COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF NORTHERN KENTUCKY	)	
WATER DISTRICT FOR ISSUANCE OF	)	CASE NO. 2016-00303
OHIO RIVER PUMP STATION	)	
NUMBER 2 REHABILITIATION	)	
CERTIFICATE OF CONVENIENCE	)	
AND NECESSITY	)	

APPLICATION FOR APPROVAL OF CONSTRUCTION

Northern Kentucky Water District (NKWD), by counsel, petitions for an order approving the construction the Ohio River Pump Station Number 2 Rehabilitation as described below pursuant to KRS 278.020.

In support of the application, the following information is provided:

1. NKWD's office address is 2835 Crescent Spring Rd., Erlanger, KY 41018-0640. Its principal officers are listed in its current Annual Report on page 6, which is filed with the Commission as are its prior years Reports and is incorporated by reference.

Its contact officer is:

Lindsey Rechtin, Acting Vice President Finance
2835 Crescent Spring Rd.
Erlanger, KY 41018-0640
(859) 578 9898 Phone
(859) 578-3668 fax
lrechtin@nkywater.org

2. NKWD is a non-profit water district organized under Chapter 74 and has no separate articles of incorporation;

3. A description of NKWD's water system and its property stated at original cost by accounts is contained in its Annual Report, which is incorporated by reference.

4. NKWD serves retail customers in Kenton, Boone and Campbell Counties and

sells water at wholesale to non-affiliated water distribution systems in Kenton, Boone, Pendleton and Campbell Counties.

5. NKWD proposes to construct new facilities as described in Exhibit A. The Ohio River Pump Station No. 2 Rehabilitation project consists of modest rehabilitation efforts throughout the pump station. The pump station was built in 1872. The rehabilitation includes various select demolition, new windows, new static trash rack, new inlet sluice gate, new suction inlet valve, new wet well platforms, installation of new lighting, installation of new ventilation equipment, replacement of the reinforced concrete operating room floor, miscellaneous new electrical work, various new carpentry work, and the rehabilitation of the foundation walls by tuck-pointing and block replacement.

A thorough study of the pumping station was performed in 2014 by HDR Engineers to further develop the design concepts prepared in the District's 2004 and 2008 Asset Management Program reports. Applicable portions of each study are included with Exhibit A. The intent of the HDR study was to identify any "fatal flaws" that may exist that would prevent an option from moving forward and to develop more accurate costs for viable options. Estimated costs were prepared as follows:

- Replace with a new station - $25 million
- Use the newer Ohio River Pumping for both plants - $21 million to $31 million for four pipe alignment options consisting of:
  - Pipe Alignment Option 1 – adjacent to railroad ($30 million)
  - Pipe Alignment Option 2 – along Route 8 in the upslope lane ($21 million)
  - Pipe Alignment Option 3 – along Route 8 in the downslope shoulder ($26 million)
  - Pipe Alignment Option 4 – along the bank of the Ohio River ($31 million)
- Rehabilitate the existing station - $26 million

To continue providing reliable supply of water to the plant, a modest rehabilitation project was recommended to repair the deteriorated concrete floor, replace the windows, and add

a slide gate to shut off flow from the river to the station.

The District solicited bids for the Ohio River Pump Station No.2 Rehabilitation on June 9, 2016 and again on June 30, 2016 and opened bids on July 21, 2016. The recommended award amount for construction is $1,564,000.

6. This project will be paid from the District's Five-Year Capital Budget, PSC No. 242 "ORPS2 Rehabilitation" with a budget of $2,000,000, which includes construction cost, engineering, and contingencies. A summary of the project costs is provided below:

- o Engineering Evaluation $ 119,557
- o Design Engineering $ 92,578
- o Construction Engineering $ 43,746
- o Contractor's Bid $1,564,000
- o Misc. & Contingencies $ 180,119

Total Project Cost $2,000,000

The project will be funded from a future Bond Anticipation Note (BAN). Because the BAN is temporary financing for fewer than two years, NKWD believes no approval of the financing is necessary. However, if approval pursuant to KRS 278.300 is needed, such approval is requested.

7. The construction is in the public interest and is required to allow NKWD to continue to provide adequate service to its customers. The project, its cost, need and other details are contained in Exhibit A. The District has received all approvals from the DOW for the Plans and Specifications and funding for these improvements. See Exhibit B.

8. Easements are not required.

9. This service will not compete with any other utility in the area.

10. The proposed construction project identified in Exhibit A is scheduled to begin

construction in upon PSC approval or December, 2016, and the expected in service date is in December, 2017. Board approval of the final bids for the project is included in Exhibit C. Bids for this project were opened on July 21, 2016 and are subject to acceptance for 120 days. Therefore, **the bids will expire on November 18, 2016.**

11. No new franchises are required. A copy of the DOW letter approving the Plans and Specifications for the proposed improvements is attached as Exhibit B. Permits from USACE and the Ft. Thomas Building Code are pending.

12. Construction descriptions are in Exhibit A and Bid Documents. Facts relied on to justify the public need are included in the project descriptions in Exhibit A.

13. Maps of the area showing location of the proposed facilities are in Exhibit A.

14. The construction costs will be funded by as described above.

15. Estimated operating costs for operation and maintenance, depreciation and debt service after construction are shown in Exhibit D.

16. A description of the facilities and operation of the system are in Exhibit A.

17. A full description of the route, location of the project, description of construction and related information is in Exhibit A.

18. The start date for construction is December, 2016 or upon PSC approval. The proposed in-service date is December, 2017. The total estimated cost of construction at completion is referenced in Exhibits A, B and D.

19. CWIP at end of test year is listed in the Annual Report incorporated by reference.

20. Plant retirements are listed in Exhibit B and the Annual Report. No salvage values are included as booked.

21. The use of the funds and need for the facilities is justified based on the engineering report included as Exhibit A

22. No rate adjustment is being proposed.

23. The following information is provided in response to 807 KAR 5:001 (8):

a. Articles of Incorporation – None. NKWD is a statutorily created water district under KRS Chapter 74;

24. The following information is supplied pursuant to 807 KAR 5:001(9):

a. Facts relied upon to show that the application is in the public interest: See Exhibit A.

25. The following information is provided as required by 807 KAR 5:001 (11):

a. A general description of the property is contained in the Annual Report,

b. No stock is to be issued; No bonds are to be issued in this case;

c. There is no refunding or refinancing;

d. The proceeds of the financing are to construct the property described in Exhibit A.

e. The par value, expenses, use of proceeds, interest rates and other information is not applicable because no bonds are being issued at this time.

26. The following exhibits are provided pursuant to 807 KAR 5:001 (11)(2):

a. There are no trust deeds. All notes, indebtedness and mortgages are included in Exhibit F.

b. Property is to be constructed is described in Exhibit A.

27. The following information is provided pursuant to 807 KAR 5:001(6):

a. No stock is authorized.

b. No stock is issued.

c. There are no stock preferences.

d. Mortgages are listed in Exhibit E.

e. Bonds are listed in Exhibit E.

f. Notes are listed in Exhibit E.

g. Other indebtedness is listed in Exhibit E.

h. No dividends have been paid.

i. Current balance sheet, income statement and debt schedule are attached

as Exhibit F.

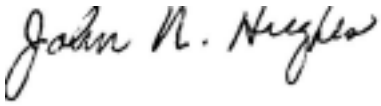
28. USoA plant accounts are included in Exhibit D.

29. Depreciation cost, cost of operation after installation and debt service are in Exhibit D.

30. The Kentucky Debt Officer has not been notified of the future BAN, but will be notified at the time the amount and issue date are determined.

For these reasons, the District requests issuance of an order granting authority to construct the facilities and for any other authorization that may be necessary.

SUBMITTED BY:



John N. Hughes
124 W. Todd St.
Frankfort, KY 40601

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Kentucky Water District
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502 227 7270 Ph.

LIST OF EXHIBITS

Section 8(1)	Full name and post office address of applicant and a reference to the particular provision of law requiring Commission approval.	Application
Section 8(2)	The original and 10 copies of the application with an additional copy for any party named therein as an interested party.	yes

Section 8(3)	If applicant is a corporation, a certified copy of the Articles of Incorporation and all amendments thereto or if the articles were filed with the PSC in a prior proceeding, a reference to the style and case number of the prior proceeding.	n/a
Section 9(2)	1. The facts relied upon to show that the proposed new construction is or will be required by public convenience or necessity.	Exhibit A
	2. Copies of franchises or permits, if any, from the proper public authority for the proposed new construction or extension, if not previously filed with the commission.	Exhibit B
	3. A full description of the proposed location, route, or routes of the new construction or extension, including a description of the manner in which same will be constructed, and also the names of all public utilities, corporations, or persons with whom the proposed new construction or extension is likely to compete.	Exhibit A
	4. Three (3) maps to suitable scale (preferably not more than two (2) miles per inch) showing the location or route of the proposed new construction or extension, as well as the location to scale of any like facilities owned by others located anywhere within the map area with adequate identification as to the ownership of such other facilities.	Exhibit A
	5. The manner, in detail, in which it is proposed to finance the new construction or extension.	Exhibits A, D
	6. An estimated cost of operation after the proposed facilities are completed.	Exhibit D
KRS 322.340	Engineering plans, specifications, plats and report for the proposed construction. The engineering documents prepared by a registered engineer, requires that they be signed, sealed, and dated by an engineer registered in Kentucky.	Exhibit A

Section 8(1)	Full name and post office address of applicant and a reference to the particular provision of law requiring Commission approval.	Application
Section 8(2)	The original and 10 copies of the application with an additional copy for any party named therein as an interested party.	yes
Section 8(3)	If applicant is a corporation, a certified copy of the Articles of Incorporation and all amendments thereto or if the articles were filed with the PSC in a prior proceeding, a reference to the style and case number of the prior proceeding.	n/a
KRS 278.300(2)	Every financing application shall be made under oath, and shall be signed and filed on behalf of the utility by its president, or by a vice president, auditor, comptroller or other executive officer having knowledge of the matters set forth and duly designated by the utility.	Application
807 KAR 5:001:		
Section 11(1)(a)	Description of applicant's property.	
	Statement of original cost of applicant's property and the cost to the applicant, if different.	Annual Rpt
Section 11(1)(b)	If stock is to be issued: and kinds to be issued.	none
	--Description of amount and kinds to be issued.	
	--If preferred stock, a description of the preferences.	none
	If Bonds or Notes or Other Indebtedness is proposed:	Exhibit E
	--Description of the amount(s)	
	--Full description of all terms	
	--Interest rates(s)	
	--Whether the debt is to be secured and if so a description of how it's secured.	
Section 11(1)(c)	Statement of how proceeds are to be used. Should show amounts for each type of use (i.e., property, debt	Exhibit A

	refunding, etc.)	
807 KAR 5:001:		
Section 11(1)(d)	If proceeds are for property acquisition, give a full description thereof. Supply any contracts.	n/a
Section 11(1)(e)	If proceeds are to refund outstanding obligations, give:	n/a
	--Par value	
	--Amount for which actually sold	
	--Expenses and application of proceeds	
	--Date of obligations	
	--Total amount	
	--Time held	
	--Interest rate	
	--Payee	
Section 11(2)(a)	Financial Exhibit (see below)	
Section 11(2)(b)	Copies of all trust deeds or mortgages. If previously filed, state case number.	Annual Rpt
Section 11(2)(c)	If Property to be acquired:	Exhibit A
	--Maps and plans of property.	
Section 11(2)(c)	--Detailed estimates by USOA account number.	Exhibit D

ALL INFORMATION BELOW IN SECTIONS 6(1) THROUGH 6(9) SHOULD COVER THE PERIOD ENDING NOT MORE THAN 90 DAYS PRIOR TO DATE ON WHICH APPLICATION WAS FILED:

807 KAR 5:001		
Section 6(1)	Amount and types of stock authorized.	None
Section 6(2)	Amount and types of stock issued and outstanding.	None
Section 6(3)	Detail of preference terms of preferred stock.	None
Section 6(4)	<u>Mortgages:</u>	Exhibit E
	--Date of Execution	
	--Name of Mortgagor	

	--Name of Mortgagee or Trustee	
	--Amount of Indebtedness Secured	
	--Sinking Fund Provisions	
Section 6(5)	Bonds	Exhibit E
	--Amount Authorized	
	--Amount Issued	
	--Name of Utility Who Issued	
	--Description of Each Class Issued	
	--Date of Issue	
	--Date of Maturity	
	--How Secured	
	--Interest Paid in Last Fiscal Year	
Section 6(6)	Notes Outstanding:	Exhibit E
	--Date of Issue	
	--Amount	
	--Maturity Date	
	--Rate of Interest	
	--In Whose Favor	
	--Interest Paid in Last Fiscal Year	
Section 6(7)	Other Indebtedness:	
	--Description of Each Class	
	--How Secured	
	--Description of Any Assumption of Indebtedness by Outside Party	

	(i.e., any transfer)	
	--Interest Paid in Last Fiscal Yr.	none
Section 6(8)	Rate and amount of dividends paid during the five (5) previous fiscal years and the amount of capital stock on which dividends were paid each year.	None
Section 6(9)	Detailed income statement and balance sheet.	Exhibits F

NORTHERN KENTUCKY
WATER DISTRICT

Case No. 2016-00303

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Ohio River Pump Station No. 2 Rehabilitation

Project 184-486

Project Description:

The Ohio River Pump Station No. 2 Rehabilitation project consists of modest rehabilitation efforts throughout the pump station. The pump station was built in 1872. The rehabilitation includes various select demolition, new windows, new static trash rack, new inlet sluice gate, new suction inlet valve, new wet well platforms, installation of new lighting, installation of new ventilation equipment, replacement of the reinforced concrete operating room floor, miscellaneous new electrical work, various new carpentry work, and the rehabilitation of the foundation walls by tuckpointing and block replacement.

The District completed a cursory evaluation of the facility as part of its Asset Management Program update in 2004 and again in 2008. The plan considered three options: building a new station, rehabilitating the existing station, and using the Ohio River Pumping Station supplying the Fort Thomas plant to also supply the Memorial Parkway plant. The costs presented in the 2008 report for each option were as follows:

- Replace with a new station - $38 million
- Use the newer Ohio River Pumping for both plants - $41 million
- Rehabilitate the existing station - $43 million

A thorough study of the pumping station was performed in 2014 by HDR Engineers to further develop the design concepts prepared in the District's 2004 and 2008 Asset Management Program reports. The intent of the study was to identify any "fatal flaws" that may exist that would prevent an option from moving forward and to develop more accurate costs for viable options. Estimated costs were prepared as follows:

- Replace with a new station - $25 million
- Use the newer Ohio River Pumping for both plants - $21 million to $31 million for four pipe alignment options consisting of:
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- Rehabilitate the existing station - $26 million

To continue providing reliable supply of water to the plant, a modest rehabilitation project was recommended to repair the deteriorated concrete floor, replace the windows, and add a slide gate to shut off flow from the river to the station.

The District solicited bids for the Ohio River Pump Station No.2 Rehabilitation on June 9, 2016 and again on June 30, 2016 and opened bids on July 21, 2016.

The recommended award amount for construction is $1,564,000.

The bids were opened July 21, 2016 and are subject to acceptance for 120 days. Therefore, the bids will expire November 18, 2016.

The estimated cost of the total project with engineering, construction, and contingencies is $2,000,000.

NORTHERN KENTUCKY WATER DISTRICT
Ohio River Pump Station No.2 Rehabilitation
184-486

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NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

ENGINEERING REPORTS AND INFORMATION

2008 Asset Management Program Update

ORPS2 Condition Assessment / MPTP Raw Water Feasibility Study

Project Map

Basis of Design Report

Engineer's Opinion of Probable Total Construction Cost

Plans prepared by Wade Trim, Inc., titled "Ohio River Pump Station No. 2 Structural Rehabilitation" dated June 2016, sealed by a P.E.

Specifications prepared by Wade Trim, Inc., titled "Ohio River Pump Station No. 2 Structural Rehabilitation" dated June 2016, sealed by a P.E.

Case No. 2016-00303
Exhibit A.1

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

2008 Asset Management Program Update

Northern Kentucky Water District
2835 Crescent Springs Rd. • PO Box 18640 • Erlanger, KY 41018-0640

2008 Asset Management Program Update

November 2011

FINAL DRAFT

Report Prepared By:

Malcolm Pirnie, Inc.

8600 Governor's Hill Drive
Suite 210
Cincinnati, OHIO 45249
513-677-8380

4775-011

GRW, Inc. | Malcolm Pirnie, The Water Division of ARCADIS | ARCADIS

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Northern Kentucky Water District

Executive Summary

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GRW, Inc.

MALCOLM PIRNIE

Executive Summary

ES.1. Purpose and Scope of Project

The Northern Kentucky Water District (NKWD) serves over 80,000 accounts in Campbell and Kenton Counties, including retail accounts and wholesale agreements. The most recent expansions of the NKWD service area included the acquisitions of the water system from the City of Newport in 2002 and the water system from the City of Taylor Mill in 2004. Recognizing the need to proactively and cost effectively manage its growing infrastructure base and sustain a high level of customer service, NKWD adopted a formal Asset Management Program in 2004, which established base-line condition assessment data for all above ground assets, provided a preliminary assessment of the overall water distribution system and resulted in a 5-year and 20-year capital improvement program.

The goal of this Asset Management Program (AMP) Update is to integrate the on-going planning for capacity and regulatory needs with an update of the 2004 Asset Management Program. This AMP Update provides a comprehensive planning document for the prioritized and coordinated implementation of all required initiatives within a phased capital improvement program. Key elements of this AMP update include the following:

- Update to the current water distribution hydraulic model including; the allocation of current and projected future water demands, storage requirements, pumping requirements and distribution piping hydraulic improvements through 2030.
- Evaluation of requirements for all three water treatment plant including; raw water intake and pumping, treatment needs and asset renewal and replacement needs.
- Evaluation of water distribution system pumping stations and storage tanks for asset renewal and replacement needs.
- Further evaluation of the water distribution system for renewal and replacement program development.
- Further development of the overall asset management "road map" focusing on condition assessment methods, asset criticality, performance measures, data management, reporting needs and O&M practices, which can guide subsequent updates.
- Review of current information technology tools and development of recommendations for the phased implementation of technology improvements to support and sustain the asset management program.

- Assessment of potential rate impacts in the development of alternatives for the minimum, moderate and aggressive 5-year and 20-year capital improvement programs.
- This AMP Update provides the final 5-yr and 20-yr capital improvement program recommendations consistent with the Northern Kentucky Water District's vision, mission and overall business objectives.

ES.2. Hydraulic Model Update and Analysis

The hydraulic model update included a full model calibration to replicate average day and maximum day demand conditions observed in 2007. The model was then used for several analyses to identify improvements for the existing system and for the planning horizons of 2020 and 2030. These analyses were conducted under average and maximum demand conditions to determine deficiencies in pumping, storage, and pipe capacity. An overall existing system storage and pumping gap analysis was also conducted.

ES.2.1. Population and Demand Projections

Key findings from this effort include the following:

- Supply to wholesale customers is not expected to increase more than 3% a year. These customers used the following amount of water in 2006:
    - City of Walton - 500,000 gpd
    - Bullock Pen Water District – 280,000 gpd
    - Pendleton County Water District – 250,000 gpd
- Population projections indicate that during the planning period through 2030, the average annual increase in population will be about 2.4%.
- Based on area planning information, the District is expected to add about 12,700 accounts through year 2020 and another 10,500 between 2020 and 2030. This number is also less than 3% a year.
- The peaking factor for average day to maximum day demand for this plan is 1.60. While average day demands heavily influence annual operating costs, the size of treatment, pumping, and storage facilities are designed to meet maximum day demand. This slight reduction in the peaking factor from the previous plan means that proposed expansions can generally be postponed for several years.
- Total demand increases about 2% a year.
- Existing treatment capacity is sufficient to meet 2020 demands.

The projected average day and maximum day demands are presented in the table below:

Demand Projections		
Year	**Average Day, MGD**	**Maximum Day, MGD**
2006	28.58	43.15
2010	30.86	48.57
2020	36.59	57.74
2030	41.44	65.50

ES.2.2. Treatment Capacity Expansion

An expansion of Memorial Parkway Treatment Plant to at least 15 MGD (up to 20 MGD) is recommended prior to year 2030. The expansion to Memorial Parkway Treatment Plant will include the addition of another ACTIFLO® train and gravity thickener, and replacement of an existing pump with a larger pump at the Reservoir Pump Station plus replacement of the Reservoir Pump Station discharge line with a 24 inch main. The chemical feed pumps would need to be upgraded to feed additional chemical. One 10 MGD pump would also be added to Ohio River Pump Station No. 2.

ES.2.3. Pumping and Storage Analysis

Key findings from this effort include the following:

- All pump stations have sufficient capacity to meet existing demand requirements. The Ripple Creek Pump Station serving southern Campbell County will not be capable of supplying 2020 demand projections and beyond.
- The combined volume from the Rossford and Lumley Tanks serving the 1017 pressure zone north of the Fort Thomas Treatment Plant are currently undersized to provide storage for meeting recommended volumes for consumption, emergency and fire flows, and equalization. These tanks are filled from the US 27 Pump Station (takes water from Fort Thomas Treatment Plant) and Waterworks Road Pump Station (takes water from Memorial Parkway Treatment Plant). Because of the dual plant supply and the fact that the US 27 Pump Station has a backup power generator, the gap in recommended storage volume is not alarming.
- There is currently a storage gap in the 1080 areas in southern Kenton County that are served by the Industrial, Independence, and Devon Tanks. Having a backup power generator to reliably supply water from Dudley 1080 Pump Station that draws water from the 10 million gallon Dudley Tanks greatly mitigates any immediate concern.
- In addition to the areas discussed above where the present gap increases with added customer demand, the Southern Campbell County area will also have a storage shortfall in year 2020 and beyond.

- The pumps at Bristow Road, Richardson Road, and West Covington Pump Stations do not operate at their best efficiency points. The pumps may have been selected to meet higher demand conditions or improvements to the system piping may have resulted in lower head conditions. This means that a different pump could use less power than the current pumps. The District should consider replacing these pumps with pumps that are better suited to the system conditions when the pumps have reached the end of their useful life or when power savings are sufficient to justify the cost of a new pump.
- The 1010 pressure zone supplied by regulators fed from the 1040 and 1080 pressure zones shows a number of areas where pressures can fall below 35 psi. Until recommended improvements are made, the District should closely monitor the pressure regulator settings and water level in the Taylor Mill Standpipe to help address this condition.

ES.2.4. Recommended Hydraulic Improvements

Recommendations to the existing system to meet projected demands and address existing or future hydraulic concerns include:

Storage Tanks:

- Replace the existing Rossford and Lumley with increased storage volume totaling 1 million gallons. The District will need to decide if one larger tank at the Rossford Tank site or two separate tanks at the existing sites will be maintained. Having two tanks in each pressure zone is helpful and sometimes required for redundancy, particularly when a tank needs to be taken out of service for maintenance. The District should be able to construct a new tank adjacent to the existing Rossford Tank. The Lumley location, however, poses challenges because the property was formerly used as a dump site and is presently used for parking by the City of Ft. Thomas.
- Build a new 1 million gallon tank east of Independence between 2015 and 2020. As this area is already quite developed, the District should consider locating and securing property for this tank around Stephens Road and Taylor Mill Road.
- Build a new 1 million gallon tank in Southern Campbell County between 2015 and 2020. The District should consider locating and securing property for this tank in the vicinity of AA Highway and Lick Hill. The Main Street Tank may be retired for water quality reasons when this new tank is in place.
- Between 2015 and 2020, retire the Taylor Mill Standpipe and convert the 1010 Taylor Mill area to 1040 pressure zone. The District should consider locating and securing property for this tank in the vicinity of the existing standpipe.
- Build a new 1 million gallon tank in Southern Kenton County near Walton between 2025 and 2030.

Pumping Stations:

- Add flow meters for each individual pump at all new pump stations.
- Replace Richardson Road Pump Station with a larger station along KY 17 between 2015 and 2020. The Hands Pike Pump Station could be retired at the same time, although redundancy is desirable in emergencies. The District should identify potential locations for this station and consider procuring the site should the opportunity arise.
- Add variable frequency drives to the pumps at US 27 Pump Station between 2015 and 2020.
- Replace the Ripple Creek Pump Station with a larger station between 2015 and 2020. The existing site may be larger enough to accommodate a new station, but the District should review the site and determine if additional property should be secured.
- Add VFDs at the Dudley 1080 and 1040 Pump Stations and two of the pumps at US 27 Pump Station.
- Between 2025 and 2030, build a new pump station from downtown Newport to downtown Covington for a merged 741 and 763 pressure zone that can be supplied by both Fort Thomas and Memorial Parkway Treatment Plants.

Piping Improvements:

- Add flow meters to the gravity discharge mains from Fort Thomas and Memorial Parkway Treatment Plants.
- By 2020, build a 24 inch pipe upstream and downstream of the existing Richardson Road Pump Station and proposed KY 17 Pump Station along Madison Pike to the new tank east of Independence.
- Build additional piping capacity upstream and downstream of the Ripple Creek Pump Station by 2020.
- Construct piping along AA Highway from Highway 547 and California Cross Roads to the new tank in Southern Campbell County by 2020.
- Between 2025 and 2030, build three miles of 24 inch main and two miles of 16 inch main to serve the South County and Claryville Tanks in Southern Campbell County.

ES.3. Asset Management

The renewal and replacement (R&R) of assets based on the condition and criticality of the asset was the focus of this effort. Approximately 1,600 above-ground assets were assigned to a priority grouping for planning based on their score. Group 1 and 2 assets

are the highest priority and were considered for inclusion within a 5-year period. Groups 3 and 4 are lower priority and were placed in the 20-year period. Groups 5 are lowest priority and were not included in the 20-year planning horizon. For the above-ground assets, approximately 60% are located at treatment plants, 20% are tanks, and 20% are pump stations.

ES.3.1. Condition Assessment for Existing Assets

Key findings of the condition assessment and asset evaluation are summarized below:

Above-Ground Assets

- The majority of assets are in good or very good condition.
- Assets should be replaced on the following schedule:
    - 10% fall within 3 to 5 years (it should be noted that the new chemical building and filter improvements at Memorial Parkway Treatment Plant has since addressed most of these items).
    - 15% fall within 6 to 10 years.
    - 30% fall within 10 to 20 years.
    - 40% fall beyond 20 years.
- Larger projects were identified as specific projects for the 5-year capital improvement projects through year 2030.
- An annual R&R fund was established to address a number of smaller projects each year.

Below-Ground Assets

- The American Water Works Association recommends a pipe break/leak rate of no more than 30 per 100 miles per year.
    - The District averaged 42 breaks/leaks per 100 miles per year for 2003 to 2007. The District is also above the median rate of 33 breaks/leaks per 100 miles per year by a national survey of utilities;
    - Approximately 50% of the distribution system piping meets this rate. The most reliable materials include PVC, ductile iron wrapped with polyethylene, and polyethylene pipe.
    - Approximately 50% of the distribution system piping does not meet this rate. The most failures occurred in cast iron and unwrapped ductile iron followed by asbestos cement and concrete.
- Achieving 30 breaks/leaks per 100 miles per year is estimated to require an expenditure of $76.8 million by targeting 120 miles of main having the highest breaks.

ES.3.2. Recommended R&R Improvements for Existing Assets

A list of the major facilities and recommendations for doing capital improvements to address aging infrastructure through the 5-year budget or the Annual R&R budget are listed below:

Raw Water Supply:

- Ohio River Pump Station No. 1 – address small items through Annual R&R Fund including adding a potable water line for lubrication of pumps, chemical make-up water, equipment washdown, and restroom use; and adding an air handling unit to cool the electrical equipment room.
- Ohio River Pump Station No. 2 – replace the entire station in 2015.
- Licking River Pump Station – add generator and miscellaneous improvements by 2015, and add a dewatering pump for the wetwell.

Treatment Plants:

- SCADA and Security – replace all plant and distribution system SCADA and security systems.
- Building, Mechanical, and Electrical Systems – replace general facility and system needs through the Annual R&R. Building items may include masonry tuck pointing, replacement of roofs and flashing, patching and painting walls, and replacement of tile/skylights/doors/windows. Site items may include driveways and walkways, fencing, and storm water drainage. Mechanical systems may include plumbing, fire protection, air handling and cooling, heating, and dehumidification. Electrical may include analytical instruments, security systems, and power distribution inside the plant.
- Fort Thomas:
    - Replace and upgrade residuals handling system (pumps, belt conveyors, presses, polymer feed, add third bay to dumpster area, upgrade HVAC, add two flow equalization tanks ahead of presses, upsize recycle line and incoming settled water line, and add a plate settler housed in a building to remove solids prior to returning to the reservoir or allowing discharge under a KPDES permit);
    - Renovate by replacing media and installing air scour backwash (note this was completed in 2011) and repair walls;
    - Replace filter backwash tank (may not be needed after installation of new backwash pumps as part of Advanced Treatment);
    - Repair deteriorating concrete walls in flocculation/sedimentation basins (No. 2 and No. 3) and upgrade to 3-stage flocculation.
    - Install an emergency generator for the laboratory;
    - Replace the raw water line to the South reservoir with a new 36" pipe;

- Replace filter valves and actuators;
- Rehabilitate or replace chemical feed systems;
- Upgrade HVAC in sludge pump room;
- Relocate copper sulfate feed system closer to feed point to minimize clogging (first investigate quality of chemical to see if performance could be enhanced by different product);
- Replace nine 30" raw water valves in the yard piping;
- Replace valves on outlet side of clearwell with SCADA controlled, electrically actuated valves to prevent large loss of water in an emergency;
- Replace fan in fluoride room with a larger unit to increase air changes and reduce corrosion (or add another fan);
- Replace laboratory equipment;
- Replace electrical components as indicated by evaluation.

- Memorial Parkway:
  - Replace suction and discharge piping for Reservoir Pump Station;
  - Remove solids from North and South Reservoirs by dredging (equipment purchase would be capitalized, but contractor services or in-house labor would be an O&M expense);
  - Upgrade residuals handling system by adding a gravity thickener, replacing 3 sludge pumps with positive displacement pumps, modify truck loading area roof height for dumpster, and modifications to holding tank and electrical improvements;
  - Rehabilitate or replace chemical feed systems;
  - Rehabilitate or replace the 24" raw water piping located in the tunnel below the old Chemical Building area;
  - Replace raw and finished water valves in yard piping;
  - Demolish or renovate old Chemical Building;
  - Replace actuators on Filters 4, 5, and 6 (note this is part of the Advanced Treatment project);
  - Replace electrical components as indicated by evaluation.

- Taylor Mill:
  - Replace filter control system (includes panels and programmable logic control);
  - Replace rapid mixing, flocculation basins, and sedimentation basins;
  - Replace sludge conveyor and belt filter press and make repairs to dumpster room;
  - Rehabilitate or replace chemical feed systems;
  - Replace electrical components as indicated by evaluation.

Pump Stations:

- Replace valves and actuators in Taylor Mill PS;
- Replace up to 4 pumps in Dudley 1040 PS;

- Replace all 6 pumps in Taylor Mill PS (4 pumps in first phase and 2 pumps in second phase);
- Replace all 3 pumps at Bromley PS, chlorine feed system (if still needed for maintaining residual), valves, actuators, and various electrical and security improvements;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Dudley 1040 PS;
- Replace pumps, motors, motor control centers, and electrical upgrades at Carothers Road PS;
- Replace pumps and install new VFDs at Bristow Road PS;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Dudley 1080 PS;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Latonia PS (if not retired with Ida Spence Tank);
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Waterworks Road PS and add an emergency generator;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at US 27 PS.

Tanks:

- Inspection – a schedule for conducting maintenance inspections after coating a tank was developed which includes a 5-year and 10-year post coating inspection. The 10-year inspection will be more detailed and will indicate whether a renovation or re-painting project needed, typically within 5 to 10 years following the 10-year inspection.
- Install isolation valves on Dudley Tanks to keep the tanks from rapid water loss that could occur from a large water main break;
- Replace Bellevue Tank (or rehabilitate if suitable);
- Replace Dayton Tank (or rehabilitate if suitable);
- Replace Lumley Tank (or retire with addition of larger Rossford Tank);
- Replace Ida Spence Tank (or retire it and Latonia PS and serve from 1040 system);
- Replace Kenton Lands Tank.

ES.3.3. Recommendations for Asset Management Program

It is recommended the District incorporate into its asset management program the recommendations provided below:

Program:

- Develop a modified hierarchy of assets in accordance with the format outlined in this report.
- Use the same asset ID for work order system, financial system, and asset management system.
- Considering the magnitude of upcoming capital program for adding advanced treatment and the need to address water main R&R, a minimal staffing review is recommended particularly considering the record high number of overtime hours reported in 2007.
- Review performance using the following eight performance measures:
    1. Service and Reliability
        - Total Water Main Breaks/Leaks
        - Total Water Quality Complaints
        - Low Water Pressure Events
    2. Regulatory Compliance
        - Total Water Quality Incidents/Failure of Safe Drinking Water Act Standards (Primary and Secondary)
    3. Financial and Business Operations
        - Total Percent of Non-Revenue Water
        - O&M Cost Ratio (O&M cost per account and per MGD processed)
    4. Operations and Maintenance
        - Planned Maintenance Ratio (scheduled vs. unscheduled) for Distribution, Pump Stations, and Plants
        - Total Miles of Water Mains Flushed (planned to actual and percent of system per year)

Above-Ground Assets:

- Develop a comprehensive condition assessment data collection form for specific types of assets and link to the work order system;
- Add the following fields to the Antero database and populate with available information and update by periodic inspections:
    - installed date;
    - installed cost;
    - estimated remaining useful life;
    - replacement cost;
    - criticality;
    - physical condition;
    - performance condition;

- For the performance condition rating (i.e. how well is the asset doing its job) need to assess its ability to:
    - Meet capacity;
    - Comply with regulations;
    - Perform reliably without breakdown;
    - Run without abnormal maintenance;
    - Find repair parts;
- Consider a separate work order type for all predictive maintenance types (e.g. similar to PUMPVIB task for pump vibration monitoring) which will allow tracking time spent on each asset;
- Prepare reports to:
    - Track corrective maintenance identified and completed as a result of scheduled preventative maintenance;
    - Review asset condition versus effective useful life by criticality (prioritize assets in worst condition that are beyond their expected life and are also a critical asset);
    - Determine maintenance cost per asset replacement value;
    - Identify mean time between asset failures;
- Review updates to new releases of the Antero and Operator 10 software from AllMAX;
- Consider upgrades to Operator 10 that will allow operator log sheets to be managed in the software instead of Excel;
- Integrate SCADA with Antero to automate comparison of equipment run-time recorded in SCADA with vibration analyses delivered from hand-held units;
- Add an electronic link to Antero to notify user that a Standard Operating Guideline exists for a particular task.

Below-Ground Assets:

- Review records and add information where it may be missing for installed date, material type, and lining;
- Consider implementing cathodic protection for new and to retrofit existing pipe and consult with a corrosion engineer to develop guidance;
- Establish internal improvement goals with the next AMP update based on recommended benchmarks and budget constraints;
- Focus R&R program on most unreliable cast iron pipe while also performing strategic replacement (or rehabilitation) of unwrapped ductile iron;
- Correct inconsistencies in pipe identification and numbering in work orders;

- Develop a Standard Operating Guideline for capturing information from mapping and updating GIS, and require as-built information from contractors and electronic record drawings from engineers;
- Consider implementing a leak detection program and utilize data to prioritize water main R&R program;
- Consider implementing a valve exercising program on a limited basis, subject to resource availability, to focus on the most reliable mains which will not be targeted for replacement.

ES.3.4. Recommendations for Additional Studies

It is recommended the District perform the following studies as part of its O&M budget:

- Electrical Systems Evaluation - evaluate power distribution systems at all 3 treatment plants as an electrical failure inside the plant would be crippling to the treatment and supply process.
- Surge Analysis – conduct a computer model surge analysis for ORPS1 to verify that the existing surge relief valve will perform as intended following a power failure. If the analysis indicates a problem, the surge valve should be converted from a pressure relief design to a surge relief design. It is also recommended that sediment protection features be added to the surge valve to help prevent possible clogging from silt.
- Pipe Corrosion Soils Analysis – implement a program to perform corrosion testing at water main break locations or other areas of concern to develop information to support on-going analysis and project prioritization. Monitoring of newly installed cathodic protection systems is also needed. The District should consult with a corrosion specialist to develop a program.
- Plant Capacity Analysis – conduct a comprehensive analysis of the treatment plants to identify hydraulic bottlenecks that may restrict plant capacity and to determine the true capacity as compared to the rated capacity. One area of concern is the filter influent flume at Fort Thomas Treatment Plant. This information will be critical for timing the expansion of MPTP.
- ORPS2 Structural Analysis – conduct a structural analysis of the building foundation, flooring, and walls. Numerous structural and destructive testing are recommended to be preformed to accurately assess the condition of the existing superstructure. The pump station's concrete and brick have significantly deteriorated over the years and any rehabilitation would be challenging and unpredictable.

ES.4. IT Master Plan

Information systems and access to key data contained in the systems play a key role in supporting the successful implementation of an Asset Management Program. The District's key IT systems related to management of assets include:

- Geographic Information System (GIS)
- Work Order System
- Customer Information System (CIS)
- Laboratory Information Management System (LIMS)
- Supervisory Control and Data Acquisition (SCADA)
- Financial Information System (FIS)

ES.4.1. Information Systems Assessment

The key findings and recommendations of information systems is summarized below:

- Use a phased approach to implement improvements in core business processes and integration of systems;
- Convert GIS to a "geodatabase" structure;
- Continue to improve reliability and speed of data network communications between facilities;
- Continue to use GBA for below-ground assets and Antero for above-ground assets in the near term, but consider migrating to one system long term;
- Implement a service request and tracking system to schedule work by IT staff;
- Identify opportunities for outsourcing IT services by issuing a solicitation for IT services by gauging the local availability and cost of services;
- Add integration of GIS, work order systems, and SCADA to improve key business processes and support the asset management program;
- Reconcile inventory control by standardizing on one method to eliminate disparity between CIS, FIS, and work order system;
- Add integration of CIS and LIMS to consolidate billing and to streamline customer inquiries;
- Long-term, through a major systems evaluation and consolidation/integration of systems, implement of a Data Management/Reporting services system or a Business Intelligence system to leverage operational data for strategic purposes.

ES.5. Funding Strategy

ES.5.1. Development of Strategy

The Asset Management Program is intended to be a comprehensive source of guidance for the District in the planning and implementation of various programs and improvements to properly respond to customers' needs, changing regulatory requirements, and aging infrastructure systems. These competing areas of needs must be satisfied and accomplished while continuing to operate the utility in a sound fiscal manner that maximizes the return for the money spent and minimizes the resulting rate impacts on the customers.

The primary guide for plotting the District's course is the 5-Year Capital Improvement Plan (CIP) which outlines significant projects that should be implemented and the timeline for their accomplishment. The current CIP includes projects to address needs identified through year 2030. It is important to understand that the implementation of projects constantly evolves depending on numerous drivers such as regulatory changes, customer viewpoints, rate making strategy, resources to implement projects, and actual water consumption. The conclusions and recommendations that are part of this report should be reviewed at regular intervals to ensure that they keep pace with the latest trends.

ES.5.2. Scenarios

With the first Asset Management Program report, the District developed and has since effectively used an approach for analyzing the potential impact on rates. This approach considers three scenarios for implementing the recommended improvements: Aggressive, Minimal, and Moderate.

> Aggressive – In this scenario all projects are built at the ideal time, if economic constraints did not exist.
>
> Minimal – This scenario would meet system demand and regulatory requirements but would not include system reliability and other items important to consumer confidence and customer care because it provides limited rehabilitation and replacement funding even though this ignores deterioration of the infrastructure. It also removes funding for extending water service to new customers.
>
> Moderate – This scenario is intended to balance needs with practical financial limitations that exit. Timing of projects is important to maintain a desirable level of customer service.

The estimated total costs for these scenarios for 5-Year CIP projects between 2009 and 2030 are as follows:

Minimal	$382,424,000
Moderate	$567,318,000
Aggressive	$737,978,000

The Moderate approach results in a cost reduction of 23% over the Aggressive approach, while the Minimal approach would result in a reduction of 48% over the Aggressive approach.

The proposed cost reductions for the Minimal approach would be as follows:

- Delete the "Annual Water Main Replacement" projects from 2009 through 2030 for a total reduction of $126,850,000. We would continue with the program for "Coordinated Water Main Replacement" that sets aside monies for coordinating projects with cities at $2,500,000 a year.
- Delete "Annual Mains into Unserved Areas" for $250,000 each year for a total reduction of $5,500,000.
- Eliminate back-up power generators at Carothers Road Pump Station, Licking River Pump Station, and FTTP Laboratory for a reduction of $4,724,000.
- Cancel projects for upgrading systems and improving technology for SCADA and IT for a total reduction of $11,395,000.
- Eliminate ten water transmission system redundancy projects for a total reduction of $17,098,000.
- Defer tank replacement of aging tanks by rehabilitating instead of replacing Bellevue, Dayton, Lumley, Taylor Mill, Ida Spence and Kenton Lands for a total reduction of $10,722,000.
- Cancel or defer 7 projects to improve hydraulics or system operations for a total reduction of $4,107,000.

The total reductions would be $180 million over the Moderate approach. Deferring or canceling projects is a difficult decision that must be weighed against many factors. It is anticipated the District will carefully consider their options as part of the annual budgeting and rate making process.

The $170 million differences in cost between the Moderate and Aggressive approach are attributed to:

- Increasing funding for "Annual Mains into Unserved Areas" for a total of $27,500,000 through 2030. The funding for unserved areas would be increased from $250,000 to $1,500,000 each year.
- Increasing "Coordinated Main Replacement by a total of $143,150,000. The accelerated funding for main replacement would bring the budget to the full amount proposed in this plan.

ES.5.3. Summary of Costs

The total costs by year for the 5-Year CIP and the annual O&M costs are presented in the table below for the planning period.

Yearly Costs for Projects and O&M				
Year	5-Year CIP, Million Dollars			O&M, Million Dollars
	Minimal	Moderate	Aggressive	
2009	$15.47	$22.17	$26.32	$23.43
2010	$23.08	$29.50	$33.25	$23.45
2011	$26.08	$30.51	$34.26	$23.47
2012	$45.73	$53.16	$57.41	$23.63
2013	$17.30	$28.69	$33.44	$26.55
2014	$12.92	$22.60	$27.85	$27.80
2015	$22.40	$38.12	$42.87	$27.99
2016	$21.39	$27.69	$32.69	$28.34
2017	$21.58	$28.63	$33.88	$28.34
2018	$11.35	$21.05	$26.55	$28.50
2019	$26.30	$38.05	$43.80	$28.68
2020	$5.88	$16.85	$23.11	$28.85
2021	$6.17	$12.92	$20.17	$29.04
2022	$20.26	$27.01	$35.26	$29.22
2023	$9.59	$16.34	$25.59	$29.42
2024	$4.32	$11.07	$21.32	$29.68
2025	$12.65	$19.40	$30.65	$29.83
2026	$6.88	$13.88	$25.88	$30.04
2027	$10.50	$17.75	$30.50	$30.26
2028	$25.64	$33.39	$46.64	$30.49
2029	$29.78	$38.03	$51.78	$30.72
2030	$7.16	$20.51	$34.76	$30.96
Total	**$382.42**	**$567.32**	**$737.98**	-

ES.5.4. Financial Analysis

A major component of any Asset Management Program and CIP program is the financial impact on the District and its rate payers. Rate payers continue to signal a disdain for any rate increase in the new economy post the 2008 "Financial Meltdown". Projects require obtaining funds, which in turn may result in a rate increase to provide revenue to sufficiently service the debt. The political climate continues to perpetuate the belief that utilities should continue to operate and provide services without raising rates and in many cases to lower rates through efficiency. This is the challenging climate in which the

District must address the multiple issues of aging infrastructure, increased uncontrollable operating costs, and unfunded regulatory mandates.

The climate has drastically redefined what is meant by "customer rate shock" to include almost any rate increase. As a result, it will be incumbent on the District to analyze and prioritize any project to demonstrate the need and potential return each project will provide. The following sections attempt to evaluate the financial impact of CIP scenarios knowing that the longer the projection horizon the more difficult to forecast the outcomes in a climate of such uncertainty.

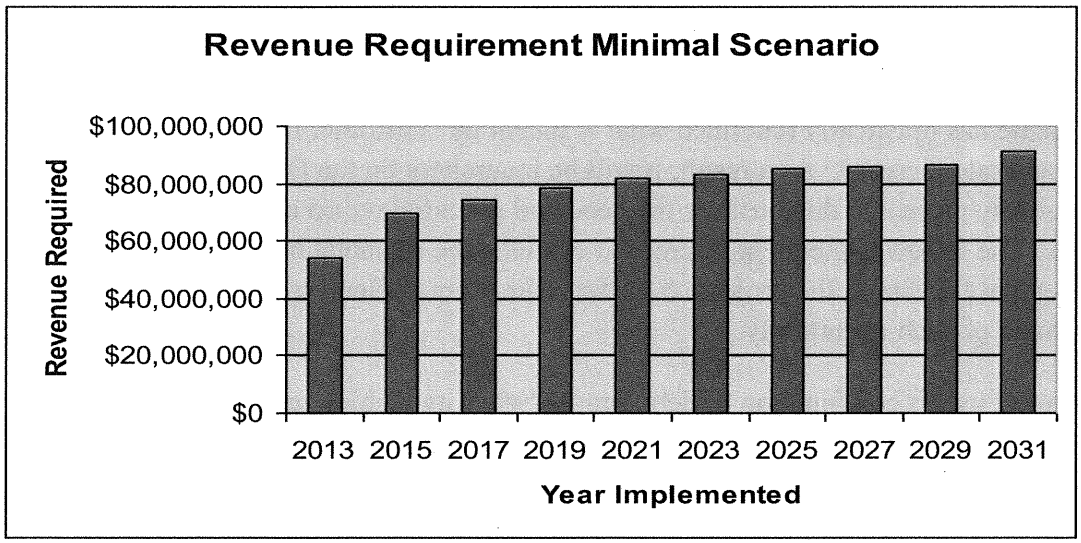
The District uses a combination of debt, grants (when available), and cash from the Internal Repair and Replacement (IRR) budget to finance major necessary capital improvements. Debt instruments include open-market revenue bonds, Kentucky Infrastructure Authority low interest loans, and Bond Anticipation Notes (BANs). The regulatory process conducted by the Kentucky Public Service Commission (PSC) requires approval before long-term debt may be issued and is part of a rate case. The following assumptions apply for projects requiring the issuance of long term debt:

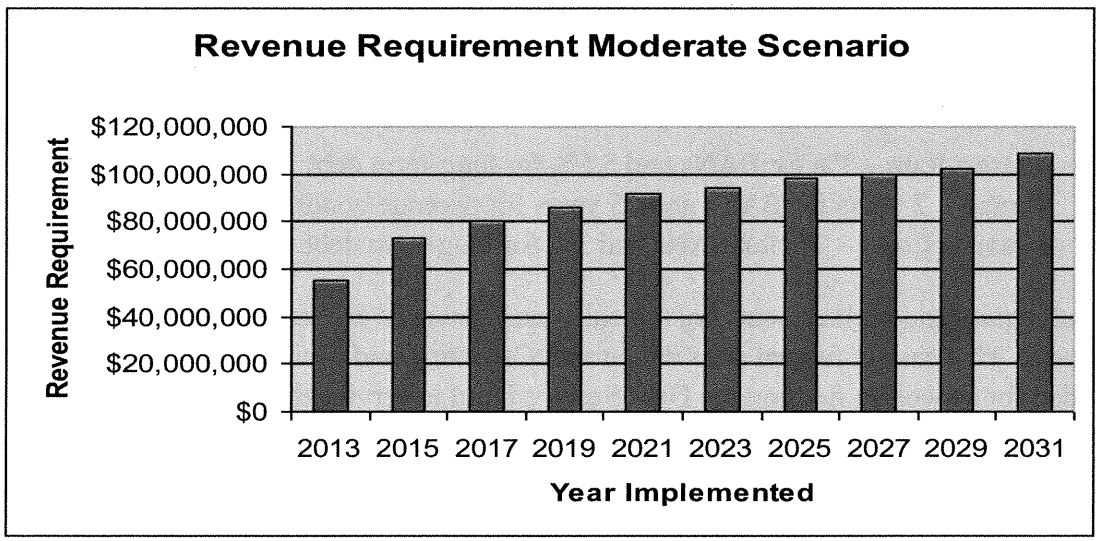
Interest Rate – 3% for BANs and 5.5% for long-term debt
Tenure – 2 years for BANs and 25 years for revenue bonds
Issuance Costs – 2% for BANs and 3% for long-term debt

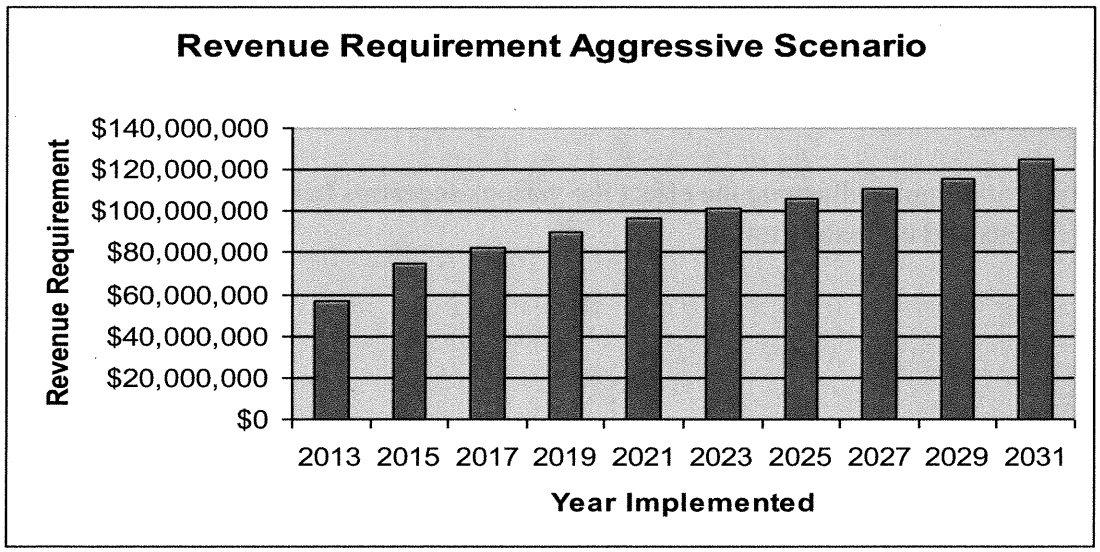
Annual repairs and replacements are typically cash financed and are satisfied from the IRR cash. This cash is funded after the normal Operating and Maintenance expenses are provided for as well as funding the Debt Service Fund to service the long term debt payments and maintaining adequate cash balances.

In general, the District files approximately every two years for rate adjustments to provide for Operation and Maintenance Expense increases, service additional long term debt acquired by paying off BANS, and changes in depreciation as a result of adding infrastructure. Revenue adjustments are effective in the analysis for 9 months of the year implemented.

The following figures illustrate the effect the various scenarios have on revenue requirements and ultimately rates.


Revenue Requirement Minimal Scenario
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Required
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented


Revenue Requirement Moderate Scenario
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Requirement
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented


Revenue Requirement Aggressive Scenario
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Requirement
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented

ES.5.5. Financial Summary

Reviewing the results of the analysis highlights several key issues as the District moves forward into an uncertain future. The Operational and Maintenance cost increase with the introduction of the Granular Activated Carbon process and the resulting replacement of spent carbon, is illustrated in the large revenue requirement increase in all the scenarios when the 2014 rate case results are implemented in 2015. As would be expected, the intensity of capital projects and the resulting debt service is the primary difference in the revenue requirements projected in each of the scenarios. At the beginning of the analysis period and subsequent to the 2010 rate case, the average monthly residential bill based on 6,000 gallons of consumption was $40.99. At the conclusion of the analysis period, the average monthly residential bills in year 2031 for each of the scenarios are as follows:

Minimal Scenario	$76.99
Moderate Scenario	$91.67
Aggressive Scenario	$105.21

The average yearly increase is 3.85% for Minimal, 6.18% for Moderate, and 7.83% for Aggressive. The actual yearly increases will vary based on the particular projects being implemented and other cost factors prevailing at the time. While it is certain the District will not implement the Aggressive scenario, it is prudent for the District as a viable service provider to implement projects listed in the Minimal scenario. The District will continually scrutinize O&M costs to dampen the impacts of implementing necessary capital projects.

The takeaways from this analysis are that many of the factors considered are unknown and highly volatile. The time frame alone in this time of drastic change and uncertainty makes it very difficult to project with any sense of reality and accuracy. Projecting what exactly will be needed and the cost to construct and implement are educated estimates at best. The current economic conditions we now face are in many ways new territory that we have little precedent to guide us into the future. The ability and desire of the rate payers to absorb higher bills to support the efforts necessary to address the increasing operation and maintenance expense, the aging infrastructure, and unfunded mandates is tenuous at this time with limited prospects to improve in the future.

In this environment, the District must keep in mind methods of operating to best represent the needs of all the stakeholders while keeping its focus on the primary mission of providing a safe water supply to meet the needs of the customer base. The District must move ahead with caution and use the rate payers' resources to the best of its abilities to provide the most basic of resources and to assure the vitality of our community.

Northern Kentucky Water District

IV. Identified Needs and Improvements

4775-011

GRW, Inc.

MALCOLM PIRNIE

4. Identified Needs and Improvements

4.1. Large Capital Projects in 5-Yr CIP

The results of the asset renewal and replacement planning were combined with evaluations of alternatives to meet the District's needs in areas of increased capacity and regulatory compliance. Areas of focus for this AMP Update included:

- Raw Water Supply
- Water Treatment Plants
- Pumping Stations and Storage Tanks
- Other (including laboratory equipment)

4.1.1. Raw Water Supply Evaluation

4.1.1.1. Ohio River Pump Station No. 2

In the 2004 Asset Management Plan, NKWD identified the Ohio River Pump Station No. 2 (ORPS2) as one of the Districts' assets that was most critically in need of improvements. The 100 plus year old pump station delivers raw water to the Memorial Parkway Water Treatment Plant (MPTP). Currently, ORPS2 contains three 10 MGD pumps with one of the three being inoperable. The remaining two pumps are able to provide the necessary 10 MGD firm capacity of raw water necessary at the MPTP. To accommodate their expanding service population over the foreseeable future, NKWD has decided to upgrade the capacity at the MPTP to 15-20 MGD at some point during the duration of this planning period. The timing of this improvement depends on available treatment plant capacity pending detailed hydraulic analyses. In order to meet that increased raw water demand and address the identified physical condition of the pump station, NKWD has several alternatives to satisfy these necessary improvements. This analysis will evaluate the raw water pumping alternatives and provide preliminary capital cost estimates associated with each alternative to assist NKWD in the critical task of improving their raw water intake asset in ORPS2.

The first alternative available to the District (Alternative A) would be a complete rehabilitation and upgrade of the existing ORPS2. The renovated pump station would house two 12 MGD pumps to meet off-peak pumping capacity needs and a third 12 MGD pump would be added giving ORPS2 a future firm pumping capacity of 24 MGD. The pump station's concrete and brick have significantly deteriorated over the years and rehabilitation would be challenging and unpredictable. Numerous amounts of structural

and destructive testing would have to be performed to accurately assess the condition of the existing superstructure. It is also not conceivable to assume the continued operation of this facility during the rehabilitation process. It is very possible that ORPS2 could be out of service for almost two years during construction. Because of the building's being listed as a historical site by the AWWA, any rehabilitation and upgrade efforts must retain the historical integrity of the structure. This alternative would result in larger design fees and disclaimers associated with the unpredictability and dangers present with the task of renovating a 100 plus year old facility. Further, by providing this summary of probable costs, Malcolm Pirnie and GRW are in no way conclusively stating that a rehabilitation of this facility can actually be accomplished.

Table 4-1.
Probable Costs for Alternative A - Rehabilitate and Upgrade Existing ORPS2

Item	Cost
Structural renovation (floors, walls, roof, etc.)	$10,800,000
Protective Cofferdams in River	$1,600,000
Equipment (HVAC, electrical, etc.)	$1,800,000
Misc. Improvements (bar screens, stairs, etc.)	$2,900,000
Three 12 MGD Pumps	$2,450,000
Back-up Generator	$1,700,000
24" DIP from PS to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Design and Fees (40%)	$10,100,000
Subtotal	**$35,350,000**
Contingency (40%)	$14,150,000
Total	**$49,500,000**

The second alternative available to the District (Alternative B) would be to retire the existing ORPS2 and replace it with a new 24 MGD intake structure and pumping facility. The new pump station would also house three 12 MGD pumps giving the ORPS2 a firm pumping capacity of 24 MGD. A large percentage of the cost for this alternative would be in the rock excavation for the superstructure, the building of coffer dams, and the pumping equipment itself. This alternative would provide NKWD a new, reliable source of raw water in comparison to what is currently available. Since there is no retrofitting to an existing facility, this alternative provides minimal effect on current operations during construction. This alternative also provides more flexibility in design and offers a greater accuracy in estimating construction costs.

Table 4-2.
Probable Costs for Alternative B - Replace ORPS2 with a New Intake & Pumping Facility

Item	Cost
Raw Water Intake Structure and Equipment	$22,400,000
Electrical Services Updates	$500,000
Back-up Generator	$1,700,000
24" DIP from PS to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Design and Fees (25%)	$7,150,000
Subtotal	**$35,750,000**
Contingency (25%)	$8,900,000
Total	**$44,650,000**

The third alternative available to the District (Alternative C) would be to retire the existing ORPS2 and supply MPTP from the existing Ohio River Pump Station No. 1 (ORPS1). Currently, ORPS1 is nominally sized for six 12 MGD pumps and supplies the District's Fort Thomas Water Treatment Plant (FTTP). The FTTP has a rated capacity of 44 MGD and the firm capacity of ORPS1 is 60 MGD. Due to site constraints, a future expansion of the FTTP has not been considered. If ORPS1 is also to supply MPTP with the future treatment capacity of 15-20 MGD, then an upgrade and possible expansion of ORPS1 would be necessary to circumvent any redundancy and reliability issues. The first option considered was to upgrade the size of the existing pumps at ORPS1 therefore raising the firm capacity at the pump station to supply raw water to both treatment plants. As it currently stands, the weight of each existing pump meets or narrowly exceeds the floor loading design capacity of the pump foundation at ORPS1. Therefore, due to floor loading issues, it is not feasible to just upgrade the size of the pumps currently in ORPS1 without considering methods to increase the floor loading capacity and pipe gallery modifications. This option was not further considered due to the assumption that it is not feasible to remove ORPS1 from service to accomplish the structural and piping modifications. The second option would be to build an addition onto the current ORPS1 structure that could house three 10 MGD pumps giving ORPS1 an additional 20 MGD of firm capacity. This would provide NKWD with the capacity and reliability to now provide MPTP with raw water from ORPS1. In addition to the upgrades at ORPS1, a transmission main would need to be constructed to supply MPTP with raw water from ORPS1. This option is the basis for the costs presented below in Table 4-3. This alternative will no longer provide the District with the redundancy of having two separate raw water intake pumping sources and would require significant hydraulic modeling to ensure proper pumping operations.

Table 4-3.
Probable Costs for Alternative C - Retire ORPS2 and Supply MPWTP from Existing ORPS1

Item	Cost
Pumping Station Structure Upgrades	$17,250,000
Three 10 MGD Pumps	$1,950,000
Changes to ORPS1 Gallery Piping	$1,150,000
24" DIP from ORPS1 to ORPS2	$2,700,000
24" DIP from ORPS2 to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Additional Back-up Generator	$1,700,000
Electrical Services Updates	$500,000
Design and Fees (25%)	$7,300,000
Subtotal	**$36,550,000**
Contingency (30%)	$11,000,000
Total	**$47,550,000**

All estimates do not include any costs associated with easement or land acquisition. The costs for Alternatives B and C are similar, but Alternative B is being recommended because it provides more redundancy and less disruption to operations at ORPS1. However, additional detailed evaluation would needed to verify costs for these options.

4.1.1.2. Licking River Pump Station

The following level of service improvements were identified during a site visit to the Licking River Pump Station and are included in the 5-year CIP as 09-05.

- **Improvements to the Building Superstructure -** A large number of structural deficiencies that were identified in the 2004 AMP have been addressed. A number of small cracks were still visible in the concrete and brick on both the interior and exterior of the building. The current condition of the roof is unsatisfactory and operations staff indicated there is no efficient method to remove and service the station's pumps. Current openings in the roof to pull pumps are not sized properly creating difficulties when removed via crane on the Licking River. It is recommended that a new roof be installed with properly sized hatches to facilitate removal of the pumps along with a new 2-ton hoist. Hatches should double as sky lights to improve lighting inside the pump room. Ventilation inside the building is provided by one roof mounted fan and one wall fan with fresh air louvers located on the river side wall. Temperatures inside the building were slightly higher than normal with both ventilation fans running. The operations staff indicated some deterioration in some of the ladders used to maneuver alongside the exterior of the building. The District expressed interest in implementing a programmatic approach to building maintenance allowing a budgeted amount of money to be set aside each year to aide

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
14-01	FTTP	Laboratory Generator	$237,000
14-02	TMTP	TMTP Sludge Pumps, Conveyors & Press	$1,537,000
14-03	ORPS2	ORPS2 Replacement Design and Construction	$42,250,000
14-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$983,000
14-05	Distribution	36" Licking River Crossing	$4,503,000
14-06	Distribution	2014 Distribution R&R	$4,000,000
14-07	Distribution	2014 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
14-08	Distribution	2014 Mains into Unserved Areas	$250,000
14-09	Distribution	Vineyard (Gunkel Rd.) Between Eight Mile & Fender Rd.	$608,000
14-10	Technology	IT Improvements - Year 4	$86,000
15-01	Distribution	2015 Mains into Unserved Areas	$250,000
15-02	Distribution	2015 Water Main Replacement Program	$5,000,000
15-03	Distribution	2015 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
15-04	Bromley	Bromley Pump Replacement and Misc. Improvements	$1,716,000
15-05	Plants/PS	Upgrade SCADA/Instrumentation/Security Equipment at Plants and PS	$10,172,000
15-06	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,007,000
15-07	Technology	IT Improvements - Year 5	$300,000
16-01	Distribution	2016 Mains into Unserved Areas	$250,000
16-02	Distribution	2016 Water Main Replacement Program	$5,250,000
16-03	Distribution	2106 Coordinated Roaday Imp./Water Main Replacement	$2,500,000
16-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,018,000
16-05	Hands Pike	Hands Pike Pumps and Misc Improvements	$700,000
16-06	Distribution	Horsebranch Road 24" from 36" to Thomas More Parkway	$800,000
17-01	FTTP	Raw water line to FTTP south reservoir	$700,000
17-02	MPTP	MPTP Residuals Handling Improvements	$4,600,000
17-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,038,000
17-04	Distribution	SR17 From Hands Pike to Apple Drive	$12,740,000
17-05	Distribution	2017 Mains into Unserved Areas	$250,000
17-06	Distribution	2017 Water Main Replacement Program	$5,500,000
17-07	Distribution	2017 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
17-08	Bellevue	Replacement Bellevue Tank	$1,300,000
18-01	New PS	New KY17 PS To Replace Richardson Rd. PS	$1,900,000
18-02	New Tank	1.0 MG Elevated Storage Tank East of Independence	$4,375,000
18-03	Dayton Tank	Replace Dayton Tank	$3,700,000
18-04	US 27 PS	US 27 Pump Station VFDs	$449,000

Case No. 2016-00303
Exhibit A.2

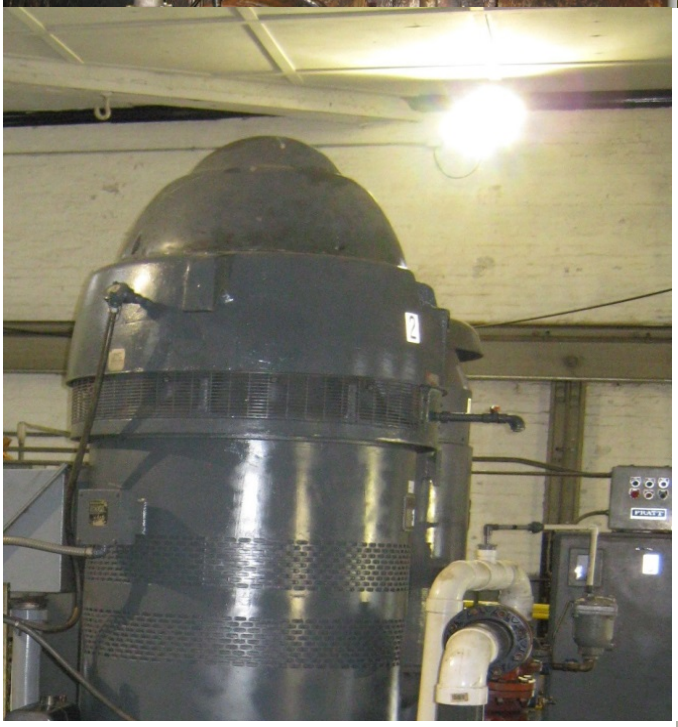
NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

ORPS2 Condition Assessment / MPTP Raw Water Feasibility Study



ORPS2 Condition Assessment / MPTP Raw Water Supply Feasibility Study

Northern Kentucky Water District

March 13, 2015

Figures **Page #**

Photos

Photos (Continued) **Page #**

Appendices

Executive Summary

I. Need for the Study/Evaluations

This study is a composite review of the current condition of the Ohio River Pump Station No.2 along with an evaluation of the available long-term raw water supply alternatives for Memorial Parkway Treatment Plant. ORPS2 is over 135 years old and appears to be approaching the end of its service life if renovations are not undertaken. It currently has deficiencies in a number of areas that need to be addressed to continue in service.

The implementation schedule for any long term supply improvements is being driven by anticipated water demand increases projected for NKWD. While socio-economic factors have impacted the projected demand growth to date, it is clear that NKWD will be producing more drinking water in coming years and needs a relevant plan for addressing how the raw water can efficiently be transported from the Ohio River to MPTP.

One of the key elements in this consideration is the projected maximum pumping requirements. These were provided by NKWD as a starting point for the study and are provided as Table ES0.1 for reference. When considering the total river pumping capacity, NKWD has historically tried to meet the demands required over a 15-16 hour pumping day so the facilities must be sized for this. As examples, the MPTP pump station alternatives will be designed for supplying 32 MGD (20 MG over 15 hours) to the MPTP and 70.4 MGD (44 MG over 15 hours) to FTTP. Table ES 0.1 provides the anticipated daily demands and resulting pump station ultimate capacities that will be used in this study. It is noted that based on these projections, the existing ORPS2 capacity will be exceeded in year 2025.

TABLE ES 0.1
PROJECTIONS FOR MAXIMUM DAY PRODUCTION AND 15-HOUR PUMPING TO MEMORIAL PARKWAY AND FORT THOMAS TREATMENT PLANTS

Year	MPTP, MGD	FTTP, MGD	Combined, MGD
2012	5.4	34.7	40.1
2020	5.6	38.1	43.7
2025	9.7	37.0	46.7
2030	15.4	34.7	50.1
2035	15.7	34.5	50.2
2040	15.9	36.0	51.9
2045	16.4	37.3	53.7
2050	16.5	40.9	57.4
Ultimate Plant Capacity, MGD	20	44	64.0
Ultimate Pump Capacity, MGD	32	70.4	102.4

II. Options Considered

HDR was selected by NKWD to conduct detailed feasibility evaluations of three raw water pumping alternatives for improving the long term raw water supply to the FTTP and MPTP as follows:

- Alternative A – Retire ORPS2 and Supply MPTP from ORPS1
- Alternative B – Replace ORPS2 with a New Facility
- Alternative C – Rehabilitate and Upgrade ORPS2

As part of the evaluation for each of these alternatives, a number of different specific investigations and reviews were undertaken and completed to determine feasibility, cost and risk. One of the most important of these was the development of a proposed pipeline between ORPS 1 and ORPS2 as part of Alternative A. Four possible alignments were identified and evaluated including:

- Option 1 – Construct raw water main along CSX right of way upslope of rails
- Option 2 – Construct raw water main in upslope lane of Mary Ingles Highway (Kentucky Route 8)
- Option 3 - Construct raw water main along downslope edge/shoulder of Mary Ingles Highway (Kentucky Route 8)
- Option 4 – Construct raw water line on lower bank of the Ohio River

Therefore a total of six feasible options were actively considered for detailed investigation and implementation. Further details on the findings of the various investigations are summarized herein and provided in subsequent sections of this report. It should be noted that HDR and NKWD did have an initial workshop to identify all possible alternatives to the current situation. Three other alternatives were identified but determined to be not feasible for additional investigation.

III. Alternative A - Retire ORPS2 and Supply MPTP from ORPS1

Alternative A for providing the necessary raw water supply to the Memorial Parkway Treatment Plant (MPTP) consists of abandoning the existing ORPS2 facility and modifying the existing ORPS1 facility to handle all demands for the MPTP as well as the Fort Thomas Treatment Plant (FTTP). A new transmission main would also be required to be installed between ORPS1 and ORPS2 to connect with the existing raw water transmission main to MPTP.

As this Alternative has a number of different elements, many investigations were carried out to determine its feasibility, benefits, cost and associated risks. The investigations are listed below with detailed findings provided in Section 2.

Pumping Option Feasibility Review for this Alternative to determine if it were feasible for ORPS1 to have a common pumping discharge to both MPTP and

FTTP (i.e. six pumps capable of pumping either direction) or a split pumping approach to the two WTPs (i.e. 4 pumps dedicated to FTTP and 2 pumps dedicated to MPTP)

Pump Capacity Review to select the appropriate pump sizing based on the pumping options and demand projections

Hydraulic Review of Pumping Options to determine if system conditions were favorable toward combined or split raw water supply pumping.

Structural Feasibility of ORPS1 to determine if the existing station could handle the additional loads from larger pumps that would be required to meet the demands of both water plants. Identification of any needed improvements to meet these demands was also completed.

Electrical Feasibility of ORPS1 to determine if existing electrical supply and infrastructure is sufficient to meet needs of larger pump drivers and increased back-up generator needs.

Hydraulic Institute (HI) Compliance Check was performed to confirm the current and projected pumping arrangements would comply with appropriate suction well conditions

Feasibility Assessment for Raw Water Line Routing was a significant investigation into the field conditions and implementation requirements for the four proposed routes between ORPS1 and ORPS2 for a 42" (or twin 30") raw water line(s). Several evaluations were completed under this Assessment including:

- Geotechnical borings and condition determinations along each of the routes
- Materials of construction review to determine feasibility of multiple pipe materials which could allow for alternative construction methods (directional drilling, etc.)
- Permitting availability for the different routes included in-field discussions with CSX and the Kentucky Transportation Cabinet as well as phone interviews with the United States Army Corps of Engineers (USACE).
- Identification of property lines and rights of way along the proposed route
- Existing utilities identification through field walks and discussions with the various utilities and agencies
- Flood impacts from FEMA mapping on any proposed alignment

The detailed findings on these investigations can be found in Section 2 including the capital costs attached to each Option of this Alternative. The proposed costs for each of these options are provided in Table ES0.2.

IV. Alternative B - Replace ORPS2 with New Facility

Alternative B for providing the necessary raw water supply to the Memorial Parkway Treatment Plant (MPTP) consists of abandoning the existing ORPS2 facility and constructing an entirely new facility. The evaluation of this option was different than Alternative A or C as very few investigations regarding facility capability were required.

A brief general description of proposed elements of the new ORPS2 facility are provided below. More detailed drawings of the proposed layouts are provided in Appendix F.

- The new ORPS2 facility is planned to sit adjacent the existing ORPS2 on an 18 acre plot already owned by NKWD located between Mary Ingles Highway (Route 8) and the Ohio River.
- Facility would be concrete and masonry structure nearly 80 feet tall. It would be constructed on the riverbank and have 3 screened inlet/supply pipes out into the river
- New ORPS2 has been laid out with similar architectural, structural, equipment, and operational characteristics as ORPS1.
- The new facility will be equipped with three vertical turbine raw water pumps, one of which will be a standby pump.
- The new ORPS2 facility can continue to pump through the existing 24" ductile iron and 20" cast iron discharge lines for the near future but will require an additional 36" (minimum) ductile iron discharge line to be constructed between ORPS2 and MPTP in time to meet the projected 15 MGD pumping demand over 15 hours.

The electrical system for the new pump station will also include the following key components similar to ORPS1.

- New primary service from Duke Energy to new outdoor, walk-in, switchgear above flood stage.
- Outdoor, walk-in, paralleling switchgear for connection to emergency power.
- Emergency, diesel fueled generator(s) to provide power to the station during an outage. The transfer to emergency power will be automatic with the miscellaneous loads being re-energized automatically and the raw water pumps being started manually, one at a time. Diesel fuel capacity will be sized to maintain a two day supply at full load.
- New motor controls will either be reduced voltage, solid-state starters or variable frequency drives (VFD).

The investigations that were performed to get a better understanding of this alternative include the following:

Pumping Capacity Analysis to determine the hydraulic performance of the system over range of flows aligned with projected system demands over next 40 years.

Hydraulic Institute Review of potential suction well configurations.

Permitting Assessment to determine the steps necessary to acquire construction permits from KDOW and USACE.

The detailed findings on these investigations can be found in Section 3. The proposed cost for this Alternative is provided in Table ES0.2.

V. Alternative C – Rehabilitate and Upgrade ORPS2

Alternative C for providing the necessary raw water supply to the Memorial Parkway Treatment Plant (MPTP) consists of the rehabilitation and upgrade of the existing ORPS2 facility to handle all demands for the MPTP through year 2050 and beyond. ORPS2 is a resilient 135 year old masonry and concrete structure moored to the bottom of the Ohio River. The station has endured multiple floods, river traffic collisions, etc. during its service. During the periodic renovation projects that it has seen, the external structure has never required substantial upgrading, strengthening or support. This is a testament to the original design and construction practices then employed.

In order to consider whether ORPS2 can be rehabilitated and meet these future demands, HDR needed to complete various investigations into the structural integrity and overall condition of the facility. A summary of the investigations performed is provided below with the findings being provided in Section 4.

Structural Condition Assessment (SCA) was performed on ORPS2 to gain an understanding of the current condition of the facility and generate new information on elements of the original construction that were unknown. This SCA consisted of many field investigations by including:

- Materials testing performed by Thelen Associates (Thelen) on the existing station to determine current condition of the materials of construction including concrete, rebar, masonry, etc. Thirteen core samples were taken from walls and floors.
- Ground Penetrating Radar investigations were undertaken by Thelen to obtain an understanding of the rebar placement in the walls and floors that could not be observed.
- Dimensional Surveys to determine plumbness and alignment of the existing structure were performed to identify any irregularities or obvious lean that could impact structural soundness.
- Petrographic analyses were performed on areas where the concrete strength was deficient or below expectation.

Underwater/Wetwell Inspection was performed by Marine Solutions (MSI) to determine the existing interior and exterior conditions in the lower

level//wetwell area of ORPS2. This interior area of ORPS2 has rarely been examined in the last 50 years. The exterior perimeter of ORPS2 from the waterline to mudline was also examined by MSI.

Lead Paint/Asbestos testing were performed to identify any potentially hazardous environmental conditions at ORPS2

Historic Designation Review on the structure was tracked to determine if it placed any limitations on use of the structure.

Flood Elevation Review was performed to determine impact of 100-year, 500-year and Flood of Record impact on Station. Interestingly, ORPS2 has actually encountered all these during its service period.

Structural Capacity Evaluation reviewed all the information obtained during the SCA, from a review of existing record drawings and from site visits to ORPS2 to provide a determination on whether the existing ORPS2 structure is sound enough to remain in service for another 50 years with some renovations.

All of these investigations contributed to developing a better understanding of ORPS2 in its current condition and whether it is suitable for continued use. The long term continued use of ORPS2 is possible based on all these reviews, but will require extensive renovations to accomplish and the resulting structure will be retrofit designed to do the best with what is available. Substantial modifications to the pump station would be required to convert the dry well style station back into a wet well style station with vertical turbine pumps to achieve the required long term (50 year) 32 MGD capacity and comply with Hydraulic Institute Standards for hydraulic design. The current wetwell/drywell configuration is limited to approximately 20.0 MGD. The costs for the long term improvements attached to Alternative 4 are summarized in Table ES 0.2

NKWD asked for an additional estimation of costs to be developed for ORPS2. They were interested in the needs associated with operating ORPS2 for a short term sunset period (5-10 years) and the needed improvements for the station to be to reliably meet that service duration. These improvements would enable NKWD to make decisions and procure funding for their ultimate raw water supply approach. The specific improvements needed to accomplish this are detailed in Section 4 and summarized with their costs in Table ES0.2.

Hydraulic Pumping Evaluation was performed on the ORPS2 pumping station. Hydraulic models were created to analyze the station with the current pumps and discharge mains configuration and then again with a new 36” main installed and the 20” cast iron line abandoned. The modeling of the existing configuration showed that the ORPS2 stations maximum hydraulic capacity when utilizing the existing 20” and 24” lines was approximately 20.0 MGD. When installing a new 36” line and abandoning the 20” cast iron, a capacity of 32 MGD would be obtainable without excessive head loss following the installation of new pumps.

VI. Preliminary Opinion of Probable Capital Cost

Table ES0.2 is provided below to illustrate the comparative capital costs of the various Alternatives.

TABLE ES0.2
SUMMARY OF ENGINEER'S OPINION OF PROBABLE PROJECT COST
ALL PUMPING ALTERNATIVES (A, B, & C)

ALT	ITEM	COST
A	***ALTERNATIVE A - RETIRE ORPS2 AND SUPPLY MPTP/FTTP FROM ORPS1***	
A1	PROBABLE PROJECT COST ORPS1 MODS + RWL OPT 1 (CSX UPSLOPE OF RAILS)	$ 29,698,856
A2	PROBABLE PROJECT COST ORPS1 MODS + RWL OPT 2 (KENTUCKY ROUTE 8 UPSLOPE)	$ 20,672,729
A3	PROBABLE PROJECT COST ORPS1 MODS + RWL OPT 3 (KENTUCKY ROUTE 8 DOWNSLOPE)	$ 25,930,533
A4	PROBABLE PROJECT COST ORPS1 MODS + RWL OPT 4 (LOWER OHIO RIVER BANK)	$ 30,856,404
B	***ALTERNATIVE B - REPLACE ORPS2 WITH NEW FACILITY***	
	TOTAL PROBABLE PROJECT COST	$ 24,891,498
C	***ALTERNATIVE C - REHABILITATE AND UPGRADE ORPS2***	
1	TOTAL PROBABLE PROJECT COST (50 Year Option)	$ 26,021,679
2	TOTAL PROBABLE PROJECT COST (10 Year Option)	$ 2,500,000

VII. Risk Identification and Review

Risk is inherent in all projects. In most cases, the alternatives considered are similar in nature and the type and degree of risk is not widely variable. That is not the case with this assessment. The three alternatives considered are widely divergent in this area. This can be demonstrated by identifying the most significant risk concerns for each of the alternatives and comparing their overlap.

Alternative A – Supply MPTP from ORPS1

- Permitting (KYTC) the raw water transmission main alignment
- Structural capacity of ORPS1 to handle increased loads

Alternative B – Replace ORPS2 with New Facility

- Permitting (KDOW/USACE) the new structure
- Minimizing capital cost to keep option viable

Alternative C – Rehabilitate ORPS2

- Unforeseen conditions inherent in upgrading a 135 year old structure
- Revising function of facility to balance structural forces and resist flooding of station

In order to make the consideration of risk less abstract and more meaningful, HDR has developed a comparative risk register for the project. The outcome of the completed risk register and analysis is to provide a total calculated risk exposure for each of the alternatives. This value can be used as a comparison between the alternatives. Additionally, the risk register is something that can follow the project and be used to identify new risks as they may found or to document methods used to mitigate known risks.

Table ES0.5 provides a summary of the calculated project risks for each alternative. More details on the risk register and the projected event impacts can be found in Section 5.

TABLE ES0.5

SUMMARY OF ESTIMATED RISK

ALL PUMPING ALTERNATIVES (A, B, & C)

	OPTION DESCRIPTION	TOTAL POTENTIAL IMPACT $	EXPECTED RISK $
A	RETIRE ORPS2 AND SUPPLY MPTP AND FTTP FROM ORPS1		
	PS OPTION A + RWL OPTION 1 (CSX UPSLOPE OF RAILS)	$19,450,000	$3,072,500
	PS OPTION A + RWL OPTION 2 (KENTUCKY ROUTE 8 UPSLOPE)	$20,150,000	$4,207,500
	PS OPTION A + RWL OPTION 3 (KENTUCKY ROUTE 8 DOWNSLOPE)	$19,900,000	$4,155,000
	PS OPTION A + RWL OPTION 4 (LOWER OHIO RIVER BANK)	$11,800,000	$1,815,000
B	REPLACE ORPS2 WITH NEW FACILITY		
	REPLACE ORPS2 WITH NEW FACILITY	$1,875,000	$417,750
C	REHABILITATE AND UPGRADE ORPS2		
	REHABILITATE AND UPGRADE ORPS2	$8,500,000	$2,775,000

VIII. Recommendations

HDR and NKWD have held several workshops and project meetings for this study. During the last meeting, NKWD requested that the draft report be submitted for a full review of the material. Once the material has been digested by NKWD, HDR proposes that final meeting be held to answer any questions, review the major findings, analyze costs and develop a unified recommendation for the short and long term provision of raw water to MPTP. Based on the decisions made at that meeting, HDR will finalize the report including any revisions, incorporating the recommendations and developing a roadmap for implementation.

1

Background

1.1 General

The Northern Kentucky Water District (NKWD) owns and operates three water treatment plants and supplies water to +/-81,000 residential, commercial, industrial, and wholesale customers in Northern Kentucky. The treatment plants consist of the Fort Thomas Treatment Plant (FTTP) 44 MGD, Memorial Parkway Treatment Plant (MPTP) 10 MGD, and the Taylor Mill Treatment Plant (TMTP) 10 MGD. Each plant is equipped with its own independent raw water intake. The FTTP and MPTP draw from the Ohio River (Ohio River Pumping Station (ORPS) 1 and ORPS2) and the TMTP draws from the Licking River. The ORPS1 and ORPS2 stations and FTTP and MPTP are the focus of this study.

There are currently no raw water interconnects between the raw water pumping stations (intakes) and the treatment plants. However, some interconnects exist in the finished water distribution system that allows for water treated at FTTP and MPTP to be distributed to some of the same areas of the NKWD system, but conveyance capacity is limited. Currently the FTTP supplements the finished water required to be treated at the MPTP through the existing interconnects. It is our understanding that the District plans to expand the MPTP from 10 MGD to 20 MGD in the future to free up capacity at the FTTP so it can be directed to the service areas to the south of FTTP.

The existing ORPS2 station is over 135 years old and has a limited remaining service life in the absence of completing major repairs and upgrades. ORPS2 is less than one mile from ORPS1 on the Ohio River. Therefore, possible options for utilizing ORPS1 to service the MPTP also exist. Due to the complexity of the feasibility analysis of pumping alternatives, HDR was selected by NKWD to conduct detailed feasibility evaluations of three raw water pumping alternatives for improving the long term raw water supply to the FTTP and MPTP as follows:

- Alternative A – Retire ORPS2 and Supply MPTP from ORPS1
- Alternative B – Replace ORPS2 with a New Facility
- Alternative C – Rehabilitate and Upgrade ORPS2

Detailed discussions of the feasibility analyses and scope of work completed are presented in Sections 2, 3, and 4 of this report. Associated risks with each alternative are evaluated in Section 5.

In order to properly assess and make recommendations regarding proposed pumping alternatives for the NKWD long term raw water supply, an understanding of the current conditions and capabilities of both the ORPS1 and ORPS2 facilities must be obtained. This section provides a summary of the construction and modification history of each facility along with general background information.

1.2 ***ORPS1 Background and Description***

The Ohio River Pump Station #1 (ORPS1) was constructed in 1997 and is in good condition. The station sits on a 2.3 acre plot between Mary Ingles Highway (Route 8), CSX railroad, and the Ohio River. ORPS1 is the dedicated raw water intake for the FTTP and has total capacity of 75 MGD and a firm capacity of 61 MGD.

Photo 1.1: ORPS1 Facility

ORPS1 supplies water to FTTP through two 30-inch mains and one 42-inch main. The 30-inch mains are cast iron and one installed in the 1930's and one prior. In 1991 a 42-inch ductile iron main was installed. Currently ORPS1 can only pump to FTTP. No raw water mains are available to allow for pumping to MPTP.

The station has 3 independent wet wells containing two vertical turbine pumps in each, and one vertical traveling screen per wet well. The station has two primary (operating) levels consisting of the top floor where all controls, pumps, and traveling screens are located and the lower floor where all chemical feed systems and internal discharge pipe valves are located. The station is equipped with a 10-ton bridge crane, two 2-ton monorails with hoists, service air compressor, and miscellaneous valving and appurtenances.

Primary electrical service (12,470 volt) to ORPS1 is provided by Duke from the Wilder 46 station and backup power service from the Cold Spring 49 station. More information regarding current electrical service and station electrical components is provided in the RFQ by NKWD. Additional electrical considerations related to the modifications to ORPS1 will be provided later in this report.

In 2005 the ORPS1 pump station was evaluated to determine the ability of the existing motor floor structure to support larger pumps. It was determined that the existing pumps may exceed the structural design capacity of the station by approximately 10% (+/-3,424 lbs per pump). It was noted that the limiting factor in the structural calculation was the size and number of reinforcing bars in the beams on each side of the pump foundation opening. This structural analysis was also performed by HDR as part of this study (Section 2) of this report with contradictory findings to the 2005 report.

Raw water pumps #1, #2, #3, #4, and #6 were replaced between 2005 and 2009 with new Floway pumps. Pump #5 was replaced immediately following station startup in 1998 and is still the Byron Jackson 6-stage pump installed at that time.

The following Figures were cropped from the ORPS1 record drawings and depict an overview of the station. Appendix A provides select full scale record drawings of the existing facility.

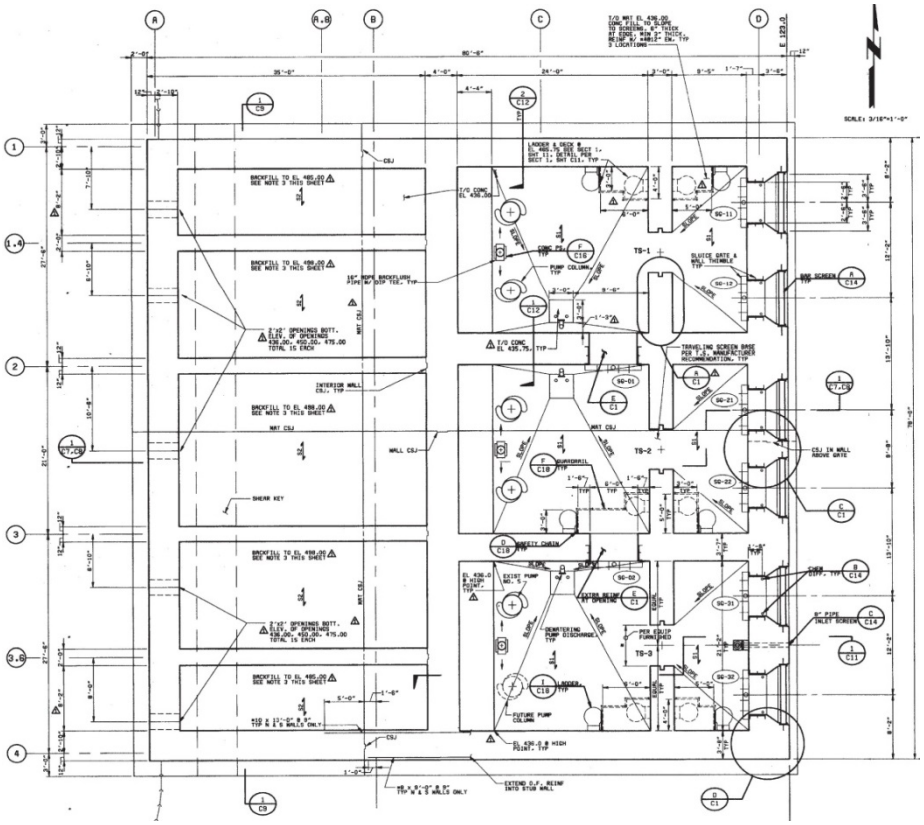


Figure 1.1: ORPS 1 Lower (Wet Well) Plan View

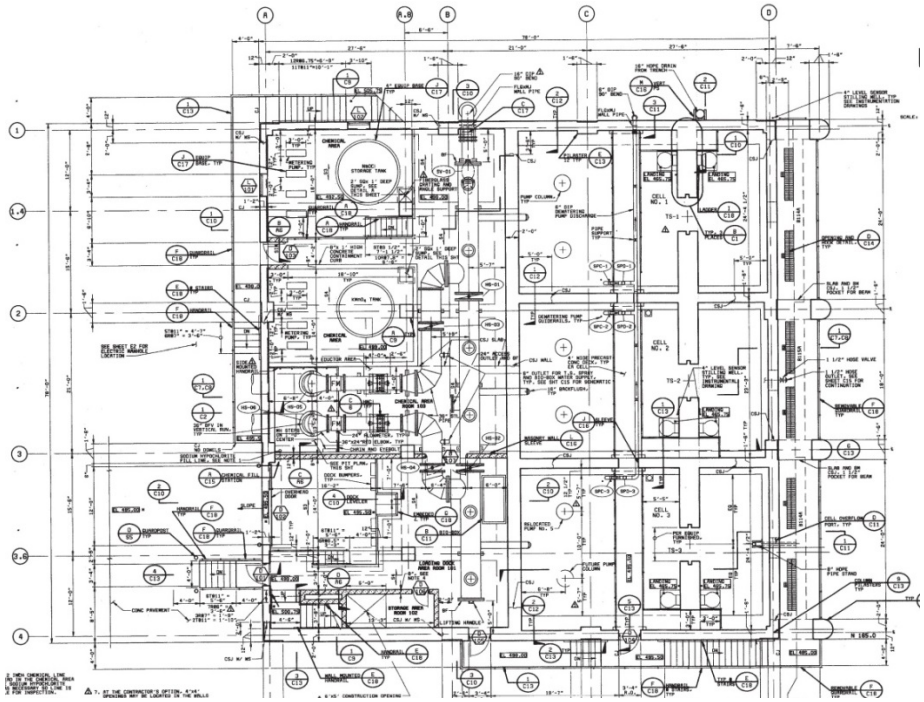


Figure 1.2: ORPS 1 Intermediate Floor Plan View

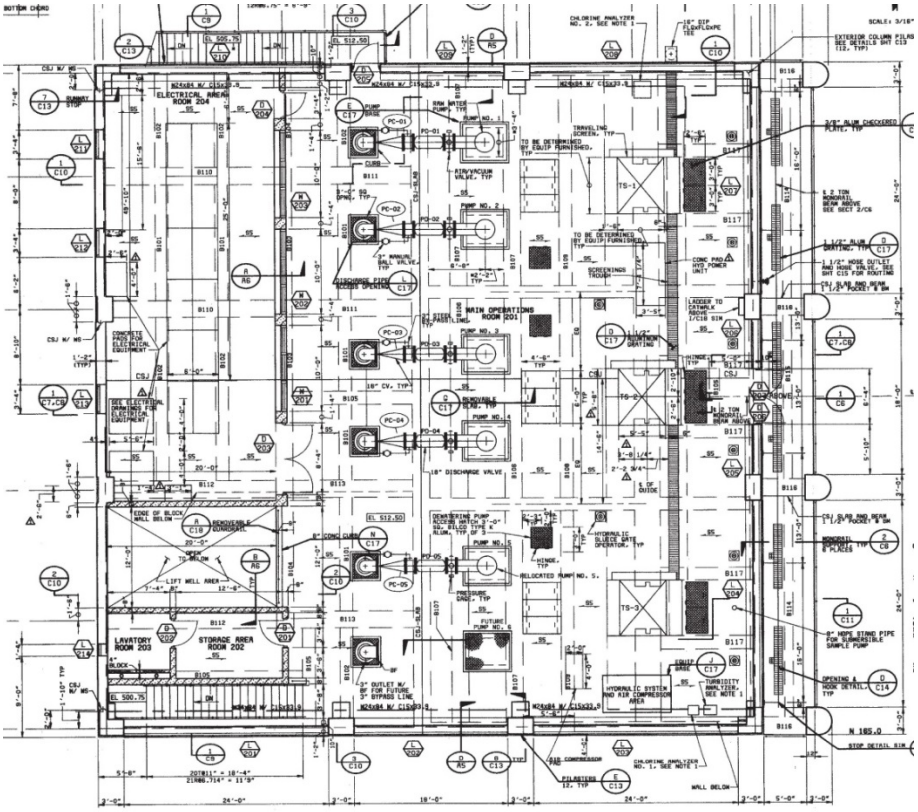


Figure 1.3: ORPS 1 Operating Floor Plan View

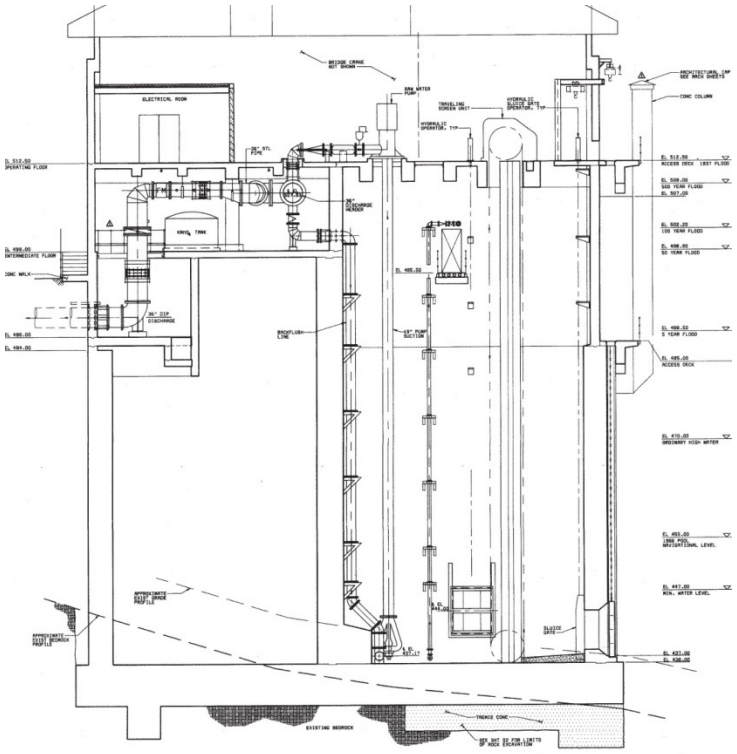


Figure 1.4: ORPS 1 Station Section View

1.3 ***ORPS2 Background and Description***

ORPS2 was originally known as the City of Newport Pumping Station, located in Ft Thomas, KY, along the West bank of the Ohio River (*photo 1.2*). Built in 1872, this intake structure is the sole water supply to the MPTP (former Newport Water Works).

Photo 1.2: ORPS2 Facility

ORPS2 is sited within the banks of the Ohio River adjacent to 18 acres owned by NKWD along Route 8 (Mary Ingles Highway). CSX has a rail line roughly parallel to Route 8 and adjacent to the NKWD property. ORPS2 is located roughly 4,000 feet north of the District's Ohio River Pumping Station No. 1 (ORPS1) that supplies the District's Fort Thomas Treatment Plant. The station is a concrete and brick structure that exhibits signs of corrosion and deterioration. The roof of the building is constructed of wood framing members with wooden plank roofing and composite shingles.

The facility has gone through a number of renovations since its original construction. Due to its age and lack of records, not all of the improvements are fully understood. In addition, plans from the original construction no longer exist. Our primary sources of historical information have the following:

- Water Works Improvement Project (1940) designed by Fosdick & Hilmer (partial set)
- Water Works Improvement Project – River Intake Pumping Station (1962) designed by Watkins and Associates (full set)
- Shop Drawings from W.L Harper related to 1962 Construction Project
- River Pumping Station Improvements (1985) designed by GRW

This information covers roughly half of the service life of ORPS2. Our investigation has inferred some anecdotal operational details from the facility layout including:

- Facility may have been entirely wetted throughout the lower floor in the early design. The structure has multiple exterior arches below the normal pool of the river that have been bricked up. These could have been intake

points into a full wetwell below the floor. Plans from 1940 clearly shown a wetwell area on the eastern half of the station.

- Steam was originally used to drive the pumps but station was converted to electrical power. It is likely this occurred after the 1937 flood. This information is derived from information on the available record drawings.
- ORPS2 was inundated during the 1937 flood. It appears the main floor was underwater at an approximate depth of 10 feet. This flooding no doubt devastated the facility and this appears to be the driver for the elevated pumping and electrical platform which was built over the “dry well” in 1940. The 1884 flood likely rose above the operating floor and the 1913 floor was very close.
- Most of the available drawings don’t show the extent of the chambers under the “old Boiler Room” nor is the use of these areas clear. These chambers have archways connecting them together and typically have approximately 30’ of accumulated river mud in the lower levels.

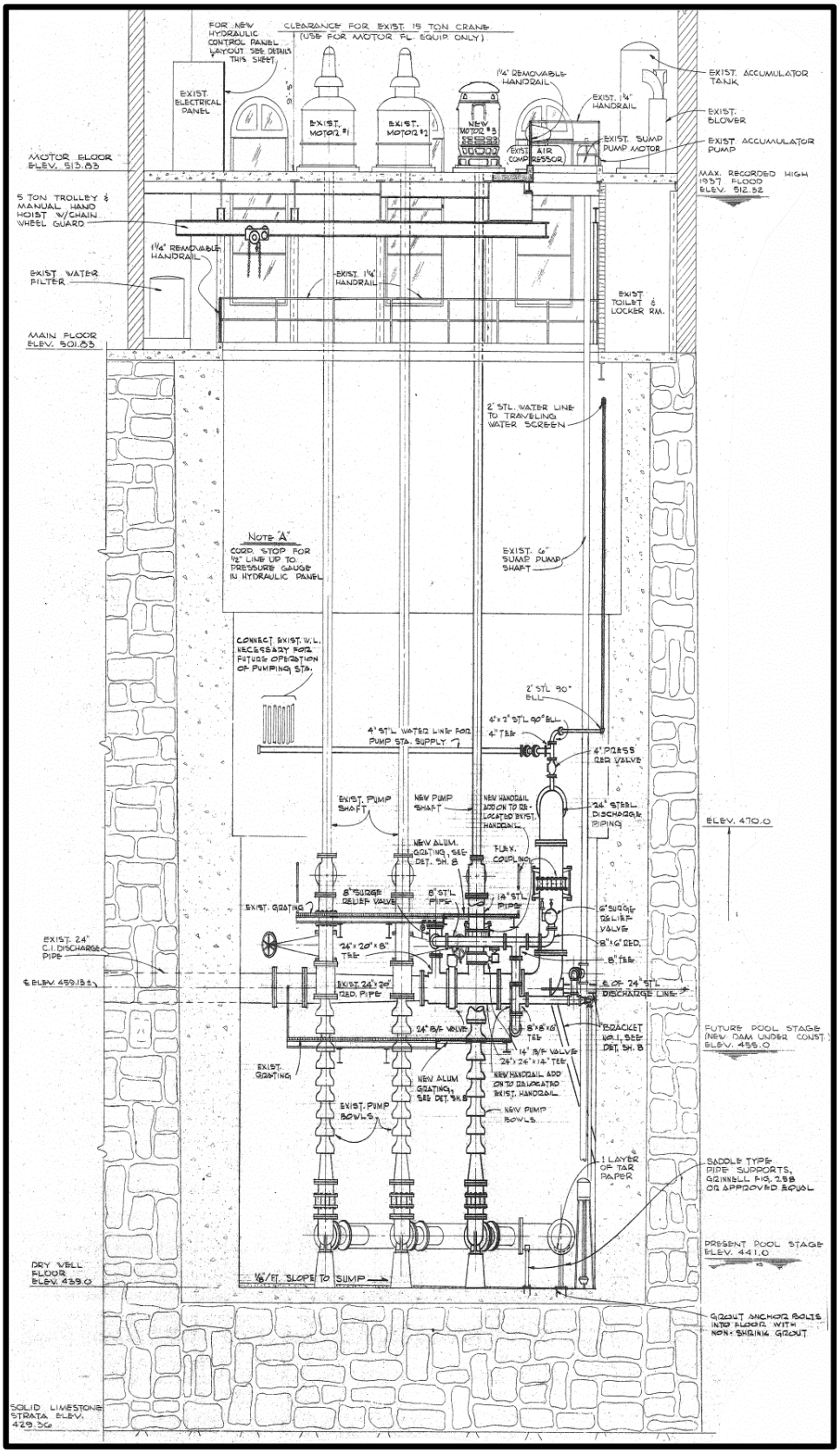


Figure 1.5: ORPS 2 Cross Section View

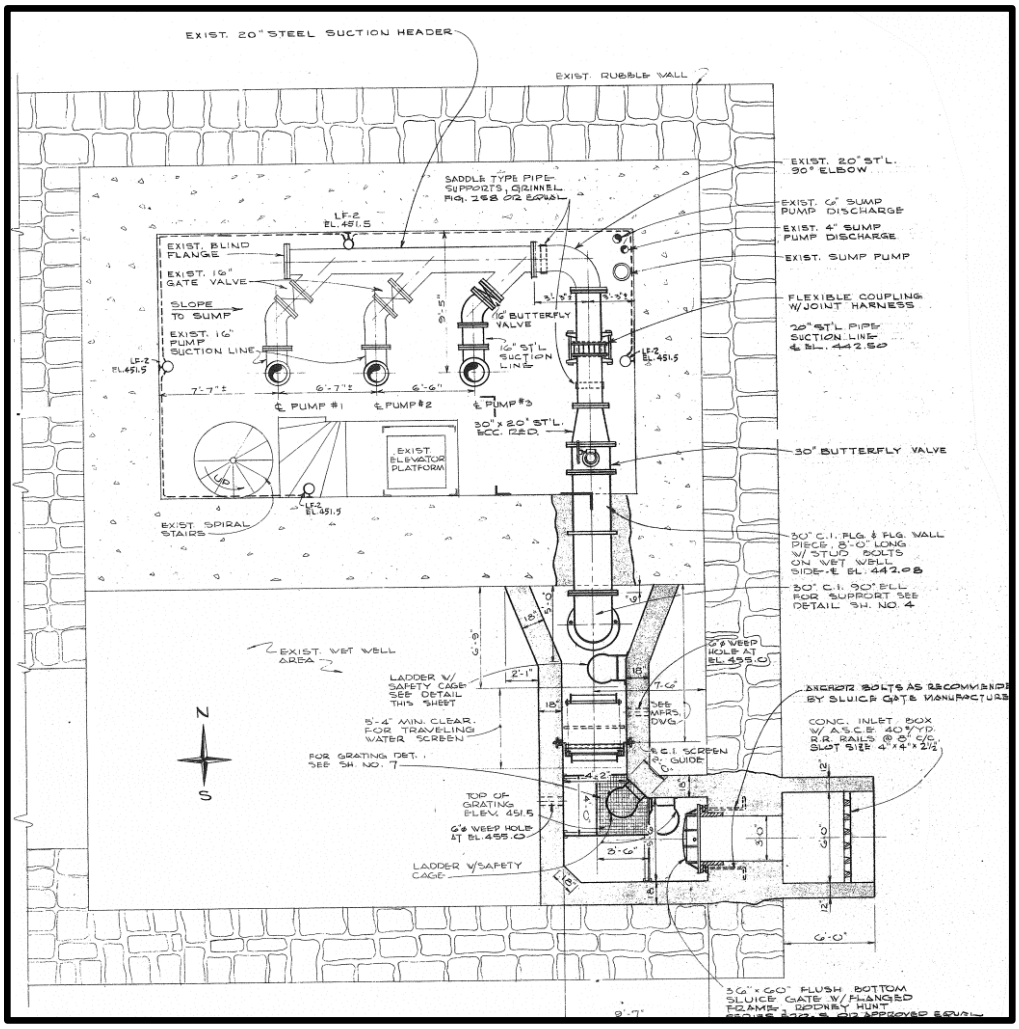


Figure 1.6: ORPS 2 Cross Lower Plan View

Several reviews and inspections have been performed over the years. HDR was able to rely on a limited number of documents. The most recent information was the Asset Management Program (AMP) prepared by Black and Veatch in 2004. The findings and observations from that assessment include the following:

- The building was rated as "Unsatisfactory" in the District's AMP. Observations from a 2004 visual inspection:
  - Daylight is visible through holes in the roof (this has since been addressed)
  - Interior brickwork and concrete floor are extremely deteriorated. In the 2004 inspection, radial cracks in the floor as wide as ½ inch were noted.
  - The upper portion of the pumping station is constructed of brick, and a number of areas show cracking and separation of the brickwork that may indicate differential settlement.

- The lower pump room is constructed of cast-in-place concrete and shows signs of excessive corrosion and deterioration.
- The lower pump pit is accessed by elevator or a spiral staircase.
- Lighting in the lower pump room is minimal and will require portable fixtures to inspect.

Three vertical turbine raw water pumps are present at ORPS2 with the following details

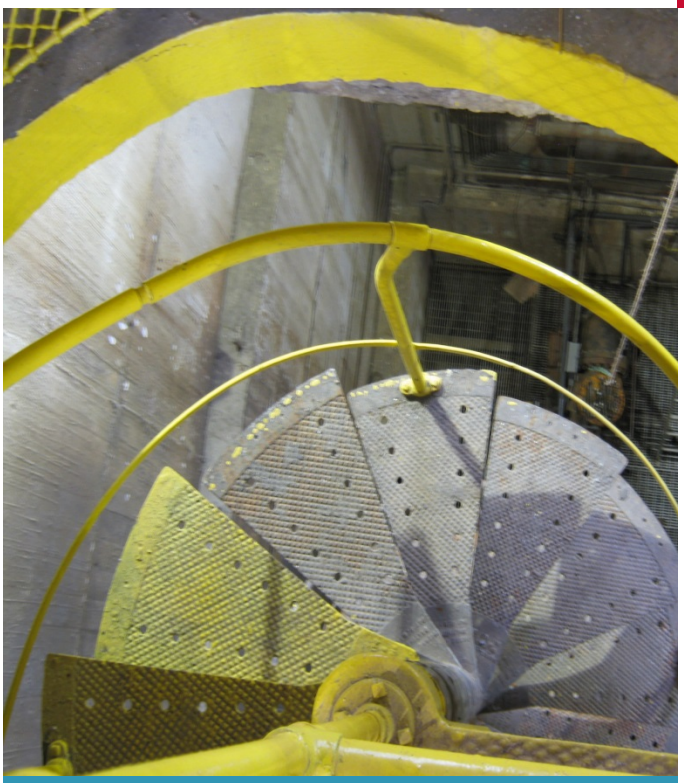
Pump #1 (2001) – Goulds - 6,000 GPM @ 400' TDH (900 Hp)
Pump #2 (2001) – Ingersoll Dresser - 6,000 GPM, 400' TDH (800 Hp)
Pump #3 (1995) – Fairbanks Morse - 5,500 GPM, 380' TDH (600 Hp)

The "Asset Management" investigation was not a detailed review of the condition of ORPS2 and therefore did not produce an analytical evaluation of the structural integrity or capacity for future use. Several investigations of this nature will be undertaken in this study.

Some of the best information available on the station was provided in discussions with NKWD staff. These discussions yielded an understanding that the major pieces of equipment were generally in working order and receiving regular maintenance. However, it was clear that maintenance frequency and costs were increasing on these items. Some of the key equipment or structures at ORPS2 include:

- Three vertical turbine pumps, valves and appurtenances
- Chemical application system
- Mechanical traveling screen
- Electrical Mezzanine platform with motor control center and switchgear
- Maintenance elevator
- Numerous metallic grating platforms in both wetwell and drywell areas.
- 5 ton bridge crane and monorail
- Gas unit heaters in pump room

Appendix B provides select full scale record drawings of the existing facility.



4

Alternative C:

Rehabilitate and Upgrade ORPS2

4.1 Purpose and Scope

Alternative 'C' for providing the necessary raw water supply to the Memorial Parkway Treatment Plant (MPTP) consists of the rehabilitation and upgrade of the existing ORPS2 facility to handle all demands for the MPTP through year 2050 and beyond. To meet these, NKWD has established the firm pumping capacity of the raw water pumping station to be at least 32 MGD (22,250 GPM) in order to pump the ultimate MPTP capacity of 20 MG over a period of 15 hours (maximum off peak power period).

Photo 4.1: ORPS2 Facility Looking Downstream

In order to consider whether ORPS2 can be rehabilitated and meet these future demands, HDR needed to complete various investigations into the structural integrity and overall condition of the facility.

First, a structural assessment of ORPS2 was completed. The assessment is a broad investigation of the current condition of ORPS2 for the purposes of determining whether additional investment at the facility is feasible. The current facility was constructed in 1872 and has undergone many renovations during its service period. Continued use in its current form, as well as its ability to be expanded to an increased capacity, are both under consideration as NKWD assesses its long-term water supply options. The scope of work to be performed as part of this assessment is provided below.

A. Building Condition Assessment and Structural Evaluation

- Perform a detailed visual inspection, including a dive inspection, and condition assessment of the interior and exterior building structure.
- Prepare photographic documentation of condition with detailed descriptions for areas of concern.
- Prepare a recommended testing plan based on visual inspection.
- Complete non-destructive and/or destructive testing as recommended by Engineer.
- Prepare a report that:
  - Identifies any safety issues.
  - Provides opinion of the current structural integrity of the station.
  - Estimates the expected remaining life for a "do nothing" approach.
  - Provides recommendations and annual cost estimates for any on-going inspection and monitoring.
  - Identifies recommendations for keeping the pump station operational until major improvements are in place, which could take at least 4 years to design and construct.

B. ORPS2 Construction History

As noted in Section 1 of this report, ORPS2 was originally constructed in 1875 as the City of Newport Pumping Station. Based on our investigations, it is believed this pump station supplied river water to the large settling reservoirs at Memorial Parkway serving as the first water treatment facilities for the city. The review of the available drawings also indicates that it is likely that the original pumping arrangement was a wetwell configuration with steam driven pumps. It is believed these were submersible duty but that can't be verified. It appears that the station was operated in this manner until 1937 when the third major flood (1884, 1913 and 1937) in 50 years overtook the station.

It is likely that the 1913 flood was very close to the operating floor level of the station. However, there is no doubt that the 1937 flood clearly inundated the facility above the first floor to an approximate submergence of 10 feet. This caused the complete failure of the station. It is believed that significant siltation was likely deposited in the station and that virtually all its operational appurtenances were fouled or destroyed. The station was re-built over a 3 year period being re-commissioned in 1942 with the elevated pumping platforms that are currently in place.

The following sections provide information pertaining to the existing condition of ORPS2 and the proposed modifications thereto for continuing and future service as the primary supply of raw water to MPTP (Alternative C).

4.2 Flood Elevations

The location of ORPS2 means that flooding is a key concern when evaluating the structure. Several sources of information were available on the subject but none

were uniform in datum. The two sources most relied upon were the existing Ohio River flood studies produced by the Federal Emergency Management Agency (FEMA), which are in North American Vertical Datum 1988 (NAVD88) and the 1962 design plans for the River Pumping Station Improvements project (vertical datum unknown). The relevant information from each is provided below.

Description	***FEMA 2013***	***1962 Design Plans***
Main Floor Elevation	TBD	501.83
100 Year Flood Elevation	501.0	NA
500 Year Flood	508.0	NA
Flood of Record (1937)	511.5’	512.32

Despite the inconsistency in datum, it is apparent that the station is susceptible to flooding could be inundated again if a 100-year flood were to occur. It is virtually certain that a 500-year flood or anything similar to 1884, 1913 or 1937 floods would submerge most of the operating level of ORPS2.

4.3 Field Observations/Condition Assessment

HDR field work consisted of visual inspection of accessible structural and envelope elements of the pump station. This included the overall structure’s alignment, areas of distress, surface condition of materials, and detrimental/unintended loading conditions.

In addition, the following subcontracted work was performed under the direction of HDR:

- Thelen Associates: concrete material testing, ground penetrating radar (GPR) for reinforcing steel and dimensional surveys
- Concrete Research and Testing, Inc. - Petrographic Examination of Concrete Core(s)
- Marine Solutions Inc.: underwater and wetwell inspections
- Horizon LLC/Corrosion Control Consultants & Labs, Inc. – Lead Paint Testing
- Larkin Environmental Solutions – Asbestos Sampling

Complete reports are provided in the appendices of this study. The relevant findings of each investigation are summarized in the following sections.

4.4 Materials Testing/Dimensional Surveys

As noted previously, records could not be located from either the original construction of ORPS2 or some of the subsequent structural work on the "dry well". As part of this investigation, Thelen Associates was retained to perform in-place sampling and materials testing to determine important structural elements of the facility such as concrete strength, placement of reinforcing and building movement.

Thelen's findings are provided in Appendix G and Appendix H of the attached report. A summary of the key elements of their findings include:

- Thirteen (13) concrete cores were extracted to determine the cured concrete strength. These were advanced into both floors and walls within the existing structure. These samples were visually analyzed with 5 being sent to the laboratory for testing. The testing results on those cores indicated compressive strengths from 2610 to 5880 psi with the lower values being on the pump room floor.

- Ground penetrating radar (GPR) was used to analyze the walls where reinforcing could not be observed. This was successful in locating the placement and spacing in both walls and floors inside the structure. These were validated by comparison with visual observation in areas of exposure

- Surveys of the floor topography and the wall plumbness were also prepared based on in-place observations to assist in revealing any movement, settling or other structural irregularities that could impact the building condition. The entire operating floor was surveyed along with 20 vertical wall investigations.

Thelen also worked with Concrete Research and Testing, Inc. to prepare a petrographic analysis of concrete core from the floor of the pump room. The sample was examined to understand the root causes behind the poor condition of concrete that was sampled. The findings of this investigation are provided in Appendix G.

4.5 Underwater/Wetwell Inspections

Marine Solutions performed a comprehensive inspection of the lower level interior and exterior surfaces of ORPS2. The exterior inspection was performed through an underwater dive while the interior inspection was performed through a combination of exploratory and hoisted descent into the lower level chambers. These inspections produced a significant amount of information, but were able to only provide partial answers to structural condition questions of the original operations approach of the facility.

Photo 4.2: Inspector Entering Dry Wet Well

This is due, in large part, to the tremendous amounts of sediment that have accumulated in the lower levels of ORPS2. In some areas, it is estimated that nearly 30 feet of mucky river solids have built up over the years of service. As a result, only a fraction of the total volume of the intake lower levels could be visually examined.

However, the areas that could be examined produced a significant amount of solid data for consideration by the structural assessment team. The full report is provided in Appendix I, but a summary of the findings is provided below.

A. Sediment Accumulation

Portions of the wells were not observed and observations of accessible areas were made at a distance due to the sediment buildup inside the well and on the lower level well platforms and due to the condition of the platforms and failed lower level ladders. Further, a significant portion of the interior walls of the wet wells cannot be accessed due to the buildup of sediment within the well.

The sediment has accumulated to elevations between 460.0 feet and 461.5 feet. Considering a floor elevation of 430.25 feet as indicated on the record drawings and the currently understood area of the well, roughly 3,500 cubic yards of sediment (approximately 30 feet deep on average) is present.

B. Main Floor and Building Stone Walls

The severe open corrosion spalls present on the underside of the main floor reinforced concrete slab may have reduced the load carrying capacity of the floor and should be repaired on a high priority basis. Until renovations are made, increased loading from additional equipment or other procedures should be prohibited and the floor should be monitored for cracking or settlement that may indicate impending failure.
Defects affecting the structural integrity of the building stone walls were not discovered below the water surface on the exterior of the structure. However, possibly significant cracking is present above the water surface on the southeast and northeast corners of the building exterior and on the interior and exterior masonry walls of the wet well.

C. Wet Well Platforms

The spalls present on the underside of the wet well platform at elevation 483.4 feet and the corrosion present on the support column and system of beams should also be evaluated and the platform system should be repaired or replaced to promote safe continued use.

The buildup of mud on the wet well platform at elevation 471.0 feet should be removed to limit the weight on the platform. Accumulation should be monitored and routinely removed as needed. Although not observed, the platform at elevation 471.0 feet is likely to be in need of significant repairs or replacement similar to the above platform.

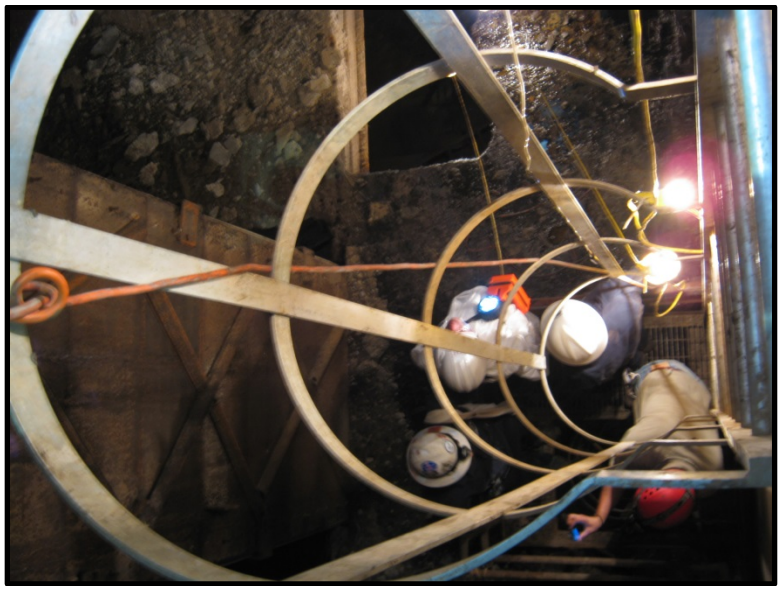


Photo 4.3: Looking Down on Platform at 471.0 Feet

D. Exterior Encasement and Ohio River Intake

The corrosion present on the steel sheet pile encasement is relatively typical given the estimated age. Corrosion of the sheet piles should be monitored during future routine underwater inspections.

The heavy mussel accumulation present on the Ohio River inlet trash rack is likely to impede water flow through the inlet and increase pressure on the trash rack bars. The heavy corrosion present on the bars may lead to failure of the bars, allowing heavy debris to enter the intake. For continued or increased use of the facility, the corrosion present on the steel trash rack bars and heavy accumulation of zebra mussels should be addressed. Regularly scheduled cleaning of marine and mussel growth from the trash rack will be required to limit accumulation.

The abandoned sluice gate, operating stem, guides and operator are not functional and should be removed. If gated control is required, a new sluice gate assembly should be installed. If replacement of the abandoned sluice gate is not required, consideration should be given to installation of a removable trash rack at the sluice gate position such that the rack could be raised and cleaned at regular intervals. It should also be noted that an anti-fouling system appears to have been in place to limit mussel growth on the gate. If the gate system is replaced, the anti-fouling system should also be restored.

4.6 Lead/Asbestos Testing

Lead and asbestos testing were performed under this project to get a full picture of the current environmental conditions at the facility. It was expected that a 140 year old facility would likely have both contaminants. It should be noted that the presence or absence of these materials does not effect the structural assessment of the facility. The results are offered only to better understand work that would need to be performed on structural surfaces or appurtenances.

Horizon LLC sampled 10 locations for lead paint, finding it present in all areas that were sampled. In 5 of the 10 locations, the lead concentration was above the recommended action level of 500 ppm. This level does not represent an immediate health hazard, but will require contractors to consider personal protective gear and will warrant a full removal of the coatings if a facility renovation occurs.

Asbestos sampling at 5 locations was completed by Larkin Environmental Solutions. Three of those five locations were found to contain asbestos. Similar to the narrative on lead paint, this will require remediation if a renovation project occurs.

Sampling reports for both contaminants can be found in Appendix J and Appendix K of this report.

4.7 Historic Designation

ORPS2 was originally constructed in 1872, and it is listed as a historical site by the American Water Works Association. The criteria for this designation is detailed as follows:

1. An American, Canadian, or Mexican Water Landmark must be a tangible, physical property that has or has had a direct and significant relationship with water's supply, treatment, distribution, or technological development. It should be of a permanent and nonexpendable nature, such as a building, dam, reservoir, tower, etc., and not machinery or a natural water resource.

2. A water landmark must be at least 50 years old and be recognized within its own community or region as a popular, valued, or historically significant property. (Evidence of this recognition must be provided.)

3. It must be apparent that the Landmark candidate has been and will continue to be maintained in a manner appropriate to the status of an American, Canadian, or Mexican Water Landmark. (A clear, current, original photo of the candidate should be provided to demonstrate its condition.) The Landmark may be utilized in a manner other than its original purpose.

Photo 4.4: AWWA Landmark Marker

HDR pursued the significance of the historic designation for ORPS2 by the AWWA and discovered that it is an honorary recognition and does not limit how the facility can be altered. Further investigation of possible state or federal historic designations was conducted with the Newport Pumping Station not appearing on any listing by either entity.

4.8 Structural Evaluation

As part of the structural evaluation, key items identified that impacted the overall evaluation will be presented in the subsequent paragraphs.

- Structural evaluation performed is for continued use of the facility for its current purpose and at its current capacity.

- Evaluation of the station for an increased capacity (bigger pumps, piping, screens, inlet approaches, etc.) will require a detailed design approach for the re-modeled station. It is likely that the "drywell" could not fit 3 larger pumps and their suction piping so a re-engineered well (wet or dry) would need to be developed. This would involve very significant structural changes that would impact walls, supports, floors and be influenced by the sediment accumulation, flood levels, etc. The amount of variables involved requires a further detailing of design approach to affirm that the structure would be capable of accommodating the revised layout.

- Under any approach, it has been assumed that the external geometry of the pump station will not be altered, thus current code(s) requirements will not be impacted.

- Key finding from Thelen's plumbness review, the structure is not settling, racking, or leaning.

The structural review was performed during a two day site visit (July 23-24, 2013). HDR's lead structural engineer was present for the entire period. During this period, he was able to view the mezzanine, operating floor, drywell and portions of the wetwell lower levels. He was also present during the wetwell inspections performed by Marine Services, Inc. and went out onto the Ohio River with MSI to visually inspect the external perimeter of the facility. The following sections describe the relevant structural findings from these investigations. All photos referenced in this section are located at the end of the section.

Foundation System - The load bearing walls are constructed of stacked (lime) stone masonry, being tapered full height and perimeter. There are interior load bearing walls in the north-south direction, one directly under the interior wall separating the original boiler portion from the pump/dry and wetwell areas. Another interior below-floor wall was discovered under the boiler area which forms the midpoint support of a barrel roof/floor for the boiler area. Sporadic tie rods are visible on the masonry walls, for reinforcing or anchoring purposes.

The construction that was visible is overall very sound with localized areas missing mortar and sporadic vegetation growing from crevices *{photos 19, 18, 23, 25, 98}.* The MSI report indicates that mortar loss is approximately 10% of exposed surface area and depth up to 3 inches. Interior inspection of these was very limited due to access restrictions. The southern arch under the main partition wall appears to have a small vertical discontinuity *(photo 87)*, yet this keystone area appears undamaged. Crack noted in MSI report at South wall near

East corner had repairs made which appear to be sound, but as approach the water level this becomes degraded. This is directly above and the probable cause of the sheet piling and concrete wrap that was added decades ago. The West wall "apparent bulge" mentioned in the MSI was not obvious on the exterior *{photo 98}*; this wall is partially stabilized through the presence of tie rods.

Masonry Envelope – The above-floor walls are composed of several wythes of solid brick, averaging 22 to 24 inches total thickness at the floor level. The condition appears satisfactory, with no obvious cracks reflecting to the outside *{typical photo 26}.* The interior of these walls showed evidence of past cracking which appear to be inactive and found their "resting place" *{photos 93, 94}*. Arches over windows are in good condition as are the areas where wind forces tend to accumulate at the wall base *{photos 84, 29}.* Wood double hung windows are all in poor condition; their functionality was not tested.

Interior Separation Wall - This solid brick wall (slightly thinner than the exterior walls) had two of its arches blocked-in. Some past cracking is evident at the South end *{photos 86, 91, 04, 85}* but these are not active, since old repairs look undamaged *{photo 92}.*

Roof Structure - Iron (or steel) trusses form the main load carrying elements, with metal beams framing there into. Solid wood planking spams between the beams and supports the roofing system. The East structure was not visible due to presence of ceiling construction. Major issues were not discovered, except that the bottom chord of one truss has been laterally displaced, perhaps damaged during the removal or installation of the boilers *{photo 82)*; no related damage was visible on the exterior masonry. It is noted that during the site visit, evidence of recent non-structural roofing repairs were noted (as new wood planking was obvious).

Main Floor System West - This area was used as the boiler area and the floor condition was sound and durable, but irregular surface concrete. As discovered by MSI (Figure 1), this area is supported by two rows of barrel shaped arches with a center support wall to river bottom, creating a center and west wet well via the arched openings in all North/South interior walls.

Main Floor System Southeast - This structural elevated floor is the worst area of the facility. This pump room floor was mapped topographically, scanned for beam locations, cored for concrete strength evaluation, and viewed from underneath (see Thelen and MSI appendices). The underside condition of this elevated floor is locally very deteriorated concrete and steel is corroded, but extent unknown *{photos 79 and 86}.* Evidence of prior repairs to underside of slab were visible *{MSI page A-4, A-5, A-6 and photo 86}.* This area will require serious consideration for its future safe use, and that of the overall structure.

Dry Well - This area including the motor mezzanine appears serviceable for current functions. Steel framing for the motor area is in sound condition, though at time of visit these we not operational so the stiffness adequacy could not be determined.

The concrete walls are of thick stepped construction {*see Thelen drawings 4 and 5}* with intermediate grated platforms. Cores were taken from the walls for strength determination, and scans performed to locate rebar. The quality of the concrete appears to be good with strengths exceeding 4800 psi. Several areas had rebar exposed or so near to the surface that corrosion-induced expansion of the rebar caused concrete to delaminate and spall. The rebar was not significantly deteriorated *{photos 03, 30, 31}.*

Wetwell – Considering the age and construction of this area, the condition is unremarkable. Reference the MSI Appendix I pages 3 and 4. Any future in-depth investigations will be seriously impeded by the sedimentation build-up on the interior which makes access a challenge. The condition of the intermediate platforms accessible through the floor hatch is assumed to be perilous, based upon the underside of the first landing (elevation 483' +/-) below main floor level *{MSI page A-7}.* The landing at elevation 484' has significant loss of strength due to rebar corrosion of the pan construction. The concrete screen enclosure (tower) was in good condition.

Access Bridge - Structure is much newer and is in good condition, with painted steel girders. No corrosion is evident.

4.9 Condition Assessment Findings

Overall structural condition of the facility is serviceable for its existing purposes at its existing capacity except as noted in next paragraph. The MSI report indicated no unusual and critical findings except for the significant sediment accumulation in all wetwell chambers.

A primary safety concern is the main structural floor over the wetwell. The portion most obviously in distress is the Southeast quadrant of the pump station. The metal substructure is badly corroded and concrete deteriorated. The remaining quality of the concrete is poor, as evidenced by the petrographic result which indicates rebar corrosion has spalled concrete and created an atmosphere for alkali-silica reaction (ASR) process to accelerate cracking within the concrete. Quick action must be taken to restore this floor's structural integrity and function if continued use is expected.

The platforms and ladders leading into the wetwell are in need of replacement due to corrosion and overloaded conditions brought about by the high sedimentation build-up.

Roof structure inspection and some truss repairs should be scheduled, if the building is to remain in some form of long-term use. It would be advantageous to obtain an opinion of the roof's condition from the firm that had made the recent repairs thereto.

The stone foundation walls must have all vegetation removed, missing stone holes filled *{photo 21}* on both faces, and major mortar gaps repaired. Decades of water exposure (erosion) and freeze thaw cycles has removed some of the

mortar from the limestone joints. Though there is no immediate peril, the restoration of the pointing must be completed to prevent further degradation. There are a few recommendations for additional inspections should the facility be considered for continued use in any capacity.

- Vertical cracks in stone noted on the exterior of the Northeast and Southeast corners should be explored in detail to determine their significance and extent.
- Cracks noted above interior arches on MSI's Figure 3 should be closely inspected even though these are in extremely inaccessible locations, due to the bottom sediment preventing direct access.
- If the current dry pump pit be considered for a wetwell, additional petrographic work on the salvaged cores should be performed, as well as explorations to determine presence and reinforcing bar details along the outer surfaces of these concrete walls.

Do not remove the sediment in bottom of pump station unless absolutely necessary for pump suction. Build-up on the inlet trash rack should be removed as this restriction may affect pump operations.

The access bridge to the building needs to be rated for it safe capacity; hopefully drawings can be found.

4.10 Recommended Improvements for Long-Term Continued Use

The continued use of the Ohio River Pump Station No. 2 for long term will require a number of significant improvements to rehabilitate the structure into a facility that can be relied upon until at least 2060 and perhaps beyond. As noted in the previous articles, ORPS2 has many deficiencies. A complete rehabilitation of ORPS2 will be required in order to remedy these deficiencies as well as to bring the facility up to modern code and operations.

HDR's approach to the continued use of the facility was developed in order to mitigate many of the shortcomings of the existing facility while remaining within the current footprint. This limits the available options and does not result in a renovated facility that is equivalent in all aspects to the other alternatives. Certain limitations will always be present with ORPS2 if this alternative is selected for implementation.

In developing this alternative, HDR has tried to produce a facility that would have the following major attributes:

- Operating floor raised to 500-year flood elevation.
- Three pumps capable of supplying the 2060 demands installed in an arrangement that is compliant with Hydraulic Institute (HI) standards
- Balances structural and buoyant forces within the intake better than current approach
- Provides substantially upgraded screening and siltation control

In order to accomplish this, HDR determined that a conversion from hard suction piping to a wetwell approach would be necessary for the raw water pumps in order to install the larger units that would eventually be needed to produce higher flows. This approach would flood the facility in the lower areas of the northern portion of ORPS2 as shown in Figure 4.4. A number of additional improvements would be required as part of the rehabilitation of ORPS2 for continued long-term use. A portion of these improvements are identified below. See also Figures 4.1 through 4.4 for more details on the existing and proposed conditions at ORPS2. Appendix F provides full scale 24"x36" plots of Exhibits 4.1 through 4.4.

- Building structural/ masonry and mortar repairs to seal the building and strengthen the facility
- Coffer dam portions of the structure to reconstruct inlet, valving and screening in order to address zebra mussels and river siltation
- Demolition of appurtenances in lower level of traveling screen area (northeast chamber)
- Removal of accumulated sediment in northeast chamber but remaining material to stay as ballast.
- Installation of new concrete walls, columns and beams in lower level of northeast chamber similar to the 1942 construction project.
- Conversion to a wetwell inlet with multiple traveling screens and sediment control pumps similar to those at ORPS1
- While installing the new concrete in northeast section, raise the floor elevation to approximately 508.0 (or the 500-year flood level). Raise existing drywell walls to 508.0
- Raise windows and door openings to accommodate increased height of operating floor through cementitious infill of openings.
- New docks, hoisting, grating and walkways to accommodate access under normal operations and during flooding
- New pumping, motors, controls, SCADA and electrical service
- Install new electrical service to facility along with emergency generator assembly to provide reliable supply
- Improvements to HVAC to improve energy efficiency, extend facility life and upgrade working environment.

The improvements identified provide a conceptual blueprint to enable ORPS2 to remain in service. As noted previously, the structure is very old but is in acceptable condition for its service life. The extension of that service life will require significant investment into a 130 year old structure. HDR has prepared a preliminary estimate of costs for this alternative (Alternative C) which is shown in Table 4.14.1.

4.11 Short-Term (5-7 Year) Continued Operation

NKWD has also requested that HDR review the essential repairs that would be necessary to sustain a shorter service life for ORPS2. This type of approach would enable NKWD to remedy some deficiencies and keep ORPS2 in operation for another 5-7 years. This would bridge the gap between the deteriorating conditions that are currently present and the final construction and start-up of the long term water supply facility, whichever alternative might be eventually

selected. The improvements that have been identified in order to meet this goal are a reduced list of those identified in Section 4.10 and a portion are provided below.

- Remove vegetation from facility exterior and provide extensive internal/ external mortar repair.
- Replace existing intake coarse bar screen and inlet sluice gate.
- Provide temporary pumping/dewatering services and construct a coffer dam to facilitate removal of sluice gate, etc.
- Replace existing suspended concrete operating floor in northeast portion of facility that has been subject to ASR.
- Repair/replace multiple ladders and walking platforms.
- Temporarily relocate permanganate feed system during construction and then replace after floor construction.
- General operator safety improvements (access openings, safety gates, etc.).
- Replacement of all primary (large) windows.
- Miscellaneous decommissioning of non critical facilities (bathroom, etc.)
- Miscellaneous masonry repairs

The costs associated with these proposed short-term improvements are provided in Table 4.14.2. This list does not address any improvements that would be directed toward the re-programming of the facility. For the purpose of this study, it is assumed that NKWD would either retain ownership of the facility or look to sell it. Either option will require additional improvements be made to the facility along with regular maintenance.

4.12 Hydraulic Analysis – Raw Water Transmission Line

Appendix C, Part 3 (as well as Section 3.4A) provide a detailed review of the hydraulic capabilities of the existing raw water transmission mains (20” and 24”) between ORPS2 and MPTP. The analysis reflects the information known to date and was generally validated with field operating information provided by NKWD staff. Performance of the model generally aligns with system conditions and performance. Based on the model results and field correlation, a few key findings include:

- C factors as low as 70 are likely to be present in certain line segments, especially the 20” CI line installed during the original 1872 construction of ORPS2.
- Velocities above 12 fps are present at the 12,000 GPM flow rate leading to significant head (and energy) loss as well as increased line pressure and pipe stress. This rate corresponds with 15 hour pumping at the 2030 flow projections.
- At the higher flow rates projected for beyond, the conditions are exacerbated.

It is evident that NKWD will need to construct a supplemental raw water line to MPTP in order to reduce velocities and pipe pressures to acceptable levels. This new raw water transmission line is likely to be sized at 36” or greater to meet the

flow needs identified for 2050 and beyond. Further development of this infrastructure is beyond the scope of this study.

4.13 Permitting Requirements

Table 4.13.1 summarizes the anticipated permits and projected review times for this pumping station alternative ‘C’.

TABLE 4.13.1
SUMMARY OF REQUIRED PERMITS FOR PUMPING ALTERNATIVE 'C'

#	PERMIT NAME	REVIEW AGENCY	EST. REVIEW TIME (MO.)	PS OPT C
1	Local Housing and Building Permit	NEWPORT	3	X
2	Railroad Encroachment/Crossing Permit	CSX	3-6	
3	Railroad Parallelism Permit	CSX	6-12	
4	Kentucky Department of Fish and Wildlife Resources Concurrence	KDFWR	1-2	
5	Kentucky Department of Highways Encroachment Permit	KDOH	2-4	
6	Kentucky Heritage Council Concurrence	KHC	1-2	
7	Kentucky Housing and Building Permit	KY HBC	2-4	X
8	Notice of Intent (NOI) for coverage of Storm Water Discharge under KPDES KYR10	KYDOW	1	
9	Section 401 Water Quality Certification	KYDOW	2-3	
10	Floodplain Construction Permit	KYDOW	2-3	
11	Drinking Water Construction Permit	KYDOW	2-3	X
12	No Rise Certificate	KYDOW	2-3	
13	Elevation Certificate	KYDOW	2-3	
14	Section 404 Floodplain Permit	USACE	2-3	
15	Section 10 Permit (for Navigable Waters)	USACE	3-4	
16	Individual Floodplain Permit	USACE	6-12	
17	US Fish and Wildlife Service Concurrence	USFWS	1-2	

DESCRIPTION OF PUMP STATION (PS) OPTIONS:

PS OPTION A - RETIRE ORPS2 AND SUPPLY MPTP FROM ORPS1

PS OPTION B - REPLACE ORPS2 WITH NEW FACILITY

PS OPTION C - REHABILITATE AND UPGRADE ORPS2

4.14 Cost

The engineer's preliminary opinions of probable project cost for the rehabilitated and upgraded facility for a +/-50 year life as well as a +/-10 year short term life are provided in Tables 4.14.1 and 4.14.2 respectively.

TABLE 4.14.1

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

PUMPING ALTERNATIVE C - REHABILITATION OF EXISTING ORPS2 FACILITY

#	ITEM	QTY	UNITS	UNIT PRICE	AMOUNT
	SITE				
1	Site earthwork - excavation and regrade	1,500	CY	$ 25.00	$ 37,500.00
2	Excavation - mechnical	1,000	CY	$ 50.00	$ 50,000.00
3	Excavation - rock	1,000	CY	$ 150.00	$ 150,000.00
4	Sheet piling for coffer dam - partial around intake	10,000	SF	$ 100.00	$ 1,000,000.00
5	Isolation valves and valve vault	1	LS	$ 50,000.00	$ 50,000.00
6	Site utilities relocation - raw water discharge line	400	LF	$ 350.00	$ 140,000.00
7	Site utilities relocation - power	1	LS	$ 50,000.00	$ 50,000.00
8	Site utilities relocation - water	1	LS	$ 25,000.00	$ 25,000.00
9	Site utilities relocation - gas	1	LS	$ 25,000.00	$ 25,000.00
10	Site access and parking base and surface stone	600	TONS	$ 25.00	$ 15,000.00
11	Site access and parking asphalt pavement	650	SY	$ 50.00	$ 32,500.00
12	Site drainage 30"x30" precast concrete box culverts	300	LF	$ 300.00	$ 90,000.00
13	Bridge Improvements	1	LS	$ 200,000.00	$ 200,000.00
14	Connection to existing water mains	1	EA	$ 50,000.00	$ 50,000.00
15	Reinforced concrete foundation for emergency generator (incl piles)	1	LS	$ 500,000.00	$ 500,000.00
	SUBTOTAL				**$ 2,415,000.00**
	PUMPING STATION - STRUCTURE				
1	Demo Existing Screen/Sluice Gate/Channel/Lower Walkways	1	LS	$ 325,000.00	$ 325,000.00
2	Miscellaneous Demolition in Drywell/Remaining Areas	1	LS	$ 200,000.00	$ 200,000.00
3	Cast in place concrete walls, floors and channels	2,000	CY	$ 1,500.00	$ 3,000,000.00
4	Cast in place concrete stairs/ramps	75	CY	$ 1,000.00	$ 75,000.00
5	Inlet Renovations to address Mussels/Corrosion/Screening	1	LS	$ 475,000.00	$ 475,000.00
6	36" cored opening through Drywell Wall	2	EA	$ 40,000.00	$ 80,000.00
7	Solids Removal & Disposal from Partial Lower Station Level	2,000	CY	$ 350.00	$ 700,000.00
8	Masonry Repair on Structure	1	LS	$ 450,000.00	$ 450,000.00
9	Roofing Repairs	4,000	SF	$ 75.00	$ 300,000.00
10	Mezzanine Floor Renovations	1	LS	$ 250,000.00	$ 250,000.00
11	Grating and Catwalks	800	SF	$ 50.00	$ 40,000.00
12	Floor hatches	2	EA	$ 15,000.00	$ 30,000.00
13	Hoisting Improvements - 10 ton	1	LS	$ 75,000.00	$ 75,000.00
14	Hydraulic Lift	1	LS	$ 50,000.00	$ 50,000.00
15	Handrails	1,000	LF	$ 50.00	$ 50,000.00
16	Fixed ladders with safety cages	350	LF	$ 75.00	$ 26,250.00
17	Repainting	1	LS	$ 400,000.00	$ 400,000.00
18	Architectural doors and windows (int & ext)	1	LS	$ 125,000.00	$ 125,000.00
19	Overhead doors	1	LS	$ 15,000.00	$ 15,000.00
	SUBTOTAL				**$ 6,666,250.00**
	PUMPING STATION - EQUIPMENT				
1	Vertical turbine raw water pump (motor, pipe column, etc.)	3	EA	$ 350,000.00	$ 1,050,000.00
2	Traveling screen assemblies	3	EA	$ 250,000.00	$ 750,000.00
3	3'x3' sluice gate with electric actuator	3	EA	$ 75,000.00	$ 225,000.00
4	6" submersible solids handling sump pump and controls	4	EA	$ 35,000.00	$ 140,000.00
5	Double walled chemical containment tank	3	EA	$ 20,000.00	$ 60,000.00
6	Chemical metering pump and controls	9	EA	$ 15,000.00	$ 135,000.00
7	Flow meter	3	EA	$ 20,000.00	$ 60,000.00
8	Air blowers and controls for diffusers	2	EA	$ 50,000.00	$ 100,000.00

TABLE 4.14.1 (CONTINUED)

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

PUMPING ALTERNATIVE C - REHABILITATION OF EXISTING ORPS2 FACILITY

#	ITEM	QTY	UNITS	UNIT PRICE	AMOUNT
9	Coarse bubble diffuser racks in wetwell/intake culverts	400	LF	$ 50.00	$ 20,000.00
10	Hoisting system upgrades	1	LS	$ 50,000.00	$ 50,000.00
11	Emergency Generator Set	1	LS	$ 1,250,000.00	$ 1,250,000.00
12	Switchgear (Generator and PS) and electrical components	1	LS	$ 850,000.00	$ 850,000.00
13	SCADA modifications (PS and Flow vault)	1	LS	$ 200,000.00	$ 200,000.00
14	Electrical Conduits, Conductors, and Appurtenances	1	LS	$ 250,000.00	$ 250,000.00
	SUBTOTAL				**$ 5,140,000.00**
	PUMPING STATION - PIPING AND APPURTENANCES				
1	Check and isolation valves	1	LS	$ 150,000.00	$ 150,000.00
2	Surge valving and air release assemblies	1	LS	$ 75,000.00	$ 75,000.00
3	Discharge Piping to Yard Piping connection	1	LS	$ 25,000.00	$ 25,000.00
5	Air purge system	3	EA	$ 10,000.00	$ 30,000.00
6	Chemical line installation	3	EA	$ 10,000.00	$ 30,000.00
	SUBTOTAL				**$ 310,000.00**
	PUMPING STATION - MISCELLANEOUS				
1	Dewatering/Temporary Pumping	1	LS	$ 250,000.00	$ 200,000.00
	SUBTOTAL				**$ 200,000.00**
	GENERAL				
1	Electrical /Instrumentation/Misc. Controls	1	LS	$ 1,031,187.50	$ 1,031,187.50
2	Mechanical/HVAC/Plumbing	1	LS	$ 441,937.50	$ 441,937.50
3	Miscellaneous Construction	1	LS	$ 1,473,125.00	$ 1,473,125.00
4	Mobilization/Demobilization	1	LS	$ 294,625.00	$ 294,625.00
5	General Conditions	1	LS	$ 294,625.00	$ 294,625.00
6	Contractor O&P	1	LS	$ 2,209,687.50	$ 2,209,687.50
7	DUKE Energy Distribution System Enhancements	1	LS	$ 250,000.00	$ 250,000.00
	SUBTOTAL				**$ 5,995,187.50**
	TOTAL PROBABLE CONSTRUCTION COST				**$ 20,726,437.50**
1	CSX Permitting Fees	1	LS	$ 5,000.00	$ 5,000.00
2	CSX Flagging and Inspection Services	1	LS	$ 5,000.00	$ 5,000.00
3	Engineering and Construction Services	1	LS	$ 2,487,172.50	$ 2,487,172.50
4	Legal/Property/Admin	1	LS	$ 103,632.19	$ 103,632.19
5	Resident Inspection	1	LS	$ 621,793.13	$ 621,793.13
6	Contingency	1	LS	$ 2,072,643.75	$ 2,072,643.75
	TOTAL PROBABLE PROJECT COST				**$ 26,021,679.06**

TABLE 4.14.2

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

PUMPING OPTION C - SHORT TERM REHABILITATION OF EXISTING ORPS2 FACILITY

#	ITEM	QTY	UNITS	UNIT PRICE	AMOUNT
	SITE				
1	Site earthwork - excavation and regrade	1,000	CY	$ 25.00	$ 25,000.00
2	Sheet piling for coffer dam - partial around inlet/screen	3,000	SF	$ 100.00	$ 300,000.00
	SUBTOTAL				**$ 325,000.00**
	PUMPING STATION - STRUCTURE				
1	Demo Existing Sluice Gate/Lower Walkways	1	LS	$ 50,000.00	$ 50,000.00
2	Miscellaneous Demolition in Drywell/Remaining Areas	1	LS	$ 100,000.00	$ 100,000.00
3	Cast in place concrete walls, floors, channel and inlet	120	CY	$ 1,500.00	$ 180,000.00
4	Coarse Screen/Sluice/Inlet Renovations to address Mussels/Corrosion	1	LS	$ 175,000.00	$ 175,000.00
5	Solids Removal & Disposal from Partial Lower Station Level	100	CY	$ 350.00	$ 35,000.00
6	Masonry Repair on Structure	1	LS	$ 250,000.00	$ 250,000.00
7	Mezzanine Floor/Stairwell/Elevator Renovations	1	LS	$ 50,000.00	$ 50,000.00
8	Grating and Catwalks	275	SF	$ 50.00	$ 13,750.00
9	Replacement Windows	18	EA	$ 7,000.00	$ 126,000.00
	SUBTOTAL				**$ 979,750.00**
	PUMPING STATION - MISCELLANEOUS				
1	Dewatering/Temporary Pumping	1	LS	$ 75,000.00	$ 75,000.00
2	Temporarily Relocate Permanganate Feed During Construction, then Restore to Original Location	1	LS	$ 30,000.00	$ 30,000.00
	SUBTOTAL				**$ 105,000.00**
	GENERAL				
1	Electrical / Misc.	1	LS	$ 56,390.00	$ 56,390.00
2	Mechanical/HVAC/Plumbing	1	LS	$ 42,293.00	$ 42,293.00
3	Miscellaneous Construction	1	LS	$ 140,975.00	$ 140,975.00
4	Mobilization/Demobilization	1	LS	$ 42,293.00	$ 42,293.00
5	General Conditions	1	LS	$ 42,293.00	$ 42,293.00
6	Contractor O&P	1	LS	$ 211,463.00	$ 211,463.00
	SUBTOTAL				**$ 535,707.00**
	TOTAL PROBABLE CONSTRUCTION COST				**$ 1,945,457.00**
1	Engineering and Construction Services	1	LS	$ 151,163.00	$ 151,163.00
2	Legal/Admin	1	LS	$ 20,000.00	$ 20,000.00
3	Resident Inspection	1	LS	$ 91,437.00	$ 91,437.00
4	Contingency	1	LS	$ 291,943.00	$ 291,943.00
	TOTAL PROBABLE PROJECT COST				**$ 2,500,000.00**

Overall SE 11

East at North 19

East Wall 18

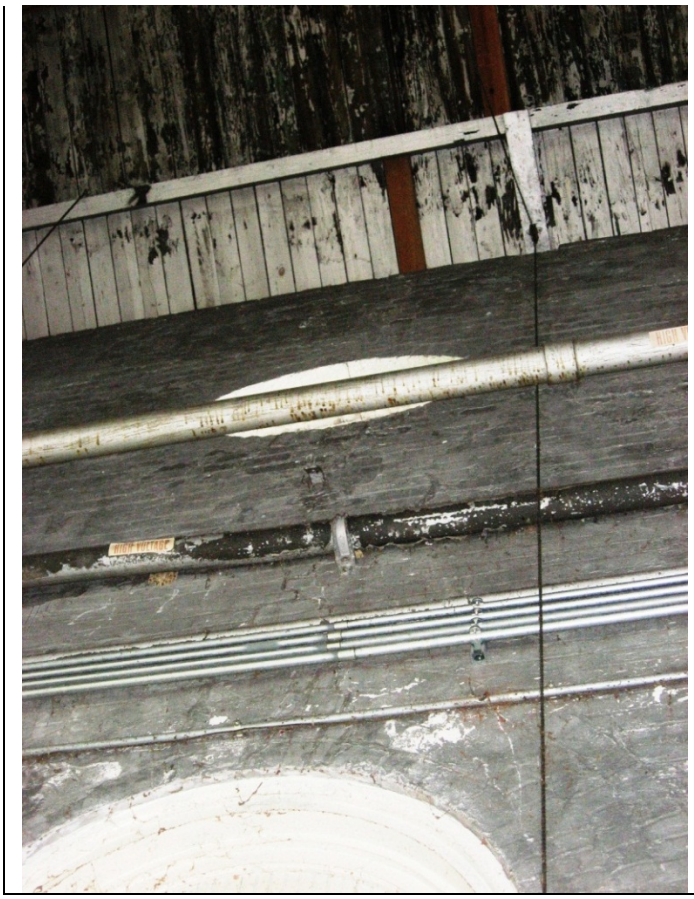
North at East 23

North Wall 25

West Wall Under Bridge 98

South Arch 87

North Wall 26



Inactive Crack 84

Inactive Crack 93

Inactive Crack 94

Inactive Crack 29

Center Wall South 86

Center Wall 92

		
Center Wall South End 91		Center Wall South End Look West 04

Ctr Wall Reflected Crack 85

Roof West 82

Slab Underside 79

Overall Underside 86

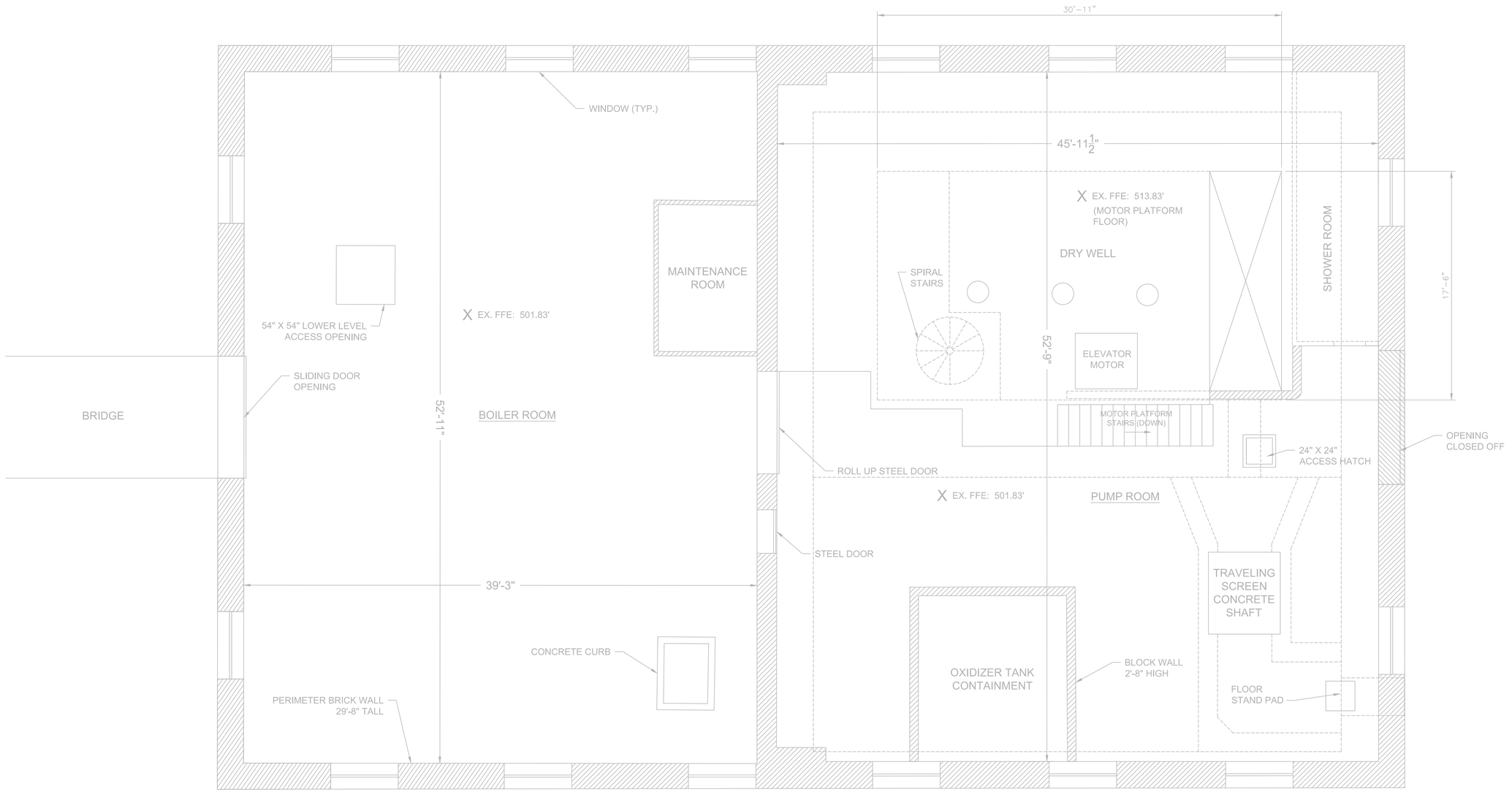
Mezz Underside 02

North Wall 03

North Wall 30

North Wall 31

East at North 21



ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRENT TIPPEY
DRAWN BY	BDF
PROJECT NUMBER	215004

Northern Kentucky Water District

OHIO RIVER PUMPING STATION #2
CONDITION ASSESSMENT AND OPTION EVALUATION

ALT. C - REHABILITATE AND UPGRADE ORPS2

EXISTING ORPS2 PUMP STATION
EXISTING OPERATING FLOOR PLAN

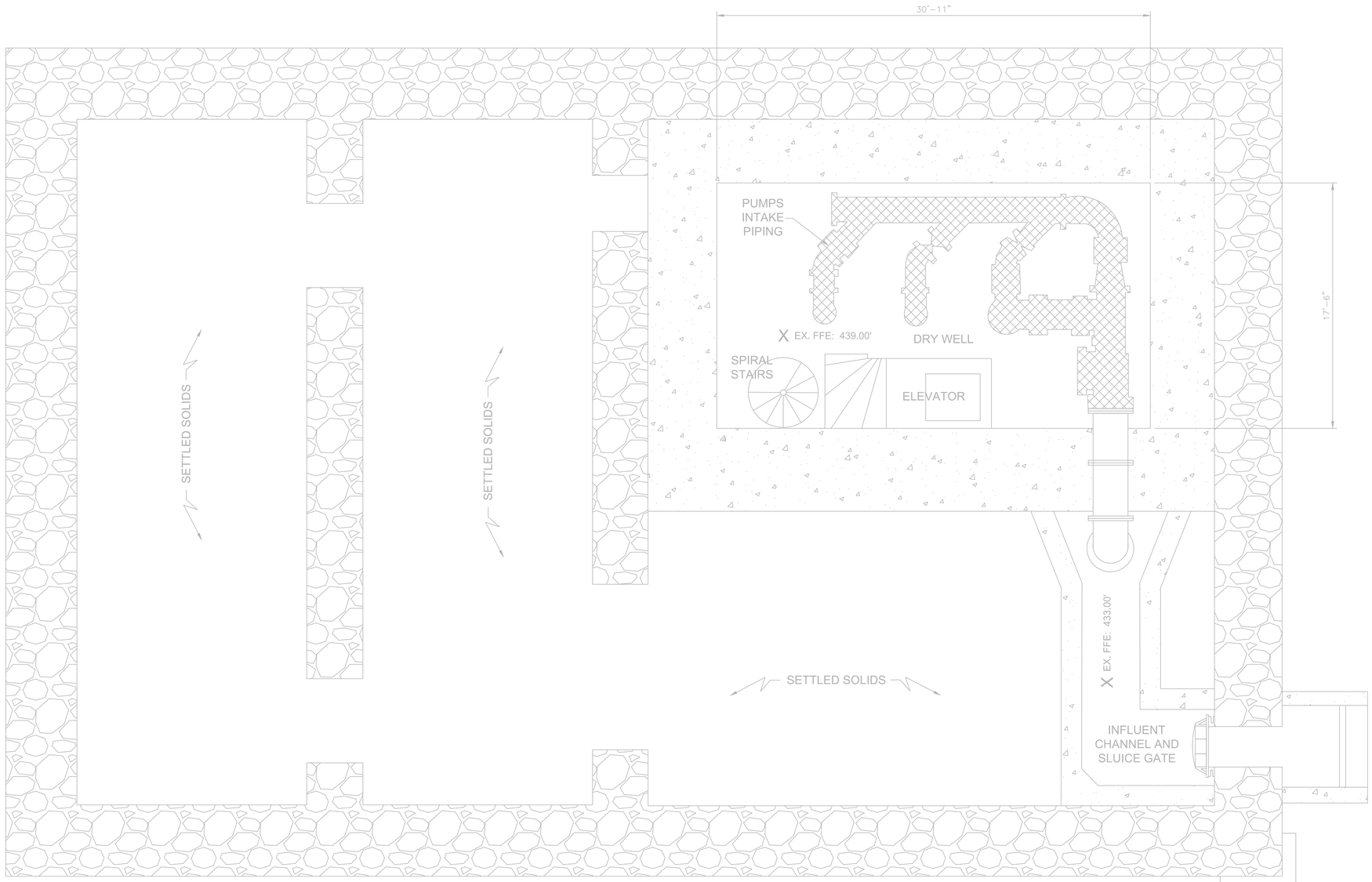
0 1" 2"

FILENAME

SCALE 1/4" = 1'

SHEET **FIG. 4.1**

SCALE IS GRAPHICAL. A FULL SIZED 24x36 PLOT OF THIS FIGURE IS REPRODUCED IN APPENDIX F.



PROJECT MANAGER	BRENT TIPPEY	
DRAWN BY	BDF	
ISSUE	DATE	DESCRIPTION
PROJECT NUMBER	215004	

OHIO RIVER PUMPING STATION #2
CONDITION ASSESSMENT AND
OPTION EVALUATION

ALT. C - REHABILITATE AND UPGRADE ORPS2

EXISTING ORPS2 PUMP STATION
EXISTING LOWER FLOOR PLAN

0 1" 2"

FILENAME

SCALE 1/4" = 1'

SHEET

FIG. 4.2

SCALE IS GRAPHICAL. A FULL SIZED 24x36 PLOT OF THIS FIGURE IS REPRODUCED IN APPENDIX F.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRENT TIPPEY
DRAWN BY	BDF
PROJECT NUMBER	215004

Northern Kentucky Water District

OHIO RIVER PUMPING STATION #2
CONDITION ASSESSMENT AND OPTION EVALUATION

ALT. C - REHABILITATE AND UPGRADE ORPS2

EXISTING ORPS2 PUMP STATION
PROPOSED OPERATING FLOOR PLAN

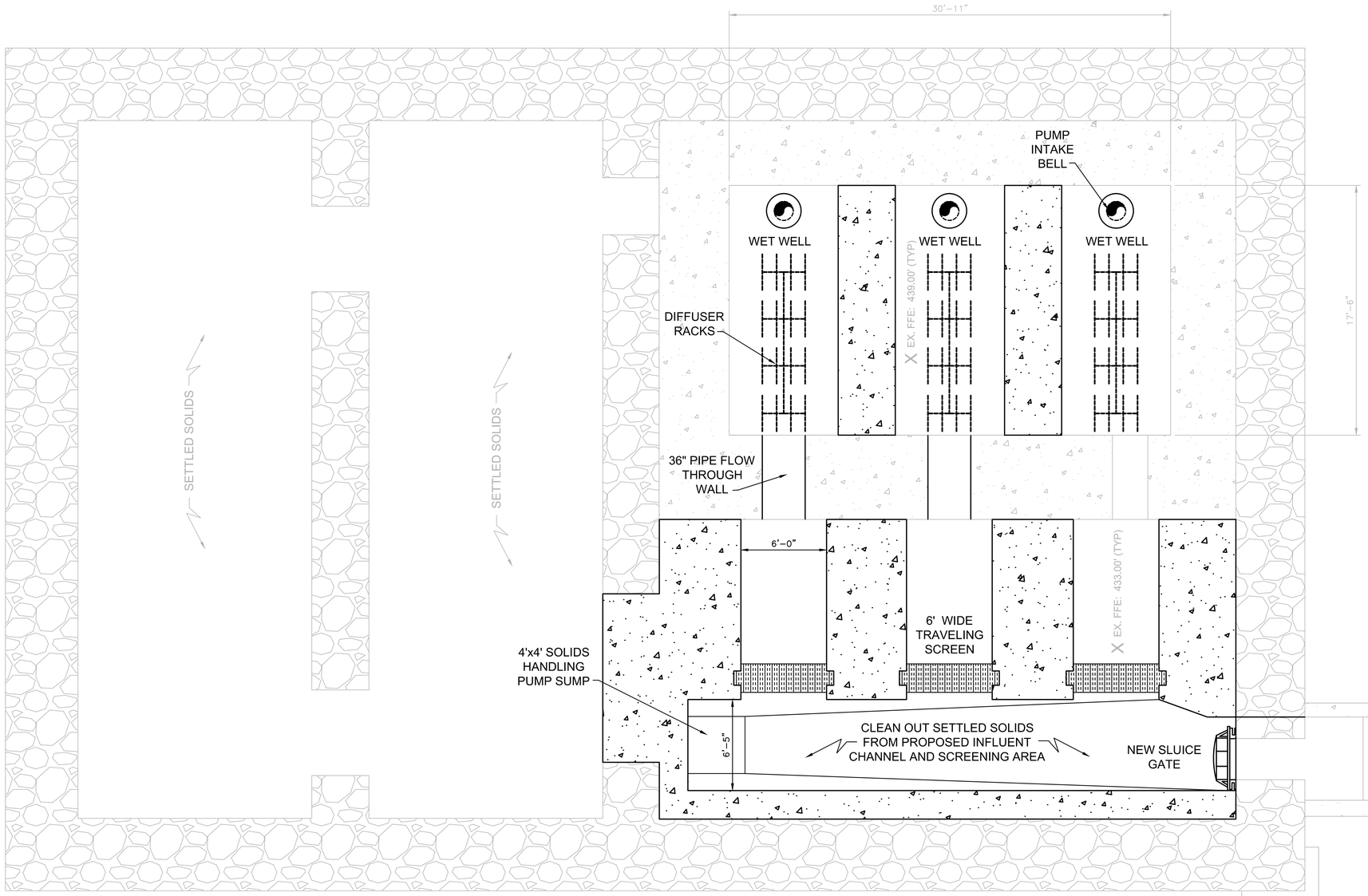
0 1" 2"

FILENAME

SCALE 1/4" = 1'

SHEET **FIG. 4.3**

SCALE IS GRAPHICAL. A FULL SIZED 24x36 PLOT OF THIS FIGURE IS REPRODUCED IN APPENDIX F.



PROJECT MANAGER	BRENT TIPPEY
DRAWN BY	BDF
PROJECT NUMBER	215004

ISSUE DATE DESCRIPTION

Northern Kentucky Water District

OHIO RIVER PUMPING STATION #2
CONDITION ASSESSMENT AND OPTION EVALUATION

ALT. C - REHABILITATE AND UPGRADE ORPS2

EXISTING ORPS2 PUMP STATION
PROPOSED LOWER FLOOR PLAN

0 1" 2"

FILENAME

SCALE 1/4" = 1'

SHEET **FIG. 4.4**

SCALE IS GRAPHICAL. A FULL SIZED 24x36 PLOT OF THIS FIGURE IS REPRODUCED IN APPENDIX F.

Case No. 2016-00303
Exhibit A.3

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Project Map


Ohio River Pump
Statoin No. 2
MEMORIAL PKWY
WATERWORKS RD
WATERWORKS RD
DIXIE PL
N FT THOMAS AVE
FAIRFIELD PL
WILSON RD
TAYLOR AVE
MAYO AVE
MAINE AVE
PARK PL
OAK RDG
BURNET RDG
LESTER LN
LESTER LN
NEWMAN AVE
OHIO AVE
INDIANA AVE
N FT THOMAS AVE
MEMORIAL PKWY
WOODSIDE PL
STERLING AVE
DUPRIES AVE
BURNET RDG
HENRY AVE
HOLMES AVE
BLUE GRASS AVE
HIGHVIEW DR
DAISY LN
FOREST AVE
LUMLEY AVE
MILLER LN
S SHAW LN
AZALEA TER
DIANA CT
LAC LN
N GRAND AVE
WOODLAND PL
MAYFIELD AVE
SWEETBRIAR AVE
JAMES AVE
RIVERVIEW AVE
HIGHLAND AVE
GADDIS DR
MT VERNON LN
CHALFONTE PL
AVENEL PL
MANOR LN
GLENWAY AVE
MADONNA PL
WILBERS LN
GREENWOOD AVE
I471 US27 RAMP S
TREMONT AVE
W VILLA PL
AVON PL
WILLOW DR
KLAINECREST AVE
ALTAMONT CT
CROWN AVE
MARY INGLES HWY
GARDEN WAY
SUMMIT AVE
BURNEY LN
LOCKWOOD PL
HOLIDAY LN
US27 I471 RAMP N
SHARON PL
MILITARY PKWY
CLITZ ST
CLARA VW
ARCADIA AVE
TOWER PL
GREENE ST
TOWER PL
MILITARY PKWY
COCHRAN AVE
ALEXANDRIA PIKE
SOUTHVIEW AVE
GARRISON AVE
GRANDVIEW AVE
SHAWNEE AVE
SERGEANT AVE
BLOSSOM LN
S PINNACLE DR
WARREN ST
BRENTWOOD PL
RIVER RD
MARY INGLES HWY
BLOSSOM LN
FAIRWAY DR

Case No. 2016-00303
Exhibit A.4

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Basis of Design Report

Northern Kentucky Water District

OHIO RIVER PUMPING STATION #2
STRUCTURAL REHABILITATION

BASIS OF DESIGN
TECHNICAL MEMORANDUM

WadeTrim

April 18, 2016

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1.0 INTRODUCTION AND BACKGROUND

The Northern Kentucky Water District (NKWD) acquired the Ohio River Pumping Station Number 2 (ORPS2), along with the Memorial Parkway Treatment Plant (MPTP) and other associated appurtenances from the City of Newport, Kentucky in 2002. The pumping station has been in service since 1872, and is located along Mary Ingles Highway in the City of Fort Thomas (see Exhibit 1). Since placement into service, ORPS2 has continued to provide raw water from the Ohio River to the MPTP for treatment before distribution to customers. The ORPS2 facility has undergone several interior modifications, but the exterior character and primary purpose of the building has not changed in 144 years.

As with any structure, maintaining the condition of the facility is important to the overall function, and provides a reliable and safe environment for staff members accessing the equipment. In the case of the ORPS2, NKWD conducted an assessment of the facility in 2014 and 2015 to ascertain the condition of the existing building and to determine the available options for providing raw water to the MPTP. The options considered: modifying the ORPS1 facility, replacement of the ORPS2 with a new adjacent structure, and the upgrade to the existing ORPS2 facility.

All three options had significant cost and schedule implications. Because the existing building has some structural reliability concerns, NKWD decided to pursue a solution to address the immediate problems while the long term options are considered. This Basis of Design (BOD) technical memorandum (TM) describes the proposed improvements for the near term upgrades of which identifies replacement of the operating room floor, repair of the foundation, upgrade of the windows, and replacement of several mechanical components.

The project has several unique components. Some of the work occurs below the normal Ohio River elevation and in areas requiring confined space entry. Because the facility is surrounded by the Ohio River on three sides, performing the work will require contractors to think creatively relative to importing materials and conducting exterior improvements. Additionally, the facility must provide continuous service during the peak summer months, requiring the contractor to carefully plan and execute the work.

2.0 PROPOSED IMPROVEMENTS

The project includes the upgrade or replacement of several different components associated with the proposed ORPS2 facility improvements, and the options considered are discussed below.

2.1 Trash Rack Replacement

The existing trash rack located on the inlet conduit for the ORPS2 facility consists of vertically installed railroad track based on the 1962 record drawings. The actual spacing between the bars is unknown at this time due to corrosion of the metal and the encrusting of zebra mussels. During the dive inspection performed in July 2013, it was estimated the mussels have decreased the available open space by 80 to 90 percent. As a result, the trash rack will be replaced by this project. Exhibit 3 indicates the location of the trash rack within the influent conduit.

The purpose of the trash rack is to keep large debris (logs, boulders, etc.) from entering the wet well and potentially damaging the traveling screen, valves, piping and pumps. The trash rack is a static construction, meaning there are no moving components, but the bars and frame should be reasonably accessible to allow for checking of the condition and to perform routine maintenance. The new trash rack will mount to the interior walls of the inlet conduit. Because the type and condition of the conduit interior is not known, the fabrication should be sufficiently flexible to accommodate adjustment. Additionally, it is recommended to consider including a bidding allowance to address unforeseen conditions that typically arise with modifications to older facilities.

While the need to replace the trash rack is without question, the options for replacement materials are varied. The new rack should be capable of resiliently resisting debris impact with minimal damage. In addition, the fabrication should resist zebra mussel attachment. Table 1 lists several available options along with the advantages and disadvantages.

Table 1 – Trash Rack Alternative Materials

Materials	Advantages	Disadvantages
Fiberglass Reinforced Plastic (FRP)	• Lighter weight fabrication • Easier installation	• Impact durability • Zebra mussel attachment
Ferrous Metal Fabrication (Carbon Steel, Stainless, etc.)	• Impact durability • Common material	• Heavier fabrication • Zebra mussel attachment • Carbon steel will corrode
Silicone Coated Ferrous Metal Fabrication	• Good zebra mussel resistance • Coating can be field applied with standard equipment • Products are common in marine applications	• Heavier fabrication • Field modification requires applying coating in field • Coating impact durability • Coating service life
Copper Infused Coating of a Ferrous Metal Fabrication	• Good zebra mussel resistance • Impact resistance	• Heavier fabrication • Field modification requires applying coating in field • Coating impact durability • Coating service life
Z Alloy Metal Fabrication (Copper)	• Good zebra mussel resistance • Similar impact durability to ferrous fabrications • Field modification	• Highest material cost • Heavier fabrication

<u>Recommendation</u>

Zebra mussels will continue to be an issue for NKWD for the foreseeable future. The new trash rack should be reasonably resistant to the attachment of the species, but capable of withstanding the impact of large debris. Coatings do present a more cost effective means of addressing the zebra mussel problem, but the inaccessible location of the trash rack limits the ability of the NKWD to remove the unit, inspect/clean, and reapply the coating. For the ORPS2 facility, the use of Z-Alloy provides a robust fabrication with good mussel repelling qualities. A Z-Alloy trash rack can be periodically inspected by a dive team to check for damage and to confirm whether aquatic organisms are attaching to the bars. The new trash rack would be located at the same location within the influent conduit as the existing trash rack.

2.2 Sluice Gate Replacement

The existing sluice gate is inoperable and the slide is no longer connected to the frame. Photos in the dive inspection report show the gate slide sitting on the wall at elevation 471.0 feet, and the gate stem is bent. Record drawings from 1962 show the installation of the sluice gate on a new wall mounted thimble. The condition of the thimble is unknown, and whether the existing sluice gate frame is still mounted to the thimble is unknown. Exhibit 3 indicates the location of the proposed sluice gate in relation to the trash rack and inlet suction valve replacement.

Figure 1 - Photo of existing sluice gate from dive inspection (photo by Marine Solutions Inc. (MSI))

The condition of the existing electric motor actuator is unknown, but given the unit was installed in 1962, the unit is beyond its expected service life. The existing pedestal was installed at the same time as the gate and actuator, and should also be replaced. There is a disconnect switch in the existing motor control center located at elevation 513.83. However, the switch is outside the line of sight requirement for current 480 volt equipment installations.

The original design condition for differential head across the gate is unknown. The 100 year flood elevation for the Ohio River at this location is approximately 499.5, but the 1937 flood generated a water surface elevation of 512.32. Given the normal pool elevation of 455, it is possible, however unlikely, to create an unseating head condition greater than 55 feet. As such, various manufacturers (Rodney Hunt, Coldwell-Wilcox) recommended utilizing a traditional cast iron sluice gate in lieu of fabricated stainless steel.

Recommendations for design of the proposed replacement sluice gate:

- Use a design unseating head condition of 60 feet for a cast iron sluice gate in accordance with American Water Works Association Standard C507.
- Provide an opening in the floor above the gate for removal and replacement. The opening would be covered with grating or plate.
- The new gate and frame will be wider than the existing three foot opening to avoid the existing wall thimble.
- New electrical conduit and conductor should be installed from the motor control center to the actuator. The actuator will have a self-contained starter and a local disconnect switch.
- A new floor mounted pedestal will be provided.
- Rodney Hunt and Coldwell-Wilcox were contacted about providing a quote for the sluice gate materials. Both manufacturers are represented in the Cincinnati marketplace, and Coldwell-Wilcox manufactures their products in Cincinnati.
- Include a provisional allowance within the budget to address unforeseen conditions.

2.3 Inlet Valve Replacement

An existing 30-inch diameter butterfly valve isolates the pump suction piping from the wet well channel. The valve, located adjacent to the south wall of the pump dry well, has flanged connections on both sides, but the condition of the piping, flanges, bolts, and nuts is unknown. The existing valve is manually actuated by a vertically mounted handwheel. The condition of the valve and actuator is unknown, and NKWD is unsure as to when the valve was last operated. It is also unknown whether the valve would create a water tight seal if closed. Regardless of condition, the valve requires replacement. Exhibit 3 indicates the location of the proposed inlet suction valve in relation to the trash rack and sluice gate replacement.

Replacement of the valve will require the pumps to be turned off for the duration of the work. Discussions with NKWD, indicate the MPTP could be taken offline for up to for up to 30 days, which should be adequate. The work would have to be scheduled during the off peak months between October and April. In addition to stopping the pumps, the contractor will need to temporarily isolate the pump suction from the river. It may be possible to isolate the pumps from the river once the new sluice gate is installed. However, it should also be feasible to install an inflatable plug in the suction bell piping with submersible pumps in the influent channel to

provide isolation while the valve was replaced. The existing overhead crane should be available to the contractor to remove and replace the valve.

Recommendations for design of the proposed replacement butterfly valve:

- The new valve will have a rubber seat, manufactured in accordance with American Water Works Association Standard (AWWA) C504.
- The new valve will have a 40 pound rim pull for the handwheel actuator.
- NKWD has stated a manufacturer's preference for Dezurik Valves. Pricing has also been obtained from Crispin Valves (K-Flo) for comparison. The pricing was similar.
- Include a provisional allowance within the budget to address unforeseen conditions.

2.4 Wet Well Platform Replacement

The existing ladders and platforms which allow personnel to enter the wet well from the operating room floor are in need of replacement. The concrete platforms, metal railings and ladders are in poor condition based on the observations made during the condition assessment of the ORPS2 facility (see Figure 2). Handrails are not present at the perimeter of all platforms (see Figure 3). The damp atmosphere and occasional inundation due to river flooding generates an environment conducive for corroding ferrous materials.

The demolition of the existing platforms and ladders may require the pump station to be removed from service. This will minimize the possibility of demolition debris from entering the pump suction and damaging the equipment. All of the existing platforms, railings and ladders must be removed from the wet well and disposed offsite. Depending on the selected floor repair alternative, it may be possible for the contractor to concurrently perform the platform and floor demolition.

Accessing the wet well is by confined space entry permit. The platforms and ladders should be configured for ease of entry into the wet well with traditional diving gear that utilizes a compressed air hose and helmet. New platforms and ladders should accommodate the anticipated weight associated with this activity.

Figure 2 - Underside of platform at Elevation 483.4 (Photo by MSI)

Figure 3 - Platform at Elevation 471.0 (Photo by MSI)

Because the platforms are solid, mud accumulates on the surface when the river is at flood stage. The mud is currently several inches thick and presents a structural concern due to this additional weight. Constructing the new platforms out of grating would minimize the potential for mud accumulation, and cleaning the grating would be easier than a solid platform floor.

The relative size and location of proposed platforms and ladders is shown on Exhibit 4.

Recommendations for design of the proposed replacement platforms:

- Existing accumulated mud will remain in the wet well. Mud on the platforms to be removed will be deposited into the wet well outside of the inlet channel.
- New ladders and platforms will be fiberglass reinforced plastic (FRP) construction with open grating.
- Platforms and ladders are primarily provided for access to the inlet channel.

- Platforms and ladders will include NKWD preferences regarding details in accordance with applicable OSHA requirements.

2.5 Window Replacement

ORPS2 has several existing windows that appear to be original to the building. Exhibit 2 shows a plan view of the main floor, and indicates the location of the windows around the building perimeter. The windows consist of three types described below.

Type 1: There are 16 large (5' wide x11' tall), single hung, rectangular windows (6 on each north and south wall, 2 on each east and west wall) with mullions that appear to be from the original construction. Many of these units do not function (either open, or stay open) properly, lack insect screens, or the glass is damaged in several panes. See Figure 4.
Type 2: Directly above the rectangular units are 16 semi-circular windows, which were intended to open. These windows are not uniform in appearance, a few are inoperable and some are covered on the interior. See Figure 4.
Type 3: Higher on the wall above the semi-circular windows are 18 small (3' wide x 2' tall, nominally) oval units. There are two additional oval windows, one above the front entrance door and one over the river door on the east building face. Several of the oval windows are false, meaning there is no access to the window from the interior. See Figure 5.

Figure 4 - Typical rectangular (Type 1) and semi-circular (Type 2) window group

Figure 5 - Typical oval window (Type 3)

Replacing the windows has two major challenges. The primary access to most of the window units is from the interior. Exterior access is limited due to the height of the windows relative to the ground or river, and the lack of a level surface to place a mechanical lifting unit, ladders, or scaffolding. The existing frames were also tested for lead based paint and found to contain levels above the minimum threshold. Demolition of the frames will necessitate managing the lead based paint materials. NKWD is concerned about lead based paint relative to the need for staff to access the facility.

Conversations were initiated with window manufacturers Pella and Anderson. Both sent representatives to the building site to measure the existing windows and to ascertain the ability to perform the work. Both manufacturers indicated the windows would be a custom fabrication, and both recommended reusing the majority of the existing frames while performing the work from the interior. The replacement process would involve removing the frame of the moveable pane and the fixed frame, and installing a new single hung unit and fixed pane of glass. The exterior of the frame would be caulked/sealed and encapsulated in vinyl or aluminum to create a weather resistance exterior. The interior frame would largely remain, including the lead based paint.

The Type 2 windows would be replaced in a similar fashion. The frame would remain, but the glass pane would be removed and replaced. The hardware needed to open and close the windows would not be replaced at this time, and the existing chains/ropes used to operate the windows would be removed. In some instances, these units have been “blanked” with wood or other material (see Figure 6). Removing the wood should be considered to allow additional light into the rooms. The wood mullions or dividers for the Type 2 windows are inconsistent. Selection of a single mullion pattern would be preferred from a manufacturing and maintenance perspective.

Figure 6 - Type 2 window with blank

Both manufacturers indicated the replacement of the oval windows will be difficult, particularly the units which can only be accessed from the exterior (east and west elevations). Even though the west elevation is on the bank, replacement of the two oval windows to the left and right of the entrance will require scaffolding approximately 70 feet in height to provide access. The same would be true on the east elevation, but it may be possible to anchor scaffolding to a barge for this work.

Replacement of the existing windows is an area we would recommend exploring cost savings. New oval windows are roughly 40 percent of the total window material cost. The oval windows are also the least accessible throughout the facility, but none of the panes are broken.

Recommendations for design of the proposed replacement windows:

- Type 1 – These windows should be replaced to address reliability and function. A single hung window unit with wood mullions to match the existing pattern is recommended. Both manufacturers indicated the window frames would remain, but the glass pane would be replaced from the interior. Abatement or encapsulation of the lead based paint would also be recommended. All 16 Type 1 windows would be replaced under this project.
- Type 2 – Because these units sit atop the Type 1 windows, it is recommended to replace these windows. The existing units were intended to open, but the hardware will be removed. Remove the wood "blanks" were installed to allow additional light into the spaces.
- Type 3 – The existing oval windows should remain in place. The issue of lead based paint would remain, but an alternative would be preferable. Replacement of these windows does not improve ventilation or the quantity of natural light entering the building.
- Allow both Pella and Anderson to be named manufacturers in the specifications for bidding.
- The replacement windows would have the same dimensions and look as the existing units. A consistent mullion pattern would be selected for the Type 2 windows to create uniformity.

2.6 Foundation Tuck Pointing and Repairs

The condition assessment of the ORPS2 facility included an investigation of the existing foundation walls both interior and exterior. The report indicates the foundation is in reasonably good condition based on site observations and measurements. There are no major cracks or defects above the water line, both on the interior and exterior. The primary concerns with the foundation are the accumulation of vegetation, the loss of joint mortar, and the loss of some foundation block.

All of the work associated with the exterior foundation walls will be performed by hand. The contractor will need to provide access to the wall face for laborers. At this time, it is believed the work would be accomplished from a platform or scaffolding mounted on a floating barge within the river. The barge would be anchored and stabilized as needed to affect the work. This will be further investigated due to the existing discharge piping along the north face, and relative to the northwest and southwest corners where the water is shallower. The west face is on the river bank, which would allow the work to be performed from a land based platform.

Tuckpointing and restoration of existing masonry structures is typically bid with estimated quantities. While the final quantity of masonry restoration work is based on actual field measurements, the determination of what work must be completed is usually a directive by an owner to a contractor. This will be included in the project specifications.

Recommendations for design of the proposed foundation rehabilitation:

- Consider prequalifying restoration contractors for the masonry work.

- Include a provisional allowance within the budget to address unforeseen conditions.

2.7 Operating Floor Repairs

The primary focus of the project is to improve the structural reliability of the existing operating room floor within ORPS2. The condition assessment indicates the existing structural steel beams are corroding, and the concrete slab is severely deteriorating. Sections of the underside of the concrete floor exposed to the wet well have spalled, exposing the reinforcing steel to the damp atmosphere of the wet well. The exposed reinforcing steel is also corroding. The condition assessment recommended the removal and replacement of the floor. This approach along with two other alternatives to consider for the repair of the operating room floor is presented below.

- Alternative 1 – Replace Existing Slab

Prior to commencing any work on the new slab, temporary steel beams and formwork would be installed underneath the existing slab (see Exhibit 5). A contractor could open holes in the exterior foundation wall, allowing the insertion of the steel beams via a barge mounted crane. The temporary steel beams provide the structural support of the wet concrete upon placement. Once the temporary support works were installed, a section of the floor would be demolished (see Exhibit 6). The replacement of the existing slab would be accomplished with a new reinforced concrete slab. The slab would be at least 15 inches thick with #8 reinforcing steel at five (5) inch centers in the bottom slab and #5 bars at 12 inch centers in the top slab. After the new reinforcing steel was installed, the concrete would be placed. Because of the need to access the motor floor, the work would require two or three phases to complete. Exhibit 2 indicates a possible phasing of the floor replacement. Once the concrete had achieved adequate strength, the next section of the floor would be removed and the work would progress until completion.

Points to consider with this alternative:

1. Replacing the floor eliminates the need to monitor the deterioration of the existing slab. A new slab also eliminates the potential for debris to enter the pump suction.
2. The design of the floor is based on the actual loads of the facility (weight of permanganate solution, motor weights, etc.), as opposed to assuming the weight and condition of the existing floor.
3. All existing equipment and associated appurtenances remain as currently configured.
4. Coordination of shut downs may require other building modifications to provide access for NKWD staff to the motor floor.

- Alternative 2 – New Floor Above the Existing Slab

Construction of a new structural slab above the existing slab is another idea to address the repair/replacement of the deteriorating slab. The new slab would be constructed as a reinforced concrete slab on top of the existing floor. The existing slab and steel support beams would be left in place, but cleaned of loose concrete and deteriorated reinforcing steel. The slab would be at least15 inches thick. Prior to commencing any work on the new slab, temporary steel beams would be installed underneath the existing slab. The temporary steel beams provide the structural support of the wet concrete upon placement. Also, all of the existing equipment, piping, conduit and appurtenances located within 15 inches of the existing floor would be raised or relocated to accommodate the new floor. A reinforcing steel mat would be prepared on top of

the existing concrete and connected to the perimeter walls. Concrete would be placed on top of the slab, and once cured, any equipment would be reinstalled. The temporary steel support beams would be removed once the concrete had achieved sufficient strength.

Points to consider with this alternative:

1. The existing doorways between the operating and storage room would need to be modified to accommodate the higher floor. It is unknown whether the existing elevator could be reconfigured to stop at the higher floor elevation.
2. Because the existing window sills are 42 inches above the finished floor, raising the floor would necessitate installing handrail or other fall protection.
3. Raising the existing piping around the perimeter of the room may require the contractor to abate asbestos insulation.
4. Raising the conduit may necessitate installing new wiring because the length may change slightly, and it is typically less expensive to install new wiring as opposed to reusing existing.

- Alternative 3 – Floor Repairs Below Existing Slab

Construction of a new structural support slab underneath the existing slab and beams was examined as a potential cost effective alternative, both in construction materials and coordination effort. The new support slab would be constructed as a reinforced concrete slab at an elevation slightly below the existing steel beams (see Exhibit 9). The underside of the existing slab would be cleaned of loose concrete and deteriorated reinforcing steel. The existing horizontal steel beams would be left in place, and the slab would be at least 18 inches thick. The reinforcing steel would be hung from wire below the existing floor, and connected to the perimeter walls. Once the reinforcing steel was arranged, temporary steel beams and formwork are required to support the placement of the concrete. Concrete would be placed to fill the void with the existing slab, encapsulating the existing steel beams. The temporary steel and formwork would be removed once the concrete had achieved sufficient strength. The existing steel pipe column would be removed at the bottom of the new slab and filled with grout. The surface of the existing slab would be resurfaced after the new slab had achieved full strength.

Points to consider with this alternative:

1. This minimizes the need to completely shut down the facility to perform the work, which could be performed during the summer months. Temporary support beams and materials could be brought into the wet well through openings in the foundation wall.
2. The structural elements (type, size, number, etc.) of the existing floor are not entirely known, and the actual structural capacity of the existing slab is unknown.

<u>Recommendation</u>

The original focus of the project was to develop a short term solution to improve the structural stability of the ORPS2 operating room floor. While it is still possible NKWD may construct a replacement for ORPS2 within the next 10 years, there is a possibility the existing pump station will need to function for some time beyond 2026. It is also possible the ORPS2 facility could be rehabilitated and upgraded to provide continued service for the foreseeable future.

All three floor repair alternatives require the installation of temporary support beams underneath the existing floor, and all three alternatives will require a similar quantity of reinforcing steel within the new slab. Therefore, the primary differences between the three alternatives are the following:

- Alternative 1 includes the demolition of the existing slab and phasing of the improvements,
- Alternative 2 requires raising the existing appurtenances affected by the new slab, and the provisions are needed to address the continued deterioration of the existing slab,
- Alternative 3 has a thicker slab.

The majority of the cost for the new floor will be included in the temporary support installation and the new structural slab. Therefore, Alternative 1 – Replace Existing Slab is recommended.

3.0 CONSTRUCTABILITY

The primary concern associated with the project is how a contractor would potentially approach the work. Also, there may be construction issues or requirements that may limit the field of contractors capable of bidding the project. By identifying the potential constructability concerns early, the design and specifications can be tailored to address those risks for both NKWD and the successful general contractor.

3.1 Project Constraints

The NKWD has already indicated the ORPS2 facility has to remain in service due to the peak demands experienced during the summer months. This limits the contractor in performing any work that would either, by the nature of the work (i.e. valve replacement), require pumps to be off, or limit the ability for NKWD personnel to access the motor floor or dry well to operate and maintain the equipment.

- Pump Operation – NKWD has stated the ORPS2 pumps normally operate between the hours of 9 pm and 9 am to minimize higher electricity costs.
- Summer Operation – ORPS2 must remain in service between May 15 and November 15. Brief shut downs may be permissible, but depends on customer demand. The contractor should not expect multiple day shut downs during this period.
- Winter Operation – NKWD has indicated the ORPS2 facility could be removed from service for an extended period of time during the winter months. It may be possible to shut down the facility for up to a month.
- Personnel Access – NKWD personnel must be able to access the dry well and the motor floor to operate and maintain the pumps and associated equipment.

3.2 Access

The proposed work includes several access restrictions around the facility. Some of the restrictions are a result of unknowns, while others are required by regulatory stakeholders.

- Ohio River – Because three sides of the building extend into the river, contractors will need to have access to equipment for performing work on water. Working over water has additional Occupational Safety and Health Administration (OSHA) requirements.
- Entrance Bridge – The structural capacity of the existing bridge connecting ORPS2 to the river bank is H20-44 Truck Loading (100 psf) based on the original design documents prepared by THP Limited, and dated October 12, 1998. Based on the record drawing information, the bridge should be capable of supporting legal truck loads as defined by the Kentucky Transportation Cabinet.
- CSX Railroad – Existing railroad tracks bisect the site and must be crossed to gain entrance to the building. There are no warning lights at this crossing, and visibility down the tracks requires a vehicle to be in close proximity to the crossing. CSX has indicated there will need to be coordination with local track personnel during construction.
- Existing Operating Floor – The actual capacity of the existing floor is unknown, but the project is moving forward because the floor is deteriorating. The contractor will need to limit the storage of materials and equipment on this floor.
- Wet Well – As previously noted, wet well access is by confined space entry permit. The contractor will need to demonstrate their personnel are adequately trained to perform the work in this environment, and have the appropriate equipment.
- Window Replacement – Once the window panes are removed, there is nothing to keep an individual from falling out of the opening to the ground or river below.

3.3 Other Impacts

In addition to the above noted considerations, there are several items which have the potential to impact the project, but are beyond the control of NKWD or the general contractor performing the work.

- Flooding – A significant portion of Ohio, Pennsylvania, West Virginia and Kentucky are tributary to the Ohio River upstream of the ORPS2 facility. Heavy rainfall in the drainage basin results in flooding, which can reach historic elevations. The motor room floor was constructed at an elevation higher than the 1937 flood. Once the river goes into flood stage, the water surface elevation can remain high for several weeks, and may slow down the contractor depending upon when they scheduled certain activities.
- River Traffic – The river is used by commercial and recreational vehicles most every day during the year, and more frequently during the summer months. ORPS2 has already been damaged as a result of an impact due to a barge. When the contractor is working on the east face, their operations will be exposed to other water craft.
- 144 Year Old Structure – ORPS2 was originally built in 1872. While the structure appears to be in relatively good condition, record drawings detailing the structural components of the building are not available. As such, there may be issues that arise during the progress of the construction which are unforeseen.

3.4 Recommendations

Recommendations to address potential constructability concerns:

- Contractor Engagement – Continue to discuss the project with the contracting community. Meeting with local general and specialty contractors allows the team to generate interest in the project and to potentially address concerns prior to bidding. This effort will continue informally as the project progresses.
- Contractor Prequalification – Another consideration may be prequalifying general or specialty contractors prior to issuing the project for bid. Because of the critical nature of the ORPS2 facility and the operational constraints, extending the duration of the construction project is not desirable. To achieve a successful project, it may be advantageous to initially select contractors familiar with this type of marine construction and building restoration.
- Project Allowance – Given the age of the facility and lack of record data available to NKWD, it is probable there will be unforeseen conditions during construction. The project allowance would be a specific dollar amount included directly in the bid form for the contractor. This money would be available to address issues that will arise during the rehabilitation of a 144 year old building. NKWD would determine whether a construction issue was the result of unforeseen conditions or part of the original project.

4.0 PERMITTING

The proposed project, while rehabilitative in nature, will require regulatory oversight because of the age and location of the structure. There are three primary agencies with jurisdiction over the project. Conversations have been initiated with all three, and a summary of the discussions, indicating the current course of action, is provided in Attachment C.

4.1 US Army Corps of Engineers

Because the ORPS2 structure sits within the normal water level of the Ohio River, a navigable waterway, the US Army Corps of Engineers (Corps) has authority to regulate activities associated with the facility which may impact navigation or water quality. The Louisville District was contacted to determine what limitations or conditions may be required of NKWD, or the selected construction contractor, during the performance of the project. A general description of the proposed project, and the activities anticipated, was provided to the Corps for their preliminary review and comment.

The Corps stated the proposed construction would be considered a maintenance activity because the existing structure will not be enlarged and the purpose for the facility will not be changed. The Corps believed the Nationwide Permit 3 (NW3) would be applicable to this project (a copy of NW3 is in Attachment D). The NW3 would allow a contractor to install temporary sheet piling as a method of performing the work. Removal of the accumulated sediment within the inlet channel was stated as a project component to the Corps, but a final determination about the material disposal is under review.

A formal submittal, in accordance with Section 404 of the Clean Water Act, was made to the Corps in late March. A reviewer was assigned to the project, and we anticipate receiving comments from the Corps in late April or early May. When submitting for a Section 404 review,

a Section 401 Water Quality Certification is usually required. For projects within Kentucky, the Division of Water provides the 401 certification, as discussed below.

Additionally, the Corps has expressed some concern about the age of the structure and whether the Kentucky State Historic Preservation Office (SHPO) has previously investigated the building. The Corps stated they are required to request a review by the SHPO in accordance with Section 106 of the National Historic Preservation Act of 1966. Additional comment regarding SHPO is included in section 4.5.

4.2 Kentucky Division of Water

Given the primary purpose of the ORPS2 facility is to provide raw water for the MPTP, contact was made with the Kentucky Division of Water (KDOW) to determine whether a construction permit is required for the project. The project will not change the currently permitted withdrawal rate or modify the intake process. Those project components which are integral to the treatment process (bar rack, inlet sluice gate, and inlet suction valve), are proposed to be replaced in kind.

KDOW was contacted in early November 2015 regarding the project. Documentation was provided, outlining the specific project improvements. It was also noted the project would be funded using bond financing, repaid by current water use rates. KDOW indicated the project would not require the submittal of a construction application. However, they did request a courtesy submittal prior to the start of construction for addressing questions that might be received from the public.

In addition to permitting water system improvements, KDOW also provides review and comment for floodplain and water quality impacts resulting from projects within waters of the United States. A formal submittal was made to the KDOW Floodplain Management Section in mid-April regarding the work within the floodplain and to obtain a Section 401 Water Quality Certification. Because the project will maintain the existing building dimensions and no permanent fill will occur within the floodplain, a permit to construct within the floodplain should be issued once a public notice period has been completed. The Section 401 certification is a necessary component for the Corps permitting process, and may take several weeks to complete.

4.3 City of Fort Thomas

Because of the age of the ORPS2 facility, there is some potential the facility may be considered a historic structure. Additionally, the replacement of the existing windows, electrical improvements and floor repair focus on the function of the building and the impact to worker safety and comfort. As such, contact was made with the City of Fort Thomas (City) to determine whether permits would be required for the project.

The City indicated their primary interest would be any structural work associated with the structure, which they believed would initiate the need for their review and permit. Additionally, any electrical improvements or modifications would also require a permit. WT did indicate the facility is normally unoccupied, with NKWD staff visiting the location on a daily basis, but only to check on the equipment and facility.

4.4 CSX Railway

The existing property containing the ORPS2 facility is bisected by an existing set of railroad tracks owned and operated by CSX Corporation (CSX). An existing private driveway crosses the railroad tracks from Mary Ingles Highway to the pump station building. The crossing is marked, but there are no warning lights or gates. While it is possible the general contractor could use barges to deliver and remove materials from the site, the more likely route will be to use the existing driveway.

CSX stated the existing private crossing is not currently shown within their records. An application for private crossing was provided to NKWD. CSX stated the application for private crossing is all that would be required of the project at this time. As the project moved closer to construction, the contractor will need to contact CSX to coordinate activities. CSX stated a flagger may be required, but a final determination will be based on the frequency of deliveries.

4.5 Kentucky Heritage Council

The ORPS2 structure is certainly unique because of its continued use as a raw water intake, serving the nearby communities for more than 140 years. The architectural style of the building is utilitarian for the intended use, but is generally considered to be in fair to good condition for its age. However, the building is somewhat isolated from the general population, and most passersby are probably unaware of the significance of the structure from either its use or its age.

The Kentucky Heritage Council (KHC) is the State Historic Preservation Office (SHPO) for the State of Kentucky, and the KHC would determine the historic significance of the ORPS2 building. The initial step in the process is to obtain a site check, which was completed in January 2016. The review indicated the presence of the structure, but whether the site would be eligible for the National Historic Register was undetermined.

A formal Section 106 review submittal for the project was made to the KHC in late March 2016, and a follow up phone call was made two weeks later. Based on a cursory review, the KHC did not have any immediate concerns with the proposed project, but the KHC anticipates providing their review comments before the end of April.

5.0 COSTS

Developing an opinion of probable construction cost for a unique project like the ORPS2 Rehabilitation requires the consideration of several variables. Various material suppliers were contacted relative to pricing for individual project components, but the bidding climate has changed significantly in the last year. Construction projects of all sizes have had fewer contractors offering proposals and bids have been at or exceeding the anticipated budget. As the design progresses, the opinion of probable construction cost will be updated. Our team will initiate discussions with other Midwestern utilities will further develop an understanding of the bidding climate as the design nears completion.

The opinion of probable construction cost applied typical percentages for contractor overhead, profit and general conditions. A project contingency of 30 percent was applied based on the American Association of Cost Engineers recommendation for the level of design completeness. As the design becomes more detailed, the project contingency will be decreased.

A total project cost of $2,225,000 was determined for the rehabilitation of ORPS2. This includes a $300,000 rehabilitation allowance to address unforeseen conditions during construction. A copy of the opinion of probable construction cost is provided in Attachment B.

6.0 SCHEDULE

The original project schedule included in the request for proposal anticipated a final completion of construction by August 1, 2017. Working backward from that point in time generates the timeline shown in Table 2. Additional interim milestones are shown as anticipated.

Table 2 – Preliminary Schedule/Sequence

Item	Description	Date
1	Bidding	May 30, 2016
2	Bid Opening	June 17, 2016
3	Award of Contract	July 21, 2016
4	Notice to Proceed	August 1, 2016
5	Pre-Construction Conference	August, 2016
6	Shop Drawing Submittals and Review	August/September, 2016
7	Foundation Cleaning and Tuckpointing	September/October, 2016
8	Installation of temporary support beams, partial floor and platform demolition	November, 2016
9	ORPS2 Continuous Operation Season Complete	November 15, 2016
10	Phase 1 Floor Replacement and new wet well platforms/ladders	December, 2016
11	Installation of trash rack, sluice gate and inlet suction valve, Phase 2 Floor demolition	January, 2017
12	Phase 2 Floor Replacement, Phase 3 Floor demolition	February, 2017
13	Phase 3 Floor Replacement	March, 2017
14	Construct new wood frame wall to replace river door, and remove temporary steel supports	May, 2017
15	ORPS2 Resumes Continuous Operation	May 15, 2017
16	Replace Windows	June, 2017
17	Substantial Completion of Construction	July 1, 2017
18	Final Completion of Construction	August 1, 2017

7.0 SUMMARY OF IMPROVEMENTS

The rehabilitation of the ORPS2 facility represents a unique construction challenge. NKWD has indicated the long term use of the facility is unknown, but providing a reliable structure for the foreseeable future is equally important. As such, it is necessary to analyze which portions of the proposed project are required to provide a functioning pump station that could remain in service for the next 20 years, or beyond. Table 3 summarizes the recommended improvement alternatives for the project.

Table 3 – Recommended Project Alternatives

Item	Project Component	Recommendation
1	Trash Rack Replacement	Z-Alloy fabrication located within the influent conduit

2	Sluice Gate Replacement	Install a wider gate to avoid existing wall thimble, and provide a floor hatch for easier gate removal in the future
3	Inlet Valve Replacement	Provide a new butterfly valve
4	Wet Well Platform Replacement	Construct new platforms with open grating using FRP materials
5	Window Replacement	Replace the rectangular and semi-circular windows, but defer the oval window replacement
6	Foundation Tuckpointing	Prequalify contractors to perform this work
7	Operating Room Repair	Remove the existing floor and replace with a new structural slab
8	Constructability	Include a bidding allowance to address unforeseen conditions

ATTACHMENT A

EXHIBITS

1/11/16
PRELIMINARY DESIGN REPORT

EXHIBIT 1

WADETRIM

VICINITY MAP

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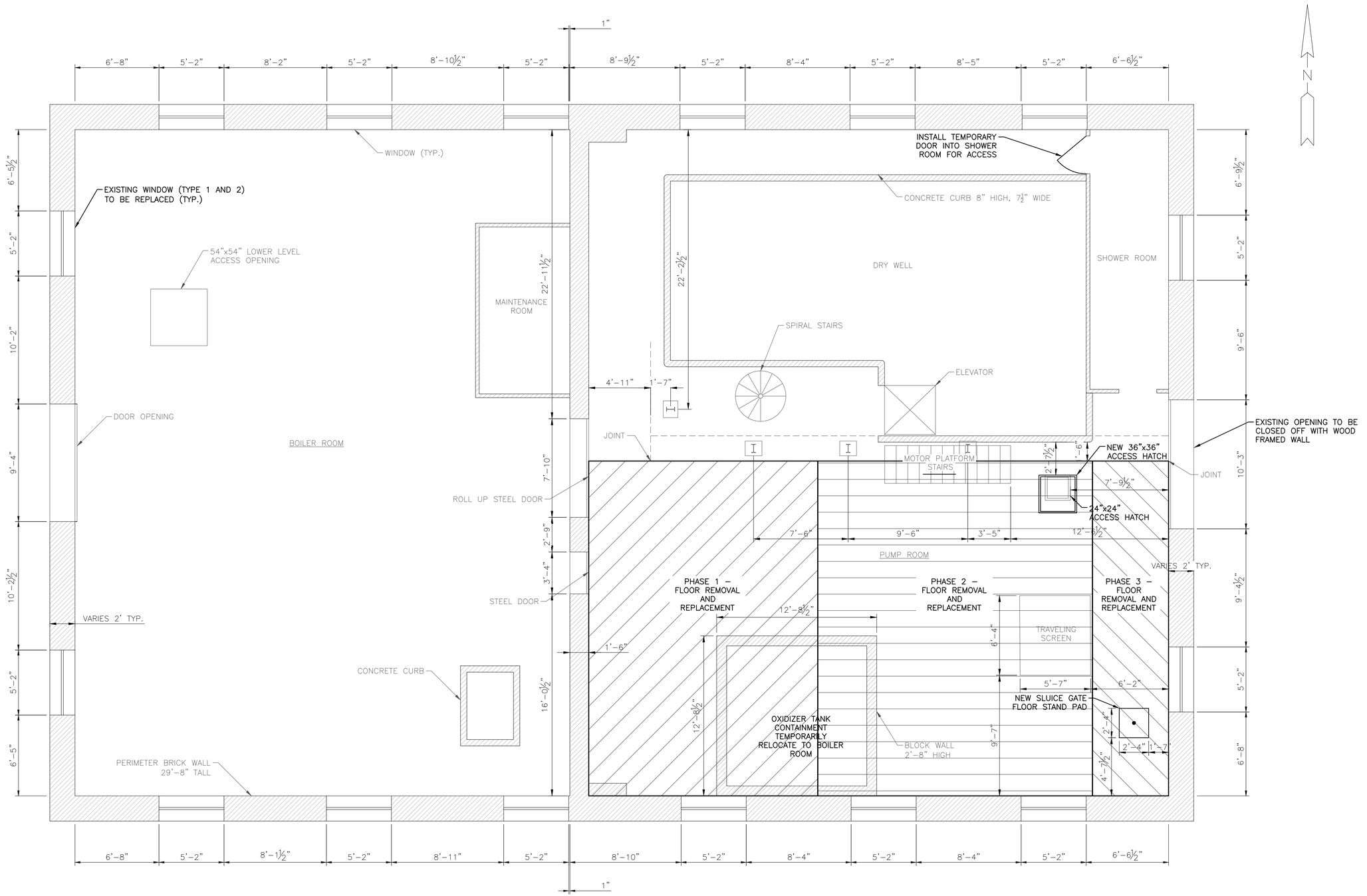
SEC.	– , – , –		
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
SHEET:	1 OF –		



FLOOR PLAN – MAIN FLOOR

SCALE: 1/4" = 1'-0"

REV#	DATE	DESCRIPTION	BY

NOT VALID FOR CONSTRUCTION UNLESS SIGNED AND DATED:

WADE TRIM
865 Central Avenue, Suite 830
Cincinnati, OH 45202
513.588.8400
FAX: 513.381.3243
www.wadetrim.com
Building relationships on a foundation of excellence

NORTHERN KENTUCKY WATER DISTRICT

OPERATING ROOM
FLOOR PLAN – ELEV. 501.3

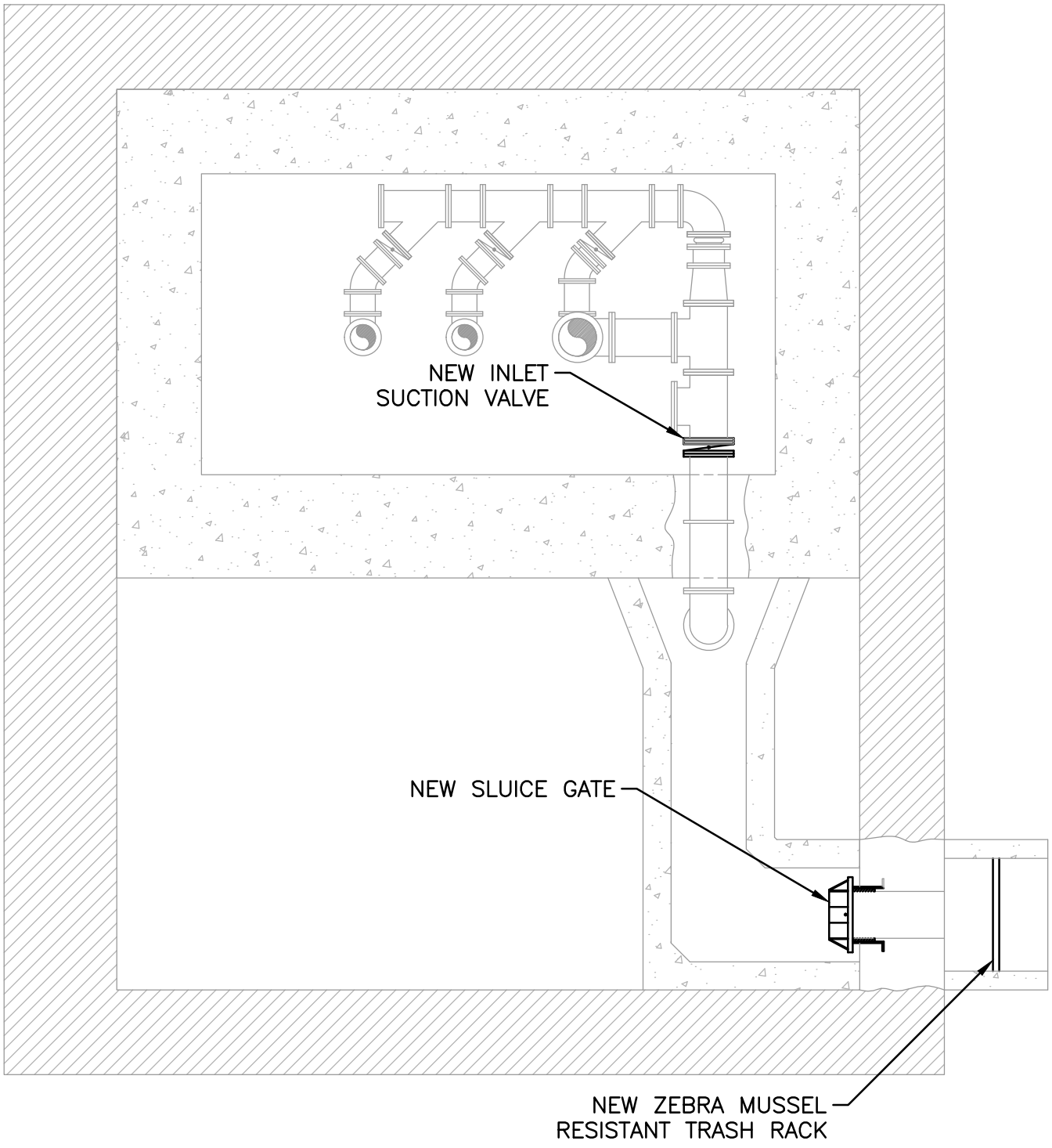
ISSUED FOR: DATE: BY:

JOB NO. NKW2001-01H

NKWD

SHEET EX – 2

PROJECT MANAGER:
C:\PW_WORK2\D0618278\SFP-PLTS- MAIN FLOOR.DWG – 11X17 EX2 – PLOTTED 1/11/2016 5:14 PM BY WELLMAN, AARON
FIELD BOOK INFORMATION:



SCALE: 1/8" = 1'–0"

1/11/16
PRELIMINARY DESIGN
REPORT

EXHIBIT 3

WADETRIM

DRY WELL AND WET WELL
FLOOR PLAN – ELEV.
440.0/433.3

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SEC.	– , – , –		
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
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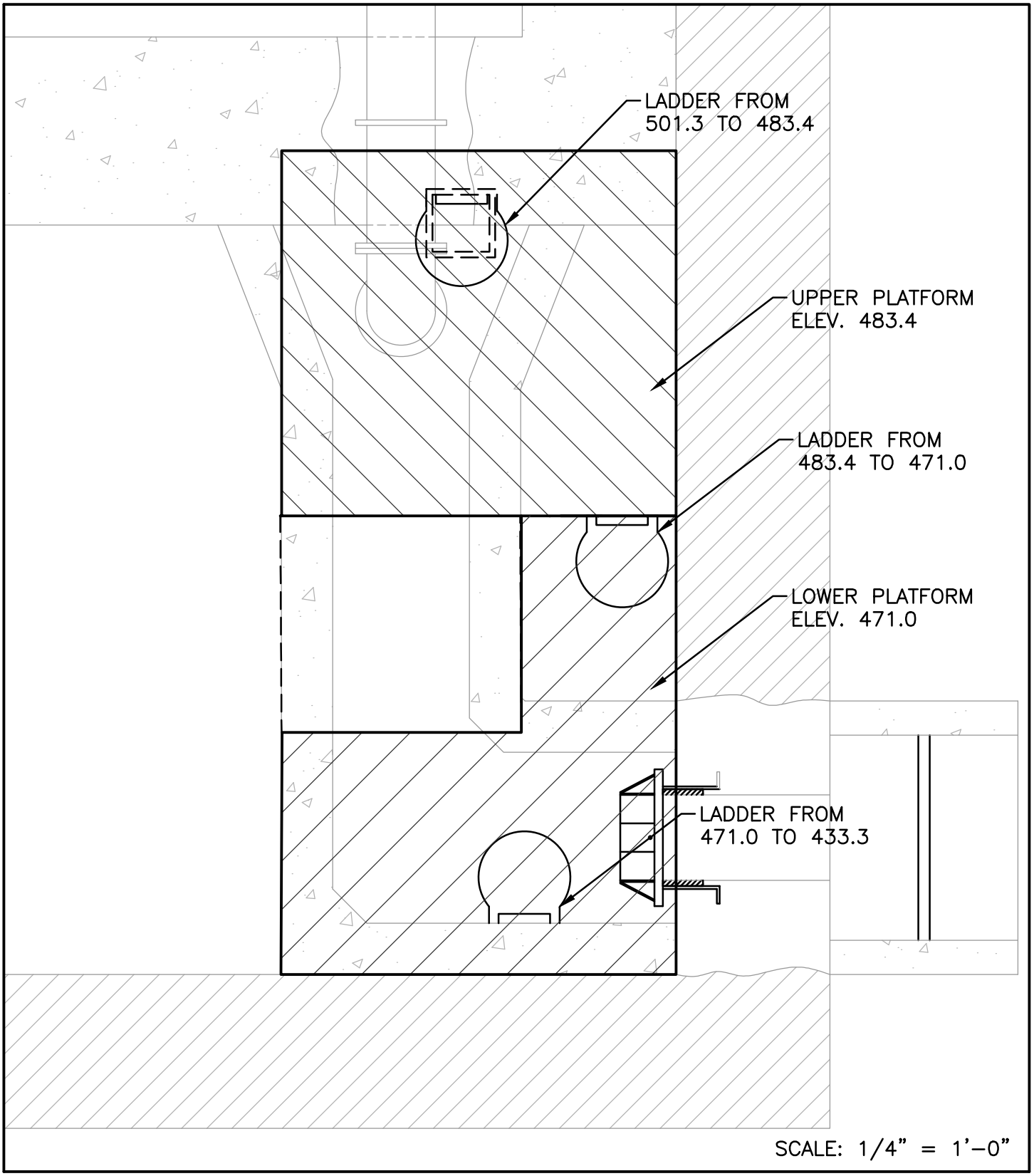

1/11/16
PRELIMINARY DESIGN
REPORT

EXHIBIT 4

WADE TRIM

DRY WELL AND WET WELL
FLOOR PLAN

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SEC.	– , – , –		
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
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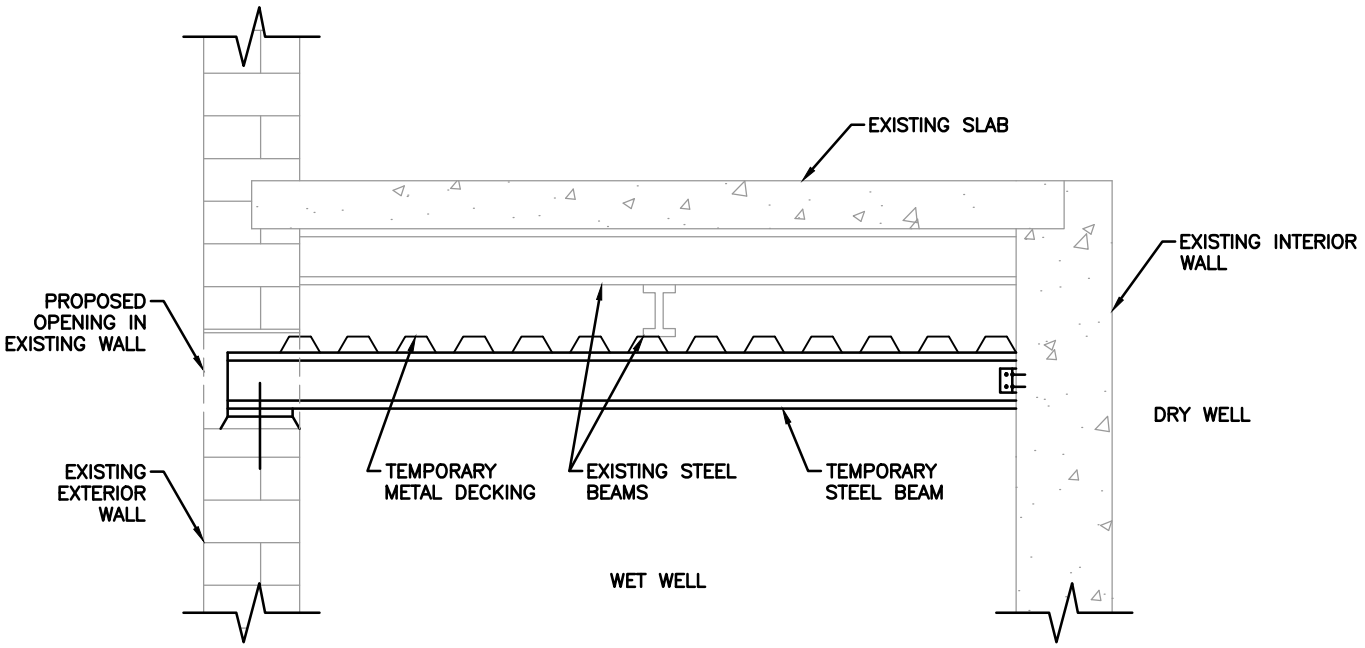

INSTALLATION OF TEMPORARY SUPPORT DETAIL

N.T.S

1/11/16
PRELIMINARY DESIGN REPORT

EXHIBIT 5

WADETRIM

ORPS 2 REHABILITATION
OPERATING ROOM FLOOR

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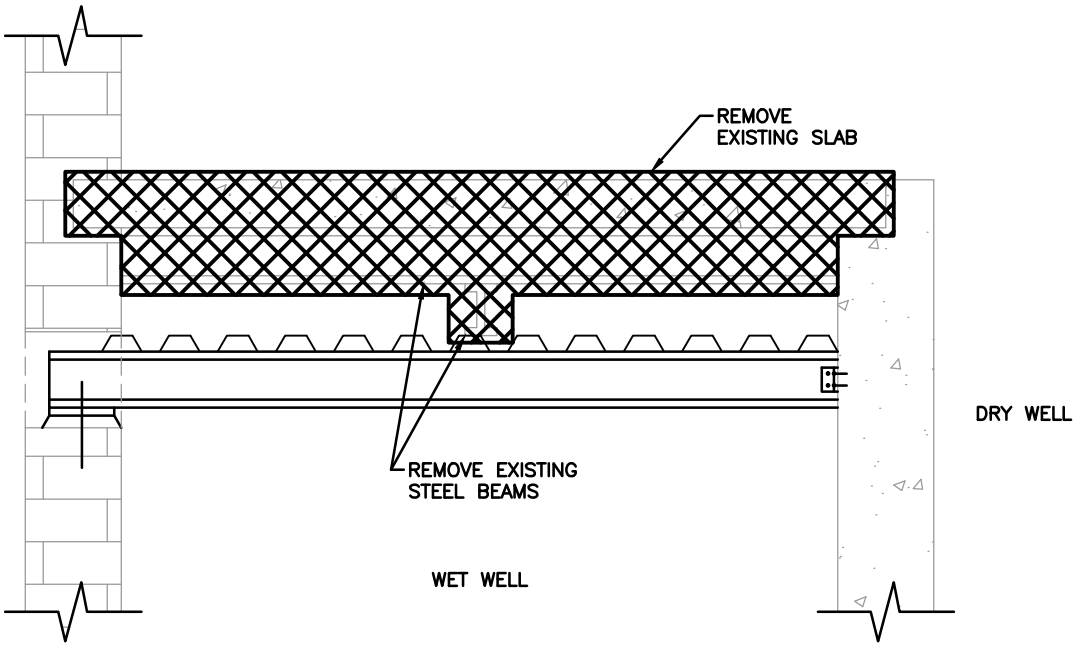
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
SHEET:	1 OF –		



FLOOR DEMOLITION DETAIL

N.T.S

1/11/16
PRELIMINARY DESIGN
REPORT

EXHIBIT 6

WADE TRIM

ORPS 2 REHABILITATION
OPERATING ROOM FLOOR

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BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
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JOB #:	NKW 2001		
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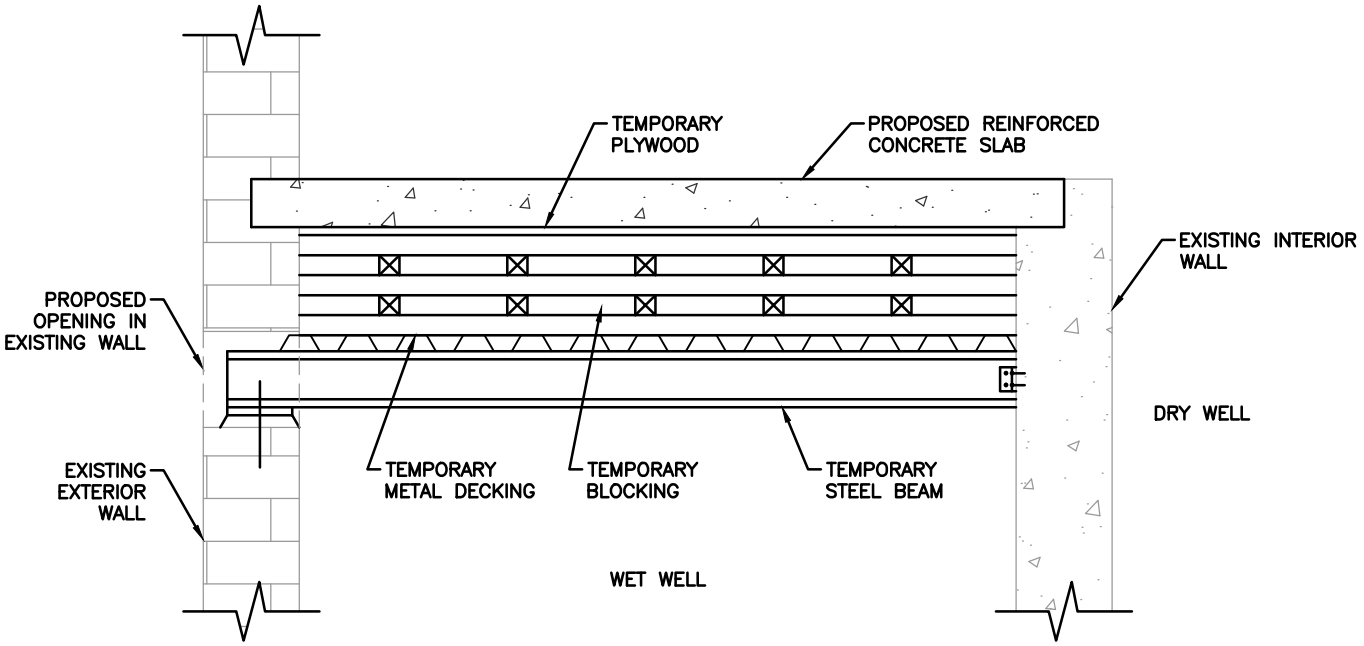

PROPOSED SLAB DETAIL

N.T.S

1/11/16
PRELIMINARY DESIGN REPORT

EXHIBIT 7

WADE TRIM

ORPS 2 REHABILITATION
OPERATING ROOM FLOOR

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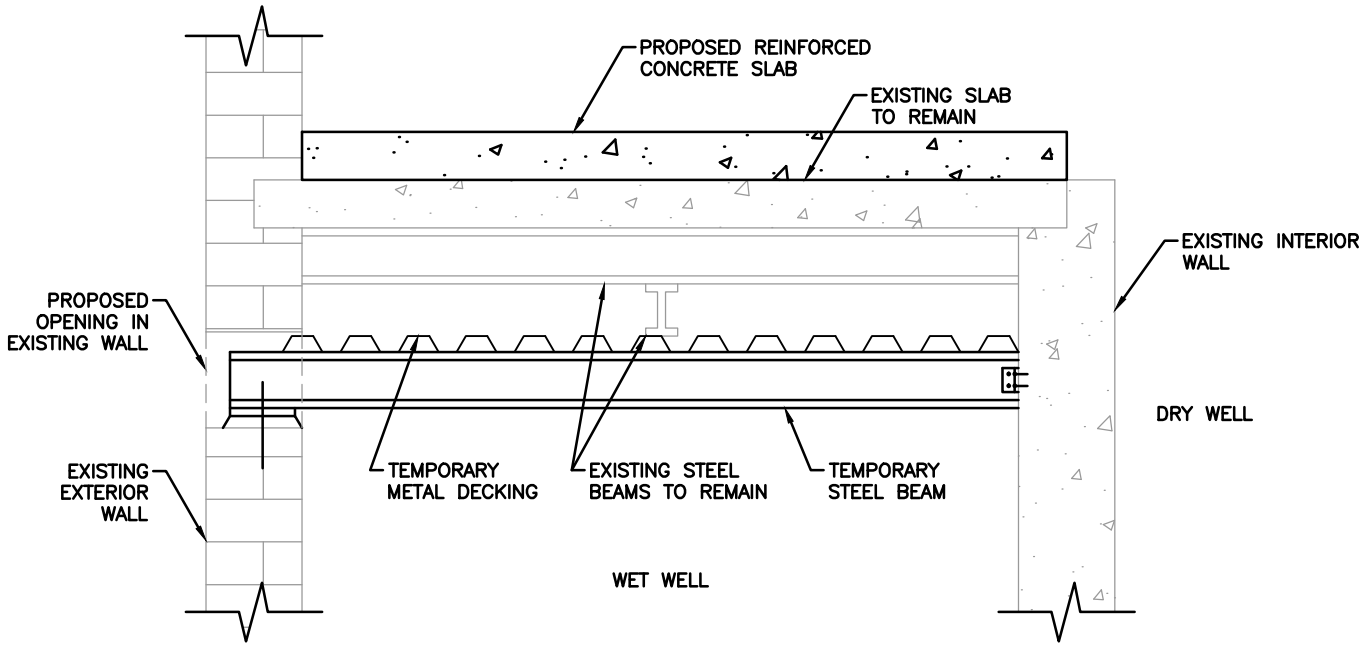
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
SHEET:	1 OF –		



FLOOR REPAIR – ALTERNATIVE 2

N.T.S

1/11/16
PRELIMINARY DESIGN REPORT

EXHIBIT 8

WADE TRIM

ORPS 2 REHABILITATION
OPERATING ROOM FLOOR

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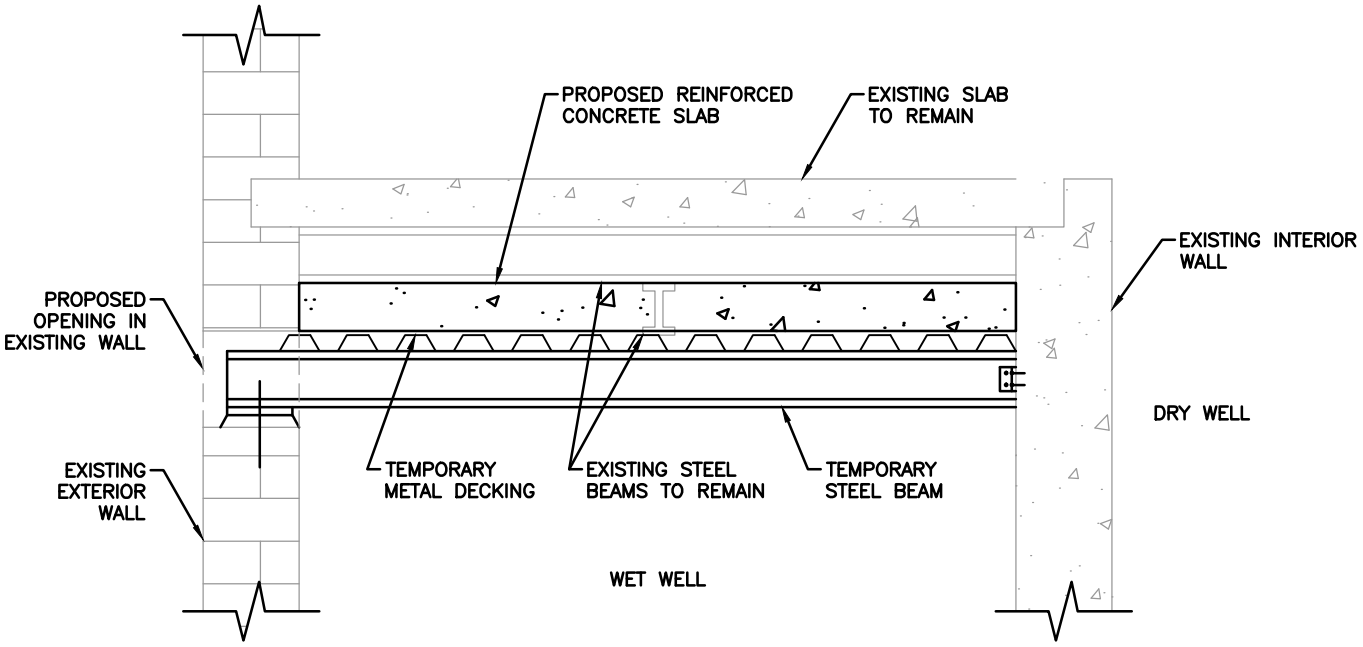
SEC.	– , – , –		
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
SHEET:	1 OF –		



FLOOR REPAIR – ALTERNATIVE 3

N.T.S

1/11/16
PRELIMINARY DESIGN REPORT

EXHIBIT 9

WADETRIM

ORPS 2 REHABILITATION
OPERATING ROOM FLOOR

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SEC.	– , – , –		
BOOK #:	–	PAGE #:	–
DR BY:	AW	COMP BY:	MR
CK BY:	KK	SRVY BY:	–
JOB #:	NKW 2001		
SHEET:	1 OF –		

ATTACHMENT B

OPINION OF PROBABLE CONSTRUCTION COST

WADE TRIM

ENGINEER'S OPINION OF CONSTRUCTION COST

PROJECT: Ohio River Pumping Station #2 Rehabilitation **DATE:** 01/11/16

LOCATION: Fort Thomas, KY **PROJECT NO.:** NKW2001

BASIS FOR ESTIMATE: [x] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL

WORK: Select demolition; tuckpointing the building foundation; replacement of windows, trash rack, influent sluice gate, and suction inlet valve; installation of new wet well platforms; repair/replacement of the operating room floor; other minor improvements

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	Demolition				
	Relocate existing KMNO4 tank and equipment	1	LS	$10,000.00	$10,000
	Remove existing KMNO4 containment	1	LS	$5,000.00	$5,000
	Reinstall KMNO4 tank and equipment	1	LS	$10,000.00	$10,000
	Temporary sub floor	1	LS	$50,000.00	$50,000
	Demolish existing floor slab	1	LS	$50,000.00	$50,000
	Remove existing wet well platforms	1	LS	$20,000.00	$20,000
	Cleaning influent channel of accumulated sediment	1	LS	$5,000.00	$5,000
	Remove existing sluice gate, stem, stand, etc.	1	EA	$10,000.00	$10,000
	Remove existing bar screen	1	EA	$10,000.00	$10,000
	Remove existing suction inlet valve	1	EA	$2,500.00	$2,500
	Temporary Pumping	1	LS	$50,000.00	$50,000
	Removal and disposal of existing windows	1	LS	$10,000.00	$10,000
	New Installation				
	New windows (16 rectangular, 16 semi-circular)	1	LS	$90,000.00	$90,000
	Window installation - from interior	1	LS	$50,000.00	$50,000
	New Z-alloy bar screen	1	EA	$16,000.00	$16,000
	New cast iron sluice gate w/ actuator and stand	1	EA	$116,000.00	$116,000
	Install new sluice gate and bar rack	1	LS	$50,000.00	$50,000
	New inlet suction butterfly valve	1	EA	$10,000.00	$10,000
	Install new suction butterfly valve	1	EA	$5,000.00	$5,000
	New FRP wet well platforms installed	300	SF	$60.00	$18,000
	New FRP ladders between floors to invert, installed	70	LF	$240.00	$16,800
	Remove vegetation, tuckpoint, fill voids - exterior only	6600	SF	$40.00	$264,000
	Specialty Equipment Rental	5	MO	$20,000.00	$100,000
	New reinforced concrete structural slab	46	CY	$2,500.00	$115,000
	New 3'x3' access hatch	1	EA	$2,500.00	$2,500
	New 1'x1' ventilation hatch	1	EA	$1,500.00	$1,500
	Conduit and conductor from MCC to actuator	1	LS	$25,000.00	$25,000
	Rehabilitation Allowance	1	LS	$300,000.00	$300,000
	Mobilzation/Demobilization				$71,000
	Subtotal direct costs				$1,483,300
	GC's, OH, P (20%)				$296,660
	Contingency (30%)				$444,990
	Total				**$2,224,950**

This Engineer's Opinion of Construction Costs is provided based on available information and the engineer's experience and qualifications and represents their best judgment as a design professional familiar with the construction industry. The engineer has no control over the costs of labor, materials, equipment, or over the contractor's methods of determining prices or over competitive bidding or market conditions. The engineer cannot and does not guarantee that proposals, bids or construction cost will not vary from this estimate.

ATTACHMENT C

CORRESPONDENCE

WADE TRIM

Record of Phone Conversation
WT109-01

☒ Incoming	☐ Outgoing	☐ In Person	☐ Left Message	☐ Returned Message

Date: 10/14/15 Time: 2:39 PM By: Ken Kamper

Contact: David Baldridge, Chief of Southern Regulatory Branch Project: ORPS2 Rehabilitation

Organization: US Army Corps of Engineers - Louisville Regulatory Job No.: NKW2001.01H

Phone Number: (502) 315-6675 Subject: Permitting for ORPS2 Project

Items Discussed: WT had contacted the US Army Corps of Engineers (Corps) to determine the regulatory aspects of the ORPS2 Rehabilitation Project. WT provided the Corps with a general explanation of the project, indicating the work was entirely maintenance and rehabilitation of an existing intake structure. The structure will not be expanded, nor will there be a change in pumping capacity at this time. However, there is work on the exterior foundation which will require a contractor to potentially work from a barge or other floating platform. Additionally, there is work inside the facility which will occur below water. The work may include the removal and disposal of accumulated sediment, but the trash rack and influent sluice gate will be replaced under the project. The Corps asked if there was an original permit for the intake, and WT indicated the structure dates to the 1870's, so there may not be a current permit. The Corps stated the project likely falls under the Nationwide 3 permit, which typically includes maintenance activities. However, given the age of the structure, it may be considered historic. As such, the Corps suggested submitting documentation relative to the project before engaging the services of a contractor. The submittal should include sketches of the proposed improvement, river mile, and any other information which would assist in the regulatory determination. WT stated a preliminary engineering report is being prepared, which should include the necessary information.

WADE TRIM

Record of Phone Conversation
WT109-01

☐ Incoming	☒ Outgoing	☐ In Person	☐ Left Message	☐ Returned Message

Date: 11/10/15 Time: 3:23 PM By: Ken Kamper

Contact: Jory Becker, Division of Water Project: ORPS2 Rehabilitation

Organization: Kentucky Department for Environmental Protection Job No.: NKW2001.01H

Phone Number: (502) 564-3410 Subject: Permitting for ORPS2 Project

Items Discussed: Wade Trim (WT) contacted the Division of Water (KDOW) to determine the regulatory aspects of the ORPS2 Rehabilitation Project. WT provided the KDOW with a general explanation of the project, indicating the work was entirely maintenance and rehabilitation of the existing intake structure. There will be no change in the withdrawal rate, nor will there be a change in pumping capacity. As such, it is WT's opinion the project does not require a construction permit from KDOW. Mr. Becker agreed that maintenance activities do not require a permit. WT stated that as the project moves closer to bidding and construction, KDOW will be contacted as a courtesy to let them know the project is proceeding. Mr. Becker indicated to either contact him or Terry Humphries when the documents are available.

WADE TRIM

Record of Phone Conversation
WT109-01

☐ Incoming	☒ Outgoing	☐ In Person	☐ Left Message	☐ Returned Message

Date: 11/10/15 Time: 4:14 PM By: Ken Kamper

Contact: Kevin Barbian, Building Department Project: ORPS2 Rehabilitation

Organization: City of Fort Thomas Job No.: NKW2001.01H

Phone Number: (859) 572-1210 Subject: Permitting for ORPS2 Project

Items Discussed: Wade Trim (WT) contacted the City of Fort Thomas (FT) to determine whether a building permit would be required for the ORPS2 Rehabilitation Project. WT provided Mr. Barbian with a general explanation of the project, indicating the work was entirely maintenance and rehabilitation of the existing structure. WT stated there may be some new lighting installed, replacement of all existing windows and the repair/rehabilitation of a portion of the floor. Mr. Barbian asked if the floor work was cosmetic or structural. WT stated a portion of the concrete slab was deteriorating, necessitating the complete removal and replacement or some kind of structural rehabilitation. Mr. Barbian asked how large is the structure? WT stated the building is roughly 55 feet wide by 90 feet long. The building has one main floor, but the motors are located on a mezzanine floor above the main floor, and there are two lower floors where the pumps and piping are located. Mr. Barbian asked if the building was normally occupied. WT stated that personnel visit the building on a regular basis (several times a week) to check on the equipment and systems, but normally the building is unoccupied. Mr. Barbian stated that the building size would likely fall under his jurisdiction, and the structural improvements would likely require a permit. WT stated the design process is just beginning, but we would continue communications with the City as the design progresses. The current schedule anticipates bidding in May 2016, with construction starting in August.

ATTACHMENT D

REGULATORY INFORMATION

Structure
Tidal wetland
Vegetated shallows
Waterbody

B. Nationwide Permits

1. Aids to Navigation. The placement of aids to navigation and regulatory markers which are approved by and installed in accordance with the requirements of the U.S. Coast Guard (see 33 CFR, chapter I, subchapter C, part 66). (Section 10)

2. Structures in Artificial Canals. Structures constructed in artificial canals within principally residential developments where the connection of the canal to a navigable water of the United States has been previously authorized (see 33 CFR 322.5(g)). (Section 10)

3. Maintenance. (a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project or within the boundaries of the structure or fill. This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

(b) This NWP also authorizes the removal of accumulated sediments and debris in the vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) and/or the placement of new or additional riprap to protect the structure. The removal of sediment is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend farther than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures. All dredged or excavated materials must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization. The placement of new or additional riprap must be the minimum necessary to protect the structure or to ensure the safety of the structure. Any bank stabilization measures not directly associated with the structure will require a separate authorization from the district engineer.

(c) This NWP also authorizes temporary structures, fills, and work necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

(d) This NWP does not authorize maintenance dredging for the primary purpose of navigation. This NWP does not authorize beach restoration. This NWP does not authorize new stream channelization or stream relocation projects.

Notification: For activities authorized by paragraph (b) of this NWP, the permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 31). The pre-construction notification must include information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals. (Sections 10 and 404)

Note: This NWP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act Section 404(f) exemption for maintenance.

4. Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities. Fish and wildlife harvesting devices and activities such as pound nets, crab traps, crab dredging, eel pots, lobster traps, duck blinds, and clam and oyster digging, fish aggregating devices, and small fish attraction devices such as open water fish concentrators (sea kites, etc.). This NWP does not authorize artificial reefs or impoundments and semi-impoundments of waters of the United States for the culture or holding of motile species such as lobster, or the use of covered oyster trays or clam racks. (Sections 10 and 404)

5. Scientific Measurement Devices. Devices, whose purpose is to measure and record scientific data, such as staff gages, tide and current gages, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Small weirs and flumes constructed primarily to record water quantity and velocity are also authorized provided the discharge is limited to 25 cubic yards. Upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to pre-construction elevations. (Sections 10 and 404)

6. Survey Activities. Survey activities, such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys. For the purposes of this NWP, the term "exploratory trenching" means mechanical land clearing of the upper soil profile to expose bedrock or substrate, for the purpose of mapping or sampling the exposed material. The area in which the exploratory trench is dug must be restored to its pre-construction elevation upon completion of the work and must not drain a water of the United States. In wetlands, the top 6 to 12 inches of the trench should

Case No. 2016-00303
Exhibit A.5

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Engineer's Opinion
Of Probable
Construction Cost

WADETRIM

STATE OF KENTUCKY KENNETH M. KAMPER 29686 LICENSED PROFESSIONAL ENGINEER 8/17/16

ENGINEER'S OPINION OF CONSTRUCTION COST

PROJECT: Ohio River Pumping Station #2 Rehabilitation **DATE:** 06/06/16

LOCATION: Fort Thomas, KY **PROJECT NO.:** NKW2001

BASIS FOR ESTIMATE: [x] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL

WORK: Select demolition; tuckpointing the building foundation; replacement of windows, trash rack, influent sluice gate, and suction inlet valve; installation of new wet well platforms; repair/replacement of the operating room floor; other minor improvements

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	Demolition				
	Relocate existing KMNO4 tank	1	LS	$1,000.00	$1,000
	Remove existing KMNO4 containment	1	LS	$5,000.00	$5,000
	Other select demolition (bathroom, wood wall, etc.)	1	LS	$5,000.00	$5,000
	Demolish existing floor slab and steel supports	1	LS	$50,000.00	$50,000
	Remove existing wet well platforms	1	LS	$20,000.00	$20,000
	Cleaning influent channel of accumulated sediment	1	LS	$5,000.00	$5,000
	Remove existing sluice gate, stem, stand, etc.	1	EA	$10,000.00	$10,000
	Remove existing bar screen	1	EA	$10,000.00	$10,000
	Remove existing suction inlet valve	1	EA	$2,500.00	$2,500
	Temporary Pumping - Dewatering	1	LS	$50,000.00	$50,000
	Removal and disposal of existing windows	1	LS	$25,000.00	$25,000
	New Installation				
	Reinstall KMNO4 tank	1	LS	$1,000.00	$1,000
	New windows (16 rectangular, 16 semi-circular)	1	LS	$90,000.00	$90,000
	Window installation - from interior	1	LS	$50,000.00	$50,000
	New Z-alloy bar screen	1	EA	$16,000.00	$16,000
	New cast iron sluice gate w/ actuator and stand	1	EA	$116,000.00	$116,000
	Install new sluice gate and bar rack	1	LS	$50,000.00	$50,000
	New inlet suction butterfly valve	1	EA	$10,000.00	$10,000
	Install new suction butterfly valve	1	EA	$5,000.00	$5,000
	New FRP wet well platforms installed	300	SF	$60.00	$18,000
	New FRP ladders between floors to invert, installed	70	LF	$240.00	$16,800
	Remove vegetation, tuckpoint, fill voids - exterior only	6600	SF	$40.00	$264,000
	Specialty Equipment Rental	5	MO	$20,000.00	$100,000
	New steel beams - W21x62 installed	220	LF	$375.00	$82,500
	New steel beams - C8x11.5 installed	45	LF	$100.00	$4,500
	New reinforced concrete structural slab	30	CY	$1,000.00	$30,000
	New reinforced concrete containment wall, curbing, etc	9	CY	$600.00	$5,400
	New 3'x3' access hatch	1	EA	$2,500.00	$2,500
	New 1'x1' ventilation hatch	1	EA	$1,500.00	$1,500
	New ventilation equipment & installation	1	LS	$10,000.00	$10,000
	Actuator mounting beams installed	1	LS	$2,000.00	$2,000
	Actuator cover plate	10.7	SF	$50.00	$535
	New wood framed wall on east elevation	1	LS	$5,000.00	$5,000
	New wet well lighting & other electrical	1	LS	$15,000.00	$15,000
	Conduit and conductor from MCC to actuator	1	LS	$25,000.00	$25,000
	New 6x9 Louver w/ motor damper, power and controls	1	LS	$25,000.00	$25,000
	Interior and exterior painting	1	LS	$10,000.00	$10,000
	Contingency Allowance	1	LS	$250,000.00	$250,000
	Mobilzation/Demobilization (5%)				$69,000
	Subtotal direct costs				$1,458,235
	GC's, OH, P (23%)				$335,394
	Contingency (10%)				$145,824
	Total				**$1,939,453**

This Engineer's Opinion of Construction Costs is provided based on available information and the engineer's experience and qualifications and represents their best judgment as a design professional familiar with the construction industry. The engineer has no control over the costs of labor, materials, equipment, or over the contractor's methods of determining prices or over competitive bidding or market conditions. The engineer cannot and does not guarantee that proposals, bids or construction cost will not vary from this estimate.

Case No. 2016-00303
Exhibit A.6&7

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Plans titled "Ohio River Pump Station No.2 Rehabilitation" dated June 2016, sealed by a P.E.

And

Specifications titled "Ohio River Pump Station No.2 Rehabilitation" dated June 2016, sealed by a P.E.

(Included as separate file)

Case No. 2016-00303
Exhibit B

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

CERTIFIED STATEMENTS

Affidavit

Franchises

Plan Review and Permit Status

Easements and Right-of-Way Status

Construction Dates and Proposed Date In Service

Plant Retirements

State Debt Officer Notification

Case No. 2016-00303
Exhibit B.1

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Affidavit

AFFIDAVIT
Ohio River Pump Station No. 2 Rehabilitation

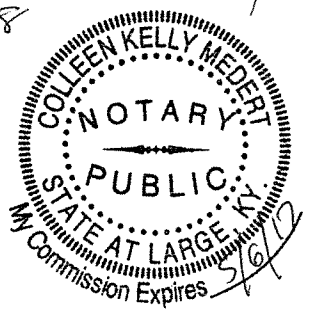
Affiant, Lindsey Rechtin, being the first duly sworn, deposes and says that she is the Acting Vice President of Finance and Support Services of the Northern Kentucky Water District, which she is the Applicant in the proceeding styled above; that she has read the foregoing "Ohio River Pump Station No. 2 Rehabilitation Project" Application and knows the contents thereof, and that the same is true of her own knowledge, except as to matters which are therein stated on information or belief, and that is to those matters she believes them to be true.

Lindsey Rechtin.
Acting Vice President, Finance & Support Services
Northern Kentucky Water District

Subscribed and sworn to before me in said County to be her act and deed by Lindsey Rechtin, Acting Vice President of Finance and Support Services of the Northern Kentucky Water District, this

31ST day of AUGUST 2016.

NOTARY PUBLIC
Kenton County, Kentucky
My commission expires 5/6/17
#486288



Case No. 2016-00303
Exhibit B.2,3,4,5,6,7

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Franchises

Plan Review and Permit Status

Easements and Right-of-Way Status

Construction Dates and Proposed Date In Service

Plant Retirements

Northern Kentucky Water District

Franchises required – None

Plan Review and Permit Status - The District has reviewed and approved the plans and specifications prepared by Wade Trim, Inc., titled "Ohio River Pump Station No. 2 Structural Rehabilitation" dated June 2016, sealed by a P.E.

The District contacted the Kentucky Division of Water in regards to water quality permitting and was told this project did not require a Water Quality Certification and that the USACE has jurisdiction.

The District submitted to the USACE for a Nationwide Permit No.3 on March 22, 2016 and is awaiting approval.

The District submitted an Application for Building Permit to the City of Fort Thomas and is awaiting approval.

Stream Construction Permit is included from Kentucky Division of Water.

Easements and Right-of-Way Status – No easements will be needed for this project.

Start date of construction – December 2016

Proposed date in service – December 2017

Plant retirements – There are no retirements as a result of this project.

Case No. 2016-00303
Exhibit B.3 & 4

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

PLAN REVIEW AND PERMIT STATUS

Approval Letter from Kentucky Division of Water

MATTHEW G. BEVIN
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

CHARLES G. SNAVELY
SECRETARY

STREAM CONSTRUCTION PERMIT

For Construction In Or Along A Stream

Issued to: **Northern KY Water District**
Address: **PO Box 18640**
Erlanger, KY 41018

Permit expires on **May 20, 2017**

Permit No. **25876P**

AI: **2485**

In accordance with KRS 151.250 and KRS 151.260, the Energy and Environment Cabinet approves the application dated **April 13, 2016** for **rehabilitation of an existing municipal water intake building structure in the left descending floodplain of Ohio River at about stream mile 463.2, with coordinates 39.080533, -84.437455, Fort Thomas, Campbell County.**

There shall be no deviation from the plans and specifications submitted and hereby approved unless the proposed change shall first have been submitted to and approved in writing by the Cabinet. This approval is subject to the attached limitations. **Please read these limitations carefully!** If you are unable to adhere to these limitations for any reason, please contact this office prior to construction.

This permit is valid from the standpoint of stream obstruction only. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. Specifically if the project involves work in a stream, such as bank stabilization, dredging, relocation, or in designated wetlands, a 401 Water Quality Certification from the Division of Water will be required.

This permit is nontransferable and is not valid unless actual construction of this authorized work is begun prior to the expiration date noted above. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990.

If you have any questions regarding this permit, please call Soheyl Bigdeli at (502) 564-3410.

Issued May 20, 2016.

Ron Dutta, P.E., Supervisor
Floodplain Management Section
Surface Water Permit Branch

RD/SB/kec

pc: Florence Regional Office
Frank Twehues – Fort Thomas Floodplain Coordinator
Ken Kemper, PE (by email)
File

Northern KY Water District floodplain application 25876A AI: 2485 permit 25876P

Stream Construction Permit

Northern KY Water District
Facility Requirements
Permit Number:25876P
Activity ID No.: APE20160004

STRC0000000013 (AI: 2485 - Bldg Rehabilitation) rehabilitation of an existing municipal water intake building structure in the left descending floodplain of Ohio River at about stream mile 463.2, with coordinates 39.080533, -84.437455, Fort Thomas in Campbell County.:

Submittal/Action Requirements:

Condition No.	Condition
S-1	Northern KY Water District must submit final construction report: Due within 90 days after completion of construction Northern KY Water District must notify in writing that the project has been completed in accordance with the approved plans and specifications. A Final Construction Report Form is enclosed. [401 KAR 4:060 Section 6]

Narrative Requirements:

Condition No.	Condition
T-1	The issuance of this permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [KRS 151.250 & 401 KAR 4:060]
T-2	This permit is issued from the standpoint of stream obstruction only and does not constitute certification of any other aspect of the proposed construction. The applicant is liable for any damage resulting from the construction, operation, or maintenance of this project. This permit has been issued under the provisions of KRS Chapter 151.250 and regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. [KRS 151.250]
T-3	A copy of this permit must be available at the construction site. [KRS 151.250]
T-4	This permit holder must to obtain a permit from the U.S. Army Corps of Engineers, Louisville District, pursuant to Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act, as may be required. [Clean Water Act Section 404 and River & Harbor Act of 1899]
T-5	Any work performed by or for Northern KY Water District that does not fully conform to the submitted application or drawings and the limitations set forth in this permit, is subject to partial or total removal and enforcement actions pursuant to KRS 151.280 as directed by the Kentucky Department for Environmental Protection. [KRS 151.280]
T-6	Any design changes or amendments to the approved plans must be submitted to the Division of Water and approved in writing prior to implementation. [KRS 151.250]

STRC0000000013 (continued):

Narrative Requirements:

Condition No.	Condition
T-7	Since Campbell County participates in the National Flood Insurance Program, a local floodplain permit must be obtained prior to beginning of construction. Upon completion of construction Northern KY Water District must contact the local permitting agency for final approval of the construction for compliance with the requirements of the local floodplain ordinance. [401 KAR 4:060 Section 9(c)]
T-8	At no point below the base flood elevation 500.0 feet MSL shall the use of construction materials or the permanent storage of materials subject to flood damage be allowed. [401 KAR 4:060]
T-9	The permittee must obtain a Water Quality Certification (or a determination that none is required) through the Division of Water, Water Quality Branch before beginning construction. Contact the Water Quality Certification Supervisor at (502) 564-3410. [KRS 224.16-050 & Clean Water Act Section 401]
T-10	All major permanent electrical appliances shall be installed at or above the base flood elevation of 500.0 feet MSL. Electric wirings below the base flood elevation, If any, shall be protected with ground fault interrupting circuit breakers. [KRS 151.250]
T-11	Erosion prevention measures, sediment control measures, and other site management practices shall be designed, installed, and maintained in an effective operating condition to prevent migration of sediment off site. [KRS 224.70-110]
T-12	To avoid secondary adverse impacts, all materials used shall be stable and inert, free from pollutants and floatable objects, and shall meet all appropriate engineering standards. (Inert here means materials that are not chemically reactive and that will not rot or decompose, such as soil, rock, broken concrete or similar materials.). [401 KAR 4:060 Section 7]
T-13	All debris and excess material shall be removed for disposal outside of the base floodplain. [401 KAR 4:060]
T-14	The entry of mobile equipment into the stream channel shall be limited as much as reasonably possible to minimize degradation of the waters of the Commonwealth. [401 KAR 4:060]
T-15	Construction other than as authorized by this permit shall require written approval from the Division of Water. [401 KAR 4:060]

FINAL CONSTRUCTION REPORT

NAME: Northern KY Water District

PERMIT NO: 25876P

AI NO: 2485

Has all work on this project been completed according to the plans and specifications on file with the Division of Water?

Yes: _____

No: _____ If no, explain. You may include attachments is necessary.

Mailing Instructions

- Fold the top edge of this page to the top edge of this box.
- Fold the bottom edge of the page up to meet the top fold and tape shut.
- Fill out return address portion
- Affix a stamp and mail.

Place
Stamp
Here

Floodplain Management Section
Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, KY 40601

Case No. 2016-00303
Exhibit C

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

BID INFORMATION

Bid Tabulation

Engineer's Recommendation of Award

Board Resolution

Case No. 2016-00303
Exhibit C

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Bid Tabulation

Ohio River Pump Station No. 2 Structural Rehabilitation

Owner: Northern Kentucky Water District
Engineer: Wade Trim, Inc.
Bid Date: July 21, 2016

				Engineer's OPCC		Building Crafts, Inc.		Dugan & Meyers	
No.	Item	Unit	Quantity	Unit Price	Item Price	Unit Price	Item Price	Unit Price	Item Price
1	Mobilization (to be no more than 3% of total price)	LS	1	$ 41,500.00	$ 41,500.00	$ 35,000.00	$ 35,000.00	$ 60,000.00	$ 60,000.00
2	Foundation Tuck Pointing	LF	5400	$ 10.00	$ 54,000.00	$ 4.50	$ 24,300.00	$ 6.75	$ 36,450.00
3	Foundation Block Replacement	LF	200	$ 500.00	$ 100,000.00	$ 294.00	$ 58,800.00	$ 194.00	$ 38,800.00
4	Pump Station Rehabilitation	LS	1	$ 1,493,953.00	$ 1,493,953.00	$ 1,195,900.00	$ 1,195,900.00	$ 1,970,750.00	$ 1,970,750.00
5	Contingency Allowance	LS	1	$ 250,000.00	$ 250,000.00	$ 250,000.00	$ 250,000.00	$ 250,000.00	$ 250,000.00
	Total				$ 1,939,453.00		$ 1,564,000.00		$ 2,356,000.00

Case No. 2016-00303
Exhibit C

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Engineer's Recommendation of Award

WADE TRIM

August 3, 2016

Mr. Jeff Schuchter, P.E.
Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, KY 41018

Re: Ohio River Pumping Station #2 Structural Rehabilitation Project
Bid Review and Recommendation

Dear Mr. Schuchter:

On Thursday July 21st, 2016 the Northern Kentucky Water District (NKWD) received two proposals to complete the Ohio River Pumping Station #2 Structural Rehabilitation Project. Upon opening the envelopes, Building Crafts, Inc. submitted the lowest bid at $1,564,000, while Dugan & Meyers Construction Co. Inc. submitted a price of $2,356,000. For comparison, the Engineer's Opinion of Probable Construction Cost for the project was $1,939,453. A bid tabulation is attached.

We reviewed each proposal and determined the necessary supporting information was submitted in accordance with the instructions to bidders. The proposal requested pricing for an alternate deduct to limit the quantity of demolition within the wet well. The Building Crafts, Inc. proposal would reduce their base bid by $19,000, if accepted.

Building Crafts, Inc. provided NKWD as a reference, but we contacted the other three references listed. We were able to discuss the contractor's past performance with two of the three references. Both Sanitation District No. 1 of Northern Kentucky and the Rathburn Regional Water Association would work with Building Crafts, Inc. on a future project, and were satisfied with the quality and timeliness of their completed project. It is our understanding that Building Crafts, Inc. has a long history of working for the NKWD on various other projects.

Based on our review of the proposal and supporting documentation, we recommend the NKWD proceed with awarding a contract to Building Crafts, Inc. for the project in the amount of $1,564,000. We further recommend that appropriate NKWD legal and financial resources evaluate the supporting documents furnished by Building Crafts, Inc. as part of your review process.

If you have any questions or require additional information, please contact our office.

Regards,
Wade Trim, Inc.

Kenneth M. Kamper, PE
Project Manager

Wade Trim, Inc.
895 Central Avenue
Suite 830
Cincinnati, OH 45202

513.598.6400
513.381.3243 fax

Case No. 2016-00303
Exhibit C

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

Board Resolution

Northern Kentucky Water District
Board of Commissioners
Special Meeting
August 18, 2016

A special meeting of the Board of Commissioners of the Northern Kentucky Water District was held on August 18, 2016 at the District's facility located at 2835 Crescent Springs Road in Erlanger, Kentucky. All Commissioners were present. Also present were Kyle Ryan, Jeff Schuchter, Jenna Cannafax, Kim Clemons, Lindsey Rechtin, Amy Kramer, Vince DiGirolamo, Ronald Lovan, and Brian Dunham.

Chairperson Macke called the meeting to order at 12:13 p.m., and Commissioner Koester led the pledge of allegiance. Chairman Macke welcomed Commissioner Koester back to the Board.

The Board reviewed correspondence received and articles published since the last special Board meeting on July 21, 2016.

On motion of Commissioner Wagner, seconded by Commissioner Spaulding, the Commissioners unanimously approved the minutes for the special Board meeting held on July 21, 2016.

The Board was provided a copy of the District's check registers, which included the check number, check date, payee, check amount and description of the reason for each payment, detailing the District's expenditures for the period July 1, 2016 through July 31, 2016. On motion of Commissioner Cunningham, seconded by Commissioner Sommerkamp, and after discussion, the Commissioners unanimously approved the expenditures of the District for the month of July, 2016.

On motion of Commissioner Spaulding, seconded by Commissioner Sommerkamp, the Commissioners unanimously approved the District's renewal of the Lucity IMS annual seat licenses and Constant Connection maintenance agreement in the amount of $21,128.59, and subsequent annual renewals, provided that same do not increase more than 5% over the prior year, and authorized the President/CEO or his/her designee to execute such documents and make such payments on behalf of the District consistent therewith, and authorized staff to execute the appropriate documents.

On motion of Commissioner Wagner, seconded by Commissioner Spaulding, the Commissioners unanimously approved the District's acceptance of the bid by and awarding a contract to Atlas Manufacturing Co., Inc., for the Construction Services contract for the Licking River Traveling Screen Replacement project, with a total project budget of $200,000, and authorized staff to execute the appropriate documents.

On motion of Commissioner Koester, seconded by Commissioner Cunningham, the Commissioners unanimously approved the District's acceptance of the bid by and awarding a

contract to the Fred A. Neuman Company for the Erlanger Road Water Main Replacement project, with a total project budget of $240,000, and authorized staff to execute the appropriate documents.

On motion of Commissioner Wagner, seconded by Commissioner Sommerkamp, the Commissioners unanimously approved the District's acceptance of the bid by and awarding a contract to Building Crafts, Inc. for the Ohio River Pump Station No. 2 Rehabilitation Project, with a total project budget of $2,000,000, and authorized staff to execute the appropriate documents.

On motion of Commissioner Sommerkamp, seconded by Commissioner Koester, the Commissioners unanimously approved the District's acceptance of the bid by and awarding a contract to Leak Detection Technical Solutions, LLC for the Leak Detection Services, and authorized staff to execute the appropriate documents.

On motion of Commissioner Wagner, seconded by Commissioner Sommerkamp, the Commissioners unanimously approved the District's authorization and adoption of the Resolution for the 2015 SRF Assistance Agreement prepared by Dinsmore & Shohl, and authorized the President and Secretary of the District to execute the necessary documents or agreements and to otherwise act on behalf of the District to effect such financing.

On motion of Commissioner Spaulding, seconded by Commissioner Wagner, the Commissioners unanimously approved the District's acceptance of the bid by and awarding a contract to Jack Gemmer and Sons, Inc. for the Highland Ridge Apartments Water Service Project, with a total project budget of $70,000, and authorized staff to execute the appropriate documents.

Mr. Dunham advised the board that he was excusing himself from the meeting due to his firm's submittal of a response to the bond counsel request for qualifications and proposal, and left the board room. Thereafter, on motion of Commissioner Koester, seconded by Commissioner Sommerkamp, the Commissioners unanimously approved the District's acceptance of the proposal by and awarding a contract to Dinsmore & Shohl for bond counsel services and Ross, Sinclaire & Associates for fiscal agent services for a period of three years with the option to cancel either or both of such engagements at any time after the first year. Mr. Dunham then returned to the meeting.

The Commissioners reviewed the District's financial reports and Department reports. As part of her report, Ms. Kramer reviewed with the Commissioners the status of on-going projects within the 2015 5-Year Capital Budget, including highlighting the change orders since the last Board meeting and highlighting the expenses incurred to date. Ms. Kramer also gave an update of Flint, Michigan-related lead issues.

Other matters of a general nature were discussed.

On motion of Commissioner Wagner, seconded by Commissioner Spaulding, the Board unanimously agreed to go into executive session under the provisions of KRS 61.810(1)(c) to

discuss pending or proposed litigation against or on behalf of the District and to protect the District's legal interests and strategy in connection with such litigation. The executive session commenced at 2:06 p.m. and ended at 2:10 p.m. The Board then came back into open session.

On motion of Commissioner Wagner, seconded by Commissioner Cunningham, the meeting was adjourned at 2:10 p.m.

CHAIRMAN	SECRETARY

0008168.0617432 4838-1307-0647v1

Case No. 2016-00303
Exhibit D

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

PROJECT FINANCE INFORMATION

Customers Added and Revenue Effect

Debt Issuance and Source of Debt

Additional Costs for Operating and Maintenance

USoA Plant Account

Depreciation Cost and Debt Service After Construction

Customers Added and Revenue Effect: There will be no new customers added and no anticipated revenue effect as a result of the Ohio River Pump Station No. 2 Rehabilitation Project.

Debt Issuance and Source of Debt: This project will be paid from the District's Five-Year Capital Budget, PSC No. 242 "ORPS2 Rehabilitation" with a budget of $2,000,000 which includes construction cost, engineering, and contingencies. A summary of the project costs is provided below:

o Engineering Evaluation	$ 119,557
o Design Engineering	$ 92,578
o Construction Engineering	$ 43,746
o Contractor's Bid	$1,564,000
o Misc. & Contingencies	$ 180,119
Total Project Cost	$2,000,000

The project will be funded from a future Bond Anticipation Note.

USoA Accounts: The anticipated amounts for the project cost of $2,000,000 will fall under the following Uniform System of Accounts Code

Code 304 "Structures and Improvements" $2,000,000

Additional Costs and O&M: Additional annual operating and maintenance costs incurred for the project are as follows:

Power	$ 0
Labor	$ 0
Maintenance	$ 0
	$ 0

Depreciation and Debt Service: Annual depreciation and debt service after construction are as follows:

Depreciation: $53,333/year over 37.5 years for Code 304 Structures and Improvements

Annual Debt Service: $67,037 over 25 years (conventional 4.5% loan).

Case No. 2016-00303
Exhibit E

NORTHERN KENTUCKY WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

SCHEDULE OF MORTGAGES, BONDS, NOTES, AND OTHER INDEBTEDNESS

Northern Kentucky Water District		
Bonds & Notes		
9/1/2016		
Bonds		
USDA 2000	$1,831,000	
Series 2003C	$0	
Series 2004A	$0	
Series 2006	$21,125,000	
Series 2009	$23,215,000	
Series 2011	$26,450,000	
Series 2012	$47,480,000	
Series 2013A	$24,510,000	
Series 2013B	$18,180,000	
Series 2014B	$11,955,000	
	$174,746,000	
KIA Currently Servicing		
F06-03	$2,685,639	
C08-01	$2,923,169	
F08-07	$3,356,334	
F9-02	$20,979,764	
F13-012	$4,328,000	
Total KIA	**$34,272,906**	
Notes		
Taylor Mill	$225,000	Non-Interest Note
Deferred Note Kenton County	$100,000	

Case No. 2016-00303
Exhibit _____F_____

NORTHERN KENTUCKY
WATER DISTRICT

Project

Ohio River Pump Station No. 2 Structural Rehabiliation, Campbell County, Kentucky

184-0486

CURRENT BALANCE SHEET AND
INCOME STATEMENT

NORTHERN KENTUCKY WATER DISTRICT
STATEMENT OF NET POSITION

ASSETS

	Month Ended July 2016	Month Ended June 2016
Current Assets		
Cash and Cash Equivalents	$ 17,524,744	$ 17,756,295
Investments	1,186,442	1,186,623
Accounts Receivable		
Customers	4,358,992	4,968,213
Unbilled Customers	5,900,000	5,900,000
Others	162,208	213,122
Assessments Receivable	123,785	123,785
Inventory Supplies for New Installation and Maintenance, at Cost	1,811,825	1,846,611
Prepaid Items	587,184	681,642
Total Current Assets	**31,655,180**	**32,676,291**
Restricted Assets		
Boone Florence Settlement	-	-
Bond Proceeds Fund	2,775,929	2,853,246
Debt Service Reserve Account	18,659,149	18,610,594
Debt Service Account	14,404,040	10,957,620
Improvement, Repair & Replacement	676,179	1,176,552
Total Restricted Assets	**36,515,297**	**33,598,012**
Noncurrent Assets		
Capital Assets:		
Land, System, Buildings and Equipment	447,957,199	447,816,728
Construction in Progress	35,610,980	34,762,003
Total Capital Assets	483,568,179	482,578,731
Less Accumulated Depreciation	137,906,195	136,899,435
Total Capital Assets, Net of Acc Dep	**345,661,984**	**345,679,296**
Total Noncurrent Assets	345,661,984	345,679,296
Total Assets	$ 413,832,461	$ 411,953,599
Deferred Outflows of Resources		
Contributions Subsequent to the Measurement Date	2,343,773	2,343,773
Total Deferred Outflows of Resources	2,343,773	2,343,773
Total Assets and Deferred Outflows of Resources	**416,176,234**	**414,297,372**

NORTHERN KENTUCKY WATER DISTRICT
STATEMENT OF NET POSITION

LIABILITIES

	Month Ended July 2016	Month Ended June 2016
Current Liabilities		
Bonded Indebtedness	$ 9,654,000	$ 9,654,000
Notes Payable	1,138,778	1,189,407
Accounts Payable	1,994,867	2,019,700
Accrued Payroll and Taxes	372,407	244,494
Other Accrued Liabilities	133,575	235,265
Customer Deposits	986,010	984,555
Total Current Liabilities	14,279,637	14,327,421
Liabilities Payable-Restricted Assets		
Accounts Payable	926,226	1,709,047
Accrued Interest Payable	4,280,134	3,520,695
Total Liabilities Payable From Restricted Assets	5,206,360	5,229,742
Long-Term Liabilities (Net of Current Portion)		
Bond Indebtedness	165,092,000	165,092,000
Notes Payable	35,358,821	33,408,500
Total Long-Term Liabilities	**200,450,821**	**198,500,500**
Non-Current Liability		
Net Pension Liability	14,819,690	14,819,690
Miscellaneous Deferred Charges	3,693,169	3,950,862
Total Liabilities	**238,449,677**	**236,828,215**
Net Position		
Invested in Capital Assets, Net of Related Debt	134,418,385	136,335,389
Restricted, Net of Related Debt	31,308,937	28,368,270
Unrestricted	11,999,235	12,765,498
Total Net Position	**177,726,557**	**177,469,157**
Total Liabilities and Net Position	$ **416,176,234**	**$ 414,297,372**

NORTHERN KENTUCKY WATER DISTRICT
STATEMENTS OF REVENUES, EXPENSES AND CHANGES IN NET POSITION

	Month Ended July 2016	Month Ended June 2016
Operating Revenues		
Water Sales	$ 3,938,934	$ 5,349,064
Forfeited Discounts	61,385	69,741
Rents From Property	38,471	35,395
Other Water Revenues	25,139	27,405
Total Operating Revenues	**4,063,929**	**5,481,605**
Operating Expenses		
Operating and Maintenance Expense	2,172,845	1,903,205
Depreciation Expense	1,006,760	1,006,760
Total Operating Expenses	**3,179,605**	**2,909,965**
Net Operating Income	**884,324**	**2,571,640**
Other Income (Expense)		
Investment Income	64,745	23,387
Unrealized (Loss)/Gain on Investments	(181)	10,108
Miscellaneous Non-Operating Income	5,392	12,291
Interest on Long-Term Debt	(767,234)	(764,118)
Amortization of Debt Discount and Expense	45,587	45,587
Total Non-Operating Expenses	**(651,691)**	**(672,745)**
Change in Net Position Before Capital Contributions	232,633	1,898,895
Capital Contributions	24,767	57,318
Change in Net Position	257,400	1,956,213
Net Position - Beginning of Month	177,469,157	175,512,944
Net Position - End of Month	$ **177,726,557**	**$ 177,469,157**

NORTHERN KENTUCKY WATER DISTRICT
STATEMENTS OF WATER OPERATING REVENUE

	Month Ended July 2016	Month Ended June 2016
Operating Revenues		
Metered Sales		
Sales to Residential Customers	$ 2,571,323	$ 3,054,886
Sales to Commercial Customers	501,816	873,291
Sales to Industrial Customers	128,443	653,313
Sales to Public Authorities	250,381	216,488
Sales to Multiple Family Dwellings	341,971	404,740
Sales Through Bulk Loading Stations	6,422	9,550
Total Metered Sales	**3,800,356**	**5,212,268**
Fire Protection Revenue	5,242	1,322
Sales For Resale	133,336	135,474
Total Sales of Water	**3,938,934**	**5,349,064**
Forfeited Discounts	61,385	69,741
Rents from Water Property	38,471	35,395
Other Water Revenue	25,139	27,405
Total Operating Revenues	$ **4,063,929**	$ **5,481,605**

NORTHERN KENTUCKY WATER DISTRICT
STATEMENTS OF COMBINED OPERATION AND MAINTENANCE EXPENSES

	Month Ended July 2016	Month Ended June 2016
Operation and Maintenance Expenses		
Salaries and Wages	$ 810,495	$ 498,636
Employee Pensions and Benefits	388,299	347,257
Taxes Other Than Income Taxes	56,360	35,084
Purchased Power	215,544	213,992
Chemicals	199,794	233,680
Materials and Supplies	114,548	157,190
Contractual Services	261,959	267,543
Rent	-	-
Transportation Expenses	41,523	45,046
Insurance	44,613	44,643
Advertising	628	99
Bad Debt Expense	22,024	45,141
Miscellaneous Expense	6,968	4,923
Regulatory Commission Assessment	10,090	9,971
Total Operation and Maintenance Expenses	$ **2,172,845**	$ **1,903,205**