

IVGID – 4th of July Non-Regulatory Surface Water Sampling

Report Prepared by: Mark Helleckson – IVGID Source Water Protection Specialist

Background

IVGID operates a water treatment plant located at Burnt Cedar Beach. That treatment plant operates under filtration avoidance criteria of the EPA Surface Water Treatment Rule. Up to 8.5 million gallons of water at the treatment plant undergoes both UV and ozone treatment each day. In combination, these systems provide disinfection of drinking water to protect against bacteria, viruses, and cysts. After treatment a small amount of chlorine is added, as required for all drinking water systems of this size, to prevent microbes from growing in the distribution system. IVGID's Waste Not team has conducted additional non-regulatory surface water sampling for many years to monitor for possible changes to our water source (Lake Tahoe) that could have impacts on our drinking water. Normal measurements taken are water temperature, total dissolved solids, electric conductivity, turbidity, pH, and microbial analysis. The team was asked to conduct additional monitoring around the fireworks for perchlorate which is currently a non-regulated contaminant that is commonly found in fireworks. IVGID conducted perchlorate monitoring in July 2024 as part of a nationwide study led by a researcher at Texas Tech under EPA grant #R840554. The Tahoe specific results are included as an attachment to this report.

Methodologies

Surface water sampling of this type is non-regulatory, and subject to uncontrollable external variables. To maintain the integrity of data collected, the team conducts sampling at consistent locations and notes any visual observations that may offer insights to potential data variability. The standard sampling procedure is as follows:

- A two-person sampling team arrives at the site, the sampling team member (Person A) wears clean waders and receives a large sampling bottle, an OAKTON® PCTSTestr™ 5 multimeter, a large WHIRL-PAK sampling bag, and an extendable (12') sampling pole. The teammate on land (Person B) begins recording visual observations of the sampling site.
 - Person A wades into the water from the designated site until standing at a depth of approximately 3-4' of water (waist-torso deep).
 - Person A rinses the large sampling bottle^a, three times with lake water and stows it empty.
 - Person A rinses the sampling cap of the multimeter three times. The sampling cap is then filled and placed on the meter. Measurements of water temperature, total dissolved solids (TDS), and pH are relayed to Person B and recorded.
 - Person A then extends the sampling pole and triple rinses the sampling end as far away from direct human influence as possible. A WHIRL-PAK is opened and placed on the sampling pole and a water sample is gathered as far from human influence as possible at a depth of approximately 18".
 - Person A wades back to shore and the water sample is transferred to both a bacterial analysis bottle which contains preservative and does not receive rinsing and the previously rinsed sample bottle that is used for other analyses.
 - The process is repeated at each sampling site.
- a. for perchlorate samples an additional bottle was used and underwent the rinsing process and was filled on shore

A special procedure was used for the intake location using a Van Dorn style underwater sampling bottle. All measurements occurred from the sample back on land.

Testing Parameters

Air Temperature:

A measure of the ambient air temperature in degrees Celsius (°C) at the time of sampling

Water Temperature:

A measure of the temperature of the surface of Lake Tahoe in degrees Celsius (°C)

Total Dissolved Solids (TDS):

A measurement of the total dissolved inorganic and organic substances in the water. The PCTSTestr™ 5 derives this measurement as an approximation from a measurement of electric conductivity. For this report TDS is reported as parts per million (ppm).

Electric conductivity (EC):

The ability for water to conduct an electric current, primarily due to dissolved ions. EC is reported as microSiemens per centimeter (µS/cm)

Turbidity:

A measurement of the cloudiness or haziness of water, caused by suspended particulates. Turbidity is measured in Nephelometric Turbidity Units (NTU).

pH:

A measurement of how acidic (low pH) or basic/alkaline (high pH) the water is. Specifically, this refers to the amount of free hydrogen (H⁺) or hydroxide (OH⁻) ions in the water. pH values range from 0 to 14 and are reported simply as pH which is a logarithmic unit, meaning each whole number represents a 10-fold change (water of pH 9 is ten times more basic the water with pH 8).

Salinity:

Salinity is an ambiguous term but usually used to represent the total concentration of all dissolved salts in water, which are a strong contributor to conductivity. Measurements of salinity in this report are as reported by the TDSTestr™ 5 which approximates salinity based on the electric conductivity measurement. Salinity is reported as parts per thousand (ppt)*

Perchlorate:

Perchlorate is a compound commonly found in fireworks. It is currently not regulated by the EPA. The EPA has considered setting a maximum contaminant level (MCL) for perchlorate, but no action has been formalized. The most stringent proposal would have set the MCL at 18 micrograms per liter (µg/L), 1µg/L is equivalent to 1 part per billion (ppb).

Bacterial analysis:

Total coliform and fecal coliform analyses are used to monitor for possible microbial contamination. Total coliform refers to a count of all coliform bacteria, many of which are found naturally in soil and water and are generally not harmful. Fecal coliform specifically refers to a class of coliform associated with the digestive tracts of warm-blooded animals, including E. Coli which is a coliform of particular concern for the safety of drinking water. Coliform counts are reported as colony-forming units/100mL (CFU).

*ppt typically refers to parts per trillion, however this specific meter reports in ppt as parts per thousand. For the integrity of the reported numbers, this report will exclusively use ppt only when referring to salinity and only as parts per thousand which is commonly represented as ‰.

Results

Baseline Samples:

Samples were taken for all standard measurements on June 25th, 2025, to establish a pre-fireworks baseline. Perchlorate specific samples were taken on July 2nd, 2025.

Post-Incident Samples:

The planned post fireworks samples were to be taken in July 5th, 2025. As IVGID became aware of the incident, those samples were instead taken in the early afternoon on July 4th, 2025. Perchlorate samples were only collected from the Burnt Cedar Beach jetty, and Ski Beach

Follow up perchlorate samples were taken on July 7th, 2025 again at Ski Beach, and from near the Burnt Cedar Intake with a volunteer on non-motorized personal watercraft using a Varn Dorn style underwater sampling bottle. Additional standard sampling occurred on July 10th, 2025, and a final round of perchlorate sampling occurred again at Ski Beach and the Burnt Cedar Intake on July 11th, 2025.

Visual Assessments:

6/25/25:

Standard summertime conditions were present. Normal algae growth was observed on the underwater rocks at the Burnt Cedar 1 and Burnt Cedar 2 (jetty) sites. Increased human activity was noted at all sampling locations. Incline Creek & Third Creek flows were reduced from the previously observed spring runoff with increased sand deposits on their western banks.

7/2/25:

Both Burnt Cedar Beach & Ski Beach were still experiencing increased human activity. A significant shelf was present underwater at ski beach indicative of the recent wave activity caused by several afternoons of thunderstorms over the past week.

7/4/25:

The water at both sites was visibly turbid. Waves of 4ft were observed at the burnt cedar jetty with wave break occurring just below the top of the boulders, spray was reaching visitors at the top of the jetty. Winds were from the southwest, with surface water moving from SW to NE. Conditions were unsafe for sampling to occur at the water line and instead occurred from the top of the jetty utilizing the extension pole. Similar waves were observed at Ski Beach and sample was taken from the shoreline utilizing the sampling pole. Firework barge debris was present near the sampling site. Burnt Cedar Beach was undergoing extreme amounts of human impact due to the holiday and closure of Incline, Ski, and Hermit beaches.

7/7/25:

The water was calm and clear. Sampling volunteer noted that the water over the intake was slightly less clear than previous times he had sampled at that location for other projects, however, the water in the sampling bottle appeared clear. Ski Beach sample site had a strong odor of boat exhaust and boat activity was present. The substrate was very soft, indicating recent disturbance from the large wind event on 7/4/25 a shelf was again present offshore. Incline beach had just received enhanced cleaning by the eco-clean solutions beach cleaning robot (Bebot). Ski beach had not received Bebot treatment but was free of any visible litter.

7/10/25:

Standard summertime conditions were present at all sites, with large amounts of human activity. Standard levels of algae growth were observed at Burnt Cedar Beach sites. Both Incline Creek and Third Creek had low flows and channels had shifted significantly eastward as sand continued to fill in the west bank of each creek. A robust boat exhaust smell was present at Ski Beach, and the offshore shelf was slightly reduced in prominence.

7/11/25:

The water was calm and clear. The offshore shelf at Ski Beach had been reduced to only a few inches.

Data Summary:

Temperature:

Water and air temperatures at all sites remained within normal ranges for early summer conditions. Water temperature for the intake samples was not recorded due to the brief time between deep water collection, and measurements taken back on shore causing a warming. Recording this temperature would be inaccurate as it is not the *actual* temperature of the water at its sample location.

Turbidity:

Turbidity averaged 0.345NTU across all lake sites during sampling on June 25th & 0.488NTU across all lake sites during sampling on July 10th. Turbidity analysis was conducted during the regularly scheduled sampling events only.

Total Dissolved Solids/Electric Conductivity/Salinity:

The measured TDS, EC, and salinity were all within the “normal” for Lake Tahoe during the summer. The highest reading for each of the three measurements was recorded on 7/4/25 at the Burnt Cedar Jetty with readings for TDS, EC, & salinity of 82.7ppm, 115.3µS/cm, & 0.05ppt respectively.

pH:

Measurements of pH ranged from 7.91 to 8.45.

Bacterial Analysis

Bacterial analysis occurred during the 6/25/25 & 7/10/25 sampling events. Comparing the pre & post sampling events, there is a notable increase in total coliform counts at the Burnt Cedar sites, and a decrease in counts at Incline and Ski Beach sites. The only fecal coliform counts for lake sites were at Ski Beach with 2CFU recorded for both sampling events.

Perchlorate:

The lab reports for all perchlorate samples taken show non-detection. The third-party lab utilized EPA Method Number 331.0 and had a detection threshold on 0.50µg/L.

Table 1.0

Date	Location	Time	Air Temp (°C)	Water Temp (°C)	Turbidity (NTU)	TDS (ppm)	EC (µS/cm)	pH	Salinity (ppt)	Perchlorate	Total Coliform (CFU)	Fecal Coliform (CFU)
6/25/2025	Burnt Cedar 1	09:59	18.0	16.8	0.309	60.5	88.4	8.28			28	0
6/25/2025	Burnt Cedar Jetty	10:12	18.5	16.9	0.338	57.7	90.9	8.23			94	0
6/25/2025	Incline Beach	10:29	18.5	16.9	0.349	56.0	92.0	8.18			60	0
6/25/2025	Third Creek	10:38	21.9	9.9	1.52	38.7	61.9	7.82			320	48
6/25/2025	Ski Beach	10:48	18.4	16.0	0.385	57.8	89.2	8.04			110	2
6/25/2025	Incline Creek	10:54	19.8	8.9	2.99	44.1	70.3	7.83			320	16
7/2/2025	Burnt Cedar Jetty	09:25	18.2	18.9		61.1	85.2	8.28	0.04	ND		
7/2/2025	Ski Beach	09:51	19.4	19.2		58.5	85.1	8.13	0.04	ND		
7/4/2025	Burnt Cedar Jetty	12:35	16.6	19.2		82.7	115.3	8.45	0.05	ND		
7/4/2025	Ski Beach	13:22	17.2	18.2		54.1	86.7	8.18	0.04	ND		
7/7/2025	Burnt Cedar Intake	09:27	16.5			73.5	112.9	8.31	0.05	ND		
7/7/2025	Ski Beach	10:06	17.7	19.4		59.7	83.5	7.91	0.04	ND		
7/10/2025	Burnt Cedar 1	10:40	21.1	19.4	0.426	54.6	88.5	8.31			100	0
7/10/2025	Burnt Cedar Jetty	10:57	21.4	19.4	0.425	57.6	89.4	8.38			334	0
7/10/2025	Incline Beach	11:20	21.6	19.5	0.674	50.7	90.1	8.25			24	0
7/10/2025	Third Creek	11:30	22.2	11.8	1.31	46.0	70.0	7.91			334	46
7/10/2025	Ski Beach	11:36	23.7	19.6	0.427	50.7	89.5	8.25			70	2
7/10/2025	Incline Creek	11:45	20.4	12.2	2.53	50.0	75.4	8.05			598	44
7/11/2025	Burnt Cedar Intake	10:42	19.4			55.7	86.9	8.19	0.04	ND		
7/11/2025	Ski Beach	10:16	19.6	19.6		57.8	90.2	8.10	0.04	ND		

Results Discussion:

The main goal of this sampling was to monitor specifically for perchlorate and any increase following the planned 4th of July fireworks display. Perchlorate was chosen as the chemical to monitor due to several properties including high water solubility, rapid settling when released in the atmosphere, and relative stability and mobility in surface waters. Perchlorate is currently a non-regulated contaminant, but the EPA has committed to issue a proposed National Primary Drinking Water Regulation for perchlorate by November 21, 2025, and final regulation by May 21, 2027. Previous proposals have listed possible maximum contaminant levels ranging from 18.0µg/L to 90µg/L. The detection threshold used by the third-party laboratory was 36 times lower than the lowest proposed MCL. Perchlorate was used in this non-regulatory sampling as an indicator for overall firework contamination.

Perchlorate samples were all received as non-detect, meaning that concentrations were below the detection threshold of 0.5µg/L.

There is an increased TDS/EC/salinity reading on 7/4 at the Burnt Cedar Jetty. While it is unknown what caused this high reading, the wind/wave event actively occurring may be a factor. When wave action occurs, solids that have fallen out of suspension and settled on the lakebed are redissolved, this same action also stirs up suspended sediments increasing turbidity. The wave action was also causing a backwashing effect from the normally dry jetty that has human activity and a manicured lawn. It is possible that backwashing of this normally dry land increased the dissolved solids in the sample that was pulled in a direct zone of influence from this land.

The increased bacterial counts at Burnt Cedar sites may have been caused by the abnormally high human influence during the July 4th weekend, caused by the closure of the other beaches. At the same time, Incline Beach and Ski Beach sites saw a decrease in bacterial counts which may have been caused by the reduction in human activity during that time frame.

Conclusion:

Overall, there is no pattern in the data indicating that the 4th of July fireworks incident had an impact on the surface water quality at the sampling sites. That is not a claim that there was “no impact” but a set of observed conditions that did not have any notable large deviations. Wave action was moving water from southwest to northeast. If any observable water quality impact was caused by the ongoing incident, it would have most likely been observed at Ski Beach which was the shore area where most debris from the barge was washing up. Since no TDS/EC/salinity increase was observed at Ski Beach, which was under far greater influence than Burnt Cedar, a conclusion can be drawn that the observed increase in TDS/EC/Salinity observed at Burnt Cedar was unrelated to the incident.

This planned non-regulatory monitoring was beneficial to IVGID as it allowed rapid mobilization during the incident to gather samples to ensure the safety and integrity of the public drinking water system. The response efforts from multiple agencies reduced the potential impact of this incident with the removal of the vast majority of the explosives from the barge prior to complete capsizing. This reduced the potential chemical load that could have entered the water which could have degraded water quality and threatened the integrity of the water at the Burnt Cedar intake. Follow-up efforts to remove the remaining fireworks have reduced any further risks.