King
ENGINEERING ASSOCIATES, INC.

WORK ORDER INITIATION FORM
for the CITY OF CLEARWATER

Date:	**December 22, 2015**
Project Number:	**2110-210-002**
City Project Number:	**15-0045-UT**
Plan Set Number:	**2016002**

1. PROJECT TITLE:

Northeast WRF Grit Removal, Salsnes Filter and Equalization System Improvements

2. SCOPE OF SERVICES:

The Northeast Water Reclamation Facility (WRF) experiences daily and seasonal variations in raw sewage flows and pollutant loadings. These variations make operation and control more difficult and costly than treating a more constant rate of flow. A feasibility study conducted by the City showed that the installation of an equalization basin provided more cost effective benefits than comparable in-plant improvements. Because of this, the City has decided to incorporate a 2 MG equalization basin (EQ Basin) and associated facilities into the treatment process at the Northeast WRF.

The existing tank located in the northwest corner of the site will be demolished and a new "off-line" EQ Basin constructed in its place. Flow in the existing primary effluent line will be pumped to/from the EQ Basin.

Also, one of the two primary clarifiers recently failed and must be replaced to ensure the City can continue to comply with its Florida Department of Environmental Protection operating permit. Based on its experience at the Marshall St. WRF, the City has elected to replace the primary clarifiers with Salsnes Filters. Sludge produced by the Salsnes Filters can be discharge directly to the digesters without thickening, which also provides operational cost savings.

Lastly, in order to incorporate the Salsnes Filters into the treatment process, it is necessary to retro-fit the existing picket thickeners with new grit removal devices as used at the Marshall St WRF. This

new stacked tray grit removal equipment is needed to remove sand and other inert materials so as to both protect the Salsnes filters and to prevent grit and sand from entering the digesters. The picket thickeners that are currently used to thicken sludge from the primary clarifiers would no longer be needed. As such, these tanks can be used for grit removal, as they had been when they were originally constructed.

For the purposes of this Work Order, it is assumed that the existing primary influent channel will be connected to the existing primary effluent channel in order to provide additional hydraulic capacity. As such, it will be necessary to demolish the existing primary sludge pump building.

Under this Work Order, the City authorizes King Engineering Associates, Inc. (King) to provide engineering services related to the design, permitting and bidding for the Grit Removal, Salsnes Filter and Equalization Basin Improvements at the Northeast WRF.

I. PRE-DESIGN PHASE

Project coordination activities will encompass the following:

Task 1.1 - Prepare a project specific **Project Management Plan** (PMP) establishing team members and responsibilities, lines of communication, project delivery schedules and project budgets.

Task 1.2 - **Coordinate** the activities of King's staff and sub-consultants with those of the City and administer communications among the project team members and with the City's staff.

Task 1.3 - Maintain and update monthly project **schedules and status reports**.

Task 1.4 - Administer a **quality assurance program** covering the technical work of the project team.

II. DESIGN PHASE

Under Task 2, King will perform the following services, which are based on the assumptions listed in Section 10:

Task 2.1 - Attend a **kick-off meeting** and collect additional field data to update record drawings of facilities including three (3) site visits to collect field measurements and verify existing facilities.

Task 2.2 - Perform **geotechnical investigations** including SPT borings (three to 60' around the periphery of the EQ tank, one to 30 foot depth at the pump stations, and two to 20 foot depth in the vicinity of the storm water ponds), limited laboratory testing with the results summarized in a report providing recommendations for subgrade preparation, foundation design, and other geotechnical construction considerations. This includes double ring infiltrometer testing for storm water systems design.

Task 2.3 - Perform a **hazardous materials assessment** of the existing primary sludge pump station including an asbestos survey, lead paint sampling, and identify other hazardous materials such as PCBs associated with light ballasts and other similar materials. Submit report of findings and prepare specifications for abatement, including removal and disposal.

Task 2.4 - Perform a **topographical survey** of the areas around the existing primary clarifiers and the irrigation tank for development of paving, grading and drainage plans for the Environmental Resources Permit.

Task 2.5 - Size the **Salsnes Filters** based on both removing BOD that is not needed for downstream biological treatment processes and removing an equivalent amount of BOD and TSS as were removed in the existing primary clarifiers. Identify approximate costs for each design basis. Provide recommendations in a technical memo and, in conjunction with the City, select the basis of design for the filters.

Task 2.6 - Prepare a revised **plant process flow diagram** depicting the revised grit removal system, the Salsnes filter system and the EQ system, including revisions to recycle flows. Submit for review and approval by the City.

Task 2.7 - Perform **hydraulic calculations** upstream of the fermentation and first anoxic basins and set the pertinent elevations of the grit removal, Salsnes Filter and the EQ Basin systems. Prepare a plant hydraulic profile and submit hydraulic calculations to the City.

Task 2.8 - Provide engineering design of the stacked tray **grit removal system**, including:

- Evaluate the existing thickened sludge grit separator and classifier/dewatering equipment to determine if it can be reused in the revised grit removal system. Provide recommendations in a technical memorandum to the City.
- Size mechanical equipment and piping associated with the grit pumps, concentrators, and dewatering equipment;
- Prepare single line diagrams of the electrical power distribution system for the grit pumps and dewatering system; and,
- Develop process and instrumentation diagrams for the grit pumps and dewatering system.

Task 2.9 - Provide engineering design of the **Salsnes Filters**, including:

- Temporary (for construction purposes) and permanent influent and effluent piping systems;
- Filter feed pump station sizing, configuration, head calculations and pump selection;
- Filter sludge pump station sizing, configuration, head calculations and pump selection;
- Air blower and piping system for filter cleaning operations;

- Size/route sludge piping to digester;
- Single line diagrams of the electrical power distribution system for the filters and filter feed pump station; and,
- Develop process and instrumentation diagrams for the filters and filter feed pump station with remote monitoring and control through the plant's distributed control system.

Task 2.10 - Provide engineering design of modifications to the **existing influent channel** and primary clarifiers, including:

- **Temporary piping systems** required to bypass the existing primary clarifier influent distribution/gate (splitter) chamber;
- Preliminary design to connect the **primary influent channel** (downstream of the existing plant flow meter (Parshall Flume) to the existing primary effluent channel on the west side of the second anoxic tanks, including foundation design; and,
- Identification of and modifications to the various **existing piping systems** that discharge into the existing channel.

Task 2.11 - Prepare engineering design of the **Equalization (EQ) System**, including:

- Evaluate glass-lined steel and cast-in-place concrete tanks for the 2.0 MG EQ basin, and provide a technical memorandum addressing access and a future cover for odor control;
- EQ basin, general arrangement/layout, access stairs and walkways, and piping connections;
- EQ basin supply and return pump stations including piping connection to existing 48" primary effluent line, pump station piping systems, TDH calculations, and pump selection;
- EQ basin ancillary systems including aeration air system consisting of positive displacement blowers, piping and membrane diffusers, tank mixing system consisting of two submersible propeller type mixers, and tank washdown system using reclaimed water and consisting of piping and monitors (water cannons) or hoses mounted above the tank;
- Single line diagrams of the electrical power distribution system for the blowers, mixers, pump stations, and site lighting; and,
- Process and instrumentation diagrams for the EQ basin, blowers, mixers and pump stations with remote monitoring and control through the plant's distributed control system.

Task 2.12 - Design of improvements to the sludge dewatering **centrate pump station** to allow it to discharge to the EQ basin, including re-routing the discharge piping, head calculations, pump selection, and electrical modifications.

Task 2.13 - Preliminary layout of **paving, grading and drainage systems** associated with the Salsnes filter installation, the primary influent/effluent channel modifications and the

EQ system, including grading and storm sewer modifications required to reduce the poorly drained area to the west of the existing Administration Building.

Task 2.14 - Design of modifications to the existing **odor control system** to remove the connections to the primary clarifier effluent launders and, if required, connect to the modified primary influent channel.

Task 2.15 - Design three new local control panels (LCP) equipped with Programmable Logic Controllers (PLC) to provide **SCADA monitoring and control** of the equipment. Develop a network diagram to show the integration of the new LCPs into the existing plant SCADA system. Develop control strategies to provide functional/control requirements of the PLC and associated equipment. It is anticipated that one PLC will serve the grit system and the Salsnes Filter system and have separate HMI's at each location. A separate SCADA PLC and LCP will be required for the EQ Basin. All new SCADA systems will be connected with fiber optic Ethernet cable to the system in the main control building.

III. FINAL DESIGN PHASE

Final Design Phase services will be provided under the following tasks:

- Task 3 - 30% Submittal
- Task 4 - 60% Submittal
- Task 5 - 90% Submittal
- Task 6 – 100% Plans and Permitting Services
- Task 7 - Final Bid Documents and Bidding Services

The scope of work for these Tasks is described below.

Task 3 – 30% Submittal

Task 3.1 - Prepare preliminary mechanical, structural, electrical and instrumentation and control drawings of the following:

- Cover sheet and Abbreviations, Notes and Legend sheet
- Electrical Abbreviations, Notes, and Legend sheet;
- Demolition, including irrigation tank, picket thickeners, grit removal; primary clarifiers, primary sludge pump house and influent channel;
- Preliminary site plans of Salsnes and EQ Basin areas and of the additions to the plant SCADA system;
- Stacked tray grit removal system, including grit pump station, concentrator dewatering unit and structural modifications;
- Salsnes filters, including feed and sludge pump stations, walkways and access stairways, and SCADA system;
- Primary clarifier and influent channel modifications;

- EQ basin, including supply and return pump stations and blowers, tank control, and SCADA system;
- Sludge dewatering centrate pump station (LS-2) modifications; and,
- Odor control system modifications.

Task 3.2 - Prepare draft specifications:

- Prepare detailed sequence of construction; and,
- Prepare Table of Contents for technical specifications.

Task 3.3 - Prepare preliminary opinion of probable construction cost:

- Estimate demolition costs;
- Identify major items of work and equipment;
- Prepare preliminary quantity take-off; and,
- Prepare preliminary cost estimate.

Task 3.4 - Submit 30% Design:

- Submit copies of the drawings, specifications and estimate as specified hereinafter;
- Meet with the City to review comments; and,
- Incorporate comments into the 60% submittal.

Task 4 – 60% Submittal

Task 4.1 - Update 30% drawings and prepare drawings of the following:

- Preliminary Paving, Grading and Drainage systems
  - Salsnes filter area
  - EQ basin area
- Yard Piping
  - Salsnes filter area (filter feed, temp and permanent filter effluent, sludge to digester)
  - LS #2 piping from primary to EQ
  - EQ basin area (supply/return piping to/from 48", washdown water)
  - Modifications to odor control piping
- Grit Removal System
  - Structural modifications to the picket thickener tanks and channels
  - Mechanical sections and details of the grit pumps, grit concentrators and dewatering units
  - Electrical modifications to MCC, conduit and cable plans, schematics, including I&C
  - One CompactLogix programmable logic controller (PLC) serving both the grit system and the Salsnes Filter system, with separate HMI's at each location and fiber optic Ethernet cabling to EQ System to SCADA system controls in the main control building.
- Salsnes Filters
  - Structural slabs on grade, stairs and access walkways

- Mechanical plans and sections filters, pump stations (2), wash water piping
- Electrical power panels, conduit and cable plans, panel schedules and details, including I&C

- Influent Channel Modifications
  - Structural concrete channel and connections to the existing primary primary clarifier influent and effluent channels
  - Mechanical piping relocations
- EQ Basin
  - Structural of EQ basin foundations, tank, future cover supports, access stairs and elevated walkway, miscellaneous slabs
  - Mechanical supply/return pump station plans and sections
  - Mechanical plans and sections aeration air blower, piping, diffuser systems
  - Mechanical details and supports mixers
  - Mechanical plans and sections EQ basin wash down system
  - Electrical power panels, conduit and cable plans, panel schedules and details, including I&C

Task 4.2 - Prepare Specifications:

- Modify City standard "front end" specifications;
- Prepare Division 1 specifications;
- Prepare Divisions 2-16 technical specifications; and,
- Prepare preliminary lump sum bid form and measurement and payment.

Task 4.3 - Update opinion of probable construction cost:

- Update quantity take-off; and,
- Update cost estimate.

Task 4.4 - Submit 60% Design:

- Submit copies of the drawings, specifications and estimate as specified hereinafter;
- Meet with the City to review comments;
- Prepare meeting minutes; and,
- Incorporate comments into the 90% submittal.

Task 5 – 90% Submittal

Task 5.1 - Prepare drawings:

- Finalize structural drawings, incorporate details and schedules;
- Finalize mechanical drawings, incorporate details and schedules;
- Finalize electrical, incorporate panel schedules and details;
- Finalize instrumentation and control; and,
- Finalize PLC design.

Task 5.2 - Prepare specifications:

- Address City comments and finalize Specifications.

Task 5.3 - Provide final opinion of probable cost.

Task 5.4 - Submit 90% Design:

- Submit copies of the drawings, specifications and estimate as specified hereinafter;
- Meet with the City to review comments; and,
- Prepare meeting minutes.

Task 6 – 100% Plans and Permitting Services

King will provide assistance in permitting the improvements including domestic wastewater, environmental resource, and the City building department permitting, as follows:

Task 6.1 - Incorporate City comments from 90% review into the Construction Documents.

Task 6.2 - Domestic Wastewater Permitting (Major Modification):

- Prepare application;
- Coordinate with City and submit with fee ($5,000) to FDEP; and,
- Answer requests for information (RFI) received from the FDEP.

Task 6.3 - Environmental Resource Permitting (Individual Permit):

- Review existing permit;
- Attend single pre-application meeting;
- Prepare calculations and Drainage Report;
- Prepare application;
- Coordinate with City and submit application with fee to FDEP; and,
- Answer RFI's and modify drawings.

Task 6.4 - Building Department Permitting:

- Sign, seal and submit drawings to the City for Building Department review; and,
- Provide response to Building Department comments and prepare Final Contract Documents.

Task 7 - Final Bid Documents and Bidding Services

Task 7.1 - Submit final plans, specs and estimates for bidding purposes;

Task 7.2 - Attend and conduct pre-bid meeting and site tour;

Task 7.3 - Prepare two Addenda; and,

Task 7.4 - Prepare recommendation of contract award.

The design plans will be compiled using the City of Clearwater Deliverables Standards, as referenced in Attachment "A".

3. PROJECT GOALS:

Project deliverables will include electronic copies of the following:

- Report of geotechnical investigations;
- Hazardous materials assessment report;
- Revised plant process flow diagram;
- Updated plant hydraulic profile and hydraulic calculations;
- Technical memorandum regarding the use of the existing thickened sludge grit separator and classifier/dewatering equipment;
- Technical memorandum recommending sizing of the Salsnes Filters;
- Technical memorandum recommending EQ basin materials of construction;
- Three (3) hardcopy and one pdf copy of the Plans (11" x 17"), Specifications and Cost Estimate shall be provided at the 30%, 60%, 90% and Final Completion stages of design;
- Three (3) signed and sealed copies of the plans (11" x 17") will be provided for FDEP permitting purposes;
- Three (3) signed and sealed copies of the plans (24" x 36") will be provided for City Building Department permitting purposes;
- Three (3) signed and sealed copies, one AutoCAD/MS Word copy, and one pdf copy of the final Plans (24 "x 36"), Specifications and Cost Estimates for bidding purposes; and,
- Electronic minutes of all meetings.

4. BUDGET:

This price includes all labor and expenses anticipated to be incurred by King Engineering Associates, Inc. for the completion of these tasks in accordance with Professional Services Method "B" – Lump Sum – Percentage of Completion by Task, **for a fee not to exceed Four Hundred Seventy Two Thousand Eight Hundred Forty Eight Dollars ($472,848.00)**.

Permit application fees will be paid by King Engineering Associates, Inc.

5. SCHEDULE:

The project is to be completed **10 months** from issuance of notice-to-proceed. The project deliverables are to be phased as follows:

30% construction plans	**Fifteen (15) weeks**
60% construction plans and permit applications	**Ten (10) weeks***
90% construction plans	**Ten (10) weeks***
Final construction documents	**Six (6) weeks***

*Including 3 weeks for City review.

6. STAFF ASSIGNMENT (Consultant):

Principal-In-Charge:	Christopher F. Kuzler, P.E.
Project Manager:	Thomas A. Traina, P.E.
Survey:	David Greer, PSM
Sr. Project Engineer:	Jeffrey E. Elick, P.E.
Subconsultants:	Engineering Technologies (Structural), Driggers Engineering Services, Inc. (Geotechnical), Carastro & Associates (Electrical), Terracon Consultants, Inc. (Hazardous Materials)

7. CORRESPONDENCE/REPORTING PROCEDURES:

Engineer's/Architect's project correspondence shall be directed to:
Thomas A. Traina, P.E.

All City project correspondence shall be directed to:
Kelly O'Brien with copies to others as may be appropriate.

8. INVOICING/FUNDING PROCEDURES:

Invoices for work performed shall be submitted monthly to the City of Clearwater, Engineering Department, Attn.: Veronica Josef, Senior Staff Assistant, PO Box 4748, Clearwater, Florida 33758-4748.

City Invoicing Code: 0315-96664-561300-535

9. INVOICING PROCEDURES

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. 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.

The scope of services, budget and schedule above are based on the following assumptions. Should it be necessary to design facilities that are significantly different than those based on the assumptions below, additional fees may be required.

- No new buildings will be designed.
- EQ System pump stations will be variable speed with pumps of the dry pit submersible design.
- EQ basin mixing will be accomplished by diffused air using positive displacement blowers and vertical submerged mechanical mixers.
- Odor control will not be provided for the EQ basin.
- Washdown systems will consist of RCW piping, valving and hoses located around the EQ Basin.
- Structural modifications are not required to modify the Centrate Pump Station to discharge to the the EQ Basin, i.e., only higher head pumps and corresponding electrical changes are required.
- The City will provide comments on the various submittals within 3 weeks of receipt thereof.
- King Engineering Associates, Inc. will comply with Section 119.0701, Florida Statutes (2013) where applicable.

PREPARED BY:

Christopher F. Kuzler, P.E.
Sr. Vice President
King Engineering Associates, Inc.

12/22/15
Date

APPROVED BY:

Michael D. Quillen, PE
City Engineer
City of Clearwater

Date

WORK ORDER INITIATION FORM

CITY OF CLEARWATER DELIVERABLES STANDARDS

FORMAT:

The design plans shall be compiled utilizing one of the following standards:

City of Clearwater CAD standards or Consultant's CAD standards (please provide all supporting documents when utilizing Consultant's Standards).

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.

DELIVERABLES:

A minimum of two (2) signed and sealed Plans and Contract Documents (specifications book) labeled "ISSUED FOR BID" shall be provided at the onset of the bid phase, as well as electronic copies. Electronic plan copies in PDF and CAD and electronic contract documents in PDF and MS Word.

The design plans shall be produced on bond material, 24" x 36" at a scale of 1" = 20' unless approved otherwise. The consultant shall also deliver all digital files in CAD drawing format and PDF format together with all project data in AutoCAD Civil 3D file format. All references, such as other drawings attached, images and graphic files, custom fonts and shapes shall be included in hard copy and electronic copy.

Prior to the City Council award date, a minimum of two (2) copies of signed and sealed plans and contract documents (specifications book) labeled "CONFORMED" shall be provided. All revisions made during the bid phase shall be included in the plan sets and noted in the revision block or as a footnote. Copies of each Addendum shall be included at the front of the contract and all revisions made during the bid phase shall be incorporated into the Contract Documents.

Electronic copies of "CONFORMED" plans (PDF and CAD) and contract documents (PDF and MS Word) shall be provided prior to the City Council award date.

NOTES:

- If approved deviation from using Clearwater CAD standards, the consultant shall include all necessary information to aid in manipulating and printing/plotting the drawings. Please address any questions regarding file format to Mr. Tom Mahony, Geographic Technology Manager, at (727) 562-4762 or email address: tom.mahony@myclearwater.com.

CITY OF CLEARWATER

Northeast WRF Grit, Salsnes Filter & Equalization System Improvements

King
ENGINEERING ASSOCIATES, INC.

WORK ORDER INITIATION FORM
PROJECT BUDGET

Task	Description	Subconsultant Services	Labor	Total
1.0	Pre-Design (Project Coordination)		$15,014	$15,014
2.0	Design Phase	$18,365	$116,030	$134,395
3.0	30% Plans, Specifications, Cost Estimate	$19,650	$88,701	$108,351
4.0	60% Plans, Specifications, Cost Estimate	$21,500	$105,713	$127,213
5.0	60% Plans, Specifications, Cost Estimate	$12,300	$25,095	$37,395
6.0	Final Construction Documents and Permitting Services	$4,650	$26,216	$30,866
	Permitting Fees			$7,000
7.0	Final Bid Documents and Bidding Services	$1,150	$11,464	$12,614
Grand Total				**$472,848**

REVIEW PERIOD SUBMITTAL REQUIREMENTS

This list is intended as a guideline of the items to be completed at various levels of project completion. The specific list for each project shall be finalized in the work order.

30% Construction Plans

Requirements for the 30% submittal shall include the following:

a. Cover Sheet,
b. Legend and Abbreviations per City standards,
c. Key Sheet,
d. Demolition Plans indicating existing improvements, utilities, and topography, and identification of trees to be removed,
e. Preliminary layout of the proposed improvements, existing right-of-way and easements, subdivision, block, and lot number, and plat book and page for adjacent parcels,
f. Engineer's/Architect's preliminary opinion of probable construction cost, based on the 30% submittal.

60% Construction Plans

In addition to the items in the 30% submittal, requirements for the 60% submittal shall include the following:

a. General Construction Notes related to best management practices, utilities, and other conditions relevant to the project,
b. Typical pavement sections shall indicate typical cross sectional slopes, median improvements, pavement requirements, right-of-way lines, sidewalks, curbs, gutters, and landscaped areas,
c. Grading, Paving, and Drainage detail sheets, including standard and nonstandard stormwater management structures, retaining walls, and related notes,
d. Erosion control and tree protection details, including best management practices applied to the project,
e. Existing private utilities, as available, such as gas, electrical, telephone, fiber optic, and cable TV,
f. Detailed Cross Sections,
g. Wetland Planting Plans and Details,
h. Utility Plan including utility relocation/adjustment details indicating utility conflicts, relocation design, proposed utility structures, and conflict manholes, design details, and specific profiles, if required,
i. Permit Applications,
j. Estimated construction quantities,
k. Engineer's/Architect's updated opinion of probable construction cost and duration based on the 60% design submittal, and
l. Engineer/Architect will review City's standard technical specifications and modify or supplement as necessary for the project.

90% Construction Plans

The 90% construction plans shall include the design items required for the construction of the project, including the special provisions and technical specifications. In addition to the items in the 60% submittal, requirements for the 90% submittal shall include the following:

a. Maintenance of Traffic Plan,
b. Structural plans, details, and calculations, including design and details of shallow foundations, pedestrian bridge abutments, retaining walls, structural reinforcing, tiebacks, and stability analyses for slopes and retaining walls,
c. Detailed construction quantities based upon 90% design,
d. Engineer's/Architect's updated opinion of probable construction cost and duration based on the 90% design submittal, and
e. Technical specifications and Special Provisions.

Final (100%) Construction Documents

The 100% submittal shall address the City's final review comments.

Engineering Projects prepared and/or submitted shall be reviewed and checked by a civil engineer registered in the state of Florida as the Engineer of Record. The Engineer of Record shall sign, seal and date the design calculations, technical specifications and contract drawings as required by Florida law.

See Attachment "A" – Deliverables – for specific labeling requirements.