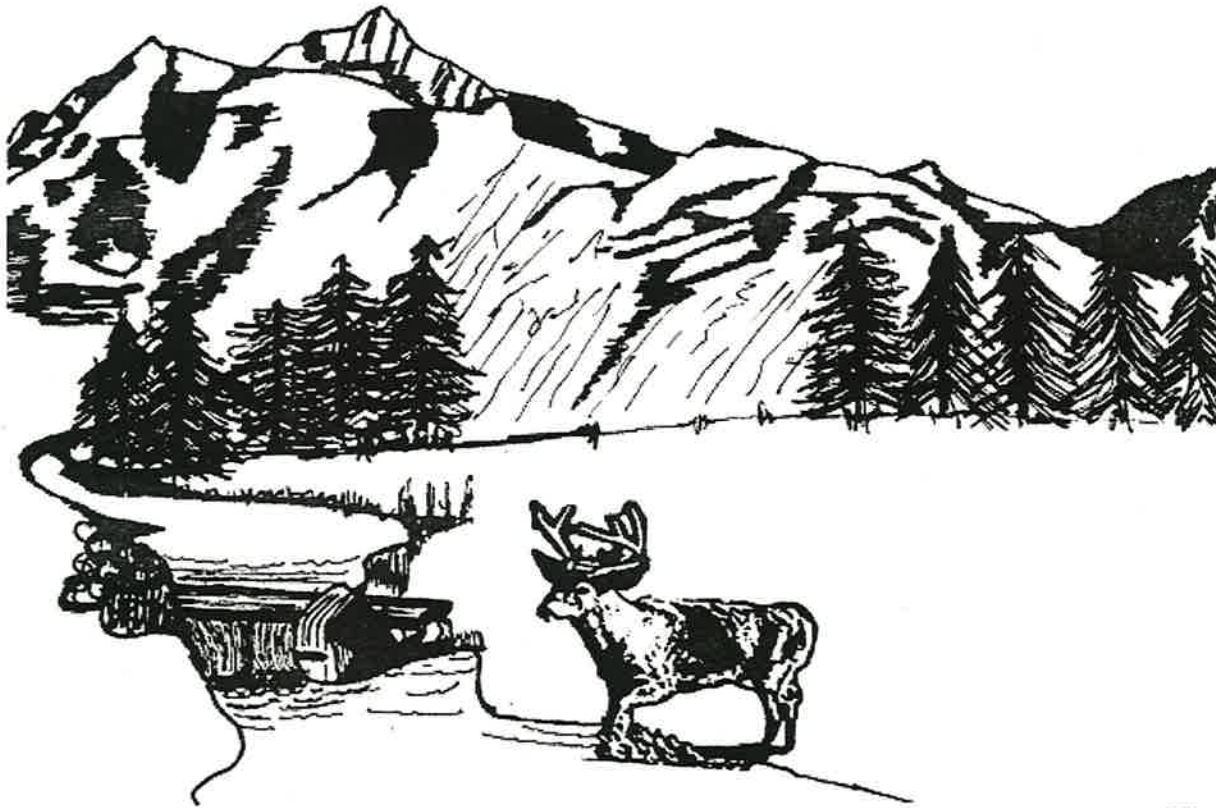

Targeted Drainage Report For:

Dean Jensen 3-Lot Short Plat- File Number -

RECEIVED
SEP 16 2002
Utilities Div.

August 19, 2002



MN-02-013-SP
Jensen, Dean



EXPIRES: 01/01/04

Prepared by:

Cascade Surveying & Eng., Inc

Job #13708

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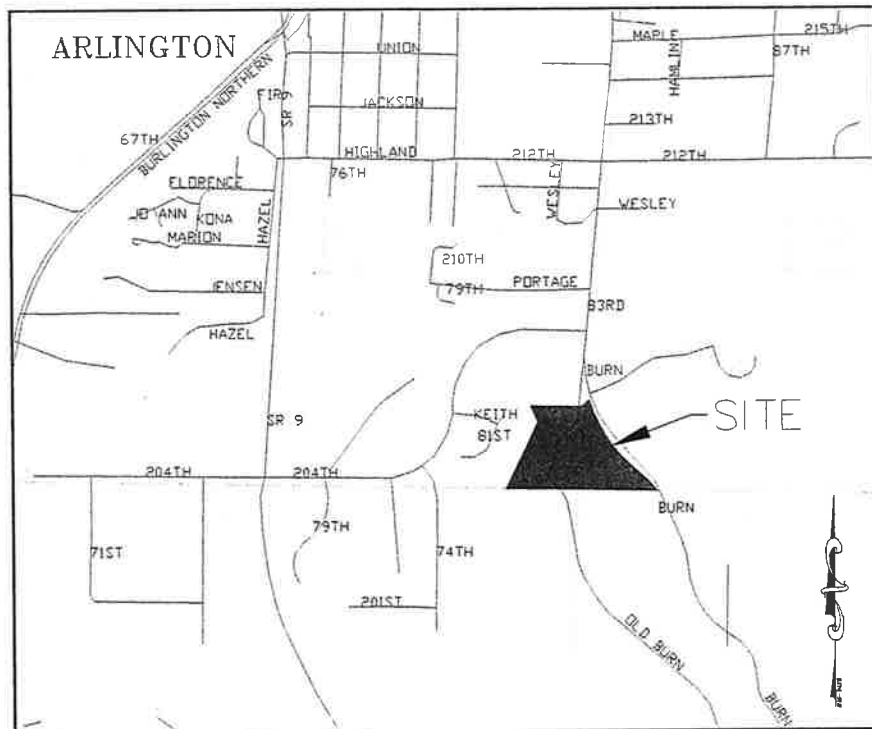
**Drainage
Calculations**

PROPERTY DESCRIPTION

The site is located in the Southwest quarter of Section 12 & the Southeast quarter of Section 11, T. 31N., R.5E., WM. The proposal is to create a 3-lot short plat of the Jensen property. Based on the S.C.S. Soil Survey, the onsite soils consist of Tokul gravelly loam (hydrologic group C). The area of proposed development is part of an approximate 9-acre drainage basin. The basin is mostly composed of pasture, grassy areas and few trees. The remainder of the basin is composed of impervious surface (existing house, garage, and driveways) on the top of the hill, or forest/heavy brush to the east and west. The basin terrain is made up of steep as well as gentle slopes that vary throughout the basin (See basin map).

The eastern side of the basin drains down a natural swale from the south to an existing catch basin at the base of the hill. The stormwater is then conveyed to another catch basin to the southwest by a 12" PVC pipe. The runoff then drains under Old Burn Road through a 12" PVC pipe to an open ditch in the northwest section of the basin. From the ditch, runoff branches out and sheet/shallow flows to an existing ditch off the property. The ditch flows from the north and eventually drains into Portage Creek southwest of the site.

The western side of the drainage basin drains to Old Burn Road and is either intercepted by a ditch along the eastside of the road or sheet/shallow flows over the road and down the hill to the west, offsite. Runoff that is intercepted by the ditch drains down the hill to the most westerly existing catch basin where it meets up with the runoff generated by the eastern half of the basin.



VICINITY MAP

PROPOSED DEVELOPMENT

The proposed improvement to the site is the subdivision of the existing lot into 3-lots and a tract. Proposed for lots 1 and 2 are a house and an access driveway.

The proposed drainage plan consists of locating the proposed access driveway in the same location as the existing natural swale (see drainage plan). Runoff generated by impervious areas of lots 1 & 2 will be directed to the proposed drainage system located in the proposed driveway. This will reduce the amount of existing runoff flowing from Lot 2 to Lot 1. The driveway will have an alley cross section, allowing runoff to collect and flow down the driveway. As the stormwater flows down the driveway, it will be collected by catch basins and conveyed down to the base of the hill. This will greatly reduce the amount of flow traveling down the steep concrete driveway. Rainfall landing on the existing concrete driveway will sheet flow to a 20" wide x 4" tall concrete speed bump that will direct the flow to a catch basin. The catch basin will be recessed approximately 6" in a concrete bowl adjacent to the concrete driveway (see Detail F of drainage plan). The speed bump and recessed catch basin will prevent flow running down the driveway from skipping over the catch basin and past the detention facility. The runoff will then be conveyed under the Old Burn Road by a 12" pipe. Stormwater will empty into the existing ditch and flow down the hill into the proposed detention pond. The pond will store and control the release of the runoff. After exiting the pond, the stormwater will travel through a bioswale for water quality treatment then empty into an existing ditch at the northwest corner of the basin.

Stormwater generated by the western portion of the basin will collect in a ditch along the eastside of the Old Burn Road and travel down to an existing catch basin. From the catch basin, stormwater will cross under the Old Burn Road through an existing 12" pipe and into the existing ditch and proposed pond.

Detention and water quality treatment is also being provided for the portion of Old Burn Road uphill of the pond site that is to be improved (paved) by the City of Arlington.

UPSTREAM AND DOWNSTREAM ANALYSIS

There is approximately 5.41 acres of upstream drainage basin to the south that enters the site (See basin map). The upstream basin is pasture and enters the site via the existing natural swale.

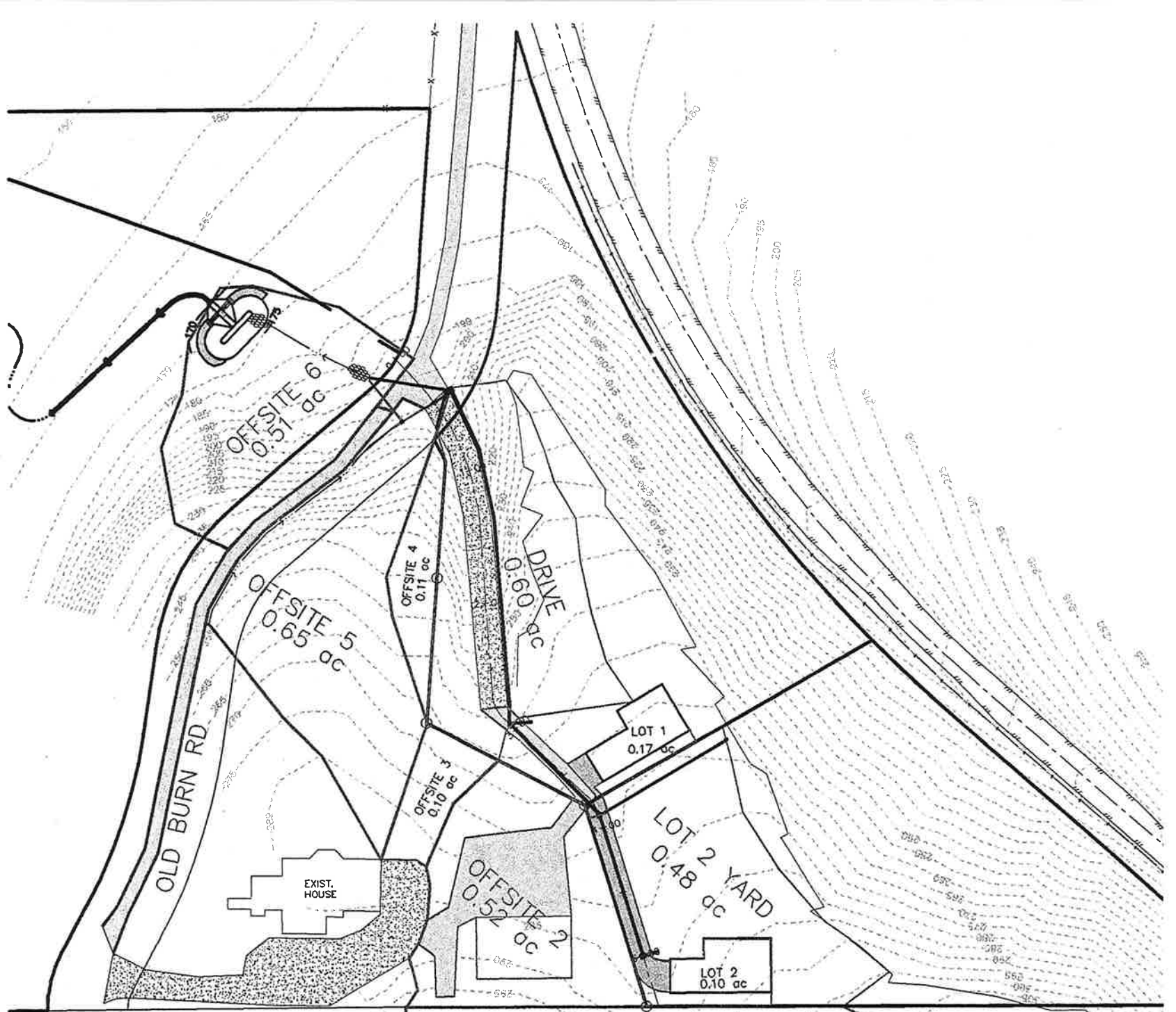
Downstream of the site, stormwater drains down an existing ditch to the south where it drains into Portage Creek approximately 1/3-mile southwest of the site. The existing ditch runs parallel to the east boundary line of Farmstead Estates. The ditch is approximately 4-ft. wide with 2:1 side slopes and slopes to the south at about 0.50%. The ditch is lined with short grass and weeds at the upstream end and immediately become engulfed by the forest with brush, weeds and tall grass.



Figure 1: Looking south at the beginning of existing ditch that runs parallel to the far west Jensen property line. To the left is the Jensen property. To the right is Farmstead Estates.



Figure 2: Looking south downstream of the ditch that runs parallel to the far west Jensen property line. To the left is the Jensen property. To the right is Farmstead Estates.



SCALE 1"=100'



OFFSITE 1
5.41 ac

RISK ASSESSMENT

Slope: Site slopes are 25 % and less, risk is high.

Critical Areas: Concrete driveway slab (25% slopes)

Soils: Soils consist of Tokul gravelly loam.

Ground Movement Potential: Potential ground movement in area of concrete driveway.

Source of Water Erosion: Rainfall.

Measures Proposed to Prevent/Minimize Erosion:

During Construction: Temporary construction BMP's, construction entrance, silt fence.

After Construction: Seeding and planting of exposed soils

Nearest Downstream body of water other than road ditches: Portage Creek (0.25 mi)

Nearest fish bearing water: Portage Creek (0.25 mi)

Conclusion: Potential for significant erosion/siltation impact onsite is **HIGH**.

Because of the following reasons:

1. Site slopes range from 0-25%.
2. Soils have high surface flow potential.

SOURCE CONTROL OF POLLUTION

The source control BMP recommended for this site would be good housekeeping. As construction occurs, other specific BMP's may be required for the site in accordance with the guidelines set forth in the City of Arlington Public Works Construction Standards and Specifications.

STREAMBANK EROSION CONTROL & WATER QUALITY BEST MANAGEMENT PLANS

The streambank erosion control BMP specified for this site is a detention pond. The pond will only have a live storage capacity. A weir will be located at downhill side of the pond where it will control the release flow. Two-year release will be limited to at most half of the existing 2-yr. runoff rate for the developed site. Ten-year and 100-yr. release rates will be limited to at most, the existing 10-yr. and 100-yr. runoff rates for the existing site.

Following the detention pond will be a prescribed length, slope and width of bioswale that will provide water quality treatment for the stormwater before it is released offsite. The size and length of the bioswale will be determined by the developed 6-month runoff rate for the entire basin, the slope at which the swale will be constructed, and the ability for the swale to handle the developed 100-yr. flow rate.

DRAINAGE MODEL METHODOLOGY & SUMMARY REPORT

The storm drainage modeling software used is StormSHED Rel. 6.1.6.3. The entire drainage basin for the site is divided into eleven sub-basins. Five of the sub-basins will contribute to the developed flow off the site: Lot 2 Sub-basin, Lot 2 Yard Sub-basin, and Old Burn Road Sub-basin, Driveway Sub-basin, and Lot 1 Sub-basin. The remaining six sub-basins (Offsite 1-6 Sub-basins) are offsite flow and will only be considered as pass-through flow in the drainage system (see basin map).

The drainage system is designed to provide streambank erosion control as well as water quality treatment. Streambank erosion control will be accomplished by the following:

- Developed 2-yr. runoff flow rate will be limited to half of the existing 2-yr. runoff flow rate for the developed areas. Since only three of the seven sub-basins are to be developed, after development, these three sub-basins must contribute at most half of the existing 2-yr. runoff rate. Therefore, the required developed 2-yr. runoff rate must be \leq the 2-yr. existing offsite sub-basins flow rate + $\frac{1}{2}$ (2-yr. existing flow rate for the Lots, Road, and Old Burn Road sub-basins). (See pages 26-27, 48).
- Developed 10-yr. runoff flow rate will be limited to less than or equal to the existing 10-yr. runoff rate for the entire basin. (See pages 28, 49)
- Developed 100-yr. runoff flow rate will be limited to less than or equal to the existing 100-yr. runoff rate for the entire basin. (See pages 29, 50)

Water quality treatment will be accomplished by the following:

- Passing the developed 6-month runoff rate through a bioswale. The bioswale dimensions will be determined by the developed 6-month runoff rate for the entire basin, bed slope of the swale, and the swale's ability to convey the developed 100-yr. runoff rate generated by a 100-yr. storm event. (See pages 47, 53)

STORM EVENT	BY-PASS FLOW	SITE FLOW	BASIN RELEASE RATE	POND STORAGE	POND STORAGE ELEVATION
	cfs	cfs	cfs	cf	ft
EX. 2-yr.	0.86	0.41	1.27	--	--
EX. 10-yr.	2.16	0.77	2.93	--	--
EX. 100-yr.	3.71	1.18	4.90	--	--
DEV. 2-yr.	--	--	1.04	723.67	170.16
DEV. 10-yr.	--	--	2.79	1381.66	171.21
DEV. 100-yr.	--	--	4.87	1830.96	171.92

Table 1: Calculations Summary. Refer to drainage model calculations (pages 11-51) for more detail.

2-YR. ORIFICE DESIGN CALCULATIONS

The design of the detention pond calls for a 6" diameter orifice to release the developed 2-yr. storm. To release the stormwater, a 6" standard perforation pipe will extend into the pond a designed length and be capped on the inside end. The standard perforation pipe has 1.88" x 0.125" slots, and 54 perforations/ft. The 2-yr. design flow is 1.04 cfs with a stage of 170.16' (pond bottom elv. = 169.00'). The flow relationship for a vertical orifice is as follows:

$$Q = CA\sqrt{2gh}$$

Where: C = Orifice Coefficient = 0.637
 A = Area of Orifice
 g = gravitational acceleration = 32.2 ft/ sec²
 h = difference in elv. between water stage and center of orifice

$$Q = 0.637 \times \frac{1.88 \times 0.125}{144} \times \sqrt{2 \times 32.2 \times (170.16 - (169 + 0.25))}$$

$$Q = 0.008 \text{ cfs}$$

$$\frac{1.04 \text{ cfs}}{0.008 \text{ cfs}} = 130 \text{ perforations / ft}$$

To avoid system failure a safety factor of 1.33 will be used; therefore:

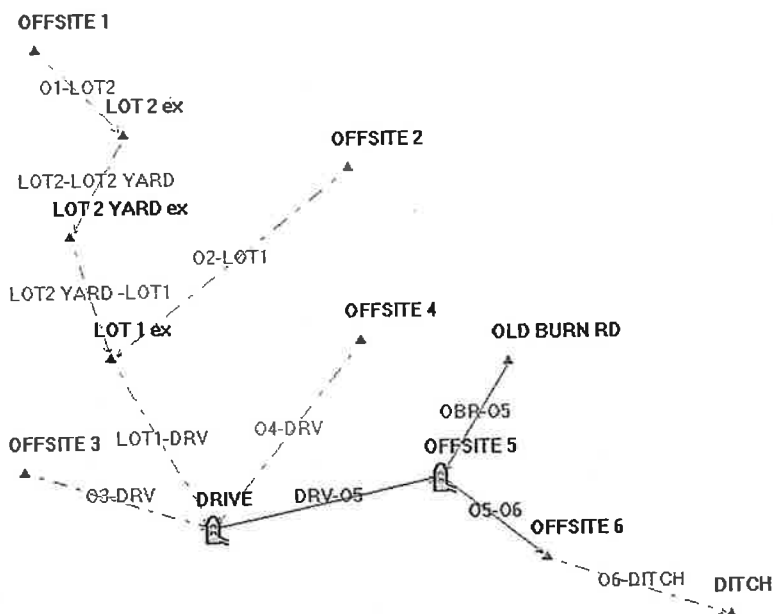
$$1.33 \times 130 = 173 \text{ perforations required}$$

$$\frac{173 \text{ perforations}}{54 \text{ perforations / ft}} = 3.2 \text{ ft.} \approx 4 \text{ ft. of perforation pipe}$$

Note: Perforation pipe specifications were obtained from the *Advanced Drainage Systems, Inc. Specifier Manual*.

DRAINAGE MODEL REPORT

EXISTING BASIN



Project Precip

[6 mo]	1.17 in
[2 yr]	1.80 in
[10 yr]	2.75 in
[100 yr]	3.75 in

Reach Records

Reach ID: DRV-05

Section Properties:

Shape:	Circular	Routing Method:	Travel Time Translation		
Size	Material	Mannings n	Hyd params By		
12" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
38.0000 ft	0.34 %	Groove End Projecting			
Diam					
1.0000 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
DRIVE	OFFSITE 5	195.7500 ft	195.6210 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
7.4200 ac	3.9116 cf	2.2566 cf	1.7334 ft/s	-1.0000 ft

Ent Loss	Exit Loss	Frict Loss	Start TW
0.077034 ft	0.385168 ft	0.388097 ft	197.1764 ft
comment:	Hydrograph not shifted, 4.82 min forwarded.Submerged or overtop bank condition.		

Reach ID: LOT1-DRV

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0160	Mannings Formula
Length	Slope	Entrance Loss		
255.0000 ft	24.19 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	0.00h:1v	0.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
LOT 1 ex	DRIVE	260.6200 ft	198.9360 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
6.6100 ac	3.4313 cf	3.4313 cf	4.8944 ft/s	0.0351 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	199.0331 ft	

Reach ID: LOT2 YARD -LOT1

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0250	Mannings Formula
Length	Slope	Entrance Loss		
94.2900 ft	14.05 %			
Width	Bank Hgt	ss1	ss2	
10.0000 ft	2.0000 ft	5.00h:1v	5.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
LOT 2 YARD ex LOT 1 ex		273.8700 ft	260.6220 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.9900 ac	3.0094 cf	3.0094 cf	3.8729 ft/s	0.0749 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	260.7599 ft	

Reach ID: LOT2-LOT2 YARD

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0250	Mannings Formula
Length	Slope	Entrance Loss		
110.0000 ft	8.55 %			

Width	Bank Hgt	ss1	ss2	
10.0000 ft	2.0000 ft	5.00h:1v	5.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
LOT 2 ex	LOT 2 YARD ex		283.2800 ft	273.8750 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.5100 ac	2.7569 cf	2.7569 cf	3.2129 ft/s	0.0824 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	274.0079 ft	

Reach ID: O1-LOT2

Section Properties:

Shape:	Ditch	Routing Method:	Travel Time Translation
Size	Material	Hyd params By	
	Corr Metal - normal	0.0250	Mannings Formula

Length	Slope	Entrance Loss
38.6200 ft	7.04 %	

Width	Bank Hgt	ss1	ss2
10.0000 ft	2.0000 ft	5.00h:1v	5.00h:1v
Up Node	Dn Node	Up Invert	Dn Invert
OFFSITE 1	LOT 2 ex	286.0000 ft	283.2810 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.4100 ac	2.7015 cf	2.7015 cf	3.0020 ft/s	0.0863 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	283.4102 ft	

Reach ID: O2-LOT1

Section Properties:

Shape:	Ditch	Routing Method:	Travel Time Translation
Size	Material	Hyd params By	
	Corr Metal - normal	0.0250	Mannings Formula

Length	Slope	Entrance Loss
44.5900 ft	15.50 %	

Width	Bank Hgt	ss1	ss2
10.0000 ft	1.0000 ft	5.00h:1v	5.00h:1v
Up Node	Dn Node	Up Invert	Dn Invert
OFFSITE 2	LOT 1 ex	267.5310 ft	260.6200 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
-----------	------	----------	----------	--------------

0.5200 ac	0.3588 cf	0.3588 cf	1.7398 ft/s	0.0204 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	260.7170 ft	

Reach ID: O3-DRV

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0160	Mannings Formula
Length	Slope	Entrance Loss		
260.0000 ft	25.41 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	0.00h:1v	0.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
OFFSITE 3	DRIVE	265.0000 ft	198.9340 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1000 ac	0.0576 cf	0.0576 cf	0.9736 ft/s	0.0030 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	198.9404 ft	

Reach ID: O4-DRV

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0160	Mannings Formula
Length	Slope	Entrance Loss		
43.0000 ft	25.74 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	0.00h:1v	0.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
OFFSITE 4	DRIVE	210.0000 ft	198.9320 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1100 ac	0.0586 cf	0.0586 cf	0.9800 ft/s	0.0030 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	198.9384 ft	

Reach ID: O5-O6

Section Properties:

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
12" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
39.0000 ft	11.54 %	Groove End Projecting		

Diam
1.0000 ft
Up Node Dn Node Up Invert Dn Invert
OFFSITE 5 OFFSITE 6 195.5700 ft 191.0690 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
8.5980 ac	4.7169 cf	13.1469 cf	15.3582 ft/s	0.4140 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.732531 ft	3.662653 ft	0.579191 ft	191.9697 ft	

Reach ID: O6-DITCH

Section Properties:

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0950	Mannings Formula
Length	Slope	Entrance Loss		
275.0000 ft	7.50 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	5.00h:1v	5.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
OFFSITE 6	DITCH	170.0000 ft	149.3750 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
9.0180 ac	4.8982 cf	4.8982 cf	1.3201 ft/s	0.1776 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	149.5526 ft	

Reach ID: OBR-O5

Section Properties:

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
12" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
6.2700 ft	25.68 %	Groove End Projecting		

Diam
1.0000 ft
Up Node Dn Node Up Invert Dn Invert
OLD BURN RD OFFSITE 5 197.3600 ft 195.7500 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
-----------	------	----------	----------	--------------

0.5280 ac	0.4500 cf	19.6119 cf	10.3033 ft/s	0.1046 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.001019 ft	0.005097 ft	0.000847 ft	197.1764 ft	

Node Records

Node ID: DITCH

Start El:	162.8400 ft	Max El:	165.0000 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	149.5526 ft		

Node ID: DRIVE

Start El:	195.7500 ft	Max El:	198.9300 ft
Contrib Basin:	DRIVE	Contrib Hyd:	
Hgl Elev:	198.0267 ft		
Struct Type:	AREA INLET- 24	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	0.0000 ft	Bot Area:	3.1416 sf
Condition:	No particular shape.	Status:	Existing Structure
Approach Credit:	0.0000 ft		

Node ID: LOT 1 ex

Start El:	260.6200 ft	Max El:	290.0000 ft
Contrib Basin:	LOT 1 ex	Contrib Hyd:	
Hgl Elev:	260.7170 ft		

Node ID: LOT 2 YARD ex

Start El:	273.8700 ft	Max El:	290.0000 ft
Contrib Basin:	LOT 2 YARD ex	Contrib Hyd:	
Hgl Elev:	274.0079 ft		

Node ID: LOT 2 ex

Start El:	283.2800 ft	Max El:	290.0000 ft
Contrib Basin:	LOT 2 ex	Contrib Hyd:	
Hgl Elev:	283.4102 ft		

Node ID: OFFSITE 1

Start El:	286.0000 ft	Max El:	290.0000 ft
Contrib Basin:	OFFSITE 1	Contrib Hyd:	
Hgl Elev:	286.1285 ft		

Node ID: OFFSITE 2

Start El:	267.5300 ft	Max El:	290.0000 ft
Contrib Basin:	OFFSITE 2	Contrib Hyd:	
Hgl Elev:	267.5650 ft		

Node ID: OFFSITE 3

Start El:	265.0000 ft	Max El:	290.0000 ft
Contrib Basin:	OFFSITE 3	Contrib Hyd:	
Hgl Elev:	265.0063 ft		

Node ID: OFFSITE 4

Start El: 210.0000 ft
Contrib Basin: OFFSITE 4
Hgl Elev: 210.0063 ft

Max El: 290.0000 ft
Contrib Hyd:

Node ID: OFFSITE 5

Start El: 195.6200 ft
Contrib Basin: OFFSITE 5
Hgl Elev: 197.1764 ft
Struct Type: AREA INLET- 24
Ke Descrip: CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5
Catch Depth: 0.0000 ft
Condition: No particular shape.
Approach Credit: 0.3852 ft
Bend Loss: 0.1804 ft

Max El: 198.6700 ft
Contrib Hyd:
Classification Catch Basin
Bot Area: 3.1416 sf
Status: Proposed Structure
Junction Loss: 0.0354 ft

Node ID: OFFSITE 6

Start El: 170.0000 ft
Contrib Basin: OFFSITE 6
Hgl Elev: 170.1776 ft

Max El: 290.0000 ft
Contrib Hyd:

Node ID: OLD BURN RD

Start El: 198.9100 ft
Contrib Basin: OLD BURN RD
Hgl Elev: 197.6100 ft

Max El: 290.0000 ft
Contrib Hyd:

Contributing Drainage Areas

Drainage Area: DRIVE

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.4800 ac	85.00	0.12 hrs
Impervious	0.1200 ac	98.00	0.02 hrs
Total	0.6000 ac		

Supporting Data:

Pervious CN Data:
HILLSIDE 85.00 0.4800 ac

Impervious CN Data:
CONC DRV 98.00 0.1200 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILLSIDE	114.00 ft	16.00%	0.1500	6.31 min
Sheet	DOWN CONC DRIVE	179.00 ft	25.00%	0.0110	0.94 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN CONC DRV	239.00 ft	25.00%	0.0110	1.18 min

Drainage Area: LOT 1 ex

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.0800 ac	86.00	0.10 hrs
Impervious	0.0200 ac	98.00	0.01 hrs
Total	0.1000 ac		

Supporting Data:

Pervious CN Data:
GRASS 86.00 0.0800 ac

Impervious CN Data:
EX DRV 98.00 0.0200 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILL	100.00 ft	15.00%	0.1500	5.84 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN EX DRV	82.00 ft	15.00%	0.0110	0.62 min

Drainage Area: LOT 2 YARD ex

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.4800 ac	85.00	0.21 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.4800 ac		

Supporting Data:

Pervious CN Data:
PASTURE 85.00 0.4800 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
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Sheet DOWN HILL 230.00 ft 11.00% 0.1500 12.86 min

Drainage Area: LOT 2 ex

Hyd Method: SCS Unit Hyd
 Peak Factor: 484.00
 Storm Dur: 24.00 hrs
 Area CN
 Pervious 0.1000 ac 85.00
 Impervious 0.0000 ac 98.00
 Total 0.1000 ac

Loss Method: SCS CN Number
 SCS Abs: 0.20
 Intv: 10.00 min
 TC
 0.07 hrs
 0.00 hrs

Supporting Data:

Pervious CN Data:
 PASTURE 85.00 0.1000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILL	70.00 ft	15.00%	0.1500	4.39 min

Drainage Area: OFFSITE 1

Hyd Method: SCS Unit Hyd
 Peak Factor: 484.00
 Storm Dur: 24.00 hrs
 Area CN
 Pervious 5.4100 ac 85.00
 Impervious 0.0000 ac 0.00
 Total 5.4100 ac

Loss Method: SCS CN Number
 SCS Abs: 0.20
 Intv: 10.00 min
 TC
 0.29 hrs
 0.00 hrs

Supporting Data:

Pervious CN Data:
 TOP OF HILL 85.00 5.4100 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	300.00 ft	13.00%	0.1500	13.78 min
Shallow	None Entered	575.00 ft	13.00%	11.0000	2.42 min

Drainage Area: OFFSITE 2

Hyd Method: SCS Unit Hyd
 Peak Factor: 484.00
 Storm Dur: 24.00 hrs
 Area CN
 Pervious 0.2900 ac 86.00
 Impervious 0.2300 ac 98.00
 Total 0.5200 ac

Loss Method: SCS CN Number
 SCS Abs: 0.20
 Intv: 10.00 min
 TC
 0.17 hrs
 0.13 hrs

Supporting Data:

Pervious CN Data:
 LAWN 86.00 0.2900 ac

Impervious CN Data:
 EX. GARAGE AND DRIVEWAY 98.00 0.2300 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	40.00 ft	15.00%	0.1500	2.80 min
Sheet	ACCROSS DRV	30.00 ft	2.00%	0.0110	0.62 min
Sheet	DOWN YARD	125.00 ft	16.00%	0.1500	6.80 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	ACROSS DRV	62.00 ft	2.00%	0.0110	1.10 min
Sheet	DOWN YARD	125.00 ft	16.00%	0.1500	6.80 min

Drainage Area: OFFSITE 3

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.1000 ac	86.00	0.09 hrs
Impervious	0.0000 ac	0.00	0.00 hrs
Total	0.1000 ac		

Supporting Data:

Pervious CN Data:
GRASSY AREA, A FEW TREES 86.00 0.1000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	107.00 ft	20.00%	0.1500	5.49 min

Drainage Area: OFFSITE 4

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.1100 ac	85.00	0.19 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.1100 ac		

Supporting Data:

Pervious CN Data:
DENSE GRASS/SOME TREES 85.00 0.1100 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	145.00 ft	44.80%	0.4000	11.11 min

Drainage Area: OFFSITE 5

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.6500 ac	85.00	0.11 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.6500 ac		

Supporting Data:

Pervious CN Data:
DENSE GRASS/ SOME TREES 85.00 0.6500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILLSIDE	138.00 ft	22.00%	0.1500	6.48 min
Channel	DITCH	197.00 ft	25.00%	17.0000	0.39 min

Drainage Area: OFFSITE 6

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.4200 ac	81.00	0.19 hrs
Impervious	0.0000 ac	98.00	0.00 hrs

Total 0.4200 ac

Supporting Data:

Pervious CN Data:

DENSE BRUSH AREA 81.00 0.4200 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	145.00 ft	44.80%	0.4000	11.11 min

Drainage Area: OLD BURN RD

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.0000 ac	78.00	0.00 hrs
Impervious	0.5280 ac	98.00	0.02 hrs
Total	0.5280 ac		

Supporting Data:

Impervious CN Data:

OLD BURN ROAD 98.00 0.5280 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	CROSSING THE ROAD	25.00 ft	2.00%	0.0110	0.53 min
Channel	DITCH	431.00 ft	20.00%	17.0000	0.94 min

Layout Hydrographs

Hydrograph ID: DITCH - 100 yr

Area:	9.0180 ac	Hyd Int:	10.00 min	Base Flow:	
Pending tt translation:	8.33 min	Peak Time:	8.00 hrs	Hyd Vol:	1.7557 acft
Peak Flow:	4.8982 cfs	Flow		Time	
Time	Flow	Time	Flow	Time	Flow
hr	cfs	hr	cfs	hr	cfs
0.67	0.0002	9.00	2.0168	17.00	0.8731
0.83	0.0141	9.17	1.8045	17.17	0.8502
1.00	0.0222	9.33	1.6095	17.33	0.8267
1.17	0.0343	9.50	1.5517	17.50	0.8196
1.33	0.0419	9.67	1.4841	17.67	0.8192
1.50	0.0480	9.83	1.4281	17.83	0.8200
1.67	0.0570	10.00	1.4150	18.00	0.8210
1.83	0.0621	10.17	1.3519	18.17	0.7975
2.00	0.0662	10.33	1.2934	18.33	0.7739
2.17	0.0742	10.50	1.2776	18.50	0.7665
2.33	0.0779	10.67	1.2343	18.67	0.7659
2.50	0.0807	10.83	1.1952	18.83	0.7665
2.67	0.0832	11.00	1.1849	19.00	0.7673
2.83	0.0854	11.17	1.1641	19.17	0.7435
3.00	0.0873	11.33	1.1457	19.33	0.7197
3.17	0.0890	11.50	1.1421	19.50	0.7120
3.33	0.0905	11.67	1.1217	19.67	0.7112
3.50	0.0926	11.83	1.1026	19.83	0.7116
3.67	0.1074	12.00	1.0983	20.00	0.7122
3.83	0.1341	12.17	1.0772	20.17	0.7129
4.00	0.1585	12.33	1.0573	20.33	0.7135
4.17	0.1965	12.50	1.0524	20.50	0.7141
4.33	0.2265	12.67	1.0308	20.67	0.7147
4.50	0.2536	12.83	1.0101	20.83	0.7153
4.67	0.2986	13.00	1.0048	21.00	0.7159
4.83	0.3360	13.17	1.0059	21.17	0.7165
5.00	0.3676	13.33	1.0081	21.33	0.7171
5.17	0.4176	13.50	1.0104	21.50	0.7177
5.33	0.4604	13.67	0.9891	21.67	0.7183
5.50	0.4948	13.83	0.9678	21.83	0.7188
5.67	0.5494	14.00	0.9620	22.00	0.7194
5.83	0.5970	14.17	0.9626	22.17	0.6951
6.00	0.6338	14.33	0.9643	22.33	0.6705
6.17	0.7194	14.50	0.9662	22.50	0.6626
6.33	0.7939	14.67	0.9442	22.67	0.6616
6.50	0.8435	14.83	0.9223	22.83	0.6618
6.67	0.9705	15.00	0.9160	23.00	0.6623
6.83	1.0830	15.17	0.9161	23.17	0.6627
7.00	1.1515	15.33	0.9175	23.33	0.6632
7.17	1.3128	15.50	0.9190	23.50	0.6636
7.33	1.4594	15.67	0.8967	23.67	0.6641
7.50	1.5456	15.83	0.8741	23.83	0.6645
7.67	2.9025	16.00	0.8672	24.00	0.6649
7.83	4.2392	16.17	0.8671	24.17	0.3398
8.00	4.8982	16.33	0.8682	24.33	0.0825
8.17	4.0063	16.50	0.8694	24.50	0.0121
8.33	3.0164	16.67	0.8707	24.67	0.0013
8.50	2.7021	16.83	0.8719	24.83	0.0001
8.67	2.3725	17.00	0.8731	25.00	0.0000
8.83	2.0942	17.17	0.8502	25.17	0.0000

Hydrograph ID: DITCH - 10 yr

Area:	9.0880 ac	Hyd Int:	10.00 min	Base Flow:	
Pending tt translation:	0.78 min				
Peak Flow:	2.7900 cfs	Peak Time:	8.00 hrs	Hyd Vol:	1.1392 acft
Time	Flow	Time	Flow	Time	Flow
hr	cfs	hr	cfs	hr	cfs
1.17	0.0205	9.33	1.1368	17.33	0.5818
1.33	0.0239	9.50	1.0780	17.50	0.5719
1.50	0.0338	9.67	1.0471	17.67	0.5659
1.67	0.0370	9.83	1.0129	17.83	0.5639
1.83	0.0476	10.00	0.9832	18.00	0.5630
2.00	0.0453	10.17	0.9551	18.17	0.5586
2.17	0.0585	10.33	0.9223	18.33	0.5474
2.33	0.0565	10.50	0.8926	18.50	0.5365
2.50	0.0674	10.67	0.8666	18.67	0.5305
2.67	0.0605	10.83	0.8404	18.83	0.5287
2.83	0.0740	11.00	0.8181	19.00	0.5279
3.00	0.0641	11.17	0.8014	19.17	0.5227
3.17	0.0785	11.33	0.7859	19.33	0.5112
3.33	0.0676	11.50	0.7748	19.50	0.4999
3.50	0.0828	11.67	0.7653	19.67	0.4939
3.67	0.0740	11.83	0.7544	19.83	0.4916
3.83	0.0907	12.00	0.7456	20.00	0.4911
4.00	0.0785	12.17	0.7370	20.17	0.4911
4.17	0.1002	12.33	0.7261	20.33	0.4920
4.33	0.0932	12.50	0.7169	20.50	0.4925
4.50	0.1025	12.67	0.7082	20.67	0.4930
4.67	0.1121	12.83	0.6965	20.83	0.4934
4.83	0.1352	13.00	0.6873	21.00	0.4939
5.00	0.1549	13.17	0.6816	21.17	0.4948
5.17	0.1814	13.33	0.6799	21.33	0.4953
5.33	0.2072	13.50	0.6799	21.50	0.4957
5.50	0.2292	13.67	0.6769	21.67	0.4967
5.67	0.2556	13.83	0.6684	21.83	0.4971
5.83	0.2852	14.00	0.6601	22.00	0.4976
6.00	0.3112	14.17	0.6553	22.17	0.4925
6.17	0.3473	14.33	0.6535	22.33	0.4803
6.33	0.3906	14.50	0.6539	22.50	0.4683
6.50	0.4269	14.67	0.6504	22.67	0.4624
6.67	0.4760	14.83	0.6412	22.83	0.4604
6.83	0.5365	15.00	0.6319	23.00	0.4594
7.00	0.5892	15.17	0.6268	23.17	0.4594
7.17	0.6518	15.33	0.6246	23.33	0.4604
7.33	0.7267	15.50	0.6246	23.50	0.4604
7.50	0.7951	15.67	0.6209	23.67	0.4609
7.67	1.0174	15.83	0.6113	23.83	0.4614
7.83	1.9505	16.00	0.6015	24.00	0.4614
8.00	2.7900	16.17	0.5962	24.17	0.3811
8.17	2.7380	16.33	0.5938	24.33	0.1656
8.33	2.1804	16.50	0.5931	24.50	0.0000
8.50	1.8104	16.67	0.5938	24.67	0.0076
8.67	1.6200	16.83	0.5946	24.83	0.0000
8.83	1.4386	17.00	0.5958	25.00	0.0000
9.00	1.3364	17.17	0.5923	25.17	0.0000
9.17	1.2479	17.33	0.5818	25.33	0.0000

Hydrograph ID: DITCH - 2 yr

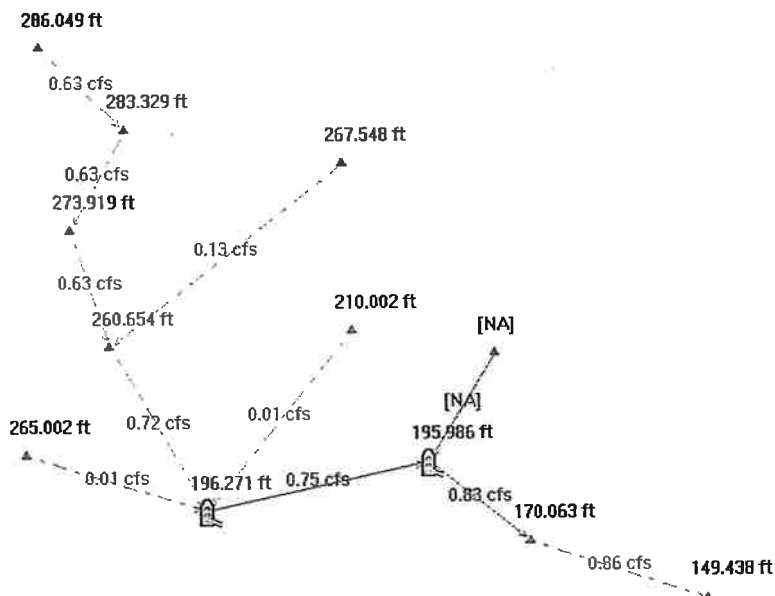
Area:	9.0880 ac	Hyd Int:	10.00 min	Base Flow:	
Pending translation:	1.09 min	Peak Time:	8.17 hrs	Hyd Vol:	0.5724 acft
Peak Flow:	1.0423 cfs	Time	Flow	Time	Flow
Time	Flow	Time	Flow	Time	Flow
hr	cfs	hr	cfs	hr	cfs
1.50	0.0023	9.50	0.5512	17.33	0.3177
1.67	0.0131	9.67	0.5183	17.50	0.3127
1.83	0.0185	9.83	0.4930	17.67	0.3105
2.00	0.0200	10.00	0.4789	17.83	0.3112
2.17	0.0254	10.17	0.4673	18.00	0.3119
2.33	0.0262	10.33	0.4504	18.17	0.3082
2.50	0.0321	10.50	0.4391	18.33	0.3007
2.67	0.0302	10.67	0.4296	18.50	0.2954
2.83	0.0364	10.83	0.4177	18.67	0.2931
3.00	0.0338	11.00	0.4100	18.83	0.2931
3.17	0.0400	11.17	0.4055	19.00	0.2938
3.33	0.0370	11.33	0.3999	19.17	0.2907
3.50	0.0427	11.50	0.3976	19.33	0.2819
3.67	0.0424	11.67	0.3941	19.50	0.2762
3.83	0.0478	11.83	0.3900	19.67	0.2737
4.00	0.0452	12.00	0.3865	19.83	0.2745
4.17	0.0545	12.17	0.3835	20.00	0.2754
4.33	0.0545	12.33	0.3775	20.17	0.2754
4.50	0.0581	12.50	0.3745	20.33	0.2762
4.67	0.0605	12.67	0.3708	20.50	0.2762
4.83	0.0676	12.83	0.3652	20.67	0.2770
5.00	0.0641	13.00	0.3608	20.83	0.2778
5.17	0.0740	13.17	0.3602	21.00	0.2778
5.33	0.0740	13.33	0.3615	21.17	0.2787
5.50	0.0740	13.50	0.3627	21.33	0.2795
5.67	0.0855	13.67	0.3615	21.50	0.2795
5.83	0.0800	13.83	0.3557	21.67	0.2803
6.00	0.0907	14.00	0.3512	21.83	0.2811
6.17	0.0979	14.17	0.3505	22.00	0.2811
6.33	0.1151	14.33	0.3512	22.17	0.2778
6.50	0.1335	14.50	0.3525	22.33	0.2678
6.67	0.1662	14.67	0.3505	22.50	0.2626
6.83	0.1970	14.83	0.3440	22.67	0.2600
7.00	0.2180	15.00	0.3393	22.83	0.2600
7.17	0.2547	15.17	0.3386	23.00	0.2609
7.33	0.2969	15.33	0.3386	23.17	0.2609
7.50	0.3304	15.50	0.3400	23.33	0.2609
7.67	0.5008	15.67	0.3373	23.50	0.2618
7.83	0.7416	15.83	0.3304	23.67	0.2626
8.00	0.9460	16.00	0.3255	23.83	0.2626
8.17	1.0423	16.17	0.3241	24.00	0.2626
8.33	1.0174	16.33	0.3241	24.17	0.1965
8.50	0.9525	16.50	0.3255	24.33	0.0283
8.67	0.8786	16.67	0.3262	24.50	0.0075
8.83	0.7963	16.83	0.3276	24.67	0.0000
9.00	0.7273	17.00	0.3283	24.83	0.0000
9.17	0.6670	17.17	0.3255	25.00	0.0000
9.33	0.6019	17.33	0.3177	25.17	0.0000

Hydrograph ID: DITCH - 6 mo

Area:	9.0880 ac	Hyd Int:	10.00 min	Base Flow:	
Pending translation:	1.54 min	Peak Flow:	0.3941 cfs	Peak Time:	8.17 hrs
Time	Flow	Time	Flow	Hyd Vol:	0.2569 acft
hr	cfs	hr	cfs	Time	Flow
				hr	cfs
2.17	0.0021	10.00	0.2028	17.67	0.1541
2.33	0.0012	10.17	0.1994	17.83	0.1556
2.50	0.0029	10.33	0.1924	18.00	0.1556
2.67	0.0076	10.50	0.1900	18.17	0.1526
2.83	0.0169	10.67	0.1875	18.33	0.1488
3.00	0.0130	10.83	0.1826	18.50	0.1465
3.17	0.0185	11.00	0.1814	18.67	0.1465
3.33	0.0169	11.17	0.1814	18.83	0.1481
3.50	0.0200	11.33	0.1788	19.00	0.1481
3.67	0.0200	11.50	0.1801	19.17	0.1450
3.83	0.0236	11.67	0.1788	19.33	0.1402
4.00	0.0214	11.83	0.1762	19.50	0.1385
4.17	0.0283	12.00	0.1775	19.67	0.1385
4.33	0.0278	12.17	0.1749	19.83	0.1385
4.50	0.0294	12.33	0.1736	20.00	0.1393
4.67	0.0321	12.50	0.1730	20.17	0.1402
4.83	0.0354	12.67	0.1710	20.33	0.1402
5.00	0.0338	12.83	0.1696	20.50	0.1402
5.17	0.0414	13.00	0.1683	20.67	0.1410
5.33	0.0385	13.17	0.1683	20.83	0.1418
5.50	0.0427	13.33	0.1710	21.00	0.1418
5.67	0.0453	13.50	0.1717	21.17	0.1418
5.83	0.0478	13.67	0.1703	21.33	0.1434
6.00	0.0476	13.83	0.1669	21.50	0.1434
6.17	0.0565	14.00	0.1669	21.67	0.1434
6.33	0.0565	14.17	0.1669	21.83	0.1434
6.50	0.0603	14.33	0.1683	22.00	0.1450
6.67	0.0693	14.50	0.1696	22.17	0.1410
6.83	0.0740	14.67	0.1669	22.33	0.1369
7.00	0.0725	14.83	0.1642	22.50	0.1335
7.17	0.0907	15.00	0.1635	22.67	0.1335
7.33	0.0907	15.17	0.1635	22.83	0.1352
7.50	0.0932	15.33	0.1642	23.00	0.1335
7.67	0.2016	15.50	0.1656	23.17	0.1352
7.83	0.3082	15.67	0.1628	23.33	0.1352
8.00	0.3835	15.83	0.1599	23.50	0.1352
8.17	0.3941	16.00	0.1585	23.67	0.1369
8.33	0.3460	16.17	0.1585	23.83	0.1352
8.50	0.3199	16.33	0.1585	24.00	0.1369
8.67	0.2977	16.50	0.1599	24.17	0.0841
8.83	0.2712	16.67	0.1614	24.33	0.0000
9.00	0.2618	16.83	0.1614	24.50	0.0176
9.17	0.2465	17.00	0.1628	24.67	0.0000
9.33	0.2231	17.17	0.1599	24.83	0.0000
9.50	0.2148	17.33	0.1556	25.00	0.0000
9.67	0.2094	17.50	0.1541	25.17	0.0000
9.83	0.2039	17.67	0.1541	25.33	0.0000

2-YEAR EXISTING

OFFSITE BASINS ONLY



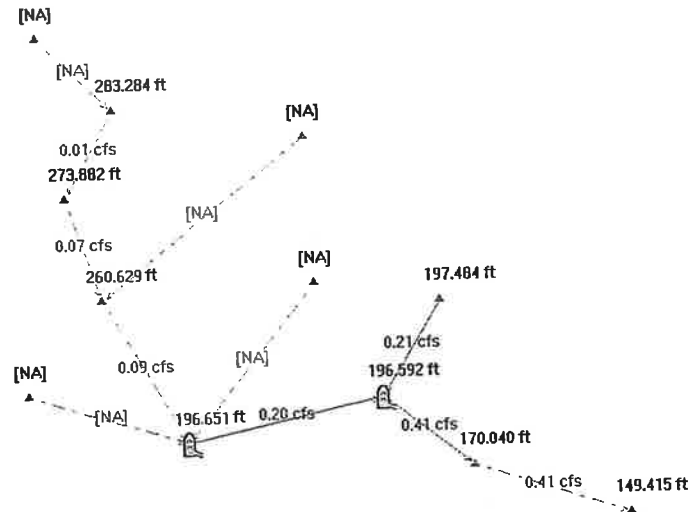
ROUTEHYD THRU [EXISTING] USING TYPE1A AND [2 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O3-DRV	0.1000	0.0148	---	1.00	0.0013	Ditch	0.5653	---	OFFSITE 3
O4-DRV	0.1100	0.0135	---	1.00	0.0012	Ditch	0.5527	---	OFFSITE 4
O2-LOT1	0.5200	0.1308	---	1.00	0.0111	Ditch	1.1678	---	OFFSITE 2
O1-LOT2	5.4100	0.6314	---	1.00	0.0362	Ditch	1.7108	---	OFFSITE 1
LOT2-LOT2 YARD	5.4100	0.6314	---	1.00	0.0342	Ditch	1.8153	---	
LOT2 YARD -LOT1	5.4100	0.6314	---	1.00	0.0295	Ditch	2.1106	---	
LOT1-DRV	5.9300	0.7197	---	1.00	0.0137	Ditch	2.6232	---	
DRV-O5	6.1400	0.7480	2.2566	0.33	0.3964	12" Diam	2.5805	2.8732	
OBR-O5	0.0000	0.0000	19.6119	0.00	0.0000	12" Diam	10.3033	24.9706	
O5-O6	6.7900	0.8328	13.1469	0.06	0.1706	12" Diam	9.3593	16.7392	OFFSITE 5
O6-DITCH	7.2100	0.8616	---	1.00	0.0630	Ditch	0.6735	---	OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max EI/ Rim EI ft
	DITCH					149.4380	
OFFSITE 6	DITCH	170.0630	-na-	-na-	-na-	170.0630	290.0000
OFFSITE 5	OFFSITE 6	196.0409	0.1034	0.0484	---	195.9860	198.6700
DRIVE	OFFSITE 5	196.2705	---	---	---	196.2705	198.9300
OFFSITE 3	DRIVE	265.0020	-na-	-na-	-na-	265.0020	290.0000
OFFSITE 4	DRIVE	210.0020	-na-	-na-	-na-	210.0020	290.0000
LOT 1 ex	DRIVE	260.6543	-na-	-na-	-na-	260.6542	290.0000
OFFSITE 2	LOT 1 ex	267.5483	-na-	-na-	-na-	267.5483	290.0000
LOT 2 YARD ex	LOT 1 ex	273.9194	-na-	-na-	-na-	273.9194	290.0000
LOT 2 ex	LOT 2 YARD ex	283.3294	-na-	-na-	-na-	283.3294	290.0000
OFFSITE 1	LOT 2 ex	286.0494	-na-	-na-	-na-	286.0494	290.0000
OLD BURN RD	OFFSITE 5	0.0000	-na-	-na-	-na-	0.0000	290.0000

2-YEAR EXISTING

EXCLUDING ALL OFFSITE BASINS



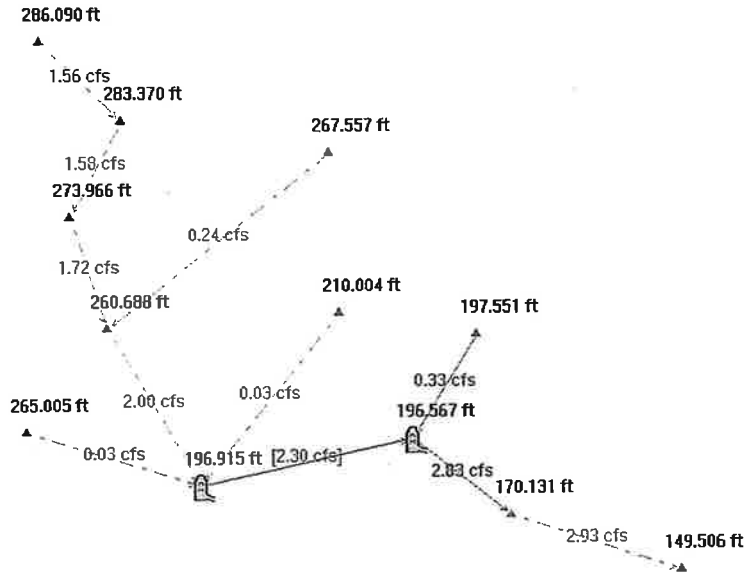
ROUTEHYD [] THRU [EXISTING] USING TYPE1A AND [2 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O3-DRV	0.0000	0.0000	---	0.00	0.0000	Ditch	0.9736	---	
O4-DRV	0.0000	0.0000	---	0.00	0.0000	Ditch	1.7398	---	
O2-LOT1	0.0000	0.0000	---	0.00	0.0000	Ditch	3.0020	---	
O1-LOT2	0.0000	0.0000	---	0.00	0.0000	Ditch	0.3937	---	LOT 2 ex
LOT2-LOT2 YARD	0.1000	0.0135	---	1.00	0.0034	Ditch	0.8874	---	LOT 2 YARD ex
LOT2 YARD -LOT1	0.5800	0.0707	---	1.00	0.0079	Ditch	1.1436	---	LOT 1 ex
LOT1-DRV	0.6800	0.0904	---	1.00	0.0040	Ditch	1.7733	2.8732	DRIVE
DRV-O5	1.2800	0.2000	2.2566	0.09	0.2012	12" Diam	8.1708	24.9706	OLD BURN RD
OBR-O5	0.5280	0.2080	19.6119	0.01	0.0725	12" Diam	7.5640	16.7392	
O5-O6	1.8080	0.4080	13.1469	0.03	0.1208	12" Diam	0.5016	---	
O6-DITCH	1.8080	0.4080	---	1.00	0.0403	Ditch	---	---	

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
						149.4153	
OFFSITE 6	DITCH	170.0403	--na--	--na--	--na--	170.0403	290.0000
OFFSITE 5	OFFSITE 6	195.8716	1.0367	1.1991	0.5581	196.5920	198.6700
DRIVE	OFFSITE 5	196.6513	---	---	---	196.6513	198.9300
OFFSITE 3	DRIVE	0.0000	--na--	--na--	--na--	0.0000	290.0000
OFFSITE 4	DRIVE	0.0000	--na--	--na--	--na--	0.0000	290.0000
LOT 1 ex	DRIVE	260.6285	--na--	--na--	--na--	260.6285	290.0000
OFFSITE 2	LOT 1 ex	0.0000	--na--	--na--	--na--	0.0000	290.0000
LOT 2 YARD ex	LOT 1 ex	273.8817	--na--	--na--	--na--	273.8817	290.0000
LOT 2 ex	LOT 2 YARD ex	283.2839	--na--	--na--	--na--	283.2839	290.0000
OFFSITE 1	LOT 2 ex	0.0000	--na--	--na--	--na--	0.0000	290.0000
OLD BURN RD	OFFSITE 5	197.4841	--na--	--na--	--na--	197.4841	290.0000

Based on the above existing basin model calculations, the existing 2-yr. flow for the entire basin excluding the developed basins is 0.86 cfs. The existing 2-yr. flow for only the developed basins is 0.41 cfs. Therefore, the required developed 2-yr. flow must be $\leq 0.86 \text{ cfs} + \frac{1}{2}(0.41 \text{ cfs}) = 1.06 \text{ cfs}$.

10-YEAR EXISTING (ENTIRE BASIN) CALCULATIONS



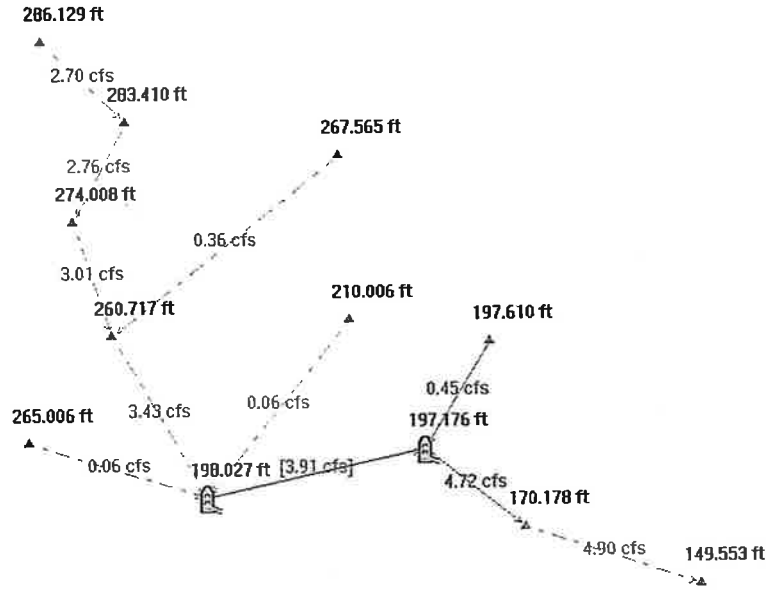
ROUTEHYD THRU [EXISTING] USING TYPE1A AND [10 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O3-DRV	0.1000	0.0346	—	1.00	0.0022	Ditch	0.7873	—	OFFSITE 3
O4-DRV	0.1100	0.0340	—	1.00	0.0022	Ditch	0.7855	—	OFFSITE 4
O2-LOT1	0.5200	0.2388	—	1.00	0.0160	Ditch	1.4814	—	OFFSITE 2
O1-LOT2	5.4100	1.5612	—	1.00	0.0622	Ditch	2.4330	—	OFFSITE 1
LOT2-LOT2 YARD	5.5100	1.5778	—	1.00	0.0591	Ditch	2.5928	—	LOT 2 ex
LOT2 YARD -LOT1	5.9900	1.7235	—	1.00	0.0537	Ditch	3.1240	—	LOT 2 YARD ex
LOT1-DRV	6.6100	2.0023	—	1.00	0.0254	Ditch	3.9477	—	LOT 1 ex
DRV-O5	7.4200	2.2986	2.2566	1.02	-1.0000	12" Diam	1.0186	2.8732	DRIVE
OBR-O5	0.5280	0.3265	19.6119	0.02	0.0898	12" Diam	9.3488	24.9706	OLD BURN RD
O5-O6	8.5980	2.8336	13.1469	0.22	0.3153	12" Diam	13.3475	16.7392	OFFSITE 5
O6-DITCH	9.0180	2.9295	—	1.00	0.1308	Ditch	1.0843	—	OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
—	DITCH	—	—	—	—	149.5058	—
OFFSITE 6	DITCH	170.1308	-na-	-na-	-na-	170.1308	290.0000
OFFSITE 5	OFFSITE 6	196.6230	0.1330	0.0623	0.0149	196.5672	198.6700
DRIVE	OFFSITE 5	196.9146	—	—	—	196.9146	198.9300
OFFSITE 3	DRIVE	265.0049	-na-	-na-	-na-	265.0049	290.0000
OFFSITE 4	DRIVE	210.0044	-na-	-na-	-na-	210.0044	290.0000
LOT 1 ex	DRIVE	260.6878	-na-	-na-	-na-	260.6878	290.0000
OFFSITE 2	LOT 1 ex	267.5569	-na-	-na-	-na-	267.5569	290.0000
LOT 2 YARD ex	LOT 1 ex	273.9658	-na-	-na-	-na-	273.9658	290.0000
LOT 2 ex	LOT 2 YARD ex	283.3704	-na-	-na-	-na-	283.3704	290.0000
OFFSITE 1	LOT 2 ex	286.0898	-na-	-na-	-na-	286.0898	290.0000
OLD BURN RD	OFFSITE 5	197.5510	-na-	-na-	-na-	197.5510	290.0000

Based on the above existing basin model calculations, the existing 10-yr. flow for the entire basin is 2.93 cfs. Therefore, the required developed 10-yr. flow must be ≤ 2.93 cfs. Note that the existing 12" pipe between the two existing catch basins is flowing beyond its capacity. This pipe will not be used for the developed drainage system.

100-YEAR EXISTING (ENTIRE BASIN) CALCULATIONS



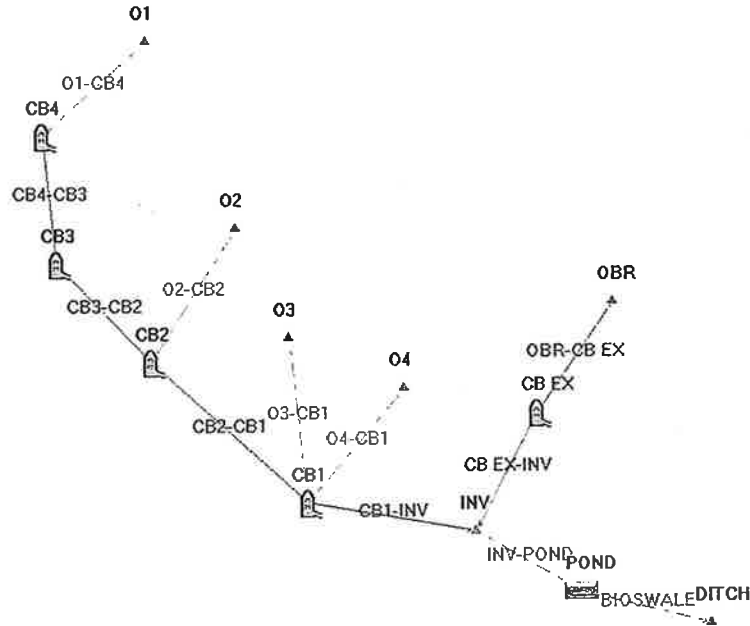
ROUTEHYD [] THRU [EXISTING] USING TYPE1A AND [100 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O3-DRV	0.1000	0.0576	—	1.00	0.0030	Ditch	0.9736	—	OFFSITE 3
O4-DRV	0.1100	0.0586	—	1.00	0.0030	Ditch	0.9800	—	OFFSITE 4
O2-LOT1	0.5200	0.3588	—	1.00	0.0204	Ditch	1.7398	—	OFFSITE 2
O1-LOT2	5.4100	2.7015	—	1.00	0.0863	Ditch	3.0020	—	OFFSITE 1
LOT2-LOT2 YARD	5.5100	2.7569	—	1.00	0.0824	Ditch	3.2129	—	LOT 2 ex
LOT2 YARD -LOT1	5.9900	3.0094	—	1.00	0.0749	Ditch	3.8729	—	LOT 2 YARD ex
LOT1-DRV	6.6100	3.4313	—	1.00	0.0351	Ditch	4.8944	—	LOT 1 ex
DRV-O5	7.4200	3.9116	2.2566	1.73	-1.0000	12" Diam	1.7334	2.8732	DRIVE
OBR-O5	0.5280	0.4500	19.6119	0.02	0.1046	12" Diam	10.3033	24.9706	OLD BURN RD
O5-O6	8.5980	4.7169	13.1469	0.36	0.4140	12" Diam	15.3582	16.7392	OFFSITE 5
O6-DITCH	9.0180	4.8982	—	1.00	0.1776	Ditch	1.3201	—	OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max EI/ Rim EI ft
OFFSITE 6	DITCH	170.1776	-na-	-na-	-na-	149.5526	290.0000
OFFSITE 5	OFFSITE 6	197.3457	0.3852	0.1804	0.0354	197.1764	198.6700
DRIVE	OFFSITE 5	198.0267	—	—	—	198.0267	198.9300
OFFSITE 3	DRIVE	265.0063	-na-	-na-	-na-	265.0063	290.0000
OFFSITE 4	DRIVE	210.0063	-na-	-na-	-na-	210.0063	290.0000
LOT 1 ex	DRIVE	260.7170	-na-	-na-	-na-	260.7170	290.0000
OFFSITE 2	LOT 1 ex	267.5650	-na-	-na-	-na-	267.5650	290.0000
LOT 2 YARD ex	LOT 1 ex	274.0079	-na-	-na-	-na-	274.0079	290.0000
LOT 2 ex	LOT 2 YARD ex	283.4102	-na-	-na-	-na-	283.4102	290.0000
OFFSITE 1	LOT 2 ex	286.1285	-na-	-na-	-na-	286.1285	290.0000
OLD BURN RD	OFFSITE 5	197.6101	-na-	-na-	-na-	197.6100	290.0000

Based on the above existing basin model calculations, the existing 100-yr. flow for the entire basin is 4.90 cfs. Therefore, the required developed 100-yr. flow must be ≤ 4.90 cfs. Note that the existing 12" pipe between the two existing catch basins is flowing beyond its capacity. This pipe will not be used for the developed drainage system.

DEVELOPED BASIN REPORT



Project Precip

[6 mo]	1.17 in
[2 yr]	1.80 in
[10 yr]	2.75 in
[100 yr]	3.75 in

Reach Records

Reach ID: BIOSWALE

Section Properties:

Shape:	Ditch	Routing Method:	Travel Time Translation
Size:	Material Corr Metal - normal	Hyd params By	0.0300 Mannings Formula
Length:	Slope	Entrance Loss	
154.0000 ft	4.00 %		
Width:	Bank Hgt	ss1	ss2
3.0000 ft	1.0000 ft	3.00h:1v	3.00h:1v
Up Node:	Dn Node	Up Invert	Dn Invert
POND	DITCH	169.0000 ft	162.8400 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
9.0880 ac	4.8716 cf	4.8716 cf	3.9365 ft/s	0.3139 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	163.2199 ft	

Reach ID: CB EX-INV**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
12" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
39.0000 ft	11.59 %	Groove End Projecting			
Diam					
1.0000 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
CB EX	INV	195.5700 ft	191.0500 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
1.1780 ac	0.8053 cf	13.1754 cf	9.2791 ft/s	0.1677 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.267395 ft	1.336974 ft	0.016881 ft	191.4251 ft	

Reach ID: CB1-INV**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
12" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
60.0000 ft	5.50 %	Groove End Projecting			
Diam					
1.0000 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
CB1	INV	194.3500 ft	191.0500 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
7.4900 ac	4.0252 cf	9.0762 cf	11.2094 ft/s	0.4664 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.390223 ft	1.951113 ft	0.648899 ft	191.8996 ft	

Reach ID: CB2-CB1**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
12" Diam	Corr Metal - new	0.0220	Mannings Formula		
Length	Slope	Entrance Loss			
255.0000 ft	24.00 %	Headwall			
Diam					
1.0000 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
CB2	CB1	256.8600 ft	195.6600 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
6.6800 ac	3.5449 cf	10.3888 cf	11.9737 ft/s	0.4027 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
1.113125 ft	2.226249 ft	7.123868 ft	196.4639 ft	

Reach ID: CB3-CB2**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
12" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
93.0000 ft	14.25 %	Groove End Projecting		

Diam

1.0000 ft

Up Node

CB3

Dn Node

CB2

Up Invert

270.1100 ft

Dn Invert

256.8570 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.9900 ac	3.0636 cf	14.6093 cf	14.7192 ft/s	0.3108 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.047253 ft	0.236266 ft	0.582627 ft	257.9924 ft	

Reach ID: CB4-CB3**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
12" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
108.0000 ft	8.50 %	Groove End Projecting		

Diam

1.0000 ft

Up Node

CB4

Dn Node

CB3

Up Invert

279.2900 ft

Dn Invert

270.1100 ft

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.5100 ac	2.7867 cf	11.2832 cf	11.9005 ft/s	0.3386 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.439822 ft	2.199110 ft	0.559833 ft	271.0764 ft	

Reach ID: INV-POND**Section Properties:**

Shape:	Ditch		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
	Corr Metal - normal		0.0275	Mannings Formula	
Length	Slope	Entrance Loss			
90.0000 ft	20.05 %				
Width	Bank Hgt	ss1	ss2		
4.0000 ft	1.0000 ft	3.00h:1v	3.00h:1v		
Up Node	Dn Node	Up Invert	Dn Invert		
INV	POND	191.0500 ft	173.0050 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
8.6680 ac	4.8305 cf	4.8305 cf	6.6873 ft/s	0.1611 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	173.3320 ft	

Reach ID: O1-CB4**Section Properties:**

Shape:	Ditch		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
	Corr Metal - normal		0.0250	Mannings Formula	
Length	Slope	Entrance Loss			
38.6300 ft	5.67 %				
Width	Bank Hgt	ss1	ss2		
0.5000 ft	0.1500 ft	50.00h:1v	50.00h:1v		
Up Node	Dn Node	Up Invert	Dn Invert		
O1	CB4	285.4700 ft	283.2800 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
5.4100 ac	2.7015 cf	2.7015 cf	2.4918 ft/s	0.1423 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	283.4300 ft	

Reach ID: O2-CB2**Section Properties:**

Shape:	Ditch		Routing Method:	Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
	Corr Metal - normal		0.0250	Mannings Formula	
Length	Slope	Entrance Loss			
50.0000 ft	18.76 %				
Width	Bank Hgt	ss1	ss2		
10.0000 ft	1.0000 ft	5.00h:1v	5.00h:1v		
Up Node	Dn Node	Up Invert	Dn Invert		
O2	CB2	270.0000 ft	260.6200 ft		

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.5200 ac	0.3588 cf	0.3588 cf	1.8442 ft/s	0.0193 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	260.6540 ft	

Reach ID: O3-CB1**Section Properties:**

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0160	Mannings Formula
Length	Slope	Entrance Loss		
260.0000 ft	25.79 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	0.00h:1v	0.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
O3	CB1	265.0000 ft	197.9460 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1000 ac	0.0576 cf	0.0576 cf	0.9736 ft/s	0.0030 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	197.9523 ft	

Reach ID: O4-CB1**Section Properties:**

Shape:	Ditch		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
	Corr Metal - normal		0.0160	Mannings Formula
Length	Slope	Entrance Loss		
43.0000 ft	28.05 %			
Width	Bank Hgt	ss1	ss2	
20.0000 ft	0.5000 ft	0.00h:1v	0.00h:1v	
Up Node	Dn Node	Up Invert	Dn Invert	
O4	CB1	210.0000 ft	197.9390 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1100 ac	0.0586 cf	0.0586 cf	1.0109 ft/s	0.0029 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000000 ft	0.000000 ft	0.000000 ft	197.9453 ft	

Reach ID: OBR-CB EX

Section Properties:

Shape:	Circular	Mannings n	Routing Method:	Travel Time Translation
Size	Material	0.0120	Hyd params By	
12" Diam	Smooth CDEP		Mannings Formula	
Length	Slope	Entrance Loss		
6.2700 ft	25.68 %	Groove End Projecting		
Diam				
1.0000 ft				
Up Node	Dn Node	Up Invert	Dn Invert	
OBR	CB EX	197.3600 ft	195.7500 ft	

Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.5280 ac	0.4500 cf	19.6119 cf	10.3033 ft/s	0.1046 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.329685 ft	1.648424 ft	0.000847 ft	196.0276 ft	

Node Records

Node ID: CB EX

Start El:	195.5700 ft	Max El:	198.6700 ft
Contrib Basin:	OFFSITE 5	Contrib Hyd:	
Hgl Elev:	194.4332 ft		
Struct Type:	AREA INLET- 24	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	0.0000 ft	Bot Area:	3.1416 sf
Condition:	No particular shape.	Status:	Existing Structure
Approach Credit:	1.6484 ft		

Node ID: CB1

Start El:	194.3500 ft	Max El:	197.9400 ft
Contrib Basin:	DRIVE	Contrib Hyd:	
Hgl Elev:	195.8452 ft		
Struct Type:	CB-TYPE 1	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	1.4160 ft	Bot Area:	3.9700 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.0000 ft		

Node ID: CB2

Start El:	256.8600 ft	Max El:	260.6200 ft
Contrib Basin:	LOT 1 DEV	Contrib Hyd:	
Hgl Elev:	257.9924 ft		
Struct Type:	CB-TYPE 1	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	1.4160 ft	Bot Area:	3.9700 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.2363 ft		
Bend Loss:	0.0045 ft	Junction Loss:	0.0221 ft

Node ID: CB3

Start El:	270.1100 ft	Max El:	273.8700 ft
Contrib Basin:	LOT 2 YARD DEV	Contrib Hyd:	
Hgl Elev:	271.0764 ft		
Struct Type:	CB-TYPE 1	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	1.4160 ft	Bot Area:	3.9700 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.1955 ft		

Node ID: CB4

Start El:	279.2900 ft	Max El:	283.2800 ft
Contrib Basin:	LOT 2 DEV	Contrib Hyd:	
Hgl Elev:	280.3449 ft		
Struct Type:	AREA INLET- 24	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	0.0000 ft	Bot Area:	3.1416 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.0000 ft		

Node ID: DITCH

Start El: 162.8400 ft
 Contrib Basin:
 Hgl Elev: 149.4153 ft

Max El: 165.0000 ft
 Contrib Hyd:

Node ID: INV

Start El: 191.0500 ft
 Contrib Basin:
 Hgl Elev: 191.3770 ft

Max El: 192.0500 ft
 Contrib Hyd:

Node ID: O1

Start El: 285.4700 ft
 Contrib Basin: OFFSITE 1
 Hgl Elev: 285.6200 ft

Max El: 286.4700 ft
 Contrib Hyd:

Node ID: O2

Start El: 270.0000 ft
 Contrib Basin: OFFSITE 2
 Hgl Elev: 270.0340 ft

Max El: 275.0000 ft
 Contrib Hyd:

Node ID: O3

Start El: 265.0000 ft
 Contrib Basin: OFFSITE 3
 Hgl Elev: 265.0063 ft

Max El: 270.0000 ft
 Contrib Hyd:

Node ID: O4

Start El: 210.0000 ft
 Contrib Basin: OFFSITE 4
 Hgl Elev: 210.0063 ft

Max El: 220.0000 ft
 Contrib Hyd:

Node ID: OBR

Start El: 197.3600 ft
 Contrib Basin: OLD BURN RD
 Hgl Elev: 197.6100 ft

Max El: 200.0000 ft
 Contrib Hyd:

Node ID: POND

Start El: 169.0000 ft
 Contrib Basin: OFFSITE 6
 Hgl Elev: 171.9232 ft
 Storage Id: POND STO

Discharge Id: COMBO DISCHARGE D
 Max El: 173.0000 ft
 Contrib Hyd:

Node ID: POND STO

Start El: 169.0000 ft
 Contrib Basin:
 Hgl Elev: 285.5598 ft

Max El: 172.0000 ft
 Contrib Hyd:

Stage	Area	Volume	Volume
169.00	0.00	0.00 cf	0.0000 acft
169.01	84.57	0.42 cf	0.0000 acft
172.00	1172.13	1879.19 cf	0.0431 acft

Control Structure ID: COMBO DISCHARGE D - Combination Control Structure

Start El	Max El	Increment		
169.0000 ft	175.0000 ft	0.10		
ID List:	2YR DISCHARGE D		10YR DISCHARGE D	100YR
	DISCHARGE D			

Control Structure ID: 2YR DISCHARGE D - Vertical oriented orifice

Start El	Max El	Increment		
169.0000 ft	169.5000 ft	0.10		
Weir Area:	0.1963 sf		Coefficient:	0.6140

Control Structure ID: 10YR DISCHARGE D - Rectangular weir

Start El	Max El	Increment
170.2600 ft	171.3000 ft	0.10
Length:	0.6000 ft	

Control Structure ID: 100YR DISCHARGE D - Rectangular weir

Start El	Max El	Increment
171.3000 ft	175.0000 ft	0.10
Length:	0.7500 ft	

Contributing Drainage Areas

Drainage Area: DRIVE

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.4800 ac	85.00	0.12 hrs
Impervious	0.1200 ac	98.00	0.02 hrs
Total	0.6000 ac		

Supporting Data:

Pervious CN Data:			
HILLSIDE	85.00	0.4800 ac	

Impervious CN Data:			
CONC DRV	98.00	0.1200 ac	

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILLSIDE	114.00 ft	16.00%	0.1500	6.31 min
Sheet	DOWN CONC DRIVE	179.00 ft	25.00%	0.0110	0.94 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN CONC DRV	239.00 ft	25.00%	0.0110	1.18 min

Drainage Area: LOT 1 DEV

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.0800 ac	86.00	0.12 hrs
Impervious	0.0900 ac	98.00	0.02 hrs
Total	0.1700 ac		

Supporting Data:

Pervious CN Data:			
GRASS	86.00	0.0800 ac	

Impervious CN Data:			
ROOFTOP/DRV	98.00	0.0900 ac	

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	11.00 ft	2.00%	0.1500	2.23 min
Sheet	ACROSS DRV	29.00 ft	2.00%	0.0110	0.60 min
Sheet	DOWN YARD	58.00 ft	13.00%	0.1500	4.00 min
Sheet	DOWN DRV	14.00 ft	14.00%	0.0110	0.15 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN ROOF	30.00 ft	50.00%	0.0110	0.17 min
Channel	GUTTER	40.00 ft	0.50%	21.0000	0.45 min
Channel	TO CB2	115.00 ft	2.00%	21.0000	0.65 min

Drainage Area: LOT 2 DEV

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	CN	TC
Pervious	0.0000 ac	85.00	0.00 hrs
Impervious	0.1000 ac	98.00	0.02 hrs
Total	0.1000 ac		

Supporting Data:**Impervious CN Data:**

ROOFTOP/DRV 98.00 0.1000 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN ROOF	30.00 ft	50.00%	0.0110	0.17 min
Channel	GUTTER	20.00 ft	0.50%	21.0000	0.22 min
Channel	TO CB4	100.00 ft	2.00%	21.0000	0.56 min

Drainage Area: LOT 2 YARD DEV

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.4400 ac	86.00	0.22 hrs
Impervious	0.0400 ac	98.00	0.02 hrs
Total	0.4800 ac		

Supporting Data:**Pervious CN Data:**

LAWN 86.00 0.4400 ac

Impervious CN Data:

DRIVE 98.00 0.0400 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	230.00 ft	12.00%	0.1500	12.42 min
Channel	YD1-CB3	108.00 ft	2.00%	21.0000	0.61 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN DRV	110.00 ft	9.00%	0.0110	0.96 min

Drainage Area: OFFSITE 1

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	5.4100 ac	85.00	0.29 hrs
Impervious	0.0000 ac	0.00	0.00 hrs
Total	5.4100 ac		

Supporting Data:**Pervious CN Data:**

TOP OF HILL 85.00 5.4100 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	300.00 ft	13.00%	0.1500	13.78 min
Shallow	None Entered	575.00 ft	13.00%	11.0000	2.42 min

Drainage Area: OFFSITE 2

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.2900 ac	86.00	0.17 hrs
Impervious	0.2300 ac	98.00	0.13 hrs
Total	0.5200 ac		

Supporting Data:

Pervious CN Data:
LAWN 86.00 0.2900 ac

Impervious CN Data:
EX. GARAGE AND DRIVEWAY 98.00 0.2300 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	40.00 ft	15.00%	0.1500	2.80 min
Sheet	ACROSS DRV	30.00 ft	2.00%	0.0110	0.62 min
Sheet	DOWN YARD	125.00 ft	16.00%	0.1500	6.80 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	ACROSS DRV	62.00 ft	2.00%	0.0110	1.10 min
Sheet	DOWN YARD	125.00 ft	16.00%	0.1500	6.80 min

Drainage Area: OFFSITE 3

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.1000 ac	86.00	0.09 hrs
Impervious	0.0000 ac	0.00	0.00 hrs
Total	0.1000 ac		

Supporting Data:

Pervious CN Data:
GRASSY AREA, A FEW TREES 86.00 0.1000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN YARD	107.00 ft	20.00%	0.1500	5.49 min

Drainage Area: OFFSITE 4

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.1100 ac	85.00	0.19 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.1100 ac		

Supporting Data:

Pervious CN Data:
DENSE GRASS/SOME TREES 85.00 0.1100 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	145.00 ft	44.80%	0.4000	11.11 min

Drainage Area: OFFSITE 5

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.6500 ac	85.00	0.11 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.6500 ac		

Supporting Data:

Pervious CN Data:
DENSE GRASS/ SOME TREES 85.00 0.6500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	DOWN HILLSIDE	138.00 ft	22.00%	0.1500	6.48 min
Channel	DITCH	197.00 ft	25.00%	17.0000	0.39 min

Drainage Area: OFFSITE 6

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.4200 ac	81.00	0.19 hrs
Impervious	0.0000 ac	98.00	0.00 hrs
Total	0.4200 ac		

Supporting Data:

Pervious CN Data:		
DENSE BRUSH AREA	81.00	0.4200 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	145.00 ft	44.80%	0.4000	11.11 min

Drainage Area: OLD BURN RD

Hyd Method:	SCS Unit Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	0.0000 ac	78.00	0.00 hrs
Impervious	0.5280 ac	98.00	0.02 hrs
Total	0.5280 ac		

Supporting Data:

Impervious CN Data:		
OLD BURN ROAD	98.00	0.5280 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	CROSSING THE ROAD	25.00 ft	2.00%	0.0110	0.53 min
Channel	DITCH	431.00 ft	20.00%	17.0000	0.94 min

Layout Hydrographs

Hydrograph ID: DITCH - 10 yr

Area:	9.0180 ac	Hyd Int:	10.00 min	Base Flow:	
Pending translation:	10.40 min				
Peak Flow:	2.9295 cfs	Peak Time:	8.00 hrs	Hyd Vol:	1.1086 acft
Time	Flow	Time	Flow	Time	Flow
hr	cfs	hr	cfs	hr	cfs
1.00	0.0015	9.17	1.1397	17.17	0.5727
1.17	0.0153	9.33	1.0223	17.33	0.5574
1.33	0.0209	9.50	0.9896	17.50	0.5530
1.50	0.0256	9.67	0.9482	17.67	0.5531
1.67	0.0318	9.83	0.9155	17.83	0.5539
1.83	0.0359	10.00	0.9096	18.00	0.5549
2.00	0.0394	10.17	0.8700	18.17	0.5391
2.17	0.0452	10.33	0.8347	18.33	0.5235
2.33	0.0483	10.50	0.8264	18.50	0.5189
2.50	0.0509	10.67	0.7993	18.67	0.5187
2.67	0.0532	10.83	0.7757	18.83	0.5194
2.83	0.0552	11.00	0.7705	19.00	0.5202
3.00	0.0570	11.17	0.7579	19.17	0.5041
3.17	0.0586	11.33	0.7473	19.33	0.4883
3.33	0.0600	11.50	0.7461	19.50	0.4833
3.50	0.0613	11.67	0.7336	19.67	0.4830
3.67	0.0662	11.83	0.7222	19.83	0.4835
3.83	0.0676	12.00	0.7205	20.00	0.4841
4.00	0.0687	12.17	0.7073	20.17	0.4848
4.17	0.0775	12.33	0.6952	20.33	0.4854
4.33	0.0790	12.50	0.6929	20.50	0.4860
4.50	0.0807	12.67	0.6792	20.67	0.4866
4.67	0.0954	12.83	0.6665	20.83	0.4872
4.83	0.1186	13.00	0.6637	21.00	0.4878
5.00	0.1401	13.17	0.6652	21.17	0.4884
5.17	0.1702	13.33	0.6673	21.33	0.4890
5.33	0.1938	13.50	0.6695	21.50	0.4896
5.50	0.2152	13.67	0.6558	21.67	0.4902
5.67	0.2489	13.83	0.6425	21.83	0.4908
5.83	0.2778	14.00	0.6393	22.00	0.4913
6.00	0.3023	14.17	0.6402	22.17	0.4747
6.17	0.3550	14.33	0.6420	22.33	0.4582
6.33	0.3976	14.50	0.6438	22.50	0.4530
6.50	0.4300	14.67	0.6294	22.67	0.4525
6.67	0.5088	14.83	0.6155	22.83	0.4528
6.83	0.5741	15.00	0.6118	23.00	0.4533
7.00	0.6192	15.17	0.6124	23.17	0.4537
7.17	0.7219	15.33	0.6138	23.33	0.4542
7.33	0.8106	15.50	0.6153	23.50	0.4546
7.50	0.8691	15.67	0.6005	23.67	0.4551
7.67	1.7081	15.83	0.5860	23.83	0.4555
7.83	2.4948	16.00	0.5818	24.00	0.4560
8.00	2.9295	16.17	0.5821	24.17	0.2314
8.17	2.4037	16.33	0.5833	24.33	0.0561
8.33	1.8451	16.50	0.5845	24.50	0.0083
8.50	1.6753	16.67	0.5857	24.67	0.0009
8.67	1.4757	16.83	0.5869	24.83	0.0001
8.83	1.3137	17.00	0.5881	25.00	0.0000
9.00	1.2727	17.17	0.5727	25.17	0.0000

Hydrograph ID: DITCH - 100 yr

Area: 9.0180 ac		Hyd Int: 10.00 min		Base Flow:	
Pending tt translation: 8.33 min		Peak Flow: 4.8982 cfs		Peak Time: 8.00 hrs	
Time	Flow	Time	Flow	Hyd Vol:	1.7557 acft
hr	cfs	hr	cfs	Time	Flow
				hr	cfs
0.67	0.0002	9.00	2.0168	17.00	0.8731
0.83	0.0141	9.17	1.8045	17.17	0.8502
1.00	0.0222	9.33	1.6095	17.33	0.8267
1.17	0.0343	9.50	1.5517	17.50	0.8196
1.33	0.0419	9.67	1.4841	17.67	0.8192
1.50	0.0480	9.83	1.4281	17.83	0.8200
1.67	0.0570	10.00	1.4150	18.00	0.8210
1.83	0.0621	10.17	1.3519	18.17	0.7975
2.00	0.0662	10.33	1.2934	18.33	0.7739
2.17	0.0742	10.50	1.2776	18.50	0.7665
2.33	0.0779	10.67	1.2343	18.67	0.7659
2.50	0.0807	10.83	1.1952	18.83	0.7665
2.67	0.0832	11.00	1.1849	19.00	0.7673
2.83	0.0854	11.17	1.1641	19.17	0.7435
3.00	0.0873	11.33	1.1457	19.33	0.7197
3.17	0.0890	11.50	1.1421	19.50	0.7120
3.33	0.0905	11.67	1.1217	19.67	0.7112
3.50	0.0926	11.83	1.1026	19.83	0.7116
3.67	0.1074	12.00	1.0983	20.00	0.7122
3.83	0.1341	12.17	1.0772	20.17	0.7129
4.00	0.1585	12.33	1.0573	20.33	0.7135
4.17	0.1965	12.50	1.0524	20.50	0.7141
4.33	0.2265	12.67	1.0308	20.67	0.7147
4.50	0.2536	12.83	1.0101	20.83	0.7153
4.67	0.2986	13.00	1.0048	21.00	0.7159
4.83	0.3360	13.17	1.0059	21.17	0.7165
5.00	0.3676	13.33	1.0081	21.33	0.7171
5.17	0.4176	13.50	1.0104	21.50	0.7177
5.33	0.4604	13.67	0.9891	21.67	0.7183
5.50	0.4948	13.83	0.9678	21.83	0.7188
5.67	0.5494	14.00	0.9620	22.00	0.7194
5.83	0.5970	14.17	0.9626	22.17	0.6951
6.00	0.6338	14.33	0.9643	22.33	0.6705
6.17	0.7194	14.50	0.9662	22.50	0.6626
6.33	0.7939	14.67	0.9442	22.67	0.6616
6.50	0.8435	14.83	0.9223	22.83	0.6618
6.67	0.9705	15.00	0.9160	23.00	0.6623
6.83	1.0830	15.17	0.9161	23.17	0.6627
7.00	1.1515	15.33	0.9175	23.33	0.6632
7.17	1.3128	15.50	0.9190	23.50	0.6636
7.33	1.4594	15.67	0.8967	23.67	0.6641
7.50	1.5456	15.83	0.8741	23.83	0.6645
7.67	2.9025	16.00	0.8672	24.00	0.6649
7.83	4.2392	16.17	0.8671	24.17	0.3398
8.00	4.8982	16.33	0.8682	24.33	0.0825
8.17	4.0063	16.50	0.8694	24.50	0.0121
8.33	3.0164	16.67	0.8707	24.67	0.0013
8.50	2.7021	16.83	0.8719	24.83	0.0001
8.67	2.3725	17.00	0.8731	25.00	0.0000
8.83	2.0942	17.17	0.8502	25.17	0.0000

Hydrograph ID: DITCH - 2 yr

Area: 1.8080 ac Hyd Int: 10.00 min Base Flow:
 Pending translation: 19.72 min

Peak Flow: 0.4080 cfs Peak Time: 8.00 hrs Hyd Vol: 0.1489 acft

Time hr	Flow cfs	Time hr	Flow cfs	Time hr	Flow cfs
1.67	0.0087	9.50	0.1263	17.17	0.0706
1.83	0.0108	9.67	0.1164	17.33	0.0699
2.00	0.0125	9.83	0.1156	17.50	0.0700
2.17	0.0151	10.00	0.1162	17.67	0.0701
2.33	0.0168	10.17	0.1060	17.83	0.0702
2.50	0.0182	10.33	0.1049	18.00	0.0703
2.67	0.0196	10.50	0.1053	18.17	0.0663
2.83	0.0208	10.67	0.0984	18.33	0.0656
3.00	0.0218	10.83	0.0977	18.50	0.0656
3.17	0.0228	11.00	0.0981	18.67	0.0657
3.33	0.0237	11.17	0.0948	18.83	0.0658
3.50	0.0246	11.33	0.0946	19.00	0.0659
3.67	0.0269	11.50	0.0949	19.17	0.0618
3.83	0.0277	11.67	0.0915	19.33	0.0611
4.00	0.0284	11.83	0.0913	19.50	0.0611
4.17	0.0326	12.00	0.0916	19.67	0.0612
4.33	0.0334	12.17	0.0881	19.83	0.0613
4.50	0.0340	12.33	0.0877	20.00	0.0614
4.67	0.0384	12.50	0.0880	20.17	0.0615
4.83	0.0391	12.67	0.0844	20.33	0.0615
5.00	0.0397	12.83	0.0840	20.50	0.0616
5.17	0.0442	13.00	0.0842	20.67	0.0617
5.33	0.0449	13.17	0.0845	20.83	0.0618
5.50	0.0455	13.33	0.0848	21.00	0.0618
5.67	0.0501	13.50	0.0850	21.17	0.0619
5.83	0.0507	13.67	0.0813	21.33	0.0620
6.00	0.0512	13.83	0.0809	21.50	0.0621
6.17	0.0603	14.00	0.0810	21.67	0.0622
6.33	0.0627	14.17	0.0812	21.83	0.0622
6.50	0.0673	14.33	0.0815	22.00	0.0623
6.67	0.0850	14.50	0.0817	22.17	0.0581
6.83	0.0891	14.67	0.0779	22.33	0.0573
7.00	0.0926	14.83	0.0774	22.50	0.0573
7.17	0.1143	15.00	0.0775	22.67	0.0574
7.33	0.1198	15.17	0.0777	22.83	0.0574
7.50	0.1243	15.33	0.0778	23.00	0.0575
7.67	0.3393	15.50	0.0780	23.17	0.0576
7.83	0.3813	15.67	0.0741	23.33	0.0576
8.00	0.4080	15.83	0.0736	23.50	0.0577
8.17	0.2305	16.00	0.0736	23.67	0.0577
8.33	0.2127	16.17	0.0738	23.83	0.0578
8.50	0.2146	16.33	0.0739	24.00	0.0578
8.67	0.1668	16.50	0.0741	24.17	0.0098
8.83	0.1621	16.67	0.0743	24.33	0.0010
9.00	0.1634	16.83	0.0744	24.50	0.0001
9.17	0.1298	17.00	0.0746	24.67	0.0000
9.33	0.1257	17.17	0.0706	24.83	0.0000

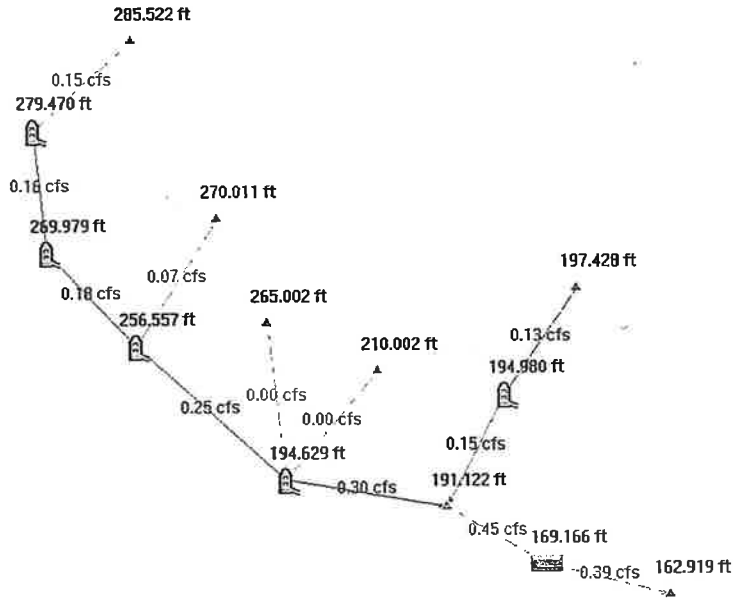
Hydrograph ID: DITCH - 6 mo

Area: 9.0880 ac Hyd Int: 10.00 min Base Flow:
 Pending tt translation: 1.54 min

Peak Flow: 0.3941 cfs Peak Time: 8.17 hrs Hyd Vol: 0.2569 acft

Time hr	Flow cfs	Time hr	Flow cfs	Time hr	Flow cfs
2.17	0.0021	10.00	0.2028	17.67	0.1541
2.33	0.0012	10.17	0.1994	17.83	0.1556
2.50	0.0029	10.33	0.1924	18.00	0.1556
2.67	0.0076	10.50	0.1900	18.17	0.1526
2.83	0.0169	10.67	0.1875	18.33	0.1488
3.00	0.0130	10.83	0.1826	18.50	0.1465
3.17	0.0185	11.00	0.1814	18.67	0.1465
3.33	0.0169	11.17	0.1814	18.83	0.1481
3.50	0.0200	11.33	0.1788	19.00	0.1481
3.67	0.0200	11.50	0.1801	19.17	0.1450
3.83	0.0236	11.67	0.1788	19.33	0.1402
4.00	0.0214	11.83	0.1762	19.50	0.1385
4.17	0.0283	12.00	0.1775	19.67	0.1385
4.33	0.0278	12.17	0.1749	19.83	0.1385
4.50	0.0294	12.33	0.1736	20.00	0.1393
4.67	0.0321	12.50	0.1730	20.17	0.1402
4.83	0.0354	12.67	0.1710	20.33	0.1402
5.00	0.0338	12.83	0.1696	20.50	0.1402
5.17	0.0414	13.00	0.1683	20.67	0.1410
5.33	0.0385	13.17	0.1683	20.83	0.1418
5.50	0.0427	13.33	0.1710	21.00	0.1418
5.67	0.0453	13.50	0.1717	21.17	0.1418
5.83	0.0478	13.67	0.1703	21.33	0.1434
6.00	0.0476	13.83	0.1669	21.50	0.1434
6.17	0.0565	14.00	0.1669	21.67	0.1434
6.33	0.0565	14.17	0.1669	21.83	0.1434
6.50	0.0603	14.33	0.1683	22.00	0.1450
6.67	0.0693	14.50	0.1696	22.17	0.1410
6.83	0.0740	14.67	0.1669	22.33	0.1369
7.00	0.0725	14.83	0.1642	22.50	0.1335
7.17	0.0907	15.00	0.1635	22.67	0.1335
7.33	0.0907	15.17	0.1635	22.83	0.1352
7.50	0.0932	15.33	0.1642	23.00	0.1335
7.67	0.2016	15.50	0.1656	23.17	0.1352
7.83	0.3082	15.67	0.1628	23.33	0.1352
8.00	0.3835	15.83	0.1599	23.50	0.1352
8.17	0.3941	16.00	0.1585	23.67	0.1369
8.33	0.3460	16.17	0.1585	23.83	0.1352
8.50	0.3199	16.33	0.1585	24.00	0.1369
8.67	0.2977	16.50	0.1599	24.17	0.0841
8.83	0.2712	16.67	0.1614	24.33	0.0000
9.00	0.2618	16.83	0.1614	24.50	0.0176
9.17	0.2465	17.00	0.1628	24.67	0.0000
9.33	0.2231	17.17	0.1599	24.83	0.0000
9.50	0.2148	17.33	0.1556	25.00	0.0000
9.67	0.2094	17.50	0.1541	25.17	0.0000
9.83	0.2039	17.67	0.1541	25.33	0.0000

6-MONTH DEVELOPED CALCULATIONS



ROUTEHYD [] THRU [DEVELOPED] USING TYPE1A AND [6 mo] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O4-CB1	0.1100	0.0030	—	1.00	0.0005	Ditch	0.3066	—	OFFSITE 4
O3-CB1	0.1000	0.0043	—	1.00	0.0006	Ditch	0.3531	—	OFFSITE 3
O2-CB2	0.5200	0.0664	—	1.00	0.0070	Ditch	0.9427	—	OFFSITE 2
O1-CB4	5.4100	0.1514	—	1.00	0.0453	Ditch	1.2089	—	OFFSITE 1
CB4-CB3	5.5100	0.1631	11.2832	0.01	0.0840	12" Diam	5.1594	14.3662	LOT 2 DEV
CB3-CB2	5.9900	0.1837	14.6093	0.01	0.0786	12" Diam	6.4046	18.6011	LOT 2 YARD DEV
CB2-CB1	6.6800	0.2500	10.3888	0.02	0.1069	12" Diam	5.5423	13.2274	LOT 1 DEV
CB1-INV	7.4900	0.3015	9.0762	0.03	0.1249	12" Diam	5.3290	11.5561	DRIVE
OBR-CB EX	0.5280	0.1283	19.6119	0.01	0.0579	12" Diam	7.0350	24.9706	OLD BURN RD
CB EX-INV	1.1780	0.1490	13.1754	0.01	0.0747	12" Diam	5.6009	16.7754	OFFSITE 5
INV-POND	8.6680	0.4506	—	1.00	0.0395	Ditch	2.7670	—	—

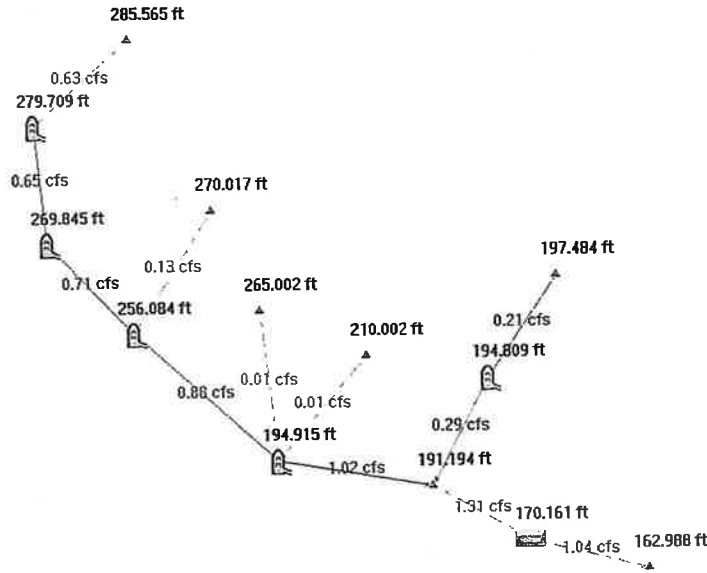
Routing thru RLPool Node POND; 6 mo event

6 mo Match Q: 0.0000 cfs Peak Out Q: 0.3941 cfs - Peak Stg: 169.17 ft - Active Vol: 98.56 cf
 BIOSWALE 9.0880 0.3941 — 1.00 0.0735 Ditch 1.6653 — OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
---	---	---	---	---	---	162.9191	---
POND	DITCH	169.0791	-na-	-na-	-na-	169.1662	173.0000
INV	POND	191.1220	-na-	-na-	-na-	191.1220	192.0500
CB1	INV	194.6289	---	---	---	194.6289	197.9400
O4	CB1	210.0020	-na-	-na-	-na-	210.0020	220.0000
O3	CB1	265.0020	-na-	-na-	-na-	265.0020	270.0000
CB2	CB1	257.0181	0.6369	0.0122	0.1635	256.5569	260.6200
O2	CB2	270.0112	-na-	-na-	-na-	270.0112	275.0000
CB3	CB2	270.2755	0.4134	0.1169	---	269.9790	273.8700
CB4	CB3	279.4702	---	---	---	279.4702	283.2800
O1	CB4	285.5216	-na-	-na-	-na-	285.5216	286.4700
CB EX	INV	195.7246	0.7685	0.0236	---	194.9797	198.6700
OBR	CB EX	197.4283	-na-	-na-	-na-	197.4283	200.0000

The above calculations show that the 6-month runoff from the entire basin is 0.39 cfs. Therefore, according to the D.O.E. Manual's biofiltration design sizing tables, for a 6-month flow of 0.40 cfs, 154 ft. of 3-ft wide bioswale is required at 4% slope.

2-YEAR DEVELOPED CALCULATIONS



ROUTEHYD [THRU [DEVELOPED] USING TYPE1A AND [2 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O4-CB1	0.1100	0.0135	—	1.00	0.0012	Ditch	0.5527	—	OFFSITE 4
O3-CB1	0.1000	0.0148	—	1.00	0.0013	Ditch	0.5653	—	OFFSITE 3
O2-CB2	0.5200	0.1308	—	1.00	0.0105	Ditch	1.2359	—	OFFSITE 2
O1-CB4	5.4100	0.6314	—	1.00	0.0805	Ditch	1.7313	—	OFFSITE 1
CB4-CB3	5.5100	0.6503	11.2832	0.06	0.1630	12" Diam	7.8074	14.3662	LOT 2 DEV
CB3-CB2	5.9900	0.7116	14.6093	0.05	0.1501	12" Diam	9.6187	18.6011	LOT 2 YARD DEV
CB2-CB1	6.6800	0.8810	10.3888	0.08	0.1968	12" Diam	8.0606	13.2274	LOT 1 DEV
CB1-INV	7.4900	1.0189	9.0762	0.11	0.2263	12" Diam	7.6425	11.5561	DRIVE
OBR-CB EX	0.5280	0.2080	19.6119	0.01	0.0725	12" Diam	8.1708	24.9706	OLD BURN RD
CB EX-INV	1.1780	0.2928	13.1754	0.02	0.1030	12" Diam	6.8572	16.7754	OFFSITE 5
INV-POND	8.6680	1.3118	—	1.00	0.0747	Ditch	4.1577	—	—

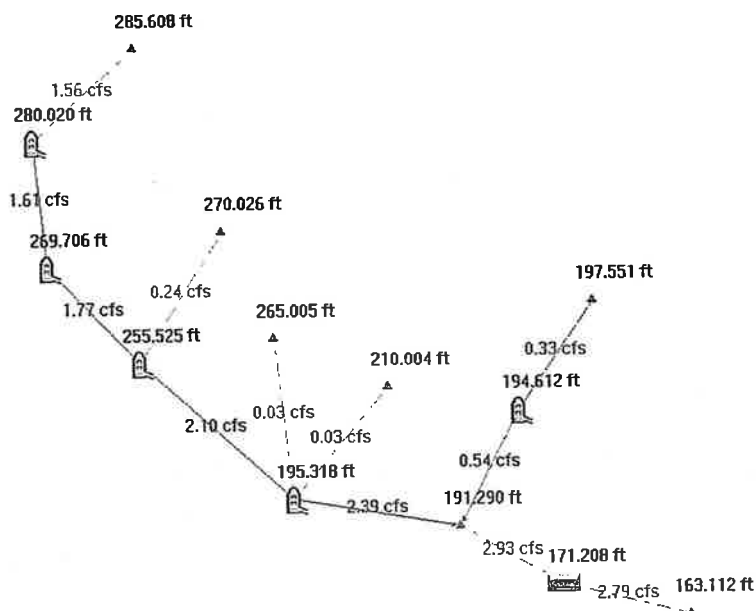
Routing thru RLPool Node POND; 2 yr event

2 yr Match Q: 0.0000 cfs Peak Out Q: 1.0423 cfs - Peak Stg: 170.16 ft - Active Vol: 723.67 cf
 BIOSWALE 9.0880 1.0423 — 1.00 0.1301 Ditch 2.3624 — OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max EI/ Rim EI ft
---	---	---	---	---	---	162.9875	---
POND	DITCH	169.1476	--na--	--na--	--na--	170.1610	173.0000
INV	POND	191.1940	--na--	--na--	--na--	191.1940	192.0500
CB1	INV	194.9145	---	---	---	194.9145	197.9400
O4	CB1	210.0020	--na--	--na--	--na--	210.0020	220.0000
O3	CB1	265.0020	--na--	--na--	--na--	265.0020	270.0000
CB2	CB1	257.2896	1.4366	0.0276	0.2038	256.0844	260.6200
O2	CB2	270.0173	--na--	--na--	--na--	270.0173	275.0000
CB3	CB2	270.5234	0.9465	0.2677	---	269.8446	273.8700
CB4	CB3	279.7089	---	---	---	279.7089	283.2800
O1	CB4	285.5650	--na--	--na--	--na--	285.5650	286.4700
CB EX	INV	195.8137	1.0367	0.0319	---	194.8089	198.6700
OBR	CB EX	197.4841	--na--	--na--	--na--	197.4841	200.0000

As shown above, the developed 2-yr. flow is 1.04 cfs < 1.06 cfs maximum.

10-YEAR DEVELOPED CALCULATIONS



ROUTEHYD [] THRU [DEVELOPED] USING TYPE1A AND [10 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O4-CB1	0.1100	0.0340	---	1.00	0.0021	Ditch	0.8083	---	OFFSITE 4
O3-CB1	0.1000	0.0346	---	1.00	0.0022	Ditch	0.7984	---	OFFSITE 3
O2-CB2	0.5200	0.2388	---	1.00	0.0151	Ditch	1.5689	---	OFFSITE 2
O1-CB4	5.4100	1.5612	---	1.00	0.1150	Ditch	2.1722	---	OFFSITE 1
CB4-CB3	5.5100	1.6067	11.2832	0.14	0.2549	12" Diam	10.1792	14.3662	LOT 2 DEV
CB3-CB2	5.9900	1.7747	14.6093	0.12	0.2354	12" Diam	12.5878	18.6011	LOT 2 YARD DEV
CB2-CB1	6.6800	2.0966	10.3888	0.20	0.3047	12" Diam	10.3547	13.2274	LOT 1 DEV
CB1-INV	7.4900	2.3929	9.0762	0.26	0.3505	12" Diam	9.7490	11.5561	DRIVE
OBR-CB EX	0.5280	0.3265	19.6119	0.02	0.0898	12" Diam	9.3488	24.9706	OLD BURN RD
CB EX-INV	1.1780	0.5350	13.1754	0.04	0.1375	12" Diam	8.2165	16.7754	OFFSITE 5
INV-POND	8.6680	2.9279	---	1.00	0.1201	Ditch	5.5910	---	---

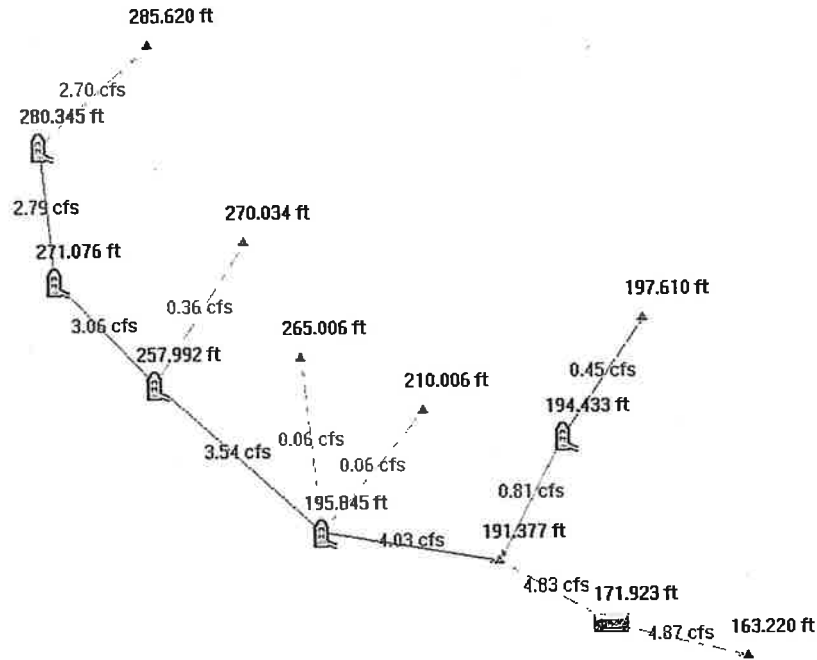
Routing thru RLPool Node POND; 10 yr event

10 yr Match Q: 0.0000 cfs Peak Out Q: 2.7900 cfs - Peak Stg: 171.21 ft - Active Vol: 1381.66 cf
 BIOSWALE 9.0880 2.7900 --- 1.00 0.2295 Ditch 3.2959 --- OFFSITE 6

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
---	DITCH	---	---	---	---	163.1121	---
POND	DITCH	169.2721	-na-	-na-	-na-	171.2082	173.0000
INV	POND	191.2897	-na-	-na-	-na-	191.2897	192.0500
CB1	INV	195.3183	---	---	---	195.3183	197.9400
O4	CB1	210.0044	-na-	-na-	-na-	210.0044	220.0000
O3	CB1	265.0049	-na-	-na-	-na-	265.0049	270.0000
CB2	CB1	257.6764	2.4604	0.0473	0.2618	255.5250	260.6200
O2	CB2	270.0259	-na-	-na-	-na-	270.0259	275.0000
CB3	CB2	270.8603	1.6089	0.4550	---	269.7064	273.8700
CB4	CB3	280.0205	---	---	---	280.0205	283.2800
O1	CB4	285.6085	-na-	-na-	-na-	285.6085	286.4700
CB EX	INV	195.9272	1.3572	0.0417	---	194.6118	198.6700
OBR	CB EX	197.5510	-na-	-na-	-na-	197.5510	200.0000

As shown above, the developed 10-yr. flow is 2.79 cfs < 2.93 cfs maximum.

100-YEAR DEVELOPED CALCULATIONS



ROUTEHYD [] THRU [DEVELOPED] USING TYPE1A AND [100 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
O4-CB1	0.1100	0.0586	—	1.00	0.0029	Ditch	1.0109	—	OFFSITE 4
O3-CB1	0.1000	0.0576	—	1.00	0.0030	Ditch	0.9736	—	OFFSITE 3
O2-CB2	0.5200	0.3588	—	1.00	0.0193	Ditch	1.8442	—	OFFSITE 2
O1-CB4	5.4100	2.7015	—	1.00	0.1423	Ditch	2.4918	—	OFFSITE 1
CB4-CB3	5.5100	2.7867	11.2832	0.25	0.3386	12" Diam	11.9005	14.3662	LOT 2 DEV
CB3-CB2	5.9900	3.0636	14.6093	0.21	0.3108	12" Diam	14.7192	18.6011	LOT 2 YARD DEV
CB2-CB1	6.6800	3.5449	10.3888	0.34	0.4027	12" Diam	11.9737	13.2274	LOT 1 DEV
CB1-INV	7.4900	4.0252	9.0762	0.44	0.4664	12" Diam	11.2094	11.5561	DRIVE
OBR-CB EX	0.5280	0.4500	19.6119	0.02	0.1046	12" Diam	10.3033	24.9706	OLD BURN RD
CB EX-INV	1.1780	0.8053	13.1754	0.06	0.1677	12" Diam	9.2791	16.7754	OFFSITE 5
INV-POND	8.6680	4.8305	—	1.00	0.1611	Ditch	6.6873	—	—

Routing thru RLPool Node POND; 100 yr event

100 yr Match Q: 0.0000 cfs Peak Out Q: 4.8716 cfs - Peak Stg: 171.92 ft - Active Vol: 1830.96 cf
 BIOSWALE 9.0880 4.8716 — 1.00 0.3139 Ditch 3.9365 — OFFSITE 6


From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
---	---					163.2199	
POND	DITCH	169.3799	-na-	-na-	-na-	171.9232	173.0000
INV	POND	191.3770	-na-	-na-	-na-	191.3770	192.0500
CB1	INV	195.8452	—	—	—	195.8452	197.9400
O4	CB1	210.0063	-na-	-na-	-na-	210.0063	220.0000
O3	CB1	265.0063	-na-	-na-	-na-	265.0063	270.0000
CB2	CB1	258.2021	0.2363	0.0045	0.0221	257.9924	260.6200
O2	CB2	270.0340	-na-	-na-	-na-	270.0340	275.0000
CB3	CB2	271.2167	0.1955	0.0553	—	271.0764	273.8700
CB4	CB3	280.3449	—	—	—	280.3449	283.2800
O1	CB4	285.6200	-na-	-na-	-na-	285.6200	286.4700
CB EX	INV	196.0309	1.6484	0.0507	—	194.4332	198.6700
OBR	CB EX	197.6101	-na-	-na-	-na-	197.6100	200.0000

As shown above, the developed 100-yr. flow is 4.87 cfs < 4.90 cfs maximum. The live storage volume of the pond is 1,830.96 cf due to a 100-yr. storm event. According to the D.O.E. Manual, streambank erosion control BMP's require a volume correction factor to be applied to the design volume. Since the proposed site has site impervious less than 20%, a 20% correction factor must be applied. Therefore, the actual pond must be capable of storing $1.2(1,830.96 \text{ cf}) = 2,198 \text{ cf}$. The proposed pond for construction has a capacity of 2,275 cf.

CONVEYANCE SYSTEM CAPACITY CAPABILITY


The 12" pipe between c.b. #1 and the existing ditch before the pond will experience a maximum flow of 4.03 cfs. Shown below, a 60-ft long 12" pipe will have a 100-yr. flow depth of 0.47 ft, 46.74% of a 12" pipe capacity.

Worksheet: cb#1 to outfall

Solve for: **Channel Depth** Manning's Formula 

Mannings Coefficient:	<input type="text" value="0.012"/>
Channel Slope:	<input type="text" value="0.055000"/> ft/ft
Depth:	<input type="text" value="0.47"/> ft
Diameter:	<input type="text" value="12.00"/> in
Discharge:	<input type="text" value="4.03"/> cfs

Flow Area:	0.36 ft ²
Wetted Perimeter:	1.51 ft
Top Width:	1.00 ft
Critical Depth:	0.85 ft
Percent Full:	46.74
Critical Slope:	0.010266 ft/ft
Velocity:	11.19 ft/s
Velocity Head:	1.95 ft
Specific Energy:	2.41 ft
Froude Number:	3.28
Maximum Discharge:	9.74 cfs
Full Flow Capacity:	9.05 cfs
Full Flow Slope:	0.010903 ft/ft



Following the pond is 154 ft of bioswale and 250 ft of ditch. These two ditches will experience 4.87 cfs of stormwater during a 100-yr. storm event.

Worksheet: bioswale

Solve for: Channel Depth

Manning's Formula

Mannings Coefficient:	0.030		Flow Area:	1.24 ft ²
Channel Slope:	0.040000	ft/ft	Wetted Perimeter:	4.99 ft
Depth:	0.31	ft	Top Width:	4.89 ft
Left Side Slope:	3.000000	H: V	Critical Depth:	0.38 ft
Right Side Slope:	3.000000	H: V	Critical Slope:	0.020250 ft/ft
Bottom Width:	3.00	ft	Velocity:	3.92 ft/s
Discharge:	4.87	cfs	Velocity Head:	0.24 ft
			Specific Energy:	0.55 ft
			Froude Number:	1.37

Output... Solve Close Help

Worksheet: ditch

Solve for: Channel Depth

Manning's Formula

Mannings Coefficient:	0.022		Flow Area:	0.82 ft ²
Channel Slope:	0.040000	ft/ft	Wetted Perimeter:	2.82 ft
Depth:	0.41	ft	Top Width:	2.00 ft
Bottom Width:	2.00	ft	Critical Depth:	0.57 ft
Discharge:	4.87	cfs	Critical Slope:	0.015517 ft/ft
			Velocity:	5.93 ft/s
			Velocity Head:	0.55 ft
			Specific Energy:	0.96 ft
			Froude Number:	1.63

Output... Solve Close Help

As shown above, the depth of water in the bioswale will be 0.31 ft and the depth of water in the ditch will be 0.41 ft.

MAINTENANCE REQUIREMENTS FOR PRIVATELY MAINTAINED DRAINAGE FACILITIES

MAINTENANCE COMPONENT	DEFECT	CONDITIONS WHEN MAINTENANCE IS NEEDED	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
PONDS			
GENERAL	TRASH & DEBRIS	ANY TRASH AND DEBRIS WHICH EXCEED 1 CUBIC FOOT PER 1,000 SQUARE FEET (THIS IS ABOUT EQUAL TO THE AMOUNT OF TRASH IT WOULD TAKE TO FILL UP ONE STANDARD SIZE OFFICE GARBAGE CAN). IN GENERAL, THERE SHOULD BE NO VISUAL EVIDENCE OF DUMPING.	TRASH AND DEBRIS CLEARED FROM SITE.
	POISONOUS VEGETATION	ANY POISONOUS VEGETATION WHICH MAY CONSTITUTE A HAZARD TO COUNTY PERSONNEL OR THE PUBLIC. EXAMPLES OF POISONOUS VEGETATION INCLUDE: TANSY RAGWORT, POISON OAK, STINGING NETTLES, DEVILS CLUB.	NO DANGER OF POISONOUS VEGETATION WHERE COUNTY PERSONNEL OR THE PUBLIC MIGHT NORMALLY BE. (COORDINATION WITH HEALTH DEPARTMENT).
	POLLUTION	OIL, GASOLINE, OR OTHER CONTAMINANTS OF ONE GALLON OR MORE OR ANY AMOUNT FOUND THAT COULD: 1) CAUSE DAMAGE TO PLANT, ANIMAL, OR MARINE LIFE; 2) CONSTITUTE A FIRE HAZARD; OR 3) BE FLUSHED DOWNSTREAM DURING RAIN STORMS.:	NO CONTAMINANTS PRESENT OTHER THAN A SURFACE FILM. (COORDINATION WITH HEALTH DEPARTMENT).
	UNMOWED GRASS/GROUND COVER	IF FACILITY IS LOCATED IN PRIVATE RESIDENTIAL AREA, MOWING IS NEEDED WHEN GRASS EXCEEDS 18 INCHES IN HEIGHT. IN OTHER AREAS, THE GENERAL POLICY IS TO MAKE THE POND SITE MATCH ADJACENT GROUND COVER AND TERRAIN AS LONG AS THERE IS NO INTERFERENCE WITH THE FUNCTION OF THE FACILITY.	WHEN MOWING IS NEEDED, GRASS/GROUND COVER SHOULD BE MOWED TO 2 INCHES HEIGHT.
	RODENT HOLES	ANY EVIDENCE OF RODENT HOLES IF FACILITY IS ACTING AS A DAM OR BERM, OR ANY EVIDENCE OF WATER PIPING THROUGH DAM OR BERM VIA RODENT HOLES.	RODENTS DESTROYED AND DAM OR BERM REPAIRED. (COORDINATION WITH HEALTH DEPARTMENT)
	INSECTS	WHEN INSECTS SUCH AS WASPS AND HORNETS INTERFERE WITH MAINTENANCE ACTIVITIES.	INSECTS DESTROYED OR REMOVED FROM SITE.

MAINTENANCE COMPONENT	DEFECT	CONDITIONS WHEN MAINTENANCE IS NEEDED	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
	TREE GROWTH	TREE GROWTH DOES NOT ALLOW MAINTENANCE ACCESS OR INTERFERES WITH MAINTENANCE ACTIVITY (I.E., SLOPE MOVING, SILT REMOVAL, VACTORING, OR EQUIPMENT MOVEMENTS). IF TREES ARE NOT INTERFERING WITH ACCESS, LEAVE TREES ALONE.	TREES DO NOT HINDER MAINTENANCE ACTIVITIES. SELECTIVELY CULTIVATE TREES SUCH AS ALDERS FOR FIREWOOD.
SIDE SLOPES OF POND	EROSION	ERODED DAMAGE OVER 2 INCHES DEEP WHERE CAUSE OF DAMAGE IS STILL PRESENT OR WHERE THERE IS POTENTIAL FOR CONTINUE EROSION.	SLOPES SHOULD BE STABILIZED BY USING APPROPRIATE EROSION CONTROL MEASURE(S); E.G., ROCK REINFORCEMENT, PLANTING OF GRASS, COMPACTION.
STORAGE AREA	SEDIMENT	ACCUMULATED SEDIMENT THAT EXCEEDS 10% OF THE DESIGNED POND DEPTH.	SEDIMENT CLEANED OUT TO DESIGNED POND SHAPE AND DEPTH; POND RESEEDED IF NECESSARY TO CONTROL EROSION.
POND DIKES	SETTLEMENTS	ANY PART OF DIKE WHICH HAS SETTLED 4 INCHES LOWER THAN THE DESIGN ELEVATION.	DIKE SHOULD BE BUILT BACK TO THE DESIGN ELEVATION.
EMERGENCY OVERFLOW/ SPILLWAY	ROCK MISSING	ONLY ONE LAYER OF ROCK EXISTS ABOVE NATIVE SOIL IN ARE FIVE SQUARE FEET OR LARGER, OR ANY EXPOSURE OF NATIVE SOIL.	REPLACE ROCKS TO DESIGN STANDARDS.

CONTROL STRUCTURE/FLOW RESTRICTOR

MAINTENANCE COMPONENT	DEFECT	CONDITIONS WHEN MAINTENANCE IS NEEDED	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
GENERAL	TRASH AND DEBRIS (INCLUDES SEDIMENT)	DISTANCE BETWEEN DEBRIS BUILD-UP AND BOTTOM OF ORIFICE PLATE IS LESS THAN 1 1/2 FEET.	ALL TRASH AND DEBRIS REMOVED.
	STRUCTURAL DAMAGE	STRUCTURE IS NOT SECURELY ATTACHED TO MANHOLE WALL AND OUTLET PIPE STRUCTURE SHOULD SUPPORT AT LEAST 1,000 POUNDS OF UP OR DOWN PRESSURE.	STRUCTURE SECURELY ATTACHED TO WALL AND OUTLET PIPE.
		STRUCTURE IS NOT IN UPRIGHT POSITION (ALLOW UP TO 10% FROM PLUMB).	STRUCTURE IN CORRECT POSITION.
		CONNECTIONS TO OUTLET PIPE ARE	CONNECTIONS TO OUTLET PIPE ARE

		NOT WATERTIGHT AND SHOW SIGNS OF RUST.	WATERTIGHT; STRUCTURE REPAIRED OR REPLACED AND WORKS AS DESIGNED.
		ANY HOLES - OTHER THAN DESIGNED HOLES - IN THE STRUCTURE.	
CLEANOUT GATE	DAMAGED OR MISSING	CLEANOUT GATE IS NOT WATERTIGHT OR IS MISSING	GATE IS WATERTIGHT AND WORKS AS DESIGNED.
		GATE CANNOT BE MOVED UP AND DOWN BY ONE MAINTENANCE PERSON.	GATE MOVES UP AND DOWN EASILY AND IS WATERTIGHT.
		CHAIN LEADING TO GATE IS MISSING OR DAMAGED.	CHAIN IS IN PLACE AND WORKS AS DESIGNED.
		GATE IS RUSTED OVER 50% OF ITS SURFACE AREA.	GATE IS REPAIRED OR REPLACED TO MEET DESIGN STANDARDS.
ORIFICE PLATE	DAMAGED OR MISSING	CONTROL DEVICE IS NOT WORKING PROPERLY DUE TO MISSING, OUT OF PLACE, OR BENT ORIFICE PLATE.	PLATE IS IN PLACE AND WORKS AS DESIGNED.
	OBSTRUCTIONS	ANY TRASH, DEBRIS, SEDIMENT, OR VEGETATION BLOCKING THE PLATE.	PLATE IS FREE OF ALL OBSTRUCTIONS AND WORKS AS DESIGNED.
OVERFLOW PIPE	OBSTRUCTIONS	ANY TRASH OR DEBRIS BLOCKING (OR HAVING THE POTENTIAL OF BLOCKING) THE OVERFLOW PIPE.	PIPE IS FREE OF ALL OBSTRUCTIONS AND WORKS AS DESIGNED.
MANHOLE		SEE "CLOSED DETENTION SYSTEMS" STANDARD NO. 3	SEE "CLOSED DETENTION SYSTEMS" STANDARD NO. 3
CATCH BASIN		SEE "CATCH BASIN" STANDARD NO. 5	SEE "CATCH BASIN" STANDARD NO. 5

CATCH BASINS

MAINTENANCE COMPONENT	DEFECT	CONDITIONS WHEN MAINTENANCE IS NEEDED	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
GENERAL	TRASH & DEBRIS (INCLUDES SEDIMENT)	TRASH OR DEBRIS OF MORE THAN 1/2 CUBIC FOOT WHICH IS LOCATED IMMEDIATELY IN FRONT OF THE CATCH BASIN OPENING OR IS BLOCKING CAPACITY OF BASIN BY MORE THAN 10%.	NO TRASH OR DEBRIS LOCATED IMMEDIATELY IN FRONT OF CATCH BASIN OPENING.
		TRASH OR DEBRIS (IN THE BASIN) THAT EXCEEDS 1/3 THE DEPTH FROM THE BOTTOM OF BASIN TO INVERT T OF THE LOWEST PIPE INTO OR OUT OF THE BASIN.	NO TRASH OR DEBRIS IN THE CATCH BASIN.
		TRASH OR DEBRIS IN ANY INLET OR OUTLET PIPE BLOCKING MORE THAN 1/3	INLET AND OUTLET PIPES FREE OF TRASH OR DEBRIS.

	OF ITS HEIGHT.	
	DEAD ANIMALS OR VEGETATION THAT COULD GENERATE ODORS THAT WOULD CAUSE COMPLAINTS OR DANGEROUS GASES (E.G., METHANE).	NO DEAD ANIMALS OR VEGETATION PRESENT WITHIN THE CATCH BASIN.
	DEPOSITS OF GARBAGE EXCEEDING 1 CUBIC FOOT IN VOLUME.	NO CONDITION PRESENT WHICH WOULD ATTRACT OR SUPPORT THE BREEDING OF INSECTS OR RODENTS.
STRUCTURAL DAMAGE TO FRAME AND/OR TOP SLAB	CORNER OF FRAME EXTENDS MORE THAN 3/4 INCH PAST CURB FACE INTO THE STREET (IF APPLICABLE).	FRAME IS EVEN WITH CURB.
	TOP SLAB HAS HOLES LARGER THAN 2 SQUARE INCHES OR CRACKS WIDER THAN 1/4 INCH (INTENT IS TO MAKE SURE ALL MATERIAL IS RUNNING INTO THE BASIN).	TOP SLAB IS FREE OF HOLES AND CRACKS.
	FRAME NOT SITTING FLUSH ON TOP SLAB, I. E., SEPARATION OF MORE THAN 3/4 INCH OF THE FRAME FROM THE TOP SLAB.	FRAME IS SITTING FLUSH ON TOP SLAB.
CRACKS IN BASIN WALLS/BOTTOM	CRACKS WIDER THAN 1/2 INCH AND LONGER THAN 3 FEET, ANY EVIDENCE OF SOIL PARTICLES ENTERING CATCH BASIN THROUGH CRACKS, OR MAINTENANCE PERSON JUDGES THAT STRUCTURE IS UNSOUND.	BASIN REPLACED OR REPAIRED TO DESIGN STANDARDS.
	CRACKS WIDER THAN 1/2 INCH AND LONGER THAN 1 FOOT AT THE JOINT OF ANY INLET/OUTLET PIPE OR ANY EVIDENCE OF SOIL PARTICLES ENTERING CATCH BASIN THROUGH CRACKS.	NO CRACKS MORE THAN 1/4 INCH WIDE AT THE JOINT OF INLET/OUTLET PIPE.
SETTLEMENT/ MISALIGNMENT	BASIN HAS SETTLED MORE THAN 1 INCH OR HAS ROTATED MORE THAN 2 INCHES OUT OF ALIGNMENT.	BASIN REPLACED OR REPAIRED TO DESIGN STANDARDS.
FIRE HAZARD	PRESENCE OF CHEMICALS SUCH AS NATURAL GAS, OIL, GASOLINE.	NO FLAMMABLE CHEMICALS PRESENT.
VEGETATION	VEGETATION GROWING ACROSS AND BLOCKING MORE THAN 10% OF THE BASIN OPENING.	NO VEGETATION BLOCKING OPENING TO BASIN.
	VEGETATION GROWING IN INLET/OUTLET PIPE JOINTS THAT IS MORE THAN SIX INCHES TALL AND LESS THAN SIX INCHES APART.	NO VEGETATION OR ROOT GROWTH PRESENT.
POLLUTION	NONFLAMMABLE CHEMICALS OF MORE THAN 1/2 CUBIC FOOT PER THREE FEET OF BASIN LENGTH.	NO POLLUTION PRESENT OTHER THAN SURFACE FILM.

CATCH BASIN COVER	COVER NOT IN PLACE	COVER IS MISSING OR ONLY PARTIALLY IN PLACE. ANY OPEN CATCH BASIN REQUIRED MAINTENANCE.	CATCH BASIN COVER IS CLOSED.
	LOCKING MECHANISM NOT WORKING	MECHANISM CANNOT BE OPENED BY ONE MAINTENANCE PERSON WITH PROPER TOOLS. BOLTS INTO FRAME HAVE LESS THAN 1/2 INCH OF THREAD.	MECHANISM OPENS WITH PROPER TOOLS.
	COVER DIFFICULT TO REMOVE	ONE MAINTENANCE PERSON CANNOT REMOVE LID AFTER APPLYING 80 LBS. OF LIFT; INTENT IS KEEP COVER FROM SEALING OFF ACCESS TO MAINTENANCE.	COVER CAN BE REMOVED BY ONE MAINTENANCE PERSON.
LADDER	LADDER RUNGS UNSAFE	LADDER IS UNSAFE DUE TO MISSING RUNGS, MISALIGNMENT, RUST, CRACKS, OR SHARP EDGES.	LADDER MEETS DESIGN STANDARDS AND ALLOWS MAINTENANCE PERSON SAFE ACCESS.
METAL GRATE (IF APPLICABLE)		GRATE OPENING WIDER THAN 7/8 INCH.	GRATE OPENINGS MEET DESIGN STANDARDS.
	TRASH AND DEBRIS	TRASH AND DEBRIS THAT IS BLOCKING MORE THAN 20% OF GRATE SURFACE.	GRATE FREE OF TRASH AND DEBRIS.
	DAMAGED OR MISSING	GRATE MISSING OR BROKEN MEMBER(S) OF THE GRATE.	GRATE IS IN PLACE AND MEETS DESIGN STANDARDS.

CONVEYANCE SYSTEMS (PIPES AND DITCHES)

MAINTENANCE COMPONENT	DEFECT	CONDITIONS WHEN MAINTENANCE IS NEEDED	RESULTS EXPECTED WHEN MAINTENANCE IS PERFORMED
PIPES	SEDIMENT & DEBRIS	ACCUMULATED SEDIMENT THAT EXCEEDS 20% OF THE DIAMETER OF THE PIPE.	PIPE CLEANED OF ALL SEDIMENT AND DEBRIS.
	VEGETATION	VEGETATION THAT REDUCES FREE MOVEMENT OF WATER THROUGH PIPES.	ALL VEGETATION REMOVED SO WATER FLOWS FREELY THROUGH PIPES.
	DAMAGED	PROTECTIVE COATING IS DAMAGED; RUST IS CAUSING MORE THAN 50% DETERIORATION TO ANY PART OF PIPE.	PIPE REPAIRED OR REPLACED.
		ANY DENT THAT DECREASES THE CROSS SECTION AREA OF PIPE BY MORE THAN 20%.	PIPE REPAIRED OR REPLACED.
	TRASH & DEBRIS	TRASH AND DEBRIS EXCEEDS 1 CUBIC FOOT PER 1,000 SQUARE FEET OF DITCH AND SLOPES.	TRASH AND DEBRIS CLEARED FROM DITCHES.
OPEN DITCHES	SEDIMENT	ACCUMULATED SEDIMENT THAT EXCEEDS 20% OF THE DESIGN DEPTH.	DITCH CLEANED/ FLUSHED OF ALL SEDIMENT AND DEBRIS SO THAT IT

		MATCHES DESIGN.
VEGETATION	VEGETATION THAT REDUCES FREE MOVEMENT OF WATER THROUGH DITCHES.	WATER FLOWS FREELY THROUGH DITCHES.
EROSION DAMAGE TO SLOPES	SEE "PONDS" STANDARD NO. 1	SEE "PONDS" STANDARD NO. 1
ROCK LINING OUT OF PLACE OR MISSING (IF APPLICABLE)	MAINTENANCE PERSON CAN SEE NATIVE SOIL BENEATH THE ROCK LINING.	REPLACE ROCKS TO DESIGN STANDARD.
CATCH BASINS	SEE "CATCH BASINS" STANDARD NO. 5	SEE "CATCH BASINS" STANDARD NO. 5
DEBRIS BARRIER E.G. TRASH RACK	SEE "DEBRIS BARRIERS" STANDARD NO. 6	SEE "DEBRIS BARRIERS" STANDARD NO. 6