



2009 Big Lake Water Quality Monitoring

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Agenda

- Why study petroleum hydrocarbons
- How was the study conducted
- What were the results
 - Standard sampling day
 - Intensive sampling day
- How did the number of watercrafts affect results
- What's next

Why Are We Here?



- Petroleum pollution in Big Lake found in 2004 & 2005 sampling
- Additional sampling in 2009
 - has anything changed &
 - how motorized watercraft use affects concentrations.

Petroleum Hydrocarbons

- Total aromatic hydrocarbons (TAH)
 - includes the compounds benzene, toluene, ethylbenzene and xylene (BTEX)
 - constituents of gasoline

Benzene is highly toxic & known to cause cancer.

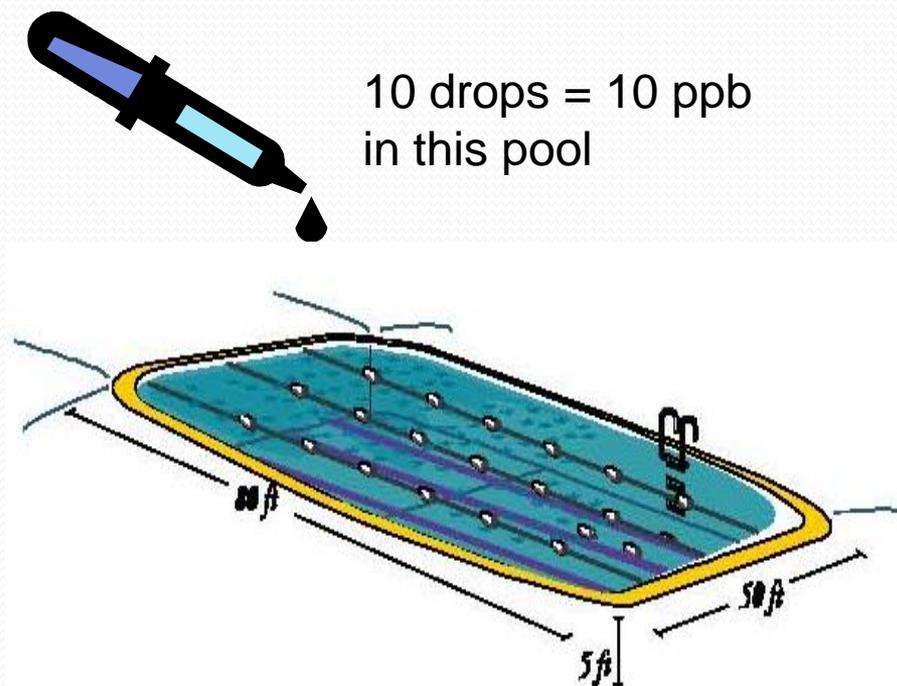
Alaska water quality standards are designed to be protective of human health and the environment.

Water Quality Standard 18 AAC 70

<p>(5) PETROLEUM HYDROCARBONS, OILS AND GREASE, FOR FRESH WATER USES</p>	
<p>(A) Water Supply (i) drinking, culinary, and food processing</p>	<p>May not cause a visible sheen upon the surface of the water. May not exceed concentrations that individually or in combination impart odor or taste as determined by organoleptic tests.</p>
<p>(A) Water Supply (ii) agriculture, including irrigation and stock watering</p>	<p>May not cause a visible sheen upon the surface of the water.</p>
<p>(A) Water Supply (iii) aquaculture</p>	<p>Total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 µg/l (see note 7). Total aromatic hydrocarbons (TAH) in the water column may not exceed 10 µg/l (see note 7). There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.</p>
<p>(A) Water Supply (iv) industrial</p>	<p>May not make the water unfit or unsafe for the use.</p>
<p>(B) Water Recreation (i) contact recreation</p>	<p>May not cause a film, sheen, or discoloration on the surface or floor of the waterbody or adjoining shorelines. Surface waters must be virtually free from floating oils.</p>
<p>(B) Water Recreation (ii) secondary recreation</p>	<p>Same as (5)(B)(i).</p>

How Much?

- Olympic-size swimming pool holds about 500,000 liters (130,000 gallons).
- One ppb of 500,000 liters is about $\frac{1}{2}$ ml (one drop of water), so ten drops of BTEX in the pool would be close to the 10 ppb contaminant limit.





What Did We Do?

- Water samples from 12 locations on 13 different days for analysis of TAH
- Measured the lake's physical parameters (pH, temperature, dissolved oxygen, depth)
- Counted motorized watercraft on the lake



Why We Needed This Data?



14 ducklings!

- Calculate how much TAH
- How the amount and type of motorized watercraft may affect TAH concentrations.

Project Schedule

Sample Date	Day of Week	Type	Reason
May 13, 2009	Wednesday	Standard	Low watercraft activity– Establish baseline lake conditions for the summer and determine hydrocarbon accumulation from winter activities
May 23, 2009	Saturday	Intensive	High watercraft activity– Memorial Day weekend
May 24, 2009	Sunday	Intensive	High watercraft activity– Memorial Day weekend
May 25, 2009	Monday	Intensive	High watercraft activity– Memorial Day
May 26, 2009	Tuesday	Intensive	Low watercraft activity– Monitor lake conditions following holiday
June 17, 2009	Wednesday	Standard	Low watercraft activity– Mid-week sample date
June 27, 2009	Saturday	Standard	Moderate to high watercraft activity– Weekend day
July 4, 2009	Saturday	Intensive	High watercraft activity– Independence Day
July 5, 2009	Sunday	Intensive	High watercraft activity– Independence Day weekend
July 6, 2009	Monday	Intensive	High watercraft activity– Independence Day weekend
July 25, 2009	Saturday	Standard	Moderate to high watercraft activity– Weekend day
August 15, 2009	Saturday	Standard	Moderate to high watercraft activity– Weekend day
September 7, 2009	Monday	Standard	High watercraft activity– Labor Day

Type of Sample Days

Standard

- Sampled all 12 sites one time per day.
- Results provided a “snapshot” of TAH
- May 13, June 17, June 27, July 25, August 15, September 7

Intensive

- Sampled all 12 sites one time per day, **plus**
- Sampling at BL-10, BL-26, and BL-27 every 3 hours (9:00am to 9:00pm)
- On holiday weekends

Sampling Information

- Samples collected using a specialized hydrocarbon sampler following stringent Quality Assurance & Quality Control procedures.
- Samples collected at a depth of 0.15 meters at all sites and also at 0.5 meters at three sites (BL-4, BL-8, BL-10).

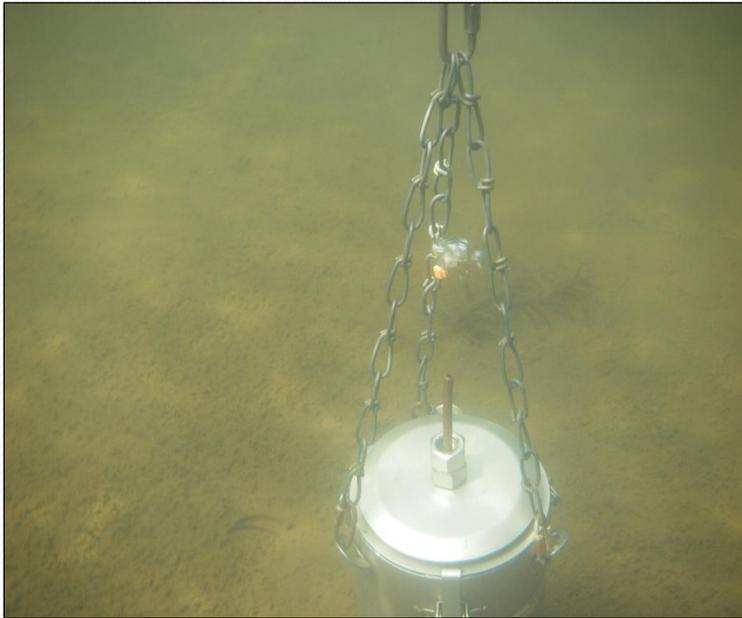


0.15 meter

6 inches

0.5 meter

1.6 feet



Watercraft Observations



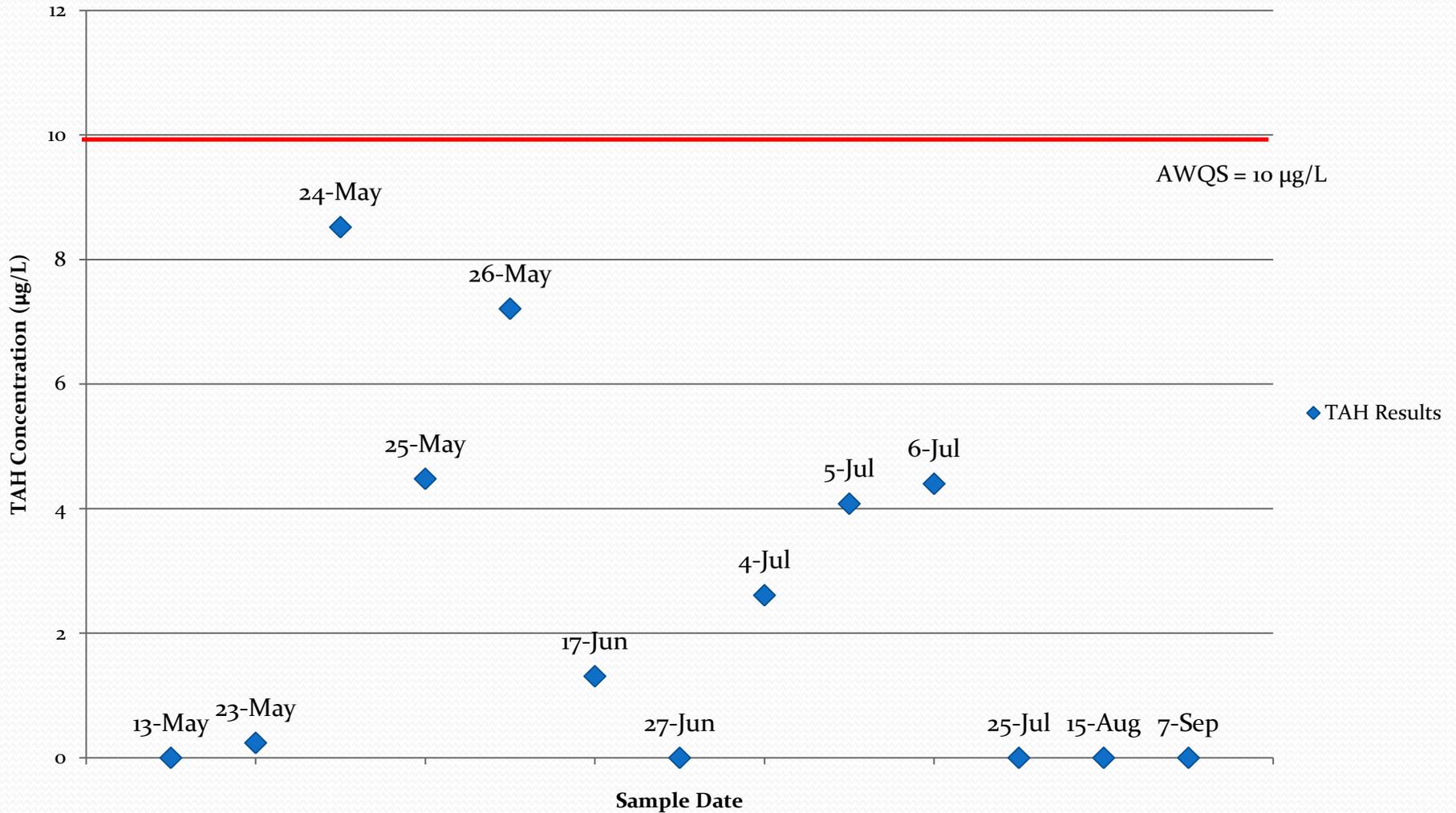
- Intensive weekends: May 24, 25 and July 5, 6.
- “Observer” stationed at South Shore Recreation Site to count watercraft .
- “Interviewer” stationed at North Shore Recreation Site to count watercraft and conduct voluntary surveys.



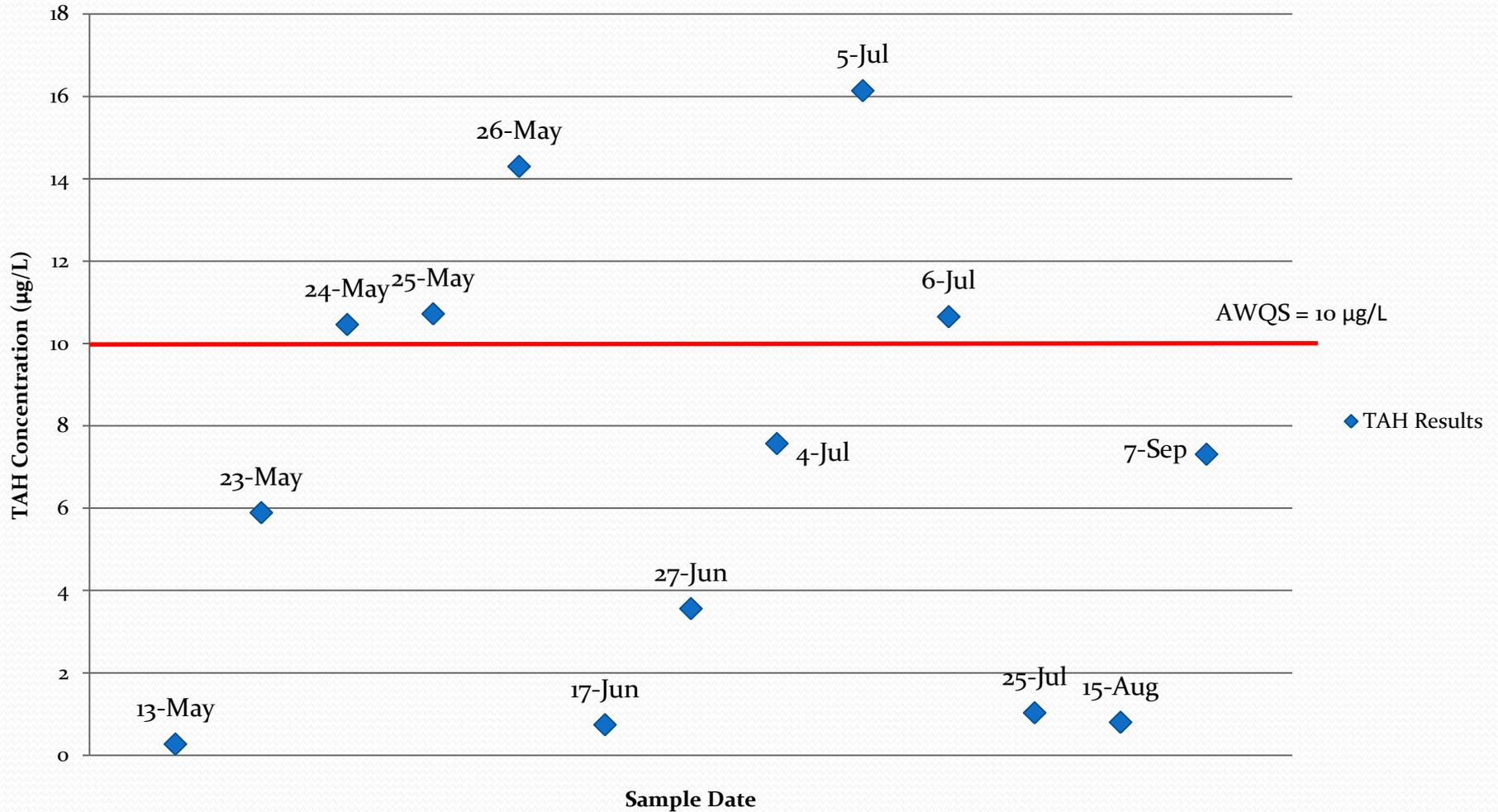
Questions About What We Did and Why We Did It?

Next section: Results for
standard sample days

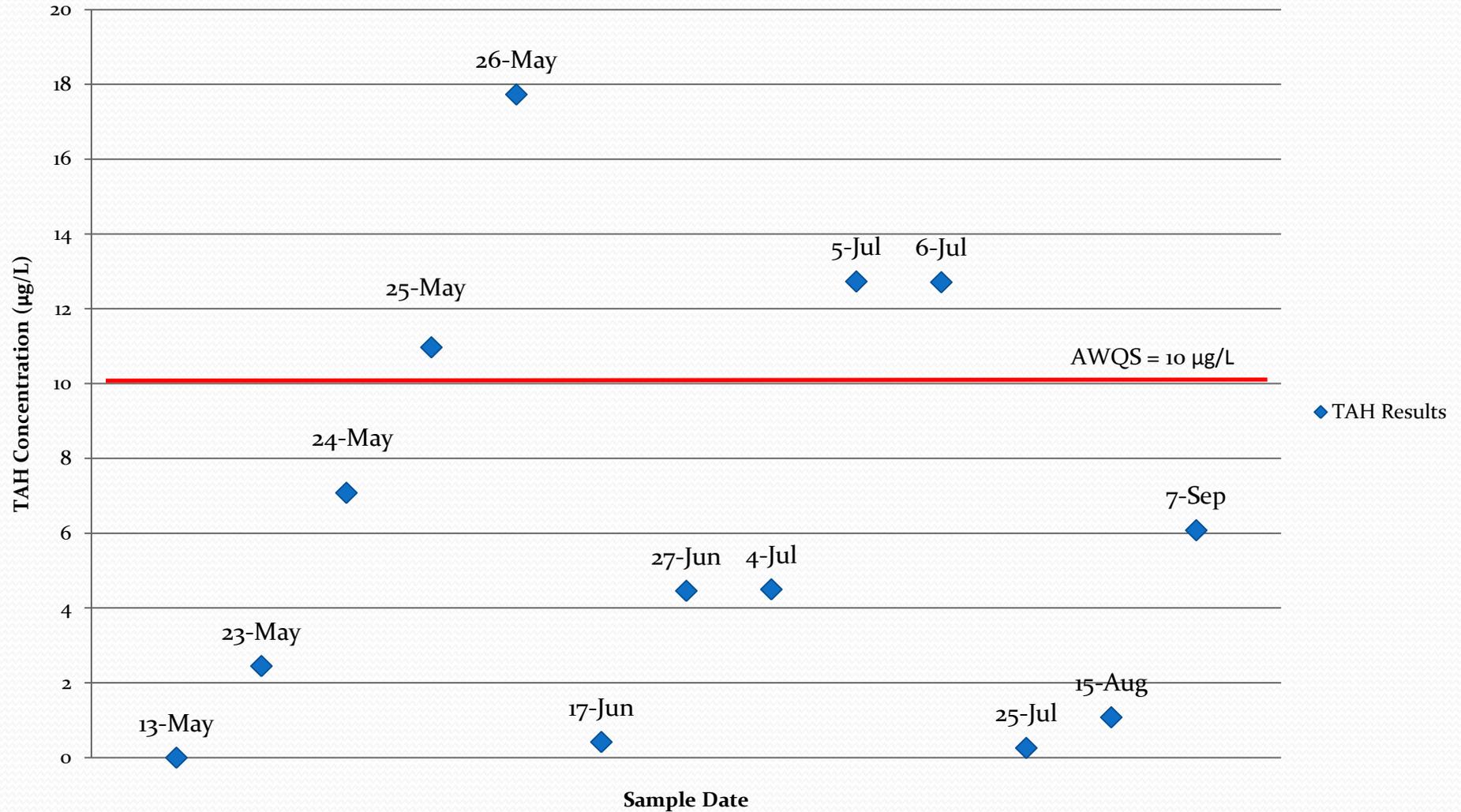
Sample Results at BL-1



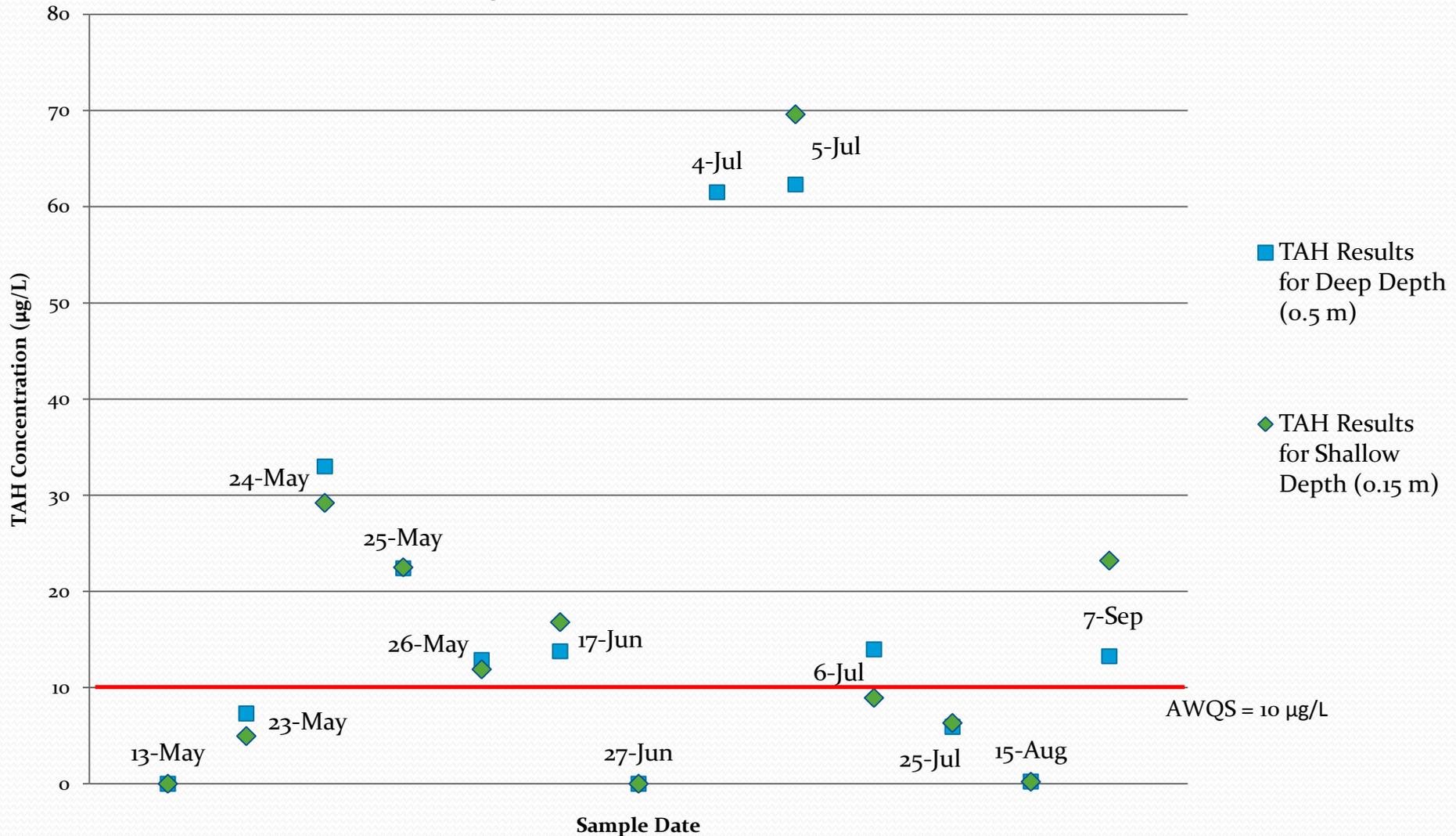
Sample Results at BL-2



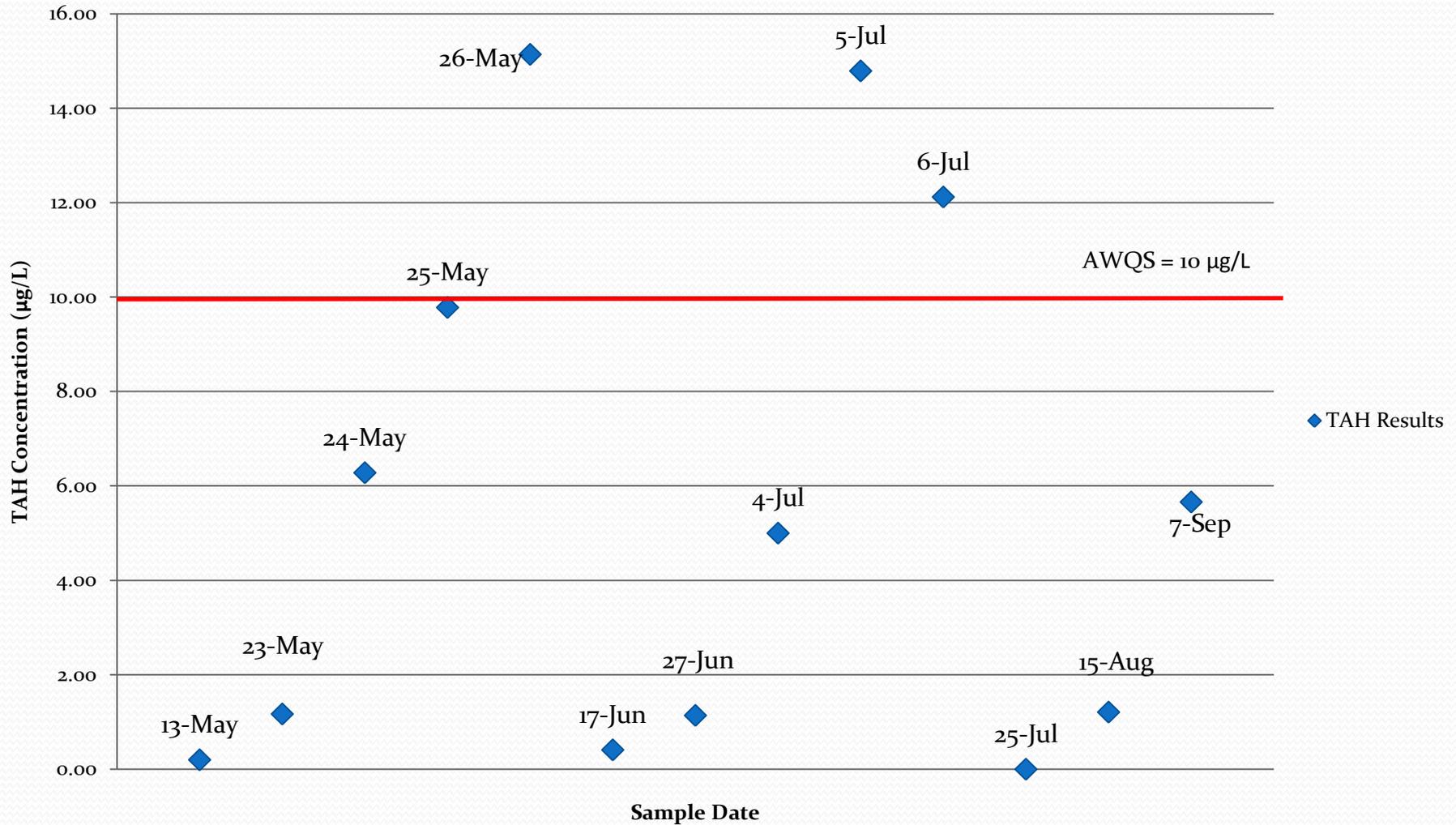
Sample Results at BL-3



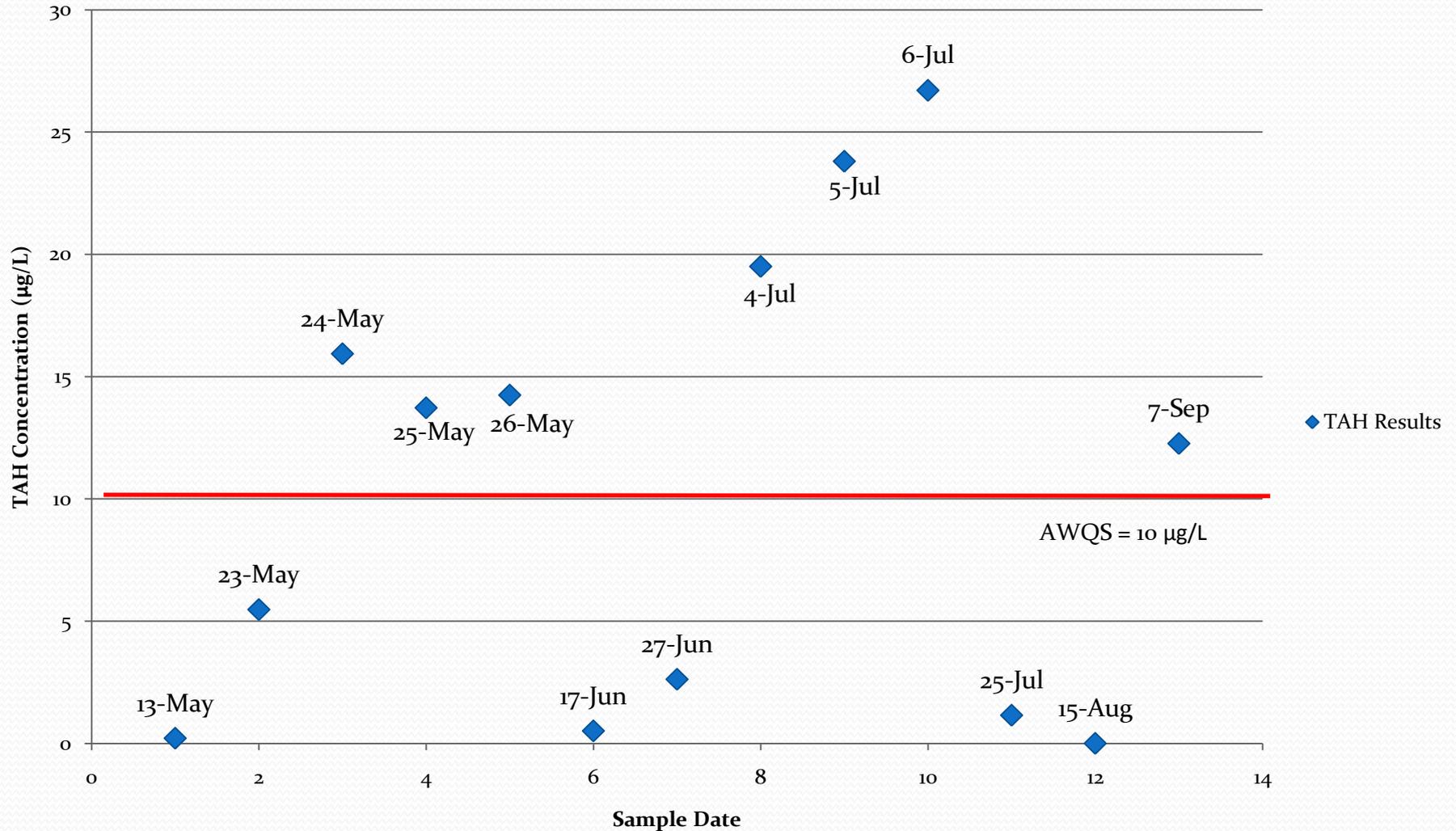
Sample Results at BL-4



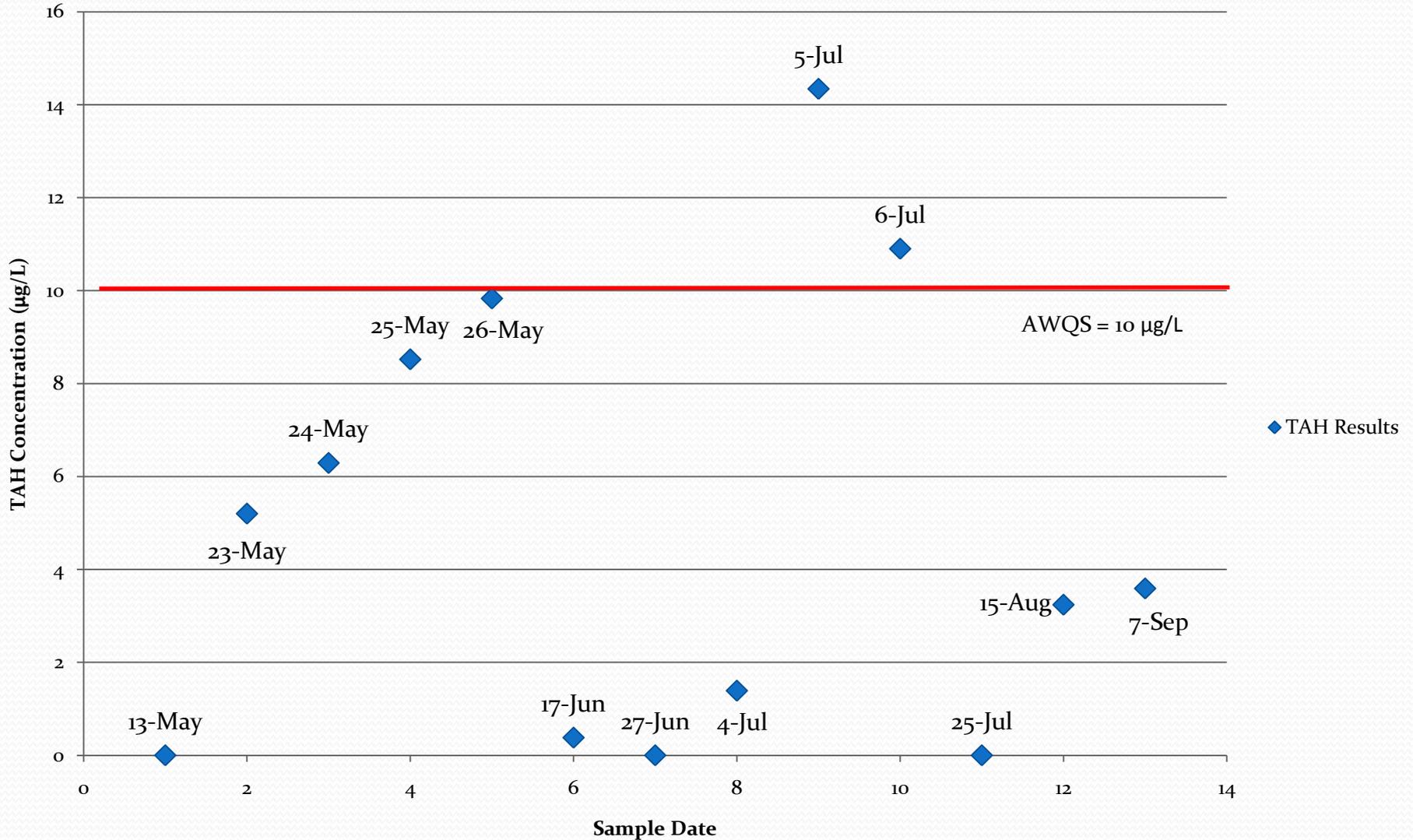
Sample Results at BL-5



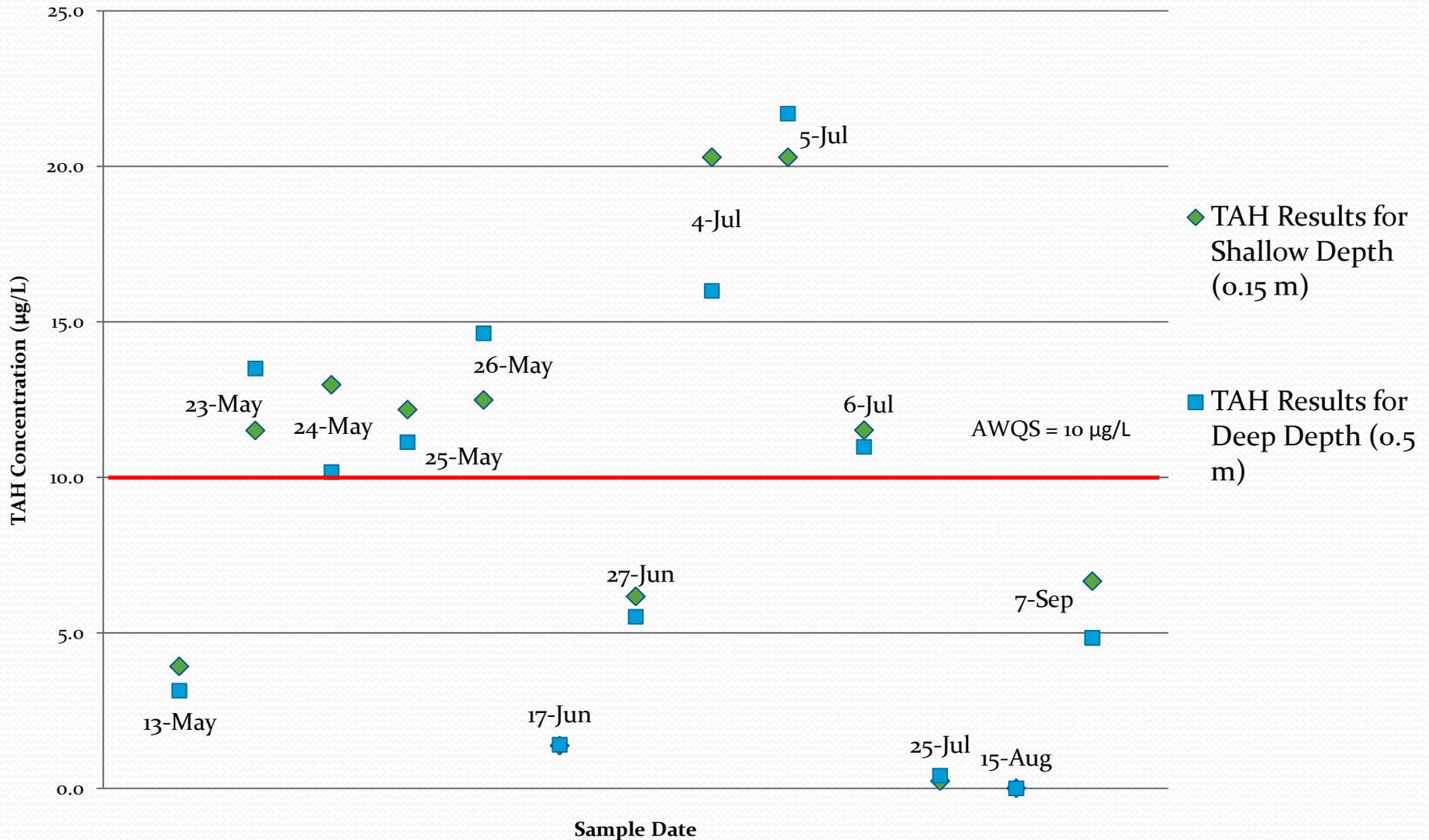
Sample Results at BL-6



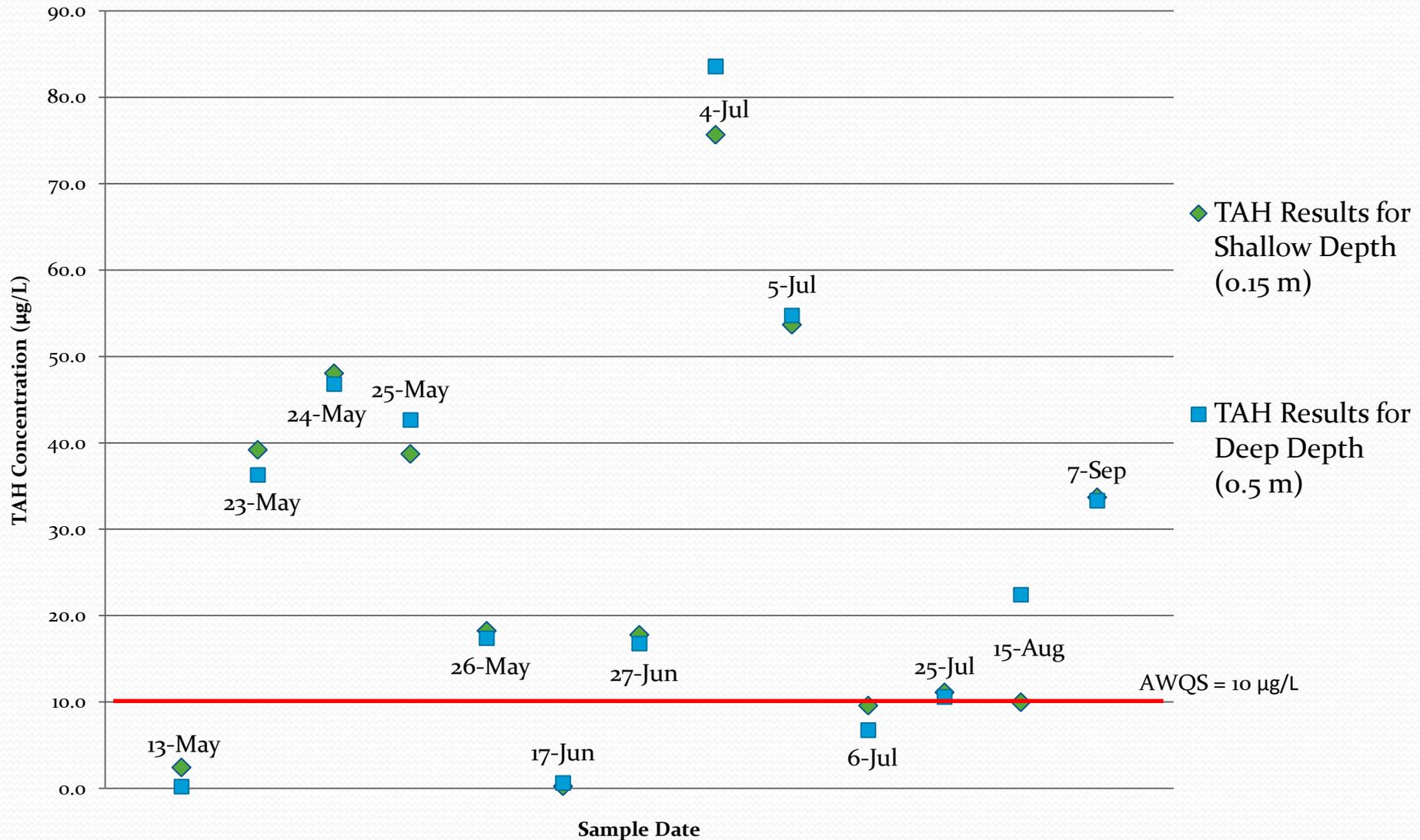
Sample Results at BL-7



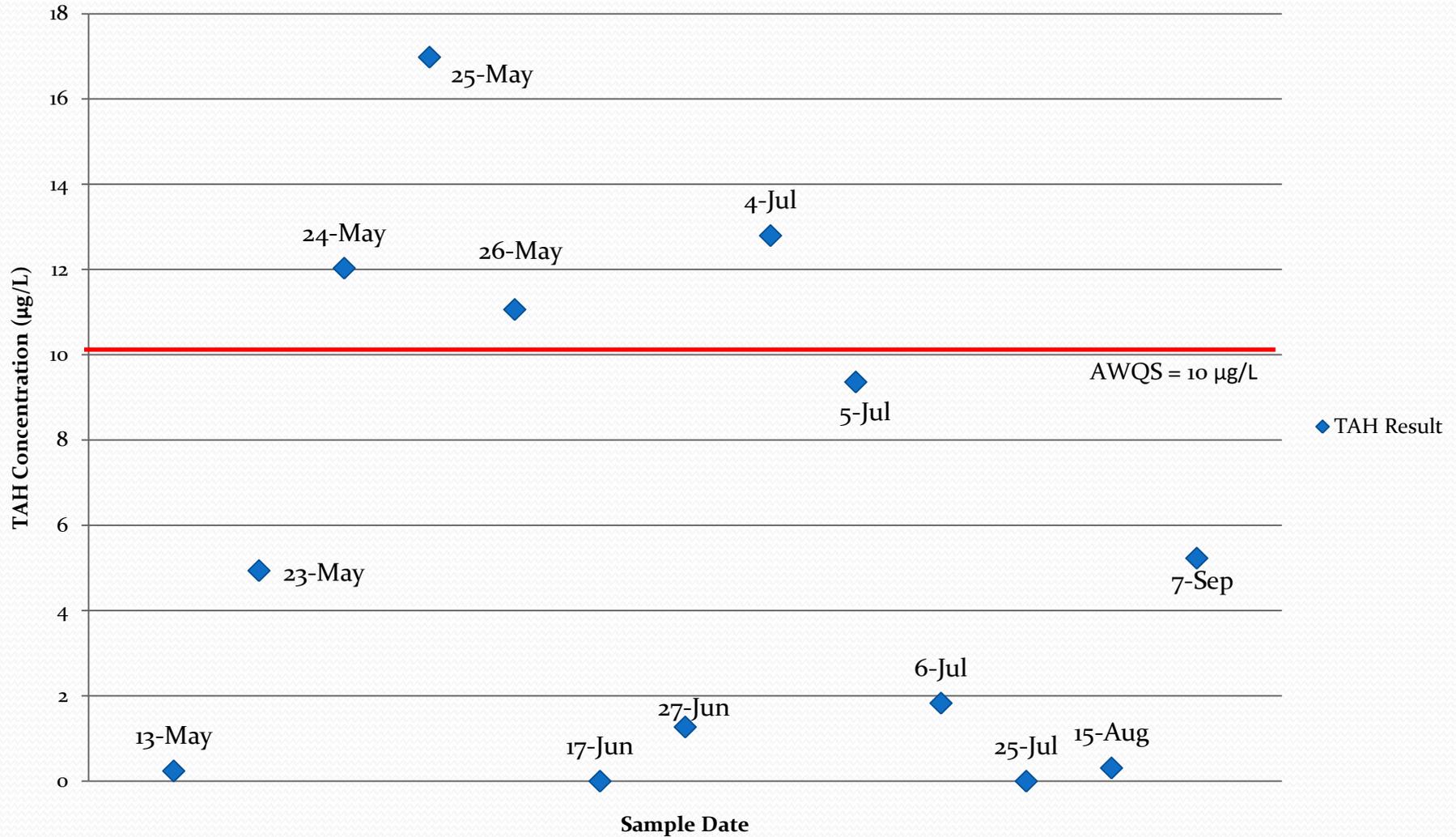
Sample Results at BL-8



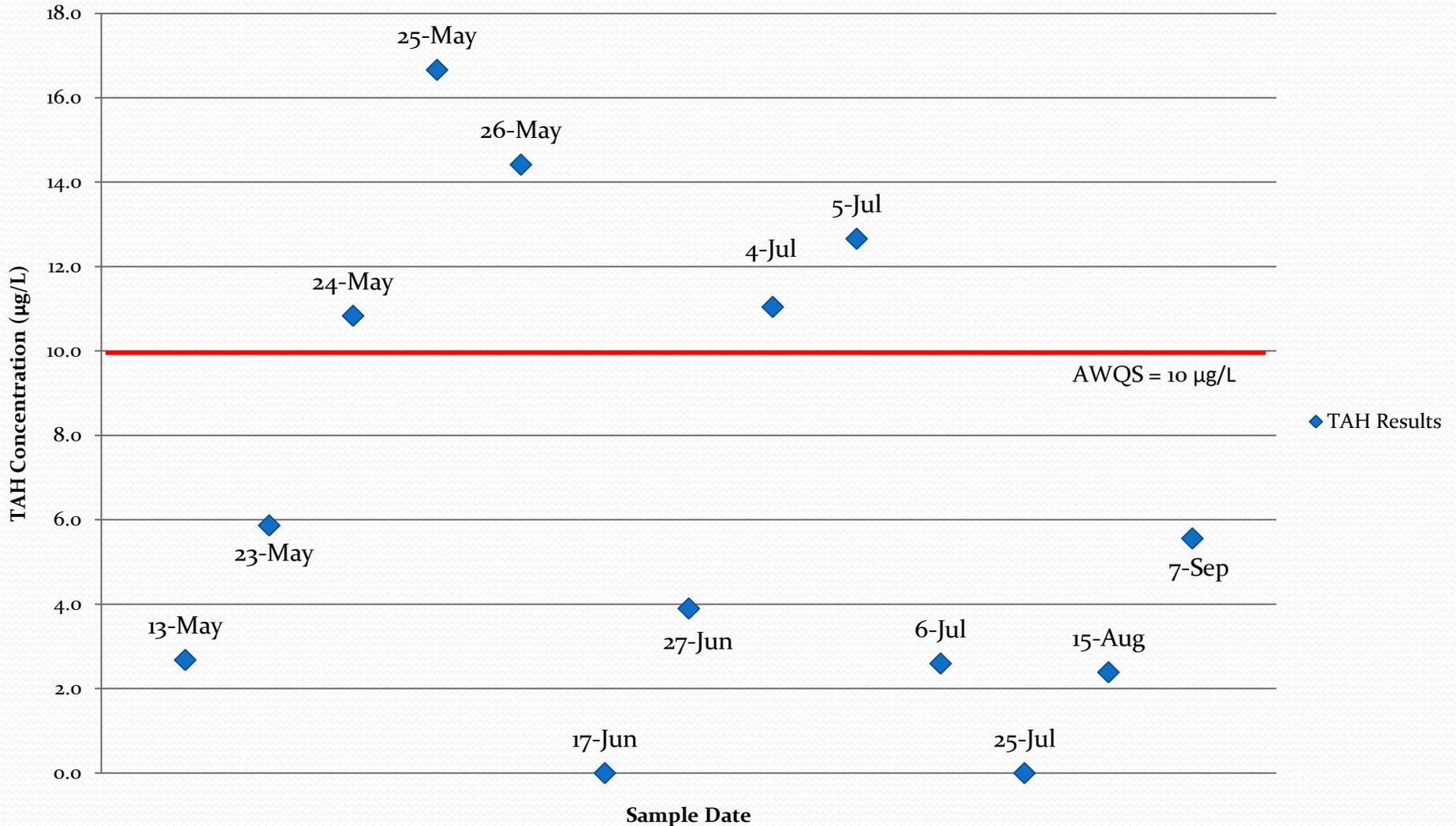
Sample Results at BL-10



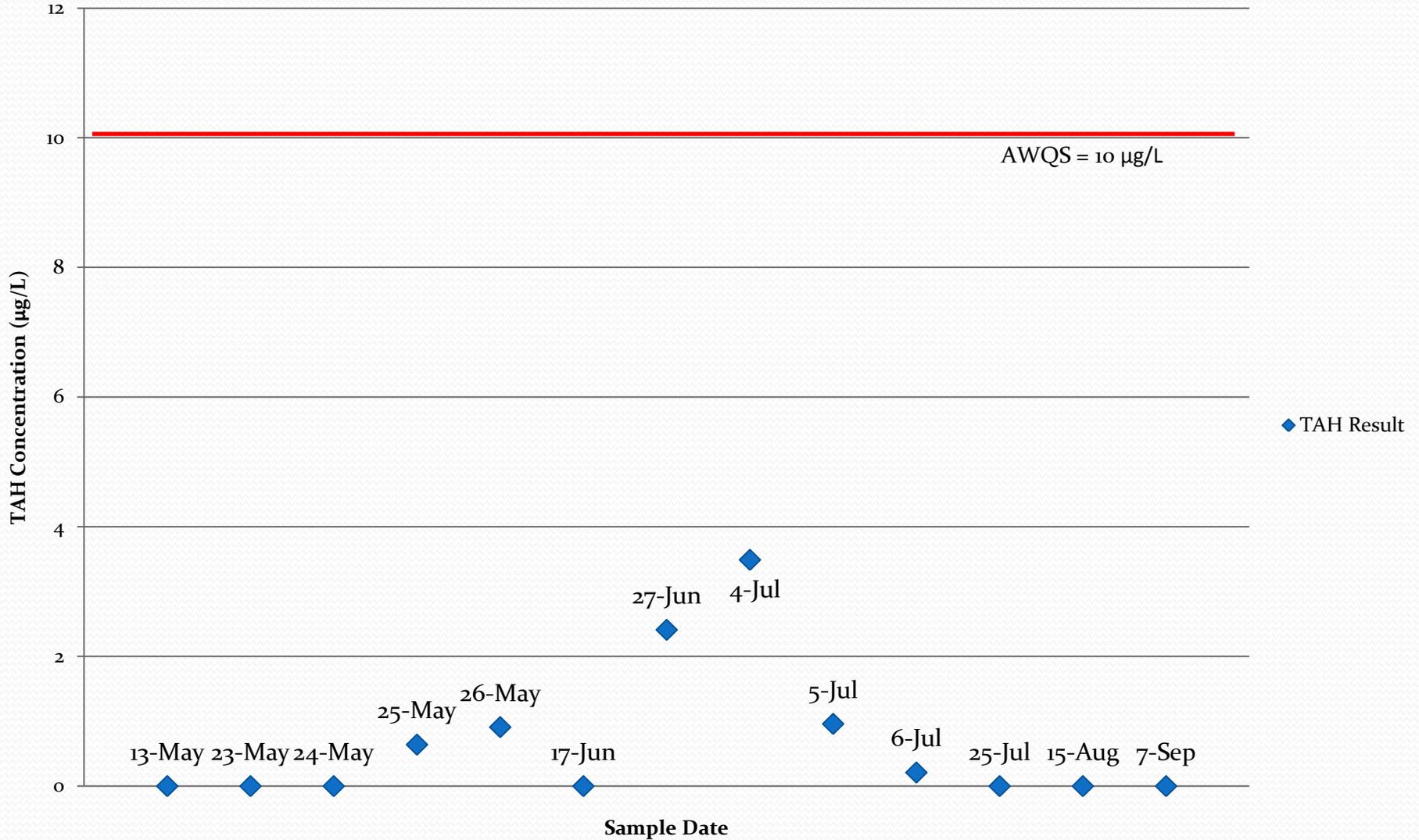
Sample Results for BL-26



Sample Results for BL-27



Sample Results at BL-11



Key Points

- Highest TAH concentrations occur on holiday weekends.
- Majority of elevated TAH concentrations occur near launch areas.

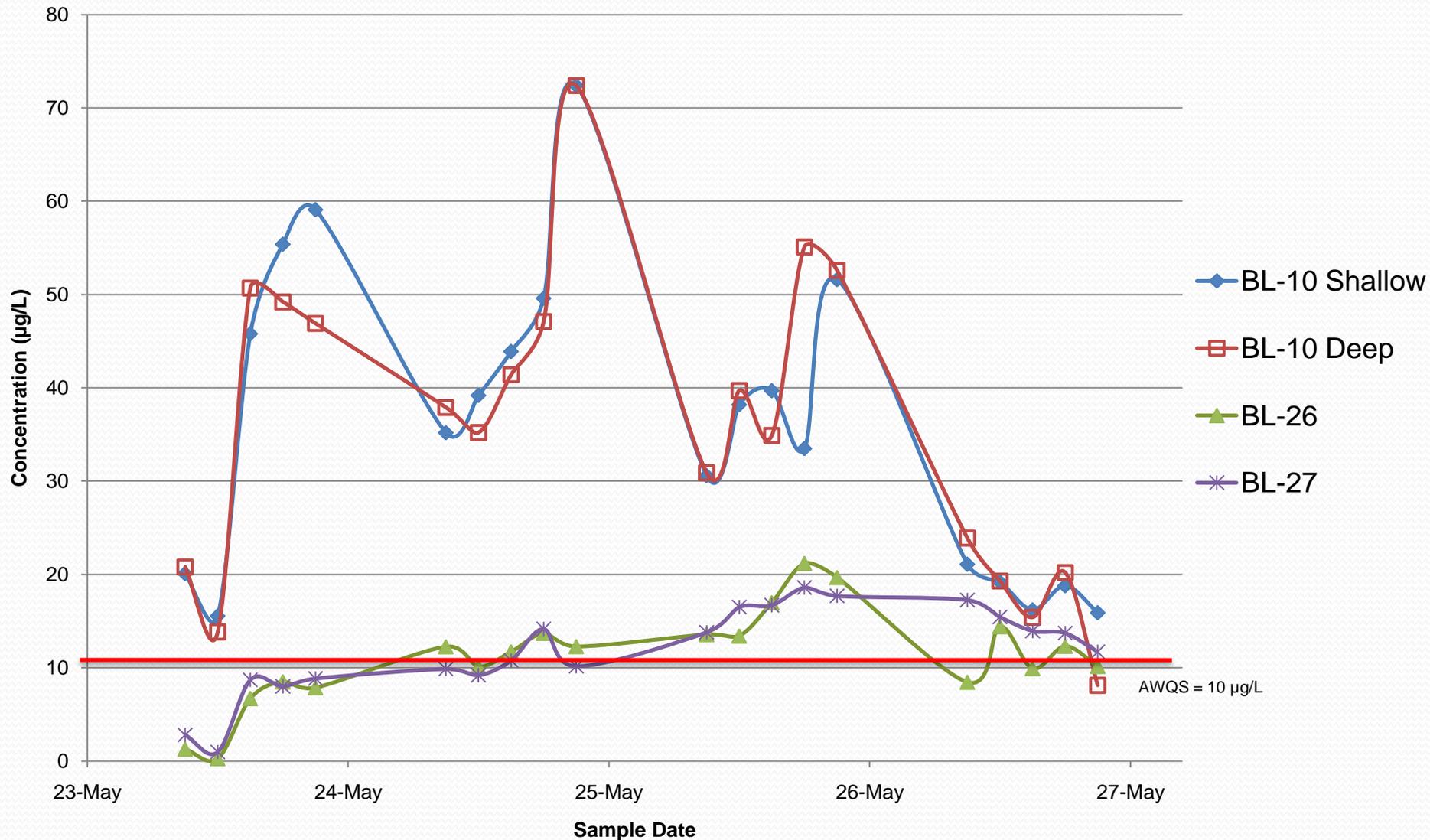




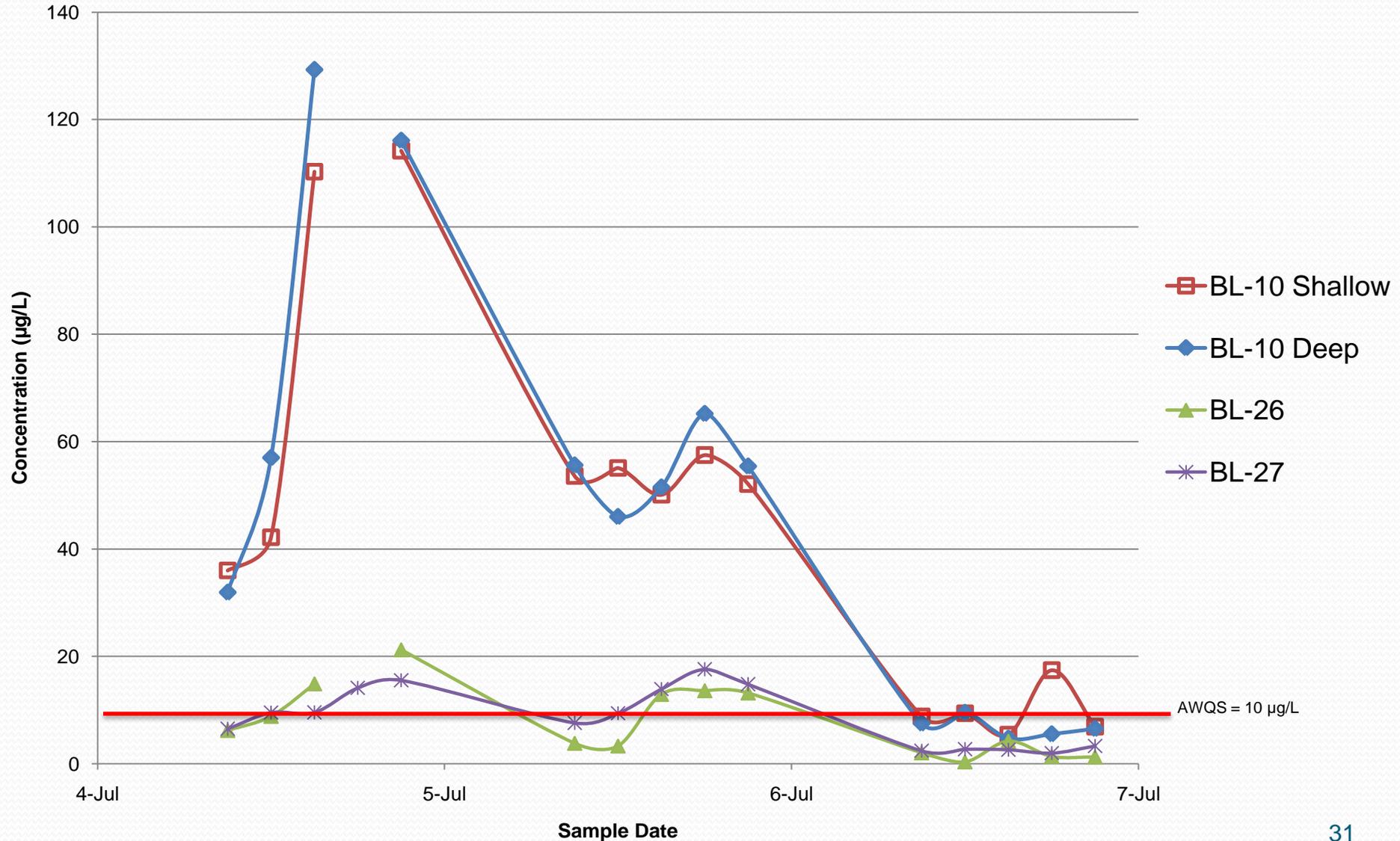
Any Questions At This Point?

Intensive Sampling Results up Next

Intensive Sample Results for Memorial Day Weekend



Intensive Sample Results for Independence Day Weekend



Observed Trends at Intensive Sample Sites

- BL-10: Rapid increases in concentration as day progressed; steep decrease in concentration overnight
- BL-26 and BL-27: Less pronounced increases and decreases.
 - Likely reasons include distance from launch, depth of water, and water temperature.

Any Questions About Intensive Data?

Up Next: watercraft observations, calculating gallons of TAH & what happens next

Watercraft Observations

South Shore Recreation Area Observations

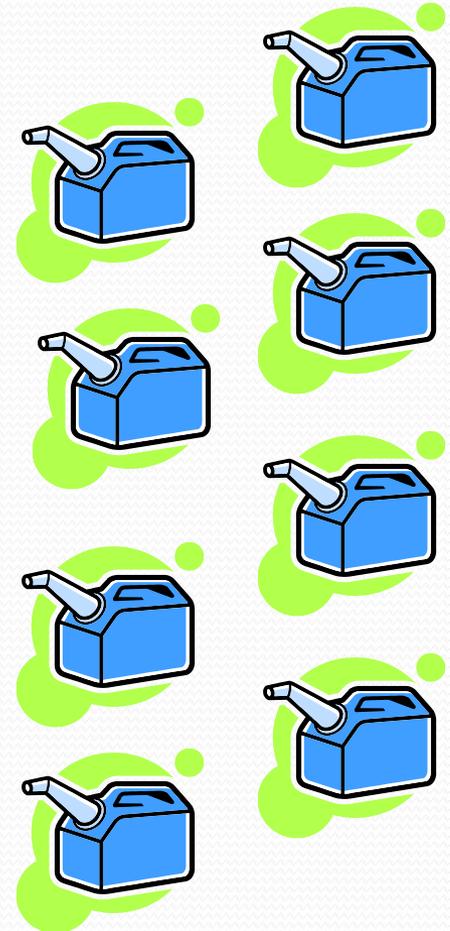
Sample Date	Total # of Observed Motorized Hours
24 May	363
25 May	255
5 July	273
6 July	210

North Shore Recreation Area Interviews

- 71 launchings witnessed at North Shore Recreation Site on May 24-25 and July 5-6.
- Complete engine data gathered for 34 of the 71 launchings.
- 30 4-stroke engines, average of 170 hp.
- 4 2-stroke engines, average of 90 hp.

Estimated Gallons of TAH into Big Lake

- MAY 24 = 14.9 GALLONS OF TAH
(40 gallons of gasoline)
- MAY 25 = 10.5 GALLONS OF TAH
(28 gallons of gasoline)
- JULY 5 = 11.2 GALLONS OF TAH
(30 gallons of gasoline)
- JULY 6 = 8.62 GALLONS OF TAH
(23 gallons of gasoline)



How Much of Big Lake is Polluted?

Sample Date	Surface Area of Impaired Waters (Acres)	Volume of Impaired Waters
May 13	0	0%
May 23	30	0.33%
May 24	430	3.8%
May 25	1,100	9.7%
May 26	1,300	8.6%
June 17	15	0.13%
June 27	15	0.20%
July 4	290	3.2%
July 5	1,300	14%
July 6	1,000	9.0%
July 25	15	0.20%
August 15	15	2.3%

We've learned....

- When - holiday weekends have highest petroleum pollution
- Where - boat launches, marinas, areas with less circulation but lots of use
- Approximately 10 gallons of TAH (equal to about 30 gallons of gasoline) directly enter Big Lake per day on holiday weekends.
- But the big question is How to fix it....



Some Ideas We've Heard

- **Clean boating campaign:** no idle zone at launches, clean fueling practices, bilge water management, use of oil absorbent pads.
- Specific policies for **holiday weekends**.
- Policy for **2-stroke engines**.
 - FYI: 10-15% of watercraft on Big Lake are 2-strokes, but they produce 50% of hydrocarbon pollution
- Encourage more **non-motorized** activities on holiday weekends at the public recreation areas.
- Other ideas? Sign-up to participate in the **Actions Committee**.

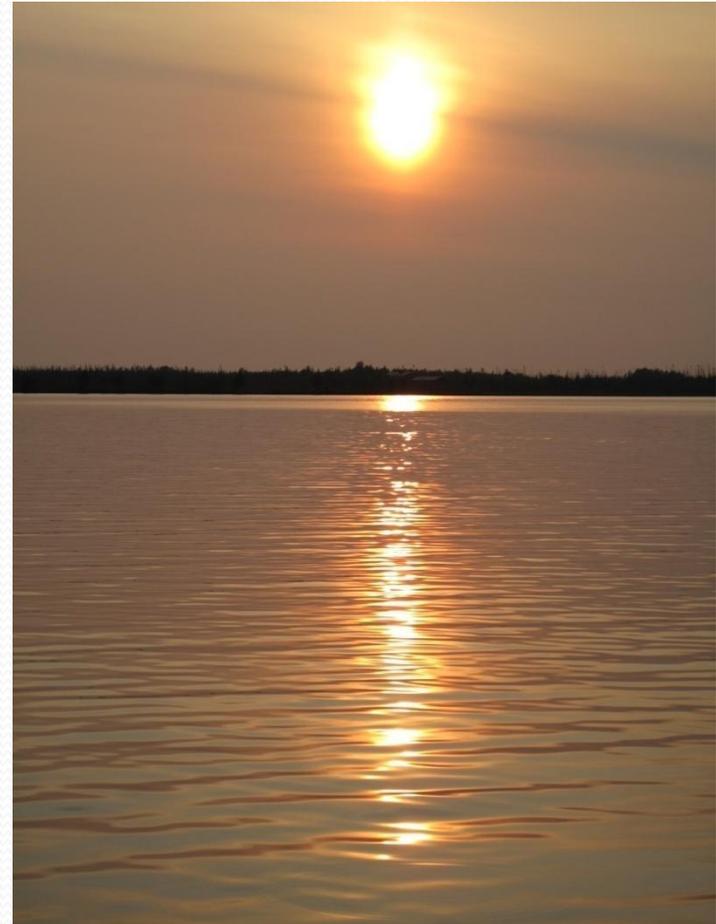
Is it safe to swim in Big Lake?

- For people Yes.
- For some of these little critters, maybe not on some days....



What happens if we do nothing?

- Lake continues to be polluted.
- Risk of toxic impacts to aquatic life continues.
 - effects to fishery & recreational opportunities
- Might lose the opportunity to have a local solution
 - more government involvement...



QUESTIONS?



Thank you for
your time
& attention!