086-19 Appendix C - Project Descriptions
Construction Management-at-Risk (CMAR) Services for the Buckman Biosolids Conversion Projects and Ultraviolet (UV) Disinfection

JEA owns and operates 11 water reclamation facilities with a combined current raw wastewater flow of approximately 73 million gallons per day (mgd). The Buckman Water Reclamation Facility (BWRF), located at 2221 Buckman Street, is the largest of the Water Reclamation Facilities (WRFs) with a permitted capacity of 52.5 mgd and houses a Residuals Management Facility (RMF) that processes biosolids from eight of the WRFs. The Buckman RMF processes waste activated sludge (WAS) and primary sludge (PS) produced from the BWRF and 8 other WRFs. The biosolids from the 8 other WRFs are delivered to the BWRF influent main pump station either by direct pumping, indirect pumping into the gravity sewer or by trailer truck and processed through the BWRF treatment train.

The existing RMF biosolids process train at BWRF includes the following components:

- WAS and PS storage tank
- Thickening with gravity belt thickeners
- Stabilization with anaerobic digestion meeting Class B requirements
- Biogas harnessed and used as fuel for energy production
- Dewatering of anaerobically digested sludge with centrifuges
- Drying dewatered sludge to 95 percent total solids using a thermal dryer
- Storing dried biosolids in silos and further processed by a third party vendor

The biosolids separated in the BWRF's primary and secondary clarifiers are sent to the RMF's raw sludge holding tank. The mixture of PS and WAS is thickened using three gravity belt thickeners (GBTs) and pumped into three primary anaerobic digester tanks, where it is anaerobically digested in the mesophilic temperature range. Digested solids are transferred from the three primary anaerobic digesters into the fourth sludge storage/gas holding tank, which is equipped with a membrane cover. Additional gas is also stored in a separate gas holder tank with a membrane cover.

The digested solids are withdrawn from the sludge storage/gas holding tank and transferred to three (3) centrifuges for dewatering. The dewatered solids are transferred to a rotating drum thermal dryer for drying. Dried biosolids are stored in two silos and hauled offsite for further processing by a third party vendor.

JEA performed a Biosolids Management Study in 2016-17 (BMS) to develop a vision and a plan for improving its biosolids management system over a 20-year period, with emphasis on systems and technologies with a projected lifetime of greater than 30 years. The BMS identified the following capital improvement projects. The order of projects listed below are organized in the order of how these will be designed, permitted and constructed.

- Project 1 – Construct a new Digestivore™ Post Aerobic Digester (PAD) process
- Project 2 – Construct a new biosolids processing facility
- Project 3 – Construction of a new raw sludge holding tank, clean and inspect existing raw sludge holding tank and replace cover
- Project 4 – Demolish the existing solids process building
- Project 5 – Construct a new Electrical and Instrumentation (E&I) building
- Project 6 – Construct a new Operations and Maintenance (O&M) building
- Project 7 – UV Disinfection
- Project 8 – Blower Improvements, including Electrical Building
- Project 9 – Construction of a new Vacuum Truck Unloading Facility (VTUF) and perform modification to existing VTUF structure

Project 1

The BMS identified the construction of the patented Digestivore™ PAD process for further treatment of the anaerobically digested sludge. The Digestivore™ PAD process is a patented process (by OVIVO) and comprises an aerobic digester tank with diffused aeration, blowers and sludge recirculation pumps. The Digestivore™ PAD process will provide several benefits including nitrogen reduction in the recycle stream, additional volatile solids

destruction, mitigation of struvite and odors generation and potentially improve sludge dewaterability. The project will comprise of the following components:

- A two-tank concept for providing 50 percent redundancy. Tanks will be cast-in-place concrete tanks. Each tank will be approximately 132-feet long, 76-feet wide and 26-feet deep. The tanks will be constructed such that the bottom of the tank will be 6-feet below grade. Each tank will have stairs and handrail for providing access from either ends. The new PAD tanks will be located just north of the existing primary clarifier tanks.
- Each tank will have two aluminum air bridges 132-feet long and a total of 144 diffuser drops with 24" shear tubes for mixing and aerating > 2 percent anaerobically digested sludge.
- A total of five (5), 400 HP each Positive displacement blowers and associated 316 SS air piping, valves and appurtenances to supply the air to the PAD tanks. The blowers will be mounted inside the proposed new dewatering building.
- Two Sludge recirculation progressive cavity pumps
- Provisions for adding alkalinity (magnesium hydroxide or equal) including storage tanks and pumps.
- Provisions for adding sludge heat exchangers to cool down the sludge, especially during warm summer months to alleviate washout of nitrifying organisms.
- Digested sludge storage tanks adjacent to the PAD tanks to the North. Each tank will be approximately 22-feet long, 76-feet wide, 26 feet deep and a coarse bubble diffuser system for mixing of the contents.
- All Electrical and instrumentation and controls including fiber optic communication between SCADA system and new I/O and controls.
- Site work and improvements to the existing storm water system with regrading and constructing a new storm water pond just west of the new PAD tanks. An access road will be constructed just south of the PAD tanks between the PAD tanks the existing primary clarifiers.

The manufacturer (OVIVO) will be responsible for providing and certifying the process guarantees to achieve a minimum 10% Volatile Solids Reduction (VSR) and 90% total nitrogen removal.

Project 2

This project includes the construction of a new thickening facility and a new dewatering facility.
The new thickening facility will be located just east of the existing Biosolids Processing Facility and north of the existing Chemical Storage Building. The new thickening facility is anticipated to be a 2-story CMU block building and supported by concrete beams and columns. The overall footprint of the building is estimated to have dimensions of 158-feet long and 41'-3" wide.

- The second floor will occupy three 3-meter gravity belt thickeners (GBTs). Each GBT will be located in a separate ventilated room. There will be a total of 4 GBT rooms (3 rooms, each with 3-meter GBT and a room for a future 3-meter GBT). An appropriately sized climate controlled electrical room will be located adjacent to the GBT rooms for housing the GBT control panels, motor control center (MCC) sections, Pump Variable Frequency Drives (VFDs) and other components.
- Each GBT room will have a 5-ton bridge crane and a 5-ton monorail.
- The first floor will house a polymer day tank, polymer batch tanks, polymer dilution equipment and pumps. The polymer room will be enclosed and ventilated.
- A new odor control system comprising of fiberglass ductwork from each GBT room to biotrickling filter based odor control units and associated fans, irrigation system and electrical and controls.
- Replace the three existing thickener feed pumps and grinders with new pumps and grinders in the basement of the Digester Control Building No. 1 and associated piping, valves and appurtenances.
- The building will have an elevator and set of external stairs.

The new dewatering building is planned to be a 3-story building, located just east of the new PAD process and north of the existing primary clarifier and will include the following:

- The third floor will potentially house the following
  - New dewatering equipment. The dewatering equipment room will house either centrifuges or belt filter presses. If centrifuges is the preferred option, it will house 3 centrifuges with space for a fourth unit.

One of the existing centrifuges will be relocated from the existing biosolids processing facility to the new dewatering building.
    - Two control rooms and a large electrical room to house the necessary MCCs, VFDs, Centrifuge control panels and other electrical components.
    - The entire third floor will have a climate control ventilation system located in the electrical room.
- The second floor will potentially house the following
    - Conveyor room with two horizontal belt conveyors (one duty/one standby). Each horizontal conveyor will feed an inclined conveyor located outside the building. The inclined conveyors will feed cake storage silo feed conveyors.
    - Two offices, one breakroom, one wet-chemistry laboratory room, men's and women's restrooms. All of this space will have climate control ventilation system located in a mechanical room also located on the second floor.
- The first floor will potentially house the following
    - Blowers and heat exchangers for the PAD process (if that is selected for implementation)
    - Magnesium hydroxide bulk storage tanks with a containment sump and pump room with ventilation for the PAD process.
    - Dewatering polymer storage room with ventilation to house bulk tanks and batch tanks with a containment sump, polymer dilution units and polymer solution feed pumps.
    - Centrifuge feed progressive cavity pumps in a separate ventilated room.

Adjacent to the dewatering building will be cake storage silos on top of two truck loading stations. The truck loading stations will be all enclosed in a metal building. The cake storage silos will have an odor control system with fiberglass ductwork and biotrickling filter type odor control units.

The project will comprise of all site work, new paving and grading and other necessary site/civil features.

- Procurement of Dewatering Centrifuge Equipment

If centrifuges are the preferred option for dewatering the Design Engineer will prepare bid specifications and assist CMAR with soliciting bids from the centrifuge manufacturers that were either invited to perform pilot testing at the Buckman facility or as determined by JEA. The specifications will be prepared to include weighting or points for the following factors, but not limited to:

- Firm price including cost of the machines and spare parts
- No. of machines including duty and standby machines
- Installed horsepower
- Polymer consumption and cake dryness guarantees
- Weight of the machine
- Footprint of the machine
- G-volume and operating RPM
- Length and coverage of warranty
- Installation base/experience
- Other factors as determined after consultation with JEA

The above will allow pre-selection and procurement of the most cost effective centrifuge machine and aid in the customized design of the new dewatering facilities.

Design Engineer will provide assistance to CMAR in answering bidder questions and evaluating the dewatering centrifuge bid proposals.
Concurrent to the final design services, it is assumed that CMAR will direct purchase the centrifuges. The centrifuges will be installed as owner furnished equipment. It is assumed that after awarding the bid to the selected manufacturer, the manufacturer will provide shop drawings for review and approval.

Design Engineer will receive and review shop drawings from centrifuge manufacturer concurrent with the final design services.

Project 3
Construction of a new Raw Sludge Holding Tank, to provide 100% redundancy for raw sludge storage. The project will comprise of the following elements.

- A new Raw Sludge Holding tank prestressed concrete tank with concrete cover or an aluminum rigid dome cover.
- The new tank will be designed with a pump/nozzle mixing system and the tank will be located near the existing Raw Sludge Holding Tank.
- The new tank will also be equipped with sludge transfer pumping system to the new thickening process.
- The new tank will also be connected to a new standalone odor control system.
- The existing Raw Sludge Holding Tank will be cleaned, inspected for any repairs and the cover will be replaced with either a concrete dome cover or a new rigid aluminum dome cover.
- All necessary Electrical and controls.

Project 4
Demolition of the existing Biosolids Processing Facility and existing Admin Building. The demolition will happen after the successful completion and start-up of Project No. 2. It is assumed that the selected CMAR will work with JEA to identify any items that will need to be salvaged in these buildings and appropriate procedures for proper care and removal of such equipment/components and return back to JEA, while the building structures will be designed for complete demolition.

Project 5
Construction of a new Electrical and Instrumentation (E&I) building. The BMS has recommended construction of a new 8,100 square feet, single story climate controlled E&I building with sufficient storage and workshop space in the space currently occupied by the Biosolids Processing Facility.

Project 6
Construction of an O&M building. The BMS has recommended construction of a new 7,000 square feet, single story, O&M building in the space currently occupied by the existing Biosolids Processing Facility. This building will include the following facilities

- Locker/shower for 44 people
- "Tailgate" meeting space and breakroom
- Walkup workstations
- Tool shop
- Forklift storage
- Some operational lab space

Potentially projects 5 and 6 may be combined into one project to construct one large building for both E&I and O&M buildings.

Project 7
Project includes the removal and replacement of the UV disinfection system including electrical, instrumentation and control. Flow diversion and by-pass of channels and UV chamber will be required. Additional channels will be constructed and equipped with UV light banks

- Existing structure modification from three (3) to five (5) channels including sluice gates.
- Storm surge and flood hardening as required by current study findings
- Hydraulic improvements to the effluent piping from the Secondary Clarifiers
- UV system to handle 28 MGD daily flow rates with peak average of 108 MGD and instantaneous flow rates of 157 MGD
- Design UV Transmittance of 35% and average daily UV transmittance of 42%

Project 8
Project to improve the reliability and redundancy of the blower system, blower system to operate in parallel with the dual-core, high-speed gearless blowers. The new blowers evaluated for this project will be dual-vane, single-stage integrally geared centrifugal blowers with an inlet butterfly valve for flow control. The design capacity of the new

centrifugal blowers will provide up to 50 percent of the air requirement for the 35-mgd biological nutrient removal (BNR) design.

- Install two new 1,000-horsepower, single-stage centrifugal blowers, each rated18,000 standard cubic feet per minute (scfm) at 9.2 pounds per square inch gauge (psig), in the existing blower building. These two new blowers will provide 50 percent of the air requirement for the 35-mgd BNR design.
- Construct two new cast-in-place concrete foundations on the existing pipe caps to support the weight of the two new single-stage blowers.
- Install new 30-inch diameter, type 304L stainless steel blower discharge piping to tie-in to the existing aeration basin header. The existing aeration basin header varies in size from 42-inch to 60-inch diameter. There is one existing 30-inch blind flange on the aeration basin header that will readily allow the new blowers to be tied-in. The pressure drop through this single 30-inch connection will be evaluated in the next phase of design.
- Construct a new electrical building will be constructed east of the blower building. The new electrical building will be similar in construction to the existing blower building and will house a new distribution switchgear. The distribution switchgear will be fed from independent primary sources to increase the reliability of the power supply.

Project 9

Construct a new VTUF and perform modification to existing VTUF structure.

- Remove and replace roof panels and trim.
- Repair and coat the existing structure.
- Replace existing push walls with higher push walls (8 feet on the east and west and 12 feet on the North).
- Add a new vacuum truck unloading structure.
- New Pre-Engineered Metal Building with an open structure, approximately 2,500 sf. 8 foot high Push walls on the east and west and 12 foot high push walls on the North.
- A mechanical screen and a washer/compactor to screen the material received in the new structure.
- A duplex pump station with controls to pump the screened wastewater to the head of the existing grit removal basins.
- Appropriate modifications to the storm-water drainage structures.
- Demolition of vacuum truck facility pump pit.

Projects 1 and 2 will be designed, permitted, and constructed as a single project. Project 4, demolition of the existing Biosolids Processing Facility, will be started after the successful completion of the Project 2. Projects 3, 5, and 6 will be designed, permitted and constructed together as a single project.