

**SCOPE OF WORK**  
**City of San Diego MWWD**  
**Biological Aerated Filter Pilot Test at PLWTP**

**BACKGROUND**

A technical memorandum (TM) was prepared that evaluated the technical and economic feasibility of utilizing the biological aerated filter (BAF) technology to provide secondary treatment technology at the Point Loma Wastewater Treatment Plant (PLWTP). Information from US BAF facilities visited by BC and the City, data received from the two BAF vendors and from the literature was used to develop the preliminary costs reported in this TM. However, the PLWTP facility has some unique characteristics that differ from facilities where data were collected. The temperature and strength of the PLWTP wastewater as well as other wastewater characteristics differ enough to possibly impact performance of the BAF system. In addition, many reports on the performance of BAFs are related to operations employing multistage BAF that provide carbonaceous BOD removal, nitrification, and/or denitrification; it is difficult to differentiate the performance of these systems on the removal of carbonaceous BOD, which is the primary design goal of the BAF technology that is being considered for the PLWTP facility. Evaluation of key design parameters through pilot testing of candidate BAF systems and a candidate clarifier/thickener system when operating under San Diego conditions will provide crucial information that will allow the City to evaluate the technical and economic feasibility of the BAF technology in more detail than has been possible to date.

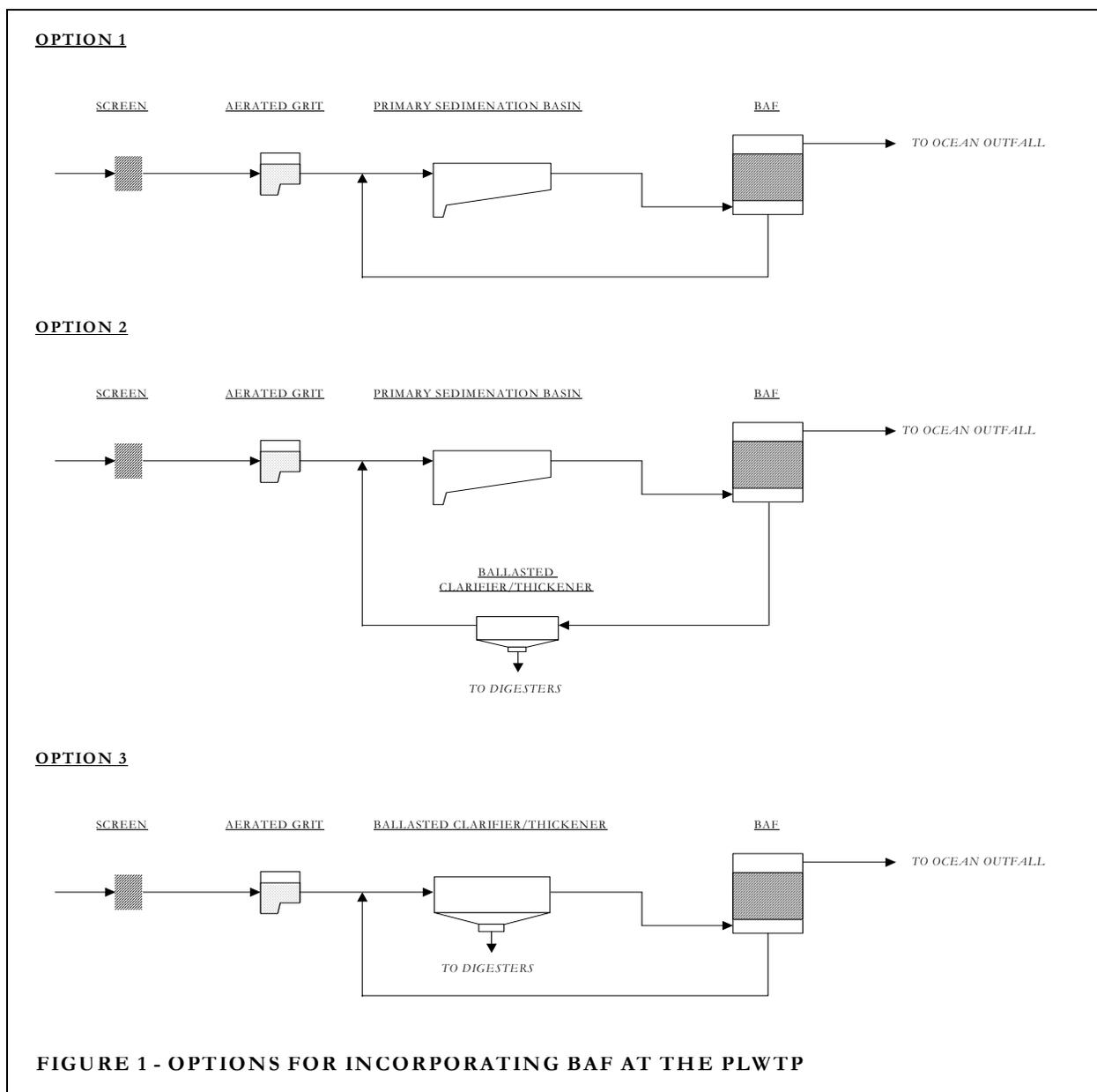
Three implementation options (shown in the Figure 1) form the basis of the pilot test. These options are as follows:

- Option 1 – Use BAF to treat advance primary effluent to secondary level. Recycle backwash to the primary sedimentation basin (PSB) influent channel to co-settle with primary sludge.
- Option 2 – Use BAF to treat advance primary effluent to secondary level. Thicken backwash in a ballasted clarifier/thickener (BC/T). Recycle BC/T effluent to the PSB influent channel. Pump thickened solids to the sludge holding tank for subsequent digestion.
- Option 3 – Replace existing PSBs with BC/Ts. Use BAF to treat primary effluent from the BC/T. Recycle backwash to the BC/T influent and co-settle BAF waste sludge with primary sludge. Pump thickened solids to the sludge holding tank for subsequent digestion.

A process flow diagram representing a scheme to allow simulation of all three options is shown in Figure 2. A layout and site plan of the proposed pilot test location are shown on Figures 3 and 4, respectively. Early communications with permitting agencies indicate that a Coastal Development Permit will be waived, but a building permit will be necessary. The 30 ft x 60 ft concrete pad shown on Figures 3 and 4 includes a one-foot wall that will contain 110% of the volume of the largest vessel within the pad. It also has provisions to drain any washdown or spilled liquid within the pad to the headworks.

The main objectives for the pilot test are as follows:

- To determine the performance of the two BAF systems under consideration when operated over a range of hydraulic, organic and solids loadings
- To develop solids generation factors required to select the appropriate solids processing to avoid construction of additional digesters at the PLWTP
- To determine energy requirements for each BAF system
- To determine aeration requirements for each BAF system
- To determine backwash frequencies associated with each BAF system
- To ascertain the potential for media loss and plugging potential
- To determine the settleability of the backwash solids, particularly focusing on their ability to co-settle and co-thicken with primary sludge
- To evaluate the performance of Densadeg (a ballasted clarification/thickening system manufactured by ODI) as a thickener and as a potential replacement for the existing PSBs
- To develop design parameters associated with the BAF system



The pilot test is scheduled to commence February-March 2004 and continue until August 2004. The pilot test is expected to proceed as follows:

Date	Event
February – June, 2004	Testing of BIOSTYR and BIOFOR using primary effluent pumped from the primary effluent channel. No processing of backwash solids will occur. Occasional evaluation of solids settleability performed.
June-July, 2004	Testing of BIOSTYR and BIOFOR using primary effluent pumped from the primary effluent channel. Backwash solids processed using Densadeg. Thickener effluent (not the thickened sludge) will be tested to assess co-settleability with post-polymer addition primary influent.
July-August, 2004	Testing of BIOSTYR and BIOFOR using pre-screened wastewater pumped from the screening channels (at the headworks) to the Densadeg. Backwash from BAF will be co-settled/co-thickened with the pre-screened wastewater. Thickener effluent (not the thickened sludge) will be tested to assess co-settleability with post-polymer addition primary influent.

At the conclusion of the pilot test, a report will be prepared summarizing the pilot test findings and providing recommended design criteria for the full scale design for each unit tested. A revised cost estimate shall also be prepared, in light of the pilot test findings.

## SCOPE OF WORK

### Task 1 – Project Management

This task covers all the management required in performing the various tasks described below.

- General Management** – This includes necessary project management to ensure successful completion of the pilot testing, such as project cost and schedule control, scheduling, resolution of CITY comments, preparation of invoices and document control. Included is attendance of one BC staff to a monthly project meeting to be held at the PLWTP. It is assumed that a total of eight (8) meetings at 2-hours each will be held. This subtask also includes a total of 40 hours (20 hours each for an Executive and Supervising Engineer) to respond to inquiries about any issues related to this project.
- Sampling Program** – Management of the sampling and monitoring program including coordination with City laboratory, plant staff, and contracted laboratory if necessary. It also includes contract development and managing invoices associated with the contract lab. Brown and Caldwell (BC) shall also supervise and review (QA/QC) all sampling and monitoring conducted by the group to ensure quality and useful data are gathered. This is anticipated to occur at a rate of 2 hours per week for 30 weeks.
- Construction Management** – BC shall retain a construction contractor to install and remove the pilot test units at the PLWTP (see Figures 3 and 4 for proposed site arrangement). This task includes negotiations and contract development and pre-construction coordination between the City and the contractor.
- Job Safety Analysis** – Based on past work performed for the City, BC has experienced the need to attend and coordinate with City safety personnel to develop a

Job Safety Analysis (JSA). Included in this task are the coordination between contractor and safety personnel and assisting the City to develop a JSA for the pilot test. Four meetings at 2 hours each are assumed.

- **Pilot Units Management** – This task involves the 1 hour per week inspection (for 30 weeks) of the pilot test units and reporting and coordinating with vendors regarding any anomalies or observed problems.

## **Task 2 – Pilot Test Design**

BC shall provide drawings of sufficient detail to satisfy the Development Services. It is assumed that this will include the following complete and signed drawings:

- Cover, Abbreviations and Civil (2 sheets)
- Structural (8 sheets)
- Mechanical (2 sheets)
- Electrical (5 sheets)

It is assumed that no intermediate submittals (30%, 60%, etc.) drawings will be submitted to the City. BC shall provide only signed and Development Services-approved drawings; no electronic files shall be provided. Only technical specifications specific to the construction involved will be prepared and submitted at 100% design. The list of technical specifications is anticipated to include the following:

- 02050 – Demolition
- 02100 – Site Preparation
- 02200 – Earthwork
- 02600 – Pipeline Construction
- 02644 – PVC Non-pressure Pipe
- 02646 – PVC Pressure Pipe
- 02712 – Trowel-Applied Manhole Rehabilitation Coating
- 02740 – Concrete Wall Surface Repair
- 03100 – Concrete Formwork
- 03200 – Reinforcement Steel
- 03290 – Joints in Concrete Structures
- 03300 - Cast-in-Place Structural Concrete
- 03315 – Grout
- 05500 – Miscellaneous Metalwork
- 07905 - Joint Sealers
- 07920 – Sealants and Caulking
- 11000 – Equipment General Provisions
- 11175 – Pumps, General
- 11198 – Horizontal Non-Clog Pumps (or)
- 11212 – Vertical Non-Clog Pumps
- 13205 – Polyethylene Tanks
- 15000 – Piping Components
- 15010 – Mill Piping – Exposed and Buried
- 15020 – Pipe Supports
- 15100 – Valves, General
- 15101 – Valve and Gate Operators
- 15105 – Check Valves
- 15106 – Ball Valves
- 16050 – Basic Electrical Materials and Methods

- 16300 – Medium Voltage Distribution

This task also includes contacts with the vendor to ensure proper coordination and representation of the pilot test units are shown on the drawings. Included are eight meetings that are expected to last 2 hours each.

### **Task 3 – Construction**

- **Submittals** – BC shall review construction submittals received from the contractor (6 submittals and 6 resubmittals are anticipated).
- **RFI/RFC** – BC shall be responsible for responding to 2 RFI/RFCs during the construction period.
- **Construction Management** - This is to supervise the construction of the pilot test at PLWTP that is anticipated to occur within 20 days (4 weeks), including mobilization and demobilization. BC shall also review all submittals from the contractor and provide coordination with the PLWTP and EPMD staff, Development Services inspection, and other construction related work. This anticipated site supervision is expected to comprise of effort that requires 4 hours per day for 20 days.

### **Task 4 – Building Permits**

BC shall be responsible for coordinating with the City of San Diego Development Services Division to acquire approval for the pilot test construction. Coordination is anticipated to include various phone calls and 2 visits at 3 hours each.

### **Task 5 – Sampling Program**

- **Sampling Program Development** – BC shall develop a sampling program for collecting the proper data to assess the performance of the BAF and Densadeg units. Five copies of a draft submittal shall be submitted to the City for review. One copy of the draft sampling program shall also be provided to the vendors for their review. Comments from both City and vendors shall be incorporated into the final sampling program. It is anticipated that only one iteration of the sampling program will be performed. If necessary, additional iterations shall be performed under Task 8 – Additional Services.
- **Pilot Units Training** – Two BC staff members shall attend 5 days (total) of training on the proper operation of the pilot test units presented by each vendor. The BC project manager shall attend 2 days (total) of training. Rental fees of a BIOSTYR and BIOFOR pilot test unit for 35 weeks and 11 weeks for a DENSADEG pilot test unit are included in this task. It is anticipated that the City staff assigned to operate the BAF facility for the duration of the study will also participate in the training program.
- **Sampling Program** – One BC staff will visit the PLWTP and the pilot unit to conduct the necessary sampling and monitoring. It is anticipated that the BC staff will coordinate with the City staff to provide 7-days-a-week coverage for the duration of the study. This includes acquiring grab samples and composite samples as specified in Exhibit B and setup of composite equipment for the next sampling event. BC shall purchase six refrigerated autosamplers and five non-refrigerated autosamplers, meters that measure pH, turbidity, temperature and dissolved oxygen for the study and relinquish to the City upon completion of the test. All sample analyses shall be provided by the City.

- **Coordination with City** – It is anticipated that during the duration of the pilot test, coordination with the City will occur at all levels.
- **Miscellaneous Meetings** - Regularly scheduled meetings are anticipated to be held to provide an update on the sampling results and to discuss/brainstorm any changes to the program.
- **Monthly Updates** – For each month during the pilot test, the data collected shall be tabulated and reported to the City and each vendor for review. This will provide guidance in future pilot runs and determine if the pilot test is proceeding as anticipated. It is anticipated that 8 reports shall be generated requiring about 6 hours each of labor to generate and disseminate.

The City of San Diego shall indemnify and hold the Consultant harmless from and against any and all claims, demands, actions and causes of actions, including without limitation, claims on account of personal injury, including death, or damage to or loss of property, or environmental damage to the extent arising out of or resulting from the City's negligent use or operation of the Pilot Plant during the Demonstration project.

#### **Task 6 – Presentation**

BC shall assist the City in generating presentation material for City management. This task includes 2 visits from BC's expert in process engineering to attend meetings with City management.

#### **Task 7 – Technical Memorandum**

BC shall prepare a technical memorandum (TM) that summarizes the pilot test findings and provides recommended design criteria and other pertinent recommendations. The TM shall include a revision of the preliminary cost estimate submitted under a separate task order. Ten (10) copies of a draft TM shall be submitted to the City for review. BC shall provide a written response to written comments provided by the City and attend a resolution meeting anticipated to last 2 hours to discuss the City comments. BC shall subsequently prepare a final TM and provide ten copies to the City.

#### **Task 8 – Additional Services**

Because of the size and duration of the pilot test, many unanticipated events occur during the test period. This task allots 20% contingency to cover such unanticipated events and to allow the City the ability to quickly provide task authorization towards accomplishing such events. No subtasks shall be performed under this task without prior written approval by the City.

**END OF SCOPE**