TO: Whom It May Concern

FROM: Diane Desotelle, St. Louis River Area of Concern Coordinator
Susan Johnson, Superfund Project Leader

RE: MPCA Disclaimer for this Report – Sediment Investigation Report, St. Louis River, Duluth Harbor by Somat Engineering, August 2012

DATE: April 12, 2013

The study for this report was funded by Minnesota's Clean Water Legacy Act and the US Army Corps of Engineers as part of the sediment investigation work in the St. Louis River Harbor.

The values and analysis presented in the report is considered preliminary as the MPCA is aware of some data discrepancies. Since the date of this report, the calculated values and analysis have been modified as part of the MPCA data interpretation effort. In particular, calculated values and summations have been modified to reflect appropriate treatment of non-detect values. The outcome of this report in addition to MPCA's modifications will be included as part of the sediment database for the St. Louis River Area of Concern. Any mention of trade names or commercial products does not constitute endorsement or recommendation for use by the MPCA.

# SEDIMENT INVESTIGATION REPORT

## ST. LOUIS RIVER, DULUTH HARBOR

## DULUTH, ST. LOUIS COUNTY, MINNESOTA

**Contract No:**
**W911XK-08-C-0029**
**W911XK-09-C-0043**
**W911XK-10-C-0025**

**Prepared for:**

US Army Corps of Engineers

**Detroit District**
**Detroit, Michigan**

Minnesota Pollution Control Agency

**Duluth, Minnesota**

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**August 2012**

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## LIST OF ACRONYMS

| | |
|---|---|
| % | Percent |
| C | Celsius, degrees |
| COPC | Contaminants of Potentially Concern |
| COE | U.S. Army Corps of Engineers – Detroit District |
| DRO | Diesel Range Organics |
| EDD | Electronic Data Deliverable |
| ESB | Equilibrium Partitioning Sediment Benchmark |
| ESBTU | Equilibrium Partitioning Sediment Benchmark Toxic Unit |
| GPS | Global Positioning System |
| LCS | Laboratory Control sample |
| LIF | Laser Induced Fluorescence |
| LWD | Low Water Datum |
| MS/MSD | Matrix spikes/matrix spike duplicates |
| MPCA | Minnesota Pollution Control Agency |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| PEC | Probable Effect Concentration |
| PEC-Q | Probable Effect Concentration Quotients |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RPD | Relative Percent Difference |
| RTI | RTI Laboratories |
| SAP | Sampling Analysis Plan |
| SOMAT | Somat Engineering, Inc. |
| SOW | Statement (or Scope) of Work |
| SQT | Sediment Quality Target |
| SSHSP | Site Specific Health and Safety Plan |

## LIST OF ACRONYMS (continued)

| | |
|---|---|
| SVOC | Semivolatile Organic Compound |
| TA | TestAmerica |
| TAL | Target Analyte List |
| TCDD | 2,3,7,8-Tetrachlorodibenzo-p-dioxin |
| TEF | Toxicity Equivalency Factor |
| TEQ | Toxicity Equivalent |
| TOC | Total Organic Carbon |
| TRACE | Trace Analytical Laboratories |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| UV | Ultra Violet |
| UVOST | Ultra Violet Optical Screening Tool |
| WHO | World Health Organization |
| WDTS | Water Depth at Time of Sampling |
| WLTS | Water Level at Time of Sampling |
| WWTP | Waste Water Treatment Plant |

**SEDIMENT INVESTIGATION REPORT**
**ST. LOUIS RIVER, DULUTH HARBOR**
**DULUTH, ST. LOUIS COUNTY, MINNESOTA**

## 1.0 INTRODUCTION

Somat Engineering, Inc. (SOMAT) under contract with the United States Army Corps of Engineers (USACE) – Detroit District (COE) has completed the Sediment Investigation of the St. Louis River and Duluth Harbor (Site) located in Duluth, St. Louis County, Minnesota. This investigation was part of the ongoing work of Regulatory Agencies and Local Communities to assess and restore the environmental conditions of the St. Louis River and Duluth Harbor. It was performed on behalf of the Minnesota Pollution Control Agency (MPCA) to conduct initial sediment assessment for the purpose of characterizing sediment material and to aid in assessing sediment quality in the area to resolve several issues with bottom sediment contamination. The MPCA shall determine if any regulatory measures are needed for further assessment or clean up as part of the investigation. The project area location is presented on Figure 1.1. The project study areas are presented on Figure 1.2.

The sediment investigation work was performed under three (3) separate COE contracts; W911XK-08-0029, W911XK-09-C-0043, and W911XK-10-C-0025. The Scope of Work (SOW) performed was consistent with that described within those contracts and as presented here.

The field data and laboratory chemical and physical analysis data were previously submitted to the COE and MPCA in February 2009, August 2010, and March 2011, respective to the contracts. This report is a culmination of the work performed under the three contracts and includes a detailed assessment of sediment quality parameters, which was previously submitted to the COE and MPCA in November 2011.

*Project Team*

The SOMAT project team that performed the detailed sediment investigation was as follows:

| Team Member | Team Role |
|---|---|
| SOMAT of Detroit, MI | A-E Project Mgr, Field Team Coordination Data Review, Sediment Quality Assessment, Report preparation |
| West Central Environmental Consultants (WCEC) of Duluth, MN | Field LIF and Geoprobe Operations |

| | |
|---|---|
| Great Lakes Environmental Center (GLEC) of Traverse City, MI | Vibracore Operations |
| Sea Service, LLC of Superior, WI | Barge Operations |
| Trace Laboratories, Inc. of Muskegon, MI | Laboratory Services |
| Test America of West Sacramento, CA and Chicago, IL | Laboratory Services |
| RTI Laboratories, Inc. of Livonia, MI | Laboratory Services |

The SOMAT project team implemented the sediment investigation in accordance with the project-specific Quality Assurance Project Plan (QAPP) (Appendix G) and Health and Safety Plan (HASP) (Appendix H) as prepared by SOMAT and accepted by MPCA and COE.

## 1.1 INVESTIGATION AREAS

The sediment investigation was performed around eight separate areas within the mouth of the St. Louis River in and around Duluth Harbor. The harbor is separated from Lake Superior to the east by Minnesota Point, a long peninsula that extends south from Duluth, MN to Superior, WI. The location of the areas is presented in Figure 1.2 and includes the following:

*Target Study Areas*

- Rice's Point (RP)
- Hearding Island (HI)
- Coast Guard Area (CG)
- Superior Bay (SB),
- Slip 2 (S2),
- Slip 3 (S3),
- Slip C (SC), and
- Twenty-First Avenue Bay (TF)

The target study areas are further described as follows:

*Rice's Point*

Rice's Point is a large industrialized peninsula situated on the north side of the St. Louis River. The LIF survey and sediment sampling activities were performed at predetermined locations from the municipal boat launch at the south west end of Rice's Point, east along the south face, and north along the east face. Six of the freighter dockage slips along the east face of Rice's Point were included as follows (from south to the north):

Freighter Dockage Slips

Murphy Oil

Azcon,

AGP,

Cargill,

Cargill B, and

General Mills

*Hearding Island*

Hearding Island is located along the east side of the harbor basin in close proximity to Minnesota Point, northeast of the south end of Rice's Point, and north of the Superior Bay study area. The island was created from stockpiling of past sediment dredging activities and is largely uninhabited.

*Coast Guard Area*

The US Coast Guard Station and nearby marina areas are located within the northeast portion of the harbor basin along the west side of Minnesota Point and south of the Duluth Aerial Bridge. This area was not part of the 2008/2009 LIF UVOST survey.

*Superior Bay*

The area designated as Superior Bay for this investigation is inclusive of a large portion of the southern part of Duluth Harbor. The area is bounded by Minnesota Point to the east, the Minnesota – Wisconsin state border (as designated by the Superior Front Shipping Channel) to the west, Hearding Island to the north, and the Wisconsin harbor shipping entrance to the to the south.

*Slip 2 and Slip 3*

Slip 2 and Slip 3 are inactive dockage slips that are located along the north end of the Duluth Harbor basin. The two slips are aligned in a north-south direction. Slip 2 is located immediately west of the Bayfront Festival Park. Slip 3 is located further west, being separated from Slip 2 by an idle industrial concrete plant.

*Slip C*

Slip C is also located along the northwest portion of the Duluth Harbor basin. It is the northernmost east-west running slip on the eastern side of Rice's Point, situated north of the General Mills Elevator A Slip and west of Slip 3. Industrial properties, both active and inactive, are situated along both the north and south of Slip C.

*Twenty First Avenue Bay*

The Twenty First Avenue Bay is located west of the Duluth Harbor basin and west of Rice's Point, along the northern shore of the mouth of the St. Louis River. The City of Duluth waste water treatment plant is located on the north shore of the bay.

## 1.2 GOALS AND OBJECTIVES

As part of an overall assessment of sediment quality throughout the St. Louis River AOC, this project evaluated sediment characterization by combining the use of in situ screening for polynuclear aromatic hydrocarbons and collecting sediment samples for comprehensive chemical laboratory analysis from designated areas located in the St. Louis River, Duluth Harbor. The project areas were evaluated based on a random grid pattern in accordance with the sampling locations designated by the COE and MPCA. The resultant chemical data and sediment quality assessment information will then be utilized by MPCA or other regulatory agencies to assess the risk to the public health, safety, welfare, and environment. The need for regulatory measures, further assessment, and/or clean up will be determined by the MPCA or other regulatory agencies.

## 1.3 REPORT ORGANIZATION

The remainder of this document contains a discussion of the methods and results from the sediment investigation including the data validation and sediment quality assessment.

- *Chapter 2* presents a description of the Scope of Work (SOW),
- *Chapter 3* presents and overview of the project and area background including a summary of relevant previous investigations,
- *Chapter 4* provides a description of the sediment investigation methods used to complete the field work tasks within the scope of work (SOW),
- *Chapter 5* provides a description of the fieldwork conducted during the three field events,
- *Chapter 6* presents the analytical parameters tested and analytical methods used for the sediment core samples,
- *Chapter 7* presents a summary of the data validation performed by SOMAT,
- *Chapter 8* presents the methods and results of the sediment quality assessment, and
- *Chapter* 9 presents the cited references for this report.

## 2.0 SCOPE OF WORK

The collective Scope of Work (SOW) for the three COE contracts was designed as part of an assessment of sediment quality in the St. Louis River/Duluth Harbor. The key work elements of the SOW were as follows:

*SOW Work Elements*

- Field Investigation,
- Chemical and Physical Laboratory Analysis,
- Field and Laboratory Data Review,
- Sediment Quality Assessment, and
- Data and Report Presentation.

The SOW work elements are further described under the following titled paragraphs:

*Field Investigation*

The fieldwork for the sediment investigation was performed in two phases. The first phase consisted of screening the target study areas at predetermined locations with a Laser Induced Fluorescence (LIF) Ultra Violet Optical Screening Tool (UVOST). The second phase consisted of sediment coring and sample collection at predetermined LIF UVOST locations. The sediment samples were then analyzed for a comprehensive list of chemical parameters.

As per the SOW and reflective of the three COE contract assignments, the investigation fieldwork was completed during three stages as follows:

*2008 LIF UVOST and Sampling*

- Rice's Point and commercial slips, and Hearding Island areas,

*Fall 2009/Winter 2010 LIF UVOST and Sampling*

- Superior Bay, Slip 2, Slip 3, Slip C, and 21st Avenue Bay areas, and

*Fall 2010 Sampling*

- Rice's Point commercial slips, Coast Guard area, and 21$^{st}$ Avenue Bay.

*Field Investigation - Phase 1*

The first field investigation phase of the project plan during the 2008 and 2009 investigation events deployed the LIF UVOST to reveal qualitative information on the presence of PAHs in real time in the sediment. An overview of the areas investigated is provided in Figure 2.1, LIF UVOST Location Overview. The LIF UVOST instrument was advanced at each sampling point selected and provided by MPCA. Each LIF survey probe was advanced to a depth of at least 3 feet below the last positive instrument reading. A direct push rig on a barge was used to deploy and advance the LIF UVOST. The results of the LIF UVOST information were reviewed by MPCA with the goal of strategically selecting the location of the sediment cores and sampling activities.

The LIF survey locations are listed in Table 1.1 with further detail presented in Appendix A.

*Field Investigation - Phase 2*

The second field investigation phase of the project plan was to **c**ollect sediment samples from approximately 20% of the points previously investigated with the LIF UVOST. The sampling locations were predetermined by the MPCA based on their review of the LIF UVOST results. The project areas were evaluated based on a random grid pattern. The sediment sampling was undertaken following the LIF UVOST in 2008 and 2009 (early March 2010 through the ice), and the fall of 2010 primarily using Vibracore methods. The sediment core collection points, as established by the MPCA, are presented in overview in Figure 2.2. In general, samples were obtained from two (2) sample intervals from each sediment core location and submitted to the analytical laboratories for specific chemical and physical analyses. The sediment sample collection and other field data activities are detailed further in Section 4.3 and Section 5.2.

*Chemical and Physical Laboratory Analysis*

The sediment samples were submitted via overnight currier, under proper chain of custody, the investigation team laboratories to be analyzed for numerous chemical and physical parameters. The analysis strategy, analytical methods, laboratories, and results are further detailed in Section 4.3, Section 5.2, and Section 6.0.

*Field and Laboratory Data Review*

The field and laboratory analytical results were reviewed for completeness and validation for use. LIF UVOST logs were reviewed by MPCA to evaluate each study area and to select the locations for sediment sample collection for chemical analysis. The sediment coring and sampling data and other field measurements were recorded and used to generate sediment core logs. Measured water depths were corrected to the low water datum elevation. Section 7.0 presents the detailed analytical data review and validation.

*Sediment Quality Assessment*

The validated chemical analytical results were used to develop and assess selected sediment quality parameters as selected by COE and MPCA. The sediment quality assessment task was added to the project work tasks as an amendment to the third contract (W911XK-10-C-0025). Section 8.0 presents the detailed description of the sediment quality parameters, the calculation methods, and the assessment results by parameter and by analyte where appropriate.

*Data and Report Presentation*

The field data and laboratory chemical and physical analysis data were previously submitted to the COE and MPCA in February 2009, August 2010, and March 2011, respective to the initial contracts. This report is a culmination of the work performed under the three contracts and includes a detailed assessment of sediment quality parameters, which was also previously submitted to the COE and MPCA in November 2011. The data, data validation and sediment quality assessment were accepted by COE and MPCA in January 2012. The validated data and detailed database set was also submitted to the National Oceanic and Atmospheric Administration (NOAA) in April 2012 and accepted in June 2012 for incorporation into their NOAA Query Manager regional database.

## 3.0 PROJECT AND AREA BACKGROUND

The need for the project is rooted in the background and history of the Duluth Harbor project area as well as that of the overall St. Louis River system and the subsequent environmental regulatory framework. This project and area background is detailed under the following titled paragraphs.

## 3.1 PROJECT BACKGROUND

The St. Louis River is the largest U.S. tributary to Lake Superior and has a special significance in the region. It serves as a geographic boundary for Wisconsin and Minnesota, and provides coastal access to Lake Superior vital to regional shipping. This waterway provides habitat for waterfowl, fish, benthic invertebrates, as well as a venue for regional recreation. Development along the waterway over the past 130 years has contributed to the contamination of this waterway. These contaminated sediments have impaired the waterway and harbor including fish advisories, habitat impairments, and restrictions on dredging. As a result 73 miles of the St. Louis River have been designated an Area of Concern (AOC) in the Great Lakes as part of the U.S.-Canada Water Quality Agreement (Annex 2 of the 1987 Protocol). Known sediment contaminates generally include elevated concentrations of oil and grease, heavy metals including mercury, and semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs.

The Duluth Harbor and targeted study areas are located within the St. Louis River AOC. In 2004, the St. Louis River Remedial Action Committee identified “clean-up all hotspot contaminated sediment sites by 2020” a goal as part of the AOC’s delisting strategy and included the Duluth Harbor area.

## 3.2 AREA BACKGROUND

Duluth Harbor is a part of the Port of Duluth-Superior, which has 20 privately owned and operated docks along its 49 miles of waterfront including a general cargo terminal, a fueling depot, tug/barge services, and a shipyard with two dry docks. The nearby areas on both the northern Minnesota side and the southern Wisconsin side of the St. Louis River and Duluth Harbor are also primarily industrial and commercial and include storage areas, loading docks, and a wastewater treatment plant.

Freighters using the St. Louis River serve as the primary method of transport for industries that include steel making, grain storage, and cement powder shipping. Duluth Harbor handles a diversified commodities base ranging from coal, iron ore, grain, and limestone to cement, salt, wood pulp, steel coil, wind turbine components, and other heavy lift/dimensional equipment. Being the largest and busiest port on the Great Lakes, it handles an average of 46 million short tons of cargo and over 1,100 vessel visits each year. Duluth harbor is separated from Lake Superior to the east by Minnesota Point, a long peninsula that extends south from Duluth, Minnesota to Superior, Wisconsin.

Historically, swampy areas were dredged in the late 1800s to form many of the existing boat slips in Duluth Harbor. Some of these slips were later filled mostly with material of unknown origin for upland development. Several commercial operations are/have been located in the port area including: Duluth Universal Milling Co., Marine Iron and Ship Building Co., Great Lakes Dredging and Dock Co., Standard Oil Co. Storage facility, Cutler-Magner salt dock, Great lakes Towing Co., Superwood Corp. (now owned by Georgia-Pacific Corp.), Duluth Timber Co., and Zenith Co. In addition, a gas station, incinerator, and coal gasification plant were located in the vicinity.

## 3.3 PREVIOUS INVESTIGATIONS

Previous environmental investigations of the Site or the surrounding areas have indicated that the contaminants of concern (COCs) generated by industrial and urban activities have been detected in the river/harbor sediments. These studies, listed below, served to identify the COCs for this investigation.

- MPCA - Bioaccumulation of contaminants in the Duluth-Superior Harbor (AScI Corporation, 1999)
- MPCA - Detailed Investigation of the Minnesota Slip, MPCA Technical Document, tdr-g1-01 (Streitz and Johnson, 2005)
- US EPA Great Lakes National Program Office - Survey of sediment quality in the Duluth-Superior Harbor: 1993 sampling results (Schubauer-Berigan and Crane 1997)
- US EPA Great Lakes National Program Office - Sediment assessment of hot spot areas in the Duluth-Superior Harbor (Crane et al. 1997)

- US EPA Great Lakes National Program Office - Sediment Remediation Scoping Project in Minnesota Slip, Duluth Harbor (Crane et al., 2002)
- Regional Environmental Monitoring and Assessment Program (R-EMAP) - Surveying, sampling and testing: 1995 and 1996 sampling results (Breneman et al., 2000)
- US EPA Great Lakes National Program Office - Assessment of Contaminated Sediments in Slip C Duluth Harbor, Minnesota (Crane 1999)

## 4.0 FIELD METHODOLOGY

The methods employed during the field investigation to implement the LIF UVOST survey, the sediment core sampling, and the sediment target interval sample processing are detailed under the following titled paragraphs.

## 4.1 LIF UVOST SURVEY METHODOLOGY

The Laser Induced Fluorescence (LIF) Ultra-Violet Optical Screening Tool (UVOST) technique was selected for this sediment investigation due to its ability to efficiently provide a detailed coverage of the Site and reveal qualitative information on the presence of polycyclic aromatic hydrocarbons (PAHs) in real time. The strategy of the investigation was to first collect the LIF UVOST information with the goal of strategically selecting the location of the sediment cores to be analyzed for a more comprehensive range of chemical parameters.

The LIF UVOST phase of the investigation was performed at 331 locations throughout the study areas within the Duluth Harbor site during two field visits; October through November 2008 and October 2009. The LIF locations were predetermined by the MPCA/COE. A general overview of the LIF UVOST locations is presented on Figure 2.1. The detailed list of LIF UVOST survey points and detailed study area location maps are presented with the LIF UVOST logs in Appendix A.

### 4.1.1 LIF UVOST Technique

LIF UVOST was developed by Dakota Technologies, Inc. of Fargo, North Dakota. Fluorescence is a property of some compounds where absorbed Ultra Violet (UV) light stimulates the release of photons (i.e., light) of a longer wavelength. As a property of aromatic hydrocarbons, fluorescence can be used to detect even small amounts of substance in/on a much larger matrix (www.dakotatechnologies.com). For subsurface evaluation, the UVOST sends a light source (laser) through fiber optic cable strung within the down-hole probe rods of a Geoprobe direct push rig. The light is emitted through a sapphire glass window positioned in the side of the probe drive cone. As the drive cone probe is advanced, the material it passes through (water and sediment) is exposed to the UV light. As fluorescence occurs the light emitted from the material is received back through the sapphire window and transmitted through the fiber optic cable, back uphole to be analyzed. Responses are indicated in real-time on a graph of signal strength versus depth. The graph displays color coded waveforms to aid in identification of the contaminant present. The color code uses the standard color scheme ROY G BIV (i.e., red, orange, yellow, green, blue, indigo, and violet) to differentiate the different light frequency waves received and indicate the type of PAHs observed. The warmer colors of red and orange are indicative of the heavier oil constituents while the cooler colors of green and blue are indicative of the lighter constituents such as gasoline and kerosene.

### 4.1.2 LIF UVOST Deployment

The UVOST was deployed using a direct push hydraulic system manufactured by the Geoprobe Systems (http://geoprobe.com) fitted to a Multi Terrain Caterpillar Loader 247B as shown in the photograph at right. The Geoprobe and LIF UVOST were operated from on top of a floating barge. Rods were then added to the probe string through the water column until the top of sediment was reached, which was easily recognizable on the LIF log by a sharp decrease in the waveforms. When the top of sediment was reached, the probe lead was pushed into the sediment strata at a steady rate. Probes were advanced to the desired depth and LIF UVOST data was processed and displayed on the UVOST unit at the surface.

LIF UVOST deployment from barge deck along Rice's Point

The coordinates of the LIF survey points provided by MPCA were located by using a handheld Garmin 300 global positioning system (GPS).

*UVOST Calibration*

Before probing at each particular survey location, the LIF UVOST was calibrated at the surface by performing a read out of a vial of calibration liquid mixture (prepared by Dakota Technologies, Inc.)

placed directly over the sapphire glass window of the drive cone. This calibration method was to establish the proper waveform configuration for detected PAHs and petroleum hydrocarbons. Following the waveform calibration, the probe was placed in an area shielded from direct sunlight and a background waveform was recorded to serve as the baseline for each subsequent LIF UVOST probe.

*Water Depth Measurements*

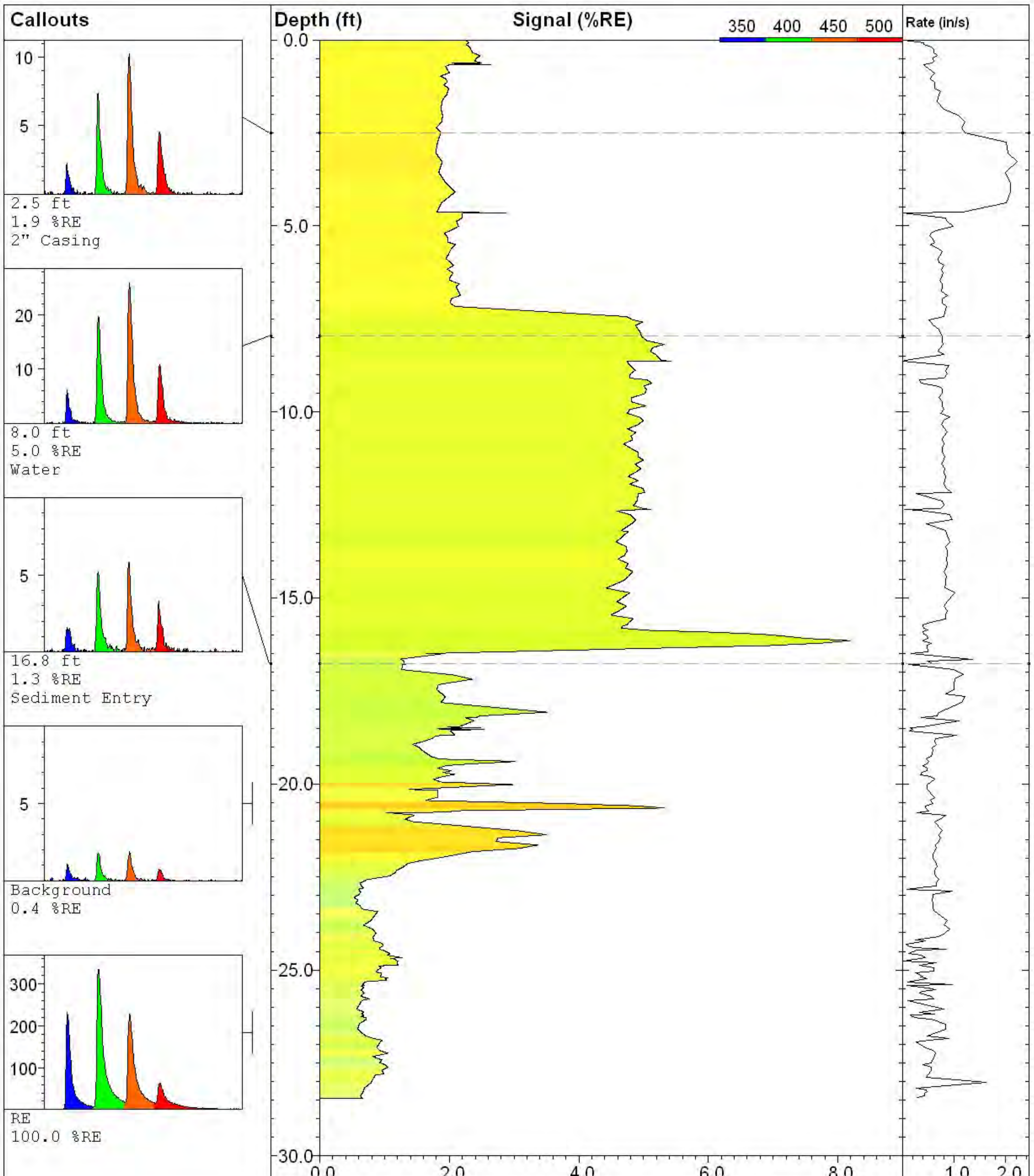
During the calibration procedures, a water depth measurement was recorded at each LIF UVOST location using a Model FL-8 Vexilar depth sounder (Vexilar) manufactured by Vexilar Inc. The water depth measurement was used to estimate the length of probe rod string needed before contacting the sediment.

### 4.1.3 LIF UVOST Logging

LIF UVOST logging begins when the laser window enters the water. The LIF UVOST data was viewed in real time on a laptop computer on the barge platform at the surface, linked to the UVOST module. The colored graphical display of the log was generated electronically at the time of probing. A copy of the LIF UVOST logs is presented in Appendix A.

### 4.1.4 LIF UVOST Response Results

The LIF UVOST data collected at the Site was stored in a variety of computer formats including the JPG and text format. Printouts of the waveforms for all the sample locations (LIF UVOST logs) are presented in Appendix A. Generally, the warmer colors of red and orange are indicative of the heavier oil constituents while the cooler colors of green and blue are indicative of the lighter constituents such as gasoline and kerosene. An example of the LIF UVOST graphic display is presented here.




| | | |
|---|---|---|
| 474-I-108 | | UVOST By Dakota<br>www.DakotaTechnologies.com |
| Site:<br>Rice's Point | Latitude / Datum:<br>46.76743 N / ? | Final depth:<br>28.45 ft |
| Client:<br>Somat | Longitude / Fix:<br>092.11117 W / 0D | Max signal:<br>8.2 % @ 16.15 ft |
| Job:<br>E08112A | Operator/Unit:<br>DS/UVOST01 | Date & Time:<br>2008-10-09 15:22 CDT |

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## 4.2 SEDIMENT CORE SAMPLING METHODS

The following section summarizes the field methods used to collect surface and subsurface sediment samples for the St. Louis River/Duluth harbor sediment investigation. These cores were collected to evaluate the vertical distribution of the contaminants at the Site. The sediment core sampling methods included Geoprobe, Vibracore, or Wildco devices. The sample locations were determined by the MPCA/COE from the locations and results of the LIF UVOST survey. The coordinates of the sediment core sample points were located by using a handheld Garmin 300 GPS receiver and are presented in Table 1.1, Sediment Core Sample Locations. The general locations of the sediment core samples are shown in Figure 2.2. Detailed sediment sample location diagrams, by specific study areas, are presented in Section 8.0, Sediment Quality Assessment and associated figures.

### 4.2.1 Geoprobe Sampling

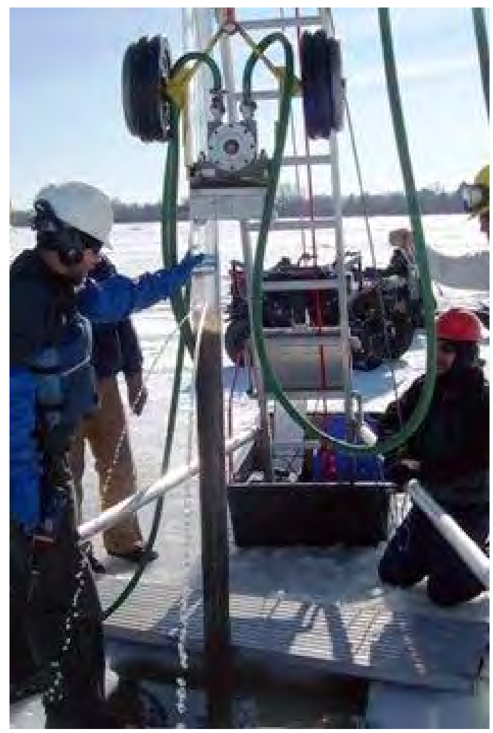
After the LIF UVOST survey work performed in 2008, the Geoprobe was then used to attempt to collect the sediment core samples at selected locations in the commercial slips at Rice's Point. The Geoprobe used a 4-feet long, 2-inch outside diameter, stainless steel sampler with disposable plastic liners. However, because of this small diameter, the sampler was ineffective in obtaining any of the very soft sediment. Subsequently, only four (4) samples were obtained over the course of 1.5 days with no control of sampling interval. Therefore, use of the Geoprobe was discontinued as a sampling method.

### 4.2.2 Vibracore Sampling

A Vibracore sampling device was used for collecting sediment cores during the 2009 and 2010 sampling events. The vibracore was selected as a more effective sampling method in lieu of Geoprobe. The vibracore unit works by high frequency vibration powered by compressed air. The unit is suspended from a 15 feet tall aluminum tripod equipped with an electric winch and pulley systems for raising and lowering the head unit. In addition to the vibration, the head unit and attached sampling tube are advanced with a 300 pound weight. The tripod-mounted vibracore unit was deployed on a pontoon boat during open water sample collection events and with a sled system adapted to enable transport over ice and snow during the winter events.

The vibration frequency of the vibracore is adjustable, allowing the operator to tune into the natural frequency of the strata being sampled, control the rate of penetration, and collect consistent and intact samples. The vibracore unit advances a continuous clear plastic or stainless steel core tubing. Once the tubing and sample is retrieved to the surface the tubing is drained, capped and transferred to shore for logging and sample processing. Because of its light weight and portability, the equipment can be mounted on sled mounted tripods and can be easily moved on ice.

The core samples were obtained by lowering the vibrating head of the vibracore with an attached twelve (12) feet long, four (4) inch internal diameter, cellulose acetate butyrate liner with interior material catcher, into the sediment until refusal.



Vibracore sampling on ice in Superior Bay

Upon refusal, the entire vibracore apparatus was lifted until the lead portion of the collection tube was just below the water surface. Two to four holes were drilled into the tube just above the top of the trapped sediment to drain the water column trapped above the sediment core. While the water column was draining, a plastic cap was fitted to the end of the core tube which was still below the water surface. These steps were used to prevent “core blowouts” or the water column overburden in the collection tube forcing the sediment material out of the bottom of the collection tube. Once the water column was drained, the collection tube was removed from the head unit. The core length was measured and the tube was cut just above the top of the sediment. The top of the tube was then capped and both capped ends were then taped. The collected core was labeled and taken to the on-shore mobile laboratory for processing. In order to obtain sufficient sediment material to fulfill the sampling requirements for the requested chemical analyses, multiple sediment cores were collected at each location.

### 4.2.3 Wildco Sampling

In the case of vibracore refusal, unsatisfactory recovery, or , a Wildco sediment core sampler, was employed an alternative sample collection device. The Wildco sediment core sampler consists of a two inch diameter No. 304 stainless steel core tube, and a screw-on Lexan™ nose piece. A plastic eggshell-type core catcher was used to hold the sediment sample intact during extraction, and a CAB liner was used to receive the sample. The sediment was retained in the liner with both the core catcher and check valve contained within the core sampler. Galvanized steel extensions were used to collect samples at water depths up to thirty (30) feet deep and extend up to four (4) feet into the underlying sediment. Extensions to collect sediment core samples up to 48 inches long were used, if required.

## 4.3 SAMPLE PROCESSING

This section presents the content of the sample logs and the sample processing methods used for the sediment core sampling.

### 4.3.1 Sample Logs

Once extracted, the sediment core samples collected at each station were photographed and a field log was prepared following the requirements and procedures in the SOW and the QAPP. Before each core tube was opened, the MPCA-designated sample intervals were measured and marked on each tube. Information recorded in the sediment core logs included the following:

- names of the sampling team,
- weather conditions,
- latitude and longitude of the actual sample location,
- the water depths recorded at the time of investigation (corrected to the Low Water Datum),
- ice thickness (if collected during winter),
- type of sampling equipment used,
- sample collection date,
- time of sample collection,
- number of cores or grabs and attempts at each location,
- station/core identification number,
- length of each core retrieved and depth probed,
- identification number of the sample photograph, and
- a description, measurement, and identification of the material of each core retrieved according to ASTM D 2488, "Standard Practice for Description and Identification of Soils (Visual - Manual Procedure)" with descriptive terminology of all material recovered with particular attention to organic components such as wood sticks, leaves, wood chips, presence of visible oil, and etc.

The sediment core photographs are included in Appendix B

### 4.3.2 Low Water Datum

Water Depth at Time of Sampling (WDTS) was corrected to the Low Water Datum (LWD) using the National Oceanic and Atmospheric Administration (NOAA) Water Level at Time of Sampling (WTLS) as follows:

- WLTS was obtained from the Center for Operational Oceanographic Products and Services, a division of NOAA. The WLTS plots for a particular day and time for Water Level Station No. 9099064 located in Duluth, Minnesota were used in this investigation. For this station, the LWD is given as 601.1 feet above mean sea level. The difference between WLTS and LWD is the depth correction (+/-) to be applied to the WDTS to obtain the LWD corrected water depth.

The corrected WDTS data was recorded on the respective sediment core logs, Appendix C and the Analytical Database presented in Appendix F.

### 4.3.3 Sample Preparation and Handling

The sediment cores were cut at the marked target sample intervals. Samples were prepared for laboratory analysis by mixing sample interval material from multiple cores recovered at a particular sampling location, but from the same depth range, to meet the quantity requirement of sample for analytical testing. Each sample was transferred from the liner to a stainless steel mixing bowl thoroughly decontaminated and washed with distilled water. Large stones and aquatic vegetation were removed from the samples. Samples were then

Mobile sediment processing station

homogenized by hand mixing with a large stainless steel spoon. Once thoroughly homogenized, the samples were transferred into pre-decontaminated/sterilized and individually labeled sample containers made of borosilicate glass with Teflon linings. The sample containers were provided by the analytical laboratories. Chain-of-custody over samples was produced and maintained at all times. The samples were stored at 4$^{o}$C in dark until transported to the laboratory for physical and chemical analysis. Sample packaging, shipping, and chain-of-custody were performed in accordance with the QAPP and the guidelines as listed in the USACE (1986). Samples of this project were considered to be ‘low level’ environmental samples for safety, packaging, and shipping purposes.

# 5.0 SUMMARY OF FIELDWORK

The SOMAT field team performed the field activities and data collection in accordance with the approved Scope of Work (SOW), project-specific Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) with specific focus to the project goals and objectives. SOMAT's field environmental scientist directed and coordinated the day to day field activities and supported the LIF UVOST survey and sediment coring and sampling activities. SOMAT's environmental technicians collected the sediment cores, processed and logged the sediment cores, and prepared and labeled the sediment samples. After preparation, the samples were kept on ice in a cooler and submitted under proper chain-of-custody for shipping via overnight courier services to the designated laboratories on a daily basis.

SOMAT's environmental scientist provided daily status reports to the A-E Project Officer and other interested parties as identified by COE and MPCA, including the A-E Quality Assurance Officer on a weekly basis.

In accordance with the SOW the investigation fieldwork was completed during the three separate contract stages as follows:

*2008 LIF UVOST and Sampling*

- Rice's Point and commercial slips, and Hearding Island areas,

*Fall 2009/Winter 2010 LIF UVOST and Sampling*

- Superior Bay, Slip 2, Slip 3, Slip C, and 21st Avenue Bay areas, and

*Fall 2010 Sampling*

- Rice's Point commercial slips, Coast Guard area, and 21$^{st}$ Avenue Bay.

The following sections discuss the nature of fieldwork during the LIF UVOST survey and sediment core sampling.

## 5.1 LIF UVOST SURVEY

The Laser Induced Fluorescence (LIF) Ultra-Violet Optical Screening Tool (UVOST) technique was selected for this sediment investigation due to its ability to efficiently provide a detailed coverage of the Site and reveal qualitative information on the presence of polycyclic aromatic hydrocarbons (PAHs) in real time. The strategy of the investigation was to first collect the LIF UVOST information with the goal of strategically selecting the location of the sediment cores to be analyzed for a more comprehensive range of chemical parameters.

The LIF UVOST phase of the investigation was performed at 331 locations throughout the study areas within the Duluth Harbor site during the first two field visit events in 2008 and 2009. The number of survey points within each study area is presented in the table below:

**Number of LIF UVOST Survey Locations**

| Study Area | Number of LIF UVOST Survey Points |
|---|---|
| Rice’s Point | 167 |
| Hearding Island | 17 |
| Superior Bay | 50 |
| Slip 2 | 16 |
| Slip 3 | 16 |
| Slip C | 25 |
| Twenty First Avenue Bay | 40 |
| **Total** | **331** |

The LIF UVOST survey locations were predetermined by the MPCA/COE. The survey approach for the Rice’s Point and Hearding Island project area locations was to follow the perimeter of the shoreline along three separate grid lines. The first grid line (inner) started 50 feet from the shoreline with the survey points on a 250-foot spacing pattern around the perimeter of the project site. The second gird line (middle) stepped out another 50 feet from the inner line with the survey point frequency reduced to a 500-foot grid pattern. The third grid line (outer) stepped out another 50 feet with the survey point frequency reduced to a 1000-foot grid pattern. Survey points were then identified based on the study area (e.g., Hearding Island – HI), the inner (I), middle (M), outer (O) grid line, and the sequential number. Therefore, the survey point designation, RP-I-15, represents the fifteenth survey point along the inner grid track around Rice's Point.

For the other study areas a stratified random sampling approach was used by MPCA to identify the target survey points within those areas. The survey point designations in these study areas were similar to the study area (e.g., Superior Bay – SB) and the sequential number. Therefore, the survey point designation, TF-34, represents the thirty-fourth survey point within the Twenty First Avenue Bay study area.

A general overview of the LIF UVOST locations is presented on Figure 2.1. The detailed list of LIF UVOST survey points and detailed study area location maps are presented with the LIF UVOST logs in Appendix A.

Of the targeted LIF UVOST survey locations, a total of 331 locations were surveyed or attempted to be surveyed. The LIF UVOST probe was advanced to a depth of at least three (3) feet below the last positive instrument reading. The remaining locations were found not to be accessible due to excessive water depth, as described in Section 5.1.1.

The LIF UVOST logs were provided to MPCA on a weekly basis during each of the LIF UVOST portions of the field investigation. The MPCA reviewed and evaluated the LIF UVOST data and selected approximately 20% of the survey locations for sediment sample collection for specific chemical and physical analysis.

### 5.1.1 LIF UVOST Challenges

Although the majority of the target locations provided by COE/MPCA were successfully probed, some locations were not due to various adverse site conditions encountered during the investigation. Generally, it was found that locations where the water depth was greater than 20 feet, the probe and barge stability were compromised as they became highly sensitive to high wind and wave activity.

At some of the locations, where the water depth was greater than 30 feet (within active shipping slips and areas along the outer survey grid line around Rice's Point), it was observed (when secured to the sea wall) that the probe penetrated to a depth less than 2 feet before encountering refusal. This was believed to be the result of the soft sediment being regularly displaced in those locations from freighter propeller wash out.

Because of the instability of the barge/probe or shallow refusal of the probe, there were instances where the angle of LIF UVOST penetration was slightly off the vertical. This was caused either by wave disturbance on the surface that affected the barge stability or obstructions at the bottom causing the probe and rods to shift off from vertical. As the rod string advanced further, the angle became greater resulting in extreme flex in the rods, even when a secondary casing was used. This condition prevented lining up of the rods with the probe arm making it impossible to advance further.

## 5.2 SEDIMENT CORE SAMPLING

The sediment sampling locations were determined by MPCA based on their review of the results of the previous LIF UVOST work conducted in the project study areas. The selected project study area locations were evaluated and selected based on a random grid pattern with the frequency of sampling at approximately 20% of the LIF UVOST survey locations.

The number of sediment core locations by study area is listed in the table below.

**Number of Sediment Core Locations**

| Study Area | Number of Sediment Core Locations |
|---|---|
| Superior Bay | 9 |
| Slip 2 | 4 |
| Slip 3 | 4 |
| Hearding Island | 0 |
| Twenty First Avenue Bay | 3 |

| Study Area | Number of Sediment Core Locations |
|---|---|
| Rice's Point | |
| Slip C | 10 |
| General Mills | 6 |
| Cargill B1 | 5 |
| Cargill B2 | 6 |
| Northland/AGP | 6 |
| Azcon | 10 |
| Clure | 6 |
| Boat Ramp | 4 |
| Hearding Island | 6 |
| Coast Guard Area | 15 |
| 21st Avenue Bay | 22 |
| **Total** | **117** |

The general overview of sediment core sample locations is presented in Figure 2.2. The sediment core logs are presented in Appendix C.

Sediment core sampling was performed during each of the three contract field events following the protocol described in Section 4.0.

In general, two (2) cores were obtained from each location to acquire sufficient volume of sediment at each target sample interval for the comprehensive chemical analysis to be performed. From each sediment core location sediment samples were obtained from two (2) target intervals, one consisting of the top six (6) inches of sediment and another 12-inch sample interval, depending on the type of material encountered in the core.

The two samples were obtained by mixing samples from the same depth interval of the two cores to obtain sufficient quantity for laboratory testing. Additional QA/QC samples in the form of duplicates were collected at approximately 10% of the sediment core locations.

### 5.2.1 Sampling Challenges

As discussed in Section 4.2, the 2008 field sampling event attempted to use the Geoprobe to obtain continuous sediment cores to collect samples for chemical analysis at target intervals. However, because of the small diameter and direct push advancement method, the sampler was ineffective in obtaining any of the very soft sediment. Subsequently, only four (4) samples were obtained over the course of 1.5 days with no control or understanding of the sampling interval that was recovered. Therefore, use of the Geoprobe was discontinued as a sampling method. The remaining sediment cores and samples were collected using the vibracore technology, allowing for penetration of up to 10 feet within soft sediment in water depths to 30 feet.

In general there were few areas where sediment coring and sample collection were not successful with the vibracore unit. These are summarized as follows:

- During the March 2010 field sampling event on the ice, Superior Bay location SB-16, near the shore of Minnesota Point, was found to be so shallow that the surface ice was directly on top of frozen sediment below with no water in between. As a result of this condition, the underlying frozen sediment was unable to be sampled using Vibracore. This location was therefore eliminated after consultation with MPCA with no alternate location selected.

- During the March 2010 field sampling event on the ice, Twenty First Ave. Bay location TF-103A, near the northeast shore in Twenty First Ave. Bay, was found to be so shallow that the surface ice was directly on top of frozen sediment below with no water in between. Because of the shallow water depth sampling at location TF-103A was performed later, during the Fall 2010 field sampling event using the hand-operated Wildco Sampler sampling equipment.

- Within the various active and inactive shipping and industrial slips sediment core recovery was generally less nearer the opening of the slips and along the seawall ship docking areas. This was largely due to the little amount of soft sediment deposition remaining in those areas frequented by freighters. The underlying materials were of a density too great for the vibracore to readily penetrate.

## 6.0 LABORATORY ANALYSIS

The laboratory analysis of the samples was conducted in accordance with the contract terms, SAP, QAPP, and as directed by MPCA/COE. The blended/homogenized sediment samples were submitted to the analytical laboratories for chemical and physical analysis.

## 6.1 LABORATORY ANALYSIS

The analytical parameters tested and analytical methods used during the investigation according to the QAPP were as follows:

| Parameter | Method of Analysis |
|---|---|
| TAL Metals | SW-846/6020 |
| Grain Size | ASTM D422 |
| Water Content | ASTM D2216 |
| Polychlorinated Biphenyls (PCBs) | SW-846/8082 |
| Diesel Range Organics (DRO) | SW-846/8015B WI |
| Total Organic Carbon (TOC) | SW-846/9060 |
| PAHs (expanded list + 34 alkylated PAHs) | SW-846/8270D |
| Pesticides | SW-846/8081 |
| SVOCs | SW-846/8270D |
| Dioxins/Furans | SW-846/1613B |
| Black Carbon ***** | Gustafson/Lloyd Kahn |

*the 2008 laboratory analysis did not include black carbon.

Three USACE-approved analytical chemical laboratories listed below were used to analyze sediment samples.

- RTI Laboratories:
  - Black carbon, DRO, PAHs, TOC, and metals
- Trace Analytical:
  - DRO, metals, pesticides, TOC, and SVOCs
- Test America:

  - PCBs and dioxins

The USACE-approved physical laboratory used to analyze the sediment samples was as follows:

- SOMAT:
  - Grain size distribution and water content

The laboratory chemical and physical analysis reports, and the respective chains of custody, are presented in Appendix D and were initially submitted to the COE and MPCA in March 2011.

# 7.0 DATA VALIDATION

This section summarizes the data validation procedure and findings for the chemical testing performed for the St. Louis River/Duluth Harbor Sediment Investigation.

Upon receipt of laboratory analytical sediment data, SOMAT conducted a quality assurance review and data validation of all data sets. Consistent with the QAPP, the guideline used for data validation including the assignment of qualifiers was the *MPCA Fact Sheet: Laboratory Data Checklist, 1998* (MPCA, 1998).

The laboratory analytical reports and electronic data deliverables (EDDs) were reviewed for the following:

- holding times,
- reporting limits,
- surrogate recovery,
- laboratory control sample (LCS) recovery,
- matrix spike/matrix spike duplicate (MS/MSD) recovery,
- method blank contamination, and
- relative percent difference (RPD) of field duplicates.

Other data review and validation considerations were made and applied as follows:

- Following guidance from the MPCA project manager, a deviation from the MPCA (1998) was made for the validation qualifiers applied for the nondetected data where the surrogate recoveries are less than 30%. Instead of rejecting such data according to the MPCA (1998) the data were considered estimated and qualified using the “J” qualifier,
- The SOMAT data quality manager did not assign qualifiers to the sample results based on MS/MSD recoveries following MPCA (1998),
- Where laboratory reports make method references to EPA SW-846 8270 (SVOC analysis) with versions such as 8270C and 8270D, the SOMAT data quality manager verified that these modified method references maintain the same specific method analysis procedures (i.e., the modifications are not related to that part of the method that dictates the analytical process).

Therefore, the analytical results between the modified method references are considered to be achieved through the same method.

- The analytical laboratory used a manual integration method to estimate alkylated PAHs. The SOMAT data quality manager confirmed this method as acceptable.

The quality assurance (QA) data review for each data set/report was documented in separate data validation memoranda presented in Appendix E. The results of the review indicated that the data were of acceptable quality and were useful for the intended purposes.

*2011 Data Submittal to COE/MPCA*

The validated analytical data and data information were assembled into one single database (MS Access), a copy of which is presented in Appendix F and which was initially submitted to the COE and MPCA on November 2, 2011, along with the sediment quality assessment results (Section 8.0).

*2012 Data Submittal to NOAA*

On April 12, 2012, the validated data/data information database was also submitted to the National Oceanic and Atmospheric Administration (NOAA) for inclusion into the NOAA Query Manager database system. NOAA review the database set and accepted and incorporated it into their system on June 26, 2012.

# 8.0 DATA ANALYSIS FOR SEDIMENT QUALITY ASSESSMENT

Analysis of the laboratory data was performed to determine parameters to aid in sediment quality assessment. The following sediment quality parameters were selected by MPCA for this purpose:

*Sediment Quality Assessment Parameters*

- Mean probable effect concentration quotients (mean PEC-Qs);
- Minnesota Level I and Level II sediment quality targets (SQTs);
- Total PAHs;
- Equilibrium partitioning sediment benchmark (ESB) toxic units of total PAHs; and
- Dioxin (TCDD) toxicity equivalent concentrations.

The sediment quality assessment results, along with the validated analytical data and data information, were assembled into one single database (MS Access), a copy of which is presented in Appendix F and which was initially submitted to the COE and MPCA on November 2, 2011, along with (Section 8.0).

The following sections present the selected analysis methods, parameters used and analysis results.

## 8.1 ASSESSMENT OF SEDIMENT QUALITY USING MEAN PEC-Q

As one way to evaluate sediment quality, mean PEC-Q provides a sediment assessment tool that distills data from a mixture of contaminants into one unit less index (MPCA 2007). The concept of mean PEC-Qs is derived as follows:

The lower and upper effect levels at which toxicity to benthic-dwelling organisms are predicted to be unlikely and probable, respectively, are established by the USEPA through several researches. The upper effect level concentration is referred to as the *probable effect concentration* (PEC). Toxicity of a contaminant to sediment dwelling organisms or benthic invertebrates can be predicted by using the PEC of the contaminant.

To predict the toxicity for *mixtures* of various contaminants in sediments, the concentration of each contaminant is divided by its corresponding PEC. The resulting values are called PEC-Quotients (PEC-Qs). The individual PEC-Qs are summed and divided by the number of PEC-Qs to yield a mean PEC-Q. The mean PEC-Q values can then be used to predict the toxicity of a mixture of contaminants in sediment samples.

According to MPCA (2007), at mean PEC-Q values less than 0.1, harmful effects on benthic invertebrates are unlikely to be observed. At mean PEC-Q greater than 0.6, harmful effects on sediment-dwelling organisms are likely to be frequently or always observed.

The method, assumptions, and parameters used in calculating mean PEC-Qs at the data points within the fourteen study areas are briefly discussed below.

### 8.1.1 Method, Parameters, and Assumptions

The mean PEC-Qs were calculated using the procedures recommended and outlined in by MPCA (2007) for the integration of total PAHs, total PCBs, and selected metals. In brief, mean PEC-Qs were calculated as described in the below text box.

Mean PEC-Q Calculation Method

$$mean\ PEC-Q = \frac{mean\ PEC-Q_{metals} + PEC-Q_{TotalPAHs} + PEC-Q_{PCBs}}{n}$$

where *n* is the number of classes of chemicals (i.e., 1 to 3),

$$mean\ PEC-Q_{metals} = \frac{\sum individual\ metal\ PEC-Qs}{n'}$$

where *n′* is the number of metals with reliable PECs (i.e., 1 to 7), and

$$PEC-Q\ (of\ \ PAHs\ or\ PCBs\ or\ individual\ metals) = \frac{chemical\ concentration\ (in\ dry\ wt)}{corresponding\ PEC\ value}$$

Only contaminants with reliable probable effect concentrations (PECs) were used in calculating mean PEC-Qs. The contaminants and corresponding PECs used in this analysis were those presented in USEPA (2000) and are summarized in the table below.

**Probable Effect Concentrations (PEC)**

| Contaminant | PEC (mg/kg dry weight) |
|---|---|
| Arsenic | 33 |
| Cadmium | 4.98 |
| Chromium | 111 |
| Copper | 149 |
| Lead | 128 |
| Nickel | 48.6 |
| Zinc | 459 |
| Total PAHs | 22.8 |
| Total PCBs | 0.676 |

The total polycyclic aromatic hydrocarbons (PAHs) concentration is the summation of the 13 priority PAH concentrations. The 13 priority PAHs (MPCA, 2007) include 2-methylnaphthalene, acenaphthelene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorine, naphthalene, phenanthrene, and pyrene.

The total PCB concentration is the summation of the seven (7) PCB Aroclors (MPCA, 2007).

Consistent with MPCA instructions, the nondetected concentrations were assumed as zero (for mean PEC-Q calculation) for analytes where all the concentrations are nondetect within a study area. Where an analyte was detected in more than one sample within a study area, the nondetects for that analyte were assumed as one-half of the reporting limit for mean PEC-Q calculation.

### 8.1.2 Results of the Mean PEC-Q Analysis

An overall summary of the mean PEC-Q results is presented in Table 8.1. Mean PEC-Qs of all sample locations in each of the fourteen study areas including the data from the 2008 phase is presented in Tables 8.2 through 8.16. In addition, Table 8.17 presents the concentration of individual Aroclors used to calculate total PCBs.

The maps showing the sediment sample locations of each study area and risk levels based on the mean PEC-Q are presented in Figures 8.1 through 8.14.

### 8.1.3 Discussion: Sediment Quality Based on Mean PEC-Qs

For risk evaluation purposes, sediment samples were categorized into three groups based on the mean PEC-Q value consistent with MPCA (2007) with as shown below:

- Low risk group: Samples with mean PEC-Qs below 0.1;
- Moderate risk group: Samples with mean PEC-Qs of >0.1 and < 0.6; and
- High risk group: Samples with mean PEC-Qs of > 0.6.

*Surface Sediment Samples:*

Mean PEC-Qs were calculated for the 116 surface (i.e., 0-0.5ft) sediment samples collected at the fourteen study areas. As presented in the Table 8.1, only 4% of the surface sediment samples show potential high risk to the sediment dwelling organisms (i.e., mean PEC-Q > 0.6). About 25% of the surface sediment samples show low risk to the sediment dwelling organisms (i.e., mean PEC-Q < 0.1). The remaining sediment samples indicate moderate risk to the sediment dwelling organism.

*At-Depth Sediment Samples:*

Mean PEC-Qs were calculated for the 119 sediment samples at depth (i.e., depth > 0.5 ft) collected at the fourteen study areas. As presented in the Table 8.1, about 8% of the sediment samples show potential high risk to the sediment dwelling organisms (i.e., mean PEC-Q > 0.6). About 32% of the surface sediment samples show low risk to the sediment dwelling organisms (i.e., mean PEC-Q < 0.1). The remaining sediment samples indicate moderate risk to the sediment dwelling organism.

The number of sediment samples in each risk category of the fourteen study areas is summarized in Figure 8.15.

The results of mean PEC-Qs of individual study areas are discussed below:

21st Avenue Bay (*Refer to Table 8.2 and Figure 8.1*): Twenty seven (27) surface sediment samples and 26 at-depth sediment samples were collected at 21st Avenue Bay area. Out of the 53 sediment samples, seven (7) samples indicated low risk to the benthic dwelling organisms and these points are located close to the shoreline. According to the mean PEC-Qs, most of the sediment samples show moderate risk to sediment dwelling organisms. Only three (3) at-depth samples indicated high risk and these points are located along an east-west line.

AGP Slip (*refer to Table 8.3 and Figure 8.2*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at AGP Slip. According to mean PEC-Qs, three (3) sediment samples indicated low risk. The low risk points are located towards the Northeast corner of the slip. In general, most of the sediment samples show moderate to high risk to sediment dwelling organisms. The high risk points are located at the base of the slip.

Azcon Slip (*refer to Table 8.4 and Figure 8.3*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Azcon Slip. According to mean PEC-Qs, the sediment samples show moderate to high risk to sediment dwelling organisms except for one low risk at-depth sediment sample located at the NE corner (harbor end) of the slip. In general, an increase of risk was observed towards the base of the slip.

Boat Landing (*refer to Table 8.5 and Figure 8.4*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected in Boat Landing area at the south end of Rice's Point. The samples show moderate to high risk to sediment dwelling organisms except for one low risk at-depth sample.

Cargill Slip (*refer to Table 8.6 and Figure 8.5*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Cargill Slip. The sediment samples show low to moderate risk to sediment dwelling organisms. None of the mean PEC-Q values calculated for Cargill Slip were above 0.33.

Cargill B Slip (*refer to Table 8.7 and Figure 8.6*): Five (5) surface sediment samples and five (5) at-depth sediment samples were collected at Cargill B Slip. The sediment samples show low to moderate risk to sediment dwelling organisms. The sediment 2 core locations (4 sediment samples) with moderate risk were located at the base of the slip. None of the mean PEC-Q values calculated for the Cargill Slip B were above 0.33. In general, an increase of risk was observed towards the base of the slip.

Coast Guard (*refer to Table 8.8 and Figure 8.7*): Fifteen (15) surface sediment samples and fifteen (15) at-depth sediment samples were collected in and around the Coast Guard Station. The sediment samples show low to moderate risk to sediment dwelling organisms. None of the mean PEC-Q values calculated for the Coast Guard area were above 0.47.

General Mills (*refer to Table 8.9 and Figure 8.8*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at General Mills Slip. The sediment samples show low to moderate risk to sediment dwelling organisms. None of the mean PEC-Q values calculated for the General Mills slip were above 0.27. The moderate risk points were located towards the base of the slip.

Hearding Island (*refer to Table 8.10 and Figure 8.9*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at Hearding Island. The sediment samples show low to moderate risk to sediment dwelling organisms. None of the mean PEC-Q values calculated for the Hearding Island samples were above 0.28. The three sample points located along the Minnesota Point side (east side of the island) indicated low risk to the sediment dwelling organisms.

Murphy Oil (*refer to Table 8.11 and Figure 8.10*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at Murphy Oil Slip. All the sediment samples show moderate to high risk to sediment dwelling organisms except for one location (RP-M-19A).

Slip 2 (*refer to Table 8.13 and Figure 8.11*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Slip 2. The samples indicted a moderate to high risk to sediment dwelling organisms.

Slip 3 (*refer to Table 8.14 and Figure 8.12*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Slip 3. Three sediment samples indicated low risk to sediment dwelling organisms. Only one at-depth sample showed high risk and the remaining samples indicated moderate risk. In general, an increase of risk was observed towards the base of the slip.

Slip C (*refer to Table 8.15 and Figure 8.13*): Ten (10) surface sediment samples and ten (10) at-depth sediment samples were collected at Slip C. The sediment samples show moderate risk to sediment dwelling organisms except for two at-depth samples with low risk located within the NE corner of the Slip.

Superior Bay (*refer to Table 8.16 and Figure 8.14*): Nine (9) surface sediment samples and nine (9) at-depth sediment samples were collected at Superior Bay area. The sediment samples show low to moderate risk to sediment dwelling organisms. None of the mean PEC-Q values calculated for the Superior Bay area were above 0.23.

## 8.2 ASSESSMENT OF SEDIMENT QUALITY USING MPCA LEVEL I AND LEVEL II SQTS

Sediment quality targets (SQTs) have been established by the MPCA for use in managing sediment quality issues in the St. Louis River AOC (MPCA 2007). In recognition of the challenges and complexities that are associated with the sediment management in the St. Louis River AOC two different SQT Levels were developed. The Level I SQTs are to identify contaminant concentrations *below* which harmful effects on sediment-dwelling organisms are *unlikely* to be observed. The Level II SQTs are to identify contaminant concentrations *above* which harmful effects on sediment-dwelling organisms are *likely* to be observed. The data from this investigation was compared to the MPCA SQT Levels to evaluate sediment quality, as discussed below:

### 8.2.1 Method, Parameters, and Assumptions

The contaminant concentrations of each sample location were compared against MPCA Level I and Level II SQTs to aid in assessing sediment quality. The contaminant and corresponding SQTs used in the analysis per MPCA (2007) are summarized in the table below.

**SQT Level I and Level II Concentrations (MPCA, 2007)**

| Substance | Level I SQT | Level II SQT |
|---|---|---|
| *Metals (in mg/kg dry weight)* | | |
| Arsenic | 9.8 | 33 |
| Cadmium | 0.99 | 5 |
| Chromium | 43 | 110 |
| Copper | 32 | 150 |
| Lead | 36 | 130 |
| Mercury | 0.18 | 1.1 |
| Nickel | 23 | 49 |
| Zinc | 120 | 460 |
| *Total PAHs (in µg/kg dry weight)* | 1600 | 23000 |
| 2-Methylnaphthalene, | 20 | 200 |
| Acenaphthelene | 6.7 | 89 |
| Acenaphthylene | 5.9 | 130 |
| Anthracene | 57 | 850 |
| Fluorine | 77 | 540 |
| Naphthalene | 180 | 560 |
| Phenanthrene | 200 | 1200 |
| Benz(a)anthracene | 110 | 1100 |
| Benzo(a)pyrene | 150 | 1500 |
| Chrysene | 170 | 1300 |
| Dibenz(a,h)anthracene | 33 | 140 |
| Fluoranthene | 420 | 2200 |
| Pyrene | 200 | 1500 |
| *Total PCBs (in µg/kg dry weight)* | 60 | 680 |
| *Pesticides (in µg/kg dry weight)* | | |
| Chlordane | 3.2 | 18 |
| Dieldrin | 1.9 | 62 |
| Sum DDD | 4.9 | 28 |
| Sum DDE | 3.2 | 31 |
| Sum DDT | 4.2 | 63 |
| Total DDT | 5.3 | 570 |
| Endrin | 2.2 | 210 |
| Heptaclor epoxide | 2.5 | 16 |
| Lindane (gamma-BHC) | 2.4 | 5 |
| *Pesticides (in µg/kg dry weight)* | | |
| Toxaphene | 0.1 | 32 |
| *Dioxins (in ng TEQ/kg dry weight)* | | |
| Polychlorinated dibenzo-p-dioxins/ dibenzo furans | 0.85 | 21.5 |

The total PAHs is the summation of the 13 priority PAH concentrations and the total PCBs is the summation of the seven PCB Aroclor concentrations.

A detailed discussion on the estimation of toxicity equivalent (TEQ) concentration of dioxins is provided in the Section 8.5.

Consistent with MPCA instructions, the nondetected concentrations were assumed as zero (for SQT comparison) for analytes where all the concentrations are nondetect within a study area. Where an analyte was detected in more than one sample within a study area, the nondetects for that analyte were assumed as one-half of the reporting limit.

### 8.2.2 Results of the SQT Comparison

The summary of the SQT comparison to the analytical data from the sample locations at each of the fourteen study areas, including sediment data of the 2008 phase, is presented in Tables 8.18 through 8.32.

Also, Figures 8.16 through 8.29 graphically present the comparison of the contaminant concentration to the SQT Level I and Level II concentrations of the surface sediment sample interval of each study area (comparison to the at-depth sample data were not presented in this manner because of the varying and inconsistent sample intervals). Each of these figures consists of a separate figure for the individual metals, total PAHs, and total PCBs.

In addition, maps showing the sediment sample locations of each study area and risk levels based on the SQT Level I and Level II concentrations are presented in Figures 8.30 through 8.44. Each of these maps consists of a separate figure for the individual metals, total PAHs, and total PCBs.

### 8.2.3 Discussion: Sediment Quality Based on MPCA SQT Level I and Level II Comparison

For risk evaluation purposes, sediment samples were categorized into three groups based on the measured contaminant concentration as shown below:

- Low risk group: Samples with contaminant concentration below SQT Level I,
- Moderate risk group: Samples with contaminant concentration between SQT Level I and Level II, and
- High risk group: Samples with contaminant concentration above SQT Level II.

In general, concentrations of metals, total PAHs ($PAH_{13}$), and PCBs were well below the SQT Level II concentration. A summary of the SQT comparison including specific exceedances of SQT Level II is presented as follows:

Inorganics: In general, the detected concentrations of inorganics were below SQT Level II and not likely to be considered high risk to the sediment dwelling organisms except for the following:

- 21st Avenue Bay (*refer to Table 8.18a, Figures 8.16a through 8.16h, and Figures 8.30a through 8.31h*): Twenty seven (27) surface sediment samples and 26 at-depth sediment samples were collected at 21st Avenue Bay area. The concentration of Mercury exceeded the SQT Level II concentration in one at-depth sample (>0.5 ft) located near the west shoreline and the concentration of Nickel exceeded the SQT Level II concentration in one at-depth sample.

- Azcon Slip (*refer to Table 8.20a, Figures 8.18a through 8.18h, and Figures 8.32a through 8.32h*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Azcon Slip. The concentration of lead exceeded the SQT Level II concentration in 2 surface sediment samples (0-0.5 ft) and 3 of the at-depth samples. Most of these samples were located towards the base of the slip.

- Boat Landing (*refer to Table 8.21a, Figures 8.19a through 8.19h, and Figures 8.33a through 8.33h*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Boat Landing. The concentration of lead exceeded the SQT Level II concentration in 1 at-depth sample.

- Cargill Slip (*refer to Table 8.22a, Figures 8.20a through 8.20h, and Figures 8.34a through 8.34h*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Cargill Slip. The concentration of copper exceeded the SQT Level II concentration in 1 surface sediment sample.

- Cargill B Slip (*refer to Table 8.23a, Figures 8.21a through 8.21h, and Figures 8.35a through 8.35h*): Five (5) surface sediment samples and five (5) at-depth sediment samples were collected at Cargill B Slip in 2010. Concentration of lead exceeded the SQT Level II concentration in 1 at-depth sample.

- Coast Guard (*refer to Table 8.24a, Figures 8.22a through 8.22h, and Figures 8.36a through 8.36h*): Fifteen (15) surface sediment samples and fifteen (15) at-depth sediment samples were collected at Coast Guard. The concentration of lead exceeded the SQT Level II concentration in 2 surface sediment samples.

- Slip C (*refer to Table 8.31a, Figures 8.28a through 8.28h, and Figures 8.43a through 8.43h*): Ten (10) surface sediment samples and ten (10) at-depth sediment samples were collected at Slip C. The concentration of lead exceeded the SQT Level II concentration in 3 surface sediment samples and 2 at-depth samples.

Priority PAHs ($PAH_{13}$): In general, the detected concentrations of total PAHs ($PAH_{13}$) were below SQT Level II and not likely to be considered high risk to the sediment dwelling organisms except for the following:

- 21$^{st}$ Avenue Bay (*refer to Table 8.18b, Figure 8.16i and Figure 8.30i*): Twenty seven (27) surface sediment samples and 26 at-depth sediment samples were collected at 21$^{st}$ Avenue Bay area. Total PAHs exceeded the SQT Level II concentration in only one (1) at-depth sediment sample.

- AGP Slip (*refer to Table 8.19b, Figure 8.17i and Figure 8.31i*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at AGP Slip. The concentration of total PAHs exceeded the SQT Level II concentration in 1 surface sediment sample.

- Azcon Slip (*refer to Table 8.20b, Figures 8.18i, and Figures 8.32i*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Azcon Slip. Total PAHs exceeded the SQT Level II concentration in two (2) at-depth sediment samples.

- Boat Landing (*refer to Table 8.21b, Figures 8.19i, and Figures 8.33i*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Boat Landing. Total PAHs exceeded the SQT Level II concentration in only one (1) at-depth sediment sample.

- Coast Guard (*refer to Table 8.24b, Figures 8.22i, and Figures 8.36i*): Fifteen (15) surface sediment samples and fifteen (15) at-depth sediment samples were collected at Coast Guard. The concentration of total PAHs exceeded the SQT Level II concentration in one (1) surface sediment sample.

- Murphy Oil (*refer to Table 8.27b, Figures 8.25i, and Figures 8.39i*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at Murphy Oil slip. The concentration of total PAHs exceeded the SQT Level II concentration in one (1) surface sediment sample and one (1) at-depth sample.

- Slip 2 (*refer to Table 8.29b, Figures 8.26i, and Figures 8.39i*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Slip 2. The concentration of total PAHs exceeded the SQT Level II concentration in two (2) surface sediment samples and two (2) at-depth samples.

- Slip 3 (*refer to Table 8.30b, Figures 8.27i, and Figures 8.40i*): Four (4) surface sediment samples and four (4) at-depth sediment samples were collected at Slip 3. The concentration of total PAHs exceeded the SQT Level II concentration in one (1) surface sediment sample and one (1) at-depth sample.

Total PCBs: In general, the detected concentrations of total PCBs were below SQT Level II and not likely to be considered high risk to the sediment dwelling organisms except for the following:

- 21st Ave Bay (*refer to Table 8.18c, Figure 8.16j and Figure 8.30j*): Twenty seven (27) surface sediment samples and 26 at-depth sediment samples were collected at 21st Avenue Bay area. The total concentration of PCBs exceeded the SQT Level II concentration in only one (1) at-depth sediment sample.

- Azcon Slip (*refer to Table 8.20c, Figures 8.18j, and Figures 8.32j*): Seven (7) surface sediment samples and seven (7) at-depth sediment samples were collected at Azcon Slip. The total PCB concentration exceeded the SQT Level II concentration in both surface sediment and at-depth samples at one location, RP-I-53.

- Murphy Oil (*refer to Table 8.27c, Figures 8.25j, and Figures 8.39j*): Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at Murphy Oil slip. The concentration of total PCBs exceeded the SQT Level II concentration in 1 surface sediment sample.

Polychlorinated dibenzo-p-dioxins/dibenzo furans (PCDD/Fs): Total TCDD equivalent concentration calculated based on fish toxicity equivalent factors were used compare with the SQTs. In general, the detected concentrations of Dioxins were below SQT Level II and not likely to be considered high risk to the aquatic life except for the following:

- 21st Avenue Bay (*refer to Table 8.18c, Figure 8.16k, and Figure 8.30k*): Fifteen (15) surface sediment samples and 15 at-depth sediment samples were analyzed for dioxins. The concentration of dioxins exceeded the SQT Level II concentration in two at-depth samples (>0.5 ft) and one surface sediment sample located closer to the shoreline.

- Azcon Slip (*refer to Table 8.20c, Figure 8.18k, and Figure 8.32k*): Two (2) surface sediment samples and two (2) at-depth sediment samples were collected at Azcon Slip. The concentration of dioxins exceeded the SQT Level II concentration in the 2 at-depth samples located towards the base of the slip.

- Cargill B Slip (*refer to Table 8.23c, Figure 8.21k, and Figure 8.35k)*: Three (3) surface sediment samples and three (3) at-depth sediment samples were collected at the Cargill B Slip. The concentration of dioxins exceeded the SQT Level II concentration in one at-depth sample located towards the base of the slip.

- Slip 3 (*refer to Table 8.30c, Figure 8.27k, and Figure 8.41k)*: Two (2) surface sediment samples and two (2) at-depth sediment samples were collected at the Slip 3. The concentration of dioxins exceeded the SQT Level II concentration in one at-depth sample.

- Slip C (*refer to Table 8.31c, Figure 8.28k, and Figure 8.42k)*: Six (6) surface sediment samples and six (6) at-depth sediment samples were collected at the Slip C. The concentration of dioxins exceeded the SQT Level II concentration in one at-depth sample located towards the base of the slip.

## 8.3 ASSESSMENT OF SEDIMENT QUALITY USING CONCENTRATION OF PAHS

Total concentration of three (3) separate PAH groups were calculated for later use by MPCA to determine distribution of the PAH contamination in the St. Louis River/Duluth Harbor study area and the potential risk to the sediment dwelling organisms. For this purpose, the following PAH group totals were calculated:

- Total of MPCA 13 priority PAHs ($PAH_{13}$);

- Total of EPA Priority Pollutant PAHs ($PAH_{16}$); and
- EPA total PAHs ($PAH_{34}$).

### 8.3.1 Priority PAHs ($PAH_{13}$)

The 13 priority PAHs listed in MPCA (2007) include:

- 2-methylnaphthalene
- Acenaphthelene
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- Benzo(a)pyrene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorine
- Naphthalene
- Phenanthrene
- Pyrene

### 8.3.2 EPA Priority Pollutant PAHs ($PAH_{16}$)

EPA priority pollutant PAHs includes sixteen parent PAHs ($PAH_{16}$). This list includes the following PAHs in addition to the contaminants listed under 13 priority PAHs (Yan et al. 2004). However, the EPA $PAH_{16}$ does not include 2- Methylnaphthalene which is included in the $PAH_{13}$.

- Benzo(b)fluoranthene;
- Benzo(k)fluoranthene;
- Benzo(ghi)perylene; and

- Indeno(1,2,3-cd)pyrene.
- (Note: $PAH_{16}$ does not include 2- Methylnaphthalene which is included in the $PAH_{13}$)

### 8.3.3 EPA Total PAHs ($PAH_{34}$)

There are 34 parent and alkylated PAHs ($PAH_{34}$). The table below lists the $PAH_{34}$ based on USEPA (2003). The individual PAHs of $PAH_{34}$ group is listed in the table below.

**EPA Total PAH List**

| *Parent PAHs* | CAS | *Alkylated PAHs* | *CAS** |
|---|---|---|---|
| Naphthalene | 91203 | C1-Naphthalenes | - |
| Acenaphthylene | 208968 | C2-Naphthalenes | - |
| Acenaphthene | 83329 | C3-Naphthalenes | - |
| Fluorene | 86737 | C4-Naphthalenes | - |
| Anthracene | 120127 | C1-Fluorenes | - |
| Phenanthrene | 85018 | C2-Fluorenes | - |
| Pyrene | 129000 | C3-Fluorenes | - |
| Fluoranthene | 206440 | C1-Phenanthrene/anthracenes | - |
| Benz(a)anthracene | 56553 | C2-Phenanthrene/anthracenes | - |
| Chrysene | 218019 | C3-Phenanthrene/anthracenes | - |
| Benzo(a)pyrene | 50328 | C4-Phenanthrenes/anthracenes | - |
| Perylene | 198550 | C1-Pyrene/fluoranthenes | - |
| Benzo(e)pyrene | 192972 | C1-Benzanthracene/chrysenes | - |
| Benzo(b)fluoranthene | 205992 | C2-Benzanthracene/chrysenes | - |
| Benzo(k)fluoranthene | 207089 | C3-Benzanthracene/chrysenes | - |
| Benzo(ghi)perylene | 191242 | C4-Benzanthracene/chrysenes | - |
| Dibenz(a,h)anthracene | 53703 | | |
| Indeno(1,2,3-cd)pyrene | 193395 | | |

*CAS number is not available

### 8.3.4 Method, Parameters, and Assumptions

The total concentration of $PAH_{13}$, $PAH_{16}$, and $PAH_{34}$ were calculated for each sediment sample by summing the relevant individual PAHs.

Consistent with MPCA instructions, the nondetected concentrations were assumed as zero for analytes where all the concentrations are nondetect within a study area. Where an analyte was detected in more than one sample within a study area, the nondetects for that analyte were assumed as one-half of the reporting limit.

### 8.3.5 Results of the Total PAH Concentrations

Table 8.33 presents the total $PAH_{13}$, $PAH_{16}$, and $PAH_{34}$ of all sample locations in the fourteen study areas. In addition, Table 8.34 also presents the individual PAH concentrations.

### 8.3.6 Discussion: Sediment Quality Based on Total PAH Concentrations

Taking SQT Level I and Level II concentrations of $PAH_{13}$ (i.e. 1,600 µg/kg and 23,000 µg/kg respectively) as a reference due to unavailability of such data for $PAH_{16}$ and $PAH_{34}$, occurrence of total PAH concentrations above these limits were summarized in the table below to provide an overall understanding on sediment contamination. Based on the sediment quality data of this study, the total PAHs concentrations are in the range of 1,600 µg/kg - 23,000 µg/kg for most of the sediment samples.

**Summary of PAH Concentrations**

| Study Area | Total Number of Samples | Number of Occurrence | | | | | |
|---|---|---|---|---|---|---|---|
| | | Below SQT Level I | | | Above SQT Level II | | |
| | | $PAH_{13}$ | $PAH_{16}$ | $PAH_{34}$ | $PAH_{13}$ | $PAH_{16}$ | $PAH_{34}$ |
| 21st Avenue Bay | 53 | 19 | 18 | 6 | 1 | 1 | 2 |
| AGP Slip | 12 | 2 | 2 | 1 | 2 | 3 | 3 |
| Azcon Slip | 14 | 2 | 2 | 1 | 2 | 2 | 2 |
| Boat Landing | 8 | 1 | 1 | 1 | 1 | 2 | 4 |
| Cargill Slip | 14 | 3 | 3 | 0 | 0 | 0 | 0 |

**Summary of PAH Concentrations**

| Study Area | Total Number of Samples | Number of Occurrence | | | | | |
|---|---|---|---|---|---|---|---|
| | | Below SQT Level I | | | Above SQT Level II | | |
| | | $PAH_{13}$ | $PAH_{16}$ | $PAH_{34}$ | $PAH_{13}$ | $PAH_{16}$ | $PAH_{34}$ |
| Cargill B Slip | 10 | 6 | 5 | 1 | 0 | 0 | 0 |
| Coast Guard | 30 | 11 | 7 | 2 | 1 | 1 | 1 |
| General Mills | 10 | 7 | 5 | 1 | 0 | 0 | 0 |
| Hearding Island | 12 | 5 | 5 | 2 | 0 | 0 | 0 |
| Murphy Oil | 12 | 3 | 2 | 0 | 2 | 2 | 2 |
| Slip 2 | 8 | 0 | 0 | 0 | 4 | 5 | 5 |
| Slip 3 | 8 | 0 | 0 | 0 | 2 | 2 | 2 |
| Slip C | 22 | 3 | 2 | 0 | 0 | 0 | 6 |
| Superior Bay | 18 | 9 | 9 | 9 | 0 | 0 | 0 |

## 8.4 ASSESSMENT OF SEDIMENT QUALITY USING ESB TOXIC UNITS: PAHS

For sediments, bioavailability of most contaminants is estimated using Equilibrium Partitioning Sediment Benchmarks (ESBs) for PAHs. USEPA (2003) recommends an approach for summing the toxicological contributions of mixtures of 34 PAHs in sediments (using ESBs) to determine if their concentrations in any specific sediment would be protective of benthic organisms from the direct toxicity. The total of ESB toxic units (ESBTU) can be used to assess the sediment quality of particular sediment. For a particular sediment, if the ESBTU for total PAHs (i.e., $PAH_{34}$) is less than or equal to 1.0, the concentration of the mixture of PAHs in the sediment is acceptable for the protection of benthic organisms. For a particular sediment, if the EESBTU is greater than 1.0, the concentration of the mixture of PAHs in the sediment may not be acceptable for the protection of benthic organisms (USEPA 2003). This methodology was used to assess toxicity of sediments (due to total PAHs) to aquatic life in this study data set and described as follows:

### 8.4.1 Method, Parameters, and Assumptions

To develop ESBs for sediment for PAHs, the total organic carbon (TOC) content of the sediment is required. TOC is used to normalize the PAHs per gram of organic carbon. The normalized concentration is then compared against the Final Chronic Value (FCV) for the PAHs presented in USEPA (2003). Individual PAHs concentrations (in µg/g) were divided by organic carbon fraction to obtain the normalized PAH concentration (in µg/g of organic carbon) of each PAH. An ESBTU was determined for each PAH by dividing the normalized PAH concentration by corresponding FCV found in the table below. If the normalized concentration for a specific PAH exceeds its maximum concentration listed in the table below, the maximum concentration was used instead of the normalized concentration in the ESBTU calculation.

**Final Chronic Value and Maximum Concentration (USEPA 2003)**

| PAH Name | FCV (µg/g of organic carbon) | Maximum Concentration (µg/g of organic carbon) |
|---|---|---|
| Acenaphthene | 491 | 33400 |
| Acenaphthylene | 452 | 24000 |
| Anthracene | 594 | 1300 |
| Benz(a)anthracene | 841 | 4153 |
| Benzo(a)pyrene | 965 | 3840 |
| Benzo(b)fluoranthene | 979 | 2169 |
| Benzo(e)pyrene | 967 | 4300 |
| Benzo(ghi)perylene | 1095 | 648 |
| Benzo(k)fluoranthene | 981 | 1220 |
| C1-benzanthracene/chrysenes | 929 | - |
| C1-fluorenes | 611 | - |
| C1-naphthalenes | 444 | - |
| C1-phenanthrene/anthracenes | 670 | - |
| C1-pyrene/fluoranthenes | 770 | - |
| C2-fluorenes | 686 | - |
| C2-naphthalenes | 510 | - |
| C2-phenanthrene/anthracenes | 746 | - |
| C3-benzanthracene/chrysenes | 1112 | - |
| C3-fluorenes | 769 | - |
| C3-naphthalenes | 581 | - |
| C4-benzanthracene/chrysenes | 1214 | - |
| C4-naphthalenes | 657 | - |
| C4-phenanthrenes/anthracenes | 913 | - |
| Chrysene | 844 | 826 |
| Dibenz(a,h)anthracene | 1123 | 2389 |
| Fluoranthene | 707 | 23870 |
| Fluorene | 538 | 26000 |
| Indeno(1,2,3-cd)pyrene | 1115 | - |
| Naphthalene | 385 | 61700 |
| Perylene | 967 | 431 |
| Phenanthrene | 596 | 34300 |
| Pyrene | 697 | 9090 |

The summation of individual ESBTUs was made as the ESBTU of total PAHs of a particular sediment sample.

The ESB analysis assumes that the total PAHs includes the 34 PAH compounds. An uncertainty factor may be needed in the event that the analyzed list did not include all 34 PAH compounds. The uncertainty factor should be chosen based on the number of PAHs analyzed, if less than 34. The level of certainty required is typically 90 or 95%. No uncertainty factor is required if all 34 PAHs are analyzed.

For this data set, no uncertainty factor was applied as the analyzed PAH compound list meets the required level of certainty.

### 8.4.2 Results of the ESB Toxic Unit Analysis

A summary of the ESBTU calculated based on the USEPA (2003) ESB guidance is presented in Table 8.33.

### 8.4.3 Discussion: Sediment Quality Based on ESB Toxic Units

When the total ESBTU of a sample is greater than 1, the sediment is considered toxic to benthic organisms. Based on the sediment quality analysis, most of the sample locations show no toxic effect to the benthic community. However, the following exceptions were noted:

**Summary of Occurrence of ESBTU > 1.0**

| Study Area | Total Number of Samples | Occurrence of ESBTU > 1.0 | |
|---|---|---|---|
| | | Surface sediment samples (0-0.5ft) | At-depth sediment samples (>0.5ft) |
| 21st Avenue Bay | 53 | 1 | 4 |
| AGP Slip | 12 | 1 | 0 |
| Azcon Slip | 14 | 1 | 2 |
| Boat Landing | 8 | 2 | 1 |
| Cargill Slip | 14 | 1 | 0 |
| Cargill B Slip | 10 | 1 | 1 |
| Coast Guard | 30 | 2 | 0 |

**Summary of Occurrence of ESBTU > 1.0**

| Study Area | Total Number of Samples | Occurrence of ESBTU > 1.0 | |
|---|---|---|---|
| | | Surface sediment samples (0-0.5ft) | At-depth sediment samples (>0.5ft) |
| General Mills | 10 | 1 | 1 |
| Hearding Island | 12 | 0 | 0 |
| Murphy Oil | 12 | 1 | 3 |
| Slip 2 | 8 | 3 | 3 |
| Slip 3 | 8 | 2 | 1 |
| Slip C | 22 | 2 | 3 |
| Superior Bay | 18 | 0 | 0 |
| **Total** | **231** | **18** | **19** |

The 116 surface sediment samples and 115 at-depth samples collected in 2010 were analyzed for PAHs. Based on the ESBTU results, about 16% of the surface sediment samples and at-depth samples indicated toxic effect to the aquatic life.

## 8.5 ASSESSMENT OF SEDIMENT QUALITY USING DIOXIN (TCDD) TOXICITY EQUIVALENT CONCENTRATIONS

Due to the complex nature of the low concentration mixtures of contaminants such as dioxin and furans, the concept of toxic equivalency factors, TEFs, was developed by the World Health Organization, WHO (van den Berg et al. 1998). In this concept, the toxicity of each dioxin and furan is determined relative to that of TCDD or 2,3,7,8-Tetrachlorodibenzo-p-dioxin, the most toxic form of dioxin. TCDD has a TEF of 1. The less toxic dioxins or furans have TEFs closer to zero. TEF values, in combination with measured concentrations of dioxins, can be used to calculate toxic equivalent (TEQ) concentrations in various environmental samples, including sediment. TEQs are typically calculated to estimate the general toxicity of a sample to classes of organisms (i.e., fish) by assuming that toxicities of individual chemical congeners are additive (van den Berg et al. 1998). The measured concentration of a dioxin, then, is multiplied by the corresponding TEF to obtain the TEQ concentration for that dioxin in that sample. The total TEQ concentration, then, is the sum of the individual dioxins or furans TEQ concentration values in the sample. TEQs are typically used for risk characterization and management purposes, e.g., to help prioritize areas of concern corrective action.

### 8.5.1 Method, Parameters, and Assumptions

The TEQ concentration of each dioxin was calculated by multiplying the dioxin concentration by the corresponding TEF. The TEQ concentration of individual dioxins were added together to calculate the total TEQ concentration of a sediment sample.

TEF values for fish presented by the World Health Organization (WHO) in van den Berg et al. (1998) were used to calculate TEQ concentrations. In addition, TEQ concentrations were calculated based on the TEF values for mammals presented in van den Berg et al. (2006).

**Toxicity Equivalent Factors – Fish and Mammals**

| **Compound** | **TEF - Fish** (van den Berg et al., 1998) | **TEF - Mammals** (van den Berg et al., 2006) |
|---|---|---|
| 2,3,7,8-TCDD | 1 | 1 |
| 1,2,3,7,8-PeCDD | 1 | 1 |
| 1,2,3,4,7,8-HxCDD | 0.5 | 0.1 |
| 1,2,3,6,7,8-HxCDD | 0.01 | 0.1 |
| 1,2,3,7,8,9-HxCDD | 0.01 | 0.1 |
| 1,2,3,4,6,7,8-HpCDD | 0.001 | 0.01 |
| OCDD | <0.0001 | 0.0003 |
| 2,3,7,8-TCDF | 0.05 | 0.1 |
| 1,2,3,7,8-PeCDF | 0.05 | 0.03 |
| 2,3,4,7,8-PeCDF | 0.5 | 0.3 |
| 1,2,3,4,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,6,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,7,8,9-HxCDF | 0.1 | 0.1 |
| 2,3,4,6,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,4,6,7,8-HpCDF | 0.01 | 0.01 |
| 1,2,3,4,7,8,9-HpCDF | 0.01 | 0.01 |
| OCDF | <0.0001 | 0.0003 |

The nondetect data were handled using the following methods/assumptions:

Method 1 Consistent with MPCA instructions, the nondetected concentrations were assumed as zero for analytes where all the concentrations are nondetect within a study area. Where an analyte was detected in more than one sample within a study area, the nondetects for that analyte were assumed as one-half of the reporting limit.

Method 2 Kaplan-Meier method (Helsel 2009) was used in handling data sets with nondetected concentrations. Kaplan-Meier (KM) procedure is commonly used to compute means of such data sets. An excel spreadsheet available in public domain was used to calculate KM mean of dioxin data sets with mixture of detections and nondetections. The spreadsheet used in this study is located at http://www.practicalstats.com/nada/.

### 8.5.2 Results of the TEQ Concentration Analysis

TEQ concentrations calculated using the three methods discussed in Section 8.5.1 are presented in Table 8.33.

### 8.5.3 Discussion: Sediment Quality Based on Dioxin (TCDD) TEQ Concentrations

Understanding the differences between handling methods of nondetect data is important in evaluating TEQ concentrations because of the potential effect of assumptions of each method. As an example, the uncertainty associated with the Method 1 described in section 8.5.1 will be significant if the reporting limit especially of dioxins with large TEF is high (e.g. Superior Bay - SB28). Conversely, in such situations, the percent difference between TEQ concentrations calculated by Method 2 is significantly small. Except for sediment samples with several nondetect dioxin data and high reporting limits, in general, the percent difference between TEQ calculated by treating nondetects using Method 1 and Method 2 described above is small. Therefore, for simplicity and avoiding addressing possibly inflated TEQ concentrations, Somat has used TEQ concentrations calculated by the Kaplan-Meier method (i.e., Method 2) in presenting the following general statistics for the 106 sediment samples of the data set.

*Fish:*

- Maximum TCDD TEQ concentration = 67.72 pg/g
- Minimum TCDD TEQ concentration = 0.0002 pg/g
- Average TCDD TEQ concentration = 8.015 pg/g
- Standard deviation = 9.425 pg/g

*Mammals:*

- Maximum TCDD TEQ concentration = 81.14 pg/g
- Minimum TCDD TEQ concentration = 0.01 pg/g
- Average TCDD TEQ concentration = 9.98 pg/g
- Standard deviation = 11.58 pg/g

## 8.6 OTHER ANALYTES: BLACK CARBON, DROS, TOCS, AND GRAIN SIZE DATA

Currently there are very limited to no guidelines to assess sediment quality based on concentrations of black carbon, diesel range organics (DRO), total organic carbon (TOCs), and grain size data. However, TOCs of the samples were used in calculating ESBTUs as presented in Section 8.4.1. A summary of the concentrations of the above analytes and grain size data is presented in Table 8.35.

## 9.0 REFERENCES

1. AScI Corporation (1999). "Summary of test results determining potential mercury, PAH and PCB bioaccumulation by Lumbriculus variegates exposed to St. Louis Bay sediment samples." AScI Corporation, Duluth, MN.
2. Breneman, D., Richards, C., and Lozano, S. (2000). "Environmental influences on benthic community structure in a Great Lakes embayment." Journal of Great Lakes Research, Vol. 26, pp 287-304.
3. Crane, J.L. (1997). "Sediment assessment of hot spot areas in the Duluth-Superior harbor." USEPA Great Lakes National Program Office, December 1997. EPA document number: EPA 905-R97-020.
4. Crane, J.L. (1999). "Assessment of contaminated sediments in Slip C Duluth Harbor, Minnesota." USEPA Great Lakes National Program Office, September 1999. EPA document number: EPA 905-R-99-007.
5. Crane, J.L., Smorng, P.E., Pillard, D.A., and MacDonald, D.D. (2002). "Sediment remediation scoping project in Minnesota Slip - Duluth harbor." USEPA Great Lakes National Program Office, February 2002. EPA document number: EPA 905-R-02-002.
6. Helsel, Denis R. (2010). "Summing Nondetects: Incorporating Low-Level Contaminants in Risk Assessment." Integrated Environmental Assessment and Management, Vol. 6(3), pp. 361-366.
7. MPCA (1998). "Fact Sheet: Laboratory Data Checklist." Minnesota Pollution Control Agency – Groundwater and Solid Waste, May 1998.
8. MPCA (2007). "Guidance for the use and application of sediment quality targets for the protection of sediment-dwelling organisms in Minnesota." MPCA document number: tdr-gl-04.
9. Schubauer-Berigan, M. and Crane, J.L. (1997). "Survey of sediment quality in the Duluth-Superior harbor." USEPA Great Lakes National Program Office, March 1997. EPA document number: EPA 905-R97-005.
10. Streitz, A, and Johnson, S. (2005). "Detailed investigation of the Minnesota Slip." MPCA Technical Document, MPCA document number: tdr-gl-01.

11. USACE (1986). “U.S. Army Corps of Engineers Sample Handling Protocol for Low, Medium and High Concentration Samples of Hazardous Waste.” October, 1986.

12. USEPA (2000). “Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines.” USEPA document number: EPA 905/R-00/007.

13. U.S. EPA ( 2003). Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/R-02/013.

14. Van den Berg M., Birnbaum L., Bosveld A.T., Brunström B., Cook P., Feeley M., Giesy J.P., Hanberg A., Hasegawa R., Kennedy S.W., Kubiak T., Larsen J.C., van Leeuwen F.X., Liem A.K., Nolt C., Peterson R.E., Poellinger L., Safe S., Schrenk D., Tillitt D., Tysklind M., Younes M., Waern F., Zacharewski T. (1998). “Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife.” Environ Health Perspect. Vol. 106(12), pp. 775–792.

15. Van den Berg, M., Birnbaum, L.S., Denison, M., DeVito, M., Farland, W., Feeley, M., Fiedler, H., Hakansson, H., Hanberg, A., Haws, L., Rose, M., Safe, S., Schrenk, D., Tohyama, C., Tritscher, A., Tuomisto, J., Tysklind, M., Walker, N., Peterson, R.E. (2006) “The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds.” Toxicological Sciences, Vol. 93, pp 223-241.

16. Yan, J., Wang, L., Fu, P.P., and Yu, H. (2004) “Photomutagenicity of 16 Polycyclic Aromatic Hydrocarbons from the US EPA Priority Pollutant List.” Mutation Research/Genetic Toxicology and Environmental Mutagenesis, Vol. 557 (1), pp. 99-108.

# Tables

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112C-103110-CCR-011 | CG-100 | Coast Guard | 46.77736 | -92.09365 | 0.0 | 15.2 | 8.14 |
| S-E08112C-103110-CCR-012 | CG-100 | Coast Guard | 46.77736 | -92.09365 | 25.3 | 55.8 | 8.14 |
| S-E08112C-103110-CCR-015 | CG-101 | Coast Guard | 46.77665 | -92.09405 | 0.0 | 15.2 | 9.30 |
| S-E08112C-103110-CCR-016 | CG-101 | Coast Guard | 46.77665 | -92.09405 | 15.2 | 45.7 | 9.30 |
| S-E08112C-103110-CCR-005 | CG-102 | Coast Guard | 46.7761 | -92.09364 | 0.0 | 15.2 | 3.75 |
| S-E08112C-103110-CCR-006 | CG-102 | Coast Guard | 46.7761 | -92.09364 | 15.2 | 43.3 | 3.75 |
| S-E08112C-103110-CCR-007 | CG-103 | Coast Guard | 46.77561 | -92.09291 | 0.0 | 15.2 | 5.55 |
| S-E08112C-103110-CCR-008 | CG-103 | Coast Guard | 46.77561 | -92.09291 | 25.3 | 58.5 | 5.55 |
| S-E08112C-103110-CCR-009 | CG-104 | Coast Guard | 46.77521 | -92.09384 | 0.0 | 15.2 | 8.47 |
| S-E08112C-103110-CCR-010 | CG-104 | Coast Guard | 46.77521 | -92.09384 | 15.2 | 30.5 | 8.47 |
| S-E08112C-103110-CCR-013 | CG-105 | Coast Guard | 46.77501 | -92.09245 | 0.0 | 15.2 | 2.35 |
| S-E08112C-103110-CCR-014 | CG-105 | Coast Guard | 46.77501 | -92.09245 | 15.2 | 35.7 | 2.35 |
| S-E08112C-103110-CCR-001 | CG-106 | Coast Guard | 46.7746 | -92.09239 | 0.0 | 15.2 | 2.35 |
| S-E08112C-103110-CCR-002 | CG-106 | Coast Guard | 46.7746 | -92.09239 | 0.0 | 15.2 | 2.35 |
| S-E08112C-103110-CCR-003 | CG-106 | Coast Guard | 46.7746 | -92.09239 | 15.2 | 55.8 | 2.35 |
| S-E08112C-103110-CCR-004 | CG-106 | Coast Guard | 46.7746 | -92.09239 | 15.2 | 55.8 | 2.35 |
| S-E08112C-103110-CCR-017 | CG-107 | Coast Guard | 46.77473 | -92.09441 | 0.0 | 15.2 | 5.76 |
| S-E08112C-103110-CCR-018 | CG-107 | Coast Guard | 46.77473 | -92.09441 | 0.0 | 15.2 | 5.76 |
| S-E08112C-103110-CCR-019 | CG-107 | Coast Guard | 46.77473 | -92.09441 | 15.2 | 50.9 | 5.76 |
| S-E08112C-103110-CCR-020 | CG-107 | Coast Guard | 46.77473 | -92.09441 | 15.2 | 50.9 | 5.76 |
| S-E08112C-102910-CCR-007 | CG-108 | Coast Guard | 46.77261 | -92.09318 | 0.0 | 15.2 | 2.87 |
| S-E08112C-102910-CCR-008 | CG-108 | Coast Guard | 46.77261 | -92.09318 | 91.4 | 121.9 | 2.87 |
| S-E08112C-102910-CCR-009 | CG-109 | Coast Guard | 46.7725 | -92.09133 | 0.0 | 15.2 | 1.52 |
| S-E08112C-102910-CCR-010 | CG-109 | Coast Guard | 46.7725 | -92.09133 | 15.2 | 40.5 | 1.52 |
| S-E08112C-103010-CCR-011 | CG-110 | Coast Guard | 46.77148 | -92.09152 | 0.0 | 15.2 | 3.41 |
| S-E08112C-103010-CCR-012 | CG-110 | Coast Guard | 46.77148 | -92.09152 | 91.4 | 121.9 | 3.41 |
| S-E08112C-11210-CCR-003 | CG-111 | Coast Guard | 46.77139 | -92.09283 | 0.0 | 15.2 | 3.32 |
| S-E08112C-11210-CCR-004 | CG-111 | Coast Guard | 46.77139 | -92.09283 | 24.4 | 55.8 | 3.32 |
| S-E08112C-103010-CCR-007 | CG-112 | Coast Guard | 46.77168 | -92.09203 | 0.0 | 15.2 | 3.41 |
| S-E08112C-103010-CCR-008 | CG-112 | Coast Guard | 46.77168 | -92.09203 | 30.5 | 61.0 | 3.41 |
| S-E08112C-103010-CCR-013 | CG-113 | Coast Guard | 46.77125 | -92.09195 | 0.0 | 15.2 | 5.06 |
| S-E08112C-103010-CCR-014 | CG-113 | Coast Guard | 46.77125 | -92.09195 | 15.2 | 45.7 | 5.06 |
| S-E08112C-103010-CCR-009 | CG-114 | Coast Guard | 46.77081 | -92.09165 | 0.0 | 15.2 | 3.08 |
| S-E08112C-103010-CCR-010 | CG-114 | Coast Guard | 46.77081 | -92.09165 | 15.2 | 58.5 | 3.08 |
| S-E08112C-11210-CCR-005 | HI-100 | Hearding Island | 46.75747 | -92.08588 | 0.0 | 15.2 | 1.58 |
| S-E08112C-11210-CCR-006 | HI-100 | Hearding Island | 46.75747 | -92.08588 | 91.4 | 121.9 | 1.58 |
| S-E08112C-11210-CCR-001 | HI-6-M1 | Hearding Island | 46.75979 | -92.08754 | 0.0 | 15.2 | 2.41 |
| S-E08112C-11210-CCR-002 | HI-6-M1 | Hearding Island | 46.75979 | -92.08754 | 45.7 | 76.2 | 2.41 |
| S-E08112C-11210-CCR-009 | HI-9-M1 | Hearding Island | 46.75726 | -92.08245 | 0.0 | 15.2 | 1.52 |
| S-E08112C-11210-CCR-010 | HI-9-M1 | Hearding Island | 46.75726 | -92.08245 | 0.0 | 15.2 | 1.52 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112C-11210-CCR-011 | HI-9-M1 | Hearding Island | 46.75726 | -92.08245 | 15.2 | 68.6 | 1.52 |
| S-E08112C-11210-CCR-012 | HI-9-M1 | Hearding Island | 46.75726 | -92.08245 | 15.2 | 68.6 | 1.52 |
| S-E08112C-103010-CCR-001 | HI-R-1 | Hearding Island | 46.7622 | -92.08391 | 0.0 | 15.2 | 0.70 |
| S-E08112C-103010-CCR-002 | HI-R-1 | Hearding Island | 46.7622 | -92.08391 | 61.0 | 91.4 | 0.70 |
| S-E08112C-103010-CCR-003 | HI-R-2 | Hearding Island | 46.76012 | -92.08184 | 0.0 | 15.2 | 0.49 |
| S-E08112C-103010-CCR-004 | HI-R-2 | Hearding Island | 46.76012 | -92.08184 | 15.2 | 40.5 | 0.49 |
| S-E08112C-103010-CCR-005 | HI-R-3 | Hearding Island | 46.75864 | -92.08022 | 0.0 | 15.2 | 0.55 |
| S-E08112C-103010-CCR-006 | HI-R-3 | Hearding Island | 46.75864 | -92.08022 | 15.2 | 30.5 | 0.55 |
| S-E08112C-101610-CCR-003 | RP-100 | Azcon Slip | 46.76133 | -92.10304 | 0.0 | 15.2 | 8.50 |
| S-E08112C-101610-CCR-004 | RP-100 | Azcon Slip | 46.76133 | -92.10304 | 30.5 | 61.0 | 8.50 |
| S-E08112C-11110-CCR-009 | RP-101 | Murphy Oil | 46.75948 | -92.10066 | 0.0 | 15.2 | 8.93 |
| S-E08112C-11110-CCR-010 | RP-101 | Murphy Oil | 46.75948 | -92.10066 | 15.2 | 38.1 | 8.93 |
| S-E08112C-102510-CCR-001 | RP-I-105 | Cargill B Slip | 46.76846 | -92.10854 | 0.0 | 15.2 | 5.15 |
| S-E08112C-102510-CCR-002 | RP-I-105 | Cargill B Slip | 46.76846 | -92.10854 | 30.5 | 61.0 | 5.15 |
| S-E08112C-102210-CCR-011 | RP-I-107 | Cargill B Slip | 46.76772 | -92.11066 | 0.0 | 15.2 | 6.49 |
| S-E08112C-102210-CCR-012 | RP-I-107 | Cargill B Slip | 46.76772 | -92.11066 | 45.7 | 76.2 | 6.49 |
| E08112A-11508-JC-SE-12 | RP-I-109 | Rice's Point | 46.767822 | -92.11128 | 76.2 | 198.1 | 0.46 |
| E08112A-11508-JC-SE-9-11 | RP-I-109 | Rice's Point | 46.767822 | -92.11128 | 76.2 | 198.1 | 0.46 |
| S-E08112C-102210-CCR-009 | RPI-109A | Cargill B Slip | 46.76774 | -92.11097 | 0.0 | 15.2 | 5.61 |
| S-E08112C-102210-CCR-010 | RPI-109A | Cargill B Slip | 46.76774 | -92.11097 | 45.7 | 76.2 | 5.61 |
| S-E08112C-102510-CCR-003 | RP-I-113 | Cargill B Slip | 46.76894 | -92.10722 | 0.0 | 15.2 | 8.72 |
| S-E08112C-102510-CCR-004 | RP-I-113 | Cargill B Slip | 46.76894 | -92.10722 | 20.4 | 50.9 | 8.72 |
| S-E08112C-102110-CCR-009 | RP-I-127 | General Mills | 46.76858 | -92.11193 | 0.0 | 15.2 | 1.58 |
| S-E08112C-102110-CCR-010 | RP-I-127 | General Mills | 46.76858 | -92.11193 | 30.5 | 61.0 | 1.58 |
| S-E08112C-102210-CCR-007 | RP-I-137 | General Mills | 46.77231 | -92.1044 | 0.0 | 15.2 | 6.40 |
| S-E08112C-102210-CCR-008 | RP-I-137 | General Mills | 46.77231 | -92.1044 | 15.2 | 45.7 | 6.40 |
| E08112A-11508-JC-SE-1-3 | RP-I-2 | Rice's Point | 46.751727 | -92.10147 | 274.3 | 396.2 | 1.52 |
| E08112A-11508-JC-SE-4 | RP-I-2 | Rice's Point | 46.751727 | -92.10147 | 274.3 | 396.2 | 1.52 |
| S-E08112C-101310-CCR-003 | RP-I-2A | Boat Landing | 46.75161 | -92.10143 | 0.0 | 15.2 | 1.71 |
| S-E08112C-101310-CCR-004 | RP-I-2A | Boat Landing | 46.75161 | -92.10143 | 61.0 | 91.4 | 1.71 |
| S-E08112C-11110-CCR-005 | RP-I-35 | Murphy Oil | 46.75818 | -92.10395 | 0.0 | 15.2 | 6.04 |
| S-E08112C-11110-CCR-006 | RP-I-35 | Murphy Oil | 46.75818 | -92.10395 | 15.2 | 48.2 | 6.04 |
| S-E08112C-11110-CCR-007 | RP-I-39 | Murphy Oil | 46.7594 | -92.10175 | 0.0 | 15.2 | 5.46 |
| S-E08112C-11110-CCR-008 | RP-I-39 | Murphy Oil | 46.7594 | -92.10175 | 15.2 | 63.4 | 5.46 |
| S-E08112C-11110-CCR-003 | RP-I-41 | Murphy Oil | 46.75998 | -92.10053 | 0.0 | 15.2 | 8.05 |
| S-E08112C-11110-CCR-004 | RP-I-41 | Murphy Oil | 46.75998 | -92.10053 | 45.7 | 76.2 | 8.05 |
| S-E08112C-101510-CCR-013 | RP-I-46 | Azcon Slip | 46.762361 | -92.09992 | 0.0 | 15.2 | 9.88 |
| S-E08112C-101510-CCR-014 | RP-I-46 | Azcon Slip | 46.762361 | -92.09992 | 15.2 | 50.9 | 9.88 |
| S-E08112C-101610-CCR-001 | RP-I-52 | Azcon Slip | 46.76057 | -92.10507 | 0.0 | 15.2 | 5.18 |
| S-E08112C-101610-CCR-002 | RP-I-52 | Azcon Slip | 46.76057 | -92.10507 | 30.5 | 61.0 | 5.18 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112C-101510-CCR-005 | RP-I-53 | Azcon Slip | 46.76076 | -92.10549 | 0.0 | 15.2 | 3.38 |
| S-E08112C-101510-CCR-006 | RP-I-53 | Azcon Slip | 46.76076 | -92.10549 | 15.2 | 50.9 | 3.38 |
| S-E08112C-101510-CCR-009 | RP-I-58 | Azcon Slip | 46.761919 | -92.10213 | 0.0 | 15.2 | 7.13 |
| S-E08112C-101510-CCR-010 | RP-I-58 | Azcon Slip | 46.761919 | -92.10213 | 45.7 | 76.2 | 7.13 |
| S-E08112C-101310-CCR-005 | RP-I-6 | Boat Landing | 46.75026 | -92.10055 | 0.0 | 15.2 | 7.65 |
| S-E08112C-101310-CCR-006 | RP-I-6 | Boat Landing | 46.75026 | -92.10055 | 30.5 | 61.0 | 7.65 |
| S-E08112C-102810-CCR-015 | RP-I-70 | AGP Slip | 46.76253 | -92.10715 | 0.0 | 15.2 | 7.38 |
| S-E08112C-102810-CCR-016 | RP-I-70 | AGP Slip | 46.76253 | -92.10715 | 15.2 | 55.8 | 7.38 |
| S-E08112C-102910-CCR-003 | RP-I-74 | AGP Slip | 46.76377 | -92.10372 | 0.0 | 15.2 | 8.47 |
| S-E08112C-102910-CCR-004 | RP-I-74 | AGP Slip | 46.76377 | -92.10372 | 15.2 | 55.8 | 8.47 |
| S-E08112C-102910-CCR-005 | RP-I-77 | AGP Slip | 46.76412 | -92.10252 | 0.0 | 15.2 | 9.05 |
| S-E08112C-102910-CCR-006 | RP-I-77 | AGP Slip | 46.76412 | -92.10252 | 15.2 | 50.9 | 9.05 |
| S-E08112C-102810-CCR-009 | RP-I-82 | Cargill Slip | 46.76593 | -92.10447 | 0.0 | 15.2 | 4.82 |
| S-E08112C-102810-CCR-010 | RP-I-82 | Cargill Slip | 46.76593 | -92.10447 | 30.5 | 53.3 | 4.82 |
| S-E08112C-102510-CCR-011 | RP-I-86 | Cargill Slip | 46.76448 | -92.10863 | 0.0 | 15.2 | 8.17 |
| S-E08112C-102510-CCR-012 | RP-I-86 | Cargill Slip | 46.76448 | -92.10863 | 30.5 | 61.0 | 8.17 |
| E08112A-11608-JC-SE-1-4 | RP-I-88 | Rice's Point | 46.763881 | -92.11018 | 548.6 | 670.6 | 4.05 |
| S-E08112C-102510-CCR-007 | RP-I-88A | Cargill Slip | 46.76388 | -92.11016 | 0.0 | 15.2 | 4.24 |
| S-E08112C-102510-CCR-008 | RP-I-88A | Cargill Slip | 46.76388 | -92.11016 | 20.4 | 55.8 | 4.24 |
| S-E08112C-101310-CCR-007 | RP-I-9 | Boat Landing | 46.75135 | -92.10053 | 0.0 | 15.2 | 0.34 |
| S-E08112C-101310-CCR-008 | RP-I-9 | Boat Landing | 46.75135 | -92.10053 | 15.2 | 42.7 | 0.34 |
| S-E08112C-102810-CCR-003 | RP-I-93 | Cargill Slip | 46.76563 | -92.1063 | 0.0 | 15.2 | 9.27 |
| S-E08112C-102810-CCR-004 | RP-I-93 | Cargill Slip | 46.76563 | -92.1063 | 30.5 | 83.8 | 9.27 |
| S-E08112C-102810-CCR-005 | RP-I-94 | Cargill Slip | 46.76597 | -92.10563 | 0.0 | 15.2 | 7.92 |
| S-E08112C-102810-CCR-006 | RP-I-94 | Cargill Slip | 46.76597 | -92.10563 | 0.0 | 15.2 | 7.92 |
| S-E08112C-102810-CCR-007 | RP-I-94 | Cargill Slip | 46.76597 | -92.10563 | 30.5 | 61.0 | 7.92 |
| S-E08112C-102810-CCR-008 | RP-I-94 | Cargill Slip | 46.76597 | -92.10563 | 30.5 | 61.0 | 7.92 |
| E08112A-11508-JC-SE-5-7 | RP-M-19 | Rice's Point | 46.758817 | -92.10358 | 213.4 | 335.3 | 1.37 |
| E08112A-11508-JC-SE-8 | RP-M-19 | Rice's Point | 46.758817 | -92.10358 | 213.4 | 335.3 | 1.37 |
| S-E08112C-11110-CCR-001 | RP-M-19A | Murphy Oil | 46.75863 | -92.10347 | 0.0 | 15.2 | 5.46 |
| S-E08112C-11110-CCR-002 | RP-M-19A | Murphy Oil | 46.75863 | -92.10347 | 15.2 | 35.7 | 5.46 |
| S-E08112C-101310-CCR-001 | RP-M-2 | Boat Landing | 46.75154 | -92.10105 | 0.0 | 15.2 | 1.10 |
| S-E08112C-101310-CCR-002 | RP-M-2 | Boat Landing | 46.75154 | -92.10105 | 15.2 | 30.5 | 1.10 |
| S-E08112C-11110-CCR-011 | RP-M-20 | Murphy Oil | 46.75946 | -92.10151 | 0.0 | 15.2 | 5.61 |
| S-E08112C-11110-CCR-012 | RP-M-20 | Murphy Oil | 46.75946 | -92.10151 | 0.0 | 15.2 | 5.61 |
| S-E08112C-11110-CCR-013 | RP-M-20 | Murphy Oil | 46.75946 | -92.10151 | 30.5 | 61.0 | 5.61 |
| S-E08112C-11110-CCR-014 | RP-M-20 | Murphy Oil | 46.75946 | -92.10151 | 30.5 | 61.0 | 5.61 |
| S-E08112C-101510-CCR-007 | RP-M-26 | Azcon Slip | 46.76089 | -92.10446 | 0.0 | 15.2 | 5.85 |
| S-E08112C-101510-CCR-008 | RP-M-26 | Azcon Slip | 46.76089 | -92.10446 | 91.4 | 121.9 | 5.85 |
| S-E08112C-101510-CCR-011 | RP-M-28 | Azcon Slip | 46.76195 | -92.10184 | 0.0 | 15.2 | 7.71 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112C-101510-CCR-012 | RP-M-28 | Azcon Slip | 46.76195 | -92.10184 | 15.2 | 30.5 | 7.71 |
| S-E08112C-102910-CCR-001 | RP-M-33 | AGP Slip | 46.76311 | -92.10559 | 0.0 | 15.2 | 6.25 |
| S-E08112C-102910-CCR-002 | RP-M-33 | AGP Slip | 46.76311 | -92.10559 | 30.5 | 61.0 | 6.25 |
| S-E08112C-102810-CCR-011 | RP-M-35 | AGP Slip | 46.76279 | -92.10703 | 0.0 | 15.2 | 5.91 |
| S-E08112C-102810-CCR-012 | RP-M-35 | AGP Slip | 46.76279 | -92.10703 | 30.5 | 61.0 | 5.91 |
| S-E08112C-102810-CCR-001 | RP-M-41 | Cargill Slip | 46.765161 | -92.10674 | 0.0 | 15.2 | 6.80 |
| S-E08112C-102810-CCR-002 | RP-M-41 | Cargill Slip | 46.765161 | -92.10674 | 15.2 | 40.5 | 6.80 |
| S-E08112C-102510-CCR-009 | RP-M-44 | Cargill Slip | 46.76432 | -92.10937 | 0.0 | 15.2 | 7.56 |
| S-E08112C-102510-CCR-010 | RP-M-44 | Cargill Slip | 46.76432 | -92.10937 | 30.5 | 61.0 | 7.56 |
| S-E08112C-102510-CCR-005 | RP-M-57 | Cargill B Slip | 46.76935 | -92.10602 | 0.0 | 15.2 | 9.60 |
| S-E08112C-102510-CCR-006 | RP-M-57 | Cargill B Slip | 46.76935 | -92.10602 | 15.2 | 38.1 | 9.60 |
| S-E08112C-102210-CCR-001 | RP-M-59 | General Mills | 46.77074 | -92.10628 | 0.0 | 15.2 | 6.16 |
| S-E08112C-102210-CCR-002 | RP-M-59 | General Mills | 46.77074 | -92.10628 | 0.0 | 15.2 | 6.16 |
| S-E08112C-102210-CCR-003 | RP-M-59 | General Mills | 46.77074 | -92.10628 | 30.5 | 61.0 | 6.16 |
| S-E08112C-102210-CCR-004 | RP-M-59 | General Mills | 46.77074 | -92.10628 | 30.5 | 61.0 | 6.16 |
| S-E08112C-102810-CCR-013 | RP-O-16 | AGP Slip | 46.76315 | -92.10596 | 0.0 | 15.2 | 5.76 |
| S-E08112C-102810-CCR-014 | RP-O-16 | AGP Slip | 46.76315 | -92.10596 | 61.0 | 91.4 | 5.76 |
| S-E08112C-102110-CCR-013 | RP-O-26 | General Mills | 46.77023 | -92.10796 | 0.0 | 15.2 | 6.34 |
| S-E08112C-102110-CCR-014 | RP-O-26 | General Mills | 46.77023 | -92.10796 | 61.0 | 91.4 | 6.34 |
| S-E08112C-102110-CCR-011 | RP-O-27 | General Mills | 46.76944 | -92.11076 | 0.0 | 15.2 | 8.14 |
| S-E08112C-102110-CCR-012 | RP-O-27 | General Mills | 46.76944 | -92.11076 | 30.5 | 61.0 | 8.14 |
| S-E08112C-102210-CCR-005 | RP-O-28 | General Mills | 46.77059 | -92.10746 | 0.0 | 15.2 | 6.19 |
| S-E08112C-102210-CCR-006 | RP-O-28 | General Mills | 46.77059 | -92.10746 | 15.2 | 45.7 | 6.19 |
| S-E08112B-030610-JC-019 | S2-12 | Slip 2 | 46.77774 | -92.10387 | 0.0 | 15.2 | 6.10 |
| S-E08112B-030610-JC-020 | S2-12 | Slip 2 | 46.77774 | -92.10387 | 30.5 | 61.0 | 6.10 |
| S-E08112B-030610-JC-041 | S2-12 | Slip 2 | 46.77774 | -92.10387 | 30.5 | 61.0 | 6.10 |
| S-E08112B-030610-JC-025 | S2-15 | Slip 2 | 46.77814 | -92.1046 | 0.0 | 15.2 | 4.45 |
| S-E08112B-030610-JC-026 | S2-15 | Slip 2 | 46.77814 | -92.1046 | 15.2 | 34.4 | 4.45 |
| S-E08112B-030610-JC-023 | S2-5 | Slip 2 | 46.77692 | -92.1031 | 0.0 | 15.2 | 6.16 |
| S-E08112B-030610-JC-024 | S2-5 | Slip 2 | 46.77692 | -92.1031 | 15.2 | 43.3 | 6.16 |
| S-E08112B-030610-JC-021 | S2-7 | Slip 2 | 46.77716 | -92.1034 | 0.0 | 15.2 | 5.94 |
| S-E08112B-030610-JC-022 | S2-7 | Slip 2 | 46.77716 | -92.1034 | 15.2 | 30.5 | 5.94 |
| S-E08112B-030810-JC-029 | S3-10 | Slip 3 | 46.7766 | -92.10537 | 0.0 | 15.2 | 4.36 |
| S-E08112B-030810-JC-030 | S3-10 | Slip 3 | 46.7766 | -92.10537 | 45.7 | 76.2 | 4.36 |
| S-E08112B-030810-JC-027 | S3-14 | Slip 3 | 46.77712 | -92.10586 | 0.0 | 15.2 | 3.72 |
| S-E08112B-030810-JC-028 | S3-14 | Slip 3 | 46.77712 | -92.10586 | 32.9 | 63.4 | 3.72 |
| S-E08112B-030810-JC-033 | S3-6 | Slip 3 | 46.77612 | -92.10394 | 0.0 | 15.2 | 5.97 |
| S-E08112B-030810-JC-034 | S3-6 | Slip 3 | 46.77612 | -92.10394 | 22.9 | 53.3 | 5.97 |
| S-E08112B-030810-JC-031 | S3-8 | Slip 3 | 46.77634 | -92.10497 | 0.0 | 15.2 | 5.21 |
| S-E08112B-030810-JC-032 | S3-8 | Slip 3 | 46.77634 | -92.10497 | 15.2 | 42.1 | 5.21 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112B-030110-JC-005 | SB-1 | Superior Bay | 46.71298 | -92.03265 | 0.0 | 15.2 | 1.62 |
| S-E08112B-030410-JC-006 | SB-1 | Superior Bay | 46.71298 | -92.03265 | 63.4 | 95.4 | 1.62 |
| S-E08112B-030110-JC-003 | SB-11 | Superior Bay | 46.7257 | -92.049 | 0.0 | 15.2 | 1.92 |
| S-E08112B-030410-JC-004 | SB-11 | Superior Bay | 46.7257 | -92.049 | 91.4 | 121.9 | 1.92 |
| S-E08112B-030310-JC-015 | SB-25 | Superior Bay | 46.74004 | -92.07078 | 0.0 | 15.2 | 2.59 |
| S-E08112B-030310-JC-016 | SB-25 | Superior Bay | 46.74004 | -92.07078 | 15.2 | 44.5 | 2.59 |
| S-E08112B-030210-JC-013 | SB-28 | Superior Bay | 46.74236 | -92.07909 | 0.0 | 15.2 | 2.96 |
| S-E08112B-030410-JC-014 | SB-28 | Superior Bay | 46.74236 | -92.07909 | 32.9 | 64.9 | 2.96 |
| S-E08112B-030310-JC-017 | SB-30 | Superior Bay | 46.74217 | -92.07153 | 0.0 | 15.2 | 1.80 |
| S-E08112B-030310-JC-018 | SB-30 | Superior Bay | 46.74217 | -92.07153 | 15.2 | 44.5 | 1.80 |
| S-E08112B-030210-JC-011 | SB-40 | Superior Bay | 46.74782 | -92.07096 | 0.0 | 15.2 | 1.16 |
| S-E08112B-030510-JC-012 | SB-40 | Superior Bay | 46.74782 | -92.07096 | 15.2 | 40.5 | 1.16 |
| S-E08112B-030210-JC-009 | SB-43 | Superior Bay | 46.75018 | -92.07922 | 0.0 | 15.2 | 2.41 |
| S-E08112B-030410-JC-010 | SB-43 | Superior Bay | 46.75018 | -92.07922 | 71.0 | 101.5 | 2.41 |
| S-E08112B-030210-JC-007 | SB-45 | Superior Bay | 46.75431 | -92.08483 | 0.0 | 15.2 | 2.32 |
| S-E08112B-030510-JC-008 | SB-45 | Superior Bay | 46.75431 | -92.08483 | 71.0 | 101.5 | 2.32 |
| S-E08112B-030110-JC-001 | SB-9 | Superior Bay | 46.72588 | -92.05658 | 0.0 | 15.2 | 4.57 |
| S-E08112B-030410-JC-002 | SB-9 | Superior Bay | 46.72588 | -92.05658 | 91.4 | 121.9 | 4.57 |
| S-E08112C-102010-CCR-013 | SC-12A | Slip C | 46.77181 | -92.10955 | 0.0 | 15.2 | 4.91 |
| S-E08112C-102010-CCR-014 | SC-12A | Slip C | 46.77181 | -92.10955 | 30.5 | 61.0 | 4.91 |
| S-E08112C-102010-CCR-015 | SC-16A | Slip C | 46.77237 | -92.10935 | 0.0 | 15.2 | 5.03 |
| S-E08112C-102010-CCR-016 | SC-16A | Slip C | 46.77237 | -92.10935 | 61.0 | 91.4 | 5.03 |
| S-E08112C-102010-CCR-001 | SC-1A | Slip C | 46.77081 | -92.11146 | 0.0 | 15.2 | 4.11 |
| S-E08112C-102010-CCR-002 | SC-1A | Slip C | 46.77081 | -92.11146 | 0.0 | 15.2 | 4.11 |
| S-E08112C-102010-CCR-003 | SC-1A | Slip C | 46.77081 | -92.11146 | 76.2 | 106.7 | 4.11 |
| S-E08112C-102010-CCR-004 | SC-1A | Slip C | 46.77081 | -92.11146 | 76.2 | 106.7 | 4.11 |
| S-E08112C-102110-CCR-001 | SC-26A | Slip C | 46.77322 | -92.10776 | 0.0 | 15.2 | 7.13 |
| S-E08112C-102110-CCR-002 | SC-26A | Slip C | 46.77322 | -92.10776 | 15.2 | 45.7 | 7.13 |
| S-E08112C-102110-CCR-003 | SC-31A | Slip C | 46.77377 | -92.10642 | 0.0 | 15.2 | 5.27 |
| S-E08112C-102110-CCR-004 | SC-31A | Slip C | 46.77377 | -92.10642 | 30.5 | 61.0 | 5.27 |
| S-E08112C-102110-CCR-005 | SC-33 | Slip C | 46.773881 | -92.10548 | 0.0 | 15.2 | 5.85 |
| S-E08112C-102110-CCR-006 | SC-33 | Slip C | 46.773881 | -92.10548 | 30.5 | 61.0 | 5.85 |
| S-E08112C-102010-CCR-005 | SC-4 | Slip C | 46.77092 | -92.11118 | 0.0 | 15.2 | 5.12 |
| S-E08112C-102010-CCR-006 | SC-4 | Slip C | 46.77092 | -92.11118 | 61.0 | 91.4 | 5.12 |
| S-E08112C-102110-CCR-007 | SC-40 | Slip C | 46.77446 | -92.10493 | 0.0 | 15.2 | 9.57 |
| S-E08112C-102110-CCR-008 | SC-40 | Slip C | 46.77446 | -92.10493 | 30.5 | 61.0 | 9.57 |
| S-E08112C-102010-CCR-007 | SC-5A | Slip C | 46.77097 | -92.11087 | 0.0 | 15.2 | 5.36 |
| S-E08112C-102010-CCR-008 | SC-5A | Slip C | 46.77097 | -92.11087 | 91.4 | 121.9 | 5.36 |
| S-E08112C-102010-CCR-009 | SC-9A | Slip C | 46.77149 | -92.11073 | 0.0 | 15.2 | 5.52 |
| S-E08112C-102010-CCR-010 | SC-9A | Slip C | 46.77149 | -92.11073 | 0.0 | 15.2 | 5.52 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112C-102010-CCR-011 | SC-9A | Slip C | 46.77149 | -92.11073 | 61.0 | 91.4 | 5.52 |
| S-E08112C-102010-CCR-012 | SC-9A | Slip C | 46.77149 | -92.11073 | 61.0 | 91.4 | 5.52 |
| S-E08112C-101910-CCR-011 | TF-10 | 21st Ave Bay | 46.75577 | -92.12405 | 0.0 | 15.2 | 0.73 |
| S-E08112C-101910-CCR-012 | TF-10 | 21st Ave Bay | 46.75577 | -92.12405 | 30.5 | 61.0 | 0.73 |
| S-E08112C-101610-CCR-007 | TF-100 | 21st Ave Bay | 46.75569 | -92.12547 | 0.0 | 15.2 | 0.34 |
| S-E08112C-101610-CCR-008 | TF-100 | 21st Ave Bay | 46.75569 | -92.12547 | 61.0 | 91.4 | 0.34 |
| S-E08112C-101610-CCR-009 | TF-101 | 21st Ave Bay | 46.75666 | -92.11497 | 0.0 | 15.2 | 9.57 |
| S-E08112C-101610-CCR-010 | TF-101 | 21st Ave Bay | 46.75666 | -92.11497 | 91.4 | 121.9 | 9.57 |
| S-E08112C-101610-CCR-005 | TF-102 | 21st Ave Bay | 46.75972 | -92.11584 | 0.0 | 15.2 | 1.10 |
| S-E08112C-101610-CCR-006 | TF-102 | 21st Ave Bay | 46.75972 | -92.11584 | 30.5 | 61.0 | 1.10 |
| S-E08112C-101810-CCR-001 | TF-103 | 21st Ave Bay | 46.76355 | -92.12034 | 0.0 | 15.2 | 0.34 |
| S-E08112C-101810-CCR-002 | TF-103 | 21st Ave Bay | 46.76355 | -92.12034 | 15.2 | 30.5 | 0.34 |
| S-E08112C-11210-CCR-007 | TF-103A | 21st Ave Bay | 46.7641 | -92.1207 | 0.0 | 15.2 | 0.94 |
| S-E08112C-11210-CCR-008 | TF-103A | 21st Ave Bay | 46.7641 | -92.1207 | 15.2 | 32.9 | 0.94 |
| S-E08112C-101910-CCR-009 | TF-12A | 21st Ave Bay | 46.75526 | -92.12122 | 0.0 | 15.2 | 1.74 |
| S-E08112C-101910-CCR-010 | TF-12A | 21st Ave Bay | 46.75526 | -92.12122 | 30.5 | 61.0 | 1.74 |
| S-E08112C-101410-CCR-007 | TF-15A | 21st Ave Bay | 46.75496 | -92.116 | 0.0 | 15.2 | 8.60 |
| S-E08112C-101410-CCR-008 | TF-15A | 21st Ave Bay | 46.75496 | -92.116 | 61.0 | 91.4 | 8.60 |
| S-E08112C-101510-CCR-001 | TF-19A | 21st Ave Bay | 46.757161 | -92.12373 | 0.0 | 15.2 | 1.22 |
| S-E08112C-101510-CCR-002 | TF-19A | 21st Ave Bay | 46.757161 | -92.12373 | 61.0 | 91.4 | 1.22 |
| S-E08112C-101410-CCR-009 | TF-1A | 21st Ave Bay | 46.75157 | -92.10384 | 0.0 | 28.0 | 0.58 |
| S-E08112C-101910-CCR-007 | TF-21A | 21st Ave Bay | 46.75712 | -92.11998 | 0.0 | 15.2 | 1.65 |
| S-E08112C-101910-CCR-008 | TF-21A | 21st Ave Bay | 46.75712 | -92.11998 | 61.0 | 91.4 | 1.65 |
| S-E08112C-101510-CCR-003 | TF-22A | 21st Ave Bay | 46.75619 | -92.11987 | 0.0 | 15.2 | 1.98 |
| S-E08112C-101510-CCR-004 | TF-22A | 21st Ave Bay | 46.75619 | -92.11987 | 61.0 | 91.4 | 1.98 |
| S-E08112C-101910-CCR-005 | TF-23A | 21st Ave Bay | 46.75637 | -92.11775 | 0.0 | 15.2 | 1.65 |
| S-E08112C-101910-CCR-006 | TF-23A | 21st Ave Bay | 46.75637 | -92.11775 | 91.4 | 121.9 | 1.65 |
| S-E08112C-101810-CCR-009 | TF-24 | 21st Ave Bay | 46.75643 | -92.11519 | 0.0 | 15.2 | 9.81 |
| S-E08112C-101810-CCR-010 | TF-24 | 21st Ave Bay | 46.75643 | -92.11519 | 0.0 | 15.2 | 9.81 |
| S-E08112C-101810-CCR-011 | TF-24 | 21st Ave Bay | 46.75643 | -92.11519 | 91.4 | 121.9 | 9.81 |
| S-E08112C-101810-CCR-012 | TF-24 | 21st Ave Bay | 46.75643 | -92.11519 | 91.4 | 121.9 | 9.81 |
| S-E08112C-101810-CCR-003 | TF-25 | 21st Ave Bay | 46.7563 | -92.11406 | 0.0 | 15.2 | 9.20 |
| S-E08112C-101810-CCR-004 | TF-25 | 21st Ave Bay | 46.7563 | -92.11406 | 91.4 | 121.9 | 9.20 |
| S-E08112C-101810-CCR-005 | TF-26A | 21st Ave Bay | 46.756989 | -92.1116 | 0.0 | 15.2 | 6.74 |
| S-E08112C-101810-CCR-006 | TF-26A | 21st Ave Bay | 46.756989 | -92.1116 | 61.0 | 91.4 | 6.74 |
| S-E08112C-101910-CCR-013 | TF-2A | 21st Ave Bay | 46.75214 | -92.122 | 0.0 | 15.2 | 0.64 |
| S-E08112C-101910-CCR-014 | TF-2A | 21st Ave Bay | 46.75214 | -92.122 | 15.2 | 50.9 | 0.64 |
| S-E08112C-101910-CCR-015 | TF-32A | 21st Ave Bay | 46.75801 | -92.11366 | 0.0 | 15.2 | 1.52 |
| S-E08112C-101910-CCR-016 | TF-32A | 21st Ave Bay | 46.75801 | -92.11366 | 15.2 | 45.7 | 1.52 |
| S-E08112B-030910-JC-037 | TF-34 | 21st Ave Bay | 46.75951 | -92.12021 | 0.0 | 15.2 | 2.16 |

| Sample Field ID | Station ID | Study Area | Latitude | Longitude | Upper Collection Depth (cm) | Lower Collection Depth (cm) | Water Depth (m) |
|---|---|---|---|---|---|---|---|
| S-E08112B-030910-JC-038 | TF-34 | 21st Ave Bay | 46.75951 | -92.12021 | 91.4 | 121.9 | 2.16 |
| S-E08112B-030910-JC-042 | TF-34 | 21st Ave Bay | 46.75951 | -92.12021 | 91.4 | 121.9 | 2.16 |
| S-E08112C-101810-CCR-013 | TF-36 | 21st Ave Bay | 46.759 | -92.11729 | 0.0 | 15.2 | 7.53 |
| S-E08112C-101810-CCR-014 | TF-36 | 21st Ave Bay | 46.759 | -92.11729 | 91.4 | 121.9 | 7.53 |
| S-E08112B-030910-JC-039 | TF-39 | 21st Ave Bay | 46.76006 | -92.12118 | 0.0 | 15.2 | 0.82 |
| S-E08112B-030910-JC-040 | TF-39 | 21st Ave Bay | 46.76006 | -92.12118 | 15.2 | 43.3 | 0.82 |
| S-E08112C-101910-CCR-003 | TF-3A | 21st Ave Bay | 46.75359 | -92.12007 | 0.0 | 15.2 | 1.58 |
| S-E08112C-101910-CCR-004 | TF-3A | 21st Ave Bay | 46.75359 | -92.12007 | 91.4 | 121.9 | 1.58 |
| S-E08112C-101910-CCR-001 | TF-4 | 21st Ave Bay | 46.75457 | -92.124 | 0.0 | 15.2 | 0.82 |
| S-E08112C-101910-CCR-002 | TF-4 | 21st Ave Bay | 46.75457 | -92.124 | 61.0 | 91.4 | 0.82 |
| S-E08112C-101810-CCR-007 | TF-41 | 21st Ave Bay | 46.75975 | -92.11797 | 0.0 | 15.2 | 6.58 |
| S-E08112C-101810-CCR-008 | TF-41 | 21st Ave Bay | 46.75975 | -92.11797 | 91.4 | 121.9 | 6.58 |
| S-E08112B-030910-JC-035 | TF-44 | 21st Ave Bay | 46.76184 | -92.11853 | 0.0 | 15.2 | 2.23 |
| S-E08112B-030910-JC-036 | TF-44 | 21st Ave Bay | 46.76184 | -92.11853 | 76.2 | 106.7 | 2.23 |
| S-E08112C-101410-CCR-005 | TF-50A | 21st Ave Bay | 46.76357 | -92.11943 | 0.0 | 15.2 | 0.30 |
| S-E08112C-101410-CCR-006 | TF-50A | 21st Ave Bay | 46.76357 | -92.11943 | 15.2 | 38.1 | 0.30 |
| S-E08112C-101410-CCR-001 | TF-8A | 21st Ave Bay | 46.75412 | -92.1088 | 0.0 | 15.2 | 0.70 |
| S-E08112C-101410-CCR-002 | TF-8A | 21st Ave Bay | 46.75412 | -92.1088 | 30.5 | 61.0 | 0.70 |
| S-E08112C-101410-CCR-003 | TF-8A | 21st Ave Bay | 46.75412 | -92.1088 | 0.0 | 15.2 | 0.70 |
| S-E08112C-101410-CCR-004 | TF-8A | 21st Ave Bay | 46.75412 | -92.1088 | 30.5 | 61.0 | 0.70 |

| Study Area | Number of Sediment Samples | Percentage Samples within Risk Ranges of Mean PEC-Qs | | |
|---|---|---|---|---|
| | | <0.1 (Low Risk) | 0.1 to 0.6 (Moderate Risk) | > 0.6 (High Risk) |
| *Top of Sediment (0-0.5 ft)* | | | | |
| 21st Avenue Bay | 27 | 11 | 89 | 0 |
| AGP Slip | 6 | 33 | 50 | 17 |
| Azcon Slip | 7 | 0 | 86 | 14 |
| Boat Landing | 4 | 0 | 75 | 25 |
| Cargill Slip | 7 | 29 | 71 | 0 |
| Cargill B Slip | 5 | 60 | 40 | 0 |
| Coast Guard | 15 | 27 | 73 | 0 |
| General Mills | 6 | 83 | 17 | 0 |
| Hearding Island | 6 | 33 | 67 | 0 |
| Murphy Oil | 6 | 17 | 67 | 17 |
| Rice's Point (2008 Phase)* | 0 | - | - | - |
| Slip C | 10 | 10 | 90 | 0 |
| Slip 2 | 4 | 0 | 75 | 25 |
| Slip 3 | 4 | 25 | 75 | 0 |
| Superior Bay | 9 | 56 | 44 | 0 |
| ***Total*** | ***116*** | ***25*** | ***71*** | ***4*** |
| *Sample at Depth ( > 0.5 ft)* | | | | |
| 21st Avenue Bay | 26 | 15 | 73 | 12 |
| AGP Slip | 6 | 17 | 67 | 17 |
| Azcon Slip | 7 | 14 | 43 | 43 |
| Boat Landing | 4 | 25 | 50 | 25 |
| Cargill Slip | 7 | 29 | 71 | 0 |
| Cargill B Slip | 5 | 60 | 40 | 0 |
| Coast Guard | 15 | 40 | 60 | 0 |
| General Mills | 6 | 67 | 33 | 0 |
| Hearding Island | 6 | 33 | 67 | 0 |
| Murphy Oil | 6 | 33 | 50 | 17 |
| Rices Point (2008 Phase) | 4 | 75 | 25 | 0 |
| Slip C | 10 | 30 | 70 | 0 |
| Slip 2 | 4 | 0 | 75 | 25 |
| Slip 3 | 4 | 50 | 25 | 25 |
| Superior Bay | 9 | 44 | 56 | 0 |
| ***Total*** | ***119*** | ***32*** | ***60*** | ***8*** |

* Surface sediment samples were not collected

**Tables 8.2 through 8.16: Mean PEC-Qs**

This tables includes the mean PEC-Qs calculated for each sample location

The following notes are useful in interpreting data presented in the Tables 8.2 through 8.16

Note 1. Only 13 priority PAHs are included in calculating total PAHs for the mean-PEC-Q calculation
Note 2. Sum of individual Aroclors are used in calculating total PCBs
Note 3. Only chemicals with reliable PECs are used in the calculation
Note 4. Calculation is based on dry weight concentrations of contaminants
Note 5. The maximum detected concentration was used when duplicate samples are available
Note 6. Non-detect data are handled using the following assumptions:
- PCBs and PAHs: Zero for the Aroclors/PAHs that are all non-detects within a study area
- PCBs and PAHs: 1/2 of the reporting limit for the Aroclors/PAHs that are detected in more than one sample within a study area
- Metals: Zero for the metals/pesticides that are all non-detects within a study area
- Metals: 1/2 of the reporting limit for the metals/pesticides that are detected in more than one sample within a study area

| | | |
|---|---|---|
| Note 7. | xxx | Mean PEC-Q value is within the mean PEC-Q low risk range of < 0.1 |
| Note 8. | xxx | Mean PEC-Q value is within the mean PEC-Q moderate risk range of 0.1 - 0.6 |
| Note 9. | **xxx** | Mean PEC-Q value is in the mean PEC-Q high risk range of > 0.6 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| TF-44 | 0-0.5 | 4.5 | 0.81 | 38.0 | 50.0 | 72.0 | 28.0 | 200 | 8.815 | 0.153 | 0.364 | 0.387 | 0.226 | 0.326 |
| TF-44 | 2.5-3.5 | 2.4 | 0.53 | 21.0 | 26.0 | 46.0 | 170.0 | 97 | 4.314 | 0.175 | 0.659 | 0.189 | 0.259 | 0.369 |
| TF-34 | 0-0.5 | 4.7 | 0.99 | 57.0 | 62.0 | 73.0 | 40.0 | 250 | 5.913 | 0.180 | 0.458 | 0.259 | 0.266 | 0.328 |
| TF-34 | 3-4 | 2.7 | 0.36 | 35.0 | 22.0 | 10.0 | 27.0 | 94 | 1.156 | 0.120 | 0.208 | 0.051 | 0.178 | 0.145 |
| TF-39 | 0-0.5 | 4.7 | 1.80 | 17.0 | 37.0 | 82.0 | 12.0 | 210 | 3.727 | 0.204 | 0.321 | 0.163 | 0.302 | 0.262 |
| TF-39 | 0.5-1.42 | 3.7 | 1.40 | 9.2 | 21.0 | 47.0 | 8.2 | 150 | 4.220 | 0.350 | 0.211 | 0.185 | 0.518 | 0.305 |
| TF-8A | 0-0.5 | 2.8 | 0.99 | 14.0 | 15.0 | 13.0 | 13.0 | 54 | 1.199 | 0.036 | 0.142 | 0.053 | 0.053 | 0.083 |
| TF-8A | 1-2 | 5.2 | 2.80 | 37.0 | 37.0 | 64.0 | 28.0 | 200 | 4.857 | 0.063 | 0.402 | 0.213 | 0.093 | 0.236 |
| TF-50A | 0-0.5 | 2.9 | 1.10 | 18.0 | 53.0 | 41.0 | 19.0 | 86 | 3.632 | 0.068 | 0.246 | 0.159 | 0.100 | 0.169 |
| TF-50A | 0.5-1.25 | 2.3 | 1.10 | 16.0 | 34.0 | 46.0 | 18.0 | 83 | 4.528 | 0.054 | 0.225 | 0.199 | 0.080 | 0.168 |
| TF-15A | 0-0.5 | 5.3 | 1.80 | 44.0 | 42.0 | 40.0 | 34.0 | 160 | 1.183 | 0.064 | 0.366 | 0.052 | 0.095 | 0.171 |
| TF-15A | 2-3 | 3.8 | 1.80 | 37.0 | 32.0 | 32.0 | 28.0 | 140 | 0.783 | 0.106 | 0.308 | 0.034 | 0.156 | 0.166 |
| TF-1A | 0-0.92 | 2.0 | 0.29 | 5.2 | 4.4 | 4.1 | 5.5 | 18 | 0.442 | 0.060 | 0.054 | 0.019 | 0.089 | 0.054 |
| TF-19A | 0-0.5 | 4.6 | 1.90 | 31.0 | 41.0 | 41.0 | 31.0 | 170 | 4.897 | 0.108 | 0.343 | 0.215 | 0.160 | 0.239 |
| TF-19A | 2-3 | 5.4 | 4.00 | 42.0 | 71.0 | 100.0 | 32.0 | 360 | 7.965 | 0.540 | 0.578 | 0.349 | 0.799 | 0.575 |
| TF-22A | 0-0.5 | 3.5 | 1.50 | 35.0 | 35.0 | 27.0 | 31.0 | 130 | 3.162 | 0.132 | 0.299 | 0.139 | 0.195 | 0.211 |
| TF-22A | 2-3 | 2.8 | 1.00 | 32.0 | 23.0 | 7.8 | 30.0 | 90 | 197.140 | 0.104 | 0.229 | 8.646 | 0.153 | **3.010** |
| TF-102 | 0-0.5 | 2.2 | 0.68 | 12.0 | 13.0 | 27.0 | 12.0 | 61 | 3.961 | 0.103 | 0.141 | 0.174 | 0.152 | 0.156 |
| TF-102 | 1-2 | 2.4 | 0.94 | 17.0 | 18.0 | 33.0 | 16.0 | 69 | 2.836 | 0.118 | 0.182 | 0.124 | 0.174 | 0.160 |
| TF-100 | 0-0.5 | 5.1 | 1.90 | 36.0 | 37.0 | 33.0 | 30.0 | 140 | 1.121 | 0.095 | 0.327 | 0.049 | 0.140 | 0.172 |
| TF-100 | 2-3 | 3.1 | 2.30 | 9.5 | 8.6 | 7.6 | 11.0 | 29 | 0.469 | 0.062 | 0.150 | 0.021 | 0.091 | 0.087 |
| TF-101 | 0-0.5 | 6.0 | 2.80 | 43.0 | 41.0 | 37.0 | 33.0 | 170 | 1.708 | 0.146 | 0.392 | 0.075 | 0.215 | 0.227 |
| TF-101 | 3-4 | 3.7 | 2.00 | 32.0 | 43.0 | 50.0 | 26.0 | 160 | 2.980 | 1.000 | 0.338 | 0.131 | 1.479 | **0.649** |
| TF-103 | 0-0.5 | 2.3 | 1.20 | 18.0 | 38.0 | 31.0 | 21.0 | 100 | 6.500 | 0.078 | 0.231 | 0.285 | 0.115 | 0.211 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| TF-103 | 0.5-1 | 1.6 | 0.75 | 11.0 | 36.0 | 23.0 | 14.0 | 110 | 6.246 | 0.059 | 0.178 | 0.274 | 0.087 | 0.180 |
| TF-25 | 0-0.5 | 5.5 | 2.00 | 44.0 | 43.0 | 46.0 | 35.0 | 170 | 3.119 | 0.137 | 0.386 | 0.137 | 0.202 | 0.242 |
| TF-25 | 3-4 | 3.3 | 1.30 | 31.0 | 28.0 | 25.0 | 27.0 | 95 | 1.214 | 0.085 | 0.255 | 0.053 | 0.126 | 0.145 |
| TF-26A | 0-0.5 | 4.2 | 1.90 | 41.0 | 51.0 | 42.0 | 32.0 | 170 | 1.829 | 0.180 | 0.368 | 0.080 | 0.266 | 0.238 |
| TF-26A | 2-3 | 5.8 | 4.10 | 62.0 | 83.0 | 120.0 | 39.0 | 340 | 5.112 | 0.660 | 0.656 | 0.224 | 0.976 | **0.619** |
| TF-41 | 0-0.5 | 3.5 | 1.50 | 31.0 | 38.0 | 43.0 | 24.0 | 130 | 5.042 | 0.133 | 0.294 | 0.221 | 0.197 | 0.237 |
| TF-41 | 3-4 | 5.0 | 2.60 | 42.0 | 43.0 | 44.0 | 36.0 | 170 | 3.555 | 0.148 | 0.399 | 0.156 | 0.219 | 0.258 |
| TF-24 | 0-0.5 | 5.9 | 2.30 | 44.0 | 42.0 | 46.0 | 34.0 | 190 | 2.258 | 0.107 | 0.399 | 0.099 | 0.158 | 0.219 |
| TF-24 | 3-4 | 2.9 | 1.30 | 46.0 | 45.0 | 42.0 | 36.0 | 180 | 2.462 | 0.088 | 0.361 | 0.108 | 0.130 | 0.200 |
| TF-36 | 0-0.5 | 5.6 | 2.50 | 49.0 | 55.0 | 61.0 | 39.0 | 210 | 3.791 | 0.142 | 0.460 | 0.166 | 0.210 | 0.279 |
| TF-36 | 3-4 | 2.9 | 1.40 | 28.0 | 25.0 | 21.0 | 23.0 | 93 | 1.298 | 0.124 | 0.233 | 0.057 | 0.183 | 0.158 |
| TF-4 | 0-0.5 | 2.6 | 1.00 | 17.0 | 15.0 | 15.0 | 16.0 | 65 | 0.849 | 0.078 | 0.160 | 0.037 | 0.115 | 0.104 |
| TF-4 | 2-3 | 3.1 | 1.30 | 21.0 | 20.0 | 22.0 | 19.0 | 93 | 2.045 | 0.072 | 0.206 | 0.090 | 0.107 | 0.134 |
| TF-3A | 0-0.5 | 3.4 | 1.30 | 21.0 | 21.0 | 29.0 | 20.0 | 95 | 2.555 | 0.102 | 0.220 | 0.112 | 0.151 | 0.161 |
| TF-3A | 3-4 | 2.3 | 0.92 | 26.0 | 15.0 | 4.6 | 21.0 | 62 | 0.850 | 0.080 | 0.170 | 0.037 | 0.118 | 0.108 |
| TF-23A | 0-0.5 | 5.5 | 1.80 | 35.0 | 36.0 | 53.0 | 28.0 | 180 | 6.543 | 0.347 | 0.352 | 0.287 | 0.513 | 0.384 |
| TF-23A | 3-4 | 3.3 | 1.30 | 39.0 | 24.0 | 9.9 | 31.0 | 100 | 1.120 | 0.101 | 0.258 | 0.049 | 0.149 | 0.152 |
| TF-21A | 0-0.5 | 3.0 | 1.30 | 26.0 | 34.0 | 28.0 | 19.0 | 110 | 11.919 | 0.214 | 0.238 | 0.523 | 0.317 | 0.359 |
| TF-21A | 2-3 | 3.2 | 1.30 | 35.0 | 29.0 | 12.0 | 29.0 | 94 | 1.297 | 0.104 | 0.252 | 0.057 | 0.153 | 0.154 |
| TF-12A | 0-0.5 | 3.1 | 1.30 | 32.0 | 29.0 | 16.0 | 25.0 | 98 | 2.157 | 0.111 | 0.242 | 0.095 | 0.164 | 0.167 |
| TF-12A | 1-2 | 2.5 | 1.10 | 32.0 | 20.0 | 7.1 | 26.0 | 77 | 1.180 | 0.098 | 0.211 | 0.052 | 0.144 | 0.136 |
| TF-10 | 0-0.5 | 3.5 | 1.20 | 28.0 | 24.0 | 36.0 | 23.0 | 100 | 2.007 | 0.073 | 0.248 | 0.088 | 0.108 | 0.148 |
| TF-10 | 1-2 | 1.7 | 0.53 | 9.7 | 8.6 | 7.5 | 11.0 | 34 | 0.457 | 0.071 | 0.095 | 0.020 | 0.104 | 0.073 |
| TF-2A | 0-0.5 | 1.1 | 0.35 | 7.4 | 5.9 | 3.7 | 7.7 | 28 | 0.439 | 0.062 | 0.065 | 0.019 | 0.091 | 0.059 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| TF-2A | 0.5-1.67 | 1.3 | 0.39 | 6.8 | 5.5 | 3.2 | 7.7 | 28 | 0.564 | 0.062 | 0.066 | 0.025 | 0.091 | 0.060 |
| TF-32A | 0-0.5 | 4.9 | 1.90 | 45.0 | 41.0 | 43.0 | 33.0 | 190 | 1.191 | 0.129 | 0.377 | 0.052 | 0.191 | 0.207 |
| TF-32A | 0.5-1.5 | 2.3 | 0.71 | 15.0 | 13.0 | 14.0 | 12.0 | 58 | 0.792 | 0.066 | 0.131 | 0.035 | 0.098 | 0.088 |
| TF-103A | 0-0.5 | 2.3 | 1.00 | 19.0 | 36.0 | 33.0 | 24.0 | 100 | 4.505 | 0.058 | 0.236 | 0.198 | 0.086 | 0.173 |
| TF-103A | 0.5-1.08 | 2.4 | 1.30 | 22.0 | 44.0 | 77.0 | 23.0 | 110 | 17.840 | 0.056 | 0.306 | 0.782 | 0.083 | 0.390 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-70 | 0-0.5 | 5.1 | 1.0 | 24.0 | 32.0 | 58.0 | 17.0 | 110 | 21.21 | 0.096 | 0.261 | 0.930 | 0.142 | 0.445 |
| RP-I-70 | 0.5-1.83 | 5.9 | 1.6 | 34.0 | 43.0 | 100.0 | 21.0 | 190 | 46.35 | 0.445 | 0.389 | 2.033 | 0.658 | **1.027** |
| RP-I-74 | 0-0.5 | 1.5 | 0.4 | 7.7 | 10.0 | 7.0 | 9.1 | 25 | 0.84 | 0.106 | 0.079 | 0.037 | 0.157 | 0.091 |
| RP-I-74 | 0.5-1.83 | 1.9 | 0.5 | 10.0 | 10.0 | 25.0 | 9.1 | 34 | 1.83 | 0.097 | 0.111 | 0.080 | 0.143 | 0.112 |
| RP-I-77 | 0-0.5 | 1.2 | 0.3 | 6.4 | 6.2 | 4.5 | 6.6 | 19 | 1.77 | 0.064 | 0.059 | 0.078 | 0.094 | 0.077 |
| RP-I-77 | 0.5-1.67 | 1.2 | 0.3 | 6.8 | 5.8 | 4.4 | 7.1 | 18 | 0.45 | 0.138 | 0.060 | 0.020 | 0.204 | 0.095 |
| RP-M-33 | 0-0.5 | 4.0 | 0.8 | 19.0 | 36.0 | 23.0 | 15.0 | 71 | 6.38 | 0.072 | 0.192 | 0.280 | 0.107 | 0.193 |
| RP-M-33 | 1-2 | 4.9 | 0.9 | 23.0 | 33.0 | 42.0 | 18.0 | 110 | 6.42 | 0.072 | 0.243 | 0.282 | 0.107 | 0.210 |
| RP-M-35 | 0-0.5 | 6.0 | 1.0 | 24.0 | 32.0 | 45.0 | 20.0 | 100 | 46.84 | 0.084 | 0.255 | 2.054 | 0.124 | **0.811** |
| RP-M-35 | 1-2 | 3.5 | 0.5 | 13.0 | 14.0 | 51.0 | 11.0 | 54 | 6.02 | 0.085 | 0.167 | 0.264 | 0.126 | 0.186 |
| RP-O-16 | 0-0.5 | 2.8 | 0.7 | 31.0 | 16.0 | 19.0 | 12.0 | 53 | 4.69 | 0.066 | 0.160 | 0.206 | 0.097 | 0.154 |
| RP-O-16 | 2-3 | 3.8 | 0.9 | 22.0 | 21.0 | 35.0 | 15.0 | 91 | 7.42 | 0.102 | 0.202 | 0.325 | 0.151 | 0.226 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-53 | 0-0.5 | 3.7 | 0.9 | 26.0 | 48.0 | 390.0 | 14.0 | 230 | 11.37 | 0.722 | 0.668 | 0.499 | 1.068 | **0.745** |
| RP-I-53 | 0.5-1.67 | 5.1 | 1.4 | 31.0 | 59.0 | 540.0 | 16.0 | 340 | 9.99 | 0.883 | 0.914 | 0.438 | 1.306 | **0.886** |
| RP-M-26 | 0-0.5 | 4.9 | 1.1 | 23.0 | 34.0 | 130.0 | 20.0 | 190 | 0.91 | 0.281 | 0.378 | 0.040 | 0.416 | 0.278 |
| RP-M-26 | 3-4 | 5.8 | 1.8 | 28.0 | 41.0 | 100.0 | 23.0 | 230 | 46.51 | 0.146 | 0.403 | 2.040 | 0.216 | **0.886** |
| RP-I-58 | 0-0.5 | 3.7 | 2.5 | 18.0 | 35.0 | 120.0 | 15.0 | 210 | 3.70 | 0.217 | 0.388 | 0.162 | 0.321 | 0.290 |
| RP-I-58 | 1.5-2.5 | 4.9 | 1.1 | 26.0 | 43.0 | 150.0 | 22.0 | 280 | 8.21 | 0.266 | 0.447 | 0.360 | 0.393 | 0.400 |
| RP-M-28 | 0-0.5 | 2.8 | 0.7 | 13.0 | 23.0 | 62.0 | 11.0 | 120 | 2.03 | 0.322 | 0.209 | 0.089 | 0.476 | 0.258 |
| RP-M-28 | 0.5-1 | 4.9 | 1.3 | 27.0 | 40.0 | 110.0 | 21.0 | 220 | 6.40 | 0.352 | 0.385 | 0.281 | 0.521 | 0.395 |
| RP-I-46 | 0-0.5 | 3.7 | 1.1 | 23.0 | 23.0 | 53.0 | 18.0 | 120 | 5.11 | 0.141 | 0.249 | 0.224 | 0.209 | 0.227 |
| RP-I-46 | 0.5-1.67 | 1.4 | 0.4 | 6.4 | 8.3 | 8.9 | 6.6 | 27 | 0.53 | 0.082 | 0.070 | 0.023 | 0.121 | 0.072 |
| RP-I-52 | 0-0.5 | 4.2 | 0.9 | 20.0 | 25.0 | 72.0 | 15.0 | 120 | 13.16 | 0.260 | 0.256 | 0.577 | 0.384 | 0.406 |
| RP-I-52 | 1-2 | 5.7 | 2.2 | 31.0 | 47.0 | 130.0 | 24.0 | 260 | 196.10 | 0.395 | 0.469 | 8.601 | 0.584 | **3.218** |
| RP-100 | 0-0.5 | 3.3 | 1.1 | 17.0 | 24.0 | 62.0 | 14.0 | 140 | 5.57 | 0.266 | 0.245 | 0.244 | 0.393 | 0.294 |
| RP-100 | 1-2 | 3.3 | 0.9 | 15.0 | 21.0 | 40.0 | 13.0 | 99 | 5.45 | 0.107 | 0.192 | 0.239 | 0.158 | 0.196 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-2A | 0-0.5 | 6.7 | 1.7 | 23.0 | 74.0 | 120.0 | 22.0 | 380 | 12.48 | 0.091 | 0.495 | 0.548 | 0.135 | 0.392 |
| RP-I-2A | 2-3 | 6.0 | 2.2 | 41.0 | 70.0 | 140.0 | 34.0 | 300 | 19.77 | 0.267 | 0.559 | 0.867 | 0.395 | **0.607** |
| RP-I-6 | 0-0.5 | 2.1 | 0.5 | 12.0 | 13.0 | 20.0 | 13.0 | 140 | 2.45 | 0.075 | 0.155 | 0.107 | 0.110 | 0.124 |
| RP-I-6 | 1-2 | 2.2 | 0.5 | 13.0 | 12.0 | 19.0 | 15.0 | 150 | 5.00 | 0.158 | 0.165 | 0.219 | 0.234 | 0.206 |
| RP-I-9 | 0-0.5 | 1.2 | 0.3 | 9.9 | 8.5 | 21.0 | 9.3 | 34 | 8.81 | 0.065 | 0.095 | 0.387 | 0.095 | 0.192 |
| RP-I-9 | 0.5-1.4 | 0.9 | 0.2 | 4.5 | 4.8 | 4.6 | 7.2 | 15 | 0.36 | 0.060 | 0.051 | 0.016 | 0.089 | 0.052 |
| RP-M-2 | 0-0.5 | 7.9 | 1.6 | 33.0 | 45.0 | 80.0 | 29.0 | 260 | 32.35 | 0.056 | 0.421 | 1.419 | 0.083 | **0.641** |
| RP-M-2 | 0.5-1 | 7.6 | 1.9 | 31.0 | 42.0 | 84.0 | 26.0 | 210 | 12.94 | 0.087 | 0.403 | 0.568 | 0.128 | 0.366 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-82 | 0-0.5 | 2.2 | 0.4 | 11.0 | 16.0 | 16.0 | 10.0 | 29 | 1.89 | 0.045 | 0.107 | 0.083 | 0.067 | 0.086 |
| RP-I-82 | 1-1.75 | 1.6 | 0.4 | 6.8 | 7.2 | 15.0 | 8.3 | 23 | 4.44 | 0.076 | 0.081 | 0.195 | 0.112 | 0.130 |
| RP-I-86 | 0-0.5 | 4.7 | 1.1 | 17.0 | 27.0 | 52.0 | 21.0 | 110 | 3.26 | 0.045 | 0.254 | 0.143 | 0.067 | 0.154 |
| RP-I-86 | 1-2 | 3.9 | 0.8 | 17.0 | 24.0 | 62.0 | 19.0 | 100 | 8.01 | 0.044 | 0.242 | 0.351 | 0.064 | 0.219 |
| RP-I-88A | 0-0.5 | 4.1 | 0.8 | 18.0 | 25.0 | 46.0 | 15.0 | 93 | 11.13 | 0.057 | 0.213 | 0.488 | 0.084 | 0.262 |
| RP-I-88A | 0.67-1.83 | 3.3 | 0.7 | 18.0 | 23.0 | 67.0 | 13.0 | 97 | 10.46 | 0.099 | 0.224 | 0.459 | 0.146 | 0.276 |
| RP-I-93 | 0-0.5 | 2.9 | 0.7 | 11.0 | 11.0 | 12.0 | 10.0 | 45 | 3.28 | 0.046 | 0.115 | 0.144 | 0.068 | 0.109 |
| RP-I-93 | 1-2.75 | 2.1 | 0.5 | 9.4 | 8.0 | 7.6 | 8.1 | 30 | 1.03 | 0.046 | 0.084 | 0.045 | 0.068 | 0.066 |
| RP-I-94 | 0-0.5 | 6.3 | 1.0 | 22.0 | 22.0 | 21.0 | 18.0 | 84 | 3.27 | 0.055 | 0.207 | 0.143 | 0.081 | 0.144 |
| RP-I-94 | 1-2 | 4.6 | 0.5 | 43.0 | 110.0 | 42.0 | 40.0 | 40 | 4.03 | 0.049 | 0.373 | 0.177 | 0.072 | 0.207 |
| RP-M-41 | 0-0.5 | 2.1 | 0.6 | 10.0 | 780.0 | 39.0 | 9.7 | 52 | 1.09 | 0.042 | 0.875 | 0.048 | 0.062 | 0.328 |
| RP-M-41 | 0.5-1.33 | 8.8 | 0.4 | 8.3 | 33.0 | 9.7 | 7.6 | 33 | 1.10 | 0.044 | 0.136 | 0.048 | 0.065 | 0.083 |
| RP-M-44 | 0-0.5 | 2.3 | 0.6 | 10.0 | 12.0 | 19.0 | 9.8 | 42 | 1.91 | 0.047 | 0.115 | 0.084 | 0.070 | 0.090 |
| RP-M-44 | 1-2 | 1.6 | 0.9 | 13.0 | 16.0 | 56.0 | 11.0 | 78 | 8.75 | 0.050 | 0.183 | 0.384 | 0.074 | 0.214 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-105 | 0-0.5 | 2.1 | 0.37 | 8.9 | 14.0 | 15.0 | 9.5 | 38 | 0.83 | 0.036 | 0.101 | 0.036 | 0.053 | 0.064 |
| RP-I-105 | 1-2 | 1.9 | 0.31 | 6.1 | 8.6 | 10.0 | 6.8 | 25 | 1.02 | 0.034 | 0.072 | 0.045 | 0.050 | 0.056 |
| RP-I-107 | 0-0.5 | 2.6 | 0.68 | 16.0 | 24.0 | 20.0 | 16.0 | 66 | 4.03 | 0.066 | 0.164 | 0.177 | 0.097 | 0.146 |
| RP-I-107 | 1.5-2.5 | 3.8 | 0.95 | 16.0 | 29.0 | 46.0 | 16.0 | 110 | 2.89 | 0.227 | 0.225 | 0.127 | 0.336 | 0.229 |
| RP-I-109A | 0-0.5 | 5.8 | 3.60 | 35.0 | 62.0 | 73.0 | 30.0 | 190 | 2.73 | 0.110 | 0.462 | 0.120 | 0.163 | 0.248 |
| RP-I-109A | 1.5-2.5 | 7.7 | 2.60 | 37.0 | 73.0 | 140.0 | 31.0 | 290 | 1.85 | 0.232 | 0.563 | 0.081 | 0.343 | 0.329 |
| RP-I-113 | 0-0.5 | 2.1 | 0.36 | 7.9 | 10.0 | 8.2 | 8.9 | 29 | 1.01 | 0.046 | 0.084 | 0.044 | 0.068 | 0.065 |
| RP-I-113 | 0.67-1.67 | 2.3 | 0.32 | 6.4 | 9.3 | 9.6 | 7.0 | 24 | 0.74 | 0.044 | 0.075 | 0.032 | 0.065 | 0.057 |
| RP-M-57 | 0-0.5 | 1.4 | 0.26 | 6.3 | 8.4 | 6.7 | 7.3 | 22 | 1.52 | 0.044 | 0.065 | 0.067 | 0.065 | 0.066 |
| RP-M-57 | 0.5-1.25 | 1.2 | 0.23 | 4.4 | 5.2 | 3.3 | 6.0 | 16 | 0.41 | 0.041 | 0.049 | 0.018 | 0.061 | 0.042 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| CG-100 | 0-0.5 | 2.0 | 0.8 | 11.0 | 13.0 | 27.0 | 13.0 | 52 | 10.99 | 0.055 | 0.141 | 0.482 | 0.081 | 0.235 |
| CG-100 | 0.83-1.83 | 3.1 | 0.9 | 9.2 | 18.0 | 28.0 | 12.0 | 48 | 9.10 | 0.084 | 0.149 | 0.399 | 0.124 | 0.224 |
| CG-101 | 0-0.5 | 3.1 | 1.2 | 21.0 | 30.0 | 41.0 | 20.0 | 81 | 7.84 | 0.058 | 0.233 | 0.344 | 0.086 | 0.221 |
| CG-101 | 0.5-1.5 | 3.1 | 1.1 | 16.0 | 23.0 | 48.0 | 13.0 | 82 | 8.24 | 0.139 | 0.205 | 0.362 | 0.206 | 0.257 |
| CG-102 | 0-0.5 | 4.4 | 1.2 | 17.0 | 27.0 | 60.0 | 16.0 | 100 | 24.33 | 0.070 | 0.246 | 1.067 | 0.103 | 0.472 |
| CG-102 | 0.5-1.42 | 1.7 | 0.5 | 7.7 | 8.7 | 21.0 | 7.6 | 35 | 2.89 | 0.050 | 0.095 | 0.127 | 0.074 | 0.099 |
| CG-103 | 0-0.5 | 2.1 | 0.5 | 8.6 | 10.0 | 28.0 | 8.3 | 43 | 1.68 | 0.056 | 0.112 | 0.074 | 0.082 | 0.089 |
| CG-103 | 0.83-1.92 | 2.8 | 0.8 | 15.0 | 17.0 | 74.0 | 11.0 | 83 | 4.41 | 0.150 | 0.211 | 0.193 | 0.222 | 0.209 |
| CG-104 | 0-0.5 | 2.6 | 0.7 | 14.0 | 19.0 | 240.0 | 40.0 | 70 | 2.41 | 0.081 | 0.475 | 0.105 | 0.120 | 0.233 |
| CG-104 | 0.5-1 | 1.5 | 0.3 | 12.0 | 6.4 | 39.0 | 12.0 | 30 | 0.72 | 0.068 | 0.126 | 0.031 | 0.100 | 0.086 |
| CG-105 | 0-0.5 | 3.6 | 0.8 | 15.0 | 39.0 | 130.0 | 14.0 | 120 | 2.16 | 0.101 | 0.318 | 0.095 | 0.149 | 0.187 |
| CG-105 | 0.5-1.17 | 1.4 | 0.2 | 4.2 | 8.6 | 41.0 | 5.6 | 27 | 0.65 | 0.060 | 0.097 | 0.029 | 0.089 | 0.072 |
| CG-106 | 0-0.5 | 1.2 | 0.2 | 2.7 | 5.1 | 6.1 | 3.2 | 27 | 0.51 | 0.060 | 0.044 | 0.022 | 0.089 | 0.052 |
| CG-106 | 0.5-1.83 | 1.0 | 0.3 | 5.0 | 12.0 | 12.0 | 4.9 | 38 | 1.06 | 0.064 | 0.070 | 0.047 | 0.094 | 0.070 |
| CG-107 | 0-0.5 | 3.0 | 0.4 | 9.6 | 11.0 | 12.0 | 7.8 | 31 | 1.12 | 0.066 | 0.093 | 0.049 | 0.098 | 0.080 |
| CG-107 | 0.5-1.67 | 2.9 | 0.9 | 14.0 | 21.0 | 42.0 | 12.0 | 79 | 6.14 | 0.077 | 0.183 | 0.269 | 0.114 | 0.189 |
| CG-108 | 0-0.5 | 6.7 | 2.3 | 58.0 | 86.0 | 100.0 | 47.0 | 250 | 10.44 | 0.160 | 0.580 | 0.458 | 0.237 | 0.425 |
| CG-108 | 3-4 | 7.3 | 1.6 | 38.0 | 47.0 | 76.0 | 31.0 | 150 | 6.92 | 0.122 | 0.394 | 0.303 | 0.180 | 0.292 |
| CG-109 | 0-0.5 | 5.0 | 1.1 | 21.0 | 29.0 | 67.0 | 16.0 | 120 | 3.67 | 0.099 | 0.267 | 0.161 | 0.146 | 0.191 |
| CG-109 | 0.5-1.33 | 4.9 | 1.3 | 27.0 | 32.0 | 60.0 | 21.0 | 140 | 5.04 | 0.130 | 0.296 | 0.221 | 0.192 | 0.236 |
| CG-110 | 0-0.5 | 2.2 | 0.7 | 11.0 | 14.0 | 27.0 | 10.0 | 58 | 1.39 | 0.054 | 0.136 | 0.061 | 0.080 | 0.092 |
| CG-110 | 3-4 | 1.4 | 0.4 | 5.3 | 6.2 | 22.0 | 4.8 | 58 | 1.33 | 0.055 | 0.086 | 0.058 | 0.081 | 0.075 |
| CG-111 | 0-0.5 | 6.4 | 1.0 | 28.0 | 26.0 | 14.0 | 26.0 | 78 | 1.50 | 0.195 | 0.234 | 0.066 | 0.288 | 0.196 |
| CG-111 | 0.8-1.83 | 3.6 | 0.4 | 9.4 | 10.0 | 4.8 | 9.0 | 34 | 0.93 | 0.116 | 0.092 | 0.041 | 0.171 | 0.101 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| CG-112 | 0-0.5 | 2.7 | 0.6 | 12.0 | 13.0 | 19.0 | 9.8 | 54 | 6.83 | 0.048 | 0.124 | 0.300 | 0.070 | 0.165 |
| CG-112 | 1-2 | 2.4 | 0.7 | 14.0 | 18.0 | 32.0 | 11.0 | 80 | 2.03 | 0.129 | 0.160 | 0.089 | 0.191 | 0.146 |
| CG-113 | 0-0.5 | 2.1 | 0.6 | 11.0 | 39.0 | 33.0 | 9.7 | 62 | 1.40 | 0.055 | 0.163 | 0.061 | 0.081 | 0.102 |
| CG-113 | 0.5-1.5 | 1.5 | 0.4 | 8.0 | 9.9 | 15.0 | 6.7 | 38 | 0.79 | 0.054 | 0.087 | 0.035 | 0.080 | 0.067 |
| CG-114 | 0-0.5 | 6.0 | 1.4 | 26.0 | 33.0 | 73.0 | 21.0 | 140 | 4.17 | 0.114 | 0.318 | 0.183 | 0.169 | 0.223 |
| CG-114 | 0.5-1.92 | 8.6 | 2.0 | 41.0 | 45.0 | 50.0 | 33.0 | 130 | 2.61 | 0.147 | 0.384 | 0.114 | 0.217 | 0.239 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-137 | 0-0.5 | 2.1 | 0.56 | 11.0 | 12.0 | 10.0 | 11.0 | 37 | 3.56 | 0.000 | 0.106 | 0.156 | - | 0.131 |
| RP-I-137 | 0.5-1.5 | 1.5 | 0.31 | 6.0 | 16.0 | 5.6 | 7.4 | 26 | 0.72 | 0.000 | 0.075 | 0.031 | - | 0.053 |
| RP-I-127 | 0-0.5 | 1.6 | 0.35 | 7.6 | 9.8 | 13.0 | 7.3 | 33 | 14.08 | 0.000 | 0.082 | 0.617 | - | 0.350 |
| RP-I-127 | 1-2 | 1.5 | 0.44 | 7.6 | 9.6 | 15.0 | 7.8 | 35 | 13.20 | 0.000 | 0.089 | 0.579 | - | 0.334 |
| RP-M-59 | 0-0.5 | 1.2 | 0.30 | 6.1 | 6.2 | 5.8 | 6.3 | 21 | 1.04 | 0.000 | 0.059 | 0.045 | - | 0.052 |
| RP-M-59 | 1-2 | 1.4 | 0.35 | 6.9 | 7.4 | 11.0 | 7.4 | 28 | 1.61 | 0.000 | 0.075 | 0.071 | - | 0.073 |
| RP-O-26 | 0-0.5 | 2.2 | 0.49 | 11.0 | 12.0 | 11.0 | 10.0 | 42 | 1.24 | 0.000 | 0.104 | 0.055 | - | 0.079 |
| RP-O-26 | 2-3 | 1.8 | 0.38 | 8.0 | 9.7 | 12.0 | 8.0 | 36 | 1.50 | 0.000 | 0.086 | 0.066 | - | 0.076 |
| RP-O-27 | 0-0.5 | 1.5 | 0.36 | 6.8 | 26.0 | 10.0 | 7.1 | 31 | 2.27 | 0.012 | 0.092 | 0.099 | 0.018 | 0.070 |
| RP-O-27 | 1-2 | 3.0 | 0.63 | 15.0 | 24.0 | 30.0 | 12.0 | 78 | 3.34 | 0.000 | 0.166 | 0.146 | - | 0.156 |
| RP-O-28 | 0-0.5 | 1.7 | 0.39 | 7.8 | 8.2 | 6.8 | 8.3 | 28 | 0.86 | 0.000 | 0.077 | 0.038 | - | 0.057 |
| RP-O-28 | 0.5-1.5 | 1.6 | 0.31 | 6.9 | 7.6 | 6.5 | 6.9 | 23 | 0.97 | 0.000 | 0.067 | 0.042 | - | 0.055 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| HI-100 | 0-0.5 | 2.2 | 0.5 | 12.0 | 9.6 | 12.0 | 10.0 | 48 | 0.87 | 0.052 | 0.105 | 0.038 | 0.077 | 0.073 |
| HI-100 | 3-4 | 6.9 | 1.4 | 44.0 | 33.0 | 10.0 | 38.0 | 100 | 2.04 | 0.150 | 0.312 | 0.089 | 0.222 | 0.208 |
| HI-6-M1 | 0-0.5 | 7.2 | 1.7 | 41.0 | 43.0 | 48.0 | 31.0 | 130 | 2.08 | 0.130 | 0.359 | 0.091 | 0.192 | 0.214 |
| HI-6-M1 | 1.5-2.5 | 13.0 | 1.5 | 46.0 | 38.0 | 13.0 | 40.0 | 110 | 3.12 | 0.210 | 0.361 | 0.137 | 0.311 | 0.270 |
| HI-9-M1 | 0-0.5 | 6.4 | 2.0 | 46.0 | 45.0 | 78.0 | 36.0 | 220 | 3.67 | 0.147 | 0.449 | 0.161 | 0.217 | 0.276 |
| HI-9-M1 | 0.5-2.25 | 7.1 | 1.6 | 38.0 | 37.0 | 52.0 | 30.0 | 150 | 6.21 | 0.085 | 0.354 | 0.272 | 0.126 | 0.251 |
| HI-R-1 | 0-0.5 | 3.8 | 0.9 | 18.0 | 21.0 | 33.0 | 14.0 | 86 | 2.59 | 0.072 | 0.190 | 0.113 | 0.107 | 0.137 |
| HI-R-1 | 2-3 | 4.1 | 0.9 | 22.0 | 24.0 | 30.0 | 17.0 | 90 | 6.80 | 0.063 | 0.208 | 0.298 | 0.093 | 0.200 |
| HI-R-2 | 0-0.5 | 1.2 | 0.3 | 4.5 | 4.1 | 6.2 | 4.3 | 22 | 0.44 | 0.042 | 0.050 | 0.019 | 0.062 | 0.044 |
| HI-R-2 | 0.5-1.33 | 1.0 | 0.2 | 3.9 | 2.9 | 4.1 | 3.7 | 13 | 0.39 | 0.040 | 0.038 | 0.017 | 0.059 | 0.038 |
| HI-R-3 | 0-0.5 | 2.2 | 0.5 | 7.7 | 8.0 | 15.0 | 7.0 | 43 | 1.03 | 0.046 | 0.092 | 0.045 | 0.068 | 0.068 |
| HI-R-3 | 0.5-1 | 3.8 | 0.8 | 14.0 | 15.0 | 33.0 | 12.0 | 81 | 0.97 | 0.036 | 0.169 | 0.043 | 0.053 | 0.088 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-101 | 0-0.5 | 2.4 | 0.53 | 11.0 | 11.0 | 9.9 | 11.0 | 43 | 1.67 | 5.500 | 0.107 | 0.073 | 8.136 | **2.772** |
| RP-101 | 0.5-1.25 | 2.1 | 0.54 | 12.0 | 12.0 | 11.0 | 11.0 | 43 | 4.13 | 0.066 | 0.110 | 0.181 | 0.098 | 0.129 |
| RP-I-35 | 0-0.5 | 3.0 | 0.52 | 10.0 | 11.0 | 16.0 | 9.0 | 43 | 4.03 | 0.060 | 0.109 | 0.177 | 0.089 | 0.125 |
| RP-I-35 | 0.5-1.58 | 1.9 | 0.44 | 8.3 | 8.8 | 9.2 | 7.5 | 32 | 2.61 | 0.071 | 0.082 | 0.114 | 0.105 | 0.101 |
| RP-I-39 | 0-0.5 | 2.0 | 0.5 | 9.9 | 9.4 | 11.0 | 8.9 | 42 | 2.92 | 0.071 | 0.096 | 0.128 | 0.105 | 0.110 |
| RP-I-39 | 0.5-2.08 | 3.9 | 0.54 | 12.0 | 11.0 | 12.0 | 9.9 | 44 | 36.88 | 0.074 | 0.115 | 1.618 | 0.109 | **0.614** |
| RP-I-41 | 0-0.5 | 2.4 | 0.65 | 16.0 | 23.0 | 39.0 | 15.0 | 51 | 25.72 | 0.069 | 0.175 | 1.128 | 0.102 | 0.468 |
| RP-I-41 | 1.5-2.5 | 3.1 | 0.71 | 15.0 | 13.0 | 17.0 | 13.0 | 58 | 1.51 | 0.061 | 0.141 | 0.066 | 0.090 | 0.099 |
| RP-M-19A | 0-0.5 | 1.3 | 0.35 | 6.3 | 8.8 | 5.4 | 6.3 | 27 | 0.96 | 0.065 | 0.065 | 0.042 | 0.095 | 0.068 |
| RP-M-19A | 0.5-1.17 | 1.5 | 0.33 | 6.0 | 6.7 | 4.0 | 6.1 | 19 | 1.24 | 0.063 | 0.058 | 0.055 | 0.093 | 0.069 |
| RP-M-20 | 0-0.5 | 2.2 | 0.52 | 12.0 | 12.0 | 10.0 | 11.0 | 41 | 3.27 | 0.067 | 0.108 | 0.143 | 0.099 | 0.117 |
| RP-M-20 | 1-2 | 2.0 | 0.47 | 10.0 | 27.0 | 12.0 | 11.0 | 44 | 10.06 | 0.065 | 0.120 | 0.441 | 0.096 | 0.219 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| RP-I-109 | 0.2-0.5 | 1.3 | 0.1 | 7.7 | 6.4 | 12.0 | | 24.0 | 6.35 | 0.000 | 0.053 | 0.279 | | 0.166 |
| RP-I-2 | 0.75-1.1 | 0.7 | 0.1 | 6.6 | 5.1 | 2.8 | | 15.0 | 0.50 | 0.000 | 0.032 | 0.022 | | 0.027 |
| RP-I-88 | 1.5-1.83 | 1.3 | 0.1 | 8.0 | 6.9 | 13.0 | | 25.0 | 1.34 | 0.000 | 0.056 | 0.059 | | 0.057 |
| RP-M-19 | 0.6-0.9 | 0.8 | 0.1 | 8.4 | 5.9 | 3.4 | | 17.0 | 0.92 | 0.000 | 0.037 | 0.040 | | 0.039 |

Note: Rice's Point 2008 Investigation: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil)

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| S2-12 | 0-0.5 | 4.4 | 0.7 | 35.0 | 69.0 | 86.0 | 25.0 | 190.0 | 45.61 | 0.025 | 0.380 | 2.000 | 0.037 | **0.806** |
| S2-12 | 1-2 | 2.1 | 0.3 | 11.0 | 24.0 | 57.0 | 9.3 | 88.0 | 22.77 | 0.140 | 0.174 | 0.999 | 0.207 | 0.460 |
| S2-15 | 0-0.5 | 2.4 | 0.3 | 18.0 | 38.0 | 46.0 | 16.0 | 100.0 | 16.22 | 0.025 | 0.209 | 0.711 | 0.036 | 0.319 |
| S2-15 | 0.5-1.13 | 1.9 | 0.1 | 11.0 | 15.0 | 30.0 | 7.7 | 46.0 | 6.32 | 0.015 | 0.110 | 0.277 | 0.022 | 0.136 |
| S2-5 | 0-0.5 | 3.6 | 0.4 | 25.0 | 34.0 | 37.0 | 19.0 | 110.0 | 9.23 | 0.032 | 0.223 | 0.405 | 0.047 | 0.225 |
| S2-5 | 0.5-1.42 | 4.1 | 0.6 | 26.0 | 41.0 | 76.0 | 19.0 | 150.0 | 24.32 | 0.024 | 0.294 | 1.067 | 0.036 | 0.465 |
| S2-7 | 0-0.5 | 3.0 | 0.4 | 20.0 | 34.0 | 45.0 | 17.0 | 110.0 | 32.72 | 0.031 | 0.217 | 1.435 | 0.046 | 0.566 |
| S2-7 | 0.5-1 | 3.5 | 0.7 | 21.0 | 30.0 | 75.0 | 17.0 | 130.0 | 43.49 | 0.062 | 0.264 | 1.907 | 0.092 | **0.754** |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| S3-10 | 0-0.5 | 1.5 | 0.1 | 8.1 | 8.2 | 17.0 | 6.4 | 36.0 | 14.07 | 0.014 | 0.077 | 0.617 | 0.021 | 0.238 |
| S3-10 | 1.5-2.5 | 3.3 | 0.7 | 18.0 | 32.0 | 120.0 | 14.0 | 140.0 | 7.37 | 0.086 | 0.307 | 0.323 | 0.127 | 0.253 |
| S3-14 | 0-0.5 | 7.2 | 0.5 | 27.0 | 35.0 | 66.0 | 20.0 | 120.0 | 7.85 | 0.029 | 0.284 | 0.344 | 0.043 | 0.224 |
| S3-14 | 1.08-2.08 | 6.3 | 0.6 | 21.0 | 80.0 | 120.0 | 15.0 | 140.0 | 32.10 | 0.100 | 0.371 | 1.408 | 0.148 | **0.642** |
| S3-6 | 0-0.5 | 1.5 | 0.1 | 8.2 | 7.5 | 12.0 | 7.0 | 27.0 | 30.35 | 0.025 | 0.069 | 1.331 | 0.037 | 0.479 |
| S3-6 | 0.75-1.75 | 1.7 | 0.1 | 7.2 | 9.4 | 17.0 | 10.0 | 44.0 | 2.55 | 0.024 | 0.090 | 0.112 | 0.036 | 0.079 |
| S3-8 | 0-0.5 | 1.3 | 0.1 | 6.4 | 7.5 | 16.0 | 5.9 | 29.0 | 3.47 | 0.024 | 0.068 | 0.152 | 0.035 | 0.085 |
| S3-8 | 0.5-1.38 | 1.1 | 0.1 | 5.7 | 8.2 | 19.0 | 5.1 | 31.0 | 4.24 | 0.017 | 0.069 | 0.186 | 0.025 | 0.093 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| SC-1A | 0-0.5 | 6.4 | 2.80 | 37.0 | 94.0 | 140.0 | 29.0 | 330 | 13.10 | 0.209 | 0.590 | 0.575 | 0.309 | 0.491 |
| SC-1A | 2.5-3.5 | 3.8 | 1.00 | 14.0 | 46.0 | 130.0 | 12.0 | 170 | 9.34 | 0.090 | 0.341 | 0.410 | 0.132 | 0.294 |
| SC-4 | 0-0.5 | 7.9 | 3.20 | 46.0 | 39.0 | 150.0 | 35.0 | 370 | 10.28 | 0.229 | 0.608 | 0.451 | 0.339 | 0.466 |
| SC-4 | 2-3 | 4.9 | 2.30 | 23.0 | 52.0 | 110.0 | 17.0 | 270 | 10.26 | 0.121 | 0.423 | 0.450 | 0.178 | 0.350 |
| SC-5A | 0-0.5 | 7.4 | 2.90 | 38.0 | 58.0 | 150.0 | 30.0 | 330 | 14.30 | 0.204 | 0.578 | 0.627 | 0.301 | 0.502 |
| SC-5A | 3-4 | 5.2 | 3.50 | 24.0 | 45.0 | 150.0 | 19.0 | 380 | 13.20 | 0.185 | 0.538 | 0.579 | 0.273 | 0.463 |
| SC-9A | 0-0.5 | 8.6 | 2.50 | 44.0 | 17.0 | 110.0 | 36.0 | 280 | 9.75 | 0.139 | 0.498 | 0.428 | 0.206 | 0.377 |
| SC-9A | 2-3 | 4.3 | 2.50 | 34.0 | 11.0 | 100.0 | 16.0 | 230 | 12.96 | 0.302 | 0.375 | 0.569 | 0.447 | 0.463 |
| SC-12A | 0-0.5 | 3.1 | 1.30 | 15.0 | 13.0 | 63.0 | 12.0 | 140 | 6.67 | 0.421 | 0.232 | 0.292 | 0.623 | 0.382 |
| SC-12A | 1-2 | 5.4 | 1.60 | 27.0 | 7.8 | 89.0 | 23.0 | 180 | 2.77 | 0.135 | 0.334 | 0.121 | 0.200 | 0.219 |
| SC-16A | 0-0.5 | 5.0 | 1.30 | 26.0 | 10.0 | 79.0 | 24.0 | 180 | 11.31 | 0.087 | 0.317 | 0.496 | 0.129 | 0.314 |
| SC-16A | 2-3 | 3.9 | 1.20 | 23.0 | 9.1 | 100.0 | 20.0 | 130 | 2.55 | 0.175 | 0.300 | 0.112 | 0.259 | 0.224 |
| SC-26A | 0-0.5 | 2.4 | 0.49 | 11.0 | 120.0 | 31.0 | 10.0 | 51 | 1.72 | 0.068 | 0.234 | 0.075 | 0.100 | 0.136 |
| SC-26A | 0.5-1.5 | 1.8 | 0.48 | 9.5 | 66.0 | 21.0 | 8.4 | 36 | 2.18 | 0.072 | 0.156 | 0.096 | 0.107 | 0.119 |
| SC-31A | 0-0.5 | 2.1 | 0.48 | 11.0 | 6.3 | 23.0 | 8.5 | 37 | 1.52 | 0.072 | 0.105 | 0.067 | 0.107 | 0.093 |
| SC-31A | 1-2 | 1.4 | 0.36 | 6.2 | 7.9 | 11.0 | 6.4 | 23 | 1.84 | 0.072 | 0.070 | 0.081 | 0.107 | 0.086 |
| SC-33 | 0-0.5 | 1.8 | 0.43 | 9.2 | 88.0 | 10.0 | 8.7 | 30 | 1.72 | 0.066 | 0.162 | 0.076 | 0.098 | 0.112 |
| SC-33 | 1-2 | 1.6 | 0.42 | 7.5 | 83.0 | 8.4 | 7.6 | 27 | 1.28 | 0.063 | 0.148 | 0.056 | 0.093 | 0.099 |
| SC-40 | 0-0.5 | 1.3 | 0.34 | 6.1 | 84.0 | 4.9 | 6.4 | 19 | 3.34 | 0.068 | 0.134 | 0.146 | 0.100 | 0.127 |
| SC-40 | 1-2 | 1.2 | 0.34 | 5.1 | 66.0 | 5.7 | 5.5 | 16 | 0.92 | 0.062 | 0.112 | 0.040 | 0.091 | 0.081 |

| Sample Location | Sample Depth (ft) | Concentrations (mg/kg in dry weight) | | | | | | | | | Mean PEC-$Q_{metal}$ | PEC-$Q_{T.PAHs}$ | PEC-$Q_{T.PCBs}$ | **Mean PEC-Q** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Metals** | | | | | | | **Total PAHs** | **Total PCBs** | | | | |
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | | | | | | |
| | | PEC concentration (mg/kg dry weight) from EPA 905/R-00/007 June 2000 | | | | | | | | | | | | |
| | | 33 | 4.98 | 111 | 149 | 128 | 48.6 | 459 | 22.8 | 0.676 | | | | |
| SB-1 | 0-0.5 | 1.8 | 0.1 | 10.0 | 7.0 | 9.6 | 8.1 | 33.0 | 0.41 | 0.023 | 0.075 | 0.018 | 0.033 | 0.042 |
| SB-1 | 2.08-3.13 | 1.7 | 0.1 | 14.0 | 9.0 | 7.5 | 11.0 | 26.0 | 0.89 | 0.024 | 0.086 | 0.039 | 0.036 | 0.053 |
| SB-11 | 0-0.5 | 2.9 | 0.3 | 26.0 | 15.0 | 14.0 | 17.0 | 61.0 | 0.67 | 0.035 | 0.153 | 0.029 | 0.051 | 0.078 |
| SB-11 | 3-4 | 3.6 | 0.4 | 36.0 | 19.0 | 8.0 | 24.0 | 84.0 | 0.51 | 0.038 | 0.197 | 0.023 | 0.055 | 0.092 |
| SB-25 | 0-0.5 | 4.6 | 0.4 | 27.0 | 17.0 | 23.0 | 20.0 | 86.0 | 0.87 | 0.050 | 0.194 | 0.038 | 0.074 | 0.102 |
| SB-25 | 0.5-1.46 | 8.6 | 0.1 | 14.0 | 16.0 | 4.4 | 11.0 | 24.0 | 2.57 | 0.180 | 0.118 | 0.113 | 0.266 | 0.166 |
| SB-28 | 0-0.5 | 4.7 | 0.4 | 19.0 | 22.0 | 7.1 | 16.0 | 40.0 | 1.89 | 0.029 | 0.145 | 0.083 | 0.043 | 0.090 |
| SB-28 | 1.08-2.13 | 8.4 | 0.4 | 31.0 | 14.0 | 2.7 | 9.7 | 30.0 | 2.74 | 0.195 | 0.142 | 0.120 | 0.288 | 0.184 |
| SB-30 | 0-0.5 | 1.2 | 0.1 | 7.8 | 3.9 | 6.0 | 6.4 | 22.0 | 0.41 | 0.021 | 0.054 | 0.018 | 0.031 | 0.034 |
| SB-30 | 0.5-1.46 | 1.3 | 0.1 | 9.3 | 4.5 | 3.3 | 7.0 | 19.0 | 0.34 | 0.022 | 0.055 | 0.015 | 0.033 | 0.034 |
| SB-40 | 0-0.5 | 1.2 | 0.1 | 3.1 | 1.5 | 0.5 | 2.7 | 8.4 | 0.31 | 0.031 | 0.024 | 0.014 | 0.045 | 0.028 |
| SB-40 | 0.5-1.33 | 0.8 | 0.1 | 2.4 | 1.3 | 0.5 | 2.5 | 4.3 | 0.32 | 0.025 | 0.020 | 0.014 | 0.036 | 0.023 |
| SB-43 | 0-0.5 | 5.3 | 1.0 | 46.0 | 31.0 | 56.0 | 29.0 | 200.0 | 4.85 | 0.072 | 0.351 | 0.213 | 0.107 | 0.223 |
| SB-43 | 2.33-3.33 | 6.2 | 0.5 | 29.0 | 20.0 | 6.3 | 24.0 | 68.0 | 1.74 | 0.115 | 0.196 | 0.076 | 0.170 | 0.147 |
| SB-45 | 0-0.5 | 3.2 | 0.6 | 30.0 | 25.0 | 35.0 | 23.0 | 130.0 | 4.45 | 0.058 | 0.241 | 0.195 | 0.086 | 0.174 |
| SB-45 | 2.33-3.33 | 5.3 | 0.2 | 17.0 | 18.0 | 4.5 | 14.0 | 43.0 | 2.05 | 0.135 | 0.129 | 0.090 | 0.200 | 0.139 |
| SB-9 | 0-0.5 | 5.5 | 0.6 | 41.0 | 26.0 | 40.0 | 30.0 | 160.0 | 2.35 | 0.055 | 0.300 | 0.103 | 0.081 | 0.161 |
| SB-9 | 3-4 | 4.3 | 0.5 | 37.0 | 27.0 | 35.0 | 28.0 | 120.0 | 2.24 | 0.020 | 0.264 | 0.098 | 0.030 | 0.131 |

| Sample Location | Sample Depth (ft) | Aroclors (µg/kg dry weight) | | | | | | | Total PBCs (µg/kg dry weight) (3) |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 (1,2) | Aroclor 1221 (1,2) | Aroclor 1232 (1,2) | Aroclor 1242 (1,2) | Aroclor 1248 (1,2) | Aroclor 1254 (1,2) | Aroclor 1260 (1,2) | |
| **Slip C** | | | | | | | | | |
| SC-1A | 0-0.5 | ND | ND | ND | ND | 55.0 | 91.0 | 63.0 | 209.0 |
| SC-1A | 2.5-3.5 | ND | ND | ND | ND | 29.5 | 34.0 | 26.0 | 89.5 |
| SC-4 | 0-0.5 | ND | ND | ND | ND | 55.0 | 110.0 | 64.0 | 229.0 |
| SC-4 | 2-3 | ND | ND | ND | ND | 31.5 | 48.0 | 41.0 | 120.5 |
| SC-5A | 0-0.5 | ND | ND | ND | ND | 46.5 | 95.0 | 62.0 | 203.5 |
| SC-5A | 3-4 | ND | ND | ND | ND | 38.5 | 98.0 | 48.0 | 184.5 |
| SC-9A | 0-0.5 | ND | ND | ND | ND | 49.0 | 58.0 | 32.0 | 139.0 |
| SC-9A | 2-3 | ND | ND | ND | ND | 110.0 | 120.0 | 72.0 | 302.0 |
| SC-12A | 0-0.5 | ND | ND | ND | ND | 31.0 | 290.0 | 100.0 | 421.0 |
| SC-12A | 1-2 | ND | ND | ND | ND | 43.0 | 49.0 | 43.0 | 135.0 |
| SC-16A | 0-0.5 | ND | ND | ND | ND | 33.0 | 30.0 | 24.0 | 87.0 |
| SC-16A | 2-3 | ND | ND | ND | ND | 72.0 | 68.0 | 35.0 | 175.0 |
| SC-26A | 0-0.5 | ND | ND | ND | ND | 22.5 | 22.5 | 22.5 | 67.5 |
| SC-26A | 0.5-1.5 | ND | ND | ND | ND | 24.0 | 24.0 | 24.0 | 72.0 |
| SC-31A | 0-0.5 | ND | ND | ND | ND | 24.0 | 24.0 | 24.0 | 72.0 |
| SC-31A | 1-2 | ND | ND | ND | ND | 24.0 | 24.0 | 24.0 | 72.0 |
| SC-33 | 0-0.5 | ND | ND | ND | ND | 22.0 | 22.0 | 22.0 | 66.0 |
| SC-33 | 1-2 | ND | ND | ND | ND | 21.0 | 21.0 | 21.0 | 63.0 |
| SC-40 | 0-0.5 | ND | ND | ND | ND | 22.5 | 22.5 | 22.5 | 67.5 |
| SC-40 | 1-2 | ND | ND | ND | ND | 20.5 | 20.5 | 20.5 | 61.5 |
| **21st Avenue Bay** | | | | | | | | | |
| TF-44 | 0-0.5 | ND | ND | ND | ND | 50.0 | 53.0 | 50.0 | 153.0 |
| TF-44 | 2.5-3.5 | ND | ND | ND | ND | 27.5 | 120.0 | 27.5 | 175.0 |
| TF-34 | 0-0.5 | ND | ND | ND | ND | 60.0 | 60.0 | 60.0 | 180.0 |
| TF-34 | 3-4 | ND | ND | ND | ND | 40.0 | 40.0 | 40.0 | 120.0 |
| TF-39 | 0-0.5 | ND | ND | ND | ND | 65.0 | 74.0 | 65.0 | 204.0 |
| TF-39 | 0.5-1.42 | ND | ND | ND | ND | 115.0 | 120.0 | 115.0 | 350.0 |
| TF-8A | 0-0.5 | ND | ND | ND | ND | ND | 36.0 | ND | 36.0 |
| TF-8A | 1-2 | ND | ND | ND | ND | ND | 40.0 | 23.0 | 63.0 |
| TF-50A | 0-0.5 | ND | ND | ND | ND | 22.5 | 22.5 | 22.5 | 67.5 |
| TF-50A | 0.5-1.25 | ND | ND | ND | ND | 20.0 | 22.0 | 12.0 | 54.0 |
| TF-15A | 0-0.5 | ND | ND | ND | ND | 23.5 | 17.0 | 23.5 | 64.0 |
| TF-15A | 2-3 | ND | ND | ND | ND | 29.5 | 52.0 | 24.0 | 105.5 |
| TF-1A | 0-0.92 | ND | ND | ND | ND | 20.0 | 20.0 | 20.0 | 60.0 |
| TF-19A | 0-0.5 | ND | ND | ND | ND | 44.0 | 46.0 | 18.0 | 108.0 |
| TF-19A | 2-3 | ND | ND | ND | ND | 200.0 | 240.0 | 100.0 | 540.0 |
| TF-22A | 0-0.5 | ND | ND | ND | ND | 44.0 | 44.0 | 44.0 | 132.0 |
| TF-22A | 2-3 | ND | ND | ND | ND | 34.5 | 34.5 | 34.5 | 103.5 |
| TF-102 | 0-0.5 | ND | ND | ND | ND | 22.5 | 48.0 | 32.0 | 102.5 |
| TF-102 | 1-2 | ND | ND | ND | ND | 22.5 | 52.0 | 43.0 | 117.5 |
| TF-100 | 0-0.5 | ND | ND | ND | ND | 31.5 | 31.5 | 31.5 | 94.5 |
| TF-100 | 2-3 | ND | ND | ND | ND | 20.5 | 20.5 | 20.5 | 61.5 |

| Sample Location | Sample Depth (ft) | Aroclors (µg/kg dry weight) | | | | | | | Total PBCs (µg/kg dry weight) [3] |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 [1,2] | Aroclor 1221 [1,2] | Aroclor 1232 [1,2] | Aroclor 1242 [1,2] | Aroclor 1248 [1,2] | Aroclor 1254 [1,2] | Aroclor 1260 [1,2] | |
| TF-101 | 0-0.5 | ND | ND | ND | ND | 48.5 | 48.5 | 48.5 | 145.5 |
| TF-101 | 3-4 | ND | ND | ND | ND | 430.0 | 410.0 | 160.0 | 1000.0 |
| TF-103 | 0-0.5 | ND | ND | ND | ND | 26.0 | 26.0 | 26.0 | 78.0 |
| TF-103 | 0.5-1 | ND | ND | ND | ND | 19.5 | 19.5 | 19.5 | 58.5 |
| TF-25 | 0-0.5 | ND | ND | ND | ND | 45.5 | 45.5 | 45.5 | 136.5 |
| TF-25 | 3-4 | ND | ND | ND | ND | 27.0 | 31.0 | 27.0 | 85.0 |
| TF-26A | 0-0.5 | ND | ND | ND | ND | 60.0 | 60.0 | 60.0 | 180.0 |
| TF-26A | 2-3 | ND | ND | ND | ND | 320.0 | 240.0 | 100.0 | 660.0 |
| TF-41 | 0-0.5 | ND | ND | ND | ND | 38.0 | 45.0 | 50.0 | 133.0 |
| TF-41 | 3-4 | ND | ND | ND | ND | 57.0 | 61.0 | 30.0 | 148.0 |
| TF-24 | 0-0.5 | ND | ND | ND | ND | 40.0 | 40.0 | 27.0 | 107.0 |
| TF-24 | 3-4 | ND | ND | ND | ND | 32.0 | 38.0 | 18.0 | 88.0 |
| TF-36 | 0-0.5 | ND | ND | ND | ND | 54.0 | 54.0 | 34.0 | 142.0 |
| TF-36 | 3-4 | ND | ND | ND | ND | 47.0 | 52.0 | 25.0 | 124.0 |
| TF-4 | 0-0.5 | ND | ND | ND | ND | 27.0 | 24.0 | 27.0 | 78.0 |
| TF-4 | 2-3 | ND | ND | ND | ND | 28.0 | 27.0 | 17.0 | 72.0 |
| TF-3A | 0-0.5 | ND | ND | ND | ND | 39.0 | 45.0 | 18.0 | 102.0 |
| TF-3A | 3-4 | ND | ND | ND | ND | 26.5 | 26.5 | 26.5 | 79.5 |
| TF-23A | 0-0.5 | ND | ND | ND | ND | 140.0 | 150.0 | 57.0 | 347.0 |
| TF-23A | 3-4 | ND | ND | ND | ND | 33.5 | 33.5 | 33.5 | 100.5 |
| TF-21A | 0-0.5 | ND | ND | ND | ND | 40.0 | 130.0 | 44.0 | 214.0 |
| TF-21A | 2-3 | ND | ND | ND | ND | 34.5 | 34.5 | 34.5 | 103.5 |
| TF-12A | 0-0.5 | ND | ND | ND | ND | 37.0 | 37.0 | 37.0 | 111.0 |
| TF-12A | 1-2 | ND | ND | ND | ND | 32.5 | 32.5 | 32.5 | 97.5 |
| TF-10 | 0-0.5 | ND | ND | ND | ND | 27.0 | 19.0 | 27.0 | 73.0 |
| TF-10 | 1-2 | ND | ND | ND | ND | 23.5 | 23.5 | 23.5 | 70.5 |
| TF-2A | 0-0.5 | ND | ND | ND | ND | 20.5 | 20.5 | 20.5 | 61.5 |
| TF-2A | 0.5-1.67 | ND | ND | ND | ND | 20.5 | 20.5 | 20.5 | 61.5 |
| TF-32A | 0-0.5 | ND | ND | ND | ND | 46.0 | 37.0 | 46.0 | 129.0 |
| TF-32A | 0.5-1.5 | ND | ND | ND | ND | 22.5 | 21.0 | 22.5 | 66.0 |
| TF-103A | 0-0.5 | ND | ND | ND | ND | 20.5 | 17.0 | 20.5 | 58.0 |
| TF-103A | 0.5-1.08 | ND | ND | ND | ND | 22.0 | 20.0 | 14.0 | 56.0 |
| **AGP Slip** | | | | | | | | | |
| RP-I-70 | 0-0.5 | ND | ND | ND | ND | 29.5 | 29.5 | 37.0 | 96.0 |
| RP-I-70 | 0.5-1.83 | ND | ND | ND | ND | 160.0 | 190.0 | 95.0 | 445.0 |
| RP-I-74 | 0-0.5 | ND | ND | ND | ND | 22.0 | 62.0 | 22.0 | 106.0 |
| RP-I-74 | 0.5-1.83 | ND | ND | ND | ND | 23.0 | 53.0 | 21.0 | 97.0 |
| RP-I-77 | 0-0.5 | ND | ND | ND | ND | 20.5 | 22.5 | 20.5 | 63.5 |
| RP-I-77 | 0.5-1.67 | ND | ND | ND | ND | 20.0 | 98.0 | 20.0 | 138.0 |
| RP-M-33 | 0-0.5 | ND | ND | ND | ND | 27.0 | 18.0 | 27.0 | 72.0 |
| RP-M-33 | 1-2 | ND | ND | ND | ND | 23.0 | 30.0 | 19.0 | 72.0 |
| RP-M-35 | 0-0.5 | ND | ND | ND | ND | 28.0 | 22.0 | 34.0 | 84.0 |
| RP-M-35 | 1-2 | ND | ND | ND | ND | 42.0 | 24.0 | 19.0 | 85.0 |

| Sample Location | Sample Depth (ft) | Aroclors (μg/kg dry weight) | | | | | | | Total PBCs (μg/kg dry weight) [3] |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 [1,2] | Aroclor 1221 [1,2] | Aroclor 1232 [1,2] | Aroclor 1242 [1,2] | Aroclor 1248 [1,2] | Aroclor 1254 [1,2] | Aroclor 1260 [1,2] | |
| RP-O-16 | 0-0.5 | ND | ND | ND | ND | 22.5 | 20.5 | 22.5 | 65.5 |
| RP-O-16 | 2-3 | ND | ND | ND | ND | 27.0 | 20.0 | 55.0 | 102.0 |
| **Azcon Slip** | | | | | | | | | |
| RP-I-53 | 0-0.5 | 22.0 | ND | ND | ND | 290.0 | 290.0 | 120.0 | 722.0 |
| RP-I-53 | 0.5-1.67 | 23.0 | ND | ND | ND | 320.0 | 360.0 | 180.0 | 883.0 |
| RP-M-26 | 0-0.5 | 30.0 | ND | ND | ND | 110.0 | 99.0 | 42.0 | 281.0 |
| RP-M-26 | 3-4 | 29.0 | ND | ND | ND | 29.0 | 58.0 | 30.0 | 146.0 |
| RP-I-58 | 0-0.5 | 23.0 | ND | ND | ND | 75.0 | 65.0 | 54.0 | 217.0 |
| RP-I-58 | 1.5-2.5 | 28.0 | ND | ND | ND | 110.0 | 83.0 | 45.0 | 266.0 |
| RP-M-28 | 0-0.5 | 40.0 | ND | ND | ND | 25.0 | 180.0 | 77.0 | 322.0 |
| RP-M-28 | 0.5-1 | 77.0 | ND | ND | ND | 28.0 | 150.0 | 97.0 | 352.0 |
| RP-I-46 | 0-0.5 | 27.5 | ND | ND | ND | 27.5 | 52.0 | 34.0 | 141.0 |
| RP-I-46 | 0.5-1.67 | 20.5 | ND | ND | ND | 20.5 | 20.5 | 20.5 | 82.0 |
| RP-I-52 | 0-0.5 | 33.0 | ND | ND | ND | 31.5 | 140.0 | 55.0 | 259.5 |
| RP-I-52 | 1-2 | 32.5 | ND | ND | ND | 32.5 | 230.0 | 100.0 | 395.0 |
| RP-100 | 0-0.5 | 24.5 | ND | ND | ND | 24.5 | 130.0 | 87.0 | 266.0 |
| RP-100 | 1-2 | 23.5 | ND | ND | ND | 23.5 | 33.0 | 27.0 | 107.0 |
| **Boat Landing** | | | | | | | | | |
| RP-I-2A | 0-0.5 | ND | ND | ND | ND | 19.0 | 49.0 | 23.0 | 91.0 |
| RP-I-2A | 2-3 | ND | ND | ND | ND | 110.0 | 100.0 | 57.0 | 267.0 |
| RP-I-6 | 0-0.5 | ND | ND | ND | ND | 24.5 | 29.0 | 21.0 | 74.5 |
| RP-I-6 | 1-2 | ND | ND | ND | ND | 59.0 | 65.0 | 34.0 | 158.0 |
| RP-I-9 | 0-0.5 | ND | ND | ND | ND | 21.5 | 21.5 | 21.5 | 64.5 |
| RP-I-9 | 0.5-1.4 | ND | ND | ND | ND | 20.0 | 20.0 | 20.0 | 60.0 |
| RP-M-2 | 0-0.5 | ND | ND | ND | ND | 21.0 | 21.0 | 14.0 | 56.0 |
| RP-M-2 | 0.5-1 | ND | ND | ND | ND | 17.5 | 45.0 | 24.0 | 86.5 |
| **Cargill Slip** | | | | | | | | | |
| RP-I-82 | 0-0.5 | ND | ND | ND | ND | 22.5 | ND | 22.5 | 45.0 |
| RP-I-82 | 1-1.75 | ND | ND | ND | ND | 29.0 | 33.0 | 14.0 | 76.0 |
| RP-I-86 | 0-0.5 | ND | ND | ND | ND | 28.0 | ND | 17.0 | 45.0 |
| RP-I-86 | 1-2 | ND | ND | ND | ND | 24.5 | ND | 19.0 | 43.5 |
| RP-I-88A | 0-0.5 | ND | ND | ND | ND | 28.5 | ND | 28.5 | 57.0 |
| RP-I-88A | 0.67-1.83 | ND | ND | ND | ND | 67.0 | ND | 32.0 | 99.0 |
| RP-I-93 | 0-0.5 | ND | ND | ND | ND | 23.0 | ND | 23.0 | 46.0 |
| RP-I-93 | 1-2.75 | ND | ND | ND | ND | 23.0 | ND | 23.0 | 46.0 |
| RP-I-94 | 0-0.5 | ND | ND | ND | ND | 27.5 | ND | 27.5 | 55.0 |
| RP-I-94 | 1-2 | ND | ND | ND | ND | 34.0 | ND | 15.0 | 49.0 |
| RP-M-41 | 0-0.5 | ND | ND | ND | ND | 21.0 | ND | 21.0 | 42.0 |
| RP-M-41 | 0.5-1.33 | ND | ND | ND | ND | 22.0 | ND | 22.0 | 44.0 |
| RP-M-44 | 0-0.5 | ND | ND | ND | ND | 23.5 | ND | 23.5 | 47.0 |
| RP-M-44 | 1-2 | ND | ND | ND | ND | 25.0 | ND | 25.0 | 50.0 |
| **Cargill B Slip** | | | | | | | | | |
| RP-I-105 | 0-0.5 | ND | ND | ND | ND | ND | 13.0 | 23.0 | 36.0 |

| Sample Location | Sample Depth (ft) | Aroclors (µg/kg dry weight) | | | | | | | Total PBCs (µg/kg dry weight) (3) |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 (1,2) | Aroclor 1221 (1,2) | Aroclor 1232 (1,2) | Aroclor 1242 (1,2) | Aroclor 1248 (1,2) | Aroclor 1254 (1,2) | Aroclor 1260 (1,2) | |
| RP-I-105 | 1-2 | ND | ND | ND | ND | ND | 12.0 | 22.0 | 34.0 |
| RP-I-107 | 0-0.5 | ND | ND | ND | ND | 19.0 | 21.0 | 25.5 | 65.5 |
| RP-I-107 | 1.5-2.5 | ND | ND | ND | ND | 91.0 | 91.0 | 45.0 | 227.0 |
| RP-I-109A | 0-0.5 | ND | ND | ND | ND | ND | 55.0 | 55.0 | 110.0 |
| RP-I-109A | 1.5-2.5 | ND | ND | ND | ND | ND | 160.0 | 72.0 | 232.0 |
| RP-I-113 | 0-0.5 | ND | ND | ND | ND | ND | 23.0 | 23.0 | 46.0 |
| RP-I-113 | 0.67-1.67 | ND | ND | ND | ND | ND | 22.0 | 22.0 | 44.0 |
| RP-M-57 | 0-0.5 | ND | ND | ND | ND | ND | 22.0 | 22.0 | 44.0 |
| RP-M-57 | 0.5-1.25 | ND | ND | ND | ND | ND | 20.5 | 20.5 | 41.0 |
| **Coast Guard** | | | | | | | | | |
| CG-100 | 0-0.5 | ND | ND | ND | ND | 21.0 | 21.0 | 13.0 | 55.0 |
| CG-100 | 0.83-1.83 | ND | ND | ND | ND | 28.0 | 28.0 | 28.0 | 84.0 |
| CG-101 | 0-0.5 | ND | ND | ND | ND | 22.0 | 21.0 | 15.0 | 58.0 |
| CG-101 | 0.5-1.5 | ND | ND | ND | ND | 53.0 | 57.0 | 29.0 | 139.0 |
| CG-102 | 0-0.5 | ND | ND | ND | ND | 18.0 | 20.0 | 31.5 | 69.5 |
| CG-102 | 0.5-1.42 | ND | ND | ND | ND | 22.0 | 16.0 | 12.0 | 50.0 |
| CG-103 | 0-0.5 | ND | ND | ND | ND | 15.0 | 15.0 | 25.5 | 55.5 |
| CG-103 | 0.83-1.92 | ND | ND | ND | ND | 48.0 | 54.0 | 48.0 | 150.0 |
| CG-104 | 0-0.5 | ND | ND | ND | ND | 28.5 | 28.5 | 24.0 | 81.0 |
| CG-104 | 0.5-1 | ND | ND | ND | ND | 22.5 | 22.5 | 22.5 | 67.5 |
| CG-105 | 0-0.5 | ND | ND | ND | ND | 44.0 | 35.0 | 22.0 | 101.0 |
| CG-105 | 0.5-1.17 | ND | ND | ND | ND | 20.0 | 20.0 | 20.0 | 60.0 |
| CG-106 | 0-0.5 | ND | ND | ND | ND | 20.0 | 20.0 | 20.0 | 60.0 |
| CG-106 | 0.5-1.83 | ND | ND | ND | ND | 20.0 | 23.5 | 20.0 | 63.5 |
| CG-107 | 0-0.5 | ND | ND | ND | ND | 22.0 | 22.0 | 22.0 | 66.0 |
| CG-107 | 0.5-1.67 | ND | ND | ND | ND | 24.0 | 29.0 | 24.0 | 77.0 |
| CG-108 | 0-0.5 | ND | ND | ND | ND | 44.0 | 66.0 | 50.0 | 160.0 |
| CG-108 | 3-4 | ND | ND | ND | ND | 40.5 | 40.5 | 40.5 | 121.5 |
| CG-109 | 0-0.5 | ND | ND | ND | ND | 38.5 | 35.0 | 25.0 | 98.5 |
| CG-109 | 0.5-1.33 | ND | ND | ND | ND | 44.0 | 54.0 | 32.0 | 130.0 |
| CG-110 | 0-0.5 | ND | ND | ND | ND | 18.0 | 21.0 | 15.0 | 54.0 |
| CG-110 | 3-4 | ND | ND | ND | ND | 21.5 | 12.0 | 21.5 | 55.0 |
| CG-111 | 0-0.5 | ND | ND | ND | ND | 65.0 | 65.0 | 65.0 | 195.0 |
| CG-111 | 0.8-1.83 | ND | ND | ND | ND | 38.5 | 38.5 | 38.5 | 115.5 |
| CG-112 | 0-0.5 | ND | ND | ND | ND | 23.5 | 12.0 | 12.0 | 47.5 |
| CG-112 | 1-2 | ND | ND | ND | ND | 47.0 | 51.0 | 31.0 | 129.0 |
| CG-113 | 0-0.5 | ND | ND | ND | ND | 19.0 | 20.0 | 16.0 | 55.0 |
| CG-113 | 0.5-1.5 | ND | ND | ND | ND | 21.5 | 11.0 | 21.5 | 54.0 |
| CG-114 | 0-0.5 | ND | ND | ND | ND | 38.0 | 38.0 | 38.0 | 114.0 |
| CG-114 | 0.5-1.92 | ND | ND | ND | ND | 49.0 | 49.0 | 49.0 | 147.0 |
| **General Mills** | | | | | | | | | |
| RP-I-137 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-I-137 | 0.5-1.5 | ND | ND | ND | ND | ND | ND | ND | ND |

| Sample Location | Sample Depth (ft) | Aroclors (μg/kg dry weight) | | | | | | | Total PBCs (μg/kg dry weight) [3] |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 [1,2] | Aroclor 1221 [1,2] | Aroclor 1232 [1,2] | Aroclor 1242 [1,2] | Aroclor 1248 [1,2] | Aroclor 1254 [1,2] | Aroclor 1260 [1,2] | |
| RP-I-127 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-I-127 | 1-2 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-M-59 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-M-59 | 1-2 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-O-26 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-O-26 | 2-3 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-O-27 | 0-0.5 | ND | ND | ND | ND | ND | 12.0 | ND | 12.0 |
| RP-O-27 | 1-2 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-O-28 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-O-28 | 0.5-1.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| **Hearding Island** | | | | | | | | | |
| HI-100 | 0-0.5 | ND | ND | ND | ND | 26.0 | 26.0 | ND | 52.0 |
| HI-100 | 3-4 | ND | ND | ND | ND | 75.0 | 75.0 | ND | 150.0 |
| HI-6-M1 | 0-0.5 | ND | ND | ND | ND | 65.0 | 65.0 | ND | 130.0 |
| HI-6-M1 | 1.5-2.5 | ND | ND | ND | ND | 105.0 | 105.0 | ND | 210.0 |
| HI-9-M1 | 0-0.5 | ND | ND | ND | ND | 52.0 | 63.0 | 32.0 | 147.0 |
| HI-9-M1 | 0.5-2.25 | ND | ND | ND | ND | 42.5 | 42.5 | ND | 85.0 |
| HI-R-1 | 0-0.5 | ND | ND | ND | ND | 36.0 | 36.0 | ND | 72.0 |
| HI-R-1 | 2-3 | ND | ND | ND | ND | 31.5 | 31.5 | ND | 63.0 |
| HI-R-2 | 0-0.5 | ND | ND | ND | ND | 21.0 | 21.0 | ND | 42.0 |
| HI-R-2 | 0.5-1.33 | ND | ND | ND | ND | 20.0 | 20.0 | ND | 40.0 |
| HI-R-3 | 0-0.5 | ND | ND | ND | ND | 25.0 | 21.0 | ND | 46.0 |
| HI-R-3 | 0.5-1 | ND | ND | ND | ND | 17.0 | 19.0 | ND | 36.0 |
| **Murphy Oil** | | | | | | | | | |
| RP-101 | 0-0.5 | ND | ND | ND | ND | 1200.0 | 3100.0 | 1200.0 | 5500.0 |
| RP-101 | 0.5-1.25 | ND | ND | ND | ND | 24.0 | 27.0 | 15.0 | 66.0 |
| RP-I-35 | 0-0.5 | ND | ND | ND | ND | 17.0 | 19.0 | 24.0 | 60.0 |
| RP-I-35 | 0.5-1.58 | ND | ND | ND | ND | 25.0 | 29.0 | 17.0 | 71.0 |
| RP-I-39 | 0-0.5 | ND | ND | ND | ND | 28.0 | 25.0 | 18.0 | 71.0 |
| RP-I-39 | 0.5-2.08 | ND | ND | ND | ND | 25.0 | 31.0 | 18.0 | 74.0 |
| RP-I-41 | 0-0.5 | ND | ND | ND | ND | 36.0 | 20.0 | 13.0 | 69.0 |
| RP-I-41 | 1.5-2.5 | ND | ND | ND | ND | 17.0 | 18.0 | 26.0 | 61.0 |
| RP-M-19A | 0-0.5 | ND | ND | ND | ND | 21.5 | 21.5 | 21.5 | 64.5 |
| RP-M-19A | 0.5-1.17 | ND | ND | ND | ND | 21.0 | 21.0 | 21.0 | 63.0 |
| RP-M-20 | 0-0.5 | ND | ND | ND | ND | 27.0 | 26.0 | 14.0 | 67.0 |
| RP-M-20 | 1-2 | ND | ND | ND | ND | 21.0 | 26.0 | 18.0 | 65.0 |
| **Rice's Point: 2008 Investigation [4]** | | | | | | | | | |
| RP-I-109 | 0.2-0.5 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-I-2 | 0.75-1.1 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-I-88 | 1.5-1.83 | ND | ND | ND | ND | ND | ND | ND | ND |
| RP-M-19 | 0.6-0.9 | ND | ND | ND | ND | ND | ND | ND | ND |
| **Slip 2** | | | | | | | | | |
| S2-12 | 0-0.5 | ND | ND | ND | ND | ND | 25.0 | ND | 25.0 |

| Sample Location | Sample Depth (ft) | Aroclors (µg/kg dry weight) | | | | | | | Total PBCs (µg/kg dry weight) [3] |
|---|---|---|---|---|---|---|---|---|---|
| | | Aroclor 1016 [1,2] | Aroclor 1221 [1,2] | Aroclor 1232 [1,2] | Aroclor 1242 [1,2] | Aroclor 1248 [1,2] | Aroclor 1254 [1,2] | Aroclor 1260 [1,2] | |
| S2-12 | 1-2 | ND | ND | ND | ND | ND | 140.0 | ND | 140.0 |
| S2-15 | 0-0.5 | ND | ND | ND | ND | ND | 24.5 | ND | 24.5 |
| S2-15 | 0.5-1.13 | ND | ND | ND | ND | ND | 15.0 | ND | 15.0 |
| S2-5 | 0-0.5 | ND | ND | ND | ND | ND | 32.0 | ND | 32.0 |
| S2-5 | 0.5-1.42 | ND | ND | ND | ND | ND | 24.0 | ND | 24.0 |
| S2-7 | 0-0.5 | ND | ND | ND | ND | ND | 31.0 | ND | 31.0 |
| S2-7 | 0.5-1 | ND | ND | ND | ND | ND | 62.0 | ND | 62.0 |
| **Slip 3** | | | | | | | | | |
| S3-10 | 0-0.5 | ND | ND | ND | ND | ND | 14.0 | ND | 14.0 |
| S3-10 | 1.5-2.5 | ND | ND | ND | ND | ND | 86.0 | ND | 86.0 |
| S3-14 | 0-0.5 | ND | ND | ND | ND | ND | 29.0 | ND | 29.0 |
| S3-14 | 1.08-2.08 | ND | ND | ND | ND | ND | 100.0 | ND | 100.0 |
| S3-6 | 0-0.5 | ND | ND | ND | ND | ND | 25.0 | ND | 25.0 |
| S3-6 | 0.75-1.75 | ND | ND | ND | ND | ND | 24.0 | ND | 24.0 |
| S3-8 | 0-0.5 | ND | ND | ND | ND | ND | 23.5 | ND | 23.5 |
| S3-8 | 0.5-1.38 | ND | ND | ND | ND | ND | 17.0 | ND | 17.0 |
| **Superior Bay** | | | | | | | | | |
| SB-1 | 0-0.5 | ND | ND | ND | ND | ND | 22.5 | ND | 22.5 |
| SB-1 | 2.08-3.13 | ND | ND | ND | ND | ND | 24.0 | ND | 24.0 |
| SB-11 | 0-0.5 | ND | ND | ND | ND | ND | 34.5 | ND | 34.5 |
| SB-11 | 3-4 | ND | ND | ND | ND | ND | 37.5 | ND | 37.5 |
| SB-25 | 0-0.5 | ND | ND | ND | ND | ND | 50.0 | ND | 50.0 |
| SB-25 | 0.5-1.46 | ND | ND | ND | ND | ND | 180.0 | ND | 180.0 |
| SB-28 | 0-0.5 | ND | ND | ND | ND | ND | 29.0 | ND | 29.0 |
| SB-28 | 1.08-2.13 | ND | ND | ND | ND | ND | 195.0 | ND | 195.0 |
| SB-30 | 0-0.5 | ND | ND | ND | ND | ND | 21.0 | ND | 21.0 |
| SB-30 | 0.5-1.46 | ND | ND | ND | ND | ND | 22.0 | ND | 22.0 |
| SB-40 | 0-0.5 | ND | ND | ND | ND | ND | 30.5 | ND | 30.5 |
| SB-40 | 0.5-1.33 | ND | ND | ND | ND | ND | 24.5 | ND | 24.5 |
| SB-43 | 0-0.5 | ND | ND | ND | ND | ND | 72.0 | ND | 72.0 |
| SB-43 | 2.33-3.33 | ND | ND | ND | ND | ND | 115.0 | ND | 115.0 |
| SB-45 | 0-0.5 | ND | ND | ND | ND | ND | 58.0 | ND | 58.0 |
| SB-45 | 2.33-3.33 | ND | ND | ND | ND | ND | 135.0 | ND | 135.0 |
| SB-9 | 0-0.5 | ND | ND | ND | ND | ND | 55.0 | ND | 55.0 |
| SB-9 | 3-4 | ND | ND | ND | ND | ND | 20.0 | ND | 20.0 |

**Notes:**
1. The maximum detected concentration was used when duplicate samples are available
2. Non-detect data are handled using the following assumptions:
   - Zero for the Aroclors that are all non-detects within a study area
   - 1/2 of the reporting limit for the Aroclors that are detected in more than one sample within a study area
3. Sum of individual Aroclors are used in calculating total PCBs
4. 2008 Investigation: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil)

**Table 8.18 Through Table 8.32: MPCA Level I and Level II SQT comparion**

These tables compare the analyte concentrations (i.e. Metals, PAHs, and PCBs) with available SQTs

The following notes are useful in intepreting data presented in the Tables 8.18 through 8.32.

Note 1. Only 13 priority PAHs are included in calculating total PAHs for the SQT comparison
Note 2. Sum of individual Aroclors are used in calculating total PCBs
Note 3. Only chemicals with Level I and II SQTs are used in the comparison
Note 4. Table contains dry weight concentrations of substances
Note 5. The maximum detected concentration was used when duplicate samples are available
Note 6. Non-detect data are handled using the following assumptions:
- Zero for the Aroclors/PAHs/Metals/Pesticides that are all non-detects within a study area
- 1/2 of the reporting limit for the Aroclors/PAHs/Metals/Pesticides that are detected in more than one sample within a study area

| | | |
|---|---|---|
| Note 7. | xxx | Concentration is less than MPCA SQT Level I |
| Note 8. | xxx | Concentration is between MPCA SQT Level I and Level II |
| Note 9. | **xxx** | Concentration is greater than MPCA SQT Level II |

Note 10. "-" Sediment samples were not analyzed for this analyte

| | | |
|---|---|---|
| Note 11. | | Reporting limit is greater than MPCA SQT Level I and less than SQT Level II for Total PCBs |
| Note 12. | | Reporting limit is greater than MPCA SQT Level II for Total PCBs |

Other Notes: 2008 Investigation points (Listed as Rice's Point) include: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil).

| Sample Location | Sample Depth (ft) | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| TF-44 | 0-0.5 | 4.5 | 0.81 | 38.0 | 50.0 | 72.0 | 0.230 | 28.0 | 200 |
| TF-44 | 2.5-3.5 | 2.4 | 0.53 | 21.0 | 26.0 | 46.0 | 0.220 | **170.0** | 97 |
| TF-34 | 0-0.5 | 4.7 | 0.99 | 57.0 | 62.0 | 73.0 | 0.480 | 40.0 | 250 |
| TF-34 | 3-4 | 2.7 | 0.36 | 35.0 | 22.0 | 10.0 | 0.076 | 27.0 | 94 |
| TF-39 | 0-0.5 | 4.7 | 1.80 | 17.0 | 37.0 | 82.0 | 0.720 | 12.0 | 210 |
| TF-39 | 0.5-1.42 | 3.7 | 1.40 | 9.2 | 21.0 | 47.0 | 0.260 | 8.2 | 150 |
| TF-8A | 0-0.5 | 2.8 | 0.99 | 14.0 | 15.0 | 13.0 | 0.660 | 13.0 | 54 |
| TF-8A | 1-2 | 5.2 | 2.80 | 37.0 | 37.0 | 64.0 | 0.063 | 28.0 | 200 |
| TF-50A | 0-0.5 | 2.9 | 1.10 | 18.0 | 53.0 | 41.0 | 0.043 | 19.0 | 86 |
| TF-50A | 0.5-1.25 | 2.3 | 1.10 | 16.0 | 34.0 | 46.0 | 0.054 | 18.0 | 83 |
| TF-15A | 0-0.5 | 5.3 | 1.80 | 44.0 | 42.0 | 40.0 | 0.190 | 34.0 | 160 |
| TF-15A | 2-3 | 3.8 | 1.80 | 37.0 | 32.0 | 32.0 | 0.300 | 28.0 | 140 |
| TF-1A | 0-0.92 | 2.0 | 0.29 | 5.2 | 4.4 | 4.1 | 0.020 | 5.5 | 18 |
| TF-19A | 0-0.5 | 4.6 | 1.90 | 31.0 | 41.0 | 41.0 | 0.440 | 31.0 | 170 |
| TF-19A | 2-3 | 5.4 | 4.00 | 42.0 | 71.0 | 100.0 | **1.700** | 32.0 | 360 |
| TF-22A | 0-0.5 | 3.5 | 1.50 | 35.0 | 35.0 | 27.0 | 0.130 | 31.0 | 130 |
| TF-22A | 2-3 | 2.8 | 1.00 | 32.0 | 23.0 | 7.8 | 0.073 | 30.0 | 90 |
| TF-102 | 0-0.5 | 2.2 | 0.68 | 12.0 | 13.0 | 27.0 | 0.110 | 12.0 | 61 |
| TF-102 | 1-2 | 2.4 | 0.94 | 17.0 | 18.0 | 33.0 | 0.100 | 16.0 | 69 |
| TF-100 | 0-0.5 | 5.1 | 1.90 | 36.0 | 37.0 | 33.0 | 0.170 | 30.0 | 140 |
| TF-100 | 2-3 | 3.1 | 2.30 | 9.5 | 8.6 | 7.6 | 0.020 | 11.0 | 29 |
| TF-101 | 0-0.5 | 6.0 | 2.80 | 43.0 | 41.0 | 37.0 | 0.240 | 33.0 | 170 |
| TF-101 | 3-4 | 3.7 | 2.00 | 32.0 | 43.0 | 50.0 | 0.560 | 26.0 | 160 |
| TF-103 | 0-0.5 | 2.3 | 1.20 | 18.0 | 38.0 | 31.0 | 0.043 | 21.0 | 100 |
| TF-103 | 0.5-1 | 1.6 | 0.75 | 11.0 | 36.0 | 23.0 | 0.017 | 14.0 | 110 |
| TF-25 | 0-0.5 | 5.5 | 2.00 | 44.0 | 43.0 | 46.0 | 0.300 | 35.0 | 170 |
| TF-25 | 3-4 | 3.3 | 1.30 | 31.0 | 28.0 | 25.0 | 0.160 | 27.0 | 95 |
| TF-26A | 0-0.5 | 4.2 | 1.90 | 41.0 | 51.0 | 42.0 | 0.200 | 32.0 | 170 |
| TF-26A | 2-3 | 5.8 | 4.10 | 62.0 | 83.0 | 120.0 | 1.000 | 39.0 | 340 |
| TF-41 | 0-0.5 | 3.5 | 1.50 | 31.0 | 38.0 | 43.0 | 0.210 | 24.0 | 130 |
| TF-41 | 3-4 | 5.0 | 2.60 | 42.0 | 43.0 | 44.0 | 0.390 | 36.0 | 170 |
| TF-24 | 0-0.5 | 5.9 | 2.30 | 44.0 | 42.0 | 46.0 | 0.300 | 34.0 | 190 |
| TF-24 | 3-4 | 2.9 | 1.30 | 46.0 | 45.0 | 42.0 | 0.190 | 36.0 | 180 |
| TF-36 | 0-0.5 | 5.6 | 2.50 | 49.0 | 55.0 | 61.0 | 0.370 | 39.0 | 210 |
| TF-36 | 3-4 | 2.9 | 1.40 | 28.0 | 25.0 | 21.0 | 0.280 | 23.0 | 93 |
| TF-4 | 0-0.5 | 2.6 | 1.00 | 17.0 | 15.0 | 15.0 | 0.150 | 16.0 | 65 |
| TF-4 | 2-3 | 3.1 | 1.30 | 21.0 | 20.0 | 22.0 | 0.080 | 19.0 | 93 |
| TF-3A | 0-0.5 | 3.4 | 1.30 | 21.0 | 21.0 | 29.0 | 0.230 | 20.0 | 95 |
| TF-3A | 3-4 | 2.3 | 0.92 | 26.0 | 15.0 | 4.6 | 0.024 | 21.0 | 62 |
| TF-23A | 0-0.5 | 5.5 | 1.80 | 35.0 | 36.0 | 53.0 | 0.280 | 28.0 | 180 |
| TF-23A | 3-4 | 3.3 | 1.30 | 39.0 | 24.0 | 9.9 | 0.035 | 31.0 | 100 |

| Sample Location | Sample Depth (ft) | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| TF-21A | 0-0.5 | 3.0 | 1.30 | 26.0 | 34.0 | 28.0 | 0.330 | 19.0 | 110 |
| TF-21A | 2-3 | 3.2 | 1.30 | 35.0 | 29.0 | 12.0 | 0.100 | 29.0 | 94 |
| TF-12A | 0-0.5 | 3.1 | 1.30 | 32.0 | 29.0 | 16.0 | 0.130 | 25.0 | 98 |
| TF-12A | 1-2 | 2.5 | 1.10 | 32.0 | 20.0 | 7.1 | 0.029 | 26.0 | 77 |
| TF-10 | 0-0.5 | 3.5 | 1.20 | 28.0 | 24.0 | 36.0 | 0.150 | 23.0 | 100 |
| TF-10 | 1-2 | 1.7 | 0.53 | 9.7 | 8.6 | 7.5 | 0.016 | 11.0 | 34 |
| TF-2A | 0-0.5 | 1.1 | 0.35 | 7.4 | 5.9 | 3.7 | 0.019 | 7.7 | 28 |
| TF-2A | 0.5-1.67 | 1.3 | 0.39 | 6.8 | 5.5 | 3.2 | 0.016 | 7.7 | 28 |
| TF-32A | 0-0.5 | 4.9 | 1.90 | 45.0 | 41.0 | 43.0 | 0.360 | 33.0 | 190 |
| TF-32A | 0.5-1.5 | 2.3 | 0.71 | 15.0 | 13.0 | 14.0 | 0.063 | 12.0 | 58 |
| TF-103A | 0-0.5 | 2.3 | 1.00 | 19.0 | 36.0 | 33.0 | 0.045 | 24.0 | 100 |
| TF-103A | 0.5-1.08 | 2.4 | 1.30 | 22.0 | 44.0 | 77.0 | 0.100 | 23.0 | 110 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs - $PAH_{13}$ (µg/kg) | Total PCBs (µg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| TF-44 | 0-0.5 | 74 | 74 | 200 | 98 | 59 | 90 | 800 | 900 | 1200 | 900 | **220** | **2200** | **2000** | 8815 | 153 |
| TF-44 | 2.5-3.5 | 73 | 40 | 170 | 99 | 49 | 68 | 670 | 460 | 350 | 260 | 85 | 1100 | 890 | 4314 | 175 |
| TF-34 | 0-0.5 | 50 | 56 | 130 | 61 | 66 | 110 | 450 | 590 | 800 | 1150 | **150** | 1200 | 1100 | 5913 | 180 |
| TF-34 | 3-4 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 31 | 15 | 335 | 110 | 225 | 335 | 1156 | 120 |
| TF-39 | 0-0.5 | 46 | 46 | 46 | 46 | 46 | 59 | 130 | 140 | 130 | 1000 | **340** | 700 | 1000 | 3727 | 204 |
| TF-39 | 0.5-1.42 | 49 | 49 | 58 | 49 | 53 | 78 | 260 | 150 | 160 | 1100 | **365** | 750 | 1100 | 4220 | 350 |
| TF-8A | 0-0.5 | 60 | 60 | 23 | 60 | 60 | 60 | 62 | 94 | 100 | 110 | 60 | 210 | 240 | 1199 | 36 |
| TF-8A | 1-2 | 39 | 62 | 140 | 96 | 150 | 330 | 420 | 460 | 550 | 540 | 80 | 790 | 1200 | 4857 | 63 |
| TF-50A | 0-0.5 | 34 | 105 | 100 | 38 | 105 | 105 | 410 | 340 | 370 | 370 | 105 | 770 | 780 | 3632 | 68 |
| TF-50A | 0.5-1.25 | 52 | 11 | 120 | 55 | 110 | 110 | 540 | 460 | 480 | 480 | 70 | 940 | 1100 | 4528 | 54 |
| TF-15A | 0-0.5 | **120** | 120 | 120 | 120 | 120 | 120 | 32 | 54 | 54 | 50 | 120 | 81 | 72 | 1183 | 64 |
| TF-15A | 2-3 | 75 | 75 | 11 | 75 | 75 | 75 | 30 | 47 | 53 | 50 | 75 | 74 | 68 | 783 | 106 |
| TF-1A | 0-0.92 | 50 | 50 | 8 | 50 | 50 | 50 | 31 | 19 | 13 | 11 | 50 | 32 | 28 | 442 | 60 |
| TF-19A | 0-0.5 | 34 | 39 | 140 | 74 | 130 | 190 | 460 | 490 | 510 | 570 | **170** | 990 | 1100 | 4897 | 108 |
| TF-19A | 2-3 | 57 | 88 | 210 | 130 | 170 | 320 | 710 | 800 | 920 | 1000 | **160** | 1400 | **2000** | 7965 | 540 |
| TF-22A | 0-0.5 | **215** | **215** | 52 | 25 | **215** | 215 | 250 | 240 | 240 | 260 | **215** | 490 | 530 | 3162 | 132 |
| TF-22A | 2-3 | **3800** | **540** | **10000** | **5500** | **1500** | **2000** | **35000** | **18000** | **16000** | **18000** | **2800** | **36000** | **48000** | **197140** | 104 |
| TF-102 | 0-0.5 | 37 | 6 | 120 | 47 | 55 | 55 | 600 | 390 | 350 | 430 | 51 | 940 | 880 | 3961 | 103 |
| TF-102 | 1-2 | 43 | 7 | 85 | 44 | 13 | 23 | 450 | 290 | 300 | 290 | 41 | 610 | 640 | 2836 | 118 |
| TF-100 | 0-0.5 | 80 | 13 | 29 | 16 | 27 | 51 | 85 | 110 | 130 | 130 | 80 | 170 | 200 | 1121 | 95 |
| TF-100 | 2-3 | 7 | 50 | 9 | 50 | 50 | 13 | 31 | 33 | 31 | 32 | 50 | 55 | 59 | 469 | 62 |
| TF-101 | 0-0.5 | **130** | 14 | 37 | 15 | 130 | 32 | 120 | 170 | 180 | 170 | 130 | 280 | 300 | 1708 | 146 |
| TF-101 | 3-4 | 27 | 26 | 77 | 48 | 34 | 62 | 310 | 330 | 330 | 330 | 46 | 680 | 680 | 2980 | **1000** |
| TF-103 | 0-0.5 | 73 | 18 | 210 | 100 | 21 | 38 | 940 | 600 | 630 | 650 | 120 | 1300 | **1800** | 6500 | 78 |
| TF-103 | 0.5-1 | **190** | 25 | 320 | 290 | 77 | 150 | **1400** | 470 | 410 | 460 | 74 | 980 | 1400 | 6246 | 59 |
| TF-25 | 0-0.5 | 29 | 35 | 82 | 57 | 46 | 110 | 250 | 310 | 400 | 400 | 110 | 620 | 670 | 3119 | 137 |
| TF-25 | 3-4 | 10 | 11 | 30 | 20 | 27 | 46 | 120 | 120 | 130 | 130 | 70 | 240 | 260 | 1214 | 85 |
| TF-26A | 0-0.5 | **145** | 12 | 42 | 17 | 145 | 33 | 130 | 170 | 200 | 180 | **145** | 300 | 310 | 1829 | 180 |
| TF-26A | 2-3 | 41 | 45 | 120 | 53 | 41 | 72 | 400 | 600 | 710 | 620 | 90 | 920 | 1400 | 5112 | 660 |
| TF-41 | 0-0.5 | 61 | 20 | 140 | 90 | 37 | 89 | 770 | 440 | 500 | 520 | 75 | 1000 | 1300 | 5042 | 133 |
| TF-41 | 3-4 | 26 | 38 | 95 | 60 | 85 | 160 | 340 | 360 | 380 | 430 | 81 | 670 | 830 | 3555 | 148 |
| TF-24 | 0-0.5 | 19 | 22 | 63 | 29 | 26 | 64 | 190 | 240 | 290 | 270 | 125 | 400 | 520 | 2258 | 107 |
| TF-24 | 3-4 | 21 | 30 | 71 | 43 | 58 | 99 | 240 | 250 | 270 | 290 | 50 | 450 | 590 | 2462 | 88 |
| TF-36 | 0-0.5 | 26 | 28 | 71 | 34 | **255** | 62 | 260 | 360 | 460 | 420 | **255** | 590 | 970 | 3791 | 142 |
| TF-36 | 3-4 | 9 | 15 | 34 | 23 | 27 | 50 | 120 | 130 | 140 | 140 | 70 | 230 | 310 | 1298 | 124 |
| TF-4 | 0-0.5 | 65 | 8 | 20 | 12 | 24 | 57 | 67 | 73 | 82 | 76 | 65 | 120 | 180 | 849 | 78 |
| TF-4 | 2-3 | 14 | 24 | 65 | 33 | 44 | 120 | 170 | 210 | 240 | 240 | 65 | 350 | 470 | 2045 | 72 |
| TF-3A | 0-0.5 | 22 | 25 | 70 | 46 | 58 | 100 | 220 | 230 | 260 | 270 | 54 | 530 | 670 | 2555 | 102 |
| TF-3A | 3-4 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 130 | 60 | 60 | 60 | 60 | 850 | 80 |
| TF-23A | 0-0.5 | 42 | 91 | 200 | 110 | 130 | 140 | 500 | 710 | 1000 | 780 | **140** | 1100 | **1600** | 6543 | 347 |
| TF-23A | 3-4 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 100 | 85 | 85 | 85 | 85 | 1120 | 101 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs - $PAH_{13}$ (µg/kg) | Total PCBs (µg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| TF-21A | 0-0.5 | **160** | 35 | 420 | 210 | 49 | 85 | **1900** | **1200** | 1200 | 1200 | **160** | **2600** | **2700** | 11919 | 214 |
| TF-21A | 2-3 | 18 | 90 | 28 | 20 | 90 | 90 | 190 | 85 | 75 | 91 | 90 | 230 | 200 | 1297 | 104 |
| TF-12A | 0-0.5 | 21 | 18 | 47 | 33 | 34 | 54 | 210 | 210 | 230 | 240 | 90 | 490 | 480 | 2157 | 111 |
| TF-12A | 1-2 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 220 | 80 | 80 | 80 | 80 | 1180 | 98 |
| TF-10 | 0-0.5 | 17 | 26 | 65 | 35 | 69 | 160 | 180 | 200 | 210 | 220 | 65 | 370 | 390 | 2007 | 73 |
| TF-10 | 1-2 | 50 | 50 | 12 | 50 | 7 | 23 | 24 | 28 | 36 | 32 | 50 | 46 | 49 | 457 | 71 |
| TF-2A | 0-0.5 | 50 | 50 | 50 | 50 | 50 | 50 | 9 | 13 | 10 | 11 | 50 | 23 | 23 | 439 | 62 |
| TF-2A | 0.5-1.67 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 7 | 50 | 50 | 50 | 7 | 50 | 564 | 62 |
| TF-32A | 0-0.5 | **115** | 115 | 115 | 115 | 115 | 115 | 39 | 54 | 59 | 50 | 115 | 90 | 94 | 1191 | 129 |
| TF-32A | 0.5-1.5 | 7 | 8 | 22 | 11 | 10 | 19 | 75 | 83 | 89 | 93 | 55 | 160 | 160 | 792 | 66 |
| TF-103A | 0-0.5 | 34 | 19 | 98 | 46 | 105 | 105 | 440 | 430 | 440 | 530 | 98 | 860 | 1300 | 4505 | 58 |
| TF-103A | 0.5-1.08 | **270** | **550** | 640 | 330 | 80 | 220 | **2700** | **1600** | **1500** | **1800** | **550** | **3400** | **4200** | 17840 | 56 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| TF-44 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 13.36 |
| TF-44 | 2.5-3.5 | ND | ND | ND | ND | ND | ND | ND | 8.34 |
| TF-34 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 16.55 |
| TF-34 | 3-4 | ND | ND | ND | ND | ND | ND | ND | **23.06** |
| TF-39 | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-39 | 0.5-1.42 | - | - | - | - | - | - | - | - |
| TF-8A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-8A | 1-2 | - | - | - | - | - | - | - | - |
| TF-50A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-50A | 0.5-1.25 | - | - | - | - | - | - | - | - |
| TF-15A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 4.22 |
| TF-15A | 2-3 | ND | ND | ND | ND | ND | ND | ND | 10.16 |
| TF-1A | 0-0.92 | - | - | - | - | - | - | - | **-** |
| TF-19A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 14.19 |
| TF-19A | 2-3 | ND | ND | ND | ND | ND | ND | ND | **67.72** |
| TF-22A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.65 |
| TF-22A | 2-3 | ND | ND | ND | ND | ND | ND | ND | 0.02 |
| TF-102 | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-102 | 1-2 | - | - | - | - | - | - | - | - |
| TF-100 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 12.28 |
| TF-100 | 2-3 | ND | ND | ND | ND | ND | ND | ND | 1.40 |
| TF-101 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 9.26 |
| TF-101 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 5.38 |
| TF-103 | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-103 | 0.5-1 | - | - | - | - | - | - | - | - |
| TF-25 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 10.49 |
| TF-25 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 6.11 |
| TF-26A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | **27.76** |
| TF-26A | 2-3 | ND | ND | ND | ND | ND | ND | ND | 9.34 |
| TF-41 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 9.17 |
| TF-41 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 8.32 |
| TF-24 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 8.90 |
| TF-24 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 9.90 |
| TF-36 | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-36 | 3-4 | - | - | - | - | - | - | - | - |
| TF-4 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 12.35 |
| TF-4 | 2-3 | ND | ND | ND | ND | ND | ND | ND | 20.58 |
| TF-3A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-3A | 3-4 | - | - | - | - | - | - | - | - |
| TF-23A | 0-0.5 | ND | ND | 20 | ND | ND | ND | ND | 2.31 |
| TF-23A | 3-4 | ND | ND | ND | ND | ND | ND | ND | 0.00 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| TF-21A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 3.92 |
| TF-21A | 2-3 | ND | ND | ND | ND | ND | ND | ND | 0.05 |
| TF-12A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 4.64 |
| TF-12A | 1-2 | ND | ND | ND | ND | ND | ND | ND | 0.03 |
| TF-10 | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-10 | 1-2 | - | - | - | - | - | - | - | - |
| TF-2A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-2A | 0.5-1.67 | - | - | - | - | - | - | - | - |
| TF-32A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-32A | 0.5-1.5 | - | - | - | - | - | - | - | - |
| TF-103A | 0-0.5 | - | - | - | - | - | - | - | - |
| TF-103A | 0.5-1.08 | - | - | - | - | - | - | - | - |

| **Sample Location** | | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Sample Depth (ft)** | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-70 | 0-0.5 | 5.1 | 1.0 | 24.0 | 32.0 | 58.0 | 0.130 | 17.0 | 110 |
| RP-I-70 | 0.5-1.83 | 5.9 | 1.6 | 34.0 | 43.0 | 100.0 | 0.160 | 21.0 | 190 |
| RP-I-74 | 0-0.5 | 1.5 | 0.4 | 7.7 | 10.0 | 7.0 | 0.009 | 9.1 | 25 |
| RP-I-74 | 0.5-1.83 | 1.9 | 0.5 | 10.0 | 10.0 | 25.0 | 0.029 | 9.1 | 34 |
| RP-I-77 | 0-0.5 | 1.2 | 0.3 | 6.4 | 6.2 | 4.5 | 0.009 | 6.6 | 19 |
| RP-I-77 | 0.5-1.67 | 1.2 | 0.3 | 6.8 | 5.8 | 4.4 | 0.011 | 7.1 | 18 |
| RP-M-33 | 0-0.5 | 4.0 | 0.8 | 19.0 | 36.0 | 23.0 | 0.043 | 15.0 | 71 |
| RP-M-33 | 1-2 | 4.9 | 0.9 | 23.0 | 33.0 | 42.0 | 0.080 | 18.0 | 110 |
| RP-M-35 | 0-0.5 | 6.0 | 1.0 | 24.0 | 32.0 | 45.0 | 0.100 | 20.0 | 100 |
| RP-M-35 | 1-2 | 3.5 | 0.5 | 13.0 | 14.0 | 51.0 | 0.030 | 11.0 | 54 |
| RP-O-16 | 0-0.5 | 2.8 | 0.7 | 31.0 | 16.0 | 19.0 | 0.034 | 12.0 | 53 |
| RP-O-16 | 2-3 | 3.8 | 0.9 | 22.0 | 21.0 | 35.0 | 0.100 | 15.0 | 91 |

| **Sample Location** | **Sample Depth (ft)** | **Priority PAHs (µg/kg dry weight)** | | | | | | | | | | | | | **Total PAHs (µg/kg dry weight)** | **Total PCBs (µg/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-70 | 0-0.5 | 860 | 340 | 1100 | 620 | 380 | 780 | 2800 | 2000 | 1400 | 2000 | 230 | 3400 | 5300 | 21210 | 96 |
| RP-I-70 | 0.5-1.83 | 2600 | 870 | 2200 | 2000 | 770 | 1400 | 5200 | 4200 | 3700 | 4000 | 310 | 8100 | 11000 | 46350 | 445 |
| RP-I-74 | 0-0.5 | 16 | 7 | 44 | 15 | 12 | 13 | 98 | 81 | 56 | 77 | 50 | 140 | 240 | 849 | 106 |
| RP-I-74 | 0.5-1.83 | 47 | 12 | 42 | 48 | 25 | 31 | 290 | 170 | 120 | 170 | 50 | 290 | 480 | 1775 | 97 |
| RP-I-77 | 0-0.5 | 30 | 50 | 41 | 40 | 14 | 38 | 290 | 160 | 100 | 140 | 50 | 320 | 460 | 1733 | 64 |
| RP-I-77 | 0.5-1.67 | 50 | 50 | 0 | 50 | 50 | 50 | 15 | 16 | 6 | 8 | 50 | 21 | 35 | 399 | 138 |
| RP-M-33 | 0-0.5 | **120** | 69 | 54 | 130 | 53 | 75 | 810 | 690 | 460 | 740 | 70 | 1000 | **1800** | 6071 | 72 |
| RP-M-33 | 1-2 | **110** | 45 | 61 | 130 | 89 | 120 | 860 | 710 | 470 | 640 | 80 | 1100 | **1800** | 6215 | 72 |
| RP-M-35 | 0-0.5 | **1300** | **400** | **2300** | **1500** | **460** | **1000** | **8700** | **4500** | **3800** | **4200** | **380** | **9400** | **8900** | **46840** | 84 |
| RP-M-35 | 1-2 | **400** | 58 | 200 | 260 | 100 | 210 | 540 | 520 | 270 | 430 | 36 | 1000 | **2000** | 6024 | 85 |
| RP-O-16 | 0-0.5 | **170** | 38 | 310 | 180 | 70 | 110 | 600 | 440 | 270 | 440 | 40 | 720 | 1300 | 4688 | 66 |
| RP-O-16 | 2-3 | **160** | 120 | 360 | 190 | 120 | 160 | 920 | 820 | 550 | 750 | 65 | 1200 | **2000** | 7415 | 102 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-70 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-70 | 0.5-1.83 | - | - | - | - | - | - | - | - |
| RP-I-74 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-74 | 0.5-1.83 | - | - | - | - | - | - | - | - |
| RP-I-77 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-77 | 0.5-1.67 | - | - | - | - | - | - | - | - |
| RP-M-33 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.61 |
| RP-M-33 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 5.64 |
| RP-M-35 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 6.47 |
| RP-M-35 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 3.28 |
| RP-O-16 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.50 |
| RP-O-16 | 2-3 | ND | ND | ND | ND | ND | ND | ND | 8.50 |

| Sample Location | Sample Depth (ft) | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-53 | 0-0.5 | 3.7 | 0.85 | 26.0 | 48.0 | **390.0** | 0.100 | 14.0 | 230 |
| RP-I-53 | 0.5-1.67 | 5.1 | 1.40 | 31.0 | 59.0 | **540.0** | 0.170 | 16.0 | 340 |
| RP-M-26 | 0-0.5 | 4.9 | 1.10 | 23.0 | 34.0 | **130.0** | 0.110 | 20.0 | 190 |
| RP-M-26 | 3-4 | 5.8 | 1.80 | 28.0 | 41.0 | 100.0 | 0.440 | 23.0 | 230 |
| RP-I-58 | 0-0.5 | 3.7 | 2.50 | 18.0 | 35.0 | 120.0 | 0.074 | 15.0 | 210 |
| RP-I-58 | 1.5-2.5 | 4.9 | 1.10 | 26.0 | 43.0 | **150.0** | 0.170 | 22.0 | 280 |
| RP-M-28 | 0-0.5 | 2.8 | 0.67 | 13.0 | 23.0 | 62.0 | 0.046 | 11.0 | 120 |
| RP-M-28 | 0.5-1 | 4.9 | 1.30 | 27.0 | 40.0 | 110.0 | 0.110 | 21.0 | 220 |
| RP-I-46 | 0-0.5 | 3.7 | 1.10 | 23.0 | 23.0 | 53.0 | 0.098 | 18.0 | 120 |
| RP-I-46 | 0.5-1.67 | 1.4 | 0.35 | 6.4 | 8.3 | 8.9 | 0.006 | 6.6 | 27 |
| RP-I-52 | 0-0.5 | 4.2 | 0.92 | 20.0 | 25.0 | 72.0 | 0.084 | 15.0 | 120 |
| RP-I-52 | 1-2 | 5.7 | 2.20 | 31.0 | 47.0 | **130.0** | 0.370 | 24.0 | 260 |
| RP-100 | 0-0.5 | 3.3 | 1.10 | 17.0 | 24.0 | 62.0 | 0.150 | 14.0 | 140 |
| RP-100 | 1-2 | 3.3 | 0.86 | 15.0 | 21.0 | 40.0 | 0.100 | 13.0 | 99 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg dry weight) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-53 | 0-0.5 | **180** | 130 | 590 | 380 | 170 | 340 | **1900** | 1100 | 1000 | 1100 | **180** | 1800 | **2500** | 11370 | **722** |
| RP-I-53 | 0.5-1.67 | **160** | 95 | 520 | 280 | 140 | 190 | **1500** | 930 | 910 | 1100 | **160** | 1700 | **2300** | 9985 | **883** |
| RP-M-26 | 0-0.5 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 910 | 281 |
| RP-M-26 | 3-4 | **870** | **160** | **2100** | **1200** | **760** | **940** | **7400** | **4300** | **4100** | **4500** | **680** | **8500** | **11000** | **46510** | 146 |
| RP-I-58 | 0-0.5 | 72 | 15 | 180 | 110 | 54 | 70 | 610 | 350 | 310 | 340 | 115 | 700 | 770 | 3696 | 217 |
| RP-I-58 | 1.5-2.5 | **130** | 32 | 410 | 190 | 57 | 64 | **1400** | 840 | 730 | 760 | 100 | 1600 | **1900** | 8213 | 266 |
| RP-M-28 | 0-0.5 | 28 | 10 | 84 | 42 | 22 | 24 | 320 | 190 | 150 | 230 | 55 | 460 | 420 | 2035 | 322 |
| RP-M-28 | 0.5-1 | **120** | 20 | 310 | 150 | 36 | 48 | 1100 | 660 | 590 | 590 | 76 | 1400 | 1300 | 6400 | 352 |
| RP-I-46 | 0-0.5 | **100** | 15 | 240 | 120 | 35 | 84 | 900 | 490 | 480 | 490 | 60 | 1100 | 1000 | 5114 | 141 |
| RP-I-46 | 0.5-1.67 | 50 | 50 | 10 | 50 | 50 | 50 | 51 | 21 | 15 | 19 | 50 | 61 | 55 | 532 | 82 |
| RP-I-52 | 0-0.5 | **270** | 55 | 700 | 420 | 110 | 150 | **2400** | **1300** | 1200 | 1300 | **150** | **2600** | **2500** | 13155 | 260 |
| RP-I-52 | 1-2 | **5300** | **1100** | **13000** | **11000** | **5000** | **14000** | **41000** | **14000** | **11000** | **13000** | **1700** | **27000** | **39000** | **196100** | 395 |
| RP-100 | 0-0.5 | **110** | 31 | 260 | 160 | 91 | 90 | 870 | 550 | 490 | 560 | 61 | 1200 | 1100 | 5573 | 266 |
| RP-100 | 1-2 | **110** | 34 | 280 | 180 | 230 | 170 | 890 | 490 | 420 | 490 | 54 | 1100 | 1000 | 5448 | 107 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-53 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-53 | 0.5-1.67 | - | - | - | - | - | - | - | - |
| RP-M-26 | 0-0.5 | ND | ND | 3.15 | ND | ND | ND | ND | 8.30 |
| RP-M-26 | 3-4 | ND | ND | 18 | ND | ND | ND | ND | **37.81** |
| RP-I-58 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-58 | 1.5-2.5 | - | - | - | - | - | - | - | - |
| RP-M-28 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-28 | 0.5-1 | - | - | - | - | - | - | - | - |
| RP-I-46 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-46 | 0.5-1.67 | - | - | - | - | - | - | - | - |
| RP-I-52 | 0-0.5 | ND | ND | 3.6 | ND | ND | ND | ND | 8.10 |
| RP-I-52 | 1-2 | ND | ND | 34 | ND | ND | ND | ND | **23.54** |
| RP-100 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-100 | 1-2 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-2A | 0-0.5 | 6.7 | 1.7 | 23.0 | 74.0 | 120.0 | 0.21 | 22 | 380 |
| RP-I-2A | 2-3 | 6.0 | 2.2 | 41.0 | 70.0 | **140.0** | 0.38 | 34 | 300 |
| RP-I-6 | 0-0.5 | 2.1 | 0.5 | 12.0 | 13.0 | 20.0 | 0.078 | 13 | 140 |
| RP-I-6 | 1-2 | 2.2 | 0.5 | 13.0 | 12.0 | 19.0 | 0.58 | 15 | 150 |
| RP-I-9 | 0-0.5 | 1.2 | 0.3 | 9.9 | 8.5 | 21.0 | 0.026 | 9.3 | 34 |
| RP-I-9 | 0.5-1.4 | 0.9 | 0.2 | 4.5 | 4.8 | 4.6 | 0.011 | 7.2 | 15 |
| RP-M-2 | 0-0.5 | 7.9 | 1.6 | 33.0 | 45.0 | 80.0 | 0.31 | 29 | 260 |
| RP-M-2 | 0.5-1 | 7.6 | 1.9 | 31.0 | 42.0 | 84.0 | 0.51 | 26 | 210 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-2A | 0-0.5 | **170** | 97 | 460 | 250 | 87 | 130 | **1500** | **1100** | 1200 | **1300** | **190** | **2700** | **3300** | 12484 | 91 |
| RP-I-2A | 2-3 | **230** | **130** | 720 | 360 | 160 | 250 | **1900** | **1900** | **1900** | **2700** | **320** | **3900** | **5300** | 19770 | 267 |
| RP-I-6 | 0-0.5 | 16 | 12 | 53 | 22 | 16 | 28 | **170** | 190 | 170 | 410 | 120 | 700 | 540 | 2447 | 75 |
| RP-I-6 | 1-2 | 60 | 46 | 150 | 100 | 130 | 290 | **620** | 470 | 490 | 540 | **145** | 960 | 1000 | 5001 | 158 |
| RP-I-9 | 0-0.5 | **670** | 16 | 520 | **510** | 73 | 130 | **1300** | 570 | 460 | 770 | 95 | 1500 | **2200** | 8814 | 65 |
| RP-I-9 | 0.5-1.4 | 14 | 49 | 7 | 11 | 49 | 25 | 23 | 17 | 16 | 14 | 49 | 45 | 43 | 361 | 60 |
| RP-M-2 | 0-0.5 | **410** | 100 | **1500** | **600** | 140 | 250 | **4300** | **2700** | **2100** | **4600** | **550** | **7400** | **7700** | **32350** | 56 |
| RP-M-2 | 0.5-1 | **260** | 83 | 440 | 240 | 130 | 260 | **1400** | **1300** | 1200 | **1400** | 130 | **3200** | **2900** | 12943 | 87 |

Table 8.21c
SQT Comparison: Pesticides and Dioxins (Boat Landing)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins* (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-2A | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-2A | 2-3 | - | - | - | - | - | - | - | - |
| RP-I-6 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 4.20 |
| RP-I-6 | 1-2 | ND | ND | ND | ND | ND | ND | ND | **41.00** |
| RP-I-9 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-9 | 0.5-1.4 | - | - | - | - | - | - | - | - |
| RP-M-2 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-2 | 0.5-1 | - | - | - | - | - | - | - | - |

* TEQ concentration was calculated treating nondetects as zero due to the lack of reporting limits

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-82 | 0-0.5 | 2.2 | 0.41 | 11.0 | 16.0 | 16.0 | 0.021 | 10.0 | 29 |
| RP-I-82 | 1-1.75 | 1.6 | 0.37 | 6.8 | 7.2 | 15.0 | 0.026 | 8.3 | 23 |
| RP-I-86 | 0-0.5 | 4.7 | 1.10 | 17.0 | 27.0 | 52.0 | 0.140 | 21.0 | 110 |
| RP-I-86 | 1-2 | 3.9 | 0.84 | 17.0 | 24.0 | 62.0 | 0.110 | 19.0 | 100 |
| RP-I-88A | 0-0.5 | 4.1 | 0.83 | 18.0 | 25.0 | 46.0 | 0.081 | 15.0 | 93 |
| RP-I-88A | 0.67-1.83 | 3.3 | 0.74 | 18.0 | 23.0 | 67.0 | 0.084 | 13.0 | 97 |
| RP-I-93 | 0-0.5 | 2.9 | 0.73 | 11.0 | 11.0 | 12.0 | 0.038 | 10.0 | 45 |
| RP-I-93 | 1-2.75 | 2.1 | 0.48 | 9.4 | 8.0 | 7.6 | 0.020 | 8.1 | 30 |
| RP-I-94 | 0-0.5 | 6.3 | 0.96 | 22.0 | 22.0 | 21.0 | 0.064 | 18.0 | 84 |
| RP-I-94 | 1-2 | 4.6 | 0.52 | 43.0 | 110.0 | 42.0 | 0.036 | 40.0 | 40 |
| RP-M-41 | 0-0.5 | 2.1 | 0.58 | 10.0 | **780.0** | 39.0 | 0.023 | 9.7 | 52 |
| RP-M-41 | 0.5-1.33 | 8.8 | 0.44 | 8.3 | 33.0 | 9.7 | 0.014 | 7.6 | 33 |
| RP-M-44 | 0-0.5 | 2.3 | 0.63 | 10.0 | 12.0 | 19.0 | 0.047 | 9.8 | 42 |
| RP-M-44 | 1-2 | 1.6 | 0.87 | 13.0 | 16.0 | 56.0 | 0.061 | 11.0 | 78 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-82 | 0-0.5 | 22 | 5 | 70 | 31 | 9 | 11 | 270 | 200 | 140 | 190 | 55 | 440 | 450 | 1894 | 45 |
| RP-I-82 | 1-1.75 | 55 | 11 | 180 | 88 | 21 | 38 | 830 | 420 | 290 | 450 | 55 | 1000 | 1000 | 4438 | 76 |
| RP-I-86 | 0-0.5 | 43 | 24 | 100 | 84 | 71 | 110 | 640 | 220 | 180 | 290 | 70 | 640 | 790 | 3262 | 45 |
| RP-I-86 | 1-2 | **95** | 85 | 260 | 220 | 190 | 180 | **1500** | 610 | 480 | 710 | 84 | 1600 | **2000** | 8014 | 44 |
| RP-I-88A | 0-0.5 | **180** | 79 | 450 | 310 | 190 | 190 | **2200** | 870 | 650 | 1000 | 110 | 2200 | **2700** | 11129 | 57 |
| RP-I-88A | 0.67-1.83 | **190** | 82 | 400 | 280 | **220** | 220 | **1900** | 820 | 600 | 940 | 110 | 2100 | **2600** | 10462 | 99 |
| RP-I-93 | 0-0.5 | 53 | 16 | 110 | 78 | 34 | 38 | 560 | 310 | 220 | 320 | 55 | 800 | 690 | 3284 | 46 |
| RP-I-93 | 1-2.75 | 18 | 7 | 32 | 23 | 14 | 17 | 160 | 91 | 74 | 95 | 50 | 230 | 220 | 1031 | 46 |
| RP-I-94 | 0-0.5 | 50 | 19 | 97 | 71 | 38 | 49 | 500 | 320 | 230 | 350 | 65 | 760 | 720 | 3269 | 55 |
| RP-I-94 | 1-2 | 48 | 18 | 110 | 72 | 27 | 31 | 590 | 300 | 240 | 490 | 56 | 1100 | 950 | 4032 | 49 |
| RP-M-41 | 0-0.5 | 12 | 7 | 40 | 19 | 16 | 17 | 180 | 82 | 71 | 94 | 50 | 220 | 280 | 1088 | 42 |
| RP-M-41 | 0.5-1.33 | 18 | 50 | 46 | 19 | 10 | 12 | 160 | 88 | 70 | 93 | 50 | 210 | 270 | 1096 | 44 |
| RP-M-44 | 0-0.5 | 24 | 12 | 95 | 54 | 18 | 21 | 380 | 160 | 100 | 170 | 55 | 350 | 470 | 1909 | 47 |
| RP-M-44 | 1-2 | **150** | 69 | 360 | 280 | 160 | 280 | **1800** | 680 | 450 | 740 | 83 | 1700 | **2000** | 8752 | 50 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-82 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-82 | 1-1.75 | - | - | - | - | - | - | - | - |
| RP-I-86 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 9.43 |
| RP-I-86 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 9.16 |
| RP-I-88A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 6.41 |
| RP-I-88A | 0.67-1.83 | ND | ND | ND | ND | ND | ND | ND | 7.02 |
| RP-I-93 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.33 |
| RP-I-93 | 1-2.75 | ND | ND | ND | ND | ND | ND | ND | 0.67 |
| RP-I-94 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 5.18 |
| RP-I-94 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 1.47 |
| RP-M-41 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-41 | 0.5-1.33 | - | - | - | - | - | - | - | - |
| RP-M-44 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-44 | 1-2 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-105 | 0-0.5 | 2.1 | 0.37 | 8.9 | 14.0 | 15.0 | 0.029 | 9.5 | 38 |
| RP-I-105 | 1-2 | 1.9 | 0.31 | 6.1 | 8.6 | 10.0 | 0.150 | 6.8 | 25 |
| RP-I-107 | 0-0.5 | 2.6 | 0.68 | 16.0 | 24.0 | 20.0 | 0.064 | 16.0 | 66 |
| RP-I-107 | 1.5-2.5 | 3.8 | 0.95 | 16.0 | 29.0 | 46.0 | 0.150 | 16.0 | 110 |
| RP-I-109A | 0-0.5 | 5.8 | 3.60 | 35.0 | 62.0 | 73.0 | 0.190 | 30.0 | 190 |
| RP-I-109A | 1.5-2.5 | 7.7 | 2.60 | 37.0 | 73.0 | **140.0** | 0.340 | 31.0 | 290 |
| RP-I-113 | 0-0.5 | 2.1 | 0.36 | 7.9 | 10.0 | 8.2 | 0.023 | 8.9 | 29 |
| RP-I-113 | 0.67-1.67 | 2.3 | 0.32 | 6.4 | 9.3 | 9.6 | 0.018 | 7.0 | 24 |
| RP-M-57 | 0-0.5 | 1.4 | 0.26 | 6.3 | 8.4 | 6.7 | 0.009 | 7.3 | 22 |
| RP-M-57 | 0.5-1.25 | 1.2 | 0.23 | 4.4 | 5.2 | 3.3 | 0.019 | 6.0 | 16 |

| **Sample Location** | **Sample Depth (ft)** | **Priority PAHs (µg/kg)** | | | | | | | | | | | | | **Total PAHs (µg/kg dry weight)** | **Total PCBs (µg/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-105 | 0-0.5 | 10 | 55 | 23 | 10 | 8 | 55 | 85 | 80 | 66 | 74 | 0 | 160 | 200 | 826 | 36 |
| RP-I-105 | 1-2 | 22 | 6 | 43 | 21 | 16 | 17 | 120 | 100 | 78 | 100 | 0 | 220 | 280 | 1023 | 34 |
| RP-I-107 | 0-0.5 | 58 | 15 | 200 | 84 | 37 | 49 | 670 | 430 | 270 | 420 | 46 | 860 | 890 | 4029 | 66 |
| RP-I-107 | 1.5-2.5 | 48 | 30 | 110 | 68 | 100 | 100 | 400 | 270 | 220 | 320 | 0 | 550 | 670 | 2886 | 227 |
| RP-I-109A | 0-0.5 | 34 | 15 | 81 | 35 | 32 | 41 | 350 | 300 | 310 | 300 | 0 | 610 | 620 | 2728 | 110 |
| RP-I-109A | 1.5-2.5 | **92** | 16 | 51 | 51 | 53 | 54 | 190 | 170 | 130 | 170 | 0 | 420 | 450 | 1847 | 232 |
| RP-I-113 | 0-0.5 | 24 | 6 | 40 | 21 | 11 | 13 | 150 | 100 | 86 | 110 | 0 | 210 | 240 | 1011 | 46 |
| RP-I-113 | 0.67-1.67 | 11 | 5 | 26 | 11 | 8 | 55 | 80 | 72 | 57 | 73 | 0 | 150 | 190 | 738 | 44 |
| RP-M-57 | 0-0.5 | 11 | 9 | 49 | 15 | 50 | 50 | 190 | 150 | 140 | 170 | 0 | 280 | 410 | 1524 | 44 |
| RP-M-57 | 0.5-1.25 | 49 | 49 | 49 | 49 | 49 | 49 | 10 | 11 | 49 | 7 | 0 | 17 | 21 | 408 | 41 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-105 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.72 |
| RP-I-105 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 0.96 |
| RP-I-107 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.43 |
| RP-I-107 | 1.5-2.5 | ND | ND | ND | ND | ND | ND | ND | 20.84 |
| RP-I-109A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 5.96 |
| RP-I-109A | 1.5-2.5 | ND | ND | ND | ND | ND | ND | ND | **23.93** |
| RP-I-113 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-113 | 0.67-1.67 | - | - | - | - | - | - | - | - |
| RP-M-57 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-57 | 0.5-1.25 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| CG-100 | 0-0.5 | 2.0 | 0.75 | 11.0 | 13.0 | 27.0 | 0.044 | 13.0 | 52 |
| CG-100 | 0.83-1.83 | 3.1 | 0.86 | 9.2 | 18.0 | 28.0 | 0.110 | 12.0 | 48 |
| CG-101 | 0-0.5 | 3.1 | 1.20 | 21.0 | 30.0 | 41.0 | 0.007 | 20.0 | 81 |
| CG-101 | 0.5-1.5 | 3.1 | 1.10 | 16.0 | 23.0 | 48.0 | 0.160 | 13.0 | 82 |
| CG-102 | 0-0.5 | 4.4 | 1.20 | 17.0 | 27.0 | 60.0 | 0.190 | 16.0 | 100 |
| CG-102 | 0.5-1.42 | 1.7 | 0.46 | 7.7 | 8.7 | 21.0 | 0.045 | 7.6 | 35 |
| CG-103 | 0-0.5 | 2.1 | 0.45 | 8.6 | 10.0 | 28.0 | 0.040 | 8.3 | 43 |
| CG-103 | 0.83-1.92 | 2.8 | 0.78 | 15.0 | 17.0 | 74.0 | 0.084 | 11.0 | 83 |
| CG-104 | 0-0.5 | 2.6 | 0.69 | 14.0 | 19.0 | **240.0** | 0.061 | 40.0 | 70 |
| CG-104 | 0.5-1 | 1.5 | 0.34 | 12.0 | 6.4 | 39.0 | 0.026 | 12.0 | 30 |
| CG-105 | 0-0.5 | 3.6 | 0.76 | 15.0 | 39.0 | **130.0** | 0.140 | 14.0 | 120 |
| CG-105 | 0.5-1.17 | 1.4 | 0.24 | 4.2 | 8.6 | 41.0 | 0.020 | 5.6 | 27 |
| CG-106 | 0-0.5 | 1.2 | 0.21 | 2.7 | 5.1 | 6.1 | 0.036 | 3.2 | 27 |
| CG-106 | 0.5-1.83 | 1.0 | 0.29 | 5.0 | 12.0 | 12.0 | 0.035 | 4.9 | 38 |
| CG-107 | 0-0.5 | 3.0 | 0.38 | 9.6 | 11.0 | 12.0 | 0.030 | 7.8 | 31 |
| CG-107 | 0.5-1.67 | 2.9 | 0.90 | 14.0 | 21.0 | 42.0 | 0.240 | 12.0 | 79 |
| CG-108 | 0-0.5 | 6.7 | 2.30 | 58.0 | 86.0 | 100.0 | 0.300 | 47.0 | 250 |
| CG-108 | 3-4 | 7.3 | 1.60 | 38.0 | 47.0 | 76.0 | 0.350 | 31.0 | 150 |
| CG-109 | 0-0.5 | 5.0 | 1.10 | 21.0 | 29.0 | 67.0 | 0.450 | 16.0 | 120 |
| CG-109 | 0.5-1.33 | 4.9 | 1.30 | 27.0 | 32.0 | 60.0 | 0.400 | 21.0 | 140 |
| CG-110 | 0-0.5 | 2.2 | 0.73 | 11.0 | 14.0 | 27.0 | 0.080 | 10.0 | 58 |
| CG-110 | 3-4 | 1.4 | 0.35 | 5.3 | 6.2 | 22.0 | 0.030 | 4.8 | 58 |
| CG-111 | 0-0.5 | 6.4 | 1.00 | 28.0 | 26.0 | 14.0 | 0.074 | 26.0 | 78 |
| CG-111 | 0.8-1.83 | 3.6 | 0.43 | 9.4 | 10.0 | 4.8 | 0.021 | 9.0 | 34 |
| CG-112 | 0-0.5 | 2.7 | 0.61 | 12.0 | 13.0 | 19.0 | 0.046 | 9.8 | 54 |
| CG-112 | 1-2 | 2.4 | 0.73 | 14.0 | 18.0 | 32.0 | 0.098 | 11.0 | 80 |
| CG-113 | 0-0.5 | 2.1 | 0.62 | 11.0 | 39.0 | 33.0 | 0.057 | 9.7 | 62 |
| CG-113 | 0.5-1.5 | 1.5 | 0.43 | 8.0 | 9.9 | 15.0 | 0.043 | 6.7 | 38 |
| CG-114 | 0-0.5 | 6.0 | 1.40 | 26.0 | 33.0 | 73.0 | 0.150 | 21.0 | 140 |
| CG-114 | 0.5-1.92 | 8.6 | 2.00 | 41.0 | 45.0 | 50.0 | 0.190 | 33.0 | 130 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| CG-100 | 0-0.5 | **220** | 24 | 480 | 240 | 48 | 82 | **1900** | 1100 | 980 | 1000 | 120 | 2200 | 2600 | 10994 | 55 |
| CG-100 | 0.83-1.83 | **160** | 29 | 370 | 160 | 35 | 59 | **1500** | 890 | 850 | 850 | 100 | 1800 | **2300** | 9103 | 84 |
| CG-101 | 0-0.5 | **130** | 27 | 310 | 140 | 26 | 38 | **1300** | 770 | 740 | 760 | 100 | 1500 | **2000** | 7841 | 58 |
| CG-101 | 0.5-1.5 | **150** | 23 | 340 | 150 | 26 | 35 | **1300** | 810 | 740 | 760 | 110 | 1600 | **2200** | 8244 | 139 |
| CG-102 | 0-0.5 | **440** | 97 | **1100** | 500 | 94 | 130 | **4100** | **2500** | **2300** | **2400** | **270** | **5100** | **5300** | **24331** | 70 |
| CG-102 | 0.5-1.42 | 51 | 12 | 120 | 44 | 13 | 18 | 440 | 300 | 290 | 290 | 32 | 610 | 670 | 2890 | 50 |
| CG-103 | 0-0.5 | 23 | 9 | 57 | 32 | 17 | 23 | 200 | 170 | 170 | 180 | 110 | 330 | 360 | 1681 | 56 |
| CG-103 | 0.83-1.92 | 60 | 21 | 140 | 83 | 26 | 32 | 640 | 430 | 440 | 450 | 63 | 920 | 1100 | 4405 | 150 |
| CG-104 | 0-0.5 | 34 | 12 | 85 | 42 | 19 | 28 | 350 | 230 | 240 | 240 | 65 | 500 | 560 | 2405 | 81 |
| CG-104 | 0.5-1 | 7 | 5 | 21 | 8 | 55 | 55 | 71 | 61 | 65 | 65 | 55 | 120 | 130 | 718 | 68 |
| CG-105 | 0-0.5 | 28 | 16 | 73 | 35 | 17 | 23 | 260 | 220 | 220 | 230 | 70 | 430 | 540 | 2162 | 101 |
| CG-105 | 0.5-1.17 | 6 | 5 | 17 | 7 | 50 | 50 | 56 | 52 | 53 | 65 | 50 | 110 | 130 | 651 | 60 |
| CG-106 | 0-0.5 | 50 | 50 | 7 | 50 | 50 | 50 | 27 | 28 | 22 | 21 | 50 | 45 | 62 | 509 | 60 |
| CG-106 | 0.5-1.83 | 15 | 6 | 45 | 21 | 8 | 11 | 170 | 100 | 98 | 100 | 49 | 230 | 210 | 1063 | 64 |
| CG-107 | 0-0.5 | 13 | 6 | 47 | 17 | 7 | 50 | 140 | 110 | 110 | 110 | 50 | 200 | 260 | 1120 | 66 |
| CG-107 | 0.5-1.67 | 68 | 27 | 200 | 84 | 36 | 38 | 750 | 720 | 670 | 650 | 98 | 1200 | **1600** | 6141 | 77 |
| CG-108 | 0-0.5 | **110** | 56 | 320 | 130 | 38 | 56 | **1300** | **1200** | 1200 | 1200 | 130 | 2200 | **2500** | 10440 | 160 |
| CG-108 | 3-4 | 86 | 32 | 240 | 89 | 23 | 29 | 950 | 740 | 720 | 710 | 98 | 1400 | **1800** | 6917 | 122 |
| CG-109 | 0-0.5 | 44 | 25 | 120 | 56 | 27 | 33 | 470 | 390 | 390 | 400 | 75 | 760 | 880 | 3670 | 99 |
| CG-109 | 0.5-1.33 | 58 | 31 | 160 | 70 | 29 | 37 | 610 | 530 | 570 | 550 | 91 | 1000 | 1300 | 5036 | 130 |
| CG-110 | 0-0.5 | 17 | 9 | 37 | 18 | 11 | 15 | 160 | 140 | 160 | 150 | 55 | 260 | 360 | 1392 | 54 |
| CG-110 | 3-4 | 10 | 36 | 35 | 7 | 8 | 11 | 88 | 150 | 200 | 190 | 34 | 230 | 330 | 1329 | 55 |
| CG-111 | 0-0.5 | **145** | **145** | 145 | 145 | 145 | 145 | 59 | 63 | 62 | 63 | **145** | 100 | 140 | 1502 | 195 |
| CG-111 | 0.8-1.83 | **95** | 95 | 95 | 95 | 95 | 95 | 12 | 19 | 95 | 95 | 95 | 19 | 26 | 931 | 116 |
| CG-112 | 0-0.5 | 21 | 59 | 73 | 28 | 12 | 19 | 190 | **1200** | 1300 | 1100 | 130 | 1000 | **1700** | 6832 | 48 |
| CG-112 | 1-2 | 23 | 14 | 60 | 28 | 14 | 20 | 230 | 220 | 230 | 230 | 38 | 390 | 530 | 2027 | 129 |
| CG-113 | 0-0.5 | 22 | 11 | 37 | 18 | 8 | 14 | 150 | 150 | 160 | 150 | 60 | 250 | 370 | 1400 | 55 |
| CG-113 | 0.5-1.5 | 11 | 6 | 20 | 10 | 50 | 50 | 79 | 69 | 73 | 71 | 50 | 120 | 180 | 789 | 54 |
| CG-114 | 0-0.5 | 29 | 46 | 100 | 37 | 31 | 44 | 290 | 540 | 560 | 500 | 81 | 810 | 1100 | 4168 | 114 |
| CG-114 | 0.5-1.92 | 27 | 12 | 91 | 28 | 130 | 130 | 310 | 240 | 230 | 220 | 130 | 430 | 630 | 2608 | 147 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| CG-100 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 3.38 |
| CG-100 | 0.83-1.83 | ND | ND | ND | ND | ND | ND | ND | 2.10 |
| CG-101 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-101 | 0.5-1.5 | - | - | - | - | - | - | - | - |
| CG-102 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-102 | 0.5-1.42 | - | - | - | - | - | - | - | - |
| CG-103 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 3.32 |
| CG-103 | 0.83-1.92 | ND | ND | ND | ND | ND | ND | ND | 5.79 |
| CG-104 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-104 | 0.5-1 | - | - | - | - | - | - | - | - |
| CG-105 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-105 | 0.5-1.17 | - | - | - | - | - | - | - | - |
| CG-106 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-106 | 0.5-1.83 | - | - | - | - | - | - | - | - |
| CG-107 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 1.12 |
| CG-107 | 0.5-1.67 | ND | ND | ND | ND | ND | ND | ND | 13.06 |
| CG-108 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 11.38 |
| CG-108 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 0.75 |
| CG-109 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-109 | 0.5-1.33 | - | - | - | - | - | - | - | - |
| CG-110 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 4.34 |
| CG-110 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 5.36 |
| CG-111 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-111 | 0.8-1.83 | - | - | - | - | - | - | - | - |
| CG-112 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 3.86 |
| CG-112 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 5.92 |
| CG-113 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-113 | 0.5-1.5 | - | - | - | - | - | - | - | - |
| CG-114 | 0-0.5 | - | - | - | - | - | - | - | - |
| CG-114 | 0.5-1.92 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-127 | 0-0.5 | 1.6 | 0.35 | 7.6 | 9.8 | 13.0 | 0.023 | 7.3 | 33 |
| RP-I-127 | 1-2 | 1.5 | 0.44 | 7.6 | 9.6 | 15.0 | 0.023 | 7.8 | 35 |
| RP-I-137 | 0-0.5 | 2.1 | 0.56 | 11.0 | 12.0 | 10.0 | 0.022 | 11.0 | 37 |
| RP-I-137 | 0.5-1.5 | 1.5 | 0.31 | 6.0 | 16.0 | 5.6 | 0.009 | 7.4 | 26 |
| RP-M-59 | 0-0.5 | 1.2 | 0.30 | 6.1 | 6.2 | 5.8 | 0.016 | 6.3 | 21 |
| RP-M-59 | 1-2 | 1.4 | 0.35 | 6.9 | 7.4 | 11.0 | 0.400 | 7.4 | 28 |
| RP-O-26 | 0-0.5 | 2.2 | 0.49 | 11.0 | 12.0 | 11.0 | 0.032 | 10.0 | 42 |
| RP-O-26 | 2-3 | 1.8 | 0.38 | 8.0 | 9.7 | 12.0 | 0.016 | 8.0 | 36 |
| RP-O-27 | 0-0.5 | 1.5 | 0.36 | 6.8 | 26.0 | 10.0 | 0.014 | 7.1 | 31 |
| RP-O-27 | 1-2 | 3.0 | 0.63 | 15.0 | 24.0 | 30.0 | 0.029 | 12.0 | 78 |
| RP-O-28 | 0-0.5 | 1.7 | 0.39 | 7.8 | 8.2 | 6.8 | 0.021 | 8.3 | 28 |
| RP-O-28 | 0.5-1.5 | 1.6 | 0.31 | 6.9 | 7.6 | 6.5 | 0.014 | 6.9 | 23 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-127 | 0-0.5 | **320** | 56 | 800 | 450 | 130 | 200 | **3100** | **1200** | 1100 | 1100 | 120 | **2600** | **2900** | 14076 | ND |
| RP-I-127 | 1-2 | **250** | 58 | 550 | 420 | 110 | 160 | **3100** | 1000 | 880 | 1000 | **275** | **2900** | **2500** | 13203 | ND |
| RP-I-137 | 0-0.5 | 41 | 17 | 240 | 80 | 20 | 29 | 600 | 320 | 290 | 390 | 41 | 760 | 730 | 3558 | ND |
| RP-I-137 | 0.5-1.5 | 9 | 50 | 25 | 12 | 50 | 50 | 95 | 54 | 44 | 49 | 50 | 120 | 110 | 718 | ND |
| RP-M-59 | 0-0.5 | 9 | 5 | 39 | 18 | 6 | 50 | 160 | 91 | 93 | 94 | 50 | 190 | 230 | 1035 | ND |
| RP-M-59 | 1-2 | 23 | 8 | 72 | 32 | 10 | 13 | 260 | 160 | 140 | 160 | 50 | 300 | 380 | 1608 | ND |
| RP-O-26 | 0-0.5 | 15 | 7 | 39 | 24 | 8 | 60 | 170 | 110 | 110 | 120 | 60 | 240 | 280 | 1243 | ND |
| RP-O-26 | 2-3 | 22 | 10 | 51 | 34 | 11 | 14 | 260 | 130 | 100 | 140 | 55 | 310 | 360 | 1497 | ND |
| RP-O-27 | 0-0.5 | 52 | 10 | 120 | 65 | 17 | 17 | 490 | 190 | 170 | 180 | 55 | 390 | 510 | 2266 | 12 |
| RP-O-27 | 1-2 | 26 | 27 | 99 | 71 | 14 | 18 | 680 | 280 | 270 | 320 | 55 | 720 | 760 | 3340 | ND |
| RP-O-28 | 0-0.5 | 11 | 5 | 29 | 15 | 6 | 55 | 100 | 75 | 80 | 85 | 60 | 150 | 190 | 861 | ND |
| RP-O-28 | 0.5-1.5 | 8 | 7 | 23 | 10 | 50 | 50 | 90 | 85 | 85 | 93 | 55 | 180 | 230 | 965 | ND |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-127 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-127 | 1-2 | - | - | - | - | - | - | - | - |
| RP-I-137 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-137 | 0.5-1.5 | - | - | - | - | - | - | - | - |
| RP-M-59 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-59 | 1-2 | - | - | - | - | - | - | - | - |
| RP-O-26 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-O-26 | 2-3 | - | - | - | - | - | - | - | - |
| RP-O-27 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.32 |
| RP-O-27 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 2.45 |
| RP-O-28 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.33 |
| RP-O-28 | 0.5-1.5 | ND | ND | ND | ND | ND | ND | ND | 0.33 |

Table 8.26a
SQT Comparison: Metals (Hearding Island)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| HI-100 | 0-0.5 | 2.2 | 0.47 | 12.0 | 9.6 | 12.0 | 0.043 | 10.0 | 48 |
| HI-100 | 3-4 | 6.9 | 1.40 | 44.0 | 33.0 | 10.0 | 0.087 | 38.0 | 100 |
| HI-6-M1 | 0-0.5 | 7.2 | 1.70 | 41.0 | 43.0 | 48.0 | 0.350 | 31.0 | 130 |
| HI-6-M1 | 1.5-2.5 | 13.0 | 1.50 | 46.0 | 38.0 | 13.0 | 0.090 | 40.0 | 110 |
| HI-9-M1 | 0-0.5 | 6.4 | 2.00 | 46.0 | 45.0 | 78.0 | 0.290 | 36.0 | 220 |
| HI-9-M1 | 0.5-2.25 | 7.1 | 1.60 | 38.0 | 37.0 | 52.0 | 0.240 | 30.0 | 150 |
| HI-R-1 | 0-0.5 | 3.8 | 0.90 | 18.0 | 21.0 | 33.0 | 0.110 | 14.0 | 86 |
| HI-R-1 | 2-3 | 4.1 | 0.94 | 22.0 | 24.0 | 30.0 | 0.130 | 17.0 | 90 |
| HI-R-2 | 0-0.5 | 1.2 | 0.30 | 4.5 | 4.1 | 6.2 | 0.022 | 4.3 | 22 |
| HI-R-2 | 0.5-1.33 | 1.0 | 0.23 | 3.9 | 2.9 | 4.1 | 0.011 | 3.7 | 13 |
| HI-R-3 | 0-0.5 | 2.2 | 0.50 | 7.7 | 8.0 | 15.0 | 0.044 | 7.0 | 43 |
| HI-R-3 | 0.5-1 | 3.8 | 0.79 | 14.0 | 15.0 | 33.0 | 0.060 | 12.0 | 81 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| HI-100 | 0-0.5 | 7 | 60 | 27 | 10 | 60 | 60 | 88 | 76 | 80 | 81 | 0 | 130 | 190 | 869 | 52 |
| HI-100 | 3-4 | **170** | **170** | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 0 | 170 | 170 | 2040 | 150 |
| HI-6-M1 | 0-0.5 | 14 | 14 | 55 | 18 | 140 | 140 | 180 | 210 | 210 | 210 | 0 | 360 | 530 | 2081 | 130 |
| HI-6-M1 | 1.5-2.5 | **260** | **260** | 260 | 260 | **260** | 260 | 260 | 260 | 260 | 260 | 0 | 260 | 260 | 3120 | 210 |
| HI-9-M1 | 0-0.5 | 28 | 35 | 97 | 49 | 56 | 75 | 330 | 400 | 440 | 430 | 78 | 650 | 1000 | 3668 | 147 |
| HI-9-M1 | 0.5-2.25 | 47 | 74 | 190 | 110 | 170 | 140 | 560 | 630 | 700 | 680 | 110 | 1100 | 1700 | 6211 | 85 |
| HI-R-1 | 0-0.5 | 37 | 14 | 99 | 43 | 22 | 22 | 380 | 260 | 270 | 250 | 0 | 530 | 660 | 2587 | 72 |
| HI-R-1 | 2-3 | **150** | 19 | 250 | 160 | 78 | 96 | 1500 | 530 | 520 | 600 | 0 | 1200 | 1700 | 6803 | 63 |
| HI-R-2 | 0-0.5 | 50 | 50 | 50 | 50 | 50 | 50 | 16 | 20 | 18 | 17 | 0 | 29 | 40 | 440 | 42 |
| HI-R-2 | 0.5-1.33 | 50 | 50 | 50 | 50 | 50 | 50 | 10 | 14 | 9 | 9 | 0 | 20 | 26 | 388 | 40 |
| HI-R-3 | 0-0.5 | 11 | 7 | 28 | 13 | 7 | 60 | 130 | 100 | 110 | 110 | 0 | 190 | 260 | 1026 | 46 |
| HI-R-3 | 0.5-1 | 7 | 11 | 26 | 11 | 12 | 13 | 99 | 120 | 100 | 130 | 0 | 180 | 260 | 969 | 36 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| HI-100 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 1.15 |
| HI-100 | 3-4 | ND | ND | ND | ND | ND | ND | ND | 0.11 |
| HI-6-M1 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 1.11 |
| HI-6-M1 | 1.5-2.5 | ND | ND | ND | ND | ND | ND | ND | 0.16 |
| HI-9-M1 | 0-0.5 | - | - | - | - | - | - | - | - |
| HI-9-M1 | 0.5-2.25 | - | - | - | - | - | - | - | - |
| HI-R-1 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 10.92 |
| HI-R-1 | 2-3 | ND | ND | ND | ND | ND | ND | ND | 7.52 |
| HI-R-2 | 0-0.5 | - | - | - | - | - | - | - | - |
| HI-R-2 | 0.5-1.33 | - | - | - | - | - | - | - | - |
| HI-R-3 | 0-0.5 | - | - | - | - | - | - | - | - |
| HI-R-3 | 0.5-1 | - | - | - | - | - | - | - | - |

Table 8.27a
SQT Comparison: Metals (Murphy Oil)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| Sample Location | Sample Depth (ft) | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-101 | 0-0.5 | 2.4 | 0.53 | 11.0 | 11.0 | 9.9 | 0.031 | 11.0 | 43 |
| RP-101 | 0.5-1.25 | 2.1 | 0.54 | 12.0 | 12.0 | 11.0 | 0.033 | 11.0 | 43 |
| RP-I-35 | 0-0.5 | 3.0 | 0.52 | 10.0 | 11.0 | 16.0 | 0.030 | 9.0 | 43 |
| RP-I-35 | 0.5-1.58 | 1.9 | 0.44 | 8.3 | 8.8 | 9.2 | 0.035 | 7.5 | 32 |
| RP-I-39 | 0-0.5 | 2.0 | 0.50 | 9.9 | 9.4 | 11.0 | 0.044 | 8.9 | 42 |
| RP-I-39 | 0.5-2.08 | 3.9 | 0.54 | 12.0 | 11.0 | 12.0 | 0.045 | 9.9 | 44 |
| RP-I-41 | 0-0.5 | 2.4 | 0.65 | 16.0 | 23.0 | 39.0 | 0.057 | 15.0 | 51 |
| RP-I-41 | 1.5-2.5 | 3.1 | 0.71 | 15.0 | 13.0 | 17.0 | 0.048 | 13.0 | 58 |
| RP-M-19A | 0-0.5 | 1.3 | 0.35 | 6.3 | 8.8 | 5.4 | 0.012 | 6.3 | 27 |
| RP-M-19A | 0.5-1.17 | 1.5 | 0.33 | 6.0 | 6.7 | 4.0 | 0.017 | 6.1 | 19 |
| RP-M-20 | 0-0.5 | 2.2 | 0.52 | 12.0 | 12.0 | 10.0 | 0.047 | 11.0 | 41 |
| RP-M-20 | 1-2 | 2.0 | 0.47 | 10.0 | 27.0 | 12.0 | 0.045 | 11.0 | 44 |

Table 8.27b
SQT Comparison: PAHs and PCBs (Murphy Oil)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| **Sample Location** | **Sample Depth (ft)** | **Priority PAHs (µg/kg)** | | | | | | | | | | | | | **Total PAHs (µg/kg dry weight)** | **Total PCBs (µg/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-101 | 0-0.5 | 30 | 7 | 70 | 34 | 11 | 16 | 260 | 150 | 160 | 160 | 55 | 310 | 410 | 1673 | **5500** |
| RP-101 | 0.5-1.25 | 88 | 10 | 220 | 110 | 31 | 44 | 760 | 380 | 350 | 360 | 46 | 760 | 970 | 4129 | 66 |
| RP-I-35 | 0-0.5 | 89 | 12 | 190 | 120 | 41 | 80 | 740 | 340 | 330 | 350 | 44 | 790 | 900 | 4026 | 60 |
| RP-I-35 | 0.5-1.58 | 43 | 13 | 87 | 52 | 18 | 28 | 350 | 270 | 250 | 270 | 36 | 470 | 720 | 2607 | 71 |
| RP-I-39 | 0-0.5 | 62 | 14 | 160 | 100 | 36 | 53 | 500 | 270 | 250 | 270 | 37 | 530 | 640 | 2922 | 71 |
| RP-I-39 | 0.5-2.08 | **1500** | **500** | **2200** | **1400** | 190 | 330 | **7400** | **3100** | **2700** | **3100** | **360** | **6600** | **7500** | **36880** | 74 |
| RP-I-41 | 0-0.5 | **440** | **550** | **1300** | **800** | 180 | 500 | **5600** | **2100** | **1700** | **2000** | **550** | **4700** | **5300** | **25720** | 69 |
| RP-I-41 | 1.5-2.5 | 21 | 11 | 55 | 31 | 15 | 25 | 210 | 150 | 160 | 160 | 65 | 300 | 310 | 1513 | 61 |
| RP-M-19A | 0-0.5 | 16 | 5 | 36 | 23 | 6 | 50 | 140 | 77 | 70 | 75 | 50 | 170 | 240 | 957 | 65 |
| RP-M-19A | 0.5-1.17 | 24 | 50 | 52 | 31 | 10 | 15 | 200 | 100 | 93 | 100 | 50 | 220 | 300 | 1244 | 63 |
| RP-M-20 | 0-0.5 | 55 | 11 | 160 | 72 | 18 | 27 | 550 | 300 | 280 | 320 | 38 | 630 | 810 | 3271 | 67 |
| RP-M-20 | 1-2 | **240** | 38 | 480 | 300 | 76 | 110 | **2100** | 890 | 710 | 920 | 94 | 1900 | **2200** | 10058 | 65 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-101 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-101 | 0.5-1.25 | - | - | - | - | - | - | - | - |
| RP-I-35 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-35 | 0.5-1.58 | - | - | - | - | - | - | - | - |
| RP-I-39 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-I-39 | 0.5-2.08 | - | - | - | - | - | - | - | - |
| RP-I-41 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 2.93 |
| RP-I-41 | 1.5-2.5 | ND | ND | ND | ND | ND | ND | ND | 4.67 |
| RP-M-19A | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-19A | 0.5-1.17 | - | - | - | - | - | - | - | - |
| RP-M-20 | 0-0.5 | - | - | - | - | - | - | - | - |
| RP-M-20 | 1-2 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| RP-I-109 | 0.2-0.5 | 1.3 | 0.10 | 7.7 | 6.4 | 12.0 | 0.00 | 0.00 | 24.0 |
| RP-I-2 | 0.75-1.1 | 0.7 | 0.10 | 6.6 | 5.1 | 2.8 | 0.00 | 0.00 | 15.0 |
| RP-I-88 | 1.5-1.83 | 1.3 | 0.10 | 8.0 | 6.9 | 13.0 | 0.00 | 0.00 | 25.0 |
| RP-M-19 | 0.6-0.9 | 0.8 | 0.10 | 8.4 | 5.9 | 3.4 | 0.00 | 0.00 | 17.0 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| RP-I-109 | 0.2-0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 950 | 840 | 880 | 980 | 0 | 1400 | 1300 | 6350 | ND |
| RP-I-2 | 0.75-1.1 | 0 | 0 | 0 | 0 | 0 | 0 | 165 | 0 | 0 | 0 | 0 | 165 | 165 | 495 | ND |
| RP-I-88 | 1.5-1.83 | 0 | 0 | 0 | 0 | 0 | 0 | 330 | 0 | 0 | 0 | 0 | 540 | 470 | 1340 | ND |
| RP-M-19 | 0.6-0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 165 | 0 | 0 | 0 | 0 | 360 | 390 | 915 | ND |

Table 8.28c
SQT Comparison: Pesticides and Dioxins (2008 Investigation - Rice's Point)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| RP-I-109 | 0.2-0.5 | - | - | - | - | - | - | - | - |
| RP-I-2 | 0.75-1.1 | - | - | - | - | - | - | - | - |
| RP-I-88 | 1.5-1.83 | - | - | - | - | - | - | - | - |
| RP-M-19 | 0.6-0.9 | - | - | - | - | - | - | - | - |

| Sample Location | Sample Depth (ft) | Metals (mg/kg dry weight) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| S2-12 | 0-0.5 | 4.4 | 0.72 | 35.0 | 69.0 | 86.0 | 0.14 | 25.0 | 190.0 |
| S2-12 | 1-2 | 2.1 | 0.34 | 11.0 | 24.0 | 57.0 | 0.16 | 9.3 | 88.0 |
| S2-15 | 0-0.5 | 2.4 | 0.34 | 18.0 | 38.0 | 46.0 | 0.07 | 16.0 | 100.0 |
| S2-15 | 0.5-1.13 | 1.9 | 0.10 | 11.0 | 15.0 | 30.0 | 0.03 | 7.7 | 46.0 |
| S2-5 | 0-0.5 | 3.6 | 0.40 | 25.0 | 34.0 | 37.0 | 0.09 | 19.0 | 110.0 |
| S2-5 | 0.5-1.42 | 4.1 | 0.57 | 26.0 | 41.0 | 76.0 | 0.17 | 19.0 | 150.0 |
| S2-7 | 0-0.5 | 3.0 | 0.38 | 20.0 | 34.0 | 45.0 | 0.07 | 17.0 | 110.0 |
| S2-7 | 0.5-1 | 3.5 | 0.66 | 21.0 | 30.0 | 75.0 | 0.21 | 17.0 | 130.0 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| S2-12 | 0-0.5 | **720** | **250** | **1600** | **890** | **350** | 360 | **7100** | **4100** | **4900** | **4800** | **540** | **10000** | **10000** | **45610** | 25 |
| S2-12 | 1-2 | **410** | 100 | 850 | 470 | 140 | 190 | **4200** | **2100** | **2100** | **2200** | **310** | **5100** | **4600** | 22770 | 140 |
| S2-15 | 0-0.5 | **170** | 75 | 460 | 220 | 75 | 75 | **2000** | **1500** | **1900** | **1900** | **240** | **4100** | **3500** | 16215 | 25 |
| S2-15 | 0.5-1.13 | **130** | 22 | 290 | 160 | 26 | 33 | 1100 | 560 | 600 | 630 | 72 | 1500 | 1200 | 6323 | 15 |
| S2-5 | 0-0.5 | **110** | 51 | 310 | 150 | 55 | 75 | **1300** | 880 | 1000 | 1000 | **295** | 2100 | **1900** | 9226 | 32 |
| S2-5 | 0.5-1.42 | **300** | **160** | 780 | 350 | 120 | 180 | **3300** | **2300** | **2800** | **2800** | **330** | **5700** | **5200** | **24320** | 24 |
| S2-7 | 0-0.5 | **650** | **160** | **1500** | **740** | 200 | 300 | **5400** | **3100** | **3400** | **3500** | **470** | **7100** | **6200** | **32720** | 31 |
| S2-7 | 0.5-1 | **810** | **210** | **2000** | **920** | **250** | 370 | **6900** | **4100** | **4600** | **4500** | **630** | **10000** | **8200** | **43490** | 62 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| S2-12 | 0-0.5 | ND | ND | 20 | ND | ND | ND | ND | 8.95 |
| S2-12 | 1-2 | ND | ND | 29 | ND | ND | ND | ND | 6.50 |
| S2-15 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 3.64 |
| S2-15 | 0.5-1.13 | ND | ND | ND | ND | ND | ND | ND | 2.21 |
| S2-5 | 0-0.5 | - | - | - | - | - | - | - | - |
| S2-5 | 0.5-1.42 | - | - | - | - | - | - | - | - |
| S2-7 | 0-0.5 | - | - | - | - | - | - | - | - |
| S2-7 | 0.5-1 | - | - | - | - | - | - | - | - |

Table 8.30a
SQT Comparison: Metals (Slip 3)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| S3-10 | 0-0.5 | 1.5 | 0.10 | 8.1 | 8.2 | 17.0 | 0.03 | 6.4 | 36.0 |
| S3-10 | 1.5-2.5 | 3.3 | 0.71 | 18.0 | 32.0 | 120.0 | 0.24 | 14.0 | 140.0 |
| S3-14 | 0-0.5 | 7.2 | 0.50 | 27.0 | 35.0 | 66.0 | 0.18 | 20.0 | 120.0 |
| S3-14 | 1.08-2.08 | 6.3 | 0.64 | 21.0 | 80.0 | 120.0 | 0.25 | 15.0 | 140.0 |
| S3-6 | 0-0.5 | 1.5 | 0.10 | 8.2 | 7.5 | 12.0 | 0.03 | 7.0 | 27.0 |
| S3-6 | 0.75-1.75 | 1.7 | 0.10 | 7.2 | 9.4 | 17.0 | 0.03 | 10.0 | 44.0 |
| S3-8 | 0-0.5 | 1.3 | 0.10 | 6.4 | 7.5 | 16.0 | 0.03 | 5.9 | 29.0 |
| S3-8 | 0.5-1.38 | 1.1 | 0.10 | 5.7 | 8.2 | 19.0 | 0.03 | 5.1 | 31.0 |

Table 8.30b
SQT Comparison: PAHs and Total PCBs (Slip 3)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| S3-10 | 0-0.5 | **430** | 24 | 690 | 470 | 110 | 220 | **3200** | 1100 | 1100 | 1100 | 130 | **2900** | **2600** | 14074 | 14 |
| S3-10 | 1.5-2.5 | **120** | 69 | 270 | 150 | 75 | 110 | 1100 | 690 | 670 | 790 | **225** | 1700 | 1400 | 7369 | 86 |
| S3-14 | 0-0.5 | **100** | 73 | 290 | 150 | 97 | 130 | 1000 | 730 | 850 | 770 | **455** | 1700 | 1500 | 7845 | 29 |
| S3-14 | 1.08-2.08 | **760** | **140** | **1700** | **1100** | **470** | 550 | **5900** | **3000** | **2700** | **3100** | **380** | **6800** | **5500** | **32100** | 100 |
| S3-6 | 0-0.5 | **850** | 82 | **1600** | **1300** | **940** | **2000** | **6800** | **2300** | **1900** | **2400** | **280** | **5500** | **4400** | **30352** | 25 |
| S3-6 | 0.75-1.75 | 46 | 10 | 130 | 55 | 14 | 28 | 410 | 270 | 250 | 215 | 45 | 540 | 540 | 2553 | 24 |
| S3-8 | 0-0.5 | 20 | 92 | 100 | 54 | 10 | 19 | 530 | 330 | 340 | 390 | 48 | 890 | 650 | 3473 | 24 |
| S3-8 | 0.5-1.38 | **130** | 10 | 250 | 140 | 19 | 43 | 860 | 360 | 350 | 350 | 43 | 930 | 760 | 4245 | 17 |

| **Sample Location** | **Sample Depth (ft)** | **Pesticides (µg/kg dry weight)** | | | | | | | **Dioxins (ng TEQ/kg dry weight)** |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| S3-10 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 1.68 |
| S3-10 | 1.5-2.5 | ND | ND | ND | ND | ND | ND | ND | **21.72** |
| S3-14 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 8.07 |
| S3-14 | 1.08-2.08 | ND | ND | ND | ND | ND | ND | ND | 11.17 |
| S3-6 | 0-0.5 | - | - | - | - | - | - | - | - |
| S3-6 | 0.75-1.75 | - | - | - | - | - | - | - | - |
| S3-8 | 0-0.5 | - | - | - | - | - | - | - | - |
| S3-8 | 0.5-1.38 | - | - | - | - | - | - | - | - |

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| SC-1A | 0-0.5 | 6.4 | 2.8 | 37.0 | 94.0 | **140.0** | 0.34 | 29.0 | 330 |
| SC-1A | 2.5-3.5 | 3.8 | 1.0 | 14.0 | 46.0 | **130.0** | 0.56 | 12.0 | 170 |
| SC-4 | 0-0.5 | 7.9 | 3.2 | 46.0 | 39.0 | **150.0** | 0.35 | 35.0 | 370 |
| SC-4 | 2-3 | 4.9 | 2.3 | 23.0 | 52.0 | 110.0 | 0.62 | 17.0 | 270 |
| SC-5A | 0-0.5 | 7.4 | 2.9 | 38.0 | 58.0 | **150.0** | 0.37 | 30.0 | 330 |
| SC-5A | 3-4 | 5.2 | 3.5 | 24.0 | 45.0 | **150.0** | 0.45 | 19.0 | 380 |
| SC-9A | 0-0.5 | 8.6 | 2.5 | 44.0 | 17.0 | 110.0 | 0.30 | 36.0 | 280 |
| SC-9A | 2-3 | 4.3 | 2.5 | 34.0 | 11.0 | 100.0 | 0.27 | 16.0 | 230 |
| SC-12A | 0-0.5 | 3.1 | 1.3 | 15.0 | 13.0 | 63.0 | 0.19 | 12.0 | 140 |
| SC-12A | 1-2 | 5.4 | 1.6 | 27.0 | 7.8 | 89.0 | 0.21 | 23.0 | 180 |
| SC-16A | 0-0.5 | 5.0 | 1.3 | 26.0 | 10.0 | 79.0 | 0.15 | 24.0 | 180 |
| SC-16A | 2-3 | 3.9 | 1.2 | 23.0 | 9.1 | 100.0 | 0.12 | 20.0 | 130 |
| SC-26A | 0-0.5 | 2.4 | 0.5 | 11.0 | 120.0 | 31.0 | 0.05 | 10.0 | 51 |
| SC-26A | 0.5-1.5 | 1.8 | 0.5 | 9.5 | 66.0 | 21.0 | 0.03 | 8.4 | 36 |
| SC-31A | 0-0.5 | 2.1 | 0.5 | 11.0 | 6.3 | 23.0 | 0.03 | 8.5 | 37 |
| SC-31A | 1-2 | 1.4 | 0.4 | 6.2 | 7.9 | 11.0 | 0.06 | 6.4 | 23 |
| SC-33 | 0-0.5 | 1.8 | 0.4 | 9.2 | 88.0 | 10.0 | 0.03 | 8.7 | 30 |
| SC-33 | 1-2 | 1.6 | 0.4 | 7.5 | 83.0 | 8.4 | 0.03 | 7.6 | 27 |
| SC-40 | 0-0.5 | 1.3 | 0.3 | 6.1 | 84.0 | 4.9 | 0.03 | 6.4 | 19 |
| SC-40 | 1-2 | 1.2 | 0.3 | 5.1 | 66.0 | 5.7 | 0.01 | 5.5 | 16 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| SC-1A | 0-0.5 | **180** | 85 | 390 | 200 | 83 | 92 | **1700** | **1400** | 1000 | **1500** | **270** | **2800** | **3400** | 13100 | 209 |
| SC-1A | 2.5-3.5 | **170** | 57 | 340 | 190 | 49 | 72 | **1600** | 870 | 630 | 950 | 110 | 1900 | **2400** | 9338 | 90 |
| SC-4 | 0-0.5 | **120** | 75 | 290 | 140 | 75 | 86 | **1300** | 950 | 780 | 1200 | **265** | 2100 | **2900** | 10281 | 229 |
| SC-4 | 2-3 | **200** | 76 | 280 | 260 | 120 | 120 | **1700** | 980 | 660 | 950 | 110 | 1700 | **3100** | 10256 | 121 |
| SC-5A | 0-0.5 | **190** | 100 | 420 | 230 | 120 | 130 | **1800** | **1600** | 1100 | **1600** | **210** | **2700** | **4100** | 14300 | 204 |
| SC-5A | 3-4 | **490** | 81 | 440 | **590** | 120 | 120 | **2500** | **1300** | 750 | 1100 | **205** | 1900 | **3600** | 13196 | 185 |
| SC-9A | 0-0.5 | **120** | 56 | 310 | 140 | 47 | 60 | **1200** | 980 | 810 | 1100 | 130 | 2000 | **2800** | 9753 | 139 |
| SC-9A | 2-3 | **490** | 62 | 460 | 500 | 130 | 100 | **3100** | 910 | 770 | 960 | 80 | **2400** | **3000** | 12962 | 302 |
| SC-12A | 0-0.5 | **110** | 43 | 220 | 150 | 68 | 86 | 1100 | 620 | 590 | 670 | 110 | 1300 | **1600** | 6667 | 421 |
| SC-12A | 1-2 | 42 | 16 | 100 | 57 | 24 | 24 | 390 | 270 | 290 | 310 | 85 | 530 | 630 | 2768 | 135 |
| SC-16A | 0-0.5 | **140** | 57 | 300 | 160 | 52 | 67 | **1500** | **1100** | 1200 | **1300** | **230** | **2300** | **2900** | 11306 | 87 |
| SC-16A | 2-3 | 37 | 13 | 71 | 44 | 17 | 20 | 370 | 240 | 260 | 280 | 69 | 480 | 650 | 2551 | 175 |
| SC-26A | 0-0.5 | 21 | 11 | 53 | 33 | 14 | 19 | 260 | 160 | 170 | 170 | 36 | 330 | 440 | 1717 | 68 |
| SC-26A | 0.5-1.5 | 19 | 34 | 62 | 40 | 18 | 26 | 380 | 190 | 200 | 210 | 50 | 500 | 450 | 2179 | 72 |
| SC-31A | 0-0.5 | 19 | 7 | 58 | 33 | 10 | 20 | 260 | 150 | 130 | 150 | 55 | 330 | 300 | 1522 | 72 |
| SC-31A | 1-2 | 22 | 5 | 58 | 35 | 11 | 16 | 280 | 170 | 120 | 170 | 55 | 480 | 420 | 1842 | 72 |
| SC-33 | 0-0.5 | 15 | 5 | 71 | 26 | 55 | 55 | 270 | 160 | 130 | 160 | 55 | 380 | 340 | 1722 | 66 |
| SC-33 | 1-2 | 13 | 5 | 46 | 18 | 55 | 55 | 170 | 120 | 98 | 160 | 55 | 250 | 240 | 1285 | 63 |
| SC-40 | 0-0.5 | 43 | 55 | 190 | 55 | 11 | 15 | 570 | 330 | 290 | 310 | 37 | 740 | 690 | 3336 | 68 |
| SC-40 | 1-2 | 7 | 55 | 27 | 11 | 55 | 55 | 130 | 66 | 57 | 67 | 55 | 170 | 160 | 915 | 62 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| SC-1A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 19.37 |
| SC-1A | 2.5-3.5 | ND | ND | ND | ND | ND | ND | ND | 19.00 |
| SC-4 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 16.44 |
| SC-4 | 2-3 | ND | ND | ND | ND | ND | ND | ND | **23.26** |
| SC-5A | 0-0.5 | - | - | - | - | - | - | - | - |
| SC-5A | 3-4 | - | - | - | - | - | - | - | - |
| SC-9A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 11.69 |
| SC-9A | 2-3 | ND | ND | ND | ND | ND | ND | ND | 15.79 |
| SC-12A | 0-0.5 | - | - | - | - | - | - | - | - |
| SC-12A | 1-2 | - | - | - | - | - | - | - | - |
| SC-16A | 0-0.5 | - | - | - | - | - | - | - | - |
| SC-16A | 2-3 | - | - | - | - | - | - | - | - |
| SC-26A | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.95 |
| SC-26A | 0.5-1.5 | ND | ND | 7.8 | ND | ND | ND | ND | 3.27 |
| SC-31A | 0-0.5 | - | - | - | - | - | - | - | - |
| SC-31A | 1-2 | - | - | - | - | - | - | - | - |
| SC-33 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.91 |
| SC-33 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 1.03 |
| SC-40 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 0.64 |
| SC-40 | 1-2 | ND | ND | ND | ND | ND | ND | ND | 0.25 |

Table 8.32a
SQT Comparison: Metals (Superior Bay)
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota

| **Sample Location** | **Sample Depth (ft)** | **Metals (mg/kg dry weight)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
| Level I SQT | | 9.8 | 0.99 | 43 | 32 | 36 | 0.18 | 23 | 120 |
| Level II SQT | | 33 | 4.98 | 111 | 149 | 128 | 1.1 | 48.6 | 459 |
| SB-1 | 0-0.5 | 1.8 | 0.10 | 10.0 | 7.0 | 9.6 | 0.07 | 8.1 | 33 |
| SB-1 | 2.08-3.13 | 1.7 | 0.10 | 14.0 | 9.0 | 7.5 | 0.03 | 11.0 | 26 |
| SB-11 | 0-0.5 | 2.9 | 0.27 | 26.0 | 15.0 | 14.0 | 0.10 | 17.0 | 61 |
| SB-11 | 3-4 | 3.6 | 0.38 | 36.0 | 19.0 | 8.0 | 0.05 | 24.0 | 84 |
| SB-25 | 0-0.5 | 4.6 | 0.40 | 27.0 | 17.0 | 23.0 | 0.13 | 20.0 | 86 |
| SB-25 | 0.5-1.46 | 8.6 | 0.10 | 14.0 | 16.0 | 4.4 | 0.03 | 11.0 | 24 |
| SB-28 | 0-0.5 | 4.7 | 0.42 | 19.0 | 22.0 | 7.1 | 0.05 | 16.0 | 40 |
| SB-28 | 1.08-2.13 | 8.4 | 0.39 | 31.0 | 14.0 | 2.7 | 0.03 | 9.7 | 30 |
| SB-30 | 0-0.5 | 1.2 | 0.10 | 7.8 | 3.9 | 6.0 | 0.03 | 6.4 | 22 |
| SB-30 | 0.5-1.46 | 1.3 | 0.10 | 9.3 | 4.5 | 3.3 | 0.03 | 7.0 | 19 |
| SB-40 | 0-0.5 | 1.2 | 0.10 | 3.1 | 1.5 | 0.5 | 0.03 | 2.7 | 8 |
| SB-40 | 0.5-1.33 | 0.8 | 0.10 | 2.4 | 1.3 | 0.5 | 0.03 | 2.5 | 4 |
| SB-43 | 0-0.5 | 5.3 | 1.00 | 46.0 | 31.0 | 56.0 | 0.38 | 29.0 | 200 |
| SB-43 | 2.33-3.33 | 6.2 | 0.47 | 29.0 | 20.0 | 6.3 | 0.05 | 24.0 | 68 |
| SB-45 | 0-0.5 | 3.2 | 0.61 | 30.0 | 25.0 | 35.0 | 0.22 | 23.0 | 130 |
| SB-45 | 2.33-3.33 | 5.3 | 0.24 | 17.0 | 18.0 | 4.5 | 0.03 | 14.0 | 43 |
| SB-9 | 0-0.5 | 5.5 | 0.55 | 41.0 | 26.0 | 40.0 | 0.23 | 30.0 | 160 |
| SB-9 | 3-4 | 4.3 | 0.47 | 37.0 | 27.0 | 35.0 | 0.28 | 28.0 | 120 |

| Sample Location | Sample Depth (ft) | Priority PAHs (µg/kg) | | | | | | | | | | | | | Total PAHs (µg/kg dry weight) | Total PCBs (µg/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo(a)pyrene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Pyrene | | |
| Level I SQT | | 6.7 | 5.9 | 57 | 77 | 20 | 180 | 200 | 110 | 150 | 170 | 33 | 420 | 200 | 1600 | 60 |
| Level II SQT | | 89 | 130 | 850 | 540 | 200 | 560 | 1200 | 1100 | 1500 | 1300 | 140 | 2200 | 1500 | 23000 | 680 |
| SB-1 | 0-0.5 | 4 | 10 | 13 | 5 | 8 | 10 | 32 | 32 | 53 | 100 | 16 | 71 | 59 | 413 | 23 |
| SB-1 | 2.08-3.13 | 10 | 11 | 13 | 10 | 10 | 10 | 44 | 72 | 110 | 230 | 75 | 120 | 170 | 885 | 24 |
| SB-11 | 0-0.5 | 7 | 10 | 17 | 11 | 16 | 19 | 59 | 69 | 82 | 80 | 20 | 150 | 130 | 669 | 35 |
| SB-11 | 3-4 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 150 | 50 | 100 | 150 | 513 | 38 |
| SB-25 | 0-0.5 | 10 | 10 | 16 | 10 | 17 | 25 | 40 | 53 | 58 | 210 | 70 | 140 | 210 | 868 | 50 |
| SB-25 | 0.5-1.46 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 750 | **255** | 500 | 750 | 2566 | 180 |
| SB-28 | 0-0.5 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 550 | **190** | 375 | 550 | 1890 | 29 |
| SB-28 | 1.08-2.13 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 800 | **270** | 550 | 800 | 2744 | 195 |
| SB-30 | 0-0.5 | 4 | 4 | 8 | 4 | 6 | 7 | 16 | 29 | 36 | 100 | 33 | 65 | 100 | 412 | 21 |
| SB-30 | 0.5-1.46 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 11 | 8 | 95 | 32 | 65 | 95 | 336 | 22 |
| SB-40 | 0-0.5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 90 | 31 | 60 | 90 | 308 | 31 |
| SB-40 | 0.5-1.33 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 95 | 32 | 65 | 95 | 324 | 25 |
| SB-43 | 0-0.5 | 47 | 82 | 160 | 84 | 74 | 130 | 320 | 550 | 730 | 670 | 110 | 990 | 900 | 4847 | 72 |
| SB-43 | 2.33-3.33 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 500 | **175** | 350 | 500 | 1737 | 115 |
| SB-45 | 0-0.5 | 42 | 75 | 140 | 81 | 76 | 140 | 300 | 480 | 640 | 610 | 115 | 920 | 830 | 4449 | 58 |
| SB-45 | 2.33-3.33 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 600 | **200** | 405 | 600 | 2048 | 135 |
| SB-9 | 0-0.5 | 22 | 35 | 79 | 37 | 53 | 99 | 180 | 230 | 270 | 260 | **165** | 420 | 495 | 2345 | 55 |
| SB-9 | 3-4 | 14 | 48 | 68 | 28 | 19 | 25 | 210 | 250 | 340 | 280 | 62 | 450 | 450 | 2244 | 20 |

| Sample Location | Sample Depth (ft) | Pesticides (µg/kg dry weight) | | | | | | | Dioxins (ng TEQ/kg dry weight) |
|---|---|---|---|---|---|---|---|---|---|
| | | Chlordane | Dieldrin | Total DDT | Endrin | Heptachlor Epoxide | gamma - BHC | Toxaphene | |
| Level I SQT | | 3.2 | 1.9 | 5.3 | 2.2 | 2.5 | 2.4 | 0.1 | 0.85 |
| Level II SQT | | 18 | 62 | 570 | 210 | 16 | 5 | 32 | 21.5 |
| SB-1 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 4.65 |
| SB-1 | 2.08-3.13 | ND | ND | ND | ND | ND | ND | ND | 0.13 |
| SB-11 | 0-0.5 | - | - | - | - | - | - | - | - |
| SB-11 | 3-4 | - | - | - | - | - | - | - | - |
| SB-25 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 8.75 |
| SB-25 | 0.5-1.46 | ND | ND | ND | ND | ND | ND | ND | 1.85 |
| SB-28 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 18.02 |
| SB-28 | 1.08-2.13 | ND | ND | ND | ND | ND | ND | ND | 0.01 |
| SB-30 | 0-0.5 | - | - | - | - | - | - | - | - |
| SB-30 | 0.5-1.46 | - | - | - | - | - | - | - | - |
| SB-40 | 0-0.5 | - | - | - | - | - | - | - | - |
| SB-40 | 0.5-1.33 | - | - | - | - | - | - | - | - |
| SB-43 | 0-0.5 | ND | ND | ND | ND | ND | ND | ND | 21.37 |
| SB-43 | 2.33-3.33 | ND | ND | ND | ND | ND | ND | ND | 0.20 |
| SB-45 | 0-0.5 | - | - | - | - | - | - | - | - |
| SB-45 | 2.33-3.33 | - | - | - | - | - | - | - | - |
| SB-9 | 0-0.5 | - | - | - | - | - | - | - | - |
| SB-9 | 3-4 | - | - | - | - | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| **Slip C** | | | | | | | | | | |
| SC-1A | 0-0.5 | 13.10 | 17.34 | 30.08 | 0.39 | | 19.37 | 19.37 | 30.17 | 30.17 |
| SC-1A | 2.5-3.5 | 9.34 | 11.99 | 19.93 | 0.62 | | 19.25 | 19.00 | 19.71 | 19.59 |
| SC-4 | 0-0.5 | 10.28 | 13.53 | 26.77 | 0.37 | | 17.49 | 16.44 | 25.95 | 25.85 |
| SC-4 | 2-3 | 10.26 | 14.50 | 43.23 | 0.68 | | 23.26 | 23.26 | 26.44 | 26.44 |
| SC-5A | 0-0.5 | 14.30 | 18.95 | 34.83 | 0.53 | | - | - | - | - |
| SC-5A | 3-4 | 13.20 | 18.08 | 57.90 | 0.56 | | - | - | - | - |
| SC-9A | 0-0.5 | 9.75 | 13.41 | 19.63 | 0.33 | | 11.69 | 11.69 | 15.60 | 15.60 |
| SC-9A | 2-3 | 12.96 | 15.26 | 42.13 | 0.71 | | 15.92 | 15.79 | 23.33 | 23.29 |
| SC-12A | 0-0.5 | 6.67 | 8.49 | 19.51 | 0.61 | | - | - | - | - |
| SC-12A | 1-2 | 2.77 | 3.61 | 5.53 | 1.62 | Toxic | - | - | - | - |
| SC-16A | 0-0.5 | 11.31 | 15.16 | 19.76 | 0.55 | | - | - | - | - |
| SC-16A | 2-3 | 2.55 | 3.42 | 4.79 | 0.22 | | - | - | - | - |
| SC-26A | 0-0.5 | 1.72 | 2.22 | 3.09 | 0.54 | | 7.03 | 0.95 | 6.06 | 1.51 |
| SC-26A | 0.5-1.5 | 2.18 | 2.76 | 3.84 | 0.42 | | 3.27 | 3.27 | 3.91 | 3.91 |
| SC-31A | 0-0.5 | 1.52 | 1.89 | 2.84 | 0.30 | | - | - | - | - |
| SC-31A | 1-2 | 1.84 | 2.19 | 3.28 | 0.76 | | - | - | - | - |
| SC-33 | 0-0.5 | 1.72 | 2.06 | 3.00 | 0.52 | | 4.93 | 0.91 | 5.01 | 1.03 |
| SC-33 | 1-2 | 1.28 | 1.56 | 2.41 | 0.40 | | 4.86 | 1.03 | 5.05 | 1.27 |
| SC-40 | 0-0.5 | 3.34 | 4.11 | 4.83 | 1.43 | Toxic | 4.89 | 0.64 | 4.92 | 0.78 |
| SC-40 | 1-2 | 0.92 | 1.05 | 1.82 | 1.21 | Toxic | 7.43 | 0.25 | 6.20 | 0.34 |
| **21st Avenue Bay** | | | | | | | | | | |
| TF-44 | 0-0.5 | 8.82 | 13.01 | 13.01 | 0.36 | | 13.36 | 13.36 | 15.86 | 15.86 |
| TF-44 | 2.5-3.5 | 4.31 | 5.68 | 5.68 | 0.37 | | 8.34 | 8.34 | 9.85 | 9.85 |
| TF-34 | 0-0.5 | 5.91 | 8.35 | 8.35 | 0.21 | | 16.55 | 16.55 | 20.24 | 20.24 |
| TF-34 | 3-4 | 1.16 | 1.30 | 1.30 | 0.00 | | 23.060 | 23.060 | 25.95 | 25.95 |
| TF-39 | 0-0.5 | 3.73 | 4.14 | 4.14 | 0.01 | | - | - | - | - |
| TF-39 | 0.5-1.42 | 4.22 | 4.87 | 4.87 | 0.01 | | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| TF-8A | 0-0.5 | 1.20 | 2.57 | 2.57 | 0.17 | | - | - | - | - |
| TF-8A | 1-2 | 4.86 | 12.76 | 12.76 | 0.37 | | - | - | - | - |
| TF-50A | 0-0.5 | 3.63 | 6.36 | 6.36 | 0.53 | | - | - | - | - |
| TF-50A | 0.5-1.25 | 4.53 | 8.01 | 8.01 | 0.75 | | - | - | - | - |
| TF-15A | 0-0.5 | 1.18 | 3.20 | 3.20 | 0.11 | | 4.30 | 4.22 | 4.89 | 4.86 |
| TF-15A | 2-3 | 0.78 | 1.97 | 1.97 | 0.09 | | 10.16 | 10.16 | 11.50 | 11.50 |
| TF-1A | 0-0.92 | 0.44 | 1.31 | 1.31 | 1.43 | Toxic | - | - | - | - |
| TF-19A | 0-0.5 | 4.90 | 12.57 | 12.57 | 0.35 | | 14.19 | 14.19 | 16.62 | 16.62 |
| TF-19A | 2-3 | 7.97 | 20.51 | 20.51 | 0.47 | | 67.72 | 67.72 | 81.14 | 81.14 |
| TF-22A | 0-0.5 | 3.16 | 7.18 | 7.18 | 0.17 | | 2.88 | 2.65 | 3.02 | 2.81 |
| TF-22A | 2-3 | 197.14 | 317.84 | 317.84 | 8.56 | Toxic | 7.15 | 0.02 | 6.02 | 0.04 |
| TF-102 | 0-0.5 | 3.96 | 6.26 | 6.26 | 0.82 | | - | - | - | - |
| TF-102 | 1-2 | 2.84 | 4.93 | 4.93 | 0.59 | | - | - | - | - |
| TF-100 | 0-0.5 | 1.12 | 2.69 | 2.69 | 0.08 | | 12.50 | 12.28 | 16.98 | 16.73 |
| TF-100 | 2-3 | 0.47 | 1.20 | 1.20 | 0.08 | | 2.30 | 1.40 | 2.56 | 1.76 |
| TF-101 | 0-0.5 | 1.71 | 4.14 | 4.14 | 0.11 | | 9.47 | 9.26 | 11.17 | 11.13 |
| TF-101 | 3-4 | 2.98 | 7.36 | 7.36 | 0.34 | | 5.38 | 5.38 | 6.60 | 6.60 |
| TF-103 | 0-0.5 | 6.50 | 10.79 | 10.79 | 0.75 | | - | - | - | - |
| TF-103 | 0.5-1 | 6.25 | 9.38 | 9.38 | 3.05 | Toxic | - | - | - | - |
| TF-25 | 0-0.5 | 3.12 | 6.97 | 6.97 | 0.22 | | 10.62 | 10.49 | 12.83 | 12.77 |
| TF-25 | 3-4 | 1.21 | 2.79 | 2.79 | 0.09 | | 6.40 | 6.11 | 7.25 | 7.08 |
| TF-26A | 0-0.5 | 1.83 | 4.45 | 4.45 | 0.13 | | 27.96 | 27.76 | 30.12 | 30.00 |
| TF-26A | 2-3 | 5.11 | 10.92 | 10.92 | 0.25 | | 9.34 | 9.34 | 13.08 | 13.08 |
| TF-41 | 0-0.5 | 5.04 | 8.74 | 8.74 | 0.41 | | 9.17 | 9.17 | 10.95 | 10.95 |
| TF-41 | 3-4 | 3.56 | 8.35 | 8.35 | 0.23 | | 8.32 | 8.32 | 9.56 | 9.56 |
| TF-24 | 0-0.5 | 2.26 | 5.05 | 5.05 | 0.14 | | 8.90 | 8.90 | 11.14 | 11.14 |
| TF-24 | 3-4 | 2.46 | 5.48 | 5.48 | 0.20 | | 10.04 | 9.90 | 11.26 | 11.24 |
| TF-36 | 0-0.5 | 3.79 | 8.59 | 8.59 | 0.24 | | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| TF-36 | 3-4 | 1.30 | 2.93 | 2.93 | 0.12 | | - | - | - | - |
| TF-4 | 0-0.5 | 0.85 | 1.99 | 1.99 | 0.08 | | 13.73 | 12.35 | 16.41 | 15.80 |
| TF-4 | 2-3 | 2.05 | 4.44 | 4.44 | 0.17 | | 20.63 | 20.58 | 24.50 | 24.48 |
| TF-3A | 0-0.5 | 2.56 | 5.36 | 5.36 | 0.27 | | - | - | - | - |
| TF-3A | 3-4 | 0.85 | 1.93 | 1.93 | 0.24 | | - | - | - | - |
| TF-23A | 0-0.5 | 6.54 | 15.20 | 15.20 | 0.42 | | 9.97 | 2.31 | 9.21 | 2.99 |
| TF-23A | 3-4 | 1.12 | 2.65 | 2.65 | 0.08 | | 12.71 | 0.00 | 10.73 | 0.01 |
| TF-21A | 0-0.5 | 11.92 | 20.79 | 20.79 | 0.46 | | 4.09 | 3.92 | 4.55 | 4.48 |
| TF-21A | 2-3 | 1.30 | 14.81 | 14.81 | 0.32 | | 5.99 | 0.05 | 4.56 | 0.36 |
| TF-12A | 0-0.5 | 2.16 | 6.24 | 6.24 | 0.17 | | 4.77 | 4.64 | 5.28 | 5.19 |
| TF-12A | 1-2 | 1.18 | 2.62 | 2.62 | 0.09 | | 6.60 | 0.03 | 5.55 | 0.06 |
| TF-10 | 0-0.5 | 2.01 | 4.90 | 4.90 | 0.22 | | - | - | - | - |
| TF-10 | 1-2 | 0.46 | 1.17 | 1.17 | 0.34 | | - | - | - | - |
| TF-2A | 0-0.5 | 0.44 | 1.29 | 1.29 | 0.21 | | - | - | - | - |
| TF-2A | 0.5-1.67 | 0.56 | 1.46 | 1.46 | 1.87 | Toxic | - | - | - | - |
| TF-32A | 0-0.5 | 1.19 | 3.07 | 3.07 | 0.12 | | - | - | - | - |
| TF-32A | 0.5-1.5 | 0.79 | 1.92 | 1.92 | 0.35 | | - | - | - | - |
| TF-103A | 0-0.5 | 4.51 | 8.28 | 8.28 | 0.89 | | - | - | - | - |
| TF-103A | 0.5-1.08 | 17.84 | 30.90 | 30.90 | 1.83 | Toxic | - | - | - | - |
| **AGP Slip** | | | | | | | | | | |
| RP-I-70 | 0-0.5 | 21.21 | 26.21 | 36.04 | 1.83 | | - | - | - | - |
| RP-I-70 | 0.5-1.83 | 46.35 | 54.38 | 76.37 | 0.00 | | - | - | - | - |
| RP-I-74 | 0-0.5 | 0.84 | 1.06 | 1.69 | 0.19 | | - | - | - | - |
| RP-I-74 | 0.5-1.83 | 1.83 | 2.30 | 3.18 | 0.20 | | - | - | - | - |
| RP-I-77 | 0-0.5 | 1.77 | 2.20 | 2.94 | 1.19 | Toxic | - | - | - | - |
| RP-I-77 | 0.5-1.67 | 0.45 | 0.54 | 1.34 | 0.26 | | - | - | - | - |
| RP-M-33 | 0-0.5 | 6.38 | 8.25 | 10.74 | 0.42 | | 2.61 | 2.61 | 3.25 | 3.25 |
| RP-M-33 | 1-2 | 6.42 | 8.30 | 10.84 | 0.29 | | 5.64 | 5.64 | 6.68 | 6.68 |

Table 8.33
PAHs 13, 16, 34, ESB Toxic Units, and Total PEQ Concentration
Sediment Investigation
St. Louis River/Duluth Harbor
USACE/MPCA
Duluth, Minnesota


| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| RP-M-35 | 0-0.5 | 46.84 | 56.28 | 73.56 | 0.72 | | 6.68 | 6.47 | 8.34 | 8.17 |
| RP-M-35 | 1-2 | 6.02 | 6.96 | 10.52 | 0.70 | | 3.19 | 3.28 | 3.97 | 3.77 |
| RP-O-16 | 0-0.5 | 4.69 | 5.72 | 8.34 | 0.31 | | 2.24 | 2.50 | 2.55 | 2.35 |
| RP-O-16 | 2-3 | 7.42 | 9.52 | 13.29 | 0.33 | | 8.50 | 8.50 | 10.94 | 10.94 |
| **Azcon Slip** | | | | | | | | | | |
| RP-I-53 | 0-0.5 | 11.37 | 14.55 | 18.75 | 1.57 | Toxic | - | - | - | - |
| RP-I-53 | 0.5-1.67 | 9.99 | 13.00 | 16.58 | 0.65 | | - | - | - | - |
| RP-M-26 | 0-0.5 | 0.91 | 1.12 | 2.17 | 0.11 | | 8.03 | 8.30 | 9.06 | 9.41 |
| RP-M-26 | 3-4 | 46.51 | 58.25 | 80.11 | 1.19 | Toxic | 39.21 | 37.81 | 47.40 | 47.83 |
| RP-I-58 | 0-0.5 | 3.70 | 4.64 | 6.63 | 0.63 | | - | - | - | - |
| RP-I-58 | 1.5-2.5 | 8.21 | 10.40 | 14.11 | 0.99 | | - | - | - | - |
| RP-M-28 | 0-0.5 | 2.03 | 2.48 | 3.54 | 0.47 | | - | - | - | - |
| RP-M-28 | 0.5-1 | 6.40 | 7.97 | 10.44 | 0.54 | | - | - | - | - |
| RP-I-46 | 0-0.5 | 5.11 | 6.42 | 8.13 | 0.64 | | - | - | - | - |
| RP-I-46 | 0.5-1.67 | 0.53 | 0.65 | 1.37 | 0.72 | | - | - | - | - |
| RP-I-52 | 0-0.5 | 13.16 | 16.12 | 21.47 | 0.80 | | 8.10 | 8.10 | 8.94 | 8.94 |
| RP-I-52 | 1-2 | 196.10 | 221.80 | 290.30 | 4.70 | Toxic | 23.54 | 23.54 | 27.86 | 27.86 |
| RP-100 | 0-0.5 | 5.57 | 6.79 | 10.85 | 0.37 | | - | - | - | - |
| RP-100 | 1-2 | 5.45 | 6.38 | 13.24 | 0.25 | | - | - | - | - |
| **Boat Landing** | | | | | | | | | | |
| RP-I-2A | 0-0.5 | 12.48 | 16.22 | 43.00 | 0.55 | | - | - | - | - |
| RP-I-2A | 2-3 | 19.77 | 26.50 | 37.44 | 1.18 | Toxic | - | - | - | - |
| RP-I-6 | 0-0.5 | 2.45 | 3.34 | 5.05 | 0.76 | | * reporting limits are not available | | * reporting limits are not available | |
| RP-I-6 | 1-2 | 5.00 | 6.33 | 10.28 | 0.29 | | | | | |
| RP-I-9 | 0-0.5 | 8.81 | 10.42 | 14.00 | 12.29 | Toxic | - | - | - | - |
| RP-I-9 | 0.5-1.4 | 0.36 | 0.48 | 1.21 | 0.78 | | - | - | - | - |
| RP-M-2 | 0-0.5 | 32.35 | 39.33 | 57.98 | 1.26 | Toxic | - | - | - | - |
| RP-M-2 | 0.5-1 | 12.94 | 16.06 | 46.07 | 0.89 | | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| **Cargill Slip** | | | | | | | | | | |
| RP-I-82 | 0-0.5 | 1.89 | 2.44 | 3.45 | 0.65 | | - | - | - | - |
| RP-I-82 | 1-1.75 | 4.44 | 5.64 | 7.21 | 0.28 | | - | - | - | - |
| RP-I-86 | 0-0.5 | 3.26 | 3.99 | 5.66 | 0.10 | | 9.43 | 9.43 | 11.20 | 11.20 |
| RP-I-86 | 1-2 | 8.01 | 9.84 | 15.10 | 0.28 | | 9.16 | 9.16 | 11.39 | 11.39 |
| RP-I-88A | 0-0.5 | 11.13 | 13.66 | 18.80 | 0.61 | | 6.55 | 6.41 | 8.40 | 8.30 |
| RP-I-88A | 0.67-1.83 | 10.46 | 12.85 | 18.91 | 0.54 | | 7.02 | 7.02 | 8.93 | 8.93 |
| RP-I-93 | 0-0.5 | 3.28 | 4.15 | 5.43 | 5.36 | Toxic | 2.52 | 2.33 | 3.10 | 2.95 |
| RP-I-93 | 1-2.75 | 1.03 | 1.29 | 2.13 | 0.22 | | 6.46 | 0.67 | 5.94 | 1.22 |
| RP-I-94 | 0-0.5 | 3.27 | 4.19 | 5.91 | 0.34 | | 5.18 | 5.18 | 6.73 | 6.73 |
| RP-I-94 | 1-2 | 4.03 | 5.04 | 6.41 | 0.65 | | 6.57 | 1.47 | 6.61 | 2.68 |
| RP-M-41 | 0-0.5 | 1.09 | 1.36 | 2.09 | 0.41 | | - | - | - | - |
| RP-M-41 | 0.5-1.33 | 1.10 | 1.36 | 2.02 | 0.51 | | - | - | - | - |
| RP-M-44 | 0-0.5 | 1.91 | 2.30 | 3.38 | 0.04 | | - | - | - | - |
| RP-M-44 | 1-2 | 8.75 | 10.51 | 14.54 | 0.56 | | - | - | - | - |
| **Cargill B Slip** | | | | | | | | | | |
| RP-I-105 | 0-0.5 | 0.83 | 1.84 | 1.84 | 0.32 | | 6.87 | 0.72 | 6.76 | 1.77 |
| RP-I-105 | 1-2 | 1.02 | 2.21 | 2.21 | 0.21 | | 6.60 | 0.96 | 6.59 | 2.11 |
| RP-I-107 | 0-0.5 | 4.03 | 6.96 | 6.96 | 0.44 | | 8.00 | 2.43 | 8.34 | 4.22 |
| RP-I-107 | 1.5-2.5 | 2.89 | 7.89 | 7.89 | 0.12 | | 20.65 | 20.84 | 24.96 | 25.04 |
| RP-I-109A | 0-0.5 | 2.73 | 5.34 | 5.34 | 0.13 | | 13.46 | 5.96 | 15.34 | 8.33 |
| RP-I-109A | 1.5-2.5 | 1.85 | 4.40 | 4.40 | 0.06 | | 23.93 | 23.93 | 36.76 | 36.76 |
| RP-I-113 | 0-0.5 | 1.01 | 2.11 | 2.11 | 0.30 | | - | - | - | - |
| RP-I-113 | 0.67-1.67 | 0.74 | 1.68 | 1.68 | 0.24 | | - | - | - | - |
| RP-M-57 | 0-0.5 | 1.52 | 2.83 | 2.83 | 1.29 | Toxic | - | - | - | - |
| RP-M-57 | 0.5-1.25 | 0.41 | 1.22 | 1.22 | 2.05 | Toxic | - | - | - | - |
| **Coast Guard** | | | | | | | | | | |
| CG-100 | 0-0.5 | 10.99 | 13.56 | 16.78 | 1.02 | Toxic | 3.38 | 3.38 | 4.12 | 4.12 |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| CG-100 | 0.83-1.83 | 9.10 | 11.39 | 14.57 | 0.55 | | 2.50 | 2.10 | 2.74 | 2.48 |
| CG-101 | 0-0.5 | 7.84 | 9.92 | 12.35 | 0.48 | | - | - | - | - |
| CG-101 | 0.5-1.5 | 8.24 | 10.31 | 13.03 | 0.33 | | - | - | - | - |
| CG-102 | 0-0.5 | 24.33 | 30.17 | 38.88 | 0.78 | | - | - | - | - |
| CG-102 | 0.5-1.42 | 2.89 | 3.63 | 5.03 | 0.67 | | - | - | - | - |
| CG-103 | 0-0.5 | 1.68 | 2.17 | 3.35 | 0.31 | | 3.67 | 3.32 | 4.45 | 4.36 |
| CG-103 | 0.83-1.92 | 4.41 | 5.66 | 8.04 | 0.75 | | 5.79 | 5.79 | 8.63 | 8.63 |
| CG-104 | 0-0.5 | 2.41 | 3.11 | 4.41 | 0.32 | | - | - | - | - |
| CG-104 | 0.5-1 | 0.72 | 0.87 | 1.86 | 0.33 | | - | - | - | - |
| CG-105 | 0-0.5 | 2.16 | 2.83 | 3.99 | 0.18 | | - | - | - | - |
| CG-105 | 0.5-1.17 | 0.65 | 0.80 | 1.42 | 0.40 | | - | - | - | - |
| CG-106 | 0-0.5 | 0.51 | 0.62 | 1.31 | 0.43 | | - | - | - | - |
| CG-106 | 0.5-1.83 | 1.06 | 1.34 | 2.06 | 0.29 | | - | - | - | - |
| CG-107 | 0-0.5 | 1.12 | 1.48 | 2.16 | 0.37 | | 8.82 | 1.12 | 7.53 | 2.74 |
| CG-107 | 0.5-1.67 | 6.14 | 7.96 | 10.28 | 0.33 | | 13.06 | 13.06 | 14.14 | 14.14 |
| CG-108 | 0-0.5 | 10.44 | 13.74 | 17.82 | 0.58 | | 11.76 | 11.38 | 14.22 | 14.03 |
| CG-108 | 3-4 | 6.92 | 8.83 | 11.67 | 0.16 | | 10.65 | 0.75 | 8.57 | 1.14 |
| CG-109 | 0-0.5 | 3.67 | 4.74 | 6.40 | 0.23 | | - | - | - | - |
| CG-109 | 0.5-1.33 | 5.04 | 6.66 | 8.76 | 0.25 | | - | - | - | - |
| CG-110 | 0-0.5 | 1.39 | 1.85 | 2.81 | 0.31 | | 4.34 | 4.34 | 5.60 | 5.60 |
| CG-110 | 3-4 | 1.33 | 1.96 | 3.21 | 0.87 | | 5.36 | 5.36 | 6.58 | 6.58 |
| CG-111 | 0-0.5 | 1.50 | 1.80 | 3.74 | 0.06 | | - | - | - | - |
| CG-111 | 0.8-1.83 | 0.93 | 1.07 | 2.45 | 0.06 | | - | - | - | - |
| CG-112 | 0-0.5 | 6.83 | 9.91 | 13.71 | 1.28 | Toxic | 4.04 | 3.86 | 4.66 | 4.53 |
| CG-112 | 1-2 | 2.03 | 2.72 | 3.98 | 0.26 | | 5.92 | 5.92 | 7.68 | 7.68 |
| CG-113 | 0-0.5 | 1.40 | 1.86 | 2.74 | 0.24 | | - | - | - | - |
| CG-113 | 0.5-1.5 | 0.79 | 0.96 | 1.63 | 0.20 | | - | - | - | - |
| CG-114 | 0-0.5 | 4.17 | 5.73 | 7.86 | 0.17 | | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| CG-114 | 0.5-1.92 | 2.61 | 3.07 | 4.90 | 0.05 | | - | - | - | - |
| **General Mills** | | | | | | | | | | |
| RP-I-137 | 0-0.5 | 3.56 | 5.76 | 5.76 | 0.77 | | - | - | - | - |
| RP-I-137 | 0.5-1.5 | 0.72 | 1.37 | 1.37 | 0.90 | | - | - | - | - |
| RP-I-127 | 0-0.5 | 14.08 | 16.62 | 21.29 | 3.27 | Toxic | - | - | - | - |
| RP-I-127 | 1-2 | 13.20 | 15.54 | 20.58 | 2.84 | Toxic | - | - | - | - |
| RP-M-59 | 0-0.5 | 1.04 | 1.86 | 1.86 | 0.34 | | - | - | - | - |
| RP-M-59 | 1-2 | 1.61 | 2.76 | 2.76 | 0.41 | | - | - | - | - |
| RP-O-26 | 0-0.5 | 1.24 | 2.22 | 2.22 | 0.28 | | - | - | - | - |
| RP-O-26 | 2-3 | 1.50 | 2.62 | 2.62 | 0.38 | | - | - | - | - |
| RP-O-27 | 0-0.5 | 2.27 | 3.57 | 3.57 | 2.87 | Toxic | 0.33 | 0.32 | 0.60 | 0.71 |
| RP-O-27 | 1-2 | 3.34 | 5.33 | 5.33 | 5.51 | Toxic | 2.28 | 2.45 | 2.96 | 2.96 |
| RP-O-28 | 0-0.5 | 0.86 | 1.68 | 1.68 | 0.36 | | 0.31 | 0.33 | 0.57 | 0.82 |
| RP-O-28 | 0.5-1.5 | 0.97 | 1.73 | 1.73 | 0.49 | | 0.31 | 0.33 | 0.79 | 0.78 |
| **Hearding Island** | | | | | | | | | | |
| HI-100 | 0-0.5 | 0.87 | 1.06 | 1.80 | 0.15 | | 1.088 | 1.149 | 1.606 | 1.606 |
| HI-100 | 3-4 | 2.04 | 2.55 | 4.93 | 0.04 | | 9.346 | 0.106 | 7.069 | 0.418 |
| HI-6-M1 | 0-0.5 | 2.08 | 2.60 | 4.45 | 0.06 | | 6.910 | 1.110 | 4.947 | 1.421 |
| HI-6-M1 | 1.5-2.5 | 3.12 | 3.90 | 7.54 | 0.05 | | 14.016 | 0.158 | 10.597 | 0.620 |
| HI-9-M1 | 0-0.5 | 3.67 | 5.08 | 7.45 | 0.15 | | - | - | - | - |
| HI-9-M1 | 0.5-2.25 | 6.21 | 8.50 | 13.83 | 0.21 | | - | - | - | - |
| HI-R-1 | 0-0.5 | 2.59 | 3.28 | 4.82 | 0.11 | | 10.920 | 10.920 | 12.425 | 12.425 |
| HI-R-1 | 2-3 | 6.80 | 8.13 | 11.35 | 0.23 | | 7.517 | 7.517 | 8.371 | 8.371 |
| HI-R-2 | 0-0.5 | 0.44 | 0.52 | 1.22 | 0.46 | | - | - | - | - |
| HI-R-2 | 0.5-1.33 | 0.39 | 0.47 | 1.17 | 0.54 | | - | - | - | - |
| HI-R-3 | 0-0.5 | 1.03 | 1.33 | 2.11 | 0.18 | | - | - | - | - |
| HI-R-3 | 0.5-1 | 0.97 | 1.26 | 3.28 | 0.16 | | - | - | - | - |
| **Murphy Oil** | | | | | | | | | | |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| RP-101 | 0-0.5 | 1.67 | 2.10 | 3.02 | 0.42 | | - | - | - | - |
| RP-101 | 0.5-1.25 | 4.13 | 5.05 | 6.63 | 0.82 | | - | - | - | - |
| RP-I-35 | 0-0.5 | 4.03 | 4.87 | 6.42 | 0.80 | | - | - | - | - |
| RP-I-35 | 0.5-1.58 | 2.61 | 3.30 | 5.18 | 0.57 | | - | - | - | - |
| RP-I-39 | 0-0.5 | 2.92 | 3.59 | 5.08 | 0.57 | | - | - | - | - |
| RP-I-39 | 0.5-2.08 | 36.88 | 44.17 | 55.87 | 4.87 | Toxic | - | - | - | - |
| RP-I-41 | 0-0.5 | 25.72 | 30.18 | 39.51 | 3.99 | Toxic | 2.93 | 2.93 | 3.69 | 3.92 |
| RP-I-41 | 1.5-2.5 | 1.51 | 1.95 | 2.95 | 0.26 | | 4.67 | 4.67 | 5.50 | 5.50 |
| RP-M-19A | 0-0.5 | 0.96 | 1.17 | 1.80 | 0.82 | | - | - | - | - |
| RP-M-19A | 0.5-1.17 | 1.24 | 1.51 | 2.19 | 1.06 | Toxic | - | - | - | - |
| RP-M-20 | 0-0.5 | 3.27 | 4.09 | 5.46 | 0.80 | | - | - | - | - |
| RP-M-20 | 1-2 | 10.06 | 12.01 | 15.90 | 1.98 | Toxic | - | - | - | - |
| **Rice's Point: 2008 Investigation [10]** | | | | | | | | | | |
| RP-I-109 | 0.2-0.5 | 6.35 | 8.06 | 8.06 | 2.22 | Toxic | - | - | - | - |
| RP-I-2 | 0.75-1.1 | 0.50 | 0.50 | 0.50 | 0.08 | | - | - | - | - |
| RP-I-88 | 1.5-1.83 | 1.34 | 1.34 | 1.34 | 0.26 | | - | - | - | - |
| RP-M-19 | 0.6-0.9 | 0.92 | 0.92 | 0.92 | 0.12 | | - | - | - | - |
| **Slip 2** | | | | | | | | | | |
| S2-12 | 0-0.5 | 45.61 | 59.26 | 59.61 | 2.28 | Toxic | 8.95 | 8.95 | 11.35 | 11.35 |
| S2-12 | 1-2 | 22.77 | 27.98 | 28.12 | 3.75 | Toxic | 6.50 | 6.50 | 7.57 | 7.57 |
| S2-15 | 0-0.5 | 16.22 | 21.90 | 21.98 | 2.00 | Toxic | 3.64 | 3.64 | 4.24 | 4.24 |
| S2-15 | 0.5-1.13 | 6.32 | 7.96 | 7.98 | 2.08 | Toxic | 2.21 | 2.21 | 2.43 | 2.43 |
| S2-5 | 0-0.5 | 9.23 | 12.43 | 12.49 | 0.73 | | - | - | - | - |
| S2-5 | 0.5-1.42 | 24.32 | 33.10 | 33.22 | 0.97 | | - | - | - | - |
| S2-7 | 0-0.5 | 32.72 | 42.02 | 42.22 | 2.05 | Toxic | - | - | - | - |
| S2-7 | 0.5-1 | 43.49 | 56.04 | 56.29 | 2.64 | Toxic | - | - | - | - |
| **Slip 3** | | | | | | | | | | |
| S3-10 | 0-0.5 | 14.07 | 16.84 | 16.95 | 4.50 | Toxic | 2.06 | 1.68 | 2.29 | 2.04 |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |
| S3-10 | 1.5-2.5 | 7.37 | 9.33 | 9.41 | 0.37 | | 21.72 | 21.72 | 26.72 | 26.72 |
| S3-14 | 0-0.5 | 7.85 | 10.17 | 10.27 | 0.34 | | 8.07 | 8.07 | 8.84 | 8.84 |
| S3-14 | 1.08-2.08 | 32.10 | 39.23 | 39.70 | 0.97 | | 11.17 | 11.17 | 13.21 | 13.21 |
| S3-6 | 0-0.5 | 30.35 | 34.48 | 35.42 | 20.20 | Toxic | - | - | - | - |
| S3-6 | 0.75-1.75 | 2.55 | 3.26 | 3.27 | 1.72 | Toxic | - | - | - | - |
| S3-8 | 0-0.5 | 3.47 | 4.42 | 4.43 | 0.99 | | - | - | - | - |
| S3-8 | 0.5-1.38 | 4.24 | 5.12 | 5.13 | 0.93 | | - | - | - | - |
| **Superior Bay** | | | | | | | | | | |
| SB-1 | 0-0.5 | 0.41 | 0.59 | 0.59 | 0.07 | | 4.89 | 4.65 | 5.83 | 5.63 |
| SB-1 | 2.08-3.13 | 0.89 | 1.18 | 1.19 | 0.09 | | 8.01 | 0.13 | 6.10 | 0.23 |
| SB-11 | 0-0.5 | 0.67 | 0.93 | 0.95 | 0.03 | | - | - | - | - |
| SB-11 | 3-4 | 0.51 | 0.57 | 0.58 | 0.01 | | - | - | - | - |
| SB-25 | 0-0.5 | 0.87 | 1.03 | 1.05 | 0.02 | | 9.37 | 8.75 | 11.28 | 10.75 |
| SB-25 | 0.5-1.46 | 2.57 | 2.85 | 2.89 | 0.01 | | 45.58 | 1.85 | 40.08 | 2.85 |
| SB-28 | 0-0.5 | 1.89 | 2.11 | 2.13 | 0.09 | | 18.02 | 18.02 | 22.52 | 22.52 |
| SB-28 | 1.08-2.13 | 2.74 | 3.05 | 3.08 | 0.01 | | 79.56 | 0.01 | 66.94 | 0.68 |
| SB-30 | 0-0.5 | 0.41 | 0.52 | 0.52 | 0.26 | | - | - | - | - |
| SB-30 | 0.5-1.46 | 0.34 | 0.37 | 0.37 | 0.19 | | - | - | - | - |
| SB-40 | 0-0.5 | 0.31 | 0.34 | 0.35 | 0.18 | | - | - | - | - |
| SB-40 | 0.5-1.33 | 0.32 | 0.36 | 0.36 | 0.19 | | - | - | - | - |
| SB-43 | 0-0.5 | 4.85 | 6.93 | 7.01 | 0.23 | | 21.37 | 21.37 | 27.70 | 27.70 |
| SB-43 | 2.33-3.33 | 1.74 | 1.93 | 1.96 | 0.01 | | 43.72 | 0.20 | 33.48 | 0.70 |
| SB-45 | 0-0.5 | 4.45 | 6.21 | 6.29 | 0.25 | | - | - | - | - |
| SB-45 | 2.33-3.33 | 2.05 | 2.28 | 2.31 | 0.01 | | - | - | - | - |
| SB-9 | 0-0.5 | 2.35 | 3.16 | 3.22 | 0.11 | | - | - | - | - |
| SB-9 | 3-4 | 2.24 | 3.18 | 3.19 | 0.09 | | - | - | - | - |

| Sample Location | Sample Interval (ft) | PAHs Group Totals | | | ESB Toxic Units, PAHs[1,5] | | Total TCDD TEQ Concentration (pg/g) - Using Fish TEF | | Total TCDD TEQ Concentration (pg/g) - Using Mammals TEF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PAHs -13 (mg/kg)[1,2] | PAHs -16 (mg/kg)[1,3] | PAHs- 34 (mg/kg)[1,4] | Sum of ESB Toxic Units[6] | Toxicity to Benthic Organisms[7] | Calculated [1,8] | Kaplan-Meier Method[9] | Calculated [1,8] | Kaplan-Meier Method[9] |

**Notes:**

1. Concentration is based on dry weight concentrations of contaminants and the nondetect data are handled using the following assumptions:
   - Zero for the PAHs that are all non-detects within a study area
   - 1/2 of the reporting limit for the PAHs that are detected in more than one sample within a study area
2. PAHs-13 is the Priority PAHs per MCPA (2007)
3. PAHs-16 is the EPA Priority Pollutant PAHs
4. PAHs -34 is the Total PAHs per USEPA (2003)
5. Equilibrium Partitioning Sediment Benchmarks (ESBs) Toxic Units are are calculated using the procedure described in (USEPA 2003)
6. Uncertainity factor of 1 is used because most of the 34 PAHs are analyzed.
7. Toxicity to aquatic life is assessed as below (USEPA 2003)
   - $\Sigma$ESB Toxic Units < 1 $\Rightarrow$ sediment will not be toxic to benthic organisms
   - $\Sigma$ESB Toxic Units ≥ 1 $\Rightarrow$ sediment may be toxic to benthic organisms and further testing or more information is necessary to determine appropriate sediment management options.
8. Calculated TEC concentration treating nondetects as described in "Note 1"
9. Calculated TEQ concentration using Kaplan-Meier Method to handle nondetects Helsel (2009).
10. 2008 Investigation: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil)

| Sample Location | Sample Depth (ft) | PAHs (μg/kg dry weight)[1,2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo (a) pyrene | Chrysene | Dibenz (a,h) anthracene | Fluoranthene | Pyrene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Benzo(ghi)perylene | Indeno(1,2,3-cd)pyrene | C1- Napthalene | C2- Napthalene | C3- Napthalene | C4- Napthalene | C1- Fluorenes | C2- Fluorenes | C3- Fluorenes | C1- Phenanthrene/anthracene | C2- Phenanthrene/anthracene | C3- Phenanthrene/anthracene | C4- Phenanthrene/anthracene | C1- Pyrene/ fluoranthenes | C1- Benzanthracene /chrysenes | C2- Benzanthracene /chrysenes | C3- Benzanthracene /chrysenes | C4- Benzanthracene /chrysenes | *Priority PAH 13 (MPCA, 2003)[3]* | *EPA PAH 16[3]* | *Total PAH 34[3]* |
| **Slip C** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC-1A | 0-0.5 | 180 | 85 | 390 | 200 | 83 | 92 | 1700 | 1400 | 1000 | 1500 | 270 | 2800 | 3400 | 2200 | 870 | 690 | 560 | 270 | 240 | 440 | 320 | 350 | 610 | 1100 | 1200 | 1500 | 1800 | 1300 | 1700 | 1300 | 530 | ND | ND | *13100* | *17337* | *30080* |
| SC-1A | 2.5-3.5 | 170 | 57 | 340 | 190 | 49 | 72 | 1600 | 870 | 630 | 950 | 110 | 1900 | 2400 | 1300 | 600 | 440 | 360 | 65 | 230 | 470 | 330 | 330 | 350 | 540 | 860 | 890 | 880 | 620 | 1000 | 850 | 480 | ND | ND | *9338* | *11989* | *19933* |
| SC-4 | 0-0.5 | 120 | 75 | 290 | 140 | 75 | 86 | 1300 | 950 | 780 | 1200 | 265 | 2100 | 2900 | 1600 | 620 | 600 | 500 | 265 | 210 | 350 | 410 | 350 | 550 | 1400 | 1200 | 1700 | 1900 | 1400 | 1400 | 1400 | 630 | ND | ND | *10281* | *13526* | *26766* |
| SC-4 | 2-3 | 200 | 76 | 280 | 260 | 120 | 120 | 1700 | 980 | 660 | 950 | 110 | 1700 | 3100 | 1600 | 1800 | 530 | 430 | 230 | 1000 | 1800 | 2100 | 580 | 1700 | 2800 | 2300 | 3800 | 4500 | 2800 | 1900 | 1900 | 1200 | ND | ND | *10256* | *14496* | *43226* |
| SC-5A | 0-0.5 | 190 | 100 | 420 | 230 | 120 | 130 | 1800 | 1600 | 1100 | 1600 | 210 | 2700 | 4100 | 2200 | 900 | 920 | 750 | 140 | 320 | 580 | 750 | 510 | 810 | 1400 | 1500 | 2000 | 2100 | 1500 | 1800 | 1600 | 750 | ND | ND | *14300* | *18950* | *34830* |
| SC-5A | 3-4 | 490 | 81 | 440 | 590 | 120 | 120 | 2500 | 1300 | 750 | 1100 | 205 | 1900 | 3600 | 1800 | 2000 | 690 | 510 | 300 | 1300 | 2500 | 2000 | 1300 | 2600 | 4300 | 3400 | 5700 | 6700 | 4100 | 2300 | 1800 | 1400 | ND | ND | *13196* | *18076* | *57896* |
| SC-9A | 0-0.5 | 120 | 56 | 310 | 140 | 47 | 60 | 1200 | 980 | 810 | 1100 | 130 | 2000 | 2800 | 1700 | 770 | 680 | 550 | 130 | 120 | 170 | 120 | 200 | 260 | 450 | 690 | 620 | 620 | 500 | 930 | 990 | 380 | ND | ND | *9753* | *13406* | *19633* |
| SC-9A | 2-3 | 490 | 62 | 460 | 500 | 130 | 100 | 3100 | 910 | 770 | 960 | 80 | 2400 | 3000 | 1100 | 340 | 520 | 470 | 190 | 730 | 1700 | 1700 | 640 | 1600 | 3500 | 2600 | 3800 | 4300 | 2700 | 1900 | 1300 | 80 | ND | ND | *12962* | *15262* | *42132* |
| SC-12A | 0-0.5 | 110 | 43 | 220 | 150 | 68 | 86 | 1100 | 620 | 590 | 670 | 110 | 1300 | 1600 | 780 | 370 | 410 | 330 | 83 | 210 | 470 | 420 | 240 | 530 | 1200 | 1100 | 1700 | 1900 | 1200 | 1000 | 770 | 125 | ND | ND | *6667* | *8489* | *19505* |
| SC-12A | 1-2 | 42 | 16 | 100 | 57 | 24 | 24 | 390 | 270 | 290 | 310 | 85 | 530 | 630 | 390 | 160 | 170 | 150 | 85 | 57 | 68 | 56 | 69 | 76 | 100 | 250 | 210 | 210 | 120 | 310 | 200 | 85 | ND | ND | *2768* | *3614* | *5534* |
| SC-16A | 0-0.5 | 140 | 57 | 300 | 160 | 52 | 67 | 1500 | 1100 | 1200 | 1300 | 230 | 2300 | 2900 | 1600 | 660 | 940 | 710 | 165 | 100 | 78 | 165 | 84 | 82 | 130 | 630 | 390 | 230 | 800 | 900 | 620 | 165 | ND | ND | *11306* | *15164* | *19755* |
| SC-16A | 2-3 | 37 | 13 | 71 | 44 | 17 | 20 | 370 | 240 | 260 | 280 | 69 | 480 | 650 | 340 | 150 | 200 | 200 | 60 | 38 | 54 | 38 | 28 | 47 | 72 | 190 | 150 | 120 | 93 | 240 | 160 | 60 | ND | ND | *2551* | *3424* | *4791* |
| SC-26A | 0-0.5 | 21 | 11 | 53 | 33 | 14 | 19 | 260 | 160 | 170 | 170 | 36 | 330 | 440 | 210 | 86 | 120 | 98 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 110 | 72 | 48 | 34 | 130 | 65 | 50 | ND | ND | *1717* | *2217* | *3090* |
| SC-26A | 0.5-1.5 | 19 | 34 | 62 | 40 | 18 | 26 | 380 | 190 | 200 | 210 | 50 | 500 | 450 | 270 | 110 | 120 | 99 | 23 | 30 | 23 | 50 | 50 | 32 | 26 | 160 | 110 | 60 | 100 | 190 | 140 | 69 | ND | ND | *2179* | *2760* | *3841* |
| SC-31A | 0-0.5 | 19 | 7 | 58 | 33 | 10 | 20 | 260 | 150 | 130 | 150 | 55 | 330 | 300 | 180 | 74 | 65 | 57 | 55 | 55 | 55 | 55 | 25 | 55 | 55 | 120 | 77 | 47 | 28 | 150 | 110 | 52 | ND | ND | *1522* | *1888* | *2837* |
| SC-31A | 1-2 | 22 | 5 | 58 | 35 | 11 | 16 | 280 | 170 | 120 | 170 | 55 | 480 | 420 | 190 | 70 | 49 | 50 | 55 | 55 | 55 | 55 | 28 | 55 | 55 | 150 | 93 | 60 | 39 | 200 | 120 | 55 | ND | ND | *1842* | *2190* | *3276* |
| SC-33 | 0-0.5 | 15 | 5 | 71 | 26 | 55 | 55 | 270 | 160 | 130 | 160 | 55 | 380 | 340 | 190 | 78 | 63 | 61 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 96 | 51 | 30 | 55 | 150 | 92 | 32 | ND | ND | *1722* | *2059* | *3005* |
| SC-33 | 1-2 | 13 | 5 | 46 | 18 | 55 | 55 | 170 | 120 | 98 | 160 | 55 | 250 | 240 | 160 | 83 | 46 | 44 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 72 | 48 | 37 | 22 | 120 | 77 | 33 | ND | ND | *1285* | *1563* | *2412* |
| SC-40 | 0-0.5 | 43 | 55 | 190 | 55 | 11 | 15 | 570 | 330 | 290 | 310 | 37 | 740 | 690 | 400 | 140 | 120 | 120 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 31 | 24 | 55 | 55 | 55 | 55 | 55 | ND | ND | *3336* | *4105* | *4831* |
| SC-40 | 1-2 | 7 | 55 | 27 | 11 | 55 | 55 | 130 | 66 | 57 | 67 | 55 | 170 | 160 | 80 | 31 | 22 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 54 | 25 | 55 | 55 | 56 | 35 | 55 | ND | ND | *915* | *1048* | *1823* |
| **21st Avenue Bay** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TF-44 | 0-0.5 | 74 | 74 | 200 | 98 | 59 | 90 | 800 | 900 | 1200 | 900 | 220 | 2200 | 2000 | 1800 | 700 | 890 | 800 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *8815* | *12946* | *13005* |
| TF-44 | 2.5-3.5 | 73 | 40 | 170 | 99 | 49 | 68 | 670 | 460 | 350 | 260 | 85 | 1100 | 890 | 640 | 240 | 250 | 240 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *4314* | *5635* | *5684* |
| TF-34 | 0-0.5 | 50 | 56 | 130 | 61 | 66 | 110 | 450 | 590 | 800 | 1150 | 150 | 1200 | 1100 | 1100 | 380 | 550 | 410 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *5913* | *8287* | *8353* |
| TF-34 | 3-4 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 31 | 15 | 335 | 110 | 225 | 335 | 36 | 36 | 36 | 36 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *1156* | *1285* | *1300* |
| TF-39 | 0-0.5 | 46 | 46 | 46 | 46 | 46 | 59 | 130 | 140 | 130 | 1000 | 340 | 700 | 1000 | 110 | 110 | 140 | 54 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *3727* | *4095* | *4141* |
| TF-39 | 0.5-1.42 | 49 | 49 | 58 | 49 | 53 | 78 | 260 | 150 | 160 | 1100 | 365 | 750 | 1100 | 250 | 115 | 190 | 100 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *4220* | *4822* | *4875* |
| TF-8A | 0-0.5 | 60 | 60 | 23 | 60 | 60 | 60 | 62 | 94 | 100 | 110 | 60 | 210 | 240 | 160 | 62 | 40 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 55 | 49 | 92 | 81 | 140 | 130 | 79 | 60 | ND | ND | *1199* | *1461* | *2567* |
| TF-8A | 1-2 | 39 | 62 | 140 | 96 | 150 | 330 | 420 | 460 | 550 | 540 | 80 | 790 | 1200 | 910 | 360 | 390 | 280 | 160 | 220 | 180 | 130 | 160 | 220 | 300 | 600 | 590 | 400 | 1700 | 770 | 450 | 83 | ND | ND | *4857* | *6647* | *12760* |
| TF-50A | 0-0.5 | 34 | 105 | 100 | 38 | 105 | 105 | 410 | 340 | 370 | 370 | 105 | 770 | 780 | 560 | 210 | 180 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 160 | 85 | 53 | 105 | 280 | 190 | 65 | ND | ND | *3632* | *4582* | *6360* |
| TF-50A | 0.5-1.25 | 52 | 11 | 120 | 55 | 110 | 110 | 540 | 460 | 480 | 480 | 70 | 940 | 1100 | 670 | 350 | 240 | 230 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 210 | 130 | 88 | 110 | 350 | 260 | 72 | ND | ND | *4528* | *5908* | *8008* |
| TF-15A | 0-0.5 | 120 | 120 | 120 | 120 | 120 | 120 | 32 | 54 | 54 | 50 | 120 | 81 | 72 | 67 | 120 | 28 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | ND | ND | *1183* | *1398* | *3198* |
| TF-15A | 2-3 | 75 | 75 | 11 | 75 | 75 | 75 | 30 | 47 | 53 | 50 | 75 | 74 | 68 | 66 | 29 | 29 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 56 | 34 | 75 | ND | ND | *783* | *907* | *1972* |
| TF-1A | 0-0.92 | 50 | 50 | 8 | 50 | 50 | 50 | 31 | 19 | 13 | 11 | 50 | 32 | 28 | 17 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | *442* | *559* | *1309* |
| TF-19A | 0-0.5 | 34 | 39 | 140 | 74 | 130 | 190 | 460 | 490 | 510 | 570 | 170 | 990 | 1100 | 780 | 360 | 240 | 180 | 140 | 260 | 320 | 300 | 200 | 320 | 430 | 680 | 650 | 680 | 500 | 850 | 480 | 300 | ND | ND | *4897* | *6327* | *12567* |
| TF-19A | 2-3 | 57 | 88 | 210 | 130 | 170 | 320 | 710 | 800 | 920 | 1000 | 160 | 1400 | 2000 | 1400 | 540 | 560 | 440 | 180 | 380 | 470 | 410 | 410 | 240 | 860 | 660 | 1100 | 1500 | 980 | 1200 | 780 | 430 | ND | ND | *7965* | *10735* | *20505* |
| TF-22A | 0-0.5 | 215 | 215 | 52 | 25 | 215 | 215 | 250 | 240 | 240 | 260 | 215 | 490 | 530 | 370 | 150 | 110 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 170 | 120 | 100 | 620 | 280 | 160 | 215 | ND | ND | *3162* | *3792* | *7177* |
| TF-22A | 2-3 | 3800 | 540 | 10000 | 5500 | 1500 | 2000 | 35000 | 18000 | 16000 | 18000 | 2800 | 36000 | 48000 | 25000 | 8100 | 8100 | 7900 | 1800 | 2200 | 1700 | 4000 | 1800 | 4000 | 4000 | 13000 | 6100 | 3600 | 2100 | 15000 | 9000 | 3300 | ND | ND | *197140* | *244740* | *317840* |
| TF-102 | 0-0.5 | 37 | 6 | 120 | 47 | 55 | 55 | 600 | 390 | 350 | 430 | 51 | 940 | 880 | 550 | 200 | 160 | 140 | 55 | 55 | 55 | 55 | 23 | 31 | 31 | 160 | 90 | 70 | 44 | 320 | 200 | 56 | ND | ND | *3961* | *4956* | *6256* |
| TF-102 | 1-2 | 43 | 7 | 85 | 44 | 13 | 23 | 450 | 290 | 300 | 290 | 41 | 610 | 640 | 410 | 180 | 140 | 110 | 55 | 25 | 39 | 30 | 31 | 45 | 66 | 180 | 130 | 110 | 73 | 260 | 150 | 59 | ND | ND | *2836* | *3663* | *4929* |
| TF-100 | 0-0.5 | 80 | 13 | 29 | 16 | 27 | 51 | 85 | 110 | 130 | 130 | 80 | 170 | 200 | 200 | 80 | 67 | 59 | 80 | 49 | 43 | 80 | 80 | 47 | 70 | 96 | 100 | 100 | 78 | 180 | 100 | 57 | ND | ND | *1121* | *1500* | *2687* |
| TF-100 | 2-3 | 7 | 50 | 9 | 50 | 50 | 13 | 31 | 33 | 31 | 32 | 50 | 55 | 59 | 41 | 20 | 12 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 22 | 26 | 23 | 50 | 40 | 50 | 50 | ND | ND | *469* | *542* | *1203* |
| TF-101 | 0-0.5 | 130 | 14 | 37 | 15 | 130 | 32 | 120 | 170 | 180 | 170 | 130 | 280 | 300 | 280 | 110 | 96 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | ND | ND | *1708* | *2194* | *4144* |
| TF-101 | 3-4 | 27 | 26 | 77 | 48 | 34 | 62 | 310 | 330 | 330 | 330 | 46 | 680 | 680 | 540 | 170 | 170 | 140 | 37 | 110 | 190 | 180 | 95 | 120 | 190 | 220 | 440 | 480 | 320 | 510 | 300 | 170 | ND | ND | *2980* | *3966* | *7362* |
| TF-103 | 0-0.5 | 73 | 18 | 210 | 100 | 21 | 38 | 940 | 600 | 630 | 650 | 120 | 1300 | 1800 | 1000 | 340 | 420 | 330 | 115 | 115 | 115 | 115 | 130 | 130 | 76 | 280 | 150 | 95 | 71 | 370 | 330 | 110 | ND | ND | *6500* | *8569* | *10792* |
| TF-103 | 0.5-1 | 190 | 25 | 320 | 290 | 77 | 150 | 1400 | 470 | 410 | 460 | 74 | 980 | 1400 | 580 | 250 | 230 | 210 | 86 | 91 | 72 | 90 | 75 | 42 | 61 | 360 | 160 | 86 | 39 | 350 | 260 | 88 | ND | ND | *6246* | *7439* | *9376* |
| TF-25 | 0-0.5 | 29 | 35 | 82 | 57 | 46 | 110 | 250 | 310 | 400 | 400 | 110 | 620 | 670 | 630 | 240 | 230 | 180 | 110 | 97 | 110 | 110 | 92 | 170 | 170 | 140 | 230 | 260 | 160 | 440 | 300 | 180 | ND | ND | *3119* | *4353* | *6968* |
| TF-25 | 3-4 | 10 | 11 | 30 | 20 | 27 | 46 | 120 | 120 | 130 | 130 | 70 | 240 | 260 | 200 | 77 | 67 | 60 | 70 | 41 | 35 | 30 | 38 | 52 | 65 | 110 | 110 | 140 | 110 | 190 | 110 | 68 | ND | ND | *1214* | *1591* | *2787* |
| TF-26A | 0-0.5 | 145 | 12 | 42 | 17 | 145 | 33 | 130 | 170 | 200 | 180 | 145 | 300 | 310 | 270 | 110 | 92 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 150 | 110 | 145 | ND | ND | *1829* | *2301* | *4446* |
| TF-26A | 2-3 | 41 | 45 | 120 | 53 | 41 | 72 | 400 | 600 | 710 | 620 | 90 | 920 | 1400 | 1000 | 440 | 410 | 290 | 120 | 95 | 64 | 63 | 180 | 120 | 430 | 190 | 330 | 400 | 340 | 740 | 400 | 200 | ND | ND | *5112* | *7211* | *10924* |
| TF-41 | 0-0.5 | 61 | 20 | 140 | 90 | 37 | 89 | 770 | 440 | 500 | 520 | 75 | 1000 | 1300 | 860 | 310 | 310 | 240 | 42 | 66 | 35 | 70 | 74 | 38 | 92 | 220 | 210 | 190 | 150 | 410 | 260 | 120 | ND | ND | *5042* | *6725* | *8739* |
| TF-41 | 3-4 | 26 | 38 | 95 | 60 | 85 | 160 | 340 | 360 | 380 | 430 | 81 | 670 | 830 | 600 | 260 | 230 | 190 | 90 | 140 | 140 | 100 | 140 | 170 | 220 | 370 | 360 | 390 | 300 | 540 | 350 | 200 | ND | ND | *3555* | *4750* | *8345* |
| TF-24 | 0-0.5 | 19 | 22 | 63 | 29 | 26 | 64 | 190 | 240 | 290 | 270 | 125 | 400 | 520 | 430 | 200 | 160 | 140 | 125 | 125 | 125 | 125 | 76 | 125 | 93 | 160 | 140 | 130 | 150 | 240 | 170 | 76 | ND | ND | *2258* | *3162* | *5048* |

| Sample Location | Sample Depth (ft) | PAHs (µg/kg dry weight)[1,2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo (a) pyrene | Chrysene | Dibenz (a,h) anthracene | Fluoranthene | Pyrene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Benzo(ghi)perylene | Indeno(1,2,3-cd)pyrene | C1- Napthalene | C2- Napthalene | C3- Napthalene | C4- Napthalene | C1- Fluorenes | C2- Fluorenes | C3- Fluorenes | C1- Phenanthrene/anthracene | C2- Phenanthrene/anthracene | C3- Phenanthrene/anthracene | C4- Phenanthrene/anthracene | C1- Pyrene/ fluoranthenes | C1- Benzanthracene /chrysenes | C2- Benzanthracene /chrysenes | C3- Benzanthracene /chrysenes | C4- Benzanthracene /chrysenes | *Priority PAH 13 (MPCA, 2003)[3]* | *EPA PAH 16[3]* | *Total PAH 34[3]* |
| TF-24 | 3-4 | 21 | 30 | 71 | 43 | 58 | 99 | 240 | 250 | 270 | 290 | 50 | 450 | 590 | 400 | 170 | 170 | 150 | 64 | 100 | 87 | 46 | 82 | 94 | 120 | 230 | 230 | 190 | 180 | 350 | 220 | 130 | ND | ND | *2462* | *3294* | *5475* |
| TF-36 | 0-0.5 | 26 | 28 | 71 | 34 | 255 | 62 | 260 | 360 | 460 | 420 | 255 | 590 | 970 | 640 | 280 | 320 | 260 | 255 | 255 | 255 | 255 | 255 | 255 | 255 | 210 | 160 | 140 | 255 | 270 | 220 | 255 | ND | ND | *3791* | *5036* | *8586* |
| TF-36 | 3-4 | 9 | 15 | 34 | 23 | 27 | 50 | 120 | 130 | 140 | 140 | 70 | 230 | 310 | 210 | 100 | 82 | 70 | 70 | 45 | 39 | 33 | 42 | 60 | 76 | 120 | 130 | 97 | 93 | 190 | 110 | 67 | ND | ND | *1298* | *1733* | *2932* |
| TF-4 | 0-0.5 | 65 | 8 | 20 | 12 | 24 | 57 | 67 | 73 | 82 | 76 | 65 | 120 | 180 | 100 | 56 | 37 | 65 | 65 | 37 | 31 | 65 | 65 | 31 | 52 | 84 | 93 | 78 | 69 | 110 | 67 | 38 | ND | ND | *849* | *1083* | *1992* |
| TF-4 | 2-3 | 14 | 24 | 65 | 33 | 44 | 120 | 170 | 210 | 240 | 240 | 65 | 350 | 470 | 330 | 150 | 130 | 110 | 48 | 68 | 50 | 32 | 54 | 70 | 91 | 170 | 180 | 150 | 140 | 280 | 200 | 140 | ND | ND | *2045* | *2721* | *4438* |
| TF-3A | 0-0.5 | 22 | 25 | 70 | 46 | 58 | 100 | 220 | 230 | 260 | 270 | 54 | 530 | 670 | 390 | 170 | 160 | 130 | 63 | 93 | 76 | 51 | 87 | 92 | 120 | 220 | 210 | 160 | 180 | 300 | 190 | 110 | ND | ND | *2555* | *3347* | *5357* |
| TF-3A | 3-4 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 130 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | ND | ND | *850* | *1030* | *1930* |
| TF-23A | 0-0.5 | 42 | 91 | 200 | 110 | 130 | 140 | 500 | 710 | 1000 | 780 | 140 | 1100 | 1600 | 1400 | 530 | 610 | 540 | 160 | 260 | 210 | 100 | 190 | 200 | 250 | 630 | 550 | 430 | 310 | 1100 | 810 | 380 | ND | ND | *6543* | *9493* | *15203* |
| TF-23A | 3-4 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 100 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | ND | ND | *1120* | *1375* | *2650* |
| TF-21A | 0-0.5 | 160 | 35 | 420 | 210 | 49 | 85 | 1900 | 1200 | 1200 | 1200 | 160 | 2600 | 2700 | 1700 | 690 | 510 | 500 | 180 | 90 | 180 | 180 | 180 | 110 | 120 | 790 | 460 | 280 | 760 | 1100 | 800 | 240 | ND | ND | *11919* | *15270* | *20789* |
| TF-21A | 2-3 | 18 | 90 | 28 | 20 | 90 | 90 | 190 | 85 | 75 | 91 | 90 | 230 | 200 | 100 | 59 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 170 | 65 | 75 | 12000 | 97 | 51 | 90 | ND | ND | *1297* | *1546* | *14814* |
| TF-12A | 0-0.5 | 21 | 18 | 47 | 33 | 34 | 54 | 210 | 210 | 230 | 240 | 90 | 490 | 480 | 330 | 170 | 170 | 120 | 39 | 58 | 47 | 90 | 54 | 72 | 86 | 250 | 190 | 160 | 1600 | 340 | 210 | 93 | ND | ND | *2157* | *2913* | *6236* |
| TF-12A | 1-2 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 220 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | ND | ND | *1180* | *1420* | *2620* |
| TF-10 | 0-0.5 | 17 | 26 | 65 | 35 | 69 | 160 | 180 | 200 | 210 | 220 | 65 | 370 | 390 | 300 | 140 | 110 | 100 | 74 | 110 | 93 | 54 | 71 | 120 | 140 | 170 | 240 | 240 | 210 | 370 | 230 | 120 | ND | ND | *2007* | *2588* | *4899* |
| TF-10 | 1-2 | 50 | 50 | 12 | 50 | 7 | 23 | 24 | 28 | 36 | 32 | 50 | 46 | 49 | 45 | 27 | 17 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 26 | 31 | 36 | 34 | 42 | 32 | 25 | ND | ND | *457* | *589* | *1172* |
| TF-2A | 0-0.5 | 50 | 50 | 50 | 50 | 50 | 50 | 9 | 13 | 10 | 11 | 50 | 23 | 23 | 24 | 27 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | *439* | *540* | *1290* |
| TF-2A | 0.5-1.67 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 7 | 50 | 50 | 50 | 7 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | *564* | *714* | *1464* |
| TF-32A | 0-0.5 | 115 | 115 | 115 | 115 | 115 | 115 | 39 | 54 | 59 | 50 | 115 | 90 | 94 | 78 | 36 | 25 | 130 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | ND | ND | *1191* | *1345* | *3070* |
| TF-32A | 0.5-1.5 | 7 | 8 | 22 | 11 | 10 | 19 | 75 | 83 | 89 | 93 | 55 | 160 | 160 | 130 | 62 | 44 | 39 | 55 | 55 | 55 | 55 | 29 | 33 | 53 | 67 | 70 | 71 | 60 | 120 | 89 | 44 | ND | ND | *792* | *1057* | *1923* |
| TF-103A | 0-0.5 | 34 | 19 | 98 | 46 | 105 | 105 | 440 | 430 | 440 | 530 | 98 | 860 | 1300 | 710 | 310 | 340 | 240 | 105 | 105 | 105 | 105 | 105 | 57 | 79 | 210 | 180 | 200 | 120 | 340 | 360 | 105 | ND | ND | *4505* | *6000* | *8281* |
| TF-103A | 0.5-1.08 | 270 | 550 | 640 | 330 | 80 | 220 | 2700 | 1600 | 1500 | 1800 | 550 | 3400 | 4200 | 2400 | 880 | 810 | 730 | 550 | 550 | 550 | 550 | 550 | 550 | 550 | 700 | 420 | 320 | 550 | 1100 | 750 | 550 | ND | ND | *17840* | *22580* | *30900* |
| **AGP Slip** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-70 | 0-0.5 | 860 | 340 | 1100 | 620 | 380 | 780 | 2800 | 2000 | 1400 | 2000 | 230 | 3400 | 5300 | 2600 | 860 | 1100 | 820 | 510 | 470 | 360 | 200 | 400 | 180 | 420 | 1100 | 1000 | 630 | 380 | 2000 | 1400 | 400 | ND | ND | *21210* | *26210* | *36040* |
| RP-I-70 | 0.5-1.83 | 2600 | 870 | 2200 | 2000 | 770 | 1400 | 5200 | 4200 | 3700 | 4000 | 310 | 8100 | 11000 | 4200 | 1700 | 1700 | 1200 | 1000 | 1000 | 820 | 500 | 1200 | 375 | 790 | 2300 | 2400 | 1800 | 960 | 5300 | 2400 | 375 | ND | ND | *46350* | *54380* | *76370* |
| RP-I-74 | 0-0.5 | 16 | 7 | 32 | 15 | 12 | 13 | 98 | 81 | 56 | 77 | 50 | 140 | 240 | 100 | 49 | 46 | 36 | 50 | 50 | 50 | 50 | 50 | ND | 50 | 48 | 45 | 30 | 50 | 64 | 39 | 50 | ND | ND | *837* | *1056* | *1694* |
| RP-I-74 | 0.5-1.83 | 47 | 12 | 97 | 48 | 25 | 31 | 290 | 170 | 120 | 170 | 50 | 290 | 480 | 210 | 100 | 100 | 80 | 31 | 37 | 24 | 50 | 33 | ND | 27 | 140 | 92 | 65 | 33 | 160 | 120 | 50 | ND | ND | *1830* | *2295* | *3182* |
| RP-I-77 | 0-0.5 | 30 | 50 | 77 | 40 | 14 | 38 | 290 | 160 | 100 | 140 | 50 | 320 | 460 | 190 | 100 | 78 | 72 | 50 | 50 | 50 | 50 | 50 | ND | 50 | 72 | 39 | 50 | 50 | 100 | 69 | 50 | ND | ND | *1769* | *2195* | *2939* |
| RP-I-77 | 0.5-1.67 | 50 | 50 | 50 | 50 | 50 | 50 | 15 | 16 | 6 | 8 | 50 | 21 | 35 | 20 | 22 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | 50 | 160 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | *449* | *540* | *1344* |
| RP-M-33 | 0-0.5 | 120 | 69 | 360 | 130 | 53 | 75 | 810 | 690 | 460 | 740 | 70 | 1000 | 1800 | 830 | 370 | 440 | 290 | 78 | 96 | 65 | 39 | 91 | ND | 95 | 330 | 260 | 170 | 120 | 570 | 380 | 140 | ND | ND | *6377* | *8254* | *10741* |
| RP-M-33 | 1-2 | 110 | 45 | 270 | 130 | 89 | 120 | 860 | 710 | 470 | 640 | 80 | 1100 | 1800 | 850 | 350 | 410 | 350 | 110 | 120 | 80 | 36 | 78 | ND | 85 | 390 | 240 | 160 | 94 | 520 | 400 | 140 | ND | ND | *6424* | *8295* | *10837* |
| RP-M-35 | 0-0.5 | 1300 | 400 | 2300 | 1500 | 460 | 1000 | 8700 | 4500 | 3800 | 4200 | 380 | 9400 | 8900 | 4900 | 1800 | 1700 | 1500 | 620 | 600 | 390 | 170 | 570 | ND | 400 | 3000 | 1900 | 1100 | 580 | 4400 | 2700 | 390 | ND | ND | *46840* | *56280* | *73560* |
| RP-M-35 | 1-2 | 400 | 58 | 200 | 260 | 100 | 210 | 540 | 520 | 270 | 430 | 36 | 1000 | 2000 | 510 | 200 | 200 | 130 | 130 | 120 | 120 | 160 | 230 | 100 | 240 | 310 | 370 | 320 | 220 | 710 | 300 | 130 | ND | ND | *6024* | *6964* | *10524* |
| RP-O-16 | 0-0.5 | 170 | 38 | 310 | 180 | 70 | 110 | 600 | 440 | 270 | 440 | 40 | 720 | 1300 | 490 | 230 | 220 | 160 | 96 | 95 | 74 | 42 | 98 | ND | 140 | 260 | 250 | 270 | 200 | 550 | 310 | 170 | ND | ND | *4688* | *5718* | *8343* |
| RP-O-16 | 2-3 | 160 | 120 | 360 | 190 | 120 | 160 | 920 | 820 | 550 | 750 | 65 | 1200 | 2000 | 990 | 430 | 490 | 310 | 160 | 180 | 140 | 76 | 140 | ND | 190 | 330 | 410 | 320 | 190 | 810 | 520 | 190 | ND | ND | *7415* | *9515* | *13291* |
| **Azcon Slip** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-53 | 0-0.5 | 180 | 130 | 590 | 380 | 170 | 340 | 1900 | 1100 | 1000 | 1100 | 180 | 1800 | 2500 | 1500 | 580 | 670 | 600 | 190 | 190 | 130 | 61 | 120 | 120 | 92 | 720 | 370 | 210 | 110 | 770 | 640 | 310 | ND | ND | *11370* | *14550* | *18753* |
| RP-I-53 | 0.5-1.67 | 160 | 95 | 520 | 280 | 140 | 190 | 1500 | 930 | 910 | 1100 | 160 | 1700 | 2300 | 1500 | 510 | 600 | 540 | 150 | 170 | 110 | 56 | 100 | 47 | 97 | 530 | 350 | 240 | 160 | 740 | 500 | 190 | ND | ND | *9985* | *12995* | *16575* |
| RP-M-26 | 0-0.5 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | ND | ND | *910* | *1120* | *2170* |
| RP-M-26 | 3-4 | 870 | 160 | 2100 | 1200 | 760 | 940 | 7400 | 4300 | 4100 | 4500 | 680 | 8500 | 11000 | 6000 | 2500 | 2200 | 1800 | 340 | 1200 | 950 | 650 | 630 | 670 | 860 | 3200 | 2200 | 2100 | 1300 | 3800 | 2200 | 1000 | ND | ND | *46510* | *58250* | *80110* |
| RP-I-58 | 0-0.5 | 72 | 15 | 180 | 110 | 54 | 70 | 610 | 350 | 310 | 340 | 115 | 700 | 770 | 510 | 220 | 150 | 120 | 61 | 70 | 115 | 115 | 60 | 51 | 89 | 280 | 170 | 110 | 94 | 370 | 220 | 130 | ND | ND | *3696* | *4642* | *6631* |
| RP-I-58 | 1.5-2.5 | 130 | 32 | 410 | 190 | 57 | 64 | 1400 | 840 | 730 | 760 | 100 | 1600 | 1900 | 1100 | 520 | 310 | 310 | 66 | 100 | 66 | 150 | 150 | 150 | 190 | 570 | 350 | 210 | 140 | 780 | 550 | 180 | ND | ND | *8213* | *10396* | *14105* |
| RP-M-28 | 0-0.5 | 28 | 10 | 84 | 42 | 22 | 24 | 320 | 190 | 150 | 230 | 55 | 460 | 420 | 220 | 100 | 75 | 72 | 25 | 36 | 55 | 55 | 55 | 55 | 24 | 140 | 86 | 64 | 40 | 220 | 130 | 50 | ND | ND | *2035* | *2480* | *3537* |
| RP-M-28 | 0.5-1 | 120 | 20 | 310 | 150 | 36 | 48 | 1100 | 660 | 590 | 590 | 76 | 1400 | 1300 | 800 | 330 | 260 | 220 | 44 | 61 | 46 | 75 | 59 | 47 | 42 | 490 | 230 | 110 | 62 | 670 | 350 | 140 | ND | ND | *6400* | *7974* | *10436* |
| RP-I-46 | 0-0.5 | 100 | 15 | 240 | 120 | 35 | 84 | 900 | 490 | 480 | 490 | 60 | 1100 | 1000 | 690 | 250 | 220 | 180 | 70 | 43 | 31 | 70 | 36 | 39 | 70 | 260 | 120 | 100 | 49 | 420 | 280 | 85 | ND | ND | *5114* | *6419* | *8127* |
| RP-I-46 | 0.5-1.67 | 50 | 50 | 10 | 50 | 50 | 50 | 51 | 21 | 15 | 19 | 50 | 61 | 55 | 18 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 22 | 50 | 50 | ND | ND | *532* | *650* | *1372* |
| RP-I-52 | 0-0.5 | 270 | 55 | 700 | 420 | 110 | 150 | 2400 | 1300 | 1200 | 1300 | 150 | 2600 | 2500 | 1500 | 750 | 420 | 400 | 140 | 160 | 120 | 47 | 150 | 120 | 75 | 1100 | 460 | 280 | 76 | 1400 | 880 | 240 | ND | ND | *13155* | *16115* | *21473* |
| RP-I-52 | 1-2 | 5300 | 1100 | 13000 | 11000 | 5000 | 14000 | 41000 | 14000 | 11000 | 13000 | 1700 | 27000 | 39000 | 15000 | 6600 | 4700 | 4400 | 5400 | 3500 | 1700 | 1850 | 3000 | 1500 | 930 | 14000 | 5700 | 2500 | 820 | 13000 | 7300 | 2300 | ND | ND | *196100* | *221800* | *290300* |
| RP-100 | 0-0.5 | 110 | 31 | 260 | 160 | 91 | 90 | 870 | 550 | 490 | 560 | 61 | 1200 | 1100 | 690 | 270 | 180 | 170 | 43 | 150 | 130 | 110 | 110 | 190 | 270 | 510 | 400 | 410 | 240 | 750 | 450 | 200 | ND | ND | *5573* | *6792* | *10846* |
| RP-100 | 1-2 | 110 | 34 | 280 | 180 | 230 | 170 | 890 | 490 | 420 | 490 | 54 | 1100 | 1000 | 590 | 260 | 160 | 150 | 270 | 470 | 410 | 480 | 180 | 370 | 370 | 630 | 740 | 680 | 450 | 810 | 500 | 270 | ND | ND | *5448* | *6378* | *13238* |
| **Boat Landing** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-2A | 0-0.5 | 170 | 97 | 460 | 250 | 87 | 130 | 1500 | 1100 | 1200 | 1300 | 190 | 2700 | 3300 | 1800 | 790 | 720 | 510 | 100 | 210 | 260 | 210 | 210 | 310 | 310 | 1500 | 870 | 730 | 20000 | 940 | 730 | 320 | ND | ND | *12484* | *16217* | *43004* |
| RP-I-2A | 2-3 | 230 | 130 | 720 | 360 | 160 | 250 | 1900 | 1900 | 1900 | 2700 | 320 | 3900 | 5300 | 3500 | 1300 | 1200 | 890 | 170 | 350 | 230 | 190 | 340 | 510 | 450 | 1000 | 1100 | 730 | 1800 | 2200 | 1200 | 510 | ND | ND | *19770* | *26500* | *37440* |
| RP-I-6 | 0-0.5 | 16 | 12 | 53 | 22 | 16 | 28 | 170 | 190 | 170 | 410 | 120 | 700 | 540 | 530 | 200 | 92 | 90 | 120 | 120 | 120 | 120 | 120 | 120 | 66 | 120 | 120 | 96 | 100 | 280 | 130 | 58 | ND | ND | *2447* | *3343* | *5049* |
| RP-I-6 | 1-2 | 60 | 46 | 150 | 100 | 130 | 290 | 620 | 470 | 490 | 540 | 145 | 960 | 1000 | 750 | 290 | 230 | 190 | 130 | 190 | 130 | 100 | 90 | 170 | 110 | 450 | 430 | 390 | 360 | 740 | 280 | 250 | ND | ND | *5001* | *6331* | *10281* |

| Sample Location | Sample Depth (ft) | PAHs (µg/kg dry weight)[1,2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo (a) pyrene | Chrysene | Dibenz (a,h) anthracene | Fluoranthene | Pyrene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Benzo(ghi)perylene | Indeno(1,2,3-cd)pyrene | C1- Napthalene | C2- Napthalene | C3- Napthalene | C4- Napthalene | C1- Fluorenes | C2- Fluorenes | C3- Fluorenes | C1- Phenanthrene/anthracene | C2- Phenanthrene/anthracene | C3- Phenanthrene/anthracene | C4- Phenanthrene/anthracene | C1- Pyrene/ fluoranthenes | C1- Benzanthracene /chrysenes | C2- Benzanthracene /chrysenes | C3- Benzanthracene /chrysenes | C4- Benzanthracene /chrysenes | *Priority PAH 13 (MPCA, 2003)*[3] | *EPA PAH 16*[3] | *Total PAH 34*[3] |
| RP-I-9 | 0-0.5 | 670 | 16 | 520 | 510 | 73 | 130 | 1300 | 570 | 460 | 770 | 95 | 1500 | 2200 | 800 | 330 | 290 | 260 | 94 | 180 | 100 | 69 | 120 | 130 | 120 | 590 | 420 | 220 | 110 | 850 | 350 | 150 | ND | ND | *8814* | *10421* | *13997* |
| RP-I-9 | 0.5-1.4 | 14 | 49 | 7 | 11 | 49 | 25 | 23 | 17 | 16 | 14 | 49 | 45 | 43 | 25 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | ND | ND | *361* | *483* | *1210* |
| RP-M-2 | 0-0.5 | 410 | 100 | 1500 | 600 | 140 | 250 | 4300 | 2700 | 2100 | 4600 | 550 | 7400 | 7700 | 3700 | 1600 | 970 | 850 | 550 | 290 | 550 | 550 | 340 | 340 | 670 | 2200 | 1400 | 670 | 4900 | 3700 | 1600 | 750 | ND | ND | *32350* | *39330* | *57980* |
| RP-M-2 | 0.5-1 | 260 | 83 | 440 | 240 | 130 | 260 | 1400 | 1300 | 1200 | 1400 | 130 | 3200 | 2900 | 1700 | 630 | 500 | 420 | 150 | 210 | 200 | 140 | 250 | 180 | 260 | 1100 | 850 | 790 | 23000 | 1500 | 840 | 410 | ND | ND | *12943* | *16063* | *46073* |
| **Cargill Slip** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-82 | 0-0.5 | 22 | 5 | 70 | 31 | 9 | 11 | 270 | 200 | 140 | 190 | 55 | 440 | 450 | 290 | 110 | 75 | 76 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 100 | 84 | 60 | 33 | 170 | 120 | 54 | ND | ND | *1894* | *2435* | *3451* |
| RP-I-82 | 1-1.75 | 55 | 11 | 180 | 88 | 21 | 38 | 830 | 420 | 290 | 450 | 55 | 1000 | 1000 | 620 | 250 | 180 | 170 | 27 | 37 | 30 | 50 | 31 | 50 | 42 | 240 | 180 | 120 | 66 | 360 | 240 | 82 | ND | ND | *4438* | *5637* | *7213* |
| RP-I-86 | 0-0.5 | 43 | 24 | 100 | 84 | 71 | 110 | 640 | 220 | 180 | 290 | 70 | 640 | 790 | 390 | 160 | 130 | 120 | 84 | 100 | 72 | 37 | 45 | 46 | 81 | 220 | 180 | 130 | 90 | 260 | 190 | 58 | ND | ND | *3262* | *3991* | *5655* |
| RP-I-86 | 1-2 | 95 | 85 | 260 | 220 | 190 | 180 | 1500 | 610 | 480 | 710 | 84 | 1600 | 2000 | 940 | 490 | 310 | 280 | 220 | 320 | 310 | 250 | 160 | 110 | 280 | 510 | 560 | 490 | 320 | 760 | 540 | 240 | ND | ND | *8014* | *9844* | *15104* |
| RP-I-88A | 0-0.5 | 180 | 79 | 450 | 310 | 190 | 190 | 2200 | 870 | 650 | 1000 | 110 | 2200 | 2700 | 1400 | 540 | 410 | 370 | 220 | 290 | 190 | 100 | 150 | 100 | 150 | 650 | 550 | 320 | 420 | 910 | 630 | 270 | ND | ND | *11129* | *13659* | *18799* |
| RP-I-88A | 0.67-1.83 | 190 | 82 | 400 | 280 | 220 | 220 | 1900 | 820 | 600 | 940 | 110 | 2100 | 2600 | 1300 | 570 | 380 | 360 | 260 | 350 | 340 | 200 | 170 | 64 | 260 | 840 | 680 | 490 | 380 | 890 | 640 | 270 | ND | ND | *10462* | *12852* | *18906* |
| RP-I-93 | 0-0.5 | 53 | 16 | 110 | 78 | 34 | 38 | 560 | 310 | 220 | 320 | 55 | 800 | 690 | 410 | 190 | 160 | 140 | 39 | 52 | 34 | 55 | 31 | 55 | 41 | 130 | 120 | 82 | 60 | 290 | 190 | 71 | ND | ND | *3284* | *4150* | *5434* |
| RP-I-93 | 1-2.75 | 18 | 7 | 32 | 23 | 14 | 17 | 160 | 91 | 74 | 95 | 50 | 230 | 220 | 130 | 52 | 43 | 44 | 50 | 27 | 50 | 50 | 50 | 50 | 50 | 79 | 120 | 53 | 37 | 100 | 75 | 34 | ND | ND | *1031* | *1286* | *2125* |
| RP-I-94 | 0-0.5 | 50 | 19 | 97 | 71 | 38 | 49 | 500 | 320 | 230 | 350 | 65 | 760 | 720 | 490 | 210 | 130 | 130 | 43 | 63 | 44 | 65 | 49 | 65 | 65 | 300 | 160 | 140 | 83 | 310 | 210 | 85 | ND | ND | *3269* | *4191* | *5911* |
| RP-I-94 | 1-2 | 48 | 18 | 110 | 72 | 27 | 31 | 590 | 300 | 240 | 490 | 56 | 1100 | 950 | 600 | 190 | 120 | 120 | 32 | 40 | 29 | 50 | 28 | 50 | 38 | 200 | 120 | 93 | 49 | 350 | 200 | 66 | ND | ND | *4032* | *5035* | *6407* |
| RP-M-41 | 0-0.5 | 12 | 7 | 40 | 19 | 16 | 17 | 180 | 82 | 71 | 94 | 50 | 220 | 280 | 140 | 60 | 48 | 44 | 50 | 28 | 50 | 50 | 50 | 30 | 50 | 67 | 62 | 59 | 44 | 82 | 62 | 27 | ND | ND | *1088* | *1364* | *2091* |
| RP-M-41 | 0.5-1.33 | 18 | 50 | 46 | 19 | 10 | 12 | 160 | 88 | 70 | 93 | 50 | 210 | 270 | 130 | 58 | 48 | 40 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 44 | 38 | 34 | 21 | 66 | 50 | 50 | ND | ND | *1096* | *1362* | *2025* |
| RP-M-44 | 0-0.5 | 24 | 12 | 95 | 54 | 18 | 21 | 380 | 160 | 100 | 170 | 55 | 350 | 470 | 200 | 95 | 60 | 58 | 55 | 29 | 55 | 55 | 25 | 55 | 55 | 190 | 92 | 42 | 55 | 180 | 130 | 36 | ND | ND | *1909* | *2304* | *3376* |
| RP-M-44 | 1-2 | 150 | 69 | 360 | 280 | 160 | 280 | 1800 | 680 | 450 | 740 | 83 | 1700 | 2000 | 1000 | 360 | 300 | 260 | 180 | 190 | 150 | 100 | 120 | 100 | 150 | 590 | 450 | 290 | 160 | 720 | 490 | 180 | ND | ND | *8752* | *10512* | *14542* |
| **Cargill B Slip** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-105 | 0-0.5 | 10 | 55 | 23 | 10 | 8 | 55 | 85 | 80 | 66 | 74 | ND | 160 | 200 | 120 | 47 | 44 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 50 | 47 | 49 | 32 | 83 | 70 | 35 | ND | ND | *826* | *1084* | *1843* |
| RP-I-105 | 1-2 | 22 | 6 | 43 | 21 | 16 | 17 | 120 | 100 | 78 | 100 | ND | 220 | 280 | 150 | 58 | 51 | 42 | 55 | 24 | 55 | 55 | 24 | 55 | 39 | 110 | 79 | 61 | 54 | 120 | 100 | 51 | ND | ND | *1023* | *1308* | *2206* |
| RP-I-107 | 0-0.5 | 58 | 15 | 200 | 84 | 37 | 49 | 670 | 430 | 270 | 420 | 46 | 860 | 890 | 550 | 240 | 170 | 150 | 41 | 62 | 46 | 27 | 78 | 60 | 67 | 210 | 190 | 140 | 89 | 410 | 290 | 110 | ND | ND | *4029* | *5102* | *6959* |
| RP-I-107 | 1.5-2.5 | 48 | 30 | 110 | 68 | 100 | 100 | 400 | 270 | 220 | 320 | ND | 550 | 670 | 420 | 180 | 65 | 120 | 110 | 200 | 210 | 180 | 180 | 120 | 400 | 250 | 540 | 530 | 390 | 510 | 390 | 210 | ND | ND | *2886* | *3571* | *7891* |
| RP-I-109A | 0-0.5 | 34 | 15 | 81 | 35 | 32 | 41 | 350 | 300 | 310 | 300 | ND | 610 | 620 | 380 | 190 | 140 | 140 | 120 | 50 | 120 | 120 | 120 | 120 | 50 | 120 | 150 | 130 | 67 | 280 | 220 | 96 | ND | ND | *2728* | *3546* | *5341* |
| RP-I-109A | 1.5-2.5 | 92 | 16 | 51 | 51 | 53 | 54 | 190 | 170 | 130 | 170 | ND | 420 | 450 | 230 | 110 | 90 | 85 | 56 | 73 | 65 | 67 | 73 | 51 | 200 | 120 | 220 | 240 | 210 | 310 | 220 | 130 | ND | ND | *1847* | *2309* | *4397* |
| RP-I-113 | 0-0.5 | 24 | 6 | 40 | 21 | 11 | 13 | 150 | 100 | 86 | 110 | ND | 210 | 240 | 160 | 74 | 51 | 46 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 64 | 48 | 38 | 31 | 91 | 70 | 37 | ND | ND | *1011* | *1331* | *2106* |
| RP-I-113 | 0.67-1.67 | 11 | 5 | 26 | 11 | 8 | 55 | 80 | 72 | 57 | 73 | ND | 150 | 190 | 99 | 39 | 30 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 63 | 46 | 40 | 28 | 69 | 56 | 29 | ND | ND | *738* | *953* | *1677* |
| RP-M-57 | 0-0.5 | 11 | 9 | 49 | 15 | 50 | 50 | 190 | 150 | 140 | 170 | ND | 280 | 410 | 260 | 92 | 92 | 82 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 61 | 49 | 32 | 50 | 120 | 89 | 28 | ND | ND | *1524* | *2000* | *2829* |
| RP-M-57 | 0.5-1.25 | 49 | 49 | 49 | 49 | 49 | 49 | 10 | 11 | 49 | 7 | ND | 17 | 21 | 13 | 15 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | ND | ND | *408* | *485* | *1220* |
| **Coast Guard** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CG-100 | 0-0.5 | 220 | 24 | 480 | 240 | 48 | 82 | 1900 | 1100 | 980 | 1000 | 120 | 2200 | 2600 | 1400 | 450 | 390 | 370 | 59 | 73 | 53 | 55 | 93 | 72 | 62 | 700 | 340 | 150 | 81 | 850 | 590 | ND | ND | ND | *10994* | *13556* | *16782* |
| CG-100 | 0.83-1.83 | 160 | 29 | 370 | 160 | 35 | 59 | 1500 | 890 | 850 | 850 | 100 | 1800 | 2300 | 1100 | 510 | 380 | 330 | 44 | 61 | 51 | 65 | 84 | 72 | 79 | 600 | 330 | 190 | 200 | 790 | 580 | ND | ND | ND | *9103* | *11388* | *14569* |
| CG-101 | 0-0.5 | 130 | 27 | 310 | 140 | 26 | 38 | 1300 | 770 | 740 | 760 | 100 | 1500 | 2000 | 1000 | 420 | 360 | 320 | 32 | 50 | 42 | 70 | 63 | 62 | 62 | 480 | 260 | 130 | 90 | 610 | 460 | ND | ND | ND | *7841* | *9915* | *12352* |
| CG-101 | 0.5-1.5 | 150 | 23 | 340 | 150 | 26 | 35 | 1300 | 810 | 740 | 760 | 110 | 1600 | 2200 | 980 | 450 | 360 | 300 | 33 | 52 | 48 | 75 | 79 | 74 | 84 | 530 | 290 | 160 | 140 | 660 | 470 | ND | ND | ND | *8244* | *10308* | *13029* |
| CG-102 | 0-0.5 | 440 | 97 | 1100 | 500 | 94 | 130 | 4100 | 2500 | 2300 | 2400 | 270 | 5100 | 5300 | 2900 | 1300 | 890 | 840 | 120 | 180 | 140 | 67 | 330 | 210 | 180 | 1800 | 860 | 480 | 250 | 2400 | 1600 | ND | ND | ND | *24331* | *30167* | *38878* |
| CG-102 | 0.5-1.42 | 51 | 12 | 120 | 44 | 13 | 18 | 440 | 300 | 290 | 290 | 32 | 610 | 670 | 370 | 160 | 110 | 110 | 50 | 25 | 25 | 50 | 25 | 36 | 37 | 230 | 150 | 93 | 160 | 300 | 210 | ND | ND | ND | *2890* | *3627* | *5031* |
| CG-103 | 0-0.5 | 23 | 9 | 57 | 32 | 17 | 23 | 200 | 170 | 170 | 180 | 110 | 330 | 360 | 260 | 97 | 87 | 63 | 55 | 33 | 29 | 26 | 55 | 68 | 66 | 100 | 140 | 130 | 88 | 210 | 160 | ND | ND | ND | *1681* | *2171* | *3348* |
| CG-103 | 0.83-1.92 | 60 | 21 | 140 | 83 | 26 | 32 | 640 | 430 | 440 | 450 | 63 | 920 | 1100 | 660 | 230 | 210 | 180 | 28 | 58 | 68 | 72 | 96 | 57 | 200 | 220 | 270 | 270 | 200 | 470 | 350 | ND | ND | ND | *4405* | *5659* | *8044* |
| CG-104 | 0-0.5 | 34 | 12 | 85 | 42 | 19 | 28 | 350 | 230 | 240 | 240 | 65 | 500 | 560 | 340 | 160 | 120 | 100 | 65 | 35 | 65 | 65 | 37 | 39 | 47 | 200 | 130 | 87 | 110 | 230 | 170 | ND | ND | ND | *2405* | *3106* | *4405* |
| CG-104 | 0.5-1 | 7 | 5 | 21 | 8 | 55 | 55 | 71 | 61 | 65 | 65 | 55 | 120 | 130 | 88 | 35 | 29 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 41 | 37 | 29 | 330 | 70 | 48 | ND | ND | ND | *718* | *870* | *1865* |
| CG-105 | 0-0.5 | 28 | 16 | 73 | 35 | 17 | 23 | 260 | 220 | 220 | 230 | 70 | 430 | 540 | 340 | 130 | 110 | 100 | 70 | 32 | 30 | 70 | 34 | 47 | 59 | 140 | 120 | 92 | 87 | 210 | 160 | ND | ND | ND | *2162* | *2825* | *3993* |
| CG-105 | 0.5-1.17 | 6 | 5 | 17 | 7 | 50 | 50 | 56 | 52 | 53 | 65 | 50 | 110 | 130 | 93 | 35 | 25 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 30 | 38 | 34 | 22 | 52 | 41 | ND | ND | ND | *651* | *804* | *1421* |
| CG-106 | 0-0.5 | 50 | 50 | 7 | 50 | 50 | 50 | 27 | 28 | 22 | 21 | 50 | 45 | 62 | 45 | 50 | 11 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | ND | *509* | *615* | *1308* |
| CG-106 | 0.5-1.83 | 15 | 6 | 45 | 21 | 8 | 11 | 170 | 100 | 98 | 100 | 49 | 230 | 210 | 130 | 48 | 58 | 50 | 49 | 49 | 49 | 49 | 49 | 29 | 49 | 71 | 56 | 32 | 44 | 110 | 80 | ND | ND | ND | *1063* | *1341* | *2065* |
| CG-107 | 0-0.5 | 13 | 6 | 47 | 17 | 7 | 50 | 140 | 110 | 110 | 110 | 50 | 200 | 260 | 160 | 80 | 67 | 60 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 62 | 44 | 37 | 25 | 89 | 66 | ND | ND | ND | *1120* | *1480* | *2160* |
| CG-107 | 0.5-1.67 | 68 | 27 | 200 | 84 | 36 | 38 | 750 | 720 | 670 | 650 | 98 | 1200 | 1600 | 950 | 340 | 300 | 260 | 42 | 62 | 47 | 26 | 53 | 64 | 76 | 390 | 280 | 150 | 96 | 560 | 440 | ND | ND | ND | *6141* | *7955* | *10277* |
| CG-108 | 0-0.5 | 110 | 56 | 320 | 130 | 38 | 56 | 1300 | 1200 | 1200 | 1200 | 130 | 2200 | 2500 | 1600 | 720 | 530 | 490 | 110 | 90 | 65 | 110 | 86 | 78 | 140 | 570 | 460 | 290 | 130 | 1100 | 810 | ND | ND | ND | *10440* | *13742* | *17819* |
| CG-108 | 3-4 | 86 | 32 | 240 | 89 | 23 | 29 | 950 | 740 | 720 | 710 | 98 | 1400 | 1800 | 940 | 390 | 310 | 300 | 100 | 49 | 100 | 100 | 64 | 58 | 58 | 470 | 290 | 220 | 160 | 670 | 470 | ND | ND | ND | *6917* | *8834* | *11666* |
| CG-109 | 0-0.5 | 44 | 25 | 120 | 56 | 27 | 33 | 470 | 390 | 390 | 400 | 75 | 760 | 880 | 540 | 230 | 170 | 160 | 32 | 47 | 44 | 75 | 34 | 41 | 42 | 260 | 170 | 92 | 160 | 370 | 260 | ND | ND | ND | *3670* | *4743* | *6397* |
| CG-109 | 0.5-1.33 | 58 | 31 | 160 | 70 | 29 | 37 | 610 | 530 | 570 | 550 | 91 | 1000 | 1300 | 850 | 270 | 280 | 250 | 33 | 55 | 57 | 80 | 58 | 75 | 74 | 370 | 200 | 150 | 92 | 460 | 370 | ND | ND | ND | *5036* | *6657* | *8760* |
| CG-110 | 0-0.5 | 17 | 9 | 37 | 18 | 11 | 15 | 160 | 140 | 160 | 150 | 55 | 260 | 360 | 230 | 86 | 84 | 68 | 55 | 36 | 75 | 51 | 44 | 52 | 47 | 110 | 91 | 63 | 110 | 120 | 98 | ND | ND | ND | *1392* | *1849* | *2812* |
| CG-110 | 3-4 | 10 | 36 | 35 | 7 | 8 | 11 | 88 | 150 | 200 | 190 | 34 | 230 | 330 | 290 | 120 | 120 | 110 | 50 | 50 | 41 | 30 | 40 | 100 | 130 | 170 | 220 | 110 | 40 | 150 | 110 | ND | ND | ND | *1329* | *1961* | *3210* |
| CG-111 | 0-0.5 | 145 | 145 | 145 | 145 | 145 | 145 | 59 | 63 | 62 | 63 | 145 | 100 | 140 | 130 | 140 | 27 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 53 | 145 | 145 | ND | ND | ND | *1502* | *1799* | *3737* |

| Sample Location | Sample Depth (ft) | PAHs (µg/kg dry weight)[1,2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo (a) pyrene | Chrysene | Dibenz (a,h) anthracene | Fluoranthene | Pyrene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Benzo(ghi)perylene | Indeno(1,2,3-cd)pyrene | C1- Napthalene | C2- Napthalene | C3- Napthalene | C4- Napthalene | C1- Fluorenes | C2- Fluorenes | C3- Fluorenes | C1- Phenanthrene/anthracene | C2- Phenanthrene/anthracene | C3- Phenanthrene/anthracene | C4- Phenanthrene/anthracene | C1- Pyrene/ fluoranthenes | C1- Benzanthracene /chrysenes | C2- Benzanthracene /chrysenes | C3- Benzanthracene /chrysenes | C4- Benzanthracene /chrysenes | *Priority PAH 13 (MPCA, 2003)*[3] | *EPA PAH 16*[3] | *Total PAH 34*[3] |
| CG-111 | 0.8-1.83 | 95 | 95 | 95 | 95 | 95 | 95 | 12 | 19 | 95 | 95 | 95 | 19 | 26 | 23 | 25 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 145 | 95 | 95 | ND | ND | ND | *931* | *1074* | *2454* |
| CG-112 | 0-0.5 | 21 | 59 | 73 | 28 | 12 | 19 | 190 | 1200 | 1300 | 1100 | 130 | 1000 | 1700 | 1600 | 510 | 540 | 440 | 60 | 60 | 28 | 42 | 46 | 85 | 140 | 320 | 590 | 390 | 95 | 1000 | 930 | ND | ND | ND | *6832* | *9910* | *13708* |
| CG-112 | 1-2 | 23 | 14 | 60 | 28 | 14 | 20 | 230 | 220 | 230 | 230 | 38 | 390 | 530 | 330 | 150 | 120 | 110 | 55 | 30 | 40 | 39 | 48 | 62 | 68 | 130 | 120 | 95 | 170 | 210 | 180 | ND | ND | ND | *2027* | *2723* | *3984* |
| CG-113 | 0-0.5 | 22 | 11 | 37 | 18 | 8 | 14 | 150 | 150 | 160 | 150 | 60 | 250 | 370 | 210 | 100 | 84 | 69 | 60 | 60 | 60 | 60 | 60 | 27 | 31 | 92 | 72 | 74 | 65 | 120 | 100 | ND | ND | ND | *1400* | *1855* | *2744* |
| CG-113 | 0.5-1.5 | 11 | 6 | 20 | 10 | 50 | 50 | 79 | 69 | 73 | 71 | 50 | 120 | 180 | 100 | 39 | 37 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 43 | 32 | 33 | 49 | 57 | 50 | ND | ND | ND | *789* | *965* | *1629* |
| CG-114 | 0-0.5 | 29 | 46 | 100 | 37 | 31 | 44 | 290 | 540 | 560 | 500 | 81 | 810 | 1100 | 750 | 320 | 270 | 250 | 90 | 64 | 75 | 90 | 67 | 83 | 77 | 250 | 250 | 180 | 50 | 450 | 380 | ND | ND | ND | *4168* | *5727* | *7864* |
| CG-114 | 0.5-1.92 | 27 | 12 | 91 | 28 | 130 | 130 | 310 | 240 | 230 | 220 | 130 | 430 | 630 | 250 | 120 | 92 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 170 | 100 | 80 | 120 | 200 | 120 | ND | ND | ND | *2608* | *3070* | *4900* |
| **General Mills** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-137 | 0-0.5 | 41 | 17 | 240 | 80 | 20 | 29 | 600 | 320 | 290 | 390 | 41 | 760 | 730 | 440 | 200 | 150 | 140 | 25 | 35 | 25 | ND | 30 | 38 | ND | 230 | 150 | 80 | 37 | 330 | 220 | 72 | ND | ND | *3558* | *4468* | *5760* |
| RP-I-137 | 0.5-1.5 | 9 | 50 | 25 | 12 | 50 | 50 | 95 | 54 | 44 | 49 | 50 | 120 | 110 | 58 | 28 | 23 | 50 | 50 | 50 | ND | ND | 50 | 50 | ND | 40 | 22 | 50 | 50 | 51 | 34 | 50 | ND | ND | *718* | *827* | *1374* |
| RP-I-127 | 0-0.5 | 320 | 56 | 800 | 450 | 130 | 200 | 3100 | 1200 | 1100 | 1100 | 120 | 2600 | 2900 | 1300 | 540 | 430 | 400 | 160 | 160 | 87 | 100 | 100 | 97 | 73 | 1100 | 510 | 250 | 100 | 1100 | 550 | 160 | ND | ND | *14076* | *16616* | *21293* |
| RP-I-127 | 1-2 | 250 | 58 | 550 | 420 | 110 | 160 | 3100 | 1000 | 880 | 1000 | 275 | 2900 | 2500 | 1100 | 450 | 470 | 430 | 140 | 140 | 275 | 275 | 225 | 275 | 275 | 850 | 340 | 170 | 275 | 970 | 550 | 170 | ND | ND | *13203* | *15543* | *20583* |
| RP-M-59 | 0-0.5 | 9 | 5 | 39 | 18 | 6 | 50 | 160 | 91 | 93 | 94 | 50 | 190 | 230 | 120 | 56 | 38 | 50 | 50 | 50 | ND | ND | 50 | 50 | ND | 68 | 39 | 24 | 50 | 74 | 58 | 50 | ND | ND | *1035* | *1293* | *1862* |
| RP-M-59 | 1-2 | 23 | 8 | 72 | 32 | 10 | 13 | 260 | 160 | 140 | 160 | 50 | 300 | 380 | 210 | 89 | 62 | 57 | 50 | 50 | ND | ND | 50 | 50 | ND | 110 | 61 | 42 | 50 | 140 | 100 | 35 | ND | ND | *1608* | *2016* | *2764* |
| RP-O-26 | 0-0.5 | 15 | 7 | 39 | 24 | 8 | 60 | 170 | 110 | 110 | 120 | 60 | 240 | 280 | 160 | 64 | 53 | 52 | 60 | 60 | ND | ND | 60 | 60 | ND | 80 | 49 | 43 | 33 | 100 | 78 | 28 | ND | ND | *1243* | *1564* | *2223* |
| RP-O-26 | 2-3 | 22 | 10 | 51 | 34 | 11 | 14 | 260 | 130 | 100 | 140 | 55 | 310 | 360 | 200 | 70 | 63 | 58 | 55 | 55 | ND | ND | 55 | 55 | ND | 100 | 61 | 49 | 48 | 130 | 90 | 38 | ND | ND | *1497* | *1877* | *2624* |
| RP-O-27 | 0-0.5 | 52 | 10 | 120 | 65 | 17 | 17 | 490 | 190 | 170 | 180 | 55 | 390 | 510 | 210 | 83 | 69 | 63 | 23 | 28 | ND | ND | 33 | 55 | ND | 210 | 89 | 43 | 55 | 180 | 130 | 36 | ND | ND | *2266* | *2674* | *3573* |
| RP-O-27 | 1-2 | 26 | 27 | 99 | 71 | 14 | 18 | 680 | 280 | 270 | 320 | 55 | 720 | 760 | 380 | 170 | 120 | 99 | 55 | 26 | ND | ND | 33 | 40 | 31 | 270 | 120 | 70 | 44 | 280 | 190 | 58 | ND | ND | *3340* | *4095* | *5326* |
| RP-O-28 | 0-0.5 | 11 | 5 | 29 | 15 | 6 | 55 | 100 | 75 | 80 | 85 | 60 | 150 | 190 | 120 | 50 | 37 | 55 | 55 | 55 | ND | ND | 55 | 55 | ND | 50 | 35 | 31 | 55 | 64 | 50 | 55 | ND | ND | *861* | *1117* | *1683* |
| RP-O-28 | 0.5-1.5 | 8 | 7 | 23 | 10 | 50 | 50 | 90 | 85 | 85 | 93 | 55 | 180 | 230 | 130 | 61 | 46 | 41 | 50 | 50 | ND | ND | 50 | 50 | ND | 42 | 25 | 50 | 23 | 57 | 37 | 50 | ND | ND | *965* | *1193* | *1727* |
| **Hearding Island** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HI-100 | 0-0.5 | 7 | 60 | 27 | 10 | 60 | 60 | 88 | 76 | 80 | 81 | ND | 130 | 190 | 100 | 54 | 38 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 42 | 34 | 60 | 25 | 62 | 40 | ND | ND | ND | *869* | *1061* | *1804* |
| HI-100 | 3-4 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | ND | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | ND | ND | ND | *2040* | *2550* | *4930* |
| HI-6-M1 | 0-0.5 | 14 | 14 | 55 | 18 | 140 | 140 | 180 | 210 | 210 | 210 | ND | 360 | 530 | 300 | 120 | 96 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 130 | 100 | 77 | 74 | 200 | 150 | ND | ND | ND | *2081* | *2597* | *4448* |
| HI-6-M1 | 1.5-2.5 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | ND | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | ND | ND | ND | *3120* | *3900* | *7540* |
| HI-9-M1 | 0-0.5 | 28 | 35 | 97 | 49 | 56 | 75 | 330 | 400 | 440 | 430 | 78 | 650 | 1000 | 690 | 300 | 260 | 220 | 59 | 100 | 65 | 120 | 120 | 120 | 110 | 210 | 240 | 180 | 240 | 390 | 360 | ND | ND | ND | *3668* | *5082* | *7452* |
| HI-9-M1 | 0.5-2.25 | 47 | 74 | 190 | 110 | 170 | 140 | 560 | 630 | 700 | 680 | 110 | 1100 | 1700 | 1100 | 480 | 450 | 430 | 190 | 280 | 210 | 140 | 140 | 210 | 270 | 580 | 600 | 450 | 490 | 890 | 710 | ND | ND | ND | *6211* | *8501* | *13831* |
| HI-R-1 | 0-0.5 | 37 | 14 | 99 | 43 | 22 | 22 | 380 | 260 | 270 | 250 | ND | 530 | 660 | 350 | 150 | 110 | 100 | 85 | 40 | 85 | 85 | 85 | 85 | 43 | 180 | 140 | 99 | 170 | 250 | 180 | ND | ND | ND | *2587* | *3275* | *4824* |
| HI-R-1 | 2-3 | 150 | 19 | 250 | 160 | 78 | 96 | 1500 | 530 | 520 | 600 | ND | 1200 | 1700 | 760 | 230 | 210 | 200 | 100 | 130 | 110 | 44 | 100 | 110 | 91 | 740 | 400 | 220 | 120 | 590 | 390 | ND | ND | ND | *6803* | *8125* | *11348* |
| HI-R-2 | 0-0.5 | 50 | 50 | 50 | 50 | 50 | 50 | 16 | 20 | 18 | 17 | ND | 29 | 40 | 35 | 39 | 7 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | ND | *440* | *521* | *1221* |
| HI-R-2 | 0.5-1.33 | 50 | 50 | 50 | 50 | 50 | 50 | 10 | 14 | 9 | 9 | ND | 20 | 26 | 15 | 17 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | ND | ND | ND | *388* | *470* | *1170* |
| HI-R-3 | 0-0.5 | 11 | 7 | 28 | 13 | 7 | 60 | 130 | 100 | 110 | 110 | ND | 190 | 260 | 160 | 56 | 52 | 44 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 61 | 46 | 60 | 35 | 82 | 65 | ND | ND | ND | *1026* | *1331* | *2107* |
| HI-R-3 | 0.5-1 | 7 | 11 | 26 | 11 | 12 | 13 | 99 | 120 | 100 | 130 | ND | 180 | 260 | 140 | 68 | 53 | 46 | 60 | 60 | 60 | 36 | 41 | 100 | 200 | 140 | 320 | 370 | 210 | 210 | 200 | ND | ND | ND | *969* | *1264* | *3283* |
| **Murphy Oil** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-101 | 0-0.5 | 30 | 7 | 70 | 34 | 11 | 16 | 260 | 150 | 160 | 160 | 55 | 310 | 410 | 220 | 88 | 73 | 60 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 120 | 71 | 49 | 28 | 150 | 100 | ND | ND | ND | *1673* | *2103* | *3017* |
| RP-101 | 0.5-1.25 | 88 | 10 | 220 | 110 | 31 | 44 | 760 | 380 | 350 | 360 | 46 | 760 | 970 | 490 | 180 | 150 | 130 | 37 | 49 | 38 | 55 | 54 | 37 | 44 | 330 | 170 | 99 | 63 | 340 | 230 | ND | ND | ND | *4129* | *5048* | *6625* |
| RP-I-35 | 0-0.5 | 89 | 12 | 190 | 120 | 41 | 80 | 740 | 340 | 330 | 350 | 44 | 790 | 900 | 430 | 180 | 140 | 130 | 49 | 58 | 37 | 55 | 49 | 27 | 63 | 210 | 170 | 110 | 88 | 370 | 230 | ND | ND | ND | *4026* | *4865* | *6422* |
| RP-I-35 | 0.5-1.58 | 43 | 13 | 87 | 52 | 18 | 28 | 350 | 270 | 250 | 270 | 36 | 470 | 720 | 360 | 150 | 100 | 98 | 50 | 30 | 24 | 57 | 54 | 70 | 200 | 150 | 200 | 260 | 150 | 350 | 270 | ND | ND | ND | *2607* | *3297* | *5180* |
| RP-I-39 | 0-0.5 | 62 | 14 | 160 | 100 | 36 | 53 | 500 | 270 | 250 | 270 | 37 | 530 | 640 | 340 | 160 | 110 | 98 | 40 | 47 | 36 | 23 | 42 | 46 | 64 | 240 | 170 | 120 | 93 | 310 | 220 | ND | ND | ND | *2922* | *3594* | *5081* |
| RP-I-39 | 0.5-2.08 | 1500 | 500 | 2200 | 1400 | 190 | 330 | 7400 | 3100 | 2700 | 3100 | 360 | 6600 | 7500 | 4000 | 1400 | 1100 | 980 | 500 | 250 | 500 | 500 | 480 | 500 | 240 | 2200 | 1000 | 440 | 500 | 3000 | 1400 | ND | ND | ND | *36880* | *44170* | *55870* |
| RP-I-41 | 0-0.5 | 440 | 550 | 1300 | 800 | 180 | 500 | 5600 | 2100 | 1700 | 2000 | 550 | 4700 | 5300 | 2500 | 930 | 620 | 590 | 550 | 550 | 550 | 550 | 550 | 550 | 550 | 1500 | 510 | 550 | 370 | 1600 | 770 | ND | ND | ND | *25720* | *30180* | *39510* |
| RP-I-41 | 1.5-2.5 | 21 | 11 | 55 | 31 | 15 | 25 | 210 | 150 | 160 | 160 | 65 | 300 | 310 | 230 | 82 | 70 | 67 | 65 | 44 | 65 | 65 | 65 | 27 | 65 | 90 | 81 | 65 | 62 | 170 | 120 | ND | ND | ND | *1513* | *1947* | *2946* |
| RP-M-19A | 0-0.5 | 16 | 5 | 36 | 23 | 6 | 50 | 140 | 77 | 70 | 75 | 50 | 170 | 240 | 96 | 42 | 33 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 60 | 39 | 29 | 50 | 66 | 34 | ND | ND | ND | *957* | *1171* | *1801* |
| RP-M-19A | 0.5-1.17 | 24 | 50 | 52 | 31 | 10 | 15 | 200 | 100 | 93 | 100 | 50 | 220 | 300 | 140 | 51 | 43 | 38 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 69 | 43 | 29 | 50 | 83 | 54 | ND | ND | ND | *1244* | *1506* | *2190* |
| RP-M-20 | 0-0.5 | 55 | 11 | 160 | 72 | 18 | 27 | 550 | 300 | 280 | 320 | 38 | 630 | 810 | 400 | 190 | 130 | 120 | 55 | 37 | 27 | 55 | 31 | 39 | 42 | 230 | 160 | 94 | 92 | 290 | 200 | ND | ND | ND | *3271* | *4093* | *5463* |
| RP-M-20 | 1-2 | 240 | 38 | 480 | 300 | 76 | 110 | 2100 | 890 | 710 | 920 | 94 | 1900 | 2200 | 1000 | 420 | 330 | 280 | 88 | 95 | 73 | 46 | 97 | 93 | 110 | 850 | 420 | 190 | 290 | 890 | 570 | ND | ND | ND | *10058* | *12012* | *15900* |
| **Rice's Point: 2008 Investigation [4]** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RP-I-109 | 0.2-0.5 | ND | ND | ND | ND | ND | ND | 950 | 840 | 880 | 980 | ND | 1400 | 1300 | 990 | 370 | 350 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *6350* | *8060* | *8060* |
| RP-I-2 | 0.75-1.1 | ND | ND | ND | ND | ND | ND | 165 | ND | ND | ND | ND | 165 | 165 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *495* | *495* | *495* |
| RP-I-88 | 1.5-1.83 | ND | ND | ND | ND | ND | ND | 330 | ND | ND | ND | ND | 540 | 470 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *1340* | *1340* | *1340* |
| RP-M-19 | 0.6-0.9 | ND | ND | ND | ND | ND | ND | 165 | ND | ND | ND | ND | 360 | 390 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *915* | *915* | *915* |
| **Slip 2** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S2-12 | 0-0.5 | 720 | 250 | 1600 | 890 | 350 | 360 | 7100 | 4100 | 4900 | 4800 | 540 | 10000 | 10000 | 7300 | 2700 | 2100 | 1900 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *45610* | *59260* | *59610* |
| S2-12 | 1-2 | 410 | 100 | 850 | 470 | 140 | 190 | 4200 | 2100 | 2100 | 2200 | 310 | 5100 | 4600 | 2400 | 890 | 1100 | 960 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *22770* | *27980* | *28120* |

| Sample Location | Sample Depth (ft) | PAHs (µg/kg dry weight)[1,2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methylnaphthalene | Naphthalene | Phenanthrene | Benz(a)anthracene | Benzo (a) pyrene | Chrysene | Dibenz (a,h) anthracene | Fluoranthene | Pyrene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Benzo(ghi)perylene | Indeno(1,2,3-cd)pyrene | C1- Napthalene | C2- Napthalene | C3- Napthalene | C4- Napthalene | C1- Fluorenes | C2- Fluorenes | C3- Fluorenes | C1- Phenanthrene/anthracene | C2- Phenanthrene/anthracene | C3- Phenanthrene/anthracene | C4- Phenanthrene/anthracene | C1- Pyrene/ fluoranthenes | C1- Benzanthracene /chrysenes | C2- Benzanthracene /chrysenes | C3- Benzanthracene /chrysenes | C4- Benzanthracene /chrysenes | *Priority PAH 13 (MPCA, 2003)*[3] | *EPA PAH 16*[3] | *Total PAH 34*[3] |
| S2-15 | 0-0.5 | 170 | 75 | 460 | 220 | 75 | 75 | 2000 | 1500 | 1900 | 1900 | 240 | 4100 | 3500 | 2900 | 1100 | 960 | 800 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *16215* | *21900* | *21975* |
| S2-15 | 0.5-1.13 | 130 | 22 | 290 | 160 | 26 | 33 | 1100 | 560 | 600 | 630 | 72 | 1500 | 1200 | 890 | 250 | 260 | 260 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *6323* | *7957* | *7983* |
| S2-5 | 0-0.5 | 110 | 51 | 310 | 150 | 55 | 75 | 1300 | 880 | 1000 | 1000 | 295 | 2100 | 1900 | 1800 | 550 | 490 | 420 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *9226* | *12431* | *12486* |
| S2-5 | 0.5-1.42 | 300 | 160 | 780 | 350 | 120 | 180 | 3300 | 2300 | 2800 | 2800 | 330 | 5700 | 5200 | 4600 | 1700 | 1300 | 1300 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *24320* | *33100* | *33220* |
| S2-7 | 0-0.5 | 650 | 160 | 1500 | 740 | 200 | 300 | 5400 | 3100 | 3400 | 3500 | 470 | 7100 | 6200 | 4900 | 1500 | 1600 | 1500 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *32720* | *42020* | *42220* |
| S2-7 | 0.5-1 | 810 | 210 | 2000 | 920 | 250 | 370 | 6900 | 4100 | 4600 | 4500 | 630 | 10000 | 8200 | 7100 | 1900 | 2000 | 1800 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *43490* | *56040* | *56290* |
| **Slip 3** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S3-10 | 0-0.5 | 430 | 24 | 690 | 470 | 110 | 220 | 3200 | 1100 | 1100 | 1100 | 130 | 2900 | 2600 | 1300 | 530 | 530 | 520 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *14074* | *16844* | *16954* |
| S3-10 | 1.5-2.5 | 120 | 69 | 270 | 150 | 75 | 110 | 1100 | 690 | 670 | 790 | 225 | 1700 | 1400 | 1000 | 360 | 350 | 330 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *7369* | *9334* | *9409* |
| S3-14 | 0-0.5 | 100 | 73 | 290 | 150 | 97 | 130 | 1000 | 730 | 850 | 770 | 455 | 1700 | 1500 | 1300 | 350 | 400 | 370 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *7845* | *10168* | *10265* |
| S3-14 | 1.08-2.08 | 760 | 140 | 1700 | 1100 | 470 | 550 | 5900 | 3000 | 2700 | 3100 | 380 | 6800 | 5500 | 3600 | 1600 | 1200 | 1200 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *32100* | *39230* | *39700* |
| S3-6 | 0-0.5 | 850 | 82 | 1600 | 1300 | 940 | 2000 | 6800 | 2300 | 1900 | 2400 | 280 | 5500 | 4400 | 2300 | 950 | 890 | 930 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *30352* | *34482* | *35422* |
| S3-6 | 0.75-1.75 | 46 | 10 | 130 | 55 | 14 | 28 | 410 | 270 | 250 | 215 | 45 | 540 | 540 | 300 | 110 | 160 | 150 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2553* | *3259* | *3273* |
| S3-8 | 0-0.5 | 20 | 92 | 100 | 54 | 10 | 19 | 530 | 330 | 340 | 390 | 48 | 890 | 650 | 460 | 170 | 160 | 170 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *3473* | *4423* | *4433* |
| S3-8 | 0.5-1.38 | 130 | 10 | 250 | 140 | 19 | 43 | 860 | 360 | 350 | 350 | 43 | 930 | 760 | 400 | 160 | 170 | 160 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *4245* | *5116* | *5135* |
| **Superior Bay** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SB-1 | 0-0.5 | 4 | 10 | 13 | 5 | 8 | 10 | 32 | 32 | 53 | 100 | 16 | 71 | 59 | 69 | 22 | 48 | 42 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *413* | *586* | *594* |
| SB-1 | 2.08-3.13 | 10 | 11 | 13 | 10 | 10 | 10 | 44 | 72 | 110 | 230 | 75 | 120 | 170 | 110 | 25 | 100 | 70 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *885* | *1180* | *1190* |
| SB-11 | 0-0.5 | 7 | 10 | 17 | 11 | 16 | 19 | 59 | 69 | 82 | 80 | 20 | 150 | 130 | 120 | 44 | 62 | 55 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *669* | *934* | *950* |
| SB-11 | 3-4 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 150 | 50 | 100 | 150 | 17 | 17 | 17 | 17 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *513* | *572* | *579* |
| SB-25 | 0-0.5 | 10 | 10 | 16 | 10 | 17 | 25 | 40 | 53 | 58 | 210 | 70 | 140 | 210 | 84 | 23 | 41 | 33 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *868* | *1031* | *1048* |
| SB-25 | 0.5-1.46 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 750 | 255 | 500 | 750 | 80 | 80 | 80 | 80 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2566* | *2851* | *2886* |
| SB-28 | 0-0.5 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 550 | 190 | 375 | 550 | 60 | 60 | 60 | 60 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *1890* | *2105* | *2130* |
| SB-28 | 1.08-2.13 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 800 | 270 | 550 | 800 | 85 | 85 | 85 | 85 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2744* | *3048* | *3084* |
| SB-30 | 0-0.5 | 4 | 4 | 8 | 4 | 6 | 7 | 16 | 29 | 36 | 100 | 33 | 65 | 100 | 50 | 11 | 26 | 25 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *412* | *517* | *523* |
| SB-30 | 0.5-1.46 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 11 | 8 | 95 | 32 | 65 | 95 | 11 | 11 | 5 | 11 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *336* | *368* | *372* |
| SB-40 | 0-0.5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 90 | 31 | 60 | 90 | 10 | 10 | 10 | 10 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *308* | *344* | *348* |
| SB-40 | 0.5-1.33 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 95 | 32 | 65 | 95 | 10 | 10 | 10 | 10 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *324* | *360* | *364* |
| SB-43 | 0-0.5 | 47 | 82 | 160 | 84 | 74 | 130 | 320 | 550 | 730 | 670 | 110 | 990 | 900 | 1100 | 360 | 360 | 340 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *4847* | *6933* | *7007* |
| SB-43 | 2.33-3.33 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 500 | 175 | 350 | 500 | 55 | 55 | 55 | 55 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *1737* | *1933* | *1957* |
| SB-45 | 0-0.5 | 42 | 75 | 140 | 81 | 76 | 140 | 300 | 480 | 640 | 610 | 115 | 920 | 830 | 880 | 340 | 330 | 290 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *4449* | *6213* | *6289* |
| SB-45 | 2.33-3.33 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 600 | 200 | 405 | 600 | 65 | 65 | 65 | 65 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2048* | *2281* | *2308* |
| SB-9 | 0-0.5 | 22 | 35 | 79 | 37 | 53 | 99 | 180 | 230 | 270 | 260 | 165 | 420 | 495 | 420 | 140 | 170 | 140 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2345* | *3162* | *3215* |
| SB-9 | 3-4 | 14 | 48 | 68 | 28 | 19 | 25 | 210 | 250 | 340 | 280 | 62 | 450 | 450 | 350 | 140 | 260 | 200 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | *2244* | *3175* | *3194* |

**Notes:**

1. The maximum detected concentration was used when duplicate samples are available
2. Non-detect data are handled using the following assumptions:
   - Zero for the PAHs that are all non-detects within a study area
   - 1/2 of the reporting limit for the PAHs that are detected in more than one sample within a study area
3. Sum of individual Aroclors are used in calculating total PAHs
4. 2008 Investigation: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil)

| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg)[1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| **Slip C** | | | | | | | |
| SC-1A | 0-0.5 | 11000 | 100000 | 1800000 | 218.8 | 55.0 | 19.1 |
| SC-1A | 2.5-3.5 | 7800 | 43000 | 740000 | 69.8 | 27.0 | 19.1 |
| SC-4 | 0-0.5 | 8800 | 94000 | 680000 | 231.8 | 66.0 | 19.1 |
| SC-4 | 2-3 | 7500 | 84000 | 1900000 | 115.7 | 35.0 | 4.8 |
| SC-5A | 0-0.5 | - | 85000 | 1800000 | 192.8 | 69.0 | 4.8 |
| SC-5A | 3-4 | - | 140000 | 2800000 | 145.7 | 40.0 | 9.5 |
| SC-9A | 0-0.5 | 7600 | 76000 | 950000 | 197.0 | 58.0 | 9.5 |
| SC-9A | 2-3 | 7500 | 81000 | 2100000 | 105.4 | 23.0 | 19.1 |
| SC-12A | 0-0.5 | - | 42000 | 1000000 | 61.6 | 20.0 | 19.1 |
| SC-12A | 1-2 | - | 4500 | 550000 | 121.5 | 48.0 | 9.5 |
| SC-16A | 0-0.5 | - | 46000 | 230000 | 115.2 | 39.0 | 9.5 |
| SC-16A | 2-3 | - | 28000 | 350000 | 62.9 | 21.0 | 9.5 |
| SC-26A | 0-0.5 | 1400 | 7600 | 36000 | 35.7 | 9.0 | 19.1 |
| SC-26A | 0.5-1.5 | 2900 | 12000 | 33000 | 33.2 | 7.0 | 9.5 |
| SC-31A | 0-0.5 | - | 13000 | 25000 | 40.3 | 10.0 | 9.5 |
| SC-31A | 1-2 | - | 5900 | 20000 | 39.9 | 7.0 | 19.1 |
| SC-33 | 0-0.5 | 580 | 7800 | 17000 | 33.6 | 10.0 | 9.5 |
| SC-33 | 1-2 | 1400 | 8200 | 16000 | 37.3 | 12.0 | 9.5 |
| SC-40 | 0-0.5 | 210 | 4600 | 85000 | 37.8 | 11.0 | 19.1 |
| SC-40 | 1-2 | 260 | 2100 | 9800 | 29.7 | 4.0 | 19.1 |
| **21st Avenue Bay** | | | | | | | |
| TF-44 | 0-0.5 | 30000 | 44000 | - | - | - | - |
| TF-44 | 2.5-3.5 | 24000 | 20000 | - | - | - | - |
| TF-34 | 0-0.5 | 45000 | 48000 | - | - | - | - |
| TF-34 | 3-4 | 55000 | 420000 | - | - | - | - |
| TF-39 | 0-0.5 | - | 510000 | - | - | - | - |
| TF-39 | 0.5-1.42 | - | 480000 | - | - | - | - |
| TF-8A | 0-0.5 | - | 21000 | 80000 | 53.1 | 38 | 19.1 |
| TF-8A | 1-2 | - | 45000 | 360000 | 91.6 | 77 | 19.1 |
| TF-50A | 0-0.5 | - | 16000 | 99000 | 43.4 | 63 | 9.5 |
| TF-50A | 0.5-1.25 | - | 14000 | 92000 | 43.5 | 63 | 19.1 |
| TF-15A | 0-0.5 | 3400 | 43000 | 93000 | 228.4 | 98 | 4.8 |
| TF-15A | 2-3 | 3600 | 32000 | 160000 | 95.6 | 94 | 19.1 |
| TF-1A | 0-0.92 | - | 1300 | 3900 | 23.7 | ND | 9.5 |
| TF-19A | 0-0.5 | 49000 | 47000 | 210000 | 107.2 | 86 | 19.1 |
| TF-19A | 2-3 | 8800 | 57000 | 1000000 | 108.5 | 96 | 4.8 |
| TF-22A | 0-0.5 | 2900 | 58000 | 48000 | 152.3 | 73 | 19.1 |
| TF-22A | 2-3 | 1100 | 50000 | 26000 | 130.2 | 93 | 4.8 |
| TF-102 | 0-0.5 | - | 10000 | 80000 | 29.6 | 29 | 19.1 |
| TF-102 | 1-2 | - | 11000 | 310000 | 37.9 | 38 | 19.1 |
| TF-100 | 0-0.5 | 2000 | 48000 | 120000 | 103.5 | 82 | 9.5 |
| TF-100 | 2-3 | 1300 | 20000 | 13000 | 31.7 | 35 | 9.5 |
| TF-101 | 0-0.5 | 21000 | 51000 | 220000 | 209.4 | 99 | 2.0 |

| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg)[1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| TF-101 | 3-4 | 9500 | 28000 | 290000 | 71.7 | 75 | 9.5 |
| TF-103 | 0-0.5 | - | 19000 | 51000 | 38.3 | 15 | 25.4 |
| TF-103 | 0.5-1 | - | 4300 | 42000 | 23.1 | 2 | 38.1 |
| TF-25 | 0-0.5 | 2750 | 42000 | 54000 | 180.2 | 95 | 4.8 |
| TF-25 | 3-4 | 9400 | 39000 | 44000 | 78.7 | 74 | 4.8 |
| TF-26A | 0-0.5 | 3650 | 46000 | 30000 | 248.3 | 95 | 4.8 |
| TF-26A | 2-3 | 2950 | 56000 | 92000 | 173.2 | 95 | 4.8 |
| TF-41 | 0-0.5 | 2000 | 28000 | 89000 | 206.0 | 98 | 2.0 |
| TF-41 | 3-4 | 6200 | 48000 | 140000 | 74.8 | 97 | 4.8 |
| TF-24 | 0-0.5 | 4000 | 48000 | 420000 | 206.5 | 96 | 4.8 |
| TF-24 | 3-4 | 5900 | 36000 | 180000 | 69.0 | 84 | 4.8 |
| TF-36 | 0-0.5 | - | 47000 | 220000 | 223.0 | 96 | 2.0 |
| TF-36 | 3-4 | - | 32000 | 190000 | 79.6 | 96 | 0.9 |
| TF-4 | 0-0.5 | 9200 | 34000 | 64000 | 63.7 | 83 | 19.1 |
| TF-4 | 2-3 | 6100 | 34000 | 120000 | 63.8 | 89 | 19.1 |
| TF-3A | 0-0.5 | - | 26000 | 190000 | 73.7 | 50 | 19.1 |
| TF-3A | 3-4 | - | 11000 | 5400 | 47.0 | 93 | 4.8 |
| TF-23A | 0-0.5 | 3900 | 46000 | 280000 | 83.4 | 66 | 19.1 |
| TF-23A | 3-4 | 1800 | 48000 | 28000 | 112.3 | 94 | 2.0 |
| TF-21A | 0-0.5 | 5000 | 60000 | 190000 | 127.6 | 46 | 19.1 |
| TF-21A | 2-3 | 2250 | 53000 | 1200000 | 133.1 | 72 | 9.5 |
| TF-12A | 0-0.5 | 4800 | 46000 | 220000 | 120.8 | 80 | 19.1 |
| TF-12A | 1-2 | 1300 | 41000 | 23000 | 101.2 | 94 | 9.5 |
| TF-10 | 0-0.5 | - | 29000 | 160000 | 66.0 | 81 | 19.1 |
| TF-10 | 1-2 | - | 5100 | 6100 | 32.9 | 45 | 9.5 |
| TF-2A | 0-0.5 | - | 8600 | 17000 | 33.5 | 4 | 19.1 |
| TF-2A | 0.5-1.67 | - | 1100 | 1250 | 27.7 | 1 | 9.5 |
| TF-32A | 0-0.5 | - | 36000 | 400000 | 192.7 | 92 | 4.8 |
| TF-32A | 0.5-1.5 | - | 7300 | 110000 | 33.0 | 25 | 9.5 |
| TF-103A | 0-0.5 | - | 12000 | 120000 | 33.6 | 25 | 9.5 |
| TF-103A | 0.5-1.08 | - | 23000 | 210000 | 39.6 | 46 | 9.5 |
| **AGP Slip** | | | | | | | |
| RP-I-70 | 0-0.5 | - | 75000 | 240000 | 83 | 28 | 19.1 |
| RP-I-70 | 0.5-1.83 | - | 110000 | 390000 | 84 | 30 | 9.5 |
| RP-I-74 | 0-0.5 | - | 12000 | 17000 | 32 | 8 | 19.1 |
| RP-I-74 | 0.5-1.83 | - | 21000 | 60000 | 38 | 13 | 19.1 |
| RP-I-77 | 0-0.5 | - | 3400 | 11000 | 27 | 9 | 19.1 |
| RP-I-77 | 0.5-1.67 | - | 7300 | 4600 | 30 | 11 | 9.5 |
| RP-M-33 | 0-0.5 | 4300 | 34000 | 52000 | 70 | 19 | 19.1 |
| RP-M-33 | 1-2 | 5100 | 49000 | 73000 | 86 | 44 | 9.5 |
| RP-M-35 | 0-0.5 | 17000 | 140000 | 460000 | 101 | 19 | 25.4 |
| RP-M-35 | 1-2 | 2900 | 21000 | 220000 | 30 | 5 | 19.1 |
| RP-O-16 | 0-0.5 | 7300 | 37000 | 75000 | 36 | 11 | 19.1 |
| RP-O-16 | 2-3 | 5500 | 54000 | 110000 | 67 | 27 | 9.5 |

| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg)[1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| **Azcon Slip** | | | | | | | |
| RP-I-53 | 0-0.5 | - | 16000 | 150000 | 29 | 4 | 19.1 |
| RP-I-53 | 0.5-1.67 | - | 34000 | 170000 | 45 | 7 | 19.1 |
| RP-M-26 | 0-0.5 | 3600 | 28000 | 99000 | 100 | 30 | 9.5 |
| RP-M-26 | 3-4 | 9800 | 90000 | 980000 | 72 | 58 | 9.5 |
| RP-I-58 | 0-0.5 | - | 14000 | 68000 | 46 | 14 | 19.1 |
| RP-I-58 | 1.5-2.5 | - | 19000 | 160000 | 72 | 28 | 9.5 |
| RP-M-28 | 0-0.5 | - | 10000 | 55000 | 42 | 13 | 9.5 |
| RP-M-28 | 0.5-1 | - | 26000 | 110000 | 98 | 37 | 19.1 |
| RP-I-46 | 0-0.5 | - | 17000 | 75000 | 78 | 39 | 9.5 |
| RP-I-46 | 0.5-1.67 | - | 2700 | 10000 | 26 | 2 | 25.4 |
| RP-I-52 | 0-0.5 | 12000 | 36000 | 350000 | 109 | 39 | 9.5 |
| RP-I-52 | 1-2 | 52000 | 90000 | 790000 | 88 | 47 | 19.1 |
| RP-100 | 0-0.5 | - | 39000 | 370000 | 52 | 21 | 19.1 |
| RP-100 | 1-2 | - | 74000 | 260000 | 44 | 27 | 19.1 |
| **Boat Landing** | | | | | | | |
| RP-I-2A | 0-0.5 | - | 95000 | 590000 | 138 | 26 | 25.4 |
| RP-I-2A | 2-3 | - | 41000 | 470000 | 127 | 90 | 9.5 |
| RP-I-6 | 0-0.5 | 3000 | 8800 | 40000 | 50 | 30 | 4.8 |
| RP-I-6 | 1-2 | 5700 | 48000 | 220000 | 79 | 73 | 9.5 |
| RP-I-9 | 0-0.5 | - | 1600 | 66000 | 26 | 7 | 9.5 |
| RP-I-9 | 0.5-1.4 | - | 2100 | 10000 | 22 | 12 | 19.1 |
| RP-M-2 | 0-0.5 | - | 61000 | 520000 | 163 | 80 | 9.5 |
| RP-M-2 | 0.5-1 | - | 63000 | 440000 | 119 | 80 | 9.5 |
| **Cargill Slip** | | | | | | | |
| RP-I-82 | 0-0.5 | - | 7100 | 21000 | 35 | 11 | 19.1 |
| RP-I-82 | 1-1.75 | - | 34000 | 17000 | 30 | 10 | 25.4 |
| RP-I-86 | 0-0.5 | 6500 | 74000 | 500000 | 80 | 32 | 19.1 |
| RP-I-86 | 1-2 | 8600 | 74000 | 380000 | 52 | 25 | 25.4 |
| RP-I-88A | 0-0.5 | 5100 | 42000 | 160000 | 72 | 40 | 19.1 |
| RP-I-88A | 0.67-1.83 | 5000 | 48000 | 220000 | 57 | 33 | 25.4 |
| RP-I-93 | 0-0.5 | 1300 | 1350 | 52000 | 51 | 16 | 9.5 |
| RP-I-93 | 1-2.75 | 2900 | 13000 | 42000 | 39 | 9 | 19.1 |
| RP-I-94 | 0-0.5 | 5000 | 23000 | 160000 | 67 | 11 | 76.2 |
| RP-I-94 | 1-2 | 2400 | 13000 | 41000 | 31 | 0 | 9.5 |
| RP-M-41 | 0-0.5 | - | 7000 | 46000 | 37 | 16 | 19.1 |
| RP-M-41 | 0.5-1.33 | - | 5500 | 5300 | 30 | 7 | 19.1 |
| RP-M-44 | 0-0.5 | - | 110000 | 110000 | 44 | 12 | 25.4 |
| RP-M-44 | 1-2 | - | 36000 | 220000 | 43 | 43 | 19.1 |
| **Cargill B Slip** | | | | | | | |
| RP-I-105 | 0-0.5 | 880 | 8100 | 12000 | 40 | 13 | 19.1 |
| RP-I-105 | 1-2 | 1100 | 14000 | 31000 | 38 | 10 | 19.1 |
| RP-I-107 | 0-0.5 | 1700 | 21000 | 57000 | 53 | 23 | 38.1 |
| RP-I-107 | 1.5-2.5 | 640 | 86000 | 490000 | 61 | 15 | 38.1 |

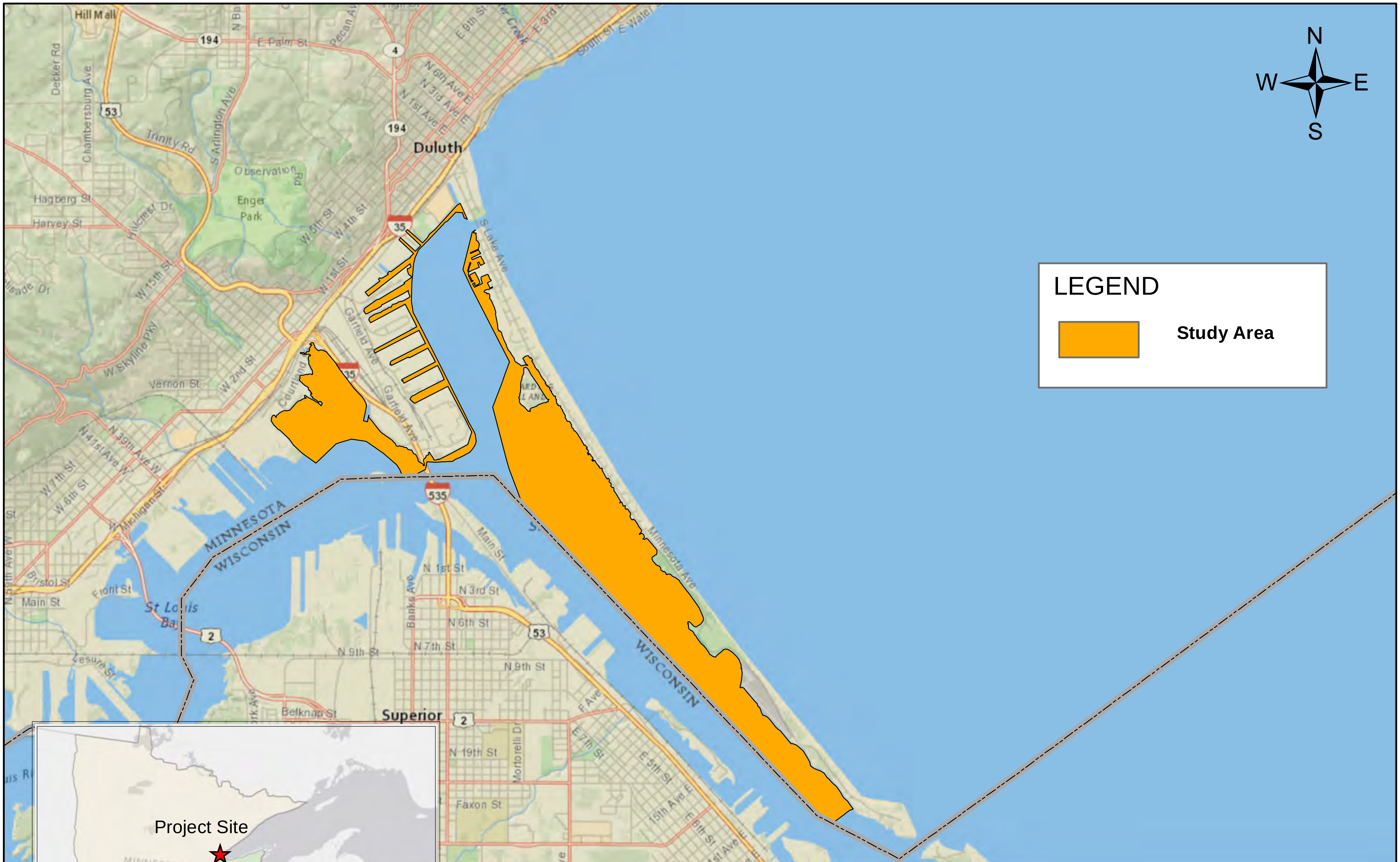
| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg) [1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| RP-I-109A | 0-0.5 | 10000 | 56000 | 130000 | 191 | 48 | 19.1 |
| RP-I-109A | 1.5-2.5 | 16000 | 100000 | 1200000 | 198 | 48 | 38.1 |
| RP-I-113 | 0-0.5 | - | 9500 | 24000 | 38 | 14 | 9.5 |
| RP-I-113 | 0.67-1.67 | - | 10000 | 16000 | 35 | 7 | 9.5 |
| RP-M-57 | 0-0.5 | - | 2900 | 18000 | 32 | 7 | 19.1 |
| RP-M-57 | 0.5-1.25 | - | 860 | 2600 | 24 | 2 | 19.1 |
| **Coast Guard** | | | | | | | |
| CG-100 | 0-0.5 | 5300 | 22000 | 90000 | 44 | 18 | 25.4 |
| CG-100 | 0.83-1.83 | 5000 | 35000 | 74000 | 69 | 15 | 9.5 |
| CG-101 | 0-0.5 | - | 34000 | 70000 | 70 | 47 | 4.8 |
| CG-101 | 0.5-1.5 | - | 53000 | 140000 | 105 | 36 | 19.1 |
| CG-102 | 0-0.5 | - | 66000 | 160000 | 81 | 42 | 19.1 |
| CG-102 | 0.5-1.42 | - | 10000 | 38000 | 33 | 19 | 19.1 |
| CG-103 | 0-0.5 | 1200 | 14000 | 60000 | 36 | 9 | 38.1 |
| CG-103 | 0.83-1.92 | 2300 | 14000 | 200000 | 46 | 13 | 19.1 |
| CG-104 | 0-0.5 | - | 18000 | 120000 | 63 | 20 | 19.1 |
| CG-104 | 0.5-1 | - | 7400 | 19000 | 37 | 7 | 38.1 |
| CG-105 | 0-0.5 | - | 29000 | 96000 | 76 | 17 | 19.1 |
| CG-105 | 0.5-1.17 | - | 4800 | 17000 | 33 | 3 | 19.1 |
| CG-106 | 0-0.5 | - | 4400 | 14000 | 31 | 2 | 9.5 |
| CG-106 | 0.5-1.83 | - | 9700 | 19000 | 35 | 6 | 9.5 |
| CG-107 | 0-0.5 | 960 | 8000 | 37000 | 30 | 8 | 19.1 |
| CG-107 | 0.5-1.67 | 6500 | 40000 | 42000 | 82 | 15 | 19.1 |
| CG-108 | 0-0.5 | 4100 | 40000 | 140000 | 216 | 97 | 4.8 |
| CG-108 | 3-4 | 4500 | 95000 | 62000 | 135 | 76 | 4.8 |
| CG-109 | 0-0.5 | - | 37000 | 100000 | 92 | 18 | 19.1 |
| CG-109 | 0.5-1.33 | - | 46000 | 180000 | 97 | 33 | 25.4 |
| CG-110 | 0-0.5 | 110 | 12000 | 46000 | 34 | 15 | 4.8 |
| CG-110 | 3-4 | 830 | 4800 | 61000 | 35 | 4 | 9.5 |
| CG-111 | 0-0.5 | - | 95000 | 27000 | 282 | 28 | 9.5 |
| CG-111 | 0.8-1.83 | - | 59000 | 8300 | 143 | 4 | 4.8 |
| CG-112 | 0-0.5 | 990 | 13000 | 31000 | 53 | 14 | 19.1 |
| CG-112 | 1-2 | 1100 | 20000 | 100000 | 38 | 18 | 4.8 |
| CG-113 | 0-0.5 | - | 15000 | 69000 | 49 | 18 | 9.5 |
| CG-113 | 0.5-1.5 | - | 11000 | 30000 | 33 | 8 | 19.1 |
| CG-114 | 0-0.5 | - | 60000 | 93000 | 120 | 21 | 19.1 |
| CG-114 | 0.5-1.92 | - | 130000 | 19000 | 246 | 51 | 9.5 |
| **General Mills** | | | | | | | |
| RP-I-137 | 0-0.5 | - | 10000 | 21000 | 50 | 22 | 19.1 |
| RP-I-137 | 0.5-1.5 | - | 2100 | 3700 | 23 | 3 | 76.2 |
| RP-I-127 | 0-0.5 | - | 9000 | 79000 | 43 | 8 | 9.5 |
| RP-I-127 | 1-2 | - | 10000 | 160000 | 34 | 4 | 19.1 |
| RP-M-59 | 0-0.5 | - | 7500 | 25000 | 35 | 10 | 9.5 |
| RP-M-59 | 1-2 | - | 9100 | 16000 | 32 | 9 | 9.5 |

| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg)[1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| RP-O-26 | 0-0.5 | - | 11000 | 36000 | 40 | 16 | 9.5 |
| RP-O-26 | 2-3 | - | 9400 | 38000 | 34 | 9 | 25.4 |
| RP-O-27 | 0-0.5 | 440 | 1700 | 6800 | 33 | 6 | 9.5 |
| RP-O-27 | 1-2 | 1900 | 1300 | 43000 | 33 | 12 | 9.5 |
| RP-O-28 | 0-0.5 | 1900 | 6400 | 26000 | 37 | 12 | 9.5 |
| RP-O-28 | 0.5-1.5 | 620 | 4700 | 12000 | 33 | 8 | 4.8 |
| **Hearding Island** | | | | | | | |
| HI-100 | 0-0.5 | 1500 | 17000 | 62000 | 55 | 11 | 19.1 |
| HI-100 | 3-4 | 3800 | 160000 | 19000 | 316 | - | - |
| HI-6-M1 | 0-0.5 | 5500 | 100000 | 180000 | 271 | 73 | 9.5 |
| HI-6-M1 | 1.5-2.5 | 3100 | 220000 | 48000 | 552 | - | - |
| HI-9-M1 | 0-0.5 | - | 62000 | 84000 | 196 | 72 | 9.5 |
| HI-9-M1 | 0.5-2.25 | - | 85000 | 190000 | 168 | 86 | 4.8 |
| HI-R-1 | 0-0.5 | 6600 | 60000 | 85000 | 111 | 28 | 9.5 |
| HI-R-1 | 2-3 | 3200 | 67000 | 100000 | 108 | 24 | 19.1 |
| HI-R-2 | 0-0.5 | - | 3900 | 35000 | 31 | 2 | 9.5 |
| HI-R-2 | 0.5-1.33 | - | 3200 | 1250 | 24 | 2 | 9.5 |
| HI-R-3 | 0-0.5 | - | 16000 | 17000 | 51 | 10 | 9.5 |
| HI-R-3 | 0.5-1 | - | 27000 | 31000 | 43 | 12 | 9.5 |
| **Murphy Oil** | | | | | | | |
| RP-101 | 0-0.5 | - | 9700 | 74000 | 38 | 14 | 4.8 |
| RP-101 | 0.5-1.25 | - | 11000 | 51000 | 40 | 17 | 9.5 |
| RP-I-35 | 0-0.5 | - | 11000 | 83000 | 39 | 14 | 9.5 |
| RP-I-35 | 0.5-1.58 | - | 12000 | 120000 | 36 | 10 | 9.5 |
| RP-I-39 | 0-0.5 | - | 12000 | 90000 | 37 | 16 | 9.5 |
| RP-I-39 | 0.5-2.08 | - | 16000 | 31000 | 36 | 11 | 19.1 |
| RP-I-41 | 0-0.5 | 2800 | 14000 | 59000 | 47 | 22 | 19.1 |
| RP-I-41 | 1.5-2.5 | 2900 | 15000 | 49000 | 55 | 27 | 9.5 |
| RP-M-19A | 0-0.5 | - | 3100 | 13000 | 32 | 5 | 9.5 |
| RP-M-19A | 0.5-1.17 | - | 2900 | 1250 | 24 | 5 | 19.1 |
| RP-M-20 | 0-0.5 | - | 9200 | 48000 | 39 | 16 | 9.5 |
| RP-M-20 | 1-2 | - | 11000 | 140000 | 32 | 11 | 19.1 |
| **Rice's Point: 2008 Investigation [4]** | | | | | | | |
| RP-I-109 | 0.2-0.5 | - | 4600 | 100000 | 18 | - | - |
| RP-I-2 | 0.75-1.1 | - | 9900 | 190000 | 28 | - | - |
| RP-I-88 | 1.5-1.83 | - | 7700 | 130000 | - | - | - |
| RP-M-19 | 0.6-0.9 | - | 11000 | 100000 | 30 | - | - |
| **Slip 2** | | | | | | | |
| S2-12 | 0-0.5 | 23000 | 34000 | 66000 | 49 | - | - |
| S2-12 | 1-2 | 41000 | 10000 | 150000 | 28 | - | - |
| S2-15 | 0-0.5 | 13000 | 14000 | 66000 | 33 | - | - |
| S2-15 | 0.5-1.13 | 8800 | 5100 | 61000 | 24 | - | - |
| S2-5 | 0-0.5 | - | 22000 | 20000 | 49 | - | - |
| S2-5 | 0.5-1.42 | - | 44000 | 60000 | 51 | - | - |

| Sample Location | Sample Depth (ft) | Black Carbon (mg/kg) | Total Organic Carbon, TOCs (mg/kg)[1,2] | DROs (µg/kg) [1,2] | % Water Content | % Less Than # 200 Sieve | Maximum Particle Size (mm) |
|---|---|---|---|---|---|---|---|
| S2-7 | 0-0.5 | - | 27000 | 24000 | 45 | - | - |
| S2-7 | 0.5-1 | - | 28000 | 56000 | 54 | - | - |
| **Slip 3** | | | | | | | |
| S3-10 | 0-0.5 | 6500 | 5200 | 33000 | 30 | - | - |
| S3-10 | 1.5-2.5 | 22000 | 33000 | 41000 | 45 | - | - |
| S3-14 | 0-0.5 | 29000 | 39000 | 100000 | 67 | - | - |
| S3-14 | 1.08-2.08 | 100000 | 55000 | 520000 | 40 | - | - |
| S3-6 | 0-0.5 | ND | 2500 | 32000 | 35 | - | - |
| S3-6 | 0.75-1.75 | 7300 | 2500 | 16000 | 30 | - | - |
| S3-8 | 0-0.5 | 5900 | 5900 | 56000 | 32 | - | - |
| S3-8 | 0.5-1.38 | ND | 7600 | 46000 | 31 | - | - |
| **Superior Bay** | | | | | | | |
| SB-1 | 0-0.5 | ND | 10000 | 21000 | 24 | - | - |
| SB-1 | 2.08-3.13 | 13000 | 16000 | 47000 | 35 | - | - |
| SB-11 | 0-0.5 | - | 42000 | 32000 | 49 | - | - |
| SB-11 | 3-4 | - | 120000 | 58000 | 51 | - | - |
| SB-25 | 0-0.5 | 30000 | 55000 | 86000 | 64 | - | - |
| SB-25 | 0.5-1.46 | 180000 | 330000 | 250000 | 90 | - | - |
| SB-28 | 0-0.5 | 130000 | 32000 | 270000 | 87 | - | - |
| SB-28 | 1.08-2.13 | 160000 | 330000 | 480000 | 91 | - | - |
| SB-30 | 0-0.5 | - | 2500 | 8400 | 23 | - | - |
| SB-30 | 0.5-1.46 | - | 2500 | 16000 | 22 | - | - |
| SB-40 | 0-0.5 | - | 2500 | 23000 | 19 | - | - |
| SB-40 | 0.5-1.33 | - | 2500 | 12000 | 21 | - | - |
| SB-43 | 0-0.5 | 20000 | 38000 | 20000 | 62 | - | - |
| SB-43 | 2.33-3.33 | 120000 | 200000 | 84000 | 86 | - | - |
| SB-45 | 0-0.5 | - | 32000 | 13000 | 57 | - | - |
| SB-45 | 2.33-3.33 | - | 320000 | 200000 | 88 | - | - |
| SB-9 | 0-0.5 | - | 37000 | 23000 | 70 | - | - |
| SB-9 | 3-4 | - | 43000 | 19000 | 52 | - | - |

**Notes:**
1. The maximum detected concentration was used when duplicate samples are available
2. Non-detect data are handled using the following assumptions:
   - Zero for the analytes that are all non-detects within a study area
   - 1/2 of the reporting limit for the Analytes that are detected in more than one sample within a study area
3. 2008 Investigation: RP-I-109 (Cargill B Slip); RP-I-2 (Boat Landing); RP-I-88 (Cargill Slip); RP-M-19 (Murphy Oil)

# Figures





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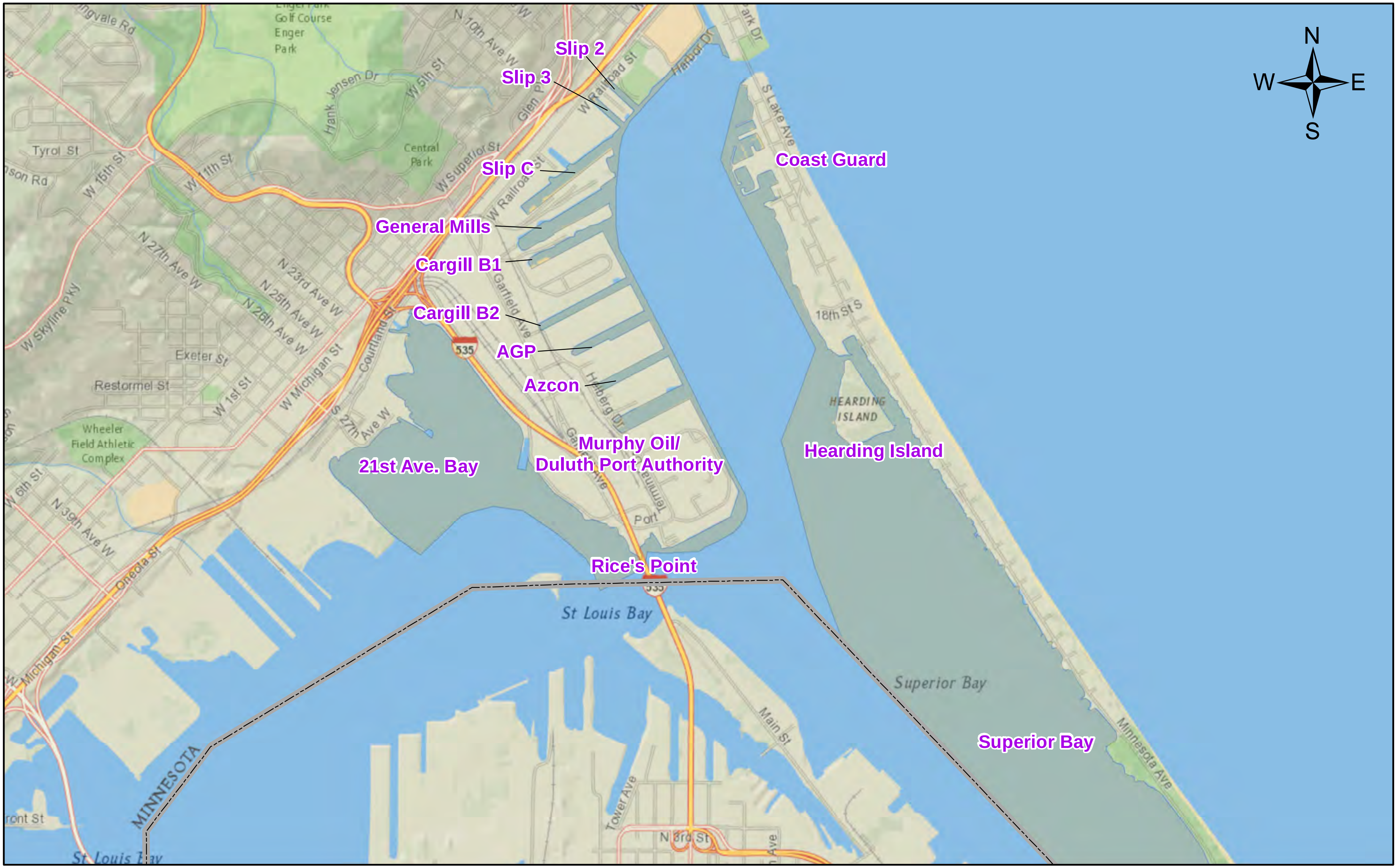
Detroit, Michigan 48226

Duluth Harbor Study Area
Sediment Investigation
USACE/MPCA
Duluth, Minnesota

| | |
|---|---|
| PROJECT NO: E08112 | DATE: 05/01/2012 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 1.1 |
| SCALE: AS SHOWN | |




LEGEND

Project Areas

0 3,000 6,000 12,000 Feet

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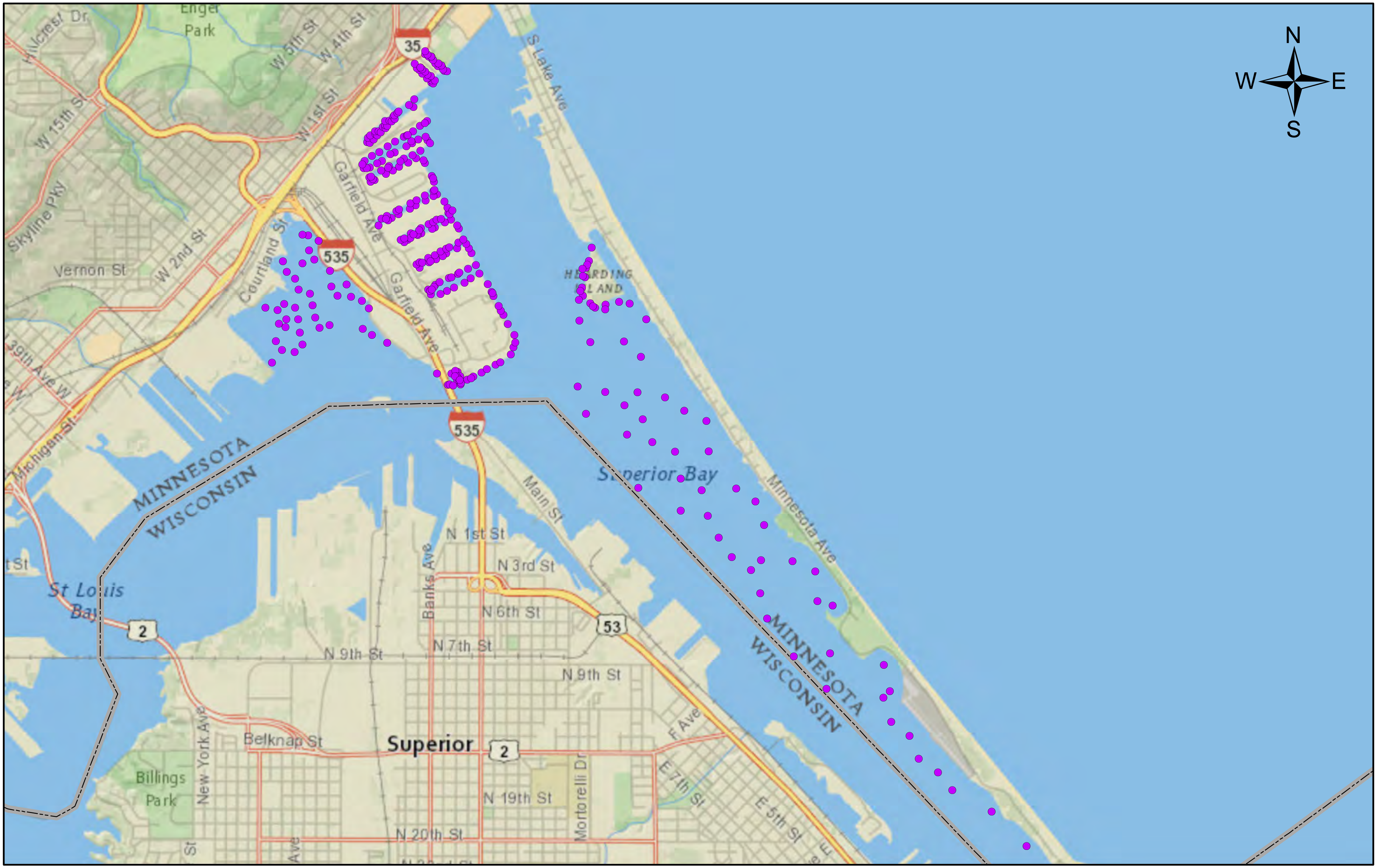
Detroit, Michigan 48226

Duluth Harbor
Sediment Investigation
Project Sampling Areas
USACE/MPCA
Duluth, Minnesota

| | |
|---|---|
| PROJECT NO: E08112 | DATE: 05/01/2012 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 1.2 |
| SCALE: AS SHOWN | |

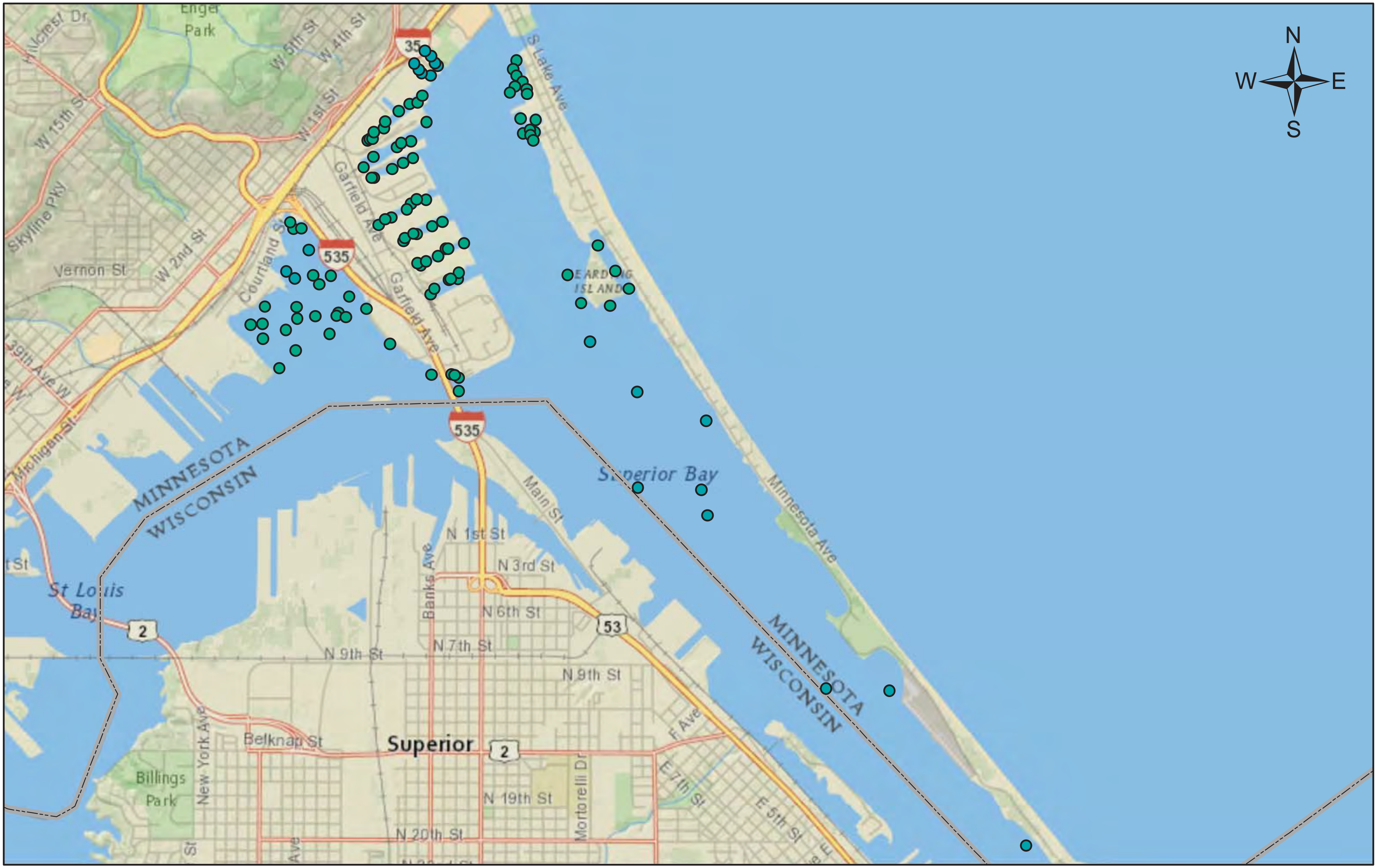



0 4,250 8,500 17,000 Feet

## LEGEND

● **LIF Locations**

| SOMAT Engineering, Inc.<br>660 Woodward Ave., Suite 2430,<br>Detroit, Michigan 48226 | Duluth Harbor<br>Sediment Investigation<br>LIF Sample Locations<br>USACE/MPCA<br>Duluth, Minnesota | PROJECT NO: E08112 | DATE: 05/01/2012 |
|---|---|---|---|
| | | DWN BY: CCR | REV. NO: 1 |
| | | CHK'D BY: | FIGURE: 2.1 |
| | | SCALE: AS SHOWN | |




LEGEND

● Vibracore Locations

0 4,250 8,500 17,000 Feet

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Detroit, Michigan 48226

Duluth Harbor
Sediment Investigation
Vibracore Sample Locations
USACE/MPCA
Duluth, Minnesota

| | |
|---|---|
| PROJECT NO: E08112 | DATE: 05/01/2012 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 2.2 |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | |
|---|---|
| 0 - 0.09 | Low Risk |
| 0.1 - 0.6 | Moderate Risk |
| > 0.6 | High Risk |

0 600 1,200 2,400 Feet

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**Mean PEC-Q**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.1 |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 125 250 500 Feet

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Detroit, Michigan 48226

**Mean PEC-Q**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.2 |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| (green) | 0 - 0.09 | Low Risk |
| (yellow) | 0.1 - 0.6 | Moderate Risk |
| (red) | > 0.6 | High Risk |

0 125 250 500 Feet

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Detroit, Michigan 48226

**Mean PEC-Q**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.3 |
| SCALE: AS SHOWN | |




**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Mean PEC-Q**

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
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Detroit, Michigan 48226

**Mean PEC-Q**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.4 |
| SCALE: AS SHOWN | |


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**LEGEND**

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Mean PEC-Q**

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 125 250 500 Feet

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Detroit, Michigan 48226

**Mean PEC-Q**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.5 |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| ● (green) | 0 - 0.09 | Low Risk |
| ● (yellow) | 0.1 - 0.6 | Moderate Risk |
| ● (red) | > 0.6 | High Risk |

0 125 250 500 Feet


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Detroit, Michigan 48226


**Mean PEC-Q**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.6 |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**Mean PEC-Q**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.7 |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**Mean PEC-Q**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.8 |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| ● | 0 - 0.09 | Low Risk |
| ● | 0.1 - 0.6 | Moderate Risk |
| ● | > 0.6 | High Risk |

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**MEAN PEC-Q**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.9 |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| 0 - 0.09 | Low Risk |
| 0.1 - 0.6 | Moderate Risk |
| > 0.6 | High Risk |

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Detroit, Michigan 48226

**Mean PEC-Q**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.10 |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

## Mean PEC-Q

| | |
|---|---|
| 0 - 0.09 | Low Risk |
| 0.1 - 0.6 | Moderate Risk |
| > 0.6 | High Risk |

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Detroit, Michigan 48226

**Mean PEC-Q**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.11 |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| (green) | 0 - 0.09 | Low Risk |
| (yellow) | 0.1 - 0.6 | Moderate Risk |
| (red) | > 0.6 | High Risk |

0 250 500 1,000 Feet

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**Mean PEC-Q**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.12 |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Mean PEC-Q**

| | | |
|---|---|---|
| (green) | 0 - 0.09 | Low Risk |
| (yellow) | 0.1 - 0.6 | Moderate Risk |
| (red) | > 0.6 | High Risk |

0 200 400 800 Feet

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**Mean PEC-Q**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.13 |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mean PEC-Q

| | | |
|---|---|---|
| (green) | 0 - 0.09 | Low Risk |
| (yellow) | 0.1 - 0.6 | Moderate Risk |
| (red) | > 0.6 | High Risk |

0 2,000 4,000 8,000 Feet

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**Mean PEC-Q**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.14 |
| SCALE: AS SHOWN | |

**Figure 15-a**
**Summary of Mean PEC-Q Analysis:**
**Total and Number of Samples in Each Risk Category -**
**Top of Sediment (0-0.5 feet)**

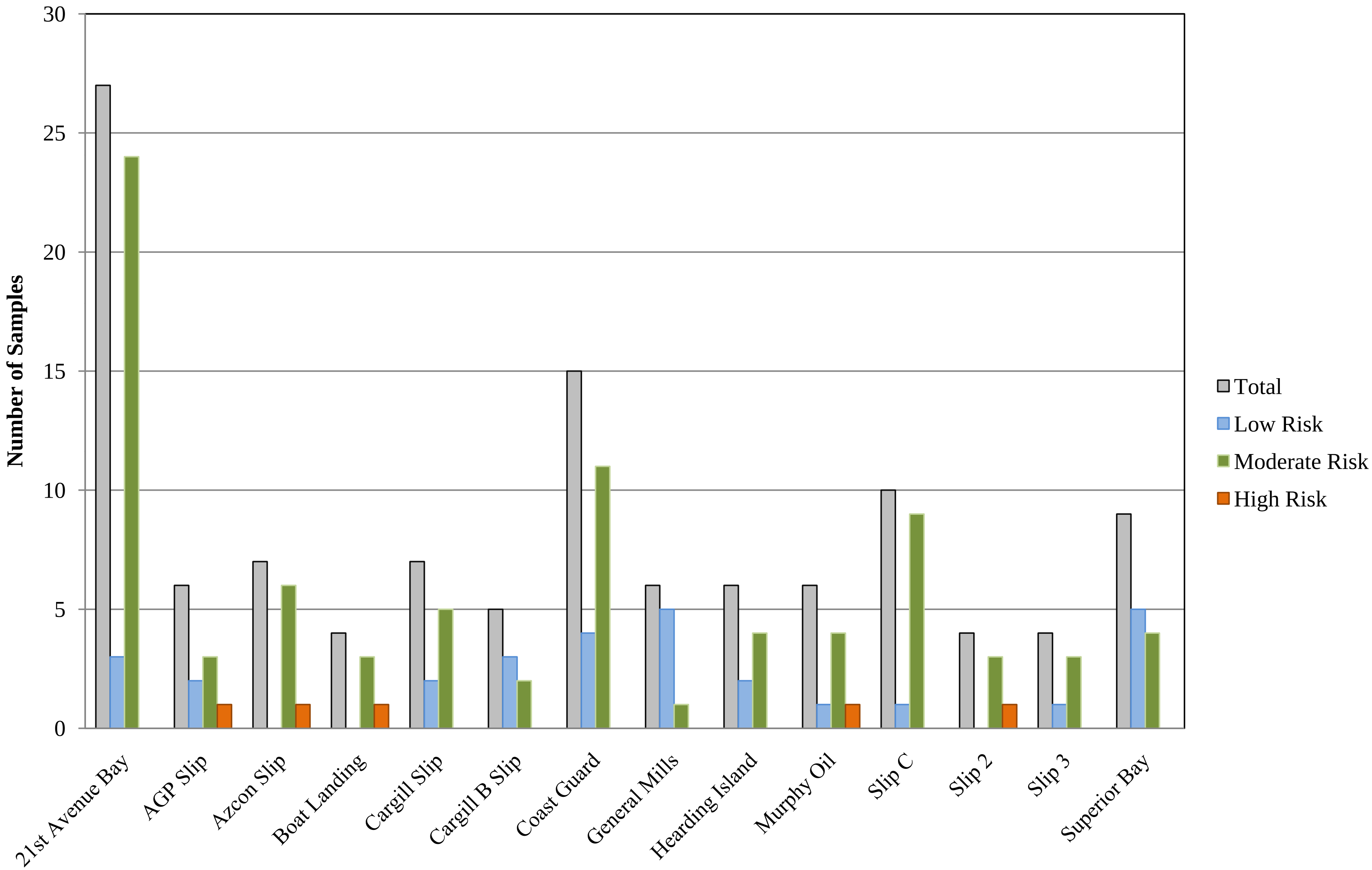


**Figure 15-b**
**Summary of Mean PEC-Q Analysis:**
**Total and Number of Samples in Each Risk Category -**
**Sample at Depth ( > 0.5 feet)**

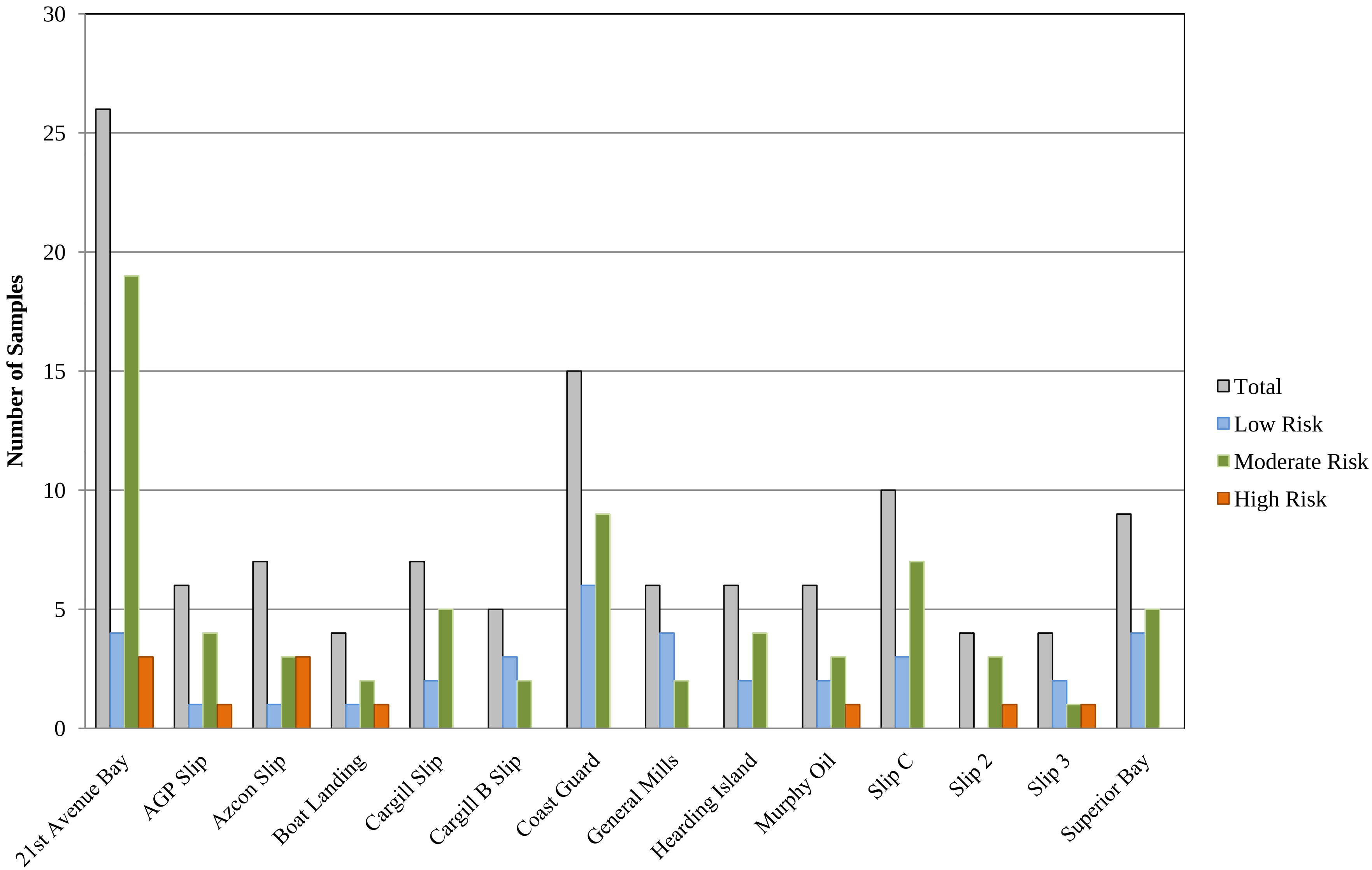


**Figure 8.16-a**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Arsenic**

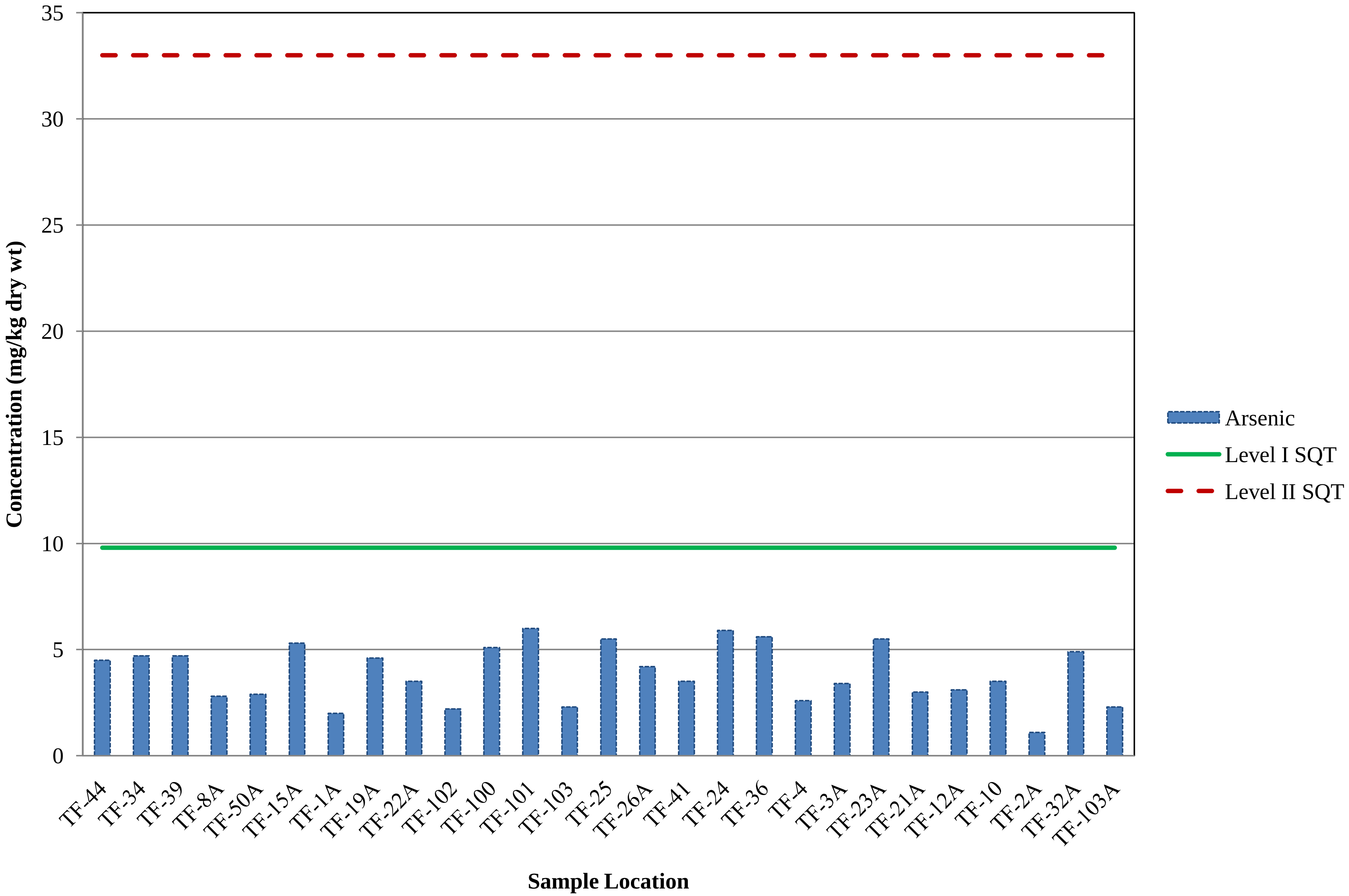


**Figure 8.16-b**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Cadmium**

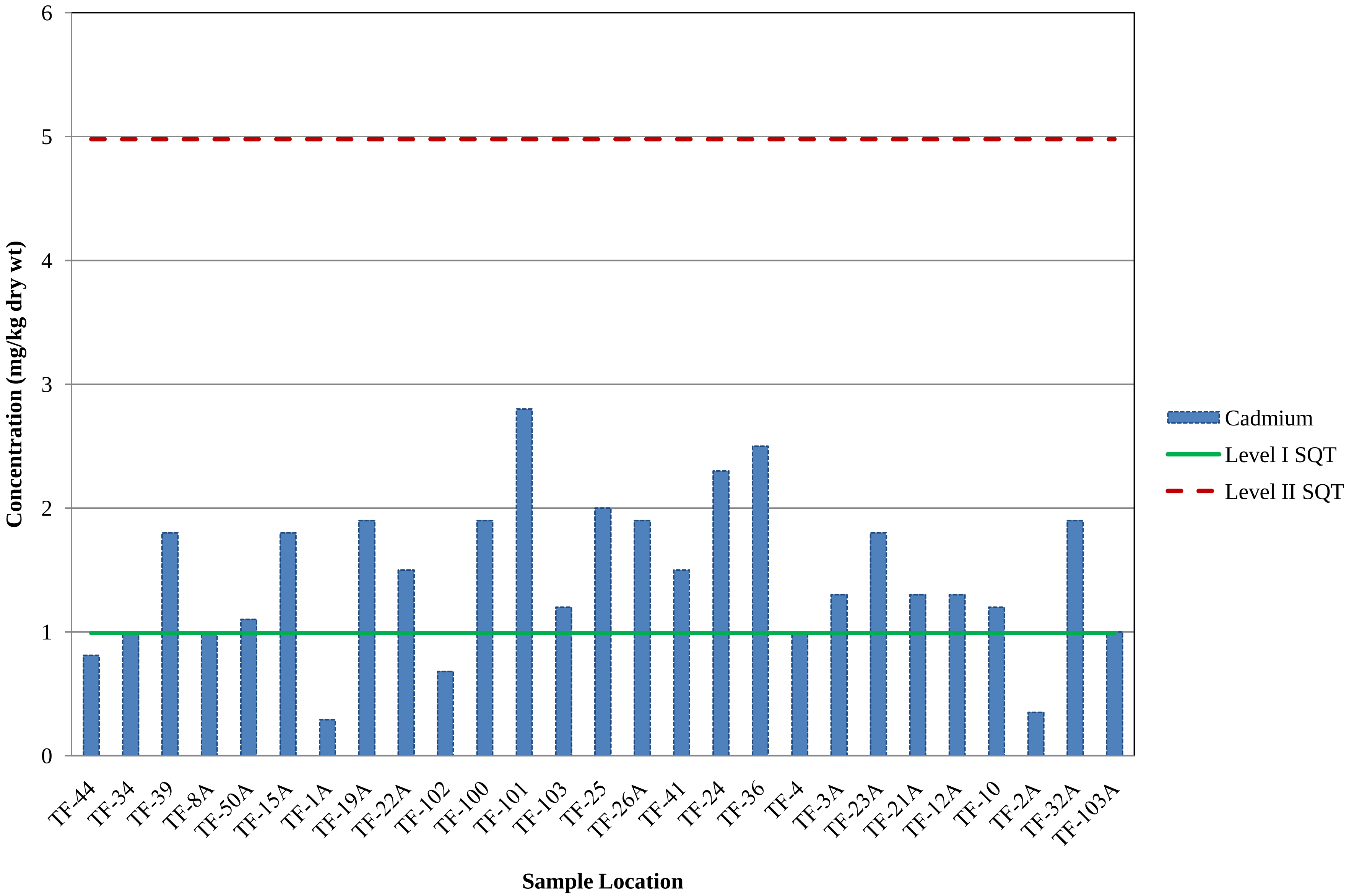


**Figure 8.16-c**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Chromium**

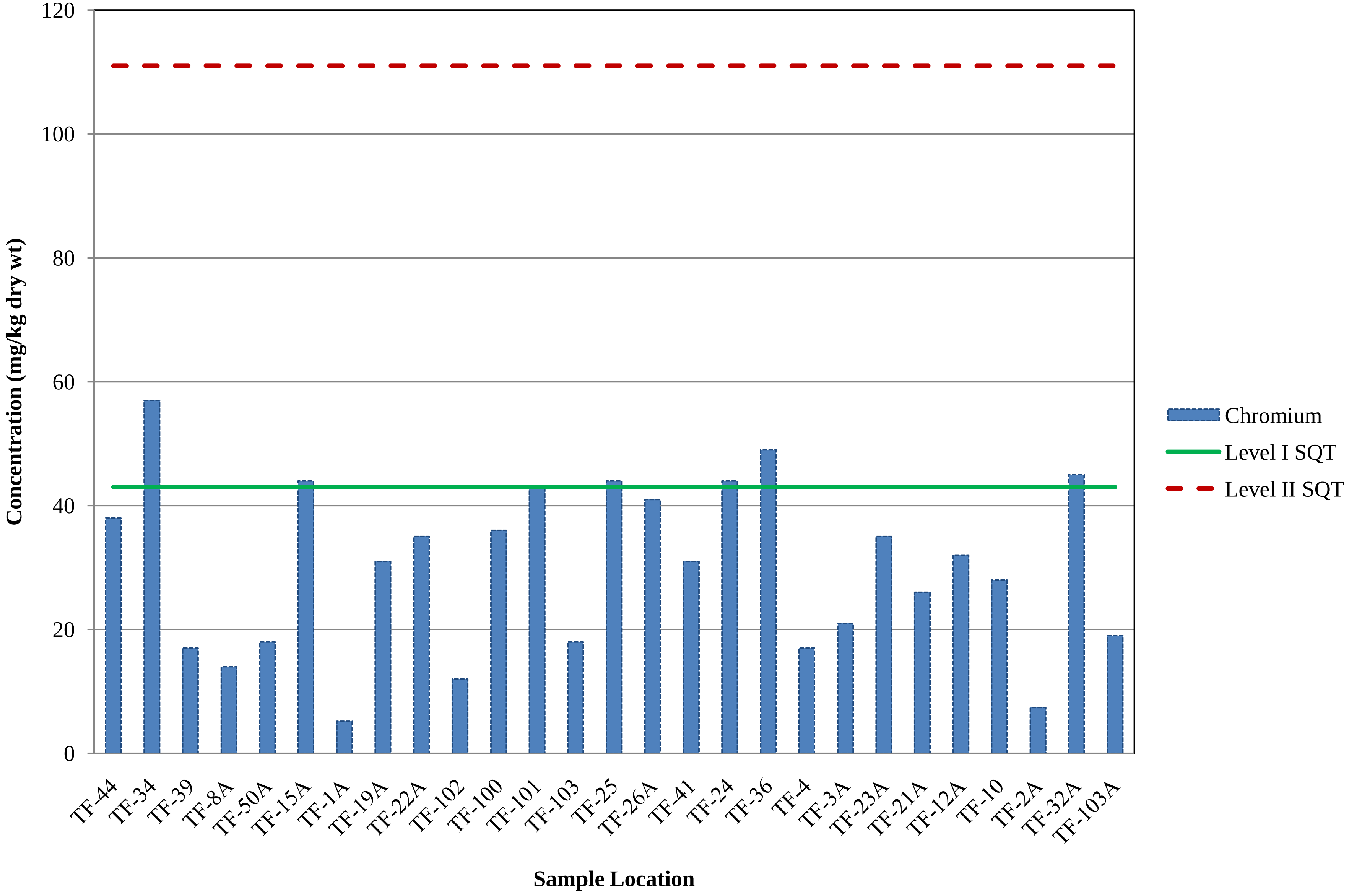


**Figure 8.16-d**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Copper**

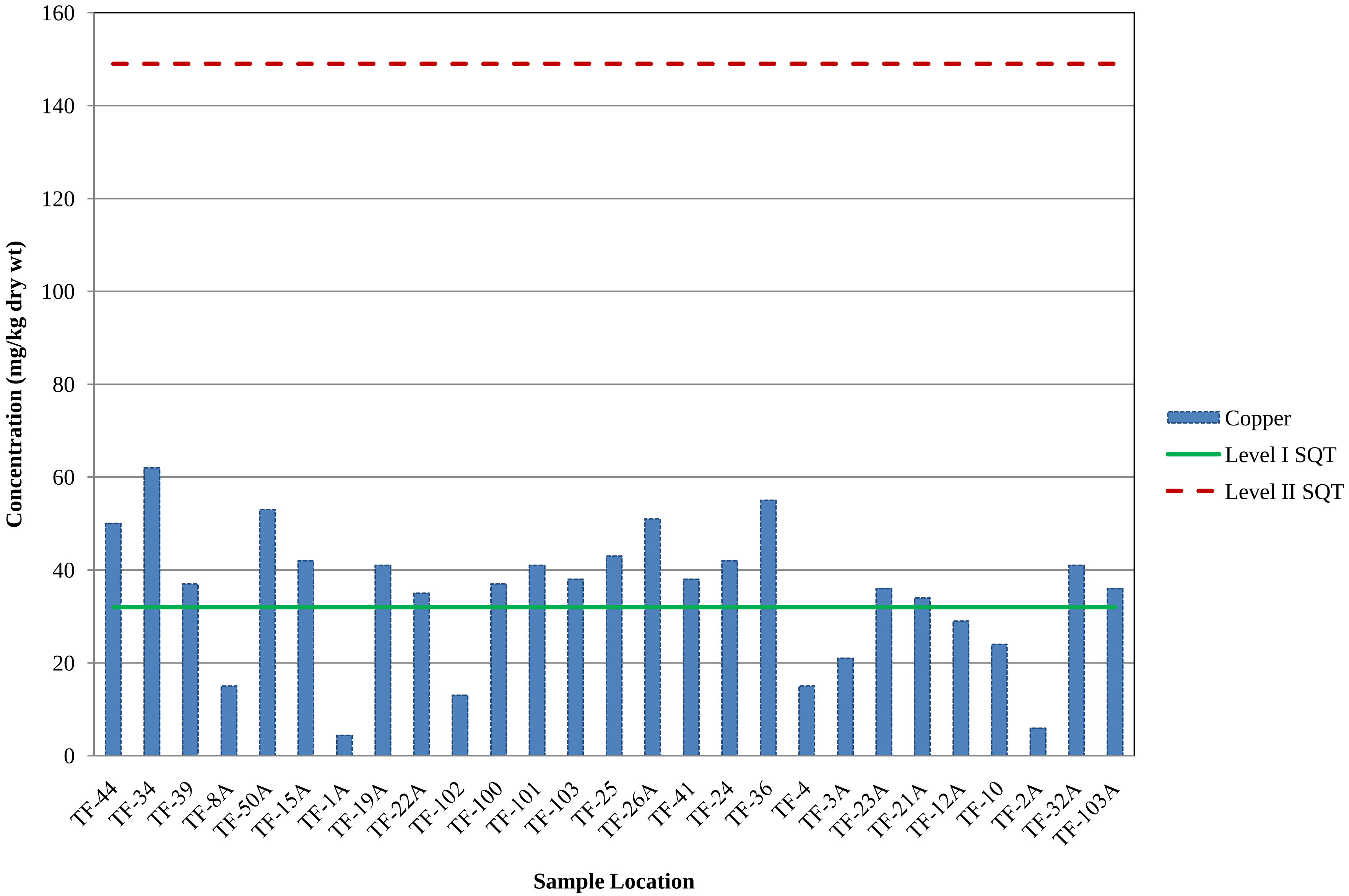


**Figure 8.16-e**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Lead**

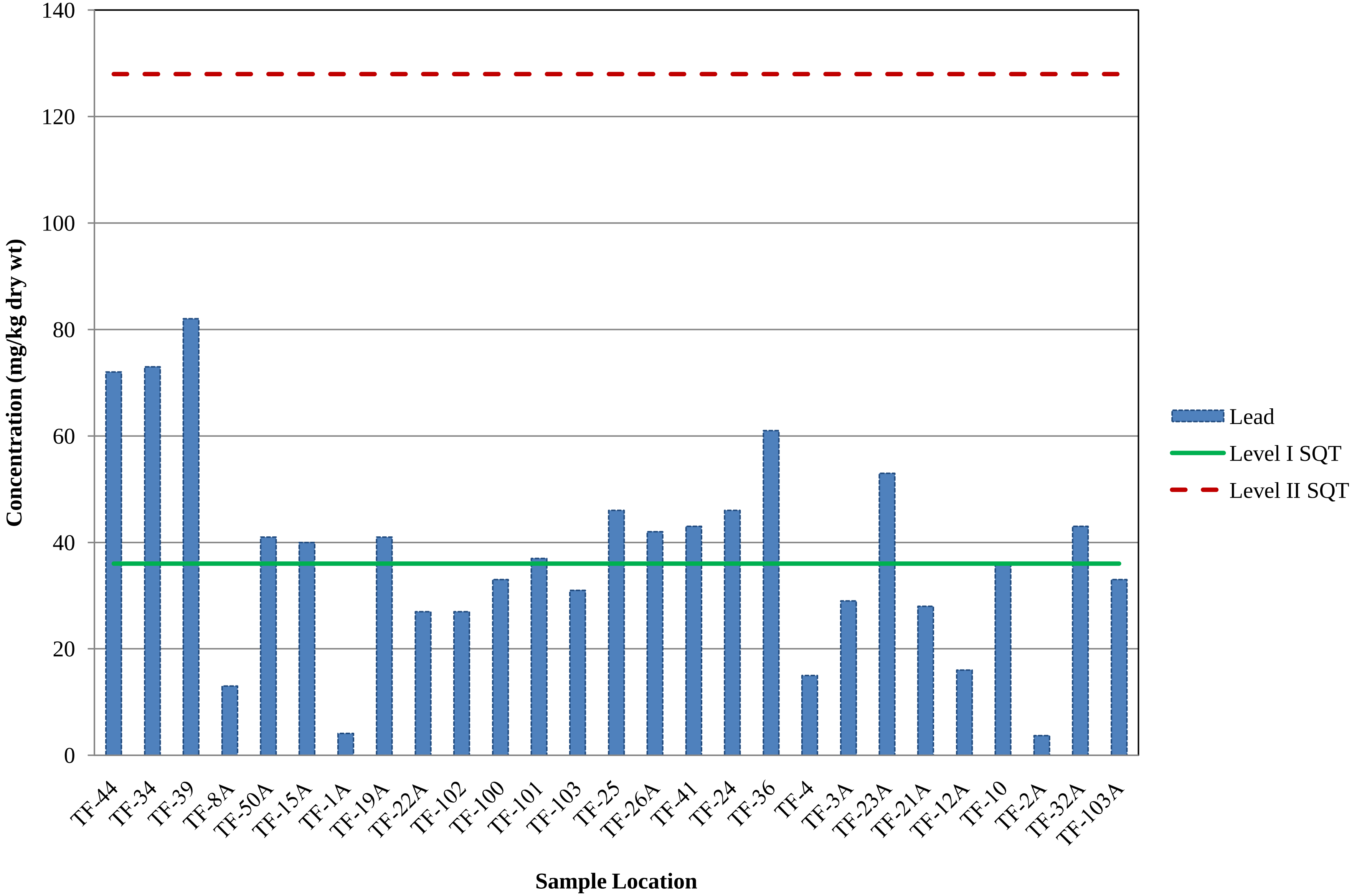


**Figure 8.16-f**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Mercury**

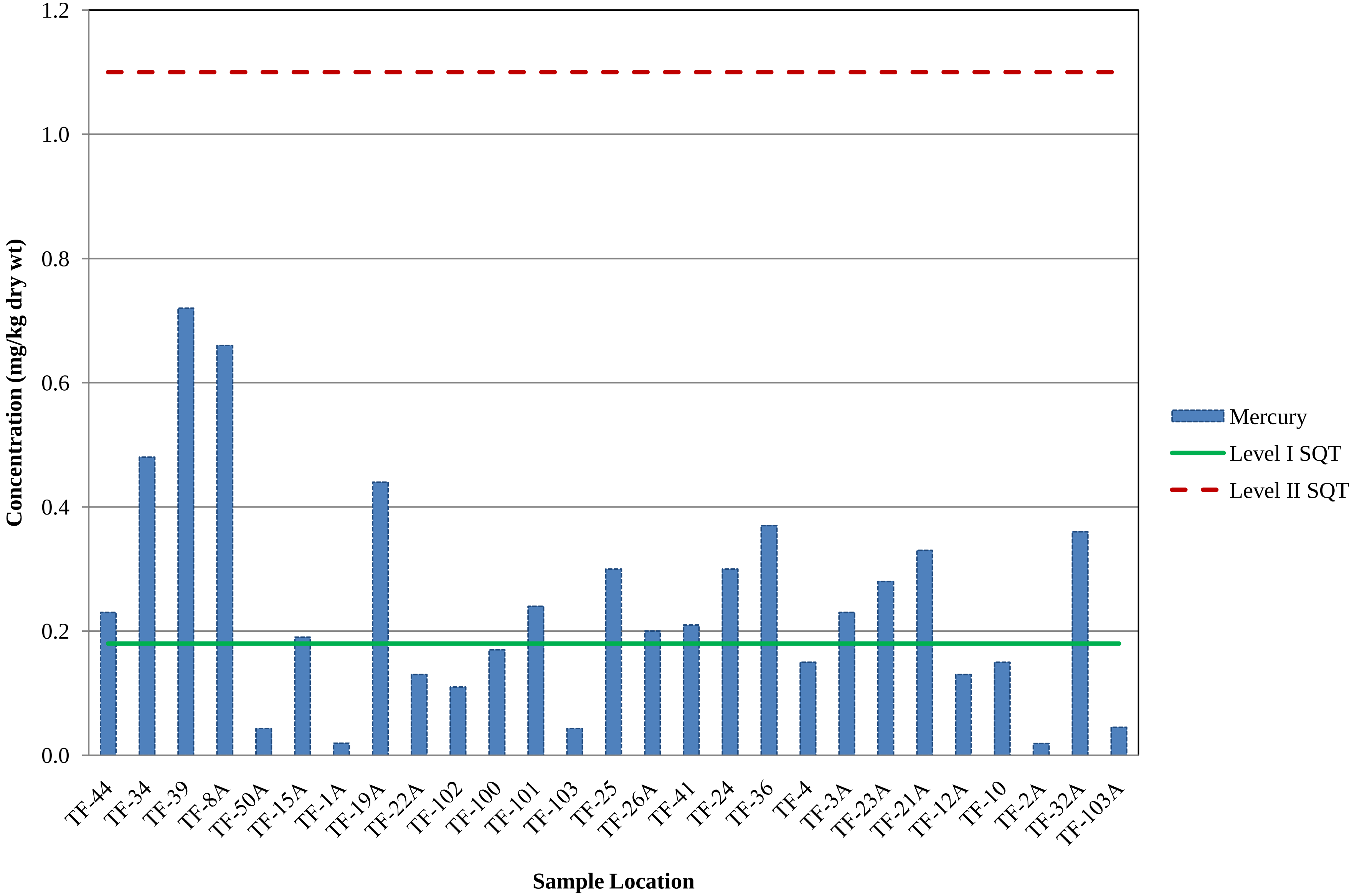


**Figure 8.16-g**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Nickel**

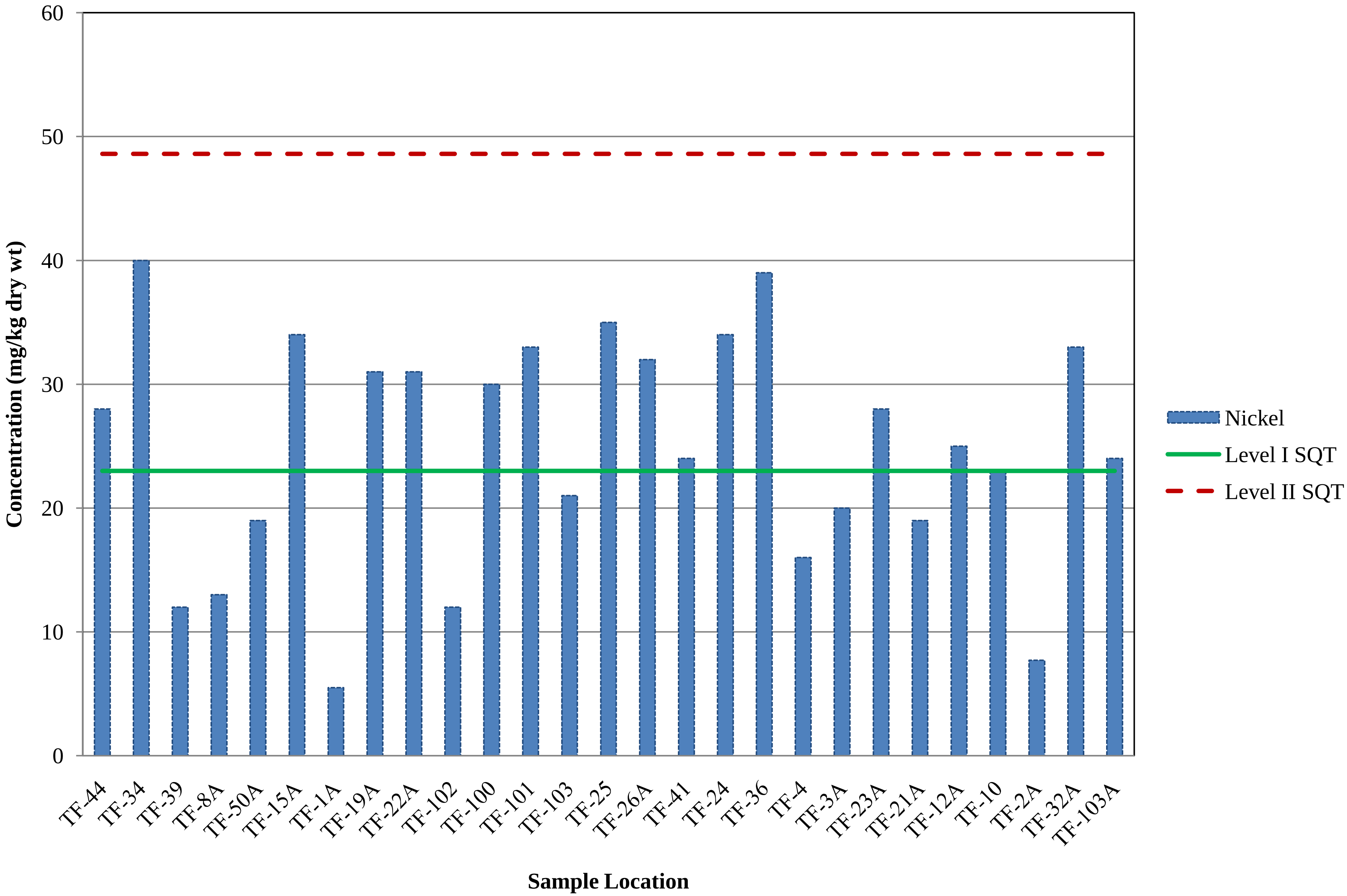
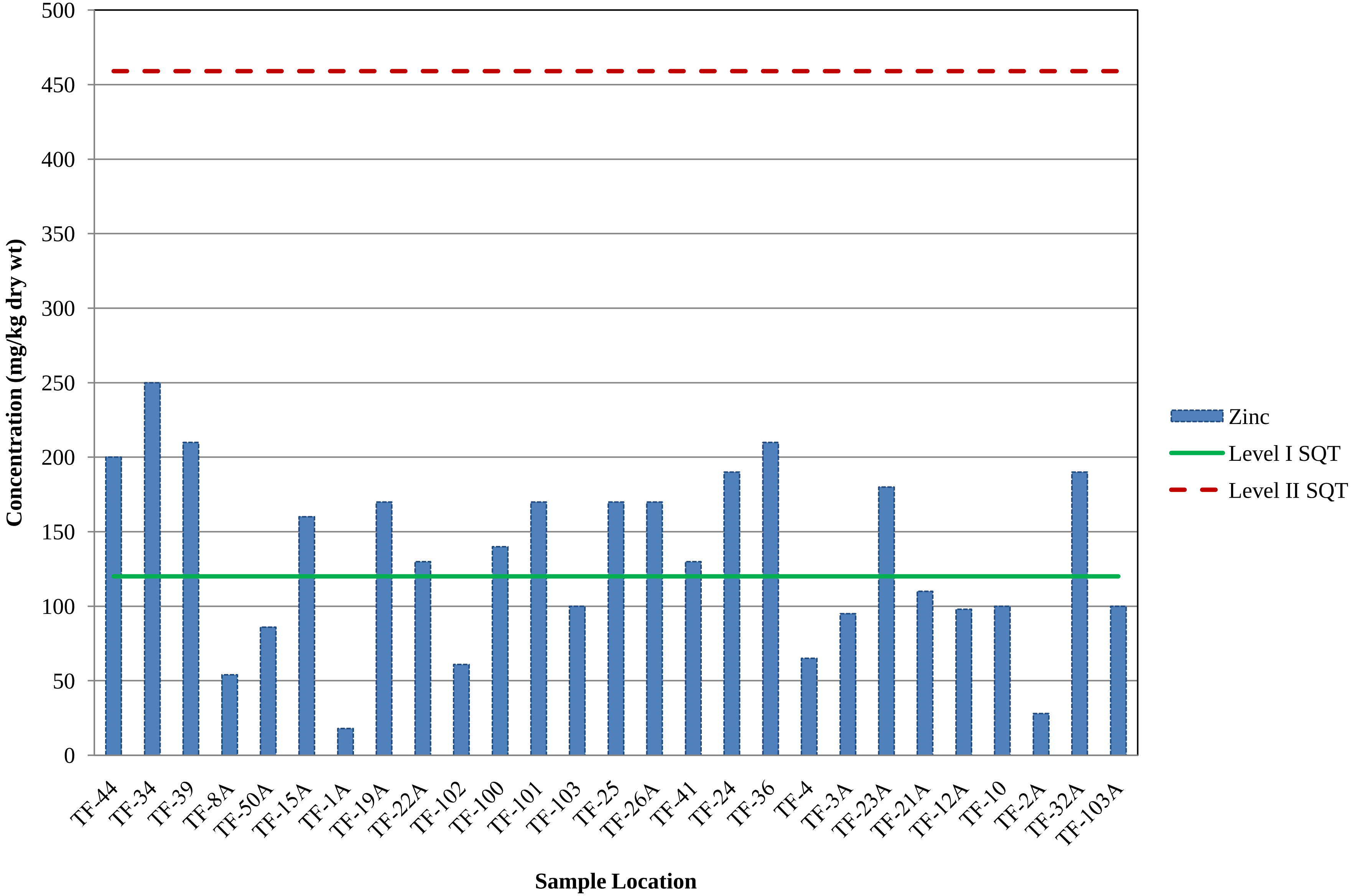


**Figure 8.16-h**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Zinc**



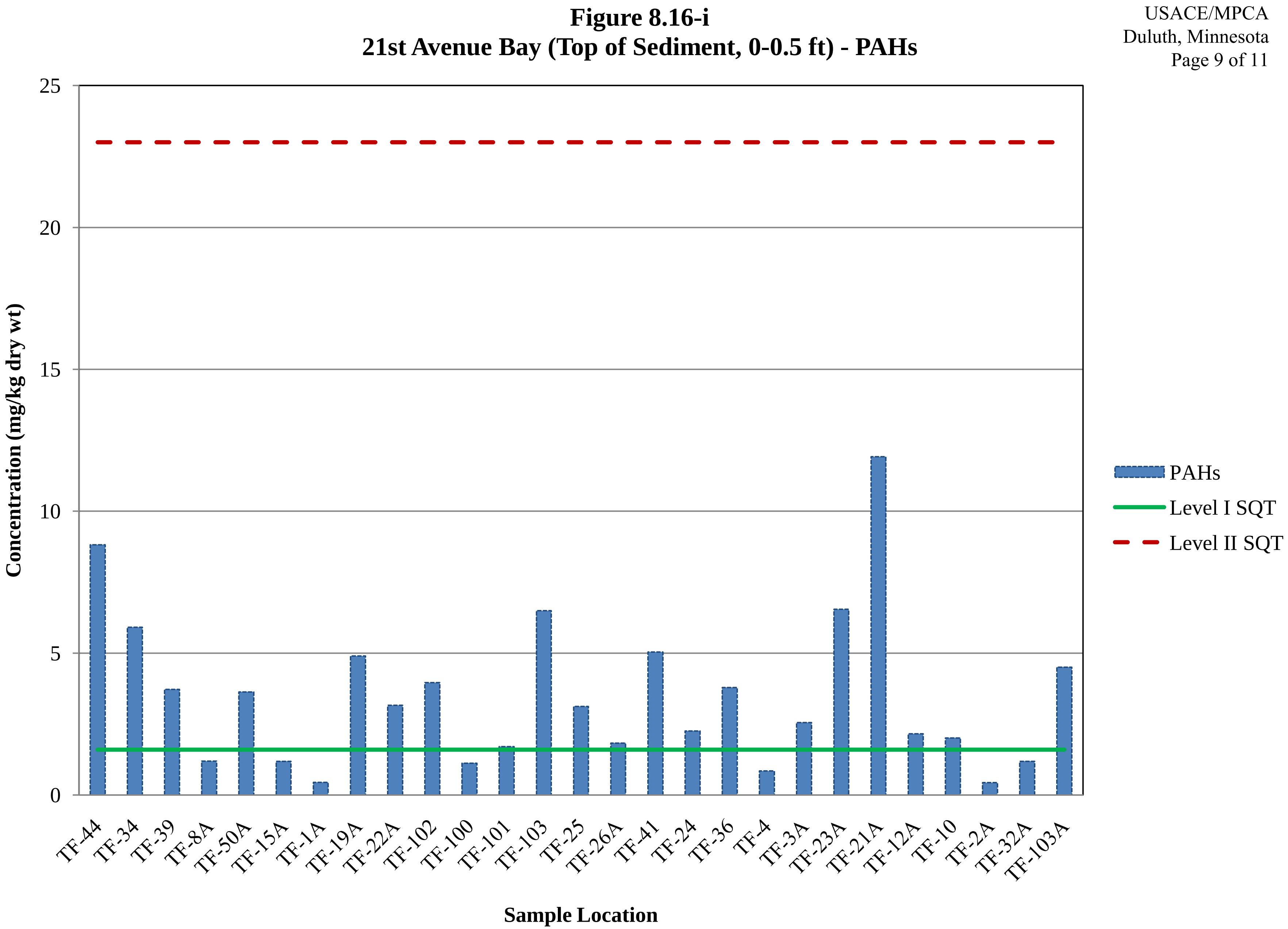


Figure 8.16-i
21st Avenue Bay (Top of Sediment, 0-0.5 ft) - PAHs
Concentration (mg/kg dry wt)
0
5
10
15
20
25
TF-44
TF-34
TF-39
TF-8A
TF-50A
TF-15A
TF-1A
TF-19A
TF-22A
TF-102
TF-100
TF-101
TF-103
TF-25
TF-26A
TF-41
TF-24
TF-36
TF-4
TF-3A
TF-23A
TF-21A
TF-12A
TF-10
TF-2A
TF-32A
TF-103A
Sample Location
PAHs
Level I SQT
Level II SQT

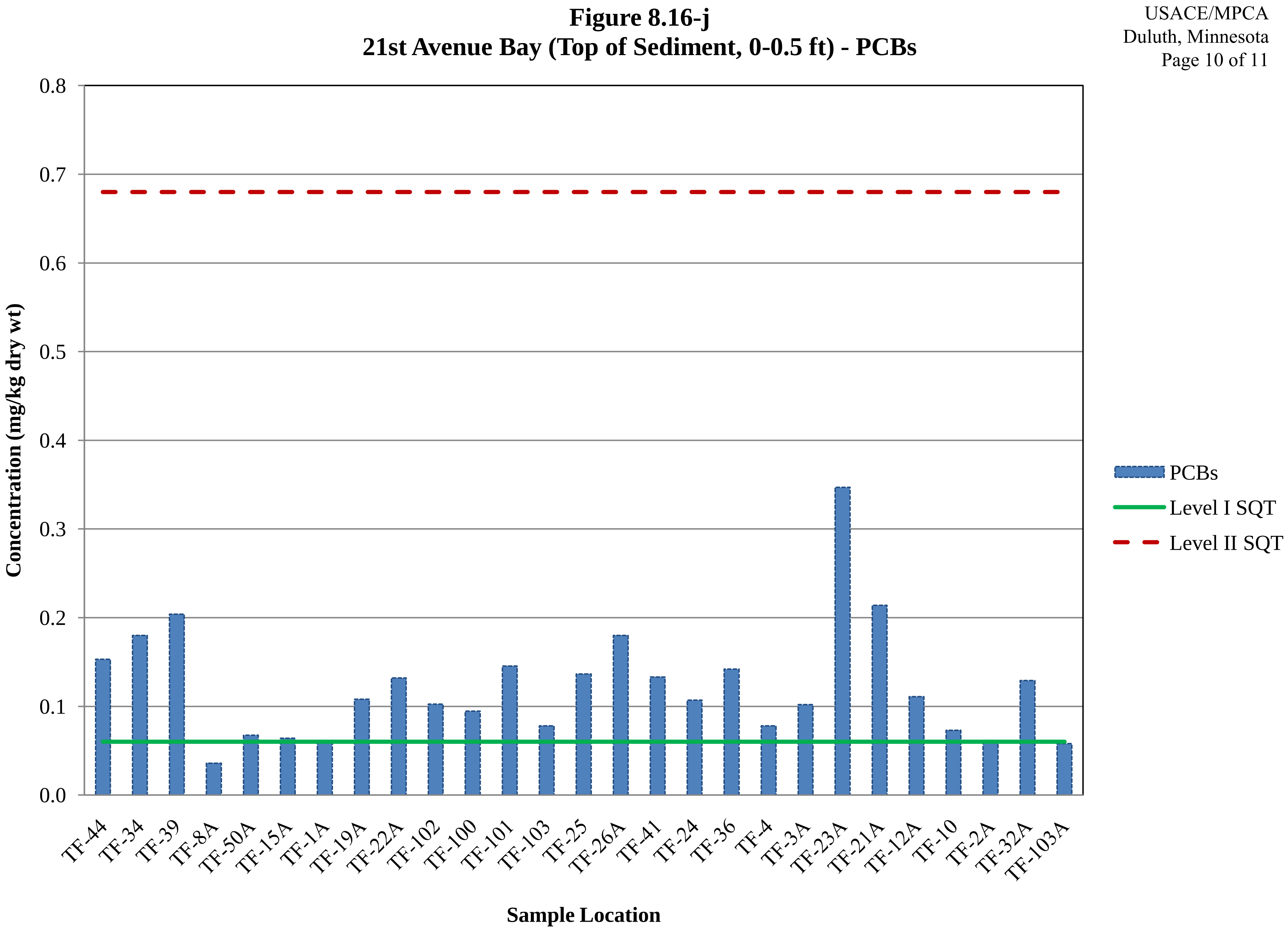


Figure 8.16-j
21st Avenue Bay (Top of Sediment, 0-0.5 ft) - PCBs
Concentration (mg/kg dry wt)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
TF-44
TF-34
TF-39
TF-8A
TF-50A
TF-15A
TF-1A
TF-19A
TF-22A
TF-102
TF-100
TF-101
TF-103
TF-25
TF-26A
TF-41
TF-24
TF-36
TF-4
TF-3A
TF-23A
TF-21A
TF-12A
TF-10
TF-2A
TF-32A
TF-103A
Sample Location
PCBs
Level I SQT
Level II SQT

**Figure 8.16-k**
**21st Avenue Bay (Top of Sediment, 0-0.5 ft) - Dioxins**

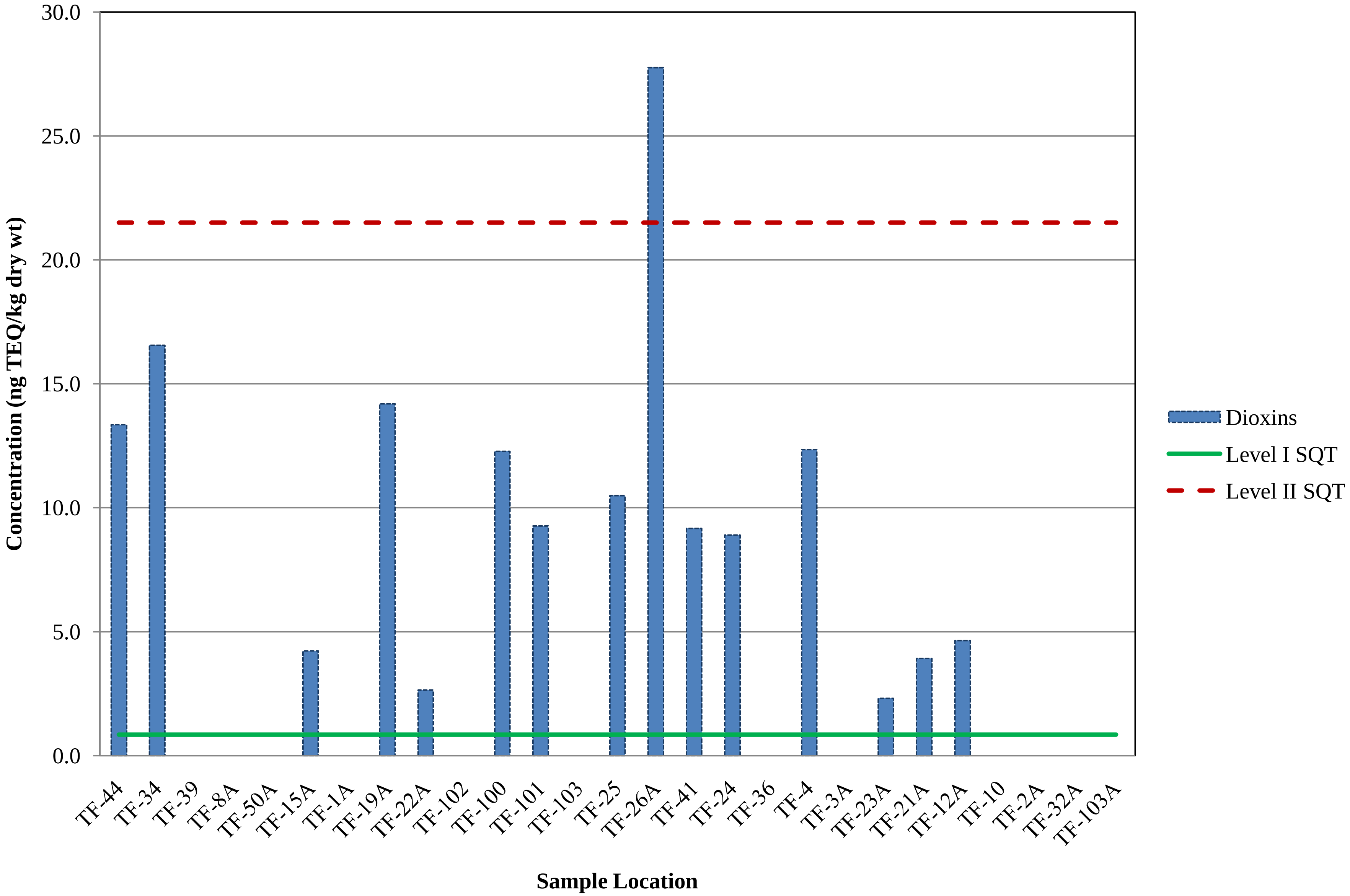
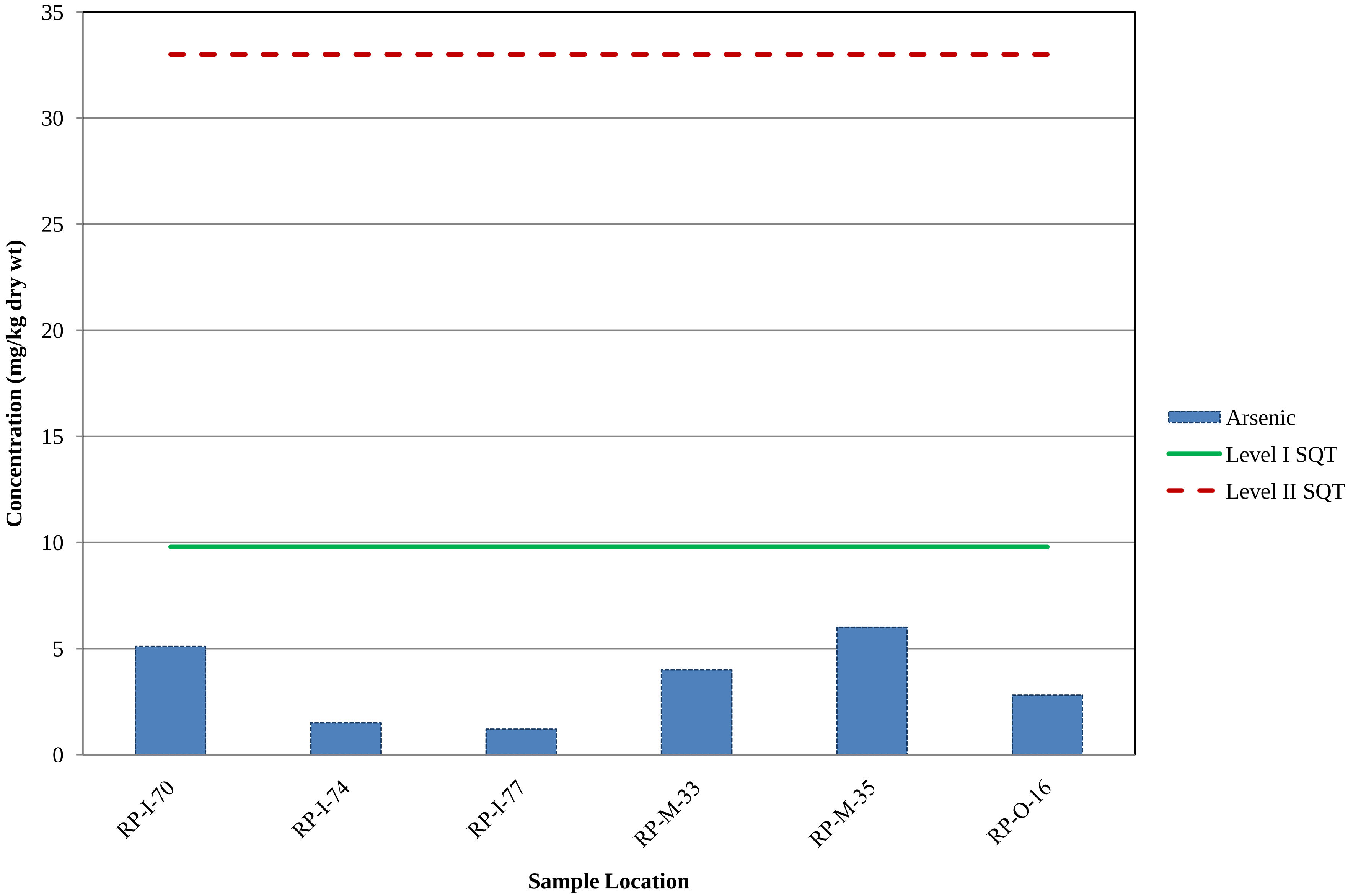


**Figure 8.17-a**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Arsenic**



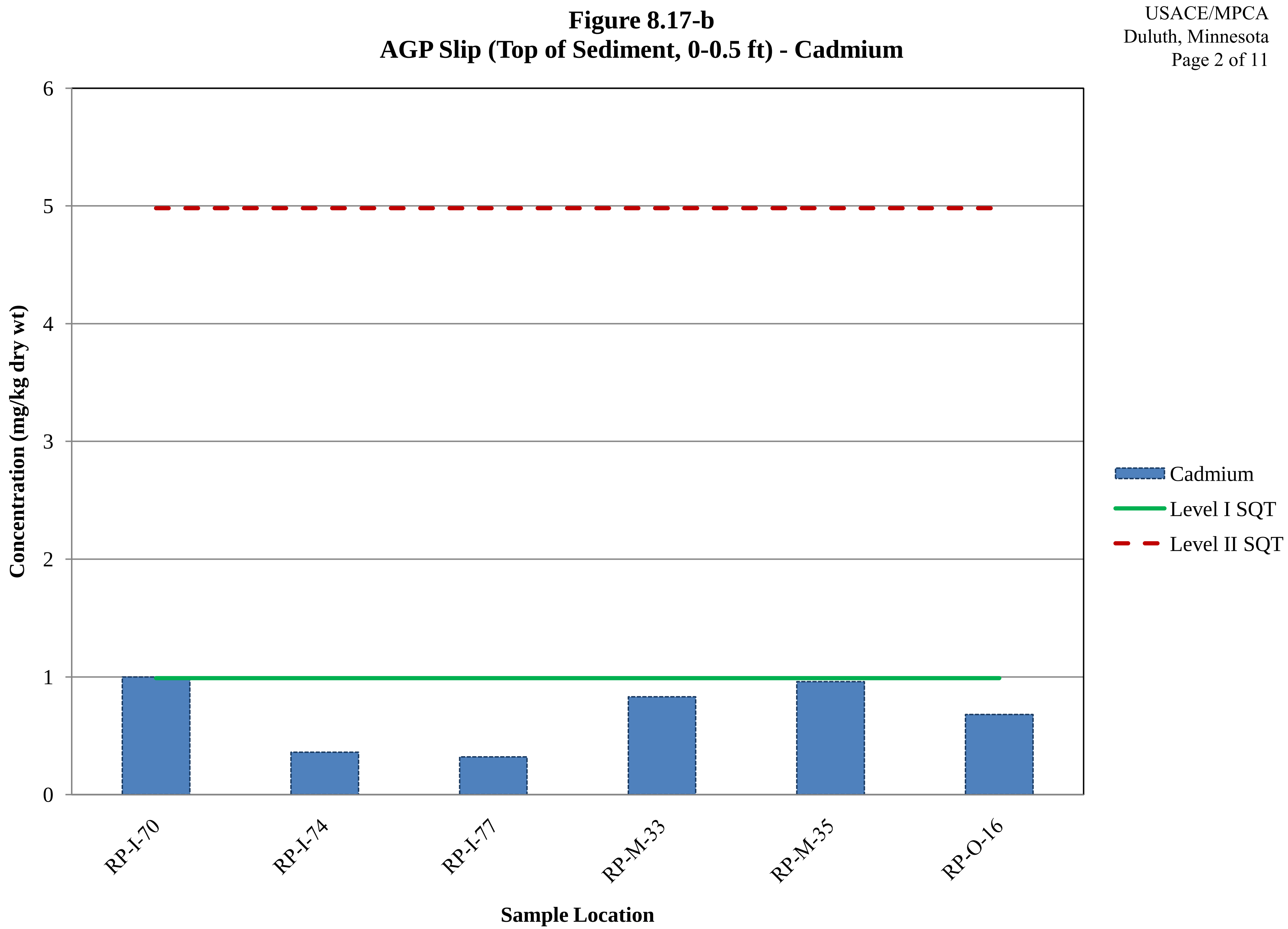


Figure 8.17-b
AGP Slip (Top of Sediment, 0-0.5 ft) - Cadmium
Concentration (mg/kg dry wt)
0
1
2
3
4
5
6
RP-I-70
RP-I-74
RP-I-77
RP-M-33
RP-M-35
RP-O-16
Sample Location
Cadmium
Level I SQT
Level II SQT

# Figure 8.17-c
## AGP Slip (Top of Sediment, 0-0.5 ft) - Chromium

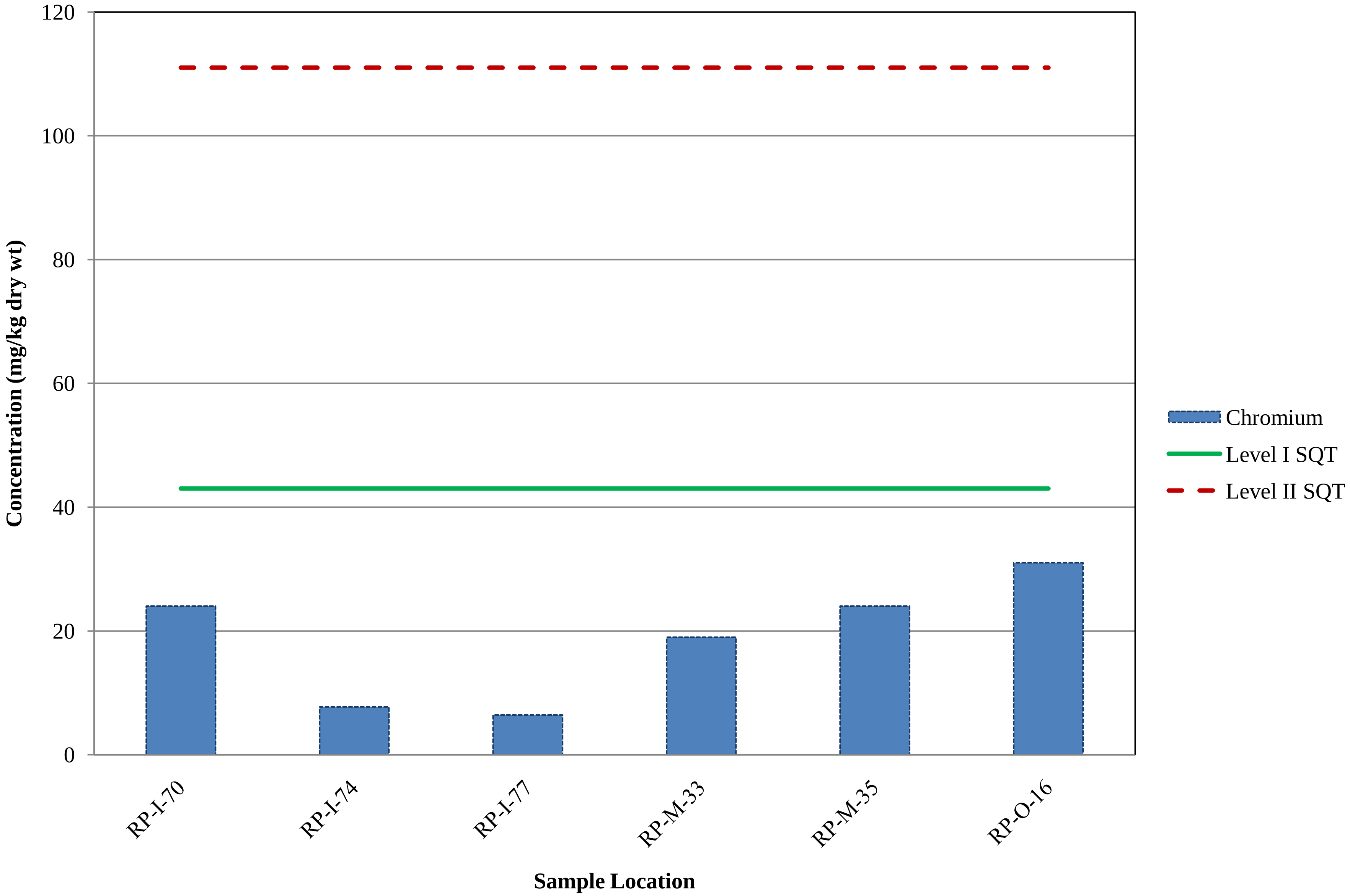


**Figure 8.17-d**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Copper**

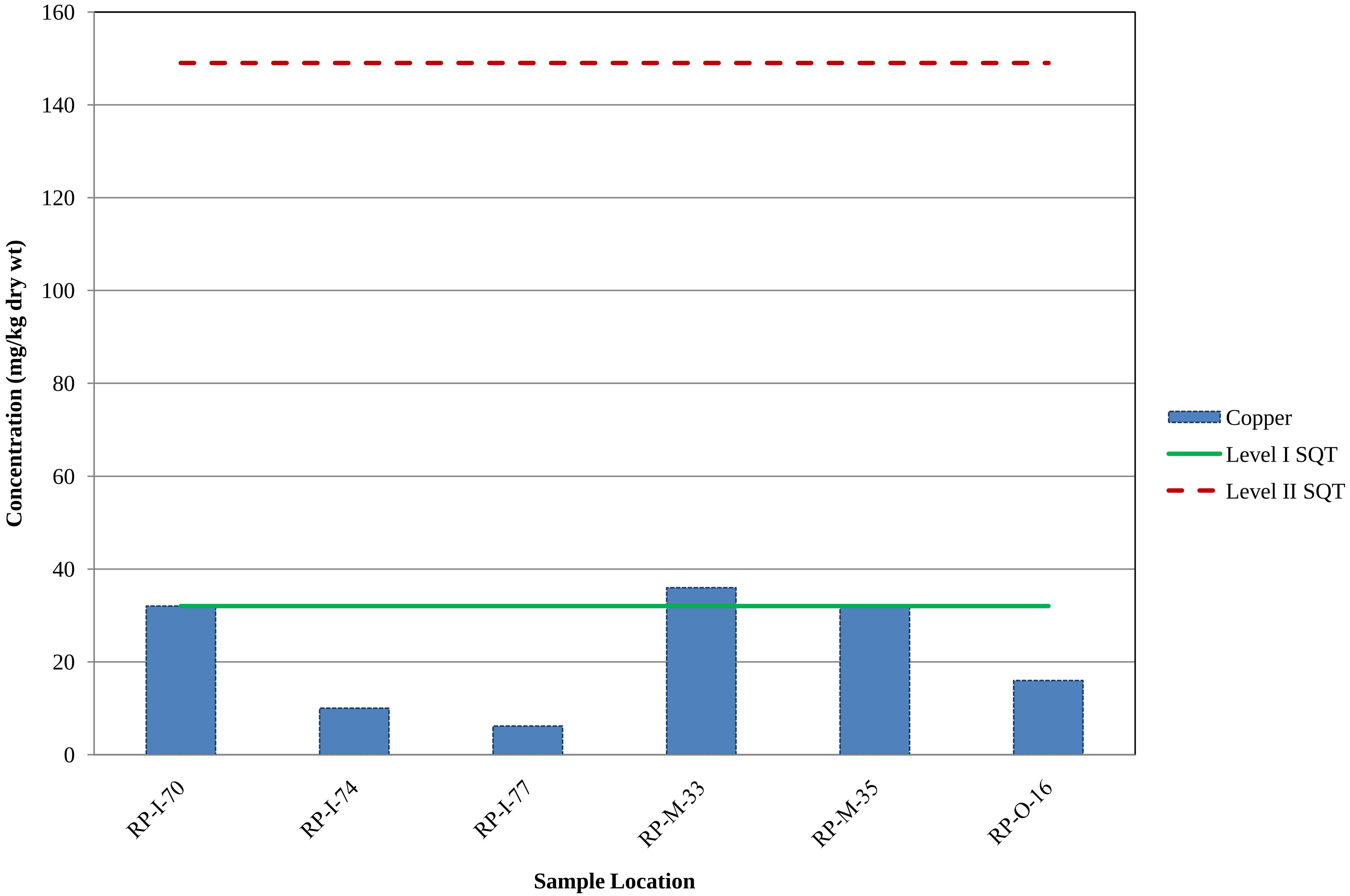


**Figure 8.17-e**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Lead**

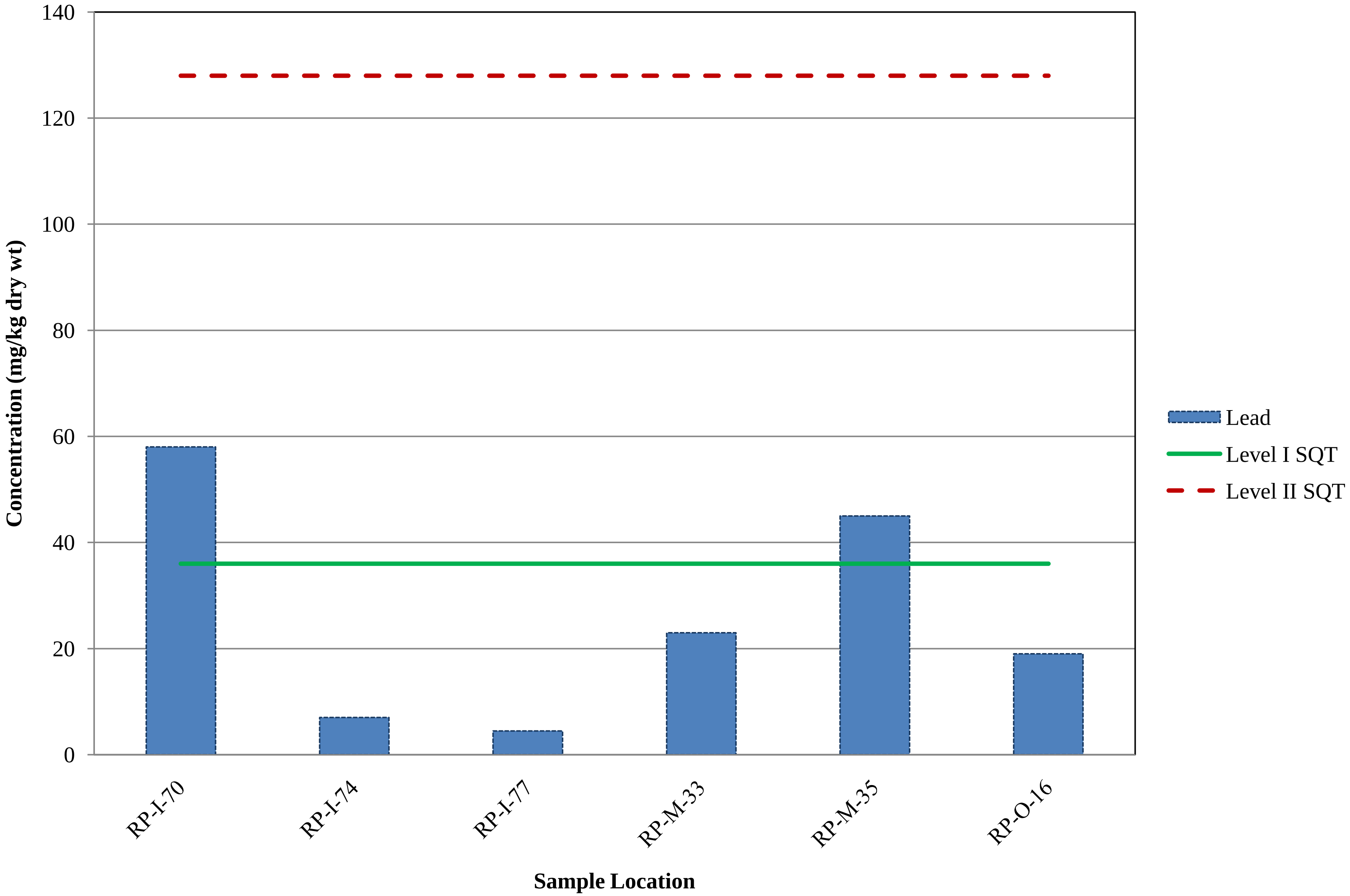


**Figure 8.17-f**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Mercury**

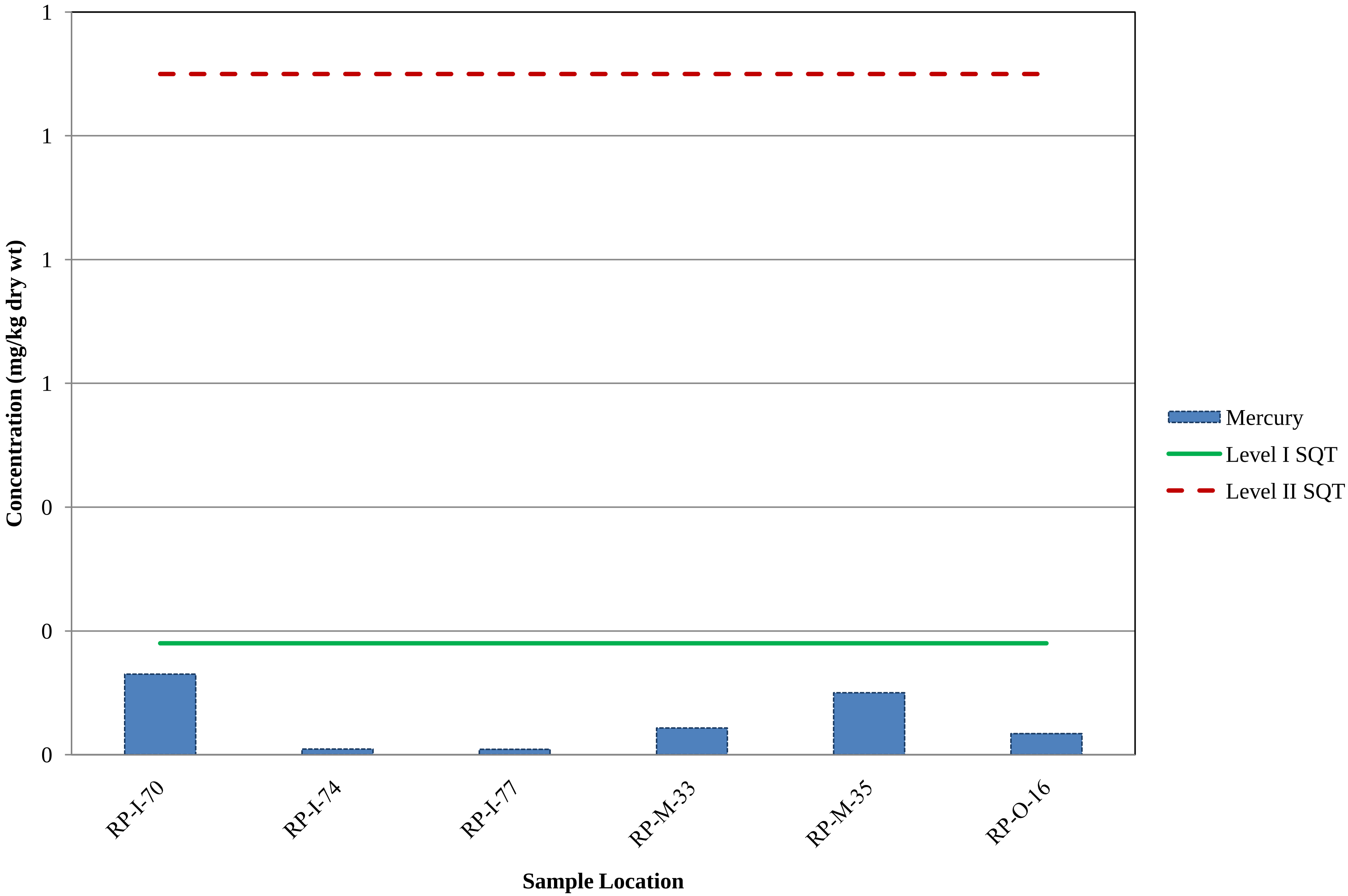
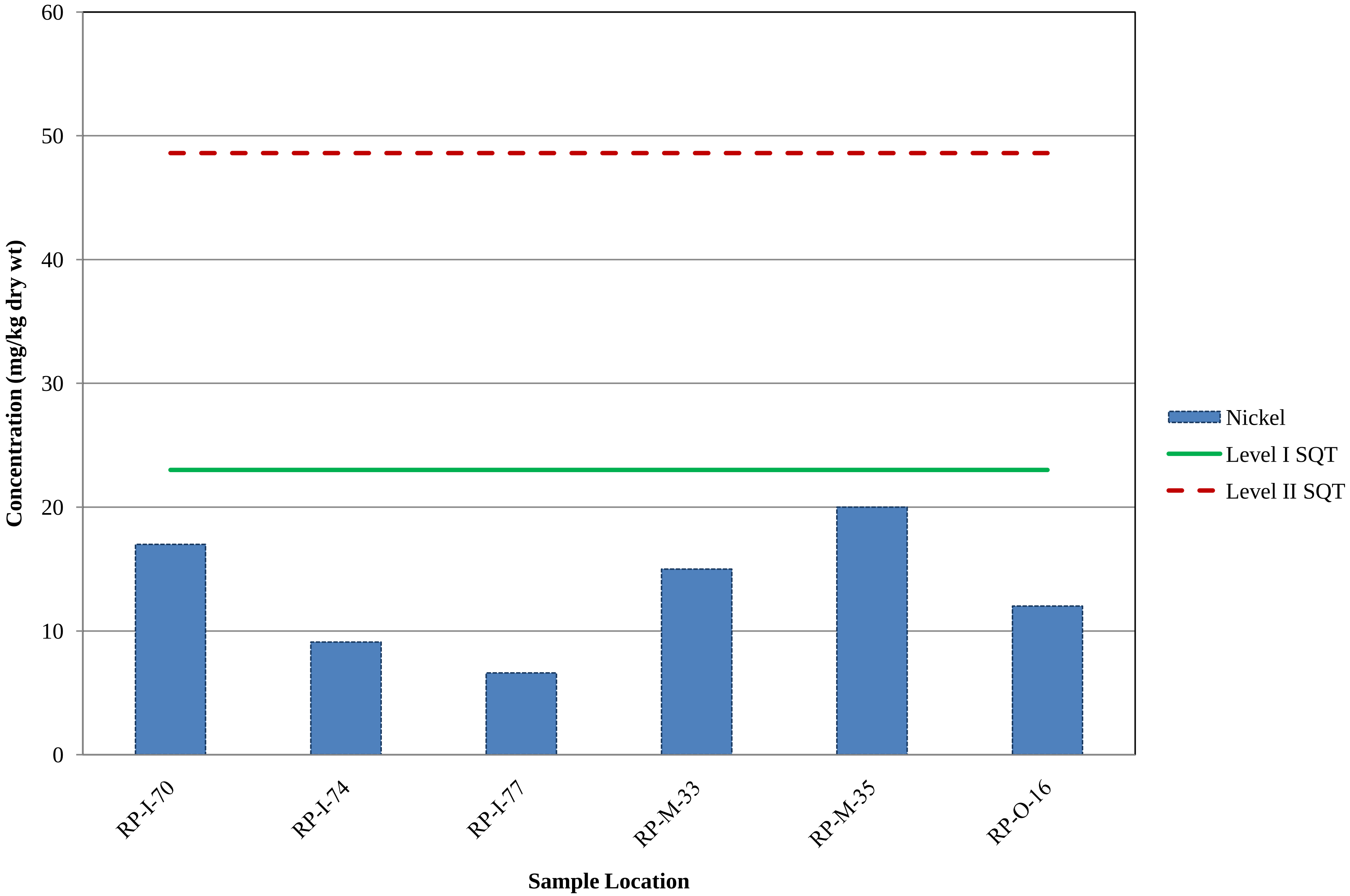


**Figure 8.17-g**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Nickel**



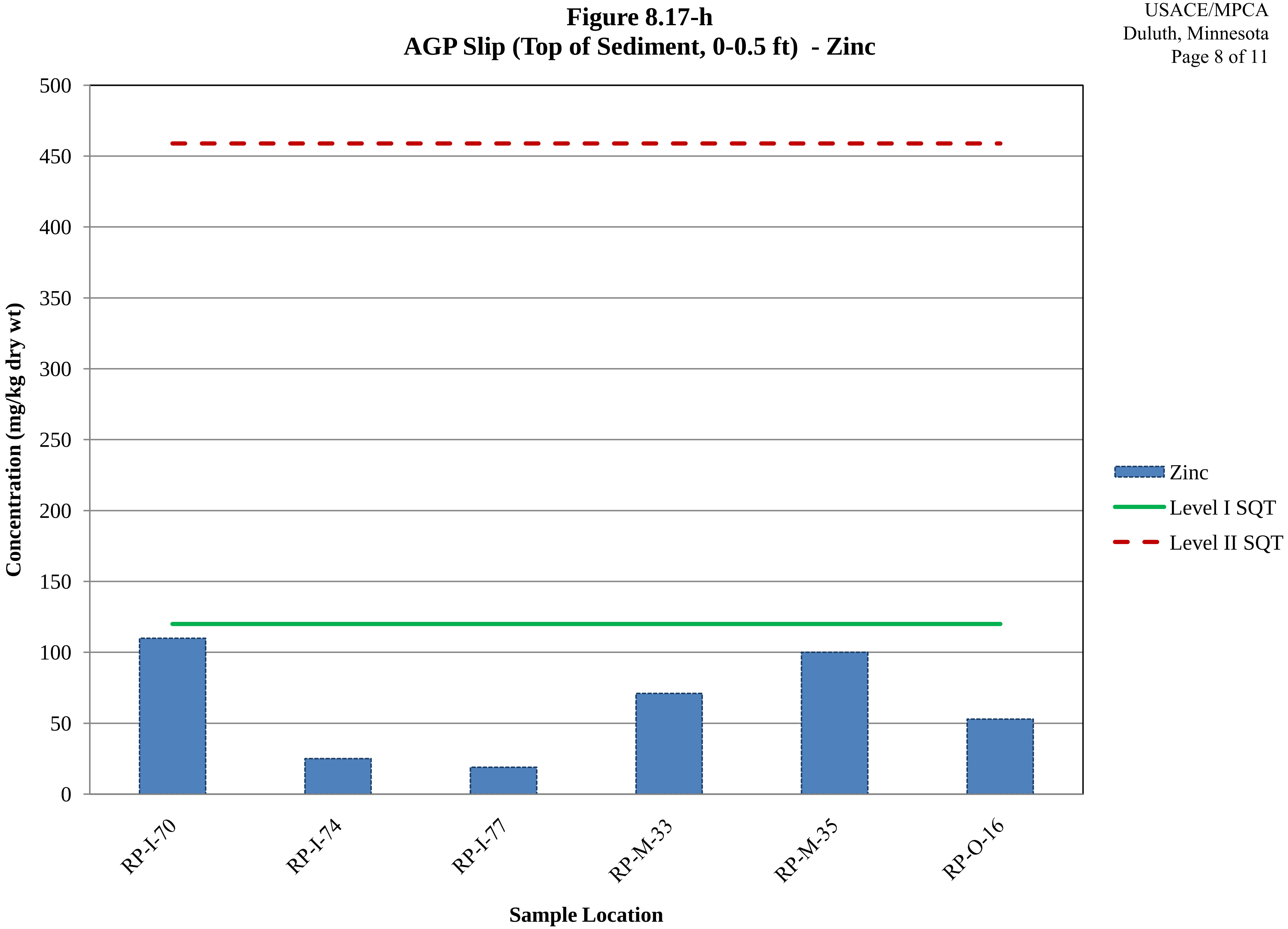
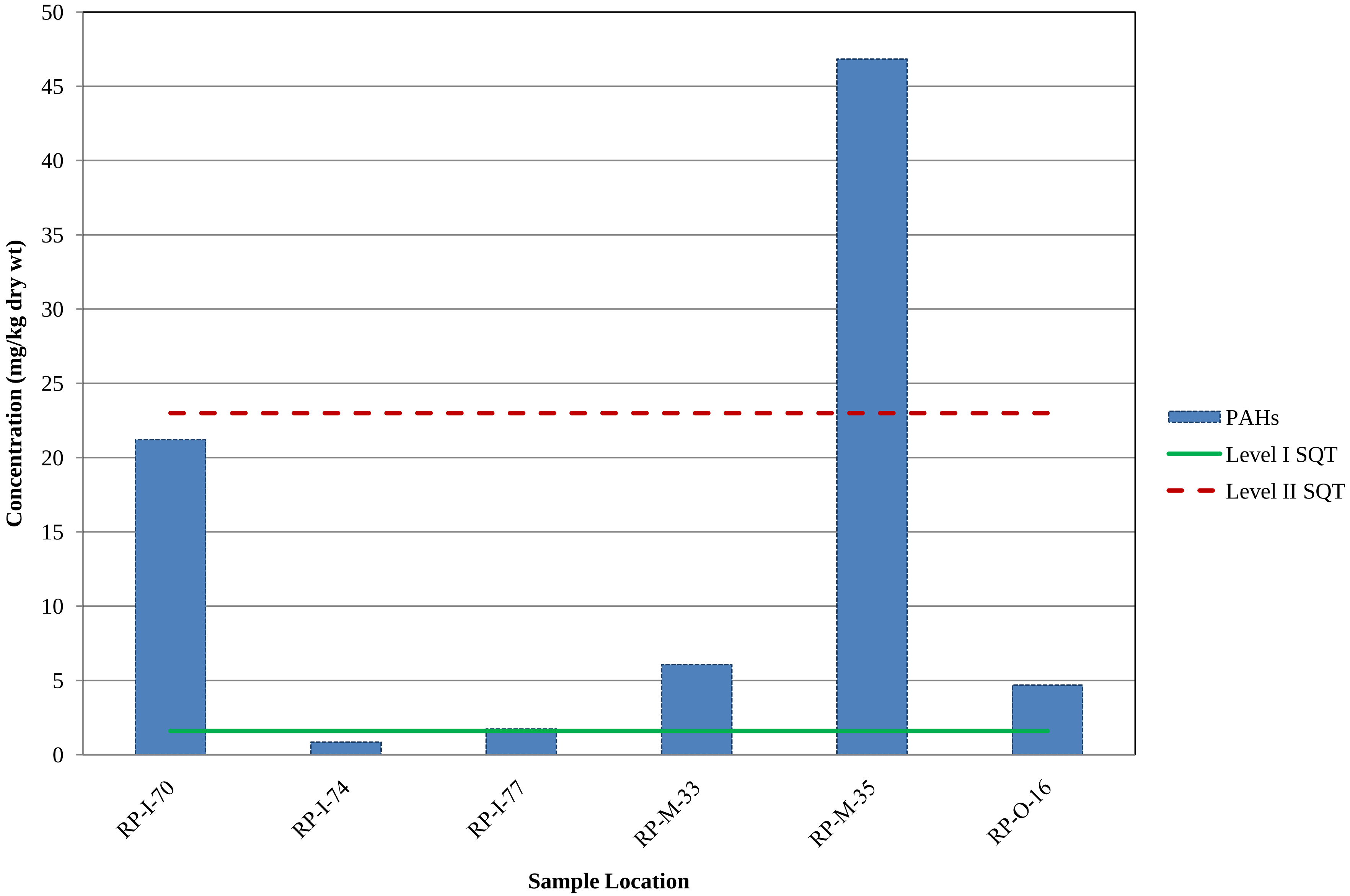


Figure 8.17-h
AGP Slip (Top of Sediment, 0-0.5 ft) - Zinc
Concentration (mg/kg dry wt)
500
450
400
350
300
250
200
150
100
50
0
RP-I-70
RP-I-74
RP-I-77
RP-M-33
RP-M-35
RP-O-16
Sample Location
Zinc
Level I SQT
Level II SQT

**Figure 8.17-i**
**AGP Slip (Top of Sediment, 0-0.5 ft) - PAHs**



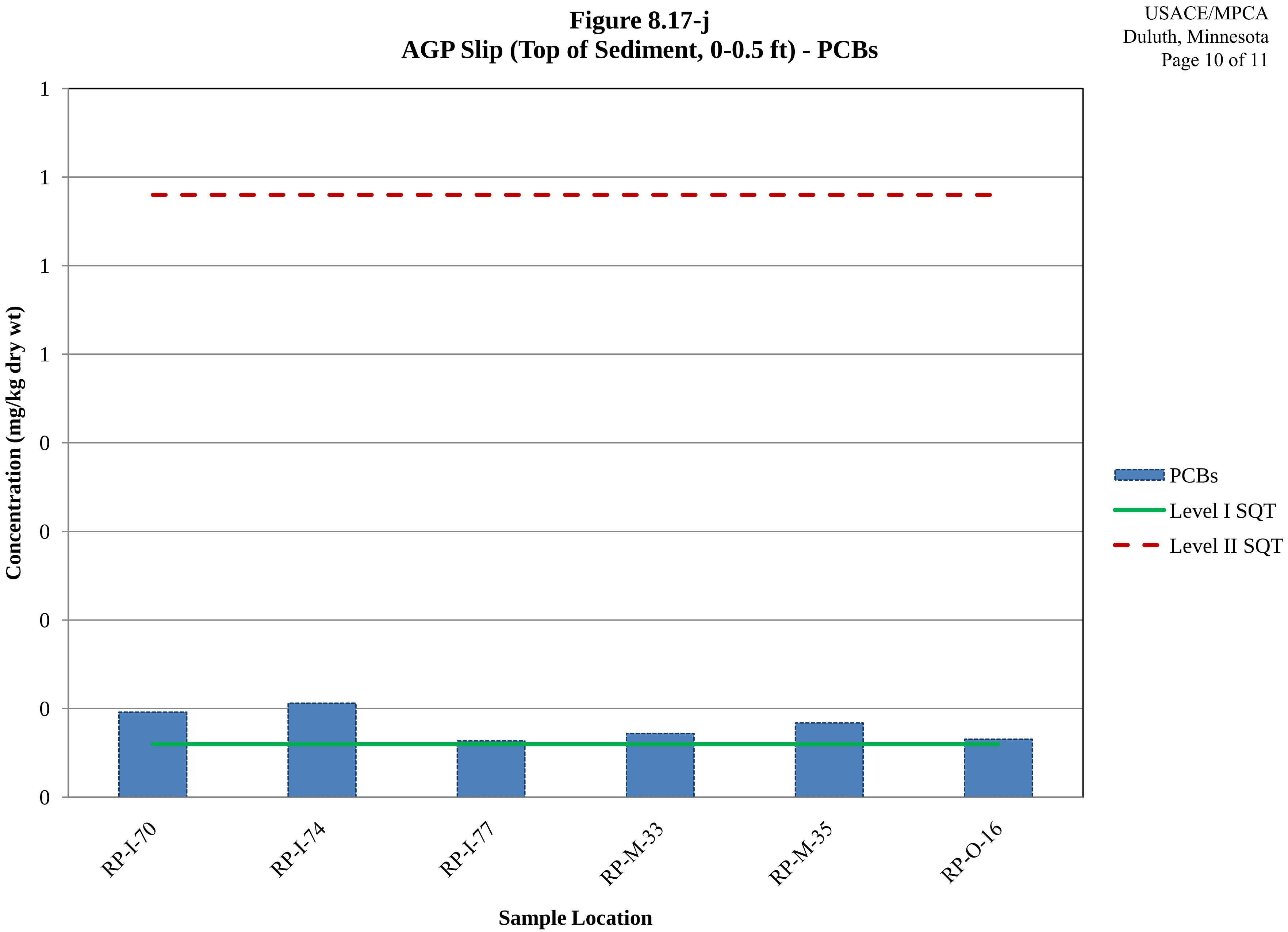
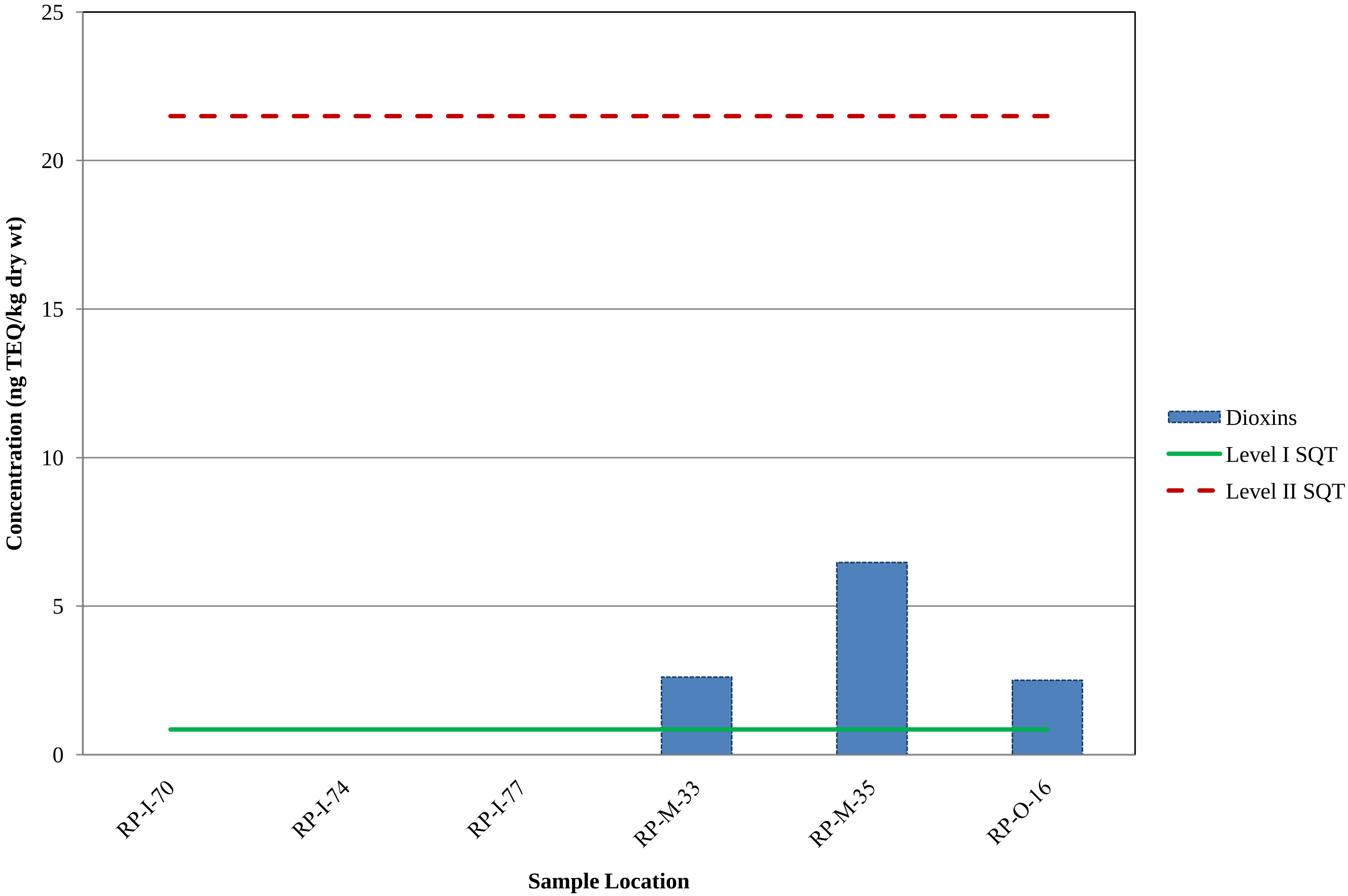


Figure 8.17-j
AGP Slip (Top of Sediment, 0-0.5 ft) - PCBs
Concentration (mg/kg dry wt)
1
1
1
1
0
0
0
0
0
RP-I-70
RP-I-74
RP-I-77
RP-M-33
RP-M-35
RP-O-16
Sample Location
PCBs
Level I SQT
Level II SQT

**Figure 8.17-k**
**AGP Slip (Top of Sediment, 0-0.5 ft) - Dioxins**



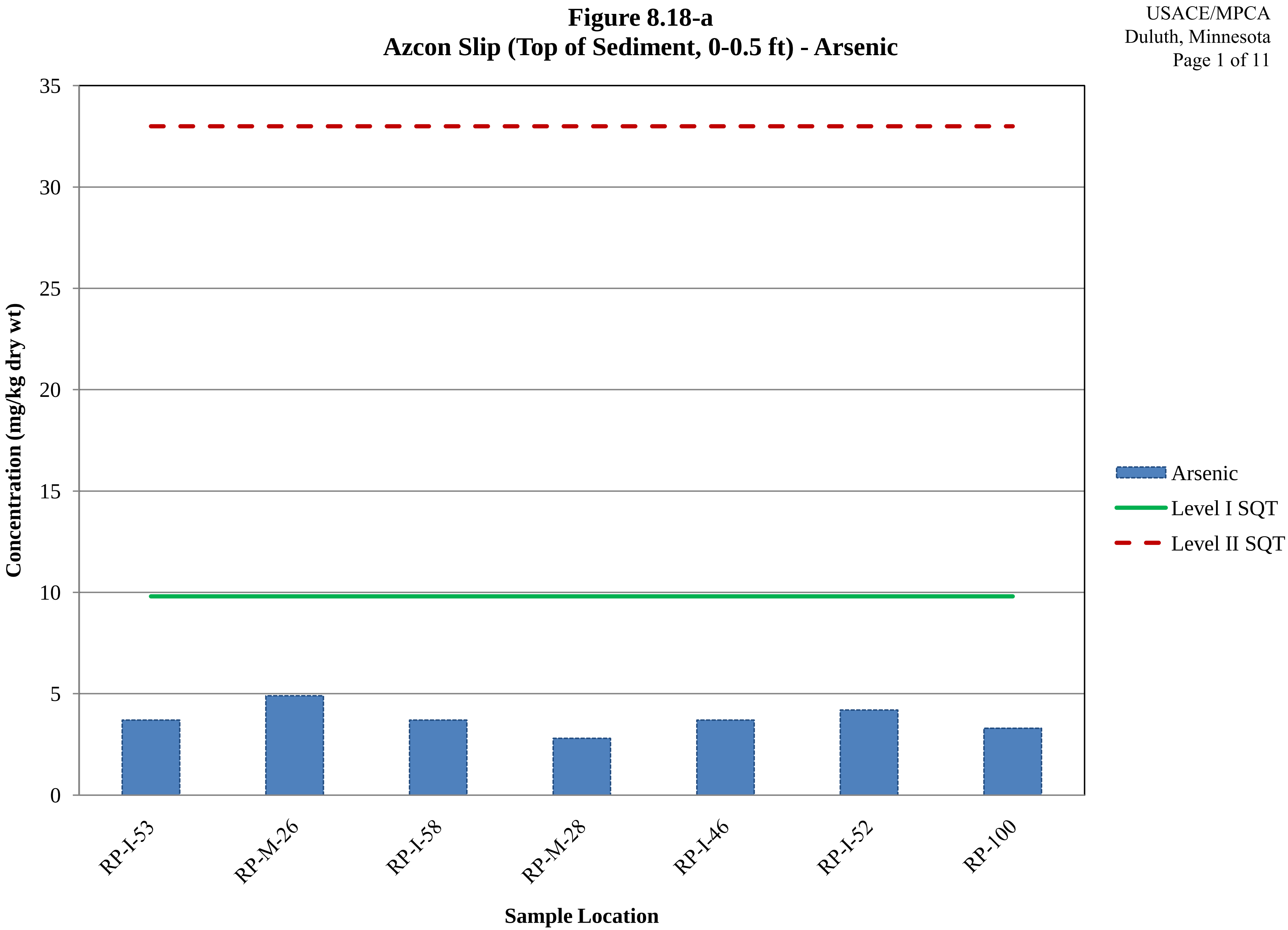
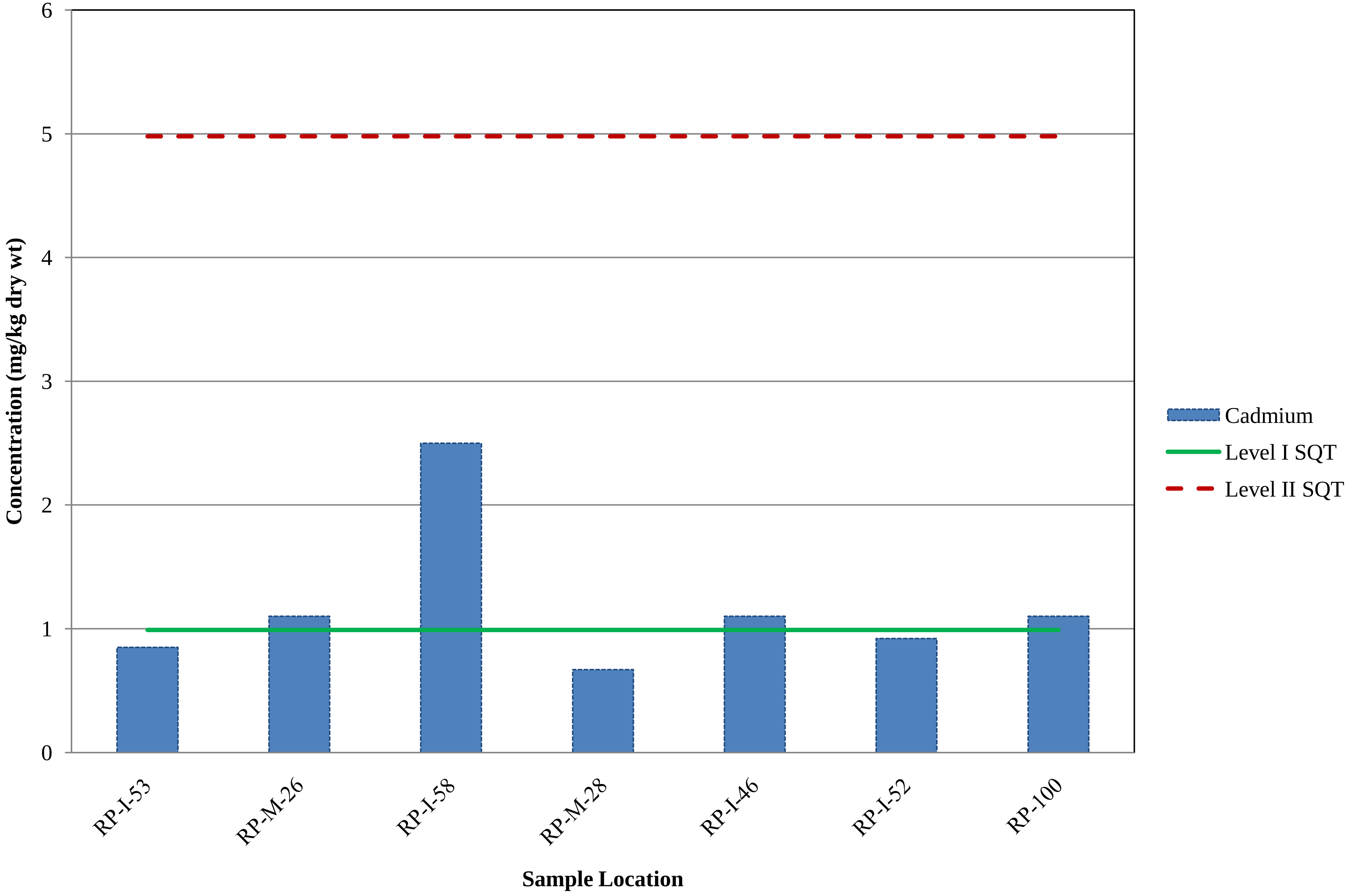


Figure 8.18-a
Azcon Slip (Top of Sediment, 0-0.5 ft) - Arsenic
35
30
25
20
15
10
5
0
Concentration (mg/kg dry wt)
RP-I-53
RP-M-26
RP-I-58
RP-M-28
RP-I-46
RP-I-52
RP-100
Sample Location
Arsenic
Level I SQT
Level II SQT

**Figure 8.18-b**
**Azcon Slip Top of Sediment, 0-0.5 ft) - Cadmium**



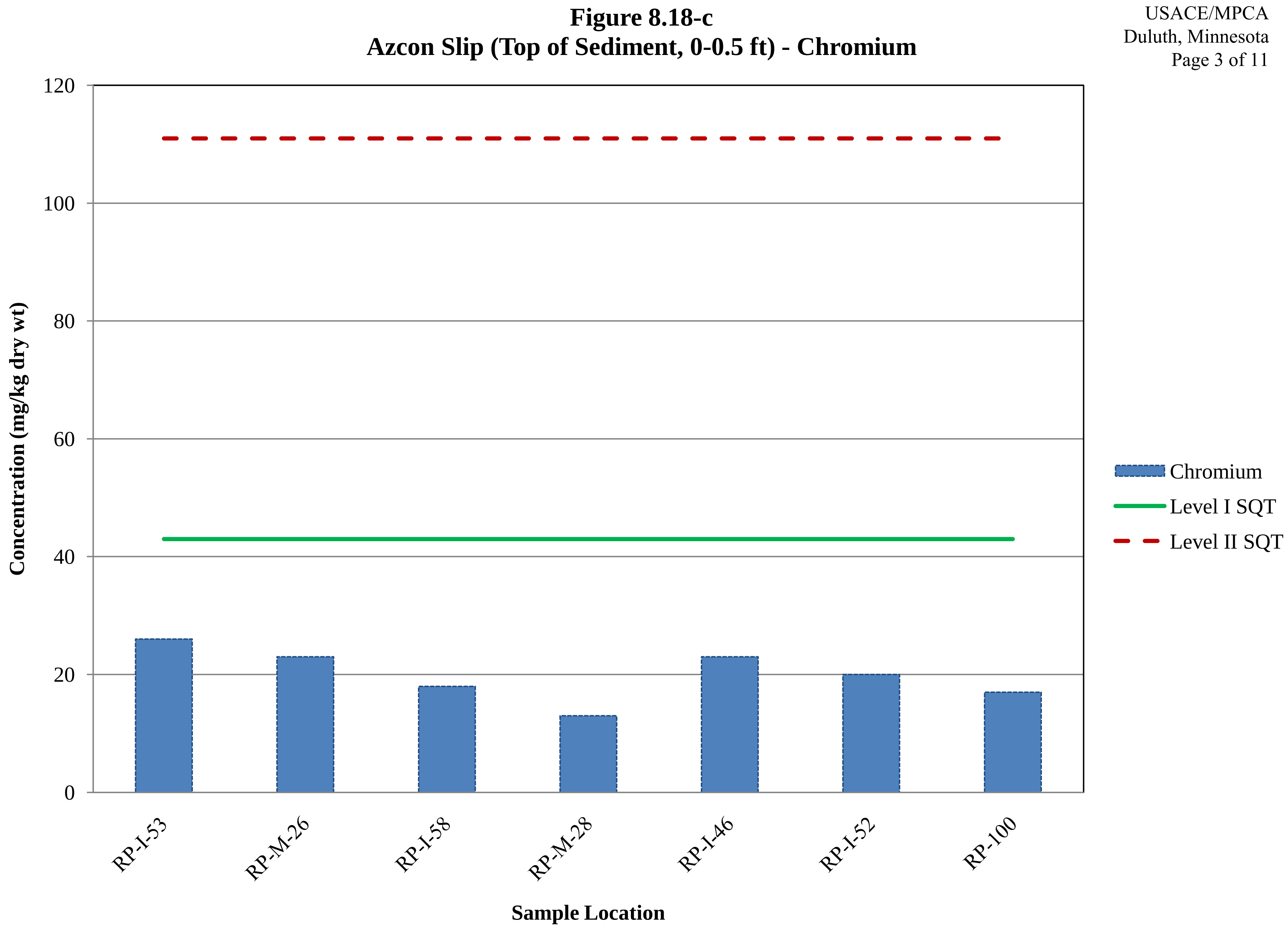


Figure 8.18-c
Azcon Slip (Top of Sediment, 0-0.5 ft) - Chromium
120
100
80
60
40
20
0
Concentration (mg/kg dry wt)
RP-I-53
RP-M-26
RP-I-58
RP-M-28
RP-I-46
RP-I-52
RP-100
Sample Location
Chromium
Level I SQT
Level II SQT

**Figure 8.18-d**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Copper**

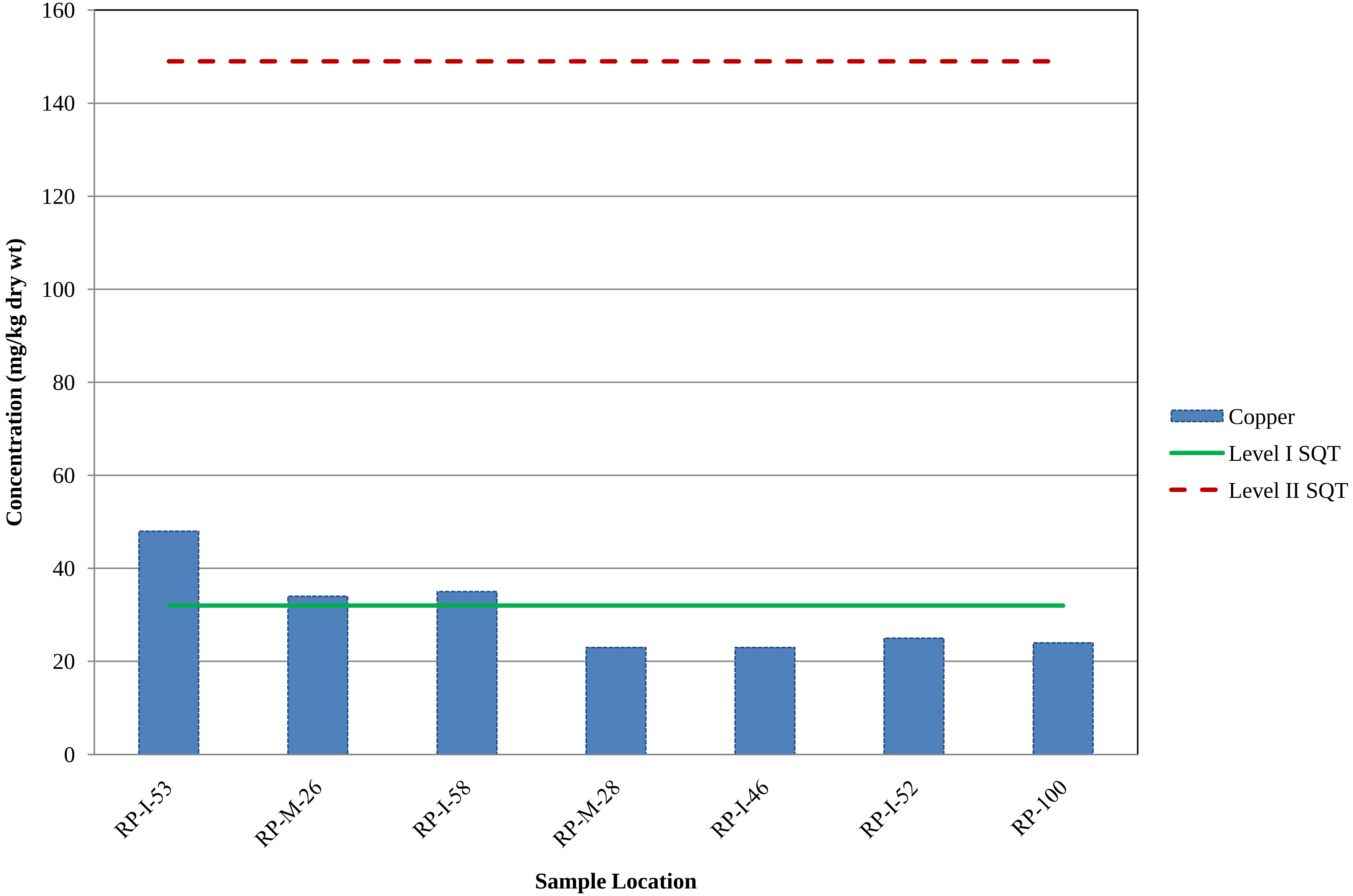


**Figure 8.18-e**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Lead**

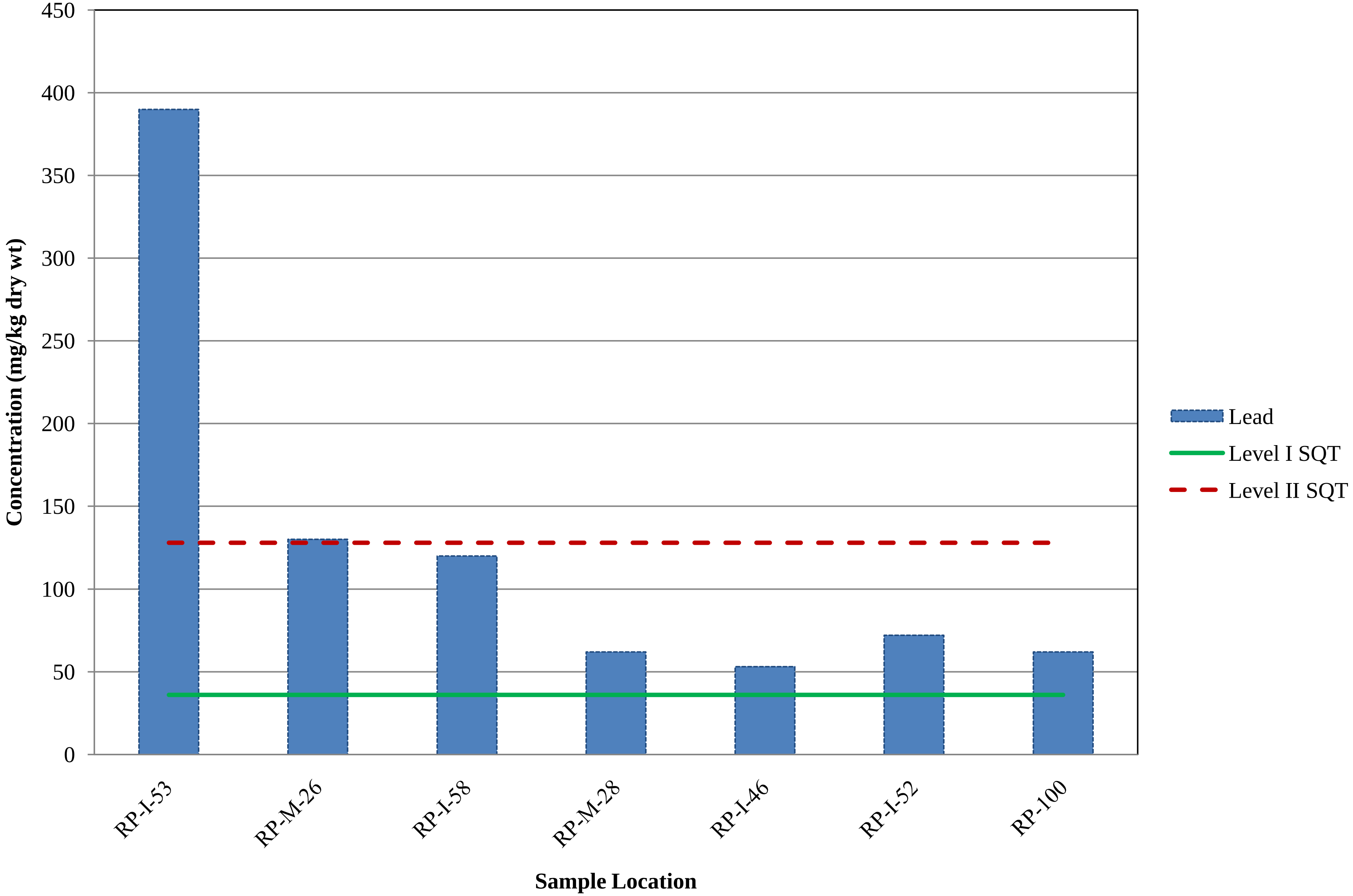


**Figure 8.18-f**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Mercury**

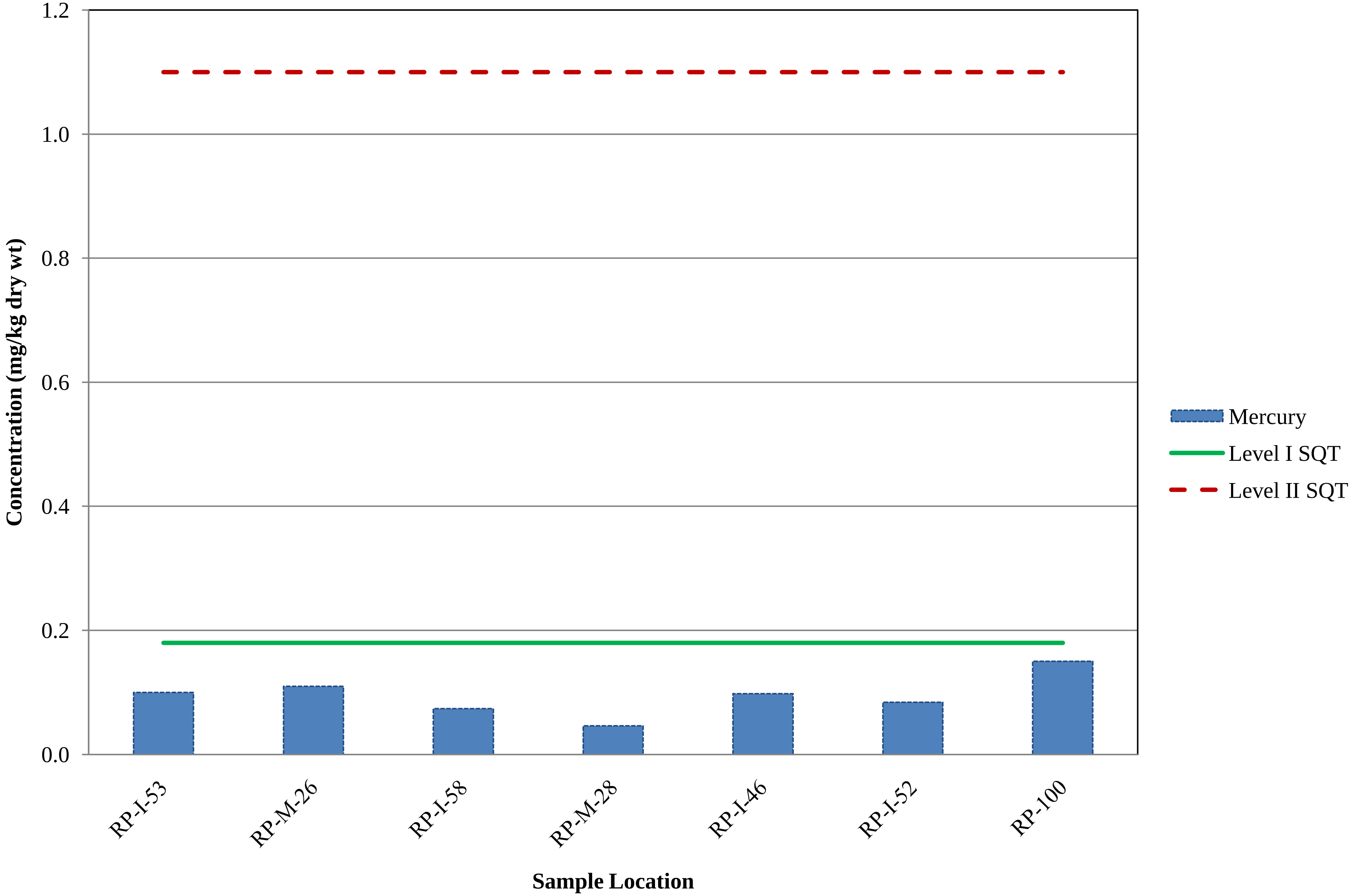


**Figure 8.18-g**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Nickel**

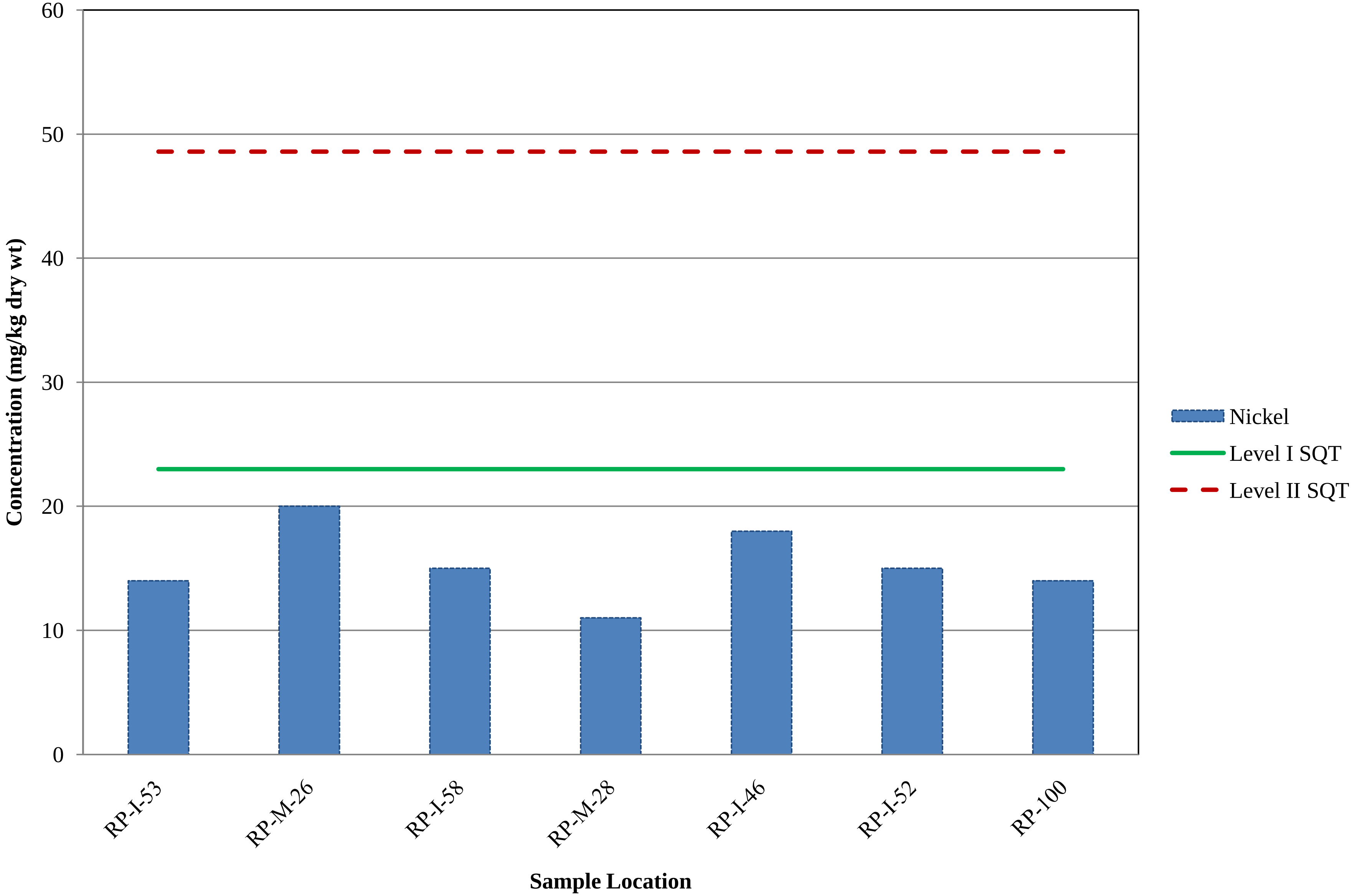


**Figure 8.18-h**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Zinc**

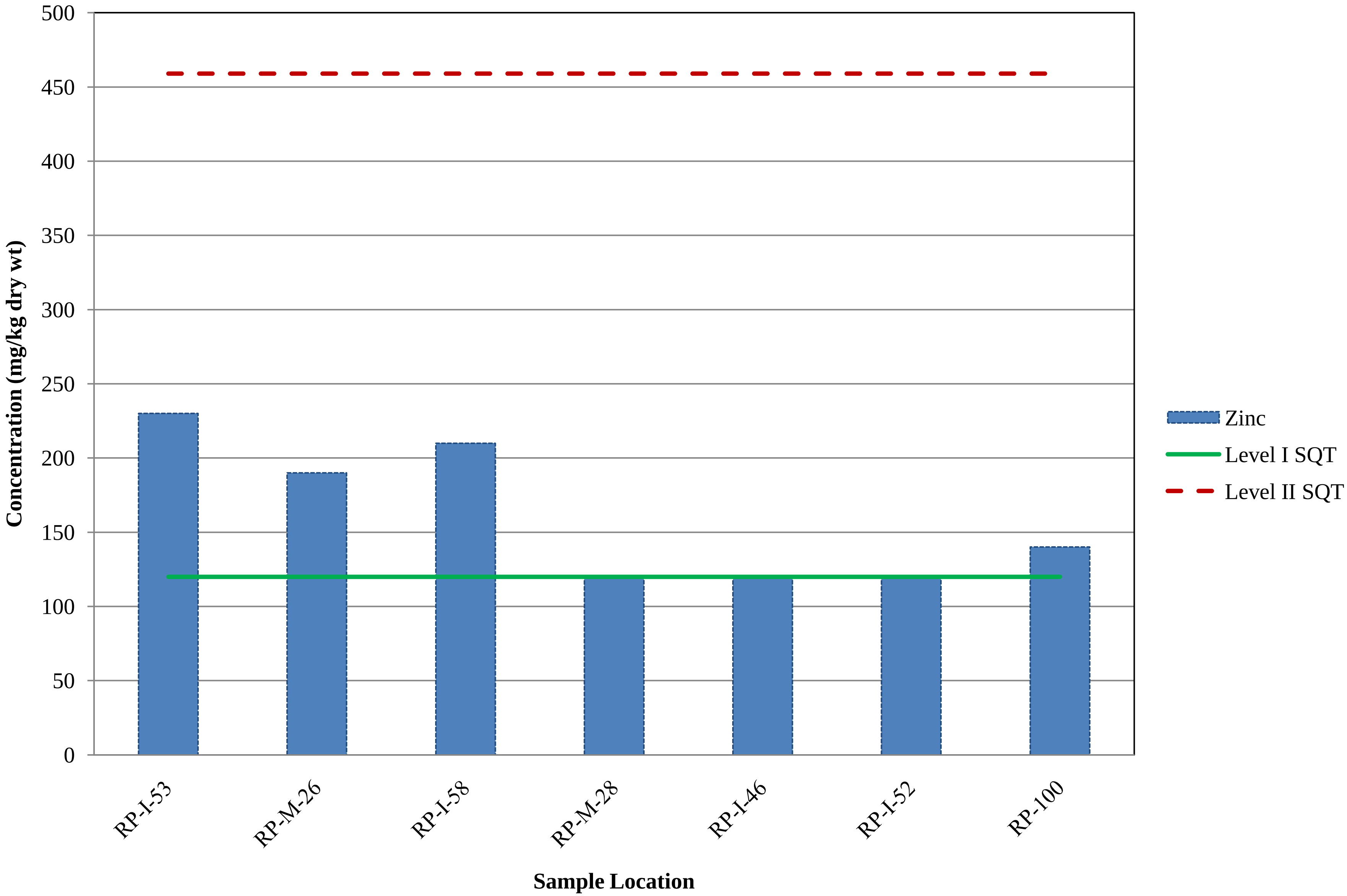
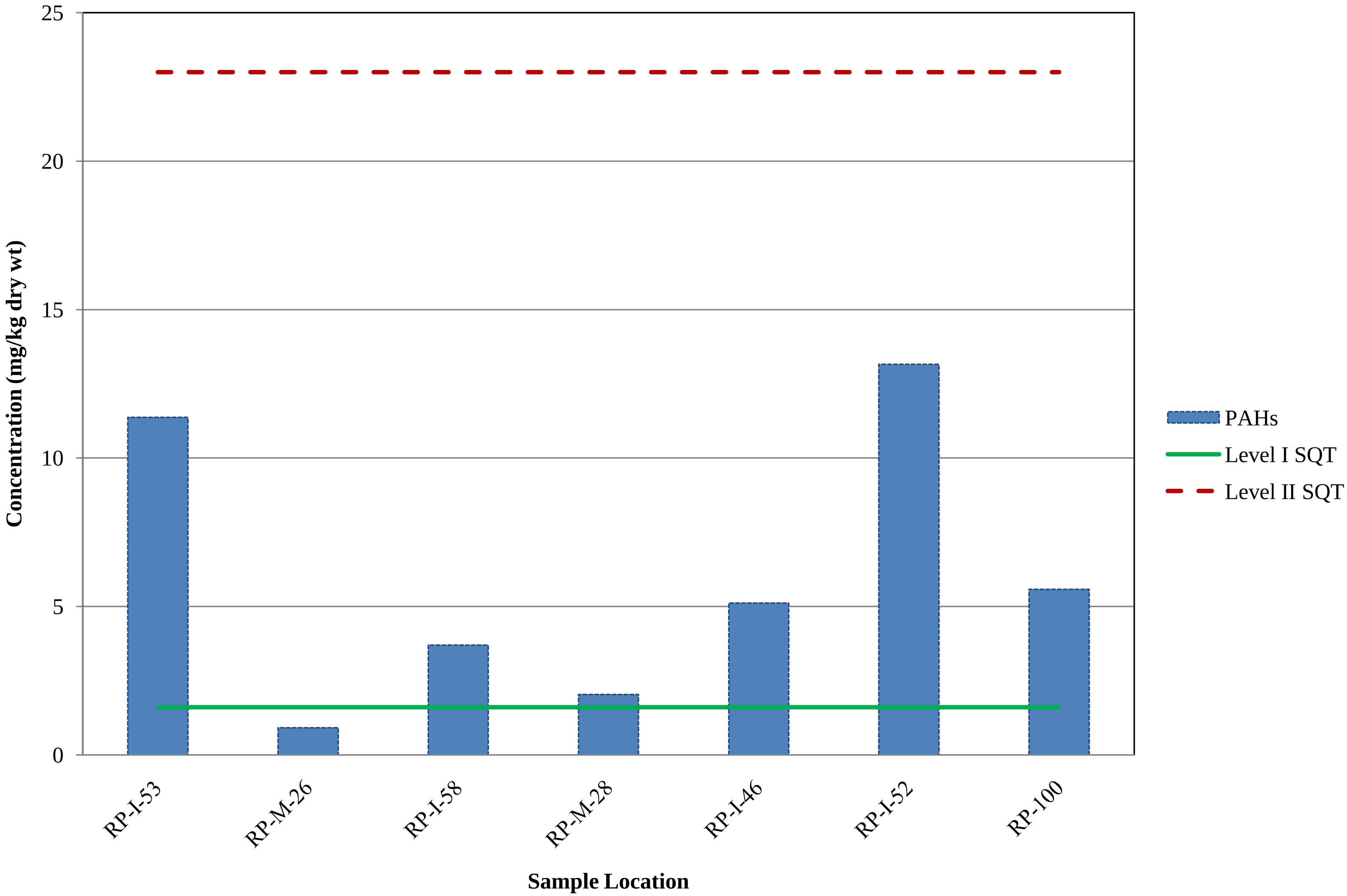


**Figure 8.18-i**
**Azcon Slip (Top of Sediment, 0-0.5 ft) PAHs**



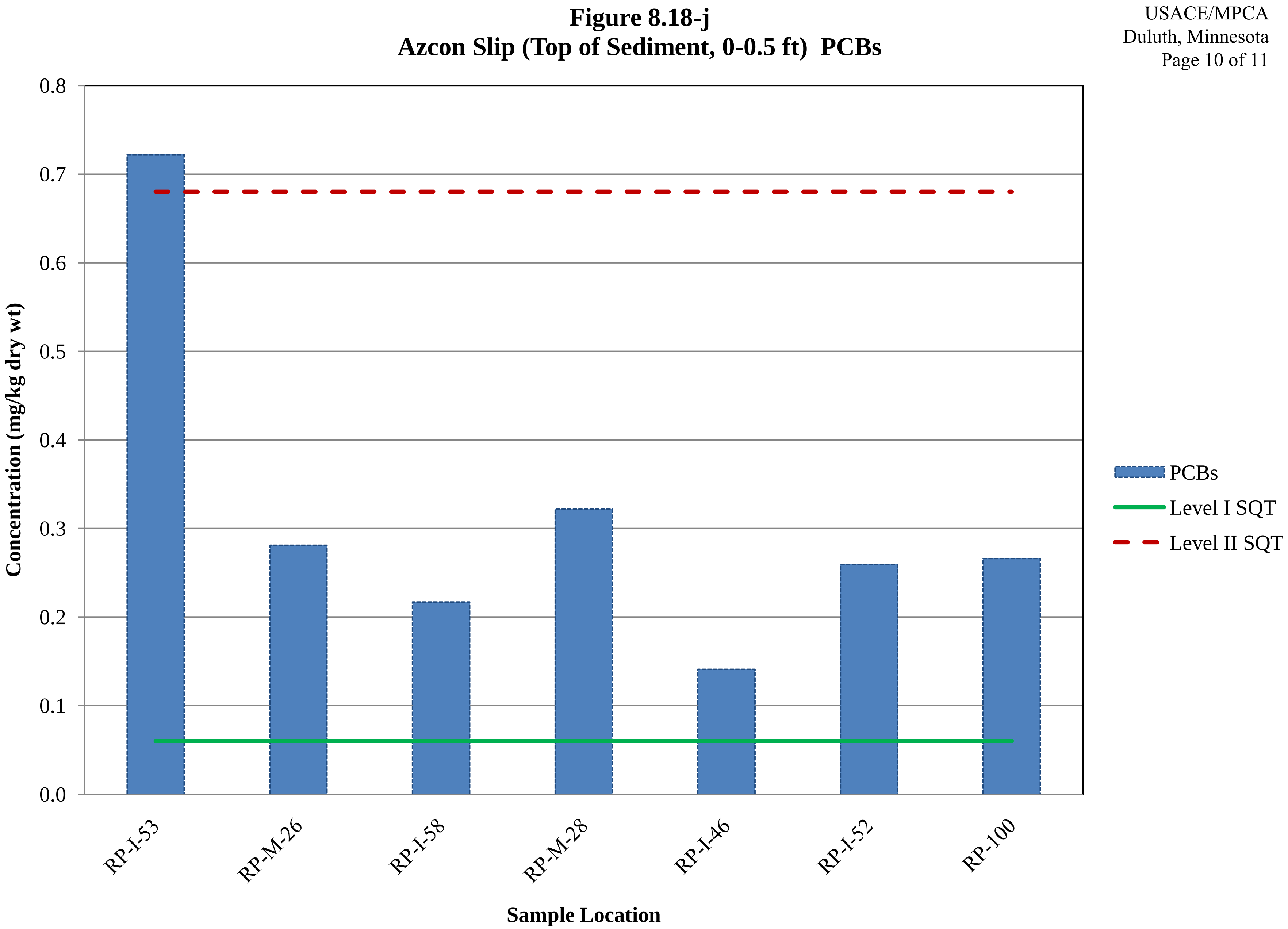


Figure 8.18-j
Azcon Slip (Top of Sediment, 0-0.5 ft) PCBs
Concentration (mg/kg dry wt)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
RP-I-53
RP-M-26
RP-I-58
RP-M-28
RP-I-46
RP-I-52
RP-100
Sample Location
PCBs
Level I SQT
Level II SQT

**Figure 18-k**
**Azcon Slip (Top of Sediment, 0-0.5 ft) - Dioxins**

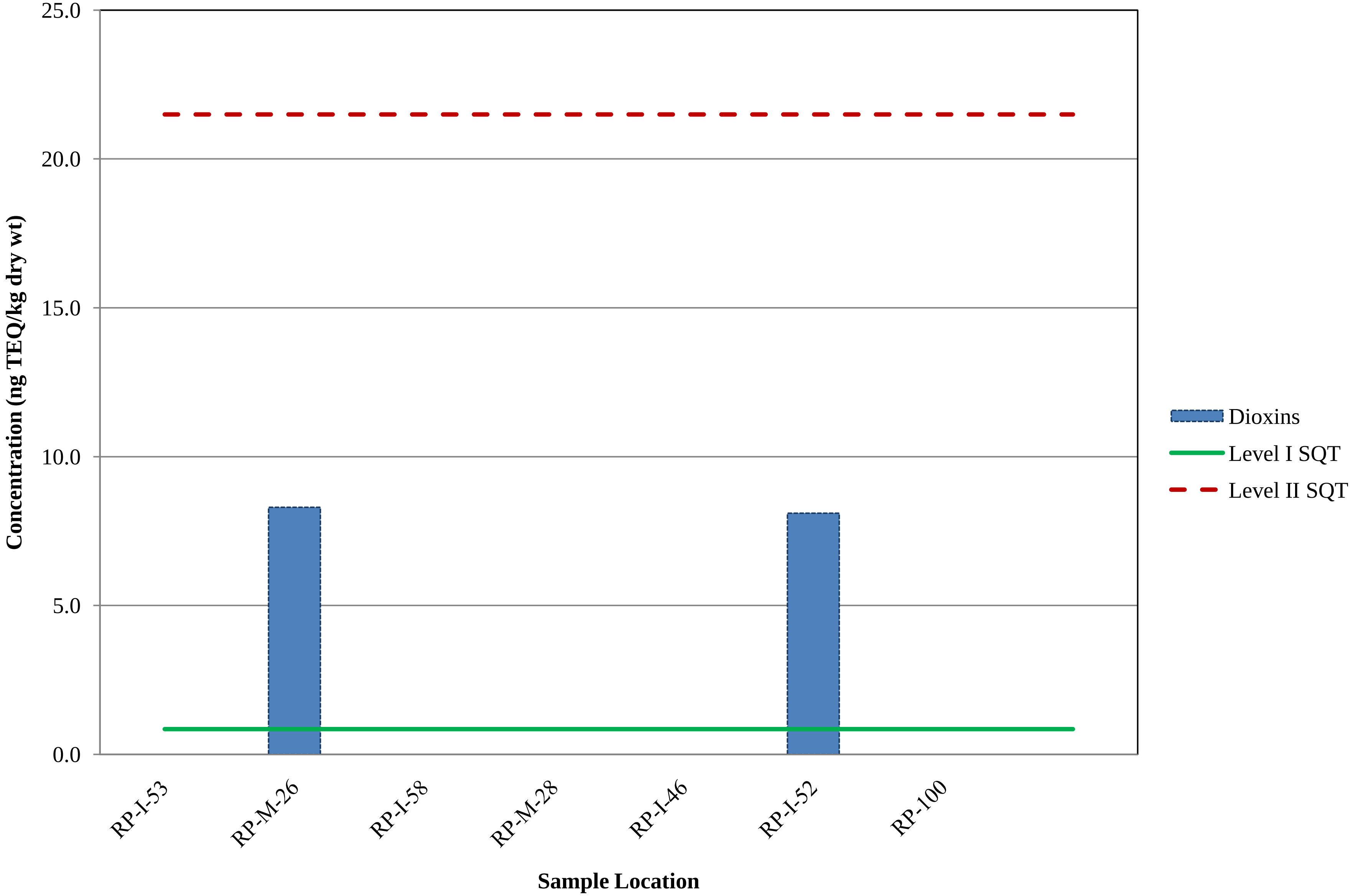


**Figure 8.19-a**
**Boat Landing (Top of Sediment, 0-0.5 ft) - Arsenic**

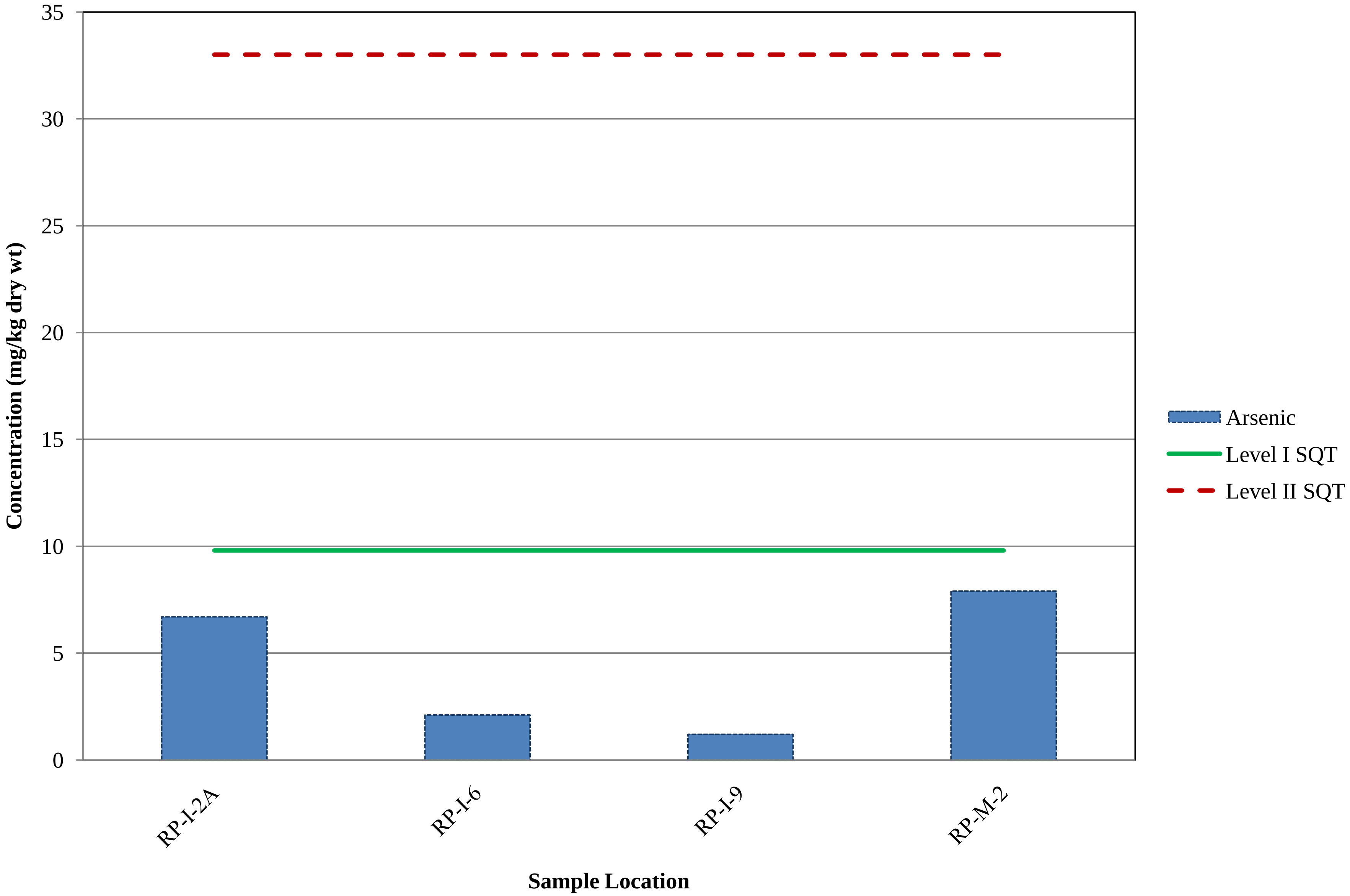


**Figure 8.19-b**
**Boat landing (Top of Sediment, 0-0.5 ft) - Cadmium**

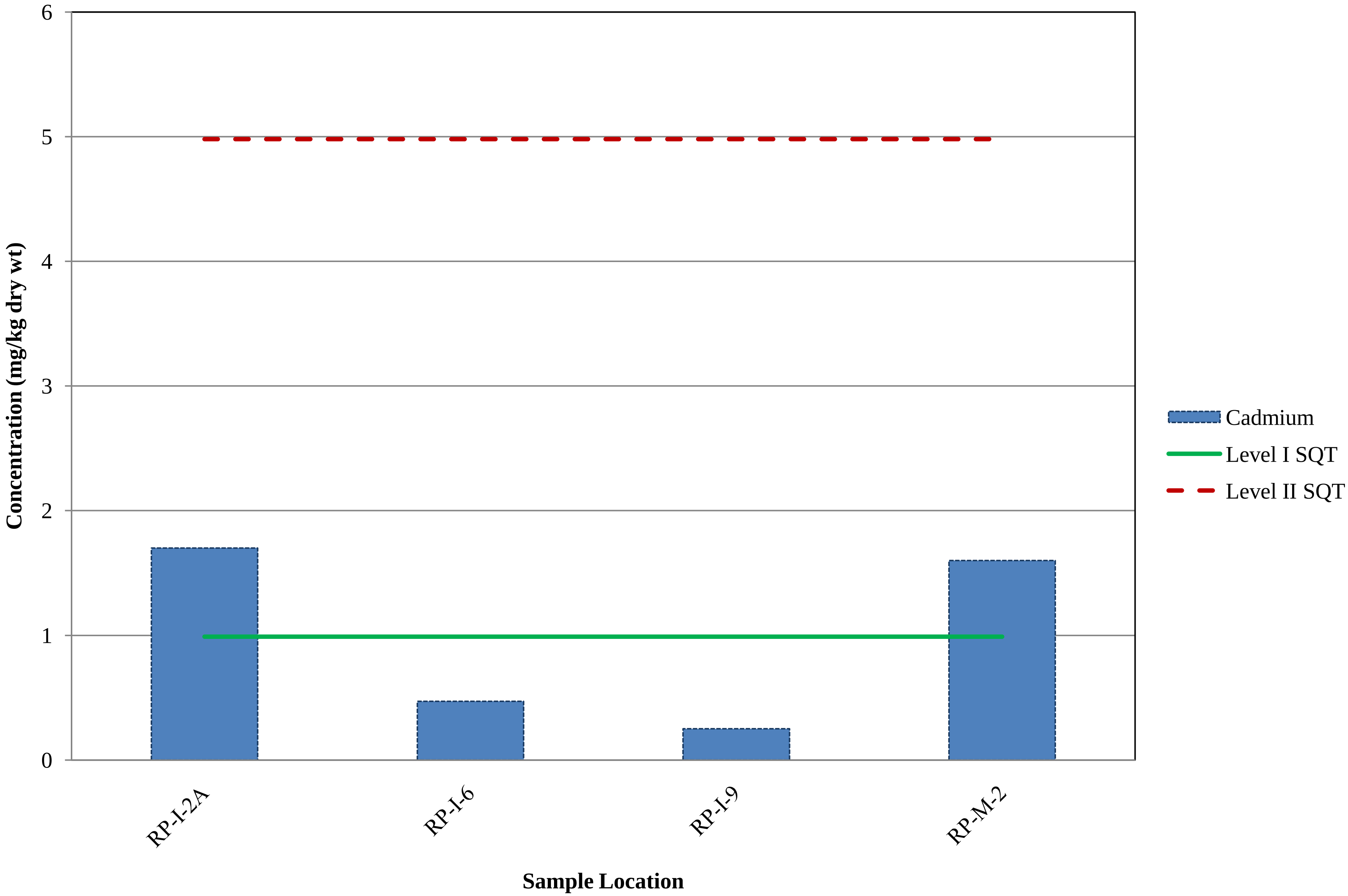


**Figure 8.19-c**
**Boat landing (Top of Sediment, 0-0.5 ft) - Chromium**

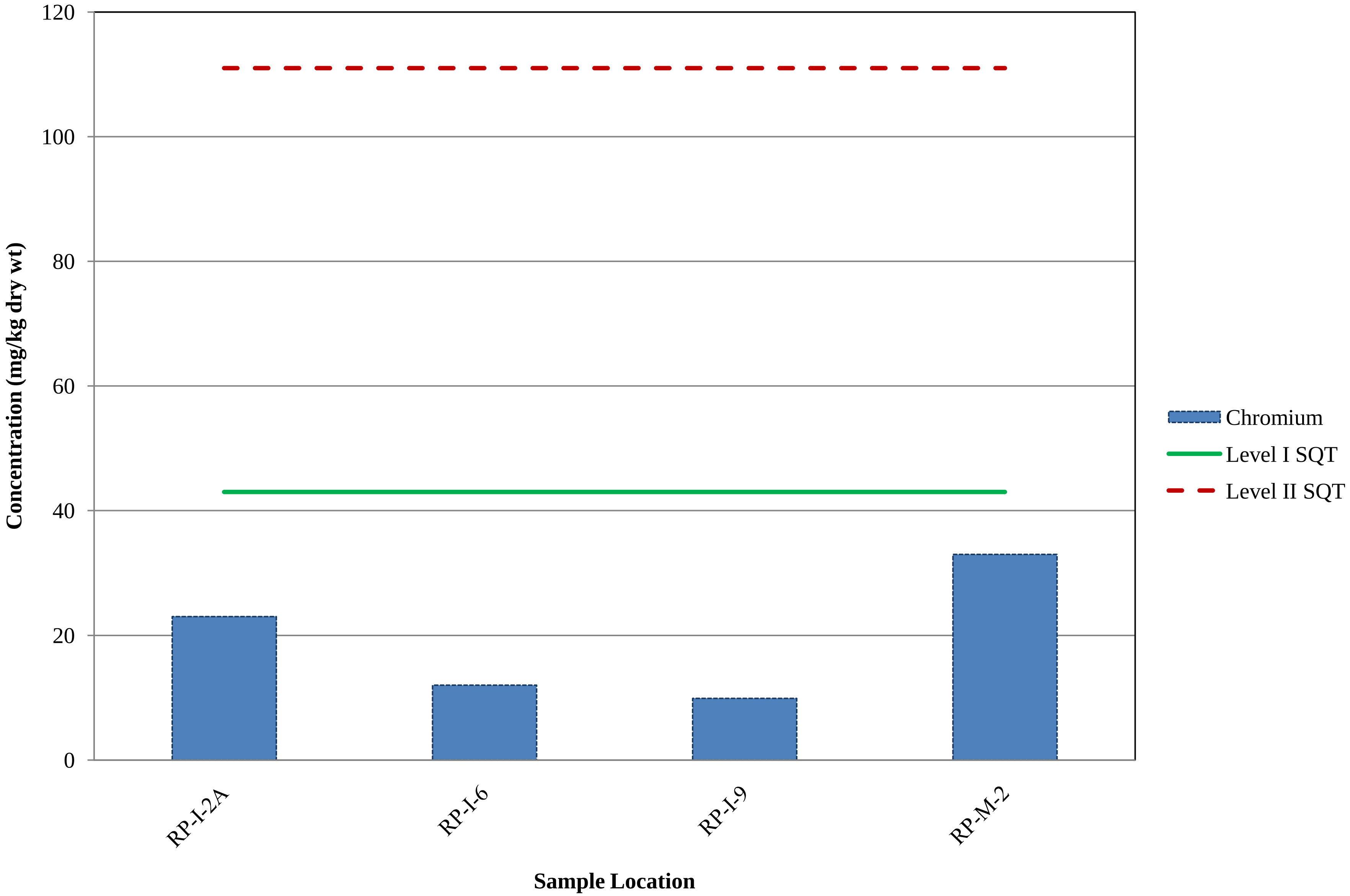


**Figure 8.19-d**
**Boat Landing (Top of Sediment, 0-0.5 ft) - Copper**

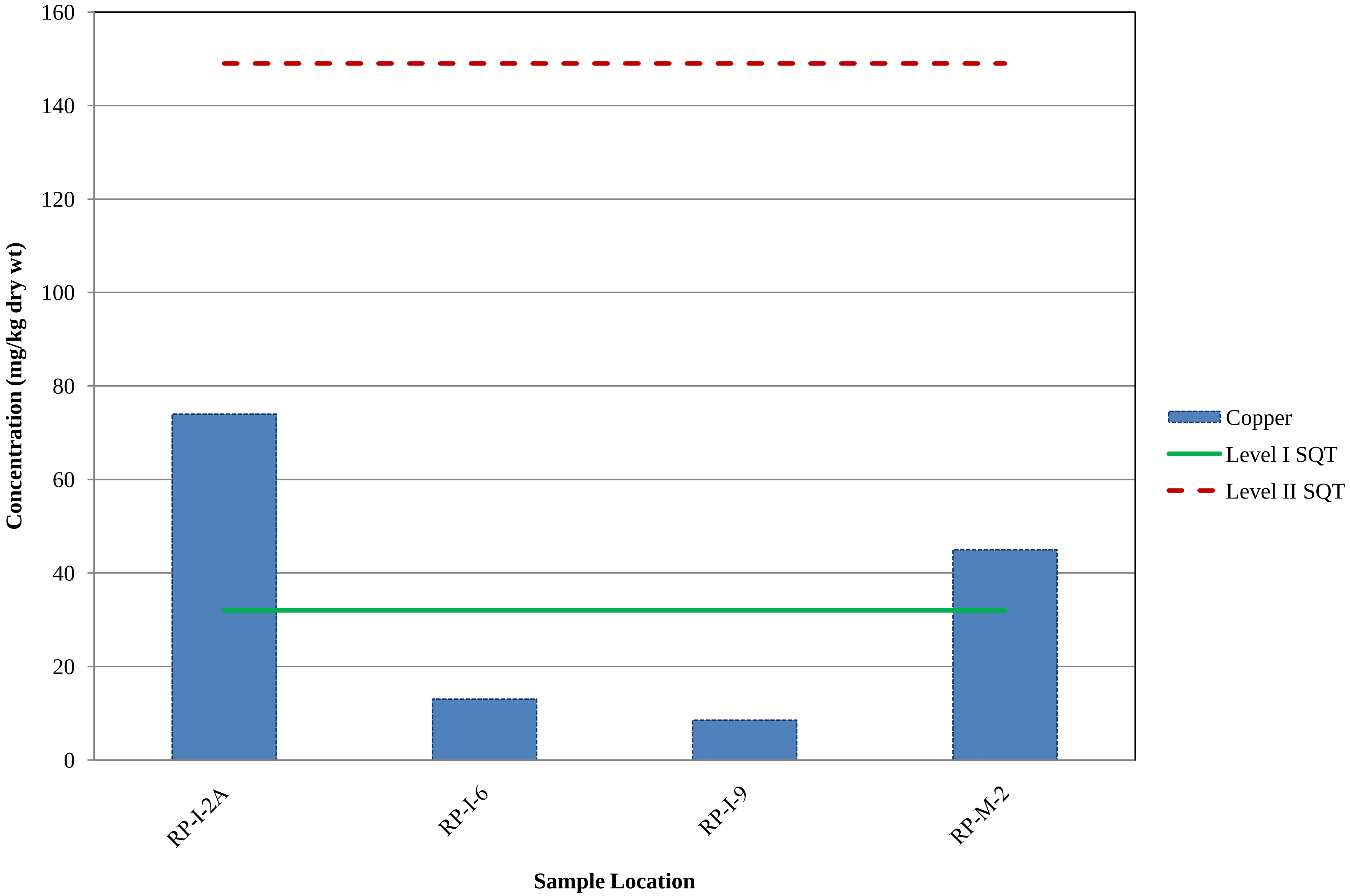


**Figure 8.19-e**
**Boat landing (Top of Sediment, 0-0.5 ft) - Lead**

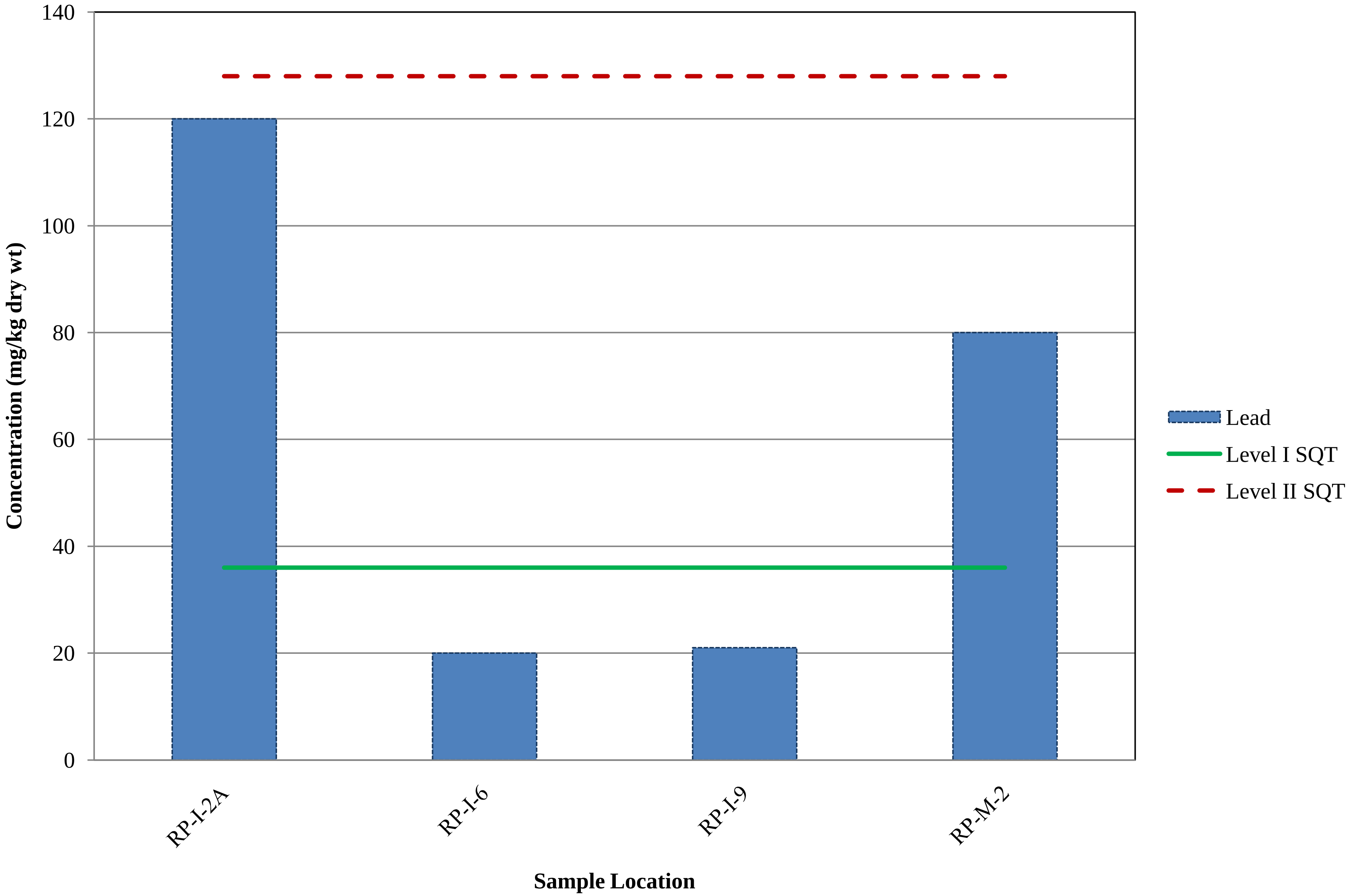


**Figure 8.19-f**
**Boat Landing (Top of Sediment, 0-0.5 ft) - Mercury**

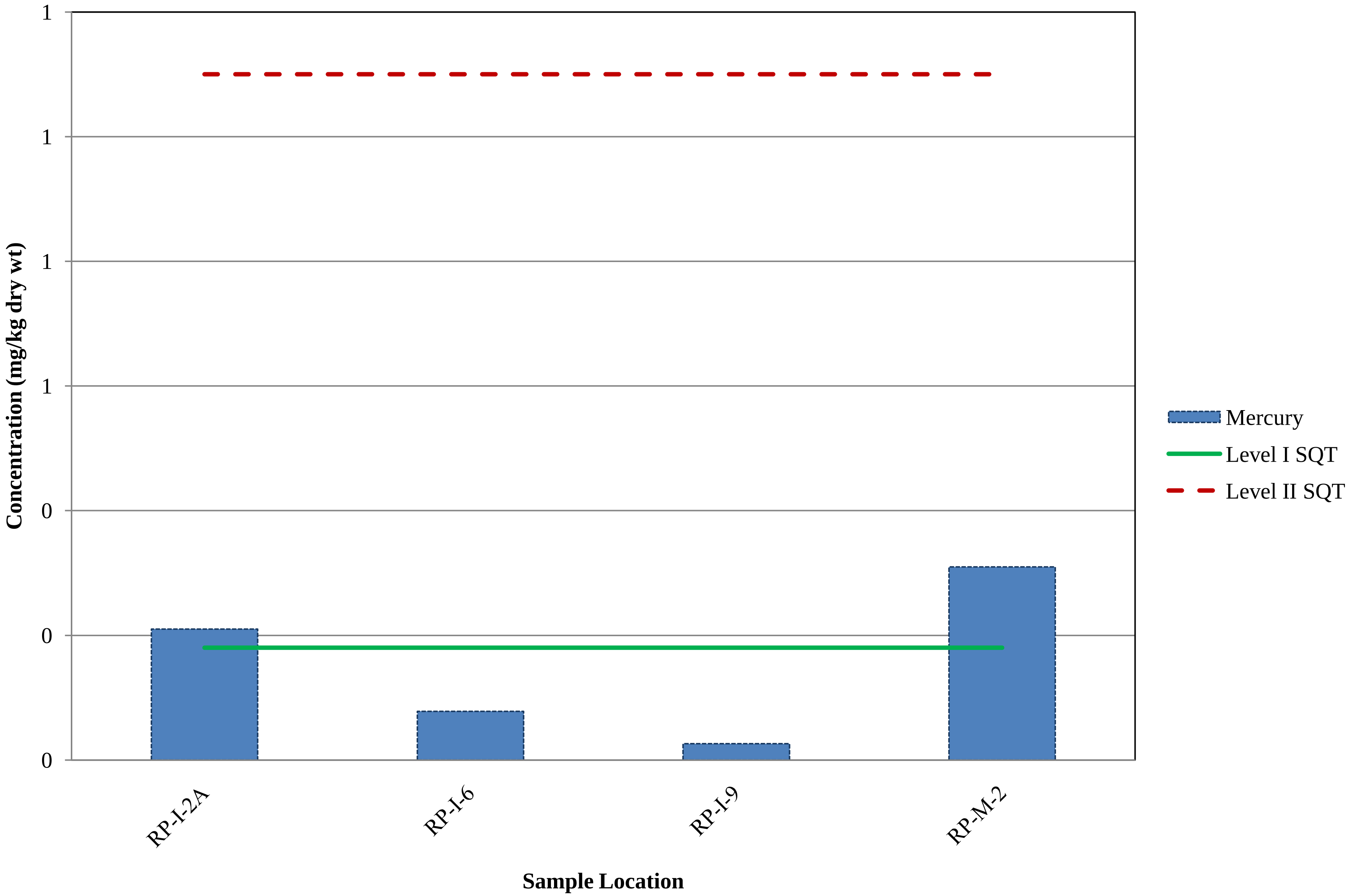
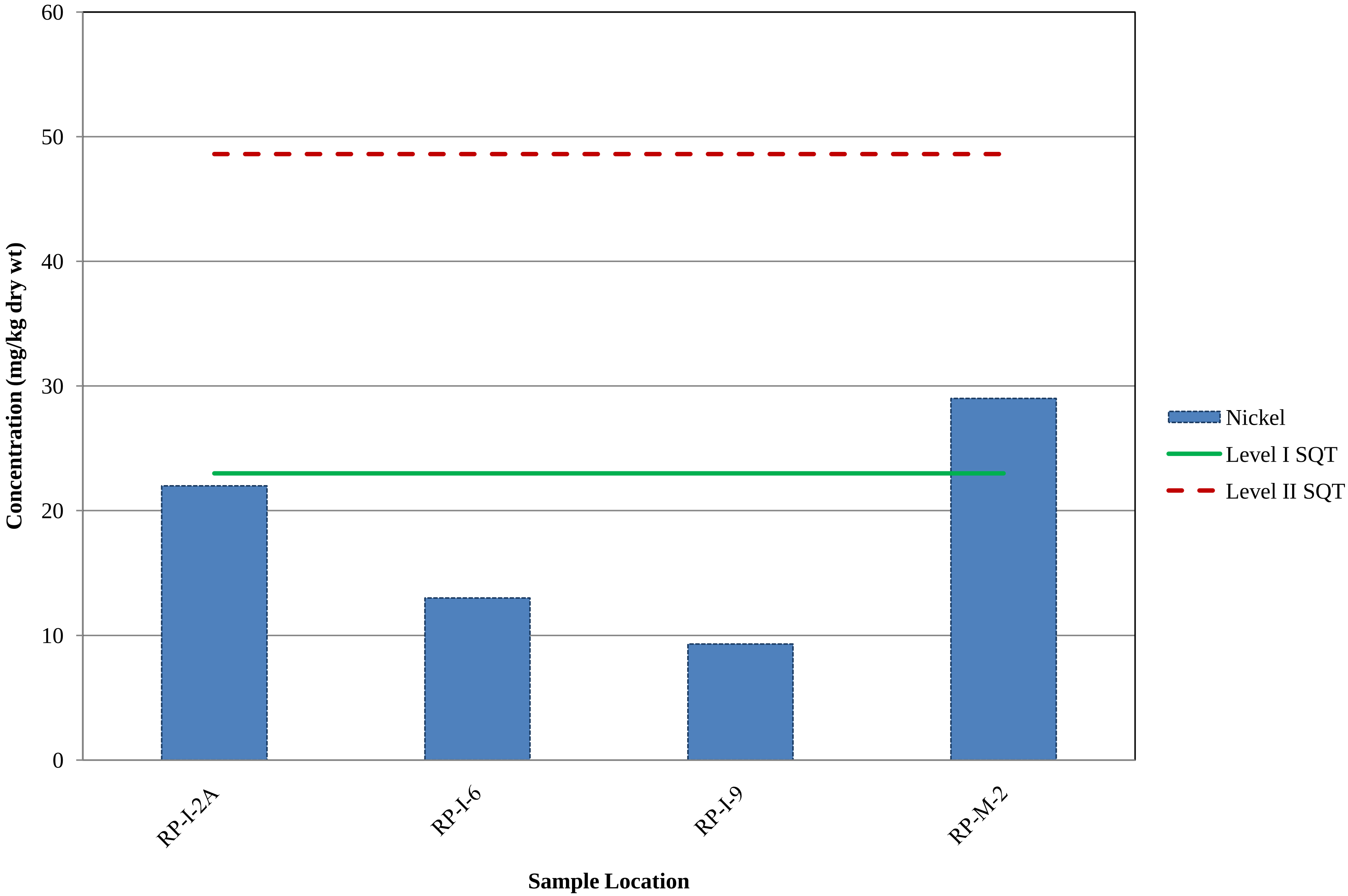


**Figure 8.19-g**
**Boat landing (Top of Sediment, 0-0.5 ft) - Nickel**



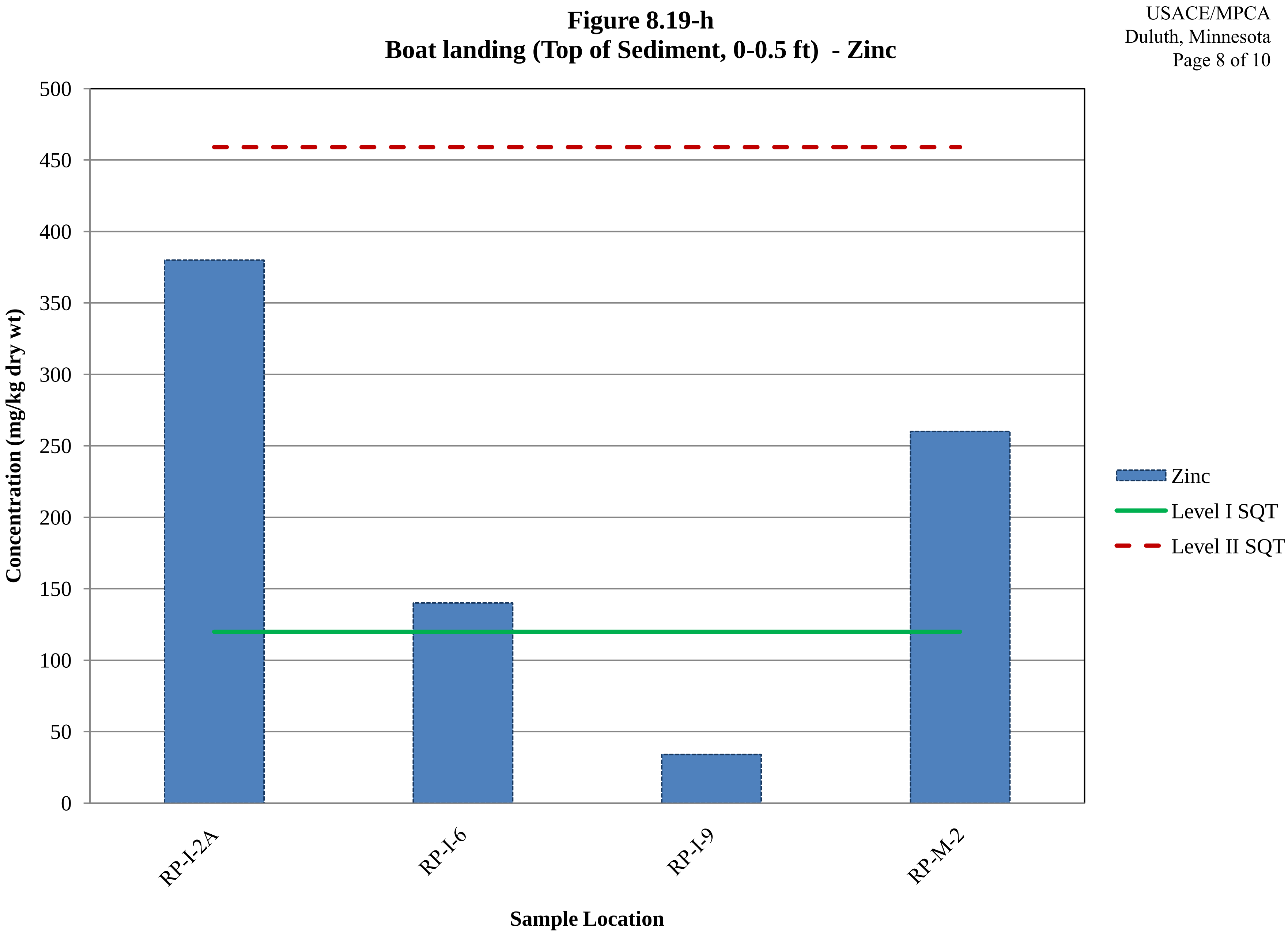


Figure 8.19-h
Boat landing (Top of Sediment, 0-0.5 ft) - Zinc
Concentration (mg/kg dry wt)
500
450
400
350
300
250
200
150
100
50
0
RP-I-2A
RP-I-6
RP-I-9
RP-M-2
Sample Location
Zinc
Level I SQT
Level II SQT

**Figure 8.18-i**
**Boat Landing (Top of Sediment, 0-0.5 ft) - PAHs**

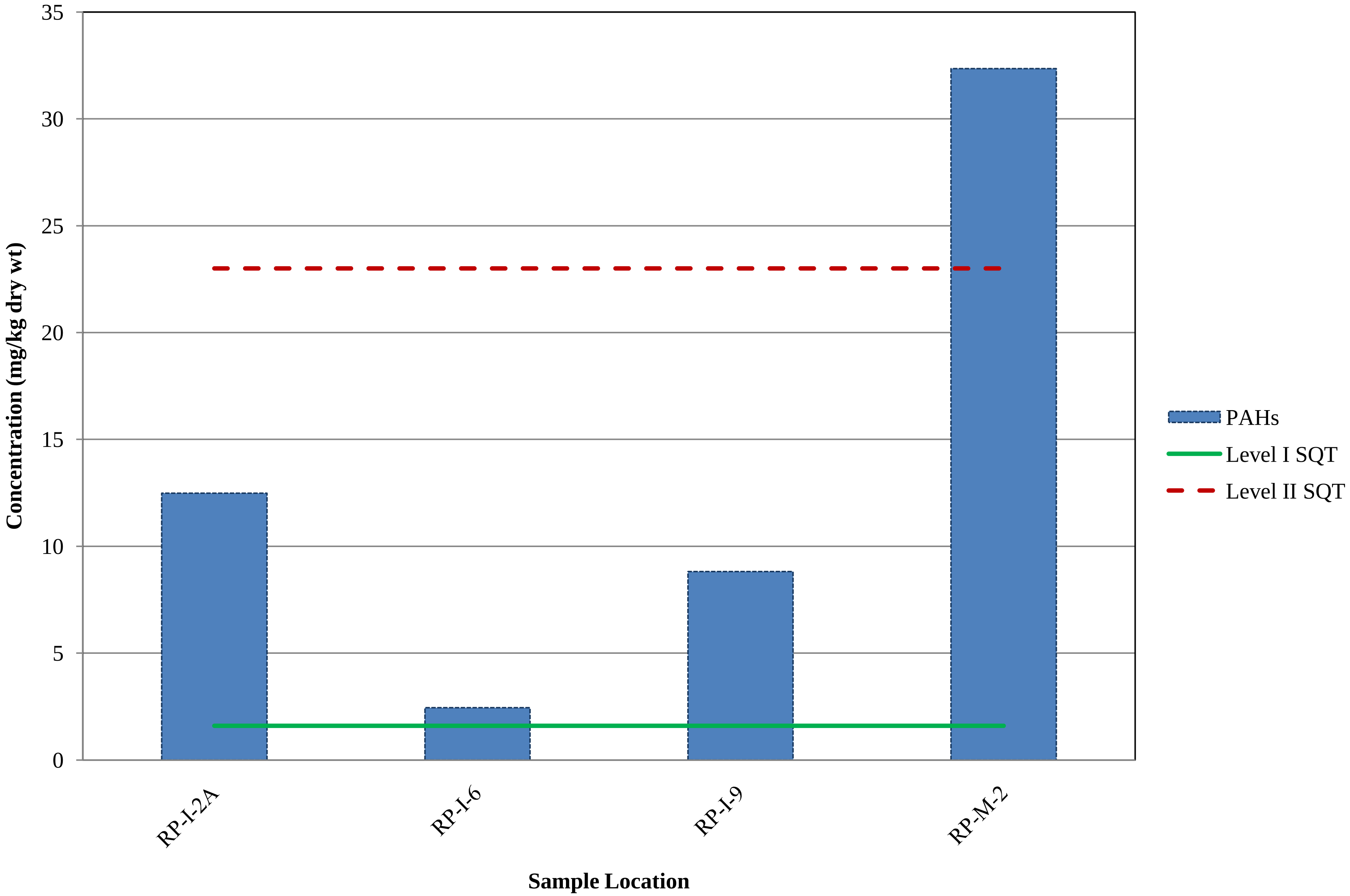
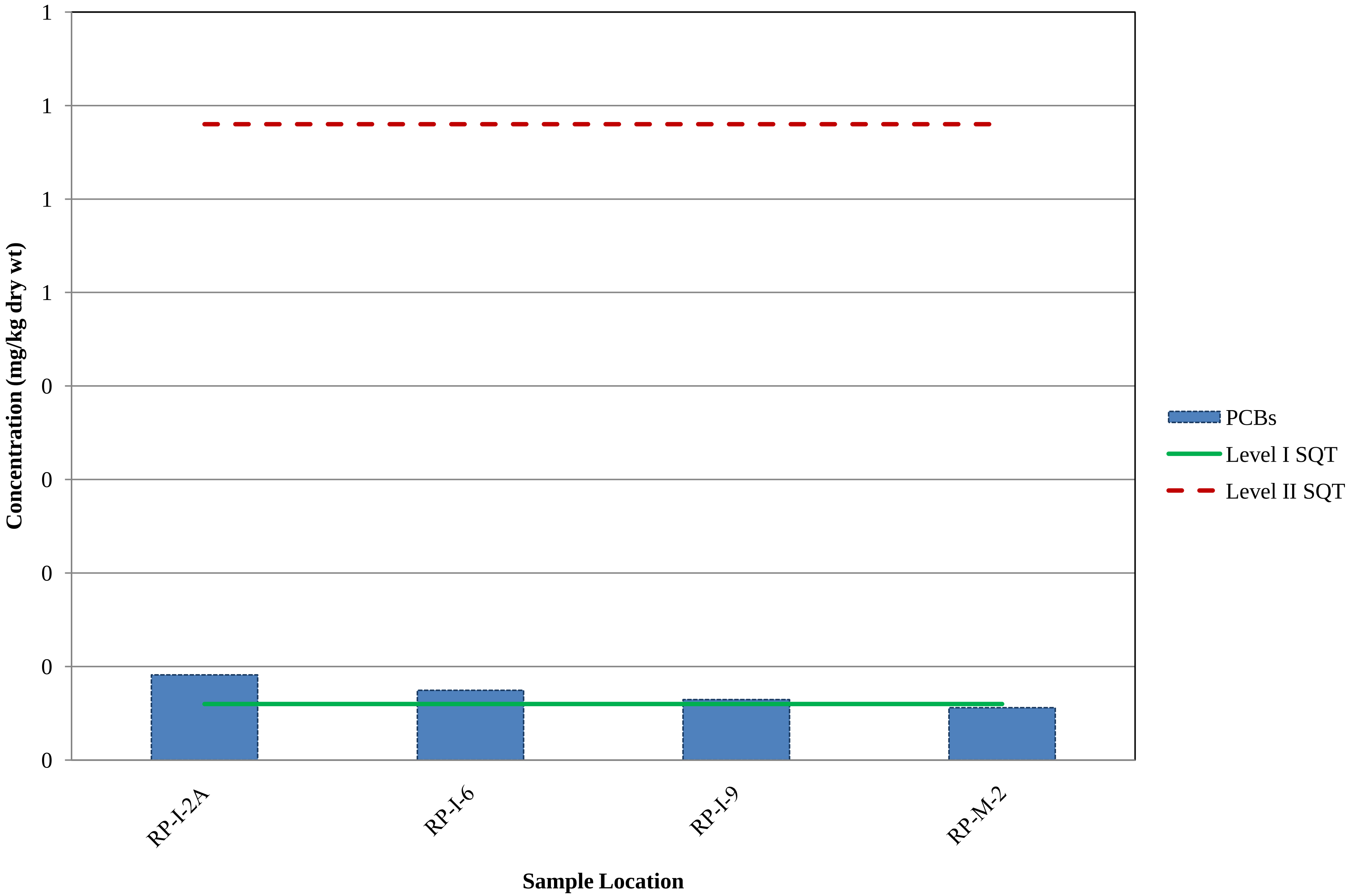


**Figure 8.19-j**
**Boat Landing (Top of Sediment, 0-0.5 ft) - PCBs**



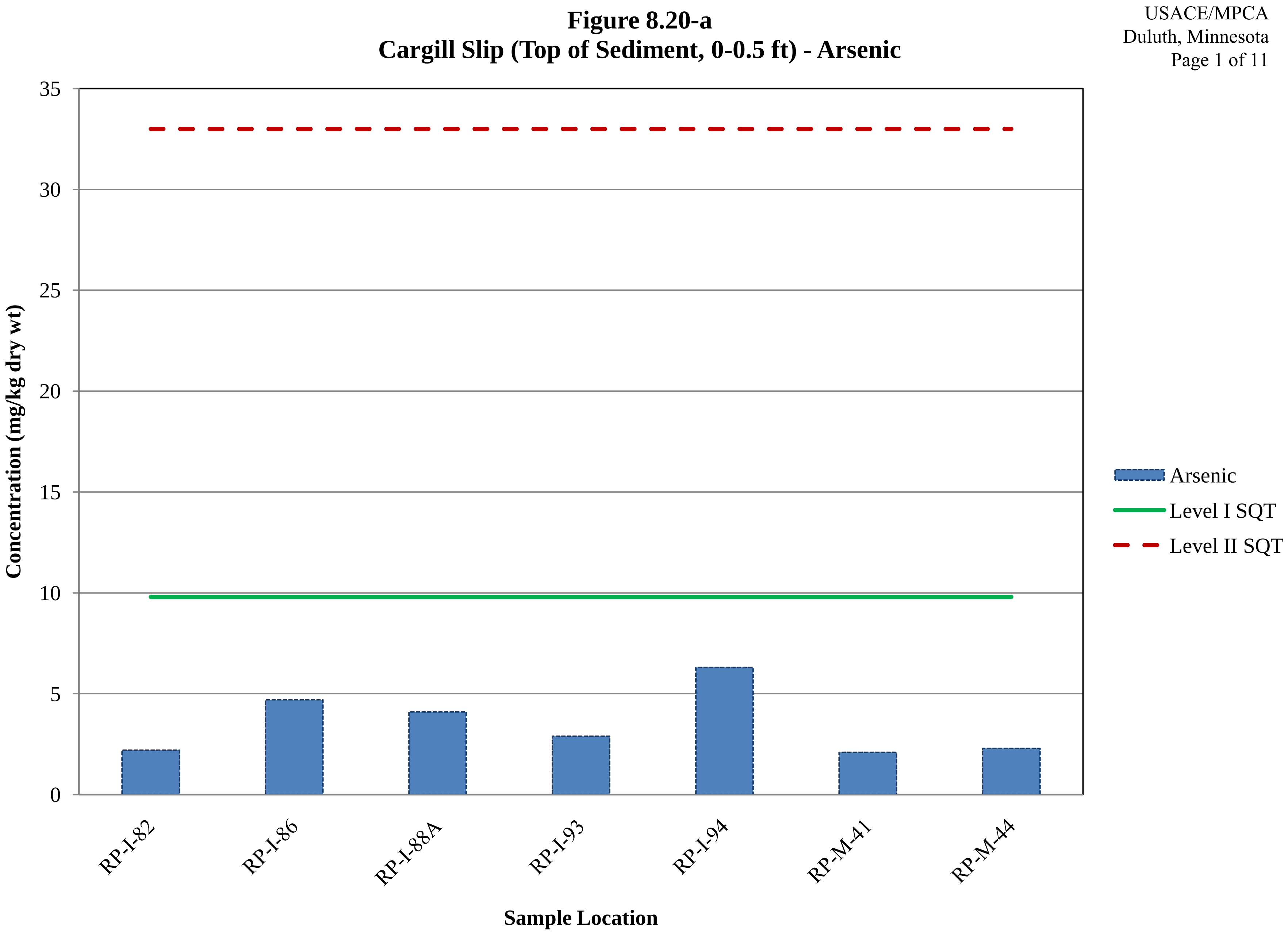


Figure 8.20-a
Cargill Slip (Top of Sediment, 0-0.5 ft) - Arsenic
Concentration (mg/kg dry wt)
35
30
25
20
15
10
5
0
RP-I-82
RP-I-86
RP-I-88A
RP-I-93
RP-I-94
RP-M-41
RP-M-44
Sample Location
Arsenic
Level I SQT
Level II SQT

**Figure 8.20-b**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Cadmium**

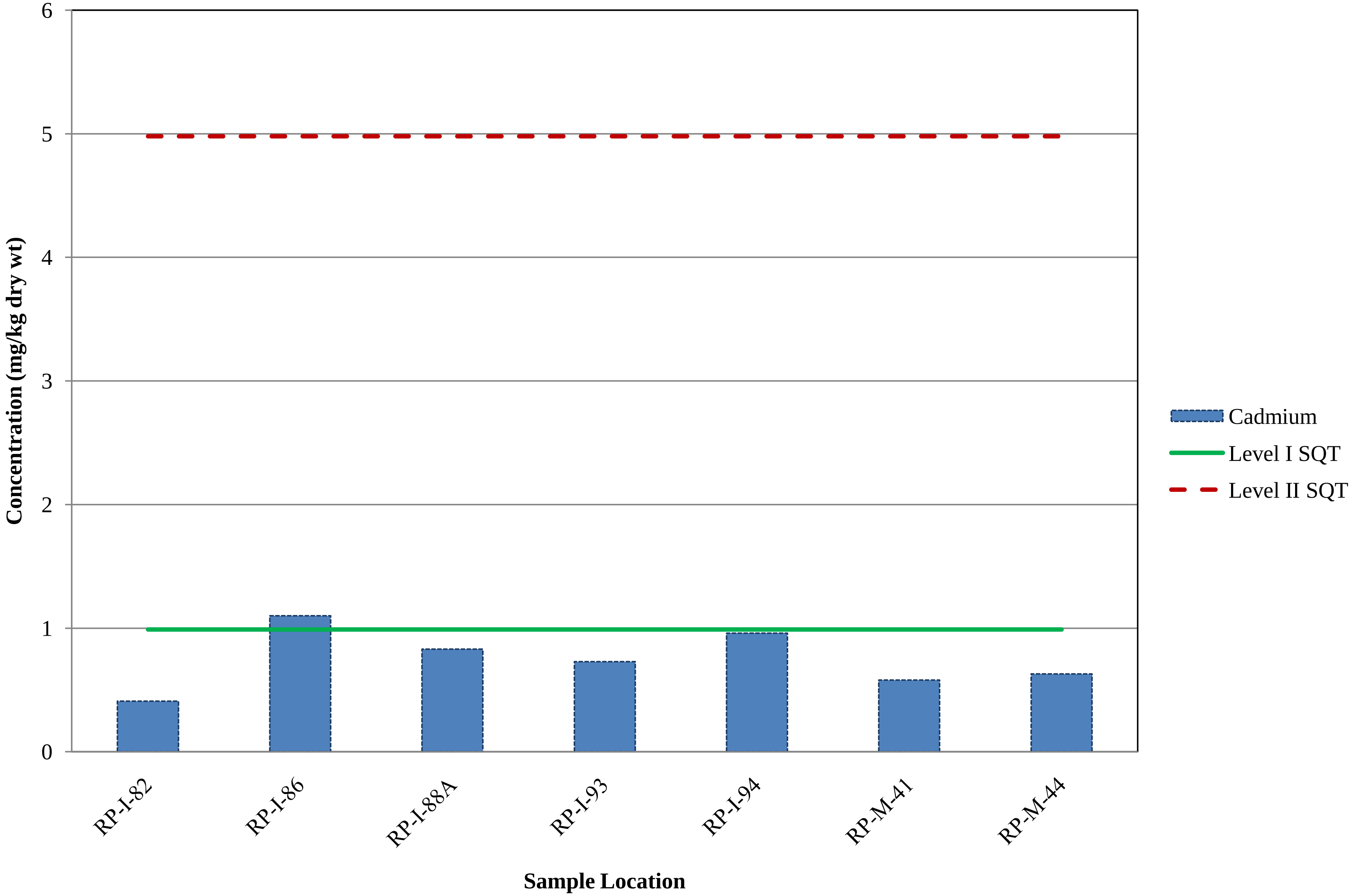


**Figure 20-c**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Chromium**

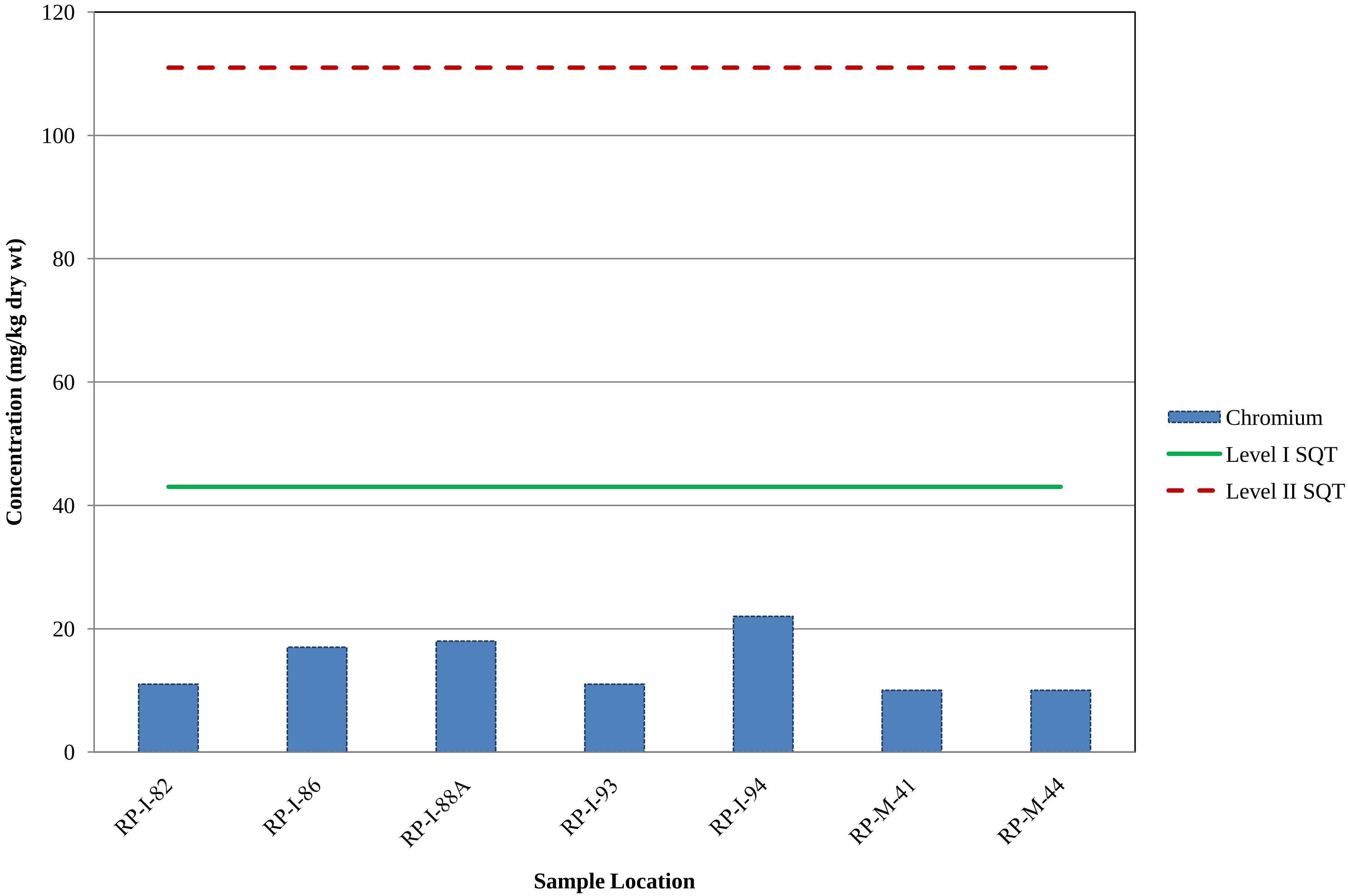


**Figure 8.20-d**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Copper**

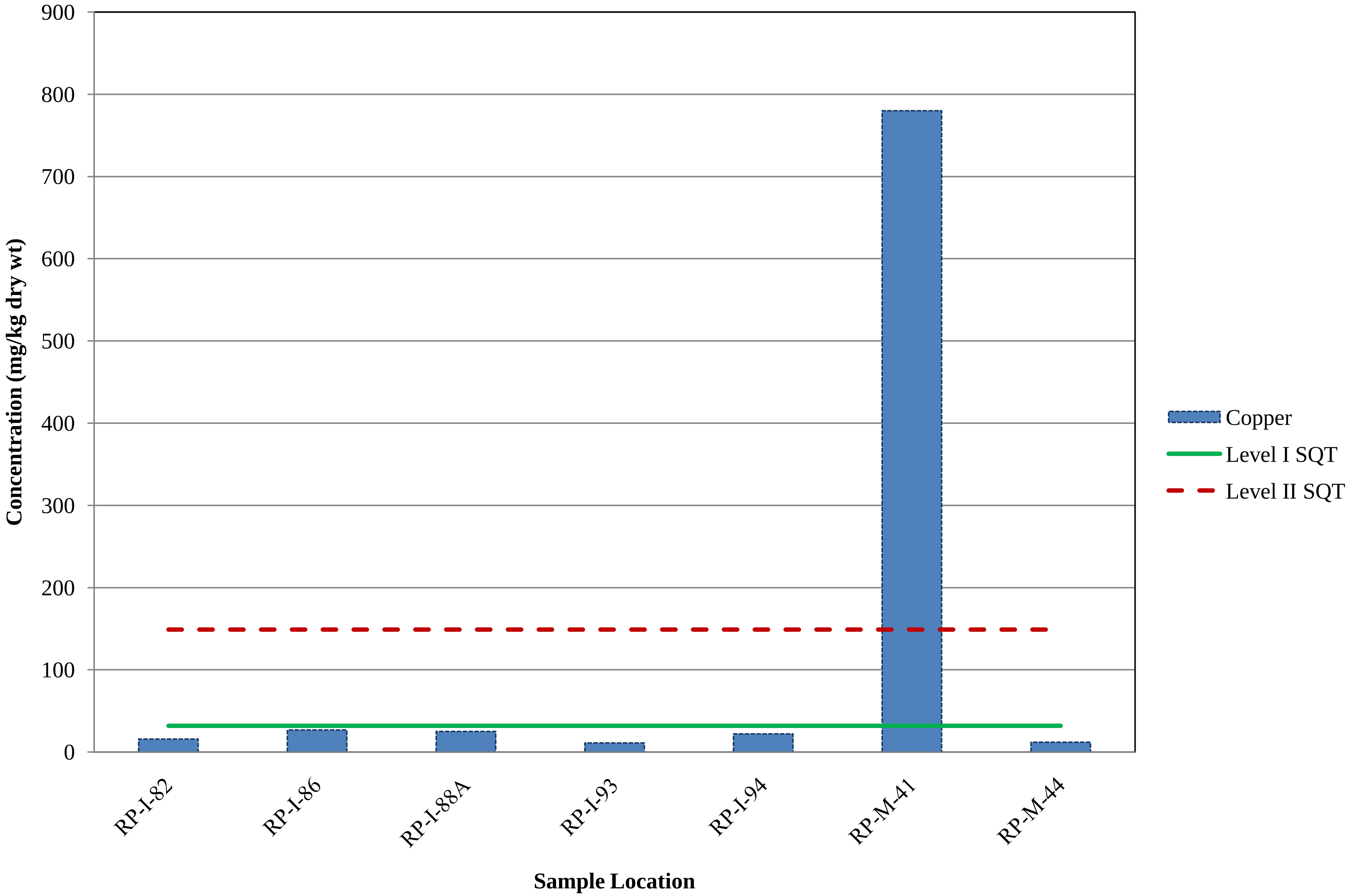


**Figure 8.20-e**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Lead**

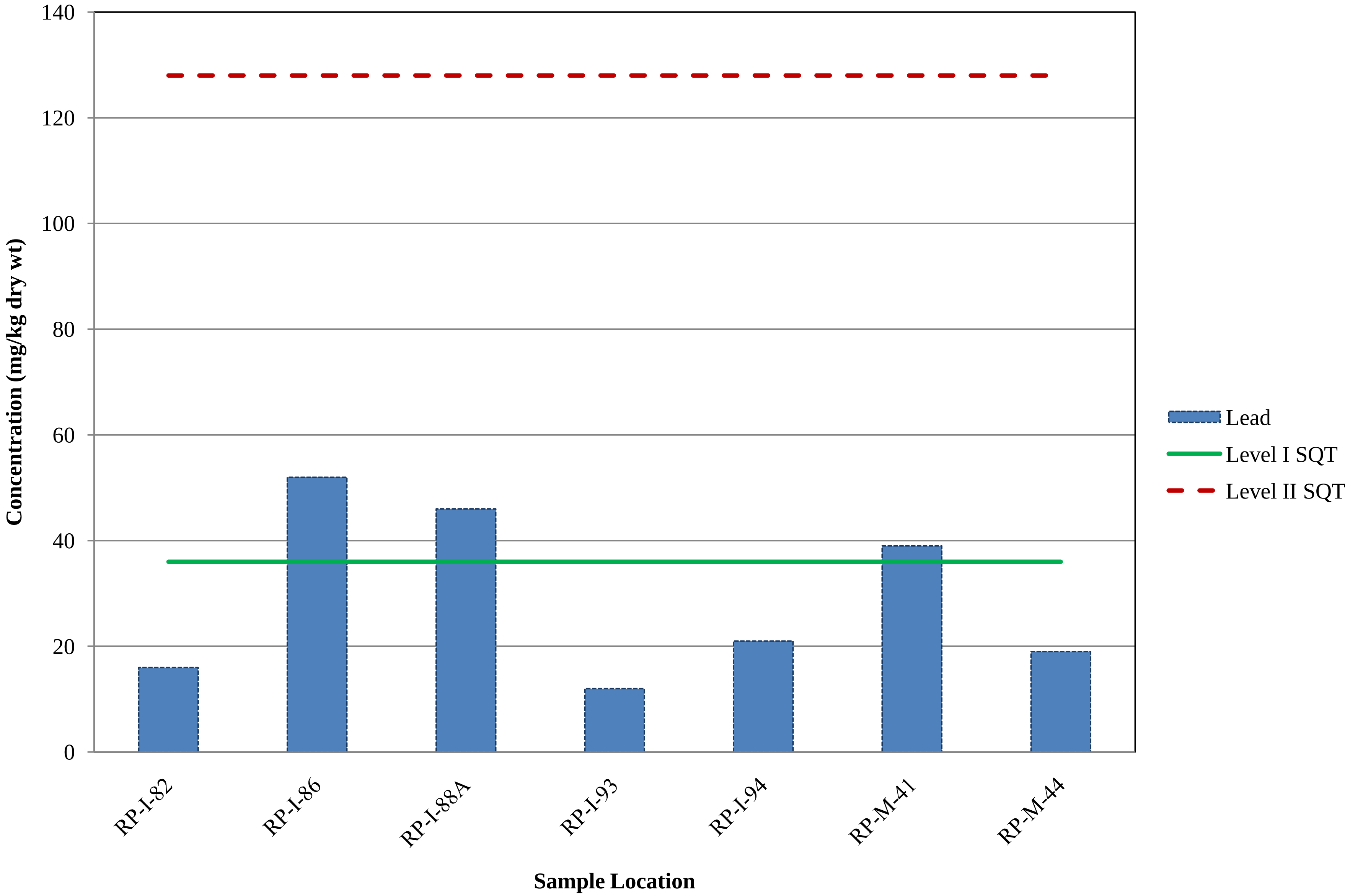


**Figure 8.20-f**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Mercury**

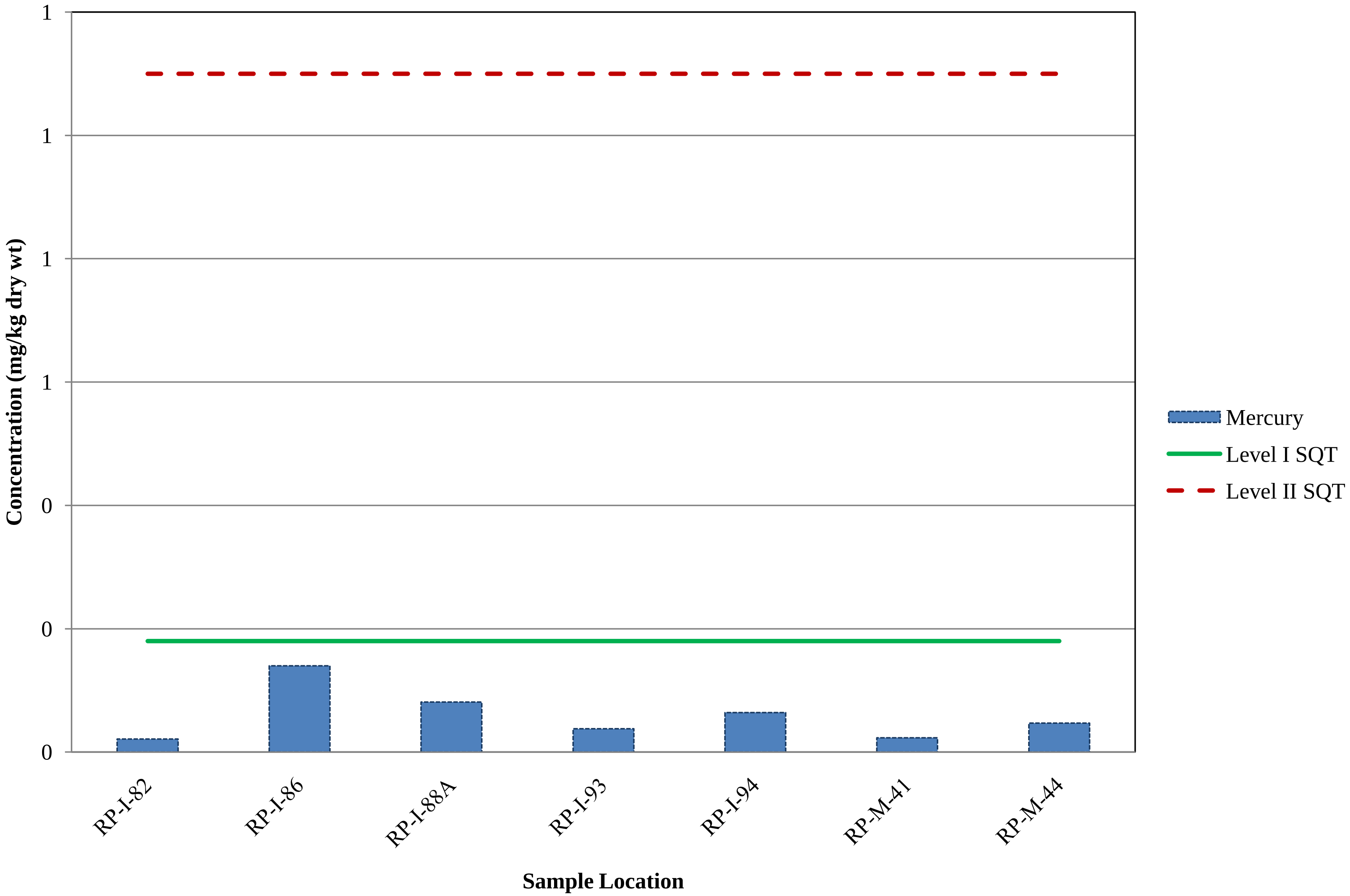


**Figure 8.20-g**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Nickel**

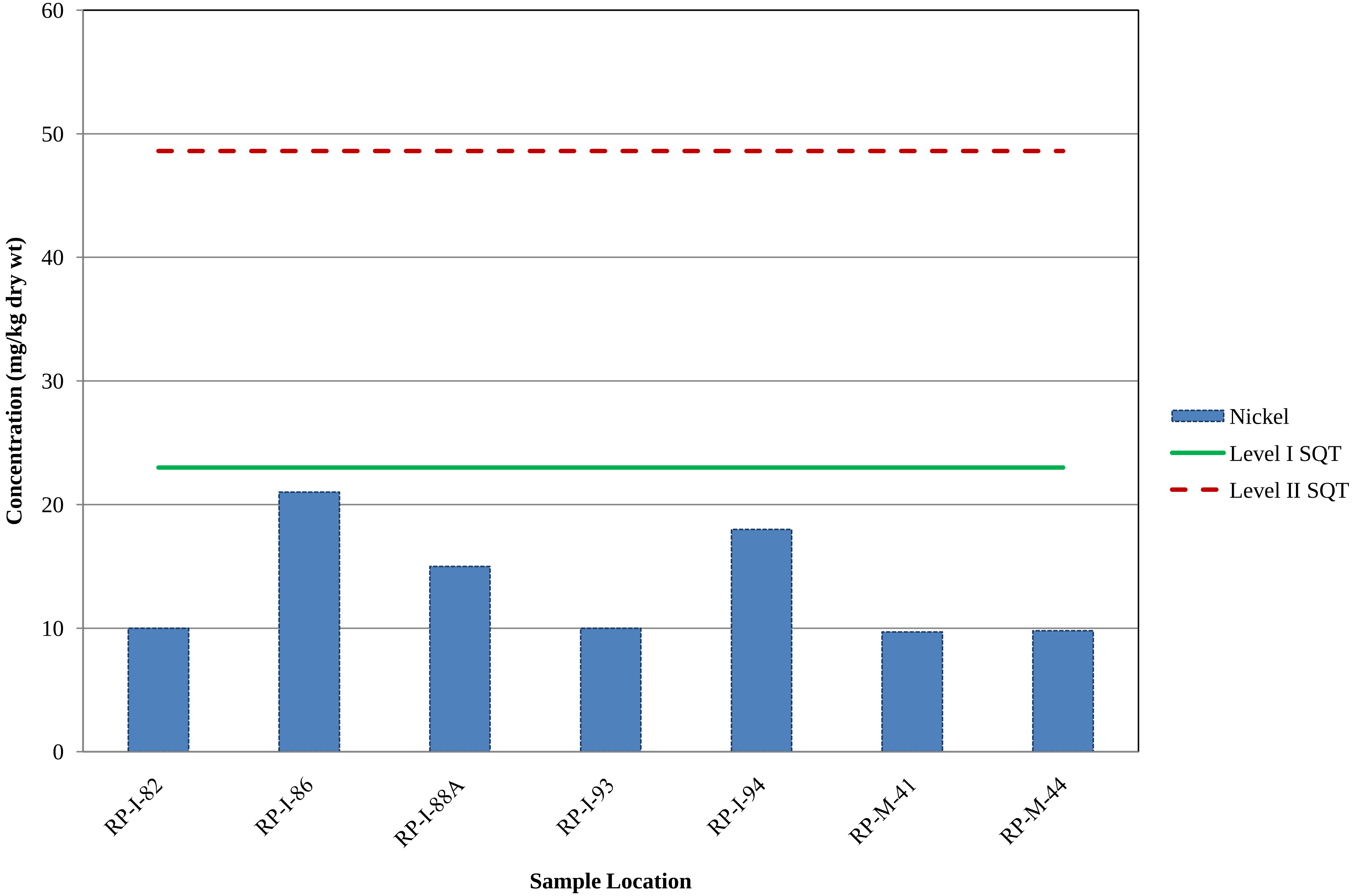


**Figure 8.20-h**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Zinc**

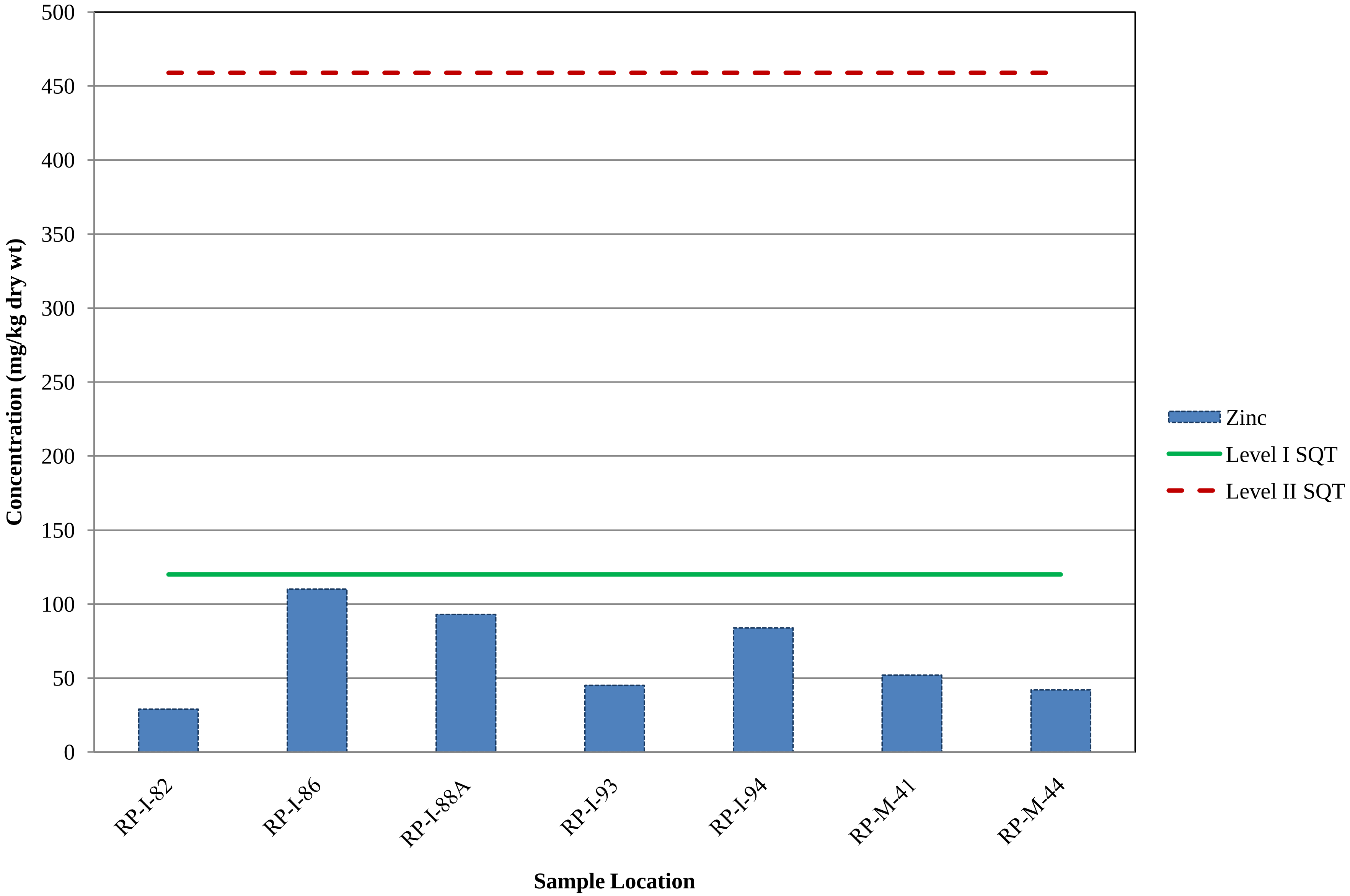


**Figure 8.20-i**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - PAHs**

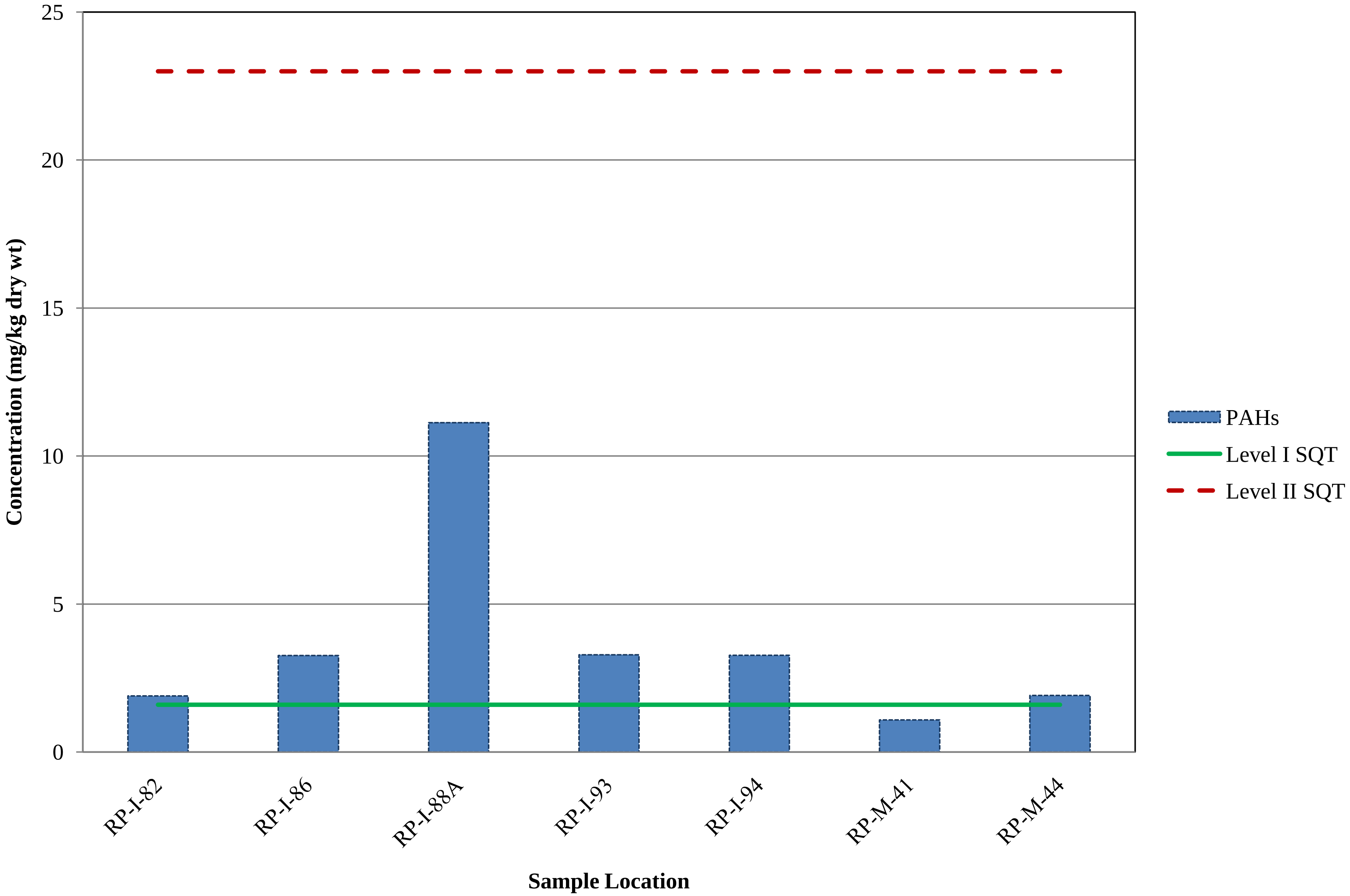


**Figure 8.20-j**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - PCBs**

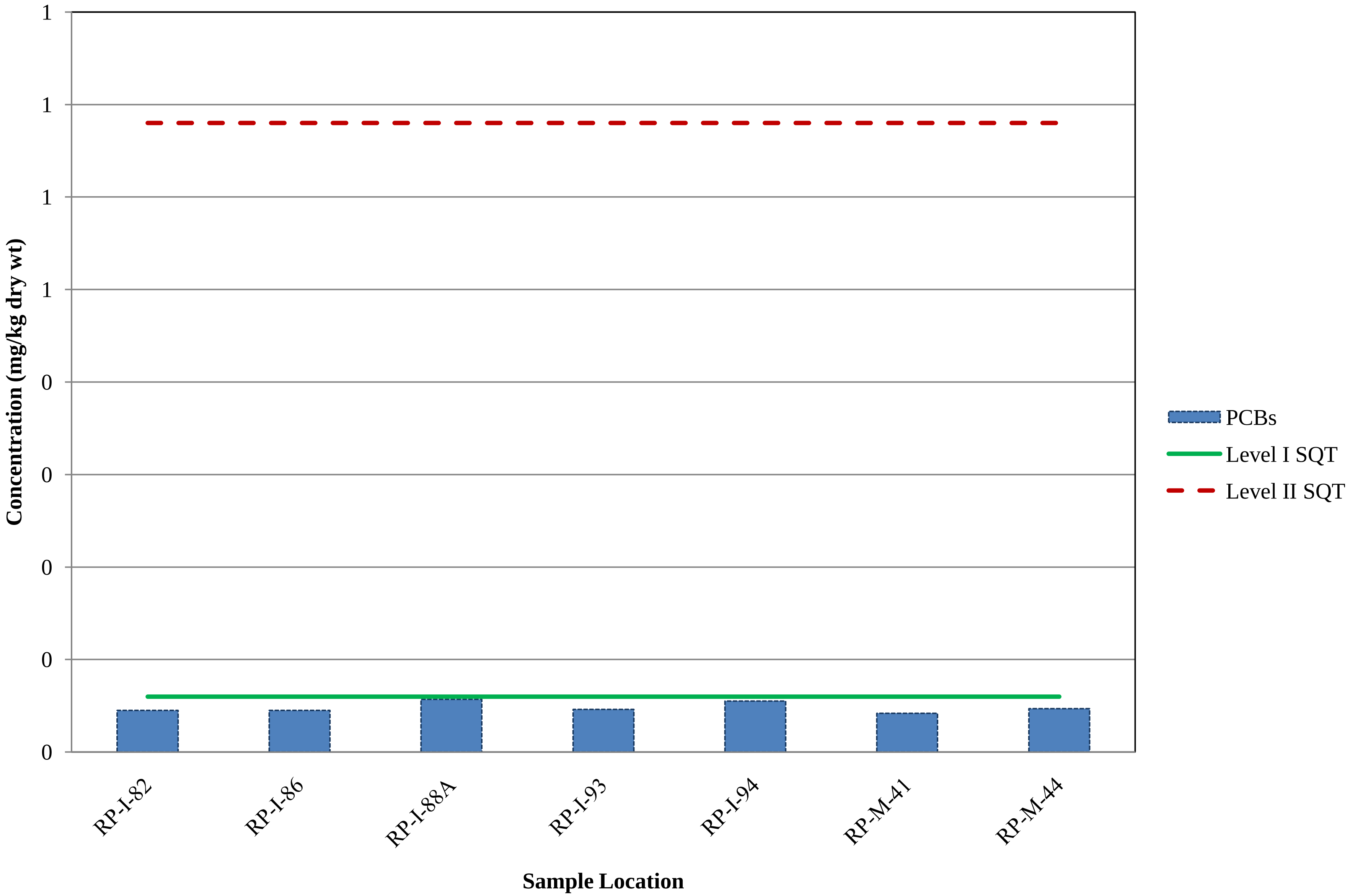


**Figure 8.20-k**
**Cargill Slip (Top of Sediment, 0-0.5 ft) - Dioxins**

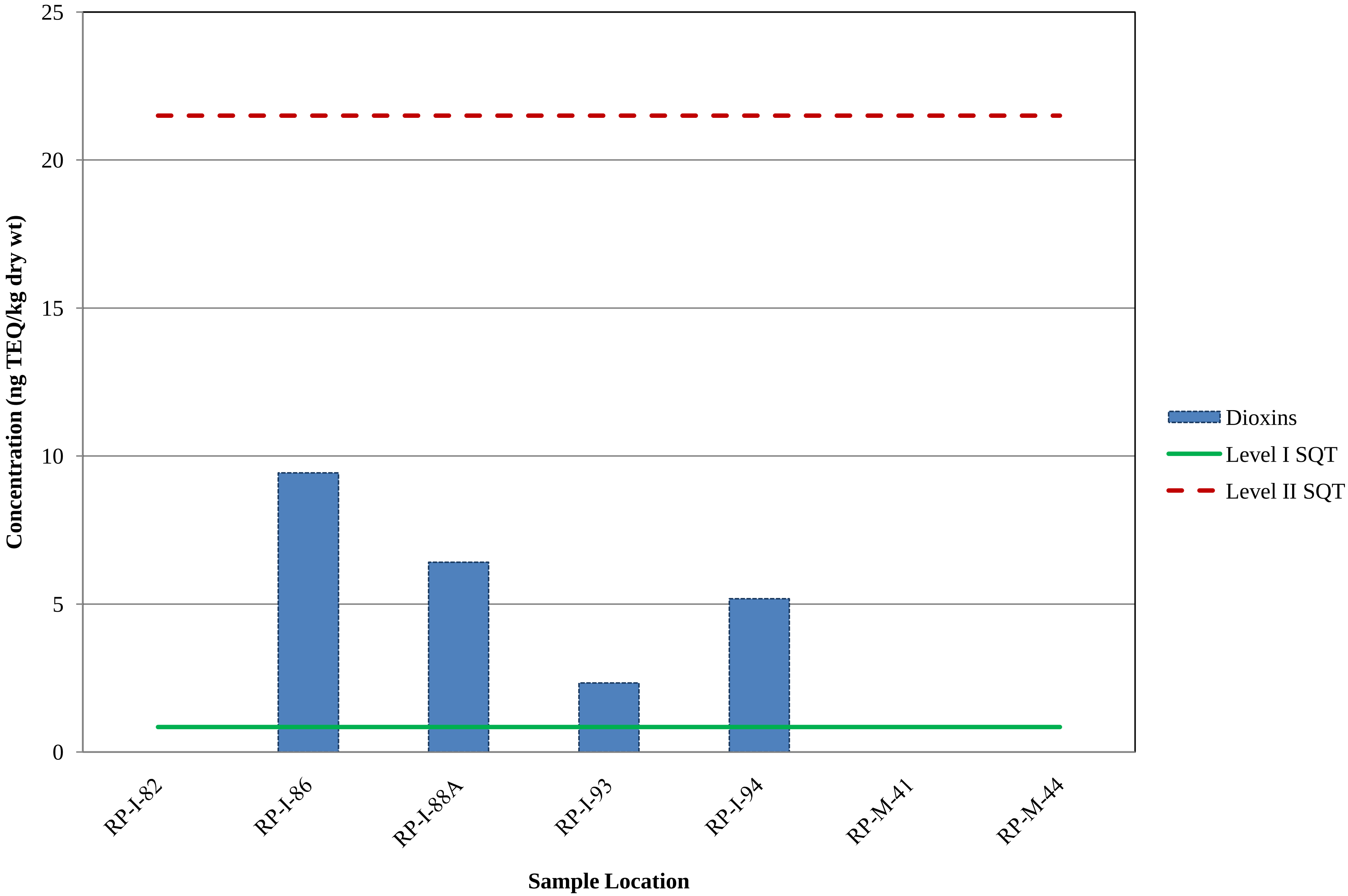


**Figure 8.21-a**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Arsenic**

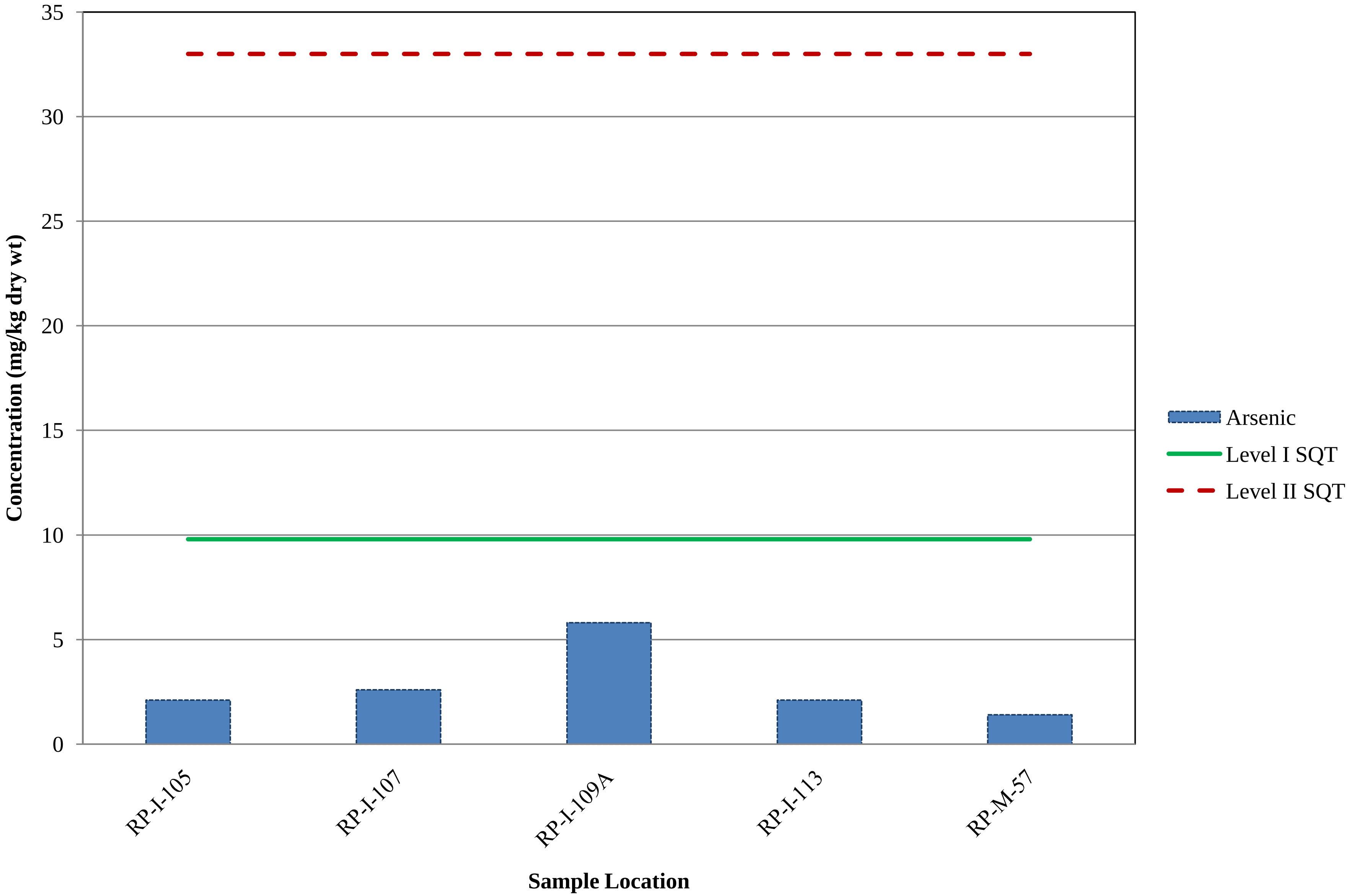


**Figure 8.21-b**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Cadmium**

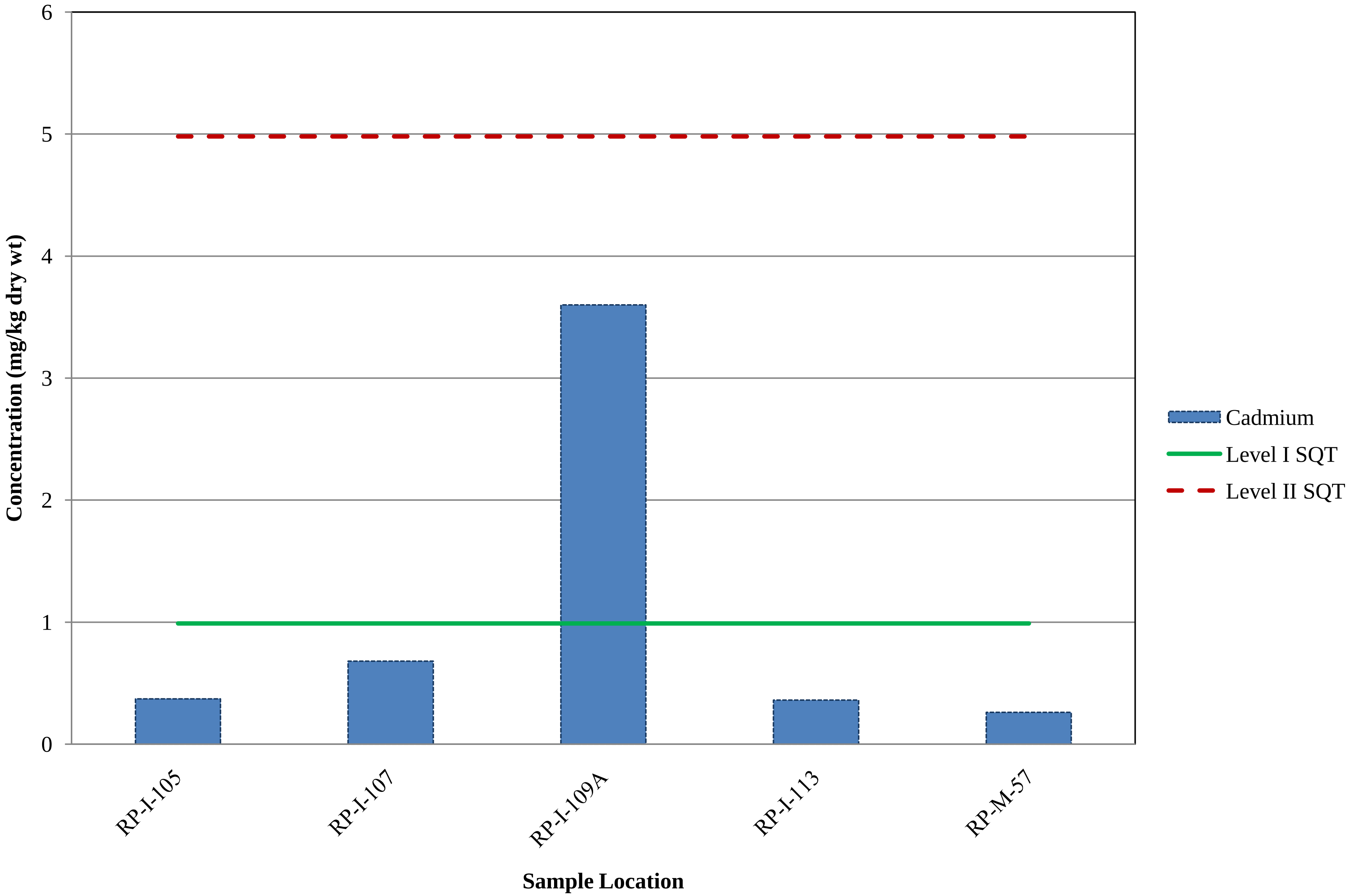


**Figure 8.21-c**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Chromium**

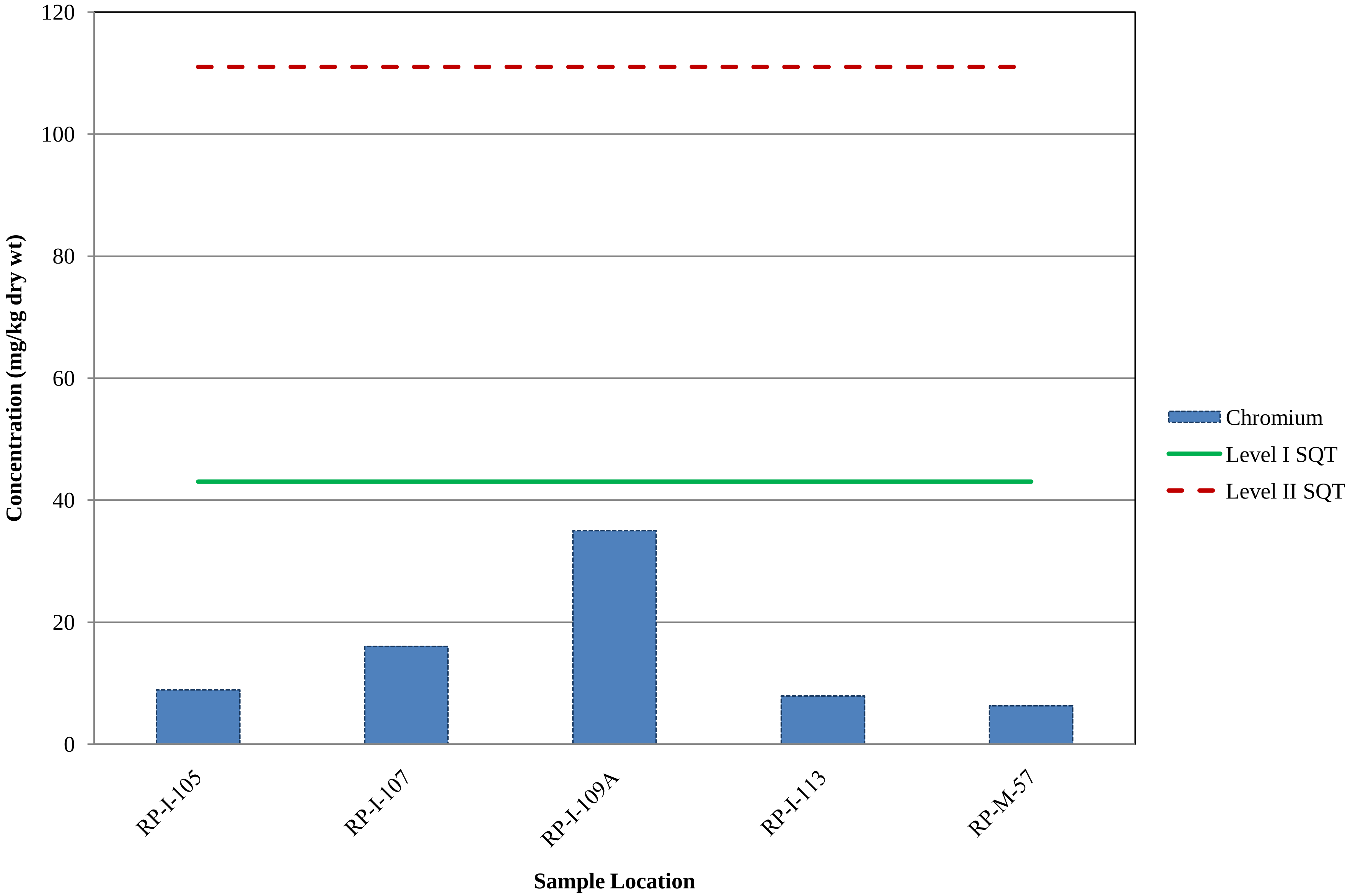


**Figure 8.21-d**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Copper**

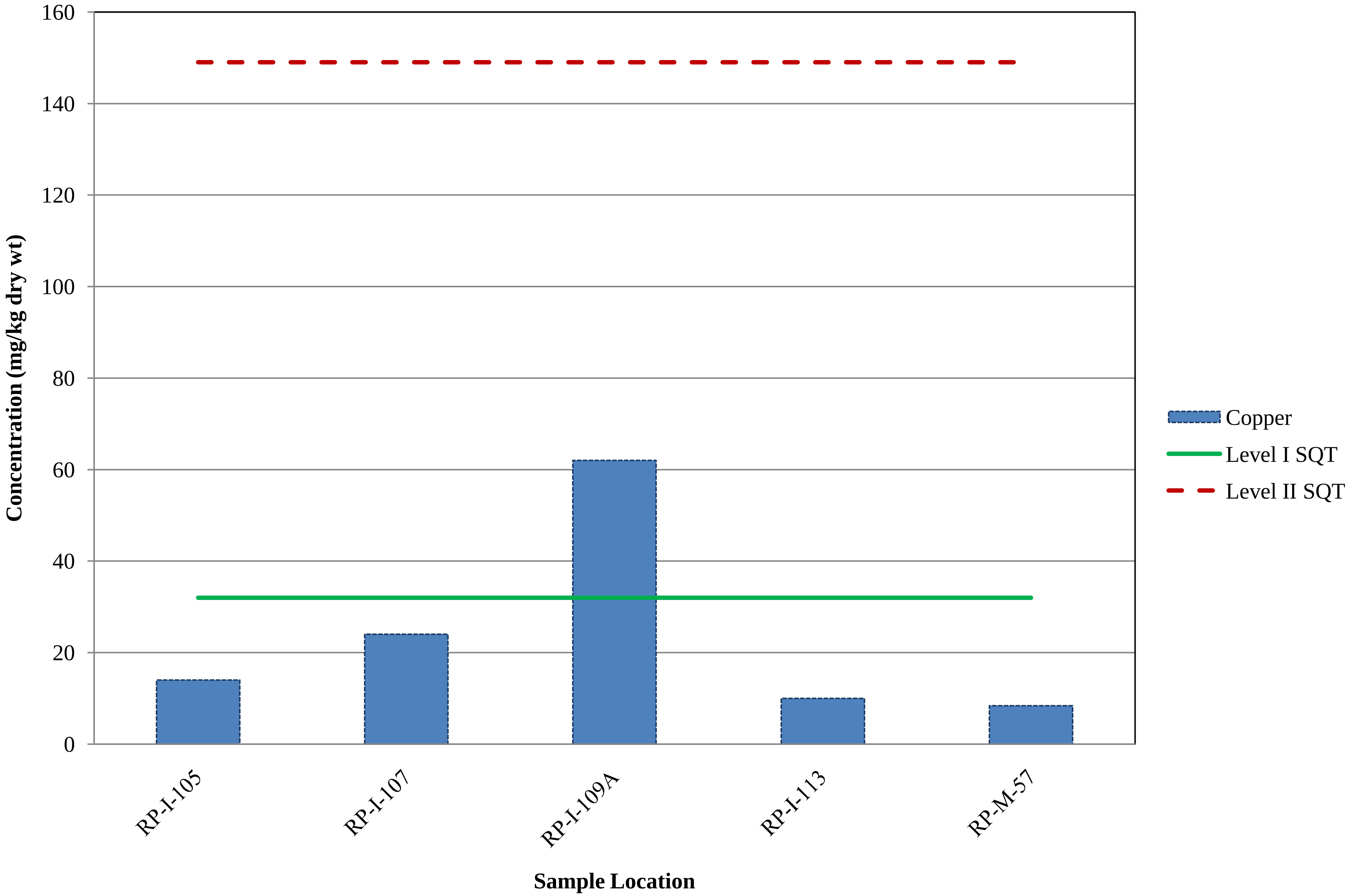
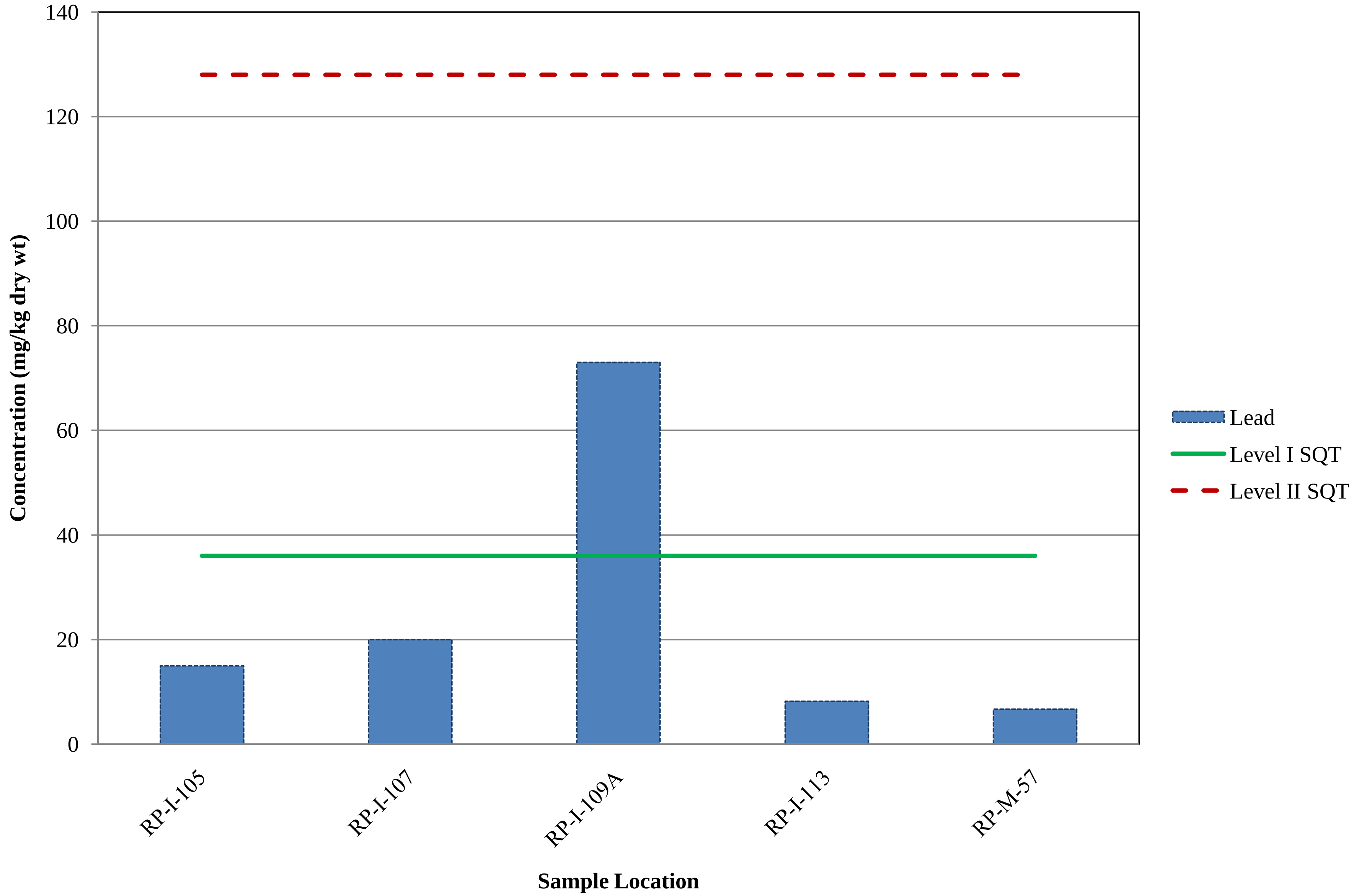


**Figure 8.21-e**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Lead**



## Figure 8.21-f
## Cargill B Slip (Top of Sediment, 0-0.5 ft) - Mercury

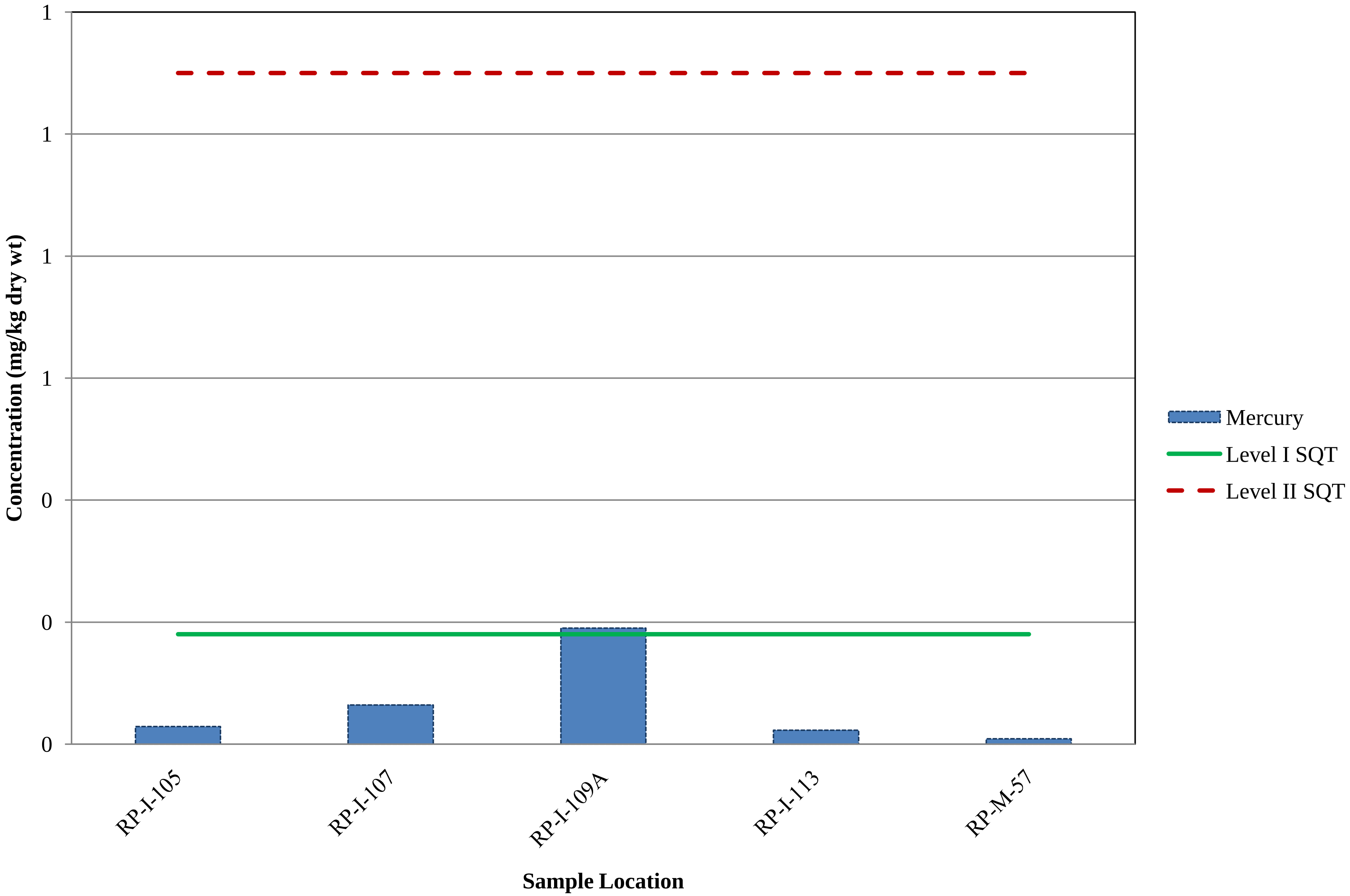
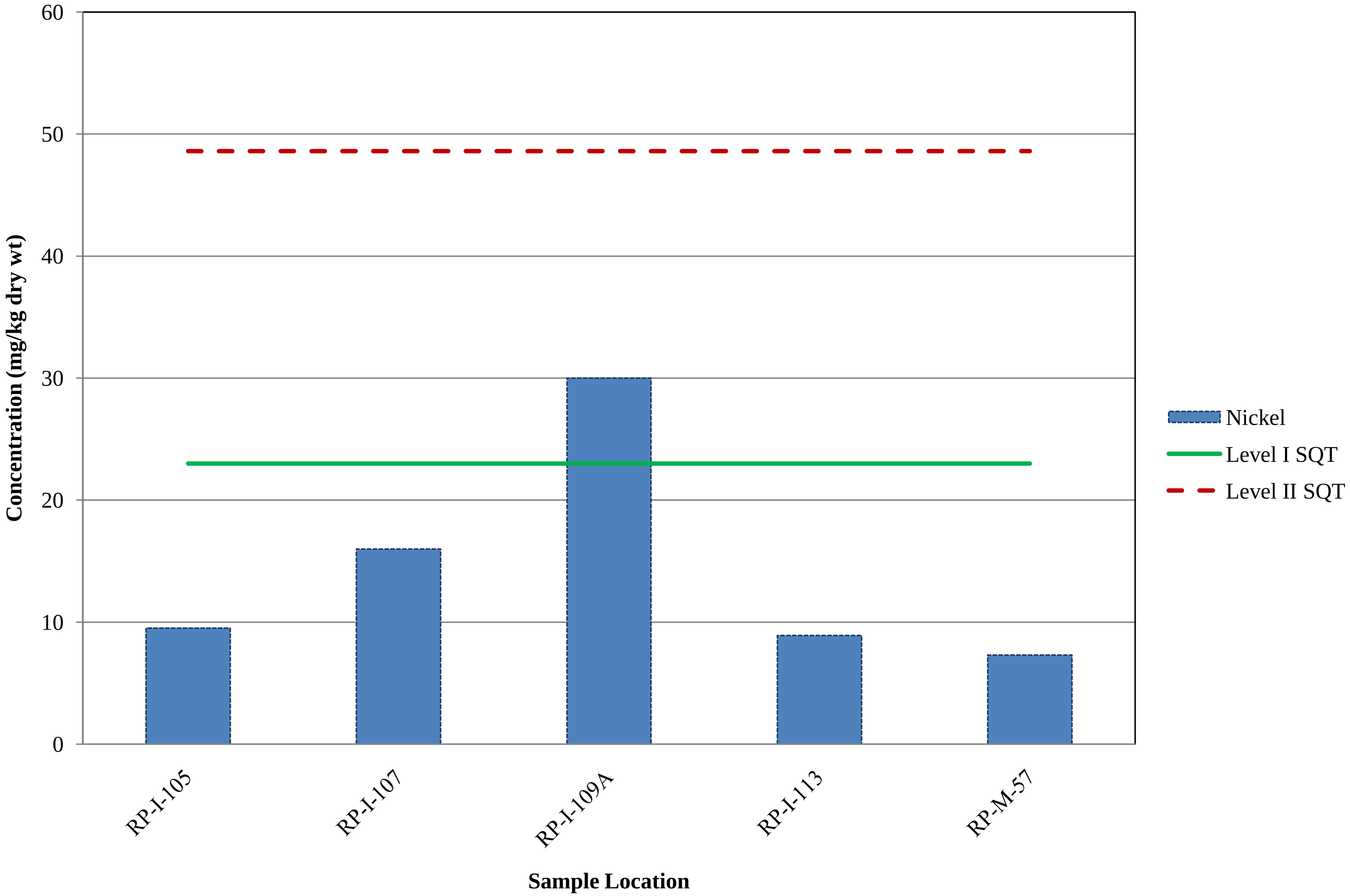


**Figure 8.21-g**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - Nickel**



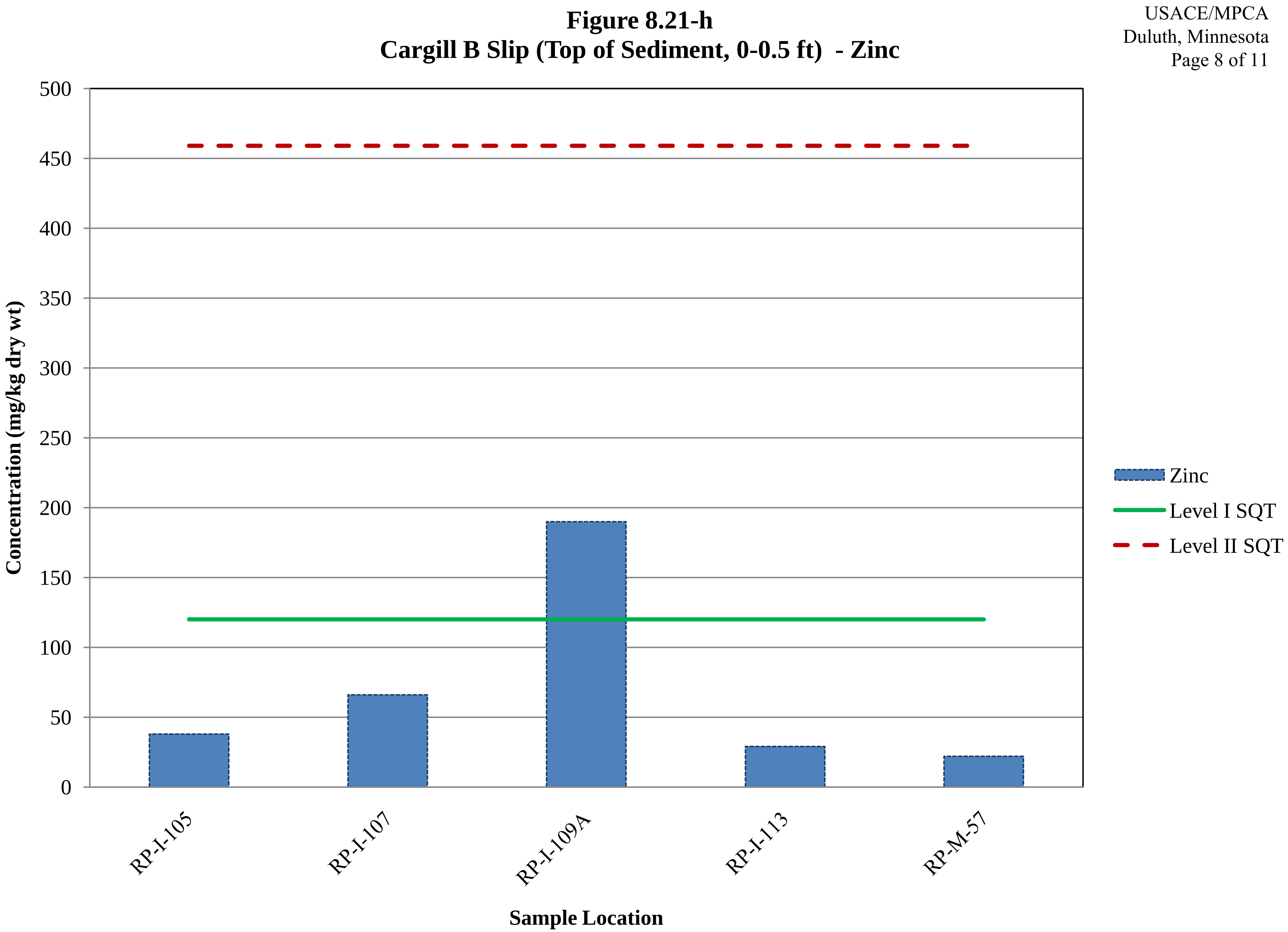


Figure 8.21-h
Cargill B Slip (Top of Sediment, 0-0.5 ft) - Zinc
Concentration (mg/kg dry wt)
500
450
400
350
300
250
200
150
100
50
0
RP-I-105
RP-I-107
RP-I-109A
RP-I-113
RP-M-57
Sample Location
Zinc
Level I SQT
Level II SQT

**Figure 8.21-i**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - PAHs**

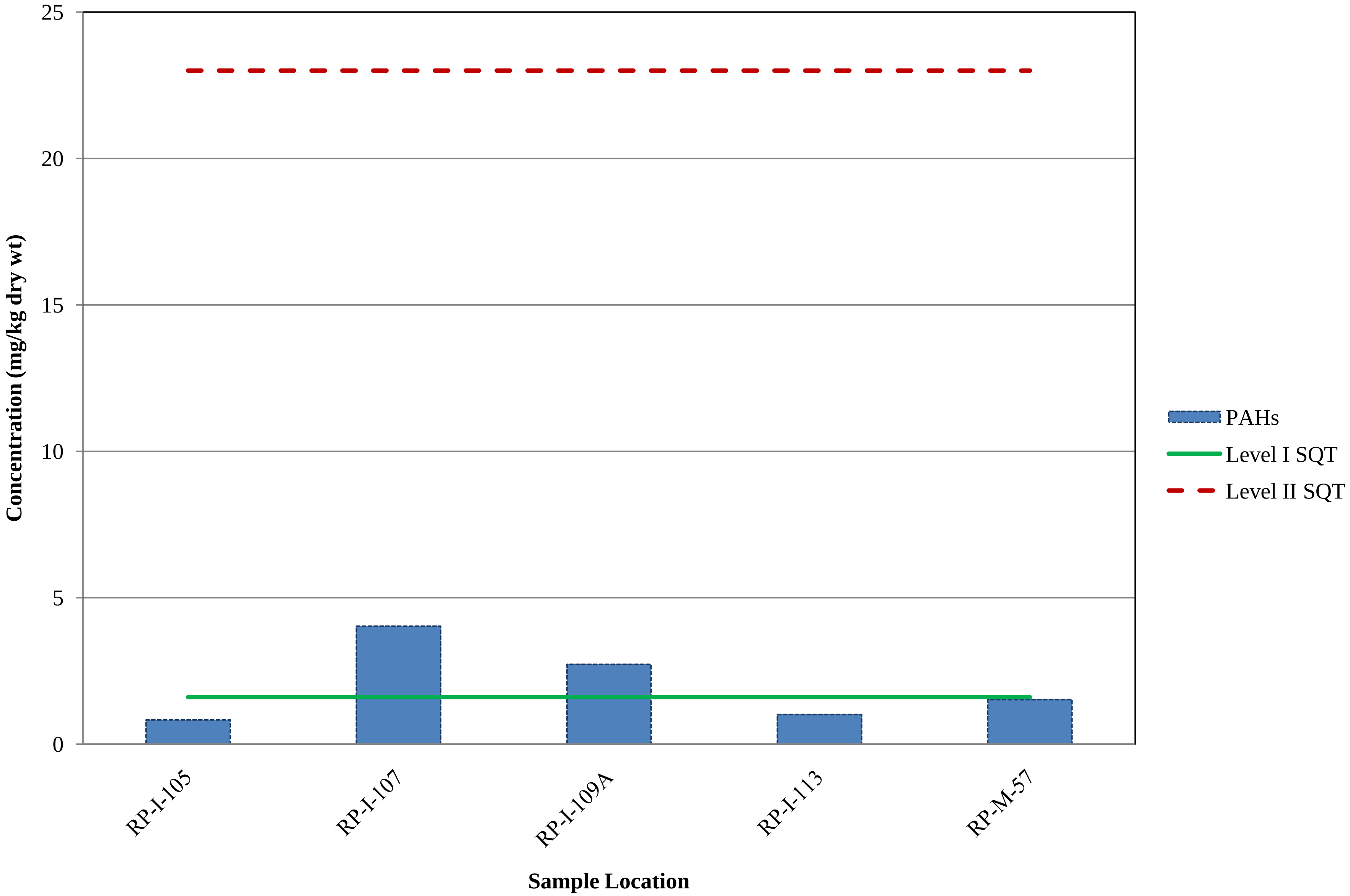
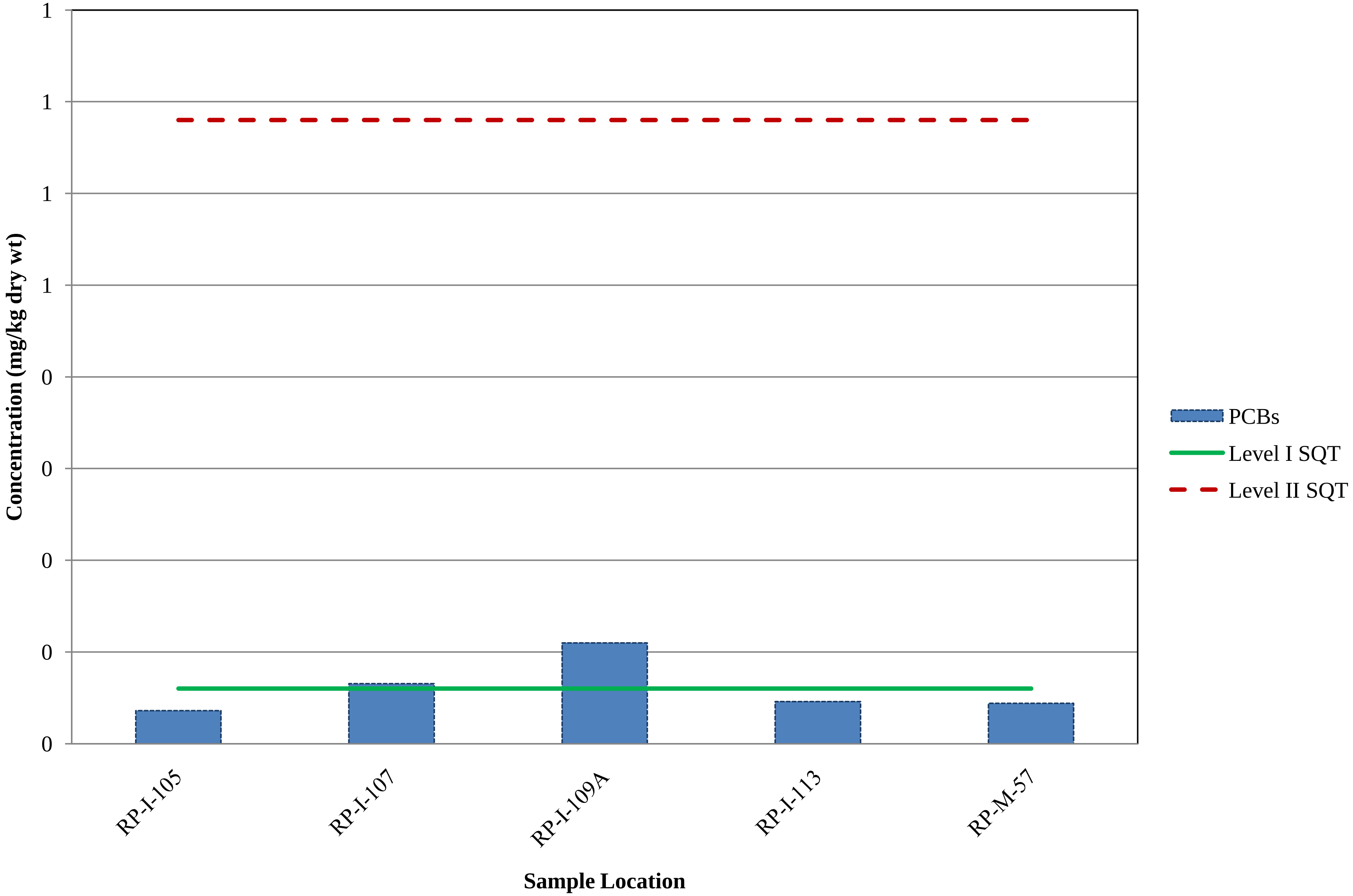


**Figure 8.21-j**
**Cargill B Slip (Top of Sediment, 0-0.5 ft) - PCBs**



## Figure 8.21-k
## Cargill B Slip (Top of Sediment, 0-0.5 ft) - Dioxins

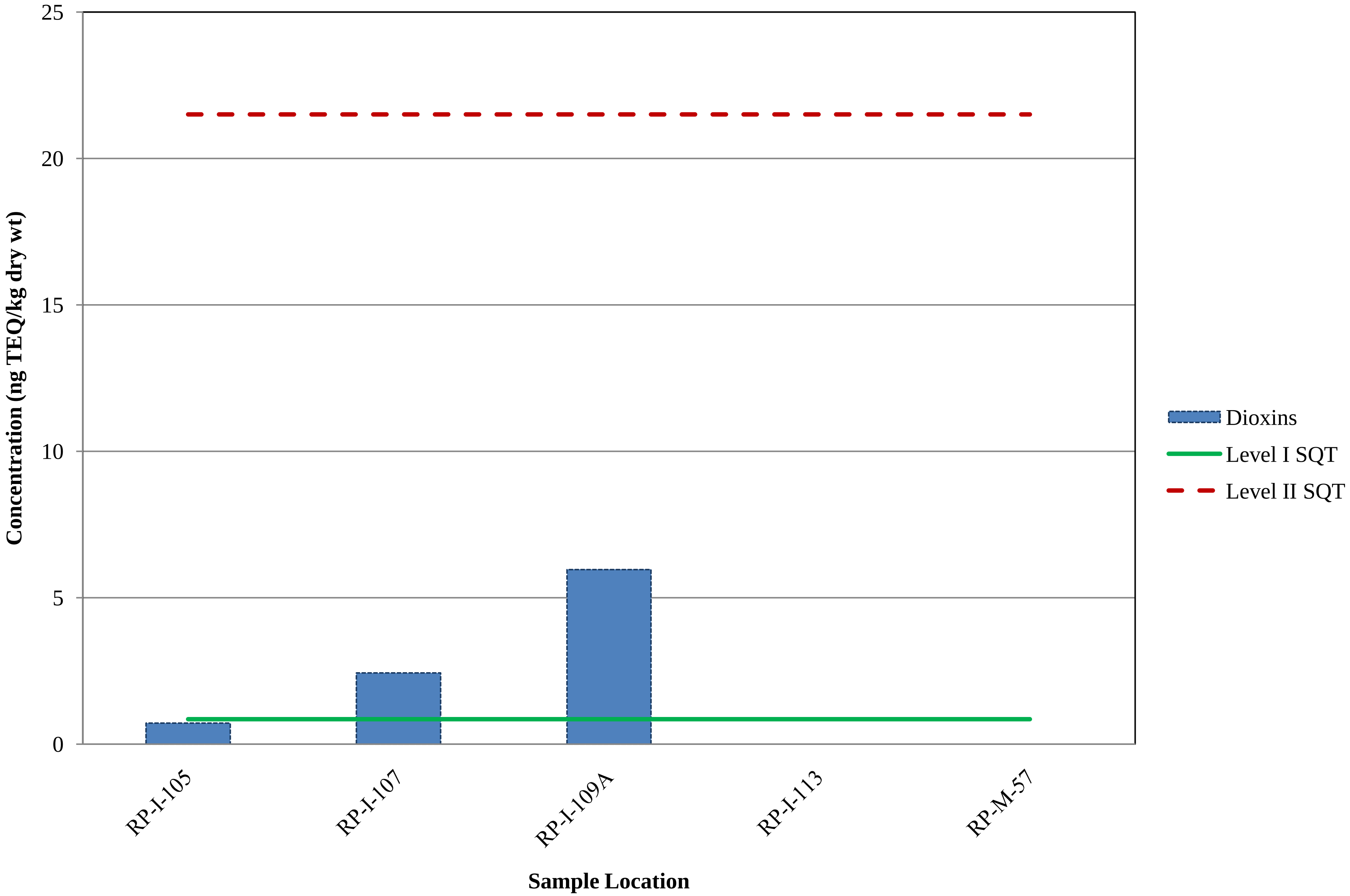


**Figure 8.22-a**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Arsenic**

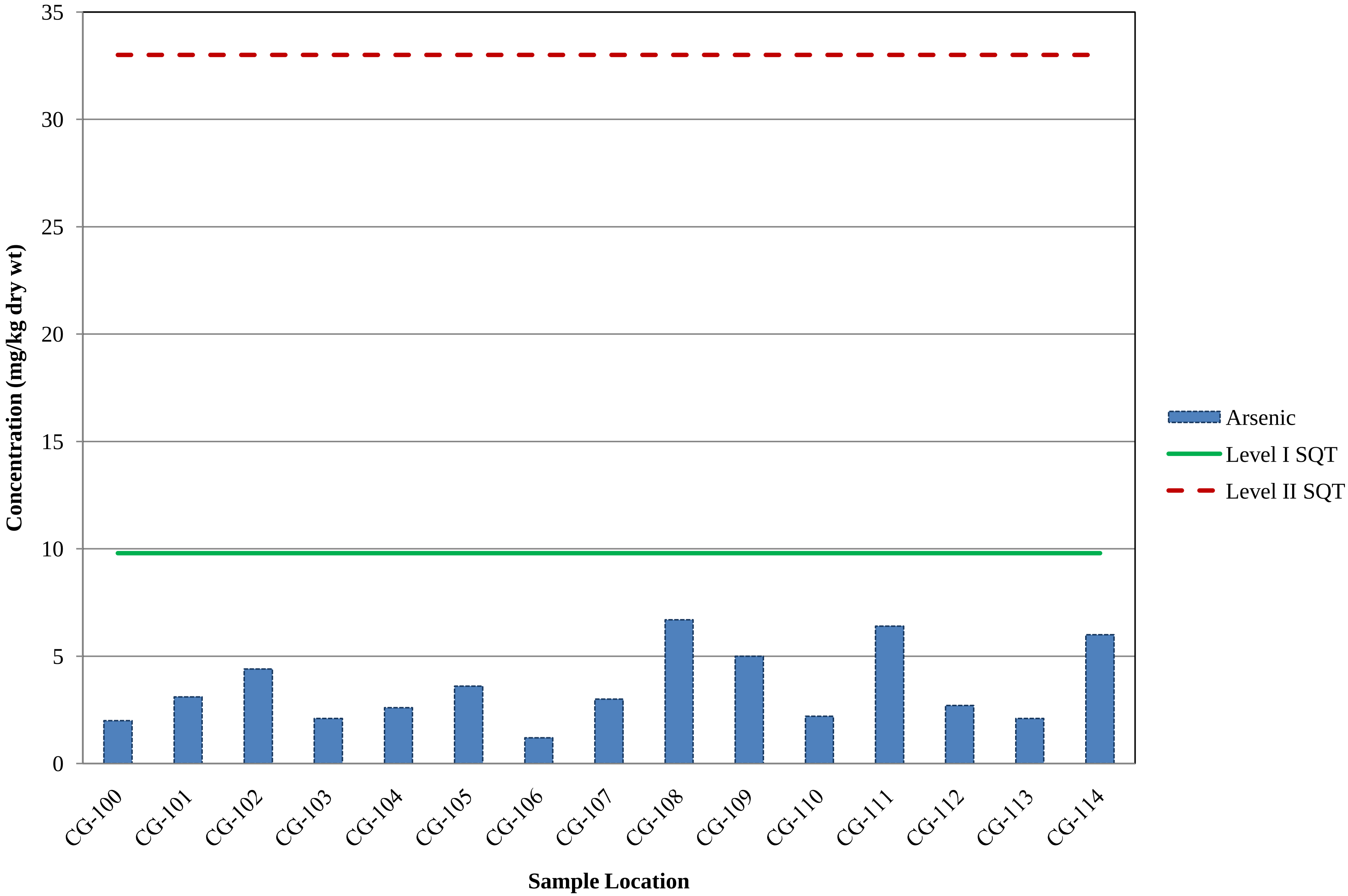


**Figure 8.22-b**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Cadmium**

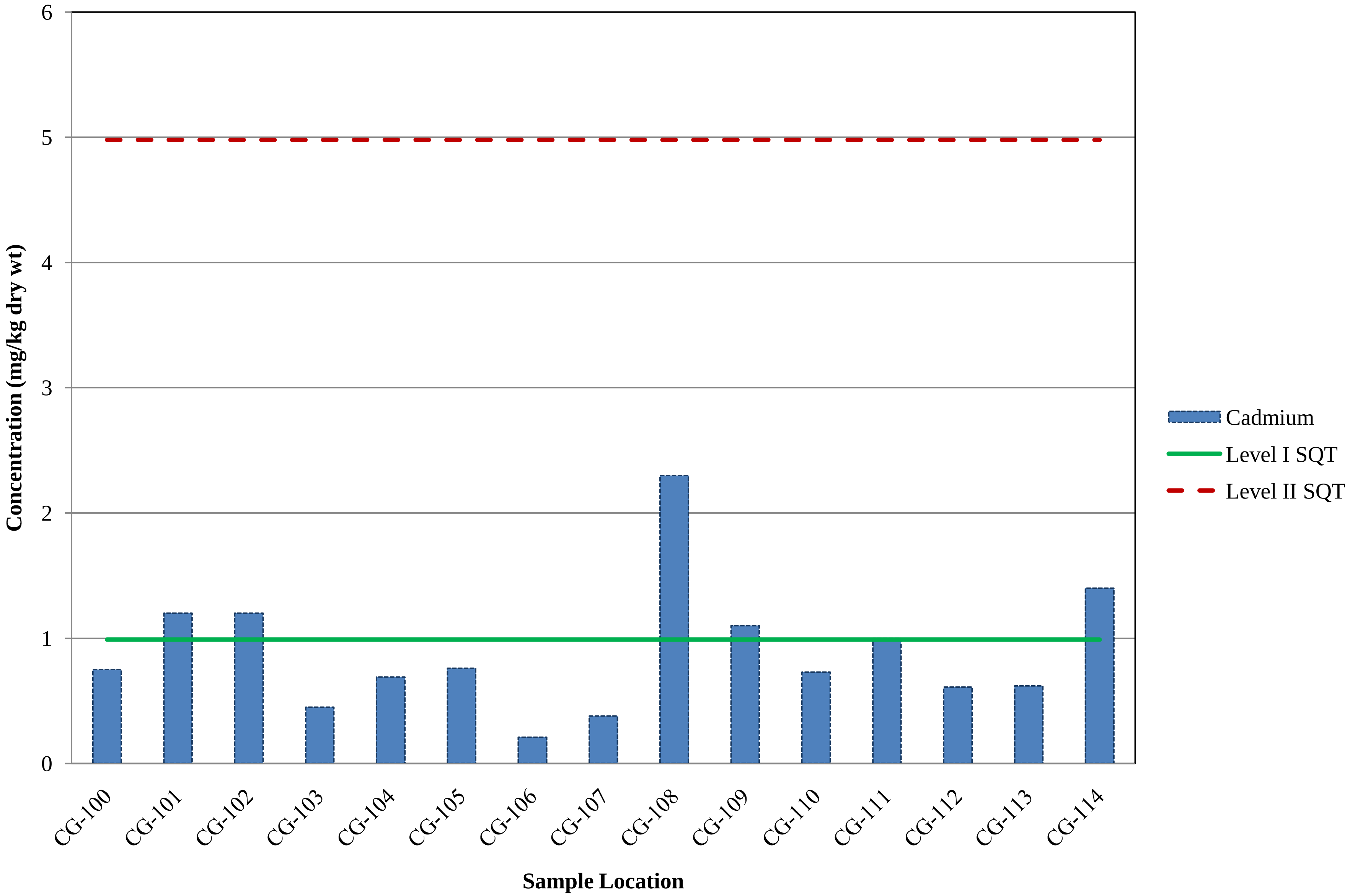


**Figure 8.22-c**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Chromium**

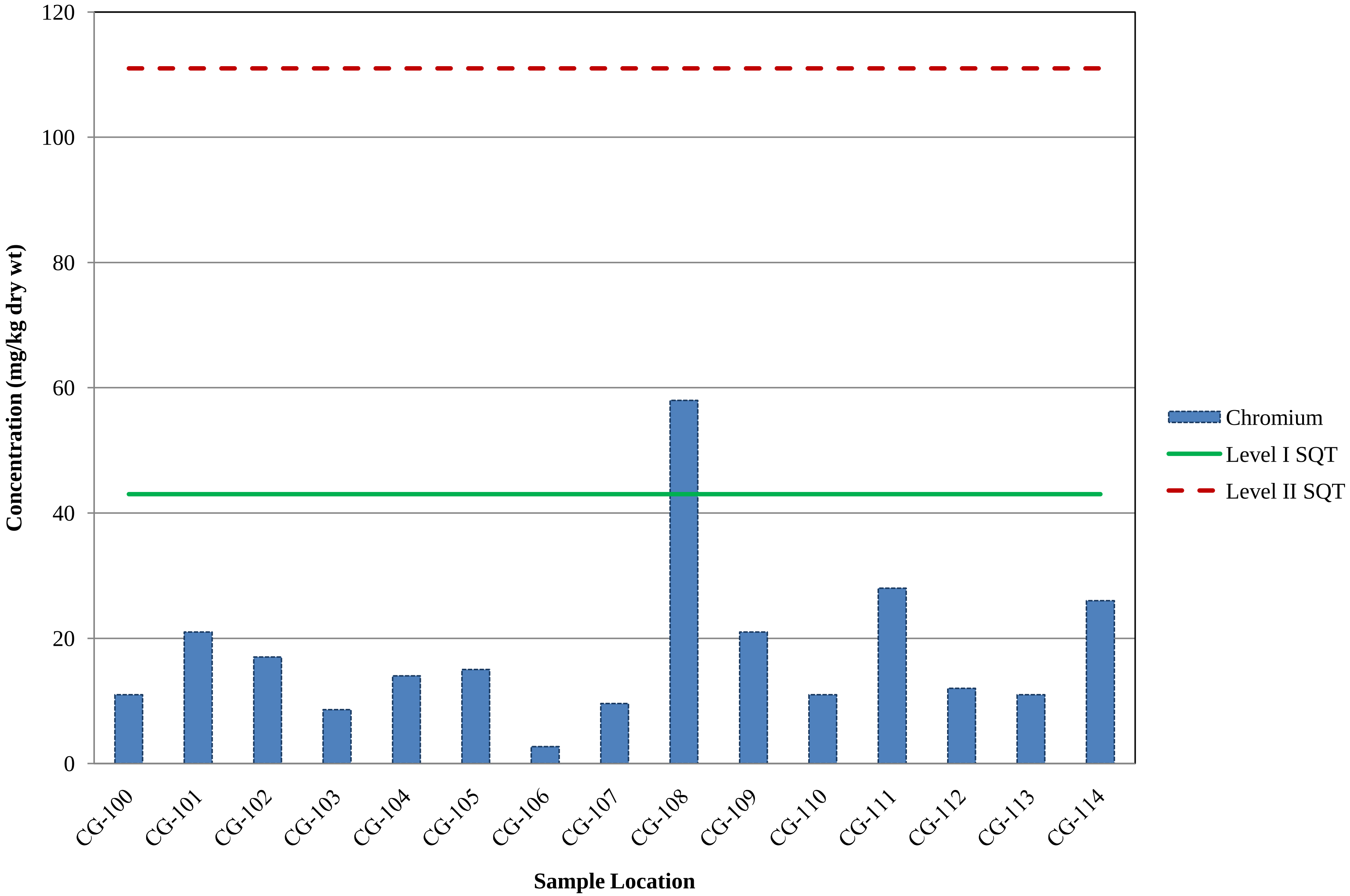
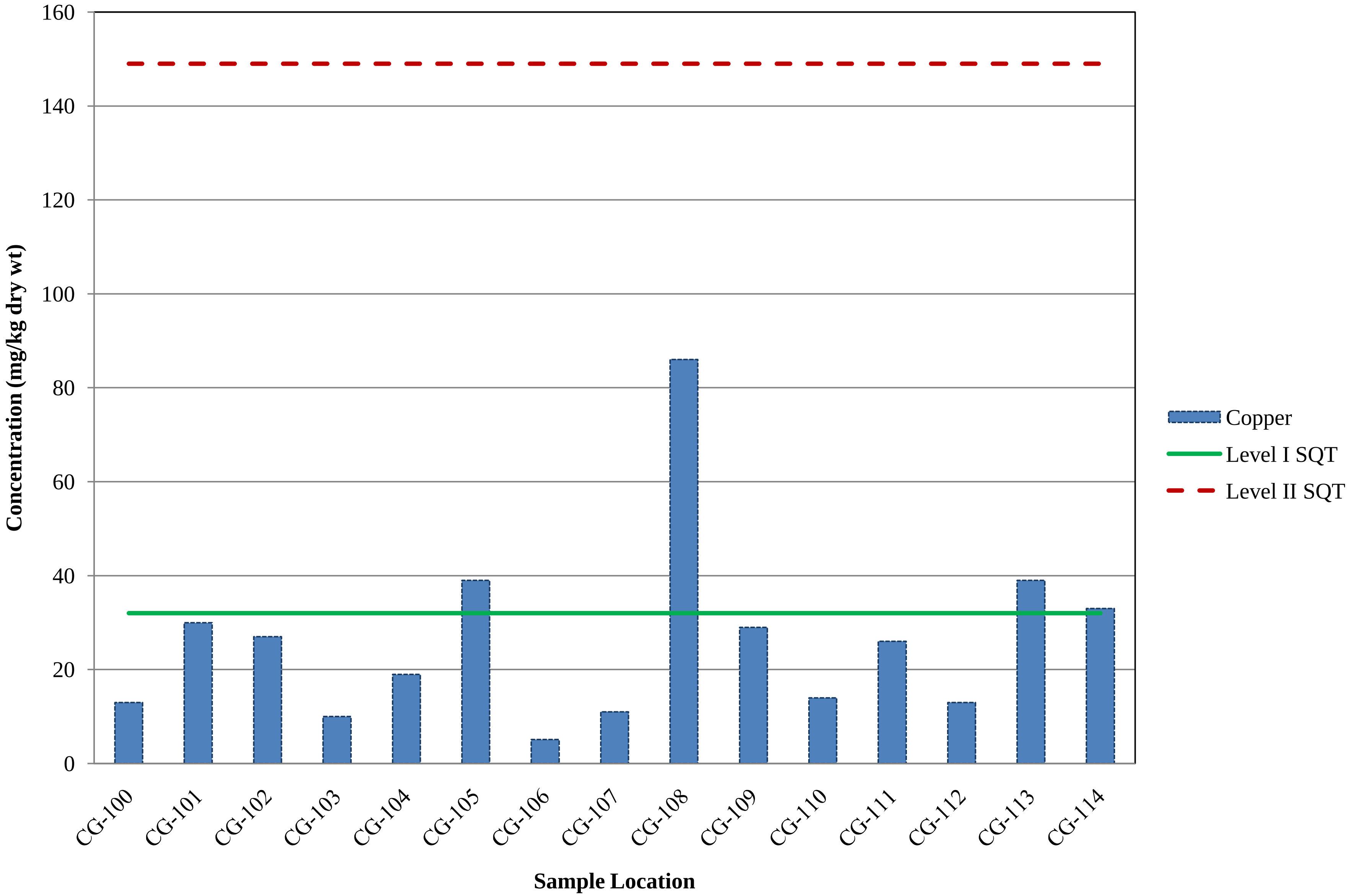


**Figure 8.22-d**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Copper**



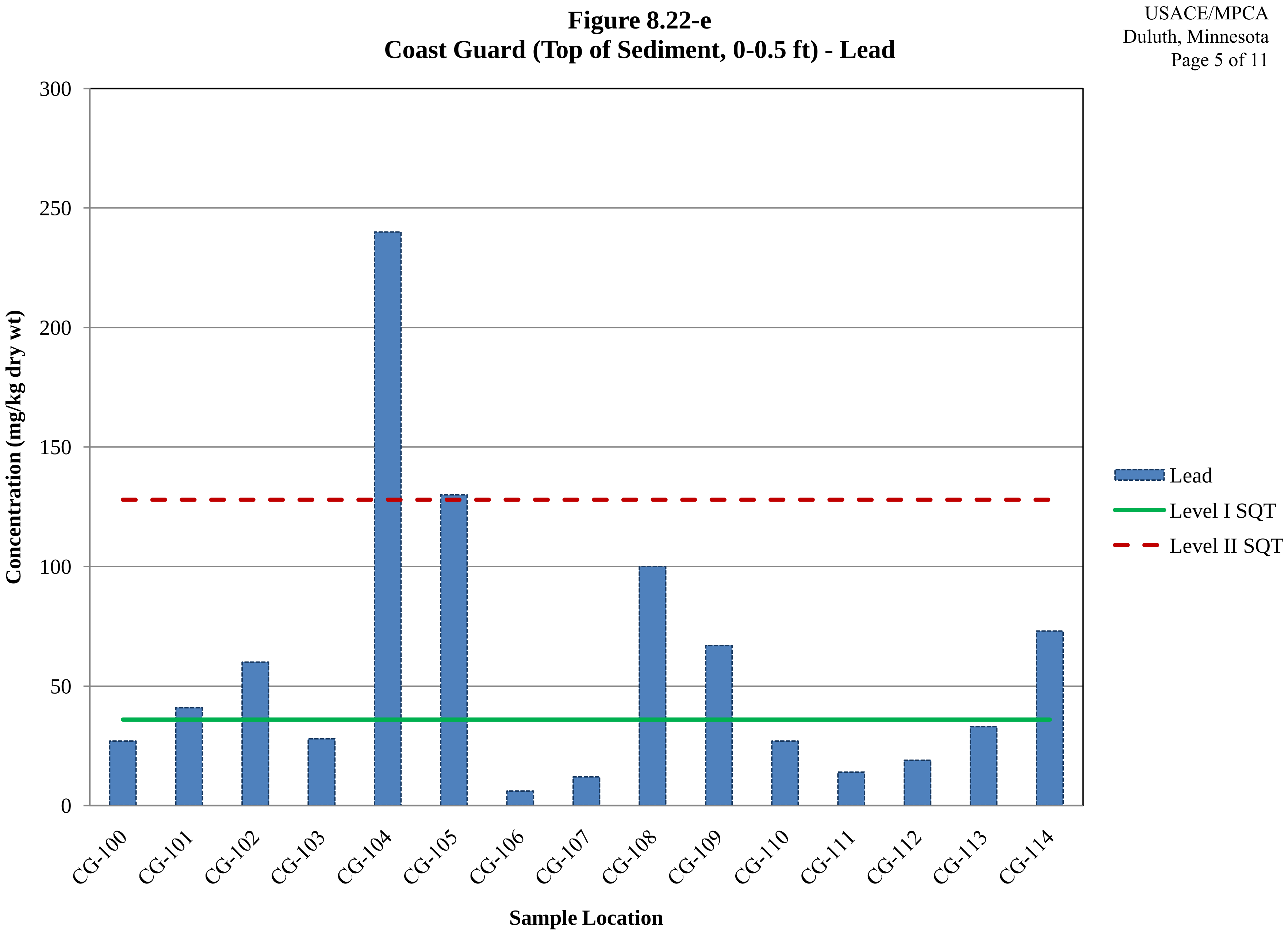
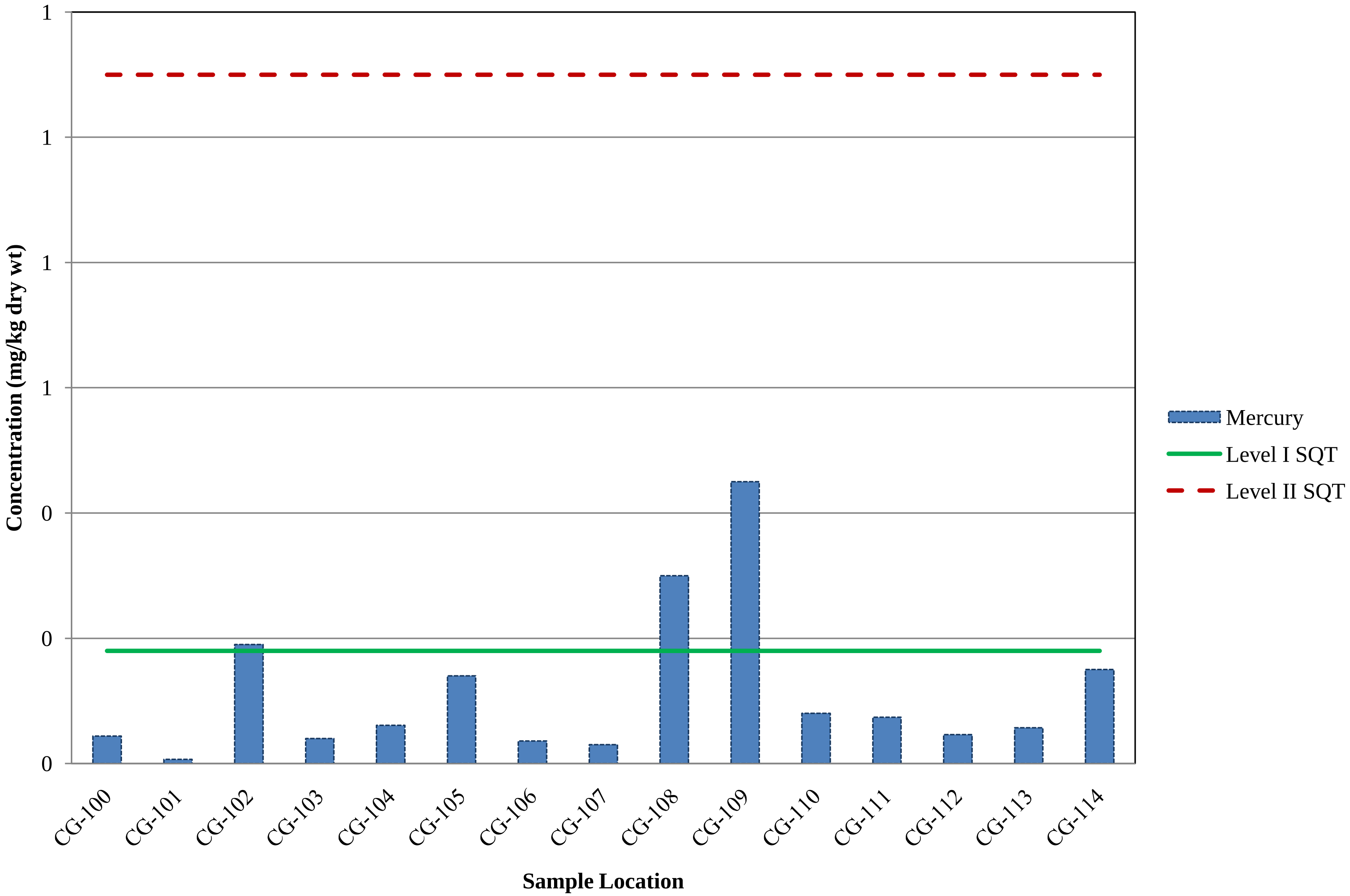


Figure 8.22-e
Coast Guard (Top of Sediment, 0-0.5 ft) - Lead
Concentration (mg/kg dry wt)
300
250
200
150
100
50
0
CG-100
CG-101
CG-102
CG-103
CG-104
CG-105
CG-106
CG-107
CG-108
CG-109
CG-110
CG-111
CG-112
CG-113
CG-114
Sample Location
Lead
Level I SQT
Level II SQT

**Figure 8.22-f**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Mercury**



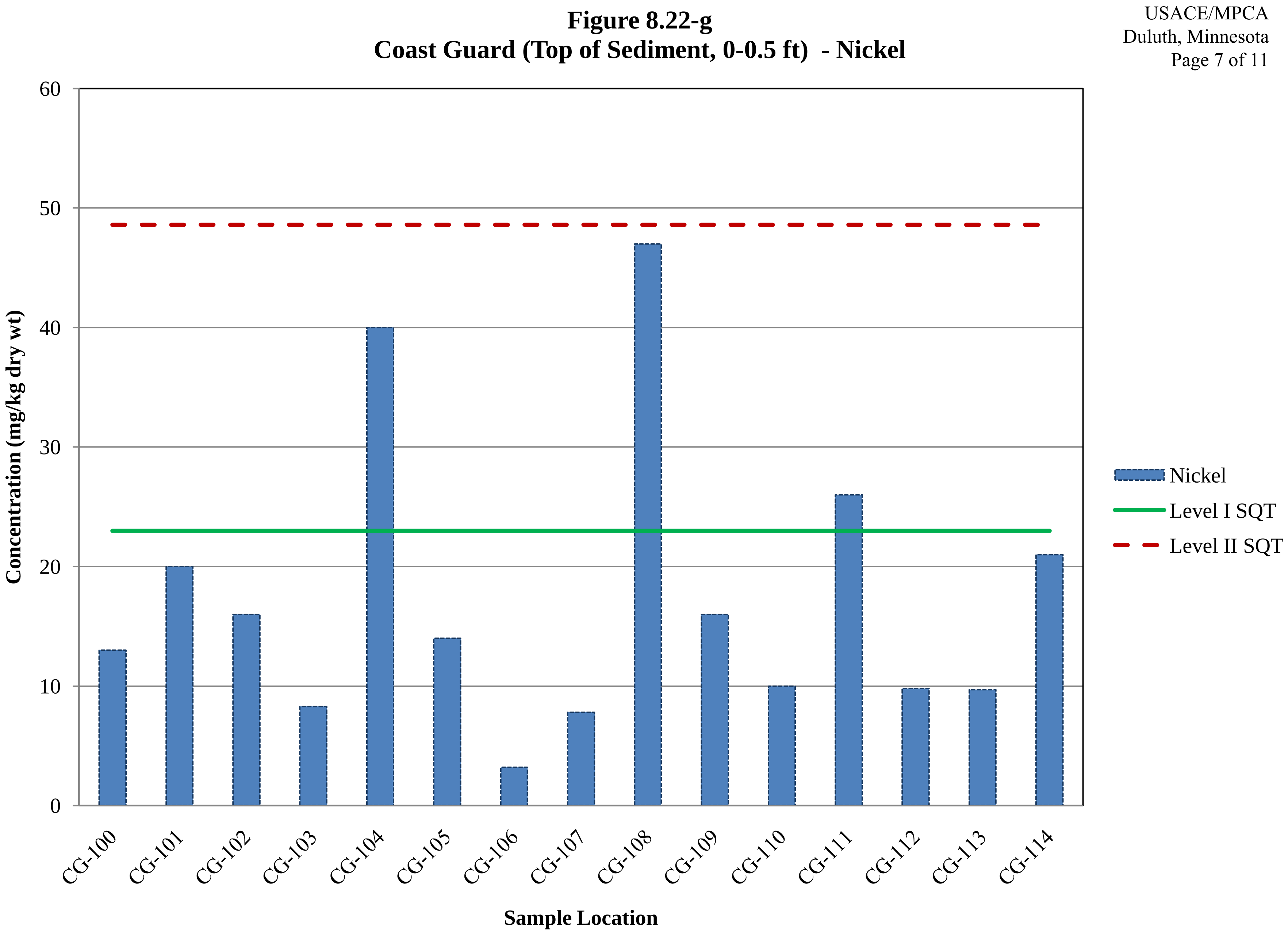


Figure 8.22-g
Coast Guard (Top of Sediment, 0-0.5 ft) - Nickel
Concentration (mg/kg dry wt)
60
50
40
30
20
10
0
CG-100
CG-101
CG-102
CG-103
CG-104
CG-105
CG-106
CG-107
CG-108
CG-109
CG-110
CG-111
CG-112
CG-113
CG-114
Sample Location
Nickel
Level I SQT
Level II SQT

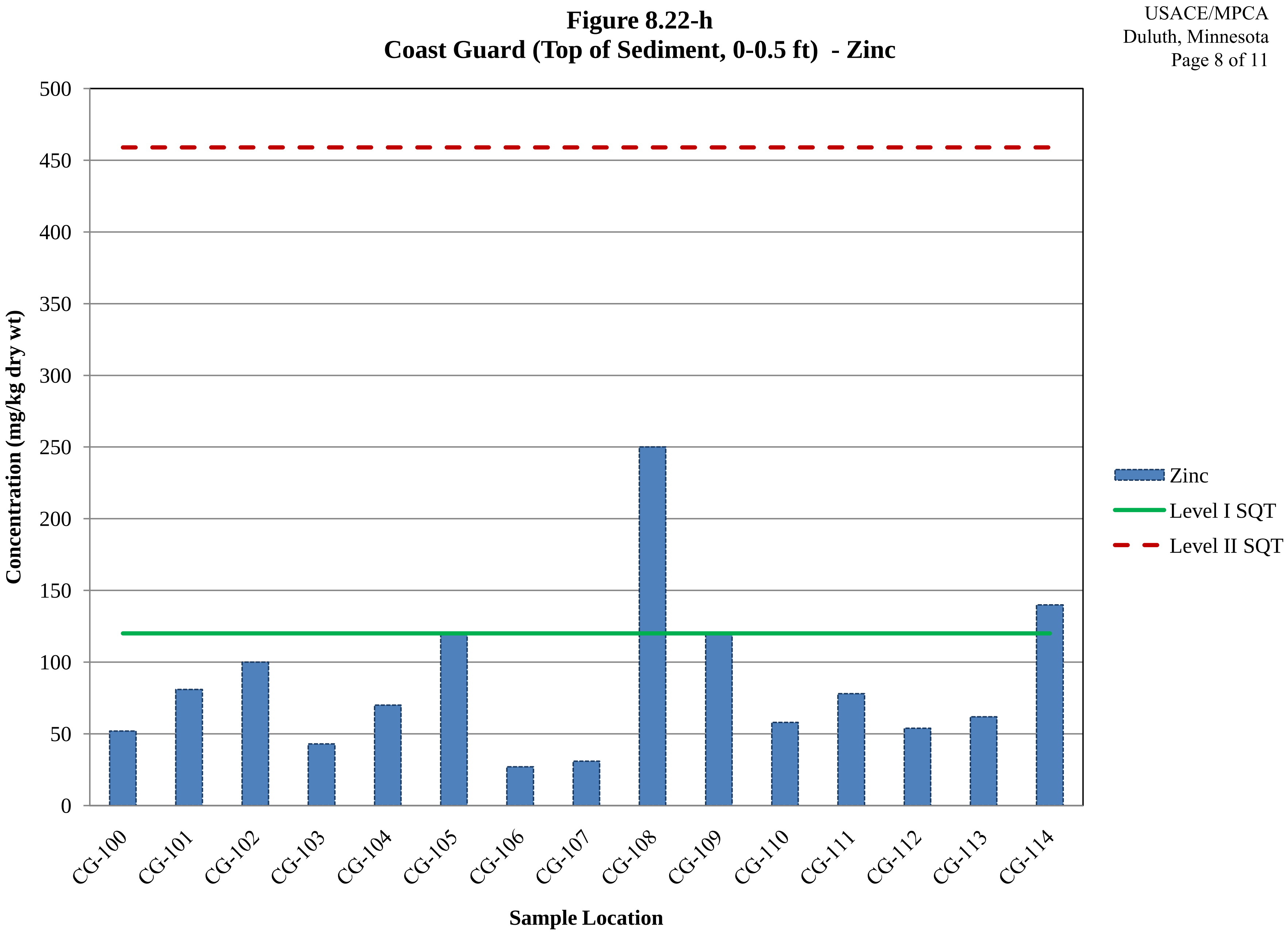


Figure 8.22-h
Coast Guard (Top of Sediment, 0-0.5 ft) - Zinc
Concentration (mg/kg dry wt)
500
450
400
350
300
250
200
150
100
50
0
CG-100
CG-101
CG-102
CG-103
CG-104
CG-105
CG-106
CG-107
CG-108
CG-109
CG-110
CG-111
CG-112
CG-113
CG-114
Sample Location
Zinc
Level I SQT
Level II SQT

**Figure 8.22-i**
**Coast Guard (Top of Sediment, 0-0.5 ft) - PAHs**

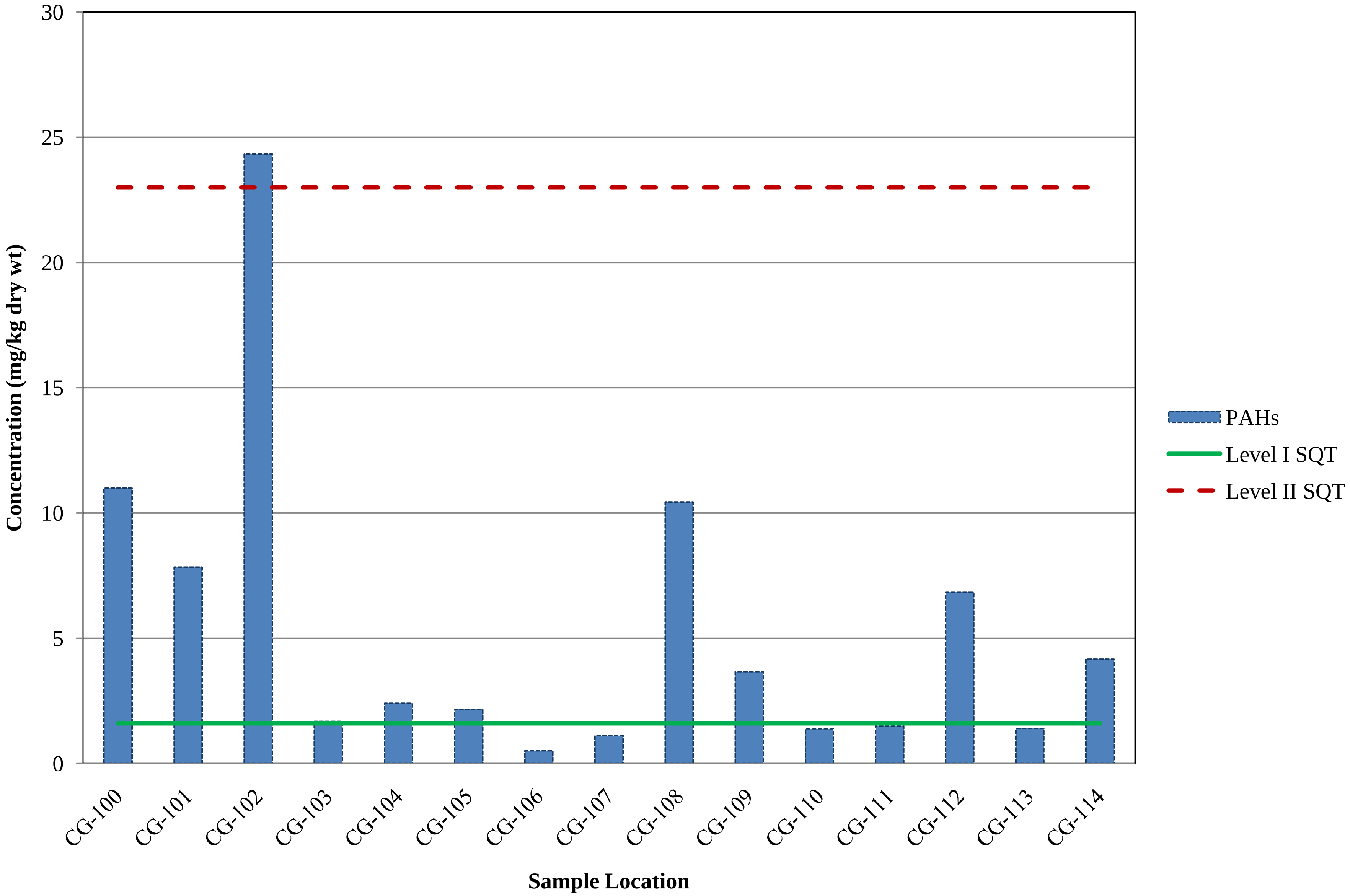


**Figure 8.22-j**
**Coast Guard (Top of Sediment, 0-0.5 ft) - PCBs**

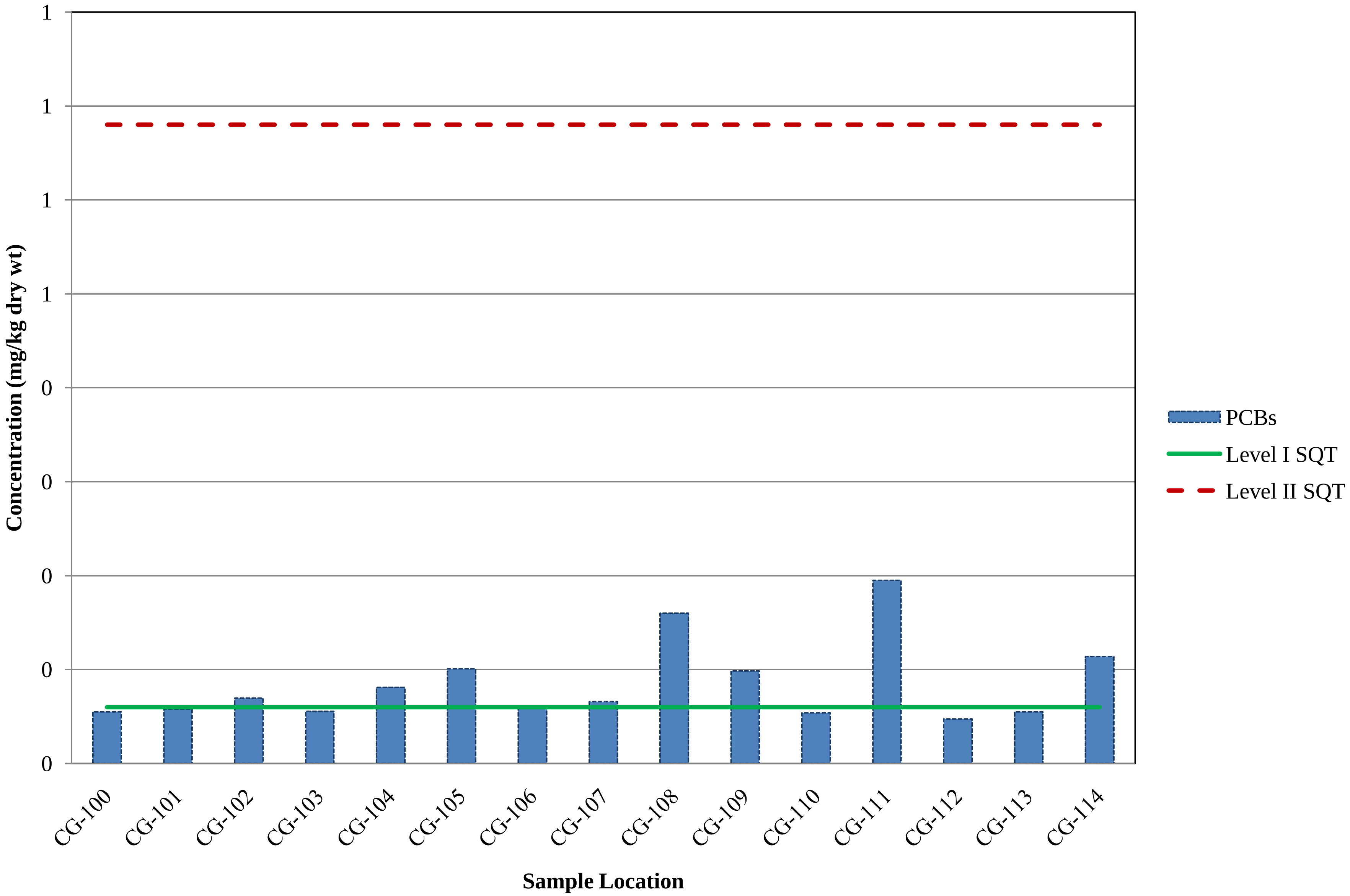


**Figure 8.22-k**
**Coast Guard (Top of Sediment, 0-0.5 ft) - Dioxins**

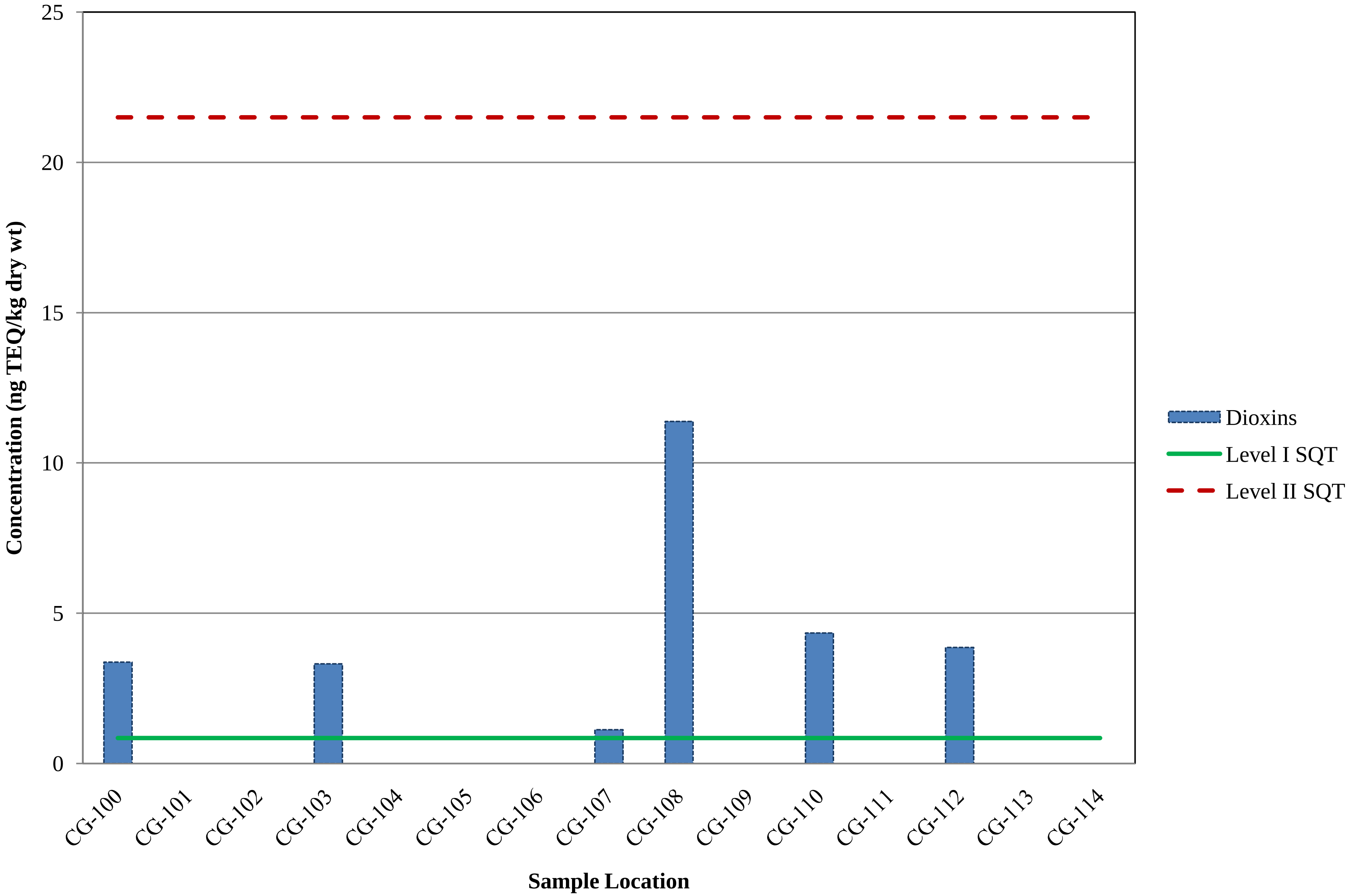


**Figure 8.23-a**
**General Mills (Top of Sediment, 0-0.5 ft) - Arsenic**

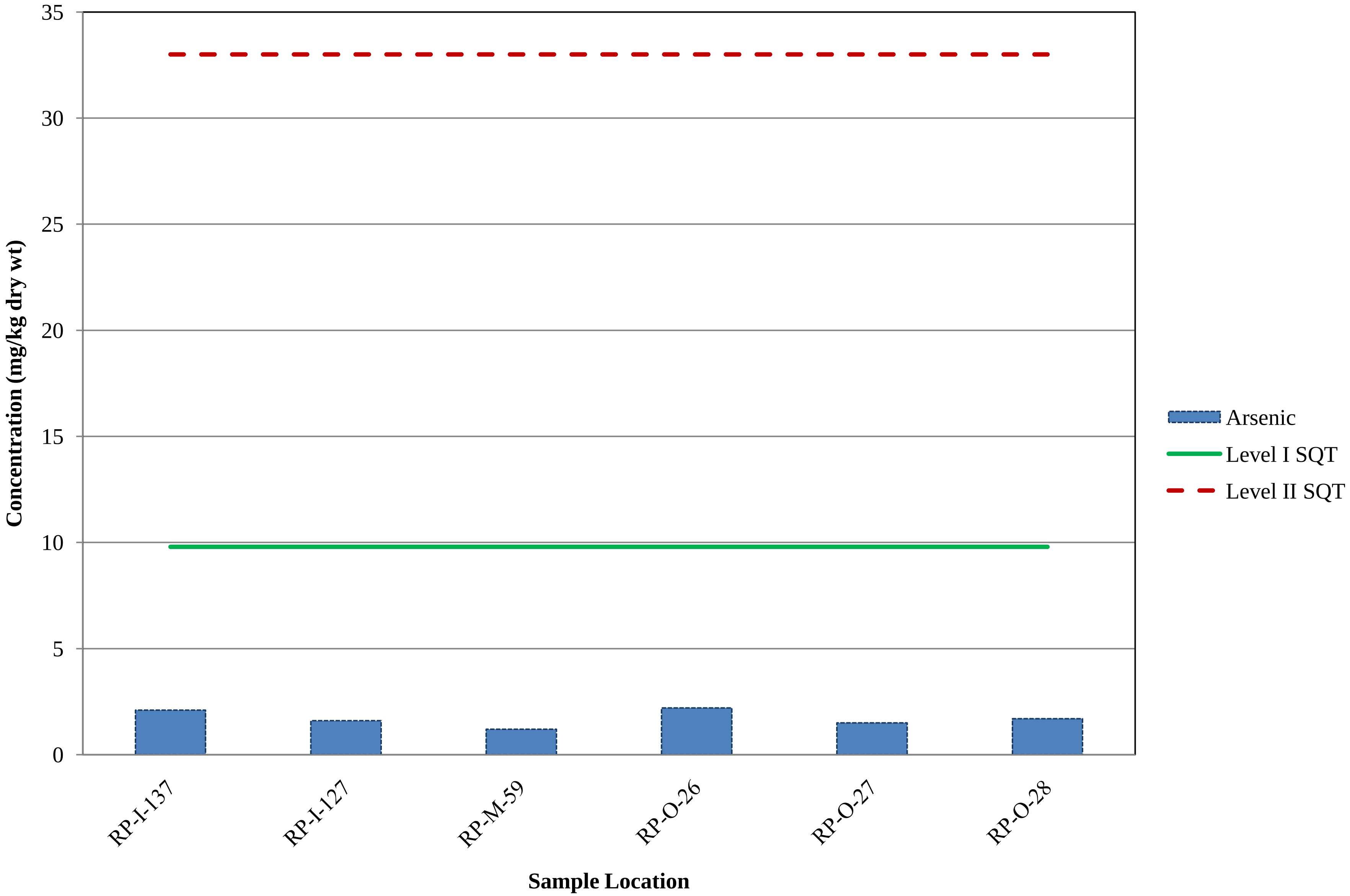
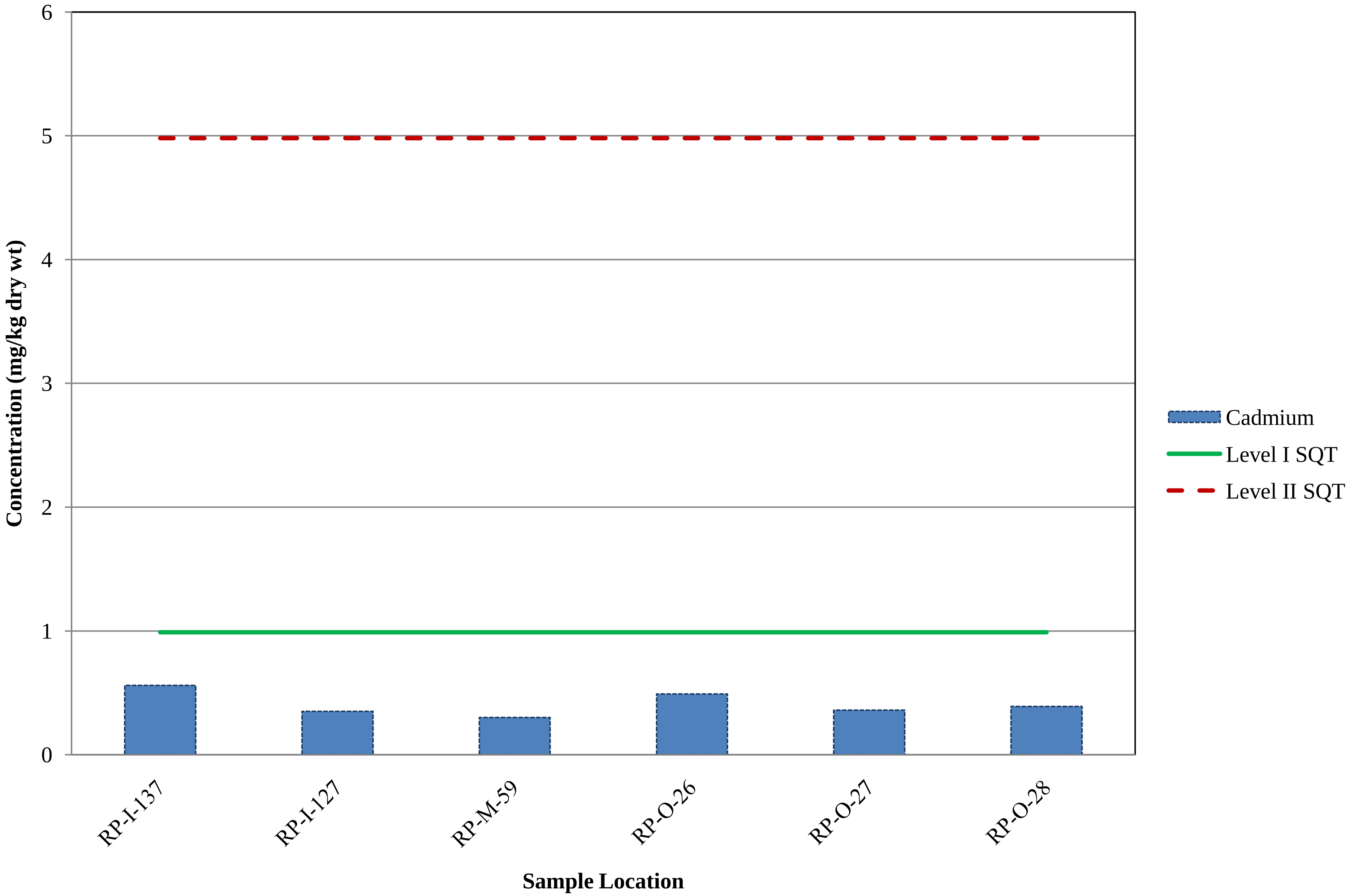


**Figure 8.23-b**
**General Mills (Top of Sediment, 0-0.5 ft) - Cadmium**



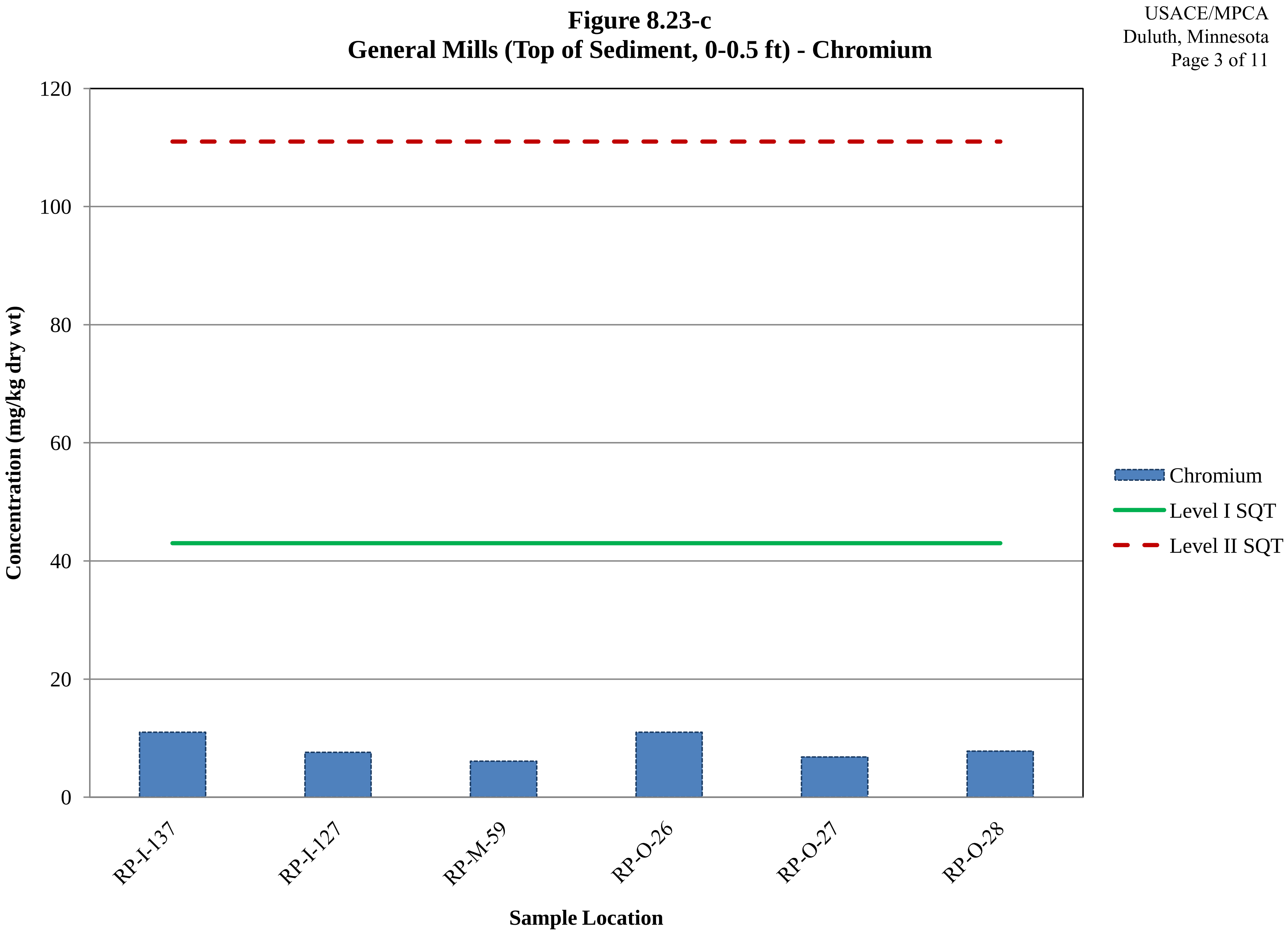


Figure 8.23-c
General Mills (Top of Sediment, 0-0.5 ft) - Chromium
Concentration (mg/kg dry wt)
120
100
80
60
40
20
0
RP-I-137
RP-I-127
RP-M-59
RP-O-26
RP-O-27
RP-O-28
Sample Location
Chromium
Level I SQT
Level II SQT

**Figure 8.23-d**
**General Mills (Top of Sediment, 0-0.5 ft) - Copper**

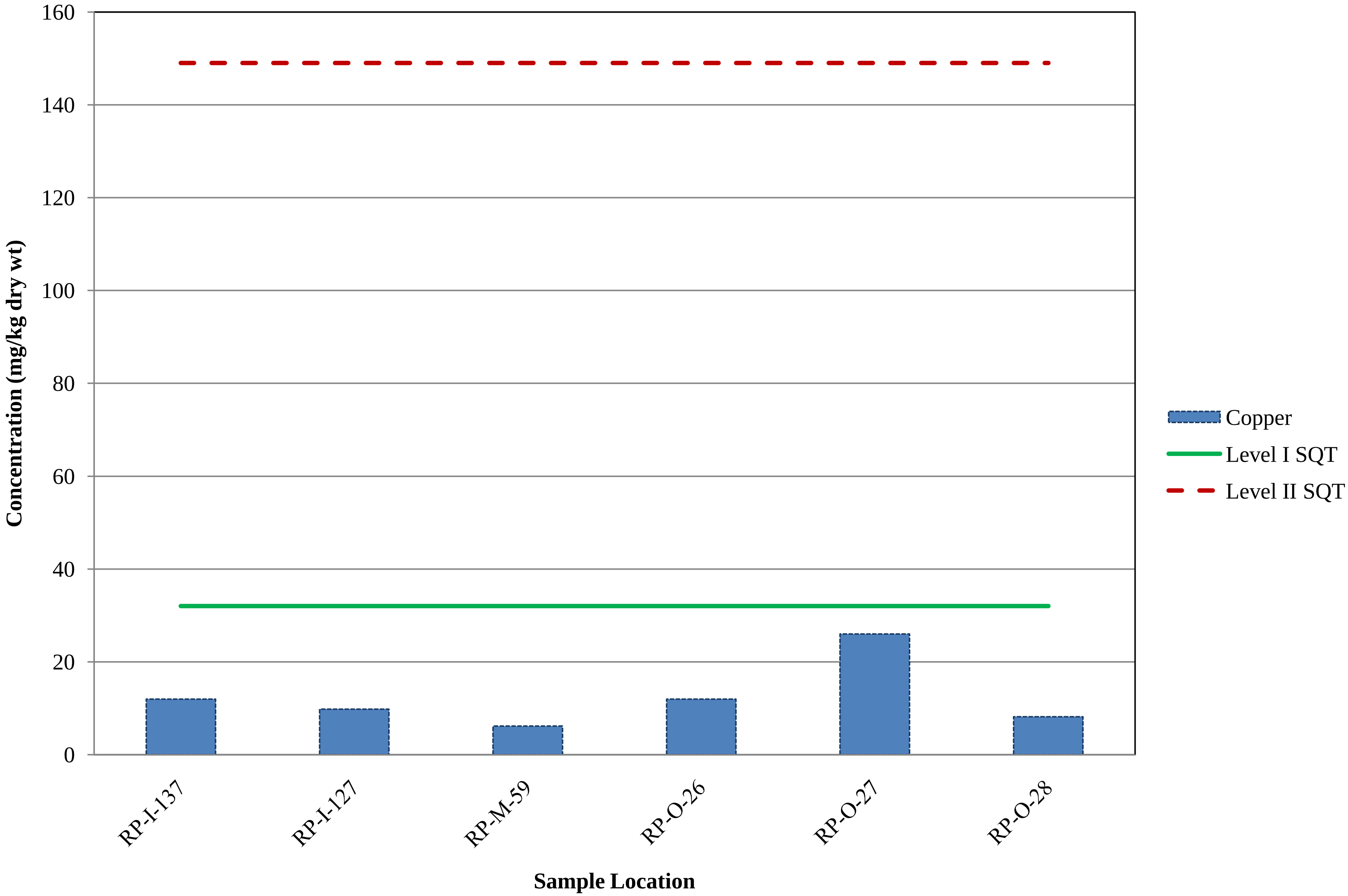


**Figure 8.23-e**
**General Mills (Top of Sediment, 0-0.5 ft) - Lead**

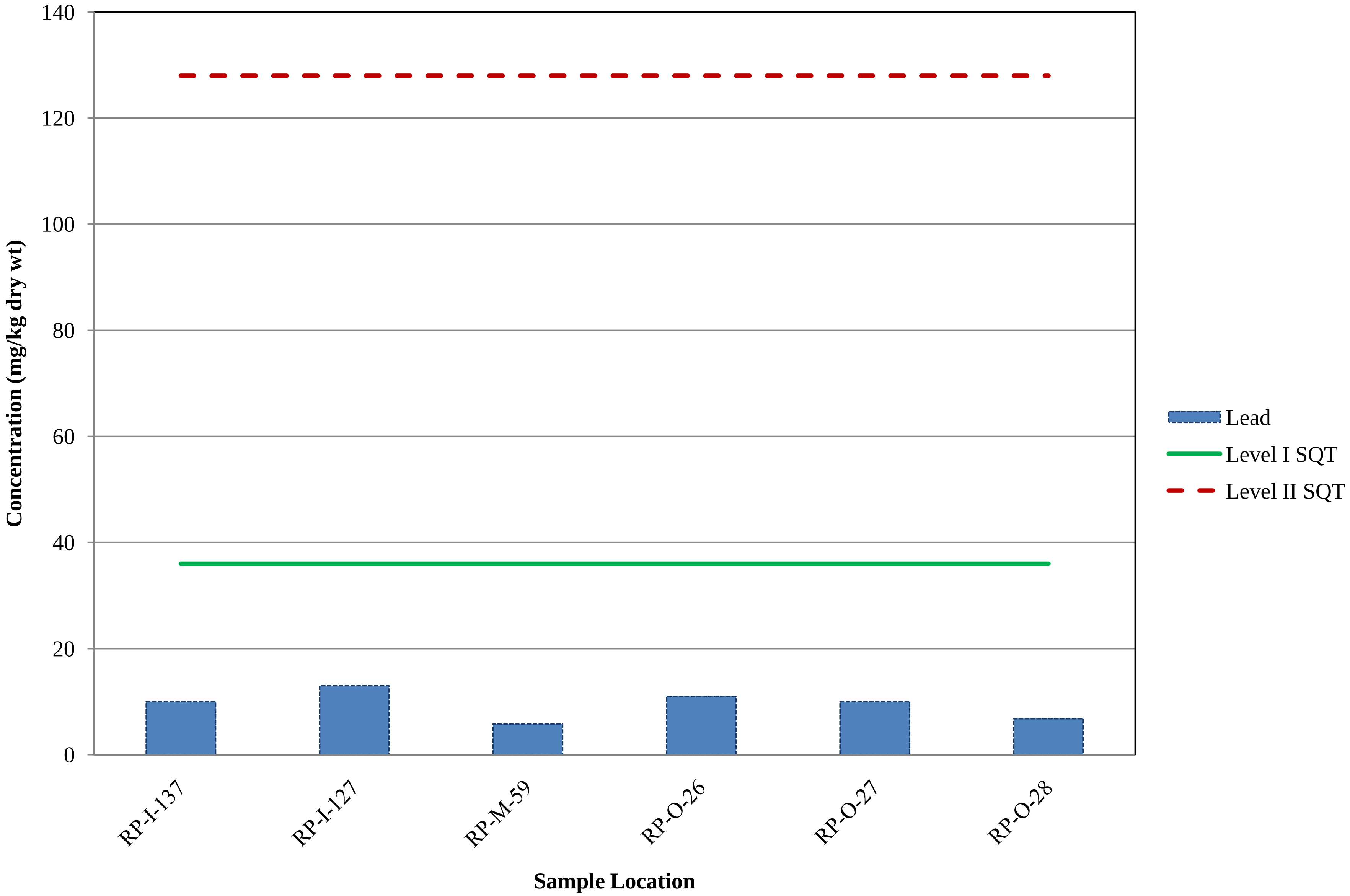


**Figure 8.23-f**
**General Mills (Top of Sediment, 0-0.5 ft) - Mercury**

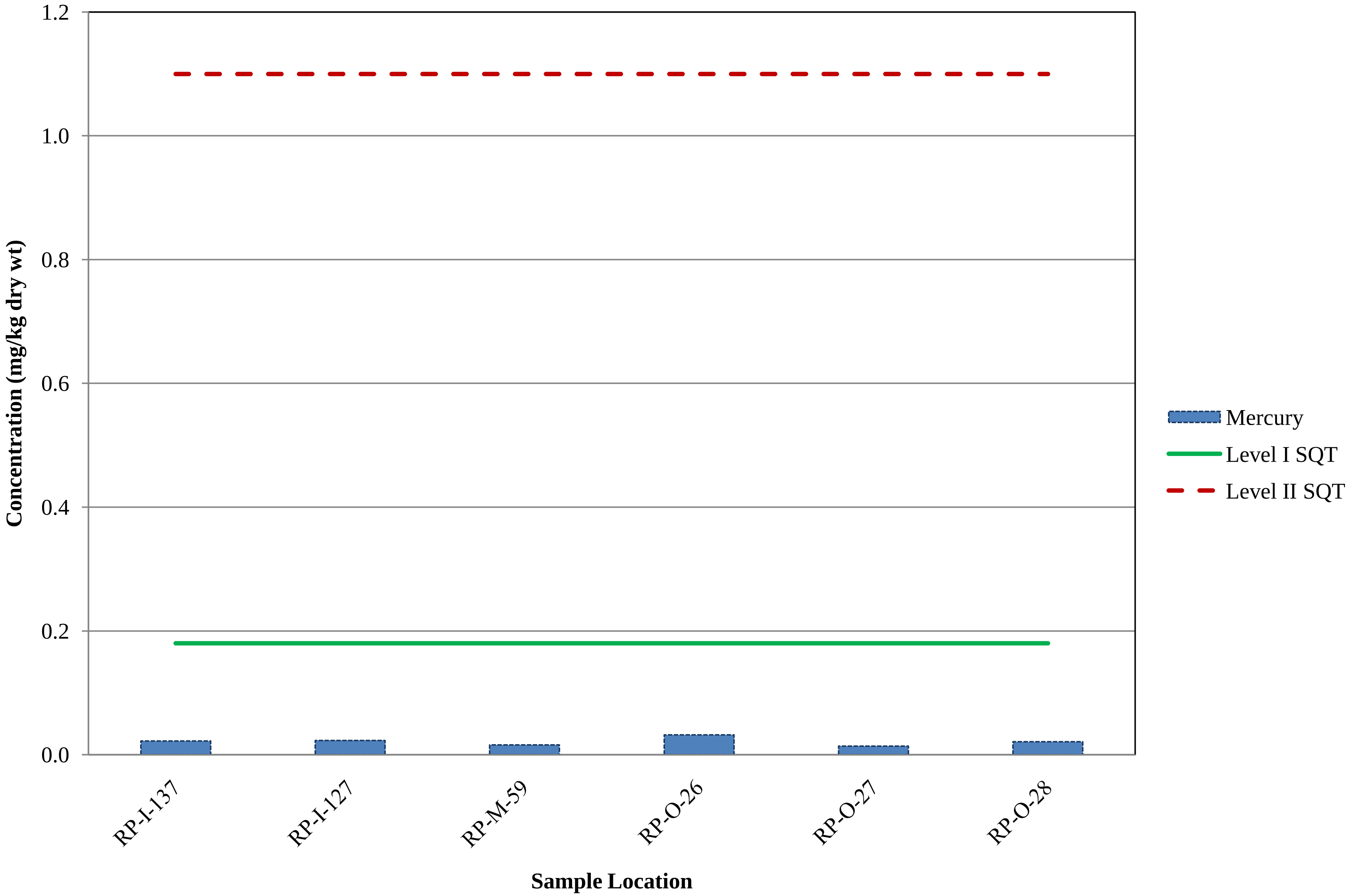


**Figure 8.23-g**
**General Mills (Top of Sediment, 0-0.5 ft) - Nickel**

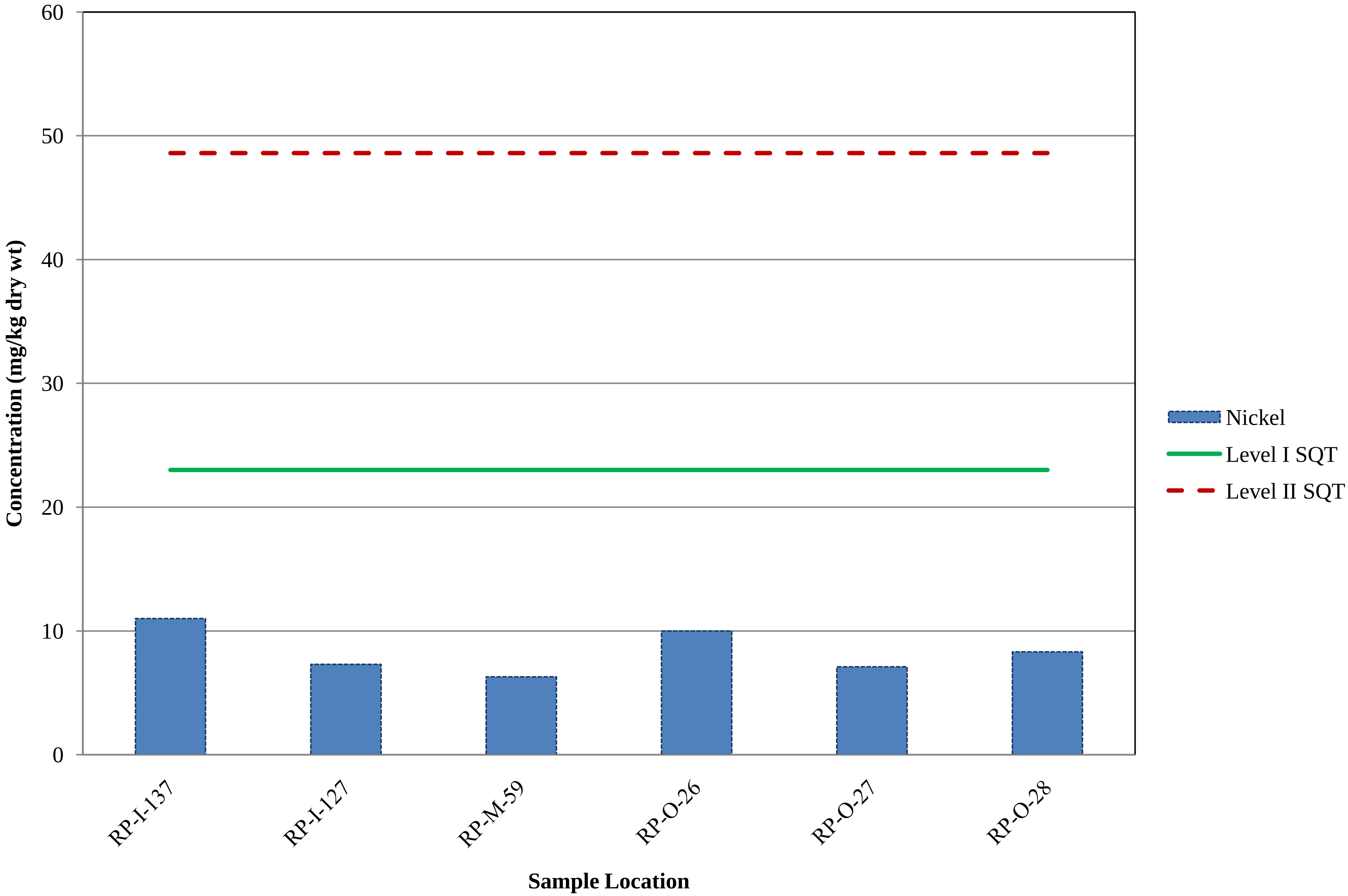


**Figure 8.23-h**
**General Mills (Top of Sediment, 0-0.5 ft) - Zinc**

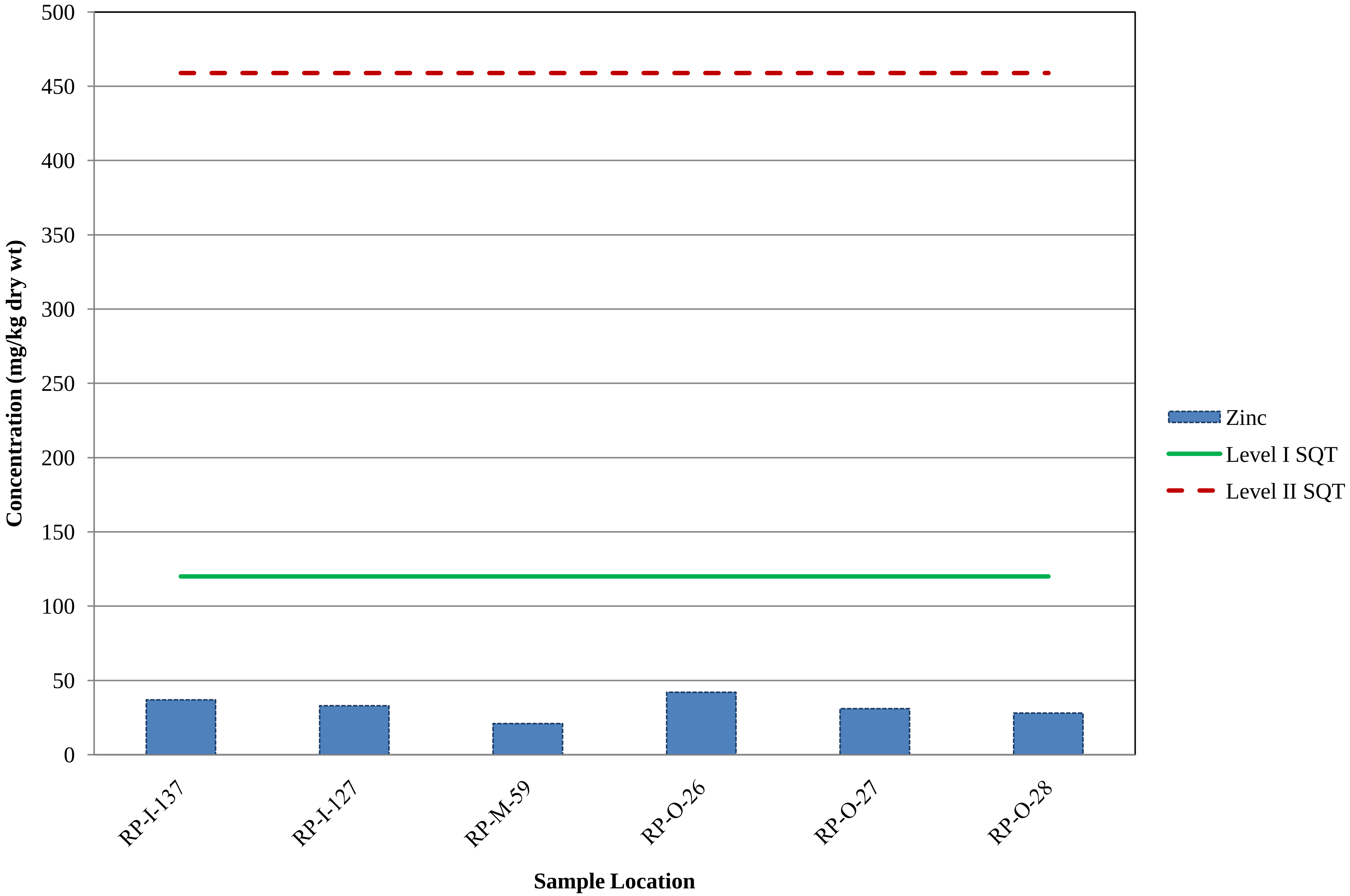


**Figure 8.23-i**
**General Mills (Top of Sediment, 0-0.5 ft) - PAHs**

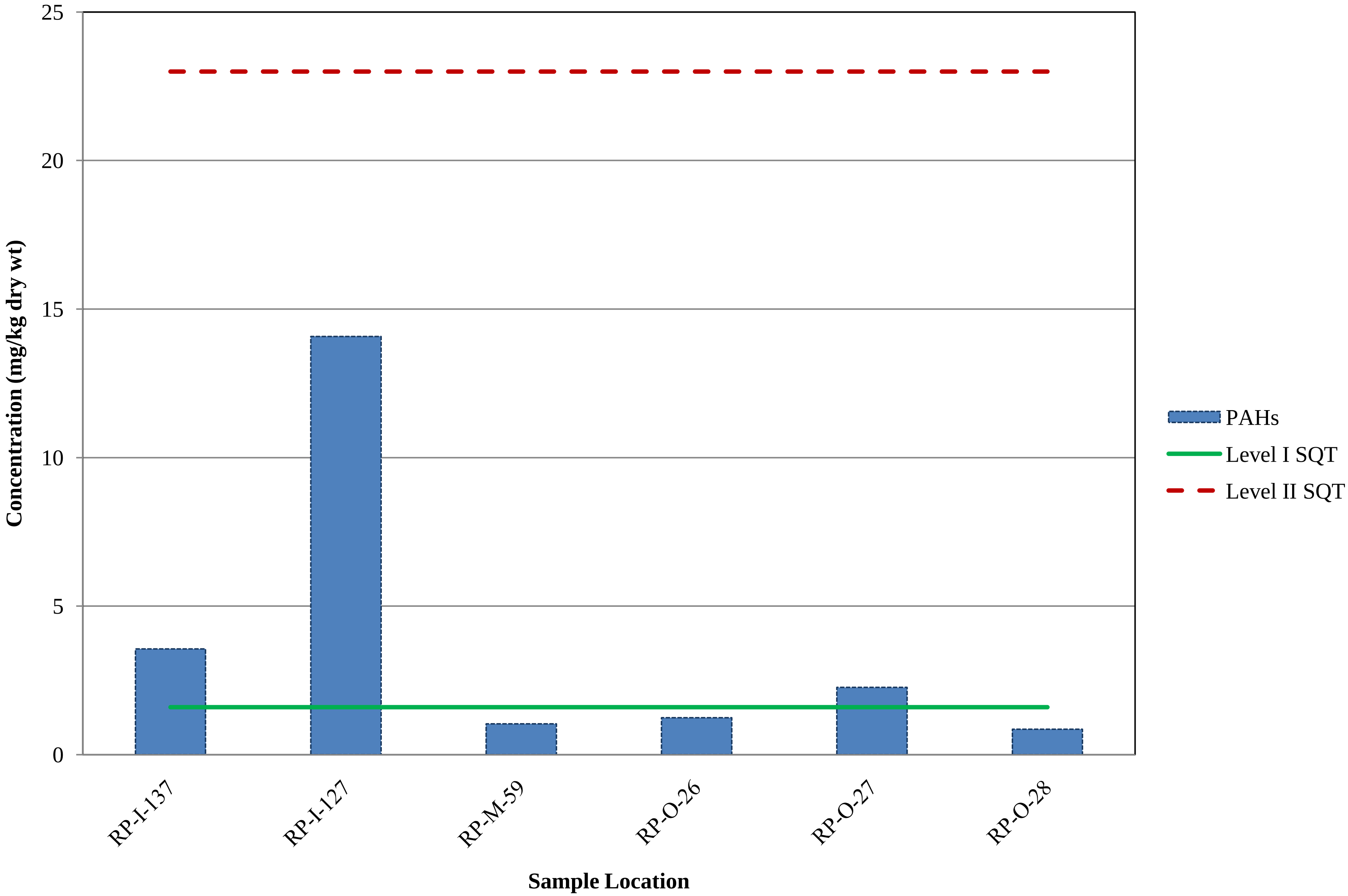


**Figure 8.23-j**
**General Mills (Top of Sediment, 0-0.5 ft) - PCBs**

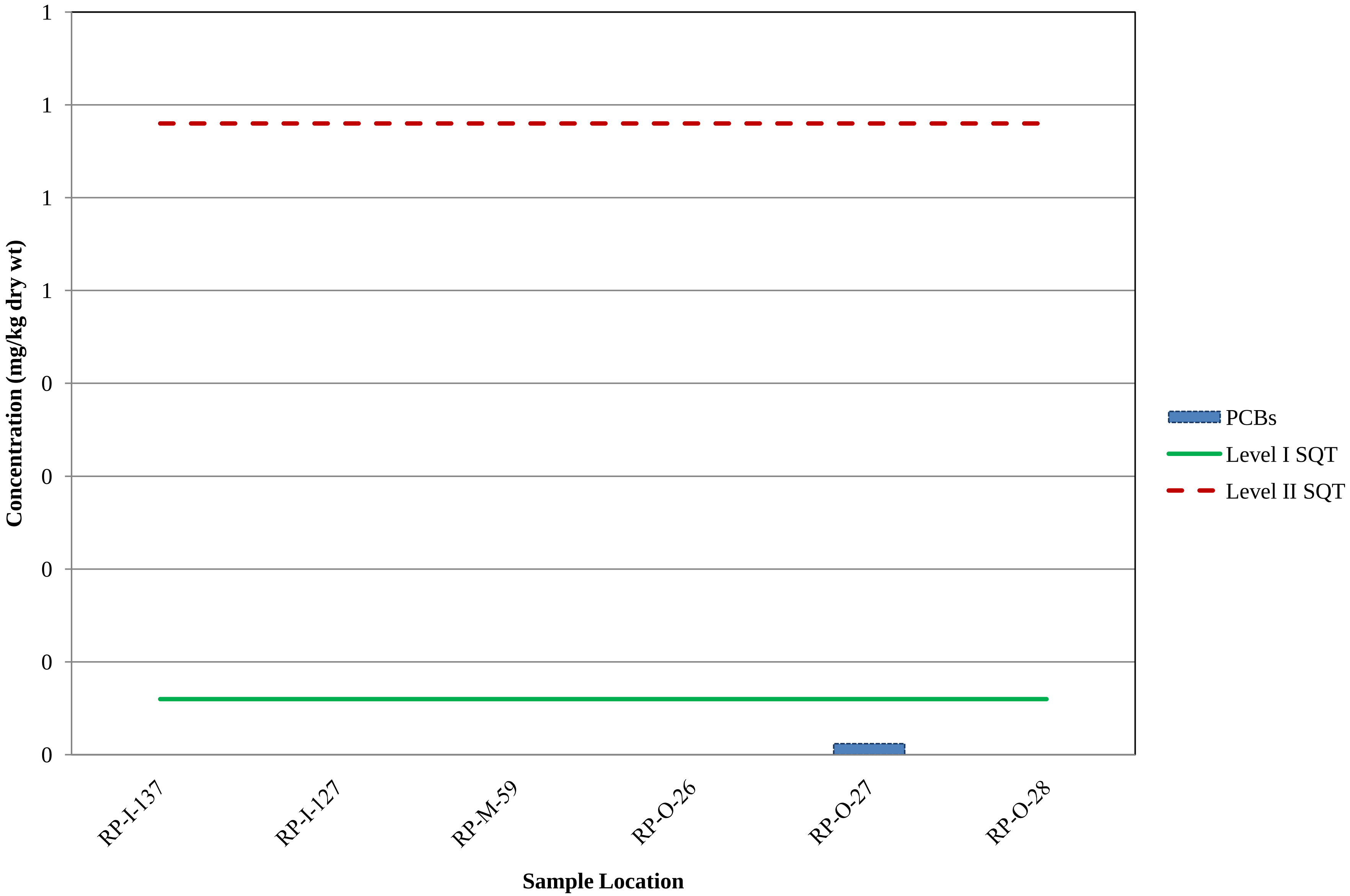


**Figure 8.23-k**
**General Mills (Top of Sediment, 0-0.5 ft) - Dioxins**

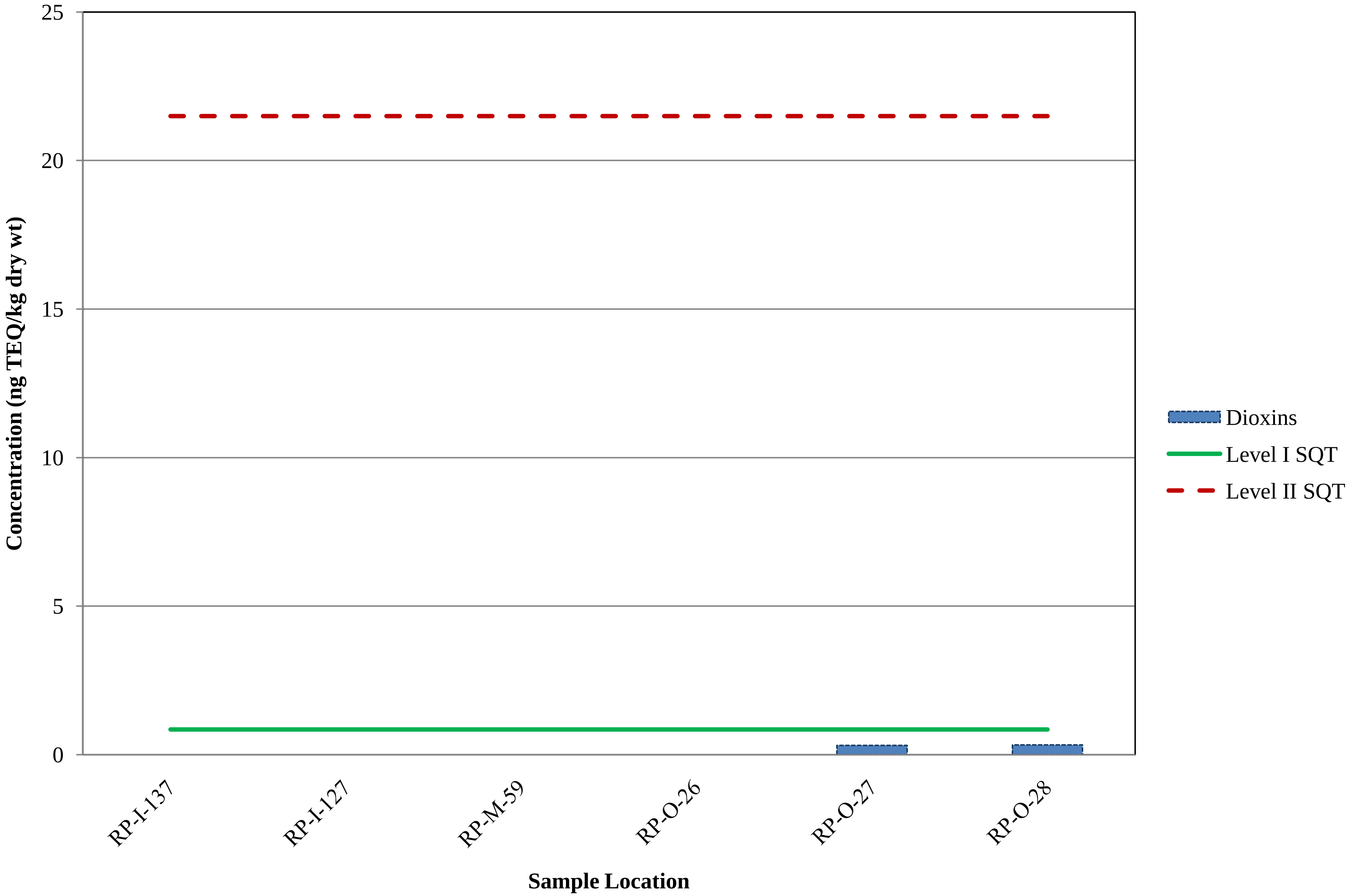


**Figure 8.24-a**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Arsenic**

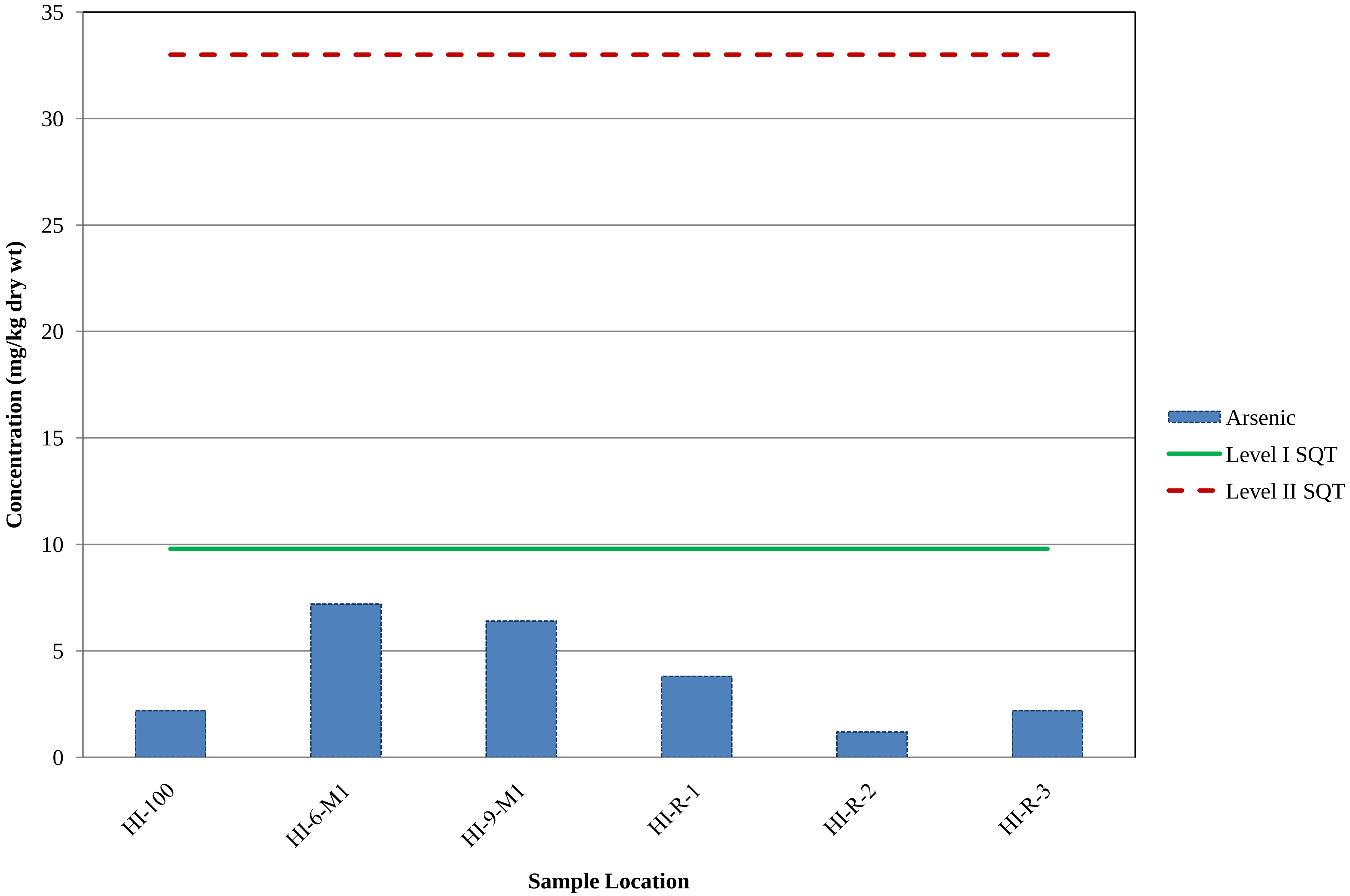


**Figure 8.24-b**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Cadmium**

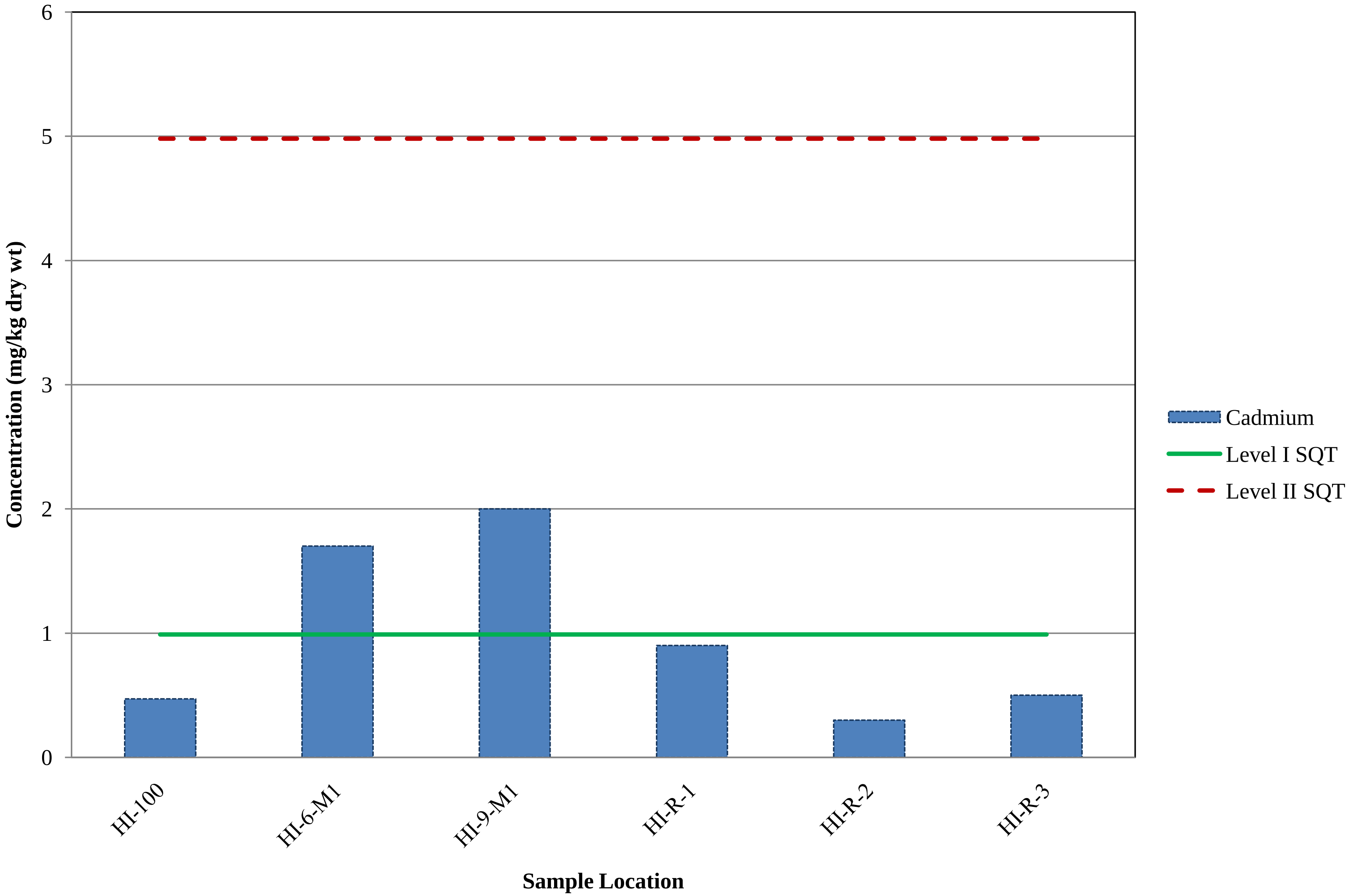


**Figure 8.24-c**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Chromium**

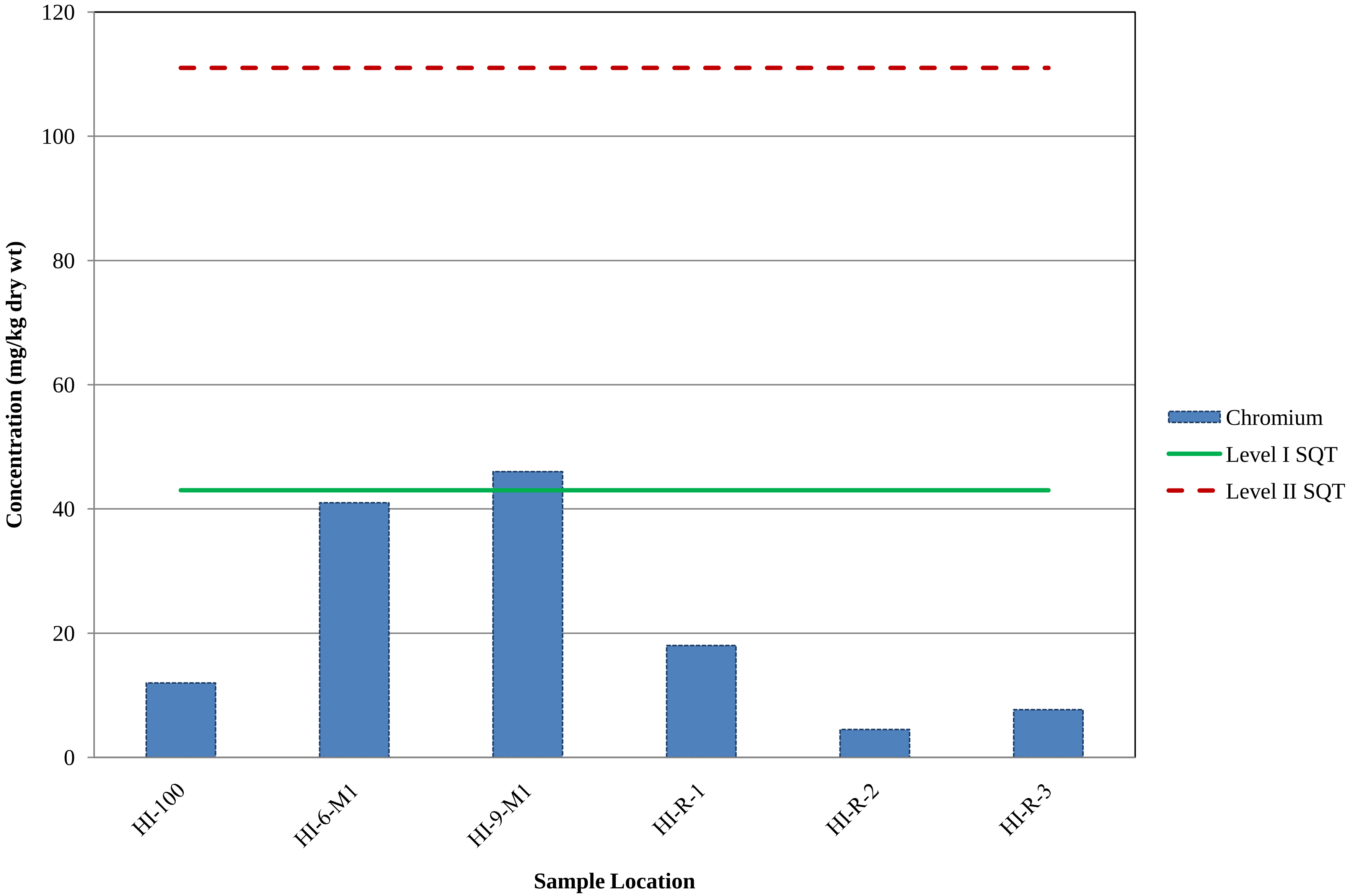


**Figure 8.24-d**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Copper**

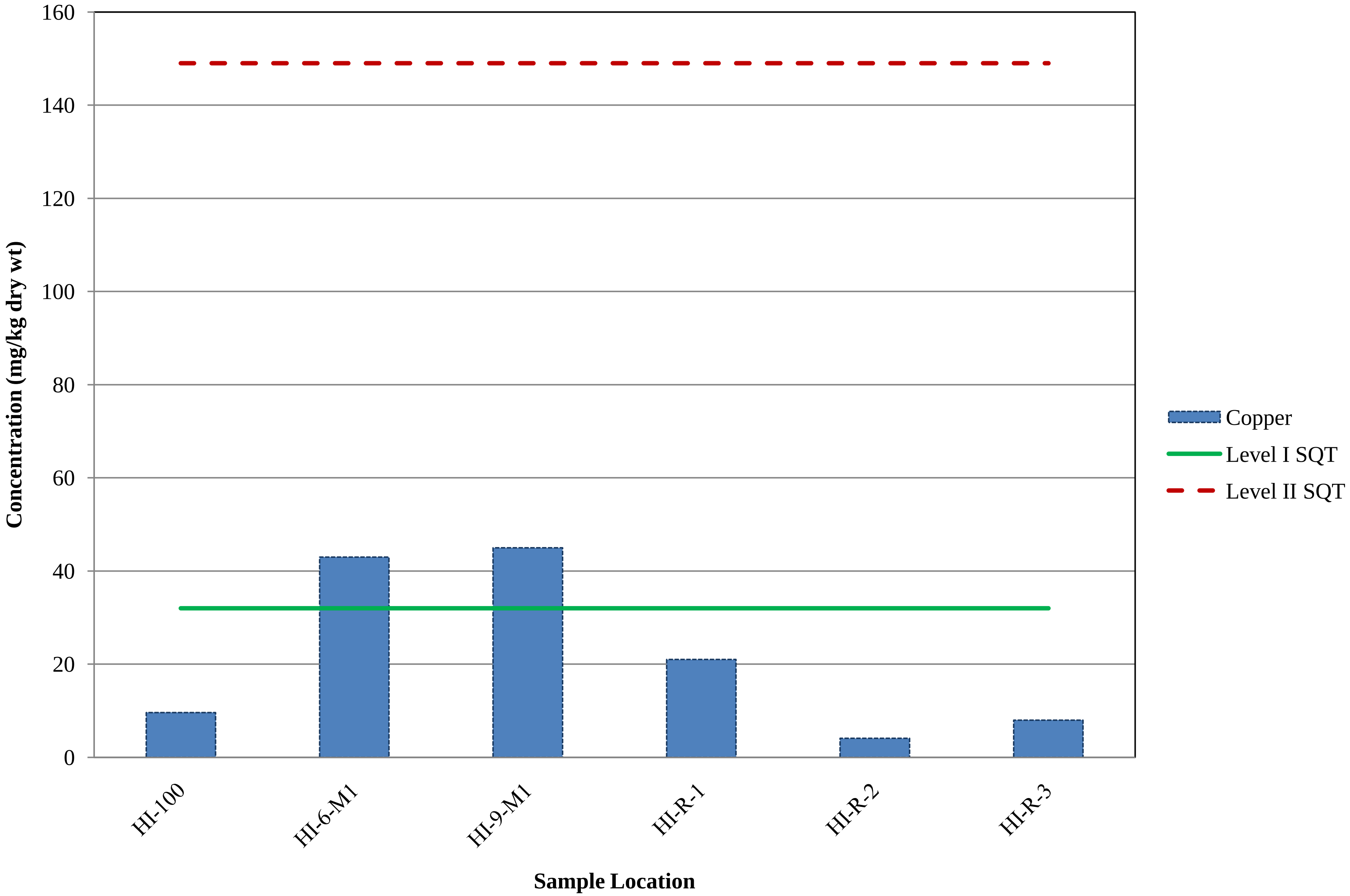


**Figure 8.24-e**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Lead**

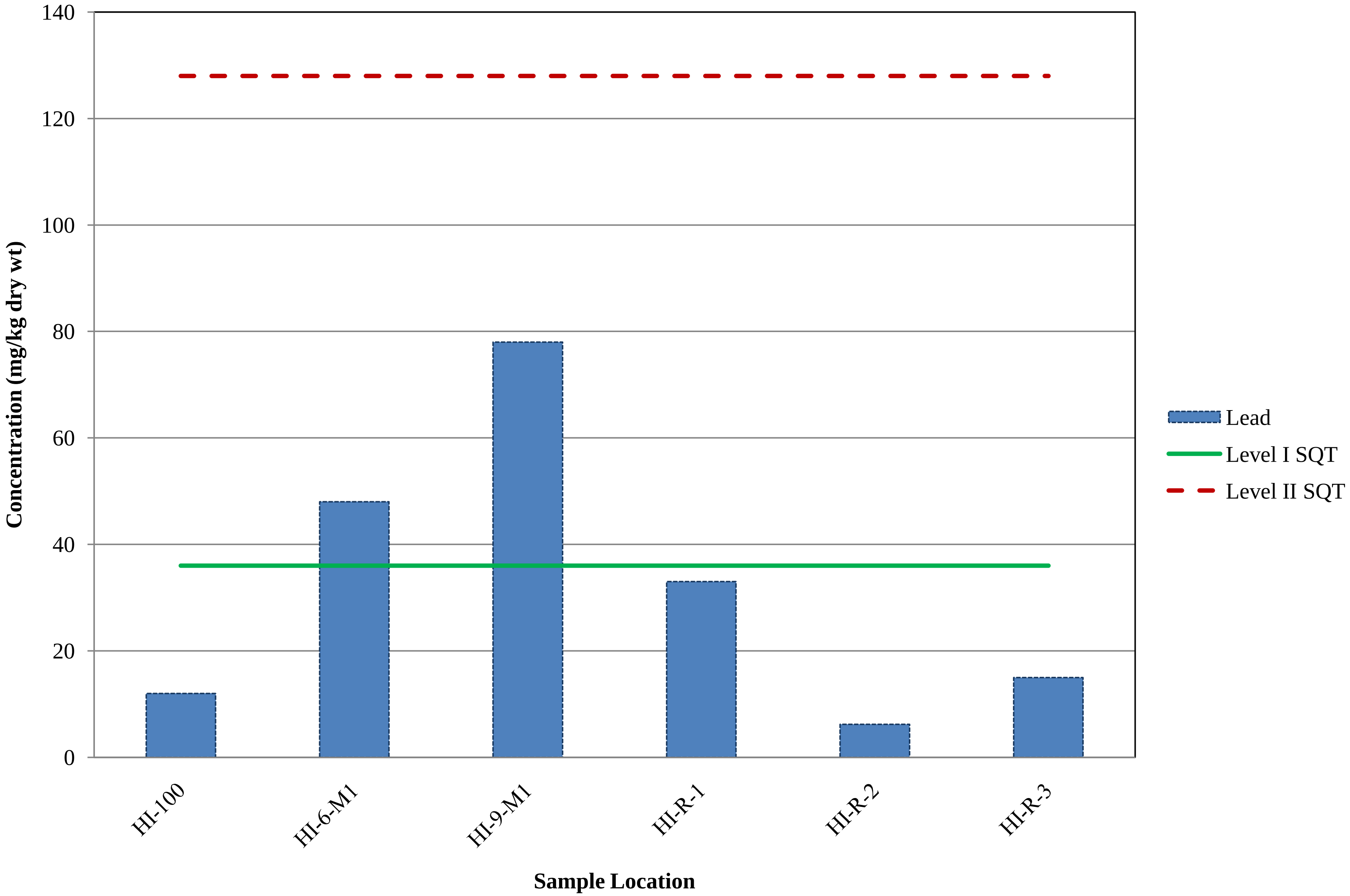
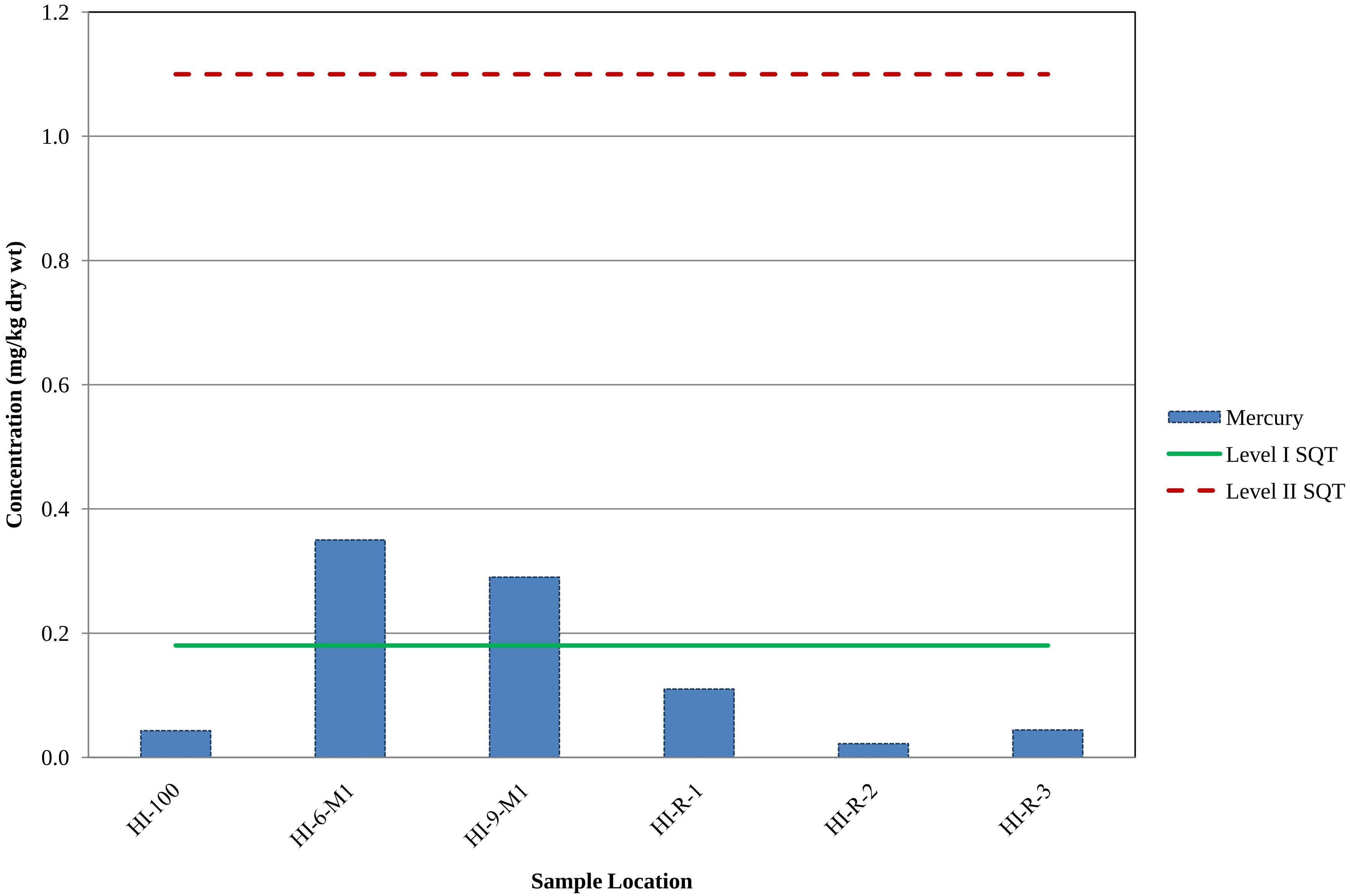


**Figure 8.24-f**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Mercury**



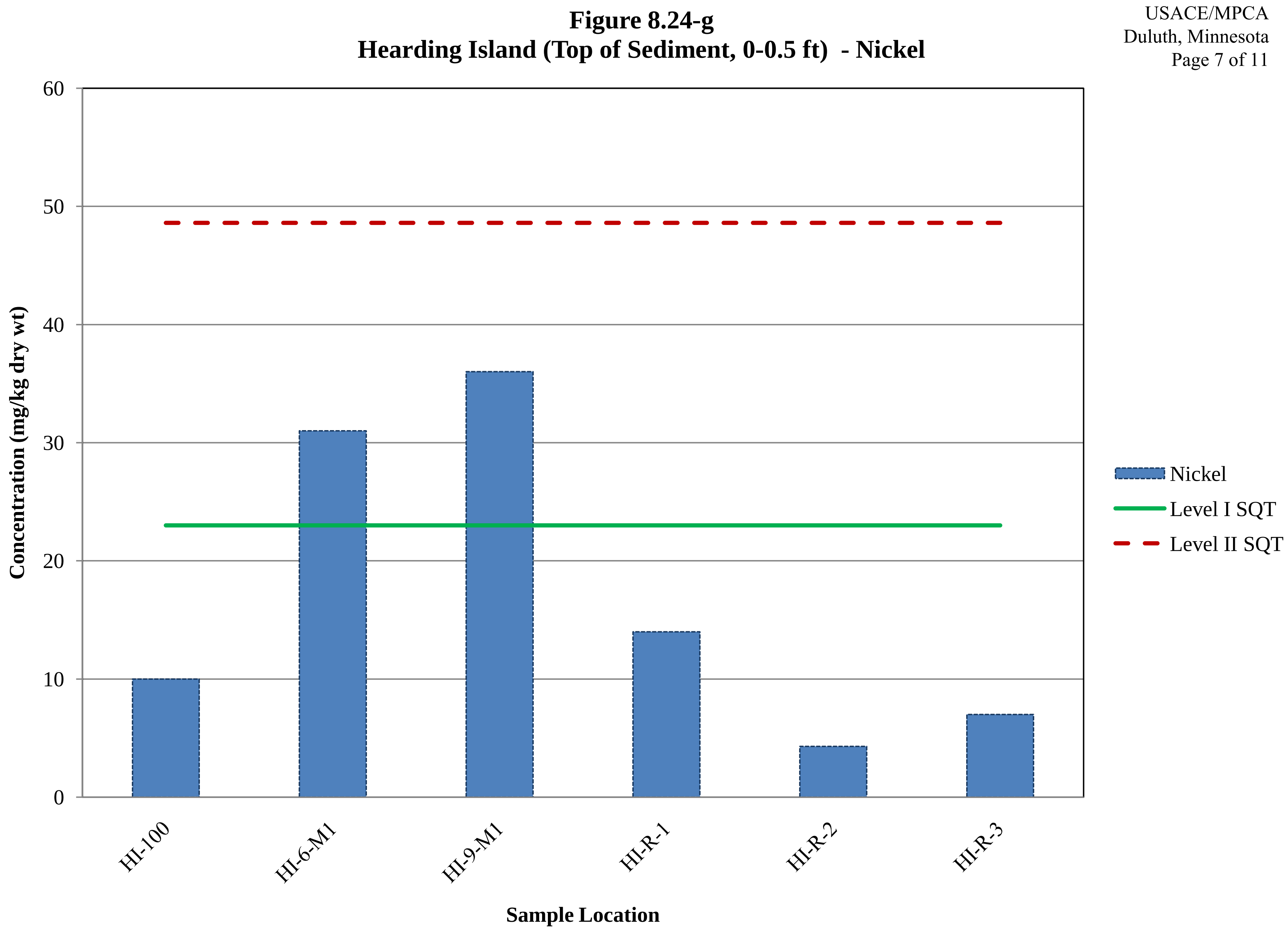


Figure 8.24-g
Hearding Island (Top of Sediment, 0-0.5 ft) - Nickel
Concentration (mg/kg dry wt)
60
50
40
30
20
10
0
HI-100
HI-6-M1
HI-9-M1
HI-R-1
HI-R-2
HI-R-3
Sample Location
Nickel
Level I SQT
Level II SQT

**Figure 8.24-h**
**Hearding Island (Top of Sediment, 0-0.5 ft) - Zinc**

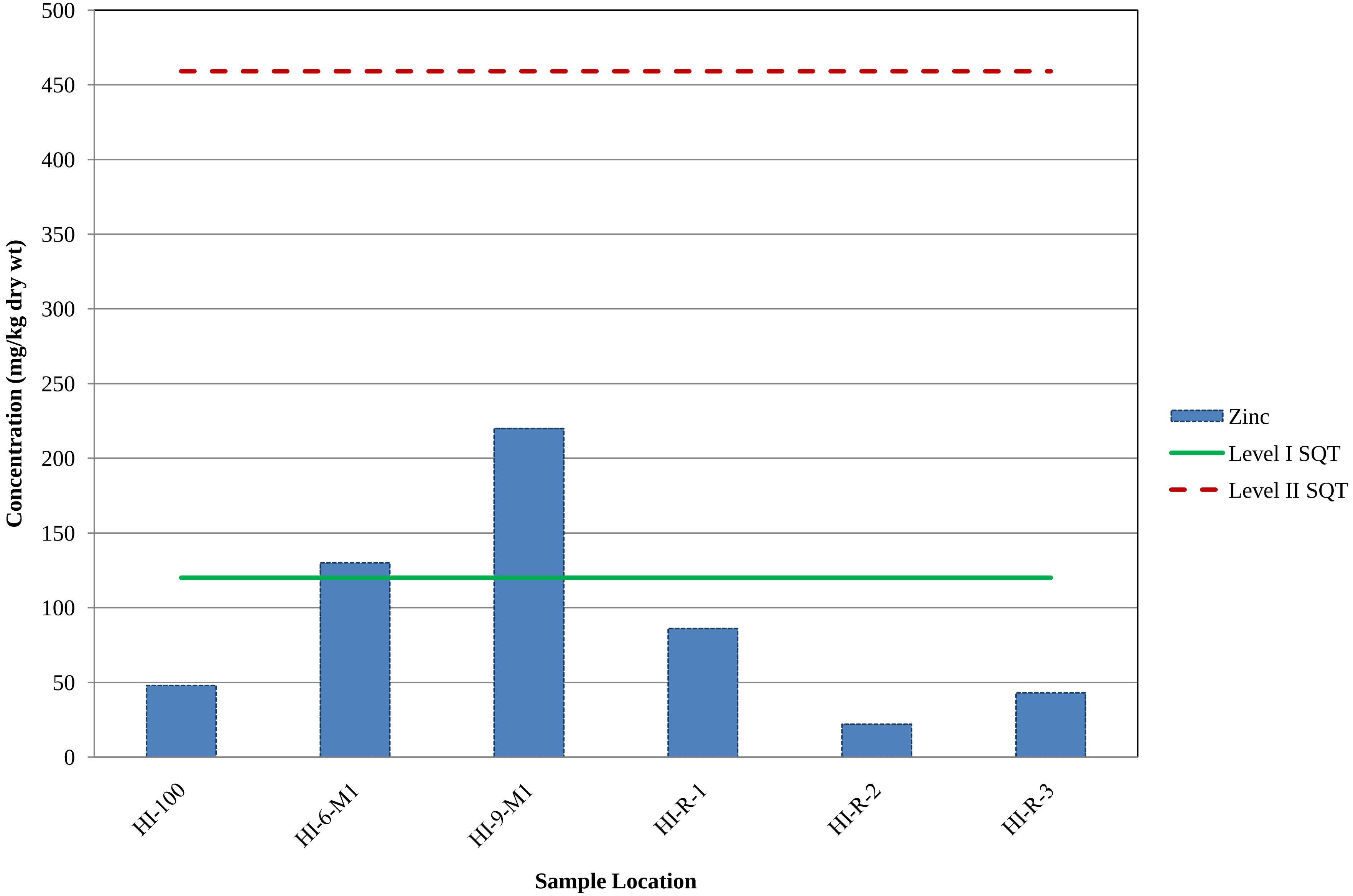


**Figure 8.24-i**
**Hearding Island (Top of Sediment, 0-0.5 ft) - PAHs**

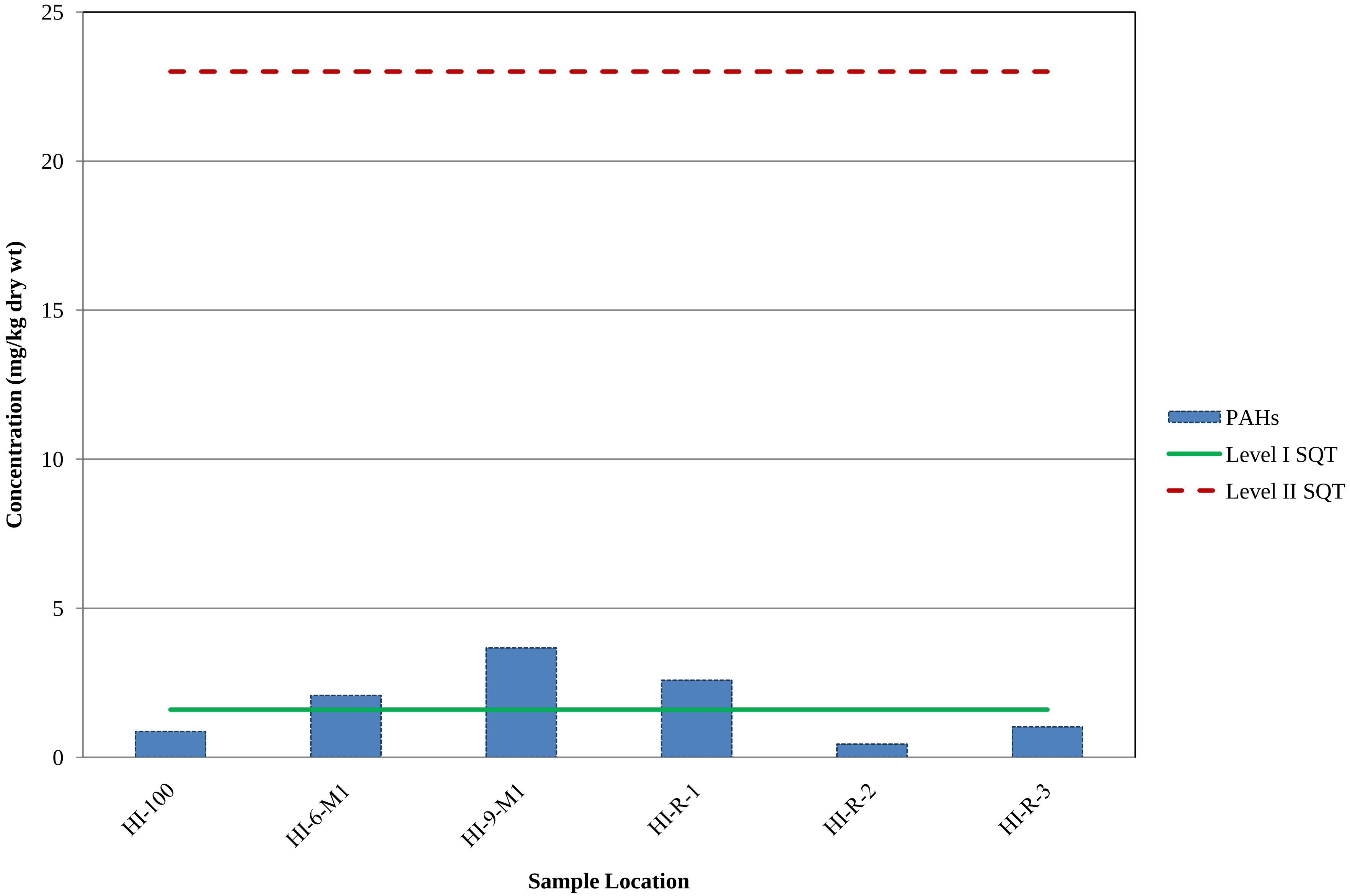
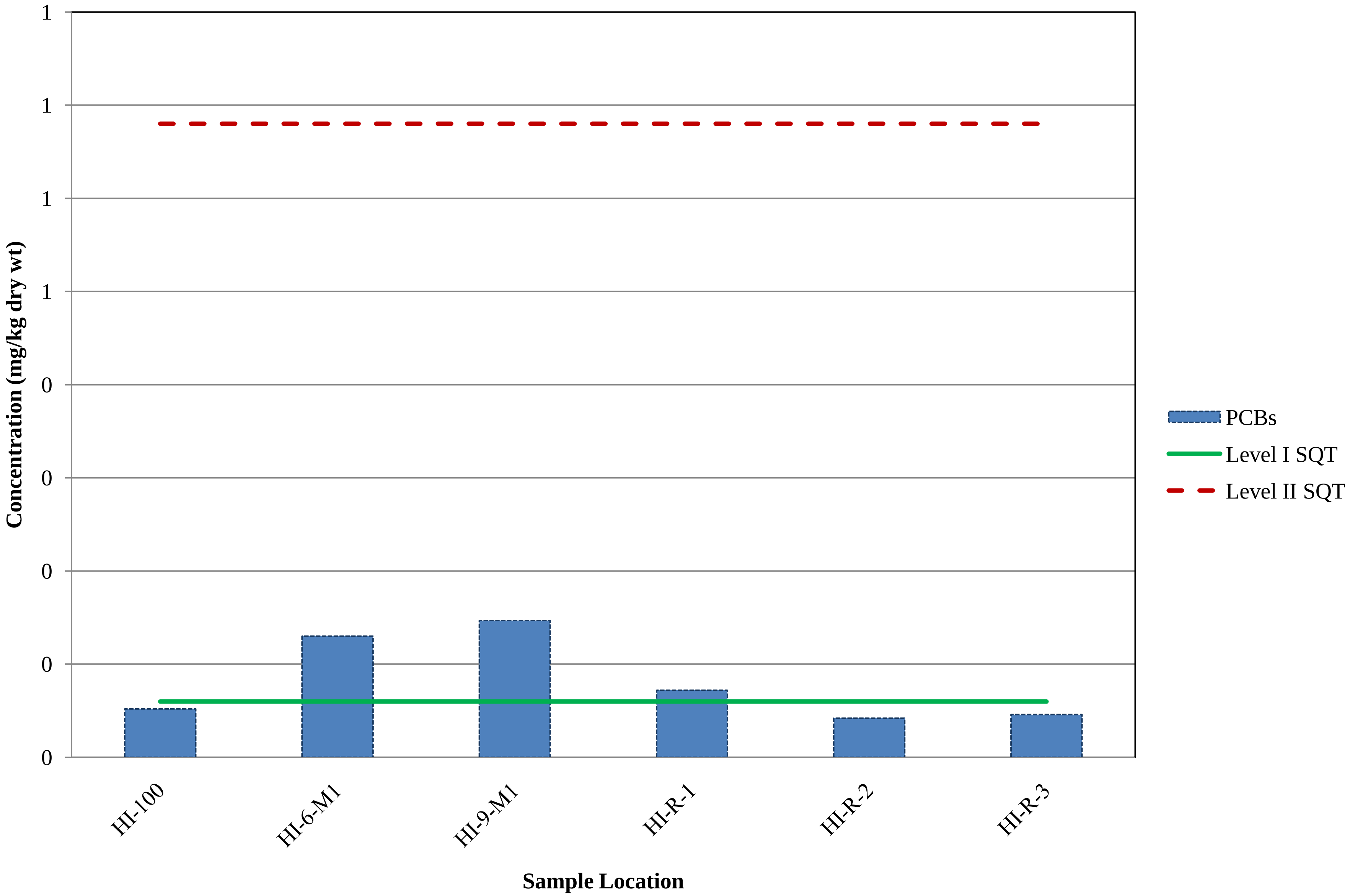


**Figure 8.24-j**
**Hearding Island (Top of Sediment, 0-0.5 ft) - PCBs**



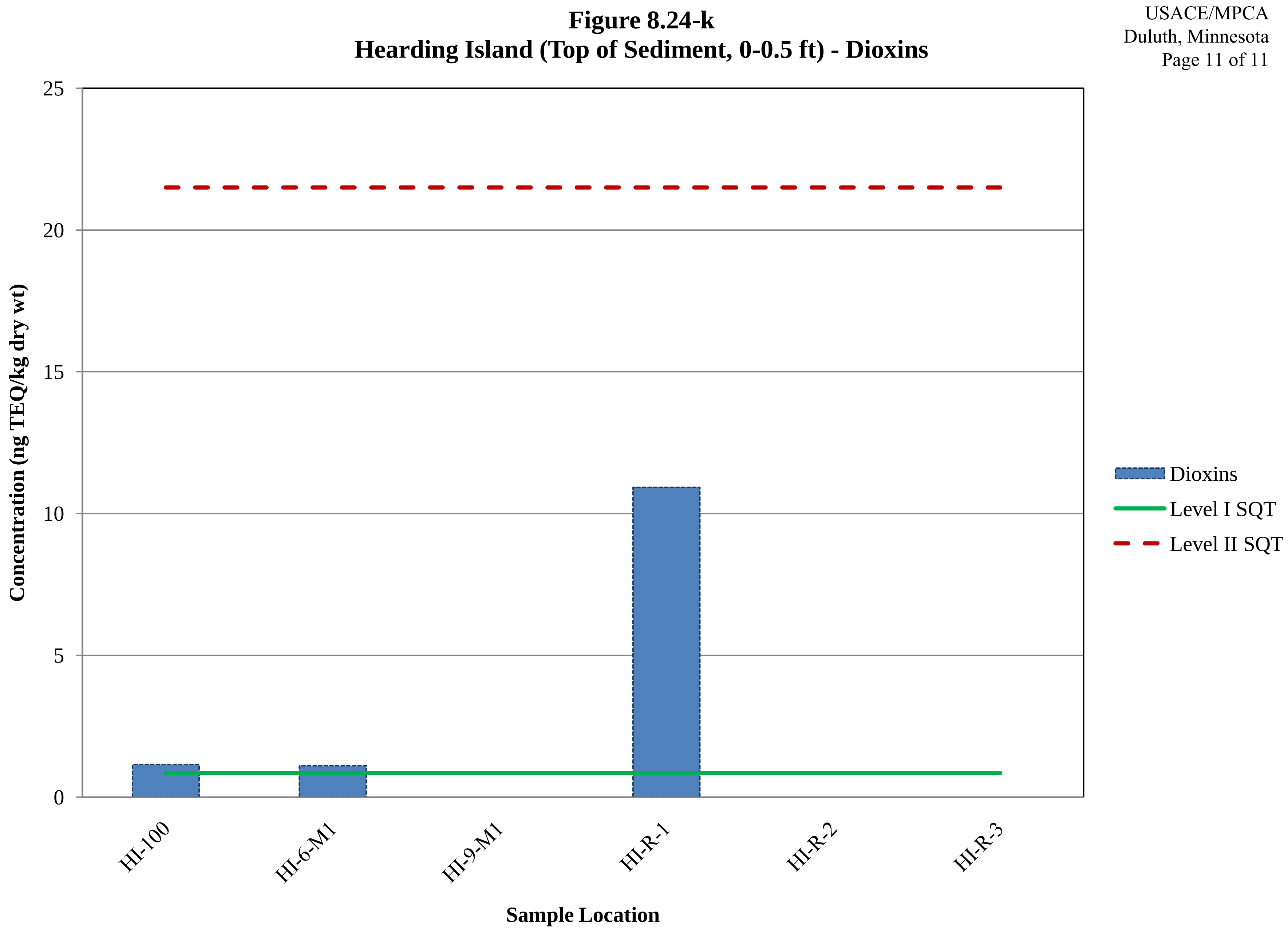


Figure 8.24-k
Hearding Island (Top of Sediment, 0-0.5 ft) - Dioxins
Concentration (ng TEQ/kg dry wt)
25
20
15
10
5
0
HI-100
HI-6-M1
HI-9-M1
HI-R-1
HI-R-2
HI-R-3
Sample Location
Dioxins
Level I SQT
Level II SQT

**Figure 8.25-a**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Arsenic**

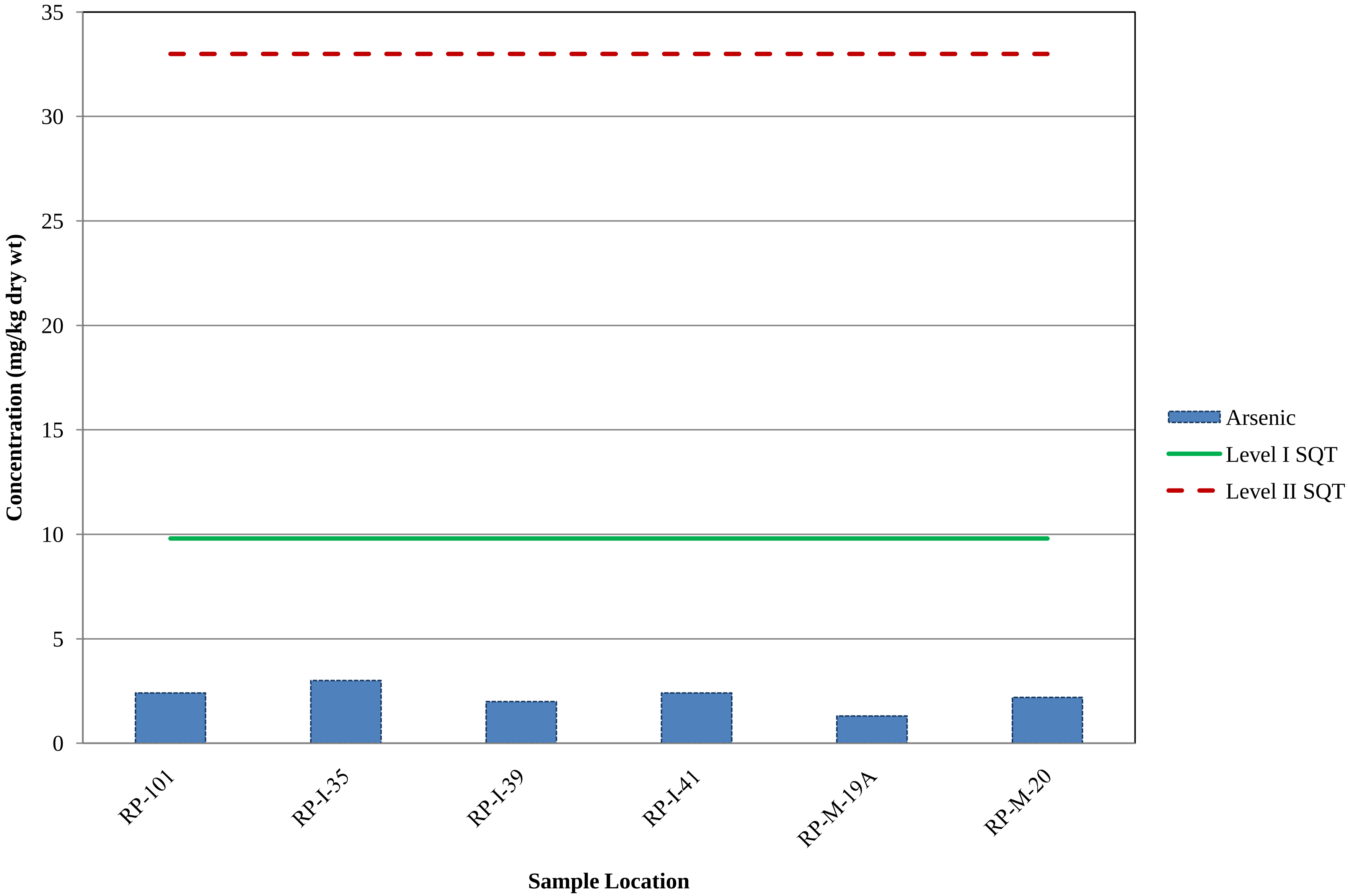


**Figure 8.25-b**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Cadmium**

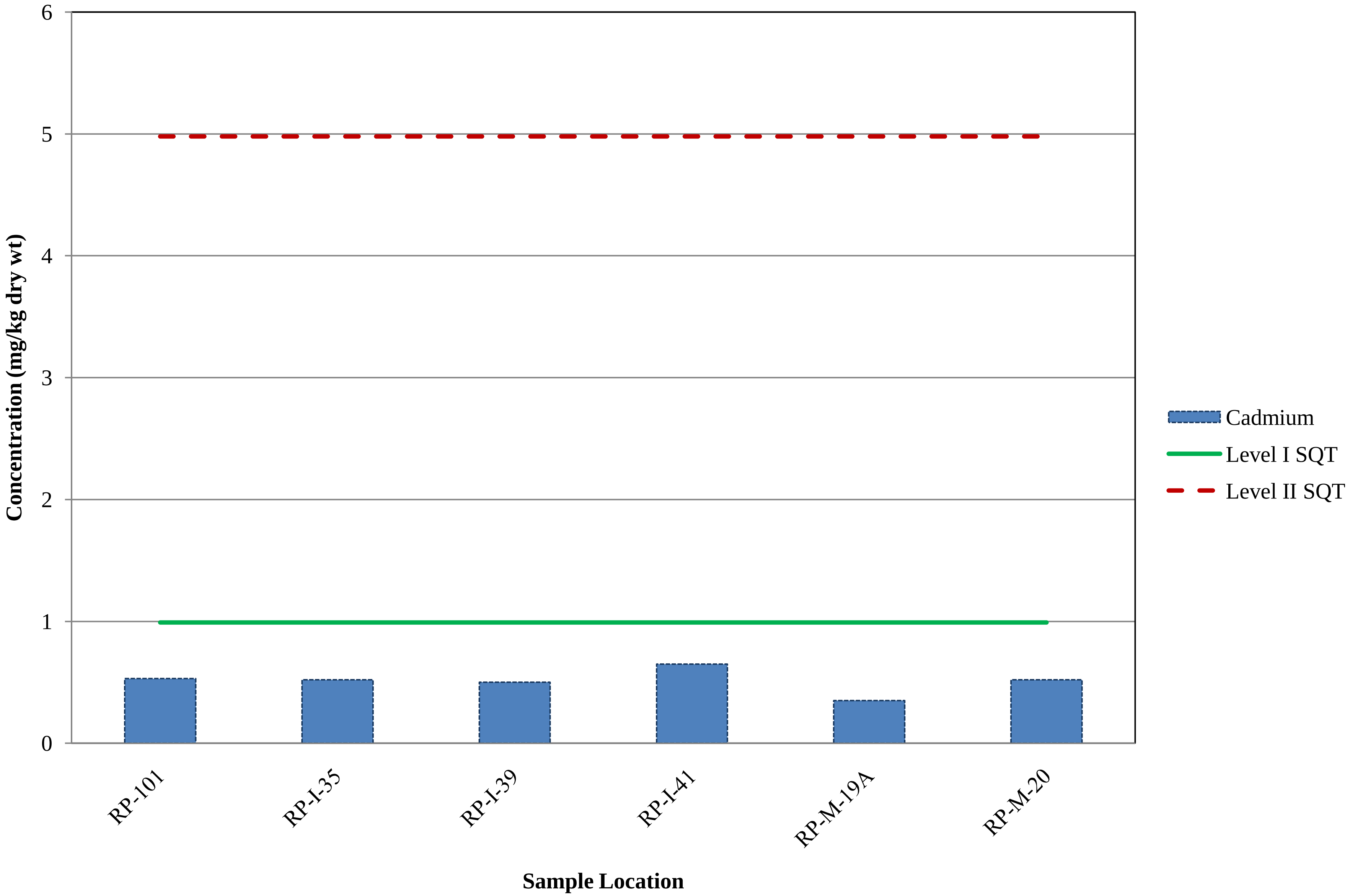


**Figure 8.25-c**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Chromium**

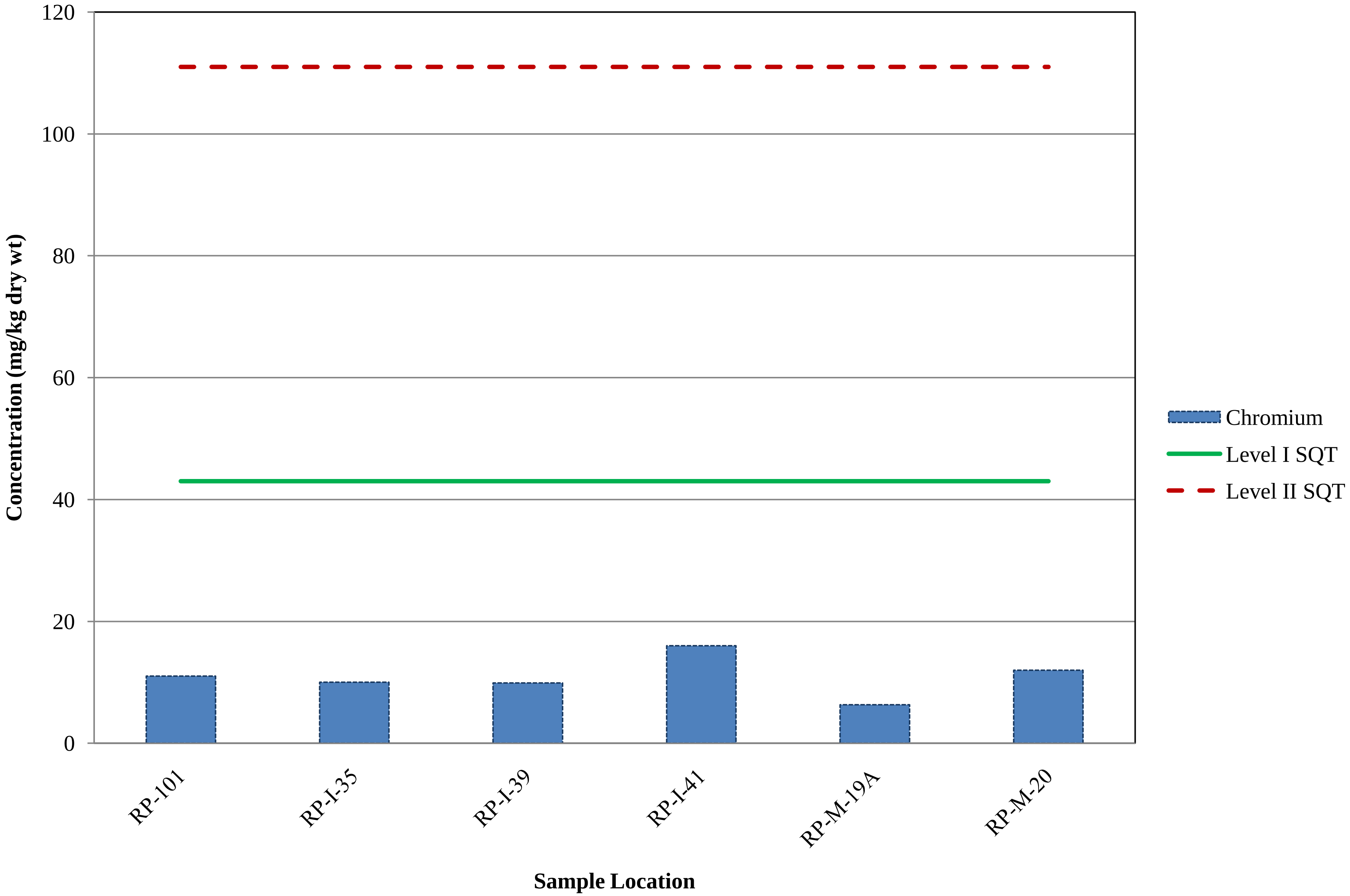


**Figure 8.25-d**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Copper**

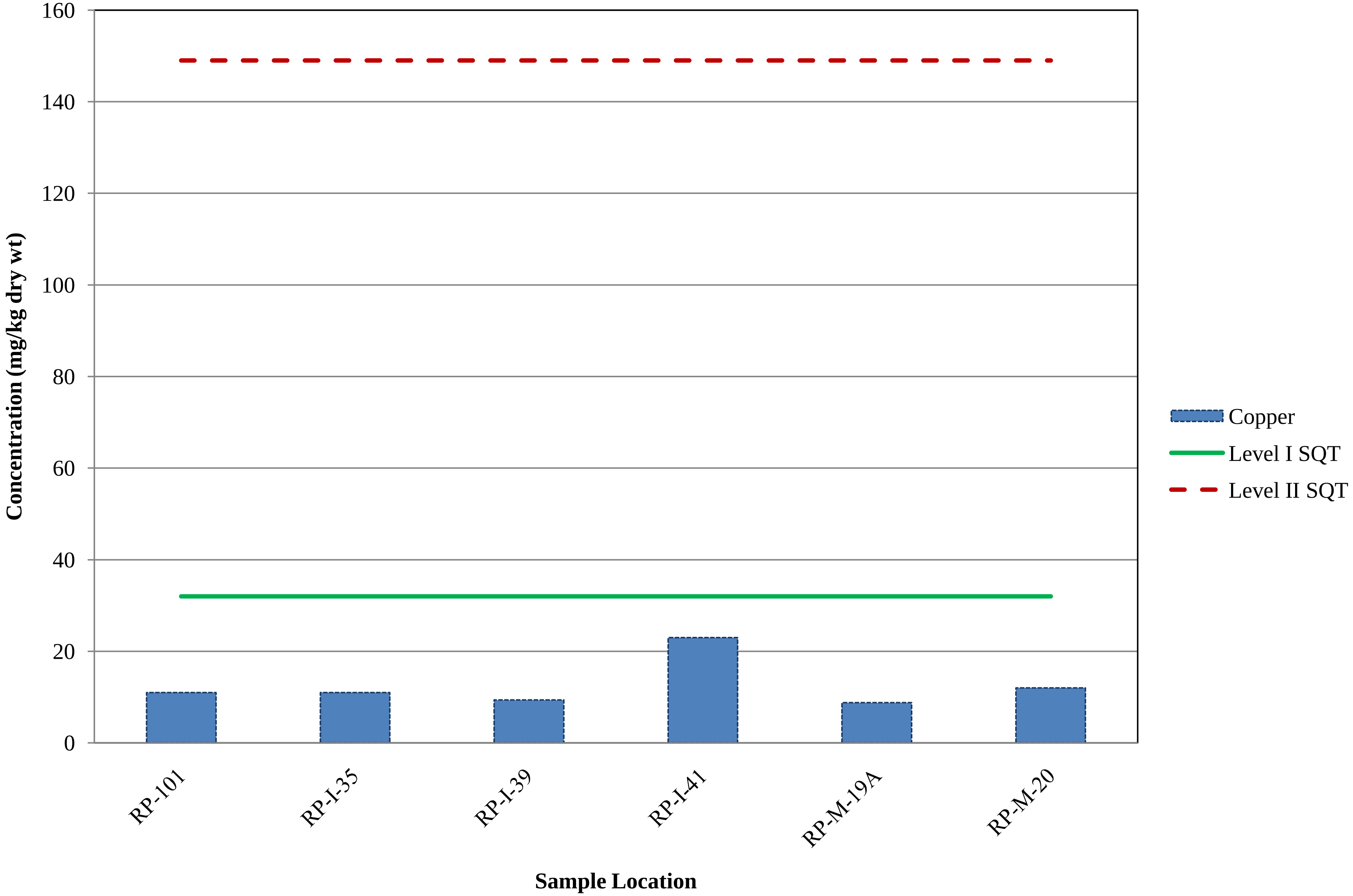


**Figure 8.25-e**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Lead**

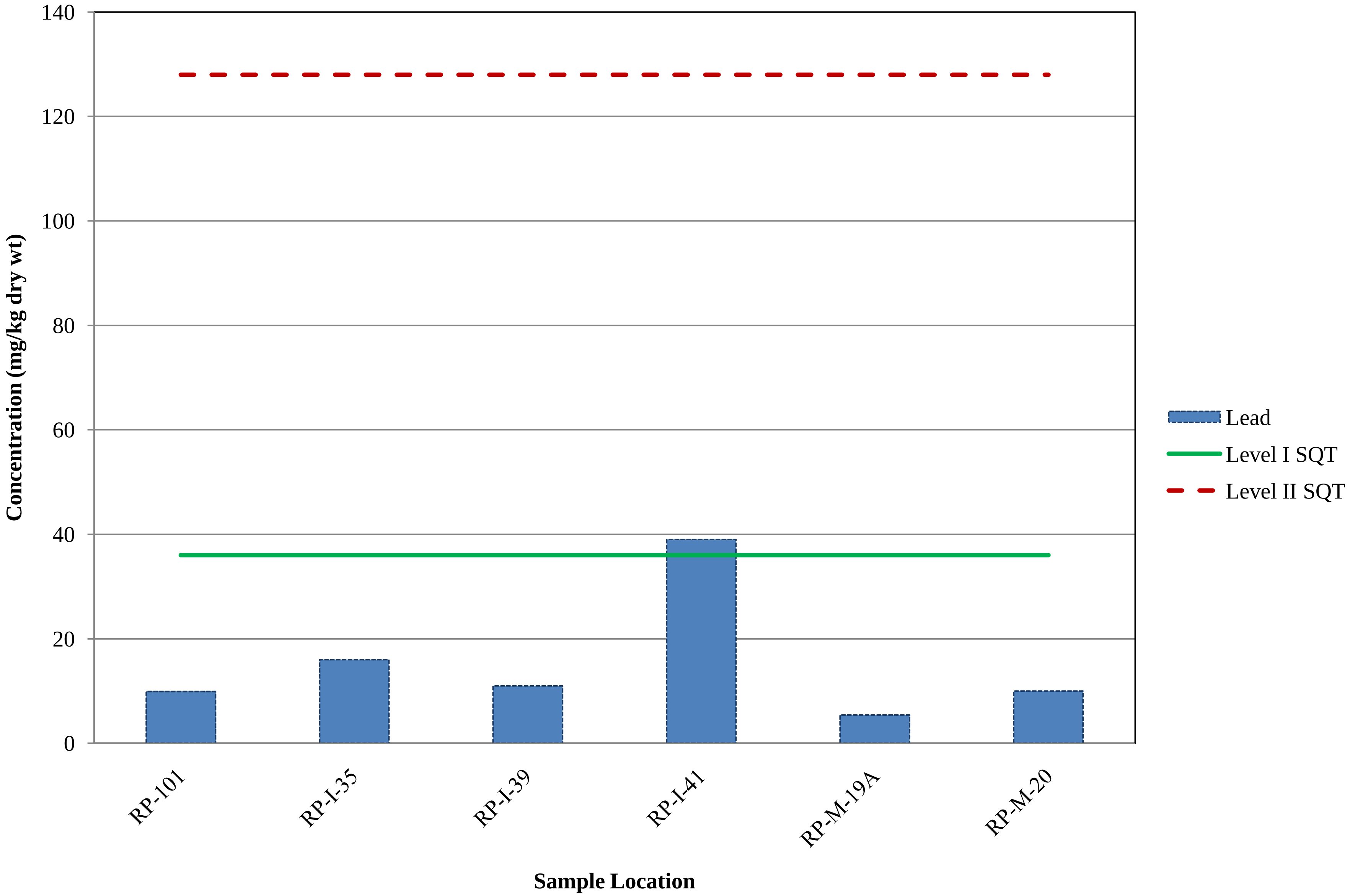


**Figure 8.25-f**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Mercury**

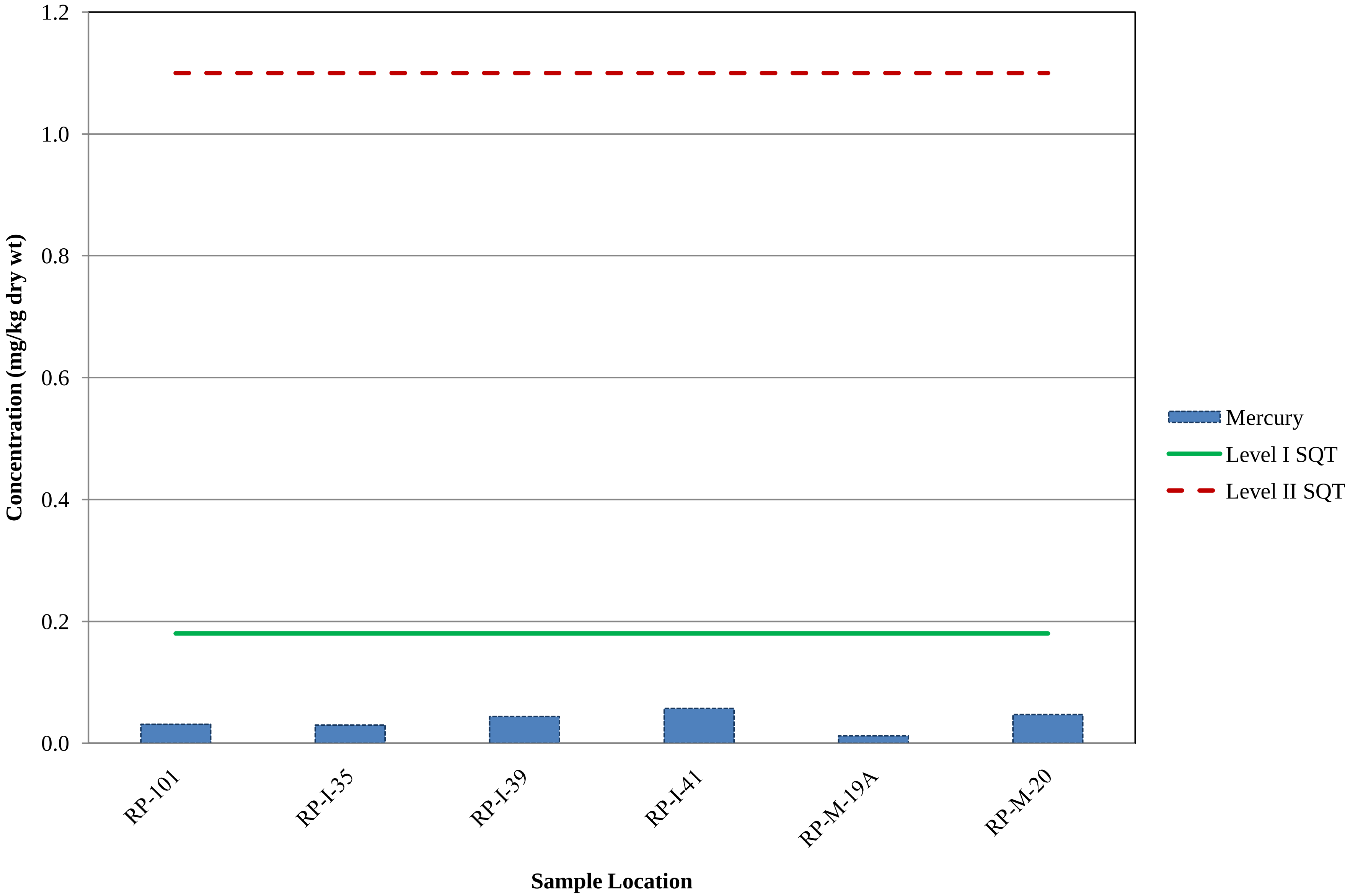


**Figure 8.25-g**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Nickel**

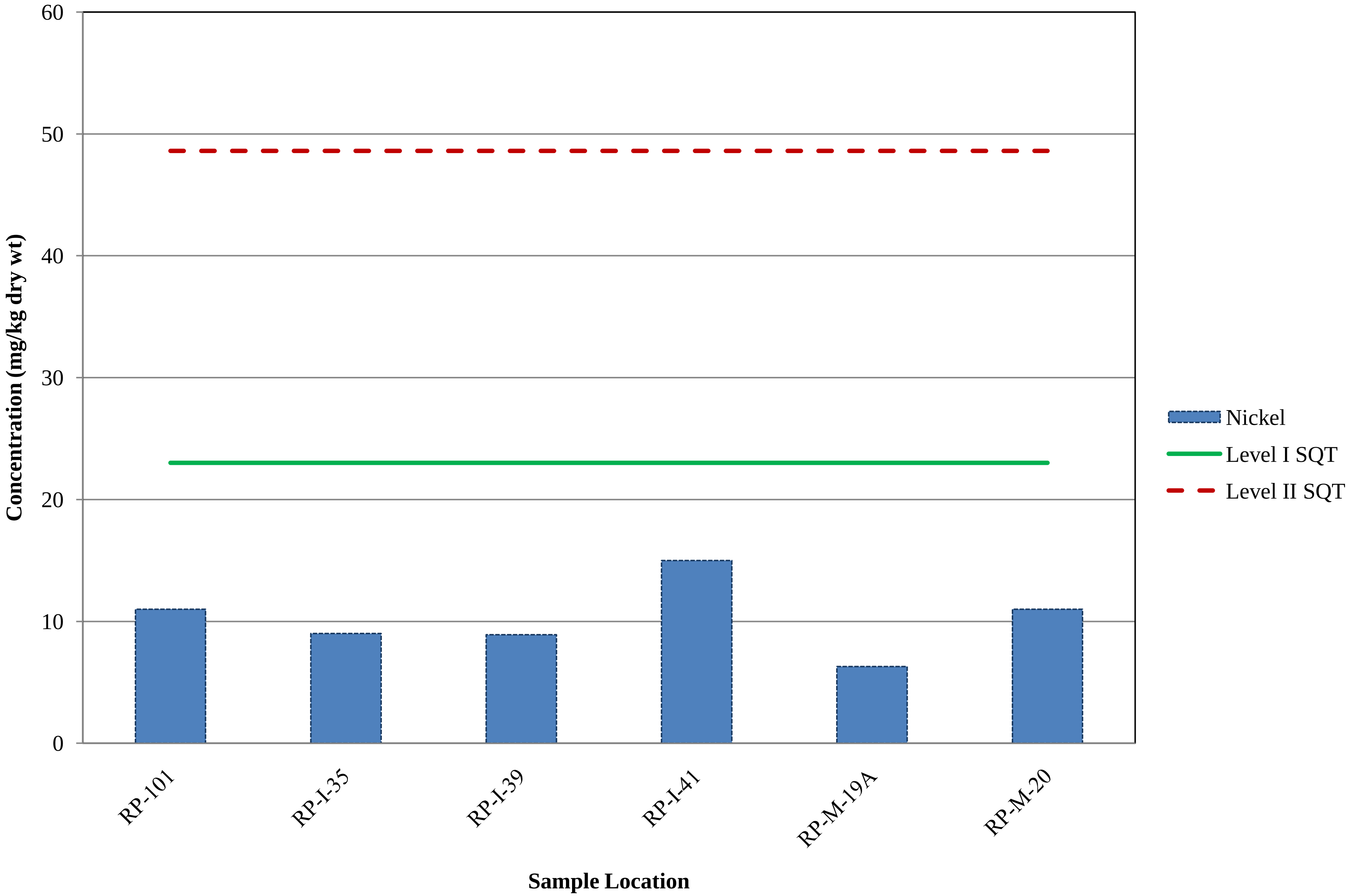


**Figure 8.25-h**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Zinc**

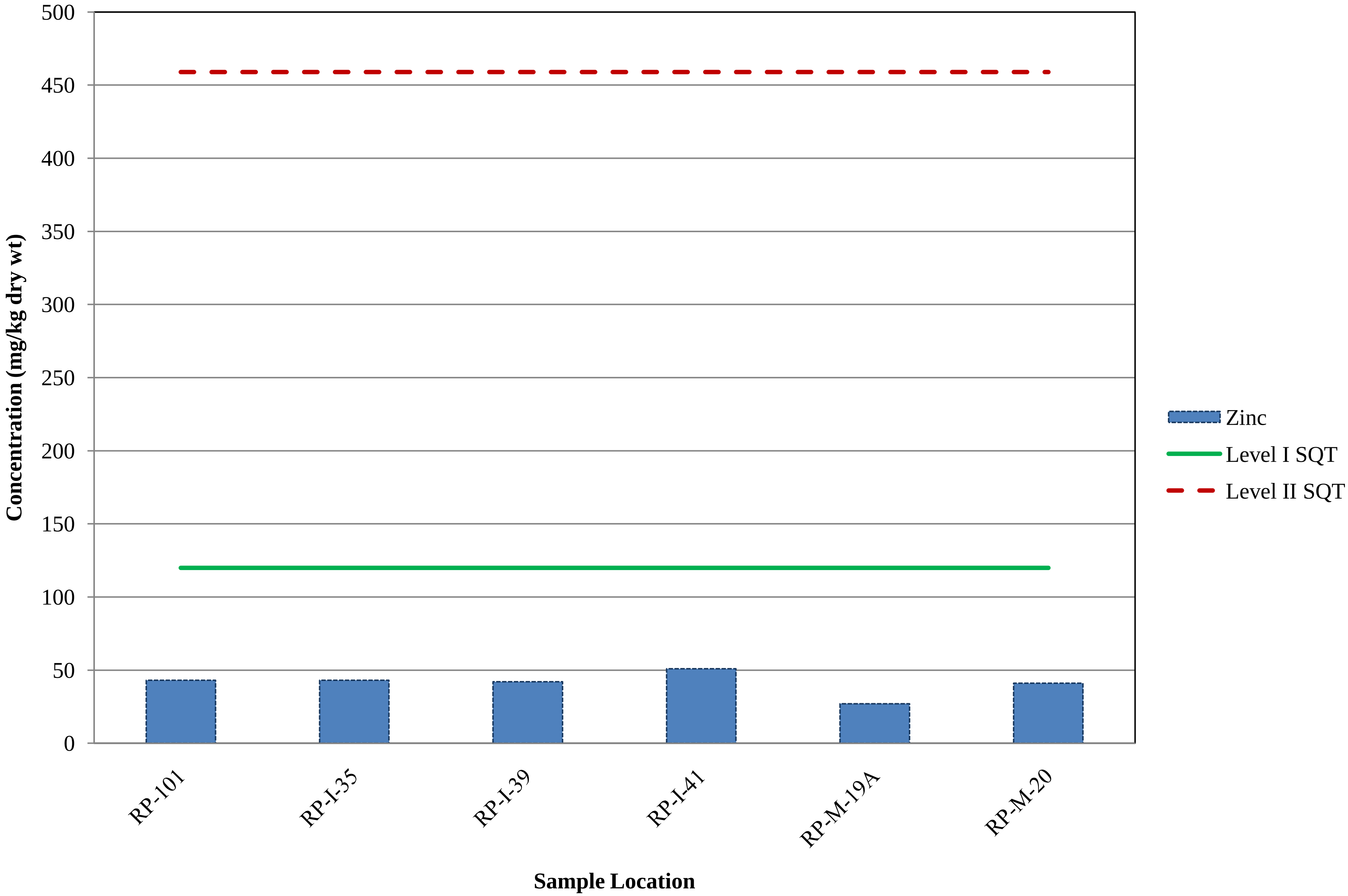


**Figure 8.25-i**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - PAHs**

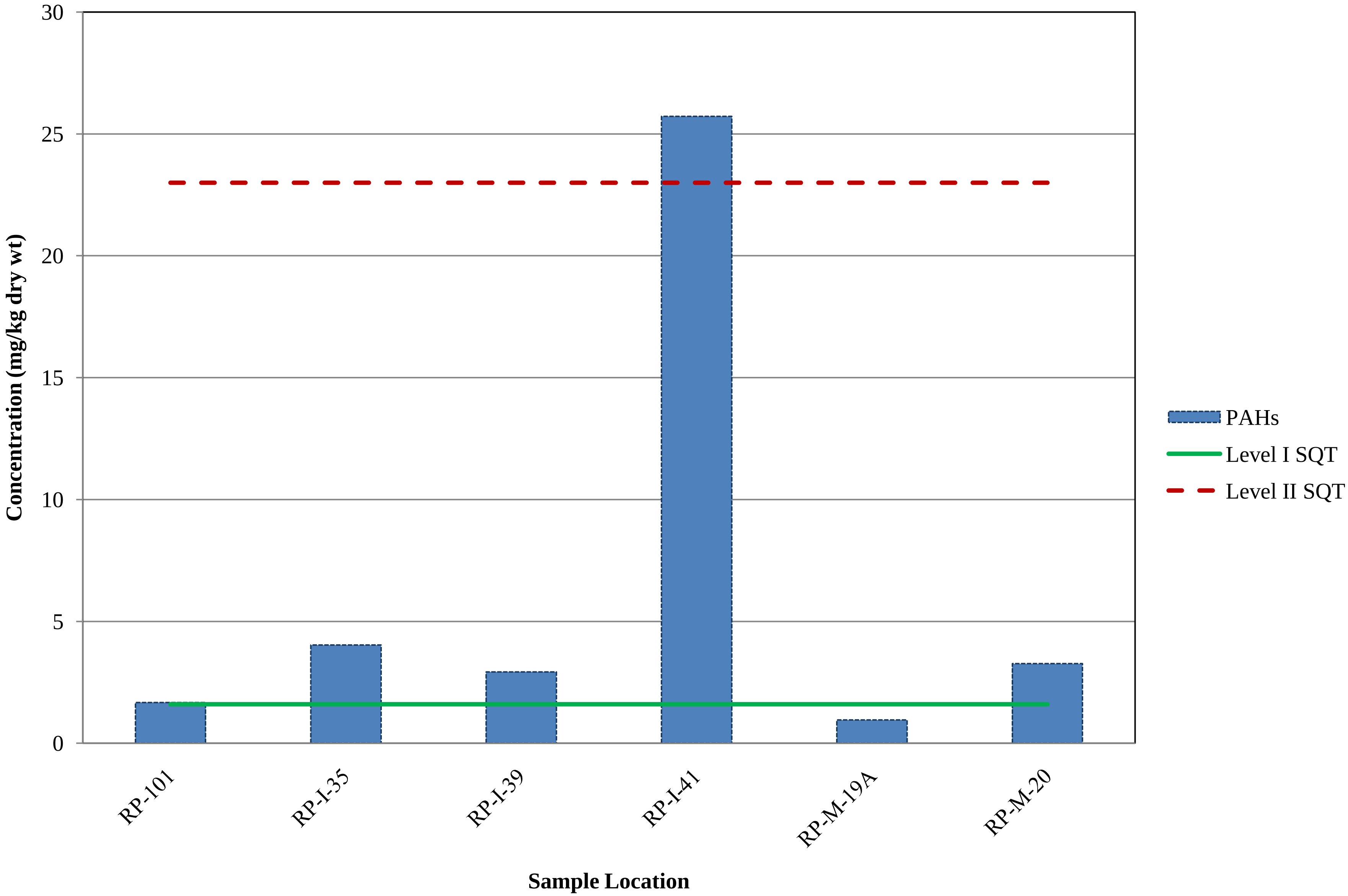


**Figure 8.25-j**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - PCBs**

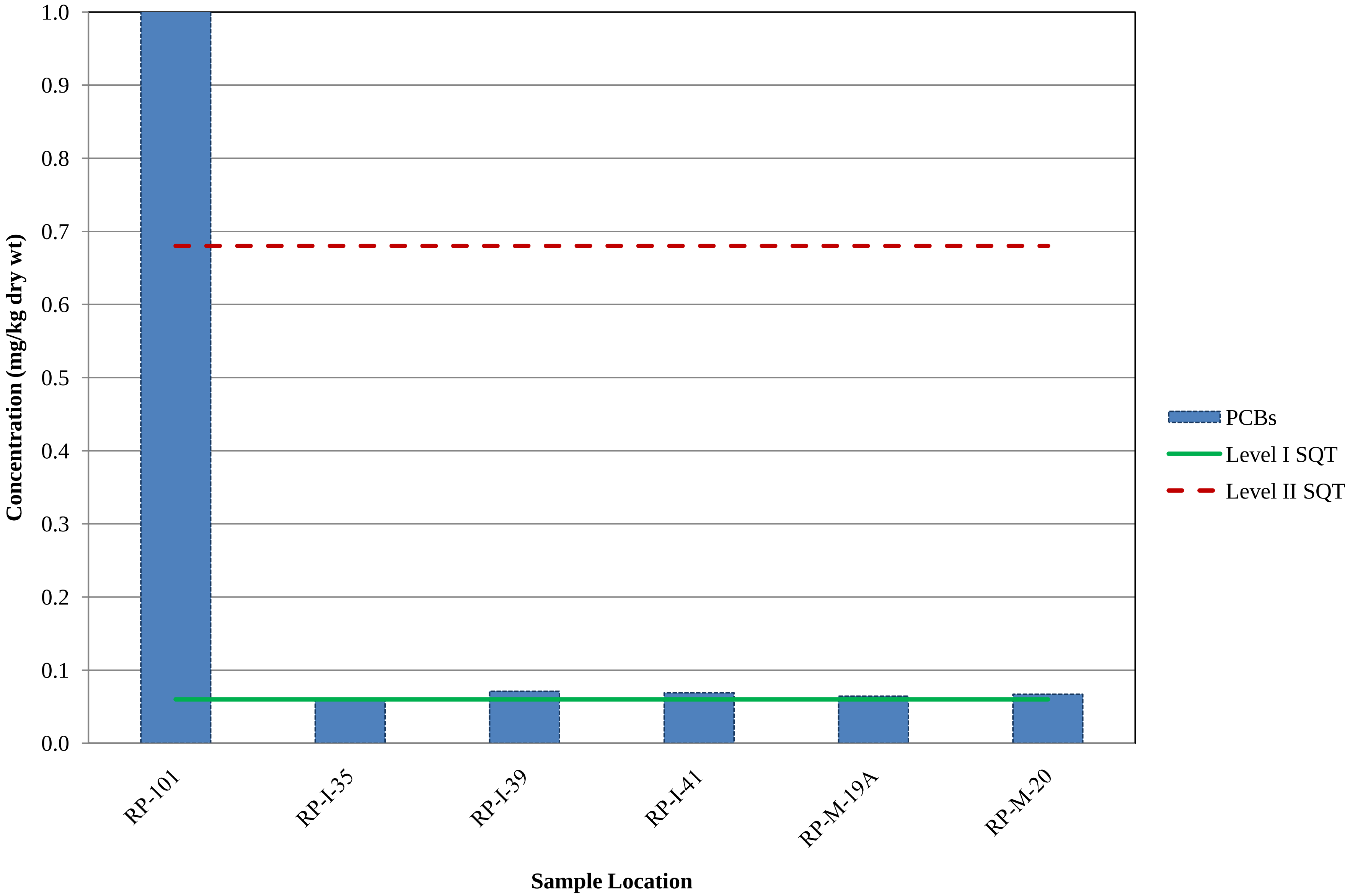


**Figure 8.25-k**
**Murphy Oil (Top of Sediment, 0-0.5 ft) - Dioxins**

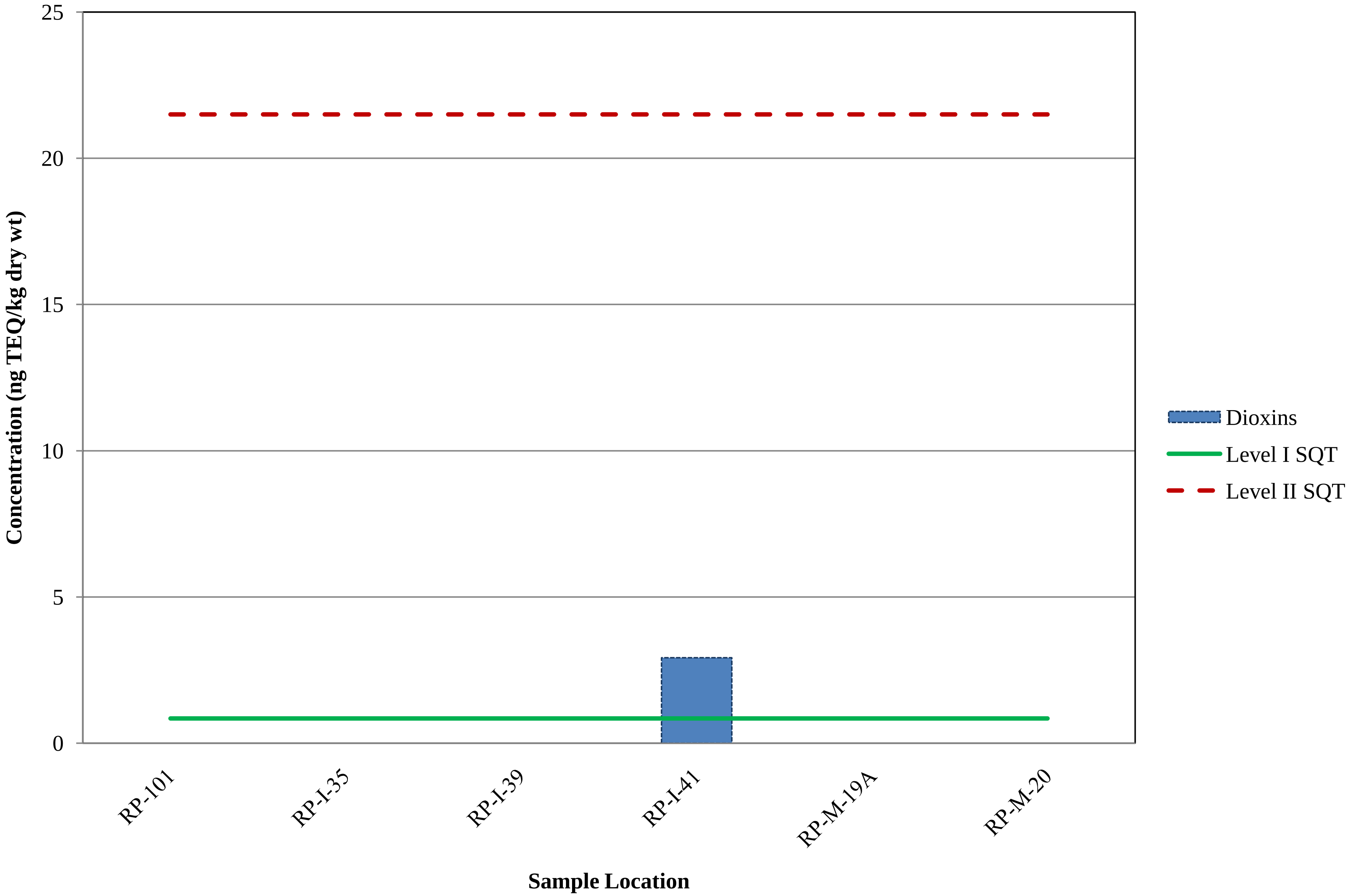


**Figure 8.26-a**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Arsenic**

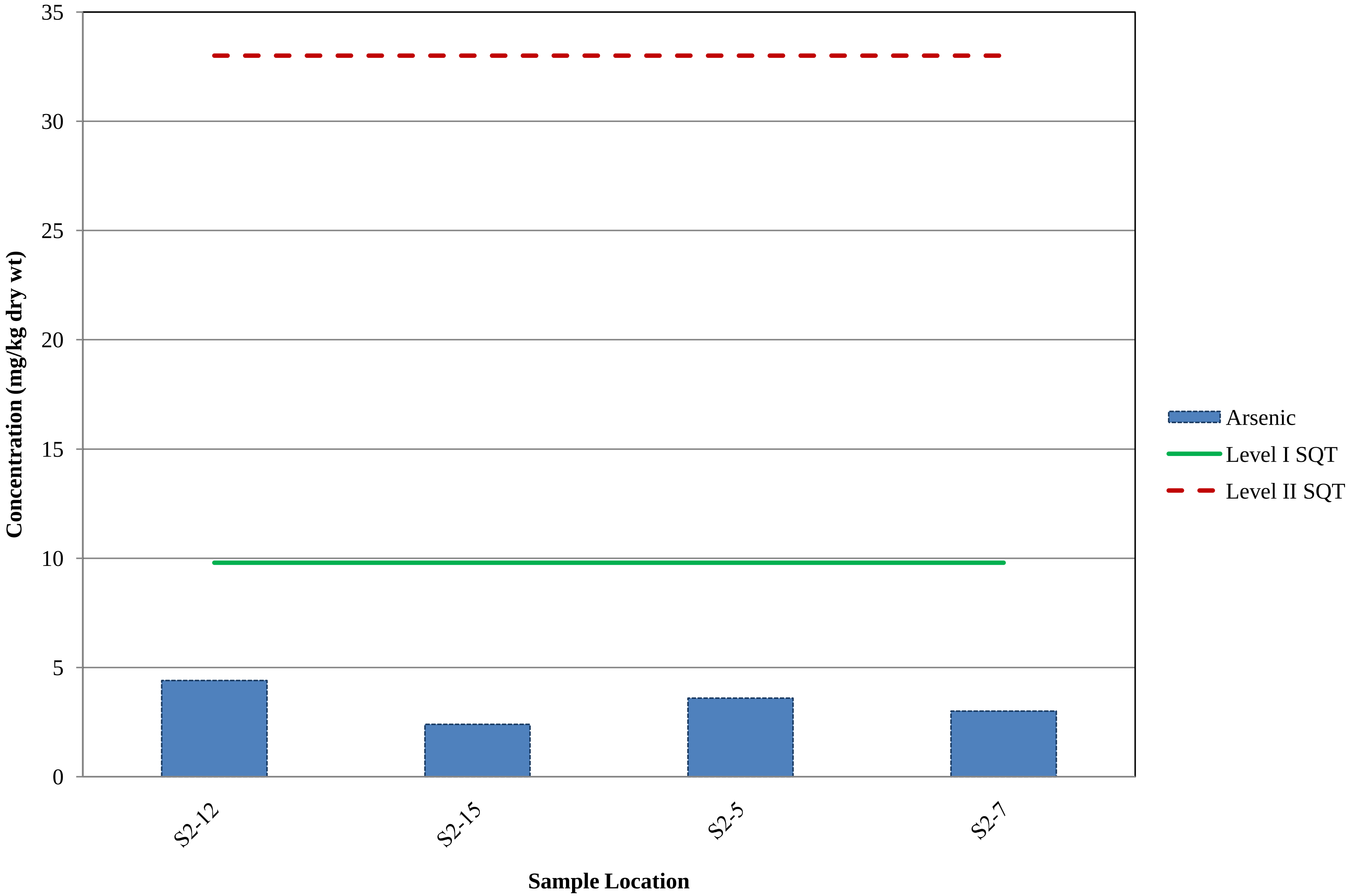


**Figure 8.26-b**
**Slip 2 Top of Sediment, 0-0.5 ft) - Cadmium**

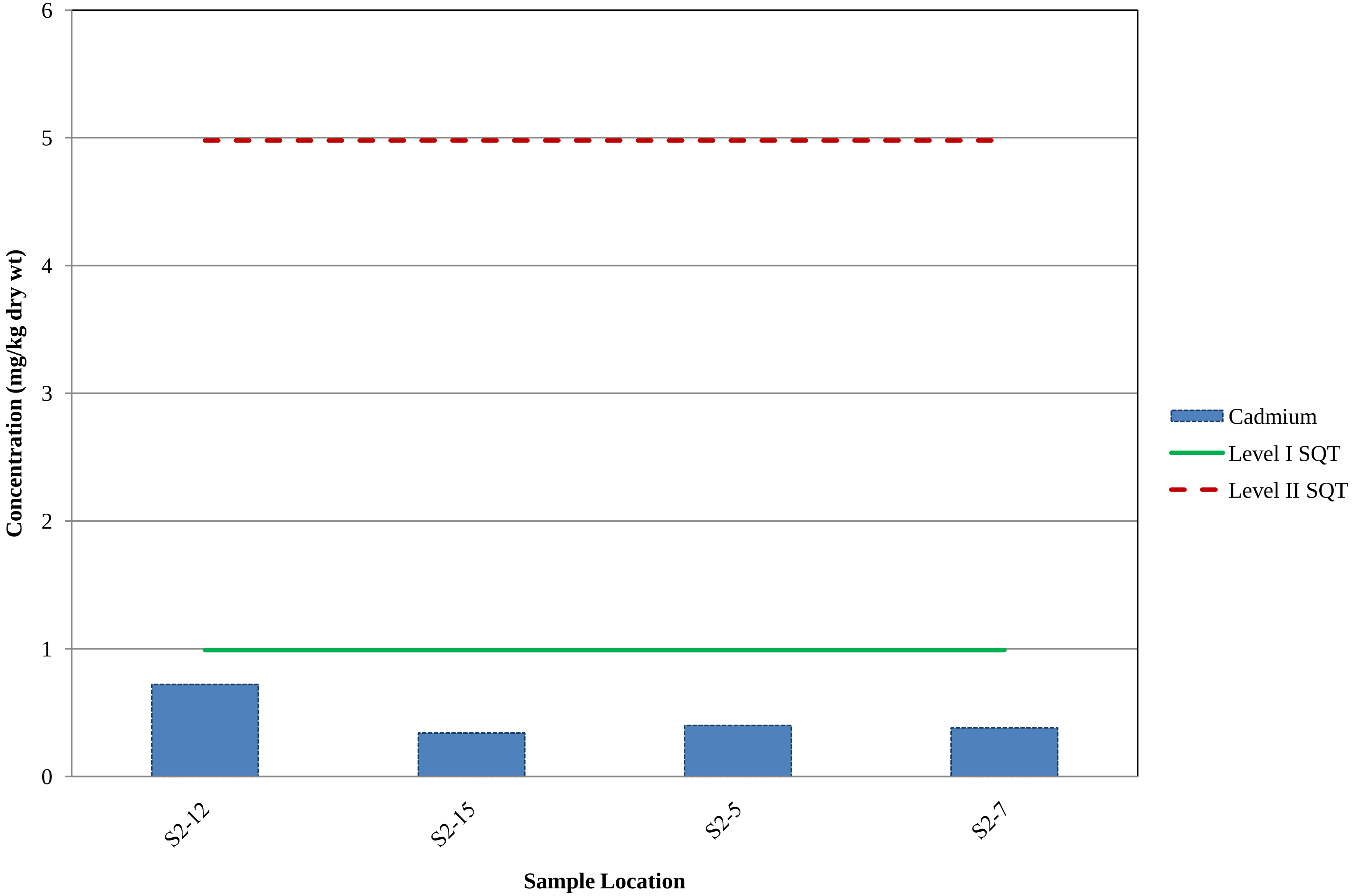


**Figure 8.26-c**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Chromium**

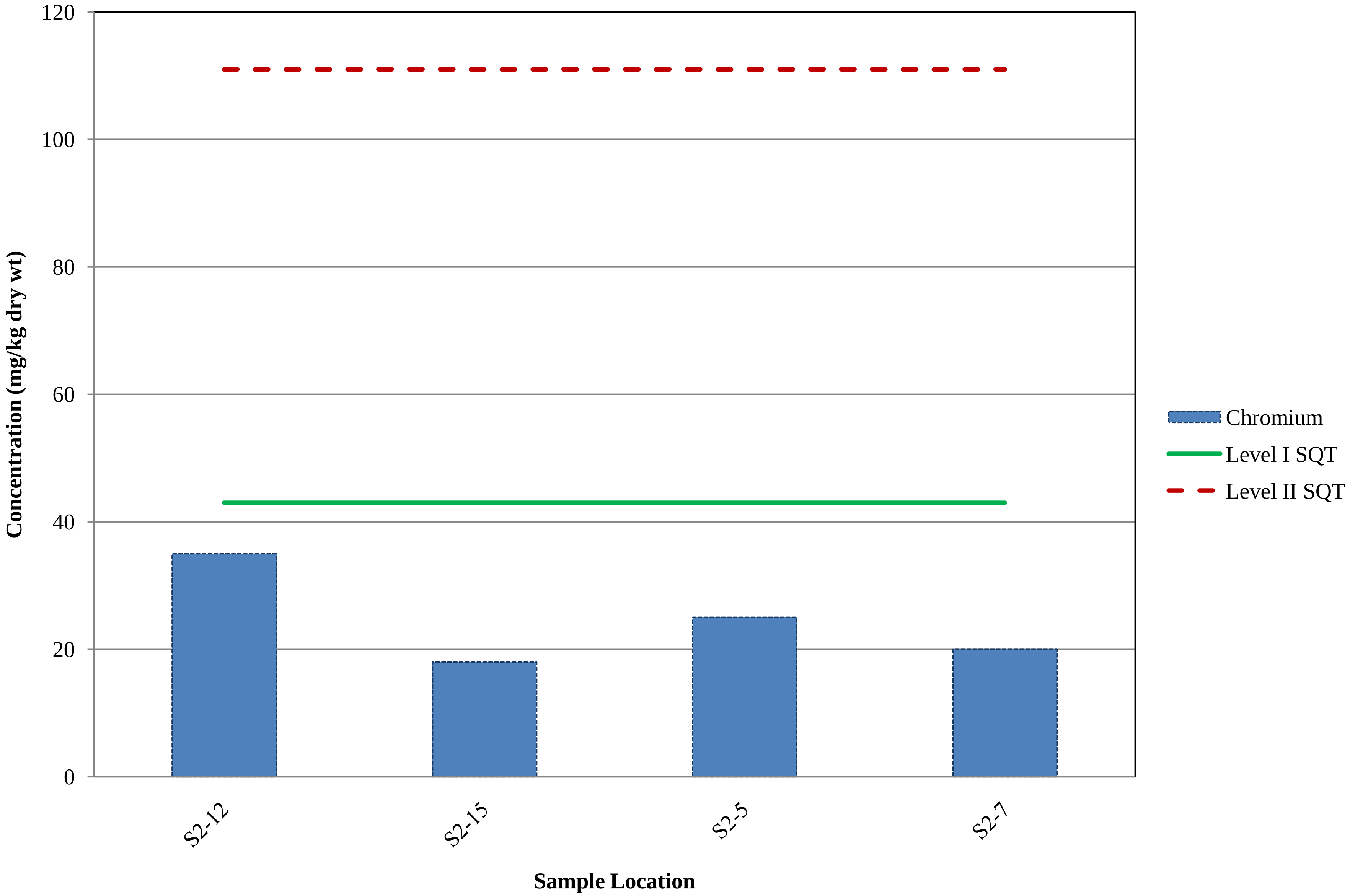
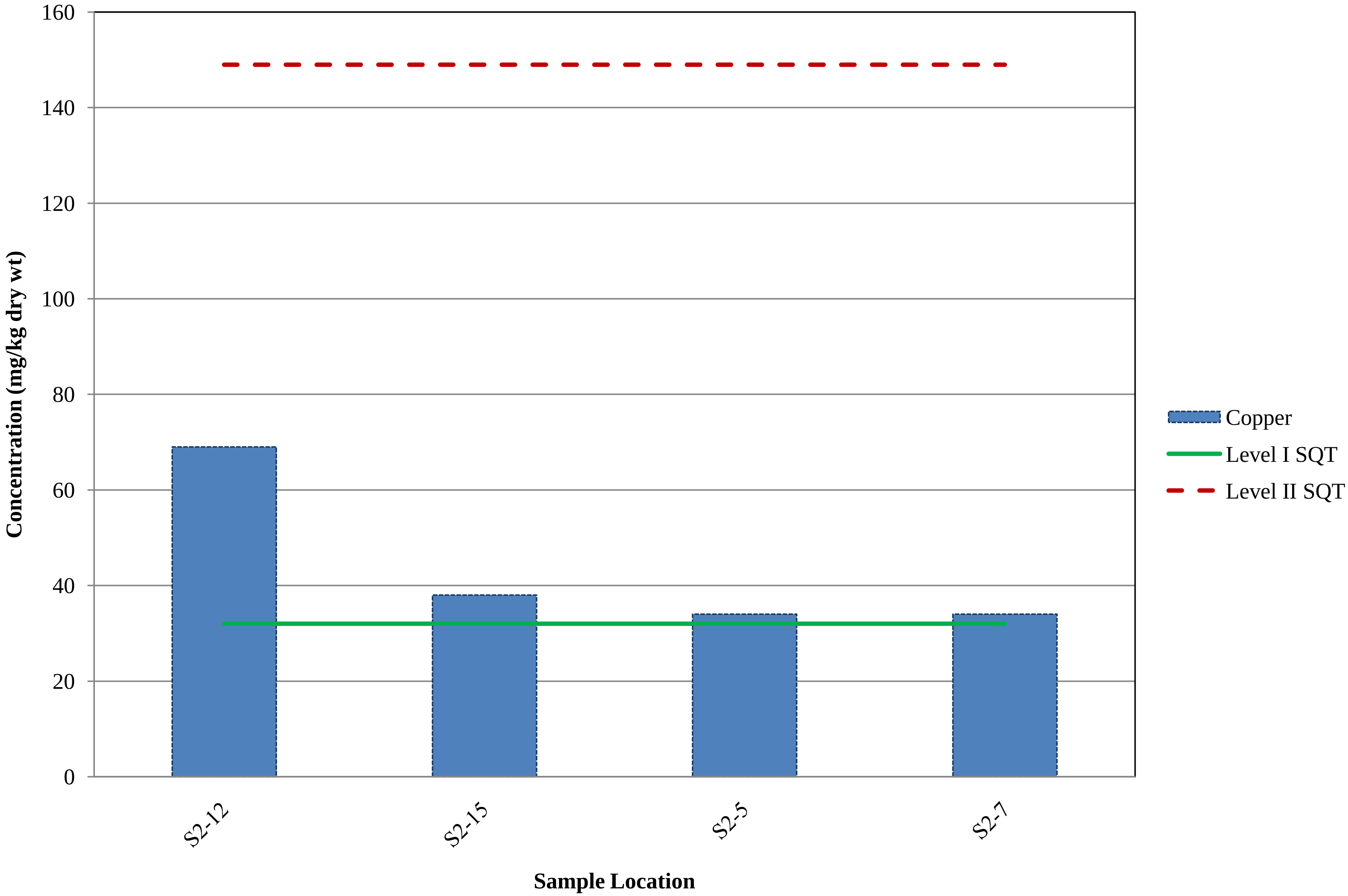


**Figure 8.26-d**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Copper**



## Figure 8.26-e
## Slip 2 (Top of Sediment, 0-0.5 ft) - Lead

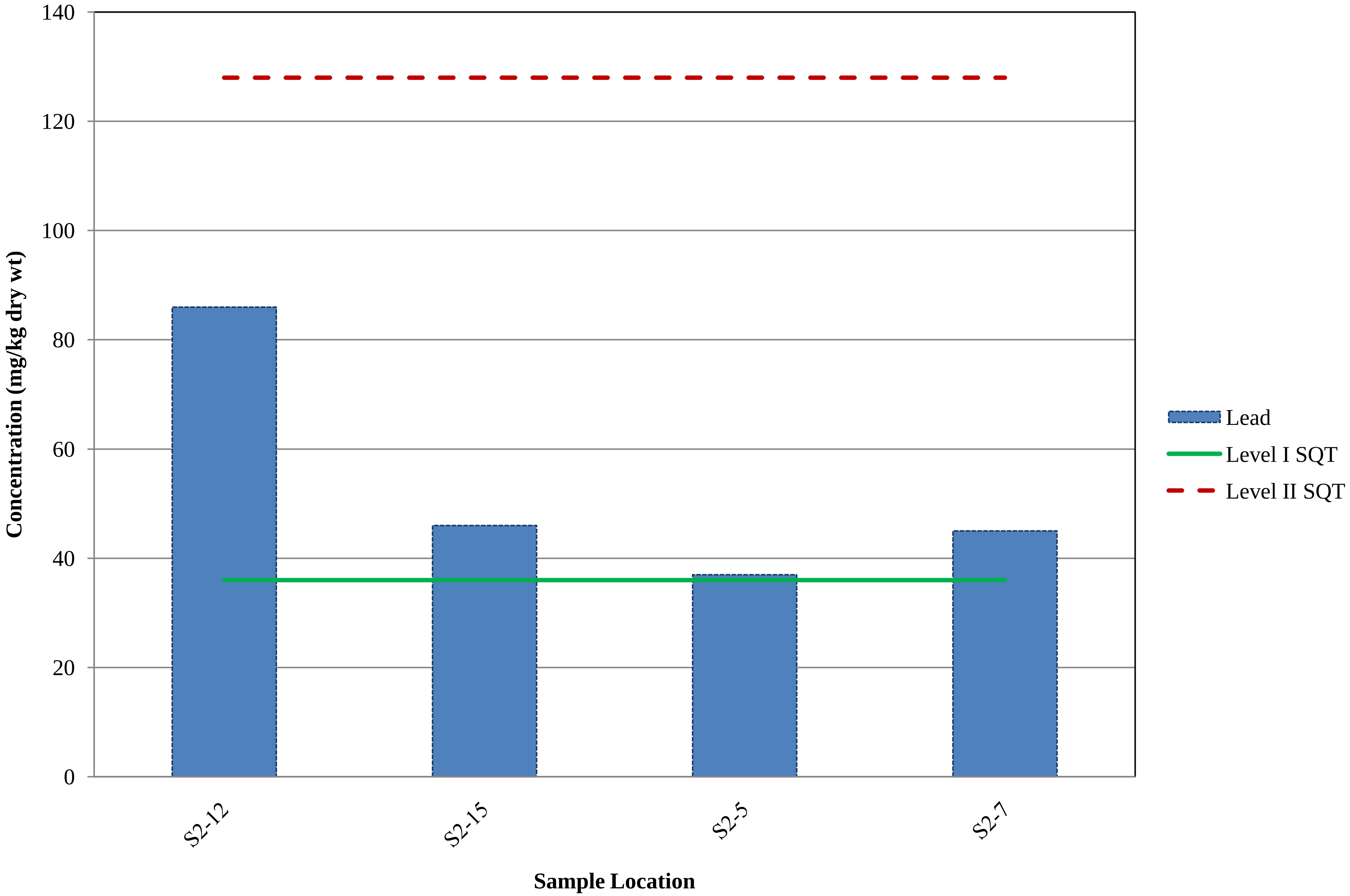


**Figure 8.26-f**
**Slip 2 Top of Sediment, 0-0.5 ft) - Mercury**

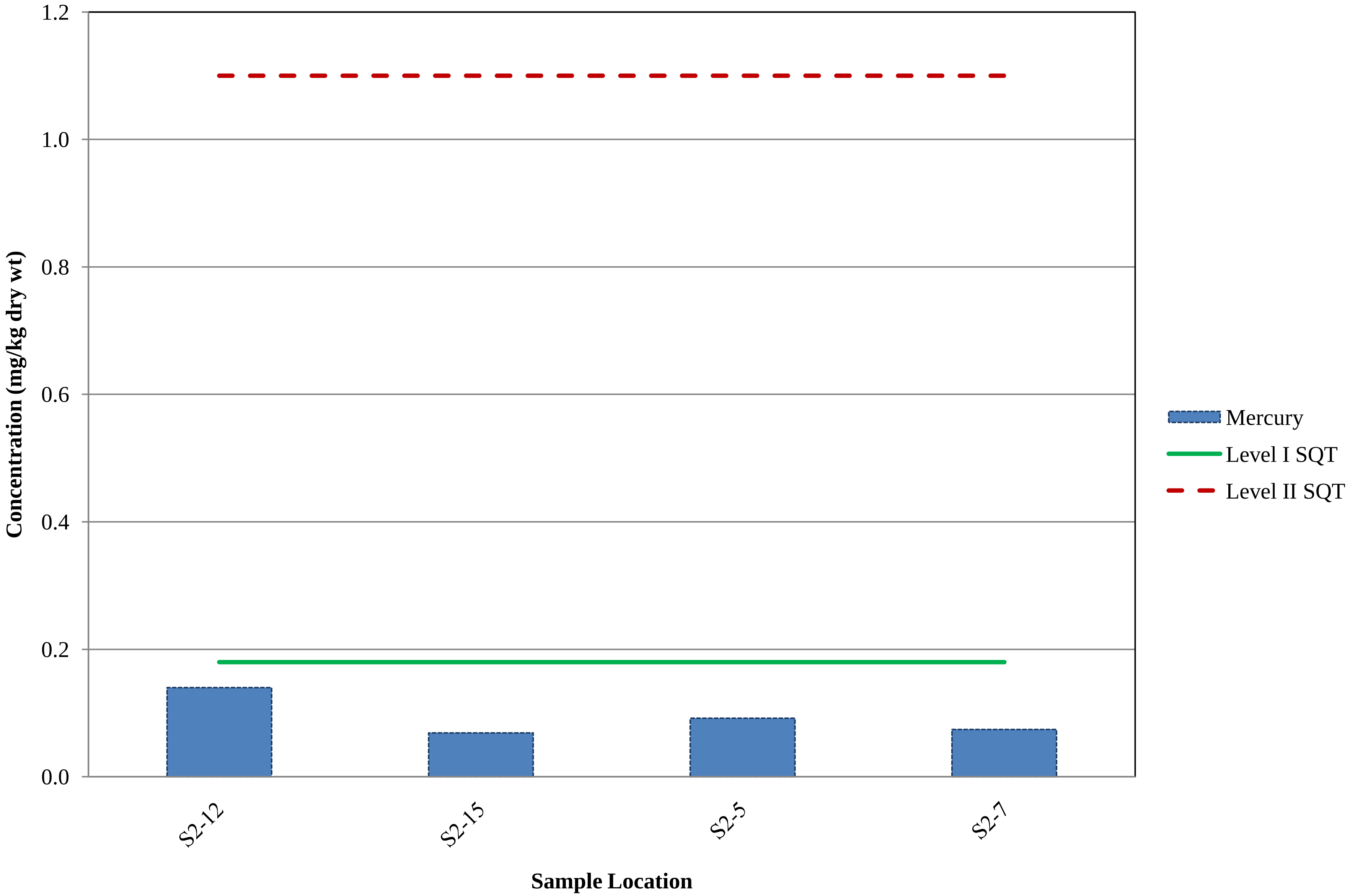


**Figure 8.26-g**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Nickel**

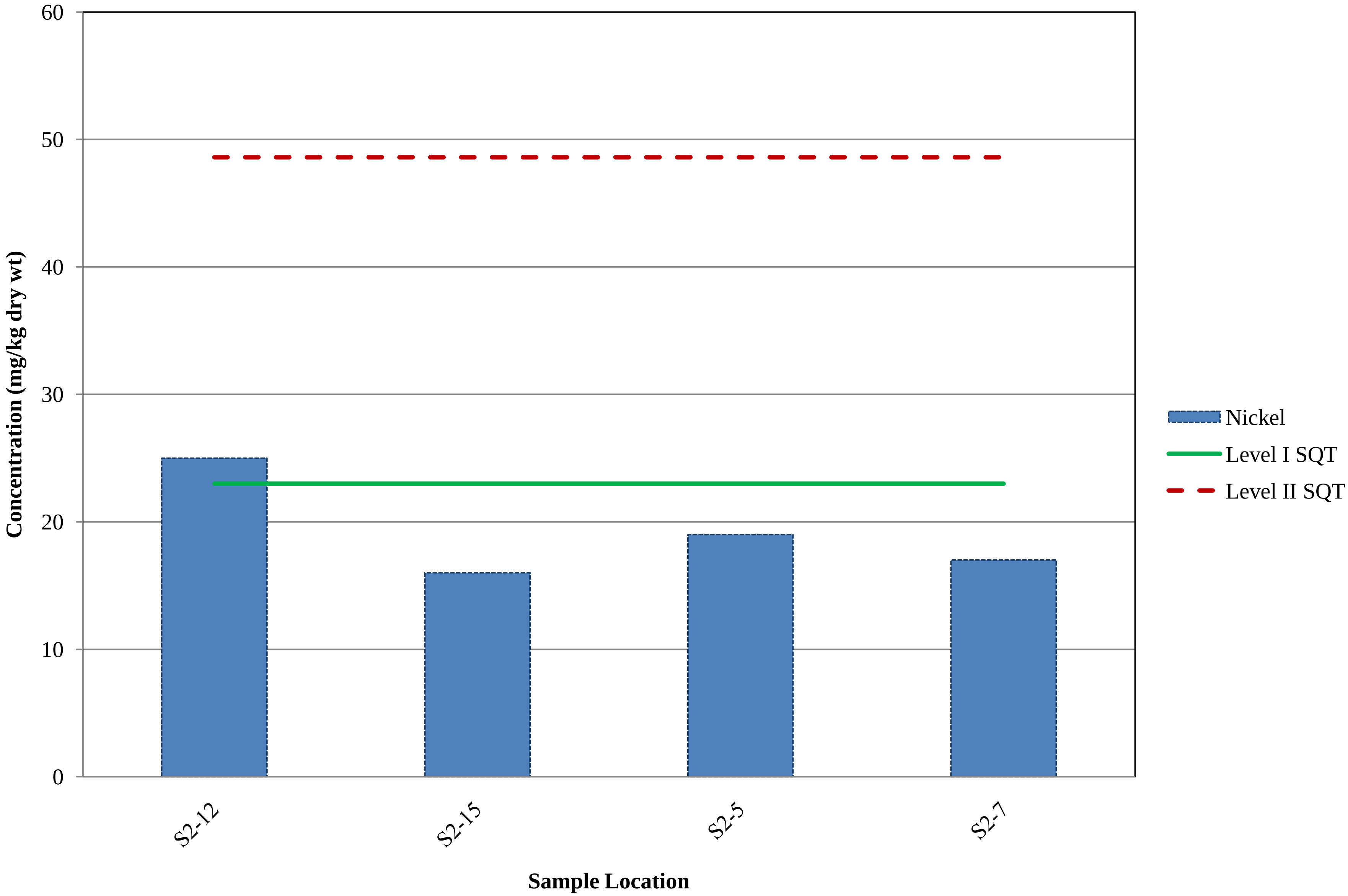


**Figure 8.26-h**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Zinc**

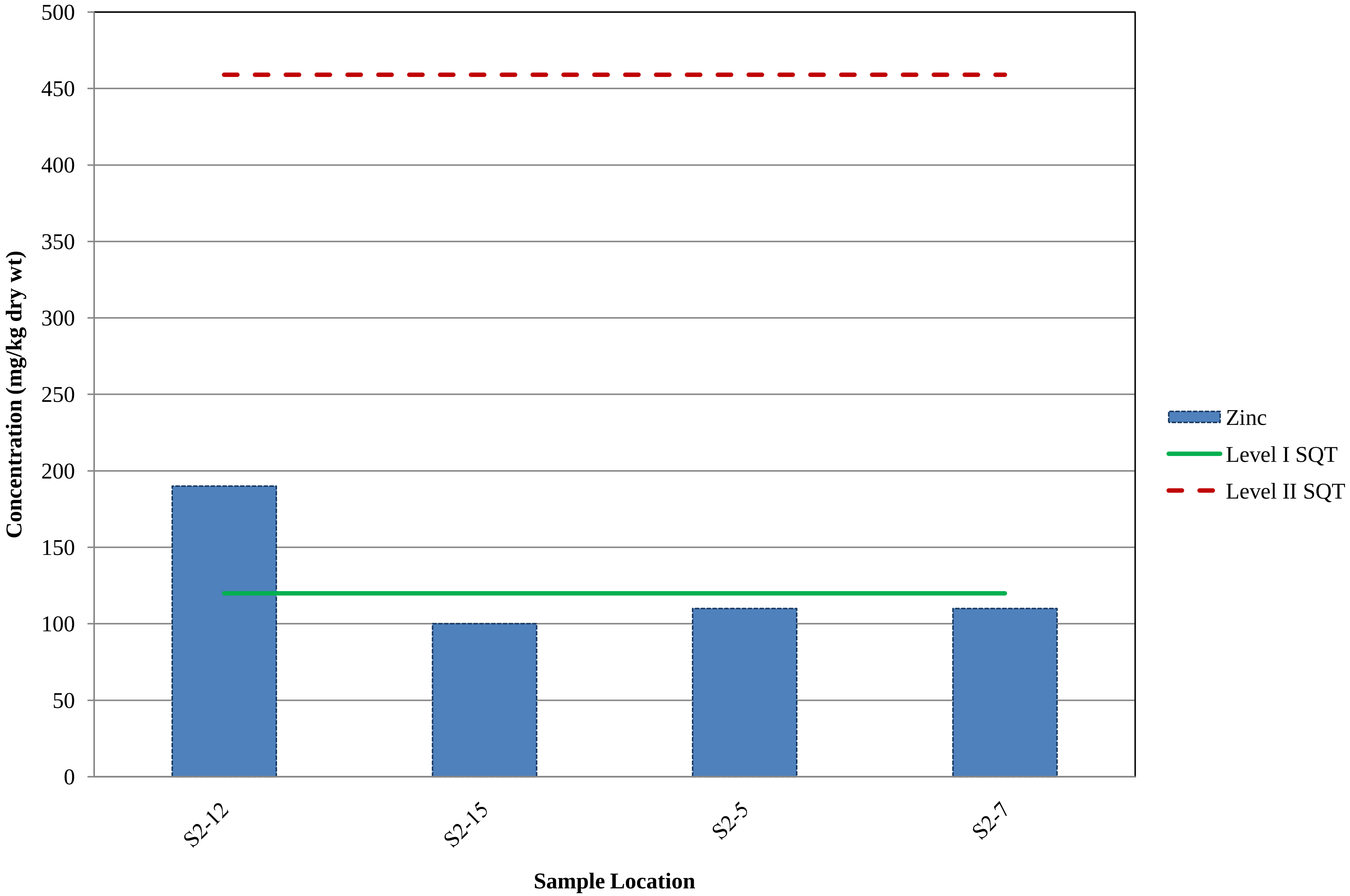


**Figure 8.26-i**
**Slip 2 (Top of Sediment, 0-0.5 ft) - PAHs**

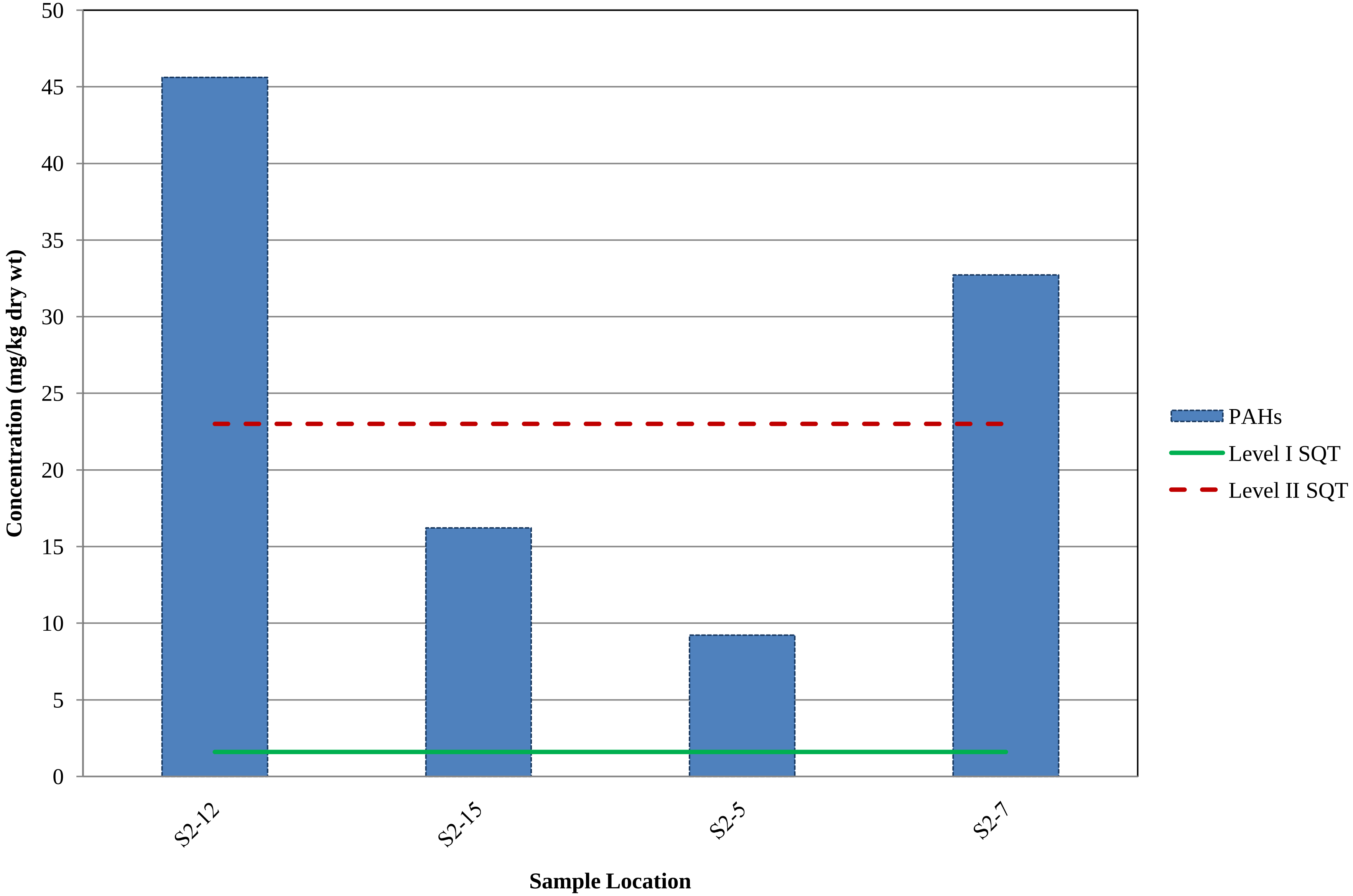


**Figure 8.26-j**
**Slip 2 (Top of Sediment, 0-0.5 ft) - PCBs**

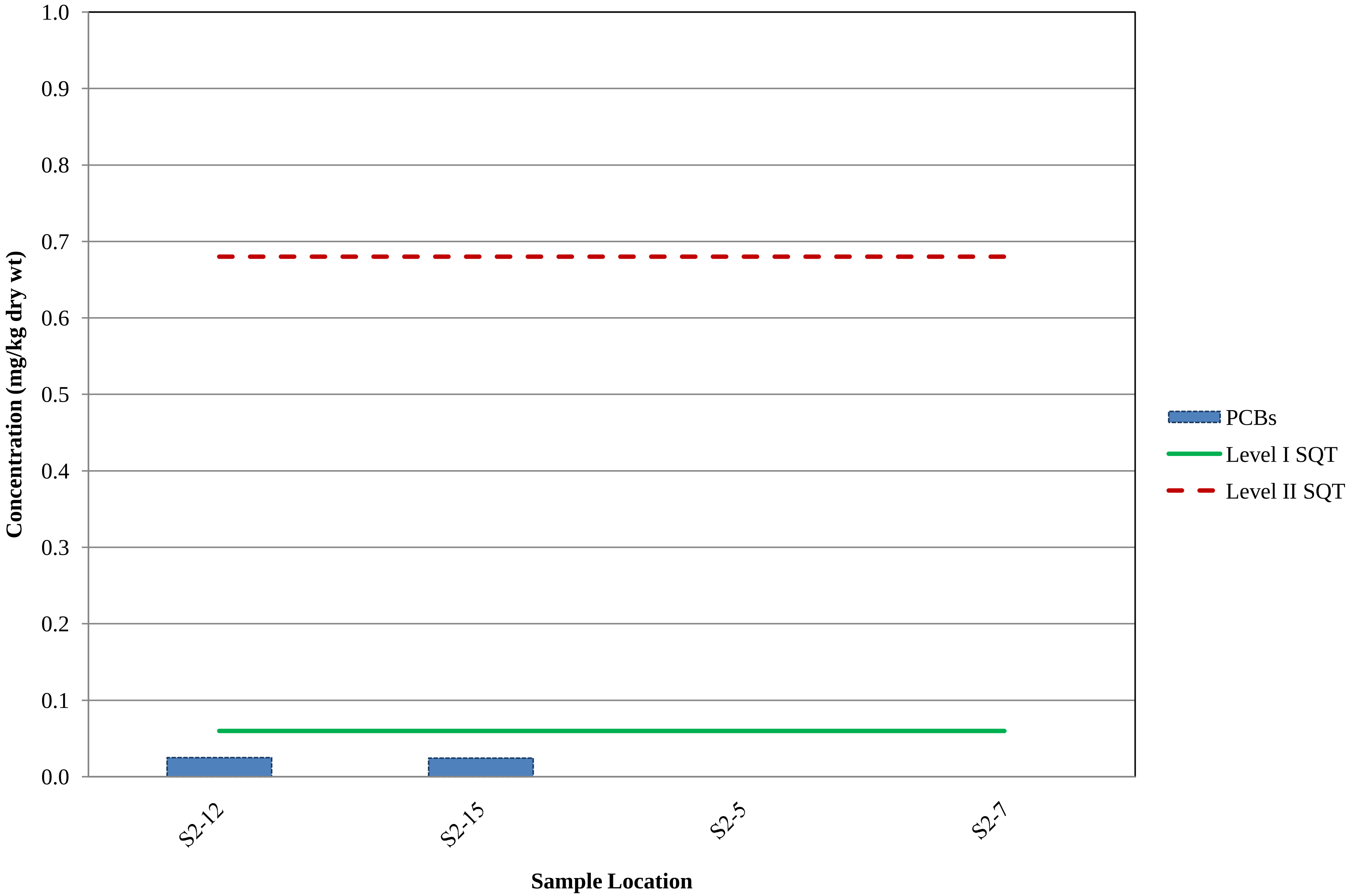


**Figure 8.26-k**
**Slip 2 (Top of Sediment, 0-0.5 ft) - Dioxins**

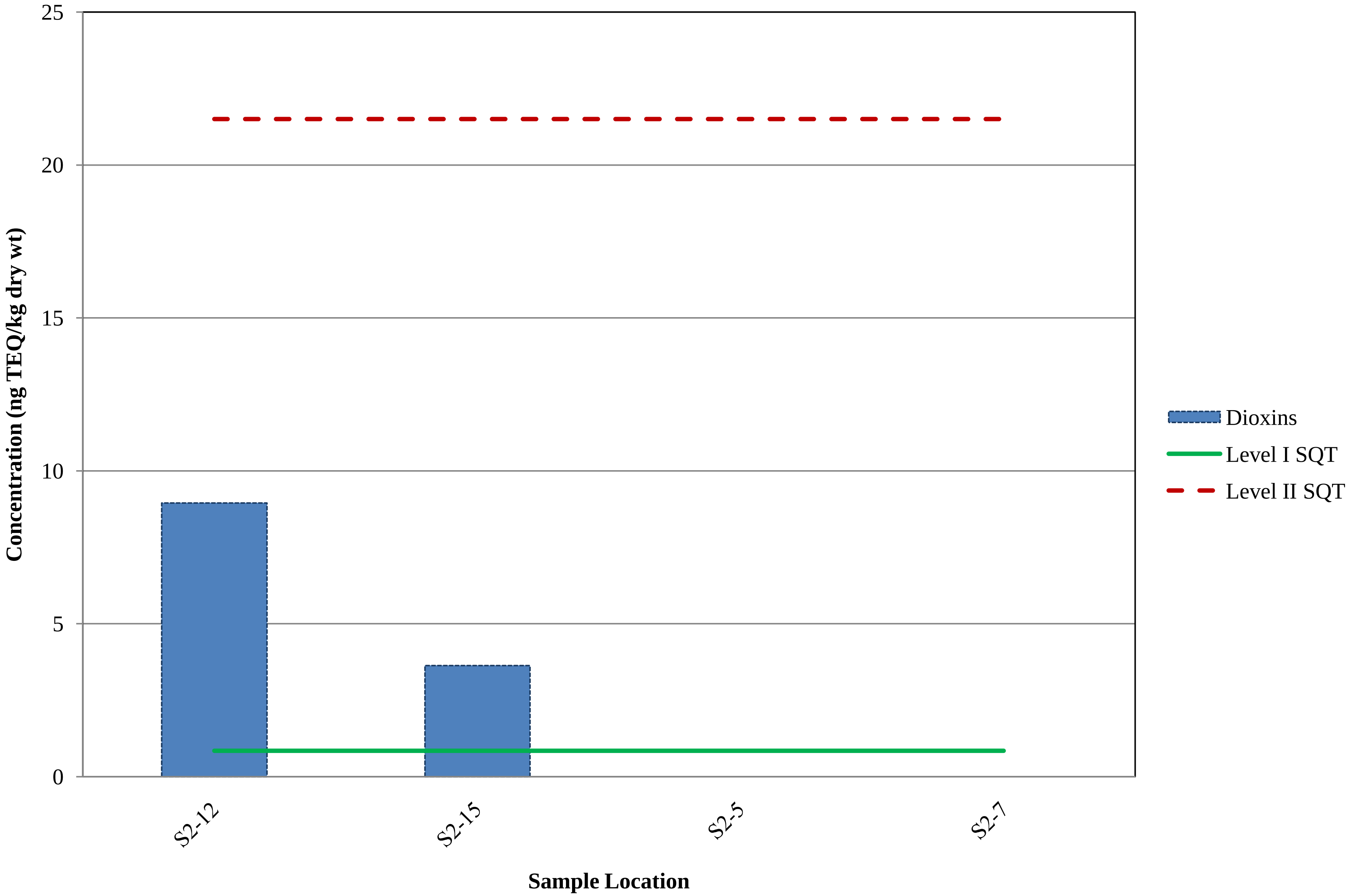
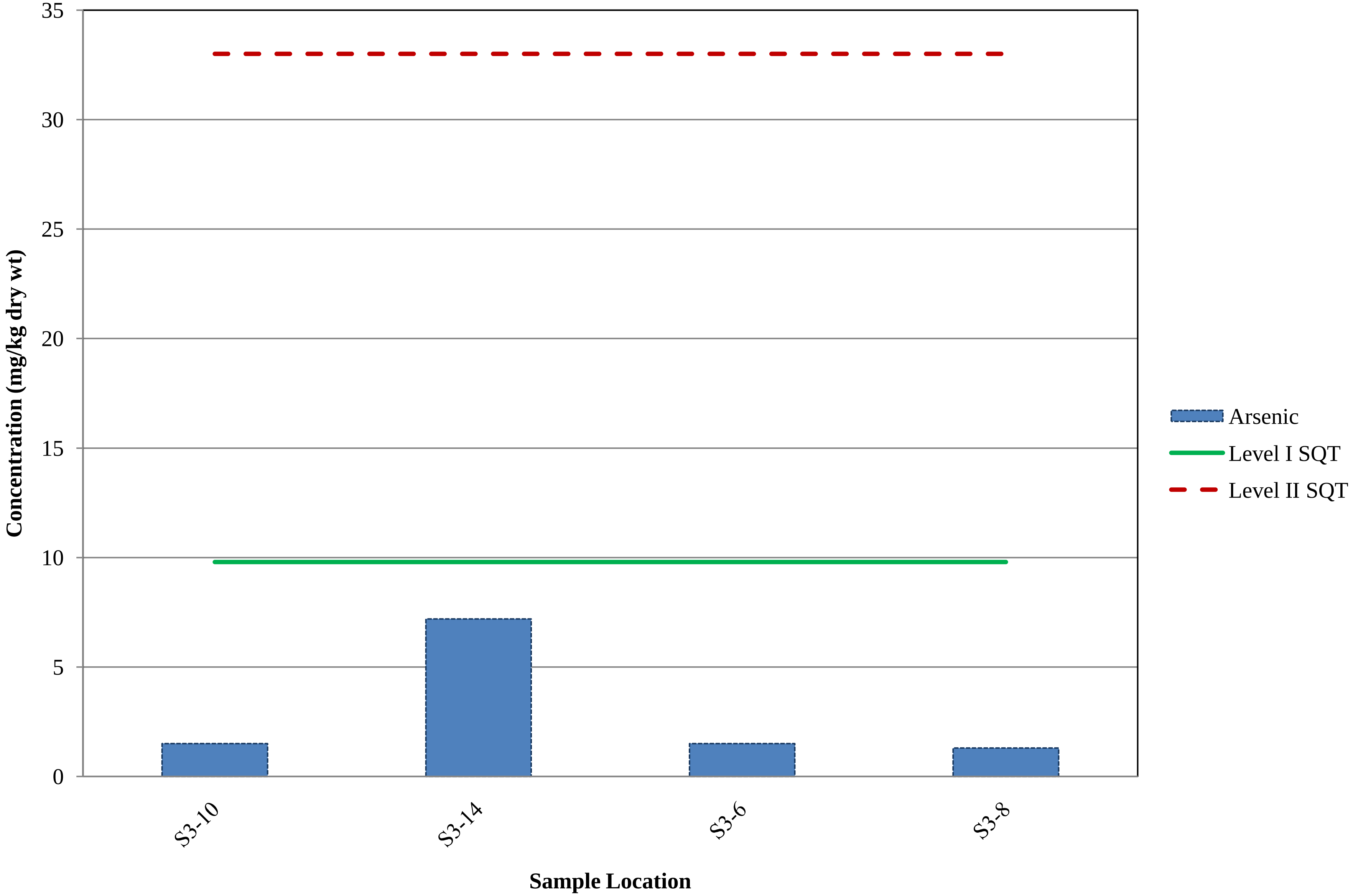


**Figure 8.27-a**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Arsenic**



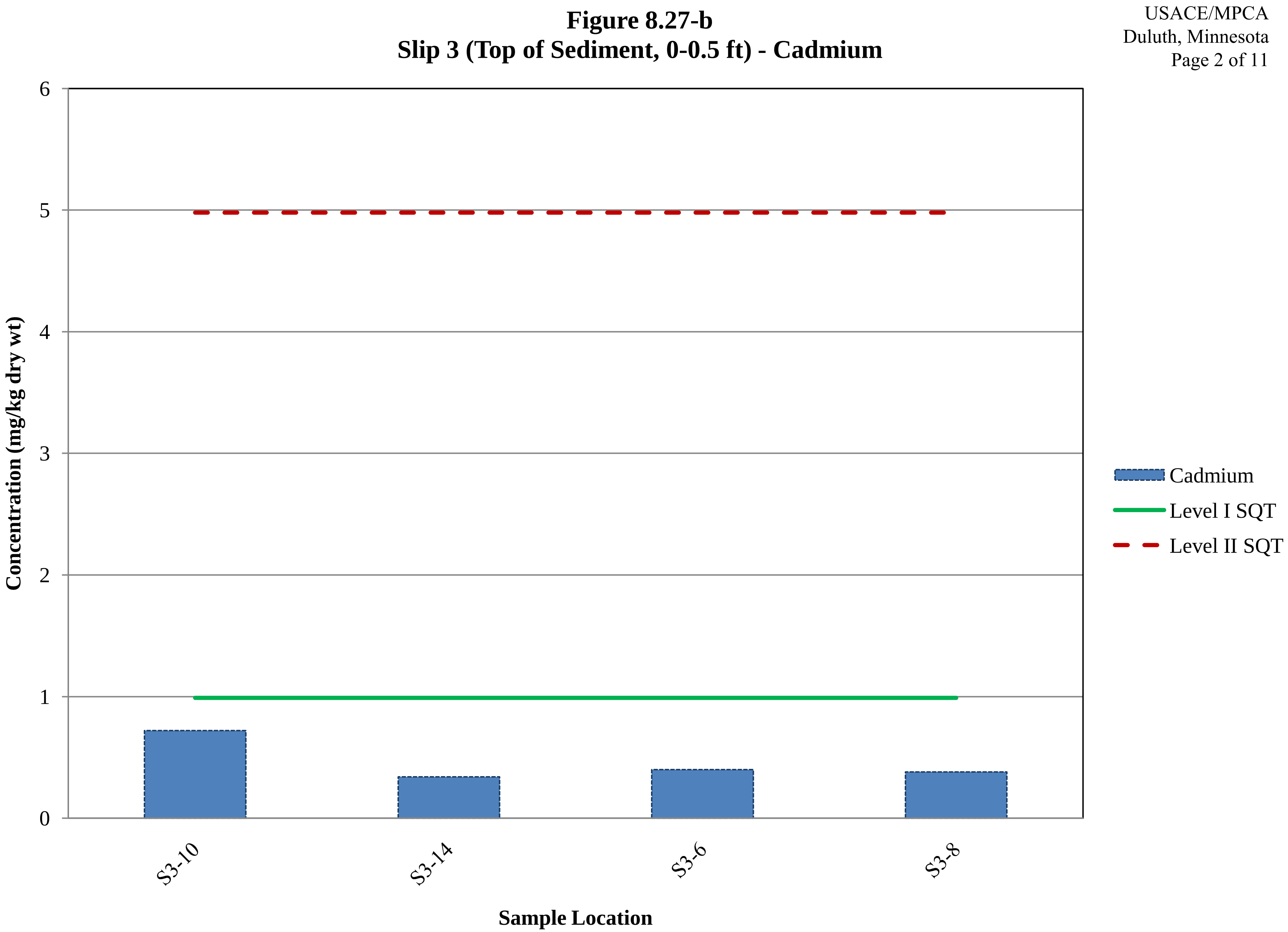


Figure 8.27-b
Slip 3 (Top of Sediment, 0-0.5 ft) - Cadmium
Concentration (mg/kg dry wt)
6
5
4
3
2
1
0
S3-10
S3-14
S3-6
S3-8
Sample Location
Cadmium
Level I SQT
Level II SQT

**Figure 8.27-c**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Chromium**

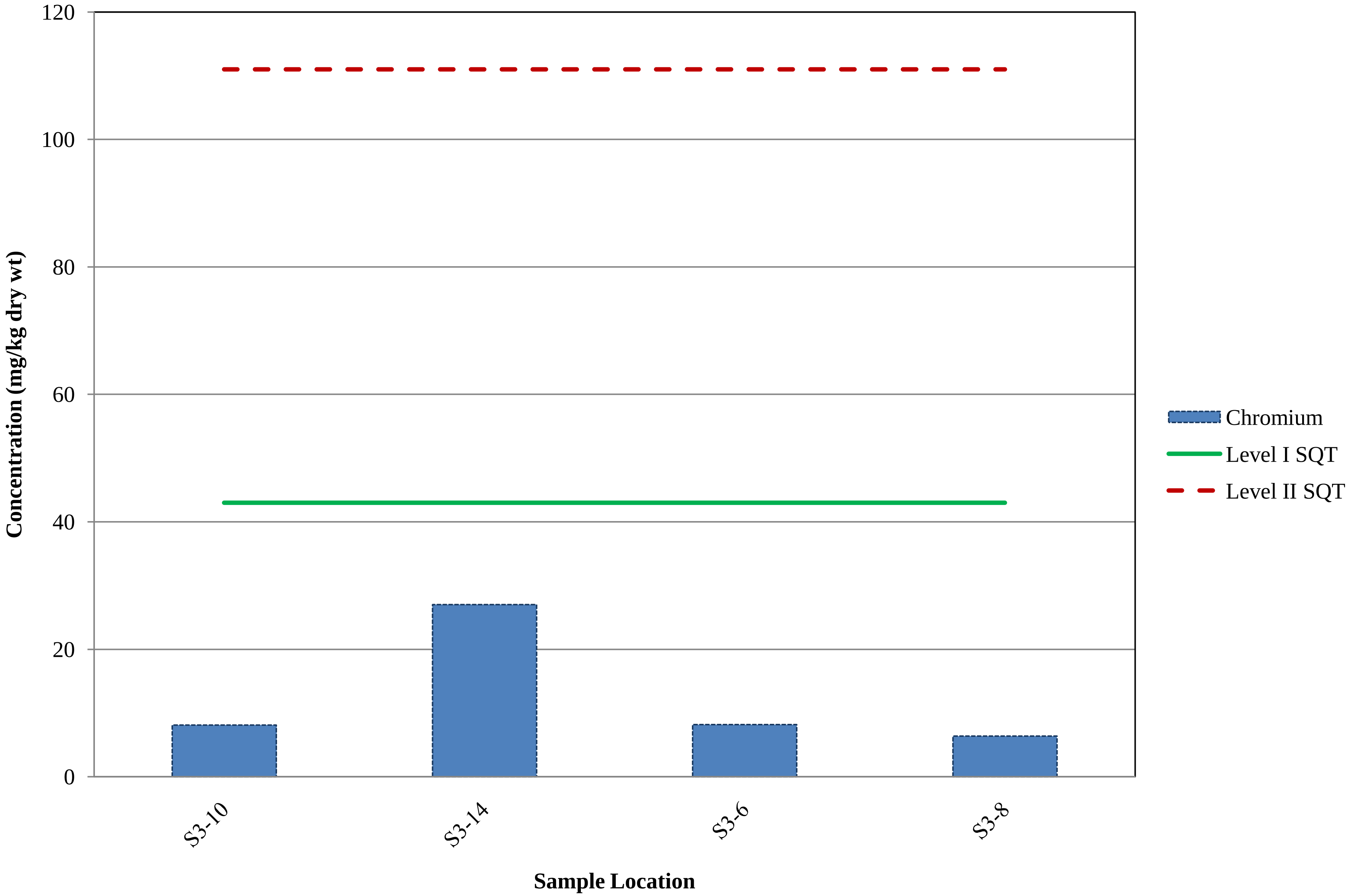


**Figure 8.27-d**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Copper**

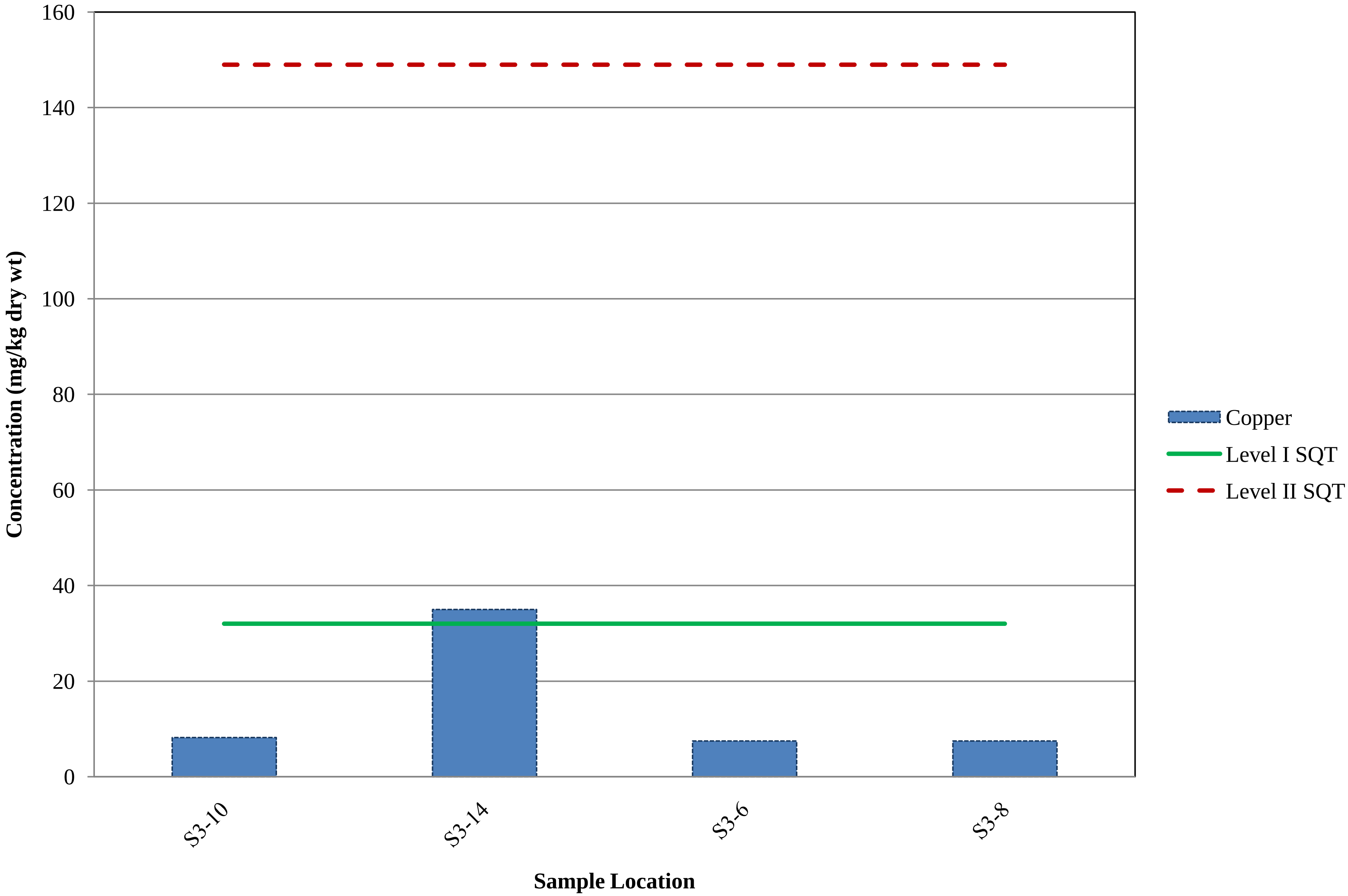


**Figure 8.27-e**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Lead**

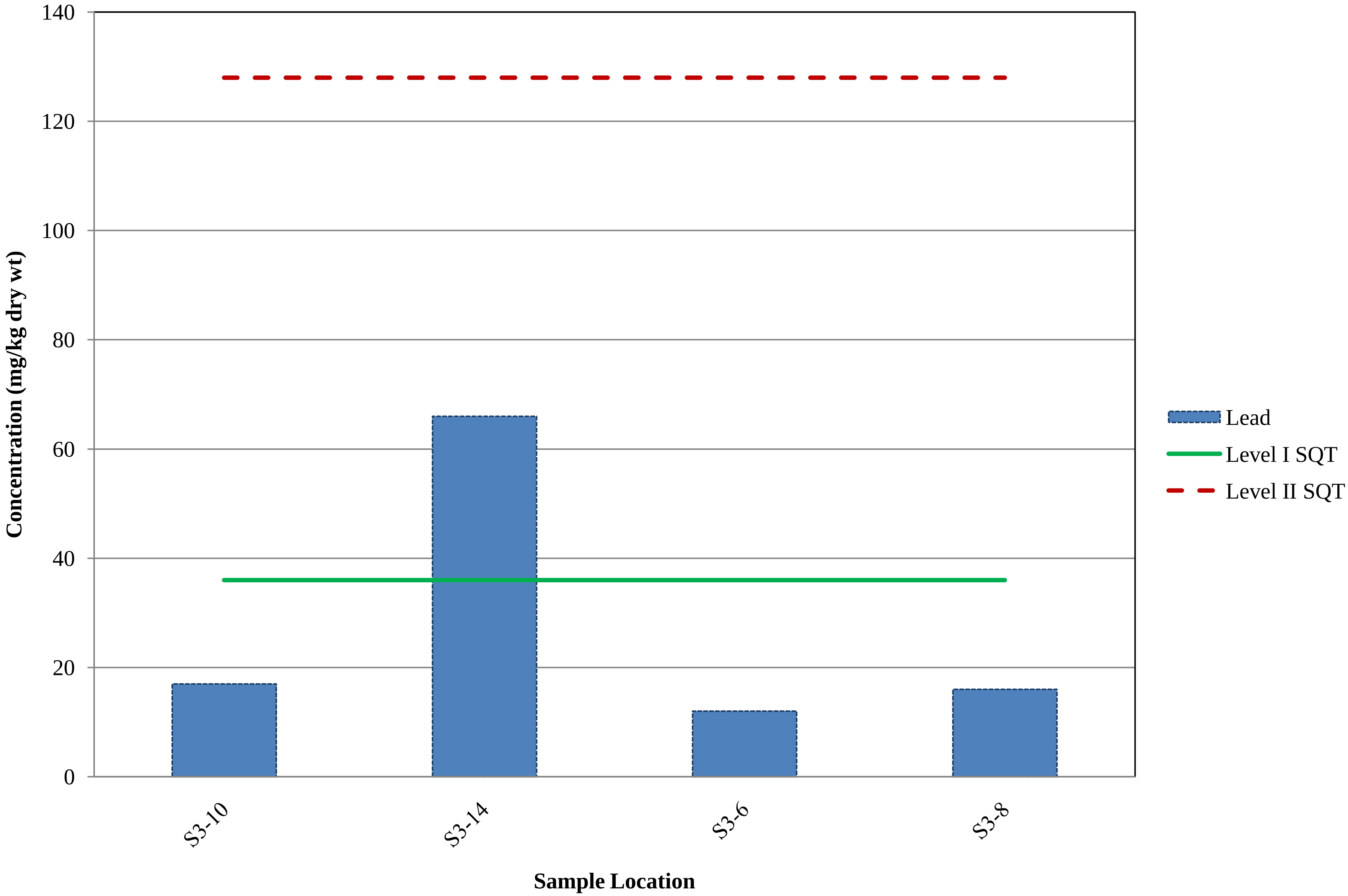


**Figure 8.27-f**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Mercury**

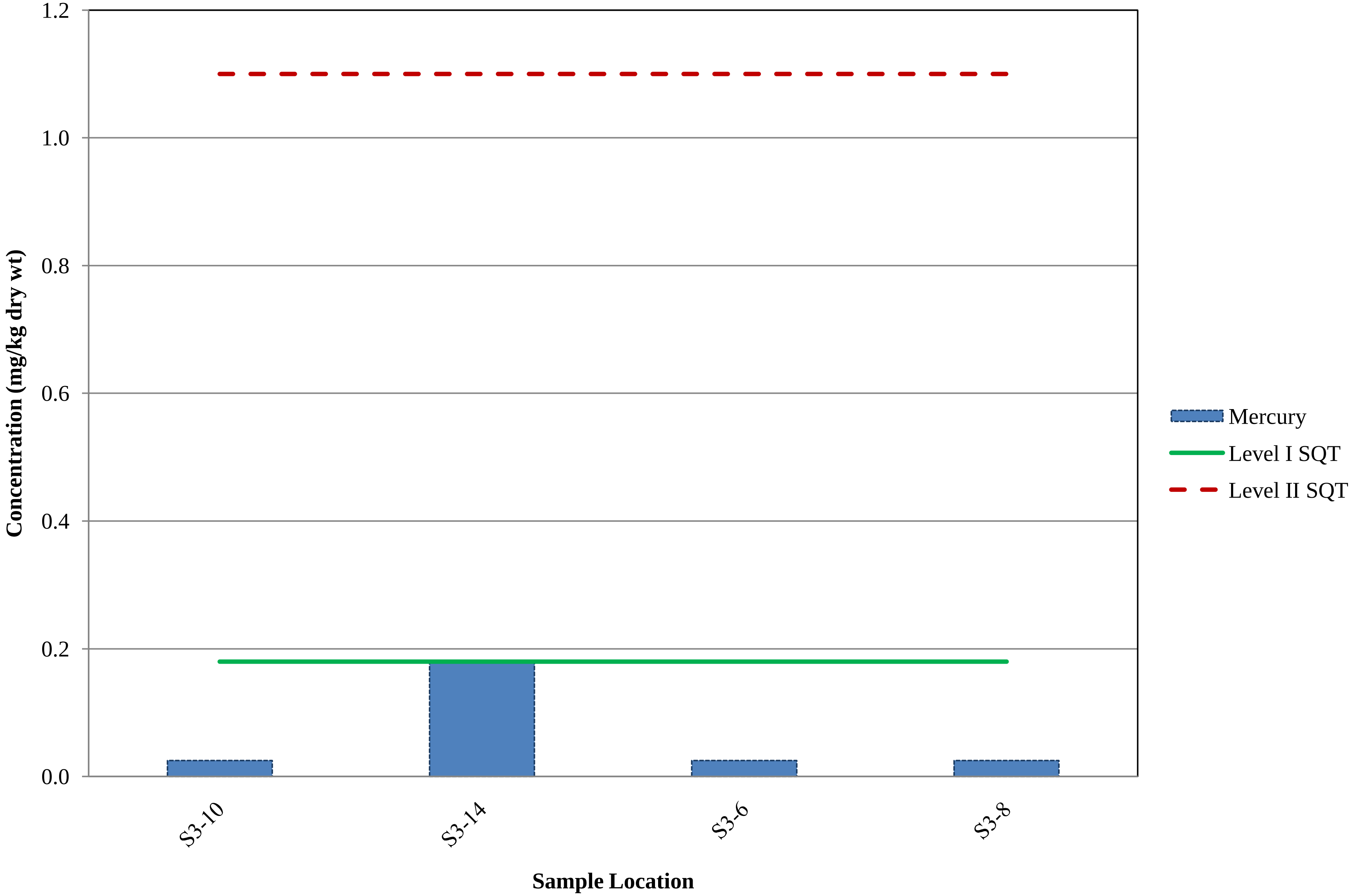


**Figure 8.27-g**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Nickel**

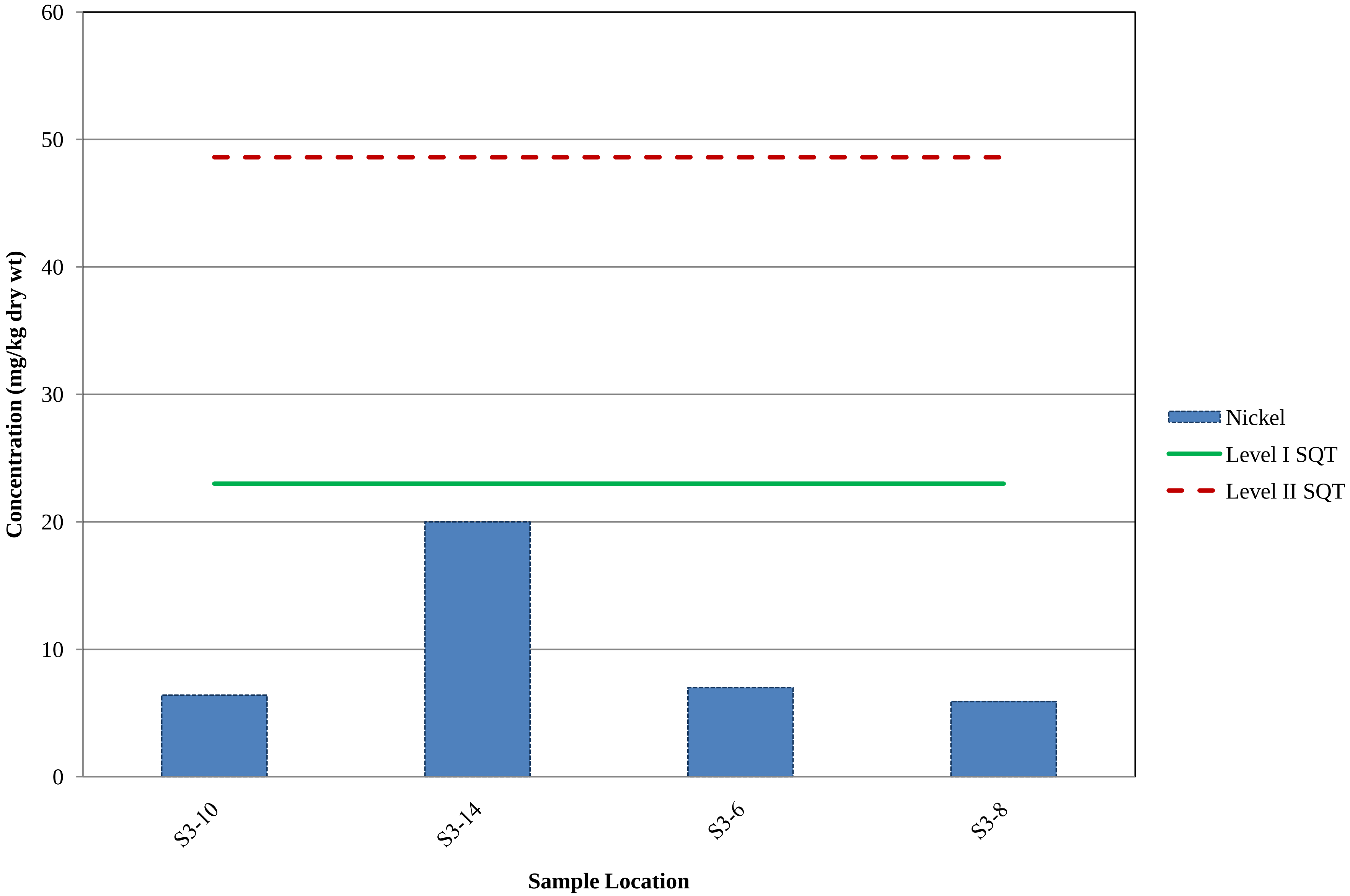


**Figure 8.27-h**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Zinc**

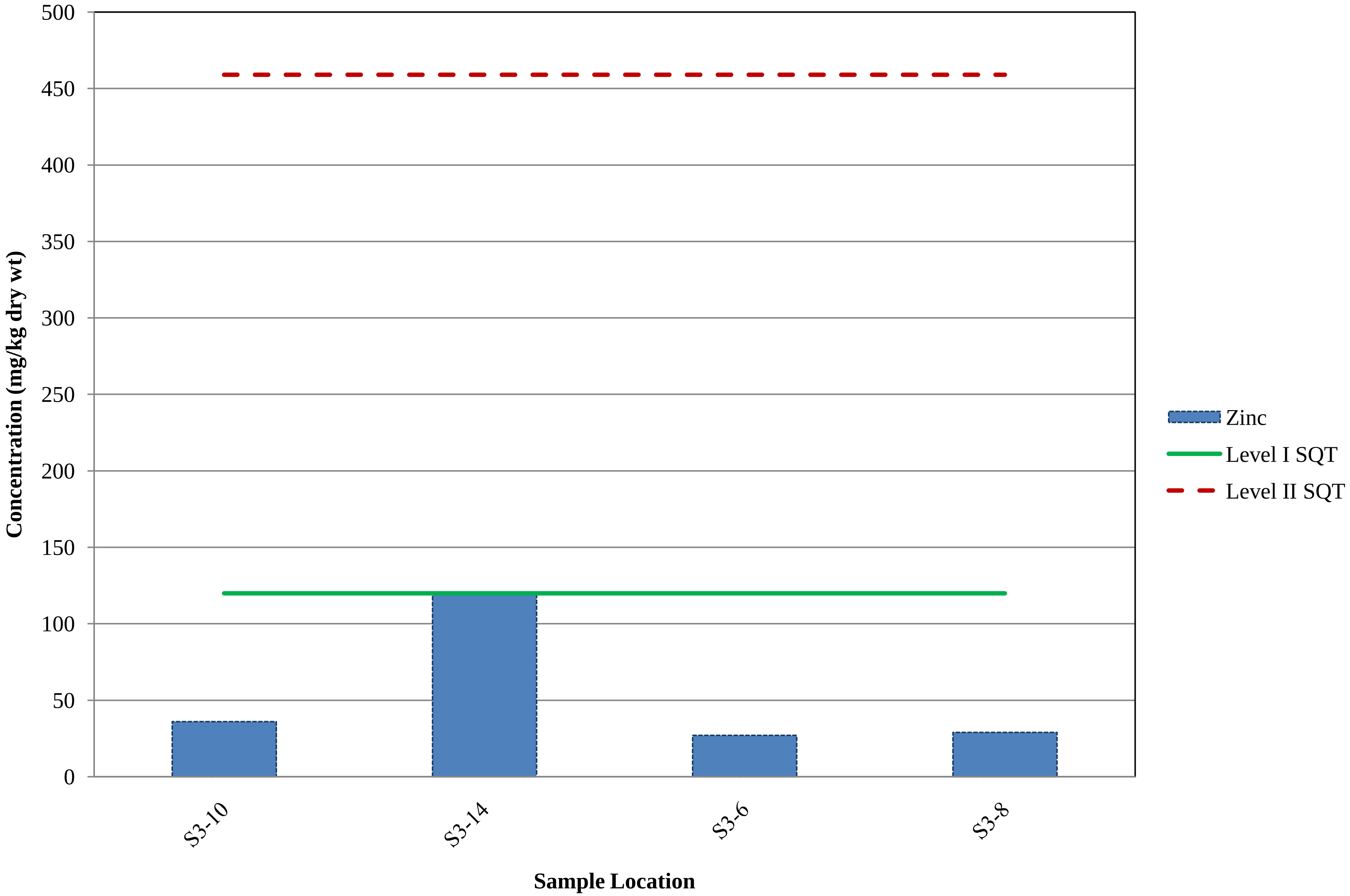


**Figure 8.27-i**
**Slip 3 (Top of Sediment, 0-0.5 ft) - PAHs**

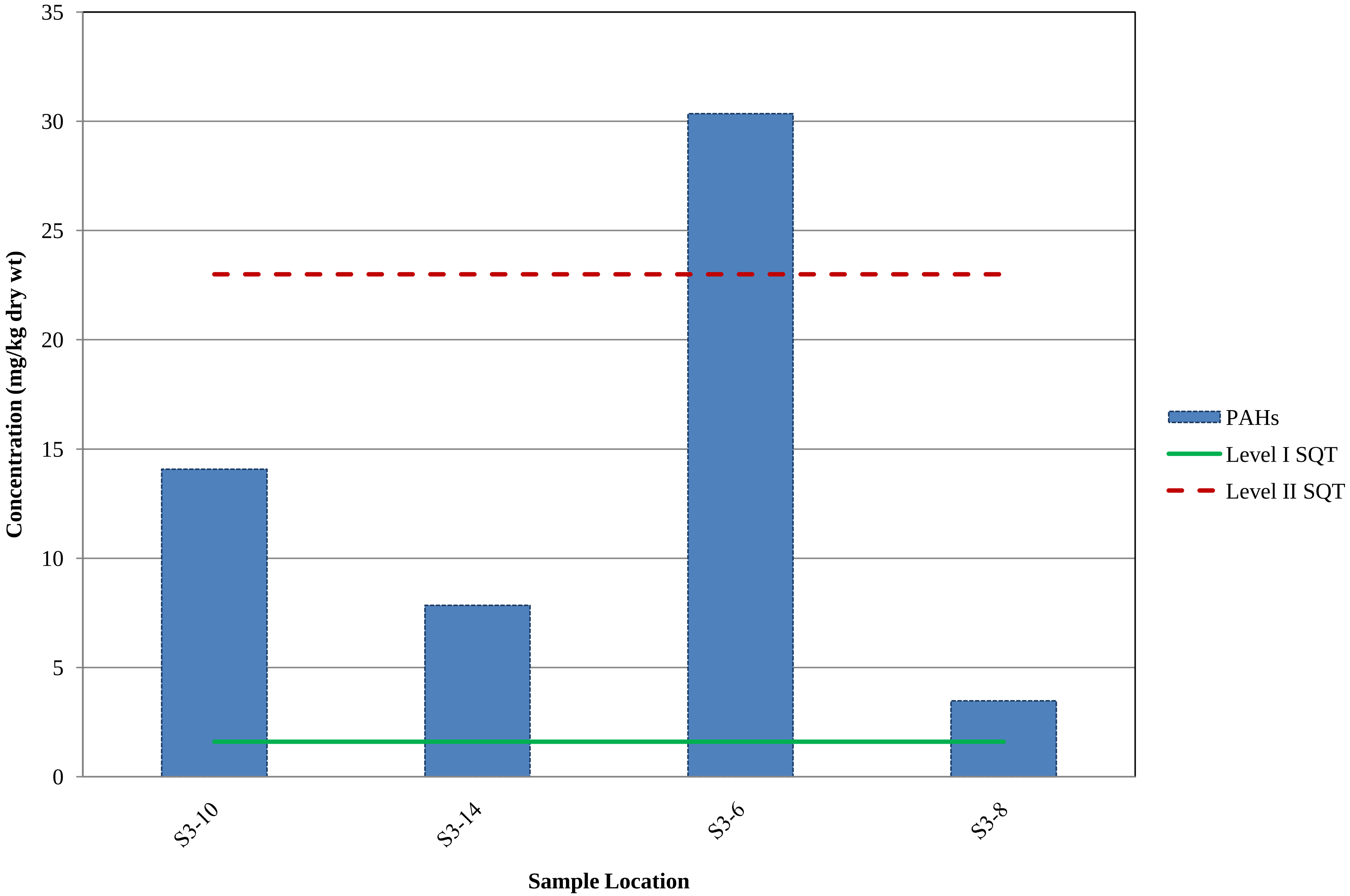


**Figure 8.27-j**
**Slip 3 (Top of Sediment, 0-0.5 ft) - PCBs**

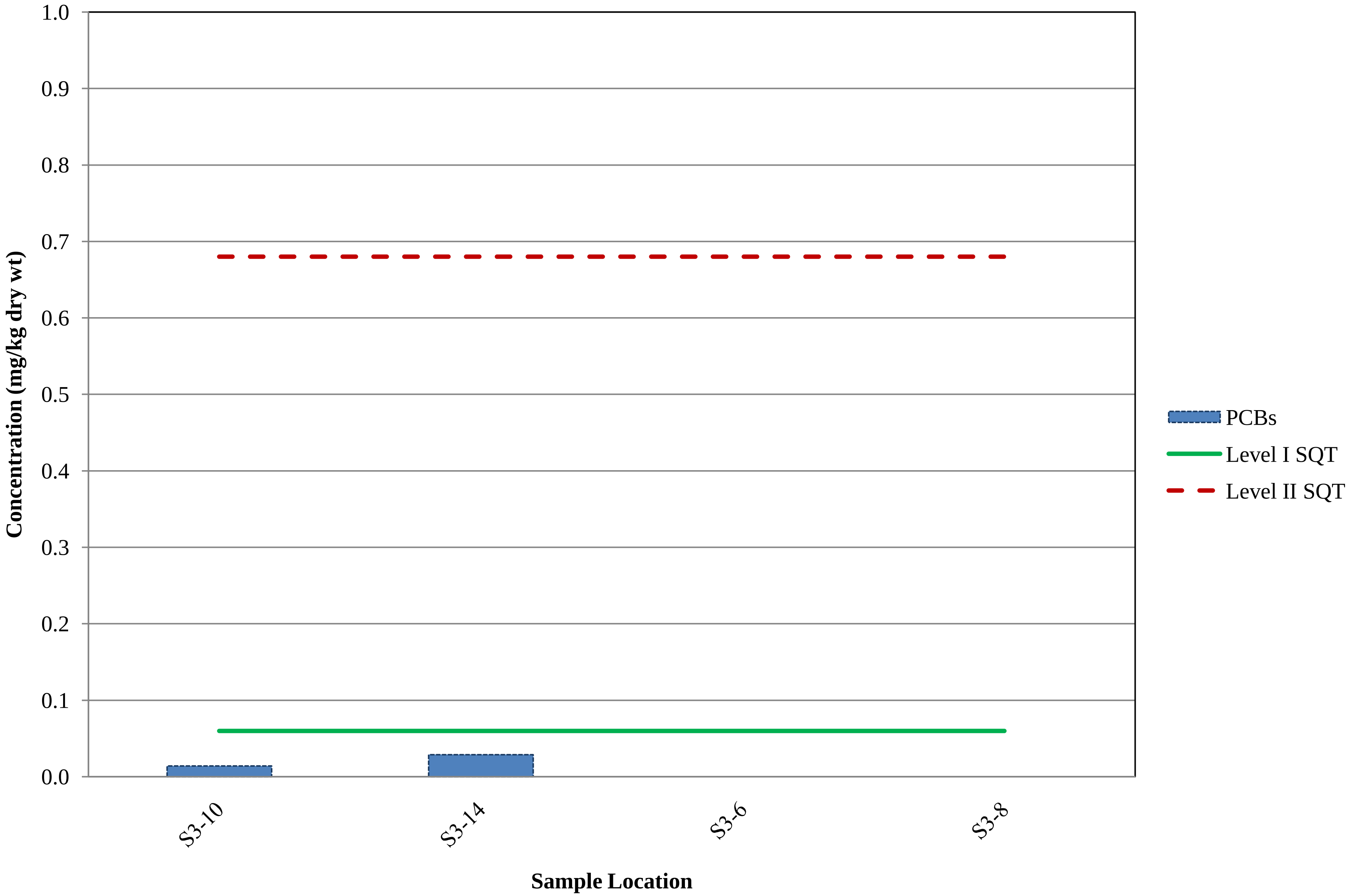


**Figure 8.27-k**
**Slip 3 (Top of Sediment, 0-0.5 ft) - Dioxins**

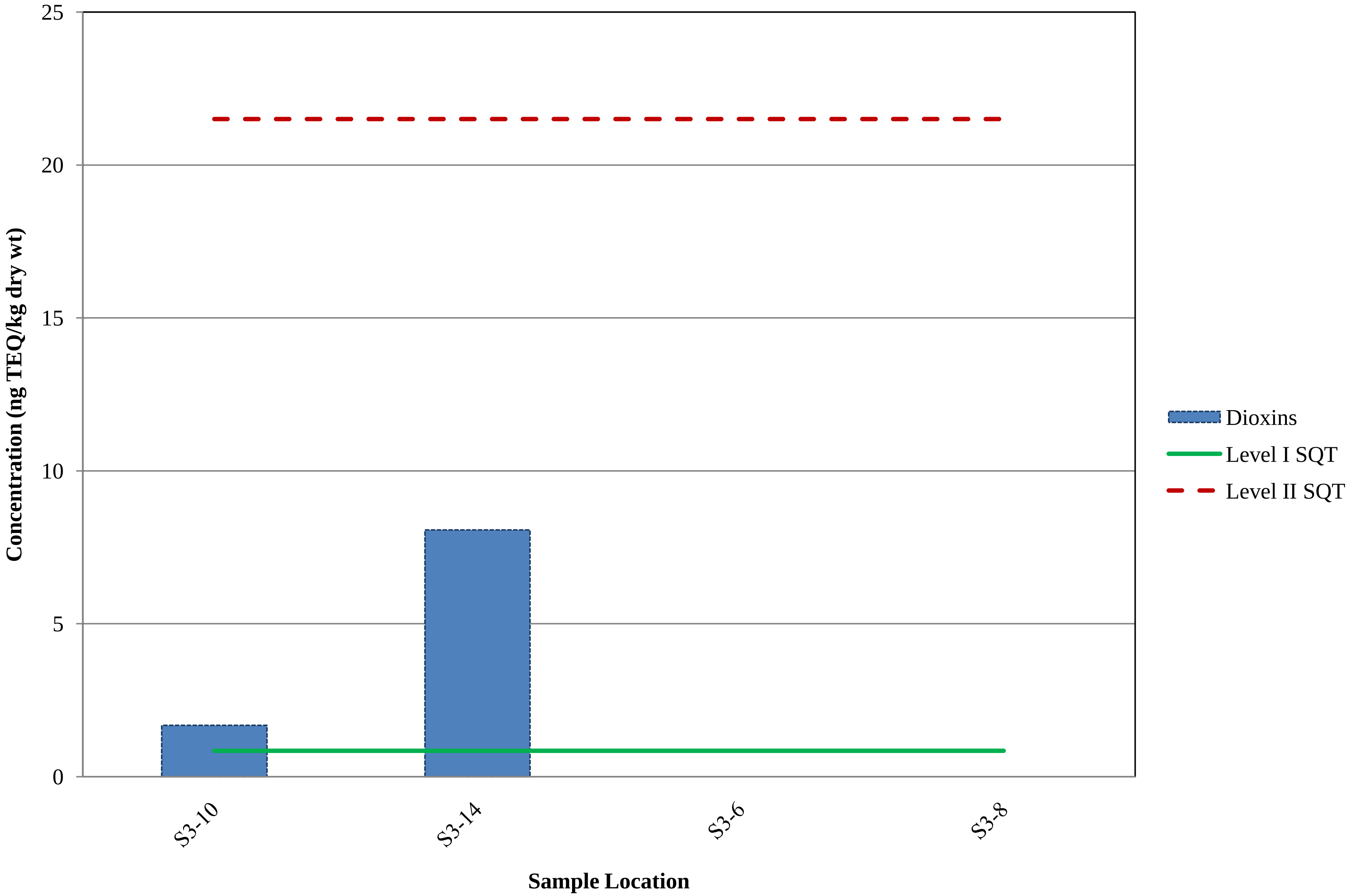


**Figure 8.28-a**
**Slip C (Top of Sediment, 0-0.5 ft) - Arsenic**

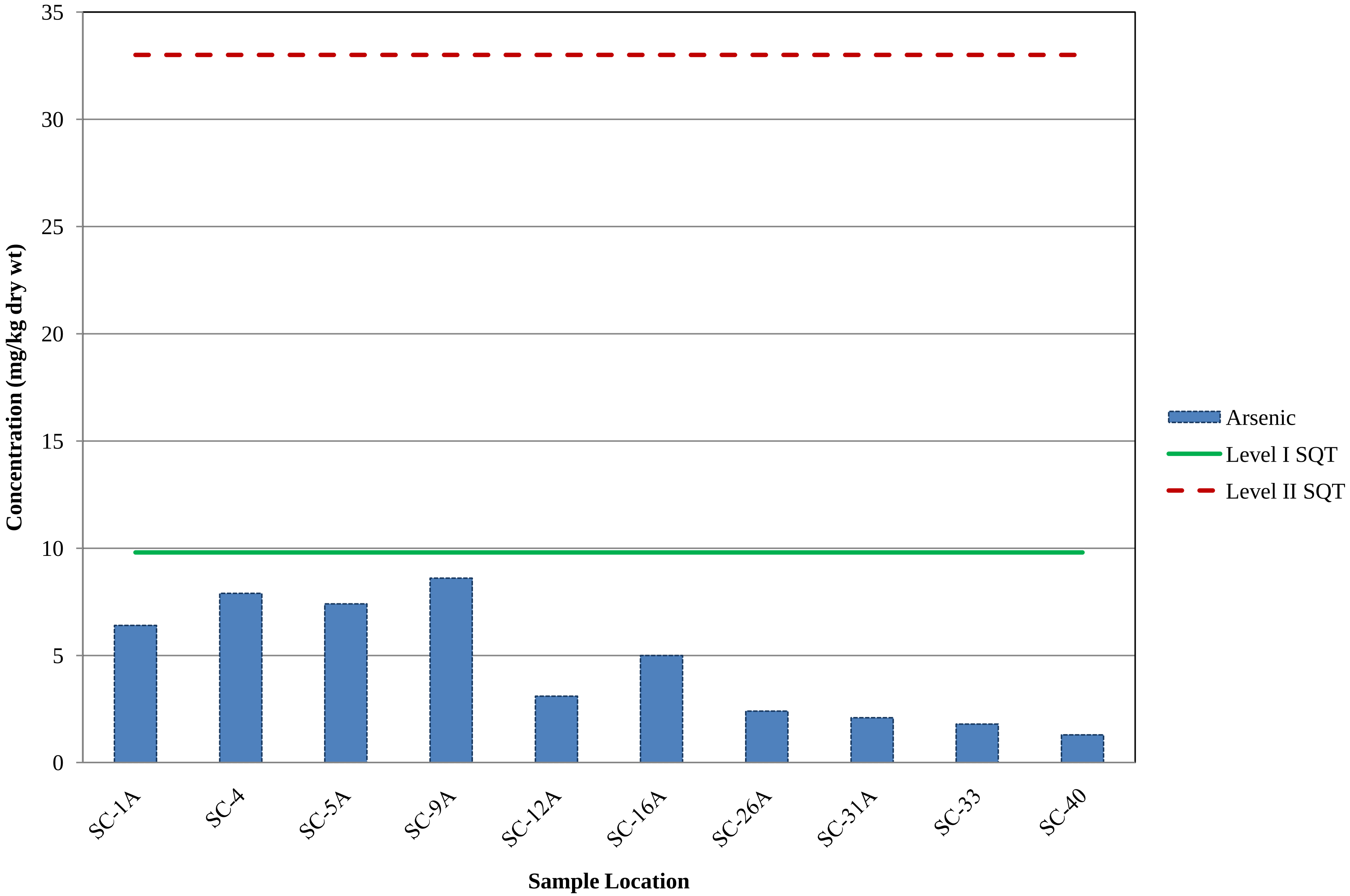


**Figure 8.28-b**
**Slip C (Top of Sediment, 0-0.5 ft) - Cadmium**

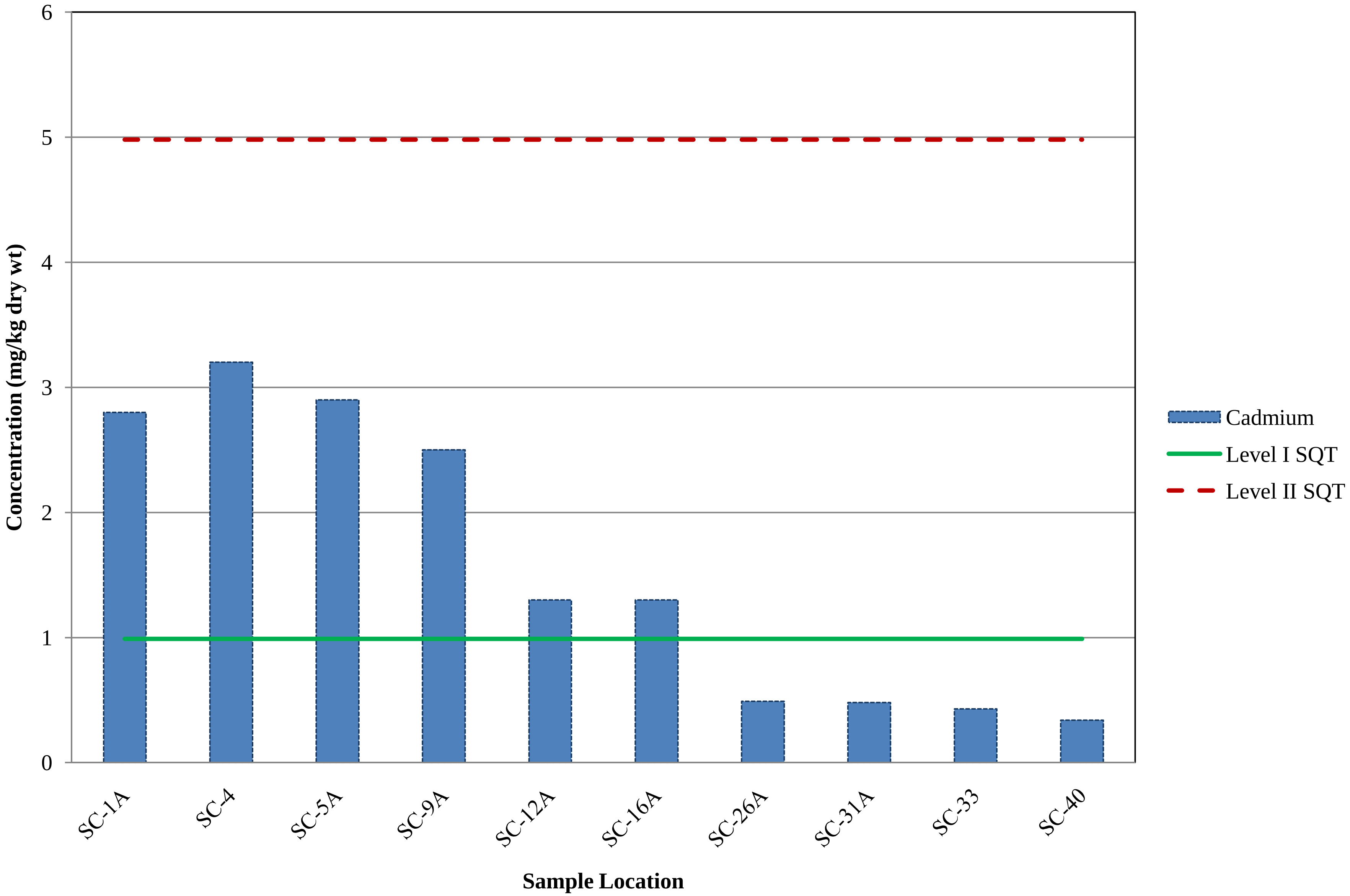


**Figure 8.28-c**
**Slip C (Top of Sediment, 0-0.5 ft) - Chromium**

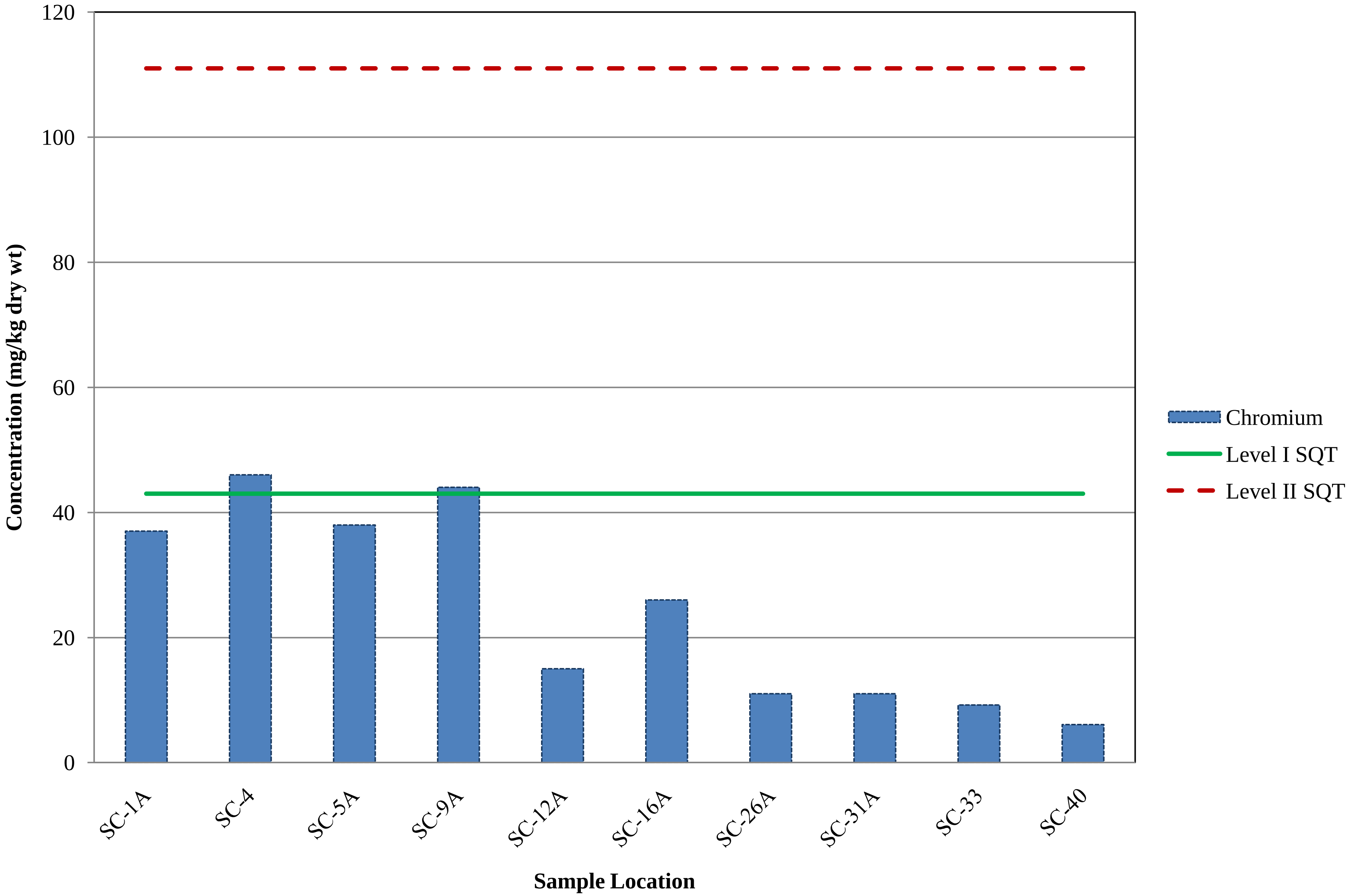


**Figure 8.28-d**
**Slip C (Top of Sediment, 0-0.5 ft) - Copper**

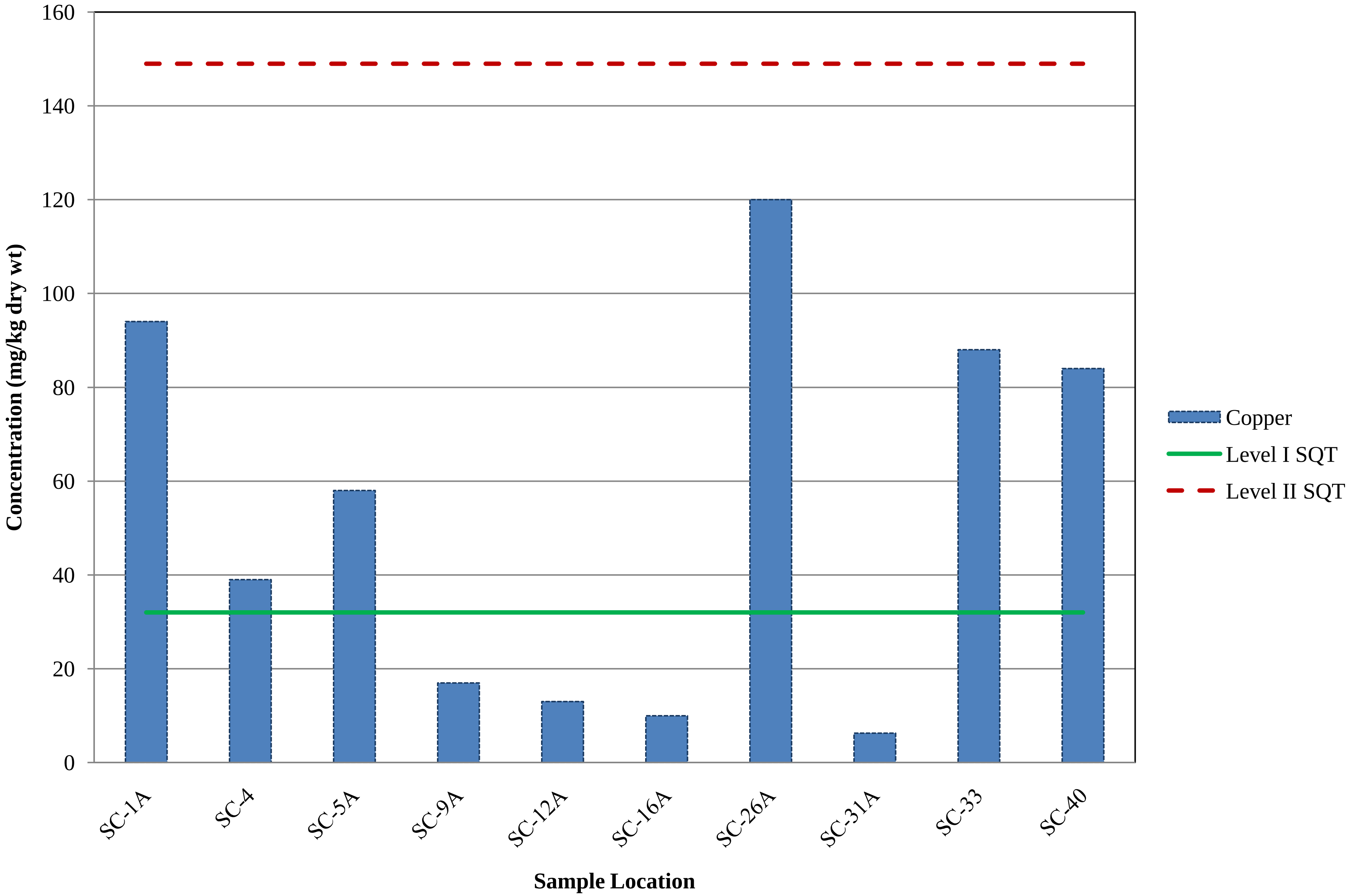


**Figure 8.28-e**
**Slip C (Top of Sediment, 0-0.5 ft) - Lead**

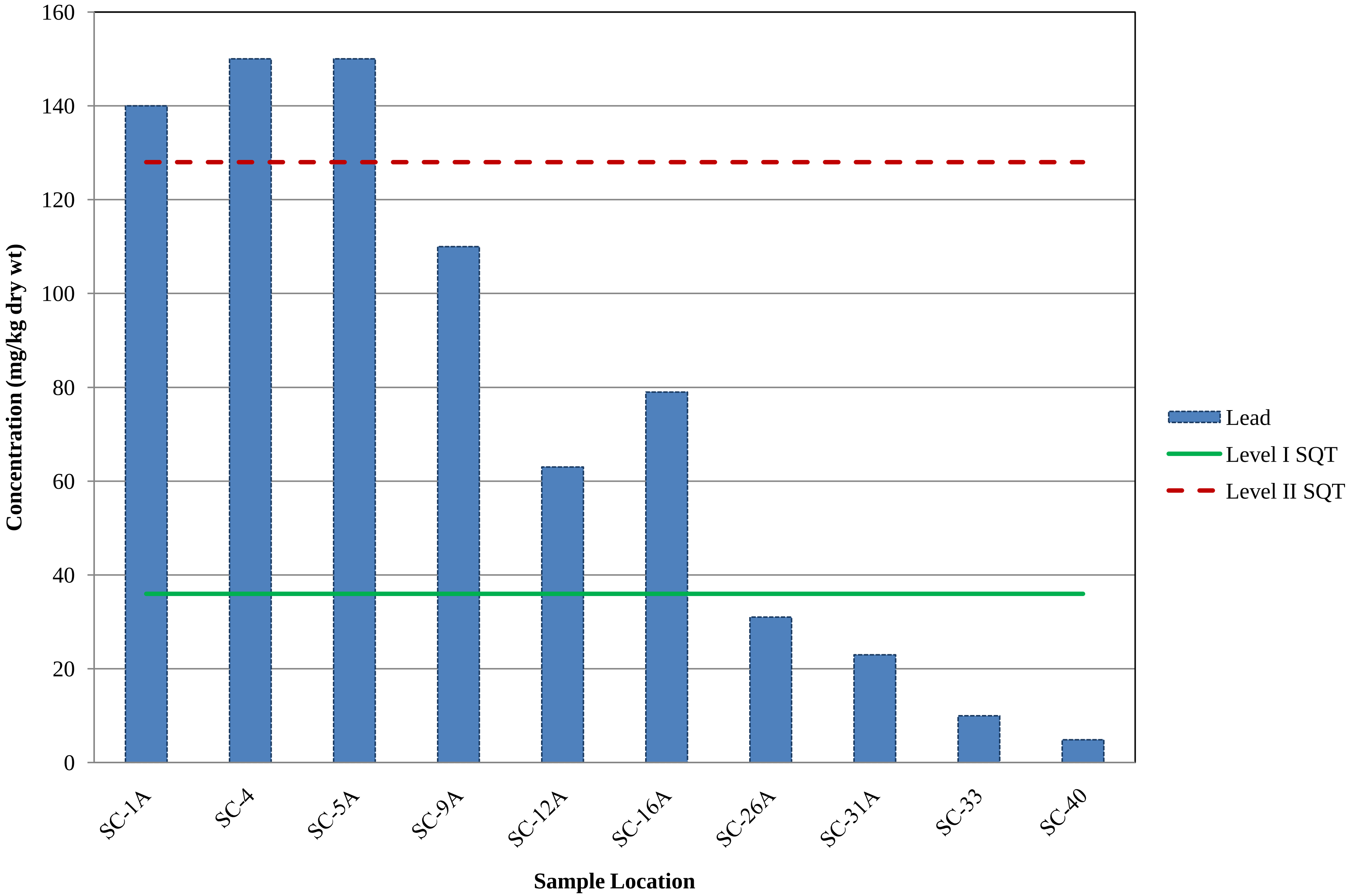


**Figure 8.28-f**
**Slip C (Top of Sediment, 0-0.5 ft) - Mercury**

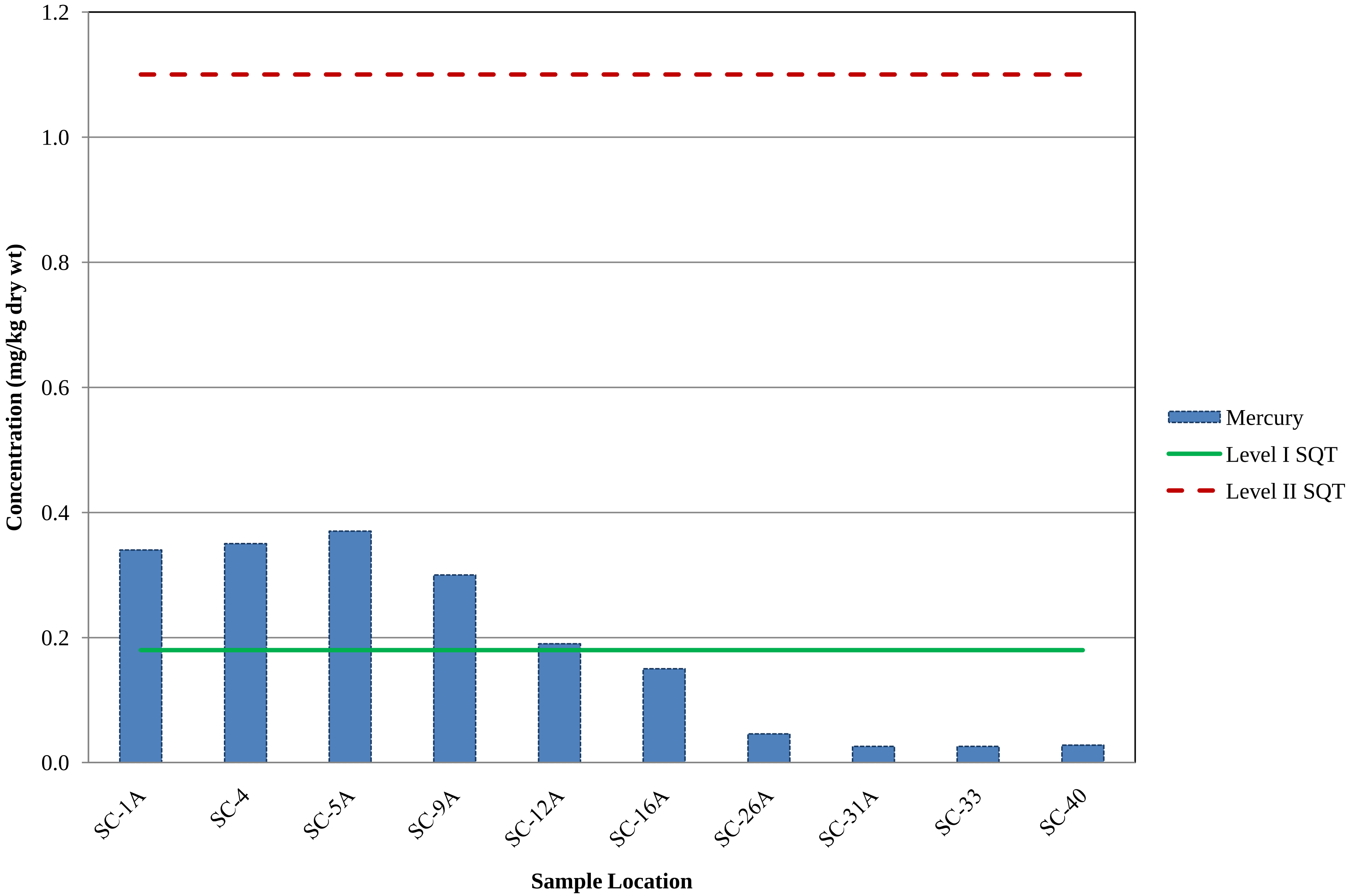


**Figure 8.28-g**
**Slip C (Top of Sediment, 0-0.5 ft) - Nickel**

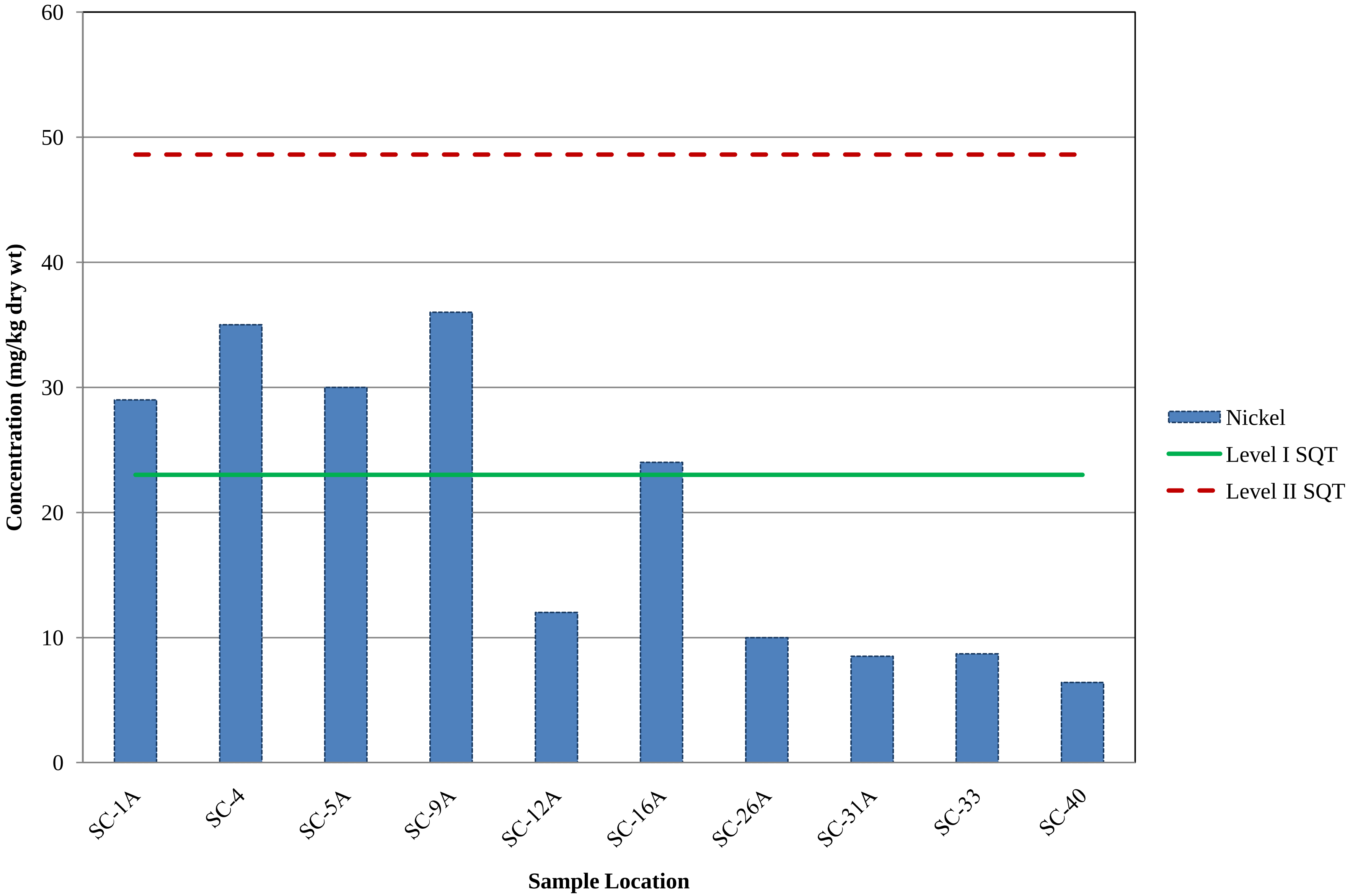


**Figure 8.28-h**
**Slip C (Top of Sediment, 0-0.5 ft) - Zinc**

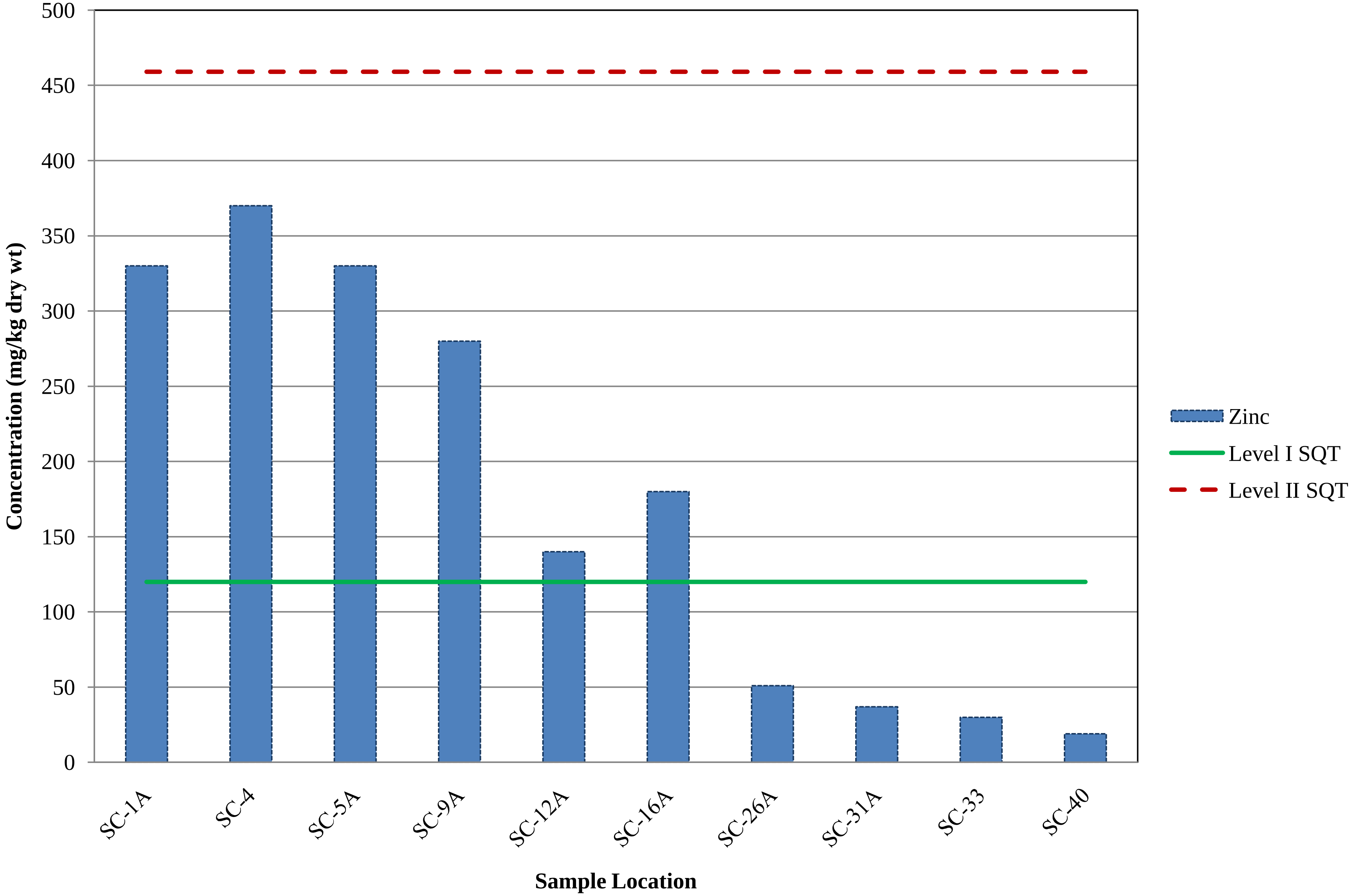


**Figure 8.28-i**
**Slip C (Top of Sediment, 0-0.5 ft) - PAHs**

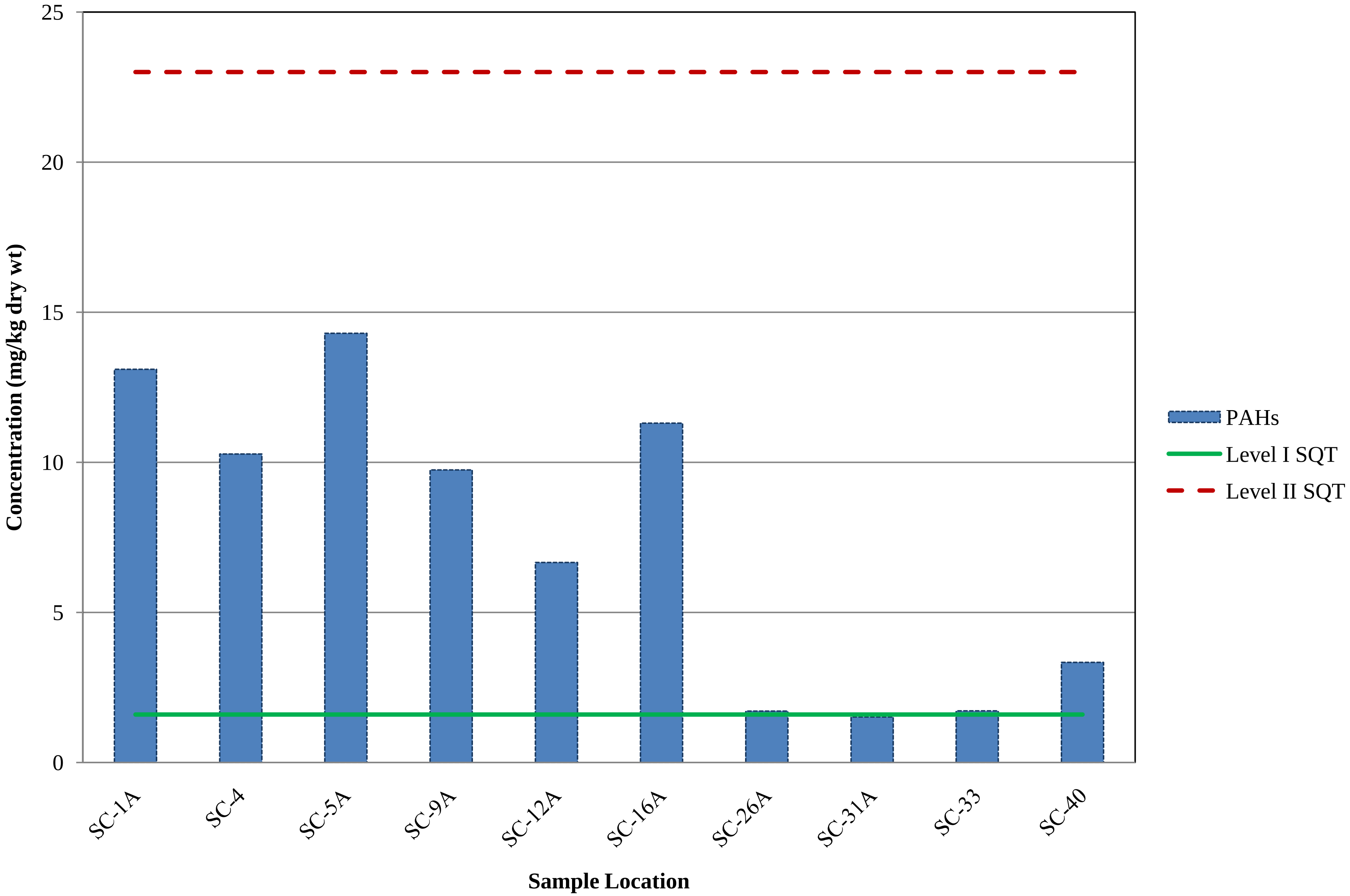


**Figure 8.28-j**
**Slip C (Top of Sediment, 0-0.5 ft) - PCBs**

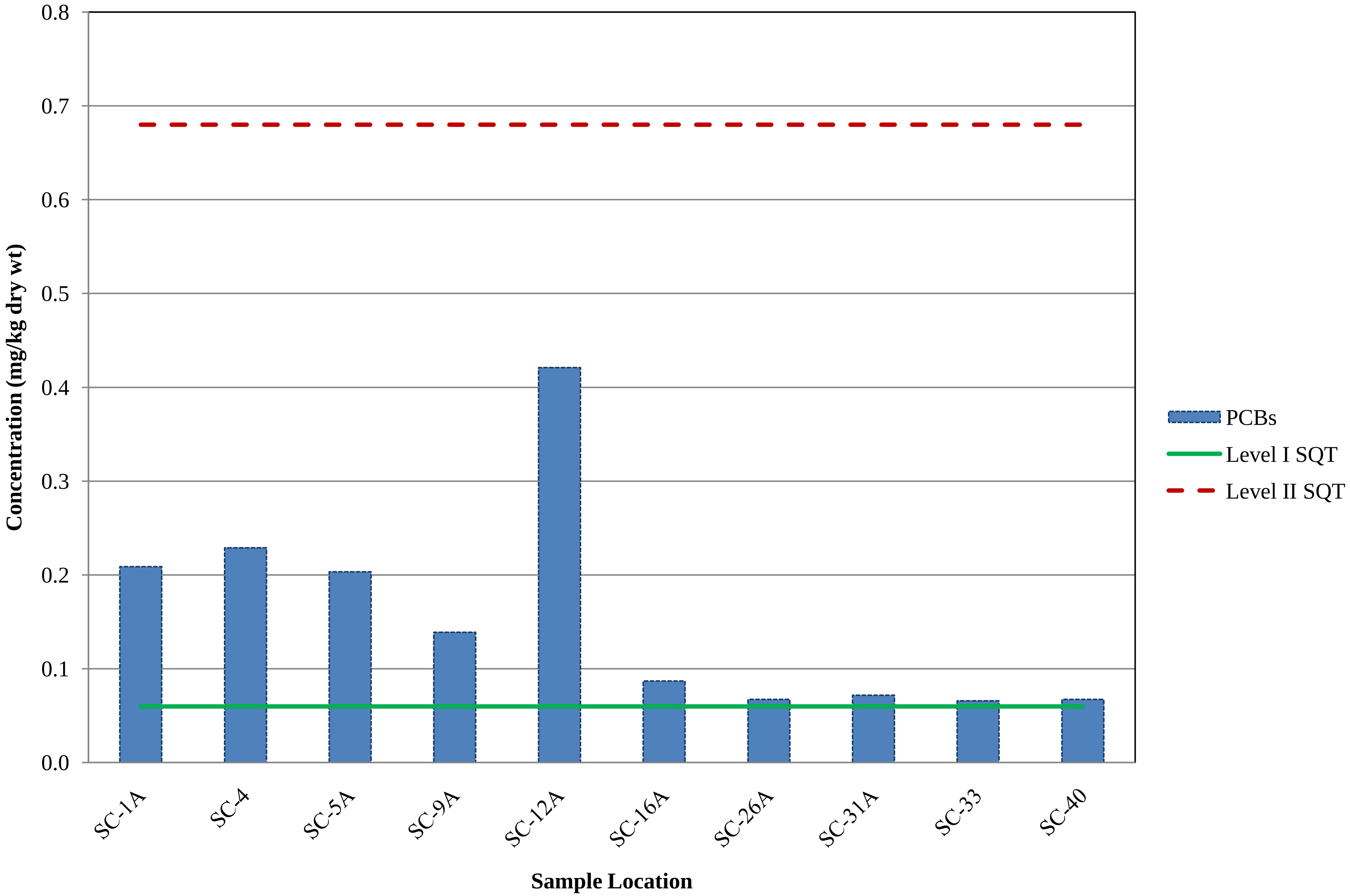
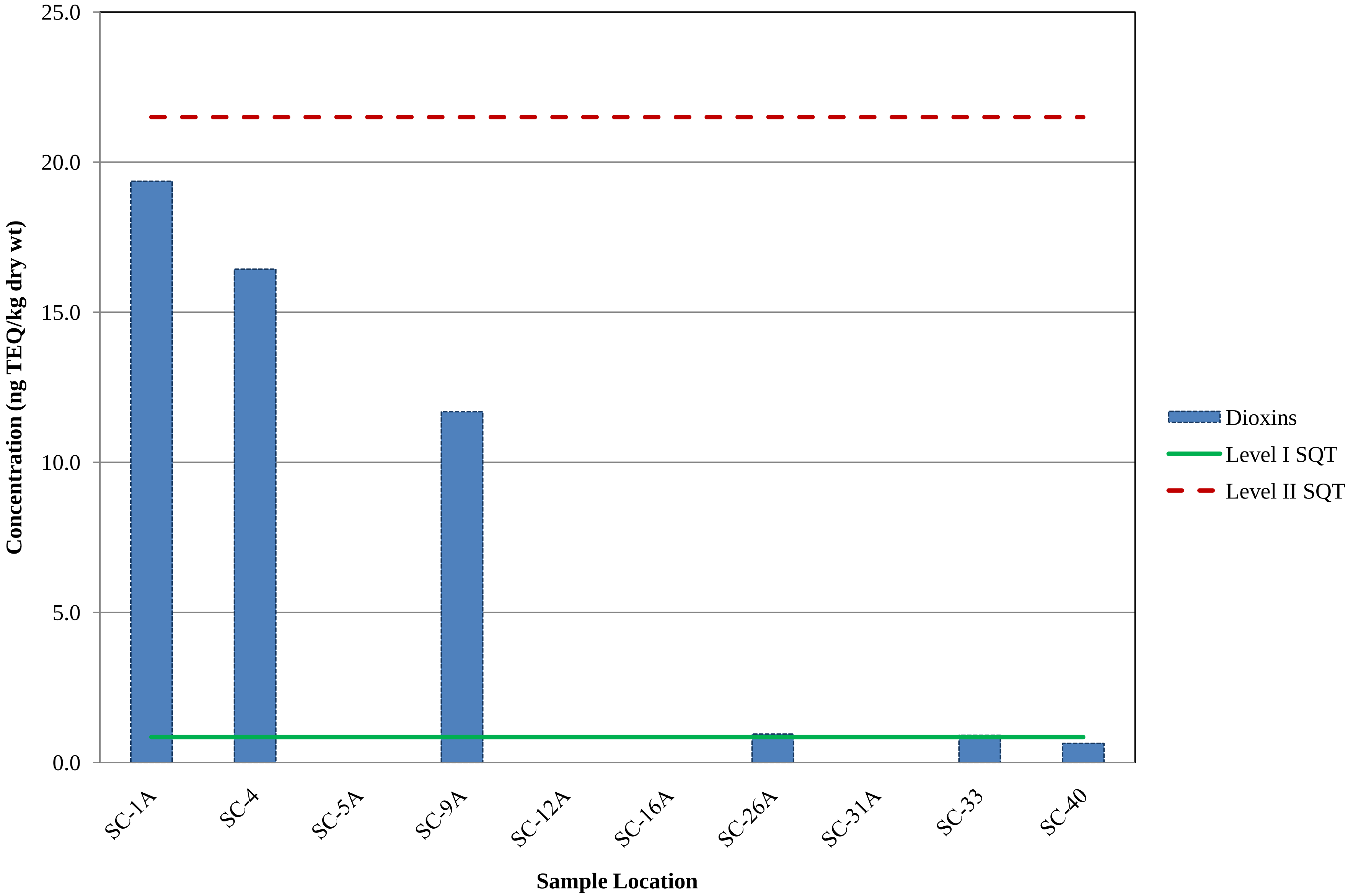


**Figure 8.28-k**
**Slip C (Top of Sediment, 0-0.5 ft) - Dioxins**



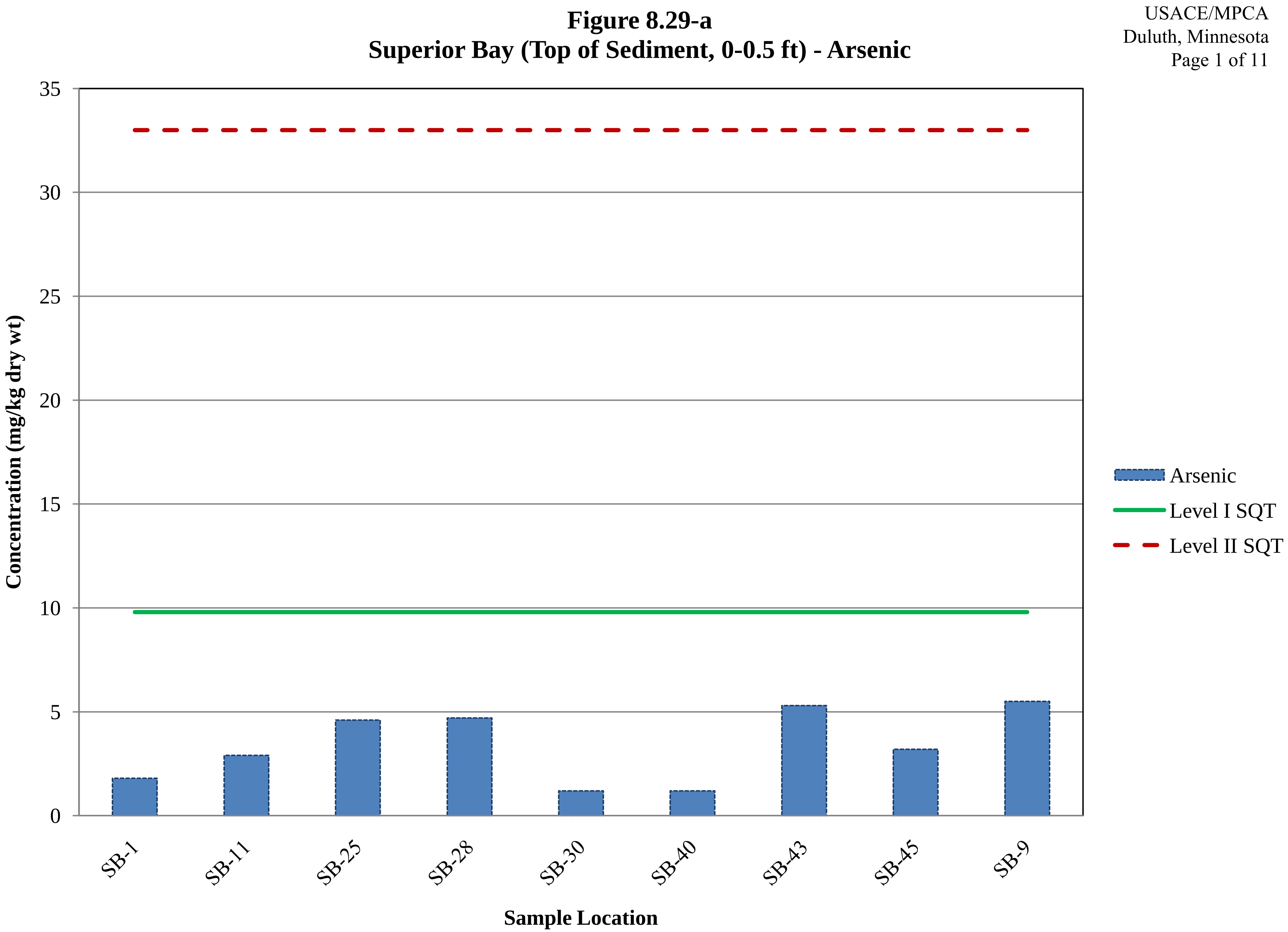


Figure 8.29-a
Superior Bay (Top of Sediment, 0-0.5 ft) - Arsenic
Concentration (mg/kg dry wt)
35
30
25
20
15
10
5
0
SB-1
SB-11
SB-25
SB-28
SB-30
SB-40
SB-43
SB-45
SB-9
Sample Location
Arsenic
Level I SQT
Level II SQT

**Figure 8.29-b**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Cadmium**

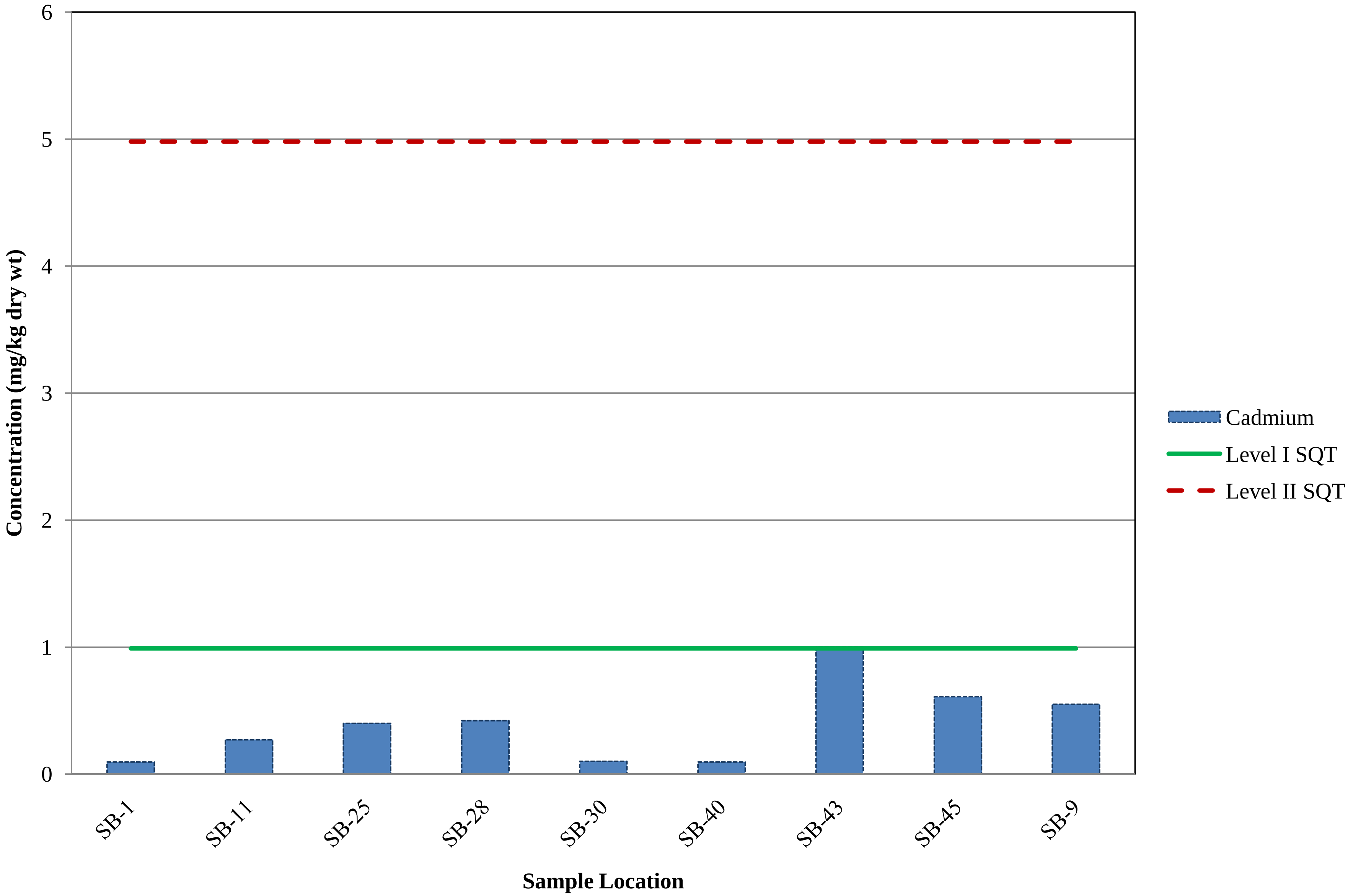


**Figure 8.29-c**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Chromium**

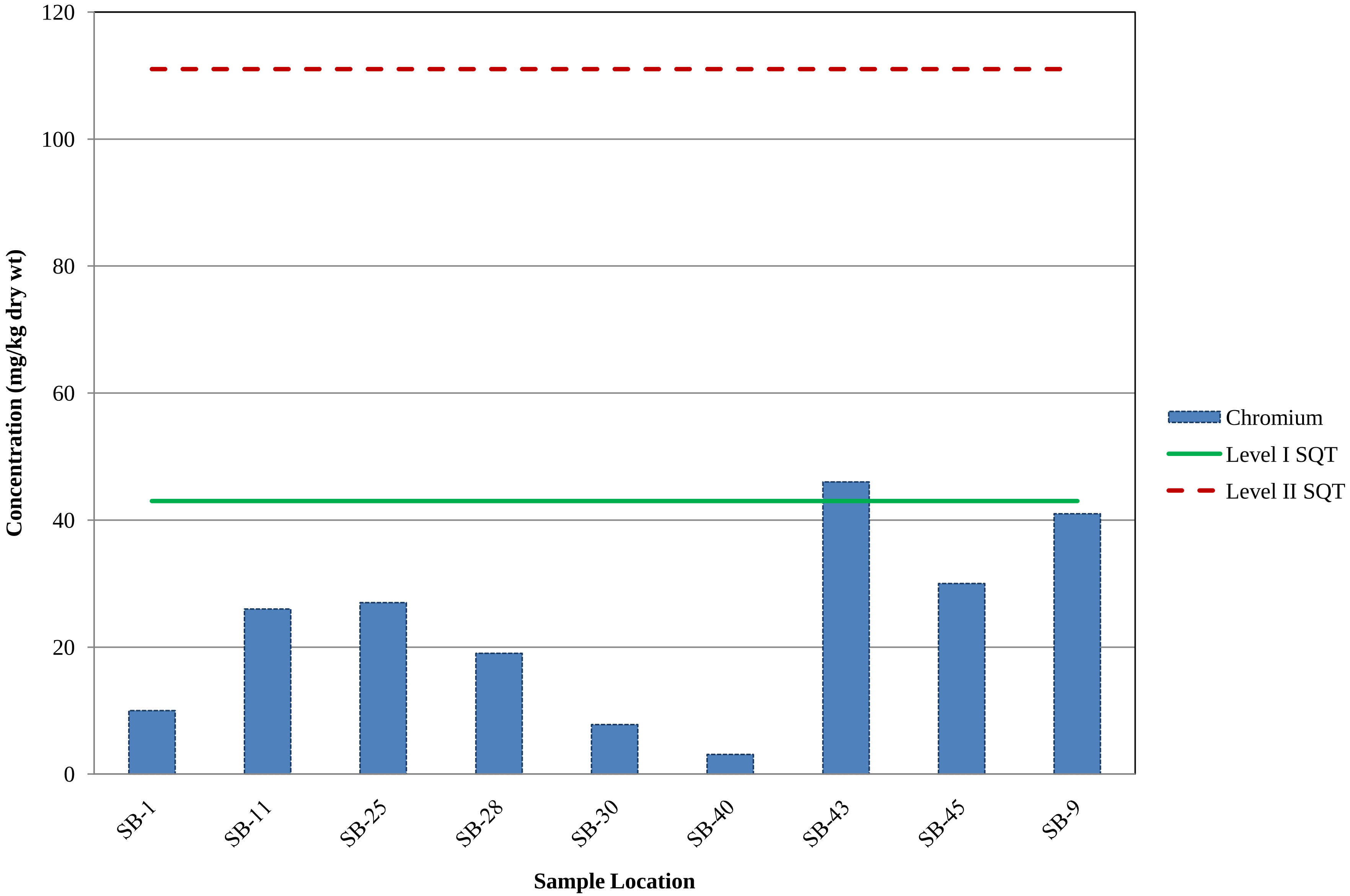
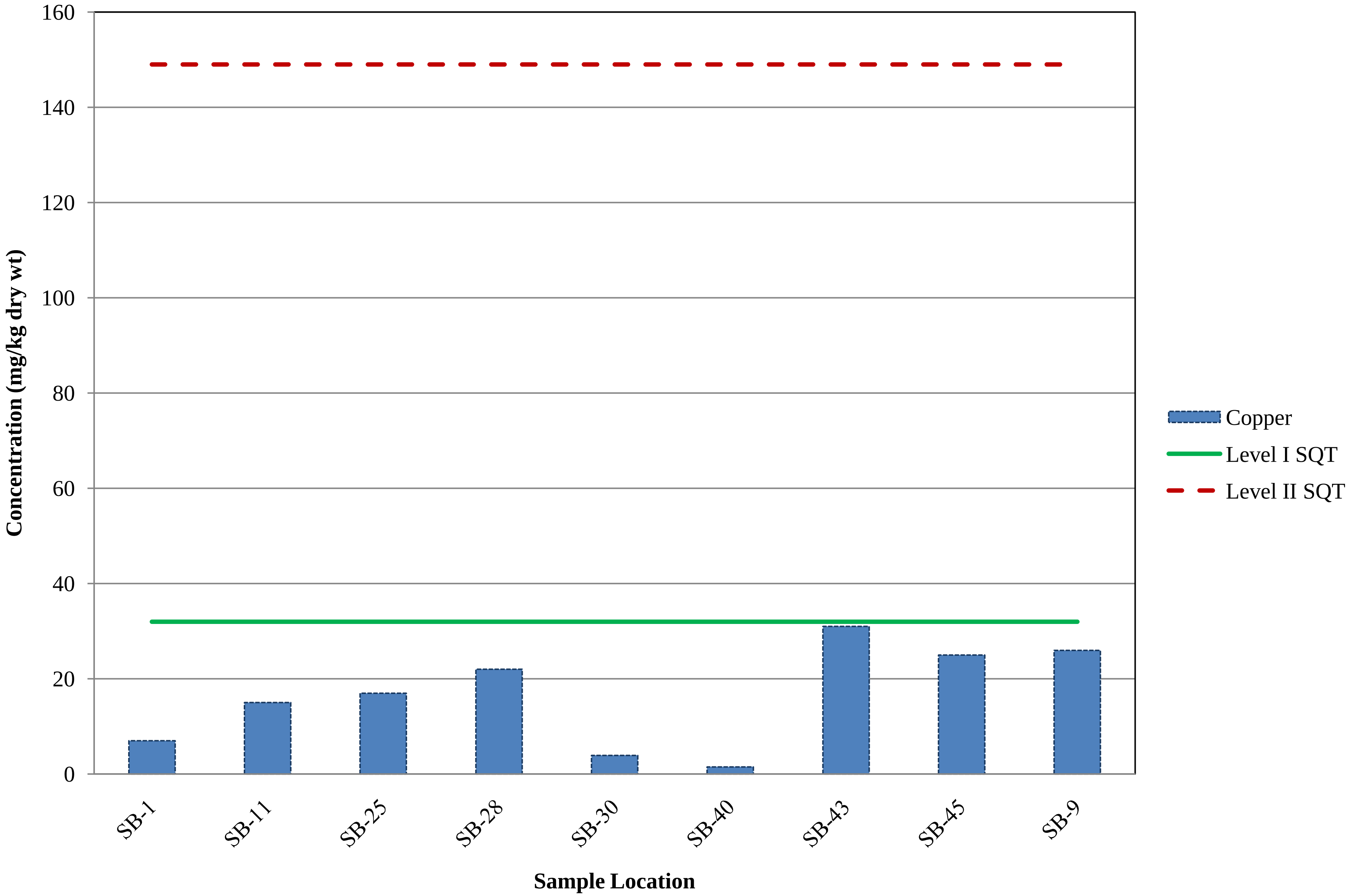


**Figure 8.29-d**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Copper**



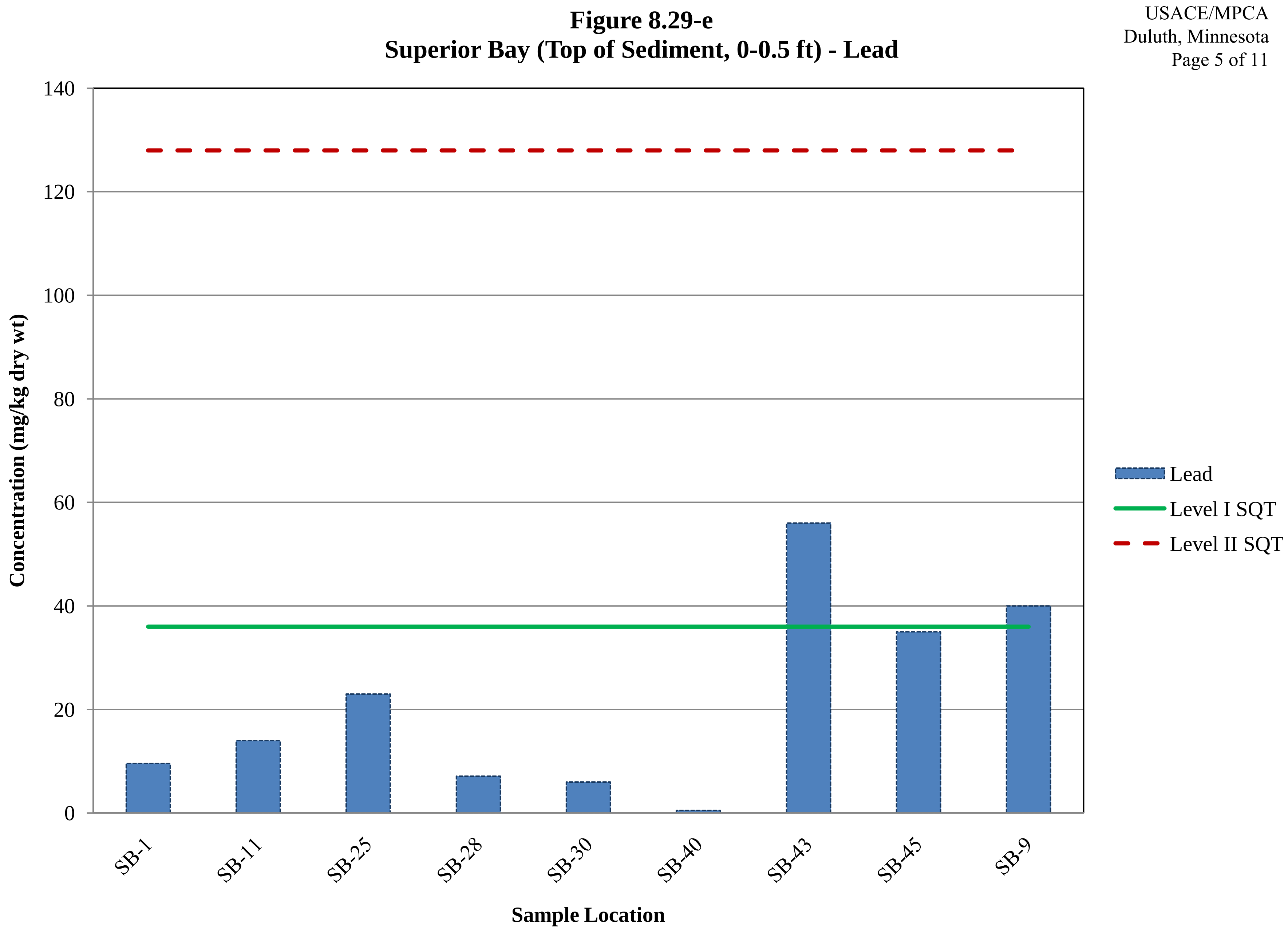


Figure 8.29-e
Superior Bay (Top of Sediment, 0-0.5 ft) - Lead
Concentration (mg/kg dry wt)
140
120
100
80
60
40
20
0
SB-1
SB-11
SB-25
SB-28
SB-30
SB-40
SB-43
SB-45
SB-9
Sample Location
Lead
Level I SQT
Level II SQT

**Figure 8.29-f**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Mercury**

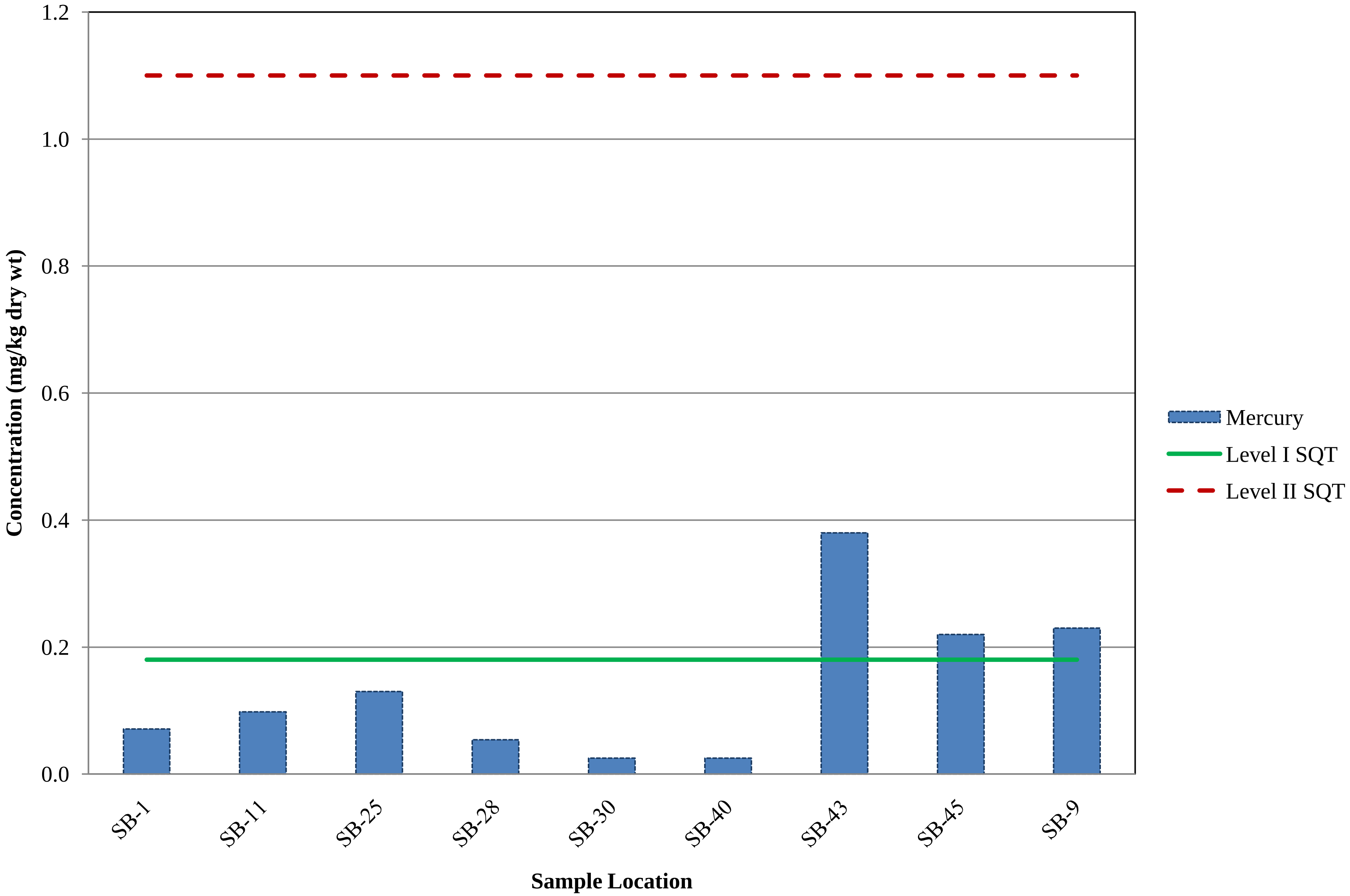


**Figure 8.29-g**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Nickel**

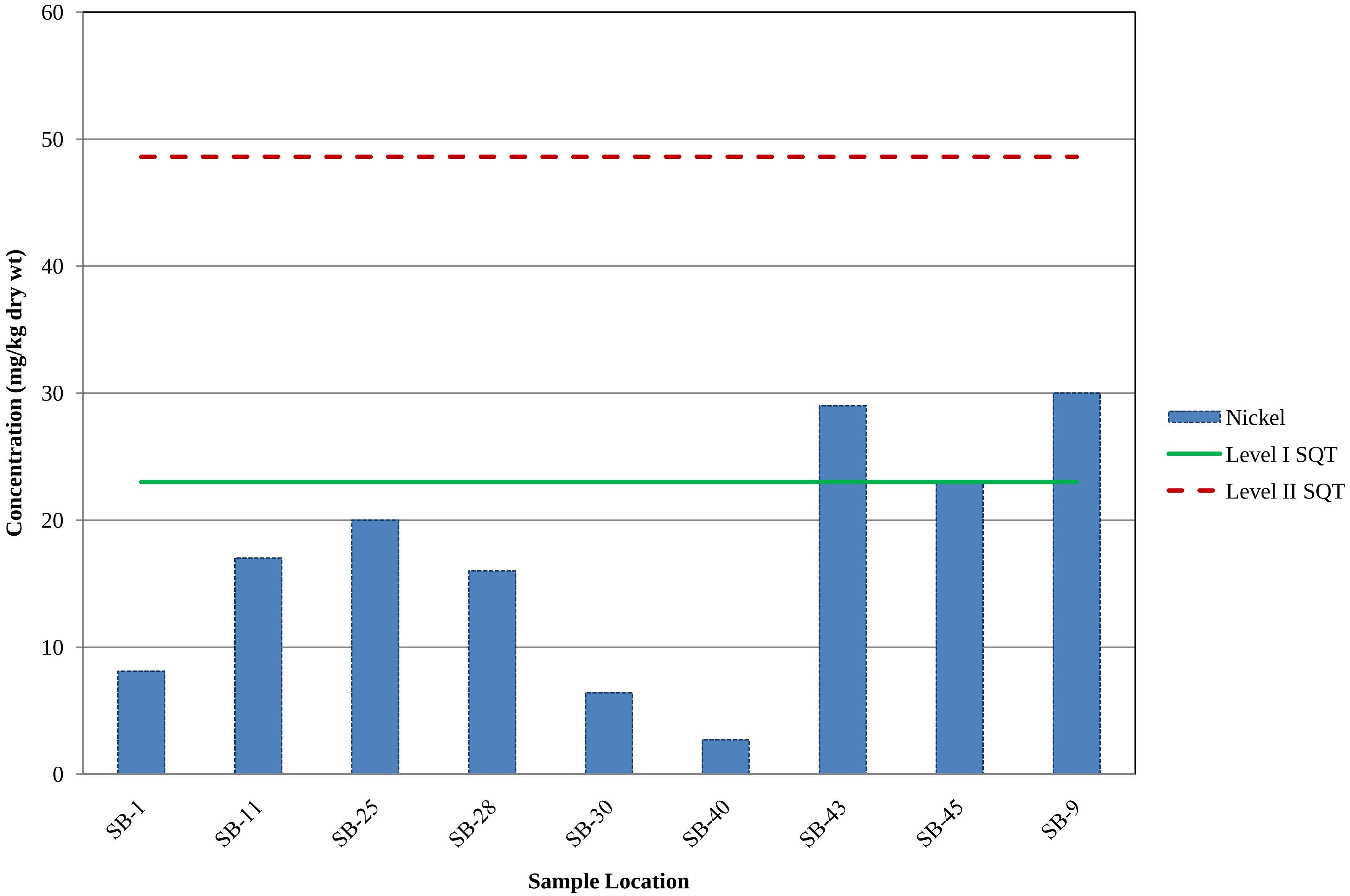


**Figure 8.29-h**
**Superior Bay (Top of Sediment, 0-0.5 ft) - Zinc**

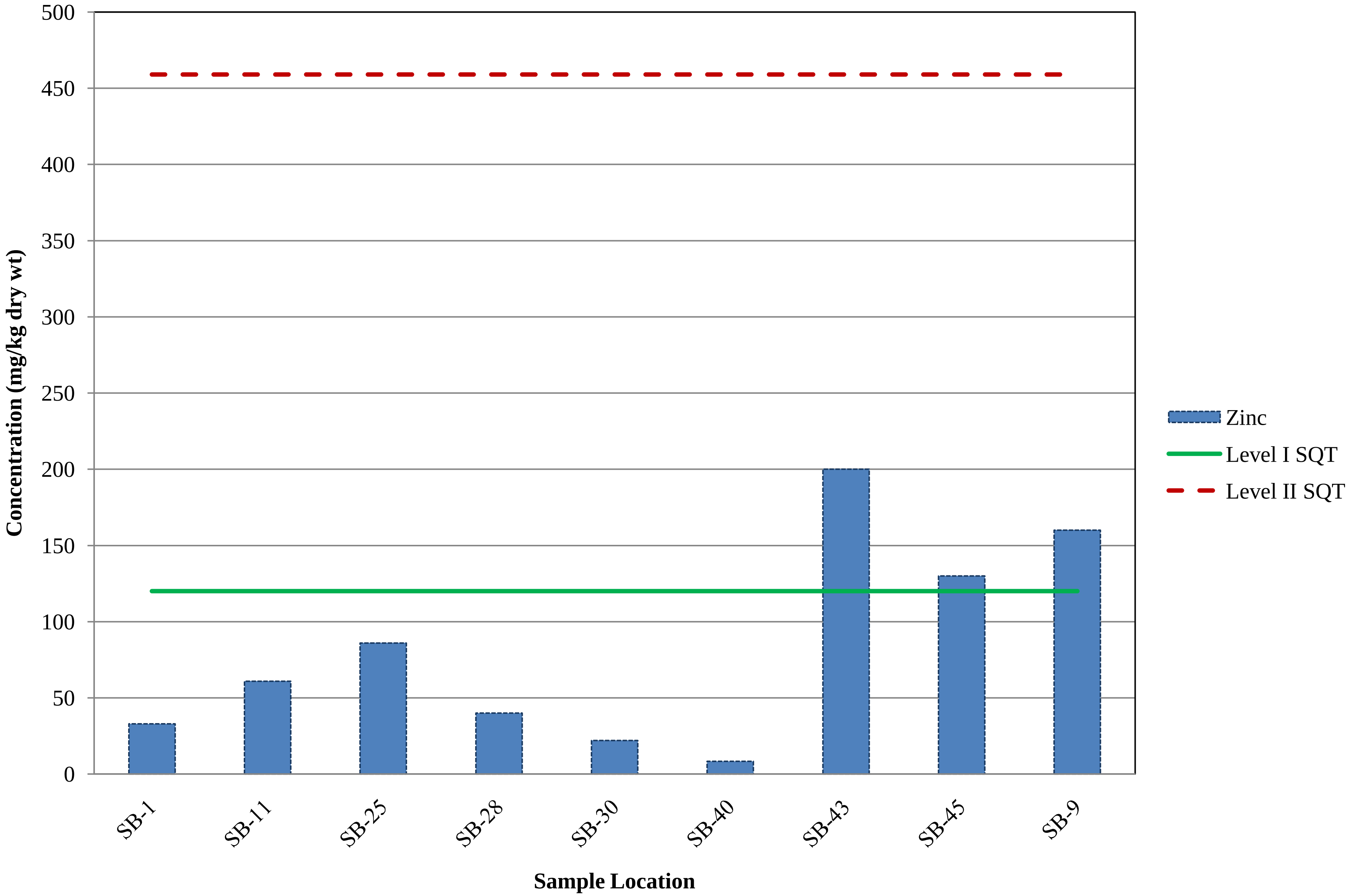


**Figure 8.29-i**
**Superior Bay (Top of Sediment, 0-0.5 ft) - PAHs**

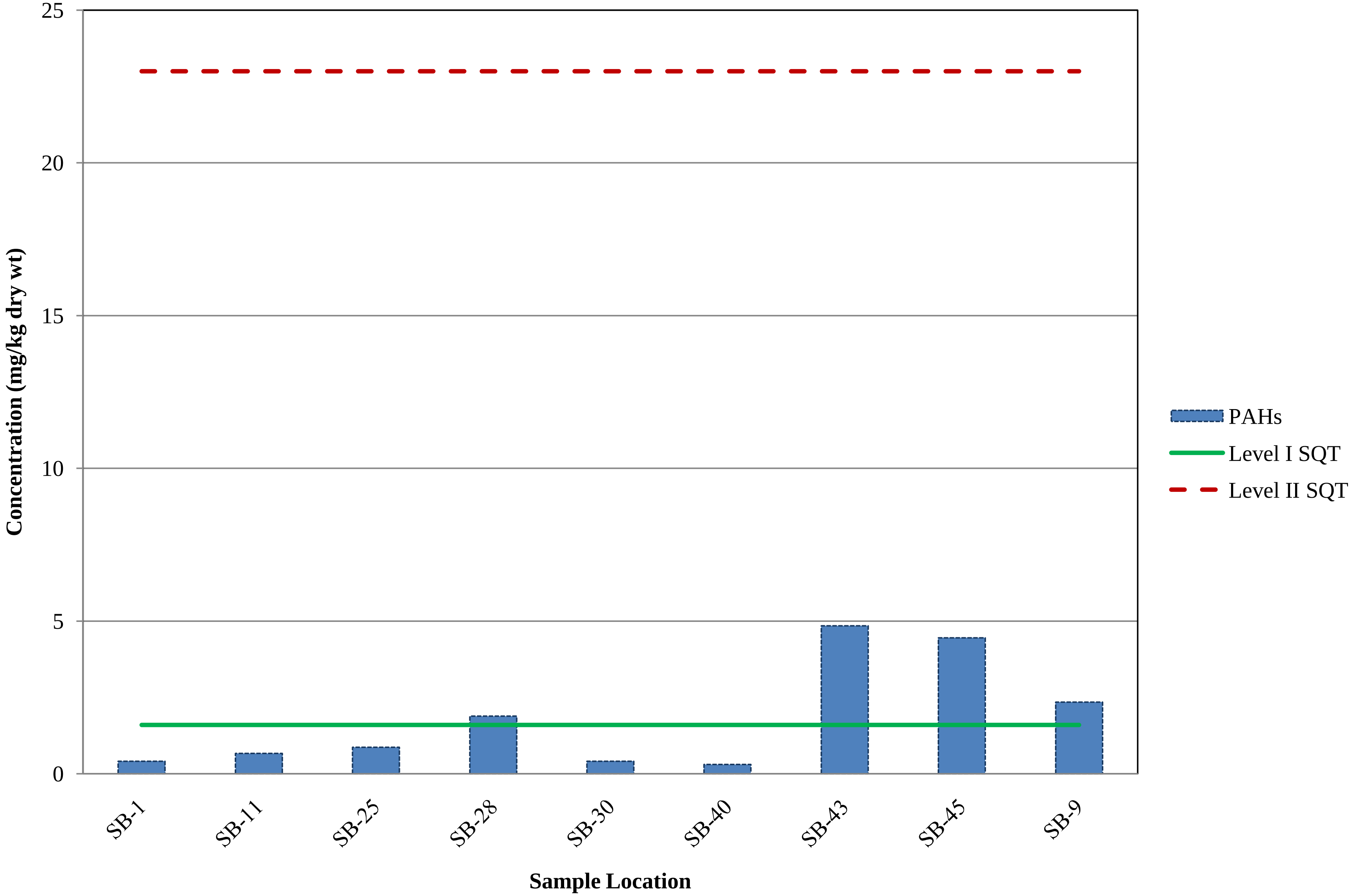
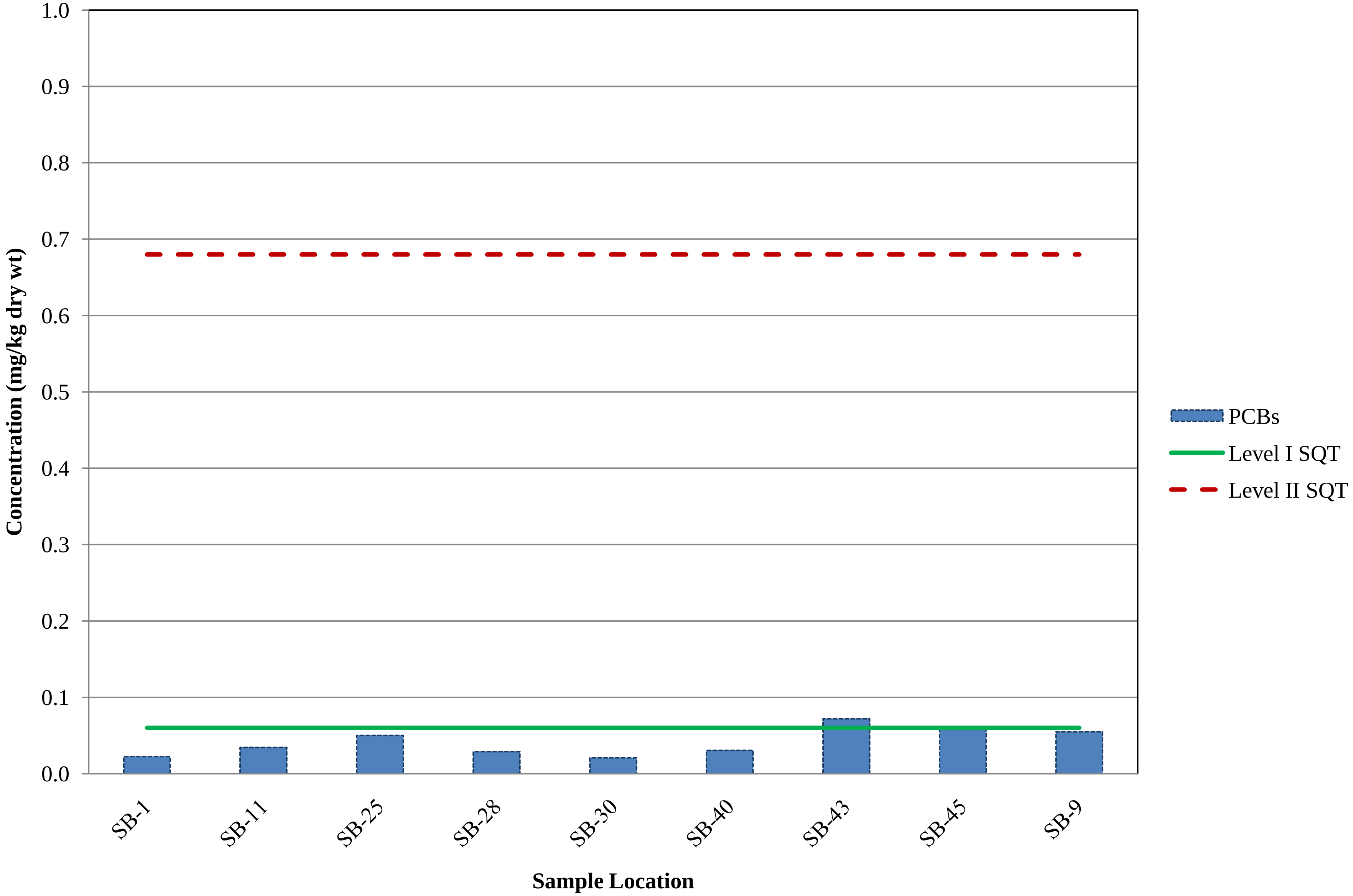
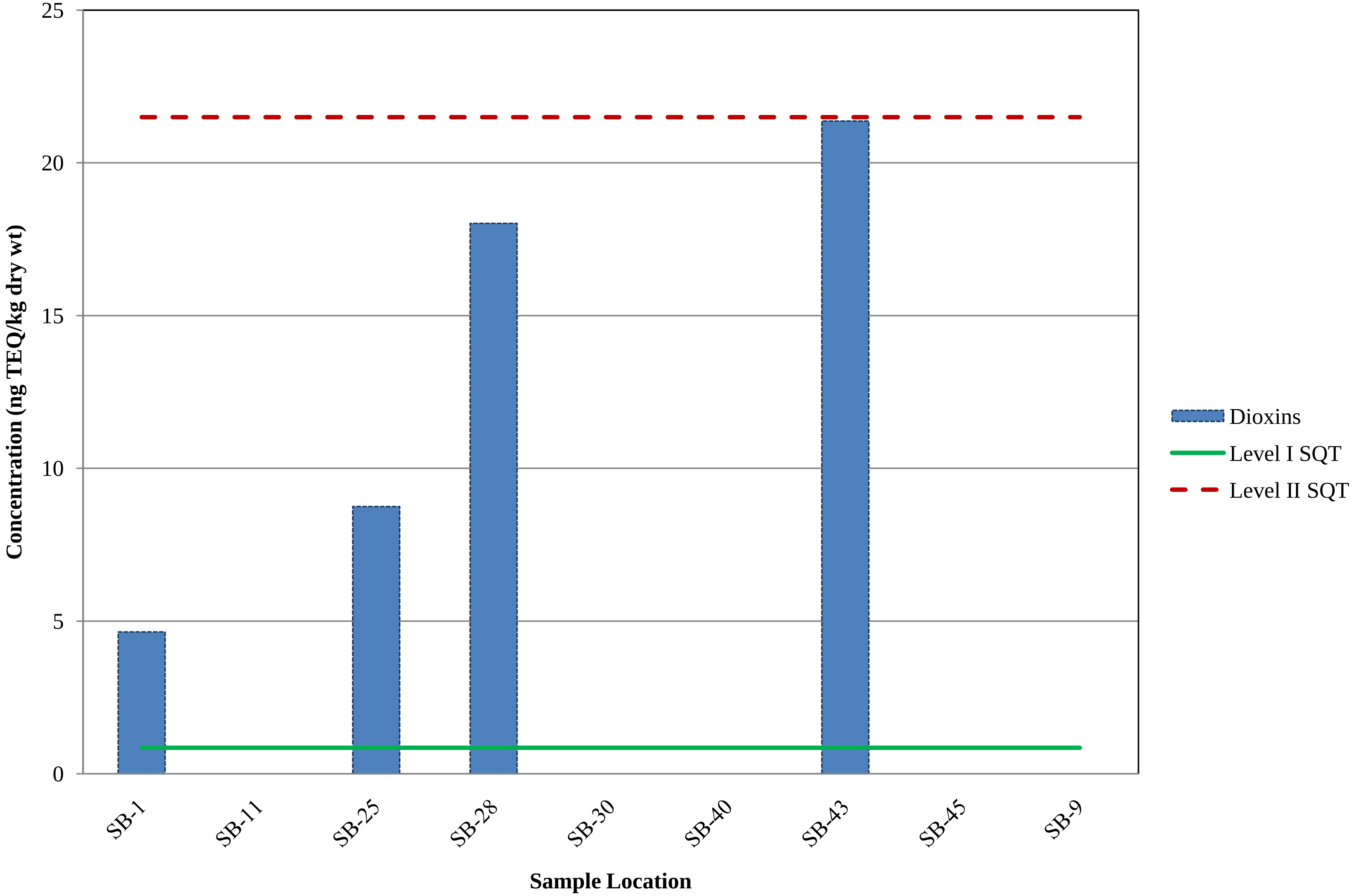


**Figure 8.29-j**
**Superior Bay (Top of Sediment, 0-0.5 ft) - PCBs**



## Figure 8.29-k
## Superior Bay (Top of Sediment, 0-0.5 ft) - Dioxins

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30a |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

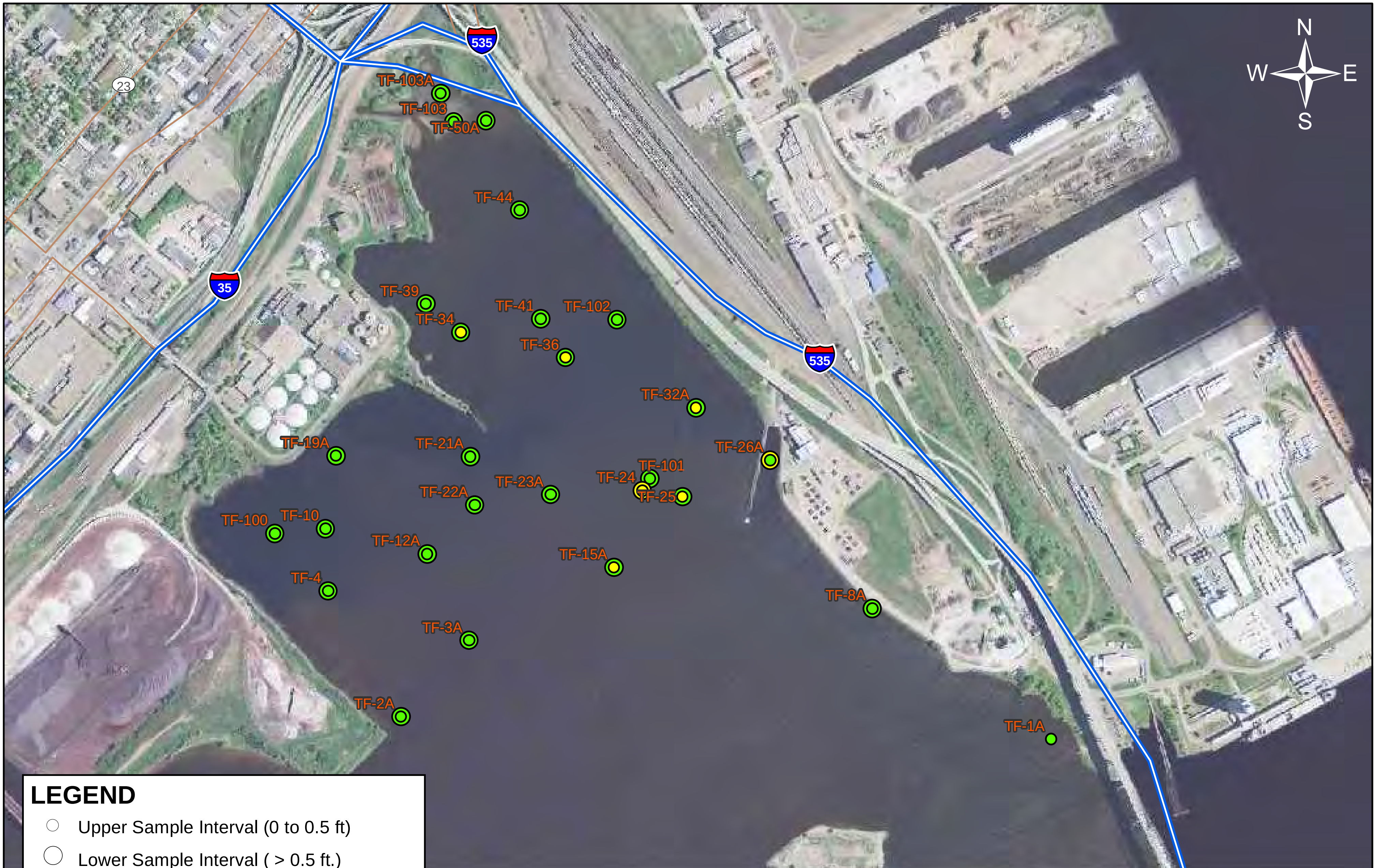
SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 | 600 | 1,200 | 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30b |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

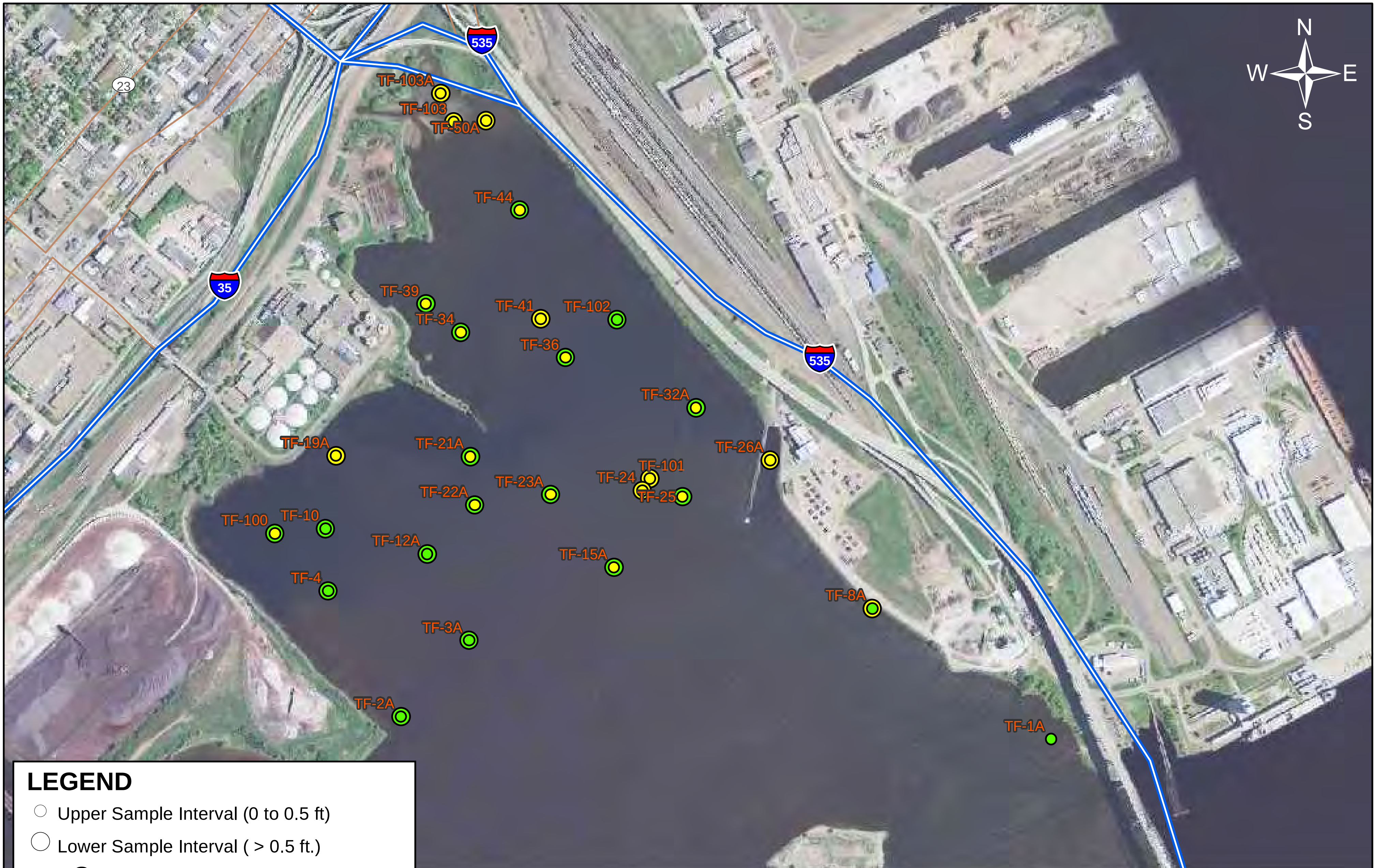
SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30c |
| SCALE: AS SHOWN | |




## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30d |
| SCALE: AS SHOWN | |

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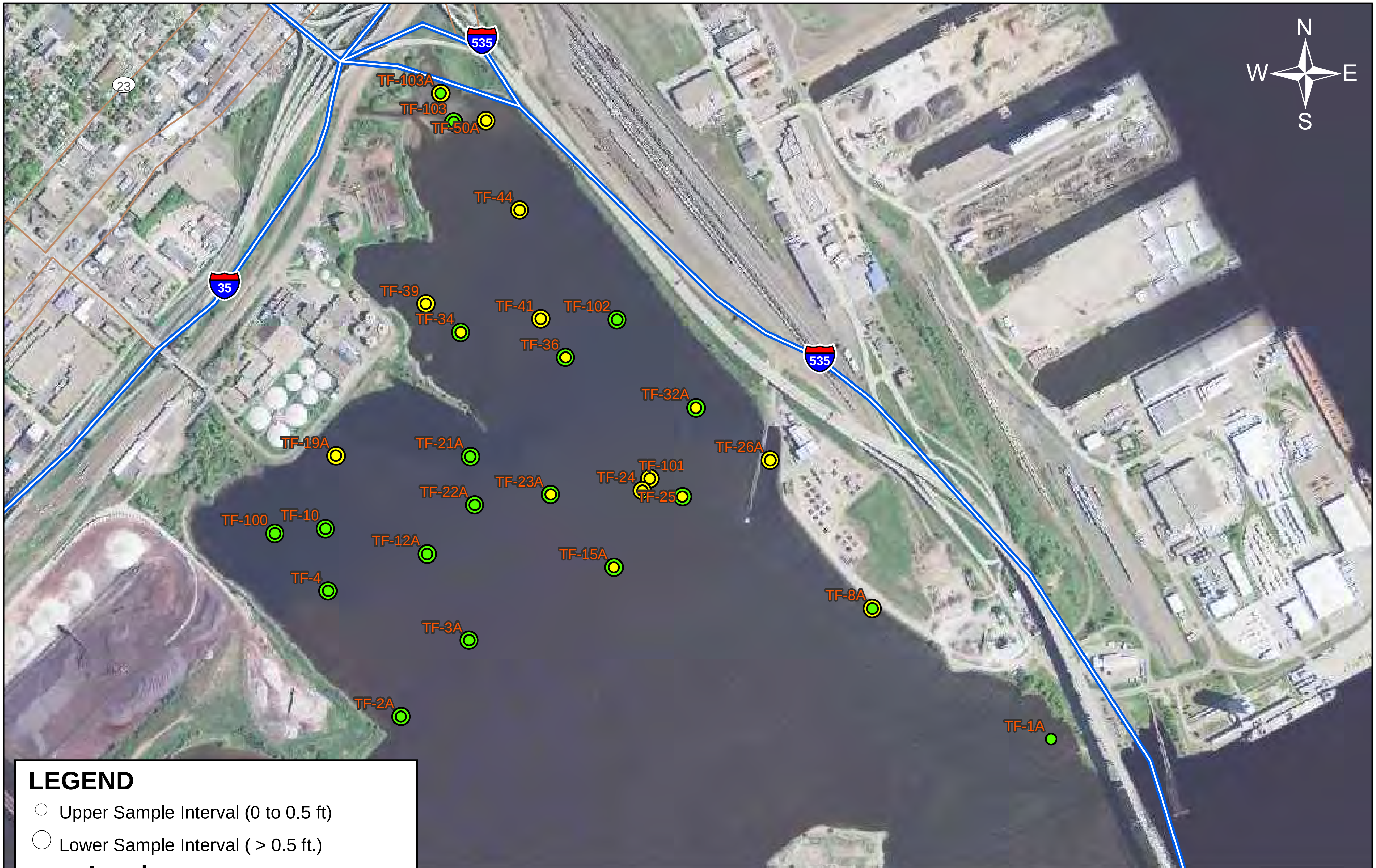


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Lead

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

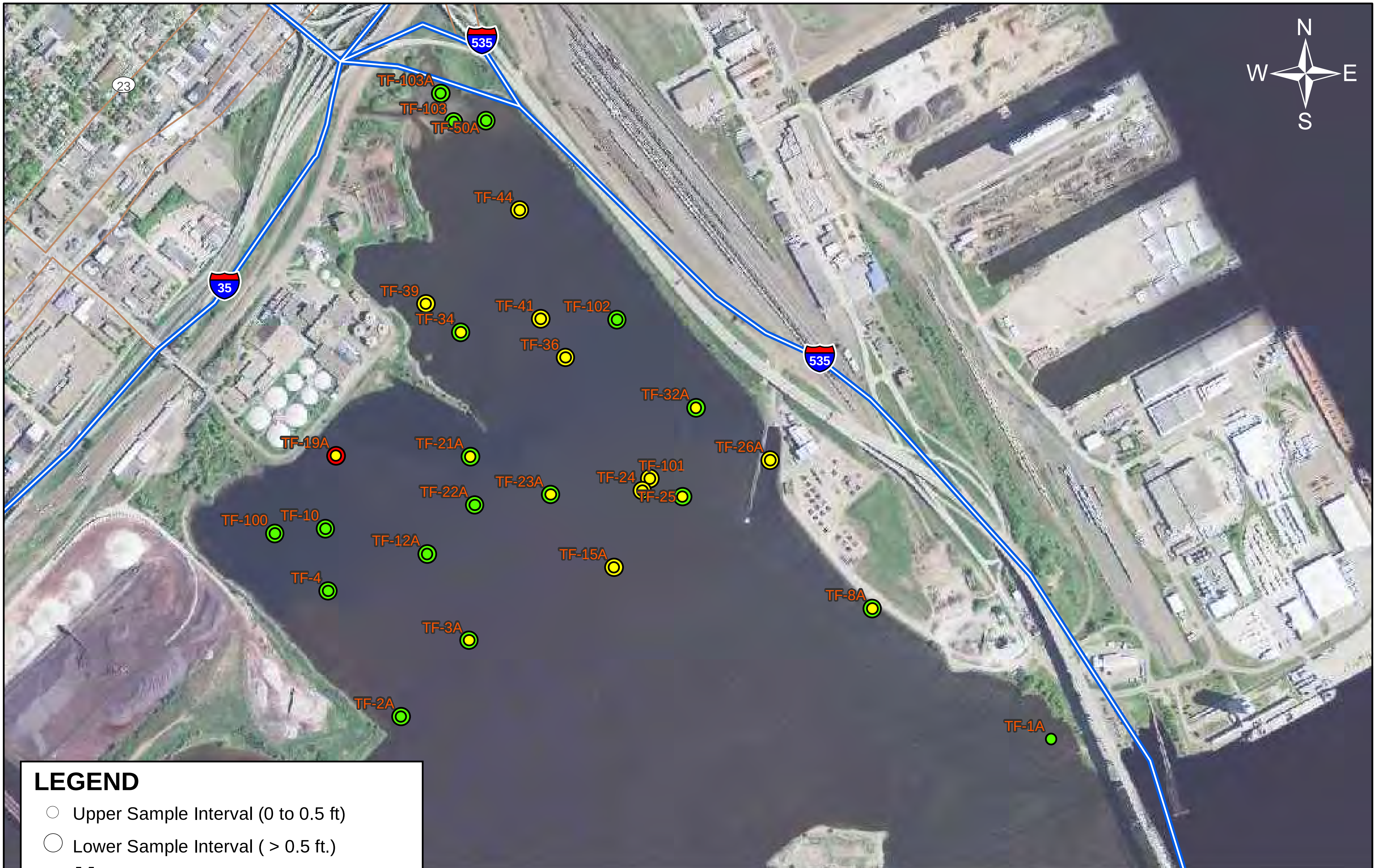
SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30e |
| SCALE: AS SHOWN | |




## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30f |
| SCALE: AS SHOWN | |

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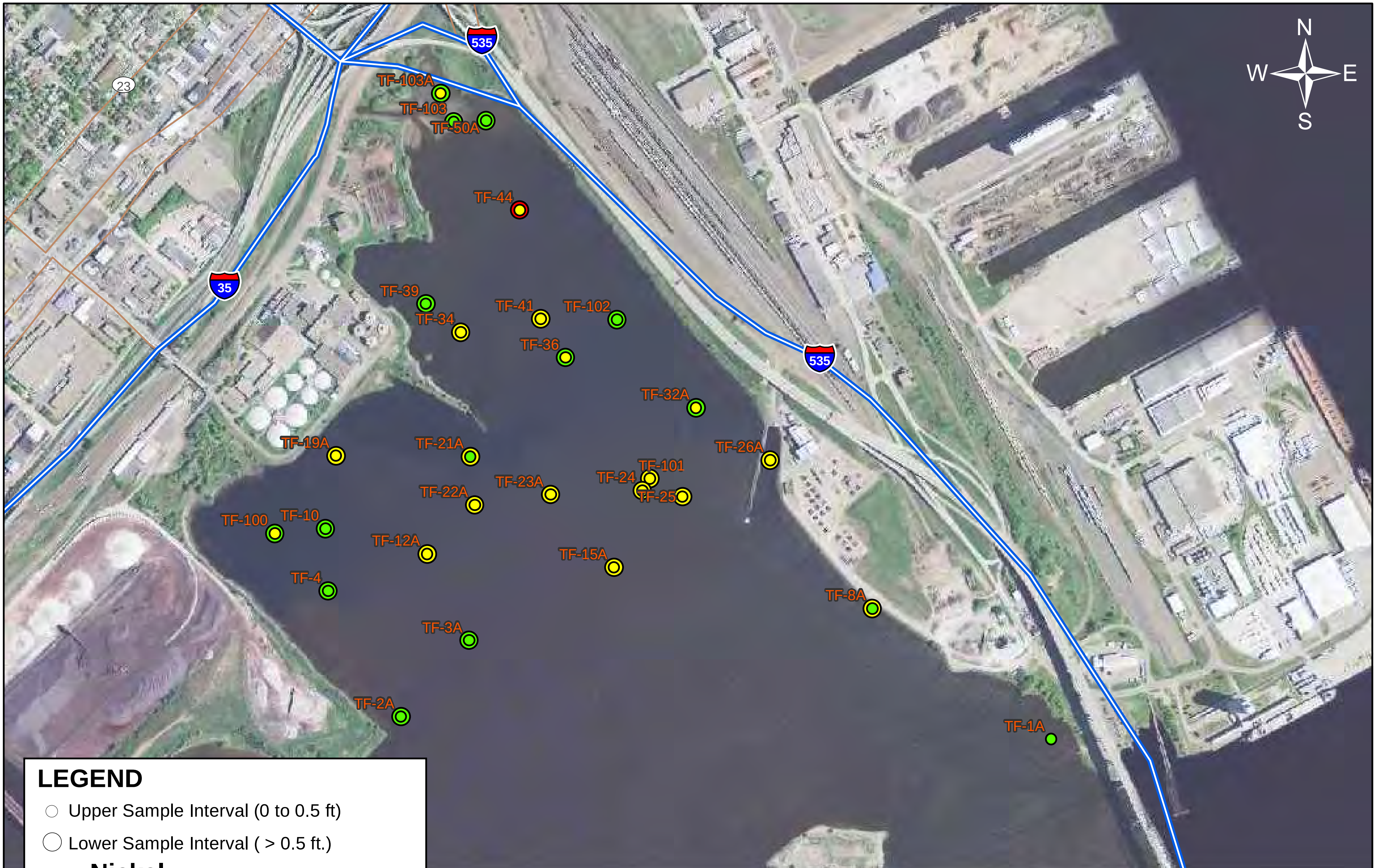


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

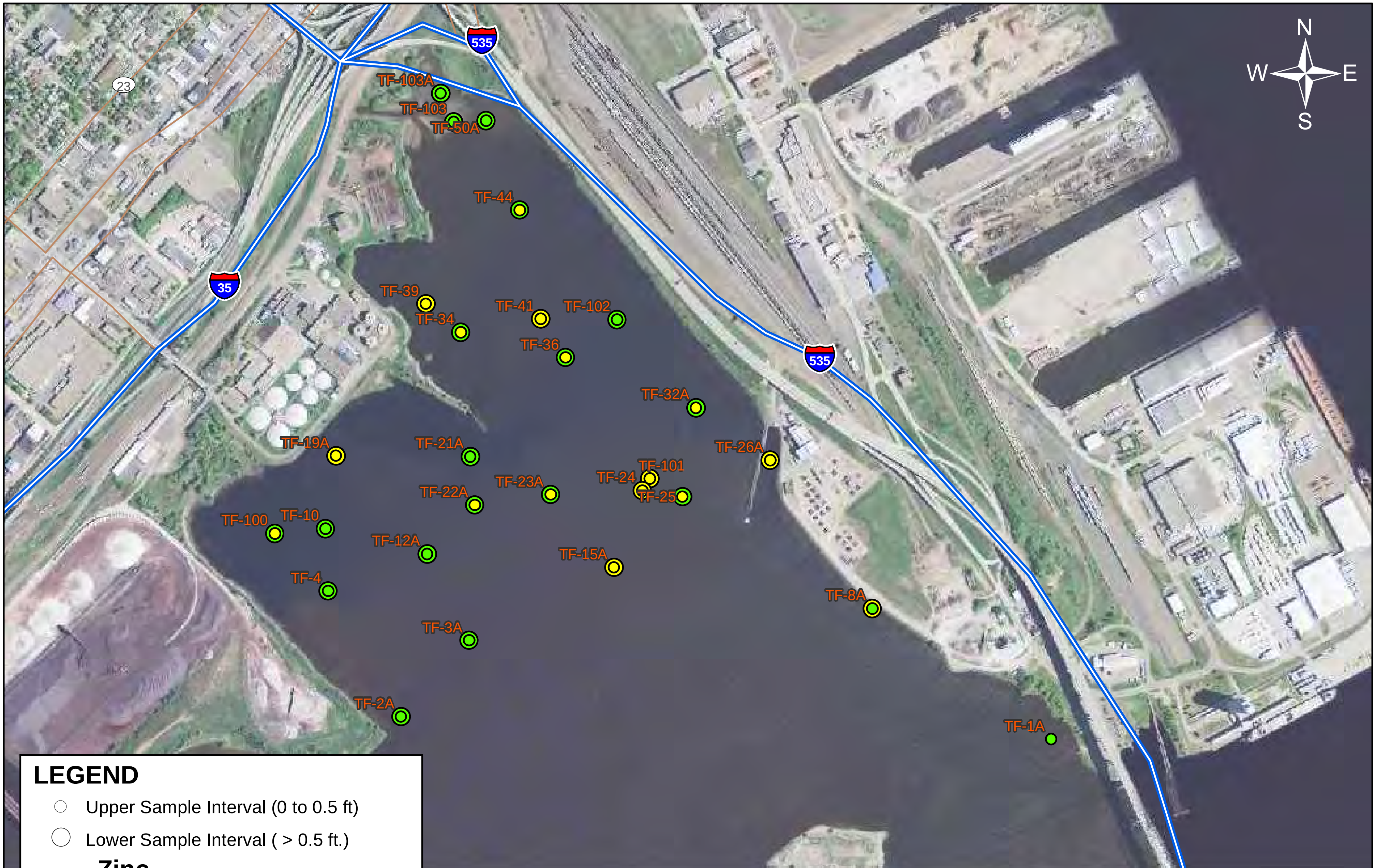
SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30g |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

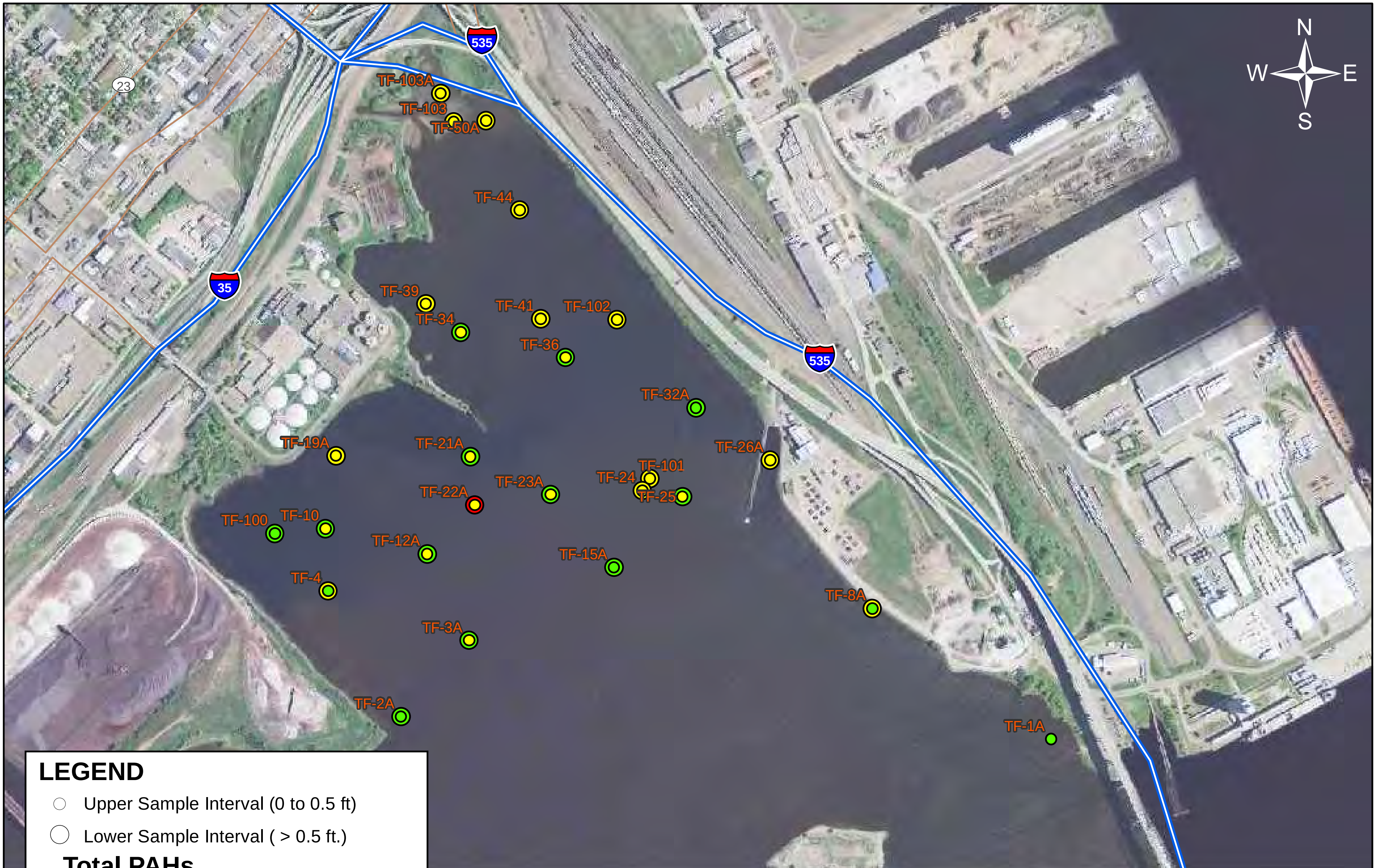
SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 600 1,200 2,400 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Zinc**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30h |
| SCALE: AS SHOWN | |




## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

0 - 1,600 µg/kg

1,600 - 23,000 µg/kg

> 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: PAHs**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30i |
| SCALE: AS SHOWN | |

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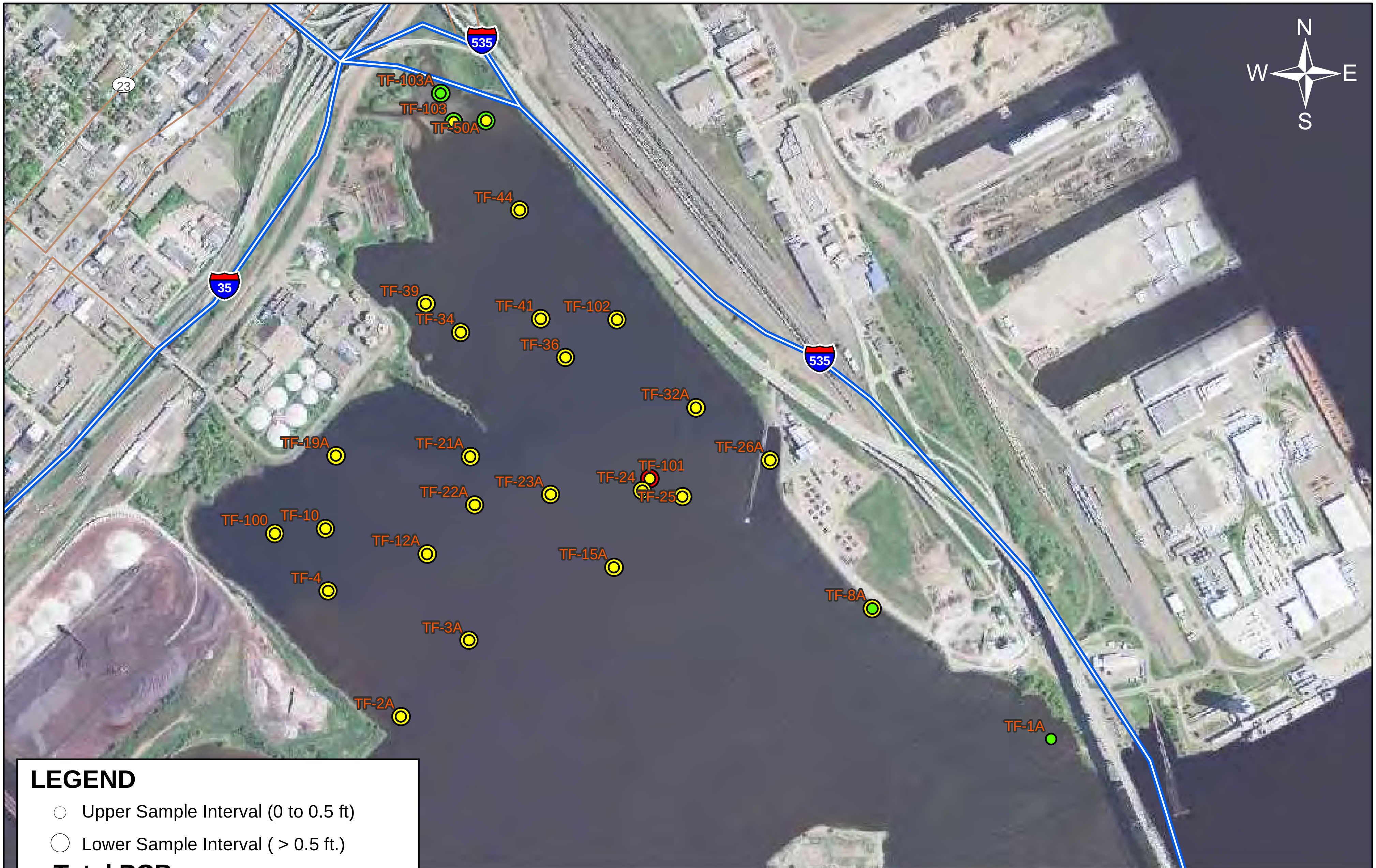


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

0 - 60 µg/kg

60 - 680 µg/kg

> 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 600 1,200 2,400 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: PCBs**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30j |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 625 1,250 2,500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Twenty First Avenue Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 1/20/12 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.30k |
| SCALE: AS SHOWN | |




## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31a |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Cadmium**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31b |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Chromium**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
| --- | --- |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31c |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
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Detroit, Michigan 48226

**SQT Comparison: Cooper**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31d |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Lead

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31e |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 125 250 500 Feet

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660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31f |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31g |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Zinc**

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31h |
| SCALE: AS SHOWN | |

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**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Total PAHs**

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 125 250 500 Feet

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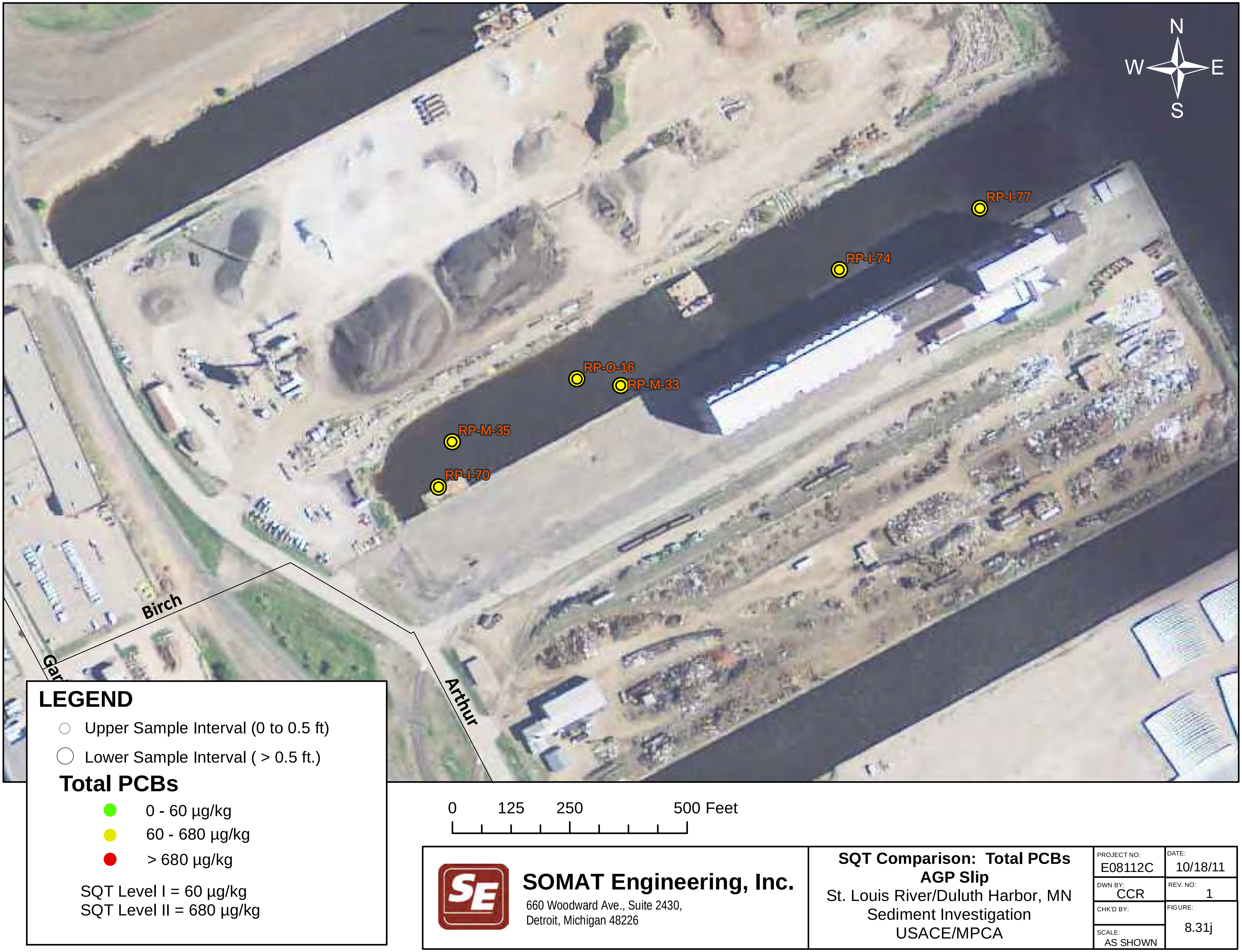
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31i |
| SCALE: AS SHOWN | |

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Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31j |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 125 250 500 Feet


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660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Dioxins**
**AGP Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.31k |
| SCALE: AS SHOWN | |


**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Arsenic**

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
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Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32a |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Cadmium**

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

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**SQT Comparison: Cadmium**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32b |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32c |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Copper**

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32d |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Lead

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**

660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32e |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 125 250 500 Feet

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660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32f |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg (green)
- 23 - 48.6 mg/kg (yellow)
- > 48.6 mg/kg (red)

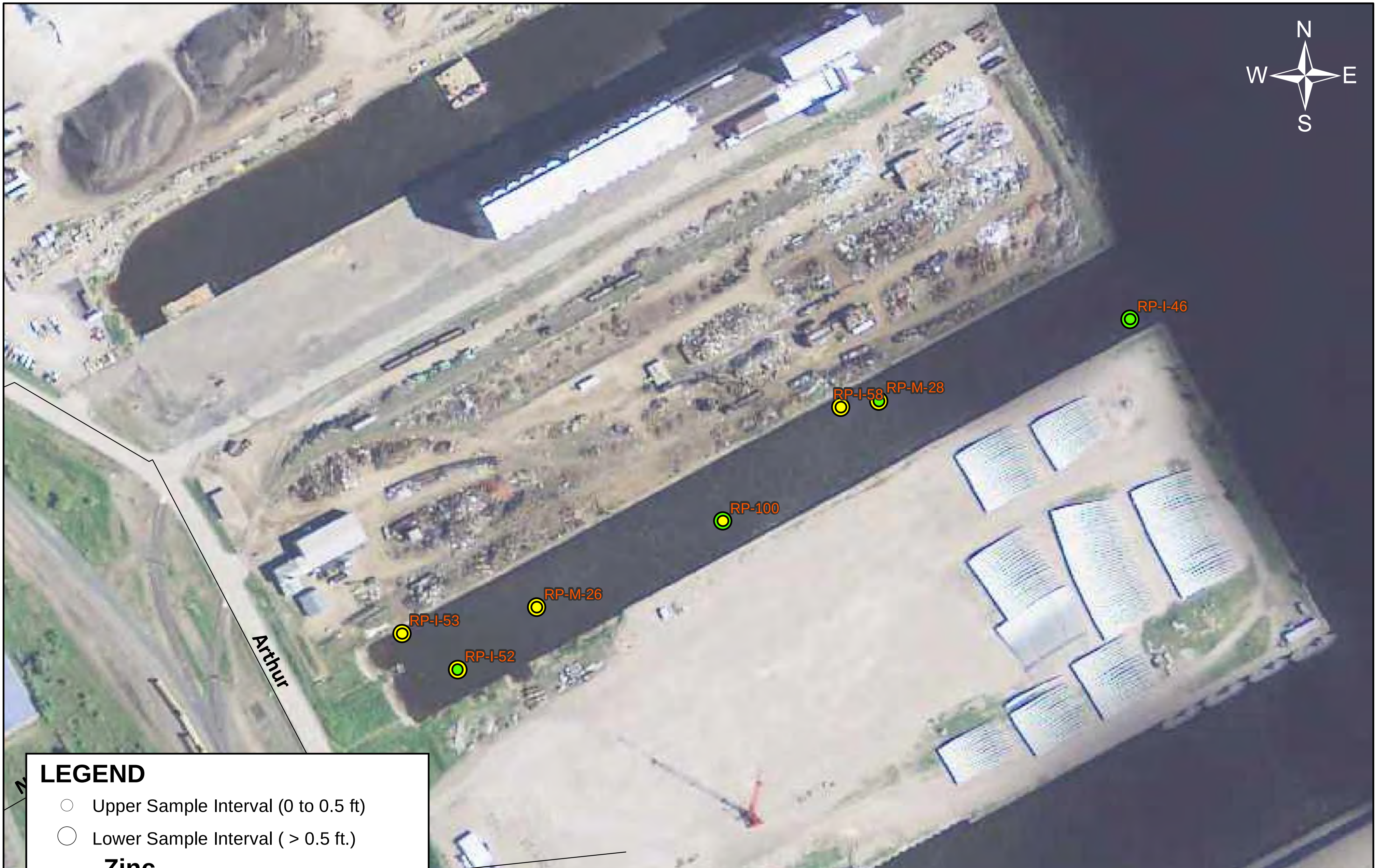
SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32g |
| SCALE: AS SHOWN | |




## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32h |
| SCALE: AS SHOWN | |

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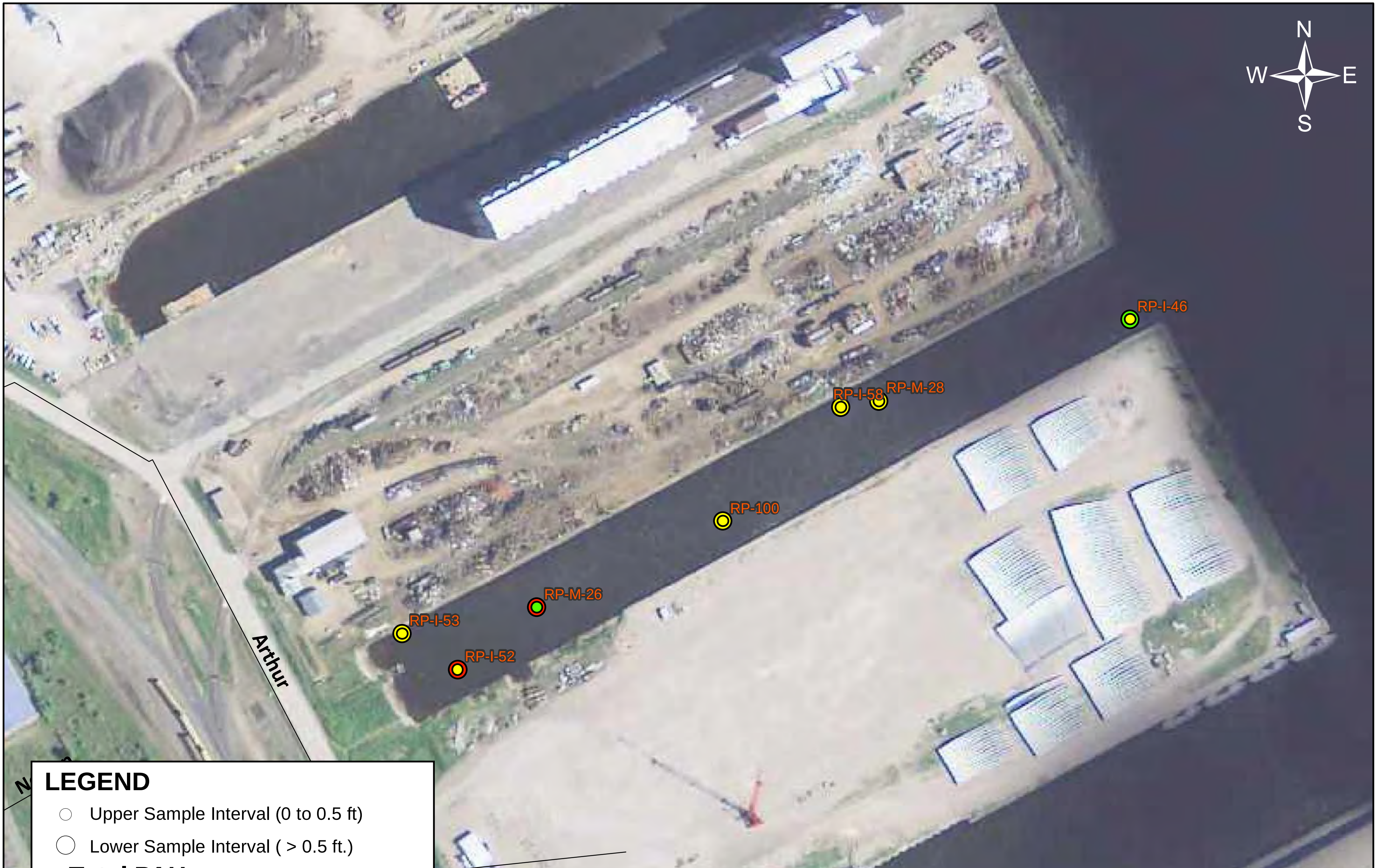


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32i |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32j |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Dioxins**
**Azcon Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.32k |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33a |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Cadmium**

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33b |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Chromium**

0 - 43 mg/kg

43 - 111 mg/kg

> 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33c |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33d |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Lead

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33e |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33f |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33g |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/10/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33h |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33i |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

## Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33j |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Boat Landing**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.33k |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Arsenic**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | | | |
|---|---|---|---|
| PROJECT NO: | E08112C | DATE: | 10/10/11 |
| DWN BY: | CCR | REV. NO: | 1 |
| CHK'D BY: | | FIGURE: | 8.35a |
| SCALE: | AS SHOWN | | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35b |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35c |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35d |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Lead**

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35e |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Mercury**

0 - 0.18 mg/kg

0.18 - 1.1 mg/kg

> 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35f |
| SCALE: AS SHOWN | |


**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Nickel**

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35g |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35h |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**

660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35i |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35j |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- >21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 130 260 520 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Cargill Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.34k |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Arsenic**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35a |
| SCALE: AS SHOWN | |


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**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Cadmium**

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35b |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Chromium

0 - 43 mg/kg

43 - 111 mg/kg

> 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35c |
| SCALE: AS SHOWN | |


**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Copper**

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35d |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Lead

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Lead**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35e |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Mercury**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35f |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35g |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Zinc

0 - 120 mg/kg

120 - 459 mg/kg

> 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35h |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35i |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 125 250 500 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35j |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 125 250 500 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Dioxins**
**Cargill Slip B**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/10/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.35k |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36a |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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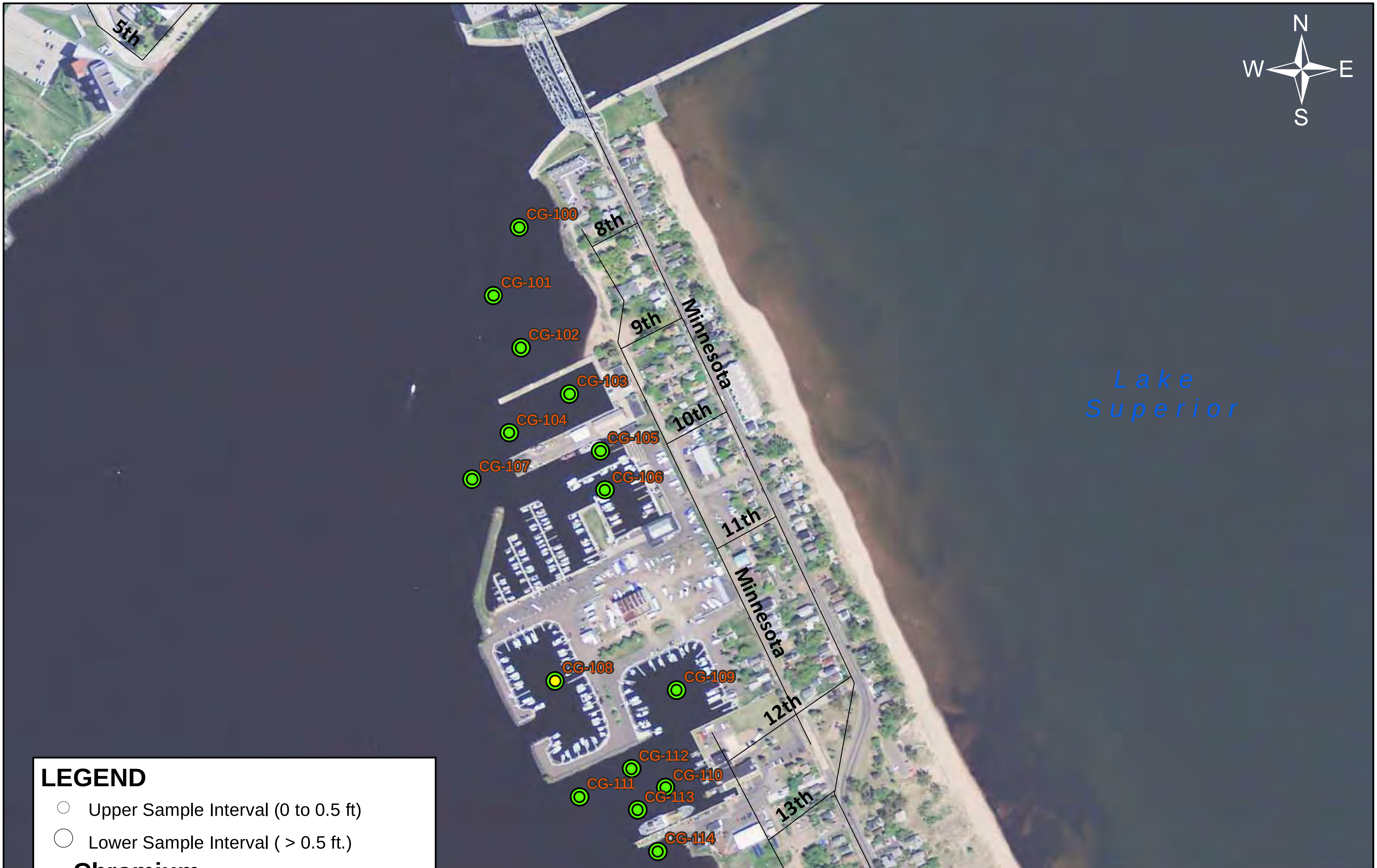
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36b |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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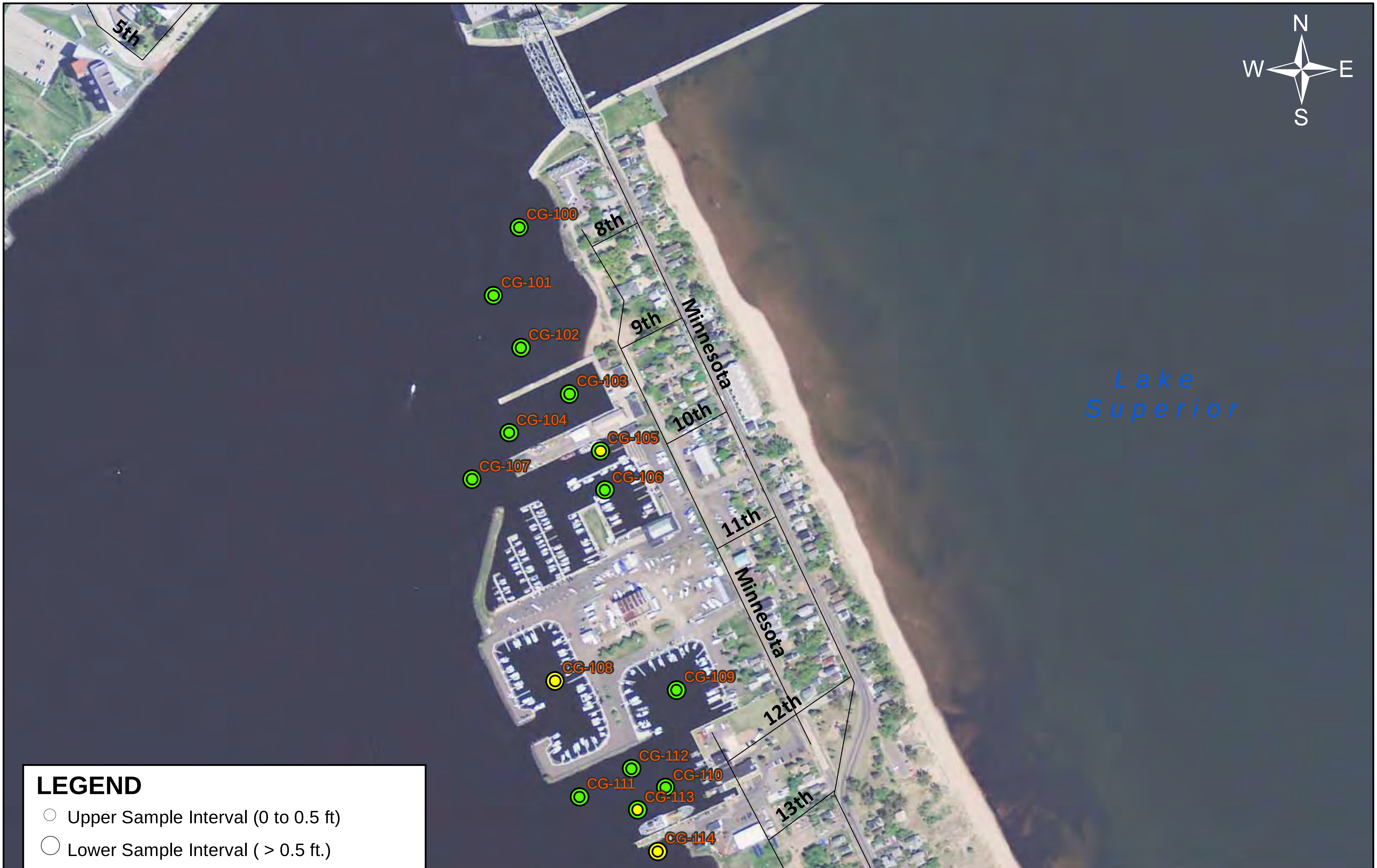
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36c |
| SCALE: AS SHOWN | |




## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36d |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Lead**

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36e |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

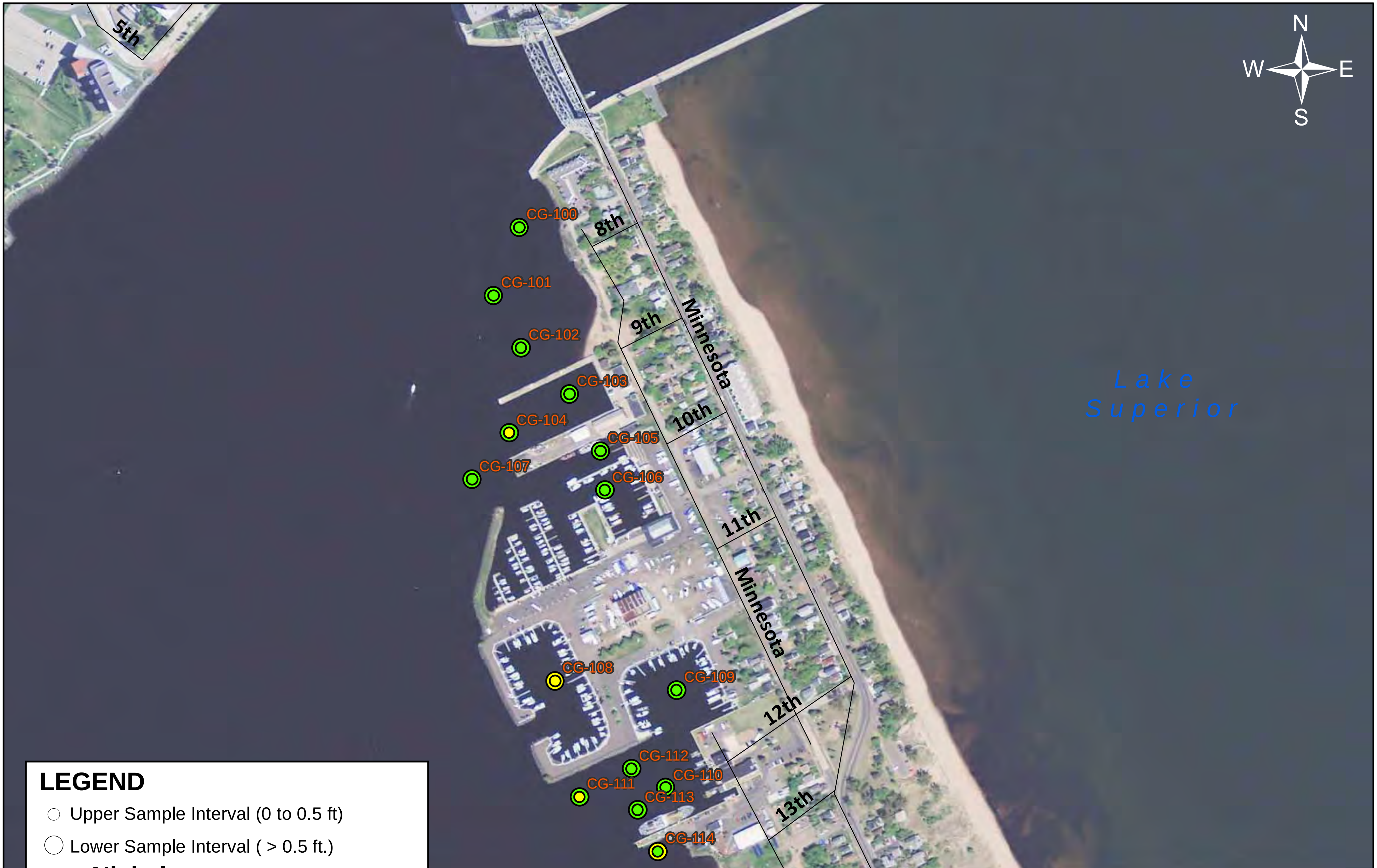
SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36f |
| SCALE: AS SHOWN | |




## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Nickel**

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36g |
| SCALE: AS SHOWN | |

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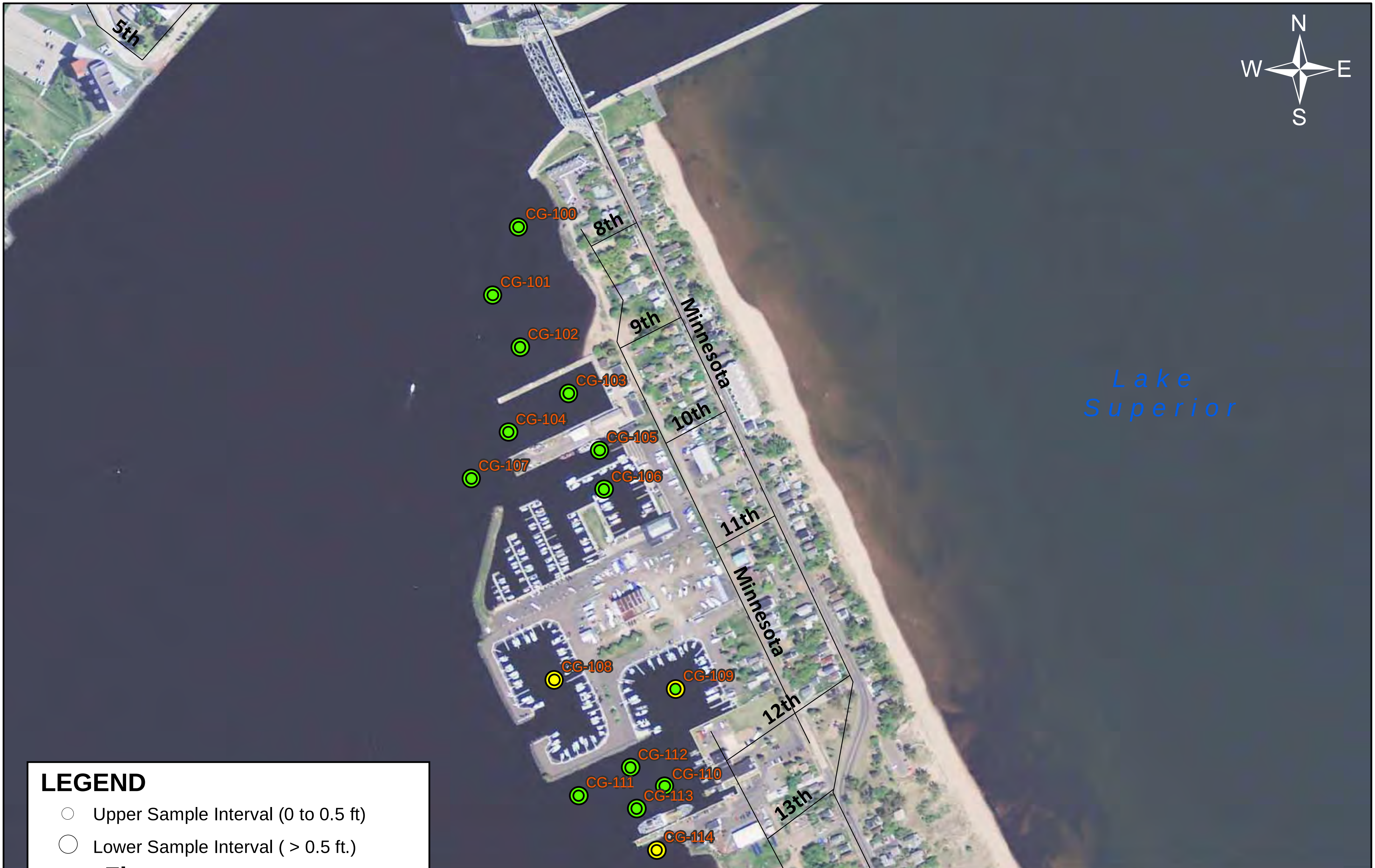


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 250 500 1,000 Feet


**SOMAT Engineering, Inc.**
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Detroit, Michigan 48226


**SQT Comparison: Zinc**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36h |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36i |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 250 500 1,000 Feet

| SOMAT Engineering, Inc. 660 Woodward Ave., Suite 2430, Detroit, Michigan 48226 | **SQT Comparison: Total PCBs** **Coast Guard** St. Louis River/Duluth Harbor, MN Sediment Investigation USACE/MPCA | PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|---|---|
| | | DWN BY: CCR | REV. NO: 1 |
| | | CHK'D BY: | FIGURE: 8.36j |
| | | SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Coast Guard**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.36k |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Arsenic**

0 - 9.8 mg/kg

9.8 - 33 mg/kg

> 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37a |
| SCALE: AS SHOWN | |


**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Cadmium**

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
| --- | --- |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37b |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37c |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Copper**

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37d |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Lead**

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Lead**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37e |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Mercury**

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37f |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 250 500 1,000 Feet

| | | | |
|---|---|---|---|
| **SOMAT Engineering, Inc.** 660 Woodward Ave., Suite 2430, Detroit, Michigan 48226 | **SQT Comparison: Nickel** **General Mills Slip** St. Louis River/Duluth Harbor, MN Sediment Investigation USACE/MPCA | PROJECT NO: E08112C | DATE: 10/18/11 |
| | | DWN BY: CCR | REV. NO: 1 |
| | | CHK'D BY: | FIGURE: 8.37g |
| | | SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 250 500 1,000 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Zinc**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37h |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37i |
| SCALE: AS SHOWN | |


**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Total PCBs**

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 235 470 940 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37j |
| SCALE: AS SHOWN | |

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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Dioxins**

0 - 0.85 ng TEQ/kg dry wt

0.85 - 21.5 ng TEQ/kg dry wt

> 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**General Mills Slip**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 01/20/2012 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.37k |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 250 500 1,000 Feet

| | | | |
|---|---|---|---|
| **SOMAT Engineering, Inc.**<br>660 Woodward Ave., Suite 2430,<br>Detroit, Michigan 48226 | **SQT Comparison: Arsenic**<br>**Hearding Island**<br>St. Louis River/Duluth Harbor, MN<br>Sediment Investigation<br>USACE/MPCA | PROJECT NO: E08112C<br>DWN BY: CCR<br>CHK'D BY:<br>SCALE: AS SHOWN | DATE: 10/18/11<br>REV. NO: 1<br>FIGURE: 8.38a |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38b |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38c |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Copper

0 - 32 mg/kg

32 - 149 mg/kg

> 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38d |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Lead**

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38e |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Mercury**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38f |
| SCALE: AS SHOWN | |


**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Nickel**

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38g |
| SCALE: AS SHOWN | |

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**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Zinc**

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
| --- | --- |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38h |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38i |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: | DATE: |
|---|---|
| E08112C | 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38j |
| SCALE: AS SHOWN | |

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**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Dioxins**

- 0 - 0.85 ng TEQ/kg dry
- 0.85 - 21.5 ng TEQ/kg dry
- > 21.5 ng TEQ/kg dry

SQT Level I = 0.85 ng TEQ/kg dry
SQT Level II = 21.5 ng TEQ/kg dry

0 195 390 780 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Hearding Island**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 1/20/12 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.38k |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Arsenic**

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 235 470 940 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39a |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Cadmium**

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39b |
| SCALE: AS SHOWN | |


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## LEGEND

- ○ Upper Sample Interval (0 to 0.5 ft)
- ○ Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 250 500 1,000 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Chromium**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39c |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Copper**

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Copper**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39d |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Lead

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39e |
| SCALE: AS SHOWN | |


**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Mercury**

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39f |
| SCALE: AS SHOWN | |


0 250 500 1,000 Feet

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39g |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39h |
| SCALE: AS SHOWN | |


**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Total PAHs**

0 - 1,600 µg/kg

1,600 - 23,000 µg/kg

> 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39i |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Total PCBs**

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39j |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Murphy Oil**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
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| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.39k |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Arsenic**

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40a |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Cadmium

0 - 0.99 mg/kg

0.99 - 4.98 mg/kg

> 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

SOMAT Engineering, Inc.
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40b |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Chromium**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40c |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

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**SQT Comparison: Copper**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40d |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Lead**

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40e |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Mercury**

0 - 0.18 mg/kg

0.18 - 1.1 mg/kg

> 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40f |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Nickel**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40g |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40h |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

- 0 - 1,600 µg/kg
- 1,600 - 23,000 µg/kg
- > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 250 500 1,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40i |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 250 500 1,000 Feet

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660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40j |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 250 500 1,000 Feet

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**SQT Comparison: Dioxins**
**Slip 2**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.40k |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Arsenic

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41a |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41b |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 250 500 1,000 Feet


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**SQT Comparison: Chromium**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
| --- | --- |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41c |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 250 500 1,000 Feet

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**SQT Comparison: Copper**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41d |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Lead

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 250 500 1,000 Feet

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**SQT Comparison: Lead**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41e |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 250 500 1,000 Feet

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Detroit, Michigan 48226

**SQT Comparison: Mercury**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41f |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Nickel**

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 250 500 1,000 Feet

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**SQT Comparison: Nickel**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41g |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Zinc

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 250 500 1,000 Feet

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**SQT Comparison: Zinc**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41h |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PAHs

0 - 1,600 µg/kg

1,600 - 23,000 µg/kg

> 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 250 500 1,000 Feet

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**SQT Comparison: Total PAHs**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41i |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 250 500 1,000 Feet


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**SQT Comparison: Total PCBs**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41j |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Dioxins

0 - 0.85 ng TEQ/kg dry wt

0.85 - 21.5 ng TEQ/kg dry wt

> 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 250 500 1,000 Feet

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**SQT Comparison: Dioxins**
**Slip 3**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.41k |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Arsenic**

- 0 - 9.8 mg/kg
- 9.8 - 33 mg/kg
- > 33 mg/kg

SQT Level I = 9.8 mg/kg
SQT Level II = 33 mg/kg

0 200 400 800 Feet

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Detroit, Michigan 48226

**SQT Comparison: Arsenic**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42a |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Cadmium

0 - 0.99 mg/kg

0.99 - 4.98 mg/kg

> 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 200 400 800 Feet

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**SQT Comparison: Cadmium**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42b |
| SCALE: AS SHOWN | |

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**LEGEND**

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Chromium**

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

0 200 400 800 Feet

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**SQT Comparison: Chromium**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42c |
| SCALE: AS SHOWN | |

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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Copper**

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 200 400 800 Feet

**SOMAT Engineering, Inc.**

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**SQT Comparison: Copper**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42d |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Lead**

0 - 36 mg/kg

36 - 128 mg/kg

> 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 200 400 800 Feet

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**SQT Comparison: Lead**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42e |
| SCALE: AS SHOWN | |


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**LEGEND**

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Mercury**

0 - 0.18 mg/kg

0.18 - 1.1 mg/kg

> 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 200 400 800 Feet

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**SQT Comparison: Mercury**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42f |
| SCALE: AS SHOWN | |


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## LEGEND

Upper Sample Interval (0 to 0.5 ft)
Lower Sample Interval ( > 0.5 ft.)

**Nickel**

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg

0 200 400 800 Feet

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**SQT Comparison: Nickel**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42g |
| SCALE: AS SHOWN | |


## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Zinc**

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 200 400 800 Feet

**SOMAT Engineering, Inc.**
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**SQT Comparison: Zinc**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
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| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42h |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

**Total PAHs**

0 - 1,600 µg/kg

1,600 - 23,000 µg/kg

> 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 200 400 800 Feet

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**SQT Comparison: Total PAHs**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42i |
| SCALE: AS SHOWN | |


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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 200 400 800 Feet

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**SQT Comparison: Total PCBs**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42j |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry
- 0.85 - 21.5 ng TEQ/kg dry
- > 21.5 ng TEQ/kg dry

SQT Level I = 0.85 ng TEQ/kg dry
SQT Level II = 21.5 ng TEQ/kg dry

0 200 400 800 Feet

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**SQT Comparison: Dioxins**
**Slip C**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.42k |
| SCALE: AS SHOWN | |

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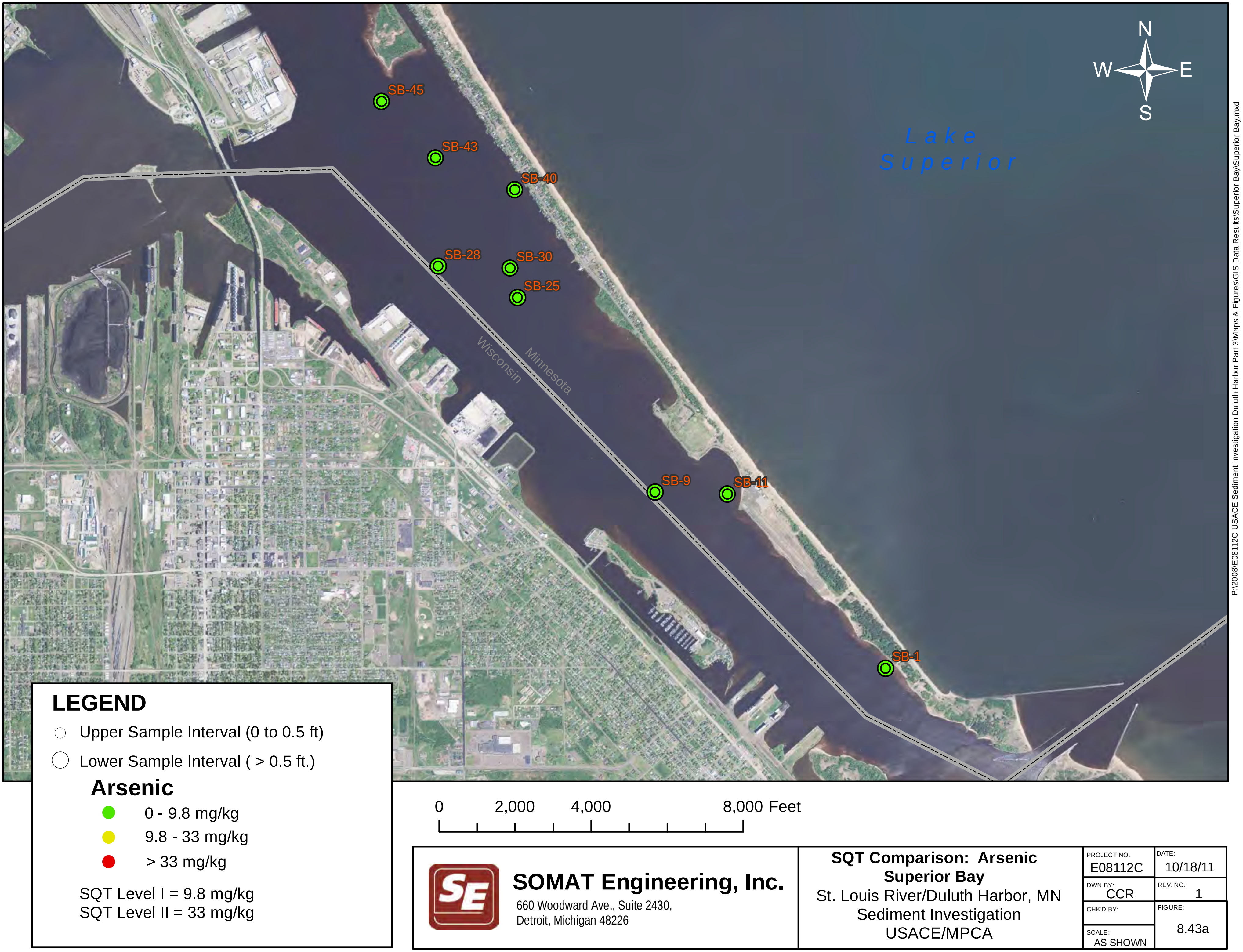


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**SQT Comparison: Arsenic**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43a |
| SCALE: AS SHOWN | |


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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Cadmium

- 0 - 0.99 mg/kg
- 0.99 - 4.98 mg/kg
- > 4.98 mg/kg

SQT Level I = 0.99 mg/kg
SQT Level II = 4.98 mg/kg

0 2,000 4,000 8,000 Feet

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Detroit, Michigan 48226

**SQT Comparison: Cadmium**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43b |
| SCALE: AS SHOWN | |


## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Chromium

- 0 - 43 mg/kg
- 43 - 111 mg/kg
- > 111 mg/kg

SQT Level I = 43 mg/kg
SQT Level II = 111 mg/kg

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**SQT Comparison: Chromium**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43c |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Copper

- 0 - 32 mg/kg
- 32 - 149 mg/kg
- > 149 mg/kg

SQT Level I = 32 mg/kg
SQT Level II = 149 mg/kg

0 2,000 4,000 8,000 Feet


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**SQT Comparison: Copper**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | | |
|---|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43d |
| SCALE: AS SHOWN | |


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**LEGEND**

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

**Lead**

- 0 - 36 mg/kg
- 36 - 128 mg/kg
- > 128 mg/kg

SQT Level I = 36 mg/kg
SQT Level II = 128 mg/kg

0 2,000 4,000 8,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Lead**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43e |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

### Mercury

- 0 - 0.18 mg/kg
- 0.18 - 1.1 mg/kg
- > 1.1 mg/kg

SQT Level I = 0.18 mg/kg
SQT Level II = 1.1 mg/kg

0 2,000 4,000 8,000 Feet


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Mercury**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
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| PROJECT NO: E08112C | DATE: 10/18/11 |
|---|---|
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43f |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Nickel

- 0 - 23 mg/kg
- 23 - 48.6 mg/kg
- > 48.6 mg/kg

SQT Level I = 23 mg/kg
SQT Level II = 48.6 mg/kg


**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226


**SQT Comparison: Nickel**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43g |
| SCALE: AS SHOWN | |

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## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Zinc**

- 0 - 120 mg/kg
- 120 - 459 mg/kg
- > 459 mg/kg

SQT Level I = 120 mg/kg
SQT Level II = 459 mg/kg

0 2,000 4,000 8,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Zinc**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

| | |
|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43h |
| SCALE: AS SHOWN | |


## LEGEND

○ Upper Sample Interval (0 to 0.5 ft)

○ Lower Sample Interval ( > 0.5 ft.)

**Total PAHs**

- (green) 0 - 1,600 µg/kg
- (yellow) 1,600 - 23,000 µg/kg
- (red) > 23,000 µg/kg

SQT Level I = 1,600 µg/kg
SQT Level II = 23,000 µg/kg

0 2,000 4,000 8,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PAHs**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43i |
| SCALE: AS SHOWN | |

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## LEGEND

Upper Sample Interval (0 to 0.5 ft)

Lower Sample Interval ( > 0.5 ft.)

### Total PCBs

- 0 - 60 µg/kg
- 60 - 680 µg/kg
- > 680 µg/kg

SQT Level I = 60 µg/kg
SQT Level II = 680 µg/kg

0 2,000 4,000 8,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Total PCBs**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 10/18/11 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43j |
| SCALE: AS SHOWN | |

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## LEGEND

- Upper Sample Interval (0 to 0.5 ft)
- Lower Sample Interval ( > 0.5 ft.)

### Dioxins

- 0 - 0.85 ng TEQ/kg dry wt
- 0.85 - 21.5 ng TEQ/kg dry wt
- > 21.5 ng TEQ/kg dry wt

SQT Level I = 0.85 ng TEQ/kg dry wt
SQT Level II = 21.5 ng TEQ/kg dry wt

0 2,000 4,000 8,000 Feet

**SOMAT Engineering, Inc.**
660 Woodward Ave., Suite 2430,
Detroit, Michigan 48226

**SQT Comparison: Dioxins**
**Superior Bay**
St. Louis River/Duluth Harbor, MN
Sediment Investigation
USACE/MPCA

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|---|---|
| PROJECT NO: E08112C | DATE: 1/20/12 |
| DWN BY: CCR | REV. NO: 1 |
| CHK'D BY: | FIGURE: 8.43k |
| SCALE: AS SHOWN | |

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# APPENDIX A

# LIF UVOST LOGS
# AND
# STUDY AREA LOCATION MAPS

# APPENDIX B

# SEDIMENT CORE PHOTOGRAPHSS

# APPENDIX C

# SEDIMENT CORE LOGS

# APPENDIX D

# LABORATORY ANALYTICAL REPORTS
# AND
# CHAIN OF CUSTODY FORMS

# APPENDIX E

# CHEMICAL DATA VALIDATION MEMORANDA

# APPENDIX F

# SEDIMENT ANALYTICAL DATABASE

# APPENDIX G

# QUALITY ASSURANCE PROJECT PLAN (QAPP)

# APPENDIX H

# HEALTH AND SAFETY PLAN (HASP)