Boliden Tara Mines

Soil and Groundwater Baseline Assessment

Boliden Tara Mines

Project reference: 60671645
Project number: 60671645_ACM_RP_EN_001

30 May 2022

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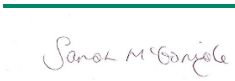			
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	17 May 2022	Draft	Yes	Brendan McCarthy	Project Manager
1	26 May 2022	Final	Yes	Brendan McCarthy	Project Manager
2	30 May 2022	Revision 1	Yes	Brendan McCarthy	Project Manager

Distribution List

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0	Yes	Boliden Tara Mines DAC

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1. Introduction

1.1 Project Background

Boliden Tara Mines DAC (Boliden) operate a mine at Knockumber, Navan, Co. Meath (the site) under Industrial Emissions (IE) Licence P0516-04 granted by the Environmental Protection Agency (EPA).

AECOM understands that Boliden wish to apply for a revision of their IE Licence. As part of the revision process Boliden are obliged to produce a soil and groundwater Baseline Report. Boliden Tara Mines appointed AECOM Ireland Limited (AECOM) to assist in the production of this Baseline Report.

A site location map and site layout are presented in Appendix A as Figures 1 and 2, respectively.

1.2 Baseline Assessment

In April 2013, Ireland implemented the requirements of Industrial Emissions Directive (IED) (2010/75/EU) through Statutory Instrument (S.I) 137 of 2013 and S.I 138 of 2013 (in force from 7 January 2014). Guidance on the application of these requirements is provided in the European Commission Guidance concerning Baseline Reports under Article 22(2) of Directive 2010/75/EU on Industrial Emissions (2014/C 136/03).

Under the IED, licenced sites are required to assess their inventory of Relevant Hazardous Substances which, as a result of their hazardousness, mobility, persistence and biodegradability (as wells as other characteristics), are capable of contaminating soil or groundwater and which are used, produced and/or released by the installation.

Licensees must consider baseline conditions with regard to soil and groundwater contamination when activity on a site involves the use, production or release Relevant Hazardous Substances under either of the following scenarios:

1. When applying for an IE Licence to operate a new installation; and,

2. When revising the permit for an existing licensed installation.

The IED (Article 16) also requires that a site undertake monitoring as per the “Baseline Report” for the RHS at least every five years in groundwater and every ten years in soils.

1.3 Project Objective

The aim of the baseline assessment is to generate a report which, on cessation of the licensed activity, will allow for direct comparison to determine if contamination has occurred during the course of the licensed activity since the baseline was established. This report consists of Stages 1 – 8 of the baseline report

1.4 Scope of Work

The Official Journal of the European Union has issued guidance[1] on the stages to be completed and the scope of content for baseline reports. In total there are eight stages to be completed, as listed below:

- Stage 1 – Identification of hazardous substances used;
- Stage 2 – Identification of relevant hazardous substances used;
- Stage 3 – Assessment of the site-specific pollution possibility;
- Stage 4 – Site history;
- Stage 5 – Environmental setting;
- Stage 6 – Site characterisation;
- Stage 7 – Site investigation; and,
- Stage 8 – Production of the baseline report.

[1] European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions (2014)

1.5 References

1.5.1 Reports

In preparation of this report, a number of historical reports relating to the site have been reviewed:

- Ground and Environmental Services Limited, 2013: Randalstown Tailings Storage Facility (TSF), An assessment of the TSF in respect of EU Directive 2012/18/EU, On behalf of Boliden Tara Mines Lts, document reference 11170, dated June 2013
- JS Remediation, 2015: Landfill Remediation Strategy, Phase 1 and Hydrogeological Risk Screening Report, licence reference IEL P056-03, report reference JS 003.IR.01, dated March 2015
- SLR, 2015: Randalstown Tailings Management Facility (TMF) – Hazardous Waste Assessment of Mine Tailings, report reference 416-03390-00004-Hazwaste, dated 21 September 2015
- JS Remediation, 2015: Detailed Site Assessment Report for the Environmental Protection Agency, licence reference IPPCL P0 516-03, report reference JS 003, dated October 2015
- CHC Environmental Solutions, 2016: Quantitative Risk Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.01.2, dated April 2016
- CHC Environmental Solutions, 2016: Remedial Options Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.02.1, dated April 2016
- PM Group, 2019: HAZID & Risk Assessment, report reference IE0311731-23-RP-0007, Issue C, dated 26 September 2019
- Boliden Tara Mines, 2019: Boliden Tara Mines Safety Report, Under the Control of Major Accident Hazard Regulations 2015
- Boliden Tara Mines, 2021: Landfill Restoration & Closure Plan, 2021

1.5.2 Publicly Available Information

To allow for site-specific data to be assessed in the context of the site's wider environmental setting, a review of publicly available data was undertaken, including:

- A review of online historical maps and aerial photography of the area, from:
  - Ordnance Survey of Ireland (OSI) Aerial Photography 1995, 2000 and 2005; http://geohive.ie accessed 17 January 2021;
  - OSI online Historical Mapping -, colour 1837-1842 and 25-inch mapping series greyscale 1888-1913; http://geohive.ie accessed 17 January 2021; and,
  - Google Earth Aerial Photography – accessed 17 January 2021.
- Site sensitivity research, including geology, hydrology, hydrogeology, areas of ecological significance and a review of potentially polluting activities in the area, from:
  - Geological Survey of Ireland (GSI) website http://www.gsi.ie, accessed 18 November 2021; (for Public Viewer and Groundwater Web Maps); and,
  - Environmental Protection Agency (EPA) website http://www.epa.ie, accessed 18 November 2021 (for Map Viewer).
- Flood risk data (as available), from: Office of Public Works (OPW) National Flood Hazard Mapping tool http://www.floodinfo.ie, accessed 18 November 2021.

A site walkover was complete by Brendan McCarthy of AECOM on 12 January 2022 and facilitated by Michelle Geraghty, Environmental Engineer at Boliden Tara Mines, who provided information in relation to present and historic site activities to assist in the investigation design and the review Boliden's material storage arrangements for the Relevant Hazardous Substances assessment.

2. Identification of Hazardous Substances (Stage 1)

The first stage in preparing a baseline assessment is to identify the hazardous substances that are used, produced or released at the site.

Boliden provided a list of 200 chemicals including mixtures, used on the site, their physical state and their usage quantities.

AECOM screened this long list based on whether these substances have relevant Hazard Statement or are defined as a Hazardous Substance to aquatic receptors or are listed as Hazardous by the EPA to derive a short list of potential hazardous substances for the site.

Substances were classified as hazardous if:

1. They were identified as 'Hazardous' by the EPA in the document *Classification of Hazardous and Non-Hazardous Substances in Groundwater* (2010)[2] ;
2. If they have a relevant hazard statement on the European Chemicals Agency website[3]. A total of 14 relevant environmental hazard statements have been identified:
   - H340 – May cause genetic defects
   - H341 – Suspected of causing genetic defects
   - H350 – May cause cancer
   - H351 – Suspected of causing cancer
   - H360D – May damage unborn child
   - H360F – May damage fertility
   - H361 – Suspected of damaging fertility or the unborn child
   - H400 – Very toxic to aquatic life
   - H401 – Toxic to aquatic life
   - H402 – Harmful to aquatic life
   - H410 – Very toxic to aquatic life with long lasting effects
   - H411 – Toxic to aquatic life with long lasting effects
   - H412 – Harmful to aquatic life with long lasting effects
   - H413 – May cause long lasting harmful effects to aquatic life

In addition, the type of firefighting foam used and stored on site was reviewed to ascertain whether it contains per/poly-fluorinated alkyl substances (PFAS). PFAS is an emerging group of environmentally-persistent compounds known to have been commonly used in aqueous film forming foams (AFFF) used in firefighting.

The supplier of the firefighting foam primarily used at Boliden Tara Mines has confirmed that the primary AFFF used and stored at site at present and historically has been PFAS-free, however a back-up foam, 3/6% Alcoseal contains PFAS.

A list of 96 potentially hazardous substances identified in Stage 1 are listed in Appendix B, Table B1.

[2] http://www.epa.ie/pubs/reports/water/ground/classificationofhazardousandnon-hazardoussubstancesingroundwater.html
[3] http://echa.europa.eu/

3. Identification of 'Relevant Hazardous Substances' (Stage 2)

Stage 2 screens the short list of hazardous substances identified following Stage 1 for potential pollution risk due to their chemical or physical properties.

This risk-based assessment screens the list of substances given in Appendix B Table 1 based on:

- The physical state of substances that will be used and stored on site, e.g. solids and gases can be removed from the list as part of the screening process; and,
- The overall quantity used on site. The EU Guidance states that "where very small quantities are used, produced or released on the site of the installation then the possibility of contamination is likely to be insignificant for the purpose of producing a baseline report".

A planned annual usage or storage of >250 L (or >250 kg) was used as the threshold above which substances used on site were considered in this assessment. Those substances that will be used/stored in small quantities on site have not been considered, for example substances used in laboratories or in the canteen.

Seventeen hazardous substances were screened in at Stage 2.

4. Assessment of Site-Specific Pollution Possibility (Stage 3)

In Stage 3, the hazardous substances taken forward from Stage 2 were considered in the context of the site to determine whether circumstances exist which may result in the potential release of a substance in sufficient quantities to pose a pollution risk. Specific circumstances include:

- The quantity of each hazardous substance or groups of similar hazardous substances[4];
- How and where hazardous substances are stored and used on site;
- How the hazardous substances are transported around the installation; and,
- In case of existing installations, the measures that have been adopted to ensure that it is impossible in practice for contamination of soil or groundwater to take place (including the presence and integrity of containment mechanisms, condition of site drainage, etc.).

For the list of on-site relevant hazardous substances derived at Stage 2, AECOM assessed the storage arrangement of each chemical substance, together with its associated handling procedures.

At Boliden, the storage and handling of process materials is undertaken in accordance with the EPA Guidance Document *IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*, EPA 2004[5]. Details on the site containment systems were obtained from the 2019 Boliden Tara Mines Safety Report and from the Boliden Environment Team.

Brief details of the storage arrangements of the planned on-site hazardous chemical substances and associated containment measures for each of the hazardous substances are provided in Appendix B Table B2.

Based on the information provided by Boliden Tara Mines to AECOM, it is expected that, as a result of current storage, containment and handling practices, the likelihood of possible significant impact to soils and groundwater from the on-site hazardous substances is low. However, previous site investigations have identified potential sources of contamination in a historic landfill on site.

The following sections detail specific storage arrangements for hazardous substances (or groups of substances) assessed at Stage 3.

4.1 Cleaning Products

Domestos Bleach and Disinfectant are considered together as cleaning products, due to their limited storage quantities and similar containment methods.

Table 1. Cleaning products

Annual Usage	Approximately 23,100 litres are used annually.
Storage Location	Stored in limited quantities at the Surface Stores.
Description of Use	Common cleaning chemicals used on site at various locations.
Deliveries and Collections	Delivered to site in small containers.
Control Measures in Place	Stored in small quantities in bunded shelves at the sites main surface stores.
Relevant Hazardous Substance Screening	Due to the small packaging size and suitable storage arrangements, cleaning products have been ruled out as Relevant Hazardous Substances.

4.2 Copper Sulphate

Table 2. Copper Sulphate

Annual Usage	807 tonnes of copper sulphate is used annually.
Storage Location	Copper sulphate is stored as a solid in 1 tonne environmentally sealed flexible intermediate bulk containers (FIBCs) in the reagent store in the main Mill Building. Copper sulphate is mixed with water and stored as a 10% solution in the concentrator

[4] Annual usage figures in this report were determined using the average usage over the years 2019-2021 inclusive
[5] http://www.epa.ie/pubs/advice/licensee/guidancetostorageandtransferofmaterialsforscheduledactivities.html

	reagent mixing area, also located in the Mill Building. Once mixed, the copper sulphate solution is transferred to a holding tank by gravity underneath the mixing area.
Description of Use	Copper sulphate solution is used as promoter of zinc during the floatation stage of ore processing.
Deliveries and Collections	Copper sulphate is delivered by truck in the FIBCs and unloaded by forklift where it is brought directly into the Mill Building.
Control Measures in Place	Copper sulphate is stored, mixed and used within the Mill Building. The Mill Building is bunded with a capacity of 700 m^3. Significantly greater than the volume of copper sulphate mixed on site at any time (maximum of 162.3 m^3). Copper sulphate is primarily stored as a solid in double skinned FIBCs. The FIBCs are stored in a bunded building and protected from the weather. In the event of a loss, the copper sulphate may be easily cleaned up. Mixing takes place in the same building. The volume in the mixing tank is monitored by an ultrasonic level meter and water addition is controlled by an interlock preventing overfilling. Copper sulphate solution is pumped directly to its point of use within the same bunded building using dedicated distribution pipework. During the transfer, pressure is monitored in the pipeline. In the event of a decrease in pressure below a set point, the system will shut down. Storage, mixing and use are at ambient pressures and temperatures.
Relevant Hazardous Substance Screening	Copper sulphate is stored in solid crystal form in double skinned environmentally sealed FIBCs on hard standing within the Mill Building. Prior to use, it is mixed with water to produce a 10 wt% solution. Copper sulphate is stored, mixed, transported and used within a bunded building which provides more than 110% capacity of the largest tank and 25% of the total tank capacity. Sensors are used to monitor levels during mixing and pressure sensors are used during distribution to detect leaks. In the event of a drop in level or pressure the system will be automatically shut down by interlock. Due to the automated control measures in place, suitable storage facilities and the provision of secondary containment at all points between storage and use, it is considered that the likelihood of a loss of copper sulphate impacting soil or groundwater is considered very low and it has been ruled out as a Relevant Hazardous Substance.

4.3 Danafloat 507 (Phosphorodithioic Acid)

Table 3. Danafloat 507

Annual Usage	31,600 litres is used annually.
Storage Location	Danafloat 507 is stored in 1 m^3 IBCs and a 3 m^3 tank in the reagent storage area of the Mill Building.
Description of Use	Danafloat 507 is used as a zinc collector during the floatation stage of ore processing.
Deliveries and Collections	Danafloat 507 is delivered to site in 1 m^3 IBCs. It is transferred to the holding tanks by gravity from a dedicated delivery location within the Mill Building.
Control Measures in Place	Danafloat 507 is stored and used within the Mill Building. The Mill Building is bunded with a capacity of 700 m^3. Significantly greater than the volume of the Danafloat 507 storage tank (maximum of 3 m^3). Danafloat 507 solution is pumped directly to its point of use using dedicated distribution pipework. During the transfer, pressure is monitored in the pipeline. In the event of a decrease in pressure below a set point the system will shut down. Storage, mixing and use are at ambient pressures and temperatures.
Relevant Hazardous Substance Screening	Danafloat is stored and used within a bunded building providing 700 m^3. The largest single container of Danafloat 507 is 3 m^3. Due to the limited quantities of Danafloat 507 in any one container and the presence of suitable containment measures, Danafloat 507 has been ruled out as a Relevant Hazardous Substance.

4.4 Diesel

Table 4. Diesel

Annual Usage	Approximately 3,819,546 litres are used annually.
Storage Location	Diesel is stored in double skinned tanks in a dedicated tank farm.
Description of Use	Diesel is used to fuel site plant and machinery. The loading point is located adjacent to the tanks and on an area of hardstanding which drains to an oil water interceptor.

Deliveries and Collections	Diesel is delivered by tanker and loaded into the tanks though an unloading point next to the tank.
Control Measures in Place	The tank is double skinned providing secondary containment and fitted with level sensors fitted to local alarms. Diesel may also be transported underground through a pipeline. Pressure in the line to the underground mine is monitored to detect leaks. In the event of a leak the tank valves can be closed and site staff will be alerted by a local alarm and in the control room by the sites SCADA system. A preventative maintenance program is in place for the tank farm, pipework and loading area. In the event of a spill during delivery or a release from secondary containment, a significant quantity of fuel is likely to enter the storm water system, where it will be contained within the oil water interceptor or one of the site's drainage pond, however diesel is also likely to pass over areas of open ground, which may lead to soil or groundwater contamination.
Relevant Hazardous Substance Screening	Diesel is used in significant quantities on site, the tank is double skinned and the chances of a significant loss are low, there have been no reports of significant losses of diesel, however there is the potential for repeated small operational losses during refuelling therefore diesel is considered to be Relevant Hazardous Substances.

4.5 Kerosene

Table 5. Kerosene

Annual Usage	Approximately 104,000 litres.
Storage Location	Kerosene is stored in a double skinned 20,000 litre tank within the site's fuel tank farm and in ten smaller tanks located across site including at contractors' compounds.
Description of Use	Kerosene is used for heating purposes.
Deliveries and Collections	Kerosene is delivered to site by road tanker.
Control Measures in Place	Each tank is double skinned providing secondary containment and fitted with level sensors fitted to local alarms. Several double skinned tanks are positioned across site, including areas of open ground. In the event of a spill or a release from secondary containment, a significant quantity of fuel is likely to enter the storm water system, where it will be contained within the oil water interceptor or one of the site's drainage ponds, however kerosene may also be lost to open ground which may lead to localised soil or groundwater contamination.
Relevant Hazardous Substance Screening	Kerosene is used in significant quantities on site, the tanks are double skinned and the chances of a significant loss are low, there have been no reports of significant losses of kerosene, however there is the potential for historic small operational losses during refuelling, therefore kerosene is considered to be Relevant Hazardous Substance.

4.6 Lead Concentrate

Table 6. Lead Concentrate

Annual Usage	Lead concentrate is produced on site.
Storage Location	Up to 5,000 tonnes of lead concentrate is stored in solid form (5-7% wt moisture) on hardstanding in a dedicated covered storage shed.
Description of Use	Lead concentration is a final product produced on site.
Deliveries and Collections	Lead ore is produced on site in the underground mine. Lead concentrate is extracted from the ore in the Mill Building. It is dispatched from site by rail in sealed containers for smelting at overseas locations.
Control Measures in Place	Lead ore is crushed underground and transported to the surface for further processing. It is milled in the Mill Building and undergoes various processing stages to extract the lead concentrate. During the extraction process it is mixed with water and various chemicals are added to extract the lead. The majority of the extraction process takes place within the Mill Building. The basement of the Mill Building is bunded, providing 700 m^3 storage capacity, significantly more than the capacity of the largest tank. However, lead thickener tank TK-13, with a capacity of 730 m^3, is located outside of the Mill Building. This tank is surrounded by drains which lead back to the Mill Building in the event of a minor leak or spill. To date, there have been no losses from this tank. The lead concentration in these tanks is low (30 µg/l). The tanks are included in a rigorous preventative maintenance schedule which includes weekly walkdowns. The tanks are emptied annually during the site shut down and the interior is visually inspected. The site tanks also undergo non-destructive thickness testing as per the EPA Guidance Document on the storage and transport of hazardous materials.

Relevant Hazardous Substance Screening	Lead concentrate is produced from a naturally occurring substance mined at the site. Once extracted the concentrate is stored in solid form in a bunded, weatherproof storage building, preventing leaching. However due to the significant quantity of lead processed on site it is considered a Relevant Hazardous Substance, although it should be noted that lead is naturally-occurring in groundwater bearing, mineralised bedrock beneath the site, however it is stored on site in concentrated form.

4.7 Maintenance Chemicals

Sika Anchor Fix-1 Adhesive and White Spirit are considered together as maintenance chemicals.

Table 7. Maintenance Chemicals

Annual Usage	Approximately 1,100 litres.
Storage Location	Maintenance chemicals are stored in drums (<25l) in bunded stores at the Surface Store.
Description of Use	These substances are used for maintenance tasks on site.
Deliveries and Collections	These chemicals are transported in small containers and would be delivered by pallet.
Control Measures in Place	These chemicals are stored in small containers located over bunds in areas of hardstanding.
Relevant Hazardous Substance Screening	Due to the small storage quantities and engineered containment systems, the risk of these utility and maintenance chemicals entering soil and/or groundwater is considered very low and they have been screened out as Relevant Hazardous Substances.

4.8 Oils and Greases

Gear Oil EPX800W-90, Rock Drill Oil 100 and Unigear 85W/140 are used in site machinery and tools and are considered together as oils and greases.

Table 8. Oils and Greases

Annual Usage	Approximately 18,300 litres.
Storage Location	Oils and greases are stored in drums (<25l) in bunded stores at the Surface Store.
Description of Use	These substances are used for maintaining plant and equipment.
Deliveries and Collections	These chemicals are transported in small containers and would be delivered by pallet.
Control Measures in Place	These chemicals are stored in small containers located over bunds in areas of hardstanding.
Relevant Hazardous Substance Screening	Due to the small storage quantities and engineered containment systems, the risk of these oils and greases entering soil and/or groundwater is considered very low and they have been screened out as Relevant Hazardous Substances.

4.9 PFAS Containing Substances

3/6% Alcoseal is a PFAS containing AFFF. This substance has now been removed from site and has been replaced with Silvara APC+, a PFAS free substitute. 3/6% Alcoseal has not been used on site since 2017.

Table 9. PFAS Containing Substances

Annual Usage	Minimal usage, the use of 3/6% Alcoseal was limited to underground fires in the event that the fire tender develops a fault. It is no longer in use and has been removed from site by an appropriate waste contractor.
Storage Location	Alcoseal AFFF is no longer stored on site.
Description of Use	3/6% Alcoseal was used to fight underground fires in the event that the fire tender develops a fault. The site contact was not aware of any use of 3/6% Alcoseal at the firefighting training area, however its usage cannot be discounted.
Deliveries and Collections	3/6% Alcoseal AFFF was previously delivered in 25 litre drums. It is no longer stored on site.
Control Measures in Place	These chemicals were stored in small containers located in areas of hardstanding. Leaks would be of limited quantity and would be quickly identified.

Relevant Hazardous Substance Screening	Due to the small storage quantities and limited usage of PFAS-containing substances the likelihood of soil or groundwater contamination is very low, however it is recommended to sample soils in firefighting training area for PFAS.

4.10 Potassium Iso-Amyl Xanthate (PAX)

Table 10. Potassium Iso-Amyl Xanthate (PAX)

Annual Usage	85,000 kg of PAX is used annually.
Storage Location	PAX is delivered and stored as solid pellets in 850 kg environmentally-sealed, double-skinned FIBCs within wooden boxes in a dedicated xanthates external storage shed adjacent to the Mill Building. PAX is transferred to the Mill Building and mixed with water prior to use. The PAX solution is stored in dedicated 19.4 m^3 storage tank within the Mill Building prior to use.
Description of Use	PAX is used as a collector during the floatation stage of ore processing.
Deliveries and Collections	PAX is delivered to site in the 850 kg environmentally-sealed, double-skinned FIBCs within wooden boxes. PAX solution is used within the Mill Building where it is mixed.
Control Measures in Place	PAX is stored as a solid indoors, where it is protected from leaching, in a double-skinned, environmentally-sealed bag within a wooden create to provide mechanical protection. In the event of a spill of the solid material, it will not flow and can easily be collected. PAX is mixed and used within the Mill Building. The Mill Building is bunded with a capacity of 700 m^3. The volume in the mixing tank is monitored by an ultrasonic level meter and water addition is controlled by an interlock preventing overfilling. Once mixed it is stored in a dedicated storage tank beneath the mixing tank. PAX solution is pumped directly to its point of use using dedicated distribution pipework. During the transfer, pressure is monitored in the pipeline. In the event of a decrease in pressure below a set point the system will shut down. Storage, mixing and use are at ambient pressures and temperatures.
Relevant Hazardous Substance Screening	As PAX is stored as a solid and, once mixed with water, the tanks, all pipework and tanks at the point of use are contained within the bunded Mill Building. During mixing, when stored in solution and when being pumped to its point of use, tank levels and pressure sensors are used to quickly detect losses. Such losses would cause the system to immediately shut down. Due to the control measures in place, PAX has been ruled out as a Relevant Hazardous Substance.

4.11 Sodium Cyanide

Table 11. Sodium Cyanide

Annual Usage	Approximately 23,300 kg is used annually in solid form.
Storage Location	Stored in a solid briquette form in a dedicated cyanide storage shed adjacent to the cyanide mixing building.
Description of Use	Sodium cyanide is used as an iron suppressant during the floatation stage of ore extraction.
Deliveries and Collections	Delivered to the site in one tonne, double-skinned, environmentally-sealed bags in wooden boxes and transported to the mixing area via a monorail crane
Control Measures in Place	Sodium cyanide is stored as a solid in double-skinned FIBCs within wooden boxes in a dedicated bunded building preventing leaching. In the event of a spill, the sodium cyanide will remain contained with the building and can easily be collected. Sodium cyanide solution is mixed in batches of up to 1.8 m^3 and stored in a 4m^3 tank in a dedicated bunded building. Due to the health risk posed by a potential hydrogen cyanide release in the event of a leak, a significant number of control measures are put in place to prevent losses during mixing and dosing. Sodium cyanide storage and mixing is prepared at ambient temperature and pressure and does not result in heat generation. Ultrasonic level sensors are used to monitor levels in the mixing tank an interlock prevents overfilling during mixing. Sodium cyanide is transported to the Mill building through a welded stainless steel pipeline with no flanges or disconnectable connections outside of bunded areas. Flow meters and pressure sensors are used to detect any potential leaks. Pressure relief valves in the mixing and pump building discharge into specially sealed boxes. During pumping the flow meter readings are compared to changes in tank level. Any discrepancy will cause the transfer system to shut down.

	A preventative maintenance program is in place for the tanks, pipework and bund. The area is visually inspected by shift personnel during routine plant walkdowns.
Relevant Hazardous Substance Screening	Due to the significant number of measures in place to prevent leaks of sodium cyanide solution in place, the likelihood of a loss of sodium cyanide impacting soil or groundwater is considered to be very low and therefore it has been ruled out as a Relevant Hazardous Substance.

4.12 Sodium Isopropyl Xanthate (SIPX)

Table 12. Sodium Isopropyl Xanthate (SIPX)

Annual Usage	Approximately 180,000 kg
Storage Location	SPIX is stored in solid pellet form in a dedicated storage building. It is transported a short distance to the Mill building in double skinned FIBCs by forklift. SPIX is mixed with water to form a 16 wt% solution within the Mill building, which is stored in a 38.9 m^3 tank within the Mill building.
Description of Use	SPIX is used as a collector during the lead floating stage of lead concentrate extraction.
Deliveries and Collections	SPIX is delivered to site in double skinned environmentally sealed FIBCs contained within wooden boxes. It is transported to its point of use within these boxes.
Control Measures in Place	SPIX is stored in double skinned environmentally sealed FIBCs in solid form. The FIBCs are stored in wooden boxes to provide protection. It is stored in a dedicated building along with PAX. The SPIX is stored on hard standing and protected from weather which may cause leaching. In the event of a loss in solid form it can easily be cleaned up. SPIX is transported to the Mill building by forklift. Inside the bag is placed into a dedicated bag splitter and hopper, which will cut the bag and allow the SPIX to enter a mixing tank. The SPIX is mixed to a 16 wt% solution and gravity fed to a storage tank beneath the mixing tank. Both the mixing tank and storage tank are fitted with ultrasonic level sensors which are used to prevent an overflow. Up to 38.9 m^4 of SPIX solution can be stored at any one time. The SPIX is pumped to its point of use through a solid HDPE pipe with no joints to the distribution room. If pressure in pipe in the distribution room drops below a set point, the pumps will shut down on interlock. The mixing tank, holding tank, pipework and points of use are all located within the bunded Mill Building. The Mill building basement is bunded providing 700 m^3 capacity.
Relevant Hazardous Substance Screening	Due to the automated control measures in place, suitable storage facilities and the provision of secondary containment it is considered that the likelihood of a loss of SPIX impacting soil or groundwater is considered very low and it has been ruled out as a Relevant Hazardous Substance.

4.13 Sodium Nitrite

Table 13. Sodium Nitrite

Annual Usage	Approximately 2,600 kg
Storage Location	Sodium nitrite is stored in solid crystal form in 25 kg bags within a container in the secure Orica explosives compound. 10.6 wt% Sodium nitrite solution is stored in a bunded IBC, when required.
Description of Use	Sodium nitrite is mixed with water to produce a 10.6 wt% solution for use as a ‘gasser solution’ to sensitise ammonium nitrate.
Deliveries and Collections	Sodium nitrite is delivered by truck on pallets and is unloaded by forklift. Sodium nitrite is transported to its point of use in specially-designed charging vehicles.
Control Measures in Place	Sodium nitrite, when stored in solid form, is stored in a container to protect it from leaching caused by rain. A loss of Sodium nitrite may easily be swept up in the event of a spill. Sodium nitrite is mixed with water in small quantities within the Orica compound to create the ‘gasser solution’. This process is supervised at all times by trained operators due to the physical risk of explosion. The mixed solution is transferred to a bunded 1 m^3 IBC. It is transferred into specially-designed vehicles for transport underground to its point of use.
Relevant Hazardous Substance Screening	Sodium nitrite is stored in solid form in a container, where it is protected from leaching caused by rainfall. It is mixed in small quantities only and the resulting solution is stored in a bunded IBC. Due to the precautions in place due to the nature of Sodium nitrite as an explosive sensitiser and due to the limited quantities prepared at any time, Sodium nitrite has been ruled out as a Relevant Hazardous Substance.

4.14 Waste Oil

Table 14. Waste Oil

Annual Usage	Approximately 133,080 litres a year.
Storage Location	Waste oil is stored in a dedicated storage tank on site.
Description of Use	Waste oil is removed from plant and vehicles when required and stored in a bulk AST prior to collection by a waste contractor for off-site disposal.
Deliveries and Collections	Waste oil is collected from maintenance areas when required and unloaded into a dedicated bunded unloading area. Waste oil gathers in a sump in the bunded unloading area, from where it is pumped to the waste oil storage tank. Where required, the waste oil tank is emptied by a tanker.
Control Measures in Place	The tank farm is suitably bunded, providing secondary containment. A preventative maintenance program is in place for the waste oil tank, pipework and bund, and each are visually inspected by shift personnel during routine plant walkdowns. Cracks were noted in the blockwork wall around the unloading area, which could lead to waste oil reaching unsurfaced ground around the storage area during unloading. The bunded area is surrounded by areas of unsurfaced ground. In the event of a spill during loading or unloading or a release from secondary containment, waste oil may contaminate soil or groundwater. Escape through the cracks in the wall surrounding the unloading area may result in localised areas of ground contamination.
Relevant Hazardous Substance Screening	Due to the significant quantities of waste oil stored and due to the observed condition of the waste oil unloading area, waste oil is considered a Relevant Hazardous Substance.

4.15 Zinc Concentrate

Table 15. Zinc Concentrate

Annual Usage	Zinc concentrate is produced on site.
Storage Location	Stored in the concentrate storage shed, a bunded enclosed building.
Description of Use	Zinc concentrate is a final product produced on site.
Deliveries and Collections	Zinc concentrate is produced from a naturally occurring substance mined at the site. Once extracted it is stored in solid form in a bunded, weatherproof storage building preventing leaching. It is collected from site by train. It is placed in sealed containers and transported to Dublin port, from where it is transported overseas for further processing.
Control Measures in Place	Zinc ore is crushed underground and transported to the surface for further processing. It is milled in the Mill Building and undergoes various processing stages to extract the zinc as a concentrate. During the extraction process milled ore is mixed with water and various chemicals are added to extract the zinc. The majority of the extraction process takes place within the Mill Building. The basement of the Mill Building is bunded providing 700 m^3 storage capacity, significantly more than the capacity of the largest tank. However, two zinc thickener tanks TK-14 and TK-15, with a capacity of 3,960 m^3 and 700 m^3, respectively, are located outside of the Mill Building. These tanks are surrounded by drains which lead back to the Mill Building in the event of a minor leak or spill. To date, there have been no losses from these tanks. Zinc in these tanks are at low concentrations. The tanks are included in a preventative maintenance schedule which include weekly walkdowns. The tanks are emptied annually during the site shut down and the interior is visually inspected. The site tanks also undergo non-destructive thickness testing as per the EPA Guidance Document on the storage and transport of hazardous materials.
Relevant Hazardous Substance Screening	Zinc concentrate is a naturally occurring substance mined at the site. Once extracted it is stored in solid form in a bunded, weatherproof storage building preventing leaching. However due to the significant quantity of zinc processed on site it is considered a Relevant Hazardous Substance, although it should be noted that zinc is naturally-occurring in groundwater bearing, mineralised bedrock beneath the site.

4.16 Zinc Sulphate

Table 16. Zinc Sulphate

Annual Usage	Approximately 58,000 kg.
Storage Location	Zinc sulphate is stored in solid crystal form in FIBCs stored within the Mill Building and in a 19.4 m^3 tank when mixed as a 9.1 wt% solution.

Description of Use	Zinc sulphate is used to suppress zinc during the lead floatation phase of concentrate extraction.
Deliveries and Collections	Zinc sulphate is delivered to site in double skinned FIBCs by truck and unloaded by forklift.
Control Measures in Place	Zinc sulphate is stored as a solid indoors on hard standing, where it is protected from leaching. Prior to use, zinc sulphate FIBCs are placed on a bag splitter/hopper and deposited into a mixing tank, where it is mixed with water to produce a 9.1 wt% solution and gravity fed to a storage tank beneath the mixing tank. Both the mixing tank and storage tank are fitted with ultrasonic level sensors which are used to prevent an overflow. Up to 19.4 m^3 of zinc sulphate solution can be stored at any one time. The zinc sulphate solution is pumped to its point of use through a solid HDPE pipe with no joints to the distribution room. If pressure in pipe in the distribution room drops below a set point, the pumps will shut down on interlock. The mixing tank, holding tank, pipework and points of use are all located within the bunded Mill Building. The Mill building basement is bunded providing 700 m^3 bund capacity.
Relevant Hazardous Substance Screening	Due to the automated control measures in place, suitable storage facilities and the provision of secondary containment, it is considered that the likelihood of a loss of zinc sulphate impacting soil or groundwater is very low and it has been ruled out as a Relevant Hazardous Substance.

4.17 Tailings

Coarse mine tailings are dewatered and retained on site for use during underground backfilling operations.

Fine fraction tailings are referred to as the ‘slime fraction’ and are generated following the extraction of lead and zinc concentrate during the milling process. Fine fraction tailings are stored at the Tailings Storage Facility (TSF).

An assessment to see if the TSF posed a major hazard (as defined by EU Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances) was conducted in 2013 (2013 GES document). This document concluded that the materials deposited at the TSF are not considered Dangerous Substances as defined in Annex 1 of EU Directive 2012/18/EU and primarily consist of limestone with limited quantities of residual lead and zinc sulphide concentrations.

A detailed waste classification conducted in 2015, including analysis by x-ray diffraction and chemometric identification of substrates and element distribution, concluded that more than 99 % of the tailings were comprised of naturally-occurring species derived from limestone and contained less than 0.5 % lead and zinc ore.

This waste classification assigned the fine tailings stored at the TMF a European Waste Catalogue Code of 01 03 06 (tailings other than those above (non-hazardous)). Therefore, these tailings have not been brought forward as a Relevant Hazardous Substance.

4.18 Other Waste Materials

Small quantities of other hazardous wastes are generated on site. These wastes are stored in a designated bunded compound and yard prior to collection. All waste is suitably stored, held in small quantities and is collected at regular intervals by a licenced waste contractor, therefore these waste materials are not considered to be Relevant Hazardous Substances in terms of potential loss to ground.

4.19 Summary

The following relevant hazardous substances were identified following Stage 3:

- Diesel
- Kerosene
- Lead Concentrate
- Waste Oil
- Zinc Concentrate

In addition, PFAS has been identified as a potential Relevant Hazardous Substance in the firefighting training area only, as its historic use underground and at the fire training area cannot be discounted.

All other substances were ruled out as Relevant Hazardous Substances, as it was deemed that, based on the handling and storage practices on site, the potential release of those substances in sufficient quantities to pose a pollution risk was deemed very low.

5. Site History (Stage 4)

5.1 Site Development

The area occupied by the current Tara Mines processing facility site and TSF were greenfield until the lead-zinc orebody was discovered in 1970 by Northgate Exploration.

Development on the site started in 1973 and the site entered production in 1977. The site has operated continuously since 1977, with the exception of between 2001 and 2003 where production stopped due to a decrease in ore prices. The equipment and methods used on site have modernised over time, including the changing from thermal drying of concentrate to the use of a filter press system, installation of a new autogenous grinding mill in 2009, changes in processes and improvements to the fuel tank storage farm.

The underground mine itself has undergone recent extensions, including an extension into the Nevinstown orebody in early 2004 and a southwest extension in late 2004. A further extension towards the Liscartan and Rathaldron orebody was approved in 2012.

The site itself was originally located in a rural area west of Navan, however Navan town has grown since the site was originally developed. The Navan Retail Park was constructed in 2009 immediately to the south of the site. The N51, running north-east south-west and located to the east and south of the site, was built in 2009 and the M3 was opened in 2010 to the west of the site.

Information pertaining to the history of the site and the surrounding area was obtained from a review of historical Ordnance Survey maps and aerial photographs available online. The findings are summarised in Table 17 below:

Table 17. Historical Maps and Aerial Photography

Date	Description
Online Map: 6-inch 1888-1913	From a review of the historic 6-inch map series, the site and its surrounding area appear to have been predominantly undeveloped and utilised for agricultural purposes with some small dwellings. A gravel pit is located where the main processing site will later be developed. A trainline runs through the future processing site.
Online Map: 6-inch 1888-1913	The 25-inch map indicates little change from the previous map, with the processing site primarily occupied by agricultural fields.
Aerial Photograph Geohive 1995	The Tara Mines processing facility has been developed and is similar to its current layout. The processing building and water management system can clearly be seen. The railway line visible in earlier maps now terminates at the processing facility. The TSF is visible at Randalstown. The surrounding area is predominantly undeveloped agricultural land, however Navan town has expanded to the east. Developments have extended as far as the processing facility's eastern boundary.
Aerial Photograph Geohive and Google Earth 2000 - 2020	The site underwent numerous minor changes between 2000 and 2020. The most significant changes are: • A roof was placed over the waste oil storage tank between July 2008 and March 2010. • Three bulk storage tanks located across the railroad from the concentrate store were removed between 2010 and 2013. • The building containing the autogenous mill first appears in an aerial photograph in March 2010. • The current xanthates store was constructed between July 2013 and July 2016. • The current fuel tank farm is shown to be under construction in May 2017 and appears to be completed by May 2018. • Construction to extend the TSF to the north is ongoing.

5.2 Current Site Layout

The Boliden Tara Mines site can be divided into three distinct areas, the underground mine, the production site and the TSF.

5.2.1 Underground Mine

The underground mine is accessible through the main processing site and covers a large geographic area.

Long hole open stoping with backfill is the primary mining method used on site, with room and pillar methods used in thinner orebody areas. Ore is extracted by blasting underground. The broken ore is then transported

underground to one of five underground crushers. Here, rock is reduced in size to less than 150 mm before being hoisted to the surface for further processing.

When required, areas of the underground mine are backfilled. Coarse sandy tailings, cement and water are mixed to produce concrete used to backfill the voids.

Storage of Relevant Hazardous Substances in the underground mine is limited to:

- Small quantities of maintenance chemicals, oils and greases in small containers stored in bunds;
- Diesel stored in bunded tanks and in plant and machinery; and
- Mixed ammonium nitrate and 'gasser' solution at its point of use as blasting substance.

Any significant losses of Relevant Hazardous Substances in the underground mine would enter the mine's water management system and would be pumped to the surface, where it would be quickly identified.

5.2.2 Processing Site

The processing site is located in Knockumber, Co. Meath. The production site consist of the Mill, storage facilities, the water management system and ancillary services.

5.2.2.1 Surface Ore Storage

Coarse ore transported from the underground pine is stored in an ore storage structure referred to as 'the Tee-pee' near the centre of the site, from there it is taken to the Mill Building for processing.

5.2.2.2 Mill Building

The Mill Building is the primary production building on site and consists of ore processing areas, chemical storage, mixing areas and control areas.

Coarse ore first passes through an autogenous mill which reduces the ore to a fine powder. This powder is mixed with water and pumped as a slurry to the Mill Building. In the Mill Building the ore slurry is mixed with water during the floatation process. During flotation, the diluted slurry enters a series of aerated cells. These aeration cells are divided into two circuits, one for the collection of lead and a second for the collection of zinc. Chemicals are added to these cells to selectively promote the collection of lead or zinc, while depressing unwanted minerals. The lead or zinc floats to the surface during collection as froth and is collected and transferred to a dewatering circuit.

During dewatering the solutions containing lead or zinc are thickened and dewatered. Once lead and zinc concentrate has been removed during floatation, the tailing enter a cyclone filter to separate coarse tailings, which are used during backfilling, and finer material which is transferred to the TMF.

The Mill building as a whole is bunded and contains storage and mixing facilities for the majority of the chemicals required during the floatation stage, including hazardous substances. These chemicals are mixed within the building before being distributed to the floatation circuits. Sodium cyanide is stored and mixed in a separate building, due to the health risk posed by cyanide. Xanthates are also stored in a separate building prior to mixing.

5.2.2.3 Concentrate Stores

The concentrate stores are used to hold lead and zinc concentrate in solid form following dewatering and prior to transportation off site by train. The concentrate stores are under negative pressure and vehicles entering the stores, including trains are washed prior to departure. Lead and zinc are considered as Relevant Hazardous Substances.

5.2.2.4 Surface Stores and Compound

The surface stores and compound is a secured area of the site containing a range of items. Small containers of hazardous substances such as maintenance chemicals, oils and greases and cleaning materials are stored in bunded areas within this compound.

5.2.2.5 Fuel Tank Farm

The fuel tank farm is located near the centre of the site and consists of five double skinned tanks and associated dispensing points and transfer pipework, pumps and equipment. The tanks are:

- 70,000L ultra low sulphur diesel tank;
- 53,000L tank divided into hydraulic oil, engine oil and kerosene;

- 9,000L road diesel tank;
- 9,000L waste oil tank; and
- 9,000L unused AdBlue tank/

The dispensing pumps are located on an area of hardstanding which drains to an oil water interceptor on the site's main drainage system.

Diesel and kerosene are stored at the fuel tank farm, which were identified as Relevant Hazardous Substances.

5.2.2.6 Orica Compound

The Orica Compound is a secure contractor's compound located on site and operated by the explosives and blasting contractor Orica.

Orica store and prepare ammonium nitrate and 'gasser' solution (Sodium nitrite) for blasting underground. The Orica compound consists of three ASTs containing ammonium nitrate (which are separated by blast walls), a storage container for sodium nitrite, a mixing area and offices. Sodium nitrite is considered hazardous, but is not defined as a Relevant Hazardous Substances due to the high standard of care by which it is handled on site.

5.2.2.7 Shotcrete Batching Plant

The shotcrete batching plant is used to prepare shotcrete for use underground. No Relevant Hazardous Substances were identified in this area of the site.

5.2.2.8 Firefighting Training Facility

The firefighting training facility is located to the west of the site. It is primarily used to test firefighting equipment and conduct training drills. Although no Relevant Hazardous Substances are currently stored at this location, the historic use of PFAS-containing AFFF during training drills cannot be discounted.

5.2.2.9 Former Landfill

A former landfill area is located to the west of the site. The landfill is divided into two separate areas; the southern area, which contains mined rock waste only, and the northern area, which contains a variety of industrial wastes including large scale plant and machinery, sludges, steel barrels containing oils and greases, rubber, plastic, fabric and ceramics in a layer that varies between 0.5 m and 4.0 m in thickness.

Further information on the former landfill can be found in Section 6.7.6.

5.2.2.10 Other Facilities

Other facilitates on site include several contractors' compounds, administration buildings, stores, water management systems, transformers, laydown areas and a laboratory.

5.2.3 Tailing Management Facility

The Tailings Management Facility (TMF) is located at Randalstown, Co. Meath, approximately 2.5 km north of the mine and processing site. The TMF is used as a settlement area for the fines fraction of tailings following the extraction of lead and zinc concentrate. At the TMF the tailings are allowed to settle, the water is then pumped back to the processing site.

A detailed waste classification conducted in 2015, including analysis by x-ray diffraction and chemometric Identification of Substrates and Element Distribution, concluded that more than 99 % of the tailings were comprised of naturally-occurring species derived from limestone and contained less than 0.5 % lead and zinc ore. The tailings stored at the TMF were classified as non-hazardous.

No other hazardous materials are stored or used in this area and therefore the TMF has not been considered further as part of this assessment.

5.3 Historic Incidents

There are no reports of historic losses of hazardous substances outside of secondary containment. Losses from process equipment into secondary containment were historically reported within the Mill Building. These were not recorded, as there was no loss to the external environment, prior to 2017, however changes to incident reporting procedures mean they are now recorded.

A loss of sodium cyanide to secondary containment was reported in February 2017 due to a partly open drain valve. The issue was identified because an atypical sump pump operation was noted on the site's SCADA

system. Following the incident, a lock was fitted to the valve and the cyanide control logic was updated to detect leaks. The cyanide mixing standard operating procedure was also updated.

5.4 Historic Investigations

Previous investigations have been conducted in the landfill area of the site. A summary of historic reports completed between 1999 and 2015 was provided in the 2015 Hydrogeological Risk Assessment report.

5.4.1 1999 Hydrogeological Investigation – K. T. Cullen

This report[6] was prepared to assess groundwater flow direction in the landfill. 4 No. trial pits and 6 No. boreholes were completed as part of this investigation. The investigation concluded that groundwater flow is downward towards the bedrock aquifer and that flow direction in the bedrock is towards the mine dewatering pumps, providing hydraulic containment of groundwater beneath the site.

Elevated minerals and metals in groundwater were considered likely to be related to glacial tills, rather than waste materials, however low levels of volatile organic compounds (VOCs) and hydrocarbons were also reported. Low levels of chemical oxygen demand (COD) and biological oxygen demand (BOD) indicated that putrescible waste may be present, however, no significant levels of landfill gas was detected. The report recommended:

- Limiting waste disposal to the on-site landfill to non-putrescible waste and non-hazardous waste only;
- Implementing capping of completed sections of the landfill; and
- Conducting two years of biannual groundwater monitoring

5.4.2 2002 Land Contamination Assessment – Knight Piesold Ltd

This assessment[7] was completed to assess the level of ground contamination across the entire Tara Mines processing site to inform the site's closure and perpetual aftercare costs.

33 no. window sampling boreholes and 8 No. trial pts were completed as part of this investigation. Gas vapour wells were also installed in the landfill area. A summary of results from the landfill area only was provided in the 2015 report. Grease and a hydrocarbon odour were encountered in a trial pit to the northwest of the landfill at the former barrel recycling area. Elevated metals and TPHs were also reported. Low levels of landfill gas were reported, however elevated methane was reported in the silt disposal area.

The report concluded that the site as a whole would be suitable for continued industrial/commercial use if hard standing was placed over the areas where high metal concentrations were reported, to break the potential pollutant linkage.

5.4.3 2002 Landfill Operation Plan – White Young Green (WYG)

The WYG[8] Landfill Operation Plan divided the landfill into five waste recovery areas for the disposal of metal, wood, waste oil, barrels (metal and plastic), rubber and plastic pipe. At that time decommissioned vehicles and plant were stored in the landfill, so WYG recommended draining oils and fluids from these vehicles prior to storage.

WYG recommended additional landfill management and environmental protection measures and prepared the site's initial after care management plan.

5.4.4 2011 Environmental Assessment Report – WYG

This report[9] consisted of a review of surface water and groundwater data collected between 1998 and 2010. This report identified impact to the culverted on site stream from the landfill. The report recommended additional sampling be completed and that waste material within the landfill should be delineated.

[6] KT Cullen & Co Ltd (March 1999), Hydrogeological Investigation of Tara Mines Landfill, Navan, Co. Meath
[7] Knight Piesold Ltd (Nov 2002), Land Contamination Assessment, Tara Mines Ltd, Navan, Co Meath.
[8] WYG (2002) Tara Mines Ltd Landfill Operational Plan
[9] WYG Environmental (Ire) Ltd (Feb 2011) Environmental Assessment Report at the Landfill Area

5.4.5 2011 Outline Options for Landfill Remediation – WYG

This report[10] outlined three remediation options for the landfill. These were:

- In-situ waste management, including hotspot removal, landfill capping, landfill gas venting and culvert sealing or stream diversion;
- Waste removal, segregation of hazardous material and off-site disposal of segregated material only; and
- Excavation and removal of all wastes off site.

5.4.6 2011 Remediation of Hydrocarbon Contamination of Soil, Options Appraisal – WYG

This report[11] lists generic remediation strategies suitable for hydrocarbon treatment. It does not provide specific information or recommendations on the Boliden Tara Mines site.

5.4.7 2014 Landfill Preliminary Risk assessment – PM Group

This assessment[12] was completed to inform the site's landfill closure plan. Following an assessment of existing soil and groundwater data, an updated CSM was produced. PM Group recommended that a detailed site investigation be completed.

5.4.8 2015 Hydrogeological Risk Screening Report – JS Drilling

A hydrogeological risk screening report[13] was prepared in 2015. This report included a summary of historic reports and presents the landfill preliminary CSM. The report recommended completing a detailed site assessment and a remediation options appraisal and developing a remediation strategy.

5.4.9 2015 Phase 1 Tier 2 Detailed Site Assessment (DSA) – JS Drilling

A DSA[14] was completed in 2015 in the landfill area. As part of this a site investigation consisting of 3 No. overburden dual well installations, 1 No. deeper bedrock well, 28 no. shallow window sample locations and 37 No. trial pits were completed. A description of the site investigation is provided in Section 7.3.

The assessment concluded that the landfill contained 54,000 m^3 of rock fill and 29,150 m^3 of industrial waste material, including plastics, fibre glass, fabric, metals, ceramics, wood, steel and barrels. No indications of municipal or organic waste was uncovered.

5.4.10 2016 Detailed Quantitative Risk Assessment (DQRA) – CHC Environmental Solutions

A DQRA[15] was completed in 2016 based on the results of the 2015 DSA supplemented by an additional three rounds of groundwater monitoring and two rounds of surface water monitoring.

The 2016 DQRA concluded that:

- Shallow groundwater is a perched aquifer and isolated from the bedrock aquifer due to dewatering in the underground mine.
- The waste material is not in contact with bedrock, however it is in contact with perched water
- A disused culvert passing through/close to the landfill could act as a pathway to surface water and should be decommissioned.
- There is an insignificant risk to human health
- There is a low risk of landfill gas to human health

[10] WYG Environmental (Ire) Ltd (2011) Outline Options for Landfill Remediation
[11] WYG Ireland (2011) Remediation of Hydrocarbon Contamination of Soil, Options Appraisal
[12] PM Group (2014) Landfill Preliminary Risk Assessment
[13] JS Drilling (2015) Hydrogeological Risk Screening Report for the Tara Mine Landfill Site, reference JS 003.IR.01 issue 4
[14] JS Remediation, 2015: Detailed Site Assessment Report for the Environmental Protection Agency, licence reference IPPCL P0 516-03, report reference JS 003, dated October 2015
[15] CHC Environmental Solutions, 2016: Quantitative Risk Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.01.2, dated April 2016

- Waste material and leachate pose a risk to controlled waters.

The conceptual site model (CSM) risk assessment prepared as part of this DQRA is presented in Section 8.4.1.

Iron nickel and zinc concentrations in groundwater were found to pose a risk to surface water receptors, and elevated aluminium, arsenic, cadmium, chromium, iron, lead, nickel, and zinc concentrations in groundwater were found to pose a risk to groundwater resources.

The DQRA recommended that remedial action in the landfill area and that additional monitoring and risk assessment be completed following reflooding of the mine working following the completion of mining activities. The DQRA also recommends further ground gas monitoring be completed.

5.4.11 Other Reports

A landfill corrective action feasibility & design report was completed in 2016.

A landfill restoration plan was prepared in 2021 and submitted to the EPA.

The conclusions of both these reports can be found in Section 6.7.6.

6. Environmental Setting (Stage 5)

6.1 Site Setting and Topography

Boliden Tara Mines comprises approximately 50 hectares on Knockumber Road in Co. Meath, approximately 2 km west of Navan, see Appendix A Figure 1. The TSF is located approximately 2.5 km to the north of the main site facility and covers over 200 hectares.

The area around the site has generally flat topography, with gently undulating farmland. The main site is at an elevation of 50m above Ordnance Datum (a OD).

Land use in the vicinity of the site is mixed residential, commercial and agricultural, as summarised below:

- North – The R147 and residential properties are located directly to the north of the processing site. The River Blackwater is located 300m to the north of the site. Land use beyond the River Blackwater is primarily agricultural. The TSF is located further to the north, approx. 2.5km from the site.
- East – The town of Navan lies to the east of the site, and consists of a mixture of commercial and residential buildings. The N51 road runs north-east south-west along the eastern site boundary.
- South – Navan Retail Park is located 100m to the south-east of the site, with agricultural land to the south-west. The N51 is situated approximately 500m to the south of the main site.
- West – Agricultural land with a number of one off residential dwellings are located to the west of the site with the M3 motorway road located approximately 1.7 km to the west.

The TSF is surrounded by agricultural land with individual dwellings.

6.2 Hydrology

The site is located in the Boyne_SC_100 surface water sub catchment (Water Framework Directive (WFD) sub-catchment ID 07_18), which forms part of the Boyne Hydrometric Area [16].

An unnamed stream flows through the site and enters the River Blackwater 0.2 km north of the site. The unnamed stream and River Blackwater are considered part of the Backwater (Kells)_120 surface water body (IE_EA_07B011800). Under the WFD the Backwater (Kells)_120 surface water body has been classified as *Poor* status under the most recent data set (2013 – 2018 data)[17] due to poor invertebrate status or potential and is considered *At Risk* of failing to achieve Good status by 2027. Agriculture has been identified as a significant pressure on this surface water body. Extractive industries, such as the Boliden site, have not been identified as a pressure on surface water quality in the surface water body.

The Backwater (Kells)_120 waterbody is defined as a drinking water body in accordance with European Communities (Drinking Water) (No. 2) Regulations 2007 (SI No. 278/2007). However it should be noted that the water abstraction point is located at Liscarton, upgradient of the Boliden site.

A second culverted stream flows northward beneath the western part of the site through the historic landfill and as is captured within the sites water management system.

The River Blackwater in turn flows into the River Boyne at a point approximately 1.5 km east of the site. The) quality status and risk status under the WFD for this section of the River Boyne (Boyne_140, code IE_EA_07B041900 are currently under review.

AECOM reviewed the OPW (Office of Public Works) flood mapping system for a record of previous flooding events on the site. According to the OPW, the site has less than 0.1% annual exceedance probability of flooding. Fluvial flooding occurs at off-site locations to the north of the site.

6.3 Geology

Geological Survey of Ireland (GSI) data[18] indicate that the bedrock geology underlying the site consists of limestone and shale of the Lucan Formation. Four fault lines traverse the site, two run north-east south-west in

[16] www.epa.ie – accessed 18 November 2021
[17] https://gis.epa.ie/EPAMaps/- Accessed 10 February 2022
[18] www.gsi.ie – accessed 18 November 2021

orientation on the eastern side of the site and two run east west to the west of the site. A section of the water management system to the east of the site is underlain by coarse to fine grained tuff of the Brittstown Formation

According to the GSI, subsoil consists of made ground of industrial origin across the majority of the site, with till derived from limestones surrounding the site. Alluvium is also recorded west of the site along the former route of the diverted stream. The Teagasc soil map (created by Teagasc in 2006) (available on the GSI website) describes the topsoil across site as made ground.

Previous investigations indicate that the overburden is up to 10 m in thickness and consists primarily of boulder clay. Gravel fill has also been used on site.

6.4 Hydrogeology

According to the GSI website, the bedrock aquifer beneath the processing site is classified as a "Locally Important Aquifer – Bedrock which is Generally Moderately Productive". The GSI's classification of vulnerability of the underlying aquifer is "Moderate" vulnerability.

The groundwater body (GWB) at the site is the Trim GWB (IE_EA_G_002) classed as a productive fissured bedrock aquifer.

Under normal conditions groundwater is likely to flow north towards the River Blackwater, however dewatering as part of mine activities is likely to have depressed the water table and altered groundwater flow direction.

6.4.1 Wells and Springs

A series of 19 groundwater monitoring wells have been installed across the main processing site; 10 of which have been installed in overburden deposits, while an additional 9 have been installed in bedrock. It is understood that 3 dual installation overburden monitoring wells and a bedrock well were installed within the landfill area as part of 2015 landfill DSA.

A search of the GSI well database identified one borehole and one dug well within 1 km of the site. There are no inner or outer source protection zones for public water supplies currently identified in the vicinity of the site.

The borehole (GSI reference: 2625NEW046) is located 0.7 km to the west of the site and drilled to a depth of 49.2m. The use of the borehole is Domestic use only and it is recorded as having a "Good" yield. One dug well (GSI reference: 2625NEW103) is located 0.3 km to the south of the site and is drilled to a depth of 6.4m, it is listed as a hand pumped public supply well, which is likely no longer on use.

No other known wells are recorded in the GSI database within a 1 km radius of the processing site. It should be noted that there is neither a permitting system to govern well drilling nor any requirement to register wells which abstract less than 25 m^3 a day in Ireland; therefore, the well records in the GSI well database may not be complete.

There are no drinking water supply source protection areas mapped within a 5 km radius of the site.

6.5 Biodiversity

Special Areas of Conservation (SAC) are habitats and species which must be protected under the Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna).

Special Protection Areas (SPA) are designated under the Birds Directive (Council Directive 2009/147/EC on the Conservation of Wild Birds) to protect a range of bird populations.

Together, SAC and SPA form a pan-European network of so-called *European sites* for nature conservation (also known as Natura 2000 sites).

Two European site has been identified to the north of the site[19]:

- River Boyne and River Blackwater SAC (code 002299)
- River Boyne and River Blackwater SPA (code 004232)

The SAC and SPA overlap and are located within 100 m of the processing site's northern site boundary.

[19] https://gis.epa.ie/EPAMaps/ - Accessed 18 November 2021

6.6 Water Management

6.6.1 Main Site Water Management System

Surface water, production water and water generated in the underground mine are integrated to form the site's main site water management system.

Water on site is recirculated and reused where possible. However, the volume of water generated exceeds usage. Excess water is discharged the River Boyne through licenced emissions point SW1.

6.6.1.1 Underground Water Management

There are three sources of water underground:

- Natural groundwater entering the mine
- Service water used during mining
- Water used as a transport medium during backfilling operations.

Water generated underground drains via a series of gullies to a central settling sump, where suspended solids settle out before the water passes through an additional filtration system. Water is then pumped to the surface minewater pond, which forms part of the surface water management system.

6.6.1.2 Surface Water Management

The surface water management system consists of a series of ponds used to store water from various sources on site and to allow sediment to settle out prior to reuse or discharge. The flow between each pond can be controlled and diverted if necessary. The primary ponds used as part of the Surface Water Management System are

Table 18. Main Surface Water Management System

Pond	Purpose
Off-site TSF	Primary settlement pond for 'slime fraction' tailings following lead and zinc concentrate removal in the Mill Building.
Mine Water Pond	Further settlement pond for water pumped from the underground mine. Pumped to the Reclaim Ponds through controlled overflow.
Site Drainage Pond (Comp House Pond)	Collects storm water from the site and allows for settlement. This pond also acts as an oil water separator. Discharges to the Main Site Drainage Pond.
Main Site Drainage Pond	This pond provides further settlement for storm water and also provides firewater retention capacity. Water is pumped from here to the Reclaim Ponds.
Reclaim Ponds 1&2	Receive water from all previous ponds for settlement prior to controlled overflow to the Clear Water Pond.
Clear Water Pond	Final pond, flow from this pond to SW1 is controlled to maintain discharge within IE Licenced limits.

A portion of the process water generated on site is treated with ferric sulphate and flocculants to remove antimony. The treated water then passes through lamella filters.

Discharge from the Clear Water Pond via SW1 to the River Boyne is continuously monitored for suspended solids, pH, dissolved oxygen, temperature and flow. The system will shut down preventing discharge if there are any deviations outside of setpoints. An automated hydrometric gauging station in the River Boyne records real time water flow to ensure there is a dilution factor of at least 100:1 available in the River Boyne. An automated valve to the Clear Water Pond may also be closed in the event that contamination is identified in earlier ponds, preventing potential contamination entering the River Boyne.

6.6.2 Nevinstown Groundwater Discharge System

Groundwater collected from the Nevinstown mine area has minimal contact with the orebody and is therefore not considered as process water. Groundwater in this section of the mine is collected in underground reservoir and is discharged through dedicated discharge point SW2 to the River Blackwater.

Discharge to the River Blackwater is continuously monitored for pH, temperature and flow. The system will shut down, preventing discharge, if there are any deviations outside of setpoints.. An automated valve may also be

closed in the event that contamination is identified preventing potential contamination entering the River Blackwater.

6.7 Hazardous Material and Waste Storage

6.7.1 Hazardous Materials Storage

6.7.1.1 Fuel Storage

Fuels consisting of diesel and kerosene are stored in double skinned tanks, primarily at the site's main fuel tank farm, however ten smaller kerosene tanks are also located across the site at contractor's compounds and other locations.

6.7.1.2 Lead and Zinc Concentrate Store

Lead and zinc concentrate is extracted from ore on site in the Mill Building. The Mill Building as a whole is bunded, however lead and zinc thickening tanks are located outside of the bunded area and contain fluids containing lead and zinc at low concentrations.

The Mill Building tanks, including the thickening tanks, are partially visually inspected daily, drained annually and visually inspected and undergo non-destructive testing every 10 years in accordance with the EPA Guidance Document on the Storage and Transfer of Materials. Tank levels are also monitored by the site's SCADA system, which will alert operators in the event of an unexpected decrease in levels.

Following dewatering, lead and zinc concentrates are stored in a dedicated storage shed on hardstanding prior to transport off site in sealed trains. Equipment and vehicles, including trains used in the concentrate stores, are cleared prior to leaving the stores.

6.7.1.3 Mill Reagent Store

Copper sulphate, Danafloat 507 and zinc sulphate are stored in the reagent store within the bunded Mill Building along with other materials used as part of ore processing. The Mill Building basement is bunded, providing 700 m^3 capacity, significantly greater than the capacity of the largest individual storage tanks in the building.

6.7.1.4 Sodium Cyanide Storage

Sodium cyanide is stored in briquette form in double-skinned, environmentally-sealed FIBCs in a dedicated storage building, due to the health risk posed to site staff. Briquettes are mixed with water to produce a 17.2% sodium cyanide solution, which is held in a bunded 4.2 m^3 tank.

6.7.1.5 Xanthates Storage

Xanthates are stored in a separate storage shed outside of the main Mill Building, due to the fire risk posed by the substances. Xanthates are mixed with water to produce a 16.3% SPIX solution, which is stored in a 38.9 m^3 tank, and PAX solution, which is stored in a 19.4 m^3 tank within the bunded Mill Building.

6.7.1.6 Non-Bulk Hazardous Materials Storage

Hazardous materials are stored on site in accordance with the terms of the site's IE Licence. Where required, materials are stored in bunds in dedicated storage facilities or near their points of use.

6.7.2 Hazardous Waste

6.7.2.1 Waste Oil

Waste oil is the largest volume of liquid hazardous waste on site. Waste oil is generated by onsite equipment and machinery, generally in limited quantities. Waste oil is collected from above ground generation points and from a dedicated bunded collection point outside of the underground mine entrance for waste oil generated underground. Waste oil generated underground is transported to the surface in individual 25 litre containers.

Waste oil is transported to a dedicated bunded single skin waste oil storage tank. Waste oil is transferred into the tank by releasing it in the unloading area adjacent to the tank. The oil is then pumped from the sump into the tank. The tank is then emptied as required by a licenced waste company.

During the site walkover, the waste oil storage tank and bund appeared to be in good condition, however the wall around the unloading area appeared to be cracked in places and small areas of hydrocarbon staining were visible on the ground outside of the unloading area bund.

6.7.3 Other Hazardous Waste Material

All hazardous waste on site is segregated at source and placed within designated, UN-approved containers. Hazardous wastes are stored at the bunded Hazardous Waste Storage Compound, from where they are removed from the site by a licenced waste contractor.

During the site walkover the Hazardous Waste Storage Compound was observed to be in excellent condition and all waste was clearly labelled.

6.7.4 Bunds

All bunds on site are included in a weekly bund inspection, where they are checked and emptied, if required. All bunds on site are included in the site's preventative maintenance schedule and are integrity tested on a three year rolling schedule.

6.7.5 Tailings Storage Facility

Following extraction of lead and zinc concentrate, larger sand size fractions of the tailings are removed using a cyclone filter for use in backfill within the mine. Smaller fractions, known as 'slime fractions' are deposited at the offsite TSF as an aqueous slurry. The tailings principally consist of milled carbonate rock with limited residual concentrations of lead and zinc and have been classified as non-hazardous. Approximately 1.2 million tonnes of material is deposited annually. Suspended solids are allowed to settle out at the TSF. Clean water is transferred back to the reclaim ponds for reuse or discharge to the River Boyne. The TSF is currently being extended. Following the completion of these works, the TSF will have a capacity of 9,600,000 m^3.

6.7.6 Former Landfill

A historic landfill, used until circa 2005, is located in the west of the main site, covering an area of approximately 8 hectares. It is likely that this landfill has been in use since the initial development of the site in the 1970s. The southern area of the landfill was used to store mined rock waste only, while the northern landfill area was used for sludge disposal, barrel recycling, barrel storage and machinery storage.

The landfill area underwent a detailed site investigation (DSA) in 2015[20] and a detailed qualitive risk assessment (DQRA) in 2016[21], see Section 5.4.

The DSA uncovered mined rock waste only in the southern landfill area. The northern landfill area was found to contain a variety of industrial wastes, including large scale plant and machinery, sludges, steel barrels containing oils and greases, rubber, plastic, fabric and ceramics, in a waste layer that varies between 0.5 m and 4.0 m in thickness.

Previous investigations indicate that the waste material placed in the landfill is not in contact with bedrock, however shallow perched water has been encountered within the waste.

A culvert bisects the northern landfill area. The 2016 DQRA recommended that this culvert is removed and infilled with low permeability material to prevent it acting as a potential contaminant migration pathway. A provision was put in place to divert the stream, if required. At present water from the culvert is captured within the site water management system.

A landfill remediation strategy was prepared in 2016[22]. This report recommended that the landfill undergoes three phases of remediation:

- Phase 1: On-site Waste Management and Source Removal. This stage involves the removal of mine rock waste for reuse as a capping material at the TMF and the segregation of the remaining waste into recyclable materials, hazardous and non-hazardous waste
- Phase 2: A groundwater-focussed monitored natural attenuation program (MNA) following source removal

[20] JS Remediation, 2015: Detailed Site Assessment Report for the Environmental Protection Agency, licence reference IPPCL P0 516-03, report reference JS 003, dated October 2015
[21] CHC Environmental Solutions, 2016: Quantitative Risk Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.01.2, dated April 2016
[22] CHC Environmental Solutions, 2016: Remedial Options Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.02.1, dated April 2016

- Phase 3 (Provisional): Active groundwater remediation. The requirement for this phase will be reviewed following the completion of Phase 2.

A Landfill Restoration and Closure Plan[23] was prepared based on the recommendations of the landfill remediation strategy and was submitted to the EPA in 2021 for approval.

6.8 Loading and Unloading Areas

Lead and zinc concentrates are stored in a dedicated load out building on hardstanding. Concentrates are generally dispatched from site by train. Concentrate is placed into a hopper and is then transported by conveyor to the train. The train wagon is sealed and the train is washed prior to leaving site. Occasionally, the concentrate is transported to Drogheda by road, using covered trucks. The trucks are loaded inside the concentrate store and are washed before leaving the site.

Cleaning products, maintenance chemicals and oils and greases are delivered to site by truck on pallets. They are delivered directly to the above ground store goods inwards, where they are unloaded by forklift or pallet truck. The delivery area is paved and in good condition. It drains to the site's main drainage system.

Diesel and kerosene are delivered to site by tanker when required. The area surrounding the main tank farm drains to an oil: water interceptor and the site's main drainage system, however several tanks are located across site in areas that are likely to drain to open ground.

Sodium nitrite are delivered directly to the Orica Compound by pallet and unloaded on an area of hard standing.

Hazardous materials used in the Mill Building and at the nearby cyanide and xanthates store are delivered directly to their storage areas by truck and unloaded by forklift.

6.9 Permitted Activities

The site is licensed for Classes 1.3 (a) of listed activities under section 90(2) of the EPA Act 1992 (as amended) defined as requiring an IE Licence:

> *1.3 The extraction and processing (including size reduction, grading and heating) of minerals within the Minerals Development Acts 1940 to 1999, where an activity involves –*
>
> *(a) a metalliferous operation, or –*
>
> *(b) any other operation where either the level of extraction or processed minerals is greater than 200,000 tonnes per annum or the total operational yield is greater than 1,000,000 tonnes, and storage of related mineral waste:*
>
> *11.1 The recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence is under the said Part is or will be required;*
>
> *11.5 Landfills, within the meaning of section 5 (amended by Regulation 11(1) of the Waste Management (Certification of Historic Unlicenced Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008)) of the Act of 1996, receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25,000 tonnes, other than landfills of inert waste*

[23] Boliden Tara Mines, 2021: Landfill Restoration & Closure Plan, 2021

7. Site Investigation (Stage 7)

7.1 Introduction

AECOM reviewed all available soil and groundwater data from recent site investigations. Boliden proactively samples on site wells for a range of parameters, including the Relevant Hazardous Substances. A review of existing groundwater data is provided in Section 7.2.

In addition, the historic landfill area of the site has undergone numerous site investigations, including a DSA in 2015 and a DQRA in 2016, which also included consideration of all Relevant Hazardous Substances. The results of these previous landfill assessments have been summarised in Section 7.3.

A site investigation was conducted by AECOM in 2022 to close data gaps identified in the existing site investigation dataset. This 2022 investigation consisted of a combined targeted and non-targeted site-wide shallow soil investigation for Relevant Hazardous Substances.

In addition, although PFAS is no longer in use on site, groundwater sampling was conducted in 2022 at existing wells located near the firefighting training area, where PFAS-containing AFFF may potentially have been used in the past.

A surface water sample was taken from the outlet from the site's Clear Water Pond (the final pond on the site water treatment system). Water from the underground mine is pumped to the site's main water management system and passes through the Clear Water Pond prior to discharge. Water in the discharge point from this pond was tested for Relevant Hazardous Substances and for PFAS.

The site investigation summary can be found in Section 7.4.

7.2 2021 - 2022 Boliden Groundwater Sampling

7.2.1 Introduction

Boliden have developed a network of 19 groundwater monitoring wells across the processing site.

Monitoring wells are screened at various depths, with the majority of wells installed in pairs into both bedrock and overburden aquifers (i.e. bedrock (BR) and overburden (OB)). At present there are 10 wells located in overburden deposits and 9 in bedrock.

Groundwater monitoring in the processing site is not required under the terms of the site's IE Licence, however Boliden regularly conduct proactive groundwater sampling for a range of relevant parameters. Two sampling events were completed in 2021, one sampling event has been completed to date in 2022.

7.2.2 Sampling Methodology

Prior to routine groundwater purging and sampling, a water level measurement ('dip') round from all on-site monitoring wells is completed by Boliden personnel using an interface probe. An interface probe is capable of discerning between non-aqueous phase liquids (NAPLs, such as hydrocarbons) and water. The interface probe is used not only to measure the depth to groundwater but also to measure the total well depth, so that wells could be assessed for the potential presence of light (floating) and dense (sinking) NAPLs.

Shallow wells were sampled by Boliden using a peristaltic pump using a 'low-flow' method. Deeper bedrock wells were sampled using a submersible pump. Samples were collected directly in laboratory-supplied bottles. Samples for metal analysis are not filtered by Boliden in the field.

7.2.3 2021 and 2022 Groundwater Analytical Results

Boliden Mines personnel conducted two groundwater monitoring events in 2021 and one in 2022. Sample analysis was conducted by ALS UK, a UKAS accredited laboratory.

Groundwater results for the site are summarised by monitoring round, as follows:

- 2021 Round 1 (03 March 2021)
- 2021 Round 2 (18 August 2021)

- 2022 Round 1 (07 April 2022)

7.2.3.1 Assessment Guidelines

A preliminary assessment of groundwater analytical data was completed by AECOM by comparing the results with a range of Irish generic groundwater assessment criteria, specifically Groundwater Threshold Values (GTVs) and EPA Interim Guideline Values (IGVs):

- The GTVs were developed to give effect to measures needed to achieve the objectives of the Water Framework and Groundwater Directives. They were originally published in January 2010 (Statutory Instrument No. 9 of 2010) and amended in 2016 (SI No. 366 of 2016). Exceedance of a threshold value triggers further investigation to confirm whether the criteria for poor groundwater chemical status are being met.
- IGVs represent negligible groundwater contamination and were published by the EPA in 2003, compiled from a number of existing water quality guidelines in use in Ireland and elsewhere, including existing national environmental quality standards, proposed common indicators for the groundwater directive, drinking water standards and Geological Survey of Ireland trigger values.

Note – separate GTVs and IGVs may have different concentration values for the same substance defined by legislation or by the Irish EPA under different exposure scenarios. These different assessment criteria are shown in the results tables in Appendix C and are referred to in the text as, for example, upper and lower GTVs.

The following additional standards were applied to Relevant Hazardous Substances only.

- DWS (Drinking Water Standards) published in SI No. 122 of 2014, as amended. While groundwater from the monitoring wells sampled is not used for potable supply and it is unlikely that groundwater is abstracted for potable use downgradient of the site, however the River Blackwater is designated as a drinking water supply due to an abstraction point from this river upgradient of the site
- Environmental Quality Standards – Fresh Water

Tabulated groundwater analytical results from 2021 and 2022 are presented in Appendix C Tables 2 - 6.

7.2.3.2 Major Ions

Orthophosphate was not detected in groundwater from any of the wells sampled in 2021, orthophosphate was not included in the 2022 monitoring event.

Total alkalinity, fluoride, total organic carbon, total oxidised nitrogen and chemical oxygen demand were detected in one or more of the three rounds but at concentrations which did not exceed relevant assessment criteria, where defined.

Round 1 2021 (March)

Several major ions exceeded the relevant assessment criteria in Round 1 2021 (March)

MAJOR ION GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 1 2021

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Calcium	165 - 422	N/A	N/A	200	**10/15 samples** SRBR2, SROB2, SROB4, SRBR5, SROB5, SRBR7, SROB7, SROB10, SRBR11, SROB11
Chloride	5.0 – 59.2	24 (Lower GTV)	**6/15 samples** SROB4, SRBR5, SROB5, SRBR8, SROB8, SROB11	30	**5/15 samples** SRBR5, SROB5, SRBR8, SROB8, SROB11

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Sulphate	52 – 758	187.5	**11/15 samples** SROB1, SRBR2, SROB2, SROB4, SRBR5, SROB5, SRBR7, SROB7, SROB10, SRBR11, SROB11	200	**11/15 samples** SROB1, SRBR2, SROB2, SROB4, SRBR5, SROB5, SRBR7, SROB7, SROB10, SRBR11, SROB11

Chloride concentrations were below the upper GTV (187.5 mg/L) in all 15 samples.

Round 2 2021 (August)

The following major ions exceeded relevant assessment criteria in Round 2 2021 (August).

MAJOR ION GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 2 2021

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Calcium	138 - 354	N/A	N/A	200	**8/14 samples** SRBR2, SROB2, SROB4, SROB5, SRBR7, SROB7, SRBR10, SROB11
Chloride	5.6 – 57.9	24 (Lower GTV)	**7/14 samples** SROB2, SROB5, SRBR8, SROB8, SRBR10, SROB10, SROB11	30	**6/14 samples** SROB2, SROB5, SRBR8, SROB8, SRBR10, SROB11
Sulphate	93 – 721	187.5	**10/14 samples** SRBR2, SROB2, SROB4, SROB5, SRBR7, SROB7, SROB8, SRBR10, SROB10, SROB11	200	**9/14 samples** SRBR2, SROB2, SROB4, SROB5, SRBR7, SROB7, SRBR10, SROB10, SROB11
Ammoniacal Nitrogen	<0.41 – 2.0	0.084 (Lower GTV)	**2/14 samples** SROB4, SROB5,	0.03	**2/14 samples** SROB4, SROB5,

Chloride concentrations were below the Upper GTV (187.5 mg/L) in all 15 samples.

Round 1 2022 (April)

The following major ions exceeded relevant assessment criteria in R1 April 2022.

MAJOR ION GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 1 2022

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Calcium	106 – 521	N/A	N/A	200	**9/16 samples** SRBR2, SROB2, SROB4, SRBR5, SROB5, SRBR7, SROB7, SROB9, SROB11

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Chloride	7.2 – 84.1	24 (Lower GTV)	**7/16 samples** SROB2, SRBR5, SROB5, SRBR8, SROB8, SROB10, SROB11	30	**7/16 samples** SROB2, SRBR5, SROB5, SRBR8, SROB8, SROB10, SROB11
Sulphate	62 – 1,190	187.5	**10/16 samples** SRBR2, SROB2, SROB4, SRBR5, SRBR5, SRBR7, SROB7, SROB9, SROB10, SROB11	200	**9/16 samples** SRBR2, SROB2, SROB4, SRBR5, SRBR5, SRBR7, SROB7, SROB9, SROB11
Ammoniacal Nitrogen	<0.41 – 3.8	0.084 (Lower GTV)	**5/16 samples** SROB4, SROB5, SROB7, SROB10, SROB11	0.03	**5/16 samples** SROB4, SROB5, SROB7, SROB10, SROB11

Chloride concentrations were below the Upper GTV (187.5 mg/L) in all 15 samples.

7.2.3.3 Metals

In 2021 and 2022 copper and boron were not detected above assessment criteria at any location during any of the three groundwater monitoring events.

Round 1 2021 (March)

METAL GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 1 2021

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Cadmium	<0.0006 – 0.019	N/A	N/A	0.005	**1/15 samples** SROB4
Iron	<0.23 – 0.55	N/A	N/A	0.2	**1/15 samples** SRBR5
Lead	<0.006 – 0.02	0.0075	**1/15 samples** SROB4	0.01	**1/15 samples** SROB4
Manganese	<0.007 – 1.22	N/A	N/A	50	**11/15 samples** SROB1, SROB2, SRBR2, SROB4, SROB5, SRBR5, SROB7, SRBR7, SRBR8, SROB11, SRBR11
Nickel	<0.003 – 0.062	N/A	N/A	0.02	**2/15 samples** SROB2, SROB4
Zinc	<0.018 – 17.00	0.075	**4/15 samples** SROB2, SROB4, SROB7, SRBR7	0.10	**4/15 samples** SROB2, SROB4, SROB7, SRBR7
Potassium	0.6 – 8.8	N/A	N/A	5	**6/15 samples** SROB5, SRBR5, SROB7, SRBR7, SROB8, SRBR8

Round 2 2021 (August)

The following major ions exceeded relevant assessment criteria in R2 August 2021.

METAL GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 2 2021

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Manganese	<0.007 – 1.180	N/A	N/A	50	**10/14 samples** SROB1, SROB2, SRBR2, SROB4, SROB5, SROB7, SRBR7, SRBR8, SRBR10, SROB11
Nickel	<0.003 – 0.048	N/A	N/A	0.02	**3/14 samples** SROB2, SROB4, SRBR7
Zinc	<0.018 – 12.40	0.075	**4/14 samples** SROB2, SROB4, SROB7, SRBR7	0.10	**3/14 samples** SROB2, SROB4, SROB7
Potassium	0.9 – 9.4	N/A	N/A	5	**6/14 samples** SROB4, SROB5, SROB7, SRBR7, SROB8, SRBR8

Round 1 2022 (April)

The following major ions exceeded relevant assessment criteria in R1 April 2022.

METAL GROUNDWATER RESULTS ABOVE ASSESSMENT CRITERIA – ROUND 1 2022

Parameter	Range (mg/L)	GTV (mg/L)	Samples >GTVs	IGV (mg/L)	Samples >IGVs
Cadmium	<0.006 – 0.014	N/A	N/A	0.005	**2/16 samples** SROB2, SROB4,
Iron	<0.23 – 1.92	N/A	N/A	0.2	**3/16 samples** SROB1, SRBR2, SROB11
Lead	<0.006 – 0.01	0.0075	**1/16 samples** SROB4	0.01	**1/16 samples** SROB4
Manganese	<0.007 – 1.21	N/A	N/A	50	**5/16 samples** SRBR1, SROB1, SRBR2, SROB2, SROB11
Nickel	<0.003 – 0.117	N/A	N/A	0.02	**2/16 samples** SROB2, SROB4
Zinc	<0.018 – 20.80	0.075	**4/16 samples** SROB2, SROB4, SROB7, SRBR7	0.10	**4/16 samples** SROB2, SROB4, SROB7, SRBR7

Potassium	0.5 – 6.9	N/A	N/A	5	**5/16 samples** SRBR1, SROB5, SRBR7, SRBR8, SROB8

In addition, the Relevant Hazardous Substances lead and zinc were compared against relevant DWS and EQS.

Lead was found to exceed the DWS (0.01 mg/L) in groundwater from well SROB4 in March 2021 only. Lead was found to exceed the EQS (mg/L) in groundwater from well SROB4, in the central area of the site, in March 2021 and April 2022. Lead was below detection in all other wells.

Zinc was detected in excess of the DWS (0.075 mg/L) and EQS (0.008 mg/L) in groundwater from upgradient well SROB2 and wells SROB4, SROB7 and SBBR7 in all three monitoring events.

7.2.3.4 Volatile Organic Compounds (VOCs)

VOC analysis was completed during the August 2021 and April 2022 rounds only. Analytical results are presented as Appendix C Table 4.

Toluene was detected marginally above the laboratory method of detection limit (MDL, 1.00 µg/L) at well SROB5 (1.64 µg/L) but did not exceed the GTV (525 µg/L) or the IGV (10 µg/L) in August 2021.

No other VOCs were reported above laboratory MDLs in groundwater from any of the fourteen wells sampled in August 2021.

No VOCs were reported above laboratory MDLs in any of the sixteen wells sampled in April 2022.

7.2.3.5 Semi Volatile Organic Compounds (SVOCs)

SVOC analysis was completed during the August 2021 round and April 2022 rounds only. Analytical results are presented as Appendix C Table 5.

Polycyclic aromatic hydrocarbons (PAHs) were reported in 13 of the 14 samples collected in August 2021.

- The GTV for the sum of six PAHs was exceeded at well SRBR10 only, with a concentration of 1.08 µg/l. The PAH detection at this well was solely due to benzo(k)fluoranthene. This detection exceeded both the GTV for the sum of PAHs and the IGV of 0.05 mg/L.
- Benzo(a)pyrene was detected in groundwater from well SRBR7 only, at a concentration of 0.011 µg/l in excess of the GTV (0.0075 µg/l) and IGV (0.01 µg/l).
- All other SVOC detections in August 2021 were below assessment criteria, where defined.

In April 2022 all SVOCs, including PAHs, were below assessment criteria, where defined.

7.2.3.6 Petroleum Hydrocarbons

Extractible Petroleum Hydrocarbon (EPH) method hydrocarbon analysis was completed during the August 2021 round. Analytical results are presented as Appendix C Table 6.

Hydrocarbons with a chain length range of EC_{20} to EC_{40} was detected at well SRBR7 (16 µg/L), exceeding the GTV (7.5 µg/L), DWS (7.5 µg/L), IGV (10 µg/L) and EQS (10 µg/L).

EPH was below detection in the remaining thirteen wells sampled in August 2022.

Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) method hydrocarbon analysis was completed in all 16 wells sampled in April 2022. TPHs were below all assessment criteria in 15 of the 16 wells sampled. Long chain length aromatic hydrocarbons were reported at well SROB10 only (C_{21} – C_{44}) at a concentration of 34 µg/L, exceeding the GTV, DWS, IGV and EQS.

7.2.4 Groundwater Analytical Results – Summary

Following Stage 3, the relevant hazardous substances identified for the site were:

- Diesel
- Kerosene

- Lead Concentrate
- Waste Oil
- Zinc Concentrate

7.2.4.1 Diesel, Kerosene and Waste Oil

Diesel, kerosene and waste oil would all be detected as part of the EPH analysis conducted in August 2021, or the TPH-CWG analysis completed in April 2022. In both cases, hydrocarbon results were below detection in all but one well in each round; SR0B7 in August 2021 and SROB10 in April 2022.

These two wells are not located near fuel or oil storage areas and, due to the low, intermittent hydrocarbon concentrations detected may be indicative of organic soil material, rather than hydrocarbon contamination.

Hydrocarbons were not reported above laboratory MDLs at wells SROB3, SROB4, SRBR5 or SROB5, which are the wells nearest to the fuel tank farm and the waste oil storage tank. Therefore there is no indication of significant groundwater contamination resulting from the Relevant Hazardous Substances diesel, kerosene or waste oil stored on the site.

7.2.4.2 Lead

Lead is below detection in the majority of groundwater samples collected in the three monitoring rounds, despite the samples not being field-filtered. Lead was not detected above the laboratory MDL in any of the 15 groundwater samples collected in August 2021

Lead was detected at well SROB4 only, in the March 2021 and April 2022 sampling rounds. SROB4 is located near the centre of the site and exhibits higher metal concentrations when compared to other wells on site. SROB4 is not located in lead processing or storage areas. Lead is naturally-occurring in bedrock in this area and detection of lead at well SROB4 is likely to be from a natural source and not due to losses during site operations.

7.2.4.3 Zinc

Like lead, zinc is naturally-occurring in bedrock beneath the site. Zinc was detected above assessment criteria in four wells in March 2021, August 2021 and April 2022.

Similar to zinc, these detections are not from wells located near zinc processing or storage areas and are likely to result from zinc naturally present in bedrock and overburden deposits on site.

7.3 2015 Landfill Site Investigation and DQRA

7.3.1 Introduction

A detailed site investigation (DSA) was completed in the former landfill area (see Appendix A Figure 2) by JS Drilling Limited in April and May 2015. This investigation included soil and groundwater analysis of a number of analytes, including all the Relevant Hazardous Substances defined by this study.

A DQRA for the former landfill area was completed by CHC Environmental in 2016 using the data collected during the 2015 DSA and also data from three additional groundwater monitoring rounds and one surface water monitoring round. Sections of these reports regarding the Relevant Hazardous Substances are summarised in this section.

7.3.2 Objectives

The objectives of the DSA and DQRA was to identify and assess the environmental risks associated with the on-site landfill. The DQRA was designed to assist in the development of a landfill remediation strategy.

7.3.3 Scope of Works

The initial site investigation and later DQRA consisted of an intrusive soil and groundwater investigation, surface water sampling, the completion of a generic quantitative risk assessment (GQRA) and a detailed quantitative risk assessment (DQRA).

7.3.3.1 Trial Pitting

Thirty seven trial pits (TP1 to TP37) were advanced throughout the northern and southern sections of the landfill. The trial pits were excavated to depths between 2.1 and 4.5 metres below ground level (m bgl). They were logged in accordance with BS5930:1999: Code of Practice for Site Investigations and a total of 10 disturbed soil

samples were taken from the excavated waste layer. Sample selection was based on observed waste characteristics, as well as visual and olfactory evidence of contamination.

7.3.3.2 Window Sampling

Twenty eight window samples (WS1 to WS28) were advanced throughout the landfill to depths between 1.2 and 7 m bgl. A total of 37 soil samples were taken for laboratory analysis.

7.3.3.3 Groundwater Monitoring Well Installation

Three dual monitoring wells (SROB A1/A2, SROB B1/B2, SROB D1/D2) were installed in the overburden and one single well monitoring well (SRBR C) was installed in the bedrock.

The three shallow dual well installations were positioned in waste hotspots in the landfill. The single deep well was installed to confirm depth to bedrock beneath the landfill.

These wells were sampled on three occasions as part of the DQRA (09 July 2015, 23 September 2015 and 01 December 2015).

7.3.4 Field Observations

7.3.4.1 Geological Observations

Geological and well installation logs are presented in Appendix B of the 2015 DSA, and summaries of the geological succession encountered in the Northern Area and Southern Area of the landfill are provided below.

Table 19. Generalised Log – Northern Landfill

Approximate Depth to Stratum (m bgl)	Geology
0 – 1	Fill material consisting of gravel and cobbles
1	Brown clay layer
1 - 4	Mixed Industrial Waste Material
4 - 8	Silty brown boulder clay
8 – 10.5	Dark brown glacial till
10.5 – 15	Weathered limestone bedrock
15	Limestone Bedrock

The thickness of the waste material varies across the northern part of the landfill and is thickest near the centre of the northern area. A description of the waste material in the northern part of the landfill can be found in Section 7.3.4.2.

Table 20. Generalised Log – Southern Landfill

Approximate Depth to Stratum (m bgl)	Geology
0 – 0.5	Fill material consisting of gravel and cobbles
0.5 – 2	Mine rock waste
2 - 4	Brown clay till

The DSA notes that the geology of the southern area of the landfill is different from the northern area and consists of mine rock waste and brown clayey glacial till subsoils only.

7.3.4.2 Field Evidence of Soil Impact

The DSA uncovered mined rock waste only in the southern landfill area, with the exception of one localised area of hydrocarbon impact at TP18.

The northern landfill area was found to contain a variety of industrial wastes, including sections of large scale plant and machinery, sludges, steel barrels containing oils and greases and rubber, plastic, fabric and ceramic items in a waste layer that varied between 0.5 m and 4.0 m in thickness. No obvious indications of municipal or large scale organic waste tipping were observed.

Contamination in the form of heavy lubricating oil hydrocarbons was noted to be present in 11 of the 29 trial pits completed in the northern landfill area.

7.3.4.3 Landfill Groundwater Flow

Waste material does not come into direct contact with the bedrock in any area of the landfill site. However, shallow perched water was noted in waste material during the DSA. Groundwater beneath the southern area of the landfill was inferred to flow to the northeast and in the northern area flows to the northwest.

7.3.5 Laboratory Analysis

DSA soil samples were sent to ALS UK and the DQRA groundwater samples were sent to Jones Environmental Laboratory (now Element Materials Technology) UK. Both laboratories are UKAS accredited.

Samples were analysed for a range of parameters including TPH CWG, metals, major ions, VOCs and SVOCs. This suite of analysis included all five relevant hazardous substances identified during Stage 3.

Soil analytical results are presented as Appendix A of the 2016 DQRA and groundwater analytical results are presented as Appendix B of the 2016 DQRA.

A review of the analytical data was completed as part of the 2016 DQRA and is summarised in the following sections.

7.3.5.1 Assessment Criteria

CHC completed a quantitative risk assessment in two stages in accordance with the guidance presented in CLR 11 for contaminated land risk assessment. First, all analytical results were compared with conservative Generic Assessment Criteria (GACs) as part of a generic quantitative risk assessment. If any results below the selected GAC the risk to human health or controlled waters were deemed negligible, however where exceedances were identified, these results were compared against site-specific assessment criteria (SSACs) as part of a detailed quantitative risk assessment (DQRA).

In the following section concentrations of Relevant Hazardous Substances were compared directly with the screening criteria adopted by CHC. However it should be noted that statistical analysis was used by CHC when assessing risk to human health, as discussed in Section 7.3.6.

CHC selected C4SL[24] screening criteria where available, in this case, for lead, and LQM/CIEH Suitable 4 Use levels for all other analytes[25].

7.3.5.2 Relevant Hazardous Substance Soil Analytical Results

Soil samples were selected for laboratory analysis by JS Drilling for specific compounds based on PID results, visual and olfactory observations, type of material and depth of the sample and nearby site operations. Results are presented as Appendix A Tables 1-10 of the 2016 DQRA.

A total of 47 samples were submitted for TPH CWG analysis. Of these, none were found to exceed GAC protective of human health.

Lead was present in all of the ten trial pit samples that were analysed with concentrations ranging from 210 mg/kg (TP37) to 21,000 mg/kg (TP35 (a)).

Lead was also present in all 37 of the window samples, with concentrations ranging from 7.1 mg/kg (WS19) to 10,000 mg/kg (WS10 (a)).

Zinc was also present in the soil samples taken from the trial pits with concentrations ranging from 840 mg/kg (TP37) to 49,000 mg/kg (TP35 (a)). None of these results exceeded the selected GAC for zinc (730,000 mg/kg).

[24] CL:AIRE 2014. Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, SP1010. Final Project Report (Revision 2)
[25] Nathanail, C.P., McGaffrey.C., Gillet, A.G., Ogden, R.C. and Nathanail, J.F. 2015. The LQM.CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham

Zinc was also present in all 37 of the window samples taken, with concentrations ranging from 37 mg/kg (WS19) to 46,000 mg/kg (WS12), with all soil sample concentrations below the selected GAC.

7.3.5.3 Relevant Hazardous Substance Groundwater and Leachate Analytical Results

Leachate/shallow groundwater grab samples were collected from 11 trial pit locations and two window sample locations in April 2015. In addition, the four wells installed as part of the DSA were sampled in July 2015.

Soil Leachate results are in Table 14 of the DSA report and groundwater results are presented as Appendix A Tables 11 – 14 of the DQRA report.

Lead was present in twelve of the sixteen samples, with concentrations ranging from 0.592 mg/L (TP37) to 212 mg/L (TP14). The lead GTV (7.5 mg/L) was exceeded in eight leachate samples and two samples; TP10 (a) (24.9 mg/L), TP10 (b), (57.1 mg/L), TP13 (19.3 mg/L), TP14 (212 mg/L), TP31 (30 mg/L), TP33 (36.5 mg/L), TP35 (9.05 mg/L), WS12 (12.8 mg/L), SROB(D) (11.5 mg/L) and SRBR(A) (10 mg/L).

Zinc was also present in the sampled groundwater, at all of the locations. The concentrations ranged from 0.05 mg/L (SRBR(A)) to 219 mg/L (TP14). All the samples, excluding SRBR(A), exceeded the IGV (0.1 mg/L) for zinc.

EPH was analysed for in the four groundwater wells only. EPH was detected in groundwater from all four locations with concentrations ranging between 69 µg/L and 275 µg/L.

7.3.5.4 Surface Water Sampling

Surface water locations LSW1 and LSW2 were sampled in September 2015 and March 2016. Analysis included lead, zinc and TPH CWG. The results are presented as Appendix A Tables 15 – 20 of the 2016 DQRA.

No hydrocarbons were reported as detected in either sampling event.

Lead was detected at LSW2 only in September 2015 at a concentration of 0.01 mg/L equalling the IGV and DWS, but below the GTV (0.0075 mg/L).

Zinc was detected at a concentration of 1.022 mg/L and 1.019 mg/L at LSW1 and LSW2 in September 2015 before decreasing to 0.003 mg/L and less than the MDL (0.003), respectively, in March 2016.

7.3.6 GQRA

CHC completed a quantitative risk assessment in two stages in accordance with the guidance presented in CLR 11 for contaminated land risk assessment. First, all analytical results were compared with conservative GACs as part of a GQRA. All results below the selected GAC the risk to human health or controlled waters were deemed negligible. Any exceedances of GAC were compared against site specific assessment criteria (SSACs) as part of the DQRA.

CHC used statistical analysis of the results collected to calculate the upper confidence limit (UCL) of the mean concentration for each analyte in the landfill area, in order to assess the risk to human health from soils.

CHC concluded that while there were individual exceedances at some locations, there were no exceedances of the UCL of assessment criteria, therefore the risk to human health from soil was deemed negligible.

Vapour risk to human health from leachate encountered in trial pits was assessed by directly comparing leachate and groundwater results against assessment criteria. CHC considered both on-site commercial / industrial end users and off-site residential land users. This assessment criteria was applied to substances with a vapour risk (mercury, hydrocarbons, VOCs and SVOCs). CHC deemed the risk to human health from vapour inhalation as negligible.

IGVs and GTVs were used as GAC when screening groundwater and leachate/shallow groundwater samples against assessment criteria protective of controlled waters. Exceedances were reported for 23 organic and inorganic parameters, including lead, zinc and hydrocarbons. It was noted that a significant number of these parameters were naturally-occurring and were therefore not considered further. In addition, mercury, which was detected in one leachate sample only, was ruled out, as there were no elevated detection in groundwater samples, which were deemed more representative of site conditions.

A total of eleven parameters were brought forward to the DQRA for further assessment, including lead, zinc and hydrocarbons.

7.3.7 DQRA

Following the completion of the GQRA, a DQRA was undertaken by CHC on the eleven remaining parameters.

7.3.7.1 Methodology

CHC used the UK Environment Agency Risk Assessment Tool "Hydrogeological Risk Assessment for land contamination – Remedial Targets Methodology" (2006) to predict the potential impacts of the identified contamination on the identified receptors.

CHC selected a groundwater monitoring well located 100m downgradient of the landfill as the compliance point protective of groundwater, and a surface water body located 125 m downgradient of the landfill as the compliance point protective of surface water.

Model parameters are presented in Table 22 of the 2015 DQRA. The DQRA identified three parameters that were deemed to be a risk to groundwater (iron, nickel and zinc) and eight parameters that were deemed to be a risk to surface water (aluminium, arsenic, cadmium, chromium, iron, lead, nickel and zinc).

7.3.8 Landfill Area Relevant Hazardous Substances

7.3.8.1 Hydrocarbons

Visual hydrocarbon contamination was noted during the DSA, primarily in the northern area of the landfill. Hydrocarbons (including diesel, kerosene and waste oil) would have been detected in the EPH or TPH CWG suites of analysis. There was no exceedances of any hydrocarbon bands above the adopted GAC protective of Human Health in the landfill area soil samples. In addition, there was no vapour risk to human health inferred by the CHC DQRA.

Following the completion of the DQRA, the risk to controlled waters from hydrocarbons was deemed negligible by CHC.

7.3.8.2 Lead and Zinc Concentrate

Lead and zinc were not detected above GAC protective of Human Health in soils from the landfill area. However, elevated lead and zinc, amongst other metals, were reported in groundwater samples collected on site. The CHC DQRA identified lead as a risk to surface water bodies and zinc as a risk to both surface water bodies and groundwater bodies.

7.3.9 Landfill Restoration Plan

Boliden submitted a landfill restoration plan to the EPA in 2021 to address risks identified to controlled waters during the 2015/2016 DQRA study. A summary of this report can be found in Section 6.7.6 of this report.

7.4 2022 AECOM Site Investigation

7.4.1 Introduction

AECOM completed a site investigation on the site between 28 March 2022 and 01 April 2022 in accordance with proposal 60671645_ACM_PL_EN_002 *Boliden Tara Mines Baseline Assessment: Stages 7 – 8*.

Following a review of existing information, as summarised in Sections 7.2 and 7.3 above, the following data gaps were identified:

- No soil data for Relevant Hazardous Substances in soils was available for areas outside of the former landfill;
- PFAS analysis has not been completed to date near the firefighting training area; and
- Water pumped from the underground mine has not been sampled for Relevant Hazardous Substances or PFAS.

7.4.2 Objectives

The main objectives of the site investigation were:

- To conduct a shallow soil investigation in areas outside of the landfill accordance with the EU Guidance Document

- To conduct a limited groundwater monitoring event at wells close to the firefighting training area for PFAS
- To sample water pumped from the underground mine for Relevant Hazardous Substances including PFAS.

7.4.3 Scope of Work

Trial pitting, soil sampling and water (groundwater and surface water) sampling were completed between 28 March 2022 and 01 April 2022. The site investigation was conducted in line with BS 10175:2011+A2:2017 Code of Practice for Investigation of Potentially Contaminated Sites, the UK Environmental Agency CLR11 and by taking into account BS5930:2015+A1:2020 Code of Practice for Site Investigations (where applicable). Sampling was carried out with techniques suitable to the conditions and materials encountered on site and logged in accordance with BS5930.

7.4.3.1 Health and Safety

The health and safety of all AECOM employees, client staff and contractors appointed by the client is of paramount importance and AECOM considers itself at the forefront of development and implementation of health and safety procedures and policies for staff for the activities they undertake. AECOM is accredited with ISO 45001:2018.

A site-specific Safety, Health and Environment (SHE) Plan was prepared for the works, which covered all elements of the site works undertaken by AECOM.

The SHE Plan outlined the nature of the works and included a hazard assessment, along with mitigation measures, so that the works were undertaken in a safe and controlled manner from both a health and safety and environmental perspective. The document included staff roles, staff training and competency requirements, method statements, risk assessments and emergency procedures, as well as site-specific information.

The SHE Plan for the site investigation works specifically addressed precautions in terms of the trial pit digging and groundwater and surface water sampling.

The SHE Plan focused on the required methodology to minimise the potential for PFAS cross-contamination via the equipment used when sampling near the firefighting training area.

7.4.4 Utility Clearance

Boliden directly appointed the utility clearance contractor.

The contractor used a combination of existing site maps and a Cable Avoidance Tool (CAT) to identify the route of the services close to the proposed trial pit locations.

AECOM attended site with the service clearance crew in order to interactively alter trial pit locations that may have been too close to apparent service detections.

7.4.5 Sampling and Analysis

7.4.5.1 Soil Sampling

Boliden directly appointed the trial pit contractor. AECOM were on site for the duration of the trial pit operations.

Excavated material was inspected for visual or olfactory evidence of impact. To assess the presence of volatile organic compounds (VOCs), field headspace testing using a calibrated photo-ionisation detector (PID) was undertaken on soil samples retrieved at approximately 1 m intervals during excavation. Soil samples were placed in plastic zip-lock bags and allowed to equilibrate prior to on-site headspace testing.

AECOM recorded the following items during the trial pitting:

- Trial pit number and location (see Appendix A Figure 2);
- Ground surfacing;
- Geological description;
- Soil headspace readings;
- The depth at which each stratum was encountered; and
- A photographic log of each trial pit location.

Discrete soil samples from encountered strata were collected in accordance with AECOM field procedures. Soil samples were collected into laboratory-supplied sample containers appropriate to the intended analysis. The sample containers were labelled with a unique sample name and were stored on-site in a chilled cool box and during transport to the laboratory.

The AECOM field scientists wore single-use disposable nitrile gloves, which were changed at each sampling location and depth to avoid cross-contamination of soil samples. Soil samples were submitted to the laboratory for analysis in chilled cooler boxes with appropriate chain-of-custody documentation.

7.4.5.2 Groundwater and Surface Water Sampling

Prior to purging and sampling, a water level measurement ('dip') was taken from the wells to be sampled using an interface probe. An interface probe is capable of discerning between non-aqueous phase liquids (NAPLs, such as hydrocarbons) and water. The interface probe was used not only to measure the depth to groundwater but also to measure the total well depth, so that wells could be assessed for the potential presence of light (floating) and dense (sinking) NAPLs.

Groundwater was sampled in accordance with standard AECOM procedures, based on ISO 5667-11:2009 and US EPA methods, using newly-installed, dedicated inertial lift sampling equipment which AECOM installed in each monitoring well.

The total volume of standing water in each monitoring well was calculated. To ensure that a groundwater sample representative of that in the surrounding aquifer was collected, between three and five times this volume was purged by AECOM from the monitoring well before sampling, where possible.

Observations of groundwater appearance and odour were noted by AECOM during purging and sampling.

For metals analysis, water samples were filtered (0.45 µm filters) in the field and collected into laboratory-supplied containers with appropriate acid preservative.

Groundwater samples were submitted to Element Materials Technology in the UK for analysis of the parameters listed in Appendix D Table 1.

All groundwater samples were transported to the contract analytical laboratory by overnight courier in cooler boxes with frozen, laboratory-supplied ice packs and appropriate chain-of-custody documentation.

7.4.5.3 QA/QC Sampling

Two blind duplicate soil samples (Dup-01 and Dup-02) were taken as a QA/QC check on the laboratory analysis. The purpose of duplicate sampling is to assess the reproducibility of sample preparation.

7.4.6 Field Observations and Results

7.4.6.1 Geological Observations

Geological and well installation logs are presented in Appendix E, with a summary provided below.

Table 21. Generalised Log – Trial Pits TP01 – TP20

Approximate Depth to Stratum (m bgl)	Geology
0 – 1	Made Ground - Sandy gravel – fine to medium, sand is dry, occasional cobbles and boulders, root fragments,
1 – 2	Made Ground - Gravelly, clayey sand – fine to course, soil is moist, cobbles and boulders, occasional pieces of timber, concrete and roots,
2 – 4	Till - Sandy clay – sand is fine to medium, medium plasticity clay, brown, cobbles and boulders, soil is occasionally moist

Sandy gravel made ground was noted at most of the trial pits, generally from ground level to a depth ranging from 0.4 m bgl (TP8 and TP18) and 1.3 m bgl (TP9). Topsoil, brown clayey sand was noted at TP19 and TP20 to a depth of 0.2 m bgl.

Beneath the top layer of sandy gravel was gravelly, clayey sand containing occasional cobbles and boulders.

This was underlain by sandy clay till at certain locations (TP4, TP10, TP11, TP13, TP14, TP17, TP18, TP19 and TP20). This was the deepest distinct soil layer reached by the excavator.

Hand augured locations HA1 and HA2 encountered a thin layer of grey gravel fill material, underlain by brown sandy gravel.

Bedrock was not encountered at any of the trial pit locations.

7.4.6.2 Field Evidence of Soil Impact

Hydrocarbon contamination was noted at the following locations:

Table 22. Hydrocarbon Impact

Trial Pit	Depth (m bgl)	Notes
TP3	1.2 – 1.8	Hydrocarbon sheen and globules
TP5	1.8 – TD (2.8)	Hydrocarbon globules, oily soil and hydrocarbon odour
TP9	1.8 – TD (2.1)	Hydrocarbon odour and oily soil

TD – Total Depth

All three trial pits are located near the site's fuel tank farm.

No field evidence of soil impact in the form of odours or discolouration was noted in any of the remaining trial pits.

The maximum PID soil headspace reading from the trial pits and hand augured locations was 0.9 ppm at TP05. Full details are provided in the trial pit and hand auger borehole logs in Appendix E.

7.4.6.3 Hydrogeology

Perched water was encountered at TP1, TP2, TP4, TP5, TP18 and TP20. A hydrocarbon sheen was noted in TP3, TP5 and TP9 at the base of grey coarse gravel fill material reported by Boliden to have been placed during the Fuel Tank Farm upgrade works in 2018

During the water level dip round, no light / dense NAPL layers were identified in any of the wells using the interface probe.

No odour or sheen was noted from the purged water at any well during groundwater sampling of well close to the fire-fighting training area.

7.4.7 Soil Analytical Results

A detailed sample inventory is presented in Appendix D Table 1. Laboratory certificates are presented as Appendix F. The results of the laboratory analysis of soil samples are presented in Appendix D Tables 2 to 4.

7.4.7.1 Soil Screening Criteria

In accordance with the guidance presented in CLR 11 for contaminated land risk assessment, the soil laboratory results were compared with Generic Assessment Criteria (GACs).

The GAC are conservative screening criteria protective of human health (assuming on-going commercial /industrial use of the site).

For an assessment of the potential risk to human health, AECOM's in-house GAC for Commercial / Industrial land use was chosen.

Soil analytical results were compared against these GAC and if concentrations were less than the GAC, then the risks to human health were considered negligible. Conversely, if concentrations were identified above the GAC, a potential risk to human health was identified. AECOM considers that the GAC are consistent with the principles of human health protection in guidance from the Irish Environmental Protection Agency, UK DEFRA and UK Environment Agency.

It should be noted that the GAC protective of human health assumes a continued commercial end use and does not consider short-term exposure pathways to construction workers during redevelopment works. An assessment of impacts to construction workers is outside the current scope of work.

As site-wide groundwater results are available, soil samples were not screened against GAC protective of controlled waters. The estimated soil GAC for heavy metals are calculated using conservative soil:water partitioning coefficients and result in theoretical soil leaching values for metals that are likely to be very conservative. Therefore, greater reliance is placed by AECOM on actual, site-specific, measured concentrations of these substances in groundwater, if available, to assess the potential risks to controlled waters in the vicinity of the site.

7.4.7.2 TPH CWG

Soil hydrocarbon results are presented in Appendix D Table 2.

TPHs were below the laboratory MDLs in 20 of the 42 primary samples.

TPH aromatics and aliphatics were detected in the remaining 22 above the laboratory MDLs, but at concentrations below relevant criteria.

The highest TPH concentrations were reported at TP3, TP5 and TP9, where visual evidence of contamination had been noted during logging. Laboratory interpretation of TPH results indicate that the majority of the TPH detections are lubricating oils or degraded diesel.

Benzene, toluene, ethylbenzene, m/p-Xylene, o-Xylene (collectively referred to as BTEX) and methyl tert butyl ether (MTBE) were below laboratory MDLs in 12 of the 42 primary soil samples. BTEX and MTBE were detected at concentration above the MDL but below all relevant assessment criteria in the remaining 30 soil samples.

7.4.7.3 Metals

Soil metal results are present in Appendix D Table 3.

Chromium VI was not detected above the laboratory MDL in any of the samples taken in 2022.

Arsenic, barium, beryllium, chromium, chromium III, copper, mercury, nickel, selenium, vanadium, water soluble boron and zinc were all detected in one or more of the samples above the laboratory MDLs but below all relevant criteria.

Cadmium was detected in all of the soil samples with concentrations ranging from 0.4 mg/kg (TP8 2.6 m bgl) to 243.3 mg/kg (TP1 1.7 m bgl). The result from TP1 1.7 m bgl exceeded the GAC protective of human health for cadmium (190 mg/kg). All other results were below assessment criteria for cadmium.

Lead was detected in all soil samples with concentrations ranging from 9 mg/kg (TP11 2.7 m bgl) to 22,760 mg/kg (TP1 1.7 m bgl). Four of the samples exceeded the GAC protective of human health (2,300 mg/kg); namely TP1 1.7 m bgl (22,760 mg/kg), TP2 1.8 m bgl (2,491 mg/kg), TP3 1.2 m bgl (9,615 mg/kg) and TP6 1 m bgl (2,670 mg/kg).

All other metals in soil samples, including zinc, were below relevant assessment criteria, where defined.

7.4.7.4 Per / Poly-fluorinated Alkyl Substances (PFAS)

Perfluorooctane sulfonic acid (PFOS) was the only PFAS compound detected in soil samples collected in the firefighting training area (Appendix D Table 4).

PFOS was detected in two out of the four soil samples (TP01 0.5 m bgl, and TP02 1.8 m bgl). In both cases at a concentration of 2 mg/kg. PFOS was not detected in the other two soil samples analysed.

7.4.7.5 QA/QC Sampling

Two duplicate soil samples were collected. DUP01 from the sample location as TP1 05 m bgl and DUP02 taken from the same location as TP19 2.5 m bgl.

Relative percentage differences (RPDs) calculated between the primary and duplicate samples are typically higher when detections are at lower concentrations (i.e. close to the detection limit) in the samples.

There was generally a good correlation between primary and duplicate results from TP19 2.5 m bgl and for the PFAS sample from TP1. Higher RPDs were reported for hydrocarbons and metals from TP01 0.5 m bgl.

7.4.8 Groundwater and Surface Water Analytical Results

The results of the laboratory analysis of groundwater and surface water samples are presented in Appendix D Tables 5 to 7.

7.4.8.1 Groundwater and Surface Water Screening Criteria

A preliminary assessment of groundwater analytical data was completed by comparing the results with a range of Irish generic groundwater assessment criteria, specifically Groundwater Threshold Values (GTVs) and EPA Interim Guideline Values (IGVs):

- The GTVs were developed to give effect to measures needed to achieve the objectives of the Water Framework and Groundwater Directives. They were originally published in January 2010 (Statutory Instrument No. 9 of 2010) and amended in 2016 (SI No. 366 of 2016). Exceedance of a threshold value triggers further investigation to confirm whether the criteria for poor groundwater chemical status are being met.
- IGVs represent negligible groundwater contamination and were published by the EPA in 2003, compiled from a number of existing water quality guidelines in use in Ireland and elsewhere, including existing national environmental quality standards, proposed common indicators for the groundwater directive, drinking water standards and Geological Survey of Ireland trigger values.

Note – separate GTVs and IGVs may have different concentration values for the same substance defined by legislation or by the Irish EPA under different exposure scenarios. These different assessment criteria are shown in the results tables in Appendix B and are referred to in the text as, for example, upper and lower IGVs.

The following additional standards were applied to Relevant Hazardous Substances

- DWS (Drinking Water Standards) published in SI No. 122 of 2014, as amended. While groundwater from the monitoring wells sampled is not used for potable supply and it is unlikely that groundwater is abstracted for potable use downgradient of the site, however the River Blackwater is designated as a drinking water supply due to an abstraction point upgradient of the site
- Environmental Quality Standards – Fresh Water
- The only Irish water-related PFAS standard is for PFOS and its derivatives in surface water, with a Maximum Admissible Concentration of 36 μg/L[26] for 'inland surface waters'.

7.4.8.2 Total Petroleum Hydrocarbons (TPH)

Surface water petroleum hydrocarbon results for the surface water location SW1 at the Clear Water Pond are presented in Appendix D Table 4.

No speciated petroleum hydrocarbons were detected above their MDLs in the surface water sample taken in March 2022.

7.4.8.3 Metals

Groundwater and surface water metal results are presented in Appendix D Table 5.

Beryllium lead, mercury, selenium and vanadium were not reported above their laboratory MDLs in any of the groundwater or surface water samples analysed in March / April 2022.

Arsenic, barium, boron, chromium and copper were detected in one or more samples but at concentrations below all relevant assessment criteria.

Cadmium was detected at well SROB4 (15.4 mg/L). This result exceeded the DWS (5 mg/L), EQS Fresh Water GAC (0.08 mg/L) and the GTV (3.75 mg/L).

Nickel was detected at well SROB4 (54 mg/L), exceeding the DWS (20 mg/L), the EQS Fresh Water GAC (4 mg/L) and the GTV (15 mg/L).

Zinc was detected in groundwater from well SROB3 (10 mg/L) and surface water location SW1 (60 mg/L) exceeding the EQS Fresh Water GAC (8 mg/L) but was below the DWS (75 mg/L) and GTV (75 mg/L) at both locations. Zinc was detected in groundwater from SROB4 (22,802 mg/L) in excess of all relevant assessment criteria.

7.4.8.4 Per / Poly-fluorinated Alkyl Substances (PFAS)

Groundwater and surface water PFAS results are presented in Appendix D Table 7.

[26] European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 S.I. 77 of 2019 – Table 12 MAC-EQS Other Surface Waters

No PFAS compounds were detected above their MDL's in any of the water samples taken in March 2022 and therefore are below the selected assessment criteria, where defined.

7.4.9 Site Investigation Conclusions

7.4.9.1 Summary

AECOM completed a soil and groundwater investigation at the Tara Mines facility between 28 March 2022 and 01 April 2022 to fill data gaps identified in relation to Relevant Hazardous Substances in soil and groundwater.

7.4.9.2 Diesel, Kerosene and Waste Oil

TPHs were detected in the majority of trial pits across site, however at concentrations below all relevant assessment criteria. A laboratory interpretation of the TPH detections indicated that the source was primarily lubricating oil with some weathered diesel, indicating historic losses.

TPHs were not detected in the surface water sample, indicating no significant contamination of water in the underground mine water.

7.4.9.3 Lead and Zinc

Metal results in soil are generally low. Detections of lead in soils deeper than 1 m at four locations were found to be in excess of assessment criteria protective of human health. The four locations (TP1, TP2 in the firefighting training area, TP3 near the fuel farm and TP6 near the mechanic stores are all located away from the ore processing areas on site, indicating that losses from production areas are unlikely. Lead concentrations at these areas are likely to be due to lead mineralisation from the ore body beneath the site.

Although the assessment criteria protective of human health were exceeded in these samples, all four samples were collected from a depth greater than 1 metre below surface and results in shallower soils at the same locations were below assessment criteria, therefore there is no pathway to human health receptors and the potential risk is deemed low.

Lead was not detected in any of the four groundwater samples or in the surface water sample collected on 28th March 2022.

Elevated zinc concentrations were reported at well SROB4 in March 2022, which is consistent with groundwater sampling conducted at this location by Boliden in 2021 and 2022. Zinc was also detected above the EQS only in groundwater from well SROB3 and the surface water sample. These locations are not located in production areas and are likely to be indicative of naturally-occurring elevated zinc in the bedrock and overburden related to the bedrock mineralisation, rather than losses during the processing and storage of zinc on site.

7.4.9.4 PFAS

One PFAS compound, PFOS, was detected at low concentrations in two of the four soil samples taken in the firefighting training area, indicating limited historic use of PFAS-containing AFFFs in this area. However PFAS compounds were below the MDL in all four nearby groundwater samples and in the surface water sample at SW1, indicating that, although PFAS containing substances are known to have been used in the underground mine in the past during historic fire events, there is no evidence of significant contamination in either the underground mine or in the firefighting training area.

7.5 Conclusions

Relevant Hazardous Substances were detected at several locations on site, but generally at concentrations below all relevant assessment criteria.

7.5.1 Diesel, Kerosene and Waste Oil

In the case of TPHs, limited visual evidence of contamination was noted near the site's tank farm. The contamination appears to consist of weathered diesel and lubricating oil. There was no detection of TPHs in groundwater samples collected in nearby groundwater wells in April 2022 following the AECOM site investigation, indicating that these losses are historic, of limited quantity and pose negligible risk to human health or controlled waters.

Visual evidence on hydrocarbon contamination was also noted in the 2015 landfill DSA, particularly in the northern area of the landfill, however the 2016 DQRA concluded that the risk to human health or controlled waters from hydrocarbon contamination was negligible.

7.5.2 Lead

Lead was generally found to be below detection in groundwater samples, with the exception of two detections at well SROB4 in the March 2021 and April 2022 sampling rounds. However, lead was found to be below detection in the August 2021 and 2022 AECOM groundwater sampling events. Lead detections in groundwater may possibly be due to lead in sediment entering solution when collecting unfiltered samples for metal analysis.

Lead was reported in four soil samples in excess of GAC protective of human health. All four samples were taken from depths greater than 1 m bgl and are therefore unlikely to pose a risk to human health. These locations are not near lead handling or storage areas and are likely to be related to natural lead mineralisation in the bedrock.

Lead was also reported in the landfill area as part of the 2015 DSA and 2016 DQRA. Lead concentrations were deemed to pose negligible risk to human health but were considered to pose a potential risk to surface waters. Boliden have subsequently submitted a landfill restoration plan to the Agency in 2021 to reduce the risk of contaminants within the landfill.

7.5.3 Zinc

Zinc was detected in the same four wells above assessment criteria in all three Boliden 2021/2022 sampling events. One of these wells, SROB4 was also sampled by AECOM in 2022 and the zinc concentration was also found to exceed all relevant assessment criteria. These well locations are not near zinc processing or storage areas and are likely to be due to naturally occurring deposits in the area.

Zinc was not detected above GAC protective of human health in any of the soil samples collected by AECOM in 2022.

CHC used the same GAC protective of human health to assess soil samples collected from the landfill in 2015. There were no reported exceedances of the selected human health assessment criteria in soil samples collected at the landfill as part of the CHC studies.

Elevated zinc concentrations were reported in leachate and groundwater samples collected as part of the 2015 DSA and 2016 DQRA. CHC concluded that zinc posed a risk to groundwater and surface water. Boliden have submitted a landfill restoration plan to reduce the risk of contaminants within the landfill.

7.5.4 PFAS

PFOS was the only PFAS analyte detected in soil samples. It was detected in two of the four samples at low concentrations, indicating that AFFF containing PFAS was likely to have been used in the firefighting training area in the past.

All PFAS analytes were below the laboratory MDL in groundwater samples indicating that the risks posed by limited PFAS use in this area is low.

As PFAS is no longer used on site and Boliden intend to dispose of any remaining stocks of PFAS-containing AFFF concentrates, future sampling for PFAS is not required.

7.5.5 Surface Water Sample

A surface water sample was collected from the Clear Water Pond (location SW1) to assess groundwater pumped from the underground mine. Lead, TPHs and PFAS were below detection in this sample. Zinc was detected above the freshwater EQS at SW1 but below all other assessment criteria.

8. Site Characterisation (Stage 6)

Potential pollutant linkages are considered viable where there is a source of impact on site which can migrate via a defined pathway to identified receptors. Receptors can be either environmental or human, and located either within or outside the site boundary.

A preliminary conceptual site model (CSM) has been developed for the site based on the information collated during the desktop review and is described in this section, identifying contaminant sources, contaminant migration pathways and potential receptors for the site.

8.1 Pollutant Linkages Concept

In the context of land contamination, there are three essential elements to any risk:

- A **source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of groundwater and surface waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant source–pathway–receptor (SPR) is described as a pollutant linkage. The conceptual model was developed to describe viable SPR linkages for the site.

Stages 1 – 5 of the baseline was used to conceptualise the potential contaminant source areas as well as the pathways and receptors and is informed by the Stage 7 (Site Investigation) data and findings.

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health and environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor, and hence whether the resulting impact is of major or minor significance.

8.1.1 Potential Sources

A review of historical data identified potential contaminants of concern (PCOC), outlined in Table 23 below. Corresponding locations are presented in Appendix A, Figure 2.

Table 23. Potential Sources

Potential Sources of Contamination	Location	Potential Contaminants of Concern
Historic Landfill (Northern Area)	Western part of the site	Petroleum hydrocarbons, volatile organic compounds (VOCs) and heavy metals
Lead and Zinc Processing	The Mill Building, thickening tanks, concentrate stores	Lead and zinc
Bulk Fuel Tanks	Fuel tank farm and individual tanks across site	Petroleum hydrocarbons
Waste Oil Area	Waste Oil Tank	Petroleum hydrocarbons
Fire Equipment Testing	Firefighting Training Area	Firefighting foam, per and poly-fluoroalkyl substances (PFAS)

8.2 Potential Receptors

The potential receptors at the site and surrounding area is outlined in Table 24 below.

Table 24. Potential Receptors

Receptor Type	Receptor	Present	Potable Supply	Description
Human Health	Future site users – commercial / industrial use	Yes	NA	AECOM understands that there is no planned change in site use. The most sensitive onsite human health receptor is, therefore, considered to be industrial workers.
	Offsite residential properties	Yes	NA	Residential properties are located within 0.1 km of the site
Waters	Groundwater abstraction within 500 m of the site.	No	No	No known groundwater abstraction in vicinity of site, unlikely to be any developed given the site's setting in an area served by municipal potable water and with highly mineralised zones in bedrock.
	Surface water body within 500m of the site in direct hydraulic connection with groundwater from the site.	Yes	Yes	The River Blackwater (Blackwater (Kells)_120) is located within 300 metres of the site and is likely to be in direct hydraulic connection with groundwater. Water is abstracted from the River Blackwater for the Navan municipal potable supply upgradient of the site, however the (Blackwater (Kells)_120) as a whole is considered a potential drinking water supply.
	Groundwater in bedrock beneath the site.	Yes	No	No known groundwater abstraction in vicinity of site, unlikely to be any developed given the site's setting in an area served by municipal potable water and with highly mineralised zones in bedrock. Dewatering has led to a depressed water table in the immediate area around the mine.
	Groundwater in superficial deposits beneath the site.	Yes	No	Due to the site's location near an urban centre it is unlikely that groundwater in superficial deposits are used as a potable drinking supply.

The River Blackwater is considered to be the most sensitive controlled water receptor in the vicinity of the site

8.3 Potential Pathways

Given the site's setting, and expected continued commercial/industrial site use there are considered to be a number of potential exposure pathways for future site users, groundwater and surface waters. The potential pathways to human health and controlled waters which are considered viable are outlined in Table 25.

Table 25 Potential Pathways

Receptors	Pathway
Human health receptors in a commercial/industrial scenario.	• Soil and dust ingestion from near surface soils in areas of soft landscaping. • Dermal contact with near surface soils in areas of soft landscaping. • Inhalation of fugitive dust from near surface soils in areas of soft landscaping. • Inhalation of vapours.
Human health receptors in an off-site residential scenario.	• Inhalation of fugitive dust from near surface soils in areas of soft landscaping. • Inhalation of vapours
Water receptors.	• Leaching from soil into perched groundwater followed by vertical migration. • Horizontal migration of impacted groundwater. • Horizontal groundwater migration to nearby surface waters.

8.3.1 Summary of Viable SPR Linkages

A summary of potential Source-Pathway-Receptor (SPR) linkages is outlined in the table below.

Table 26. Summary of Viable SPR Linkages

Receptor	Source	Pathway						
		1) Soil and dust ingestion	2) Dermal contact	3) Inhalation of fugitive dust	4) Inhalation of vapours	5) Leaching from unsaturated zone	6) Lateral migration of impacted groundwater	7) Horizontal groundwater migration to nearby surface waters
Industrial Site Users	Soil	✓	✓	✓	✓			
	Groundwater		✓		✓			
Groundwater	Soil					✓	✓	✓
	Groundwater					✓	✓	✓
Surface Water	Soil					✓	✓	✓
	Groundwater					✓	✓	✓

8.4 Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health and environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor, and hence whether the resulting impact is of major or minor significance.

The risk assessment has been undertaken with reference to BS10175:2001 and CIRIA Document C552: 'Contaminated Land Risk assessment - A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential severity of the hazard and the sensitivity of the target, based on the categories given in Table 27. Potential Hazard Severity Definition.

Table 27. Potential Hazard Severity Definition

Hazard Severity	Definition
Severe	Acute risks to human health, catastrophic damage to buildings or property, major pollution of controlled waters.
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species.

The probability, or likelihood of an event occurring, takes into account both the presence of the hazard and target, and the integrity of the pathway, and is assessed based on the categories in Table 28 below.

Table 28. Probability of Risk Definition

Risk Probability	Definition
High Likelihood	Pollutant linkage may be present and the risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.

Risk Probability	Definition
Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will.
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard as shown in Table 29 below.

Table 29. Level of Risk for Potential Hazard Definition

Risk Probability	Potential Hazard Severity			
	Severe	Medium	Mild	Minor
High Likelihood	Very High	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low Likelihood	Moderate	Low/Moderate	Low	Low
Unlikely	Low/Moderate	Low	Very Low	Very Low

A description of the levels of risk outlined in Table 30.

Table 30. Description of the Classified Risks and Likely Action Required

Level of Risk	Description
Very High Risk	• There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or there is evidence that severe harm to a designated receptor is currently happening. • This risk, if realised, is likely to result in substantial liability. • Urgent investigation and remediation are likely to be required.
High Risk	• Harm is likely to arise to a designated receptor from an identified hazard. • Realisation of the risk is likely to present a substantial liability. • Urgent investigation is required, and remedial works may be necessary in the short term and are likely over the long term.
Moderate Risk	• It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild, if realised.
Low Risk	• It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	• There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

8.4.1 Landfill Area Risk Assessment

A risk assessment for the landfill area was completed as part of the DSA in 2015 and DQRA in 2016 and is presented below.

Table 31. Landfill Risk Assessment (based on *Table 21: Updated Conceptual Site Model & Risk Assessment* - from the 2016 DQRA)

Source	Pollutants	Pathway	Receptor	Associated Severity	Likelihood of Occurrence	Discussion	Potential Impact on Site
Landfill Area	Waste Material including TPHs, metals, VOCs	Ingress and accumulation of landfill gas	Potential Future Commercial Development	Low Likelihood	Medium	Based on the limited ground gas detected on the site to date the likelihood of gas generation, migration and accumulation inside buildings is low.	Moderate
		Direct contact with poor quality soils		Low Likelihood	Medium	Waste material/soils have been proven to be impacted. Based on a commercial end use and the assumption that surface cover would be largely hardstanding, with the possibility of grassy (non – vegetative areas) there is a low likelihood of site users coming into contact with waste materials/soils.	Moderate/Low
		Ingestion of dust		Low Likelihood	Medium	Waste material/soils have been proven to be impacted. Based on a commercial end use and the assumption that surface cover would be largely hardstanding, with the possibility of grassy (non – vegetative areas) there is a low likelihood of site users ingesting dust associated with waste materials/soils.	Moderate/Low
		Inhalation of vapours		Low Likelihood	Medium	Circumstances are possible for ground gases to accumulate in indoor spaces resulting from waste material present at the site to date. However, given the very low level of ground gases detected at the site the likelihood of this occurring is low.	Moderate/Low
		Aggressive attack on subsurface structure		Likely	Mild	Based on the current site status chemical attack on buildings may occur, however the risk may be managed with appropriate mitigation measures at the design stage.	Moderate/Low
	Leachate	Inhalation of vapours		Low Likelihood	Medium	Circumstances are possible for ground gases to accumulate in indoor spaces resulting from dissolved phase contamination present at the site. However, given the very low level of ground gases detected at the site to date the likelihood of this occurring is low.	Moderate/Low
	Waste Material	Direct contact with poor quality soils	Construction Workers	Low Likelihood	Mild	Based on the use of appropriate PPE and a mild consequence, resulting from limited exposure.	Low
		Inhalation of landfill gasses		Low Likelihood	Mild	Based on the use of appropriate PPE and a mild consequence, resulting from limited exposure.	Low

Source	Pollutants	Pathway	Receptor	Associated Severity	Likelihood of Occurrence	Discussion	Potential Impact on Site
	Leachate	Direct contact with leachate		Low Likelihood	Mild	Based on the use of appropriate PPE and a mild consequence, resulting from limited exposure.	Low
	Waste Material	Migration of landfill gasses offsite	Existing Off-site Development	Low Likelihood	Medium	Circumstances are possible for ground gases to accumulate in offsite indoor spaces resulting from waste material present at the site to date. However, given the very low level of ground gases detected at the site the likelihood of this occurring is low.	Moderate/Low
	Leachate	Migration of leachate offsite followed by vapour release		Low Likelihood	Medium	Circumstances are possible for ground gases to accumulate in offsite indoor spaces resulting from waste material present at the site to date. However, given the very low level of ground gases detected at the site the likelihood of this occurring is low.	Moderate/Low
	Leachate	Migration of leachate offsite followed by discharge	Surface Water	Highly Likely	Medium	The potential exists for surface water to be impacted as a result of the contaminated leachate/groundwater noted to be present at the site to date. The shallow aquifer is noted to be impacted at this time.	High
		Migration of impacted groundwater in the bedrock aquifer		Likely	Medium	The potential exists for surface water to be impacted as a result of the dissolved phase contamination noted to be present.	High
	Leachate	Vertical Migration	Bedrock Aquifer	Highly Likely	Medium	The potential exists for groundwater to be impacted as a result of the contaminated leachate/groundwater noted to be present at the site to date. The shallow aquifer is noted to be impacted at this time. The shallow groundwater acts as a pathway for contamination to migrate to the deeper bedrock aquifer. The bedrock aquifer is not in use as a potable resource at this time. However, once mining operation cease it is likely that this aquifer will be exploited as a potable resource.	High

Source: CHC Environmental Solutions, 2016: Quantitative Risk Assessment Report, licence reference IEL P056-03, report reference CHC 00133.FR.01.2, dated April 2016

8.4.2 Processing Site CSM

A CSM has been prepared following a review of data gathered during Stages 1-5 of the baseline assessment for the site, with the exception of the landfill area which had been subject to DSA and DQRA in 2015/2016, as discussed in Section 8.4.1.

The CSM was informed by data gathered during the site investigations discussed in Sections 7.2 and 7.4 of this report.

Table 32. Summary of Viable SPR Linkages

Source	Pollutants	Receptor	Pathway	Associated Severity	Likelihood of Occurrence	Discussion	Potential Impact on Site
Lead and Zinc Processing	Lead Zinc	Current and future site users Adjacent offsite users	Dermal contact and inhalation of dust	Medium	Unlikely	Control measures in place to control the generation of dust on site. Lead and zinc concentrate is stored in a dedicated storage shed under negative pressure. Vehicles entering the storage area, including trains, are washed prior to leaving the building, reducing the likelihood of contact with lead or zinc products.	Low Risk
		Bedrock Aquifer	Vertical migration through permeable deposits	Medium	Unlikely	Lead is intermittently detected in groundwater at one overburden well on site Zinc is routinely detected in 4 of the 14 wells sampled above relevant assessment criteria.	Low Risk
		Surface water bodies	Leaching from soil, migrating vertically to shallow groundwater and lateral flow toward surface water receptors	Medium	Unlikely	Lead and zinc detections are unlikely to be related solely to site operations and are likely to be due to natural lead and zinc deposits in the local subsoils and bedrock	Low Risk
Bulk Fuel and Waste Oil	Hydrocarbons	Current and future site users	Dermal contact and ingestion	Medium	Low Likelihood	There have been no reports of significant losses of fuel or waste oil on site. Hydrocarbon staining was visible on surface soil beside the waste oil unloading point. Limited evidence of hydrocarbon contamination, in the form of sheens and globules in perched water, was encountered at site investigation locations near the fuel tank farm. Hydrocarbon analysis of soil and groundwater samples from across site found that all hydrocarbon detections are below GAC protective of human health. Hydrocarbon soil and groundwater detections were all at depth and there is considered to be no risk of ingestion or direct dermal contact.	Low/Moderate Risk
		Current and future site users Adjacent offsite users	Inhalation of vapours.	Medium	Unlikely	There have been no reports of significant losses of fuels or waste oils. Free phase hydrocarbon product has not been detected at site groundwater wells. Fuel storage areas are not located near buildings on site. Hydrocarbon impact in perched water near fuel tank farm is limited to sheen and globules however analytical results were below GAC.	Low Risk
		Bedrock Aquifer	Vertical migration through permeable deposits	Medium	Unlikely	Groundwater at the main processing site is proactively and routinely sampled for a range of parameters which includes TPHs.	Low Risk

Source	Pollutants	Receptor	Pathway	Associated Severity	Likelihood of Occurrence	Discussion	Potential Impact on Site
		Surface water bodies	Leaching from soil, migrating vertically to shallow groundwater and lateral flow toward surface water receptors	Medium	Unlikely	TPHs were detected at 1 of the 15 wells sampled in August 2021. This detection was at a concentration of 16 µg/L, less than twice the method detection limit. Therefore it is considered unlikely that fuels or waste oils have been lost to ground in quantities that pose an unacceptable risk to local groundwater or surface water receptors	Low Risk
Firefighting Foam	PFAS	Receptor	Vertical migration through permeable deposits	Medium	Unlikely	The use of AFFF containing PFAS was limited to underground areas in the past, in the event of a problem with the site's main firefighting appliance. Boliden have indicated that PFAS-containing AFFF will no longer be used on site Low detections of PFAS in soil samples in 2022 indicate that PFAS-containing AFFF may have been used historically in the firefighting training area. However, PFAS was below detection in all four groundwater samples collected near the firefighting training area and in the surface water sample taken from final effluent, which includes water abstracted from the underground mine, indicating that the wider risk posed by limited historic PFAS use at the site is negligible	Low Risk
		Current and future site users Adjacent offsite users	Leaching from soil, migrating vertically to shallow groundwater and lateral flow toward surface water receptors.	Medium	Unlikely		Low Risk

9. Production of Baseline Report (Stage 8)

Boliden Tara Mines dac (Boliden) operate a mine at Knockumber, Navan, Co. Meath under IE Licence P0516-04 granted by the EPA. AECOM understands that Boliden wish to apply for a revision of their IE Licence. As part of the revision process Boliden are obliged to produce a soil and groundwater baseline report. Boliden Tara Mines appointed AECOM to assist in the production of this Baseline Report.

Boliden provided a list of 200 chemicals including mixtures, used on the site, their physical state and their usage quantities.

AECOM screened this long list based on whether these substances have relevant Hazard Statement or are defined as a Hazardous Substance to aquatic receptors or are listed as Hazardous by the EPA to derive a short list of potential hazardous substances for the site (Stage 1).

The short list of hazardous substances identified following Stage 1 was screened for potential pollution risk due to their chemical or physical properties (Stage 2)

In Stage 3, the hazardous substances taken forward from Stage 2 were considered in the context of the site to determine whether circumstances exist which may result in the potential release of a substance in sufficient quantities to pose a pollution risk. Specific circumstances include:

- The quantity of each hazardous substance or groups of similar hazardous substances;
- How and where hazardous substances are stored and used on site;
- How the hazardous substances are transported around the installation; and,
- In case of existing installations, the measures that have been adopted to ensure that it is impossible in practice for contamination of soil or groundwater to take place (including the presence and integrity of containment mechanisms, condition of site drainage, etc.).

The following relevant hazardous substances were identified following Stage 3:

- Diesel
- Kerosene
- Lead Concentrate
- Waste Oil
- Zinc Concentrate

In addition, PFAS containing AFFF was stored on site prior to disposal in May 2022 by a licenced waste contractor. The PFAS AFFF was for use in the underground mine only as a back-up in case an issue developed with the site's fire tender. It was used underground on at least one occasion. It was reportedly not used recently in the firefighting training area, however historic use could not be discounted.

All other substances were ruled out as Relevant Hazardous Substances, as it was deemed that, based on the handling and storage practices on site, the potential release of those substances in sufficient quantities to pose a pollution risk was deemed very low.

A site walkover was conducted as required by the EU Guidance Document. The site walkover included interviews with Boliden staff and an inspection of storage areas and the water drainage system. The TSF was ruled out as an area requiring a site investigation, as no Relevant Hazardous Substances were used or stored in this area of the site.

As part of Stage 4, the site history was reviewed, including a review of aerial photography and existing site investigation reports.

In Stage 5 the site's environmental setting was reviewed including a review of potential sensitive environmental receptors, the site's drainage system and hazardous material and waste storage provisions.

A CSM for the site was developed in Stage 6 for areas of the site other than the former landfill. The CSM was informed by the information collected during Stages 1-5 and was reviewed in light the site investigations in Stage 7. A previous CSM completed by JS Drilling and CHC Environmental for the landfill area is also presented in Stage 6.

In Stage 7 groundwater data collected in 2021 and 2022 and previous soil and groundwater data from site investigations in the Landfill area in 2015 and recent Boliden routine monitoring events were reviewed. A site-wide shallow soil investigation was completed. A limited groundwater sampling event was conducted targeting areas of suspected historical PFAS use and elevated metals. A surface water sample was also collected from the site clean water pond to test the quality of water pumped from the underground mine in relation to Relevant Hazardous Substances.

Several parameters including lead and zinc, but not hydrocarbons, were identified as a risk to controlled waters by the 2015 DSA and 2016 DQRA in relation to the landfill area. A corrective action report for the landfill was submitted to the EPA in 2021.

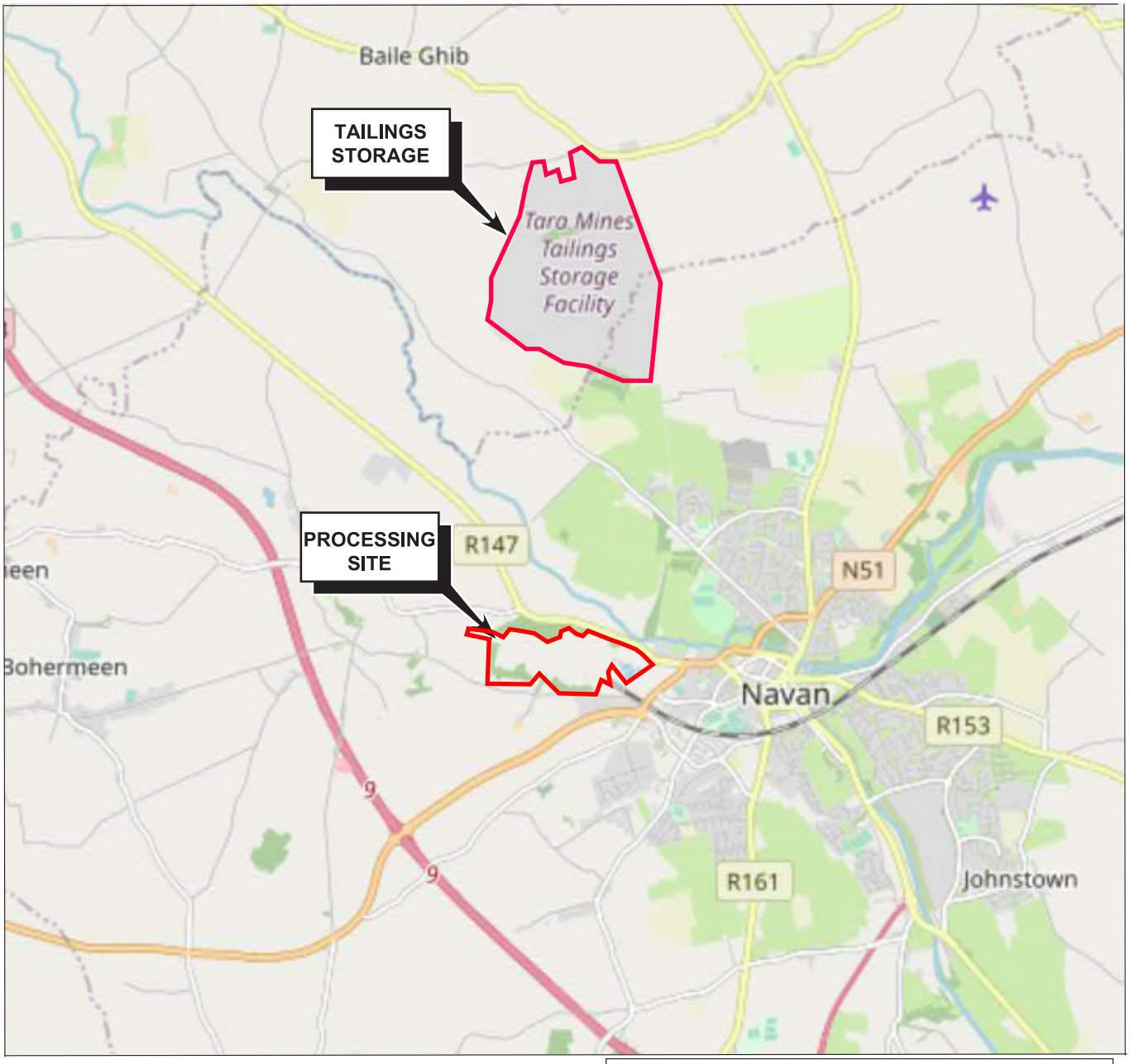
The 2021 AECOM site investigation concluded that there was no significant contamination caused by Relevant Hazardous Substances outside of the landfill area investigated in 2015 and 2016. Exceedances of assessment criteria for lead was reported in soil samples and groundwater in four locations during all three recent Boliden groundwater sampling events and the AECOM April 2022 groundwater sampling event and is likely to be due to naturally-occurring base metal mineralisation in the area and not as a result of site activities. Concentrations of lead and zinc in shallow soils were found to be low in processing and storage areas.

Visual evidence of contamination, in the form of a sheen and hydrocarbon globules, was noted at locations near the fuel tank farm. Limited detections of hydrocarbons, interpreted to be primarily degraded diesel and lubricating oil, were reported at several locations across site but at concentrations significantly below assessment criteria, including at trial pits near the fuel tank farm, indicating the risk of hydrocarbons to human health or controlled waters is negligible.

The AECOM Baseline Assessment therefore concludes there is no significant impact from Relevant Hazardous Substances to soil or groundwater on the Boliden Tara Mines site.

Appendix A Figures

North



Approximate Scale

0 km 2.0 km 4.0 km

Approximate Site Boundary

CLIENT
BOLIDEN TARA MINES

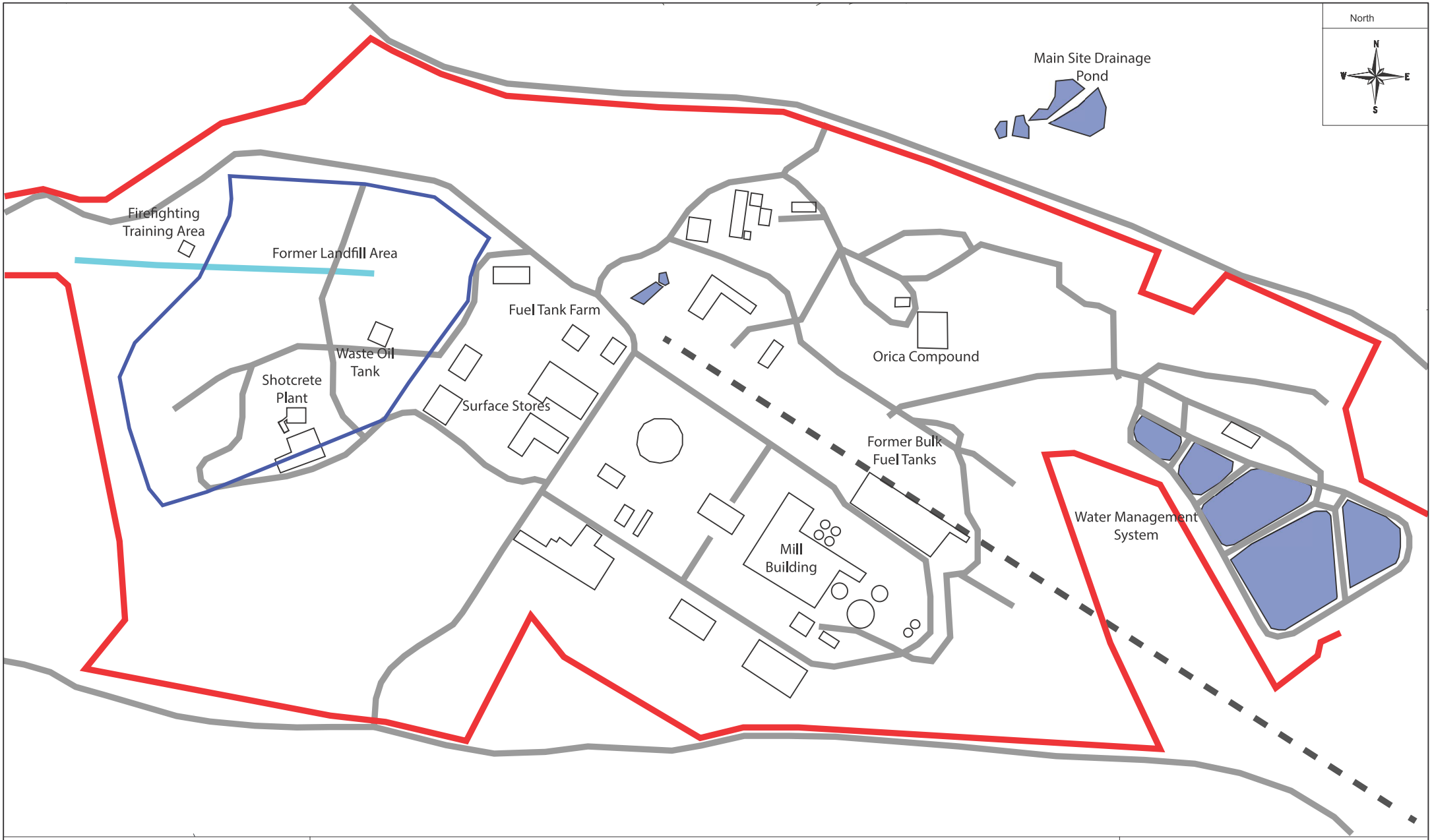
PROJECT LOCATION
BOLIDEN TARA MINES
MAIN PROCESSING SITE

DRAWING TITLE
FIGURE 1 - SITE LOCATION PLAN

ENVIRONMENTAL CONSULTANTS
AECOM
1st Floor Montrose House
Carrigaline Road, Douglas, Cork.
Tel 021 4365 006

DRAWN	TRACED	CHECKED	APPROVED	DATE
BMC		BMC	KF/COR	FEB 2022

SCALE	Job No.
AS SHOWN	60671645_ACM_RP_EN_001



CLIENT
BOLIDEN TARA MINES

PROJECT
BASELINE ASSESSMENT

DRAWING TITLE
FIGURE 2_SITE LAYOUT

NOTES
- APPROXIMATE SITE BOUNDARY
- LANDFILL BOUNDARY
- CULVERT
- ROADS
- RAILS
- WATER MANAGEMENT SYSTEM

DRAWN	CHECKED	APPROVED	DATE
BMC	KF	KF	FEB 2022
SCALE	DRG NO.		
N.T.S	60671645_ACM_RP_EN_001		

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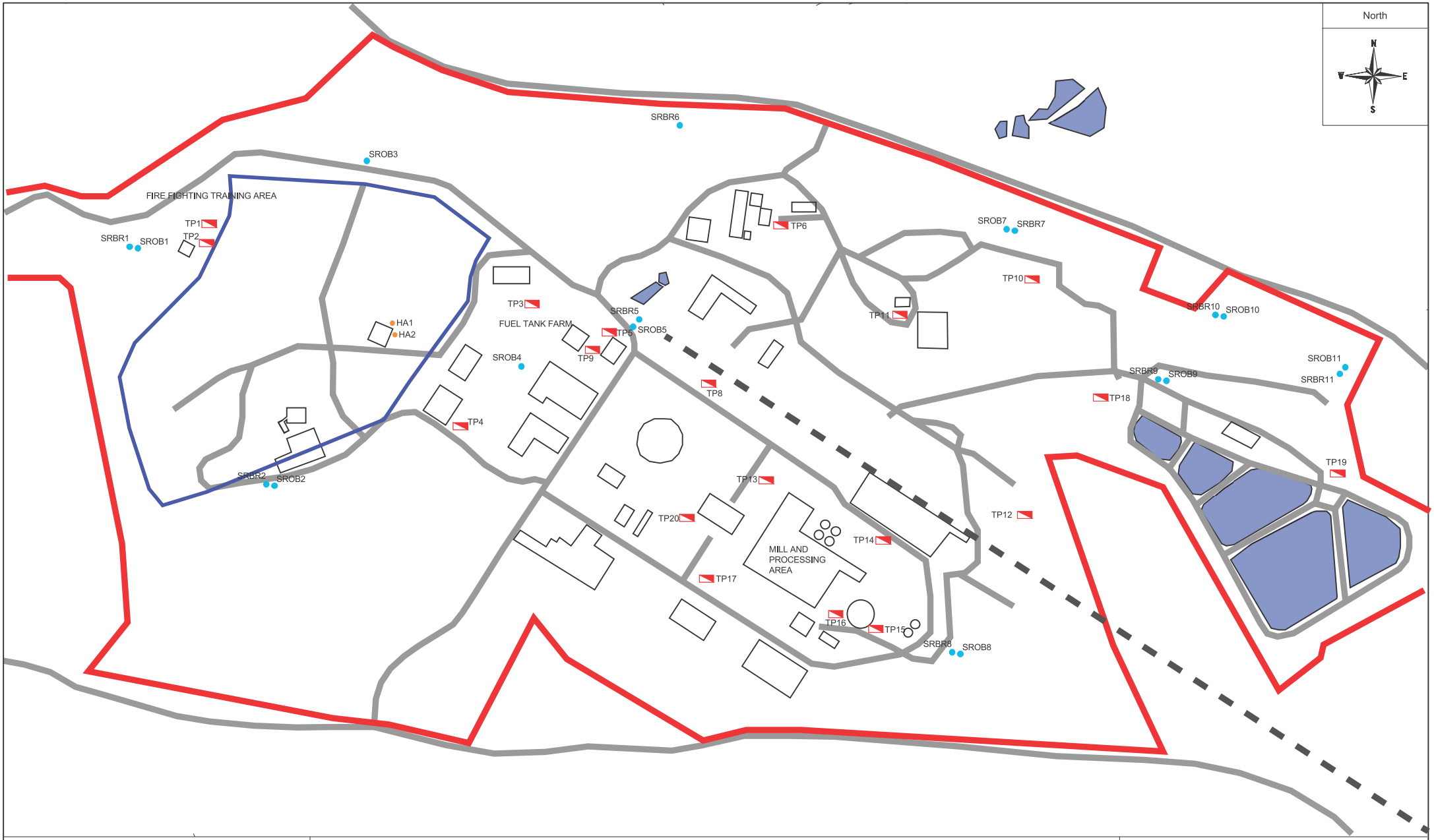

CLIENT
BOLIDEN TARA MINES

PROJECT
BASELINE ASSESSMENT

DRAWING TITLE
FIGURE 3_2022 SAMPLE LOCATIONS

NOTES
- Groundwater Wells
- Hand Augered Locations
- Trial Pit Locations
- Approximate Site Boundary
- Landfill Boundary

DRAWN	CHECKED	APPROVED	DATE
BMC	KF	KF	MAY 2022
SCALE	DRG NO.		
N.T.S	60671645_ACM_RP_EN_001		

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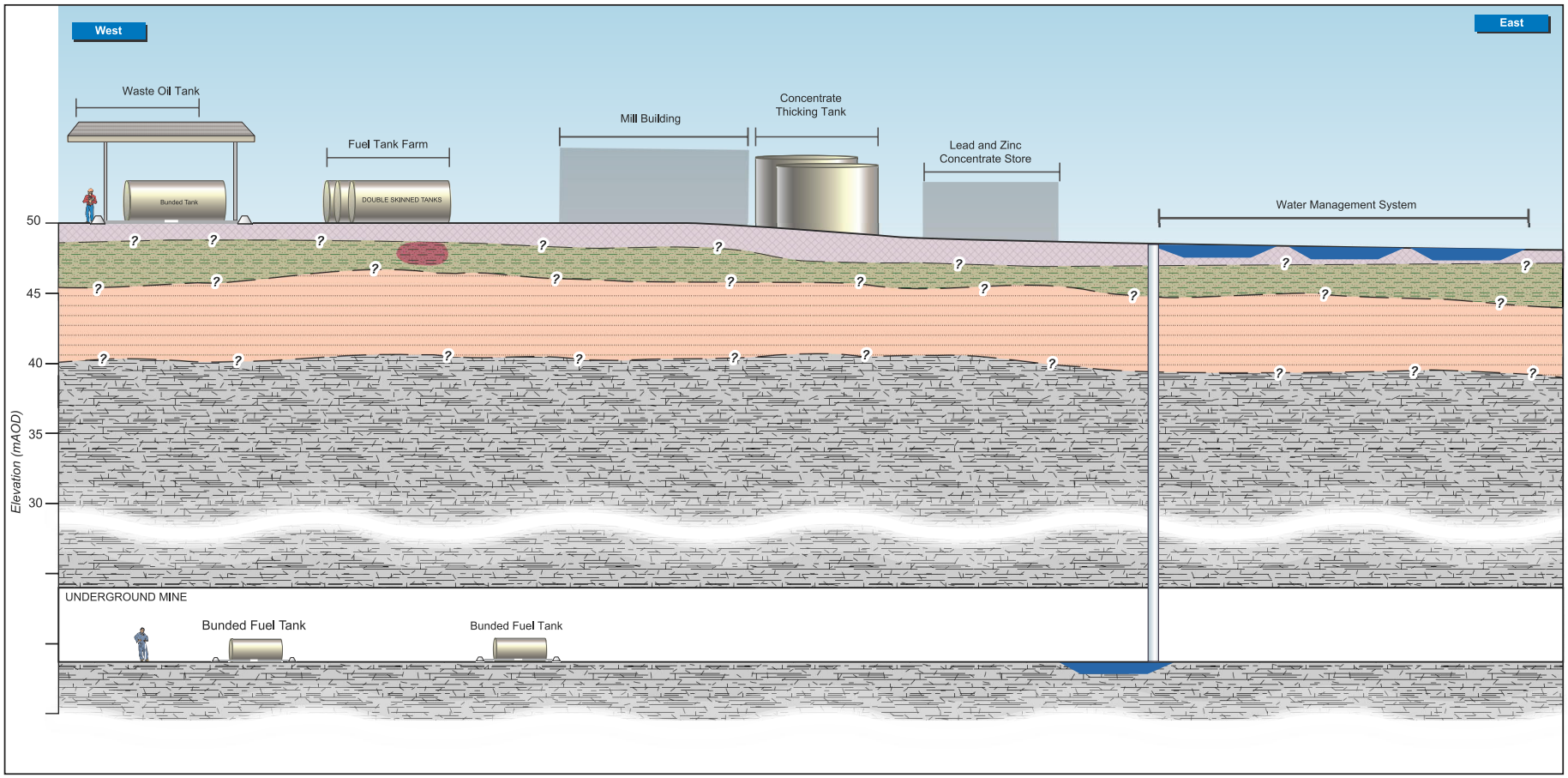

KEY:

- MADE GROUND
- TILL : SANDY CLAY
- EPIKARST
- LIMESTONE
- HYDROCARBON GLOBULES (HISTORIC)
- WATER COLLECTED IN UNDERGOUND MINE IS PUMPED TO WATER MANAGEMENT SYSTEM

AREAS OF POTENTIAL CONCERN

Hydrocarbons
- Main Fuel Farm
- Waste Diesel Storage Area
- Kerosene Fuel Tanks
- Underground Fuel Storage

Metals
- Concentrate Storage Building
- Mill Building and Thickening Tanks

RELEVANT HAZARDOUS SUBSTANCES

Hydrocarbons
- Diesel
- Kerosene
- Waste Oil

Metals
- Lead Concentrate
- Zinc Concentratate

POTENTIAL PATHWAYS

Human Health
- Particulate – Ingestion, inhalation, dermal contact, with soil particulates.
- Migration of hydrocarbon vapours in shallow subsurface.

Controlled Waters
- Vertical migration through permeable deposits.
- Leaching from soil, migrating vertically to shallow groundwater and lateral flow toward surface water receptors

POTENTIAL RECEPTORS

Human Health
- Current and future site users.
- Adjacent offsite users.

Controlled Waters
- Surface water (River Boyne and River Blackwater).
- Groundwater beneath the site.

POTENTIALLY COMPLETE POLLUTANT LINKAGES

Human Health
- None identified.

Controlled Waters
- None identified.

NO	DESCRIPTION	DRAWN	APPROVED	DATE

STATUS: FOR INFORMATION

CONSULTING ENGINEERS
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CLIENT: BOLIDEN TARA MINES

PROJECT: BOLIDEN TARA MINES BASELINE ASSESSMENT

DRAWING TITLE: FIGURE 4 CONCEPTUAL SITE MODEL

DRAWN	DESIGNED	CHECKED	APPROVED	DATE
BMC		KF	KF	MAY 2022

SCALE	Project No.	REV.
NTS	60671645	

Appendix B Relevant Hazardous Substances Tables

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
360 Cutting Oil (Aerosol)	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreatment heavy naphthenic	64742-52-5	Hazardous	-	Yes					
Propane	74-98-6	Not Listed	-	No					
Butane	106-97-8	Not Listed	-	Yes					
388 Synthetic Tapping Fluid	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Oxirane, methyl-, polymer with oxirane, monobutyl ether, phosphate	71662-44-7	Not Listed	H412	Yes					
Oleic Acid, Ethoxylated	9004-96-0	Not Listed	-	No					
Ethylene oxide-Propylene oxide copolymer monobutylether	9038-95-3	Not Listed	-	No					
7a-Ethyldihydro-1H, 3H, 5H-oxazolo [3,4-c] oxazole	7747-35-5	Not Listed	H412	Yes					
395 Tapping Lubricant	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated light	64742-47-8	Hazardous	H412	Yes					
Propane	74-98-6	Not Listed	-	No					
White Mineral Oil (petroleum)	8042-47-5	Hazardous	-	No					
438 PTFE Coating	Mixture	Not Listed	H361D	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Acetone	67-64-1	Undetermined	-	No					
Butanone	78-93-3	Not Listed	-	Yes					
Isobutane	75-28-5	Not Listed	-	Yes					
Toluene	108-88-3	Hazardous	H361D, H412	Yes					
Propane	74-98-6	Not Listed	-	No					
601 Chain Drive Pin & Bushing Lubricant	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Carbon Dioxide	124-38-9	Not Listed	-	Yes					
Oleyl Acohol, ethoxylated, phosphate	39464-69-2	Not Listed	H400, H412	Yes					
651 Detergent Lubricating Oil (Aerosol)	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Carbon Dioxide	124-38-9	Not Listed	-	Yes					
Oleyl Acohol, ethoxylated, phosphate	39464-69-2	Not Listed	H400, H412	Yes					
730 Spragrip	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydrocarbons, C7-C9, n-alkanes, isoalkanes, cyclics	64742-49-0	Not Listed	H411	Yes					
Isobutane	75-28-5	Not Listed	-	Yes					
740 Heavy Duty Rust Guard	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	64742-47-8	Not Listed	-	Yes					
775 Moisture Shield	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated light	64742-47-8	Hazardous	-	Yes					
Distillates (petroleum), hydrotreated heavy naphthenic	64742-52-2	Hazardous	-	Yes					
Hydrocarbon Waves (petroleum), Oxidized, Me Esters, Barium Salts	68603-10-1	Hazardous	-	Yes					
Benzenesulfonic Acid, di-C10-18-alkyl derivs, Barium Salts	93820-55-4	Not Listed	-	Yes					
785 Parting Lubricant	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Hazardous	H411	Yes					
Solvent Naphtha (petroleum), light aromatic	64742-95-6	Hazardous	H411	Yes					
Methanol	67-56-1	Not Listed	H411	Yes					
Aluminium	7429-90-5	Not Listed	-	No					
900 GoldEnd Paste	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Methanol	76-56-1	Not Listed	-	Yes					
Talc	14807-96-6	Not Listed	-	No					
Fatty Acids, tallow, Me esters, chlorinated	68440-29-9	Not Listed	-	No					
Titanium Dioxide	13463-67-7	Not Listed	-	No					
White Mineral Oil (petroleum)	8042-47-5	Hazardous	-	No					
Acid Cleaner: Dissolvex	Mixture	Not Listed	-	Yes	Yes	Liquid	1,566	L	No - not classified as hazardous and no relevant hazard statement
Adblue	Mixture	Not Listed	-	No	Yes	Liquid	94,406	L	No - not classified as hazardous and no relevant hazard statement
Adhesive: Loctite	7085-85-0	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Adhesive: Bondloc 515	Mixture	Not Listed	H413	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
4,4'-isopropylidenediphenol, ethoxylated and 2-methylprop-2-enoic acid	41637-38-1	Not Listed	H413	Yes					
2-hydroxypropyl	923-26-2	Not Listed	-	No					
α,α-dimethylbezyl hydroperoxide	80-15-9	Not Listed	H411	Yes					
2''-phenylacetohydrazide	114-83-0	Not Listed	-	No					
Adhesive: Evo-Stik Impact Solvent Free	Mixture	Not Listed	H402, H400, H410	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Potassium Hydroxide	1310-58-3	Undetermined	H402	Yes					
Zinc Oxide Active	1314-13-2	Not Listed	H400, H410	Yes					
Adhesive: Loctite B542	Mixture	Not Listed	H400, H410, H411, H413	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Cumene hydroperoxide	80-15-9	Not Listed	H411	Yes					
N,N-Diethyl-p-toluidine	613-48-9	Not Listed	H412	Yes					
N,N-dimethyl-o-toluidine	609-72-3	Not Listed	H412	Yes					
Methyl methacrylate	80-62-6	Undetermined	-	No					
1,4-Naphthalenedione	130-15-4	Not Listed	H400, H410	Yes					
Adhesive: Loctite 55	Mixture	Not Listed	No	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Limestone	1317-65-3	Not Listed	-	No					
Talc	14807-96-6	Not Listed	-	No					
Titanium Dioxide	13463-67-7	Not Listed	-	No					
Quartz	14808-60-7	Not Listed	-	No					
Adhesive: Sika Anchor Fix-1	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	Yes - Relevant H Statement (H412)
Vinyltoulene	25013-15-4	Not Listed	H411	No					
Adhesive: Contact VA 100	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Ethyl 2-cyanoacrylate	7085-85-0	Not Listed	-	No					
Aerosol Glade Room Spray	Mixture	Not Listed	H400, H410	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Sobutane	75-28-5	Not Listed	-	No					
Propane	74-98-2	Not Listed	-	No					
Trimethyloctadecylammonium chloride	112-03-8	Not Listed	H400, H410	Yes					

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
Agri Trans 80W	Mixture	Not Listed	H411, H413	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Petroleum	64742-48-9	Hazardous	H413	Yes					
Zinc bis[O,O-bis(2-ethlyhexyl)] bis (dithiophosphate)	4259-15-8	Not Listed	H411	Yes					
Albany Vinyl Matt Emulsion Paint	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Alpha SP 150 Gear Oil	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum)	64741-88-4	Hazardous	H413	Yes					
Residual Oils (petroleum)	64742-62-7	Hazardous	H413	Yes					
Alpha SP 220 Gear Oil	64742-54-7	Hazardous	H413	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Alpha SP 320 Gear Oil	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Alphasyn T220	Mixture	Not Listed	H400, H410	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Butylphenyldiphenyl phosphate	56803-37-3	Not Listed	-	No					
Bis (p-t-butylphenyl)phenyl phosphate	65652-41-7	Not Listed	-	No					
Triphenyl phosphate	115-86-6	Hazardous	H400, H410	Yes					
Ammonia	7664-41-7	Non-Hazardous	H400, H410, H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Anti Seize: 785 Parting Lubricant	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Auminium Powder	7429-90-5	Not Listed	-	Yes					
Hydrocarbons	64742-48-9	Not Listed	-	Yes					
Solvent Naphtha	64742-95-6	Not Listed	H411	Yes					
5,5'-dithiodi-1,3,4-thiadiazole-2(3H)-thione	72676-55-2	Not Listed	H411	Yes					
Methanol	67-56-1	Not Listed	-	Yes					
Anti Seize: Assembly Paste Weicon	Mixture	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Calcium Dihydroxide	1305-62-0	Not Listed	-	Yes					
Anti Seize: Rocol	Mixture	Not Listed	H400, H410, H412	Yes	No	Solid	<250	kg	No - Material is a Solid
Copper	7440-50-8	Not Listed	H400, H411	Yes					
Calcium Carbonate	1317-65-3	Not Listed	-	No					
Disodium Sebacate	17265-14-4	Not Listed	-	Yes					
Aminic Phenyl Derivative	68411-46-1	Not Listed	H412	Yes					
Anti Splatter Aerosol: Eco-Tech	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Glycerol	56-81-5	Undetermined	-	No					
2-(2-butoxyethoxy) ethanol	112-34-5	Not Listed	-	Yes					
Nitrogen	7727-37-9	Not Listed	-	Yes					
2-aminoethanol	141-43-5	Not Listed	-	Yes					
Auto Luber Grease	Mixture	Not Listed	-	No	Yes	Solid	600	kg	No - Material is a Solid
Phosphorodithioic Acid, mixed O,O bis(2-ethylhexyl and iso-Bu and iso-Pr) ester, zinc salts	85940-28-9	Not Listed	H411	Yes					
Autran MBX	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-65-0	Hazardous	-	Yes					
Distillates (petroleum), hydrotreated , light naphthenic	64742-53-6	Hazardous	-	Yes					
1-(tert-dodecylthio)propan-2-ol	67124-09-8	Not Listed	H400, H410	Yes					
Benzene	71-43-2	Hazardous	-	Yes					
Ethanol	61791-44-4	Undetermined	H400	Yes					
Bacti Vir: Antibacterial Spray	Mixture	Not Listed	H400, H411	Yes	Yes	Liquid	333	L	Yes - Relevant H statement (H400, H411)
Alcohol Ethoxylate-7 Mole	68131-39-5	Undetermined	H400	Yes					
Alkyl Dimethyl Ethylbenzyl Ammonium Chloride	85409-23-0	Non-Hazardous	H400	Yes					
Benzalkonium Chloride	68391-01-5	Non-Hazardous	H400	Yes					
Dipropylene Glycol Monomethyl Ether	34590-94-8	Not Listed	-	No					
Tetrasodium Ethylene Diamine Tetraacetate	64-02-8	Not Listed	-	No					
Barbituric Acid	67-52-7	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Barium Chloride	10361-37-2	Non-Hazardous	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Belzona 9111	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), heavy alkylate	64742-48-9	Hazardous	H411	Yes					
Bleach: Domestos	Mixture	Not Listed	H400	Yes	Yes	Liquid	2,765	L	Yes - Relevant H statement (H400)
Sodium Hypochlorite	7681-52-9	Undetermined	H410	Yes					
Sodium hydroxide	1310-73-2	Not Listed	-	Yes					
Cocamine Oxide	68955-55-5	Undetermined	H400, H411	Yes					
Break Fluid Dot 4	Mixture	Not Listed	H361D	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
2-[2-(2-butoxyethoxy)ethoxy]ethanol	143-22-6	Not Listed	-	No					
Diethylene Glycol Monomethyl Ether	111-77-3	Undetermined	-	No					
3,6,9,12-tetraoxahexadecan-1-ol	1559-34-8	Not Listed	-	No					
2-(2-butoxyethoxy) ethanol	112-34-5	Not Listed	-	No					
1,1'-iminodipropan-2-ol	110-97-4	Not Listed	-	No					
Butane	270-704-2	Not Listed	-	No	No	Gas	9,884	L	No - not classified as hazardous and no relevant hazard statement
Castrol Agri MP 15W-30	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-65-0	Hazardous	-	Yes					
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
Phosphorodithioc Acid	85940-28-9	Not Listed	H411	Yes					
Castrol Alpha SP 460	Mixture	Not Listed	-	No	Yes	Liquid	2,080	L	No - not classified as hazardous and no relevant hazard statement
Castrol Alphasyn T 32	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Dec-1-ene, trimers, hydrogenated	157707-86-3	Not Listed	-	No					
Reaction Mass	Mixture	Not Listed	H411	Yes					
Castrol Alphasyn T460	Mixture	Not Listed	H361, H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Phenol, isobutylenated, phosphate	68937-40-6	Non-Hazardous	H400, H410	Yes					
n-phenyl-1-naphthylamine	90-30-2	Not Listed	H410	Yes					
9-Octadecenoic Acid (9Z) - reaction products with 3-(dodecenyl)dihydro-2,5-furandione and triethylenetetramine	68478-81-9	Not Listed	H412	Yes					

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
Castrol Moly Grease	Mixture	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Base Oil	Mixture	Not Listed	-	Yes					
Lithium Hydroxide Monhydrate	1310-66-3	Not Listed	-	Yes					
Phosphorodithioc Acid	68649-42-3	Not Listed	H411	Yes					
Castrol TQF Trans Oil	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Lubricating oils (petroleum), C20-5-, hydrotreated neutral oil-base	72623-87-1	Hazardous	-	No					
Methacrylate Copolymer	30396-85-1	Not Listed	-	No					
Castrol Vecton 15W-40 CJ-4	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
CD-90 Chain Spray	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
C3-C4-rich, petroleum distillate Petroleumgas (1,2-butadiene <0.1%)	68512-91-4	Not Listed	-	Yes					
2,6-di-tert-butyl-p-cresol	128-37-0	Not Listed	H400, H410	Yes					
Cement Gasket	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Rosin	2,246,493	Not Listed	-	Yes					
Ethanol	64-17-5	Undetermined	H400	Yes					
Cleanrite Sanitiser	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hypochlorous Acid	7790-92-3	Not Listed	-	No					
Ionised Water	7732-18-5	Not Listed	-	No					
Sodium Chloride	7647-14-5	Undetermined	-	No					
Chloros	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Sodium Hypochlorite Solution	7681-52-9	Non-Hazardous	-	No					
Cold Galvanizing Compound: Aerosol	Mixture	Not Listed	H400, H410	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Zinc	7440-66-6	Non-Hazardous	H400, H410	Yes					
Acetone	67-64-1	Undetermined	-	No					
Xylene	1330-20-7	Hazardous	-	Yes					
Butanone	78-93-3	Not Listed	-	Yes					
Propane	74-98-6	Not Listed	-	Yes					
Butane	106-97-8	Not Listed	-	Yes					
Stoddard Solvent	8052-41-3	Not Listed	H411	Yes					
Carbon Dioxide	124-38-9	Not Listed	-	Yes					
Ethylbenzene	100-41-4	Hazardous	-	Yes					
n-Butyl Acetate	123-86-4	Not Listed	-	Yes					
Copper Grease	Mixture	Not Listed	H400, H412	Yes	No	Solid	<250	kg	No - Material is a Solid
Copper	7440-50-8	Not Listed	H400, H411	No					
Copper Sulphate	7758-98-7	Non-Hazardous	H400, H410	Yes	Yes	Solid	807,000	kg	Yes- Material is mixed on site to produce a solution. Relevant H
Crack Detector	Mixture	Not Listed	-	No	No	Gas	<250	L	No - Material is a Gas
Proprietry Blend of Aliphatic Hydrocarbon Solvents	8052-41-3	Hazardous	-	Yes					
Butane	106-97-8	Not Listed	-	Yes					
Danafloat 068	Mixture	Not Listed	-	No	Yes	Liquid	12,355	L	No - not classified as hazardous and no relevant hazard statement
Phosphorodithioc Acid, O,O-bis(methyl-phenyl) Ester, Sodium Salt	61792-48-1	Not Listed	-	Yes					
Danafloat TM 507	85940-28-9	Not Listed	H411	Yes	Yes	Liquid	31,600	L	Yes- Relevant H statement (H411)
Diesel	68334-30-5	Hazardous	H351, H411	Yes	Yes	Liquid	60,748	L	Yes - Relevent Hazard Statement (H351 and H411)
Diesel Fuel Additive	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated light	64742-47-8	Hazardous	-	Yes					
Naphtha (petroleum), heavy aromatic	64742-94-5	Hazardous	-	Yes					
Ethylene Glycol Monobutyl Ether	111-76-2	Undetermined	-	Yes					
Trimethylbenzenes (mixed)	25551-13-7	Hazardous	-	Yes					
Naphthalene	91-20-3	Hazardous	H400, H410	Yes					
Digester Toilet Cleaner	Mixture	Not Listed	-	No	Yes	Liquid	1,661	L	No - not classified as hazardous and no relevant hazard statement
Dipropylene Glycol Monomethyl Ether	34590-94-8	Not Listed	-	No					
Alcohols, Ethoxylated	68439-46-3	Undetermined	H400, H412	Yes					
Dihydroxy Benzenedisulfonic Acid	149-45-1	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Disinfectant	Mixture	Not Listed	H400, H411	Yes	Yes	Liquid	20,000	L	Yes - Relevent Hazard Statement (H400 and H411)
Deox Extra	Mixture	Not Listed	-	Yes	Yes	Liquid	846	L	No - not classified as hazardous and no relevant hazard statement
Hydrochloric Acid	7647-01-0	Not Listed	-	No					
Citric Acid	77-92-9	Undetermined	-	No					
ALIPHATIC ALCOHOL, C13-15 LARGELY LINEAR, ETHOXYLATED POLYMER	157627-86-6	Not Listed	H412	Yes					
Di-Lithium Tetraborate	12007-60-2	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Drewfloc 270	Mixture	Not Listed	-	No	Yes	Liquid	4,791	kg	No - not classified as hazardous and no relevant hazard statement
Drewfloc 2234	Mixture	Not Listed	H412	Yes	Yes	Solid	13,958	kg	No - Material is a Solid
Drewfloc 2418	Mixture	Not Listed	-	No	Yes	Liquid	5,666	kg	No - not classified as hazardous and no relevant hazard statement
DS 20	Mixture	Not Listed	-	Yes	Yes	Solid	9,000	kg	No - Material is a Solid
Lignosulphate	8061-52-8	Not Listed	H413	Yes					
Potato Dextrin	9004-53-9	Not Listed	-	No					
Quebracho Tannin	1401-55-4	Not Listed	H413	Yes					
Dychem's Germinus	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Alkyl (C12-C16) Dimethyl Benzalkonium Chloride	68424-85-1	Non-Hazardous	-	No					
Didecyl Dimethyl Ammonium Chloride	7173-51-5	Not Listed	H400	Yes					
Electronic Component Cleaner 267	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), light alkylate	64741-66-8	Hazardous	H411	Yes					
Isopropanol	67-63-0	Undetermined	-	No					
Carbon Dioxide	124-696-9	Not Listed	-	No					
Emo Lithium EP 00	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Highly Refined Base Oil	9072-35-9	Not Listed	-	Yes					
Emulsion Paint	Mixture	Not Listed	H401	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Pyrithione Zinc	13463-41-7	Not Listed	-	No					
2-octyl-2H-isothiazol-3-one	26530-20-1	Not Listed	H410	Yes					
Methylisothiazolinone	2682-20-4	Not Listed	H400	Yes					

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
Energol THB 68	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Solvent Naphtha (petroleum), heavy aromatic	6,474,209,405	Hazardous	H411	Yes					
Engine Oil: 5W30 Fully Synthetic	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Lubricating oils (petroleum), C20-5-, hydrotreated neutral oil-base	72623-87-1	Hazardous	-	Yes					
Reaction Products of Benzeneamine, N-phenyl-with Nonene (Branched)	68411-46-1	Not Listed	H413	Yes					
Diphenylamine	122-39-4	Not Listed	H400, H410	Yes					
Dodecylphenol, Mixed Isomers	27193-86-8	Not Listed	H400, H410	Yes					
Engine Oil: Truckline LSP 15W40	Mixture	Not Listed	-	No	Yes	Liquid	21,693	L	No - not classified as hazardous and no relevant hazard statement
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
2,5-Furandione	873694-48-5	Not Listed	-	No					
C7-9-alkyl 3-(3,5-di-tert-butyl-4-hydroxphenyl)propionate	125643-61-0	Not Listed	H413	Yes					
Eucalyptus Milk	8000-48-4	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Eurol ATF III H	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Evo-Stik Foam Filler	Mixture	Not Listed	H351, H414	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Alkanes, C14-17, Chloro	85535-85-9	Hazardous	H400, H410	Yes					
Dimethyl Ether	115-10-6	Not Listed	-	Yes					
Diphenylmethane-4,4'-di-isocyanate	101-68-8	Not Listed	H351	Yes					
Ferric Sulphate 40%	10028-22-5	Undetermined	-	No	Yes	Solid	450,000	kg	No - not classified as hazardous and no relevant hazard statement
Flexane 80 Resin	Mixture	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
4,4'-methylenedi(cyclohexyl isocyanate)	5124-30-1	Not Listed	-	Yes					
Flexane GP Putty Resin	Mixture	Not Listed	H351	Yes	No	Solid	<250	kg	No - Material is a Solid
Diphenylmethane-4,4'-di-isocyanate	101-68-8	Not Listed	H351	Yes					
4,4'-methylenedi(cyclohexyl isocyanate)	5124-30-1	Not Listed	-	Yes					
Frothbel J1000	1310-58-3	Not Listed	-	No	Yes	Liquid	8,000	L	No - not classified as hazardous and no relevant hazard statement
Fuchs Grease Cartridge	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Quantity below 250 L / 250 kg
Gear Oil: EP80W-90	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	No					
Residual Oils (petroleum)	64742-62-7	Hazardous	-	No					
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-54-7	Hazardous	-	No					
Mineral Oil	8042-47-5	Hazardous	-	No					
Gear Oil: EPX80W-90	Mixture	Not Listed	H412	Yes	Yes	Liquid	4,000	L	Yes - Relevent Hazard Statement (H412)
Amines, C12-14-tert-alkyl	68955-53-3	Not Listed	H410	Yes					
(Z)-octadec-9-enylamine	112-90-3	Not Listed	H400, H410	Yes					
Gloss Paint	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Hazardous	-	Yes					
Hydrocarbons, C9-11, n-alkanes, isoalkanes, cyclics, <2% aromatics	64742-48-9	Not Listed	-	Yes					
Hydrocarbons, C10-13, n-alkanes, isoalkanes, cyclics, <2% aromatics	64742-48-9	Not Listed	-	Yes					
Hydrocarbons, C14-18, n-alkanes, isoalkanes, cyclics, <2% aromatics	64742-47-8	Not Listed	-	Yes					
Grafloscon Ultra Grease	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Grease	Mixture	Not Listed	-	No	Yes	Solid	1,100	kg	No - Material is a Solid
Grease Cartridge	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Hi-Dur AD100 Finish	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Xylene	1330-20-7	Hazardous	-	Yes					
Ethylbenzene	100-41-4	Hazardous	-	Yes					
2-Methoxy-1-Methylethyl Acetate	108-65-6	Not Listed	-	Yes					
Methyl Ethyl Ketoxime	96-29-7	Undetermined	H351	Yes					
Cobalt Bis(2-Ethylhexanoate)	136-52-7	Not Listed	H360F, H400, H412	Yes					
Hocut B65	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Severely Refined Mineral Oil	64741-97-5	Hazardous	-	Yes					
3-iodo-2 Propynylbutyl Carbamate	55406-53-6	Not Listed	-	No					
2-(2-butoxyethoxy) ethanol	112-34-5	Not Listed	-	Yes					
Alcohol Polyethoxylate	68131-39-5	Not Listed	H401, H412	Yes					
Bis(dimethyl oxazolidinyl)methane	66204-44-2	Not Listed	-	No					
Boric Acid Salt of Ethanolamine	94095-04-2	Not Listed	H360D, H360F	Yes					
Hutplex HV Grease	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Hycote: Matt Black	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
2-butoxyethanol	111-76-2	Undetermined	-	No					
Acetone	67-64-1	Undetermined	-	No					
Butane	106-97-8	Not Listed	-	Yes					
Isobutane	106-97-8	Not Listed	-	Yes					
Propane	74-98-6	Not Listed	-	No					
Xylene	1330-20-7	Hazardous	-	Yes					
Hycote: Primer	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
1-methoxy-2-propanol	107-98-2		-	Yes					
2-butoxyethanol	111-76-2	Undetermined	-	No					
Acetone	67-64-1	Undetermined	-	No					
Butane	106-97-8	Not Listed	-	Yes					
Isobutane	106-97-8	Not Listed	-	Yes					
Propane	74-98-6	Not Listed	-	No					
Solvent Naphtha(petroleum), light arom	64742-95-6	Hazardous	H411	Yes					
Xylene	1330-20-7	Hazardous	-	Yes					
Hydramax 32	Mixture	Not Listed	-	No	Yes	Liquid	20,556	L	No - not classified as hazardous and no relevant hazard statement
Hydraulic Oil: HVI 68	Mixture	Not Listed	-	No	Yes	Liquid	213,880	L	No - not classified as hazardous and no relevant hazard statement
Distillates (petroleum) solvent-refined heavy paraffinic	64741-96-4	Hazardous	-	No					
Hydrochloric Acid	91671-69-1	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydrochloric Acid, 36.5-38%	7647-01-0	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydroflouric Acid	7664-39-3	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydroflouric Acid, 40%	7664-39-3	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
Hyspin AWS 46	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
Industrial & Marine Solvent II	Mixture	Not Listed	H360D	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Sodium Carbonate	497-19-8	Undetermined	-	No					
Hexyl D-glucoside	54549-24-5	Not Listed	-	No					
Potassium Hydroxide	1310-58-3	Undetermined	-	No					
N-methyl-2-pyrrolidone	872-50-4	Not Listed	H360D	Yes					
Interlac 665	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), hydrosulfurized heavy	64742-82-1	Hazardous	H411	Yes					
Hydrocarbons, C9–12	1174921-79-9	Not Listed	H411	Yes					
Xylene	1330-20-7	Hazardous	-	Yes					
2-butanone oxime	96-29-7	Not Listed	H351	Yes					
Neodecanoic Acid, Cobalt Salt	27253-31-2	Not Listed	H361F, H412	Yes					
Jumbo Mini 2 Ply 3"	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Quantity below 250 L / 250 kg
Kerosene	64742-48-9	Hazardous	H411	Yes	Yes	Liquid	103,969	L	Yes - Classified as Hazardous and relevant H-statement (H411)
Kluberfluid C-F 3 Ultra	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Synthetic Hydrocarbon Oil	8020-83-5	Hazardous	-	Yes					
Mineral Oil	8042-47-5	Hazardous	-	No					
Lanthanum (III) Oxide	1312-81-8	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Lead Concentrate (Galena -PbS)	999999-99-4	Not Listed	H351, H360D, H360F, H411	Yes	Yes	Solid	>5,000,000	kg	Yes - Material is processed as a liquid. Relevent H statements (H351, H360DF,
Leak Detection Spray	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Nitrous Oxide	10024-97-2	Not Listed	-	No					
Dihydroxyethylcocoalkylamineoxide	61791-47-7	Not Listed	H400	Yes					
Lithium Bromide	7550-35-8	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Gas
Lithium Complex Grease: Blasolube	Mixture	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Dilithium Azelate	38900-29-7	Not Listed	-	Yes					
Naphthenic Acids, Zinc Salts, Basic	84418-50-8	Not Listed	H412	Yes					
Reaction Products	931-384-6	Not Listed	H411	Yes					
Lithium Nitrate	7790-69-4	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Loctite 221	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Cumene hydroperoxide	80-15-9	Not Listed	H411	Yes					
N,N-Diethyl-p-toluidine	613-48-9	Not Listed	H412	Yes					
N,N-dimethyl-o-toluidine	609-72-3	Not Listed	H412	Yes					
Loctite 270	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Loctite 496	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Methyl 2-cyanoacrylate	137-05-3	Not Listed	-	Yes					
Hydroquinone	123-31-9	Undetermined	H351, H400, H410	Yes					
Loctite 574	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Decan-1-ol	112-30-1	Not Listed	H412	Yes					
Cumene hydroperoxide	80-15-9	Not Listed	H411	Yes					
Acetic Acid, 2-phenylhydrazide	114-83-0	Not Listed	H351	Yes					
Maleic Acid	110-16-7	Not Listed	-	Yes					
N,N'-Ethane-1,2-diylbis(12-hydroxyoctadecan-1-amide)	123-26-2	Not Listed	H413	Yes					
1,4-Naphthalenedione	130-15-4	Not Listed	H400, H410	Yes					
Loctite 577	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Lokset Resin	Mixture	Not Listed	H361D, H410	Yes	Yes	Solid	16,000	kg	No - Material is a solid
Styrene	100-42-5	Hazardous	H361D	Yes					
Dibenzoyl peroxide	94-36-0	Not Listed	-	No					
N,N-dimethyl-p-toluidine	99-97-8	Not Listed	H412	Yes					
N,N-bis(2-hdroxyethyl)-p-toluidine	103671-44-9	Not Listed	-	No					
Alkanes, C14–17	85535-85-9	Hazardous	H400, H410	Yes					
Long Life Coolant	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Mono Ethylene Glycol	107-21-1	Not Listed	-	Yes					
Disodium Tetraborate Pentahydrate	12179-04-3	Not Listed	H360F	Yes					
Low Sulphur Diesel	Mixture	Not Listed	H350, H410	Yes	Yes	Liquid	3,758,798	L	Yes - Relevent Hazard Statement (H350 and H410)
Gas Oils, hydrotreated	97862-78-7	Not Listed	H350	Yes					
Distillates (petroleum), light catalytic cracked	64741-59-9	Hazardous	H350, H410	Yes					
Fuel Oil, heavy high-sulfur	92045-14-2	Hazardous	H350, H361, H410	Yes					
Methyl Isobutyl Cabinol (MIBC)	108-11-2	Not Listed	-	No	Yes	Liquid	4,000	L	No - not classified as hazardous and no relevant hazard statement
Milton Disinfecting Liquid	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Sodium Hypochlorite	7681-52-9	Non-Hazardous	H400	No		Liquid	<250	L	No - Quantity below 250 L / 250 kg
Mobil Rarus 426	Mixture	Not Listed	-	No	Yes	Liquid	<250	L	No - not classified as hazardous and no relevant hazard statement
n-phenyl-1-naphthylamine	90-30-2	Not Listed	H400, H410	Yes					
Oxa Dithia Phosphatetradecanoic Acid Ethylhexyl Ester	83547-95-9	Not Listed	H401, H411	Yes					
Mobil Delvac MX 15W-40	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Zinc Alykl Dithiophosphate	113706-15-3	Not Listed	H401, H411	Yes					
Mobil EAL Arctic 68	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Mobil Grease XHP 222	Mixture	Not Listed	-	No	Yes	Solid	5,000	kg	No - Material is a Solid
Benzenamine, n-phenyl-, Rection Products with 2,4,4-Trimethylpentene	68411-46-1	Not Listed	H412	Yes					
Naphthenic Acids, Zinc Salts	12001-85-3	Not Listed	H401, H411	Yes					
Zinc Dialkyl Dithiophosphate	68457-79-4	Not Listed	H401, H411	Yes					
Mobil SHC 624	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
1-decene, tetramer and trimer hydrogenated	68649-12-7	Not Listed	-	No					
Phosphoric Acid, Methylphenyl Diphenyl Ester	26444-49-5	Non-Hazardous	H400, H410	Yes					
Triphenyl phosphate	115-86-6	Hazardous	H400, H411	Yes					

Material/Substance	CAS Number	Stage 1				Stage 2			
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Mobil SHC Gear 46M	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Amines, C12-14-tert-alkyl	68955-53-3	Not Listed	H400, H410	Yes					
Benzenamine, n-phenyl-, Rection Products with 2,4,4-Trimethylpentene	68411-46-1	Not Listed	H402, H412	Yes					
Long-Chain Alkenyl Amine	112-90-3	Not Listed	H400, H410	Yes					
Multi Surface Cleaning & Disinfect Wipes	Mixture	Not Listed	-	No	Yes	Solid	500	kg	No - Material is a Solid
Didecyl Dimethyl Ammonium Chloride	7173-51-5	Not Listed	H400	Yes					
Alkyl Dimethyl Ethylbenzyl Ammonium Chloride	85409-23-0	Non-Hazardous	H400	Yes					
Alkyl (C12-C16) Dimethyl Benzalkonium Chloride	68424-85-1	Non-Hazardous	-	No					
Multivis 68	Mixture	Not Listed	-	No	Yes	Liquid	213,814	L	No - not classified as hazardous and no relevant hazard statement
Mineral Oil	8042-47-5	Hazardous	-	No					
Nitric Acid	7697-37-2	Undetermined	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Opticool 972	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Poly(oxy-1,2-ethanediol)-phenyl-hydroxyphosphat)	39464-70-5	Not Listed	-	Yes					
1,2-benzisothiazol-3(2H)-one, 1,2-benzisothiazolin-3-one	2634-33-5	Not Listed	H400	Yes					
Pyridine-2-thiol 1-oxide, sodium salt	3811-73-2	Not Listed	H400, H411	Yes					
Plastic Steel 5-Min Putty (SF) Hardener	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
2,4,6-tris(dimethylaminomethyl)phenol	90-72-2	Not Listed	-	No					
Plastic Steel Putty (A) Resin	Mixture	Not Listed	H412	Yes	No	Solid	<250	kg	No - Material is a Solid
Epoxy Resin	25068-38-6	Not Listed	H411	Yes					
2-Methoxy-1-Methylethyl Acetate	108-65-6	Not Listed	-	No					
Potassium Isoamyl Xanthate (PAX)	Mixture	Not Listed	H411	Yes	Yes	Solid	85,000	kg	Yes- Material is mixed on site to produce a solution. Relevant H statement (H411)
Potassium Sulfide	1312-73-8	Not Listed	-	No					
Carbonodithioic Acid, O-(3-methylbutyl) Ester, Potassium Salt	1928-70-1	Not Listed	H411	Yes					
Potassium Hydroxide	1310-58-3	Undetermined	H402	Yes					
Propan-2-Ol	67-63-0	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Pulsarlube V	Mixture	Not Listed	-	No	Yes	Liquid	28,000	L	No - not classified as hazardous and no relevant hazard statement
Water	7732-18-5	Not Listed	-	No					
Ethylene Glycol	107-21-1	Undetermined	-	No					
Potassium Carbonate	584-08-7	Not Listed	H402	Yes					
Pyridine	110-86-1	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Q8 Rembrandt EP 2	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Mineral Oil	8042-47-5	Hazardous	-	Yes					
Q8 Rembrandt Moly 2	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Quantity below 250 L / 250 kg
Lithium Greased based on Mineral Oil with Additives	-	Not Listed	-	No					
RBS 25	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Tetrapotassium Pyrophosphate	7320-3405	Non-Hazardous	-	No					
Sodium Hypochlorite Solution	7681-52-9	Non-Hazardous	H400	Yes					
Sodium Hydroxide	1310-73-2	Undetermined	-	Yes					
RBS 50	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Tetrapotassium Pyrophosphate	7320-3405	Non-Hazardous	-	No					
Sodium Hypochlorite Solution	7681-52-9	Non-Hazardous	H400	Yes					
Sodium Hydroxide	1310-73-2	Undetermined	-	Yes					
Red Lithium Complex EP 2	Mixture	Not Listed	-	No	Yes	Solid	4,150	kg	No - Material is a Solid
Refined Mineral Base Oil	64741-97-5	Hazardous	-	Yes					
Phosphorodithioic Acid, mixed O,O bis(2-ethylhexyl and iso-Bu and iso-Pr) ester, zinc salts	85940-28-9	Not Listed	H411	Yes					
Rema Tip Top Cement SC 4000	Mixture	Not Listed	H410	Yes	No	Solid	<250	kg	No - Material is a Solid
Ethyl Acetate	141-78-6	Not Listed	-	No					
Cyclohexane	110-82-7	Not Listed	H400, H410	Yes					
Zinc Oxide	1314-13-2	Not Listed	H400, H410	Yes					
Colophony	8050-19-7	Not Listed	-	No					
Rema Tip Top Cement SC-BL	Mixture	Not Listed	H411	No	No	Solid	<250	kg	No - Material is a Solid
Rema Tip Top Fixpaste	Mixture	Not Listed	H411	No	No	Solid	<250	kg	No - Material is a Solid
Rema Tip Top Hardener E40	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Ethyl Acetate	141-78-6	Not Listed	-	No					
Thionophosphoric Acid-tris-(p-isocyanatophenyl)	4151-51-3	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Rema Tip Top Solvent Liquid Buffer	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Naphtha (petroleum), hydrocarbons C6-C7, n-alkanes, iso-alkanes, cyclic compounds, <3% n-hexane	64742-49-0	Hazardous	H411	Yes					
Renolit H EP 1	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Mineral Oil	8042-47-5	Hazardous	-	No					
Glycerin	56-81-5	Not Listed	-	No					
Olefin Sulphide	72162-26-6	Not Listed	H412	Yes					
Reodorizer	Mixture	Not Listed	-	No	Yes	Liquid	5,485	L	No - not classified as hazardous and no relevant hazard statement
Ethoxylated Alcohols, C9-C11	68439-46-3	Not Listed	-	No					
Ethanol	64-17-5	Undetermined	H400	Yes					
Rock Drill Grease	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8	Hazardous	-	Yes					
Distillates (petroleum), solvent-refined light paraffinic	64741-89-5	Hazardous	-	Yes					
Rock Drill Oil 100	Mixture	Not Listed	H400, H410, H411, H412	No	Yes	Liquid	10,613	L	Yes - Relevent Hazard Statement (H400, H410, H411 and H412)
Base Oil Severly Refined	64742-65-0	Hazardous	-	Yes					
Residual Oils (petroleum), solvent-dewaxed	64742-62-7	Hazardous	H413	Yes					
Lubricating oils (petroleum), hydrotreated	64742-58-1	Hazardous	-	No					
Rocol Wire Rope Spray	Mixture	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Hydrocarbon Aerosol Propellant	68476-85-7	Not Listed	-	No					
Hydrocarbons, C7, N-alkanes, Isoalkanes, Cyclics	64742-49-0	Not Listed	H411	Yes					

Material/Substance	CAS Number	Stage 1				Stage 2			
		EPA's Classification of Hazardous and Non-hazardous Substances	Relevant Hazard Statement	Hazardous Substance	Annual Usage greater than 250 L / 250 kg	Physical State of Chemical Stored On-Site	Annual Usage (approximate)	Unit	Considered a Relevant Hazardous Substance
Sapphire Premier	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Dilithium Sebacate	19370-86-6	Not Listed	-	Yes					
N-phenyl-1,1,3,3-tetramethylbutylnaphthalen-1-amine	51772-35-1	Not Listed	H413	Yes					
Shell Spirax S4 TXM	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Zinc Dialkyl Dithiophosphate	4259-15-8	Not Listed	H411	Yes					
Borated Ester	84819-41-0	Not Listed	-	No					
Sika Concrete Primer	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
2-Methoxy-1-Methylethyl Acetate	108-65-6	Not Listed	-	Yes					
Diphenylmethanediisocyanate, isomerers and homolouges	9016-87-9	Not Listed	H351	Yes					
Propyl Acetate	109-60-4	Not Listed	-	No					
Sika Sprayguard	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Sika Viscoflex 3000	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - not classified as hazardous and no relevant hazard statement
Silicone Grease Spray	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
LVP Petroleum Solvent	64742-47-8	Hazardous	-	Yes					
Poly(dimethylsiloxane)	63148-62-9	Not Listed	-	No					
Propellant (propane, n-butane)	74-98-6/106-97-8	Not Listed	-	Yes					
Silite Sealant X0107 Clear	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Ethyltriacetoxysilane	17689-77-9	Not Listed	-	Yes					
4,5-Dichloro-2-octylisothiazol-3(2H)-one	64359-81-5	Not Listed	H400	Yes					
Sodium Dihydrogen Orthophosphate	13472-35-0	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Sodium Cyanide	143-33-9	Not Listed	H400, H410	Yes	Yes	Solid	23,370	kg	Yes - material is mixed on site to make a solution. Relevant H statement (H400,
Sodium Hydroxide	1310-73-2	Undetermined	-	No	Yes	Liquid	466	L	No - not classified as hazardous and no relevant hazard statement
Sodium Isopropyl Xanthate (SIPX)	140-93-2	Not Listed	H411	Yes	Yes	Solid	180,000	kg	Yes - material is mixed on site to make a solution. Relevant H statement (H400)
Sodium Nitrite	7632-00-0	Not Listed	H400	Yes	Yes	Solid	2,600	kg	Yes - material is mixed on site to make a solution. Relevant H statement (H400)
Solvent Cement	Mixture	Not Listed	-	No	No	Solid	<250	kg	No - Material is a Solid
Speedspray QDH	Mixture	Not Listed	H412	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Xylene	1330-20-7	Hazardous	-	Yes					
Ethylbenzene	100-41-4	Hazardous	-	Yes					
Trizinc bis(orthophosphate)	7779-90-0	Not Listed	H400, H410	Yes					
Methyl Ethyl Ketoxime	96-29-7	Undetermined	H351	Yes					
Cobalt Bis(2-Ethylhexanoate)	136-52-7	Not Listed	H360F, H400, H412	Yes					
Spheerol EPL 1	Mixture	Not Listed	-	Yes	No	Solid	<250	kg	No - Material is a Solid
Phosphorodithioic Acid, mixed O,O bis(2-ethylhexyl and iso-Bu and iso-Pr) ester, zinc salts	85940-28-9	Not Listed	H411	Yes					
Spheerol LCX 6002	Mixture	Not Listed	H412	Yes	No	Solid	<250	kg	No - Material is a Solid
Alkaryl Amine	68411-46-1	Not Listed	H411	Yes					
Zinc bis[O,O-bis(2-ethlyhexyl)] bis (dithiophosphate)	4259-15-8	Not Listed	H411	Yes					
Subtek ANE	Mixture	Not Listed	-	No	Yes	Solid	2,000,000	kg	No - not classified as hazardous and no relevant hazard statement
Ammonium Nitrate	6484-52-2	Not Listed	-	No					
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed	H411	No					
Distillates (petroleum), hydrotreated heavy paraffinic	64742-45-7	Not Listed	-	No					
Tetraethylenepentamine	112-57-2	Not Listed	H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Tetrosyl Standard Thinners	Mixture	Not Listed	H361D, H411	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Toluene	108-88-3	Hazardous	H361D, H412	Yes					
Propan-1-Ol	71-23-8	Not Listed	-	Yes					
Ethanol	61791-44-4	Undetermined	H400	Yes					
Hexane-norm	110-54-3	Not Listed	H361F, H411	Yes					
Ethylbenzene	100-41-4	Hazardous	-	Yes					
Xylene	1330-20-7	Hazardous	-	Yes					
Cyclohexane	110-82-7	Not Listed	H400, H410	Yes					
Heptane	142-82-5	Not Listed	H400, H410	Yes					
Methyl Acetate	79-20-9	Not Listed	-	Yes					
Butan-2-Ol	78-92-2	Undetermined	-	Yes					
IPA	67-63-0	Not Listed	-	Yes					
Butyl Acetate-norm	123-86-4	Not Listed	-	Yes					
Propyl Acetate	109-60-4	Not Listed	-	No					
Texaco Geartex Oil	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Highly Refined Mineral Oil (C15-C50)	-	Hazardous	-	No					
Olefine Sulfide	72162-26-6	Not Listed	H413	Yes					
Methacrylate Copolymer	30396-85-1	Not Listed	-	No					
Phosphoric Acid Ester, Amine Salt	90506-45-9	Non-Hazardous	H411	Yes					
Substituted Thiadiazole	93925-00-9	Not Listed	H412	Yes					
Transformer Oil	6774-74-7	Not Listed	-	No	No	Liquid	0	L	No - not classified as hazardous and no relevant hazard statement
Transmission Oil T0430	Mixture	Not Listed	-	No	Yes	Liquid	6,463	L	No - not classified as hazardous and no relevant hazard statement
Distillates (petroleum), solvent-based heavy paraffinic	67472-65-0	Hazardous	-	Yes					
Distillates (petroleum), hydrotreated heavy paraffinic	64742-54-7	Hazardous	-	Yes					
Mineral Oil	8042-47-5	Hazardous	-	No					
Calcium Long Chain Alkylphenate Sulphide	90480-91-4	Not Listed	H413	Yes					
Unigear 85W/140	-	Not Listed	H412	Yes	Yes	Liquid	7,600	L	Yes - Relevent Hazard Statement (H412)
Polysulfides, di-tert,Bu	68937-96-2	Not Listed	H412	Yes					
Phosphoric Acid Ester Amine Salt	92623-72-8	Not Listed	H411	Yes					
WD40 Smart Straw	-	Not Listed	-	No	Yes	Liquid	282	L	No - not classified as hazardous and no relevant hazard statement
Hydrocarbons, C9-11, n-alkanes, isoalkanes, cyclics, <2% aromatics	64742-48-9	Not Listed	-	Yes					
Carbon Dioxide	124-38-9	Not Listed	-	Yes					
White Spirit	919-446-0	Not Listed	H411	Yes	Yes	Liquid	866	L	Yes - Relevent Hazard Statement (H411)
Windscreen Bond	Mixture	Not Listed	-	No	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
WR1 Tolette	Mixture	Not Listed	-	Yes	No	Liquid	<250	L	No - Quantity below 250 L / 250 kg
Phosphoric Acid	766-38-2	Non-Hazardous	-	No					
Glycerine	56-81-5	Not Listed	-	No					
Zinc Concentrate	999999-99-4	Not Listed	H351, H360, H372, H412	Yes	Yes	Solid	5,000,000	kg	Yes - Material is a solution during processing. Relevent Hazard Statements
Zinc Sulphate	7446-19-7	Not Listed	H400, H410	Yes	No	Solid	58,000	kg	Yes - Material is mixed to make a solution. Relevent Hazard Statements

Appendix B Table B2 - Stage 3

Group	Material/Substance	Stage 3				
		Storage Location	**Transportation Method**	**Containment Measures**	**Likelihood of Release to Open Ground**	**To be Monitored as a Relevant Hazardous Substance - Rationale**
Cleaning Materials	Bacti Vir	Stored in small containers	Delivered in small containers by truck and unloaded by forklift	Stored on bunded shelves	Very Low - stored, used and transported in small quantities	No - Stored in small containers
	Bleach: Domestos					
	Disinfectant					
Copper Sulphate		Stored as a solid in the bunded mill building. It is mixed on site within the mill building and stored in a 162.3 m^3 holding tank	Delivered to the Mill Building in 1 tonne double skinned, environmentally sealed bags. It is stored near the dedicated bag splitter/hopper. Once mixed it is transported by a HDPE pipeline with no joints to the distribution room and onwards to its point of use by pipeline	Stored, mixed and used in the Mill Building. The Mill Building has a basement bund with a capacity of 700 m^3 significantly more than the capacity of the storage tank. Ultrasonic sensors are used during mixing to prevent overfilling. Pressure sensors and flow meters are used to detect leaks during pumping and dosing. In the event of a loss the system will shut down on interlock	Very Low - stored as a solid protected from weather on hardstanding in double skinned bags. The storage area, mixing area and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place
Danafloat TM 507		Stored in the reagent storage area in the Mill	Delivered to site in 1 m^3 IBCs	Stored in IBCs and gravity fed to the holding tank located in the Mill building. There is a basement bund with a capacity of 700m^3. It is then pumped from the holding tank to its dosing destination in the process via a dedicated positive displacement diaphragm pump and flow meter. Pressure sensors and flow meters are used to detect leaks during pumping and dosing. In the event of a loss the system will shut down on interlock	Very Low - stored on hardstanding in a bunded building. The storage area, holding tank and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place
Diesel		Stored in ASTs in the fuel tank farm	Delivered to site by tanker	Stored in double skinned ASTs with the outer skin of each of the totally enclosed bunded tanks containing a minimum of 110% of the volume of the inner tanks	Low - Suitable containment measures in place	Yes - Stored in bulk, a loss from secondary containment may reach areas of open ground, potential for minor losses during filling
Kerosene		Stored in ASTs in the fuel tank farm and at other points around the site	Delivered to site in containers	Stored in storage tanks that are double skinned with the outer skin on each of the totally enclosed bunded tanks containing a minimum of 110% of the volume of the inner tanks.	Low - Suitable containment measures in place	Yes - Stored in bulk, a loss from secondary containment may reach areas of open ground, potential for minor losses during filling
Lead Concentrate		Stored in a concentrate storage shed in an enclosed building.	Concentrate is extracted from ore in the Mill Building, it is processed in dilute form before dewatering where it is transported to the concentrate store by conveyor. It is loaded into a train within the concentrate store for transport off site	Stored in the concentrate storage shed in particulate form. The concentrate storage shed is an enclosed building and is maintained at ambient temperature and pressure. Maximum storage capacity is approximately 7,000 tonnes of wet concentrate. During processing it is stored in the Mill building which is bunded, the thickening process takes place in an external single skinned tank. All tanks are on a preventative maintenance program. All vehicles, including the train are washed before leaving the storage shed	Low - Suitable containment measures in place	Yes - Stored in bulk
Maintenance Chemicals	Adhesive: Sika Anchor Fix-1	Stored in small containers	Delivered in small containers by truck	Stored on bunded shelves	Very Low - stored, used and transported in small quantities	No - Stored in small quantities only
	White Spirit					
Oils and Greases	Gear Oil: EPX80W-90	Stored in small containers	Delivered in drums or small containers by truck	Stored on bunded shelves	Very Low - stored, used and transported in small quantities	No - Stored in small quantities only
	Rock Drill Oil 100					
	Unigear 85W/140					
Potassium Isoamyl Xanthate (PAX)		Stored in a dedicated storage shed near the mill	Delivered to site in 850 kg double skinned, environmentally sealed bags contained in wooden boxes by truck, moved to the Mill when required by forklift over hardstanding	Stored in a dedicated shed protected from rainfall and on hard standing. Mixed and used in the Mill Building. The Mill Building has a basement bund with a capacity of 700 m^3 significantly more than the capacity of the storage tank. Ultrasonic sensors are used during mixing to prevent overfilling. Pressure sensors and flow meters are used to detect leaks during pumping. In the event of a loss the system will shut down on interlock	Very Low - stored as a solid protected from weather on hardstanding in double skinned bags. The mixing area and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place

Appendix B Table B2 - Stage 3

Group	Material/Substance	Stage 3				
		Storage Location	**Transportation Method**	**Containment Measures**	**Likelihood of Release to Open Ground**	**To be Monitored as a Relevant Hazardous Substance - Rationale**
Sodium Cyanide		Stored in a locked storage shed with restricted access	Delivered to site in one tonne double skinned, environmentally friendly sealed bags contained in wooden boxes	Sodium cyanide is stored as a solid in double skinned FIBCs in wooden boxes in a dedicated bunded building preventing leaching. In the event of a spill the sodium cyanide will remain contained with the building and can easily be collected. Sodium cyanide solution is mixed in batches of up to 1.8 m^3 and stored in a 4 m^3 tank in a bunded building. Due to the health risk posed by a potential hydrogen cyanide release in the event of a leak, a significant number of control measures are put in place to prevent losses during mixing and dosing. Sodium cyanide storage and mixing is prepared at ambient temperature and pressure and does not result in heat generation. Ultrasonic level sensors are used to monitor levels in the mixing tank an interlock prevents overfilling during mixing. Sodium cyanide is transported to the mill building through a welded stainless steel pipeline with no disconnectable connections outside of bunded areas. Flow meters and pressure sensors are used to detect any potential leaks. Pressure relieve valves in the mixing and pump building discharge into specially sealed boxes in the mixing room. During pumping the flow meter readings are compared to changes in tank level. Any discrepancy will cause the transfer system to shut down on interlock.	Very Low - stored as a solid protected from weather on hardstanding in double skinned bags. The mixing area and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place
Sodium Isopropyl Xanthate (SPIX)		Stored in a storage shed in the Mill	Delivered to site in 850 kg double skinned, environmentally sealed bags contained in wooden boxes by truck, moved to the Mill when required by forklift over hardstanding	Stored in a dedicated shed protected from rainfall and on hard standing. Mixed and used in the Mill Building. The Mill Building has a basement bund with a capacity of 700 m^3 significantly more than the capacity of the storage tank. Ultrasonic sensors are used during mixing to prevent overfilling. Pressure sensors and flow meters are used to detect leaks during pumping. In the event of a loss the system will shut down on interlock	Very Low - stored as a solid protected from weather on hardstanding in double skinned bags. The mixing area and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place
Sodium Nitrite		Stored in 25 kg bags in a metal container in a contractors compound. Mixed as a solution in a bunded IBC when required	Delivered to site by truck in solid form. Once mixed with water it is transferred to a specially designed vehicle and taken to its point of use	Stored as a solid and protected from the weather, it is mixed with water in small quantitates in a bunded IBC when required. The process is monitored at all times due to the explosion risk posed by sodium nitrate solution	Very Low - stored as a solid protected from weather on hardstanding in double 25 kg bags. Mixed under the direct supervision of trained staff in small quantities, suitable containment measures in place	No - Stored as a solid, Prepared in small quantities with suitable control measures in place
Zinc Concentrate		Stored in a concentrate storage shed in an enclosed building.	Concentrate is extracted from ore in the Mill Building, it is processed in dilute form before dewatering where it is transported to the concentrate store by conveyor. It is loaded into a train within the concentrate store for transport off site	Stored in the concentrate storage shed in particulate form. The concentrate storage shed is an enclosed building and is maintained at ambient temperature and pressure. Maximum storage capacity is approximately 7,000 tonnes of wet concentrate. During processing it is stored in the Mill building which is bunded, the thickening process takes place in an external single skinned tank. All tanks are on a preventative maintenance program. All vehicles, including the train are washed before leaving the storage shed	Low - Suitable containment measures in place	Yes - Stored in bulk
Zinc Sulphate		Stored as a solid in the bunded mill building. It is mixed on site within the mill building and stored in a holding tank	Delivered to the site in 1 tonne double skinned, environmentally sealed bags	Stored, mixed and used in the Mill Building. The Mill Building has a basement bund with a capacity of 700 m^3 significantly more than the capacity of the storage tank. Ultrasonic sensors are used during mixing to prevent overfilling. Pressure sensors and flow meters are used to detect leaks during pumping. In the event of a loss the system will shut down on interlock	Very Low - stored as a solid protected from weather on hardstanding in double skinned bags. The storage area, mixing area and distribution pipework are suitably bunded with automated control measures in place to prevent losses	No - Suitable control measures in place

Appendix C Boliden Groundwater Results 2021 – 2022

Table 1 Sample Inventory - Boliden Tara Mines GWM - 2021

Monitoring Well	Laboratory Parameters																	
	Major Ions			VOCs			SVOCs			Petroleum Hydrocarbons			Total Organic Carbon			COD		
	03-Mar-21	18-Aug-21	06-Apr-22	03-Mar-21	18-Aug-21	06-Apr-22	03-Mar-21	18-Aug-21	06-Apr-22	03-Mar-21	18-Aug-21	06-Apr-22	03-Mar-21	18-Aug-21	06-Apr-22	03-Mar-21	18-Aug-21	06-Apr-22
SR BR1	~	~	X	~	~	X	~	~	X	~	~	X	~	~	X	~	~	X
SR OB1	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR2	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR OB2	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR OB3	~	~	X	~	~	X	~	~	X	~	~	X	~	~	X	~	~	X
SR OB4	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR5	X	~	X	~	~	X	~	~	X	~	~	X	X	~	X	X	~	X
SR OB5	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR7	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR OB7	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR8	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR OB8	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR9	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR OB9	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR10	~	X	~	~	X	~	~	X	~	~	X	~	~	X	~	~	X	~
SR OB10	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X
SR BR11	X	~	~	~	~	~	~	~	~	~	~	~	X	~	~	X	~	~
SR OB11	X	X	X	~	X	X	~	X	X	~	X	X	X	X	X	X	X	X

Notes:

X - indicates parameter scheduled for analysis

~ - indicates parameter not scheduled for analysis

Major Ions: Total Alkalinity, Calcium, Chloride, Sulphate, Fluoride, Total Oxidised Nitrogen, Ammoniacal Nitrogen, Orthophosphate

Metals: Arsenic, Boron, Cadmium, Total Chromium, Copper, Iron, Lead, Manganese, Nickel, Zinc, Potassium and Sodium

Table 2a Major Ions 2021 R1 - Boliden Tara Mines GWM - Round 1 2021

Major Ion	MDL	Units	GTV	IGV	Monitoring Point														
					SR OB1	SR BR2	SR OB2	SR OB4	SR BR5	SR OB5	SR BR7	SR OB7	SR BR8	SR OB8	SR BR9	SR OB9	SR OB10	SR BR11	SR OB11
					03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21
Total Alkalinity as CaCO3	-	mg/L	-	-	312	376	244	322	323	340	229	220	290	251	247	247	337	299	272
Calcium	<0.2	mg/L	-	200	165	*234*	*392*	*422*	*319*	*243*	*267*	*276*	164	156	143	124	*209*	*225*	*309*
Chloride	<0.3	mg/L	24 - 187.5	30	7.6	20.5	18.3	**25.0**	***53.5***	***55.8***	7.9	8.3	***54.0***	***50.6***	5.3	5.0	23.7	16.5	***59.2***
Sulphate	<0.5	mg/L	187.5	200	***204***	***370***	***758***	***642***	***474***	***378***	***528***	***521***	134	129	58	52	***213***	***349***	***648***
Fluoride	-	mg/L	-	1	0.4	0.2	0.2	0.2	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
Total Organic Carbon	-	mg/L	-	-	1.4	2.1	2.5	5.3	2.2	3.6	2.2	3.0	2.1	2.4	1.7	1.0	1.4	1.7	1.7
Total Oxidised Nitrogen	<0.7	mg/L	-	-	-	-	-	-	-	1.2	-	-	3.1	6.4	-	-	0.9	-	-
Ammoniacal Nitrogen as N	<0.41	mg/L	0.084 - 0.225	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand	<11	mg/L	-	-	-	-	17	18	16	-	-	-	-	-	-	-	-	-	-
Orthorphosphate as P	<0.6	mg/L	0.11	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
IGV - EPA draft Interim Guideline Value for the protection of groundwater
Bold - Indicates result above GTV
Italics - Indicates result above IGV
MDL - Method Detection Limit
mg/L - micrograms per litre
---- indicates no guideline value defined
- Indicates results below the laboratory MDL

ncr - No criteria required
xx Exceedance to Drinking Water Standard (DWS)
xx Exceeds Environmental Quality Standard (EQS) Fresh Water
xx Exceeds Groundwater Threshold Value (GTV)

Table 2b Major Ions 2021 R2 - Boliden Tara Mines GWM - Round 2 2021

Major Ion	MDL	Units	GTV	IGV	Monitoring Point													
					SROB 1	SRBR 2	SROB 2	SROB 4	SROB 5	SRBR 7	SROB 7	SRBR 8	SROB 8	SRBR 9	SROB 9	SRBR 10	SROB 10	SROB 11
					18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	#########	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21
Total Alkalinity as CaCO3	-	mg/L	-	-	319	363	385	379	355	240	221	320	316	254	281	209	324	277
Calcium	<0.2	mg/L	-	200	155	*220*	*354*	*318*	*224*	*291*	*274*	178	187	138	143	*233*	196	*307*
Chloride	<0.3	mg/L	24 - 187.5	30	7.3	20.8	***35.2***	13.0	***47.4***	8.8	8.2	***53.2***	***52.8***	5.6	5.9	***53.4***	***25.3***	***57.9***
Sulphate	<0.5	mg/L	187.5	200	185	***340***	***721***	***582***	***383***	***637***	***574***	183	**190**	96	93	***568***	***221***	***644***
Fluoride	-	mg/L	-	1	0.4	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Total Organic Carbon	-	mg/L	-	-	1.1	2.0	2.5	5.6	2.9	1.8	1.2	1.5	2.1	1.1	-	1.4	1.5	1.2
Total Oxidised Nitrogen	<0.7	mg/L	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	1	-
Ammoniacal Nitrogen as N	<0.41	mg/L	0.084 - 0.225	0.15	-	-	-	***0.8***	***2.0***	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand	<11	mg/L	-	-	12	-	17	20	15	15	25	20	20	-	20	200	-	-
Orthorphosphate as P	<0.6	mg/L	0.11	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
IGV - EPA draft Interim Guideline Value for the protection of groundwater
Bold - Indicates result above GTV
Italics - Indicates result above IGV
MDL - Method Detection Limit
mg/L - micrograms per litre
---- indicates no guideline value defined
- Indicates results below the laboratory MDL

ncr - No criteria required
xx Exceedance to Drinking Water Standard (DWS)
xx Exceeds Environmental Quality Standard (EQS) Fresh Water
xx Exceeds Groundwater Threshold Value (GTV)

Table 2c Major Ions 2022 - Boliden Tara Mines GWM - Round 1 2022

Major Ion	MDL	Units	GTV	IGV	Monitoring Point															
					SRBR1	SROB1	SRBR2	SROB2	SROB3	SROB4	SRBR5	SROB5	SRBR7	SROB7	SRBR8	SROB8	SRBR9	SROB9	SROB10	SROB11
					07-Apr-22	07-Apr-22	07-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	07-Apr-22
Total Alkalinity as CaCO3	-	mg/L	-	-	428	338	364	263	221	352	283	350	239	242	297	271	239	307	318	281
Calcium	<0.2	mg/L	-	200	106	164	*243*	*521*	157	*431*	*258*	*243*	*364*	*304*	188	181	150	*229*	194	*301*
Chloride	<0.3	mg/L	24 - 187.5	30	8.8	7.2	20.1	***34.1***	12.5	17.0	***49.1***	***58.6***	8.5	9.2	***69.6***	***84.1***	13.0	14.3	**26.0**	***59.1***
Sulphate	<0.5	mg/L	187.5	200	136	183	***373***	***1,190***	62	***856***	***439***	***399***	***753***	***621***	176	145	93	***313***	**194**	***627***
Fluoride	-	mg/L	-	1	0.6	0.4	0.2	0.2	0.2	0.3	0.4	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.1	0.3
Total Organic Carbon	-	mg/L	-	-	1.4	1.0	1.9	2.5	1.8	5.5	2.3	3.9	1.3	1.7	2.6	2.6	-	0.7	1.2	1.2
Total Oxidised Nitrogen	<0.7	mg/L	-	-	-	-	-	-	25.0	-	-	-	-	-	5.1	6.1	-	-	1.2	-
Ammoniacal Nitrogen as N	<0.41	mg/L	0.084 - 0.225	0.15	-	-	-	-	-	***1.0***	-	***3.8***	-	***0.5***	-	-	-	-	***0.6***	***0.5***
Chemical Oxygen Demand	<11	mg/L	-	-	11	-	-	-	6	19	-	14	-	6	7	10	-	-	-	-
Orthorphosphate as P	<0.6	mg/L	0.11	0.03	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

Notes:
IGV - EPA draft Interim Guideline Value for the protection of groundwater
Bold - Indicates result above GTV
Italics - Indicates result above IGV
MDL - Method Detection Limit
mg/L - micrograms per litre
---- indicates no guideline value defined
- Indicates results below the laboratory MDL

Table 3a Metals 2021 R1 - Boliden Tara Mines GWM - Round 1 2021

Metals	MDL	Units	Drinking Water Standard	EQS Fresh Water	GTV	IGV	Monitoring Point													
							SR-OB1	SR OB2	SR BR2	SR OB4	SR OB5	SR BR5	SR OB7	SR BR7	SR OB8	SR BR8	SR BR9	SR OB 9	SR OB10	SR OB11	SR BR11
							03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21	03-Mar-21
Arsenic	<0.0002	mg/L	ncr	ncr	0.0075	0.01	0.0015	0.00052	0.0012	0.0031	0.0023	0.00083	-	0.0005	0.00073	0.0014	0.00063	0.00029	-	0.00072	0.00024
Boron	<0.23	mg/L	ncr	ncr	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	<0.0006	mg/L	ncr	ncr	-	0.005	-	-	-	*0.019*	-	-	-	-	-	-	-	-	-	-	-
Chromium	<0.002	mg/L	ncr	ncr	0.0375	0.03	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-
Copper	<0.009	mg/L	ncr	ncr	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	<0.23	mg/L	ncr	ncr	-	0.2	-	-	-	-	-	*0.55*	-	-	-	-	-	-	-	-	-
Lead	<0.006	mg/L	0.01	0.0012	0.0075	0.01	-	-	-	***0.02***	-	-	-	-	-	-	-	-	-	-	-
Manganese	<0.007	mg/L	ncr	ncr	-	0.05	*0.302*	*0.0815*	*1.03*	*0.365*	*1.16*	*0.479*	*0.0662*	*0.0977*	-	*0.712*	-	-	-	*1.22*	*0.076*
Nickel	<0.003	mg/L	ncr	ncr	-	0.02	-	*0.045*	0.005	*0.062*	0.004	0.005	0.006	0.005	-	0.010	-	-	-	-	-
Zinc	<0.018	mg/L	0.075	0.008	0.075	0.1	-	***6.020***	0.029	***17.000***	0.055	-	***0.406***	***0.138***	-	-	-	-	-	-	-
Potassium	<0.1	mg/L	ncr	ncr	-	5	3.6	3.3	3.8	4.8	*6.5*	*5.2*	*6.5*	*6.4*	*6.5*	*8.8*	0.7	0.6	2.1	3.0	2.4
Sodium	<0.1	mg/L	ncr	ncr	-	150	9.7	25.7	27.8	16.8	51.6	34.7	13.4	14.0	30.8	29.4	3.6	4.3	17.9	67.7	12.3

Notes:
IGV - EPA draft Interim Guideline Value for the protection of groundwater
Bold - Indicates result above GTV
Italics - Indicates result above IGV
MDL - Method Detection Limit
mg/L - micrograms per litre
---- indicates no guideline value defined
- Indicates results below the laboratory MDL

ncr - No criteria required
xx Exceedance to Drinking Water Standard (DWS)
xx Exceeds Environmental Quality Standard (EQS) Fresh Water

Table 3b Metals 2021 R2 - Boliden Tara Mines GWM - Round 2 2021

Metals	MDL	Units	Drinking Water Standard	EQS Fresh Water	GTV	IGV	Monitoring Point												
							SROB 1	SROB 2	SRBR 2	SROB 4	SROB 5	SROB 7	SRBR 7	SROB 8	SRBR 8	SROB 9	SRBR 9	SRBR 10	SROB 10	SROB 11
							18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21
Arsenic	<0.0002	mg/L	ncr	ncr	0.0075	0.01	0.0011	0.0004	0.0014	0.0058	0.0024	0.0003	0.0010	0.0020	0.0025	0.0002	0.0005	0.0012	-	0.0009
Boron	<0.23	mg/L	ncr	ncr	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	<0.0006	mg/L	ncr	ncr	-	0.005	-	0.0048	-	0.0036	-	-	-	-	-	-	-	-	-	-
Chromium	<0.002	mg/L	ncr	ncr	0.0375	0.03	-	0.005	-	-	-	0.004	0.003	-	0.003	-	-	0.021	-	-
Copper	<0.009	mg/L	ncr	ncr	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	<0.23	mg/L	ncr	ncr	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	<0.006	mg/L	0.01	0.0012	0.0075	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	<0.007	mg/L	ncr	ncr	-	0.05	*0.297*	*0.207*	*0.971*	*0.494*	*0.983*	*0.153*	*0.216*	0.031	*0.655*	0.017	-	*0.061*	-	*1.180*
Nickel	<0.003	mg/L	ncr	ncr	-	0.02	-	*0.03*	-	*0.048*	-	0.006	*0.028*	0.004	0.014	-	-	0.018	-	-
Zinc	<0.018	mg/L	0.075	0.008	0.075	0.1	-	***4.59***	-	***12.40***	0.019	***0.281***	**0.080**	-	-	-	-	-	-	-
Potassium	<0.1	mg/L	ncr	ncr	-	5	3.7	3.3	3.7	*5.3*	*9.4*	*5.9*	*6.2*	*8.3*	*8.5*	1.0	0.9	4.4	2.1	3.1
Sodium	<0.1	mg/L	ncr	ncr	-	150	9.2	38.1	26.3	13.8	51.7	15.0	16.3	30.5	26.0	5.4	5.0	55.5	18.2	68.7

Notes:
IGV - EPA draft Interim Guideline Value for the protection of groundwater
Bold - Indicates result above GTV
Italics - Indicates result above IGV
MDL - Method Detection Limit
mg/L - micrograms per litre
---- indicates no guideline value defined
- Indicates results below the laboratory MDL

ncr - No criteria required
xx Exceedance to Drinking Water Standard (DWS)
xx Exceeds Environmental Quality Standard (EQS) Fresh Water
xx Exceeds Groundwater Threshold Value (GTV)

Table 3c Metals 2022 R1 - Boliden Tara Mines GWM - Round 1 2022

Metals	MDL	Units	GTV	Drinking Water Standard	EQS Fresh Water	IGV	Monitoring Point														
							SRBR1	SROB1	SRBR2	SROB2	SROB3	SROB4	SRBR5	SROB5	SRBR7	SROB7	SRBR8	SROB8	SROB9	SRBR9	SROB10	SROB11
							07-Apr-22	07-Apr-22	07-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	07-Apr-22
Arsenic	<0.0002	mg/L	0.0075	ncr	ncr	0.01	0.0004	0.0011	0.0018	0.0002	-	0.0067	0.0009	0.0021	-	-	0.0017	0.0009	0.0002	0.0005	-	0.0009
Boron	<0.23	mg/L	-	ncr	ncr	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	<0.0006	mg/L	-	ncr	ncr	0.005	-	-	-	*0.009*	-	*0.014*	-	-	-	-	-	-	-	-	-	-
Chromium	<0.002	mg/L	0.0375	ncr	ncr	0.03	0.007	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-
Copper	<0.009	mg/L	-	ncr	ncr	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	<0.23	mg/L	-	ncr	ncr	0.2	-	*1.88*	*1.92*	-	-	-	-	-	-	-	-	-	-	-	-	*0.31*
Lead	<0.006	mg/L	0.0075	0.01	0.0012	0.01	-	-	-	-	-	***0.01***	-	-	-	-	-	-	-	-	-	-
Manganese	<0.007	mg/L	-	ncr	ncr	0.05	*0.097*	*0.27*	*1.07*	*0.096*	0.022	-	-	-	-	-	-	-	-	-	0.03	*1.21*
Mercury	<0.001	mg/L	0.75	ncr	ncr	1	-	-	-	0.00002	0.00001	-	-	-	-	-	-	-	-	-	0.00003	-
Nickel	<0.003	mg/L	-	ncr	ncr	0.02	0.004	*0.003*	0.005	*0.117*	-	*0.069*	0.016	-	0.02	0.006	0.015	-	-	0.003	-	-
Zinc	<0.018	mg/L	0.075	0.075	0.008	0.1	-	-	-	***18.50***	-	***20.80***	-	-	***0.578***	***0.901***	-	-	-	-	-	-
Potassium	<0.1	mg/L	-	ncr	ncr	5	*5.7*	3.4	3.3	3.7	0.5	4.7	4.2	*6.9*	*5.6*	4.7	*7.2*	*6.9*	1.1	0.7	1.6	2.4
Sodium	<0.1	mg/L	-	ncr	ncr	150	22.0	10.8	26.9	43.4	5.9	15.7	35.0	55.2	12.3	12.2	34.4	39.4	10.8	4.5	21.2	66.3

Notes:

IGV - EPA draft Interim Guideline Value for the protection of groundwater

Bold - Indicates result above GTV

Italics - Indicates result above IGV

MDL - Method Detection Limit

mg/L - micrograms per litre

---- indicates no guideline value defined

- Indicates results below the laboratory MDL

ncr - No criteria required

xx Exceedance to Drinking Water Standard (DWS)

xx Exceeds Environmental Quality Standard (EQS) Fresh Water

xx Exceeds Groundwater Threshold Value (GTV)

Table 4 VOCs 2021 R2 - Boliden Tara Mines GWM - 2021

Volatile Organic Compounds	Units	MDL	GTV	IGV	Monitoring Point													
					SROB 1	SROB 2	SRBR 2	SROB 4	SROB 5	SRBR 7	SRBR 8	SRBR 9	SRBR 10	SROB 10	SROB 11	SROB 7	SROB 8	SROB 9
					18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21
1,1,1,2-Tetrachloroethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	µg/l	<1	-	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	µg/l	<1	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/l	<1	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/l	<1	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/l	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	µg/l	<1	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	µg/l	<1	2.25	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/l	<1	0.75	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromobenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	µg/l	<1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	µg/l	<1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	µg/l	<1	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	µg/l	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	µg/l	<1	0.375	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromomethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	µg/l	<1	15	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Benzene	µg/l	<1	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	µg/l	<1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
iso-Propylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m&p Xylene	µg/l	<1	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTBE	µg/l	<1	10	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-butylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-propylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	µg/l	<1	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p-isopropyltoluene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sec-butylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	µg/l	<1	7.5	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/l	<1	525	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	µg/l	<1	0.375	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	µg/l	<1	7.5	70, 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	µg/l	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	ug/l	<0.5	0.375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, Total	µg/l	<1	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

MDL - Method Detection Limit
µg/L - micrograms per litre
GAC - Generic Assessment Criteria
----: IGV/GTV Not Defined

IGV - EPA Draft Interim Guideline Valu GTV: Groundwater Threshold Value, S.I No. 366 of 2016, Schedule 5
Italics Indicates result above (Lower) IC **Bold** indicates result above GTV
[1] IGV is for the sum of dichloroethenes [A] GTV is for the sum of dichloroethenes
[2] Two IGVs are given for trichloroethene - Indicates results below the laboratory MDL
[3] Two IGVs are given for tetrachloroethene
[4] IGV is for the sum of xylenes
[5] IGV is for the sum of trichlorobenzenes

Table 4 VOCs 2022 R1 - Boliden Tara Mines GWM - 2022

Volatile Organic Compounds	Units	MDL	GTV	IGV	Monitoring Point															
					SRBR1	SROB1	SRBR2	SROB2	SROB3	SROB4	SRBR5	SROB5	SRBR7	SROB7	SRBR8	SROB8	SROB9	SRBR9	SROB10	SROB11
					07-Apr-22	07-Apr-22	07-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	07-Apr-22
1,1,1,2-Tetrachloroethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	µg/l	<1	----	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	µg/l	<1	----	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/l	<1	----	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/l	<1	----	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/l	<2	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	µg/l	<1	----	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	µg/l	<1	2.25	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/l	<1	0.75	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromobenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	µg/l	<1	----	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	µg/l	<1	----	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	µg/l	<1	----	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	µg/l	<2	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	µg/l	<1	0.375	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromomethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	µg/l	<1	15	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Benzene	µg/l	<1	----	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	µg/l	<1	----	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
iso-Propylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m&p Xylene	µg/l	<1	----	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTBE	µg/l	<1	10	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-butylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-propylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	µg/l	<1	----	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p-isopropyltoluene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sec-butylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	µg/l	<1	7.5	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/l	<1	525	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	µg/l	<1	0.375	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	µg/l	<1	7.5	70, 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	µg/l	<1	----	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	µg/l	<0.5	0.375	----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, Total	µg/l	<1	---	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

MDL - Method Detection Limit
µg/L - micrograms per litre
GAC - Generic Assessment Criteria
----: IGV/GTV Not Defined

IGV - EPA Draft Interim Guideline Valu GTV: Groundwater Threshold Value, S.I No. 366 of 2016, Schedule 5
Italics Indicates result above (Lower) IC **Bold** indicates result above GTV
[1] IGV is for the sum of dichloroethenes [4] GTV is for the sum of dichloroethenes
[2] Two IGVs are given for trichloroethene - Indicates results below the laboratory MDL

[3] Two IGVs are given for tetrachloroethene
[4] IGV is for the sum of xylenes
[5] IGV is for the sum of trichlorobenzenes

Prepared by: SMG
Checked by: BMC

Table 5a SVOCs 2021 R2 - Boliden Tara Mines GWM - 2021

Polycyclic Aromatic Hydrocarbons	Units	MDL	GTV	IGV	Monitoring Point													
					SROB 1	SROB 2	SRBR 2	SROB 4	SROB 5	SRBR 7	SRBR 8	SRBR 9	SRBR 10	SROB 10	SROB 11	SROB 7	SROB 8	SROB 9
					18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21
Polycyclic Aromatic Hydrocarbons																		
Acenaphthene	µg/l	<0.1	---	---	0.01	0.011	0.066	0.014	-	0.079	0.066	0.09	-	-	0.012	0.013	-	0.011
Acenaphthylene	µg/l	<0.1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	µg/l	<0.1	0.075 [A]	10,000	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	µg/l	<0.01	0.0075	0.01	-	-	-	-	-	***0.011***	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/l	<0.01	0.075 [A]	0.05	0.011	-	0.011	-	0.011	0.011	0.011	-	***1.08***	0.011	-	-	-	-
Chrysene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(ah)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	µg/l	<0.01	---	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	µg/l	<0.01	---	---	-	-	0.011	-	-	0.015	0.011	0.013	-	-	-	-	-	-
Indeno(123cd)pyrene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	ug/l	<0.01	0.075 [A]	1	-	-	0.019	-	-	0.03	0.025	0.023	-	-	-	-	-	-
Phenanthrene	µg/l	<0.01	---	---	-	-	-	-	-	0.012	-	-	-	-	-	-	-	-
Pyrene	µg/l	<0.01	---	---	-	-	-	-	-	0.024	-	-	-	-	-	-	-	-
Sum of 6 PAHs	µg/l	<0.07	0.075	---	0.021	-	0.03	-	0.011	0.041	0.036	0.023	**1.08**	0.011	-	-	-	-
PAH, Total of 16	µg/l	<0.01	---	---	0.032	0.011	0.107	0.014	0.011	0.182	0.113	0.126	1.080	0.011	0.012	0.013	-	0.011
Other SVOCs																		
1,2,4-Trichlorobenzene	µg/l	<1	---	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	µg/l	<1	---	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	µg/l	<1	---	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorophenol	µg/l	<1	---	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylphenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitrophenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitrophenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azobenzene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	µg/l	<1	0.075 [A]	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroethyl)ether	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroethoxy)methane	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-Ethylhexyl) phthalate	µg/l	<2	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	µg/l	<1	0.075 [A]	0.5, 0.05*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/l	<1	0.075 [A]	0.5, 0.05*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	µg/l	<1	0.0075	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	µg/l	<1	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Dibutyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	1.49	-	-	-	-	-	-	-	-
Diethyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	µg/l	<1	---	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Dioctyl phthalate	µg/l	<5	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	µg/l	<1	---	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	µg/l	<1	---	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	µg/l	<1	---	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	µg/l	<1	---	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	µg/l	<1	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Nitroso-n-dipropylamine	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	µg/l	<1	---	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/l	<1	0.075 [A]	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isophorone	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	µg/l	<1	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

MDL - Method Detection Limit
µg/L - micrograms per litre
GAC - Generic Assessment Criteria
----: IGV/GTV Not Defined

IGV - EPA Draft Interim Guideline Value
Italics Indicates result above (Lower) IGV
1 - IGV is for the sum of phenols
2 - IGV is for the sum of phthalates

A - PAH compounds specified in GTV

Prepared by: SMG
Checked by:

Table 5b SVOCs 2022 R1 - Boliden Tara Mines GWM - 2021

SVOCs	Units	MDL	GTV	IGV	Monitoring Point															
					SRBR1	SROB1	SRBR2	SROB2	SROB3	SROB4	SRBR5	SROB5	SRBR7	SROB7	SRBR8	SROB8	SROB9	SRBR9	SROB10	SROB11
					07-Apr-22	07-Apr-22	07-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	07-Apr-22
Polycyclic Aromatic Hydrocarbons																				
Acenaphthene	µg/l	<0.1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	µg/l	<0.1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	µg/l	<0.1	0.075 [A]	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	µg/l	<0.01	0.0075	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	µg/l	<0.01	0.075 [A]	0.05	0.02	-	-	-	-	-	0.012	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	µg/l	<0.01	0.075 [A]	0.05	0.013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	µg/l	<0.01	---	---	0.128	-	-	-	-	-	0.02	-	0.012	-	-	-	-	-	-	-
Dibenzo(ah)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	µg/l	<0.01	---	1	0.038	-	-	-	-	-	0.022	-	0.014	-	-	-	-	-	-	-
Fluorene	µg/l	<0.01	---	---	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(123cd)pyrene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	ug/l	<0.01	0.075 [A]	1	0.015	-	-	-	-	-	-	-	0.015	-	-	-	-	-	-	-
Phenanthrene	µg/l	<0.01	---	---	0.077	-	-	-	-	-	0.012	-	0.02	-	-	-	-	-	-	-
Pyrene	µg/l	<0.01	---	---	0.473	0.014	-	-	-	-	0.094	-	0.111	-	-	-	-	-	-	-
Sum of 6 PAHs	µg/l	<0.07	0.075	---	0.048	-	-	-	-	-	0.012	-	0.015	-	-	-	-	-		
PAH, Total of 16	µg/l	<0.01	---	---	0.167	0.014	-	-	-	-	0.027	-	0.05	-	-	-	-	-	-	-
Other SVOCs																				
1,2,4-Trichlorobenzene	µg/l	<0.01	---	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	µg/l	<0.01	---	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	µg/l	<0.01	---	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorophenol	µg/l	<0.01	---	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylphenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	0.12	-	-	-	-	-	-
2-Nitroaniline	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitrophenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	0.13	-	-	-	-	-	-
3-Nitroaniline	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	µg/l	<0.01	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitrophenol	µg/l	<5	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azobenzene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	µg/l	<0.01	0.075 [A]	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroethyl)ether	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroethoxy)methane	µg/l	<1	---	---	-	0.11	-	-	-	-	0.12	-	-	-	-	-	0.15	-	0.1	-
bis(2-Ethylhexyl) phthalate	µg/l	<1	6	8	3.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	µg/l	<0.01	0.075 [A]	0.5, 0.05*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/l	<0.01	0.075 [A]	0.5, 0.05*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	µg/l	<0.01	0.0075	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	µg/l	<0.01	---	---	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Dibutyl phthalate	µg/l	<5	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	µg/l	<1	---	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Dioctyl phthalate	µg/l	<1	---	5 [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	µg/l	<0.01	---	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	µg/l	<0.01	---	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	µg/l	<1	---	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	uo/l	<1	---	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	µg/l	<0.5	---	0.5 [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Nitroso-n-dipropylamine	µg/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	uo/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	µg/l	<0.01	---	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/l	<0.01	0.075 [A]	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isophorone	uo/l	<1	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	µg/l	<0.01	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	µg/l	<0.01	---	---	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	µg/l	<0.01	0.075 [A]	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	µg/l	<0.01	---	---	0.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

MDL - Method Detection Limit
µg/L - micrograms per litre
GAC - Generic Assessment Criteria
----: IGV/GTV Not Defined

IGV - EPA Draft Interim Guideline Value
Italics Indicates result above (Lower) IGV
1 - IGV is for the sum of phenols
2 - IGV is for the sum of phthalates

A - PAH compounds specified in GTV

Table 6 TPHs 2021 R2 - Boliden Tara Mines GWM - 2021

Extractable Petroleum Hydrocarbons	Units	MDL	Drinking Water Standard (mg/L)	EQS Fresh Water	GTV	IGV	Monitoring Point												
							SROB 1	SROB 2	SRBR 2	SROB 4	SROB 5	SRBR 7	SRBR 8	SRBR 9	SRBR 10	SROB 10	SROB 11	SROB 7	SROB 8	SROB 9
							18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21
EH >C6 - C40	µg/l	<10	7.5*	10*	7.5	---	-	-	-	-	-	16	-	-	-	-	-	-	-	-
EH >C10 - C20	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EH >C20 - C40	µg/l	<10	7.5*	10*	7.5	---	-	-	-	-	-	16	-	-	-	-	-	-	-	-
EH >C6 - C10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

IGV - EPA draft Interim Guideline Value for the protection of groundwater

Bold - Indicates result above GTV

Italics - Indicates result above IGV

MDL - Method Detection Limit

mg/L - micrograms per litre

---- indicates no guideline value defined

- Indicates results below the laboratory MDL

* DWS and EQS for TPH C2 - C40 used

ncr - No criteria required

xx Exceedance to Drinking Water Standard (DWS)

xx Exceeds Environmental Quality Standard (EQS) Fresh Water

xx Exceeds Groundwater Threshold Value (GTV)

Table 6b TPHs 2022 R1 - Boliden Tara Mines GWM - 2022

Extractable Petroleum Hydrocarbons	Units	MDL	Drinking Water Standard	EQS Fresh Water	GTV	IGV	Monitoring Point														
							SRBR1	SROB1	SRBR2	SROB2	SROB3	SROB4	SRBR5	SROB5	SRBR7	SROB7	SRBR8	SROB8	SROB9	SRBR9	SROB10	SROB11
							07-Apr-22	07-Apr-22	07-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	06-Apr-22	07-Apr-22	07-Apr-22
Aliphatic VPH >C5 - C6	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic VPH >C6 - C8	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic VPH >C8 - 10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic VPH >C5 - C10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic VPH >C5 - C7	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic VPH >C7 - C8	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic VPH >C8 - C10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic VPH >C5 - C10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VPH >C5 - C10	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic EPH >C10 - C12	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic EPH >C12 - C16	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic EPH >C16 - C35	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic EPH >C35 - C44	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatic EPH >C10 - C44	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic EPH >C10 - C12	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic EPH >C12 - C16	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic EPH >C16 - C21	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatic EPH >C21 - C35	µg/l	<10	90	nc	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	-
Aromatic EPH >C35 - C44	µg/l	<10	300	nc	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-
Aromatic EPH >C10 - C44	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-
EPH >C10 - C44	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-
Aromatic VPH/EPH >C5 - C44	µg/l	<10	7.50	10.00	7.50	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**34**	-
TPH >C5 - C44	µg/l	<10	ncr	ncr	---	---	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-
Benzene	µg/l	<1	ncr	ncr	0.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/l	<1	ncr	ncr	----	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m&p-Xylene	µg/l	<1	ncr	ncr	----	10^4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	µg/l	<1	ncr	ncr	----	10^4																
Toluene	µg/l	<1	ncr	ncr	525	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix D 2022 AECOM Site Investigation Tables

Table 1: Sample Inventory
Boliden Tara Mines - March / April 2022

Sampling Date	Location ID	Easting (ITM)	Northing (ITM)	Sample Depth m bgl	Sample Matrix	TPH-CWG	CLEA Metals	TOC	PFAS Compounds
01/04/2022	**HA1**	**684495**	**768122**	0.35	S	X	X	X	~
01/04/2022	**HA2**	**684505**	**768118**	0.35	S	X	X	X	~
30/03/2022	**DUP01**			0.5	S	X	X	X	X
31/03/2022	**DUP02**			2.5	S	X	X	X	~
30/03/2022	**TP1**	**684295**	**768212**	0.5	S	X	X	X	X
				1.7	S	X	X	X	X
30/03/2022	**TP2**	**684295**	**768224**	0.6	S	X	X	X	X
				1.8	S	X	X	X	X
01/04/2022	**TP3**	**684664**	**768154**	0.6	S	X	X	X	~
				1.2	S	X	X	X	~
				2.9	S	X	X	X	~
01/04/2022	**TP4**	**684572**	**768017**	1	S	X	X	X	~
				2.5	S	X	X	X	~
30/03/2022	**TP5**	**684748**	**768117**	0.7	S	X	X	X	~
				1.8	S	X	X	X	~
				2.8	S	X	X	X	~
31/03/2022	**TP6**	**684944**	**768252**	1	S	X	X	X	~
				2	S	X	X	X	~
30/03/2022	**TP8**	**684858**	**768069**	0.9	S	X	X	X	~
29/03/2022				2.6	S	X	X	X	~
30/03/2022	**TP9**	**684739**	**768106**	0.8	S	X	X	X	~
				1.9	S	X	X	X	~
31/03/2022	**TP10**	**685248**	**768172**	1	S	X	X	X	~
				2.2	S	X	X	X	~
01/04/2022	**TP11**	**685076**	**768139**	0.5	S	X	X	X	~
				2.7	S	X	X	X	~
31/03/2022	**TP12**	**685219**	**767921**	0.6	S	X	X	X	~
				2.6	S	X	X	X	~
29/03/2022	**TP13**	**684917**	**767960**	1.4	S	X	X	X	~
				2.3	S	X	X	X	~
29/03/2022	**TP14**	**685053**	**767900**	0.4	S	X	X	X	~
				2.5	S	X	X	X	~
28/03/2022	**TP15**	**685048**	**767796**	0.6	S	X	X	X	~
				2.5	S	X	X	X	~
28/03/2022	**TP16**	**684993**	**767818**	1.2	S	X	X	X	~
				3	S	X	X	X	~
29/03/2022	**TP17**	**684858**	**767845**	0.5	S	X	X	X	~
				2.1	S	X	X	X	~
31/03/2022	**TP18**	**685299**	**768057**	1	S	X	X	X	~
				3.2	S	X	X	X	~
31/03/2022	**TP19**	**685580**	**767968**	0.6	S	X	X	X	~
				2.5	S	X	X	X	~
29/03/2022	**TP20**	**684839**	**767915**	0.4	S	X	X	X	~
				2	S	X	X	X	~
28/03/2022	**SRBR1**			-	GW	~	X	X	X
28/03/2022	**SROB1**			-	GW	~	X	X	X
28/03/2022	**SROB3**			-	GW	~	X	X	X
28/03/2022	**SROB4**			-	GW	~	X	X	X
28/03/2022	**SW1**			-	SW	X	X	X	X

Notes:
ITM: Irish Transverse Mercator
S - soil/subsoil
GW - groundwater
SW - surface water
m bgl - metres below ground level
TPH-CWG - total petroleum hydrocarbons criteria working group (speciated hydrocarbons with aromatic/aliphatic split)
CLEA Metals - Antimony, Arsenic, Barium, Beryllium, Water Soluble Boron, Cadmium, Chromium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Vanadium and Zinc
TOC - Total Organic Carbon
PFAS - Per- and Polyfluoroalkyl Substances
X - analysis scheduled
~ - analysis not scheduled

Table 2: Soil Total Petroleum Hydrocarbon Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL	Human Health GAC - Commercial / Industrial (mg/kg)	Max Concentration (mg/kg)	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID					**HA1**	**HA2**	**DUP01**	**DUP02**	**TP01**	**TP01**	**TP02**	**TP02**	**TP3**	**TP3**	**TP3**	**TP4**	**TP4**	**TP5**	**TP5**	**TP5**	**TP6**	**TP6**	**TP8**	**TP8**	**TP9**	**TP9**
Sample Depth (m)					0.35	0.35	0.5	2.5	0.5	1.7	0.6	1.8	0.6	1.2	2.9	1	2.5	0.7	1.8	2.8	1	2	0.9	2.6	0.8	1.9
Date Sampled					01/04/2022	01/04/2022	30/03/2022	31/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	30/03/2022	30/03/2022	30/03/2022	31/03/2022	31/03/2022	30/03/2022	29/03/2022	30/03/2022	30/03/2022
Parameter																										
TPH Aromatics																										
TPH (>EC5-7) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	<0.2	16,000	2.40	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	1.5	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	<4.0	36,000	225	8	13	-	-	-	-	-	-	21	-	-	-	8	-	225	21	-	-	-	-	12	-
TPH (>EC16-21) aromatic	mg/kg	<7.0	28,000	1,442	32	47	34	-	-	-	-	-	66	20	-	-	22	43	1,442	213	-	-	-	-	73	61
TPH (>EC21-35) aromatic	mg/kg	<7.0	28,000	4,642	559	377	500	-	14	55	96	143	430	127	-	120	154	623	4,642	662	142	45	-	-	562	171
Total Aromatics (C5-35)	mg/kg	<19.0	nca	6,311	599	437	534	-	-	55	96	143	519	147	-	120	184	666	6,311	896	142	45	-	-	647	232
TPH Aliphatics																										
TPH (>EC5-6) aliphatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	<0.1	7,800	0.20	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	<0.1	2,000	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
TPH (>EC10-12) aliphatic	mg/kg	<0.2	9,700	50	6.4	4.9	7.6	-	-	-	-	-	-	-	-	-	-	0.6	50	3.8	-	-	-	-	6.4	1.8
TPH (>EC12-16) aliphatic	mg/kg	<4.0	5,900	734	11	11	36	-	-	-	-	-	-	-	-	-	-	11	734	104	-	-	-	-	30	45
TPH (>EC16-21) aliphatic	mg/kg	<7.0	nca	2,021	74	40	148	-	37	14	36	46	-	25	-	-	-	71	2,021	308	23	17	-	-	130	126
TPH (EC21-35) aliphatic	mg/kg	<7.0	nca	8,095	1,251	713	1,586	-	222	306	444	541	356	209	-	55	-	1,717	8,095	1,063	538	72	49	-	971	359
Total Aliphatics (C5-35)	mg/kg	<19.0	nca	10,900	1,342	769	1,778	-	259	320	480	587	356	234	-	55	-	1,800	10,900	1,479	561	89	49	-	1,137	532
Total aliphatics and aromatics (C5-C35)	mg/kg	<38.0	nca	17,211	1,941	1,206	2,312	-	259	375	576	730	875	381	-	175	184	2,466	17,211	2,375	703	134	49	-	1,784	764
BTEX																										
Benzene	mg/kg	<5.0	27	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	0.017	-	-	-	-	-
Toluene	mg/kg	<5.0	56,000	0.06	0.009	-	0.013	0.01	0.007	-	0.02	0.005	-	0.012	0.012	0.022	-	0.032	0.01	0.011	0.033	0.039	0.006	-	0.014	0.012
Ethylbenzene	mg/kg	<5.0	5,700	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m/p-Xylene	mg/kg	<5.0		0.04	-	-	0.006	-	-	0.005	0.015	0.008	-	0.016	0.007	-	-	0.027	0.007	0.019	0.022	-	-	-	-	0.008
o-Xylene	mg/kg	<5.0	6,600	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	0.008	-	0.009	0.007	-	-	-	-	-
MTBE																										
MTBE	mg/kg	<5.0	7,900	0.01	-	-	-	-	-	-	-	-	-	0.009	-	-	-	-	-	0.006	0.008	0.007	-	-	-	-
Miscellaneous																										
Total Organic Carbon	%	<0.02	nca	2								0.38		1.8							0.45					0.94

Notes:

MDL - Method Detection Limit
mg/kg - milligrams per kilogram
mg/kg - micrograms per kilogram
GAC - Generic Assessment Criteria
- <MDL
ncr - No criteria required
NA - Not Analysed

xx Exceeds Human Health GAC - Commercial / Industrial

Sandy Loam TOC 0.58 - 1.45%

Table 2: Soil Total Petroleum Hydrocarbon Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL	Human Health GAC - Commercial / Industrial (mg/kg)	Max Concentration (mg/kg)	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID					**TP10**	**TP10**	**TP11**	**TP11**	**TP12**	**TP12**	**TP13**	**TP13**	**TP14**	**TP14**	**TP15**	**TP15**	**TP16**	**TP16**	**TP17**	**TP17**	**TP18**	**TP18**	**TP19**	**TP19**	**TP20**	**TP20**
Sample Depth (m)					1	2.2	0.5	2.7	0.6	2.6	1.4	2.3	0.4	2.5	0.6	2.5	1.2	3	0.5	2.1	1	3.2	0.6	2.5	0.4	2
Date Sampled					31/03/2022	31/03/2022	01/04/2022	01/04/2022	31/03/2022	31/03/2022	29/03/2022	29/03/2022	29/03/2022	29/03/2022	28/03/2022	28/03/2022	28/03/2022	28/03/2022	29/03/2022	29/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	29/03/2022	29/03/2022
Parameter																										
TPH Aromatics																										
TPH (>EC5-7) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	<0.2	16,000	2.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	<4.0	36,000	225	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aromatic	mg/kg	<7.0	28,000	1,442	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	<7.0	28,000	4,642	-	-	192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Aromatics (C5-35)	mg/kg	<19.0	nca	6,311	-	-	237	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH Aliphatics																										
TPH (>EC5-6) aliphatic	mg/kg	<0.1	ncr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	<0.1	7,800	0.20	-	-	0.2	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	<0.1	2,000	0.10	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	<0.2	9,700	50	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-
TPH (>EC12-16) aliphatic	mg/kg	<4.0	5,900	734	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-
TPH (>EC16-21) aliphatic	mg/kg	<7.0	nca	2,021	-	-	115	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-	-	27	-
TPH (EC21-35) aliphatic	mg/kg	<7.0	nca	8,095	-	-	530	-	-	84	-	-	9	-	-	-	-	-	-	-	-	-	-	-	51	-
Total Aliphatics (C5-35)	mg/kg	<19.0	nca	10,900	-	-	681	-	-	84	-	-	38	-	-	-	-	-	-	-	-	-	-	-	90	-
Total aliphatics and aromatics (C5-C35)	mg/kg	<38.0	nca	17,211	-	-	918	-	-	84	-	-	38	-	-	-	-	-	-	-	-	-	-	-	90	-
BTEX																										
Benzene	mg/kg	<5.0	27	0.02	-	-	0.018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	<5.0	56,000	0.06	0.02	0.015	0.064	0.014	0.014	0.016	0.01	-	-	-	0.008	-	0.02	-	-	-	-	0.005	0.024	0.009	0.01	-
Ethylbenzene	mg/kg	<5.0	5,700	0.01	-	-	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m/p-Xylene	mg/kg	<5.0		0.04	0.005	-	0.038	-	-	0.006	-	-	-	-	-	-	0.007	-	-	-	-	-	0.008	-	-	-
o-Xylene	mg/kg	<5.0	6,600	0.01	-	-	0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTBE																										
MTBE	mg/kg	<5.0	7,900	0.01	-	-	0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous																										
Total Organic Carbon	%	<0.02	nca	2		0.24		0.23			0.95					0.21							0.98			0.22

Notes:

MDL - Method Detection Limit
mg/kg - milligrams per kilogram
mg/kg - micrograms per kilogram
GAC - Generic Assessment Criteria
- <MDL
ncr - No criteria required
NA - Not Analysed

xx Exceeds Human Health GAC - Commercial / Industrial

Sandy Loam TOC 0.5

Table 3: Soil Heavy Metal Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL (mg/kg)	Human Health GAC - Commercial / Industrial (mg/kg)	Max Concentration (mg/kg)	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID					**HA1**	**HA2**	**DUP01**	**DUP02**	**TP01**	**TP01**	**TP02**	**TP02**	**TP3**	**TP3**	**TP3**	**TP4**	**TP4**	**TP5**	**TP5**	**TP5**	**TP6**	**TP6**	**TP8**	**TP8**	**TP9**	**TP9**
Sample Depth (m)					0.35	0.35	0.5	2.5	0.5	1.7	0.6	1.8	0.6	1.2	2.9	1	2.5	0.7	1.8	2.8	1	2	0.9	2.6	0.8	1.9
Date Sampled					01/04/2022	01/04/2022	30/03/2022	31/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	30/03/2022	30/03/2022	30/03/2022	31/03/2022	31/03/2022	30/03/2022	29/03/2022	30/03/2022	30/03/2022
Parameter																										
Arsenic	mg/kg	<0.5	640	500	131.2	174.9	147.7	7.2	65.9	499.7	67.1	153.4	77.2	275.0	7.8	30.2	11.0	66.4	30.0	60.6	179.4	13.8	28.9	3.2	383.0	47.6
Barium	mg/kg	<1.0	22,000	1,096	556	462	335	134	793	63	345	528	1,003	82	157	853	151	935	963	671	230	460	1,096	412	513	878
Beryllium	mg/kg	<0.5	12	2	0.9	-	0.6	1.0	0.5	-	-	-	0.9	1.1	0.7	1.0	1.0	0.7	0.6	1.0	0.5	0.9	1.0	-	0.6	1.0
Cadmium	mg/kg	<0.1	190	243	21.3	24.0	35.4	0.9	18.5	243.3	18.3	29.4	7.4	102.9	1.0	5.6	1.0	10.8	8.3	8.4	44.0	2.6	12.0	0.4	10.3	20.9
Chromium	mg/kg	<0.5	8,600	157	40.4	21.5	35.5	83.7	30.9	25.5	29.1	56.7	157.4	57.5	58.0	57.4	59.8	55.0	46.0	47.7	50.7	104.7	49.4	9.9	29.4	44.8
Chromium III	mg/kg	<0.5	8,600	157	40.4	21.5	35.5	83.7	30.9	25.5	29.1	56.7	157.4	57.5	58.0	57.4	59.8	55.0	46.0	47.7	50.7	104.7	49.4	9.9	29.4	44.8
Chromium VI	mg/kg	<0.3	ncr	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	<1.0	68,000	61	24	10	20	20	13	27	15	23	29	34	19	61	25	19	35	32	19	25	34	8	11	21
Lead	mg/kg	<5.0	2,300	22,760	1,465	2,022	1,839	21	1,072	22,760	980	2,491	360	9,615	26	309	44	788	447	1,010	2,670	137	495	14	747	598
Mercury	mg/kg	<0.1	350	2	0.8	1.2	1.6	0.1	1.1	2.1	1.2	0.7	0.1	1.2	-	0.2	0.1	0.5	0.4	0.4	2	-	0.4	-	0.5	0.6
Nickel	mg/kg	<0.7	980	99	37.2	32.5	37.5	44.7	25.4	36.4	24.7	24.7	98.7	72.6	37.9	49	47.5	38.4	35	44.2	46.9	71.9	44.2	11.4	26.2	32
Selenium	mg/kg	<1.0	12,000	5	2	-	2	2	-	-	2	-	1	3	-	2	2	-	2	4	-	2	1	5	-	2
Vanadium	mg/kg	<1.0	9,000	78	22	9	18	45	12	9	15	16	78	34	31	40	38	25	19	32	21	60	30	5	10	26
Water Soluble Boron	mg/kg	<0.1	240,000	2	1	0.6	0.8	0.9	0.9	0.5	0.8	0.5	0.6	0.9	0.4	1.3	1.1	0.9	0.6	0.8	0.8	0.4	0.5	0.6	1.2	1.7
Zinc	mg/kg	<5.0	730,000	56,640	7,051	8,368	9,078	92	5,064	56,640	12,140	6,718	3,032	40,770	120	2,101	164	3,487	2,011	3,121	16,940	692	3,252	77	3,284	5,573

Notes:
MDL - Method Detection Limit
mg/kg - milligrams per kilogram
GAC - Generic Assessment Criteria
- <MDL
ncr - No criteria required
nca - No criteria available

xx Exceeds Human Health GAC - Commercial / Industrial Sandy Loam TOC 0.58 - 1.45%

Table 3: Soil Heavy Metal Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL (mg/kg)	Human Health GAC - Commercial / Industrial (mg/kg)	Max Concentration (mg/kg)	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID					**TP10**	**TP10**	**TP11**	**TP11**	**TP12**	**TP12**	**TP13**	**TP13**	**TP14**	**TP14**	**TP15**	**TP15**	**TP16**	**TP16**	**TP17**	**TP17**	**TP18**	**TP18**	**TP19**	**TP19**	**TP20**	**TP20**
Sample Depth (m)					1	2.2	0.5	2.7	0.6	2.6	1.4	2.3	0.4	2.5	0.6	2.5	1.2	3	0.5	2.1	1	3.2	0.6	2.5	0.4	2
Date Sampled					31/03/2022	31/03/2022	01/04/2022	01/04/2022	31/03/2022	31/03/2022	29/03/2022	29/03/2022	29/03/2022	29/03/2022	28/03/2022	28/03/2022	28/03/2022	28/03/2022	29/03/2022	29/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	29/03/2022	29/03/2022
Parameter																										
Arsenic	mg/kg	<0.5	640	500	24.6	6.4	166.3	5.2	7.8	8.8	10.2	6.7	15.8	5.6	8.3	7.0	155.5	14.8	6.4	7.5	7.6	9.9	29.6	6.2	97.2	7.3
Barium	mg/kg	<1.0	22,000	1,096	812	167	205	42	165	152	206	96	220	55	215	81	376	373	114	311	129	54	772	168	491	100
Beryllium	mg/kg	<0.5	12	2	0.8	0.8	0.6	0.6	0.9	0.9	1.5	0.8	0.9	0.7	1.0	0.9	0.9	0.8	0.7	0.8	1.0	0.8	0.9	1.0	1.0	0.8
Cadmium	mg/kg	<0.1	190	243	4.5	0.6	29.0	1.0	1.0	1.3	1.0	0.9	10.3	0.9	1.9	1.0	21.4	10.9	1.3	1.0	0.5	0.6	4.8	0.7	48.6	1.2
Chromium	mg/kg	<0.5	8,600	157	47.8	72.0	29.7	46.4	47.9	47.5	63.8	30.7	53.6	46.9	62.7	38.8	40.4	39.9	46.4	32.8	66.9	65.3	66.4	96.3	60.4	52.5
Chromium III	mg/kg	<0.5	8,600	157	47.8	72.0	29.7	46.4	47.9	47.5	63.8	30.7	53.6	46.9	62.7	38.8	40.4	39.9	46.4	32.8	66.9	65.3	66.4	96.3	60.4	52.5
Chromium VI	mg/kg	<0.3	ncr	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	<1.0	68,000	61	21	19	13	17	25	21	19	23	37	20	27	23	54	22	20	23	25	21	20	17	24	24
Lead	mg/kg	<5.0	2,300	22,760	268	36	1,816	9	31	30	28	13	275	12	102	13	885	332	41	26	19	13	309	24	1,888	19
Mercury	mg/kg	<0.1	350	2	0.2	-	0.9	-	-	-	0.2	-	0.2	-	-	-	0.6	0.2	-	-	-	-	0.2	-	1.2	-
Nickel	mg/kg	<0.7	980	99	37.4	41.7	29.7	31.3	41.8	41.1	47.5	42.4	40.8	37.3	45.8	44	38.3	38	37.7	42.5	46.6	36.8	37.7	38.1	49.3	46.4
Selenium	mg/kg	<1.0	12,000	5	1	-	2	-	1	2	1	-	-	-	2	-	1	1	-	2	-	2	1	2	2	2
Vanadium	mg/kg	<1.0	9,000	78	26	34	15	24	34	38	50	24	37	27	43	30	19	28	22	24	42	31	34	48	34	27
Water Soluble Boron	mg/kg	<0.1	240,000	2	0.9	0.4	0.8	0.4	0.5	0.5	1.3	0.3	0.3	0.4	0.9	0.4	0.5	0.5	0.3	0.3	0.3	0.4	1	1.3	0.5	0.4
Zinc	mg/kg	<5.0	730,000	56,640	1,013	156	13,260	62	160	140	104	76	2,742	78	493	78	6,770	1,923	200	139	96	69	1,606	108	12,170	152

Notes:
MDL - Method Detection Limit
mg/kg - milligrams per kilogram
GAC - Generic Assessment Criteria
- <MDL
ncr - No criteria required
nca - No criteria available

xx Exceeds Human Health GAC - Commercial / Industrial Sandy Loam TOC

Table 4: Soil Per and Polfluoroalkyl Substance Results
Boliden Tara Mines - March / April 2022

Sample Type	**Units**	**MDL (mg/L)**	**Human Health GAC - Commercial / Industrial (mg/kg)**	**Max Concentration (mg/kg)**	Soil	Soil	Soil	Soil	Soil
Well					**DUP01**	**TP01**	**TP01**	**TP02**	**TP02**
Sampled Depth (m)					0.5	0.5	1.7	0.6	1.8
Date Sampled					30-Mar-22	30-Mar-22	30-Mar-22	30-Mar-22	30-Mar-22
Parameter									
Perfluorobutanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluoropentanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorohexanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluoroheptanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorooctanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorononanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorodecanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluoro-n-undecanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorododecanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorotridecanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorotetradecanoic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorobutanesulfonic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluoropentanesulfonic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorohexanesulfonic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluoroheptanesulfonic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorooctane sulfonic acid	µg/kg	<0.01	nca	2.00	2	2	<1	<1	2
Perfluorononanesulfonate	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1
Perfluorodecanesulfonic acid	µg/kg	<0.01	ncr	-	<1	<1	<1	<1	<1

Notes:

MDL - Method Detection Limit

µg/kg - micrograms per kilogram

GAC - Generic Assessment Criteria

- <MDL

nca - No criteria available

ncr - No criteria required

xx Exceeds Human Health GAC - Commercial / Industr Sandy Loam TOC 0.58 - 1.45%

Table 5: Water Total Petroleum Hydrocarbon Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL	Drinking Water Standard (DWS)	EQS Fresh Water	GTV	Surface Water
Well						**SW1**
Date Sampled						28-Mar-22
Parameter						
TPH Aromatics						
TPH (>EC5-7) aromatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC7-8) aromatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC8-10) aromatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC10-12) aromatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC12-16) aromatic	µg/L	10.0	ncr	ncr	ncr	-
TPH (>EC16-21) aromatic	µg/L	10.0	ncr	ncr	ncr	-
TPH (>EC21-35) aromatic	µg/L	10.0	ncr	ncr	ncr	-
Total Aromatics (C5-35)	µg/L	10.0	ncr	ncr	ncr	-
TPH Aliphatics						
TPH (>EC5-6) aliphatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC6-8) aliphatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC8-10) aliphatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC10-12) aliphatic	µg/L	5.0	ncr	ncr	ncr	-
TPH (>EC12-16) aliphatic	µg/L	10.0	ncr	ncr	ncr	-
TPH (>EC16-21) aliphatic	µg/L	10.0	ncr	ncr	ncr	-
TPH (EC21-35) aliphatic	µg/L	10.0	ncr	ncr	ncr	-
Total Aliphatics (C5-35)	µg/L	10.0	ncr	ncr	ncr	-
Total aliphatics and aromatics (C5-C35)	µg/L	10.0	ncr	ncr	ncr	-
BTEX						
Benzene	µg/L	0.5	ncr	ncr	ncr	-
Toluene	µg/L	0.5	ncr	ncr	ncr	-
Ethylbenzene	µg/L	0.5	ncr	ncr	ncr	-
m/p-Xylene	µg/L	1.0	ncr	ncr	ncr	-
o-Xylene	µg/L	0.5	ncr	ncr	ncr	-
MTBE						
MTBE	µg/L	0.1	ncr	ncr	ncr	-

Notes:

MDL - Method Detection Limit

µg/L - Micrograms per litre

- <MDL

----: IGV/GTV Not Defined

ncr - No criteria required

xx	Exceedance to Drinking Water Standard (DWS)
xx	Exceeds Environmental Quality Standard (EQS) Fresh Water
xx	Exceeds Groundwater Threshold Value (GTV)

Table 6: Water Dissolved Metal Results
Boliden Tara Mines - March / April 2022

Sample Type	**Units**	**MDL**	**Drinking Water Standard**	**EQS Fresh Water**	**GTV**	**Max Concentration**	Groundwater	Groundwater	Groundwater	Groundwater	Surface Water
Well							**SRBR1**	**SROB1**	**SROB3**	**SROB4**	**SW1**
Date Sampled							28-Mar-22	28-Mar-22	28-Mar-22	28-Mar-22	28-Mar-22
Parameter											
Dissolved Arsenic	µg/L	<2.5	10[#1]	*25* [#2]	**7.5**[#3]	6.2	-	3.5	-	5.2	6.2
Dissolved Barium	µg/L	<3.0	100[#4]	*100* [#5]	**100**[#4]	98.0	98	63	80	98	30
Dissolved Beryllium	µg/L	<0.5	ncr	*ncr*	ncr	-	-	-	-	-	-
Dissolved Boron	µg/L	<12.0	1000[#1]	*2000* [#5]	**750**[#7]	142	142	56	-	32	115
Dissolved Cadmium	µg/L	<0.5	5[#1]	*0.08* [#8]	**3.75**[#7]	15	-	-	-	***15.4***	-
Dissolved Total Chromium	µg/L	<1.5	50[#1]	*3.4*	**37.5**[#3]	2	-	-	2.4	-	-
Dissolved Copper	µg/L	<7.0	2000[#1]	*5* [#2]	**1500**[#7]	10	-	*10*	-	-	-
Dissolved Lead	µg/L	<5.0	ncr	*ncr*	ncr	-	-	-	-	-	-
Dissolved Mercury	µg/L	<1.0	ncr	*ncr*	ncr	-	-	-	-	-	-
Dissolved Nickel	µg/L	<2.0	20[#1]	*4* [#8]	**15**[#7]	54	-	-	3	***54***	*12*
Dissolved Selenium	µg/L	<3.0	ncr	*ncr*	ncr	-	-	-	-	-	-
Dissolved Vanadium	µg/L	<1.5	ncr	*ncr*	ncr	-	-	-	-	-	-
Dissolved Zinc	µg/L	<3.0	75[#3]	*8* [#2]	**75**[#3]	22,802	-	5	*10*	***22,802***	*60*

Notes:

MDL - Method Detection Limit

µg/L - Micrograms per litre

- <MDL

----: IGV/GTV Not Defined

ncr - No criteria required

xx	Exceedance to Drinking Water Standard (DWS)
xx	Exceeds Environmental Quality Standard (EQS) Fresh Water
xx	Exceeds Groundwater Threshold Value (GTV)

Table 7: Water Per and Polfluoroalkyl Substance Results
Boliden Tara Mines - March / April 2022

Sample Type	Units	MDL	Drinking Water Standard	EQS Fresh Water	Groundwater Threshold Value	Max Concentration	Groundwater	Groundwater	Groundwater	Groundwater	Surface Water
Well							**SRBR1**	**SROB1**	**SROB3**	**SROB4**	**SW1**
Date Sampled							28-Mar-22	28-Mar-22	28-Mar-22	28-Mar-22	28-Mar-22
Parameter											
Perfluorobutanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluoropentanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorohexanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluoroheptanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorooctanoic acid	µg/L	<0.2	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorononanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorodecanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluoro-n-undecanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorododecanoic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorotridecanoic acid	µg/L	<0.2	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorotetradecanoic acid	µg/L	<0.1	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorobutanesulfonic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluoropentanesulfonic acid	µg/L	<1	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorohexanesulfonic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluoroheptanesulfonic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorooctane sulfonic acid	µg/L	<0.2	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorononanesulfonate	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorodecanesulfonic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
4:2 Fluorotelomer sulfonate	µg/L	<1	ncr	ncr	ncr	-	-	-	-	-	-
6:2 Fluorotelomer sulfonate	µg/L	<0.2	ncr	ncr	ncr	-	-	-	-	-	-
8:2 Fluorotelomer sulfonate	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
N-ethylperfluorooctane sulfonamidoacetic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
N-methylperfluorooctane sulfonamidoacetic acid	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-
Perfluorooctane sulfonamide	µg/L	<0.05	ncr	ncr	ncr	-	-	-	-	-	-

Notes:

MDL - Method Detection Limit

µg/L - Micrograms per litre

- <MDL

----: IGV/GTV Not Defined

ncr - No criteria required

xx	Exceedance to Drinking Water Standard (DWS)
xx	Exceeds Environmental Quality Standard (EQS) Fresh Water
xx	Exceeds Groundwater Threshold Value (GTV)

Appendix E Geological Logs

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

Record of

HA1

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							0.10	MADE GROUND: Grey GRAVEL, medium grained, sub-angular to sub-rounded, dry.	NEC
0.4	ES		0.1				0.35	MADE GROUND: Brown, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, root fragments.	NEC
								Trial pit terminated at 0.35m	

1

2

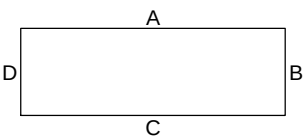
3

4

5

GENERAL REMARKS

Terminated due to hard made ground. Not possible to hand dig any deeper.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 01/04/2022	AGS
	Contractor:	Not surveyed		End: 01/04/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

Record of

HA2

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							0.10	MADE GROUND: Grey GRAVEL, medium grained, sub-angular to sub-rounded, dry.	NEC
0.4	ES		0.1				0.35	MADE GROUND: Brown, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, root fragments.	NEC
								Trial pit terminated at 0.35m	

1

2

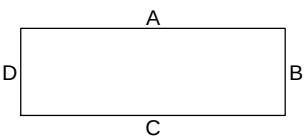
3

4

5

GENERAL REMARKS

Terminated due to hard made ground. Not possible to hand dig any deeper.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 01/04/2022	AGS
	Contractor:	Not surveyed		End: 01/04/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

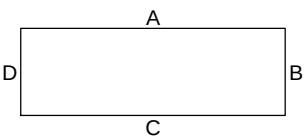
Record of Trial Pit

TP1

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.40) 0.40	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, dry.	
0.5	ES ES/DUP01						(0.60) 1.00	Slightly moist.	NEC
1			0.2				(0.40) 1.40	MADE GROUND: Brown, clayey SAND, fine grained sand, low plasticity clay, slightly moist.	NEC
			0.1						
1.7	ES						(0.40) 1.80	MADE GROUND: Grey, sandy GRAVEL, coarse grained, sub-angular to sub-rounded gravel, coarse grained sand, saturated.	Pieces of metal wire.
			0.0					**Trial pit terminated at 1.80m**	
2									
3									
4									
5									

GENERAL REMARKS

Terminated due to water strike and quickly filling up trial pit. Unsafe to proceed.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 30/03/2022	AGS
	Contractor:	Not surveyed		End: 30/03/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

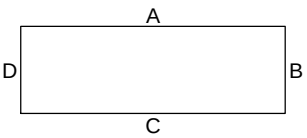
Record of Trial Pit

TP2

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.6	ES						(0.80) 0.80	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, dry.	Pieces of wire and plastic.
1			0.1				(0.70) 1.50	MADE GROUND: Brown, clayey SAND, fine grained sand, low plasticity clay, slightly moist.	Pieces of cable and plastic.
1.8	ES						(0.50) 2.00	MADE GROUND: Grey, sandy GRAVEL, coarse grained, sub-angular to sub-rounded gravel, coarse grained sand, saturated.	NEC
2			0.2					**Trial pit terminated at 2.00m**	
3									
4									
5									

GENERAL REMARKS

Terminated due to water strike and quickly filling up. Unsafe to proceed.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 30/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 30/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

Record of Trial Pit

TP3

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.6	ES						(0.70)	MADE GROUND: Grey, gravelly SAND, medium to coarse grained sand, fine to medium grained gravel, dry with occasional cobbles and frequent root fragments.	Pieces of old wire. NEC.
							0.70		
			0.1				(0.50)	MADE GROUND: Grey, clayey, sandy GRAVEL, fine to coarse grained gravel, fine to coarse grained sand, moist.	
1.2	ES		0.1				1.20	Very wet.	Slight sheen and globules on surface of water at strike.
							(0.60)		
							1.80		
			0.0				(1.30)	MADE GROUND: Brown, slightly gravelly, clayey SAND, fine to medium grained sand, medium plasticity clay, moist.	Possible water contamination introduced from strike. NEC in soil.
2.9	ES						3.10		
			0.0					**Trial pit terminated at 3.10m**	

GENERAL REMARKS

Terminated due to trial pit collapsing.

A
D B
C

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 01/04/2022	AGS
	Contractor:	Not surveyed		End: 01/04/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

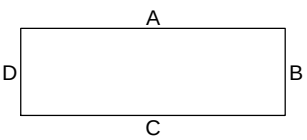
Record of Trial Pit

TP4

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.30) 0.30	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, dry.	Pieces of plastic.
						(0.90) 1.20	MADE GROUND: Brown, gravelly, clayey SAND, fine grained sand, low plasticity clay, slightly moist with occasional cobbles.	Timber pieces.
1 1.0	ES					(0.80) 2.00	MADE GROUND: Black, gravelly SILT, soft silt, fine to medium grained, sub-angular to sub-rounded gravel, wet.	NEC
2 2.5	ES					(0.30) 2.30	TILL: Brown, gravelly CLAY, medium plasticity clay, fine to medium grained, sub-angular to sub-rounded gravel, wet with frequent cobbles and occasional boulders. Very wet.	NEC
						(0.70) 3.00		
3							**Trial pit terminated at 3.00m**	
4								
5								

GENERAL REMARKS

Terminated due to water strike filling up trial pit and becoming unstable.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 01/04/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 01/04/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

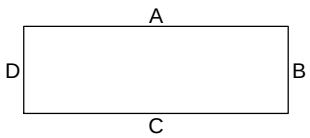
Record of Trial Pit

TP5

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.40) 0.40	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, dry.	Pieces of wire.
0.7	ES						(1.00) 1.40	MADE GROUND: Brownish grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, dry.	Plastic and metal pieces.
1			0.4						
1.8	ES						(0.90) 2.30	MADE GROUND: Brown, clayey SAND, fine grained sand, low plasticity clay, moist with frequent cobbles and occasional boulders.	Strong HC odour and oily soil observed from 1.8m.
2			0.6						
			0.5						
2.8	ES		0.9				(0.50) 2.80	MADE GROUND: Grey, sandy CLAY, medium plasticity clay, fine grained sand, stiff, wet with frequent cobbles and boulders.	Strong HC odour and oily soil throughout strata. Globules in water and HC odour from water strike.
3								**Trial pit terminated at 2.80m**	
4									
5									

GENERAL REMARKS

Terminated due to water strike and water flowing into trial pit.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 30/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 30/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

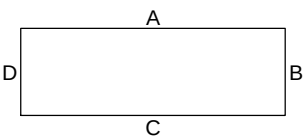
Record of Trial Pit

TP6

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
1 1.0	ES		0.2				0.20 (0.30) 0.50 (1.50)	MADE GROUND: Grey-brown, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, fine to coarse grained sand, dry with frequent cobbles and boulders, plastic, metal wires, concrete, and pieces of steel throughout (approx 5%). Moist. Slightly moist.	5% of waste. Plastic, metal, wires, concrete, pieces of steel and tyre uncovered at 1.9m. No evidence of hydrocarbon contamination.
2 2.0	ES		0.1				2.00	**Trial pit terminated at 2.00m**	
3									
4									
5									

GENERAL REMARKS

Terminated due to trial pit sides collapsing and becoming unstable. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 31/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 31/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

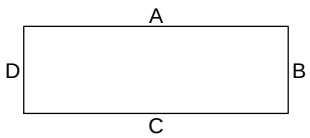
Record of Trial Pit

TP8

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.40) 0.40	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to angular gravel, fine to medium grained sand, dry.	NEC
							(0.50) 0.90	MADE GROUND: Brown, sandy CLAY, medium plasticity clay, fine to medium grained sand, frequent roots.	NEC
0.9	ES		0.1				(1.60) 2.50	MADE GROUND: Brown, clayey GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, medium plasticity clay, frequent cobbles with occasional boulders, pieces of timber, concrete, and roots.	Pieces of wood and roots. Cylindrical piece of metal at 1.3m.
2.6	ES		0.0				(0.50) 3.00	MADE GROUND: Grey, sandy SILT, soft silt, fine grained sand, moist with occasional pieces of timber and roots. Wet.	Block of concrete at 2.5m.
			0.0				(1.00) 4.00		
								Trial pit terminated at 4.00m	

GENERAL REMARKS

Terminated at target depth.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 29/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 30/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

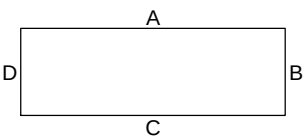
Record of Trial Pit

TP9

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
1			0.2				(0.70) 0.70	MADE GROUND: Light grey, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, fine to coarse grained sand, slightly moist with occasional cobbles.	Pieces of plastic, metal, and wood.
							(0.70) 1.40	MADE GROUND: Brown-grey, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, fine to coarse grained sand, moist with frequent cobbles and occasional boulders.	Pieces of broken concrete, glass, and metal.
2			0.2 7.5				(0.70) 2.10	MADE GROUND: Grey, clayey SAND, fine grained sand, soft, low plasticity clay, frequent cobbles and boulders.	Pieces of pipe, cable, and metal. Strong HC odour and oily soil from 1.8m. Possible diesel at 2.1m.
								Trial pit terminated at 2.10m	
3									
4									
5									

GENERAL REMARKS

Terminated due to gravelly made ground collapsing. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 30/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 30/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

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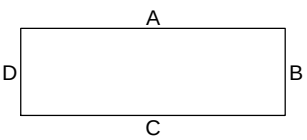
Record of Trial Pit

TP10

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.50) 0.50	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, fine to medium grained sand, slightly moist with frequent roots.	NEC
1 1.0	ES		0.1				(0.60) 1.10	MADE GROUND: Brown, gravelly, clayey SAND, fine grained sand, soft, medium plasticity clay, slightly moist with frequent grey cobbles.	NEC
2 2.2	ES		0.0				(1.30) 2.40	TILL: Grey, clayey, gravelly SAND, fine grained sand, fine to coarse grained, sub-angular to sub-rounded gravel, moist with frequent grey cobbles and occasional boulders.	NEC
			0.0					**Trial pit terminated at 2.40m**	
3									
4									
5									

GENERAL REMARKS

Terminated due to boulders, possible bedrock. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 31/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 31/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

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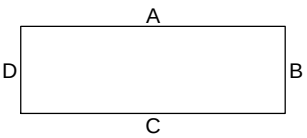
Record of Trial Pit

TP11

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.5	ES		0.1				0.20	MADE GROUND: Grey, GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, slightly moist.	NEC
							(0.80)	MADE GROUND: Grey, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, slightly moist.	Pieces of plastic, metal, and an old pipe.
1			0.1				1.00		
							(0.90)	MADE GROUND: Brown, gravelly SAND, fine to coarse grained sand, fine to coarse grained, sub-angular to sub-rounded gravel, moist.	Pieces of steel.
2			0.1				1.90		
							(1.00)	MADE GROUND: Brown, SAND, coarse grained sand, moist.	NEC
3			0.0				2.90		
							(0.30)	TILL: Brown, sandy CLAY, soft, low plasticity clay, medium to coarse grianed sand, wet.	NEC
							3.20	**Trial pit terminated at 3.20m**	
4									
5									

GENERAL REMARKS

Terminated due to trial pit sides collapsing. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 01/04/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 01/04/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

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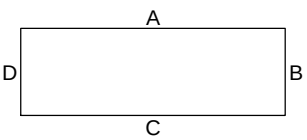
Record of Trial Pit

TP12

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.50)	MADE GROUND: Brown, gravelly SAND, fine to coarse grained sand, fine to medium grained, sub-angular to sub-rounded gravel, dry with lots of roots.	
							0.50		
0.6	ES							Slightly moist.	Pieces of wood and old cable.
							(0.50)		
1			0.0				1.00		
								MADE GROUND: Grey, gravelly, sandy CLAY, soft, medium plasticity clay, fine grained sand, fine to coarse grained, sub-angular to sub-rounded gravel, moist with frequent cobbles and occasional boulders.	
2			0.0				(2.00)		Pieces of timber, plastic, and wire.
2.6	ES								
3			0.0				3.00		
								Trial pit terminated at 3.00m	
4									
5									

GENERAL REMARKS

Terminated due to trial pit sides collapsing and becoming unstable. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 31/03/2022	AGS
	Contractor:	Not surveyed		End: 31/03/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

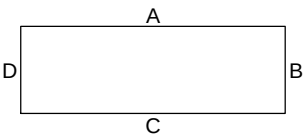
Record of Trial Pit

TP13

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.70)	MADE GROUND: Grey, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, coarse grained sand, slightly moist.	NEC
							0.70		
1			0.4				(1.10)	MADE GROUND: Brown-grey, gravelly SAND, coarse grained sand, fine to coarse grained, sub-angular to sub-rounded gravel, moist with occasional cobbles and boulders. Grey sub-angular to rounded limestone.	
1.4	ES						1.80		
2			0.1				(0.50)	TILL: Brown, gravelly, clayey SAND, fine to medium grained sand, medium plasticity clay, moist with frequent cobbles.	Pieces of metal, screws, bolts, and plastic. Uncovered plastic storm pipe at 1.4m with water leaking out. Piece of timber at 1.7m.
2.3	ES						2.30		
3			0.0				(1.50)	TILL: Brown, sandy, gravelly CLAY, stiff, medium plasticity clay, fine to coarse grained, sub-angular to rounded gravel, wet with frequent cobbles and occasional boulders.	
			0.0				3.80		
4								**Trial pit terminated at 3.80m**	
5									

GENERAL REMARKS

Terminated due to gravels falling in. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 29/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 29/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

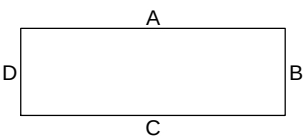
Record of Trial Pit

TP14

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.4	ES		0.0				(0.40) 0.40	MADE GROUND: Brown, clayey GRAVEL, fine to medium grained, sub-rounded to rounded gravel, low plasticity clay, moist with frequent root fragments and sub-angular to rounded cobbles.	Pieces of wire and plastic.
1							(2.20) 2.60	TILL: Brown, gravelly, clayey SAND, fine to medium grained sand, medium plasticity clay, moist with frequent cobbles, grey sub-angular to sub-rounded limestone, and occasional boulders.	NEC
2			0.0						
2.5	ES								
3			0.0				(1.00) 3.60	TILL: Brown, gravelly CLAY, stiff, medium plasticity clay, fine to coarse grained, sub-angular to sub-rounded gravel, moist with frequent cobbles and occasional boulders.	NEC
			0.0						
4								**Trial pit terminated at 3.60m**	
5									

GENERAL REMARKS

Terminated due to trial pit sides collapsing and gravels falling in. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 29/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 29/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

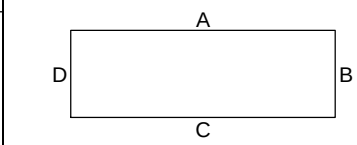
Record of Trial Pit

TP15

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.6	ES		0.1				(0.60) 0.60	HARDSAND: Grey, sandy GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, dry.	NEC
							(0.30) 0.90	TOP SOIL: Grey, slightly gravelly, silty SAND, fine grained sand, low plasticity silt, dry with occasional root fragments.	NEC
1							(0.40) 1.30	MADE GROUND: Brown, clayey SAND, fine grained sand, low plasticity clay, slightly moist.	NEC
2			0.0				(1.20) 2.50	MADE GROUND: Brown, gravelly CLAY, stiff, medium plasticity clay, fine to coarse grained, sub-angular to sub-rounded gravel, slightly moist with frequent pale grey sub-angular to sub-rounded limestone cobbles and occasional boulders.	NEC
2.5	ES								
3			0.0				(1.30) 3.80	MADE GROUND: Brown-grey, slightly sandy, clayey GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, medium plasticity clay, moist with occasional sub-angular to sub-rounded limestone cobbles and boulders.	NEC
			0.0						
4								**Trial pit terminated at 3.80m**	
5									

GENERAL REMARKS

Terminated due to boulders. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 28/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 28/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

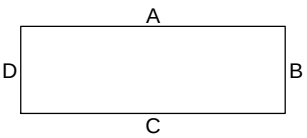
Record of Trial Pit

TP16

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							0.15	MADE GROUND: Grey, slightly sandy GRAVEL, fine to medium grained, sub-angular to angular gravel, coarse grained sand, dry.	Pieces of plastic, metal, and brick.
							(0.75)	MADE GROUND: Grey, sandy GRAVEL, medium to coarse grained, sub-angular to sub-rounded gravel, fine to coarse grained sand, dry with frequent sub-angular to angular cobbles and occasional boulders, some iron stained cobbles, 5% bricks.	Pieces of plastic, metal, and brick.
1			0.0				0.90		
1.2	ES						(0.80)	MADE GROUND: Brown, gravelly SAND, medium to coarse grained sand, fine to medium grained, sub-angular to sub-rounded gravel, dry with 5% red bricks.	Pieces of metal, wood, old wire, and 5% red brick.
2			0.0				1.70		
							(0.70)	MADE GROUND: Brown, clayey SAND, fine to medium grained sand, medium plasticity clay, moist with frequent grey sub-angular to sub-rounded limestone cobbles and occasional boulders.	NEC
3 3.0	ES		0.0				2.40		
							(1.60)	MADE GROUND: Brown-grey, slightly sandy, clayey GRAVEL, fine to coarse grained, sub-angular to sub-rounded gravel, medium plasticity clay, slightly moist with occasional limestone cobbles and boulders.	NEC
4			0.0				4.00		
								Trial pit terminated at 4.00m	
5									

GENERAL REMARKS

Terminated at target depth. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 28/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 28/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

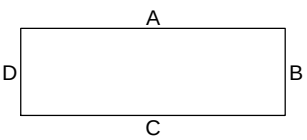
Record of Trial Pit

TP17

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							(0.40) 0.40	TOPSOIL: Brown, clayey SAND, fine grained sand, low plasticity clay, slightly moist with lots of roots.	NEC
0.5	ES						(0.50) 0.90	MADE GROUND: Brown, gravelly CLAY, stiff, medium plasticity clay, fine to coarse grained, sub-angular to sub-rounded gravel, frequent cobbles and roots.	NEC
1			0.2				1.10	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, slightly moist.	NEC
							(1.10)	TILL: Brown, gravelly, sandy CLAY, medium plasticity clay, fine coarsed sand, slightly moist with frequent sub-angular to sub-rounded grey limestone cobbles.	NEC
2			0.1						
2.1	ES		0.0				2.20	**Trial pit terminated at 2.20m**	
3									
4									
5									

GENERAL REMARKS

Terminated due to gravels limiting digger ability to continue. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 29/03/2022	AGS
	Contractor:	Not surveyed		End: 29/03/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

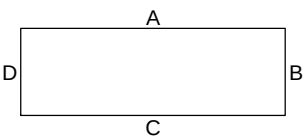
Record of Trial Pit

TP18

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
1 1.0	ES		0.1				(0.40) 0.40	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to angular gravel, fine to medium grained sand, dry.	NEC
							(0.60) 1.00	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to angular gravel, fine to medium grained sand, dry.	Pieces of plastic and roots.
2			0.0				(1.50) 2.50	TILL: Brown-grey, clayey SAND, fine grained sand, soft, medium plasticity clay, moist. Wet.	NEC
3 3.2	ES		0.1				(0.70) 3.20	Very wet.	
			0.0				3.40	**Trial pit terminated at 3.40m**	
4									
5									

GENERAL REMARKS

Terminated due to water strike and quickly filling up trial pit. Unsafe to proceed.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 31/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 31/03/2022	Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

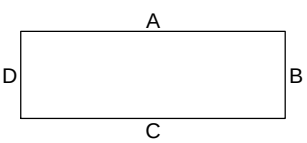
Record of Trial Pit

TP19

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							0.20	TOPSOIL: Brown, clayey SAND, fine grained sand, low plasticity clay, moist with root fragments.	NEC
							0.40	MADE GROUND: Grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, moist.	NEC
0.6	ES						(0.50)	MADE GROUND: Brown, sandy CLAY, soft, medium plasticity clay, fine grained sand, moist.	Pieces of plastic, old cables, wire, and timber.
							0.90		
1			0.1					TILL: Grey, slightly sandy CLAY, soft, medium plasticity clay, fine grained sand, moist with occasional sub-angular to sub-rounded grey cobbles.	
2			0.0				(2.40)		Power cable at 1.1m at edge of trial pit.
2.5	ES ES/DUP02								
3			0.0						
			0.0				3.30		
							3.50	TILL: Brown, slightly clayey SAND, fine to medium grained sand, low plasticity clay, moist.	NEC
								Trial pit terminated at 3.50m	
4									
5									

GENERAL REMARKS

Terminated due to trial pit sides becoming unstable. No water strike.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 31/03/2022	AGS
	Contractor:	Not surveyed		End: 31/03/2022	
Status: Draft	SEM Construction				Sheet 1 of 1

Client: Boliden Tara Mines

Project: Boliden Tara Mines - Soil and Groundwater Baseline Assessment, Knockumber, County Meath.

Contract No: 60671645

AECOM

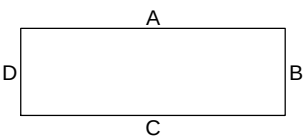
Record of Trial Pit

TP20

Samples & in situ Tests				Water Level	Strata				
Depth	Type/ No.	Test Results	PID (ppm)		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
							0.20	TOPSOIL: Brown, clayey SAND, fine grained sand, low plasticity clay, slightly moist with lots of roots.	NEC
0.4	ES						(0.30) 0.50	MADE GROUND: Dark grey, sandy GRAVEL, fine to medium grained, sub-angular to sub-rounded gravel, medium to coarse grained sand, slightly moist.	Pieces of wire.
								TILL: Brown, gravelly, sandy CLAY, medium plasticity clay, fine grained sand, slightly moist with frequent limestone grey cobbles and occasional boulders.	
1			0.2				(1.90)		NEC
2 2.0	ES		0.1						
			0.0				2.40 2.50	Very wet.	
								Trial pit terminated at 2.50m	
3									
4									
5									

GENERAL REMARKS

Terminated due to gravels limiting digger ability to continue.



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates:	Ground Level:	Date:	
Checked by:		Not surveyed	Not surveyed	Start: 29/03/2022	AGS
Status: Draft	Contractor: SEM Construction	Not surveyed		End: 29/03/2022	Sheet 1 of 1

Appendix F Laboratory Certificates

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

AECOM
1st Floor, Montrose House
Carrigaline Road
Douglas
Cork
Ireland

Attention :	Brendan McCarthy
Date :	7th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5245 Batch 1
Location :	Navan
Date samples received :	31st March, 2022
Status :	Final Report
Issue :	1

Nine samples were received for analysis on 31st March, 2022 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5245

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	14-15	16-17	18	19-20							LOD/LOR	Units	Method No.
Sample ID	TP15	TP15	TP16	TP16									
Depth	0.60	2.50	1.20	3.00									
COC No / misc													
Containers	V J	V J	J	V J									
Sample Date	28/03/2022	28/03/2022	28/03/2022	28/03/2022									
Sample Type	Clay	Clay	Clayey Sand	Clay									
Batch Number	1	1	1	1									
Date of Receipt	31/03/2022	31/03/2022	31/03/2022	31/03/2022									
Arsenic #M	8.3	7.0	155.5	14.8							<0.5	mg/kg	TM30/PM15
Barium #M	215	81	376	373							<1	mg/kg	TM30/PM15
Beryllium	1.0	0.9	0.9	0.8							<0.5	mg/kg	TM30/PM15
Cadmium #M	1.9	1.0	21.4	10.9							<0.1	mg/kg	TM30/PM15
Chromium #M	62.7	38.8	40.4	39.9							<0.5	mg/kg	TM30/PM15
Copper #M	27	23	54	22							<1	mg/kg	TM30/PM15
Lead #M	102	13	885	332							<5	mg/kg	TM30/PM15
Mercury #M	<0.1	<0.1	0.6	0.2							<0.1	mg/kg	TM30/PM15
Nickel #M	45.8	44.0	38.3	38.0							<0.7	mg/kg	TM30/PM15
Selenium #M	2	<1	1	1							<1	mg/kg	TM30/PM15
Vanadium	43	30	19	28							<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.9	0.4	0.5	0.5							<0.1	mg/kg	TM74/PM32
Zinc #M	493	78	6770_{AA}	1923							<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	<0.2	<0.2	<0.2	<0.2							<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	<4	<4	<4	<4							<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	<19	<19							<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1	<0.1	<0.1	$<0.1^{SV}$							<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	<0.2	<0.2							<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4	<4	<4							<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	<19	<19	<19	<19							<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	<38	<38							<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5	<5	<5	$<5^{SV}$							<5	ug/kg	TM36/PM12
Benzene #	<5	<5	<5	$<5^{SV}$							<5	ug/kg	TM36/PM12
Toluene #	8	<5	20	$<5^{SV}$							<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	<5	$<5^{SV}$							<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	<5	7	$<5^{SV}$							<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	<5	$<5^{SV}$							<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3							<0.3	mg/kg	TM38/PM20
Chromium III	62.7	38.8	40.4	39.9							<0.5	mg/kg	NONE/NONE

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5245

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	14-15	16-17	18	19-20									
Sample ID	TP15	TP15	TP16	TP16									
Depth	0.60	2.50	1.20	3.00									
COC No / misc													
Containers	V J	V J	J	V J									
Sample Date	28/03/2022	28/03/2022	28/03/2022	28/03/2022									
Sample Type	Clay	Clay	Clayey Sand	Clay									
Batch Number	1	1	1	1									
Date of Receipt	31/03/2022	31/03/2022	31/03/2022	31/03/2022									
Total Organic Carbon #	-	0.21	-	-							<0.02	%	TM21/PM24
Sample Type	Clay	Clay	Clayey Sand	Clay								None	PM13/PM0
Sample Colour	Medium Brown	Light Brown	Medium Brown	Medium Brown								None	PM13/PM0
Other Items	stones	stones	stones	stones								None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5245

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-5	6-7	8-9	10-11	12-13						LOD/LOR	Units	Method No.
Sample ID	SW1	SROB1	SRBR1	SROB3	SROB4								
Depth													
COC No / misc													
Containers	V HN PF G	HN PF	HN PF	HN PF	HN PF								
Sample Date	28/03/2022	28/03/2022	28/03/2022	28/03/2022	28/03/2022								
Sample Type	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1	1								
Date of Receipt	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022								
Dissolved Arsenic #	6.2	3.5	<2.5	<2.5	5.2						<2.5	ug/l	TM30/PM14
Dissolved Barium #	30	63	98	80	98						<3	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Dissolved Boron	115	56	142	<12	32						<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	15.4						<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	2.4	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	10	<7	<7	<7						<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5						<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel #	12	<2	<2	3	54						<2	ug/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3						<3	ug/l	TM30/PM14
Dissolved Vanadium #	<1.5	<1.5	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Zinc #	60	5	<3	10	22802_{AB}						<3	ug/l	TM30/PM14
MTBE #	<5	-	-	-	-						<5	ug/l	TM36/PM12
Benzene #	<5	-	-	-	-						<5	ug/l	TM36/PM12
Toluene #	<5	-	-	-	-						<5	ug/l	TM36/PM12
Ethylbenzene #	<5	-	-	-	-						<5	ug/l	TM36/PM12
m/p-Xylene #	<5	-	-	-	-						<5	ug/l	TM36/PM12
o-Xylene #	<5	-	-	-	-						<5	ug/l	TM36/PM12
TPH CWG													
Aliphatics													
>C5-C6 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>C6-C8 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>C8-C10 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>C10-C12 #	<5	-	-	-	-						<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	-	-	-	-						<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	-	-	-	-						<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	-	-	-	-						<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	-	-	-	-						<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	-	-	-	-						<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	-	-	-	-						<10	ug/l	TM5/TM36/PM12/PM16/PM30
Hexavalent Chromium	<6	-	-	-	-						<6	ug/l	TM38/PM0
Total Dissolved Chromium III	<6	-	-	-	-						<6	ug/l	TM0/PM0

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5245

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-5	6-7	8-9	10-11	12-13							
Sample ID	SW1	SROB1	SRBR1	SROB3	SROB4							
Depth												
COC No / misc												
Containers	V HN PF G	HN PF	HN PF	HN PF	HN PF							
Sample Date	28/03/2022	28/03/2022	28/03/2022	28/03/2022	28/03/2022							
Sample Type	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1							
Date of Receipt	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022							
PFAAS												
PFBA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFPeA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFBS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFHxA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
4:2 FTS	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	ug/l
PFPeS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFHpA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFHxS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFOA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
6:2 FTS	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	ug/l
PFHpS	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l
PFNA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFOSA	<1	<1	<1	<1	<1						<1	ug/l
PFOS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFDA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
8:2 FTS	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	ug/l
PFNS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFUnA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
N-MeFOSAA	<1	<1	<1	<1	<1						<1	ug/l
N-EtFOSAA	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	ug/l
PFDS	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFDoA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFTrDA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l
PFTeDA	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	ug/l

Please see attached notes for all abbreviations and acronyms

LOD/LOR	Units	Method No.

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5245						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5245

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5245

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				

EMT Job No: 22/5245

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes

EMT Job No: 22/5245

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM135	Analysis of PFAS compounds in Water and Soil by LC-MS/MS	PM121	Preparation of PFAS liquid samples – As received samples are centrifuged and the supernatant is used for PFAS analysis.				
NONE	No Method Code	NONE	No Method Code			AD	Yes

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AECOM
1st Floor, Montrose House
Carrigaline Road
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Ireland

Attention :	Brendan McCarthy
Date :	8th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5361 Batch 1
Location :	Navan
Date samples received :	1st April, 2022
Status :	Final Report
Issue :	1

Twenty one samples were received for analysis on 1st April, 2022 of which twenty one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	LOD/LOR	Units	Method No.
Sample ID	TP16	TP9	TP5	TP13	TP8	TP5	TP20	TP8	TP20	TP13			
Depth	1.20	1.90	2.80	1.40	2.60	1.80	2.00	0.90	0.40	2.30			
COC No / misc													
Containers	V	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	28/03/2022	30/03/2022	30/03/2022	29/03/2022	29/03/2022	30/03/2022	29/03/2022	30/03/2022	29/03/2022	29/03/2022			
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Arsenic #M	50.6	47.6	60.6	10.2	3.2	30.0	7.3	28.9	97.2	6.7	<0.5	mg/kg	TM30/PM15
Barium #M	734	878	671	206	412	963	100	1096	491	96	<1	mg/kg	TM30/PM15
Beryllium	1.2	1.0	1.0	1.5	<0.5	0.6	0.8	1.0	1.0	0.8	<0.5	mg/kg	TM30/PM15
Cadmium #M	19.0	20.9	8.4	1.0	0.4	8.3	1.2	12.0	48.6 AB	0.9	<0.1	mg/kg	TM30/PM15
Chromium #M	78.3	44.8	47.7	63.8	9.9	46.0	52.5	49.4	60.4	30.7	<0.5	mg/kg	TM30/PM15
Copper #M	54	21	32	19	8	35	24	34	24	23	<1	mg/kg	TM30/PM15
Lead #M	738	598	1010	28	14	447	19	495	1888	13	<5	mg/kg	TM30/PM15
Mercury #M	0.4	0.6	0.4	0.2	<0.1	0.4	<0.1	0.4	1.2	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #M	58.9	32.0	44.2	47.5	11.4	35.0	46.4	44.2	49.3	42.4	<0.7	mg/kg	TM30/PM15
Selenium #M	1	2	4	1	5	2	2	1	2	<1	<1	mg/kg	TM30/PM15
Vanadium	43	26	32	50	5	19	27	30	34	24	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.4	1.7	0.8	1.3	0.6	0.6	0.4	0.5	0.5	0.3	<0.1	mg/kg	TM74/PM32
Zinc #M	5106 AB	5573 AB	3121 AB	104	77	2011	152	3252 AB	12170 AB	76	<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	<0.2	1.8	3.8	<0.2	<0.2	50.0	<0.2	<0.2	0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	<4	45	104	<4	<4	734	<4	<4	12	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	<7	126	308	<7	<7	2021	<7	<7	27	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	<7	359	1063	<7	<7	8095	<7	49	51	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	532	1479	<19	<19	10900	<19	49	90	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	<0.2	<0.2	<0.2	1.5	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4	21	<4	<4	225	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	61	213	<7	<7	1442	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	<7	171	662	<7	<7	4642	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	<19	232	896	<19	<19	6311	<19	<19	<19	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	764	2375	<38	<38	17211	<38	49	90	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5	<5	6	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Toluene #	16	12	11	10	<5	10 SV	<5	6	10 SV	<5	<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	8	19	<5	<5	7 SV	<5	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	9	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	78.3	44.8	47.7	63.8	9.9	46.0	52.5	49.4	60.4	30.7	<0.5	mg/kg	NONE/NONE

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	LOD/LOR	Units	Method No.
Sample ID	TP16	TP9	TP5	TP13	TP8	TP5	TP20	TP8	TP20	TP13			
Depth	1.20	1.90	2.80	1.40	2.60	1.80	2.00	0.90	0.40	2.30			
COC No / misc													
Containers	V	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	28/03/2022	30/03/2022	30/03/2022	29/03/2022	29/03/2022	30/03/2022	29/03/2022	30/03/2022	29/03/2022	29/03/2022			
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Total Organic Carbon #	-	0.94	-	0.95	-	-	0.22	-	-	-	<0.02	%	TM21/PM24
PFAAS													
PFBA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFPeA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFBS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFHxA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFPeS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFHpA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFHxS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFOA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFHpS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFNA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFOS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFDA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFNS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFUnA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFDS	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFDoA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFTrDA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
PFTeDA	-	-	-	-	-	-	-	-	-	-	<1	ug/kg	TM135/PM120
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay		None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown		None	PM13/PM0
Other Items	stones	stones	stones, sand	stones, vegetation	stones, vegetation	stones, sand	stones	stones, vegetation	stones, vegetation	stones		None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	20-21	22-23	24-25	26-27	28-30	31-33	34-36	37-39	40-42	43-44	LOD/LOR	Units	Method No.
Sample ID	TP17	TP17	TP14	TP14	TP01	TP02	TP02	TP01	DUP01	TP9			
Depth	2.10	0.50	2.50	0.40	0.50	1.80	0.60	1.70	0.50	0.80			
COC No / misc													
Containers	V J	V J	V J	V J	V J T	V J T	V J T	V J T	V J T	V J			
Sample Date	29/03/2022	29/03/2022	29/03/2022	29/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022			
Sample Type	Clay	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clayey Sand			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Arsenic #M	7.5	6.4	5.6	15.8	65.9	153.4	67.1	499.7 AB	147.7	383.0 AB	<0.5	mg/kg	TM30/PM15
Barium #M	311	114	55	220	793	528	345	63	335	513	<1	mg/kg	TM30/PM15
Beryllium	0.8	0.7	0.7	0.9	0.5	<0.5	<0.5	<0.5	0.6	0.6	<0.5	mg/kg	TM30/PM15
Cadmium #M	1.0	1.3	0.9	10.3	18.5	29.4 AB	18.3	243.3 AC	35.4 AB	10.3	<0.1	mg/kg	TM30/PM15
Chromium #M	32.8	46.4	46.9	53.6	30.9	56.7	29.1	25.5	35.5	29.4	<0.5	mg/kg	TM30/PM15
Copper #M	23	20	20	37	13	23	15	27	20	11	<1	mg/kg	TM30/PM15
Lead #M	26	41	12	275	1072	2491	980	22760 AC	1839	747	<5	mg/kg	TM30/PM15
Mercury #M	<0.1	<0.1	<0.1	0.2	1.1	0.7	1.2	2.1	1.6	0.5	<0.1	mg/kg	TM30/PM15
Nickel #M	42.5	37.7	37.3	40.8	25.4	24.7	24.7	36.4	37.5	26.2	<0.7	mg/kg	TM30/PM15
Selenium #M	2	<1	<1	<1	<1	<1	2	<1	2	<1	<1	mg/kg	TM30/PM15
Vanadium	24	22	27	37	12	16	15	9	18	10	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.3	0.3	0.4	0.3	0.9	0.5	0.8	0.5	0.8	1.2	<0.1	mg/kg	TM74/PM32
Zinc #M	139	200	78	2742 AB	5064 AB	6718 AB	12140 AB	56640 AD	9078 AB	3284 AB	<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	7.6	6.4	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	<4	<4	<4	<4	<4	<4	<4	<4	36	30	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	<7	<7	<7	29	37	46	36	14	148	130	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	<7	<7	<7	9	222	541	444	306	1586	971	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	<19	38	259	587	480	320	1778	1137	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4	<4	<4	<4	<4	<4	<4	<4	12	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	<7	<7	<7	<7	<7	<7	<7	34	73	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	<7	<7	<7	<7	14	143	96	55	500	562	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	<19	<19	<19	<19	<19	143	96	55	534	647	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	<38	38	259	730	576	375	2312	1784	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Toluene #	<5	<5	<5	<5	7	5	20	<5	13	14	<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	8	15	5	6	<5	<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.6 AA	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	32.8	46.4	46.9	53.6	30.9	56.7	29.1	25.5	35.5	29.4	<0.5	mg/kg	NONE/NONE

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	20-21	22-23	24-25	26-27	28-30	31-33	34-36	37-39	40-42	43-44	LOD/LOR	Units	Method No.
Sample ID	TP17	TP17	TP14	TP14	TP01	TP02	TP02	TP01	DUP01	TP9			
Depth	2.10	0.50	2.50	0.40	0.50	1.80	0.60	1.70	0.50	0.80			
COC No / misc													
Containers	V J	V J	V J	V J	V J T	V J T	V J T	V J T	V J T	V J			
Sample Date	29/03/2022	29/03/2022	29/03/2022	29/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022			
Sample Type	Clay	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clayey Sand			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Total Organic Carbon #	-	-	-	-	-	0.38	-	-	-	-	<0.02	%	TM21/PM24
PFAAS													
PFBA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFPeA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFBS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFHxA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFPeS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFHpA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFHxS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFOA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFHpS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFNA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFOS	-	-	-	-	2	2	<1	<1	2	-	<1	ug/kg	TM135/PM120
PFDA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFNS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFUnA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFDS	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFDoA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFTrDA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
PFTeDA	-	-	-	-	<1	<1	<1	<1	<1	-	<1	ug/kg	TM135/PM120
Sample Type	Clay	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clayey Sand		None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown		None	PM13/PM0
Other Items	stones	stones	stones	stones	stones	stones, sand	stones	stones	stones	stones, vegetation		None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	45-46												
Sample ID	TP5												
Depth	0.70												
COC No / misc													
Containers	V J												
Sample Date	30/03/2022												
Sample Type	Clay												
Batch Number	1												
Date of Receipt	01/04/2022												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Arsenic #M	66.4										<0.5	mg/kg	TM30/PM15
Barium #M	935										<1	mg/kg	TM30/PM15
Beryllium	0.7										<0.5	mg/kg	TM30/PM15
Cadmium #M	10.8										<0.1	mg/kg	TM30/PM15
Chromium #M	55.0										<0.5	mg/kg	TM30/PM15
Copper #M	19										<1	mg/kg	TM30/PM15
Lead #M	788										<5	mg/kg	TM30/PM15
Mercury #M	0.5										<0.1	mg/kg	TM30/PM15
Nickel #M	38.4										<0.7	mg/kg	TM30/PM15
Selenium #M	<1										<1	mg/kg	TM30/PM15
Vanadium	25										<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.9										<0.1	mg/kg	TM74/PM32
Zinc #M	3487 AB										<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1										<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1										<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1										<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	0.6										<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	11										<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	71										<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	1717										<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	1800										<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1										<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1										<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1										<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2										<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4										<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	43										<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	623										<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	666										<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	2466										<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5										<5	ug/kg	TM36/PM12
Benzene #	10										<5	ug/kg	TM36/PM12
Toluene #	32										<5	ug/kg	TM36/PM12
Ethylbenzene #	<5										<5	ug/kg	TM36/PM12
m/p-Xylene #	27										<5	ug/kg	TM36/PM12
o-Xylene #	8										<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3										<0.3	mg/kg	TM38/PM20
Chromium III	55.0										<0.5	mg/kg	NONE/NONE

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5361

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	45-46										LOD/LOR	Units	Method No.
Sample ID	TP5												
Depth	0.70												
COC No / misc													
Containers	V J												
Sample Date	30/03/2022												
Sample Type	Clay												
Batch Number	1												
Date of Receipt	01/04/2022												
Total Organic Carbon #	-										<0.02	%	TM21/PM24
PFAAS													
PFBA	-										<1	ug/kg	TM135/PM120
PFPeA	-										<1	ug/kg	TM135/PM120
PFBS	-										<1	ug/kg	TM135/PM120
PFHxA	-										<1	ug/kg	TM135/PM120
PFPeS	-										<1	ug/kg	TM135/PM120
PFHpA	-										<1	ug/kg	TM135/PM120
PFHxS	-										<1	ug/kg	TM135/PM120
PFOA	-										<1	ug/kg	TM135/PM120
PFHpS	-										<1	ug/kg	TM135/PM120
PFNA	-										<1	ug/kg	TM135/PM120
PFOS	-										<1	ug/kg	TM135/PM120
PFDA	-										<1	ug/kg	TM135/PM120
PFNS	-										<1	ug/kg	TM135/PM120
PFUnA	-										<1	ug/kg	TM135/PM120
PFDS	-										<1	ug/kg	TM135/PM120
PFDoA	-										<1	ug/kg	TM135/PM120
PFTrDA	-										<1	ug/kg	TM135/PM120
PFTeDA	-										<1	ug/kg	TM135/PM120
Sample Type	Clay											None	PM13/PM0
Sample Colour	Medium Brown											None	PM13/PM0
Other Items	stones, tile											None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5361						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5361

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution
AB	x5 Dilution
AC	x10 Dilution
AD	x50 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5361

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 22/5361

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM135	Analysis of PFAS compounds in Water and Soil by LC-MS/MS	PM120	Methanol/NH4OH Extraction for PFAS Analysis by LC-MS - As received solid samples are extracted in Methanol: Ammonium Hydroxide solution by Sonication and End over End shaker.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

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AECOM
1st Floor, Montrose House
Carrigaline Road
Douglas
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Ireland

Attention :	Brendan McCarthy
Date :	14th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5569 Batch 1 Schedule A 22/5569 Batch 1 Schedule B 22/5569 Batch
Location :	Navan
Date samples received :	5th April, 2022
Status :	Final Report
Issue :	1

Twenty samples were received for analysis on 5th April, 2022 of which twenty were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5569

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	LOD/LOR	Units	Method No.
Sample ID	TP19	TP19	DUP02	TP18	TP18	TP10	TP10	TP12	TP12	TP6			
Depth	0.60	2.50	2.50	1.00	3.20	1.00	2.20	0.60	2.60	1.00			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022			
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022			
Arsenic #M	29.6	6.2	7.2	7.6	9.9	24.6	6.4	7.8	8.8	179.4	<0.5	mg/kg	TM30/PM15
Barium #M	772	168	134	129	54	812	167	165	152	230	<1	mg/kg	TM30/PM15
Beryllium	0.9	1.0	1.0	1.0	0.8	0.8	0.8	0.9	0.9	0.5	<0.5	mg/kg	TM30/PM15
Cadmium #M	4.8	0.7	0.9	0.5	0.6	4.5	0.6	1.0	1.3	44.0 AA	<0.1	mg/kg	TM30/PM15
Chromium #M	66.4	96.3	83.7	66.9	65.3	47.8	72.0	47.9	47.5	50.7	<0.5	mg/kg	TM30/PM15
Copper #M	20	17	20	25	21	21	19	25	21	19	<1	mg/kg	TM30/PM15
Lead #M	309	24	21	19	13	268	36	31	30	2670 AA	<5	mg/kg	TM30/PM15
Mercury #M	0.2	<0.1	0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	2.0	<0.1	mg/kg	TM30/PM15
Nickel #M	37.7	38.1	44.7	46.6	36.8	37.4	41.7	41.8	41.1	46.9	<0.7	mg/kg	TM30/PM15
Selenium #M	1	2	2	<1	2	1	<1	1	2	<1	<1	mg/kg	TM30/PM15
Vanadium	34	48	45	42	31	26	34	34	38	21	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	1.0	1.3	0.9	0.3	0.4	0.9	0.4	0.5	0.5	0.8	<0.1	mg/kg	TM74/PM32
Zinc #M	1606	108	92	96	69	1013	156	160	140	16940 AB	<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	<7	<7	<7	<7	<7	<7	<7	<7	<7	23	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	<7	<7	<7	<7	<7	<7	<7	<7	84	538	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	<19	<19	<19	<19	<19	<19	84	561	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	<7	<7	<7	<7	<7	<7	<7	<7	<7	142	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	<19	<19	<19	<19	<19	<19	<19	<19	<19	142	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	<38	<38	<38	<38	<38	<38	84	703	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5	<5	<5	<5	<5 SV	<5	<5	<5	<5	8	<5	ug/kg	TM36/PM12
Benzene #	<5	<5	<5	<5	<5 SV	<5	<5	<5	<5	17	<5	ug/kg	TM36/PM12
Toluene #	24	9	10	<5	5 SV	20	15	14	16	33	<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5 SV	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	8	<5	<5	<5	<5 SV	5	<5	<5	6	22	<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5 SV	<5	<5	<5	<5	7	<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	66.4	96.3	83.7	66.9	65.3	47.8	72.0	47.9	47.5	50.7	<0.5	mg/kg	NONE/NONE

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5569

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	LOD/LOR	Units	Method No.
Sample ID	TP19	TP19	DUP02	TP18	TP18	TP10	TP10	TP12	TP12	TP6			
Depth	0.60	2.50	2.50	1.00	3.20	1.00	2.20	0.60	2.60	1.00			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022	31/03/2022			
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022			
Total Organic Carbon #	0.98	-	-	-	-	-	0.24	-	-	0.45	<0.02	%	TM21/PM24
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clayey Sand	Clay	Clay	Clay		None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown		None	PM13/PM0
Other Items	stones, vegetation	stones	stones, vegetation	stones, water	stones	stones	stones	stones, sand	stones	stones		None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5569

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	LOD/LOR	Units	Method No.
Sample ID	TP6	TP11	TP11	HA1	HA2	TP4	TP4	TP3	TP3	TP3			
Depth	2.00	0.50	2.70	0.35	0.35	1.00	2.50	0.60	1.20	2.90			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	31/03/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Sample Type	Clayey Sand	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022			
Arsenic #M	13.8	166.3	5.2	131.2	174.9	30.2	11.0	77.2	275.0 AA	7.8	<0.5	mg/kg	TM30/PM15
Barium #M	460	205	42	556	462	853	151	1003	82	157	<1	mg/kg	TM30/PM15
Beryllium	0.9	0.6	0.6	0.9	<0.5	1.0	1.0	0.9	1.1	0.7	<0.5	mg/kg	TM30/PM15
Cadmium #M	2.6	29.0 AA	1.0	21.3	24.0	5.6	1.0	7.4	102.9 AA	1.0	<0.1	mg/kg	TM30/PM15
Chromium #M	104.7	29.7	46.4	40.4	21.5	57.4	59.8	157.4	57.5	58.0	<0.5	mg/kg	TM30/PM15
Copper #M	25	13	17	24	10	61	25	29	34	19	<1	mg/kg	TM30/PM15
Lead #M	137	1816	9	1465	2022	309	44	360	9615 AA	26	<5	mg/kg	TM30/PM15
Mercury #M	<0.1	0.9	<0.1	0.8	1.2	0.2	0.1	0.1	1.2	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #M	71.9	29.7	31.3	37.2	32.5	49.0	47.5	98.7	72.6	37.9	<0.7	mg/kg	TM30/PM15
Selenium #M	2	2	<1	2	<1	2	2	1	3	<1	<1	mg/kg	TM30/PM15
Vanadium	60	15	24	22	9	40	38	78	34	31	<1	mg/kg	TM30/PM15
Water Soluble Boron #M	0.4	0.8	0.4	1.0	0.6	1.3	1.1	0.6	0.9	0.4	<0.1	mg/kg	TM74/PM32
Zinc #M	692	13260 AB	62	7051 AA	8368 AA	2101	164	3032 AA	40770 AC	120	<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #M	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #M	<0.1	0.2	0.2	<0.1	<0.1 SV	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #M	<0.2	5.8	<0.2	6.4	4.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #M	<4	30	<4	11	11	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #M	17	115	<7	74	40	<7	<7	<7	25	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #M	72	530	<7	1251	713	55	<7	356	209	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	89	681	<19	1342	769	55	<19	356	234	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #M	<0.1	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.4	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	5	<4	8	13	<4	8	21	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	40	<7	32	47	<7	22	66	20	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	45	192	<7	559	377	120	154	430	127	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) #	45	237	<19	599	437	120	184	519	147	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	134	918	<38	1941	1206	175	184	875	381	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	7	14	<5	<5	<5 SV	<5	<5	<5	9	<5	<5	ug/kg	TM36/PM12
Benzene #	<5	18	<5	<5	<5 SV	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Toluene #	39	64	14	9	<5 SV	22	<5	<5	12	12	<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	6	<5	<5	<5 SV	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	38	<5	<5	<5 SV	<5	<5	<5	16	7	<5	ug/kg	TM36/PM12
o-Xylene #	<5	12	<5	<5	<5 SV	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	104.7	29.7	46.4	40.4	21.5	57.4	59.8	157.4	57.5	58.0	<0.5	mg/kg	NONE/NONE

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy
EMT Job No: 22/5569

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	LOD/LOR	Units	Method No.
Sample ID	TP6	TP11	TP11	HA1	HA2	TP4	TP4	TP3	TP3	TP3			
Depth	2.00	0.50	2.70	0.35	0.35	1.00	2.50	0.60	1.20	2.90			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	31/03/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022	01/04/2022			
Sample Type	Clayey Sand	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clay	Clay	Clay			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022	05/04/2022			
Total Organic Carbon #	-	-	0.23	-	-	-	-	-	1.80	-	<0.02	%	TM21/PM24
Sample Type	Clayey Sand	Clay	Clayey Sand	Clay	Clay	Clay	Clay	Clay	Clay	Clay		None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown		None	PM13/PM0
Other Items	stones, water	stones	stones	stones	stones	stones	stones, sand	stones	stones, sand	stones		None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5569						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5569

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It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

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% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

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WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

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Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x20 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5569

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 22/5569

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

Element Materials Technology
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AECOM
1st Floor, Montrose House
Carrigaline Road
Douglas
Cork
Ireland

Attention :	Brendan McCarthy
Date :	19th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5245 Batch 1 Schedule D
Location :	Navan
Date samples received :	31st March, 2022
Status :	Final Report
Issue :	1

Nine samples were received for analysis on 31st March, 2022 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Client Name: AECOM

Reference: 60671645

Location: Navan

Contact: Brendan McCarthy

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
22/5245	1	TP15	0.60	14-15	No Interpretation Possible
22/5245	1	TP15	2.50	16-17	No Interpretation Possible
22/5245	1	TP16	1.20	18	No Interpretation Possible
22/5245	1	TP16	3.00	19-20	No Interpretation Possible

Client Name: AECOM

Reference: 60671645

Location: Navan

Contact: Brendan McCarthy

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
22/5245	1	SW1		1-5	No Interpretation Possible

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5245						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5245

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Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

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All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5245

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				

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AECOM
1st Floor, Montrose House
Carrigaline Road
Douglas
Cork
Ireland

Attention :	Brendan McCarthy
Date :	20th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5361 Batch 1 Schedule E
Location :	Navan
Date samples received :	1st April, 2022
Status :	Final Report
Issue :	1

Twenty one samples were received for analysis on 1st April, 2022 of which twenty one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Client Name: AECOM

Reference: 60671645

Location: Navan

Contact: Brendan McCarthy

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
22/5361	1	TP16	1.20	1	No Interpretation Possible
22/5361	1	TP9	1.90	2-3	Lubricating oil, Possible degraded diesel & Trace of possible PAH's
22/5361	1	TP5	2.80	4-5	Lubricating oil & Possible degraded diesel
22/5361	1	TP13	1.40	6-7	No Interpretation Possible
22/5361	1	TP8	2.60	8-9	No Interpretation Possible
22/5361	1	TP5	1.80	10-11	Lubricating oil & Possible degraded diesel
22/5361	1	TP20	2.00	12-13	No Interpretation Possible
22/5361	1	TP8	0.90	14-15	Trace of lubricating oil
22/5361	1	TP20	0.40	16-17	Trace of possible degraded diesel
22/5361	1	TP13	2.30	18-19	No Interpretation Possible
22/5361	1	TP17	2.10	20-21	No Interpretation Possible
22/5361	1	TP17	0.50	22-23	No Interpretation Possible
22/5361	1	TP14	2.50	24-25	No Interpretation Possible
22/5361	1	TP14	0.40	26-27	Trace of possible degraded diesel
22/5361	1	TP01	0.50	28-30	Lubricating oil
22/5361	1	TP02	1.80	31-33	Lubricating oil
22/5361	1	TP02	0.60	34-36	Lubricating oil & Trace of possible degraded diesel
22/5361	1	TP01	1.70	37-39	Lubricating oil
22/5361	1	DUP01	0.50	40-42	Lubricating oil & Possible degraded diesel
22/5361	1	TP9	0.80	43-44	Lubricating oil & Possible degraded diesel
22/5361	1	TP5	0.70	45-46	Lubricating oil & Possible degraded diesel

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5361						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5361

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5361

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	

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AECOM
1st Floor, Montrose House
Carrigaline Road
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Ireland

Attention :	Brendan McCarthy
Date :	20th April, 2022
Your reference :	60671645
Our reference :	Test Report 22/5569 Batch 1 Schedule D
Location :	Navan
Date samples received :	5th April, 2022
Status :	Final Report
Issue :	1

Twenty samples were received for analysis on 5th April, 2022 of which twenty were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc
Senior Project Manager

Client Name: AECOM

Reference: 60671645

Location: Navan

Contact: Brendan McCarthy

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
22/5569	1	TP19	0.60	1-2	No Interpretation Possible
22/5569	1	TP19	2.50	3-4	No Interpretation Possible
22/5569	1	DUP02	2.50	5-6	No Interpretation Possible
22/5569	1	TP18	1.00	7-8	No Interpretation Possible
22/5569	1	TP18	3.20	9-10	No Interpretation Possible
22/5569	1	TP10	1.00	11-12	No Interpretation Possible
22/5569	1	TP10	2.20	13-14	No Interpretation Possible
22/5569	1	TP12	0.60	15-16	No Interpretation Possible
22/5569	1	TP12	2.60	17-18	No interpretation possible
22/5569	1	TP6	1.00	19-20	Lubricating oil & Trace of possible degraded diesel
22/5569	1	TP6	2.00	21-22	Lubricating oil & Trace of degraded diesel
22/5569	1	TP11	0.50	23-24	Lubricating oil & Degraded diesel
22/5569	1	TP11	2.70	25-26	No Interpretation Possible
22/5569	1	HA1	0.35	27-28	Lubricating oil, Possible tarmac/bitumen & Possible degraded diesel
22/5569	1	HA2	0.35	29-30	Lubricating oil, Possible tarmac/bitumen & Possible degraded diesel
22/5569	1	TP4	1.00	31-32	Possible naturally occurring compounds
22/5569	1	TP4	2.50	33-34	Naturally occurring compounds
22/5569	1	TP3	0.60	35-36	Possible PAH's
22/5569	1	TP3	1.20	37-38	PAH's & Trace of lubricating oil
22/5569	1	TP3	2.90	39-40	No Interpretation Possible

Client Name: AECOM
Reference: 60671645
Location: Navan
Contact: Brendan McCarthy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/5569						

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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/5569

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Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

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Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

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HWOL ACRONYMS AND OPERATORS USED

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#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/5569

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	

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