RESTORING OKLAHOMA’S WAURIKA LAKE TO A RESILIENT WATER SUPPLY

PROJECT BRIEFING

PHASE 1.0 - RECONNAISSANCE AND SCOPING STUDY

PHASE 2.0 - PRELIMINARY DESIGN REPORT

PHASE 3.0 - FUNDING, PERMITS, AND CONTRACTORS

PHASE 4.0 - DISPOSAL SITE AND PROCEDURES

PHASE 5.0 - PLANS, SPECIFICATION, AND PROPOSAL

PHASE 6.0 - ADVERTISE-BIDDING-AWARD SERVICES

PHASE 7.0 - CONSTRUCTION AND GENERAL/INSPECTION DURING CONSTRUCTION

PHASE 8.0 - POST-CONSTRUCTION OPERATION AND CLOSURE
Waurika Project Location

1) Lake located 27 River Mile on Beaver Creek
2) 10,100 Acre Lake
3) Construction Completed Aug 1977
4) Storage of 187,000 ac-ft
5) Lake is 39 years old
6) Purpose:
   Flood Control
   Irrigation
   Water Supply
   Water Quality
   Recreation
   Fish & Wildlife
7) WLMCD conveys 10 to 34 mgd 24/7/365
Waurika Lake Water Conveyance

1) Five (5) Member Cities and Townes
2) 275,000 people
3) 8% of State Population
4) Fort Sill is a water customer
5) Services 4 Counties 
   Comanche  
   Cotton Wood  
   Jefferson  
   Stephens
WAURIKA LAKE
WATER INTAKE CHANNEL
MAINTENANCE
PROJECT

“FIRST INLAND DREDGING PROJECT IN THE NATION
SINCE SECTION 408 APPROVAL & REQUEST WERE
INTRODUCED IN 2005 TO COMPLY WITH 33 U.S.C.
SECTION 408”
ASSESSMENT OF CONDITIONS

NORMAL OPERATIONS - The underwater intake supply channel depth is 46.0 feet at normal pool of El 951.4 with a storage capacity of 187,000 ac-ft

1) DROUGHT – On 4th May 2015 the lake was 19.54 feet below normal pool at an El 931.85 with a storage capacity of 53,233 ac-ft.

2) NOT ACCESSIBLE - Transported sediment and local surface erosion sediment had filled in the lower section of the underwater intake channel 18 feet from El 905.0 to El 923.0 at 28,000 ac-ft lake storage NOT accessible.

3) ACCESSIBLE - Middle 8.46 feet section of the conservation pool with a storage capacity of 25,233 Ac-Ft available or 14% of the conservation pool was accessible.

4) A decrease in quantity and quality of water available for water district conveyance.

5) Waurika Lake entered LEVEL 4 DROUGHT conditions 19th Feb 2015.
MAY 2015 PROJECT UPDATE during Bidding

May/June 2015

1) 20 inches of rainfall occurred, raising lake levels from EL 931 to 951+/- (normal conservation pool)

2) LATE SPRING RAINS – On 3rd June 2015 the lake was 1.70 feet above normal pool at an El 953.1 with a storage capacity of 207,871 ac-ft.
Project Goals

1) Increase amount of water available for conveyance, **increase dependable yield**

2) Lowering the intake channel by maintenance dredging to **access lower elevations of conservation pool**

3) Installing HDPE pipe from lower gates along intake channel to allow continued access during **future sediment deposits**

4) Keithline Engineering retained to investigate permitting and dredging of the channel or other alternatives

   4.1) Develop long-term solution to **reduce, minimize, stop or mitigate** continue sediment deposits from interfering with water supply operations in the future

   4.2) Investigate **Alternate Solutions**
USACE Project Oversight – Bi-Weekly Meetings Sept 2013 thru Aug 2015
Project Phasing

Phase 1.0 – Reconnaissance & Scoping Study
- Sediment fill was 18' thick at intake structure
- Sediment fill was at least 7' thick the entire 4,000 foot length of the channel
- Sediment determined non-toxic non-hazardous

Phase 2.0 – Preliminary Design Report
- Replace gates and investigate current pumps
- Dredge Channel, then install 42” HDPE pipe along intake channel bottom
- Dewater dredged material

Schedule of Project Phases
- Phase 1.0 - Reconnaissance and Scoping Study: Completed December 2013
- Phase 2.0 - Preliminary Design Reports: Completed October 2014
- Phase 3.0 - Procure Funding/Permits/Prospective Contractors: Completed June 2015
- Phase 4.0 - Permit Disposal Site: Completed June 2015
- Phase 5.0 - Develop Final Plans, Specifications and Proposal: Completed May 2015
- Phase 7.0 - Construction and General/Inspection during Construction: August 2015 to July 2016
Phase 3.0 – Funding, Permits

- 35% Section 408 Permit filed with USACE on November 12, 2014
- 95% Section 408 Permit filed with USACE on April 8, 2015*
- 408 Approval expected June 2015
- Complete funding - June 2015
- City/County permits not required
- ODEQ NPDES discharge permit to be issued in conjunction with 408 Approval

<table>
<thead>
<tr>
<th>TASK</th>
<th>Cost</th>
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<tbody>
<tr>
<td>TASK 1 - Maintenance Prep., Monitoring &amp; Management</td>
<td>$2,160,000</td>
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<tr>
<td>TASK 2 - Maintenance Dredging &amp; Related Activities</td>
<td>$3,740,000</td>
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<tr>
<td>TASK 3 - Lower Gate Extension</td>
<td>$5,800,000</td>
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<td>TASK 4 - Post Maintenance Operations</td>
<td>$300,000</td>
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<tr>
<td>Total Project Estimate</td>
<td>$12,000,000</td>
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* Included all soil, sediment, elutriate, cultural surveys
Phase 4.0 – Disposal Site and Procedures

- Dewatering of dredged material on Site performed in Confined Dredged Material Storage Area (CDMSA)
- Decant free water off
- Dried material will remain on-site
- Indigenous background was established
- Dredged material monitored for toxicity, heavy metals and pesticides constituents
Phase 5.0 – Plans, Specification, and Proposal

- 95% Plans submitted to USACE January 6 2015 – “no comments”
- 100% Plans completed May 2015
- Project divided into 4 ‘Tasks’
  - Task 1 – Maintenance Preparation, Monitoring, and Management
  - Task 2 – Maintenance Dredging & Related Activities
  - Task 3 – Intake Structure Repair & Lower Gate Extension
  - Task 4 – Post Maintenance Operations
- Total construction time of 330 days.
Phase 6.0 & 7.0

**Phase 6.0 – Advertise-Bidding-Award Services**

- Advertising: April 29 2015 (Lawton, Duncan, Waurika, national plan rooms)
- Mandatory Pre-Bid: May 21 2015. **Ten (10) contractors attended.**
- Bid Opening: June 23 2015; **three (3) bidders**
- Contract awarded to Wynn Construction Company Inc, Oklahoma City, in the amount of $8,734,535.00 on July 7 2015
- Contract executed July 7 2015 for TOTAL BASE BID plus Additive Alternates 2 and 3
- **Pre-Construction Conference: August 18 2015**
- Project Notice-to-Proceed: August 14 2015 w/ 10 days to proceed. Day 1 is Aug 24 2015.

**Phase 7.0 – Construction and General Inspection during Construction**

- August 2015 thru July 2016 (330 days)
- Intake Structure will be fully operational throughout project; however, one wetwell closed during gate replacement.
- Keithline Engineering will provide a 3/4-time professional engineer inspector.
- Water supply interruptions are not anticipated; however, contingencies are in-place
Phase 6.0 Permit Approvals

33 USC Section 408 (alter/occupy/use Waurika Lake)  July 2015

USACE “Findings of No Significant Impact” FONSI  July 2015

USACE NWP-12 (authorizes repairs/construction)  July 2015

USACE NWP-16 (approval to discharge CDMSA decant into Waurika Lake)  July 2015

USACE Real Estate Early-Right-of-Entry  Aug 2015

USACE Real Estate Land and Water Easements  Sept 2015

ODEQ SWP3 Erosion and Sediment Control  Mar 2015

ODEQ 401 (Oklahoma Authorizes CDMSA discharge to Waurika Lake using USACE BMPs)  July 2015
Phase 6.0 Funding Approvals

Project fully funded

1) Oklahoma Water Resources Board - $10.2 Million Loan - Approved June 16, 2015
2) US Bureau of Reclamation - $0.3 Million Grant
3) FEMA Grant $$$ disappeared when drought was over
TSS and pH Monitoring at Intake Structure and CDMSA discharge
Conducted daily when inspector on-site

## Waurika Lake Water Intake Channel Maintenance Project
### Dredging, Gate Extensions Gate Replacements
#### Daily Water Sampling Log

<table>
<thead>
<tr>
<th>Date-Time and Inspector</th>
<th>NW Corner North CDMSA</th>
<th>SE Corner South CDMSA</th>
<th>CDMSA Outfall</th>
<th>Outside Curtain of CDMSA Outfall</th>
<th>Lake Water - West of Intake Str</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Day</td>
<td>Initials</td>
<td>pH</td>
<td>Water Temp (°F)</td>
<td>TSS (mg/L)</td>
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<tr>
<td>2/21/2016</td>
<td>Sun</td>
<td>MM</td>
<td>8.2</td>
<td>69</td>
<td>1193</td>
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<td>2/23/2016</td>
<td>Tue</td>
<td>MM</td>
<td>8.4</td>
<td>58.3</td>
<td>282</td>
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<tr>
<td>2/24/2016</td>
<td>Wed</td>
<td>MM</td>
<td>8.4</td>
<td>58.3</td>
<td>282</td>
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<tr>
<td>2/25/2016</td>
<td>Thur-AM</td>
<td>MM</td>
<td>8.4</td>
<td>56.1</td>
<td>471</td>
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<tr>
<td>2/25/2016</td>
<td>Thur-FM</td>
<td>MM</td>
<td>8.3</td>
<td>48.6</td>
<td>205</td>
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<tr>
<td>2/26/2016</td>
<td>Fri-AM</td>
<td>MM</td>
<td>8.1</td>
<td>56.1</td>
<td>754</td>
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<tr>
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<td>Fri-FM</td>
<td>MM</td>
<td>8.5</td>
<td>55.5</td>
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<tr>
<td>2/27/2016</td>
<td>Sat-AM</td>
<td>RSV</td>
<td>8.11</td>
<td>51.5</td>
<td>865</td>
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<tr>
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<td>Sat-FM</td>
<td>RSV</td>
<td>8</td>
<td>61.2</td>
<td>1413</td>
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Note 1: TSS and turbidity are always high during windy days. Note elevated readings on Wed 3/21, Friday-PM 3/26, and Sat-PM 3/27.
Note 2: No CDMSA discharge entered the lake from 2/2/23 onward due to the CDMSA sifterboards being raised to allow only two feet of treeboard for the duration of dredging.
Note 3: A pH of 9 was noted in the lake in the vicinity of the outfall on Wednesday 2/24 and Friday 2/26 PM; however, no CDMSA discharge was entering the lake on that day.
HANDHELD TSS, SLUDGE LEVEL, pH METERS
Logging Geotechnical Measurements
Soil Densities and Constituent Sampling – Terracon OKC
Soil Sampling – Terracon & Accurate Labs - OKC
Dredged Material Sampling – Environmental Testing Inc & Accurate Labs - OKC
Health-Safety-Environmental and Work Plans

Each Project Task is accompanied by:

- Safety Plan *
  - Medical Emergencies
  - Weekly Safety Toolbox Talks
  - Safety Inspections
- Equipment Safety Plan *
  - Equipment Accidents
  - Submerged Equipment
- Environmental Plan *
  - Oil Spills
  - Fuel Storage Areas
- Work Plan
  - Means/Methods/Procedures

* references 2014 EM 385-1-1 USACE Safety and Health Manual
WAURIKA LAKE MASTER CONSERVANCY DISTRICT

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

PLAN OF PROPOSED DREDGING, GATE EXTENSIONS & GATE REPLACEMENTS
CONTOURS AND DRAINAGE
USACE PROJECT LAND AND WATER EASEMENTS
## TASK 1 – PREPARATION BID ITEMS

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</table>
PRE- MID- POST-BATHYMETRY (OWRB)
LOWRANCE HDS GEN 3 SIDE-SCAN SONAR
LOWERING 800 FT SECTION OF 42” HDPE INTO DREDGED CHANNEL
SIDE-SCAN IMAGES
UNDERWATER IMAGES
TASK 1 - GATE REPLACEMENT
REMOVE / REPLACE SIX SLIDE GATES

1) Cast Iron Tuberculation
2) Tuberculation restricts movement of slide gates
3) Restriction breaks other components of slide gates
4) Key factor is lake water characteristics
5) Ductile Iron gate versus stainless
FINAL GATE INSPECTION - 2
## TASK 2 – DREDGING BID ITEMS

<table>
<thead>
<tr>
<th>Task No</th>
<th>Description</th>
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<tbody>
<tr>
<td>13</td>
<td>Mobilization</td>
</tr>
<tr>
<td>14</td>
<td>Construct Confined Dredge Material Storage Area (CDMSA) - Cell 1</td>
</tr>
<tr>
<td>15</td>
<td>Construct Confined Dredge Material Storage Area (CDMSA) - Cell 2</td>
</tr>
<tr>
<td>16</td>
<td>Construct Confined Dredge Material Storage Area (CDMSA) - Cell 3 &amp; Starter Cell</td>
</tr>
<tr>
<td>17</td>
<td>Maintain Water Supply and Quality for Pump Station Conveyance</td>
</tr>
<tr>
<td>18</td>
<td>Section A Dredging</td>
</tr>
<tr>
<td>19</td>
<td>Section B Dredging</td>
</tr>
<tr>
<td>20</td>
<td>Section C Dredging</td>
</tr>
<tr>
<td>21</td>
<td>Dewater, Treatment, Manage Water Volume and Release for CDMSAs</td>
</tr>
<tr>
<td>22</td>
<td>Remove Submerged Riprap and Stockpile</td>
</tr>
<tr>
<td>23</td>
<td>Erosion and Sediment Control for Field Operations</td>
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</tbody>
</table>
TASK 2 – EXISTING INTAKE CHANNEL PROFILE

EXHIBIT 5
TASK 2 - DREDGING PLAN AND PROFILE
TASK 2 - EROSION CONTROL
TASK 2 - STORMWATER MANAGEMENT PLAN
TASK 2 – DREDGE AMERICA CDMSA CONFIGURATION
CDMSA Considerations

- Real Estate – no wetlands, no groundwater conflicts, no cultural conflicts
- Suitable material to construct berms
- CDMSA to hold 4 times the volume of dredged material
- Dredged material should dewater easily
- Final destination of dewatered dredged material
- ODEQ BMP parameters on effluent decant water discharge
- Desiccation & native vegetation growth during final operations & monitoring
Waurika CDMSA Construction starting August 2015
WAURIKA CDMSA IN OPERATION
DREDGE AMERICA “LIBERTY”
CUTTERHEAD DREDGE
TASK 2 – FLASHBOARD RISER WEIR
CDMSA DISCHARGE INTO LAKE

12" Discharge Pipes

Turbidity Curtain
PROJECT AT PEAK OF CONSTRUCTION ACTIVITIES
### TASK 3 – EXTENDING LOWER GATES

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<th>Task</th>
<th>Description</th>
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<tbody>
<tr>
<td>24</td>
<td>Mobilization</td>
</tr>
<tr>
<td>25</td>
<td>Install Underwater Pipe Anchors</td>
</tr>
<tr>
<td>26</td>
<td>Install Fuzed 42” (42.41” OD/36.762”ID) PE4710 DR 17 125 psi HDPE Pipe</td>
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<tr>
<td>27</td>
<td>Install 36” Expansion Joints</td>
</tr>
<tr>
<td>28</td>
<td>Install 36” Flexible Expansion Joints</td>
</tr>
<tr>
<td>29</td>
<td>Install 42”x42”x42” DR 17 HDPE WYE</td>
</tr>
<tr>
<td>30</td>
<td>Install 100’ (5 ea 20’ sections) of 36” SBR Flexible Hose w/ molded Stainless Steel Class 125/150 Flanges</td>
</tr>
<tr>
<td>31</td>
<td>Install 60’ (3 ea 20’ sections) of 36” SBR Flexible Hose w/ molded Stainless Steel Class 125/150 Flanges</td>
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<tr>
<td>32</td>
<td>Install 20’x14’x1’ Concrete Pad and Pipe Fasteners</td>
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<tr>
<td>33</td>
<td>Install 36” DR17 HDPE Flange Adapters</td>
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<tr>
<td>34</td>
<td>Install 36” IPS Class 125/150 310 Stainless Steel Back Up Rings</td>
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<tr>
<td>35</td>
<td>Install 42”x36” DR17 HDPE Concentric Reducer</td>
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<tr>
<td>36</td>
<td>Install 30 MGD Floating Intake Screen</td>
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<td>37</td>
<td>Install Intake Screen Protective Enclosure</td>
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<tr>
<td>38</td>
<td>Install Navigation Buoy</td>
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<td>39</td>
<td>Install Floating Intake Anchor System</td>
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<tr>
<td>40</td>
<td>Install Permanent 13” Spar Buoys with anchors</td>
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<tr>
<td>41</td>
<td>Install Temporary 30” Float Balls with anchors</td>
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TASK 3 – 42” HDPE PLAN AND PROFILE
TASK 3 - LOWER GATE DIFFUSER
TASK 3 – TYPICAL 42’’ HDPE SUBMARINE INSTALLATION
HDPE FUSING - QUALITY CONTROL

Operator Certification

Joint Datalogging
Task 3 – Intake Screen
### TASK 4 - Post Maintenance Operations

<table>
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<tr>
<td>42</td>
<td>32 72 00 Construction and Staging Site Restoration and Closing CDMSAs</td>
</tr>
<tr>
<td>43</td>
<td>01 55 24 WLMCD Road Repairs</td>
</tr>
<tr>
<td>44</td>
<td>01 71 14 Demobilization</td>
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</tbody>
</table>
1) WLMCD and USACE Grounds – restore to pre-project condition, or better, as determined by WLMCD and USACE representatives

2) WLMCD frontage road – rehabilitated to pre-project condition

3) CDMSA Period 1 – Dredging Activities CDMSA receiving dredged slurry
   CDMSA Period 2 – Facility is isolated to decant free water, dryout & settle
   CDMSA Period 3 – Cover dry sediment, reclaim land back to original shape encourage native vegetative species to grow back to area.
Waurika Lake Water Intake Channel Maintenance Project
Talking Points for a Successful Project:

1). ACCESS TO ALL DEPTHS of the conservation pool is critical; especially when water reservoirs are lowered due to drought conditions regardless of the amount of sediment deposits.

2). Solutions to expensive infrastructure problems should be JUSTIFIED by RISK BASED PRIORITIZATION/DECISION MAKING with methodologies that includes cost to benefit analysis that includes a full cycle maintenance and future replacement cost for a comprehensive project funding model. For example; do we spend an extra million dollars to double the life of the project.

3). POSITION THE PROJECT TO BE SUCCESSFUL BY DEVELOPING A COOPERATIVE EFFORTS WITH ALL STAKEHOLDERS, REGULATORS AND AGENCY REVIEWERS. In other words, get everybody pushing and pulling in the same direction.

4). ALWAYS KEEP IT SIMPLE as possible.
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QUESTIONS & COMMENTS