

TECHNICAL MEMORANDUM

TO: Jing Liu, Washington State Department of Ecology
FROM: Jeremy Davis, P.E., C.H.M.M., and Larry Beard, P.E., L.G.
DATE: July 19, 2013

**RE: REMEDIAL INVESTIGATION PRELIMINARY GROUNDWATER CHARACTERIZATION
RESULTS AND ADDITIONAL MONITORING WELL
BLAINE MARINA INC. SITE
BLAINE, WASHINGTON**

INTRODUCTION

This technical memorandum presents a summary of the groundwater analytical results for the first round of sampling of the recently installed groundwater monitoring wells at the Blaine Marina Inc. Site (Site) in Blaine, Washington. Also included are the identification and proposed actions related to data gaps determined based on the groundwater monitoring results.

The locations of groundwater monitoring wells are shown on Figure 1. These wells will be sampled twice for the remedial investigation (RI), as specified in the RI work plan (Landau Associates 2012). Monitoring wells MW-4 through MW-10, and RW-1 were installed by the Port of Bellingham (Port) in April 2013. Monitoring wells MW-1 through MW-3 were installed during previous investigations.

GROUNDWATER MONITORING RESULTS

The first round of RI groundwater monitoring was conducted in April 2013. During groundwater monitoring, non-aqueous phase liquid (NAPL) was present in monitoring wells MW-1, MW-2, and MW-3, and pilot NAPL recovery well RW-1. These wells are all located near the aboveground storage tanks (ASTs), the apparent source area for Site petroleum hydrocarbon contamination. As a result, groundwater samples were not collected from these wells, and the groundwater is assumed to contain constituents of potential concern (COPCs) at concentrations in excess of the Site screening levels (SLs).

Groundwater samples were collected from the seven other groundwater monitoring wells installed outside of the immediate vicinity of the ASTs that did not exhibit indications of NAPL presence. Of these wells, only the groundwater sample collected from MW-7 exhibited concentrations of COPCs above the SLs. Concentrations of gasoline-range petroleum hydrocarbons, total naphthalenes, and benzene were above the SLs in the groundwater sample collected from MW-7, as summarized in Table 1.

Figure 1 also provides approximate groundwater elevation contours. As indicated on the figure, there appears to be a slight groundwater mound in the area of the ASTs that is covered with a gravel

surface. This area likely receives more stormwater infiltration than paved areas of the Site. The additional stormwater infiltration, in conjunction with a significant subsurface clay layer present in this area, likely causes the observed groundwater mounding.

DATA GAPS

Based on the detected concentrations of COPCs above SLs at MW-7, the extent of groundwater contamination in the southwest corner of the Site is not fully bounded and represents a data gap related to the extent of groundwater contamination. The Port proposes to install one additional groundwater monitoring well (MW-11) south of MW-7 to fill this data gap at the location shown on Figure 1. The groundwater grab sample collected from the proposed location for MW-11 (BMI-GP-12) did not contain concentrations of COPCs above SLs. As a result, it is anticipated that the second round of groundwater sampling (including the installation and sampling of MW-11) will complete the RI activities.

Monitoring well MW-11 would be installed and sampled using the procedures presented in the RI Work Plan and associated Upland Sampling and Analysis Plan (Landau Associates 2012). As a result, a work plan addendum is not planned prior to the construction and monitoring of the new RI well. The additional monitoring well would be installed prior to the second round of groundwater monitoring, and would be sampled in conjunction with the other groundwater monitoring wells.

CLOSING

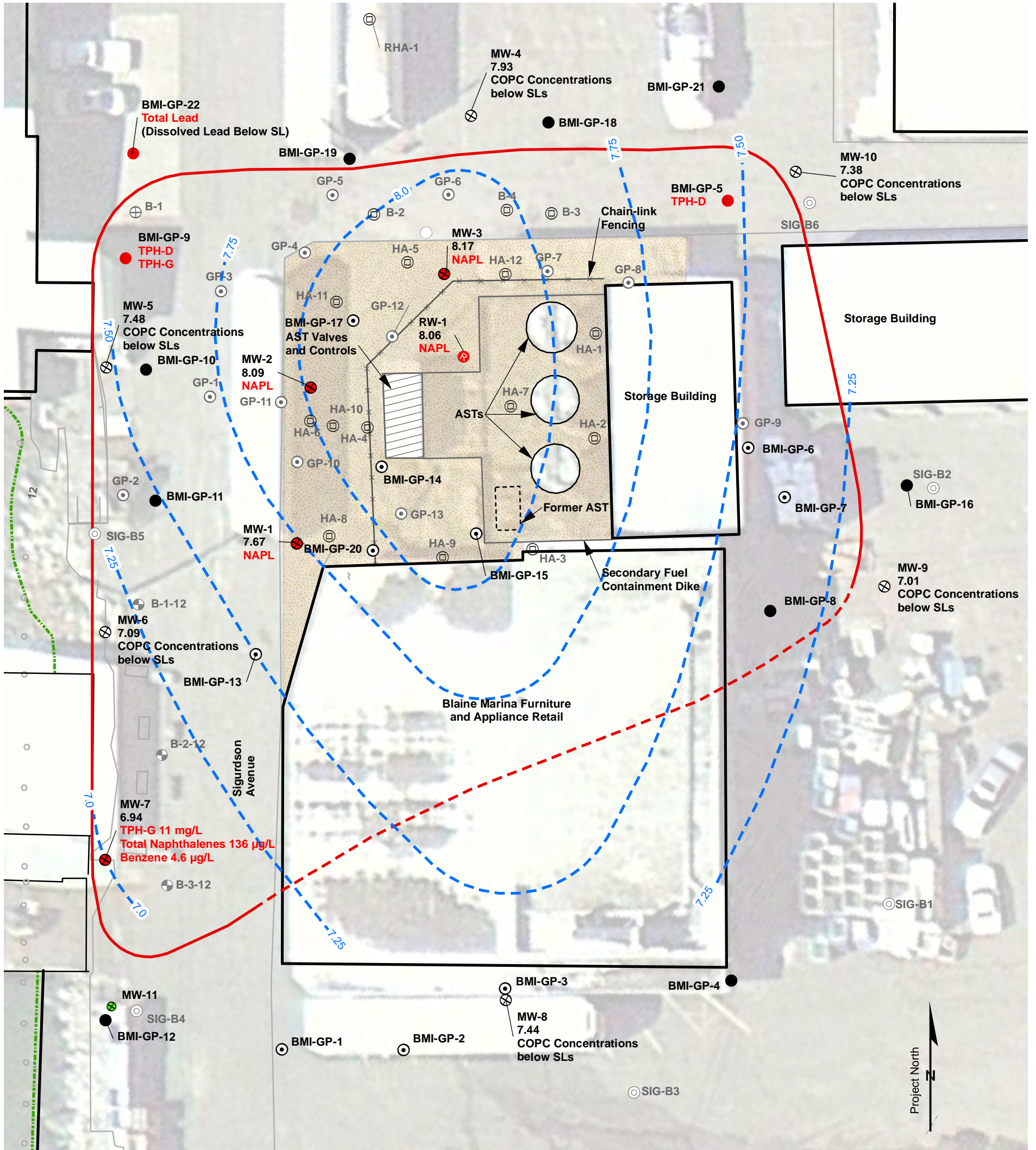
We request that Ecology concur with the proposed scope for additional RI groundwater monitoring. Following Ecology concurrence, installation of MW-11 and the second round of RI groundwater monitoring will be scheduled. Please contact us with any comments or questions.

REFERENCE

Landau Associates. 2012. *Remedial Investigation Work Plan, Blaine Marina Inc. Site, Blaine, Washington*. Prepared for Port of Bellingham. October 4.

ATTACHMENTS

Figure 1: Preliminary Remedial Investigation Groundwater Results
Table 1: Groundwater Analytical Results



Legend

- 2012 Remedial Investigation**
- ⊕ Proposed Monitoring Well Location
 - Groundwater Grab Sample Location
 - 7.93 Groundwater Elevation - April 24, 2013 (Low Tide)
 - ⊙ Soil Sample Location (Groundwater not Sampled)
 - ⊕ Geotechnical Boring Location (Soil Sampling, Landau Associates 2012c)
 - ⊙ Pilot NAPL Recovery Well

- Historical Investigations**
- ⊕ Boring Location
 - ⊙ Groundwater Monitoring Well Location
 - ⊕ Hand Auger Location (Soil Sampling, SEACOR 1990)
 - ⊙ Geoprobe Location (Groundwater Sampling and Sheen Testing, RETEC 1996)
 - ⊙ Geoprobe Location (Soil Sampling, Farallon Consulting 2008)

- Approximate Groundwater Elevation Contour (ft. MLLW)
- Approximate Site Boundary
- MHHW - 9.5 ft
- Gravel Area

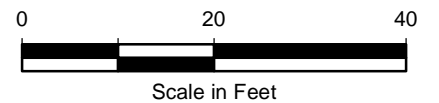
Abbreviations

- TPH-Dx = Diesel
- TPH-G = Gasoline
- NAPL = Non-Aqueous Phase Liquid
- MHHW = Mean Higher High Water
- MLLW = Mean Lower Low Water
- SL = Screening Level
- mg/L = Milligrams per Liter
- µg/L = Micrograms per Liter
- COPC = Constituent of Potential Concern

Note

1. Explorations shown in red indicate concentrations exceed the SL.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Wilson Engineering 2011, Port of Bellingham 2011, Walker and Associates, Inc.



**TABLE 1
GROUNDWATER ANALYTICAL RESULTS
BLAINE MARINA, INC. SITE
BLAINE, WASHINGTON**

Screening Levels (d)	Groundwater Grab Sampling Results (Collected from Direct-Push Borings)														Groundwater Monitoring Results (Collected from Groundwater Monitoring Wells)									
	BMI-GP-4	BMI-GP-5	BMI-GP-8	BMI-GP-9	BMI-GP-10	BMI-GP-11	BMI-GP-12	BMI-GP-16	BMI-GP-18	BMI-GP-19	Dup of BMI-GP-19	BMI-GP-DUP	BMI-GP-21	BMI-GP-22	MW-4	MW-5	MW-6	Dup of MW-6	MW-7	MW-8	MW-9	MW-10		
	VQ82E	VQ82A	VQ82I	VQ82G	VQ82N	VQ82H	VQ82F	VQ82J	VQ82C	VQ82D	VQ82L	VQ82B	VQ82K	WN48G	WN48A	WN48B	WN48H	WN48C	WN48D	WN48E	WN48F			
	10/30/2012	10/29/2012	11/01/2012	10/31/2012	10/30/2012	10/31/2012	10/30/2012	11/01/2012	10/29/2012	10/29/2012	10/29/2012	10/29/2012	11/01/2012	04/24/2013	04/24/2013	04/24/2013	04/24/2013	04/24/2013	04/24/2013	04/24/2013	04/24/2013	04/24/2013		
TOTAL PETROLEUM HYDROCARBONS (mg/L)																								
NWTPH-Dx																								
Diesel Range Organics	0.5	0.10 U	5.3	0.10 U	34	NA	0.12	0.10 U	0.23	0.10 U	0.10 U	0.10 U	0.18	0.10 U	0.10 U	0.10 U	0.10 U	0.27	0.10 U	0.42	0.10 U			
Lube Oil	---	0.20 U	1.0 U	0.20 U	0.43	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U			
NWTPH-Gx																								
Gasoline Range Organics	0.8/1.0 (b)	0.25 U	0.30	0.25 U	1.2	0.25 U	0.30	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.41	0.36	11	0.25 U	0.65	0.25 U		
VOLATILES (µg/L)																								
Method SW8260C																								
1,2-Dichloroethane	4.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U		
Benzene	2.4	0.20 U	0.20 U	1.8	0.20 U	0.20 U	0.21	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.46	0.44	4.6	0.20 U	0.20 U	0.20 U		
Toluene	15,000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	1.1	1.0	13	0.20 U	0.20 U	0.20 U		
Ethylbenzene	2,100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	3.5	3.2	360	0.20 U	0.20 U	0.20 U		
m, p-Xylene	1,000 (c)	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.83	0.80	770	0.40 U	0.40 U	0.40 U		
o-Xylene	440	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.35	0.33	59	0.20 U	0.20 U	0.20 U		
Ethylene Dibromide	2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U		
Methyl tert-Butyl Ether	610	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.7	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		
METALS (µg/L)																								
Method EPA 200.8/6020																								
Lead, Dissolved	8.1	0.1 U	0.1 U	0.1 U	1 U	NA	1 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.5	0.1 U	0.1 U	0.1 U		
Lead, Total	8.1	1.5	0.5	0.1 U	2	NA	1 U	2	0.3	2.1 J	6.0	6.7	0.9	19	0.1	0.5 U	0.9	0.8	0.8	0.1 U	0.1	0.1 U		
SEMIVOLATILES (µg/L)																								
Method SW8270D																								
1-Methylnaphthalene	---	1.0 U	14	2.6	1.0 U	NA	1.0 U	1.0 U	1.4	1.0 U	1.2	1.5	2.2	1.0 U	1.0 U	1.0 U	2.9	2.9	50	1.0 U	37	1.0 U		
2-Methylnaphthalene	---	1.0 U	3.8	1.0 U	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10	1.0 U	25	1.0 U		
Naphthalene	---	1.0 U	5.0	1.0 U	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.2	1.0	76	1.0 U	1.0 U	1.0 U		
Total Naphthalenes	83	ND	22.8	2.6	ND	NA	ND	ND	1.4	ND	1.2	1.5	2.2	ND	ND	ND	4.1	3.9	136	ND	62	ND		
CONVENTIONALS (mg/L)																								
Nitrate (EPA 300.0)	---														0.1 U		0.1 U	0.1 U		0.1 U	0.1 U			
Sulfate (EPA 300.0)	---														94.7		407	407		47.1	137			

Notes:
 (a) Monitoring Wells MW-1, MW-2, MW-3, and RW-1 contained NAPL and as a result were not sampled.
 (b) For gasoline, the groundwater screening level is 0.8 when benzene is present, and 1.0 when benzene is not present.
 (c) Value is for total xylenes.
 (d) Preliminary Screening Levels developed in the Remedial Investigation Work Plan dated October 2012
 NA = Not analyzed.
 ND = Not detected.
 U = Indicates the compound was not detected at the reported concentration.
 UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
 J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
 Bold = Detected compound.
 Box = Exceedance of preliminary screening level.