

APPENDIX IV
STORMWATER MANAGEMENT PLAN
NORTHERN SANDS
TOWN OF HOWARD, CHIPPEWA COUNTY, WISCONSIN

JANUARY 30, 2015

Nicole K. Hodkiewicz

1-30-15



**COOPER
ENGINEERING**

2600 College Drive, P.O. Box 230
Rice Lake, WI 54868-0230
Phone: 715-234-7008
nhodkiewicz@cooperengineering.net
CEC Project No. 15365006

TABLE OF CONTENTS

Storm Water Management Plan Summary	1
Assumptions.....	1
Modeling Summary (HydroCAD Output)	2
Design Theory.....	3
Internally Drained Condition	4
Monitoring and Maintenance	4

Exhibits

Exhibit 1 – HydroCAD Output

Exhibit 2 – Figures and Details

STORM WATER MANAGEMENT PLAN SUMMARY

This storm water management plan was developed to provide a more comprehensive design for the beginning two phases of mining (cell 1a and cell 1b) and the processing and transload site than what would generally be included in a reclamation plan. It was devised based on past experiences and concerns of the Chippewa County Land Conservation and Forest Management Department related to non-metallic mining. The goal of the design specifically attempts to reduce the discharge of suspended solids and provide infiltration opportunities.

The design of the stormwater management facilities was developed in accordance with NR 151, Runoff Management, for peak discharge and protective area requirements, meaning ponds will be located 50 feet from wetlands (Figure 11 of the reclamation plan shows a conceptual representation of a pond located for the processing and transload facility that is not an actual location, but simply showing that a stormwater facility will serve that area), DNR Conservation Practice Standards, and engineering judgment. At this time, total suspended solids (TSS) and infiltration requirements were not modeled. When a Wisconsin Pollutant Discharge Elimination system (WPDES) general permit is applied for, detailed modeling for TSS removal and infiltration will be completed, designed for, and submitted.

In addition, at that time, the HydroCAD modeling provided here will be revisited and verified based on a detailed mining plan. Revisions will be made as required.

ASSUMPTIONS

Infiltration rates were based on the DNR Conservation Practice Standards Guideline, Site Evaluation for Stormwater Infiltration 1002, for loamy sand at 1.63 inches per hour. Infiltration was applied to the infiltration basins, but not to wet ponds in the modeling.

Runoff curve numbers (RCN) for land use were derived based on the hydrologic soil types.

Pre-development runoff was generated using RCNs allowed in NR 151 and time of concentration assumptions for each area analyzed.

Mining stage RCNs were selected for a fallow, bare soil condition based on the hydrologic soil types.

As a conservative approach, and one made without a detailed mining plan, it was assumed that the entire 1a cell will be opened at once and thus be susceptible to runoff. The same assumption was made for the entire 1b cell. For the processing and transload facility, disturbed areas



assumed were limited to the rail, plants and stockpile areas. The remainder of that site was assumed and planned to be hay.

No off site flow was accounted for in the modeling as diversions of offsite runoff are planned to be used.

MODELING SUMMARY (HYDROCAD OUTPUT)

The tables below represent HydroCAD modeling output based on conditions assumed above as input in the model. Once detailed mine plans are developed and when applying for a permit to mine, the HydroCAD model will be revisited, modeling parameters verified, and adjustments made as necessary to meet State and County regulations.

Table 1 Mine Cell 1a

	Area (AC)	Time of Concentration (Min)	Q 1-year (CFS)	Q 2-year (CFS)	Q 10-year (CFS)	Q 100-year (CFS)
Existing Condition	25	38.9	4.95	8.28	22.74	57.10
Proposed Condition With Wet Pond	25	20	0.9	1.15	4.56	66.42

Table 2 Mine Cell 1b

	Area (AC)	Time of Concentration (MIN)	Q 1-year (CFS)	Q 2-year (CFS)	Q 10-year (CFS)	Q 100-year (CFS)
Existing Condition	28	30.7	9.41	14.58	35.55	82.92
Proposed Condition With Wet Pond	28	22	3.17	9.61	46.56	116.96

Table 3 Infiltration Basin for Mine Cells 1a and 1b

	Tributary Area (AC)	Q 1-year (CFS)	Q 2-year (CFS)	Q 10-year (CFS)	Q 100-year (CFS)
Discharge from Infiltration Basin (Excluding Infiltration)	53	0	0	1.09	48.98
Infiltration	-	1.97	1.97	2.76	3.66



Table 4 Processing and Transload Site

	Area (AC)	Time of Concentration (MIN)	Q 1-year (CFS)	Q 2-year (CFS)	Q 10-year (CFS)	Q 100-year (CFS)
Existing Condition	80	31.3	10.10	19.53	65.44	183.34
Proposed Condition With Wet Pond	80	25	1.13	4.26	51.16	196.98
Discharge from Infiltration Basin (Excluding Infiltration)	80	-	0	0	1.17	58.99
Infiltration			1.81	1.81	2.69	3.62

Table 5 Pond Size Summary

Site	Pond Size at Normal Water Level (AC)	Pond Size at Top of Berm (AC)
Cell 1a Wet Pond	1.5	2.3
Cell 1b Wet Pond	1.6	2.5
Cell 1a and 1b Infiltration Basin	1.2	2.4
Plant and Transload Site Wet Pond	1.3	2.5
Plant and Transload Site Infiltration Basin	1.1	2.5

DESIGN THEORY

The stormwater design system incorporates treatment for peak flow and sediment removal. It also attempts to include Chippewa County's desire to infiltrate, but treat the colloidal nature of the runoff. With that in mind, wet ponds will be placed at each of the lowest parts of mine cell 1a and mine cell 1b. These wet ponds will then flow into an infiltration basin located just downstream of the wet pond for mine cell 1a. Sediment will settle in these wet ponds and cleaner water will continue on to the infiltration basin.

The wet ponds are designed to release flow at a rate smaller than the existing condition runoff in the one- and two-year, 24-hour storm events, but as the storm events increase, this is not always the case as shown in Tables 1, 2, and 4. However, with the inclusion of the infiltration basins, the release rate for the mine cells and the processing and transload facility is lower than the existing condition runoff.



In fact, for both the mine cells and the processing and rail transload facility, no flow is released during the 1-year and 2-year, 24-hour storm events, except through infiltration. At the 10-year, 24-hour event and above, runoff is significantly reduced to well below existing condition.

Off site runoff will be diverted from the storm water treatment facilities through vegetated or rock-lined diversion channels.

INTERNALLY DRAINED CONDITION

If the mine cells are able to become internally drained, infiltration within the cells will be encouraged. However, prior to becoming internally drained and once land disturbing activities begin, the cells will be susceptible to runoff. The stormwater management facilities, as detailed here, will be in place.

MONITORING AND MAINTENANCE

Monitoring and maintenance will consist of the following activities:

1. Perform weekly inspections of storm water facilities and implemented BMPs.
2. Inspect storm water facilities and BMPs within 24 hours after a precipitation event of 0.5 inches or greater that results in runoff.
3. Prepare weekly written reports of all inspections including:
 - date, time, and place
 - name of individual who performed the inspection
 - assessment of the condition of the storm water facilities and BMPs
 - description of any implementation and maintenance performed
 - description of the present phase of construction
4. Determine the need for storm water facility and BMP maintenance.
5. Execute maintenance as needed in a timely manner.



EXHIBIT 1

HYDROCAD OUTPUT

1a 1b and plant site modeling

Prepared by Cooper Engineering

HydroCAD® 10.00-13 s/n 00632 © 2014 HydroCAD Software Solutions LLC

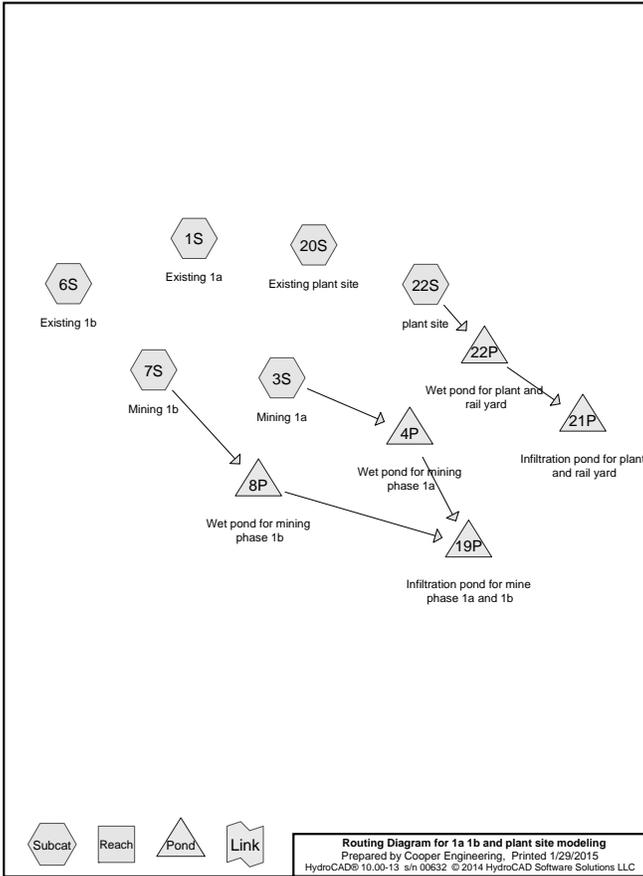
Northern Sands

Printed 1/29/2015

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
28.000	55	A soils crop (20S)
45.000	69	B soils crop (20S)
57.100	61	B soils hay (22S)
7.600	78	C soils crop (6S, 20S)
3.000	70	C soils woods (6S)
6.300	83	D soils crop (6S, 20S)
1.500	77	D soils woods (6S)
0.500	77	Fallow, bare soil, HSG A (3S)
41.100	86	Fallow, bare soil, HSG B (3S, 7S)
7.600	91	Fallow, bare soil, HSG C (7S)
3.800	94	Fallow, bare soil, HSG D (7S)
0.500	55	Legumes, contoured, Good, HSG A (1S)
41.100	69	Small grain, C&T + CR, Good, HSG B (1S, 6S)
4.100	86	bare soil, HSG B (22S)
1.800	98	plant and piles (22S)
17.000	84	rail (22S)
266.000	71	TOTAL AREA



Routing Diagram for 1a 1b and plant site modeling
Prepared by Cooper Engineering, Printed 1/29/2015
HydroCAD® 10.00-13 s/n 00632 © 2014 HydroCAD Software Solutions LLC

1a 1b and plant site modeling

Prepared by Cooper Engineering

HydroCAD® 10.00-13 s/n 00632 © 2014 HydroCAD Software Solutions LLC

Northern Sands

Printed 1/29/2015

Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.000	HSG A	1S, 3S
86.300	HSG B	1S, 3S, 6S, 7S, 22S
7.600	HSG C	7S
3.800	HSG D	7S
167.300	Other	6S, 20S, 22S
266.000		TOTAL AREA

1a 1b and plant site modeling

Prepared by Cooper Engineering

HydroCAD® 10.00-13 s/n 00632 © 2014 HydroCAD Software Solutions LLC

Northern Sands

Printed 1/29/2015

Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	28.000	28.000	A soils crop	20S
0.000	0.000	0.000	0.000	45.000	45.000	B soils crop	20S
0.000	0.000	0.000	0.000	57.100	57.100	B soils hay	22S
0.000	0.000	0.000	0.000	7.600	7.600	C soils crop	6S, 20S
0.000	0.000	0.000	0.000	3.000	3.000	C soils woods	6S
0.000	0.000	0.000	0.000	6.300	6.300	D soils crop	6S, 20S
0.000	0.000	0.000	0.000	1.500	1.500	D soils woods	6S
0.500	41.100	7.600	3.800	0.000	53.000	Fallow, bare soil	3S, 7S
0.500	0.000	0.000	0.000	0.000	0.500	Legumes, contoured, Good	1S
0.000	41.100	0.000	0.000	0.000	41.100	Small grain, C&T + CR, Good	1S, 6S
0.000	4.100	0.000	0.000	0.000	4.100	bare soil	22S
0.000	0.000	0.000	0.000	1.800	1.800	plant and piles	22S
0.000	0.000	0.000	0.000	17.000	17.000	rail	22S
1.000	86.300	7.600	3.800	167.300	266.000	TOTAL AREA	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

- Subcatchment 1S: Existing 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=0.39"
 Flow Length=1,500' Tc=38.9 min CN=69 Runoff=4.95 cfs 0.820 af
- Subcatchment 3S: Mining 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=1.19"
 Tc=20.0 min CN=86 Runoff=32.91 cfs 2.489 af
- Subcatchment 6S: Existing 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=0.50"
 Flow Length=1,400' Tc=30.7 min CN=72 Runoff=9.41 cfs 1.161 af
- Subcatchment 7S: Mining 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=1.33"
 Tc=22.0 min CN=88 Runoff=39.07 cfs 3.104 af
- Subcatchment 20S: Existing plant site** Runoff Area=80.000 ac 0.00% Impervious Runoff Depth=0.28"
 Flow Length=4,600' Tc=31.3 min CN=65 Runoff=10.10 cfs 1.836 af
- Subcatchment 22S: plant site** Runoff Area=80.000 ac 2.25% Impervious Runoff Depth=0.36"
 Tc=25.0 min CN=68 Runoff=18.96 cfs 2.414 af
- Pond 4P: Wet pond for mining phase 1a** Peak Elev=1,059.09' Storage=1.748 af Inflow=32.91 cfs 2.489 af
 Outflow=0.90 cfs 1.800 af
- Pond 8P: Wet pond for mining phase 1b** Peak Elev=1,078.06' Storage=1.865 af Inflow=39.07 cfs 3.104 af
 Outflow=3.17 cfs 2.473 af
- Pond 19P: Infiltration pond for mine phase** Peak Elev=1,057.00' Storage=1.800 af Inflow=3.93 cfs 4.272 af
 Discarded=1.97 cfs 5.949 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.97 cfs 5.949 af
- Pond 21P: Infiltration pond for plant and** Peak Elev=1,015.00' Storage=1.600 af Inflow=1.13 cfs 1.928 af
 Discarded=1.81 cfs 3.524 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.81 cfs 3.524 af
- Pond 22P: Wet pond for plant and rail** Peak Elev=1,022.98' Storage=1.458 af Inflow=18.96 cfs 2.414 af
 Outflow=1.13 cfs 1.928 af

Total Runoff Area = 266.000 ac Runoff Volume = 11.824 af Average Runoff Depth = 0.53"
 99.32% Pervious = 264.200 ac 0.68% Impervious = 1.800 ac

Summary for Subcatchment 1S: Existing 1a

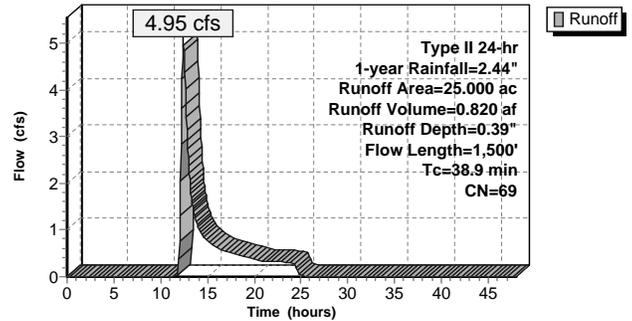
Runoff = 4.95 cfs @ 12.44 hrs, Volume= 0.820 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
24.500	69	Small grain, C&T + CR, Good, HSG B
0.500	55	Legumes, contoured, Good, HSG A
25.000	69	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	300	0.0200	0.18		Sheet Flow, first 300' Cultivated: Residue=20% n= 0.170 P2= 2.83"
7.3	500	0.0160	1.14		Shallow Concentrated Flow, next 500 feet Cultivated Straight Rows Kv= 9.0 fps
3.9	700	0.0170	3.02	96.59	Channel Flow, channel to the end Area= 32.0 sf Perim= 23.0' r= 1.39' n= 0.080 Earth, long dense weeds
38.9	1,500	Total			

Subcatchment 1S: Existing 1a Hydrograph



Summary for Subcatchment 3S: Mining 1a

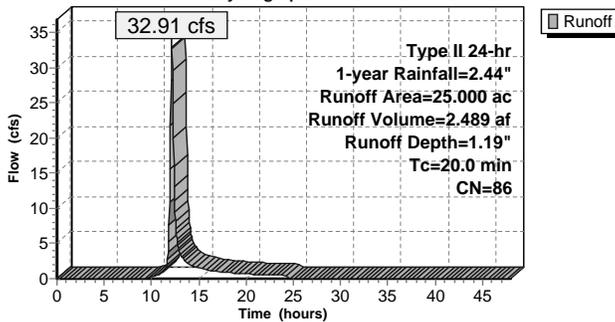
Runoff = 32.91 cfs @ 12.13 hrs, Volume= 2.489 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
24.500	86	Fallow, bare soil, HSG B
0.500	77	Fallow, bare soil, HSG A
25.000	86	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry, Assumed

Subcatchment 3S: Mining 1a Hydrograph



Summary for Subcatchment 6S: Existing 1b

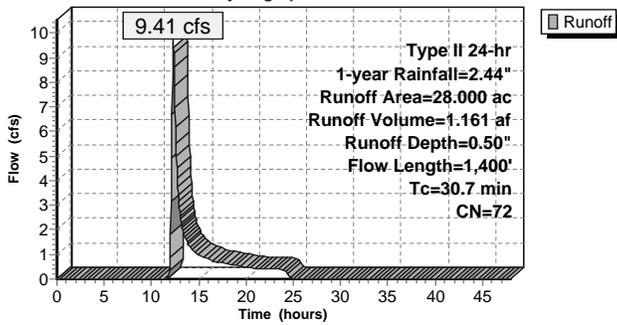
Runoff = 9.41 cfs @ 12.30 hrs, Volume= 1.161 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
16.600	69	Small grain, C&T + CR, Good, HSG B
* 3.000	70	C soils woods
* 4.600	78	C soils crop
* 1.500	77	D soils woods
* 2.300	83	D soils crop
28.000	72	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	300	0.0370	0.23		Sheet Flow, first 300' Cultivated: Residue=20% n= 0.170 P2= 2.83"
6.6	600	0.0280	1.51		Shallow Concentrated Flow, Next 600 feet Cultivated Straight Rows Kv= 9.0 fps
2.4	500	0.0200	3.53	197.49	Channel Flow, assumed channelized to end Area= 56.0 sf Perim= 36.0' r= 1.56' n= 0.080 Earth, long dense weeds
30.7	1,400	Total			

Subcatchment 6S: Existing 1b
 Hydrograph



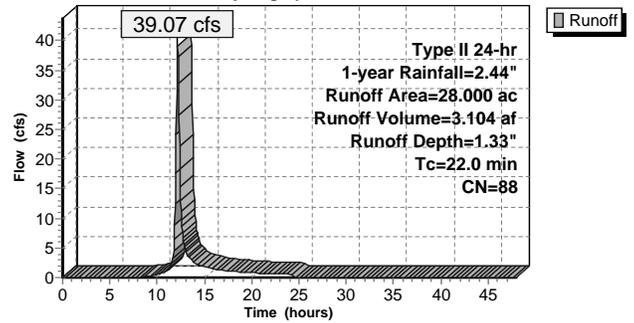
Summary for Subcatchment 7S: Mining 1b

Runoff = 39.07 cfs @ 12.15 hrs, Volume= 3.104 af, Depth= 1.33"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
16.600	86	Fallow, bare soil, HSG B
7.600	91	Fallow, bare soil, HSG C
3.800	94	Fallow, bare soil, HSG D
28.000	88	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0					Direct Entry, Assumed

Subcatchment 7S: Mining 1b
 Hydrograph



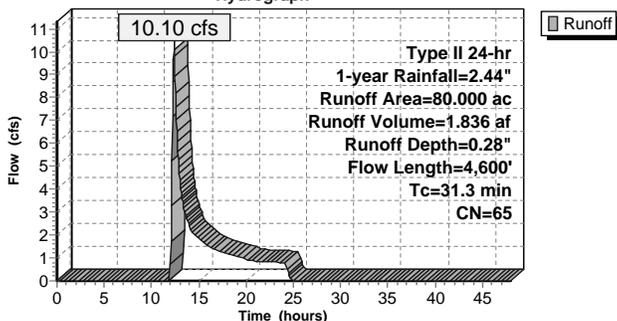
Summary for Subcatchment 20S: Existing plant site

Runoff = 10.10 cfs @ 12.37 hrs, Volume= 1.836 af, Depth= 0.28"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
* 28.000	55	A soils crop
* 45.000	69	B soils crop
* 3.000	78	C soils crop
* 4.000	83	D soils crop
80.000	65	Weighted Average
80.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	200	0.0250	0.20		Sheet Flow, first 200 feet Grass: Short n= 0.150 P2= 2.83"
2.6	300	0.0170	1.96		Shallow Concentrated Flow, Next 300 feet Grassed Waterway Kv= 15.0 fps
12.1	4,100	0.0090	5.64	129.70	Channel Flow, to end Area= 23.0 sf Perim= 23.0' r= 1.00' n= 0.025 Earth, grassed & winding
31.3	4,600	Total			

Subcatchment 20S: Existing plant site
 Hydrograph



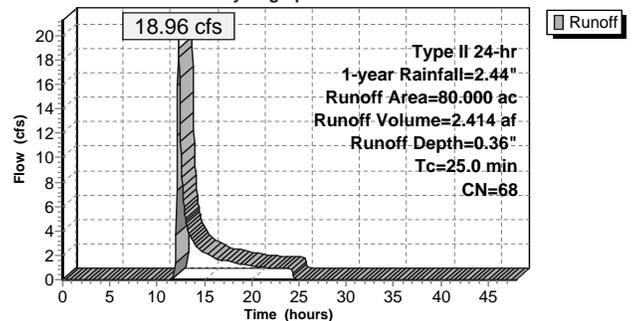
Summary for Subcatchment 22S: plant site

Runoff = 18.96 cfs @ 12.25 hrs, Volume= 2.414 af, Depth= 0.36"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-year Rainfall=2.44"

Area (ac)	CN	Description
* 17.000	84	rail
* 1.800	98	plant and piles
* 4.100	86	bare soil, HSG B
* 57.100	61	B soils hay
80.000	68	Weighted Average
78.200		97.75% Pervious Area
1.800		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.0					Direct Entry, assumed

Subcatchment 22S: plant site
 Hydrograph



Summary for Pond 4P: Wet pond for mining phase 1a

Inflow Area = 25,000 ac, 0.00% Impervious, Inflow Depth = 1.19" for 1-year event
 Inflow = 32.91 cfs @ 12.13 hrs, Volume= 2,489 af
 Outflow = 0.90 cfs @ 18.08 hrs, Volume= 1,800 af, Atten= 97%, Lag= 356.9 min
 Primary = 0.90 cfs @ 18.08 hrs, Volume= 1,800 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,059.09' @ 18.08 hrs Surf.Area= 1.726 ac Storage= 1,748 af

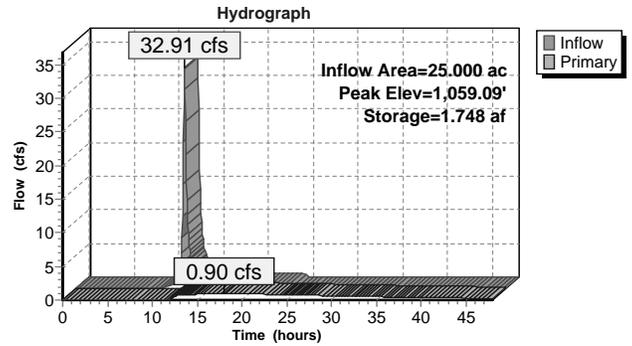
Plug-Flow detention time= 845.9 min calculated for 1,800 af (72% of inflow)
 Center-of-Mass det. time= 744.7 min (1,589.4 - 844.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,058.00'	5,600 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,058.00	1.500	0.000	0.000
1,059.00	1.700	1.800	1.600
1,060.00	2.000	1.850	3,450
1,061.00	2.300	2.150	5,600

Device	Routing	Invert	Outlet Devices
#1	Primary	1,058.00'	8.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,058.00' / 1,058.00' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Primary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.90 cfs @ 18.08 hrs HW=1,059.09' (Free Discharge)
 1=Culvert (Barrel Controls 0.90 cfs @ 2.58 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Wet pond for mining phase 1a



Summary for Pond 8P: Wet pond for mining phase 1b

Inflow Area = 28,000 ac, 0.00% Impervious, Inflow Depth = 1.33" for 1-year event
 Inflow = 39.07 cfs @ 12.15 hrs, Volume= 3,104 af
 Outflow = 3.17 cfs @ 13.47 hrs, Volume= 2,473 af, Atten= 92%, Lag= 79.2 min
 Primary = 3.17 cfs @ 13.47 hrs, Volume= 2,473 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,078.06' @ 13.47 hrs Surf.Area= 1.918 ac Storage= 1,865 af

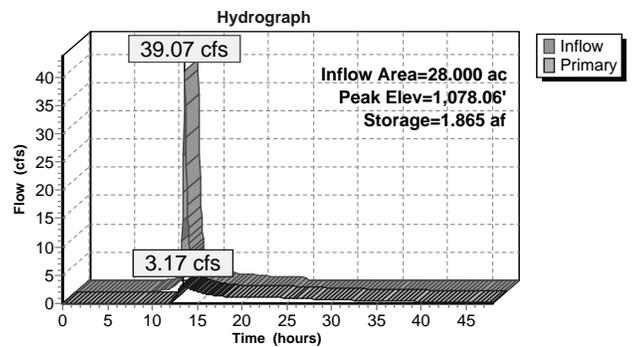
Plug-Flow detention time= 642.2 min calculated for 2,470 af (80% of inflow)
 Center-of-Mass det. time= 559.3 min (1,397.7 - 838.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,077.00'	6,150 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,077.00	1.600	0.000	0.000
1,078.00	1.900	1.750	1,750
1,079.00	2.200	2.050	3,800
1,080.00	2.500	2.350	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	1,077.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,077.00' / 1,077.00' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,078.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=3.13 cfs @ 13.47 hrs HW=1,078.06' (Free Discharge)
 1=Culvert (Barrel Controls 1.23 cfs @ 2.29 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 1.90 cfs @ 0.63 fps)

Pond 8P: Wet pond for mining phase 1b



Summary for Pond 19P: Infiltration pond for mine phase 1a and 1b

Inflow Area = 53.000 ac, 0.00% Impervious, Inflow Depth > 0.97" for 1-year event
 Inflow = 3.93 cfs @ 13.50 hrs, Volume= 4.272 af
 Outflow = 1.97 cfs @ 0.00 hrs, Volume= 5.949 af, Atten= 50%, Lag= 0.0 min
 Discarded = 1.97 cfs @ 0.00 hrs, Volume= 5.949 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,057.00' Surf.Area= 1.200 ac Storage= 1.800 af
 Peak Elev= 1,057.00' @ 0.00 hrs Surf.Area= 1.200 ac Storage= 1.800 af

Plug-Flow detention time= 385.9 min calculated for 4.149 af (97% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,055.00'	9.000 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,055.00	0.600	0.000	0.000
1,056.00	0.900	0.750	0.750
1,057.00	1.200	1.050	1.800
1,058.00	1.500	1.350	3.150
1,059.00	1.800	1.650	4.800
1,060.00	2.100	1.950	6.750
1,061.00	2.400	2.250	9.000

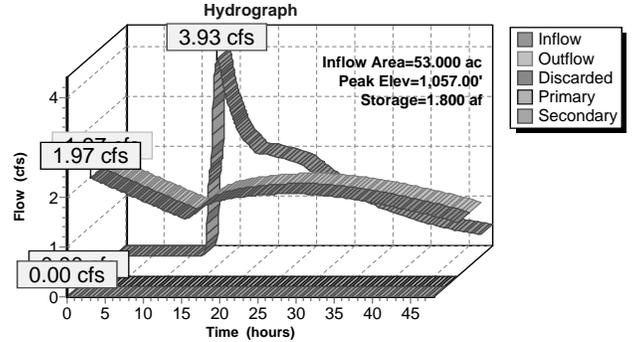
Device	Routing	Invert	Outlet Devices
#1	Primary	1,057.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,057.00' / 1,056.80' S= 0.0050' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,057.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,059.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,055.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=1.97 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 1.97 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 1=Culvert (Controls 0.00 cfs)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration pond for mine phase 1a and 1b



Summary for Pond 21P: Infiltration pond for plant and rail yard

Inflow Area = 80.000 ac, 2.25% Impervious, Inflow Depth > 0.29" for 1-year event
 Inflow = 1.13 cfs @ 19.81 hrs, Volume= 1.928 af
 Outflow = 1.81 cfs @ 0.00 hrs, Volume= 3.524 af, Atten= 0%, Lag= 0.0 min
 Discarded = 1.81 cfs @ 0.00 hrs, Volume= 3.524 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,015.00' Surf.Area= 1.100 ac Storage= 1.600 af
 Peak Elev= 1,015.00' @ 0.00 hrs Surf.Area= 1.100 ac Storage= 1.600 af

Plug-Flow detention time= 104.7 min calculated for 1.924 af (100% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,013.00'	10.800 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,013.00	0.500	0.000	0.000
1,014.00	0.800	0.650	0.650
1,015.00	1.100	0.950	1.600
1,016.00	1.400	1.250	2.850
1,017.00	1.700	1.550	4.400
1,018.00	2.000	1.850	6.250
1,019.00	2.300	2.150	8.400
1,020.00	2.500	2.400	10.800

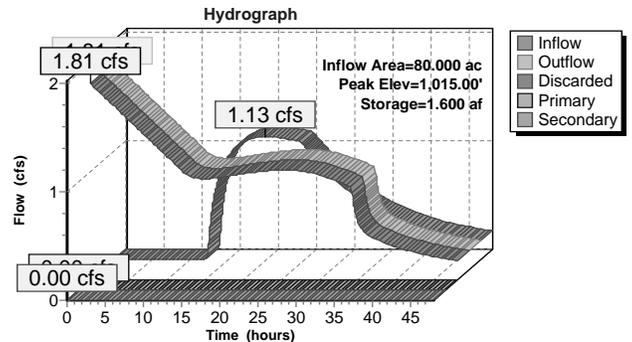
Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,015.00' / 1,015.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,015.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,017.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,018.00'	30.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,013.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=1.81 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 1.81 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 1=Culvert (Controls 0.00 cfs)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 21P: Infiltration pond for plant and rail yard



Summary for Pond 22P: Wet pond for plant and rail yard

Inflow Area = 80.000 ac, 2.25% Impervious, Inflow Depth = 0.36" for 1-year event
 Inflow = 18.96 cfs @ 12.25 hrs, Volume= 2,414 af
 Outflow = 1.13 cfs @ 19.81 hrs, Volume= 1,928 af, Atten= 94%, Lag= 453.9 min
 Primary = 1.13 cfs @ 19.81 hrs, Volume= 1,928 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,022.98' @ 19.81 hrs Surf.Area= 1.690 ac Storage= 1,458 af

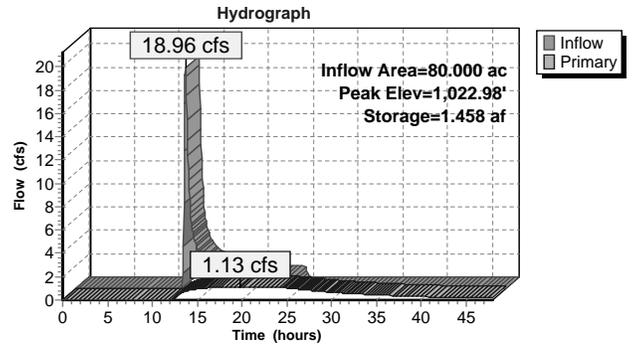
Plug-Flow detention time= 691.7 min calculated for 1,928 af (80% of inflow)
 Center-of-Mass det. time= 601.5 min (1,527.8 - 926.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,022.00'	5,700 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,022.00	1.300	0.000	0.000
1,023.00	1.700	1.500	1.500
1,024.00	2.100	1.900	3,400
1,025.00	2.500	2.300	5,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,022.00' / 1,022.00' S= 0.0000' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,023.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=1.13 cfs @ 19.81 hrs HW=1,022.98' (Free Discharge)
 1=Culvert (Barrel Controls 1.13 cfs @ 2.23 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 22P: Wet pond for plant and rail yard



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

- Subcatchment 1S: Existing 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=0.58"
 Flow Length=1,500' Tc=38.9 min CN=69 Runoff=8.28 cfs 1,210 af
- Subcatchment 3S: Mining 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=1.52"
 Tc=20.0 min CN=86 Runoff=41.93 cfs 3,162 af
- Subcatchment 6S: Existing 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=0.71"
 Flow Length=1,400' Tc=30.7 min CN=72 Runoff=14.58 cfs 1,654 af
- Subcatchment 7S: Mining 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=1.67"
 Tc=22.0 min CN=88 Runoff=48.98 cfs 3,892 af
- Subcatchment 20S: Existing plant site** Runoff Area=80.000 ac 0.00% Impervious Runoff Depth=0.43"
 Flow Length=4,600' Tc=31.3 min CN=65 Runoff=19.53 cfs 2,870 af
- Subcatchment 22S: plant site** Runoff Area=80.000 ac 2.25% Impervious Runoff Depth=0.54"
 Tc=25.0 min CN=68 Runoff=32.71 cfs 3,607 af
- Pond 4P: Wet pond for mining phase 1a** Peak Elev=1,059.35' Storage=2,221 af Inflow=41.93 cfs 3,162 af
 Outflow=1.15 cfs 2,354 af
- Pond 8P: Wet pond for mining phase 1b** Peak Elev=1,078.16' Storage=2,058 af Inflow=48.98 cfs 3,892 af
 Outflow=9.61 cfs 3,248 af
- Pond 19P: Infiltration pond for mine** Peak Elev=1,057.00' Storage=1,800 af Inflow=10.53 cfs 5,602 af
 Discarded=1.97 cfs 6,833 af Primary=0.00 cfs 0,000 af Secondary=0.00 cfs 0,000 af Outflow=1.97 cfs 6,833 af
- Pond 21P: Infiltration pond for plant and** Peak Elev=1,015.00' Storage=1,600 af Inflow=4.26 cfs 3,105 af
 Discarded=1.81 cfs 4,701 af Primary=0.00 cfs 0,000 af Secondary=0.00 cfs 0,000 af Outflow=1.81 cfs 4,701 af
- Pond 22P: Wet pond for plant and rail** Peak Elev=1,023.08' Storage=1,641 af Inflow=32.71 cfs 3,607 af
 Outflow=4.26 cfs 3,105 af

Total Runoff Area = 266.000 ac Runoff Volume = 16,395 af Average Runoff Depth = 0.74"
 99.32% Pervious = 264.200 ac 0.68% Impervious = 1.800 ac

Summary for Subcatchment 1S: Existing 1a

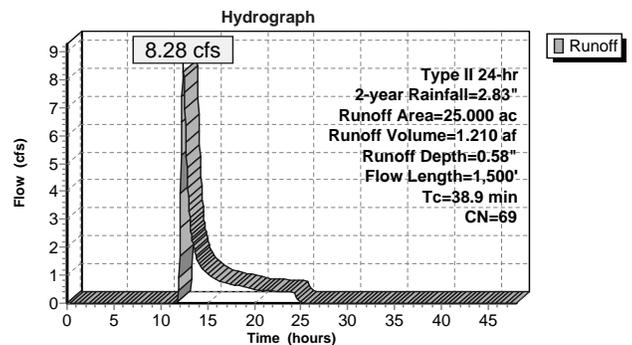
Runoff = 8.28 cfs @ 12.42 hrs, Volume= 1,210 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
24.500	69	Small grain, C&T + CR, Good, HSG B
0.500	55	Legumes, contoured, Good, HSG A
25.000	69	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	300	0.0200	0.18		Sheet Flow, first 300'
7.3	500	0.0160	1.14		Cultivated; Residues=20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, next 500 feet
3.9	700	0.0170	3.02	96.59	Cultivated Straight Rows Kv= 9.0 fps Channel Flow, channel to the end Area= 32.0 sf Perim= 23.0' r= 1.39' n= 0.080 Earth, long dense weeds
38.9	1,500	Total			

Subcatchment 1S: Existing 1a



Summary for Subcatchment 3S: Mining 1a

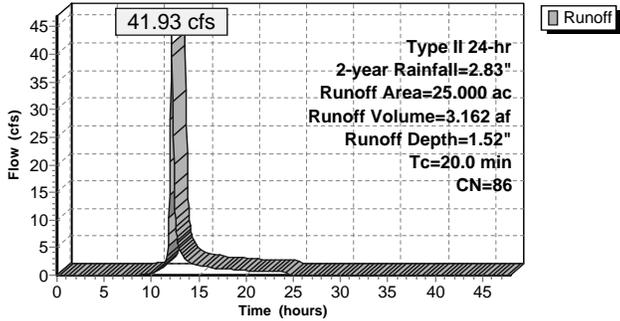
Runoff = 41.93 cfs @ 12.13 hrs, Volume= 3.162 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
24.500	86	Fallow, bare soil, HSG B
0.500	77	Fallow, bare soil, HSG A
25.000	86	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry, Assumed

Subcatchment 3S: Mining 1a Hydrograph



Summary for Subcatchment 6S: Existing 1b

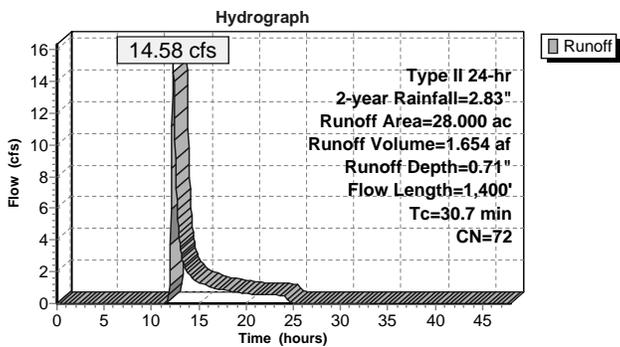
Runoff = 14.58 cfs @ 12.29 hrs, Volume= 1.654 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
16.600	69	Small grain, C&T + CR, Good, HSG B
* 3.000	70	C soils woods
* 4.600	78	C soils crop
* 1.500	77	D soils woods
* 2.300	83	D soils crop
28.000	72	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	300	0.0370	0.23		Sheet Flow, first 300'
6.6	600	0.0280	1.51		Cultivated: Residue>20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, Next 600 feet
2.4	500	0.0200	3.53	197.49	Cultivated Straight Rows Kv= 9.0 fps Channel Flow, assumed channelized to end Area= 56.0 sf Perim= 36.0' r= 1.56' n= 0.080 Earth, long dense weeds
30.7	1,400	Total			

Subcatchment 6S: Existing 1b Hydrograph



Summary for Subcatchment 7S: Mining 1b

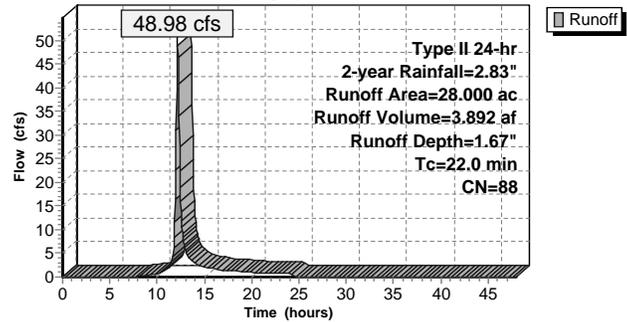
Runoff = 48.98 cfs @ 12.15 hrs, Volume= 3.892 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
16.600	86	Fallow, bare soil, HSG B
7.600	91	Fallow, bare soil, HSG C
3.800	94	Fallow, bare soil, HSG D
28.000	88	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0					Direct Entry, Assumed

Subcatchment 7S: Mining 1b Hydrograph



Summary for Subcatchment 20S: Existing plant site

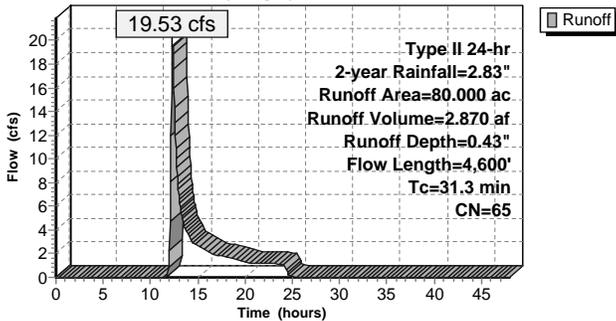
Runoff = 19.53 cfs @ 12.34 hrs, Volume= 2.870 af, Depth= 0.43"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
* 28.000	55	A soils crop
* 45.000	69	B soils crop
* 3.000	78	C soils crop
* 4.000	83	D soils crop
80.000	65	Weighted Average
80.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	200	0.0250	0.20		Sheet Flow, first 200 feet Grass: Short n= 0.150 P2= 2.83"
2.6	300	0.0170	1.96		Shallow Concentrated Flow, Next 300 feet Grassed Waterway Kv= 15.0 fps
12.1	4,100	0.0090	5.64	129.70	Channel Flow, to end Area= 23.0 sf Perim= 23.0' r= 1.00' n= 0.025 Earth, grassed & winding
31.3	4,600	Total			

Subcatchment 20S: Existing plant site

Hydrograph



Summary for Subcatchment 22S: plant site

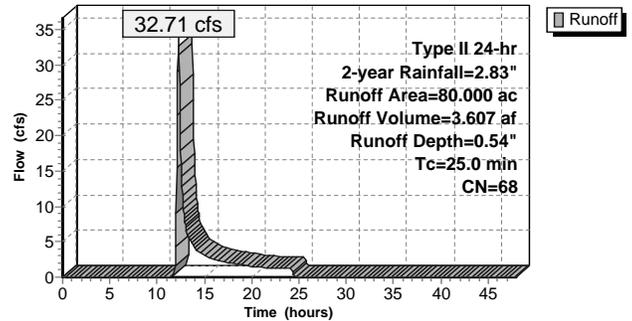
Runoff = 32.71 cfs @ 12.23 hrs, Volume= 3.607 af, Depth= 0.54"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 2-year Rainfall=2.83"

Area (ac)	CN	Description
* 17.000	84	rail
* 1.800	98	plant and piles
* 4.100	86	bare soil, HSG B
* 57.100	61	B soils hay
80.000	68	Weighted Average
78.200		97.75% Pervious Area
1.800		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.0					Direct Entry, assumed

Subcatchment 22S: plant site

Hydrograph



Summary for Pond 4P: Wet pond for mining phase 1a

Inflow Area = 25.000 ac, 0.00% Impervious, Inflow Depth = 1.52" for 2-year event
 Inflow = 41.93 cfs @ 12.13 hrs, Volume= 3.162 af
 Outflow = 1.15 cfs @ 17.66 hrs, Volume= 2.354 af, Atten= 97%, Lag= 331.8 min
 Primary = 1.15 cfs @ 17.66 hrs, Volume= 2.354 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,059.35' @ 17.66 hrs Surf.Area= 1.806 ac Storage= 2.221 af

Plug-Flow detention time= 849.7 min calculated for 2.351 af (74% of inflow)
 Center-of-Mass det. time= 755.1 min (1,593.0 - 837.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,058.00'	5.600 af	Custom Stage Data (Prismatic) Listed below (Recalc)

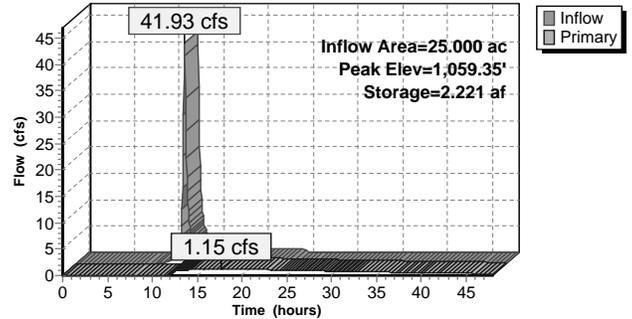
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,058.00	1.500	0.000	0.000
1,059.00	1.700	1.600	1.600
1,060.00	2.000	1.850	3.450
1,061.00	2.300	2.150	5.600

Device	Routing	Invert	Outlet Devices
#1	Primary	1,058.00'	8.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Invert= 1,058.00' / 1,058.00' S= 0.0000 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Primary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=1.15 cfs @ 17.66 hrs HW=1,059.35' (Free Discharge)
 1=Culvert (Barrel Controls 1.15 cfs @ 3.30 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Wet pond for mining phase 1a

Hydrograph



Summary for Pond 8P: Wet pond for mining phase 1b

Inflow Area = 28.000 ac, 0.00% Impervious, Inflow Depth = 1.67" for 2-year event
 Inflow = 48.98 cfs @ 12.15 hrs, Volume= 3.892 af
 Outflow = 9.61 cfs @ 12.69 hrs, Volume= 3.248 af, Atten= 80%, Lag= 32.3 min
 Primary = 9.61 cfs @ 12.69 hrs, Volume= 3.248 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,078.16' @ 12.69 hrs Surf.Area= 1.948 ac Storage= 2.058 af

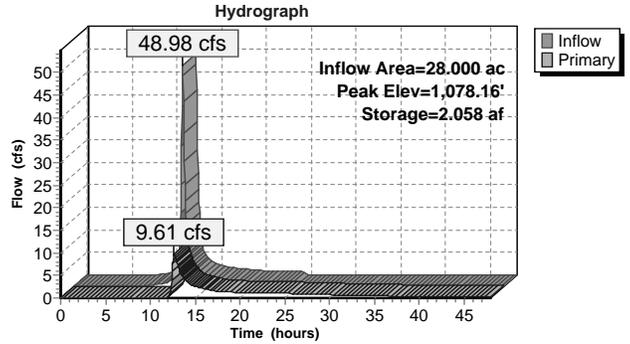
Plug-Flow detention time= 520.4 min calculated for 3.248 af (83% of inflow)
 Center-of-Mass det. time= 446.9 min (1,278.9 - 832.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,077.00'	6,150 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,077.00	1.600	0.000	0.000
1,078.00	1.900	1.750	1.750
1,079.00	2.200	2.050	3.800
1,080.00	2.500	2.350	6.150

Device	Routing	Invert	Outlet Devices
#1	Primary	1,077.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,077.00' / 1,077.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,078.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=9.57 cfs @ 12.69 hrs HW=1,078.16' (Free Discharge)
 1=Culvert (Barrel Controls 1.34 cfs @ 2.45 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 8.23 cfs @ 1.03 fps)

Pond 8P: Wet pond for mining phase 1b



Summary for Pond 19P: Infiltration pond for mine phase 1a and 1b

Inflow Area = 53.000 ac, 0.00% Impervious, Inflow Depth > 1.27" for 2-year event
 Inflow = 10.53 cfs @ 12.69 hrs, Volume= 5.602 af
 Outflow = 1.97 cfs @ 0.00 hrs, Volume= 6.833 af, Atten= 81%, Lag= 0.0 min
 Discarded = 1.97 cfs @ 0.00 hrs, Volume= 6.833 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,057.00' Surf.Area= 1.200 ac Storage= 1.800 af
 Peak Elev= 1,057.00' @ 0.00 hrs Surf.Area= 1.200 ac Storage= 1.800 af

Plug-Flow detention time= 542.0 min calculated for 5.033 af (90% of inflow)
 Center-of-Mass det. time= 34.0 min (1,444.8 - 1,410.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,055.00'	9,000 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,055.00	0.600	0.000	0.000
1,056.00	0.900	0.750	0.750
1,057.00	1.200	1.050	1.800
1,058.00	1.500	1.350	3.150
1,059.00	1.800	1.650	4.800
1,060.00	2.100	1.950	6.750
1,061.00	2.400	2.250	9.000

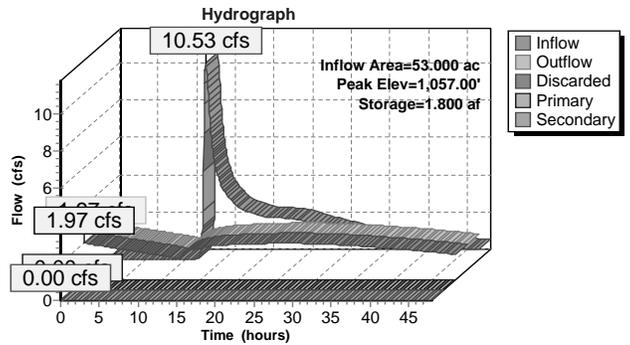
Device	Routing	Invert	Outlet Devices
#1	Primary	1,057.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,057.00' / 1,056.80' S= 0.0050' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,057.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,059.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,055.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=1.97 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 1.97 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 1=Culvert (Controls 0.00 cfs)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration pond for mine phase 1a and 1b



Summary for Pond 21P: Infiltration pond for plant and rail yard

Inflow Area = 80,000 ac, 2.25% Impervious, Inflow Depth > 0.47" for 2-year event
 Inflow = 4.26 cfs @ 13.87 hrs, Volume= 3,105 af
 Outflow = 1.81 cfs @ 0.00 hrs, Volume= 4,701 af, Atten= 58%, Lag= 0.0 min
 Discarded = 1.81 cfs @ 0.00 hrs, Volume= 4,701 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,015.00' Surf.Area= 1,100 ac Storage= 1,600 af
 Peak Elev= 1,015.00' @ 0.00 hrs Surf.Area= 1,100 ac Storage= 1,600 af

Plug-Flow detention time= 346.0 min calculated for 3.098 af (100% of inflow)
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,013.00'	10,800 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,013.00	0.500	0.000	0.000
1,014.00	0.800	0.650	0.650
1,015.00	1.100	0.950	1.600
1,016.00	1.400	1.250	2.850
1,017.00	1.700	1.550	4.400
1,018.00	2.000	1.850	6.250
1,019.00	2.300	2.150	8.400
1,020.00	2.500	2.400	10,800

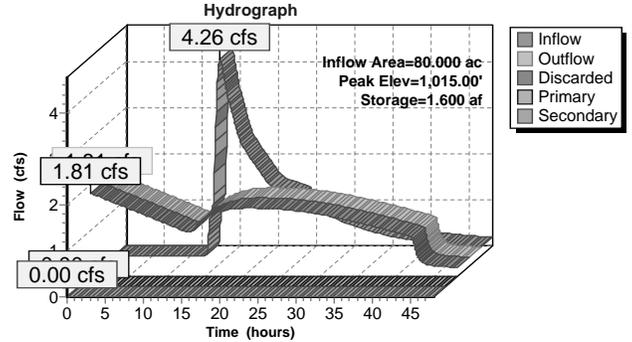
Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,015.00' / 1,015.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,015.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,017.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,018.00'	30.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,013.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=1.81 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 1.81 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 1=Culvert (Controls 0.00 cfs)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 21P: Infiltration pond for plant and rail yard



Summary for Pond 22P: Wet pond for plant and rail yard

Inflow Area = 80,000 ac, 2.25% Impervious, Inflow Depth = 0.54" for 2-year event
 Inflow = 32.71 cfs @ 12.23 hrs, Volume= 3,607 af
 Outflow = 4.26 cfs @ 13.87 hrs, Volume= 3,105 af, Atten= 87%, Lag= 98.6 min
 Primary = 4.26 cfs @ 13.87 hrs, Volume= 3,105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,023.08' @ 13.87 hrs Surf.Area= 1,733 ac Storage= 1,641 af

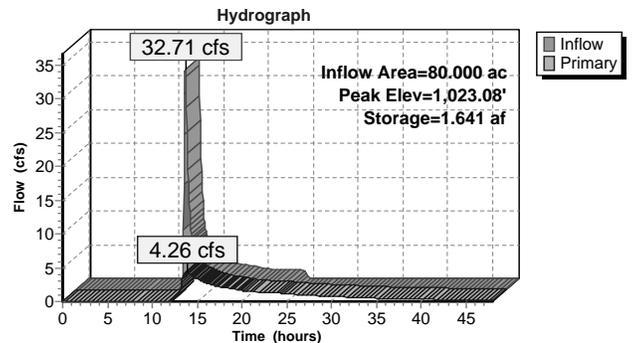
Plug-Flow detention time= 497.6 min calculated for 3.105 af (86% of inflow)
 Center-of-Mass det. time= 430.8 min (1,340.1 - 909.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,022.00'	5,700 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,022.00	1.300	0.000	0.000
1,023.00	1.700	1.500	1,500
1,024.00	2.100	1.900	3,400
1,025.00	2.500	2.300	5,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,022.00' / 1,022.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,023.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=4.25 cfs @ 13.87 hrs HW=1,023.08' (Free Discharge)
 1=Culvert (Barrel Controls 1.24 cfs @ 2.30 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 3.01 cfs @ 0.74 fps)

Pond 22P: Wet pond for plant and rail yard



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

- Subcatchment 1S: Existing 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=1.35"
 Flow Length=1,500' Tc=38.9 min CN=69 Runoff=22.74 cfs 2.816 af
- Subcatchment 3S: Mining 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=2.66"
 Tc=20.0 min CN=86 Runoff=73.38 cfs 5.551 af
- Subcatchment 6S: Existing 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=1.55"
 Flow Length=1,400' Tc=30.7 min CN=72 Runoff=35.55 cfs 3.621 af
- Subcatchment 7S: Mining 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=2.85"
 Tc=22.0 min CN=88 Runoff=82.85 cfs 6.650 af
- Subcatchment 20S: Existing plant site** Runoff Area=80.000 ac 0.00% Impervious Runoff Depth=1.10"
 Flow Length=4,600' Tc=31.3 min CN=65 Runoff=65.44 cfs 7.365 af
- Subcatchment 22S: plant site** Runoff Area=80.000 ac 2.25% Impervious Runoff Depth=1.29"
 Tc=25.0 min CN=68 Runoff=93.11 cfs 8.587 af
- Pond 4P: Wet pond for mining phase 1a** Peak Elev=1,060.08' Storage=3.610 af Inflow=73.38 cfs 5.551 af
 Outflow=4.56 cfs 4.320 af
- Pond 8P: Wet pond for mining phase 1b** Peak Elev=1,078.48' Storage=2.704 af Inflow=82.85 cfs 6.650 af
 Outflow=46.56 cfs 5.985 af
- Pond 19P: Infiltration pond for mine** Peak Elev=1,058.59' Storage=4.088 af Inflow=47.96 cfs 10.305 af
 Discarded=2.76 cfs 8.660 af Primary=1.09 cfs 1.943 af Secondary=0.00 cfs 0.000 af Outflow=3.85 cfs 10.603 af
- Pond 21P: Infiltration pond for plant and** Peak Elev=1,016.78' Storage=4.034 af Inflow=51.16 cfs 8.078 af
 Discarded=2.69 cfs 7.592 af Primary=1.17 cfs 1.626 af Secondary=0.00 cfs 0.000 af Outflow=3.86 cfs 9.219 af
- Pond 22P: Wet pond for plant and rail** Peak Elev=1,023.51' Storage=2.428 af Inflow=93.11 cfs 8.587 af
 Outflow=51.16 cfs 8.078 af

Total Runoff Area = 266.000 ac Runoff Volume = 34.589 af Average Runoff Depth = 1.56"
 99.32% Pervious = 264.200 ac 0.68% Impervious = 1.800 ac

Summary for Subcatchment 1S: Existing 1a

Runoff = 22.74 cfs @ 12.38 hrs, Volume= 2.816 af, Depth= 1.35"

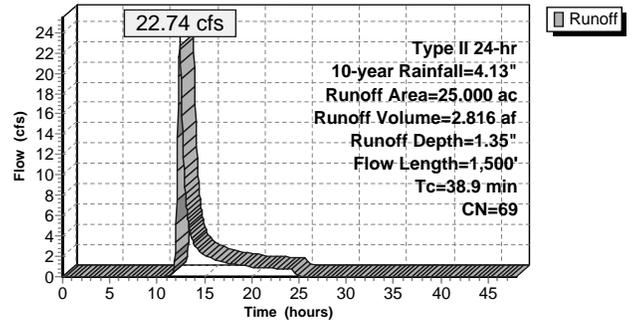
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
24.500	69	Small grain, C&T + CR, Good, HSG B
0.500	55	Legumes, contoured, Good, HSG A
25.000	69	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	300	0.0200	0.18		Sheet Flow, first 300'
7.3	500	0.0160	1.14		Cultivated: Residue=20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, next 500 feet Cultivated Straight Rows Kv= 9.0 fps
3.9	700	0.0170	3.02	96.59	Channel Flow, channel to the end Area= 32.0 sf Perim= 23.0' r= 1.39' n= 0.080 Earth, long dense weeds
38.9	1,500	Total			

Subcatchment 1S: Existing 1a

Hydrograph



Summary for Subcatchment 3S: Mining 1a

Runoff = 73.38 cfs @ 12.12 hrs, Volume= 5.551 af, Depth= 2.66"

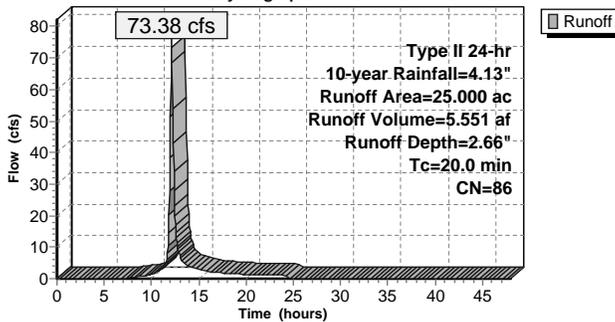
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
24.500	86	Fallow, bare soil, HSG B
0.500	77	Fallow, bare soil, HSG A
25.000	86	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry, Assumed

Subcatchment 3S: Mining 1a

Hydrograph



Summary for Subcatchment 6S: Existing 1b

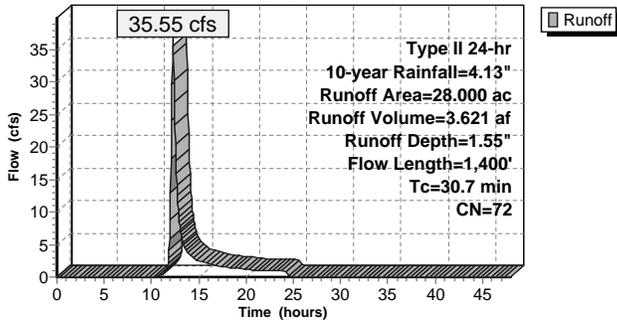
Runoff = 35.55 cfs @ 12.27 hrs, Volume= 3.621 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
16.600	69	Small grain, C&T + CR, Good, HSG B
3.000	70	C soils woods
4.600	78	C soils crop
1.500	77	D soils woods
2.300	83	D soils crop
28.000	72	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	300	0.0370	0.23		Sheet Flow, first 300'
6.6	600	0.0280	1.51		Cultivated: Residue=20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, Next 600 feet Cultivated Straight Rows Kv= 9.0 fps
2.4	500	0.0200	3.53	197.49	Channel Flow, assumed channelized to end Area= 56.0 sf Perim= 36.0' r= 1.56' n= 0.080 Earth, long dense weeds
30.7	1,400	Total			

Subcatchment 6S: Existing 1b
 Hydrograph



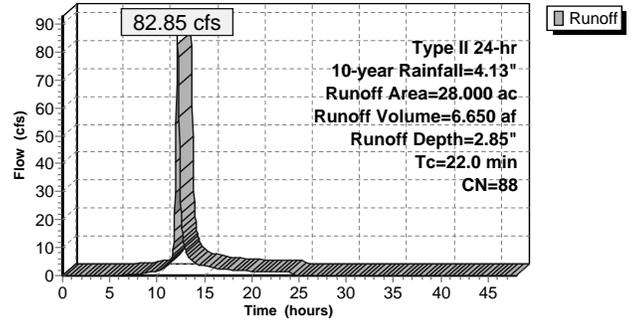
Summary for Subcatchment 7S: Mining 1b

Runoff = 82.85 cfs @ 12.15 hrs, Volume= 6.650 af, Depth= 2.85"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
16.600	86	Fallow, bare soil, HSG B
7.600	91	Fallow, bare soil, HSG C
3.800	94	Fallow, bare soil, HSG D
28.000	88	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0					Direct Entry, Assumed

Subcatchment 7S: Mining 1b
 Hydrograph



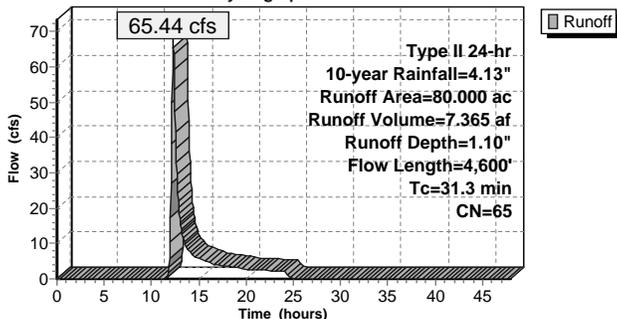
Summary for Subcatchment 20S: Existing plant site

Runoff = 65.44 cfs @ 12.29 hrs, Volume= 7.365 af, Depth= 1.10"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
* 28.000	55	A soils crop
* 45.000	69	B soils crop
* 3.000	78	C soils crop
* 4.000	83	D soils crop
80.000	65	Weighted Average
80.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	200	0.0250	0.20		Sheet Flow, first 200 feet Grass: Short n= 0.150 P2= 2.83"
2.6	300	0.0170	1.96		Shallow Concentrated Flow, Next 300 feet Grassed Waterway Kv= 15.0 fps
12.1	4,100	0.0090	5.64	129.70	Channel Flow, to end Area= 23.0 sf Perim= 23.0' r= 1.00' n= 0.025 Earth, grassed & winding
31.3	4,600	Total			

Subcatchment 20S: Existing plant site
 Hydrograph



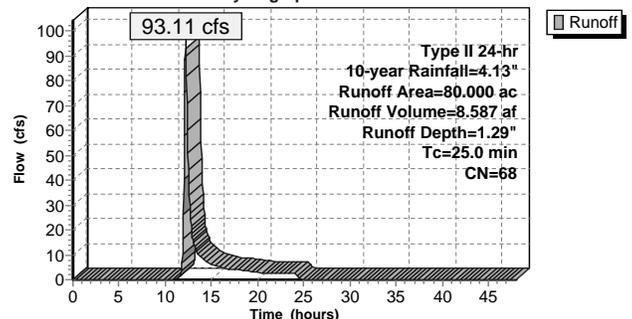
Summary for Subcatchment 22S: plant site

Runoff = 93.11 cfs @ 12.21 hrs, Volume= 8.587 af, Depth= 1.29"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year Rainfall=4.13"

Area (ac)	CN	Description
* 17.000	84	rail
* 1.800	98	plant and piles
* 4.100	86	bare soil, HSG B
* 57.100	61	B soils hay
80.000	68	Weighted Average
78.200		97.75% Pervious Area
1.800		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.0					Direct Entry, assumed

Subcatchment 22S: plant site
 Hydrograph



Summary for Pond 4P: Wet pond for mining phase 1a

Inflow Area = 25.000 ac, 0.00% Impervious, Inflow Depth = 2.66" for 10-year event
 Inflow = 73.38 cfs @ 12.12 hrs, Volume= 5,551 af
 Outflow = 4.56 cfs @ 13.70 hrs, Volume= 4,320 af, Atten= 94%, Lag= 94.8 min
 Primary = 4.56 cfs @ 13.70 hrs, Volume= 4,320 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,060.08' @ 13.70 hrs Surf.Area= 2.024 ac Storage= 3,610 af

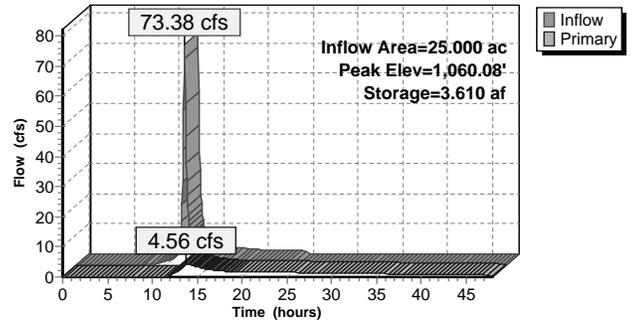
Plug-Flow detention time= 785.8 min calculated for 4,320 af (78% of inflow)
 Center-of-Mass det. time= 699.4 min (1,521.2 - 821.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,058.00'	5,600 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,058.00	1.500	0.000	0.000
1,059.00	1.700	1.800	1.600
1,060.00	2.000	1.850	3,450
1,061.00	2.300	2.150	5,600

Device	Routing	Invert	Outlet Devices
#1	Primary	1,058.00'	8.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,058.00' / 1,058.00' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Primary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=4.53 cfs @ 13.70 hrs HW=1,060.08' (Free Discharge)
 1=Culvert (Barrel Controls 1.65 cfs @ 4.74 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 2.88 cfs @ 0.72 fps)

Pond 4P: Wet pond for mining phase 1a
Hydrograph



Summary for Pond 8P: Wet pond for mining phase 1b

Inflow Area = 28.000 ac, 0.00% Impervious, Inflow Depth = 2.85" for 10-year event
 Inflow = 82.85 cfs @ 12.15 hrs, Volume= 6,650 af
 Outflow = 46.56 cfs @ 12.35 hrs, Volume= 5,985 af, Atten= 44%, Lag= 12.4 min
 Primary = 46.56 cfs @ 12.35 hrs, Volume= 5,985 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,078.48' @ 12.35 hrs Surf.Area= 2,045 ac Storage= 2,704 af

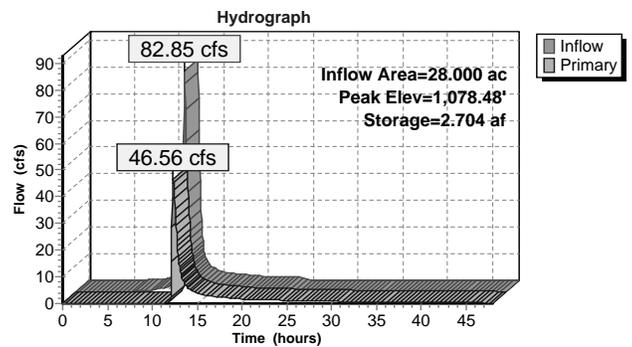
Plug-Flow detention time= 319.0 min calculated for 5,985 af (90% of inflow)
 Center-of-Mass det. time= 268.0 min (1,084.7 - 816.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,077.00'	6,150 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,077.00	1.600	0.000	0.000
1,078.00	1.900	1.750	1,750
1,079.00	2.200	2,050	3,800
1,080.00	2.500	2,350	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	1,077.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,077.00' / 1,077.00' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,078.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=46.47 cfs @ 12.35 hrs HW=1,078.48' (Free Discharge)
 1=Culvert (Barrel Controls 1.89 cfs @ 3.46 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 44.59 cfs @ 1.84 fps)

Pond 8P: Wet pond for mining phase 1b
Hydrograph



Summary for Pond 19P: Infiltration pond for mine phase 1a and 1b

[79] Warning: Submerged Pond 4P Primary device # 1 by 0.59'

Inflow Area = 53.000 ac, 0.00% Impervious, Inflow Depth > 2.33" for 10-year event
 Inflow = 47.96 cfs @ 12.35 hrs, Volume= 10.305 af
 Outflow = 3.85 cfs @ 18.59 hrs, Volume= 10.603 af, Atten= 92%, Lag= 374.2 min
 Discarded = 2.76 cfs @ 18.59 hrs, Volume= 8.660 af
 Primary = 1.09 cfs @ 18.59 hrs, Volume= 1.943 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,057.00' Surf.Area= 1.200 ac Storage= 1.800 af
 Peak Elev= 1,058.59' @ 18.59 hrs Surf.Area= 1.677 ac Storage= 4.088 af (2.288 af above start)

Plug-Flow detention time= 640.0 min calculated for 8.794 af (85% of inflow)
 Center-of-Mass det. time= 224.2 min (1,491.9 - 1,267.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,055.00'	9.000 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,055.00	0.600	0.000	0.000
1,056.00	0.900	0.750	0.750
1,057.00	1.200	1.050	1.800
1,058.00	1.500	1.350	3.150
1,059.00	1.800	1.650	4.800
1,060.00	2.100	1.950	6.750
1,061.00	2.400	2.250	9.000

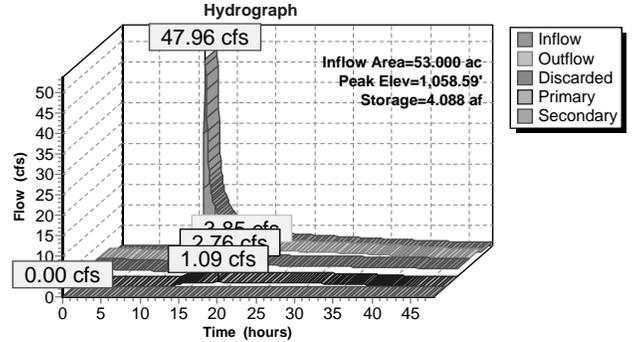
Device	Routing	Invert	Outlet Devices
#1	Primary	1,057.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,057.00' / 1,056.80' S= 0.0050' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,057.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,059.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,055.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=2.76 cfs @ 18.59 hrs HW=1,058.59' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 2.76 cfs)

Primary OutFlow Max=1.09 cfs @ 18.59 hrs HW=1,058.59' (Free Discharge)
 1=Culvert (Passes 1.09 cfs of 6.51 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 1.09 cfs @ 5.57 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,057.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 19P: Infiltration pond for mine phase 1a and 1b



Summary for Pond 21P: Infiltration pond for plant and rail yard

Inflow Area = 80.000 ac, 2.25% Impervious, Inflow Depth > 1.21" for 10-year event
 Inflow = 51.16 cfs @ 12.46 hrs, Volume= 8.078 af
 Outflow = 3.86 cfs @ 18.41 hrs, Volume= 9.219 af, Atten= 92%, Lag= 357.2 min
 Discarded = 2.69 cfs @ 18.41 hrs, Volume= 7.592 af
 Primary = 1.17 cfs @ 18.41 hrs, Volume= 1.626 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,015.00' Surf.Area= 1.100 ac Storage= 1.600 af
 Peak Elev= 1,016.78' @ 18.41 hrs Surf.Area= 1.634 ac Storage= 4.034 af (2.434 af above start)

Plug-Flow detention time= 644.6 min calculated for 7.619 af (94% of inflow)
 Center-of-Mass det. time= 352.0 min (1,412.1 - 1,060.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,013.00'	10.800 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,013.00	0.500	0.000	0.000
1,014.00	0.800	0.650	0.650
1,015.00	1.100	0.950	1.600
1,016.00	1.400	1.250	2.850
1,017.00	1.700	1.550	4.400
1,018.00	2.000	1.850	6.250
1,019.00	2.300	2.150	8.400
1,020.00	2.500	2.400	10.800

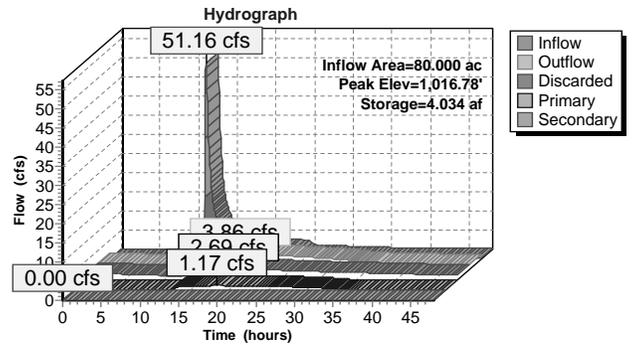
Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,015.00' / 1,015.00' S= 0.0000' / Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,015.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,017.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,018.00'	30.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,013.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=2.69 cfs @ 18.41 hrs HW=1,016.78' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 2.69 cfs)

Primary OutFlow Max=1.17 cfs @ 18.41 hrs HW=1,016.78' (Free Discharge)
 1=Culvert (Passes 1.17 cfs of 6.17 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 1.17 cfs @ 5.96 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,015.00' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 21P: Infiltration pond for plant and rail yard



Summary for Pond 22P: Wet pond for plant and rail yard

Inflow Area = 80.000 ac, 2.25% Impervious, Inflow Depth = 1.29" for 10-year event
 Inflow = 93.11 cfs @ 12.21 hrs, Volume= 8.587 af
 Outflow = 51.16 cfs @ 12.46 hrs, Volume= 8.078 af, Atten= 45%, Lag= 15.1 min
 Primary = 51.16 cfs @ 12.46 hrs, Volume= 8.078 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,023.51' @ 12.46 hrs Surf.Area= 1.906 ac Storage= 2.428 af

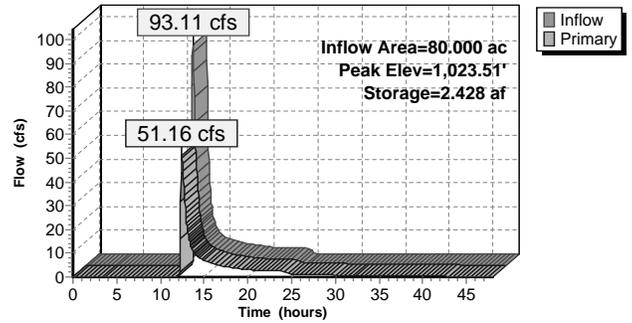
Plug-Flow detention time= 213.3 min calculated for 8.078 af (94% of inflow)
 Center-of-Mass det. time= 181.3 min (1,060.1 - 878.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,022.00'	5,700 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,022.00	1.300	0.000	0.000
1,023.00	1.700	1.500	1.500
1,024.00	2.100	1.900	3.400
1,025.00	2.500	2.300	5.700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0" Round Culvert L= 40.0' Ks= 0.900 Inlet / Outlet Inverts= 1,022.00' / 1,022.00' S= 0.0000 /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,023.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=50.99 cfs @ 12.46 hrs HW=1,023.51' (Free Discharge)
 1=Culvert (Barrel Controls 1.93 cfs @ 3.54 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 49.06 cfs @ 1.91 fps)

Pond 22P: Wet pond for plant and rail yard Hydrograph



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

- Subcatchment 1S: Existing 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=3.18"
 Flow Length=1,500' Tc=38.9 min CN=69 Runoff=57.10 cfs 6.626 af
- Subcatchment 3S: Mining 1a** Runoff Area=25.000 ac 0.00% Impervious Runoff Depth=4.97"
 Tc=20.0 min CN=86 Runoff=134.11 cfs 10.359 af
- Subcatchment 6S: Existing 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=3.48"
 Flow Length=1,400' Tc=30.7 min CN=72 Runoff=82.92 cfs 8.125 af
- Subcatchment 7S: Mining 1b** Runoff Area=28.000 ac 0.00% Impervious Runoff Depth=5.20"
 Tc=22.0 min CN=88 Runoff=147.46 cfs 12.123 af
- Subcatchment 20S: Existing plant site** Runoff Area=80.000 ac 0.00% Impervious Runoff Depth=2.79"
 Flow Length=4,600' Tc=31.3 min CN=65 Runoff=183.34 cfs 18.594 af
- Subcatchment 22S: plant site** Runoff Area=80.000 ac 2.25% Impervious Runoff Depth=3.08"
 Tc=25.0 min CN=68 Runoff=237.11 cfs 20.544 af
- Pond 4P: Wet pond for mining phase 1a** Peak Elev=1,060.61' Storage=4.729 af Inflow=134.11 cfs 10.359 af
 Outflow=66.42 cfs 9.056 af
- Pond 8P: Wet pond for mining phase 1b** Peak Elev=1,078.90' Storage=3.590 af Inflow=147.46 cfs 12.123 af
 Outflow=116.96 cfs 11.450 af
- Pond 19P: Infiltration pond for mine** Peak Elev=1,060.42' Storage=7.648 af Inflow=180.03 cfs 20.506 af
 Discarded=3.66 cfs 9.639 af Primary=13.81 cfs 8.449 af Secondary=35.18 cfs 2.426 af Outflow=52.64 cfs 20.514 af
- Pond 21P: Infiltration pond for plant** Peak Elev=1,018.68' Storage=7.674 af Inflow=196.98 cfs 20.031 af
 Discarded=3.62 cfs 8.521 af Primary=14.01 cfs 8.820 af Secondary=44.98 cfs 3.593 af Outflow=62.61 cfs 20.935 af
- Pond 22P: Wet pond for plant and rail** Peak Elev=1,024.29' Storage=4.015 af Inflow=237.11 cfs 20.544 af
 Outflow=196.98 cfs 20.031 af

Total Runoff Area = 266.000 ac Runoff Volume = 76.372 af Average Runoff Depth = 3.45"
 99.32% Pervious = 264.200 ac 0.68% Impervious = 1.800 ac

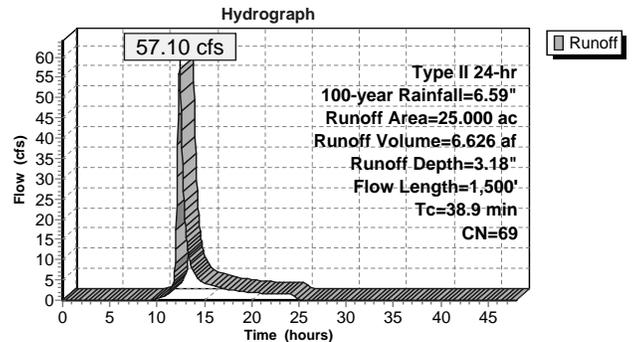
Summary for Subcatchment 1S: Existing 1a

Runoff = 57.10 cfs @ 12.36 hrs, Volume= 6.626 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description			
24.500	69	Small grain, C&T + CR, Good, HSG B			
0.500	55	Legumes, contoured, Good, HSG A			
25.000	69	Weighted Average			
25.000		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	300	0.0200	0.18		Sheet Flow, first 300'
7.3	500	0.0160	1.14		Cultivated; Residues=20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, next 500 feet
3.9	700	0.0170	3.02	96.59	Cultivated Straight Rows Kv= 9.0 fps Channel Flow, channel to the end Area= 32.0 sf Perim= 23.0' r= 1.39" n= 0.080 Earth, long dense weeds
38.9	1,500	Total			

Subcatchment 1S: Existing 1a Hydrograph



Summary for Subcatchment 3S: Mining 1a

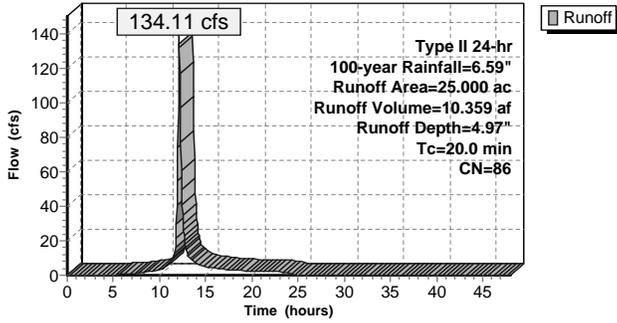
Runoff = 134.11 cfs @ 12.12 hrs, Volume= 10.359 af, Depth= 4.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description
24.500	86	Fallow, bare soil, HSG B
0.500	77	Fallow, bare soil, HSG A
25.000	86	Weighted Average
25.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry, Assumed

Subcatchment 3S: Mining 1a Hydrograph



Summary for Subcatchment 6S: Existing 1b

Runoff = 82.92 cfs @ 12.26 hrs, Volume= 8.125 af, Depth= 3.48"

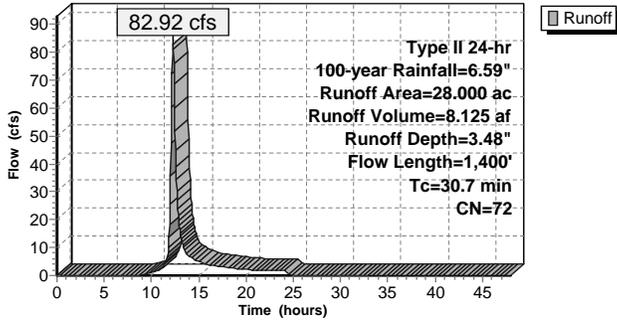
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description
16.600	69	Small grain, C&T + CR, Good, HSG B
* 3.000	70	C soils woods
* 4.600	78	C soils crop
* 1.500	77	D soils woods
* 2.300	83	D soils crop
28.000	72	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	300	0.0370	0.23		Sheet Flow, first 300'
6.6	600	0.0280	1.51		Cultivated: Residue>20% n= 0.170 P2= 2.83" Shallow Concentrated Flow, Next 600 feet
2.4	500	0.0200	3.53	197.49	Cultivated Straight Rows Kv= 9.0 fps Channel Flow, assumed channelized to end Area= 56.0 sf Perim= 36.0' r= 1.56' n= 0.080 Earth, long dense weeds
30.7	1,400	Total			

Subcatchment 6S: Existing 1b

Hydrograph



Summary for Subcatchment 7S: Mining 1b

Runoff = 147.46 cfs @ 12.14 hrs, Volume= 12.123 af, Depth= 5.20"

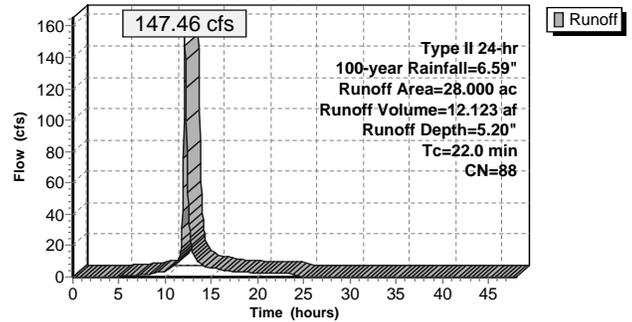
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description
16.600	86	Fallow, bare soil, HSG B
7.600	91	Fallow, bare soil, HSG C
3.800	94	Fallow, bare soil, HSG D
28.000	88	Weighted Average
28.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0					Direct Entry, Assumed

Subcatchment 7S: Mining 1b

Hydrograph

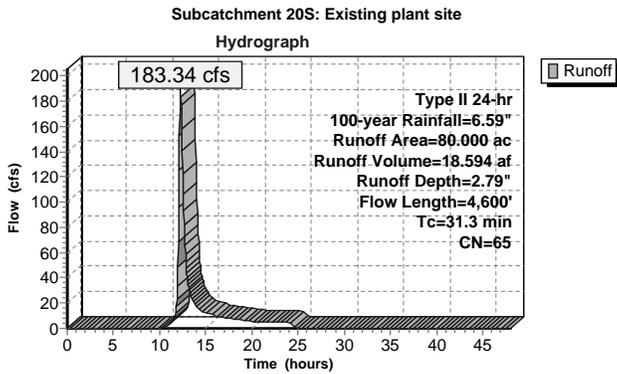


Summary for Subcatchment 20S: Existing plant site

Runoff = 183.34 cfs @ 12.27 hrs, Volume= 18,594 af, Depth= 2.79"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description
* 28.000	55	A soils crop
* 45.000	69	B soils crop
* 3.000	78	C soils crop
* 4.000	83	D soils crop
80.000	65	Weighted Average
80.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	200	0.0250	0.20		Sheet Flow, first 200 feet Grass: Short n= 0.150 P2= 2.83"
2.6	300	0.0170	1.96		Shallow Concentrated Flow, Next 300 feet Grassed Waterway Kv= 15.0 fps
12.1	4,100	0.0090	5.64	129.70	Channel Flow, to end Area= 23.0 sf Perim= 23.0' r= 1.00' n= 0.025 Earth, grassed & winding
31.3	4,600	Total			

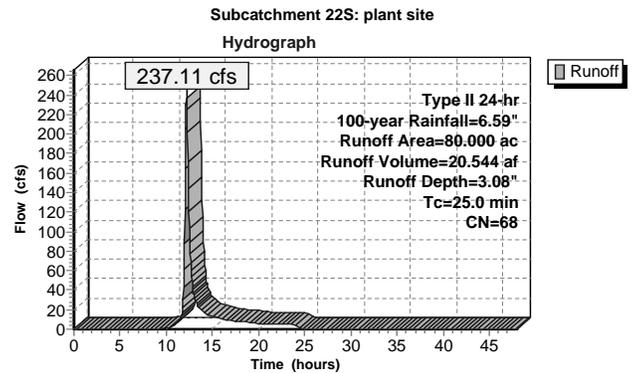


Summary for Subcatchment 22S: plant site

Runoff = 237.11 cfs @ 12.19 hrs, Volume= 20,544 af, Depth= 3.08"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year Rainfall=6.59"

Area (ac)	CN	Description
* 17.000	84	rail
* 1.800	98	plant and piles
* 4.100	86	bare soil, HSG B
* 57.100	61	B soils hay
80.000	68	Weighted Average
78.200		97.75% Pervious Area
1.800		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.0					Direct Entry, assumed



Summary for Pond 4P: Wet pond for mining phase 1a

Inflow Area = 25,000 ac, 0.00% Impervious, Inflow Depth= 4.97" for 100-year event
 Inflow = 134.11 cfs @ 12.12 hrs, Volume= 10,359 af
 Outflow = 66.42 cfs @ 12.34 hrs, Volume= 9,056 af, Atten= 50%, Lag= 13.0 min
 Primary = 66.42 cfs @ 12.34 hrs, Volume= 9,056 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,060.61' @ 12.34 hrs Surf.Area= 2.183 ac Storage= 4,729 af
 Plug-Flow detention time= 424.8 min calculated for 9,056 af (87% of inflow)
 Center-of-Mass det. time= 364.5 min (1,168.6 - 804.2)

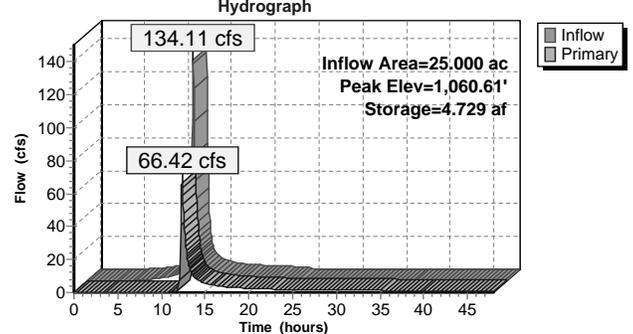
Volume	Invert	Avail.Storage	Storage Description
#1	1,058.00'	5,600 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,058.00	1.500	0.000	0.000
1,059.00	1.700	1.600	1.600
1,060.00	2.000	1.850	3.450
1,061.00	2.300	2.150	5.600

Device	Routing	Invert	Outlet Devices
#1	Primary	1,058.00'	8.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Invert= 1,058.00' / 1,058.00' S= 0.0000 ' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Primary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=66.05 cfs @ 12.34 hrs HW=1,060.61' (Free Discharge)
 1=Culvert (Barrel Controls 1.94 cfs @ 5.55 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 64.11 cfs @ 2.11 fps)

Pond 4P: Wet pond for mining phase 1a



Summary for Pond 8P: Wet pond for mining phase 1b

Inflow Area = 28.000 ac, 0.00% Impervious, Inflow Depth = 5.20" for 100-year event
 Inflow = 147.46 cfs @ 12.14 hrs, Volume= 12.123 af
 Outflow = 116.96 cfs @ 12.26 hrs, Volume= 11.450 af, Atten= 21%, Lag= 7.1 min
 Primary = 116.96 cfs @ 12.26 hrs, Volume= 11.450 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,078.90' @ 12.26 hrs Surf.Area= 2.171 ac Storage= 3.590 af

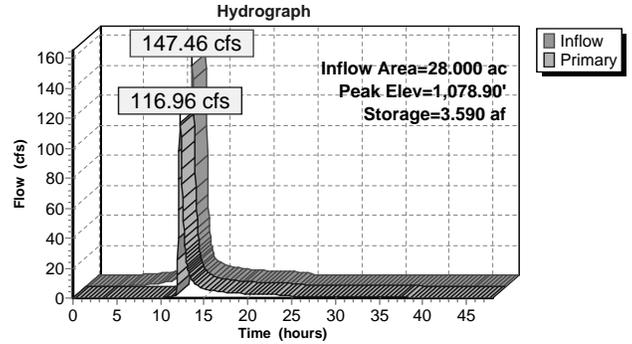
Plug-Flow detention time= 190.9 min calculated for 11.438 af (94% of inflow)
 Center-of-Mass det. time= 160.6 min (960.5 - 799.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,077.00'	6,150 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,077.00	1.600	0.000	0.000
1,078.00	1.900	1.750	1.750
1,079.00	2.200	2.050	3.800
1,080.00	2.500	2.350	6.150

Device	Routing	Invert	Outlet Devices
#1	Primary	1,077.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Inverts= 1,077.00' / 1,077.00' S= 0.0000 /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,078.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=116.31 cfs @ 12.26 hrs HW=1,078.90' (Free Discharge)
 1=Culvert (Barrel Controls 2.42 cfs @ 4.43 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 113.89 cfs @ 2.53 fps)

Pond 8P: Wet pond for mining phase 1b



Summary for Pond 19P: Infiltration pond for mine phase 1a and 1b

[81] Warning: Exceeded Pond 4P by 0.13' @ 13.00 hrs

Inflow Area = 53.000 ac, 0.00% Impervious, Inflow Depth > 4.64" for 100-year event
 Inflow = 180.03 cfs @ 12.30 hrs, Volume= 20.506 af
 Outflow = 52.64 cfs @ 12.90 hrs, Volume= 20.514 af, Atten= 71%, Lag= 36.1 min
 Discarded = 3.66 cfs @ 12.90 hrs, Volume= 9.639 af
 Primary = 13.81 cfs @ 12.90 hrs, Volume= 8.449 af
 Secondary = 35.18 cfs @ 12.90 hrs, Volume= 2.426 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,057.00' Surf.Area= 1.200 ac Storage= 1.800 af
 Peak Elev= 1,060.42' @ 12.90 hrs Surf.Area= 2.225 ac Storage= 7.648 af (5.848 af above start)

Plug-Flow detention time= 414.1 min calculated for 18.695 af (91% of inflow)
 Center-of-Mass det. time= 207.7 min (1,260.1 - 1,052.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,055.00'	9,000 af	Custom Stage Data (Prismatic), Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,055.00	0.600	0.000	0.000
1,056.00	0.900	0.750	0.750
1,057.00	1.200	1.050	1.800
1,058.00	1.500	1.350	3.150
1,059.00	1.800	1.650	4.800
1,060.00	2.100	1.950	6.750
1,061.00	2.400	2.250	9.000

Device	Routing	Invert	Outlet Devices
#1	Primary	1,057.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Inverts= 1,057.00' / 1,056.80' S= 0.0050 /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,057.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,059.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,060.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,055.00'	1.630 in/hr Exfiltration over Horizontal area

Primary OutFlow Max=13.81 cfs @ 12.90 hrs HW=1,060.42' (Free Discharge)
 1=Culvert (Barrel Controls 13.81 cfs @ 7.81 fps)
 2=Orifice/Grate (Passes < 1.68 cfs potential flow)
 3=Orifice/Grate (Passes < 62.53 cfs potential flow)

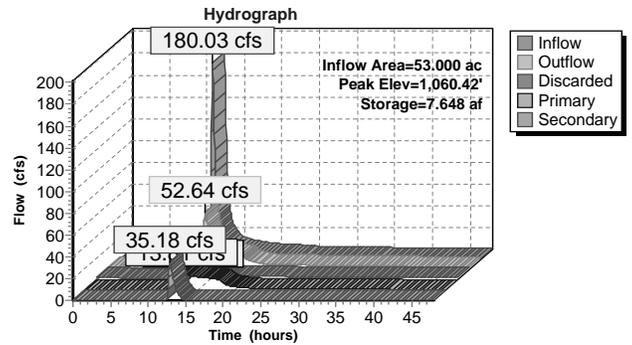
Secondary OutFlow Max=35.10 cfs @ 12.90 hrs HW=1,060.42' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Weir Controls 35.10 cfs @ 1.69 fps)

Discarded OutFlow Max=3.66 cfs @ 12.90 hrs HW=1,060.42' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 3.66 cfs)

Primary OutFlow Max=13.81 cfs @ 12.90 hrs HW=1,060.42' (Free Discharge)
 1=Culvert (Barrel Controls 13.81 cfs @ 7.81 fps)
 2=Orifice/Grate (Passes < 1.68 cfs potential flow)
 3=Orifice/Grate (Passes < 62.53 cfs potential flow)

Secondary OutFlow Max=35.10 cfs @ 12.90 hrs HW=1,060.42' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Weir Controls 35.10 cfs @ 1.69 fps)

Pond 19P: Infiltration pond for mine phase 1a and 1b



Summary for Pond 21P: Infiltration pond for plant and rail yard

Inflow Area = 80,000 ac, 2.25% Impervious, Inflow Depth > 3.00" for 100-year event
 Inflow = 196.98 cfs @ 12.31 hrs, Volume= 20,031 af
 Outflow = 62.61 cfs @ 12.87 hrs, Volume= 20,935 af, Atten= 68%, Lag= 33.3 min
 Discarded = 3.62 cfs @ 12.87 hrs, Volume= 8,521 af
 Primary = 14.01 cfs @ 12.87 hrs, Volume= 8,820 af
 Secondary = 44.98 cfs @ 12.87 hrs, Volume= 3,593 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 1,015.00' Surf.Area= 1,100 ac Storage= 1,600 af
 Peak Elev= 1,018.68' @ 12.87 hrs Surf.Area= 2,203 ac Storage= 7,674 af (6.074 af above start)

Plug-Flow detention time= 348.2 min calculated for 19,335 af (97% of inflow)
 Center-of-Mass det. time= 238.1 min (1,173.6 - 935.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,013.00'	10,800 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,013.00	0.500	0.000	0.000
1,014.00	0.800	0.650	0.650
1,015.00	1.100	0.950	1.600
1,016.00	1.400	1.250	2.850
1,017.00	1.700	1.550	4.400
1,018.00	2.000	1.850	6.250
1,019.00	2.300	2.150	8.400
1,020.00	2.500	2.400	10,800

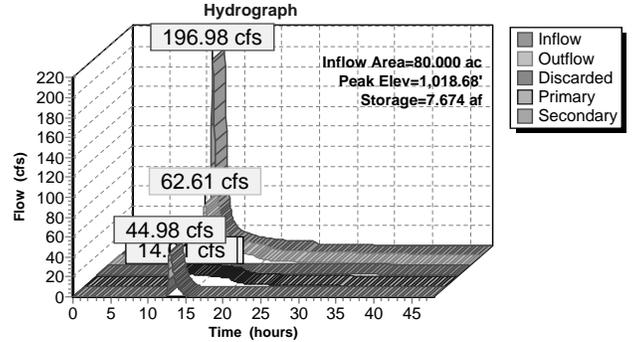
Device	Routing	Invert	Outlet Devices
#1	Primary	1,015.00'	18.0" Round Culvert L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 1,015.00' / 1,015.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	1,015.00'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,017.00'	1.7" x 3.2" Horiz. Orifice/Grate X 17.00 columns X 17 rows C= 0.600 in 60.0" Grate (56% open area) Limited to weir flow at low heads
#4	Secondary	1,018.00'	30.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#5	Discarded	1,013.00'	1.630 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=3.62 cfs @ 12.87 hrs HW=1,018.68' (Free Discharge)
 5=Exfiltration (Exfiltration Controls 3.62 cfs)

Primary OutFlow Max=14.00 cfs @ 12.87 hrs HW=1,018.68' (Free Discharge)
 1=Culvert (Barrel Controls 14.00 cfs @ 7.92 fps)
 2=Orifice/Grate (Passes < 1.75 cfs potential flow)
 3=Orifice/Grate (Passes < 68.05 cfs potential flow)

Secondary OutFlow Max=44.82 cfs @ 12.87 hrs HW=1,018.68' (Free Discharge)
 4=Broad-Crested Rectangular Weir (Weir Controls 44.82 cfs @ 2.21 fps)

Pond 21P: Infiltration pond for plant and rail yard



Summary for Pond 22P: Wet pond for plant and rail yard

Inflow Area = 80,000 ac, 2.25% Impervious, Inflow Depth = 3.08" for 100-year event
 Inflow = 237.11 cfs @ 12.19 hrs, Volume= 20,544 af
 Outflow = 196.98 cfs @ 12.31 hrs, Volume= 20,031 af, Atten= 17%, Lag= 7.1 min
 Primary = 196.98 cfs @ 12.31 hrs, Volume= 20,031 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,024.29' @ 12.31 hrs Surf.Area= 2,214 ac Storage= 4,015 af

Plug-Flow detention time= 96.2 min calculated for 20,010 af (97% of inflow)
 Center-of-Mass det. time= 83.0 min (935.6 - 852.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,022.00'	5,700 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,022.00	1.300	0.000	0.000
1,023.00	1.700	1.500	1.500
1,024.00	2.100	1.900	3.400
1,025.00	2.500	2.300	5,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0" Round Culvert L= 40.0' Ke= 0.900 Inlet / Outlet Invert= 1,022.00' / 1,022.00' S= 0.0000' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	1,023.00'	50.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=196.00 cfs @ 12.31 hrs HW=1,024.28' (Free Discharge)
 1=Culvert (Barrel Controls 2.81 cfs @ 5.16 fps)
 2=Broad-Crested Rectangular Weir (Weir Controls 193.19 cfs @ 3.02 fps)

Pond 22P: Wet pond for plant and rail yard

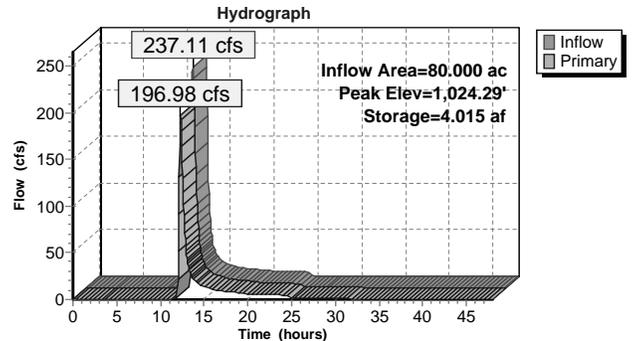
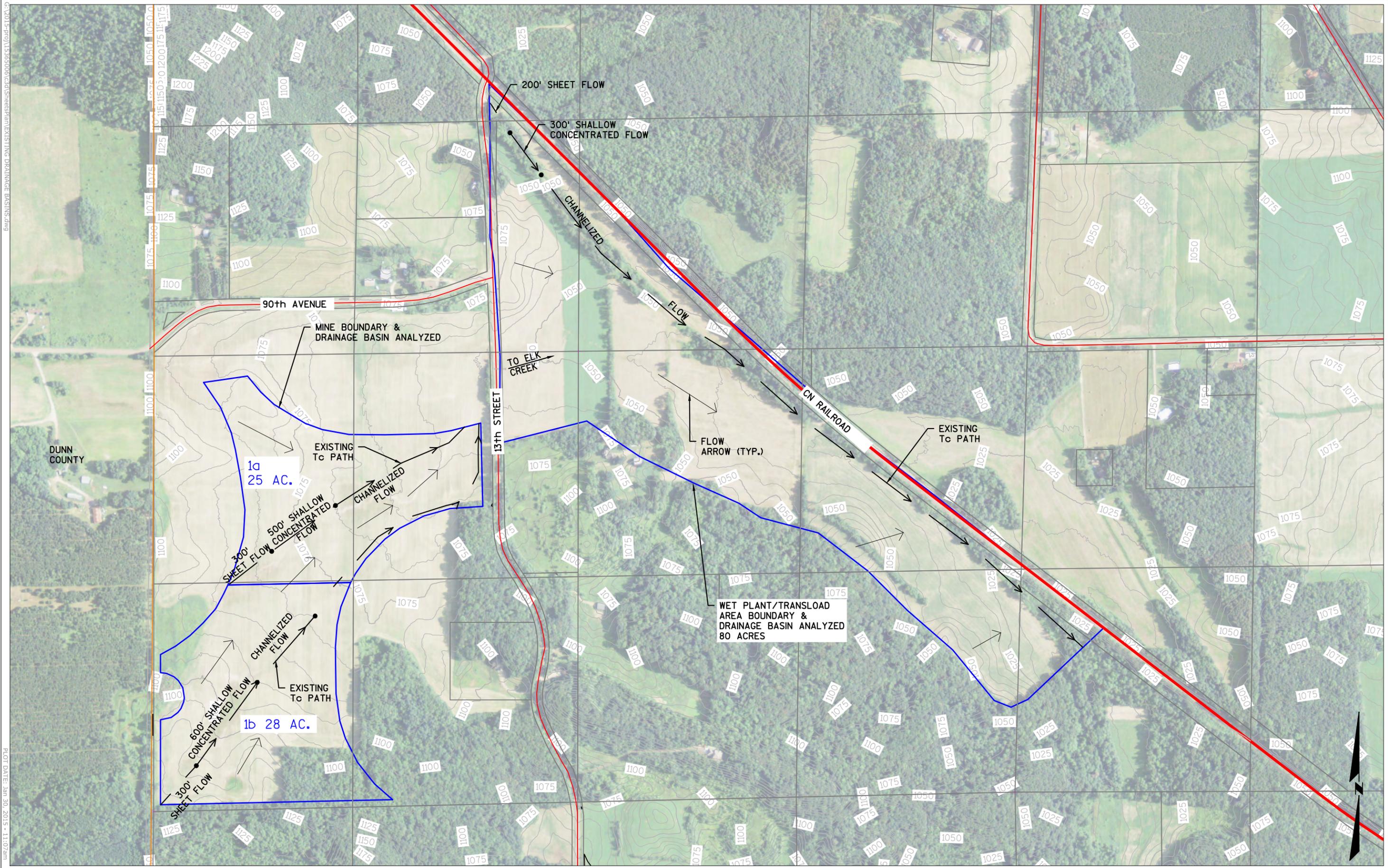


EXHIBIT 2

FIGURES AND DETAILS

G:\2015-PROJ\15365006\CAD\Sheets\plan\EXISTING DRAINAGE BASINS.dwg

PLOT DATE: Jan 30, 2015 - 11:07am



NO.	BY	DATE	REVISIONS

PROJECT MANAGER: NICOLE HODKIEWICZ
 CHECKED BY:
 APPROVED BY:



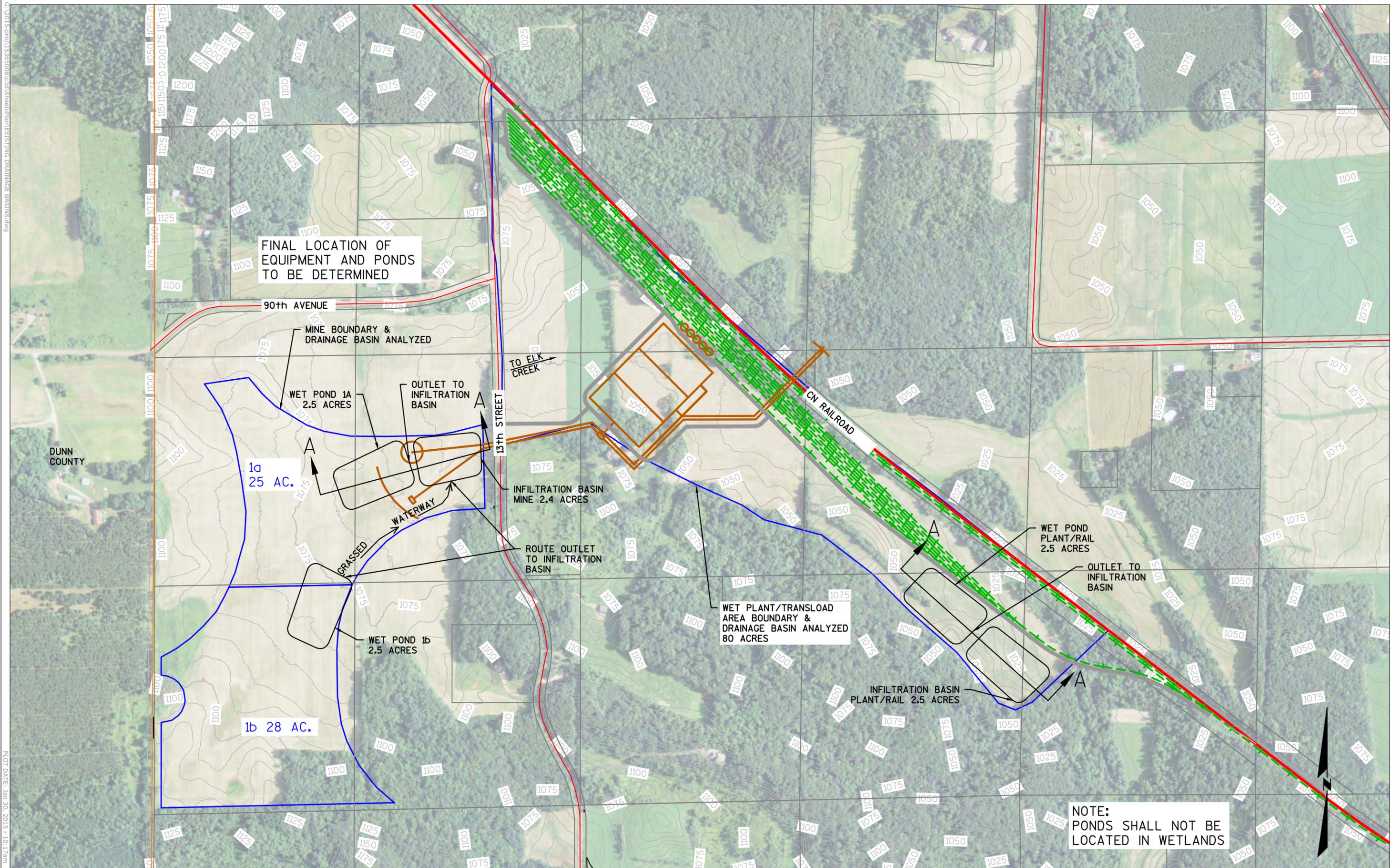
2600 COLLEGE DRIVE, P.O. BOX 230
 RICE LAKE, WISCONSIN 54868-0230
 TELEPHONE (715) 234-7008
 FAX (715) 234-1025

NORTHERN SANDS
 TOWN OF HOWARD, CHIPPEWA COUNTY, WISCONSIN

SHEET DESCRIPTION		DATE	DRAWN BY	
PHASES 1a, 1b, & WASH PLANT-TRANSLOAD EXISTING HYDROLOGY		1/30/2015	D.NESS	
SCALE 0 125 250		PROJECT NO.	SHEET NO.	
15263006		1		

G:\2015-PROJ\15365006\CAD\Sheets\plan\EXISTING DRAINAGE BASINS.dwg

PLOT DATE: Jan 30, 2015 - 10:17am



FINAL LOCATION OF EQUIPMENT AND PONDS TO BE DETERMINED

1a
25 AC.

1b 28 AC.

NOTE:
PONDS SHALL NOT BE LOCATED IN WETLANDS

NO.	BY	DATE	REVISIONS

PROJECT MANAGER
NICOLE HODKIEWICZ

CHECKED BY:

APPROVED BY:



2600 COLLEGE DRIVE, P.O. BOX 230
RICE LAKE, WISCONSIN 54868-0230
TELEPHONE (715) 234-7008
FAX (715) 234-1025

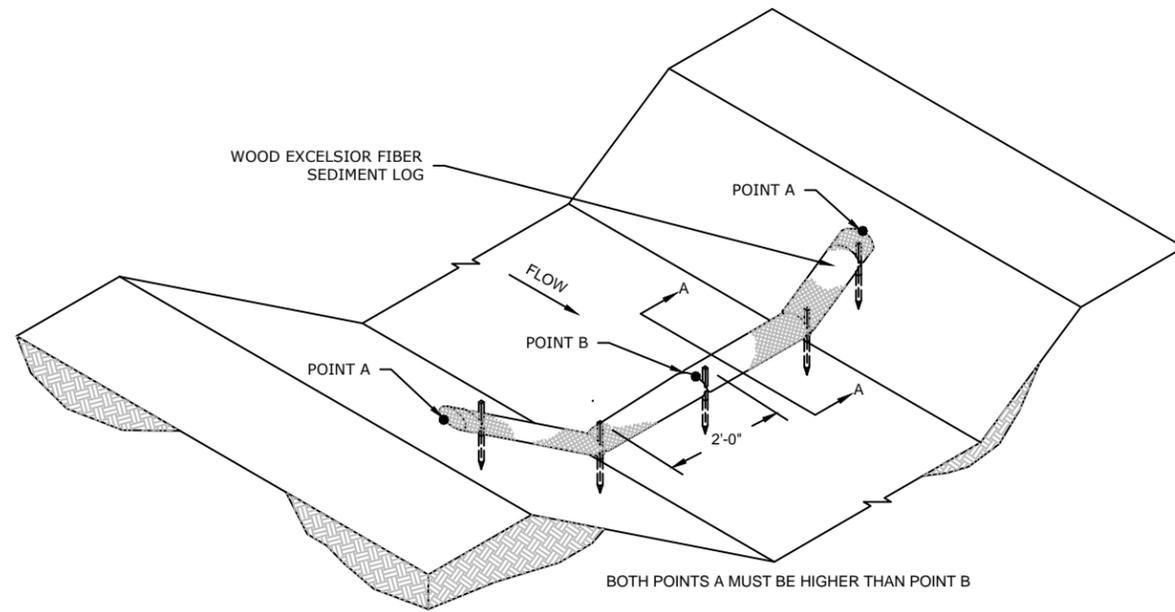
NORTHERN SANDS
TOWN OF HOWARD, CHIPPEWA COUNTY, WISCONSIN

SHEET DESCRIPTION
PHASES 1a, 1b, & WASH PLANT-TRANSLOAD PROPOSED STORMWATER MANAGEMENT

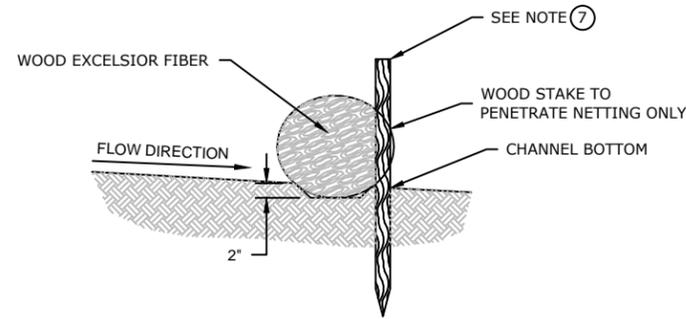
DATE 1/30/2015
SCALE 0 125 250

DRAWN BY D.NESS
PROJECT NO. 15263006
SHEET NO. 2

G:\2015-proj\15263006\cadd\Sheets\plan\EXISTING DRAINAGE BASINS.dwg



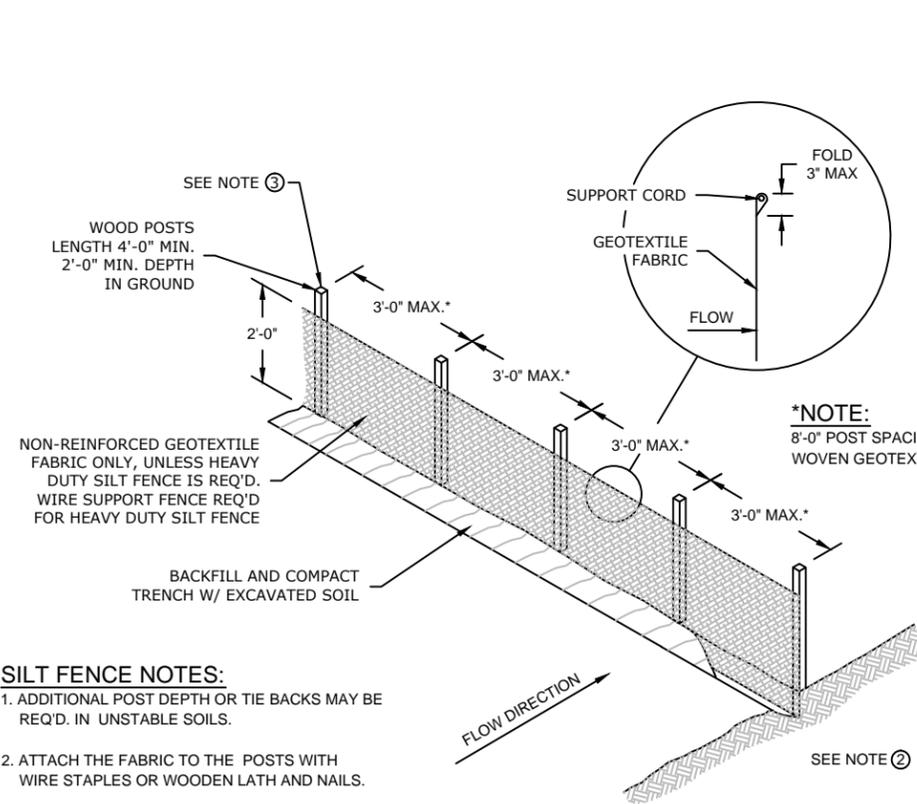
CHANNEL SEDIMENT LOG



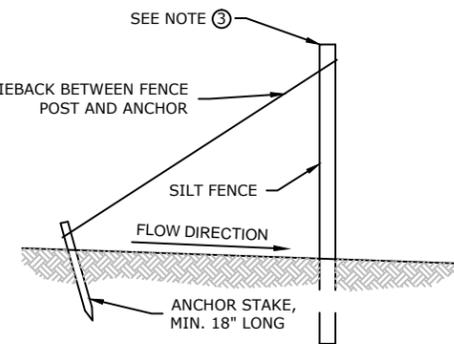
DETAIL A-A: STAKING DETAIL

SILT FENCE & INLET PROTECTION NOTES

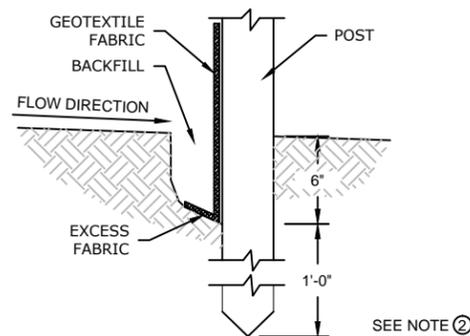
- ① HORIZONTAL BRACE WITH 2" X 4" WOODEN FRAME OR EQUIVALENT AT TOP OF POSTS AS DIRECTED BY THE ENGINEER.
- ② SILT FENCE SHALL BE MACHINE SLICED OR TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
- ③ WOOD POSTS SHALL BE A MINIMUM SIZE OF 1 1/8" X 1 1/8" OF OAK OR HICKORY.
- ④ DETAILS SHALL NOT BE SCALED.
- ⑤ PLAN SHEETS IDENTIFY RECOMMENDED LOCATION FOR EROSION & SEDIMENT CONTROL INSTALLATION. ACTUAL LOCATIONS SHALL BE AS DIRECTED BY THE ENGINEER.
- ⑥ FABRIC SHALL BE REPLACED AT THE ENGINEERS DISCRETION.
- ⑦ 1" DIAMETER STAKE SHALL EXTEND A MINIMUM OF 16" INTO GROUND AND PROTRUDE NO MORE THAN 6" ABOVE TOP OF LOG



SILT FENCE (NON-REINFORCED)



SILT FENCE TIE BACK (WHEN REQUIRED BY THE ENGINEER)



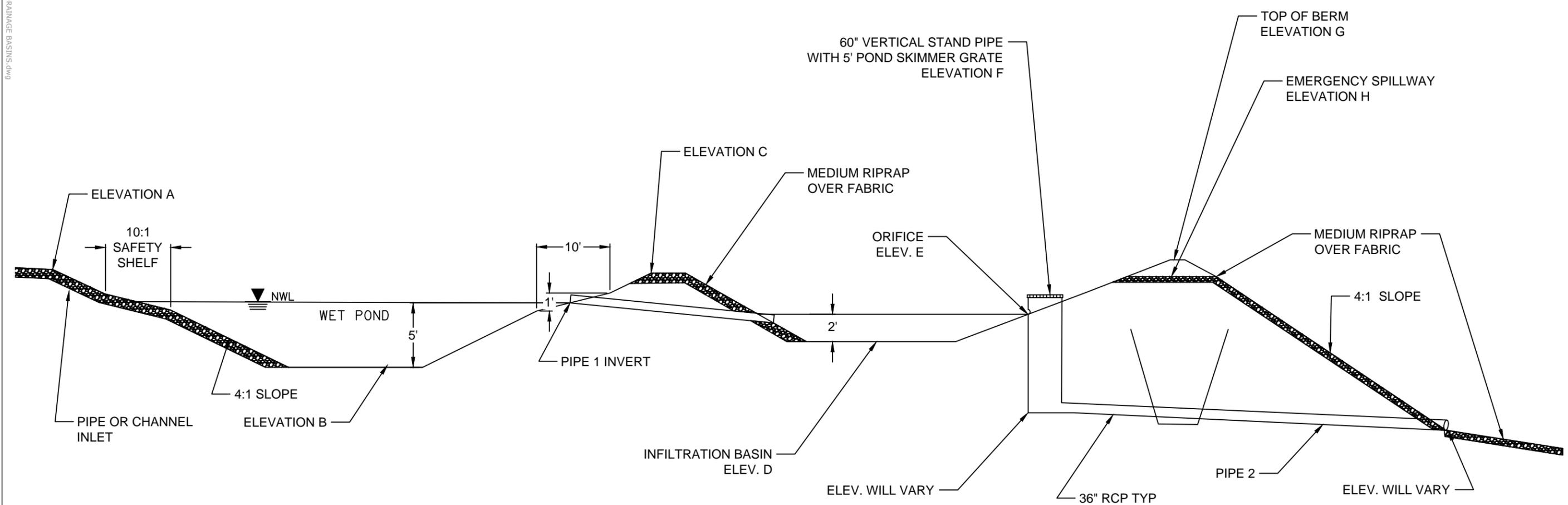
TRENCH DETAIL

SILT FENCE NOTES:

1. ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQ'D. IN UNSTABLE SOILS.
2. ATTACH THE FABRIC TO THE POSTS WITH WIRE STAPLES OR WOODEN LATH AND NAILS.
3. JOINING OF TWO LENGTHS OF SILT FENCE SHALL BE ACCOMPLISHED BY COMPLETELY TWISTING GEOTEXTILE FABRIC AROUND TWO ADJACENT END POSTS. GAPS IN FENCE ARE NOT ACCEPTABLE AND SHALL JUSTIFY NON-PAYMENT.

PLOT DATE: Jan 29, 2015 - 03:39pm

				PROJECT MANAGER NICOLE HODKIEWICZ		2600 COLLEGE DRIVE, P.O. BOX 230 RICE LAKE, WISCONSIN 54868-0230 TELEPHONE (715) 234-7008 FAX (715) 234-1025	NORTHERN SANDS TOWN OF HOWARD, CHIPPEWA COUNTY, WISCONSIN		SHEET DESCRIPTION		DATE 1/30/2015	DRAWN BY D.NESS	
NO.	BY	DATE	REVISIONS	CHECKED BY:					APPROVED BY:	EROSION CONTROL DETAILS		SCALE 0 N/A	PROJECT NO. 15263006



POND ELEMENT ELEVATIONS										
LOCATION	ELEV. A	ELEV. B	ELEV. C	ELEV. D	ELEV. E	ELEV. F	ELEV. G	ELEV. H	PIPE 1 INV.	PIPE 2 INV.
1a WET	1061	1053	1060	----	----	----	----	----	1058	----
1b WET	1080	1072	1078	----	----	----	----	----	1077	----
1a & 1b INFILTRATION	----	----	----	1055	1057	1059	1061	1060	----	VARIES
PLANT/RAIL WET	1025	1017	1023	----	----	----	----	----	1022	----
PLANT & RAIL INFILTRATION	----	----	----	1013	1015	1017	1020	1018	----	VARIES