PERIODIC RUN-ON AND RUN-OFF CONTROL PLAN REVISION 3 391-3-4-.10(5) and 40 C.F.R. PART 257.81 PLANT BOWEN PRIVATE INDUSTRY SOLID WASTE DISPOSAL FACILITY (ASH LANDFILL) GEORGIA POWER COMPANY

The Federal CCR Rule, and, for existing CCR Landfills where applicable, the Georgia CCR Rule (391-3-4-.10) require the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to prepare a run-on and run-off control system plan to document how these control systems have been designed and constructed to meet the applicable requirements of this section of the Rule. *See* 40 C.F.R. § 257.81; Ga. Comp. R. & Regs. r. 391.3-4-.10(5)(a). In addition, the Rules require periodic run-on and run-off control system plans every five years. *See* 40 C.F.R. § 257.81(c)(4); Ga. Comp. R. & Regs. r. 391.3-4-.10(5)(a).

The CCR Landfill known as the Plant Bowen CCR Landfill is located in Bartow County, just west of Cartersville, Georgia on Plant Bowen property. Active Cells 1 & 2 and 9 & 10 were permitted and constructed with a minimum 2-ft. compacted clay liner with a maximum hydraulic conductivity of 1×10^{-7} cm/sec, underlain with a structural fill layer with a maximum hydraulic conductivity of 1×10^{-6} cm/sec. Cells 9 & 10 were subsequently retrofitted with a composite liner and leachate collection system. Active Cells 3 & 4 were permitted and constructed with a composite liner system consisting of a HDPE geomembrane and a minimum 2-ft. compacted clay layer with a maximum hydraulic conductivity of 1×10^{-7} cm/sec. The composite liner is underlain with a structural fill layer svaried in thickness from 5 ft. (minimum) to 13 ft. The facility consists of the CCR storage cells, leachate ponds for Cell 3 and 4, and separate sedimentation ponds and clear pools. Future Cells 5-8 will be constructed in the same manner as Cells 3 & 4.

The storm water flows have been calculated using the Natural Resources Conservation Service (NRCS) method (also known as the Soil Conservation Service (SCS) method) using the 25-yr, 24hr storm event. The storm water detention system has been designed in accordance with the Georgia Soil and Water Conservation Commission requirements and Technical Release 55 (TR-55) as well as other local, city, and government codes. The post-developed storm water discharge was designed to be less than the pre-developed storm water discharge in accordance with the requirements of the State of Georgia.

Run-off curve number data was determined using Table 2.1.5-1 from the Georgia Stormwater Management Manual. Run-off coefficient data was determined by utilizing Table 2.1.5-2. The rainfall distribution for Plant Bowen (Type II) was determined from Technical Release 55 (TR-55). National Oceanic and Atmospheric Administration (NOAA) Atlas 14 was used to determine the 24-hr precipitation for the design storm event of 25-yr for Plant Bowen.

The NRCS provides information on soil characteristics and hydrologic groups present at the site. It was determined that the hydrological group "C" for Cells 1 & 2 and "B" for Cells 3 through 8 and Cells 9 & 10 should be used to best reflect the characteristics of the soils on site. This information was placed into Hydraflow Hydrographs 2019 and used to generate appropriate precipitation curves, runoff curve numbers and storm basin run-off values. This methodology has also been utilized for future cells within the unit.

The Plant Bowen CCR Landfill Cells are designed and constructed with perimeter berms and drainage ditches around the cells that prevent stormwater run-on during the peak discharge of a 24-hr, 25-yr storm from flowing onto the active portion of the landfill. The leachate from Cells 3 & 4, future Cells 5 through 8 and Cells 9 & 10 is collected and treated separately from all storm water run-off in the cells. Storm water run-off from Cells 1 & 2, Cells 9 & 10 and Cells 3 through 8, is routed through a system of sedimentation ponds designed to handle the run-off from a 24-hr, 25-yr storm. This plan is supported by appropriate engineering calculations (attached) and was reviewed to reflect current conditions.

The facility is operated subject to and in accordance with § 257.3-3 of EPA's regulations.

I hereby certify that the run-on and run-off control system plan meets the requirements of 40 C.F.R. Part 257.81.

R \cap G ISIE +No 24/24 PROVES James C. Pegues, P. Licensed State of Georgia, PE 419



| Calculation Number: |
|---------------------|
| DC-BN-735210-004 |
| |
| |

| Project/Plant: | Unit(s): | Discipline/Area: |
|--|----------------------|---------------------|
| Bowen | 1 - 4 | Civil |
| Title/Subject: | | |
| Run-on and Run-off Study for Bowen Cells 1 & 2 | | 2 |
| Purpose/Objective: | | |
| To determine if the Cell's stormwater manageme | nt can safely manage | and pass the design |
| storm event. | | |
| System or Equipment Tag Numbers: | Originator: | (#) |
| N/A | Jeremy Brown | |

.

Contents

| Торіс | Page | Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence) | # of Pages |
|---|-------|---|---------------|
| Purpose of Calculation | 1 | | 1 |
| Summary of Conclusions | 1 | | 1 |
| Project Narrative | 1-2 | | 2 |
| Methodology | 2 | 95 | ୀ ି |
| Assumptions/Criteria | 2 | | 1 |
| Design Inputs/References | 3-9 | | 7 |
| Body of Calculation | 10-23 | | 14 |
| Total # of pages including cover sheet & attachments: | 24 | | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|-------------|---------------------------------------|------------------------------|----------------------------|----------------------------|
| 0 | Issued for Review | JKB 2/9/21 | AOG 3/1/21 | JWM 6/7/21 |
| | | | | |
| | · · · · · · · · · · · · · · · · · · · | | · · · · · · | 1 |
| | | | | |
| | | | | |

Notes:





| Project | Prepared by | Date | |
|---|---|------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 | |
| | Calculation Number DC-BN- 735210-004 | Sheet 1 of 23 | |

Purpose of Calculation

The purpose of this calculation is to determine if the existing sedimentation ponds and clear pools can sufficiently handle run-on/run-off during a minimum 25-yr, 24-hr storm event per federal stormwater requirements Title 40 CFR Part 257.81 and the Georgia Environmental Protection Division's (EPD) Georgia CCR Rule (391-3-4-.10).

Summary of Conclusions

Based on our analysis, the detention pond system is adequate to collect and control the volume of water resulting from a 24-hour 25-year storm, as required.

| Chause David Name | Normal Pool Elevation (feet, | Maximum 25 year pool elevation | Spillway/Top of Dike Elevation (feet, | Freeboard to Spillway (feet, |
|--------------------|------------------------------------|--------------------------------------|--|---------------------------------------|
| Storage Pond Name | NAVD 88) | (feet, NAVD 88) | NAVD 88) | NAVD 88) |
| Clear Pool | 691.00 | 693.88 | 696.00/700.00 | 2.12/6.12 |
| Sedimentation Pond | 691.00 | 693.88 | 696.00/700.00 | 2.12/6.12 |

Project Narrative

The Plant Bowen CCB Disposal Facility Cells 1 & 2 site is located in Bartow County and is approximately 1.5 miles East of Euharlee, Georgia and 6 miles southwest of Cartersville, Georgia. The plant is bordered on the north and east by the Etowah River and on the south and west by farmland.

Cells 1 & 2 cover 34.88 acres and the two disposal cells are not divided by any means. (See Image 1).

Cells 1 & 2 are comprised of a 31.12 acres storage cell, 2.53 acres sedimentation pond, 1.23 acres clear pool, berms, access roads and ditches. (See Image 2) Cells 1 & 2 include a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for these cells. Run-off from this area is directed through interior perimeter ditches and through 3 - 36" diameter HDEP pipes into a sedimentation pond that is connected to a clear pool via two 72" diameter risers and two 48" diameter pipes. Stormwater from the clear pool is discharged through a 72" diameter riser and 48" diameter pipe.



2 of 23

Design Calculations Project Prepared by Date 2/9/21 Plant Bowen Run-on Run-off Control Jeremy Brown Subject/Title Reviewed by Date Provide run-on and run-off system 3/1/21 Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 Calculation Number Sheet

The clear pool has an auxiliary spillway that is a grassed trapezoidal weir. The auxiliary spillway is 8' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cells 1 & 2.

DC-BN-735210-004

Methodology

The stormwater flows were calculated using the National Resources Conservation Service method (also known as the Soil Conservation Service (SCS) method) using a 25-yr, 24-hr design storm event.

Storm basin calculation information was gathered from a number of sources to include the Georgia Stormwater Manual and Technical Release 55.

The National Resources Conservation Service (NCRS) provided information on the soil characteristics and hydrologic groups. The soil types found on the site are Urban Land, Wax Silt Loam and Waynesboro Clay Loam. (See Images 3 & 4). Almost the entire site (99.9%) is considered Urban Land because the cells currently have some waste stacked in it. The soils in Cells 9 & 10 that are adjacent to the North and Cells 3 & 4 that are in the vicinity to the Northwest both consist of hydrological group "B". Therefore, hydrological group "B" should be used to best reflect the characteristics of the soils on site.

Run-off curve number data was determined using Table 2.1.5-1 from the Georgia Stormwater Management Manual. Run-off coefficient data was determined by utilizing Table 2.1.5-2 from the Georgia Stormwater Management Manual and Manning's n for Channels (Chow, 1959).

Appendix B from the TR-55 was used to determine the rain distribution for Plant Bowen is Type II. (See Image 5)

NOAA Atlas 14 was used to determine the 24-hour precipitation for the design storm event of 25-yr for Plant Bowen is 6.07 in. (See Image 6)

Assumptions/Criteria

- Refer to Title 40 CFR Part 257.81 Hydrologic and hydraulic capacity requirements for the runon and run-off controls for CCR landfills.
- Other assumptions are listed on attached calculation sheets.



| Design Calculations | | company |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 3 of 23 |

Design Inputs/References

- AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Hydrographs Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Express Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- NOAA Atlas 14, Volume 9, Version 2 for Taylorsville, GA.
- Georgia Stormwater Manual
- TR-55 Urban Hydrology for Small Watersheds, Appendix B, National Resources Conservation Service, Conservation Engineering Division, 1986.
- Georgia Power Company Plant Bowen CCB Disposal Facility Design and Operation Plans H15061 H15097, H15296 H15315 and H52258 H52260.



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown2/9/21Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 1 & 2Reviewed byDateCalculation Number
DC-BN- 735210-004Sheet
4 of 2323



Image 1



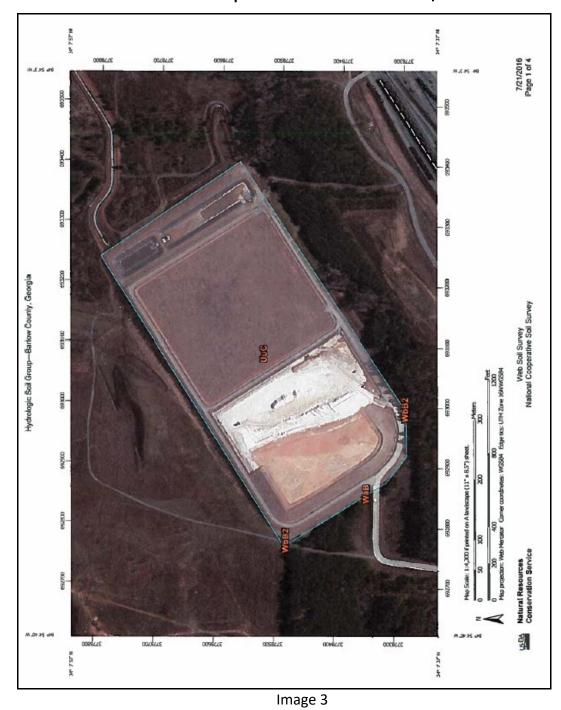
Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown2/9/21Subject/TitleReviewed byAshley GrissomProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 1 & 2Reviewed by
Ashley GrissomDate
3/1/21Calculation Number
DC-BN- 735210-004Sheet
5 of 23



Image 2



| Design Calculations | | Company |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 6 of 23 |





| Design Calculations | | eep |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 7 of 23 |

| Hydi | rologic Soil Gr | oup | | |
|--|---|--|---|---|
| Hy | drologic Soil Group—Sur | mmary by Map Unit — B | artow County, Georgia (GA0 | 15) |
| Map unit symbol | Map unit name | Rating | Acres In AOI | Percent of AOI |
| UuC | Urban land-Udorthents complex. 0 to 10 percent slopes | | 40.2 | 99.9 % |
| WaB | Wax silt loam, 2 to 6 percent slopes, rarely flooded | D | 0.0 | 0.03 |
| WbB2 | Waynesboro clay loam,2 to 6 percent slopes, moderately eroded | B | 0.1 | 0.1 9 |
| Totals for Area of Inte | rest | | 40.2 | 100.0% |
| soils ar from lo The so three d | re not protected by veg ng-duration storms, ils in the United States lual classes (A/D, B/D, | etation, are thorough are assigned to fou and C/D). The group | ate of water infiltration wh nly wet, and receive prece r groups (A, B, C, and D) ps are defined as follows runoff potential) when tho | ipitation) and :: |
| soils ar from lo The so three d Group wet, Th gravell Group consist soils th | re not protected by veg ng-duration storms, ills in the United States lual classes (A/D, B/D, A. Soils having a high rese consist mainly of y sands. These soils h B. Soils having a mode t chiefly of moderately of | etation, are thorough are assigned to fou and C/D), The group infiltration rate (low r deep, well drained to ave a high rate of wa erate infiltration rate deep or deep, moder to texture to moderal | r groups (A, B, C, and D) ps are defined as follows runoff potential) when tho o excessively drained sar | ipitation) and :: proughly nds or drained |
| soils ar from lo The so three d Group wet, Tr gravell Group consist soils th have a Group chiefly | re not protected by veg ng-duration storms, ills in the United States lual classes (A/D, B/D, A. Soils having a high nese consist mainly of y sands. These soils h B. Soils having a mode t chiefly of moderately fin moderate rate of wate C. Soils having a slow of soils having a layer f moderately fine texture | etation, are thorough are assigned to fou and C/D), The group infiltration rate (low r deep, well drained to ave a high rate of wa erate infiltration rate deep or deep, moder the texture to moderate r transmission. infiltration rate when that impedes the do | r groups (A, B, C, and D) ps are defined as follows unoff potential) when tho o excessively drained sar aler transmission. when thoroughly wet. Th ately well drained or well | ipitation and coughly nds or drained e solls consist ater or |
| soils ar from lo The so three d Group wet, Tr gravell Group consist soils th have a Group chiefly soils of transm Group thorouy potenti at or no | re not protected by veg ng-duration storms, ills in the United States lual classes (A/D, B/D, A. Soils having a high rese consist mainly of y sands. These soils h B. Soils having a mode t chiefly of moderately fin moderate rate of wate C. Soils having a slow of soils having a layer f moderately fine texture ission. D. Soils having a very ghly wet. These consis ial, soils that have a high | etation, are thorough are assigned to fou and C/D). The group infiltration rate (low r deep, well drained to ave a high rate of wat erate infiltration rate of wat erate infiltration rate of wat that impedes the do a or fine texture. The slow infiltration rate the tohiefly of clays that in water table, soils bills that are shallow of | nly wet, and receive preci- r groups (A, B, C, and D) ps are defined as follows runoff potential) when tho o excessively drained sar aler transmission. when thoroughly wet. The ately well drained or well tely coarse texture. These in thoroughly wet. These is soils have a slow rate of (high runoff potential) wh that have a high shrink-swell that have a claypan or cla pover nearly impervious m | ipitation ipitation and ic proughly nds or drained e soils consist ater or of water hen ll ay layer |
| soils ar from lo The so three d Group wet, Tr gravell Group consist soils th have a Group chiefly soils of transm Group thorou; potenti at or n These If a soi for drai | re not protected by veg ng-duration storms, ills in the United States lual classes (A/D, B/D, A. Soils having a high rese consist mainly of a y sands. These soils h B. Soils having a mode t chiefly of moderately fin moderate rate of wate C. Soils having a layer moderately fine texture ission. D. Soils having a very ghly wet. These consis ial, soils that have a hig ear the surface, and so soils have a very slow I is assigned to a dual | etation, are thorough are assigned to fou and C/D), The group infiltration rate (low r deep, well drained to ave a high rate of wa erate infiltration rate of deep or deep, moder to the texture to moderate r transmission. infiltration rate when that impedes the do e or fine texture, The slow infiltration rate when that impedes the do e or fine texture, The slow infiltration rate when that impedes the do e or fine texture, The slow infiltration rate the thiefly of clays that gh water table, soils is that are shallow or rate of water transm hydrologic group (A/ ond is for undrained | nly wet, and receive preci- r groups (A, B, C, and D) ps are defined as follows unoff potential) when tho b excessively drained sar aler transmission. when thoroughly wet. The ately well drained or well tely coarse texture. These in thoroughly wet. These is soils have a slow rate of winward movement of was se soils have a slow rate of (high runoff potential) whit t have a high shrink-swell that have a claypan or cla over nearly impervious m hission. (D, B/D, or C/D), the first areas, Only the soils thal | ipitation) and :: proughly nds or drained e soils consist ater or of water hen ll ay layer laterial. letter is |



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control Jeremy Brown 2/9/21 Subject/Title Reviewed by Date Provide run-on and run-off system calculations for the peak discharge from 3/1/21 Ashley Grissom a 24-hr 25-year storm Cells 1 & 2 Calculation Number Sheet DC-BN-735210-004 8 of 23

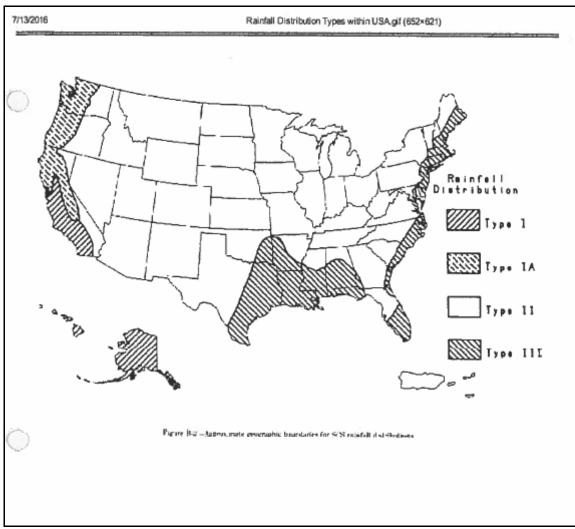


Image 5



| Design Calculations | | company |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 9 of 23 |

| bitation Frequen | cy Data So | erver | | | | | | | Page 1 |
|---|--|--|--|---|---|---|---|---------------------|---------------------|
| | Ě | Local | Statio tion name: T tude: 34.086 E evation (stat | LORSVILLI on ID: 09-86 Taylorsville, 1*, Longitu Ilevation: | i 00 Georgia, I de: -84.982 sta): 721 ft* | us. 8* | | | |
| | | | RECIPITATIO | | | | | | |
| | Sanja Penc | | | el Yekta, Geoffe | ry Bonnin | | aluk, Dale | | |
| | | | National Weath abular <u>PF_c</u> | | | | | | |
| | | | p | tabular | | | | | |
| PDS-based po | oint precipi | itation fre | | | /ith 90% | confiden | ce interva | als (in inc | hes)1 |
| Duration | | | | recurrence | | | | | |
| 1 | 0,464 | 5 0.568 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 6-min (0.321-0.518 | (0.367-0.593) | (0.448-0.726) | (0.520-0.849) | (0.619-1.05) | (0.695-1.23) | (0.768-1.42) | (0.838+1.62) | (0.943-1.92) | (1.02-2.14) |
| 10-min 0.594 (0.471-0.755 | 0.679 | 0.831 (0.655-1.06) | 0.969 (0.761-1.24) | 1.18 (0.907-1.56) | 1.35 (1.02-1.80) | 1.54 (1.12-2.07) | 1.75 (1.23-2.38) | 2.03 (1.38-2.81) | 2.27 (1.50-3.14) |
| 15-min 0.725 (0.574-0.926 | 0.828 | 1.01 (0.799-1.30) | 1.18 (0.928-1.52) | 1.44 (1.11-1.90) | 1.65 (1.24-2.19) | 1.88 (1.37-2.53) | 2.13 (1.50-2.90) | 2.48 (1.68-3.43) | 2.77 (1.83-3.83) |
| 30-min 1.02 (0.811-1.31 | 1.17 (0.924-1.49) | 1.43 (1.13-1.83) | 1.66 (1.31-2.13) | 2,02 (1.56-2.68) | 2.33 (1.75-3.09) | 2.65 | 3.01 | 3.52 | 3.93 |
| 60-min 1.33 (1.05-1.70) | 1.52 (1.20-1.94) | 1.85 (1.46-2.36) | 2.15 (1.69-2.78) | 2.61 (2.01-3.45) | 3.00 (2.25-3.98) | 3.41 (2.49-4.58) | 3.86 | 4,49 | 5.01 (3.31-6.93) |
| 2-hr 1.64 (1.31-2.06) | 1.86 | 2.27 | 2,64 (2.10-3.34) | 3.20 | 3.66 | 4.16 | 4.70 | 5.47 | 6.09 |
| 3-hr 1.84 (1.49-2.30) | 2.10 (1.69-2.62) | 2.55 (2.05-3.19) | 2.96 (2.37-3.71) | 3.56 (2.80-4.60) | 4.07 | 4.60 | 5.18 (3.73-6.91) | 6.00 (4.17-8,12) | 6.55 |
| 6-hr 2.27 (1.86-2.79) | 2.57 | 3.10 | 3.57 | 4,26 (3.38-5.41) | 4.82 | 5.42 | 6.05 | 6.94 (4.90-9.27) | 7.65 |
| 12-hr 2.79 (2.32-3.39) | 3.15 (2.61-3.63) | 3.77 (3.12-4.58) | 4.31 (3.54-5.25) | 5.08 (4.08-6.34) | 5.70 (4.49-7.17) | 6.36 (4.67-8.10) | 7.04 | 7.99 | 8.73 |
| 24-hr 3.34 (2.81-3.99) | 3.79 | 4.54 | 5.18 (4.32-6.21) | 6,07 (4.93-7.43) | 6.77 (5.40-8.35) | 7.48 (5.81-9.38) | 8.22 (6.17-10.5) | 9.21 (6.70-11.9) | 9.98 (7,10-13.0) |
| 2-day 3.87 (3.29-4.55) | 4.43 | 5.34 (4.54-6.30) | 6.10 (5.16-7.22) | 7.14 | 7.95 | 8.75 (6.85-10.5) | 9.56 (7.27-12.0) | 10.6 (7.84-13.6) | 11.4 (8.27-14.6) |
| 3-day 4.24 (3.64-4.96) | 4.81 (4.13-5.62) | 5.76 | 6.56 | 7.66 | 8.53 | 9.40 | 10.3 (7.92-12.6) | 11.5 (8.57-14.6) | 12.4 (9.06-15.9) |
| 4-day (3.94-5.28) | 5.14 (4.43-5.96) | 6.10 (5.25-7.08) | 6.92 (5 93-8.06) | 8.07 | 8.98 (7.38-10.8) | 9.92 | 10.9 (8.43-13.5) | 12.2 (9.16-15.4) | 13.2 (9 72-16 6) |
| 7-day 5.37 (4.69-6.14) | 5.99 (5.22-6.66) | 7.04 (6.13-8.07) | 7.94 (6 88-9.14) | 9.24 (7.84-10.9) | 10.3 | 11.3 (9.21-13.7) | 12.5 | 14.0 (10.7-17.5) | 15.2 (11.3-19.2) |
| 10-day (5.34-6.69) | 6.74 (5.92-7.66) | 7.88 | 8.87 | 10.3 (8.79-12.0) | 11.4 (9.58-13.5) | 12.6 | 13.8 (11.0-16.8) | 15.5 (11.9-19.3) | 16.8 (12.7-21.1) |
| 20-day 8.08 (7.21-9.03) | 8.91 (7.95-9.96) | 10.3 | 11.5 | 13.2 (11.5-15.2) | 14.6 (12.4-16.9) | 16.0 | 17.4 (14.0-20.9) | 19.4 (15.2-23.7) | 21.0 |
| 30-day 9.86 (8.87-10.9) | 10.8 (9.75-12.0) | 12.5 | 13.9 (12.4-15.4) | 15.8 (13.8-17.9) | 17.3 | 18.8 | 20.4 (16.6-24.2) | 22.5 (17.8-27.3) | 24.1 (18.7-29.5) |
| 45-day 12.2 (11.1-13.4) | 13.5 | 15.4 (14.0-17.0) | 17.1 (15.4-18.8) | 19.3 (16.9-21.6) | 20.9 (18.1-23.7) | 22.6 (19,1-26.1) | 24.3 (19.9-28.5) | 26.4 | 28.1 |
| 60-day 14.4 (13.1-15.6) | 15.8 | 18.1 (16.5-19.6) | 19.9 | 22.4 (19.8-24.9) | 24.2 | 25.9 (22.0-29.7) | 27.7 (22.8-32.2) | 29.8 (23.9-35.5) | 31.4 (24.8-37.9) |
| ¹ Precipitation frequency Numbers in parenthesia (for a given duration and bounds are not checked Please refer to NOAA All | (PF) estimates in are PF estimates average recurre against probable | n this table are at lower and unce interval) wi maximum pres | based on frequi pper bounds of t be greater that cipitation (PMP) | ency analysis the 90% confi in the upper bo | of partial dura dence interval ound (or less t | ion series (PE . The probabil han the lower | 25). Ity that precipi bound) is 5%. | tation frequen | cy estimates |
| THE REAL PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS | | as more interio | | ack to Top | | | | 1.00 | |

Image 6



| Project | Prepared by | Date | |
|---|---|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 | |
| | Calculation Number DC-BN- 735210-004 | Sheet 10 of 23 | |

Body of Calculation

See detailed calculations and software output.

```
Drainage Area = 34.88 AC (See Map 1)
Curve Number = 64 (See Attached Table 1)
       31.17 AC @ CN 61 (Grass)
      2.56 AC @ CN 85 (Gravel)
       1.15 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool)
      ((31.17*61)+(2.56*85)+(1.15*98))/34.88 = 63.98 = 64
Time of Concentration = 20.49 Min (See Attached TR55 Worksheet and Map 2)
      Sheet Flow
             Manning's n-Value = 0.15 (Short Grass) (See Table 2)
             Flow Length = 300 \text{ LF}
             Land Slope = (806.50-784.00)/300 = 0.075 = 7.50%
       Shallow Concentrated
             Flow Length = 202 LF
             Watercourse Slope = (784.00-746.50)/202 = 0.1856 = 18.56%
             Surface is Unpaved
       Channel Flow (See Channel Report 1)
             Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep
             Cross Sectional Area = 6.00 SF
             Wetted Perimeter = 8.47 LF
              Channel Slope = (746.50-700.01)/2387 = 0.0195 = 1.95%
             Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
             Flow Length = 2387 LF
       Channel Flow (See Channel Report 2)
             3 - 36" Dia. HDPE Pipes @ 2.75%
             Cross Section Area = 2.079 SF
             Wetted Perimeter = 3.70 LF
             Channel Slope = (700.01-698.00)/74 = 0.0272 = 2.72%
              Manning's n-Value = 0.013 (HDPE Pipes) (See Table 4)
             Flow Length = 74 LF
```

Time Interval = 3 Min Tc*0.1333 = 20.49*0.1333 = 2.73 = 3



| | | = - · · · F - · · · 7 |
|---|---|-----------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 11 of 23 |

Storm Distribution = Type II

Q₂₅ = 78.47 CFS (See Hydrograph Report 1)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|---------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 689 | 0 | 15,324 | 15,324 | 0* |
| 690 | 39,353 | 16,778 | 56,131 | 33,591* |
| 691 | 42,351 | 18,271 | 60,622 | 91,947 |
| 692 | 45,389 | 19,804 | 65,193 | 154,835 |
| 693 | 48,465 | 21,375 | 69,840 | 222,331 |
| 694 | 51,581 | 22,986 | 74,567 | 294,515 |
| 695 | 54,737 | 24,637 | 79,374 | 371,465 |
| 696 | 57,931 | 26,326 | 84,257 | 453,260 |

Note: Stage storage is based on topographic information from 2020. *Dead Storage

Spillways

- Principal Spillway consists of a 72" Dia. Riser with a 48" Dia. CMP.
- Auxiliary Spillway consist of a grass lined trapezoidal weir that is 8' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 693.88 (See Pond Reports 1 & 2)



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown2/9/21Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 1 & 2Reviewed byCalculation Number
DC-BN- 735210-004Sheet
12 of 23



Map 1



| Project | Prepared by | Date | |
|---|---|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 | |
| | Calculation Number DC-BN- 735210-004 | Sheet 13 of 23 | |

| Table 2.1.5-1 Runoff C | urve Numbers ¹ | | | | | |
|---|---|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Cover description | | | | numbe | | DS |
| Cover type and | | Average percent | | | | |
| hydrologic condition | | impervious area ² | A | в | С | D |
| Cultivated land: | without conserv with conservation | vation treatment on treatment | 72 62 | 81 71 | 88 78 | 91 81 |
| Pasture or range land | poor condition good condition | | 68 39 | 79 61 | 86 74 | 89 80 |
| Meadow: good condition | n | | 30 | 58 | 71 | 78 |
| Wood or forest land: | thin stand, poor good cover | r cover | 45 25 | 66 55 | 77 70 | 83 77 |
| Fair condition (Good condition | arks, golf cours (grass cover <50 grass cover 50% (grass cover > 7 | %) to 75%) | 68 49 39 | 79 69 61 | 86 79 74 | 89 84 80 |
| Impervious areas. Paved parking (excluding right | lots, roofs, drivev -of-way) | ways, etc. | 98 | 98 | 98 | 98 |
| right-of-way) Paved; open di | nd storm drains (tches (including ng right-of-way) ight-of-way) | right-of-way) | 98 83 76 72 | 98 89 85 82 | 98 92 89 87 | 98 93 91 89 |
| Urban districts: Commercial and busi Industrial | ness | 85% 72% | 89 81 | 92 88 | 94 91 | 95 93 |
| Residential districts I 1/8 acre or less (town 1/4 acre 1/3 acre 1/2 acre 1 acre 2 acres | | ize: 85% 38% 30% 25% 20% 12% | 77 61 57 54 51 46 | 85 75 72 70 68 65 | 90 83 81 80 79 77 | 92 87 86 85 84 82 |
| Developing urban an Newly graded areas only, no vegetation) | (pervious areas | 3 | 77 | 86 | 91 | 94 |
| Average runoff condition. The average percent impr follows impervious areas at areas are considered equiv SCS method has an adjustr CNs shown are equivalen cover type. | ervious area shown v re directly connected alent to open space i ment to reduce the ef | to the drainage system. Imp In good hydrologic condition Rect. | If the impe | as have a ervious are | CN of 98. a is not o | and pervicus onnected, the |



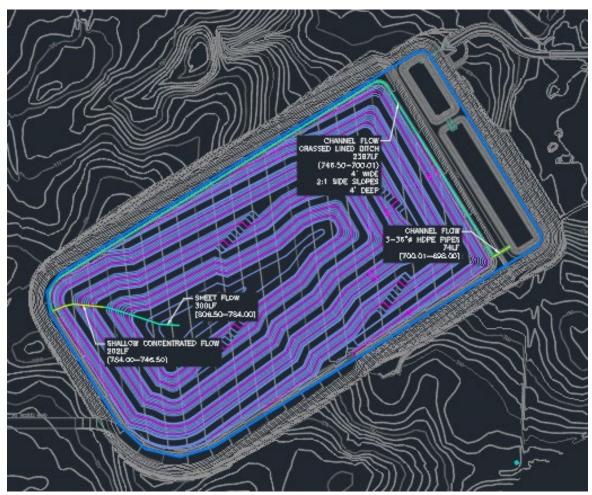
| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 14 of 23 |

TR55 Tc Worksheet Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Hyd. No. 2 Ditch Description B C Totals <u>A</u> Sheet Flow = 0.150 0.011 0.011 Manning's n-value = 300.0 0.0 Flow length (ft) 0.0 Two-year 24-hr precip. (in) = 3.79 0.00 0.00 = 7.50 Land slope (%) 0.00 0.00 Travel Time (min) = 12.78 + 0.00 0.00 12.78 + = Shallow Concentrated Flow = 202.00 0.00 0.00 Flow length (ft) 0.00 Watercourse slope (%) = 18.56 0.00 Paved Paved Surface description = Unpaved =6.95 0.00 Average velocity (ft/s) 0.00 Travel Time (min) = 0.48 0.00 0.00 0.48 + = + Channel Flow X sectional flow area (sqft) = 6.00 0.00 0.00 Wetted perimeter (ft) = 8.47 0.00 0.00 Channel slope (%) 0.00 0.00 = 1.95 Manning's n-value = 0.030 0.015 0.015 Velocity (ft/s) =5.51 0.00 0.00 Flow length (ft) ({0})2387.0 0.0 0.0 Travel Time (min) = 7.23 0.00 0.00 7.23 + + = Total Travel Time, Tc 20.49 min

TR55 Worksheet



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control Jeremy Brown 2/9/21 Subject/Title Reviewed by Date Provide run-on and run-off system calculations for the peak discharge from Ashley Grissom 3/1/21 a 24-hr 25-year storm Cells 1 & 2 Calculation Number DC-BN- 735210-004 Sheet 15 of 23



Map 2



| 8 | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 16 of 23 |

| Surface Description | <u>n</u> |
|---|--|
| Smo oth surfaces (concrete, asphalt, | |
| gravel, or bare soil) | 0.011 |
| Fallow (no residue) | 0.05 |
| Cultivated soils | 0.00 |
| Residue cover < 20% | 0.06 |
| Residue cover > 20% | 0.17 |
| Grass | 0, 11 |
| Short grass prairie | 0.15 |
| Dense grasses ² | 0.24 |
| Bermuda grass | 0.41 |
| Range (natural) | 0.13 |
| Woods ³ | |
| Light underbrush | 0.40 |
| Dense underbrush | 0.80 |
| The n values are a composite of information by Engman (1988). | |
| | |
| ncludes species such as weeping lovegrass, bluegrass, buffalo (| grass, blue grama grass, and native grass mixtures |

Table 2



| Design Calculations | | company |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 17 of 23 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® Civ | 11 3D® by Autodesk, Inc. | | Thursday, Feb 4 2021 |
|---|---|--------------------------|--|----------------------|
| Cells 1 & 2 Ditch | 1 | | | |
| Trapezoidal Bottom Width (ft) Side Slopes (z:1) Total Depth (ft) Invert Elev (ft) Slope (%) N-Value Calculations Compute by: Known Q (cfs) | = 4.00 = 700.01 = 1.95 = 0.030 | | Highlighted Depth (ft) Q (cfs) Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) Top Width (ft) EGL (ft) | = 1.06 |
| Elev (ft) | | 0 | | Depth (f |
| 705.00 | | Section | 1 | 4.99 |
| 704.00 | | | | 3.99 |
| 703.00 | | | | 2.99 |
| 702.00 | | | | 1.99 |
| 701.00 | | | | 0.99 |
| 700.00 | | | | -0.01 |
| | | | | |

Channel Report 1



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control Jeremy Brown 2/9/21 Reviewed by Ashley Grissom Subject/Title Date Provide run-on and run-off system calculations for the peak discharge from 3/1/21 a 24-hr 25-year storm Cells 1 & 2 Sheet 18 of 23 Calculation Number DC-BN-735210-004

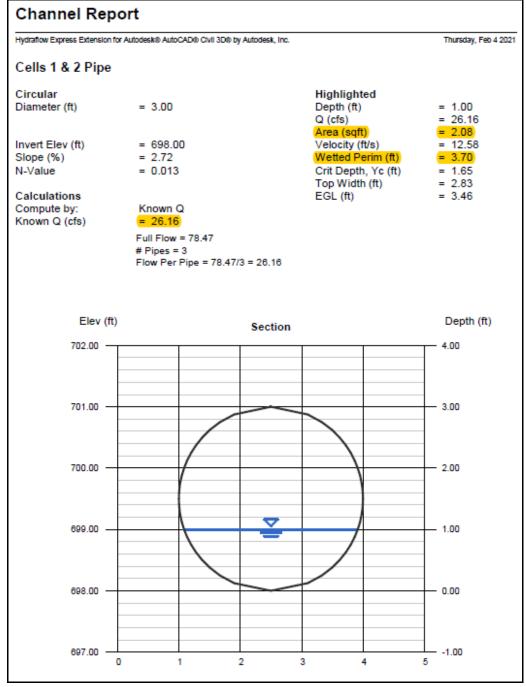
λ

| s n Values | | | Pag |
|--|-------|-------|-------|
| 3. finished, with gravel on bottom | 0.015 | 0.017 | 0.020 |
| 4. unfinished | 0.014 | 0.017 | 0.020 |
| 5. gunite, good section | 0.016 | 0.019 | 0.023 |
| 6. gunite, wavy section | 0.018 | 0.022 | 0.025 |
| 7. on good excavated rock | 0.017 | 0.020 | |
| 8. on irregular excavated rock | 0.022 | 0.027 | |
| d. Concrete bottom float finish with sides of: | | | |
| 1. dressed stone in mortar | 0.015 | 0.017 | 0.020 |
| 2. random stone in mortar | 0.017 | 0.020 | 0.024 |
| 3. cement rubble masonry, plastered | 0.016 | 0.020 | 0.024 |
| 4. cement rubble masonry | 0.020 | 0.025 | 0.030 |
| 5. dry rubble or riprap | 0.020 | 0.030 | 0.035 |
| e. Gravel bottom with sides of: | | 1 | |
| 1. formed concrete | 0.017 | 0.020 | 0.025 |
| 2. random stone mortar | 0.020 | 0.023 | 0.026 |
| 3. dry rubble or riprap | 0.023 | 0.033 | 0.036 |
| f. Brick | | | 1 |
| 1. glazed | 0.011 | 0.013 | 0.015 |
| 2. in cement mortar | 0.012 | 0.015 | 0.018 |
| g. Masonry | | | |
| 1. cemented rubble | 0.017 | 0.025 | 0.030 |
| 2. dry rubble | 0.023 | 0.032 | 0.035 |
| h. Dressed ashlar/stone paving | 0.013 | 0.015 | 0.017 |
| i. Asphalt | | | 1 |
| 1. smooth | 0.013 | 0.013 | |
| 2. rough | 0.016 | 0.016 | |

Table 3



| Design Calculations | | company |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 |
| | Calculation Number DC-BN- 735210-004 | Sheet 19 of 23 |





| Project | Prepared by | Date | |
|---|---|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/9/21 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 | Reviewed by Ashley Grissom | Date 3/1/21 | |
| | Calculation Number DC-BN- 735210-004 | Sheet 20 of 23 | |

| ning's n Values | | | Page |
|--|-------|-------|-------|
| 7. Concrete: | | I | |
| Culvert, straight and free of debris | 0.010 | 0.011 | 0.013 |
| Culvert with bends, connections, and some debris | 0.011 | 0.013 | 0.014 |
| Finished | 0.011 | 0.012 | 0.014 |
| Sewer with manholes, inlet, etc., straight | 0.013 | 0.015 | 0.017 |
| Unfinished, steel form | 0.012 | 0.013 | 0.014 |
| Unlinished, smooth wood form | 0.012 | 0.014 | 0.016 |
| Unfinished, rough wood form | 0.015 | 0.017 | 0.020 |
| 8. Wood: | | | |
| Stave | 0.010 | 0.012 | 0.014 |
| Laminated, treated | 0.015 | 0.017 | 0.020 |
| 9. Clay: | | | |
| Common drainage tile | 0.011 | 0.013 | 0.017 |
| Vitrified sewer | 0.011 | 0.014 | 0.017 |
| Vitrilied sewer with manholes, inlet, etc. | 0.013 | 0.015 | 0.017 |
| Vitrified Subdrain with open joint | 0.014 | 0.016 | 0.018 |
| 10. Brickwork: | | | |
| Glazed | 0.011 | 0.013 | 0.015 |
| Lined with cement mortar | 0.012 | 0.015 | 0.017 |
| Sanitary sewers coated with sewage slime with bends and connections | 0.012 | 0.013 | 0.016 |
| Paved invert, sewer, smooth bottom | 0.016 | 0.019 | 0.020 |
| Rubble masonry, cemented | 0.018 | 0.025 | 0.030 |

Table 4



Design Calculations Project Prepared by Date 2/9/21 Plant Bowen Run-on Run-off Control Jeremy Brown Subject/Title Reviewed by Date Provide run-on and run-off system 3/1/21 Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 1 & 2 Calculation Number Sheet 21 of 23 DC-BN-735210-004 Hydrograph Report Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Thursday, 02 / 4 / 2021 Hyd. No. 3 Pipe Hydrograph type = SCS Runoff Peak discharge = 78.47 cfs Storm frequency = 25 yrs = 12.15 hrs Time to peak Time interval = 3 min Hyd. volume = 285,591 cuft Drainage area = 34,880 ac Curve number = 64* Basin Slope = 0.0 % Hydraulic length = 0 ft Tc method = TR55 = 20.60 min Time of conc. (Tc) Total precip. = 6.07 in Distribution = Type II Storm duration = 24 hrs Shape factor = 484 * Composite (Area/CN) = [(31.170 x 61) + (2.560 x 85) + (1.150 x 98)] / 34.880 Pipe Q (cfs) Q (cfs) Hyd. No. 3 -- 25 Year 80.00 80.00 70.00 70.00 60.00 60.00 50.00 50.00 40.00 40.00 30.00 30.00 20.00 20.00 10.00 10.00 0.00 0.00 9 12 15 18 21 27 0 3 6 24 Time (hrs) Hyd No. 3

Hydrograph Report 1



691.00

_____ 689.00 120.0

Discharge (cfs)

100.0

90.0

110.0

| | ulatio | 115 | | | | | | | | | - | _ | Compa |
|--|--------------------------------|---|---------------------------|--|---------------------------|-------------------------------|---|-------------|---|----------------------------|----------------------|----------------------|---------------------|
| t | | | | | | Prepareo | 5 | | | | | Date | |
| Bower | n Run | on Rui | n-off Co | ontrol | J | leremy | y Brown | | | | | 2/9/21 | |
| ^{oject/Title} ovide run-on and run-off system lculations for the peak discharge from 24-hr 25-year storm Cells 1 & 2 | | | | | I | Reviewed by Ashley Grissom | | | | | Date 3/1/21 | | |
| 111 20 9 | your o | | | | | | tion Numb N- 73521 | |)4 | | | Sheet 22 o | ıf 23 |
| Por | nd R | eport | | | | | | | | | | | |
| Pond Pond Contou | No. 1 - Data Irs -User-c | Cell 182 | Sed Pond | /Clear Po | ool | | esk, Inc. v12 culation. Begin | ing Ele | vation = 6 | 89.00 ft | | Frida | ay, 02 / 5 / 2021 |
| Stage (| rt) | Elevatio | n (ft) | Contour a | rea (sqft) | Incr. | Storage (cuft) | Т | otal stor | age (cuft) | | | |
| 0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 | | 689.00 690.00 691.00 693.00 693.00 694.00 695.00 | | 15,324 56,131 60,622 65,193 69,840 74,567 79,374 84,257 | | | 0 33,591 58,356 62,887 67,496 67,496 72,183 76,950 81,795 | | 33,5 91,9 154,8 222,3 294,5 371,4 453,2 | 47 35 31 15 65 | | | |
| Culve | rt / Orifi | ice Struct | ures | | | v | Veir Struct | ures | | | | | |
| | | [A] | [B] | [C] | [PrfRsr | 1 | | | [A] | [B] | [C] | [D] | |
| Rise (in Span (i No. Bar Invert E | n) rrels | 48.00 48.00 1 673.50 | 0.00 0.00 0 0.00 | 0.00 0.00 0 0.00 | 0.00 0.00 0 0.00 | C W | rest Len (ft) rest El. (ft) /eir Coeff. /eir Type | - 6 | 18.85 594.50 3.33 | 0.00 0.00 3.33 | 0.00 0.00 3.33 | 0.00 0.00 3.33 | |
| Length Slope (* N-Value | (ft) %) 9 | 128.00 0.40 .024 | 0.00 0.00 .013 | 0.00 0.00 .013 | 0.00 n/a n/a | M | luiti-Stage | - 1 | (es | No | No | No | |
| Onflice Multi-St | | = 0.60 = n/a | 0.60 No | 0.60 No | 0.60 No | | xiil.(in/hr) W Elev. (it) | | 1.000 (by 1.00 | Contour) | | | |
| | | | Note | Culvert/Orific | e outflows are a | inalyzed und | eriniet (ic) and out | let (oc) co | ntrol. Weir r | isers checked | tor orifice oc | nditiona (ic) a | nd submergence (s). |
| tana (B) | | | | | | ane / D | ischarge | | | | | | |
| tage (ft) 8.00 | | | | | | | | | | | | | Elev (ft) 697.00 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 6.00 - | - | | | | | | | | | | | | 695.00 |
| | | | | | | | | | | | | | |
| 4.00 - | | | | | | | | | | | + | | 693.00 |
| | 1 | | I | | | | | | 1 | | | | |

70.0

80.0

50.0 60.0

2.00 -

0.00 <u>|</u> 0.0

10.0

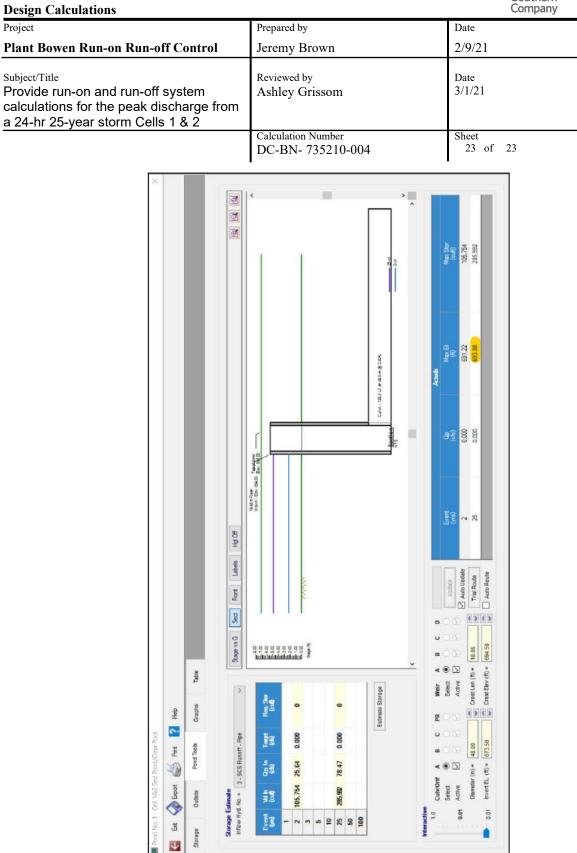
Total Q

20.0

30.0

40.0





Pond Report 2



Technical and Project Solutions Calculation

Calculation Number: DC-BN-735210-002

| Project/Plant: Bowen | Unit(s): 1 - 4 | Discipline/Area: Civil | | | |
|--|-----------------------------|---------------------------|--|--|--|
| Title/Subject: Run-on and Run-off Study for Bowen Cells 3-8 | | | | | |
| Purpose/Objective: To determine if the Cell's stormwater management can safely manage and pass the design storm event. | | | | | |
| System or Equipment Tag Numbers: N/A | Originator: Jeremy Brown | | | | |

Contents

| Торіс | Page | Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence) | # of Pages |
|---|-------|---|---------------|
| Purpose of Calculation | 1 | | 1 |
| Summary of Conclusions | 1 | | 1 |
| Project Narrative | 1-3 | | 3 |
| Methodology | 3-4 | | 2 |
| Assumptions/Criteria | 4 | | 1 |
| Design Inputs/References | 5-10 | | 6 |
| Body of Calculation | 11-70 | | 59 |
| Total # of pages including cover sheet & attachments: | 70 | | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|-------------|---|------------------------------|----------------------------|----------------------------|
| 0 | Issued for Review | JKB 3/19/21 | AOG 4/1/21 | JWM 4/6/21 |
| 1 | Replace concrete flumes with pipes and changes to leachate system in Cells 5&6. | JKB 9/15/23 | AOG 9/21/23 | JWM 9/25/23 |
| | | | | |
| | | | | |

Notes:





| | | eepairij |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 1 of 70 |

Purpose of Calculation

The purpose of this calculation is to determine if the existing sedimentation ponds and clear pools can sufficiently handle run-on/run-off during a minimum 25-yr, 24-hr storm event per federal stormwater requirements Title 40 CFR Part 257.81 and the Georgia Environmental Protection Division's (EPD) Georgia CCR Rule (391-3-4-.10).

Summary of Conclusions

Based on our analysis, the detention pond system is adequate to collect and control the volume of water resulting from a 24-hour 25-year storm, as required.

| | Normal Pool | Maximum 25 | Spillway/Top of Dike | Freeboard to |
|------------------------------|---------------------|------------------------|-------------------------|--------------------|
| | Elevation (feet, | year pool elevation | Elevation (feet, | Spillway (feet, |
| Storage Pond Name | NAVD 88) | (feet, NAVD 88) | NAVD 88) | NAVD 88) |
| Cells 3, 5 & 7 Clear Pool | 685.5 | 688.37 | 690.50/694.00 | 2.13/5.63 |
| Cells 3, 5 & 7 Sediment Pond | 685.5 | 688.37 | 690.50/694.00 | 2.13/5.63 |
| Cell 4 Clear Pool | 698.50 | 701.04 | 702.00/704.00 | 0.96/2.96 |
| Cell 4 Sediment Pond | 698.50 | 701.04 | 702.00/704.00 | 0.96/2.96 |
| Cell 6 Clear Pool | 686 | 688.25 | 689.50/692.00 | 1.25/3.75 |
| Cell 6 Sediment Pond | 686 | 688.25 | 689.50/692.00 | 1.25/3.75 |
| Cell 8 Clear Pool | 686 | 688.03 | 689.50/692.00 | 1.47/3.97 |
| Cell 8 Sediment Pond | 686 | 688.03 | 689.50/692.00 | 1.47/3.97 |

Project Narrative

The Plant Bowen CCB Disposal Facility Cells 3-8 site is located in Bartow County and is approximately 1.5 miles East of Euharlee, Georgia and 6 miles southwest of Cartersville, Georgia. The plant is bordered on the north and east by the Etowah River and on the south and west by farmland.

Since Cells 3-8 share an interconnected cap the storage area information below is based on the drainage area for each cells' sedimentation and clear pool. It should be noted that Cells 3, 5 & 7 share a sedimentation pond and clear pool.



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control 9/15/23 Jeremy Brown Subject/Title Reviewed by Date 9/21/23 Provide run-on and run-off system Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet 2 of 70 DC-BN-735210-002

<u>Cells 3, 5 & 7</u>

Cells 3, 5 & 7 cover 41.47 acres and their cap is not divided by any means. (See Image 1).

Cells 3, 5 & 7 are comprised of a 43.27 acres storage cell, 2.25 acres sedimentation pond, 0.73 acres clear pool, berms, access roads and ditches. (See Image 2) Cells 3, 5 & 7 include a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for these cells. Run-off from this area is directed through a down drain system into an interior perimeter ditch and is conveyed by pipe(s) into a sedimentation pond that is connected to a clear pool via two 48" diameter risers and two 30" diameter pipes. Stormwater from the clear pool is discharged through two 54" diameter risers and two 36" diameter pipes.

The sediment pond and clear pool both have an auxiliary spillway that is a concrete trapezoidal weir. The auxiliary spillway is 20' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cells 3, 5 & 7.

<u>Cell 4</u>

Cell 4 covers 12.83 acres and its cap is not divided by any means. (See Image 1).

Cell 4 is comprised of a 12.24 acres storage cell, 1.27 acres sedimentation pond, 0.45 acres clear pool, berms, access roads and ditches. (See Image 2) Cell 4 includes a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for this cell. Run-off from this area is directed through a down drain system into an interior perimeter ditch and is conveyed by pipes into a sedimentation pond that is connected to a clear pool via two 48" diameter risers and two 30" diameter pipes. Stormwater from the clear pool is discharged through a 66" diameter riser and 42" diameter pipe.

The sediment pond and clear pool both have an auxiliary spillway that is a concrete trapezoidal weir. The auxiliary spillway is 18' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cell 4.

<u>Cell 6</u>

Cell 6 covers 28.61 acres and its cap is not divided by any means. (See Image 1).



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control 9/15/23 Jeremy Brown Subject/Title Reviewed by Date 9/21/23 Provide run-on and run-off system Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet 3 of 70 DC-BN-735210-002

Cell 6 is comprised of a 16.37 acres storage cell, 1.52 acres sedimentation pond, 0.31 acres clear pool, berms, access roads and ditches. (See Image 2) Cell 6 includes a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for these cells. Run-off from this area is directed through a down drain system into an interior perimeter ditch and is conveyed by pipes into a sedimentation pond that is connected to a clear pool via a 36" diameter riser and six 24" diameter pipes. Stormwater from the clear pool is discharged through a 36" diameter riser and two 24" diameter pipes.

The sediment pond and clear pool both have an auxiliary spillway that is a grassed trapezoidal weir. The auxiliary spillway is 8' wide with 3:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cell 6.

<u>Cell 8</u>

Cell 8 cover 10.49 acres and its cap is not divided by any means. (See Image 1).

Cell 8 is comprised of a 13.51 acres storage cell, 0.74 acres sedimentation pond, 0.34 acres clear pool, berms, access roads and ditches. (See Image 2) Cell 8 includes a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for this cell. Run-off from this area is directed through a down drain system into an interior perimeter ditch into a sedimentation pond that is connected to a clear pool via a 36" diameter riser and five 24" diameter pipes. Stormwater from the clear pool is discharged through a 36" diameter riser and two 24" diameter pipes.

The sediment pond and clear pool both have an auxiliary spillway that is a grassed trapezoidal weir. The auxiliary spillway is 8' wide with 3:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cell 8.

Methodology

The stormwater flows were calculated using the National Resources Conservation Service method (also known as the Soil Conservation Service (SCS) method) using a 25-yr, 24-hr design storm event.



| Design Calculations | | Sompany |
|---|---|------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 4 of 70 |
| | | • |

Storm basin calculation information was gathered from a number of sources to include the Georgia Stormwater Manual and Technical Release 55.

The National Resources Conservation Service (NCRS) provided information on the soil characteristics and hydrologic groups. The soil types found on the site are Etowah Loam (17.1%), Waynesboro Clay Loam (81.8%) and Whitwell Silt Loam (1.1%) (See Images 3 & 4). Therefore, hydrological group "B" should be used to best reflect the characteristics of the soils on site.

Run-off curve number data was determined using Table 2.1.5-1 from the Georgia Stormwater Management Manual. Run-off coefficient data was determined by utilizing Table 2.1.5-2 from the Georgia Stormwater Management Manual and Manning's n for Channels (Chow, 1959).

Appendix B from the TR-55 was used to determine the rain distribution for Plant Bowen is Type II. (See Image 5)

NOAA Atlas 14 was used to determine the 24-hour precipitation for the design storm event of 25-yr for Plant Bowen is 6.07 in. (See Image 6)

Assumptions/Criteria

- Refer to Title 40 CFR Part 257.81 Hydrologic and hydraulic capacity requirements for the runon and run-off controls for CCR landfills.
- Other assumptions are listed on attached calculation sheets.

Design Inputs/References

- AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Hydrographs Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Express Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- NOAA Atlas 14, Volume 9, Version 2 for Taylorsville, GA.
- TR-55 Urban Hydrology for Small Watersheds, Appendix B, National Resources Conservation Service, Conservation Engineering Division, 1986.
- Georgia Power Company Plant Bowen CCB Disposal Facility Design and Operation Plans H15061 H15097, H15296 H15315 and H52258 H52260.



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byCalculation Number
DC-BN- 735210-002Sheet
5 of 70

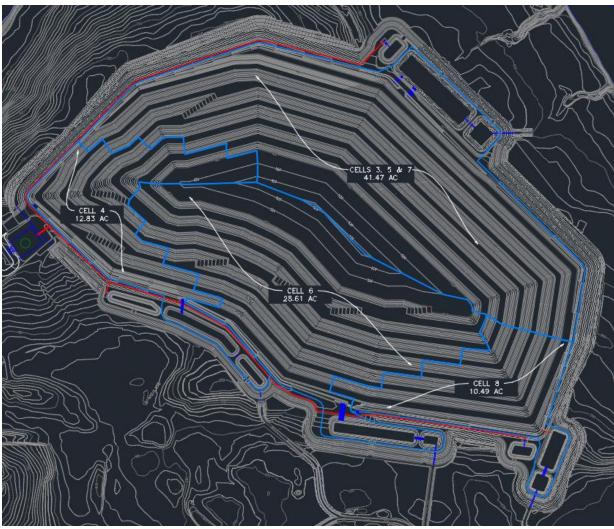


Image 1



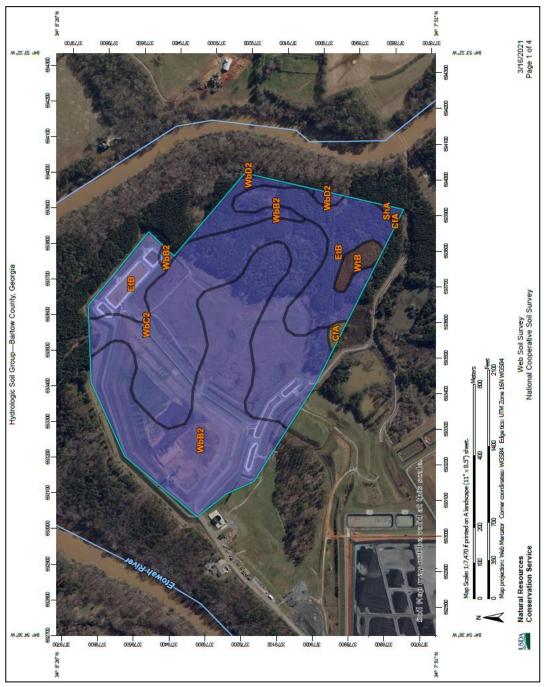
Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
6 of 70Sheet



Image 2



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
7 of 7070





| Project | Prepared by | Date |
|---|---|------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 8 of 70 |

| | , | ologic Soil G | | |
|-------------------------|---|-----------------------|--|----------------|
| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| CfA | Cedarbluff loam, 0 to 2 percent slopes, occasionally flooded | C/D | 0.0 | 0.05 |
| EtB | Etowah loam, 2 to 6 percent slopes | в | 19.9 | 17.15 |
| WbB2 | Waynesboro clay loam, 2 to 6 percent slopes, moderately eroded | В | 50.0 | 42.95 |
| WbC2 | Waynesboro clay loam, 6 to 10 percent slopes, moderately eroded | В | 45.0 | 38.65 |
| WbD2 | Waynesboro clay loam, 10 to 15 percent slopes, moderately eroded | В | 0.3 | 0.35 |
| WtB | Whitwell silt loam, 1 to 5 percent slopes, rarely flooded | B/D | 1.3 | 1.15 |
| Totals for Area of Inte | erest | | 116.5 | 100.09 |
| groups according | oups are based on estir | tration when the soil | ntial. Soils are assigned t is are not protected by ve storms. | |

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

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

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

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

| USDA | Natural Resources | Web Soil Survey | 3/17/2021 |
|------|----------------------|----------------------------------|-------------|
| | Conservation Service | National Cooperative Soil Survey | Page 3 of 4 |
| | | | |



Design Calculations Prepared by Project Date Plant Bowen Run-on Run-off Control 9/15/23 Jeremy Brown Date 9/21/23 Subject/Title Reviewed by Provide run-on and run-off system Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 9 of 70

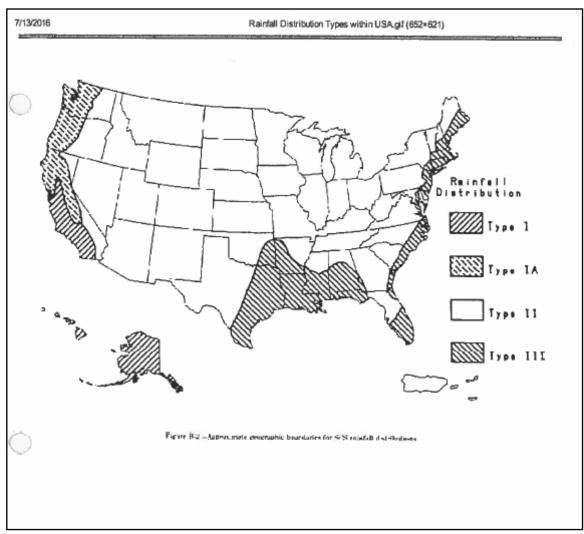


Image 5



| | | 1 3 |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 10 of 70 |

| cipitation | Frequenc | y Data Se | erver | | | | | | | Page 1 c |
|--|--|--|--|---|--|--|-------------------------------------|-------------------------------------|------------------------------------|------------------------------------|
| | | Ě | Local Latit | Station tion name: T tude: 34.086 E evation (stat source | LORSVILLE in ID: 09-86 aylorsville, 1*, Longitu levation: tion metada ce: Geogle Map | 5 00 , Georgia, I de: -84.982 sta): 721 ft' s | US* 8* | | | |
| | | Sania Perica | | RECIPITATIO | | | | abis Date | | |
| | Sanja Perica, Deborah Marini, Sandra Pavlovic, Lahani Roy, Michael St, Leuvert, Can Trypeiuk, Dete Urnah, Michael Yeka, Geoffery Bonnia NDAL, National Walther Sanico, Silver Spring, Morstand | | | | | | | | | |
| | PE. tabular PF graphical Maos & aerials | | | | | | | | | |
| | PF tabular | | | | | | | | | |
| PDS | -based po | int precipi | tation fre | quency es | timates v | vith 90% | confiden | ce interva | als (in inc | hes) ¹ |
| Duration | | 2 | 5 | Average 10 | 25 | Interval (ye | ars) | 200 | 500 | 1000 |
| 5-min | 0.406 | 0.464 (0.367-0.593) | 0.568 | 0.662 | 0.804 | 0.924 | 1.05 | 1.19 | 1.39 | 1.55 |
| 10-min | 0.594 | 0.679 (0.537-0.868) | 0.831 (0.655-1.06) | 0.969 | 1.18 | (0.695-1.23) 1.35 (1.02-1.80) | (0.768-1.42) 1.54 (1.12-2.07) | (0.838-1.62) 1.75 (1.23-2.38) | 2.03 | (1.02-2.14) 2.27 (1.50-3.14) |
| 15-min | 0.725 | 0.828 | 1.01 | 1.18 | 1.44 | 1.65 (1.24-2.19) | 1.88 (1.37-2.53) | 2.13 | (1.38-2.81) 2.48 (1.68-3.43) | 2.77 (1.83-3.83) |
| 30-min | 1.02 | 1.17 (0.924-1.49) | 1.43 (1.13-1.83) | 1.66 (1.31-2.13) | 2,02 (1.56-2.68) | 2.33 (1.75-3.09) | 2.65 | 3.01 | 3.52 | 3.93 |
| 60-min | 1.33 | 1.52 (1.20-1.94) | 1.85 (1.46-2.36) | 2.15 (1.69-2.76) | 2.61 (2.01-3.45) | 3.00 (2.25-3.98) | 3.41 (2.49-4.58) | 3.86 | 4,49 (3.05-6.21) | 5.01 (3.31-6.93) |
| 2-hr | 1.64 (1.31-2.06) | 1.86 (1.49-2.35) | 2.27 (1.81-2.86) | 2,64 (2.10-3.34) | 3.20 | 3.66 | 4.16 | 4.70 | 5.47 (3.77-7.46) | 6.09 (4.09-8.32) |
| 3-hr | 1.84 (1.49-2.30) | 2.10 (1.69-2.62) | 2.55 (2.05-3.19) | 2.96 (2.37-3.71) | 3.56 (2.80-4.60) | 4.07 | 4.60 | 5.18 (3.73-6.91) | 6.00 (4.17-8,12) | 6.66 |
| 6-hr | 2.27 (1.86-2.79) | 2.57 (2.10-3.17) | 3.10 (2.53-3.83) | 3.57 (2.90-4.41) | 4,26 (3.38-5.41) | 4.82 (3.75-6.16) | 5.42 (4.10-7.02) | 6.05 (4.42-7.96) | 6.94 (4.90-9.27) | 7.65 |
| 12-hr | 2.79 (2.32-3.39) | 3.15 (2.61-3.63) | 3.77 (3.12-4.58) | 4.31 (3.54-5.25) | 5.08 (4.08~6.34) | 5.70 (4.49-7.17) | 6.36 (4.67-8.10) | 7.04 (5.21-9.11) | 7.99 (5.72-10.5) | 8.73 (6,11-11,6) |
| 24-hr | 3.34 (2.81-3.99) | 3.79 (3.18-4.53) | 4.54 (3.80-5.44) | 5.18 (4.32-6.21) | 6,07 (4.93-7.43) | 6.77 (5.40-8.35) | 7.48 (5.61-9.38) | 8.22 (6.17-10.5) | 9.21 (6.70-11.9) | 9.98 (7,10-13.0) |
| 2-day | 3.87 (3.29-4.55) | 4.43 (3.77-5.21) | 5.34 (4.54_6.30) | 6.10 (5.16-7.22) | 7.14 (5.88-8.60) | 7.95 (6,42-9.65) | 8.75 (6.85-10.5) | 9.55 (7.27-12.0) | 10.6 (7.84-13.6) | 11.4 (8.27-14.6) |
| 3-day | 4.24 (3.64-4.95) | 4.81 (4,13-5.62) | 5.76 (4.93-6.73) | 6.56 (5.59-7.68) | 7.66 (6.37-9.16) | 8.53 (6.95-10.3) | 9.40 (7.47-11.5) | 10.3 (7.92-12.6) | 11.5 (8.57-14.6) | 12.4 (9.06-15.9) |
| 4-day | 4.56 (3.94-5.28) | 5.14 (4.43-5.95) | 6.10 (5.25-7.08) | 6.92 (5 93-8.06) | 8.07 (6.76-9.61) | 8.98 (7.38-10.8) | 9.92 (7.94-12.1) | 10.9 (8.43-13.5) | 12.2 (9.16-15.4) | 13.2 (972-16 6) |
| 7-day | 5.37 (4.69-6.14) | 5.99 (5.22-8.88) | 7.04 (6.13-8.07) | 7.94 (6 88-9 14) | 9,24 (7.84-10.9) | 10.3 (8.56-12.2) | 11.3 (9.21-13.7) | 12.5 (9.80-15.3) | 14.0 (10.7-17.5) | 15.2 (11.3-19.2) |
| 10-day | 6.07 (5.34-6.69) | 6.74 (5.92-7.66) | 7.88 (6.91-8.97) | 8.87 (7.74-10.1) | 10.3 (8.79-12,0) | 11.4 (9.58-13.5) | 12.6 (10 3-15.1) | 13.8 (11.0-16.8) | 15.5 (11.9-19.3) | 16.8 (12.7-21.1) |
| 20-day | 8.08 (7.21-9.03) | 8.91 (7.95-9.96) | 10.3 (9.17-11.5) | 11.5 (10.2-12.9) | 13.2 (11.5-15.2) | 14.6 (12.4-16.9) | 16.0 (13.3-18.8) | 17.4 (14.0-20.9) | 19.4 (15.2-23.7) | 21.0 (16.1-25.9) |
| 30-day | 9.86 (8.87-10.9) | 10.8 (9.75-12.0) | 12.5 (11.2-13.8) | 13.9 (12.4-15.4) | 15.8 (13.8-17.9) | 17.3 (14.9-19.8) | 18.8 (15.8-22.0) | 20.4 (16.6-24.2) | 22.5 (17.8-27.3) | 24.1 (18.7-29.5) |
| 45-day | 12.2 (11.1-13.4) 14.4 | 13.5 (12.2-14.8) 15.8 | 15.4 (14.0-17.0) 18.1 | 17.1 (15.4-18.8) 19.9 | 19.3 (16.9-21.6) | 20.9 (18.1-23.7) | 22.6 (19.1-28.1) | 24.3 (19.9-28.5) | 26.4 (21.1-31.7) | 28.1 (22.0-34.1) |
| 60-day | (13.1-15.6) | (14.4-17.2) | (16.5-19.6) | (18.1-21.8) | 22.4 (19.8-24.9) | 24.2 (21.0-27.2) | 25.9 (22.0-29.7) | 27.7 (22.8-32.2) | 29.8 (23.9-35.5) | 31.4 (24.8-37.9) |
| Numbers i (for a giver bounds an | tion frequency (In parenthesis ar In duration and a e not checked a er to NOAA Atla | e PF estimates verage recurrer gainst probable | at lower and u tce interval) wi maximum pres | pper bounds of It be greater that cipitation (PMP) nation. | the 90% confi n the upper bo estimates and | dence interva | The probabil | ity that precipi bound) is 5% | Estimates at | cy estimates upper |
| | | | | _ | ack to Top | | | | | |
| | | | | PF | graphica | al | | | | |

Image 6



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 11 of 70 |

See detailed calculations and software output.

<u>Cells 3, 5 & 7</u>

Cells 3, 5 & 7 is broken down into 3 smaller subbasins (1A, 1B & 1C)

Drainage Area = 11.20 AC (See Map 1A)

Curve Number = 64 (See Table 1) 10.88 AC @ CN 61 (Grass) 0.32 AC @ CN 85 (Gravel) ((10.88*61)+(0.32*85))/10.88 = 63.50 = 64

```
Time of Concentration = 22.18 Min (See TR55 Worksheet 1A and Map 2A)
       Sheet Flow
             Manning's n-Value = 0.15 (Short Grass) (See Table 2)
             Flow Length = 167 LF
             Land Slope = (826.25-821.50)/167 = 0.0284 = 2.84%
       Shallow Concentrated
             Flow Length = 161 LF
             Watercourse Slope = (821.50-820.50)/161 = 0.0062 = 0.62%
             Surface is Unpaved
       Channel Flow (See Channel Report 1A1)
             15" Dia. HDPE Downdrain Pipes
             Cross Sectional Area = 0.23 SF
             Wetted Perimeter = 1.28 LF
             Channel Slope = (820.50-724.00)/1099 = 0.0878 = 8.78%
             Manning's n-Value = 0.012 (HDPE Pipe)(See Table 4)
             Flow Length = 1099 LF
       Channel Flow (See Channel Report 1A2)
             Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep
             Cross Sectional Area = 4.99 SF
             Wetted Perimeter = 7.89 LF
             Channel Slope = (724.00-694.00)/1847 = 0.0162 = 1.62%
             Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
             Flow Length = 1847 LF
       Channel Flow (See Channel Report 1A3)
```



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 12 of 70 |

2 – 30" Dia. HDPE Pipes Cross Sectional Area = 1.00 SF Wetted Perimeter = 2.66 LF Channel Slope = (694.00-692.00)/60 = 0.0333 = 3.33% Manning's n-Value = 0.012 (HDPE Pipes) (See Table 4) Flow Length = 60 LF

Time Interval = 3 Min

Tc*0.1333 = 22.18*0.1333 = 2.96 = 3

Storm Distribution = Type II

Q₂₅1A = 23.05 CFS (See Hydrograph Report 1A)

Drainage Area = 27.35 AC (See Map 1B)

```
Curve Number = 64 (See Table 1)
27.06 AC @ CN 61 (Grass)
0.29 AC @ CN 85 (Gravel)
((27.06*61)+(0.29*85))/27.35 = 61.25 = 61
```

```
Time of Concentration = 37.23 Min (See TR55 Worksheet 1B and Map 2B)

Sheet Flow

Manning's n-Value = 0.15 (Short Grass) (See Table 2)

Flow Length = 300 LF

Land Slope = (828.50-824.95)/300 = 0.0118 = 1.18\%

Shallow Concentrated

Flow Length = 92 LF

Watercourse Slope = (824.95-822.00)/92 = 0.0321 = 3.21\%

Surface is Unpaved

Channel Flow (See Channel Report 1B1)

15" Dia. HDPE Downdrain Pipes

Cross Sectional Area = 0.65 SF

Wetted Perimeter = 2.02 LF

Channel Slope = (822.00-705.75)/1957 = 0.0594 = 5.94\%

Manning's n-Value = 0.012 (HDPE Pipe)(See Table 4)
```



| besign eureununons | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 13 of 70 |

Flow Length = 1957 LF Channel Flow (See Channel Report 1B2) Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep Cross Sectional Area = 8.67 SF Wetted Perimeter = 9.86 LF Channel Slope = (705.75-694.67)/1673 = 0.0066 = 0.66%Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3) Flow Length = 1673 LF Channel Flow (See Channel Report 1B3) 4 - 30" Dia. HDPE Pipes Cross Sectional Area = 0.70 SF Wetted Perimeter = 2.32 LF Channel Slope = (694.67-692.00)/60 = 0.0445 = 4.45%Manning's n-Value = 0.012 (HDPE Pipes) (See Table 4) Flow Length = 60 LF

Time Interval = 5 Min Tc*0.1333 = 37.23*0.1333 = 4.96 = 5

```
Storm Distribution = Type II
```

```
Q<sub>25</sub>1B = 32.02 CFS (See Hydrograph Report 1B)
```

Drainage Area = 2.92 AC (See Map 1C)

Curve Number = 64 (See Table 1) 1.97 AC @ CN 85 (Gravel) 0.95 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool) ((1.97*85)+(0.95*98))/2.92 = 89.23 = 89

```
Time of Concentration = 5.00 Min (See TR55 Worksheet 1C)
*Use Tc of 5.00 minutes due to small drainage area and only receiving what stormwater
falls directly in the ponds and the small area around them.
```

Time Interval = 1 Min Tc*0.1333 = 5.00*0.1333 = 0.67= 1



Design Calculations Project Prepared by Date 9/15/23 Plant Bowen Run-on Run-off Control Jeremy Brown Subject/Title Reviewed by Date 9/21/23 Provide run-on and run-off system Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet 14 of 70 DC-BN-735210-002

Storm Distribution = Type II

 $Q_{25}1C = 24.05 \text{ CFS}$ (See Hydrograph Report 1C)

Q₂₅1Total = 57.16 CFS (See Hydrograph Report 1 Total)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|----------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 683 | 0 | 9,025 | 9,025 | 0* |
| 684 | 43,996 | 9,996 | 53,992 | 28,361* |
| 685 | 46,707 | 11,007 | 57,714 | 84,198* |
| 685.5 | 48,077 | 11,527 | 59,604 | 113,523* |
| 686 | 49,457 | 12,057 | 61,514 | 143,799 |
| 687 | 52,247 | 13,147 | 65,394 | 207,236 |
| 688 | 55,076 | 14,276 | 69,352 | 274,593 |
| 689 | 57,944 | 15,444 | 73,388 | 345,946 |
| 690 | 60,851 | 16,651 | 77,502 | 421,374 |
| 690.5 | 62,320 | 17,270 | 79,590 | 460,642 |

*Dead Storage

Spillways

- Principal Spillway consists of two 54" Dia. Risers with two 36" Dia. HDPE Pipes.
- Auxiliary Spillway consist of a concrete lined trapezoidal weir that is 20' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 688.37 (See Pond Reports 1 & 2)



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
15 of 70Sheet



Map 1A



| Design Culculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 16 of 70 |

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

TR55 Tc Worksheet

| Hyd. No. 4 | |
|------------|--|

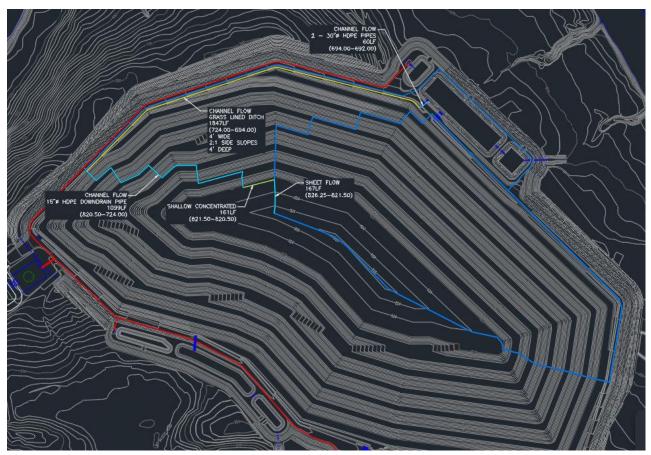
Cell 3, 5 & 7 Pipes 1A

| Description | <u>A</u> | B | <u>c</u> | Totals |
|--|-----------------------|----------------|---------------|---------------|
| Sheet Flow | = 0.150 | 0.011 | 0.011 | |
| Manning's n-value Flow length (ft) | = 167.0 | 0.0 | 0.0 | |
| Two-year 24-hr precip. (in) | = 3.79 | 0.00 | 0.00 | |
| Land slope (%) | = 2.84 | 0.00 | 0.00 | |
| Travel Time (min) | = 11.79 + | 0.00 + | 0.00 = | 11.79 |
| Shallow Concentrated Flow | | | | |
| Flow length (ft) | = 161.00 | 0.00 | 0.00 | |
| Watercourse slope (%) Surface description | = 0.62 = Unpaved | 0.00 Paved | 0.00 Paved | |
| Average velocity (ft/s) | = 011paved =1.27 | 0.00 | 0.00 | |
| | | | | |
| Travel Time (min) | = 2.11 + | 0.00 + | 0.00 = | 2.11 |
| Channel Flow | | | | |
| X sectional flow area (sqft) | = 0.23 | 4.99 | 1.00 | |
| Wetted perimeter (ft) | = 1.28 | 7.89 | 2.66 | |
| Channel slope (%) Manning's n-value | = 8.78 = 0.012 | 1.62 0.030 | 3.33 0.012 | |
| | | 0.000 | | |
| Velocity (ft/s) | =11.65 | | 0.012 | |
| Velocity (ft/s) | =11.65 | 4.65 | 0.012 | |
| Velocity (ft/s) | =11.65 | 4.65 | 11.76 | |
| Velocity (ft/s) Flow length (ft) | =11.65 ({0})1099.0 | 4.65 1847.0 | | |
| | | | 11.76 | 8.28 |

TR55 Worksheet 1A



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
17 of 70Tot



Map 2A



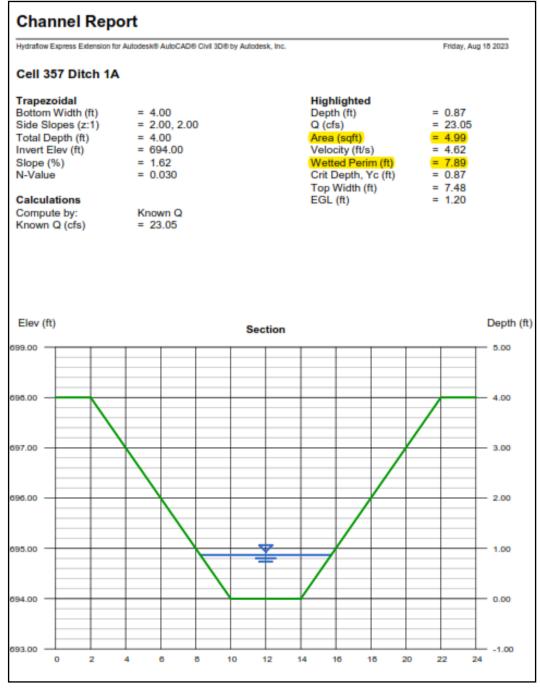
| Design Calculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 18 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® Ci | vil 3D® by Autodesk, Inc. | | Thursday, Sep 7 2023 |
|--|-------------------------------|---------------------------|--|---|
| Cell 357 Downd | rain 1A1 | | | |
| Circular Diameter (ft) | = 1.25 | | Highlighted Depth (ft) Q (cfs) | = 0.30 = 2.550 |
| Invert Elev (ft) Slope (%) N-Value | = 724.00 = 8.78 = 0.012 | | Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) Top Width (ft) | = 0.23 = 11.23 = 1.28 = 0.64 = 1.07 |
| Calculations Compute by: Known Q (cfs) | Known Q = 2.55 | | EGL (ft) | = 2.26 |
| | | | | |
| Elev (ft) | | | Section | |
| 726.00 | | | | |
| 725.50 | | | | |
| 725.50 | | | | |
| 725.00 | | \bigwedge | \searrow | |
| | | | | |
| 725.00 | | | | |

Channel Report 1A1



| Prepared by | Date |
|---|---|
| Jeremy Brown | 9/15/23 |
| Reviewed by Ashley Grissom | Date 9/21/23 |
| Calculation Number DC-BN- 735210-002 | Sheet 19 of 70 |
| | Jeremy Brown Reviewed by Ashley Grissom Calculation Number |



Channel Report 1A2



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 20 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® | Civil 3D® by Autodesk, I | inc. | Wednesday, Sep 6 2023 |
|--|------------------------|--------------------------|--------------------------------------|-----------------------|
| Cell357_Pipes1/ | λ. | | | |
| Circular Diameter (ft) | = 2.50 | | Highlighted Depth (ft) Q (cfs) | = 0.64 = 11.53 |
| Invert Elev (ft) | = 692.00 | | Area (sqft) Velocity (ft/s) | = 1.00 = 11.51 |
| Slope (%) | = 3.33 | | Wetted Perim (ft) | |
| N-Value | = 0.012 | | Crit Depth, Yc (ft) | = 1.14 |
| Calculations | | | Top Width (ft) EGL (ft) | = 2.19 = 2.70 |
| Compute by: | Known Q | | EGE (ii) | - 2.10 |
| Known Q (cfs) | = 11.53 | | | |
| Full flow of 23.05 is di are two pipes. | video by 2 since th | ere | | |
| Elev (f | 0 | | Section | |
| 695.00 - | | | | |
| | | | | |
| 694.50 - | | | | |
| | | | | |
| | | | | |
| 694.00 - | | +/ | \rightarrow | |
| | | 1 | | |
| 693.50 - | | / | | |
| | | | | |
| 000.00 | | | | |
| 000.00 | | | | |
| 693.00 - | | | | |
| | | | | |
| 693.00 — | | | / | |
| | | | ₹ / | |
| 693.00 — | | | ≚ | |
| 693.00 — | | | ≚ | |
| 693.00 - 692.50 - | | | ₽ | |
| 693.00 - 692.50 - | | | ≥ | |

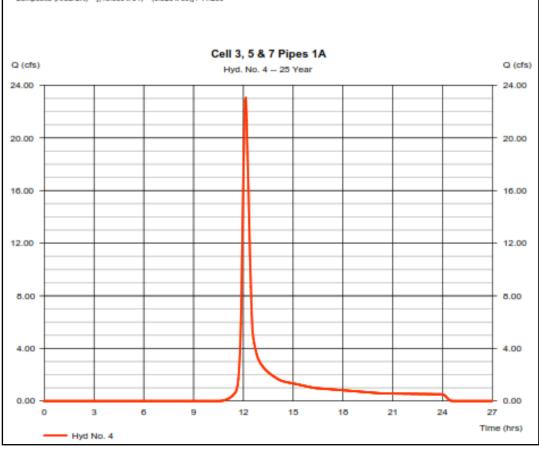
Channel Report 1A3



Ι

| sign Calculations | | | |
|---|--|---|--|
| roject | | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | | Jeremy Brown | 9/15/23 |
| ubject/Title Provide run-on and run-off system alculations for the peak discharge from 24-hr 25-year storm Cells 3-8 | | Reviewed by Ashley Grissom | Date 9/21/23 |
| | | Calculation Number DC-BN- 735210-002 | Sheet 21 of 70 |
| Hydrograph F | Report on for Autodesk® Civil 3D® 2019 by A | Autodesk, Inc. v12 | Thursday, 09 / 7 / 2023 |
| Hydraflow Hydrographs Extensi Hyd. No. 4 | on for Autodesk® Civil 3D® 2019 by A | Autodesk, Inc. v12 | Thursday, 09 / 7 / 2023 |
| Hydraflow Hydrographs Extensi Hyd. No. 4 Cell 3, 5 & 7 Pipes 1/ | on for Autodesk® Civil 3D® 2019 by J | | |
| Hydraflow Hydrographs Extensi Hyd. No. 4 | on for Autodesk® Civil 3D® 2019 by A | Autodesk, Inc. v12 Peak discharge Time to peak Hyd. volume | = 23.05 cfs = 12.15 hrs |
| Hydraftow Hydrographs Extensi Hyd. No. 4 Cell 3, 5 & 7 Pipes 1/ Hydrograph type Storm frequency | on for Autodesk® Civil 3D® 2019 by A A = SCS Runoff = 25 yrs | Peak discharge Time to peak | 23.05 cfs 12.15 hrs 84,769 cuft 62* |
| Hydraftow Hydrographs Extensi Hyd. No. 4 Cell 3, 5 & 7 Pipes 1/ Hydrograph type Storm frequency Time interval Drainage area | on for Autodesk® Civil 3D® 2019 by A = SCS Runoff = 25 yrs = 3 min = 11.200 ac | Peak discharge Time to peak Hyd. volume Curve number | 23.05 cfs 12.15 hrs 84,769 cuft 62* |

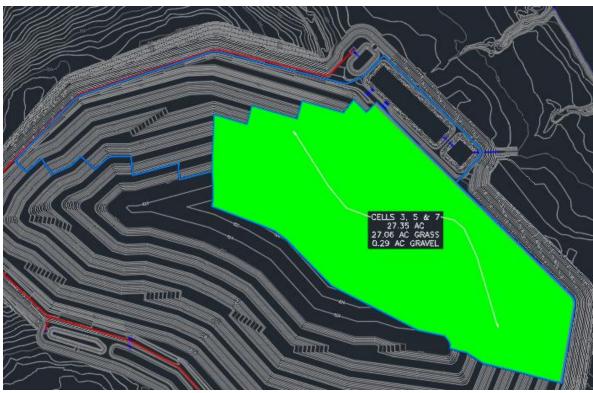
* Composite (Area/CN) = [(10.880 x 61) + (0.320 x 85)] / 11.200



Hydrograph Report 1A



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
22 of 70Sheet



Map 1B



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 23 of 70 |

TR55 Tc Worksheet

| | H | ydraflov | w Hydrographs | Exten | sion for Autod | esk® Ci | vil 3D® 2019 by Aut |
|------------------------------|-------------|----------|---------------|-------|----------------|---------|---------------------|
| Hyd. No. 6 | | | | | | | |
| Cell 3, 5 & 7 1B | | | | | | | |
| Description | A | | B | | <u>c</u> | | <u>Totals</u> |
| Sheet Flow | | | | | | | |
| Manning's n-value | = 0.150 | | 0.011 | | 0.011 | | |
| Flow length (ft) | = 300.0 | | 0.0 | | 0.0 | | |
| Two-year 24-hr precip. (in) | = 3.79 | | 0.00 | | 0.00 | | |
| Land slope (%) | = 1.18 | | 0.00 | | 0.00 | | |
| Travel Time (min) | = 26.78 | + | 0.00 | + | 0.00 | = | 26.78 |
| Shallow Concentrated Flow | | | | | | | |
| Flow length (ft) | = 92.00 | | 0.00 | | 0.00 | | |
| Watercourse slope (%) | = 3.21 | | 0.00 | | 0.00 | | |
| Surface description | = Unpaveo | b | Paved | | Paved | | |
| Average velocity (ft/s) | =2.89 | | 0.00 | | 0.00 | | |
| Travel Time (min) | = 0.53 | + | 0.00 | + | 0.00 | = | 0.53 |
| Channel Flow | | | | | | | |
| X sectional flow area (sqft) | = 0.65 | | 8.67 | | 0.70 | | |
| Wetted perimeter (ft) | = 2.02 | | 9.86 | | 2.32 | | |
| Channel slope (%) | = 5.94 | | 0.66 | | 4.45 | | |
| Manning's n-value | = 0.012 | | 0.030 | | 0.012 | | |
| Velocity (ft/s) | =14.16 | | | | | | |
| | | | 3.70 | | | | |
| | | | | | 11.74 | | |
| Flow length (ft) | ({0})1957.0 |) | 1673.0 | | 60.0 | | |
| Travel Time (min) | = 2.30 | + | 7.53 | + | 0.09 | = | 9.92 |
| Total Travel Time, Tc | | | | | | | 37.23 min |
| Total Haver Hile, To | | | | | | | 01.20 1111 |

TR55 Worksheet 1B



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
24 of 70Sheet



Map 2B



-

Design Calculations

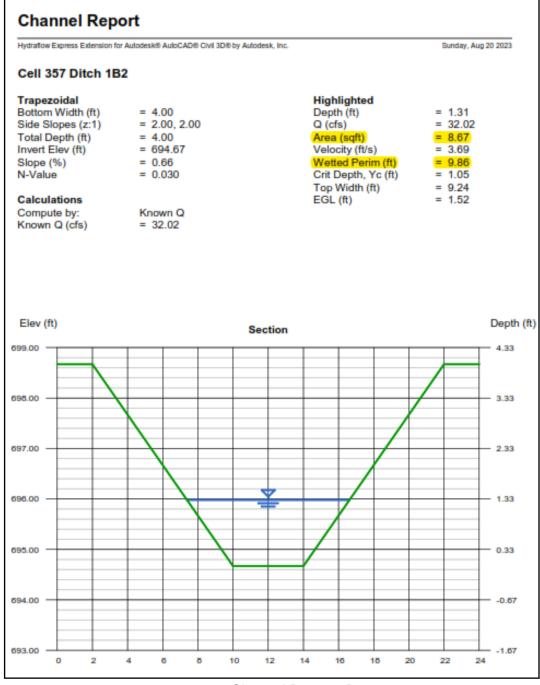
| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 25 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® | Civil 3D® by Autodesk, In | ю. | Thursday, Sep 7 2023 |
|--|-------------------------------|---------------------------|--|-----------------------------|
| Cell 357 Downdi | ain 1B1 | | | |
| Circular Diameter (ft) | = 1.25 | | Highlighted Depth (ft) Q (cfs) | = 0.65 = 9.110 = 0.65 |
| Invert Elev (ft) Slope (%) N-Value | = 705.75 = 5.94 = 0.012 | | Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) Top Width (ft) | = 14.06 |
| Calculations Compute by: Known Q (cfs) | Known Q = 9.11 | | EGL (ft) | = 3.72 |
| Elev (ft) | | | Section | |
| 707.50 | | | | |
| 707.00 | | \sim | | |
| | | | | |
| 706.50 | | (| | |
| 706.50 | | | | |
| | | | | |

Channel Report 1B1



| Design Calculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 26 of 70 |



Channel Report 1B2



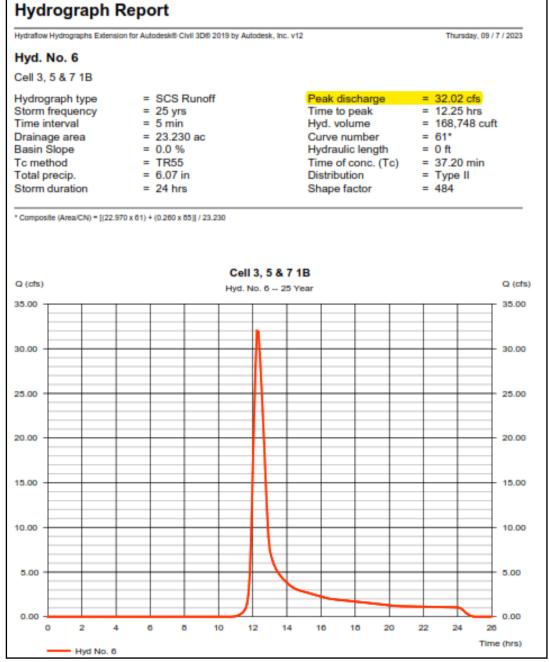
| Design Culculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 27 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCA | D® Civil 3D® by Autod | esk, Inc. | | Thursday, Sep 7 202 |
|--|----------------------|-----------------------|-------------|--------------------------|---------------------|
| Cell357_Pipes1 | B3 | | | | |
| Circular Diameter (ft) | = 2.50 | | Dep Q (d | | = 0.50 = 8.010 |
| Invert Elev (ft) | = 692.00 | | | a (sqft) ocity (ft/s) | = 0.70 = 11.37 |
| Slope (%) | = 4.45 | | | tted Perim (ft) | |
| N-Value | = 0.012 | | Crit | Depth, Yc (ft) | = 0.94 |
| Calculations | | | | Width (ft) L (ft) | = 2.00 = 2.51 |
| Compute by: | Known Q | | 20 | | |
| Known Q (cfs) | | | | | |
| Full flow 32.02 is div are 4 pipes. Elev (ft) | vided by 4 since t | here | | | |
| | | | | | |
| | | | Section | 1 | |
| 695.00 | | | Section | n | |
| | | | Section | | |
| 695.00 | | | Section | | |
| | | | Section | , | |
| 695.00 | | _ | Section | | |
| 695.00 694.50 694.00 | | _ | Section | | |
| 695.00 | | | Section | | |
| 695.00 694.50 694.00 | | | Section | | |
| 695.00 694.50 694.00 | | | Section | | |
| 695.00 694.50 694.00 693.50 | | | Section | | |
| 695.00 694.50 694.00 693.50 693.00 | | | Section | | |
| 695.00 694.50 694.00 693.50 | | | Section | | |
| 695.00 694.50 694.00 693.50 693.00 | | | Section | | |
| 695.00 694.50 694.00 693.50 693.00 | | | Section | | |
| 695.00 694.50 694.00 693.50 693.00 693.00 | | | Section | | |
| 695.00 694.50 694.00 693.50 693.00 693.00 | | | Section | | |

Channel Report 1B3



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 28 of 70 |



Hydrograph Report 1B



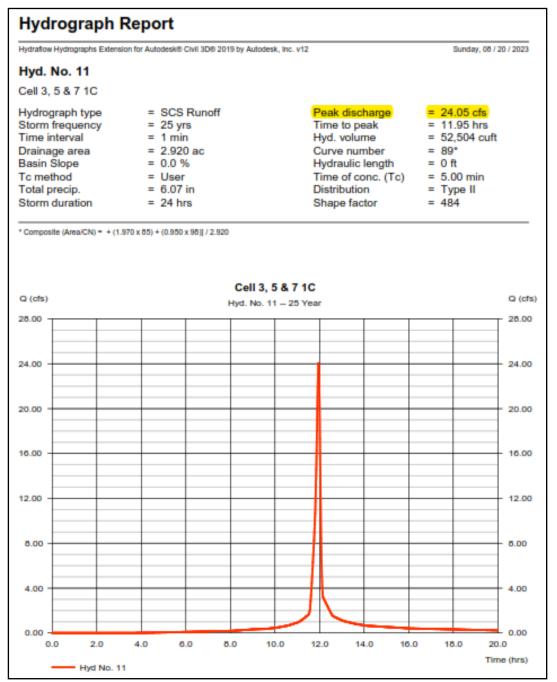
Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byDateCalculation Number
DC-BN- 735210-002Sheet
29 of 70Sheet



Map 1C



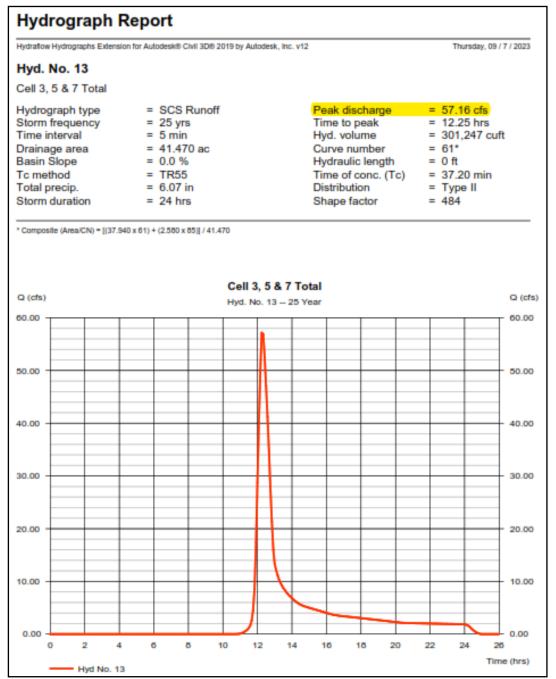
| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 30 of 70 |
| | | |



Hydrograph Report 1C



| Project Plant Bowen Run-on Run-off Control | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | | |
| | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 31 of 70 |



Hydrograph Report 1Total

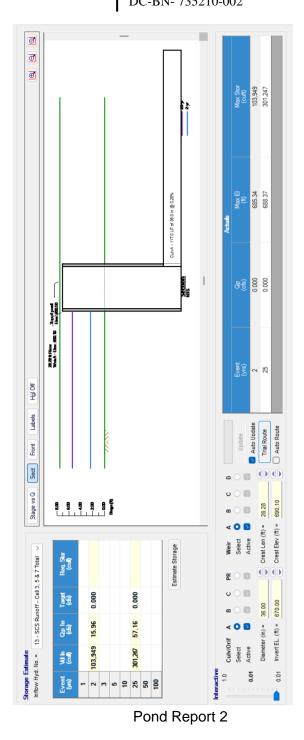


| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 32 of 70 |

| | ographs Extension | n for Auto | desk® Civil | 3D® 2019 by | Autodesk, Inc. v12 | | | | Monday | , 04 / 12 / 2021 |
|--|---------------------------|--------------|------------------|----------------------------------|--|-----------------------|-------------|------------------|------------------|-----------------------------------|
| Pond No. 1 | - Cell 3 Sed F | Pond/C | lear Pool | | | | | | | |
| Pond Data | | | | | | | | | | |
| Contours -Use | r-defined contour | areas. Co | onic method | l used for volu | me calculation. Begini | ng Elevation = | 683.00 ft | | | |
| Stage / Stor | age Table | | | | | | | | | |
| Stage (ft) | Elevation (| ft) | Contour a | rea (sqft) | Incr. Storage (cuft) | Total sto | rage (cuft) | | | |
| 0.00 | 683.00 | | 9.025 | | 0 | | 0 | | | |
| 1.00 | 684.00 | | 53,992 | | 28,361 | 28, | | | | |
| 2.00 2.50 | 685.00 685.50 | | 57,714 59,604 | | 55,837 29,325 | 84, 113, | | | | |
| 3.00 | 686.00 | | 61,514 | | 30,275 | 143, | 799 | | | |
| 4.00 5.00 | 687.00 688.00 | | 65,394 69,352 | | 63,438 67,357 | 207. 274. | | | | |
| 6.00 | 689.00 | | 73,388 | 3 | 71,353 | 345, | 946 | | | |
| 7.00 7.50 | 690.00 690.50 | | 77,502 79,590 | | 75,428 39,268 | 421, 460, | | | | |
| Culvert / Or | ifice Structure | es | | | Weir Structu | | | | | |
| | [A] | [B] | [C] | [PrfRsr] | | [A] | [B] | [C] | [D] | |
| Rise (in) | = 36.00 | 0.00 | 0.00 | 0.00 | Crest Len (ft) | = 28.28 | 0.00 | 0.00 | 0.00 | |
| Span (in) | = 36.00 | 0.00 | 0.00 | 0.00 | Crest El. (ft) | = 690.10 | 0.00 | 0.00 | 0.00 | |
| No. Barrels | = 2 | 0 | 0 | 0 | Weir Coeff. | = 3.33 | 3.33 | 3.33 | 3.33 | |
| Invert El. (ft) | = 670.00 | 0.00 | 0.00 | 0.00 | Weir Type | = 1 | | | | |
| Length (ft) | = 117.00 | 0.00 | 0.00 | 0.00 | Multi-Stage | = Yes | No | No | No | |
| Slope (%) | = 0.25 | 0.00 | 0.00 | n/a | | | | | | |
| M Malue | - 012 | 040 | 040 | | | | | | | |
| | = .013 = 0.60 | .013 0.60 | .013 | n/a 0.60 | Exfil (in/br) | = 0.000 (by | (Contour) | | | |
| Orifice Coeff. | = .013 = 0.60 = n/a | 0.60 No | 0.60 No | 0.60 No | Exfil.(in/hr) TW Elev. (ft) lyzed under iniet (ic) and outle | = 0.000 (by = 0.00 | | i for orflice co | nditions (ic) ar | nd submergence (s) |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orffice co | nditions (ic) ar | |
| N-Value Orifice Coeff. Multi-Stage age (ft) 8.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (|
| Orifice Coeff. Multi-Stage age (ft) | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orffice co | nditions (ic) ar | Elev (|
| Orifice Coeff. Multi-Stage age (ft) | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (|
| Orifice Coeff. Multi-Stage age (ft) | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orffice co | nditions (ic) ar | Elev (|
| Orifice Coeff. Multi-Stage age (ft) 8.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (091.0 |
| Orifice Coeff. Multi-Stage age (ft) | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (|
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orffice co | nditions (ic) ar | Elev (091.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditons (ic) ar | Elev (091.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (891.0 689.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (891.0 689.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (891.0 689.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (891.0 689.0 |
| Age (ft) 8.00 6.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditions (ic) ar | Elev (091.0 089.0 689.0 |
| Orifice Coeff. Multi-Stage | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditons (ic) ar | Elev (091.0 089.0 689.0 |
| Age (ft) 8.00 6.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditons (ic) ar | Elev (091.0 089.0 689.0 |
| Orifice Coeff. Multi-Stage 8.00 6.00 4.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditons (ic) ar | Elev (091.0 |
| Age (ft) 8.00 6.00 | = 0.60 | 0.60 No | 0.60 No | 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | i for orifice co | nditons (ic) ar | Elev (091.0 089.0 689.0 |



Design Calculations Prepared by Project Date 9/15/23 Plant Bowen Run-on Run-off Control Jeremy Brown Date 9/21/23 Subject/Title Reviewed by Provide run-on and run-off system Ashley Grissom calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 33 of 70





Drainage Area = 12.83 AC (See Map 3)

| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 34 of 70 |

<u>Cell 4</u>

```
Curve Number = 64 (See Table 1)
       10.84 AC @ CN 61 (Grass)
       1.49 AC @ CN 85 (Gravel)
      0.50 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool)
      ((10.84*61)+(1.49*85)+(0.50*98))/12.83 = 65.23 = 65
Time of Concentration = 20.51 Min (See TR55 Worksheet 2 and Map 4)
      Sheet Flow
              Manning's n-Value = 0.15 (Short Grass) (See Table 2)
             Flow Length = 167 LF
             Land Slope = (826.66-822.00)/167 = 0.0279 = 2.79%
       Shallow Concentrated
             Flow Length = 161 \text{ LF}
             Watercourse Slope = (822.00-820.90)/161 = 0.0068 = 0.68%
              Surface is Unpaved
       Channel Flow (See Channel Report 4)
              12" Dia. HDPE Downdrain Pipes
             Cross Sectional Area = 0.59 SF
             Wetted Perimeter = 1.98 LF
             Channel Slope = (820.90-723.50)/1089 = 0.0894 = 8.94%
             Manning's n-Value = 0.12 (HDPE Pipe)(See Table 4)
             Flow Length = 1089 LF
       Channel Flow (See Channel Report 5)
             Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep
             Cross Sectional Area = 5.07 SF
             Wetted Perimeter = 7.94 LF
             Channel Slope = (723.50-705.82)/1379 = 0.0128 = 1.28%
             Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
             Flow Length = 1379 LF
       Channel Flow (See Channel Report 6)
             2 – 30" Dia. HDPE Pipes
             Cross Sectional Area = 0.70 SF
             Wetted Perimeter = 2.32 LF
```



| besign curculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 35 of 70 |
| | | |

Channel Slope = (705.82-701.00)/60 = 0.0803 = 8.03%Manning's n-Value = 0.012 (HDPE Pipe) (See Table 4) Flow Length = 60 LF

Time Interval = 3 Min

Tc*0.1333 = 20.51*0.1333 = 2.73 = 3

Storm Distribution = Type II

 $Q_{25} = 30.10$ CFS (See Hydrograph Report 2)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|---------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 697 | 740 | 5,913 | 6,653 | 0* |
| 698 | 16,648 | 6,917 | 23,565 | 14,245* |
| 698.5 | 17,772 | 7,435 | 25,207 | 26,434* |
| 699 | 18,906 | 7,962 | 26,868 | 39,450 |
| 700 | 21,203 | 9,045 | 30,248 | 67,988 |
| 701 | 23,539 | 10,168 | 33,707 | 99,947 |
| 702 | 25,915 | 11,330 | 37,215 | 135,390 |

*Dead Storage

Spillways

- Principal Spillway consists of a 66" Dia. Riser with a 42" Dia. HDPE Pipe.
- Auxiliary Spillway consist of a concrete lined trapezoidal weir that is 18' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 701.04 (See Pond Reports 3 & 4)



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byCalculation Number
DC-BN- 735210-002Sheet
36 of 70



Мар 3



| Prepared by | Date |
|---|---|
| Jeremy Brown | 9/15/23 |
| Reviewed by Ashley Grissom | Date 9/21/23 |
| Calculation Number DC-BN- 735210-002 | Sheet 37 of 70 |
| | Jeremy Brown Reviewed by Ashley Grissom Calculation Number |

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

TR55 Tc Worksheet

Hyd. No. 16

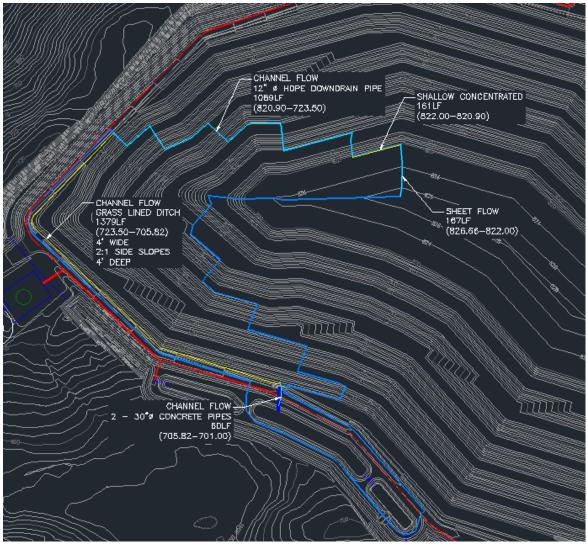
Cell 4

| Description | Δ | | B | | <u>C</u> | | <u>Totals</u> |
|--|--|---|---|---|--|---|---------------|
| Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%) | = 0.150 = 167.0 = 3.79 = 2.79 | | 0.011 0.0 0.00 0.00 | | 0.011 0.0 0.00 0.00 | | |
| Travel Time (min) | = 11.88 | + | 0.00 | + | 0.00 | = | 11.88 |
| Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s) | = 161.00 = 0.68 = Unpaved =1.33 | | 0.00 0.00 Paved 0.00 | | 0.00 0.00 Paved 0.00 | | |
| Travel Time (min) | = 2.02 | + | 0.00 | + | 0.00 | = | 2.02 |
| Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s) | = 0.59 = 1.98 = 8.94 = 0.012 =16.50 ({0})1089.0 | | 5.22 8.02 1.28 0.030 4.21 1379.0 | | 0.70 2.32 8.03 0.012 15.77 60.0 | | |
| Flow length (ft) | ({0})1089.0 | | 1379.0 | | 60.0 | | |
| Travel Time (min) | = 1.10 | + | 5.45 | + | 0.06 | = | 6.62 |
| | | | | | | | |

TR55 Worksheet 2



Design Calculations Prepared by Date Project 9/15/23 Plant Bowen Run-on Run-off Control Jeremy Brown Subject/Title Reviewed by Date Provide run-on and run-off system Ashley Grissom 9/21/23 calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 38 of 70



Map 4



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 39 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® Civil 3D | 8 by Aufodesk, Inc. | Thursday, Sep 7 202 |
|--|---------------------------------|--|---------------------|
| Cell 4 Downdrai | n | | |
| Circular Diameter (ft) | = 1.00 | Highlighted Depth (ft) Q (cfs) | = 0.70 = 9.560 |
| Invert Elev (ft) Slope (%) N-Value | = 723.50 = 8.94 = 0.012 | Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) | = 1.00 |
| Calculations Compute by: Known Q (cfs) | Known Q = 9.56 | Top Width (ft) EGL (ft) | = 0.92 = 4.80 |
| Elev (ft) | | Section | |
| 724.50 | | | |
| | | ✓ ¥ | |
| 724.00 | | | |
| 724.00 | | | |



| 2 congin ouroundhons | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 40 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® Civil 3D® by Au | odesk, Inc. | Sunday, Aug 20 2023 |
|---|---|--|---------------------|
| Cell 4 Ditch 1 | | | |
| Trapezoidal Bottom Width (ft) Side Slopes (z:1) Total Depth (ft) Invert Elev (ft) Slope (%) N-Value | = 4.00 = 2.00, 2.00 = 4.00 = 704.73 = 1.28 = 0.030 | Highlighted Depth (ft) Q (cfs) Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) Top Width (ft) | |
| Calculations Compute by: | Known Q | EGL (ft) | = 1.17 |
| Known Q (cfs) | | | |
| | | | |
| Elev (ft) | 5 | Section | Depth (|
| 00.00 | | | 4.27 |
| | | | |
| 00.00 | | | 3.27 |
| | | | 3.27 |
| 17.00 | | | |
| 17.00 | | * | 2.27 |
| 86.00 | | | 2.27 |
| 17.00 | | | 2.27 |

Channel Report 5

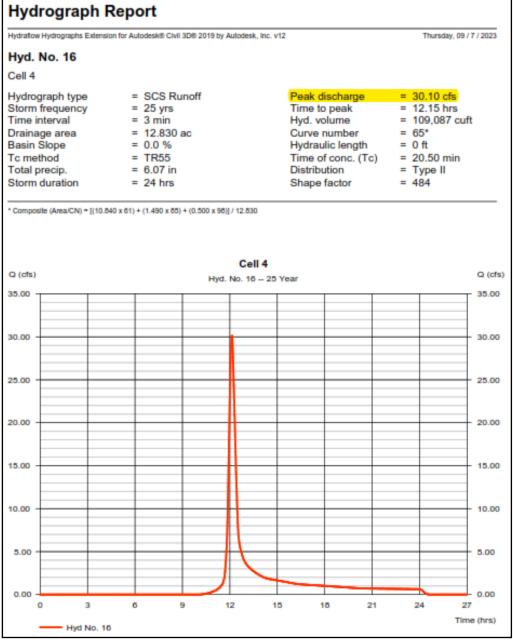


| | | 1 3 |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 41 of 70 |
| | DC DI(755210 002 | 1 |

| Hydraflow Express Extension fo | or Autodesk® AutoCAD® | Civil 3D® by Autodesk | , Inc. | Monday, Sep 18 202 | | |
|---|-------------------------------|-----------------------|---|--------------------|--|--|
| Cell 4 Pipes | | | | | | |
| Circular Diameter (ft) | = 2.50 | | Highlighted Depth (ft) Q (cfs) | = 0.50 = 10.85 | | |
| Invert Elev (ft) Slope (%) N-Value | = 701.00 = 8.03 = 0.012 | | Area (sqft) = 0.70 Velocity (ft/s) = 15.40 Wetted Perim (ft) = 2.32 Crit Depth, Yc (ft) = 1.10 Tape Width (ft) = 2.00 | | | |
| Calculations Compute by: Known Q (cfs) | Known Q = 10.85 | | Crit Depth, Yc (ft) = 1.10 Top Width (ft) = 2.00 EGL (ft) = 4.19 | | | |
| 21.70/2=10.85 Total Flow of 21.70 is o by 2 since there are 2 | | | | | | |
| Elev (ft) |) | | Section | | | |
| 704.00 — | | | | | | |
| 703.50 — | | | | | | |
| 703.00 — | | | | \searrow | | |
| 702.50 — | | / | | | | |
| 702.00 — | | | | | | |
| 701.50 — | | \land | <u> </u> | | | |
| | | | \searrow | | | |
| 701.00 — | | | | | | |



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 42 of 70 |



Hydrograph Report 2

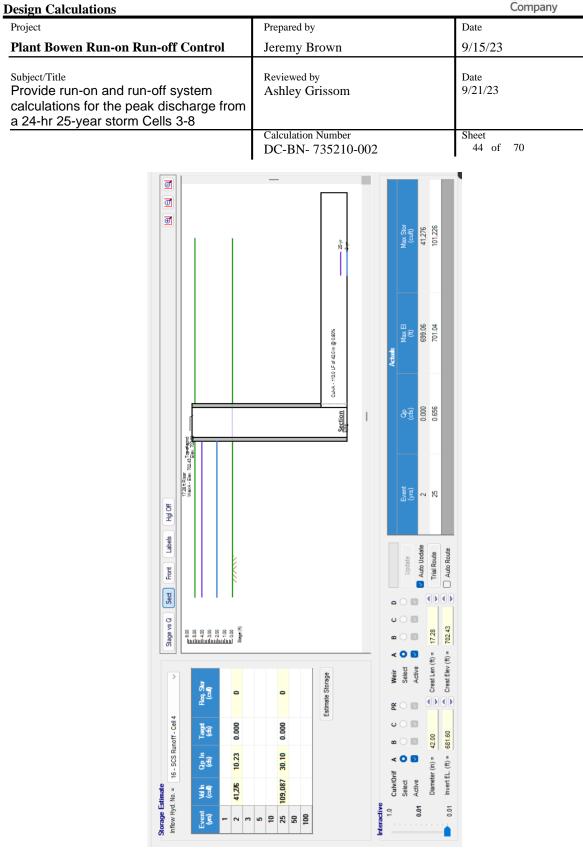


| Project | Prepared by | Date | |
|---|---|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 | |
| | Calculation Number DC-BN- 735210-002 | Sheet 43 of 70 | |

| nyulailow nyul | ographs Extension | n for Auto | odesk® CM | II 3D® 2019 by | Autodesk, Inc. v12 | | | | Thursday | , 09 / 7 / 2023 |
|---|--------------------|------------|---------------|-----------------|--|--|-------------|------|-------------------|---|
| Pond No. 2 | - Cell 4 Sed F | ond/C | lear Poo | | | | | | | |
| Pond Data | | | | | | | | | | |
| Contours -Use | r-defined contoura | areas. C | onic method | d used for volu | me calculation. Beginir | g Elevation = | 697.00 ft | | | |
| Stage / Stor | age Table | | | | | | | | | |
| Stage (ft) | Elevation (| ft) | Contour a | area (sqft) | Incr. Storage (cuft) | Total sto | rage (cuft) | | | |
| 0.00 | 697.00 | | 6,653 | | 0 | | 0 | | | |
| 1.00 | 095.00 095.50 | | 23,565 25,207 | | 14,245 | 14,2 | 245 434 | | | |
| 2.00 | 699.00 | | 26,668 | 5 | 13,015 | 39, | 450 | | | |
| 3.00 4.00 | 700.00 701.00 | | 30,248 | | 25,535 31,959 | 67,5 | | | | |
| 5.00 | 702.00 | | 37,215 | | 35,443 | 135, | | | | |
| Culvert / Or | fice Structure | es | | | Weir Structu | res | | | | |
| | [A] | [B] | [C] | [PrfRsr] | | [A] | [B] | [C] | [D] | |
| Rise (in) | = 42.00 | 0.00 | 0.00 | 0.00 | Crest Len (ft) | = 17.28 | 0.00 | 0.00 | 0.00 | |
| Span (in) | = 42.00 | 0.00 | 0.00 | 0.00 | Crest El. (ft) | = 702.43 | 0.00 | 0.00 | 0.00 | |
| No. Barrels | = 1 | 0 | 0 | 0 | Weir Coeff. | = 3.33 | 3.33 | 3.33 | 3.33 | |
| Invert EI. (ft) Length (ft) | = 681.60 = 113.00 | 0.00 | 0.00 | 0.00 | Weir Type Multi-Stage | = 1 = Yes | No | No | No | |
| Slope (%) | = 0.80 | 0.00 | 0.00 | n/a | Multi-burge | - 105 | PRO 1 | NO | NU | |
| N-Value | = .013 | | | | | | | | | |
| | 013 | .013 | .013 | nía | | | | | | |
| | = 0.60 | .013 | .013 | n/a 0.60 | Exfll.(In/hr) | = 0.000 (by | Wet area) | | | |
| Orlfice Coeff. | | 0.60 No | 0.60 No | 0.60 No | Exfil.(In/hr) TW Elev. (ft) lyzed under inlet (ic) and cutle | = 0.000 (by = 0.00 t(oc) control. Weir | | | nditions (ic) and | f submergence (s). |
| Orifice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditions (ic) and | |
| Orifice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditions (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | ndilona (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditons (ic) and | Elev (1) |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | ndtions (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditons (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage age (ft) 5.00 | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditora (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage age (fl) 5.00 | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditora (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage age (fl) 5.00 | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage age (fl) 5.00 | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (ic) and | Elev (f |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (ic) and | Elev (f |
| Orifice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | ndiions (ic) and | Elev (f 702.00 701.00 700.00 699.00 |
| Ortfice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f |
| Orifice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | nditors (c) and | Elev (f 702.00 701.00 700.00 699.00 |
| Orifice Coeff. Multi-Stage | - 0.60 | 0.60 No | 0.60 No | 0.60 No | TW Elev. (ft) | - 0.00 | | | | Elev (f 702.00 701.00 700.00 699.00 |

| Pond | Report | 3 |
|------|--------|---|
|------|--------|---|





Pond Report 4



Drainage Area = 28.61 AC (See Map 5)

| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 45 of 70 |

<u>Cell 6</u>

```
Curve Number = 64 (See Table 1)
       26.50 AC @ CN 61 (Grass)
       1.53 AC @ CN 85 (Gravel)
       0.58 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool)
       ((26.50^{\circ}61) + (1.53^{\circ}85) + (0.58^{\circ}98))/28.61 = 63.03 = 63
Time of Concentration = 47.04 Min (See TR55 Worksheet 3 and Map 6)
       Sheet Flow
              Manning's n-Value = 0.15 (Short Grass) (See Table 2)
              Flow Length = 300 LF
              Land Slope = (828.25-826.75)/300 = 0.0050 = 0.50%
       Shallow Concentrated
              Flow Length = 403 LF
              Watercourse Slope = (826.75-822.00)/403 = 0.0118 = 1.18%
              Surface is Unpaved
       Channel Flow (See Channel Report 7)
              18" Dia. HDPE Downdrain Pipes
              Cross Sectional Area = 1.01 SF
              Wetted Perimeter = 2.52 LF
              Channel Slope = (822.00-703.63)/1778 = 0.0666 = 6.66%
              Manning's n-Value = 0.12 (HDPE Pipe) (See Table 4)
              Flow Length = 1778 LF
       Channel Flow (See Channel Report 8)
              Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep
              Cross Sectional Area = 7.95 SF
              Wetted Perimeter = 9.50 LF
              Channel Slope = (703.63-697.94)/810 = 0.0070 = 0.70%
              Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
              Flow Length = 810 LF
       Channel Flow (See Channel Report 9)
              5 – 30" Dia. HDPE Pipes
              Cross Sectional Area = 0.42 SF
              Wetted Perimeter = 1.92 LF
```



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 46 of 70 |
| | | - |

Channel Slope = (697.65-690.00)/79 = 0.0968 = 9.68%Manning's n-Value = 0.012 (HDPE Pipe) (See Table 4) Flow Length = 79 LF

Time Interval = 3 Min

Tc*0.1333 = 47.04*0.1333 = 6.27 = 7

Storm Distribution = Type II

Q₂₅ = 34.28 CFS (See Hydrograph Report 3)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|---------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 685 | 0 | 4,531 | 4,531 | 0* |
| 686 | 20,795 | 5,195 | 25,990 | 13,790* |
| 687 | 22,799 | 5,899 | 28,698 | 41,120 |
| 688 | 24,842 | 6,642 | 31,484 | 71,197 |
| 689 | 26,925 | 7,245 | 34,170 | 104,011 |
| 689.50 | 27,981 | 7,831 | 35,812 | 121,504 |

*Dead Storage

Spillways

- Principal Spillway consists of a 36" Dia. Riser with two 24" Dia. HDPE Pipes.
- Auxiliary Spillway consist of a grass lined trapezoidal weir that is 8' wide with 3:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 688.25 (See Pond Reports 5 & 6)



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byCalculation Number
DC-BN- 735210-002Sheet
47 of 70



Map 5



| | | Contract Contraction |
|---|---|----------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 48 of 70 |

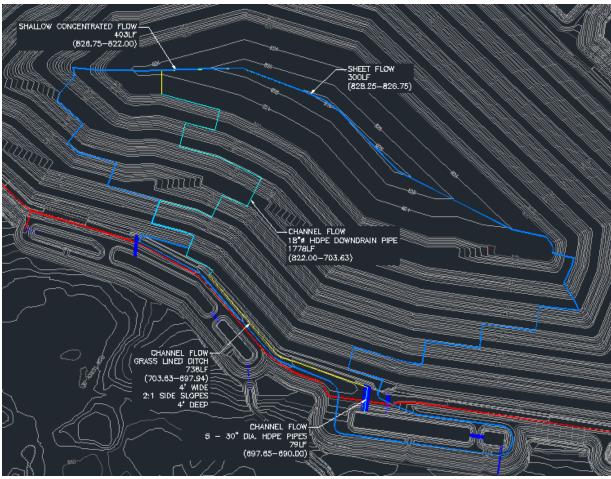
TR55 Tc Worksheet

| | н | ydrafio | w Hydrographs | s Extens | sion for Autode | ask® C | wil 3D8 2019 by A |
|-----------------------------|-------------|---------|---------------|----------|-----------------|--------|-------------------|
| yd. No. 22 | | | | | | | |
| ell 6 | | | | | | | |
| escription | Δ | | B | | <u>c</u> | | Totals |
| heet Flow | | | | | | | |
| Manning's n-value | = 0.150 | | 0.011 | | 0.011 | | |
| Flow length (ft) | = 300.0 | | 0.0 | | 0.0 | | |
| wo-year 24-hr precip. (in) | = 3.79 | | 0.00 | | 0.00 | | |
| and slope (%) | = 0.50 | | 0.00 | | 0.00 | | |
| avel Time (min) | = 37.75 | + | 0.00 | + | 0.00 | = | 37.75 |
| hallow Concentrated Flow | | | | | | | |
| low length (ft) | = 403.00 | | 0.00 | | 0.00 | | |
| Vatercourse slope (%) | = 1.18 | | 0.00 | | 0.00 | | |
| Surface description | = Unpave | d | Paved | | Paved | | |
| Average velocity (ft/s) | =1.75 | | 0.00 | | 0.00 | | |
| avel Time (min) | = 3.83 | + | 0.00 | + | 0.00 | = | 3.83 |
| nannel Flow | | | | | | | |
| (sectional flow area (sqft) | = 1.01 | | 7.95 | | 0.42 | | |
| Vetted perimeter (ft) | = 2.52 | | 9.50 | | 1.92 | | |
| hannel slope (%) | = 6.66 | | 0.70 | | 10.05 | | |
| lanning's n-value | = 0.012 | | 0.030 | | 0.012 | | |
| /elocity (ft/s) | =17.37 | | | | | | |
| | | | 3.69 | | | | |
| | | | | | 14.22 | | |
| Flow length (ft) | ({0})1778.0 |) | 810.0 | | 79.0 | | |
| ravel Time (min) | = 1.71 | + | 3.66 | + | 0.09 | = | 5.46 |
| otal Travel Time, Tc | | | | | | | 47.04 min |

TR55 Worksheet 3



Design Calculations Prepared by Project Date Plant Bowen Run-on Run-off Control 9/15/23 Jeremy Brown Subject/Title Provide run-on and run-off system Reviewed by Ashley Grissom Date 9/21/23 calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 49 of 70



Map 6



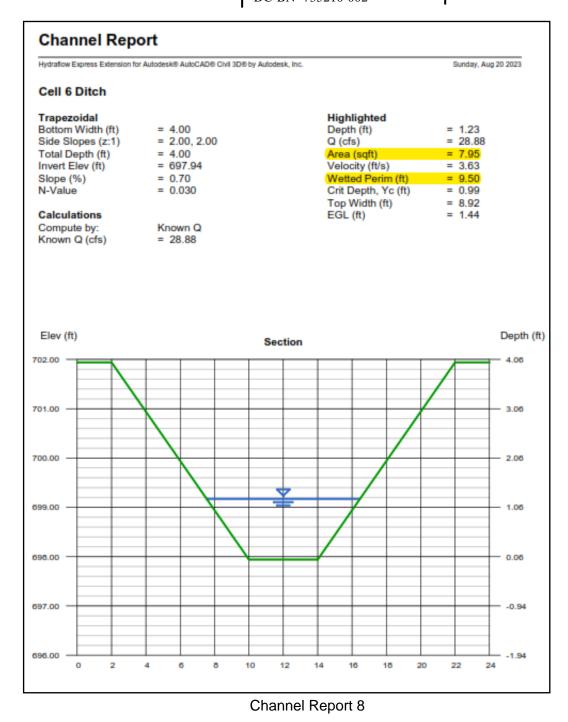
| Design Calculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 50 of 70 |

| Hydraflow Express Extension | for Autodesk® AutoCAD® | vil 3D® by Autodesk, Inc. | | Thursday, Sep 7 202 |
|---|------------------------|---------------------------|--------------------------------------|---------------------|
| Cell 6 Downdrai | 'n | | | |
| Circular Diameter (ft) | = 1.50 | | Highlighted Depth (ft) Q (cfs) | = 0.83 = 17.28 |
| Invert Elev (ft) | = 703.63 | | Area (sqft) Velocity (ft/s) | = 1.01 = 17.18 |
| Slope (%) | = 6.66 | | Wetted Perim (ft) | = 2.52 |
| N-Value | = 0.012 | | Crit Depth, Yc (ft) | = 1.45 |
| | | | Top Width (ft) | = 1.49 |
| Calculations | KO | | EGL (ft) | = 5.42 |
| Compute by: Known Q (cfs) | Known Q = 17.28 | | | |
| | | | | |
| | | | | |
| Elev (ft) | | | | |
| Elev (it) | | Sec | ction | |
| 706.00 | | Sec | ction | |
| | | Sec | tion | |
| | | Sec | stion | |
| 706.00 | | Sec | ction | |
| | | Sec | ction | |
| 706.00 | | Sec | | |
| 705.50 | | Sec | ction | |
| 706.00 | | Sec | ction | |
| 705.50 | | Sec | ction | |
| 705.50 | | Sec | ction | |
| 705.50 | | Sec | ction | |
| 705.50 | | Sec | ction | |
| 706.00 705.50 705.00 704.50 | | Sec | etion | |
| 705.50 | | Sec | etion | |
| 706.00 705.50 705.00 704.50 | | Sec | ction | |
| 706.00 705.50 705.00 704.50 | | Sec | etion | |
| 706.00 705.50 705.00 704.50 | | Sec | etion | |
| 706.00 705.50 705.00 704.50 | | Sec | etion | |
| 706.00 705.50 705.00 704.50 | | Sec | etion | |

Channel Report 7



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 51 of 70 |





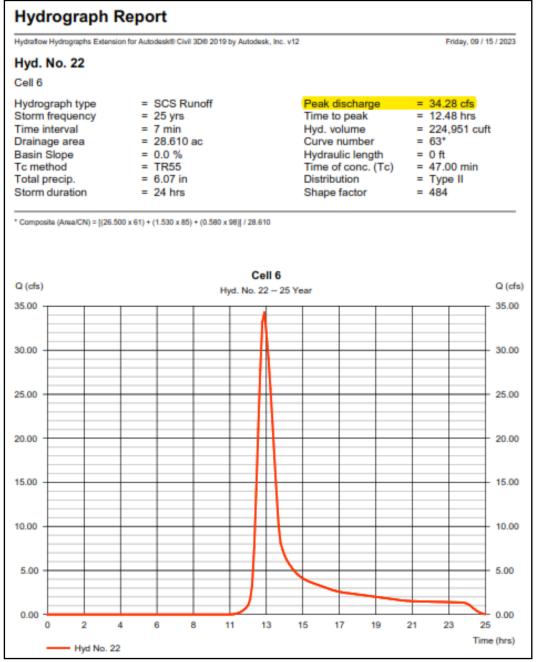
| | | 1 3 |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 52 of 70 |
| | DC-DIN- 755210-002 | 52 01 70 |

| Hydraflow Express Extension for | r Autodesk® AutoCAD® | Civil 3D® by Autodesk, Inc. | | Monday, Sep 18 202 |
|--|-------------------------------|-----------------------------|---|-----------------------------|
| Cell 6 Pipes | | | | |
| Circular Diameter (ft) | = 2.50 | | Highlighted Depth (ft) Q (cfs) Area (sqft) | = 0.35 = 5.780 = 0.42 |
| Invert Elev (ft) Slope (%) N-Value | = 690.00 = 9.68 = 0.012 | | Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) | = 13.6 ⁹ |
| Calculations Compute by: Known Q (cfs) | Known Q = 5.78 | | Top Width (ft) EGL (ft) | = 1.74 = 3.26 |
| 28.92/5=5.78 Total Flow of 28.92 is d by 5 since there are 5 p | livided | | | |
| Elev (ft) | | | Section | |
| 693.00 | | | | |
| 692.50 — | | | | |
| 692.00 — | | | | |
| | | / | | \land |
| 691.50 — | | 1 | | |
| 691.50 — 691.00 — | | | | |
| | | | ↓ | |
| 691.00 — | | | | |

Channel Report 9



| | | Contraction Provide State |
|---|---|---------------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 53 of 70 |



Hydrograph Report 3

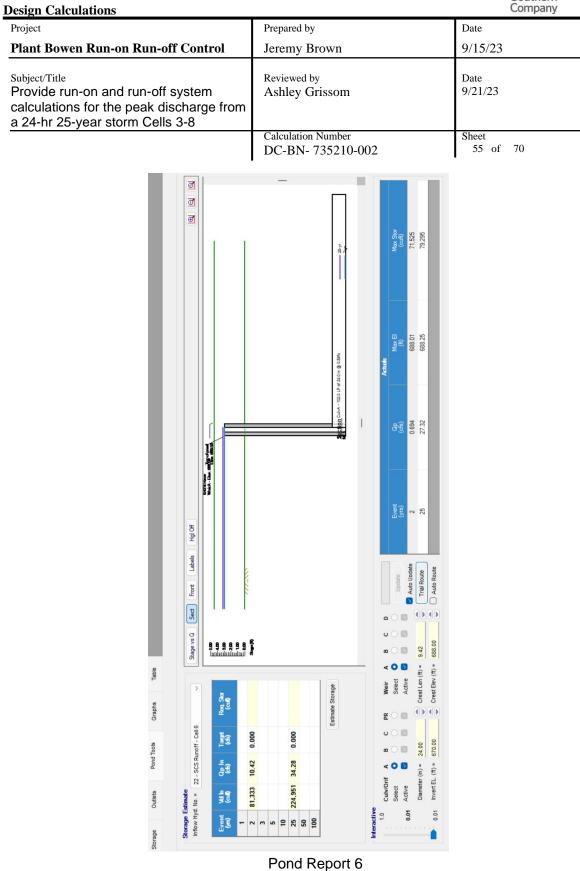


| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 54 of 70 |

| Hydraflow Hydri | ographs Extension | n for Auto | desk® Civi | 3D8 2019 by | Autodesk, Inc. v12 | | | | Friday, | 09/15/2023 |
|---------------------------------|--------------------|------------|------------------|---------------------------|--|--------------------|-------------|------------------|-------------------|---|
| Pond No. 3 | - Cell 6 Sed F | ond/Cl | ear Pool | 1 | | | | | | |
| Pond Data | | | | | | | | | | |
| Contours .Use | r-defined contour | areas. Co | nic method | l used for volu | me calculation. Beginin | g Elevation = | 685.00 ft | | | |
| Stage / Stor | age Table | | | | | | | | | |
| Stage (ft) | Elevation (| ft) | Contour a | irea (sqft) | Incr. Storage (cuft) | Total sto | rage (cuft) | | | |
| 0.00 | 685.00 | | 4,531 | | 0 | | 0 | | | |
| 1.00 2.00 | 686.00 687.00 | | 25,990 28,698 | | 13,790 27,330 | 13,3 | | | | |
| 3.00 | 688.00 | | 31,484 | | 30,077 | 71,1 | 197 | | | |
| 4.00 4.50 | 689.00 689.50 | | 34,170 35,812 | | 32,815 17,492 | 104,0 | | | | |
| | | | 30,612 | | | | 004 | | | |
| Culvert / Ori | ifice Structure | | | | Weir Structu | | | | | |
| | [A] | [B] | [C] | [PrfRsr] | | [A] | [B] | [C] | [D] | |
| Rise (in) Span (in) | = 24.00 = 24.00 | 0.00 | 0.00 | 0.00 | Crest Len (ft) Crest El. (ft) | = 9.42 = 688.00 | 0.00 | 0.00 | 0.00 | |
| span (in) No. Barrels | = 24.00 | 0.00 | 0.00 | 0.00 | Weir Coeff. | = 688.00 | 3.33 | 3.33 | 3.33 | |
| invert EL (ft) | = 670.00 | 0.00 | 0.00 | 0.00 | Weir Type | = 1 | | | | |
| Length (ft) | = 102.00 | 0.00 | 0.00 | 0.00 | Multi-Stage | = Yes | No | No | No | |
| Slope (%) | = 0.59 | 0.00 | 0.00 | n/a | | | | | | |
| N-Value | = .013 | .013 | .013 | n/a | | | | | | |
| Orifice Coeff. | | | | | | | | | | |
| | = 0.60 = n/a | 0.60 No | 0.60 No | 0.60 No | Exfil.(in/hr) TW Elev. (ft) lyzed under inlet (ic) and outle | = 0.00 | (Wet area) | for orifice car | uditions (ic) an | d submergence (s). |
| Multi-Stage | | No | No | No | TW Elev. (ft) | = 0.00 | | for orifice-cor | nditions (ic) an | d submergence (s). |
| | | No | No | No | TW Elev. (ft) | = 0.00 | | for or filos con | uditions (ic) an | f submergence (s). |
| | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifica-con | ditons (ic) an | |
| Multi-Stage | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifica-con | uditions (ic) an | Elev (f |
| Multi-Stage 19e (ft) | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice con | ditions (ic) an | Elev (f |
| Multi-Stage 19e (ft) | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for online con | ditions (ic) and | Elev (ft |
| Multi-Stage 19e (ft) | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice con | nditions (ic) and | Elev (f |
| Multi-Stage 19e (ft) | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice con | ditions (ic) an | Elev (ft |
| 99 (ft) 5.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for online con | ditions (ic) an | Elev (ft |
| 99 (ft) 5.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for online con | ditors (c) av | Elev (ft |
| 99 (ft) 5.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifica cor | nditions (c) an | Elev (ft |
| ge (ft) | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifica cor | nditions (c) an | Elev (ft |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice cor | nditions (c) an | Elev (f |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice con | nditions (ic) and | Elev (f |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice cor | nditions (ic) an | Elev (f |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice cor | nditions (c) an | Elev (f 690.00 689.00 688.00 |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice cor | nditions (c) an | Elev (f 690.00 689.00 688.00 |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice-cor | nditions (c) an | Elev (f 690.00 689.00 688.00 |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | for orifice con | ditions (ic) and | Elev (f 690.00 689.00 688.00 |
| ge (ft) 5.00 4.00 3.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | | aditions (ic) an | Elev (f 690.00 689.00 688.00 688.00 |
| ge (ft) 5.00 4.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev (f 690.00 689.00 688.00 688.00 |
| ge (ft) 5.00 4.00 3.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | | nditions (c) an | Elev (f 690.00 689.00 688.00 688.00 |
| ge (ft) 5.00 4.00 3.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | | nditions (c) an | Elev (f 690.00 689.00 688.00 688.00 |
| ge (ft) 5.00 4.00 3.00 | | No | No | No te outflows are and | TW Elev. (ft) | = 0.00 | | | | Elev (f 690.00 689.00 688.00 |

Pond Report 5







| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 56 of 70 |

<u>Cell 8</u>

```
Drainage Area = 10.41 AC (See Map 7)
Curve Number = 64 (See Table 1)
      9.10 AC @ CN 61 (Grass)
      0.97 AC @ CN 85 (Gravel)
      0.34 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool)
      ((9.10*61)+(0.97*85)+(0.34*98))/10.41 = 64.44 = 64
Time of Concentration = 19.37 Min (See TR55 Worksheet 4 and Map 8)
       Sheet Flow
             Manning's n-Value = 0.15 (Short Grass) (See Table 2)
             Flow Length = 99 LF
             Land Slope = (806.00-805.10)/99 = 0.0091 = 0.91\%
       Channel Flow (See Channel Report 10)
              15" Dia. HDPE Downdrain Pipes
             Cross Sectional Area = 0.62 SF
             Wetted Perimeter = 1.97 LF
             Channel Slope = (805.10-696.77)/1541 = 0.0703 = 7.03%
             Manning's n-Value = 0.12 (HDPE Pipe)(See Table 4)
             Flow Length = 1541 LF
       Channel Flow (See Channel Report 11)
             Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep
             Cross Sectional Area = 5.76 SF
             Wetted Perimeter = 8.34 LF
             Channel Slope = (696.77-692.14)/895 = 0.0052 = 0.52%
             Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
             Flow Length = 895 LF
       Channel Flow (See Channel Report 12)
             Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 2' Deep
             Cross Sectional Area = 2.87 SF
             Wetted Perimeter = 6.50 LF
             Channel Slope = (692.14-688.00)/52 = 0.0796 = 7.96%
             Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3)
             Flow Length = 52 LF
```



| Design Calculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 57 of 70 |

Time Interval = 3 Min

Tc*0.1333 = 19.37*0.1333 = 2.58 = 3

Storm Distribution = Type II

Q₂₅ = 27.43 CFS (See Hydrograph Report 4)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|---------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 685 | 0 | 6,230 | 6,230 | 0* |
| 686 | 15,795 | 6,995 | 22,790 | 13,644* |
| 687 | 17,149 | 7,789 | 24,948 | 37,502 |
| 688 | 18,542 | 8,642 | 27,184 | 63,558 |
| 689 | 19,975 | 9,525 | 29,500 | 91,889 |
| 689.50 | 20,706 | 9,981 | 30,687 | 106,933 |

*Dead Storage

Spillways

- Principal Spillway consists of a 36" Dia. Riser with two 24" Dia. HDPE Pipes.
- Auxiliary Spillway consist of a grass lined trapezoidal weir that is 8' wide with 3:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 688.03 (See Pond Reports 7 & 8)



Design CalculationsCompanyProjectPrepared byDatePlant Bowen Run-on Run-off ControlJeremy Brown9/15/23Subject/TitleReviewed byDateProvide run-on and run-off system
calculations for the peak discharge from
a 24-hr 25-year storm Cells 3-8Reviewed byCalculation Number
DC-BN- 735210-002Sheet
58 of 70



Map 7



| Design Culculations | | | |
|---|---|-------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 | |
| | Calculation Number DC-BN- 735210-002 | Sheet 59 of 70 | |

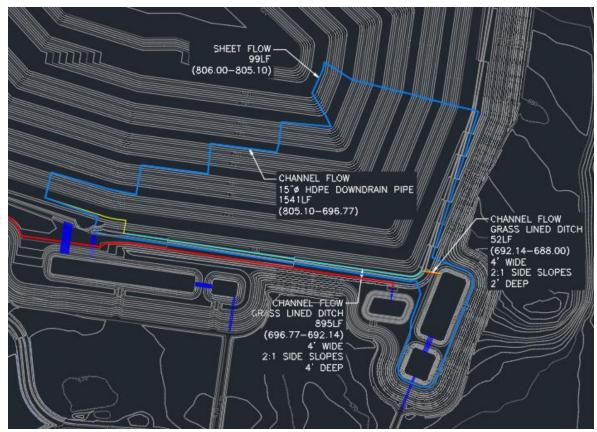
TR55 Tc Worksheet

| | H | lydrafio | w Hydrograph | s Extern | sion for Autode | isk® C | MI 3D® 2019 by Au |
|------------------------------|-------------|----------|--------------|----------|-----------------|--------|-------------------|
| Hyd. No. 28 | | | | | | | |
| Cell 8 | | | | | | | |
| Description | Δ | | B | | <u>c</u> | | Totals |
| Sheet Flow | | | | | | | |
| Manning's n-value | = 0.150 | | 0.011 | | 0.011 | | |
| Flow length (ft) | = 99.0 | | 0.0 | | 0.0 | | |
| Two-year 24-hr precip. (in) | = 3.79 | | 0.00 | | 0.00 | | |
| Land slope (%) | = 0.91 | | 0.00 | | 0.00 | | |
| Travel Time (min) | = 12.24 | + | 0.00 | + | 0.00 | = | 12.24 |
| Shallow Concentrated Flow | | | | | | | |
| Flow length (ft) | = 0.00 | | 0.00 | | 0.00 | | |
| Watercourse slope (%) | = 0.00 | | 0.00 | | 0.00 | | |
| Surface description | = Unpave | d | Paved | | Paved | | |
| Average velocity (ft/s) | =0.00 | | 0.00 | | 0.00 | | |
| Travel Time (min) | = 0.00 | + | 0.00 | + | 0.00 | = | 0.00 |
| Channel Flow | | | | | | | |
| X sectional flow area (sqft) | = 0.62 | | 5.76 | | 2.87 | | |
| Wetted perimeter (ft) | = 1.97 | | 8.34 | | 6.50 | | |
| Channel slope (%) | = 7.03 | | 0.52 | | 7.96 | | |
| Manning's n-value | = 0.012 | | 0.030 | | 0.030 | | |
| Velocity (ft/s) | =15.17 | | | | | | |
| | | | 2.79 | | | | |
| | | | | | 8.10 | | |
| | | | | | | | |
| Flow length (ft) | ({0})1541.0 | 0 | 895.0 | | 52.0 | | |
| Travel Time (min) | = 1.69 | + | 5.34 | + | 0.11 | = | 7.14 |
| Total Travel Time, Tc | | | | | | | 19.37 min |

TR55 Worksheet 3



Design Calculations Prepared by Date Project Plant Bowen Run-on Run-off Control Jeremy Brown 9/15/23 Subject/Title Reviewed by Date Provide run-on and run-off system Ashley Grissom 9/21/23 calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 60 of 70



Map 8

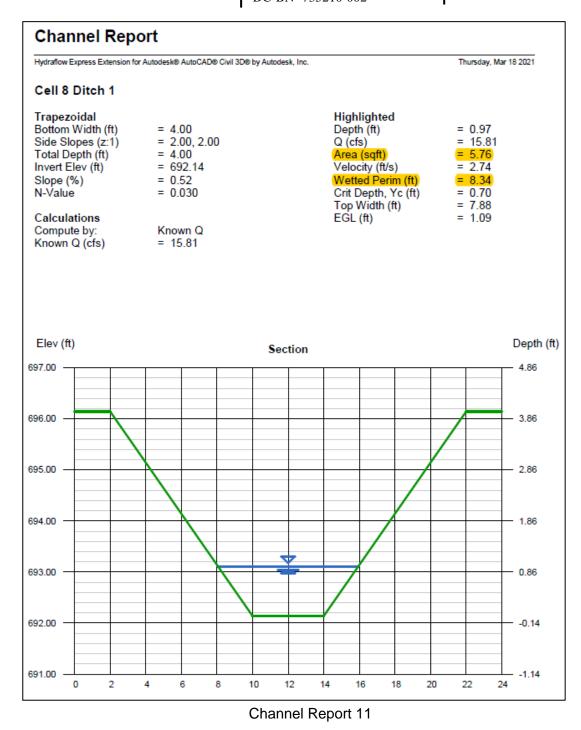


| Prepared by | Date |
|---|---|
| Jeremy Brown | 9/15/23 |
| Reviewed by Ashley Grissom | Date 9/21/23 |
| Calculation Number DC-BN- 735210-002 | Sheet 61 of 70 |
| | Jeremy Brown Reviewed by Ashley Grissom Calculation Number |

| Hydraflow Express Extension fo | or Autodesk® AutoCAD® Civil 3D | 6 by Autodesk, Inc. | | Friday, Sep 15 2023 |
|--------------------------------|--------------------------------|---------------------|--------------------------------|---------------------|
| Cell 8 Downdrain | ı | | | |
| Circular | | | Highlighted | |
| Diameter (ft) | = 1.25 | | Depth (ft) Q (cfs) | = 0.63 = 9.380 |
| nvert Elev (ft) | = 696.77 | | Area (sqft) Velocity (ft/s) | = 0.62 = 15.11 |
| Slope (%) | = 7.03 | | Wetted Perim (ft) | |
| N-Value | = 0.012 | | Crit Depth, Yc (ft) | |
| v-value | - 0.012 | | Top Width (ft) | = 1.17 |
| Calculations | | | EGL (ft) | = 4.18 |
| Compute by: | Known Q | | 202(1) | 1.10 |
| Known Q (cfs) | = 9.38 | | | |
| | | | | |
| Elev (ft) | 2 | | Section | |
| 699.00 | | | | |
| | | | | |
| | | | | |
| 698.50 - | | | | |
| 090.00 | | | | |
| | | | | |
| | | | | |
| 698.00 | | | | |
| | | / | | |
| | | / | | |
| | | / | | |
| 807.50 | | / | | |
| 697.50 — | | <u>×</u> | | |
| 697.50 — | | / | | |
| 697.50 — | | / ≚ | | |
| 697.50 | | ✓ | | |
| | | | | |
| | | | | |
| 697.00 — | | | | |
| | | | | |
| 697.00 — | | | | |
| 697.00 — | | | | |
| 697.00 — | | | | |



| | | , |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 62 of 70 |





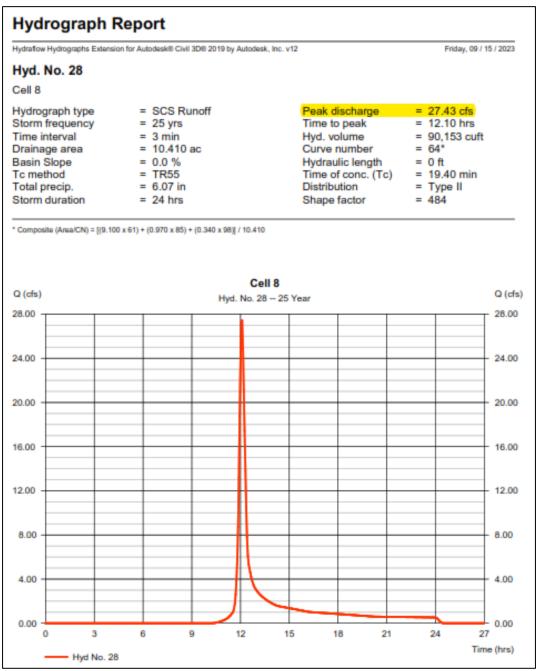
| Design Culculations | | |
|---|---|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 63 of 70 |

| Hydraflow Express Extension 1 | ior Autodesk® AutoCAD® Civil 3D® | Autodesk, Inc. Ti | hursday, Mar 18 2021 |
|---|---|---|---|
| Cell 8 Ditch 2 | | | |
| Trapezoidal Bottom Width (ft) Side Slopes (z:1) Total Depth (ft) Invert Elev (ft) Slope (%) N-Value Calculations Compute by: Known Q (cfs) | = 4.00 = 2.00, 2.00 = 2.00 = 688.00 = 7.96 = 0.030 Known Q = 22.51 | Q (cfs) = Area (sqft) = Velocity (ft/s) = Wetted Perim (ft) = Crit Depth, Yc (ft) = Top Width (ft) = | 0.56 22.51 2.87 7.85 6.50 0.86 6.24 1.52 |
| Elev (ft) | | Section | Depth (|
| 390.50 | | | 2.50 |
| 590.00 N | | | 2.00 |
| 89.50 | | | 1.50 |
| 689.00 | | | 1.00 |
| 688.50 | | | 0.50 |
| | | | 0.00 |
| 88.00 | | | |

Channel Report 12



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 64 of 70 |



Hydrograph Report 4

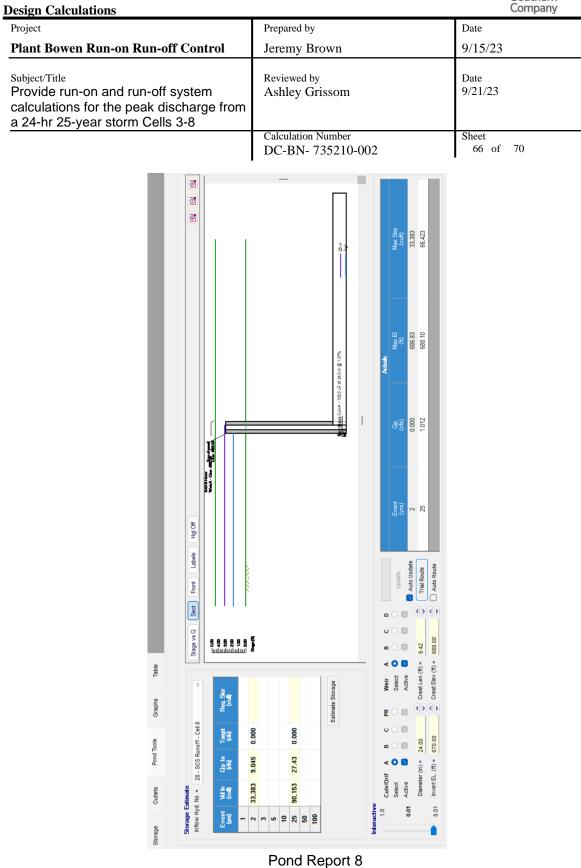


| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 65 of 70 |

| Hydraflow Hydro | ographs Extension | n for Aut | odesk® Civi | 3D8 2019 by | Autodesk, Inc. v12 | | | | Friday, (| 09 / 15 / 2023 |
|---------------------------------|--------------------|-----------|------------------|---------------------------|-------------------------------|--------------------|-------------|-------------------|-------------------|--|
| Pond No. 4 | - Cell 8 Sed F | ond/C | lear Pool | 1 | | | | | | |
| Pond Data | | | | | | | | | | |
| Contours -User | r-defined contour | areas. C | onic method | l used for volu | me calculation. Beginin | g Elevation = | 685.00 ft | | | |
| Stage / Stor | age Table | | | | | | | | | |
| Stage (ft) | Elevation (| ft) | Contour a | rea (sqft) | Incr. Storage (cuft) | Total stor | rage (cuft) | | | |
| 0.00 | 685.00 | | 6,230 | | 0 | | 0 | | | |
| 1.00 2.00 | 686.00 687.00 | | 22,790 24,948 | | 13,644 23,858 | 13,0 | 644 502 | | | |
| 3.00 | 688.00 | | 27,184 | | 26,055 | 63,5 | 558 | | | |
| 4.00 4.50 | 689.00 689.50 | | 29,500 30,687 | | 28,331 15,044 | 91,8 | | | | |
| | | | 30,667 | | | | V33 | | | |
| Culvert / Ori | fice Structure | | | | Weir Structu | | | | | |
| | [A] | [B] | [C] | [PrfRsr] | | [A] | (B) | [C] | [D] | |
| Rise (in) | = 24.00 = 24.00 | 0.00 | 0.00 | 0.00 | Crest Len (ft) | = 9.42 = 688.00 | 0.00 | 0.00 | 0.00 | |
| Span (in) No. Barreis | = 24.00 | 0.00 | 0.00 | 0.00 | Crest El. (ft) Weir Coeff. | = 688.00 | 3.33 | 3.33 | 3.33 | |
| Invert EI. (ft) | = 670.00 | 0.00 | 0.00 | 0.00 | Weir Type | = 1 | 0.00 | 0.00 | 0.00 | |
| Length (ft) | = 103.00 | 0.00 | 0.00 | 0.00 | Multi-Stage | = Yes | No | No | No | |
| Slope (%) | = 1.07 | 0.00 | 0.00 | n/a | | | | | | |
| N-Value | = .013 | .013 | .013 | n/a | | | | | | |
| Orifice Coeff. | | | | | | | | | | |
| | = 0.60 | 0.60 | 0.60 | 0.60 | Exfil.(in/hr) | | Wet area) | | | |
| | = 0.60 = n/a | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifice cor | nditions (ic) and | submergence (s) |
| Multi-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for or ilicae cor | rditions (ic) and | |
| Multi-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifica-cor | nditions (ic) and | Elev (|
| Multi-Stage age (ft) | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifice-cor | uditions (ic) and | Elev (|
| Multi-Stage age (ft) | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifice cor | utitions (ic) and | Elev (|
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | ter oritica cor | nditions (ic) and | Elev (1 |
| Multi-Stage age (ft) | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | ter orifica cor | ditors (c) and | Elev (|
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orfice cor | uliions (ic) and | Elev (1 |
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifice cor | ditions (c) and | Elev (1 |
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | ter cellica cor | ditions (ic) and | Elev () 690.00 689.00 |
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | to orifice cor | utitions (ic) and | Elev (1 |
| Multi-Stage Ige (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orfice cor | utitions (ic) and | Elev () 690.00 689.00 |
| Multi-Stage 199 (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifica cor | ultions (c) and | Elev () 690.00 689.00 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orifica cor | ditions (c) and | Elev (690.0 689.0 688.0 |
| Multi-Stage Ige (ft) 5.00 | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | ter orifica cor | | Elev () 690.00 689.00 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | | | Elev (690.0 689.0 688.0 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orfice cor | ditions (ic) and | Elev (690.0 689.0 688.0 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orfice cor | | Elev (690.0 689.0 688.0 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | for orfice cor | | Elev (690.0 689.0 688.0 688.0 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | | | Elev (1 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | | | Elev (690.0 689.0 688.0 688.0 |
| Autti-Stage | | No | No | No te cutilove are ana | TW Elev. (ft) | = 0.00 | | | | Elev (690.0 689.0 688.0 688.0 |

Pond Report 7







| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 67 of 70 |

| Table 2.1.5-1 Runoff C | urve Numbers ¹ | | | | | |
|---|--|---|---|----------------------------------|----------------------------------|----------------------------------|
| Cover description | | | Curve numbers for hydrologic soll groups | | | |
| Cover type and | | Average percent | | | | |
| hydrologic condition | | impervious area ² | А | В | с | D |
| Cultivated land: | without conservation | | 72 62 | 81 71 | 88 78 | 91 81 |
| Pasture or range land | Pasture or range land: poor condition good condition | | | | 86 74 | 89 80 |
| Meadow: good condition | 30 | 58 | 71 | 78 | | |
| Wood or forest land: | Wood or forest land: thin stand, poor cover good cover | | | | 77 70 | 83 77 |
| Open space (lawns, p Poor condition Fair condition (Good condition Impervious areas: | 68 49 39 | 79 69 61 | 86 79 74 | 89 84 80 | | |
| Paved parking (excluding right | 98 | 98 | 98 | 98 | | |
| Streets and roads: Paved; curbs a right-of-way) Paved; open di Gravel (includin Dirt (including) | 98 83 76 72 | 98 89 85 82 | 98 92 89 87 | 98 93 91 89 | | |
| Urban districts: Commercial and busi Industrial | | 85% 72% | 89 81 | 92 88 | 94 91 | 95 93 |
| Residential districts 1/8 acre or less (town 1/4 acre 1/3 acre 1/2 acre 1 acre 2 acres | | ze: 65% 38% 30% 25% 20% 12% | 77 61 57 54 51 46 | 85 75 72 70 68 65 | 90 83 81 80 79 77 | 92 87 86 85 84 82 |
| Developing urban a Newly graded areas only, no vegetation) | (pervious areas | | 77 | 86 | 91 | 94 |
| ¹ Average runoff condition. ² The average percent imp follows, impervious areas a areas are considered equiv SCS method has an adjust ³ CNs shown are equivaler cover type. | ervious area shown w re directly connected t alent to open space in ment to reduce the effi | to the drainage system. Im good hydrologic condition ect. | pervious are If the impe | ervious are | CN of 98. Is not o | and pervicus onnected, the |



| Project | Prepared by | Date | |
|---|---|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 | |
| | Calculation Number DC-BN- 735210-002 | Sheet 68 of 70 | |

| Surface Description | n |
|---|---|
| | - |
| Smooth surfaces (concrete, asphalt | |
| gravel, or bare soil) | 0.011 |
| Fallow (no residue) | 0.05 |
| Cultivated soils | |
| Residue cover < 20% | 0.06 |
| Residue cover > 20% | 0.17 |
| Grass: | 0, 11 |
| Short grass prairie | 0.15 |
| Dense grasses ² | 0.24 |
| Bermuda grass | 0.41 |
| Range (natural) | 0.13 |
| Woods ³ | |
| Light underbrush | 0.40 |
| Dense underbrush | 0.80 |
| | 10 |
| The n values are a composite of information by Engman (1986). | |
| Includes species such as weeping lovegrass, bluegrass, buffalo g | rass, blue grama grass, and native grass mixtures |
| When selecting n, consider cover to a height of about 0.1 ft. This obstruct sheet flow | - |

Table 2



Design Calculations Prepared by Date Project Plant Bowen Run-on Run-off Control Jeremy Brown 9/15/23 Subject/Title Provide run-on and run-off system Reviewed by Ashley Grissom Date 9/21/23 calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 Calculation Number Sheet DC-BN-735210-002 69 of 70

Ν

| s n Values | | | Paş |
|--|-------|-------|-------|
| 3. linished, with gravel on bottom | 0.015 | 0.017 | 0.020 |
| 4. unfinished | 0.014 | 0.017 | 0.020 |
| 5. gunite, good section | 0.016 | 0.019 | 0.023 |
| 6. gunite, wavy section | 0.018 | 0.022 | 0.025 |
| 7. on good excavated rock | 0.017 | 0.020 | |
| 8. on irregular excavated rock | 0.022 | 0.027 | |
| d. Concrete bottom float finish with sides of: | | | |
| 1. dressed stone in mortar | 0.015 | 0.017 | 0.020 |
| 2. random stone in mortar | 0.017 | 0.020 | 0.024 |
| 3. cement rubble masonry, plastered | 0.016 | 0.020 | 0.024 |
| 4. cement rubble masonry | 0.020 | 0.025 | 0.030 |
| 5. dry rubble or riprap | 0.020 | 0.030 | 0.035 |
| e. Gravel bottom with sides of: | | | |
| 1. formed concrete | 0.017 | 0.020 | 0.025 |
| 2. random stone mortar | 0.020 | 0.023 | 0.026 |
| dry rubble or riprap | 0.023 | 0.033 | 0.036 |
| f. Brick | | | |
| 1. glazed | 0.011 | 0.013 | 0.01 |
| 2. in cement mortar | 0.012 | 0.015 | 0.01 |
| g. Masonry | | | |
| 1. cemented rubble | 0.017 | 0.025 | 0.03 |
| 2. dry rubble | 0.023 | 0.032 | 0.03 |
| h. Dressed ashlar/stone paving | 0.013 | 0.015 | 0.01 |
| i Asphalt | | | |
| 1. smooth | 0.013 | 0.013 | |
| 2. rough | 0.016 | 0.016 | |

Table 3



| Project | Prepared by | Date |
|---|---|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 9/15/23 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 3-8 | Reviewed by Ashley Grissom | Date 9/21/23 |
| | Calculation Number DC-BN- 735210-002 | Sheet 70 of 70 |

ADS N-12 WT IB Pipe (per AASHTO) Specification

Scope

This specification describes 4- through 60-inch (100 to 1500 mm) ADS N-12 WT IB pipe (per AASHTO) for use in gravity-flow land drainage applications.

Pipe Requirements

ADS N-12 WT IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.

- 4- through 60-inch (100 to 250 mm) shall meet AASHTO M252, Type S
- 12-through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or ASTM F2306
- Manning's "n" value for use in design shall be 0.012.

Joint Performance

Pipe shall be joined using a bell & spigot joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

Fittings

Fittings shall conform to AASHTO M252, AASHTO M294 or ASTM F2306. Bell and spigot connections shall utilize a welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.

Field Pipe and Joint Performance

To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F2487. Appropriate safety precautions must be used when field testing any pipe material. Contact the manufacturer for recommended leakage rates.

Material Properties

Material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500 mm) pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

Installation

Installation shall be in accordance with ASTM D2321 and ADS' recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot (0.3 m) and for 60-inch (1500 mm) diameter, the minimum cover shall be two feet (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD) or Class 3 (minimum 95%) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.01. Contact your local ADS representative or visit our website *adspipe.com* for a copy of the latest installation guidelines.

Build America, Buy America (BABA)

ADS N-12 WT IB pipe (per AASHTO), manufactured in accordance with AASHTO M252, AASHTO M294 or ASTM F2306, complies with the requirements in the Build America, Buy America (BABA) Act.

Pipe Dimensions*

| Pipe I.D. | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 24 | 30 | 36 | 42 | 48 | 60 |
|-----------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| in (mm) | (100) | (150) | (200) | (250) | (300) | (375) | (450) | (600) | (750) | (900) | (1050) | (1200) | (1500) |
| Pipe O.D. | 4.8 (122) | 6.9 | 9.1 | 11.4 | 14.5 | 18 | 22 | 28 | 36 | 42 | 48 | 54 | 67 |
| in (mm) | | (175) | (231) | (290) | (368) | (457) | (559) | (711) | (914) | (1067) | (1219) | (1372) | (1702) |



Technical and Project Solutions Calculation

Calculation Number: DC-BN-735210-003

| Project/Plant: | Unit(s): | Discipline/Area: |
|---|-----------------------------|-------------------------|
| Bowen | 1 - 4 | Civil |
| Title/Subject: | | |
| Run-on and Run-off Study for Bowen Cells 9 & | <u>s</u> 10 | |
| Purpose/Objective: To determine if the Cell's stormwater manager | ment can safely mana | age and pass the design |
| storm event. | Originatory | |
| System or Equipment Tag Numbers: N/A | Originator: Jeremy Brown | |

Contents

| | | Attachments | # of |
|--|-------|--|-------|
| Торіс | Page | (Computer Printouts, Tech. Papers, Sketches, Correspondence) | Pages |
| Purpose of Calculation | 1 | | 1 |
| Summary of Conclusions | 1 | | 1 |
| Project Narrative | 1-2 | | 2 |
| Methodology | 2. | 11.5 | 1 |
| Assumptions/Criteria | 2 | 42 | 1 |
| Design Inputs/References | 3-9 | | 7 |
| Body of Calculation | 10-23 | | 14 |
| Total # of pages including cover sheet & attachments: | 24 | | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|-------------|-----------------------|------------------------------|----------------------------|----------------------------|
| 0 | Issued for Review | JKB 2/12/21 | AOG 3/1/21 | JWM 6/7/21 |
| 1 | Revised per as-builts | JKB 2/10/22 | AOG 2/11/22 | JWM 2/11/22 |
| | | | | |
| | | | | |

Notes:





| Project | Prepared by | Date 2/10/22 Date 2/11/22 | | |
|--|--|------------------------------------|--|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | | | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | | | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 1 of 23 | | |

Purpose of Calculation

The purpose of this calculation is to determine if the existing sedimentation ponds and clear pools can sufficiently handle run-on/run-off during a minimum 25-yr, 24-hr storm event per federal stormwater requirements Title 40 CFR Part 257.81 and the Georgia Environmental Protection Division's (EPD) Georgia CCR Rule (391-3-4-.10).

Summary of Conclusions

Based on our analysis, the detention pond system is adequate to collect and control the volume of water resulting from a 24-hour 25-year storm, as required.

| Storage Pond Name | Normal Pool Elevation (feet, NAVD 88) | Maximum 25 year pool elevation (feet, NAVD 88) | Spillway/Top of Dike Elevation (feet, NAVD 88) | Freeboard to Spillway (feet, NAVD 88) |
|--------------------|--|---|--|---|
| Clear Pool | 697.00 | 701.44 | 703.50/706.00 | 2.06/4.56 |
| Sedimentation Pond | 697.00 | 701.44 | 703.50/706.00 | 2.06/4.56 |

Project Narrative

The Plant Bowen CCB Disposal Facility Cells 9 & 10 site is located in Bartow County and is approximately 1.5 miles East of Euharlee, Georgia and 6 miles southwest of Cartersville, Georgia. The plant is bordered on the north and east by the Etowah River and on the south and west by farmland.

Cells 9 & 10 cover 34.71 acres and are not divided by any means. (See Image 1).

Cells 9 & 10 are comprised of a 31.67 acres storage cell, 2.12 acres sedimentation pond, 0.92 acres clear pool, berms, access roads and ditches. (See Image 2) Cells 9 & 10 include a perimeter dike to control surface rainfall run-off. There is no stormwater run-on for these cells. Run-off from this area is directed through interior perimeter ditches and through $4 - 42^{"}$ diameter HDPE pipes into a sedimentation pond that is connected to a clear pool via two 54" diameter risers and two 36" diameter pipes. Stormwater from the clear pool is discharged through a 54" diameter riser and 42" diameter pipe.

The sediment pond and clear pool have identical auxiliary spillways that are concrete trapezoidal weirs. The auxiliary spillways are 24' wide with 6:1 side slopes and sloped at 1% in



| Design Calculations | | | |
|--|--|------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 2 of 23 | |

the direction of flow with a 3:1 slope on the discharge channel at the downstream end. Following pages will show the analysis for Cells 9 & 10.

Leachate is collected separately from stormwater run-off in a sump. From there leachate is pumped to a 592,000 gallon leachate storage tank and then sent to the Low Volume Waste Treatment System.

Methodology

The stormwater flows were calculated using the National Resources Conservation Service method (also known as the Soil Conservation Service (SCS) method) using a 25-yr, 24-hr design storm event.

Storm basin calculation information was gathered from a number of sources to include the Georgia Stormwater Manual and Technical Release 55.

The National Resources Conservation Service (NCRS) provided information on the soil characteristics and hydrologic groups. The soil types found on the site are Etowah Loam and Waynesboro Clay Loam. (See Images 3 & 4). It was determined that the hydrological group "B" should be used to best reflect the characteristics of the soils on site.

Run-off curve number data was determined using Table 2.1.5-1 from the Georgia Stormwater Management Manual. Run-off coefficient data was determined by utilizing Table 2.1.5-2 from the Georgia Stormwater Management Manual and Manning's n for Channels (Chow, 1959).

Appendix B from the TR-55 was used to determine the rain distribution for Plant Bowen is Type II. (See Image 5)

NOAA Atlas 14 was used to determine the 24-hour precipitation for the design storm event of 25-yr for Plant Bowen is 6.07 in. (See Image 6)

Assumptions/Criteria

- Refer to Title 40 CFR Part 257.81 Hydrologic and hydraulic capacity requirements for the runon and run-off controls for CCR landfills.
- Other assumptions are listed on attached calculation sheets.



| Project | Prepared by | Date |
|--|--|------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 3 of 23 |

Design Inputs/References

- AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Hydrographs Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- Hydraflow Express Extension for AutoCad Civil 3D 2019, Autodesk, Inc.
- NOAA Atlas 14, Volume 9, Version 2 for Taylorsville, GA.
- Georgia SW Manual
- TR-55 Urban Hydrology for Small Watersheds, Appendix B, National Resources Conservation Service, Conservation Engineering Division, 1986.
- Georgia Power Company Plant Bowen CCB Disposal Facility Design and Operation Plans H15061 H15097, H15296 H15315 and H52258 H52260.
- Cells 9&10 As-built drawing from 2014 titled "13471-Plant Bowen-CCB Facility CELL9_10 2014.dwg"



| Project | Prepared by | Date | |
|--|--|------------------|--|
| Plant Bowen Run-on Run-off Control | Run-off ControlJeremy Brown2/10/2 | | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 4 of 23 | |



Image 1



| Design Calculations | company | | |
|--|--|------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 5 of 23 | |



Image 2



Design Calculations Company Project Prepared by Date Plant Bowen Run-on Run-off Control Jeremy Brown 2/10/22 Subject/Title Reviewed by Date Provide run-on and run-off system calculations for the peak discharge from Ashley Grissom 2/11/22 a 24-hr 25-year storm Cells 9 & 10 Calculation Number DC-BN- 735210-003 (Rev1) Sheet 6 of 23

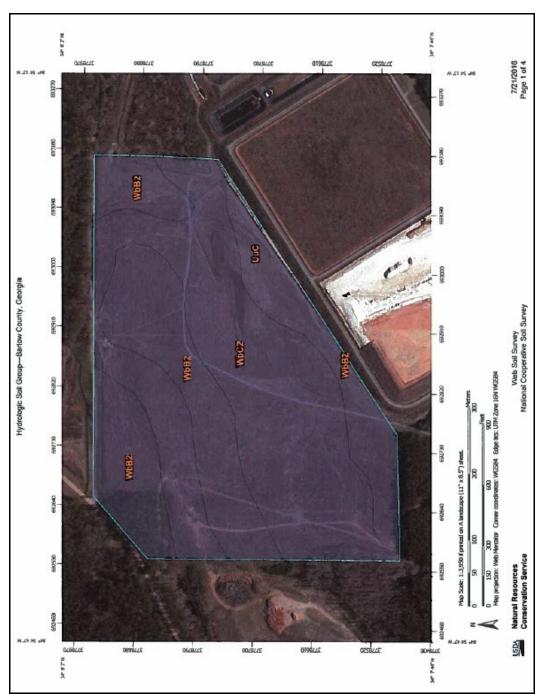


Image 3



| Design Calculations | | | |
|--|--|------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 7 of 23 | |

| | drologic Soil Gr | oup | | |
|--|---|--|---|---|
| | Hydrologic Solt Group- Sur | nmary by Map Unit — B | artow County, Georgia (GA0 | 15) |
| Map unit symbo | Map unit name | Rating | Acres in AOI | Percent of AOI |
| UuC | Urban land-Udorthents complex, 0 to 10 percent slopes | | 0.3 | 0.5% |
| WbB2 | Waynesboro clay loam. 2 to 6 percent slopes, moderately eroded | в | 25.4 | 46-6% |
| WbC2 | Waynesboro clay loam. 6 to 10 percent slopes. moderately eroded | B | 28.8 | 52.9% |
| Totals for Area of | nterest | | 54.5 | 100.0% |
| | | | unoff potential) when tho | roughly |
| grav Gro com soils hav Gro chie soils | These consist mainly of e elly sands. These soils having a mode sist chiefly of moderately of that have moderately fin a moderate rate of wate up C. Soils having a slow fly of soils having a layer of moderately fine texture smission. | deep, well drained to ave a high rate of wa erate infiltration rate leep or deep, moder e texture to moderal r transmission. infiltration rate wher that impedes the do | excessively drained sar ater transmission. when thoroughly wet. Th ately well drained or well kely coarse texture. These in thoroughly wet. These wnward movement of wa | roughly nds or drained e soils consist ater or |



| Project | Prepared by | Date | |
|--|--|------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 8 of 23 | |

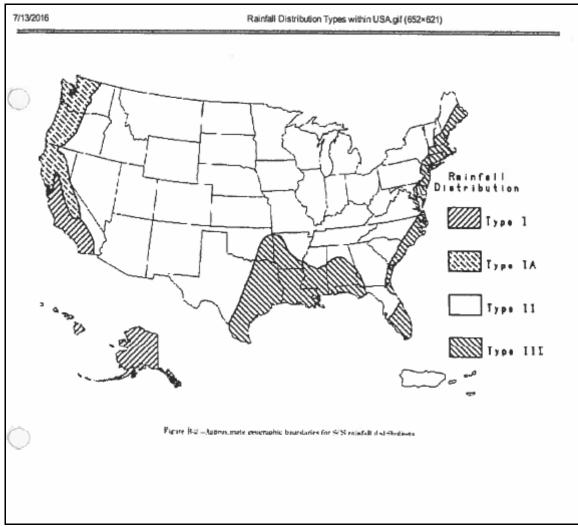


Image 5



| Design Calculations | | company | |
|--|--|------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 9 of 23 | |

| cipitation Freque | ncy Data Server | | | | | | | Page 1 o |
|--|--|--|---|--|---|--|---------------------|---------------------|
| | | Statio Location name: T Latitude: 34.086 Elevation (stat | LORSVILLE in ID: 09-860 aylorsville, 1*, Longitus levation: tion metada ca: Google Maps | 00 Georgia, L ie: -84.982 ta): 721 ft* | J5* 8* | | | |
| | Sanja Perica, Oebora | ah Martin, Serdre Pavlo Umrsh, Michae NOAA, National Weath | el Yekta, Geoffer | y Bonnin | | aluk, Dale | | |
| | | PE_tabular PF_g | raphical M | aps & aeri | als | | | |
| r | | PF | tabular | | | | | |
| PDS-based | point precipitation | COLUMN TWO IS NOT THE OWNER. | | | | e interva | ls (in inc | hes) ¹ |
| Duration | 2 6 | | 25 | 50 | ans) 100 | 200 | 500 | 1000 |
| 5-min 0.406 | 0.464 0.5 | | 0.804 | 0.924 | 1.05 (0.768-1.42) | 1.19 | 1.39 | 1.55 (1.02-2.14) |
| 10-min 0.594 | 0.679 0.8 | 31 0.969 | 1.18 (0.907-1.56) | 1.35 (1.02-1.80) | 1.54 (1.12-2.07) | 1.75 (1.23-2.38) | 2.03 (1.38-2.81) | 2.27 (1.50-3.14) |
| 15-min 0.725 (0.574-0.9 | 0.828 1.0 (0.655-1.06) (0.799- | 1.18 -1.30) (0.928-1.52) | 1.44 (1.11-1.90) | 1.65 (1.24-2.19) | 1.88 (1.37-2.53) | 2.13 (1.50-2.90) | 2.48 (1.68-3.43) | 2.77 (1.83-3.83) |
| 30-min 1.02 (0.811-1. | 1.17 1.4 31) (0.924-1.49) (1.13- | | 2.02 (1.56-2.68) | 2.33 (1.75-3.09) | 2.65 (1.94-3.57) | 3.01 (2.12-4.11) | 3.52 (2.39-4.85) | 3.93 (2.60-5.44) |
| 60-min 1.33 (1.05-1.3 | 1.52 1.8 (1.20-1.94) (1.46- | | 2.61 (2.01-3.45) | 3.00 (2.25-3.98) | 3.41 (2.49-4.58) | 3.86 (2.71-5.26) | 4,49 (3.05-6.21) | 5.01 (3.31-6.93) |
| 2-hr 1.64 (1.31-2.0 | 1.86 2.2 6) (1.49-2.35) (1.51- | | 3.20 | 3.66 | 4.16 | 4.70 | 5.47 (3.77-7.48) | 6.09 (4.09-8.32) |
| 3-hr 1.84 {1,49-2.3 | 2.10 2.5 (1.69-2.62) (2.05- | 3.19) (2.37-3.71) | 3.56 (2.80-4.60) | 4.07 (3.12-5.28) | 4.60 (3.43-6.05) | 5.18 (3.73-6.91) | 6.00 (4.17-8.12) | 6.66 (4.51-9.04) |
| 6-hr 2.27 (1.86-2.3 | 2.57 3.1 9) (2.10-3.17) (2.53- | | 4,26 (3.38-5.41) | 4.82 (3.75-6.16) | 5.42 (4.10-7.02) | 6.05 (4.42-7.96) | 6.94 (4 90-9.27) | 7.65 (5.27-10.3) |
| 12-hr 2.79 (2.32-3.3 | 3.15 3.7 9) (2.61-3.63) (3.12- | | 5,08 (4.08-6.34) | 5.70 (4.49-7.17) | 6.36 (4.67-8.10) | 7.04 (5.21-9.11) | 7.99 (5.72-10.5) | 8.73 (6,11-11,6) |
| 24-hr 3.34 (281-35 | 3.79 4.4 (3.18-4.53) (3.60- | | 6,07 (4.93-7.43) | 6.77 (5.40-8.35) | 7.48 (5.61-9.38) | 8.22 (6.17-10.5) | 9.21 (6.70-11.9) | 9.98 (7.10-13.0) |
| 2-day 3.87 (3.29-4.5 | 4.43 5.3 (3.77-5.21) (4.54- | 6 30) (5 18-7.22) | 7.14 (5.88-8.60) | 7.95 (6.42-9.65) | 8.75 (6.85-10.5) | 9.56 (7.27-12.0) | 10.6 (7.84-13.6) | 11.4 (8.27-14.6) |
| 3-day 4.24 (3.64-4.9 | 4.81 5.3 6) (4,13-5.62) (4.93- | | 7.66 (6.37-9.16) | 8.53 (6.95-10.3) | 9.40 (7.47-11.5) | 10.3 (7.92-12.6) | 11.5 (8.57-14.6) | 12.4 (9.06-15.9) |
| 4-day 4.56 (3.94-5.2 | 8) (4.43-5.96) (5.25- | | 8.07 (6.76-9.61) | 8.98 (7.38-10.8) | 9.92 (7 94-12.1) | 10.9 (8.43-13.5) | 12.2 (9.16-15.4) | 13.2 (972-16 6) |
| 7-day 5.37 (4.69-6.1 | 4) (5.22-6.86) (6.13- | | 9.24 (7.84-10.9) | 10.3 (8.56-12.2) | 11.3 (9.21-13.7) | 12.5 (9.80-15.3) | 14.0 (10.7-17.5) | 15.2 (11.3-19.2) |
| 10-day 6.07 (5.34-6.0 | 6.74 7.8 (5.92-7.66) (6.91- | | 10.3 (8.79-12,0) | 11.4 (9.58-13.5) | 12.6 (10 3-15.1) | 13.8 (11.0-16.8) | 15.5 (11.9-19.3) | 16.8 (12.7-21.1) |
| 20-day 8.08 (7.21-9) | 8.91 10 | | 13.2 (11.5-15.2) | 14.6 (12.4-16.9) | 16.0 (13.3-18.8) | 17.4 (14.0-20.9) | 19.4 (15.2-23.7) | 21.0 (16.1-25.9) |
| 30-day 9.85 (8.87-10 | 10.8 12 (9.75-12.0) (11.2- | .5 13.9 | 15.8 (13.8-17.9) | 17.3 (14.9-19.8) | 18.8 (15.8-22.0) | 20.4 (16.6-24.2) | 22.5 (17.8-27.3) | 24.1 (18.7-29.5) |
| 45-day 12.2 (11.1-13 | 13.5 15 | .4 17.1 | 19.3 (16.9-21.6) | 20.9 (18.1-23.7) | 22.6 (19.1-28.1) | 24.3 (19.9-28.5) | 26.4 (21.1-31.7) | 28.1 (22.0-34.1) |
| 60-day 14.4 (13.1-15 | 15.8 18 | .1 19.9 | 22.4 (19.8-24.9) | 24.2 (21.0-27.2) | 25.9 (22.0-29.7) | 27.7 (22.8-32.2) | 29.8 (23.9-35.5) | 31.4 |
| Numbers in parenthes (for a given duration a bounds are not checks | cy (PF) estimates in this tab s are PF estimates at lower to average recurrence inter d against probable maximu Attas 14 document for more | vie are based on frequi r and upper bounds of vol) will be greater tha im precipitation (PMP) e information. | ency analysis of the 90% confic in the upper bo estimates and | f pertial dural lence interval und (or less ti | ion series (PC The probabilition the lower | S). Ity that precipi bound) is 5%. | ation frequent | cy estimates |
| | | B | ack to Top | | | | | |
| | | PF | graphica | 1 | | | | |

Image 6

Body of Calculation

See detailed calculations and software output.



| Project | Prepared by | Date |
|--|--|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 10 of 23 |

Drainage Area = 34.71 AC (See Map 1)

Curve Number = 64 (See Attached Table 1) 31.47 AC @ CN 61 (Grass) 2.48 AC @ CN 85 (Gravel) 0.76 AC @ CN 98 (Impervious – Liner in Sediment Pond and Clear Pool) ((31.47*61)+(2.48*85)+(0.76*98))/34.88 = 63.52 = 64Time of Concentration = 31.49 Min (See Attached TR55 Worksheet and Map 2) Sheet Flow Manning's n-Value = 0.15 (Short Grass) (See Table 2) Flow Length = 300 LF Land Slope = (805.50-799.00)/300 = 0.0217 = 2.17% Shallow Concentrated Flow Length = 353 LF Watercourse Slope = (799.00-744.54)/353 = 0.1543 = 15.43% Surface is Unpaved Channel Flow (See Channel Report 1) Grass Lined 4' Wide Ditch with 2:1 Side Slopes and 4' Deep Cross Sectional Area = 6.57 SF Wetted Perimeter = 8.79 LF Channel Slope = (744.54-704.46)/2773 = 0.0145= 1.45% Manning's n-Value = 0.030 (Vegetal Lining) (See Table 3) Flow Length = 2773 LF Channel Flow (See Channel Report 2) 4 – 42" Dia. HDPE Pipes @ 1.51% Cross Section Area = 1.85 SF Wetted Perimeter = 3.64 LF Channel Slope = (704.46-702.92)/102 = 0.0151 = 1.51% Manning's n-Value = 0.013 (HDPE Pipes) (See Table 4) Flow Length = 102 LFTime Interval = 3 Min Tc*0.1333 = 31.49*0.1333 = 4.20 = 5

Storm Distribution = Type II



| Project | Prepared by | Date | |
|--|--|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 11 of 23 | |

 $Q_{25} = 65.64$ CFS (See Hydrograph Report 1)

To Evaluate for Storage Capacity, Treat The Sediment Pond and Clear Pool As One Pond Since They Are Interconnected.

| Elevation | Sed. Pond Area | Clear Pool Area | Total Area | Volume |
|-----------|----------------|-----------------|------------|---------|
| (FT) | (SF) | (SF) | (SF) | (CF) |
| 695 | 0 | 9369 | 9369 | 0* |
| 696 | 30,498 | 10,378 | 40,876 | 23,269* |
| 697 | 32,804 | 11,426 | 44,230 | 65,807 |
| 698 | 35,149 | 12,514 | 47,663 | 111,738 |
| 699 | 37,533 | 13,640 | 51,173 | 161,141 |
| 700 | 39,956 | 14,806 | 54,762 | 214,093 |
| 701 | 42,419 | 16,012 | 58,431 | 270,674 |
| 702 | 44,921 | 17,256 | 62,177 | 330,962 |
| 703 | 47,462 | 18,540 | 66,002 | 395,036 |
| 703.5 | 48,748 | 19,197 | 67,945 | 428,518 |

Note: Stage storage is based on topographic information from 2020. *Dead Storage

Spillways

- Principal Spillway consists of a 54" Dia. Riser with a 42" Dia. HDPE Pipe.
- Auxiliary Spillways in the Clear Pool and Sediment Pond consist of a concrete trapezoidal weir that is 24' wide with 6:1 side slopes and sloped at 1% in the direction of flow with a 3:1 slope on the discharge channel at the downstream end.

High Water Elevation is 701.44 (See Pond Reports 1 & 2)



| Project | Prepared by | Date |
|--|--|-------------------|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 12 of 23 |



Map 1



| Design Calculations | Company | |
|--|--|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 13 of 23 |

| Table 2.1.5-1 Runoff C | urve Numbers ¹ | | | | | |
|---|---|--|---|----------------------------------|----------------------------------|----------------------------------|
| Cover description | | | Curve numbers for hydrologic soll groups | | | |
| Cover type and | A | verage percent | | | | |
| hydrologic condition | in | npervious area ² | A | в | С | D |
| Cultivated land: | without conservat with conservation | | 72 62 | 81 71 | 88 78 | 91 81 |
| Pasture or range land | poor condition good condition | | 68 39 | 79 61 | 86 74 | 89 80 |
| Meadow: good condition | n | | 30 | 58 | 71 | 78 |
| Wood or forest land: | thin stand, poor c good cover | over | 45 25 | 66 55 | 77 70 | 83 77 |
| Open space (lawns, parks, golf courses, cemeteries, etc.) Poor condition (grass cover <50%) Fair condition (grass cover 50% to 75%) Good condition (grass cover > 75%) Impervious areas: Paved parking lots, roofs, driveways, etc. | | |) ³ 68 49 39 | 79 69 61 | 86 79 74 | 89 84 80 |
| (excluding right | | | 98 | 98 | 98 | 98 |
| right-of-way) Paved; open di | nd storm drains (e) tches (including rig ng right-of-way) ight-of-way) | • | 98 83 76 72 | 98 89 85 82 | 98 92 89 87 | 98 93 91 89 |
| Urban districts: Commercial and busi Industrial | | 85% 72% | 89 81 | 92 88 | 94 91 | 95 93 |
| Residential districts 1/8 acre or less (town 1/4 acre 1/3 acre 1/2 acre 1 acre 2 acres | | e: 65% 38% 30% 25% 20% 12% | 77 61 57 54 51 46 | 85 75 72 70 68 65 | 90 83 81 80 79 77 | 92 87 86 85 84 82 |
| Developing urban areas and Newly graded areas (pervious areas only, no vegetation) 77 86 91 | | | 94 | | | |
| ¹ Average runoff condition, and I _a = 0.2S ² The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not connected, the SCS method has an adjustment to reduce the effect. ³ CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type. | | | | | | |



| Design Calculations | Company | |
|--|--|-------------------|
| Project | roject Prepared by | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 14 of 23 |

| TR55 Tc Worksheet | : | | | | | | |
|--|--|---------|---------------------------------------|----------|---------------------------------------|---------|------------------------------------|
| | H | /drafio | w Hydrograph: | s Extens | sion for Autode | esk® Ci | vil 3D® 2019 by Autodesk, Inc. v12 |
| Hyd. No. 1 | | | | | | | |
| Cells 9 & 10 | | | | | | | |
| Description | Α | | B | | <u>C</u> | | Totals. |
| Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%) | = 0.150 = 300.0 = 3.79 = 2.17 | | 0.011 0.0 0.00 0.00 | | 0.011 0.0 0.00 0.00 | | |
| Travel Time (min) | = 20.99 | + | 0.00 | + | 0.00 | = | 20.99 |
| Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s) | = 353.00 = 15.43 = Unpaved =6.34 | 1 | 0.00 0.00 Paved 0.00 | | 0.00 0.00 Paved 0.00 | | |
| Travel Time (min) | = 0.93 | + | 0.00 | + | 0.00 | = | 0.93 |
| Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s) | = 6.57 = 8.79 = 1.45 = 0.030 =4.92 | | 1.79 3.39 1.51 0.013 9.18 | | 0.00 0.00 0.00 0.015 0.00 | | |
| Flow length (ft) | ({0})2773.0 | | 102.0 | | 0.0 | | |
| Travel Time (min) | = 9.39 | + | 0.19 | + | 0.00 | = | 9.58 |
| Total Travel Time, Tc | | | | | | | 31.49 min |

TR55 Worksheet



| Project | Prepared by | Date | |
|--|--|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 15 of 23 | |



Map 2



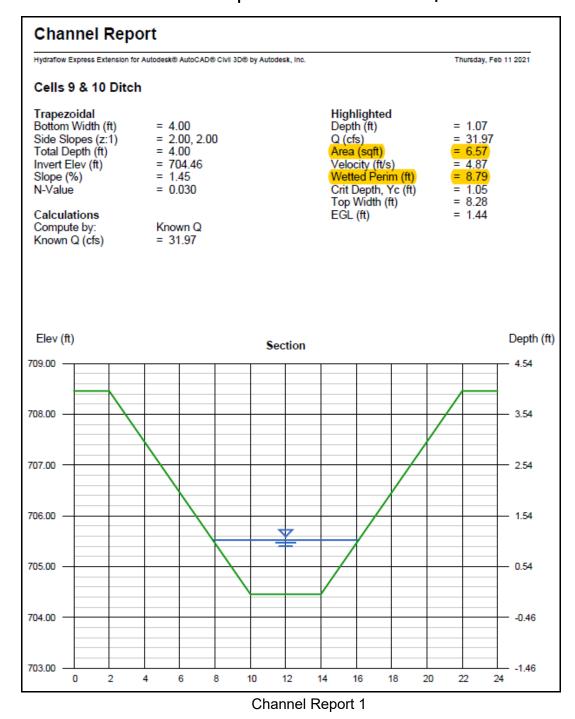
| Project | Prepared by | Date | |
|--|--|-------------------|--|
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 16 of 23 | |

| Table 2.1.5-2 Roughness Coefficients (Manning's n) | for Sheet Flow ¹ |
|--|---|
| Surface Description | n |
| Smooth surfaces (concrete, asphalt, | |
| gravel, or bare soil) | 0.011 |
| Fallow (no residue) | 0.05 |
| Cultivated soils | |
| Residue cover < 20% | 0.06 |
| Residue cover > 20% | 0.17 |
| Grass: | |
| Short grass prairie | 0.15 |
| Dense grasses ² | 0.24 |
| Bermuda grass | 0.41 |
| Range (natural) | 0.13 |
| Woods ³ | |
| Light underbrush | 0.40 |
| Dense underbrush | 0,80 |
| 1 The purples are a comparing of information by Research (1995). | |
| The n values are a composite of information by Engman (1986). | |
| Includes species such as weeping lovegrass, bluegrass, buffalo | - |
| When selecting n, consider cover to a height of about 0.1 ft. This obstruct sheet flow. | s is the only part of the plant cover that will |
| Source: SCS, TR-55, Second Edition, June 1986, | |

Table 2



| Design Calculations | | | |
|--|--|-------------------|--|
| Project | Prepared by | Date | |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 | |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 | |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 17 of 23 | |





| Design Calculations | | company |
|--|--|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 18 of 23 |

| ng's n Values | | | Page |
|--|-------|-------|-------|
| 3. finished, with gravel on bottom | 0.015 | 0.017 | 0.020 |
| 4. unfinished | 0.014 | 0.017 | 0.020 |
| 5. gunite, good section | 0.016 | 0.019 | 0.023 |
| 6. gunite, wavy section | 0.018 | 0.022 | 0.025 |
| on good excavated rock | 0.017 | 0.020 | |
| on irregular excavated rock | 0.022 | 0.027 | |
| d. Concrete bottom float finish with sides of: | | | |
| 1. dressed stone in mortar | 0.015 | 0.017 | 0.020 |
| 2. random stone in mortar | 0.017 | 0.020 | 0.024 |
| 3. cement rubble masonry, plastered | 0.016 | 0.020 | 0.024 |
| 4. cement rubble masonry | 0.020 | 0.025 | 0.030 |
| 5. dry rubble or riprap | 0.020 | 0.030 | 0.035 |
| e. Gravel bottom with sides of: | | | |
| 1. formed concrete | 0.017 | 0.020 | 0.025 |
| 2. random stone mortar | 0.020 | 0.023 | 0.026 |
| dry rubble or riprap | 0.023 | 0.033 | 0.036 |
| f. Brick | | | |
| 1. glazed | 0.011 | 0.013 | 0.015 |
| 2. in cement mortar | 0.012 | 0.015 | 0.018 |
| g. Masonry | | | |
| 1. cemented rubble | 0.017 | 0.025 | 0.030 |
| 2. dry rubble | 0.023 | 0.032 | 0.035 |
| h. Dressed ashlar/stone paving | 0.013 | 0.015 | 0.017 |
| i. Asphalt | | | |
| 1. smooth | 0.013 | 0.013 | |
| 2. rough | 0.016 | 0.016 | |
| J. Vegetal lining | 0.030 | | 0.500 |

Table 3



| Design Calculations | | Company |
|--|--|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 19 of 23 |

| Hydraflow Express Extension for | Autodesk® AutoCAD® Civil 3D® | y Autodesk, Inc. | Thursday, Feb 10 2022 |
|---|--|--|-----------------------|
| Cells 9 & 10 Pipe | | | |
| C ircular Diameter (ft) | = 3.50 | Highlighted Depth (ft) Q (cfs) | = 0.86 = 16.41 |
| Invert Elev (ft) Slope (%) N-Value | = 702.92 = 1.51 = 0.013 | Area (sqft) Velocity (ft/s) Wetted Perim (ft) Crit Depth, Yc (ft) Top Width (ft) | = 1.24 |
| Calculations Compute by: <mark>Known Q (cfs)</mark> | Known Q = 16.41 | EGL (ft) | = 3.02 = 2.09 |
| | Full Flow = 65.64 # Pipes = 4 Flow Per Pipe = 65.64/4 = 16.41 | | |
| Elev (ft) | | Section | Depth (ft) |
| 707.00 | | | 4.08 |
| 706.00 | | | 3.08 |
| 705.00 | | | 2.08 |
| 704.00 | | <u> </u> | 1.08 |
| 703.00 | | | 0.08 |
| 702.00 | | | -0.92 |
| 701.00 | 1 2 | 3 4 5 | -1.92 |

Channel Report 2



| Design Calculations | | company |
|--|--|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 20 of 23 |

| nning's n Values | | | Page 4 |
|--|-------|-------|--------|
| 7. Concrete: | | 1 | |
| Culvert, straight and free of debris | 0.010 | 0.011 | 0.013 |
| Culvert with bends, connections, and some debris | 0.011 | 0.013 | 0.014 |
| Finished | 0.011 | 0.012 | 0.014 |
| Sewer with manholes, inlet, etc., straight | 0.013 | 0.015 | 0.017 |
| Unfinished, steel form | 0.012 | 0.013 | 0.014 |
| Unlinished, smooth wood form | 0.012 | 0.014 | 0.016 |
| Unlinished, rough wood form | 0.015 | 0.017 | 0.020 |
| 8. Wood: | | | |
| Stave | 0.010 | 0.012 | 0.014 |
| Laminated, treated | 0.015 | 0.017 | 0.020 |
| 9. Clay: | | | |
| Common drainage tile | 0.011 | 0.013 | 0.017 |
| Vitrified sewer | 0.011 | 0.014 | 0.017 |
| Vitrified sewer with manholes, inlet, etc. | 0.013 | 0.015 | 0.017 |
| Vitrified Subdrain with open joint | 0.014 | 0.016 | 0.018 |
| 10. Brickwork: | | | |
| Glazed | 0.011 | 0.013 | 0.015 |
| Lined with cement mortar | 0.012 | 0.015 | 0.017 |
| Sanitary sewers coated with sewage slime with bends and connections | 0.012 | 0.013 | 0.016 |
| Paved invert, sewer, smooth bottom | 0.016 | 0.019 | 0.020 |
| Rubble masonry, cemented | 0.018 | 0.025 | 0.030 |

Table 4



30.00

20.00

10.00

0.00

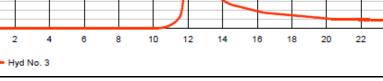
26

Time (hrs)

- 1

24

| 70.00 Transformed and the second seco | Southerr Company | |
|--|---------------------|--|
| bject/Title rovide run-on and run-off system alculations for the peak discharge from 24-hr 25-year storm Cells 9 & 10 Calculation Number DC-BN- 735210-003 (Rev1) Calculation Number DC-BN- 735210-003 (Rev1) Sheet 21 of 23 Hydrograph Report Hydrafow Hydrograph Extension for Autodesk® Civil 30® 2019 by Autodesk, inc. v12 Hydr No. 3 Pipe Hydrograph type = SCS Runoff Storm frequency = 25 yrs Time ito peak Storm frequency = 5 min Drainage area = 34.710 ac Curve number = 64* Basin Slope = 0.0 % Hydraulic length = 0 ft Tc method = TR55 Time of Hydraulic length = 0 ft Storm duration = 24 hrs Curve number = 484 * Composite (ArealCN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98)] / 34.710 Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe Q (efs) Pipe P | | |
| Ashley Grissom 2/11/22 Ashley Grissom 2/11/22 24-hr 25-year storm Cells 9 & 10 Calculation Number DC-BN- 735210-003 (Rev1) Sheet 21 of 23 Hydrograph Report Thursday, 02/11/2 Hydrograph Report Hydrograph Report Thursday, 02/11/2 Hydrograph Report Thursday, 02/11/2 Hydrograph Report Thursday, 02/11/2 Hydrograph Report Thursday, 02/11/2 Hydrograph type = SCS Runoff Peak discharge G5.64 cfs Storm frequency a 34,710 ac Curve number Distribution Time of conc. (Tc) Type II Storm frequency E 6.07 in Distribution Type II Storm duration Pipe Hyd. No. 3 - 25 Year Q <td cols<="" td=""><td></td></td> | <td></td> | |
| Calculation Number DC-BN- 735210-003 (Rev1) Sheet 21 of 23 Hydrograph Report Thureday, 02 / 11 / 2 Hydrafow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Thureday, 02 / 11 / 2 Hydr No. 3 Pipe Hydrograph type = SCS Runoff Pipe Fine to peak Hydrograph type = SCS Runoff Drainage area = 34.710 ac Drainage area = 34.710 ac Basin Slope = 0.0 % Hydraulic length = 0 ft Total precip. = 6.07 in Storm duration = 24 hrs ' composite (Area(CN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98)] / 34.710 | | |
| Pipe Hydraforw Hydrograph Stetension for Autodesk@ Civil 3D@ 2019 by Autodesk, Inc. v12 Thursday, 02 / 11 / 2 Hydr. No. 3 Pipe Peak discharge = 65,64 cfs Hydrograph type = SCS Runoff Peak discharge = 12.17 hrs Time interval = 5 min Hyd. volume = 300,595 cuft Drainage area = 34.710 ac Curve number = 64* Basin Slope = 0.0 % Hydraulic length = 0 ft Tc method = TR55 Time of conc. (Tc) = 31.50 min Total precip. = 6.07 in Distribution = Type II Storm duration = 24 hrs Shape factor = 484 * Composite (Area/CN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98]] / 34.710 | | |
| Hyd. No. 3 Pipe Hydrograph type = SCS Runoff Storm frequency = 25 yrs Time interval = 5 min Drainage area = 34,710 ac Basin Slope = 0.0 % Tc method = TR55 Time of conc. (Tc) = 31.50 min Total precip. = 6.07 in Storm duration = 24 hrs * Composite (Area/CN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98)] / 34.710 | | |
| Pipe Hydrograph type = SCS Runoff Peak discharge = 65.64 cfs Storm frequency = 25 yrs Time to peak = 12.17 hrs Time interval = 5 min Hyd. volume = 300,595 cuft Drainage area = 34.710 ac Curve number = 64* Basin Slope = 0.0 % Hydraulic length = 0 ft Tc method = TR55 Time of conc. (Tc) = 31.50 min Total precip. = 6.07 in Distribution = Type II Storm duration = 24 hrs Shape factor = 484 * Composite (Area/CN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98)] / 34.710 | 2021 | |
| Storm frequency = 25 yrs Time to peak = 12.17 hrs Time interval = 5 min Hyd. volume = 300,595 cuft Drainage area = 34.710 ac Curve number = 64* Basin Slope = 0.0 % Hydraulic length = 0 ft Tc method = TR55 Time of conc. (Tc) = 31.50 min Total precip. = 6.07 in Distribution = Type II Storm duration = 24 hrs Shape factor = 484 * Composite (Area/CN) - [(31.470 x 61) + (2.480 x 85) + (0.760 x 98)] / 34.710 Pipe Q (cfs) Hyd. No. 3 - 25 Year 7 70.00 | | |
| Pipe Q (cfs) Hyd. No. 3 25 Year Q 70.00 | | |
| Q (cfs) Hyd. No. 3 25 Year Q | | |
| | Q (cfs) | |
| 60.00 | 70.00 | |
| 60.00 | | |
| | 60.00 | |
| | | |
| 50.00 | 50.00 | |
| | | |
| 40.00 | 40.00 | |



30.00

20.00

10.00

0.00

0

2

Hydrograph Report 1



| Design Calculations | | eepa, |
|--|--|-------------------|
| Project | Prepared by | Date |
| Plant Bowen Run-on Run-off Control | Jeremy Brown | 2/10/22 |
| Subject/Title Provide run-on and run-off system calculations for the peak discharge from a 24-hr 25-year storm Cells 9 & 10 | Reviewed by Ashley Grissom | Date 2/11/22 |
| | Calculation Number DC-BN- 735210-003 (Rev1) | Sheet 22 of 23 |

| | ographs Extensio | n for Auto | odesk® Civil | 3D@ 2019 by | Autodesk, Inc. v12 | | | | Monday, | 01/31/202 |
|---|-------------------|--------------------|--------------------|---|--------------------------------|---|--------------------|----------------|------------------|--|
| Pond No. 1 | - Cell 9&10 S | ed Por | d/Clear F | Pool | | | | | | |
| Pond Data | | | | | | | | | | |
| Contours -Use | r-defined contour | areas. Co | onic method | used for volu | me calculation. Beginir | ng Elevation = (| 895. 00 f t | | | |
| Stage / Stor | age Table | | | | | | | | | |
| Stage (ft) | Elevation (| (ft) | Contour a | rea (sqft) | Incr. Storage (cuft) | Total stor | rage (cuft) | | | |
| 0.00 | 695.00 696.00 | | 9,369 | | 0 23,269 | 23.2 | 0 | | | |
| 2.00 | 697.00 | | 40,876 44,230 | | 42,538 | 65,8 | | | | |
| 3.00 | 698.00 | | 47,663 | | 45,931 | 111,7 | 738 | | | |
| 4.00 5.00 | 699.00 700.00 | | 51,173 54,762 | | 49,403 52,952 | 161,1 214,0 | | | | |
| 6.00 | 701.00 | | 58,431 | | 56,581 | 270,6 | | | | |
| 7.00 | 702.00 | | 62,177 | | 60,288 | 330,9 | 962 | | | |
| 8.00 8.50 | 703.00 703.50 | | 66,002 67,945 | | 64,074 33,482 | 395,0 428,5 | | | | |
| Culvert / Ori | ifice Structur | es | | | Weir Structu | res | | | | |
| | [A] | [B] | [C] | [PrfRsr] | | [A] | [B] | [C] | [D] | |
| Rise (in) | = 42.00 | 0.00 | 0.00 | 0.00 | Crest Len (ft) | = 14.13 | 0.00 | 0.00 | 0.00 | |
| Span (in) | = 42.00 | 0.00 | 0.00 | 0.00 | Crest El. (ft) | = 701.40 | 0.00 | 0.00 | 0.00 | |
| No. Barrels | = 1 | 0 | 0 | 0 | Weir Coeff. | = 3.33 | 3.33 | 3.33 | 3.33 | |
| Invert El. (ft) | = 679.90 | 0.00 | 0.00 | 0.00 | Weir Type | = 1 | | | | |
| Length (ft) Slope (%) | = 200.00 | 0.00 | 0.00 | 0.00 | Multi-Stage | = Yes | No | No | No | |
| Slope (%) | | | | | | | | | | |
| | = 2.45 | 0.00 | 0.00 | n/a | | | | | | |
| N-Value | = .013 | .013 | .013 | n/a | F | - 0.000 /bu | Contour | | | |
| | | .013 0.60 No | .013 0.60 No | n/a 0.60 No | Exfil.(in/hr) TW Elev. (ft) | = 0.000 (by = 0.00 t (oc) control. Weir | | for orflice co | nditions (ic) an | i submergence (; |
| N-Value Orifice Coeff. | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orifice co | nditions (ic) an | |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev 705.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for office co | nditions (ic) an | Elev 705. |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev 705.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev 705.0 703.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev 705.0 703.0 |
| N-Value Orifice Coeff. Multi-Stage age (ft) 10.00 8.00 6.00 | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | for orffice co | nditions (ic) an | Elev 705.0 703.0 703.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev 705.0 703.0 703.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev 705.0 703.0 703.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev 705.0 703.0 701.0 699.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev 705.0 703.0 701.0 699.0 |
| N-Value Orifice Coeff. Multi-Stage | = .013 = 0.60 | .013 0.60 No | .013 0.60 No | n/a 0.60 No e outflows are ana | TW Elev. (ft) | = 0.00 | | | nditions (ic) an | Elev 705.0 703.0 701.0 699.0 |

Pond Report 1



Design Calculations Project Prepared by Date Plant Bowen Run-on Run-off Control Jeremy Brown 2/10/22 Subject/Title Reviewed by Date Provide run-on and run-off system calculations for the peak discharge from 2/11/22Ashley Grissom a 24-hr 25-year storm Cells 9 & 10 Calculation Number Sheet 23 of 23 DC-BN-735210-003 (Rev1) > đ ₫ € Max Stor (cuft) 111.312 297.335 697.99 701.44 Max El (ft) - 200.0 LF of 42.0 in @ 2.45% child - Avla 0.000 1.254 Weith-Day, 2016 Law, 2010 Event (yrs) 25 25 Hol Off Labels Front Sect 0 υ Stage vs Q 701.40 14.13 8 < 🖲 🗖 Crest Len (ft) = Crest Elev (ft) = Weir Select Active > Estimate Storage Req. Star (cul) 0 0 ()() Inflow Hyd. No. = 1 - SCS Runoff - Cells 9 & 10 **K** O D U 0.000 0.000 679.90 42.00 8 65.64 20.90 а В < 🖲 🗖 = (u) =(1)= Invert EL. Culv/Orit 111.312 300,995 Diameter Select A P Activ Storage Estimate 0.01 0.01 2 2 5 50 100 (vent .

Pond Report 2