January 20, 2017

Dear BACWA member,

AECOM invites your participation in a consortium to demonstrate Nereda® Aerobic Granular Sludge (AGS) technology in the Bay Area.

Bay Area regulations are expected to impose stringent effluent nitrogen and phosphorus limits in the future. We understand that as a BACWA member you are concerned about the impending cost of meeting stricter nutrient standards in the Bay Area and are working in collaboration with other agencies in an effort to address the challenges of significant regulatory changes that impact you as an agency.

Nutrient removal requires a considerable expansion of treatment volume using conventional treatment approaches. Space at many Bay Area plants is at a premium and retrofits in this context may be prohibitively expensive. Nereda® AGS is an innovative treatment technology that can achieve nutrient removal in a small footprint with significant energy savings over conventional activated sludge processes. There are over 30 full scale installations of Nereda® worldwide that have successfully demonstrated meeting performance objectives for nutrient removal in sustained full scale operation. This technology was commercially developed in Europe, with installations now spanning the globe; however, as of now, there are no installations in the United States.

Aerobic Granular Sludge is an evolution of Conventional Activated Sludge technology (CAS) whereby microorganisms form large dense granules instead of fluffy flocs. These granules are stratified, surface-to-core, with layered biomass that enables respective roles of nitrification and denitrification, so that these processes occur in-situ and simultaneously, avoiding the need for dedicated reactor zones and recycle streams.

Granules are formed by enforcing strict feast-famine feeding regimes in Sequencing Batch Reactors (SBRs) ensuring selection of phosphate-accumulating organisms (PAOs), thereby also removing phosphorus as well as nitrogen. These dense granules increase reactor capacity by increasing mixed liquor suspended solids (MLSS) concentrations to 6-8000 mg/l, and by achieving rapid settling due to the high granule density and size. *See photo at right, comparing CAS with Nereda® after a few minutes of settling.*

Use of a sequencing batch approach negates the need for a secondary clarifier, further saving space and conserving energy. Nereda® has reportedly been shown to use approximately 30-40% less energy than conventional flow-through CAS, in part due to the absence of recycle pumping for Internal Mixed Liquor Recycle (IMLR) and Return Activated Sludge (RAS).

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An important component of this Nereda® demonstration is to show that a conventional flow-through, continuous CAS process can be cost-effectively adapted/retrofitted to a quasi-SBR (step-wise continuous) process. In the last two years, a retrofit of continuous, flow-through CAS has been successfully demonstrated at the Frielas wastewater treatment plant (WWTP) outside of Lisbon Portugal. A similar demonstration in the U.S. would not be a "first"; however, a retrofit of a Bay area CAS basin into an AGS quasi-SBR in a well-documented study would pave the way for acceptance by Bay area regulators. The study would provide evaluation and design criteria for Bay area consortium members and accelerate the adoption of this revolutionary wastewater treatment technology in the U.S.

AECOM has had an expression of interest from a BACWA member, Fairfield-Suisun Sewer District (FSSD), to host a Nereda AGS demonstration at their 12 MGD wastewater treatment facility. We have also submitted a pre-proposal for research funding to Water Research Foundation (WRF) which has been favorably received. WRF provides matching funds up to $100,000 for innovative technology demonstrations, through subscribing utilities. Our intent is to build a consortium that in aggregate will generate contributions matching the $100,000 grant from WRF, which would be awarded through wastewater subscribers.

As a member of the prospective consortium we are proposing, you'll have the opportunity to participate in the design of the demonstration, receive periodic progress reports, participate in workshops to review findings, and provide input to operations; in order to create relevant findings that will inform your future nutrient removal decisions.

We will be following up with a phone call to answer any questions you may have and explore the prospect of your agency's interest in participating in the proposed Nereda AGS demonstration project. In the meantime, if you have any questions, please don't hesitate to contact one of us at the email address or numbers listed.

Thank You,

Sincerely,

Dr. Beverley Stinson, Global Wastewater Practice Leader

Sheba Hafiz, Oakland Office

Samuel Bruce, Sacramento Office

AECOM