JonesEdmunds

Jones Edmunds & Associates, Inc.

SUPPLEMENTAL WORK ORDER
for the CITY OF CLEARWATER

Date:	**August 13, 2018**
Consultant Project Number:	**03720-051-01**
City Project Number:	**17-0034-UT**
City Plan Set Number:	**N/A**

1. PROJECT TITLE:

East WRF BOD Spikes Investigation – Phase 2

2. SCOPE OF SERVICES:

As part of a Florida Department of Environmental Protection (FDEP)-approved Plan of Study (POS) to investigate the effluent BOD variability occurring at the East Water Reclamation Facility (WRF), Jones Edmunds & Associates, Inc. completed a preliminary evaluation that included an analysis of historical data, bench-scale chemical dose and response tests, and review of the City's sampling and laboratory procedures. The findings and recommendations from the POS evaluation are documented in the Technical Memorandum (TM) – East WRF BOD Spikes Investigation (submitted to the City on May 29, 2018). Following the initial evaluation, the City of Clearwater (City) requested Jones Edmunds continue further investigations and implement their recommendations.

Jones Edmunds is pleased to provide the City with this proposal for continued assistance in identifying and mitigating the BOD exceedances that randomly occur in the East WRF effluent. The proposed scope of work outlined herein is to provide engineering services to complete the next steps and recommendations directed towards detailed investigations to locate the source of the intermittent BOD exceedances in the WRF final effluent as well as BioWin model development and strategies to optimize the performance of the WRF. A summary of the tasks that may be conducted under this scope of work include:

I. PRE-DESIGN PHASE

Task 1 – East WRF Effluent BOD Spikes Investigation (Previously completed under PO number ST 114305).

The following summarizes recommended investigations being added to the original Scope with the understanding that the City will select the investigations to be completed.

Task 2 – Standard Operating Protocols Review

A. Review the available standard operating protocols for sampling collection and preservation procedures for the East, Northeast, and Marshall Street WRFs for the following parameters (Biochemical Oxygen Demand (BOD) (soluble and particulate), Volatile Fatty Acids (VFAs), Chemical Oxygen Demand (COD), Total Kjeldahl Nitrogen (TKN) and Ammonia-Nitrogen (NH_3-N)) and compares them with industry standards.
B. Work with the City to develop their standard operating protocols for sample collection and preservation.

<u>Deliverables</u>

- Prepare standard operating protocols for sample collection and preservation and meet with the City to discuss the document.
- Submit a final document to the City.

<u>Assumptions</u>

- WRF Operational staff familiar with standard protocols will be available at each facility.

Task 3 – Supplemental Investigations

A. East WRF Chemical Use Evaluation
    - Develop annual, monthly, and daily chemical use trends with respect to CBOD spikes for aluminum sulfate and polymer.
    - Determine if aluminum sulfate addition is necessary for phosphorus removal considering changes to influent wastewater characteristics. If it is not necessary to meet effluent standards determine the annual cost savings for the chemical.
    - Determine if the City's current polymer and dosage is optimal for thickening the East WRF sludge.
B. East WRF Sampling & Analysis Plan
    - Conduct supplemental sampling of BOD (soluble and particulate), VFAs, COD, TKN and NH_3-N at selected unit treatment processes to isolate source or cause of BOD issues.
        - Sampling locations to include: WRF influent, headworks effluent, fermentation zone effluent, 1st anoxic zone effluent, oxidation ditch effluent, chemical feed to the 2nd anoxic zone, 2nd anoxic zone effluent, reaeration zone effluent, WRF effluent and other locations as discussed and selected with City.

        - Sampling to include two grab samples per day for the above parameters and continuous sampling of COD at the selected locations.
    - Summarize and review the sampling data and develop facility-wide profiles for selected parameter BOD (soluble & particulate), VFA, COD, TKN, and NH3-N) mapping.

C. East WRF Contributing Industrial Users/Institutions Investigation
    - Review of industrial users/institutions contributing to the East WRF collection system.
    - Potentially recommend sampling locations in the collection system based on suspected BOD sources.

Deliverables

- Prepare and submit a draft technical memorandum and meet with the City to discuss the document.
- Submit a final technical memorandum to the City.

Assumptions

- The City is responsible for collecting and analyzing all water quality samples. All laboratory analysis fees to be paid by the City.
- The City shall provide data to Jones Edmunds in Excel format (when available).
- Daily trends will be developed showing a maximum time-scale of 1 month.
- The City will provide data on the industries/users contributing to the East WRF collection system.

Task 4 – BioWin Model Development

A. Develop a planning level static BioWin™ model for the existing liquid and solids trains at the East WRF to establish existing secondary system treatment capacities, identify potential process bottlenecks, and determine potential future expansion requirements. The model will be calibrated using historical influent flows and wastewater characteristics, historical wastewater temperature data, historical plant operating data (e.g. headworks effluent quality, Mixed Liquor Suspended Solids (MLSS), Mixed Liquor Volatile Suspended Solids (MLVSS), Internal Recycle (IR) ration, Return Activated Sludge (RAS) flow and concentration, Waste Activated Sludge (WAS) flow and concentration, dissolved oxygen levels, Standard Oxygen Transfer Efficiency (SOTE) coefficients for the installed aerators, effluent quality, and Side-stream flows and loadings from sludge handling facilities), and supplemental sampling results from Task 3. The calibrated model will closely mimic the performance of the existing WRF and achieve similar effluent quality results.
B. Evaluate supplemental carbon source requirements based on future flows and loads projections and secondary system capacity using the calibrated model.

C. Develop a more comprehensive dynamic model that can be used as a tool for facility operations optimization and troubleshooting. The dynamic model would provide the facility operators the ability to test the impact of process changes or modifications. It also allows operations staff to optimize the process to improve effluent quality.

Deliverables

- Prepare and submit a draft technical memorandum and meet with the City to discuss the document.
- Submit a final technical memorandum to the City.

Assumptions

- The City is responsible for collecting and analyzing all water quality samples.
- The City shall provide data to Jones Edmunds in Excel format (when available).
- The City will provide available historical plant operating conditions for each unit process (liquid stream and solids handling streams) as follows:

Parameter	Raw Influent	Headworks Effluent	Oxidation Ditch	Secondary Clarifiers	IR	RAS/ WAS	Tertiary Filter	Solids Handling Cake	Recycle Stream from Solids Handling
Flow, mgd	X			X	X	X	X	X	X
BOD – Soluble, mg/L	X			X			X		X
BOD – Particulate, mg/L	X	X		X			X		X
COD, mg/L	X			X			X		X
TKN, mg/L	X			X			X		X
NH_3-N, mg-N/L	X			X			X		X
NO_2-N, mg-N/L				X			X		
NO_3-N, mg-N/L				X			X		
TP, mg-P/L	X	X		X			X		X
Ortho-P, mg-P/L	X			X			X		X
TSS, mg/L	X	X	X	X	X	X	X	X	X
VSS, mg/L	X		X		X	X			X
VFA, mg/L	X								X
Alkalinity, mg/L as $CaCO_3$	X								
Temperature, °F	X								
pH	X								

- Annual and monthly trends will be developed showing a maximum time-scale of 5 years.
- After verifying the data is unavailable by the City, any missing data will be replaced with typical values for similar WRFs that have been established through years of

experience in biological modeling. Nonetheless, generalizations of this kind may miss any particularities of the City's catchment area and this might impact the ultimate accuracy of the model and its capacity to predict present and future WRF performance.

Task 5 – Related Design Services

A. East WRF – Oxidation Ditch Mechanical Aeration System and Biological Nutrient Removal Control Loop Process Evaluations
    - Conduct dissolved oxygen (D.O.) and oxidation-reduction potential (ORP) profiling within the oxidation ditch, fermentation, 1st anoxic and 2nd anoxic basins to confirm appropriate oxic, anoxic and anaerobic levels exist at each unit treatment process. Jones Edmunds will provide the YSI – D.O. and ORP probe to conduct tank profiling.
    - Evaluate the current PLC control method (D.O., Ammonia Based, ORP, Other) for the oxidation ditch aeration system, and discuss current operation, setup, and ability to properly control aerobic and anoxic conditions within the ditch basin, and identify control options alternatives as determined feasible.
    - Review and document date of calibration for D.O. and nutrient monitoring equipment.
    - Conduct a desktop analysis to evaluate the oxygen transfer efficiency of the existing mechanical aerator blades considering oxygen requirements, coordinate with the mechanical aerator manufacturer to discuss average equipment efficiency degradation over time.
    - Discuss results and develop recommendations for increasing aerator capacity requirements, if needed.
B. East WRF Disinfection and Dechlorination System Improvements
    - Determine system requirements for sodium hypochlorite and sodium bisulfite for disinfection and quenching, respectively.
    - Evaluate the injection and mixing methods for disinfection and dechlorination systems to determine if short circuiting is occurring.
    - Perform a screening analysis by identifying up to three mixing technologies for mixer upgrades.
    - Provide recommendation and selection of mixing equipment for the disinfection and dechlorination systems to improve chemical dispersion and reduce chemical use.

<u>Deliverables</u>

- Prepare and submit a draft technical memorandum and meet with the City to discuss the document.
- Submit a final technical memorandum to the City.

Key Assumptions

- The City is responsible for collecting and analyzing all water quality samples.
- The City shall provide data to Jones Edmunds in Excel format (when available).
- Up to three (3) alternatives will be investigated for the screening analysis for aerator and mixer upgrades, respectively .
- Drawings and specifications will be provided under a separate work order.

3. PROJECT GOALS:

The goal of this work is to identify and mitigate the BOD exceedances that randomly occur in the East WRF effluent, estimate the treatment capacity of the WRF, and provide recommendations for potential process improvements as described above. Four project meetings and four site visits are expected to complete this task.

4. BUDGET:

See attachment B. This price includes all labor and expenses anticipated to be incurred by Jones Edmunds & Associates, Inc. for the completion of these tasks in accordance with Professional Services Method "A" – Cost Times Multiplier Basis **for a fee not to exceed <u>One Hundred and Fifteen Thousand</u> Dollars ($115,000)**.

Permit application fees are not expected to be incurred for this work and thus not included.

5. SCHEDULE:

The project is estimated to be completed over a mutually agreed upon schedule following a Notice to Proceed from City.

6. STAFF ASSIGNMENT:

The firm's staff assignments to this project include:

Tom Friedrich, PE, BCEE	Client Services Manager/Senior QA/QC
Lisa Rhea, PE	Project Manager/ Department Manager
Hatim Fadlalla, PhD, PE	Senior Engineer
David Yonge, PhD, PE	Engineer
Elizabeth Kennelley, MS, CEPM	Project Scientist

The City's staff assignments to this project include:

Lan-Anh Nguyen	Project Manager
Jeremy J. Brown, PE	Utilities Engineering Manager
Jason Jennings	Public Utilities Liaison
Jack Sadowski	Public Utilities Site Representative
Richard G. Gardner, PE	Public Utilities Assistant Director

7. CORRESPONDENCE/REPORTING/COMMUNICATION PROCEDURES:

ENGINEER's project correspondence shall be directed to Lisa Rhea, Hatim Fadlalla, and David Yonge, with copy to Tom Friedrich.

All City project correspondence shall be directed to the Project Manager, with copies to the Utilities Engineering Manager and Public Utilities Assistant Director.

ENGINEER shall provide a minimum of forty-eight (48) hours' notice prior to conducting fieldwork/site visits. ENGINEER shall provide a minimum of seven (7) days notification for site visits requiring the assistance of City Operations and Maintenance personnel.

ENGINEER acknowledges that all City directives shall be provided by the City Project Manager.

In addition to the original copies delivered as stated in the scope of work, all project deliverables will be submitted in electronic format on CD or other City approved device prior to approval of final invoice.

8. INVOICING/FUNDING PROCEDURES:

For work performed, invoices shall be submitted monthly to the:

City of Clearwater, Engineering Department
Attention: Veronica Josef, Senior Staff Assistant
PO Box 4748
Clearwater, Florida 33758-4748.

Contingency services will be billed as incurred only after written authorization provided by the City to proceed with those services.

City Invoicing Code: 3277327-561300-96218.

9. INVOICING PROCEEDURES

At a minimum, in addition to the invoice amount(s) the following information shall be provided on all invoices submitted on the Work Order:

A. Project Number, Purchase Order Number and Contract Amount.
B. The time period (begin and end date) covered by the invoice.
C. A short narrative summary of activities completed in the time period
D. Contract billing method – Lump Sum or Cost Times Multiplier
E. If Lump Sum, the percent completion, amount due, previous amount earned and total earned to date for all tasks (direct costs, if any, shall be included in lump sum amount).
F. If Cost Times Multiplier, hours, hourly rates, names of individuals being billed, amount due, previous amount earned, total earned to date for each task and other direct costs (receipts will be required for any single item with a cost of $50 or greater or cumulative monthly expenses greater than $100).
G. If the Work Order is funded by multiple funding codes, an itemization of tasks and invoice amounts by funding code.

10. SPECIAL CONSIDERATIONS:

The consultant named above is required to comply with Section 119.0701, Florida Statutes (2013) where applicable.

PREPARED BY:

_____

Stanley F. Ferreira, PE
President / Chief Executive Officer
Jones Edmunds & Associates, Inc.

_____
Date

APPROVED BY:

_____

D. Scott Rice, PE
City Engineer
City of Clearwater

_____
Date

CITY OF CLEARWATER
ENGINEERING DEPARTMENT

WORK ORDER INITIATION FORM
CITY DELIVERABLES

1. FORMAT

The design plans shall be compiled utilizing the following methods:

1. City of Clearwater CAD standards.
2. Datum: Horizontal and Vertical datum shall be referenced to North American Vertical Datum of 1988 (vertical) and North American Datum of 1983/90 (horizontal). The unit of measurement shall be the United States Foot. Any deviation from this datum will not be accepted unless reviewed by City of Clearwater Engineering/Geographic Technology Division.

2. DELIVERABLES

The design plans shall be produced on bond material, 24" x 36" at a scale of 1" = 20’ unless approved otherwise. Upon completion the consultant shall deliver all drawing files in digital format with all project data in Autodesk Civil 3D file format. If not available Land Desktop files are still acceptable, however the City or Clearwater is currently phasing out Land Desktop.

NOTE: If approved deviation from Clearwater CAD standards are used the Consultant shall include all necessary information to aid in manipulating the drawings including either PCP, CTB file or pen schedule for plotting. The drawing file shall include only authorized fonts, shapes, line types or other attributes contained in the standard release of Autodesk, Inc. software. All block references and references contained within the drawing file shall be included. Please address any questions regarding format to Mr. Tom Mahony, at (727) 562 4762 or email address Tom.Mahony@myClearwater.com.

All electronic files must be delivered upon completion of project or with 100% plan submittal to City of Clearwater.

East WRF BOD Spikes Investigation
Jones Edmunds & Associates, Inc.
City ID 17-0034-UT

WORK ORDER INITIATION FORM
PROJECT BUDGET

Task	Description	Subconsultant Services	Labor	Total
1.0	**Pre- Design**			
Task 2	Standard Operation Protocols Review		$21,000	$21,000
Task 3	Supplemental Investigations		$27,000	$27,000
Task 4	Biowin Model Development		$44,000	$44,000
Task 5	Related Design Services		$23,000	$23,000
Grand Total				**$115,000**