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Technical Memorandum

DRAFT

Prepared for: East Bay Municipal Utility District

Project Title: Digester Upgrades Planning

Project No.: 137180

Subject: Digesters 3 and 4 Condition Assessment Review

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Limitations:

This is a draft memorandum and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report.

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Introduction

This Technical Memorandum (TM) discusses the results of the Condition Assessment (CA) of the interior of the floating covers on Digesters 3 and 4 at the East Bay Municipal Utility District Main Wastewater Treatment Plant (EBMUD/District). EBMUD requested that Brown and Caldwell (BC) review the condition assessment report and estimate the remaining useful life of the floating covers. The estimate of remaining life will influence the replacement timeline for these floating covers, which are the oldest covers in the EBMUD Digester System.

Section 1: Condition Assessment Results

V&A Consulting Engineers, Inc. (V&A) was retained by the District to conduct ultrasonic thickness (UT) testing and condition assessment of the floors of the floating covers for Digesters 3 and 4. V&A's draft TM, dated October 28, 2014, presents the findings of their investigation. Overall, the welded steel plate floors of both digester covers were in good condition. The average loss of steel floor thickness is approximately 10 percent. The maximum loss of thickness was 23 and 24 percent in Digesters 3 and 4, respectively, and they were located in the outermost portion of the cover floors. A number of truss sections supporting the outer portion of the roof were found to have moderate-to-severe levels of corrosion. V&A's recommendations were as follows:

1. Perform a visual assessment of the internal truss work on the outer portion of the digester covers every two years.
2. The floor should also be evaluated for any exfoliation, the presence of new perforations, or the presence of large amounts of fresh sludge every two years.
3. Repeat the UT testing performed in this assessment in five years.

These recommendations were based on the assumption that the District would replace the covers within 5 years.

Section 2: Condition Assessment Discussion

The welded steel plate floor of the digester covers appear to be in good condition. Based on the age of the covers and the measured thickness loss, the average loss-per-year is low. The District has replaced, patched and coated these floor plates in the past, so it is anticipated that necessary repairs could be performed if needed.

BC acknowledges that "worm-holing" is a potential floor plate failure mode. Although the CA used more than 900 UT readings, there could be undetected pits and potential worm holes. These holes would eventually present themselves in the form of leaking sludge into the digester cover. BC recommends that the District inspect the Digester floors twice per year to confirm that there are no leaks. Leaks should be repaired immediately.

Corrosion was observed on the internal truss work at the outer portion of the digester covers. This is likely due to sludge and foam accumulation on the outer portion of the digester covers, which has likely deteriorated the roofing system and resulted in leaks into the attic space. The CA does not report the loss of thickness in the truss members, so it is not possible to determine the structural impacts of this corrosion; however, the limited instances of these moderate areas of corrosion and the location at the outer edge both

reduce the structural concerns. The District should attempt to minimize sludge and foam accumulation on the floating covers and attempt to keep the roofing systems in good repair.

Section 3: Seismic Issues

BC performed a preliminary seismic evaluation on Digesters 2, 3 and 4. The results of this effort were summarized in a draft TM dated August 5, 2014. BC found that with the existing floating covers, the walls of Digesters 3 and 4 would fail in the design seismic event. BC recommended that the District:

- Replace the existing floating covers on Digesters 3 and 4 with steel, fixed-dome covers or dual-membrane covers, which are significantly lighter than floating covers thereby reducing the seismic weight of the structure.
- Build a new concrete curb inside the digesters to prevent sliding during a seismic event.
- Reduce the liquid level of the digesters to a maximum elevation of 9 feet below the top of the digester wall to prevent rocking.

The digesters are at risk of seismic failure until these changes are designed and constructed. Any estimate of remaining useful life based on the recent CA must be qualified with these seismic deficiencies.

Section 4: Recommendations and Remaining Useful Life

Based on the CA report, the remaining useful life of the Digester 3 and 4 floating covers is two years or greater. The relatively good condition of the covers must be qualified with the serious seismic deficiency of the structures. The fact that the digester covers are not at risk of imminent corrosion-based failure should not diminish the urgency of efforts to reduce seismic risk.

If Digesters 3 and 4 are left in service with the existing floating covers, the District should:

1. Perform a visual assessment of the internal truss work on the outer portion of the digester covers <u>every six months</u>.
2. The floor should also be evaluated for any exfoliation, the presence of new perforations, or the presence of large amounts of fresh sludge <u>every six months</u>.
3. <u>Attempt to minimize sludge and foam accumulation on the floating covers and keep the roofing systems in good repair</u>.
4. Repeat the UT testing performed in this assessment in five years.

(Modifications and additions to the V&A recommendations are underlined.)