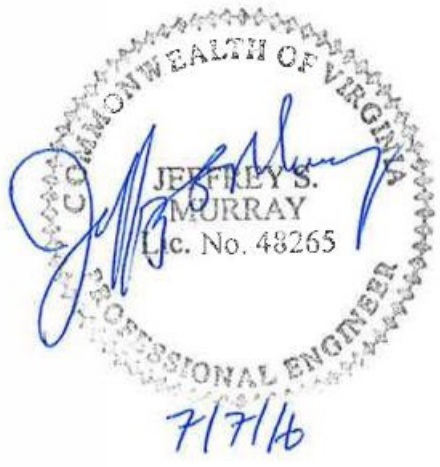
Public Facilities Report

Conditional Use Permit and Conditional Rezoning Application

SPSA Regional Landfill

Suffolk, Virginia
July 2016



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Attachment E – Erosion and Sediment Control Checklist

1 Project Purpose

The Southeastern Public Service Authority (SPSA) is proposing to expand the Regional Landfill located off Bob Foeller Drive in Suffolk, Virginia. The Regional Landfill property consists of approximately 833 acres, and is comprised of three parcels owned by SPSA, Tax Map Nos. 27*37, 27*37*1 and 27*38A. The existing landfill is comprised of six cells (Cells I-VI) which have been constructed on parcels 27*37 and 27*37*1. Cells I-IV are closed with a final cover system and Cells V and VI are currently operational. Cell VII has been permitted with the Virginia Department of Environmental Quality (VADEQ) for construction onto a portion of parcel 27*38A, which portion is currently zoned as Heavy Manufacturing (M-2). The Cell VII area is currently being used by SPSA as a soil borrow area in accordance with the Erosion and Sediment Control Permit, ESC-2009-00002, issued by the City of Suffolk.

SPSA is requesting through applications to the City of Suffolk, conditional rezoning of the remaining portion of parcel 27*38A from Agricultural (A) to M-2 and Conditional Use approval of Cell VII and development of a sand or gravel extraction (soil borrow operation) and vegetative composting system on 129 aces of future Cells VIII and IX area within portions of the property to be rezoned. See Figure 1 for the locations of the existing facility and proposed areas of development.

In accordance with Appendix B-4(e)(1), B-5(e) and B-19 of the Unified Development Ordinance, this Public Facilities Report is being submitted as a supplement to SPSA's application for the Conditional Rezoning of a portion of parcel 27*28A and the Conditional Use Permit.

The Report specifically addresses the impacts of the proposed conditional uses of Cell VII and the soil borrow operations (worst case) within future Cell VIII and IX area. The development of the landfill within Cells VIII and IX or on other areas of the rezoned parcel are not addressed in this report as the development of these uses is not anticipated to be within the next twenty (20) years and review of their impacts on public facilities would be addressed under their subsequent conditional use permit applications.

SPSA received a waiver from the City for B-19-(a)(1) and (2) on June 28, 2016. This report addresses the items in Parts B-19(a)(3) and (4).

2 Overview

SPSA is requesting approval to rezone the approximate 440.34 acre portion of parcel 27*28A from the A to M-2. Within these 440.34 acres, SPSA has established a 50-acre wetland preservation area, 12-acre wetland restoration area, and a 36-acre wetland enhancement area. Outside of the 440.34 acres and within the M-2 zone, SPSA has established a 73-acre area for Cell VII landfill and ancillary facilities. The 98 acres of wetland protection were in response to mitigation required for the 12 acres of jurisdictional wetland disturbance associated with the Cell VII landfill and soil borrow operations.

Most of the area proposed for rezoning consists of jurisdictional wetlands. SPSA proposes to use the rezoned property for soil borrow areas, composting, future landfill cells and associated stormwater management. Additional wetland mitigation measures associated with future development onto portions of 27*28A would most likely be completed off-site.

The 129 acres future Cells VIII and IX area includes the future waste cell boundaries and ancillary support systems for access roadways and stormwater management. The development of the soil borrow area will likely be required prior to construction of Cell VII in order to support ongoing landfill operations.

It is anticipated that construction of Cell VII will take place one to two years prior to the completion of waste filling operations in Cells V and VI. Cell V and VI operations are anticipated to continue through at least 2024, based on current and anticipated disposal rates, and could possibly extend up to 2040 depending on the success of planned alternative waste disposal strategies.

3 Stormwater Management Plan

3.1 Pre-Development Conditions

3.1.1 Cell VII

The 73 acre Cell VII area is currently operated as soil borrow source for the landfill operations. Prior to its development as a soil borrow area it was partially cleared and wooded with small trees and brush and included 12 acres of jurisdictional wetlands. The partially cleared areas were being used for stockpiling of soils for the facility operation. The topography of the area was very flat, with a slight gradient for run-off toward the existing drainage ditch to the east. Stormwater that made it to the ditch discharges to the southwest beneath the landfill access road and into Burnetts Mill Creek and then Beamon Pond. The soils in Cell VII area consist primarily of Tomotley Loam and other loamy soils all identified as Class B soils according to the City of Suffolk Soil Survey.

The Cell VII borrow area was developed following receipt of wetland permits for the disturbance of 12 acres of wetlands and the Erosion and Sediment Control Permit ESC-2009-00002, issued by the City of Suffolk. Most of the area has been cleared and grubbed and is being utilized for the soil borrow operations or for control of stormwater discharge. Soil borrow operations are being completed below grade and most stormwater run-off is contained within the borrow area and is not discharged off-site. Drainage channels and two sediment basins have been established for the management of run-off from the borrow area and the access roadways. The basins were conservatively sized in accordance with Virginia Erosion and Sediment Control Handbook for the entire area to be disturbed. Copies of the calculations from the permitted Erosion and Sediment Control Plan are included in Attachment A for reference. The sediment basins discharge via stabilized overflow weirs into the existing drainage ditch that flows to the southwest and to Burnetts Mill Creek.

The Cell VII borrow area will continue in operation for several more years until the Cell VII landfill is constructed.

The pre-development peak flow (prior to borrow operation) was calculated using the Rational Method and are summarized below for the Cell VII Area. The calculations for the peak flows are included in Attachment B.

Table 3-1 - Cell VII Pre-Development Peak Flow Rates

				Storm Intensity I (in/hr)			Peak Discharge Q (cfs)		
Stage in Development	**C**	**A (acres)**	**Tc (min)**	**2 yr**	**10 yr**	**25 yr**	**2 yr**	**10 yr**	**25 yr**
Existing Conditions/ Undeveloped	0.25	73	56	1.7	2.5	2.9	31	46	53

3.1.2 Future Cell VIII and IX Area

The future Cell VIII and IX area is mainly a forested wetland consisting of a relatively new growth of red maple, sweet gum and swamp chestnut oak. The timber in the area was harvested prior to SPSA acquiring the property in 2002. The topography is very flat and contains areas of standing water. Stormwater run-off from the area is to the east and toward the existing 50 acre preserved wetland and drainage channel that flows to the southwest and eventually connects with the discharge from the Cell VII area and flows into the Burnetts Mill Creek and Beamond Pond. The soils in the Cell VIII and IX area consist of Tomotley and Torhunta Loam with some areas of mucky loam, all designated as Class B Soils according to the City of Suffolk Soil Survey.

The pre-development peak flows were calculated using the Rational Method for the Cells VIII and IX Area. The calculations for the peak flows are included in Attachment B.

Table 3-2 - Cells VIII and IX Area Pre-Development Peak Flow Rates

				Storm Intensity I (in/hr)			Peak Discharge Q (cfs)		
Stage in Development	**C**	**A (acres)**	**Tc (min)**	**2 yr**	**10 yr**	**25 yr**	**2 yr**	**10 yr**	**25 yr**
Existing Conditions/ Undeveloped	0.20	129	61	1.7	2.3	2.8	43	59	72

3.2 Post-Development Conditions

3.2.1 Cell VII

Development of Cell VII includes construction and operation of a 56 acre lined landfill. The worst case conditions for stormwater peak runoff exist following closure construction of the landfill cell. Cell VII will be constructed to Virginia Department of Solid Waste Management regulations, which requires stabilized intermediate cover on the finished slopes and a final cap design consisting of eighteen (18) inches of final cover soil material and six (6) inches of topsoil, which is a pervious material. The only new impervious areas would mainly consist of the perimeter access roads and internal haul roads. Since the proposed Cell VII area is adjacent to the existing landfill facility, the landfill's existing roadways would be utilized for access to the new cell. A perimeter gravel roadway will be installed as part of Cell VII construction for operation and access for maintenance of the erosion control and stormwater best management practices.

Methods described in "Elements of Urban Stormwater Design", by H. Rooney Malcom, P.E. and the Virginia Erosion and Sediment Control Handbook were used in the overall analyses of runoff from the Cell VII drainage area. Stormwater calculations were based on Sheet C-09, Final Grading and Drainage Plan, which represents the condition during the life of Cell VII that will generate the most stormwater runoff. The overall area draining to the two proposed sediment basins has been broken down into several subareas along the drainage divides.

The design for Cell VII includes grass lined drainage channels around the perimeter of the landfill to direct flow toward the existing sediment basins. The design also includes a series of built in drainage benches in the slopes to catch and direct runoff to slope drains or reinforced drainage channels. These slope drains and/or reinforced drainage channels will direct runoff down the slopes into the perimeter channels shown on the Plan 0C-09 in Attachment C. The channels are designed to retain stormwater runoff and discharge into the sediment basins, where the discharge rates are controlled to reduce the peak flows off-site through overflow weirs at the basins.

The rational method was utilized in determining peak runoff of channels, sideslope channels, and downchutes as indicated in the stormwater calculations.

Analysis was completed, using Hydroflow Hydrographs, to size culverts in the proposed perimeter channel. The entire perimeter channel was assumed to act as a pond with multiple discharge points. This calculation, along with all other stormwater calculations can be found in Attachment C.

In order to predict the anticipated annual soil loss and erosion potential, the Universal Soil Loss Equation was used. This calculation is also included in Attachment C.

For comparisons to the pre-development flows, the estimated post-development peak discharge rates for the Cell VII area were calculated using the Rational Method and are summarized below. The calculations are included in Attachment B.

Table 3-3 - Cells VII Post-Development Peak Flow Rates without Retention BMP

				Storm Intensity I (in/hr)			Peak Discharge Q (cfs)		
Stage in Development	**C**	**A (acres)**	**Tc (min)**	**2 yr**	**10 yr**	**25 yr**	**2 yr**	**10 yr**	**25 yr**
Closed Cell VII	0.30	73	10	4.7	5.9	6.8	103	129	149

As part of the 2009 Cell VII Permit Application to VADEQ, the post development conditions were evaluated for the 25-year storm flow, using the SCS Method (Attachment C). These calculations determined that the perimeter drainage swales and two retention basins were able to effectively reduce the estimated 25-year storm peak flow to 56 cfs, which is below the estimated pre-development peak discharge rate from the Cell VII area.

3.2.2 Future Cells VIII and IX Area

The development of the soil borrow area within future Cells VIII and IX will be completed similarly to the Cell VII soil borrow area and will incorporate drainage channels and sediment basins for treatment of run-off during operation. The proposed extent and grading of the Cell VIII and IX borrow area will be based off of the Cell VIII and IX landfill design and wetland permitting, which have not yet been completed. Based on the VADEQ Erosion and Sediment Control Handbook, if all 129 acres were to be developed as the borrow area (conservative), the sediment basin would need to provide 134 CY/acre of storage volume (17,286 CY) and 33.5

CY/acre of sediment storage (4,322 CY). A sediment basin with an area of approximately 3 acres and depth of 7 feet would provide sufficient storage and treatment for the stormwater run-off. Conceptual calculations for the sediment basin are included in Attachment D.

The development of the soil borrow would be subject to an erosion and sediment control permit from the City of Suffolk. The vegetative waste composting system would be subject to VADEQ solid waste permitting as well as City of Suffolk site plan approval, which would include review of proposed erosion and sediment and stormwater management systems.

For comparisons to the pre-development flows, the estimated post-development peak discharge rates for the borrow operations in Cell VIII and IX area were calculated using the Rational Method and are summarized below. The calculations are included in Attachment B.

Table 3-4 - Cells VIII and IX Area Post-Development Peak Flow Rates without Retention BMP

				Storm Intensity I (in/hr)			Peak Discharge Q (cfs)		
Stage in Development	**C**	**A (acres)**	**Tc (min)**	**2 yr**	**10 yr**	**25 yr**	**2 yr**	**10 yr**	**25 yr**
Post Development Borrow Area Cell VIII & IX	0.35	129	31.5	2.4	3.4	4.0	108	154	181

Similar to the Cell VII borrow area, the proposed retention basin BMP would be designed reduce the peak flows to below the pre-development peak flow rates.

3.3 Existing and Future Permits

Below is a list of anticipated permits for applicable agencies needed to develop Cell VII and borrow area or compost facility in the Cell VIII and IX area.

Table 3-5 - Federal, State and Local Permits Needed for Project

Permit Type	Issuing Agency/ Authority	Permitted Activity
Conditional Use Permits	City of Suffolk	Construction and operation of municipal solid waste landfill Cell VII, construction and operation of soil borrow area and compost facility in future Cells VIII and IX area
Solid Waste Permit	Virginia Department of Environmental Quality (DEQ)	Cell VII - Construction and operation of municipal solid waste landfill per VAC (Permit # 417, Amended June 8, 2011) Compost Facility – future permit amendment
Industrial Wastewater Discharge	Hampton Roads Sanitation District	Discharge of leachate to local publicly owned treatment works (Industrial Discharge Permit No. 0087)
VA Pollutant Discharge Elimination Permit	DEQ-Water Division	Discharge of storm water to Burnett's Mill Creek (VPDES Permit # VA0090034)
Section 401 of Clean Water Act	VADEQ	Impact on forested wetlands for Cells VIII and IX development
Section 404 of the Clean Water Act	US Army Corps of Engineers	Impact on forested wetlands for Cells VIII and IX development

3.4 FEMA Floodplain

The proposed Cell VII and future Cells VIII and IX area are not located within an established 100-year floodplain, and lie well above the 100-year flood elevation of the Nansemond River tributary to which it drains. While additional surface flow to this tributary could result from development of the site, its flood storage capacity would not be altered since development would occur upstream of and outside the floodplain. Flow increases would be minimized through proper implementation of stormwater management controls. According to 1990 the flood insurance rate maps for the City of Suffolk, the site does lie within an "approximate flood hazard area" which appears to closely match the delineation of the Dismal Swamp on the U.S.G.S. Chuckatuck typographic quadrangle

During permitting of the Cell VII landfill, SPSA performed a floodplain study and determined that the 100-year floodplain elevation for the Cell VII area is approximately 18.6 feet MSL, which is lower than the existing topography of the area. A Letter of Map Revision (LOMR) application was approved by the Federal Emergency Management Agency (FEMA) to revise the 100-year floodplain to be outside the proposed facility boundary.

3.5 Pollutant Control

For the determination of pollutant loading for existing conditions, VADEQ and the City has adopted the default value 16 percent impervious as the average land cover condition. For any new developments, if the existing and proposed site imperviousness is less than the average land cover condition of 16 percent impervious, then no further determination of post development pollutant loading is required and no BMP measures are necessary. Both the Cell VII and borrow area and compost facility in future Cells VIII and IX meet this criteria, as summarized below. Therefore no stormwater management practices are required for treatment of run-off.

The facility does maintain a Stormwater Pollution Prevention Plan for its VPDES permit for stormwater discharges from the landfill industrial activities. The Plan includes provisions for good housekeeping, preventative maintenance, spill prevention and response, training, inspections and sampling and reporting. The Plan is reviewed annually and revised as appropriate to address any changes in the facility operation or BMPs employed.

While stormwater BMPs are not required for pollutant control and a Maintenance Agreement is not required, we have summarized below the erosion and sediment control measures planned for Cell VII and for the future Cell VIII and IX area.

3.5.1 Cell VII

The proposed Cell VII area encompasses approximately 73 acres, of which 56.1 acres will be the lined landfill footprint. The proposed Cell VII will be constructed to Virginia Department of Solid Waste Management regulations. This means the landfill will have a final cap design consisting of eighteen (18) inches of final cover soil material and six (6) inches of topsoil, which is a pervious material. The only new impervious areas would mainly consist of haul and perimeter access roads. The perimeter gravel roadway will be approximately 30 feet in width and be 5,100 feet in length for approximately 153,000 square feet of new impervious gravel surface, or less than 5% of the total 73 acre area. Figure 2 depicts the approximate extent of the perimeter gravel roadways.

The proposed erosion and sediment control measures for the Cell VII landfill will consist of vegetated exterior intermediate and final cover slopes with built-in benches every 40 vertical feet to collect stormwater and direct it to either slope drains or reinforced channels which will drain to the perimeter channel shown on the Site Plan. The perimeter channels will direct the runoff to the proposed sediment basin for treatment and peak flow control, prior to discharge into the existing drainage system.

All disturbed areas will be seeded to minimize runoff. Some channels may have rip-rap placed within them to minimize erosion and runoff velocities. All erosion and sedimentation control devices will be maintained during and after construction to ensure that the devices will operate properly

3.5.1.1 SEDIMENT BASINS

Sediment basins will be installed where there is a potential sediment runoff from the disturbed area that will exceed three (3) acres as per Standard and Specification 3.14 of the Virginia Erosion and Sediment Control Handbook. The basin will retain sediment long enough for the majority of the sediment to settle out. Design of each sediment basin was completed with assistance from Standard and Specification 3.14. The sedimentation basins have been designed to attenuate and control the peak flow resulting from the 24-hour, 25-year storm event.

3.5.1.2 STORMWATER CHANNELS

Stormwater channels will be established during excavation to convey the flow of runoff away from the excavation and towards the sediment basins. Installation of the stormwater channels will be in accordance with Standard and Specification 3.17.

3.5.1.3 TEMPORARY DIVERSION DIKE

The temporary diversion dikes will be installed along the perimeter of the soil borrow area to divert off-site stormwater around the soil borrow area. The temporary diversion dikes will be vegetated for stabilization and installed in accordance with Standard and Specification 3.09 of the Virginia Erosion and Sediment Control Handbook.

3.5.1.4 VEGETATIVE STABILIZATION

Vegetative stabilization will be in accordance with the seeding schedule referenced in the project specifications and on the plans. The seeding schedule was prepared with reference to the Virginia Erosion and Sediment Control Handbook and seeding regimes used in the geographic location.

3.5.2 Future Cell VIII and IX Area

The development of the soil borrow area within future Cells VIII and IX will be completed similarly to the Cell VII soil borrow area and will incorporate drainage channels and sediment basins for treatment of run-off during operation. The potential development of a compost system would require installation of some impervious areas for collection of contact water for treatments and some gravel roadways for access to the facility areas, but any impervious surface would be much less than 5% of the total 129 acre area. Figure 2 depicts the approximate extent of the perimeter gravel roadways.

The soil borrow area in future Cells VIII and IX will be developed in accordance with an erosion and sediment control plan to be prepared by SPSA and submitted to the City of Suffolk for approval. It is anticipated that the plan will be similar to that employed for the Cell VII soil borrow area and will include vegetated drainage channels and a temporary sediment basins for settlement and management of run-off.

3.6 Maintenance Plan

All erosion and sediment control structures and systems shall be maintained, inspected and repaired as needed to insure continued performance of their intended function. All erosion and

sedimentation control devices will be inspected at lease once every two weeks, and within 48 hours following any run-off producing storm event.

All sediments that are removed from erosion and sedimentation control measures and stormwater management measures will be disposed of in an approved manner at a location and in such a manner that further erosion and sedimentation will not occur.

The Erosion and Sediment Control Checklist utilized by SPSA is included as Attachment E.

4 Transportation

In accordance with Appendix B-5(f) and B-21 of the Unified Development Ordinance (UDO), HDR has completed a Traffic Impact Study to assess the transportation impacts created by the proposed Cell VII, Soil Borrow Area, and Compost Facility operations. The study identified the existing traffic conditions at the intersection of landfill entrance roadway, Bob Foeller Drive, and Route 13/58/460, and assessed the proposed future traffic conditions in 2018 and 2036. The study determined that the existing median crossing utilized by eastbound traffic on 13/58/460 to enter the facility has a level of service (LOS) rating of F, due to the heavy through movements on westbound 13/58/460. The majority of vehicles utilizing the median crossing are City of Suffolk Refuse Division trucks accessing the transfer station at the Regional Landfill, and area residents accessing the transfer station, household hazardous waste facility or tire processing facility.

The development and operation of Cell VII and the soil borrow or composting system operation uses requested as part of the CUP application would not cause further measurable deterioration at the intersection. The delay associated with the median entrance during peak traffic hours will continue to worsen over time due to population growth in the region. The existing exit configuration and weave movement for all vehicles has an acceptable LOS of B under the current conditions and future conditions.

It is understood that the Virginia Department of Transportation is evaluating the construction of a state funded flyover between east bound and west bound 13/58/460, to the east of the Regional Landfill. The flyover would provide City of Suffolk solid waste and residential traffic an alternative to enter the facility without using the median crossing. If the flyover is not constructed by the time that Cell VII operations are planned to commence, SPSA would propose for consideration an alternative that would include the permitting and construction of a one-way rear entrance roadway to provide access for Suffolk refuse trucks and residents to the Regional Landfill site, and that the entrance to the landfill via the median crossing be eliminated.

Additional information regarding the existing and future traffic conditions for the existing entrance and exit and proposed rear entrance roadway alternatives are detailed in the full Traffic Impact Study, prepared by HDR, dated June 2016.

5 Summary

The proposed development of Cell VII and soil borrow area or composting facility in future Cells VIII and IX area will have minimal affect on the City's Public Facilities. The proposed development will result in very little new impervious surfaces on the site and the erosion and sediment control can be adequately managed through the use of conventional retention basins, which will also mitigate the peak stormwater discharges rates from the site. The extent of the proposed impervious surfaces is well below the 16% threshold for average land cover condition and no additional formal BMPs are needed to control potential pollutant discharge. SPSA will maintain the existing and proposed retention basins for management of sediment and the facility operation would remain subject to VPDES Permit requirements for stormwater discharges off-site.

The existing entrance roadway configuration for traffic utilizing the median crossing remains at a LOS rating of F, and while Cell VII or the compost facility traffic will not cause further measurable deterioration at the intersection, it would extend the service condition for additional length of time for Suffolk solid waste vehicles and residents to enter the facility. SPSA continues to support a state funded flyover between eastbound and westbound 13/58/460 that would be of benefit to the region and also provide a better entrance way for traffic accessing the facility from the west. Should the flyover not be constructed by the time Cell VII is planned for operation, SPSA would propose for consideration, a rear single lane entrance roadway to the SPSA facility would improve the delay of the turning movements and functionality of the intersection at Route 13/58/460, Bob Foeller Drive, and Welch Parkway.

A

Attachment A – Cell VII
Erosion and Sediment
Control Calculations

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Project:	SPSA Borrow Area	Computed: GMW	Date: 8/3/07
Subject:	Drainage	Checked	
Task:	Channel Design	Sheet 1	Of 1

References

1. Elements of Urban Storm Water Design, H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook

Objective: Determine the flow of a channel to be placed around the perimeter of the borrow area

Given Input Data:		Unit
Shape	Trapezoidal	
Solve for	Flowrate	
Slope	0.002	ft/ft
Manning's n	0.02	
Depth	24	in
Height	24	in
Bottom Width	4	in
Left Slope	0.5	ft/ft (V/H)
Right Slope	0.5	ft/ft (V/H)

Computed Results:		Unit
Flowrate	27.52	cfs
Velocity	3.18	fps
Full Flowrate	27.52	cfs
Area	8.67	ft2
Perimeter	111.33	in
Flow Area	8.67	ft2
Flow Perimeter	111.33	in
Hydraulic Radius	11.21	in
Top Width	100	in
Percent	100	%
Critical Information:		
Critical Depth	18.68	in
Critical slope	0.01	ft/ft
Critical velocity	5.13	fps
Critical area	5.36	ft2
Critical perimeter	87.53	in
Critical hydraulic radius	8.83	in
Critical top width	78.72	in
Specific energy	2.16	ft
Minimum energy	2.33	ft
Froude number	0.55	
Flow Condition	Subcritical	

Conclusion A channel with 0.02% slope, two to one side slopes, and a bottom width of 4' can pass 27.52 cfs at a velocity of 3.18 fps.

Project:	SPSA Borrow Area	Computed:	GMW	Date	7/10/07
Subject:	Drainage	Checked			
Task:	Culvert Design	Sheet	1	Of	1

References

1. Elements of Urban Storm Water Design, H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook

Objective:

Determine the flow of a 18" RCP pipe to carry channel drainage to sediment basin I.

Shape	Circular
Solve for	Flowrate

Given Input Data:		Units
Diameter	1.50	ft
Depth	1.50	ft
Slope	0.005	ft/ft
Manning's n	0.01	
Computed Results:		
Flowrate	7.43	cfs
Area	1.77	ft2
Wetted Area	1.77	ft2
Wetted Perimeter	4.71	ft
Perimeter	4.71	ft
Velocity	4.20	fps
Hydraulic Radius	0.38	ft
Full flow flow rate	7.43	cfs
Full flow velocity	4.20	fps

Critical Information:		Units
Critical Depth	1.31	ft
Critical slope	0.01	ft/ft
Critical velocity	6.09	fps
Critical area	1.73	ft2
Critical perimeter	3.48	ft
Critical hydraulic radius	0.50	ft
Critical top width	1.50	ft
Specific energy	1.93	ft
Minimum energy	1.97	ft
Froude number	0.80	
Flow Condition	Subcritical	

Conclusion A 18" RCP pipe with 0.5% slope, can pass 7.43 cfs at a velocity of 4.20 fps.

HDR Computation

Job No. 1743-115-018

Project:	SPSA Soil Borrow Area	Computed: GMW	Date: 3/10/09
Subject:	Drainage	Checked:	Date:
Task:	Sediment Basin SB #1	Sheet 1	Of 1

References

1. "Elements of Urban Stormwater Design" by H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook.

Pond Volume Requirements

Post Dev Drainage Area A (ac) = 33.50

67	cy/acre wet storage	2245 cy	Ref 2, III-78
67	cy/acre dry storage	2245 cy	
134	Total Volume	4489 cy	
33.5	cy/acre Minimum sediment storage volume =	1122 cy	

Estimate Depth of Runoff for design storm @ location: Ref 1, III-4

Determine Ultimate Storage Capacity (S): Soil Group B

CN = Varies Ref 2, V-56

S = (1000/CN) - 10 = Varies

Q_p = (qu)(A)(Q*)

Runoff Depth Q* (inches) = (P-0.2S)2/(P+0.8S)

T_P (min) = 60.5(Q*)A/Q_P/1.39

CN		Pre development	Post Development
98	Impervious Area (ac) =	0	0
61	Pervious Area (ac) =	33.5	33.5
	Total	33.5	33.5

Calculate Peak Flow Into Basin

Development	Post	Post	Post	Post		
Storm Event (yrs) =	2	10	25	100		
Time of conc (min) =	5	5	5	5		
Rainfall Depth P (in) =	3.7	5.7	6.7	8.5	(24 rainfall)	Ref 2, V-50
Initial Abstraction Ia (in)=	1.279	1.279	1.279	1.279		Ref 2, V-64
Ia/P ratio =	0.346	0.224	0.191	0.150		
Curve Number CN =	61.00	61.00	61.00	61.00		Ref 2, V-56
S =	6.39	6.39	6.39	6.39		
qu (cfs/sq.mi./in) =	1000	1000	1000	1000		Ref 2, V-55
Drainage Area A (ac) =	33.5	33.5	33.5	33.5		
Peak Flow Q_p (cfs) =	34.8	94.6	130.2	200.5		
Runoff Depth Q* (inches) =	0.67	1.81	2.49	3.83		
Time to Peak T_p (min) =	27.86	27.86	27.86	27.86		Ref 1, III-4

Determine Shape of Basin:

Measure the area of the Basin using AutoCADD.

Calculate Volume of the Basin using Truncated Pyramid Method.

Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Cumulative Vol (cf)	Cumulative Vol (cy)	
17	0	31,630	-	0	0	
18	1	33,071	32,348	32,348	1,198	
19	2	34,544	33,805	66,153	2,450	
20	3	36,049	69,099	101,446	3,757	
20.5	3.5	37,587	120,980	120,980	4,481	Spillway Crest
21	4	37,587	138,263	138,263	5,121	
22	5	39,157	176,633	176,633	6,542	

Conclusion

Pond to have permanent pool @ elevation 20.5 with a 3.3 ' berm around the basin. Spillway to route a 25 year storm.

Project:	SPSA Soil Borrow Area	Computed: GMW	Date: 3/10/09
Subject:	Drainage	Checked:	Date:
Task:	Sediment Basin SB #2	Sheet	Of

References

1. "Elements of Urban Stormwater Design" by H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook.

Pond Volume Requirements

Pre Dev Drainage Area A (ac) = 26.50

67	cy/acre wet storage	1776 cy	Ref 2, III-78
67	cy/acre dry storage	1776 cy	
134	Total Volume	3551 cy	
33.5	cy/acre Minimum sediment storage volume =	888 cy	

Estimate Depth of Runoff for design storm @ location: Ref 1, III-4

Determine Ultimate Storage Capacity (S): Soil Group B

CN = Varies Ref 2, V-56

S = (1000/CN) - 10 = Varies

Q_p = (qu)(A)(Q*)

Runoff Depth Q* (inches) = (P-0.2S)2/(P+0.8S)

T_P (min) = 60.5(Q*)A/Q_P/1.39

CN		Pre development	Post Development
98	Impervious Area (ac) =	0	0
61	Pervious Area (ac) =	26.5	26.5
	Total	26.5	26.5

Calculate Peak Flow Into Basin

Development	Post	Post	Post	Post		
Storm Event (yrs) =	2	10	25	100		
Time of conc (min) =	5	5	5	5		
Rainfall Depth P (in) =	3.7	5.7	6.7	8.5	(24 rainfall)	Ref 2, V-50
Initial Abstraction Ia (in)=	1.279	1.279	1.279	1.279		Ref 2, V-64
Ia/P ratio =	0.346	0.224	0.191	0.150		
Curve Number CN =	61.00	61.00	61.00	61.00		Ref 2, V-56
S =	6.39	6.39	6.39	6.39		
qu (cfs/sq.mi./in) =	1000	1000	1000	1000		Ref 2, V-55
Drainage Area A (ac) =	26.5	26.5	26.5	26.5		
Peak Flow Q_p (cfs) =	27.5	74.8	103.0	158.6		
Runoff Depth Q* (inches) =	0.67	1.81	2.49	3.83		
Time to Peak T_p (min) =	27.86	27.86	27.86	27.86		Ref 1, III-4

Determine Shape of Basin:

Measure the area of the Basin using AutoCADD.

Calculate Volume of the Basin using Truncated Pyramid Method.

Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Cumulative Vol (cf)	Cumulative Vol (cy)	
15.75	0	12,504	-	0	0	
16	0.25	12,750	3,157	3,157	117	
18	2.25	14,783	30,662	30,662	1,136	
19	3.25	15,848	45,965	76,627	2,838	
20	4.25	16,944	16,393	93,020	3,445	
20.2	4.45	17,168	3,411	96,431	3,572	Spillway Crest
21	5.25	18,073	17,506	110,526	4,094	
22	6.25	19,234	18,650	129,176	4,784	

Determine the Sediment Cleanout Interval:

V_C (cf) = 18 * T * $A^{0.84}$

V_C (cf) = Cleanout Volume

T (days) = Cleanout Interval

A (acres) = Drainage Area

34 CY/acre = 24,327 cf

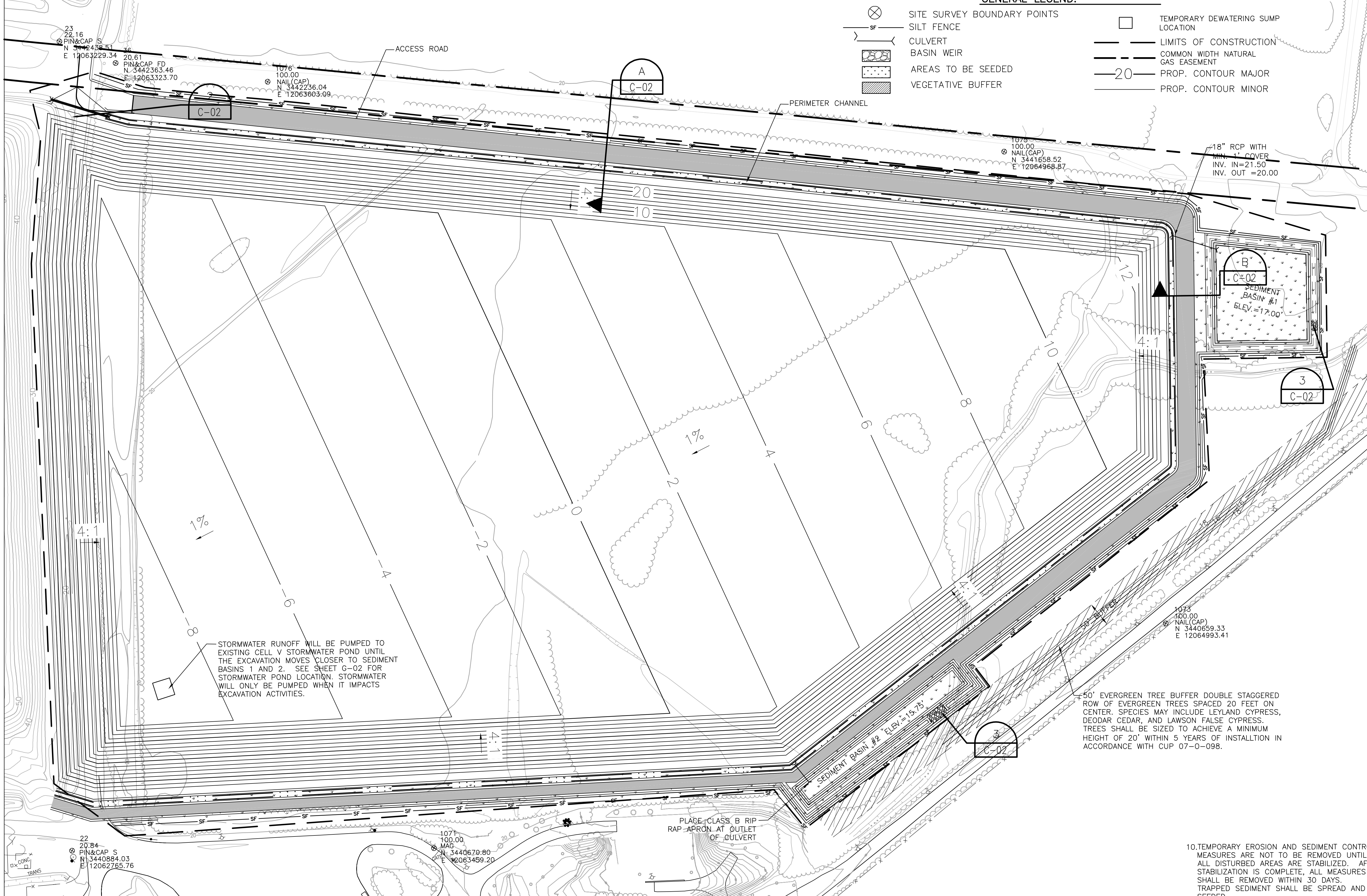
Set Sediment Storage Elevation Z_{sed} (ft) = 1.5

Sediment Volume corresponding to the Sediment Storage Elevation V_C(cf) = 3,157

Clean Out Interval (T), days = 11 or as needed

Conclusion

Pond to have permanent pool @ elevation 20.2 with a 3.1 ' berm around the basin. Spillway to route a 25 year storm.



NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED DECEMBER 29, 2006. EXISTING TOPOGRAPHY WITHIN THE SOIL BORROW AREA SUPPLIED BY HURT & PROFFITT, INC FROM AERIAL PHOTOGRAPHY DATED JUNE 28, 2007. EXISTING TOPOGRAPHY WITHIN THE TRANSFER STATION SUPPLIED BY HURT & PROFFITT, INC FROM AERIAL PHOTOGRAPHY DATED DECEMBER 23, 2005.
2. CONTOURS DEPICT PROPOSED GRADES FOR THE BORROW AREA. QUANTITY TO BE EXCAVATED IS APPROXIMATELY 1,480,000 CY.
3. THE NUMBER OF SUMPS MAY VARY DURING THE PHASES OF EXCAVATION.

CITY OF SUFFOLK STANDARD EROSION AND SEDIMENT CONTROL NOTES

1. UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES, WILL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (3RD EDITION, 1992) AND THE CITY OF SUFFOLK EROSION AND SEDIMENT CONTROL ORDINANCE.
2. THE CONTRACTOR SHALL APPLY PERMANENT OR TEMPORARY SOIL STABILIZATION TO ALL DENUDED OR DISTURBED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION MUST ALSO BE APPLIED TO DENUDED OR DISTURBED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WHICH WILL REMAIN UNDISTURBED FOR LONGER THAN 30 DAYS. SOIL STABILIZATION MEASURES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING, AND THE EARLY APPLICATION OF GRAVEL BASE MATERIAL ON AREAS TO BE PAVED.
3. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN LAND DISTURBANCE.
4. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES AND CLEANUP OF SEDIMENTATION ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SHOULD BE MADE IMMEDIATELY.
5. THE CONTRACTOR SHALL LIMIT SITE ACCESS BY CONSTRUCTION VEHICLES TO ENTRANCES PROTECTED BY A STONE CONSTRUCTION ENTRANCE (VESCH STD. & SPEC. 3.02) OR AN APPROVED COMPARABLE CONTROL MEASURE. SEDIMENT SHALL BE REMOVED FROM PAVED AREAS ON A DAILY BASIS.
6. STOCKPILES OF SOIL AND OTHER ERODIBLE MATERIALS SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY PROTECTION AND PERMANENT STABILIZATION FOR STOCKPILES ON SITE AS WELL AS FOR MATERIALS TRANSPORTED FROM THE PROJECT SITE.
7. THE CONTRACTOR SHALL MONITOR AND TAKE PRECAUTIONS TO CONTROL DUST, INCLUDING (BUT NOT LIMITED TO) USE OF WATER, MULCH, OR CHEMICAL DUST ADHESIVES AND CONTROL OF CONSTRUCTION SITE TRAFFIC.
8. EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGED IN A MANNER THAT DOES NOT ADVERSELY AFFECT ADJACENT PROPERTIES, WETLANDS, WATERWAYS OR STORM DRAINAGE SYSTEM.
9. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION AND MAINTENANCE OF ANY ADDITIONAL CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED NECESSARY BY THE PLAN APPROVING AUTHORITY.
10. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. AFTER STABILIZATION IS COMPLETE, ALL MEASURES SHALL BE REMOVED WITHIN 30 DAYS. TRAPPED SEDIMENT SHALL BE SPREAD AND SEEDED.

HDR

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Phone: (919) 785-1118
Fax: (919) 785-1187

ISSUE	DATE	DESCRIPTION
B	3/2009	REVISED PER SUFFOLK'S COMMENTS DATED 3/26/09
A	3/2009	ISSUED FOR APPROVAL

PROJECT MANAGER	D. DECESARE, P.E.
	L. PATTERSON
	G.M.WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

COMMONWEALTH OF VIRGINIA — DOUGLAS TRISTAN DECESARE — Lic. No. 38358 — PROFESSIONAL ENGINEER — 3-27-09

SPSA

Regional Landfill SOIL BORROW AREA

EROSION AND SEDIMENT CONTROL PLAN

SUFFOLK VIRGINIA

GRADING, DRAINAGE, AND EROSION CONTROL PLAN

0 1" 2"

FILENAME	00C-01.dwg
SCALE	1"=100'

SHEET C-01

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B

Attachment B – Pre and Post-Development Flow Calculations

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Project:	SPSA Cell VII and Cell VIII and IX Soil Borrow Area	Computed: JSM	Date: 7/3/16
Subject:	Drainage	Checked:	Date:
Task:	Peak Runoff Rates	Sheet	Of

Objective

Calculate the Peak Pre and Post Development Discharge Rates.

References

1. "Elements of Urban Stormwater Design" by H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook.

Calculations

Cell VII Area

	Pre Development	Cell VII Post Development	Pre Development	Cell VII Post Development	Pre Development	Cell VII Post Development
Storm Event (yrs) =	2	2	10	10	25	25
Land Use =	Woodlands and Bare Soil	Ag-Land Rough Packed Surface	Woodlands	Ag-Land Rough Packed Surface	Woodlands	Ag-Land Rough Packed Surface
Rational Coeff (C) =	0.25	0.30	0.25	0.30	0.25	0.30
Overland Flow Time (min)	25	10	25	10	25	10
Shallow Concentrated Flow Distance (ft)	2,000	0	2,000	0	2,000	0
Shallow Concentated Velocity (ft/sec)	1.08	0	1.08	0	1.08	0
Time of Concentration (min) =	56	10	56	10	56	10
Intensity (in/hr) =	1.7	4.7	2.5	5.9	2.9	6.8
Total Drainage Area A (ac) =	73.0	73.0	73.0	73.0	73.0	73.0
Disturbed Area (ac) =	73.0	73.0	73.0	73.0	73.0	73.0
Soil Group =	B	B	B	B	B	B
Ground Cover =	Woods/Brush	Grass	Woods/Brush	Grass	Woods/Brush	Grass

Inflow Data

Calculate Peak Flow using the Rational Method (Q_p):

Q_P (cfs) = CIA						
Peak Flow Q_p (cfs) =	31	103	46	129	53	149

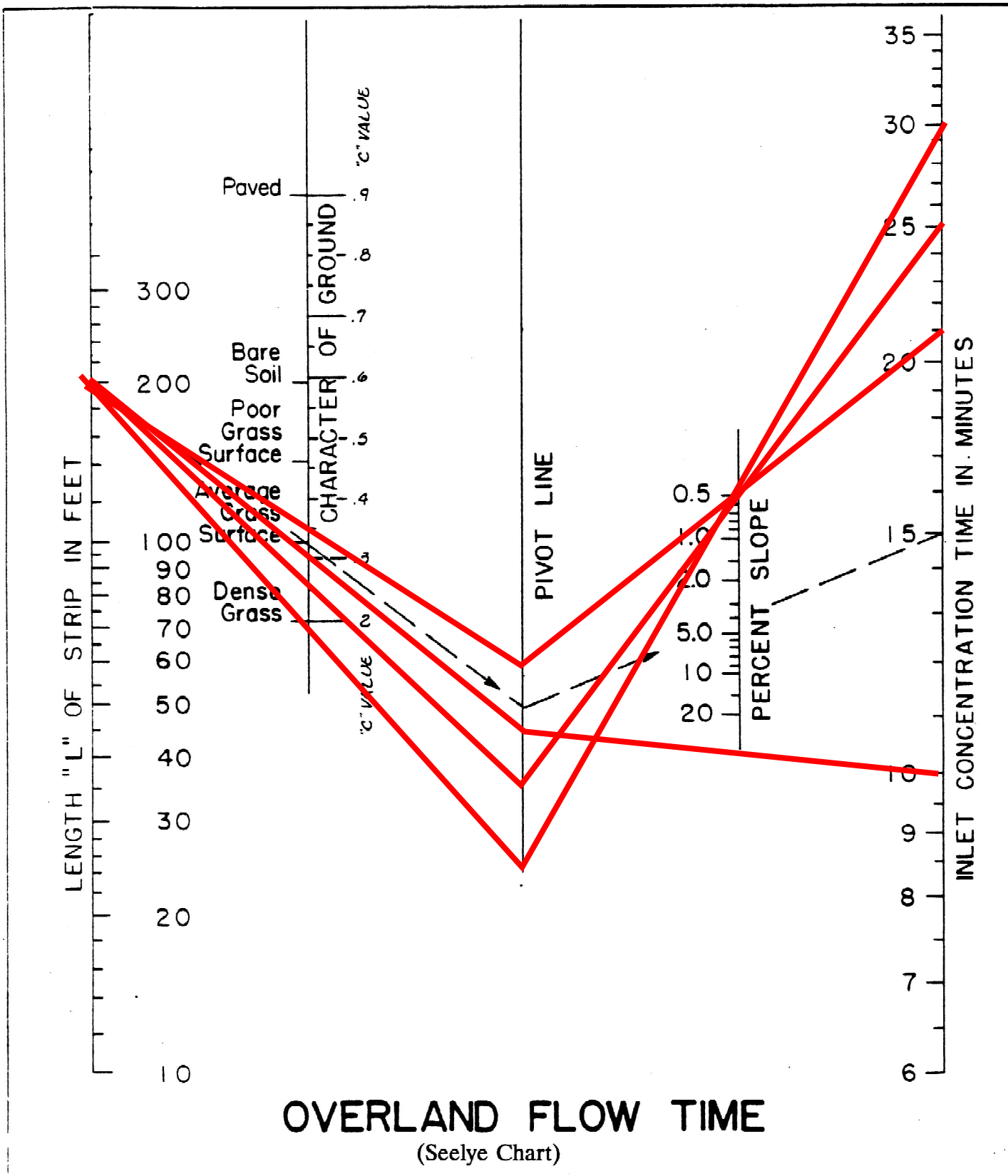
Future Cells VIII and IX Area

	Pre Development	Borrow Area Post Development	Pre Development	Borrow Area Post Development	Pre Development	Borrow Area Post Development
Storm Event (yrs) =	2	2	10	10	25	25
Land Use =	Woodlands	Ag-Land Rough Packed Surface	Woodlands	Ag-Land Rough Packed Surface	Woodlands	Ag-Land Rough Packed Surface
Rational Coeff (C) =	0.20	0.35	0.20	0.35	0.20	0.35
Overland Flow Time (min)	30	21	30	21	30	21
Shallow Concentrated Flow Distance (ft)	2,000	680	2,000	680	2,000	680
Shallow Concentated Velocity (ft/sec)	1	1	1	1	1	1
Time of Concentration (min) =	61	31.5	61	31.5	61	31.5
Intensity (in/hr) =	1.7	2.4	2.3	3.4	2.8	4.0
Total Drainage Area A (ac) =	129.0	129.0	129.0	129.0	129.0	129.0
Disturbed Area (ac) =	129.0	129.0	129.0	129.0	129.0	129.0
Soil Group =	B	B	B	B	B	B
Ground Cover =	Woods/Brush	Bare Soil	Woods/Brush	Bare Soil	Woods/Brush	Bare Soil

Inflow Data

Calculate Peak Flow using the Rational Method (Q_p):

Q_P (cfs) = CIA						
Peak Flow Q_p (cfs) =	43	108	59	154	72	181

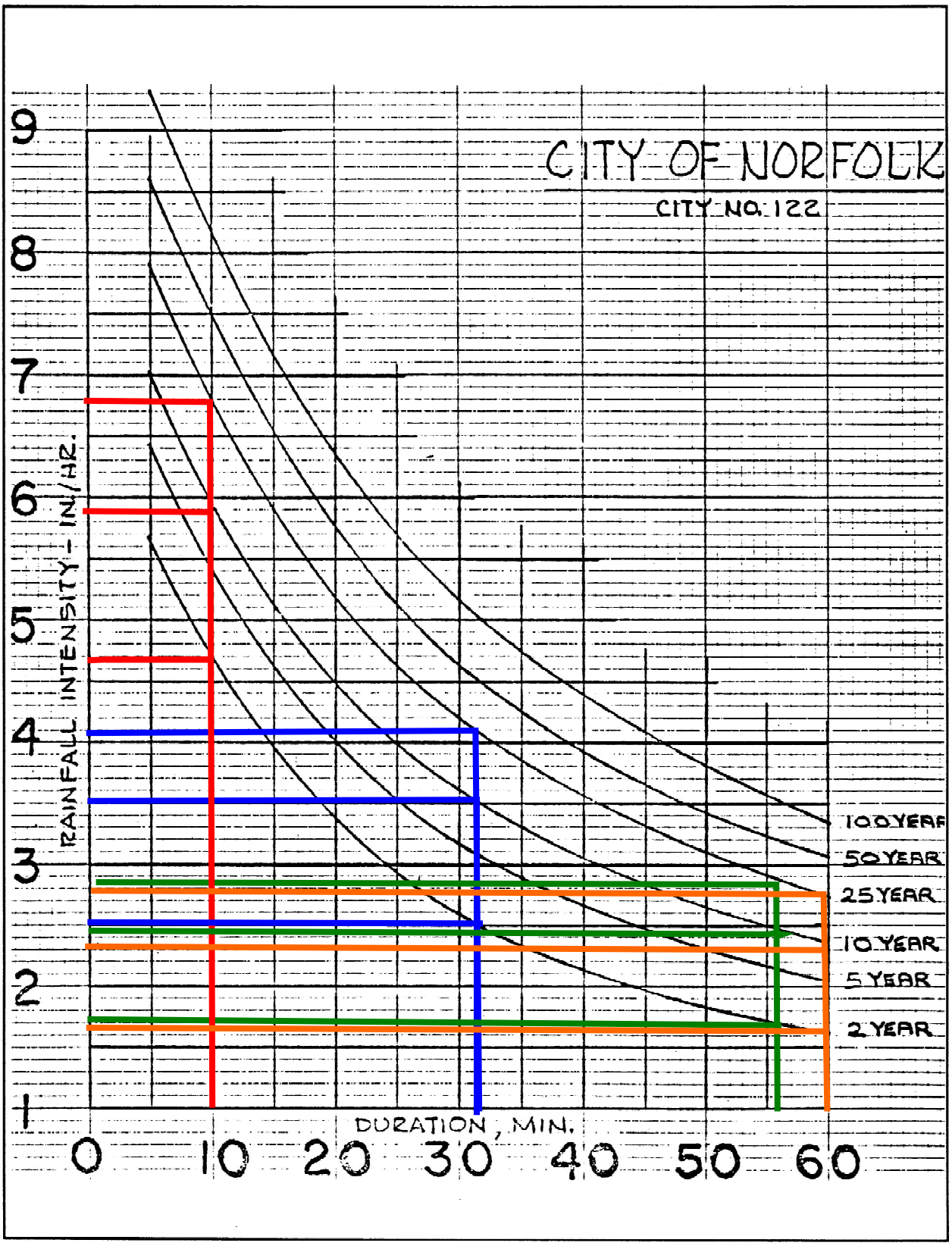


OVERLAND FLOW TIME

(Seelye Chart)

Source: Data Book for Civil Engineers, E.E. Seelye

Plate 5-1



Source: VDOT

Plate 5-5

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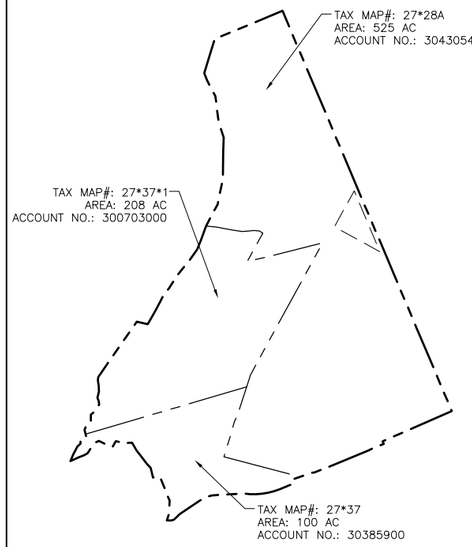
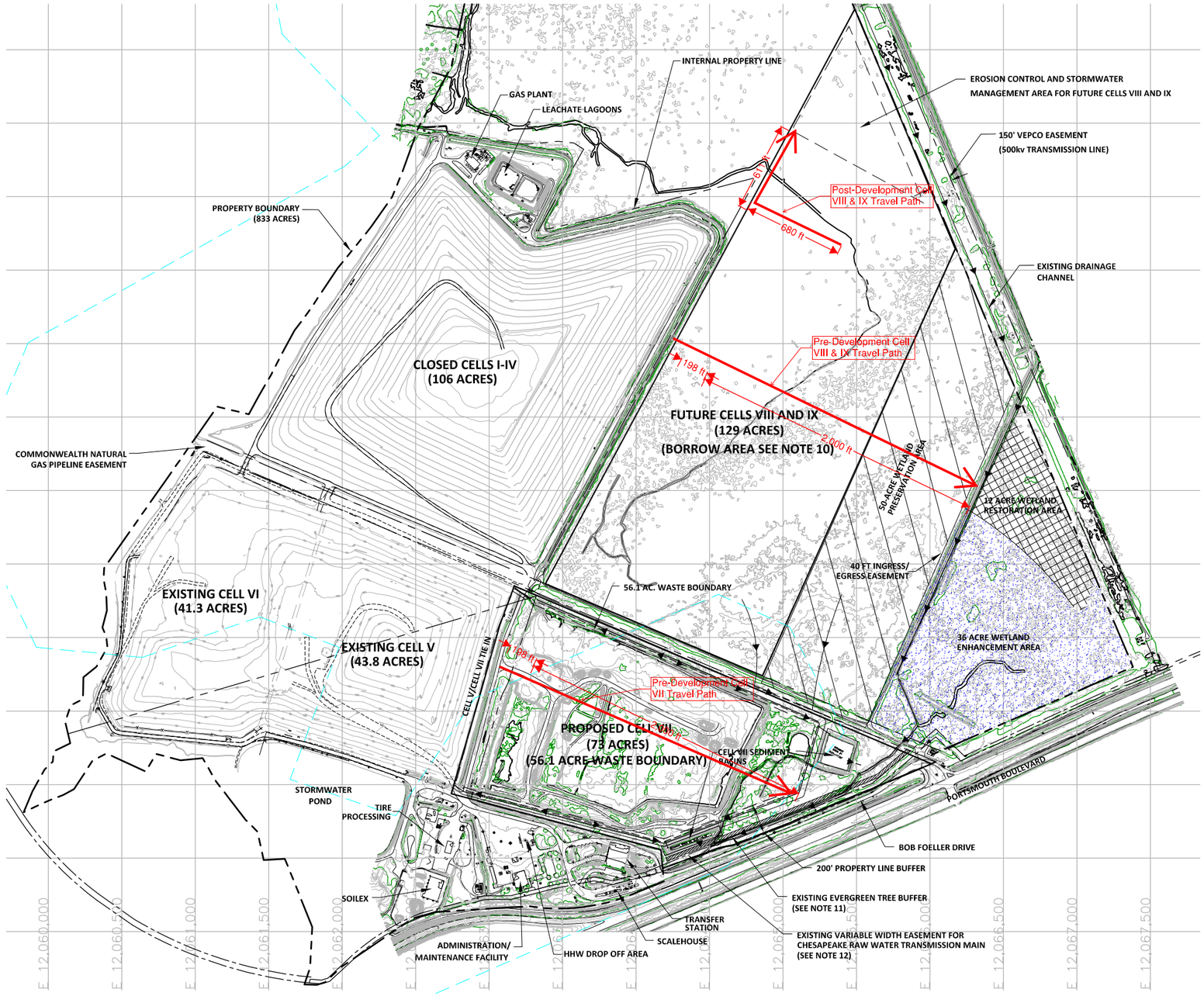


TAX MAP KEY



- PROPOSED DRAINAGE CHANNEL
- EXISTING DRAINAGE CHANNEL
- CHESAPEAKE BAY PRESERVATION AREA
- STREAMS
- PROPERTY LINE
- INTERNAL PROPERTY LINE
- FACILITY BOUNDARY (APPROXIMATE)
- EASEMENT
- WETLAND PRESERVATION AREA
- WETLAND RESTORATION AREA
- WETLAND ENHANCMENT AREA

N

NOTES:

1. EXISTING TOPOGRAPHY WITHIN TAX MAP# 27*28A SUPPLIED BY HOGGARD-EURE ASSOCIATES BASED ON AERIAL PHOTOGRAPHY DATED MARCH 22, 2016. BASE PLAN AND TOPOGRAPHY OF AREAS OUTSIDE TAX MAP# 27*28A COMPILED FROM AERIAL AND FIELD SURVEYS FROM 2005 – 2015.
2. ELEVATIONS REFER TO NGS MEAN SEA LEVEL HORIZONTAL CONTROL BASED UPON VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 1983.
3. PROPERTY LINE BOUNDARY FROM VANASSE HANGEN BRUSTLIN DATED FEBRUARY 29, 2000.
4. WETLAND PRESERVATION, RESTORATION AND ENHANCEMENT AREAS FROM THE US ARMY CORP OF ENGINEERS, SECTION 404 WETLAND PERMIT (88-0707-12) ISSUED NOVEMBER 30, 2002 AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, SECTION 401 WETLAND PERMIT (88-0707) ISSUED JUNE 3, 2002, FOR THE PROPOSED 12 ACRES OF WETLAND DISTURBANCE REQUIRED FOR THE CELL VII EXPANSION OF THE REGIONAL LANDFILL. PERMIT APPLICATIONS WERE PREPARED BY TELLUS ENVIRONMENTAL ASSOCIATES, INC. AND DAVIS ENVIRONMENTAL CONSULTANTS, INC..
5. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 56.1 ACRE AREA DEPICTED IN THIS DRAWING.
6. PROPOSED CELL VII AREA WILL BE UTILIZED AS A SOIL STOCKPILE AREA OR BORROW SOURCE PRIOR TO CONSTRUCTION AND OPERATION OF CELL VII.
7. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
8. APPROVAL FOR THE CONSTRUCTION AND OPERATION OF THE CELL VII EXPANSION WAS GRANTED BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY WITH THE ISSUANCE OF THE PERMIT AMENDMENT TO PERMIT #417, ON JUNE 8, 2011. CONSTRUCTION START DATE FOR CELL VII IS NOT YET DETERMINED AND WILL DEPEND ON THE REMAINING LIFE OF EXISTING CELL VI, WHICH IS ANTICIPATED TO REMAIN OPERATIONAL THROUGH AT LEAST 2024 AND MAY BE AS LONG AS THROUGH 2040.
9. SOIL DISTURBANCE WITHIN CELL VII AREA BORROW OPERATIONS IS BEING COMPLETED IN ACCORDANCE WITH EROSION AND SEDIMENT CONTROL PERMIT ISSUED BY THE CITY OF SUFFOLK (ESC-2009-00002), MARCH 26, 2009.
10. DISTURBANCE OF SOILS AND WETLANDS WITHIN FUTURE CELLS VIII AND IX 129 ACRE AREA WILL REQUIRE 404 AND 401 WETLAND PERMITS THROUGH US ARMY CORP OF ENGINEERS AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, AND EROSION AND SEDIMENT CONTROL PERMIT THROUGH THE CITY OF SUFFOLK. THE FUTURE CELL VIII AND IX AREA IS PLANNED FOR USE AS A SAND OR GRAVEL EXTRACTION (SOIL BORROW) AREA TO SUPPORT LANDFILL CONSTRUCTION AND OPERATION, AND MAY BE UTILIZED AS A VEGETATIVE WASTE COMPOST SYSTEM AREA, SUBJECT TO STATE AND LOCAL PERMITTING. THE 129 ACRE DEVELOPMENT AREA INCLUDES ANCILLARY FACILITIES INCLUDING PERIMETER BERMS, ACCESS ROADS, AND STORMWATER AND LEACHATE MANAGEMENT AREAS.
11. EXISTING VARIABLE WIDTH EVERGREEN TREE BUFFER (TYP 25' WIDTH) TO BE SUPPLEMENTED WITH LOBLOLLY PINE SEEDLINGS TO RE-ESTABLISH AND ENHANCE VISUAL BUFFER WEST OF STREAM CROSSING NEAR SEDIMENT BASIN #2.
12. EXISTING VARIABLE WIDTH EASEMENT FOR CITY OF CHESAPEAKE RAW WATER TRANSMISSION MAIN (TYP 40' WIDTH). LOCATIONS OBTAINED FROM CITY OF CHESAPEAKE RAW WATER FACILITIES, RED TOP TO LAKE GASTON WATER TREATMENT PLANT RAW WATER TRANSMISSION MAIN DRAWINGS, ISSUED FOR CONSTRUCTION SEPTEMBER 2012, PREPARED BY HDR ENGINEERING, INC.

HDR Engineering, Inc.
555 Fayetteville Street, Suite 900
Raleigh, NC 27601
919.232.6600

ISSUE	DATE	DESCRIPTION
-	-	-

PROJECT MANAGER	J. MURRAY, P.E.
PROJECT ENGINEER	T. PREDDY, E.I.
DRAWN BY	T. PREDDY, E.I.
PROJECT NUMBER	107091-279011-018

SPSA

Southeastern Public Service Authority

Public Facilities Report

SUFFOLK VIRGINIA

SITE PLAN

0 1" 2"

FILENAME Figure 1.DWG
SCALE 1"=400'

SHEET
Figure 1

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C

Attachment C – Cell VII Stormwater Calculations

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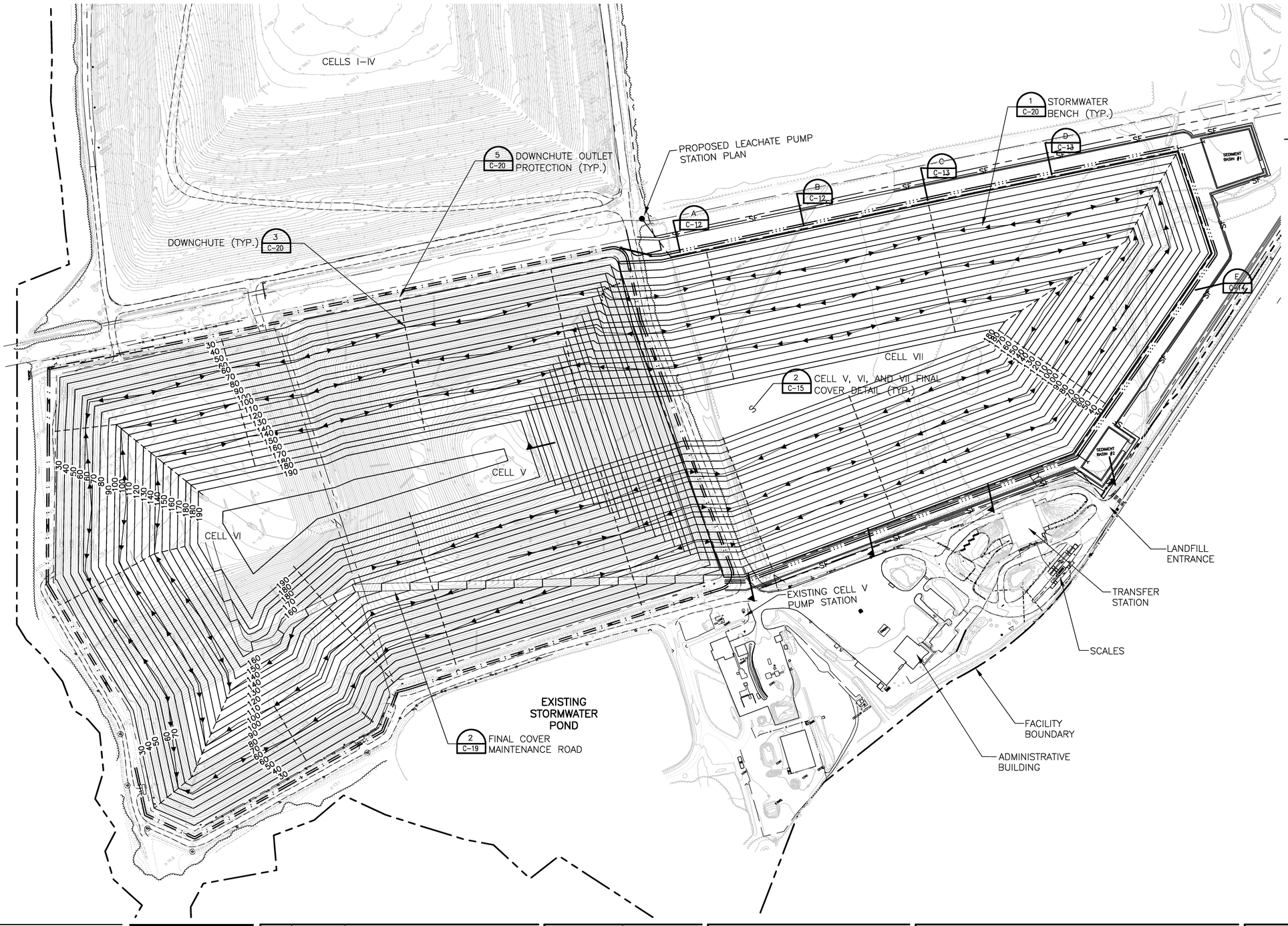

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I–IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED DECEMBER 27, 2007.
5. AS–BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL–SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
7. AS–BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PRIFFITT DATED SEPTEMBER 19, 2005.
8. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
9. THE BUFFERS OUTLINED IN 9VAC 20–80–250 A(7) WILL BE MAINTAINED.
10. THE CONDITIONS SHOWN AS EXISTING ON THIS DRAWING REPRESENT GENERAL CONDITIONS AT THE TIME OF THE SURVEYS REFERENCED HEREIN.
11. FINAL COVER GRADES DEPICT TOP OF FINAL COVER.
12. STORMWATER BENCHES ARE SHOWN SCHEMATICALLY. ARROWS SHOW DIRECTION OF FLOW.

LEGEND

- EXISTING CONTOURS
- FINAL COVER GRADES
- CONSTRUCTION BASELINE
- FACILITY BOUNDARY
- SILT FENCE
- SIDESLOPE BENCH
- DOWNCHUTE
- PROPERTY BOUNDARY
- PERIMETER CHANNEL

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

COMMONWEALTH OF VIRGINIA — THOMAS M. YANOSCHAK — Lic. No. 043303 — PROFESSIONAL ENGINEER — 8/27/08

COMMONWEALTH OF VIRGINIA — DOUGLAS GARY DECESARE — Lic. No. 38558 — PROFESSIONAL ENGINEER — 8-27-08

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK **VIRGINIA**

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C–09.dwg
SCALE	1"=200'

SHEET **C-09**

C:\pwworking\tpal\dms65507\00C-09.DWG, Plot, 8/28/2008 10:45:22 AM, lpatters

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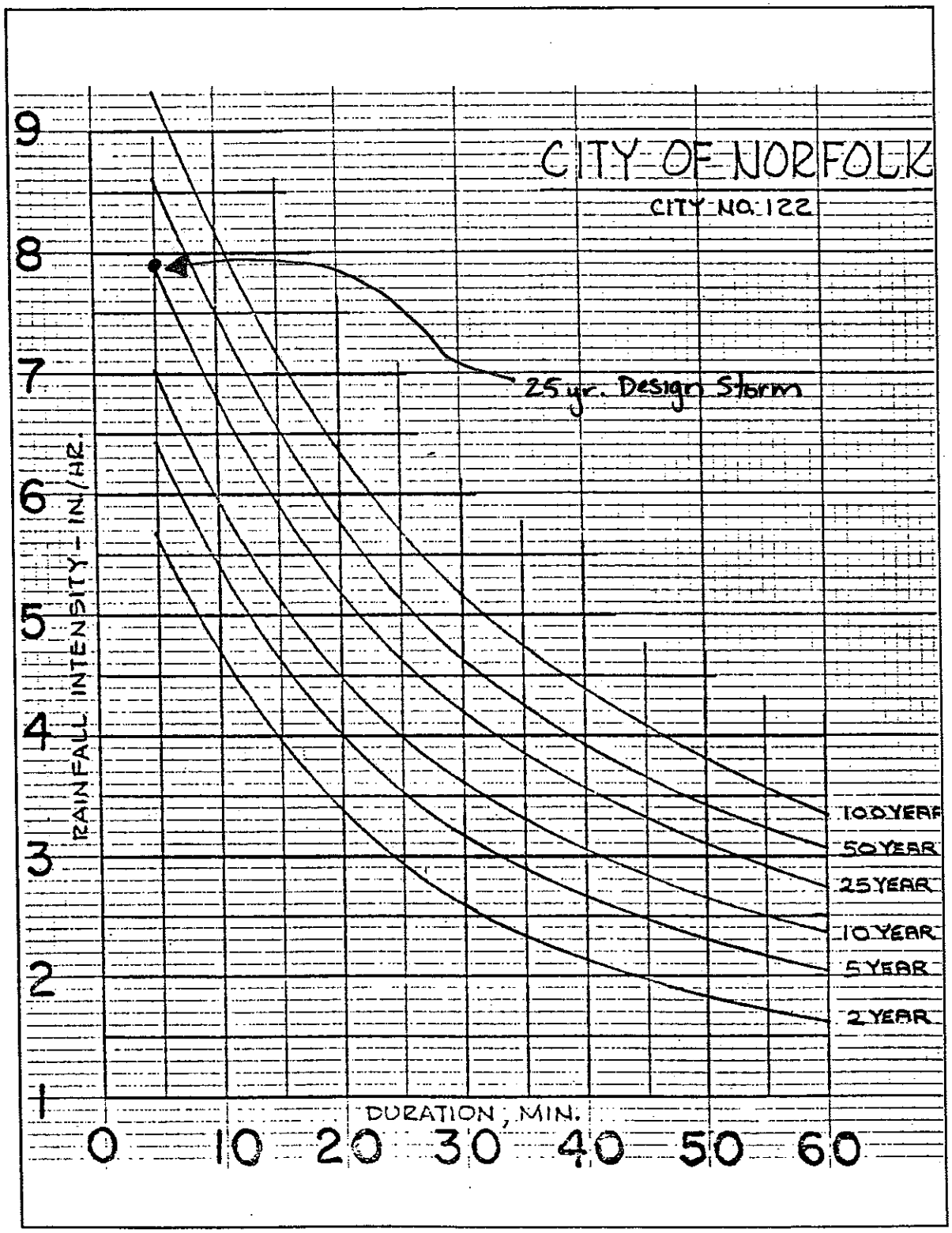


Source: VDOT

Plate 5-5

TABLE 5-2
VALUES OF RUNOFF COEFFICIENT (C) FOR RATIONAL FORMULA

Land Use	C	Land Use	C
Business:		Lawns:	
Downtown areas	0.70-0.95	Sandy soil, flat, 2%	0.05-0.10
Neighborhood areas	0.50-0.70	Sandy soil, average, 2-7%	0.10-0.15
		Sandy soil, steep, 7%	0.15-0.20
		Heavy soil, flat, 2%	0.13-0.17
		Heavy soil, average, 2-7%	0.18-0.22
		Heavy soil, steep, 7%	0.25-0.35
Residential:		Agricultural land:	
Single-family areas	0.30-0.50	Bare packed soil	
Multi units, detached	0.40-0.60	* Smooth	0.30-0.60
Multi units, attached	0.60-0.75	* Rough	0.20-0.50
Suburban	0.25-0.40	Cultivated rows	
		* Heavy soil, no crop	0.30-0.60
		* Heavy soil, with crop	0.20-0.50
		* Sandy soil, no crop	0.20-0.40
		* Sandy soil, with crop	0.10-0.25
		Pasture	
		* Heavy soil	0.15-0.45
		* Sandy soil	0.05-0.25
		Woodlands	0.05-0.25
Industrial:		Streets:	
Light areas	0.50-0.80	Asphaltic	0.70-0.95
Heavy areas	0.60-0.90	Concrete	0.80-0.95
		Brick	0.70-0.85
Parks, cemeteries	0.10-0.25	Unimproved areas	0.10-0.30
Playgrounds	0.20-0.35	Drives and walks	0.75-0.85
Railroad yard areas	0.20-0.40	Roofs	0.75-0.95

Note: The designer must use judgement to select the appropriate "C" value within the range. Generally, larger areas with permeable soils, flat slopes and dense vegetation should have the lowest C values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should be assigned the highest C values.

Source: American Society of Civil Engineers

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PMW	Date 2-12-09
Task: Sideslope Channels	Sheet 1	Of 2

References

1. Elements of Urban Stormwater Design, H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook

Objective Design and size perimeter ditches to handle flow from a 25 year storm event.

Equations

Normal Depth Procedure (Manning's Eqn)

$AR^{2/3}=Qn/1.49s^{0.5}$ Area (A)= $bd+z(d^2)$ $Z_{av}=AR^{2/3}$

$Z_{req}=Qn/1.49s^{0.5}$ $R=Area/(b+2d((z^2+1)^{0.5})$ Avg Shear Stress(T) = d*s*unit weight of water

Design Channels along the access road

Min Channel Freeboard =	0.5	ft
Inside Channel Side Slope =	3	(enter X for X:1)
Outside Channel Side Slope =	2	(enter X for X:1)
Bottom Width, b =	0	ft

Q (cfs) = CIA = Peak Flow

Runoff Coefficient, C = 0.3 Ag Land, Bare Packed Soil, Rough (0.20 - 0.50) Ref 2, Table 5-2, p V-29

Design Storm: 25-Yr, 5-min

I (in/hr) = 7.9 Ref 2, Plate 5-5, Norfolk, p V-15

A (Ac) = 1.72 based on max drainage area off the LF waste pile (North East side of Cell 7, Fig 1)

Calculated Flow Rate Q (cfs) = 4.08

Various Lining Types

Lining Type	Lining Description	Manning's n depths of 0.5-2.0 ft	Vp (ft/sec)	Allowable Shear Stress psf
A	Jute Net (HEC-15)	0.015	2.0	0.45
B	Erosion Control Blanket Single Net (Curlex 1)	0.034	5.0	1.55
C	Erosion Control Blanket Double Net (Curlex HV)	0.026	10.0	1.65
D	Ordinary Firm Loam (Ref 2)	0.020	3.5	2.0
E	Grass Lined (Ref 2)	0.030	5.0	2.0
F	6" Rip Rap (Ref 2, Ref 1)	0.069	9.0	2.0
G	Unvegetated Turf Reinforcement Mat (TRM) (NAG C350)	0.025	9.5	2.25
H	Class D Phase 2 (Partially vegetated) TRM (NAG C350)	0.048	14.0	3.34
I	12" Rip Rap (Ref 2, Ref 1)	0.078	12.5	4.0
J	Class B Phase 3 (Fully vegetated) TRM (NAG C350)	0.048	18.0	5.7
K	Concrete (HEC-15, EPA 832-F-99-002)	0.013	25.0	10.0

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PAW	Date 2-12-09
Task: Sideslope Channels	Sheet 2	Of 2

Select Lining System for each channel slope that will handle the design flow when vegetated and when initially constructed.

Assume the channel slope is constructed at 3% but settles to 1%

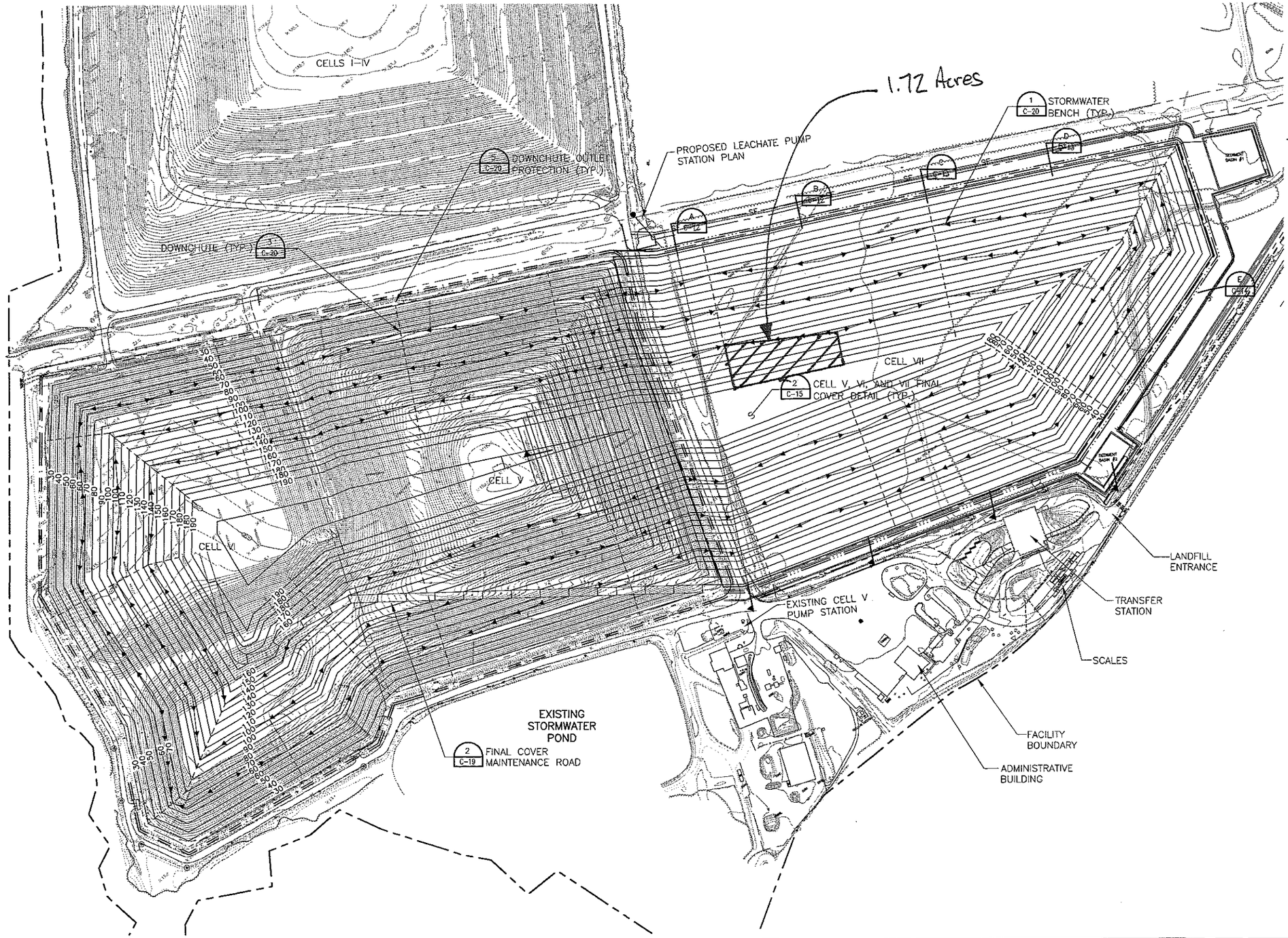
Lining Type	Channel Slope	Z_{req}	Flow Depth d (ft)	Cross Sectional Area (sf)	R	Z_{avail}	Velocity (ft/sec)	Average Shear Stress (lb/sf)	
Permanent Lining									
E	3.0%	0.47	0.6	1.05	0.30	0.47	3.9	1.2	
E	1.0%	0.82	0.8	1.59	0.37	0.82	2.6	0.5	
Initial Lining									
D	3.0%	0.32	0.6	0.79	0.26	0.32	5.2	1.0	Need Temp Lining
D	1.0%	0.55	0.7	1.18	0.32	0.55	3.5	0.4	
Temporary Lining									
B	3.0%	0.54	0.7	1.16	0.32	0.54	3.5	1.3	
B	1.0%	0.93	0.8	1.75	0.39	0.93	2.3	0.5	

CONCLUSION

1. The above calculations are for the "Worst Case Scenario" or largest drainage area of a sideslope channel for Cells V, VI andVII
   Drainage area= 1.72 ac
   Bottom Width (ft) = 0
   Depth (ft) = 1.3
   Channel Slope = 3.0%
   Side Slope= 3H:1V Inside and 2H:1V Outside

2. The sideslope channel design approved for Cells V, VI, and VII are as follows:
   Bottom Width (ft) = 0
   Side Slopes = 3H:1V Inside and 2H:1V Outside
   Depth = 2

3. Permanent lining shall be grass and the temporary lining shall be Curlex I.



N

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
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3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
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11. FINAL COVER GRADES DEPICT TOP OF FINAL COVER.
12. STORMWATER BENCHES ARE SHOWN SCHEMATICALLY. ARROWS SHOW DIRECTION OF FLOW.

LEGEND

- EXISTING CONTOURS
- FINAL COVER GRADES
- CONSTRUCTION BASELINE
- FACILITY BOUNDARY
- SILT FENCE
- SIDESLOPE BENCH
- DOWNCHUTE
- PROPERTY BOUNDARY
- PERIMETER CHANNEL

C:\P\Working\TPA\dms93507\00C-09.DWG, Plot, 2/11/2009 9:47:17 AM, gwilliam

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
B	01/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C-09.dwg
SCALE	1"=200'

SHEET FIG 1

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Project:	SPSA Cell VII	Computed:	GMW	Date:	2/11/09
Subject:	Storm Water Drainage	Checked	PAW	Date	2-12-09
Task:	Reno Mattress Lined Downchute	Sheet	1	Of	2

Objective

Size a Reno Mattress downchute based on sideslope swale inlet flow rates

Constraints

Minimize the cross sectional area since this will be incorporated into the cover system

References:

1. Elements of Urban Stormwater Design, H. Rooney Malcom, P.E.
2. VA Erosion and Sediment Control Handbook
3. Macaferri, Inc.

Drainage Area

Calculate Peak Flow

Q (cfs) = CIA = Peak Flow

Drainage Area, A (acres) = to be determined

Runoff Coefficient, C =	0.3	Ag Land,Bare Packed Soil, Rough (0.20 - 0.50)	Ref 2, Table 5-2, p V-29
Intensity, I (in/hr) =	7.9	25-year, 5-min Design Storm	Ref 2, Plate 5-5, Norfolk, p V-15

Equations:

Normal Depth Procedure (Ref 1)

$AR^{2/3}=Qn/1.49s^{0.5}$ Area (A)= bd+z(d^2) $Z_{av}=AR^{2/3}$

$Z_{req}=Qn/1.49s^{0.5}$ R=Area/(b+2d((z^2)+1)^.5) Q=CIA

Assumptions

The drainage area may vary for each downchute, therefore determine the max drainage area that may be routed through the downchute.

Max (ac) =	8.94	See attached drawing (Figure 2)
Flow Rate Q (cfs) =	21.2	flow at bottom of downchute (max drainage area)

Project:	SPSA Cell VII	Computed:	GMW	Date:	2/11/09
Subject:	Storm Water Drainage	Checked	PMW	Date	2-12-09
Task:	Reno Mattress Lined Downchute	Sheet	2	Of	2

Prefer Reno Mattress

Manning's n =	0.07	Reno Mattress Lined, 6" (Ref 3)
max permissible velocity (ft/sec) =	13.8	for 6" (Ref 3)
Desired Freeboard =	0.5	ft
Design Channel Slope (s) =	3	X:1
Design Channel Slope (s) =	0.33	feet fall / foot run
Channel Side Slope (z) =	3	X:1
Bottom Width (b) =	8	ft

Flow Depth d (ft)	Cross Sectional A (sf)	Z_{req}	R	Z_{avail}	V (ft/sec)	Comment
0.39	3.54	1.72	0.34	1.72	6.0	OK

Check effects of settlement (flatter slope) on flow depth

Assume the landfill settles to approximately a 3.5:1 slope.

Channel Slope After Settlement (s) =	3.5	X:1
Channel Slope After Settlement (s) =	0.286	ft fall / foot run
Channel Side Slope (z) =	3	X:1
Bottom Width (b) =	8	ft

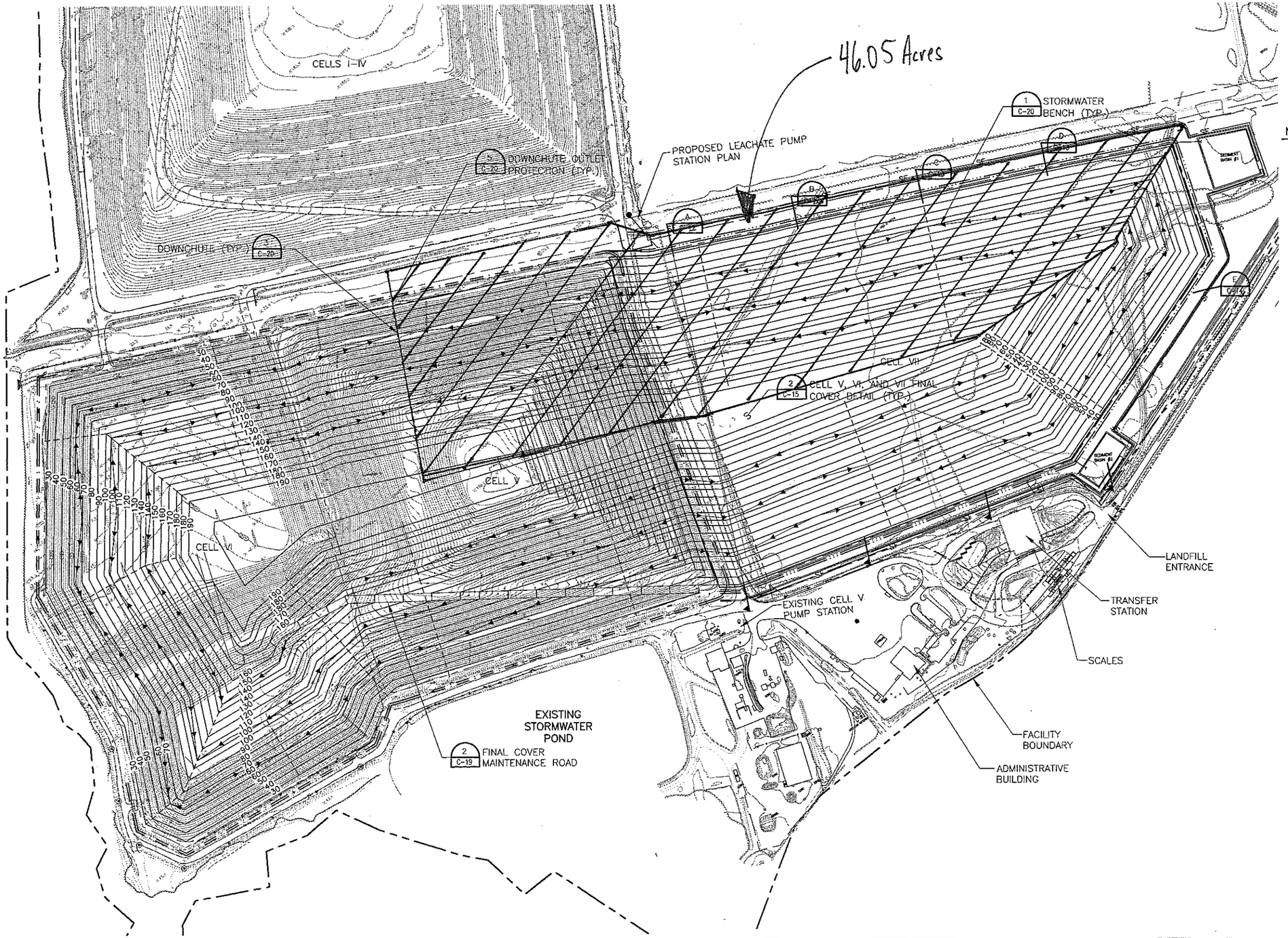
Flow Depth d (ft)	Cross Sectional A (sf)	Z_{req}	R	Z_{avail}	V (ft/sec)	Comment
0.53	3.83	1.86	0.34	1.86	5.5	OK

Conclusion:

Construct a trapezoidal shaped channel with the following dimensions:

Min Depth of downchute (ft) =	1.03	(includes freeboard)
Set Depth of downchute (ft) =	1.50	
Outside Channel Side Slope (X:1) =	3	
Inside Channel Side Slope (X:1) =	3	
Design Channel Slope (X:1) =	3	
Bottom Width (ft) =	8	

Permanent Lining type = Reno Mattress w/6" diameter rip rap



N

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LEGEND

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- 20 FINAL COVER GRADES
- CONSTRUCTION BASELINE
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- SILT FENCE
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SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C–09.dwg
SCALE	1"=200'

SHEET FIG 3

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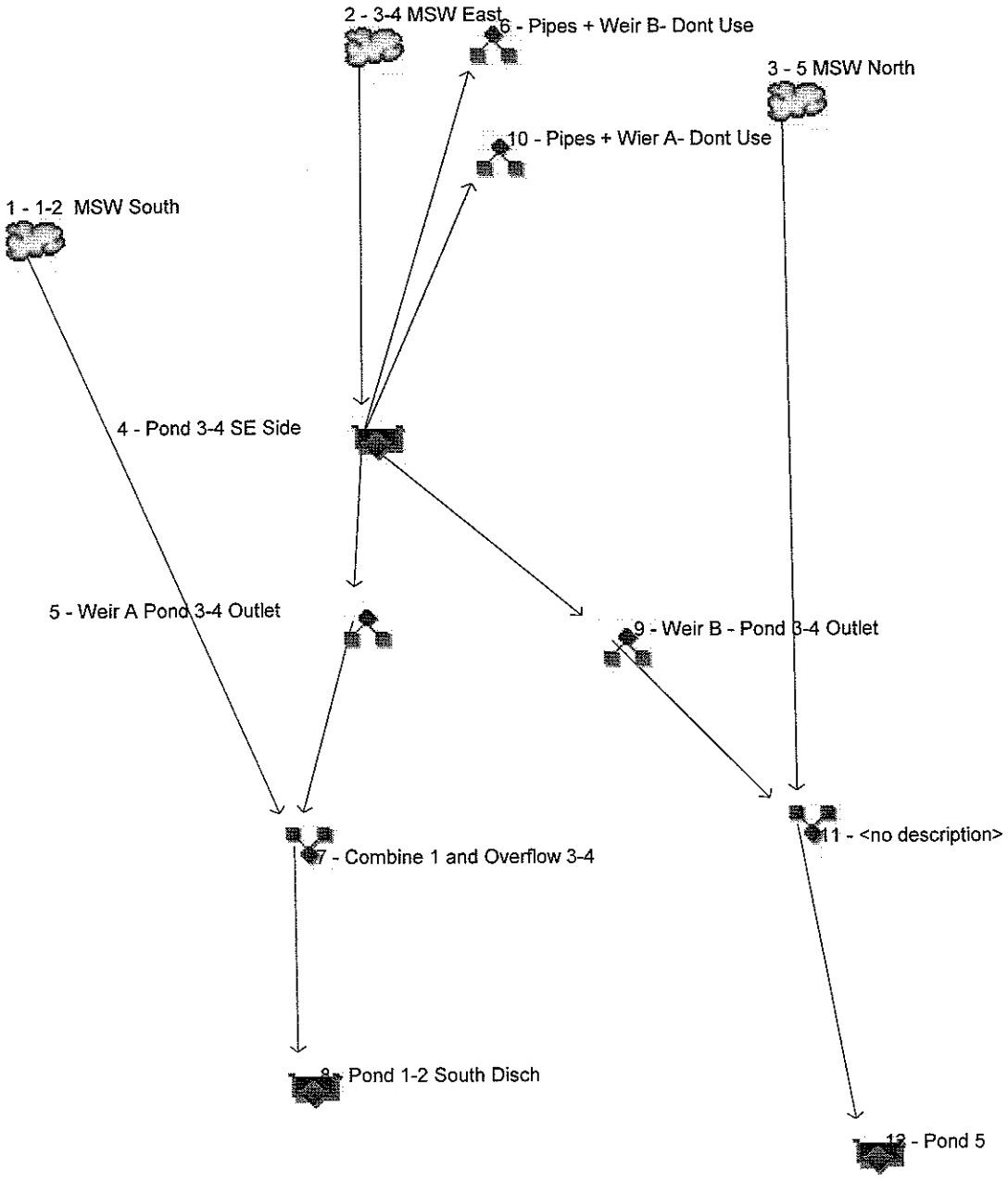
Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	142.36	1	727	12.330	------	------	------	1-2 MSW South
2	SCS Runoff	264.00	1	727	22.866	------	------	------	3-4 MSW East
3	SCS Runoff	113.68	1	727	9.847	------	------	------	5 MSW North
4	Reservoir	181.43	1	736	21.678	2	23.63	3.83	Pond 3-4 SE Side
5	Diversion1	82.91	1	736	7.613	4	------	------	Weir A Pond 3-4 Outlet
6	Diversion2	98.52	1	736	14.064	4	------	------	Pipes + Weir B- Dont Use
7	Combine	208.07	1	729	19.944	1, 5,	------	------	Combine 1 and Overflow 3-4
8	Reservoir	175.40	1	737	19.774	7	17.07	1.85	Pond 1-2 South Disch
9	Diversion1	55.54	1	736	2.782	4	------	------	Weir B - Pond 3-4 Outlet
10	Diversion2	125.90	1	736	18.895	4	------	------	Pipes + Wier A- Dont Use
11	Combine	154.65	1	729	12.629	3, 9,	------	------	<no description>
12	Reservoir	127.38	1	738	12.629	11	21.52	1.71	Pond 5

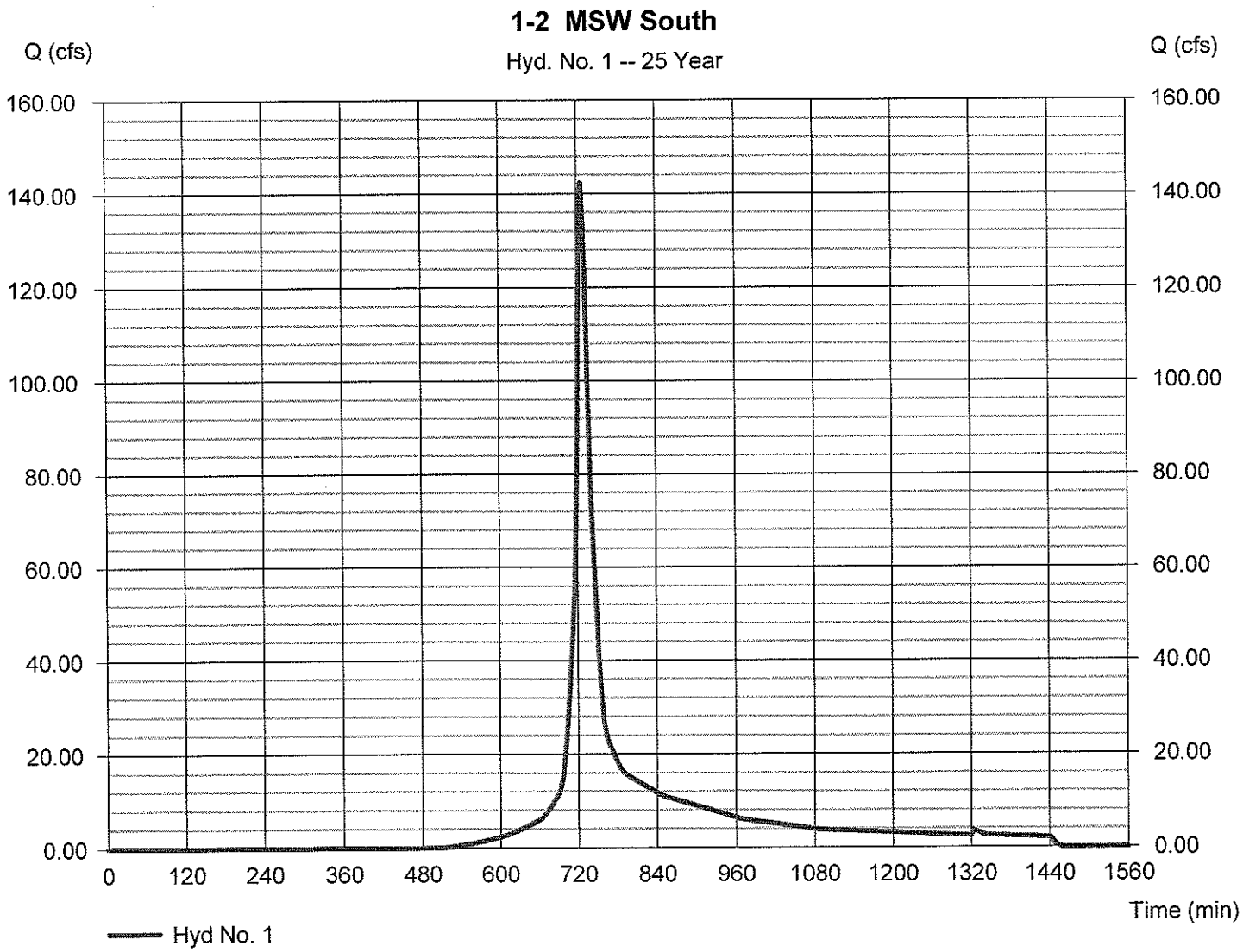
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 1

1-2 MSW South

Hydrograph type	= SCS Runoff	Peak discharge	= 142.36 cfs
Storm frequency	= 25 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 12.330 acft
Drainage area	= 42.200 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 256



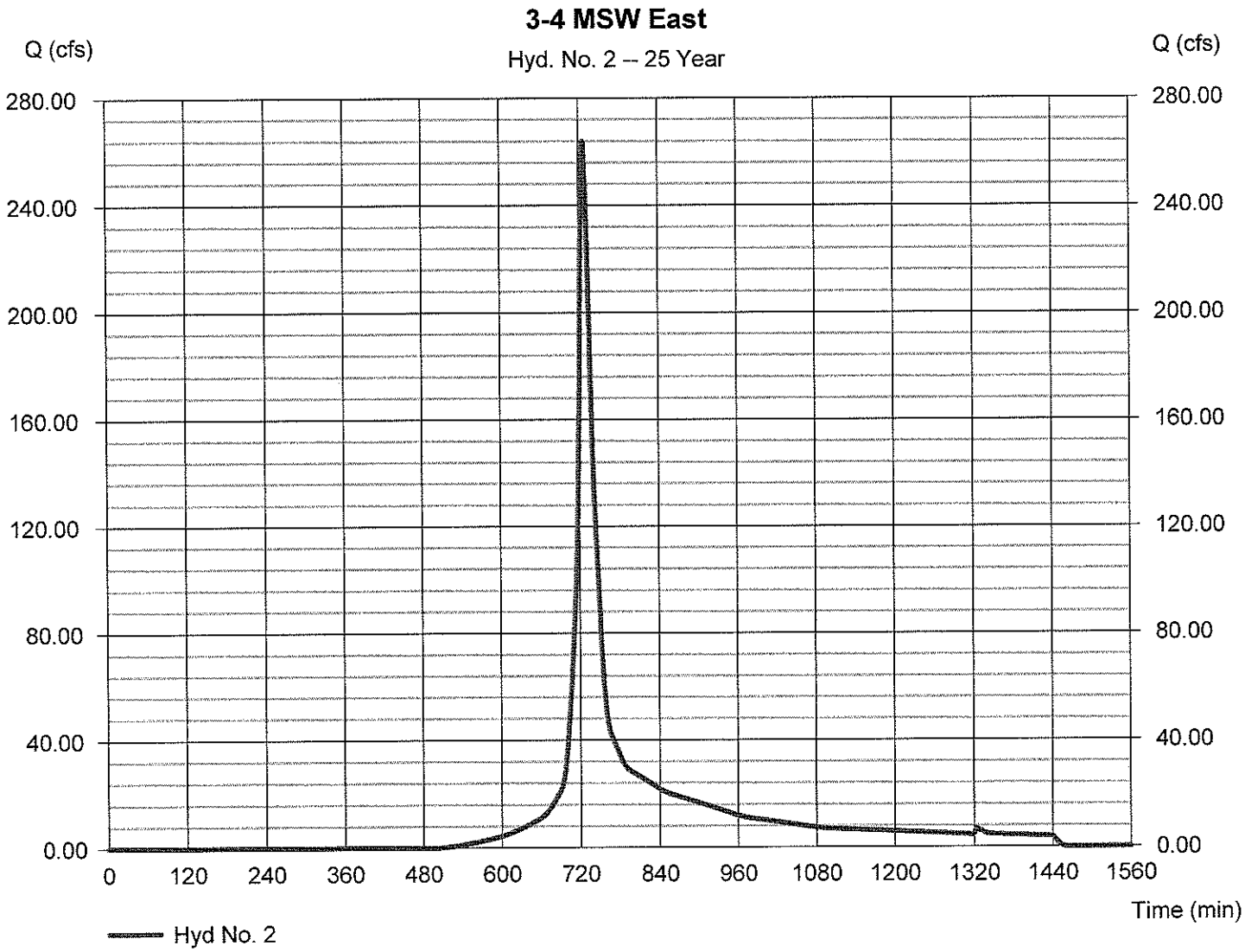
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 2

3-4 MSW East

Hydrograph type	= SCS Runoff	Peak discharge	= 264.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 22.866 acft
Drainage area	= 78.260 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 256



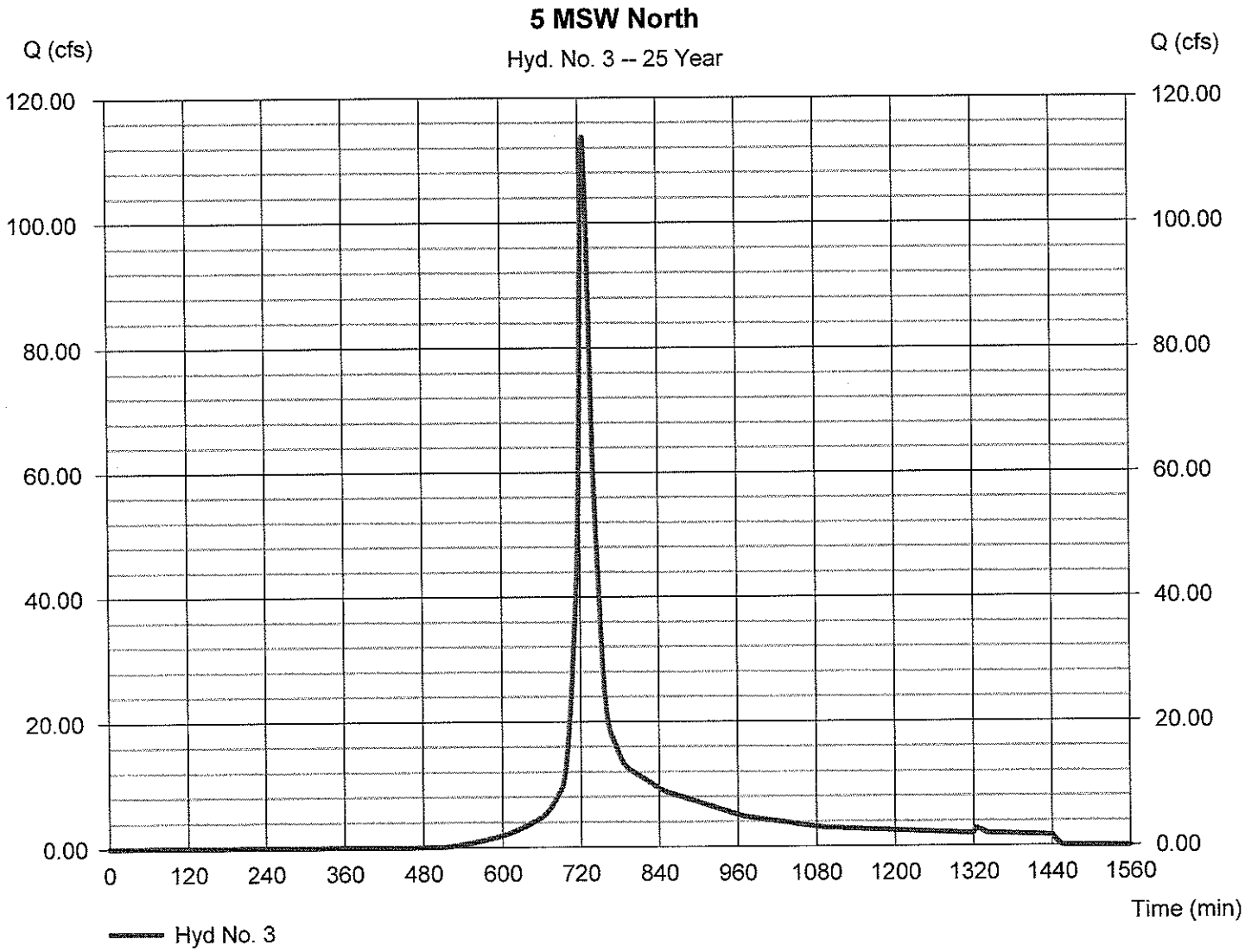
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 3

5 MSW North

Hydrograph type	= SCS Runoff	Peak discharge	= 113.68 cfs
Storm frequency	= 25 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 9.847 acft
Drainage area	= 33.700 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 256



Hydrograph Report

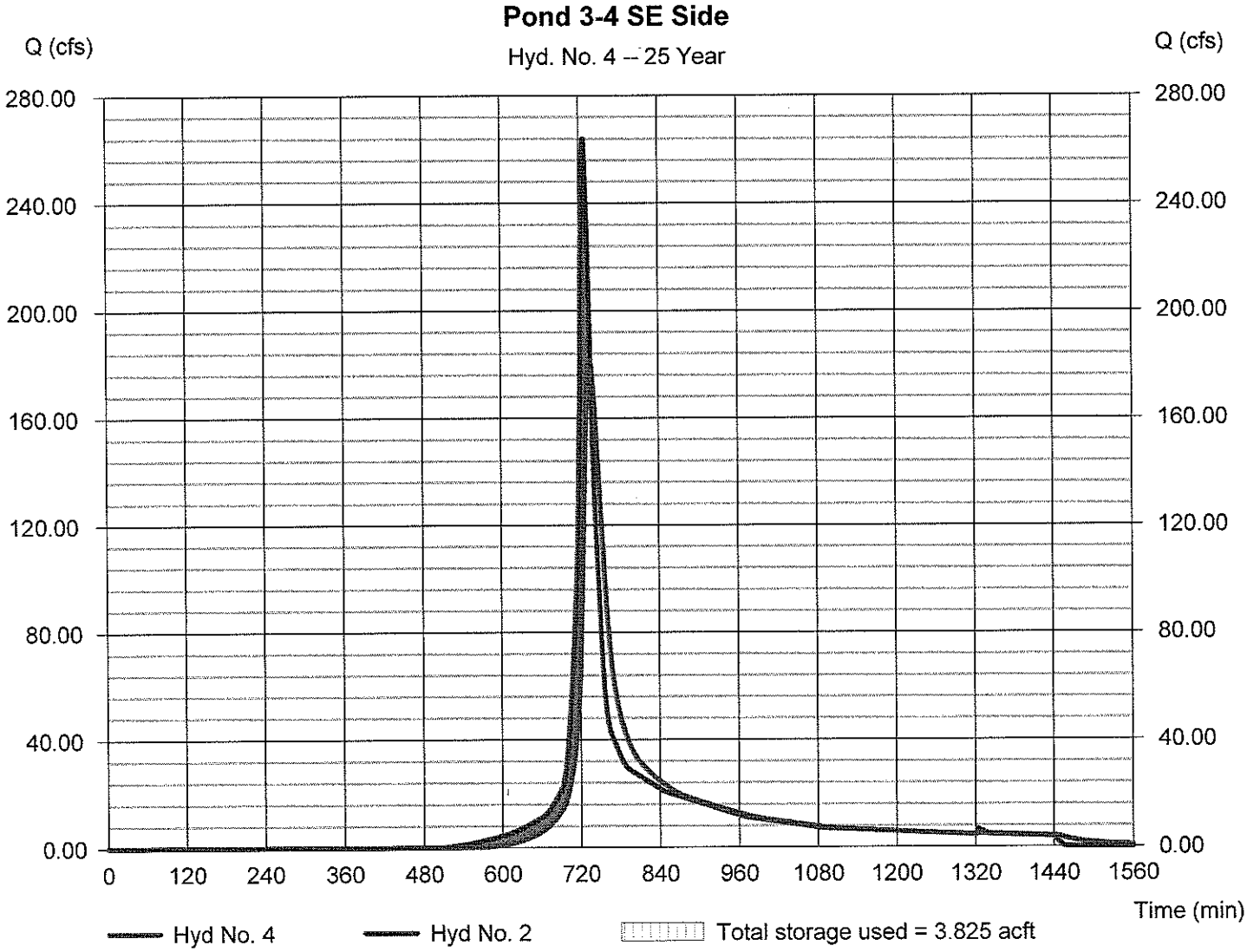
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 4

Pond 3-4 SE Side

Hydrograph type	= Reservoir	Peak discharge	= 181.43 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 21.678 acft
Inflow hyd. No.	= 2 - 3-4 MSW East	Max. Elevation	= 23.63 ft
Reservoir name	= 3-4 Pond	Max. Storage	= 3.825 acft

Storage Indication method used.



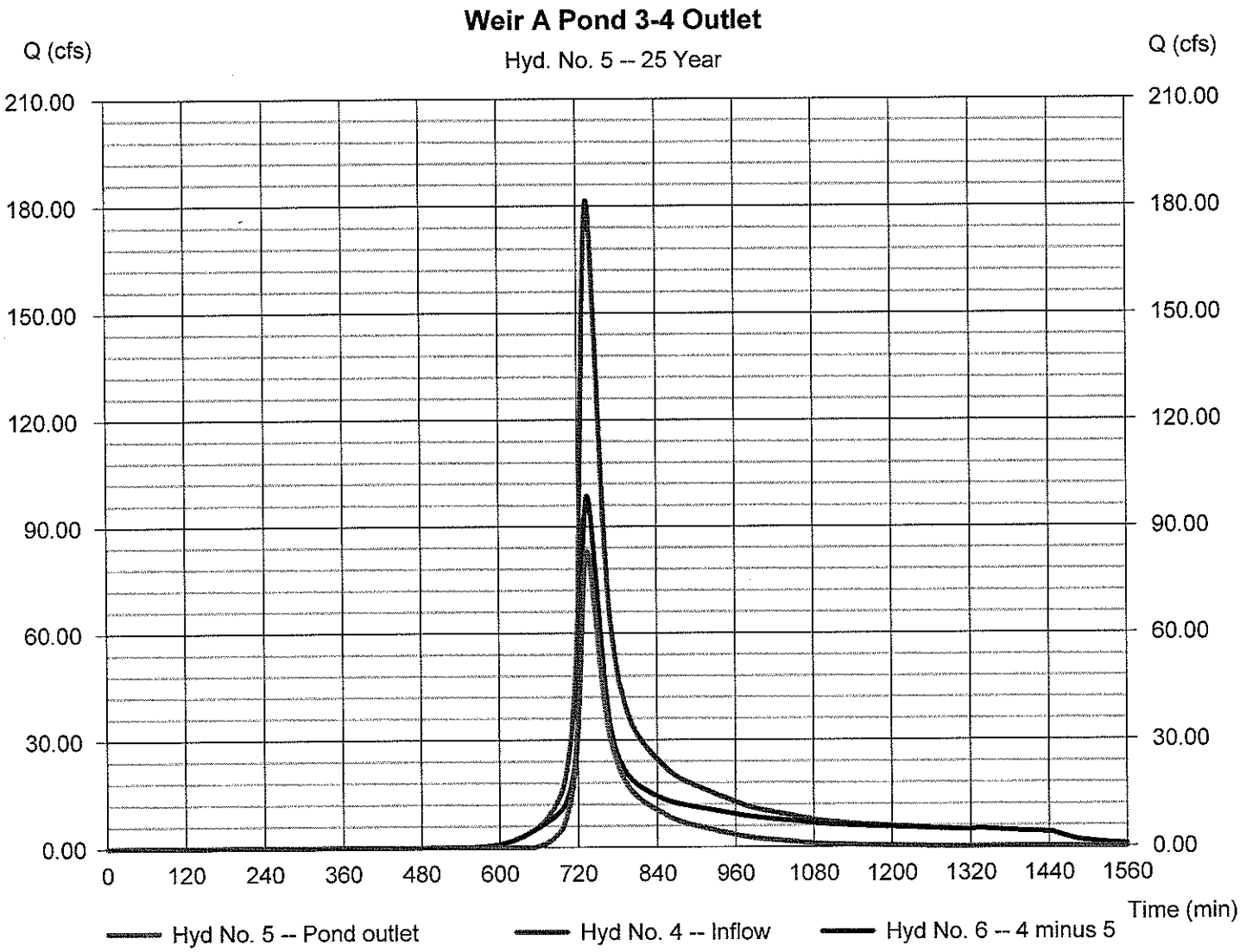
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 5

Weir A Pond 3-4 Outlet

Hydrograph type	= Diversion1	Peak discharge	= 82.91 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 7.613 acft
Inflow hydrograph	= 4 - Pond 3-4 SE Side	2nd diverted hyd.	= 6
Diversion method	= Pond - 3-4 Pond	Pond structure	= Weir A



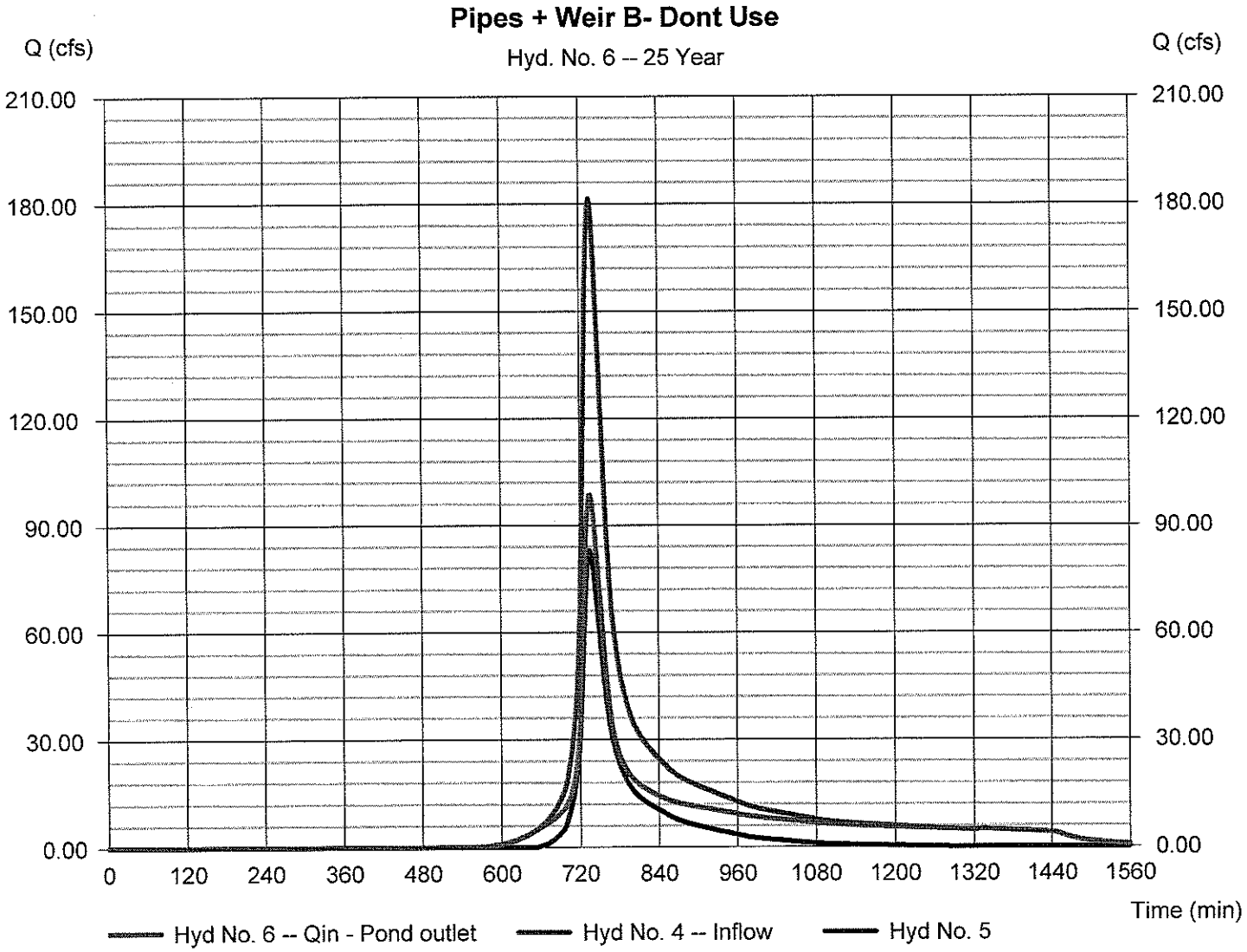
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 6

Pipes + Weir B- Dont Use

Hydrograph type	= Diversion2	Peak discharge	= 98.52 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 14.064 acft
Inflow hydrograph	= 4 - Pond 3-4 SE Side	2nd diverted hyd.	= 5
Diversion method	= Pond - 3-4 Pond	Pond structure	= Weir A



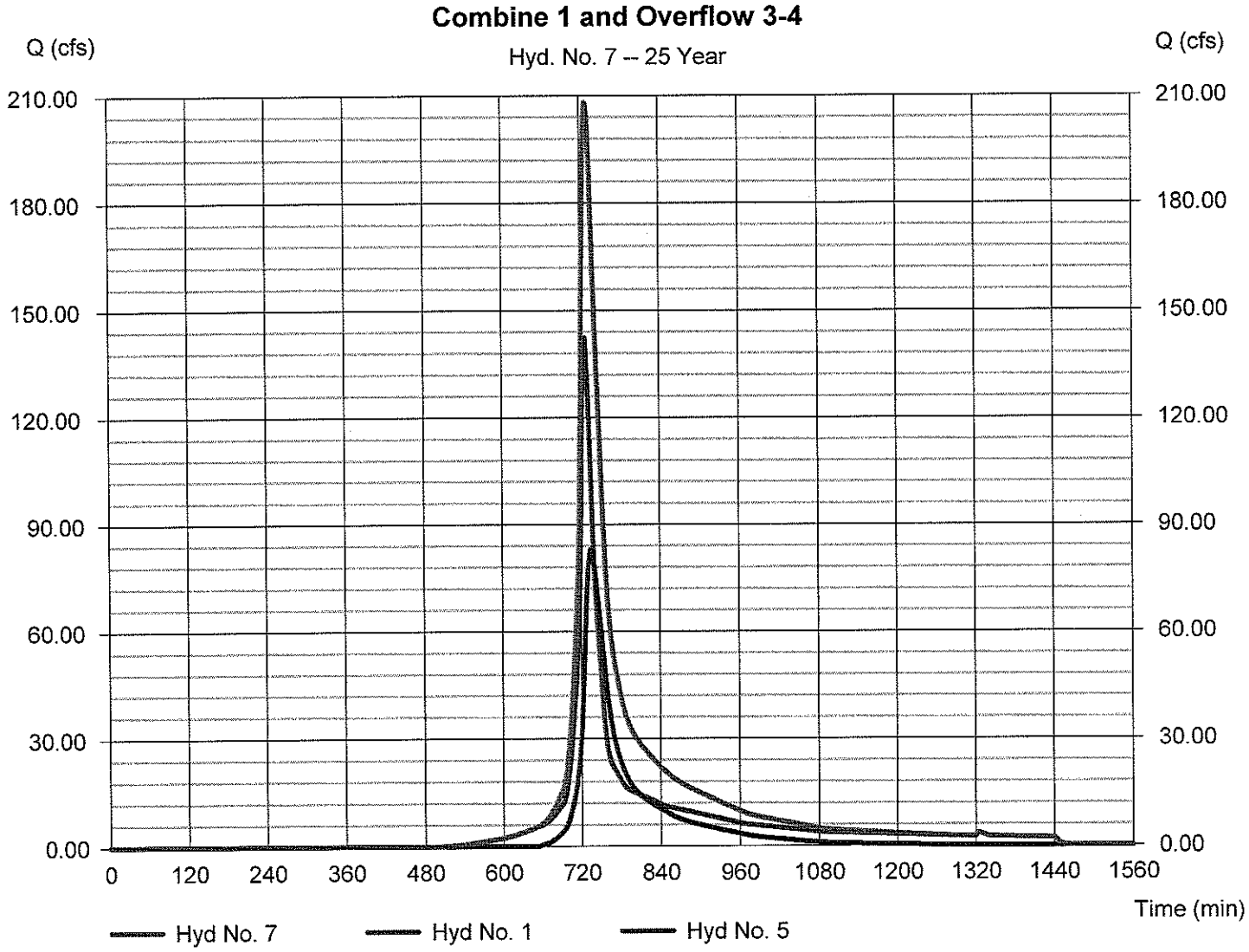
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 7

Combine 1 and Overflow 3-4

Hydrograph type	= Combine	Peak discharge	= 208.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 19.944 acft
Inflow hyds.	= 1, 5	Contrib. drain. area	= 42.200 ac



Hydrograph Report

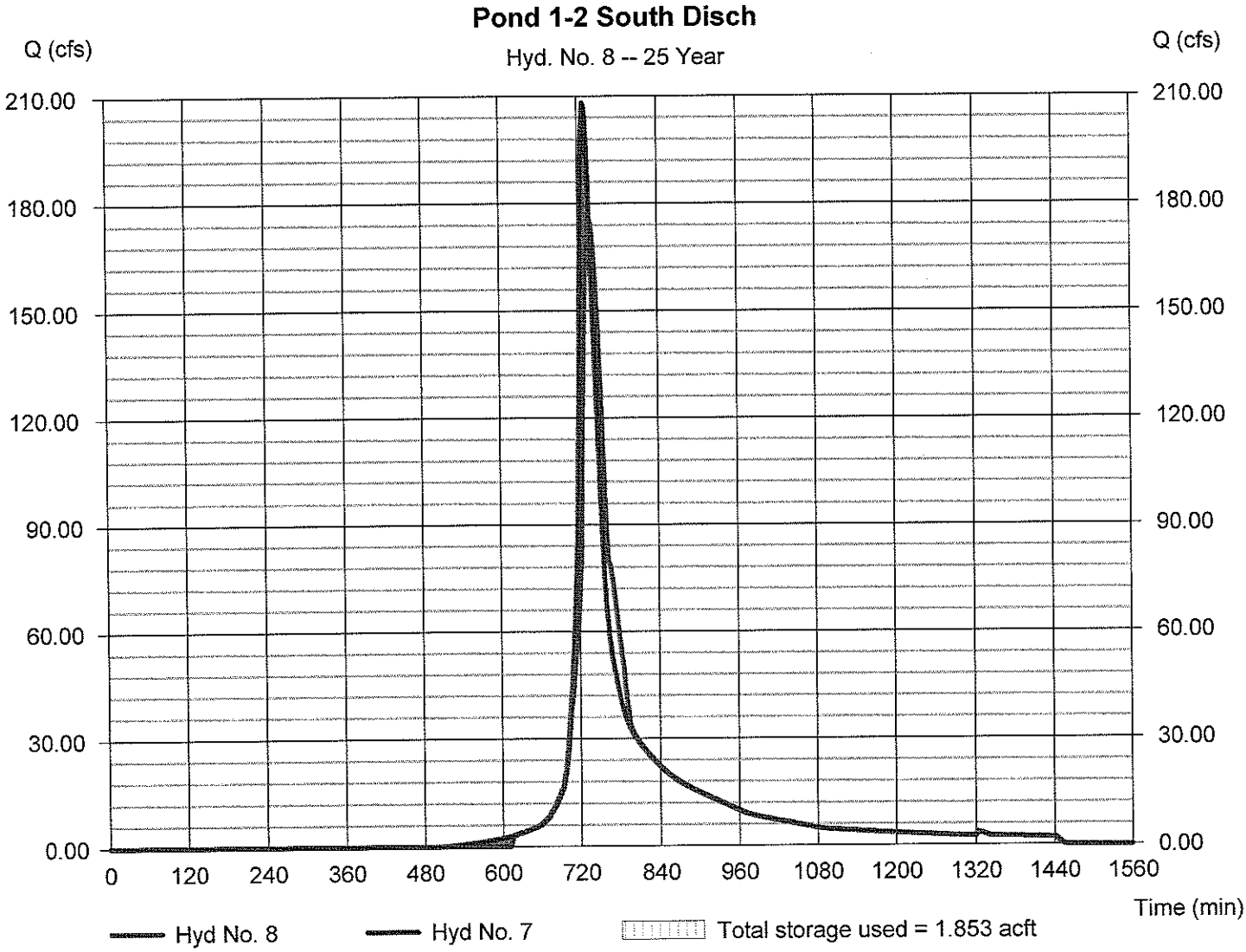
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 8

Pond 1-2 South Disch

Hydrograph type	= Reservoir	Peak discharge	= 175.40 cfs
Storm frequency	= 25 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 19.774 acft
Inflow hyd. No.	= 7 - Combine 1 and Overflow 3-4	Max. Elevation	= 17.07 ft
Reservoir name	= Pond 1-2	Max. Storage	= 1.853 acft

Storage Indication method used.



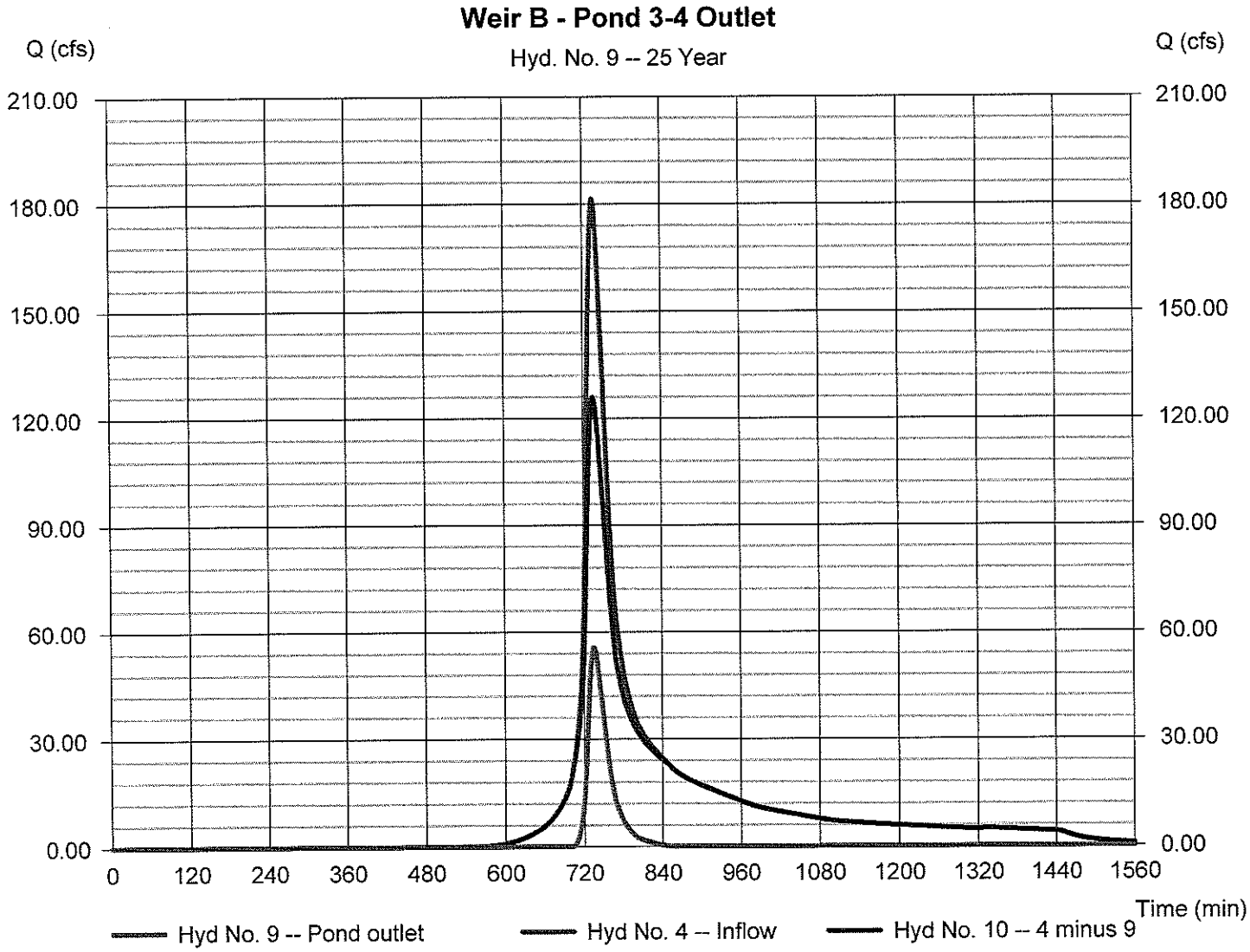
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 9

Weir B - Pond 3-4 Outlet

Hydrograph type	= Diversion1	Peak discharge	= 55.54 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 2.782 acft
Inflow hydrograph	= 4 - Pond 3-4 SE Side	2nd diverted hyd.	= 10
Diversion method	= Pond - 3-4 Pond	Pond structure	= Weir B



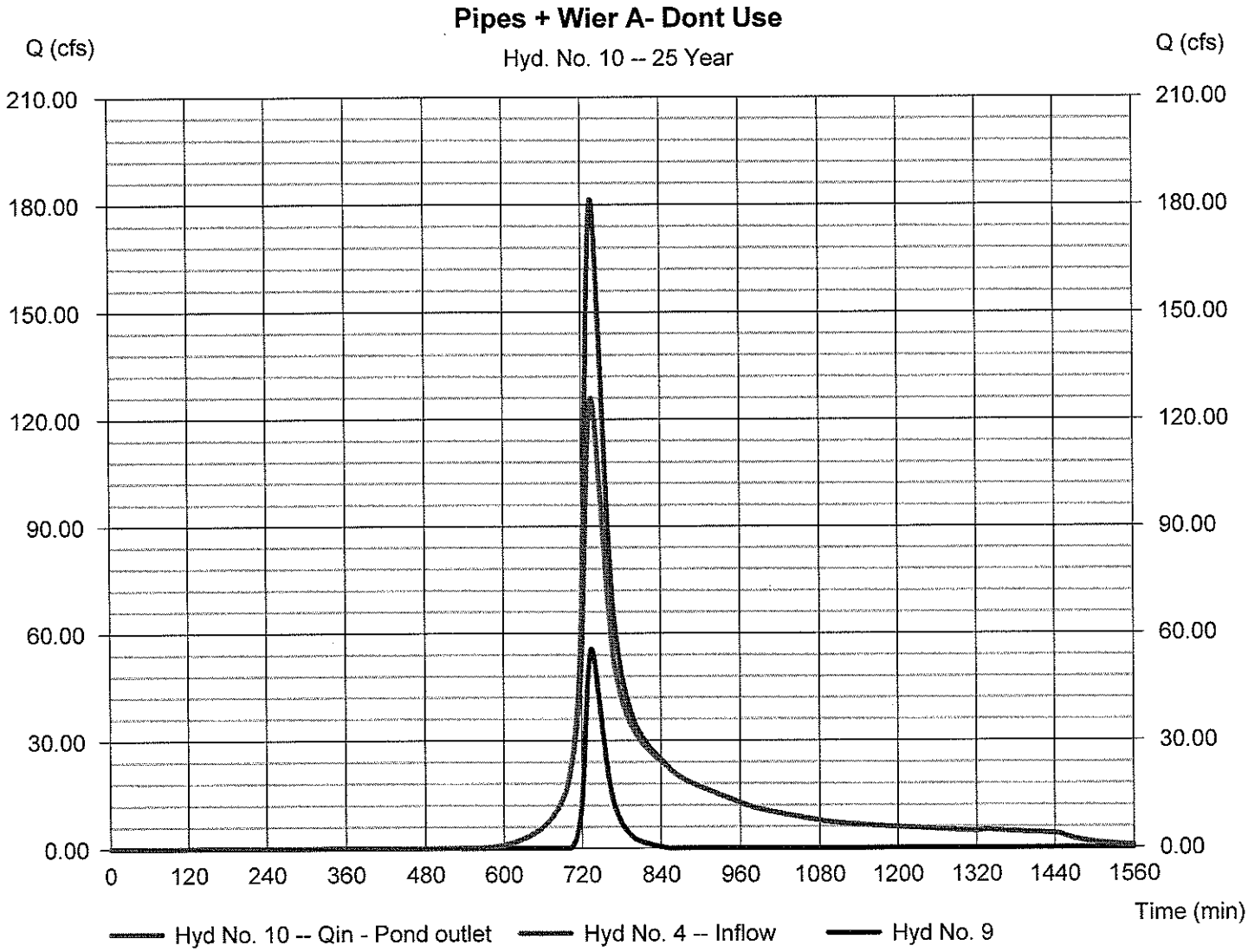
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 10

Pipes + Wier A- Dont Use

Hydrograph type	= Diversion2	Peak discharge	= 125.90 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 18.895 acft
Inflow hydrograph	= 4 - Pond 3-4 SE Side	2nd diverted hyd.	= 9
Diversion method	= Pond - 3-4 Pond	Pond structure	= Weir B



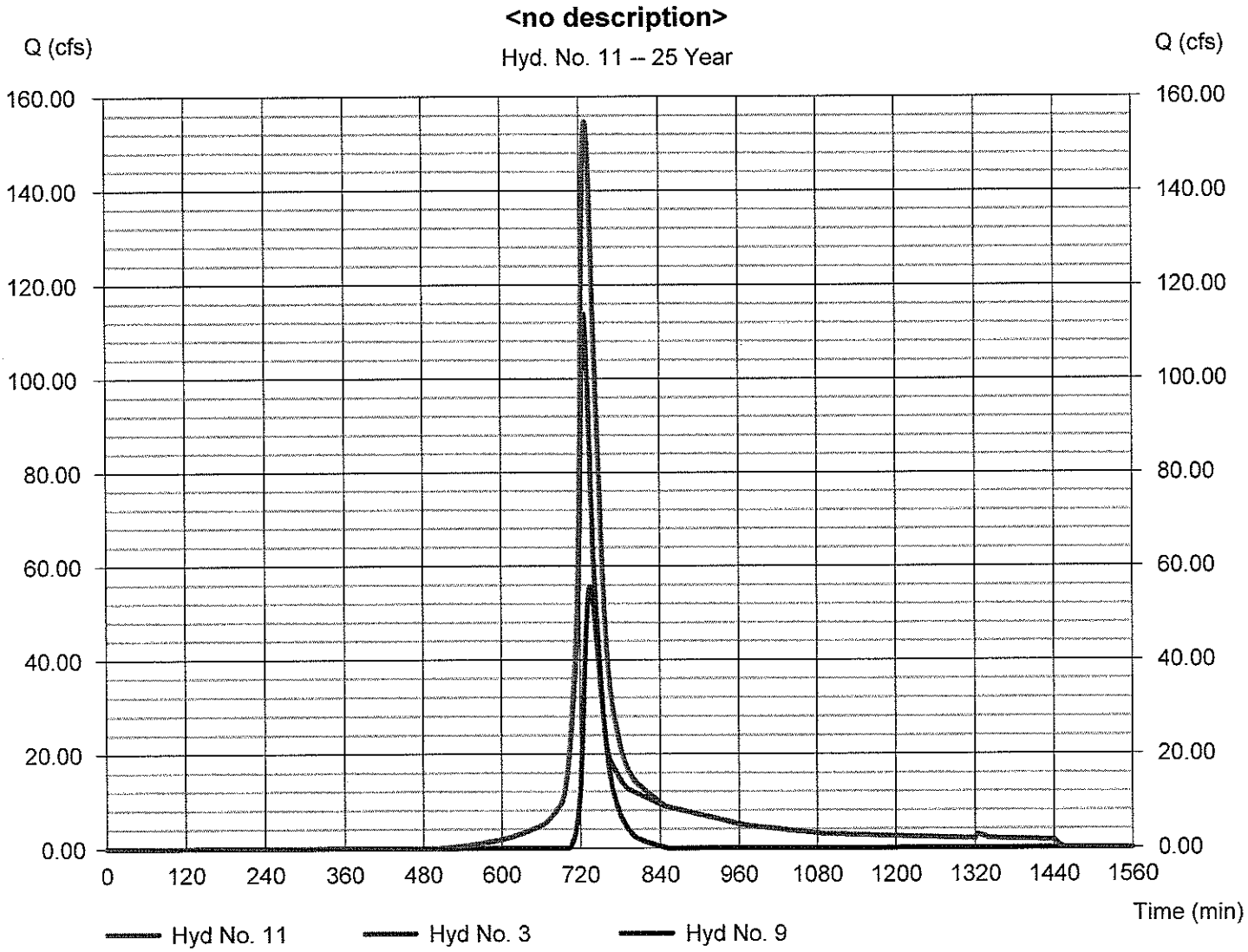
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

Hyd. No. 11

<no description>

Hydrograph type	= Combine	Peak discharge	= 154.65 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 12.629 acft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 33.700 ac



Hydrograph Report

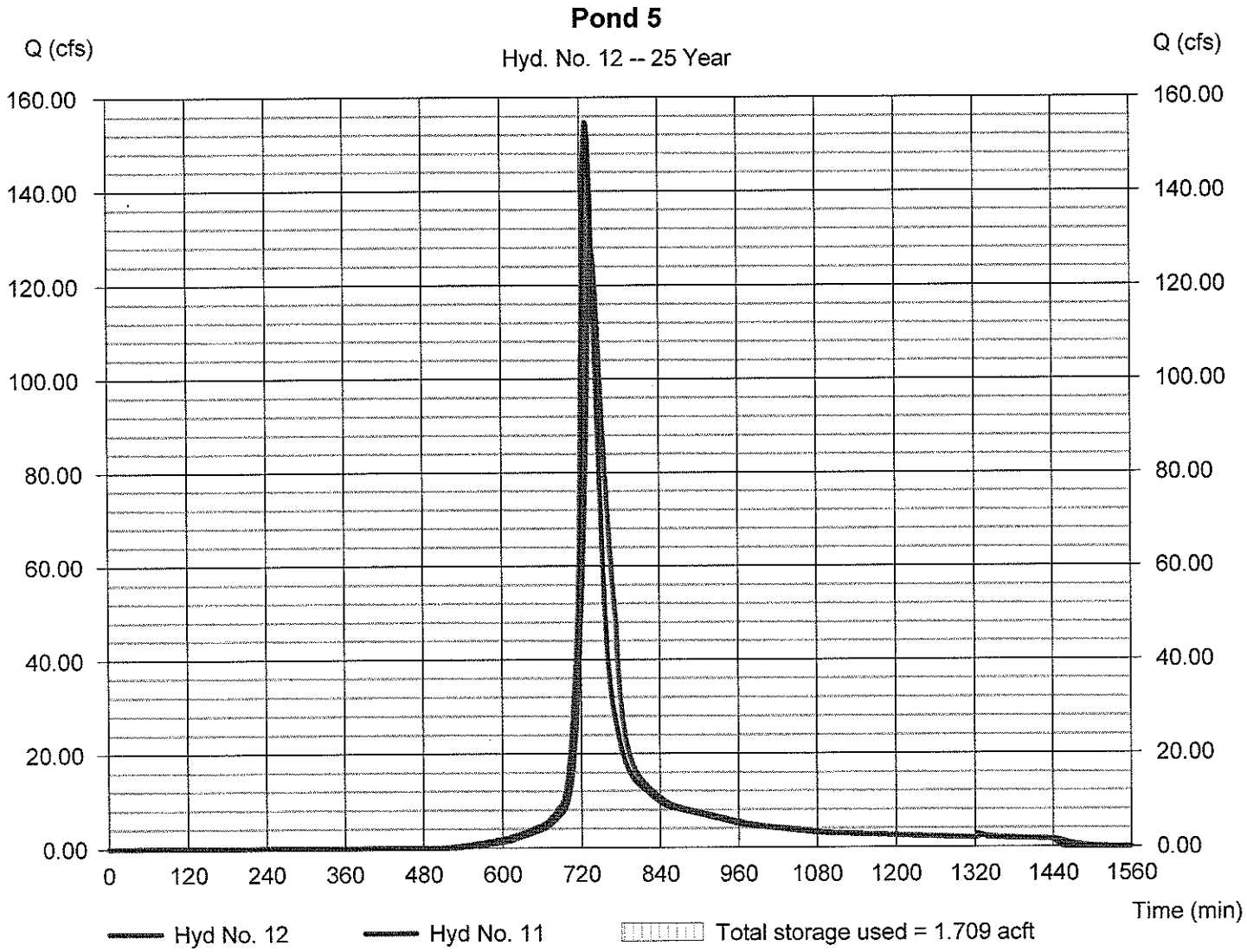
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 — Thursday, Feb 12, 2009

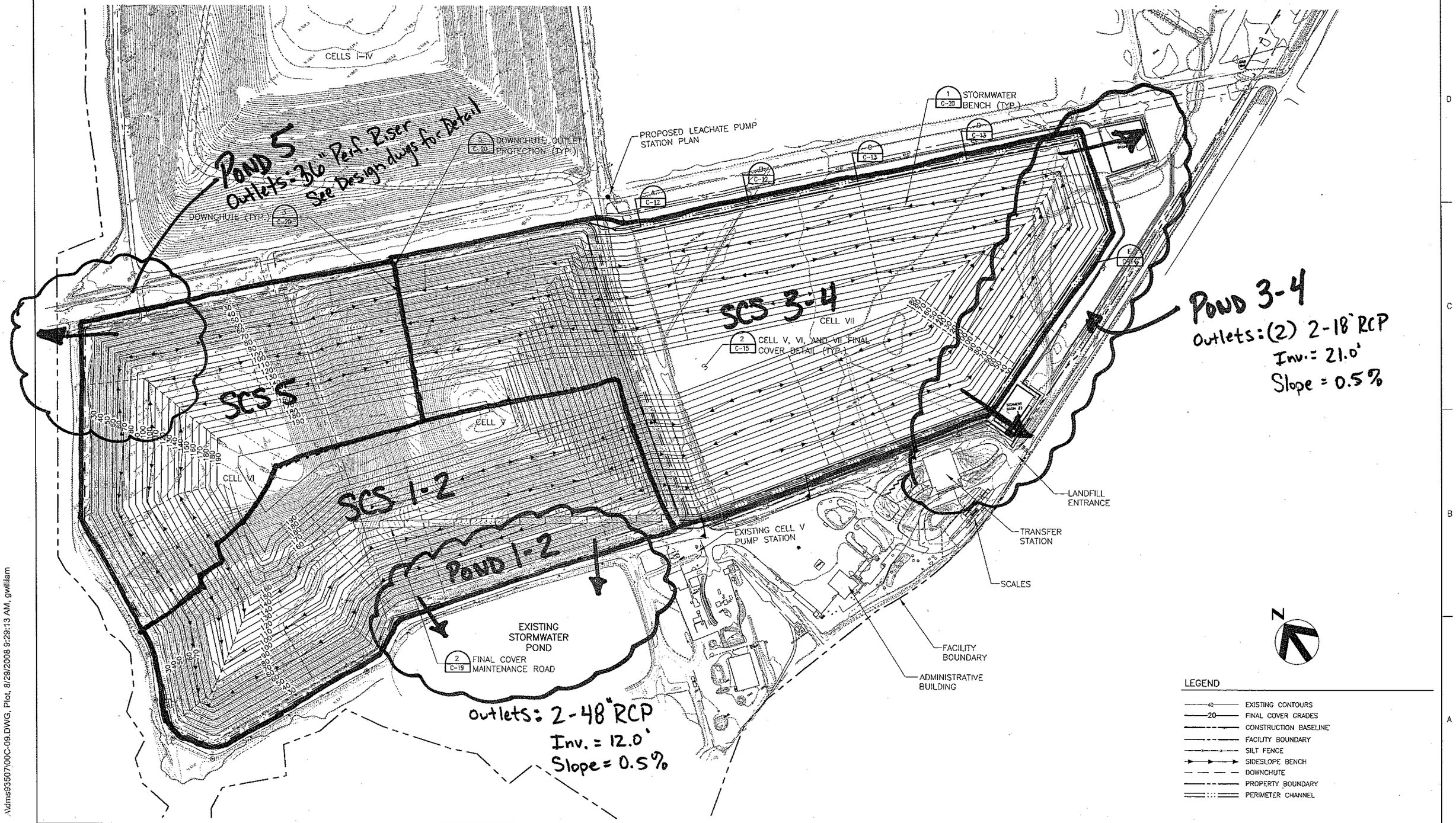
Hyd. No. 12

Pond 5

Hydrograph type	= Reservoir	Peak discharge	= 127.38 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 1 min	Hyd. volume	= 12.629 acft
Inflow hyd. No.	= 11 - <no description>	Max. Elevation	= 21.52 ft
Reservoir name	= Pond 5	Max. Storage	= 1.709 acft

Storage Indication method used.





HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

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SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C-09.dwg
SCALE	1"=200'

SHEET C-09

C:\PWworkin\..\dms93507\00C-09.DWG, Plot, 8/29/2008 9:29:13 AM, gwilliam

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D

Attachment D – Cell VIII and IX Borrow Area Sediment Basin Calculations

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HDR Computation

Job No. 1743-115-018

Project:	SPSA Cell VIII and IX Soil Borrow Area	Computed: JSM	Date: 6/20/16
Subject:	Drainage	Checked:	Date:
Task:	Sediment Basin SB #3	Sheet	Of

References 1. "Elements of Urban Stormwater Design" by H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook.

Pond Volume Requirements

Pre Dev Drainage Area A (ac) = 129.00

67	cy/acre wet storage	8643	cy	Ref 2, III-78
67	cy/acre dry storage	8643	cy	
134	Total Volume	17286	cy	
33.5	cy/acre Minimum sediment storage volume	4322	cy	

Estimate Depth of Runoff for design storm @ location: Ref 1, III-4

Determine Ultimate Storage Capacity (S): Soil Group B

CN = Varies Ref 2, V-56

S = (1000/CN) - 10 = Varies

Q_p = (qu)(A)(Q*)

Runoff Depth Q* (inches) = (P-0.2S)2/(P+0.8S)

T_P (min) = 60.5(Q*)A/Q_P/1.39

CN		Pre development	Post Development
98	Impervious Area (ac) =	0	0
61	Pervious Area (ac) =	129	129
	Total	129	129

Calculate Peak Flow Into Basin

Development	Post	Post	Post	Post		
Storm Event (yrs) =	2	10	25	100		
Time of conc (min) =	5	5	5	5		
Rainfall Depth P (in) =	3.7	5.7	6.7	8.5	(24 rainfall)	Ref 2, V-50
Initial Abstraction Ia (in)=	1.279	1.279	1.279	1.279		Ref 2, V-64
Ia/P ratio =	0.346	0.224	0.191	0.150		
Curve Number CN =	61.00	61.00	61.00	61.00		Ref 2, V-56
S =	6.39	6.39	6.39	6.39		
qu (cfs/sq.mi./in) =	1000	1000	1000	1000		Ref 2, V-55
Drainage Area A (ac) =	129.0	129.0	129.0	129.0		
Peak Flow Q_p (cfs) =	134.1	364.3	501.4	772.0		
Runoff Depth Q* (inches) =	0.67	1.81	2.49	3.83		
Time to Peak T_p (min) =	27.86	27.86	27.86	27.86		Ref 1, III-4

Determine Shape of Basin:

Measure the area of the Basin using AutoCADD.

Calculate Volume of the Basin using Truncated Pyramid Method.

Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Cumulative Vol (cf)	Cumulative Vol (cy)	
15	0	126,825	-	0	0	
16	1	132,088	129,448	129,448	4,794	
17	2	137,458	132,106	132,106	4,893	
18	3	138,818	132,776	264,882	9,810	
19	4	148,520	143,642	408,524	15,131	
20	5	154,212	151,357	559,881	20,736	Spillway Crest
21	6	160,010	157,102	716,983	26,555	
22	7	165,915	162,954	879,937	32,590	

Determine the Sediment Cleanout Interval:

V_C (cf) = 18 * T * $A^{0.84}$

V_C (cf) = Cleanout Volume

T (days) = Cleanout Interval

A (acres) = Drainage Area

34 CY/acre = 118,422 cf

Set Sediment Storage Elevation Z_{sed} (ft) = 1.5

Sediment Volume corresponding to the Sediment Storage Elevation V_S(cf) = 129,448

Clean Out Interval (T), days = 121 or as needed

Conclusion

Pond to have permanent pool @ elevation 20 with a 2' berm around the basin. Spillway to route a 25 year storm.

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E

Attachment E – Erosion and Sediment Control Checklist

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CHECKLIST

FOR EROSION AND SEDIMENT CONTROL PLANS

____ Minimum Standards - All applicable Minimum Standards must be addressed.

NARRATIVE

✓ Project description - Briefly describes the nature and purpose of the land-disturbing activity, and the area (acres) to be disturbed.

✓ Existing site conditions - A description of the existing topography, vegetation and drainage.

✓ Adjacent areas - A description of neighboring areas such as streams, lakes, residential areas, roads, etc., which might be affected by the land disturbance.

✓ Off-site areas - Describe any off-site land-disturbing activities that will occur (including borrow sites, waste or surplus areas, etc.). Will any other areas be disturbed? No

✓ Soils - A brief description of the soils on the site giving such information as soil name, mapping unit, erodibility, permeability, depth, texture and soil structure.

N/A Critical areas - A description of areas on the site which have potentially serious erosion problems (e.g., steep slopes, channels, wet weather/ underground springs, etc.).

✓ Erosion and sediment control measures - A description of the methods which will be used to control erosion and sedimentation on the site. (Controls should satisfy minimum standards in Chapter 3.)

✓ Permanent stabilization - A brief description, including specifications, of how the site will be stabilized after construction is completed.

✓ Stormwater runoff considerations - Will the development site cause an increase in peak runoff rates? Will the increase in runoff cause flooding or channel degradation downstream? Describe the strategy to control stormwater runoff.

✓ Calculations - Detailed calculations for the design of temporary sediment basins, permanent stormwater detention basins, diversions, channels, etc. Include calculations for pre- and post-development runoff.

SITE PLAN

✓ Vicinity map - A small map locating the site in relation to the surrounding area. Include any landmarks which might assist in locating the site.

✓ Indicate north - The direction of north in relation to the site.

✓ Limits of clearing and grading - Areas which are to be cleared and graded.

✓ Existing contours - The existing contours of the site.

✓ Final contours - Changes to the existing contours, including final drainage patterns.

✓ Existing vegetation - The existing tree lines, grassed areas, or unique vegetation.

N/A Soils - The boundaries of different soil types.

FLAT/SWAMP N/A Existing drainage patterns - The dividing lines and the direction of flow for the different drainage areas. Include the size (acreage) of each drainage area.

N/A Critical erosion areas - Areas with potentially serious erosion problems. (See Chapter 6 for criteria.)

✓ Site Development - Show all improvements such as buildings, parking lots, access roads, utility construction, etc.

✓ Location of practices - The locations of erosion and sediment control and stormwater management practices used on the site. Use the standard symbols and abbreviations in Chapter 3 of the E&S Handbook.

N/A Off-site areas - Identify any off-site land-disturbing activities (e.g., borrow sites, waste areas, etc.). Show location of erosion controls. (Is there sufficient information to assure adequate protection and stabilization?)

✓ Detail drawings - Any structural practices used that are not referenced to the E&S Handbook or local handbooks should be explained and illustrated with detail drawings.

✓ Maintenance - A schedule of regular inspections and repair of erosion and sediment control structures should be set forth.

Figures

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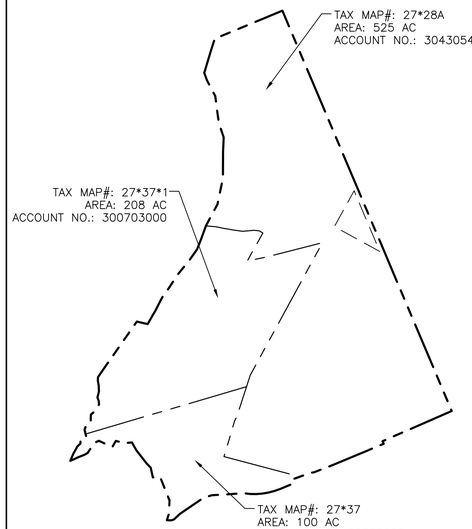
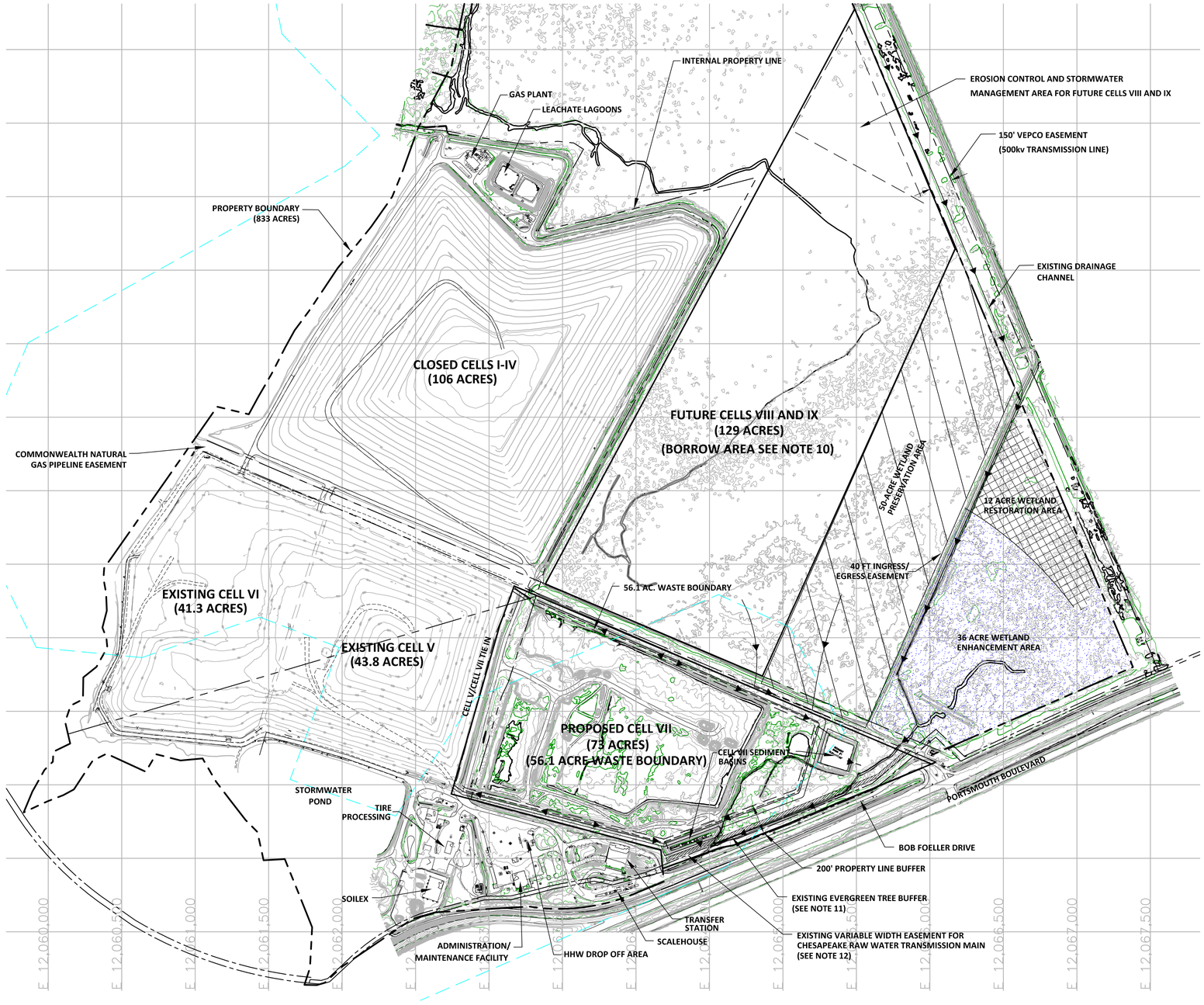


TAX MAP KEY



- PROPOSED DRAINAGE CHANNEL
- EXISTING DRAINAGE CHANNEL
- CHESAPEAKE BAY PRESERVATION AREA
- STREAMS
- PROPERTY LINE
- INTERNAL PROPERTY LINE
- FACILITY BOUNDARY (APPROXIMATE)
- EASEMENT
- WETLAND PRESERVATION AREA
- WETLAND RESTORATION AREA
- WETLAND ENHANCMENT AREA

N

NOTES:

1. EXISTING TOPOGRAPHY WITHIN TAX MAP# 27*28A SUPPLIED BY HOGGARD–EURE ASSOCIATES BASED ON AERIAL PHOTOGRAPHY DATED MARCH 22, 2016. BASE PLAN AND TOPOGRAPHY OF AREAS OUTSIDE TAX MAP# 27*28A COMPILED FROM AERIAL AND FIELD SURVEYS FROM 2005 – 2015.
2. ELEVATIONS REFER TO NGS MEAN SEA LEVEL HORIZONTAL CONTROL BASED UPON VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 1983.
3. PROPERTY LINE BOUNDARY FROM VANASSE HANGEN BRUSTLIN DATED FEBRUARY 29, 2000.
4. WETLAND PRESERVATION, RESTORATION AND ENHANCEMENT AREAS FROM THE US ARMY CORP OF ENGINEERS, SECTION 404 WETLAND PERMIT (88–0707–12) ISSUED NOVEMBER 30, 2002 AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, SECTION 401 WETLAND PERMIT (88–0707) ISSUED JUNE 3, 2002, FOR THE PROPOSED 12 ACRES OF WETLAND DISTURBANCE REQUIRED FOR THE CELL VII EXPANSION OF THE REGIONAL LANDFILL. PERMIT APPLICATIONS WERE PREPARED BY TELLUS ENVIRONMENTAL ASSOCIATES, INC. AND DAVIS ENVIRONMENTAL CONSULTANTS, INC..
5. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 56.1 ACRE AREA DEPICTED IN THIS DRAWING.
6. PROPOSED CELL VII AREA WILL BE UTILIZED AS A SOIL STOCKPILE AREA OR BORROW SOURCE PRIOR TO CONSTRUCTION AND OPERATION OF CELL VII.
7. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
8. APPROVAL FOR THE CONSTRUCTION AND OPERATION OF THE CELL VII EXPANSION WAS GRANTED BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY WITH THE ISSUANCE OF THE PERMIT AMENDMENT TO PERMIT #417, ON JUNE 8, 2011. CONSTRUCTION START DATE FOR CELL VII IS NOT YET DETERMINED AND WILL DEPEND ON THE REMAINING LIFE OF EXISTING CELL VI, WHICH IS ANTICIPATED TO REMAIN OPERATIONAL THROUGH AT LEAST 2024 AND MAY BE AS LONG AS THROUGH 2040.
9. SOIL DISTURBANCE WITHIN CELL VII AREA BORROW OPERATIONS IS BEING COMPLETED IN ACCORDANCE WITH EROSION AND SEDIMENT CONTROL PERMIT ISSUED BY THE CITY OF SUFFOLK (ESC–2009–00002), MARCH 26, 2009.
10. DISTURBANCE OF SOILS AND WETLANDS WITHIN FUTURE CELLS VIII AND IX 129 ACRE AREA WILL REQUIRE 404 AND 401 WETLAND PERMITS THROUGH US ARMY CORP OF ENGINEERS AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, AND EROSION AND SEDIMENT CONTROL PERMIT THROUGH THE CITY OF SUFFOLK. THE FUTURE CELL VIII AND IX AREA IS PLANNED FOR USE AS A SAND OR GRAVEL EXTRACTION (SOIL BORROW) AREA TO SUPPORT LANDFILL CONSTRUCTION AND OPERATION, AND MAY BE UTILIZED AS A VEGETATIVE WASTE COMPOST SYSTEM AREA, SUBJECT TO STATE AND LOCAL PERMITTING. THE 129 ACRE DEVELOPMENT AREA INCLUDES ANCILLARY FACILITIES INCLUDING PERIMETER BERMS, ACCESS ROADS, AND STORMWATER AND LEACHATE MANAGEMENT AREAS.
11. EXISTING VARIABLE WIDTH EVERGREEN TREE BUFFER (TYP 25' WIDTH) TO BE SUPPLEMENTED WITH LOBLOLLY PINE SEEDLINGS TO RE–ESTABLISH AND ENHANCE VISUAL BUFFER WEST OF STREAM CROSSING NEAR SEDIMENT BASIN #2.
12. EXISTING VARIABLE WIDTH EASEMENT FOR CITY OF CHESAPEAKE RAW WATER TRANSMISSION MAIN (TYP 40' WIDTH). LOCATIONS OBTAINED FROM CITY OF CHESAPEAKE RAW WATER FACILITIES, RED TOP TO LAKE GASTON WATER TREATMENT PLANT RAW WATER TRANSMISSION MAIN DRAWINGS, ISSUED FOR CONSTRUCTION SEPTEMBER 2012, PREPARED BY HDR ENGINEERING, INC.

HDR Engineering, Inc.
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Raleigh, NC 27601
919.232.6600

ISSUE	DATE	DESCRIPTION
-	-	-

PROJECT MANAGER	J. MURRAY, P.E.
PROJECT ENGINEER	T. PREDDY, E.I.
DRAWN BY	T. PREDDY, E.I.
PROJECT NUMBER	107091–279011–018

SPSA

Southeastern Public Service Authority

Public Facilities Report

SUFFOLK VIRGINIA

SITE PLAN

0 1" 2"

FILENAME Figure 1.DWG
SCALE 1"=400'

SHEET
Figure 1

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N

NOTES:

1. SOIL MAP COMPILED ON 1970 AERIAL PHOTOGRAPHY BY THE U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND COOPERATING AGENCIES. MAPS OBTAINED FROM THE CITY OF SUFFOLK VIRGINIA SOIL SURVEY, JUNE, 1981.
2. PROPERTY BOUNDARY SHOWN FOR 833 ACRES ON SOILS MAP IS APPROXIMATE. SPSA PROPERTY CONSISTS OF THREE PARCELS TAX MAP/LOTS 27*37*1, 27*37, AND 27*28A.
3. A TOTAL OF 440.34 AC PORTION OF LOT 27*28A OF AGRICULTURAL (A) ZONED IS PROPOSED TO BE REZONED TO HEAVY MANUFACTURING (M-2).
4. IMERVIOUS SURFACES SHOWN ARE COMPRISED OF PAVED ROADWAYS AT FACILITY ENTRANCE AND TRANSFER STATION AND PARKING AND STAGING AREAS FOR FACILITY OPERATIONS AND 30-WIDE GRAVEL ROADWAYS AROUND BOUNDARIES OF EXISTING AND PROPOSED LANDFILL CELLS.

LEGEND:

- PROPERTY LINE
- FACILITY BOUNDARY
- INTERNAL PROPERTY LINE
- PROPOSED AREA TO BE REZONED
- WETLAND PRESERVATION AREA
- WETLAND RESTORATION AREA
- WETLAND ENHANCEMENT AREA
- IMPERVIOUS SURFACE AREA

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ISSUE	DATE	DESCRIPTION
-	-	-

PROJECT MANAGER	J. MURRAY, P.E.
PROJECT ENGINEER	T. PREDDY, E.I.
DRAWN BY	T. PREDDY, E.I.
PROJECT NUMBER	107091-279011-018

SPSA

SUFFOLK VIRGINIA

Southeastern Public Service Authority
Public Facilities Report

IMPERVIOUS SURFACE DELINEATION

0 1" 2"

FILENAME 00C-01.dwg
SCALE 1"=600'

SHEET
FIGURE 2

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