Temporary Debris Storage (TDS) Site Monitoring
U.S. Army Corps of Engineers and County of Maui Department of Environmental Management
November 1, 2024

The Temporary Debris Storage (TDS) area located in Olowalu was designed and is underlain by a thick (80 mil or 0.08 inches) plastic liner to be protect the soil, groundwater, and ocean. The entire TDS site is being monitored closely by USACE, County of Maui, and Hawai'i Department of Health (DOH) to ensure no impacts to the surrounding area or the marine environment from the ash and debris, along with any leachate or rainwater run-off generated.

Leachate is a liquid, usually rainwater, which percolates through the ash and debris within the lined area of the TDS working boundaries. Though most of this water is either absorbed into the waste mass or evaporates into the air, some may pass through the ash and debris, and may pick up contaminants present within the ash, such as heavy metals (i.e., arsenic, lead and cobalt) as detected by Hawai'i DOH in samples of the ash taken in Lahaina. Leachate is different than rainwater or surface water run-off which is diverted around the TDS working area from the surrounding hills. Stormwater is intentionally diverted around the TDS to minimize the generation of leachate. All leachate collected within the TDS area is drained by gravity to a low spot in the TDS working area called a sump, where it is drained via a drainpipe to a leachate basin. This leachate basin is located directly downhill from the TDS working area and is constructed with the same thick (80 mil) liner to prevent any infiltration into the underlying soils.

The leachate basin has a design capacity of 1.375 million gallons, which is much more than is ever expected to be collected, even in the most significant rain event in West Maui. For example, during a rainstorm in early January during which over 3" of rain fell in less than 24 hours, the leachate basin successfully collected all rainwater which fell directly into the TDS working area as well as its surroundings, as construction had yet to be completed on the stormwater diversion canals around the TDS working area. The leachate basin filled with approximately 500,000 gallons of rainwater, which only caused it to reach just over 1/3 of its total capacity. A subsequent storm event in early April, during which approximately 2" of rain fell in less than 24 hours, resulted in the leachate basin filling with 100,000 gallons of rainwater run-off. The quantity is substantially less because the TDS working area now contains a substantial amount of soil, ash and debris which absorbed most of the water.

The leachate generated in the TDS is utilized within the limits of the lined TDS working area where the storage of ash and debris is taking place. It is being applied via wet spray atop the debris to control dust generation. During this process, most of the liquid evaporates. The water spray is applied several times throughout the workday, especially on drier days. Leachate basin level monitoring results are presented in Table 1.

Date	Level	Gallons (est)
1/2024 – 8/2024		see previous reports
8/28/2024	< 1'	< 10,000
9/10/2024	< 1'	< 10,000
10/9/2024	< 1'	< 10,000
10/30/2024	< 1'	< 10,000

Table 1. Leachate basin monitoring levels.

A percolation basin is located below the TDS site, designed to receive rainwater run-off, which is diverted around the TDS working area, which does not come into contact with any ash or debris. The purpose of the percolation basin is to allow rainwater run-off to percolate into the natural soils and not run down the roadway or drainage channels. A Stormwater Pollution Prevention Plan (SWPPP) was developed to prevent contamination of the surrounding area from site operations which complies with applicable state and federal requirements.

On January 21, 2024, the County of Maui approved Ordinance #5596, also known as "Bill #120." Among other recordkeeping, operational and planning requirements, the ordinance required the following specific monitoring at the TDS:

1) Leachate quantity, quality and treatment processes, if required
2) Run-off, including nearby waterways
3) Air quality for toxins and contaminants

The data from this monitoring must be made publicly available, which is the purpose of this section. Reports providing details on the first 90 days (January 21, 2024 – April 21, 2024), second 90 days (April 21, 2024 – July 20, 2024), and third 90 days (July 21, 2024 – October 19, 2024) of TDS site operation are submitted to the County Council and will be posted here.

1) Leachate

Due to the dry conditions in West Maui, 'baseline' sampling of run-off water was collected directly from the leachate basin two days after a significant storm event on January 9, 2024. Approximately 3" of rain fell over 24 hours during this storm event, generating approximately 500,000 gallons of run-off, which was collected in the leachate basin. At the time of the storm, no ash or debris had been placed in the TDS working area, so the run-off represented typical precipitation run-off un-impacted by waste, therefore considered typical of what normally runs off the natural soils present in the area.

Since the preliminary, baseline sampling event, USACE has sampled the leachate basin periodically, and plans to continue sampling leachate monthly directly from the leachate basin if a 1" or greater storm event occurs within that month.

Table 2 shows the analytes and parameters analyzed by environmental laboratories, along with the results from samplings conducted by USACE to date. Not all parameters shown below were analyzed for by the laboratory during each event, as additional parameters were added at the request of Hawai'i DOH and the Maui County after the baseline sampling event on January 11, 2024.

Table 2. Leachate monitoring analytes and parameters.

Parameter	Method*	1/11/2024 (Baseline)	1/30/2024	2/8/2024	2/13/2024	2/20/2024	4/15/2024	5/20/2024	Units
TSS	SM 2540D	316	46	32	8	-	39	23	mg/L
TDS	EPA 2540C	NS	NS	289	315	-	670	730	mg/L
TOC	EPA 5310C	NS	NS	7.96	9.16	-	7.0	11	mg/L
COD	EPA 410.4	NS	NS	15.5	12	-	38	59	mg/L
Turbidity	EPA 180.1	650	103	NS	NS	-	80	11	NTU
Total Alkalinity	EPA 2320B	NS	NS	69.9	74.1	-	44	42	mg/L
Nitrogen-Total	EPA 351.2	NS	NS	15.9	16.5	-	22	21	mg/L
Nitrates	EPA 353.2	NS	10.1	14.4	15	-	21	15	mg/L
Nitrites	EPA 353.2	NS	0.369	0.74	0.59	-	0.32	1.5	mg/L
Oil & Grease	EPA 1664B	< 5.0	3.9	< 5.0	9	-	1.5	1.4	mg/L
TPH	EPA 1664B	< 5.0	NS	NS	NS	-	4.1	4.0	mg/L
DRO (C10-28)	EPA 8015D	NS	NS	NS	NS		250	290	µg/L
Chlorine	EPA 330.4	NS	< 0.01	0.317	0.283	-	ND	ND	mg/L
Hex Chromium	EPA 218.6	NS	0.185	NS	NS	-	NS	NS	mg/L
Cyanide-Total	EPA 9012A	NS	NS	NS	NS	-	0.021	ND	mg/L
Carbonate		NS	NS	1.2	5	-	6	5.6	mg/L
Ammonia	EPA 4500	NS	NS	NS	NS	-	ND	0.11	mg/L
Sulfide	EPA 9034	NS	NS	0.057	0.058	-	ND	ND	mg/L
Sulfate	EPA 300.0	NS	NS	107	121	-	230	240	mg/L
Dioxins / Furans (2,3,7,8-TCDD)	8290A	NS	-	-	< 1.9	< 2.0	ND	< 2.1	pg/L
PCBs (total)	8082A	NS	NS	ND	ND	ND	ND	ND	ug/L
Herbicides (2,4-D)	8151A	NS	NS	NS	ND	ND	0.78	ND	µg/L
Pesticides	8081B	NS	-	-	NS	ND	ND	< LOQ	µg/L
VOCs	8260D	NS	ND	-	ND	ND	ND	ND	µg/L
SVOCs	8270D/E	NS	-	-	NS	ND	ND	ND	µg/L
DO	EPA 360.1	NS	NS	9.53	9.91		6.5	5.0	mg/L
pH	EPA 9040C	NS	NS	8.21	8.88	-	7.4	8.5	
Total Metals (ICP)	6010D								
Beryllium		< 0.010	0.00048	-	< 0.0015	0.030	ND	ND	mg/L
Vanadium		0.13	0.019	-	0.013	0.92	0.017	0.011	mg/L
Chromium		0.136	0.013	-	0.0075	0.56	0.024	0.0055	mg/L
Cobalt		0.026	0.0033	-	0.0019	0.4	0.0028	0.0020	mg/L
Nickel		0.078	0.011	-	0.0063	0.38	0.0085	ND	mg/L
Copper		0.042	0.007	-	0.0047	0.23	ND	ND	mg/L
Zinc		< 0.100	0.017	-	0.0052	0.49	0.0048	ND	mg/L
Arsenic		< 0.010	0.0027	-	0.0027	<0.16	ND	ND	mg/L
Selenium		< 0.010	< 0.005	-	< 0.025	<0.16	ND	ND	mg/L
Molybdenum		< 0.010	0.0021	-	0.0024	<0.02	0.0074	0.0061	mg/L
Silver		< 0.010	NS	-	< 0.008	<0.04	ND	ND	mg/L
Cadmium		< 0.010	NS	-	< 0.0035	<0.01	ND	ND	mg/L
Antimony		< 0.010		-	< 0.0011	<0.16	ND	ND	mg/L
Barium		0.251	0.04	-	0.025	2.6	0.037	0.025	mg/L
Mercury	7470A	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.085	0.14	ND	mg/L
Thallium		< 0.010	NS	-	NS	<0.12	ND	ND	mg/L
Lead		< 0.010	0.00096	-	0.0042	<0.071	ND	ND	mg/L

Note: Lab methods may vary. Data from parameters included in the baseline event not sampled in subsequent sampling events is not included.

Abbreviations & Symbols:

<: less than
COD: chemical oxygen demand
EPA: United States Environmental Protection Agency
ND: nondetect or below detection limit
NTU: nephelometric turbidity unit
SVOC: semivolatile organic compound
TOC: total organic carbon
TPH: total petroleum hydrocarbons – oil
VOC: volatile organic compound
µg/L: micrograms per liter
pg/L: picograms per liter
mg/L: milligrams per liter
NS: not sampled
PCB: polychlorinated biphenyl
TCDD: Tetrachlorodibenzo-P-dioxin
TDS: total dissolved solids
TSS: total suspended solids
LOQ: limit of quantitation

2) Nearby Waterways

Because there have been no observable releases of leachate from the TDS site, there has been no need to sample surface water in creeks or drainage ditches adjacent to the TDS.

DOH continues nearshore water quality monitoring at eight locations from Olowalu to Kaanapali, with data available on the DOH website. DOH continues to affirm that these data show that there are no ash/debris or fire-related chemicals present in the surface water at concentrations of human health concern and are consistent with background levels.

3) Air Quality

There are several air monitoring stations (a.k.a. 'PurpleAir Sensors' and 'DustTrak' monitors) in the vicinity of the TDS, which are operated, maintained, and monitored by either DOH or a contractor to USACE. The air monitoring equipment provides data for both Particulate Matter (PM) 2.5 and 10, which correspond to the size of the particulate matter in micrometers (or microns), which represent one millionth of a meter. The measurement units for PM are expressed in micrograms/cubic meter, or $\mu g/m^3$, which is basically the weight of the total dust particles (in micrograms) in a defined area of space (one cubic meter). The smaller the particle (i.e., 2.5 microns), the deeper into the respiratory tract and lungs the particles can penetrate and either cause or exacerbate existing respiratory health problems. More information on the health effects of particulate matter pollution can be found here.

The locations of the PurpleAir monitors operated by DOH are found in Figure 1. Monitoring data can be viewed at https://fire.airnow.gov and https://map.purpleair.com/. In addition, DOH has established a 'Data Portal' where all wildfire-related data can be viewed here.

Figure 1. Locations of air monitors near the TDS site.

In addition, a contractor to USACE is collecting air monitoring samples following a DOH-approved plan that includes all debris removal work zones as well as the TDS site. A summary of data collected to date at various locations around the TDS site (monitors are not always placed in the same location depending on wind conditions) can be found in Table 3.

DATE	Average PM10 (ug/m^3)	Average PM2.5 (ug/m^3)	Monitor ID #s
23-Jan	10.62	8.42	4,5,11
28-Jan	16.55	13.49	9,10,11
2-Feb	9.74	7.6	1,10,11
3-Feb	7.46	5.52	9
8-Feb	7.53	2.64	6,11,13
28-Feb	9.46	7.36	3,4
6-Mar	4.33	6.06	3,8
13-Mar	14.24	11.78	1,4
14-Mar	5.75	3.24	1,11
20-Mar	8.54	6.62	4,10
27-Mar	10.24	8.35	5,10
3-Apr	4.42	3.23	8,14
10-Apr	8.87	6.95	8,14
17-Apr	11.54	8.52	1,6
24-Apr	5.18	3.89	11,14
1-May	8.76	5.72	4,12
8-May	12.26	9.53	1,13
15-May	9.47	8.87	9,10
22-May	11.27	8.64	10,11
29-May	8.36	6.38	3,16
5-Jun	14.61	12.62	6,9
12-Jun	6.08	5.74	6,15
19-Jun	7.95	6.84	9,14
26-Jun	5.97	5.13	3,9
3-Jul	5.2	3.53	15,16
10-Jul	8.02	4.15	6,15
17-Jul	5.7	5.25	9,14
24-Jul	5.65	4.46	4,14
31-Jul	6.55	4.53	11,12
7-Aug	6.64	4.57	12,16
14-Aug	8.17	5.48	12,16
21-Aug	6.39	4.64	12,16
28-Aug	12.29	11.65	12,16
4-Sept	5.06	3.95	12,16
11-Sept	9.18	7.25	12,16
18-Sept	4.84	7.42	12,16
25-Sept	4.13	2.48	12,16
2-Oct	7.16	4.58	12,16
9-Oct	4.47	3.20	11,16
16-Oct	7.41	5.34	11,16
23-Oct	5.95	4.57	11,16
30-Oct	7.82	6.86	11,16

Table 3. Air monitoring data collected around the TDS site.

USACE has established an 'Action Limit' of 35 for Particulate Matter (PM 2.5), which means that engineering and/or operating controls such as water sprays and limiting truck speed are implemented in the event of an exceedance of an Action Limit.

Finally, USACE conducts personnel air monitoring according to an Air Monitoring and Sampling Plan (AMSP) using personal air cartridges directly on-site workers. The results are evaluated against criteria based on the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PELs)

and/or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). All sampling results to date collected from excavator operators and laborers have not found any exceedances of these health-based criteria, so this activity was largely discontinued as of late June.

4) Groundwater

To comply with Bill 120, USACE installed temporary groundwater monitoring wells (MW) adjacent to the TDS site. An upgradient (uphill) MW and downgradient (downhill) MW were installed at the TDS site in June – July 2024 as shown in Figures 2 & 3. A well completion report was submitted to the County by USACE in August 2024 with specific construction details.

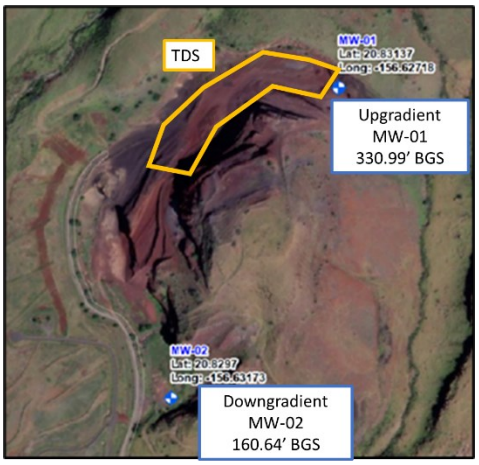

Figure 2. Locations of groundwater monitoring wells.

Figure 3. Groundwater monitoring well MW-02.

The first samples were collected on July 7, 2024. Samples will continue to be collected and analyzed quarterly (every 3 months), which is a typical frequency for waste storage and disposal facilities. A second sample was scheduled to be taken the week of October 7, 2024, with laboratory analysis and reporting pending at the time of this report. The results to be reported in the next quarterly report.

The first samples taken on July 7, 2024 are considered 'baseline' samples, since MW-01 and MW-02 are newly installed, and there are no previous sampling data from them to compare. The analysis performed includes the analytes and parameters found in Table 4, which includes contaminants or indicators of contaminants present in the TDS leachate (see Section 1, Table 2).

Table 4. Analytes and parameters for groundwater samples.

Major cations & anions	Method	7/7/2024 MW-01 Q3 2024 (Baseline)	10/8/2024 MW-01 Q4 2024	7/7/2024 MW-02 Q3 2024 (Baseline)	10/8/2024 MW-02 Q4 2024	Units
Magnesium	6020B	12000	12000	17000	17000	ug/L
Sodium	6020B	78000	76000	130000	130000	ug/L
Calcium	6020B	15000	14000	21000	22000	ug/L
Potassium	6020B	5400	5200	7600	7700	ug/L
Chloride	300	100	110	190	200	mg/L
Carbonate	2320B	ND	ND	ND	ND	mg/L
Sulfate	300	19	20	25	25	mg/L
Major Indicators						
TDS	2540C	210	340	350	500	mg/L
TOC	5310C	4.6	9.7	0.58	0.95	mg/L
Total Alkalinity	2320B	69	69	67	69	mg/L
Ammonia (as Nitrogen)	350.1	ND	0.069	0.05	0.091	mg/L
Iron	6020B	140	630*	380	2500*	ug/L
Field Parameters						
pH	9040C	7.2	7.5	7.5	7.9	S.U.
Turbidity	180.1	2.5	8.1*	18	80*	NTU
Major cations & anions	**Method**	**7/7/2024 MW-01 Q3 2024 (Baseline)**		**7/7/2024 MW-02 Q3 2024 (Baseline)**		**Units**
Metals	6020B					
Arsenic		ND	ND	ND	1.1	ug/L
Lead		ND	0.30	ND	0.76	ug/L
Antimony		ND	0.21	ND	ND	ug/L
Cobalt		0.84	1.9	0.19	0.41	ug/L
Copper		2.5	3.0	0.72	1.0	ug/L

***Note:** Elevated readings for Iron and Turbidity are likely related to a change in sample collection method. This will be confirmed in a subsequent sampling event.

Abbreviations & Symbols:

mg/L: milligrams per liter
MW: monitoring well
ND: nondetect or below detection limit
NTU: nephelometric turbidity unit
TDS: total dissolved solids
TOC: total organic carbon
µg/L: micrograms per liter

The baseline sampling data from MW-01 and MW-02 is used to evaluate any changes or impacts to groundwater from the TDS site as quarterly sampling data continues to be collected and analyzed. All groundwater data will be evaluated by the County of Maui and DOH to determine whether there are any impacts to groundwater from the TDS site, and if so, what action(s) may be necessary after closure and removal of the TDS site to address them. Due to the thick liner (80 mil, or 0.08 inches) underlying all ash and debris in the TDS as well as the leachate basin to prevent infiltration, and the distance between these bottom liners and the uppermost groundwater level (between 150 – 300 feet), it is unlikely that the TDS site will have any impact on groundwater.

5) Background Soils

A pre-construction assessment divided the TDS site into five decision units—or set areas—to analyze pre-existing soil conditions for contaminants. Analytical results from this assessment, summarized in the below table, will be used once debris has been removed from the site, as the soil will be sampled at similar locations for the analysis of constituents; the pre-assessment measurements will serve as a data comparison. Both the pre-construction and post-construction data will be evaluated by the County of Maui and DOH to conclude whether any action is necessary prior to grading the TDS area.

Constituent (mg/kg)	DU-1 (mg/kg)	DU-2 (mg/kg)	DU-3 (mg/kg)	DU-4 (mg/kg)	DU-5 (mg/kg)
Antimony	0.18	0.19	0.19	0.19	0.19
Arsenic	1.4	1.5	0.73	0.584	0.94
Barium	15	15	32	40	39
Berylium	0.56	0.66	0.6	0.75	0.66
Cadmium	0.093	0.13	0.094	0.099	0.1
Chromium	0.81	1	0.84	0.53	7
Cobalt	1.1	1.4	1.2	1.2	3
Copper	1.6	4.9	1.6	0.86	4.9
Lead	2.1	1	1.1	0.97	2.2
Molybdenum	0.51	0.54	0.5	0.67	0.9
Nickel	0.79	1	0.92	0.53	9
Selenium	4.9	5.4	3.6	3.2	3.7
Silver	0.046	0.021	0.047	0.048	0.047
Thallium	0.14	0.15	0.14	0.14	0.14
Vanadium	1.2	1.4	1.2	1.0	8.5
Zinc	48	51	44	49	52
Mercury	0.010	0.011	0.0096	0.010	0.011
Oil Range Organics	18	26	30	29	30
Gasoline Range Organics	2.9	1.1	1.6	1.7	1.5
Diesel Range Organics	32	33	28	30	16

Abbreviations: DU: decision unit mg/kg: milligrams per kilogram