C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, P.C.

ENGINEERING ASSESSMENT
for
SILVER CREEK DETENTION BASIN DAM

NATIONAL DAM ID: Not Registered
NY STATE ID: Not Registered

Owned and Operated by:

CITY OF ONEONTA
OTSEGO COUNTY, NY

Latitude N 42° 27′ 41.5″
Longitude W 75° 4′ 10″

Document Date: February 18, 2014

Assessment Performed by: Richard C. Wakeman, P.E.
NYS License No. 057208

Engineering Assessment
Silver Creek Detention Basin Dam
City of Oneonta, New York

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1.0 INTRODUCTION

This Engineering Assessment of Silver Creek Detention Basin Dam in the City of Oneonta, New York has been made in general accordance with New York State Department of Environmental Conservation (DEC) Dam Safety Regulations, Part 673.13. Included in this assessment is a review of existing documentation for the dam, an Initial Safety Inspection, a hydraulic and hydrologic analysis, a hazard classification and stability assessment of the dam. Conclusions and recommendations along with a schedule for correcting deficiencies disclosed by this assessment are presented herein.

2.0 SAFETY INSPECTION

2.1 Document Review

Prior to visually inspecting the dam, existing documentation in the possession of the City of Oneonta was reviewed. Very little information was recovered and was limited to a topographic survey of the dam and its discharge channel for a distance of approximately 550 feet downstream of the dam. The dam is not currently registered in DEC's Dam Safety database and, as such, does not have either a New York State identification number or a hazard classification.

2.2 Dam Description

Silver Creek Detention Basin Dam is a structure consisting of a concrete spillway section and earthen closure embankments on either side of the spillway. The dam is located in the City of Oneonta, New York, at latitude 42 degrees, 27 minutes, 41.5 seconds north and longitude 75 degrees, 4 minutes, 10 seconds west. City personnel are unsure as to the date of the dam's original construction, although it is believed to have been at least several decades ago. No modifications or repairs are known to have been made to the structure.

The dam's primary spillway is a 12-inch diameter drop-inlet present along the upstream face of the dam. If the capacity of this drop inlet is exceeded, flow may also pass over the dam's concrete spillway. Steel beams, approximately 2 feet on-center, are present along the length of the crest. It is reported by City personnel that these beams were placed along the crest to stop debris from entering the downstream channel, although it is believed that they were originally constructed for holding flashboards.

The approximate length of the spillway is 50 feet and its height approximately 6.5 feet as measured from the crest of the spillway to its downstream toe. On either side of the spillway are short sections of earthen embankment extending from the spillway training walls to original ground. The spillway itself is stepped on its downstream side (See photograph No. 1).

2.3 Physical Inspection

The physical condition of Silver Creek Detention Basin Dam was inspected on July 19, 2012 by personnel from our office. Weather conditions on the day of inspection were cool and overcast. The water level retained behind the dam was approximately 6 inches above the invert of the drop-inlet structure.

Appendix A contains a Visual Inspection Checklist. Photographs that are referenced on the Visual Inspection Checklist are included in Appendix B. A field sketch of the dam made at the time of the ISI is included in Appendix C.

2.3.1 Spillway Section

The dam's spillway is a reinforced concrete structure, approximately 6.5 feet tall and 50 feet in length as shown in Photograph No. 1. At the time of inspection, the spillway's concrete was observed to be in relatively poor condition, as seen in Photograph Nos. 7 & 8. Significant deterioration and erosion of its concrete surfaces were apparent, and, at or near the centerline of the spillway, this erosion has removed approximately 3 inches of concrete. At several locations, in particular along the upstream edge of the spillway crest, the concrete's reinforcing steel is exposed as seen in Photograph No. 12. Structural cracking was observed along the upstream face of the spillway as shown in Photograph No. 13. At the time of inspection, the crack extended from at or near the left abutment to a point near the drop-inlet structure. The width of the crack was estimated to range from hairline to nearly one (1) inch. Its depth could not be determined due to the presence of impounded water behind the dam, although it appeared to be limited. Areas of crazing were observed along the downstream face of the spillway and, at several of these locations, efflorescence was noted (Photograph Nos. 1, 7, & 8). On the downstream side of the spillway, efflorescence was observed at the base of each of the spillway's steps, as seen in Photograph Nos. 8 and 11.

Grouted masonry training walls are present at the transition point between the concrete gravity section and a pair of small earthen closure embankments to each side of the spillway. A series of small diameter pipes (either 2 or 4 inch) were observed daylighting through the training walls and discharge channel walls at approximate 10-foot intervals (Photograph No. 2). The training walls appeared to be in fair condition, with only modest amounts of deterioration noted of the mortar. Concrete placed as caps over the walls have experienced moderate deterioration of their surfaces as shown in Photograph No. 14.

2.3.2 Earthen Embankments

The dam's earthen closure embankments were found to be poorly maintained. Numerous trees, ranging in size from 1 inch to 4 inches in diameter, were present at or just behind the right training wall. With the exception of the right upstream slope, little to no vegetative cover was present across the earthen embankments as shown in Photograph Nos. 3 & 4. Also observed and shown in Photograph No. 4 are the remains of a tree stump and its root mass. A poorly defined crest was observed on each of the

embankments. Its width generally ranged from 3 to 4 feet. Inclination of the upstream slope was estimated to be 1:3 (Vertical: Horizontal) while the downstream slope was estimated at 1:2.5 (V:H). No animal burrows in the embankments were observed at the time of inspection.

2.3.3 Downstream Channel

At the time of the Initial Safety Inspection, little flow was entering the downstream channel allowing for its inspection (Photograph No. 6). For a distance of several hundred feet downstream of the dam, the downstream channel consists of a cyclopean concrete base slab with grouted masonry training walls. The channel's concrete base slab was in poor to fair condition, with moderate to severe deterioration observed. In some areas, the base slab has experienced up to 3 inches of erosion and has exposed the cyclopean concrete's aggregate (Photograph No. 9). Sedimentation and vegetative growth was observed in isolated areas.

3.0 DAM CLASSIFICATION

Although Silver Creek Detention Basin Dam is not currently listed as a dam by DEC's Division of Dam Safety, its classification as a dam was evaluated using the criterion set forth by DEC's Dam Safety Section. The Dam Safety criterion utilized is based upon an internal memorandum from 1999 (see Appendix D), which provides a storage versus height chart to determine if the dam requires a Dam Safety permit for its alteration/rehabilitation. The height of Silver Creek Detention Basin Dam is 8.3 feet, as measured from the top of the dam's closure embankment to the bottom of the concrete spillway at the upstream side of the dam, and has an estimated impoundment volume of 34,500 cubic feet or 258,000 gallons. In order for an 8.3 foot high dam to be considered a structure requiring a permit for its alteration/rehabilitation, the impoundment must be greater than 3 million gallons. Accordingly, Silver Creek Detention Basin Dam does not require any Dam Safety permits from DEC for its rehabilitation/maintenance.

4.0 HYDROLOGIC & HYDRAULIC ANALYSIS

The hydrologic and hydraulic analysis of Silver Creek Basin Dam is presented below and has been made assuming the dam is a Class "A - Low Hazard" structure. For a dam with this hazard classification, it must have a spillway capable of passing the 100-year storm event.

4.1 Design Rainfall Analysis

The precipitation hyetograph for a 100-year storm based upon TP-40 methodology occurs over 24 hours and has a total precipitation during that time period of 5.8 inches[1].

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[1] NRCC precipitation curves were reviewed as a second source of precipitation data. The 100-year precipitation for Oneonta from the NRCC curves is 5.5 inches in 24 hours. Therefore, TP-40 produces a higher rainfall and was used for this analysis.

By comparison, a 10-year storm event has a total precipitation of 4.2 inches in 24 hours. For Oneonta, the hyetographs are Type II. Appendix E, Rainfall Data, contains the TP-40 rainfall curves for New York State.

4.2 Watershed Analysis

Watershed delineations for the dam were made using topographic information shown on the "Mount Vision and Oneonta" USGS 7.5-minute quadrangles (Refer to Figure 1, Watershed Delineation Map). The total watershed area draining to the Silver Creek Detention Basin was computed to be 1,010 acres (1.57 square miles). The watershed was broken into two sub-watersheds for the purpose of modeling. Soils information was obtained from the USDA's Web Soil Survey (Appendix F), and land use information was obtained from aerial imagery.

Area 1 contains the northern portion of the watershed (530 acres) and drains to a small impoundment on Silver Creek located on the west side of West Street, approximately 2,500 feet south of the intersection with Blend Hill Road. From the soil survey, it was determined that 90 percent of the soils within Area 1 belong to Hydrologic Soil Group "D" and 10 percent to Group "C." Within Area 1, the land use was half woods and half brush/meadow/open fields. Based upon topographic mapping, it was assumed that a spillway is present on the small impoundment and, from notations on the topographic maps, the spillway width was estimated to be 85 feet.

Area 2 contains the southern portion of the watershed (480 acres). From the soil survey, it was determined that 75 percent of the soils within this area belong to Hydrologic Soil Group "C", 10 percent to both Groups "A" and "D," and 5 percent to Group "B." Within Area 1, the land use varies with approximately 25 percent being wooded, 25 percent being college campus (SUNY Oneonta) and 50 percent being moderate density residential.

The computer program HydroCAD was used for the hydrologic modeling. Appendix G contains specific information related to each sub-watershed, including land use breakdown, curve number calculations and time of concentration calculations. The time of concentration paths are shown on Figure 1.

It should be noted that the hydrologic analysis is conservative, given that there are likely additional impoundments or constrictions in flow along the Silver Creek upstream of the detention basin. The creek crosses roadways at several locations, including West Street at two locations, and the SUNY Oneonta Campus. On the SUNY Campus, the creek is piped below the parking lot located to the west of the tennis courts, and crosses Ravine Drive at two locations. Information on these crossings is not known, but it is likely that these culverts were not sized to pass the 100-year storm event without some impoundment at the culvert entrances (most culverts are sized to pass the 10-year storm without upstream impoundment). Accordingly, the hydrologic modeling is likely conservative (i.e. produces a higher flood flow) since the potential upstream constrictions are not modeled.

4.3 Spillway Capacity Analysis

Information about the spillway for Silver Creek Detention Basin Dam was obtained from field measurements and from a limited topographic survey of the spillway performed in 2012 for the Spruce Street corridor. The survey established elevations of the spillway, the earthen embankment and the toe of the spillway. The remainder of the spillway dimensions, including the drop inlet pipe, was obtained from field measurements.

Silver Creek Detention Basin Dam has a 50-foot concrete spillway and an earthen embankment. There is a drop inlet that maintains low flows, with an inside diameter of approximately 10 inches. Downstream of the spillway is a concrete channel through which Silver Creek is conveyed downstream. Based upon the survey and field measurements, the elevation of the bottom of the spillway at the upstream end is 1,205.73 feet, and the top of the spillway is at elevation 1,211.73 feet. The concrete spillway is stepped, however, for modeling purposes, it was assumed to have a breadth of 5 feet to account for any tailwater impacts of the steps. During periods of normal to low flow, there is little to no impoundment behind the dam. Accordingly the normal pool level was set at elevation 1,205.73 feet, which is the invert elevation of the drop inlet. On both sides of the spillway is an earthen embankment with a crest elevation of 1,214.01 feet. The embankment extends approximately 25 feet on both sides of the spillway and abuts natural ground.

The 100-year storm event was simulated over the watershed. The peak inflow from the watershed during this design storm event was determined to be 1,310 cubic feet per second (cfs), occurring at hour 12.84 of the 24-hour of the storm event. The peak outflow over the spillway was determined to be 1,309 cfs, with a peak water surface elevation of 1,214.99 feet, occurring at hour 12.85. During the 100-year storm event, the concrete spillway provides for no attenuation of the flood flows. In addition, the small impoundment off West Street provides no attenuation of the 100-year storm event.

The peak water surface elevation simulated during the 100-year storm event is approximately one (1) foot above the crest of the embankment. Accordingly, the dam's spillway is not capable of passing the 100-year storm event without the embankment sections of the dam overtopping.

For comparison purposes, the 10-year storm event was simulated over the watershed. The peak inflow from the watershed during the 10-year storm event was determined to be 723 cubic feet per second (cfs), occurring at hour 12.89 of the 24-hour storm event. The peak outflow over the spillway was determined to be 723 cfs, with a peak water surface elevation of 1,213.98 feet, occurring at hour 12.85. The spillway is able to safely pass the 10-year storm event with the water surface elevation at the top of the dam's earthen embankment.

5.0 SUBSURFACE CONDITIONS

No information was recovered during our document review regarding subsurface conditions present beneath the dam or the materials utilized to construct the dam's earthen closure embankments or of any past subsurface investigations of the same. The United States Department of Agriculture's (USDA) Web Soil Survey was consulted to determine the composition of the soils in close proximity to the dam, assuming that the embankments would have been constructed utilizing soils from a nearby borrow source. The USDA mapping indicates that, with the exception of the stream channel and those areas immediately adjacent to the same, the soils are composed of a thin sequence of "loamy till" overlying glacial till at depths of generally less than 5 feet. Soils noted within and adjacent to the stream channel were typically identified as being granular in nature.

6.0 STABILITY ASSESSMENT

As the dam does is not listed on DEC's dam data base and is very small in height and storage volume, a detailed stability analysis is not required nor was one performed for the structure. While the dam's spillway shows moderate to severe deterioration of its concrete surfaces, no signs of impending failure or serious distress were observed. Structural cracking was observed at several locations, but the crack depths appeared to be limited at the time of the ISI. In addition, the side slopes of the dam's closure embankments had modest inclinations and did not have any signs of structural distress at the time of the Initial Safety Inspection. Accordingly, based upon the observations made during the ISI and from past performance, it is our opinion that Silver Creek Detention Basin Dam is stable.

7.0 CONCLUSIONS & RECOMMENDATIONS

7.1 Deficiencies & Their Correction

Documentation reviewed for the dam consisted of a limited topographic survey of the dam reportedly performed in 2012 and discussions with City personnel regarding the structure. Based upon our review of this information and the dam's Initial Safety Inspection, it is our opinion that the dam has several deficiencies. These deficiencies and recommendations for their correction are individually presented below and are followed by a schedule for addressing the same.

7.1.1 Embankment Repairs & Maintenance

The crest and slopes of the closure embankments should be maintained in a groomed condition to facilitate their visual inspection for signs of seepage, erosion, animal burrows, and slope instability. At the time of inspection, numerous trees ranging in diameter from 1 to 4 inches were present on the right closure embankment and little to no vegetative cover was present across large portions of both embankments. The remains of a tree stump and its associated root mass were present immediately behind the left abutment.

All trees should be cut down and removed from the embankments. Tree stumps and their associated root masses should be removed following written procedures provided by a licensed professional engineer. A uniform vegetative cover should be established across both embankments upon completion of this work. Upon its establishment, the grass and weeds should be mowed and/or weed-whacked on a regular basis and the growth should be maintained to a height on the order of three (3) inches or less to facilitate visual inspection of the embankment slopes. This maintenance work should extend at least 10 feet beyond the embankment-original ground surface interface and a similar distance beyond the toe of the downstream slope of the dam. Where barren soil is exposed by this work, it should be seeded and covered with erosion control matting to promote establishment of a vegetative cover. All of the work indicated above is not considered urgent but, once initiated, should be performed on a regular basis.

7.1.2 Concrete Repairs & Maintenance

Moderate deterioration was observed of the dam's concrete gravity section/spillway, including but not limited to erosion/spalling, pitting, crazing and structural cracking. It is recommended that structural cracks be sealed through injection of a polyurethane resin and the crack surface sealed with the application of a cementitious waterproofing mortar.

Minor seepage was observed to be occurring through the dam's concrete gravity section as evidenced by efflorescence visible at the base of the downstream terraces. This seepage should be eliminated through the injection of an acrylic based grout into each of the joints.

Once this work has been completed, it is recommended that the dam's gravity section and the concrete base slab of the discharge channel be resurfaced through the application of shotcrete. Any "unsound" or deteriorated concrete should be removed prior to the restoration of the concrete surface.

7.1.3 Spillway Improvements

Section 4.3 indicates that the spillway is capable of passing the 10-year storm event without overtopping, but that the 100-year storm event cannot be conveyed without overtopping the earthen embankment by approximately 1 foot. It is recommended that the structure be able to safely pass the 100-year storm event, consistent with DEC regulations governing dams and stormwater management basins.

In order to pass the 100-year storm event, the width of the spillway would need to be 90 feet wide, which is not practical given the current configuration of the structure. A more practical alternative to increase the ability for the detention basin to safely pass the 100-year storm event would be to minimize the potential for erosion of the embankment under such a storm event. An erosion control measure such as permanent turf reinforcing mat should be considered. The peak flow velocity over the earthen embankment is estimated to be 6.5 feet per second, which is well within velocity ranges acceptable for turf reinforcing mat.

7.2 Recommended Schedule of Work

Each of the deficiencies outlined above should be corrected in order to bring Silver Creek Detention Basin Dam into compliance with engineering standards. These deficiencies should be addressed according to the schedule shown in Table 1.

Table 1
Schedule for Addressing Deficiencies

Deficiency	Schedule
Removal of Trees & Brush, Establishment of Vegetative Cover upon Closure Embankments	2014
Prepare Scope of Work for Engineering Services & Submit to City for Approval	2016
Preparation of Project Plans & Specifications for Spillway Remedial Work	2017
Advertise & Award Remedial Work Contract	2017
Completion of Work	2018

8.0 CLOSURE

This Engineering Assessment of Silver Creek Detention Basin Dam has been based on conversations with City of Oneonta personnel, the results of an Initial Safety Inspection and hydraulic and hydrologic analyses of Silver Creek Detention Basin. Several deficiencies have been identified. Recommendations fir their correction and a proposed schedule for implementing the same have been provided in this report.

Respectfully Submitted,

C.T. MALE ASSOCIATES

Richard C. Wakeman

Richard C. Wakeman, P.E.
Vice President – Civil Engineering

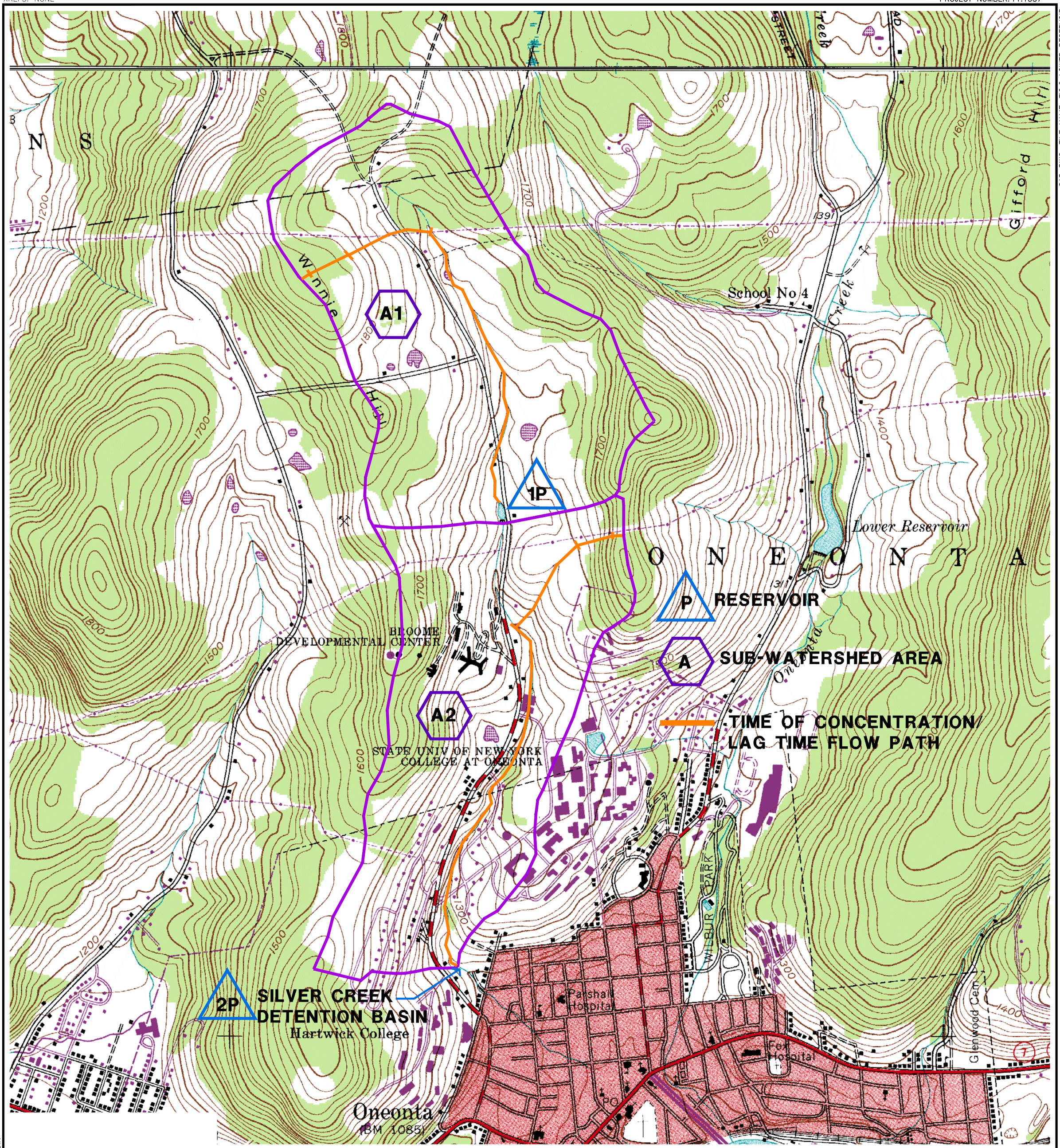
FIGURE 1

Watershed Delineation Map

XREFS: NONE

PROJECT NUMBER: 11.1537

CAD DWG. FILE NAME: FIG.2 LOWER RESERVOIR



DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				

DESIGNED : KCS
DRAFTED : KCS
CHECKED : RCW
PROJ. NO: 11.1537
SCALE : 1"=1,500 FT
DATE : 2.10.2014

WATERSHED DELINEATION MAP

SILVER CREEK DETENTION BASIN

CITY AND TOWN OF ONEONTA — OTSEGO COUNTY, NY

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FIG.1

SHEET 1 OF 1

DWG. NO:

APPENDIX A

Visual Inspection Checklist

PHASE 1

VISUAL INSPECTION CHECKLIST

1. BASIC DATA — Date of Inspection: June 6, 2012

a. General

Name of Dam Silver Creek Detention Basin Dam

Fed. I.D. # N/A DEC Dam No. N/A

River Basin Susquehanna River Basin

Location City Oneonta County Otsego

Stream Name Unnamed Tributary to Susquehanna River

Tributary of Susquehanna River

Latitude (N) 42° 27′ 41.54″ Longitude (W) 75° 4′ 10″

Type of Dam Concrete Gravity with Earthen Closure Embankments

Hazard Classification N/A

Weather Conditions 65° F, cool & overcast

Reservoir Level at Time of Inspection +/- 6 inches above drop-inlet structure

b. Inspection Personnel (*Recorder) Thomas J. Morgan, P.E., Alan Evenson

c. Persons Contacted (Including Title, Address & Phone No.)

Mr. James Hawver

Engineering Technician, City of Oneonta

Department of Engineering

City Hall, 258 Main Street, Oneonta, New York 13820

d. History

Date Constructed Unknown. Date(s) Reconstructed Unknown.

Designer Unknown.

Constructed By Unknown.

Owner City of Oneonta.

Name of Dam Silver Creek Detention Basin Date 6/6/2012

2. EMBANKMENT

a. Characteristics

1) Embankment Material The dam consists of a concrete spillway with earthen closure embankments on either side of the same. See Photograph No. 1. It is unknown what the material utilized to construct the earthen embankments consists of. Significant amounts of gravel and cobbles were observed to be present at grade along each of the closure embankments.

2) Cutoff Type Unknown.

3) Impervious Core Unknown.

4) Internal Drainage System Unknown. A series of pipes, spaced approximately 10 feet on-center and having an apparent diameter of 2 or 4 inches, were observed protruding through the left abutment wall (Photograph No. 2). No flow was observed emanating from these pipes at the time of inspection.

b. Crest

1) Vertical Alignment Modest variations were observed in elevation along the crest of the closure embankments. It was visually estimated that these variations may be on the order of 6 inches.

2) Horizontal Alignment No significant variations were observed.

3) Impervious Core Unknown.

4) Internal Drainage Systems Unknown.

5) Miscellaneous In general, the crest width is estimated to be approximately 3 to 4 feet.

c. Upstream Slope

1) Slope (Estimate H:V) 3:1 by eye. See Photograph No. 3.

2) Undesirable Growth, Debris, or Animal Burrows Several trees, approximately 4 to 6 inch diameter, are present along the right closure embankment as shown in Photograph No. 3.

Sparse vegetative cover is present over large portions of the closure embankments. No animal burrows were observed.

3) Sloughing, Subsidence or Depressions None observed.

4) Slope Protection None observed. See Photograph No. 3.

5) Surface Cracks or Movement of Toe None observed.

d. Downstream Slope

1) Slope (Estimate H:V) 2.5:1 by eye.

2) Undesirable Growth, Debris, or Animal Burrows Several trees, ranging in size from 2 to 6 inches in diameter, are present along the downstream slope of the right closure embankment. A stump and its associated root system are present on the left closure embankment as shown in Photograph No. 4. Sparse vegetative cover is present over most of the closure embankments downstream slopes. No animal burrows were observed.

3) Sloughing, Subsidence or Depressions Moderate erosion has occurred along the left closure embankment, resulting in numerous irregularities to the slope. Similar conditions but to a lesser degree were also observed along the right closure embankment. No signs of instability were observed.

4) Surface Cracks or Movement at Toe None observed.

5) Seepage No seepage was observed. At the time of inspection, less than 1 foot of water was present within the detention basin. See Photograph No. 5.

6) External Drainage System (Ditches, Trenches, Blanket) None observed.

7) Condition Around Outlet Structure Fair. No obstructions were noted, although moderate to severe deterioration was observed around the dam's outlet.

8) Seepage Beyond Toe None observed.

e. Abutments - Embankment Contact

1) Erosion at Contact None observed.

Name of Dam Silver Creek Detention Basin Date 6/6/2012

2) Seepage Along Contact None observed.

3. DRAINAGE SYSTEM

a. Description of System Unknown. A series of pipes, spaced approximately 10 feet on center and having an apparent diameter of 2 or 4 inches, were observed emanating from the right training wall and discharge channel walls, beginning approximately 5 feet downstream of the dam and extending over 100 feet beyond the same. See Photograph No. 2. It is likely that these pipes are most likely associated with drainage of the walls and are not related to an internal drainage system.

b. Condition of System Unknown.

c. Discharge from Drainage System None observed at time of inspection.

4. INSTRUMENTATION (Monumentation/Survey, Observation Wells, Weirs, Piezometers, Etc.)

None observed.

5. RESERVOIR

a. Slopes Grades in and around the reservoir are relatively flat (approximately 1:20 V:H) within approximately 50 to 100 feet of the edge of reservoir. Beyond this, grades change sharply and are visually estimated to be 1:3 (V:H). See Photograph No. 5.

b. Sedimentation It would appear that little to modest sedimentation has occurred, with fair amounts of sediment noted in and adjacent to the crest of the drop-inlet structure.

c. Unusual Condition(s) Which Affect Dam Portions of the downstream channel run through the City of Oneonta and appear to be piped below ground at isolated locations.

6. AREA DOWNSTREAM OF DAM

a. Downstream Hazard (No. of Homes, Highways, etc.) Numerous homes and local roadways are present immediately downstream of the dam prior to its junction with the Susquehanna River. For significant portions of this length, the stream is confined to a man-made channel and is reportedly piped in several areas.

b. Seepage, Growth Significant vegetative growth, such as trees, brush, and grass, is present along either side of the downstream channel for a distance of several hundred feet downstream of the dam as shown in Photograph No. 6. No seepage was observed within the downstream channel extending to a distance of approximately 50 to 100 feet downstream of the dam.

c. Evidence of Movement Beyond Toe of Dam None observed.

d. Condition of Downstream Channel For several hundred feet immediately downstream of the dam, the downstream channel consists of a concrete base slab with grouted masonry training walls. The depth of channel within the first 100 to 200 feet is between 4 to 6 feet. At the time of inspection, the channel was observed to be relatively free of debris and the concrete and masonry appeared to be in fair condition. See Photograph No. 6.

7. SPILLWAY(S) (Including Discharge Channel)

a. General The dam consists of a reinforced concrete spillway, approximately 50 feet in length and with a crest width of 1.3 feet as shown in Photograph No. 7. As measured from the downstream toe, the dam is approximately 6.6 feet in height. The downstream slope is terraced, with two (2) levels present in between the spillway crest and the dam's junction with the downstream channel. Each terrace is sloped, with grades decreasing by approximately 6 inches between the upstream and downstream side of the terrace. A series of metal posts, approximately 2 feet on-center and extending approximately 2 feet above the spillway crest, are present across the breadth of the spillway. The approximate breadth and height of each terrace is 1.5 feet. A discharge channel, approximately 100 feet in length, is present downstream of the dam prior to the downstream channel.

b. Condition of Service Spillway The concrete comprising the dam's spillway is generally in poor condition, as shown in Photograph No. 8. Severe weathering and erosion has occurred of all concrete surfaces and reinforcing steel is exposed at several locations.

c. Condition of Auxiliary Spillway N/A.

d. Condition of Discharge Channel Fair. The base slab, which appears to consist of cyclopean concrete, has been heavily eroded and significant erosion was observed as shown in Photograph No. 9. This erosion appears to be as great as 3 inches in those areas in close proximity to the dam. The discharge channel's walls appear to be constructed of grouted stone masonry. Moderate signs of weathering and erosion were noted of the mortared joints, and at several locations, no mortar was observed. Moss and other vegetation were observed growing across the surface of portions of the channel walls.

8. RESERVOIR DRAIN/OUTLET

a. Type The dam utilizes a drop-inlet structure and a rectangular outlet channel to discharge flow from the reservoir. See Photograph Nos. 10 & 11.

b. Material: The drop-inlet structure appears to be constructed of concrete.

c. Size The drop-inlet is approximately 4 feet by 4 feet. Length The outlet channel is approximately 5 feet in length.

d. Invert Elevations: Entrance Unknown. Exit Unknown.

e. Physical Condition (Describe) Very little could be observed of the drop-inlet structure due to accumulation of sediment and debris around the structure. Severe weathering/erosion of the concrete was observed in and around the rectangular outlet channel's downstream end (Photograph No. 11). The upstream end of the outlet could not be observed.

f. Means of Control: Gate A steel plate, approximately one-half (1/2) inch thick, is used to control flow through the outlet channel. See Photograph No. 12.

Operation: The plate does not appear to have been used recently.

Present Condition The plate is in fair condition, with moderate amounts of deterioration due to weathering observed.

9. STRUCTURAL

Name of Dam Silver Creek Detention Basin Date 6/6/2012

a. Concrete Surfaces Significant weathering and deterioration were observed of all the dam's concrete surfaces, as shown in Photograph Nos. 7, 8 & 11. As much as 3 to 5 inches of concrete has eroded in some areas, with those areas closest to the dam's centerline having experienced the greatest amount of deterioration. Some areas of crazing were also observed.

b. Structural Cracking Several cracks were observed, with the most pronounced of these being along the upstream face of the spillway as shown in Photograph No. 13. A near continuous crack runs along the length of the spillway from at or near the left abutment to a point just to the left of the drop-inlet structure. The width of this crack ranged from hairline to as much as 1 inch. Areas of crazing were observed along the downstream face of the spillway, and efflorescence was observed emanating from many of these cracks and from the base of each of the terraces along the downstream face of the spillway.

c. Movement - Horizontal & Vertical Alignment (Settlement) No apparent settlement has occurred. Severe erosion and deterioration of the dam's concrete has occurred, resulting in variations from vertical alignment along the length of the crest as shown in Photograph Nos. 7 & 8.

d. Junctions with Abutments or Embankments Good, no significant gaps or openings were observed along either side of the spillway. Soil was observed to be tight against the training walls (See Photograph No. 14).

e. Water Passages, Conduits, Sluices Significant deterioration has occurred along the downstream end of the rectangular outlet channel as shown in Photograph No. 11.

f. Seepage or Leakage No seepage was observed at the time of inspection, although efflorescence was observed at the base of each of the terraces along the downstream level as seen in Photograph No. 11

g. Joints - Construction, etc. None observed.

h. Foundation Could not be observed.

i. Approach & Outlet Channels The outlet channel was observed to be in fair condition, with areas of significant deterioration observed along the main flow channel. In these areas, the aggregate for the

base slab's cyclopean concrete is exposed as shown in Photograph No. 9. Some minor debris was observed within the channel.

j. Intake Structures Very little could be observed of the drop-inlet structure, and it appears to be in fair condition. A trash rack is present over the drop-inlet structure and at the time of inspection was observed to be covered with vegetation and other debris (Photograph No. 10).

k. Stability No signs of structural instability were observed.

l. Miscellaneous A series of steel posts are present along the crest of the spillway, extending above the crest by approximately 2 feet, as seen in Photograph Nos. 7 & 8. These posts were reportedly utilized for placement of flashboards across the crest of the dam's spillway.

APPENDIX B

Photographs

Photograph No. 1: Silver Creek Detention Basin Dam.

Photograph No. 2: Drain pipe along left abutment wall.

Photograph No. 3: Upstream slope of right closure embankment.

Photograph No. 4: Tree stump and associated root mass on downstream slope of left closure embankment.

Photograph No. 5: Area upstream of Silver Creek Detention Basin Dam.

Photograph No. 6: Downstream channel.

Photograph No. 7: Concrete spillway of Silver Creek Detention Basin Dam.

Photograph No. 8: Weathering and erosion of Silver Creek Detention Basin Dam.

Photograph No. 9: Weathering and deterioration of downstream channel.

Photograph No. 10: Drop-inlet structure.

Photograph No. 11: Outlet from drop-inlet structure.

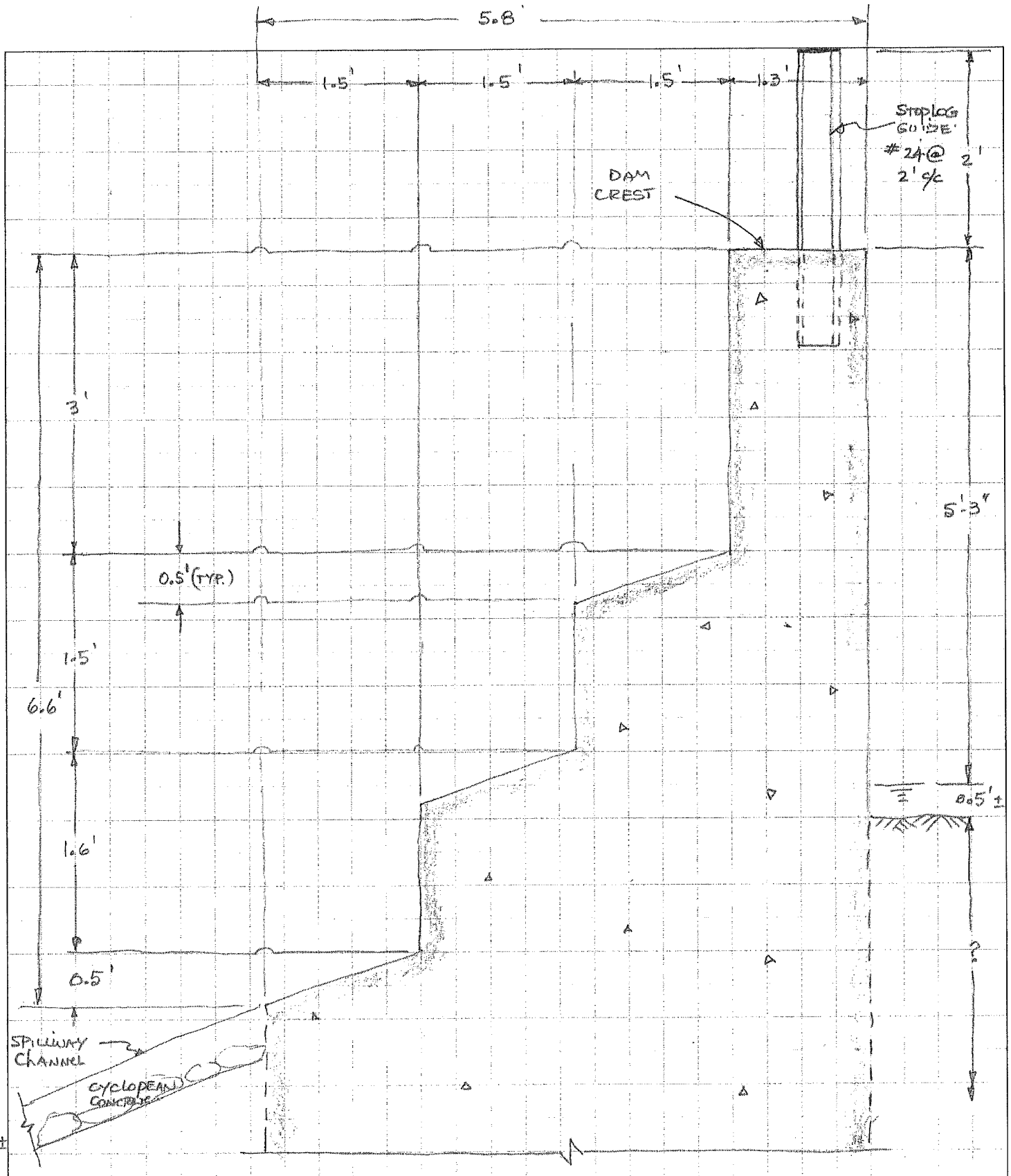
Photograph No. 12: Steel plate used to close outlet of drop-inlet structure.

Photograph No. 13: Upstream face of dam's spillway section. Structural crack noted in foreground above water line.

Photograph No. 14: Training wall-embankment interface.

APPENDIX C

Field Sketch of Dam



SECTION THRU DAM (APPROX.)
(Scale: 3/4" = 1' ±)

NOTE: A. SPILLWAYS: (1) Drop inlet (@ 1'x4')
(2) Crest (@ 25 SP @ 2' = 50')

B. See photos of Dam for arrangement

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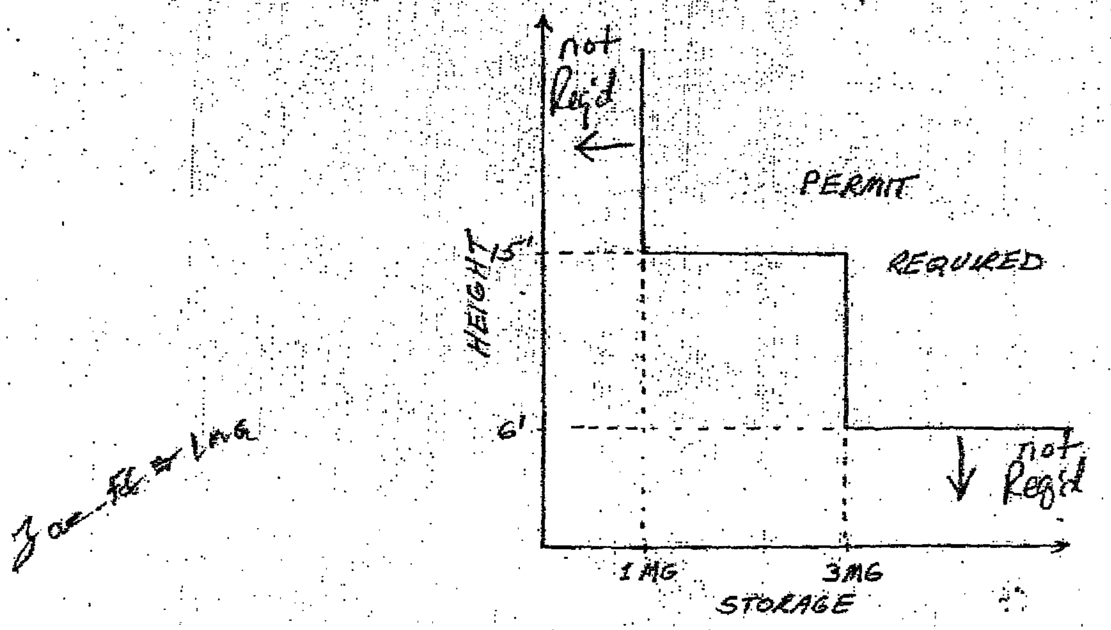
Report No.: 1 Page: 2 of 2

APPENDIX D

NYSDEC Memorandum- Height vs. Impoundment

We do not have a brochure, at least not yet. Here is a graph which summarizes the new (1999) criteria:



If a structure falls to the right or above the stepped line, a dam permit is required. If it falls to the left or below, a dam permit is not required.

Please let me know if this is useful.

cc: Bill Adriance

APPENDIX E

Rainfall Data

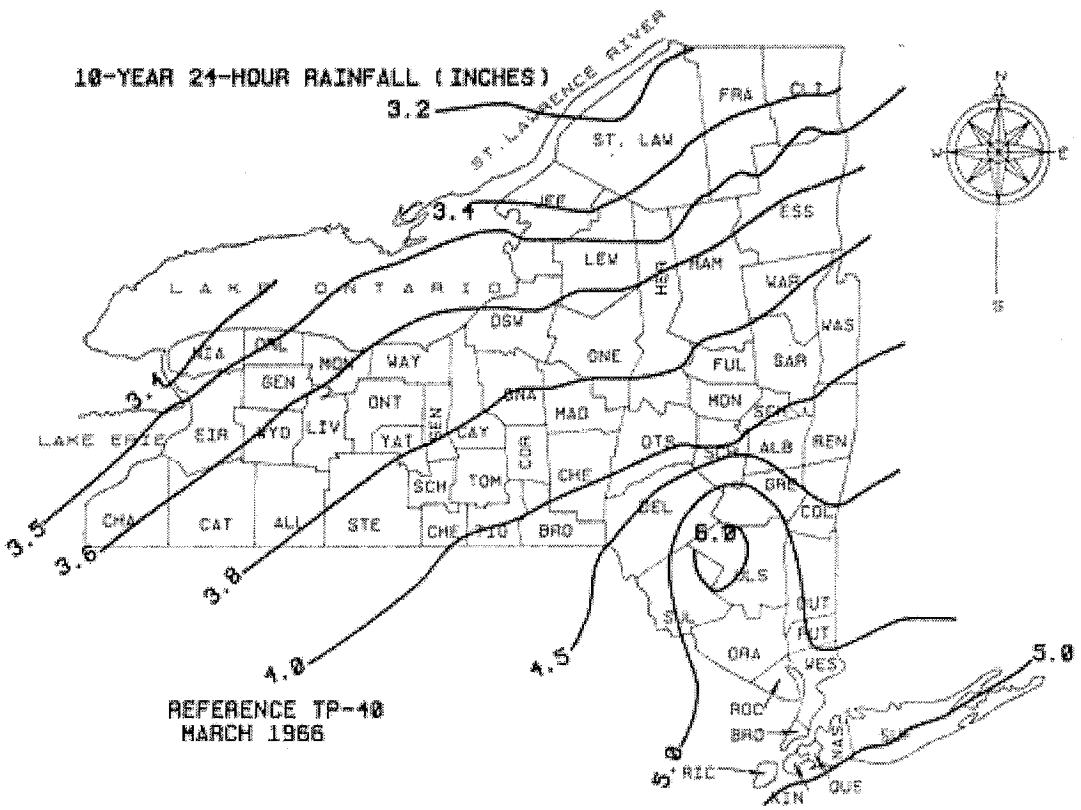
Basis for Design of Overbank Flood Control

When addressing the overbank flooding design criteria, the following represent the minimum basis for design:

- TR-55 and TR-20 (or approved equivalent) will be used to determine peak discharge rates.
- When the predevelopment land use is agriculture, the curve number for the pre-developed condition shall be "taken as meadow".
- Off-site areas should be modeled as "present condition" for the 10-year storm event.
- Figure 4.3 indicates the depth of rainfall (24 hour) associated with the 10-year storm event throughout the State of New York.

  The length of overland flow used in t_c calculations is limited to no more than 150 feet for predevelopment conditions and 100 feet for post development conditions. On areas of extremely flat terrain (<1% average slope), this maximum distance is extended to 250 feet for predevelopment conditions and 150 feet for post development conditions.

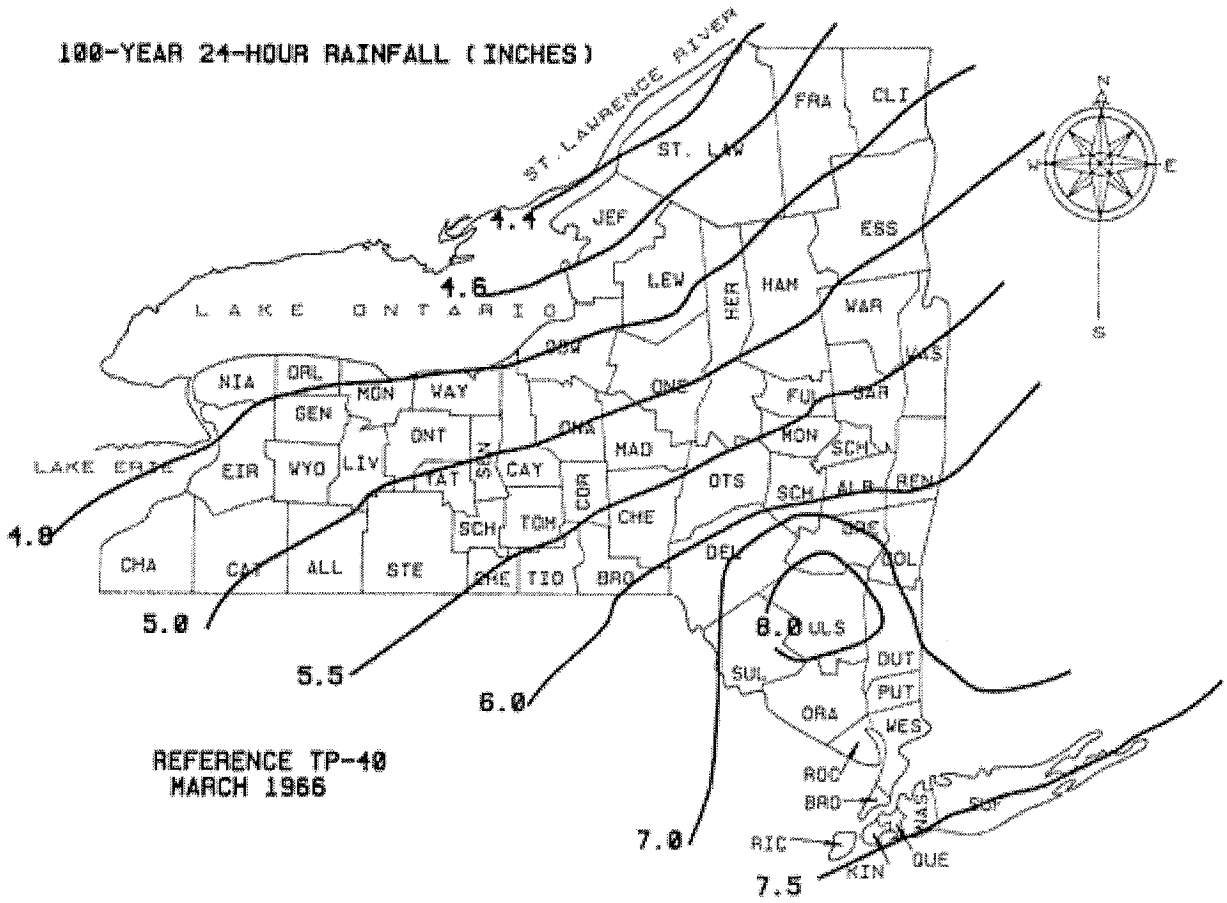
Figure 4.3 10-Year Design Storm



under current conditions.

- When determining storage required to safely pass the 100-year flood, model off-site areas under ultimate conditions.

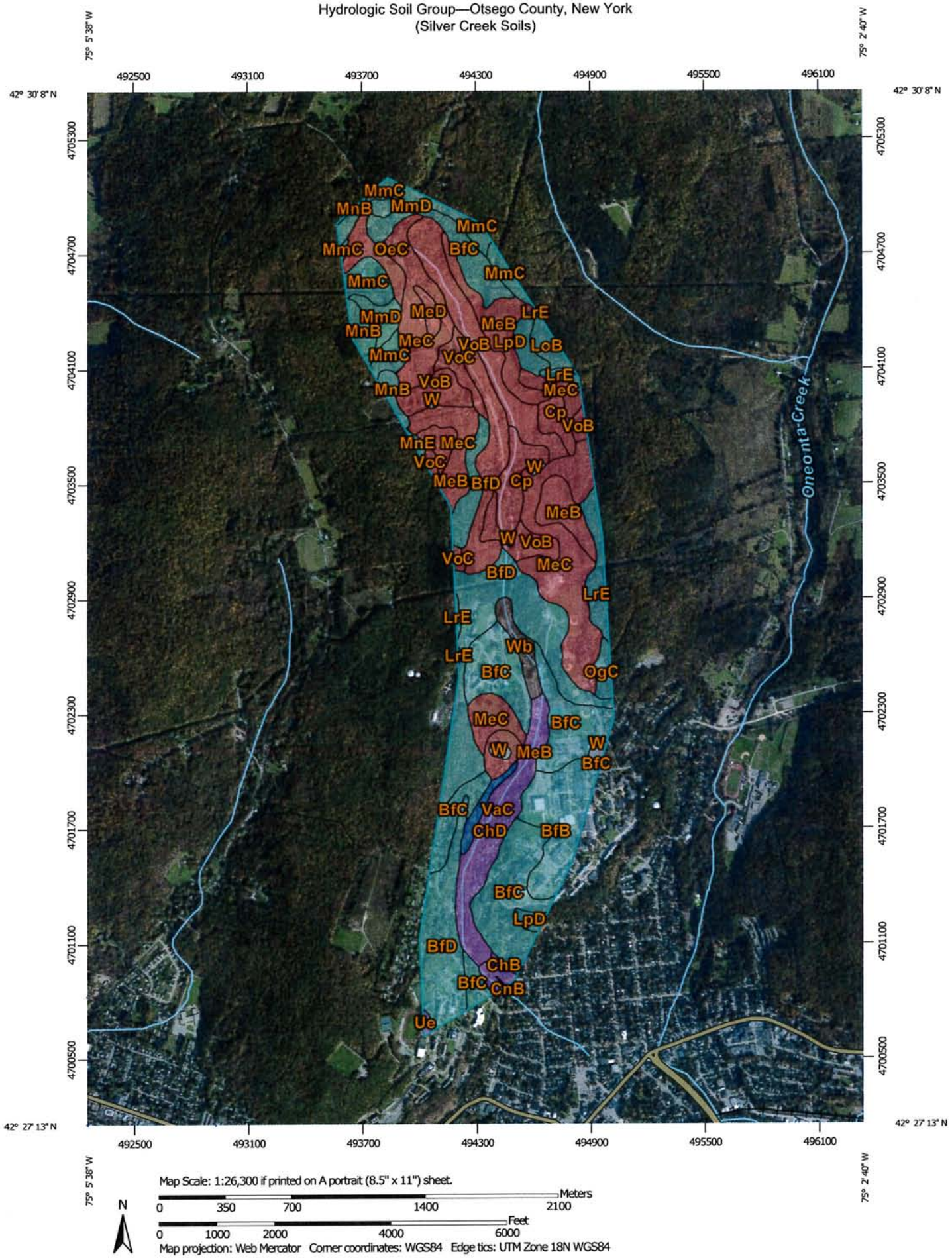
Figure 4.4 100-Year Design Storm



APPENDIX F

Soils Information

Hydrologic Soil Group—Otsego County, New York
(Silver Creek Soils)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Otsego County, New York
Survey Area Data: Version 11, Dec 15, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 10, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Otsego County, New York (NY077)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BfB	Bath channery silt loam, 3 to 8 percent slopes	C	42.3	5.0%
BfC	Bath channery silt loam, 8 to 15 percent slopes	C	146.2	17.2%
BfD	Bath channery silt loam, 15 to 25 percent slopes	C	127.6	15.0%
ChB	Chenango gravelly silt loam, 3 to 8 percent slopes	A	1.7	0.2%
ChD	Chenango gravelly silt loam, 15 to 25 percent slopes	A	45.5	5.4%
CnB	Chenango channery loam, fan, 3 to 8 percent slopes	A	4.7	0.6%
Cp	Chippewa and Norwich soils	D	25.7	3.0%
LoB	Lordstown-Arnot complex, 1 to 8 percent slopes, rocky	C	7.5	0.9%
LpD	Lordstown-Chadakoin complex, 15 to 25 percent slopes	C	11.1	1.3%
LrE	Lordstown, Chadakoin, and Manlius soils, 25 to 50 percent slopes, very rocky	C	17.8	2.1%
MeB	Mardin channery silt loam, 3 to 8 percent slopes	D	69.2	8.2%
MeC	Mardin channery silt loam, 8 to 15 percent slopes	D	153.6	18.1%
MeD	Mardin channery silt loam, 15 to 25 percent slopes	D	4.3	0.5%
MmC	Mongaup-Franklinville complex, 8 to 15 percent slopes	C	28.2	3.3%
MmD	Mongaup-Franklinville complex, 15 to 25 percent slopes	C	23.7	2.8%
MnB	Mongaup-Hawksnest complex, 1 to 8 percent slopes, rocky	C	13.0	1.5%

Hydrologic Soil Group— Summary by Map Unit — Otsego County, New York (NY077)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
MnE	Mongaup-Hawksnest complex, 25 to 50 percent slopes, rocky	C	1.5	0.2%
OeC	Ontusia channery silt loam, 8 to 15 percent slopes	D	12.2	1.4%
OgC	Oquaga-Arnot complex, 8 to 15 percent slopes, rocky	C	5.7	0.7%
Ue	Udorthents, smoothed	A	1.1	0.1%
VaC	Valois gravelly loam, 8 to 15 percent slopes	B	6.0	0.7%
VoB	Volusia silt loam, 3 to 8 percent slopes	D	68.9	8.1%
VoC	Volusia silt loam, 8 to 15 percent slopes 140	D	12.9	1.5%
W	Water		7.0	0.8%
Wb	Wakeville silt loam	B/D	10.5	1.2%
Totals for Area of Interest			**847.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

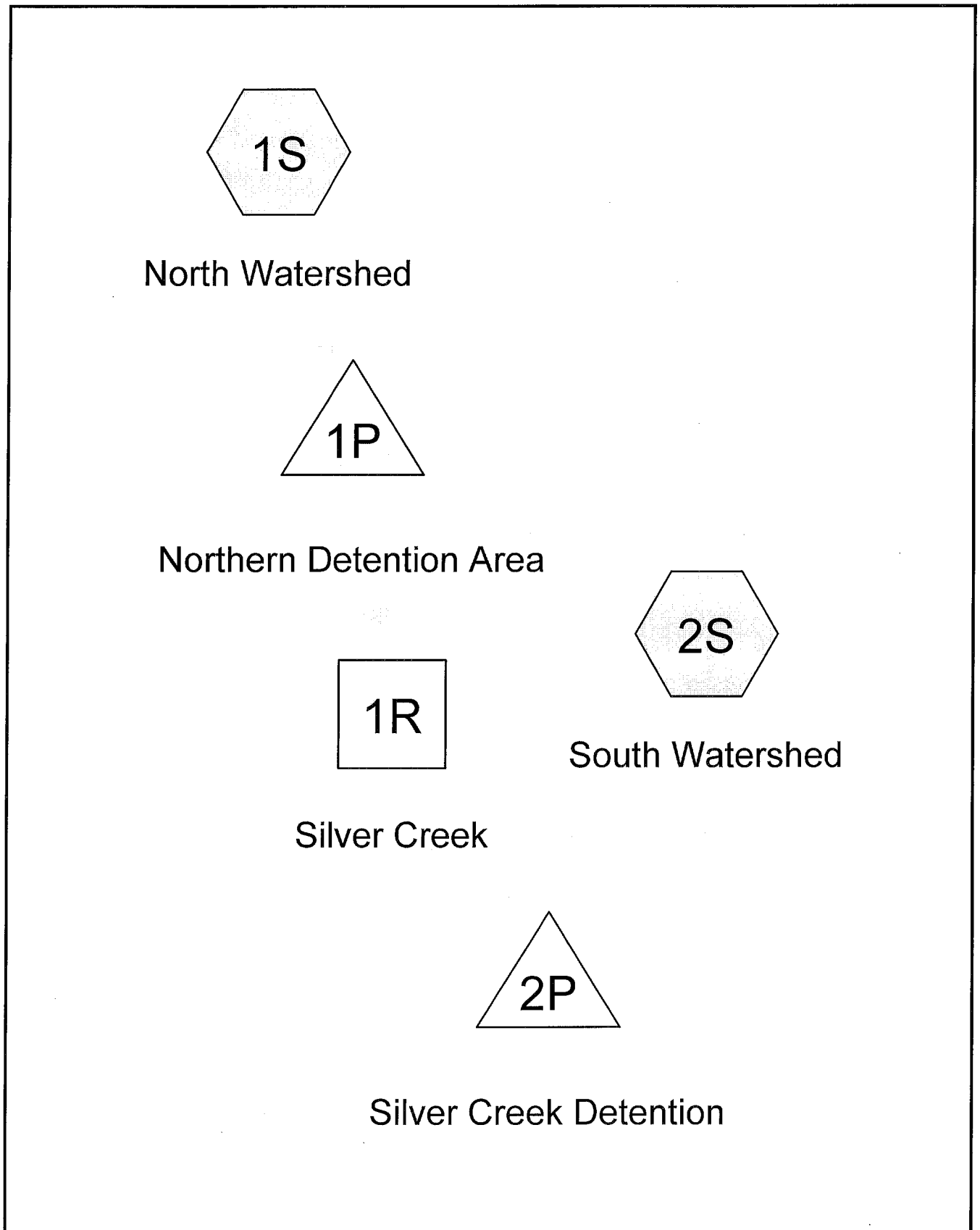
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX G

HydroCAD Modeling Reports



Routing Diagram for Silver Creek Detention Basin H&H
Prepared by {enter your company name here}, Printed 2/18/2014
HydroCAD® 10.00 s/n 00410 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
60.000	54	1/2 acre lots, 25% imp, HSG A (2S)
36.000	70	1/2 acre lots, 25% imp, HSG B (2S)
173.000	70	Woods, Good, HSG C (1S, 2S)
237.000	73	Brush, Good, HSG D (1S)
240.000	77	Woods, Good, HSG D (1S)
84.000	80	1/2 acre lots, 25% imp, HSG C (2S)
60.000	85	1/2 acre lots, 25% imp, HSG D (2S)
120.000	86	Campus (2S)
1,010.000	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
60.000	HSG A	2S
36.000	HSG B	2S
257.000	HSG C	1S, 2S
537.000	HSG D	1S, 2S
120.000	Other	2S
1,010.000		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
60.000	36.000	84.000	60.000	0.000	240.000	1/2 acre lots, 25% imp	2S
0.000	0.000	0.000	237.000	0.000	237.000	Brush, Good	1S
0.000	0.000	0.000	0.000	120.000	120.000	Campus	2S
0.000	0.000	173.000	240.000	0.000	413.000	Woods, Good	1S, 2S
60.000	**36.000**	**257.000**	**537.000**	**120.000**	**1,010.000**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	1,206.05	1,205.73	10.0	0.0320	0.015	10.0	0.0	0.0

Notes Listing (all nodes)

Line#	Node Number	Notes
1	1P	Assumptions on size of impoundment and structure (if any) made based upon aerial images and topo maps.
2	2P	Storage volumes from topo maps and Google Earth estimates.
3		Spillway dimensions from 2012 survey for Spruce Street Study and field measurements by CTM.

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: North Watershed Runoff Area=530.000 ac 0.00% Impervious Runoff Depth=3.11"
Flow Length=6,815' Tc=76.5 min CN=75 Runoff=731.40 cfs 137.462 af

Subcatchment2S: South Watershed Runoff Area=480.000 ac 12.50% Impervious Runoff Depth=3.21"
Flow Length=8,255' Tc=58.2 min CN=76 Runoff=839.04 cfs 128.328 af

Reach 1R: Silver Creek Avg. Flow Depth=5.08' Max Vel=14.77 fps Inflow=730.28 cfs 137.462 af
n=0.040 L=7,700.0' S=0.0430 '/' Capacity=2,802.45 cfs Outflow=711.98 cfs 137.461 af

Pond 1P: Northern Detention Area Peak Elev=1,539.19' Storage=66,360 cf Inflow=731.40 cfs 137.462 af
Outflow=730.28 cfs 137.462 af

Pond 2P: Silver Creek Detention Peak Elev=1,214.99' Storage=42,281 cf Inflow=1,310.03 cfs 265.790 af
Outflow=1,309.69 cfs 265.776 af

Total Runoff Area = 1,010.000 ac Runoff Volume = 265.790 af Average Runoff Depth = 3.16"
94.06% Pervious = 950.000 ac 5.94% Impervious = 60.000 ac

Summary for Subcatchment 1S: North Watershed

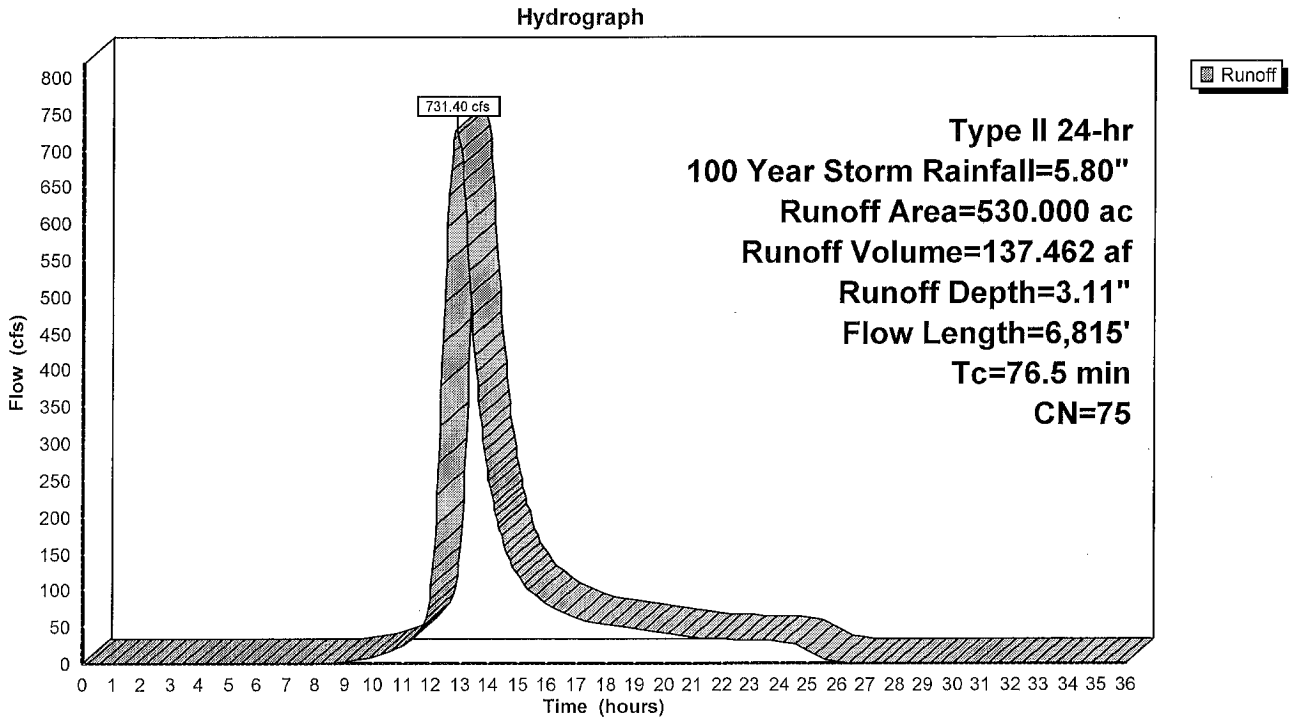
Runoff = 731.40 cfs @ 12.85 hrs, Volume= 137.462 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 Year Storm Rainfall=5.80"

Area (ac)	CN	Description
53.000	70	Woods, Good, HSG C
240.000	77	Woods, Good, HSG D
237.000	73	Brush, Good, HSG D
530.000	75	Weighted Average
530.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.5	150	0.0533	0.06		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 2.50"
17.1	665	0.0676	0.65		**Shallow Concentrated Flow, Shallow Conc Flow (Woods)** Forest w/Heavy Litter Kv= 2.5 fps
9.9	1,400	0.1142	2.37		**Shallow Concentrated Flow, Shallow Conc Flow (brush)** Short Grass Pasture Kv= 7.0 fps
10.0	4,600	0.0300	7.66	204.33	**Parabolic Channel, Creek Flow** W=20.00' D=2.00' Area=26.7 sf Perim=20.5' n= 0.040 Winding stream, pools & shoals
76.5	6,815	Total			

Subcatchment 1S: North Watershed



Hydrograph for Subcatchment 1S: North Watershed

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.06	0.00	0.00
1.50	0.09	0.00	0.00
2.00	0.13	0.00	0.00
2.50	0.16	0.00	0.00
3.00	0.20	0.00	0.00
3.50	0.24	0.00	0.00
4.00	0.28	0.00	0.00
4.50	0.32	0.00	0.00
5.00	0.37	0.00	0.00
5.50	0.41	0.00	0.00
6.00	0.46	0.00	0.00
6.50	0.52	0.00	0.00
7.00	0.57	0.00	0.00
7.50	0.63	0.00	0.00
8.00	0.70	0.00	0.00
8.50	0.77	0.00	0.19
9.00	0.85	0.01	1.47
9.50	0.95	0.02	4.42
10.00	1.05	0.04	8.65
10.50	1.18	0.07	14.27
11.00	1.36	0.12	23.41
11.50	1.64	0.22	39.86
12.00	3.85	1.55	104.98
12.50	4.26	1.87	**547.01**
13.00	4.48	2.03	**702.18**
13.50	4.63	2.16	421.32
14.00	4.76	2.25	250.87
14.50	4.86	2.33	164.66
15.00	4.95	2.41	119.79
15.50	5.03	2.48	96.14
16.00	5.10	2.53	81.28
16.50	5.17	2.59	70.41
17.00	5.23	2.64	62.74
17.50	5.29	2.68	57.55
18.00	5.34	2.73	53.74
18.50	5.39	2.77	50.43
19.00	5.44	2.81	47.28
19.50	5.48	2.85	44.17
20.00	5.52	2.88	41.06
20.50	5.56	2.91	37.97
21.00	5.60	2.94	35.41
21.50	5.63	2.97	33.85
22.00	5.67	3.00	32.89
22.50	5.70	3.03	32.14
23.00	5.73	3.06	31.49
23.50	5.77	3.09	30.86
24.00	**5.80**	**3.11**	30.25
24.50	5.80	3.11	27.85
25.00	5.80	3.11	16.73
25.50	5.80	3.11	6.62
26.00	5.80	3.11	2.52
26.50	5.80	3.11	0.94
27.00	5.80	3.11	0.34
27.50	5.80	3.11	0.11
28.00	5.80	3.11	0.02
28.50	5.80	3.11	0.00
29.00	5.80	3.11	0.00
29.50	5.80	3.11	0.00
30.00	5.80	3.11	0.00
30.50	5.80	3.11	0.00
31.00	5.80	3.11	0.00
31.50	5.80	3.11	0.00
32.00	5.80	3.11	0.00
32.50	5.80	3.11	0.00
33.00	5.80	3.11	0.00
33.50	5.80	3.11	0.00
34.00	5.80	3.11	0.00
34.50	5.80	3.11	0.00
35.00	5.80	3.11	0.00
35.50	5.80	3.11	0.00
36.00	5.80	3.11	0.00

Summary for Subcatchment 2S: South Watershed

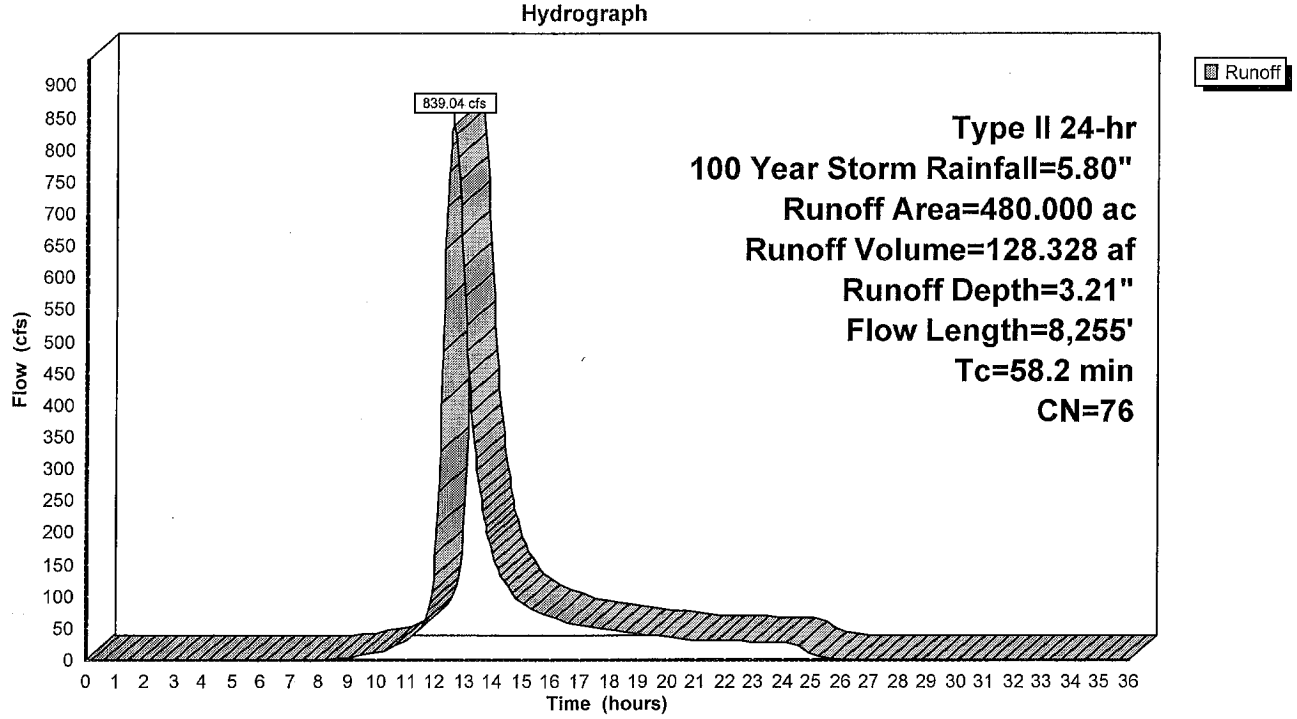
Runoff = 839.04 cfs @ 12.60 hrs, Volume= 128.328 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 Year Storm Rainfall=5.80"

	Area (ac)	CN	Description
*	120.000	86	Campus
	120.000	70	Woods, Good, HSG C
	84.000	80	1/2 acre lots, 25% imp, HSG C
	60.000	54	1/2 acre lots, 25% imp, HSG A
	60.000	85	1/2 acre lots, 25% imp, HSG D
	36.000	70	1/2 acre lots, 25% imp, HSG B
	480.000	76	Weighted Average
	420.000		87.50% Pervious Area
	60.000		12.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.1	150	0.1667	0.10		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 2.50"
8.3	570	0.2105	1.15		**Shallow Concentrated Flow, Shallow Conc Flow (Woods)** Forest w/Heavy Litter Kv= 2.5 fps
13.3	1,635	0.0856	2.05		**Shallow Concentrated Flow, Shallow Conc Flow (Brush)** Short Grass Pasture Kv= 7.0 fps
11.5	5,900	0.0373	8.54	227.84	**Parabolic Channel, Creek Flow** W=20.00' D=2.00' Area=26.7 sf Perim=20.5' n= 0.040
58.2	8,255	Total			

Subcatchment 2S: South Watershed



Hydrograph for Subcatchment 2S: South Watershed

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.06	0.00	0.00
1.50	0.09	0.00	0.00
2.00	0.13	0.00	0.00
2.50	0.16	0.00	0.00
3.00	0.20	0.00	0.00
3.50	0.24	0.00	0.00
4.00	0.28	0.00	0.00
4.50	0.32	0.00	0.00
5.00	0.37	0.00	0.00
5.50	0.41	0.00	0.00
6.00	0.46	0.00	0.00
6.50	0.52	0.00	0.00
7.00	0.57	0.00	0.00
7.50	0.63	0.00	0.00
8.00	0.70	0.00	0.09
8.50	0.77	0.01	1.14
9.00	0.85	0.01	3.63
9.50	0.95	0.03	7.55
10.00	1.05	0.05	12.18
10.50	1.18	0.08	18.63
11.00	1.36	0.14	29.82
11.50	1.64	0.24	50.54
12.00	3.85	1.62	165.32
12.50	4.26	1.94	**806.72**
13.00	4.48	2.11	**571.29**
13.50	4.63	2.24	279.05
14.00	4.76	2.34	164.87
14.50	4.86	2.42	114.34
15.00	4.95	2.49	89.25
15.50	5.03	2.56	76.48
16.00	5.10	2.62	67.87
16.50	5.17	2.68	60.05
17.00	5.23	2.73	54.28
17.50	5.29	2.77	50.57
18.00	5.34	2.82	47.51
18.50	5.39	2.86	44.63
19.00	5.44	2.90	41.79
19.50	5.48	2.94	38.96
20.00	5.52	2.97	36.10
20.50	5.56	3.00	33.30
21.00	5.60	3.03	31.37
21.50	5.63	3.06	30.38
22.00	5.67	3.09	29.70
22.50	5.70	3.12	29.12
23.00	5.73	3.15	28.56
23.50	5.77	3.18	28.02
24.00	**5.80**	**3.21**	27.46
24.50	5.80	3.21	22.95
25.00	5.80	3.21	8.79
25.50	5.80	3.21	2.45
26.00	5.80	3.21	0.67
26.50	5.80	3.21	0.17
27.00	5.80	3.21	0.02
27.50	5.80	3.21	0.00
28.00	5.80	3.21	0.00
28.50	5.80	3.21	0.00
29.00	5.80	3.21	0.00
29.50	5.80	3.21	0.00
30.00	5.80	3.21	0.00
30.50	5.80	3.21	0.00
31.00	5.80	3.21	0.00
31.50	5.80	3.21	0.00
32.00	5.80	3.21	0.00
32.50	5.80	3.21	0.00
33.00	5.80	3.21	0.00
33.50	5.80	3.21	0.00
34.00	5.80	3.21	0.00
34.50	5.80	3.21	0.00
35.00	5.80	3.21	0.00
35.50	5.80	3.21	0.00
36.00	5.80	3.21	0.00

Summary for Reach 1R: Silver Creek

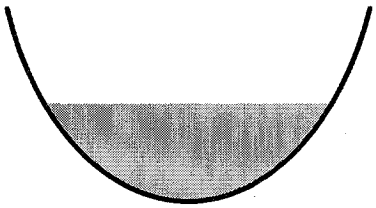
[81] Warning: Exceeded Pond 1P by 2.96' @ 13.10 hrs

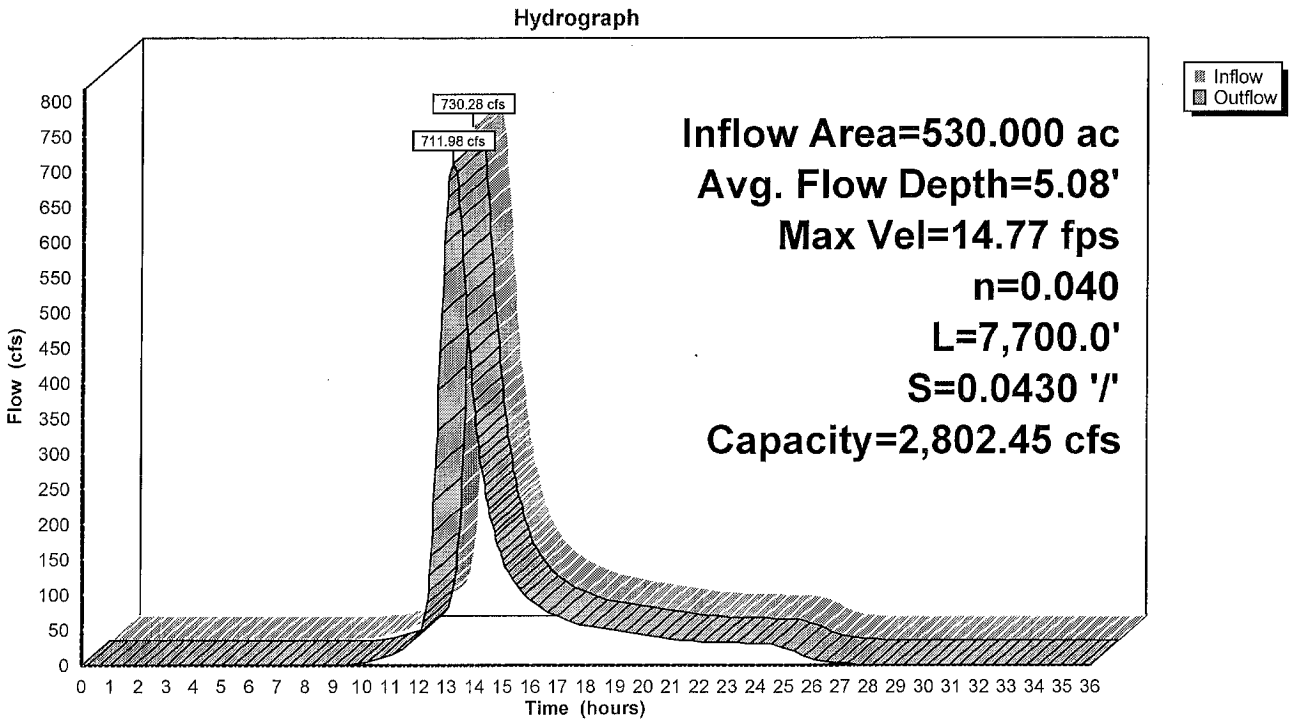
Inflow Area = 530.000 ac, 0.00% Impervious, Inflow Depth = 3.11" for 100 Year Storm event
Inflow = 730.28 cfs @ 12.86 hrs, Volume= 137.462 af
Outflow = 711.98 cfs @ 13.13 hrs, Volume= 137.461 af, Atten= 3%, Lag= 15.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.77 fps, Min. Travel Time= 8.7 min
Avg. Velocity = 4.99 fps, Avg. Travel Time= 25.7 min

Peak Storage= 371,356 cf @ 12.98 hrs
Average Depth at Peak Storage= 5.08'
Bank-Full Depth= 10.00' Flow Area= 133.3 sf, Capacity= 2,802.45 cfs

20.00' x 10.00' deep Parabolic Channel, n= 0.040
Length= 7,700.0' Slope= 0.0430 '/'
Inlet Invert= 1,537.00', Outlet Invert= 1,206.00'





Hydrograph for Reach 1R: Silver Creek

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	1,537.00	0.00
1.00	0.00	0	1,537.00	0.00
2.00	0.00	0	1,537.00	0.00
3.00	0.00	0	1,537.00	0.00
4.00	0.00	0	1,537.00	0.00
5.00	0.00	0	1,537.00	0.00
6.00	0.00	0	1,537.00	0.00
7.00	0.00	0	1,537.00	0.00
8.00	0.00	0	1,537.00	0.00
9.00	1.12	864	1,537.08	0.07
10.00	7.76	9,604	1,537.44	3.13
11.00	22.20	25,295	1,537.85	14.21
12.00	**95.45**	64,233	1,538.58	46.62
13.00	**707.40**	**371,217**	**1,542.08**	**689.04**
14.00	256.69	195,105	1,540.31	**339.66**
15.00	121.58	111,166	1,539.27	147.48
16.00	82.12	81,617	1,538.85	91.81
17.00	63.17	66,917	1,538.62	68.45
18.00	53.99	59,137	1,538.49	56.71
19.00	47.54	53,986	1,538.40	49.80
20.00	41.30	49,028	1,538.32	43.58
21.00	35.56	44,090	1,538.23	37.51
22.00	32.93	41,242	1,538.17	33.74
23.00	31.53	39,853	1,538.15	32.05
24.00	30.29	38,745	1,538.12	30.78
25.00	18.14	32,047	1,537.99	25.97
26.00	3.12	13,399	1,537.55	8.26
27.00	0.43	5,143	1,537.29	2.09
28.00	0.03	2,185	1,537.16	0.61
29.00	0.00	1,047	1,537.10	0.21
30.00	0.00	581	1,537.06	0.10
31.00	0.00	322	1,537.03	0.06
32.00	0.00	179	1,537.02	0.03
33.00	0.00	99	1,537.01	0.02
34.00	0.00	55	1,537.01	0.01
35.00	0.00	30	1,537.00	0.01
36.00	0.00	17	1,537.00	0.00

Stage-Discharge for Reach 1R: Silver Creek

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
1,537.00	0.00	0.00
1,537.10	1.26	0.17
1,537.20	1.99	0.75
1,537.30	2.60	1.80
1,537.40	3.14	3.35
1,537.50	3.63	5.40
1,537.60	4.08	7.99
1,537.70	4.50	11.11
1,537.80	4.90	14.78
1,537.90	5.28	19.01
1,538.00	5.64	23.79
1,538.10	5.99	29.14
1,538.20	6.33	35.06
1,538.30	6.65	41.55
1,538.40	6.96	48.61
1,538.50	7.26	56.25
1,538.60	7.55	64.46
1,538.70	7.84	73.26
1,538.80	8.12	82.64
1,538.90	8.39	92.60
1,539.00	8.65	103.14
1,539.10	8.91	114.26
1,539.20	9.16	125.97
1,539.30	9.40	138.27
1,539.40	9.64	151.15
1,539.50	9.88	164.61
1,539.60	10.11	178.66
1,539.70	10.33	193.30
1,539.80	10.56	208.52
1,539.90	10.77	224.32
1,540.00	10.99	240.71
1,540.10	11.20	257.68
1,540.20	11.40	275.24
1,540.30	11.61	293.37
1,540.40	11.81	312.10
1,540.50	12.00	331.40
1,540.60	12.20	351.29
1,540.70	12.39	371.75
1,540.80	12.58	392.80
1,540.90	12.76	414.43
1,541.00	12.94	436.63
1,541.10	13.12	459.42
1,541.20	13.30	482.78
1,541.30	13.48	506.72
1,541.40	13.65	531.24
1,541.50	13.82	556.33
1,541.60	13.99	582.00
1,541.70	14.16	608.25
1,541.80	14.32	635.07
1,541.90	14.49	662.46
1,542.00	14.65	690.42
1,542.10	14.81	718.96
1,542.20	14.96	748.06
1,542.30	15.12	777.74
1,542.40	15.27	807.99
1,542.50	15.42	838.80
1,542.60	15.57	870.19
1,542.70	15.72	902.14
1,542.80	15.87	934.66
1,542.90	16.02	967.74
1,543.00	16.16	1,001.39
1,543.10	16.30	1,035.60
1,543.20	16.44	1,070.38
1,543.30	16.58	1,105.72
1,543.40	16.72	1,141.62
1,543.50	16.86	1,178.08
1,543.60	17.00	1,215.11
1,543.70	17.13	1,252.69
1,543.80	17.27	1,290.84
1,543.90	17.40	1,329.54
1,544.00	17.53	1,368.80
1,544.10	17.66	1,408.61
1,544.20	17.79	1,448.99
1,544.30	17.92	1,489.92
1,544.40	18.04	1,531.40
1,544.50	18.17	1,573.44
1,544.60	18.29	1,616.03
1,544.70	18.42	1,659.17
1,544.80	18.54	1,702.87
1,544.90	18.66	1,747.11
1,545.00	18.78	1,791.91
1,545.10	18.90	1,837.26
1,545.20	19.02	1,883.15
1,545.30	19.14	1,929.60
1,545.40	19.26	1,976.59
1,545.50	19.37	2,024.13
1,545.60	19.49	2,072.22
1,545.70	19.60	2,120.85
1,545.80	19.72	2,170.03
1,545.90	19.83	2,219.75
1,546.00	19.94	2,270.02
1,546.10	20.05	2,320.83
1,546.20	20.16	2,372.18
1,546.30	20.27	2,424.07
1,546.40	20.38	2,476.51
1,546.50	20.49	2,529.48
1,546.60	20.60	2,583.00
1,546.70	20.70	2,637.06
1,546.80	20.81	2,691.65
1,546.90	20.91	2,746.78
1,547.00	**21.02**	**2,802.45**

Stage-Area-Storage for Reach 1R: Silver Creek

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
1,537.00	0.0	0
1,537.10	0.1	1,027
1,537.20	0.4	2,904
1,537.30	0.7	5,335
1,537.40	1.1	8,213
1,537.50	1.5	11,478
1,537.60	2.0	15,089
1,537.70	2.5	19,014
1,537.80	3.0	23,231
1,537.90	3.6	27,720
1,538.00	4.2	32,466
1,538.10	4.9	37,456
1,538.20	5.5	42,678
1,538.30	6.2	48,122
1,538.40	7.0	53,780
1,538.50	7.7	59,644
1,538.60	8.5	65,707
1,538.70	9.3	71,962
1,538.80	10.2	78,404
1,538.90	11.0	85,028
1,539.00	11.9	91,828
1,539.10	12.8	98,800
1,539.20	13.8	105,941
1,539.30	14.7	113,246
1,539.40	15.7	120,711
1,539.50	16.7	128,333
1,539.60	17.7	136,110
1,539.70	18.7	144,037
1,539.80	19.8	152,113
1,539.90	20.8	160,334
1,540.00	21.9	168,699
1,540.10	23.0	177,203
1,540.20	24.1	185,847
1,540.30	25.3	194,626
1,540.40	26.4	203,539
1,540.50	27.6	212,584
1,540.60	28.8	221,760
1,540.70	30.0	231,064
1,540.80	31.2	240,494
1,540.90	32.5	250,050
1,541.00	33.7	259,728
1,541.10	35.0	269,529
1,541.20	36.3	279,450
1,541.30	37.6	289,489
1,541.40	38.9	299,646
1,541.50	40.2	309,919
1,541.60	41.6	320,307
1,541.70	43.0	330,808
1,541.80	44.3	341,422
1,541.90	45.7	352,147
1,542.00	47.1	362,981
1,542.10	48.6	373,925
1,542.20	50.0	384,977
1,542.30	51.4	396,135
1,542.40	52.9	407,399
1,542.50	54.4	418,768
1,542.60	55.9	430,241
1,542.70	57.4	441,816
1,542.80	58.9	453,494
1,542.90	60.4	465,273
1,543.00	62.0	477,152
1,543.10	63.5	489,130
1,543.20	65.1	501,207
1,543.30	66.7	513,382
1,543.40	68.3	525,653
1,543.50	69.9	538,021
1,543.60	71.5	550,485
1,543.70	73.1	563,043
1,543.80	74.8	575,695
1,543.90	76.4	588,441
1,544.00	78.1	601,280
1,544.10	79.8	614,210
1,544.20	81.5	627,232
1,544.30	83.2	640,345
1,544.40	84.9	653,547
1,544.50	86.6	666,840
1,544.60	88.3	680,221
1,544.70	90.1	693,690
1,544.80	91.9	707,247
1,544.90	93.6	720,892
1,545.00	95.4	734,623
1,545.10	97.2	748,440
1,545.20	99.0	762,343
1,545.30	100.8	776,330
1,545.40	102.6	790,403
1,545.50	104.5	804,559
1,545.60	106.3	818,799
1,545.70	108.2	833,121
1,545.80	110.1	847,527
1,545.90	111.9	862,014
1,546.00	113.8	876,583
1,546.10	115.7	891,234
1,546.20	117.7	905,965
1,546.30	119.6	920,776
1,546.40	121.5	935,667
1,546.50	123.5	950,637
1,546.60	125.4	965,687
1,546.70	127.4	980,815
1,546.80	129.4	996,021
1,546.90	131.3	1,011,305
1,547.00	**133.3**	**1,026,667**

Summary for Pond 1P: Northern Detention Area

Assumptions on size of impoundment and structure (if any) made based upon aerial images and topo maps.

Inflow Area = 530.000 ac, 0.00% Impervious, Inflow Depth = 3.11" for 100 Year Storm event
Inflow = 731.40 cfs @ 12.85 hrs, Volume= 137.462 af
Outflow = 730.28 cfs @ 12.86 hrs, Volume= 137.462 af, Atten= 0%, Lag= 1.1 min
Primary = 730.28 cfs @ 12.86 hrs, Volume= 137.462 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 1,539.19' @ 12.86 hrs Surf.Area= 35,310 sf Storage= 66,360 cf

Plug-Flow detention time= 2.3 min calculated for 137.271 af (100% of inflow)
Center-of-Mass det. time= 2.3 min (892.5 - 890.2)

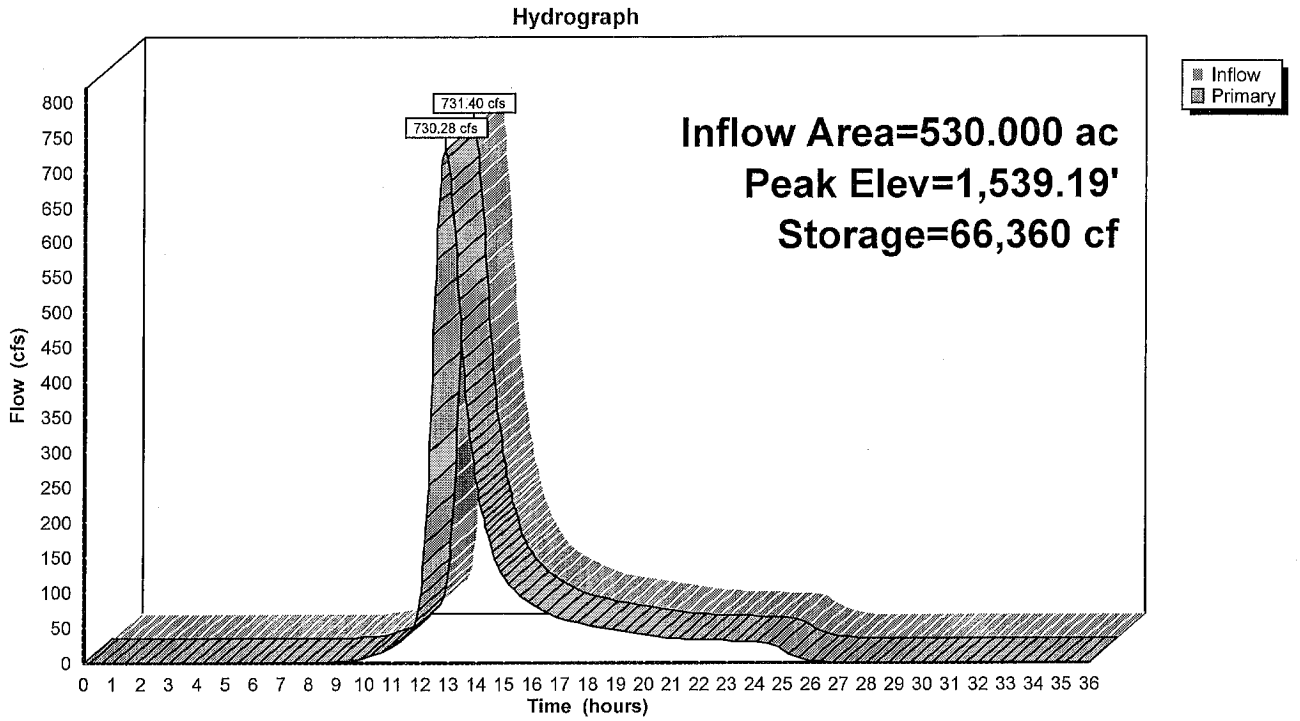
Volume	Invert	Avail.Storage	Storage Description
#1	1,537.00'	1,576,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,537.00	25,400	0	0
1,540.00	39,000	96,600	96,600
1,550.00	257,000	1,480,000	1,576,600

Device	Routing	Invert	Outlet Devices
#1	Primary	1,537.00'	**85.0' long x 5.0' breadth Assumed Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=729.21 cfs @ 12.86 hrs HW=1,539.18' (Free Discharge)
↑—**1=Assumed Spillway** (Weir Controls 729.21 cfs @ 3.93 fps)

Pond 1P: Northern Detention Area



Hydrograph for Pond 1P: Northern Detention Area

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	1,537.00	0.00
1.00	0.00	0	1,537.00	0.00
2.00	0.00	0	1,537.00	0.00
3.00	0.00	0	1,537.00	0.00
4.00	0.00	0	1,537.00	0.00
5.00	0.00	0	1,537.00	0.00
6.00	0.00	0	1,537.00	0.00
7.00	0.00	0	1,537.00	0.00
8.00	0.00	0	1,537.00	0.00
9.00	1.47	402	1,537.02	1.12
10.00	8.65	2,779	1,537.11	7.76
11.00	23.41	5,842	1,537.23	22.20
12.00	**104.98**	**15,012**	**1,537.56**	**95.45**
13.00	**702.18**	**64,779**	**1,539.14**	**707.40**
14.00	250.87	30,218	1,538.08	256.69
15.00	119.79	17,622	1,537.66	121.58
16.00	81.28	13,666	1,537.51	82.12
17.00	62.74	11,547	1,537.44	63.17
18.00	53.74	10,519	1,537.40	53.99
19.00	47.28	9,677	1,537.37	47.54
20.00	41.06	8,794	1,537.34	41.30
21.00	35.41	7,982	1,537.31	35.56
22.00	32.89	7,610	1,537.29	32.93
23.00	31.49	7,411	1,537.28	31.53
24.00	30.25	7,236	1,537.28	30.29
25.00	16.73	5,053	1,537.20	18.14
26.00	2.52	1,119	1,537.04	3.12
27.00	0.34	153	1,537.01	0.43
28.00	0.02	11	1,537.00	0.03
29.00	0.00	0	1,537.00	0.00
30.00	0.00	0	1,537.00	0.00
31.00	0.00	0	1,537.00	0.00
32.00	0.00	0	1,537.00	0.00
33.00	0.00	0	1,537.00	0.00
34.00	0.00	0	1,537.00	0.00
35.00	0.00	0	1,537.00	0.00
36.00	0.00	0	1,537.00	0.00

Stage-Discharge for Pond 1P: Northern Detention Area

Elevation (feet)	Primary (cfs)
1,537.00	0.00
1,537.15	11.56
1,537.30	33.80
1,537.45	65.43
1,537.60	106.66
1,537.75	148.24
1,537.90	194.50
1,538.05	244.64
1,538.20	297.22
1,538.35	353.65
1,538.50	413.81
1,538.65	477.41
1,538.80	543.97
1,538.95	613.36
1,539.10	686.51
1,539.25	763.09
1,539.40	842.55
1,539.55	923.80
1,539.70	1,005.37
1,539.85	1,089.07
1,540.00	1,174.85
1,540.15	1,266.91
1,540.30	1,361.53
1,540.45	1,458.67
1,540.60	1,558.31
1,540.75	1,660.42
1,540.90	1,764.96
1,541.05	1,873.30
1,541.20	1,987.11
1,541.35	2,103.76
1,541.50	2,223.25
1,541.65	2,348.12
1,541.80	2,476.06
1,541.95	2,607.07
1,542.10	2,748.98
1,542.25	2,898.75
1,542.40	3,052.67
1,542.55	3,200.74
1,542.70	3,331.38
1,542.85	3,463.74
1,543.00	3,597.81
1,543.15	3,733.57
1,543.30	3,870.99
1,543.45	4,010.06
1,543.60	4,150.76
1,543.75	4,293.06
1,543.90	4,436.96
1,544.05	4,582.42
1,544.20	4,729.44
1,544.35	4,878.01
1,544.50	5,028.09
1,544.65	5,179.69
1,544.80	5,332.78
1,544.95	5,487.34
1,545.10	5,643.38
1,545.25	5,800.86
1,545.40	5,959.78
1,545.55	6,120.13
1,545.70	6,281.89
1,545.85	6,445.05
1,546.00	6,609.60
1,546.15	6,775.53
1,546.30	6,942.82
1,546.45	7,111.47
1,546.60	7,281.46
1,546.75	7,452.78
1,546.90	7,625.43
1,547.05	7,799.39
1,547.20	7,974.65
1,547.35	8,151.21
1,547.50	8,329.05
1,547.65	8,508.16
1,547.80	8,688.54
1,547.95	8,870.18
1,548.10	9,053.07
1,548.25	9,237.20
1,548.40	9,422.56
1,548.55	9,609.14
1,548.70	9,796.93
1,548.85	9,985.94
1,549.00	10,176.14
1,549.15	10,367.54
1,549.30	10,560.13
1,549.45	10,753.89
1,549.60	10,948.82
1,549.75	11,144.91
1,549.90	**11,342.17**

Stage-Area-Storage for Pond 1P: Northern Detention Area

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,537.00	25,400	0
1,537.15	26,080	3,861
1,537.30	26,760	7,824
1,537.45	27,440	11,889
1,537.60	28,120	16,056
1,537.75	28,800	20,325
1,537.90	29,480	24,696
1,538.05	30,160	29,169
1,538.20	30,840	33,744
1,538.35	31,520	38,421
1,538.50	32,200	43,200
1,538.65	32,880	48,081
1,538.80	33,560	53,064
1,538.95	34,240	58,149
1,539.10	34,920	63,336
1,539.25	35,600	68,625
1,539.40	36,280	74,016
1,539.55	36,960	79,509
1,539.70	37,640	85,104
1,539.85	38,320	90,801
1,540.00	39,000	96,600
1,540.15	42,270	102,695
1,540.30	45,540	109,281
1,540.45	48,810	116,357
1,540.60	52,080	123,924
1,540.75	55,350	131,981
1,540.90	58,620	140,529
1,541.05	61,890	149,567
1,541.20	65,160	159,096
1,541.35	68,430	169,115
1,541.50	71,700	179,625
1,541.65	74,970	190,625
1,541.80	78,240	202,116
1,541.95	81,510	214,097
1,542.10	84,780	226,569
1,542.25	88,050	239,531
1,542.40	91,320	252,984
1,542.55	94,590	266,927
1,542.70	97,860	281,361
1,542.85	101,130	296,285
1,543.00	104,400	311,700
1,543.15	107,670	327,605
1,543.30	110,940	344,001
1,543.45	114,210	360,887
1,543.60	117,480	378,264
1,543.75	120,750	396,131
1,543.90	124,020	414,489
1,544.05	127,290	433,337
1,544.20	130,560	452,676
1,544.35	133,830	472,505
1,544.50	137,100	492,825
1,544.65	140,370	513,635
1,544.80	143,640	534,936
1,544.95	146,910	556,727
1,545.10	150,180	579,009
1,545.25	153,450	601,781
1,545.40	156,720	625,044
1,545.55	159,990	648,797
1,545.70	163,260	673,041
1,545.85	166,530	697,775
1,546.00	169,800	723,000
1,546.15	173,070	748,715
1,546.30	176,340	774,921
1,546.45	179,610	801,617
1,546.60	182,880	828,804
1,546.75	186,150	856,481
1,546.90	189,420	884,649
1,547.05	192,690	913,307
1,547.20	195,960	942,456
1,547.35	199,230	972,095
1,547.50	202,500	1,002,225
1,547.65	205,770	1,032,845
1,547.80	209,040	1,063,956
1,547.95	212,310	1,095,557
1,548.10	215,580	1,127,649
1,548.25	218,850	1,160,231
1,548.40	222,120	1,193,304
1,548.55	225,390	1,226,867
1,548.70	228,660	1,260,921
1,548.85	231,930	1,295,465
1,549.00	235,200	1,330,500
1,549.15	238,470	1,366,025
1,549.30	241,740	1,402,041
1,549.45	245,010	1,438,547
1,549.60	248,280	1,475,544
1,549.75	251,550	1,513,031
1,549.90	**254,820**	**1,551,009**

Summary for Pond 2P: Silver Creek Detention

Storage volumes from topo maps and Google Earth estimates.

Spillway dimensions from 2012 survey for Spruce Street Study and field measurements by CTM.

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[62] Hint: Exceeded Reach 1R OUTLET depth by 5.16' @ 12.30 hrs

Inflow Area = 1,010.000 ac, 5.94% Impervious, Inflow Depth = 3.16" for 100 Year Storm event
Inflow = 1,310.03 cfs @ 12.84 hrs, Volume= 265.790 af
Outflow = 1,309.69 cfs @ 12.85 hrs, Volume= 265.776 af, Atten= 0%, Lag= 0.2 min
Primary = 1,309.69 cfs @ 12.85 hrs, Volume= 265.776 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 1,205.73' Surf.Area= 2,683 sf Storage= 1,892 cf
Peak Elev= 1,214.99' @ 12.85 hrs Surf.Area= 8,155 sf Storage= 42,281 cf (40,389 cf above start)

Plug-Flow detention time= 3.0 min calculated for 265.733 af (100% of inflow)
Center-of-Mass det. time= 2.1 min (895.4 - 893.3)

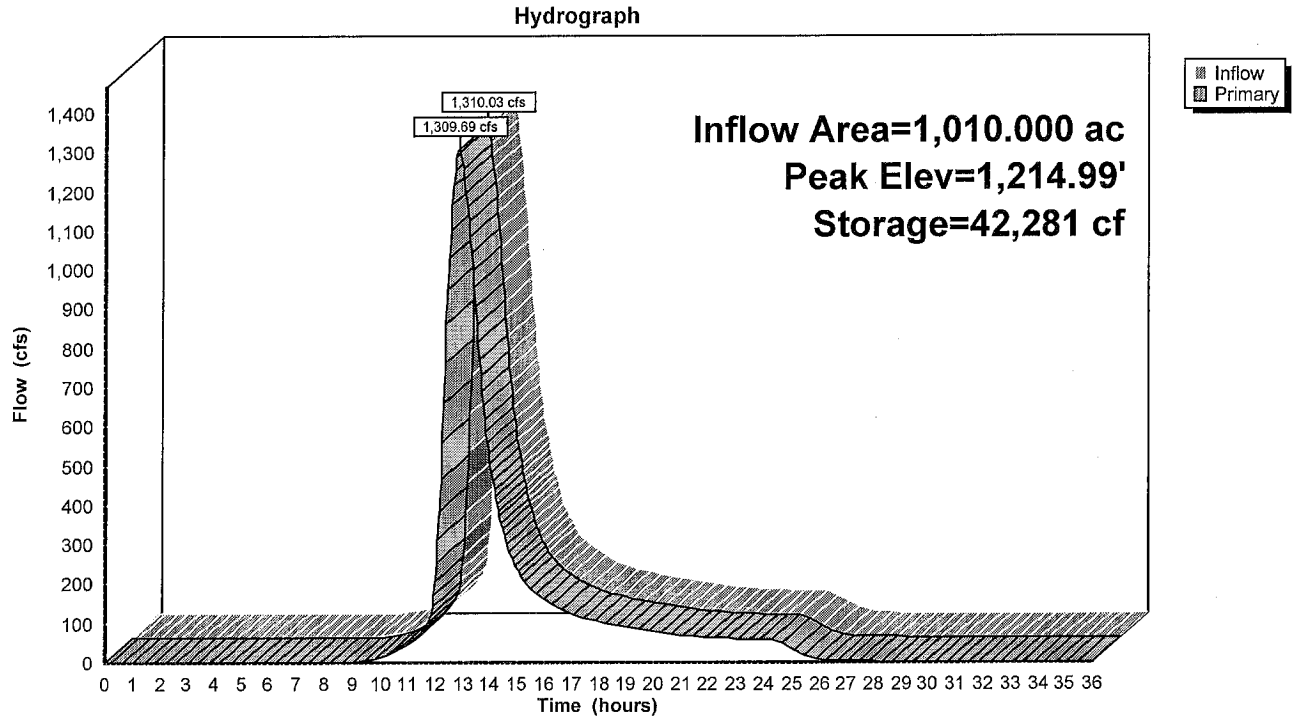
Volume	Invert	Avail.Storage	Storage Description
#1	1,205.00'	1,503,180 cf	**Silver Creek Detention (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,205.00	2,500	0	0
1,208.00	3,250	8,625	8,625
1,211.00	3,750	10,500	19,125
1,214.00	6,750	15,750	34,875
1,220.00	15,235	65,955	100,830
1,240.00	125,000	1,402,350	1,503,180

Device	Routing	Invert	Outlet Devices
#1	Primary	1,206.05'	**10.0" Round 10" Low Flow Outlet** L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,206.05' / 1,205.73' S= 0.0320 '/' Cc= 0.900 n= 0.015, Flow Area= 0.55 sf
#2	Primary	1,211.32'	**50.0' long x 1.0' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Primary	1,214.00'	**50.0' long x 5.0' breadth Top of Dam** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1,307.29 cfs @ 12.85 hrs HW=1,214.99' (Free Discharge)
└─**1=10" Low Flow Outlet** (Inlet Controls 6.05 cfs @ 11.10 fps)
└─**2=Spillway** (Weir Controls 1,168.61 cfs @ 6.36 fps)
└─**3=Top of Dam** (Weir Controls 132.63 cfs @ 2.67 fps)

Pond 2P: Silver Creek Detention



Hydrograph for Pond 2P: Silver Creek Detention

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	1,892	1,205.73	0.00
1.00	0.00	1,892	1,205.73	0.00
2.00	0.00	1,892	1,205.73	0.00
3.00	0.00	1,892	1,205.73	0.00
4.00	0.00	1,892	1,205.73	0.00
5.00	0.00	1,892	1,205.73	0.00
6.00	0.00	1,892	1,205.73	0.00
7.00	0.00	1,892	1,205.73	0.00
8.00	0.09	1,926	1,205.74	0.00
9.00	3.70	5,715	1,207.07	1.60
10.00	15.31	20,944	1,211.45	15.06
11.00	44.03	22,177	1,211.74	43.66
12.00	**211.94**	**25,941**	**1,212.51**	**208.13**
13.00	**1,260.33**	**41,725**	**1,214.92**	**1,261.97**
14.00	504.53	31,109	1,213.42	506.88
15.00	236.72	26,471	1,212.61	237.42
16.00	159.68	25,064	1,212.34	159.97
17.00	122.73	24,249	1,212.18	122.88
18.00	104.23	23,841	1,212.09	104.31
19.00	91.59	23,563	1,212.04	91.67
20.00	79.68	23,274	1,211.98	79.78
21.00	68.88	22,945	1,211.91	68.95
22.00	63.44	22,779	1,211.87	63.47
23.00	60.61	22,692	1,211.85	60.64
24.00	58.24	22,620	1,211.84	58.26
25.00	34.76	21,916	1,211.68	35.08
26.00	8.93	20,624	1,211.38	9.14
27.00	2.11	17,878	1,210.66	4.25
28.00	0.61	9,338	1,208.22	2.74
29.00	0.21	4,340	1,206.61	0.79
30.00	0.10	3,426	1,206.29	0.23
31.00	0.06	3,100	1,206.17	0.12
32.00	0.03	2,941	1,206.11	0.06
33.00	0.02	2,859	1,206.08	0.03
34.00	0.01	2,816	1,206.07	0.02
35.00	0.01	2,792	1,206.06	0.01
36.00	0.00	2,779	1,206.06	0.01

Stage-Discharge for Pond 2P: Silver Creek Detention

Elevation (feet)	Primary (cfs)
1,205.00	0.00
1,205.40	0.00
1,205.80	0.00
1,206.20	0.07
1,206.60	0.76
1,207.00	1.51
1,207.40	2.00
1,207.80	2.39
1,208.20	2.73
1,208.60	3.03
1,209.00	3.30
1,209.40	3.55
1,209.80	3.79
1,210.20	4.01
1,210.60	4.22
1,211.00	4.41
1,211.40	7.65
1,211.80	50.21
1,212.20	124.75
1,212.60	231.63
1,213.00	363.72
1,213.40	500.67
1,213.80	651.90
1,214.20	826.97
1,214.60	1,054.75
1,215.00	1,311.93
1,215.40	1,593.72
1,215.80	1,900.39
1,216.20	2,229.66
1,216.60	2,579.86
1,217.00	2,944.96
1,217.40	3,334.33
1,217.80	3,742.27
1,218.20	4,171.64
1,218.60	4,624.44
1,219.00	5,100.05
1,219.40	5,615.78
1,219.80	6,118.22
1,220.20	6,623.40
1,220.60	7,142.19
1,221.00	7,674.26
1,221.40	8,219.26
1,221.80	8,776.88
1,222.20	9,346.85
1,222.60	9,928.89
1,223.00	10,522.75
1,223.40	11,128.20
1,223.80	11,745.02
1,224.20	12,373.00
1,224.60	13,011.93
1,225.00	13,661.65
1,225.40	14,321.95
1,225.80	14,992.69
1,226.20	15,673.68
1,226.60	16,364.79
1,227.00	17,065.87
1,227.40	17,776.76
1,227.80	18,497.34
1,228.20	19,227.49
1,228.60	19,967.06
1,229.00	20,715.95
1,229.40	21,474.04
1,229.80	22,241.21
1,230.20	23,017.37
1,230.60	23,802.40
1,231.00	24,596.21
1,231.40	25,398.70
1,231.80	26,209.78
1,232.20	27,029.36
1,232.60	27,857.35
1,233.00	28,693.66
1,233.40	29,538.21
1,233.80	30,390.92
1,234.20	31,251.72
1,234.60	32,120.53
1,235.00	32,997.27
1,235.40	33,881.88
1,235.80	34,774.28
1,236.20	35,674.41
1,236.60	36,582.20
1,237.00	37,497.58
1,237.40	38,420.50
1,237.80	39,350.89
1,238.20	40,288.70
1,238.60	41,233.85
1,239.00	42,186.31
1,239.40	43,146.01
1,239.80	**44,112.89**

Stage-Area-Storage for Pond 2P: Silver Creek Detention

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,205.00	2,500	0
1,205.40	2,600	1,020
1,205.80	2,700	2,080
1,206.20	2,800	3,180
1,206.60	2,900	4,320
1,207.00	3,000	5,500
1,207.40	3,100	6,720
1,207.80	3,200	7,980
1,208.20	3,283	9,278
1,208.60	3,350	10,605
1,209.00	3,417	11,958
1,209.40	3,483	13,338
1,209.80	3,550	14,745
1,210.20	3,617	16,178
1,210.60	3,683	17,638
1,211.00	3,750	19,125
1,211.40	4,150	20,705
1,211.80	4,550	22,445
1,212.20	4,950	24,345
1,212.60	5,350	26,405
1,213.00	5,750	28,625
1,213.40	6,150	31,005
1,213.80	6,550	33,545
1,214.20	7,033	36,253
1,214.60	7,598	39,180
1,215.00	8,164	42,332
1,215.40	8,730	45,711
1,215.80	9,295	49,316
1,216.20	9,861	53,147
1,216.60	10,427	57,205
1,217.00	10,993	61,489
1,217.40	11,558	65,999
1,217.80	12,124	70,735
1,218.20	12,690	75,698
1,218.60	13,255	80,887
1,219.00	13,821	86,302
1,219.40	14,387	91,944
1,219.80	14,952	97,811
1,220.20	16,333	103,987
1,220.60	18,528	110,959
1,221.00	20,723	118,809
1,221.40	22,919	127,537
1,221.80	25,114	137,144
1,222.20	27,309	147,629
1,222.60	29,504	158,991
1,223.00	31,700	171,232
1,223.40	33,895	184,351
1,223.80	36,090	198,348
1,224.20	38,286	213,223
1,224.60	40,481	228,977
1,225.00	42,676	245,608
1,225.40	44,872	263,118
1,225.80	47,067	281,505
1,226.20	49,262	300,771
1,226.60	51,457	320,915
1,227.00	53,653	341,937
1,227.40	55,848	363,837
1,227.80	58,043	386,616
1,228.20	60,239	410,272
1,228.60	62,434	434,806
1,229.00	64,629	460,219
1,229.40	66,825	486,510
1,229.80	69,020	513,679
1,230.20	71,215	541,726
1,230.60	73,410	570,651
1,231.00	75,606	600,454
1,231.40	77,801	631,135
1,231.80	79,996	662,695
1,232.20	82,192	695,133
1,232.60	84,387	728,448
1,233.00	86,582	762,642
1,233.40	88,778	797,714
1,233.80	90,973	833,664
1,234.20	93,168	870,492
1,234.60	95,363	908,199
1,235.00	97,559	946,783
1,235.40	99,754	986,246
1,235.80	101,949	1,026,586
1,236.20	104,145	1,067,805
1,236.60	106,340	1,109,902
1,237.00	108,535	1,152,877
1,237.40	110,731	1,196,730
1,237.80	112,926	1,241,462
1,238.20	115,121	1,287,071
1,238.60	117,316	1,333,558
1,239.00	119,512	1,380,924
1,239.40	121,707	1,429,168
1,239.80	**123,902**	**1,478,290**