



J2463-03-01
May 12, 2021

BETA Group, Inc.
315 Norwood Park South
Norwood, Massachusetts 02062
Attn: Mr. Robert Smith

Re: Chicopee Levee Slope Stability – Response to USACE Comments
Uniroyal Filling Project
Chicopee, Massachusetts

Dear Mr. Smith:

Per your request, OTO provides this response to comments prepared by the U.S. Army Corps of Engineers (USACE) in a letter dated September 20, 2020. A copy of the USACE comments are attached. We note that a portion of the comments relate to our scope of services (namely Geotechnical Analyses). The following items are OTO's response to comments 17, 18, and 19 of the numbered review comments. A revised slope stability analysis to support our response is attached.

Comments:

17. The sections were analyzed for three separate conditions, per the USACE manual: rapid drawdown (performed using the USACE 3-stage method¹), long term (steady seepage during 100-year flood conditions), and normal water conditions. In each of these cases, effective strength parameters were used. In the rapid drawdown case, both effective and total were used as part of the 3-stage method. As noted in our September 14, 2016 letter, the soil properties were consistent with those previously used by GZA in their report dated November 2010. Copies of the appropriate pages of the GZA report showing the soil properties used are attached. These properties are consistent with the Soil Properties table provided in our September 14, 2016 letter.
18. Our analysis has been updated to account for the abandonment of the existing toe drain on the landward side of the embankment. In addition, we have also not included a drainage blanket on the landward side of the embankment, which was recommended in previous submittals but is no longer included since the toe drain has been eliminated.

We agree that the gradation of the crushed fill will likely be variable, and the permeability will vary depending upon the type of fill. We concur with the USACE comment that low permeability layers may be present which may limit the vertical drainage of water through the fill. Therefore, we have revised the water levels within the rapid drawdown and modified standard project flood scenarios to incorporate the lower permeability of these soils. We note that a new perforated drain line and crushed stone trench will be installed within the crushed fill on the landward side of the embankment. This new drain line will function like a toe drain (although it will be at a

¹ US Army Corps of Engineers, "Engineer Manual, Slope Stability, EM1110-2-1902", October 2003, Section 2.5.

different elevation than the existing toe drain) and will lower the water level within the new fill and the embankment. The new drain line is shown on the attached plans and is discussed further below.

The water levels for the analysis at Station 41+00 have been revised assuming the gravel fill layer is saturated. The revised analysis outputs are included with this letter.

19. The analysis has been revised to include the construction of the new infiltration basins on the landward side of the levee embankment. These basins are shown on the attached project plans (Enlarged Grading & Drainage Plan I, II – Figures 5 and 6; and Grading & Drainage Plan – Figure 7). As seen on these plans, a catch basin is present within each of these basins. These catch basins allow water within the basins to drain relatively quickly during the design storm event. Each catch basin is connected through a manhole into an 18 or 24 inch perforated drainage line, which is placed within a crushed stone trench. These drain lines follow the alignment of the embankment and discharge into existing drains at both the upstream and downstream ends of the project. The new drain lines are of sufficient size to drain quickly. Since the drain pipes are perforated and installed within crushed stone trenches, they will function like toe drains and thus lower the water level within the fill and existing levee embankment.

We understand that the purpose of the basins is to temporarily store stormwater runoff prior to discharge through the perforated piping system. Based upon the HydroCAD analysis for each basin, the basins will be almost entirely drained (less than 4 inches of water in the basin) within approximately 7 hours after the end of the 100-year storm event, and completely drained within approximately 15 hours. It is our opinion that the levee embankment will not become saturated during this period of time, and it is reasonable to assume that the water level within the fill will be controlled by the level of the perforated drain pipe, and not by the short-term level of the water in the retention basins. A copy of the hydrographs, containing the storage volumes and holding time for each basin, is attached. Therefore, our revised analysis for the basins during the rapid drawdown condition has located the phreatic surface to be at the invert of the perforated pipe. We note that in our analysis of Section 13+30 (which represents the “worst case” condition for the eastern portion of the project site) we have assumed the condition at drain manhole DMH-17B (where the drain pipe is the most shallow). The outputs for the revised analyses are included with this letter. A summary of each of the revised analyzed conditions and critical factors of safety are presented in Table 1 below.

The analyses indicate the worst-case condition consists of a saturated levee following a rapid drawdown with crushed fill at final grade. As part of their original analyses, GZA also considered the two sections (13+30 and 41+00) we evaluated. A summary of each of the conditions analyzed and critical factors of safety are presented in Table 1 below. As was discussed above, these analyses assume that the new perforated pipe and drain on the landward side of the embankment levee control groundwater levels.

Case 3, 7: The analysis titled “Modified Standard Project Flood Rapid Drawdown” identified multiple factors of safety for the levee during the rapid drawdown scenario, the lowest factor of safety identified is presented. In this case, the critical failure surfaces were relatively shallow and located along the surface of the levee. It does not appear the crushed fill will impact the levee as these results are similar to the results provided in GZA’s report.

Case 4, 8: The analysis titled “Modified Standard Project Flood Rapid Drawdown Composite Failure Surface” presents a condition where a fully specified slip surface was used to evaluate the factors of safety for a composite failure surface extending through the levee to horizontal silty sand present at the base of the levee. In this case, the lowest factor of safety identified is presented.

Table 1
Analyzed Levee Conditions

Case	Condition	Critical Factor of Safety
1	Sta. 13+30 Normal Water Conditions	1.45
2	Sta. 13+30 Modified Standard Project Flood	1.61
3	Sta. 13+30 Modified Standard Project Flood Rapid Drawdown	1.01
4	Sta. 13+30 Modified Standard Project Flood Rapid Drawdown Composite Failure	1.39
5	Sta. 41+00 Normal Water Conditions	1.43
6	Sta. 41+00 Modified Standard Project Flood	1.67
7	Sta. 41+00 Modified Standard Project Flood Rapid Drawdown	1.10
8	Sta. 41+00 Modified Standard Project Flood Rapid Drawdown Composite Failure Surface	2.06

Note: Factors of safety shown are critical factors of safety for each case

Should you have any additional comments or questions, please do not hesitate to contact the undersigned.

Sincerely yours,
 O'Reilly, Talbot & Okun Associates, Inc.

Stephen McLaughlin
 Project Engineer

Michael J. Talbot, P.E.
 Principal

Attachments: USACE Review Comments, Project Plans, OTO 2021 Updated Slope Stability Analyses, GZA Soil Properties, HydroCAD Outputs

USACE Review Comments



REVIEW COMMENTS

Project Name: Former Uniroyal-Facemate Property Filling Project	Date: 23 September 2020
Location: Chicopee, MA	Reviewers: Kevin DiRocco/ Patrick Blumeris
USACE ICW Project: Chicopee Riv LB - Chicopee Falls, MA	
Documents Reviewed: (1) Stormwater Management Report, Former Uniroyal & Facemate Properties, Chicopee, MA, dated July 2020 (Marked ACOE Permit Only) (2) Figure No. 3 through No. 11, dated July 24, 2020 titled: Former Uniroyal & Facemate Properties (Marked ACOE Permit Only) (3) Letter report prepared by O'Reilly, Talbot & Okun Associates for BETA Group, titled Chicopee Levee Slope Stability, Uniroyal Filling Project, dated Sept. 14, 2016 (4) Letter report prepared by O'Reilly, Talbot & Okun Associates for BETA Group, titled Chicopee Levee Slope Stability, Uniroyal Filling Project, dated Sept. 29, 2017.	
Submitted By: BETA Group	Submittal Dated: Varies

No.	Reference	COMMENTS	RESPONSE
1.	General	Provide a site-specific conversion from NAVD88 to NGVD29 for direct comparison to the original design plans.	
2.	General	The City needs to be aware and acknowledge that if the Oak Street Pumping Station is abandoned as planned, they will need to retain the physical property in perpetuity, unless the pump station is deauthorized by Congress. Also, the City will need to retain the property rights for the full width of the levee embankment.	
3.	Doc. No. 1	Will the proposed infiltration basin and drain in the former Facemate property increase flow to the Main Street Pumping Station? If so, has the capacity of the pump station been evaluated to ensure that it can pass the additional flow? Provide verification that the proposed stormwater management system will pass the original design precipitation and that flows to the Main Street Pumping Station will not increase.	
4.	Doc. No. 1	The current proposal is to leave the landside grade approximately 3 feet below the crest of the levee embankment at both properties to act infiltration basins. The infiltration basins will be provided with a perforated HDPE drainage pipe surrounded by a crushed stone drainage layer and geotextile. This is different from the previous concept drawings where filling was proposed to the landside crest of the levee embankment. This proposed configuration will potentially result in landside water loading that must be accounted for in the geotechnical evaluation.	
5.	Doc. Nos. 1&2	There is no discussion in the report or drawings about abandonment of the 4x4 concrete box discharge culvert from the Oak Street Pumping Station to the river. Because the conduit penetrates the levee embankment, it should be fully grouted or filled with concrete or flowable fill to prevent collapse and settlement of the remaining embankment. While collapse of the conduit does not appear to significantly increase the risk of flooding in the leveed area, filling of the conduit is required for this portion of the project to remain active in the PL84-99 Rehabilitation Program.	



No.	Reference	COMMENTS	RESPONSE
6.	Doc. Nos. 1&2	How will the stormwater in the Uniroyal property infiltration pond be managed when the Oak Street Pumping Station is taken off line and the HDPE drain piping has not yet been extended to the South Outfall? Is there a temporary condition of potentially significant water loading on the landside of the levee embankment that needs to be considered in the geotechnical evaluation?	
7.	Doc. No. 1	<p>The proposed design, especially for the Uniroyal property relies heavily on infiltration, especially when the river is elevated. We have the following comments:</p> <ul style="list-style-type: none"> ○ Has an evaluation been performed to demonstrate that the infiltration rates will be adequate to handle the inflow and that storage within the soil will be sufficient to capture all of the inflow during design storms? Provide the analysis and assumptions that demonstrate the infiltration demand will be met. ○ The materials management plan provided to us suggests that a wide-range of materials will be accepted at the site, with the primary acceptance criteria being type and level of contamination. Compacted materials used for fill may have a lower than anticipated hydraulic conductivity. What requirements will be placed on the materials accepted to ensure sufficient infiltration rate and storage capacity? 	
8.	Doc. No. 1	In the Existing Conditions Description (page 3 of the report, page 12 of the 88-page pdf), there was an unfinished thought in the paragraph that followed the listed bullets - “an underground toe drain that groundwater.” Was the intent to say “an underground toe drain that <i>connects</i> to groundwater?”	
9.	Doc. No. 1	In the explanations for the Ten Standards, Page 9, Standard 9 ends with “will be in accordance with the attached Operations and Maintenance Plan.” Should this statement read “... with a <i>Regulator-approved</i> version of the attached Operations and Maintenance Plan?”	
10.	Doc. No. 1	The models provided for the existing layout include a lot of concrete pipe, with an assumed Manning n=0.011 (range for concrete is 0.011 to 0.015). The modeled assumption is that the new pipe will be PVC, with Manning n= 0.010 (this is typical for glass, but is unlikely to remain so small if it is PVC, subject to wear and tear over many years). The levee system is intend to have a very long design life, and we assume that the drainage system will be designed for a long life as well. Based on our experience, the assumed n values are optimistic for long term conditions. While the assumed n values fall within the ranges stated in references (for example, HEC RAS), we recommend that the models also be evaluated with a Manning n value at the middle to upper end of the range for each material. For example using n=0.012 or higher for PVC and n=0.013 or higher for concrete pipe.	



No.	Reference	COMMENTS	RESPONSE
11.	Doc. No. 1	<p>On Page 73 of the report, there is a runoff volume of 0.5 inch that is used to estimate a required storage volume. It was not clear how that 0.5 inch was derived (24-hour precipitation values for the location ranged from 2.5 inches for a 1-year event to 6.50 inches for a 100-year event). The 0.5-inch appears to be based on a shorter duration, or else most of the storm event is being “lost” as seepage to groundwater, which is not true for these largely impervious areas (percentage impervious in excess of 85%). The delta-t in the model is typically 0.05 hours (3 minutes), but the delta-t was once quoted in the computer output as this value, divided by 2. The number may be correct, but a couple of lines of explanation seem to be needed, to include a depth-area-duration statement along the lines of “the XX inch flow requirement is based on the most intense TTT minutes of the RTP-year storm, and assumes that PP% of the storm rainfall needs to be conveyed.” This statement may need to precede or follow the computer outputs.</p>	
12.	Doc. No. 1	<p>Velocity checks for half-full or completely full pipes: The calculations should yield identical velocities with double the flow in the full pipe, but that doesn’t appear to be what is presented.</p> <p>For a headloss equation – such as the Manning equation – in a circular pipe, the ratio of half-full area to half-full wetted perimeter is the same as the ratio of the full area to full wetted perimeter. Since the other parameters in the Manning equation do not change for a given pipe, only one of the velocity estimates stated is correct. For the case that was checked, the velocity in the pipe flowing full appeared correct and the half-full pipe was nevertheless found to be greater 2 fps (but should have been 4.24 fps). The design result is acceptable for self-cleansing, but this could lead to early scouring of the pipe wall as well as materials reaching their destination (pumps, possibly) earlier than anticipated by the designer (can the pumps cope with this flow?) Please review these calculations and their context.</p>	
13.	Doc. No. 1	<p>On Page 77 of the technical pdf report there is reference to TSS removal. It was not clear how the 25% rate was obtained.</p>	
14.	Doc. No. 2	<p>The drawings indicate that the existing to drain pipes and the drain lines within the footprint of the backfill are to be “abandoned” in place. Please explain what is meant by abandoned. For example, will they be filled, capped and left empty, or other method.</p>	



No.	Reference	COMMENTS	RESPONSE
15.	Doc. No. 2	Based on a review of the original as-built drawings, aerial imagery from Google Earth, and inspection photos, it's not clear if some regrading has already been done on the original high ground between Sta. 36+00 and Sta. 37+00 (between former Uniroyal and Facemate properties). Are there plans to grade this area as well as filling the two areas shown on the plans provided? If so, what are the details? What will the finished grade be in this area relative to the top of the existing levee embankment?	
16.	Doc. No. 2	It appears that a new ramp will be constructed at the northern end of the Facemate property. Design and construction details will be required for the new ramp. In addition, we have the following questions: <ul style="list-style-type: none">○ The existing toe drain passes through the proposed ramp area. Will the toe drain still be required? Will the ramp be permeable with a filter between the embankment and the ramp to allow drainage?○ Will the ramp affect the short and long term global stability of the levee toward the river? Need an engineering evaluation.	
17.	Doc. Nos. 3&4	The stability report indicates that the rapid drawdown analyses were performed using the USACE 3-Stage Method. However, only drained strengths are provided in the report, which only applies to the first stage of the analysis. Provide the undrained strengths and final strength envelope used for the second and third stages of the analysis.	



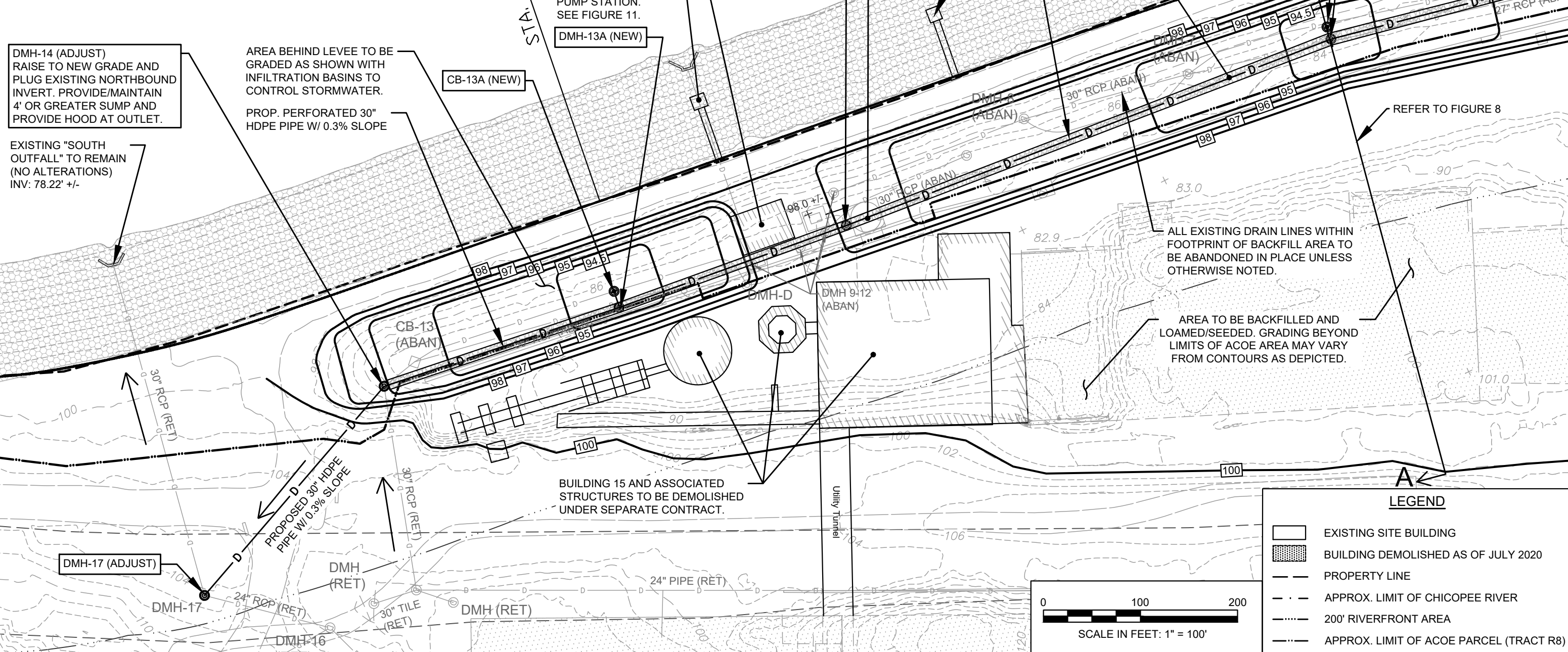
No.	Reference	COMMENTS	RESPONSE
18.	Doc. Nos. 3&4	<p>The stability analyses show the landside groundwater during rapid drawdown will be at or close to the normal level in the granular fill shown beneath and landward of the levee embankment. Seepage analyses are not provided, and it is not clear if the analysis for determining the landside groundwater level included the benefit of the toe drain or assumed that the granular fill provided drainage. It seems likely that the analysis considered the toe drains given the reliance on the BEC analyses and recommendation to provide a landside blanket drain connected to the toe drain. The current fill plan calls for abandonment of the toe drain, so the analysis needs to assume that the toe drain does not exist. Also, it is not clear if the analyses considered the following:</p> <ul style="list-style-type: none"> ○ The current plan for the site filling, does not include the blanket drain on the landside slope of the embankment recommended in the original stability report. ○ The gradation of the "crushed fill" placed landward of the levee embankment is likely to be highly variable and the permeability is unknown. This fill is unlikely to be free draining may retain water during a rapid drawdown scenario in the river. ○ The gravel fill shown in the Sta. 41+00 cross section may not extend the full width of the fill area landward of the existing levee embankment and the former building walls likely penetrate the gravel fill, forming a seepage block. Also, according to DM-2, the levee embankment downstream of Sta. 35+00 was constructed within the former river channel, and as a result, the gravel fill in this area may have been placed within the original river channel to increase the size of the Uniroyal property. As a result, the lateral extent of the gravel fill landward of the levee may be limited. The crushed fill could have a significantly lower permeability than the gravel fill, forming a low permeability cap, and increasing the steady-state seepage pressures in the gravel fill. 	
19.	Doc. Nos. 3&4	<p>The current plan calls for construction of infiltration basins immediately landward of the levee embankment. The Stormwater Management Report suggests that the proposed infiltration basin will be filled with water during an extreme event. For the stability analyses, the landside groundwater level for both cross sections evaluated should either be assumed to be at or near the top of the levee embankment, to reflect the maximum estimated water level in the infiltration basin during the design storm event, or a seepage analysis or other evaluation is required to justify a lower anticipated phreatic surface in the embankment and landside fill prior to rapid drawdown.</p>	

Project Plans

DRAINAGE STRUCTURE TABLE				
STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
OUTFALL	N/A	78.22' (RIVER)	78.22' (DMH-17)	RETAIN
DMH-17	107' +/-	85.84' (OUTFALL)	85.84' (DMH-16) 87.8' (DMH-14)	ADJUST
DMH-14	96.1'	88.2' (DMH-17)	88.2' (CB-13A) 89.7' (30" RCP)	ADJUST, SEE NOTE 4
DMH-13A	94.5'	88.6' (DMH-14)	88.6' (DMH-12A) 88.6' (CB-13A)	NEW
CB-13A	94.83'	88.7' (DMH-13A)		NEW
DMH-12A	96.9'	89.05' (DMH-13A)	89.05' (DMH-11A)	NEW
DMH-11A	94.5'	90.05' (DMH-11A)	90.05' (DMH-10A) 90.05' (CB-11A)	NEW
CB-11A	94.83'	90.1' (DMH-11A)		NEW

NOTES:

1. ANY CATCH BASINS OR DRAIN MANHOLES TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
3. ALL EXISTING AND PROPOSED DRAIN INLETS WITHIN AND IN THE VICINITY OF THE WORK AREA SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.
4. EXISTING 30" RCP INVERT AT DMH-14 SHALL BE LOCATED AND FIELD VERIFIED. INVERT TO BE ADJUSTED AS NECESSARY TO PROVIDE POSITIVE DRAINAGE TO DMH-17.



DMH-14 (ADJUST)
RAISE TO NEW GRADE AND
PLUG EXISTING NORTHBOUND
INVERT. PROVIDE/MAINTAIN
4' OR GREATER SUMP AND
PROVIDE HOOD AT OUTLET.

AREA BEHIND LEVEE TO BE
GRADED AS SHOWN WITH
INFILTRATION BASINS TO
CONTROL STORMWATER.

PROP. PERFORATED 30"
HDPE PIPE W/ 0.3% SLOPE

EXISTING "SOUTH
OUTFALL" TO REMAIN
(NO ALTERATIONS)
INV: 78.22' +/-

OAK STREET PUMP
STATION TO BE
DECOMMISSIONED.
SEE FIGURE 11.

REMOVE EXIST.
ELEVATED TANK
STRUCTURE.
SEE FIGURE 11.

DECOMMISSION EXIST
DISCHARGE FROM
PUMP STATION.
SEE FIGURE 11.

PROP. CRUSHED STONE
ALONG PROP. DRAIN PIPE.
SEE FIGURE 8.

EXISTING RIPRAP
ALONG LEVEE
SLOPE (TYP.)

PROP. PERFORATED 18"
HDPE PIPE W/ 0.35% SLOPE
(DMH-11A TO DMH-8A)

PROP. PERFORATED 24"
HDPE W/ 0.35% SLOPE
(DMH-13A TO DMH-11A)

INTAKE STRUCTURE
TO BE MANAGED BY
OTHERS.

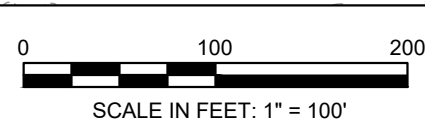
ALL EXISTING DRAIN LINES
WITHIN
FOOTPRINT OF BACKFILL AREA TO
BE ABANDONED IN PLACE UNLESS
OTHERWISE NOTED.

AREA TO BE BACKFILLED AND
LOAMED/SEEDED. GRADING BEYOND
LIMITS OF ACOE AREA MAY VARY
FROM CONTOURS AS DEPICTED.

BUILDING 15 AND ASSOCIATED
STRUCTURES TO BE DEMOLISHED
UNDER SEPARATE CONTRACT.

LEGEND

- EXISTING SITE BUILDING
- BUILDING DEMOLISHED AS OF JULY 2020
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- 200' RIVERFRONT AREA
- APPROX. LIMIT OF ACOE PARCEL (TRACT R8)



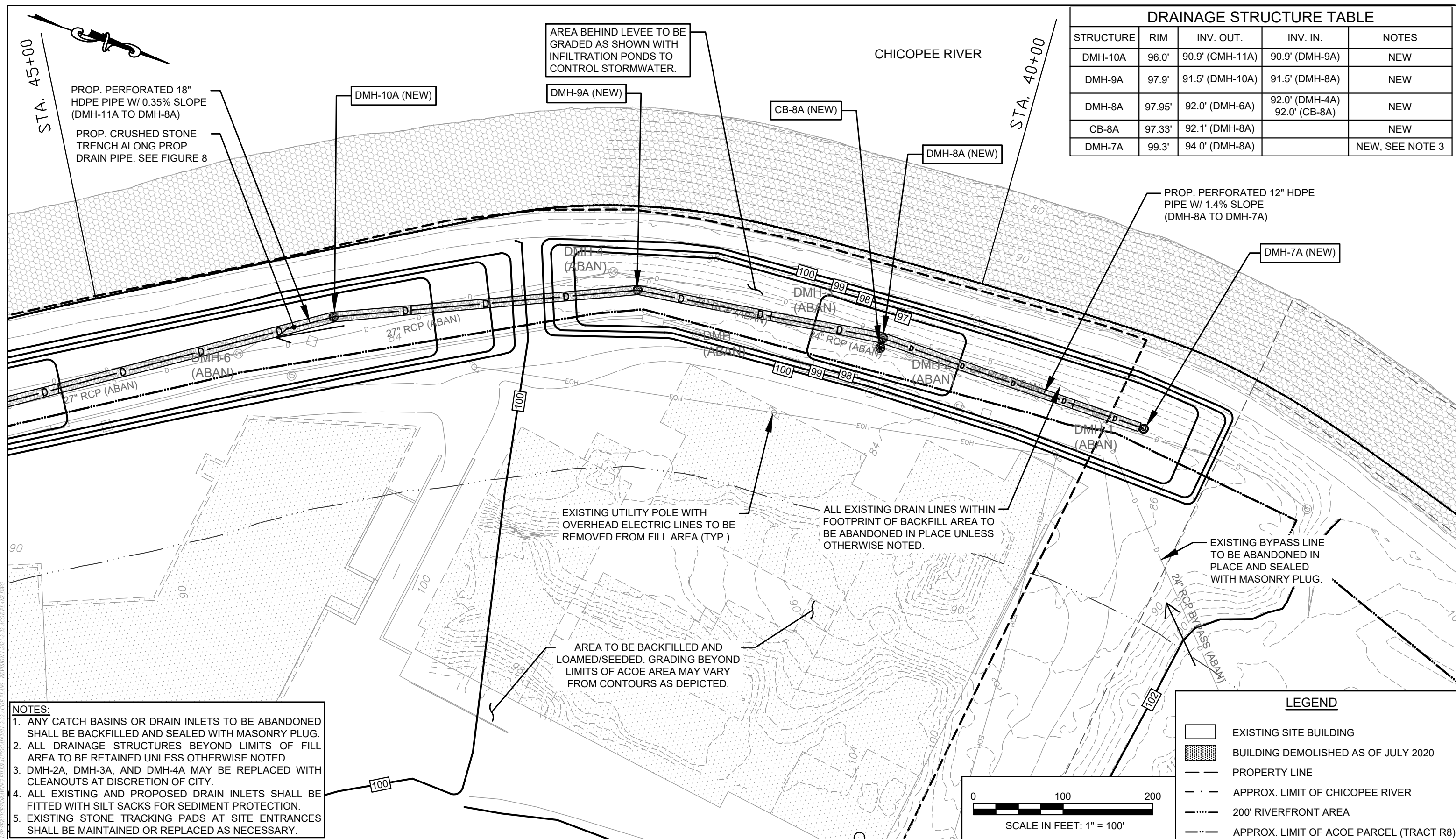
Former Uniroyal & Facemate Properties

ACOE Permit Review Only
154 Grove Street & 75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

Figure No. 5

**Enlarged Grading & Drainage Plan I
Uniroyal Property**



DRAINAGE STRUCTURE TABLE				
STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
DMH-10A	96.0'	90.9' (CMH-11A)	90.9' (DMH-9A)	NEW
DMH-9A	97.9'	91.5' (DMH-10A)	91.5' (DMH-8A)	NEW
DMH-8A	97.95'	92.0' (DMH-6A)	92.0' (DMH-4A) 92.0' (CB-8A)	NEW
CB-8A	97.33'	92.1' (DMH-8A)		NEW
DMH-7A	99.3'	94.0' (DMH-8A)		NEW, SEE NOTE 3

STA. 45+00

PROP. PERFORATED 18" HDPE PIPE W/ 0.35% SLOPE (DMH-11A TO DMH-8A)

PROP. CRUSHED STONE TRENCH ALONG PROP. DRAIN PIPE. SEE FIGURE 8

AREA BEHIND LEVEE TO BE GRADED AS SHOWN WITH INFILTRATION PONDS TO CONTROL STORMWATER.

CHICOPEE RIVER

STA. 40+00

PROP. PERFORATED 12" HDPE PIPE W/ 1.4% SLOPE (DMH-8A TO DMH-7A)

EXISTING UTILITY POLE WITH OVERHEAD ELECTRIC LINES TO BE REMOVED FROM FILL AREA (TYP.)

ALL EXISTING DRAIN LINES WITHIN FOOTPRINT OF BACKFILL AREA TO BE ABANDONED IN PLACE UNLESS OTHERWISE NOTED.

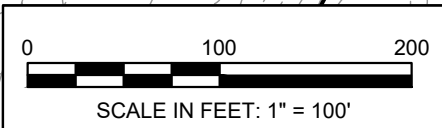
EXISTING BYPASS LINE TO BE ABANDONED IN PLACE AND SEALED WITH MASONRY PLUG.

AREA TO BE BACKFILLED AND LOAMED/SEEDED. GRADING BEYOND LIMITS OF ACOE AREA MAY VARY FROM CONTOURS AS DEPICTED.

- NOTES:**
1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
 2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
 3. DMH-2A, DMH-3A, AND DMH-4A MAY BE REPLACED WITH CLEANOUTS AT DISCRETION OF CITY.
 4. ALL EXISTING AND PROPOSED DRAIN INLETS SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.
 5. EXISTING STONE TRACKING PADS AT SITE ENTRANCES SHALL BE MAINTAINED OR REPLACED AS NECESSARY.

LEGEND

- EXISTING SITE BUILDING
- BUILDING DEMOLISHED AS OF JULY 2020
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- 200' RIVERFRONT AREA
- APPROX. LIMIT OF ACOE PARCEL (TRACT R8)



Former Uniroyal & Facemate Properties
 ACOE Permit Review Only
 154 Grove Street & 75 West Main Street
 Chicopee, MA

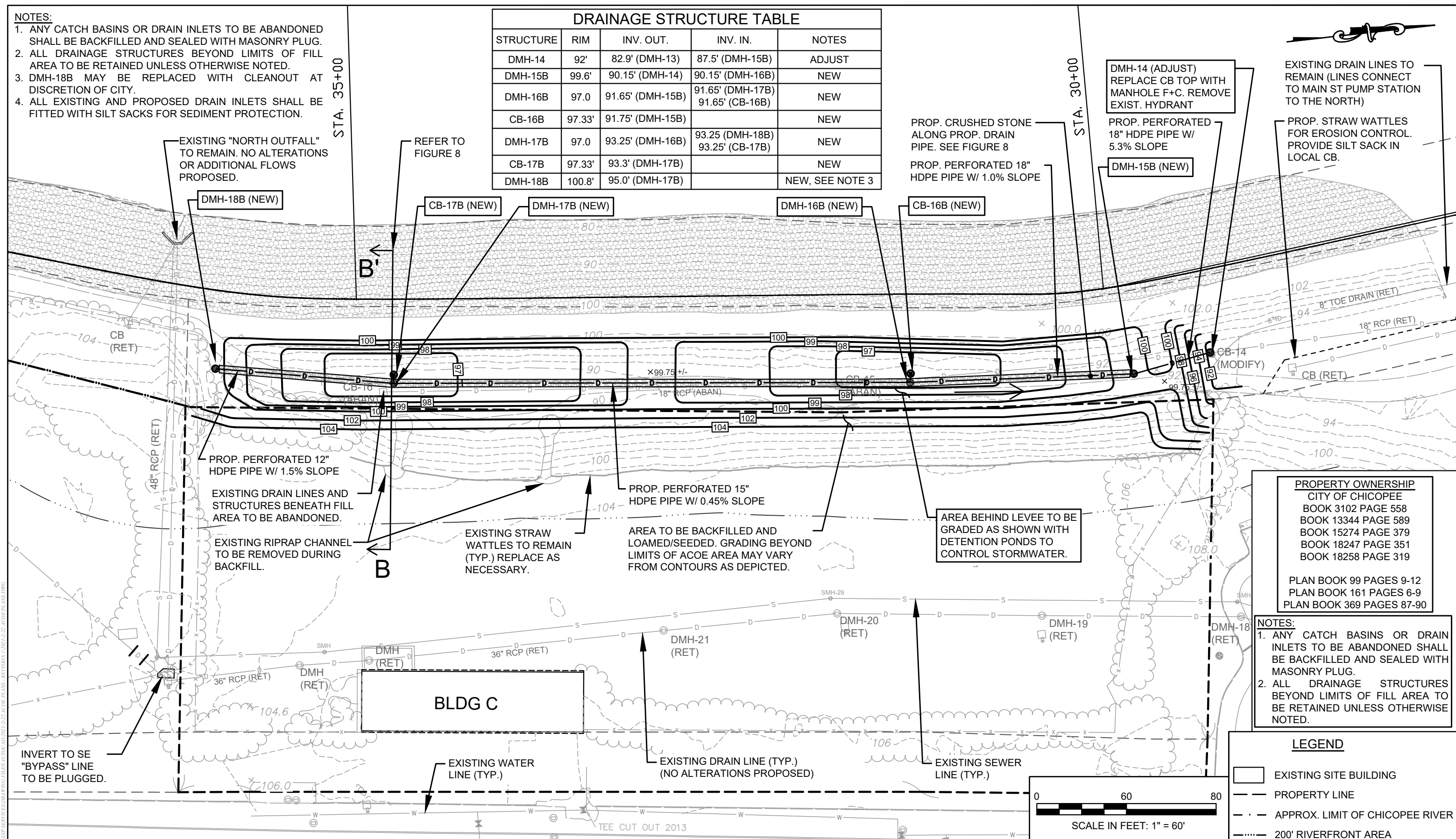
Issue Date: 3-10-2021

Figure No. 6
Enlarged Grading & Drainage Plan II
Uniroyal Property

NOTES:

1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
3. DMH-18B MAY BE REPLACED WITH CLEANOUT AT DISCRETION OF CITY.
4. ALL EXISTING AND PROPOSED DRAIN INLETS SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.

DRAINAGE STRUCTURE TABLE				
STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
DMH-14	92'	82.9' (DMH-13)	87.5' (DMH-15B)	ADJUST
DMH-15B	99.6'	90.15' (DMH-14)	90.15' (DMH-16B)	NEW
DMH-16B	97.0	91.65' (DMH-15B)	91.65' (DMH-17B) 91.65' (CB-16B)	NEW
CB-16B	97.33'	91.75' (DMH-15B)		NEW
DMH-17B	97.0	93.25' (DMH-16B)	93.25' (DMH-18B) 93.25' (CB-17B)	NEW
CB-17B	97.33'	93.3' (DMH-17B)		NEW
DMH-18B	100.8'	95.0' (DMH-17B)		NEW, SEE NOTE 3



PROPERTY OWNERSHIP
 CITY OF CHICOPEE
 BOOK 3102 PAGE 558
 BOOK 13344 PAGE 589
 BOOK 15274 PAGE 379
 BOOK 18247 PAGE 351
 BOOK 18258 PAGE 319

 PLAN BOOK 99 PAGES 9-12
 PLAN BOOK 161 PAGES 6-9
 PLAN BOOK 369 PAGES 87-90

- NOTES:**
1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
 2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.

LEGEND

- EXISTING SITE BUILDING
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- 200' RIVERFRONT AREA



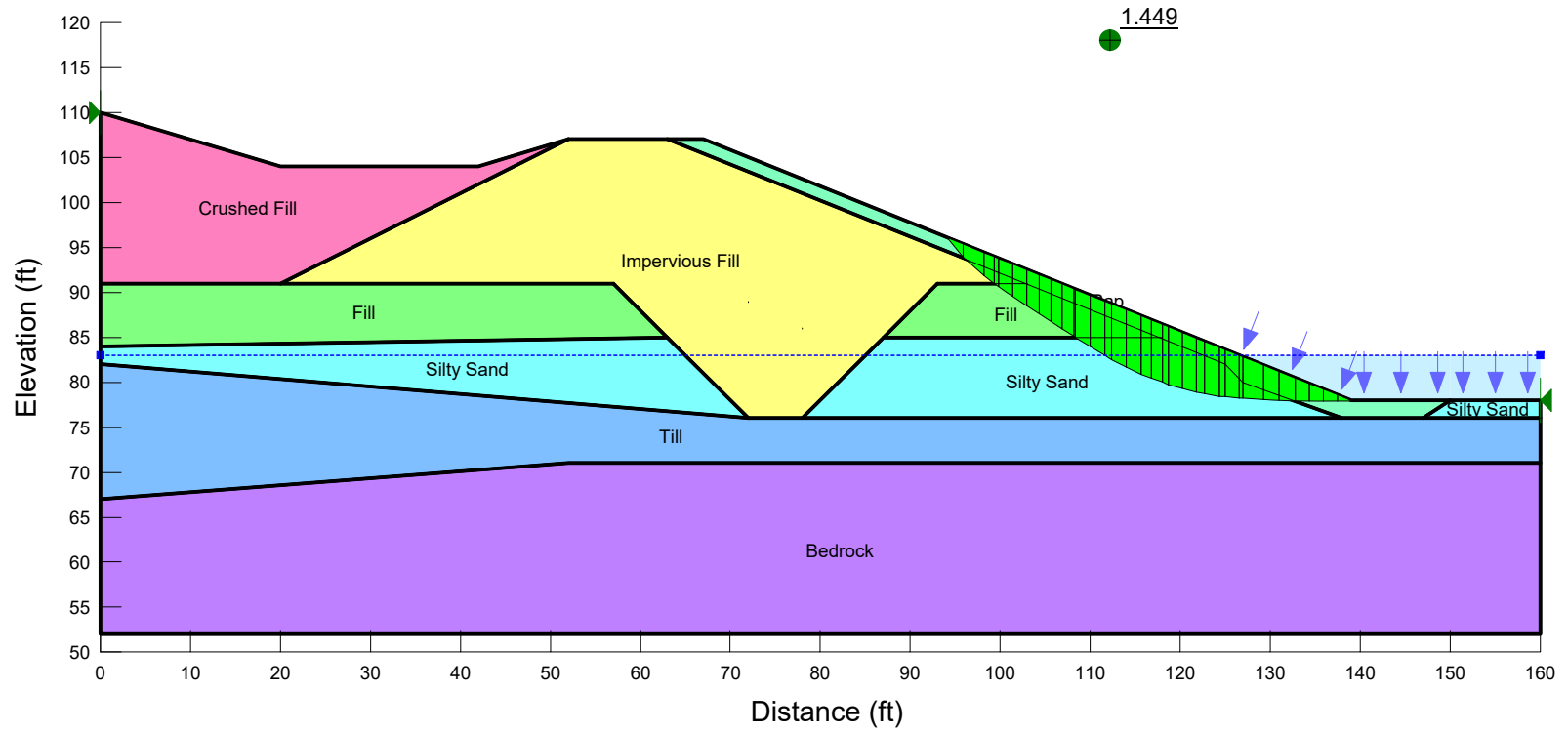
Former Unioryal & Facemate Properties
 ACOE Permit Review Only
 75 West Main Street
 Chicopee, MA

Issue Date: 3-10-2021

Figure No. 7
Grading & Drainage Plan
Facemate Property

Slope Stability Analysis

Chicopee Levee Slope Stability



CASE 1
Station 13+30 - Normal Water Conditions

Chicopee Levee Slope Stability

Station 13+30 – Normal Water Conditions

Report generated using GeoStudio 2007, version 7.23. Copyright © 1991-2013 GEO-SLOPE International Ltd.

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Auto-Search](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Slip Surface Limits

Left Coordinate: [\(0, 110\) ft](#)
Right Coordinate: [\(160, 78\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 118 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 42 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Till

Model: [Mohr-Coulomb](#)
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

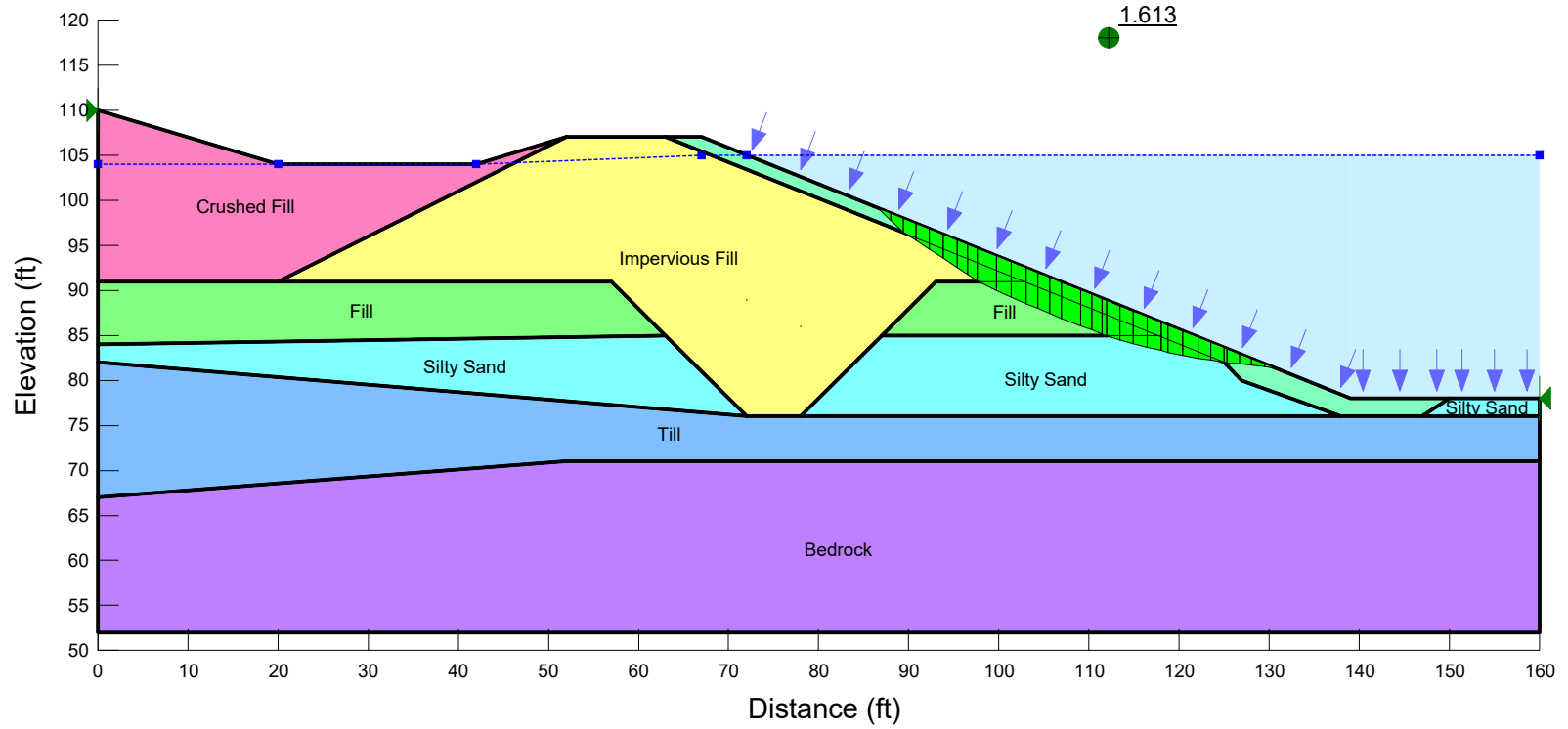
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: 1

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Chicopee Levee Slope Stability



CASE 2
Station 13+30 - Modified Standard Project Flood

Chicopee Levee Slope Stability

Station 13+30 – Modified Standard Project Flood

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Auto-Search](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Slip Surface Limits

Left Coordinate: [\(0, 110\) ft](#)
Right Coordinate: [\(160, 78\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 118 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 42 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Till

Model: [Mohr-Coulomb](#)
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

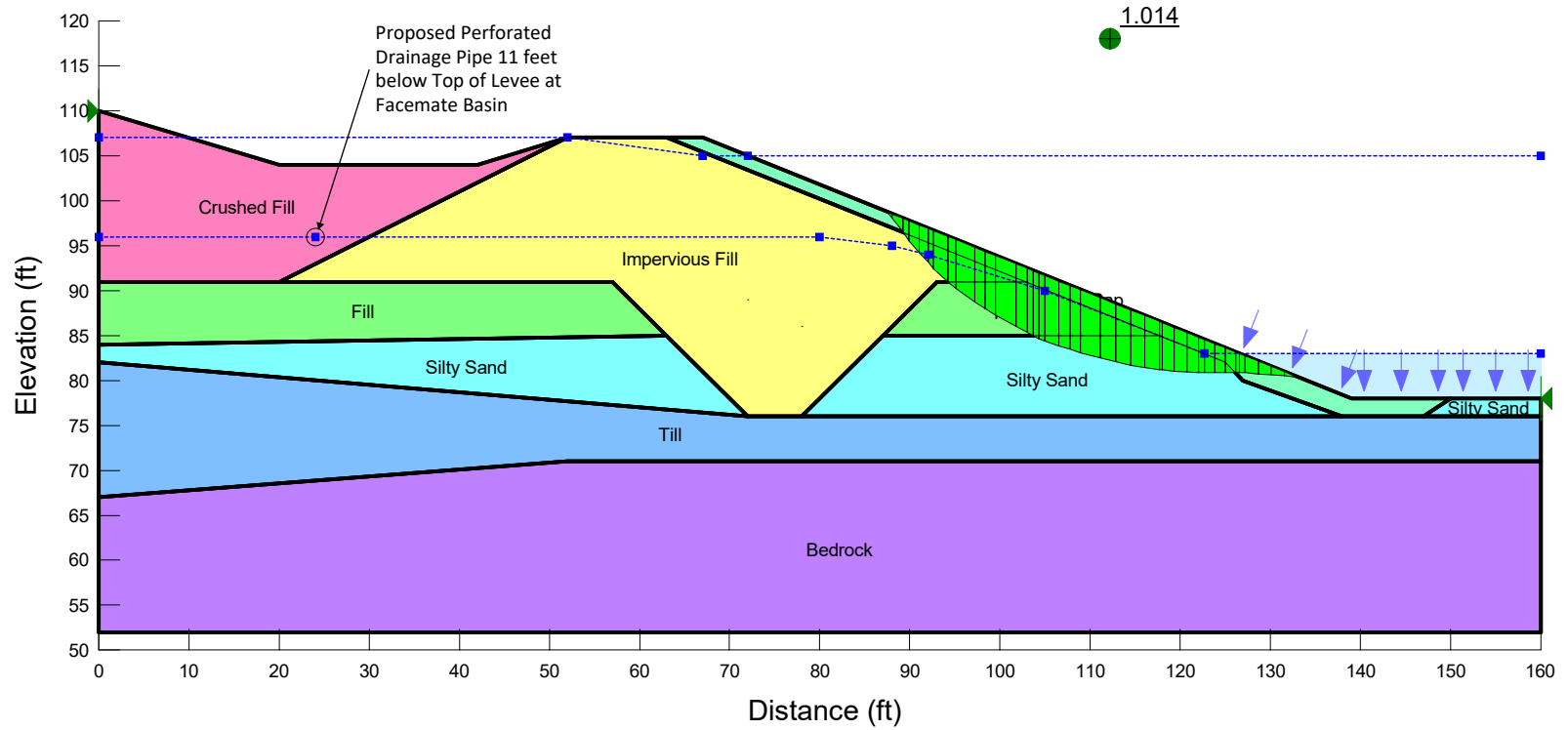
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: 1

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Chicopee Levee Slope Stability



CASE 3
Station 13+30 - Modified Standard Project Flood Rapid Drawdown

Chicopee Levee Slope Stability

Station 13+30 – Modified Standard Project Flood Rapid Drawdown

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Chicopee Levee Slope Stability

Description: [Station 13+30 - Modified Standard Project Flood Rapid Drawdown](#)

Kind: [SLOPE/W](#)

Method: [Spencer](#)

Settings

Apply Phreatic Correction: [No](#)

PWP Conditions Source: [Piezometric Line](#)

Use Staged Rapid Drawdown: [Yes](#)

Slip Surface

Direction of movement: [Left to Right](#)

Use Passive Mode: [No](#)

Slip Surface Option: [Auto-Search](#)

Critical slip surfaces saved: [1](#)

Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [\(none\)](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Slip Surface Limits

Left Coordinate: [\(0, 110\) ft](#)

Right Coordinate: [\(160, 78\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [118 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [30 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: [140 pcf](#)
Cohesion: [0 psf](#)
Phi: [42 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [27 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Till

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

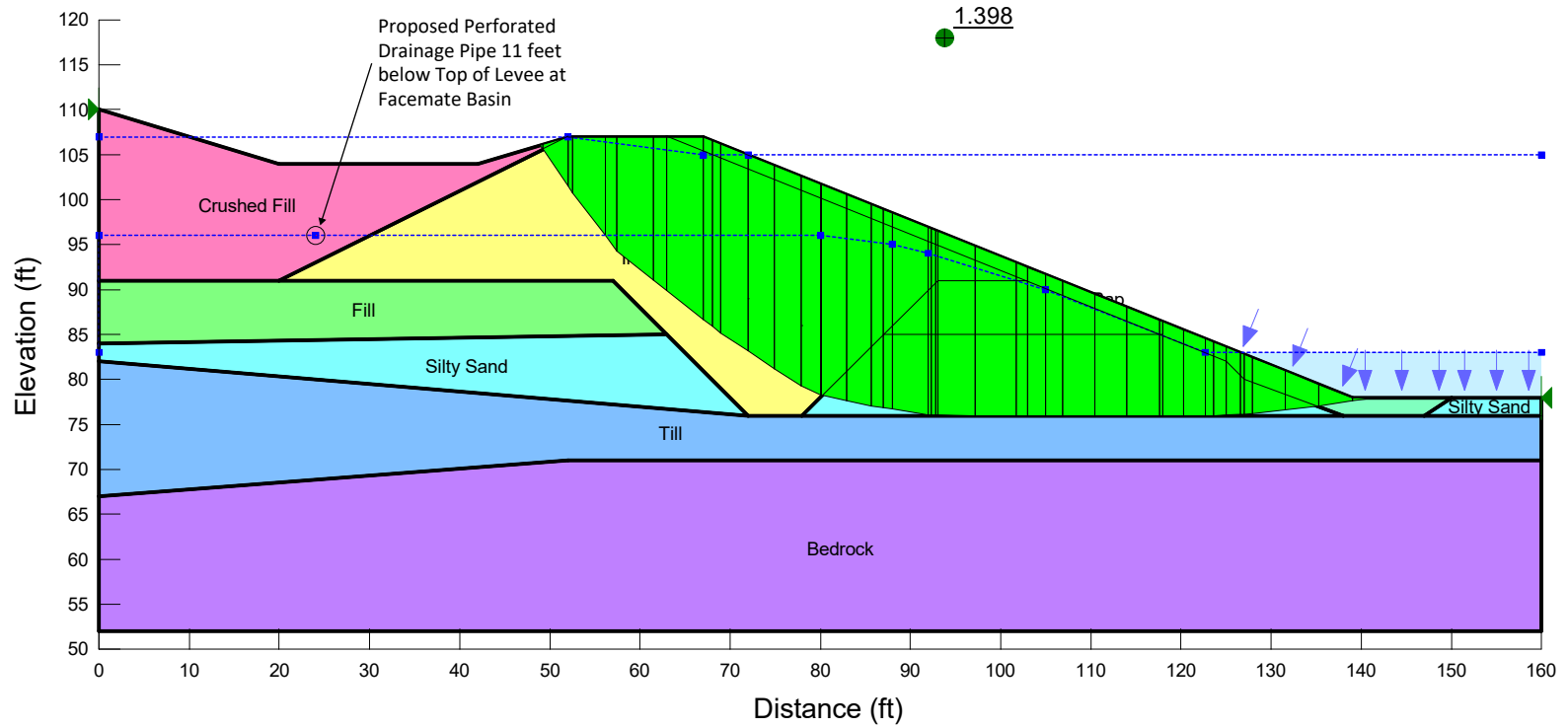
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Chicopee Levee Slope Stability



CASE 4
Station 13+30 - Modified Standard Project Flood Rapid Drawdown
Composite Failure Surface

Chicopee Levee Slope Stability

Station 13+30 – Modified Standard Project Flood Rapid Drawdown – Composite Failure Surface

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [Yes](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Fully-Specified](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Slip Surface Limits

Left Coordinate: [\(0, 110\) ft](#)
Right Coordinate: [\(160, 78\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [118 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [30 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: [140 pcf](#)
Cohesion: [0 psf](#)
Phi: [42 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [27 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Till

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	25	109
	39	84
	72	76
	115	76
	129	78
	135	81

Fully Specified Slip Surface 2

	X (ft)	Y (ft)
	30	109
	44	84
	72	76
	115	76
	129	78
	135	81

Fully Specified Slip Surface 3

	X (ft)	Y (ft)
	35	109
	49	84
	72	76
	115	76
	129	78
	135	81

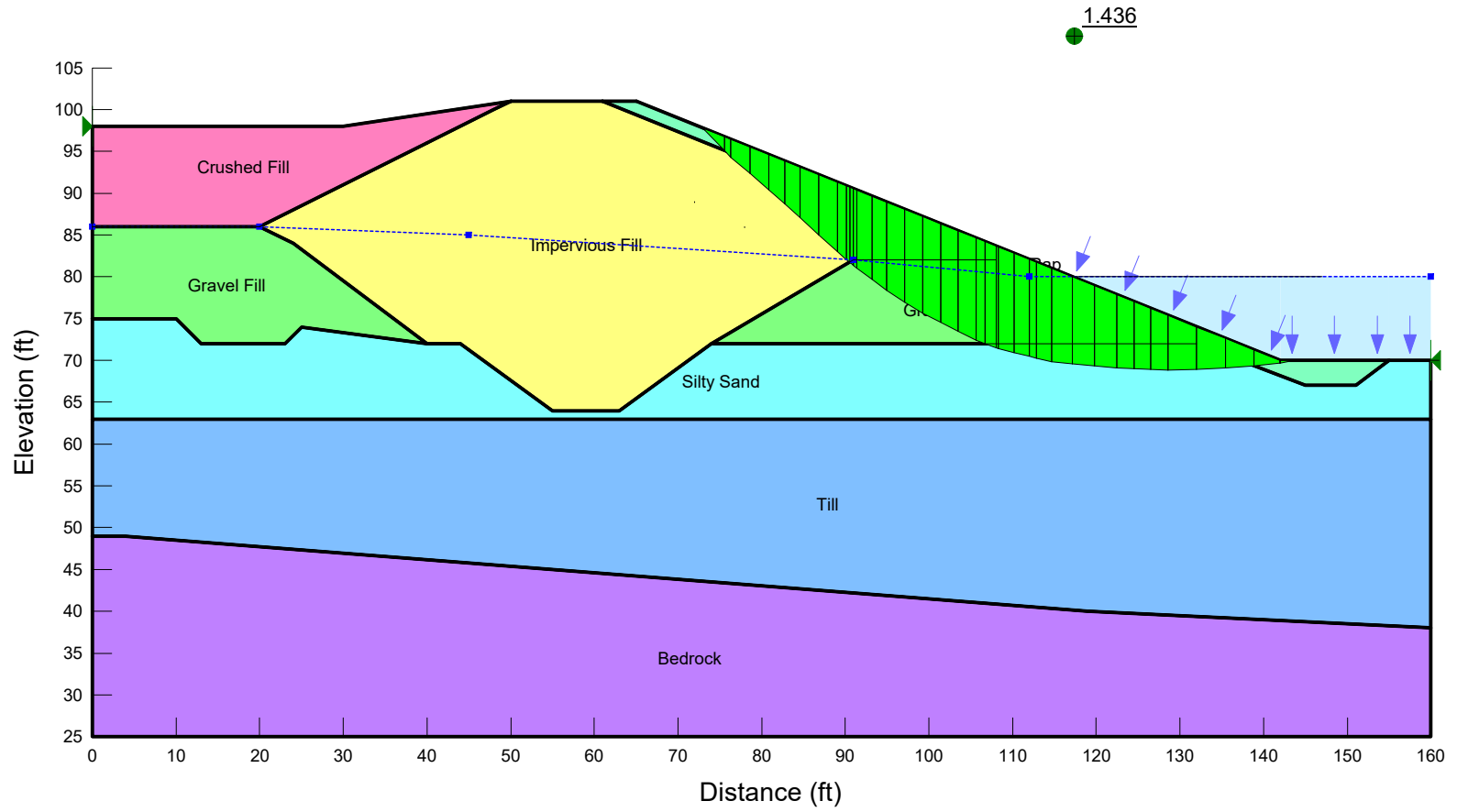
Fully Specified Slip Surface 4

	X (ft)	Y (ft)
	40	109
	54	84
	72	76
	115	76
	129	78
	135	81

Fully Specified Slip Surface 5

	X (ft)	Y (ft)
	45	109
	59	84
	72	76
	115	76
	129	78
	135	81

Chicopee Levee Slope Stability



CASE 5
Station 41+00 - Normal Water Conditions

Chicopee Levee Slope Stability

Station 41+00 – Normal Water Conditions

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Chicopee Levee Slope Stability

Description: [Station 41+00 - Normal Water Conditions](#)

Kind: [SLOPE/W](#)

Method: [Spencer](#)

Settings

Apply Phreatic Correction: [No](#)

PWP Conditions Source: [Piezometric Line](#)

Use Staged Rapid Drawdown: [No](#)

Slip Surface

Direction of movement: [Left to Right](#)

Use Passive Mode: [No](#)

Slip Surface Option: [Auto-Search](#)

Critical slip surfaces saved: [1](#)

Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [\(none\)](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Slip Surface Limits

Left Coordinate: [\(0, 98\) ft](#)

Right Coordinate: [\(160, 70\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [118 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Gravel Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [32 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: [140 pcf](#)
Cohesion: [0 psf](#)
Phi: [42 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Till

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

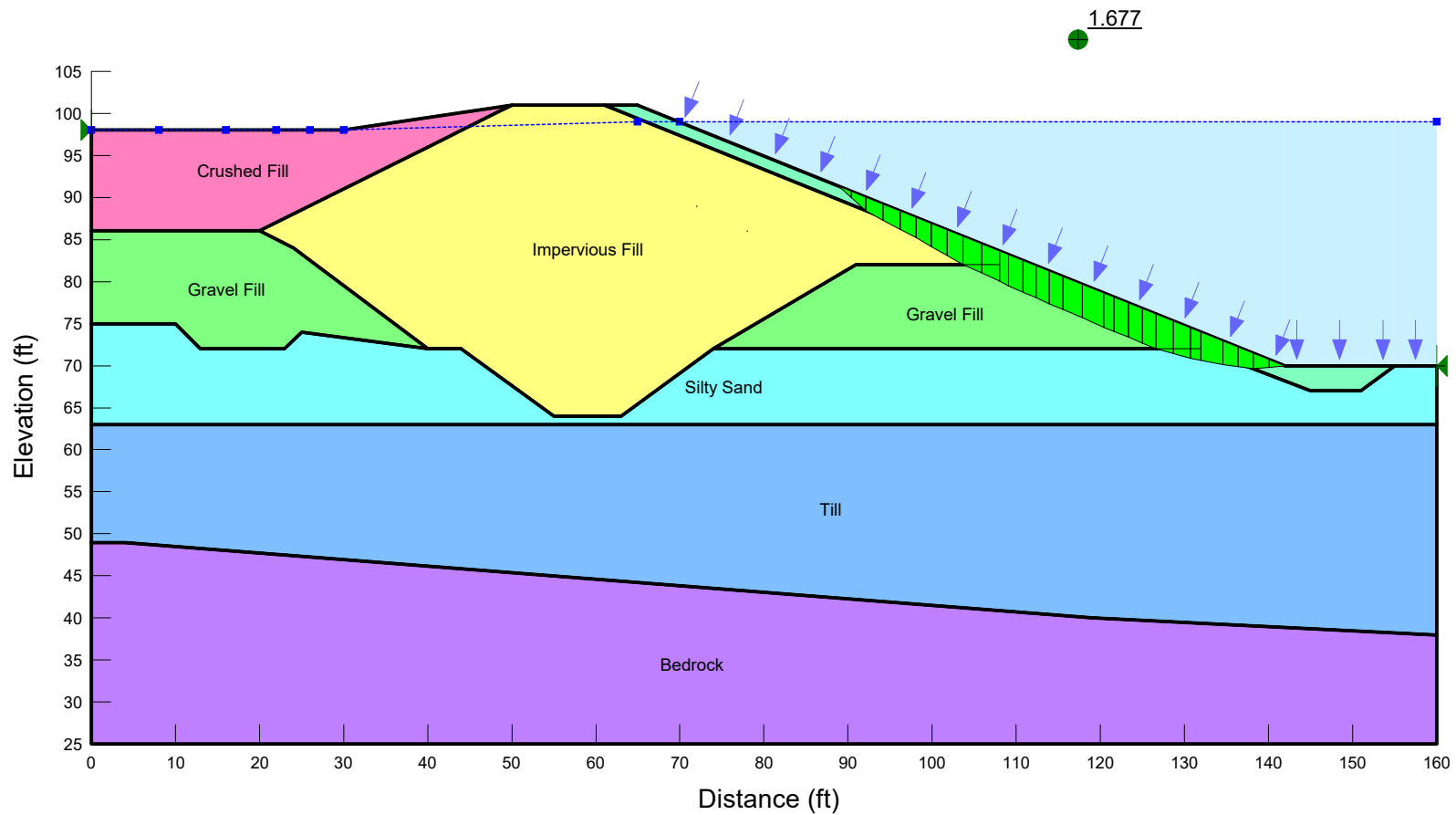
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: [1](#)

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Chicopee Levee Slope Stability



CASE 6
Station 41+00 - Modified Standard Project Flood

Chicopee Levee Slope Stability

Station 41+00 – Modified Standard Project Flood

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Auto-Search](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Slip Surface Limits

Left Coordinate: [\(0, 98\) ft](#)
Right Coordinate: [\(160, 70\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 118 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gravel Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 42 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Till

Model: [Mohr-Coulomb](#)
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

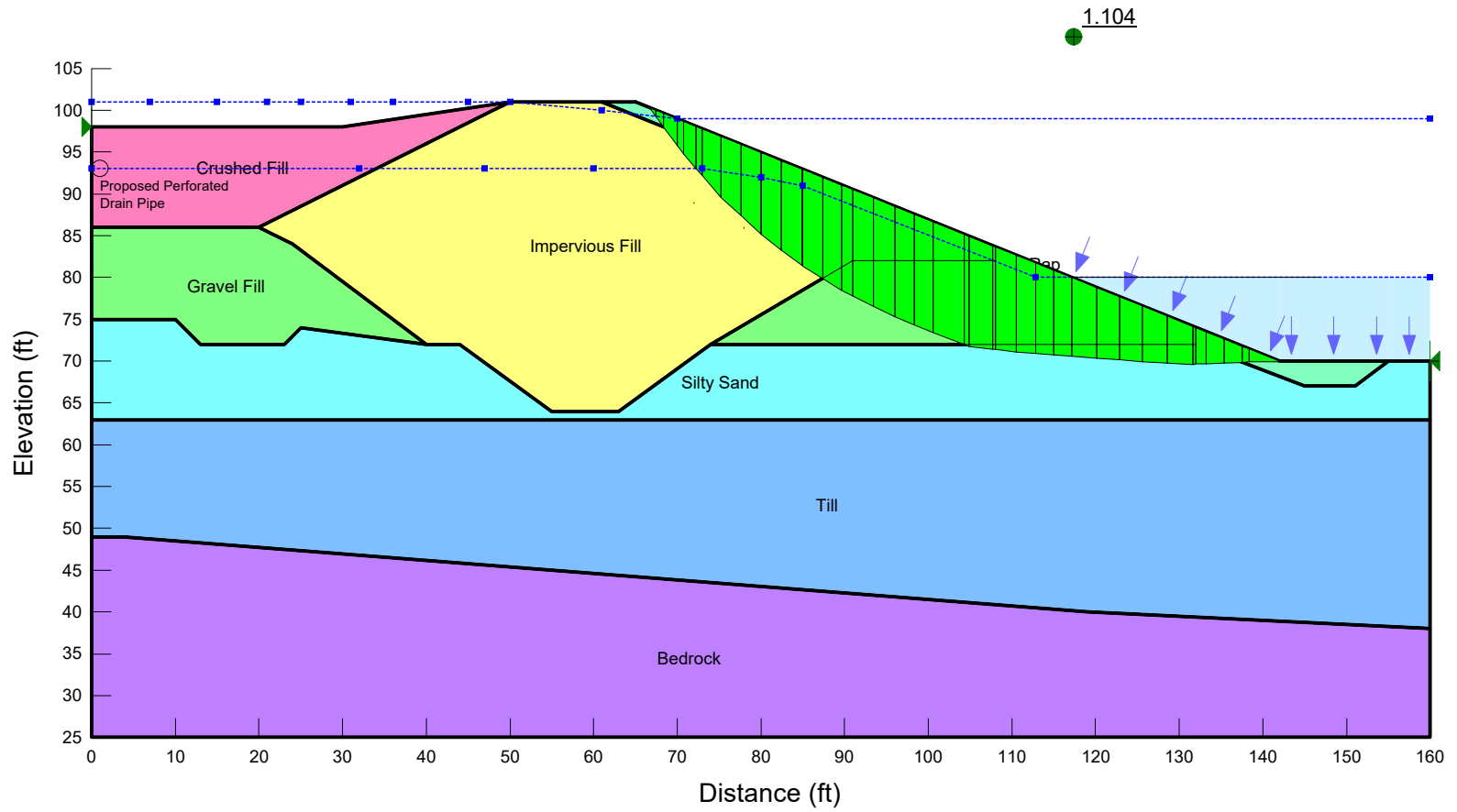
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
Piezometric Line: 1

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Chicopee Levee Slope Stability



CASE 7
Station 41+00 - Modified Standard Project Flood Rapid Drawdown

Chicopee Levee Slope Stability

Station 41+00 – Modified Standard Project Flood Rapid Drawdown

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [Yes](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Auto-Search](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Slip Surface Limits

Left Coordinate: [\(0, 98\) ft](#)
Right Coordinate: [\(160, 70\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [118 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Gravel Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [32 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [32 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: [140 pcf](#)
Cohesion: [0 psf](#)
Phi: [42 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [27 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Till

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

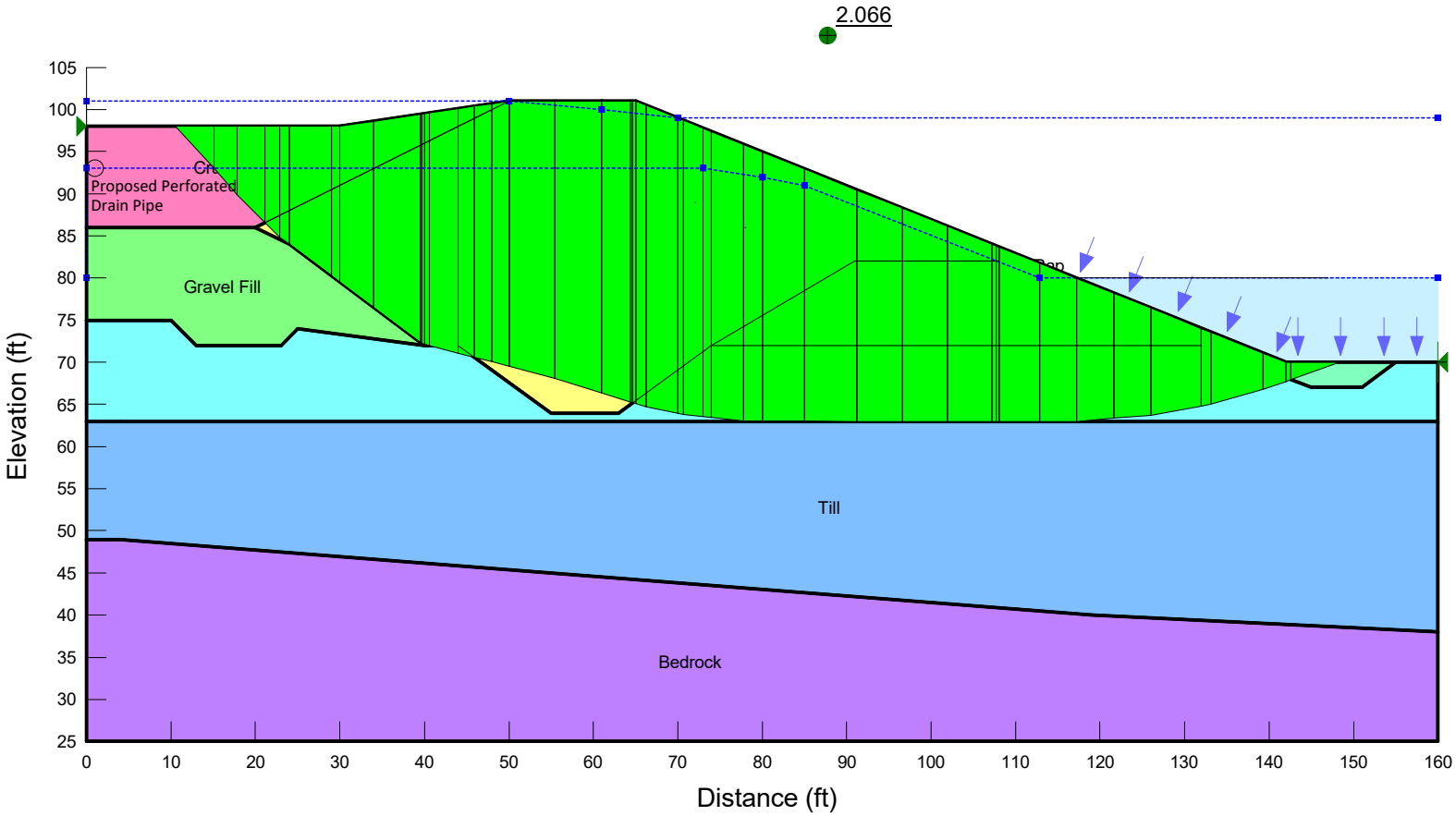
Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Chicopee Levee Slope Stability



CASE 8
Station 41+00 - Modified Standard Project Flood Rapid Drawdown
Composite Failure Surface

Chicopee Levee Slope Stability

Station 41+00 – Modified Standard Project Flood Rapid Drawdown – Composite Failure Surface

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Uniroyal Initial Conditions

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [Yes](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Fully-Specified](#)
 Critical slip surfaces saved: [5](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Slip Surface Limits

Left Coordinate: [\(0, 98\) ft](#)
Right Coordinate: [\(160, 70\) ft](#)

Materials

Impervious Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [118 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Gravel Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [32 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [32 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Rip Rap

Model: [Mohr-Coulomb](#)
Unit Weight: [140 pcf](#)
Cohesion: [0 psf](#)
Phi: [42 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Silty Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [27 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Till

Model: [Mohr-Coulomb](#)
Unit Weight: [130 pcf](#)
Cohesion: [0 psf](#)
Phi: [35 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [35 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Bedrock

Model: [Bedrock \(Impenetrable\)](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Crushed Fill

Model: [Mohr-Coulomb](#)
Unit Weight: [120 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)
Drawdown Total Cohesion: [0 psf](#)
Drawdown Total Phi: [0 °](#)
Pore Water Pressure
 Piezometric Line: [2](#)
 Piezometric Line After Drawdown: [1](#)

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

X (ft)	Y (ft)
4	103
19	81
43	63
97	63
123	68
138	74

Fully Specified Slip Surface 2

X (ft)	Y (ft)
9	103
22	81
43	63
97	63
123	68
138	74

Fully Specified Slip Surface 3

X (ft)	Y (ft)
14	103
25	81
43	63
97	63
123	68
138	74

Fully Specified Slip Surface 4

X (ft)	Y (ft)
19	103
28	81
43	63
97	63
123	68
138	74

Fully Specified Slip Surface 5

	X (ft)	Y (ft)
	24	103
	31	81
	43	63
	97	63
	123	68
	138	74

Fully Specified Slip Surface 6

	X (ft)	Y (ft)
	29	103
	34	81
	43	63
	97	63
	123	68
	138	74

GZA Soil Properties



GZA
GeoEnvironmental, Inc.

One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
<http://www.gza.com>

Engineers and
Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	1	OF	2
CALCULATED BY	RDH/JGD	DATE	5/13/2010
CHECKED BY	JGD	DATE	5/13/2010
SCALE	N/A		

Objective: To assess seepage and stability of the **Chicopee Falls Section** of the Chicopee Flood Control Works

Method:

- 1) Develop typical cross section of levee at **Station 13+30, typical from Station 9+50 to 16+82 and 25+25 to 39+25** (See attached figure).
- 2) Determine material parameters from test borings and typical values of similar materials.
- 3) Calculate location of phreatic surface within levee for normal and flood conditions, using SEEP/W. Calculate factor of safety against piping failure (where applicable).
- 4) Using pore water data from SEEP/W, calculate factors of safety against slope failure for the following load cases defined by requirements of EM 1110-2-1913, Section 6-7302. Steady-state factors of safety calculated for both riverside and landside slopes using Spencer method. Rapid drawdown factor of safety calculated using USACE 3-stage method.

- Case #1 - Steady-state seepage at normal pool
- Case #2 - Steady-state seepage at 100yr Flood
- Case #3 - Rapid Drawdown from 100 yr Flood (Riverside only)

5) Where applicable, the above load cases were also checked for non-functioning drains and/or cutoffs

Subsurface Information:

- Test borings CF-1 through CF-11 and Exploration Location Plan by GZA (2009)
- "Chicopee River Flood Control - Chicopee Falls, Chicopee River, Massachusetts" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated April 1963
- "Chicopee Falls Local Protection Project - Design Memorandum No. 5 - Embankments and Foundations" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated March 1963

Assumptions:

- Soil strata interpreted from available test boring data and design drawings, actual configuration may vary.

Material Properties:

Strata	Total Unit Weight, γ_t	Effective Strength		Total Strength		K Ratio (k_v/k_h)	Saturated Horizontal Permeability, k_{sat}		Notes
		Cohesion, c	Friction	Cohesion, c	Friction				
Impervious Fill	118	0	35	0	35	1	4.6E-06	1.4E-04	(2),(3)
Existing Fill	120	0	30	0	30	1	3.3E-05	1.0E-03	(4),(5)
Silty Sand	110	0	30	0	27	1	4.6E-06	1.4E-04	(2),(4)
Gravelly Sand	130	0	35	0	35	1	6.6E-05	2.0E-03	(2),(4)
Riprap	140	0	42	0	42	1	8.0E-03	2.4E-01	(1)
Sandstone	-	-	-	-	-	1	1.6E-06	5.0E-05	(1),(6)

- (1) - Unit weight and permeability values based on typical values for similar materials
- (2) - Permeability values estimated from correlations with grain size distribution
- (3) - Drained strength values based on correlations from SPT-N testing, total strength values are estimated
- (4) - Drained strength based on values in USACE design
- (5) - Permeability values based values used in USACE report
- (6) - Strength of sandstone not included in slope stability analysis (assumed impenetrable)

Analysis Results:

SEEPAGE ANALYSIS RESULTS - EXISTING CONDITIONS

Case	River Elevation	Unit Flowrate, $Q^{(1)}$ (through slope into drain)	Exit Gradient, $i_e^{(1)}$	Limiting Gradient ⁽²⁾	OK?
1	Normal (El. ±83)	0 ft ³ /s/ft	N/A	0.5	Y
2	100yr Flood (El. 97.9)	3.3E-05 ft ³ /s/ft	0.04	0.5	Y
2a	100yr Flood (No Drain)	0 ft ³ /s/ft	0.14	0.5	Y

- Note: Factor of safety values less than recommended values are shown in italics

- (1) - Flow and exit gradient estimated from results of SEEP/W analysis at toe drain or landside face of the levee
- (2) - Limiting gradient per requirements of US Army Corps Technical Letter ETL 1110-2-569 "DESIGN GUIDANCE FOR LEVEE UNDERSEEPAGE"

HydroCAD Outputs

Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.04" for 1-Year event
 Inflow = 2.69 cfs @ 12.10 hrs, Volume= 0.197 af
 Outflow = 1.54 cfs @ 12.23 hrs, Volume= 0.197 af, Atten= 43%, Lag= 8.3 min
 Primary = 1.54 cfs @ 12.23 hrs, Volume= 0.197 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.51' @ 12.23 hrs Surf.Area= 4,853 sf Storage= 1,881 cf

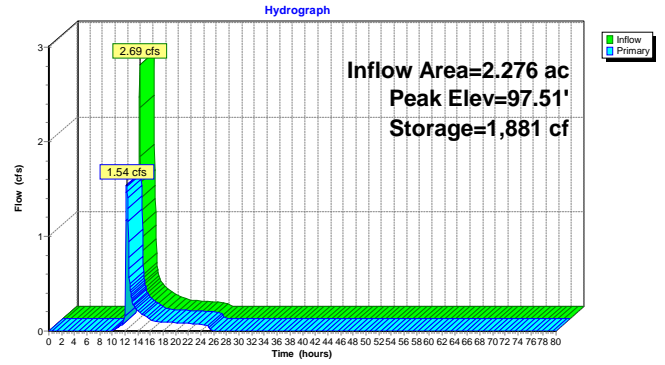
Plug-Flow detention time= 80.9 min calculated for 0.197 af (100% of inflow)
 Center-of-Mass det. time= 81.0 min (926.6 - 845.7)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

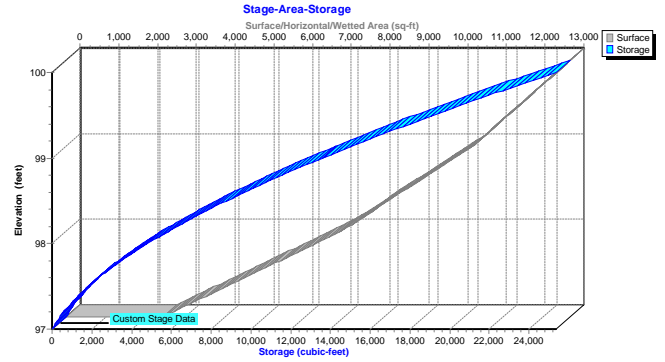
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 5.00 columns X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=1.54 cfs @ 12.23 hrs HW=97.51' (Free Discharge)
 1=Catch Basin (Orifice Controls 1.42 cfs @ 2.05 fps)
 2=Exfiltration (Controls 0.12 cfs)

Pond 1Pa: CB-17B Basin



Pond 1Pa: CB-17B Basin



Hydrograph for Pond 1Pa: CB-17B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.01	6	97.00	0.01
12.50	0.71	1,576	97.45	1.16
15.00	0.15	1,135	97.34	0.16
17.50	0.08	1,048	97.32	0.10
20.00	0.06	791	97.26	0.09
22.50	0.04	488	97.17	0.08
25.00	0.00	73	97.03	0.06
27.50	0.00	0	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pa: CB-17B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,500	0	99.70	12,250	21,563
97.05	2,730	131	99.75	12,375	22,178
97.10	2,960	273	99.80	12,500	22,800
97.15	3,190	427	99.85	12,625	23,428
97.20	3,420	592	99.90	12,750	24,063
97.25	3,650	769	99.95	12,875	24,703
97.30	3,880	957	100.00	13,000	25,350
97.35	4,110	1,157			
97.40	4,340	1,368			
97.45	4,570	1,591			
97.50	4,800	1,825			
97.55	5,030	2,071			
97.60	5,260	2,328			
97.65	5,490	2,597			
97.70	5,720	2,877			
97.75	5,950	3,169			
97.80	6,180	3,472			
97.85	6,410	3,787			
97.90	6,640	4,113			
97.95	6,870	4,451			
98.00	7,100	4,800			
98.05	7,270	5,159			
98.10	7,440	5,527			
98.15	7,610	5,903			
98.20	7,780	6,288			
98.25	7,950	6,681			
98.30	8,120	7,083			
98.35	8,290	7,493			
98.40	8,460	7,912			
98.45	8,630	8,339			
98.50	8,800	8,775			
98.55	8,970	9,219			
98.60	9,140	9,672			
98.65	9,310	10,133			
98.70	9,480	10,603			
98.75	9,650	11,081			
98.80	9,820	11,568			
98.85	9,990	12,063			
98.90	10,160	12,567			
98.95	10,330	13,079			
99.00	10,500	13,600			
99.05	10,625	14,128			
99.10	10,750	14,662			
99.15	10,875	15,203			
99.20	11,000	15,750			
99.25	11,125	16,303			
99.30	11,250	16,862			
99.35	11,375	17,428			
99.40	11,500	18,000			
99.45	11,625	18,578			
99.50	11,750	19,163			
99.55	11,875	19,753			
99.60	12,000	20,350			
99.65	12,125	20,953			

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 0.98" for 1-Year event
 Inflow = 3.01 cfs @ 12.10 hrs, Volume= 0.222 af
 Outflow = 2.02 cfs @ 12.21 hrs, Volume= 0.222 af, Atten= 33%, Lag= 6.5 min
 Primary = 2.02 cfs @ 12.21 hrs, Volume= 0.222 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.50' @ 12.21 hrs Surf.Area=5,052 sf Storage=2,014 cf

Plug-Flow detention time= 83.0 min calculated for 0.222 af (100% of inflow)
 Center-of-Mass det. time= 83.0 min (932.4 - 849.4)

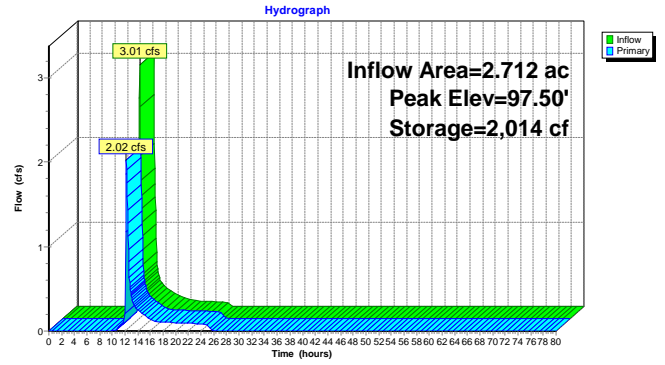
Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	27,653 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,945	0	0
98.00	7,130	5,038	5,038
99.00	11,400	9,265	14,303
100.00	15,300	13,350	27,653

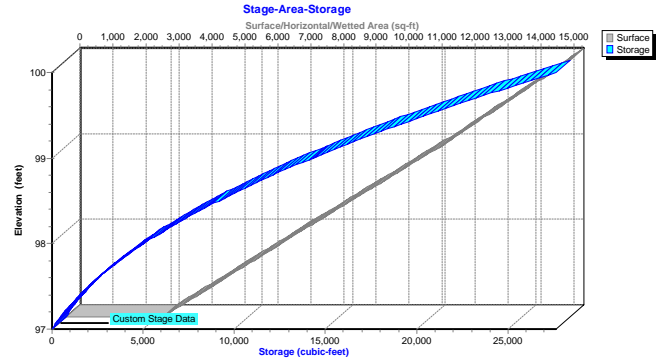
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.00 cfs @ 12.21 hrs HW=97.50' (Free Discharge)
 1=Catch Basin (Weir Controls 1.88 cfs @ 1.36 fps)
 2=Exfiltration (Controls 0.12 cfs)

Pond 1Pb: CB-16B Basin



Pond 1Pb: CB-16B Basin



Hydrograph for Pond 1Pb: CB-16B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.01	1	97.00	0.00
12.50	0.81	1,718	97.44	1.12
15.00	0.18	1,281	97.35	0.19
17.50	0.09	1,188	97.33	0.10
20.00	0.06	941	97.27	0.10
22.50	0.05	617	97.18	0.09
25.00	0.00	137	97.04	0.07
27.50	0.00	0	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pb: CB-16B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,945	0	99.70	14,130	23,238
97.05	3,154	152	99.75	14,325	23,949
97.10	3,363	315	99.80	14,520	24,670
97.15	3,573	489	99.85	14,715	25,401
97.20	3,782	673	99.90	14,910	26,142
97.25	3,991	867	99.95	15,105	26,892
97.30	4,200	1,072	100.00	15,300	27,653
97.35	4,410	1,287			
97.40	4,619	1,513			
97.45	4,828	1,749			
97.50	5,038	1,996			
97.55	5,247	2,253			
97.60	5,456	2,520			
97.65	5,665	2,798			
97.70	5,875	3,087			
97.75	6,084	3,386			
97.80	6,293	3,695			
97.85	6,502	4,015			
97.90	6,712	4,345			
97.95	6,921	4,686			
98.00	7,130	5,038			
98.05	7,343	5,399			
98.10	7,557	5,772			
98.15	7,771	6,155			
98.20	7,984	6,549			
98.25	8,198	6,953			
98.30	8,411	7,369			
98.35	8,624	7,795			
98.40	8,838	8,231			
98.45	9,052	8,678			
98.50	9,265	9,136			
98.55	9,478	9,605			
98.60	9,692	10,084			
98.65	9,906	10,574			
98.70	10,119	11,075			
98.75	10,333	11,586			
98.80	10,546	12,108			
98.85	10,759	12,641			
98.90	10,973	13,184			
98.95	11,187	13,738			
99.00	11,400	14,303			
99.05	11,595	14,877			
99.10	11,790	15,462			
99.15	11,985	16,056			
99.20	12,180	16,661			
99.25	12,375	17,274			
99.30	12,570	17,898			
99.35	12,765	18,531			
99.40	12,960	19,175			
99.45	13,155	19,827			
99.50	13,350	20,490			
99.55	13,545	21,162			
99.60	13,740	21,844			
99.65	13,935	22,536			

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 0.93" for 1-Year event
 Inflow = 3.63 cfs @ 12.17 hrs, Volume= 0.326 af
 Outflow = 2.23 cfs @ 12.39 hrs, Volume= 0.326 af, Atten= 39%, Lag= 12.9 min
 Primary = 2.23 cfs @ 12.39 hrs, Volume= 0.326 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.51' @ 12.39 hrs Surf.Area= 9,837 sf Storage= 3,270 cf

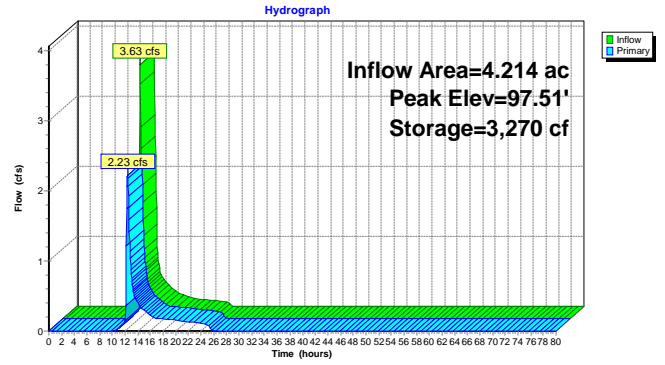
Plug-Flow detention time= 78.8 min calculated for 0.326 af (100% of inflow)
 Center-of-Mass det. time= 78.8 min (937.4 - 858.6)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	47,780 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	16,420	9,710	9,710
99.00	19,000	17,710	27,420
100.00	21,720	20,360	47,780

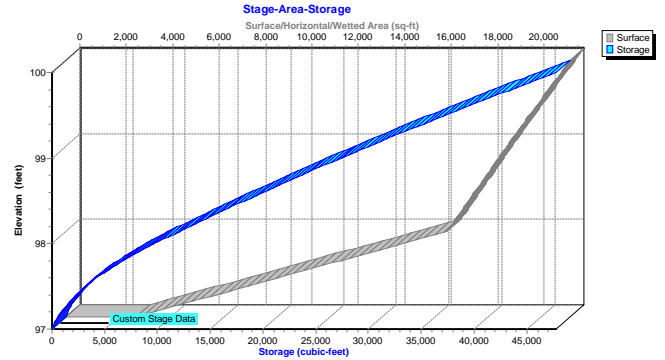
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=2.22 cfs @ 12.39 hrs HW=97.51' (Free Discharge)
 1=Catch Basin (Weir Controls 1.98 cfs @ 1.38 fps)
 2=Exfiltration (Controls 0.24 cfs)

Pond 2Pa: CB-8A Basin



Pond 2Pa: CB-8A Basin



Hydrograph for Pond 2Pa: CB-8A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.00	0	97.00	0.00
12.50	1.66	3,177	97.50	2.07
15.00	0.27	1,912	97.36	0.30
17.50	0.14	1,662	97.32	0.18
20.00	0.10	1,191	97.25	0.15
22.50	0.08	717	97.17	0.13
25.00	0.00	151	97.05	0.09
27.50	0.00	0	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 2Pa: CB-8A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	3,000	0	99.70	20,904	41,386
97.05	3,671	167	99.75	21,040	42,435
97.10	4,342	367	99.80	21,176	43,490
97.15	5,013	601	99.85	21,312	44,553
97.20	5,684	868	99.90	21,448	45,622
97.25	6,355	1,169	99.95	21,584	46,697
97.30	7,026	1,504	100.00	21,720	47,780
97.35	7,697	1,872			
97.40	8,368	2,274			
97.45	9,039	2,709			
97.50	9,710	3,178			
97.55	10,381	3,680			
97.60	11,052	4,216			
97.65	11,723	4,785			
97.70	12,394	5,388			
97.75	13,065	6,024			
97.80	13,736	6,694			
97.85	14,407	7,398			
97.90	15,078	8,135			
97.95	15,749	8,906			
98.00	16,420	9,710			
98.05	16,549	10,534			
98.10	16,678	11,365			
98.15	16,807	12,202			
98.20	16,936	13,046			
98.25	17,065	13,896			
98.30	17,194	14,752			
98.35	17,323	15,615			
98.40	17,452	16,484			
98.45	17,581	17,360			
98.50	17,710	18,243			
98.55	17,839	19,131			
98.60	17,968	20,026			
98.65	18,097	20,928			
98.70	18,226	21,836			
98.75	18,355	22,751			
98.80	18,484	23,672			
98.85	18,613	24,599			
98.90	18,742	25,533			
98.95	18,871	26,473			
99.00	19,000	27,420			
99.05	19,136	28,373			
99.10	19,272	29,334			
99.15	19,408	30,301			
99.20	19,544	31,274			
99.25	19,680	32,255			
99.30	19,816	33,242			
99.35	19,952	34,237			
99.40	20,088	35,238			
99.45	20,224	36,245			
99.50	20,360	37,261			
99.55	20,496	38,281			
99.60	20,632	39,310			
99.65	20,768	40,345			

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 0.93" for 1-Year event
 Inflow = 5.81 cfs @ 12.15 hrs, Volume= 0.493 af
 Outflow = 3.17 cfs @ 12.38 hrs, Volume= 0.493 af, Atten= 45%, Lag= 13.8 min
 Primary = 3.17 cfs @ 12.38 hrs, Volume= 0.493 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 95.19' @ 12.38 hrs Surf.Area= 11,022 sq ft Storage= 4,250 cf

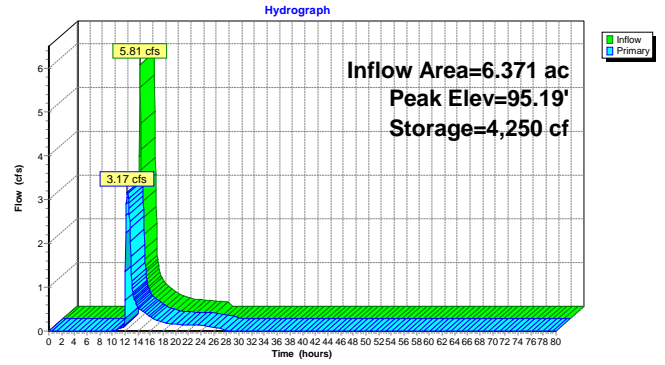
Plug-Flow detention time= 56.7 min calculated for 0.493 af (100% of inflow)
 Center-of-Mass det. time= 56.6 min (913.4 - 856.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	78,798 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,720	0	0
95.00	7,950	2,418	2,418
96.00	23,855	15,903	18,320
97.00	30,550	27,203	45,523
98.00	36,000	33,275	78,798

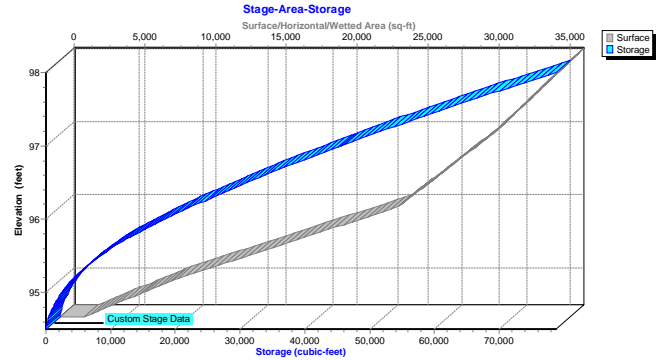
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=3.17 cfs @ 12.38 hrs HW=95.19' (Free Discharge)
 1=Catch Basin (Orifice Controls 2.90 cfs @ 2.90 fps)
 2=Exfiltration (Controls 0.27 cfs)

Pond 2Pb: CB-11A Basin



Pond 2Pb: CB-11A Basin



Hydrograph for Pond 2Pb: CB-11A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.00	0	94.50	0.00
10.00	0.00	0	94.50	0.00
12.50	2.28	4,072	95.18	3.09
15.00	0.41	1,536	94.88	0.43
17.50	0.21	1,366	94.85	0.22
20.00	0.15	1,266	94.83	0.15
22.50	0.12	1,176	94.82	0.14
25.00	0.00	669	94.72	0.11
27.50	0.00	25	94.51	0.02
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pb: CB-11A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,720	0	97.20	31,640	51,742
94.55	2,343	102	97.25	31,913	53,330
94.60	2,966	234	97.30	32,185	54,933
94.65	3,589	398	97.35	32,457	56,549
94.70	4,212	593	97.40	32,730	58,179
94.75	4,835	819	97.45	33,003	59,822
94.80	5,458	1,077	97.50	33,275	61,479
94.85	6,081	1,365	97.55	33,547	63,149
94.90	6,704	1,685	97.60	33,820	64,833
94.95	7,327	2,036	97.65	34,093	66,531
95.00	7,950	2,418	97.70	34,365	68,243
95.05	8,573	2,835	97.75	34,638	69,968
95.10	9,196	3,292	97.80	34,910	71,706
95.15	9,819	3,789	97.85	35,182	73,459
95.20	10,442	4,326	97.90	35,455	75,225
95.25	11,065	4,902	97.95	35,728	77,004
95.30	11,688	5,518	98.00	36,000	78,798
95.35	12,311	6,174			
95.40	12,934	6,870			
95.45	13,557	7,605			
95.50	14,180	8,381			
95.55	14,803	9,196			
95.60	15,426	10,050			
95.65	16,049	10,945			
95.70	16,672	11,879			
95.75	17,295	12,853			
95.80	17,918	13,867			
95.85	18,541	14,921			
95.90	19,164	16,014			
95.95	19,787	17,147			
96.00	20,410	18,320			
96.05	21,033	19,521			
96.10	21,656	20,739			
96.15	22,279	21,974			
96.20	22,902	23,225			
96.25	23,525	24,493			
96.30	24,148	25,778			
96.35	24,771	27,079			
96.40	25,394	28,398			
96.45	26,017	29,733			
96.50	26,640	31,084			
96.55	27,263	32,453			
96.60	27,886	33,838			
96.65	28,509	35,240			
96.70	29,132	36,659			
96.75	29,755	38,094			
96.80	30,378	39,546			
96.85	30,999	41,015			
96.90	31,622	42,501			
96.95	32,245	44,003			
97.00	32,868	45,523			
97.05	33,491	47,057			
97.10	34,114	48,605			
97.15	34,737	50,166			

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 1.10" for 1-Year event
 Inflow = 4.22 cfs @ 12.10 hrs, Volume= 0.309 af
 Outflow = 2.62 cfs @ 12.21 hrs, Volume= 0.309 af, Atten= 38%, Lag= 7.0 min
 Primary = 2.62 cfs @ 12.21 hrs, Volume= 0.309 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 95.09' @ 12.21 hrs Surf.Area= 6,482 sf Storage= 2,557 cf

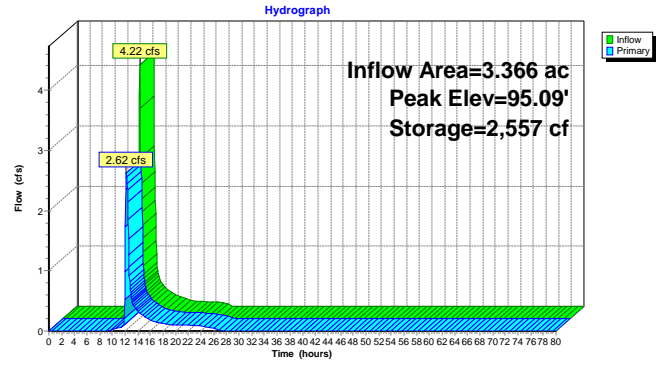
Plug-Flow detention time= 61.4 min calculated for 0.309 af (100% of inflow)
 Center-of-Mass det. time= 61.3 min (903.2 - 841.9)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	31,216 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,580	0	0
95.00	6,285	1,966	1,966
96.00	8,420	7,353	9,319
97.00	10,550	9,485	18,804
98.00	14,275	12,413	31,216

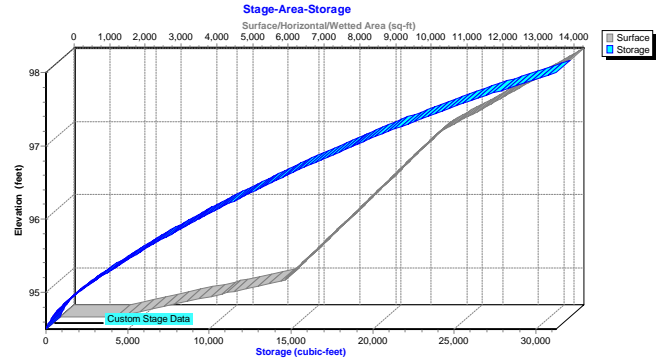
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=2.62 cfs @ 12.21 hrs HW=95.09' (Free Discharge)
 1=Catch Basin (Orifice Controls 2.46 cfs @ 2.46 fps)
 2=Exfiltration (Controls 0.16 cfs)

Pond 2Pc: CB-13A Basin



Pond 2Pc: CB-13A Basin



Hydrograph for Pond 2Pc: CB-13A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.00	0	94.50	0.00
10.00	0.03	22	94.51	0.02
12.50	1.10	1,912	94.99	1.84
15.00	0.24	1,166	94.86	0.25
17.50	0.12	1,055	94.83	0.13
20.00	0.08	917	94.80	0.11
22.50	0.07	691	94.75	0.09
25.00	0.00	284	94.63	0.07
27.50	0.00	1	94.50	0.00
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pc: CB-13A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,580	0	97.20	11,295	20,988
94.55	2,050	91	97.25	11,481	21,558
94.60	2,521	205	97.30	11,667	22,136
94.65	2,992	343	97.35	11,854	22,724
94.70	3,462	504	97.40	12,040	23,322
94.75	3,933	689	97.45	12,226	23,928
94.80	4,403	897	97.50	12,413	24,544
94.85	4,873	1,129	97.55	12,599	25,170
94.90	5,344	1,385	97.60	12,785	25,804
94.95	5,815	1,664	97.65	12,971	26,448
95.00	6,285	1,966	97.70	13,158	27,101
95.05	6,756	2,283	97.75	13,344	27,764
95.10	7,227	2,605	97.80	13,530	28,436
95.15	7,698	2,933	97.85	13,716	29,117
95.20	8,169	3,266	97.90	13,903	29,807
95.25	8,640	3,604	97.95	14,089	30,507
95.30	9,111	3,948	98.00	14,275	31,216
95.35	9,582	4,297			
95.40	10,053	4,651			
95.45	10,524	5,011			
95.50	10,995	5,376			
95.55	11,466	5,746			
95.60	11,937	6,122			
95.65	12,408	6,503			
95.70	12,879	6,889			
95.75	13,350	7,280			
95.80	13,821	7,677			
95.85	14,292	8,080			
95.90	14,763	8,487			
95.95	15,234	8,900			
96.00	15,705	9,319			
96.05	16,176	9,742			
96.10	16,647	10,171			
96.15	17,118	10,606			
96.20	17,589	11,045			
96.25	18,060	11,490			
96.30	18,531	11,941			
96.35	19,002	12,396			
96.40	19,473	12,857			
96.45	19,944	13,323			
96.50	20,415	13,795			
96.55	20,886	14,272			
96.60	21,357	14,754			
96.65	21,828	15,242			
96.70	22,299	15,735			
96.75	22,770	16,233			
96.80	23,241	16,736			
96.85	23,712	17,245			
96.90	24,183	17,759			
96.95	24,654	18,279			
97.00	25,125	18,804			
97.05	25,596	19,336			
97.10	26,067	19,877			
97.15	26,538	20,428			

Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.54" for 2-Year event
 Inflow = 4.03 cfs @ 12.09 hrs, Volume= 0.293 af
 Outflow = 2.11 cfs @ 12.26 hrs, Volume= 0.293 af, Atten= 48%, Lag= 9.7 min
 Primary = 2.11 cfs @ 12.26 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.68' @ 12.26 hrs Surf.Area= 5,624 sf Storage= 2,758 cf

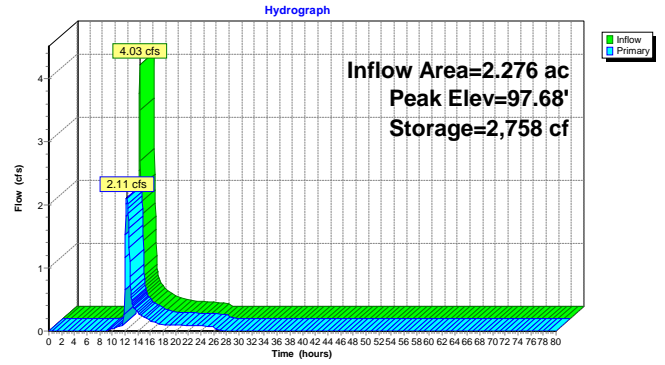
Plug-Flow detention time= 69.0 min calculated for 0.293 af (100% of inflow)
 Center-of-Mass det. time= 69.1 min (903.2 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

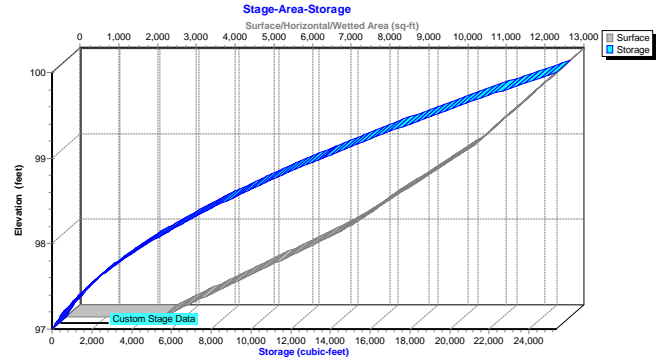
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 5.00 columns X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.11 cfs @ 12.26 hrs HW=97.68' (Free Discharge)
 1=Catch Basin (Orifice Controls 1.97 cfs @ 2.84 fps)
 2=Exfiltration (Controls 0.14 cfs)

Pond 1Pa: CB-17B Basin



Pond 1Pa: CB-17B Basin



Hydrograph for Pond 1Pa: CB-17B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.05	43	97.02	0.03
12.50	1.01	2,323	97.60	1.86
15.00	0.21	1,189	97.36	0.23
17.50	0.11	1,091	97.33	0.11
20.00	0.08	993	97.31	0.09
22.50	0.06	781	97.25	0.09
25.00	0.00	353	97.13	0.07
27.50	0.00	1	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pa: CB-17B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,500	0	99.70	12,250	21,563
97.05	2,730	131	99.75	12,375	22,178
97.10	2,960	273	99.80	12,500	22,800
97.15	3,190	427	99.85	12,625	23,428
97.20	3,420	592	99.90	12,750	24,063
97.25	3,650	769	99.95	12,875	24,703
97.30	3,880	957	100.00	13,000	25,350
97.35	4,110	1,157			
97.40	4,340	1,368			
97.45	4,570	1,591			
97.50	4,800	1,825			
97.55	5,030	2,071			
97.60	5,260	2,328			
97.65	5,490	2,597			
97.70	5,720	2,877			
97.75	5,950	3,169			
97.80	6,180	3,472			
97.85	6,410	3,787			
97.90	6,640	4,113			
97.95	6,870	4,451			
98.00	7,100	4,800			
98.05	7,270	5,159			
98.10	7,440	5,527			
98.15	7,610	5,903			
98.20	7,780	6,288			
98.25	7,950	6,681			
98.30	8,120	7,083			
98.35	8,290	7,493			
98.40	8,460	7,912			
98.45	8,630	8,339			
98.50	8,800	8,775			
98.55	8,970	9,219			
98.60	9,140	9,672			
98.65	9,310	10,133			
98.70	9,480	10,603			
98.75	9,650	11,081			
98.80	9,820	11,568			
98.85	9,990	12,063			
98.90	10,160	12,567			
98.95	10,330	13,079			
99.00	10,500	13,600			
99.05	10,625	14,128			
99.10	10,750	14,662			
99.15	10,875	15,203			
99.20	11,000	15,750			
99.25	11,125	16,303			
99.30	11,250	16,862			
99.35	11,375	17,428			
99.40	11,500	18,000			
99.45	11,625	18,578			
99.50	11,750	19,163			
99.55	11,875	19,753			
99.60	12,000	20,350			
99.65	12,125	20,953			

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 1.47" for 2-Year event
 Inflow = 4.58 cfs @ 12.09 hrs, Volume= 0.333 af
 Outflow = 2.84 cfs @ 12.21 hrs, Volume= 0.333 af, Atten= 38%, Lag= 7.0 min
 Primary = 2.84 cfs @ 12.21 hrs, Volume= 0.333 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.65' @ 12.21 hrs Surf.Area= 5,648 sf Storage= 2,776 cf

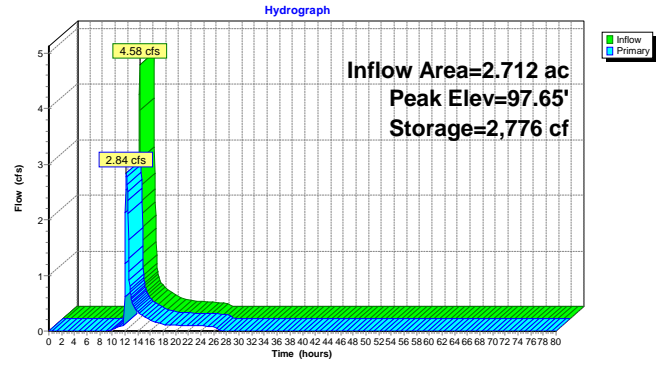
Plug-Flow detention time= 69.0 min calculated for 0.333 af (100% of inflow)
 Center-of-Mass det. time= 69.1 min (906.6 - 837.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	27,653 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,945	0	0
98.00	7,130	5,038	5,038
99.00	11,400	9,265	14,303
100.00	15,300	13,350	27,653

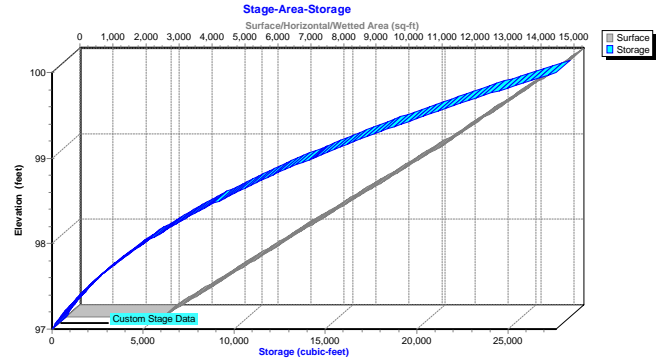
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.84 cfs @ 12.21 hrs HW=97.64' (Free Discharge)
 1=Catch Basin (Orifice Controls 2.70 cfs @ 2.70 fps)
 2=Exfiltration (Controls 0.14 cfs)

Pond 1Pb: CB-16B Basin



Pond 1Pb: CB-16B Basin



Hydrograph for Pond 1Pb: CB-16B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.05	37	97.01	0.03
12.50	1.17	2,045	97.51	2.12
15.00	0.25	1,339	97.36	0.26
17.50	0.13	1,228	97.34	0.13
20.00	0.09	1,155	97.32	0.10
22.50	0.07	958	97.27	0.10
25.00	0.00	484	97.15	0.08
27.50	0.00	4	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pb: CB-16B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,945	0	99.70	14,130	23,238
97.05	3,154	152	99.75	14,325	23,949
97.10	3,363	315	99.80	14,520	24,670
97.15	3,573	489	99.85	14,715	25,401
97.20	3,782	673	99.90	14,910	26,142
97.25	3,991	867	99.95	15,105	26,892
97.30	4,200	1,072	100.00	15,300	27,653
97.35	4,410	1,287			
97.40	4,619	1,513			
97.45	4,828	1,749			
97.50	5,038	1,996			
97.55	5,247	2,253			
97.60	5,456	2,520			
97.65	5,665	2,798			
97.70	5,875	3,087			
97.75	6,084	3,386			
97.80	6,293	3,695			
97.85	6,502	4,015			
97.90	6,712	4,345			
97.95	6,921	4,686			
98.00	7,130	5,038			
98.05	7,343	5,399			
98.10	7,557	5,772			
98.15	7,771	6,155			
98.20	7,984	6,549			
98.25	8,198	6,953			
98.30	8,411	7,369			
98.35	8,624	7,795			
98.40	8,838	8,231			
98.45	9,052	8,678			
98.50	9,265	9,136			
98.55	9,478	9,605			
98.60	9,692	10,084			
98.65	9,906	10,574			
98.70	10,119	11,075			
98.75	10,333	11,586			
98.80	10,546	12,108			
98.85	10,759	12,641			
98.90	10,973	13,184			
98.95	11,187	13,738			
99.00	11,400	14,303			
99.05	11,595	14,877			
99.10	11,790	15,462			
99.15	11,985	16,056			
99.20	12,180	16,661			
99.25	12,375	17,274			
99.30	12,570	17,898			
99.35	12,765	18,531			
99.40	12,960	19,175			
99.45	13,155	19,827			
99.50	13,350	20,490			
99.55	13,545	21,162			
99.60	13,740	21,844			
99.65	13,935	22,536			

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 1.41" for 2-Year event
 Inflow = 5.63 cfs @ 12.17 hrs, Volume= 0.494 af
 Outflow = 3.06 cfs @ 12.42 hrs, Volume= 0.494 af, Atten= 46%, Lag= 14.9 min
 Primary = 3.06 cfs @ 12.42 hrs, Volume= 0.494 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 97.66' @ 12.42 hrs Surf.Area= 11,885 sf Storage= 4,928 cf

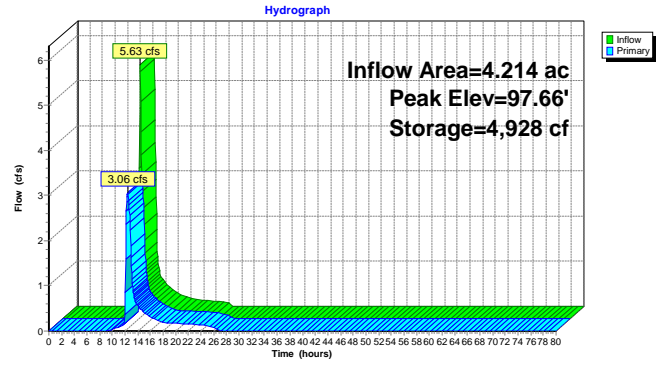
Plug-Flow detention time= 67.5 min calculated for 0.494 af (100% of inflow)
 Center-of-Mass det. time= 67.4 min (913.7 - 846.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	47,780 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	16,420	9,710	9,710
99.00	19,000	17,710	27,420
100.00	21,720	20,360	47,780

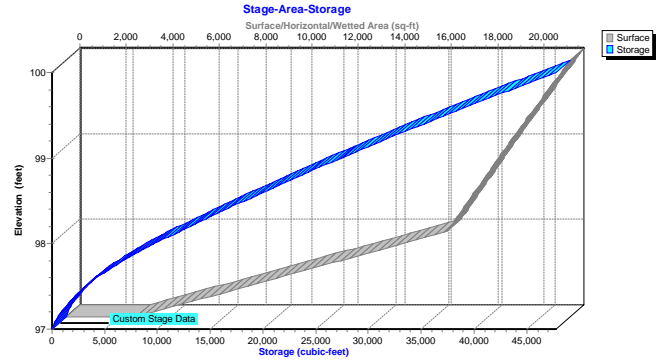
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=3.06 cfs @ 12.42 hrs HW=97.66' (Free Discharge)
 1=Catch Basin (Orifice Controls 2.77 cfs @ 2.77 fps)
 2=Exfiltration (Controls 0.29 cfs)

Pond 2Pa: CB-8A Basin



Pond 2Pa: CB-8A Basin



Hydrograph for Pond 2Pa: CB-8A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.00	0	97.00	0.00
10.00	0.05	31	97.01	0.03
12.50	2.43	4,837	97.65	3.03
15.00	0.38	2,032	97.37	0.41
17.50	0.19	1,781	97.34	0.22
20.00	0.13	1,554	97.31	0.17
22.50	0.11	1,184	97.25	0.15
25.00	0.00	528	97.13	0.11
27.50	0.00	2	97.00	0.00
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 2Pa: CB-8A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	3,000	0	99.70	20,904	41,386
97.05	3,571	167	99.75	21,040	42,435
97.10	4,342	367	99.80	21,176	43,490
97.15	5,013	601	99.85	21,312	44,553
97.20	5,684	868	99.90	21,448	45,622
97.25	6,355	1,169	99.95	21,584	46,697
97.30	7,026	1,504	100.00	21,720	47,780
97.35	7,697	1,872			
97.40	8,368	2,274			
97.45	9,039	2,709			
97.50	9,710	3,178			
97.55	10,381	3,680			
97.60	11,052	4,216			
97.65	11,723	4,785			
97.70	12,394	5,388			
97.75	13,065	6,024			
97.80	13,736	6,694			
97.85	14,407	7,398			
97.90	15,078	8,135			
97.95	15,749	8,906			
98.00	16,420	9,710			
98.05	16,549	10,534			
98.10	16,678	11,365			
98.15	16,807	12,202			
98.20	16,936	13,046			
98.25	17,065	13,896			
98.30	17,194	14,752			
98.35	17,323	15,615			
98.40	17,452	16,484			
98.45	17,581	17,360			
98.50	17,710	18,243			
98.55	17,839	19,131			
98.60	17,968	20,026			
98.65	18,097	20,928			
98.70	18,226	21,836			
98.75	18,355	22,751			
98.80	18,484	23,672			
98.85	18,613	24,599			
98.90	18,742	25,533			
98.95	18,871	26,473			
99.00	19,000	27,420			
99.05	19,136	28,373			
99.10	19,272	29,334			
99.15	19,408	30,301			
99.20	19,544	31,274			
99.25	19,680	32,255			
99.30	19,816	33,242			
99.35	19,952	34,237			
99.40	20,088	35,238			
99.45	20,224	36,245			
99.50	20,360	37,260			
99.55	20,496	38,281			
99.60	20,632	39,310			
99.65	20,768	40,345			

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 1.41" for 2-Year event
 Inflow = 8.99 cfs @ 12.15 hrs, Volume= 0.747 af
 Outflow = 4.07 cfs @ 12.44 hrs, Volume= 0.747 af, Atten= 55%, Lag= 17.2 min
 Primary = 4.07 cfs @ 12.44 hrs, Volume= 0.747 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 95.42' @ 12.44 hrs Surf.Area= 14,680 sf Storage= 7,206 cf

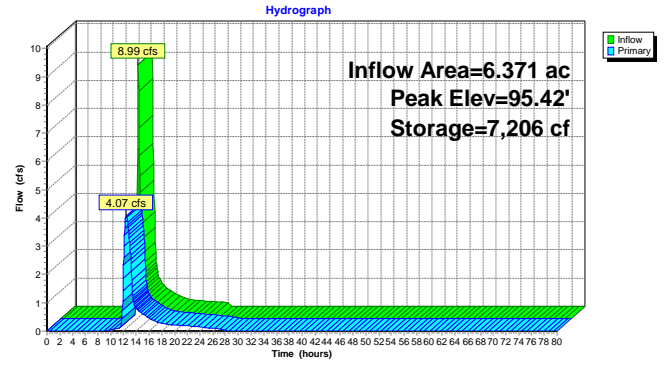
Plug-Flow detention time= 47.1 min calculated for 0.746 af (100% of inflow)
 Center-of-Mass det. time= 47.2 min (891.7 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	78,798 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,720	0	0
95.00	7,950	2,418	2,418
96.00	23,855	15,903	18,320
97.00	30,550	27,203	45,523
98.00	36,000	33,275	78,798

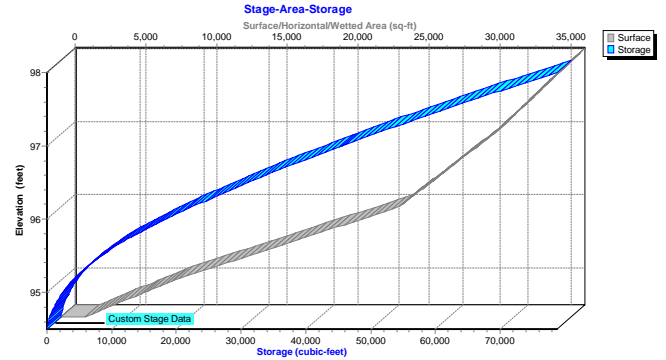
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary Outflow Max=4.06 cfs @ 12.44 hrs HW=95.42' (Free Discharge)
 1=Catch Basin (Orifice Controls 3.71 cfs @ 3.71 fps)
 2=Exfiltration (Controls 0.36 cfs)

Pond 2Pb: CB-11A Basin



Pond 2Pb: CB-11A Basin



Hydrograph for Pond 2Pb: CB-11A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.00	0	94.50	0.00
10.00	0.07	53	94.53	0.04
12.50	3.34	7,124	95.42	4.05
15.00	0.58	1,653	94.90	0.60
17.50	0.29	1,436	94.86	0.31
20.00	0.20	1,353	94.85	0.21
22.50	0.16	1,288	94.84	0.17
25.00	0.00	856	94.76	0.12
27.50	0.00	87	94.54	0.05
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pb: CB-11A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,720	0	97.20	31,640	51,742
94.55	2,343	102	97.25	31,913	53,330
94.60	2,966	234	97.30	32,185	54,933
94.65	3,589	398	97.35	32,457	56,549
94.70	4,212	593	97.40	32,730	58,179
94.75	4,835	819	97.45	33,003	59,822
94.80	5,458	1,077	97.50	33,275	61,479
94.85	6,081	1,365	97.55	33,547	63,149
94.90	6,704	1,685	97.60	33,820	64,833
94.95	7,327	2,036	97.65	34,093	66,531
95.00	7,950	2,418	97.70	34,365	68,243
95.05	8,573	2,835	97.75	34,638	69,968
95.10	9,196	3,292	97.80	34,910	71,706
95.15	9,819	3,789	97.85	35,182	73,459
95.20	10,442	4,326	97.90	35,455	75,225
95.25	11,065	4,902	97.95	35,728	77,004
95.30	11,688	5,518	98.00	36,000	78,798
95.35	12,311	6,174			
95.40	12,934	6,870			
95.45	13,557	7,605			
95.50	14,180	8,381			
95.55	14,803	9,196			
95.60	15,426	10,050			
95.65	16,049	10,945			
95.70	16,672	11,879			
95.75	17,295	12,853			
95.80	17,918	13,867			
95.85	18,541	14,921			
95.90	19,164	16,014			
95.95	19,787	17,147			
96.00	20,410	18,320			
96.05	21,033	19,521			
96.10	21,656	20,739			
96.15	22,279	21,974			
96.20	22,902	23,225			
96.25	23,525	24,493			
96.30	24,148	25,778			
96.35	24,771	27,079			
96.40	25,394	28,398			
96.45	26,017	29,733			
96.50	26,640	31,084			
96.55	27,263	32,453			
96.60	27,886	33,838			
96.65	28,509	35,240			
96.70	29,132	36,659			
96.75	29,755	38,094			
96.80	30,378	39,546			
96.85	30,999	41,015			
96.90	31,622	42,501			
96.95	32,245	44,003			
97.00	32,868	45,523			
97.05	33,491	47,057			
97.10	34,114	48,605			
97.15	34,737	50,166			

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 1.62" for 2-Year event
 Inflow = 6.25 cfs @ 12.09 hrs, Volume= 0.453 af
 Outflow = 3.36 cfs @ 12.24 hrs, Volume= 0.453 af, Atten= 46%, Lag= 9.0 min
 Primary = 3.36 cfs @ 12.24 hrs, Volume= 0.453 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 95.27' @ 12.24 hrs Surf.Area= 6,863 sf Storage= 3,746 cf

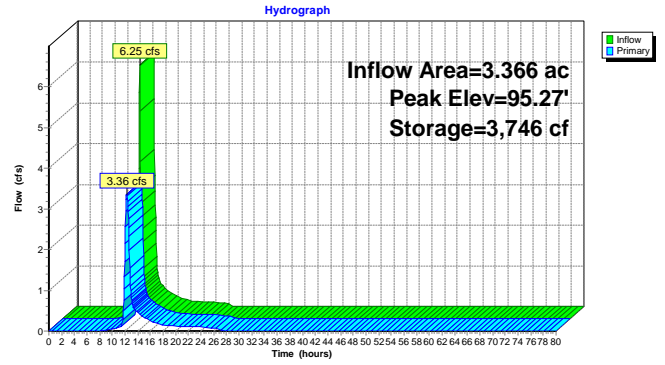
Plug-Flow detention time= 52.1 min calculated for 0.453 af (100% of inflow)
 Center-of-Mass det. time= 52.2 min (883.0 - 830.7)

Volume #1	Invert	Avail.Storage	Storage Description
	94.50'	31,216 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,580	0	0
95.00	6,285	1,966	1,966
96.00	8,420	7,353	9,319
97.00	10,550	9,485	18,804
98.00	14,275	12,413	31,216

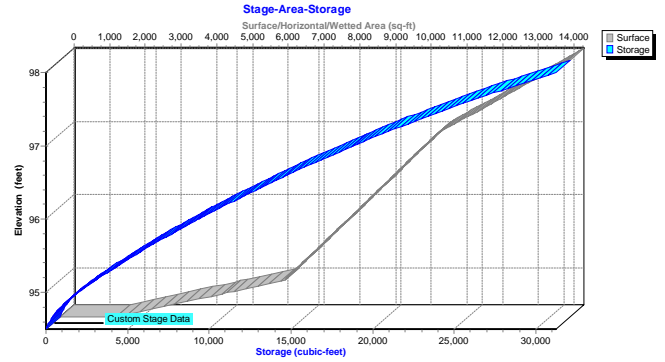
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=3.36 cfs @ 12.24 hrs HW=95.27' (Free Discharge)
 1=Catch Basin (Orifice Controls 3.19 cfs @ 3.19 fps)
 2=Exfiltration (Controls 0.17 cfs)

Pond 2Pc: CB-13A Basin



Pond 2Pc: CB-13A Basin



Hydrograph for Pond 2Pc: CB-13A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.00	0	94.50	0.00
10.00	0.09	94	94.55	0.05
12.50	1.55	2,991	95.16	2.92
15.00	0.32	1,226	94.87	0.34
17.50	0.16	1,111	94.85	0.18
20.00	0.11	1,041	94.83	0.12
22.50	0.09	955	94.81	0.11
25.00	0.00	524	94.71	0.08
27.50	0.00	16	94.51	0.01
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pc: CB-13A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,580	0	97.20	11,295	20,988
94.55	2,050	91	97.25	11,481	21,558
94.60	2,521	205	97.30	11,667	22,136
94.65	2,992	343	97.35	11,854	22,724
94.70	3,462	504	97.40	12,040	23,322
94.75	3,933	689	97.45	12,226	23,928
94.80	4,403	897	97.50	12,413	24,544
94.85	4,873	1,129	97.55	12,599	25,170
94.90	5,344	1,385	97.60	12,785	25,804
94.95	5,815	1,664	97.65	12,971	26,448
95.00	6,285	1,966	97.70	13,158	27,101
95.05	6,756	2,283	97.75	13,344	27,764
95.10	6,498	2,605	97.80	13,530	28,436
95.15	6,605	2,933	97.85	13,716	29,117
95.20	6,712	3,266	97.90	13,903	29,807
95.25	6,819	3,604	97.95	14,089	30,507
95.30	6,925	3,948	98.00	14,275	31,216
95.35	7,032	4,297			
95.40	7,139	4,651			
95.45	7,246	5,011			
95.50	7,353	5,376			
95.55	7,459	5,746			
95.60	7,566	6,122			
95.65	7,673	6,503			
95.70	7,780	6,889			
95.75	7,886	7,280			
95.80	7,993	7,677			
95.85	8,100	8,080			
95.90	8,207	8,487			
95.95	8,313	8,900			
96.00	8,420	9,319			
96.05	8,526	9,742			
96.10	8,633	10,171			
96.15	8,740	10,606			
96.20	8,846	11,045			
96.25	8,953	11,490			
96.30	9,059	11,941			
96.35	9,165	12,396			
96.40	9,272	12,857			
96.45	9,379	13,323			
96.50	9,485	13,795			
96.55	9,591	14,272			
96.60	9,698	14,754			
96.65	9,805	15,242			
96.70	9,911	15,735			
96.75	10,018	16,233			
96.80	10,124	16,736			
96.85	10,230	17,245			
96.90	10,337	17,759			
96.95	10,444	18,279			
97.00	10,550	18,804			
97.05	10,736	19,336			
97.10	10,922	19,877			
97.15	11,109	20,428			

Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 3.21" for 10-Year event
 Inflow = 8.35 cfs @ 12.09 hrs, Volume= 0.609 af
 Outflow = 3.28 cfs @ 12.34 hrs, Volume= 0.609 af, Atten= 61%, Lag= 14.9 min
 Primary = 3.28 cfs @ 12.34 hrs, Volume= 0.609 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.19' @ 12.34 hrs Surf.Area= 7,729 sf Storage= 6,172 cf

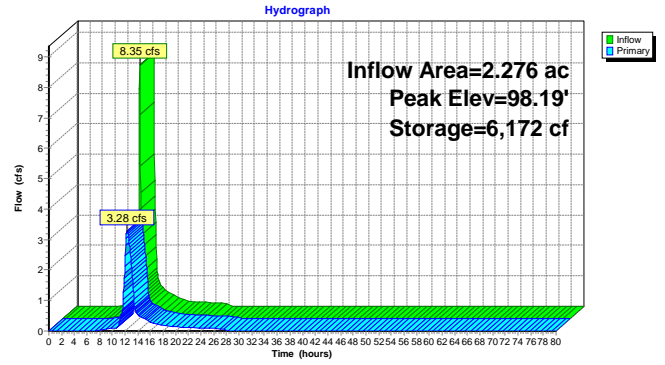
Plug-Flow detention time= 51.1 min calculated for 0.609 af (100% of inflow)
 Center-of-Mass det. time= 51.2 min (864.3 - 813.1)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

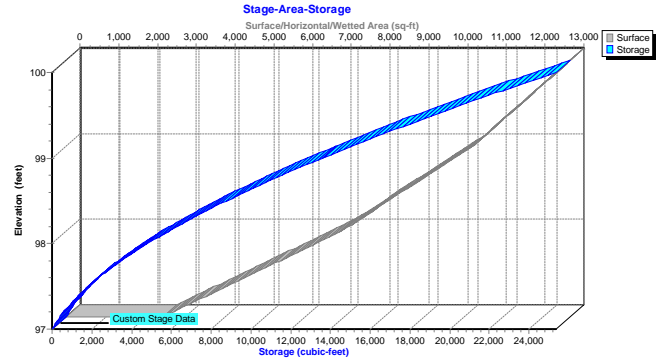
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 5.00 columns X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=3.28 cfs @ 12.34 hrs HW=98.18' (Free Discharge)
 1=Catch Basin (Orifice Controls 3.09 cfs @ 4.45 fps)
 2=Exfiltration (Controls 0.19 cfs)

Pond 1Pa: CB-17B Basin



Pond 1Pa: CB-17B Basin



Hydrograph for Pond 1Pa: CB-17B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.02	17	97.01	0.01
10.00	0.20	397	97.14	0.07
12.50	1.94	5,801	98.14	3.19
15.00	0.39	1,285	97.38	0.41
17.50	0.20	1,173	97.35	0.21
20.00	0.14	1,114	97.34	0.14
22.50	0.11	1,088	97.33	0.11
25.00	0.00	768	97.25	0.09
27.50	0.00	92	97.04	0.06
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pa: CB-17B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,500	0	99.70	12,250	21,563
97.05	2,730	131	99.75	12,375	22,178
97.10	2,960	273	99.80	12,500	22,800
97.15	3,190	427	99.85	12,625	23,428
97.20	3,420	592	99.90	12,750	24,063
97.25	3,650	769	99.95	12,875	24,703
97.30	3,880	957	100.00	13,000	25,350
97.35	4,110	1,157			
97.40	4,340	1,368			
97.45	4,570	1,591			
97.50	4,800	1,825			
97.55	5,030	2,071			
97.60	5,260	2,328			
97.65	5,490	2,597			
97.70	5,720	2,877			
97.75	5,950	3,169			
97.80	6,180	3,472			
97.85	6,410	3,787			
97.90	6,640	4,113			
97.95	6,870	4,451			
98.00	7,100	4,800			
98.05	7,270	5,159			
98.10	7,440	5,527			
98.15	7,610	5,903			
98.20	7,780	6,288			
98.25	7,950	6,681			
98.30	8,120	7,083			
98.35	8,290	7,493			
98.40	8,460	7,912			
98.45	8,630	8,339			
98.50	8,800	8,775			
98.55	8,970	9,219			
98.60	9,140	9,672			
98.65	9,310	10,133			
98.70	9,480	10,603			
98.75	9,650	11,081			
98.80	9,820	11,568			
98.85	9,990	12,063			
98.90	10,160	12,567			
98.95	10,330	13,079			
99.00	10,500	13,600			
99.05	10,625	14,128			
99.10	10,750	14,662			
99.15	10,875	15,203			
99.20	11,000	15,750			
99.25	11,125	16,303			
99.30	11,250	16,862			
99.35	11,375	17,428			
99.40	11,500	18,000			
99.45	11,625	18,578			
99.50	11,750	19,163			
99.55	11,875	19,753			
99.60	12,000	20,350			
99.65	12,125	20,953			

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 3.11" for 10-Year event
 Inflow = 9.67 cfs @ 12.09 hrs, Volume= 0.704 af
 Outflow = 4.52 cfs @ 12.28 hrs, Volume= 0.704 af, Atten= 53%, Lag= 11.1 min
 Primary = 4.52 cfs @ 12.28 hrs, Volume= 0.704 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.14' @ 12.28 hrs Surf.Area= 7,713 sf Storage= 6,050 cf

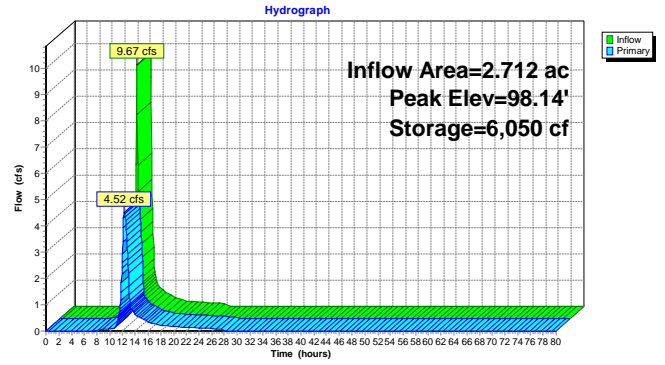
Plug-Flow detention time= 47.2 min calculated for 0.704 af (100% of inflow)
 Center-of-Mass det. time= 47.0 min (863.0 - 816.0)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	27,653 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,945	0	0
98.00	7,130	5,038	5,038
99.00	11,400	9,265	14,303
100.00	15,300	13,350	27,653

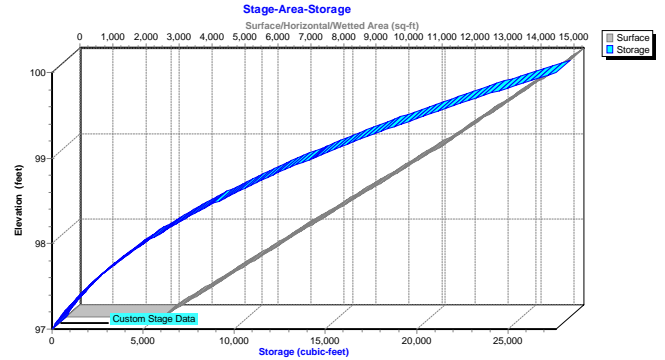
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=4.51 cfs @ 12.28 hrs HW=98.13' (Free Discharge)
 1=Catch Basin (Orifice Controls 4.32 cfs @ 4.32 fps)
 2=Exfiltration (Controls 0.19 cfs)

Pond 1Pb: CB-16B Basin



Pond 1Pb: CB-16B Basin



Hydrograph for Pond 1Pb: CB-16B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.02	11	97.00	0.01
10.00	0.22	399	97.12	0.08
12.50	2.27	5,212	98.02	4.19
15.00	0.46	1,459	97.39	0.48
17.50	0.23	1,329	97.36	0.24
20.00	0.16	1,258	97.34	0.17
22.50	0.13	1,225	97.34	0.13
25.00	0.00	878	97.25	0.10
27.50	0.00	116	97.04	0.07
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pb: CB-16B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,945	0	98.70	14,130	23,238
97.05	3,154	152	98.75	14,325	23,949
97.10	3,363	315	98.80	14,520	24,670
97.15	3,573	489	98.85	14,715	25,401
97.20	3,782	673	98.90	14,910	26,142
97.25	3,991	867	98.95	15,105	26,892
97.30	4,200	1,072	99.00	15,300	27,653
97.35	4,410	1,287			
97.40	4,619	1,513			
97.45	4,828	1,749			
97.50	5,038	1,996			
97.55	5,247	2,253			
97.60	5,456	2,520			
97.65	5,665	2,798			
97.70	5,875	3,087			
97.75	6,084	3,386			
97.80	6,293	3,695			
97.85	6,502	4,015			
97.90	6,712	4,345			
97.95	6,921	4,686			
98.00	7,130	5,038			
98.05	7,343	5,399			
98.10	7,557	5,772			
98.15	7,771	6,155			
98.20	7,984	6,549			
98.25	8,198	6,953			
98.30	8,411	7,369			
98.35	8,624	7,795			
98.40	8,838	8,231			
98.45	9,052	8,678			
98.50	9,265	9,136			
98.55	9,478	9,605			
98.60	9,692	10,084			
98.65	9,906	10,574			
98.70	10,119	11,075			
98.75	10,333	11,586			
98.80	10,546	12,108			
98.85	10,759	12,641			
98.90	10,973	13,184			
98.95	11,187	13,738			
99.00	11,400	14,303			
99.05	11,595	14,877			
99.10	11,790	15,462			
99.15	11,985	16,056			
99.20	12,180	16,661			
99.25	12,375	17,274			
99.30	12,570	17,898			
99.35	12,765	18,531			
99.40	12,960	19,175			
99.45	13,155	19,827			
99.50	13,350	20,490			
99.55	13,545	21,162			
99.60	13,740	21,844			
99.65	13,935	22,536			

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 3.02" for 10-Year event
 Inflow = 12.21 cfs @ 12.17 hrs, Volume= 1.061 af
 Outflow = 4.77 cfs @ 12.51 hrs, Volume= 1.061 af, Atten= 61%, Lag= 20.5 min
 Primary = 4.77 cfs @ 12.51 hrs, Volume= 1.061 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.15' @ 12.51 hrs Surf.Area= 16,802 sf Storage= 12,172 cf

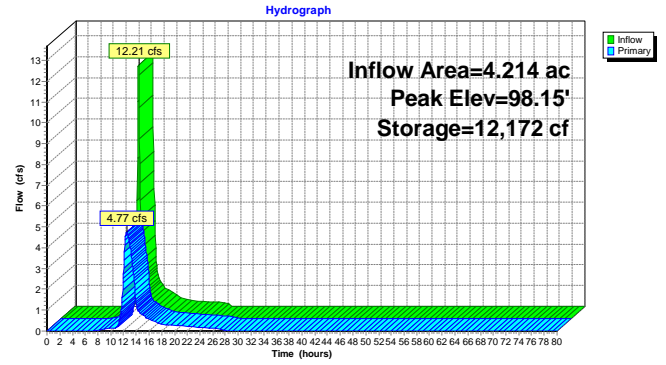
Plug-Flow detention time= 54.0 min calculated for 1.061 af (100% of inflow)
 Center-of-Mass det. time= 53.9 min (878.1 - 824.2)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	47,780 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	16,420	9,710	9,710
99.00	19,000	17,710	27,420
100.00	21,720	20,360	47,780

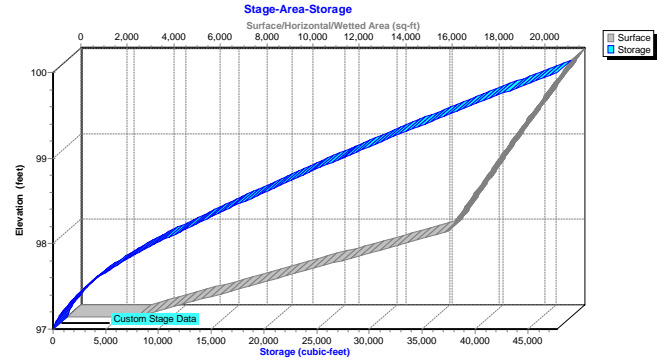
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=4.77 cfs @ 12.51 hrs HW=98.15' (Free Discharge)
 1=Catch Basin (Orifice Controls 4.35 cfs @ 4.35 fps)
 2=Exfiltration (Controls 0.41 cfs)

Pond 2Pa: CB-8A Basin



Pond 2Pa: CB-8A Basin



Hydrograph for Pond 2Pa: CB-8A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.01	3	97.00	0.00
10.00	0.29	514	97.13	0.11
12.50	4.88	12,170	98.15	4.77
15.00	0.72	2,334	97.41	0.77
17.50	0.36	2,007	97.37	0.39
20.00	0.25	1,852	97.35	0.26
22.50	0.20	1,764	97.34	0.21
25.00	0.00	1,219	97.26	0.15
27.50	0.00	145	97.04	0.08
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 2Pa: CB-8A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	3,000	0	99.70	20,904	41,386
97.05	3,671	167	99.75	21,040	42,435
97.10	4,342	367	99.80	21,176	43,490
97.15	5,013	601	99.85	21,312	44,553
97.20	5,684	868	99.90	21,448	45,622
97.25	6,355	1,169	99.95	21,584	46,697
97.30	7,026	1,504	100.00	21,720	47,780
97.35	7,697	1,872			
97.40	8,368	2,274			
97.45	9,039	2,709			
97.50	9,710	3,178			
97.55	10,381	3,680			
97.60	11,052	4,216			
97.65	11,723	4,785			
97.70	12,394	5,388			
97.75	13,065	6,024			
97.80	13,736	6,694			
97.85	14,407	7,398			
97.90	15,078	8,135			
97.95	15,749	8,906			
98.00	16,420	9,710			
98.05	16,549	10,534			
98.10	16,678	11,365			
98.15	16,807	12,202			
98.20	16,936	13,046			
98.25	17,065	13,896			
98.30	17,194	14,752			
98.35	17,323	15,615			
98.40	17,452	16,484			
98.45	17,581	17,360			
98.50	17,710	18,243			
98.55	17,839	19,131			
98.60	17,968	20,026			
98.65	18,097	20,928			
98.70	18,226	21,836			
98.75	18,355	22,751			
98.80	18,484	23,672			
98.85	18,613	24,599			
98.90	18,742	25,533			
98.95	18,871	26,473			
99.00	19,000	27,420			
99.05	19,136	28,373			
99.10	19,272	29,334			
99.15	19,408	30,301			
99.20	19,544	31,274			
99.25	19,680	32,255			
99.30	19,816	33,242			
99.35	19,952	34,237			
99.40	20,088	35,238			
99.45	20,224	36,245			
99.50	20,360	37,260			
99.55	20,496	38,281			
99.60	20,632	39,310			
99.65	20,768	40,345			

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 3.02" for 10-Year event
 Inflow = 19.46 cfs @ 12.14 hrs, Volume= 1.604 af
 Outflow = 5.92 cfs @ 12.53 hrs, Volume= 1.604 af, Atten= 70%, Lag= 23.4 min
 Primary = 5.92 cfs @ 12.53 hrs, Volume= 1.604 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 96.05' @ 12.53 hrs Surf.Area= 24,189 sf Storage= 19,517 cf

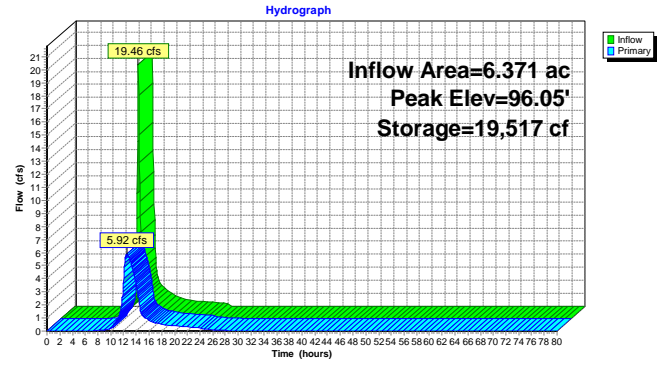
Plug-Flow detention time= 43.5 min calculated for 1.604 af (100% of inflow)
 Center-of-Mass det. time= 43.3 min (865.8 - 822.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	78,798 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,720	0	0
95.00	7,950	2,418	2,418
96.00	23,855	15,903	18,320
97.00	30,550	27,203	45,523
98.00	36,000	33,275	78,798

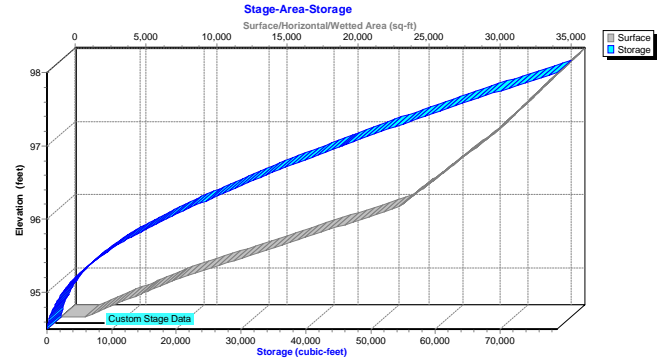
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary Outflow Max=5.92 cfs @ 12.53 hrs HW=96.05' (Free Discharge)
 1=Catch Basin (Orifice Controls 5.32 cfs @ 5.32 fps)
 2=Exfiltration (Controls 0.60 cfs)

Pond 2Pb: CB-11A Basin



Pond 2Pb: CB-11A Basin



Hydrograph for Pond 2Pb: CB-11A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.02	6	94.50	0.00
10.00	0.45	1,060	94.80	0.13
12.50	6.66	19,476	96.05	5.92
15.00	1.09	1,978	94.94	1.16
17.50	0.54	1,631	94.89	0.57
20.00	0.38	1,498	94.87	0.39
22.50	0.30	1,432	94.86	0.30
25.00	0.00	953	94.78	0.12
27.50	0.00	133	94.56	0.06
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pb: CB-11A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,720	0	97.20	31,640	51,742
94.55	2,343	102	97.25	31,913	53,330
94.60	2,966	234	97.30	32,185	54,933
94.65	3,589	398	97.35	32,457	56,549
94.70	4,212	593	97.40	32,730	58,179
94.75	4,835	819	97.45	33,003	59,822
94.80	5,458	1,077	97.50	33,275	61,479
94.85	6,081	1,365	97.55	33,547	63,149
94.90	6,704	1,685	97.60	33,820	64,833
94.95	7,327	2,036	97.65	34,093	66,531
95.00	7,950	2,418	97.70	34,365	68,243
95.05	8,573	2,835	97.75	34,638	69,968
95.10	9,196	3,292	97.80	34,910	71,706
95.15	9,819	3,789	97.85	35,182	73,459
95.20	10,442	4,326	97.90	35,455	75,225
95.25	11,065	4,902	97.95	35,728	77,004
95.30	11,688	5,518	98.00	36,000	78,798
95.35	12,311	6,174			
95.40	12,934	6,870			
95.45	13,557	7,605			
95.50	14,180	8,381			
95.55	14,803	9,196			
95.60	15,426	10,050			
95.65	16,049	10,945			
95.70	16,672	11,879			
95.75	17,295	12,853			
95.80	17,918	13,867			
95.85	18,541	14,921			
95.90	19,164	16,014			
95.95	19,787	17,147			
96.00	20,410	18,320			
96.05	21,033	19,521			
96.10	21,656	20,759			
96.15	22,279	22,034			
96.20	22,902	23,345			
96.25	23,525	24,691			
96.30	24,148	26,072			
96.35	24,771	27,489			
96.40	25,394	28,942			
96.45	26,017	30,431			
96.50	26,640	31,956			
96.55	27,263	33,517			
96.60	27,886	35,114			
96.65	28,509	36,747			
96.70	29,132	38,416			
96.75	29,755	40,121			
96.80	30,378	41,862			
96.85	30,999	43,639			
96.90	31,622	45,452			
96.95	32,245	47,291			
97.00	32,868	49,156			
97.05	33,491	51,047			
97.10	34,114	52,964			
97.15	34,737	54,907			

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 3.31" for 10-Year event
 Inflow = 12.68 cfs @ 12.09 hrs, Volume= 0.928 af
 Outflow = 5.21 cfs @ 12.32 hrs, Volume= 0.928 af, Atten= 59%, Lag= 13.8 min
 Primary = 5.21 cfs @ 12.32 hrs, Volume= 0.928 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 95.91' @ 12.32 hrs Surf.Area= 8,228 sf Storage= 8,572 cf

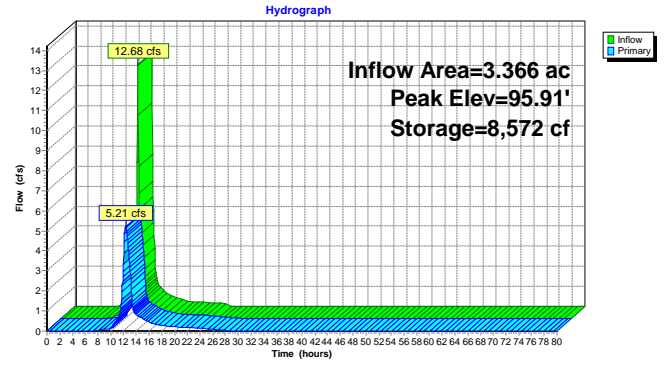
Plug-Flow detention time= 38.4 min calculated for 0.927 af (100% of inflow)
 Center-of-Mass det. time= 38.5 min (848.7 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	31,216 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,580	0	0
95.00	6,285	1,966	1,966
96.00	8,420	7,353	9,319
97.00	10,550	9,485	18,804
98.00	14,275	12,413	31,216

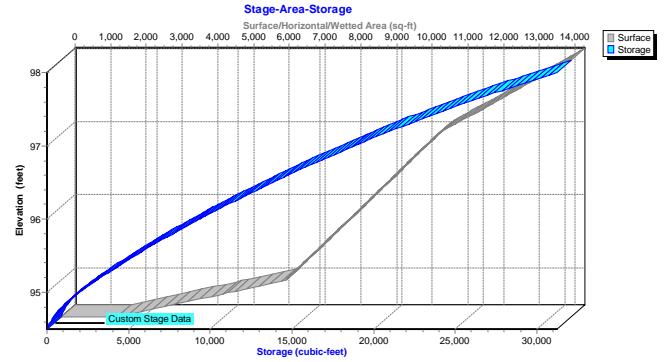
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=5.21 cfs @ 12.32 hrs HW=95.91' (Free Discharge)
 1=Catch Basin (Orifice Controls 5.00 cfs @ 5.00 fps)
 2=Exfiltration (Controls 0.21 cfs)

Pond 2Pc: CB-13A Basin



Pond 2Pc: CB-13A Basin



Hydrograph for Pond 2Pc: CB-13A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.05	40	94.52	0.03
10.00	0.33	877	94.79	0.10
12.50	2.93	7,868	95.82	5.00
15.00	0.59	1,381	94.90	0.61
17.50	0.29	1,205	94.86	0.31
20.00	0.20	1,141	94.85	0.21
22.50	0.16	1,100	94.84	0.17
25.00	0.00	722	94.76	0.10
27.50	0.00	80	94.54	0.05
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pc: CB-13A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,580	0	97.20	11,295	20,988
94.55	2,050	91	97.25	11,481	21,558
94.60	2,521	205	97.30	11,667	22,136
94.65	2,992	343	97.35	11,854	22,724
94.70	3,462	504	97.40	12,040	23,322
94.75	3,933	689	97.45	12,226	23,928
94.80	4,403	897	97.50	12,413	24,544
94.85	4,873	1,129	97.55	12,599	25,170
94.90	5,344	1,385	97.60	12,785	25,804
94.95	5,815	1,664	97.65	12,971	26,448
95.00	6,285	1,966	97.70	13,158	27,101
95.05	6,756	2,283	97.75	13,344	27,764
95.10	7,227	2,605	97.80	13,530	28,436
95.15	7,698	2,933	97.85	13,716	29,117
95.20	8,169	3,266	97.90	13,903	29,807
95.25	8,640	3,604	97.95	14,089	30,507
95.30	9,111	3,948	98.00	14,275	31,216
95.35	9,582	4,297			
95.40	10,053	4,651			
95.45	10,524	5,011			
95.50	10,995	5,376			
95.55	11,466	5,746			
95.60	11,937	6,122			
95.65	12,408	6,503			
95.70	12,879	6,889			
95.75	13,350	7,280			
95.80	13,821	7,677			
95.85	14,292	8,080			
95.90	14,763	8,487			
95.95	15,234	8,900			
96.00	15,705	9,319			
96.05	16,176	9,742			
96.10	16,647	10,171			
96.15	17,118	10,606			
96.20	17,589	11,045			
96.25	18,060	11,490			
96.30	18,531	11,941			
96.35	19,002	12,396			
96.40	19,473	12,857			
96.45	19,944	13,323			
96.50	20,415	13,795			
96.55	20,886	14,272			
96.60	21,357	14,754			
96.65	21,828	15,242			
96.70	22,299	15,735			
96.75	22,770	16,233			
96.80	23,241	16,736			
96.85	23,712	17,245			
96.90	24,183	17,759			
96.95	24,654	18,279			
97.00	25,125	18,804			
97.05	25,596	19,336			
97.10	26,067	19,871			
97.15	26,538	20,428			

Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 4.31" for 25-Year event
 Inflow = 11.09 cfs @ 12.09 hrs, Volume= 0.817 af
 Outflow = 3.84 cfs @ 12.38 hrs, Volume= 0.817 af, Atten= 65%, Lag= 17.3 min
 Primary = 3.84 cfs @ 12.38 hrs, Volume= 0.817 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.50' @ 12.38 hrs Surf.Area= 8,803 sf Storage= 8,782 cf

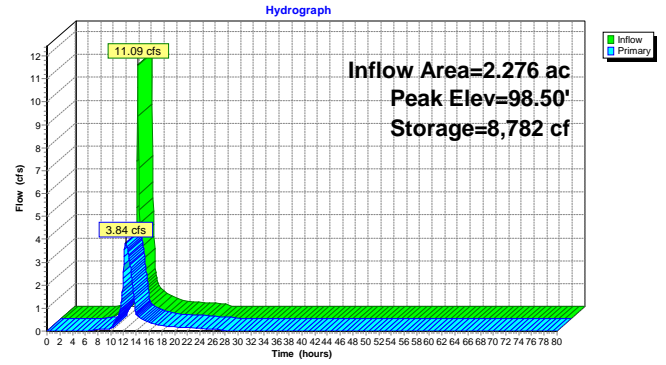
Plug-Flow detention time= 46.2 min calculated for 0.816 af (100% of inflow)
 Center-of-Mass det. time= 46.4 min (851.2 - 804.8)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

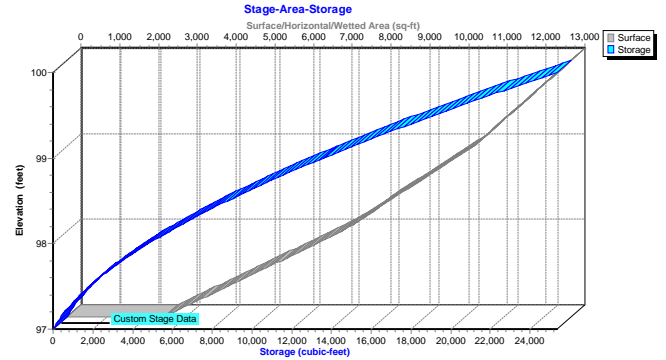
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 5.00 columns X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=3.84 cfs @ 12.38 hrs HW=98.50' (Free Discharge)
 1=Catch Basin (Orifice Controls 3.62 cfs @ 5.21 fps)
 2=Exfiltration (Controls 0.22 cfs)

Pond 1Pa: CB-17B Basin



Pond 1Pa: CB-17B Basin



Hydrograph for Pond 1Pa: CB-17B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.06	55	97.02	0.04
10.00	0.32	890	97.28	0.09
12.50	2.52	8,503	98.47	3.79
15.00	0.50	1,338	97.39	0.52
17.50	0.25	1,210	97.36	0.26
20.00	0.17	1,148	97.35	0.18
22.50	0.14	1,114	97.34	0.14
25.00	0.00	791	97.26	0.09
27.50	0.00	108	97.04	0.06
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pa: CB-17B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,500	0	99.70	12,250	21,563
97.05	2,730	131	99.75	12,375	22,178
97.10	2,960	273	99.80	12,500	22,800
97.15	3,190	427	99.85	12,625	23,428
97.20	3,420	592	99.90	12,750	24,063
97.25	3,650	769	99.95	12,875	24,703
97.30	3,880	957	100.00	13,000	25,350
97.35	4,110	1,157			
97.40	4,340	1,368			
97.45	4,570	1,591			
97.50	4,800	1,825			
97.55	5,030	2,071			
97.60	5,260	2,328			
97.65	5,490	2,597			
97.70	5,720	2,877			
97.75	5,950	3,169			
97.80	6,180	3,472			
97.85	6,410	3,787			
97.90	6,640	4,113			
97.95	6,870	4,451			
98.00	7,100	4,800			
98.05	7,270	5,159			
98.10	7,440	5,527			
98.15	7,610	5,903			
98.20	7,780	6,288			
98.25	7,950	6,681			
98.30	8,120	7,083			
98.35	8,290	7,493			
98.40	8,460	7,912			
98.45	8,630	8,339			
98.50	8,800	8,775			
98.55	8,970	9,219			
98.60	9,140	9,672			
98.65	9,310	10,133			
98.70	9,480	10,603			
98.75	9,650	11,081			
98.80	9,820	11,568			
98.85	9,990	12,063			
98.90	10,160	12,567			
98.95	10,330	13,079			
99.00	10,500	13,600			
99.05	10,625	14,128			
99.10	10,750	14,662			
99.15	10,875	15,203			
99.20	11,000	15,750			
99.25	11,125	16,303			
99.30	11,250	16,862			
99.35	11,375	17,428			
99.40	11,500	18,000			
99.45	11,625	18,578			
99.50	11,750	19,163			
99.55	11,875	19,753			
99.60	12,000	20,350			
99.65	12,125	20,953			

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 4.20" for 25-Year event
 Inflow = 12.93 cfs @ 12.09 hrs, Volume= 0.949 af
 Outflow = 5.33 cfs @ 12.32 hrs, Volume= 0.949 af, Atten= 59%, Lag= 13.6 min
 Primary = 5.33 cfs @ 12.32 hrs, Volume= 0.949 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.45' @ 12.32 hrs Surf.Area= 9,060 sf Storage= 8,696 cf

Plug-Flow detention time= 41.1 min calculated for 0.949 af (100% of inflow)
 Center-of-Mass det. time= 41.3 min (848.7 - 807.5)

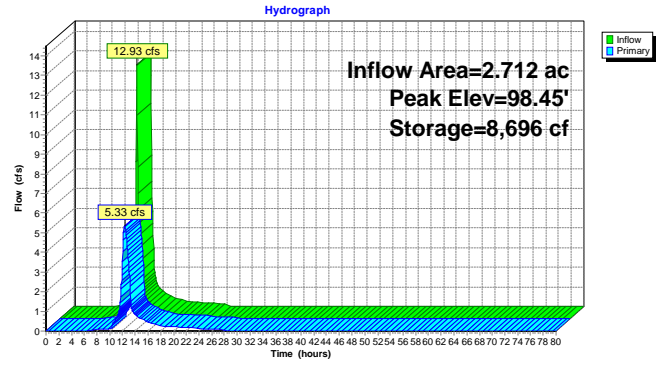
Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	27,653 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,945	0	0
98.00	7,130	5,038	5,038
99.00	11,400	9,265	14,303
100.00	15,300	13,350	27,653

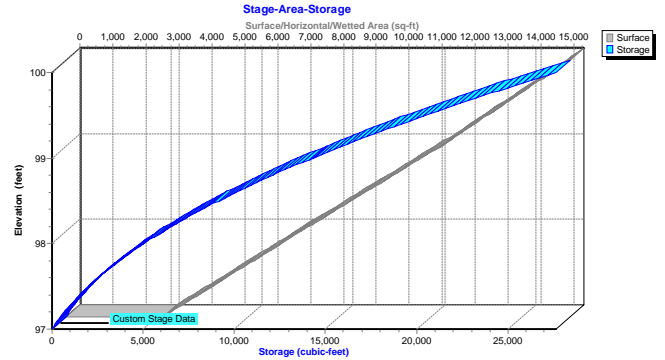
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=5.32 cfs @ 12.32 hrs HW=98.45' (Free Discharge)
 1=Catch Basin (Orifice Controls 5.10 cfs @ 5.10 fps)
 2=Exfiltration (Controls 0.23 cfs)

Pond 1Pb: CB-16B Basin



Pond 1Pb: CB-16B Basin



Hydrograph for Pond 1Pb: CB-16B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.06	52	97.02	0.04
10.00	0.35	946	97.27	0.10
12.50	2.96	7,951	98.37	5.12
15.00	0.59	1,518	97.40	0.61
17.50	0.30	1,366	97.37	0.31
20.00	0.21	1,302	97.35	0.21
22.50	0.16	1,259	97.34	0.17
25.00	0.00	901	97.26	0.10
27.50	0.00	134	97.04	0.07
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pb: CB-16B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,945	0	99.70	14,130	23,238
97.05	3,154	152	99.75	14,325	23,949
97.10	3,363	315	99.80	14,520	24,670
97.15	3,573	489	99.85	14,715	25,401
97.20	3,782	673	99.90	14,910	26,142
97.25	3,991	867	99.95	15,105	26,892
97.30	4,200	1,072	100.00	15,300	27,653
97.35	4,410	1,287			
97.40	4,619	1,513			
97.45	4,828	1,749			
97.50	5,038	1,996			
97.55	5,247	2,253			
97.60	5,456	2,520			
97.65	5,665	2,798			
97.70	5,875	3,087			
97.75	6,084	3,386			
97.80	6,293	3,695			
97.85	6,502	4,015			
97.90	6,712	4,345			
97.95	6,921	4,686			
98.00	7,130	5,038			
98.05	7,343	5,399			
98.10	7,557	5,772			
98.15	7,771	6,155			
98.20	7,984	6,549			
98.25	8,198	6,953			
98.30	8,411	7,369			
98.35	8,624	7,795			
98.40	8,838	8,231			
98.45	9,052	8,678			
98.50	9,265	9,136			
98.55	9,478	9,605			
98.60	9,692	10,084			
98.65	9,906	10,574			
98.70	10,119	11,075			
98.75	10,333	11,586			
98.80	10,546	12,108			
98.85	10,759	12,641			
98.90	10,973	13,184			
98.95	11,187	13,738			
99.00	11,400	14,303			
99.05	11,595	14,877			
99.10	11,790	15,462			
99.15	11,985	16,056			
99.20	12,180	16,661			
99.25	12,375	17,274			
99.30	12,570	17,898			
99.35	12,765	18,531			
99.40	12,960	19,175			
99.45	13,155	19,827			
99.50	13,350	20,490			
99.55	13,545	21,162			
99.60	13,740	21,844			
99.65	13,935	22,536			

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 4.09" for 25-Year event
 Inflow = 16.47 cfs @ 12.16 hrs, Volume= 1,438 af
 Outflow = 5.57 cfs @ 12.54 hrs, Volume= 1,438 af, Atten= 66%, Lag= 22.7 min
 Primary = 5.57 cfs @ 12.54 hrs, Volume= 1,438 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.46' @ 12.54 hrs Surf.Area= 17,617 sf Storage= 17,609 cf

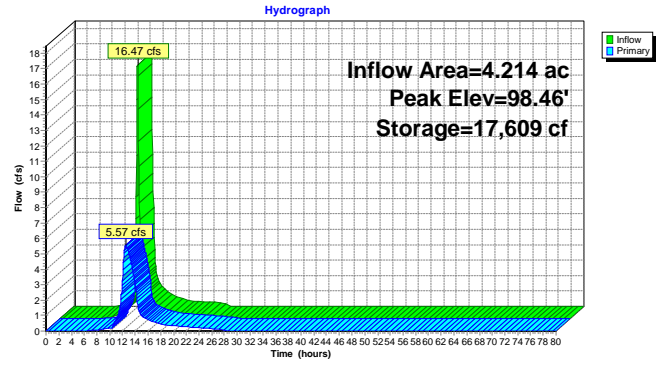
Plug-Flow detention time= 51.5 min calculated for 1,437 af (100% of inflow)
 Center-of-Mass det. time= 51.6 min (867.1 - 815.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	47,780 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	16,420	9,710	9,710
99.00	19,000	17,710	27,420
100.00	21,720	20,360	47,780

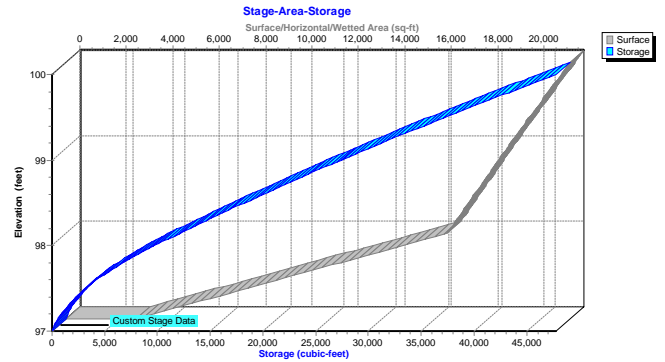
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=5.57 cfs @ 12.54 hrs HW=98.46' (Free Discharge)
 1=Catch Basin (Orifice Controls 5.13 cfs @ 5.13 fps)
 2=Exfiltration (Controls 0.44 cfs)

Pond 2Pa: CB-8A Basin



Pond 2Pa: CB-8A Basin



Hydrograph for Pond 2Pa: CB-8A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.06	52	97.02	0.04
10.00	0.48	1,224	97.26	0.15
12.50	6.42	17,545	98.46	5.56
15.00	0.94	2,506	97.43	1.00
17.50	0.46	2,110	97.38	0.50
20.00	0.32	1,955	97.36	0.33
22.50	0.25	1,855	97.35	0.26
25.00	0.00	1,287	97.27	0.16
27.50	0.00	163	97.05	0.09
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 2Pa: CB-8A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	3,000	0	99.70	20,904	41,386
97.05	3,671	167	99.75	21,040	42,435
97.10	4,342	367	99.80	21,176	43,490
97.15	5,013	601	99.85	21,312	44,553
97.20	5,684	868	99.90	21,448	45,622
97.25	6,355	1,169	99.95	21,584	46,697
97.30	7,026	1,504	100.00	21,720	47,780
97.35	7,697	1,872			
97.40	8,368	2,274			
97.45	9,039	2,709			
97.50	9,710	3,178			
97.55	10,381	3,680			
97.60	11,052	4,216			
97.65	11,723	4,785			
97.70	12,394	5,388			
97.75	13,065	6,024			
97.80	13,736	6,694			
97.85	14,407	7,398			
97.90	15,078	8,135			
97.95	15,749	8,906			
98.00	16,420	9,710			
98.05	16,549	10,534			
98.10	16,678	11,365			
98.15	16,807	12,202			
98.20	16,936	13,046			
98.25	17,065	13,896			
98.30	17,194	14,752			
98.35	17,323	15,615			
98.40	17,452	16,484			
98.45	17,581	17,360			
98.50	17,710	18,243			
98.55	17,839	19,131			
98.60	17,968	20,026			
98.65	18,097	20,928			
98.70	18,226	21,836			
98.75	18,355	22,751			
98.80	18,484	23,672			
98.85	18,613	24,599			
98.90	18,742	25,533			
98.95	18,871	26,473			
99.00	19,000	27,420			
99.05	19,136	28,373			
99.10	19,272	29,334			
99.15	19,408	30,301			
99.20	19,544	31,274			
99.25	19,680	32,255			
99.30	19,816	33,242			
99.35	19,952	34,237			
99.40	20,088	35,238			
99.45	20,224	36,245			
99.50	20,360	37,260			
99.55	20,496	38,281			
99.60	20,632	39,310			
99.65	20,768	40,345			

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 4.09' for 25-Year event
 Inflow = 26.22 cfs @ 12.14 hrs, Volume= 2.174 af
 Outflow = 6.74 cfs @ 12.57 hrs, Volume= 2.174 af, Atten= 74%, Lag= 25.6 min
 Primary = 6.74 cfs @ 12.57 hrs, Volume= 2.174 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 96.42' @ 12.57 hrs Surf.Area= 26,637 sf Storage= 28,812 cf

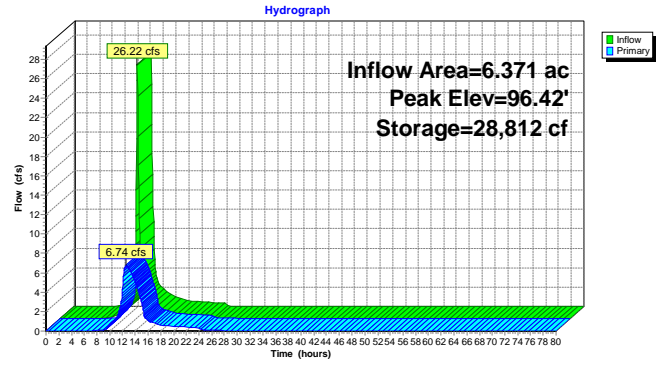
Plug-Flow detention time= 47.3 min calculated for 2.172 af (100% of inflow)
 Center-of-Mass det. time= 47.4 min (861.2 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	78,798 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,720	0	0
95.00	7,950	2,418	2,418
96.00	23,855	15,903	18,320
97.00	30,550	27,203	45,523
98.00	36,000	33,275	78,798

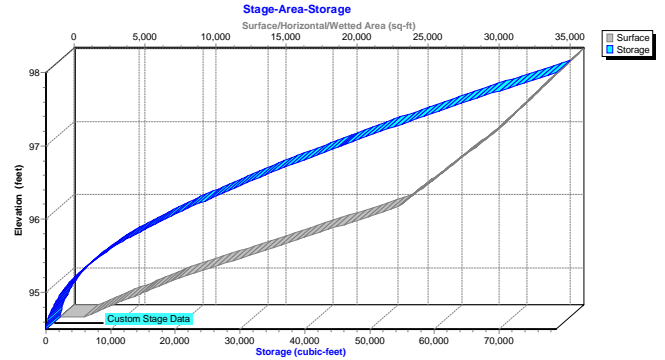
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=6.74 cfs @ 12.57 hrs HW=96.41' (Free Discharge)
 1=Catch Basin (Orifice Controls 6.06 cfs @ 6.06 fps)
 2=Exfiltration (Controls 0.67 cfs)

Pond 2Pb: CB-11A Basin



Pond 2Pb: CB-11A Basin



Hydrograph for Pond 2Pb: CB-11A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.10	91	94.54	0.05
10.00	0.74	1,686	94.90	0.66
12.50	8.74	28,567	96.41	6.72
15.00	1.40	3,643	95.14	2.91
17.50	0.70	1,731	94.91	0.73
20.00	0.48	1,584	94.88	0.49
22.50	0.38	1,501	94.87	0.39
25.00	0.00	979	94.78	0.13
27.50	0.00	145	94.57	0.06
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pb: CB-11A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,720	0	97.20	31,640	51,742
94.55	2,343	102	97.25	31,913	53,330
94.60	2,966	234	97.30	32,185	54,933
94.65	3,589	398	97.35	32,457	56,549
94.70	4,212	593	97.40	32,730	58,179
94.75	4,835	819	97.45	33,003	59,822
94.80	5,458	1,077	97.50	33,275	61,479
94.85	6,081	1,365	97.55	33,547	63,149
94.90	6,704	1,685	97.60	33,820	64,833
94.95	7,327	2,036	97.65	34,093	66,531
95.00	7,950	2,418	97.70	34,365	68,243
95.05	8,573	2,835	97.75	34,638	69,968
95.10	9,196	3,292	97.80	34,910	71,706
95.15	9,819	3,789	97.85	35,182	73,459
95.20	10,442	4,326	97.90	35,455	75,225
95.25	11,065	4,902	97.95	35,728	77,004
95.30	11,688	5,518	98.00	36,000	78,798
95.35	12,311	6,174			
95.40	12,934	6,870			
95.45	13,557	7,605			
95.50	14,180	8,381			
95.55	14,803	9,196			
95.60	15,426	10,050			
95.65	16,049	10,945			
95.70	16,672	11,879			
95.75	17,295	12,853			
95.80	17,918	13,867			
95.85	18,541	14,921			
95.90	19,164	16,014			
95.95	19,787	17,147			
96.00	20,410	18,320			
96.05	21,033	19,521			
96.10	21,656	20,739			
96.15	22,279	21,974			
96.20	22,902	23,225			
96.25	23,525	24,493			
96.30	24,148	25,778			
96.35	24,771	27,079			
96.40	25,394	28,398			
96.45	26,017	29,733			
96.50	26,640	31,084			
96.55	27,263	32,453			
96.60	27,886	33,838			
96.65	28,509	35,240			
96.70	29,132	36,659			
96.75	29,755	38,094			
96.80	30,378	39,546			
96.85	30,999	41,015			
96.90	31,622	42,501			
96.95	32,245	44,003			
97.00	32,868	45,523			
97.05	33,491	47,057			
97.10	34,114	48,605			
97.15	34,737	50,166			

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 4.41" for 25-Year event
 Inflow = 16.74 cfs @ 12.09 hrs, Volume= 1,238 af
 Outflow = 6.14 cfs @ 12.36 hrs, Volume= 1,238 af, Atten= 63%, Lag= 16.0 min
 Primary = 6.14 cfs @ 12.36 hrs, Volume= 1,238 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 96.34' @ 12.36 hrs Surf.Area= 9,134 sf Storage= 12,260 cf

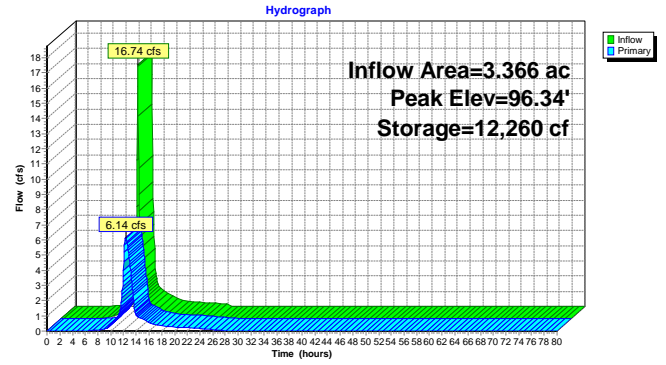
Plug-Flow detention time= 35.7 min calculated for 1,237 af (100% of inflow)
 Center-of-Mass det. time= 35.9 min (837.9 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	31,216 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,580	0	0
95.00	6,285	1,966	1,966
96.00	8,420	7,353	9,319
97.00	10,550	9,485	18,804
98.00	14,275	12,413	31,216

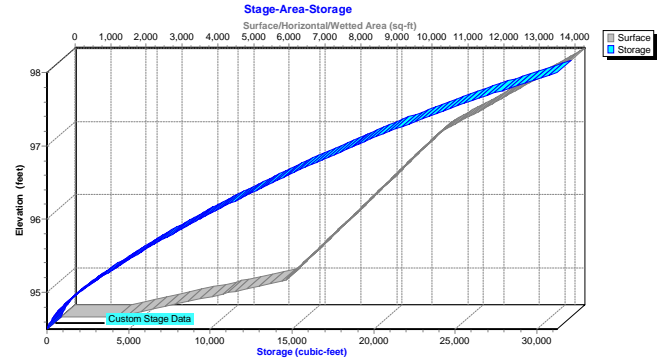
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=6.14 cfs @ 12.36 hrs HW=96.33' (Free Discharge)
 1=Catch Basin (Orifice Controls 5.91 cfs @ 5.91 fps)
 2=Exfiltration (Controls 0.24 cfs)

Pond 2Pc: CB-13A Basin



Pond 2Pc: CB-13A Basin



Hydrograph for Pond 2Pc: CB-13A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.10	132	94.57	0.05
10.00	0.50	1,296	94.88	0.45
12.50	3.78	11,668	96.27	6.01
15.00	0.75	1,465	94.91	0.78
17.50	0.37	1,259	94.88	0.39
20.00	0.26	1,178	94.86	0.27
22.50	0.20	1,141	94.85	0.21
25.00	0.00	750	94.76	0.10
27.50	0.00	94	94.55	0.05
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pc: CB-13A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,580	0	97.20	11,295	20,988
94.55	2,050	91	97.25	11,481	21,558
94.60	2,521	205	97.30	11,667	22,136
94.65	2,992	343	97.35	11,854	22,724
94.70	3,462	504	97.40	12,040	23,322
94.75	3,933	689	97.45	12,226	23,928
94.80	4,403	897	97.50	12,413	24,544
94.85	4,873	1,129	97.55	12,599	25,170
94.90	5,344	1,385	97.60	12,785	25,804
94.95	5,815	1,664	97.65	12,971	26,448
95.00	6,285	1,966	97.70	13,158	27,101
95.05	6,756	2,283	97.75	13,344	27,764
95.10	7,227	2,605	97.80	13,530	28,436
95.15	7,698	2,933	97.85	13,716	29,117
95.20	8,169	3,266	97.90	13,903	29,807
95.25	8,640	3,604	97.95	14,089	30,507
95.30	9,111	3,948	98.00	14,275	31,216
95.35	9,582	4,297			
95.40	10,053	4,651			
95.45	10,524	5,011			
95.50	10,995	5,376			
95.55	11,466	5,746			
95.60	11,937	6,122			
95.65	12,408	6,503			
95.70	12,879	6,889			
95.75	13,350	7,280			
95.80	13,821	7,677			
95.85	14,292	8,080			
95.90	14,763	8,487			
95.95	15,234	8,900			
96.00	15,705	9,319			
96.05	16,176	9,742			
96.10	16,647	10,171			
96.15	17,118	10,606			
96.20	17,589	11,045			
96.25	18,060	11,490			
96.30	18,531	11,941			
96.35	19,002	12,396			
96.40	19,473	12,857			
96.45	19,944	13,323			
96.50	20,415	13,795			
96.55	20,886	14,272			
96.60	21,357	14,754			
96.65	21,828	15,242			
96.70	22,299	15,735			
96.75	22,770	16,233			
96.80	23,241	16,736			
96.85	23,712	17,245			
96.90	24,183	17,759			
96.95	24,654	18,279			
97.00	25,125	18,804			
97.05	25,596	19,336			
97.10	26,067	19,871			
97.15	26,538	20,428			

Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 6.04" for 100-Year event
 Inflow = 15.34 cfs @ 12.09 hrs, Volume= 1.146 af
 Outflow = 4.55 cfs @ 12.42 hrs, Volume= 1.146 af, Atten= 70%, Lag= 20.0 min
 Primary = 4.55 cfs @ 12.42 hrs, Volume= 1.146 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.97' @ 12.42 hrs Surf.Area= 10,404 sf Storage= 13,304 cf

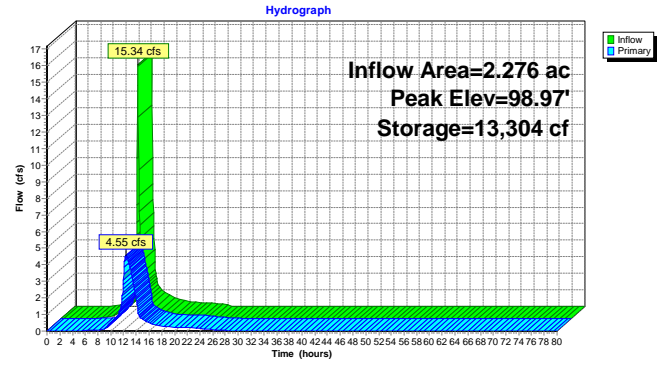
Plug-Flow detention time= 44.2 min calculated for 1.146 af (100% of inflow)
 Center-of-Mass det. time= 44.1 min (839.4 - 795.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

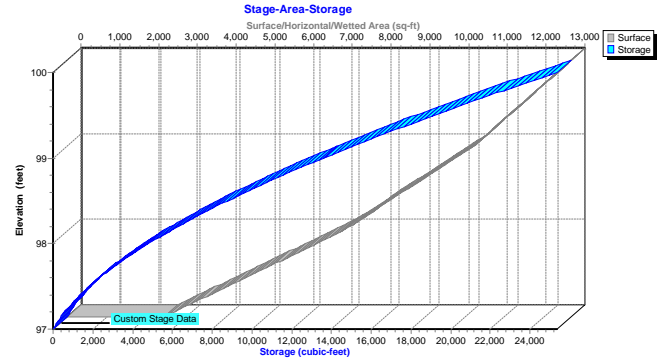
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 5.00 columns X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=4.55 cfs @ 12.42 hrs HW=98.97' (Free Discharge)
 1=Catch Basin (Orifice Controls 4.28 cfs @ 6.17 fps)
 2=Exfiltration (Controls 0.27 cfs)

Pond 1Pa: CB-17B Basin



Pond 1Pa: CB-17B Basin



Hydrograph for Pond 1Pa: CB-17B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.01	4	97.00	0.00
7.50	0.13	174	97.07	0.07
10.00	0.51	1,319	97.39	0.48
12.50	3.41	13,148	98.96	4.53
15.00	0.67	1,408	97.41	0.70
17.50	0.33	1,253	97.37	0.35
20.00	0.23	1,198	97.36	0.24
22.50	0.18	1,155	97.35	0.19
25.00	0.00	813	97.26	0.09
27.50	0.00	124	97.05	0.06
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pa: CB-17B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,500	0	98.70	12,250	21,563
97.05	2,730	131	98.75	12,375	22,178
97.10	2,960	273	98.80	12,500	22,800
97.15	3,190	427	98.85	12,625	23,428
97.20	3,420	592	98.90	12,750	24,063
97.25	3,650	769	98.95	12,875	24,703
97.30	3,880	957	100.00	13,000	25,350
97.35	4,110	1,157			
97.40	4,340	1,368			
97.45	4,570	1,591			
97.50	4,800	1,825			
97.55	5,030	2,071			
97.60	5,260	2,328			
97.65	5,490	2,597			
97.70	5,720	2,877			
97.75	5,950	3,169			
97.80	6,180	3,472			
97.85	6,410	3,787			
97.90	6,640	4,113			
97.95	6,870	4,451			
98.00	7,100	4,800			
98.05	7,270	5,159			
98.10	7,440	5,527			
98.15	7,610	5,903			
98.20	7,780	6,288			
98.25	7,950	6,681			
98.30	8,120	7,083			
98.35	8,290	7,493			
98.40	8,460	7,912			
98.45	8,630	8,339			
98.50	8,800	8,775			
98.55	8,970	9,219			
98.60	9,140	9,672			
98.65	9,310	10,133			
98.70	9,480	10,603			
98.75	9,650	11,081			
98.80	9,820	11,568			
98.85	9,990	12,063			
98.90	10,160	12,567			
98.95	10,330	13,079			
99.00	10,500	13,600			
99.05	10,625	14,128			
99.10	10,750	14,662			
99.15	10,875	15,203			
99.20	11,000	15,750			
99.25	11,125	16,303			
99.30	11,250	16,862			
99.35	11,375	17,428			
99.40	11,500	18,000			
99.45	11,625	18,578			
99.50	11,750	19,163			
99.55	11,875	19,753			
99.60	12,000	20,350			
99.65	12,125	20,953			

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 5.93" for 100-Year event
 Inflow = 18.00 cfs @ 12.09 hrs, Volume= 1,339 af
 Outflow = 6.36 cfs @ 12.37 hrs, Volume= 1,339 af, Atten= 65%, Lag= 16.6 min
 Primary = 6.36 cfs @ 12.37 hrs, Volume= 1,339 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.92' @ 12.37 hrs Surf.Area= 11,067 sf Storage= 13,425 cf

Plug-Flow detention time= 37.4 min calculated for 1,339 af (100% of inflow)
 Center-of-Mass det. time= 37.6 min (835.4 - 797.8)

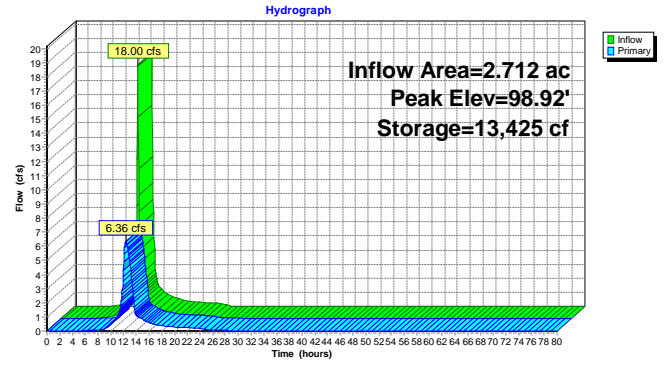
Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	27,653 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,945	0	0
98.00	7,130	5,038	5,038
99.00	11,400	9,265	14,303
100.00	15,300	13,350	27,653

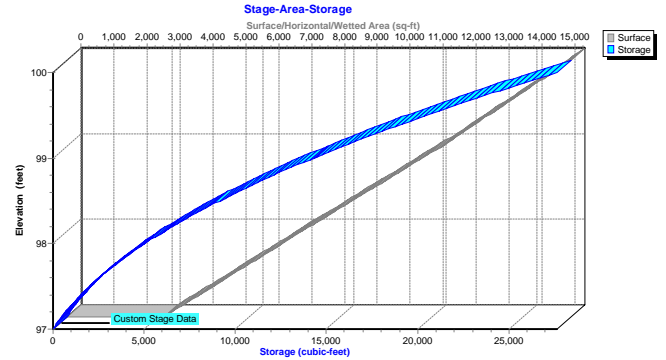
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=6.35 cfs @ 12.37 hrs HW=98.92' (Free Discharge)
 1=Catch Basin (Orifice Controls 6.07 cfs @ 6.07 fps)
 2=Exfiltration (Controls 0.28 cfs)

Pond 1Pb: CB-16B Basin



Pond 1Pb: CB-16B Basin



Hydrograph for Pond 1Pb: CB-16B Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.13	165	97.05	0.08
10.00	0.57	1,486	97.39	0.54
12.50	4.02	12,878	98.87	6.26
15.00	0.80	1,606	97.42	0.82
17.50	0.39	1,421	97.38	0.41
20.00	0.27	1,351	97.36	0.28
22.50	0.22	1,311	97.36	0.22
25.00	0.00	927	97.26	0.10
27.50	0.00	154	97.05	0.07
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 1Pb: CB-16B Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	2,945	0	98.70	14,130	23,238
97.05	3,154	152	98.75	14,325	23,949
97.10	3,363	315	98.80	14,520	24,670
97.15	3,573	489	98.85	14,715	25,401
97.20	3,782	673	98.90	14,910	26,142
97.25	3,991	867	98.95	15,105	26,892
97.30	4,200	1,072	100.00	15,300	27,653
97.35	4,410	1,287			
97.40	4,619	1,513			
97.45	4,828	1,749			
97.50	5,038	1,996			
97.55	5,247	2,253			
97.60	5,456	2,520			
97.65	5,665	2,798			
97.70	5,875	3,087			
97.75	6,084	3,386			
97.80	6,293	3,695			
97.85	6,502	4,015			
97.90	6,712	4,345			
97.95	6,921	4,686			
98.00	7,130	5,038			
98.05	7,343	5,399			
98.10	7,557	5,772			
98.15	7,771	6,155			
98.20	7,984	6,549			
98.25	8,198	6,953			
98.30	8,411	7,369			
98.35	8,624	7,795			
98.40	8,838	8,231			
98.45	9,052	8,678			
98.50	9,265	9,136			
98.55	9,478	9,605			
98.60	9,692	10,084			
98.65	9,906	10,574			
98.70	10,119	11,075			
98.75	10,333	11,586			
98.80	10,546	12,108			
98.85	10,759	12,641			
98.90	10,973	13,184			
98.95	11,187	13,738			
99.00	11,400	14,303			
99.05	11,595	14,877			
99.10	11,790	15,462			
99.15	11,985	16,056			
99.20	12,180	16,661			
99.25	12,375	17,274			
99.30	12,570	17,898			
99.35	12,765	18,531			
99.40	12,960	19,175			
99.45	13,155	19,827			
99.50	13,350	20,490			
99.55	13,545	21,162			
99.60	13,740	21,844			
99.65	13,935	22,536			

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 5.81" for 100-Year event
 Inflow = 23.11 cfs @ 12.16 hrs, Volume= 2,040 af
 Outflow = 6.65 cfs @ 12.58 hrs, Volume= 2,040 af, Atten= 71%, Lag= 25.0 min
 Primary = 6.65 cfs @ 12.58 hrs, Volume= 2,040 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.97' @ 12.58 hrs Surf.Area= 18,921 sf Storage= 26,838 cf

Plug-Flow detention time= 52.5 min calculated for 2,038 af (100% of inflow)
 Center-of-Mass det. time= 52.6 min (858.3 - 805.7)

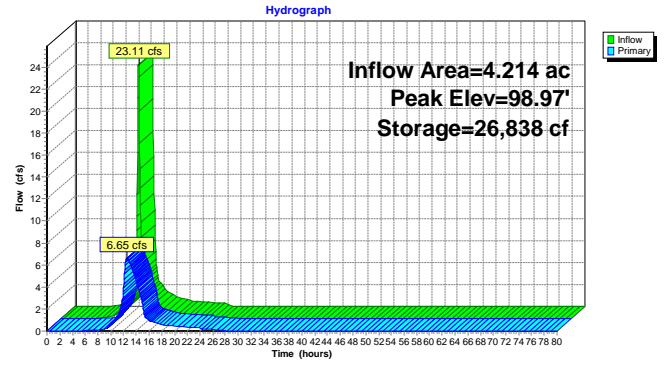
Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	47,780 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	16,420	9,710	9,710
99.00	19,000	17,710	27,420
100.00	21,720	20,360	47,780

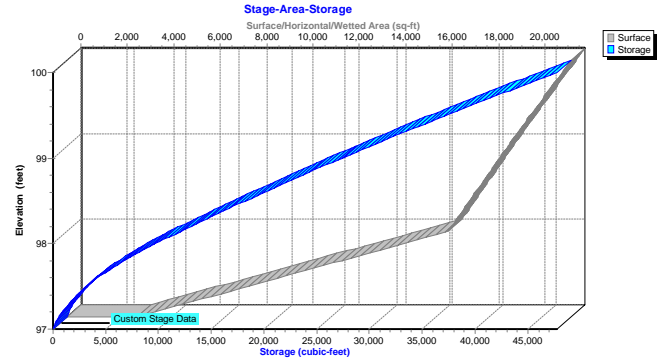
Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=6.65 cfs @ 12.58 hrs HW=98.97' (Free Discharge)
 1=Catch Basin (Orifice Controls 6.16 cfs @ 6.16 fps)
 2=Exfiltration (Controls 0.48 cfs)

Pond 2Pa: CB-8A Basin



Pond 2Pa: CB-8A Basin



Hydrograph for Pond 2Pa: CB-8A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	97.00	0.00
2.50	0.00	0	97.00	0.00
5.00	0.00	0	97.00	0.00
7.50	0.17	214	97.06	0.09
10.00	0.81	2,268	97.40	0.68
12.50	8.79	26,540	98.95	6.62
15.00	1.26	3,492	97.53	2.39
17.50	0.62	2,248	97.40	0.66
20.00	0.43	2,059	97.37	0.44
22.50	0.34	1,970	97.36	0.35
25.00	0.00	1,360	97.28	0.16
27.50	0.00	224	97.06	0.09
30.00	0.00	0	97.00	0.00
32.50	0.00	0	97.00	0.00
35.00	0.00	0	97.00	0.00
37.50	0.00	0	97.00	0.00
40.00	0.00	0	97.00	0.00
42.50	0.00	0	97.00	0.00
45.00	0.00	0	97.00	0.00
47.50	0.00	0	97.00	0.00
50.00	0.00	0	97.00	0.00
52.50	0.00	0	97.00	0.00
55.00	0.00	0	97.00	0.00
57.50	0.00	0	97.00	0.00
60.00	0.00	0	97.00	0.00
62.50	0.00	0	97.00	0.00
65.00	0.00	0	97.00	0.00
67.50	0.00	0	97.00	0.00
70.00	0.00	0	97.00	0.00
72.50	0.00	0	97.00	0.00
75.00	0.00	0	97.00	0.00
77.50	0.00	0	97.00	0.00
80.00	0.00	0	97.00	0.00

Stage-Area-Storage for Pond 2Pa: CB-8A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
97.00	3,000	0	99.70	20,904	41,386
97.05	3,671	167	99.75	21,040	42,435
97.10	4,342	367	99.80	21,176	43,490
97.15	5,013	601	99.85	21,312	44,553
97.20	5,684	868	99.90	21,448	45,622
97.25	6,355	1,169	99.95	21,584	46,697
97.30	7,026	1,504	100.00	21,720	47,780
97.35	7,697	1,872			
97.40	8,368	2,274			
97.45	9,039	2,709			
97.50	9,710	3,178			
97.55	10,381	3,680			
97.60	11,052	4,216			
97.65	11,723	4,785			
97.70	12,394	5,388			
97.75	13,065	6,024			
97.80	13,736	6,694			
97.85	14,407	7,398			
97.90	15,078	8,135			
97.95	15,749	8,906			
98.00	16,420	9,710			
98.05	16,549	10,534			
98.10	16,678	11,365			
98.15	16,807	12,202			
98.20	16,936	13,046			
98.25	17,065	13,896			
98.30	17,194	14,752			
98.35	17,323	15,615			
98.40	17,452	16,484			
98.45	17,581	17,360			
98.50	17,710	18,243			
98.55	17,839	19,131			
98.60	17,968	20,026			
98.65	18,097	20,928			
98.70	18,226	21,836			
98.75	18,355	22,751			
98.80	18,484	23,672			
98.85	18,613	24,599			
98.90	18,742	25,533			
98.95	18,871	26,473			
99.00	19,000	27,420			
99.05	19,136	28,373			
99.10	19,272	29,334			
99.15	19,408	30,301			
99.20	19,544	31,274			
99.25	19,680	32,255			
99.30	19,816	33,242			
99.35	19,952	34,237			
99.40	20,088	35,238			
99.45	20,224	36,245			
99.50	20,360	37,260			
99.55	20,496	38,281			
99.60	20,632	39,310			
99.65	20,768	40,345			

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 5.81" for 100-Year event
 Inflow = 36.75 cfs @ 12.14 hrs, Volume= 3.084 af
 Outflow = 7.83 cfs @ 12.61 hrs, Volume= 3.084 af, Atten= 79%, Lag= 28.2 min
 Primary = 7.83 cfs @ 12.61 hrs, Volume= 3.084 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 96.97' @ 12.61 hrs Surf.Area= 30,344 sf Storage= 44,584 cf

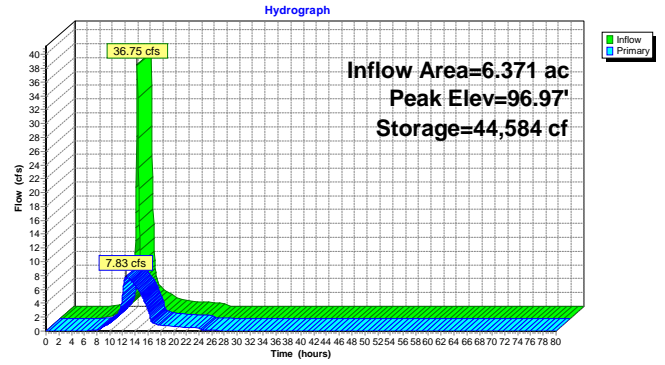
Plug-Flow detention time= 56.8 min calculated for 3.084 af (100% of inflow)
 Center-of-Mass det. time= 56.6 min (860.6 - 803.9)

Volume	Invert	Avail. Storage	Storage Description
#1	94.50'	78,798 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
94.50	1,720	0	0
95.00	7,950	2,418	2,418
96.00	23,855	15,903	18,320
97.00	30,550	27,203	45,523
98.00	36,000	33,275	78,798

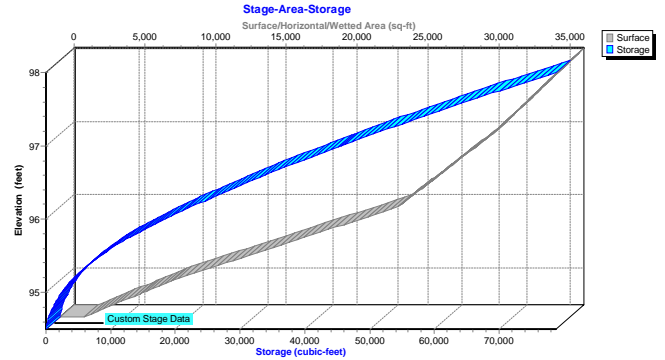
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=7.83 cfs @ 12.61 hrs HW=96.97' (Free Discharge)
 1=Catch Basin (Orifice Controls 7.04 cfs @ 7.04 fps)
 2=Exfiltration (Controls 0.79 cfs)

Pond 2Pb: CB-11A Basin



Pond 2Pb: CB-11A Basin



Hydrograph for Pond 2Pb: CB-11A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.00	0	94.50	0.00
7.50	0.27	513	94.68	0.09
10.00	1.24	1,976	94.94	1.16
12.50	11.96	43,812	96.94	7.78
15.00	1.89	13,268	95.77	5.17
17.50	0.94	1,875	94.93	0.97
20.00	0.64	1,687	94.90	0.66
22.50	0.51	1,599	94.89	0.52
25.00	0.00	1,009	94.79	0.13
27.50	0.00	160	94.57	0.06
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pb: CB-11A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,720	0	97.20	31,640	51,742
94.55	2,343	102	97.25	31,913	53,330
94.60	2,966	234	97.30	32,185	54,933
94.65	3,589	398	97.35	32,457	56,549
94.70	4,212	593	97.40	32,730	58,179
94.75	4,835	819	97.45	33,003	59,822
94.80	5,458	1,077	97.50	33,275	61,479
94.85	6,081	1,365	97.55	33,547	63,149
94.90	6,704	1,685	97.60	33,820	64,833
94.95	7,327	2,036	97.65	34,093	66,531
95.00	7,950	2,418	97.70	34,365	68,243
95.05	8,573	2,835	97.75	34,638	69,968
95.10	9,196	3,292	97.80	34,910	71,706
95.15	9,819	3,789	97.85	35,182	73,459
95.20	10,442	4,326	97.90	35,455	75,225
95.25	11,065	4,902	97.95	35,728	77,004
95.30	11,688	5,518	98.00	36,000	78,798
95.35	12,311	6,174			
95.40	12,934	6,870			
95.45	13,557	7,605			
95.50	14,180	8,381			
95.55	14,803	9,196			
95.60	15,426	10,050			
95.65	16,049	10,945			
95.70	16,672	11,879			
95.75	17,295	12,853			
95.80	17,918	13,867			
95.85	18,541	14,921			
95.90	19,164	16,014			
95.95	19,787	17,147			
96.00	20,410	18,320			
96.05	21,033	19,521			
96.10	21,656	20,739			
96.15	22,279	21,974			
96.20	22,902	23,225			
96.25	23,525	24,493			
96.30	24,148	25,778			
96.35	24,771	27,079			
96.40	25,394	28,398			
96.45	26,017	29,733			
96.50	26,640	31,084			
96.55	27,263	32,453			
96.60	27,886	33,838			
96.65	28,509	35,240			
96.70	29,132	36,659			
96.75	29,755	38,094			
96.80	30,378	39,546			
96.85	30,999	41,015			
96.90	31,622	42,501			
96.95	32,245	44,003			
97.00	32,868	45,523			
97.05	33,491	47,057			
97.10	34,114	48,605			
97.15	34,737	50,166			

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 6.16" for 100-Year event
 Inflow = 23.02 cfs @ 12.09 hrs, Volume= 1.729 af
 Outflow = 7.34 cfs @ 12.40 hrs, Volume= 1.729 af, Atten= 68%, Lag= 18.6 min
 Primary = 7.34 cfs @ 12.40 hrs, Volume= 1.729 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 96.98' @ 12.40 hrs Surf.Area= 10,512 sq Storage= 18,618 cf

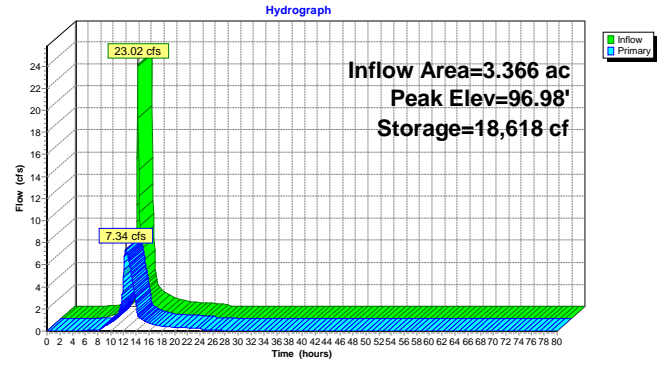
Plug-Flow detention time= 34.9 min calculated for 1.728 af (100% of inflow)
 Center-of-Mass det. time= 35.1 min (827.8 - 792.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	31,216 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,580	0	0
95.00	6,285	1,966	1,966
96.00	8,420	7,353	9,319
97.00	10,550	9,485	18,804
98.00	14,275	12,413	31,216

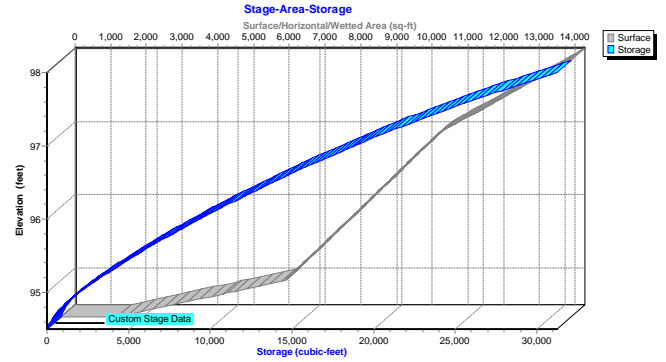
Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	2.0" x 2.0" Horiz. Catch Basin X 6.00 columns X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=7.34 cfs @ 12.40 hrs HW=96.98' (Free Discharge)
 1=Catch Basin (Orifice Controls 7.06 cfs @ 7.06 fps)
 2=Exfiltration (Controls 0.28 cfs)

Pond 2Pc: CB-13A Basin



Pond 2Pc: CB-13A Basin



Hydrograph for Pond 2Pc: CB-13A Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	94.50	0.00
2.50	0.00	0	94.50	0.00
5.00	0.03	17	94.51	0.01
7.50	0.21	476	94.69	0.08
10.00	0.79	1,446	94.91	0.74
12.50	5.09	18,215	96.94	7.28
15.00	1.00	1,580	94.94	1.04
17.50	0.50	1,331	94.89	0.51
20.00	0.34	1,234	94.87	0.35
22.50	0.27	1,185	94.86	0.28
25.00	0.00	772	94.77	0.10
27.50	0.00	105	94.56	0.05
30.00	0.00	0	94.50	0.00
32.50	0.00	0	94.50	0.00
35.00	0.00	0	94.50	0.00
37.50	0.00	0	94.50	0.00
40.00	0.00	0	94.50	0.00
42.50	0.00	0	94.50	0.00
45.00	0.00	0	94.50	0.00
47.50	0.00	0	94.50	0.00
50.00	0.00	0	94.50	0.00
52.50	0.00	0	94.50	0.00
55.00	0.00	0	94.50	0.00
57.50	0.00	0	94.50	0.00
60.00	0.00	0	94.50	0.00
62.50	0.00	0	94.50	0.00
65.00	0.00	0	94.50	0.00
67.50	0.00	0	94.50	0.00
70.00	0.00	0	94.50	0.00
72.50	0.00	0	94.50	0.00
75.00	0.00	0	94.50	0.00
77.50	0.00	0	94.50	0.00
80.00	0.00	0	94.50	0.00

Stage-Area-Storage for Pond 2Pc: CB-13A Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.50	1,580	0	97.20	11,295	20,988
94.55	2,050	91	97.25	11,481	21,558
94.60	2,521	205	97.30	11,667	22,136
94.65	2,992	343	97.35	11,854	22,724
94.70	3,462	504	97.40	12,040	23,322
94.75	3,933	689	97.45	12,226	23,928
94.80	4,403	897	97.50	12,413	24,544
94.85	4,873	1,129	97.55	12,599	25,170
94.90	5,344	1,385	97.60	12,785	25,804
94.95	5,815	1,664	97.65	12,971	26,448
95.00	6,285	1,966	97.70	13,158	27,101
95.05	6,756	2,283	97.75	13,344	27,764
95.10	7,227	2,605	97.80	13,530	28,436
95.15	7,698	2,933	97.85	13,716	29,117
95.20	8,169	3,266	97.90	13,903	29,807
95.25	8,640	3,604	97.95	14,089	30,507
95.30	9,111	3,948	98.00	14,275	31,216
95.35	9,582	4,297			
95.40	10,053	4,651			
95.45	10,524	5,011			
95.50	10,995	5,376			
95.55	11,466	5,746			
95.60	11,937	6,122			
95.65	12,408	6,503			
95.70	12,879	6,889			
95.75	13,350	7,286			
95.80	13,821	7,687			
95.85	14,292	8,093			
95.90	14,763	8,504			
95.95	15,234	8,920			
96.00	15,705	9,341			
96.05	16,176	9,767			
96.10	16,647	10,198			
96.15	17,118	10,634			
96.20	17,589	11,075			
96.25	18,060	11,521			
96.30	18,531	11,972			
96.35	19,002	12,428			
96.40	19,473	12,889			
96.45	19,944	13,355			
96.50	20,415	13,826			
96.55	20,886	14,302			
96.60	21,357	14,783			
96.65	21,828	15,269			
96.70	22,299	15,760			
96.75	22,770	16,256			
96.80	23,241	16,757			
96.85	23,712	17,263			
96.90	24,183	17,774			
96.95	24,654	18,290			
97.00	25,125	18,811			
97.05	25,596	19,337			
97.10	26,067	19,868			
97.15	26,538	20,404			