

MEMORANDUM

TO: Programs, Projects, and Operations Subcommittee
FROM: Martin P. Cleveland
SUBJECT: Wehrspann Sediment Dam Evaluation
DATE: March 31, 2023

The Wehrspann Lake Aquatic Improvement Project also known as the Wehrspann Sediment Dam is located immediately south of Nebraska Highway 370 between the interchange on Interstate 80 and the intersection with South 168th Street (see attached location map). This Dam is located on the major tributary to Wehrspann Lake at Chalco Hills Recreation Area and is classified as a significant hazard dam by the Nebraska Department of Natural Resources Dam Safety Division (NDNR Dam Safety). The dam was designed and constructed by the United States Army Corps of Engineers (USACE) and is owned by the Papio NRD. The dam was completed in 2000. It is an earthfill dam with a reinforced concrete riser and 24-inch concrete conduit principal spillway. The auxiliary spillway is on the earthfill and has soil cement erosion protection on the crest. Soil cement lifts in a “stair step” configuration provide erosion protection on the upstream and downstream faces to the respective normal water levels.

The Papio NRD was notified by the NDNR Dam Safety in a 2022 inspection report that their analysis indicates the dam has inadequate spillway capacity and was determined to have a condition assessment rating of “poor.” As designed, the auxiliary spillway was expected to convey flow 4.0 feet deep before overtopping the embankment. As it exists today, the auxiliary spillway can convey flow approximately 2.3 feet deep before the embankment is overtopped, significantly reducing the auxiliary spillway capacity. Preliminary analysis by the NDNR Dam Safety Division indicates the 100-year design hydrograph may overtop the embankment. To achieve a satisfactory rating for significant hazard classification dams, hydraulic criteria include passing the 500-year design hydrograph without overtopping the embankment. NDNR has informed the Papio NRD that “corrective action is necessary.”

To respond to the NDNR assessment that Wehrspann Sediment Dam needs corrective action, it is recommended that the current dam situation be evaluated, and corrective measures be taken to restore the dam to satisfactory condition, so a dam safety issue does not exist. Papio NRD staff have met with USACE staff to discuss the Wehrspann Sediment Dam NDNR status and the USACE staff informed Papio NRD that they will not provide any engineering assistance or modification assistance to address the NDNR concerns. The Dam operation and maintenance was turned over to the Papio NRD in 2005.

It is recommended that HDR Engineering be hired provide professional services to evaluate the Wehrspann Sediment Dam and prepare a preliminary design to restore the Dam to a satisfactory rating. The maximum not to exceed cost of the agreement is \$143,860. This amount is beyond the fee limit of \$100,000 for consultant selection without a Request for Proposals (RFP) as per Board Policy 15.2 Purchasing-Professional Services. Because HDR Engineering is the most qualified to design repairs for Wehrspann Sediment Dam Project, staff recommends that the Board waive the RFP process and approve the proposed professional services agreement with HDR Engineering (attached).

Management recommends that the Programs, Projects, and Operation Subcommittee recommend to the Board of Directors that Policy 15.2 Purchasing-Professional Services be waived and that the General Manager be authorized to execute the proposed Professional Services Agreement with HDR Engineering for the Wehrspann Sediment Dam, with the maximum not to exceed amount of \$143,860, subject to changes deemed necessary by the General Manager and approval as to form by District Legal Counsel.

SCOPE OF SERVICES

Wehrspann Sedimentation Dam Evaluation Sarpy County, NE

BACKGROUND AND BASIS OF PROPOSAL

The Wehrspann Lake Aquatic Improvement Project known as the Wehrspann Sediment Dam (NE02529) is located immediately south of Nebraska Highway 370 between the interchange on Interstate 80 and the intersection with South 168th Street. The dam was designed by the United States Army Corps of Engineers (USACE) and is owned by the Papio-Missouri Natural Resources District (District). The dam was completed in 2000. It is an earthfill dam with a reinforced concrete riser and 24-inch concrete conduit principal spillway. Normal pool level is controlled by stop logs in the riser and a 24-inch sluice gate drawdown valve. The auxiliary spillway is on the earthfill and is approximately 300 feet wide and 56 feet long with soil cement erosion protection on the crest. Soil cement lifts in a “stair step” configuration provide erosion protection on the upstream and downstream faces to the respective normal water levels.

The Operation and Management Manual prepared December 2005 by the USACE states the elevation of the auxiliary spillway crest was constructed 2.0 feet above the design elevation with the expectation that the combined foundation and embankment soils settlement would be 2.0 feet. The earthfill profile was constructed to match the 2.0 feet of expected settlement at the auxiliary spillway tapering to 0.0 feet at each abutment.

Survey data collected September 1st, 2021, indicate the auxiliary spillway weir crest settlement ranges from 0.2 to 0.6 feet lower than the as-constructed profile with the maximum value occurring at the maximum embankment section. The earthfill embankment settlement on either side of the auxiliary spillway ranged from 0.0 to 0.3 feet. Post construction settlement was much less than expected. Twenty-three years have elapsed since the embankment was placed and it is unlikely that additional settlement will occur, based on experience with other earthfill dams constructed in the Papillion Creek watershed.

The District was notified by the Nebraska Department of Natural Resources Dam Safety Division (NDNR Dam Safety) that their analysis indicates the dam has inadequate spillway capacity and was determined to have a condition assessment rating of poor. The following deficiency was identified by the NDNR Dam Safety Division. As designed, the auxiliary spillway was expected to convey flow 4.0 feet deep before overtopping the embankment. As it exists today, the auxiliary spillway can convey flow approximately 2.3 feet deep before the embankment is overtopped, significantly reducing the auxiliary spillway capacity. Preliminary analysis by the NDNR Dam Safety Division indicates the 100-year design hydrograph may overtop the embankment. To achieve a satisfactory rating for significant hazard classification dams, hydraulic criteria include passing the 500-year design hydrograph without overtopping the embankment. Observations from the site visit on February 14th, 2023, indicate soil cement weathering may account for a loss of surface materials as much as 0.1 to 0.2 feet of the elevation differential.

SCOPE OF SERVICES – Wehrspann Sediment Dam Evaluation

The objective of this Project is to provide professional services to the P-MRNRD in two phases. Phase I will consist of hydrologic, hydraulic, and geotechnical analyses, permit coordination, and preliminary design. Phase II will consist of final design, bid phase services, and construction administration. The scope of work for Phase I is segmented into five (5) task series:

Task Series 100 – Project Management
Task Series 200 – Geotechnical Analysis
Task Series 300 – Hydrologic and Hydraulic Analysis
Task Series 400 – Permit Coordination
Task Series 500 – Preliminary Design

The following professional services are proposed.

TASK SERIES 100 – PROJECT MANAGEMENT

Task Objectives: Coordinate work effort, administer contract, and provide quality control.

HDR Activities: **Task 110 Project Management.** Conduct general project management tasks. Includes development of project initiation forms, a project management plan, monthly invoicing, monthly progress reports, project close out activities and other administration activities.

Task 120 Meetings. Conduct coordinating meetings to discuss Project tasks and present findings.

- Kickoff meeting with P-MRNRD staff.
- Meetings with P-MRNRD staff after engineering evaluations and analysis to discuss results.
- Review meeting with NeDNR Dam Safety and P-MRNRD staff to discuss results and selected alternative.

Task Deliverables:

- Monthly invoices and progress reports.
- Meeting agenda and notes.

Key Understandings:

- Meetings will be attended by up to three (3) HDR staff members.
- Two (2) project coordination meetings will be held.
- Coordination Meetings will be held at the offices of the P-MRNRD or at the Project site.

TASK SERIES 200 – GEOTECHNICAL ANALYSIS

Task Objectives: Develop and perform geotechnical data collection plan, and perform geotechnical analysis to analyze potential mitigation alternatives.

HDR Activities: **Task 210 Data Collection.** Collect and review existing information and conduct site visits as needed throughout the work.

Subtask 210.1 Data Collection and Review. Collect and review existing information including:

- Historical site and aerial photographs.
- Preconstruction and as-built drawings and photographs.
- Survey data.
- U.S. Army Corps of Engineers' Wehrspann Lake Section 1135 Restoration, Hydrologic, Hydraulic, and Geotechnical Analysis, Engineering Division Technical Report, dated February 1997.
- U.S. Army Corps of Engineers' Wehrspann Lake Aquatic Improvement Project O&M Manual, Sarpy County, NE, dated December 2005.
- Report on Recommendations for Rehabilitation, Wehrspann Sedimentation Dam, dated December 19, 2002.
- Discussions with Nebraska DNR and U.S. Army Corps of Engineers personnel regarding the history of the Sedimentation Dam (various e-mails and letters) as provided by P-MRNRD staff.

- Results of any available geotechnical information, grading and building plans.

Subtask 210.2 Site Visits. Conduct up to one (1) site visit to evaluate existing conditions and site constraints.

Task 220 Geotechnical Investigation. Perform geotechnical investigation for up to three (3) mitigation alternatives.

- Prepare a borehole investigation plan to advance two (2) cores through the soil cement control section and sand blanket to provide information on the soil cement lifts, total soil cement thickness and strength, sand blank thickness and composition, and elevation of the earthfill embankment below the weir crest. This task to be performed by Thiele Geotech.
- A Drilling Program Plan will be prepared and submitted to USACE Omaha District for the proposed field work.
- Review the geotechnical investigation field and laboratory results and prepare a memorandum of the evaluation and provide an opinion on the condition of the soil cement weir crest and suitability for continued utilization.
- Evaluate design approaches for interface between existing soil cement weir crest and potential reinforced concrete slab weir crest.

Task 230 Auxiliary Spillway Rehabilitation Concept Development. Prepare three auxiliary rehabilitation concepts.

- Alternate 1 - restore the existing soil cement to provide a uniform control section through the auxiliary spillway and improve durability and raise the embankment as required to pass the 500-yr design hydrograph without overtopping the embankment.
- Alternate 2 – add a supplemental auxiliary spillway to Alternate 1 to add capacity and decrease the amount of dam raise required.
- Alternate 3 - remove the soil cement weir crest as required and construct a durable control section to provide the original design elevation of the auxiliary spillway and raise embankment a minor amount at each abutment.

Deliverables:

- Technical Memorandum.

Key Understandings:

- For Alternate 2 - Surface topography prevents raising dam sufficiently within existing land rights.
- The three alternatives assume the existing principal spillway riser and conduit remain unchanged.
- P-MRNRD to provide access to/across private property for site visits and geotechnical investigation.
- P-MRNRD will provide results of all USACE geotechnical investigations (borings, lab test reports, instrumentation data, and photographs) if available.
- All deliverables will be electronic. No hard copies will be printed.
- P-MRNRD will provide existing survey information. Available LiDAR data will be used to the extent possible. No additional survey information will be required.
- Prevailing science and understanding of natural forces including, but not limited to, flood, rain, temperature, earthquakes, and wind indicates a dynamic and non-stationary system of potential loads. The Engineer selected the design loads based upon the information available to the Engineer at the time the analysis was conducted and based upon the standard of care at the time the analysis was completed. These loads were accepted by client for use in the design. The

Engineer makes no warranties or guarantees on future predictions of seismic and hydrological conditions that may impact the design, safety, or performance of the dam.

TASK SERIES 300 – HYDROLOGIC AND HYDRAULIC ANALYSIS

Task Objectives: Evaluate the auxiliary spillway to confirm the hydraulic deficiency and to analyze potential remedies to address that deficiency

HDR Activities:

Task 310 Existing Condition.

- Prepare a hydraulic model of the existing dam using SITES and WinDAM software based on existing available survey data, available record drawings and specifications, field measurements and stop log configuration of the principal spillway, and current hydrologic data to meet hydrologic criteria for NDNR Dam Safety Division significant hazard classification.
- Develop hydrographs. Operate the SITES model of the existing dam to develop design hydrographs and determine top of dam elevation required to prevent overtopping (Alternate 1).
- Develop HEC-RAS model to evaluate hydraulic controls of downstream channel and Highway 370 crossing.

Task 320 Alternative Condition.

- Prepare a WinDAM model to evaluate spillway performance of Alternative 2 and Alternative 3, based on initial inspection of topographic plans and field observations. It is anticipated the supplemental auxiliary spillway might best fit on the embankment between the existing auxiliary spillway and right abutment.
- Revise existing condition HEC-RAS model to evaluate hydraulic controls of proposed condition on downstream channel and Highway 370 crossing.
- Prepare concept level plans and profiles for each alternative and opinions of approximate costs.
- Meet with District representatives to present initial findings and identify if one or more of the alternatives are feasible to advance to preliminary design and to receive input on a preferred alternative. Incorporate input and prepare a presentation to the Board of Directors of the evaluation and findings.
- Develop technical memorandum detailing results.

Deliverables:

- Technical Memorandum

Key Understandings:

- For scope development, the selected design is to remove a portion of the soil cement erosion protection and replace with RC Concrete slab at original design elevation (1117.0) of the weir crest with minor embankment raises at each abutment to contain

500-year design hydrograph. Remainder of soil cement to remain in-place with minor repairs to address eroded steps flanking principal spillway outlet.

- Update design storm using NOAA Atlas 14. The following design storms will be evaluated:
 - 25-year;
 - 50-year;
 - 100-year;
 - 500-year;
 - Principal spillway hydrograph;
 - Stability design hydrograph;
 - Freeboard hydrograph.

TASK SERIES 400 – PERMIT COORDINATION

Task Objectives: Assist P-MRNRD in coordinating with regulatory agencies and developing necessary documentation for submission of Section 404 permitting and Section 408 approval.

HDR Activities: **Task 410 Agency Coordination.** Conduct a pre-application meeting with USACE to discuss compliance with Section 404 of the Clean Water Act.

Task 420 Wetland Delineation. Perform wetland delineations for all instability locations. A delineation report will be prepared. No wetland or stream functional assessments will be performed.

Task 430 Section 404 Documentation. Prepare a Pre-Construction Notification per Nationwide Permit #43 – Stormwater Management Facilities.

Task 440 Section 408 Coordination. Conduct Section 408 coordination with P-MRNRD and USACE Omaha District:

- Prepare for and conduct one (1) pre-submittal meeting with P-MRNRD with respect to Section 408 requirements. The meeting will confirm design criteria and submittal requirements.
- Prepare for and conduct one (1) pre-submittal meetings with USACE with respect to Section 408 requirements. The meeting will confirm design criteria and submittal requirements.

Deliverables:

- Wetland Delineation Report (Draft, electronic submittal, Final, electronic, and hard copy)
- Section 404 Pre-Construction Notifications (Draft and Final)
- Section 408 Coordination meeting notes with P-MRNRD and USACE.

Key Understandings:

- The pre-application meeting with USACE staff will be attended by two (2) HDR staff.
- It is assumed that Nationwide Permit #43 – Stormwater Management Facilities, can be utilized for the maintenance of an existing stormwater management facility. A pre-construction notification is assumed even though the capacity of the original design will be maintained.
- Section 401 Water Quality Certification has been provided for Nationwide Permit #43.

- If the proposed activities do not comply with the requirements of Nationwide Permit #43, an Individual Permit would be required. An Individual Permit is not included in this scope of services.
- Permanent wetland impacts are not anticipated to exceed 0.1 acres and no mitigation would be required.
- No stream or wetland functional assessment would be required.
- The requirements of the Section 408 submittal will conform with USACE Engineering Circular (EC) 1165-2-220 Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408.
- USACE updated the Engineering and Construction Bulletin (ECB) 2022-7 Interim Approach for Risk-Informed Designs for Dam and Levee Projects. At this time, this scope assumes that a risk analysis will not be required for P-MRNRD to provide. This will be confirmed in the pre-submittal meetings.
- Preparation of the Section 408 submittal is not included in this Scope of Services.
- It is assumed that USACE will not require Section 106 documentation support by P-MRNRD.
- P-MRNRD is exempt from city and county zoning and building regulations. As the site is on Federal property, the project is exempt from state and local floodplain permitting regulations.

TASK SERIES 500 – PRELIMINARY DESIGN

Task Objectives: Develop draft and final preliminary design details of the proposed mitigation measure.

HDR Activities: **Task 510 Preliminary Design.** Prepare preliminary design and associated drawing, drawings.

- Meet with Review and Permitting Agencies to confirm design approach and coordinate necessary environmental reviews, approvals and permits. (NDNR, USACE Section 408 Approval, Section 404 Permit, Construction SWPPP).
- Develop 30% design plans and specification table of contents for:
 - partial removal of soil cement weir crest,
 - replacement with reinforced concrete weir crest slab,
 - and minor embankment raise at each abutment.
- Drawings to be prepared in AutoCAD, Version 2020 format. A preliminary list of sheets may include:
 - Cover Sheet (1 sheet)
 - Site Plan (1 sheet)
 - Profile and Section (1 sheet)
 - Details (1 sheet)

Task 520 OPCC & TM.

- Develop opinion of probable construction costs for preliminary design.
- Prepare design summary memorandum of investigation, evaluation, hydraulic and hydrologic evaluation, and design approach.

Deliverables:

- Preliminary Design Documents (drawings, technical specifications).
- Design summary memorandum.

Key Understandings:

- The preliminary design will be at the 30% design level, consist with sufficient detail to determine an opinion of probable construction cost, and advance permit coordination.
- One set of contract documents will be developed for the site. If it is determined that additional contract documents are required, that work effort will be provided as Additional Service.
- Drawings will be 11"x17" format.
- P-MRNRD will provide pre-construction topographic survey and legal description. This information will be used for design and development of quantities.
- All plans will be electronic. No hard copies will be printed.
- No right of way (ROW) documentation or legal descriptions, or acquisition support is included. Should it be required, it can be provided as an additional service.

**PAPIO - MISSOURI RIVER NATURAL RESOURCES DISTRICT
WEHRSPANN SEDIMENTATION DAM EVALUATION
FEE ESTIMATE**

TASKS		Labor									Expenses				Subconsultants	Est. Total Cost
		Project Manager/ QC	Sr. Geotech. Engineer	Sr Engr/Sr. Scientist	Geotech. Engineer	Project Engineer/ Scientist	Technical Support	Clerical	Total Hours	Total Labor Cost	Printing	Travel	Misc.	Total Expenses		
TASK SERIES 100 – PROJECT MANAGEMENT		<i>PJE/EJ</i>	<i>Poepsel</i>	<i>MP/JC/TM/VT</i>		<i>Josh J./MS</i>	<i>MS</i>	<i>KK</i>								
Task 110	Project Management	8							8	\$2,248				\$0		\$2,248
Task 120	Meetings	12	8	8					28	\$7,252		\$100	\$50	\$150		\$7,402
Estimated Task Hour Subtotal		20	8	8	0	0	0	0	36	\$9,500	\$0	\$100	\$50	\$150	\$0	\$9,650
TASK SERIES 200 – GEOTECHNICAL ANALYSIS																
Task 210	Data Collection															
Subtask 210.1	Data Collection and Review	2	2	4	4	2	4		18	\$3,454		\$50		\$50		\$3,504
Subtask 210.2	Site Visits	4	2	4	4		4		18	\$3,752		\$50		\$50		\$3,802
Task 220	Geotechnical Investigation	2	8	2	24		4		40	\$7,448					\$7,172	\$14,620
Task 230	Auxiliary Spillway Rehabilitation Concept Development	4	2	14	6	12			38	\$7,380				\$0		\$7,380
Estimated Task Hour Subtotal		12	14	24	38	14	12	0	114	\$22,034	\$0	\$100	\$0	\$100	\$7,172	\$29,306
TASK SERIES 300 – HYDROLOGIC AND HYDRAULIC ANALYSIS																
Task 310	Existing Condition	4		12		32	4		52	\$8,660	\$50	\$20		\$70		\$8,730
Task 320	Alternative Condition	4	8	48		60	16		136	\$24,340	\$50			\$50		\$24,390
Estimated Task Hour Subtotal		8	8	60	0	92	20	0	188	\$33,000	\$100	\$20	\$0	\$120	\$0	\$33,120
TASK SERIES 400 – PERMIT COORDINATION																
Task 410	Agency Coordination	4		6		6			16	\$3,290		\$25		\$25		\$3,315
Task 420	Wetland Delineation			4		36	2		42	\$5,950		\$50	\$85	\$135		\$6,085
Task 430	Section 404 Documentation			12		32	2		46	\$7,254				\$0		\$7,254
Task 440	Section 408 Coordination	4		12		24			40	\$7,040				\$0		\$7,040
Estimated Task Hour Subtotal		8	0	34	0	98	4	0	144	\$23,534	\$0	\$75	\$85	\$160	\$0	\$23,694
TASK SERIES 500 – PRELIMINARY DESIGN																
Task 510	Preliminary Design	8	8	50	16	60	50	40	232	\$38,460	\$100			\$100		\$38,560
Task 520	OPCC & TM	4	8	12	16	8			48	\$9,520	\$10			\$10		\$9,530
Estimated Task Hour Subtotal		12	16	62	32	68	50	40	280	\$47,980	\$110	\$0	\$0	\$110	\$0	\$48,090
TOTAL HOURS		60	46	188	70	272	86	40	762	\$136,048	\$210	\$295	\$135	\$640	\$7,172	\$143,860

LOCATION MAP

WEHRSPANN
LAKE
DAM

168th ST.

HWY 370

WEHRSPANN
SEDIMENT
DAM

