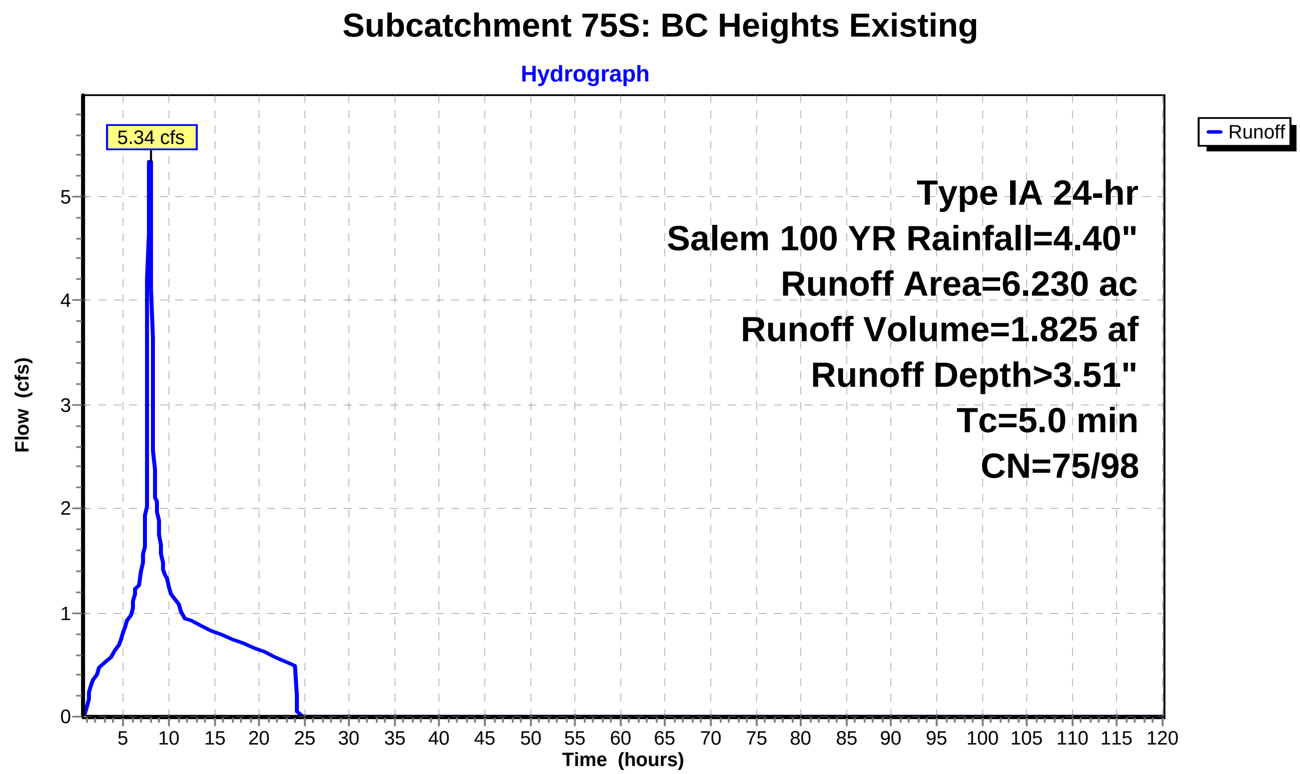
[49] Hint: Tc<2dt may require smaller dt

Runoff = 5.34 cfs @ 7.91 hrs, Volume= 1.825 af, Depth> 3.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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



Summary for Pond 76P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth > 3.51" for Salem 100 YR event
Inflow = 6.51 cfs @ 7.91 hrs, Volume= 2.228 af
Outflow = 2.36 cfs @ 8.81 hrs, Volume= 2.227 af, Atten= 64%, Lag= 53.7 min
Discarded = 0.07 cfs @ 8.81 hrs, Volume= 0.343 af
Primary = 2.29 cfs @ 8.81 hrs, Volume= 1.885 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 416.00' @ 8.81 hrs Surf.Area= 8,408 sf Storage= 30,828 cf

Plug-Flow detention time= 511.7 min calculated for 2.227 af (100% of inflow)
Center-of-Mass det. time= 511.3 min (1,196.7 - 685.4)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

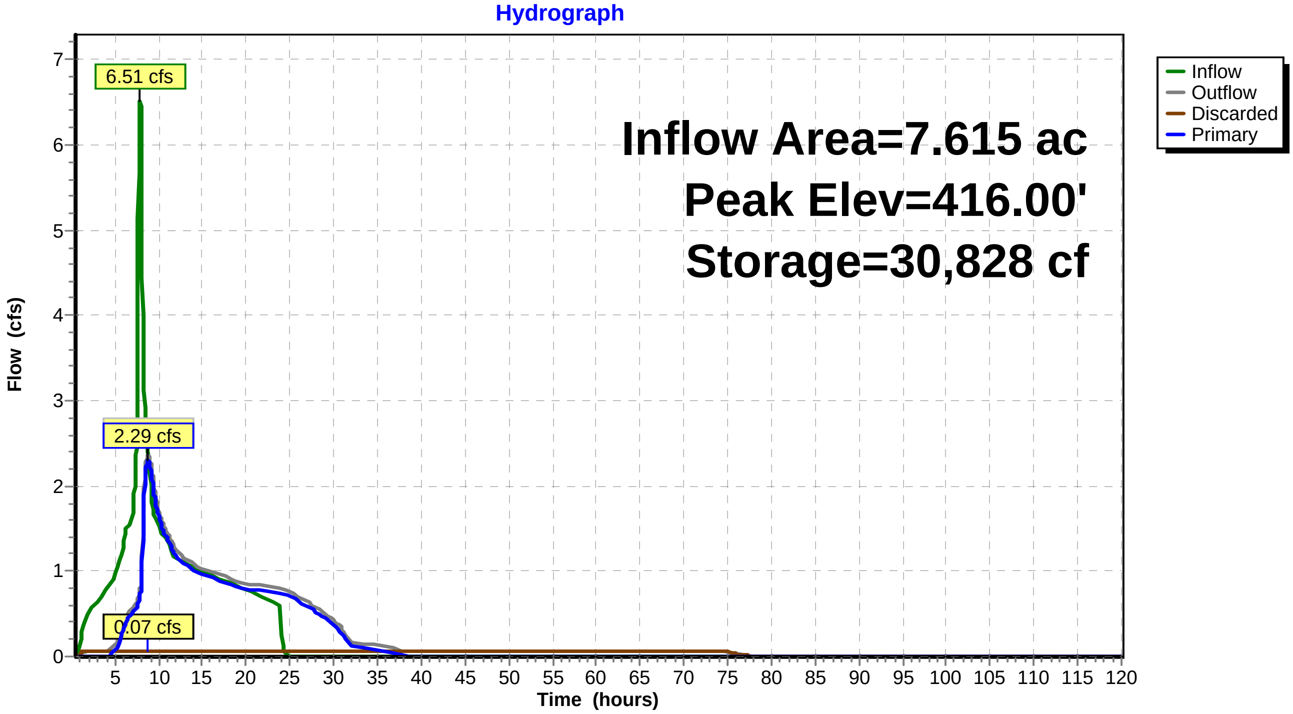
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 8.81 hrs HW=416.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.29 cfs @ 8.81 hrs HW=416.00' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.28 cfs @ 11.49 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.55 cfs @ 8.27 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.46 cfs @ 1.84 fps)

Pond 76P: Pond 2 - Type III Control



Summary for Pond 88P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[79] Warning: Submerged Pond 76P Primary device # 2 by 3.31'
[79] Warning: Submerged Pond 76P Primary device # 3 by 0.71'

Inflow Area = 13.845 ac, 70.26% Impervious, Inflow Depth > 3.22" for Salem 100 YR event
Inflow = 6.07 cfs @ 7.93 hrs, Volume= 3.710 af
Outflow = 7.11 cfs @ 7.90 hrs, Volume= 3.710 af, Atten= 0%, Lag= 0.0 min
Primary = 7.11 cfs @ 7.90 hrs, Volume= 3.710 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 413.62' @ 7.90 hrs Surf.Area= 0.001 ac Storage= 0.083 af

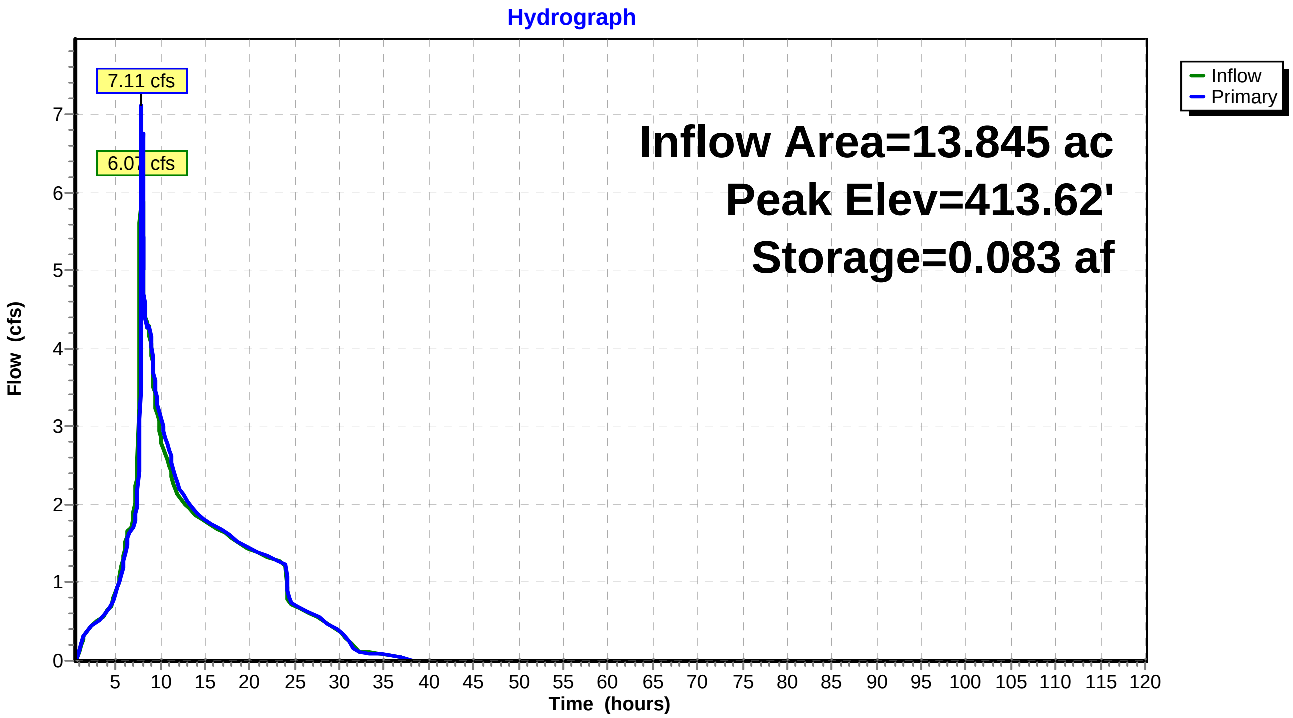
Plug-Flow detention time= 8.1 min calculated for 3.710 af (100% of inflow)
Center-of-Mass det. time= 8.1 min (855.8 - 847.8)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	412.55'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.03 cfs @ 7.90 hrs HW=413.60' (Free Discharge)
1=Orifice/Grate (Orifice Controls 3.81 cfs @ 9.22 fps)
2=Orifice/Grate (Orifice Controls 0.84 cfs @ 4.30 fps)
3=Orifice/Grate (Orifice Controls 2.38 cfs @ 3.03 fps)

Pond 88P: 42" Detention Pipe



Summary for Subcatchment 74S: Developed Basin 2

[49] Hint: Tc<2dt may require smaller dt

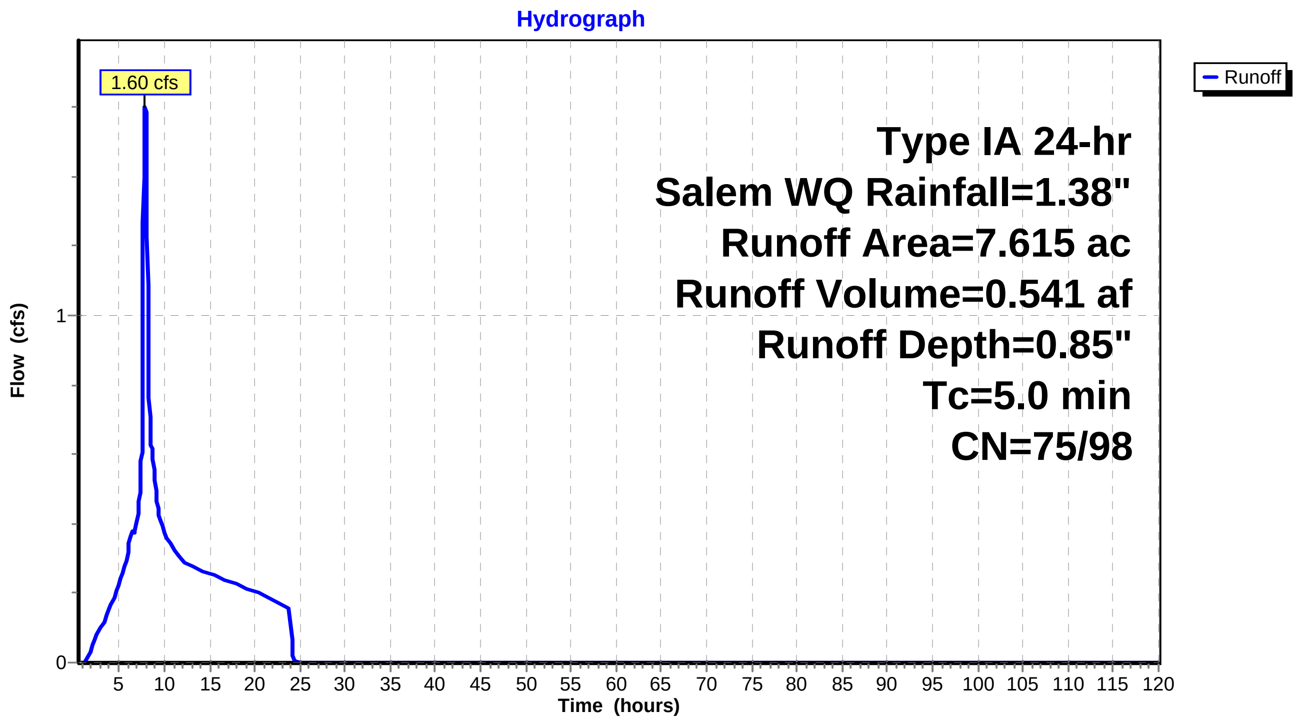
Runoff = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af, Depth= 0.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
2.180	98	Paved parking, HSG C
0.257	74	>75% Grass cover, Good, HSG C
4.428	90	1/8 acre lots, 65% imp, HSG C
0.750	83	1/4 acre lots, 38% imp, HSG C
7.615	91	Weighted Average
2.272		29.83% Pervious Area
5.343		70.17% Impervious Area

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

Subcatchment 74S: Developed Basin 2



Summary for Subcatchment 75S: BC Heights Existing

[49] Hint: Tc<2dt may require smaller dt

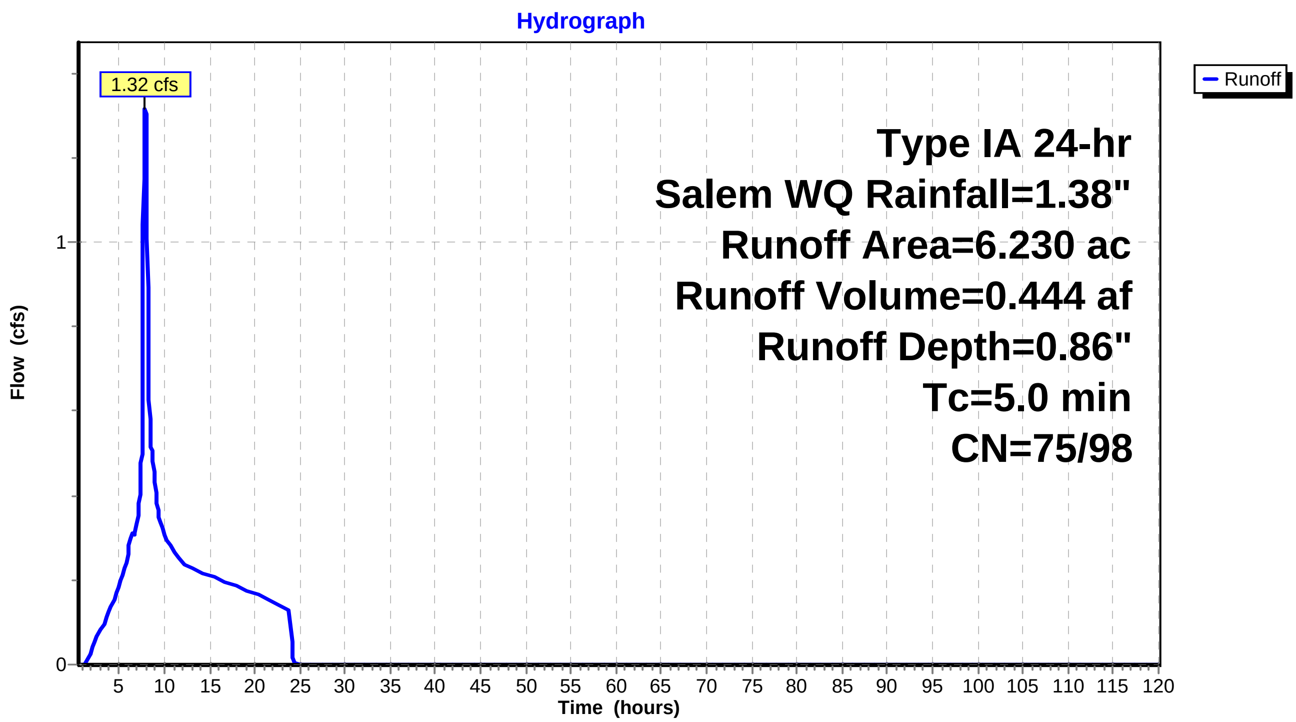
Runoff = 1.32 cfs @ 7.91 hrs, Volume= 0.444 af, Depth= 0.86"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

Area (ac)	CN	Description
4.260	90	1/8 acre lots, 65% imp, HSG C
0.572	83	1/4 acre lots, 38% imp, HSG C
1.398	98	Paved parking, HSG C
6.230	91	Weighted Average
1.846		29.63% Pervious Area
4.384		70.37% Impervious Area

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

Subcatchment 75S: BC Heights Existing



Summary for Pond 76P: Pond 2 - Type III Control

Inflow Area = 7.615 ac, 70.17% Impervious, Inflow Depth = 0.85" for Salem WQ event
Inflow = 1.60 cfs @ 7.91 hrs, Volume= 0.541 af
Outflow = 0.28 cfs @ 13.34 hrs, Volume= 0.541 af, Atten= 83%, Lag= 326.0 min
Discarded = 0.05 cfs @ 3.10 hrs, Volume= 0.285 af
Primary = 0.23 cfs @ 13.34 hrs, Volume= 0.257 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 413.03' @ 13.34 hrs Surf.Area= 5,453 sf Storage= 10,347 cf

Plug-Flow detention time= 920.8 min calculated for 0.541 af (100% of inflow)
Center-of-Mass det. time= 921.8 min (1,633.7 - 711.9)

Volume	Invert	Avail.Storage	Storage Description
#1	407.50'	35,286 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

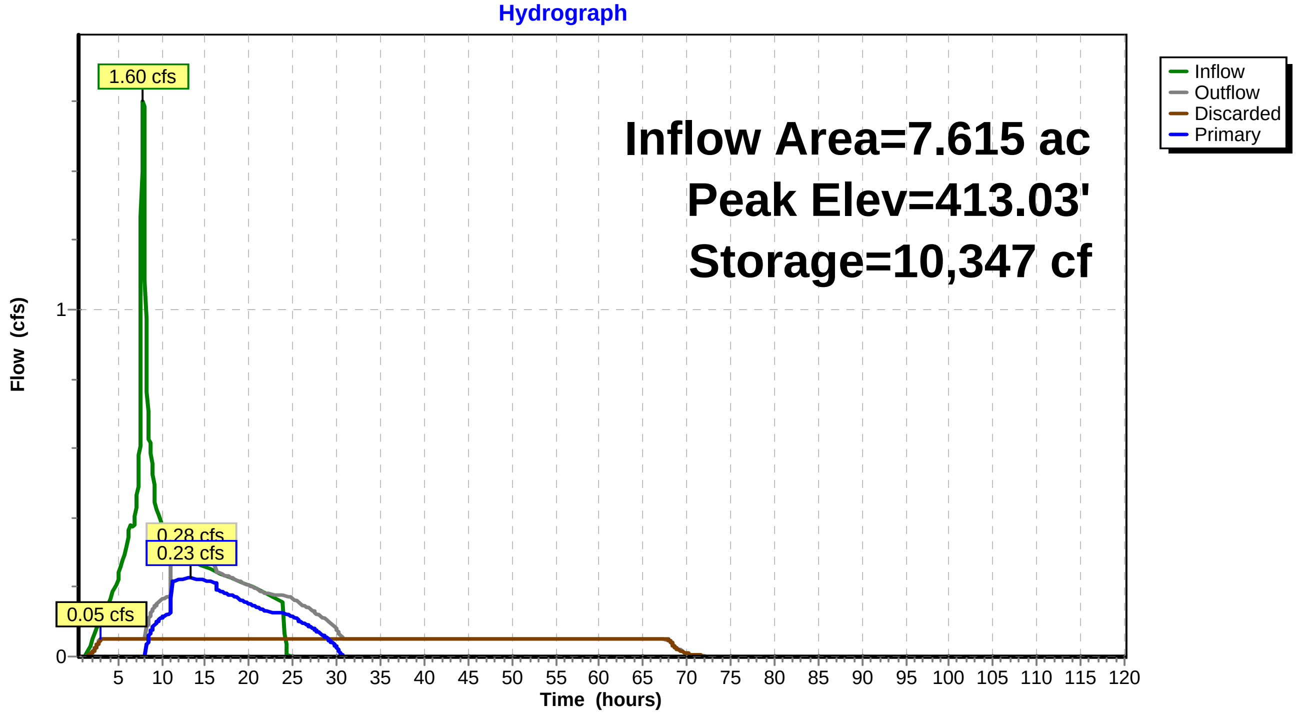
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
407.50	6,375	0.0	0	0	6,375
411.50	6,375	40.0	10,200	10,200	7,507
413.00	5,430	0.1	9	10,209	8,537
414.00	6,375	100.0	5,896	16,105	9,520
415.00	7,360	100.0	6,862	22,967	10,548
416.00	8,410	100.0	7,879	30,846	11,644
416.50	9,360	100.0	4,440	35,286	12,608

Device	Routing	Invert	Outlet Devices
#1	Discarded	407.50'	**0.350 in/hr Exfiltration over Horizontal area**
#2	Primary	410.30'	**2.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	412.90'	**3.5" Vert. Orifice/Grate** C= 0.600
#4	Primary	415.60'	**2.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 3.10 hrs HW=407.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.22 cfs @ 13.34 hrs HW=413.03' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 7.95 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.21 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 76P: Pond 2 - Type III Control



Summary for Pond 88P: 42" Detention Pipe

[44] Hint: Outlet device #1 is below defined storage
[81] Warning: Exceeded Pond 76P by 0.55' @ 7.95 hrs

Inflow Area = 13.845 ac, 70.26% Impervious, Inflow Depth = 0.61" for Salem WQ event
Inflow = 1.32 cfs @ 7.91 hrs, Volume= 0.701 af
Outflow = 1.25 cfs @ 8.01 hrs, Volume= 0.701 af, Atten= 5%, Lag= 6.2 min
Primary = 1.25 cfs @ 8.01 hrs, Volume= 0.701 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 410.33' @ 8.01 hrs Surf.Area= 0.021 ac Storage= 0.007 af

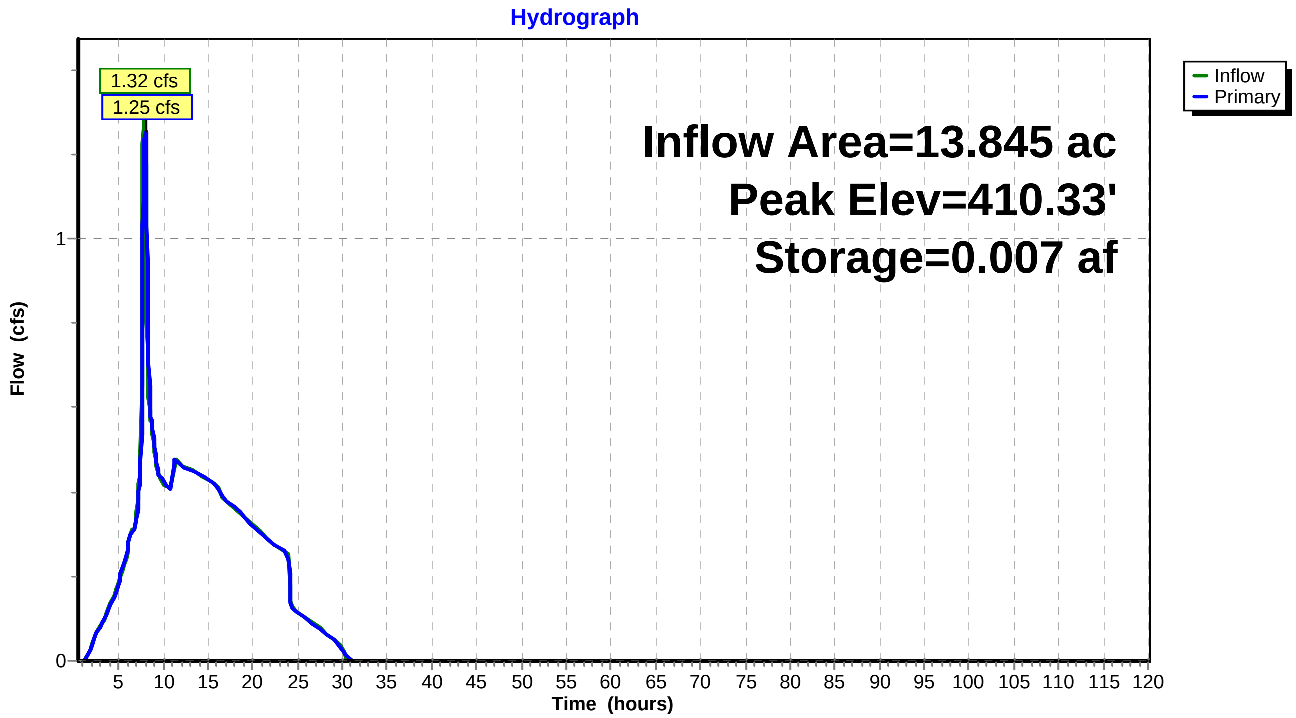
Plug-Flow detention time= 1.8 min calculated for 0.700 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (843.1 - 841.2)

Volume	Invert	Avail.Storage	Storage Description
#1	409.67'	0.080 af	**42.0" Round Pipe Storage** L= 363.0' S= 0.0009 '/'
#2	409.67'	0.007 af	**6.00'D x 10.10'H Vertical Cone/Cylinder**
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	409.57'	**8.7" Vert. Orifice/Grate** C= 0.600
#2	Primary	412.55'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	413.20'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.25 cfs @ 8.01 hrs HW=410.33' (Free Discharge)
1=Orifice/Grate (Orifice Controls 1.25 cfs @ 3.03 fps)
2=Orifice/Grate (Controls 0.00 cfs)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 88P: 42" Detention Pipe



APPENDIX E

OPERATIONS AND MAINTENANCE

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden

A rain garden is a **vegetated infiltration basin** or depression created by excavation, berms, or small dams to provide for short-term ponding of surface water until it percolates into the soil. The basin should infiltrate stormwater within 24 hours.

Inspections

All facility components and vegetation shall be inspected for proper operations and structural stability. *These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, and two times per year thereafter.* It is recommended that a visual inspection be made within 48 hours after each major storm event to ensure proper function. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Date: ____/____/_________ Inspector's Name: ______________________________

Basin inlet shall ensure unrestricted stormwater flow to the vegetated basin.

- □ Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- □ Inlet shall be kept clear at all times.
- □ Rock splash pads shall be replenished to prevent erosion.

Inspection Comments: ______________________________

____

Embankment, dikes, berms, and side slopes retain water in the infiltration basin.

- □ Structural deficiencies shall be corrected upon discovery.
- □ Slopes shall be stabilized using appropriate erosion control measures when soil is exposed/flow channels are forming.
- □ Sources of erosion damage shall be identified and controlled.

Inspection Comments: ______________________________

____

Overflow or emergency spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.

- □ Overflow shall be kept clear at all times.
- □ Sources of erosion damage shall be identified and controlled when soil is exposed.
- □ Rocks or other armament shall be replaced when only one layer of rock exists.

Inspection Comments: ______________________________

____

Amended soils shall allow stormwater to percolate uniformly through the infiltration basin. If water remains 36 hours after a storm, sources of possible clogging shall be identified and corrected.

- □ Basin shall be raked and, if necessary, soil shall be excavated and cleaned or replaced.

Inspection Comments: ______________________________

____

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden (continued)

Sediment/Basin debris management shall prevent loss of infiltration basin volume caused by sedimentation.

- □ Sediment exceeding 3 inches in depth, or so thick as to damage or kill vegetation, shall be removed.
- □ Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures.

Inspection Comments: ____

____

Debris and litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.

- □ Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.

Inspection Comments: ____

____

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Proper horticultural practices shall be employed to ensure that plants are vigorous and healthy.

- □ Mulch shall be replenished as needed, but not inhibiting water flow.
- □ Vegetation, large shrubs, or trees that interfere with rain garden operation shall be pruned.
- □ Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- □ Nuisance or prohibited vegetation from the City of Salem Non-Native Invasive Plant list shall be removed when discovered. Invasive vegetation shall be removed immediately upon discovery.
- □ Dead vegetation shall be removed upon discovery.
- □ Vegetation shall be replaced as soon as possible to maintain cover density and control erosion where soils are exposed.

Inspection Comments: ____

____

Spill prevention measures shall be exercised when handling substances that contaminate stormwater.

- □ Releases of pollutants shall be corrected as soon as identified.

Inspection Comments: ____

Training and/or written guidance information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. This Facility Maintenance Form can be used to meet this requirement.

Inspection Comments: ____

Access to the infiltration basin shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- □ Obstacles preventing maintenance personnel and/or equipment access to the infiltration basin shall be removed.
- □ Gravel or ground cover shall be added if erosion has occurred.

Inspection Comments: ____

____

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden (continued)

Nuisance insects and rodents shall not be harbored in the infiltration basin. Pest control measures shall be taken when nuisance insects/rodents are found to be present.

- ◻ Holes in the ground located in and around the infiltration basin shall be filled.

Inspection Comments: ____

____

If used at this site, the following will be applicable:

Fences shall be maintained to preserve their functionality and appearance.

- ◻ Collapsed fences shall be restored to an upright position.
- ◻ Jagged edges and damaged fences shall be repaired or replaced.

Inspection Comments: ____

____

APPENDIX E

CIVIL DRAWINGS

NO.	DATE	DESCRIPTION	BY
1		REVISIONS	

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DSN.	JW
DRN.	AK
CKD.	JW
DATE:	11/2020

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

STATE ST HOMES INC

THE RESERVE AT BATTLECREEK

OA SUBDIVISION PLAN

DRAWING

G-4

JOB NUMBER

3063.0000.0

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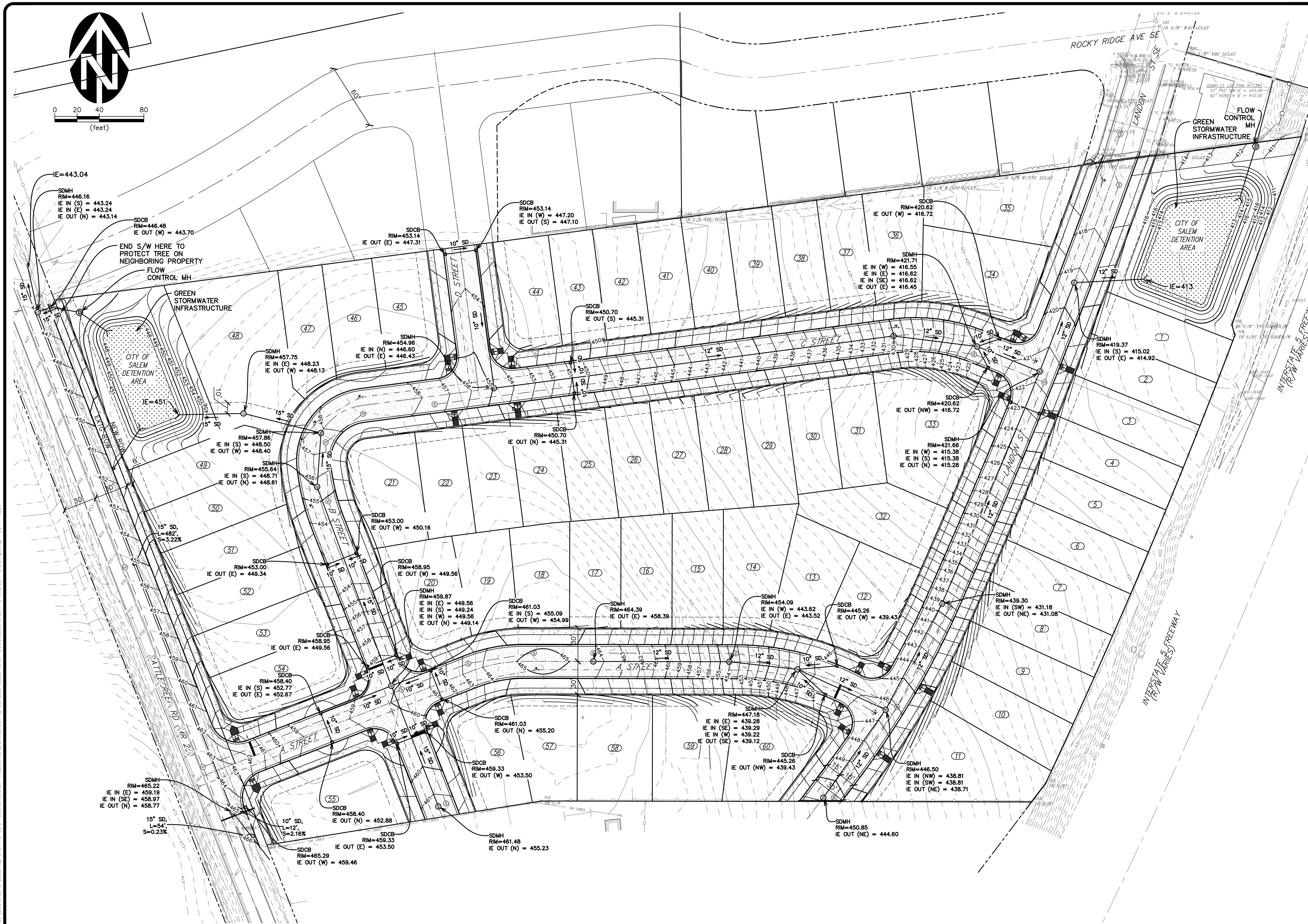

CLIENT
THE RESERVE AT BATTLECREEK

OA GRADING PLAN

NO.	DATE	DESCRIPTION	BY
1		REVISIONS	

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DSN. JW
DRN. AK
CKD. JW
DATE: 11/2020

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

DRAWING
G-7

JOB NUMBER
3063.0000.0

CITY OF Salem AT YOUR SERVICE

Land Use Application

Planning/Permit Application Center
City Hall / 555 Liberty St. SE / Room 320 / Salem, OR 97301-3513
503-588-6173 * planning@cityofsalem.net
If you need the following translated in Spanish, please call 503-588-6256.
Si usted necesita lo siguiente traducido en español, por favor llame 503-588-6256.

(For office use only)
Permit #:

Application type

Please describe the type of land use action requested:

LAND DIVISION - SUBDIVISION, AIRPORT OVERLAY ZONE HEIGHT VARIANCE, CLASS 1 ADJUSTMENT

Work site location and information

Street address or location of subject property	5826 BATTLE CREEK ROAD SE
Total size of subject property	11.14 acres
Assessor tax lot numbers	08 3W 13C Lot 900
Existing use structures and/or other improvements on site	Residential
Zoning	RS - Single Family Residential
Comprehensive Plan Designation	Developing Residential
Project description	THE PROPOSED PROJECT CONSISTS OF CONSTRUCTION OF A 60-LOT SUBDIVISION, INCLUDING SUBDIVISION STREETS AND LANDSCAPING. THE PROJECT ALSO INCLUDES STREET FRONTAGE IMPROVEMENTS ON BATTLE CREEK ROAD AND OFFSITE SANITARY SEWER CONNECTION.

People information

	Name	Full Mailing Address	Phone Number and Email address
Applicant	State Street Homes, Inc. (Mark Wilde)	1233 NW Northrup St., Suite 125 Portland, OR 97209	503.593.1529 mark@cityhomespdx.com
Agent	Westech Engineering, Inc. (Josh Wells)	3840 Fairview Industrial Dr SE, Suite 100 Salem, OR 97302	503.585.2474 jwells@westech-eng.com

Project information

Project Valuation for Site Plan Review	$1,800,000
Neighborhood Association	South Gateway
Have you contacted the Neighborhood Association?	⊙ Yes ○ No
Date Neighborhood Association contacted	8/20/20
Describe contact with the affected Neighborhood Association (The City of Salem recognizes, values, and supports the involvement of residents in land use decisions affecting neighborhoods across the city and strongly encourages anyone requesting approval for any land use proposal to contact the affected neighborhood association(s) as early in the process as possible.)	Email was sent to chair to notify Neighborhood Association of proposed project.
Have you contacted Salem-Keizer Transit?	○ Yes ⊙ No
Date Salem-Keizer Transit contacted	
Describe contact with Salem-Keizer Transit	

Authorization by property owner(s)/applicant

***If the applicant and/or property owner is a Limited Liability Company (LLC), please also provide a list of all members of the LLC with your application.**

Copyright release for government entities: I hereby grant permission to the City of Salem to copy, in whole or part, drawings and all other materials submitted by me, my agents, or representatives. This grant of permission extends to all copies needed for administration of the City's regulatory, administrative, and legal functions, including sharing of information with other governmental entities.

Authorizations: Property owners and contract purchasers are required to authorize the filing of this application and must sign below.

- **All signatures represent that they have full legal capacity to and hereby do authorize the filing of this application and certify that the information and exhibits herewith submitted are true and correct.**
- **I (we) hereby grant consent to the City of Salem and its officers, agents, employees, and/or independent contractors to enter the property identified above to conduct any and all inspections that are considered appropriate by the City to process this application.**
- **I (we) hereby give notice of the following concealed or unconcealed dangerous conditions on the property:**

Electronic signature certification: By attaching an electronic signature (whether typed, graphical or free form) I certify herein that I have read, understood and confirm all the statements listed above and throughout the application form.

Authorized Signature: ______________________

Print Name: Mark Wilde, Principal   Date: 1-8-21

Address (include ZIP): 1233 NW Northrup St. STE 125 Portland, OR 97209

Authorized Signature: ______________________

Print Name: ______________________   Date: ______________

Address (include ZIP): ______________________

(For office use only)		
Received by Revised application form received by BB	Date: 2-23-2021	Receipt Number: 20-117944-LD; 21-105659-ZO; 21-105662-ZO

Original application form submitted on 11-16-2020

Not using Internet Explorer?
Save the file to your computer and email to planning@cityofsalem.net.

NO.	DATE	DESCRIPTION	BY
1		REVISIONS	

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DSN. JW
DRN. AK
CKD. JW
DATE: 02/2021

REVIEW
REGISTERED PROFESSIONAL ENGINEER
OREGON
WILLIAM A. WELLS
RENEWS: 6/30/2022

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

STATE ST HOMES INC

THE RESERVE AT BATTLECREEK

0A SUBDIVISION PLAN

DRAWING
G-4

JOB NUMBER
3063.0000.0

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Curve Table

Curve #	Length	Radius	Delta	Chord Direction	Chord Length
C1	100.36	800.00	7.19	N33° 35' 40"E	100.29
C2	40.00	800.00	2.87	N28° 34' 05"E	40.00
C3	40.00	800.00	2.87	N25° 42' 11"E	40.00
C4	3.78	800.00	0.27	N24° 08' 07"E	3.78
C5	36.22	5506.54	0.38	N23° 48' 41"E	36.22
C6	40.00	5506.54	0.42	N23° 24' 54"E	40.00
C7	40.00	5506.54	0.42	N22° 59' 55"E	40.00
C8	40.00	5506.54	0.42	N22° 34' 57"E	40.00
C9	40.00	5506.54	0.42	N22° 09' 59"E	40.00
C10	40.00	5506.54	0.42	N21° 45' 00"E	40.00
C11	40.00	5506.54	0.42	N21° 20' 02"E	40.00
C12	40.00	5506.54	0.42	N20° 55' 04"E	40.00
C13	130.00	5506.54	1.35	N20° 02' 00"E	130.00
C14	5.21	5626.54	0.05	S20° 42' 08"W	5.21
C15	40.88	5626.54	0.42	S20° 56' 13"W	40.88
C16	40.88	5626.54	0.42	S21° 21' 12"W	40.88
C17	40.88	5626.54	0.42	S21° 46' 11"W	40.88
C18	40.88	5626.54	0.42	S22° 11' 09"W	40.88
C19	40.88	5626.54	0.42	S22° 36' 08"W	40.88
C20	40.88	5626.54	0.42	S23° 01' 07"W	40.88
C21	40.88	5626.54	0.42	S23° 26' 06"W	40.88
C22	40.88	5626.54	0.42	S23° 51' 05"W	40.88
C23	46.13	5626.54	0.47	S24° 17' 40"W	46.13
C24	46.33	5626.54	0.47	S24° 45' 54"W	46.33
C25	12.72	5626.54	0.13	S25° 03' 57"W	12.72
C26	37.32	20.00	106.91	S16° 16' 05"E	32.14
C27	70.41	200.00	20.17	S79° 48' 35"E	70.05
C28	11.87	100.00	6.80	N86° 42' 17"E	11.86
C29	25.50	100.00	14.61	N76° 00' 03"E	25.43
C30	31.42	20.00	90.00	N23° 41' 48"E	28.28
C31	31.42	20.00	90.00	N66° 18' 12"W	28.28
C32	31.42	20.00	90.00	S23° 41' 48"W	28.28
C33	31.42	20.00	90.00	S66° 18' 12"E	28.28

Curve Table

Curve #	Length	Radius	Delta	Chord Direction	Chord Length
C34	31.42	20.00	90.00	N23° 41' 48"E	28.28
C35	29.20	230.00	7.27	N17° 39' 58"W	29.18
C36	26.41	230.00	6.58	N10° 44' 23"W	26.39
C37	7.94	80.00	5.69	N4° 36' 27"W	7.94
C38	30.18	80.00	21.61	N9° 02' 32"E	30.00
C39	33.33	80.00	23.87	N31° 46' 58"E	33.08
C40	34.56	80.00	24.75	N56° 05' 31"E	34.29
C41	19.66	80.00	14.08	N75° 30' 31"E	19.61
C42	31.42	20.00	90.00	N37° 32' 59"E	28.28
C43	31.42	20.00	90.00	S52° 27' 01"E	28.28
C44	29.37	180.00	9.35	N87° 13' 29"E	29.34
C45	62.55	180.00	19.91	S78° 08' 44"E	62.23
C46	31.66	20.00	90.71	N66° 27' 24"E	28.46
C47	57.78	5446.54	0.61	N20° 48' 01"E	57.77
C48	77.95	5446.54	0.82	N20° 05' 11"E	77.95
C49	61.28	120.00	29.26	S82° 49' 14"E	60.62
C50	31.54	20.00	90.35	S23° 00' 56"E	28.37
C51	94.88	5446.54	1.00	S22° 39' 32"W	94.88
C52	59.04	5446.54	0.62	S23° 28' 07"W	59.04
C53	20.99	5446.54	0.22	S23° 53' 22"W	20.99
C54	54.75	740.00	4.24	S26° 07' 10"W	54.74
C55	30.14	20.00	86.34	S71° 24' 31"W	27.37
C56	37.38	260.00	8.24	N69° 32' 27"W	37.35
C57	43.17	260.00	9.51	N78° 25' 00"W	452.06
C58	30.50	260.00	6.72	N86° 32' 04"W	451.03
C59	5.30	160.00	1.90	S89° 09' 24"W	5.30
C60	42.61	160.00	15.26	S80° 34' 46"W	42.48
C61	11.88	160.00	4.25	S70° 49' 26"W	11.88
C62	31.42	20.00	90.00	N66° 18' 12"W	28.28
C62	11.88	160.00	4.25	S70° 49' 26"W	11.88
C63	41.10	170.00	13.85	N14° 22' 36"W	41.00
C64	31.42	20.00	90.00	N37° 32' 59"E	28.28

NO. | DATE | DESCRIPTION | BY
1
REVISIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DSN. JW
DRN. AK
CKD. JW
DATE: 02/2021

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOV. 12, 2002
WILLIAM J. WELLS
RENEWS: 6/30/2022
REVIEW

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
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STATE ST HOMES INC
THE RESERVE AT BATTLECREEK
OA SUBDIVISION CURVE TABLE

DRAWING
G-5

JOB NUMBER
3063.0000.0