

102
OLNEY POND DAM

OLNEY POND DAM, LINCOLN (102)

Olney Pond Dam (**Figure 1**) has been classified by DEM as having a **High Hazard** potential. The following report summarizes GZA's evaluation of the dam's potential impact area due to failure of the dam.



1.00 SUMMARY OF SITE AND POTENTIAL DOWNSTREAM IMPACT AREA

In addition to compiling background information, including the U.S. Army Corps of Engineers Phase I Inspection Report from 1979, and GIS mapping data, GZA performed field reconnaissance of the dam and its associated downstream area (**Figure 2**). GZA representatives David M. Leone, P.E. and Celeste N. Fay visited the site and the downstream river valley on June 12, 2009. A field checklist from the reconnaissance is provided in **Attachment I** and selected photographs are provided in **Attachment II**.

1.10 Site Description

Olney Pond Dam is located on Threadmill Brook in the Town of Lincoln, Providence County, Rhode Island (See Locus Map, Figure 1). The following state and federal identification numbers are associated with the dam:

- DEM ID Number 102
- NID ID Number RI01702

The dam is an approximately 220 foot long earthfill embankment with a masonry core wall and a maximum height of approximately 29.5 feet. The left abutment is composed of a natural rock outcropping through which a tunnel was cored to serve as a spillway. The downstream side of the embankment consists of a 220 foot long masonry wall with a rockfill slope buttress. Pertinent engineering data, as obtained from the DEM dam information database and the Army Corps Phase I Report, is provided in **Table 1**.

The purpose of the dam and its impoundment is for recreation. The pond and dam are located within Lincoln Woods State Park.

TABLE 1. Pertinent Engineering Data

Dam	
Type	Earthen Embankment
Length	± 220 feet
Height	± 29.5 feet
Drainage Area	± 0.87 square miles
Elevation (feet above approximate MSL)	
Normal Pool (Spillway)	± 196 ft
Top of Dam	± 198.6 ft



Storage (Acre-feet)	
Normal Pool	±1,490
Top of Dam	± 1,860
Primary Spillway	
Type	Curved tunnel cut into cut into bedrock
Weir Length	± 7 ft

1.20 Downstream Description

Immediately downstream of dam, the spillway discharges into a steep ravine which drops approximately 120 feet over a ½ mile distance. Development appears to be well above the anticipated dam break impact area along Threadmill Brook. At approximately the same distance (½ mile downstream), Threadmill Brook joins the Moshassuck River at Barney Pond.

1.21 Downstream Dams

There are two dams located downstream of Olney Pond Dam as shown below:

Dam Name	Distance Downstream from Olney Pond Dam	River
Barney Pond Dam (101)	0.68 Miles	Moshassuck River
Bleachery Pond Dam (104)	1.0 Miles	Moshassuck River

1.22 Downstream Bridges

Threadmill Brook is not conveyed under any bridges. However, downstream of the confluence of Threadmill Brook and the Moshassuck River, the Moshassuck River passes under many bridges. Approximately 0.65 miles downstream of Olney Pond Dam, the Moshassuck River passes under Smithfield Avenue and continues to flow under many other bridges before flowing into the Providence River.

1.23 Downstream Development

Barney Pond is located about 0.7 miles downstream of the dam and is partially surrounded by residential buildings. Just below Barney Pond is Bleachery Pond, which is located within a mill complex about ½ mile below Barney Pond Dam. Beyond the mill complex, the Moshassuck River are densely developed with residential, commercial and industrial facilities as the channelized river threads its way through the Cities of Central Falls, Pawtucket, and Providence, before emptying into Providence Harbor.



2.00 DAM HAZARD POTENTIAL ASSESSMENT

To further evaluate the extent of flooding due to a potential dam failure, GZA performed a limited hydraulic investigation of the hypothetical dam break flood. The analysis was performed with the National Weather Service (NWS) Simplified Dam Break (SMPDBK) model, which estimates the peak dam break flood outflow, peak water surface elevations, and the timing of the flood wave as it travels downstream, given breach characteristics specific to the dam and the geometry of the downstream channel and overbank. SMPDBK output summaries are provided in **Attachment III**.

Please note that the approximate extent of hypothetical dam break flooding generated with SMPDBK is not generally applicable for emergency planning or other hydraulic design purposes. Detailed hydraulic modeling using state-of-the-practice unsteady flow models such as the NWS DAMBRK or FLDWAV or U.S. Army Corps of Engineers unsteady flow version of HEC-RAS computer programs, which is not in the scope of this study, should be performed when generating inundation maps for Emergency Action Plans or for use in spillway design / inflow design flood (IDF) studies.

2.10 Potential Dam Failure Mechanisms and Breach Description

As specified by the DEM, the simplified hypothetical dam failure analysis assumed starting pool elevations in the impoundment coincident with the top of dam elevation and average stream flow conditions prevailing (i.e., assumed about 2 cfs per square mile of drainage area). Dam breach parameters such as time of breach formation, breach shape, and the average width of the breach were selected according to these conditions and based upon the type of materials used in constructing the dam, in accordance with the recommended range of values published in the Federal Energy Regulatory Committee (FERC) guidelines and based on engineering judgment. For Olney Pond Dam, primarily an earth embankment structure, a time to failure of 0.5 hrs and a trapezoidal breach shape (0.5 H : 1.0 V) was utilized. Such an earthen embankment dam is assumed to fail due to piping under fair weather circumstances. The average breach width was assumed to equal to three times the height of the dam or about 88.5 ft.

There are two dams located downstream of the Olney Pond Dam. Due to the large volume of water anticipated in the event of dam failure, it is GZA's opinion that both of the dams listed in Section 1.21 of this report will overtop and likely fail as a result of the failure of the Olney Pond Dam. The downstream dams are small or low-head structures relative to Olney Pond Dam. Therefore, it is anticipated that the domino failure of these structures will not significantly contribute to the magnitude of the downstream flood wave, and they were not separately modeled.



2.20 Estimated Peak Outflow from Dam Break

The peak outflow from the hypothetical dam break was estimated using the breach outflow approximation equation developed by the National Weather Service as part of their SMPDBK computer model (see Attachment III), using the breach parameters described above and top-of-dam pool reservoir characteristics. The estimated peak breach outflow is approximately 32,000 cfs. The FEMA 100-yr flood value at Barney Pond Dam (0.68 miles downstream of the Olney Pond Dam) on the Moshassuck River is 935 cfs. The dam break flood is about 32-times greater than the FEMA 100-yr flood for the Moshassuck River.

2.30 Estimated Approximate Flood Impact Area

Several riverine cross sections, developed by GZA from USGS 7.5 minute quadrangle maps and RIGIS mapping data, were input into the SMPDBK model to preliminarily estimate approximate peak water surface elevations. The results of the analysis are provided as the approximate inundation area depicted in **Figures 2A through 2D**.

2.31 Downstream Extent of Flooding

The stream channel downstream of Olney Pond Dam has moderate slopes. Typical Manning's "n" roughness coefficients used in the analysis were 0.04 for the channel areas, and 0.08 for the overbank areas. The dam break analysis was ended at the confluence with the tidal estuary of the Providence River.

2.32 Potential Effects of Dam Break

Results of the analysis indicate a peak flood depth of about 22 feet downstream of the dam on the Threadmill Brook.

The hypothetical failure of the dam would likely flood the residential, commercial and industrial buildings and facilities in the low-lying areas along the Threadmill Brook and Moshassuck River throughout the inundation zones. The inundation area is anticipated to include several occupied buildings. Loss of life is considered probable, in GZA's opinion.

Failure of the dam would also likely overtop and wash out the Smithfield Avenue Bridge, among others located downstream. Finally, since the flood wave is likely to be considerably larger than the spillway capacity of the downstream dams, it is GZA's opinion, that it is likely that both of the dams summarized in section 1.21 will overtop and fail due to the large flows expected in the event of failure of Olney Pond Dam.

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ATTACHMENT I
FIELD RECONNAISSANCE CHECKLIST

DAM HAZARD POTENTIAL FIELD CHECKLIST

Name of Dam:	Olney Pond Dam		RI DEM ID NO.	102
Location:	Lincoln	Threadmill Brook		
	Town	River or Stream		
Classification Data:	Pawtucket, Providence	Blackstone River		
	Downstream Communities	Major Confluence		
Intermediate Size	1913	Reconstruction date	1883	Date Built
	29.5 ft	Height of Dam	220 ft	Length of Dam
PHYSICAL DATA:	Earthen Embankment	7 ft	Normal Freeboard	
	Type of Dam	Length of Spillway	1490 ac-ft	Normal Pool Storage Capacity
	7 ft by 4 ft tunnel into ledge	18" below dam crest	1860 ac-ft	Maximum Pool Storage Capacity
	Type of Spillway	Pool at Inspection		
	Recreation			
	Purpose of Dam			
Name	Title/Position		Representing	
David M. Leone	Senior Project Manager/ Hydrogeologist		GZA GeoEnvironmental, Inc.	
Celeste N. Fay	Staff Engineer		GZA GeoEnvironmental, Inc.	
DATE OF INSPECTION:	6/12/2009			
WEATHER:	Overcast		TEMPERATURE: 60s F	

Name of Dam:

Olney Pond Dam

I.D. No.: 102

Inspection Date: 12-Jun-09

STRUCTURAL CONDITION DOWNSTREAM AREA DAM & IMMEDIATE DOWNSTREAM AREA GENERAL DOWNSTREAM AREA	1	Concrete Condition	Not applicable	
	2	Outlet Condition	Obscured by trash rack	
	3	Unusual Movement	None observed	
	4	Seepage / Wet Area	None observed	
	5	Embankment Slides/Erosion	None observed	
	6	Vegetation / Pest Control	Well maintained	
	7	Vicinity Description	Park with no utilities, park access road, not throughway	
	8	Dam Roads & Utilities	Park access road	
	9	Discharge Channel	Flows through ledge tunnel before final discharge	
	10	Structures (Gatehouses, etc.)	Trash Rack on intake structure	
	11	Adjacent Land Use	Lincoln Woods State Park & Residential	
	12	Adjacent Population Density	Moderate residential population located downstream however, not visible from dam	
	13	Downstream Constrictions	None observed immediately downstream	
	14	Downstream Access / Use	By foot	
	15	Property / Infrastructure / Utility Description & Distance	None observed	
	17	Land Use Classification	Wooded, Residential, Commerical	
	18	Population Density	Moderately populated	
	19	Property / Infrastructure	See above	
	21	Downstream Dams	Several	
	22	Downstream Bridges	Several	
	23	Upstream Dams	None	
	24	Channel Description (depth, Manning's n, width, overbank)	Channel: Rocky, sandy Bank: vegetated	
	ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE			

ATTACHMENT II
FIELD PHOTOGRAPHS

DAM 102 – OLNEY POND DAM 6/12/2009



Photo 1. View of left side of dam and primary spillway from downstream.



Photo 2. View looking at dam from left abutment.



Photo 3. View of channel downstream of dam.

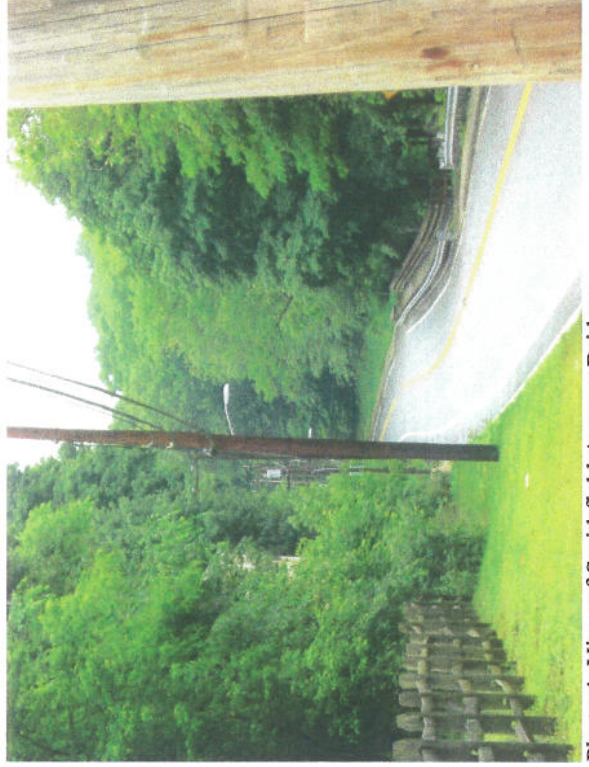


Photo 4. View of Smithfield Avenue Bridge.

ATTACHMENT III
SMPDBK OUTPUT SUMMARY

OLNEY POND DAM

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH	
DAM BREACH ELEVATION (HDE)		198.60 FT
FINAL BREACH ELEVATION (BME)		168.60 FT
SURFACE AREA OF RESERVOIR (SA)		156.00 ACRES
FINAL BREACH WIDTH (BW)		88.50 FT
TIME OF DAM FAILURE (TFM)		30.00 MINUTES
NON-BREACH FLOW (QO)		2.00 CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)		7.38 MILES
DEAD STORAGE EQUIV. MANN. N (CMS)		.50

CROSS SECTION NO. 1

FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	168.6	175.0	185.0	190.0	198.6
TWIDTHS(FT) (BS)	180.0	190.0	200.0	210.0	220.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 2

REACH LENGTH (D) .01 MI
FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	168.5	175.0	185.0	190.0	198.6
TWIDTHS(FT) (BS)	180.0	190.0	200.0	210.0	220.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 3

REACH LENGTH (D) .21 MI
FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	118.1	121.4	127.9	137.8	147.6
TWIDTHS(FT) (BS)	3.0	20.0	100.0	200.0	290.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 4

REACH LENGTH (D) .62 MI
FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	68.9	71.2	78.7	88.6	98.4
TWIDTHS(FT) (BS)	300.0	460.0	650.0	715.0	840.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 5

REACH LENGTH (D) 1.29 MI
FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	49.2	52.5	59.0	68.9	78.7
TWIDTHS(FT) (BS)	20.0	40.0	365.0	800.0	920.0

			102.0		
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 6
 REACH LENGTH (D) 2.24 MI
 FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	29.5	32.8	39.4	49.2	59.0
TWIDTHS(FT) (BS)	20.0	40.0	80.0	400.0	660.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 7
 REACH LENGTH (D) 4.01 MI
 FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	29.4	32.8	39.4	49.2	59.0
TWIDTHS(FT) (BS)	20.0	40.0	100.0	310.0	480.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 8
 REACH LENGTH (D) 5.45 MI
 FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	19.7	22.9	29.5	39.4	49.2
TWIDTHS(FT) (BS)	20.0	40.0	100.0	550.0	850.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 9
 REACH LENGTH (D) 6.42 MI
 FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	9.8	12.1	19.7	29.5	39.4
TWIDTHS(FT) (BS)	40.0	170.0	1850.0	3000.0	3500.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

CROSS SECTION NO. 10
 REACH LENGTH (D) 7.38 MI
 FLOOD DEPTH (FLD) 3.30 FT

ELEV.(FT) (HS)	1.0	3.3	9.8	19.7	29.5
TWIDTHS(FT) (BS)	2600.0	3000.0	4600.0	4800.0	5200.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080	.080

AN ASTERISK (*) BESIDE A PARAMETER IMPLIES THAT A DEFAULT VALUE WAS COMPUTED

NAME OF DAM: OLNEY RESERVOIR UPPE NAME OF RIVER: THREADMILL BROOK

RVR MILE	MAX FLOW	MAX ELEV	MAX DEPTH	TIME(HR)	TIME(HR)	TIME(HR)	FLOOD
FROM DAM	(CFS)	(FT-MSL)	(FT)	MAX DEPTH	FLOOD	DEFLOOD	DEPTH(FT)
*****	*****	*****	*****	*****	*****	*****	*****

102.OUT							
.00	31972.	190.03	21.43	.50	.04	1.66	3.30
.01	25189.	186.85	18.35	.50	.06	2.05	3.30
.21	24937.	135.68	17.58	.51	.03	2.24	3.30
.62	24687.	74.07	5.17	.55	.44	.95	3.30
1.29	24441.	63.04	13.84	.64	.16	2.39	3.30
2.24	24196.	51.66	22.16	.84	.35	2.64	3.30
4.01	21363.	48.28	18.88	1.31	.83	3.38	3.30
5.45	20217.	37.34	17.64	1.74	1.26	3.95	3.30
6.42	16218.	18.84	9.04	2.17	1.71	4.97	3.30
7.38	13427.	3.01	2.01	2.20	.00	.00	3.30

ANALYSIS IS COMPLETE

FIGURES

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SOURCE : SCANNED USGS TOPOGRAPHIC QUADRANGLES DISTRIBUTED BY THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM, RIGIS.
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 DESIGNED BY: CNF
 REVIEWED BY: PHB
 OPERATOR: CNF
 DATE: 8/11/09

OLNEY POND DAM (102)
 LINCOLN, RI
 SITE LOCUS

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 17085.40
 FIGURE NO.
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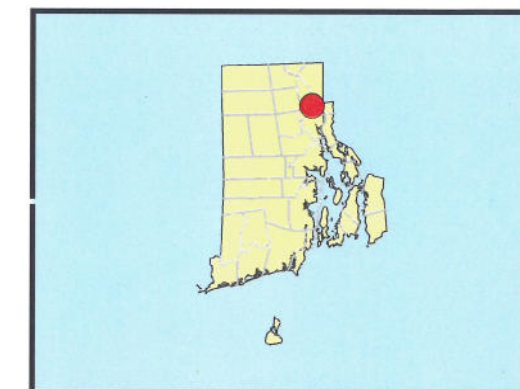
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- BRIDGE
- SCHOOLS
- PUBLIC SAFETY BUILDINGS (FIRE, POLICE, TOWN HALLS)
- HOSPITALS
- APPROX. FLOOD HAZARD AREA
- WATER SUPPLY WITHDRAWALS
- DAMS



SOURCE

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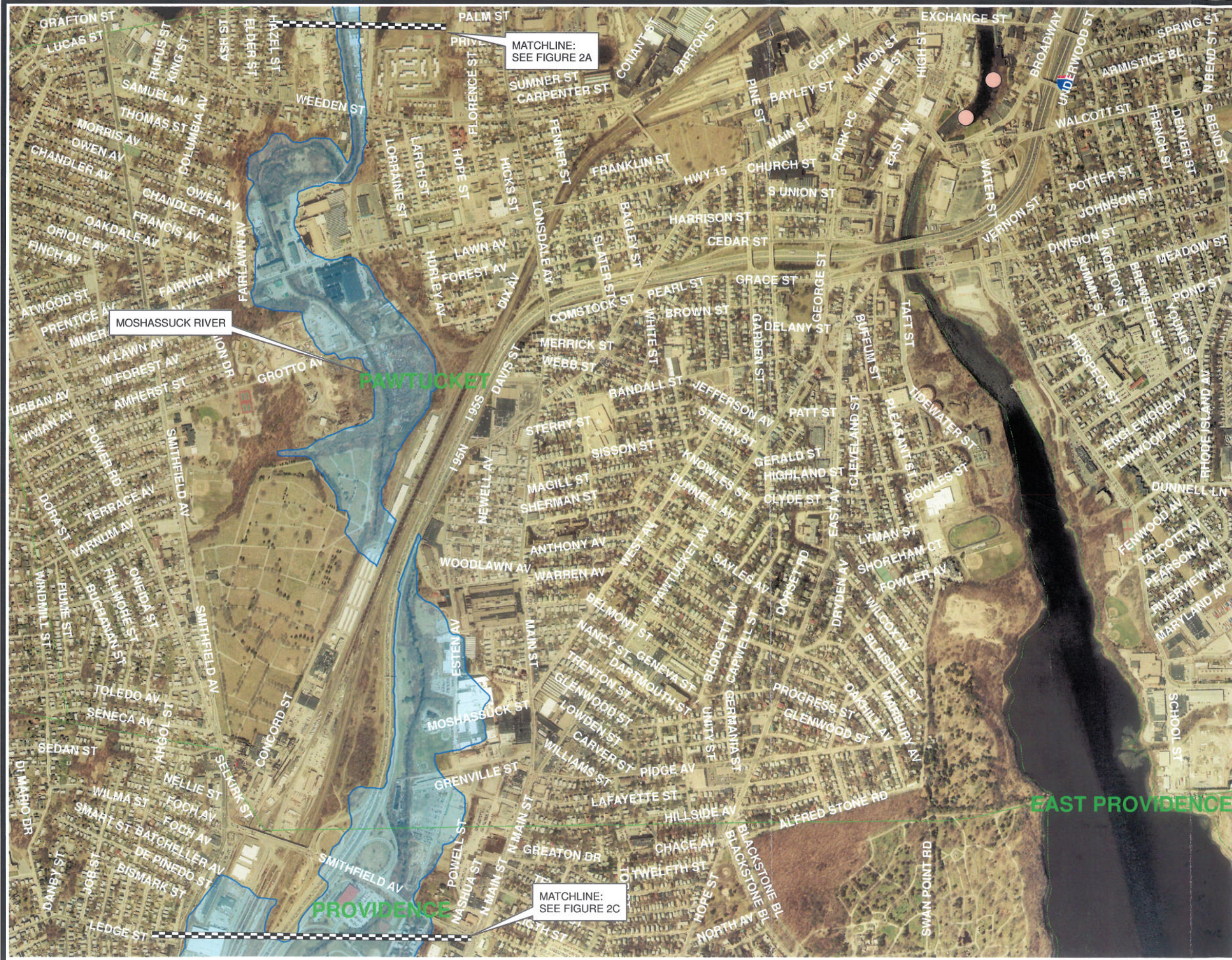
GZA GeoEnvironmental, Inc.
 One Edgewater Drive
 Norwood, MA 02062
 Phone: (781) 278-3700 Fax: (781) 278-5701



OLNEY POND DAM (102)
 LINCOLN, RHODE ISLAND

DAM FAILURE INUNDATION MAP

Proj. Mgr.: DML Designed By: CNF Reviewed By: PHB Operator: CNF	Dwg. Date: 2009 Job No.: 17085.40	Figure No.: 24
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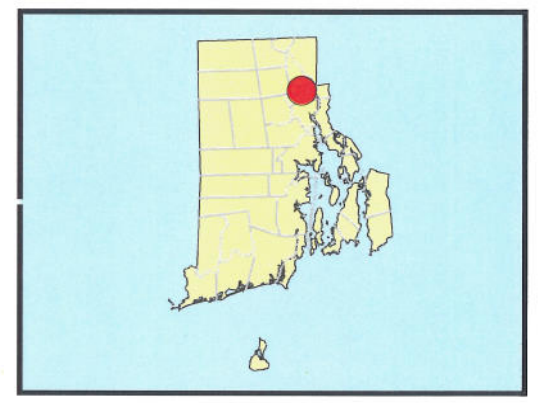
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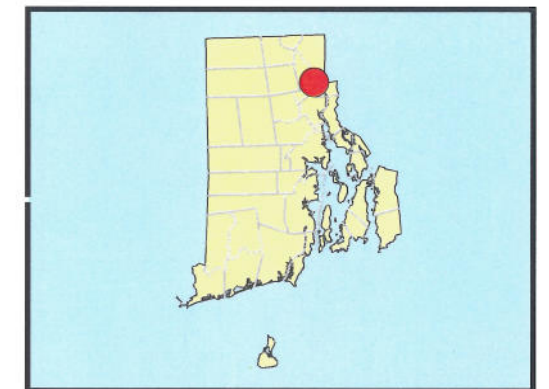
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Dwg. Date: 2009
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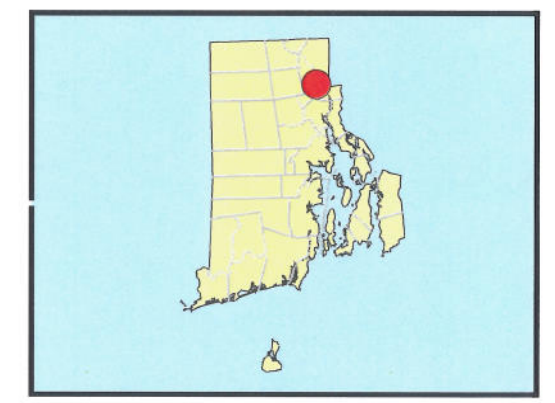
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DAM FAILURE INUNDATION MAP

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Operator: CNF		