

LAKE LEWISVILLE WATER PLANT
SLUDGE DEWATERING SYSTEM - PRELIMINARY DESIGN
SCOPE OF WORK

PROJECT OVERVIEW

City of Denton Water Reclamation plant is experiencing constant issues processing the solids coming from the Lake Lewisville water treatment plant (LLWTP). The management of the wastewater group has requested elimination of sludge/solids discharges into the wastewater collection system and thus into the wastewater treatment plant.

Lake Lewisville water plant has one (1) equalization basin (184,000 gallons) and one (1) wash water recovery basin (235,000 gallons) to process the water plant sludge. The first 15 minutes of a filter backwash, including air scour, ramp up and part of the high rate portion goes to the equalization basin and slowly released to sanitary sewer. The remaining portion of the filter backwash is diverted to the recovery basin to be pumped to the head of the plant. Sludge and wash downs from sedimentation basins follow similar path to the sanitary sewer.

LLWTP staff is installing two (2) submersible pumps as a temporary measure, to collect all treatment plant solids and discharge flows in the equalization basin and pump them to the adjacent pond. The pumping from the equalization basin will be to the southern end of the pond and then decant water, from the northern end, will gravity flow to the wash water recovery basin which will then pump the water to the rapid mixing facility to receive complete treatment.

SCOPE OF SERVICES

The Consultant will provide preliminary engineering design services for a residual dewatering system at Lake Lewisville water plant. The preliminary design will become the basis for the City of Denton's efforts to install a zero discharge dewatering facility including sludge thickening capability.

The scope of services to be provided by the Consultant shall consist of the following four Tasks:

Task 1: Project Management

The Consultant shall be responsible for project management and administration activities for the project.

Scope of Services:

Project management responsibilities shall include, but not be limited to:

- Scope of work and project schedule.
- Tentative workshop dates and deliverable deadlines.
- Project Monitor and Control.
- Project Management Plan including the following:
 - Project goals;
 - Team member roles and responsibilities;
 - Communications approach
 - Risk and resource management
 - Cost and schedule management
 - Sub-contractor management and coordination
 - Invoice content and schedule
- Progress Meetings. The Consultant will schedule monthly progress meetings with the City to review key deliverables and project milestones.

The Consultant shall provide:

- Monthly electronic invoices including an activity report for the period, anticipated work for the next period, decisions needs, and an updated project schedule. Of work and project schedule.
- Decision log summarizing key communications and decisions made throughout the course of the project workshop dates and deliverable deadlines.
- Meeting agendas, workshop presentations, and meeting minutes.

Task 2: Site Survey

The Consultant shall perform a site survey to collect data on the existing water treatment processes and solids loading to the sanitary sewer system.

Scope of Services:

Site survey and data collection shall include, but not be limited to:

- City of Denton will provide detailed design drawings of all facilities, water quality data, treatment plant process flow diagrams, chemical and flow data in electronic format where possible.

- City of Denton will provide wash-water sample data collected from the equalization basin. The Consultant may collect additional samples from the wash-water equalization basin if necessary.
- Review existing sludge handling facility information including as-built drawings and operational information as well as associated water treatment plant process schematics, water quality and plant operational data.
- Based on information gathered on the WTP, including flows, typical coagulant/polymer dose, and information on the coagulant that is used, a design criteria summary and estimates of residuals production will be developed.

The Consultant will prepare a Site Assessment Memorandum that delineates the results of this task. The memorandum will include water treatment plant operations and residuals volume generation data analysis.

Task 3: Analysis of Alternatives

The Consultant shall perform a study of available water plant residuals dewatering technologies and provide an analysis of project alternatives.

Scope of Services:

Analysis of water treatment plant residuals dewatering alternatives shall include, but not be limited to:

- Conduct a study of different sludge dewatering technology (lagoon, screw press, centrifuge or belt press facility etc.) including sludge thickening for a zero discharge sludge handling facility for the sedimentation basin and filter backwash sludge.
- Investigate current successful dewatering technologies including possible upcoming technologies from other industries such as utilities, mining, power generation, and/or other applicable industries faced with similar concerns.
- Compare and contrast alternate dewatering technologies. This comparison will consider the advantages and disadvantages of each studied alternative. Such concerns as capital, operation and maintenance (O&M) and 20-year life cycle cost, adaptability, workability (if applicable) shall be considered.
- An alternatives analysis workshop will be held with City of Denton to review, rank and select the most viable/feasible alternative for the preliminary engineering design.

The Consultant will prepare a Technical Memorandum that delineates the results of this task. The memorandum will include a discussion of the advantages and disadvantages of all water plant residuals dewatering technologies studied.

Task 4: Preliminary Design

The Consultant shall provide preliminary engineering design services for the selected zero discharge dewatering facility including sludge thickening capability.

Scope of Services:

Preliminary engineering design services shall include, but not be limited to:

- Conduct all field, topographic and control surveys, prepare all preliminary geotechnical studies and reports, and complete preliminary design calculations, preliminary plan preparation, preliminary engineers cost estimate, and all other appropriate preliminary engineering work.
- Collect all data necessary to evaluate existing pump station layouts, mechanical, electrical, pneumatic and hydraulic equipment, controls, and structures to determine suitability for upgrade.
- Conduct a preliminary environmental review and identify areas of potential environmental impact and permit requirements for the work location.
- Conduct a preliminary right-of-way assessment and identify potential right-of-way issues for the work location. This project is to be performed on City property and within street right-of-way.
- Prepare a preliminary design report that identifies each relevant design item, outlines the preferred design, potential environmental impacts and requirements, right-of-way issues, constructability analysis, and estimated construction costs. The level of detail provided in the PDR should be equivalent to a 30% design effort for each major element of the project.

The Consultant shall prepare a Preliminary Design Report (PDR) and Engineer's Estimate that delineates the results of this task. Formal PDR submittals shall be prepared for distribution, with drawings reduced by 50% and printed on 11" x 17" reproducible paper, and all written documentation printed on 8 1/2" x 11" reproducible paper. Five (5) document sets shall be submitted for review. In addition, the PDR shall be submitted in Portable Document Format (.pdf) on PC-compatible USB flash drive or CD.

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SLUDGE DEWATERING SYSTEM - PRELIMINARY DESIGN

| WORK TASK DESCRIPTIONS | PM RGM | Sr. Eng JLS | Eng EMK | Eng JK | EIT KPD | Tech KSG | Admin LSS | Labor Hours | Labor Cost | Expenses | Total |
|---|-------------|----------------|------------|-----------|------------|-------------|--------------|----------------|--------------------|-----------------|--------------------|
| 1. Project Management | | | | | | | | | | | |
| Scope of Work and Project Schedule | | | 4 | | | | | 4 | \$715.36 | | \$715.36 |
| Workshop scheduling | | | | | | | | 0 | \$0.00 | | \$0.00 |
| Project Monitoring and Progress Reports | | | 6 | | | | | 6 | \$1,073.03 | | \$1,073.03 |
| Project Coordination | | | | | | | | 0 | \$0.00 | | \$0.00 |
| Project Management Plan | | | 2 | | | | | 2 | \$357.68 | | \$357.68 |
| Sub Coordination | | | | | | | | 0 | \$0.00 | | \$0.00 |
| Monthly Progress Meetings (3) | 6 | | 12 | | | | | 18 | \$3,889.82 | \$300.00 | \$4,189.82 |
| QA/QC Plan | 1 | | 2 | | | | | 3 | \$648.30 | | \$648.30 |
| Subtotal - Project Management | 7 | 0 | 26 | 0 | 0 | 0 | 0 | 33 | \$6,684.19 | \$300.00 | \$6,984.19 |
| 2. Site Survey | | | | | | | | | | | |
| Previous plan and report reviews | | 2 | | 1 | 8 | | | 11 | \$1,410.00 | | \$1,410.00 |
| Water quality data review and analysis | | 4 | | 1 | 16 | | | 21 | \$2,663.52 | \$100.00 | \$2,763.52 |
| PFD review and development | | 1 | | | 4 | | | 5 | \$626.76 | | \$626.76 |
| Develop sheets based on as-built | | | | | | | | 0 | \$0.00 | | \$0.00 |
| Wash water data sample analysis | | 2 | | 1 | 16 | | | 19 | \$2,125.48 | | \$2,125.48 |
| Sample request plan | | 1 | | | 4 | | | 5 | \$626.76 | | \$626.76 |
| Drawing review | | 2 | 1 | | 4 | | | 7 | \$1,074.62 | | \$1,074.62 |
| Coagulant/Polymer Dose analysis | | 1 | | 2 | 4 | | | 7 | \$939.73 | | \$939.73 |
| Design criteria development | 1 | 2 | 1 | | 4 | | | 8 | \$1,365.24 | | \$1,365.24 |
| Residuals Mass Balance | | 12 | | 8 | 24 | | | 44 | \$6,626.56 | | \$6,626.56 |
| Site Assessment TM Draft | 2 | 4 | 1 | 2 | 16 | 8 | 4 | 37 | \$4,538.49 | | \$4,538.49 |
| Site Assessment TM Final | 1 | 1 | 1 | 2 | 8 | | 2 | 15 | \$1,908.11 | | \$1,908.11 |
| Subtotal - Site Survey | 4 | 32 | 4 | 17 | 108 | 8 | 4 | 177 | \$23,764.10 | \$100.00 | \$23,864.10 |
| 3. Analysis of Alternatives | | | | | | | | | | | |
| Alternatives Development (criteria dev) | 2 | 2 | | 2 | 2 | | | 8 | \$1,611.13 | | \$1,611.13 |
| Lagoon | 1 | 4 | | 1 | 24 | 4 | | 34 | \$4,007.65 | | \$4,007.65 |
| Screw Press | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Centrifuge | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Belt Filter Press | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Sludge Thickening | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Evaporation | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Drying | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Other | 0.5 | 2 | | 1 | 12 | 3 | | 18.5 | \$2,166.57 | | \$2,166.57 |
| Compare and Contrast Alternatives | 1 | 4 | 8 | 4 | 24 | | | 41 | \$5,569.80 | | \$5,569.80 |
| Capital & Operational Cost Development | | 2 | 8 | | 32 | | | 42 | \$4,830.67 | | \$4,830.67 |
| Ranking criteria | 2 | 2 | | 2 | 8 | | | 14 | \$2,147.74 | | \$2,147.74 |
| Non economic evaluation | | | | | | | | 0 | \$0.00 | | \$0.00 |
| Alternatives Analysis TM Draft & Workshop Prep. | 4 | 8 | 8 | 8 | 24 | 8 | 8 | 68 | \$9,384.44 | | \$9,384.44 |
| Alternatives Analysis Workshop | 4 | 4 | | 4 | 8 | | | 20 | \$3,580.00 | \$300.00 | \$3,880.00 |
| Alternatives Analysis TM Final | | 2 | | 2 | 8 | 4 | 4 | 20 | \$2,186.86 | | \$2,186.86 |
| Subtotal - Analysis of Alternatives | 17.5 | 42 | 24 | 30 | 214 | 25 | 0 | 352.5 | \$46,623.21 | \$300.00 | \$46,923.21 |
| TOTAL | 28.5 | 74 | 54 | 47 | 322 | 33 | 4 | 562.50 | \$77,071.50 | \$700.00 | \$77,771.50 |