345
JORDAN POND DAM

JORDAN POND DAM (345), SCITUATE

Jordan Pond Dam (Figure 1) is classified by DEM as having a **Significant 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 and GIS mapping data, GZA performed field reconnaissance of the dam and its associated downstream area (Figure 2). GZA representatives David M. Leone and Gregory W. Hunt visited the site and the downstream river valley on May 17, 2007. A field checklist from the reconnaissance is provided in **Attachment I** and selected photographs are provided in **Attachment II**.

1.10 Site Description

Jordan Pond Dam is located off Route 14/102 in the Town of Scituate, Providence County, Rhode Island (See Locus Map, Figure 1). The dam is also known as Clayville Pond Dam. The following ID numbers are associated with the dam:

- DEM ID Number 345
- NID ID Number RI4298

The dam impounds Westconnaug Brook to form Jordan Pond. The dam consists of an approximately 22-foot high, 230-foot long stone masonry gravity structure with a primary spillway and emergency spillway. Note that the DEM database lists the dam as having a structural height of 13 feet. Based on GZA field measurement, the dam has a structural height of approximately 22 feet and a hydraulic height of approximately 19 feet. Pertinent engineering data, as obtained from the DEM dam information database and GZA preliminary analysis, is provided in **Table 1**. The dam is located within a residential area, and the purpose of the dam and its impoundment is for water supply.

TABLE 1: Pertinent Engineering Data

Dam	
Type	Stone Masonry Gravity
Length	± 230 feet
Height	± 22 feet
Drainage Area	± 4.5 mi^2
Elevation (feet above approximate MSL)	
Normal Pool	444 ft
Top of Dam	± 447 ft
Storage (Acre-feet)	
Normal Pool	± 125
Top of Dam	± 205

TABLE 1 (Cont.): Pertinent Engineering Data

Spillways	
Type	
- Primary Spillway:	Stoplog Weir to RCP to Stilling Basin
- Emergency Spillway:	Broad-crested stone masonry overflow weir
Length	
- Primary Spillway:	± 8 foot weir, ± 24-inch diameter RCP
- Emergency Spillway:	± 35 ft weir

1.20 Downstream Description

Downstream of the dam, discharge from the primary spillway flows through a rectangular channel formed by stone masonry walls. Discharge from the emergency spillway flows though a second rectangular channel with stone masonry walls that joins with the primary spillway discharge channel downstream. The discharge channel (Westconnaug Brook) flows through a wooded area for about 1.1 miles to its confluence with the Scituate Reservoir. Between the dam and the Scituate Reservoir, the brook crosses three roadways, and is impounded by the Peabody Reservoir (Lower) Dam. The brook flows through a wooded area, with some residences along Route 14/102 that are in the right and left overbank area.

1.21 Downstream Dams

About 0.75 miles downstream of Jordan Pond Dam, Westconnaugh Brook is impounded by the Peabody Reservoir (Lower) Dam (344), which is a stone masonry gravity dam with a maximum height of approximately 10 feet. Failure of the Jordan Pond Dam would likely overtop and potentially lead to the failure of the Peabody Reservoir (Lower) Dam.

1.22 Downstream Bridges

There are three bridges that cross Westconnaug Brook between Jordan Pond Dam and the Scituate Reservoir. About 0.2 miles downstream of the dam, the brook flows through a stone arch culvert under Route 14/102 (Plainfield Pike). About 0.8 miles downstream of the dam, Route 14/102 crosses the brook on a single span bridge. About 0.9 miles downstream of the dam, Route 12 (Tunk Hill Road) crosses the brook on a single span bridge. The dam break flood wave from Jordan Pond Dam would likely overtop Route 14/102 at the second brook crossing and would likely overtop Route 12. At the first channel crossing, Route 14/102 is about 20 feet above the stream channel, and is not expected to be overtopped. Backwater flooding due to the failure of the Jordan Pond Dam would likely overtop Rockland Cemetery Road just downstream of the first Route 14/102 bridge.

1.23 Downstream Development

Development in the area downstream of the dam consists of Route 14/102, Peabody Reservoir (Lower) Dam, and some private residences located along Route 14/102. The residences are located on the right and left overbank, outside of the anticipated dam failure inundation area.

2.00 DAM BREAK FLOOD 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 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 1 to 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 Jordan Pond Dam, it was assumed that the failure of the dam was along the maximum section of the stone masonry gravity dam, with a time to failure of 6 minutes and a rectangular breach shape (vertical side walls) utilized. Because the breach was assumed to occur at the maximum stone masonry section of the dam, the average breach width was assumed to be the height of the dam, about 22 ft.

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 6,400 cfs. Although there is no published FEMA 100-yr flood estimate for Westconnaug Brook, the peak dam break outflow is expected to be significantly larger than the 100-yr flood, given the dam's contributory watershed area of approximately 4½ square miles.

2.30 Estimated Approximate Flood Impact Area

Several riverine cross sections, developed by GZA from USGS 7.5 minute quadrangle maps, were input into the SMPDBK models to preliminarily estimate approximate peak water surface elevations. The results of the analysis are provided as the approximate inundation area depicted in **Figure 2**.

2.31 Downstream Extent of Flooding

The stream channel downstream of Jordan Pond Dam has moderate to steep 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. These values are consistent with the range of values used in the FEMA Flood Insurance study for nearby communities.

2.32 Potential Effects of Dam Break

Results of the analysis indicate a peak flood depth downstream of the dam on Westconnaugh Brook of about 10 feet. A peak flood depth of about 2 feet is anticipated in the Scituate Reservoir just downstream of the Westconnaug Brook confluence.

The hypothetical failure of the dam would likely flood the low-lying valley along the Westconnaugh Brook for about 1.1 miles to its confluence with the Scituate Reservoir. Failure of the dam would likely result in the overtopping and possible destruction of Route 14/102 (second crossing), Rockland Cemetery Road, and Route 12. Failure of the dam would likely result in the "domino" failure of the Peabody Reservoir (Lower) Dam. No residences or other structures are located within the anticipated dam break inundation area.

FIGURES

SOURCE : SCANNED USGS TOPOGRAPHIC QUADRANGLES DISTRIBUTED BY THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM, RIGIS.
DATA SET CREDIT: This DRG was produced through an Innovative Partnership agreement between The Land Information Technology Company, Ltd., of Aurora, CO and the USGS.

Data Supplied by : RIGIS

0 1,000 2,000 4,000 Feet

N W E S

GZA

PROJ. MGR.: DML
DESIGNED BY: GWH
REVIEWED BY: PHB
OPERATOR: GWH

DATE: 05-17-07

JORDAN POND DAM (345)

JOB NO. 01.0017085.30

SITE LOCUS

FIGURE NO. 1

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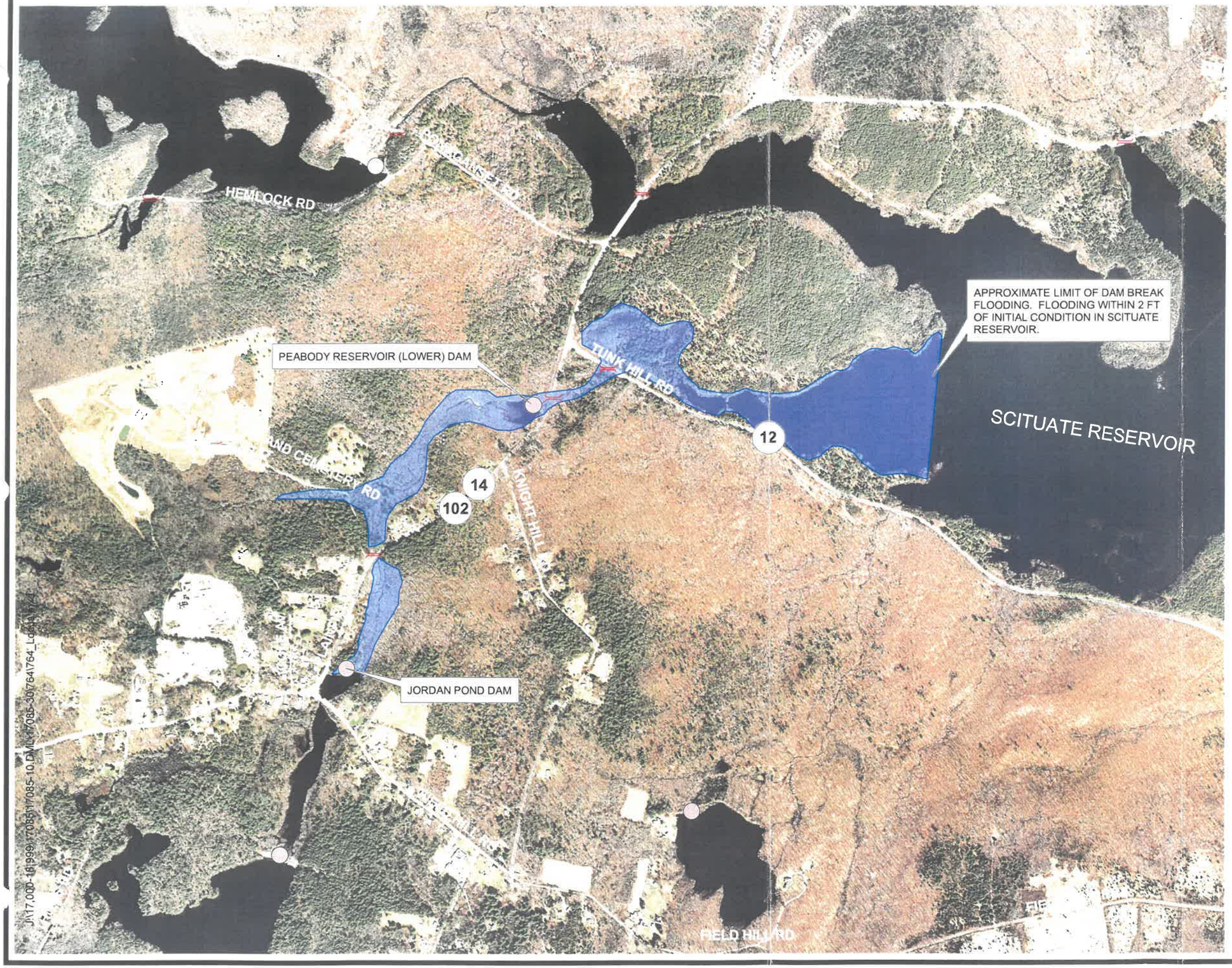

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LEGEND

- BRIDGE
- SCHOOLS
- PUBLIC SAFETY BUILDINGS (FIRE, POLICE, TOWN HALLS)
- HOSPITALS
- APPROX. FLOOD HAZARD AREA
- WATER SUPPLY WITHDRAWALS
- DAMS

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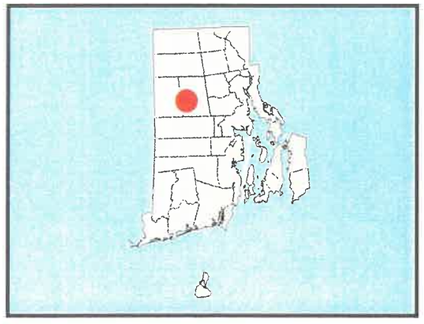
SOURCE

DIGITAL AERIAL OTHOPHOTOGRAPHY PROVIDED BY THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM, (RIGIS) AND THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION, (RIDOT). ORTHOPHOTO IMAGES WERE ORIGINALLY PRODUCED BY CHAS. H. SELLS UNDER CONTRACT TO THE (RIDOT). THE IMAGES WERE OBTAINED ON APRIL 14, 2003 AND WERE RELEASED IN NOVEMBER 2005.

RIGIS

0 500 1,000 2,000
Feet



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GZA

JORDAN POND DAM (345)
SCITUATE, RHODE ISLAND

DAM FAILURE INUNDATION MAP

Proj. Mgr.: DML Designed By: GWH Reviewed By: PHB Operator: GWH	Dwg. Date: 07-11-2007 Job No.: 17085.30	Figure No.: 2

ATTACHMENT I

FIELD RECONNAISSANCE CHECKLIST

DAM HAZARD POTENTIAL FIELD CHECKLIST

Name of Dam:	JORDAN POND DAM	RI DEM ID NO.	345
Location:	SCITUATE (Town)	WESTCONNAUG BROOK (River or Stream)	
	N/A (Downstream Communities)	SCITUATE RESERVOIR (Major Confluence)	
Classification Data:	Intermediate (Size)		Unknown (Date Built)

PHYSICAL DATA:	Earthen embankment (Type of Dam)	± 22 ft (Height of Dam)	230 ft (Length of Dam)
	Stoplog weir to stilling basin (Type of Spillway)	± 8' Primary / ± 35' Emergency (Length of Spillway)	
	Water Supply (Purpose of Dam)	2.5" over stoplogs (Pool at Inspection)	125 ac-ft (Normal Pool Storage Capacity)
	± 3 ft (Freeboard)		205 ac-ft (Maximum Pool Storage Capacity)

Name	Title/Position	Representing
David M. Leone	Project Mgr / Hydrologist	GZA GeoEnvironmental, Inc.
Gregory W. Hunt	Project Engineer	GZA GeoEnvironmental, Inc.

DATE OF INSPECTION: 5/17/2007

WEATHER: Overcast TEMPERATURE: 50s F

Nat. of Dam: JORDAN POND DAM D. No.: 345 Inspection Date: 17-l. -07

STRUCTURAL CONDITION	1	Concrete Condition	Good, recent repair work at spillway.
	2	Outlet Condition	Good.
	3	Unusual Movement	Missing stones along crest left of spillway. Some stones recently replaced.
	4	Seepage / Wet Area	Orange-stained seepage on left side.
	5	Embankment Slides/Erosion	None observed
	6	Vegetation / Pest Control	Grassed.
DAM & IMMEDIATE DOWNSTREAM AREA	7	Vicinity Description	Wooded, remnants of stone masonry mill foundation
	8	Dam Roads & Utilities	None observed
	9	Discharge Channel	Dry stone masonry channels (primary spillway & emerg. spillway)
	10	Structures (Gatehouses, etc.)	None observed
	11	Adjacent Land Use	Wooded
	12	Adjacent Population Density	Low
	13	Downstream Constrictions	Stone arch bridge downstream of primary spillway over channel.
	14	Downstream Access / Use	No formal access, posted No Tresspass.
	15	Property / Infrastructure / Utility Description & Distance	Multiple road crossings, one downstream dam.
GENERAL DOWNSTREAM AREA	17	Land Use Classification	Residential
	18	Population Density	Low
	19	Property / Infrastructure	Downstream state roads, Rts 14/107 and 12
	21	Downstream Dams	Peabody Reservoir (Lower) Dam, ID #344. stone masonry, small impoundment.
	22	Downstream Bridges	1) Rt 14/107: concrete/masonry arch culvert about 10' w x 16' h. Road about 20' above channel. 2) Rt 14/107: concrete/steel span. 3) Downstream of Turk Hill Road.
	23	Upstream Dams	Westconnaug Reservoir Dam (163)
	24	Channel Description (depth, Manning's n, width, overbank)	Wooded overbanks, swift sandy/rocky channel about 15' wide, 2' deep.

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

ATTACHMENT II

FIELD PHOTOGRAPHS

DAM 345 – JORDAN POND DAM

Photo 1. Overview of dam from left abutment.

Photo 2. View of Jordan Pond from top of dam.

Photo 3. View of primary spillway with stoplogs.

Photo 4. View of emergency spillway on right side of dam.

Photo 5. View from top of dam of primary spillway discharge Channel with stone arch bridge.

Photo 6. View of stream channel looking upstream from first bridge at Route 14 / 107.

Photo 7. View from right abutment of downstream dam (DEM #344) along Route 14 / 107.

Photo 8. View of Route 14 / 107 crossing downstream of Dam 344.

ATTACHMENT III

SMPDBK OUTPUT SUMMARY

SIMPLIFIED DAMBREAK MODEL (SMPDBK) VERSION: 9/91
BY D.L. FREAD, J.M. LEWIS, & J.N. WETMORE - PHONE: (301) 427-7640
NWS HYDROLOGIC RESEARCH LAB W/OH3, 1325 EAST-WEST HIGHWAY,
SILVER SPRING, MD 20910

***** DISTANCE TO PRIMARY POINT OF INTEREST MOVED TO THE CROSS SECTION
***** CLOSEST TO THIS LOCATION (MI 1.92)

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	CONCRETE GRAVITY	
DAM BREACH ELEVATION (HDE)	447.00	FT
FINAL BREACH ELEVATION (BME)	425.00	FT
SURFACE AREA OF RESERVOIR (SA)	14.00	ACRES
FINAL BREACH WIDTH (BW)	22.00	FT
TIME OF DAM FAILURE (TFM)	6.00	MINUTES
NON-BREACH FLOW (QO)	5.00	CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)	1.92	MILES
DEAD STORAGE EQUIV. MANN. N (CMS)	.50	

CROSS SECTION NO. 1
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	425.0	427.0	440.0	447.0
TWIDTHS(FT) (BS)	22.0	22.0	230.0	350.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 2
REACH LENGTH (D) .19 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	390.0	392.0	400.0	410.0
TWIDTHS(FT) (BS)	.0	15.0	360.0	575.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 3
REACH LENGTH (D) .50 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	370.0	372.0	380.0	390.0
TWIDTHS(FT) (BS)	.0	15.0	160.0	360.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 4
REACH LENGTH (D) .75 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	352.0	355.0	360.0	370.0
TWIDTHS(FT) (BS)	.0	15.0	275.0	660.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 5
REACH LENGTH (D) .89 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	310.0	312.0	320.0	330.0
TWIDTHS(FT) (BS)	.0	15.0	185.0	495.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 6
REACH LENGTH (D) 1.47 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	284.1	290.0	295.0	300.0
TWIDTHS(FT) (BS)	620.0	700.0	745.0	815.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0

MANNING N (CM)	.040	.080	.080	.080

CROSS SECTION NO. 7
REACH LENGTH (D) 1.92 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	284.0	290.0	295.0	300.0
TWIDTHS(FT) (BS)	3040.0	3160.0	3455.0	3755.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.080	.080	.080

NAME OF DAM: JORDAN POND DAM - 34 NAME OF RIVER: WESTCONNAUG BROOK

RVR MILE FROM DAM	MAX FLOW (CFS)	MAX ELEV (FT-MSL)	MAX DEPTH (FT)	TIME(HR) MAX DEPTH	TIME(HR) FLOOD	TIME(HR) DEFLOOD	FLOOD DEPTH(FT)
.00	6417.	433.52	8.52	.10	.03	.43	5.00
.19	6125.	397.33	7.33	.13	.06	.48	5.00
.50	5704.	379.89	9.89	.19	.11	.65	5.00
.75	5294.	360.94	8.94	.28	.19	.81	5.00
.89	5241.	318.07	8.07	.28	.22	.69	5.00
1.47	5189.	286.12	2.02	.29	.00	.00	5.00
1.92	5137.	284.74	.74	.53	.00	.00	5.00

ANALYSIS IS COMPLETE