Attachment C

Source Water Quality Assessment (Items G.3., G.8., & G.9.)

Source Water Quality Assessment for Kaipapa‘u Stream Bridge replacement project Hau’ula, O‘ahu

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Introduction

Hawai‘i Department of Transportation (HDOT) will be replacing Kamehameha Highway-Kaipapa`u Stream Bridge (herein referred to as the "Project") in Hau`ula on the windward coast of O`ahu (Figure 1). *AECOS*, Inc. was contracted[1] to collect and analyze water samples and provide a Source Water Quality Assessment (SWQA) for potential environmental impacts from dewatering activities associated with the Project.

Kaipapa`u Stream (State Perennial Stream ID No. 3-1-10) is an interrupted perennial stream that originates in the northern part of Ko`olau Mountain and descends to the Pacific Ocean from an elevation of around 2600 ft (792 m). An interrupted perennial stream is one that flows year-round in the upper reaches and usually intermittently at lower elevations. Kaipapa`u Stream flows under the bridge at Kamehameha Highway and discharges at the coastline between Kaipapa‘u Point and Hau‘ula Beach Park. Kaipapa’u Stream is listed on the 2018 State of Hawaii Water Quality Monitoring Assessment Report (HDOH, 2018) as having “insufficient data” to make a determination as to whether the stream is meeting state water quality criteria.

[1] This report was prepared for R.M. Towill Corporation and may become part of the public record.

Methods

Water quality samples were collected on November 26, 2018 under Kaipapa'u Stream Bridge (Sta. Bridge; Figure 2). Temperature, conductivity, pH, and dissolved oxygen (DO) were measured in the field. Samples for turbidity and total suspended solids (TSS) were collected in appropriate containers, stored on ice, and delivered to *AECOS* Inc. laboratory on O'ahu for analyses (*AECOS* Log No. 36914). Samples for nutrients (nitrate+nitrite, ammonium, total nitrogen, total phosphorus), oil and grease, 32 polynuclear aromatic hydrocarbons, 30 pesticides/PCBs, and 51 volatile organics were collected in appropriate containers, stored on ice, and shipped to Calscience Environmental Laboratories for analyses. Sample collection techniques are detailed in Appendix A. Samples were analyzed according to methods listed in Table 1.

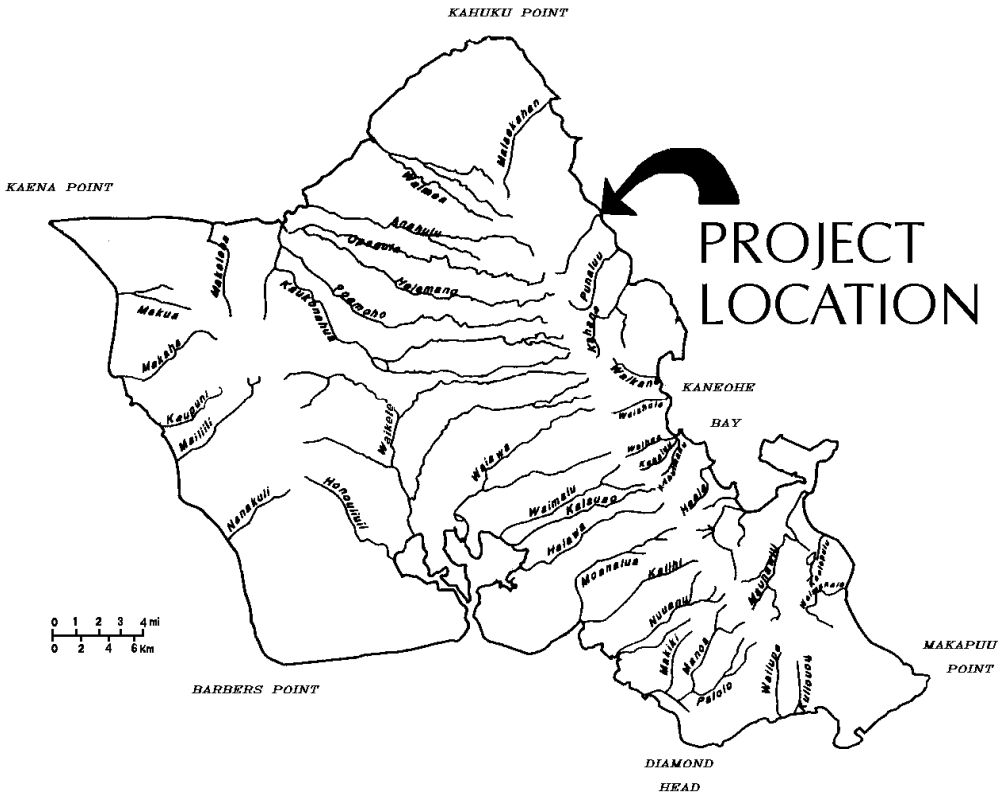

Figure 1. Project location on the Island of O`ahu.

Figure 2. Location of water quality sampling station: Sta. Bridge.

Results

Laboratory quality assurance/quality control (QA/QC) statements for all analyses of water quality samples are provided in Appendix A. Table 2 presents results of the November 26, 2018 sampling event for physical parameters, inorganic nutrients, turbidity, TSS, and oil and grease.

Water quality samples were also analyzed for 32 polynuclear aromatic hydrocarbons, 30 pesticides/PCBs, and 51 volatile organics. Laboratory results for these 113 compounds were all "not detected" and therefore are not expected to occur during proposed bridge construction.

Stream water temperature and conductivity values were typical for freshwater streams. pH levels were slightly acidic and DO saturation levels were low. Particulates (turbidity and TSS) were both low for flowing streams. Ammonium was not present in detectable amounts, whereas nitrate+nitrite and total

nitrogen concentrations were elevated. Total phosphorus was typical of stream waters. "Oil and grease" was not present in detectable concentrations.

Table 1. Methods used in analyses of water sampled from Well Site.

Analysis	Method	Reference
Temperature	SM 2550 B	SM (1998)
pH	SM 4500 H+	SM (1998)
Dissolved Oxygen	YSI meter/SM 4500-O G	SM (1998)
Conductivity	SM 2510-B	SM (1998)
Turbidity	EPA 180.1 Rev 2.0	USEPA (1993)a
Total Suspended Solids (TSS)	SM 2540 D	SM (1999)
Ammonia	SM4500 NH3 B/C	SM (1999)
Nitrate + Nitrite	SM 4500 NO3-E	SM (1999)
Kjeldahl Nitrogen	EPA 351.2	USEPA 1993b
Total Nitrogen	By calculation	
Total Phosphorus	SM 4500 P B/E	SM (1998)
Oil & Grease	EPA 1664A	USEPA (1999)
Polynuclear Aromatic Hydrocarbons	EPA 610	USEPA (1995)
Pesticides & PCBs	EPA 605	USEPA (1995)
Volatile Organics	EPA 624	USEPA (1995)

Table 2. Results for selected water quality parameters measured at Sta. Bridge on November 26, 2018.

Temp. (°C)	Salinity (PSU)	Conduct. (µmhos/cm)	pH	DO sat. (%)	Turbidity (ntu)
24.7	nd†	357	6.74	62	0.42

TSS (mg/l)	Ammonium (µgN/l)	Nitrate + Nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Oil & Grease (mg/l)
0.6	nd	540	710	28	nd

† nd = not detected

Assessment

Water quality data collected from Kaipapa'u Stream on November 26 (see Table 2) can be compared to certain water quality criteria established for streams (Table 7).. Criteria for turbidity, TSS, and nutrients are based on geometric means not to exceed specific criterion values. Since geometric means require a minimum of three separate sampling events per station, our single event results cannot be compared with state geometric mean criteria. Nevertheless, these criteria are useful guides for what HDOH regards as good water quality. Our results for physical parameters (temperature, DO saturation and pH) can be evaluated for compliance with state criteria.

Table 3. Water quality criteria applicable to streams (HDOH, 2014a).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/L)	250.0* 180.0**	520.0* 380.0**	800.0* 600.0**
Nitrate+Nitrite (µg N/L)	70.0* 30.0**	180.0* 90.0**	300.0* 170.0**
Total Phosphorus (µg P/L)	50.0* 30.0**	100.0* 60.0**	150.0* 80.0**
Total Suspended Solids (µg/L)	20.0* 10.0**	50.0* 30.0**	80.0* 55.0**
Turbidity (NTU)	5.0* 2.0**	15.0* 5.5**	25.0* 10.0*

* Wet season – November 1 through April 30
** Dry season – May 1 through October 31
Other "standards":
- pH units are not to deviate more than 0.5 units from ambient and are to be neither lower than 5.5 nor higher than 8.0.
- Dissolved oxygen is not to decrease below 80% of saturation.
- Temperature is not to vary more than 1C^{o} from ambient conditions.
- Specific conductance is to be less than 300 µmhos/cm.

Criteria for specific conductance and DO saturation did not meet state criteria on November 26, 2018 at Sta. Bridge. pH values were within criteria specified for streams. The criterion for temperature is based on "deviations from ambient conditions" and essentially pertains to discharges that might cause deviations. The cause of elevated nitrate+nitrite and total nitrogen concentrations are unknown. Particulates, ammonium, and total phosphorus were low at Sta. Bridge.

Dewatering effluents during bridge replacement construction will likely result in increases in turbidity and TSS levels and nutrient (nitrogen and phosphorus moieties and will not meet NPDES requirements for discharge into state waters. It is also likely that oil and grease will be present in dewatering effluents due to machine operations. No treatment of polynuclear aromatic hydrocarbons, pesticides, PBCs or volatile organics will be required due to lack of presence at the Project site.

Potential dewatering treatment options for the Project include:

1) Pumping to an on-site settling basin, allowing for percolation back into the ground. This is the most economical option, but depends on available open-ground for a settling basin, groundwater intrusion rate, and percolation rate at a selected settling basin site. Percolation rate could be increased by pre-filtration of particulates. If available ground area is limited, back trenching may be a viable option;
2) Transport of dewatering effluents off-site to a state-approved landfill. This option would be feasible if only a small amount of dewatering effluents is generated.

It should be noted that there are no practical treatment methods available to reduce nutrient concentrations to levels that would permit direct discharge into state waters such as Kaipapa'u Stream.

Conclusions

It is likely that dewatering will generate effluents that will result in increases of turbidity and TSS levels as well as nutrient (nitrogen and phosphorus moieties) concentrations that exceed state standards. Oil and grease may also exceed state standards due to equipment operations during the dewatering process, rendering these effluents unsuitable for direct discharge into state waters. Potential dewatering treatment options for the Project include percolation via

settling basins or back-trenching or transport and disposal in a state-approved landfill.

Water quality impacts generated by construction should be temporary and minimal if effective treatment and BMPs are employed. An Applicable Monitoring and Assessment Plan (AMAP) should be developed to monitor effectiveness of best management practices (BMPs) deployed during construction.

References

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