NYC Environmental Protection

CONTRACT EE-DSGN3

Small Dams Contract Development
Technical Memorandum 2-3
EOH Dam Inspection Reports

Eastern Operations Division:
EOH-07 – Seven Hills Lake Dam

October 2010

Document #4779

AECOM

TABLE OF CONTENTS

Figures

Appendices

1.0 Introduction

1.1 Scope of Services

Through their land acquisition program, NYCDEP has obtained ownership or part ownership of several small dams in the watersheds of both the East of Hudson (EOH) and West of Hudson (WOH) Operations divisions. As part of Contract EE-DSGN3, NYCDEP has requested AECOM to evaluate 25 small dams in the EOH and WOH divisions. This report is for the Seven Hills Lake Dam in the EOH Division.

The visual inspection report herein was authorized under Task 2, Collection of Existing Information of Contract EE-DSGN 3. The purpose of this report is to compile and evaluate the existing information available on the dam from NYCDEP record files and the existing conditions of the dam as determined from a site inspection in accordance with NYSDEC standards and the NYCDEP dam inspection program. Based on the site inspections, AECOM has determined the main characteristics of each dam, such as dam height and reservoir area and volume, the general conditions of the dam and appurtenant works, and the likely consequences of failure.

1.2 Inspection Visit

This report summarizes the site inspection performed at the Seven Hills Lake Dam, which is included in the EOH system. The inspection visit was conducted on April 21, 2010 at 8:45 A.M and on April 22, 2010, at approximately 11:00 A.M. The weather during the inspection was sunny and the temperature was approximately 65°F. Field notes, measurements, GPS measurements and photographs were collected at the dam site. On the second day, a boat was also used to facilitate the inspection of the spillway drop inlet.

1.3 Inspection Team

The Seven Hills Lake Dam was inspected on April 21and 22, 2010 by Jean-Pierre Minois, P.E., Jyotindra Patel, P.E., Elaine Labate, E.I.T., and Valerie Bauza, E.I.T., in the presence of Bill Stroh and Nino Modica (NYCDEP – Eastern Division).

1.4 Additional Site Visit

On June 30, 2010, a second visit to the dam was organized to assess the extent of the proposed repair. The team comprised of Eric Cole, PE, Ingo Fox, PE and Jean-Pierre Minois, PE met Frank Barquet, Bill Stroh, and Nino Modica of NYCDEP – Eastern Division.

2.0 Project Data

2.1 Project Description and Location

The Seven Hills Lake Dam is located in Kent Township, off of Seven Hills Lake Road in Putnam County, New York (Figure 1). The approximate coordinates of the dam are 41°28'52"N, 73°45'00"W. The Seven Hills Lake Dam is located on the Leetown Brook approximately one mile north of its confluence with the NYCDEP Boyd Corners Reservoir. At the dam location the Leetown Brook has a drainage area of 7.45 square miles.

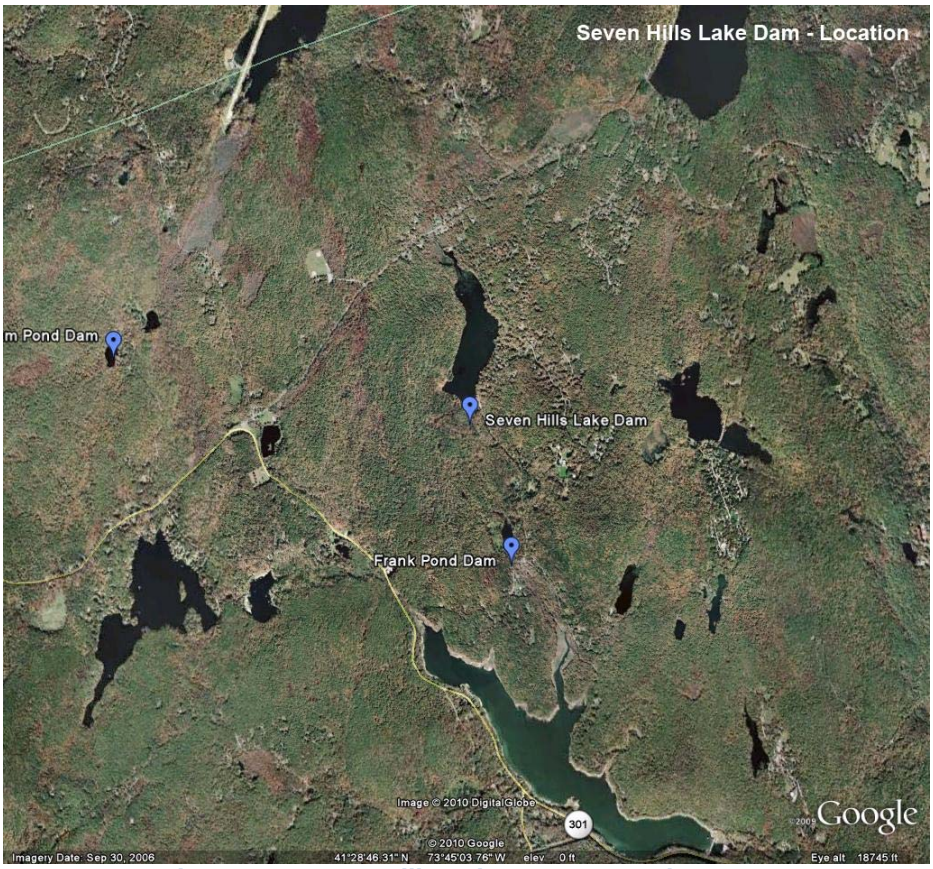


Figure 1 - Seven Hills Lake Dam - Location Map

The Seven Hills Lake Dam is listed on the New York State Inventory of Dams. Its identification number is 213-2531. The NYSDEC listing is included in Appendix B. Construction of the dam is reported by NYSDEC to have been completed in 1957. The most recent inspection was performed in 2008.

The Seven Hills Lake Dam is an earth embankment approximately 240 feet long. The dam height is approximately 15 feet. The dam has a drop inlet service spillway with a rectangular crest

structure approximately 33 feet long by 10 foot wide. Two sluice gates at the base of the drop inlet shaft provide a means of drawing the reservoir down below spillway crest level.

2.2 Size Classification

The maximum dam height is approximately 15 feet. The reservoir is approximately 3,200 feet long by 750 feet wide and has an approximate surface area of 55 acres (see Reservoir Aerial in Appendix A). The impoundment capacity is estimated to be approximately 295 acre-feet or 96 million gallons.

Based on its height and storage capacity the Seven Hills Lake Dam falls under Parts 608 and 673 of NYSDEC Dam Safety Regulations.

2.3 Hazard Classification

The Seven Hills Lake Dam has been classified as a Hazard Class B by NYSDEC as reported in the NYS Inventory of Dams. There are no houses or roads located in close proximity to the downstream channel of Seven Hills Lake Dam. However, Frank Pond Dam is located approximately 3,500 feet downstream of Seven Hills Lake Dam and a residence is located in very close proximity to the right side of Frank Pond Dam. A failure at Seven Hills Lake Dam may result in damage to the home, but will not likely result in loss of human life. AECOM agrees with the Hazard Class B classification.

2.4 Ownership

The reservoir impounded by the Seven Hills Lake Dam, belongs to a local resident association known as the Seven Hills Lake Property Association. The property line between the association and NYCDEP crosses the dam at approximately 60 feet from the right abutment of the dam; the remainder of the embankment is located on the Association property.

2.5 Use of Dam

The Seven Hills Lake is primarily used for recreational swimming, boating and fishing. On the eastern side of Seven Hills Lake, near the left abutment of the dam there is a small beach and picnic area used for recreational purposes.

3.0 Visual Inspection

3.1 General

The field sketches of the dam and spillway are included in Appendix C. Selected photographs of the project are given in Appendix D. The AECOM and NYCDEP inspection checklists for the dam are included in Appendix E.

3.2 Condition of Dam and Appurtenant Works

Dam

The Seven Hills Lake Dam is a 240-foot long earth embankment with a crest width that varies between 16 and 18 feet (Photo 1). The embankment is in generally good condition, except for about 30 feet of the downstream embankment slope near the right abutment, which is in poor condition. The upper reaches of the upstream slope are grassed and the remainder of the slope to lake level and below is protected with dumped stone riprap (Photo 2). The slope is in generally in good condition except for some grass growing through the riprap stones.

The embankment crest is covered with grass. There are no visible signs of sloughing, erosion, cracking, or other signs of distress in the embankment crest area.

The downstream embankment slope on the left side of the service spillway is covered with grass and is in good condition (Photo 3). There is moderate erosion along the lower area of the slope abutting the downstream left spillway training wall, which is most likely a result of surface runoff. Other than this, there are no other visible signs of sloughing, erosion or cracking.

The downstream slope on the right side of the service spillway is not well maintained and is overgrown with trees, bushes, saplings, cattails, and grass. There is moderate erosion along the lower area of the slope abutting the downstream right spillway training wall, which is most likely a result of surface runoff (Photo 4).

About 30 feet of the downstream slope surface near the right abutment consists of dumped large size boulders and rock fill; additionally, this area is overgrown with grass and bushes (Photo 5). There is significant seepage along the downstream toe of the rock fill, but the exact source of seepage is not clear (Photo 6). The area downstream of the toe is covered with lush vegetative growth.

Spillway

The spillway is a drop inlet type located in the lake, approximately 160 feet from the left abutment. The drop inlet crest structure is a rectangular concrete box structure, which is protected at the top by a chain link fence, which serves as trash rack (Photo 7). The overall dimensions of the opening are approximately 37 feet long by 12 feet wide, resulting in a total net weir length of 85 feet. The inspection of the structure was made by boat. At the time of inspection, the discharges from the lake were flowing over the top of the structure and the lake level was about 3 or 4 inches above the top surface of the box structure (Photo 8). The concrete box structure and the trash rack are in good condition with no visible signs of distress.

The drop shaft is connected to a 16-foot wide by 5-foot high box culvert crossing the embankment dam at right angle; the culvert is centrally divided by a concrete vertical wall approximately 8 inch thick.

The spillway outlet concrete structure located at the downstream slope of the embankment is in good condition, except for minor erosion at the bottom surfaces of both downstream training walls (Photo 9). The discharge from the downstream outlet structure flows into a natural channel.

Low Level Outlet

The low level outlet of the dam is combined with the drop inlet service spillway. There are two openings 24” diameter, with sluice gates located at the bottom of the upstream face of the concrete intake structure; these gates serve as the upstream intake of the low level outlet. The operating gate stems of both sluice gates are located at the top of the structure. Both sluice gates remained closed during the inspection. The operating stem of the right low level outlet sluice gate is out of alignment and has bent about 10 degrees from the vertical. The operating stem of the left sluice gate is aligned vertically.

Abutments

There are no signs of seepage or unusual conditions at the either abutment of the dam.

Reservoir Area

In the vicinity of the dam there is no evidence of sloughing, potentially unstable slopes, or unusual conditions which would adversely affect the dam.

3.3 Downstream Conditions

Within 100 feet from the spillway outlet, there are remnants of the abutment walls of an old bridge crossing the Leetown Brook (Photo 10); the abutments have been washed away, the deck is missing and the abutment walls are in poor structural conditions.

Further downstream, the floodplain is a wooded area, approximately 200 to 300 feet wide, for approximately 2,700 feet until it reaches Frank Pond. The 800-foot long Frank Pond is impounded by the Frank Pond Dam (EOH-05): there is a residence located on the right abutment of the Frank Pond Dam that would be affected by the potential failure of the Seven Hills Lake Dam. Approximately 300 feet downstream of the Frank Pond Dam spillway the Leetown Brook crosses Nimham Road under a bridge with a 12-foot wide opening. It also crosses East Boyd Road under a similar bridge approximately 100 feet further downstream. These are the only structures in the Leetown Brook valley located between Frank Pond Dam and the Boyd Corners Reservoir, a distance of approximately 2,300 feet.

3.4 Developments Along Reservoir Rim

Several residences are located at or near the eastern 3,500-foot long reservoir rim. There is also a beach and picnic area in the vicinity of the dam right (east) abutment.

4.0 Recommendations and Remedial Measures

The capacity of the spillway to pass 150% of the 100 year flood should be checked, taking into account the impact of the two upstream dams on Leetown Brook, namely the Upper and Lower Chai Lin Dams. In addition, the ability of the low level outlet to draw down the reservoir should be reviewed.

There are a number of deficiencies that should be repaired or monitored to assess potential future changes in the performance of the dam and appurtenant structures. These include:

a) The eroded areas of the downstream embankment slope abutting both downstream spillway training walls should be restored with compacted backfill and erosion protection.

b) Heavy brushes, shrubs, saplings, and other vegetative debris should be removed from the right side of the downstream embankment crest edge and the downstream slope.

c) The overgrown vegetation, including bushes, saplings, and fallen trees, in the downstream toe area should be removed.

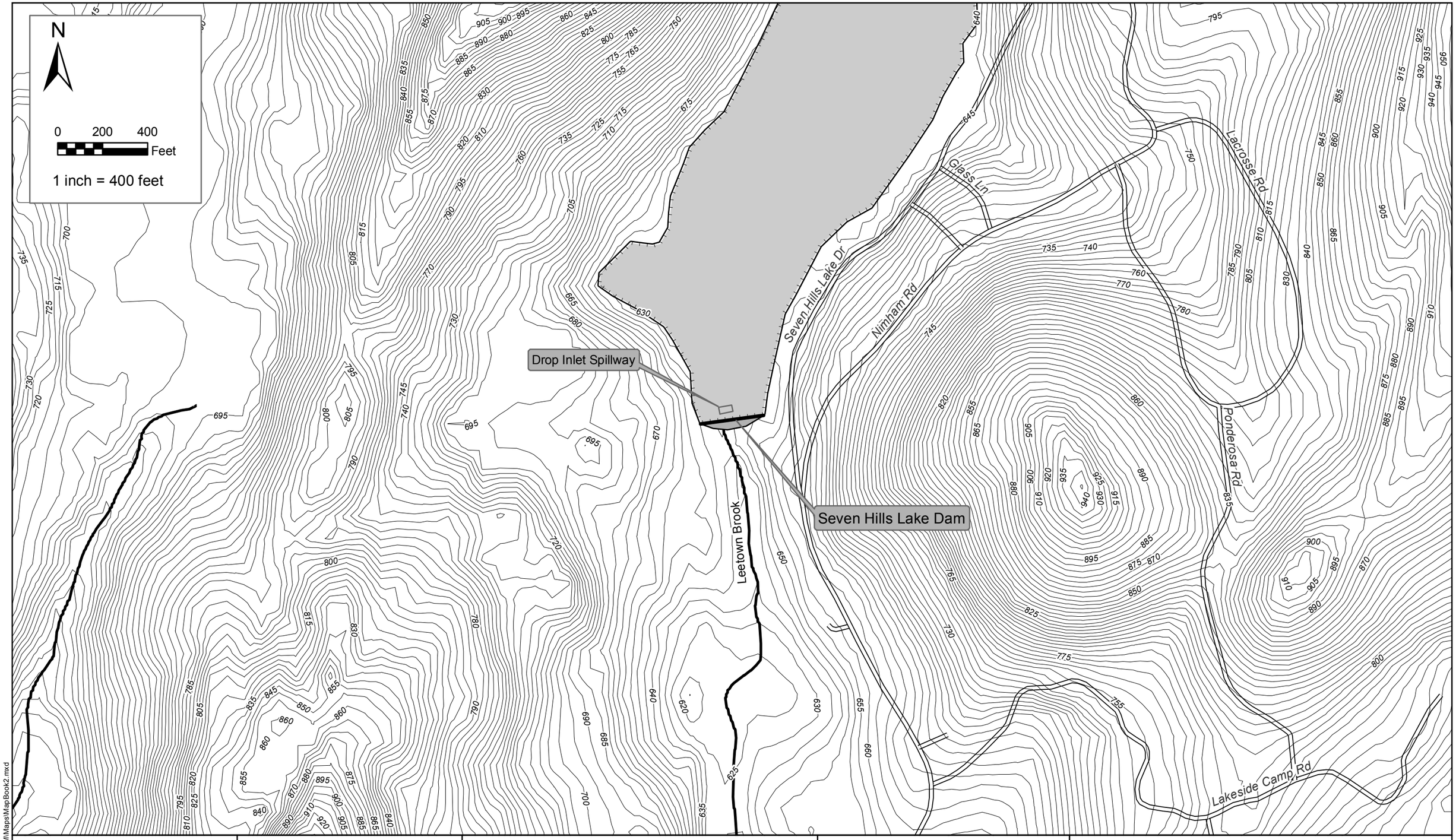
d) The trees within the embankment crest, both slopes, and in vicinity of downstream embankment dam toe area should be inventoried monitored. If a tree dies, the area around the tree should be monitored. Any fallen trees should be removed.

e) The condition of the low level outlet should be reviewed by operating the slide gates; the bent operating gate stem of the right side sluice gate should be repaired.

f) The seepage at the toe of the rock filled downstream slope near the right abutment dam contact should be monitored.

APPENDIX A

VICINITY MAP AND RESERVOIR AERIAL



G:\Projects\MUNI\60147303DAM\Maps\MapBook2.mxd

NYC Environmental Protection

605 Third Avenue
New York, NY 10158

AECOM

Legend

- Contour Elevation (feet)
- Stream
- Paved Road
- Lake or Pond
- Unpaved Road

CONTRACT EE-DSGN3

SMALL DAMS CONTRACT DEVELOPMENT

SEVEN HILLS LAKE DAM - EOH-07
KENT, NY

VICINITY MAP

OCTOBER 2010

Appendix A-1

G:\Projects\MUNI\60147303DAM\Maps\MapBookAerials.mxd

NYC Environmental Protection

605 Third Avenue
New York, NY 10158

AECOM

Legend

Paved Road

Unpaved Road

CONTRACT EE-DSGN3

SMALL DAMS CONTRACT DEVELOPMENT

SEVEN HILLS LAKE DAM - EOH-07
KENT, NY

RESERVOIR AERIAL

OCTOBER 2010

APPENDIX A2

APPENDIX B

NEW YORK STATE INVENTORY OF DAMS

New York State Inventory of Dams

Name of Dam: Seven Hills Realty Co Inc Dam

State ID: 213-2531

Hazard Code: B

See below for hazard code definition

Year Completed: 1957

Most Recent Inspection: 7/16/2008

Location Information:				
County	**Municipality**	**River or Stream**	**Latitude**	**Longitude**
Putnam	Unknown	TR-W BRANCH CROTON RIVER	41° 28' 50.0" N	73° 45' 2.0" W

Type:	
Type of Construction	**Purpose**
RE – Earth	Recreation

Technical Information:	
Federal ID Number	NY01143
Dam Length (feet)	345
Dam Height (feet)	14
Spillway Width (feet)	58
Maximum Discharge (cfs)	1000
Maximum Storage (acre-feet)	295
Normal Storage (acre-feet)	138
Reservoir Surface Area (acres)	45
Drainage Area (square miles)	5.5
Basin	LOWER HUDSON
Date of Data Update	7/6/2009

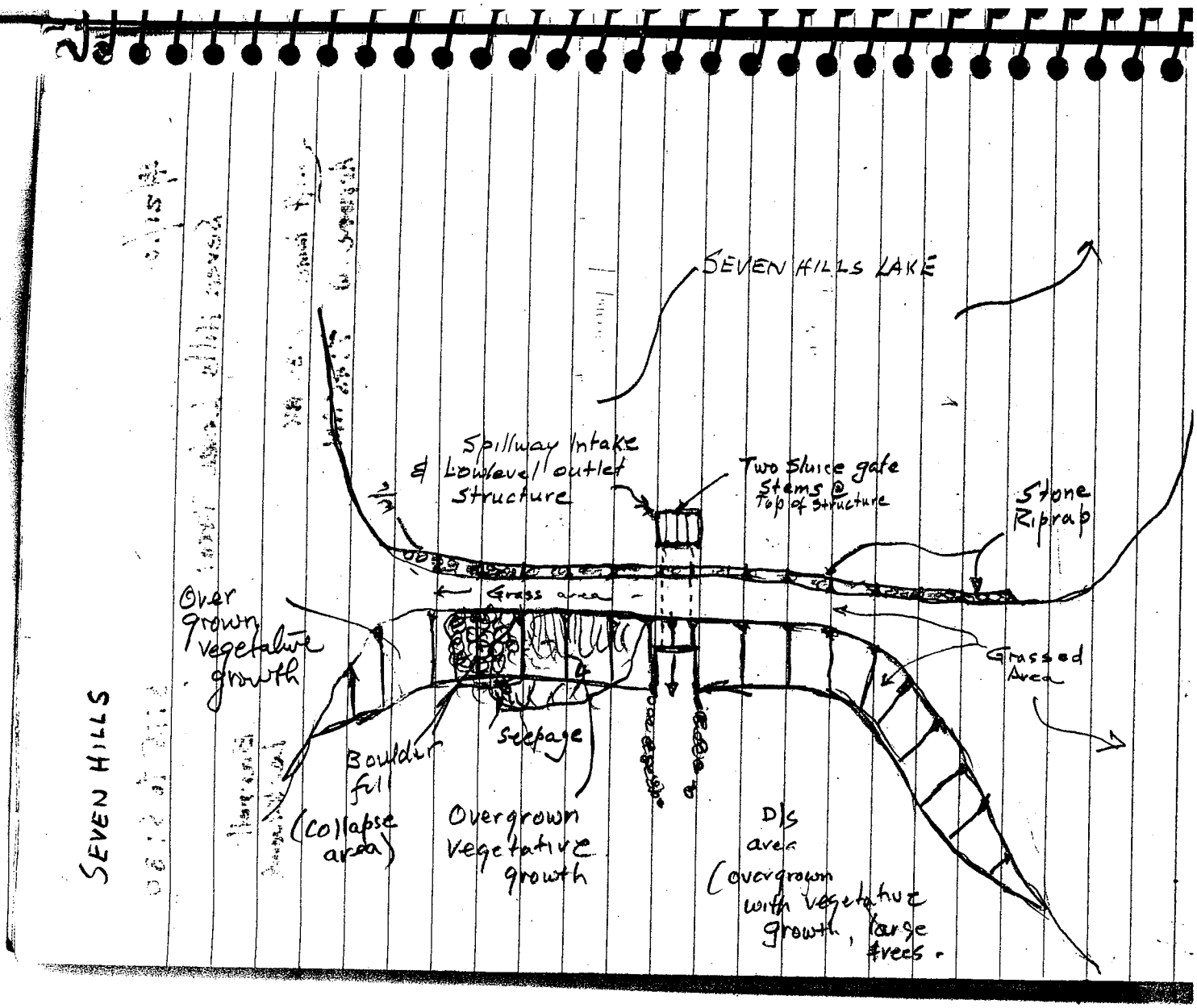
Note -- The Hazard Code denotes the downstream hazard potential in the event of a dam failure:

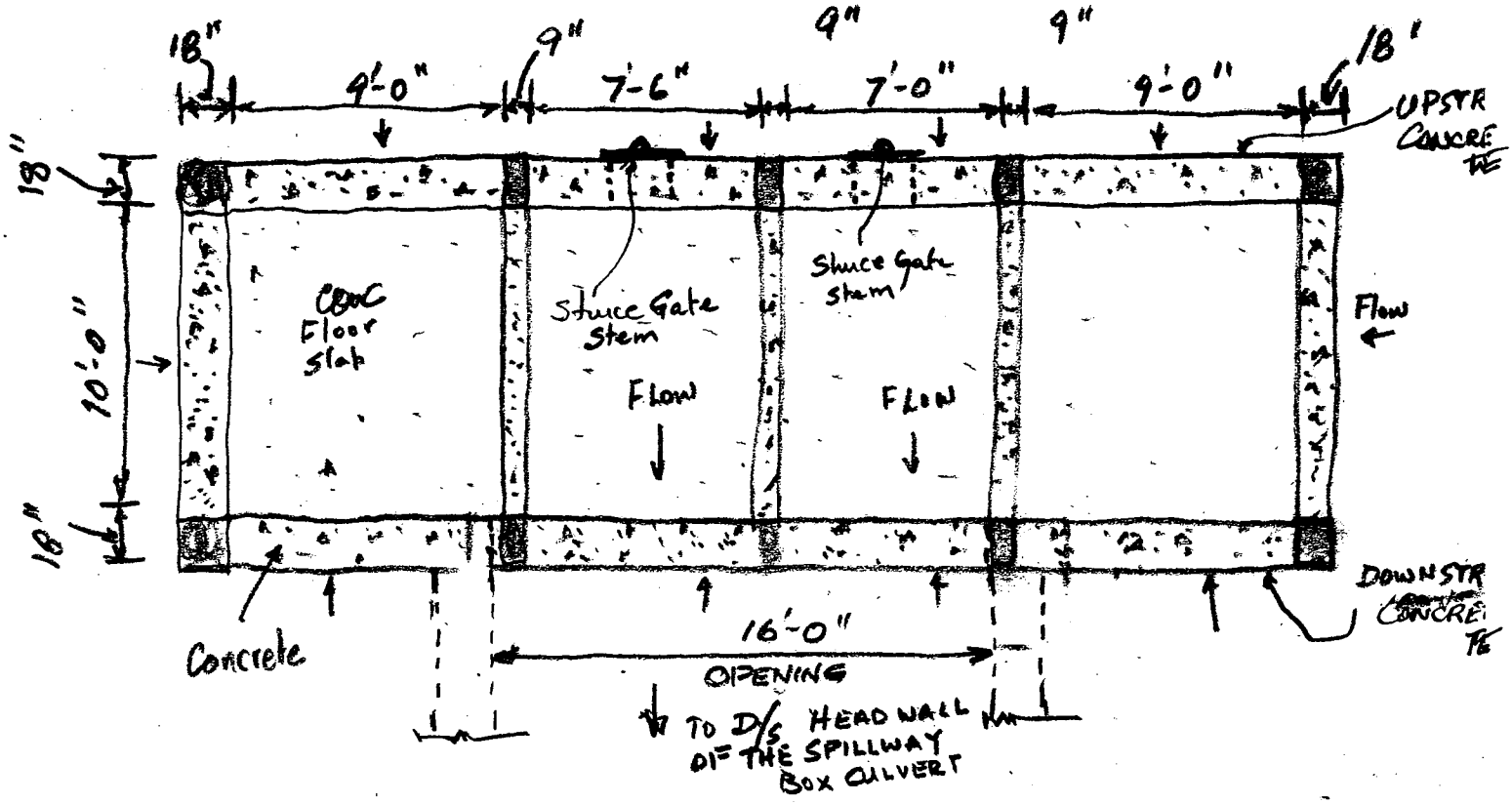
C = High Hazard
B = Intermediate Hazard
A = Low Hazard
0 = Null; No hazard code assigned

Also Note -- This data was exported from DEC's database in January 2010. Updates to data that occurred after January 2010 are not reflected here.

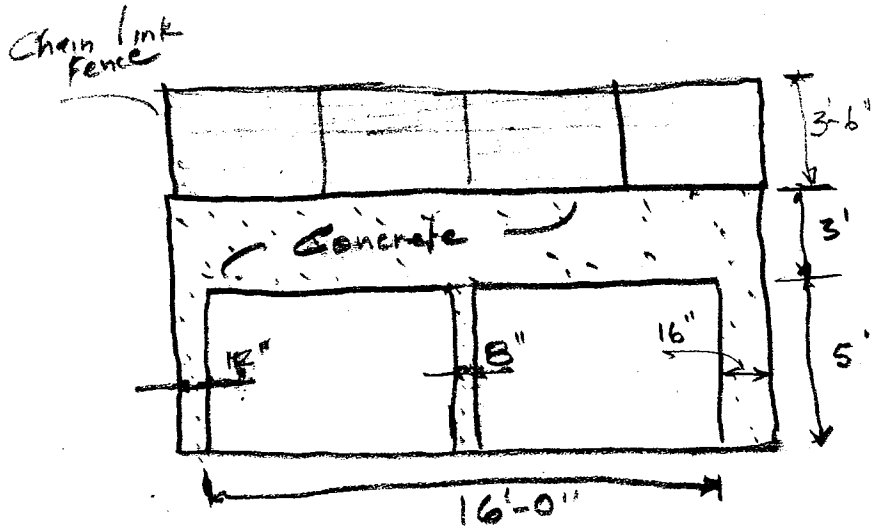
APPENDIX C

INSPECTION SKETCHES


SEVEN HILLS LAKE
Spillway Intake & Low level outlet structure
Two Sluice gate Stems @ Top of structure
Stone Riprap
Grass area
Over grown vegetative growth
Grassed Area
SEVEN HILLS
Boulder fill (collapse area)
Seepage
Overgrown vegetative growth
D/S area
Covergrown with vegetative growth, large trees.



SEVEN HILLS
SPILLWAY & LOWLEVEL OUTLET STRUCTURE
PLAN @ RESERVOIR LEVEL
NTS



SPILLWAY CULVERT
DOWNSTREAM HEADWALL
NTS

SEVEN HILLS LAKE – SPILLWAY

APPENDIX D

SITE PHOTOGRAPHS

Photo 1 - EOH-07 Lake and Upstream View of Dam

Photo 2 - EOH-07 Upstream Slope

Photo 3 - EOH-07 Downstream Slope

Photo 4 - EOH-07 Erosion near the Right Spillway Outlet Training Wall

Photo 5 - EOH-07 Right Abutment Downstream Slope

Photo 6 - EOH-07 Seepage near Right Abutment

Photo 7 - EOH-07 Spillway

Photo 8 - EOH-07 Drop Inlet Spillway

Photo 9 - EOH-07 Spillway Discharge Outlet

Photo 10 - EOH-07 Downstream Channel with Bridge Remnants

APPENDIX E

INSPECTION FORMS

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CONTRACT EE-DSGN3
Small Dams Contract Development

General Dam Inspection Form

Division: (EOH) WOH **Date:** 4/21/2010 **Time:** 8:45AM

Dam Name: SEVEN HILLS **Dam No.** 7 **PID No:** _____

Weather & Temperature: 65°F ; SUNNY **Town:** KENT

GPS Coordinates: _____ **Nearby Roads:** Nimham Road & Rambler Road

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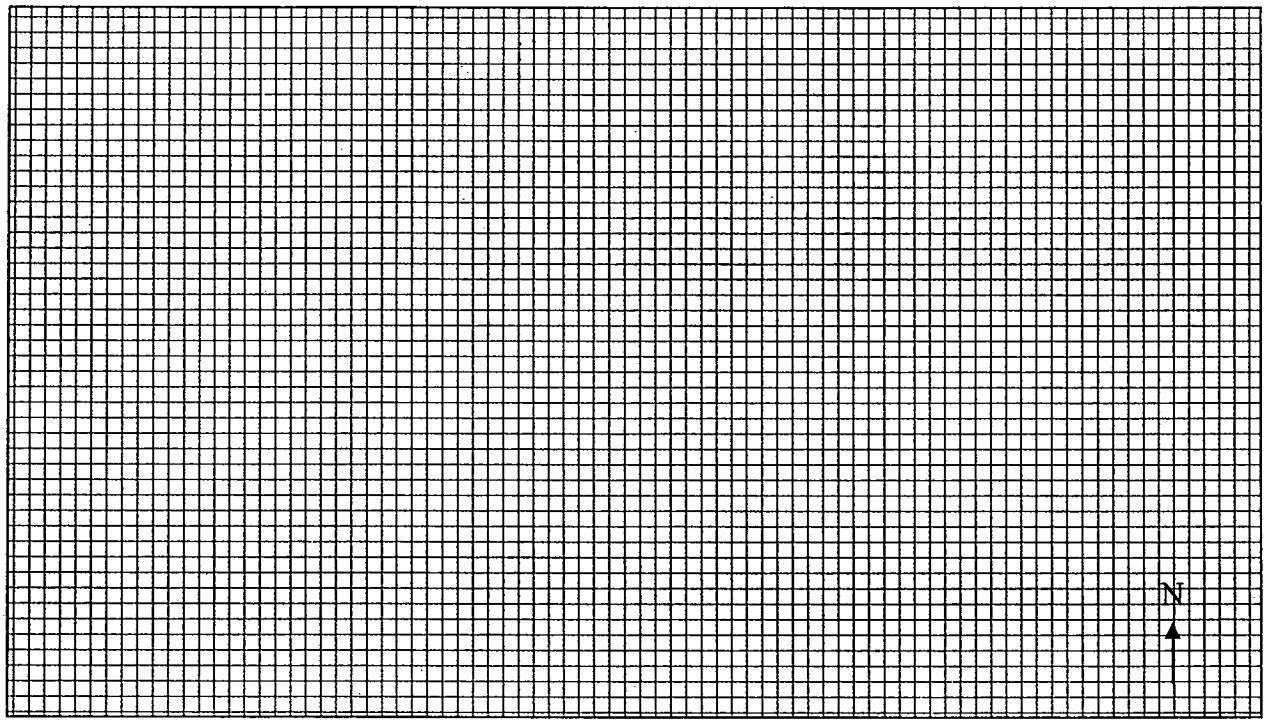
Plan Sketch – Dam, Appurtenant Works, and Downstream Channel



Dam Type: (Embankment) Concrete Masonry Beaver Other: _____

Spillway Type: Channel Service (Drop Shaft Service) Emergency Within Concrete Dam

Preliminary Estimates

-Dam Height 15 ft -Watershed Area _____ sq. miles

-Reservoir Volume _____ MG -100 years Flood _____ cfs

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NYC Environmental Protection

CONTRACT EE-DSGN3
Small Dams Contract Development

General Dam Inspection Form

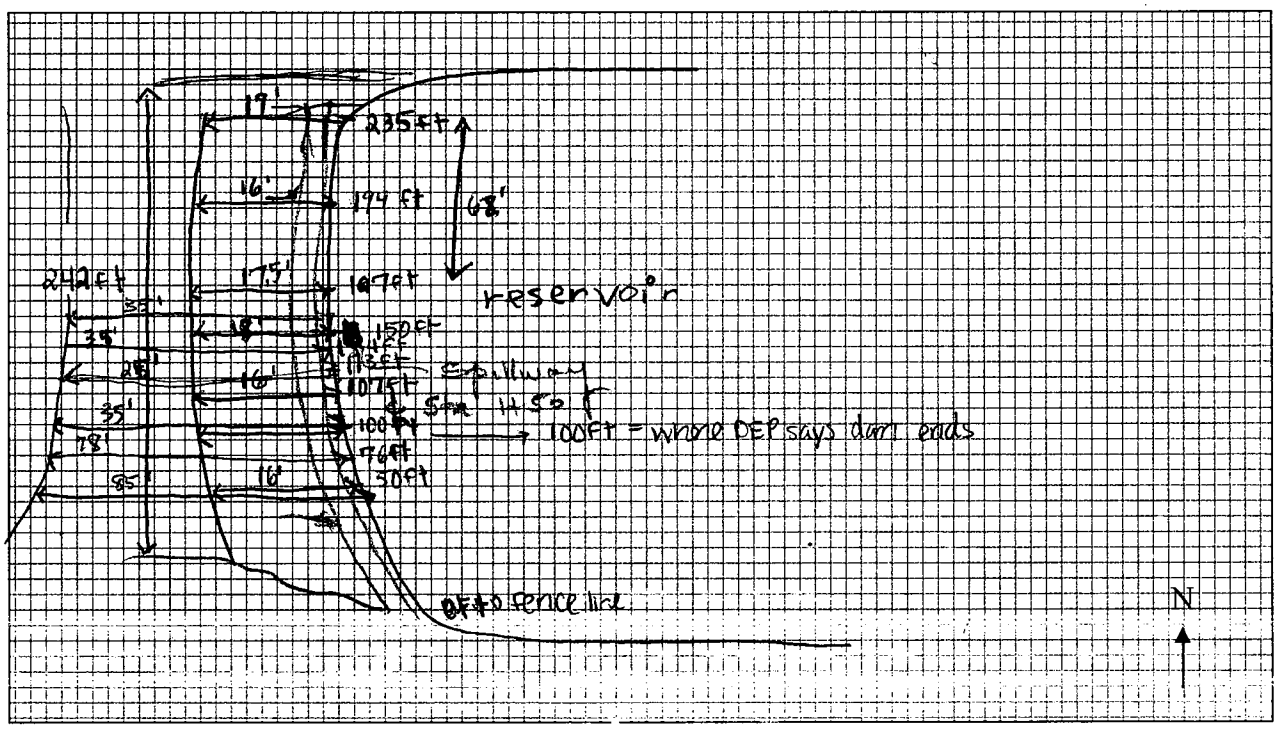
Division (EOH) WOH **Date:** 4/21/2010 **Time:** 8:45am

Dam Name: Seven Hills **Dam No.** 7 **PID No:** –

Weather & Temperature: 65° Sunny **Town:** KENT

GPS Coordinates: _____ **Nearby Roads:** Nimham Rd, Rambler Rd

Plan Sketch – Dam, Appurtenant Works, and Downstream Channel



Dam Type: (Embankment) Concrete Masonry Beaver Other: _____

Spillway Type: Channel Service (Drop Shaft Service) Emergency Within Concrete Dam

Preliminary Estimates
-Dam Height 15 ft -Watershed Area _____ sq. miles
-Reservoir Volume _____ MG -100 years Flood _____ cfs

Downstream Hazard Conditions

Proximity of Houses:

None along downstream channel. (See additional Comment #1

Proximity of Roads:

None

Preliminary Hazard Classification:

B

Downstream Flow Facilities

Road Culvert:

None. Bridge remnants observed in the downstream channel.

Stream Channel:

Natural with trees, brushes, sapling and fallen trees.

Additional Observations

1. Frank Pond Dam is located about 4000 ft downstream of Dam. In close proximity of right side of the Frank Pond Dam there is a house.

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CONTRACT EE-DSGN3
Small Dams Contract Development

Embankment Dam Inspection Form

Division: (EOH) WOH **Date:** 4/21/2010 **Time:** 8:45am

Dam Name: Seven Hills **Dam No.** 7 **PID No:** —

Main Dimensions and Features

Crest Width varies 16-18 ft Crest Length 240 ft

Crest Level _____ ft Toe Level _____ ft

Dam Height 15 ft

Upstream Slope _____ Downstream Slope _____

Upstream Slope

Cracks: None observed

Slides: _____

Deformations: None Observed

Erosion: None observed.

Vegetation Condition: Mowed grassed slope above stone riprap & is in generally good condition.

Slope Protection: Dumped riprap is in fair condition; minor grass growing through the stones.

Downstream Slope

Cracks: None observed

Slides: None observed (see additional comments)

Seepage: Significant Seepage occuring at the dumped boulders areas of the slope near the right side of the dam near right abutment (see Additional Comments)

Deformation: None observed.

Erosion: Minor erosion at contact between D/s slope and both concrete downstream training wall of the spillway culvert.

Vegetation Condition: Left side of spillway culvert: mowed grassed slope in good condition. Right side of spillway culvert: Overgrown vegetative growth and poor condition.

Slope Protection: Natural slope

Crest

Longitudinal Cracking: None observed

Transverse Cracking: None observed.

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Misalignment: Crest alignment straight; no change in crest alignment observed

Cave-in/Animal Burrow: None observed

Low Areas: None observed

Ruts/Puddles: None observed

Vegetation Conditions: Moved grassed surface and kept in good condition

Additional Seepage Areas

—

Additional Observations

At right side of dam near right abutment, about 30 feet of the slope has dumped boulders mixed with tree, grass and vegetation growth. At toe of this portion of the slope significant seepage was occurring.

It was reported that this portion of slope had sloughed in past; and temporary fix was done.

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CONTRACT EE-DSGN3
Small Dams Contract Development

Drop Inlet Service Spillway Inspection Form

Division: EOH / WOH Date: 04/22/2010 Time: 11:30 am -

Dam Name: SEVEN HILLS LAKEDAM Dam No. 7 PID No: _____

Main Dimensions and Features

Crest Length 85 ft Depth from Top of Dam ? ft

Crest Elevation _____ ft

Drop Inlet

Concrete Structure: Rectangular Box 9 ft high (37ft x 12ft) To twin culvert under Embankment (outlet) - opening (5x8') x 2

Trashrack: chain link fence - Welded Rebar (18-inch high)

Stop-logs: None

Stilling Basin

None

Additional Observations

Rectangular Concrete Box Structure (uncontrolled)
4 openings length wise each side (9 + 7 + 7.5 + 9) x 2
1 opening width wise each side 10' wide.

Two sluice gates: 24" Dia opening: Invert at 7 ft from Spillway Crest - Gate stem out of alignment (Right).

Floating debris + branches -

EOH-07
Seven Hills Lake Dam

New York City Department of Environmental Protection
Generic Dam/Dike/Appurtenances Observations Form

Rev. 1/11/08 (TD), 3/5/08(TD), 4/30/08(TD)

The intent of this Observations Form (along with a brief training class) is to guide non-engineering personnel during checks of various and differing DEP dams, dikes, and appurtenances. The Observer should look for expressions of ***significant hazardous conditions*** by which failure may result. All forms shall be filled out as originals (no photo copies), signed & dated. Below are some of the typical items that may be encountered. If a question is inappropriate for the facility or data unavailable then mark **"N/A"**. ***Please fill out form with red ink.***

NOTE – Any question enclosed in a box and checked YES by the Observer requires IMMEDIATE notification to the CHAIN OF COMMAND. Do NOT continue to complete your observations; make notification immediately!

Facility Name: EOH-07: Seven Hills Lake Dam Date: ___/___/___ Time: _____

Location: Off Seven Hills Lake Road Town: Kent Township DEP Ref # (Lands, Ops.) : _____

Observer's Name(s) & Contact info: _____ Weather & Temp: _____
(Please print neatly)

1. In laymen's terms, **briefly** describe the type of dam or dike (e.g. earthen, stone, combo, masonry, gravity etc), the height, the length, the size of impoundment being reviewed, and the type of spillway.
Embankment dam, 15 feet high, 240 feet long with drop-inlet spillway
Reservoir storage ≐ 96 mg

CREST, SPILLWAY &/or RELEASE WORKS:

2. Does there appear to be any **"large"** obstructions (e.g. beaver dams, fallen trees, etc.) blocking what would otherwise appear to be the spillway channel, inlet pipe or other designed water outlet ?..... Yes ☐ No ☑

3. Does the upstream pool show any **"major"** air bubbles, whirlpools or **"unusual"** current flows?..... Yes ☐ No ☑

4. Is water now or does it appear to have recently flowed over the crest of the dam/dike away from what would appear to be the normal water flow area and/or spillway channel? (indicated by signs of **"recent"** erosion of or cuts in dam/dike crest or **"recent"** movement around abutments, etc.)..... **Yes** ☐ No ☑

STONE or MASONRY SECTIONS:

5. Does the masonry dam or the dam abutments (where the masonry dam meets any earthen sections) show **"recent"** signs of **"severe"** leakage, cracking, misalignment, movement, concrete spalling or other **"severe"** deterioration or failure? ..... **Yes** ☐ No ☑

6. Does the stone or masonry section(s) show any **"severe"** leaks that appear as fan spray or jets of water under pressure? ..... **Yes** ☐ No ☑

DOWNSTREAM SECTIONS:

7. Any **"large"** sections of erosion or **"raw"** soil showing on downstream face of earthen sections?..... **Yes** ☐ No ☑

8. Any Slides or Sloughing of **"large"** wedge shaped areas on downstream face of earthen sections?..... **Yes** ☐ No ☑

9. On the downstream side of a earthen dam/dike, is there any observable running water from non-drainage discharge points? ..... Yes ☑ No ☐

10. Does any running water noted in Question 9 show as a boil or **"large"** upwelling?..... **Yes** ☐ No ☑

11. Does any running water noted in Question 9 or 10 appear muddy or cloudy (turbid)?..... **Yes** ☐ No ☑

Observer: _____ Date: _____
Signature

EOH-7
Seven Hills Lake Dam

New York City Department of Environmental Protection
Generic Dam/Dike/Appurtenances Observations Form

Rev. 1/11/08 (TD), 3/5/08(TD), 4/30/08(TD)

NOTE – Any question enclosed in a box and checked YES by the Observer requires IMMEDIATE notification to the CHAIN OF COMMAND. Do NOT continue to complete your observations; make notification immediately!

GENERAL ASSESSMENT:

12. Does any question above NOT marked "Yes" or anything else observed give the Observer cause to state that "*as a result of this facility review, one of the following four actions should be taken*"?..... **Yes** ☑ No ☐
(If "Yes" please circle the appropriate statement and briefly describe the condition below):

a. **Immediate and Emergency** Attention Required (Observer to **Immediately** Notify Proper Chain of Command)
b. Urgent Professional Inspection and Follow-up Required (Observer to Notify Proper Chain of Command)
c. Priority Review Under Normal Watershed Maintainer Maintenance Schedules
(d.) Standard Review Under Normal Watershed Maintainer Maintenance Schedules

- Monitor eroded areas in the dam fill adjacent to outlet portal wells of drop inlet culvert
- Monitor seepage flows at toe of rockfill on downstream slope of right abutment
- Determine whether both low level outlet slide gates incorporated into the spillway drop shaft are operable.

Note any miscellaneous observations regarding Property Issues, Security Fences, Animal Issues, Access Roads, Rights-of-Way, Locks, Gates, etc. if necessary and not noted on previous reports.

If any of the checked boxes on Page 1 require additional space to describe locations, sizes, estimates, quantities, GPS coords., etc, please note the question number and describe below. If any of the questions on Page 1 have accompanying photos please indicate which question(s) and how many photos for each is attached.

Observer:_____ Date:_____
Signature