Scope of Work

September 4, 2014

Task 1 – Project Management

Task 1.1 - Project Management

Consultant shall control the Project in terms of staffing, budget, schedule and scope, and promote communication within the project team including the participating agencies, the Contract Management Group (CMG), and the BACWA Executive Director. Consultant shall provide the following services under this task:

- Kickoff meeting (one)
- Monthly meetings with the BACWA CMG (up to 39, 1 hour conference calls). It is assumed that after the Bay Area POTW Nutrient Optimization and Upgrade Evaluation Plan is completed, monthly meetings will be reduced as needed to review progress and results for Task 7.
- Quarterly progress meetings at the BACWA Executive Board Meetings (up to 12 meetings)
- Twice-yearly meetings to present findings to the entire BACWA membership and regulators (up to 7 meetings)
- Scope, budget and schedule management
- Management and coordination of Consultant staff
- Monthly invoicing and progress reports by task and describing percent complete

Unless noted otherwise in the tasks that follow, all deliverables shall be submitted electronically, in Adobe PDF format.

Task 1.2 – QA/QC Program

Consultant shall develop and implement a quality assurance and quality control (QA/QC) program during the course of executing this scope of work.

Task 2: Scoping and Evaluation Plans

The initial steps in performing the special studies in Tasks 4 and 5 require a series of subtasks to scope the effort, develop an evaluation plan, and submit these documents to BACWA and the Regional Water Board for approval.

Task 2.1 - Scoping Plan

The Scoping Plan will identify the work necessary to complete the two special studies: i) optimize facilities for nutrient reduction (including the implementation of sidestream treatment) and ii) determine nutrient reductions possible through treatment plant upgrades. The special studies will look at three types of nutrient removal: ammonia removal, nitrogen removal and phosphorus removal. Because the science has not yet indicated the type or level of nutrient removal that might be required to protect the San Francisco Bay, Consultant will develop nutrient removal objectives as part of the Scoping Plan. Consultant will propose a strategy for setting these objectives to meet either concentration- or load-based nutrient reduction goals. Objectives will include different levels of ammonia removal, nitrogen removal and phosphorus removal, or combinations thereof, as well as how the removal rates may vary seasonally.

It is anticipated that two levels of optimization and two levels of upgrades will be considered, as follows:

- Level 1: General optimization / sidestream nutrient reduction
- Level 2: Seasonal performance
- Level 3: Upgrades to achieve less stringent nutrient removal limits (to be defined)
- Level 4: Upgrades to achieve more stringent nutrient removal limits (to be defined)

The nutrient removal limits for levels 3 and 4 will be determined in consultation with the CMG and Water Board.

It is expected that optimization recommendations will be based on existing flows and loads, whereas upgrade recommendations will be based on plant design flows and loads.

Task 2.2 - Evaluation Plan

An Evaluation Plan is required as part of the Watershed Permit that includes a schedule describing how the work will be conducted to evaluate the potential nutrient discharge reduction by treatment optimization (Study 1) or by treatment upgrades (Study 2). The Evaluation Plan shall include guidance to participating agencies for additional sampling (Consultant will not perform sampling or analysis), as necessary, to support the proposed optimization study. Consultant review a small sample of the data available from the California Integrated Water Quality System (CIWQS) to determine if additional sampling is needed.

In addition, the Evaluation Plan shall define the treatment works categories that will be evaluated to support the potential upgrades and alternative discharge scenarios. The Evaluation Plan will also set up a standard approach/basis for conducting planning level cost estimates.

Task 2 Responsibilities

BACWA Agencies Responsibilities

- Review draft plans
- Participate in meetings and provide feedback
- Coordinate Water Board participation, submit documents

HDR Team Deliverables

- Prepare draft and final Scoping and Evaluation Plans
- Participate in up to two meetings (total) with the CMG to discuss and review plans
- Participate in up to two meetings with the Water Board to discuss and review plans

Task 3 - Data Collection and Synthesis

This Task includes data collection and review, as well as synthesis of existing data, including development of descriptions of existing facilities.

Task 3.1: Data Collection and Review

The Consultant will work through the BACWA Executive Director, who will act as the point contact person with participating agencies, to gather information necessary to complete the study.

Prior to contract execution, BACWA will work with participating member agencies to determine a single responsible point of contact for each plant, collect basic facility information, and obtain copies of related planning documentation such as master plans. BACWA will provide the influent and effluent nutrient data of participating agencies collected from the Water Code 13267 Letter issued by Regional Water Board Executive Officer (dated March 2, 2012) and compiled by San Francisco Estuarine Institute (SFEI).

After contract execution, Consultant will work with the CMG to develop a data collection template. The data collection template will be accessible online. The requested material will include both data and facility information and shall build upon the influent and effluent data already collected and compiled. The requested material may also include information about the existing facilities, future growth and development, and other site specific questions (e.g., space constraints, excess tankage, etc.) necessary to conduct the studies. Where there are data gaps, the Consultant will use assumptions based on the best available industry data. Additional data may be requested, as required, to complete the studies.
Consultant will facilitate a kickoff meeting with participating agencies, following the January 2015 Annual Meeting, to present the final data collection template, including how to use the template, the type and reasoning for requested information, and to answer questions regarding the data request. In addition, next steps will be described including the project schedule and expectations for the site visits described in Task 3.1a. (This meeting is budgeted as one of the Annual Meetings in Task 1.)

Consultant will also facilitate one follow-up conference call (web meeting) with participating agencies regarding the data collection template.

Task 3.1.a: Site Visits

Consultant will send a two-person, tactical team to visit participating plants (up to 37 plants). During the site visit, the two-person teams will:

- Validate and confirm the facility mode of operation,
- Produce a list of potential optimization strategies: flow routing related, chemical dosing strategy, aeration strategy, etc.
- Identify/confirm site constraints,

- Identify unused tanks and any other available assets for use in optimization and/or upgrades,
- Discuss any questionable data or gaps from the data collection template, and Develop / confirm concepts regarding upgrade concepts.

Consultant will prepare a site visit summary to highlight key information collected during each site visit. The site visit summary will be provided to the respective responsible point of contact for validation. The responsible agency point of contact shall provide confirmation of the site visit report and submit adjustments or changes within five (5) working days.

Task 3.b2 – Summary of Existing Facilities

Consultant will use the information collected in Task 3.1 and 3.1.a to develop descriptions of each treatment plant, treatment plant unit processes, and service area. The descriptions shall include the following:

- Service area description – defines the service area by number of service connections, area covered by the agency, etc.
- Current permit discharge requirements for BOD, TSS, and nutrients.
- Summary of current and future flows and loads, based on available data.
- Description of each major unit process, including information such as number of unit processes, size, operational loadings at design, etc.
- Process flow diagram
- Current design capacity
- Plant footprint and summary of any space constraints
- Factors which may increase or decrease influent/effluent loads through 2040.
- Document options for optimization, ability to implement sidestream treatment, and upgrade options.

The Consultant will use the nutrient discharge information collected from the 13267 Letter to establish a baseline for existing levels of nutrient loadings that may be used to account for changes in loadings that result from optimization and upgrade efforts at treatment facilities.

Task 3.3 – Evaluate the Impact on Nutrient Loads in Response to Other Regulations or Requirements

Consultant shall identify any regulatory-driven changes to plant performance that are expected to impact effluent nutrient levels. Background about these other regulatory drivers will be provided by agencies in the data collection template. Consultant shall provide high-level estimates of how nutrient loads will increase or decrease due to process upgrades made in response to other regulations or requirements. The nutrient load increases or decreases will be summarized by plant category.

Task 3 Responsibilities

BACWA Agencies Responsibilities

- BACWA will coordinate with participating agencies to gather information necessary to complete the study, including existing master plans and studies, as well as the completed data collection templates.
- BACWA will coordinate with participating agencies to identify one, responsible point of contact for each participating agency.
- Participating agencies will fill out the electronic data collection template and submit all requested data electronically, within 60 calendar days.
- Operator(s) will participate in the site visit with the Operations and Process Team
- Responsible point of contact will review and confirm the site visit summary within five working days Participating agencies respond to follow-up inquiries, as needed

HDR Team Deliverables

- Draft and final electronic data collection template
- One kickoff meeting with participating agencies to review the data collection template
- One conference call / web-meeting with participating agencies to review the data collection template
- List of questionable data and gaps noted
- 2-person site visits for up to 37 plants
- Site visit summaries for each participating agency for validation of information
- Summary of existing facilities (based on the data collection results) which will be included in the draft report in Task 8
- List of which potential regulatory drivers or plant updates which might impact net nutrient discharge loads

Task 4 – Special Study No. 1 - Evaluation of Potential Nutrient Discharge Reduction by Treatment Optimization and Sidestream Treatment

The Consultant shall evaluate options and costs for nutrient discharge reduction by optimization of current treatment works, including the addition of sidestream treatment. For each participating agency, the following subtasks will be completed.

Task 4.1 – Describe Existing Optimization, Minor Upgrades, and Sidestream Treatment

Based on the information collected and reviewed in Task 3, Consultant shall summarize the past work already conducted for each plant to optimize their treatment works, including minor upgrades and sidestream treatment additions that may have achieved nutrient reductions. This will include modifications that have been completed and are reported in the data collection template. In addition, modifications that are planned for implementation within the next five (5) years as part of an existing, adopted CIP, and as reported in the data collection template, will also be included.

Task 4.2 – Evaluate Site-Specific Strategies for Process Optimization

Prior to the site visits in Task 3.1a, consultant will coordinate with the CMG to confirm what constitutes plant optimization (e.g., additional chemical dosing, minor equipment upgrades, a limit on cost per mgd of capacity, etc.) such that the focus of the optimization recommendations is appropriate.

The Consultant will use the data and information obtained under Task 3 to identify strategies to reduce nutrient discharge levels for ammonia, total nitrogen, and phosphorus removal. Strategies could consider modest changes to the existing process, typically modifications that may require some equipment replacement, but no additional basin volume.

Consultant shall identify a list of up to five strategies, from the site visit, that could be employed to optimize treatment works. For each participating agency, the list will be reviewed and likely strategies for success will be identified. Some typical options might include, but are not limited to: i) split flow treatment, ii) return sidestream flow control, iii) additional chemicals, etc.

Task 4.3 – Evaluate Side-Stream Treatment Opportunities

Based on the information collected and reviewed in Task 3, the Consultant will evaluate the feasibility of implementing sidestream treatment into the existing treatment plant for the participating agencies. It is anticipated that the load removal is about 85 percent for either nitrogen or phosphorus.

For sidestream nitrogen treatment, the Consultant shall only consider nitrogen removal. For sidestream phosphorus treatment, the Consultant shall consider both phosphorus removal and phosphorus recovery.

Consultant shall summarize the expected reduction in nutrient concentration as a result of sidestream treatment.

Task 4.4 – Evaluate Beneficial and Adverse Ancillary Impacts

The Consultant shall identify, and where possible, quantify, beneficial and adverse ancillary impacts associated with each optimization strategy. These impacts shall include items such as nutrient effluent concentrations, energy usage, greenhouse gas emissions, space requirements, plant capacity, sludge production and quality, and others.
Optimization options that re-purpose available capacity in existing facilities at current loadings will be noted as having an adverse impact in terms of reduced capacity. . Impacts will be assessed semi-quantitatively; particular attention will be paid to impacts on plant capacity.

Task 4.5 – Develop Capital and Operating Costs

For each optimization strategy identified in Subtask 4.2, the Consultant shall prepare planning level costs for any facility modifications. In addition to capital cost estimates, the Consultant shall also provide estimated annual costs (or savings) for energy, chemicals, and labor associated with one optimization strategy. Consultant shall develop appropriate unit costs for energy, chemicals, and labor. Where appropriate, associated operating costs will also be developed for the beneficial and adverse ancillary impacts identified in Task 4.4.

Task 4 Responsibilities

BACWA Agencies Responsibilities

- BACWA to provide support in managing timeliness of responses, scheduling, etc.
- Participating agencies discuss plant optimization opportunities during the site visit (in Task 3) Participating agencies validate the most attractive optimization strategy for cost estimating.
- Participating agencies review and comment on Draft Report section

HDR Team Deliverables

- Prepare Draft Report section(s) on plant optimization (to be incorporated in Task 8). The report section(s) will include the following elements:
    - Descriptions of prior and on-going optimization and sidestream treatment efforts
    - List potential plant optimization ideas. For the most attractive concept, prepare:
        - Summary of adverse and ancillary impacts (e.g., greenhouse gas impacts)
        - Develop Capital and O&M cost estimates (energy, chemicals, and labor) and present both annualized costs and net present value costs
        - Estimate nutrient reduction and unit costs (e.g., $/lb nutrient; lb GHG/lb nutrient)
        - Identify attractive participating plants for sidestream treatment. For each plant, list the following:
            - Potential to remove ammonia and phosphorus
                - Reduction in ammonia and phosphorus
                - Unit cost for removing ammonia and phosphorus
            - Potential to recover phosphorus
                - Reduction in phosphorus recovered
                - Unit cost for recovering phosphorus (net cost taking credit for product sales)
        - For non-attractive plants, describe why sidestream treatment is not attractive
    - Coordinate sidestream findings from this effort and the EBMUD EPA Grant Project

Task 5 – Special Study No. 2 - Evaluation of Potential Nutrient Discharge Reduction Treatment Upgrades

The purpose of this task is to evaluate options, constraints, and costs for treatment upgrades to meet the nutrient discharge objectives identified under Task 2.1.

Task 5.1 – Describe Existing Technology Upgrades and Pilot Studies

Based on the information collected and reviewed in Task 3, the Consultant shall summarize treatment plant upgrades already implemented by each participating agency to upgrade their treatment works for nutrient reductions, including minor and major upgrades, or pilot studies. In addition, the Consultant shall summarize the level of nutrient removal the upgrade or pilot study is achieving for total nitrogen and phosphorus (i.e., by comparing influent and effluent loads). Summary shall be based on agency-provided data.

Task 5.2 – Identify Site-Specific Constraints

Based on the information collected and reviewed in Task 3, the Consultant shall identify any site-specific constraints or other circumstances that may limit the feasibility of a lower cost treatment upgrade for each participating agency. For example, some participating agencies have footprint constraints which may eliminate a particular treatment upgrade as an option for their facility.

Task 5.3 – Identify Potential Upgrade Technologies

Consultant shall develop a set of standard plant-type categories and group each participating POTW into a category. Categories may include for example, high purity oxygen plants, conventional activated sludge plants, plants without anaerobic digestion, etc. For each treatment plant category, the Consultant shall develop a list of potentially viable treatment upgrade technologies that meet the two treatment objectives identified in Task 2.1. Consultant shall also develop high level evaluation criteria. The criteria will focus on, but not be limited to, nutrient removal requirements coupled with constraints identified in Subtask 5.2. The treatment upgrades that best meet the evaluation criteria for each category, shall be carried forward for planning level cost estimating.

Task 5.4 – Evaluate Beneficial and Adverse Ancillary Impacts

The Consultant shall identify, and where possible, quantify, beneficial and adverse ancillary impacts associated with each treatment plant upgrade carried forward for planning level cost estimating. These impacts shall include, if appropriate, nutrient effluent concentrations and loads, energy usage, greenhouse gas emissions, plant capacity, sludge and biosolids production and disposal, reduction of other pollutants (e.g., pharmaceuticals), and others.

Task 5.5 – Develop Capital and Operating Costs

For each upgrade identified in Subtask 5.3, the Consultant shall prepare planning level costs.

In addition to capital cost estimates, the Consultant shall also provide estimated annual costs (or savings) for energy, chemicals, and labor. Consultant shall develop appropriate unit costs for energy, chemicals, and labor.

Task 5.6 –Evaluate Impacts of Sea Level Rise

Consultant shall identify participating agencies that are vulnerable to the impacts of sea level rise. Analysis shall be based on publically available data from the United States Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and publically available topography data. Participating agencies shall provide key plant elevation data in the data collection template.

For each of those identified agencies, the Consultant shall identity the impacts of sea level rise with respect to potential for inundation. Results are anticipated to be presented in a map format, illustrating location of the participating plants and areas of inundation. Development of costs for mitigation of sea level rise impacts are not included.

Task 5 Responsibilities

BACWA Agencies Responsibilities

- Discuss plant upgrade opportunities and constraints during the site visit (in Task 3)
- Review and comment on Draft Report section

HDR Team Deliverables

- Prepare Draft Report section(s) on facility upgrades (to be incorporated in Task 8). The report section(s) will include the following elements:
    - Describe prior and on-going plant upgrades and/or pilot studies ○ Identify site specific constraints from the questionnaire responses and site visits ○ Identify viable nutrient removal technology(s) to meet the defined nutrient limits from Task 2.1 ○ Describe the adverse and ancillary impacts for each technology considered to meet the defined nutrient limits or range (e.g., solids yield, micro-constituents removal, GHG emissions, etc.)
    - Develop Capital and O&M cost estimates (energy, chemicals, and labor) and present in both annualized and net present values
    - Identify plants vulnerable to the impacts of sea level rise

Task 6 – Potential Nutrient Discharge Reduction by Other Means

Per the Watershed Permit, dischargers may also decide to evaluate strategies that reduce nutrient loadings separate from the special studies identified in the Watershed Permit (Tasks 4 and 5). The Consultant shall incorporate / summarize information provided by participating agencies through the data collection template. No separate analysis of these strategies is included.

Task 6 Responsibilities

BACWA Agencies Responsibilities

- Provide relevant information for review and inclusion in the report
- Review and comment on the Draft Report section(s)

HDR Team Deliverables

- Compile alternative nutrient discharge reduction studies based on prior studies from each responding agency.
- Prepare a Draft Summary of the prior studies for each responding agency. This will be included as an Appendix to the Report

Task 7 – Group Annual Report

The purpose of this task is to gather and provide analysis of the magnitude and trends in nutrient loads from POTWs to the SF Bay.

Task 7.1 – Data Collection and Review

Consultant shall obtain the previous reporting year's nutrient loading data, covering July 1st to June 30th, from the California Integrated Water Quality System (CIWQS). The Consultant will identify data gaps and work with BACWA and its member agencies to address these. The nutrient load data will be sorted by subembayment to calculate aggregate loads.

Task 7.2 – Data Analysis and Reporting

Consultant shall compare data from each reporting year to data from previous reporting years, as well as data collected from the Water Code 13267 Letter issued by Regional Water Board Executive Officer (dated March 2, 2012) and compiled by San Francisco Estuarine Institute (SFEI). If significant trends in nutrient loads are observed (significant to be defined in the Scoping Plan in Task 2.1), the Consultant will request additional information from participating agencies regarding the cause of the trends.

Consultant will prepare draft and final Group Annual Reports for 2015, 2016, 2017, and 2018. The reports shall include graphical representations of the data.

Task 7 Responsibilities

BACWA Agencies Responsibilities

- Provide access to data and plant performance
- Answer questions about data, collection system and plant operations (Task 3)
- Review and discuss data discrepancies and gaps
- Review and comment on the Draft Group Annual Report

HDR Team Deliverables

- Identify questionable data and gaps
- Consolidate data sets in spreadsheet format for review; and final accepted data
- Prepare Draft and Final Group Annual Reports for 2015, 2016, 2017, and 2018

Task 8 – Reporting

This task includes the preparation of the Bay Area POTW Nutrient Optimization and Upgrade Evaluation Plan. The report shall include the technical information developed in Tasks 2 through 5. It is assumed the report will include an appendix for each participating plant to summarize the technical information developed in Tasks 2 through 5. The report body will be an executive summary style report that will summarize key information including the study approach and major findings and recommendations.

Consultant shall prepare an annotated report outline for review and approval following completion of Task 3.

The Draft Report will be released to the participating agencies for a 30 day comment period. Following the comment period, the Consultant will work with BACWA to prepare a Final Draft Report for submission to the Regional Water Board. After review by the Regional Water Board, the Final Report will be prepared.

Task 8 Responsibilities

BACWA Agencies Responsibilities

- Review and comment on the Draft Report
- Assist in addressing comments from the Water Board on the Final Draft Report

HDR Team Deliverables

- Draft Report - Bay Area POTW Nutrient Optimization and Upgrade Evaluation Plan
- Incorporate comments on the Draft Report and submit the Final Draft Report for review by the Water Board
- Incorporate comments from the Water Board and submit the Final Report