APPENDIX U

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Letter Report

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City of Davis
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203659

Subject: Capacity Analysis Evaluation Interim Findings

Dear Mr. Gryczko:

As part of our Capacity Analysis evaluation, Brown and Caldwell (BC) has reviewed previous reports by others, including:

- 2018 As-built drawings (AECOM and W.M. Lyles Co.)
- 2022 Davis Wastewater Treatment Plant (WWTP) Capacity Analysis Report (West Yost)
- 2025 Impacts of Landfill Leachate to WWTP Influent Flows and Loads Technical Memorandum (West Yost)

At your request, this letter summarizes differences in key assumptions compared to previous capacity studies and provides preliminary information on the capacity implications. BC's full capacity evaluation results will be documented in a future report.

Changes to Influent Flow and Loadings

Plant capacity is rated in terms of average dry weather flow (ADWF), but capacity limitations typically occur:

- During peak flow events for preliminary treatment, primary treatment, secondary clarifiers, and filtration
- During peak loading events (over 2 to 4 weeks) for aeration basins and solids handling processes including anaerobic digestion

Flow and loading projections are used to translate the peak flow or loading capacity into an ADWF. For the City of Davis (City), the capacity limitations are related to peak loading.

Water conservation reduces the flow per person but does not significantly impact the amount of organic loading produced per person. As a result, many California plants have seen changes in the relation between ADWF and peak loading, resulting in reduced ADWF capacity. The Davis WWTP was designed for an ADWF of 6 million gallons per day (mgd). The rated capacity was reduced to 5.3 mgd in the 2022 Capacity Analysis Report for most processes and 5.1 mgd for anaerobic digestion. The reduced flow capacity was due to water conservation (same population, similar loading, but lower flow).

Table 1 compares the rated capacity to the current flow and loading projections. Plant influent biochemical oxygen demand (BOD) loadings exceeded design loading capacity in the spring of 2023; according to City staff this period had high groundwater intrusion and impacts of leachate. Assuming peak loadings similar to this would occur in the future, West Yost noted in the 2025 flow and loading projections that there may be no organic loading capacity available at the WWTP to accommodate any future population growth.

Table-1. Influent Flow and Loading Changes

Parameter	2022 Capacity Analysis Report Revised Design Target	2025 Flow and Load Projections, Current	BC Estimate of Current Loading (Preliminary)[a]
Population	85,700	65,100	65,100
ADWF, mgd	5.3	4.1	4.1
Maximum Month BOD, lb/day[b]	13,300	15,800	12,000
Max Month BOD Loading During Maintenance Period, lb/day[c]	12,200	11,000	10,200

a. *Plant experienced extreme loadings between 12/1/2023 and 5/13/2023, likely due to high ground water intrusion and impacts of leachate. City staff assume this event will be prevented from occurring again, so the BC estimate excludes this time period.*
b. *BOD is shown as a parameter representative of organic loading. The full evaluation will include other influent parameters (TSS, ammonia).*
c. *Maintenance period is used to confirm capacity with process units out of service. Maintenance is assumed to take place during the non-student period (June 15 to September 15).*

lb/d = pound(s) per day

For comparison, BC estimated loadings excluding the spring of 2023, assuming leachate return is controlled to prevent future extreme peaks. Assuming leachate return is controlled so extreme peak loadings do not occur, the current influent loadings are less than the design loadings.

Plant Operational Assumptions

Several operational assumptions have changed since the original design, resulting in reduced plant capacity:

- **Reduction in Aeration Basin Aerated Volume.** The design capacity assumed the swing zone and final aerobic zone were aerated, but plant staff have reported operational issues when these zones are aerated. This reduces the aerobic volume by about 25 percent, reducing aeration basin capacity by providing less volume to transfer oxygen needed for treatment.
- **Changes in Aeration Basin Dissolved Oxygen (DO).** The plant staff have found that optimal DO setpoints use higher DO in the early zones and lower DO in later zones compared to the original design. Diffusers in the early zones do not have sufficient capacity, further reducing basin capacity.

- **Effluent Ammonia Target.** The plant was designed to have spikes of ammonia up to 3.6 milligrams per liter (mg/L) during peak loading conditions each day. This is allowable based on the discharge permit ammonia limit, but the varying ammonia concentrations cause issues for chlorination. To maintain consistent chlorination, the plant targets 1 mg/L of ammonia. The modified DO setpoints are needed to meet this ammonia target.
- **Anaerobic Digester Operations.** The original design had capacity to take a digester out of service at average loadings, assuming a primary sludge thickness of 4 percent. Actual primary sludge thicknesses are lower, reducing digester capacity. In addition, the maximum month loadings during the maintenance period exceed average loadings. The plant has capacity with both digesters in service, but capacity is limited for the maintenance condition.

The first three items reduce the aeration basin capacity to below current loadings. Preliminary capacity results are consistent with plant performance during a stressed period in October 2024 when one aeration basin was out of service, during which the plant struggled to maintain DO concentrations due to diffuser limitations. The preliminary capacity evaluations indicate that the plant will need additional aeration basin capacity and additional digester capacity to accommodate increased loadings.

Temporary Options to Address Capacity Limitations

BC is evaluating several temporary options to accommodate additional capacity while long-term improvements are constructed:

- **Reduce Leachate.** Leachate return was high during the spring of 2023. Controlling the return of leachate can help address capacity limitations.
- **Chemically enhanced primary treatment (CEPT).** By adding ferric chloride and polymer during high loading periods, primary treatment performance can be improved, allowing the plant to treat a higher influent loading without overloading the aeration basins. Jar testing and full-scale testing of CEPT performance can confirm the capacity increase. Because of the cost and challenges of relying on chemicals, this is not recommended as a long-term option.
- **Aerate swing zone.** Although aerating the swing zone presents challenges to operations, the plant aerated the swing zone during the peak loading in the spring of 2023. Aerating the swing zone temporarily to reduce ammonia during high loading periods helps the plant accommodate additional capacity. This may not be a solution long-term, especially if the plant receives nitrate limits in a future discharge permit.
- **CEPT and aerate swing zone.** These can be combined to further increase capacity.
- **Operate both digesters.** Capacity is sufficient with both digesters in service, but in five to seven years the digesters will need to be taken out of service for maintenance.
- **Thicken primary sludge.** If a digester needs to be out of service, thickening primary sludge will reduce the flow to the digester and increase digester capacity.

Permanent Options to Address Capacity Limitations

There are a variety of options to address aeration basin capacity limitations, including construction of additional basins. Once new basins are constructed, addition of baffles and mixers to the existing basins will help maximize capacity of the existing basins, diffusers, and blowers.

Intensification of the existing basins could also be considered, although the limited time each summer available for basin maintenance may make it impossible to modify the existing basins. Blower capacity limitations likely necessitate another blower if the process is intensified.

Addition of primary effluent equalization would reduce the diurnal peaks in loading and increase aeration basin capacity.

Summary of Findings

Based on the current flows and loadings and the plant operational configuration for optimized operations, the City plant has limited or no capacity for additional loading. Temporary options are available to address capacity limitations while permanent options are being implemented.

BC looks forward to the opportunity to complete the Capacity Evaluation Report. Should you have any questions, please do not hesitate to call me at 925-210-2551.

Very truly yours,

Brown and Caldwell

Fran Burlingham

Fran Burlingham, Project Manager
Walnut Creek

Limitations:

This document was prepared solely for the City of Davis in accordance with professional standards at the time the services were performed and in accordance with the contract between the City of Davis and Brown and Caldwell dated August 8, 2024. This document is governed by the specific scope of work authorized by City of Davis; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City of Davis and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.