Astron Energy Fuels Industry Environment & Contaminated Land Committee (ECLC) Q1 2025 Meeting: Successes with remediation technologies

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Astron Energy Site A

Background

- The site was constructed over 30 years ago and has operated as a retail service station since construction;

Leaking pipe replaced in January 2011.

- Baseline environmental assessment (installation of 3 groundwater monitoring wells (MW1 to MW3)) as part of a COT.
- Follow up assessment was conducted in November 2013 (installation of two groundwater monitoring wells (MW4 and MW5);

Leaking diesel dispenser repaired in August 2015;

UST 4 leak in September 2016 (ULP).

- A total of 500L PSH was recovered from onsite groundwater monitoring wells (Sept 2016-Feb 2017) using Vacuum Enhanced Recovery;
- In Feb 2017, tanks were replaced where 2 tanks had holes;
- A total of 770 tonnes contaminated soil was removed offsite for safe disposal at a HH landfill site;
- The contamination plume was delineated offsite in the direction of groundwater users and an onsite vapour intrusion (VI) study was completed. Confirmed no risk to the onsite buildings
- The plume was found to be localized and limited to the area of the forecourt and no onsite VI issues were noted.
- As such, the strategy that was adopted was the was routine groundwater sampling of wells to document plume stability and possible PSH recovery from wells should PSH return in these wells;
- In Oct 2017; adjacent property to the north began excavation works for construction of a 2-storey building with a basement.

Astron Energy Site A

Background…..

- In Oct 2017; adjacent property to the north began excavation works for construction of a 2-storey building with a basement.
- On the 23rd of October 2017, we received a telephone call from one of the property developer of the 2-storey building (Neighbouring property), informing that groundwater with a fuel odour, from the Service Station, was seeping into the excavation;
- A site visit was undertaken (for visual inspection and recovery of groundwater samples) and the following findings were made:
    - The neighbouring property had been excavated to approximately 4 m below ground level.
    - Seepage with a fuel odour was observed in the bank between the two sites.
    - Parts of the backfilled layers in the bank were collapsing.
    - A soil and groundwater sample from the contaminated seep zone was collected and submitted for laboratory analysis.
    - The petroleum hydrocarbons concentrations in the groundwater were benzene at 4 400 µg/L, xylenes at 10 000 µg/L and GRO (C7-C9) at 14 000 µg/L. The results for the soil sample were benzene at 0.078 mg/kg and EPH at 110 mg/kg).
    - An explosive gasses survey of the neighbouring development site using a Lower Explosivity Level (LEL) meter. All LEL readings were zero.
    - Soil samples from 0.5 m below current ground level across the neighbouring excavation footprint. All results were below the SSV1 levels (benzene, ethylbenzene and xylenes at <0.008 mg/kg, toluene at <0.02 mg/kg, EPH at <22 mg/kg and GRO at a maximum of 1.2 mg/kg), indicating that the subsurface soil immediately below the excavation footprint is not impacted.
    - soil sample was collected from the seep zone in the wall between the service station and the neighbouring development, and the results were benzene at 11 mg/kg, toluene at 110 mg/kg, ethylbenzene at 51 mg/kg, xylenes at 244 mg/kg, GRO at 400 mg/kg and EPH (C10-C36) at 25 mg/kg. Benzene, toluene, ethylbenzene and xylenes exceed the SSV1 levels.
- A Notification of Contaminated Land in terms of Part 8 of NEM:WA was submitted to DFFE on 7 November 2017 by Astron Energy;
- The SAR was submitted in January 2018 and presented the site conditions and interpretation of the site data and RAP within the context of Part 8 of the National Waste Act, 2008 (Act No.59 of 2008);
- Remediation Order was closed in 2023

23 October 2017

Astron Energy Site A

Site Setting

- The site is located in a mixed commercial / residential area.
- Site itself is built on backfill (including some surrounding properties).
- Two potential off-site sources of contamination were identified located approximately 170 m west and 170 m northeast of the site;

Risk Drivers

- Surface Water Receptors: The nearest surface water body is an unnamed stream *located* approximately 55 m west of the site;
- Potential for VI:
  - Groundwater depth ranges between 1.42 to 2.86 mbgl;
  - Benzene concentrations: PSH in MW5 with benzene concentrations around 40 500ug/l.
- Three groundwater users were identified during a hydrocensus, located as follows:
  - 75 m to the northeast (Islamic School),
  - 270 m southeast (Commercial property) and
  - 470 m northeast (Mosque).
- Site geology consists of backfill to c.3 mbgl, silty clay overlying shale Formation.

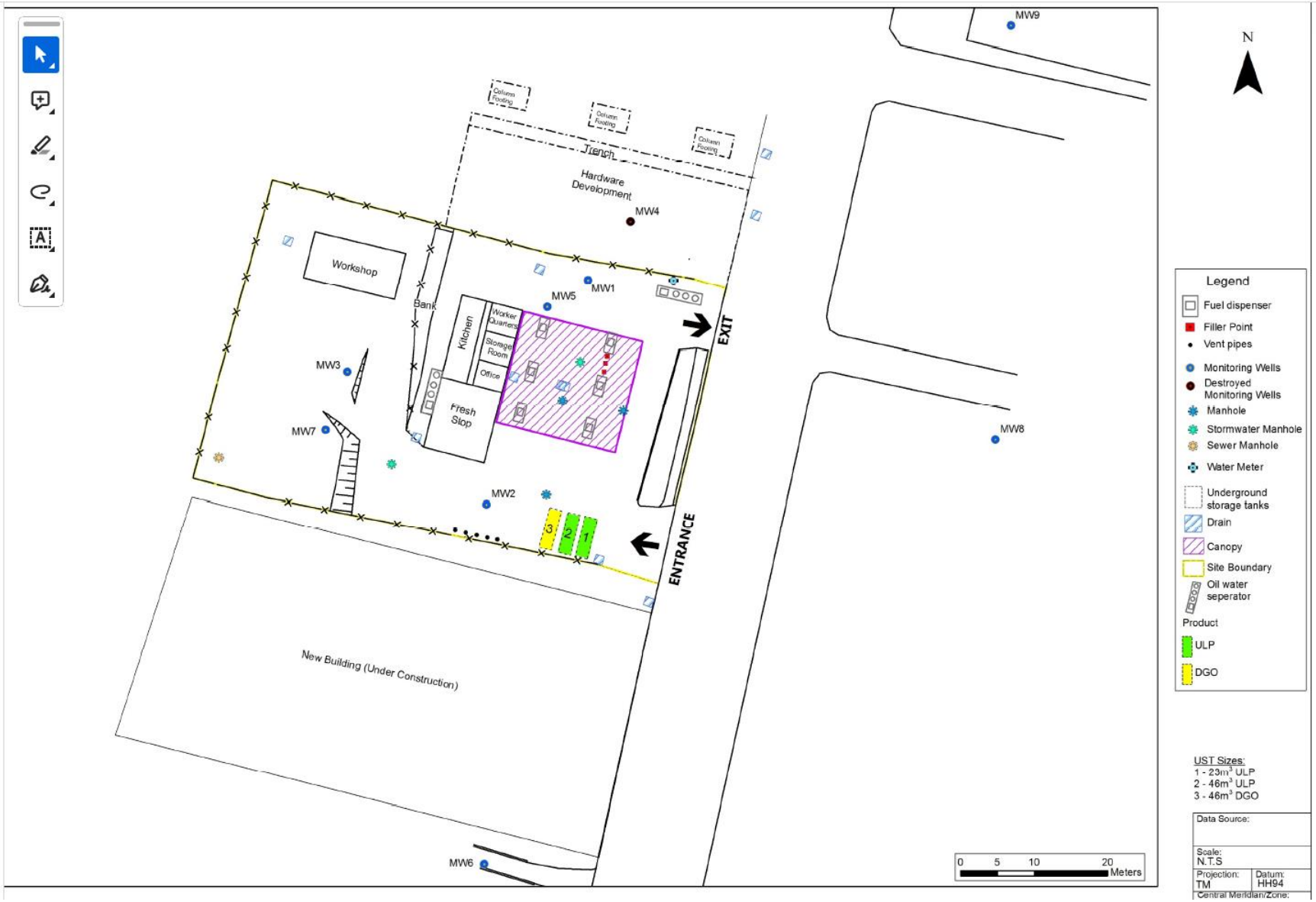
Astron Energy Site A: Remediation Action Plan

Background

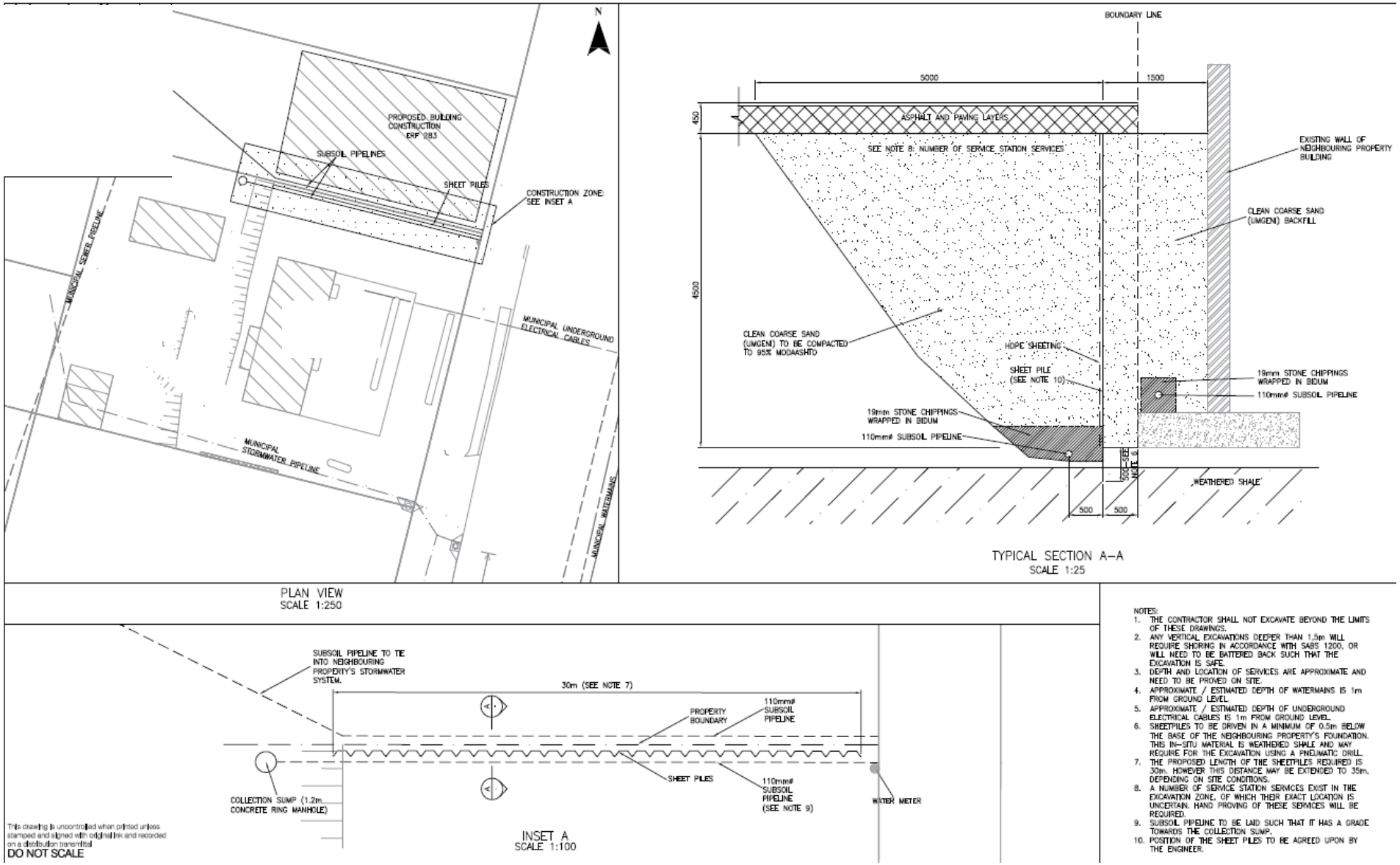
Sheet Piling Barrier with sub-soil drainage on either side of sheet piles at their base. Routing contaminated seepage to on-site oil-water separator. The following steps were undertaken:

1) **Installation of a construction zone barrier:** The installation of a 1.8m sheet pile barrier (temporary fence with hessian cloth attached to the fence);
2) **Prove location of existing services:** services along the route of the sheet pile barrier. The services were located using daylighting and Ground Penetrating Radar (GPR)
3) **Installation of Sheet Pile Barrier:** The sheet piles were driven approximately 0.5 m to 1 m into the ground. An HDPE liner was placed against the sheet piles and backfill material (clean coarse sand – Umgeni) carefully placed into the trench against the sheet piles;
4) **Installation of sub-soil pipeline (simultaneously with sheet piles):** The sub-soil pipeline is to consist of a 110 mm diameter perforated pipeline to the end of the wall and thereafter solid to the sump;
5) **Installation of manhole/sump:** A manhole sump was constructed at the downstream end of the sub-soil pipeline for groundwater discharge.

Site Layout



Design



Site Photos

Site Layout

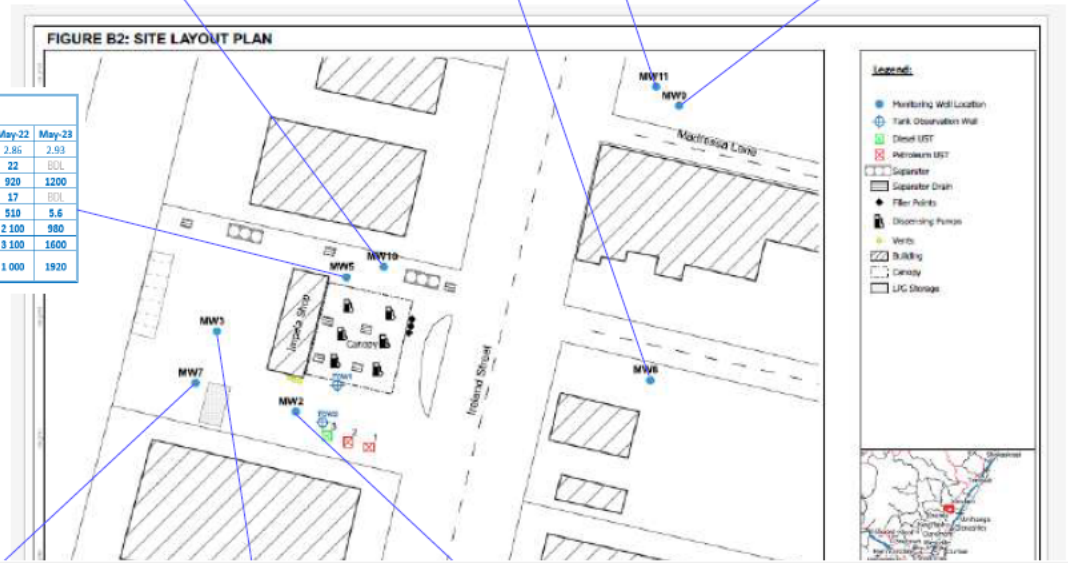
Sample ID (µg/l)	MW8								
Date sampled	Sept-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	5.76	5.62	5.33	5.03	6.01	5.97	5.47	5.68	6.42
MTBE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	1.06	BDL	BDL	BDL	BDL	1
Toluene	BDL	BDL	BDL	1.74	BDL	3.27	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	3.23	BDL	2.68	BDL	BDL	BDL
Xylene (total)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TPH (C7-C9)	BDL	BDL	BDL	20	BDL	BDL	BDL	BDL	BDL
TPH (C10-C36)	287	137	154	152	154	144	133	BDL	BDL

Sample ID (µg/l)	MW10							
Date sampled	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	3.09	2.09	2.65	2.65	2.58	2.66	2.68	2.90
MTBE	41.2	148	32.6	35.2	18.2	48.4	19	11
Benzene	3 620	4 090	1 040	861	BDL	1 200	330	120
Toluene	4 240	1 350	856	291	719	93.4	14	1.8
Ethylbenzene	78.2	9.45	1 190	8.37	641	BDL	BDL	18
Xylene (total)	11 400	9360	3 750	2 270	1 860	1 800	348	44.5
TPH (C7-C9)	27 100	35 100	12 000	6 960	4 940	9 580	690	150
TPH (C10-C36)	4 100	4460	2 920	649	1 800	2 220	440	330

Sample ID (µg/l)	MW11	
Date sampled	May-22	May-23
SWL (mbgl)	9.96	12.5
MTBE	BDL	BDL
Benzene	BDL	BDL
Toluene	BDL	BDL
Ethylbenzene	BDL	BDL
Xylene (total)	BDL	BDL
TPH (C7-C9)	BDL	BDL
TPH (C10-C36)	BDL	BDL

Sample ID (µg/l)	MW9								
Date sampled	Sept-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	11.07	Dry	11.01	10.6	10.36	10.89	Blocked	9.98	Dry
MTBE	BDL		BDL	BDL	BDL	BDL		BDL	
Benzene	BDL		BDL	BDL	BDL	BDL		BDL	
Toluene	BDL		BDL	BDL	BDL	BDL		BDL	
Ethylbenzene	BDL		BDL	BDL	BDL	BDL		BDL	
Xylene (total)	BDL		BDL	BDL	BDL	BDL		BDL	
TPH (C7-C9)	BDL		BDL	BDL	BDL	BDL		BDL	
TPH (C10-C36)	234		142	418	175	347		BDL	

Sample ID (µg/l)	MW5												
Date sampled	Nov-13	Aug-15	Sep-16	Oct-16	Sep-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	2.65	2.78	2.93	2.86	3.06	-	-	-	2.73	2.73	2.77	2.86	2.93
MTBE	BDL	227	PSH (GRO)		96.4	Sheen					72.3	22	BDL
Benzene	93	BDL			40 500						12 000	920	1200
Toluene	20	BDL			89 800						775	17	BDL
Ethylbenzene	-	-			-						3 510	510	5.6
Xylene (total)	103	BDL			76 500						18 900	2 100	980
TPH (C7-C9)	2 100	1 170			481 000						217 000	3 100	1600
TPH (C10-C36)	1 290	308			1050 000						166 000	1 000	1920



Site Layout

Sample ID (µg/l)	MW5												
Date sampled	Nov-13	Aug-15	Sep-16	Oct-16	Sep-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	2.65	2.78	2.93	2.86	3.06	-	-	-	2.73	2.73	2.77	2.86	2.93
MTBE	BDL	227	PSH (GRO)		96.4	Sheen					72.3	22	BDL
Benzene	93	BDL			40 500						12 000	920	1200
Toluene	20	BDL			89 800						775	17	BDL
Ethylbenzene	-	-			-						3 510	510	5.6
Xylene (total)	103	BDL			76 500						18 900	2 100	980
TPH (C7-C9)	2 100	1 170			481 000						217 000	3 100	1600
TPH (C10-C36)	1 290	308			1050 000						166 000	1 000	1920

Sample ID (µg/l)	MW7										
Date sampled	Sep-16	Oct-16	Sept-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	1.06	1.06	1.33	1.14	Inaccessible	1.01	1.16	1.09	1.02	1.05	1.28
MTBE	BDL	BDL	BDL	BDL		BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	BDL		BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL		BDL	BDL	2.19	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL		1.38	BDL	BDL	BDL	BDL	BDL
Xylene (total)	BDL	BDL	BDL	BDL		BDL	BDL	BDL	BDL	BDL	BDL
TPH (C7-C9)	BDL	BDL	BDL	BDL		BDL	BDL	BDL	BDL	BDL	BDL
TPH (C10-C36)	265	BDL	153	168		228	128	140	338	BDL	BDL

Sample ID (µg/l)	MW2													
Date sampled	Jun-12	Nov-13	Aug-15	Sep-16	Oct-16	Sep-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	3.21	3.09	3.89	3.81	3.73	3.61	3.5	3.46	3.44	3.38	3.41	3.27	3.38	3.58
MTBE	BDL	BDL	PSH (GRO/DRO)			1.75	BDL	BDL	4.71	3.15	BDL	BDL	BDL	BDL
Benzene	7.01	BDL				505	6.86	BDL	139	BDL	BDL	BDL	BDL	BDL
Toluene	43.9	BDL				1 990	BDL	BDL	4.13	BDL	2.79	BDL	BDL	BDL
Ethylbenzene	3.15	BDL				759	4.02	BDL	36.1	BDL	BDL	BDL	BDL	BDL
Xylene (total)	51	BDL				10 000	BDL	BDL	58.8	BDL	BDL	BDL	BDL	BDL
TPH (C7-C9)	263	BDL				62 200	647	102	747	80	83	11	BDL	BDL
TPH (C10-C36)	196	51.6				406 000	6 670	25 800	2 350	941	5 000	398	BDL	BDL

Sample ID (µg/l)	MW3													
Date sampled	Jun-12	Nov-13	Aug-15	Sep-16	Oct-16	Sep-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	1.36	1.39	1.48	1.45	1.42	1.45	1.37	1.34	1.32	1.39	1.3	1.41	2.49	1.41
MTBE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	3.76	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.62	BDL	BDL	BDL
Ethylbenzene	1.81	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.07	BDL	BDL	BDL
Xylene (total)	7.52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.77	BDL	BDL	BDL
TPH (C7-C9)	54	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TPH (C10-C36)	106	178	314	112	BDL	105	102	244	114	109	111	BDL	BDL	BDL

Sample ID (µg/l)	MW6									
Date sampled	Oct-16	Sep-17	Oct-18	Jan-19	Apr-19	Aug-19	Oct-19	Oct-20	May-22	May-23
SWL (mbgl)	2.03	2.22	2.24	2.22	2.08	2.28	2.28	2.09	2.0	2.10
MTBE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	1.17	BDL	2.67	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	2	BDL	2.19	BDL	BDL	BDL
Xylene (total)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TPH (C7-C9)	BDL	BDL	BDL	BDL	17	BDL	BDL	BDL	BDL	BDL
TPH (C10-C36)	61.2	201	128	BDL	168	BDL	131	BDL	BDL	BDL

Thank you