

Remediation Success – Soil & Groundwater Contamination

Fuels Industry Environment & Contaminated Land Committee Meeting

01 April 2025

Background

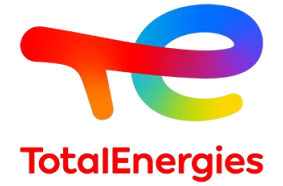
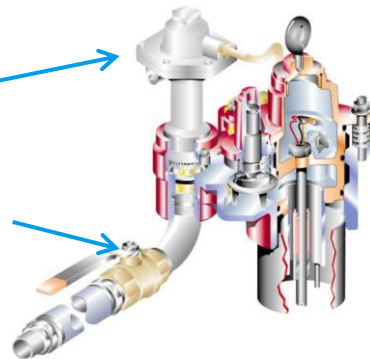


Contamination Trigger

A leak on a valve stem of a ball valve resulted in large volume of ULP accumulating in tank manholes and monitoring wells at a TMSA site

Mechanical line leak detector

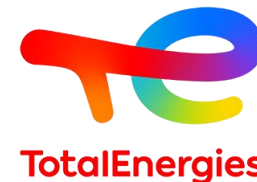
Ball valve



- ❑ **Location**
 - Near coast of SA
- ❑ **Surrounding land use**
 - Commercial - shops & offices
- ❑ **Geology**
 - Mudstone and sandstone of the Karoo Super-group
- ❑ **Geohydrology**
 - Intergranular & fractured
 - Minor, mod. vulnerability & med. susceptibility to contam.
 - High EC: 370 - 520 mS-m
 - No known GW users within 1km radius



Contamination Overview



2014-2015

Nov 2014

-Due diligence – Elevated **Naphthalene 1 392 mg/kg** in soil

Jan 2015

-Phase 2 : 3 wells were installed to 10 m bgl

2016

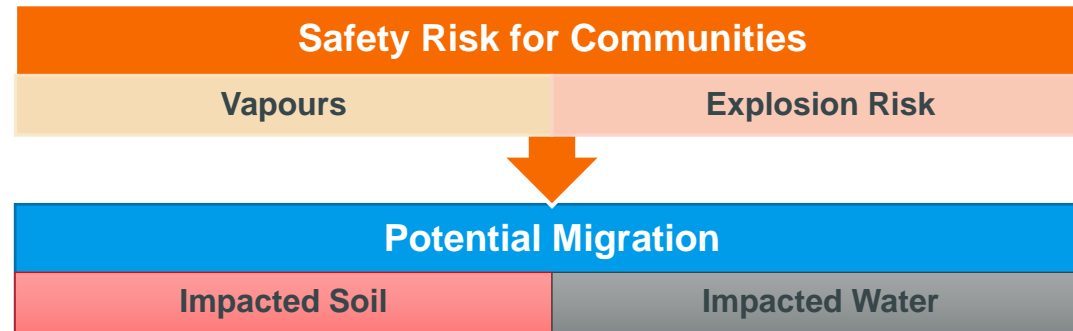
Jul '16

- Complaint about fuel smell at the mall (bank).
- Contractor dispatched to site; no smell detected. Only small amount of fuel in one tank manhole.
- Dealer complained of fuel in manholes following rain events

Aug '16

- Wetstock reported major losses (>**30k €**, period 04/06 - 16/08)
- ULP product was found in manholes
- ULP sales was stopped & sump pump switched off
- Site closed following initial HSEQ evaluation
- Emergency actions were implemented
- Onsite & off-site plume delineation

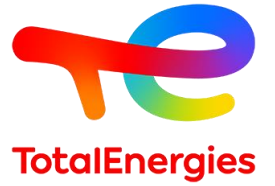
Risks Identified



Actions Implemented

Investigations & Communication	Safety Response	Environmental Response
<ul style="list-style-type: none"> • ERA (phase I & II) • Root cause analysis • Stakeholder engagement (S30, communities) • Media release 	<ul style="list-style-type: none"> • Align emergency response procedures for site & surrounding businesses • Appoint fire respondent to be on site (24 hrs) • Monitor air quality on site, in the Mall & in the storm water network 	<ul style="list-style-type: none"> • Install recovery & plume delineation wells • Free phase recovery • Install SVE & MPE system to address soil vapour & GW water impact • Assess impact in storm water & river

Remedial Objectives



1

- Prevent impact on health and safety for neighbors.

2

- Prevent the off-site migration of vapors

3

- Prevent off site migration of both free phase and dissolved contamination

4

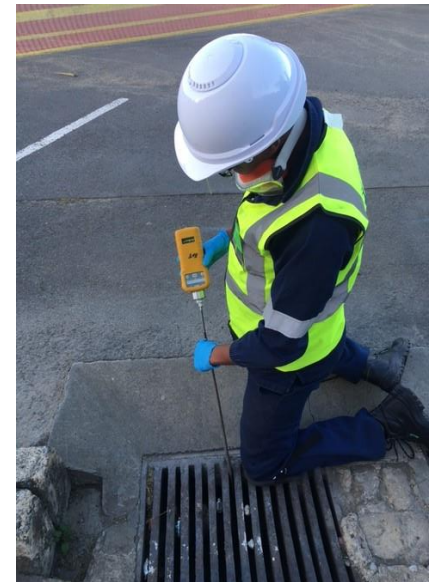
- To remove the “secondary source” of contamination

5

- To remediate the remaining contamination on site and off site (long term)

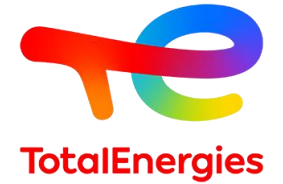


Purple dye used to trace storm water outlet



Vapour monitoring in storm water

Soil & Groundwater Remediation



- ✓ Continued operation of MPE & SVE
- ✓ Remediation order was received
- ✓ A total of 16 000 l product was recovered (excl vapour & emulsified)
- ✓ Asymptotic levels reached
- ✓ Site Upgrade was initiated
- ✓ Reconfigured MPE for further in-situ remediation
- ✓ Continue with GW monitoring
- ✓ Site re-opened for business

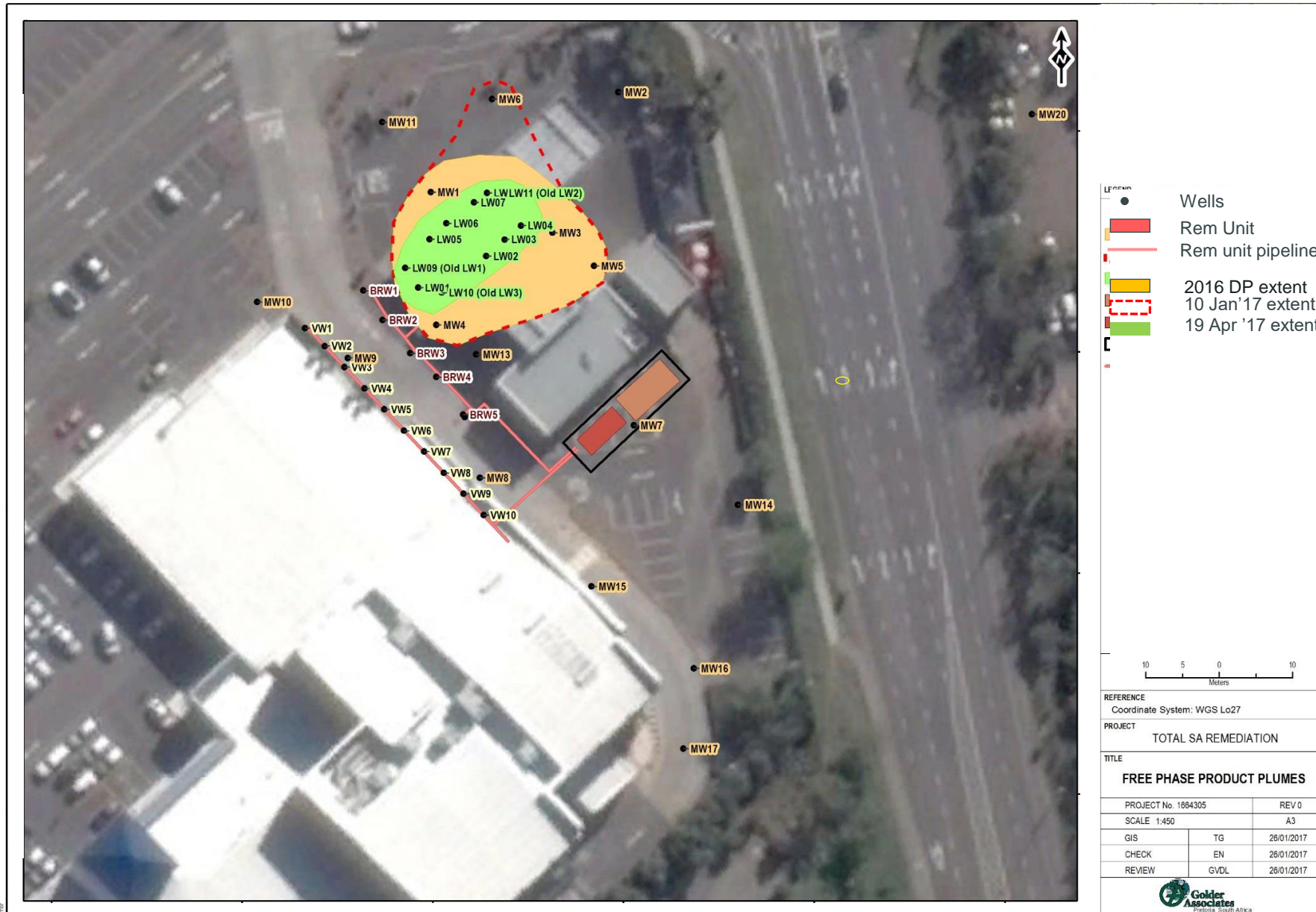
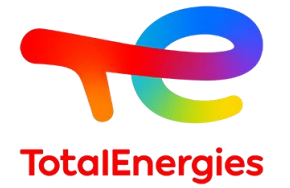
Risks Identified



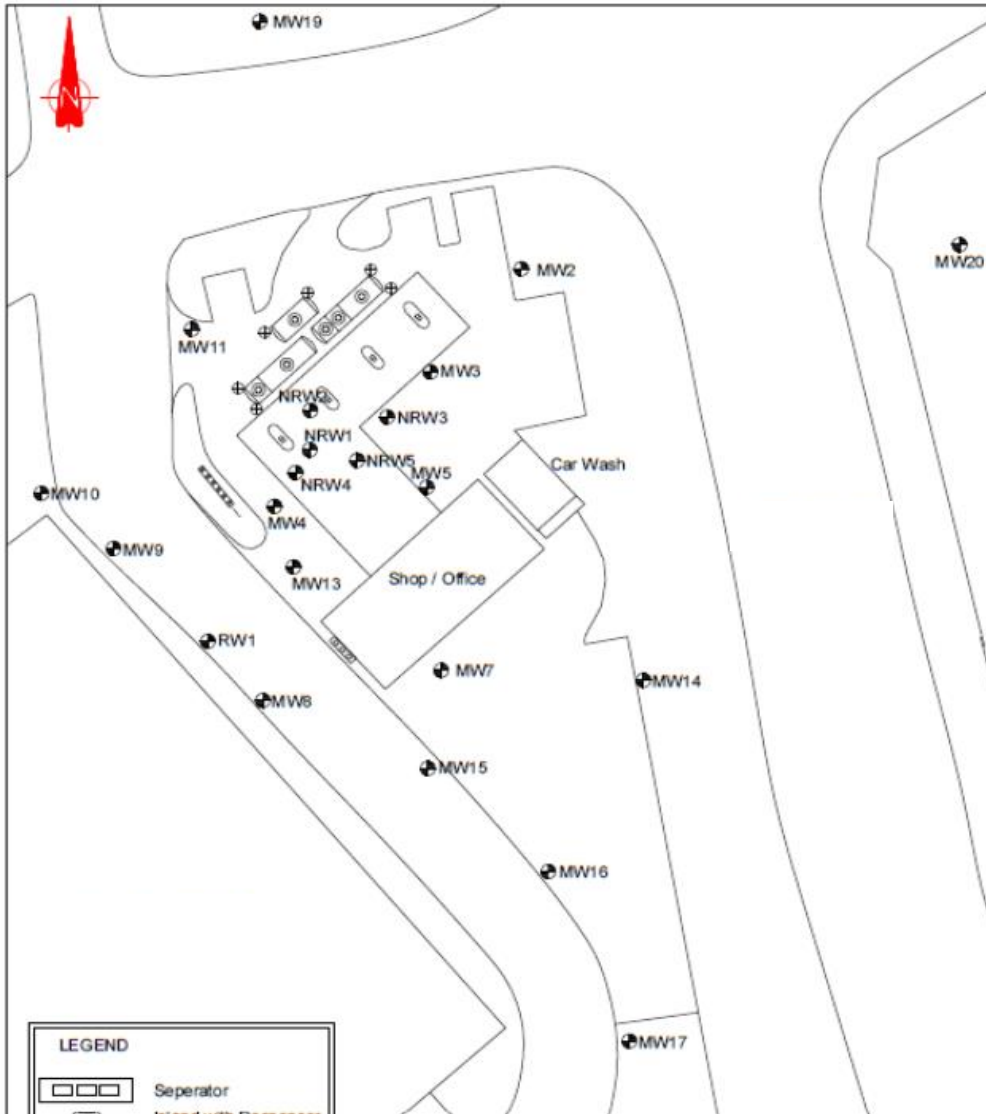
Actions Implemented

Communication	Safety Response	Environmental Response
<ul style="list-style-type: none"> • Stakeholder engagement (notification of commencement to DFFE & communities) 	<ul style="list-style-type: none"> • Align emergency response procedures for site & surrounding businesses • Developed traffic management plan • Fire responders & traffic control on site • Monitor air vapour on site and at the Mall 	<ul style="list-style-type: none"> • Install two recovery sump in old tank area • Continue operate SVE & MPE on-site & off-site • Surface & GW monitoring (on & off site)

Free phase plume over time



Contamination Trends GRO – 2018 vs 2023

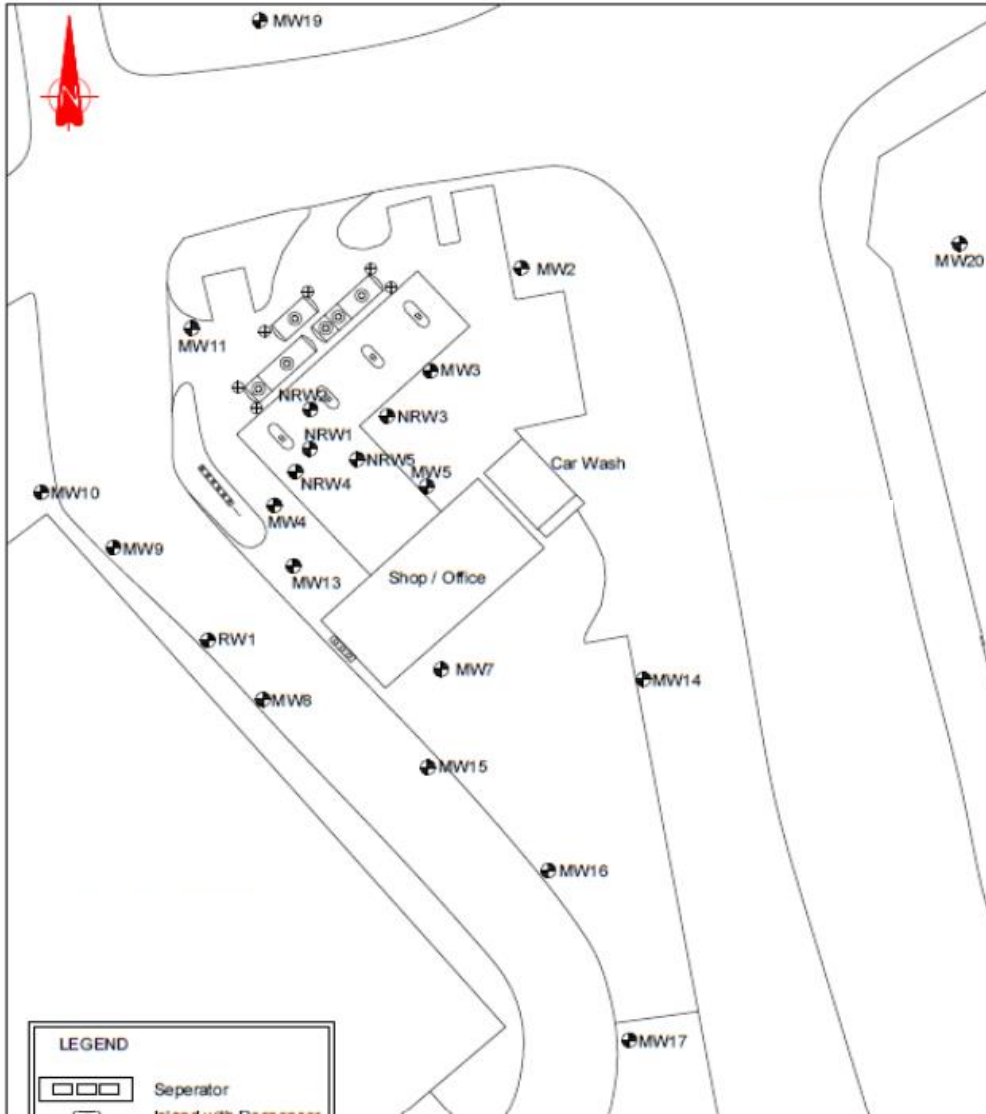


Sample ID	Benzene	Toluene	Ethyl- Benzene	Xylenes	Naphthalene	MTBE	TAME	
TBB MW2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW4	31 000	51 000	3 200	18 000	360	BDL	BDL	
TBB MW7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW13	24000	46 000	3 500	14 900	210	BDL	BDL	
TBB MW14	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB MW19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB Dup	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
TBB RW1	41	BDL	BDL	340	20	BDL	BDL	
TBB NRW4	1 400	440	36	750	12	BDL	BDL	
Trip Blank 1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Trip Blank 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Trip Blank 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
RBCA Tier 1: Ingestion of groundwater	Residential	2	1 564	782	1 564	156	6 700	-
	Commercial / Industrial	99	20 440	10 220	20 440	2 044	88 000	-
RBCA Tier 1: Inhalation of indoor air vapours	Residential	66	27 685	72 406	8 147	2 993	2.4E+06	2.6E+05
	Commercial / Industrial	4 757	445 730	> Sol	131 171	> Sol	3.9E+07	5.7E+05
RBCA Tier 1: Inhalation of outdoor air vapours	Residential	26 265	> Sol	> Sol	> Sol	> Sol	>Sol	>Sol
	Commercial / Industrial	573 630	> Sol	> Sol	> Sol	>Sol	>Sol	>Sol

Well ID	Depth (m bgl)	Benzene	Toluene	Ethyl- Benzene	Xylenes	Naphthalene	MTBE	TAME
MW2	4.92	BDL	BDL	2.2	1.1	BDL	BDL	BDL
MW3	1.60	1 200	280	1 000	3 070	77	BDL	BDL
MW4	1.00	3.9	BDL	1.9	26	2.6	BDL	BDL
MW5	0.74	0.7	BDL	3.7	4.4	BDL	BDL	BDL
MW7	0.86	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW8	1.23	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW9	0.93	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW10	1.03	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW11	1.03	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW13	1.45	3 900	180	3 600	7 400	250	BDL	BDL
MW14	2.90	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW16	1.28	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW17	9.82	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW18	0.96	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW19	1.41	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW20	7.85	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dup	1.03	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trip Blank	N/A	BDL	BDL	BDL	BDL	BDL	BDL	BDL
RPD	N/A	N/C	N/C	N/C	N/C	N/C	N/C	N/C

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RBCA Tier 1:	Residential	26 265	> Sol	> Sol	> Sol	> Sol	>Sol	>Sol

Contamination Trends DRO – 2018 vs 2023



Sample ID	Depth (m bgl)	TPH (C ₆ -C ₁₀)	TPH (C ₁₀ -C ₁₄)	TPH (C ₁₄ -C ₁₆)	TPH (C ₁₆ -C ₂₁)	TPH (C ₂₁ -C ₃₆)
TBB MW2	6.68	BDL	BDL	BDL	BDL	BDL
TBB MW4	1.00	120 000	28 000	232	150	BDL
TBB MW5	1.45	59 000	12 000	124	170	BDL
TBB MW7	1.52	BDL	BDL	BDL	BDL	BDL
TBB MW8	3.87	23	180	BDL	230	BDL
TBB MW9	2.60	1 800	850	BDL	BDL	BDL
TBB MW10	1.60	BDL	BDL	BDL	BDL	BDL
TBB MW11	1.23	BDL	BDL	BDL	BDL	BDL
TBB MW13	1.60	100 000	4 700	BDL	BDL	BDL
TBB MW14	7.52	BDL	BDL	BDL	BDL	BDL
TBB MW15	8.69	14	BDL	BDL	BDL	BDL
TBB MW16	1.74	BDL	BDL	BDL	BDL	BDL
TBB MW19	1.54	BDL	BDL	BDL	BDL	BDL
TBB RW1	1.35	2 200	880	BDL	BDL	BDL
TBB DUP	1.45	48 000	11 000	125	170	BDL
Trip Blank 1	N/A	BDL	NM	NM	NM	NM
Trip Blank 2	N/A	BDL	NM	NM	NM	NM
Trip Blank 3	N/A	BDL	NM	NM	NM	NM
Trip Blank 4	N/A	BDL	NM	NM	NM	NM
Trip Blank 5	N/A	BDL	NM	NM	NM	NM
TRIPBLANK1	N/A	BDL	NM	NM	NM	NM
RPD	N/A	20.56	8.70	0.80	0.00	N/C
RBCA Tier 1:	Residential	312	312	312	234	>Sol

Well ID	Water Depth (m bgl)	TPH (C ₆ -C ₁₀)	TPH (C ₁₀ -C ₁₄)	TPH (C ₁₄ -C ₁₆)	TPH (C ₁₆ -C ₂₁)	TPH (C ₂₁ -C ₃₆)
MW2	4.92	BDL	BDL	BDL	BDL	BDL
MW3	1.60	8 300	530	BDL	BDL	BDL
MW4	1.00	55	BDL	BDL	BDL	BDL
MW5	0.74	30	BDL	BDL	BDL	BDL
MW7	0.86	BDL	BDL	BDL	BDL	BDL
MW8	1.23	21	BDL	BDL	BDL	BDL
MW9	0.93	BDL	BDL	BDL	BDL	BDL
MW10	1.03	BDL	BDL	BDL	BDL	BDL
MW11	1.03	BDL	BDL	BDL	BDL	BDL
MW13	1.45	19 000	1 500	BDL	BDL	BDL
MW14	2.90	BDL	BDL	BDL	BDL	BDL
MW16	1.28	BDL	BDL	BDL	BDL	BDL
MW17	9.82	BDL	BDL	BDL	BDL	BDL
MW18	0.96	BDL	BDL	BDL	BDL	BDL
MW19	1.41	BDL	BDL	BDL	BDL	BDL
MW20	7.85	BDL	BDL	BDL	BDL	BDL
Dup	1.03	BDL	BDL	BDL	BDL	BDL
Trip Blank 1	N/A	BDL	BDL	N/A	N/A	N/A
RPD %	N/A	N/C	N/C	N/C	N/C	N/C
RBCA Tier 1:	Residential	312	312	312	234	>Sol
Ingestion of groundwater	Commercial / Industrial	4 088	4 088	4 088	>Sol	>Sol

System Decommission & Dismantling

- System decommissioned in December 2024.



Long Term Actions

1. Continue with bi-annual GW Monitoring - (MNA)
3. Remediation close out with DFFE

