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National Dam Inspection Program. Howells Run Dam (ID Number PA 434), Ohio River Basin, Howells Run, Cambria County, Pennsylvania. Phase I Inspection Report . 11) Jun 78 TABLE OF CONTENTS PAGE SECTION 1 - PROJECT INFORMATION DACW31-78-C-\$\$49 1 1.1 General 1 1.2 Description of Project 1 1.3 Pertinent Data 3 SECTION 2 - ENGINEERING DATA 5 2.1 Design 5 2.2 Construction 6 2.3 Operation 7 2.4 Other Investigations 7 2.5 Evaluation 7 SECTION 3 - VISUAL INSPECTION 9 3.1 Findings 9 3.2 Evaluation 10 SECTION 4 - OPERATIONAL FEATURES 12 4.1 Procedures 12 4.2 Maintenance of the Dam 12 4.3 Maintenance of Operating Facilities 12 4.4 Warning System in Effect 12 4.5 Evaluation 12 SECTION 5 - HYDRAULICS AND HYDROLOGY 13 5.1 Evaluation of Features 13 SECTION 6 - STRUCTURAL STABILITY 14 6.1 Evaluation of Structural Stability 14 SECTION 7 - ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES 15 7.1 Dam Assessment 15 7.2 Recommendations/Remedial Measures 15 ORIGINAL CONTAINS COLOR PLATES: ALL DOG REPRODUCTIONS WILL BE IN BLACK AND WHITE. DISTRIBUTION STATEMENT A 411001 LB Approved for public release; ibution Unlimited

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PHASE I REPORT NATIONAL DAM INSPECTION PROGRAM

4 5

NAME OF DAM: Howells Run Dam (New City Reservoir) STATE LOCATED: Pennsylvania COUNTY LOCATED: Cambria STREAM: Howells Run, tributary of North Branch of Little Conemaugh River DATE OF INSPECTION: (May 16 and 30, 1978)

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection, and as revealed by visual observations, the condition of Howells Run Dam is assessed to be good. The spillway has the recommended capacity to pass the probable maximum flood. Therefore, the spillway is adequate.

Operation of the outlet pipe gate was not observed. The owner reports that the gate has never been operated and therefore its operational condition is questionable.

It is recommended that the owner monitor the uncontrolled seeps on each side of the spillway channel and take necessary remedial measures if seeps are found to be increasing.

Lawrence D. Andersen, P.E. Vice President

APPROVED BY:

G. K. WITHERS Colonel, Corps of Engineers District Engineer

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HOWELLS RUN DAM NDS I.D. NO. 434 MAY 16, 1978

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Upstream Face



Downstream Face

PHASE I NATIONAL DAM INSPECTION PROGRAM HOWELLS RUN DAM NDS I.D. NO. 434

SECTION 1 PROJECT INFORMATION

1.1 General

a. <u>Authority</u>. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. <u>Purpose</u>. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. <u>Dam and Appurtenances</u>. Howells Run Dam consists of an earth embankment 670 feet long with a maximum height of 63 feet from the downstream toe (Plate 1). A 50-foot-wide concrete chute spillway located on the right abutment (looking downstream) serves as both primary and emergency spillway for the reservoir. (Plate 2). Flow through the spillway is controlled by an ogee weir at Elevation 2050 (USGS Datum) which is 8 feet below the dam crest at Elevation 2058. The spillway discharges into the concrete channel which in turn discharges into a plunge pool. The outlet works for the dam consist of a 5-foot by 5.5-foot horseshoe outlet conduit located left of the center of the embankment and a 16-inch cast-iron supply line. In 1964, the outlet conduit was extended approximately 150 feet by 60-inch-diameter reinforced concrete pipe. This outlet system constitutes the emergency drawdown facility for the dam.

b. Location. Howells Run Dam, which is known to the Borough of Ebensburg as New City Reservoir, is located (Plate 3) at the headwaters of Howells Run, 1/2 mile north of the town of Ebensburg in Cambria Township, Cambria County, Pennsylvania. The impounded reservoir serves as a domestic water supply source.

Downstream from the dam, Howells Run flows through three reservoirs located over a distance of one mile below the dam. The first downstream reservoir is the Old City Reservoir. It is retained by an approximately 15-foot-high earth embankment and stores about 60 acre-feet of water. This dam has a 56-foot-wide concrete-lined chute spillway. Flow through the spillway is controlled by a broad-crested weir three feet below the dam crest. The second

1 -

impoundment is locally known as Lake Jenks. It is retained by a four-foot-high embankment. A 150-foot-long masonry wall, the top of which is located about four feet below the top of the embankment, constitutes the spillway for the lake. The reservoir appears to be very shallow and it is estimated that the stored volume of water is in the range of 5 to 10 acre-feet. The third reservoir, Lake Rowena, is also retained by an earth embankment, approximately 300 feet long and 12 feet high. An 80-foot-wide ogee weir, approximately 7 feet below the dam crest, serves as the combined primary and emergency spillway for the reservoir.

The city water treatment plant located immediately downstream from Old City Reservoir is the first structure in the Howells Run flood plain.

Downstream from the Old City Reservoir, the stream flows under a railroad embankment, into Lake Jenks, and then under another railroad embankment before flowing into Lake Rowena. It is estimated that the discharge capacity of the Old City Reservoir spillway and the culvert under the first railroad embankment is significantly less than the full spillway capacity of the Howells Run Dam. Therefore, continued full discharge from the Howells Run Dam is likely to overtop the Old City Reservoir, form an impoundment behind the 20-foot-high first railroad embankment, and subsequently overtop and breach this railroad embankment. The two 9-foot-diameter culverts through the second railroad embankment are considered to have sufficient discharge capacity to pass the full flow from Howells Run Dam spillway.

The main impact area of a flood due to failure of Howells Run Dam is located upstream from Lake Rowena and below the second railroad embankment. This area includes approximately 15 homes and several commercial buildings. In the event of a failure of Howells Run Dam, further life loss and property damage may occur in the areas west of Lake Rowena and downstream from Lake Rowena.

- c. Size Classification. Intermediate (based on 63-foot height).
- d. Hazard Classification. High.
- e. Ownership. Borough of Ebensburg.
- f. Purpose of Dam. Water supply.

g. <u>Design and Construction History</u>. The dam was designed by L. R. Kimball Consulting Engineers of Ebensburg, Pennsylvania in 1961. The dam was constructed by Frank M. Sheesley Company of Johnstown, Pennsylvania, with completion in 1964.

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h. <u>Normal Operating Procedure</u>. The reservoir is maintained at the spillway crest, Elevation 2050, leaving 8 feet of freeboard to the low section on the crest of the dam. All flow occurring when pool is at or above the spillway elevation is discharged through the spillway. It was reported by water company personnel that the outlet pipe for the dam has never been operated since the completion of the dam.

1.3 Pertinent Data

- a. Drainage Area 1.4 square miles (Plate 3)
- b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Unknown Warm water outlet at pool elevation - N/A Diversion tunnel low pool outlet at pool elevation - 355 Gated spillway capacity at pool elevation - N/A Gated spillway capacity at maximum pool elevation - N/A Ungated spillway capacity at maximum pool elevation - 2750 Total spillway capacity at maximum pool elevation - 2750

c. Elevation (USGS Datum) (feet)

Top of dam - 2058 to 2060 (the dam has a 2-foot crown) Maximum pool-design surcharge - 2055.7 Full flood control pool - N/A Recreation pool - N/A Spillway crest - 2050 Upstream portal invert diversion tunnel - Unknown Downstream portal invert diversion tunnel - 1997+ Streambed at center line of dam - 1995+ Maximum tailwater - Unknown

d. Reservoir (feet)

Length of maximum pool - 5400 Length of recreation pool - N/A Length of flood control pool - N/A

e. Storage (acre-feet)

Recreation pool (normal pool) - 1324 Flood control pool - N/A Design surcharge - 752 Top of dam - 2076

f. Reservoir Surface (acres)

Top of dam - 121+ Maximum pool - N/A Flood control pool - N/A Recreation pool - N/A Spillway crest - 82

g. Dam

Type - Earth Length (crest excluding spillway) - 670 feet Height - 64 feet Top width - 20 feet Side slopes - 2.5:1, 3:1 downstream; 3:1 upstream Zoning - Yes Impervious core - Yes Cutoff - Yes Grout curtain - Yes

h. Diversion and Regulating Tunnel

Type - 5 feet by 5 feet horseshoe Length - 330 feet Closure - Sluice gate Access - Gate controls at intake tower (Plate 4) Regulating Facilities - Yes

i. Spillway

Type - Ogee chute spillway Length of weir - 50 feet Crest elevation - 2050 feet Gates - None. Upstream channel - Lake Downstream channel - Discharging to trapezoidal channel with 20-foot bottom width

SECTION 2 ENGINEERING DATA

2.1 Design

a. Data Available

(1) <u>Hydrology and Hydraulics</u>. A report prepared by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), dated February 7, 1961, summarizes most of the hydrologic and hydraulic design data which are available for the project. The report states the criteria used for the design of the spillway.

(2) <u>Embankment</u>. The embankment design is based on <u>Engineering</u> <u>Report on the Proposed Water Supply Dam for the Borough of Ebensburg</u>, <u>Cambria County</u>, <u>Pennsylvania</u>, prepared by L. R. Kimball, Consulting Engineers, 1961.

The report includes results of geologic reconnaissance of the site, subsurface exploration, laboratory testing programs, and recommendations for the embankment design.

(3) <u>Appurtemant Structures</u>. Structural design data for the appurtemant structures were not available.

b. Design Features

(1) <u>Embankment</u>. A review of design drawings and the engineering report shows the following main features of the project:

- (a) As designed, the dam is a zoned embankment with an impervious core section. In the design drawing, two zones were identified:
 (1) select impervious material forming the core; and (2) random fill, forming the downstream and upstream slopes.
- (b) The embankment was designed to have a constant upstream slope of three to one (horizontal to vertical). The downstream slope is 2.5 to 1 from the crest to a 10-foot bench at Elevation 2035 and three to one below the bench to the toe level.
- (c) The impervious core was designed to have a maximum width of 98 feet at the foundation level. At the upstream toe of the core section, core material was extended down to the foundation rock level to form a cutoff for the embankment.

- (d) Design included a grout curtain extending to a maximum depth of 60 feet below the bottom of the cutoff trench. Grouting was to be done in zones 20 feet deep using the split spacing, stage grouting method.
- (e) A three-pot-thick filter blanket beneath the downstream slope was provided to control the phreatic surface. The filter was designed to consist of a two-foot-thick layer of coarse gravel with six inches of sand both below and above the gravel layer. The filter blanket originated 65 feet downstream from the axis of the dam and terminated at the rock toe.

(2) <u>Appurtemant Structures</u>. Appurtemant structures for the dam consist of spillway and outlet works. The spillway structures consist of an ogee weir, spillway chute, and stilling basin. The uncontrolled ogee weir is located at Elevation 2050. The base of the weir is extended to bedrock. The chute section consists of a rectangular concrete channel varying in width from 50 feet at the ogee crest to 20 feet, 120 feet below the crest and then constant below this point to the stilling basin. The design specified grouted anchor bars to tie the chute spillway slabs to the foundation.

c. Design Data

(1) <u>Hydrology and Hydraulics</u>. The PennDER report states that according to the criteria in effect at the time of the design, the spillway was required to pass 1850 cfs. It is further stated that the spillway is capable of passing this flow with a freeboard of three feet.

(2) <u>Dam</u>. The embankment design was based on the geology and soils report prepared by L. R. Kimball Consulting Engineers. The report includes a description of the subsurface conditions and the types of laboratory tests conducted on the foundation and borrow materials. The report states that the safety factor of the upstream slope was calculated to be 1.55 for rapid drawdown conditions using strength values of 850 psf cohesion and a friction angle of 10 degrees. No other stability analysis was reported.

(3) <u>Appurtement Structures</u>. There are no design values or calculations available for appurtement structures.

2.2 <u>Construction</u>. Construction drawings and various construction progress reports and photographs were available for review. To the extent that can be determined, the construction of the dam was apparently conducted according to the design specifications. No reference was found to indicate that any unusual problems were encountered during the construction, except during the excavation of the cutoff trench where various crevices were uncovered. These crevices were located 75 feet to the left of the outlet conduit. They were approximately one-foot wide and extended over a distance of 20 feet. The crevices were capped with concrete slabs and later grouted.

In 1964, immediately following completion of the dam, a landslide occurred on the left abutment. The slide was approximately 150 feet long and 40 feet high from the toe level. Significant seepage was observed in the slide area. Remedial measures consisted of extending the outlet conduit by 150 feet and placing a sand filter and earth-fill buttress against the slide area. Seepage from the slide area was collected into the drainpipe discharging into the outlet pipe stilling basin. Seepage from the area was monitored over a period of 125 days following the completion of the corrective measures. A similar treatment consisting of filter and earth-fill buttress was also used to correct a seepage and slumping area on the left side of the spillway in the natural ground.

2.3 <u>Operation</u>. There are no formal operating records available for this dam. As designed, the dam serves as a water supply reservoir. The supply water from the reservoir discharges through a 16-inch pipe, controlled by manually operated valves located at the intake tower. The drainpipe is also controlled from the intake tower. It discharges into the stream through a channel located near the left abutment.

2.4 <u>Other Investigations</u>. The available information indicates no investigations other than the infrequent periodic inspections conducted by the state.

2.5 Evaluation

a. <u>Availability</u>. Available engineering data was provided by PennDER.

b. Adequacy

(1) <u>Hydrology and Hydraulics</u>. The reported results of the hydrology and hydrualic analysis indicate that the design followed the criteria set forth by the Commonwealth of Pennsylvania, Department of Forests and Waters, applicable at the time of the design.

(2) <u>Dam</u>. Review of the geotechnical aspects of the design indicates that although the design generally followed currently accepted practice for subsurface investigations and laboratory testing, it appears that the stability analysis was conducted for only one condition: upstream slope rapid drawdown. No seepage analysis was found in the design report.

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(3) <u>Appurtemant Structures</u>. Review of design drawings indicates that as designed there are no significant design deficiencies that should affect the overall performance of the appurtemant structures.

c. <u>Operating Records</u>. No formal operating records are available for the dam. Water company personnel reported that there was no need to operate the drainpipe sluice gate in the past, therefore to the best of their knowledge, it has never been operated since completion of the dam.

d. <u>Post-Construction Changes</u>. Immediately following the completion of the dam in 1964, a landslide was observed on the left abutment. The extent of repair measures taken at the time is described in Section 2.2.

e. <u>Seismic Stability</u>. The dam is located in Seismic Zone 1 and static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is assumed to present no hazard from earthquakes.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. <u>General</u>. The on-site inspection of Howells Run Dam consisted of:

- Visual inspection of the embankment, abutments, and embankment toe.
- 2. Visual examination of spillway and its components, the downstream end of the outlet pipe, and other appurtenant features.
- 3. Observation factors affecting the runoff potential of the drainage basin.
- 4. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 5 and in the photographs in Appendix C.

b. Dam. The general inspection of the dam consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

- Two concentrated seeps were observed on the natural ground located on each side of the spillway chute. The flow from the right side seepage was estimated to be two to three gallons per minute (gpm). The left side seepage was estimated to be one gpm. These seeps are not considered to be affecting the overall performance of the embankment, however, they should be closely observed to assure that they are not increasing.
- Various wet areas were observed along the bench on the downstream slope of the dam. No perceivable amount of water was discharging from these areas.
- The crest elevation along a 100-foot section immediately adjacent to the spillway was found to be one to two feet below the crest

elevation. Review of the design drawings indicates that this condition was the result of camber built into the crest of the dam (Plate 1).

4. High grass and patches of brush were found to impair the adequate inspection of the downstream face of the dam.

c. <u>Appurtenant Structures</u>. The spillway crests and plunge pools were examined for deterioration of the concrete or other signs of distress and obstructions that would limit flow. These structures were found to be in good condition and performing satisfactorily. As can be determined from the downstream end, the condition of the drainpipe is considered good.

d. <u>Reservoir Area</u>. The watershed is predominantly covered with woodlands and infiltration capacity is estimated to be good. There appeared to be no major land clearing activities or other operations that would significantly increase the runoff rate of the drainage basin.

The shorelines are not considered to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water.

e. <u>Downstream Channel</u>. Howells Run downstream from the dam flows through three reservoirs over a distance of one mile. There are two railroad embankments across the stream within this reach. The reservoirs and culverts below the railroad embankments are shown in Photographs 7 through 12. Sketches of the reservoir spillway and culverts are included in Appendix A. Further description of the downstream condition is included in Section 1.

3.2 Evaluation. In general, the condition of the dam is considered to be good. Review of PennDER correspondence files indicates that the seepage condition along the spillway chute was previously noted (1964) and the owner was advised to evaluate the condition and to undertake necessary repair measures. The seepage problem was evaluated by F. T. Kitlinski and Associates, Consulting Foundation Engineers, of Harrisburg, Pennsylvania, and was found to be not serious. Subsequent flow measurements taken indicated that the seepage was gradually decreasing.

The present condition of this seepage problem is considered not serious.

Various wet areas observed along the bench on the downstream slope do not appear to be affecting the stability of the downstream face. These areas in the future should be monitored to assure continued safety of the embankment. Clearing of high grass and brush from the downstream face is required to facilitate adequate inspection of the downstream face.

SECTION 4 OPERATIONAL FEATURES

4.1 <u>Procedures</u>. Review of the design drawings and field observations indicates that there are no formal procedures for operating the dam. The only operational feature of the dam which may affect the safety of the dam is the outlet pipe sluice gate, in case it is required to lower the reservoir.

The clearing of debris from the spillway as required and continued inspection of the facilities by the dam tender are the principal maintenance operations which would affect safety.

4.2 <u>Maintenance of the Dam</u>. The overall maintenance conditions of the dam appear satisfactory. However, annual mowing of the downstream face should be instituted.

4.3 <u>Maintenance of Operating Facilities</u>. The operation of the outlet pipe sluice gate was not observed. Borough personnel reported that the gate has never been operated and the functional condition of the gate was questionable.

4.4 <u>Warning System in Effect</u>. There is no formal warning system in effect. The dam tender *does* not reside at the site and no permanent communication facilities are available at the dam site.

4.5 <u>Evaluation</u>. The dam is satisfactorily maintained, and it is considered to be accessible under all weather conditions for inspection and emergency action.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. <u>Design Data</u>. Howells Run Dam has a watershed area of 1.4 square miles and impounds a reservoir with a surface area of 84 acres. A 50-foot-wide spillway constitutes the flood discharge system for the impoundment. The flow through the spillway is controlled by an ogee weir at Elevation 2050, eight feet below the low section of the dam crest at Elevation 2058.

b. Experience Data. As previously stated, Howells Run Dam is classified to be an "intermediate" size dam in the "high" hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass the probable maximum flood (PMF).

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers (Appendix D). Based on this analysis procedure, it was determined that the PMF inflow hydrograph would have a peak flow of 2660 cfs and a total volume of approximately 3500 acre-feet. It was calculated that the spillway can pass the peak PMF inflow with a freeboard of 1.6 feet.

c. <u>Visual Observations</u>. On the date of inspection, no conditions were observed which would indicate that the spillway of the dam could not operate satisfactorily in the event of flood.

d. <u>Overtopping Potential</u>. As stated above, the spillway can pass the peak PMF without the dam being overtopped.

e. <u>Spillway Adequacy</u>. The spillway can pass the peak PMF, therefore, it is classified as adequate.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. <u>Visual Observations</u>. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam and none were reported in the past after completion of repair measures for the landslide that occurred in 1964 on the left abutment.

b. Design and Construction Data

(1) <u>Dam</u>. The engineering report prepared by L. R. Kimball Consulting Engineers includes the results of rapid drawdown stability analysis for the upstream face of the dam. The minimum factor of safety was reported to be 1.55. It appears that the stability of the embankment was not analyzed for other conditions, such as steady-state seepage.

(2) <u>Appurtemant Structures</u>. Review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of appurtemant structures.

c. <u>Operating Records</u>. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. <u>Post-Construction Changes</u>. The repair measures taken to correct the landslide condition that existed in 1964 appear to be performing satisfactorily.

SECTION 7 ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. <u>Safety</u>. The visual observations and review of available information indicate that Howells Run Dam is in good condition. It appears that the dam was constructed with reasonable care and the design generally followed the currently accepted engineering practices.

The capacity of the spillway was found to be "adequate" to pass the peak PMF flow.

b. <u>Adequacy of Information</u>. The available information in conjunction with visual observations and previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the dam.

c. <u>Urgency</u>. The recommendations listed below should be implemented immediately or as soon as practicable, as noted.

d. <u>Necessity for Further Investigation</u>. The condition of the dam is not considered to require further investigation at this time.

7.2 Recommendations/Remedial Measures

- The owner should take immediate action to evaluate the operational condition of the drainpipe sluice gate.
- The downstream face of the dam should be cleared of high grass and brush to permit adequate inspection of the face of the dam and annual mowing of the dam face should be instituted.
- It is recommended that the owner monitor the uncontrolled seeps on each side of the spillway channel and take necessary remedial measures if the seeps are found to be increasing.
- 4. The owner should be advised that the dam and appurtenant structures should be inspected regularly and any unusual conditions should be reported to the appropriate authorities.

















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APPENDIX A CHECKLIST, VISUAL INSPECTION PHASE I

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CHECKLIST VISUAL INSPECTION PHASE I

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NAME OF DAM HOWELLS FUN DAIN	COUNTY CAMERIA.	STATE PA.	ID# NDS: 434
TYPE OF DAM EARTH FILL	HAZARD	CATEGORY HIGH.	DER: 11-103
DATE(S) INSPECTION MAY 16, 1973	WEATHER PT, CLOUDY	TEMPERATURE 70 \$	
POOL ELEVATION AT TIME OF INSPECTION	2050 M.S.L. TI	AILWATER AT TIME OF INSPEC	TION 1990 M.S.L.
INSPECTION PERSONNEL:			

ELLO D'APPOLONIA.	LAWELNCE ANDLESEN	UAMES POELLOT.
REVIEW INSPECTION BY	(MAY 30, 1778)	
BILGIN EPEL	W.T. CHAN	

BILGIN EREL RECORDER

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ID# NLS:434 DEP: 11-103 7 NAME OF DAM HOWELLS PUN I REMARKS OR RECOMMENDATIONS SEC PLATE -S. 5 SEE PLATE S PLATE SPE ONE DISCIALGING SONE WET ARLAS DII DOWNSTREAM SLOPE Linkad to stud INTO THE SPILLWAY PLUNGE POOL. EACH SIDE VISUAL INSPECTION PHASE I **OBSERVATIONS** SECH ON EMBANKMENT THREE DEANUS LOCATED THIS NO THINAT CAL GIUTE . CONCLATICATLD SpillwA1 NONE FOUND. BENCH . アート to STAFF GAGE AND RECORDER JUNCTION OF EMBANKMENT AND ABUTMENT, SPIILLWAY AND DAM ANY NOTICEABLE SEEPAGE VISUAL EXAMINATION OF DRAINS

Page 3 of 11

0	VISUAL INSPECTION PHASE I	NAME OF DAM HOWFLLS PLIN . N
	CONCRETE/MASONRY DAMS	ID# NDS : 434 DER : 11-13
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	(EARTHFILL LAM)	
	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	M/A.	
DRAINS	N/A	
WATER PASSAGES	11/A.	
FOUNDATION	11/A .	

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D	VISUAL INSPECTION PHASE I CONCRETE/MASONRY DAMS	E OF DAM HOWELLS EUN D
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	EALTH FILL LAIN	
	· N/N .	
STRUCTURAL CRACKING		
	N/A.	
VERTICAL AND HORIZONTAL ALIGNMENT		
	01/A .	
SINIOF HIITONOW		
	N/A	
CONSTRUCTION JOINTS		
STAFF GAGE OF RECORDER:	M/A .	

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ID# NLC: 434 LEP: 11-103 NAME OF DAM HOWELLS EUN CAM REMARKS OR RECOMMENDATIONS END VISIBLE , NONE FOUND. THER KNOWLEDE IT HAS NEVED THEN PERSONNEL RCHORTLD THAT BEST TO NOT OBSERVED. BORDUGH CHANNEL. VISUAL INSPECTION PHASE I OUTLET WORKS OBSERVATIONS NO OUT LET STRUCTURE . RIPRAPPED TRAPEZOIDAL ONLY OUTLET SUBMEP att. 4 OPERATION . OPERATCD CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT VISUAL EXAMINATION OF INTAKE STRUCTURE OUTLET STRUCTURE EMERGENCY GATE OUTLET CHANNEL

Page 6 of 11

AY IDH HOWE OF DAM HOWELLS RUN DA	REMARKS OR RECOMMENDATIONS					
VISUAL INSPECT PHASE 1 UNGATED SPILLM	OBSERVATIONS	GOOD CONDITION	LAKE .	MINDE STELCTUEAL CEACE	NONE .	
	VISUAL EXAMINATION OF	CONCRETE WEIR	APPROACH CHANNEL	DISCHARGE CHANNEL	BRIDGE AND PIERS	

Page 7 of 11

0	VISUAL INSPECTION PHASE I	NAME OF DAM HOWELLS EUCH LOATH
	GATED SPILLWAY	ID# NUC: 434 DEF : 11-103
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	NO GATED SPILLMAY	
	N/A .	
APPROACH CHANNEL		
	N/A.	
DISCHARGE CHANNEL		
	N/A .	
BRIDGE PIERS		
	N/A.	
GATES AND OPERATION EQUIPMENT	NA	

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ID# NDS: 434 DEF: 1403 NAME OF DAM HOWELLS PUN DAM LATE OF INSPECTION. REMARKS OR RECOMMENDATIONS LOCATION AND THE DISCHARGES ON THE SEE PLATE S FOR WERE INSTALLED TO THE DISCHARGE THE OF THEEE DEALN PIPES. TRIANGULAR SHARP CRESTED WEIRS VISUAL INSPECTION PHASE I INSTRUMENTATION OBSERVATIONS NONE FOUND NONE FOUND NONT FOUND NONE . MONUMENTATION/SURVEYS VISUAL EXAMINATION OF **OBSERVATION WELLS** PIEZOMETERS WEIRS OTHER

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NAME OF DAM HOWFLLS PUN MAN	REMARKS OR RECOMMENDATIONS	(e. t)	an of cumulation.		
VISUAL INSPECTION PHASE I RESERVOIR	OBSERVATIONS	GRATLE . 113 INDICATION OF H. SHORELINE LEADON.	LAKE IS CLEAR NO INDICATI		
)	VISUAL EXAMINATION OF	SLOPES	SEDIMENTATION		

Page 10 of 11

VISUAL INSPECTION PHASE I DOWNSTREAM CHANNEL ID# NLS: 434 DEF 11-102	XAMINATION OF OBSERVATIONS OR RECOMMENDATIONS REMARKS OR RECOMMENDATIONS	N STREAM FLOWS THEODERM THREE UCTIONS, STREAM FLOWS THEODERM THREE S, ETC.) A MILE DOWNSTREAM FROM THE DAM.		ATE NUMBER EVERNMENTE VATER TECATMENT PLANT, AND IS HOMES SEVERAL COMMERCIAL EULIDINGS POPULATION :-100	
	VISUAL EXAMINATION O	CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	SLOPES	APPROXIMATE NUMBER OF HOMES AND POPULATION	

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APPENDIX B

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ENGINEERING DATA DESIGN, CONSTRUCTION, OPERATION PHASE I CHECKLIST ENCINEERING DATA DESIGN, CONSTRUCTION, OPERATION PHASE I

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NAME OF DAM HOVJELLS PUN DAM ID# NDS:434 PEP: 11-103

ITEM	REMARKS
AS-BUILT DRAWINGS	DESIGN PRAMING ARE AVAILABLE IN DER FILES.
REGIONAL VICINITY MAP	see plate-3
CONSTRUCTION HISTORY	COMPLETED IN 1964 . FURTHER INFORMATION ARE INCLUDED IN ONSTRUCTION PROBESS PUPPET IN DER FILES.
TYPICAL SECTIONS OF DAM	-26 PLATE -1
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATING	SEE PLATES 2 \$ 4
	Page 1 of 4

CHECKLIST ENCINEERING DATA DESIGN, CONSTRUCTION, OPERATION PHASE I

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NAME OF DAM HOWELLS EUN DAN ID# NDS:434 DER ; 11-103

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ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NOT AVAILAELE
DESIGN REPORTS	ENGINEERING REPORT ON THE PROPOSED WATER SUPPLY DAM FOR THE RORDUGH OF EBENSRURG, PREVARED BY L. P. KIMBALI CONSULTING ENGINEERS. 1961
GEOLOGY REPORTS	INCLUDED IN ENGINEERING REPORT.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	RESULTS REPORTED IN ENGINEERING REPORT.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	BORING LAG ARE INCLUDED TO DESIGN DRAWINGS.

Page 2 of 4

CHECKLIST ENGINEERING DATA DESIGN, CONSTRUCTION, OPERATION PHASE I

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NAME OF DAM HOWELLS CUN DAM

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	. UN TOT TON
BORROW SOURCES	LAKE ARCA , & SHILWAY CHANNEL EXCAVATION
MONITORING SYSTEMS	THEEL TEIANGULAR WEIRS ARE AUAILABLE & FUNCTIONING TO HONITOR SEEMIGE FLOWS.
MODIFICATIONS	1964 DEAIN PIPE WAS EXTENDED BY 155 FT IN DOWNSTRLAM PIPECTIAN , AN EARTHFILL BUTRESS WAS PLACED AGAINST A SLILL ARLA ON THE LEFT SIDE OF OUTLET PIPE.
HIGH POOL RECORDS	NOT AVAILABLE
	Page 3 of 4

CHECKLIST ENCINEERING DATA DESIGN, CONSTRUCTION, OPERATION PHASE I

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NAME OF DAM 1/2013ELLS ELITI DAM ID# NDS:434 DEPE 11-103

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	THE LANDSLIDE ON THE LEFT ABUTMENT IN 1964 MAU STUDIED BY F.T NITLINSEL AND ASSOCIATES CONSULTING UNDUERS OF HAREISEDEG. VARIOUS LETTER REPORTS ARE INCLUDED IN DER FILES.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE LEPORTED.
MAINTENANCE OPERATION RECORDS	NOT AUAILABLE .
SPILLWAY PLAN SECTIONS	SEE PLATE - 2
DETAILS	DETNILS ARE IN DER FILES
OPERATING EQUIPMENT PLANS AND DETAILS	INCLUPED IN PESICIN DEAMINGS .
	Page 4 of 4

NAME OF DAM HOWELLS RIN DAM

ID# NOS: 434 DER: 11-103

CHECKLIST HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: WOODED (1.4 SO. MILES) ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 1324 ACEE.FEET DEL 2050 ELEVATION; TOP FLOOD CONTROL BOOL AND STORAGE CAPACITY: SAME AS ABOVE ELEVATION; MAXIMUM DESIGN POOL: 2050 FT (AS DESIGNED) LISCES DATEM, ELEVATION; TOP DAM: 2058 FT (AS DESIGNED) DSGS DATEM, CREST:

a. Elevation 2058 FT

b. Type EARTH .

c. Width 20 FT.

d. Length 670 FT

e. Location Spillover 100 FT OF CREST LEFT OF SPILLWAY

f. Number and Type of Gates NO GATE ON SPILLWAY OUTLET WORKS:

a. Type REINFORCED CONCRETE DEAIN CONDUIT,

b. Location NEAR LEFT ABUTMENT

c. Entrance Inverts 1996 FT.

d. Exit Inverts 1986 FT (ESTIMATED)

e. Emergency Draindown Facilities DEAIN CONDUIT,

HYDROMETEOROLOGICAL GAGES:

a. Type NONE

b. Location NONE

c. Records NONE

MAXIMUM NONDAMAGING DISCHARGE: MAK SDILLWAY DISCHARGE ~ 2750 LFS.

APPENDIX C PHOTOGRAPHS

LIST OF PHOTOGRAPHS HOWELLS RUN DAM NDS I.D. NO. 434 MAY 16, 1978

PHOTOGRAPH NO. DESCRIPTION 1 Dam crest. 2 Right abutment, spillway, and discharge channel. 3 Plunge pool. 4 Spillway approach channel. 5 Outlet pipe and toe drainpipes. 6 Seepage at the right abutment. 7 Old city reservoir spillway 0.6 mile downstream. 8 Five-foot-diameter railroad culvert 0.7 mile downstream. 9 Lake Jenks spillway 0.8 mile downstream. 10 Two 9-foot-diameter railroad culverts 0.9 mile downstream. 11 Lake Rowena 1.5 miles downstream. 12 Lake Rowena spillway and outlet pipe.



Photograph No. 1 Dam crest.



Photograph No. 2 Right abutment, spillway, and discharge channel.



Photograph No. 3 Plunge pool.



Photograph No. 4 Spillway approach channel.



Photograph No. 5 Outlet pipe and toe drainpipes.



Photograph No. 6 Seepage at the right abutment.



Photograph No. 7 Old city reservoir spillway 0.6 mile downstream.



Photograph No. 8 Five-foot-diameter railroad culvert 0.7 mile downstream.



Photograph No. 9 Lake Jenks spillway 0.8 mile downstream.



Photograph No. 10 Two 9-foot-diameter railroad culverts 0.9 mile downstream.



Photograph No. 11 Lake Rowena 1.5 miles downstream.



Photograph No. 12 Lake Rowena spillway and outlet pipe.

APPENDIX D CALCULATIONS

IDAIPIPOILONILA CONSULTING ENGINEERS INC
By INTC Date 5.22-78 Subject Howen's Run Dary Sheet No. 1 of 2
Chkd. By EA Date 6-1-78 Hypeology & HypeAccus Proj. No. 78-14-13
DAM : HOWELLS RUN DAM (NEW EBENSBURG CITY RESERVOIR)
WATERSHED AREA, A = 1.40 SQ MILES
INFLOW HYDROGRAPH : BASIN OHIO RIVER BASIN - HOWELLS RUN, TRIBUTARY OF NORTH BRANCH LITTLE CONEMAUGH RIVER.
TOTAL TIME, T, = 32 Houre
PMF PEAK FLOW, q, = 1900 cfs/SQ. MILES
PMF PEAK FLOW Q = 9 A = 1900 11.4 = 2660 cfs
VOLUME OF INFLOID = $V_i = \frac{1}{2} (T \times 3600) \times Q$ = $\frac{1}{2} (32 \times 3600) (2660)$ = 153.2 ×10 ⁶ CF = 153.2 ×10 ⁶ CF = 153.2 KCF = 3500 ACRE-FT LipERUAL TO 47.1 ×10.47F
Type (DUCRETE OGEE WEAR W/ CHUTE Spilling BASIN, APPROCHING CHANNEL -LAKE (REST WEIR LENGTH = 50 FT HEAD (MAX) $f = 2058 (DAM CREST) - 2050 (Spilling) = 8 FT Q5 = (3.6)(50)(H)15 FOR Q1 = 2660 => H = 602FT AppRocHING V = \frac{2660}{(50)(6+5)} = 4.84fps$

IDAIPIPOILONLA CONSULTING ENGINEERS, INC
By LATC Date 5-27.78 Subject Hauseus Run DAM Sheet No 2 of 2 Chkd. By E4 Date 6-1-78 Hydrology & Hydronuc Proj. No. 78-114-13
VELOCITY HEAD > $\frac{\sqrt{2}}{29} = \frac{484^2}{644} = 3.36 \text{ FT}$
REQ D TOTAL HEAD = 602 + 0.36 = 6.3877
OR RESERVOIR WATER LEVEL = 2050 + 6 39
EL 2056-38
AVAILABLE HAA DAM (REST) 20ER
Southan = 2050
W.L. EL 2056-38 (FOR PHF)
FREEBOARD 1.62FT (FOR PHF)
(ONCLUSION: THE SPILLWAY IS ADEQUATE FOR PHF DELIGN STOPH MAX. SPILLWAY (ADDESIGNED BY KIMBALL) CAPACITY = 2750 45 E EL 2055.7
TAIL WATER DEPTH
REVIEW L. ROBERT KIMBALL CONSULTING ENGR'S
"ENGINEERING REPORT ON THE PROPOSED
WATER Supply DAM FOR THE BORDUGH
OF EBENSBURG, CAMBRIA COUNTY, PA"
1961
THE TAILWATER DEPTH FOR PMF IS 6.0 + ABOVE Stream Led

(EL 2082) FOR SECTION A-A

APPENDIX E REGIONAL GEOLOGY

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APPENDIX E REGIONAL GEOLOGY

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A preliminary review of existing geologic information indicates that the site is located approximately two miles west of the Allegheny Front, on the east limb of the Wilmore Syncline. Dip of the strata averages five degrees to the northwest towards the Wilmore Syncline. Rocks at the site belong to the Allegheny and Pottsville Formations of the Pennsylvanian System. The Allegheny Group is composed of sandstones, shales, thin limestones, and several coal seams. The most important coals in the dam site area are the Lower Freeport and the Upper and Lower Kittanning. The Pottsville Group underlies the Allegheny and is composed of the Homewood Sandstone, Mercer Shale, and the Conoquessing Sandstone.

Deep mining of the Lower Kittanning Coal has taken place beneath portions of the valley and the hogback near the dam.