# *FINAL*
# STORM DRAINAGE ANALYSIS

## CASTLE CREEK SUBDIVISION
Highway 41 North at Schroeder Road
Evansville, Indiana

*BLA Project No. 197-0181-APD*

*Prepared for:*

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Rec'd 1-11-001

January 8, 2001

## INTRODUCTION

The proposed Castle Creek Subdivision is to be constructed along the Highway 41 North corridor at the northeast quadrant of the intersection of Schroeder Road and U.S. Highway 41 North in Evansville, Indiana. A part of this site falls within the 100 year Zone "A", as noted on Community Panel No. 180256 0015 C of the Flood Insurance Rate Maps dated August 5, 1991. A complete hydraulic study has been undertaken to determine the 100 year flows and floodway for the adjoining Rusher Creek that flows east to west along the north side of this development. The proposed commercial/light industrial park is situated on cultivated fields ranging in slope from 2% to 5%. The soils are predominantly silt loams. The entire tract drains from east to west and from south to north toward Rusher Creek. In June of 2000 a preliminary drainage plan showing a large pond constructed on Lot 7 was presented to the Drainage Board and approved.

In the interim, after consulting with marketing consultants, the Owner has requested that a very linear storm retention facility be designed stretching across many of the lots in lieu of the plan originally approved. Contained in this report is a revised report which will address the storm detention requirements for this proposed development in accordance with the current Vanderburgh County Drainage Ordinance. This ordinance states that a 10 year undeveloped condition should be compared to a 25 year developed condition and the quantitative difference in runoff experienced under these conditions be temporarily detained. Due to the sensitivity of drainage throughout this area, the county has deemed this an impacted area and therefore the 100 year developed conditions will be compared to the 10 year undeveloped condition.

There are 27 acres (plus or minus) east of this project that drains through the subject property by way of a 36 inch diameter pipe beneath that section of Schroeder Road that runs north/south and lies east of the subject property. There is also approximately seven acres south of this project that drains through this site by way of an 18 inch diameter pipe beneath that section of Schroeder Road that runs east/west and lies to the south of the subject property.

These offsite flows will be routed through the basin rather than around the site because, due to the very flat terrain and lay of the land, routing the offsite stormwater completely around the site will be very difficult. The offsite flows will enter the long linear drainage basin at Schroeder Road to the east and also Schroeder Road to the south. The stretch of ditch from Schroeder Road east to Castle Creek Drive will remain a dry drainage-way and, due to the very flat, longitudinal grade, the invert will be paved.

A wet facility is proposed for that length of ditch north from Schroeder Road (south) to Rusher Creek Road (west) and then west from this juncture to the Highway 41 right-of-way, then again from this juncture north along Highway 41 to the northwest corner of the project.

This rather long, lineal drainage basin will provide storm detention for nearly all of the runoff from within the site. A dual stage outlet structure will be installed at the northwest corner of the basin which will help throttle the smaller storms while also providing the overflow capacity necessary for the larger storms where much offsite runoff must route through the basin.

## METHOD

The rational Method (Q = cia) will be used to compute the 1 and 10 year undeveloped flows. This flow rate will be determined by analyzing the entire watershed area since it will be routed through the basin. The summation of this flow, inclusive of the offsite area that drain through this site, will be used as the allowable outflow rates for the developed site.

"c" = Runoff Coefficient. The existing land slopes from west to east. The soils are silt loams. The area is currently cultivated fields ranging from 2% to 5% in slope. Table 3.2.1 of the drainage ordinance suggests an undeveloped runoff

coefficient of 0.50 be used. This value will be used to determine both onsite and offsite flows.

"i" = Intensity. Kerby's Formula will used to determine the Time of Concentration for the undeveloped site and the corresponding 10-year intensity will be calculated. For the area flowing from the south and east towards the basin, a value of 66 minutes was calculated. The resulting 10-year intensity equals 1.33 (see Appendix "B").

"a" – Area. The entire contributory area flowing into the basin from the proposed site and the associated offsite areas is approximately 74 acres (less INDOT right-of-way).

In addition, a developed "c" factor of 0.7 will be used on the proposed land use and anticipated surface improvements.

To the product of the developed "c" value and the area "a", a range of intensity values for different duration storms having a 25 year and 100 year specified returns rate will be multiplied to compute expected inflow rates from the subdivision.

The difference between the inflow rates and outflow rates for each interval will establish the required storage for that interval. From this data a curve can be generated and the peak or largest value attained will be used as the required storage basin capacity.

This conventional method of determining the allowable outflow is the most utilized method of analyzing the site as outlined in the drainage ordinance, however, due to the very linear nature of the basin (which is actually a series of basins having pool elevations of 444, 446 and 447) this site cannot be analyzed adequately with the approach outlined above. Designing a series of basins set one behind the other and installing walls with weir outlet configurations built into them between the lakes will

allow for much storage in the basins. Although the allowable outflow computed using the Rational Formula, as described herein, will be the maximum design outflow, the nature of the basins set in series will result in a final outflow from the northern-most basin being significantly less than the allowable 45 CFS.

Each weir set to control pool elevations will in itself act to limit the discharge of stormwater as it moves through the linear drainage basin. Each basin will be designed to fill to capacity. The stormwater release from the last lake in the series will be controlled through a dual stage outlet structure and outlet pipe sized to keep the release rate well below the allowable outflow.

## RESULTS

The allowable 10 year outflow rate for the developed site is 45 CFS. This value was calculated using the Rational Method (see appendix C).

Using a sophisticated modeling program, the site was modeled as a series of lakes working together to detain the runoff and a summary of the calculation results of the computer run are as follows:

| BASIN | PEAK FLOW (CFS) | MAX. POND STORAGE (Acre/Feet) | MAXIMUM WATER SURFACE ELEVATION (Feet) |
|---|---|---|---|
| A | 4.23 | 0.214 | 448.90 |
| B | 4.50 | 0.218 | 448.63 |
| C | 21.67 | 0.507 | 448.39 |
| D | 31.57 | 1.52 | 448.06 |
| E | 31.97 | 0.272 | 447.40 |
| F | 3.43 | 0.422 | 446.31 |
| G | 37.11 | 1.406 | 446.33 |

Maximum outflow leaving site (Basin G) = 37.11 CFS

Total Available Storage needed per analysis (Summation Basins A thru G) = 4.559 acre feet

There is a total of 6.65 acre/feet of storage available in the basins. The total storage needed per this analysis is 4.559 acre feet. This exceeds the 3.42 required by requirements set forth in the Vanderburgh County Drainage Ordinance for the 100 year storm (See Appendix C).

By utilizing a complex software package we have controlled the outflows and reduced the final outflow to a value of 37.1 CFS, which is also less than the 45 CFS allowed by ordinance (refer to calculations in Appendix C). This outflow was modeled with a tailwater of the final outlet pipe being influenced by the headwater of Rusher Creek.

## SUMMARY

An association of lot owners will assume maintenance of the proposed storm water facility.

All runoff from all paved area and rooftops constructed on all of the lots and the two adjoining areas to the east and south of this project will be routed through this basin. In addition, the runoff from the public roadways within the dedicated site will be routed through this basin.

The roadside ditch along Schroeder Road south and east of the project will also be routed through the basin.

All stormwater modeling 10/100 exceeds the requirements set by INDOT for projects adjacent to INDOT facilities.

By utilizing Pond Pack and capitalizing on the available stormwater storage capacity in these ponds, we can control the release rate to much less than that required as previously stated in the results.

Minimum building elevations on all lots on this site should be set by the Building Commissioner in accordance with both the results of this report and the hydraulic study for Rusher Creek performed independently of this report. With this linear stormwater retention facility, the maximum 100 year ponding elevations vary from basin to basin.

We believe that with this report and the independently performed 100 year Floodway Analysis for Rusher Creek a very good database has been provided. This data base should serve as a guidance tool for the best and safest utilization of this property.

OK PER CO. SURVEYOR

W/:

1. Floodway Approval DNR
2. INDOT Approval discharge into R/W 41 if needed
3. Commission approval of any detention / conveyance open Basins/waterways in Dedicated R/W

Bill 1/12/2001

# APPENDICES INDEX

# APPENDIX "A"

# DRAINAGE PLAN

# APPENDIX "B"

## TIME OF CONCENTRATION / INTENSITY

# TIME OF CONCENTRATION

## SHEET FLOW

$$TC = .827 \left[ \frac{(N)(L)}{\sqrt{S}} \right]^{.467}$$

N = 0.4 Coefficient Grass
L = Length
S = Slope

L = 3000'
H = 580 – 550 = 30 feet
S = .01

$$TC = .827 \left[ \frac{(0.4)(3000)}{\sqrt{S}} \right]^{.467} = 66 \text{ minutes}$$

## INTENSITY

$$i( ) = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533
α = 0.1747
d = 0.522
β = 1.6408

T = duration
Tc = Time of Concentration (10 yr. undeveloped)

$$i_{10} = \frac{1.9533(10)^{0.1747}}{(66/60+0.522)^{1.6408}} = \frac{2.9361}{2.211} = 1.33$$

# APPENDIX "C"

# STORAGE VOLUME DATA

Sub area

PROJECT: CASTLECRE
ENGINEER:

DATE: *********

RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 5\10\25\100
TIME OF CONCENTRATION UNDEV. (min): 40
RAINFALL INTENSITY (INCHES/HR): 39
2.70 2.250985 2.302636

UNDEVELOPED RUNOFF COEFFICIENT: 0.5
UNDEVELOPED RUNOFF RATE (CFS): 45.02
DEVELOPED RUNOFF COEFFICIENT: 0.7

25 YEAR STORM

| STORM DURATION (HRS) | RAINFALL INTENSITY (INCH/HR) | INFLOW RATE (CFS) | OUTFLOW RATE (CFS) | STORAGE RATE (CFS) | REQUIRED STORAGE (ACRE-FT) | |
|---|---|---|---|---|---|---|
| 0.08 | 8.02 | 224.44 | 45.02 | 179.42 | 1.196 | 6.85 |
| 0.17 | 6.20 | 173.54 | 45.02 | 128.53 | 1.821 | 5.45 |
| 0.25 | 5.26 | 147.41 | 45.02 | 102.39 | 2.133 | 4.65 |
| 0.33 | 4.62 | 129.34 | 45.02 | 84.32 | 2.319 | 4.15 |
| 0.42 | 4.09 | 114.42 | 45.02 | 69.40 | 2.429 | 3.80 |
| 0.50 | 3.72 | 104.17 | 45.02 | 59.15 | 2.465 | 3.40 |
| 0.58 | 3.42 | 95.84 | 45.02 | 50.82 | 2.457 | 3.20 |
| 0.67 | 3.15 | 88.12 | 45.02 | 43.10 | 2.406 | 2.85 |
| 0.75 | 2.94 | 82.34 | 45.02 | 37.32 | 2.333 | 2.75 |
| 0.83 | 2.76 | 77.36 | 45.02 | 32.34 | 2.237 | 2.60 |
| 0.92 | 2.59 | 72.49 | 45.02 | 27.47 | 2.106 | 2.45 |
| 1.00 | 2.45 | 68.70 | 46.05 | 22.64 | 1.887 | 2.30 |
| 1.25 | 2.11 | 59.20 | 46.05 | 13.15 | 1.370 | 2.05 |
| 1.50 | 1.86 | 52.15 | 46.05 | 6.09 | 0.762 | 1.85 |
| 1.75 | 1.67 | 46.67 | 46.05 | 0.62 | 0.090 | 1.60 |
| 2.00 | 1.51 | 42.27 | 46.05 | -3.78 | -0.630 | 1.40 |
| 2.50 | 1.27 | 35.63 | 46.05 | -10.43 | -2.172 | 1.25 |
| 3.00 | 1.10 | 30.82 | 46.05 | -15.24 | -3.809 | 1.10 |
| 4.00 | 0.87 | 24.27 | 46.05 | -21.78 | -7.259 | 0.84 |

PEAK STORAGE (ACRE/FT): 2.46
PEAK STORAGE (CUBIC FT): *********

100 YEAR STORM

| STORM DURATION (HRS) | RAINFALL INTENSITY (INCH/HR) | INFLOW RATE (CFS) | OUTFLOW RATE (CFS) | STORAGE RATE (CFS) | REQUIRED STORAGE (ACRE-FT) |
|---|---|---|---|---|---|
| 0.08 | 9.52 | 266.63 | 45.02 | 221.61 | 1.477 |
| 0.17 | 7.40 | 207.09 | 45.02 | 162.07 | 2.296 |
| 0.25 | 6.30 | 176.38 | 45.02 | 131.36 | 2.737 |
| 0.33 | 5.54 | 155.10 | 45.02 | 110.08 | 3.027 |
| 0.42 | 4.91 | 137.48 | 45.02 | 92.46 | 3.236 |
| 0.50 | 4.48 | 125.35 | 45.02 | 80.33 | 3.347 |
| 0.58 | 4.12 | 115.48 | 45.02 | 70.46 | 3.406 |
| 0.67 | 3.80 | 106.32 | 45.02 | 61.30 | 3.422 |
| 0.75 | 3.55 | 99.45 | 45.02 | 54.43 | 3.402 |
| 0.83 | 3.34 | 93.52 | 45.02 | 48.50 | 3.355 |
| 0.92 | 3.13 | 87.73 | 45.02 | 42.71 | 3.274 |
| 1.00 | 2.97 | 83.21 | 46.05 | 37.15 | 3.096 |
| 1.25 | 2.57 | 71.87 | 46.05 | 25.82 | 2.690 |
| 1.50 | 2.27 | 63.43 | 46.05 | 17.38 | 2.173 |
| 1.75 | 2.03 | 56.87 | 46.05 | 10.81 | 1.577 |
| 2.00 | 1.84 | 51.59 | 46.05 | 5.54 | 0.923 |
| 2.50 | 1.56 | 43.59 | 46.05 | -2.46 | -0.512 |
| 3.00 | 1.35 | 37.79 | 46.05 | -8.26 | -2.065 |
| 4.00 | 1.07 | 29.88 | 46.05 | -16.18 | -5.392 |
| | | | 46.05 | | |

PEAK STORAGE (ACRE/FT): 3.42
PEAK STORAGE (CUBIC FT): *********

# APPENDIX "D"

# OUTLET CONTROL STRUCTURE

# OUTLET CONTROL STRUCTURE

## Primary Outlet Pipe or Opening in Face of Outlet Structure

$$cd = Cc \times Cv = (.62)(.97) = .60$$

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

Allow Outflow Q = 45 cfs

Allow HW = Top Box Outlet Str. To IE Lower-Water Outlet Pipe

$$(45) = Q = (.60)(A)\sqrt{2(32.2)(3.75)}$$

$$A = \frac{45}{9.32} = 0.333 = \frac{\Pi d^2}{4}$$

d = 2.50 = 30" diameter hole in box or 16"x42" rectangular opening

**See HY8 Computer Runs which follow**

## Secondary Outlet Pipe

30" round or 16"x42" rectangular opening with 3.75' of head will pass 45 cfs and 42" diameter outlet pipe with 9' of head working against a 7' tail water will pass 8.5 cfs.1 Twin "E" casting in top box with 42" outlet pipe will provide secondary outlet should lake fill up to within 1' of top of dam

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CURRENT DATE: 01-08-2001
CURRENT TIME: 16:30:03

FILE DATE: 01-08-2001
FILE NAME: CAS

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

| CULV NO. | SITE DATA | | | CULVERT SHAPE, MATERIAL, INLET | | | | |
|---|---|---|---|---|---|---|---|---|
| | INLET ELEV. (ft) | OUTLET ELEV. (ft) | CULVERT LENGTH (ft) | BARRELS SHAPE MATERIAL | SPAN (ft) | RISE (ft) | MANNING n | INLET TYPE |
| 1 | 438.00 | 437.90 | 46.00 | 1 RCP | 2.50 | 2.50 | .012 | CONVENTIONAL |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

SUMMARY OF CULVERT FLOWS (cfs) FILE: CAS DATE: 01-08-2001

| ELEV (ft) | TOTAL | 1 | 2 | 3 | 4 | 5 | 6 | ROADWAY | ITR |
|---|---|---|---|---|---|---|---|---|---|
| 446.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 446.04 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 446.17 | 12.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 446.39 | 18.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 446.69 | 24.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 447.08 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 447.55 | 36.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 448.11 | 42.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 448.43 | 45.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 449.49 | 54.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 450.31 | 60.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0 |
| 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | OVERTOPPING | |

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAS DATE: 01-08-2001

| HEAD ELEV (ft) | HEAD ERROR (ft) | TOTAL FLOW (cfs) | FLOW ERROR (cfs) | % FLOW ERROR |
|---|---|---|---|---|
| 446.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| 446.04 | 0.000 | 6.00 | 0.00 | 0.00 |
| 446.17 | 0.000 | 12.00 | 0.00 | 0.00 |
| 446.39 | 0.000 | 18.00 | 0.00 | 0.00 |
| 446.69 | 0.000 | 24.00 | 0.00 | 0.00 |
| 447.08 | 0.000 | 30.00 | 0.00 | 0.00 |
| 447.55 | 0.000 | 36.00 | 0.00 | 0.00 |
| 448.11 | 0.000 | 42.00 | 0.00 | 0.00 |
| 448.43 | 0.000 | 45.00 | 0.00 | 0.00 |
| 449.49 | 0.000 | 54.00 | 0.00 | 0.00 |
| 450.31 | 0.000 | 60.00 | 0.00 | 0.00 |

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 01-08-2001 FILE DATE: 01-08-2001
CURRENT TIME: 16:30:03 FILE NAME: CAS

PERFORMANCE CURVE FOR CULVERT 1 - 1( 2.50 (ft) BY 2.50 (ft)) RCP

| DIS-CHARGE FLOW (cfs) | HEAD-WATER ELEV. (ft) | INLET CONTROL DEPTH (ft) | OUTLET CONTROL DEPTH (ft) | FLOW TYPE <F4> | NORMAL DEPTH (ft) | CRIT. DEPTH (ft) | OUTLET DEPTH (ft) | TW DEPTH (ft) | OUTLET VEL. (fps) | TW VEL. (fps) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 446.00 | 0.00 | 8.00 | 0-NF | 0.00 | 0.00 | 0.00 | 8.10 | 0.00 | 0.00 |
| 6.00 | 446.04 | 1.09 | 8.04 | 4-FFt | 0.91 | 0.80 | 2.50 | 8.10 | 1.22 | 0.00 |
| 12.00 | 446.17 | 1.69 | 8.17 | 4-FFt | 1.36 | 1.16 | 2.50 | 8.10 | 2.44 | 0.00 |
| 18.00 | 446.39 | 2.17 | 8.39 | 4-FFt | 1.79 | 1.43 | 2.50 | 8.10 | 3.67 | 0.00 |
| 24.00 | 446.69 | 2.64 | 8.69 | 4-FFt | 2.50 | 1.66 | 2.50 | 8.10 | 4.89 | 0.00 |
| 30.00 | 447.08 | 3.16 | 9.08 | 4-FFt | 2.50 | 1.86 | 2.50 | 8.10 | 6.11 | 0.00 |
| 36.00 | 447.55 | 3.80 | 9.55 | 4-FFt | 2.50 | 2.03 | 2.50 | 8.10 | 7.33 | 0.00 |
| 42.00 | 448.11 | 4.56 | 10.11 | 4-FFt | 2.50 | 2.15 | 2.50 | 8.10 | 8.56 | 0.00 |
| 45.00 | 448.43 | 4.99 | 10.43 | 4-FFt | 2.50 | 2.22 | 2.50 | 8.10 | 9.17 | 0.00 |
| 54.00 | 449.49 | 6.47 | 11.49 | 4-FFt | 2.50 | 2.41 | 2.50 | 8.10 | 11.00 | 0.00 |
| 60.00 | 450.31 | 7.61 | 12.31 | 4-FFt | 2.50 | 2.50 | 2.50 | 8.10 | 12.22 | 0.00 |

El. inlet face invert 438.00 ft El. outlet invert 437.90 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

| | |
|---|---|
| INLET STATION | 0.00 ft |
| INLET ELEVATION | 438.00 ft |
| OUTLET STATION | 46.00 ft |
| OUTLET ELEVATION | 437.90 ft |
| NUMBER OF BARRELS | 1 |
| SLOPE (V/H) | 0.0022 |
| CULVERT LENGTH ALONG SLOPE | 46.00 ft |

***** CULVERT DATA SUMMARY **********

| | |
|---|---|
| BARREL SHAPE | CIRCULAR |
| BARREL DIAMETER | 2.50 ft |
| BARREL MATERIAL | CONCRETE |
| BARREL MANNING'S n | 0.012 |
| INLET TYPE | CONVENTIONAL |
| INLET EDGE AND WALL | SQUARE EDGE WITH HEADWALL |
| INLET DEPRESSION | NONE |

CURRENT DATE: 01-08-2001
CURRENT TIME: 16:30:03

FILE DATE: 01-08-2001
FILE NAME: CAS

## TAILWATER

CONSTANT WATER SURFACE ELEVATION
446.00

## ROADWAY OVERTOPPING DATA

| | |
|---|---|
| ROADWAY SURFACE | PAVED |
| EMBANKMENT TOP WIDTH | 12.00 ft |
| CREST LENGTH | 50.00 ft |
| OVERTOPPING CREST ELEVATION | 449.00 ft |

# APPENDIX "E"

# BASIN VOLUMES

# BASIN VOLUMES

## Lake A

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 447 | 3,804 | | | Pool |
| 448 | 4,934 | 4,369 | 4,369 | |
| 449 | 6,129 | 5,532 | 9,900 | |
| 450 | 6,970 | 6,549 | 16,450 | |
| | | **Total** | **0.377 ac/ft** | |

## Lake B

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 447 | 4,685 | | | Pool |
| 448 | 5,976 | 5,330 | 5,330 | |
| 449 | 7,272 | 6.624 | 11,954 | |
| 450 | 7,841 | 7,556 | 19,510 | |
| | | **Total** | **0.447 ac/ft** | |

## Lake C

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 445.50 | 3,049 | | | Pool |
| 446 | 4,759 | 1,952 | 1,952 | |
| 447 | 7,370 | 5,974 | 7,926 | |
| 448 | 11,636 | 9,503 | 17,429 | |
| 449 | 12,632 | 12,134 | 29,563 | |
| | | **Total** | **0.677 ac/ft** | |

## Lake D

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 445.50 | 18,731 | | | Pool |
| 446 | 22,830 | 10,390 | 10,390 | |
| 447 | 26,934 | 24,883 | 35,273 | |
| 448 | 31,047 | 28,990 | 64,263 | |
| 449 | 35,161 | 33,104 | 97,367 | |
| | | **Total** | **2.235 ac/ft** | |

# BASIN VOLUMES

## Lake E

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 445.50 | 4,356 | | | Pool |
| 446 | 5,337 | 2,423 | 2,423 | |
| 447 | 7,156 | 6,246 | 8,669 | |
| 448 | 8,948 | 8,052 | 16,721 | |
| | | **Total** | **0.3839 ac/ft** | |

## Lake F

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 444 | 5,862 | | | Pool |
| 445 | 7,588 | 6,725 | 6,725 | |
| 446 | 9,354 | 9,436 | 16,161 | |
| 447 | 11,284 | 10,319 | 26,480 | |
| | | **Total** | **0.60 ac/ft** | |

## Lake G

| Elevation | Surface Area | Stage Volume (cubic feet) | Accumulated Volume (cubic feet) | Remarks |
|---|---|---|---|---|
| 444 | 19,676 | | | Pool |
| 445 | 25,071 | 22,373 | 22,373 | |
| 446 | 30,103 | 27,587 | 49,960 | |
| 447 | 38,659 | 34,381 | 84,341 | |
| | | **Total** | **1.936 ac/ft** | |

Total storage available in ponds = 6.65 acre/feet

# APPENDIX "F"

# STORMWATER ANALYSIS

Job File: S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW
Rain Dir: C:\HAESTAD\PPKW\RAINFALL\

==========
JOB TITLE
==========

POST DEVELOPED
CASTLE CREEK



Appendix F

# Table of Contents

Table of Contents (continued)

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = HUFF.RNQ Eville Storms

Storm Tag Name = 100 YR
Description: Evansville Huff 100yr

---

Data Type, File, ID = Synthetic Storm HUFF.RNF 3rd Qrt Eville
Storm Frequency = 100 yr
Total Rainfall Depth= 6.5200 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 24.0000 hrs

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0500 hrs
Output Time Step = .0500 hrs
ICPM Ending Time = 35.0000 hrs

| | Node ID | | Type | HYG Vol ac-ft | Trun. | Qpeak hrs | Qpeak cfs | Max WSEL ft |
|---|---|---|---|---|---|---|---|---|
| | AREA A | | AREA | 1.016 | | 16.5500 | 1.15 | |
| | AREA B | | AREA | .285 | | 16.1500 | .32 | |
| | AREA C | | AREA | 3.560 | | 16.6500 | 4.04 | |
| | AREA D | | AREA | 9.019 | | 16.8000 | 10.24 | |
| | AREA E | | AREA | .427 | | 16.7000 | .49 | |
| | AREA F | | AREA | 1.358 | | 16.7000 | 1.54 | |
| | AREA G | | AREA | 1.828 | | 16.4500 | 2.07 | |
| | EAST OFFSITE | | AREA | 10.297 | | 16.8000 | 13.30 | |
| Outfall | OUTLET | | T-E | 30.015 | R | 13.6500 | 37.11 | 446.50 |
| | P-A | | POND | 3.252 | | 16.8000 | 4.29 | |
| | P-A | OUT | POND | 3.252 | | 16.8000 | 4.23 | 448.90 |
| | P-B | | POND | 3.536 | | 16.8000 | 4.55 | |
| | P-B | OUT | POND | 3.536 | | 16.8500 | 4.50 | 448.63 |
| | P-C | | POND | 17.393 | | 16.8000 | 21.83 | |
| | P-C | OUT | POND | 17.413 | | 16.8000 | 21.67 | 448.39 |
| | P-D | | POND | 26.432 | | 16.8000 | 31.90 | |
| | P-D | OUT | POND | 26.415 | R | 16.9000 | 31.57 | 448.06 |
| | P-E | | POND | 26.842 | R | 16.8500 | 32.02 | |
| | P-E | OUT | POND | 26.840 | R | 16.9000 | 31.97 | 447.40 |
| | P-F | | POND | 1.358 | | 16.7000 | 1.54 | |
| | P-F | OUT | POND | 1.430 | R | 13.7000 | 3.43 | 446.31 |
| | P-F | OUT | POND | -.075 | R | 13.1000 | -3.80 (-Q) | |

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

| Node ID | Type | HYG Vol ac-ft | Trun. | Qpeak hrs | Qpeak cfs | Max WSEL ft |
|---|---|---|---|---|---|---|
| P-G | POND | 30.023 | R | 16.8000 | 35.52 | |
| P-G OUT | POND | 30.015 | R | 13.6500 | 37.11 | 446.33 |
| SOUTH OFFSITE | AREA | 2.236 | | 16.8000 | 3.14 | |

File.... C:\HAESTAD\PPKW\RAINFALL\HUFF.RNQ
Title... POST DEVELOPED
CASTLE CREEK

## DESIGN STORMS SUMMARY

Design Storm File,ID = HUFF.RNQ Eville Storms

Storm Tag Name = 100 YR
Description: Evansville Huff 100yr

---

Data Type, File, ID = Synthetic Storm HUFF.RNF 3rd Qrt Eville
Storm Frequency = 100 yr
Total Rainfall Depth= 6.5200 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 24.0000 hrs

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 447.00 | ----- | .0873 | .0000 | .000 | .000 |
| 448.00 | ----- | .1133 | .3000 | .100 | .100 |
| 449.00 | ----- | .1407 | .3802 | .127 | .227 |
| 450.00 | ----- | .1600 | .4507 | .150 | .377 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 447.00 | ----- | .1076 | .0000 | .000 | .000 |
| 448.00 | ----- | .1372 | .3662 | .122 | .122 |
| 449.00 | ----- | .1669 | .4555 | .152 | .274 |
| 450.00 | ----- | .1800 | .5203 | .173 | .447 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 445.50 | ----- | .0700 | .0000 | .000 | .000 |
| 446.00 | ----- | .1093 | .2667 | .044 | .044 |
| 447.00 | ----- | .1692 | .4144 | .138 | .183 |
| 448.00 | ----- | .2671 | .6489 | .216 | .399 |
| 449.00 | ----- | .2900 | .8354 | .278 | .677 |
| 450.00 | ----- | .3000 | .8850 | .295 | .972 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 445.50 | ----- | .4300 | .0000 | .000 | .000 |
| 446.00 | ----- | .5241 | 1.4289 | .238 | .238 |
| 447.00 | ----- | .6183 | 1.7117 | .571 | .809 |
| 448.00 | ----- | .7127 | 1.9949 | .665 | 1.474 |
| 449.00 | ----- | .8072 | 2.2784 | .759 | 2.233 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 445.50 | ----- | .1000 | .0000 | .000 | .000 |
| 446.00 | ----- | .1225 | .3332 | .056 | .056 |
| 447.00 | ----- | .1643 | .4287 | .143 | .198 |
| 448.00 | ----- | .2054 | .5534 | .184 | .383 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 444.00 | ----- | .1346 | .0000 | .000 | .000 |
| 445.00 | ----- | .1742 | .4619 | .154 | .154 |
| 446.00 | ----- | .2147 | .5823 | .194 | .348 |
| 447.00 | ----- | .2590 | .7096 | .237 | .585 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

| Elevation (ft) | Planimeter (sq.in) | Area (acres) | A1+A2+sqr(A1*A2) (acres) | Volume (ac-ft) | Volume Sum (ac-ft) |
|---|---|---|---|---|---|
| 444.00 | ----- | .4517 | .0000 | .000 | .000 |
| 445.00 | ----- | .5756 | 1.5371 | .512 | .512 |
| 446.00 | ----- | .6911 | 1.8973 | .632 | 1.145 |
| 447.00 | ----- | .8875 | 2.3617 | .787 | 1.932 |

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET "POND "A"
STR No —
18" ϕ PIPE

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 447.00 ft
Increment = .50 ft
Max. Elev.= 450.00 ft

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Culvert-Circular | CV | <---> | TW | 447.000 | 450.000 |
| TW SETUP, DS Channel | | | | | |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET STRUCTURE INPUT DATA

| | | | |
|---|---|---|---|
| Structure ID | = | CV | |
| Structure Type | = | Culvert-Circular | |
| No. Barrels | = | 1 | |
| Barrel Diameter | = | 1.5000 | ft |
| Upstream Invert | = | 447.00 | ft |
| Dnstream Invert | = | 447.00 | ft |
| Horiz. Length | = | 36.00 | ft |
| Barrel Length | = | 36.00 | ft |
| Barrel Slope | = | .00000 | ft/ft |

OUTLET CONTROL DATA...

| | | | |
|---|---|---|---|
| Mannings n | = | .0120 | |
| Ke | = | .0000 | (forward entrance loss) |
| Kb | = | .015519 | (per ft of full flow) |
| Kr | = | .0000 | (reverse entrance loss) |
| HW Convergence | = | .001 | +/- ft |

INLET CONTROL DATA...

| | | | |
|---|---|---|---|
| Equation form | = | 1 | |
| Inlet Control K | = | .0098 | |
| Inlet Control M | = | 2.0000 | |
| Inlet Control c | = | .03980 | |
| Inlet Control Y | = | .6700 | |
| T1 ratio (HW/D) | = | 1.160 | |
| T2 ratio (HW/D) | = | 1.307 | |
| Slope Factor | = | -.500 | |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | | |
|---|---|---|---|---|---|
| At T1 Elev = | 448.74 ft | ---> | Flow = | 7.58 | cfs |
| At T2 Elev = | 448.96 ft | ---> | Flow = | 8.66 | cfs |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | .00 | 447.00 | .000 | None contributing |
| 447.50 | .76 | 447.00 | .000 | CV |
| 448.00 | 3.04 | 447.00 | .000 | CV |
| 448.50 | 6.19 | 447.00 | .000 | CV |
| 449.00 | 8.83 | 447.00 | .000 | CV |
| 449.50 | 10.83 | 447.00 | .000 | CV |
| 450.00 | 12.51 | 447.00 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -.76 | 447.50 | .000 | CV |
| 447.50 | .00 | 447.50 | .000 | CV |
| 448.00 | 3.04 | 447.50 | .000 | CV |
| 448.50 | 6.19 | 447.50 | .000 | CV |
| 449.00 | 8.83 | 447.50 | .000 | CV |
| 449.50 | 10.83 | 447.50 | .000 | CV |
| 450.00 | 12.51 | 447.50 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -3.04 | 448.00 | .000 | CV |
| 447.50 | -3.04 | 448.00 | .000 | CV |
| 448.00 | .00 | 448.00 | .000 | CV |
| 448.50 | 6.17 | 448.00 | .000 | CV |
| 449.00 | 8.83 | 448.00 | .000 | CV |
| 449.50 | 10.83 | 448.00 | .000 | CV |
| 450.00 | 12.51 | 448.00 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -6.19 | 448.50 | .000 | CV |
| 447.50 | -6.19 | 448.50 | .000 | CV |
| 448.00 | -6.18 | 448.50 | .000 | CV |
| 448.50 | .00 | 448.50 | .000 | CV |
| 449.00 | 8.02 | 448.50 | .000 | CV |
| 449.50 | 10.83 | 448.50 | .000 | CV |
| 450.00 | 12.51 | 448.50 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -9.24 | 449.00 | .000 | CV |
| 447.50 | -9.24 | 449.00 | .000 | CV |
| 448.00 | -9.24 | 449.00 | .000 | CV |
| 448.50 | -8.03 | 449.00 | .000 | CV |
| 449.00 | .00 | 449.00 | .000 | CV |
| 449.50 | 8.03 | 449.00 | .000 | CV |
| 450.00 | 11.35 | 449.00 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -11.80 | 449.50 | .000 | CV |
| 447.50 | -11.80 | 449.50 | .000 | CV |
| 448.00 | -11.80 | 449.50 | .000 | CV |
| 448.50 | -11.35 | 449.50 | .000 | CV |
| 449.00 | -8.03 | 449.50 | .000 | CV |
| 449.50 | .00 | 449.50 | .000 | CV |
| 450.00 | 8.03 | 449.50 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -14.11 | 450.00 | .000 | CV |
| 447.50 | -14.11 | 450.00 | .000 | CV |
| 448.00 | -14.11 | 450.00 | .000 | CV |
| 448.50 | -13.91 | 450.00 | .000 | CV |
| 449.00 | -11.35 | 450.00 | .000 | CV |
| 449.50 | -8.03 | 450.00 | .000 | CV |
| 450.00 | .00 | 450.00 | .000 | CV |

POND B
OUTLET STR — WEIR WALL

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 447.00 ft
Increment = .50 ft
Max. Elev.= 450.00 ft

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Weir-Rectangular | W1 | <---> | TW | 447.000 | 450.000 |
| Weir-Rectangular | W2 | <---> | TW | 448.500 | 450.000 |

TW SETUP, DS Channel

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = W1
Structure Type = Weir-Rectangular

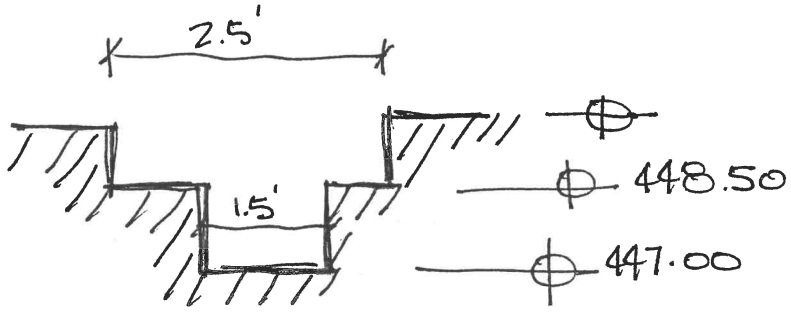
| | | |
|---|---|---|
| # of Openings | = | 1 |
| Crest Elev. | = | 447.00 ft |
| Weir Length | = | 1.50 ft |
| Weir Coeff. | = | 3.320000 |

Weir TW effects (Use adjustment equation)

Structure ID = W2
Structure Type = Weir-Rectangular

| | | |
|---|---|---|
| # of Openings | = | 1 |
| Crest Elev. | = | 448.50 ft |
| Weir Length | = | 2.50 ft |
| Weir Coeff. | = | 3.000000 |

Weir TW effects (Use adjustment equation)



File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | .00 | 445.50 | .000 | W1 |
| 447.50 | 1.76 | 445.50 | .000 | W1 |
| 448.00 | 4.98 | 445.50 | .000 | W1 |
| 448.50 | 9.15 | 445.50 | .000 | W1 +W2 |
| 449.00 | 16.74 | 445.50 | .000 | W1 +W2 |
| 449.50 | 27.19 | 445.50 | .000 | W1 +W2 |
| 450.00 | 39.66 | 445.50 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | .00 | 446.00 | .000 | W1 |
| 447.50 | 1.76 | 446.00 | .000 | W1 |
| 448.00 | 4.98 | 446.00 | .000 | W1 |
| 448.50 | 9.15 | 446.00 | .000 | W1 +W2 |
| 449.00 | 16.74 | 446.00 | .000 | W1 +W2 |
| 449.50 | 27.19 | 446.00 | .000 | W1 +W2 |
| 450.00 | 39.66 | 446.00 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-BC

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | .00 | 446.50 | .000 | W1 |
| 447.50 | 1.76 | 446.50 | .000 | W1 |
| 448.00 | 4.98 | 446.50 | .000 | W1 |
| 448.50 | 9.15 | 446.50 | .000 | W1 +W2 |
| 449.00 | 16.74 | 446.50 | .000 | W1 +W2 |
| 449.50 | 27.19 | 446.50 | .000 | W1 +W2 |
| 450.00 | 39.66 | 446.50 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-BC

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | .00 | 447.00 | .000 | W1 |
| 447.50 | 1.76 | 447.00 | .000 | W1 |
| 448.00 | 4.98 | 447.00 | .000 | W1 |
| 448.50 | 9.15 | 447.00 | .000 | W1 +W2 |
| 449.00 | 16.74 | 447.00 | .000 | W1 +W2 |
| 449.50 | 27.19 | 447.00 | .000 | W1 +W2 |
| 450.00 | 39.66 | 447.00 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -1.76 | 447.50 | .000 | W1 |
| 447.50 | .00 | 447.50 | .000 | W1 |
| 448.00 | 4.21 | 447.50 | .000 | W1 |
| 448.50 | 8.43 | 447.50 | .000 | W1 +W2 |
| 449.00 | 16.03 | 447.50 | .000 | W1 +W2 |
| 449.50 | 26.49 | 447.50 | .000 | W1 +W2 |
| 450.00 | 38.96 | 447.50 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -4.98 | 448.00 | .000 | W1 |
| 447.50 | -4.21 | 448.00 | .000 | W1 |
| 448.00 | .00 | 448.00 | .000 | W1 |
| 448.50 | 6.76 | 448.00 | .000 | W1 +W2 |
| 449.00 | 14.56 | 448.00 | .000 | W1 +W2 |
| 449.50 | 25.09 | 448.00 | .000 | W1 +W2 |
| 450.00 | 37.61 | 448.00 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -9.15 | 448.50 | .000 | W1 +W2 |
| 447.50 | -8.43 | 448.50 | .000 | W1 +W2 |
| 448.00 | -6.76 | 448.50 | .000 | W1 +W2 |
| 448.50 | .00 | 448.50 | .000 | W1 +W2 |
| 449.00 | 12.06 | 448.50 | .000 | W1 +W2 |
| 449.50 | 22.98 | 448.50 | .000 | W1 +W2 |
| 450.00 | 35.65 | 448.50 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -16.74 | 449.00 | .000 | W1 +W2 |
| 447.50 | -16.03 | 449.00 | .000 | W1 +W2 |
| 448.00 | -14.56 | 449.00 | .000 | W1 +W2 |
| 448.50 | -12.06 | 449.00 | .000 | W1 +W2 |
| 449.00 | .00 | 449.00 | .000 | W1 +W2 |
| 449.50 | 18.47 | 449.00 | .000 | W1 +W2 |
| 450.00 | 31.81 | 449.00 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-BC

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Notes | | |
|---|---|---|---|---|
| | | Converge | | |
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -27.19 | 449.50 | .000 | W1 +W2 |
| 447.50 | -26.49 | 449.50 | .000 | W1 +W2 |
| 448.00 | -25.09 | 449.50 | .000 | W1 +W2 |
| 448.50 | -22.98 | 449.50 | .000 | W1 +W2 |
| 449.00 | -18.47 | 449.50 | .000 | W1 +W2 |
| 449.50 | .00 | 449.50 | .000 | W1 +W2 |
| 450.00 | 25.10 | 449.50 | .000 | W1 +W2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 447.00 | -39.66 | 450.00 | .000 | W1 +W2 |
| 447.50 | -38.96 | 450.00 | .000 | W1 +W2 |
| 448.00 | -37.61 | 450.00 | .000 | W1 +W2 |
| 448.50 | -35.65 | 450.00 | .000 | W1 +W2 |
| 449.00 | -31.81 | 450.00 | .000 | W1 +W2 |
| 449.50 | -25.10 | 450.00 | .000 | W1 +W2 |
| 450.00 | .00 | 450.00 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 445.50 ft
Increment = .50 ft
Max. Elev.= 450.00 ft

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Culvert-Circular | CV | <---> | TW | 445.500 | 450.000 |
| Culvert-Circular | c2 | ---> | TW | 445.500 | 450.000 |

TW SETUP, DS Channel

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET STRUCTURE INPUT DATA

| | | | |
|---|---|---|---|
| Structure ID | = | CV | |
| Structure Type | = | Culvert-Circular | |
| No. Barrels | = | 1 | |
| Barrel Diameter | = | 2.5000 | ft ← 30" ϕ pipe |
| Upstream Invert | = | 445.50 | ft |
| Dnstream Invert | = | 445.50 | ft |
| Horiz. Length | = | 36.00 | ft |
| Barrel Length | = | 36.00 | ft |
| Barrel Slope | = | .00000 | ft/ft |

OUTLET CONTROL DATA...

| | | | |
|---|---|---|---|
| Mannings n | = | .0120 | |
| Ke | = | .0000 | (forward entrance loss) |
| Kb | = | .007854 | (per ft of full flow) |
| Kr | = | .0000 | (reverse entrance loss) |
| HW Convergence | = | .001 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = | 1 |
| Inlet Control K | = | .0098 |
| Inlet Control M | = | 2.0000 |
| Inlet Control c | = | .03980 |
| Inlet Control Y | = | .6700 |
| T1 ratio (HW/D) | = | 1.160 |
| T2 ratio (HW/D) | = | 1.307 |
| Slope Factor | = | -.500 |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | | |
|---|---|---|---|---|---|
| At T1 Elev = | 448.40 ft | ---> | Flow = | 27.16 cfs | |
| At T2 Elev = | 448.77 ft | ---> | Flow = | 31.05 cfs | |

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OUTLET STRUCTURE INPUT DATA

| | | |
|---|---|---|
| Structure ID | = c2 | |
| Structure Type | = Culvert-Circular | |
| No. Barrels | = 1 | |
| Barrel Diameter | = 1.5000 ft | ← 18" ϕ pipe |
| Upstream Invert | = 445.50 ft | |
| Dnstream Invert | = 445.50 ft | |
| Horiz. Length | = 36.00 ft | |
| Barrel Length | = 36.00 ft | |
| Barrel Slope | = .00000 ft/ft | |

OUTLET CONTROL DATA...

| | | |
|---|---|---|
| Mannings n | = .0120 | |
| Ke | = .0000 | (forward entrance loss) |
| Kb | = .015519 | (per ft of full flow) |
| Kr | = .0000 | (reverse entrance loss) |
| HW Convergence | = .001 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = 1 | |
| Inlet Control K | = .0098 | |
| Inlet Control M | = 2.0000 | |
| Inlet Control c | = .03980 | |
| Inlet Control Y | = .6700 | |
| T1 ratio (HW/D) | = 1.160 | |
| T2 ratio (HW/D) | = 1.307 | |
| Slope Factor | = -.500 | |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 447.24 ft ---> Flow = 7.58 cfs
At T2 Elev = 447.46 ft ---> Flow = 8.66 cfs

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 445.50 | .000 | None contributing |
| 446.00 | 1.79 | 445.50 | .000 | CV +c2 |
| 446.50 | 7.39 | 445.50 | .000 | CV +c2 |
| 447.00 | 15.75 | 445.50 | .000 | CV +c2 |
| 447.50 | 24.86 | 445.50 | .000 | CV +c2 |
| 448.00 | 33.07 | 445.50 | .000 | CV +c2 |
| 448.50 | 40.73 | 445.50 | .000 | CV +c2 |
| 449.00 | 47.22 | 445.50 | .000 | CV +c2 |
| 449.50 | 52.85 | 445.50 | .000 | CV +c2 |
| 450.00 | 57.91 | 445.50 | .000 | CV +c2 |

Type.... Composite Rating Curve
Name.... PR-CD

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -1.04 | 446.00 | .000 | CV |
| 446.00 | .00 | 446.00 | .000 | CV +c2 |
| 446.50 | 7.39 | 446.00 | .000 | CV +c2 |
| 447.00 | 15.75 | 446.00 | .000 | CV +c2 |
| 447.50 | 24.86 | 446.00 | .000 | CV +c2 |
| 448.00 | 33.07 | 446.00 | .000 | CV +c2 |
| 448.50 | 40.73 | 446.00 | .000 | CV +c2 |
| 449.00 | 47.22 | 446.00 | .000 | CV +c2 |
| 449.50 | 52.85 | 446.00 | .000 | CV +c2 |
| 450.00 | 57.91 | 446.00 | .000 | CV +c2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -4.35 | 446.50 | .000 | CV |
| 446.00 | -4.35 | 446.50 | .000 | CV |
| 446.50 | .00 | 446.50 | .000 | CV +c2 |
| 447.00 | 15.74 | 446.50 | .000 | CV +c2 |
| 447.50 | 24.86 | 446.50 | .000 | CV +c2 |
| 448.00 | 33.07 | 446.50 | .000 | CV +c2 |
| 448.50 | 40.73 | 446.50 | .000 | CV +c2 |
| 449.00 | 47.22 | 446.50 | .000 | CV +c2 |
| 449.50 | 52.85 | 446.50 | .000 | CV +c2 |
| 450.00 | 57.91 | 446.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -9.56 | 447.00 | .000 | CV |
| 446.00 | -9.56 | 447.00 | .000 | CV |
| 446.50 | -9.56 | 447.00 | .000 | CV |
| 447.00 | .00 | 447.00 | .000 | CV +c2 |
| 447.50 | 23.92 | 447.00 | .000 | CV +c2 |
| 448.00 | 33.07 | 447.00 | .000 | CV +c2 |
| 448.50 | 40.73 | 447.00 | .000 | CV +c2 |
| 449.00 | 47.22 | 447.00 | .000 | CV +c2 |
| 449.50 | 52.85 | 447.00 | .000 | CV +c2 |
| 450.00 | 57.91 | 447.00 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -16.16 | 447.50 | .000 | CV |
| 446.00 | -16.16 | 447.50 | .000 | CV |
| 446.50 | -16.16 | 447.50 | .000 | CV |
| 447.00 | -15.90 | 447.50 | .000 | CV |
| 447.50 | .00 | 447.50 | .000 | CV +c2 |
| 448.00 | 29.79 | 447.50 | .000 | CV +c2 |
| 448.50 | 39.57 | 447.50 | .000 | CV +c2 |
| 449.00 | 47.14 | 447.50 | .000 | CV +c2 |
| 449.50 | 52.85 | 447.50 | .000 | CV +c2 |
| 450.00 | 57.91 | 447.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -23.56 | 448.00 | .000 | CV |
| 446.00 | -23.56 | 448.00 | .000 | CV |
| 446.50 | -23.56 | 448.00 | .000 | CV |
| 447.00 | -23.56 | 448.00 | .000 | CV |
| 447.50 | -21.74 | 448.00 | .000 | CV |
| 448.00 | .00 | 448.00 | .000 | CV +c2 |
| 448.50 | 32.61 | 448.00 | .000 | CV +c2 |
| 449.00 | 44.59 | 448.00 | .000 | CV +c2 |
| 449.50 | 51.42 | 448.00 | .000 | CV +c2 |
| 450.00 | 57.41 | 448.00 | .000 | CV +c2 |

Type.... Composite Rating Curve
Name.... PR-CD

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -31.09 | 448.50 | .000 | CV |
| 446.00 | -31.09 | 448.50 | .000 | CV |
| 446.50 | -31.09 | 448.50 | .000 | CV |
| 447.00 | -31.09 | 448.50 | .000 | CV |
| 447.50 | -30.97 | 448.50 | .000 | CV |
| 448.00 | -24.60 | 448.50 | .000 | CV |
| 448.50 | .00 | 448.50 | .000 | CV +c2 |
| 449.00 | 32.63 | 448.50 | .000 | CV +c2 |
| 449.50 | 46.12 | 448.50 | .000 | CV +c2 |
| 450.00 | 55.26 | 448.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -37.98 | 449.00 | .000 | CV |
| 446.00 | -37.98 | 449.00 | .000 | CV |
| 446.50 | -37.98 | 449.00 | .000 | CV |
| 447.00 | -37.98 | 449.00 | .000 | CV |
| 447.50 | -37.98 | 449.00 | .000 | CV |
| 448.00 | -34.76 | 449.00 | .000 | CV |
| 448.50 | -24.60 | 449.00 | .000 | CV |
| 449.00 | .00 | 449.00 | .000 | CV +c2 |
| 449.50 | 32.61 | 449.00 | .000 | CV +c2 |
| 450.00 | 46.12 | 449.00 | .000 | CV +c2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 445.50 ft
Increment = .50 ft
Max. Elev.= 449.00 ft

POND D

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Culvert-Circular | CV | <---> | TW | 445.500 | 449.000 |
| Culvert-Circular | c2 | ---> | TW | 445.500 | 449.000 |

TW SETUP, DS Channel

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET STRUCTURE INPUT DATA

| | | |
|---|---|---|
| Structure ID | = CV | |
| Structure Type | = Culvert-Circular | |
| No. Barrels | = 1 | |
| Barrel Diameter | = 2.5000 ft | ← 30" |
| Upstream Invert | = 445.50 ft | |
| Dnstream Invert | = 445.50 ft | |
| Horiz. Length | = 37.00 ft | |
| Barrel Length | = 37.00 ft | |
| Barrel Slope | = .00000 ft/ft | |

OUTLET CONTROL DATA...

| | | |
|---|---|---|
| Mannings n | = .0120 | |
| Ke | = .0000 | (forward entrance loss) |
| Kb | = .007854 | (per ft of full flow) |
| Kr | = .0000 | (reverse entrance loss) |
| HW Convergence | = .001 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = 1 | |
| Inlet Control K | = .0098 | |
| Inlet Control M | = 2.0000 | |
| Inlet Control c | = .03980 | |
| Inlet Control Y | = .6700 | |
| T1 ratio (HW/D) | = 1.160 | |
| T2 ratio (HW/D) | = 1.307 | |
| Slope Factor | = -.500 | |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | | |
|---|---|---|---|---|---|
| At T1 Elev = | 448.40 ft | ---> | Flow = | 27.16 cfs | |
| At T2 Elev = | 448.77 ft | ---> | Flow = | 31.05 cfs | |

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OUTLET STRUCTURE INPUT DATA

| | | |
|---|---|---|
| Structure ID | = c2 | |
| Structure Type | = Culvert-Circular | |
| No. Barrels | = 1 | |
| Barrel Diameter | = 1.5000 ft | 18" |
| Upstream Invert | = 445.50 ft | |
| Dnstream Invert | = 445.50 ft | |
| Horiz. Length | = 37.00 ft | |
| Barrel Length | = 37.00 ft | |
| Barrel Slope | = .00000 ft/ft | |

OUTLET CONTROL DATA...

| | | |
|---|---|---|
| Mannings n | = .0120 | |
| Ke | = .0000 | (forward entrance loss) |
| Kb | = .015519 | (per ft of full flow) |
| Kr | = .0000 | (reverse entrance loss) |
| HW Convergence | = .001 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = 1 | |
| Inlet Control K | = .0098 | |
| Inlet Control M | = 2.0000 | |
| Inlet Control c | = .03980 | |
| Inlet Control Y | = .6700 | |
| T1 ratio (HW/D) | = 1.160 | |
| T2 ratio (HW/D) | = 1.307 | |
| Slope Factor | = -.500 | |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | | |
|---|---|---|---|---|---|
| At T1 Elev = | 447.24 ft | ---> | Flow = | 7.58 cfs | |
| At T2 Elev = | 447.46 ft | ---> | Flow = | 8.66 cfs | |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 445.50 | .000 | None contributing |
| 446.00 | 1.79 | 445.50 | .000 | CV +c2 |
| 446.50 | 7.36 | 445.50 | .000 | CV +c2 |
| 447.00 | 15.72 | 445.50 | .000 | CV +c2 |
| 447.50 | 24.86 | 445.50 | .000 | CV +c2 |
| 448.00 | 33.07 | 445.50 | .000 | CV +c2 |
| 448.50 | 40.73 | 445.50 | .000 | CV +c2 |
| 449.00 | 47.22 | 445.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -1.03 | 446.00 | .000 | CV |
| 446.00 | .00 | 446.00 | .000 | CV +c2 |
| 446.50 | 7.36 | 446.00 | .000 | CV +c2 |
| 447.00 | 15.72 | 446.00 | .000 | CV +c2 |
| 447.50 | 24.86 | 446.00 | .000 | CV +c2 |
| 448.00 | 33.07 | 446.00 | .000 | CV +c2 |
| 448.50 | 40.73 | 446.00 | .000 | CV +c2 |
| 449.00 | 47.22 | 446.00 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -4.34 | 446.50 | .000 | CV |
| 446.00 | -4.34 | 446.50 | .000 | CV |
| 446.50 | .00 | 446.50 | .000 | CV +c2 |
| 447.00 | 15.71 | 446.50 | .000 | CV +c2 |
| 447.50 | 24.86 | 446.50 | .000 | CV +c2 |
| 448.00 | 33.07 | 446.50 | .000 | CV +c2 |
| 448.50 | 40.73 | 446.50 | .000 | CV +c2 |
| 449.00 | 47.22 | 446.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -9.54 | 447.00 | .000 | CV |
| 446.00 | -9.54 | 447.00 | .000 | CV |
| 446.50 | -9.54 | 447.00 | .000 | CV |
| 447.00 | .00 | 447.00 | .000 | CV +c2 |
| 447.50 | 23.85 | 447.00 | .000 | CV +c2 |
| 448.00 | 33.07 | 447.00 | .000 | CV +c2 |
| 448.50 | 40.73 | 447.00 | .000 | CV +c2 |
| 449.00 | 47.22 | 447.00 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -16.12 | 447.50 | .000 | CV |
| 446.00 | -16.12 | 447.50 | .000 | CV |
| 446.50 | -16.12 | 447.50 | .000 | CV |
| 447.00 | -15.88 | 447.50 | .000 | CV |
| 447.50 | .00 | 447.50 | .000 | CV +c2 |
| 448.00 | 29.72 | 447.50 | .000 | CV +c2 |
| 448.50 | 39.52 | 447.50 | .000 | CV +c2 |
| 449.00 | 47.07 | 447.50 | .000 | CV +c2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -23.51 | 448.00 | .000 | CV |
| 446.00 | -23.51 | 448.00 | .000 | CV |
| 446.50 | -23.51 | 448.00 | .000 | CV |
| 447.00 | -23.51 | 448.00 | .000 | CV |
| 447.50 | -21.70 | 448.00 | .000 | CV |
| 448.00 | .00 | 448.00 | .000 | CV +c2 |
| 448.50 | 32.52 | 448.00 | .000 | CV +c2 |
| 449.00 | 44.53 | 448.00 | .000 | CV +c2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 445.50 ft
Increment = .50 ft
Max. Elev.= 448.00 ft

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Weir-Rectangular | W1 | <---> | TW | 445.500 | 448.000 |
| Weir-Rectangular | W2 | <---> | TW | 446.833 | 448.000 |

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

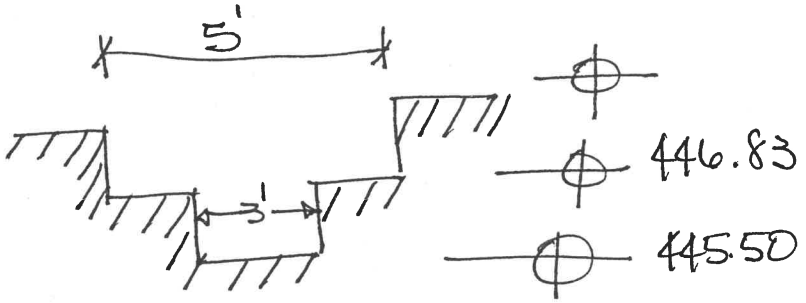
POND E

Structure ID = W1
Structure Type = Weir-Rectangular
---
# of Openings = 1
Crest Elev. = 445.50 ft
Weir Length = 3.00 ft
Weir Coeff. = 3.320000

Weir TW effects (Use adjustment equation)

Structure ID = W2
Structure Type = Weir-Rectangular
---
# of Openings = 1
Crest Elev. = 446.83 ft
Weir Length = 5.00 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)



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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 444.00 | .000 | W1 |
| 446.00 | 3.52 | 444.00 | .000 | W1 |
| 446.50 | 9.96 | 444.00 | .000 | W1 |
| 446.83 | 15.33 | 444.00 | .000 | W1 +W2 |
| 447.00 | 19.32 | 444.00 | .000 | W1 +W2 |
| 447.50 | 36.34 | 444.00 | .000 | W1 +W2 |
| 448.00 | 58.28 | 444.00 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-EG

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 444.50 | .000 | W1 |
| 446.00 | 3.52 | 444.50 | .000 | W1 |
| 446.50 | 9.96 | 444.50 | .000 | W1 |
| 446.83 | 15.33 | 444.50 | .000 | W1 +W2 |
| 447.00 | 19.32 | 444.50 | .000 | W1 +W2 |
| 447.50 | 36.34 | 444.50 | .000 | W1 +W2 |
| 448.00 | 58.28 | 444.50 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 445.00 | .000 | W1 |
| 446.00 | 3.52 | 445.00 | .000 | W1 |
| 446.50 | 9.96 | 445.00 | .000 | W1 |
| 446.83 | 15.33 | 445.00 | .000 | W1 +W2 |
| 447.00 | 19.32 | 445.00 | .000 | W1 +W2 |
| 447.50 | 36.34 | 445.00 | .000 | W1 +W2 |
| 448.00 | 58.28 | 445.00 | .000 | W1 +W2 |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | .00 | 445.50 | .000 | W1 |
| 446.00 | 3.52 | 445.50 | .000 | W1 |
| 446.50 | 9.96 | 445.50 | .000 | W1 |
| 446.83 | 15.33 | 445.50 | .000 | W1 +W2 |
| 447.00 | 19.32 | 445.50 | .000 | W1 +W2 |
| 447.50 | 36.34 | 445.50 | .000 | W1 +W2 |
| 448.00 | 58.28 | 445.50 | .000 | W1 +W2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -3.52 | 446.00 | .000 | W1 |
| 446.00 | .00 | 446.00 | .000 | W1 |
| 446.50 | 8.42 | 446.00 | .000 | W1 |
| 446.83 | 13.86 | 446.00 | .000 | W1 +W2 |
| 447.00 | 17.88 | 446.00 | .000 | W1 +W2 |
| 447.50 | 34.93 | 446.00 | .000 | W1 +W2 |
| 448.00 | 56.89 | 446.00 | .000 | W1 +W2 |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -9.96 | 446.50 | .000 | W1 |
| 446.00 | -8.42 | 446.50 | .000 | W1 |
| 446.50 | .00 | 446.50 | .000 | W1 |
| 446.83 | 10.24 | 446.50 | .000 | W1 +W2 |
| 447.00 | 14.54 | 446.50 | .000 | W1 +W2 |
| 447.50 | 31.99 | 446.50 | .000 | W1 +W2 |
| 448.00 | 54.10 | 446.50 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-EG

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -15.33 | 446.83 | .000 | W1 +W2 |
| 446.00 | -13.86 | 446.83 | .000 | W1 +W2 |
| 446.50 | -10.24 | 446.83 | .000 | W1 +W2 |
| 446.83 | .00 | 446.83 | .000 | W1 +W2 |
| 447.00 | 10.11 | 446.83 | .000 | W1 +W2 |
| 447.50 | 28.99 | 446.83 | .000 | W1 +W2 |
| 448.00 | 51.47 | 446.83 | .000 | W1 +W2 |

Type.... Composite Rating Curve
Name.... PR-EG

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 445.50 | -19.32 | 447.00 | .000 | W1 +W2 |
| 446.00 | -17.88 | 447.00 | .000 | W1 +W2 |
| 446.50 | -14.54 | 447.00 | .000 | W1 +W2 |
| 446.83 | -10.11 | 447.00 | .000 | W1 +W2 |
| 447.00 | .00 | 447.00 | .000 | W1 +W2 |
| 447.50 | 26.58 | 447.00 | .000 | W1 +W2 |
| 448.00 | 49.46 | 447.00 | .000 | W1 +W2 |

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 444.00 ft
Increment = .50 ft
Max. Elev.= 447.00 ft

POND F

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Culvert-Circular | CV | <---> | TW | 444.000 | 447.000 |
| TW SETUP, DS Channel | | | | | |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

OUTLET STRUCTURE INPUT DATA

| | | | |
|---|---|---|---|
| Structure ID | = | CV | |
| Structure Type | = | Culvert-Circular | |
| No. Barrels | = | 1 | |
| Barrel Diameter | = | 2.0000 ft | ← 24"? |
| Upstream Invert | = | 444.00 ft | |
| Dnstream Invert | = | 444.00 ft | |
| Horiz. Length | = | 44.00 ft | |
| Barrel Length | = | 44.00 ft | |
| Barrel Slope | = | .00000 ft/ft | |

OUTLET CONTROL DATA...

| | | | |
|---|---|---|---|
| Mannings n | = | .0120 | |
| Ke | = | .0000 | (forward entrance loss) |
| Kb | = | .010575 | (per ft of full flow) |
| Kr | = | .0000 | (reverse entrance loss) |
| HW Convergence | = | .001 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = | 1 |
| Inlet Control K | = | .0098 |
| Inlet Control M | = | 2.0000 |
| Inlet Control c | = | .03980 |
| Inlet Control Y | = | .6700 |
| T1 ratio (HW/D) | = | 1.160 |
| T2 ratio (HW/D) | = | 1.307 |
| Slope Factor | = | -.500 |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | | |
|---|---|---|---|---|---|
| At T1 Elev = | 446.32 ft | ---> | Flow = | 15.55 cfs | |
| At T2 Elev = | 446.61 ft | ---> | Flow = | 17.77 cfs | |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 444.00 | .000 | None contributing |
| 444.50 | .88 | 444.00 | .000 | CV |
| 445.00 | 3.66 | 444.00 | .000 | CV |
| 445.50 | 7.91 | 444.00 | .000 | CV |
| 446.00 | 12.73 | 444.00 | .000 | CV |
| 446.50 | 16.91 | 444.00 | .000 | CV |
| 447.00 | 20.29 | 444.00 | .000 | CV |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -.88 | 444.50 | .000 | CV |
| 444.50 | .00 | 444.50 | .000 | CV |
| 445.00 | 3.66 | 444.50 | .000 | CV |
| 445.50 | 7.91 | 444.50 | .000 | CV |
| 446.00 | 12.73 | 444.50 | .000 | CV |
| 446.50 | 16.91 | 444.50 | .000 | CV |
| 447.00 | 20.29 | 444.50 | .000 | CV |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -3.67 | 445.00 | .000 | CV |
| 444.50 | -3.67 | 445.00 | .000 | CV |
| 445.00 | .00 | 445.00 | .000 | CV |
| 445.50 | 7.91 | 445.00 | .000 | CV |
| 446.00 | 12.73 | 445.00 | .000 | CV |
| 446.50 | 16.91 | 445.00 | .000 | CV |
| 447.00 | 20.29 | 445.00 | .000 | CV |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -7.90 | 445.50 | .000 | CV |
| 444.50 | -7.90 | 445.50 | .000 | CV |
| 445.00 | -7.90 | 445.50 | .000 | CV |
| 445.50 | .00 | 445.50 | .000 | CV |
| 446.00 | 12.51 | 445.50 | .000 | CV |
| 446.50 | 16.91 | 445.50 | .000 | CV |
| 447.00 | 20.29 | 445.50 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -12.95 | 446.00 | .000 | CV |
| 444.50 | -12.95 | 446.00 | .000 | CV |
| 445.00 | -12.95 | 446.00 | .000 | CV |
| 445.50 | -12.49 | 446.00 | .000 | CV |
| 446.00 | .00 | 446.00 | .000 | CV |
| 446.50 | 14.73 | 446.00 | .000 | CV |
| 447.00 | 20.29 | 446.00 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -17.95 | 446.50 | .000 | CV |
| 444.50 | -17.95 | 446.50 | .000 | CV |
| 445.00 | -17.95 | 446.50 | .000 | CV |
| 445.50 | -17.95 | 446.50 | .000 | CV |
| 446.00 | -14.73 | 446.50 | .000 | CV |
| 446.50 | .00 | 446.50 | .000 | CV |
| 447.00 | 14.72 | 446.50 | .000 | CV |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | -22.26 | 447.00 | .000 | CV |
| 444.50 | -22.26 | 447.00 | .000 | CV |
| 445.00 | -22.26 | 447.00 | .000 | CV |
| 445.50 | -22.26 | 447.00 | .000 | CV |
| 446.00 | -20.81 | 447.00 | .000 | CV |
| 446.50 | -14.73 | 447.00 | .000 | CV |
| 447.00 | .00 | 447.00 | .000 | CV |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 444.00 ft
Increment = .50 ft
Max. Elev.= 447.00 ft

POND G
OUTFALL

**********
OUTLET CONNECTIVITY
**********

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

| Structure | No. | | Outfall | E1, ft | E2, ft |
|---|---|---|---|---|---|
| Inlet Box | BX | ---> | CV | 445.250 | 447.000 |
| Orifice-Area | OR | ---> | CV | 444.000 | 447.000 |
| Culvert-Circular | CV | ---> | TW | 438.000 | 447.000 |

TW SETUP, DS Channel

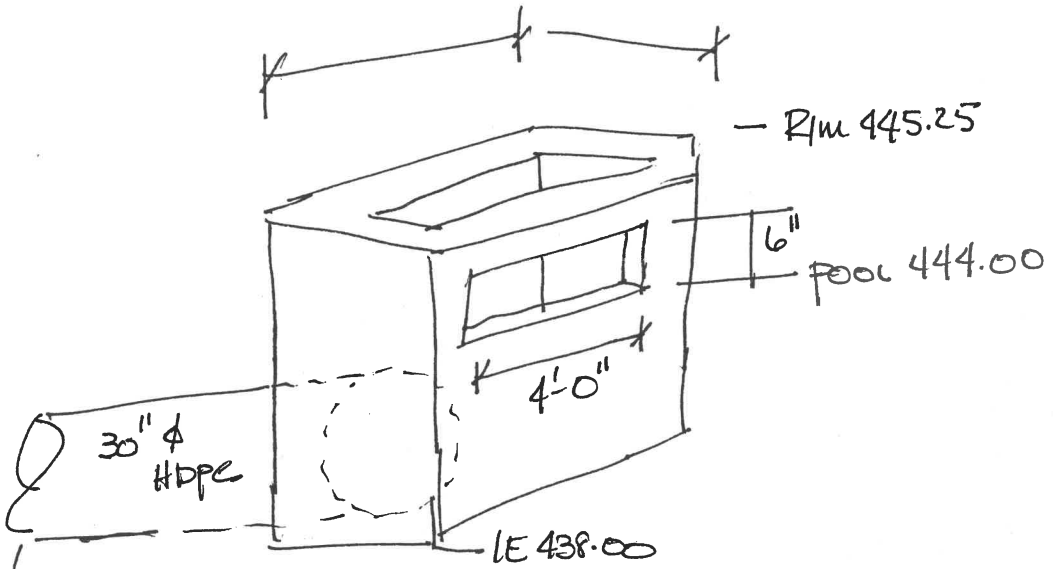
OUTLET STRUCTURE INPUT DATA

Structure ID = BX
Structure Type = Inlet Box

| | | |
|---|---|---|
| # of Openings | = | 1 |
| Invert Elev. | = | 445.25 ft |
| Orifice Area | = | 12.5000 sq.ft |
| Orifice Coeff. | = | .600 |
| Weir Length | = | 15.00 ft |
| Weir Coeff. | = | 3.000 |
| K, Submerged | = | .000 |
| K, Reverse | = | 1.000 |
| Kb,Barrel | = | .000000 (per ft of full flow) |
| Barrel Length | = | .00 ft |
| Mannings n | = | .0000 |

Structure ID = OR
Structure Type = Orifice-Area

| | | |
|---|---|---|
| # of Openings | = | 1 |
| Invert Elev. | = | 444.00 ft |
| Area | = | 2.0000 sq.ft |
| Top of Orifice | = | 444.50 ft |
| Datum Elev. | = | 444.00 ft |
| Orifice Coeff. | = | .600 |



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OUTLET STRUCTURE INPUT DATA

| | | |
|---|---|---|
| Structure ID | = CV | |
| Structure Type | = Culvert-Circular | |
| No. Barrels | = 1 | |
| Barrel Diameter | = 2.5000 | ft |
| Upstream Invert | = 438.00 | ft |
| Dnstream Invert | = 437.90 | ft |
| Horiz. Length | = 57.00 | ft |
| Barrel Length | = 57.00 | ft |
| Barrel Slope | = .00175 | ft/ft |

OUTLET CONTROL DATA...

| | | |
|---|---|---|
| Mannings n | = .0150 | |
| Ke | = .0000 | (forward entrance loss) |
| Kb | = .012271 | (per ft of full flow) |
| Kr | = .0000 | (reverse entrance loss) |
| HW Convergence | = .100 | +/- ft |

INLET CONTROL DATA...

| | | |
|---|---|---|
| Equation form | = 1 | |
| Inlet Control K | = .0098 | |
| Inlet Control M | = 2.0000 | |
| Inlet Control c | = .03980 | |
| Inlet Control Y | = .6700 | |
| T1 ratio (HW/D) | = 1.159 | |
| T2 ratio (HW/D) | = 1.306 | |
| Slope Factor | = -.500 | |

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

| | | | | |
|---|---|---|---|---|
| At T1 Elev = | 440.90 ft | ---> | Flow = | 27.16 cfs |
| At T2 Elev = | 441.26 ft | ---> | Flow = | 31.05 cfs |

Type.... Composite Rating Curve
Name.... PR-OUT

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 437.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 437.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 437.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 437.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 437.00 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 437.00 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 437.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 437.00 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 437.90 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 437.90 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 437.90 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 437.90 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 437.90 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 437.90 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 437.90 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 437.90 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 438.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 438.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 438.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 438.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 438.00 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 438.00 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 438.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 438.00 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 439.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 439.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 439.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 439.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 439.00 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 439.00 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 439.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 439.00 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 440.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 440.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 440.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 440.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 440.00 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 440.00 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 440.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 440.00 | .000 | BX,CV (no Q: OR) |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 441.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 441.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 441.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 441.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 441.00 | .000 | BX,OR,CV |
| 446.00 | 42.84 | 441.00 | .000 | BX,OR,CV |
| 446.50 | 64.09 | 441.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 441.00 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .004 (+/- ft)
FLOW PATH: Elev= 446; Branch: OR-CV-TW

* Max. convergence errors shown may also occur for flow paths other than the ones listed above.

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 442.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 442.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 442.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 442.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 442.00 | .000 | BX,OR,CV |
| 446.00 | 42.80 | 442.00 | .004 | BX,OR,CV |
| 446.50 | 63.59 | 442.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 66.38 | 442.00 | .000 | BX,CV (no Q: OR) |

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***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .008 (+/- ft)
FLOW PATH: Elev= 446; Branch: OR-CV-TW

* Max. convergence errors shown may also occur for flow paths other than the ones listed above.

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 443.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.81 | 443.00 | .000 | OR,CV (no Q: BX) |
| 445.00 | 9.63 | 443.00 | .000 | OR,CV (no Q: BX) |
| 445.25 | 10.76 | 443.00 | .000 | OR,CV (no Q: BX) |
| 445.50 | 17.41 | 443.00 | .000 | BX,OR,CV |
| 446.00 | 39.96 | 443.00 | .008 | BX,OR,CV |
| 446.50 | 56.08 | 443.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 60.15 | 443.00 | .000 | BX,CV (no Q: OR) |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .008 (+/- ft)
FLOW PATH: Elev= 445.5; Branch: OR-CV-TW

* Max. convergence errors shown may also occur for flow paths other than the ones listed above.

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 444.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | 6.45 | 444.00 | .005 | OR,CV (no Q: BX) |
| 445.00 | 9.18 | 444.00 | .001 | OR,CV (no Q: BX) |
| 445.25 | 10.26 | 444.00 | .001 | OR,CV (no Q: BX) |
| 445.50 | 16.25 | 444.00 | .008 | BX,OR,CV |
| 446.00 | 36.34 | 444.00 | .000 | BX,CV (no Q: OR) |
| 446.50 | 48.07 | 444.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 51.86 | 444.00 | .000 | BX,CV (no Q: OR) |

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .007 (+/- ft)
FLOW PATH: Elev= 445.5; Branch: OR-CV-TW

* Max. convergence errors shown may also occur for flow paths other than the ones listed above.

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 445.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | .00 | 445.00 | .000 | (no Q: BX,OR,CV) |
| 445.00 | .00 | 445.00 | .000 | (no Q: BX,OR,CV) |
| 445.25 | 4.56 | 445.00 | .003 | OR,CV (no Q: BX) |
| 445.50 | 11.43 | 445.00 | .007 | BX,OR,CV |
| 446.00 | 30.90 | 445.00 | .000 | BX,CV (no Q: OR) |
| 446.50 | 36.05 | 445.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 43.56 | 445.00 | .000 | BX,CV (no Q: OR) |

Type.... Composite Rating Curve
Name.... PR-OUT

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 445.25 | .000 | (no Q: BX,OR,CV) |
| 444.50 | .00 | 445.25 | .000 | (no Q: BX,OR,CV) |
| 445.00 | .00 | 445.25 | .000 | (no Q: BX,OR,CV) |
| 445.25 | .00 | 445.25 | .000 | (no Q: BX,OR,CV) |
| 445.50 | 14.88 | 445.25 | .000 | BX,CV (no Q: OR) |
| 446.00 | 27.04 | 445.25 | .000 | BX,CV (no Q: OR) |
| 446.50 | 34.05 | 445.25 | .000 | BX,CV (no Q: OR) |
| 447.00 | 39.41 | 445.25 | .000 | BX,CV (no Q: OR) |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 445.00 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 445.25 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 445.50 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 446.00 | .00 | 446.00 | .000 | (no Q: BX,OR,CV) |
| 446.50 | 20.03 | 446.00 | .000 | BX,CV (no Q: OR) |
| 447.00 | 29.04 | 446.00 | .000 | BX,CV (no Q: OR) |

File.... S:\HAESTAD\PROJECTS\CASTLECREEK197-181\POST_DEVELOP_EGCHK.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

| WS Elev, Total Q | | Converge | | Notes |
|---|---|---|---|---|
| Elev. ft | Q cfs | TW Elev ft | Error +/-ft | Contributing Structures |
| 444.00 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 444.50 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 445.00 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 445.25 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 445.50 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 446.00 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 446.50 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |
| 447.00 | .00 | 447.00 | .000 | (no Q: BX,OR,CV) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-A IN 100 YR
Outflow HYG file = P-A OUT 100 YR

Pond Node Data = P-A
Pond Volume Data = P-A
Pond Outlet Data = PR-AB

No Infiltration

INITIAL CONDITIONS

| | |
|---|---|
| Starting WS Elev = | 447.00 ft |
| Starting Volume = | .000 ac-ft |
| Starting Outflow = | .00 cfs |

CALCULATION TOLERANCES

| | |
|---|---|
| Target Convergence= | .000 cfs +/- |
| Max. Iterations = | 35 loops |
| ICPM Time Step = | .0500 hrs |
| Output Time Step = | .0500 hrs |
| ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 16.9000 | 448.90 | .214 |

| | FORWARD FLOW PEAKS Tp, hrs | Qp, cfs | REVERSE FLOW PEAKS Tp, hrs | Qp, cfs |
|---|---|---|---|---|
| Pond Inflow..... | 16.8000 | 4.29 | .0000 | .00 |
| Pond Outflow.... | 16.8000 | 4.23 | .0000 | .00 |

| | TOTAL VOLUME IN Vol, ac-ft | Direction | TOTAL VOLUME OUT Vol, ac-ft | Direction |
|---|---|---|---|---|
| Pond Inflow..... | 3.252 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 3.252 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 3.252 |
| - | Total Vol OUT... | 3.252 |
| - | Ending Pond Vol. | .000 <-- (At 35.0000 hrs Elev.= 447.00 ft) |
| | Difference..... | .000 ac-ft (.004% of Inflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-B IN 100 YR
Outflow HYG file = P-B OUT 100 YR

Pond Node Data = P-B
Pond Volume Data = P-B
Pond Outlet Data = PR-BC

No Infiltration

| INITIAL CONDITIONS | | CALCULATION TOLERANCES | |
|---|---|---|---|
| Starting WS Elev = | 447.00 ft | Target Convergence= | .000 cfs +/- |
| Starting Volume = | .000 ac-ft | Max. Iterations = | 35 loops |
| Starting Outflow = | .00 cfs | ICPM Time Step = | .0500 hrs |
| | | Output Time Step = | .0500 hrs |
| | | ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 16.9000 | 448.63 | .218 |

| | FORWARD FLOW PEAKS | | REVERSE FLOW PEAKS | |
|---|---|---|---|---|
| | Tp, hrs | Qp, cfs | Tp, hrs | Qp, cfs |
| Pond Inflow..... | 16.8000 | 4.55 | .0000 | .00 |
| Pond Outflow.... | 16.8500 | 4.50 | .0000 | .00 |

| | TOTAL VOLUME IN | | TOTAL VOLUME OUT | |
|---|---|---|---|---|
| | Vol, ac-ft | Direction | Vol, ac-ft | Direction |
| Pond Inflow..... | 3.536 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 3.536 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 3.536 |
| - | Total Vol OUT... | 3.536 |
| - | Ending Pond Vol. | .000 <-- (At 35.0000 hrs Elev.= 447.00 ft) |
| | Difference..... | -.000 ac-ft (.001% of Outflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-C IN 100 YR
Outflow HYG file = P-C OUT 100 YR

Pond Node Data = P-C
Pond Volume Data = P-C
Pond Outlet Data = PR-CD

No Infiltration

INITIAL CONDITIONS

| | |
|---|---|
| Starting WS Elev = | 445.50 ft |
| Starting Volume = | .000 ac-ft |
| Starting Outflow = | .00 cfs |

CALCULATION TOLERANCES

| | |
|---|---|
| Target Convergence= | .000 cfs +/- |
| Max. Iterations = | 35 loops |
| ICPM Time Step = | .0500 hrs |
| Output Time Step = | .0500 hrs |
| ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 16.9000 | 448.39 | .507 |

| | FORWARD FLOW PEAKS Tp, hrs | FORWARD FLOW PEAKS Qp, cfs | REVERSE FLOW PEAKS Tp, hrs | REVERSE FLOW PEAKS Qp, cfs |
|---|---|---|---|---|
| Pond Inflow..... | 16.8000 | 21.83 | .0000 | .00 |
| Pond Outflow.... | 16.8000 | 21.67 | .0000 | .00 |

| | TOTAL VOLUME IN Vol, ac-ft | TOTAL VOLUME IN Direction | TOTAL VOLUME OUT Vol, ac-ft | TOTAL VOLUME OUT Direction |
|---|---|---|---|---|
| Pond Inflow..... | 17.393 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 17.413 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 17.393 |
| - | Total Vol OUT... | 17.413 |
| - | Ending Pond Vol. | .003 <-- (At 35.0000 hrs Elev.= 445.53 ft) |
| | Difference..... | -.022 ac-ft (.127% of Outflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-D IN 100 YR
Outflow HYG file = P-D OUT 100 YR

Pond Node Data = P-D
Pond Volume Data = P-D
Pond Outlet Data = PR-DE

No Infiltration

| INITIAL CONDITIONS | | CALCULATION TOLERANCES | |
|---|---|---|---|
| Starting WS Elev = | 445.50 ft | Target Convergence= | .000 cfs +/- |
| Starting Volume = | .000 ac-ft | Max. Iterations = | 35 loops |
| Starting Outflow = | .00 cfs | ICPM Time Step = | .0500 hrs |
| | | Output Time Step = | .0500 hrs |
| | | ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 16.9000 | 448.06 | 1.522 |

| | FORWARD FLOW PEAKS | | REVERSE FLOW PEAKS | |
|---|---|---|---|---|
| | Tp, hrs | Qp, cfs | Tp, hrs | Qp, cfs |
| Pond Inflow..... | 16.8000 | 31.90 | .0000 | .00 |
| Pond Outflow.... | 16.9000 | 31.57 | .0000 | .00 |

| | TOTAL VOLUME IN | | TOTAL VOLUME OUT | |
|---|---|---|---|---|
| | Vol, ac-ft | Direction | Vol, ac-ft | Direction |
| Pond Inflow..... | 26.432 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 26.415 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 26.432 |
| - | Total Vol OUT... | 26.415 |
| - | Ending Pond Vol. | .015 <-- (At 35.0000 hrs Elev.= 445.53 ft) |
| | Difference..... | .001 ac-ft (.004% of Inflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-E IN 100 YR
Outflow HYG file = P-E OUT 100 YR

Pond Node Data = P-E
Pond Volume Data = P-E
Pond Outlet Data = PR-EG

No Infiltration

| INITIAL CONDITIONS | | CALCULATION TOLERANCES | |
|---|---|---|---|
| Starting WS Elev = | 445.50 ft | Target Convergence= | .000 cfs +/- |
| Starting Volume = | .000 ac-ft | Max. Iterations = | 35 loops |
| Starting Outflow = | .00 cfs | ICPM Time Step = | .0500 hrs |
| | | Output Time Step = | .0500 hrs |
| | | ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 16.9000 | 447.40 | .272 |

| | FORWARD FLOW PEAKS | | REVERSE FLOW PEAKS | |
|---|---|---|---|---|
| | Tp, hrs | Qp, cfs | Tp, hrs | Qp, cfs |
| Pond Inflow..... | 16.8500 | 32.02 | 13.1000 | .00 |
| Pond Outflow.... | 16.9000 | 31.97 | 13.1000 | .00 |

| | TOTAL VOLUME IN | | TOTAL VOLUME OUT | |
|---|---|---|---|---|
| | Vol, ac-ft | Direction | Vol, ac-ft | Direction |
| Pond Inflow..... | 26.842 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 26.840 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 26.842 |
| - | Total Vol OUT... | 26.840 |
| - | Ending Pond Vol. | .002 <-- (At 35.0000 hrs Elev.= 445.51 ft) |
| | Difference..... | .001 ac-ft (.002% of Inflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-F IN 100 YR
Outflow HYG file = P-F OUT 100 YR

Pond Node Data = P-F
Pond Volume Data = P-F
Pond Outlet Data = PR-FG

No Infiltration

INITIAL CONDITIONS

| | |
|---|---|
| Starting WS Elev = | 444.00 ft |
| Starting Volume = | .000 ac-ft |
| Starting Outflow = | .00 cfs |

CALCULATION TOLERANCES

| | |
|---|---|
| Target Convergence= | .000 cfs +/- |
| Max. Iterations = | 35 loops |
| ICPM Time Step = | .0500 hrs |
| Output Time Step = | .0500 hrs |
| ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 13.3500 | 446.31 | .422 |

| | FORWARD FLOW PEAKS Tp, hrs | FORWARD FLOW PEAKS Qp, cfs | REVERSE FLOW PEAKS Tp, hrs | REVERSE FLOW PEAKS Qp, cfs |
|---|---|---|---|---|
| Pond Inflow..... | 16.7000 | 1.54 | .0000 | .00 |
| Pond Outflow.... | 13.7000 | 3.43 | 13.1000 | -3.80 |

| | TOTAL VOLUME IN Vol, ac-ft | TOTAL VOLUME IN Direction | TOTAL VOLUME OUT Vol, ac-ft | TOTAL VOLUME OUT Direction |
|---|---|---|---|---|
| Pond Inflow..... | 1.358 | Forward | .000 | Reverse |
| Pond Outflow.... | .075 | Reverse | 1.430 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 1.433 |
| - | Total Vol OUT... | 1.430 |
| - | Ending Pond Vol. | .003 <-- (At 35.0000 hrs Elev.= 444.02 ft) |
| | Difference..... | -.000 ac-ft (.003% of Inflow Volume) |

## ICPM POND ROUTING SUMMARY

HYG Dir = S:\HAESTAD\PROJECTS\CASTLECREEK197-181\
Inflow HYG file = P-G IN 100 YR
Outflow HYG file = P-G OUT 100 YR

Pond Node Data = P-G
Pond Volume Data = P-G
Pond Outlet Data = PR-OUT

No Infiltration

INITIAL CONDITIONS

| | |
|---|---|
| Starting WS Elev = | 444.00 ft |
| Starting Volume = | .000 ac-ft |
| Starting Outflow = | .00 cfs |

CALCULATION TOLERANCES

| | |
|---|---|
| Target Convergence= | .000 cfs +/- |
| Max. Iterations = | 35 loops |
| ICPM Time Step = | .0500 hrs |
| Output Time Step = | .0500 hrs |
| ICPM Ending Time = | 35.0000 hrs |

MAXIMUM STORAGE

| Tp, hrs | Elev, ft | Vol, ac-ft |
|---|---|---|
| 13.2000 | 446.33 | 1.406 |

| | FORWARD FLOW PEAKS Tp, hrs | FORWARD FLOW PEAKS Qp, cfs | REVERSE FLOW PEAKS Tp, hrs | REVERSE FLOW PEAKS Qp, cfs |
|---|---|---|---|---|
| Pond Inflow..... | 16.8000 | 35.52 | 13.1000 | .00 |
| Pond Outflow.... | 13.6500 | 37.11 | 13.1000 | .00 |

| | TOTAL VOLUME IN Vol, ac-ft | TOTAL VOLUME IN Direction | TOTAL VOLUME OUT Vol, ac-ft | TOTAL VOLUME OUT Direction |
|---|---|---|---|---|
| Pond Inflow..... | 30.023 | Forward | .000 | Reverse |
| Pond Outflow.... | .000 | Reverse | 30.015 | Forward |

MASS BALANCE (ac-ft)

| | | |
|---|---|---|
| + | Initial Vol..... | .000 |
| + | Total Vol IN.... | 30.023 |
| - | Total Vol OUT... | 30.015 |
| - | Ending Pond Vol. | .005 <-- (At 35.0000 hrs Elev.= 444.01 ft) |
| | Difference..... | .002 ac-ft (.008% of Inflow Volume) |

# Index of Starting Page Numbers for ID Names