0021

Incoming
C0070038
cc: Pam G
Dana D.

June 12, 2006

RECEIVED
JUN 14 2006
DIV. OF OIL, GAS & MINING

EarthFax

EarthFax
Engineering, Inc.
Engineers/Scientists
7324 So. Union Park Ave.
Suite100
Midvale, Utah 84047
Telephone 801-561-1555
Fax 801-561-1861
www.earthfax.com

Dennis N. Ware
Plateau Mining Corporation
P.O. Box 30
Helper, UT 84526

Subject: Willow Creek Raw Water Pond Permanent Impoundment Adequacy

Dear Dennis:

Pursuant to your request, I have evaluated the adequacy of the Raw Water Pond at the Willow Creek preparation plant for retention as a permanent impoundment under the rules of the Utah Division of Oil, Gas and Mining (specifically, the requirements of R645-301-733.200). The Raw Water Pond is designed to contain water diverted from the adjacent Price River. Prior to site reclamation, this water was used in the preparation plant for process purposes. Plateau has transferred ownership of this pond to the Price River Water Improvement District ("PRWID"), who currently utilizes the pond to provide a raw water source for the Willow Creek Mine buildings in Willow Creek Canyon.

The pond has been in place for at least 20 years, as evidenced by aerial photographs of the site. It is designed to hold approximately 4.3 acre-feet of water below the overflow device (a 15-inch diameter corrugated metal pipe that discharges to the Price River). The embankment of the pond extends a minimum of 2 feet above the overflow pipe.

I conducted an inspection of the pond on June 1, 2006 and observed no signs of instability. My casual observations of the pond over the past several years have also indicated no concerns with respect to the structural stability of the pond. In accordance with the requirements of R645-301-733.210, I also evaluated the minimum static safety factor of the pond embankment with normal pool for steady state seepage saturation conditions. Results of this evaluation are presented in Attachment A. These calculations were performed assuming the conservative condition that the embankment was saturated from the normal operating pool to the toe, with the phreatic surface extending at a constant slope from embankment toe to the Price River. Furthermore, in keeping with prior analyses of embankment stability at the preparation plant, the following conservative soil properties were assumed based on an evaluation of soils in the embankment:

Moist unit weight =	115 lb/ft^3
Saturated unit weight =	135 lb/ft^3
Cohesion intercept =	100 lb/ft^2
Friction angle =	34°

Using these conservative assumptions, the minimum static safety factor for the embankment is 4.698 (see Attachment A). Hence, the pond embankment meets the requirements of R645-301-733.210.

The following factors indicate that the Raw Water Pond also meets the requirements of R645-301-733.220 for use as a permanent impoundment:

- Size and configuration: The pond will be used as a storage impoundment by PRWID to meet the incidental raw-water needs of the Willow Creek Mine buildings under future operation by the College of Eastern Utah. These water needs are substantially lower than the past needs of the Willow Creek preparation plant, which was adequately serviced by the Raw Water Pond. Hence, in accordance with R645-301-733.221, the size and configuration of the pond are adequate for their intended use.
- Water quality: The quality of water diverted from the Price River to the Raw Water Pond is sufficient for the needs of the Willow Creek Mine buildings. Furthermore, any discharges from the pond will re-enter the Price River immediately downstream from the initial point of diversion. Since the pond is intended only for storage, the quality of any water discharged from the pond will be the same as that of the river into which it is discharged. Hence, the requirements of R645-301-733.222 will be satisfied after site reclamation is completed.
- Water level: PRWID will be both the owner and operator of the pond. Hence, they will maintain the pond level as necessary for their intended use. Thus, the pond will satisfy the requirements of R645-301-733.223.
- Final grading: No additional grading of the pond area is anticipated. The Raw Water Pond has operated adequately at its current configuration for over 20 years. As such, this configuration will be adequate to provide safe access for proposed water users, indicating that the pond will meet the requirements of R645-301-733.224.
- Diminution of water quality and quantity: Rights for use of this water have existed for several years. These or equivalent rights will be used by PRWID for future operation of the pond. Hence, downstream users will not be adversely affected by future use of the pond. Furthermore, as discussed above, use of the pond will not adversely affect downstream water quality. Thus, the pond will meet the requirements of R645-301-733.226.
- Suitability: The approved post-mining land use includes future operation of the Willow Creek Mine buildings. The Raw Water Pond is of a suitable capacity to supply the raw water needed at this facility. Hence, the requirements of R645-301-733.226 are met by the pond.

In accordance with the requirements of R645-301-743, I also evaluated the adequacy of the overflow pipe to safely handle runoff flowing into the pond. Results of this evaluation are presented in Attachment B. As indicated, the spillway system will safely convey the peak runoff into the pond from both the 25-year, 6-hour precipitation event and the 100-year, 6-hour precipitation event. As further indicated, the amount of water entering the pond during the 25- and 100-year events will be 2.5% and 5.1% of the storage volume below the invert of the

outflow pipe. Given the settling capacity of the pond and the effects of dilution, no adverse impacts to water quality in the Price River are anticipated from runoff entering the pond.

I also evaluated the ability of the Raw Water Pond to contain runoff from the 10-year, 24-hour precipitation event. The results of this evaluation, which are provided in Attachment A, indicate that runoff from this event equals 0.13 acre-foot. With a capacity of approximately 4.3 acre-feet, the pond can more than adequately contain runoff from the 10-year, 24-hour event. In the event that the pond is full to the invert of the outflow pipe, the calculations in Attachment A also indicate that the outflow pipe can adequately handle the peak flow from this event.

Based on these evaluations, it is my opinion that the Raw Water Pond meets the permanent impoundment requirements of R645-301-733 and other applicable regulations. Specifically, the size and configuration of this permanent impoundment is adequate for its intended purpose; the quality of impounded water will be suitable on a permanent basis for its intended use; any discharge from the impoundment will not degrade the quality of the receiving waters; the impoundment will not result in the diminution of the quality and quantity of water utilized by adjacent or surrounding landowners for agricultural, industrial, recreational or domestic uses; the water level will be sufficiently stable and be capable of supporting the approved post mining land use; final grading provides adequate safety and access for the proposed water users; and the embankment construction was designed to achieve necessary stability with an adequate margin of safety.

Please contact me if you have any questions.

Sincerely,

Richard B. White, P.E.
President

Attachments

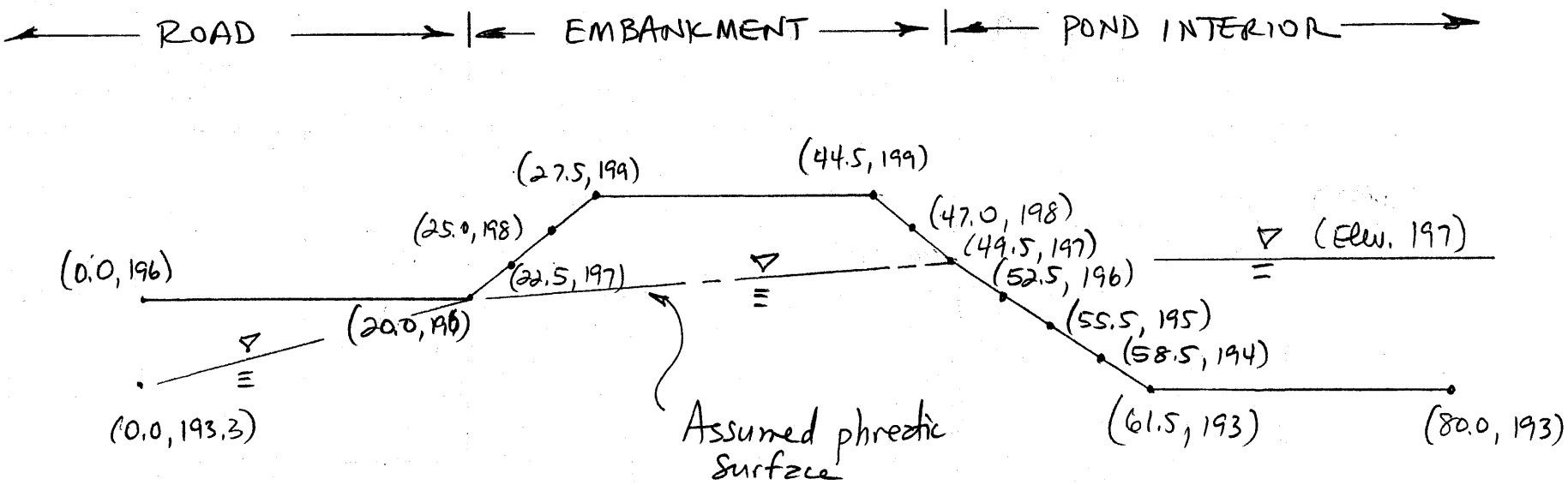
REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
12 Jun 2006
STATE OF UTAH

ATTACHMENT A

Slope Stability Calculations

PROJECT UC-709-23 PAGE 1 OF 1
COMPUTED TAW DATE 12 Jun 2006
CHECKED DATE

EARTHFAX ENGINEERING, INC.
ENGINEERS / SCIENTISTS



RAW WATER POND EMBANKMENT

CROSS SECTION THRU SW CORNER

SCALE: 1" = 10' (H.); 1" = 5' (V)
(VIEW TO NORTH)

```
*******************************************************************************
*****                              GeoSlope                               *****
*****                            Version 5.00                             *****
*****                                                                     *****
*****                 (c)1992 by GEOCOMP Corp, Concord, MA                *****
*****                   Licensed to EarthFax Engineering                  *****
*******************************************************************************
```

Problem Title : Raw Water Pond
Description : Determination of minimum slope safety factor
Remarks : Pond to remain as permanent impoundment

```
*******************************************************************************
*****                              INPUT DATA                             *****
*******************************************************************************
```

Profile Boundaries

Number of Boundaries : 12
Number of Top Boundaries : 12

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	196.00	20.00	196.00	1
2	20.00	196.00	22.50	197.00	1
3	22.50	197.00	25.00	198.00	1
4	25.00	198.00	27.50	199.00	1
5	27.50	199.00	44.50	199.00	1
6	44.50	199.00	47.00	198.00	1
7	47.00	198.00	49.50	197.00	1
8	49.50	197.00	52.50	196.00	1
9	52.50	196.00	55.50	195.00	1
10	55.50	195.00	58.50	194.00	1
11	58.50	194.00	61.50	193.00	1
12	61.50	193.00	80.00	193.00	1

Soil Parameters

Number of Soil Types : 1

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	115.0	135.0	100.0	34.0	0.00	0.0	0

Piezometric Surfaces

Number of Surfaces : 1
Unit Weight of Water : 62.40 pcf

Piezometric Surface No. : 1
Number of Coordinate Points : 4

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	193.30
2	20.00	196.00
3	49.50	197.00
4	80.00	197.00

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 10.00 ft
Right Initiation Point : 20.00 ft
Left Termination Point : 28.00 ft
Right Termination Point : 40.00 ft
Minimum Elevation : 190.00 ft
Segment Length : 1.00 ft
Positive Angle Limit : 0.00 deg
Negative Angle Limit : 0.00 deg

****
***** RESULTS *****
****

Surface No. : 1
Factor of Safety : 4.698
Circle Center X : 22.24 ft
Circle Center Y : 203.37 ft
Circle Radius : 8.10 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	19.03	195.94	0.29	1.8	0.0	0.0	4.8	7.3
2	19.50	195.77	0.64	17.3	0.0	0.0	25.5	18.3
3	19.91	195.62	0.18	7.7	0.0	0.0	9.2	5.2
4	20.40	195.50	0.79	60.0	0.0	0.0	68.5	27.3
5	21.29	195.35	0.99	133.7	0.0	0.0	139.5	41.3
6	22.14	195.29	0.71	128.4	0.0	0.0	128.2	33.6
7	22.64	195.29	0.29	58.4	0.0	0.0	58.3	14.5
8	23.28	195.36	0.99	223.0	0.0	0.0	218.0	52.6
9	24.26	195.55	0.97	240.2	0.0	0.0	233.9	54.9
10	24.87	195.72	0.25	64.6	0.0	0.0	63.6	14.9
11	25.34	195.91	0.68	173.6	0.0	0.0	170.9	40.0
12	25.83	196.12	0.30	75.1	0.0	0.0	75.7	18.0
13	26.26	196.36	0.58	143.5	0.0	0.0	144.5	34.9
14	26.96	196.81	0.81	184.0	0.0	0.0	191.6	48.8
15	27.43	197.17	0.13	27.7	0.0	0.0	30.2	8.2
16	27.80	197.51	0.60	103.1	0.0	0.0	109.8	33.2
17	28.42	198.17	0.64	61.7	0.0	0.0	60.3	29.9
18	28.89	198.77	0.29	7.6	0.0	0.0	-3.0	11.0

Surface No. : 2
Factor of Safety : 4.832
Circle Center X : 23.31 ft
Circle Center Y : 200.99 ft
Circle Radius : 5.98 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	20.44	195.76	0.88	41.9	0.0	0.0	64.1	29.6
2	21.35	195.35	0.94	128.7	0.0	0.0	150.8	41.7
3	22.16	195.13	0.68	135.0	0.0	0.0	142.7	34.2
4	22.65	195.05	0.31	71.2	0.0	0.0	75.0	16.9
5	23.31	195.02	1.00	264.4	0.0	0.0	264.4	57.6
6	24.30	195.11	0.99	296.3	0.0	0.0	290.1	61.2
7	24.90	195.23	0.21	64.8	0.0	0.0	63.9	13.4
8	25.37	195.39	0.74	234.0	0.0	0.0	231.0	48.4
9	26.18	195.76	0.88	273.3	0.0	0.0	279.0	59.6
10	26.76	196.12	0.30	87.9	0.0	0.0	95.4	21.1
11	27.15	196.43	0.49	136.8	0.0	0.0	147.9	33.5
12	27.45	196.68	0.10	26.7	0.0	0.0	31.6	7.5
13	27.78	197.05	0.57	127.7	0.0	0.0	148.2	38.3
14	28.34	197.79	0.54	75.0	0.0	0.0	87.9	33.0
15	28.77	198.60	0.33	15.3	0.0	0.0	-2.2	17.5

Surface No. : 3
Factor of Safety : 5.065
Circle Center X : 21.74 ft
Circle Center Y : 206.25 ft
Circle Radius : 11.44 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	17.06	195.83	0.78	15.5	0.0	0.0	25.9	20.3
2	17.52	195.63	0.13	5.8	0.0	0.0	8.1	4.0
3	18.06	195.44	0.95	61.5	0.0	0.0	75.1	29.7
4	19.01	195.16	0.97	94.4	0.0	0.0	105.5	33.8
5	19.75	195.00	0.50	57.7	0.0	0.0	61.1	18.1
6	20.24	194.92	0.49	66.1	0.0	0.0	69.8	19.0
7	20.99	194.85	1.00	177.2	0.0	0.0	180.5	43.8
8	21.99	194.83	1.00	226.0	0.0	0.0	225.0	49.7
9	22.49	194.84	0.01	3.5	0.0	0.0	3.4	0.7
10	22.99	194.89	0.98	259.3	0.0	0.0	255.0	53.4
11	23.97	195.05	0.98	286.7	0.0	0.0	280.9	57.2
12	24.73	195.22	0.54	165.6	0.0	0.0	162.9	32.8
13	25.21	195.36	0.42	131.6	0.0	0.0	129.5	25.9
14	25.89	195.61	0.93	294.5	0.0	0.0	293.2	58.8
15	26.80	196.01	0.90	279.5	0.0	0.0	283.4	57.5
16	27.26	196.24	0.03	8.1	0.0	0.0	8.4	1.7
17	27.39	196.32	0.22	68.3	0.0	0.0	71.0	14.7
18	27.80	196.57	0.60	168.7	0.0	0.0	174.9	37.2
19	28.51	197.05	0.81	181.0	0.0	0.0	191.4	45.2
20	29.28	197.67	0.75	114.6	0.0	0.0	121.1	35.9
21	30.00	198.36	0.69	50.4	0.0	0.0	45.9	25.9
22	30.46	198.86	0.22	3.4	0.0	0.0	-2.7	6.6

Surface No. : 4
Factor of Safety : 5.077
Circle Center X : 21.51 ft
Circle Center Y : 204.19 ft
Circle Radius : 8.33 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	20.00	196.00	0.00	0.0	0.0	0.0	0.0	0.0
2	20.50	195.94	0.99	29.6	0.0	0.0	32.8	24.0
3	21.49	195.88	1.00	82.9	0.0	0.0	83.0	30.7
4	22.25	195.91	0.51	57.9	0.0	0.0	56.3	17.5
5	22.74	195.96	0.49	63.3	0.0	0.0	61.7	17.8
6	23.25	196.06	0.52	74.5	0.0	0.0	71.7	20.1
7	23.73	196.17	0.45	68.4	0.0	0.0	66.1	17.9
8	24.43	196.40	0.94	147.3	0.0	0.0	142.8	38.7
9	24.95	196.61	0.11	16.6	0.0	0.0	16.4	4.5
10	25.39	196.84	0.78	118.8	0.0	0.0	116.8	32.9
11	26.20	197.32	0.83	110.1	0.0	0.0	109.8	34.3
12	26.99	197.93	0.75	74.7	0.0	0.0	73.5	29.5
13	27.43	198.34	0.14	10.1	0.0	0.0	9.2	5.3
14	27.76	198.71	0.53	17.8	0.0	0.0	8.1	16.6

Surface No. : 5
Factor of Safety : 5.247
Circle Center X : 23.50 ft
Circle Center Y : 204.61 ft
Circle Radius : 10.34 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	17.98	195.88	0.41	5.8	0.0	0.0	13.2	10.8
2	18.41	195.62	0.45	19.5	0.0	0.0	31.1	14.0
3	19.09	195.27	0.90	75.5	0.0	0.0	98.4	31.7
4	19.77	194.98	0.46	53.9	0.0	0.0	63.5	17.4
5	20.24	194.81	0.48	71.4	0.0	0.0	83.2	20.5
6	20.97	194.60	0.97	199.2	0.0	0.0	217.3	47.0
7	21.95	194.40	0.99	270.1	0.0	0.0	281.6	55.3
8	22.47	194.33	0.06	18.1	0.0	0.0	18.3	3.5
9	22.97	194.30	0.94	312.0	0.0	0.0	315.6	58.5
10	23.94	194.30	1.00	376.8	0.0	0.0	374.3	67.2
11	24.72	194.36	0.56	228.0	0.0	0.0	224.7	39.7
12	25.21	194.43	0.43	180.4	0.0	0.0	177.8	31.1
13	25.91	194.57	0.97	424.0	0.0	0.0	418.6	72.9
14	26.87	194.85	0.94	423.3	0.0	0.0	422.6	73.4
15	27.42	195.05	0.15	69.4	0.0	0.0	70.7	12.3
16	27.88	195.26	0.75	324.5	0.0	0.0	330.3	58.3
17	28.69	195.69	0.86	329.4	0.0	0.0	344.3	63.3
18	29.39	196.13	0.54	178.8	0.0	0.0	193.3	37.6
19	29.80	196.42	0.27	79.8	0.0	0.0	85.8	17.4
20	30.31	196.85	0.75	185.7	0.0	0.0	207.0	45.7
21	31.02	197.55	0.68	114.4	0.0	0.0	129.2	35.7
22	31.67	198.31	0.61	48.7	0.0	0.0	47.2	25.1
23	32.07	198.85	0.19	3.2	0.0	0.0	-3.9	6.2

Surface No. : 6
Factor of Safety : 5.367
Circle Center X : 21.38 ft
Circle Center Y : 208.62 ft
Circle Radius : 13.90 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	16.02	195.81	0.92	20.5	0.0	0.0	31.7	22.6
2	16.57	195.58	0.19	9.1	0.0	0.0	11.3	5.1
3	17.05	195.42	0.76	50.4	0.0	0.0	60.7	22.5
4	17.91	195.17	0.97	92.4	0.0	0.0	103.6	31.7
5	18.89	194.96	0.98	118.2	0.0	0.0	126.5	34.5
6	19.69	194.83	0.62	83.5	0.0	0.0	86.5	22.5
7	20.19	194.78	0.37	55.6	0.0	0.0	57.4	14.2
8	20.87	194.74	1.00	185.1	0.0	0.0	186.7	42.1
9	21.87	194.74	1.00	231.1	0.0	0.0	229.6	47.5
10	22.44	194.76	0.13	32.8	0.0	0.0	32.3	6.5
11	22.93	194.82	0.87	234.6	0.0	0.0	231.1	45.3
12	23.86	194.95	0.98	293.3	0.0	0.0	288.1	54.8
13	24.67	195.12	0.65	205.5	0.0	0.0	202.4	37.9
14	25.16	195.25	0.32	103.0	0.0	0.0	101.5	18.9

15	25.79	195.45	0.95	312.9	0.0	0.0	310.7	57.7
16	26.73	195.80	0.92	307.1	0.0	0.0	308.7	57.4
17	27.34	196.07	0.31	102.5	0.0	0.0	104.8	19.7
18	27.61	196.20	0.23	73.2	0.0	0.0	74.9	14.2
19	27.91	196.35	0.35	108.0	0.0	0.0	110.3	21.3
20	28.51	196.70	0.86	227.3	0.0	0.0	236.0	48.3
21	29.35	197.24	0.82	165.8	0.0	0.0	174.0	40.5
22	30.15	197.84	0.78	103.3	0.0	0.0	107.0	32.1
23	30.90	198.50	0.73	41.9	0.0	0.0	35.7	23.1
24	31.34	198.92	0.14	1.3	0.0	0.0	-2.1	3.7

Surface No. : 7
Factor of Safety : 5.394
Circle Center X : 24.24 ft
Circle Center Y : 203.45 ft
Circle Radius : 9.17 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	18.99	195.94	0.19	1.4	0.0	0.0	4.7	4.9
2	19.41	195.67	0.65	24.7	0.0	0.0	41.8	19.5
3	19.87	195.40	0.27	18.6	0.0	0.0	25.1	8.7
4	20.31	195.17	0.63	68.8	0.0	0.0	88.7	24.1
5	21.10	194.85	0.94	172.0	0.0	0.0	199.0	43.4
6	22.03	194.56	0.93	241.6	0.0	0.0	261.2	50.5
7	22.52	194.44	0.04	11.5	0.0	0.0	12.4	2.3
8	23.03	194.37	0.99	324.1	0.0	0.0	335.0	60.4
9	24.03	194.29	1.00	381.5	0.0	0.0	383.2	66.5
10	24.76	194.30	0.47	194.8	0.0	0.0	192.7	32.9
11	25.26	194.35	0.53	227.5	0.0	0.0	225.1	37.9
12	26.02	194.47	0.98	444.6	0.0	0.0	438.7	73.4
13	26.98	194.71	0.95	447.8	0.0	0.0	446.0	74.3
14	27.48	194.87	0.04	18.5	0.0	0.0	18.8	3.1
15	27.94	195.07	0.88	396.1	0.0	0.0	402.6	68.1
16	28.81	195.51	0.87	347.4	0.0	0.0	364.0	64.1
17	29.64	196.05	0.79	267.0	0.0	0.0	291.0	54.5
18	30.04	196.35	0.02	5.9	0.0	0.0	6.4	1.2
19	30.42	196.69	0.74	195.8	0.0	0.0	223.0	46.4
20	31.12	197.41	0.66	121.0	0.0	0.0	142.1	36.3
21	31.73	198.19	0.57	53.5	0.0	0.0	56.6	25.6
22	32.13	198.80	0.22	5.1	0.0	0.0	-4.0	8.0

Surface No. : 8
Factor of Safety : 5.431
Circle Center X : 23.89 ft
Circle Center Y : 200.72 ft
Circle Radius : 6.88 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	18.96	195.93	0.14	1.1	0.0	0.0	5.3	4.2
2	19.33	195.60	0.59	27.6	0.0	0.0	57.5	22.0
3	19.81	195.20	0.37	34.4	0.0	0.0	51.6	14.7
4	20.23	194.92	0.45	61.3	0.0	0.0	88.4	21.1
5	20.90	194.55	0.90	188.0	0.0	0.0	231.7	47.2
6	21.83	194.18	0.95	280.3	0.0	0.0	311.9	57.1
7	22.40	194.01	0.19	65.1	0.0	0.0	67.8	12.0
8	22.90	193.93	0.80	295.2	0.0	0.0	307.6	53.0
9	23.80	193.86	1.00	420.5	0.0	0.0	421.6	70.8
10	24.65	193.90	0.70	320.8	0.0	0.0	316.6	52.4
11	25.14	193.97	0.29	134.9	0.0	0.0	133.2	21.9
12	25.77	194.12	0.96	463.0	0.0	0.0	459.9	75.5
13	26.70	194.46	0.91	442.5	0.0	0.0	451.7	74.5
14	27.33	194.78	0.34	162.1	0.0	0.0	173.7	29.0
15	27.75	195.05	0.50	229.2	0.0	0.0	245.4	41.5
16	28.38	195.53	0.76	301.5	0.0	0.0	345.6	61.3
17	28.95	196.09	0.39	130.2	0.0	0.0	163.1	31.2
18	29.28	196.46	0.26	77.3	0.0	0.0	95.8	19.4
19	29.68	197.04	0.54	121.0	0.0	0.0	164.5	38.8
20	30.15	197.92	0.41	50.9	0.0	0.0	65.3	26.5
21	30.45	198.69	0.18	6.4	0.0	0.0	-13.2	10.4

Surface No. : 9
Factor of Safety : 5.448
Circle Center X : 21.91 ft
Circle Center Y : 202.92 ft
Circle Radius : 9.39 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	15.87	195.74	0.63	18.5	0.0	0.0	40.4	19.9
2	16.25	195.42	0.15	9.7	0.0	0.0	17.2	5.6
3	16.75	195.09	0.83	87.5	0.0	0.0	127.3	34.1
4	17.61	194.58	0.89	144.7	0.0	0.0	184.0	41.1
5	18.52	194.17	0.93	195.8	0.0	0.0	228.0	46.6
6	19.47	193.86	0.97	237.2	0.0	0.0	259.3	50.5
7	19.97	193.73	0.05	13.3	0.0	0.0	13.8	2.7
8	20.47	193.65	0.94	273.3	0.0	0.0	285.0	52.7
9	21.44	193.55	1.00	347.2	0.0	0.0	350.7	61.8
10	22.22	193.54	0.56	217.0	0.0	0.0	215.3	37.0
11	22.72	193.57	0.43	175.5	0.0	0.0	174.2	29.5
12	23.43	193.66	0.99	420.7	0.0	0.0	414.9	69.7
13	24.40	193.88	0.96	430.5	0.0	0.0	427.0	71.2
14	24.94	194.03	0.12	52.2	0.0	0.0	52.6	8.8
15	25.41	194.22	0.82	369.9	0.0	0.0	373.1	62.3
16	26.26	194.61	0.89	396.8	0.0	0.0	411.5	69.3

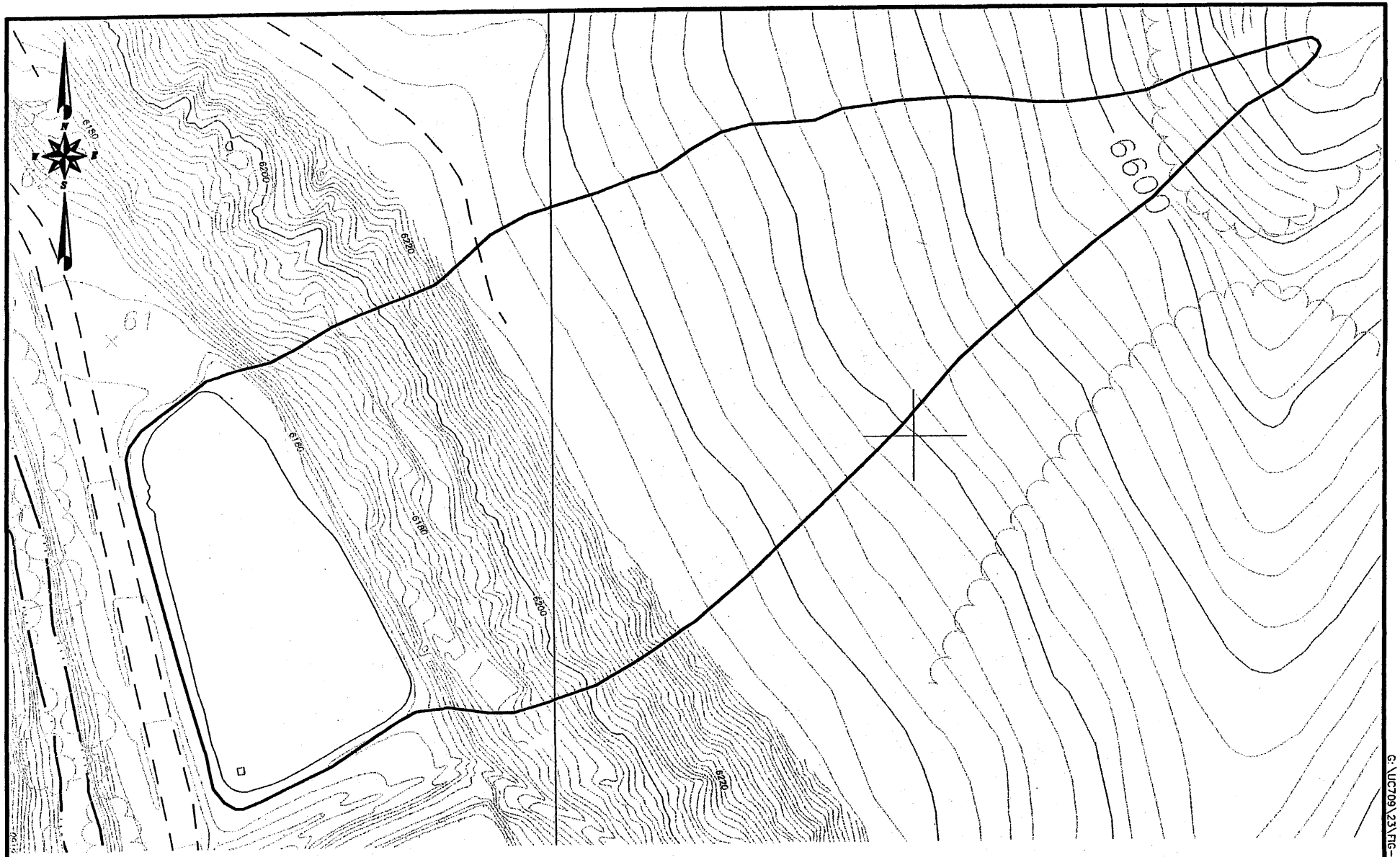
17	27.10	195.11	0.80	342.9	0.0	0.0	369.9	63.4
18	27.52	195.39	0.03	13.7	0.0	0.0	14.7	2.6
19	27.92	195.72	0.77	290.0	0.0	0.0	328.4	59.0
20	28.42	196.16	0.24	79.8	0.0	0.0	95.8	18.3
21	28.77	196.52	0.45	128.4	0.0	0.0	152.8	30.8
22	29.30	197.15	0.62	130.9	0.0	0.0	163.4	38.6
23	29.88	197.97	0.53	62.6	0.0	0.0	74.3	27.6
24	30.29	198.70	0.29	10.2	0.0	0.0	-1.7	12.2

Surface No. : 10
Factor of Safety : 5.479
Circle Center X : 22.01 ft
Circle Center Y : 200.73 ft
Circle Radius : 7.14 ft

Slice	X (ft)	Y (ft)	Width (ft)	Weight (lbs)	Load (lbs)	Water (lbs)	Normal (lbs)	Shear (lbs)
1	16.87	195.80	0.40	9.2	0.0	0.0	26.1	13.5
2	17.23	195.45	0.31	19.6	0.0	0.0	40.1	12.9
3	17.78	195.00	0.80	92.3	0.0	0.0	141.0	35.6
4	18.62	194.47	0.88	155.0	0.0	0.0	199.4	42.8
5	19.53	194.06	0.94	209.1	0.0	0.0	240.8	47.9
6	20.00	193.88	0.00	0.5	0.0	0.0	0.6	0.1
7	20.49	193.77	0.98	272.1	0.0	0.0	290.3	54.0
8	21.48	193.63	1.00	339.6	0.0	0.0	345.1	60.7
9	22.24	193.61	0.52	197.9	0.0	0.0	196.2	33.7
10	22.74	193.64	0.47	188.3	0.0	0.0	186.6	31.6
11	23.46	193.76	0.98	408.3	0.0	0.0	402.9	67.9
12	24.42	194.03	0.94	404.6	0.0	0.0	405.5	68.2
13	24.95	194.23	0.11	45.7	0.0	0.0	47.4	8.0
14	25.39	194.46	0.78	330.8	0.0	0.0	343.3	58.3
15	26.18	194.96	0.81	327.6	0.0	0.0	359.1	62.5
16	26.95	195.60	0.72	263.7	0.0	0.0	311.5	56.6
17	27.40	196.07	0.19	63.3	0.0	0.0	82.5	15.8
18	27.53	196.22	0.05	17.2	0.0	0.0	22.4	4.4
19	27.74	196.49	0.37	107.5	0.0	0.0	138.4	28.1
20	28.18	197.16	0.50	105.7	0.0	0.0	148.0	36.5
21	28.62	198.06	0.37	40.5	0.0	0.0	48.2	24.2
22	28.86	198.76	0.12	3.2	0.0	0.0	-15.1	7.1

ATTACHMNT B

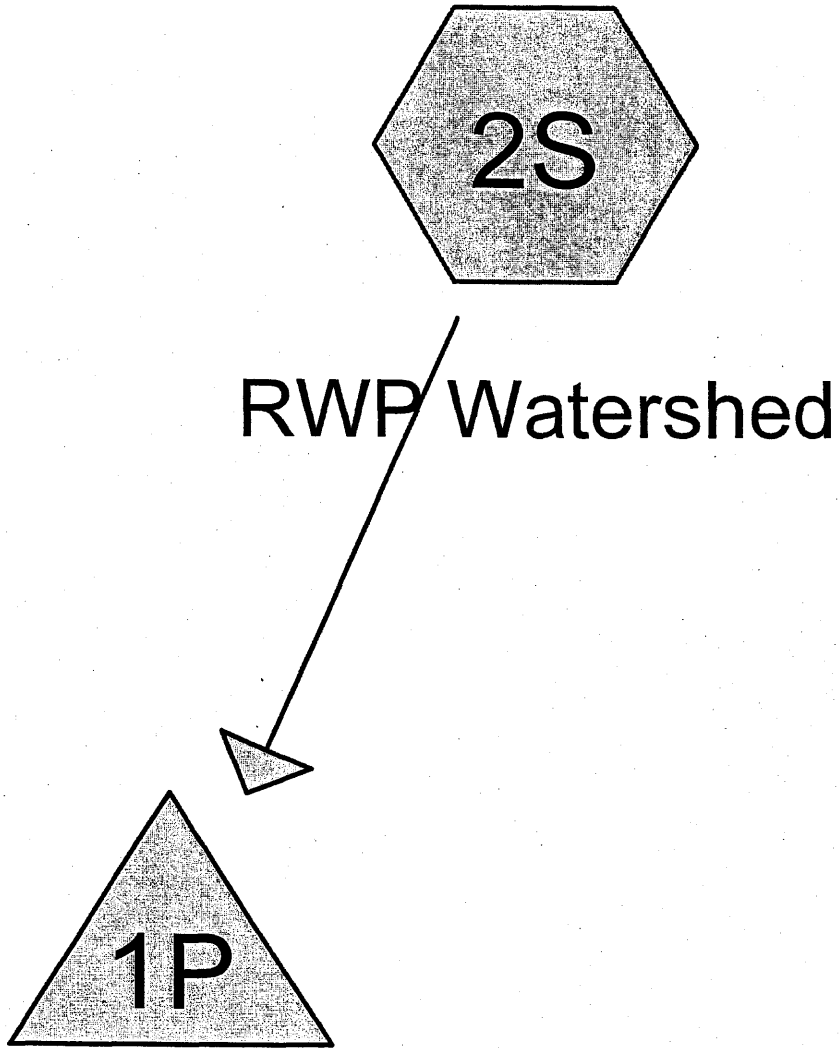
HydroCAD Calculations

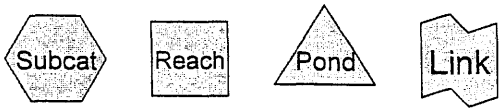


RAW WATER POND DRAINAGE AREA

EarthFax

G:\UC709\23\FIG-DRAINAGE.DWG\06-05-06





Drainage Diagram for Raw Water Pond
Prepared by EarthFax Engineering, Inc. 6/5/2006
HydroCAD® 7.10 s/n 003900 © 2005 HydroCAD Software Solutions LLC

Subcatchment 2S: RWP Watershed

Runoff = 1.20 cfs @ 3.39 hrs, Volume= 0.114 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type II 24-hr 6.00 hrs 25-yr, 6-hr Rainfall=1.60"

Area (ac)	CN	Description
5.580	70	Drainage area
1.110	100	Pond area
6.690	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.4	6,400	0.3800	4.0		**Lag/CN Method, Raw water pond watershed**

Pond 1P: Raw Water Pond

Inflow Area =	6.690 ac,	Inflow Depth =	0.20"	for 25-yr, 6-hr event	
Inflow =	1.20 cfs @	3.39 hrs,	Volume=	0.114 af	
Outflow =	0.02 cfs @	6.63 hrs,	Volume=	0.033 af,	Atten= 98%, Lag= 194.6 min
Primary =	0.02 cfs @	6.63 hrs,	Volume=	0.033 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Starting Elev= 197.00' Surf.Area= 1.112 ac Storage= 4.299 af
Peak Elev= 197.10' @ 6.63 hrs Surf.Area= 1.117 ac Storage= 4.408 af (0.109 af above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 552.4 min (805.3 - 252.8)

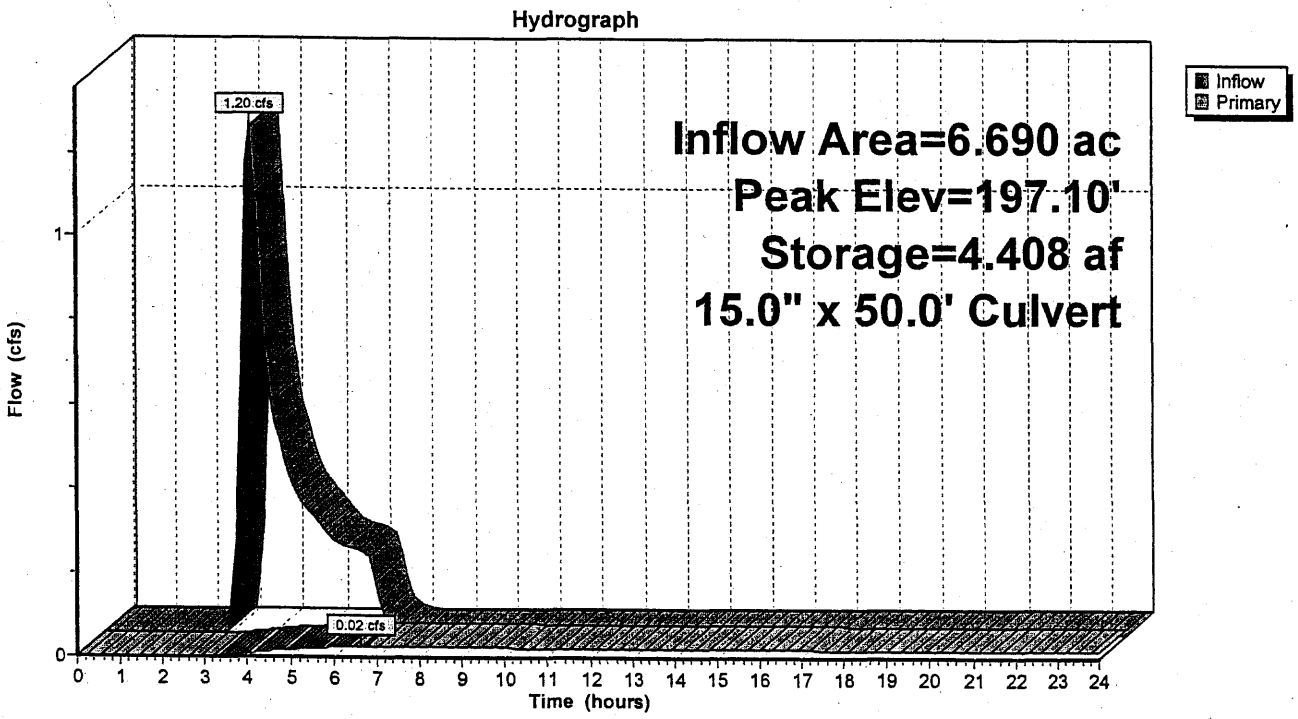
Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	6.631 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
192.00	0.413	0.000	0.000
193.00	0.647	0.530	0.530
194.00	0.847	0.747	1.277
195.00	0.988	0.918	2.195
196.00	1.054	1.021	3.216
197.00	1.112	1.083	4.299
198.00	1.165	1.139	5.437
199.00	1.223	1.194	6.631

Device	Routing	Invert	Outlet Devices
#1	Primary	197.00'	**15.0" x 50.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 196.50' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=0.02 cfs @ 6.63 hrs HW=197.10' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.02 cfs @ 0.8 fps)

Pond 1P: Raw Water Pond



Subcatchment 2S: RWP Watershed

Runoff = 3.14 cfs @ 3.35 hrs, Volume= 0.240 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type II 24-hr 6.00 hrs 100-yr, 6-hr Rainfall=2.10"

Area (ac)	CN	Description
5.580	70	Drainage area
1.110	100	Pond area
6.690	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.4	6,400	0.3800	4.0		**Lag/CN Method, Raw water pond watershed**

Pond 1P: Raw Water Pond

Inflow Area =	6.690 ac,	Inflow Depth =	0.43"	for	100-yr, 6-hr event
Inflow =	3.14 cfs @	3.35 hrs,	Volume=	0.240 af	
Outflow =	0.10 cfs @	6.47 hrs,	Volume=	0.108 af,	Atten= 97%, Lag= 187.1 min
Primary =	0.10 cfs @	6.47 hrs,	Volume=	0.108 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Starting Elev= 197.00' Surf.Area= 1.112 ac Storage= 4.299 af
Peak Elev= 197.20' @ 6.47 hrs Surf.Area= 1.122 ac Storage= 4.520 af (0.221 af above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 496.8 min (741.6 - 244.8)

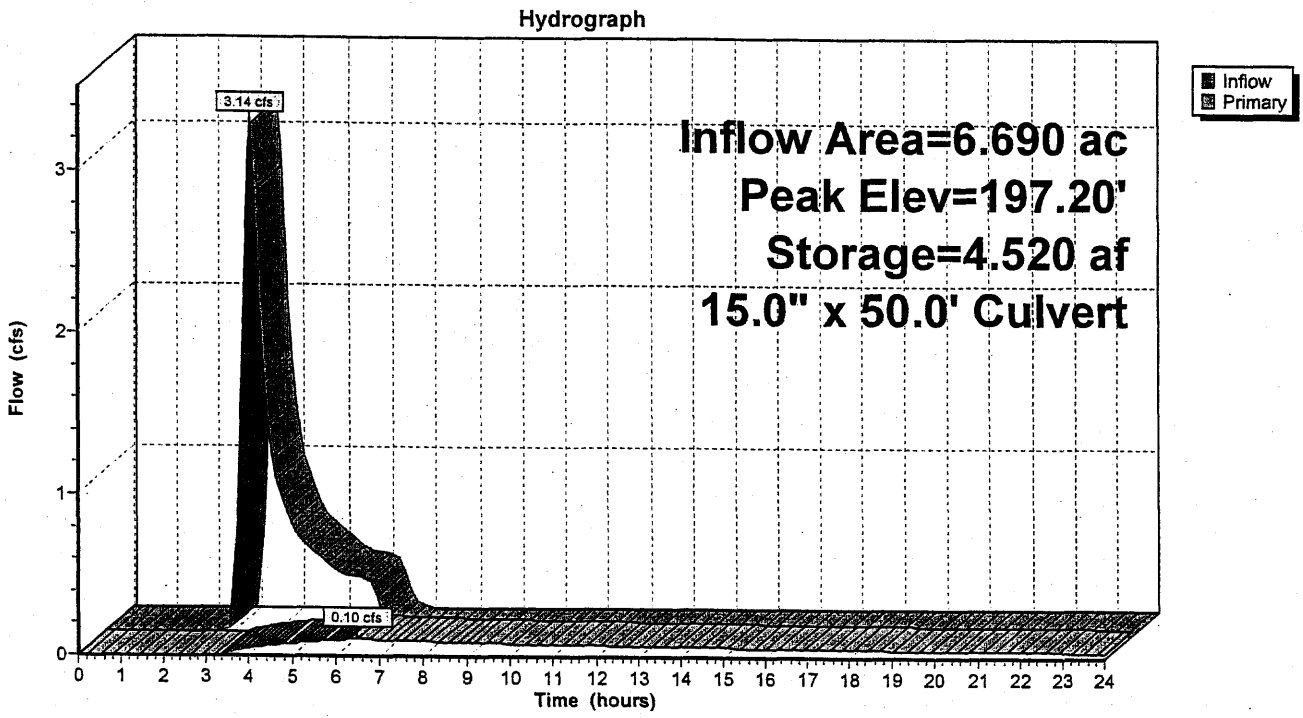
Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	6.631 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
192.00	0.413	0.000	0.000
193.00	0.647	0.530	0.530
194.00	0.847	0.747	1.277
195.00	0.988	0.918	2.195
196.00	1.054	1.021	3.216
197.00	1.112	1.083	4.299
198.00	1.165	1.139	5.437
199.00	1.223	1.194	6.631

Device	Routing	Invert	Outlet Devices
#1	Primary	197.00'	**15.0" x 50.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 196.50' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=0.10 cfs @ 6.47 hrs HW=197.20' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.10 cfs @ 1.2 fps)

Pond 1P: Raw Water Pond



Subcatchment 2S: RWP Watershed

Runoff = 1.24 cfs @ 12.27 hrs, Volume= 0.160 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 10-yr, 24-hr Rainfall=1.80"

Area (ac)	CN	Description
5.580	70	Drainage area
1.110	100	Pond area
6.690	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.4	6,400	0.3800	4.0		**Lag/CN Method, Raw water pond watershed**

Pond 1P: Raw Water Pond

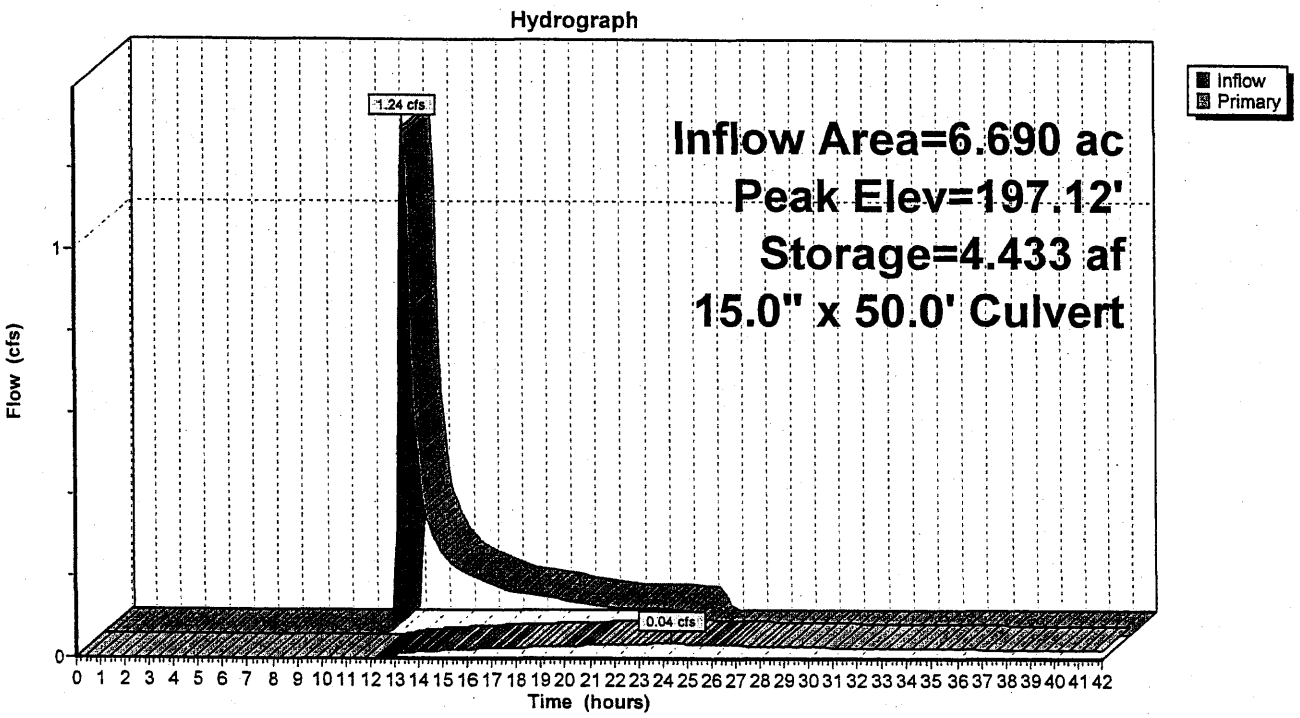
Inflow Area =	6.690 ac,	Inflow Depth =	0.29"	for	10-yr, 24-hr event
Inflow =	1.24 cfs @	12.27 hrs,	Volume=	0.160 af	
Outflow =	0.04 cfs @	24.32 hrs,	Volume=	0.065 af,	Atten= 97%, Lag= 723.1 min
Primary =	0.04 cfs @	24.32 hrs,	Volume=	0.065 af	

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 197.00' Surf.Area= 1.112 ac Storage= 4.299 af
Peak Elev= 197.12' @ 24.32 hrs Surf.Area= 1.118 ac Storage= 4.433 af (0.134 af above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 712.5 min (1,635.1 - 922.5)

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	6.631 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
192.00	0.413	0.000	0.000
193.00	0.647	0.530	0.530
194.00	0.847	0.747	1.277
195.00	0.988	0.918	2.195
196.00	1.054	1.021	3.216
197.00	1.112	1.083	4.299
198.00	1.165	1.139	5.437
199.00	1.223	1.194	6.631

Device	Routing	Invert	Outlet Devices
#1	Primary	197.00'	**15.0" x 50.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 196.50' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=0.04 cfs @ 24.32 hrs HW=197.12' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.04 cfs @ 0.9 fps)

Pond 1P: Raw Water Pond