



TYPE II APPLICATION (LAND USE) -- 2019

File #: DR219-0002

TYPES - PLEASE CHECK ONE:

- Design review (checked)
Tentative Plan for Partition
Tentative Plan for Subdivision
Type II Major Modification
Variance
Other: (Explain)

APPLICANT INFORMATION:

APPLICANT: VERITAS SCHOOL, Attn: Drew Ackerlund
ADDRESS: 26288 NE Bell Rd, Newberg OR 97132
EMAIL ADDRESS: Dackerlund@VeritasSchool.net
PHONE: 503.538.1962 MOBILE: 503.930.0930
OWNER: Veritas School
ENGINEER/SURVEYOR: Corina Muntean, Green Mountain Structural Engineering

GENERAL INFORMATION:

PROJECT NAME: Veritas Covered Play Area PROJECT LOCATION: 26288 NE Bell Rd, Newberg OR
PROJECT VALUATION: 180,000
PROJECT DESCRIPTION/USE: Covered play area; used for outdoor recreation
MAP/TAX LOT NO. (i.e.3200AB-400): R3208 02702 ZONE: R1 SITE SIZE: 3600 SQ. FT.
CURRENT USE: Undeveloped School Property
SURROUNDING USES: NORTH: Church/Retail SOUTH: Church EAST: Residential WEST: Church/Residential

SPECIFIC PROJECT CRITERIA AND REQUIREMENTS ARE ATTACHED

General Checklist: Fees Public Notice Information Current Title Report Written Criteria Response Owner Signature

For detailed checklists, applicable criteria for the written criteria response, and number of copies per application type, turn to:

- Design Review p. 12
Partition Tentative Plat p. 14
Subdivision Tentative Plat p. 17
Variance Checklist p. 20

The above statements and information herein contained are in all respects true, complete, and correct to the best of my knowledge and belief.

Drew Ackerlund 7-2-19
Applicant Signature Date

Sarah Rahkola 7/2/2019
Owner Signature Date

Drew Ackerlund
Print Name

Sarah Rahkola, Board Chair
Print Name

Attachments: General Information, Fee Schedule, Criteria, Checklists

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JUL 02 2019

Page 1 Initials

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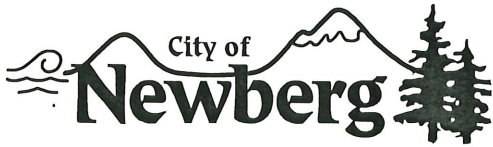
JUL 02 2019

Initial: _____

Veritas School
26288 NE Bell Road, Newberg, OR 97132
Lot #R3208-02702

Subject: Applicant response to design review criteria, application for building permit and construction of a 3600 square foot Covered Outdoor Play Area on the campus of Veritas School.

1. Design Compatibility.
 - a. Architectural design of the Covered Outdoor Play Area is modest and functional incorporating glulam beams with black powder-coated metal plate braces, exposed 2x6 T&G planking as underlayment; concrete posts and 30-year composite shingles. The Covered Outdoor Play Area will blend nicely with existing structures and will set prominently on the south west corner of the campus, giving students a covered recreational area for recess activities and shelter from our seasonal rains. The roof is a 6/12 pitch with an open vault ceiling for overhead clearance. The planned useage is during school/business hours. Currently there is no additional campus lighting planned in or around the Covered Outdoor Play Area.
2. Parking and On-site Circulation.
 - a. The construction of the Covered Outdoor Play Area will not alter the existing use of Veritas School nor its current off street parking and on site circulation.
3. Setbacks and General Requirements.
 - a. The Covered Outdoor Play Area will be 24ft 6in in overall height. All setbacks for the Covered Outdoor Play Area are greater than 25 feet from every boundary line of any property bordering Veritas Lot R3208-02702.
4. Landscaping Requirements.
 - a. The Covered Outdoor Play Area does not alter the existing landscape components on the Veritas School campus.
5. Signs.
 - a. Not Applicable. There is no plan for signage on the Covered Outdoor Play Area.
6. Manufactured Dwelling, Mobile Home and RV Parks.
 - a. Not Applicable.
7. Zoning District Compliance.
 - a. Veritas School lot R3208-02702 is zoned R1, permitted in the zoning use table 15.305.020. The Covered Outdoor Play Area is a planned school structure and will not alter the current use of the property except to allow students to recreate out of the rain.
8. Sub district Compliance.
 - a. Not Applicable .
9. Alternate Circulation, Roadway Frontage Improvements and Utility Improvements'.
 - a. Veritas School has previously accomplished required Alternative Circulation, Roadway Frontage Improvements and Utility Improvements.
10. Traffic Study Improvements.
 - a. The Veritas Covered Outdoor Play Area does not change the current use of the property and is not associated with additional traffic that would impact the public right of way.



Community Development Department

P.O. Box 970 • 414 E First Street • Newberg, Oregon 97132

503-537-1240. Fax 503-537-1272 www.newbergoregon.gov

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WE WANT YOUR COMMENTS ON A PROPOSED NEW DEVELOPMENT IN YOUR NEIGHBORHOOD

Initial: _____

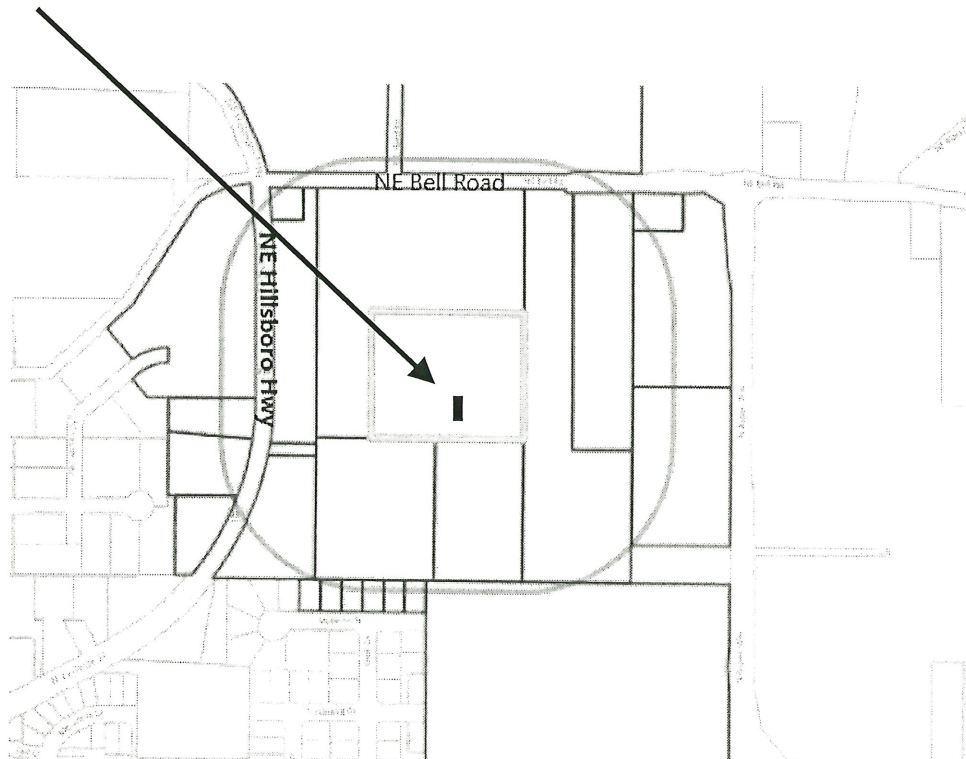
A property owner in your neighborhood submitted an application to the City of Newberg to construct a Covered Play Area. You are invited to take part in the City's review of this project by sending in your written comments. For more details about giving comments, please see the back of this sheet.

The construction project is a Covered Play structure to allow outdoor recreation activities at Veritas School. Constructed of wood with glulam beams, 2x6 T&G sheathing, cement posts and composite shingle roofing, this open sided building will be 40feet x 90feet with asphalt covered ground surface. The construction project will be located on the south/southwest side of campus.

APPLICANT: **Veritas School**
TELEPHONE: **503/538-1962**
PROPERTY OWNER: **Veritas School**

LOCATION: **26288 NE Bell Rd. Newberg OR 97132**

TAX LOT NUMBER: **R3208-02702**



We are mailing you information about this project because you own land within 500 feet of the proposed new project. We invite you to send any written comments for or against the proposal within 14 days from the date this notice is mailed.

If you mail your comments to the City, please put the following information on the outside of the envelope:

Written Comments: File No. DR 219-0002
City of Newberg
Community Development Department
PO Box 970
Newberg, OR 97132

You can look over all the information about this project or drop comments off at Newberg City Hall, 414 E. First Street. You can also buy copies of the information for a cost of 25 cents a page. If you have any questions about the project, you can call the Newberg Planning Division at 503-537-1240.

All written comments must be turned in by 4:30 p.m. on _____.
Any issue which might be raised in an appeal of this case to the Land Use Board of Appeals (LUBA) must be submitted to the City in writing before this date. You must include enough detail to enable the decision maker an opportunity to respond. The applicable criteria used to make a decision on this application for design review approval are found in Newberg Development Code 15.220.050(B).

The Community Development Director will make a decision at the end of a 14-day comment period. If you send in written comments about this project, you will be sent information about any decision made by the City relating to this project.

Date Mailed: _____



First American

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JUL 02 2019
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Date of Production: Monday, June 10, 2019

The ownership information enclosed is time sensitive and should be utilized as soon as possible.

This mailing list was produced with taxlot data from the Portland Metro regional government.

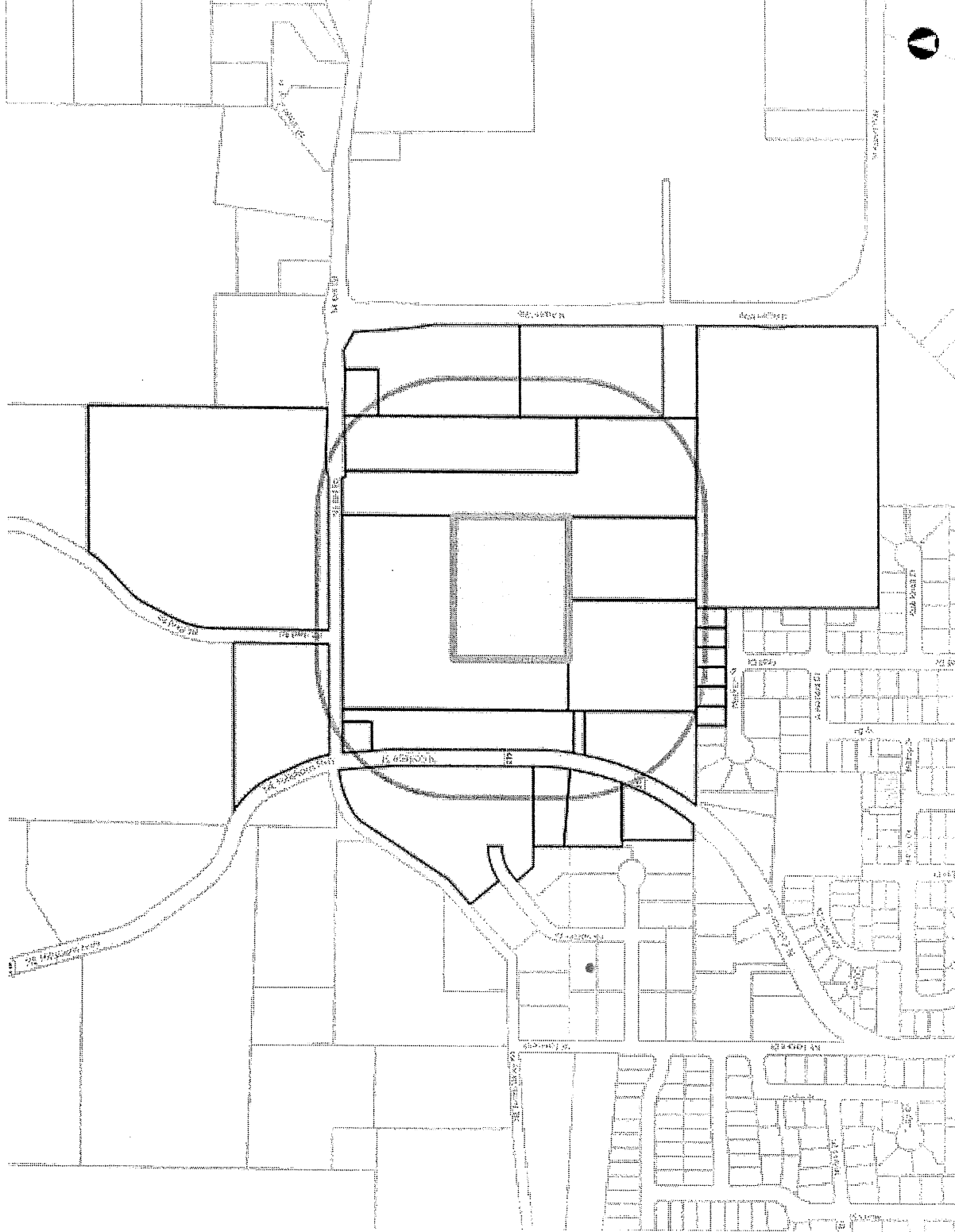
First American Title Company makes no express or implied warranty respecting the information presented and assumes no responsibility for errors or omissions

Thank you for your business and for using First American Title.

Veritas School - 500 ft Buffer



Taxlot



6/10/2019

Notes

0.3 0.14 0.3 Miles
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R3205 02401	R3205 02301	R3208 02801
Rain Dance Ranch Llamas Llc	Chehalam Valley Baptist Church	North Valley Friends Church
Po Box 1060	26155 NE Bell Rd	4020 N College St
Newberg, OR 97132	Newberg, OR 97132	Newberg, OR 97132
R3208 02700	R3208 02600	R3208 02601
North Valley Friends Church	Melissa Filter	John & Troy Rutten
4020 N College St	3921 Calaroga Cir	26530 NE Bell Rd
Newberg, OR 97132	West Linn, OR 97068	Newberg, OR 97132
R3208 02500	R3208 02400	R3208 02702
Mark Wanker	Somerset Ventures Iii Llc	Veritas School
21373 SW Johnson Rd	Po Box 1060	401 Mission Dr
West Linn, OR 97068	Newberg, OR 97132	Newberg, OR 97132
R3208 02490	R3208 02703	R3208BC 00206
Rain Dance Ranch Llamas Llc	North Valley Friends Church	Nancy & Edward Macy
Po Box 1060	4020 N College St	1101 Madison Dr
Newberg, OR 97132	Newberg, OR 97132	Newberg, OR 97132
R3208BC 00207	R3208BC 00208	R3208BC 00209
Eric & Collen Hemmer	James & Melinda Allison	Jeffery & Heidi Jones
1115 Madison Dr	1125 Madison Dr	17305 NE Leander Dr
Newberg, OR 97132	Newberg, OR 97132	Shenwood, OR 97140
R3208BC 00210	R3208BC 00211	R3208 02701
Kerry & Monica Tweet	Gregory & Elizabeth Woolsey	North Valley Friends Church
1215 Madison Dr	1225 Madison Dr	4020 N College St
Newberg, OR 97132	Newberg, OR 97132	Newberg, OR 97132
R3208 03200	R3207AA 00100	R3208 02802
Somerset Ventures Iv Llc	Newberg Gospel Chapel Inc	North Valley Friends Church
Po Box 1060	4301 N College St	4020 N College St
Newberg, OR 97132	Newberg, OR 97132	Newberg, OR 97132
R3208 02800	R3207AA 00200	R3208 02900
North Valley Friends Church	Debralyn Evans	J & Myrlene Rourke
4020 N College St	4009 N College St	1201 Fulton St APT 13
Newberg, OR 97132	Newberg, OR 97132	Newberg, OR 97132
R3207AA 00400	R3207AA 00300	
Jerry & Marie Brown	Lirnea Fettig	
1180 SW 9th St	3993 N College St	
Dundee, OR 97115	Newberg, OR 97132	



First American

First American Title Insurance Company

825 NE Evans Street
McMinnville, OR 97128
Phn - (503)376-7363
Fax - (866)800-7294

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JUL 02 2019

Initial: _____

YAMHILL COUNTY TITLE UNIT

FAX (866)800-7294

Title Officer:
(503)376-7363

LOT BOOK SERVICE

Veritas School, Attn: Mike Stice
401 Mission Dr
Newberg, OR 97132

Order No.: 1039-3259381
June 18, 2019

Attn: Drew Ackerlund
Phone No.: - Fax No.:
Email: mstice@veritasschool.net

Re:

Fee: \$300.00

We have searched our Tract Indices as to the following described property:

The land referred to in this report is described in Exhibit A attached hereto.

and as of June 14, 2019 at 8:00 a.m.

We find that the last deed of record runs to

Veritas School, an Oregon non-profit corporation

We find the following apparent encumbrances within ten (10) years prior to the effective date hereof:

1. Subject property is under public ownership and is tax exempt. Any change in ownership before delivery of assessment roll may result in tax liability. Account No. 529351.
2. Development Agreement and the terms and conditions thereof:
Between: North Valley Friends Church
And: City of Newberg, an Oregon municipal corporation
Recording Information: June 16, 2003 as Instrument No. 200314309, Deed and Mortgage Records

3. Reciprocal Easement and Maintenance Agreement and the terms and conditions thereof:
Between: North Valley Friends Church
And: Veritas School, an Oregon nonprofit corporation
Recording Information: December 17, 2004 as Instrument No. 200425601, Deed and Mortgage Records
4. Right of First Refusal between Veritas School and North Valley Friends Church, including terms and provisions thereof.
Recorded: December 17, 2004 as Instrument No. 200425603
5. Easement, including terms and provisions contained therein:
Recording Information: September 24, 2013 as Instrument No. 201315144, Deed and Mortgage Records
In Favor of: City of Newberg, a municipal corporation
For: A public sanitary sewer line and/or a public water line
6. Deed of Trust and the terms and conditions thereof.
Grantor/Trustor: Veritas School, an Oregon non-profit corporation
Grantee/Beneficiary: First Federal Savings & Loan Association of McMinnville
Trustee: David C Haugeberg
Amount: \$750,000.00
Recorded: May 18, 2017
Recording Information: Instrument No. 201708124, Deed and Mortgage Records

Note: This Deed of Trust contains Line of Credit privileges. If the current balance owing on said obligation is to be paid in full in the forthcoming transaction, confirmation should be made that the beneficiary will issue a proper request for full reconveyance.

Modification and/or amendment by instrument:

Recording Information: April 30, 2018 as Instrument No. 201806111, Deed and Mortgage Records

7. Assignment of leases and/or rents and the terms and conditions thereof:
Assignor: Veritas School, an Oregon non-profit corporation
Assignee: First Federal Savings & Loan Association of McMinnville
Recorded: May 18, 2017
Recording Information: Instrument No. 201708125, Deed and Mortgage Records
8. Financing Statement, indicating a Security Agreement
Debtor: Veritas School
Secured Party: First Federal Savings & Loan Association
Recorded: May 18, 2017
Recording Information: Instrument No. 201708126, Deed and Mortgage Records

We have also searched our General Index for Judgments and State and Federal Liens against the Grantee(s) named above and find:

NONE

We find the following unpaid taxes and city liens:

THIS IS NOT a title report since no examination has been made of the title to the above described property. Our search for apparent encumbrances was limited to our Tract Indices, and therefore above listings do not include additional matters which might have been disclosed by an examination of the record title. We assume no liability in connection with this Lot Book Service and will not be responsible for errors or omissions therein. The charge for this service will not include supplemental reports, rechecks or other services.

Exhibit "A"

Real property in the County of Yamhill, State of Oregon, described as follows:

A tract of land in Section 8, Township 3 South, Range 2 West of the Willamette Meridian in Yamhill County, Oregon, being more particularly described as follows:

Beginning at a point that is South 80 rods (1320.00 feet) and East 116 rods (1914.00 feet) from the Northwest corner of the William T. Wallace Donation Land Claim No. 47; thence North 465.46 feet to the TRUE POINT OF BEGINNING; thence North 422.17 feet; thence North 89°56'45" West 515.74 feet; thence South 422.17 feet; thence South 89°56'45" East 515.74 feet to the true point of beginning.

TOGETHER WITH a Reciprocal Easement and Maintenance Agreement recorded December 17, 2004 as Instrument No. 200425601, Deed and Mortgage Records, Yamhill County, Oregon.

NOTE: This legal description was created prior to January 1, 2008.



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Initial: _____

July 22, 2019

City of Newberg, OR
414 E. First Street
Newberg, OR 97132

RE: Design Review Type II application completeness check
Veritas School Playground Cover

File No: DR219-0002

Item 1. See attached documents from Haworth Inc.

Item 2. Oak Knoll Booster Pump Memorandum of Understanding (MOU)

This project does not require additional water connections. When new projects occur with the school requiring a new water connection per the MOU the school will continue to meet the MOU expectations in upgrading the pump station before requesting additional connections. Veritas School is in active and regular discussions with each party in the MOU on next steps and timing for supporting the pump upgrades. NVFC is evaluating their desired timing for sewer and water connection currently.

Item 3. See attached documents from Haworth, Inc.

Item 4. Landscaping

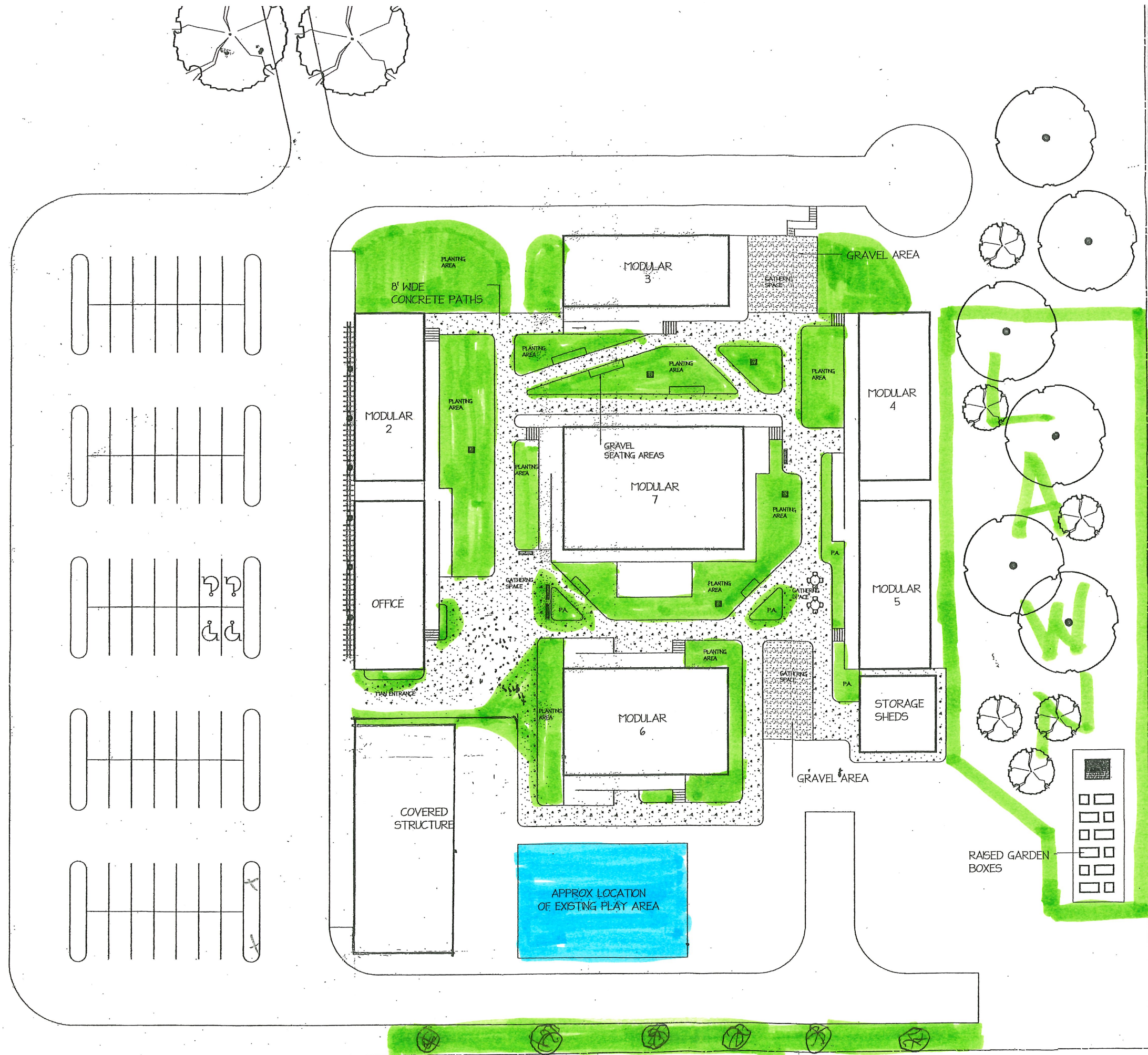
Currently approximately 50,800 square feet of the site is landscaped, including plantings, lawn, chipped play area and a raised-bed garden area. (See attached layout plan.) This proposal does not reduce the landscaped areas, which are in excess of the 15% (32,670 square feet) required.

Item 5. Exterior Lighting

No exterior lighting is proposed.

Thank you,

Drew Ackerlund
drewackerlund@gmail.com



Layout Plan

- Landscaped play area
- Landscaped plantings

Veritas School
 26288 NE Bell Rd.
 Newberg, OR 97132

SCALE 1" = 40'-0"
 DATE 3/9/2018
 DRAWING # 218-012



Veritas School

SOLI DEO GLORIA

September 5, 2018

Memorandum of Understanding

RE Veritas School connection to City of Newberg water; potential future upgrades

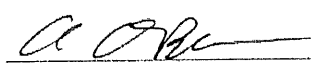
It is agreed that Veritas School will connect to the City of Newberg water as is, with no upgrades to the pump or generators, etc., required.

Further, Veritas School, North Valley Friends Church and Bill Rourke acknowledge that additional water supply and fire suppression system calculations will be prepared, and future onsite or offsite pipe or booster station improvements may be required, when additional structures are proposed to be added to the site or another connection is proposed.

The parties agree that no requests will be made for additional connections to the existing pump station without upgrades to the pump station to support the development needs to all three properties. If any one of the three (Veritas School, North Valley Friends Church, Bill Rourke) connect at any time in the future, we will all participate proportionately.

The undersigned declare that they have authority to sign for their respective organizations. See attached Notarial Certificate.

Sarah Rahkola  9/5/2018
Board of Governors Chair, Veritas School Signature Date

Andrew Baker  9/5/2018
Trustee, North Valley Friends Church Signature Date

Lynn Holt  9-5-2018
Trustee, North Valley Friends Church Signature Date

Bill Rourke  9-5-18
Signature Date

State of Oregon Notarial Certificate (ORS Ch. 194.280, 194.285)

Acknowledgment in a Representative Capacity

State of OREGON

County of Yamhill

This record was acknowledged before me on (date) September 5, 2018

by (name(s) of individual(s)) Sarah Rankola as

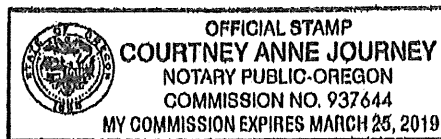
(type of authority) Board of Governors Chair of (name of party on whose behalf

record was executed) Veritas School.

Courtney Anne Journey

Notary Public - State of Oregon

Official Stamp



Document Description

This certificate is attached to page 1 of a Memorandum of Understanding (title or type of document), dated September 5, 2018, consisting of 5 pages.



Acknowledgment in a Representative Capacity

State of OREGON

County of Yamhill

This record was acknowledged before me on (date) September 5, 2018

by (name(s) of individual(s)) Andrew Baker as

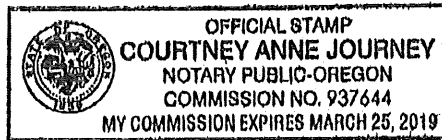
(type of authority) Trustee of (name of party on whose behalf

record was executed) North Valley Friends Church

Courtney Anne Journey

Notary Public - State of Oregon

Official Stamp



Document Description

This certificate is attached to page 1 of a Memorandum of Understanding (title or type of document), dated September 5, 2018, consisting of 5 pages.

Acknowledgment in a Representative Capacity

State of OREGON

County of Yamhill

This record was acknowledged before me on (date) September 5, 20 18

by (name(s) of individual(s)) Lynn Holt as

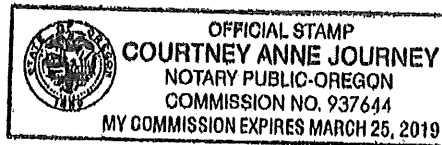
(type of authority) Trustee of (name of party on whose behalf

record was executed) North Valley Friends Church

Courtney Anne Journey

Notary Public - State of Oregon

Official Stamp



Document Description

This certificate is attached to page 1 of a Memorandum of Understanding (title or type of document), dated September 5, 20 18, consisting of 5 pages.

Acknowledgment in an Individual Capacity

State of OREGON

County of Yamhill

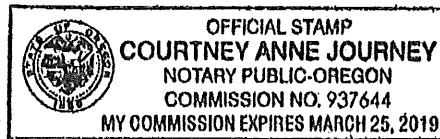
This record was acknowledged before me on (date) September 5, 2018 by

(name(s) of individual(s) Bill Powke

Courtney Anne Journey

Notary Public - State of Oregon

Official Stamp



Document Description

This certificate is attached to page 1 of a Memorandum of Understanding (title or type of document), dated September 5, 2018, consisting of 5 pages.



Commercial & Industrial General Contractor
www.haworthinc.net

13500 SW Hwy 99W
McMinnville, OR 97128
(503) 472-2452

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OCT 02 2019

Initial: _____

City of Newberg, OR.
414 E First Street
Newberg Oregon 97132

Re: Design Review Type II application completeness check
Veritas School Playground Cover

File No: DR219-0002

Item 1. Drainage and Grading

Please see attached existing Storm plan (C420).

Foot print of new building is in an area that is designed to drain current surface water to storm system swale. The new building will divert any water that falls on the roof to existing storm water system. (See new site plan) The new asphalt pad will be constructed so that any water that collects on the pad will be diverted to the existing / relocated area basin. (See new site plan)

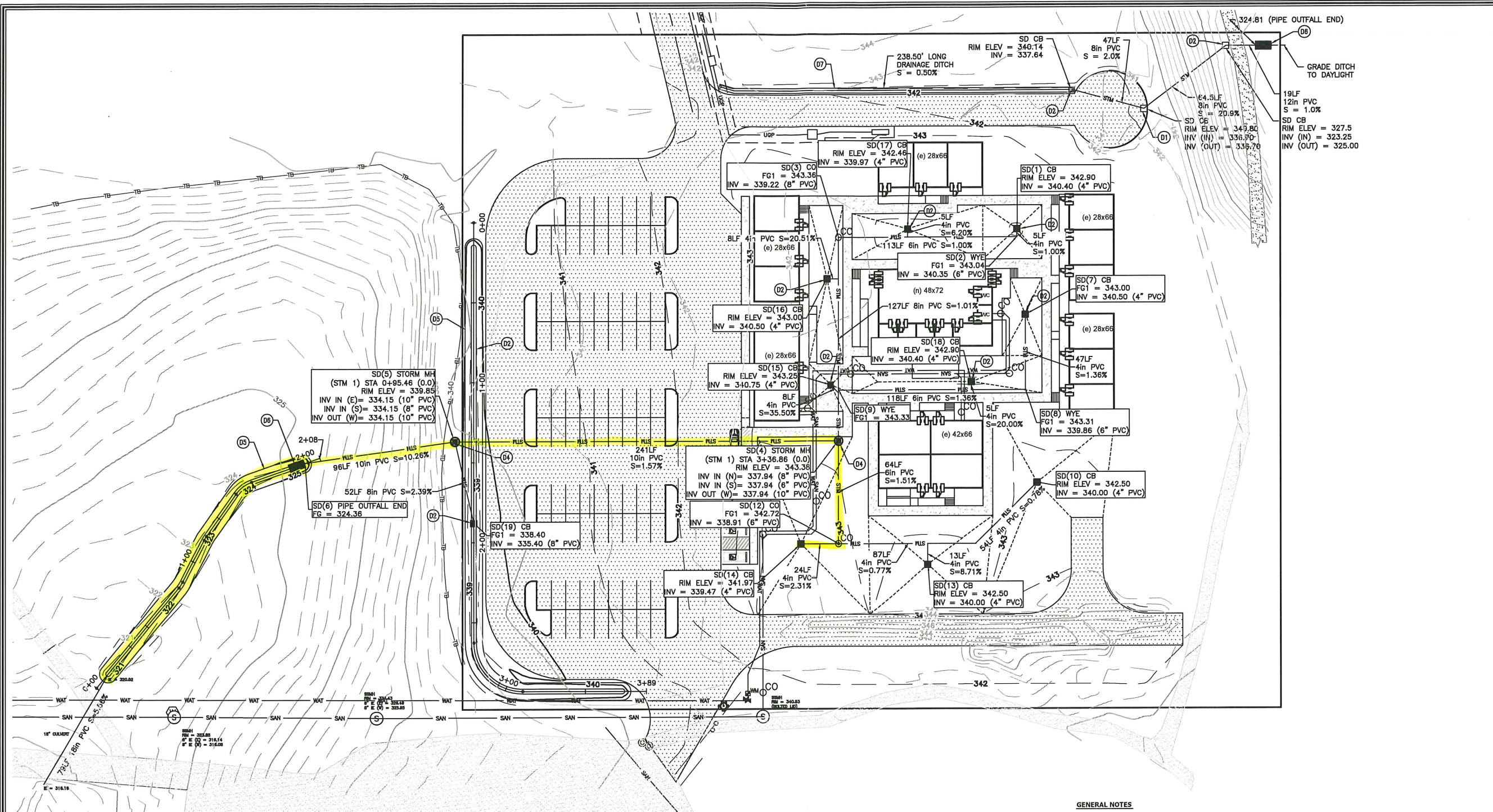
Item 3. Utilities

Please see attached existing composite utility plan (C400) for sewer, water, storm and power locations.

Thanks

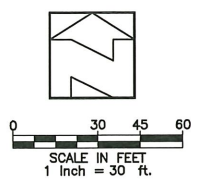
Todd Haworth
todd@haworthinc.net
HAWORTH INC.
(503) 472-2452

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LEGEND	
	PROPERTY BOUNDARY
	ADJACENT PROPERTY LINES
	CENTERLINE
	EASEMENT LINES
	BUILDING
	CURB
	SIDWALK
	FENCE
	WATERLINE
	SANITARY SEWER
	STORM DRAIN LINE
	OVERHEAD POWER
	UNDERGROUND POWER
	RETAINING WALL
	PROPOSED PAVING
	PROPERTY CORNER
	CONTROL POINT
	STORM MANHOLE
	STORM CATCHBASIN
	STORM/SEWER CLEANOUT
	FLOW DIRECTION ARROW
	STORM CULVERT END
	SEWER MANHOLE
	WATER METER
	CONCRETE PAVING
	ASPHALT PAVING
	GRAVEL SURFACE
	EXISTING MAJOR CONTOURS
	EXISTING MINOR CONTOURS
	MAJOR CONTOURS
	MINOR CONTOURS
	WATER VALVE
	WATER METER
	POWER/UTILITY POLE
	STREET LIGHT
	STREET SIGN
	GAS VALVE
	GAS METER
	TEL/COMM PED/RISER

- GENERAL NOTES**
- PROVIDE TRENCH BACKFILL PER CITY OF NEWBERG STD. DRAWING 201A.
 - PROVIDE PIPE BEDDING PER CITY OF NEWBERG STD. DRAWING 201B.
 - ALL PLUMBING SHALL BE INSTALLED IN ACCORDANCE WITH IPC REQUIREMENTS. PROVIDE ADDITIONAL CLEANOUTS (NOT SHOWN) ON SEWER & STORM LINES AT 100' MAX SPACING OR FOR EVERY 135° OF PIPE BENDS.
 - CONNECT BUILDING RAIN DRAINS TO COLLECTOR LINES AS REQUIRED. NOT SHOWN.
- STORM NOTES**
- D1 CONSTRUCT TRAPPED LYNCH STYLE BASIN WITH CONCRETE COLLAR PER DETAIL ON C720.
 - D2 CONSTRUCT TRAPPED LYNCH STYLE BASIN WITHOUT CONCRETE COLLAR PER DETAIL ON C720.
 - D3 CONSTRUCT CLEANOUTS PER CITY OF NEWBERG STD. DRAWING 210
 - D4 CONSTRUCT STANDARD STORMWATER MANHOLE PER CITY OF NEWBERG STD. DRAWING 204.
 - D5 CONSTRUCT DRAINAGE SWALE. SEE DETAIL "A" SHEET C421 FOR PROFILE AND X-SECTION DETAIL. INSTALL MINIMUM 6 INCH TOPSOIL BEDDING. SEED SWALE PER TABLE C-2.
 - D6 CONSTRUCT 10' LONG x 5' WIDE x 2.3' DEEP RIPRAP PAD PER CITY OF NEWBERG STD DRAWING 422. USE CLASS 50 RIPRAP.
 - D7 CONSTRUCT DRAINAGE DITCH. SEE DETAIL "B" SHEET C421 FOR X-SECTION DETAIL. LINE DRAINAGE DITCH WITH 6 INCHES OF 3 INCH CRUSHED AGGREGATE



CLAIR COMPANY
 525 NW 2ND ST. #3
 CORVALLIS, OR 97330
 541-758-1302

VERITAS SCHOOL SITE DEVELOPMENT
 NEWBERG, OREGON
STORM PLAN
 26500 NE BELL ROAD NEWBERG, OR 97132

PRESIDENT PROFESSIONAL ENGINEER
 PETER J. SEADERS
 RENEWAL: 6/30/2018

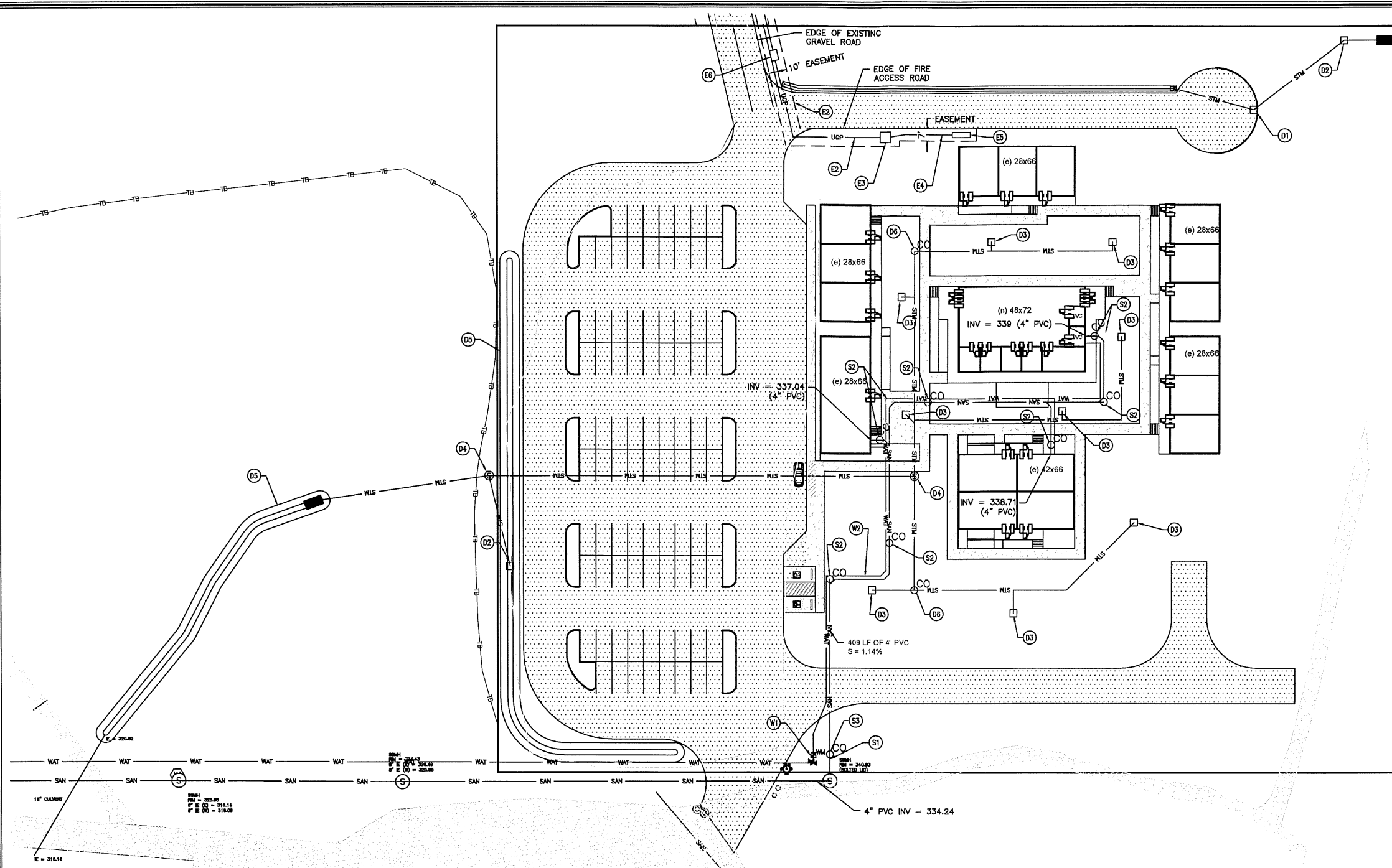
MSS INC
 ENGINEERING CONSULTANTS AND PLANNERS
 215 NW 4th STREET
 CORVALLIS, OR 97330
 (541) 753-1320 FAX: (541) 753-5956

JOB # 17001 FILE STORM DRAW AS
 SCALE AS SHOWN DATE 06.12.17
C420
 # 7 OF 11 SHEETS

MSS, Inc. holds all rights to the plans and files on this sheet. These plans and specifications were prepared by MSS, Inc. for the use of the client. These plans are not to be copied in any form whatsoever without the expressed written permission of MSS, Inc. The contractor shall be responsible for any errors or omissions in writing to the design team before the start of construction.

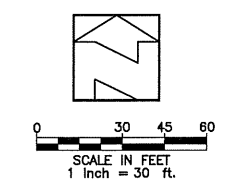
BUILDING PERMIT SET

6/13/2017 9:36:39 AM X:\17001\CIVIL\UTIL\DWG SAVED ON 6/13/2017



- GENERAL NOTES**
- PROVIDE TRENCH BACKFILL AND PIPE BEDDING PER CITY OF NEWBERG STD DWG 201A AND 201B.
 - ALL PLUMBING SHALL BE INSTALLED IN ACCORDANCE WITH IPC REQUIREMENTS. PROVIDE ADDITIONAL CLEANOUTS (NOT SHOWN) ON SEWER & STORM LINES AT 100' MAX SPACING OR FOR EVERY 135° OF PIPE BENDS.
- ELECTRICAL NOTES**
- ALL ELECTRICAL NOTES AND CONDUIT LOCATIONS ARE FOR COORDINATION PURPOSES ONLY. VERIFY ALL WIRING CONNECTIONS, SIZES AND REQUIREMENTS WITH THE ELECTRICAL PLANS PRIOR TO CONSTRUCTION. IN THE EVENT OF ANY CONFLICT THE REQUIREMENTS NOTED ON THE ELECTRICAL PLANS SHALL APPLY.
 - ADHERE TO PGE DTL 6/C721 FOR BACKFILL, MATERIAL AND CLEARANCES.
- E1** NEW DROP ON EXISTING POWER POLE ALONG BELL ROAD. CONTRACTOR TO COORDINATE. SEE SHEET C401.
- E2** PROVIDE TRENCHING, BACKFILL & CONDUIT FOR PRIMARY UNDERGROUND FEED PER UTILITY'S REQUIREMENTS. PROVIDE PULL STRING.
- E3** PROVIDE & INSTALL TRANSFORMER VAULT PER UTILITY REQUIREMENTS. INSTALL BOLLARDS PER DTL 1/C721 AS SHOWN. PROVIDE ADEQUATE CLEARANCES FOR TRANSFORMER PER PGE DTL 7/C721. TRANSFORMER SHALL BE 5' (MIN) FROM DRIVING SURFACES OR HAVE FIXED & REMOVABLE BOLLARDS INSTALLED PER PGE REQ'S.
- E4** PROVIDE & INSTALL TRENCHING, BACKFILL & CONDUIT FOR SECONDARY UNDERGROUND FEED PER UTILITY'S REQUIREMENTS. PROVIDE PULL STRING.
- E5** 600A SERVICE PANEL PER ELECTRICAL PLANS
- E6** PROVIDE & INSTALL SECTIONALIZING POWER VAULT PER UTILITY REQUIREMENTS.
- WATER NOTES**
- W1** INSTALL 1" WATER METER AND BACKFLOW PREVENTION DEVICE PER CITY OF NEWBERG STANDARDS.
- W2** INSTALL 1-1/2" PEX BUILDING SERVICE LINE
- SANITARY NOTES:**
- S1** EXISTING 15 FOOT LONG 8" SANITARY STUB
- S2** INSTALL CLEANOUT PER CITY OF NEWBERG STD. DWG 210.
- S3** INSTALL CLEANOUT AND 8"x4" ECCENTRIC REDUCER AT END OF EXISTING 8" SEWER STUB
- STORM DRAIN NOTES (SEE STORM SHEETS FOR PLAN AND PROFILES):**
- D1** CONSTRUCT TRAPPED LYNCH STYLE CATCH BASIN WITH A CONCRETE COLLAR PER DETAIL SHEET C720
- D2** CONSTRUCT TRAPPED LYNCH STYLE CATCH BASIN WITHOUT A CONCRETE COLLAR PER DETAIL SHEET C720
- D3** CONSTRUCT 12"x12" NDS CATCH BASIN PER DETAIL ON SHEET C722. INSTALL 12"x12" NDS SQUARE GRATE (PART NO. 1212/ADA COMPLIANT)
- D4** STANDARD STORM SEWER MANHOLE
- D5** DRAINAGE SWALE
- D6** INSTALL CLEANOUT PER CITY OF NEWBERG STD. DWG 210

LEGEND							
	PROPERTY BOUNDARY		PROPERTY CORNER		CONCRETE PAVING		WATER VALVE
	ADJACENT PROPERTY LINES		CONTROL POINT		ASPHALT PAVING		WATER METER
	CENTERLINE		STORM MANHOLE		GRAVEL SURFACE		POWER/UTILITY POLE
	EASEMENT LINES		STORM CATCHBASIN		EXISTING MAJOR CONTOURS		STREET LIGHT
	BUILDING		STORM/SEWER CLEANOUT		EXISTING MINOR CONTOURS		STREET SIGN
	CURB		FLOW DIRECTION ARROW		MAJOR CONTOURS		GAS VALVE
	SIDWALK		STORM CULVERT END		MINOR CONTOURS		GAS METER
	FENCE		SEWER MANHOLE				TEL/COMM PED/RISER
	WATERLINE		WATER METER				
	SANITARY SEWER						
	STORM DRAIN LINE						
	OHP						
	UNDERGROUND POWER						
	RETAINING WALL						
	PROPOSED PAVING						



CLAIR COMPANY
525 NW 2ND ST. #3
CORVALLIS, OR 97330
541-759-1302

**VERITAS SCHOOL SITE DEVELOPMENT
NEWBERG, OREGON
COMPOSITE UTILITY PLAN**
28500 NE BELL ROAD NEWBERG, OR 97132

REGISTERED PROFESSIONAL ENGINEER
PETER J. SENEKAS
RENEWAL: 6/30/2018

MSS INC
ENGINEERING CONSULTANTS AND PLANNERS
215 NW 4th STREET
CORVALLIS, OR 97330
(541) 753-1320 FAX: (541) 753-5956

JOB # 17001 FILE UTIL DRAW AS
SCALE AS SHOWN DATE 06.12.17
C400
5 OF 11 SHEETS

MSS, Inc. holds all rights to the plans and ideas on this sheet. Those plans and specifications are for the construction of one project and are not to be used for any other project without the expressed written permission of MSS, Inc. The contractor shall be responsible for checking dimensions and site conditions and is to report any errors or omissions in writing to the designers before the start of construction.

BUILDING PERMIT SET



AREA MAP



SITE MAP

SHEET INDEX

1. COVER SHEET	(C-S)
2. SITE PLAN	(S-P)
3. FLOOR PLAN	(1-3)
4. ELEVATIONS	(2-3)
5. SECTION / DETAILS	(3-3)
6. STRUCTURAL NOTES	(S-1)

STRUCTURAL CALCULATIONS ATTACHED

HAWORTH INC.
 COMMERCIAL & RESIDENTIAL
 DESIGN, DRAFTING & CONST.
 13500 SW HWY 99W
 McMinnville Oregon 97128
 1-503-472-2452

Veritas School
 COVERED PLAY AREA
 26288 NE Bell Rd.
 Newberg Oregon 97132

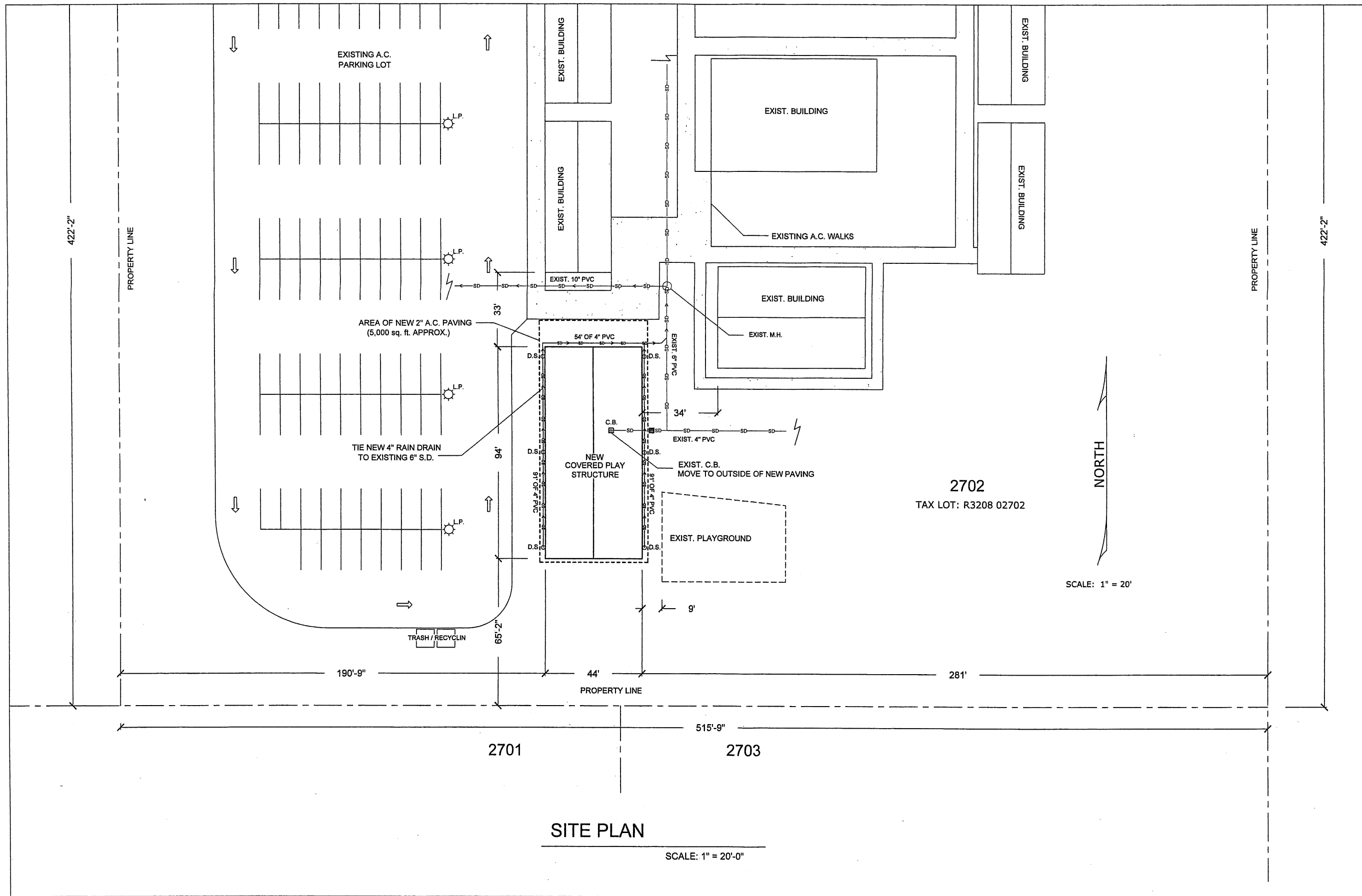
CLIENT:
 JOB DESCRIPTION:
 LOCATION:

No.	Revision / Issue	Date

Project:
 Date: 6-27-19
 Plan: COVER SHEET

Sheet:
C-S

Scale: AS NOTED



SITE PLAN

SCALE: 1" = 20'-0"

SCALE: 1" = 20'

NORTH

2702
TAX LOT: R3208 02702

FLAWORTH INC.
COMMERCIAL & RESIDENTIAL
DESIGN, DRAFTING & CONST.
13500 SW HWY 99W
MCMINNVILLE OREGON 97128
1-(503)-472-2462

Veritas School
COVERED PLAY AREA
26288 NE Bell RD.
NEWBERG OREGON 97132

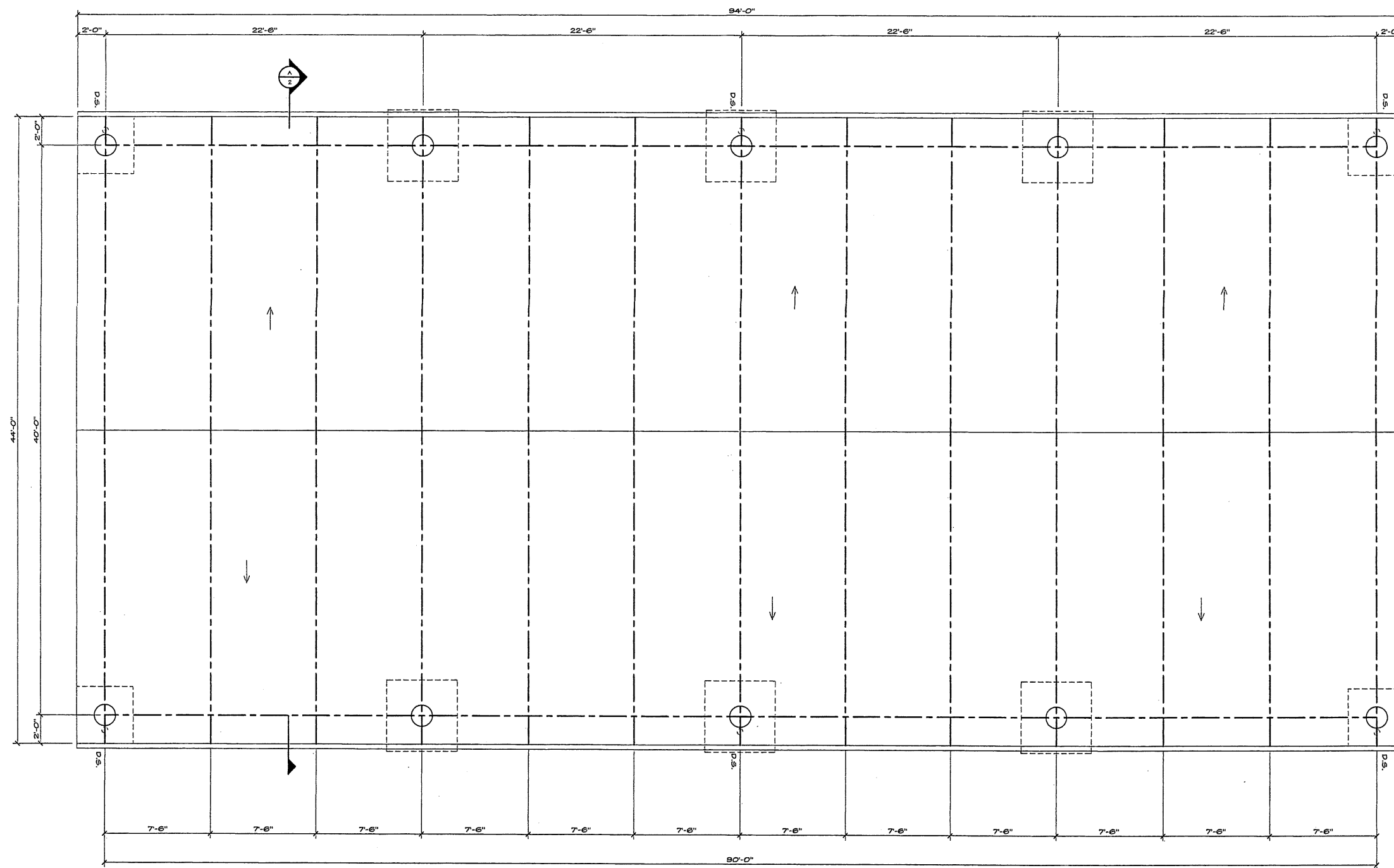
CLIENT:
JOB DESCRIPTION:
LOCATION:

No.	Revision / Issue	Date

Project:
Date: 6-27-19
Plan: SITE PLAN

Sheet: **S-P**

Scale: 1" = 30'



1 MAIN FLOOR PLAN VIEW
 1 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)

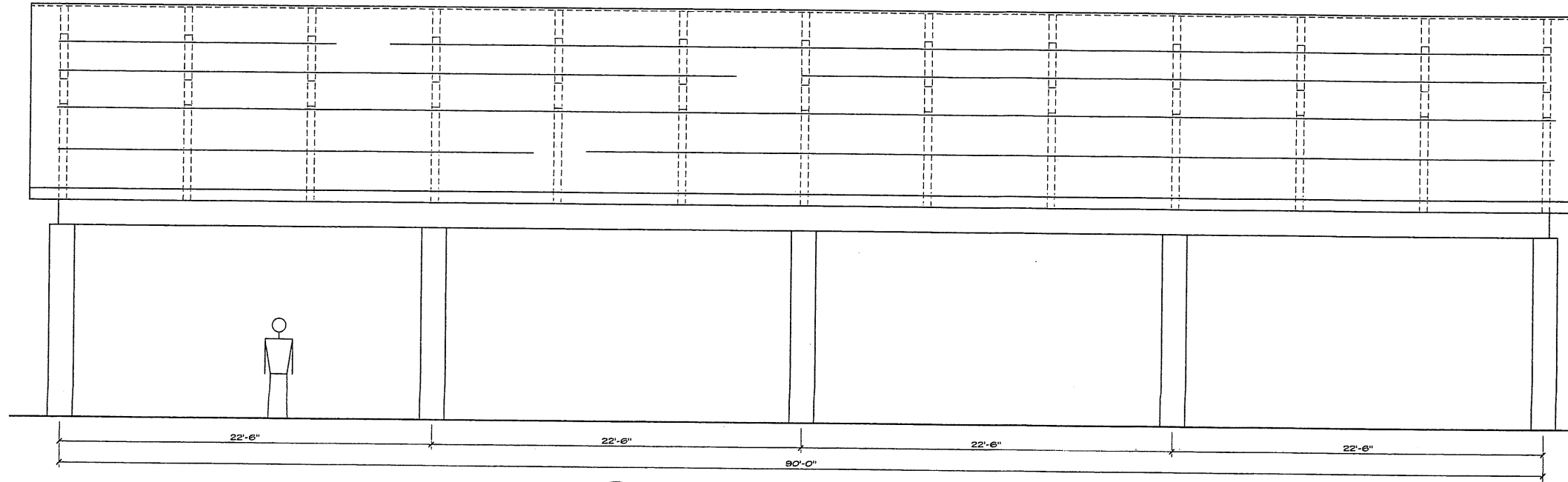
COVERED PLAY AREA 3600 SF

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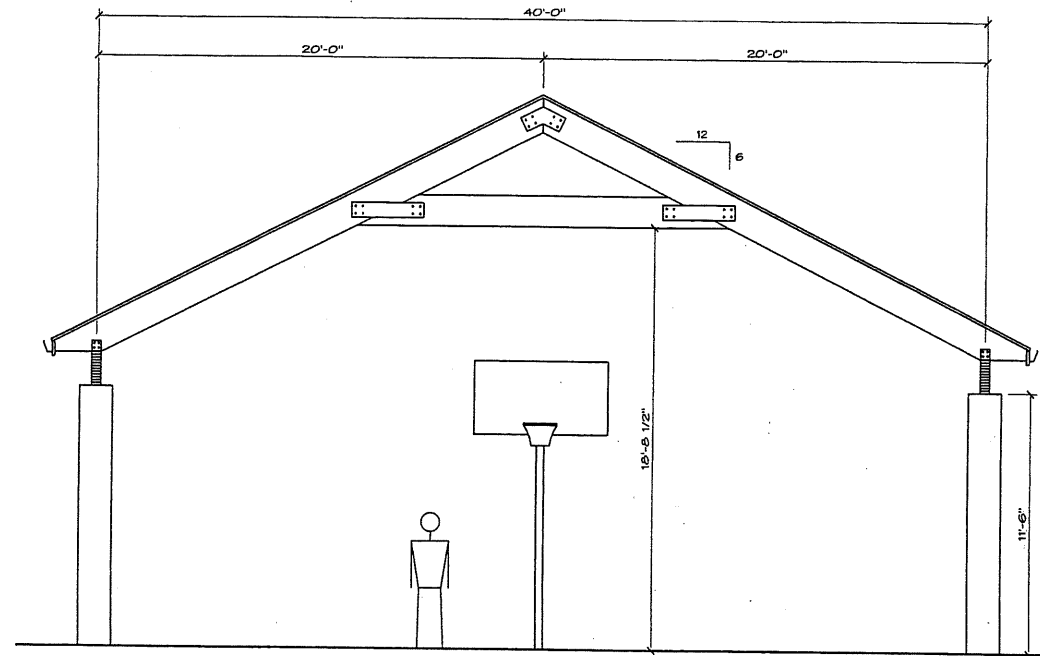
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BRABEC DRAFTING SERVICE
 BATTLE GROUND, WA (360) 921-0386

RESIDENCY FOR: VERITAS CLASSICAL CHRISTIAN SCHOOL	DRAWN BY: ROB BRABEC	1 3
ADDRESS: 20200 NE BELL RD. NEWBERG, OR. 97132	DATE: 06-16-18	
	SCALE: 1/4"=1'-0"	
	REVISION: DWG.# D-3600-0-0	



1 SIDE ELEV. VIEW
 2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)



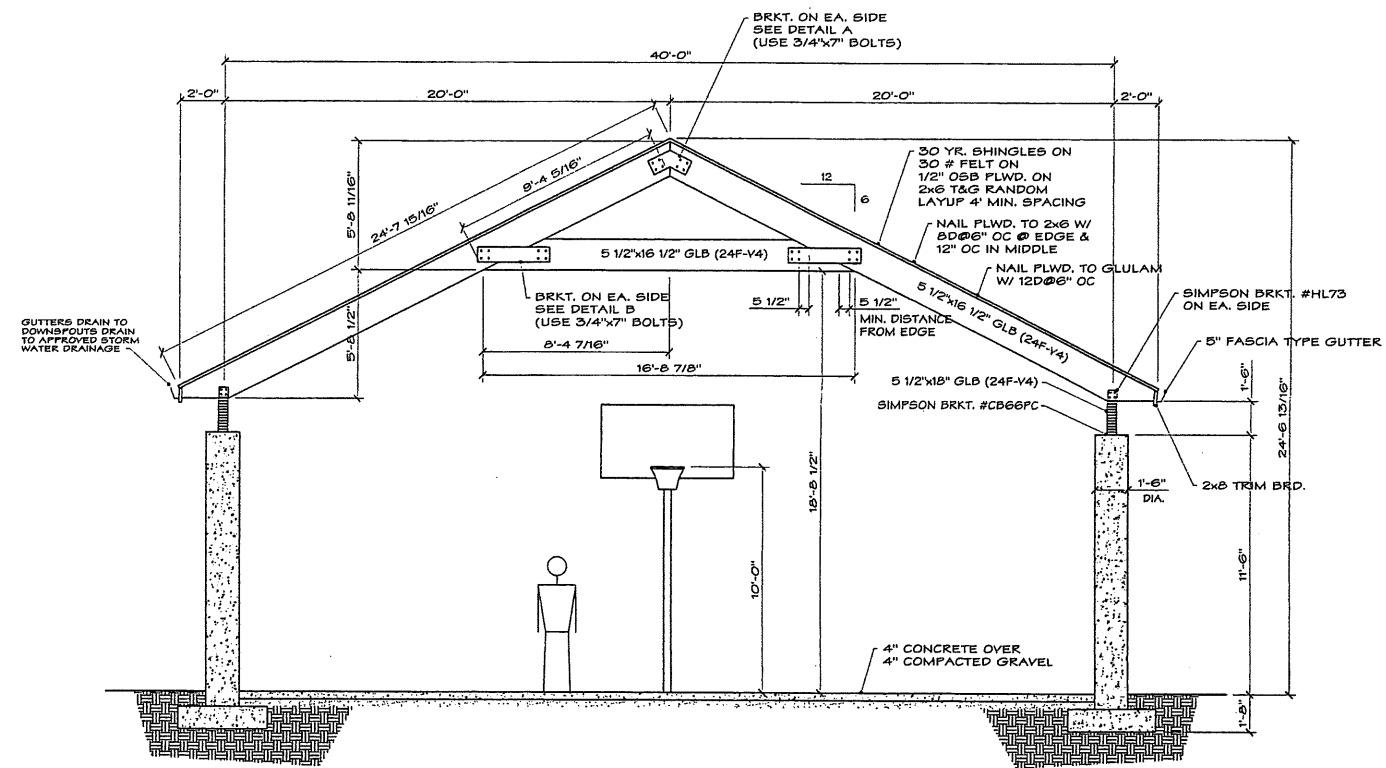
2 FRONT ELEV. VIEW
 2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)

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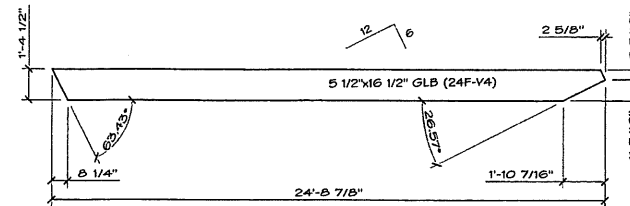
BRABEC DRAFTING SERVICE
 BATTLE GROUND, WA (360) 921-0386

RESIDENCY FOR: VERITAS CLASSICAL CHRISTIAN SCHOOL	DRAWN BY: ROB BRABEC	2 3
ADDRESS: 26288 NE BELL RD. NEWBERG, OR. 97132	DATE: 06-16-18	
	SCALE: 1/4"=1'-0"	
	REVISION: D-3600-0-0	

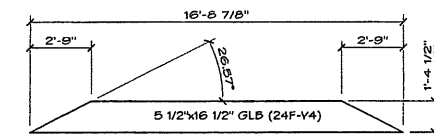


1 SECTION A-A
3 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)

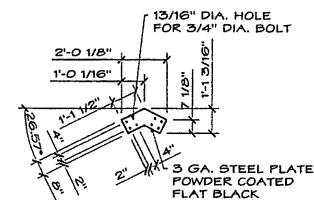
SEE ENG. FOR FTG. & POST
DETAILS & REBAR REQUIREMENTS



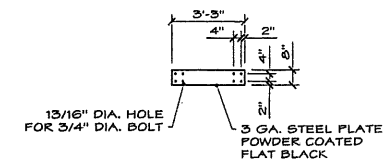
4 GLU. LAM. BEAM DETAIL
2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)



5 GLU. LAM. BEAM DETAIL
2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)



6 TOP PLATE DETAIL A
2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)



7 TOP PLATE DETAIL B
2 SCALE 1/4"=1'-0" (1/8"=1'-0" ON 11X17 FORMAT)

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RESIDENCY FOR: VERITAS CLASSICAL CHRISTIAN SCHOOL	DRAWN BY: ROB BRABEC	3 3
ADDRESS: 26288 NE BELL RD, NEWBERG, OR. 97132	DATE: 06-16-18	
	SCALE: 1/4"=1'-0"	
	REVISION: D-3600-0-0	

STRUCTURAL NOTES

GENERAL

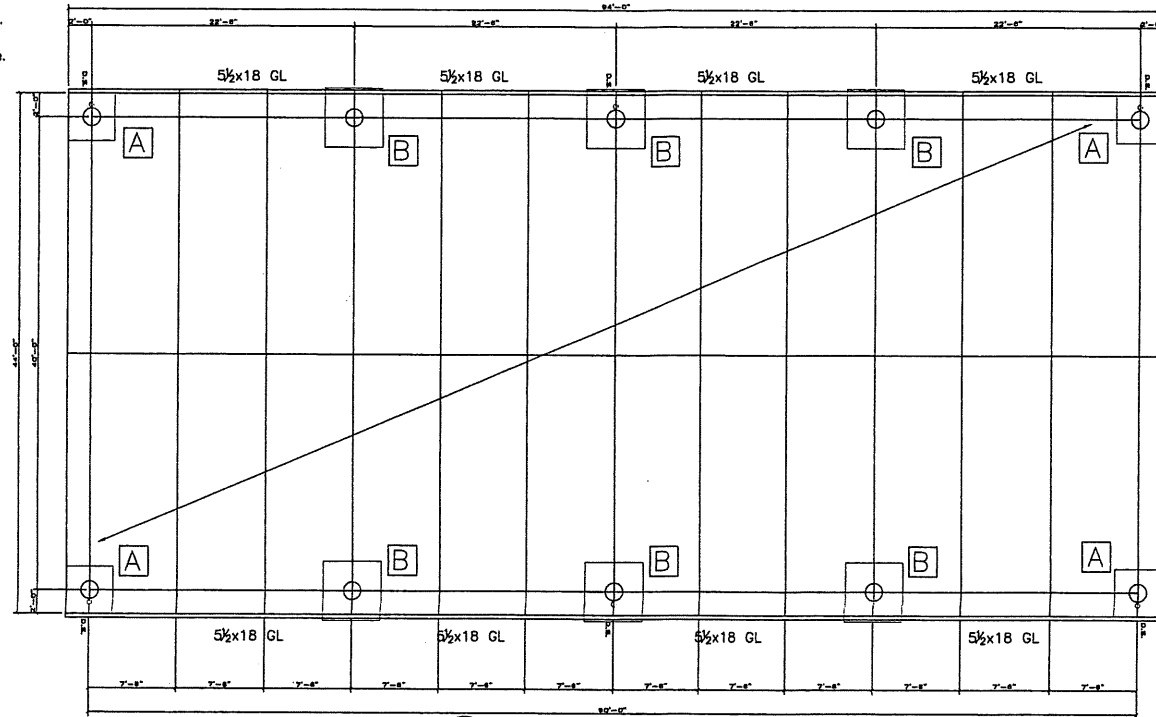
- These Structural Drawings pertain to the lateral force resisting system and framing elements as noted. See architectural plans for framing & foundation plans, dimensions and more information.
- The governing code is the 2015 International Residential Code and the 2015 International Building Code.
- All framing and other work shall comply with the 2015 International Residential Code for "conventional construction" unless noted otherwise as more restrictive.
- Shop drawings, stamped by a Registered Structural Engineer licensed in the State of Oregon, shall be required on: Pre-fabricated Joists and Light Metal Plate Connected Wood Trusses.
- This structure and all of its parts must be adequately braced against wind, lateral earth and seismic forces until the permanent lateral-force resisting systems have been constructed and all attachments and connections necessary for the stability of the structure and its parts have been made.

STRUCTURAL LOADINGS

- Dead Load.....10 psf at floor, 15 psf at roof
- Floor Live Load.....40 psf
- Roof Snow Load.....25psf
- Wind load: IBC 3 Second Gust Wind Speed.....126 mph - Exposure B
- Seismic load: IBC Seismic Category D..... $S_s = 1.0, S_1 = 0.34$

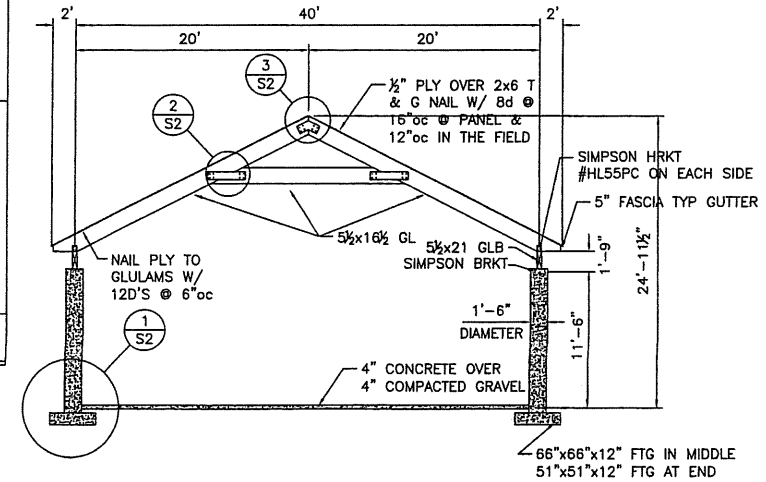
STRUCTURAL MATERIALS

- Foundation Soil Properties:
 - Maximum vertical bearing pressure for footings founded 1'-6" minimum below original or finish grade.....1500 psf
- Concrete:
 - 28 day design strength F'_c2500 psi
 - Minimum cement content.....5 1/2 sacks per cubic yard
 - Maximum water/cement ratio......6 gallons per sack of cement
 - Concrete exposed to elements shall have 5% ± 1% entrained air, by volume per ASTM C260
 - Consolidate concrete using mechanical vibration.
 - Follow ACI recommendations regarding hot and cold weather.
 - Do not place concrete on loose, muddy or frozen ground.
 - Mild steel reinforcing bars.....ASTM A615, Grade 60
Note: Grade 40 Rebar is okay for rebar in footings and stemwalls of one and two story homes on flat lots without concrete basement and/or retaining walls.
- Wood:
 - Sawn Lumber: All framing lumber shall be as follows unless noted otherwise on drawings.
 - Studs.....DF-L or HF Stud Grade
 - Joists and Planks.....DF-L #2
 - Beams, Stringers and Posts.....DF-L #2
 - All members 3x or less shall be 19% moisture content maximum.
 - Provide solid blocking at all points of bearing, solid bridging at B'-0" on center max shall be required where joists have a five-to-one or greater depth-to-thickness ratio and where one edge is not held in line by sheathing, wallboard, bracing, etc.
 - All plates and ledgers in contact with concrete or masonry shall be pressure treated in accordance with A.W.P.A. Standard C-2.
 - Nail in accordance with IRC Fastening Schedule Table R602.3 and drawings.
 - Glue-Laminated Members
 - Beams (typical).....AITC 117 combination 24F-V4 (DF/DF)
 - All glue laminated members shall be notched, shaped and finished in accordance with plans and specifications, and shall be fabricated with waterproof glues.
 - Erection of members shall conform to A.I.T.C. specifications.
 - Glue laminated members shall be western species and bear the A.P.A.-E.W.S. mark of American Wood Systems.
 - TrusJoist or Boise Cascade Joist Products:
 - Joists shall not exceed a live load deflection of $L/600$ at floors, or the working stresses as shown in the IBC standards for the appropriate loads.
 - TJI or BCI series: Manufacturer shall furnish all end and intermediate stiffeners, blocking and/or shear panels, metal bridging assemblies and hangers, as required to provide a complete floor structural system.
 - Laminated Veneer Lumber, noted on the plans as "LVL" or "ML" shall be provided by the joist manufacturer. It shall be 1-3/4" wide and match the floor joist depth.
 - Lumber noted on the plans as "Parallam" (PSL), shall be Parallel Strand Lumber, as manufactured by TrusJoist MacMillan.
 - Lumber, noted on the plans as Versalor (VL) shall be Boise Cascade Versa-Lam material.
 - Light-Metal Plate-Connected Wood Trusses:
 - Trusses shall comply with all provisions of the design specifications for light metal plate connected wood trusses of the Truss Plate Institute, unless noted otherwise.
 - Connect all trusses to supporting members with one Simpson H2.5 anchor, unless noted otherwise.
 - Plywood Sheathing:
 - All plywood sheathing shall be C-D grade, unless noted otherwise (with exterior glue), shall conform with IBC standards and shall bear the A.P.A. trademark.
 - Roof sheathing.....1/2" Index 24/0
 - 2nd Floor sheathing.....3/4" Index 48/24 T&G
 - 1st Floor sheathing.....1 1/8" 2-4-1 T&G
 - Wall sheathing.....7/16" Index 24/0
 - Nail exterior wall sheathing with 8d at 6 inches on center at panel edges and 12 inches on center in-the-field unless noted otherwise on drawings.
 - Nail (or screw) floor sheathing with 10d at 6 inches on center at panel edges and 12 inches on center in-the-field unless noted otherwise on drawings.
 - Apply a 1/4" diameter continuous bead of construction adhesive conforming to AFG-01 to tops of all joists, blocking and plates immediately before placing sheathing.
 - Plywood sheathing shall be laid with end joints staggered.
 - Block all shear wall sheathing with 2x4 flat blocking at all edges.
 - Lay out plywood to eliminate any width less than 1'-0", except at plywood floors where minimum dimension shall be 2'-0", unless all edges of the undersized sheets are supported by blocking.
 - Oriented Strand Board conforming with IBC standards, Grade 2-M-W, manufactured with exterior glue, may be substituted for plywood, provided it has equal load/span rating index and bears the A.P.A. trademark of the American Plywood Association.
 - Contractor is to protect floor and roof sheathing from extreme wet conditions to limit movements due to expansion caused by moisture.
 - Wood Connectors:
 - All plates and ledgers shall be anchored with a minimum of 3 anchors per piece.
 - Expansion anchors shall have a 3 1/2 inch minimum embedment.
 - All framing connectors shall be Simpson or approved. Fill all nail holes with nails as specified by the hanger manufacturer, unless noted otherwise.
 - Bolts and lag bolts to be ASTM A307 unless noted otherwise.
 - Provide standard plate washers under heads or nuts of bolts bearing on wood unless noted otherwise.
 - Pre-drill holes for lag threads.

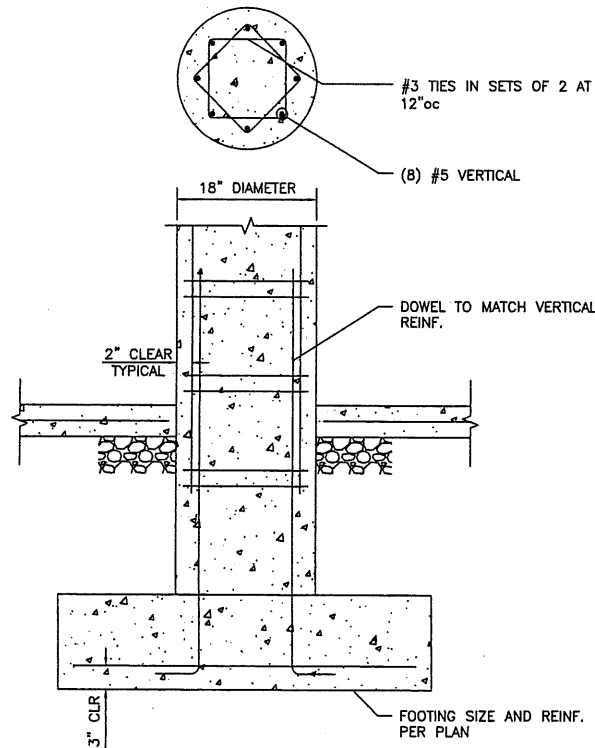


PLAN
1/8"=1'-0"

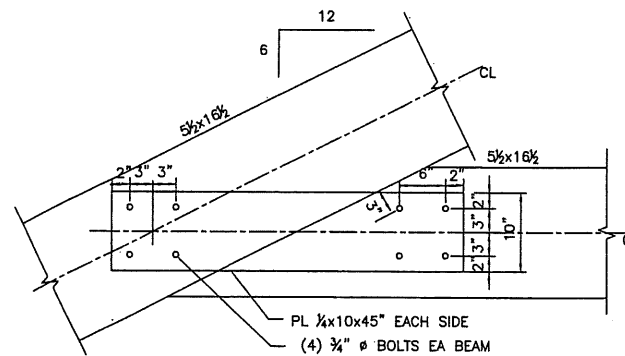
FOOTING SCHEDULE		
A	4'-3"x4'-3"x12"	#4 @ 8"oc E.W.
B	5'-6"x5'-6"x12"	#4 @ 8"oc E.W.



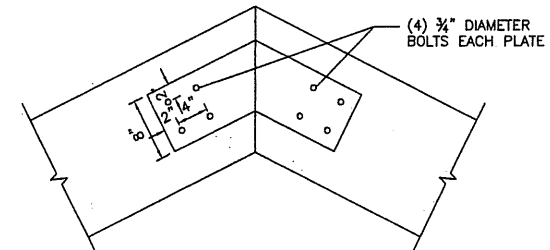
SECTION
1/8"=1'-0"



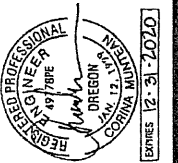
1
S1
CONCRETE COLUMN REINF.
1"=1'-0"



2
S1
DETAIL
1"=1'-0"



3
S1
DETAIL
1"=1'-0"



GREEN MOUNTAIN
structural engineering

greenmountainse.com

98607

19215 SE 34th St. Ste. #106-186 Camas, WA

PLANS AND NOTES

Veritas Classical Christian School
Play Cover

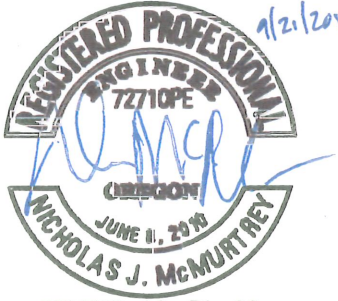
Revisions:

Project No.: 19185
Date: 5/1/2019
Checked by: CM

Sheet No.

S1

**Stormwater Management Plan
Veritas School Site Development
26500 NE Bell Road, Newberg, Oregon 97132**

Date:	September 21, 2019	 <p>RENEWS 12-31-20</p>
City of Newberg Case File #:	DR219-0002	
Project Type:	Site Development	
Project Location:	Yamhill County	
Latitude/Longitude:	45° 19' 49.08" N (45.3303), 122° 58' 00.56" W (-122.9668)	
Prepared By:	Nicholas J McMurtrey, P.E.	
Design Manual:	City of Newberg Public Works Design and Construction Standards (2015)	

PROJECT INTRODUCTION

Construction of Phase 1 of the Veritas School development has already occurred and consists of six modular buildings with a total of 14 classrooms, a science/art lab, a music room, a library and an office. These buildings are accessed via NE Bell Road (see Figure 1) by an asphalt driveway and served by a parking lot with approximately 90 stalls. The current student body includes approximately 220, with over 40 staff, both full- and part-time.

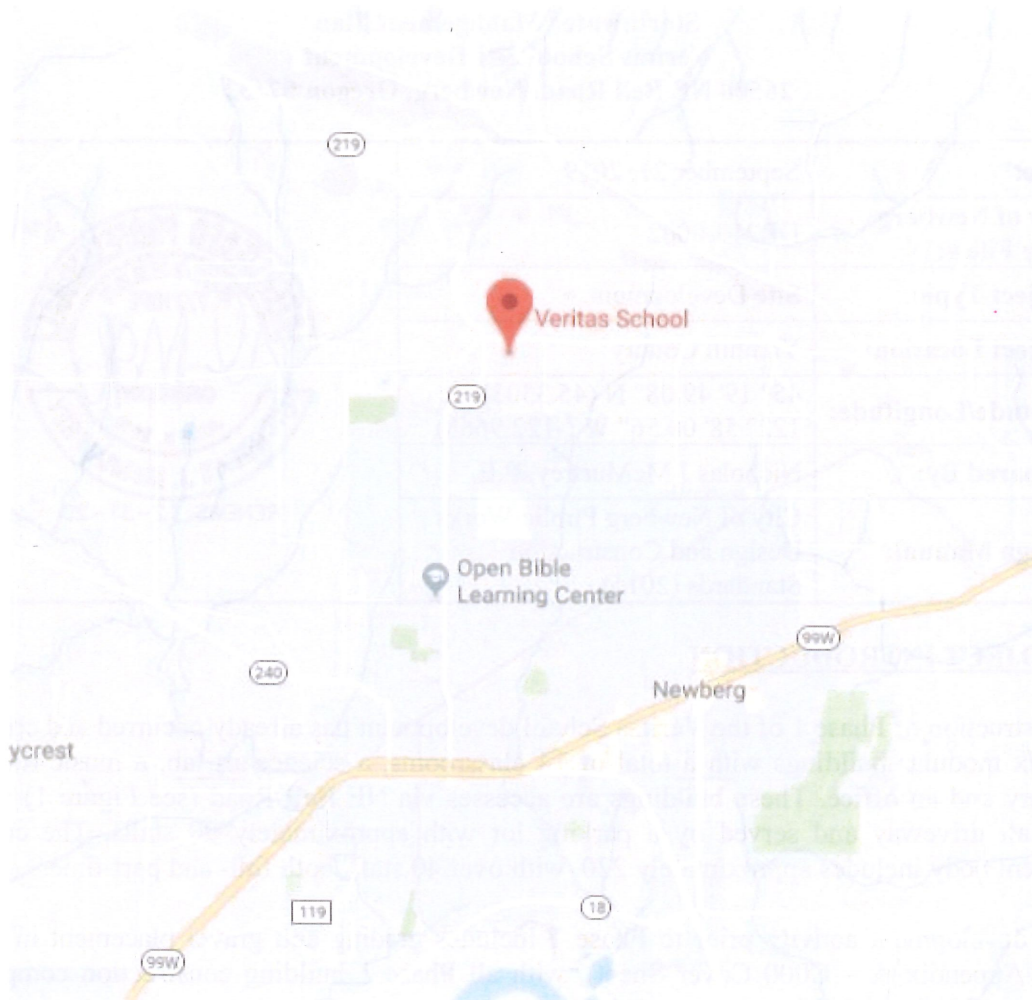
Site development activity prior to Phase 1 includes grading and gravel placement in 2010 (see Appendix A – C000 Cover Sheet), with all Phase 1 building construction completed between 2017 and 2018.

Phase 2 development includes a covered play area planned for construction in 2019. Phase 3 development includes a modular classroom and storage buildings in the southeast corner of the site, with an undefined construction schedule.

This Stormwater Management Plan considers prior site development during Phase 1 as ‘new development’, so that pre-development land conditions are documented circa 2006. Stormwater management facilities described herein reflect the City of Newberg Public Works Design and Construction Standards (2015) for all three phases of development summarized above. Future amendments to the City’s design standards may require updates to these findings if future development phases remain in the planning stage.

A summary of findings is provided in the Conclusion subsection below, including remedial action necessary for the site’s prior development to achieve compliance with City standards.

Figure 1: Vicinity Map



Climate:

Oregon Climate Zone 2 (Valley): Cool, wet winters, warm dry summers and mild temperatures throughout the year. Annual average total precipitation: 35 – 40 inches (Oregon DEQ – Erosion and Sediment Control Manual, 2005).

Soil Permeability:

Project soils along the project alignment consist of silty clay loams, which have relatively low potential for infiltration of stormwater runoff. Soils generally consist of the following NRCS soil types from north to south, as mapped in Appendix B:

- No. 2211B, Cove silty clay loam, hydrologic soil group D
- No. 2706C, Hazelair silty clay loam, hydrologic soil group D

Best Management Practices (BMPs):

Water quality treatment will occur via an existing vegetated swale constructed during Phase 1 development.

Water quantity considerations were excluded from prior development. As a result, additional site improvements are necessary to realize compliance with Section 4.7 of the City of Newberg (the City) Public Works Design and Construction Standards (D&CS).

POLLUTANTS OF CONCERN:

During and after construction, the types of pollutants associated with the project that pose a potential risk for release into the surrounding environment are: metals (zinc, copper, lead, etc.); oil, grease and other petroleum products; sediment; temperature; and polycyclic Aromatic Hydrocarbons (PAHs). For the purposes of this report, post-construction drainage contaminated by dissolved metals is due mainly to the operation of automobiles over the roadways. The main contributors of metal pollution are car brake pads and oil deposits leaking from vehicles.

Oil and grease are common contaminants resulting from the use of construction equipment and automobiles. The oil used to lubricate these machines leaks from moving parts over time. Petroleum spills are also a potential hazard during construction from the refueling of equipment on the construction site.

Sediments are a common source of contamination within runoff leaving a project site. Once native soils are exposed during grading activities, storm runoff can suspend loose soil particles and carry them downstream.

Temperature impacts to the surrounding environment occur mainly from impervious pavement areas, which contribute to the “heat island effect”. These surfaces collect and retain the sun’s energy more readily than natural vegetation and soil, so that during rainfall, heat is transferred into the resulting runoff. If the runoff is not infiltrated into the ground, or passed through vegetation, it retains a larger portion of this heat which is passed down the conveyance system into larger streams and rivers. In Oregon, temperature of drainage is primarily a function of shading (or lack thereof) over impervious surfaces, because of the hot, dry summer months.

Polycyclic aromatic hydrocarbons (PAHs) are generated from vehicular traffic as by-products of the fuel combustion process. These pollutants may remain airborne, or settle and adhere to sediments on the roadway where drainage can transport them into local receiving waters.

STATUS OF RECEIVING WATERS:

Rivers, Streams and Lakes:

The project is divided into two watersheds with separate receiving waters, as shown in **Table 1** below and illustrated on maps in Appendix B.

Table 1: Project Waterway Information

Waterway	Site Description	Location
Hess Creek	East Basin (E1)	±3,000 feet southeast
Chehalem Creek	West Basin (E2)	±5,000 feet southwest

Approximately 20% of the site's northeastern corner drains easterly to an unnamed tributary of Hess Creek, while the larger remainder drains westerly to an unnamed tributary of Chehalem Creek.

Wetlands

While the site is omitted from publicly available State and local wetland inventories, the State's 2018 GIS mapping tool shows USDA NRCS soil mapping on-site for predominately hydric soils. Further analysis of wetland potential is outside the scope of this report, and future development activity is shown to remain within the bounds of prior ground disturbance activity.

TMDLs and 303(d) listings:

Hess Creek is not listed under any water quality categories according to Oregon's 2012 Integrated Report developed by Oregon DEQ; however, Chehalem Creek is listed as shown in **Table 2** below.

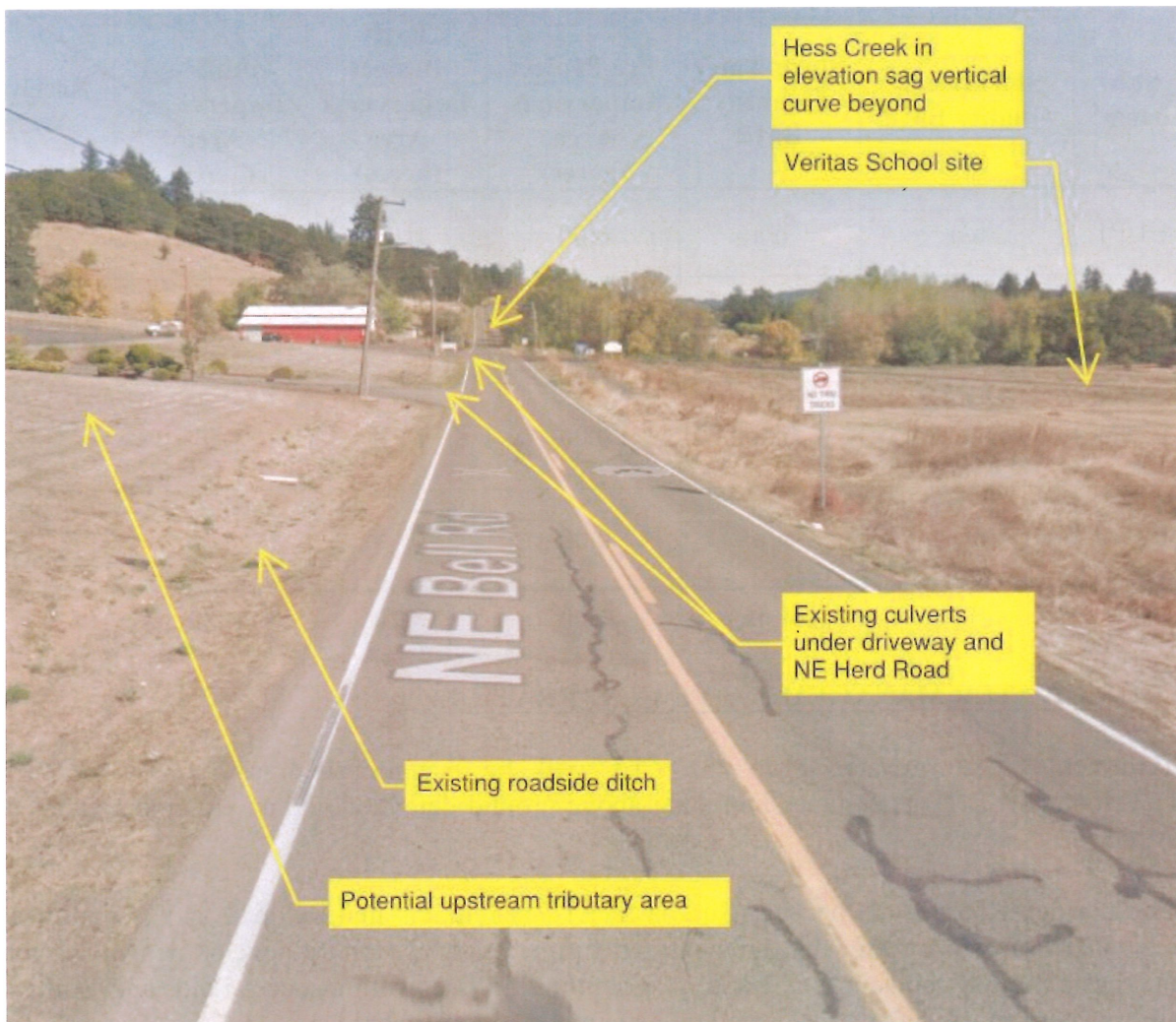
Table 2: Project Site 303(d) Listing Status of Receiving Water and 2-year Peak Flow

Project Site	Receiving Water	TMDL Pollutant
East Basin (E1)	Hess Creek	n/a
West Basin (E2)	Chehalem Creek	Dissolved oxygen; Temperature

UPSTREAM TRIBUTARY AREA:

Potential for upstream tributary area to discharge overland flow into the project area was assessed using visual observation and the USGS maps shown in Appendix B. An elevated hillside to the north of Bell Road has the potential to contribute overland flow into the school property, however a series of roadside ditches and culverts on the north side of Bell Road intercepts this flow and conveys it east towards Hess Creek (see Figure 2). These conveyances are assumed to intercept upstream flow before contributing to the Veritas site, and are therefore excluded from further analysis.

Figure 2: Upstream Tributary Area



CONTRIBUTING IMPERVIOUS AREA:

The project's contributing impervious area (CIA) are summarized in **Table 3** below. The CIA is limited to asphalt, concrete and roof areas within the site area shown in Appendix C.

Table 3: Contributing Impervious Area and Stormwater Treatment BMP by Sub-basin

Sub-basin ¹	Stormwater Quality BMP	Stormwater Quantity BMP	Pre-Project Impervious Area (acres)	Post-Project Impervious Area (acres)	Additional Impervious Area (acres)	Receiving Water
E1/P1	n/a	n/a	0.00	0.00	0.00	Hess Creek
E2/P2	Existing vegetated swale	Detention basin	0.00	1.67	1.67	Chehalem Creek
E2/P3	Existing vegetated swale	n/a	0.00	1.53 ²	1.53 ²	Chehalem Creek
E2/P4	n/a	n/a	0.00	0.00	0.00	Chehalem Creek
Totals =			0.00	3.20	3.20	

STORMWATER MANAGEMENT PLAN NARRATIVE:

Treatment of stormwater from the CIA will be accomplished using Low Impact Development (LID) techniques including above ground detention and an existing vegetated swale.

The northeast corner of the site (Sub-basin E1/P1) remains undeveloped and is therefore excluded from stormwater management and further analysis. Future development plans for this basin include replacing the existing agricultural grasses with a soccer field, with similar stormwater runoff characteristics and no new impervious surfaces.

The primary development area consists of the following sub-basins:

- Sub-basin E2/P2 includes Phase 1 driveway and parking lot areas that will drain to a new detention basin. This detention area will function as an above ground stilling basin, providing qualitative opportunity for infiltration and evapotranspiration. Discharges from the new detention basin are directed to an existing vegetated swale for water quality treatment.

¹ Subbasin naming convention ‘E’ indicates a pre-development (or ‘existing’) project basin, while ‘P’ indicates a post-development (or ‘proposed’) project basin.

² Impervious area tabulations include future Phase 2 and Phase 3 improvements.

- Sub-basin E2/P3 includes Phase 1, Phase 2 and Phase 3 building roofs and walkways draining to lynch style catch basins. These inlets are conveyed to a below grade pipe system that outfalls to a new detention basin. Discharges from the new detention basin are directed to an existing vegetated swale for water quality treatment.
- Sub-basin E2/P4 includes the western half of the site that remains undeveloped. Future development plans for this basin include replacing the existing agricultural grasses with a baseball field and/or amphitheater, with similar stormwater runoff characteristics and no new impervious surfaces.

WATER QUALITY AND FLOW-CONTROL DESIGN STORMS:

The City’s D&CS Sections 4.5.1 and 4.8.5 flow determination requirements, including storm recurrence intervals and 24-hour rainfall depths. **Table 4** shows the design storm rainfall amounts, with supporting calculations contained in Appendix D. **Tables 5 and 6** summarizes the runoff results for the sub-basins and overall CIA.

Table 4: Design Storm Rainfall Data

Recurrence Interval	Precipitation (inches/24-hours) ³
Water Quality (WQ)	1.00
50% of 2-year (50%)	1.25
2-year	2.50
5-year	3.00
10-year	3.50
25-year	4.00

Table 5: Pre-Developed Basin Peak Flow Summary (cfs)

Design Storm Event	Pervious Land Use	Sub-basin E2	Chehalem Creek Outfall
50%	Agricultural CN=80	0.15	0.15
2-Year		2.03	2.03
5-Year		3.16	3.16
10-Year		4.39	4.39
25-Year		5.70	5.70

³ Rainfall depths reported from City D&CS, Table 4.2.

Table 6: Post-Developed Basin Peak Flow Summary (cfs)

Design Storm Event	Pervious Land Use	Sub-basin P2	Sub-basin P3	Sub-basin P4	Chehalem Creek Outfall ⁴
50%	Play Field CN=80	0.29	0.38	0.08	0.15
2-Year		1.38	0.93	1.10	1.28
5-Year		1.90	1.15	1.69	2.28
10-Year		2.44	1.36	2.34	3.51
25-Year		2.99	1.58	3.01	5.33

Table 7 summarizes the physical properties of the new detention basin necessary to provide the flow control performances summarized in Table 6.

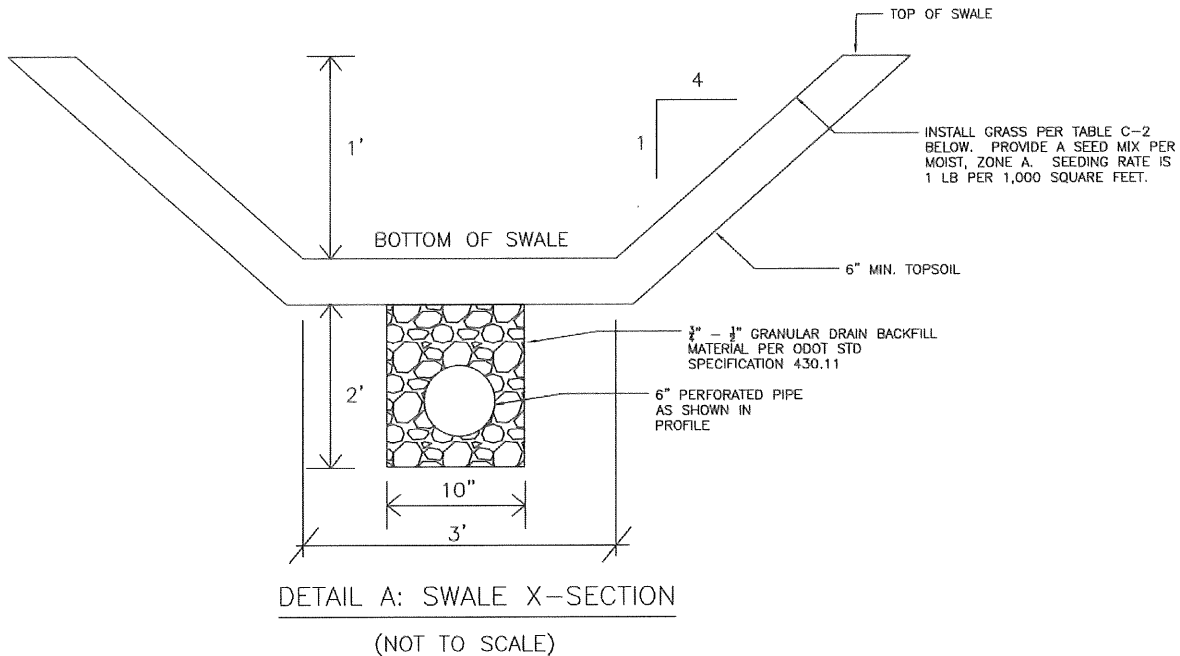
Detention Basin Property	Detention Basin Value
Base elevation	322.50 feet
Base area	11,460 sq.ft.
Basin side slopes	4 horizontal:1 vertical
Ditch inlet orifice diameter	2.9 inches
Ditch inlet orifice invert elevation	322.50 feet
Ditch inlet outlet diameter	12 inches
Ditch inlet rim elevation	323.17 feet
High flow bypass elevation	323.90 feet
High flow bypass width	5 feet
25-Year storm ponded water depth	17.4 inches
Top of embankment elevation	325.00 feet

TREATMENT CAPACITY, DIMENSIONS & DETAILS:

The water quality vegetated swale used to treat the CIA for this project is shown from prior construction drawings in **Figure 2** below.

⁴ Outfall includes detention effects of a new detention basin.

Figure 2: Vegetated Swale



A summary of the vegetated swales performance is provided in **Table 8** below.

Table 8: BMP Water Quality Flow Rates and Volumes

Drainage Segment	WQDS peak (cfs)	Runoff Velocity (ft/s)		Slope	Length (ft)	Width (ft)	WQDS Residence Time (min)
		WQDS	25-Year				
Vegetated Swale	0.11	0.10	1.02	2.0%	100	3	16.7

WQDS – water quality design storm
cfs – cubic feet per second
cf – cubic feet

min – minutes
ft – feet
s – seconds

BMP EFFECTIVENESS:

Table 3 of the Stormwater Treatment Program – ODOT BMP Selection Tool indicates the key treatment mechanisms for a water quality vegetated swale are sorption and filtration. Associated treatment mechanisms for a water quality vegetated swale are hydraulic attenuation, density separation, uptake/storage, and microbial transformation. The water quality vegetated swale will have a high capability to remove suspended solids and particulate metals; and a moderate capability to remove nutrients, oil and grease, polycyclic aromatic hydrocarbons, and dissolved metals.

Prior construction drawings indicate the vegetated swale omits the 12-inches of topsoil and concrete level spreaders as specified by City Standard Drawing No. 460, however the facility does exceed the minimum residence time of 9 minutes by nearly 185%. As a result, these omissions are not anticipated to compromise the swales overall water quality performance.

OPERATION SUMMARY:

Basin Flow Routing:

Flow routes for each project improvement are summarized below. Since the increase in runoff from each improvement reported at the property outfall in **Table 6** comprises a negligible impact to the existing discharge flows presented in **Table 5**, the downstream conveyance capability of each receiving water is unaffected by the proposed project.

- Sub-basin P2 – This basin consists of pavement runoff from the access driveway and parking lot serving the project area. A ditch collects runoff along the east side of the driveway and drains south towards the parking lot where a new culvert is required to transfer drainage to a new detention basin (see Appendix C). This runoff will be managed to mimic pre-development conditions by a new detention basin before eventually reaches Chehalem Creek.
- Sub-basin P3 – This basin contains the building area and courtyard of the school site, which drains to existing catch basins serving a centralized underground piped conveyance system. This runoff will be managed to mimic pre-development conditions by a new detention basin before eventually reaches Chehalem Creek.
- Sub-basin P4 – This basin consists of vegetated landscaped areas, and is anticipated to remain landscaped into the future, potentially serving as a baseball field or amphitheater. Drainage bypasses the new detention basin and vegetated swale serving sub-basins P2 and P3, and eventually reaches Chehalem Creek.

High Flow Operation:

During high flow events, the vegetated swale will function like conventional open channel drainage conveyances and transport runoff downstream as noted in the flow routes section above. There is ample adjacent open area to convey flows should the swales' capacity become limited by debris.

A high flow bypass channel is required in the detention basin embankment (see **Table 7**) to facilitate controlled overtopping. Since the velocity through the opening in the embankment as relatively low (around 0.5 feet per second) during the 25-year storm, establish grass vegetation is anticipated as sufficient to control erosion through the bypass. Erosion control measures are likely necessary prior to plant establishment to provide slope stability following construction.

Downstream Analysis:

The downstream system was assessed for approximately 1/4 mile south of the property. Once drainage leaves the vegetated swale, it flows southwesterly via an 18-inch diameter pipe where it continues via open channel conveyance towards Highway 219 (see **Figure 4**).

Figure 4: Swale Discharge Channel



From there, drainage follows a roadside ditch paralleling Highway 219 (see Figure 5), before turning southbound the traversing an open area (see Figure 6). Due to dense brush, the nature of the flow path leaving the Highway 219 should be unknown, however assumed to retain an open channel configuration in route to Chehalem Creek.

Figure 5: Highway 219 Open Channel Conveyance



Figure 6: Conveyance Route to Chehalem Creek



MAINTENANCE PLAN:

Responsible Party:

School staff are responsible to provide oversight during project construction and ensure that the water quality and stormwater management elements of the project are properly constructed in accordance with City requirements. After construction, School maintenance staff are responsible to review the stormwater facilities at intervals that facilitate continued functionality.

Routine Maintenance Actions and Schedule:

Specific maintenance recommendations are as follows:

- General maintenance of vegetated areas, including the new detention basin, see Table 1 in Appendix E.
- Maintenance of vegetated swales, see Table 1 and Table 3 in Appendix E.

- Complete annual inspection and maintenance of each facility as defined in the Operations, Maintenance, Contingency & Repair Plan in Appendix E.

Contingency and repair plan:

In the event of hazardous material spills, crashes, or uprooted or fallen trees, inspect stormwater facilities for contamination or damage. Repair or reconstruct these facilities to conform to original design intent. Handle and dispose of contaminated materials using only approved methods, equipment, and sites.

CONCLUSION:

Stormwater treatment on this project will achieve pollutant removal to the maximum extent practicable by treating runoff from 100% of the CIA with vegetated swales. Flow control is realized through a new detention basin, so that pre-development runoff characteristics are mimicked in the post-development condition.

Remedial activity is necessary to bring Phase 1 development into compliance with City drainage standards. Those remedial improvements are anticipated to accompany Phase 2 development and are described in Appendix C – Retrofit Strategy.

APPENDIX LIST

APPENDIX A: DEVELOPMENT PLANS

- C000 Cover Sheet
- C401 Power Plan
- C420 Storm Plan
- C421 Storm Profiles

APPENDIX B: MAPS

- NRCS Soil Survey
- USGS Receiving Waters

APPENDIX C: BASINS AND RETROFIT STRATEGY

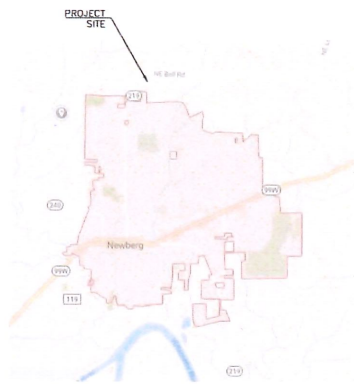
- Pre-Development Basin Map
- Post-Development Basin Map
- Retrofit Strategy

APPENDIX D: STORMWATER CALCULATIONS

APPENDIX E: OPERATIONS, MAINTENANCE, CONTINGENCY & REPAIR PLAN

APPENDIX A
DEVELOPMENT PLANS

**VERITAS SCHOOL SITE
DEVELOPMENT**
26500 NE BELL ROAD
NEWBERG, OREGON 97132



VICINITY MAP
NOT TO SCALE



SITE MAP
LATITUDE: 43.33 LONGITUDE: -122.97



SHEET INDEX

Sheet Number	Sheet Title
C000	COVER SHEET
C001	CONSTRUCTION NOTES
C200	SITE PLAN
C300	GRADING & PAVING PLAN
C400	COMPOSITE UTILITY PLAN
C401	POWER PLAN
C420	STORM PLAN
C421	STORM PROFILES
C720	DETAILS
C721	DETAILS
C722	DETAILS

ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center. (Note: the telephone number for the Oregon Utility Notification Center is (503) 232-1987).

CLAIR COMPANY
305 NW 10th St., #7
Gresham, OR 97030
503.664.1987

VERITAS SCHOOL SITE DEVELOPMENT
NEWBERG, OREGON
COVER SHEET
26500 NE BELL ROAD NEWBERG, OR 97132



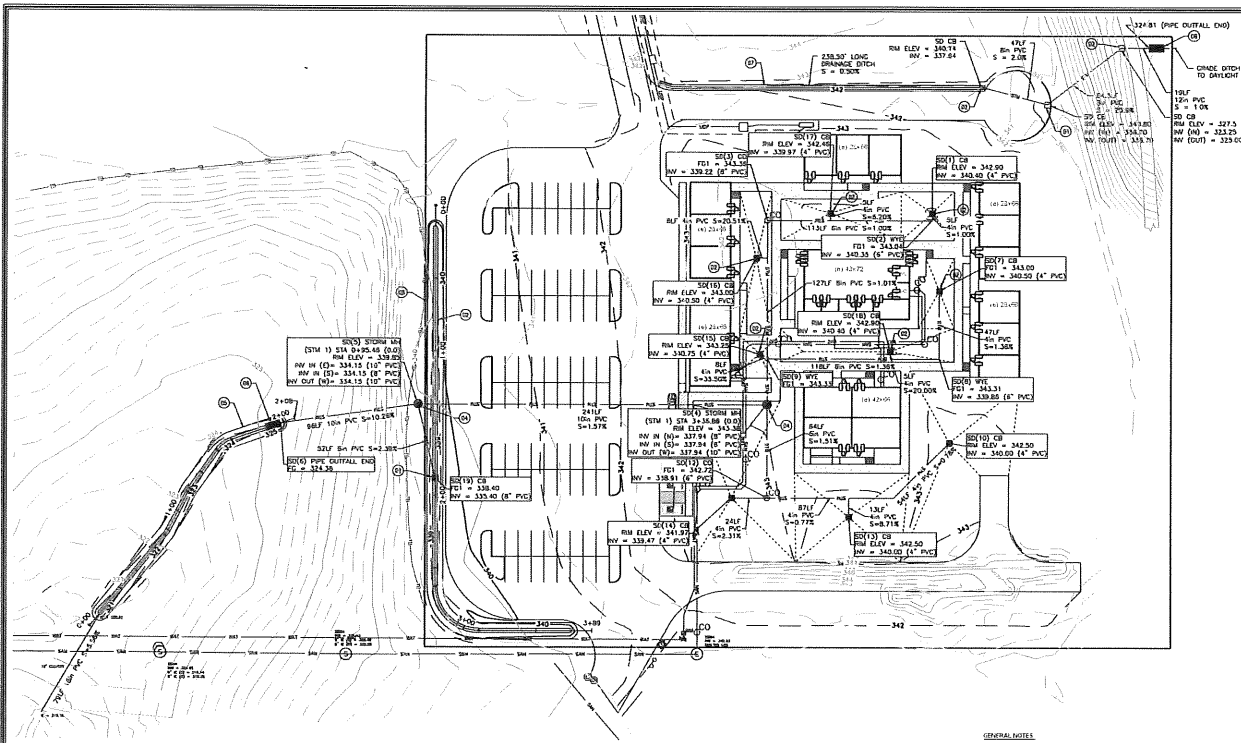
MSS INC
ENGINEERING CONSULTANTS
10000 SW 10th St
Gresham, OR 97030
(503) 232-1987 FAX (503) 232-1988



DATE	FILE	SCALE
1/18/17	0000	AS SHOWN
DRAWN BY: [Signature]		
CHECKED BY: [Signature]		
DATE: 05.13.17		
C000		
1 OF 11 SHEETS		

BUILDING PERMIT SET

6/13/2017 8:37 AM K:\1706\1706\1706\1706.DWG SHED 01 6/13/2017



STORM SI (STM 1) STA 0+25.45 (0.0)
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 RM HI (1) = 334.15 (10" PVC)
 RM HI (2) = 334.15 (8" PVC)
 RM OUT (1) = 334.15 (10" PVC)
 RM OUT (2) = 334.15 (10" PVC)

LEGEND

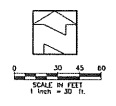
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	ADJACENT PROPERTY LINES		STORM MANHOLE		ASPHALT PAVING		WATER METER
	CENTERLINE		STORM CATCHBASIN		GRAVEL SURFACE		POWER/UTILITY POLE
	EASEMENT LINES		STORM/SEWER CLEANOUT		EXISTING MAJOR CONTOURS		STREET LIGHT
	BUILDING		FLOW DIRECTION ARROW		EXISTING MINOR CONTOURS		STREET SIGN
	CURB		STORM CULVERT END		MAJOR CONTOURS		GAS VALVE
	SIDEWALK		SEWER MANHOLE		MINOR CONTOURS		GAS METER
	FENCE		RETAINING WALL		T/O/COMB PED/WALK		
	WATERLINE						
	SANITARY SEWER						
	STORM DRAIN LINE						
	OVERHEAD POWER						
	UNDERGROUND POWER						
	PROPOSED PAVING						

GENERAL NOTES

- 1. PROVIDE TO SHOW EXACTLY PER CITY OF NEWBERG STD. DR-06-02-2014.
- 2. PROVIDE FIRE SIZES PER CITY OF NEWBERG STD. OF PAVING 2015.
- 3. ALL PROPOSED SHALL BE INSTALLED IN ACCORDANCE WITH PUC REGULATIONS. PROVIDE MINIMUM CLEARANCE NOT LESS THAN 10 FT. FROM UNITS 4 FT. FROM CURB.
- 4. CONCRETE FINISHING SUPERVISION TO COLLECTION LINES TO BE REQUIRED. NOT SPECIFY.

STORM NOTES

- 01. CONSTRUCT TRUNK TO BRANCH STYLE BATH WITH CONCRETE COLLAR PER DETAIL 01-01-03.
- 02. CONSTRUCT TRUNK TO BRANCH STYLE BATH WITHOUT CONCRETE COLLAR PER DETAIL 01-01-04.
- 03. CONSTRUCT CLEANOUTS PER CITY OF NEWBERG STD. DR-06-02-2014.
- 04. CONSTRUCT STORM AND SEWER WATER MAINS PER CITY OF NEWBERG STD. DR-06-02-2014.
- 05. CONSTRUCT MANHOLE TO 48" DIA. SEE DETAIL "A" SHEET FOR MANHOLE AND INJECTION DETAIL. DETAIL INFORMATION IS DASHED TO INDICATE YES OR NO FOR FIELD USE.
- 06. CONSTRUCT 48" DIA. 4" DIA. 3.5' DEEP HEPABOND PER CITY OF NEWBERG STD. DR-06-02-2014. USE SLABS TO RAMP UP.
- 07. CONSTRUCT MANHOLE OTHER. SEE DETAIL "A" SHEET FOR DETAIL. DETAIL INFORMATION IS DASHED TO INDICATE YES OR NO FOR FIELD USE.



CLAIR COMPANY
 200 N. 10TH ST. STE. 100
 NEWBERG, OREGON 97132
 TEL: 503.535.1100
 FAX: 503.535.1101

**VERITAS SCHOOL SITE DEVELOPMENT
 NEWBERG, OREGON
 STORM PLAN**

20500 NE BELL ROAD NEWBERG, OR 97132

RENEWAL 6/29/2018

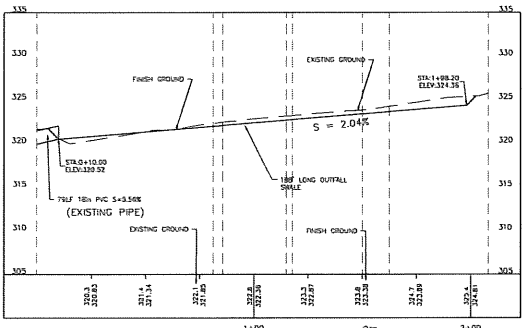
MSS INC
 1706 VERITAS DRIVE
 NEWBERG, OREGON 97132
 TEL: 503.535.1100
 FAX: 503.535.1101

SCALE IN FEET
 1" = 30' TL

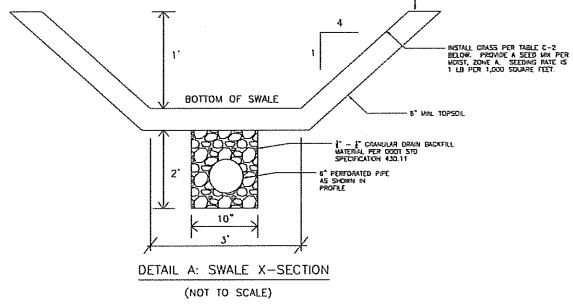
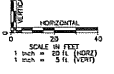
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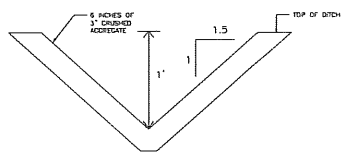
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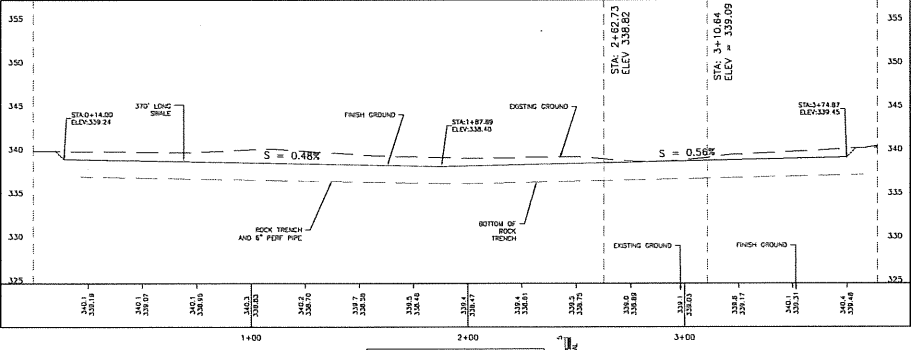
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VERT SCALE FACTOR: 4.0



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(NOT TO SCALE)



DETAIL B: DRAINAGE DITCH X-SECTION
(NOT TO SCALE)



parking lot swale_longitudinal
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VERT SCALE FACTOR: 4.0

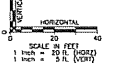


TABLE C-3 Sand Mixtures Specifications

Material Name	Common Name	% By Weight
Group 1 - 10.64	Group 1 - 10.64	100%
Group 2 - 10.64	Group 2 - 10.64	100%
Group 3 - 10.64	Group 3 - 10.64	100%
Group 4 - 10.64	Group 4 - 10.64	100%
Group 5 - 10.64	Group 5 - 10.64	100%
Group 6 - 10.64	Group 6 - 10.64	100%
Group 7 - 10.64	Group 7 - 10.64	100%
Group 8 - 10.64	Group 8 - 10.64	100%
Group 9 - 10.64	Group 9 - 10.64	100%
Group 10 - 10.64	Group 10 - 10.64	100%
Group 11 - 10.64	Group 11 - 10.64	100%
Group 12 - 10.64	Group 12 - 10.64	100%
Group 13 - 10.64	Group 13 - 10.64	100%
Group 14 - 10.64	Group 14 - 10.64	100%
Group 15 - 10.64	Group 15 - 10.64	100%
Group 16 - 10.64	Group 16 - 10.64	100%
Group 17 - 10.64	Group 17 - 10.64	100%
Group 18 - 10.64	Group 18 - 10.64	100%
Group 19 - 10.64	Group 19 - 10.64	100%
Group 20 - 10.64	Group 20 - 10.64	100%
Group 21 - 10.64	Group 21 - 10.64	100%
Group 22 - 10.64	Group 22 - 10.64	100%
Group 23 - 10.64	Group 23 - 10.64	100%
Group 24 - 10.64	Group 24 - 10.64	100%
Group 25 - 10.64	Group 25 - 10.64	100%
Group 26 - 10.64	Group 26 - 10.64	100%
Group 27 - 10.64	Group 27 - 10.64	100%
Group 28 - 10.64	Group 28 - 10.64	100%
Group 29 - 10.64	Group 29 - 10.64	100%
Group 30 - 10.64	Group 30 - 10.64	100%
Group 31 - 10.64	Group 31 - 10.64	100%
Group 32 - 10.64	Group 32 - 10.64	100%
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Group 46 - 10.64	Group 46 - 10.64	100%
Group 47 - 10.64	Group 47 - 10.64	100%
Group 48 - 10.64	Group 48 - 10.64	100%
Group 49 - 10.64	Group 49 - 10.64	100%
Group 50 - 10.64	Group 50 - 10.64	100%

CLAIR COMPANY
INCORPORATED
1000 W. 10TH ST. SUITE 100
PORTLAND, OREGON 97202
503.253.1111

VERITAS SCHOOL SITE DEVELOPMENT
NEWBERG, OREGON
STORM PROFILES

26000 NE BELL ROAD NEWBERG, OR 97132

REVISION 6/30/2016

MSS INC.
ENGINEERING
1000 W. 10TH ST. SUITE 100
PORTLAND, OREGON 97202
503.253.1111

DATE: 06.12.17
TIME: 08:12:17

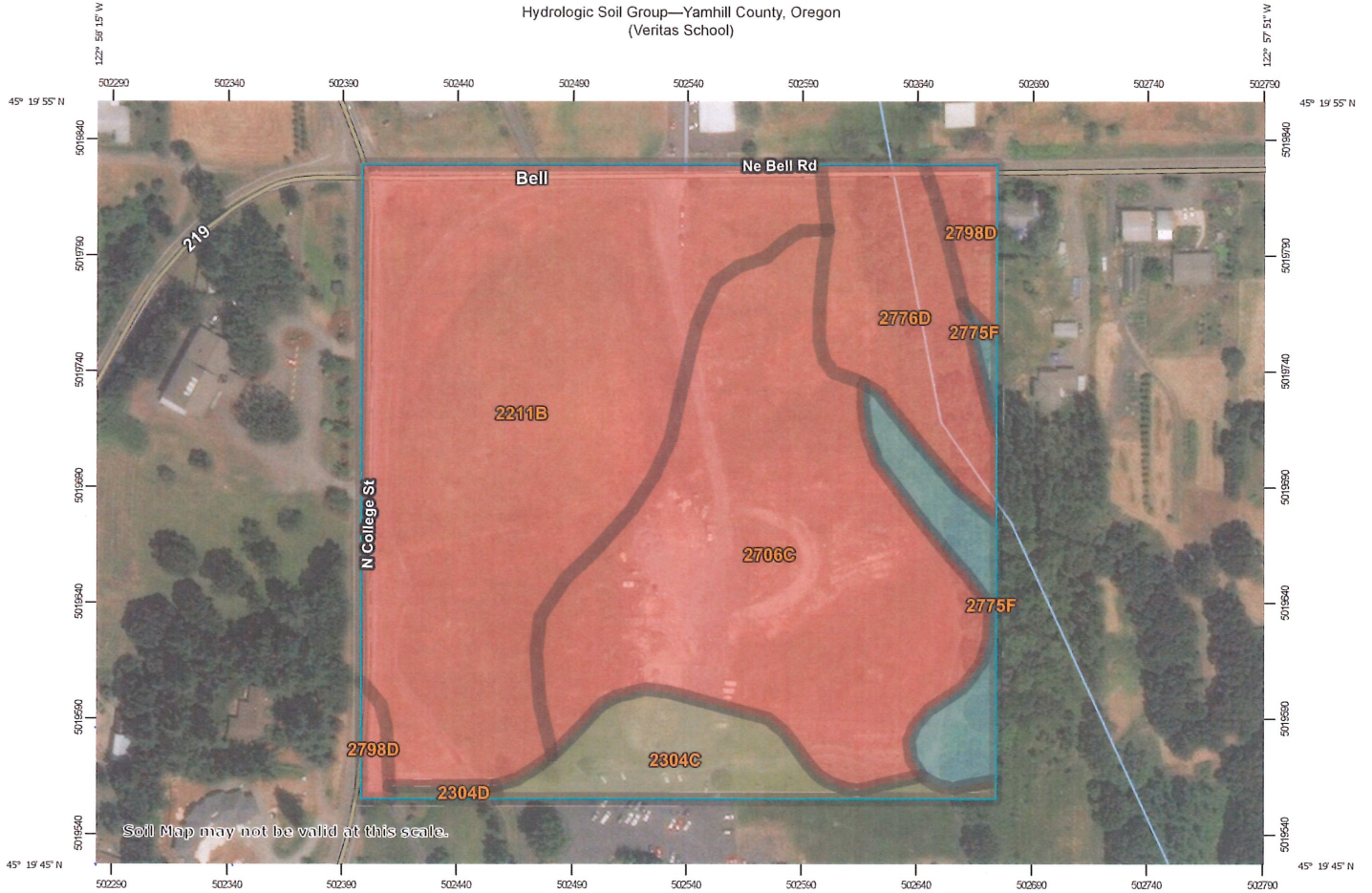
C421
8 OF 11 SHEETS

BUILDING PERMIT SET

APPENDIX B

MAPS

Hydrologic Soil Group—Yamhill County, Oregon
(Veritas School)



Map Scale: 1:2,320 if printed on A landscape (11" x 8.5") sheet.

0 30 60 120 180 Meters
0 100 200 400 600 Feet

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2211B	Cove silty clay loam, 3 to 8 percent slopes	D	8.1	43.2%
2304C	Carlton silt loam, 2 to 12 percent slopes	C/D	1.2	6.7%
2304D	Carlton silt loam, 12 to 20 percent slopes	C/D	0.1	0.3%
2706C	Hazelair silty clay loam, 2 to 12 percent slopes	D	6.2	32.9%
2775F	Saum-Ritner complex, 30 to 75 percent slopes	C	0.9	4.9%
2776D	Panther-Witham complex, hummocky, 2 to 25 percent slopes	D	1.7	9.3%
2798D	Witham silty clay loam, hummocky, 2 to 25 percent slopes	D	0.5	2.6%
Totals for Area of Interest			18.8	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

Chehalem Creek: StreamStats Report

Region ID:
 Workspace ID:
 Clicked Point (Latitude, Longitude):
 Time:

OR
 OR20190908123723925000
 45.32934, -122.96914
 2019-09-08 05:37:39 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0195	square miles
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.99	inches
SOILPERM	Average Soil Permeability	0.53	inches per hour
JANMAXT2K	Mean Maximum January Temperature from 2K resolution PRISM 1961-1990 data	45.1	degrees F
WATCAPORC	Available water capacity from STATSGO data using methods from SIR 2005-5116	0.15	inches
ORREG2	Oregon Region Number	10001	dimensionless
BSLOPD	Mean basin slope measured in degrees	3.16	degrees
JANMINT2K	Mean Minimum January Temperature from 2K resolution PRISM PRISM 1961-1990 data	32.7	degrees F
ELEV	Mean Basin Elevation	341	feet

Peak-Flow Statistics ParameterS[Reg 2B Western Interior LT 3000 ft Cooper]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0195	square miles	0.37	7270
BSLOPD	Mean Basin Slope degrees	3.16	degrees	5.62	28.3
I24H2Y	24 Hour 2 Year Precipitation	1.99	inches	1.53	4.48
ELEV	Mean Basin Elevation	341	feet		
ORREG2	Oregon Region Number	10001	dimensionless		

Peak-Flow Statistics DisclaimerS[Reg 2B Western Interior LT 3000 ft Cooper]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report[Reg 2B Western Interior LT 3000 ft Cooper]

Statistic	Value	Unit
2 Year Peak Flood	0.811	ft ³ /s
5 Year Peak Flood	1.18	ft ³ /s
10 Year Peak Flood	1.44	ft ³ /s
25 Year Peak Flood	1.77	ft ³ /s
50 Year Peak Flood	2.02	ft ³ /s
100 Year Peak Flood	2.27	ft ³ /s
500 Year Peak Flood	2.86	ft ³ /s

Peak-Flow Statistics Citations

Cooper, R.M., 2005, Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5116, 76 p. (<http://pubs.usgs.gov/sir/2005/5116/pdf/sir2005-5116.pdf>)

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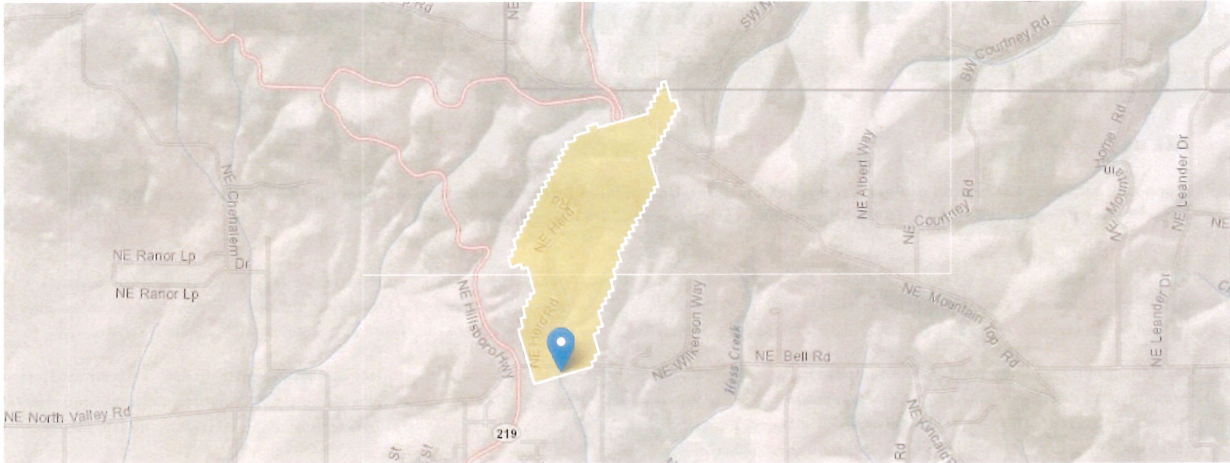
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Application Version: 4.3.8

Hess Creek Tributary: StreamStats Report

Region ID:
 Workspace ID:
 Clicked Point (Latitude, Longitude):
 Time:

OR
 OR20190908123357715000
 45.33149, -122.96663
 2019-09-08 05:34:13 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.31	square miles
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	2.09	inches
SOILPERM	Average Soil Permeability	0.86	inches per hour
JANMAXT2K	Mean Maximum January Temperature from 2K resolution PRISM 1961-1990 data	45	degrees F
WATCAPORC	Available water capacity from STATSGO data using methods from SIR 2005-5116	0.18	inches
ORREG2	Oregon Region Number	10001	dimensionless
BSLOPD	Mean basin slope measured in degrees	9.54	degrees
JANMINT2K	Mean Minimum January Temperature from 2K resolution PRISM PRISM 1961-1990 data	32.6	degrees F
ELEV	Mean Basin Elevation	719	feet

Peak-Flow Statistics Parameters(Reg 2B Western Interior LT 3000 ft Cooper)

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.31	square miles	0.37	7270
BSLOPD	Mean Basin Slope degrees	9.54	degrees	5.62	28.3
I24H2Y	24 Hour 2 Year Precipitation	2.09	inches	1.53	4.48
ELEV	Mean Basin Elevation	719	feet		
ORREG2	Oregon Region Number	10001	dimensionless		

Peak-Flow Statistics Disclaimers(Reg 2B Western Interior LT 3000 ft Cooper)

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report(Reg 2B Western Interior LT 3000 ft Cooper)

Statistic	Value	Unit
-----------	-------	------

Statistic	Value	Unit
2 Year Peak Flood	17.1	ft ³ /s
5 Year Peak Flood	25.2	ft ³ /s
10 Year Peak Flood	30.7	ft ³ /s
25 Year Peak Flood	37.6	ft ³ /s
50 Year Peak Flood	42.8	ft ³ /s
100 Year Peak Flood	47.9	ft ³ /s
500 Year Peak Flood	59.8	ft ³ /s

Peak-Flow Statistics Citations

Cooper, R.M., 2005, Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5116, 76 p. (<http://pubs.usgs.gov/sir/2005/5116/pdf/sir2005-5116.pdf>)

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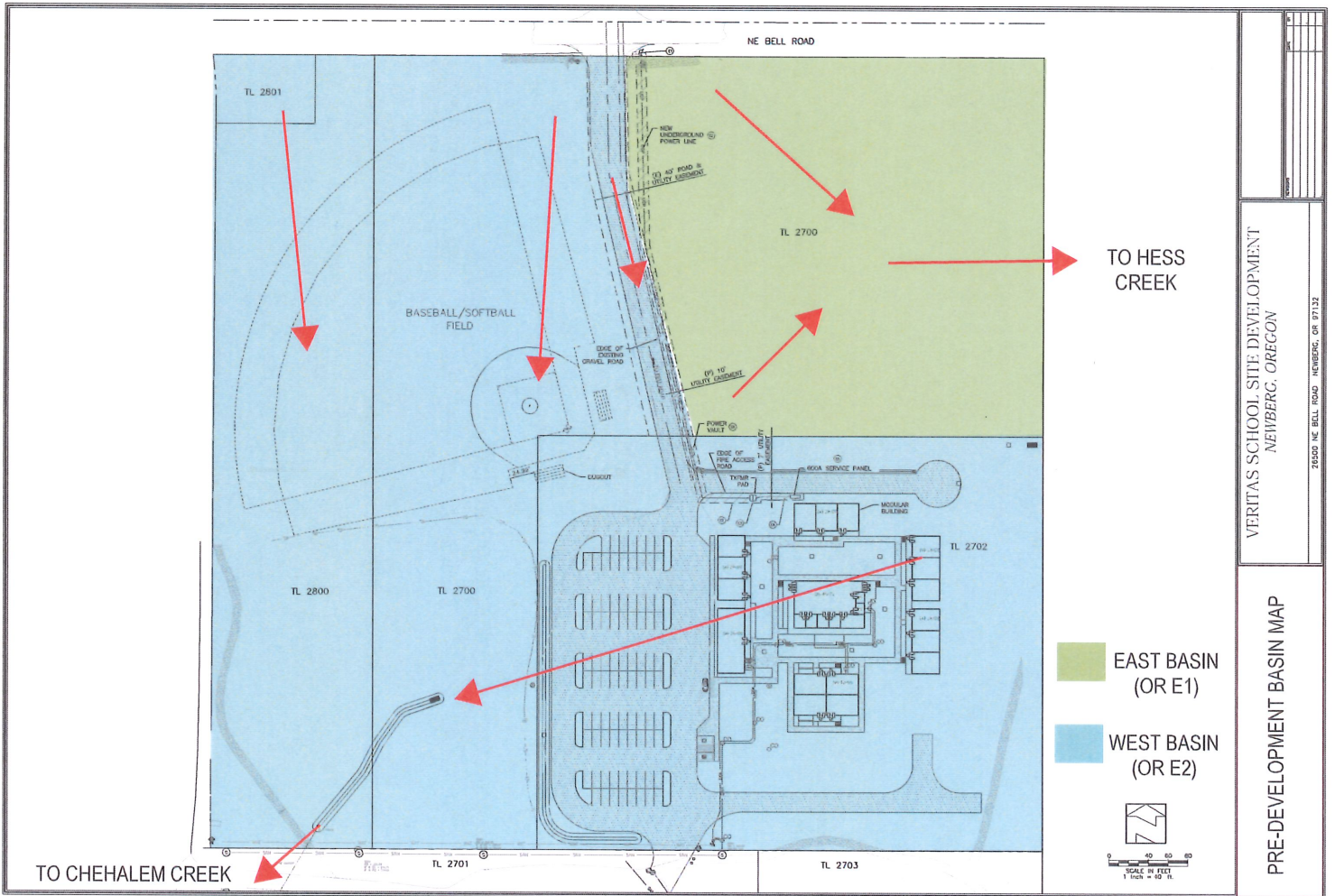
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Application Version: 4.3.8

APPENDIX C

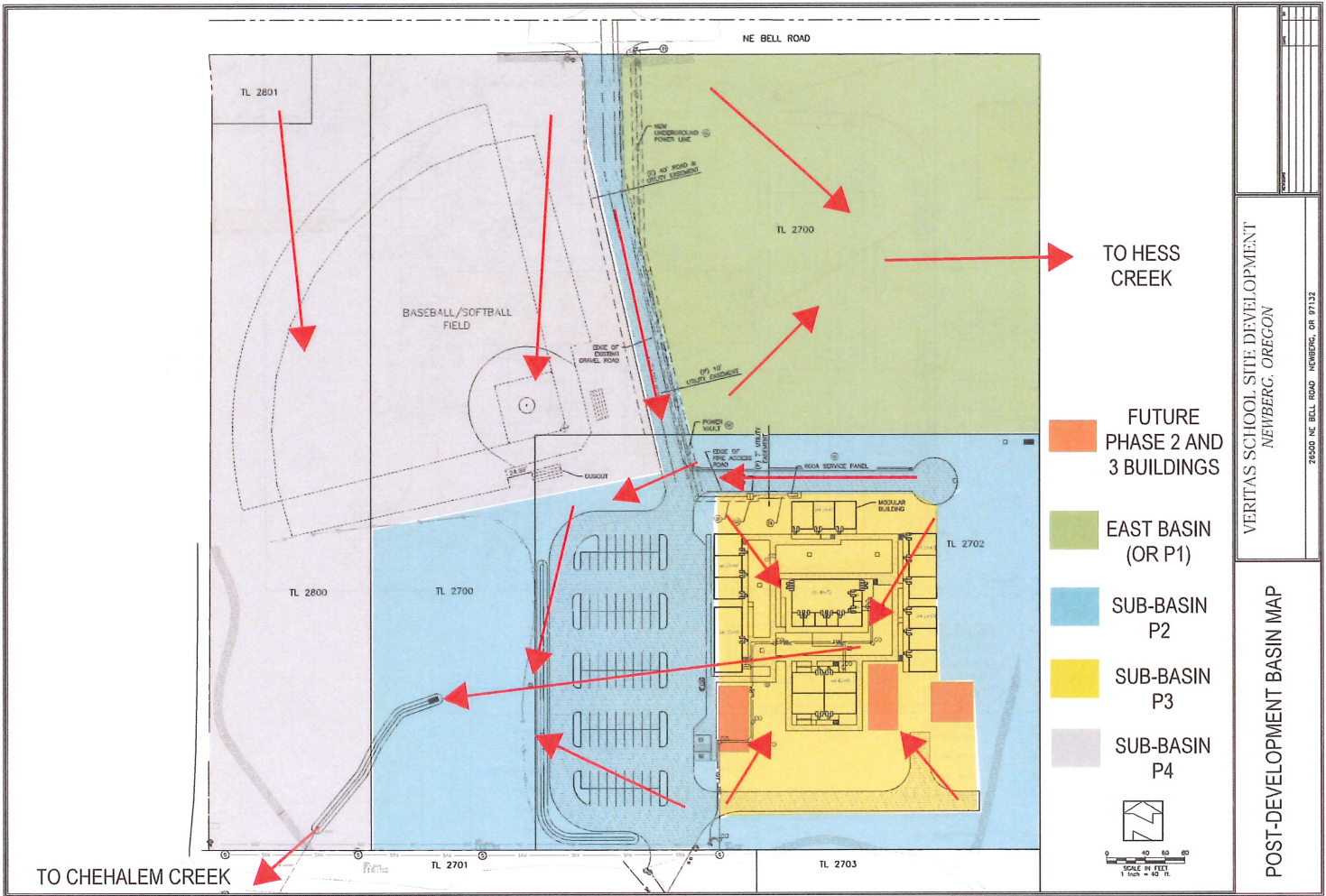
BASINS AND RETROFIT STRATEGY



VERTITAS SCHOOL SITE DEVELOPMENT
 NEWBERG, OREGON

26500 NE BELL ROAD NEWBERG, OR 97132

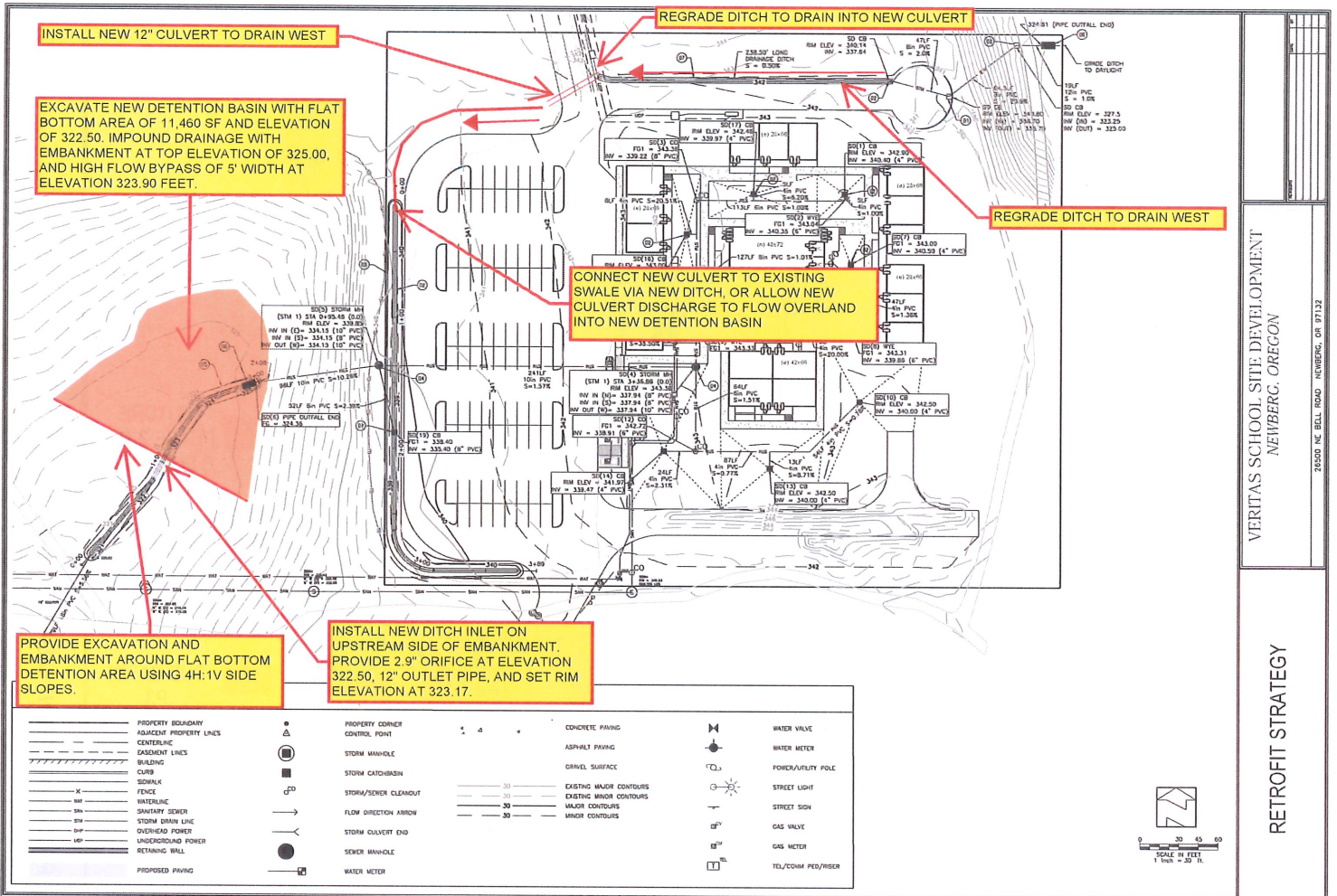
PRE-DEVELOPMENT BASIN MAP



VERITAS SCHOOL SITE DEVELOPMENT
NEWBERG, OREGON

24250 NE BELL ROAD NEWBERG, OR 97132

POST-DEVELOPMENT BASIN MAP



APPENDIX D
STORMWATER CALCULATIONS

Project Description

File Name 20190920-Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method SCS TR-55
 Time of Concentration (TOC) Method SCS TR-55
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods YES

Analysis Options

Start Analysis On Sep 21, 2019 00:00:00
 End Analysis On Sep 23, 2019 00:00:00
 Start Reporting On Sep 21, 2019 00:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
 Reporting Time Step 0 00:05:00 days hh:mm:ss
 Routing Time Step 1 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	5
Nodes.....	8
<i>Junctions</i>	4
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	7
<i>Channels</i>	3
<i>Pipes</i>	4
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-50%	Intensity	inches	Oregon	Yamhill	1	1.25	SCS Type IA 24-hr

Subbasin Summary

SN	Subbasin ID	Area	Total	Total	Peak
			Runoff	Runoff	Runoff
		(ac)	(in)	(ac-in)	(cfs)
1	E1/P1	2.97	0.17	0.51	0.04
2	E2_E3_E4	12.74	0.17	2.20	0.15
3	P2	4.46	0.36	1.61	0.29
4	P3	1.72	0.86	1.48	0.38
5	P4	6.56	0.17	1.13	0.08

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 REV-Swale-End	Junction	320.52	330.00	320.52	330.00	12.00	0.15	321.09	0.00	8.91	0 00:00	0.00	0.00
2 REV-Swale-Start	Junction	322.50	330.00	322.50	330.00	12.00	0.15	322.59	0.00	7.41	0 00:00	0.00	0.00
3 SD(5)	Junction	334.15	339.85	334.15	340.00	12.00	0.38	334.31	0.00	5.54	0 00:00	0.00	0.00
4 SD(6)	Junction	324.36	330.00	324.36	330.00	12.00	0.66	324.40	0.00	5.60	0 00:00	0.00	0.00
5 Out-PRE-East	Outfall	325.00					0.04	325.00					
6 Out-PRE-West	Outfall	316.16					0.15	316.16					
7 Out-REV-POST-West	Outfall	316.16					0.15	316.25					
8 Det-Basin	Storage Node	322.50	326.00	322.50		12.00	0.66	323.17				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Reported Surcharged Condition (min)
1 Ditch-Inlet	Pipe	Det-Basin	REV-Swale-Start	5.00	323.17	322.50	13.4000	12.000	0.0150	0.00	11.30	0.00	0.01	0.05	0.05	0.00 Calculated
2 Orifice	Pipe	Det-Basin	REV-Swale-Start	5.00	322.50	322.50	0.0000	2.900	0.0130	0.15	0.01	13.43	4.54	0.17	0.69	0.00 > CAPACITY
3 REV-Swale-Discharge	Pipe	REV-Swale-End	Out-REV-POST-West	68.56	321.00	316.16	7.0600	18.000	0.0150	0.15	24.19	0.01	3.78	0.09	0.06	0.00 Calculated
4 SD5_SD6	Pipe	SD(5)	SD(6)	96.00	334.15	324.36	10.2000	10.000	0.0130	0.38	7.00	0.05	10.06	0.10	0.12	0.00 Calculated
5 HF_Bypass	Channel	Det-Basin	REV-Swale-Start	5.00	323.90	322.50	28.0000	24.000	0.0320	0.00	263.60	0.00	0.00	0.05	0.02	0.00
6 Link-22	Channel	SD(6)	Det-Basin	5.00	324.36	322.50	37.2000	60.000	0.0320	0.66	995.36	0.00	1.63	0.34	0.07	0.00
7 REV-Swale	Channel	REV-Swale-Start	REV-Swale-End	100.00	322.50	320.52	1.9800	18.000	0.2400	0.15	31.07	0.00	0.11	0.33	0.22	0.00

Subbasin Hydrology

Subbasin : E1/P1

Input Data

Area (ac) 2.97
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	2.97	D	80.00
Composite Area & Weighted CN	2.97		80.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T_c = Time of Concentration (hr)
 n = Manning's roughness
 L_f = Flow Length (ft)
 P = 2 yr, 24 hr Rainfall (inches)
 S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
 V = 20.3282 * (S_f^{0.5}) (paved surface)
 V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
 V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
 V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
 V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
 V = 5.0 * (S_f^{0.5}) (woodland surface)
 V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
 T_c = (L_f / V) / (3600 sec/hr)

Where:

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
 R = A_q / W_p
 T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 R = Hydraulic Radius (ft)
 A_q = Flow Area (ft²)
 W_p = Wetted Perimeter (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)
 n = Manning's roughness

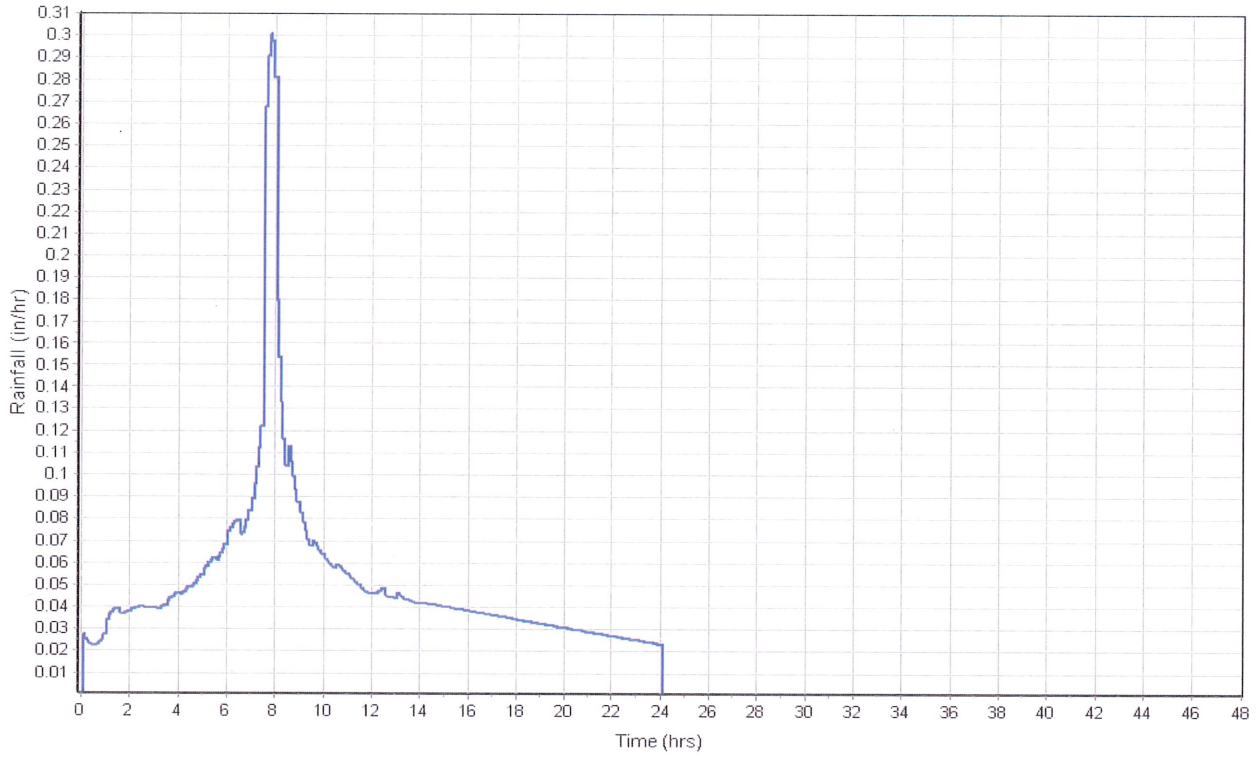
	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.10	0.00	0.00
Computed Flow Time (min) :	16.14	0.00	0.00
Shallow Concentrated Flow Computations			
	A	B	C
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.28	0.00	0.00
Computed Flow Time (min) :	1.46	0.00	0.00
Total TOC (min)	17.61		

Subbasin Runoff Results

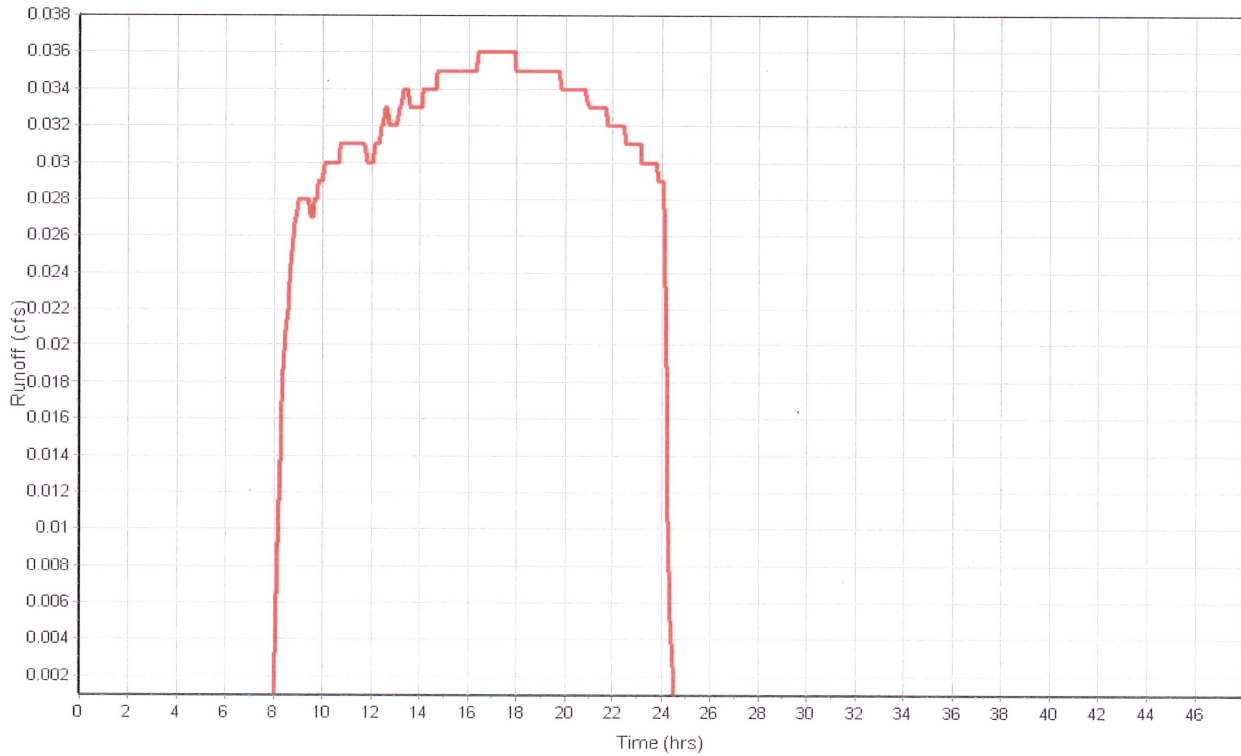
Total Rainfall (in)	1.25
Total Runoff (in)	0.17
Peak Runoff (cfs)	0.04
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:17:37

Subbasin : E1/P1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : E2_E3_E4

Input Data

Area (ac) 12.74
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	12.74	D	80.00
Composite Area & Weighted CN	12.74		80.00

Time of Concentration

	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	13.73	0.00	0.00

	Subarea	Subarea	Subarea
	A	B	C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	500	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	2.99	0.00	0.00

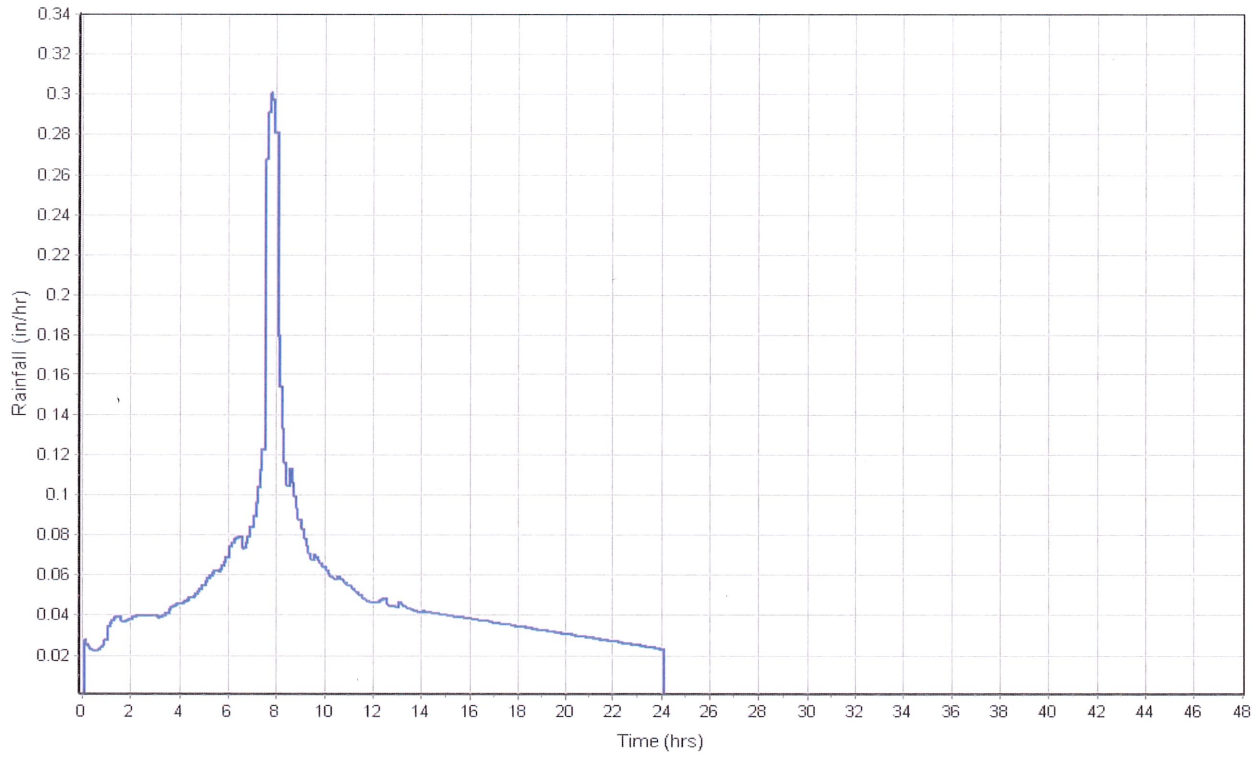
	Subarea	Subarea	Subarea
	A	B	C
Channel Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Channel Slope (%) :	3	0.00	0.00
Cross Section Area (ft ²) :	12	0.00	0.00
Wetted Perimeter (ft) :	12	0.00	0.00
Velocity (ft/sec) :	1.08	0.00	0.00
Computed Flow Time (min) :	4.65	0.00	0.00
Total TOC (min)	21.36		

Subbasin Runoff Results

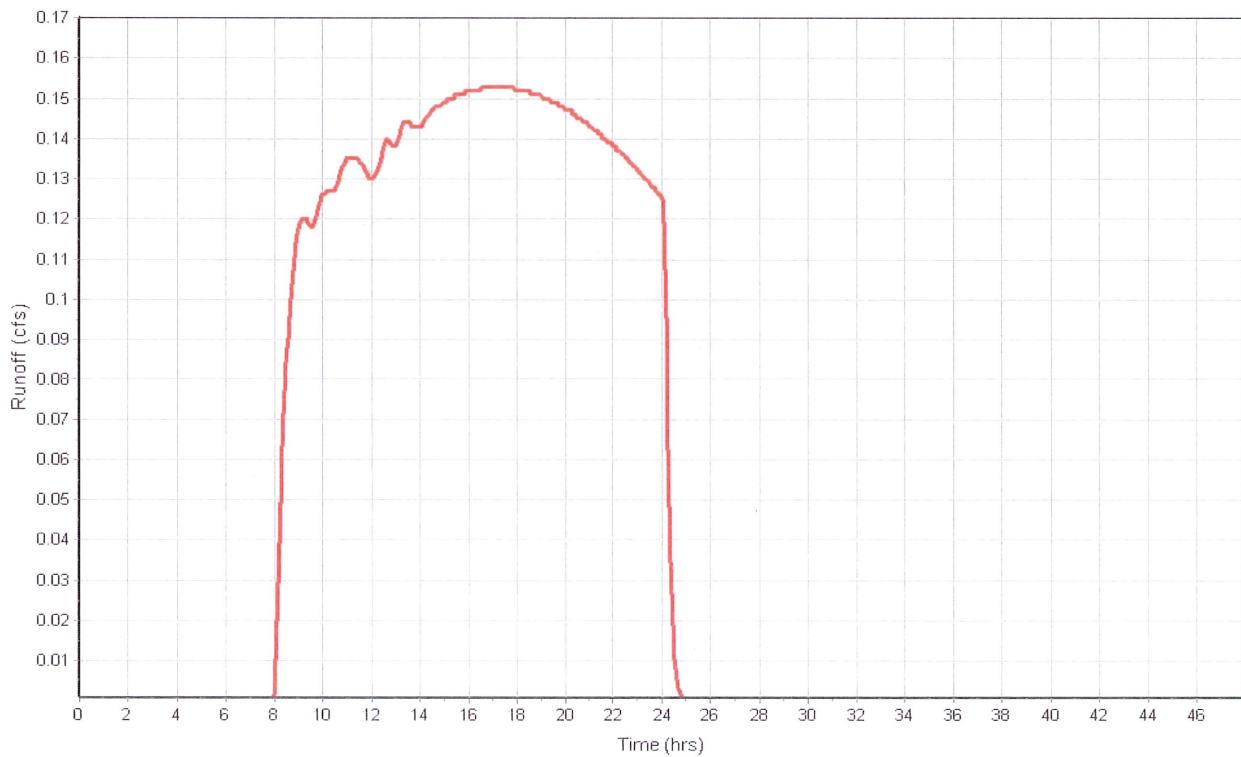
Total Rainfall (in) 1.25
 Total Runoff (in) 0.17
 Peak Runoff (cfs) 0.15
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:21:22

Subbasin : E2_E3_E4

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P2

Input Data

Area (ac) 4.46
Weighted Curve Number 86.74
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.67	-	98.00
-	2.79	-	80.00
Composite Area & Weighted CN	4.46		86.74

Time of Concentration

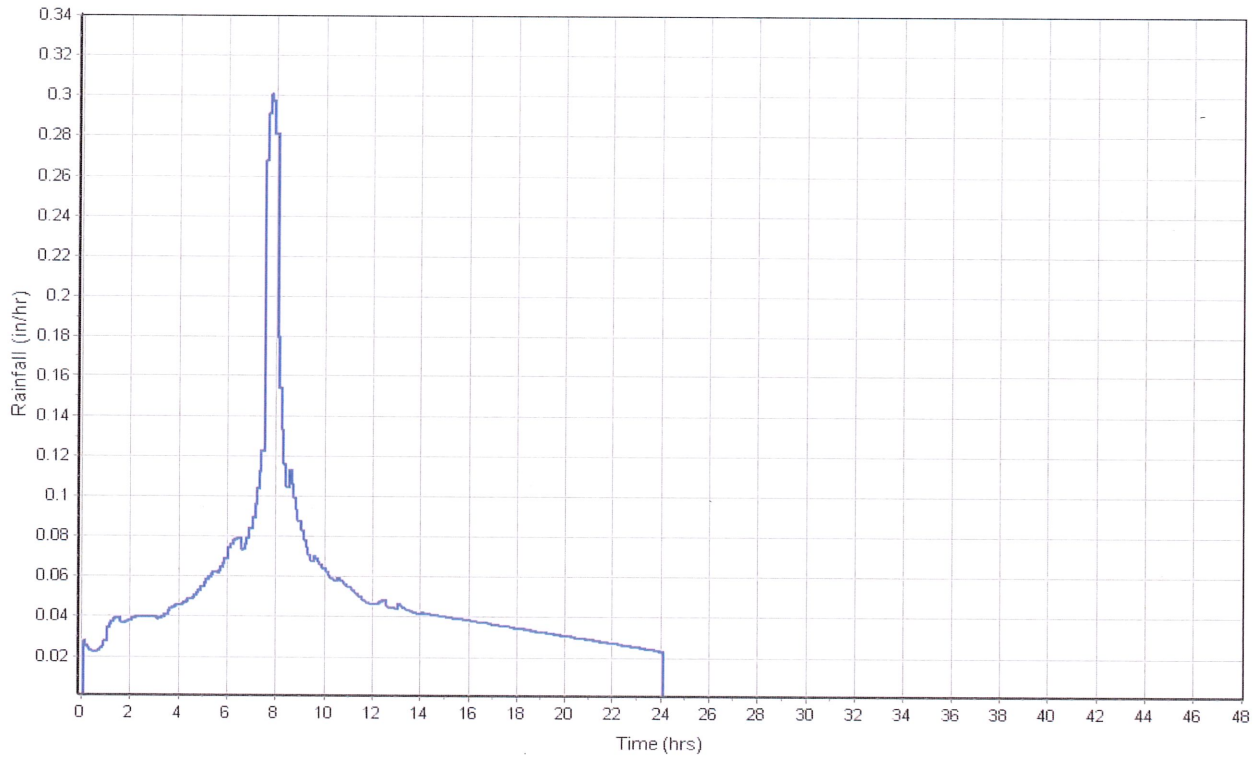
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

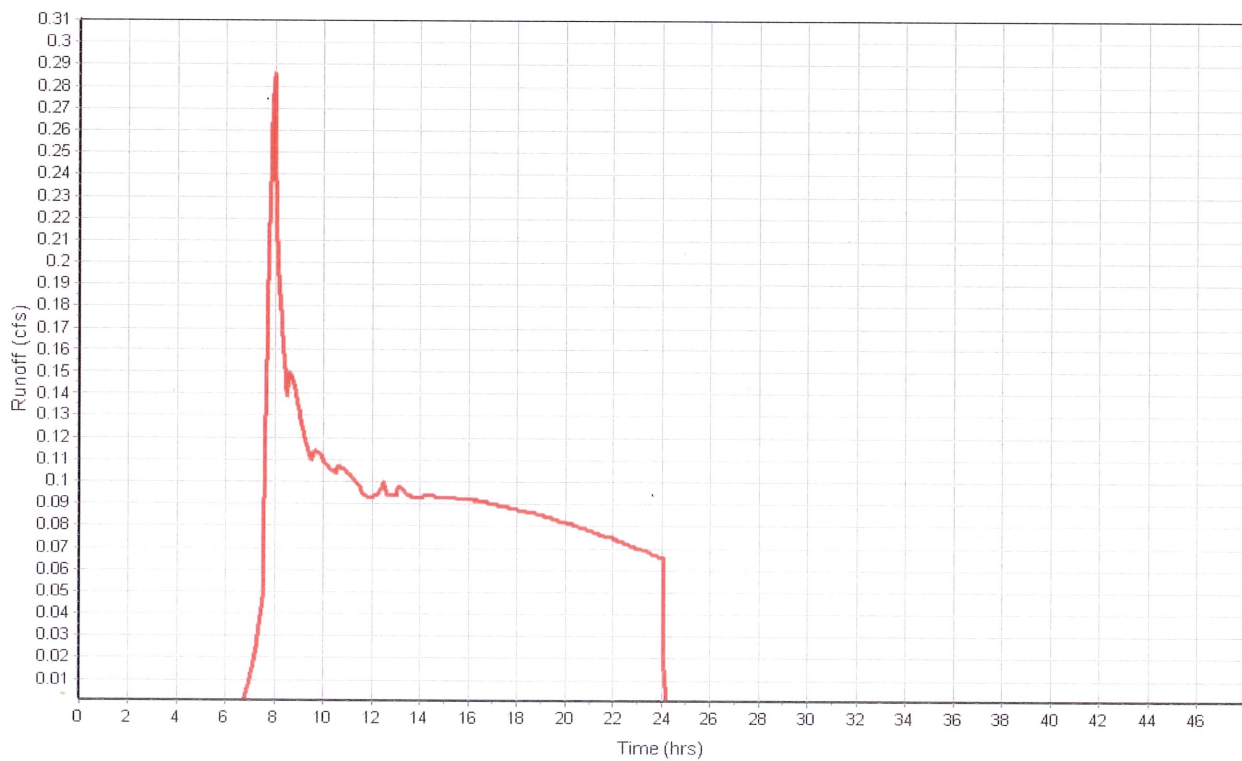
Total Rainfall (in) 1.25
Total Runoff (in) 0.36
Peak Runoff (cfs) 0.29
Weighted Curve Number 86.74
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P3

Input Data

Area (ac) 1.72
 Weighted Curve Number 96.01
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.53	-	98.00
-	0.19	-	80.00
Composite Area & Weighted CN	1.72		96.01

Time of Concentration

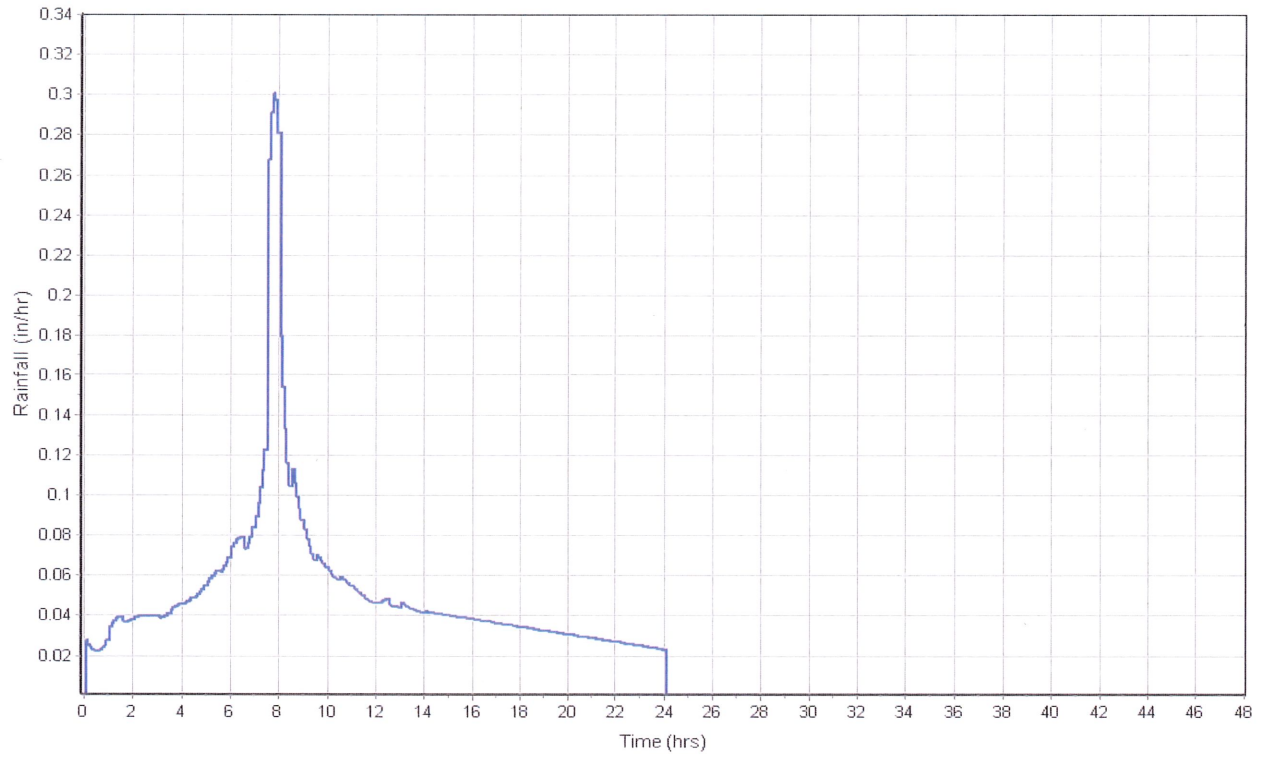
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

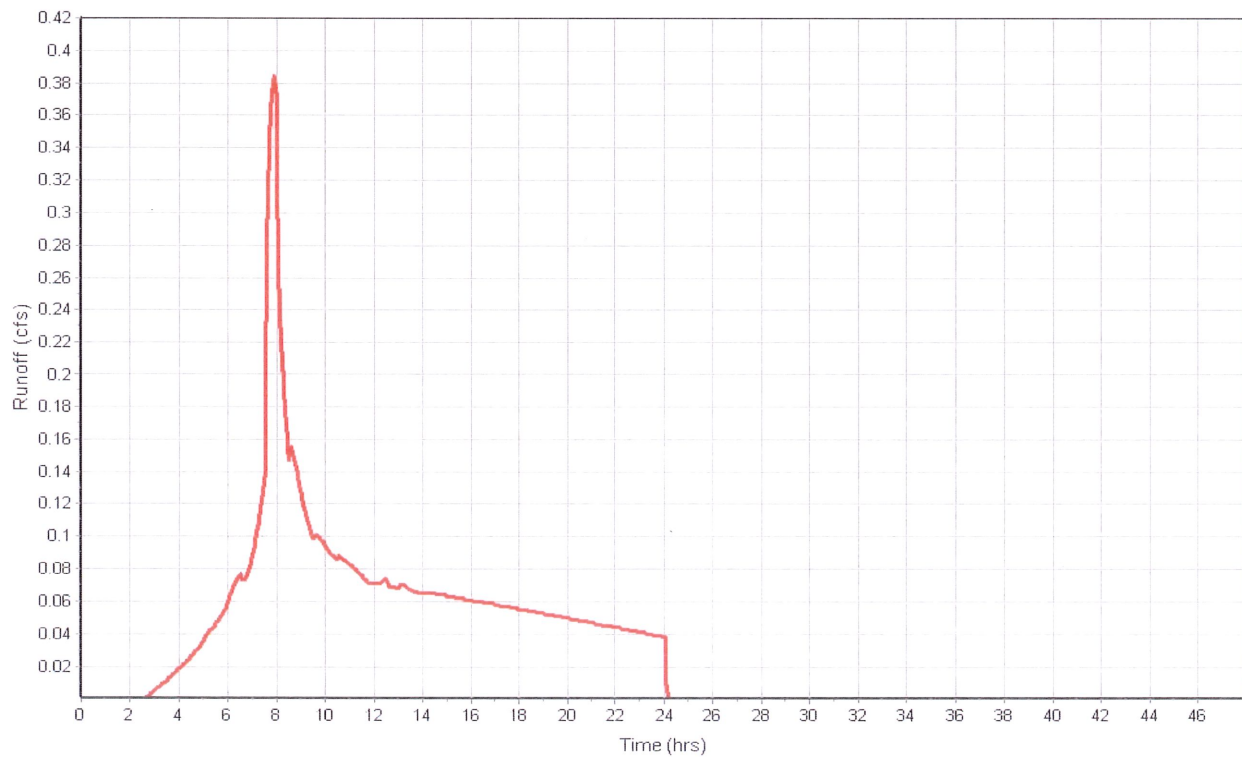
Total Rainfall (in) 1.25
 Total Runoff (in) 0.86
 Peak Runoff (cfs) 0.38
 Weighted Curve Number 96.01
 Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P4

Input Data

Area (ac) 6.56
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	9.91	D	80.00
Composite Area & Weighted CN	9.91		80.00

Time of Concentration

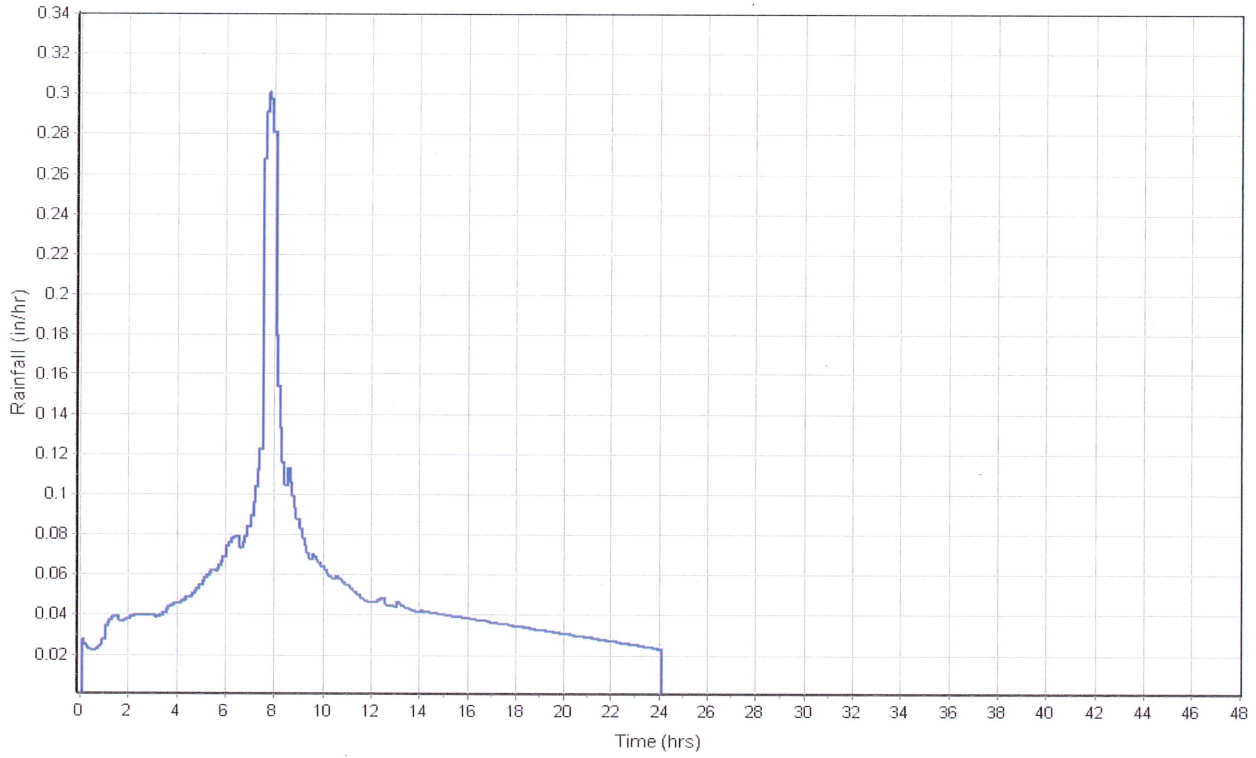
User-Defined TOC override (minutes): 16.71

Subbasin Runoff Results

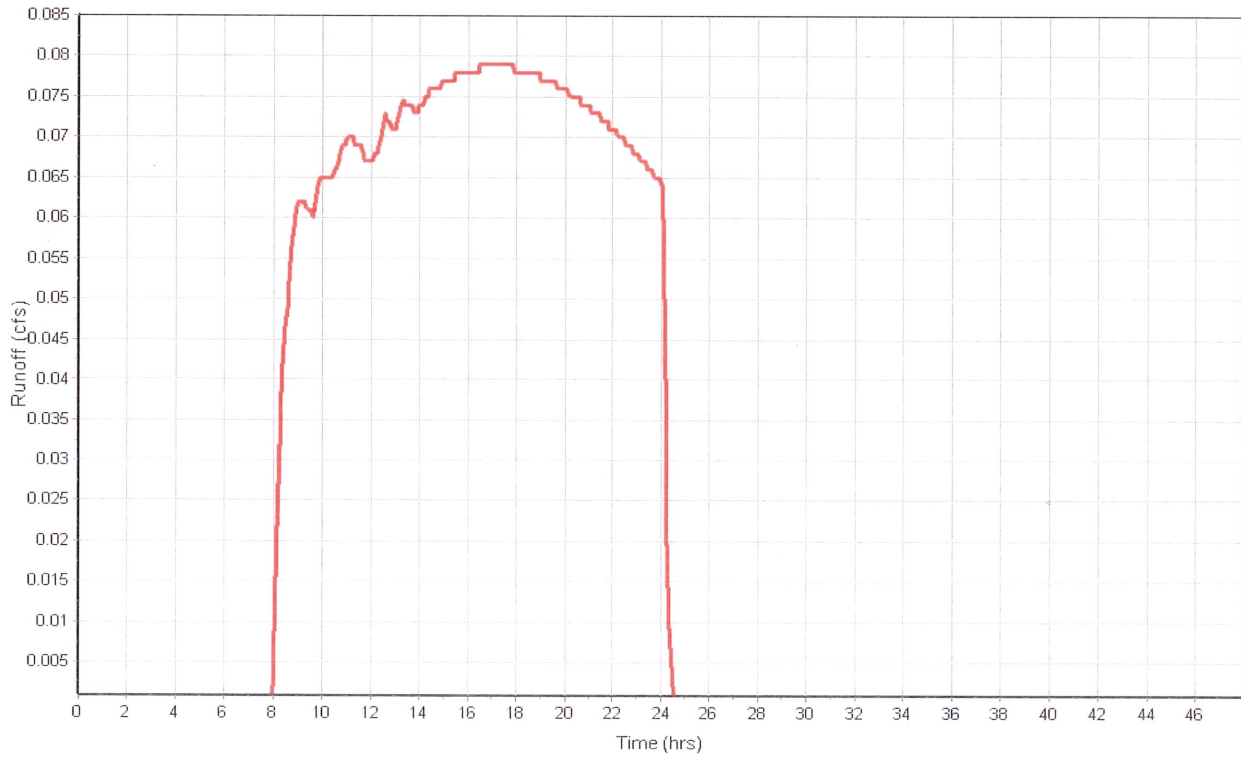
Total Rainfall (in) 1.25
 Total Runoff (in) 0.17
 Peak Runoff (cfs) 0.08
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:16:43

Subbasin : P4

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : Det-Basin

Input Data

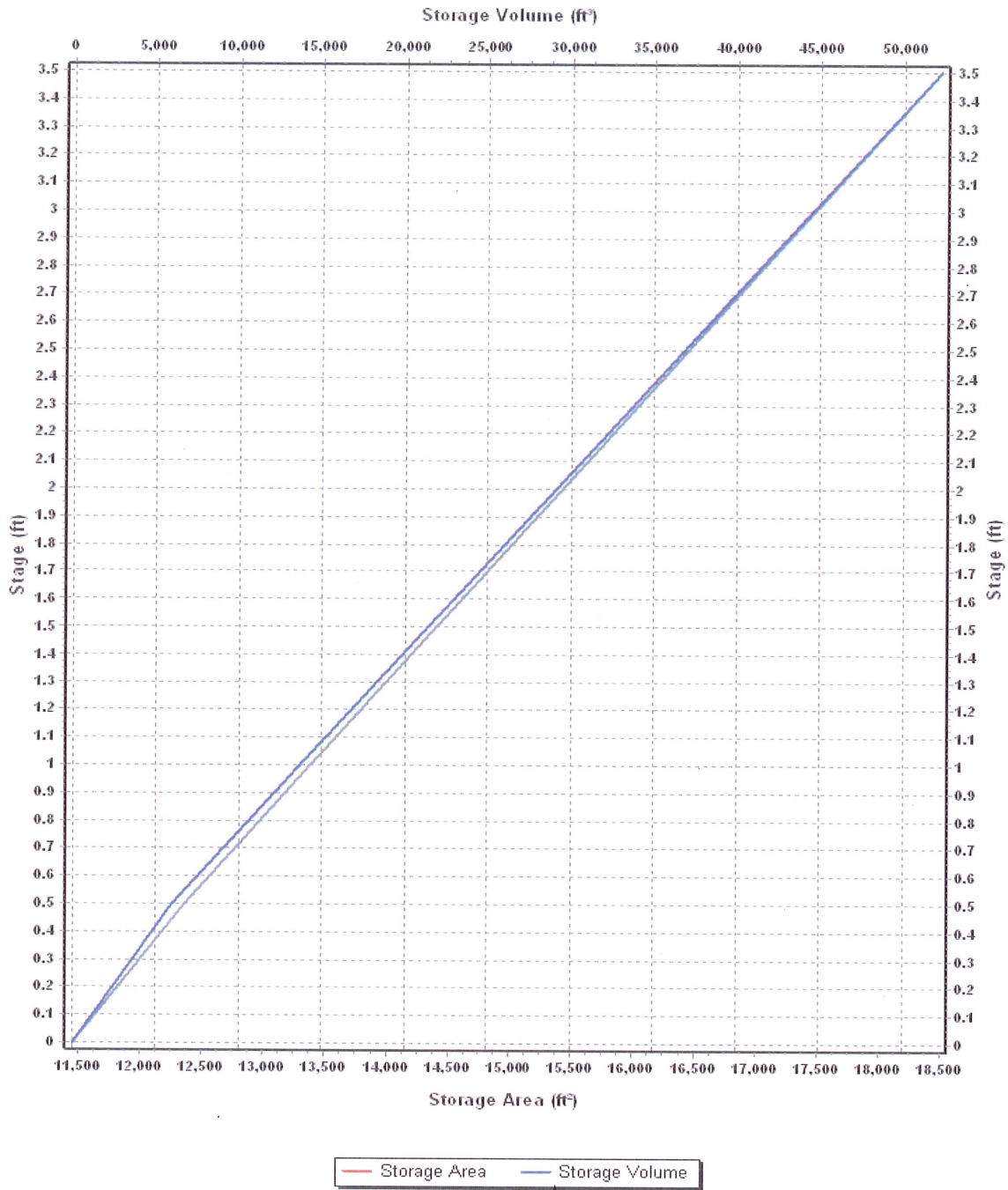
Invert Elevation (ft)	322.50
Max (Rim) Elevation (ft)	326.00
Max (Rim) Offset (ft)	3.50
Initial Water Elevation (ft)	322.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	12.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Detention_Basin

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	11460	0.000
0.5	12362	5955.50
3.5	18484	52224.50

Storage Area Volume Curves



Storage Node : Det-Basin (continued)

Output Summary Results

Peak Inflow (cfs)	0.66
Peak Lateral Inflow (cfs)	0.08
Peak Outflow (cfs)	0.15
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	323.17
Max HGL Depth Attained (ft)	0.67
Average HGL Elevation Attained (ft)	322.88
Average HGL Depth Attained (ft)	0.38
Time of Max HGL Occurrence (days hh:mm)	1 00:06
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Subbasin Summary

SN	Subbasin ID	Area	Total	Total	Peak
			Runoff	Runoff	Runoff
		Volume			
		(ac)	(in)	(ac-in)	(cfs)
1	E1/P1	2.97	0.89	2.64	0.49
2	E2_E3_E4	12.74	0.89	11.33	2.05
3	P2	4.46	1.29	5.77	1.38
4	P3	1.72	2.06	3.55	0.93
5	P4	6.56	0.89	5.83	1.10

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth (ft)	Min Freeboard (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)	
1	REV-Swale-End	Junction	320.52	330.00	320.52	330.00	12.00	1.28	321.25	0.00	8.75	0 00:00	0.00	0.00
2	REV-Swale-Start	Junction	322.50	330.00	322.50	330.00	12.00	1.28	322.81	0.00	7.19	0 00:00	0.00	0.00
3	SD(5)	Junction	334.15	339.85	334.15	340.00	12.00	0.93	334.40	0.00	5.45	0 00:00	0.00	0.00
4	SD(6)	Junction	324.36	330.00	324.36	330.00	12.00	2.31	324.45	0.00	5.55	0 00:00	0.00	0.00
5	Out-PRE-East	Outfall	325.00					0.49	325.00					
6	Out-PRE-West	Outfall	316.16					2.03	316.16					
7	Out-REV-POST-West	Outfall	316.16					1.28	316.39					
8	Det-Basin	Storage Node	322.50	326.00	322.50		12.00	3.32	323.46			0.00	0.00	

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)
1	Ditch-Inlet	Pipe Det-Basin	REV-Swale-Start	5.00	323.17	322.50	13.4000	12.000	0.0150	1.07	11.30	0.09	5.46	0.30	0.30	0.00
2	Orifice	Pipe Det-Basin	REV-Swale-Start	5.00	322.50	322.50	0.0000	2.900	0.0130	0.21	0.01	18.26	4.72	0.24	1.00	259.00
3	REV-Swale-Discharge	Pipe REV-Swale-End	Out-REV-POST-West	68.56	321.00	316.16	7.0600	18.000	0.0150	1.28	24.19	0.05	7.01	0.24	0.16	0.00
4	SD5_SD6	Pipe SD(6)	SD(6)	96.00	334.15	324.36	10.2000	10.000	0.0130	0.93	7.00	0.13	11.89	0.17	0.20	0.00
5	HF_Bypass	Channel Det-Basin	REV-Swale-Start	5.00	323.90	322.50	28.0000	24.000	0.0320	0.00	263.60	0.00	0.00	0.15	0.08	0.00
6	Link-22	Channel SD(6)	Det-Basin	5.00	324.36	322.50	37.2000	60.000	0.0320	2.31	995.36	0.00	1.50	0.50	0.10	0.00
7	REV-Swale	Channel REV-Swale-Start	REV-Swale-End	100.00	322.50	320.52	1.9800	18.000	0.2400	1.28	31.07	0.04	0.49	0.52	0.34	0.00

Reported
Condition

Calculated
SURCHARGED
Calculated
Calculated

Subbasin Hydrology

Subbasin : E1/P1

Input Data

Area (ac) 2.97
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	2.97	D	80.00
Composite Area & Weighted CN	2.97		80.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hr)
 n = Manning's roughness
 L_f = Flow Length (ft)
 P = 2 yr, 24 hr Rainfall (inches)
 S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
 V = 20.3282 * (S_f^{0.5}) (paved surface)
 V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
 V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
 V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
 V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
 V = 5.0 * (S_f^{0.5}) (woodland surface)
 V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
 T_c = (L_f / V) / (3600 sec/hr)

Where:

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
 R = A_q / W_p
 T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 R = Hydraulic Radius (ft)
 A_q = Flow Area (ft²)
 W_p = Wetted Perimeter (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)
 n = Manning's roughness

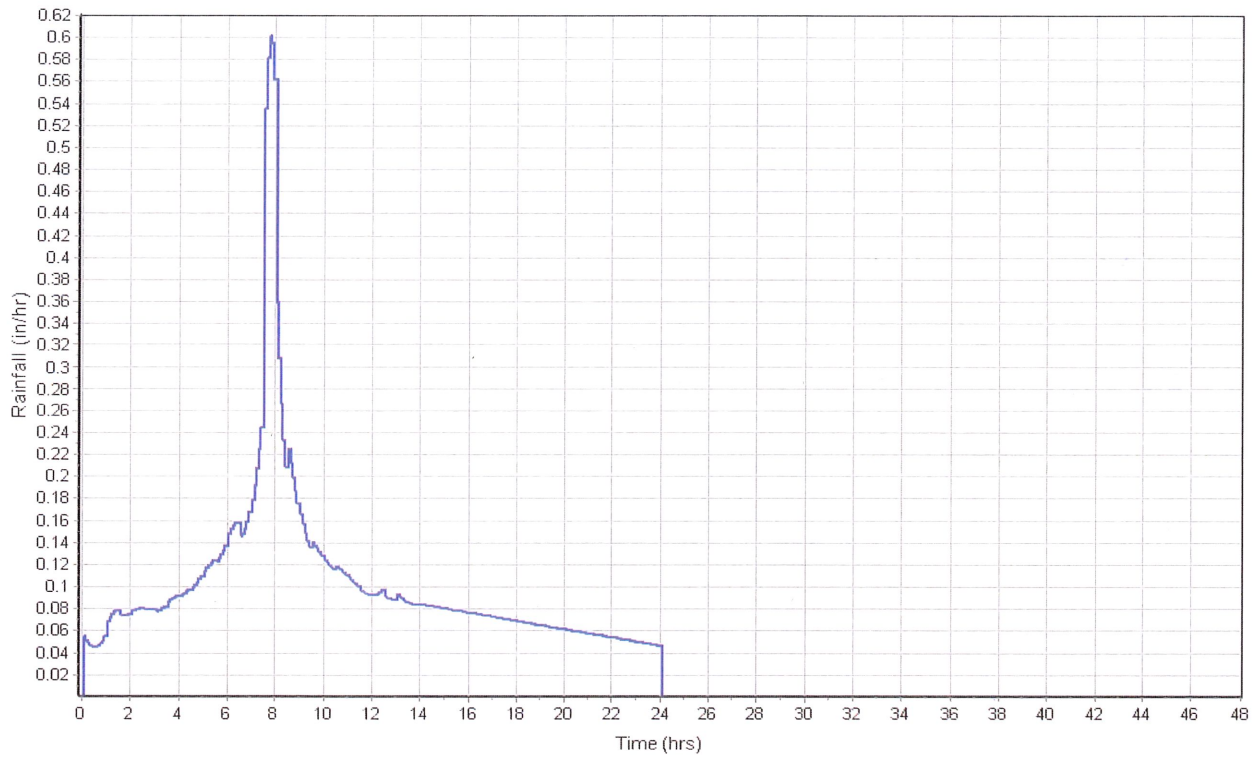
	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.10	0.00	0.00
Computed Flow Time (min) :	16.14	0.00	0.00
	Subarea	Subarea	Subarea
	A	B	C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.28	0.00	0.00
Computed Flow Time (min) :	1.46	0.00	0.00
Total TOC (min)	17.61		

Subbasin Runoff Results

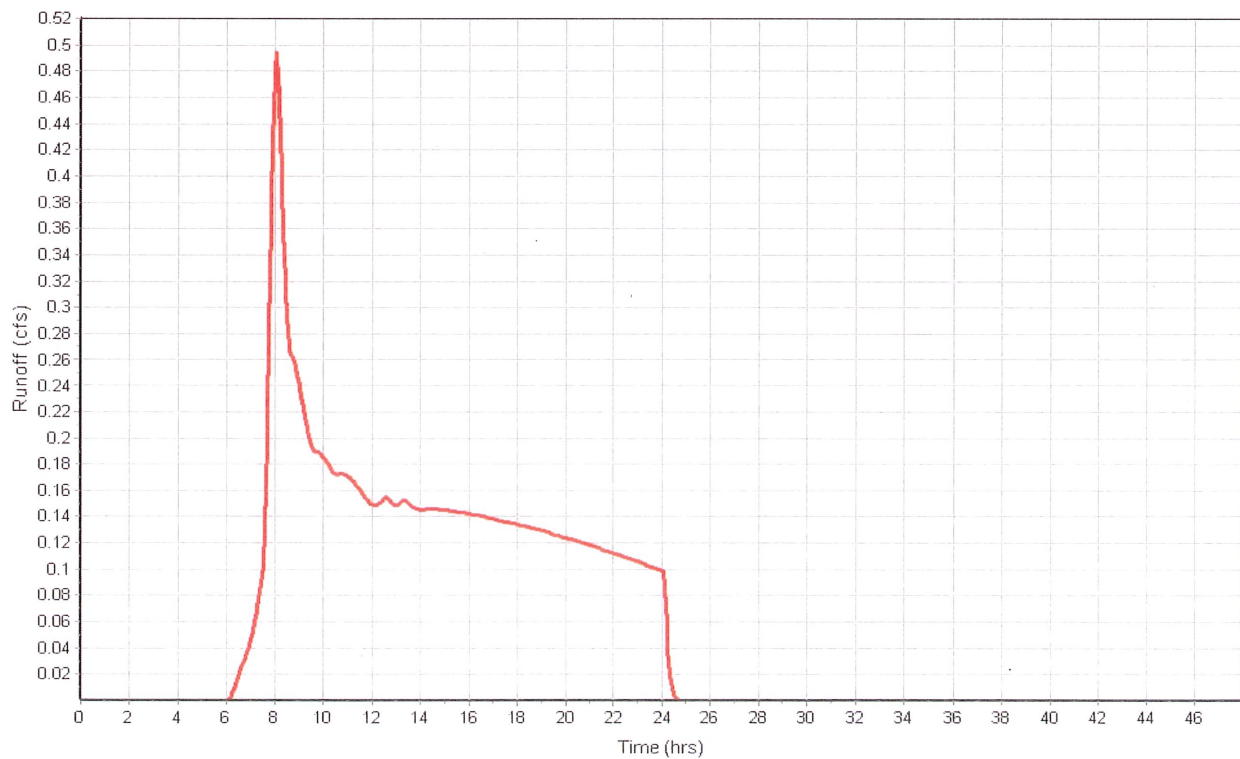
Total Rainfall (in)	2.50
Total Runoff (in)	0.89
Peak Runoff (cfs)	0.49
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:17:37

Subbasin : E1/P1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : E2_E3_E4

Input Data

Area (ac) 12.74
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	12.74	D	80.00
Composite Area & Weighted CN	12.74		80.00

Time of Concentration

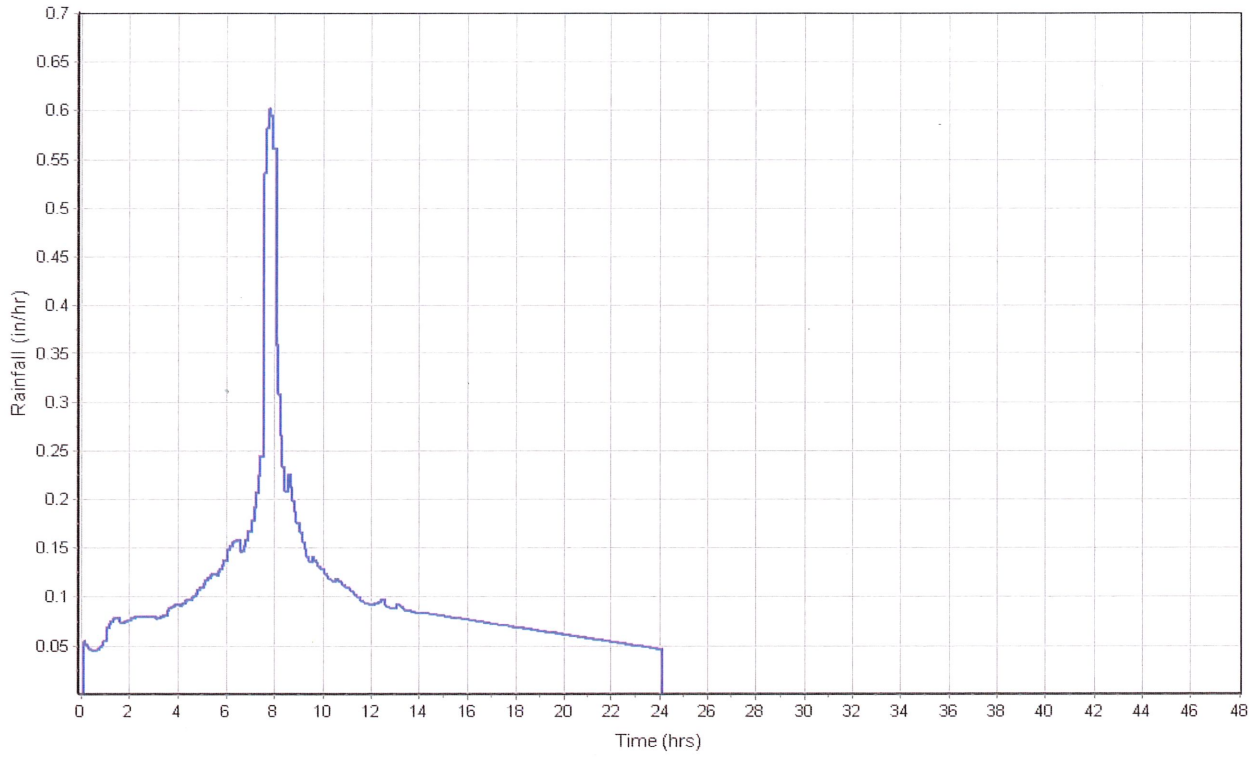
	Subarea		
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	13.73	0.00	0.00
Shallow Concentrated Flow Computations			
	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	500	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	2.99	0.00	0.00
Channel Flow Computations			
	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Channel Slope (%) :	3	0.00	0.00
Cross Section Area (ft ²) :	12	0.00	0.00
Wetted Perimeter (ft) :	12	0.00	0.00
Velocity (ft/sec) :	1.08	0.00	0.00
Computed Flow Time (min) :	4.65	0.00	0.00
Total TOC (min)	21.36		

Subbasin Runoff Results

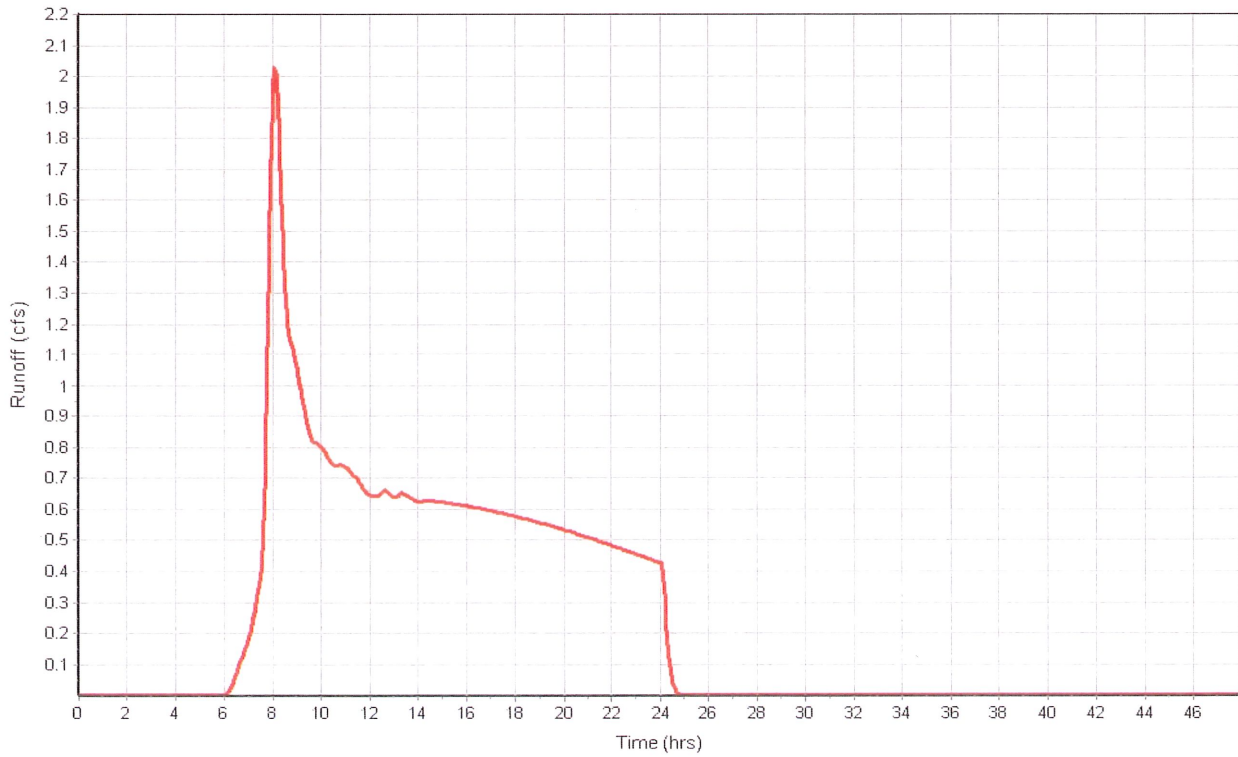
Total Rainfall (in) 2.50
 Total Runoff (in) 0.89
 Peak Runoff (cfs) 2.05
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:21:22

Subbasin : E2_E3_E4

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P2

Input Data

Area (ac) 4.46
Weighted Curve Number 86.74
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.67	-	98.00
-	2.79	-	80.00
Composite Area & Weighted CN	4.46		86.74

Time of Concentration

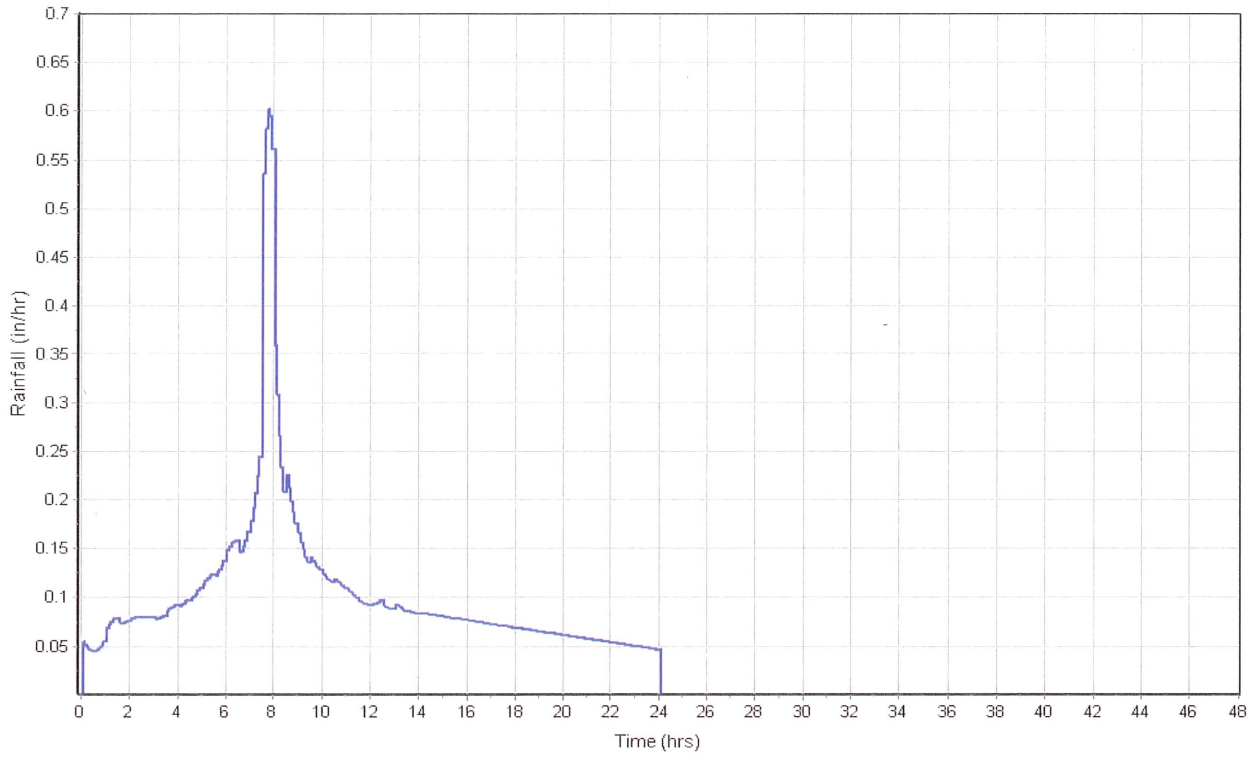
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

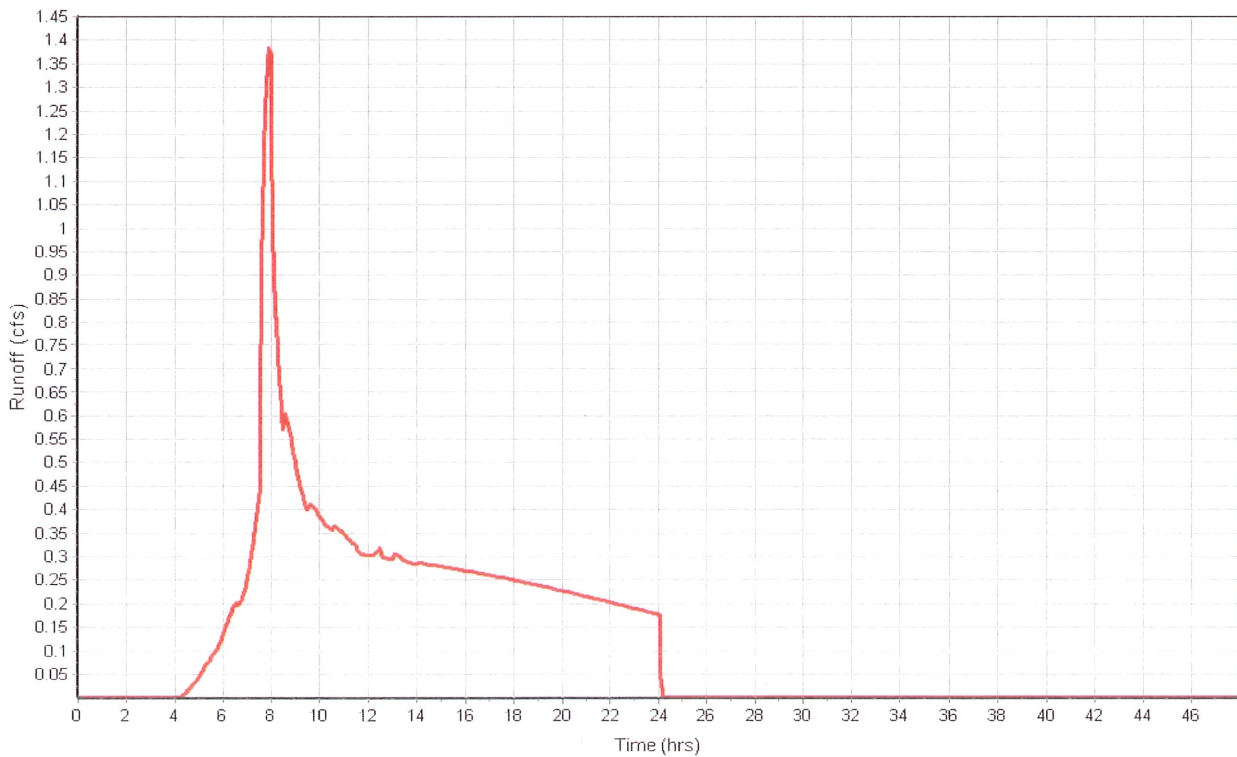
Total Rainfall (in) 2.50
Total Runoff (in) 1.29
Peak Runoff (cfs) 1.38
Weighted Curve Number 86.74
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P3

Input Data

Area (ac) 1.72
 Weighted Curve Number 96.01
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.53	-	98.00
-	0.19	-	80.00
Composite Area & Weighted CN	1.72		96.01

Time of Concentration

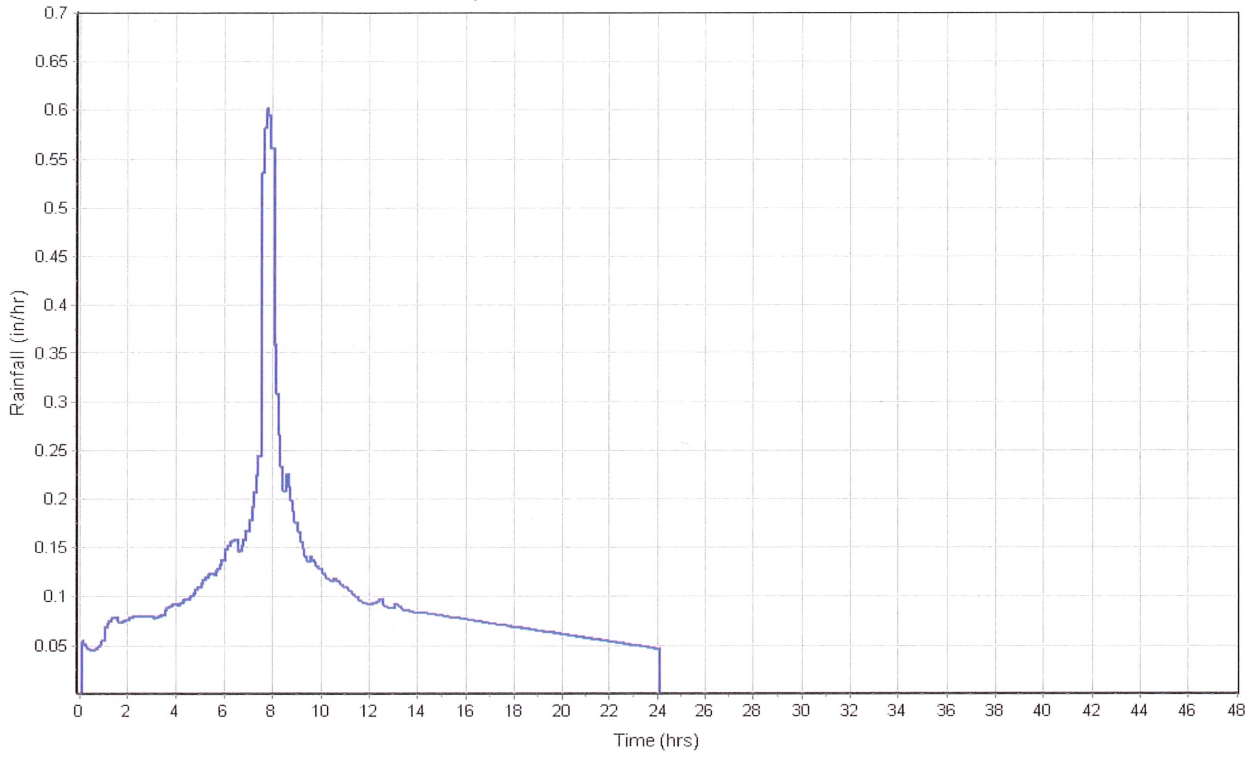
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

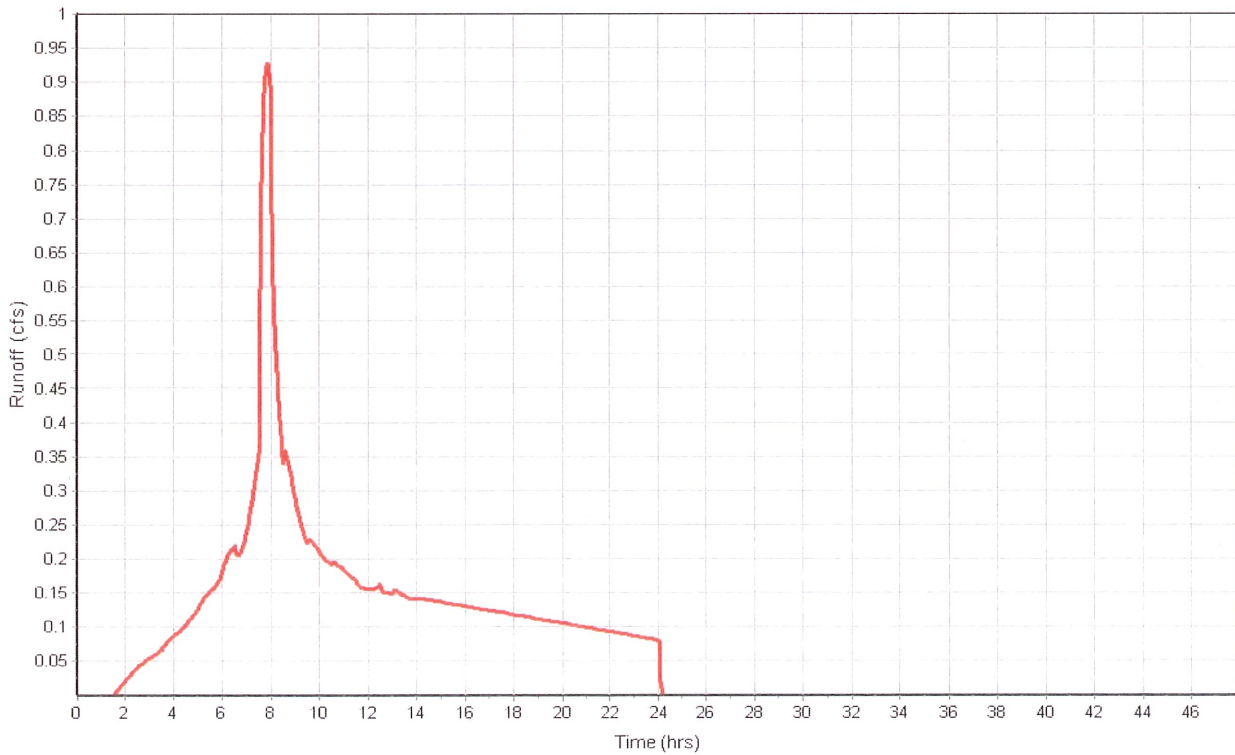
Total Rainfall (in) 2.50
 Total Runoff (in) 2.06
 Peak Runoff (cfs) 0.93
 Weighted Curve Number 96.01
 Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P4

Input Data

Area (ac) 6.56
Weighted Curve Number 80.00
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	9.91	D	80.00
Composite Area & Weighted CN	9.91		80.00

Time of Concentration

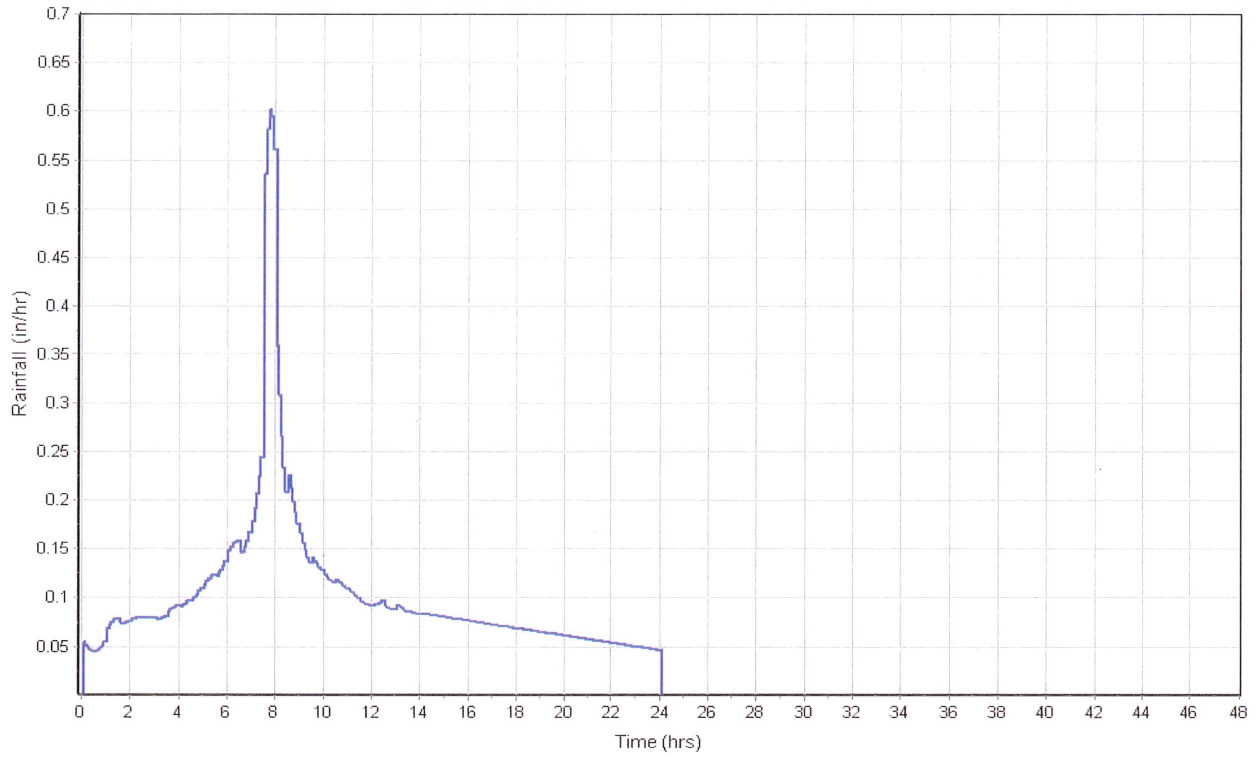
User-Defined TOC override (minutes): 16.71

Subbasin Runoff Results

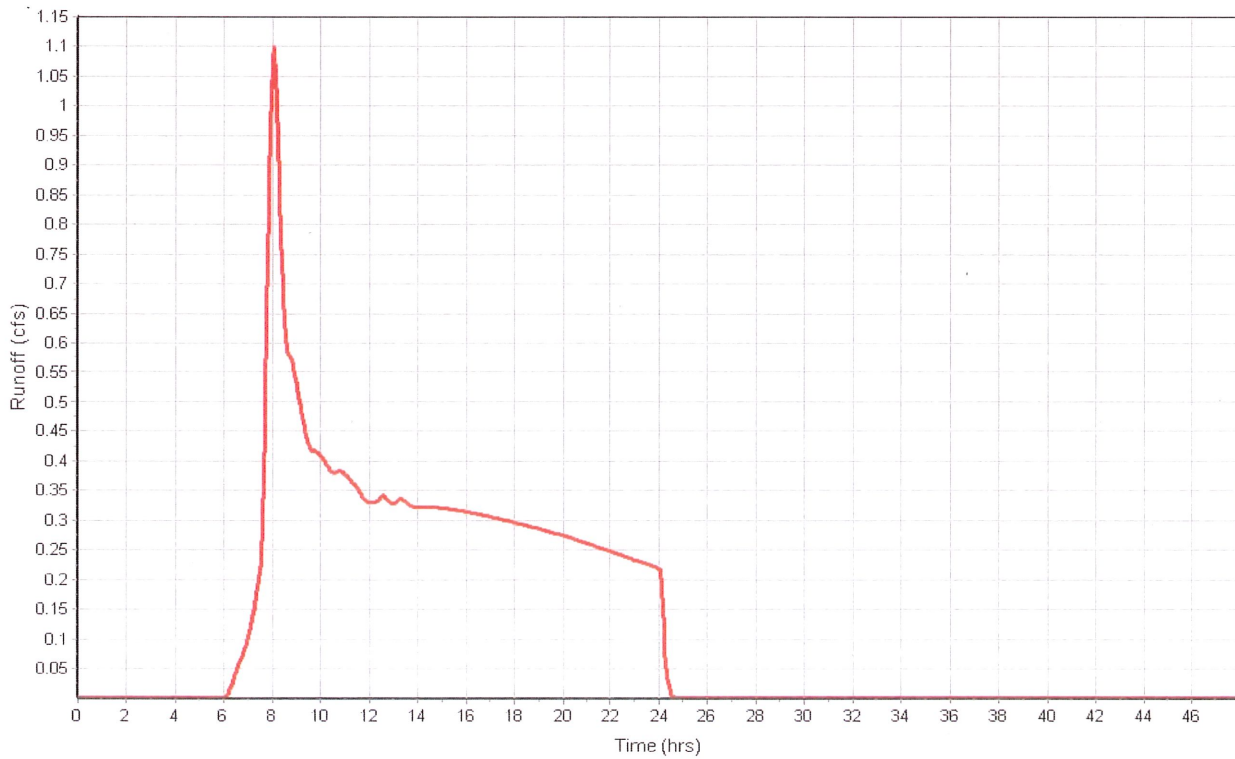
Total Rainfall (in) 2.50
Total Runoff (in) 0.89
Peak Runoff (cfs) 1.10
Weighted Curve Number 80.00
Time of Concentration (days hh:mm:ss) 0 00:16:43

Subbasin : P4

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : Det-Basin

Input Data

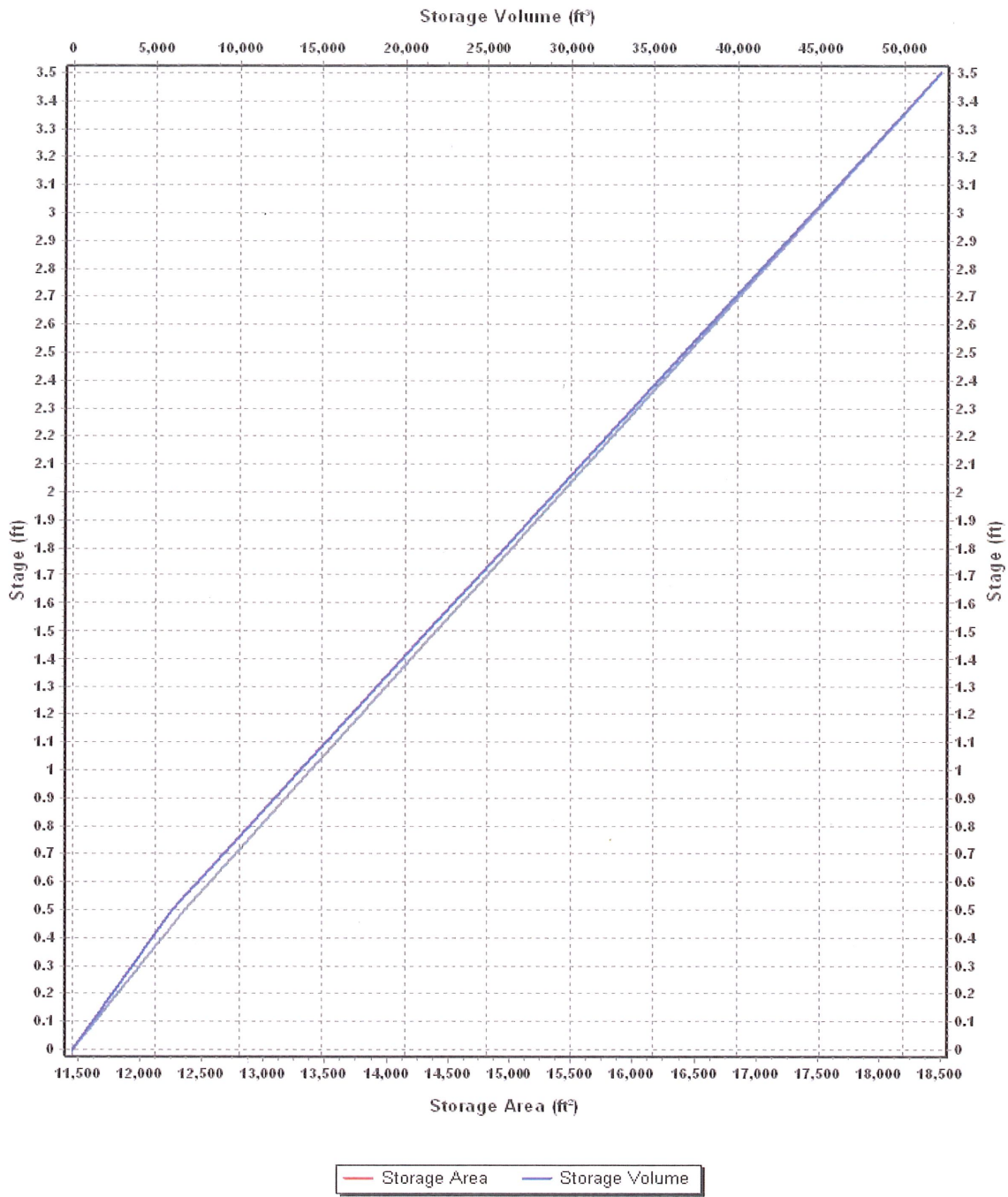
Invert Elevation (ft)	322.50
Max (Rim) Elevation (ft)	326.00
Max (Rim) Offset (ft)	3.50
Initial Water Elevation (ft)	322.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	12.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Detention_Basin

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	11460	0.000
0.5	12362	5955.50
3.5	18484	52224.50

Storage Area Volume Curves



Storage Node : Det-Basin (continued)

Output Summary Results

Peak Inflow (cfs)	3.32
Peak Lateral Inflow (cfs)	1.10
Peak Outflow (cfs)	1.28
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	323.46
Max HGL Depth Attained (ft)	0.96
Average HGL Elevation Attained (ft)	323.06
Average HGL Depth Attained (ft)	0.56
Time of Max HGL Occurrence (days hh:mm)	0 09:08
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name 20190920-Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method SCS TR-55
 Time of Concentration (TOC) Method SCS TR-55
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods YES

Analysis Options

Start Analysis On Sep 21, 2019 00:00:00
 End Analysis On Sep 23, 2019 00:00:00
 Start Reporting On Sep 21, 2019 00:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
 Reporting Time Step 0 00:05:00 days hh:mm:ss
 Routing Time Step 1 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	5
Nodes.....	8
<i>Junctions</i>	4
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	7
<i>Channels</i>	3
<i>Pipes</i>	4
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-005	Intensity	inches	Oregon	Yamhill	5	3.00	SCS Type IA 24-hr

Subbasin Summary

SN ID	Subbasin	Area	Total	Total	Peak
			Runoff	Runoff	Runoff
		(ac)	(in)	(ac-in)	(cfs)
1	E1/P1	2.97	1.25	3.71	0.76
2	E2_E3_E4	12.74	1.25	15.93	3.17
3	P2	4.46	1.72	7.67	1.90
4	P3	1.72	2.55	4.39	1.15
5	P4	6.56	1.25	8.20	1.70

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	REV-Swale-End	Junction	320.52	330.00	320.52	330.00	12.00	2.29	321.33	0.00	8.67	0 00:00	0.00	0.00
2	REV-Swale-Start	Junction	322.50	330.00	322.50	330.00	12.00	2.29	322.92	0.00	7.08	0 00:00	0.00	0.00
3	SD(5)	Junction	334.15	339.85	334.15	340.00	12.00	1.15	334.43	0.00	5.42	0 00:00	0.00	0.00
4	SD(6)	Junction	324.36	330.00	324.36	330.00	12.00	3.05	324.46	0.00	5.54	0 00:00	0.00	0.00
5	Out-PRE-East	Outfall	325.00					0.76	325.00					
6	Out-PRE-West	Outfall	316.16					3.16	316.16					
7	Out-REV-POST-West	Outfall	316.16					2.29	316.47					
8	Det-Basin	Storage Node	322.50	326.00	322.50		12.00	4.62	323.63				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	
1	Ditch-Inlet	Pipe	Det-Basin	REV-Swale-Start	5.00	323.17	322.50	13.4000	12.000	0.0150	2.07	11.30	0.18	6.28	0.44	0.44	0.00
2	Orifice	Pipe	Det-Basin	REV-Swale-Start	5.00	322.50	322.50	0.0000	2.900	0.0130	0.22	0.01	19.02	4.73	0.24	1.00	684.00
3	REV-Swale-Discharge	Pipe	REV-Swale-End	Out-REV-POST-West	68.56	321.00	316.16	7.0600	18.000	0.0150	2.29	24.19	0.09	8.20	0.32	0.21	0.00
4	SD5_SD6	Pipe	SD(5)	SD(6)	96.00	334.15	324.36	10.2000	10.000	0.0130	1.15	7.00	0.16	12.33	0.19	0.23	0.00
5	HF_Bypass	Channel	Det-Basin	REV-Swale-Start	5.00	323.90	322.50	28.0000	24.000	0.0320	0.00	263.60	0.00	0.00	0.21	0.10	0.00
6	Link-22	Channel	SD(6)	Det-Basin	5.00	324.36	322.50	37.2000	60.000	0.0320	3.05	995.36	0.00	1.38	0.59	0.12	0.00
7	REV-Swale	Channel	REV-Swale-Start	REV-Swale-End	100.00	322.50	320.52	1.9800	18.000	0.2400	2.29	31.07	0.07	0.68	0.62	0.41	0.00

Reported
Condition

Calculated
SURCHARGED
Calculated
Calculated

Subbasin Hydrology

Subbasin : E1/P1

Input Data

Area (ac) 2.97
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	2.97	D	80.00
Composite Area & Weighted CN	2.97		80.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hr)
 n = Manning's roughness
 L_f = Flow Length (ft)
 P = 2 yr, 24 hr Rainfall (inches)
 S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
 V = 20.3282 * (S_f^{0.5}) (paved surface)
 V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
 V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
 V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
 V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
 V = 5.0 * (S_f^{0.5}) (woodland surface)
 V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
 T_c = (L_f / V) / (3600 sec/hr)

Where:

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
 R = A_q / W_p
 T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 R = Hydraulic Radius (ft)
 A_q = Flow Area (ft²)
 W_p = Wetted Perimeter (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)
 n = Manning's roughness

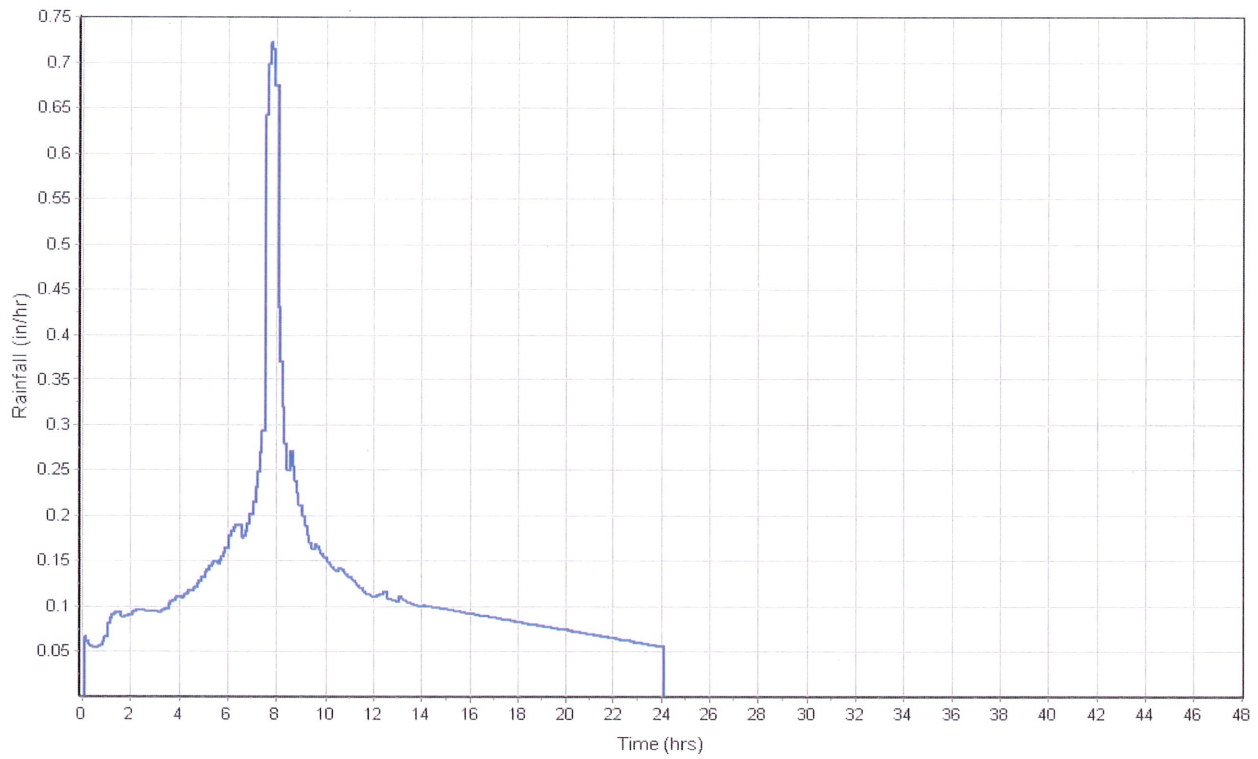
	Subarea A	Subarea B	Subarea C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.10	0.00	0.00
Computed Flow Time (min) :	16.14	0.00	0.00
	Subarea A	Subarea B	Subarea C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.28	0.00	0.00
Computed Flow Time (min) :	1.46	0.00	0.00
Total TOC (min)	17.61		

Subbasin Runoff Results

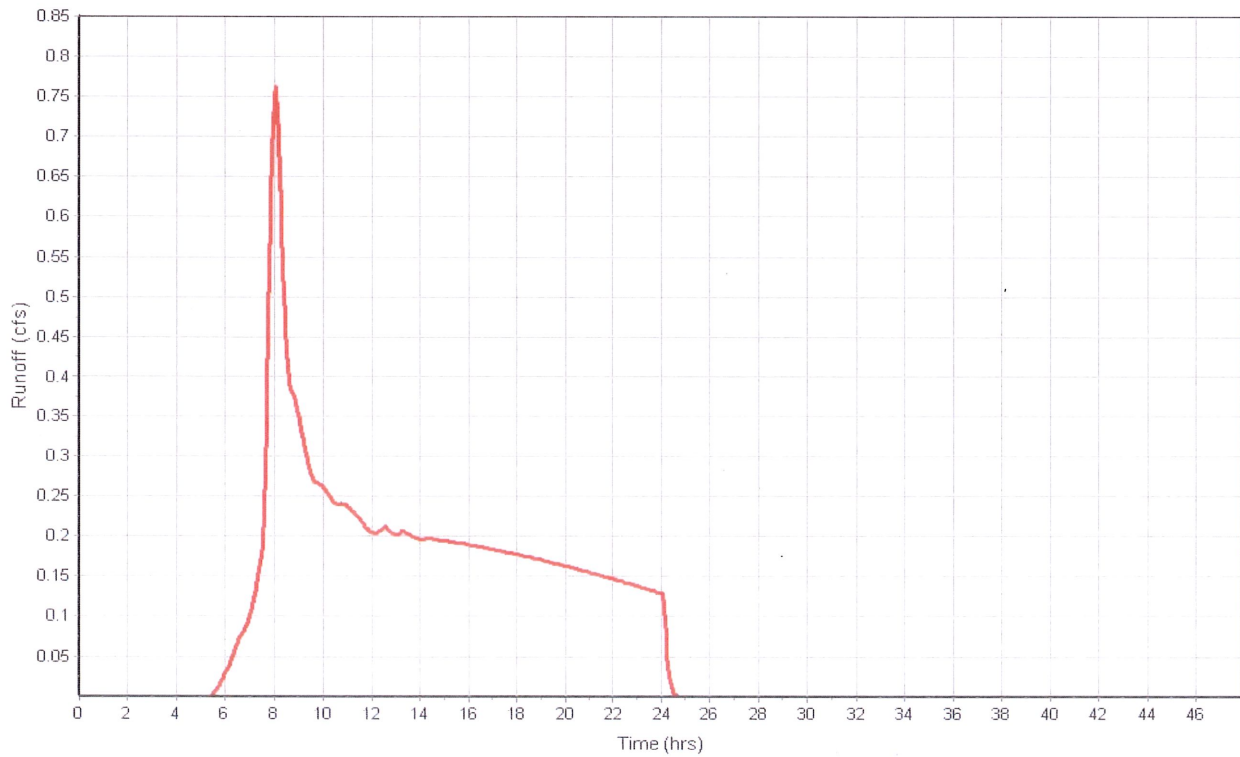
Total Rainfall (in)	3.00
Total Runoff (in)	1.25
Peak Runoff (cfs)	0.76
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:17:37

Subbasin : E1/P1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : E2_E3_E4

Input Data

Area (ac) 12.74
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	12.74	D	80.00
Composite Area & Weighted CN	12.74		80.00

Time of Concentration

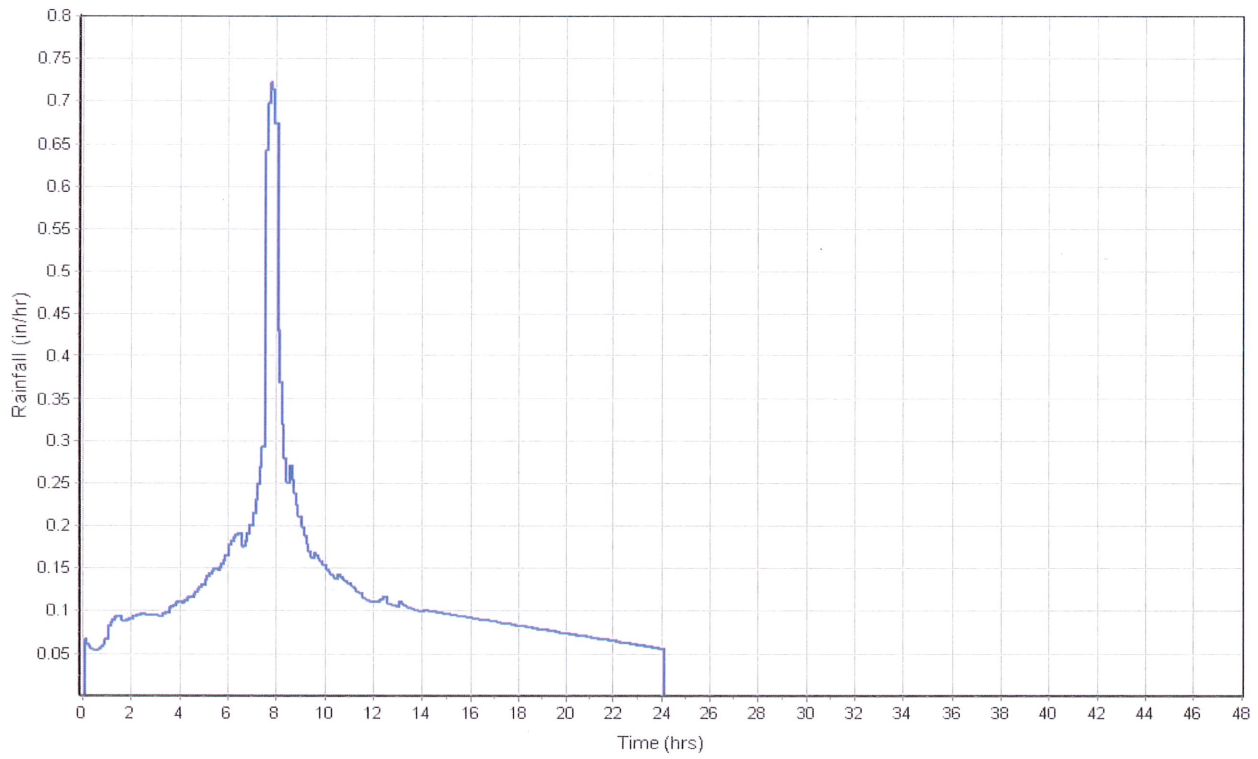
	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	13.73	0.00	0.00
Shallow Concentrated Flow Computations			
Flow Length (ft) :	500	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	2.99	0.00	0.00
Channel Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Channel Slope (%) :	3	0.00	0.00
Cross Section Area (ft ²) :	12	0.00	0.00
Wetted Perimeter (ft) :	12	0.00	0.00
Velocity (ft/sec) :	1.08	0.00	0.00
Computed Flow Time (min) :	4.65	0.00	0.00
Total TOC (min)	21.36		

Subbasin Runoff Results

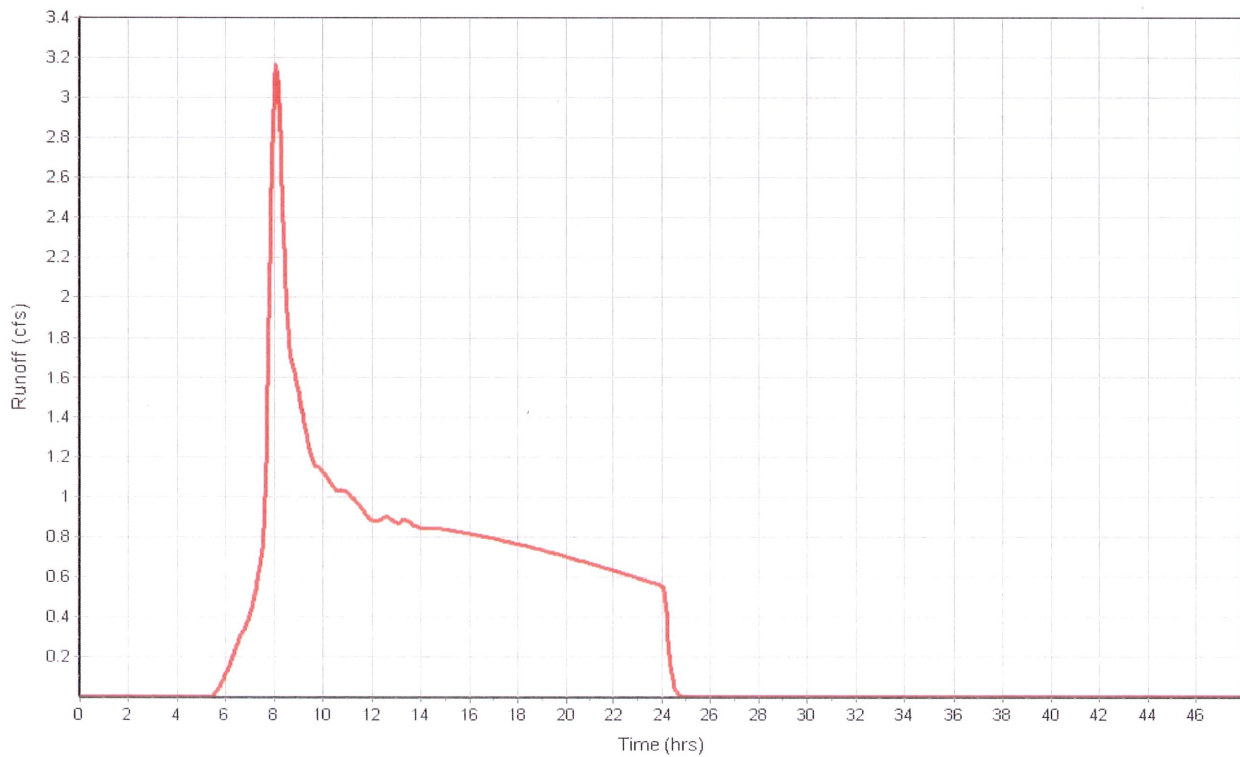
Total Rainfall (in) 3.00
 Total Runoff (in) 1.25
 Peak Runoff (cfs) 3.17
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:21:22

Subbasin : E2_E3_E4

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P2

Input Data

Area (ac) 4.46
Weighted Curve Number 86.74
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.67	-	98.00
-	2.79	-	80.00
Composite Area & Weighted CN	4.46		86.74

Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 3.00
Total Runoff (in) 1.72
Peak Runoff (cfs) 1.90
Weighted Curve Number 86.74
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P3

Input Data

Area (ac) 1.72
 Weighted Curve Number 96.01
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.53	-	98.00
-	0.19	-	80.00
Composite Area & Weighted CN	1.72		96.01

Time of Concentration

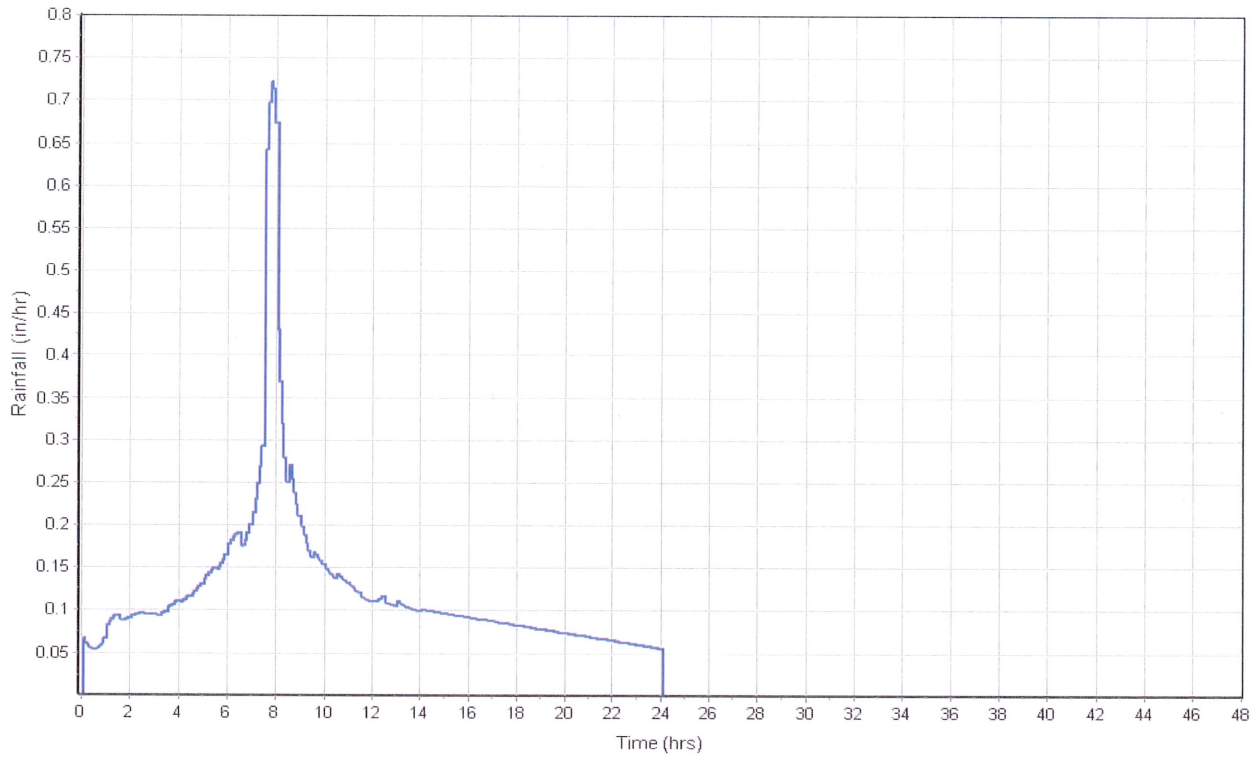
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

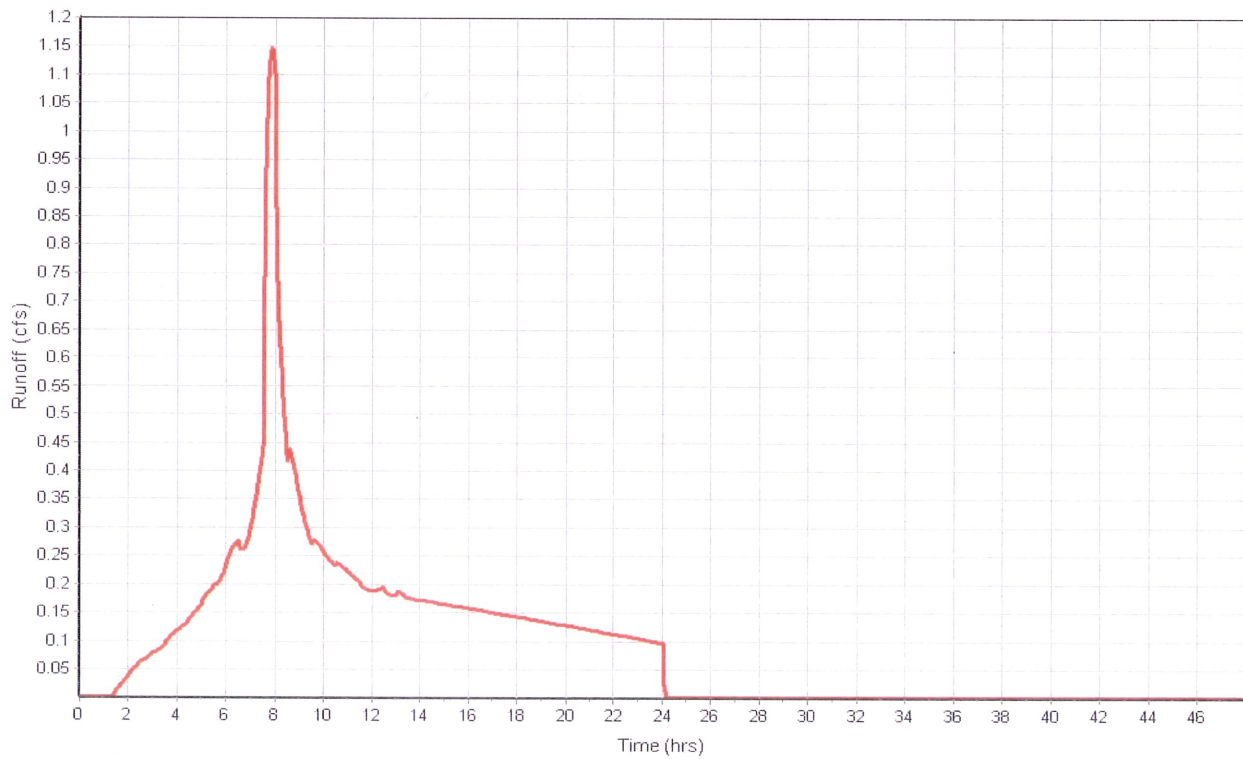
Total Rainfall (in) 3.00
 Total Runoff (in) 2.55
 Peak Runoff (cfs) 1.15
 Weighted Curve Number 96.01
 Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P4

Input Data

Area (ac) 6.56
Weighted Curve Number 80.00
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	9.91	D	80.00
Composite Area & Weighted CN	9.91		80.00

Time of Concentration

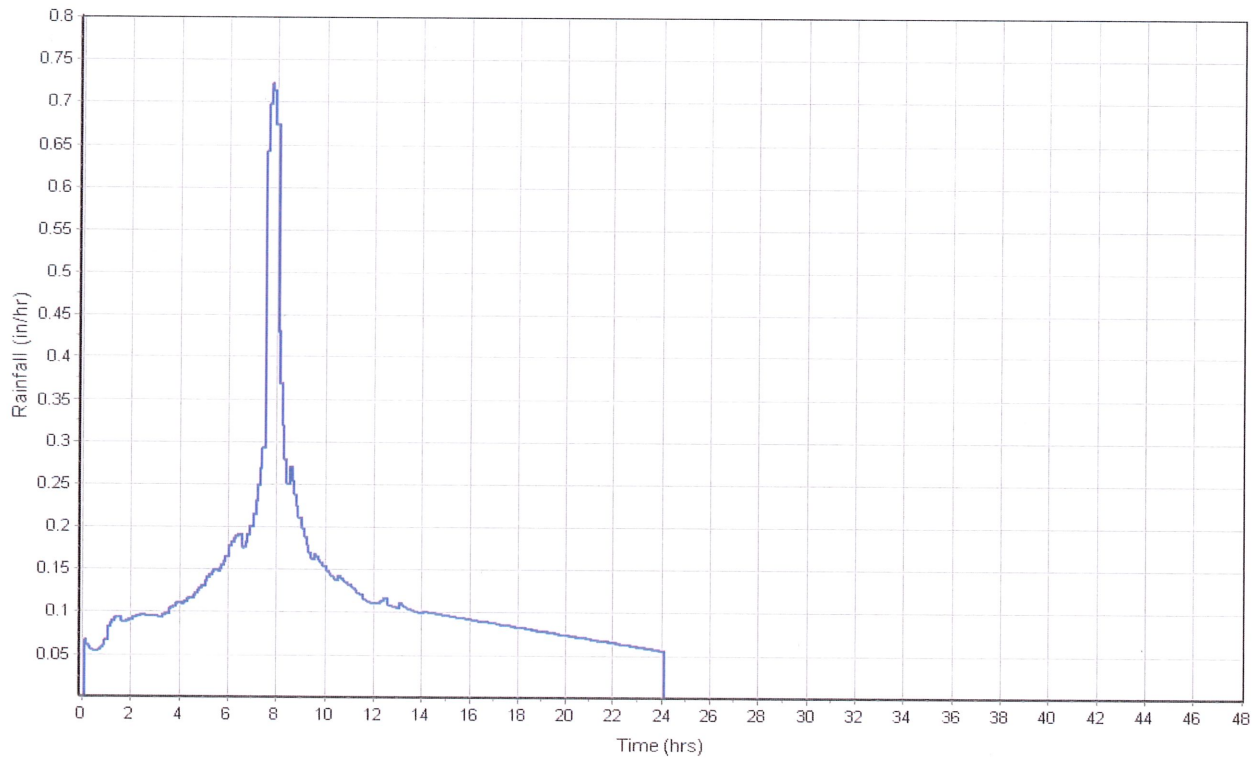
User-Defined TOC override (minutes): 16.71

Subbasin Runoff Results

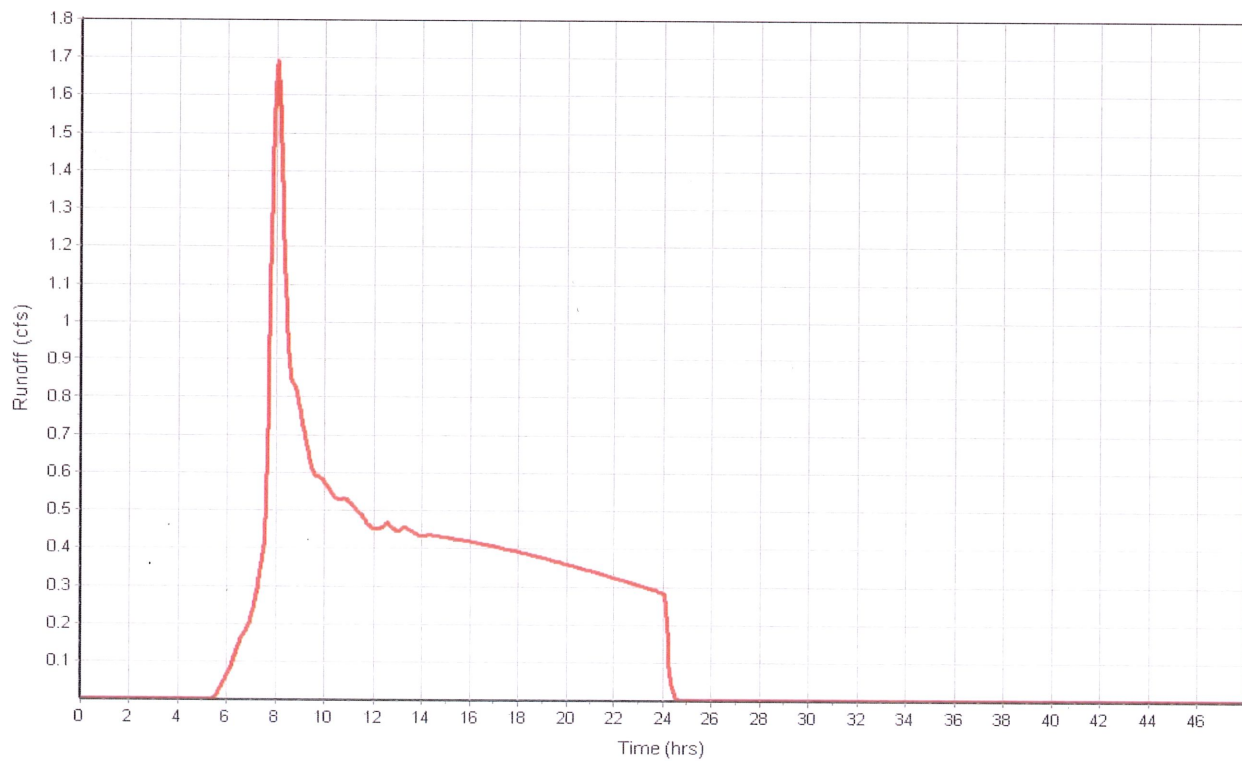
Total Rainfall (in) 3.00
Total Runoff (in) 1.25
Peak Runoff (cfs) 1.70
Weighted Curve Number 80.00
Time of Concentration (days hh:mm:ss) 0 00:16:43

Subbasin : P4

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : Det-Basin

Input Data

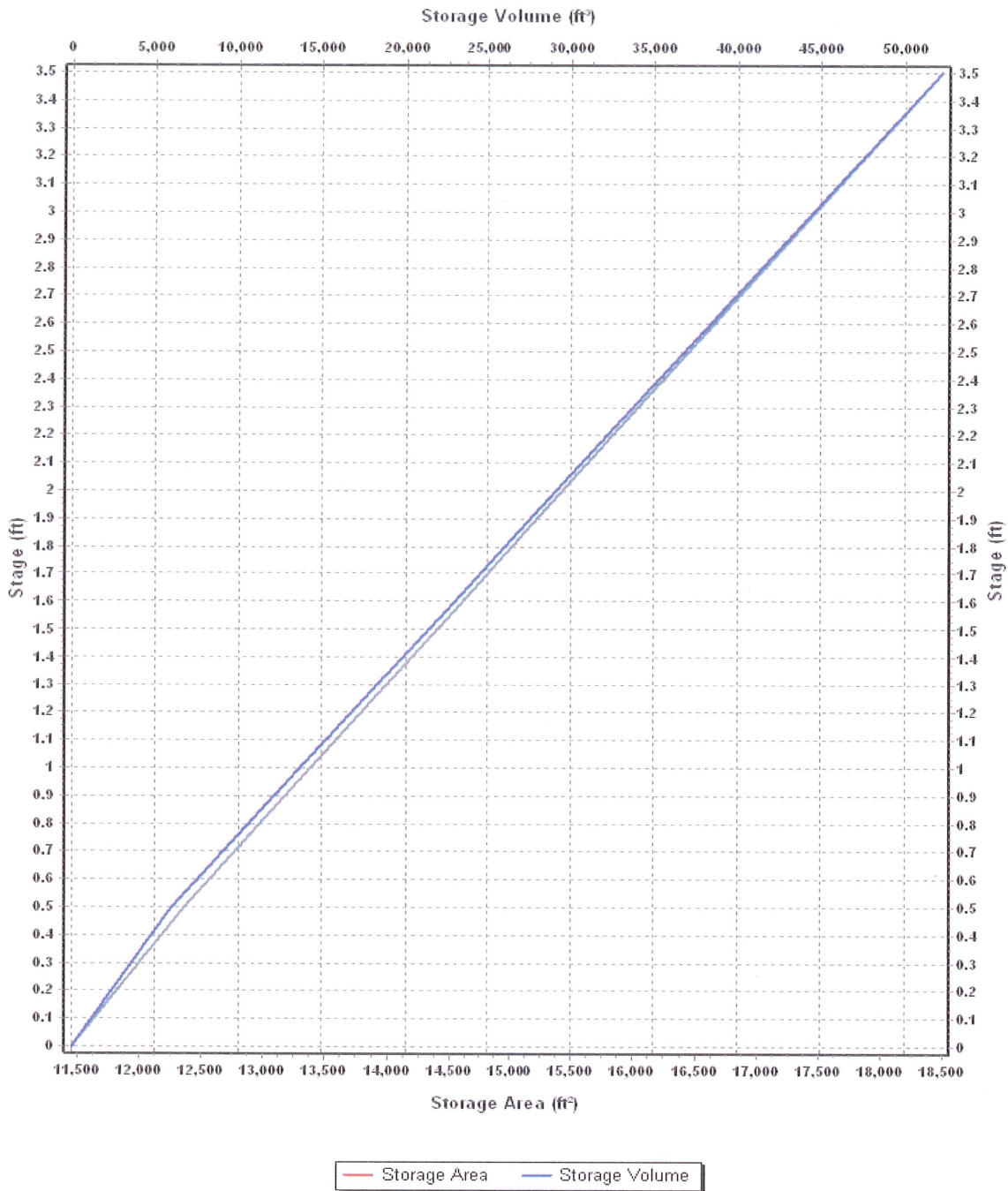
Invert Elevation (ft)	322.50
Max (Rim) Elevation (ft)	326.00
Max (Rim) Offset (ft)	3.50
Initial Water Elevation (ft)	322.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	12.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Detention_Basin

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	11460	0.000
0.5	12362	5955.50
3.5	18484	52224.50

Storage Area Volume Curves



Storage Node : Det-Basin (continued)

Output Summary Results

Peak Inflow (cfs)	4.62
Peak Lateral Inflow (cfs)	1.69
Peak Outflow (cfs)	2.29
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	323.63
Max HGL Depth Attained (ft)	1.13
Average HGL Elevation Attained (ft)	323.10
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 08:31
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name 20190920-Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method SCS TR-55
 Time of Concentration (TOC) Method SCS TR-55
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods YES

Analysis Options

Start Analysis On Sep 21, 2019 00:00:00
 End Analysis On Sep 23, 2019 00:00:00
 Start Reporting On Sep 21, 2019 00:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
 Reporting Time Step 0 00:05:00 days hh:mm:ss
 Routing Time Step 1 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	5
Nodes.....	8
<i>Junctions</i>	4
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links.....	7
<i>Channels</i>	3
<i>Pipes</i>	4
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-010	Intensity	inches	Oregon	Yamhill	10	3.50	SCS Type IA 24-hr

Subbasin Summary

SN	Subbasin ID	Area	Total Runoff	Total Runoff Volume	Peak Runoff
		(ac)	(in)	(ac-in)	(cfs)
1	E1/P1	2.97	1.64	4.86	1.06
2	E2_E3_E4	12.74	1.64	20.84	4.40
3	P2	4.46	2.16	9.63	2.44
4	P3	1.72	3.05	5.24	1.36
5	P4	6.56	1.64	10.73	2.35

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth (ft)	Min Freeboard (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)	
1	REV-Swale-End	Junction	320.52	330.00	320.52	330.00	12.00	3.51	321.42	0.00	8.58	0 00:00	0.00	0.00
2	REV-Swale-Start	Junction	322.50	330.00	322.50	330.00	12.00	3.52	323.02	0.00	6.98	0 00:00	0.00	0.00
3	SD(5)	Junction	334.15	339.85	334.15	340.00	12.00	1.36	334.45	0.00	5.40	0 00:00	0.00	0.00
4	SD(6)	Junction	324.36	330.00	324.36	330.00	12.00	3.80	324.48	0.00	5.52	0 00:00	0.00	0.00
5	Out-PRE-East	Outfall	325.00					1.05	325.00					
6	Out-PRE-West	Outfall	316.16					4.39	316.16					
7	Out-REV-POST-West	Outfall	316.16					3.51	316.55					
8	Det-Basin	Storage Node	322.50	326.00	322.50		12.00	5.99	323.81			0.00	0.00	

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)
1 Ditch-Inlet	Pipe	Det-Basin	REV-Swale-Start	5.00	323.17	322.50	13.4000	12.000	0.0150	3.29	11.30	0.29	6.94	0.58	0.58	0.00
2 Orifice	Pipe	Det-Basin	REV-Swale-Start	5.00	322.50	322.50	0.0000	2.900	0.0130	0.23	0.01	20.08	5.00	0.24	1.00	914.00
3 REV-Swale-Discharge	Pipe	REV-Swale-End	Out-REV-POST-West	68.56	321.00	316.16	7.0600	18.000	0.0150	3.51	24.19	0.15	9.16	0.40	0.27	0.00
4 SD5_SD6	Pipe	SD(5)	SD(6)	96.00	334.15	324.36	10.2000	10.000	0.0130	1.36	7.00	0.19	12.70	0.21	0.25	0.00
5 HF_Bypass	Channel	Det-Basin	REV-Swale-Start	5.00	323.90	322.50	28.0000	24.000	0.0320	0.00	263.60	0.00	0.00	0.26	0.13	0.00
6 Link-22	Channel	SD(6)	Det-Basin	5.00	324.36	322.50	37.2000	60.000	0.0320	3.80	995.36	0.00	1.33	0.69	0.14	0.00
7 REV-Swale	Channel	REV-Swale-Start	REV-Swale-End	100.00	322.50	320.52	1.9800	18.000	0.2400	3.51	31.07	0.11	0.85	0.71	0.47	0.00

Reported
Condition

Calculated
SURCHARGED
Calculated
Calculated

Subbasin Hydrology

Subbasin : E1/P1

Input Data

Area (ac) 2.97
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	2.97	D	80.00
Composite Area & Weighted CN	2.97		80.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

Tc = Time of Concentration (hr)
 n = Manning's roughness
 Lf = Flow Length (ft)
 P = 2 yr, 24 hr Rainfall (inches)
 Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^{0.5}) (unpaved surface)
 V = 20.3282 * (Sf^{0.5}) (paved surface)
 V = 15.0 * (Sf^{0.5}) (grassed waterway surface)
 V = 10.0 * (Sf^{0.5}) (nearly bare & untilled surface)
 V = 9.0 * (Sf^{0.5}) (cultivated straight rows surface)
 V = 7.0 * (Sf^{0.5}) (short grass pasture surface)
 V = 5.0 * (Sf^{0.5}) (woodland surface)
 V = 2.5 * (Sf^{0.5}) (forest w/heavy litter surface)
 Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
 Lf = Flow Length (ft)
 V = Velocity (ft/sec)
 Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (Sf^{0.5})) / n
 R = Aq / Wp
 Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
 Lf = Flow Length (ft)
 R = Hydraulic Radius (ft)
 Aq = Flow Area (ft²)
 Wp = Wetted Perimeter (ft)
 V = Velocity (ft/sec)
 Sf = Slope (ft/ft)
 n = Manning's roughness

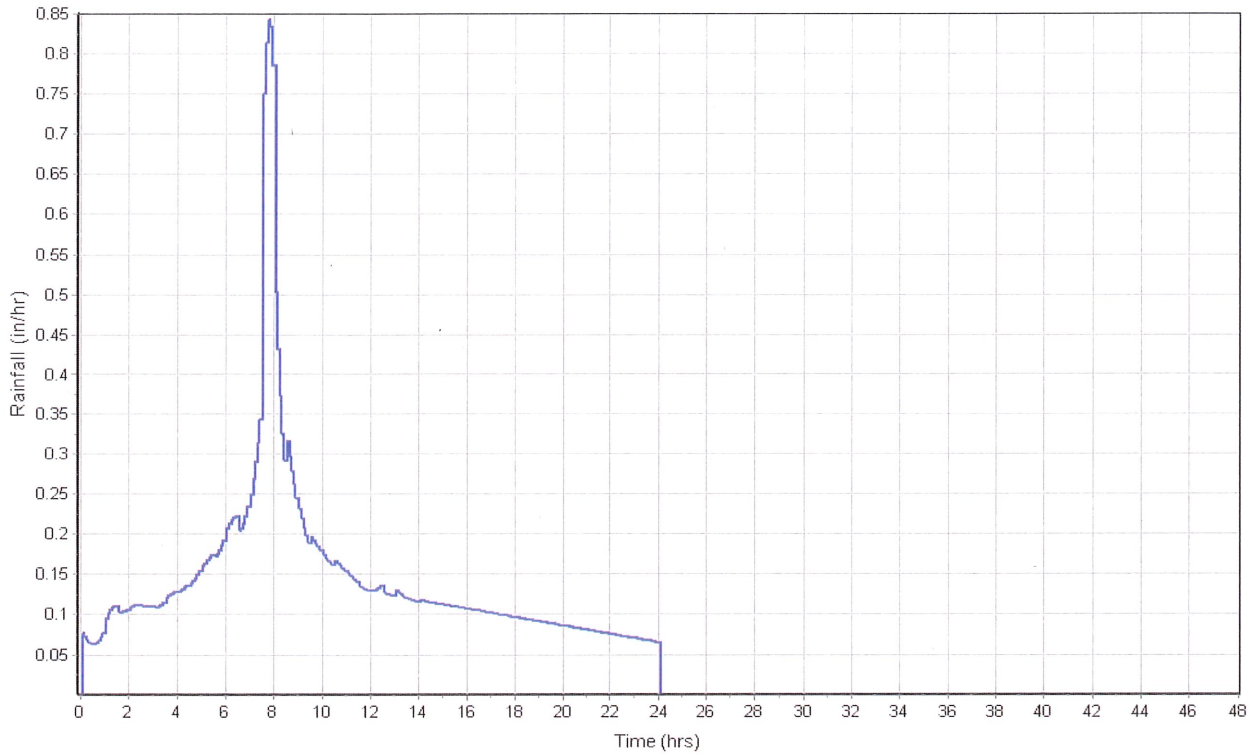
	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.10	0.00	0.00
Computed Flow Time (min) :	16.14	0.00	0.00
Shallow Concentrated Flow Computations			
	Subarea	Subarea	Subarea
	A	B	C
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.28	0.00	0.00
Computed Flow Time (min) :	1.46	0.00	0.00
Total TOC (min)	17.61		

Subbasin Runoff Results

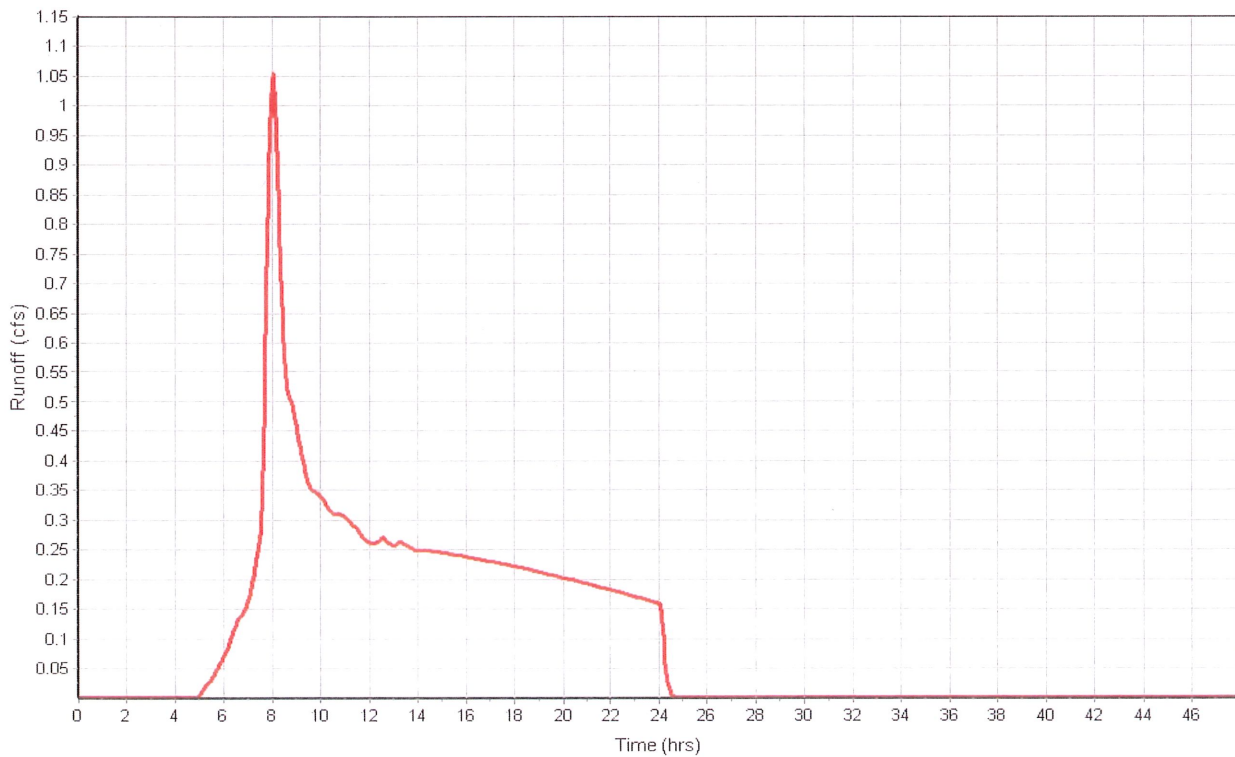
Total Rainfall (in)	3.50
Total Runoff (in)	1.64
Peak Runoff (cfs)	1.06
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:17:37

Subbasin : E1/P1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : E2_E3_E4

Input Data

Area (ac) 12.74
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	12.74	D	80.00
Composite Area & Weighted CN	12.74		80.00

Time of Concentration

	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	13.73	0.00	0.00

	Subarea	Subarea	Subarea
	A	B	C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	500	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	2.99	0.00	0.00

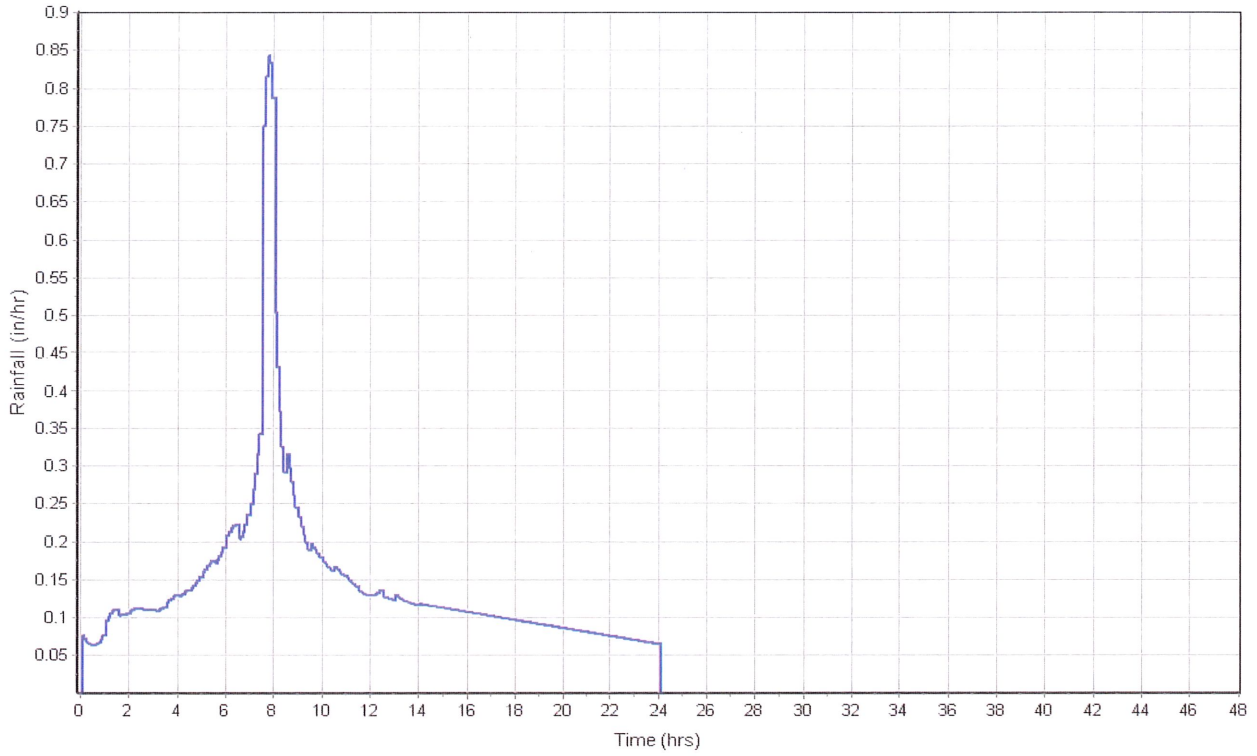
	Subarea	Subarea	Subarea
	A	B	C
Channel Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Channel Slope (%) :	3	0.00	0.00
Cross Section Area (ft ²) :	12	0.00	0.00
Wetted Perimeter (ft) :	12	0.00	0.00
Velocity (ft/sec) :	1.08	0.00	0.00
Computed Flow Time (min) :	4.65	0.00	0.00
Total TOC (min)	21.36		

Subbasin Runoff Results

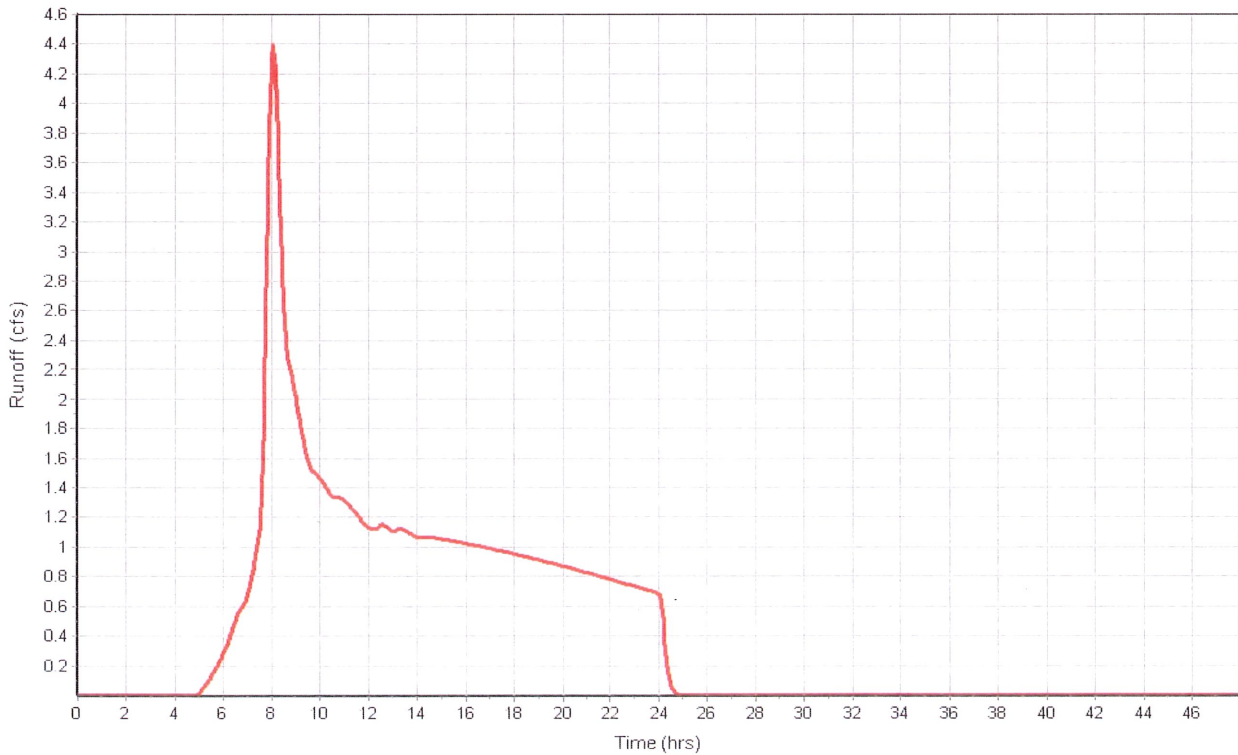
Total Rainfall (in) 3.50
 Total Runoff (in) 1.64
 Peak Runoff (cfs) 4.40
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:21:22

Subbasin : E2_E3_E4

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P2

Input Data

Area (ac) 4.46
 Weighted Curve Number 86.74
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.67	-	98.00
-	2.79	-	80.00
Composite Area & Weighted CN	4.46		86.74

Time of Concentration

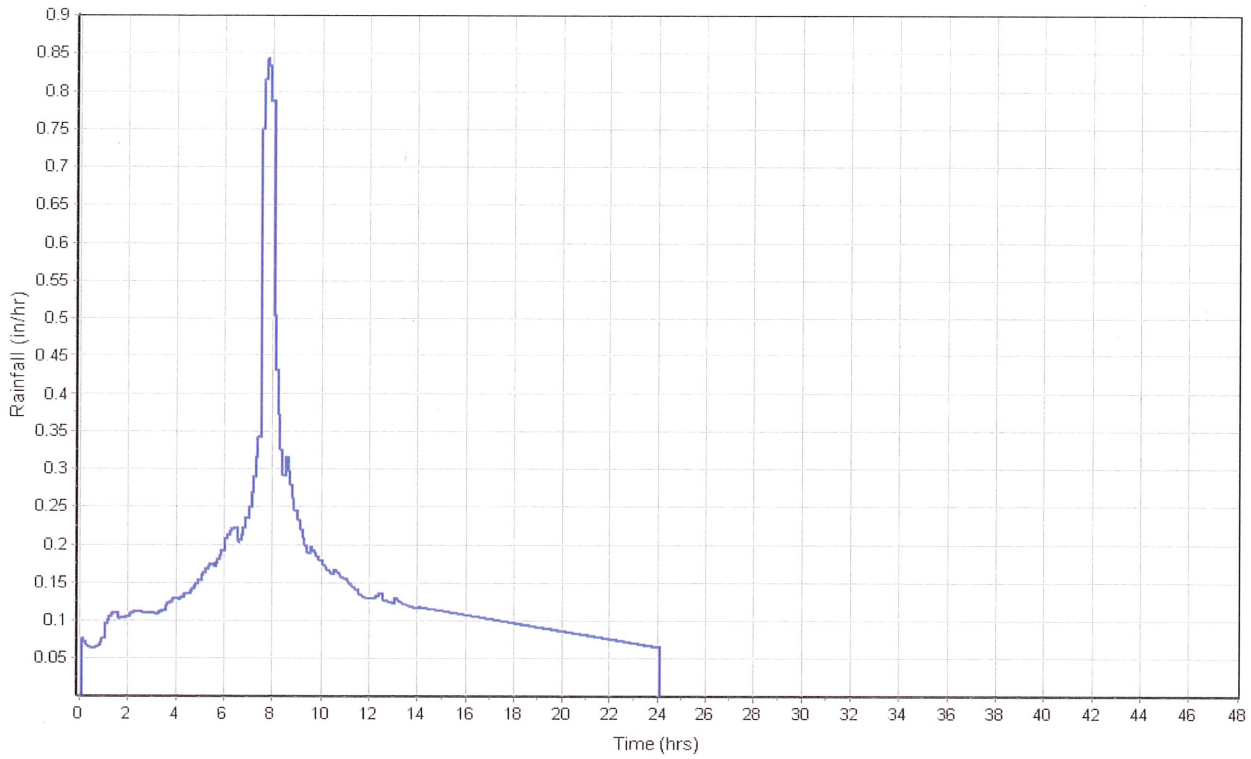
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

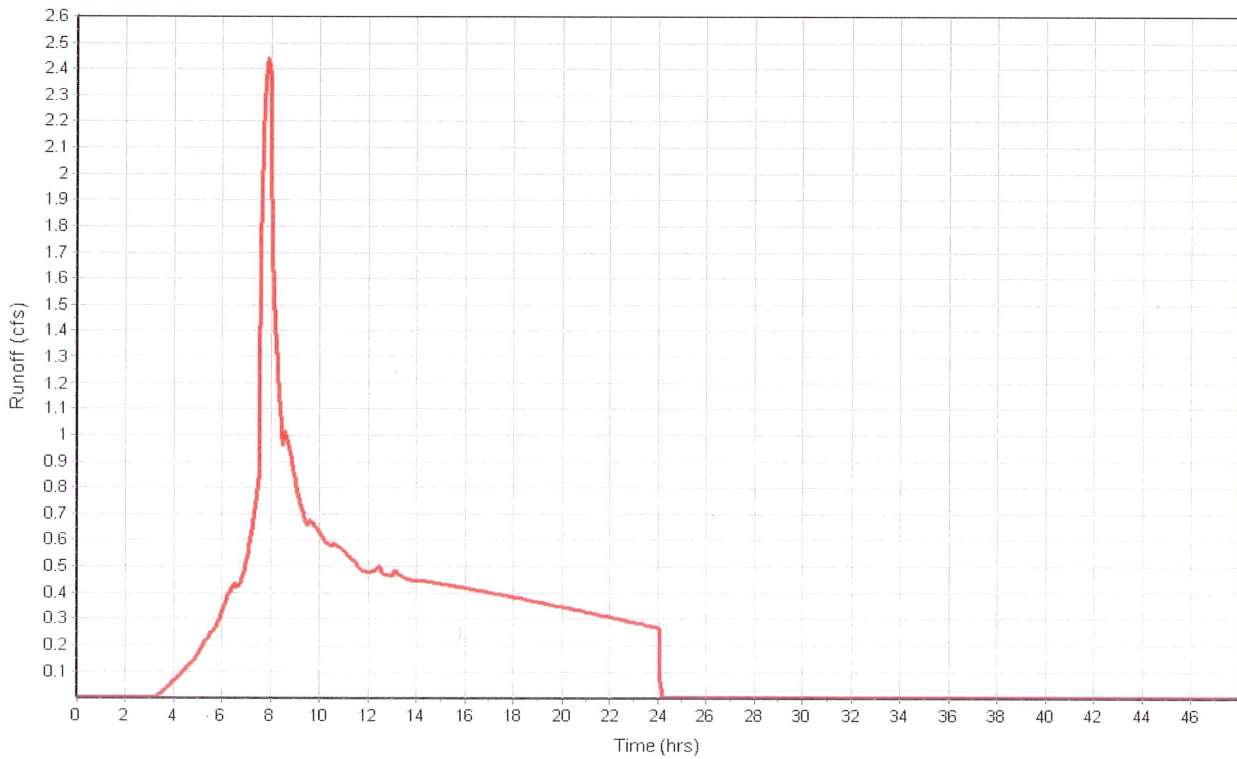
Total Rainfall (in) 3.50
 Total Runoff (in) 2.16
 Peak Runoff (cfs) 2.44
 Weighted Curve Number 86.74
 Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P2

Rainfall Intensity Graph

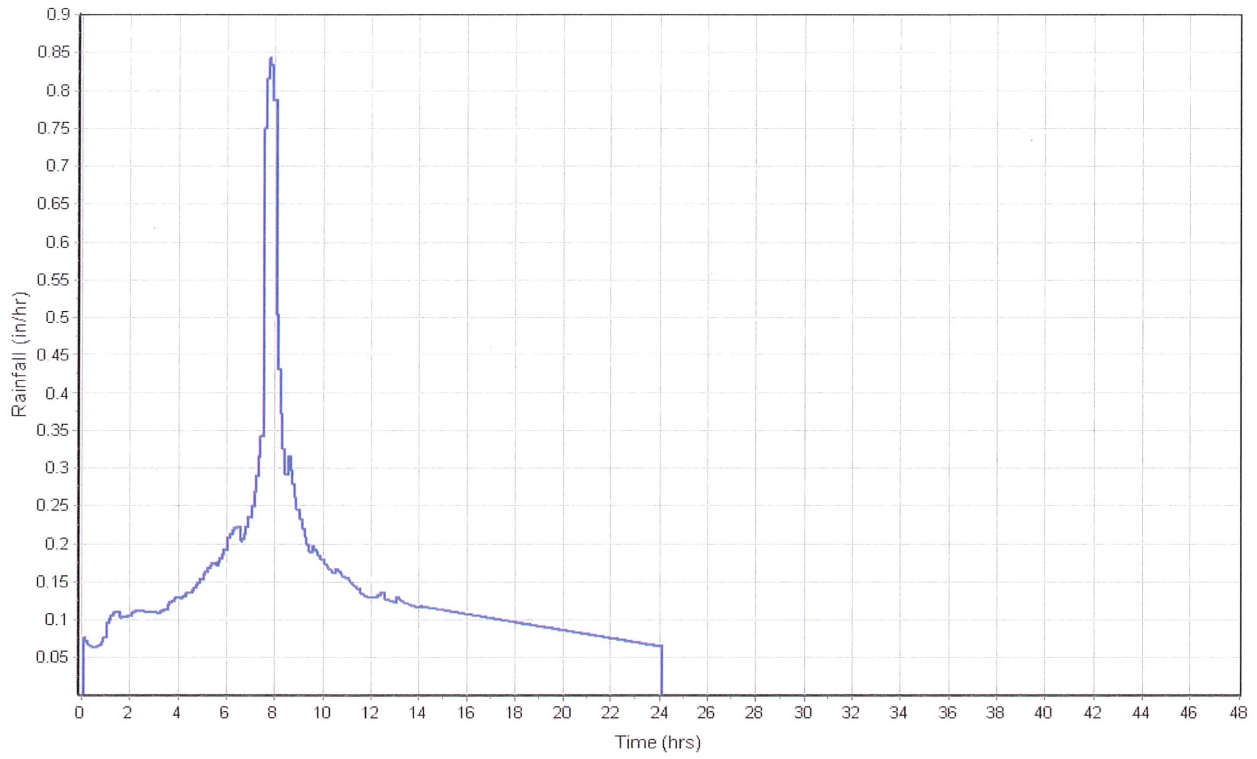


Runoff Hydrograph

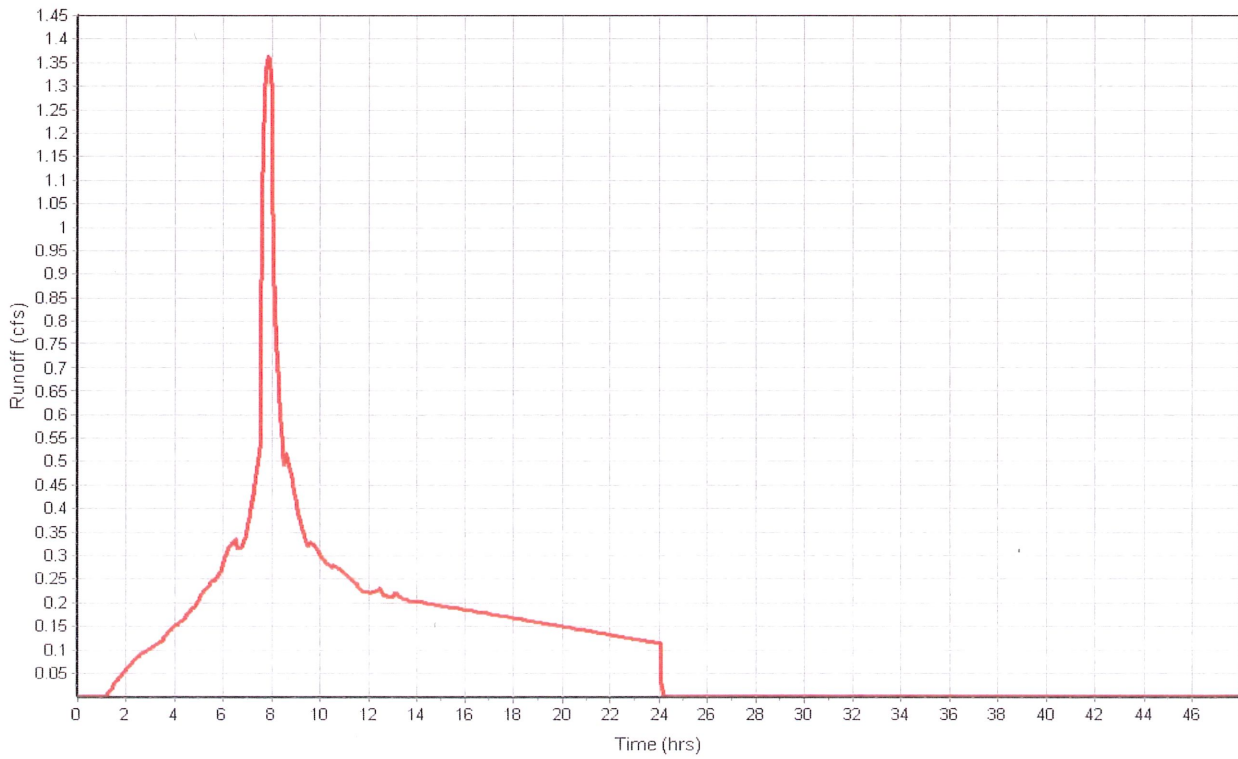


Subbasin : P3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P4

Input Data

Area (ac) 6.56
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	9.91	D	80.00
Composite Area & Weighted CN	9.91		80.00

Time of Concentration

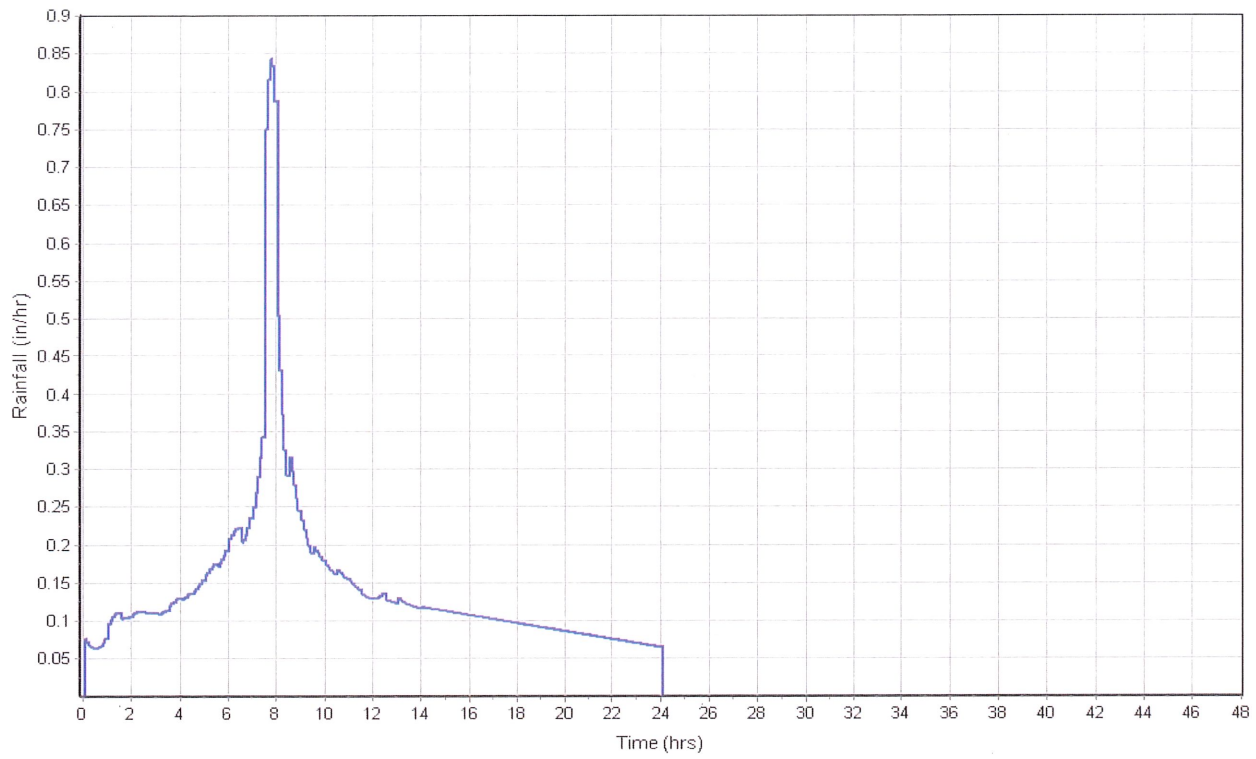
User-Defined TOC override (minutes): 16.71

Subbasin Runoff Results

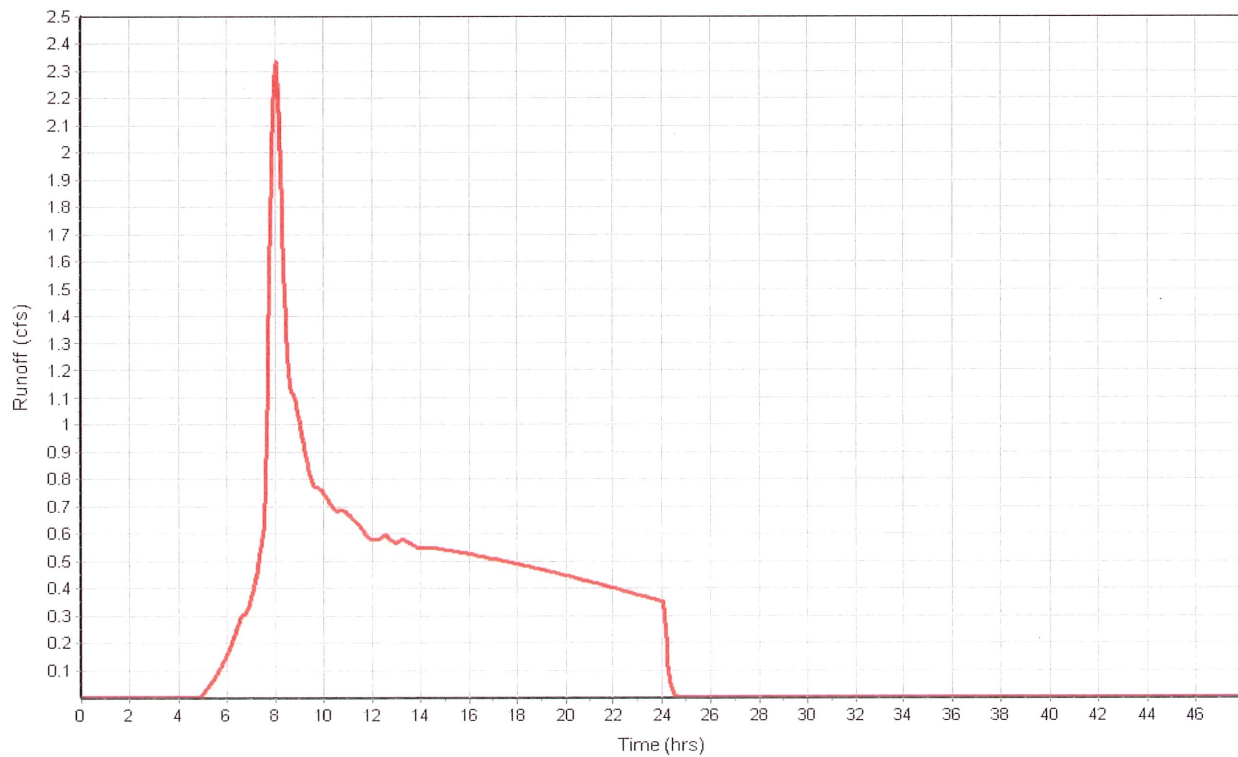
Total Rainfall (in) 3.50
 Total Runoff (in) 1.64
 Peak Runoff (cfs) 2.35
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:16:43

Subbasin : P4

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : Det-Basin

Input Data

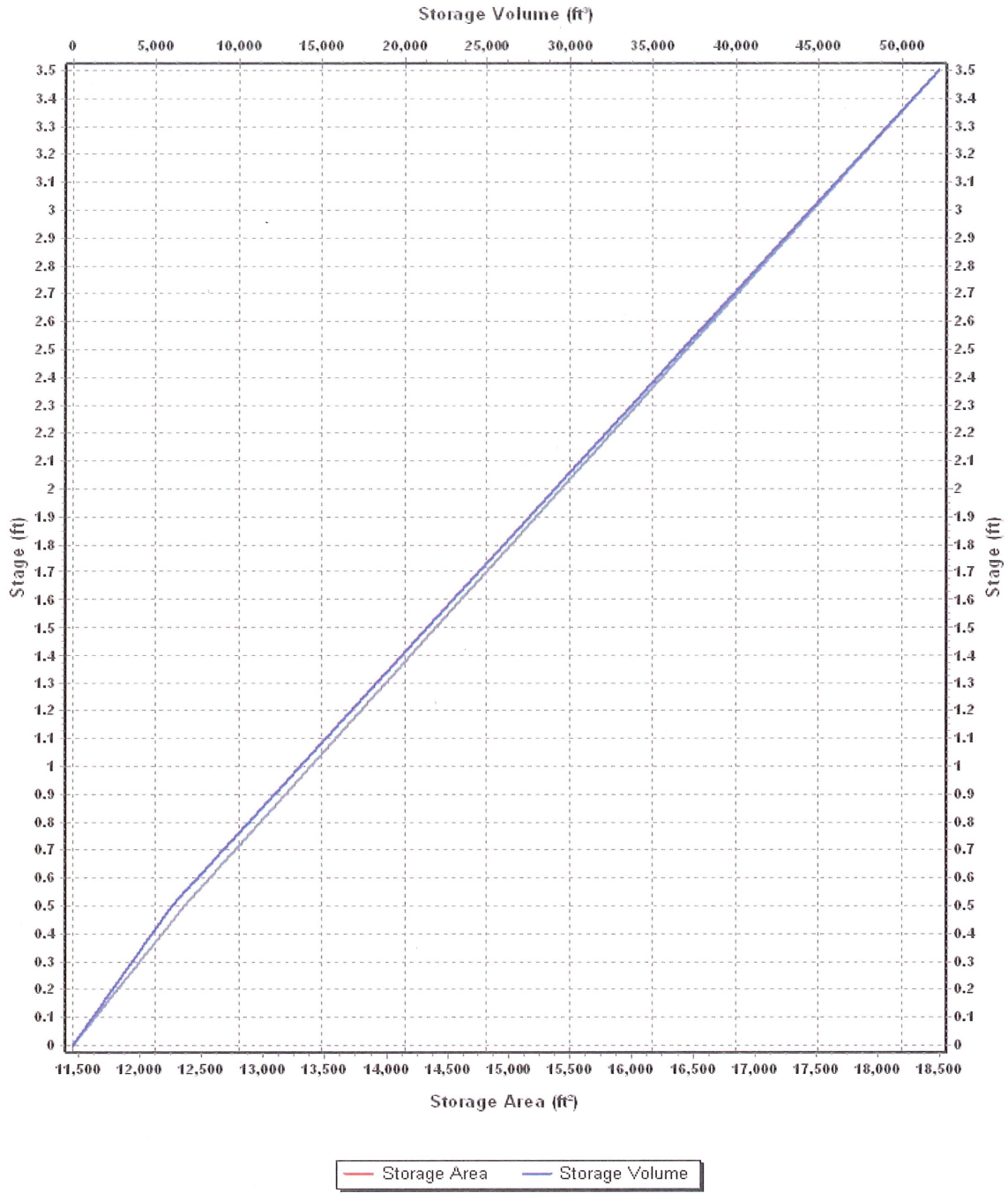
Invert Elevation (ft)	322.50
Max (Rim) Elevation (ft)	326.00
Max (Rim) Offset (ft)	3.50
Initial Water Elevation (ft)	322.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	12.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Detention_Basin

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	11460	0.000
0.5	12362	5955.50
3.5	18484	52224.50

Storage Area Volume Curves



Storage Node : Det-Basin (continued)**Output Summary Results**

Peak Inflow (cfs)	5.99
Peak Lateral Inflow (cfs)	2.34
Peak Outflow (cfs)	3.52
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	323.81
Max HGL Depth Attained (ft)	1.31
Average HGL Elevation Attained (ft)	323.13
Average HGL Depth Attained (ft)	0.63
Time of Max HGL Occurrence (days hh:mm)	0 08:23
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name 20190920-Model.SPF

Project Options

Flow Units CFS
 Elevation Type Elevation
 Hydrology Method SCS TR-55
 Time of Concentration (TOC) Method SCS TR-55
 Link Routing Method Hydrodynamic
 Enable Overflow Ponding at Nodes YES
 Skip Steady State Analysis Time Periods YES

Analysis Options

Start Analysis On Sep 21, 2019 00:00:00
 End Analysis On Sep 23, 2019 00:00:00
 Start Reporting On Sep 21, 2019 00:00:00
 Antecedent Dry Days 0 days
 Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
 Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
 Reporting Time Step 0 00:05:00 days hh:mm:ss
 Routing Time Step 1 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	5
Nodes	8
<i>Junctions</i>	4
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	1
Links	7
<i>Channels</i>	3
<i>Pipes</i>	4
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-025	Intensity	inches	Oregon	Yamhill	25	4.00	SCS Type IA 24-hr

Subbasin Summary

SN ID	Subbasin	Area	Total	Total	Peak
			Runoff	Runoff	Runoff
		(ac)	(in)	(ac-in)	(cfs)
1	E1/P1	2.97	2.04	6.06	1.37
2	E2_E3_E4	12.74	2.04	26.02	5.70
3	P2	4.46	2.61	11.65	2.99
4	P3	1.72	3.54	6.09	1.58
5	P4	6.56	2.04	13.40	3.04

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 REV-Swale-End	Junction	320.52	330.00	320.52	330.00	12.00	5.35	321.54	0.00	8.46	0 00:00	0.00	0.00
2 REV-Swale-Start	Junction	322.50	330.00	322.50	330.00	12.00	5.35	323.14	0.00	6.86	0 00:00	0.00	0.00
3 SD(5)	Junction	334.15	339.85	334.15	340.00	12.00	1.58	334.48	0.00	5.37	0 00:00	0.00	0.00
4 SD(6)	Junction	324.36	330.00	324.36	330.00	12.00	4.56	324.49	0.00	5.51	0 00:00	0.00	0.00
5 Out-PRE-East	Outfall	325.00					1.36	325.00					
6 Out-PRE-West	Outfall	316.16					5.70	316.16					
7 Out-REV-POST-West	Outfall	316.16					5.35	316.64					
8 Det-Basin	Storage Node	322.50	326.00	322.50		12.00	7.41	323.95				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	
1	Ditch-Inlet	Pipe	Det-Basin	REV-Swale-Start	5.00	323.17	322.50	13.4000	12.000	0.0150	4.19	11.30	0.37	7.23	0.71	0.71	0.00
2	Orifice	Pipe	Det-Basin	REV-Swale-Start	5.00	322.50	322.50	0.0000	2.900	0.0130	0.24	0.01	20.74	5.16	0.24	1.00	1010.00
3	REV-Swale-Discharge	Pipe	REV-Swale-End	Out-REV-POST-West	68.56	321.00	316.16	7.0600	18.000	0.0150	5.35	24.19	0.22	10.15	0.51	0.34	0.00
4	SD5_SD6	Pipe	SD(5)	SD(6)	96.00	334.15	324.36	10.2000	10.000	0.0130	1.58	7.00	0.23	13.02	0.23	0.27	0.00
5	HF_Bypass	Channel	Det-Basin	REV-Swale-Start	5.00	323.90	322.50	28.0000	24.000	0.0320	0.93	263.60	0.00	0.53	0.35	0.17	0.00
6	Link-22	Channel	SD(6)	Det-Basin	5.00	324.36	322.50	37.2000	60.000	0.0320	4.56	995.36	0.00	1.40	0.77	0.16	0.00
7	REV-Swale	Channel	REV-Swale-Start	REV-Swale-End	100.00	322.50	320.52	1.9800	18.000	0.2400	5.35	31.07	0.17	1.02	0.83	0.55	0.00

Reported
Condition

Calculated
SURCHARGED
Calculated
Calculated

Subbasin Hydrology

Subbasin : E1/P1

Input Data

Area (ac) 2.97
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	2.97	D	80.00
Composite Area & Weighted CN	2.97		80.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hr)
 n = Manning's roughness
 L_f = Flow Length (ft)
 P = 2 yr, 24 hr Rainfall (inches)
 S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
 V = 20.3282 * (S_f^{0.5}) (paved surface)
 V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
 V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
 V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
 V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
 V = 5.0 * (S_f^{0.5}) (woodland surface)
 V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
 T_c = (L_f / V) / (3600 sec/hr)

Where:

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R<sup>(2/3)) * (S_f^{0.5})) / n
 R = A_q / W_p
 T_c = (L_f / V) / (3600 sec/hr)</sup>

Where :

T_c = Time of Concentration (hr)
 L_f = Flow Length (ft)
 R = Hydraulic Radius (ft)
 A_q = Flow Area (ft²)
 W_p = Wetted Perimeter (ft)
 V = Velocity (ft/sec)
 S_f = Slope (ft/ft)
 n = Manning's roughness

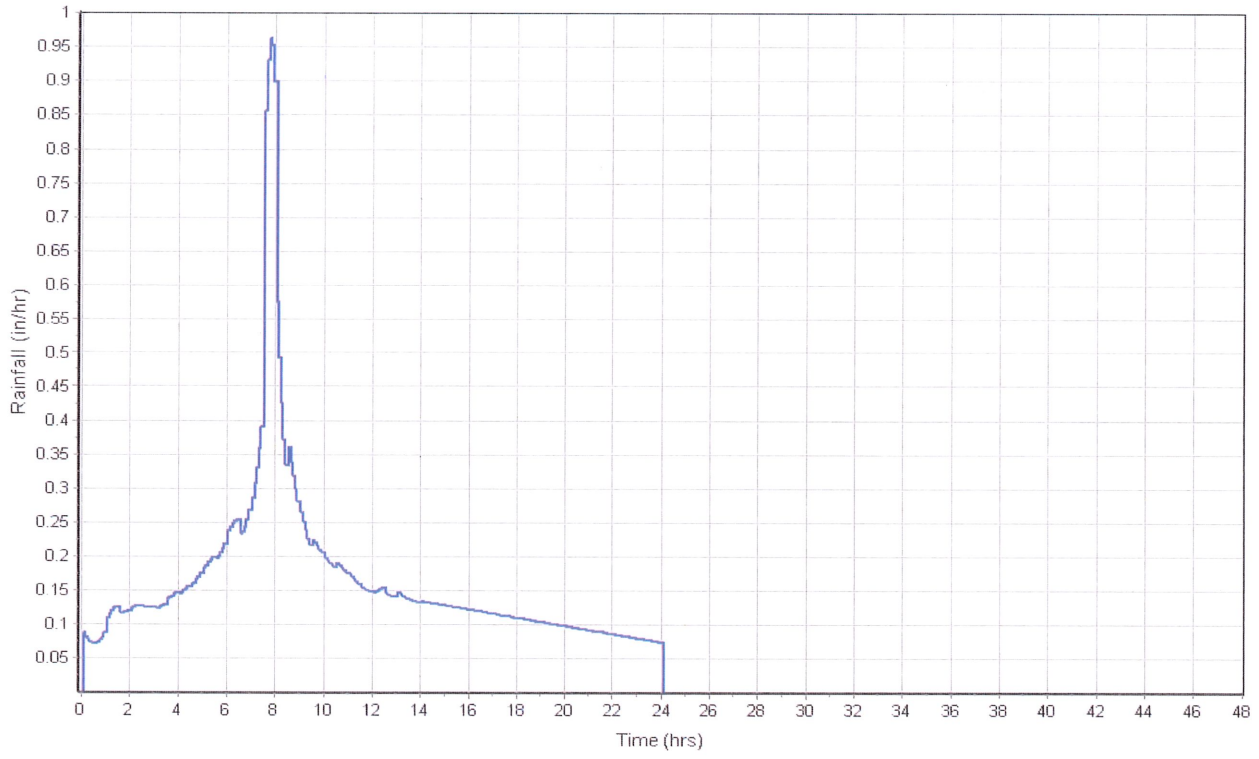
	Subarea A	Subarea B	Subarea C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2	0.00	0.00
2 yr. 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.10	0.00	0.00
Computed Flow Time (min) :	16.14	0.00	0.00
	Subarea A	Subarea B	Subarea C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	200	0.00	0.00
Slope (%) :	2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.28	0.00	0.00
Computed Flow Time (min) :	1.46	0.00	0.00
Total TOC (min)	17.61		

Subbasin Runoff Results

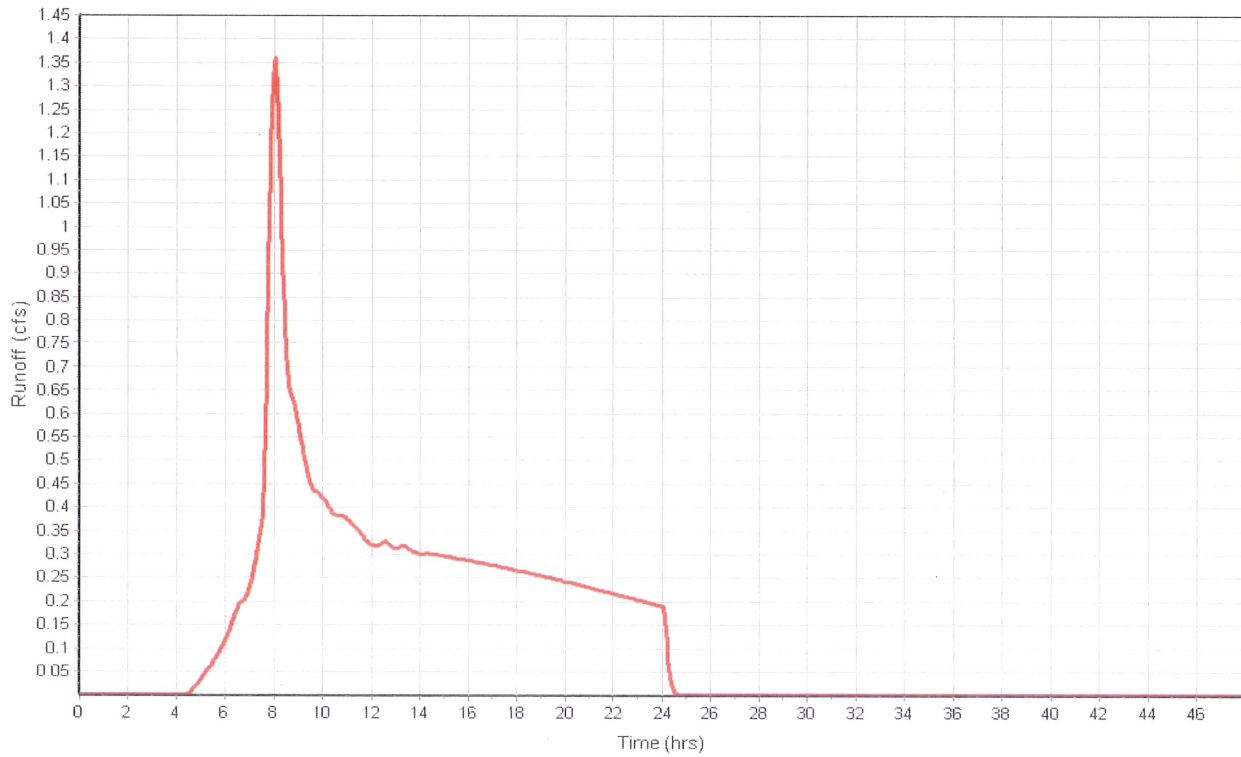
Total Rainfall (in)	4.00
Total Runoff (in)	2.04
Peak Runoff (cfs)	1.37
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:17:37

Subbasin : E1/P1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : E2_E3_E4

Input Data

Area (ac) 12.74
 Weighted Curve Number 80.00
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Pasture, grassland, or range, Good	12.74	D	80.00
Composite Area & Weighted CN	12.74		80.00

Time of Concentration

	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	3	0.00	0.00
2 yr, 24 hr Rainfall (in) :	2.5	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	13.73	0.00	0.00
Shallow Concentrated Flow Computations			
Flow Length (ft) :	500	0.00	0.00
Slope (%) :	3	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.79	0.00	0.00
Computed Flow Time (min) :	2.99	0.00	0.00
Channel Flow Computations			
Manning's Roughness :	0.24	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Channel Slope (%) :	3	0.00	0.00
Cross Section Area (ft ²) :	12	0.00	0.00
Wetted Perimeter (ft) :	12	0.00	0.00
Velocity (ft/sec) :	1.08	0.00	0.00
Computed Flow Time (min) :	4.65	0.00	0.00
Total TOC (min)	21.36		

Subbasin Runoff Results

Total Rainfall (in) 4.00
 Total Runoff (in) 2.04
 Peak Runoff (cfs) 5.70
 Weighted Curve Number 80.00
 Time of Concentration (days hh:mm:ss) 0 00:21:22

Subbasin : P2

Input Data

Area (ac) 4.46
Weighted Curve Number 86.74
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.67	-	98.00
-	2.79	-	80.00
Composite Area & Weighted CN	4.46		86.74

Time of Concentration

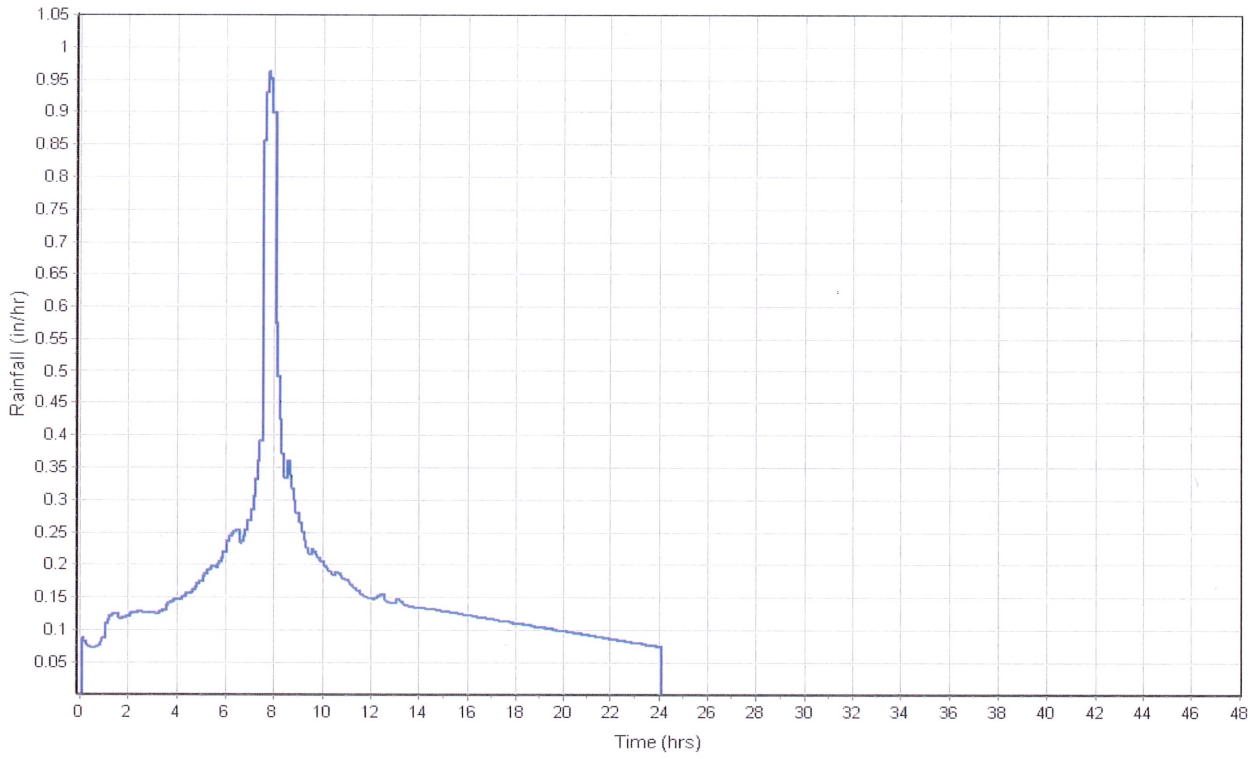
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

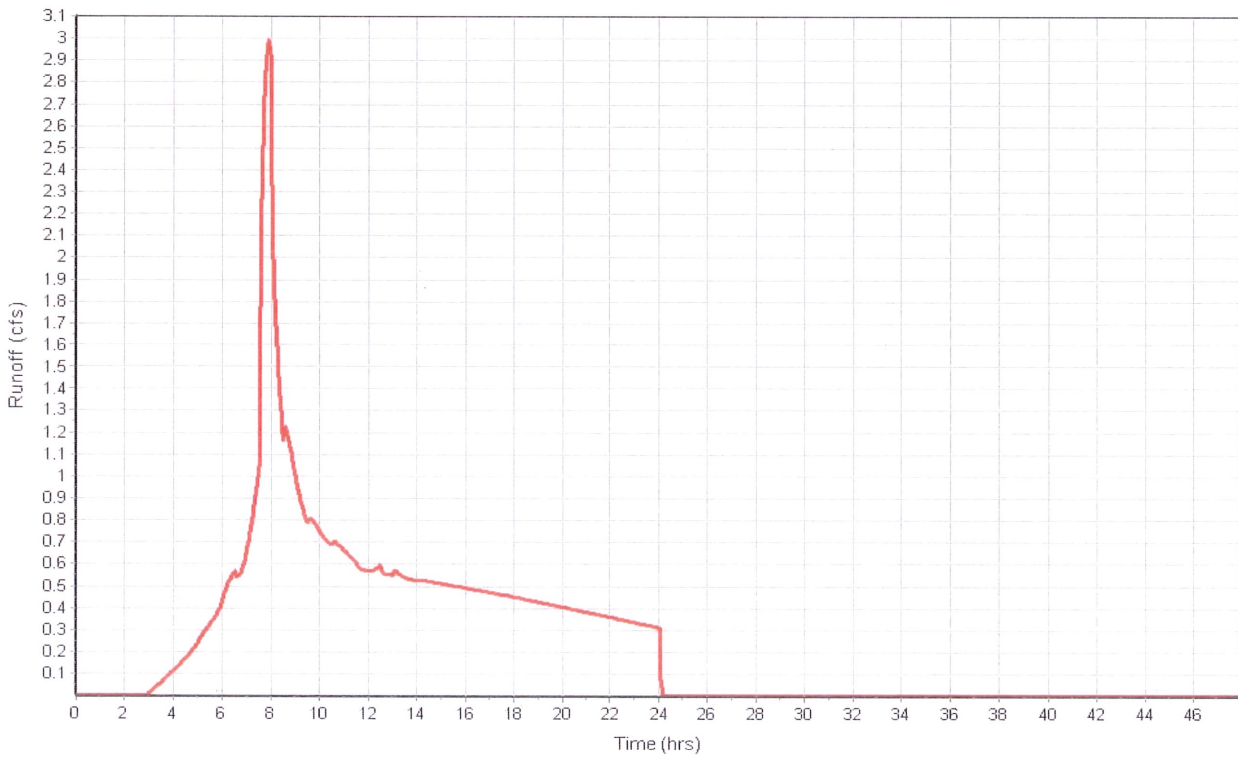
Total Rainfall (in) 4.00
Total Runoff (in) 2.61
Peak Runoff (cfs) 2.99
Weighted Curve Number 86.74
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P3

Input Data

Area (ac) 1.72
 Weighted Curve Number 96.01
 Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	1.53	-	98.00
-	0.19	-	80.00
Composite Area & Weighted CN	1.72		96.01

Time of Concentration

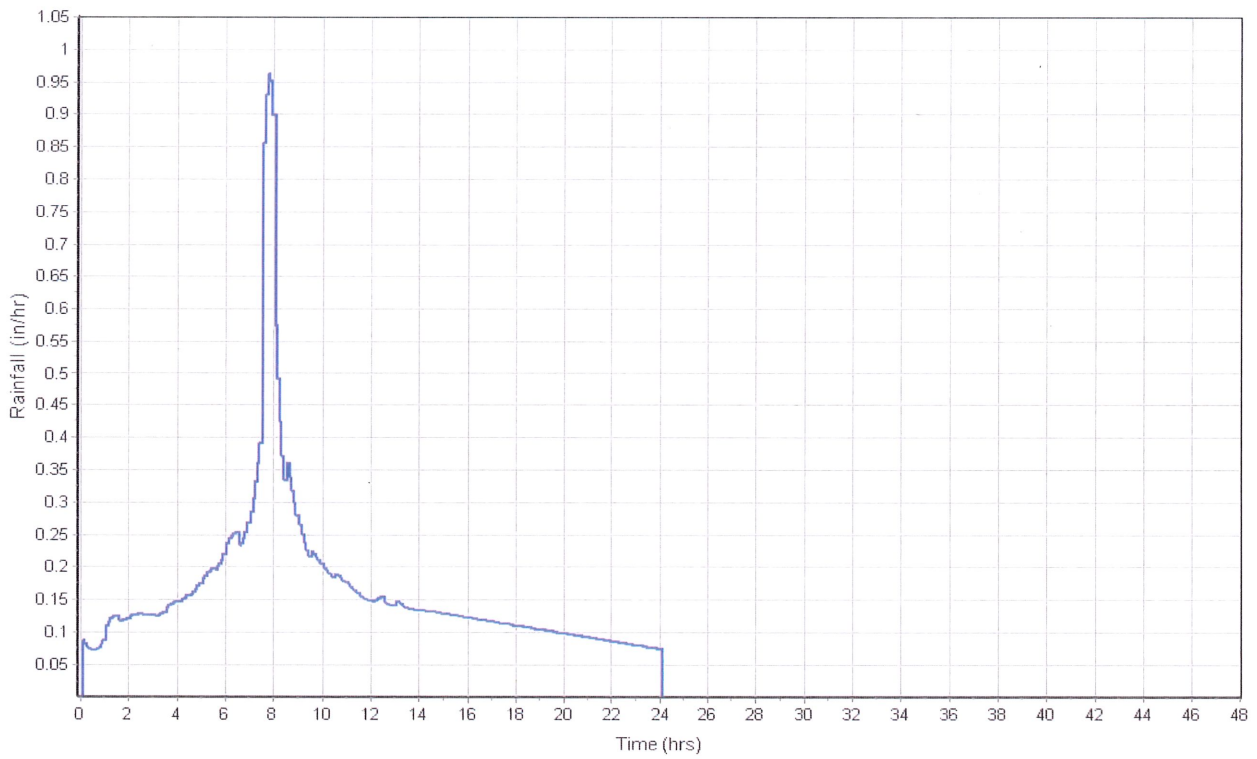
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

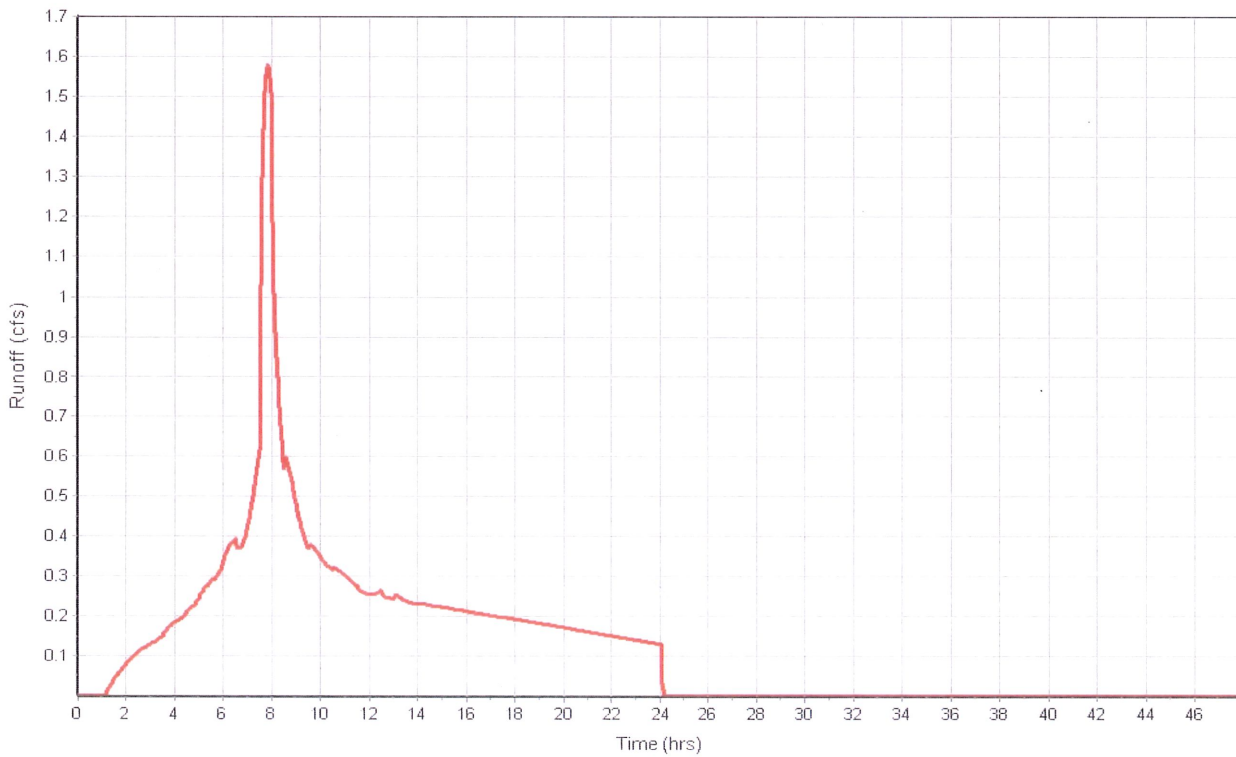
Total Rainfall (in) 4.00
 Total Runoff (in) 3.54
 Peak Runoff (cfs) 1.58
 Weighted Curve Number 96.01
 Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : P3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : P4

Input Data

Area (ac) 6.56
Weighted Curve Number 80.00
Rain Gage ID Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	9.91	D	80.00
Composite Area & Weighted CN	9.91		80.00

Time of Concentration

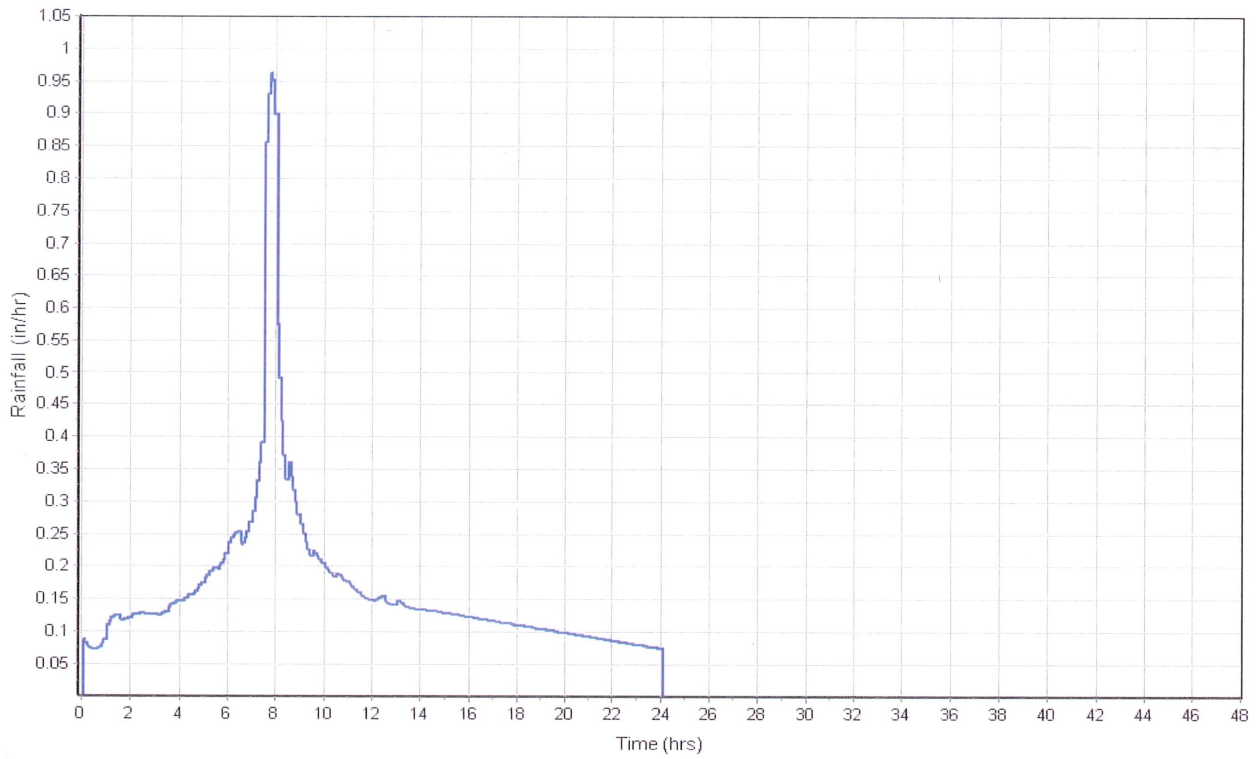
User-Defined TOC override (minutes): 16.71

Subbasin Runoff Results

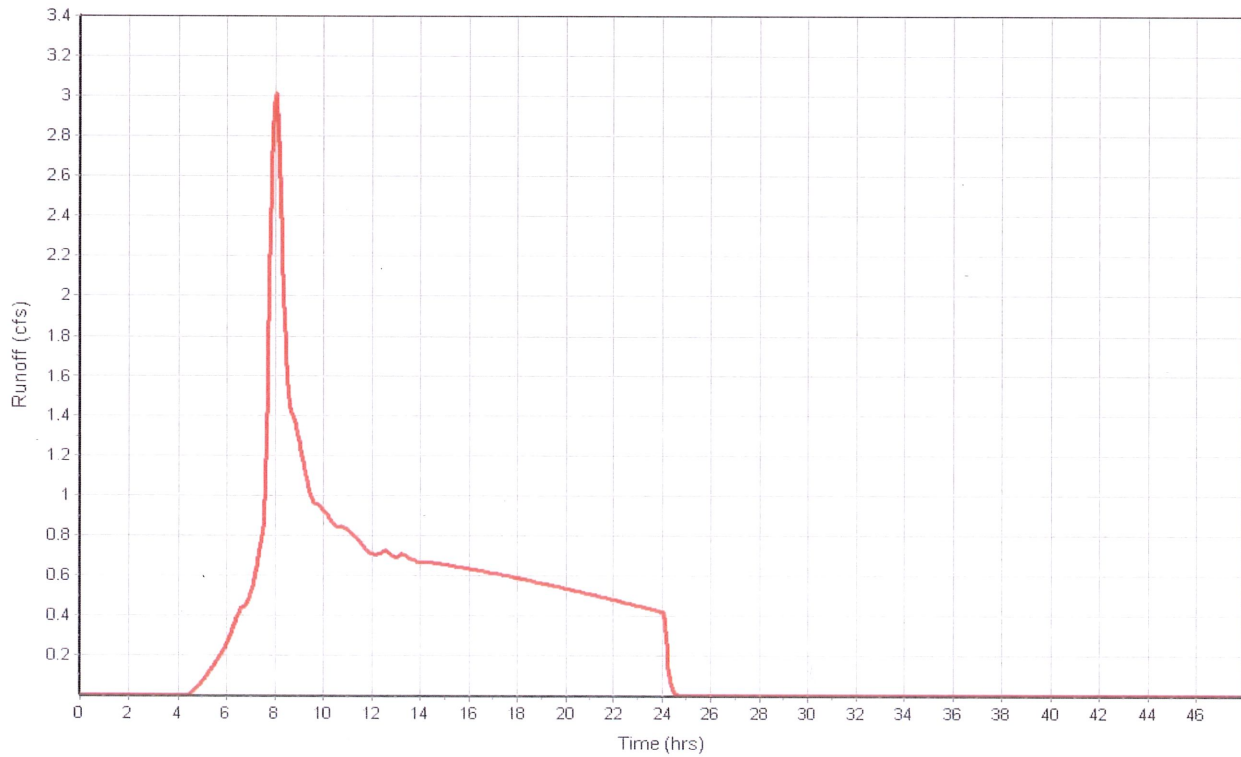
Total Rainfall (in) 4.00
Total Runoff (in) 2.04
Peak Runoff (cfs) 3.04
Weighted Curve Number 80.00
Time of Concentration (days hh:mm:ss) 0 00:16:43

Subbasin : P4

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : Det-Basin

Input Data

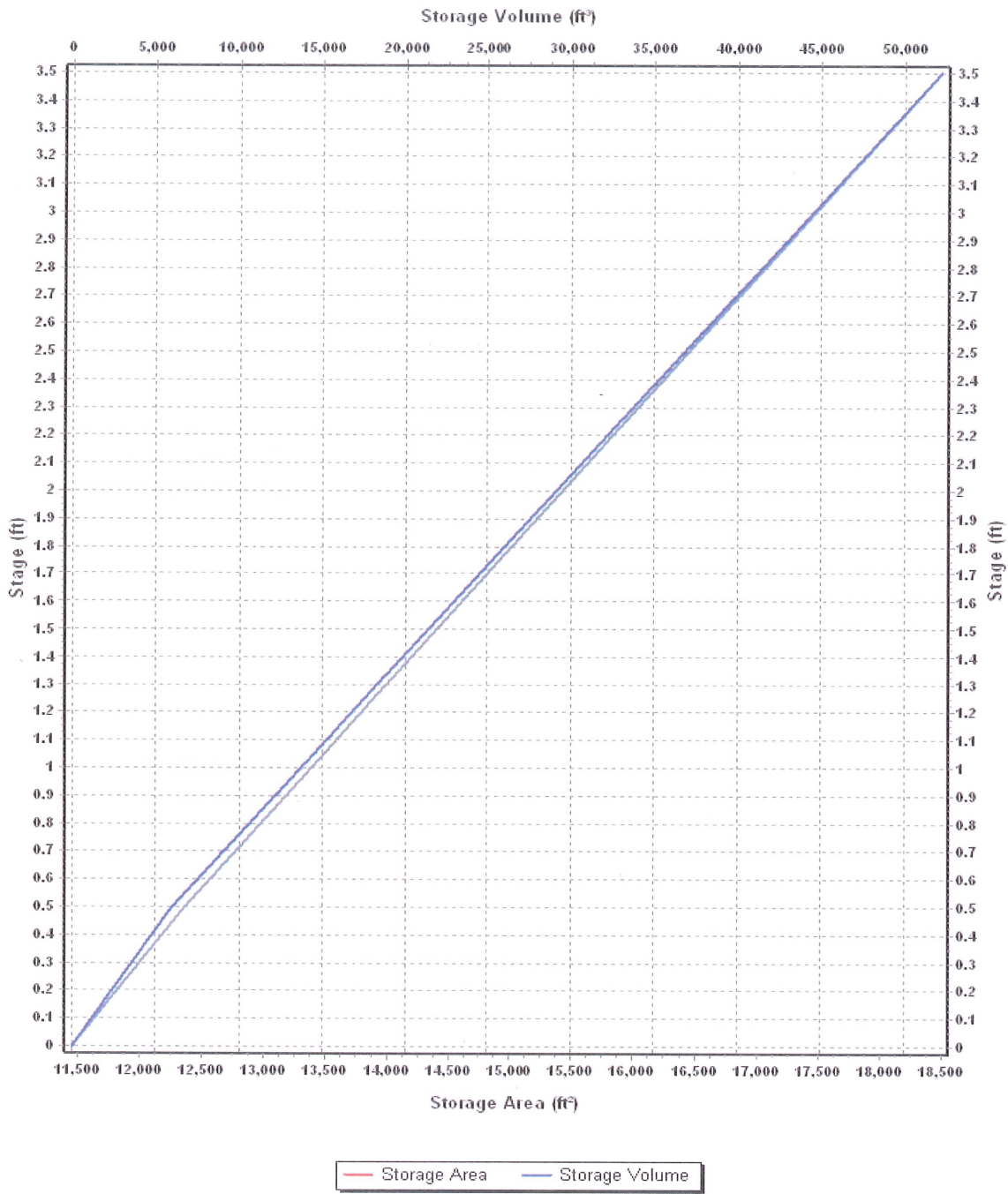
Invert Elevation (ft)	322.50
Max (Rim) Elevation (ft)	326.00
Max (Rim) Offset (ft)	3.50
Initial Water Elevation (ft)	322.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	12.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Detention_Basin

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	11460	0.000
0.5	12362	5955.50
3.5	18484	52224.50

Storage Area Volume Curves



Storage Node : Det-Basin (continued)**Output Summary Results**

Peak Inflow (cfs)	7.41
Peak Lateral Inflow (cfs)	3.01
Peak Outflow (cfs)	5.35
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	323.95
Max HGL Depth Attained (ft)	1.45
Average HGL Elevation Attained (ft)	323.16
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 08:15
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

APPENDIX E

OPERATIONS, MAINTENANCE, CONTINGENCY & REPAIR PLAN

OPERATIONS, MAINTENANCE, CONTINGENCY & REPAIR PLAN

FOR THE

Veritas School Site Development

***City of Newberg, Yamhill County, Oregon
Case File # DR219-0002***

In order for the storm water treatment facilities to continue operating at acceptable levels, regular maintenance and inspection are required. This plan provides instructions for how to do this.

Prepared by: Nicholas McMurtrey, P.E.

September 2019

**Storm Water System
Operations, Maintenance, Contingency & Repair Plan**

O & M TABLE OF CONTENTS

- A. Responsibility
- B. Description
- C. Schedule
- D. Procedure
- E. Inspection & Maintenance Logs
- F. Sample O&M Logs
- G. O&M Log Sheet
- H. Appendix: Exhibits

Storm Water System Operations, Maintenance, Contingency & Repair Plan

A. RESPONSIBILITY

The stormwater management facilities are to be maintained by School staff. The preparer has worked with the owner's designated personnel to design a system that can be easily maintained by maintenance staff. A copy of this plan shall be provided to all applicable maintenance personnel.

B. DESCRIPTION

The stormwater system collects and conveys all runoff within the site and treats drainage from both landscaping and impervious surfaces. All runoff is will either infiltrate into the ground, or be collected by **catch basins, ditches and culverts** before discharging into stormwater quality and/or quantity facilities. Stormwater quantity, or **detention basins**, will eventually overflow towards the piped conveyance system via a catch basin.

These conveyance systems discharge to a **riprap outfall** upstream of **vegetated swale**. Stormwater in the vegetated swale either (1) infiltrates through the plants and soil for treatment, (2) flows through the swale for treatment in route to an outfall or downstream conveyance channel. Drainage originating from impervious surfaces throughout the project area will be treated by the vegetated swale. Any facility unable to absorb drainage during high flow events will discharge towards the historic discharge location for the project, and ultimately Chehalem Creek.

Definitions

- **Riprap outfalls** are rock lined depressions installed where pipes daylight to reduce scour at the discharge location.
- **Vegetated swales** are depressed landscaped channels used to collect, filter, infiltrate, and convey storm water runoff. Their primary purpose is to treat storm water runoff as it passes through the vegetation, and underlying topsoil. These facilities also provide detention for stormwater runoff and slowly release it over extended periods of time.
- **Catch basins** are inlet structures with a sump for sediment and debris storage and a turned down elbow on the outlet pipe. They collect surface storm water and convey it to the storm system.
- **Detention basins** are depressed landscaped areas used to collect, filter, infiltrate, and convey storm water runoff. Their primary purpose is to slow down and detain stormwater runoff as the basin fills. These facilities slowly release runoff over extended periods of time.

**Storm Water System
Operations, Maintenance, Contingency & Repair Plan**

**Table B1
Stormwater Facility Summary**

Facility Type	Size (sf)	Contributing Source	Impervious Area Managed (ac)	Discharge Point
Vegetated Swale	570 (base area)	Building roofs and central courtyard walkways	1.16	Flows discharge to SW corner of property, and eventually Chehalem Creek.
Detention Basin	7,100 (base area)	Parking lot; asphalt pavement and concrete sidewalk	1.67	Flows discharge to vegetated swale

C. SCHEDULE

The whole system shall be inspected and maintained quarterly and within 24 hours after each major storm event. For this O&M plan, a major storm event is defined as 1.0 inches of rain in 24 hours or more. All components of the storm system as described below must be inspected and maintained frequently or they will cease to function effectively. The facility owner must keep a log recording all inspection dates, observations, and maintenance activities. Receipts shall be saved when maintenance is performed and there is record of expense.

D. PROCEDURE

The following items shall be inspected and maintained as stated:

Riprap Outfalls

- Facilities shall be inspected for debris and sediment buildup, which shall be removed upon discovery. If necessary, sources of potential sediment and debris, such as discarded landscape clippings, shall be identified and prevented.
- Inspect outfalls and adjacent landscaping areas for areas of erosion, scouring, undercutting, and slumping. Fill eroded area with compacted soil and cover with mulch, riprap, seed, sod, or other erosion prevention materials.

Vegetated Swale and Detention Basin

- Fallen leaves and debris from deciduous plant foliage shall be raked and removed biannually.
- Nuisance and prohibited vegetation of all species shall be removed biannually. Invasive vegetation shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced to maintain cover density and control erosion where soils are exposed.
- The facilities shall fully drain within 24 hours after a storm event. If water continues to pond after that time, sources of possible clogging shall be identified and corrected. If necessary,

Storm Water System Operations, Maintenance, Contingency & Repair Plan

the topsoil layers shall be tilled and amended with compost; if this is not sufficient, they shall be removed and replaced with new freely draining growing medium.

- Inlets and outlets shall be inspected quarterly and after any large rain event.
- Any trash or debris that collects in the planters may inhibit function and shall be removed quarterly.
- Use of pesticides and/or herbicides is not recommended.

Catch Basins and Piped Storm System

- Quarterly inspection for clogging shall be performed.
- Shall be inspected for cracks or leaks during each inspection. Area drains, overflow structures and manholes shall be cleaned out at a minimum of once per year or more frequently if inspections deem it necessary. Cleanout shall be done in a manner to minimize the amount of sediment and trapped oil entering the outlet pipe. Any valves on outlet pipes shall be closed or plugged prior to cleanout.
- Water, oil, and sediment in sumps shall be removed, tested, and disposed of in accordance with federal and state regulations. Grit and sediment that has settled to the bottom of drainage structures shall be removed during each cleaning.
- Cleaning shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.

Source Control measures prevent pollutants from mixing with storm water. Typical non-structural control measures include raking and removing leaves, street sweeping, vacuum sweeping, controlled application of pesticides and fertilizers, and other good house keeping practices.

- Source control measures shall be inspected and maintained (where applicable).

Spill Prevention measures shall be exercised when handling substances that can contaminate storm water. It is important to exercise caution when handling substances that can contaminate storm water. Activities that pose the chance of hazardous material spills shall not take place near collection facilities.

- Contact facility owner immediately if spill is observed.
- Releases of pollutants shall be corrected as soon as identified.

Insects & Rodents shall not be harbored in the any part of the storm system.

- Pest control measures shall be taken when insects/rodents are found to be present.
- If sprays are considered, then a mosquito larvicide, such as Bacillus thurendensis or Altoside formulations can be applied only if absolutely necessary and shall not be used where it will enter groundwater or come in contact with any standing water. Sprays shall be applied only by a licensed individual or contractor.
- Holes in the ground located in and around the storm system shall be filled.
- Outfalls draining into storm water planters shall be inspected and cleaned regularly to insure no rodent activity which would clog or decrease the efficiency of the storm system.

**Storm Water System
Operations, Maintenance, Contingency & Repair Plan**

Access to the storm system is required for efficient maintenance.

- Egress and ingress routes adjacent to stormwater facilities shall be opened for maintenance. Traffic control may be necessary to safely perform maintenance activities.

E. INSPECTION AND MAINTENANCE LOGS

Maintenance staff shall complete inspection and maintenance logs. The logs shall be produced for:

Proper Conveyance – All facilities shall drain within 24 hours. Date, time, weather, and site conditions when ponding occurs shall be recorded.

Pollution Prevention – All sites shall implement best management practices to prevent hazardous wastes, litter, or excessive oil and sediment from contaminating storm water. Contact Spill Prevention & Citizen Response at (503) 823-7180 for immediate assistance with responding to spills. Record date, time, weather, and site conditions if activities are found to contaminate storm water.

Vectors (mosquitoes and rodents) – Storm water facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Washington County Vector Control at (503) 846-8722 for recommendations and guidance with eradicating vectors. Record date, time, weather, and site conditions when vector activity is observed.

Maintenance – Record date, description, and contractor (if applicable) for all structural repairs, landscape maintenance, and facility cleanout activities.

**Storm Water System
Operations, Maintenance, Contingency & Repair Plan**

F. SAMPLE O&M LOG SHEET

SAMPLE

Date: 9/10/2019 Time: 13:30 Initials: NJM
 Weather and site conditions: Overcast
 Work performed by: Veritas School maintenance personnel
 Work performed: Replanted Vegetated Swale with sedges and rushes
 Details: *Work order on file and available by request

G. O&M LOG SHEET

Date: _____ Time: _____ Initials: _____
 Weather and site conditions: _____
 Work performed by: _____
 Work performed: _____
 Details: _____

Date: _____ Time: _____ Initials: _____
 Weather and site conditions: _____
 Work performed by: _____
 Work performed: _____
 Details: _____

**Storm Water System
Operations, Maintenance, Contingency & Repair Plan**

Date: _____ Time: _____ Initials: _____
Weather and site conditions: _____
Work performed by: _____
Work performed: _____
Details: _____

Date: _____ Time: _____ Initials: _____
Weather and site conditions: _____
Work performed by: _____
Work performed: _____
Details: _____

H. Appendix: Exhibits