Intelligent
Ground
Remediation

Remediation Strategy

Enterprise Autos
Newbridge Bypass- A 647
Crumlin
Newport
NP11 4QJ

For Ascona Retail Ltd

10 October 2025
Report ref. 25.816.18.3

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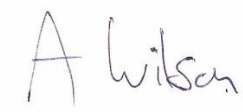
Revision log

Issue No.	Date	Description
1	26th March 2025	First issue of report
2	30th June 2025	Revised following comments from NRW and following pilot testing.
3	10 October 2025	Amended to reflect proposed site redevelopment.

Report Prepared By	Signature	Date
Adam Wilson Technical Director		10 October 2025
Report Reviewed By	**Signature**	**Date**
Paul Stapleton Director		10 October 2025

Contents

1.0 Introduction & Objectives

Geo^2 Remediation Limited were commissioned by Ascona Retail Ltd to compile a Remediation Strategy document to support the proposed redevelopment of the Enterprise Autos site, located at:

Newbridge Bypass- A 647
Crumlin
Newport
NP11 4QJ

This report has been produced to address Planning Condition 3 (Points 3 and 4) of the Caerphilly Council Planning Condition, Application Number 23/0440/FULL, which requires a Remediation Strategy and Verification Plan.

The site, a petrol filling station, reported a fuel loss in July 2024 and is currently subject to an NRW Anti-Pollution Works Notice (APWN). The Client is seeking to address the land contamination issue at the site and following detailed discussion with NRW consider that this can most effectively be achieved by delivering the remedial works as part of the site redevelopment package.

This report has been produced to address the requirements of planning, which take a risk-based approach to land contamination, whereas the guidance in relation new pollution and the APWN requires that 'all reasonable efforts' are made to 'remove the pollution as far as is practical and to return the site to its original condition'.

This report draws upon the available data resulting from a number of historical investigation reports, including pre-lease condition surveys preceding the reported fuel loss, as well as data collected by Geo^2 from existing and newly installed monitoring wells, as collated and presented in the Updated Site Investigation report (25.0816.29.2).

The area shown within the red site boundary on Figure A below, will be referred to throughout this document as 'the site'.

Figure A: Site Location Plan. Extract from Google Maps.

The Remediation Strategy has been compiled in order to determine a methodology of works to allow the completion of the proposed development including the remediation the identified ground contamination associated with the known fuel loss from an underground storage tank on this site and mitigate risks from this and any other impact on the site to the identified human health and environmental receptors.

This report will establish appropriate steps to demonstrate that these works have been completed successfully. This strategy is of relevance to the client and any relevant sub-contractors involved in future works at the site.

Collated evidence should be retained to allow the completion of a Verification Report by Geo^2.

This report does not provide any engineering or geotechnical guidance, does not aim to address the health and safety implications of any system of work, nor does it inform the CDM Construction Phase Health, Safety and Environmental Plans.

2.0 Key Contacts

If you have any questions regarding this document or on site, please contact:

Contact	Email	Phone
Adam Wilson Technical Director	Adan.Wilson@geo2.co.uk	07779 604 026
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Table 1. Geo^2 Contact Details

3.0 Report Reliance

This report has been produced for use solely by Ascona Retail Ltd and their appointed subcontractors.

This report reflects current guidance and legislation at the time of writing (June 2025). Any printed copy should be considered uncontrolled.

4.0 Site Setting

The site is situated approximately 200m southeast of the village of Crumlin and approximately 12.5km northwest of Newport. The site is currently an operational petrol filling station (PFS).

The PFS, located in the centre of the site, comprises of a single storey rectangular shop and a canopy covered forecourt with three pump islands and one HGV fuel pump.

The site is accessed via one ingress and one egress point on the Newbridge Bypass (A467) road which runs along the west boundary of site.

4.1 Desk Study Data

Information regarding the environmental setting of the site has been drawn from the findings of earlier investigation reports.

Site Geology	The BGS on-line mapping tool indicates that the site is underlain by Hughes Formation - Sandstone. This is sedimentary Bedrock formed approximately 308 to 310 million years ago in the Carboniferous period. Neither BGS on-line mapping nor the Envirocheck report note any superficial deposits.
Site Hydrogeology	The Envirocheck dataset using in the 2018 Geo^2 report has classified the geology as follows: • Bedrock deposits – Secondary A Aquifer. • No groundwater abstractions within 1,000m • Site does not lie within a Source Protection Zone. Groundwater is considered to lie in a Minor Aquifer of Variable Permeability (Undefined).
Site Hydrology	The nearest surface water feature is the River Ebbw approximately 40m to the west of the site. Groundwater flow direction has been identified as being towards the River Ebbw.

Table 2. Environmental Assessment of the Site.

4.2 Ground Conditions

Ground conditions encountered across the site, from previous site investigations, comprised tarmac or concrete hardstanding over made ground comprising reworked sandy, gravelly silt with cobbles of mudstone, red brick and sandstone. Bituminous material was noted in some locations within made ground. The depth of the made ground extended to 2.2mbgl.

Limited superficial deposits were encountered comprising mudstone gravels to a depth of 3.0mbgl.

The underlying ground was found to be weathered sandstone (with some mudstone lenses), at depths of between 1.5 to 3.0mbgl.

Anecdotal evidence from earlier reports indicated that the site may have previously been connected to the Canal (now the adjoining road) and have been used as a 'Winding Hole' for turning canal barges; whilst made ground has been encountered in areas of the site there is no clear evidence to indicate that this is tied to or associated with the former canal (no evidence of a clay liner, or structural containment).

Sandstone has been proven to depths of 12.0m bgl. The sandstone was noted to be fractured with gravel and sandy lenses, although it should be noted that the rotary, open hole drilling method did not permit recovery of cores for detailed examination.

4.3 Existing Site Infrastructure

There is one tank farm on the site, located in the south of the property. Tanks appear to have been installed in two phases.

Four pump islands are present, located under the canopy in line with a lane either side. An additional HGV pump is located to the south of the shop building. All tanks are served by offset fill points, which are located south of the canopy covered area.

The contents and capacity of the tanks, which were obtained during the investigation, are summarised below in Table 3. No current wetstock issues have been reported.

Tank No.	Capacity (L)	Contents	Notes
1	35,073	Unleaded	
2	35,073	Unleaded	
3	13,852	V-Power	Loss of 3,000 litres of super unleaded in July 2024. The tank was relined in August 2024 and remains out of service.
4	43,551	Diesel	The tank was relined in August 2024.

Table 3. Summary of Known Current Tank Capacity and Contents.

4.4 Fuel Loss Incident

On Monday 15th July, Ascona were notified by Sure-Site, their 3rd Party Stock Reconciliation Monitoring Contractor, that there were anomalous readings from Tank 3 (Super Unleaded Petrol). The reason was unclear at this time, so all fuel was transferred from Tank 3 to different tanks, and a precautionary notification was made to NRW.

A tank test was immediately scheduled, which was completed at the earliest available opportunity, with results available on 20th July; this recorded that Tank 3 had failed. Records suggest that around 3,000 litres of Super Unleaded Petrol has been lost into the environment as a result.

Inspection undertaken by Alder and Allen identified the source of the loss as a small hole (approx 1cm by 3cm) in the base of the tank close to the forecourt end of the chamber.

Tank 3 and Tank 4 (two chambers of the same single tank) were both drained, cleaned and relined in August 2024 by Adler and Allen. Ultrasonic testing of the tank thickness verified the effectiveness of the lining. Subsequently, tank and line testing has demonstrated that all infrastructure on the site is structurally sound.

Tanks 3 remains out of commission to date, and Tank 4 is in use.

5.0 Ground Model

Multiple phases of investigation have been undertaken to date, the findings of which are collated in the accompanying Updated Site Investigation Report (25.0816.29.2), which should be read in conjunction with this document.

For convenience this section of the report will outline the investigation background that provides the data which form the established conceptual site model.

Figure B, below, shows the locations of investigation points installed at the site.

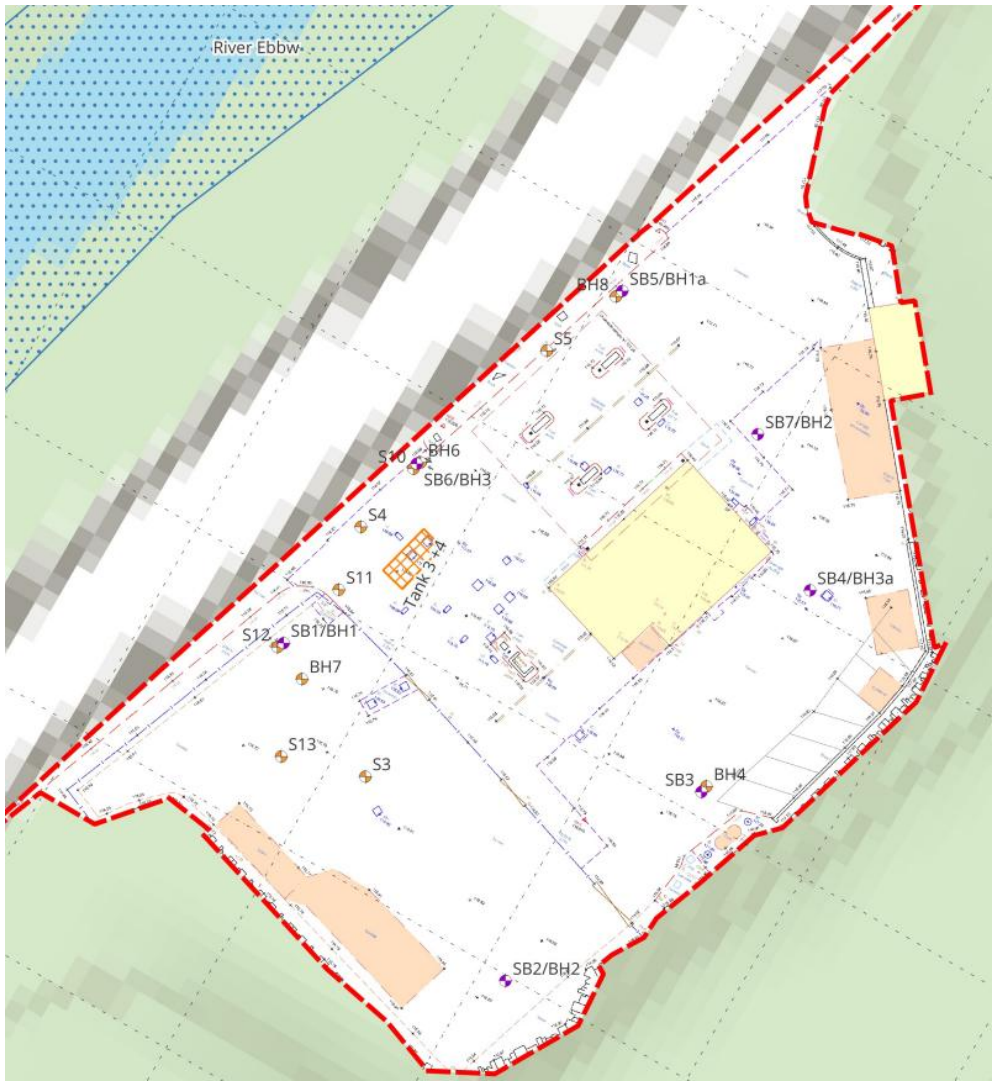

Figure B. Site Investigation Locations

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Investigation works have included sampling of soils and groundwater from within the shallow soils and underlying aquifer with a particular focus on the area around the known loss from Tank 3. No significant impact was encountered associated with any of the plausible point sources across the site, although the investigation was necessarily constrained due to the presence of live fuel storage infrastructure and a low canopy.

Ground gas and vapour sampling has been undertaken from within the ground and the store to assess potential hazards to human health, which did not identify any significant source of ground gas or risk from hydrocarbon vapour.

Limited investigation was undertaken prior to the leak onsite, which did not identify any significant contamination, although the site constraints and ground conditions restricted the investigation.

The investigation data allows the production of a ground model for the site reflecting the underlying geology, groundwater and infrastructure of the site, these demonstrate that the site is underlain by sandstone, as formerly quarried from the site. The shallower deposits of sandstone and limited superficial deposits encountered, function similar to a gravel or highly fractured rock, based on the hydraulic conductivity assessments undertaken and also the borehole logs which record both fractured sandstone, poor returns and gravel strata beneath the site.

Groundwater beneath the site is encountered within the bedrock, however monitoring of the groundwater level over twelve months demonstrates a substantial variation in water level, lifting the rest level from the sandstone bedrock into the made ground and superficial deposits for approximately 4-6 months of the year (centred around the spring season).

The groundwater flux is dominated by the site's setting in the base of a quarry. Observation in wetter months has reported water entering the site from the backwall of the quarry, entering the site as surface water and sinking into the ground along the rear of the site. The monitoring shows a strong correlation with water level indicating that groundwater beneath the site is controlled more by rainfall ingress than by a baseflow within the rock (although a baseflow contribution would be expected).

The hydraulic regime of the site indicates that the groundwater beneath the site functions as a single body (no shallower perched water has been encountered by earlier shallow wells installed into the superficial deposits). Over the course of a year the groundwater flow remains largely consistent in a southwestern direction towards the River Ebbw. Surveying of the site and the height of the riverbed (as shown on the illustrated Conceptual Site Model (CSM) included in this report) suggests that groundwater beneath the site will come into contact with the River downgradient from the site.

The depth of the groundwater, typically between 1.5 and 4.5mbgl, is likely to allow the groundwater to come into contact with the failed UST during the wetter months, which based on its size and age (as well as observations from the Adler and Allen inspection) is likely to extend to a depth of 3.0mbgl. The tank itself is therefore likely to have been installed within an excavation which either rests on the top of, or has been excavated into, the fractured sandstone bedrock.

6.0 Proposed Development

The Client proposes to undertake the development outlined in the existing Planning Permission Consent, Application Number 23/0440/FULL. An illustration of the proposed layout is shown below.

This comprises the following:

- A full knock down and rebuild of the site, to include removal of existing fuel storage and distribution facilities.
- Construction of a new Petrol Filling Station to include a new store, a retail unit, EV charging units, canopy covered forecourt and HGV pump island.
- Ancillary works associated with the development include the construction of a new substation, cliff face stabilisation works and surface water control measures.

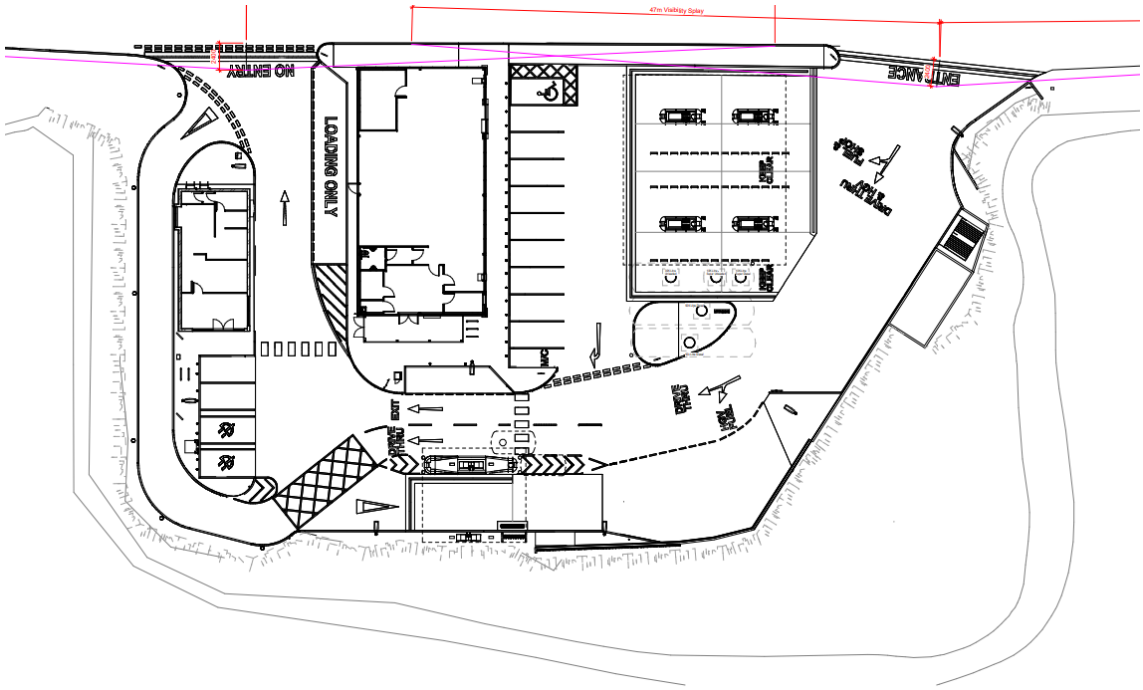


Figure C: Proposed Layout

7.0 Revised Conceptual Site Model

The updated qualitative risk assessment is undertaken in line with guidance provided in CIRIA's Contaminated Land Risk Assessment: a guide to good practice CIRIA C552, 2001. The purpose of this assessment is to determine the relative significance of the identified contamination linkages by assessing the probability of an impact occurring and by assessing the perceived severity of an impact to a receptor.

The following model has been reproduced from the Updated Site Investigation report (25.0816.29.2).

Those linkages considered as low risk or less on the basis of the available site data will not be considered any further in this assessment.

7.1 Disucssion of Conceptual Site Model

The following potential sources have been assessed

7.1.1 Known Loss

The known release of super unleaded from Tank 3 has caused a plume of dissolved hydrocarbons to form in the groundwater within the underlying sandstone bedrock, flowing through weathered sandstone or fractures.

No LNAPL has been encountered in the aquifer, the observed impact indicates that much of the fuel may remain in and around the cradle or vault (depending upon the installation of the tank which is unrecorded), or the immediate surrounding of Tank 3 in the (typically) unsaturated soils and backfill material.

Given the point of loss was at the very base of the tank and the timing of the loss (July 2024), during conditions of a lower groundwater table, it is reasonable to assume that fuel will have entered the environment through the hole in the tank at a depth of 3mbgl, entering the tank excavation (backfill unknown but anticipated to be granular, we cannot rule out a buried chamber or concrete surround) which might have limited LNAPL release.

Gross contamination may also remain within the saturated bedrock beneath the tank.

The borehole logs do suggest a potential variation in geology around the tank, with reports indicating fractured sandstone, gravel and also poor returns. Groundwater sampling from wells which indicate variation in the geology (BH7, located SW of the tank and BH6 and S10, located adjacent to each other near Tank 3) have reported some higher concentrations of TPH than other wells in September 2024, however recent testing does not indicate that these wells are acting differently from any other location. Further to this, hydraulic testing does not suggest any variation which would suggest the presence of preferential flow routes within the geology around the source.

The area of dissolved phase groundwater impact following the loss (based on an upper confidence level of 95%, averaging the data reported onsite) is shown overleaf on Figure D. The plume remains currently centred around Tank 3 but is likely to spread within the groundwater which flows a towards the River Ebbw, 40m from Tank 3.

It is unfeasible for the impact to have migrated along fuel lines or other utility pathways as these are all located at a much shallow depth. It is not considered likely that there will be any migration of flow into area of limited investigation such as the forecourt and below the store, both of which are hydraulically upgradient.

7.1.2 Other Sources

Investigation preceding the loss, which provided coverage of other point sources on the site, such as the garage, forecourt and other areas of the site, did not encounter any evidence suggestive of further contaminant sources. Whilst some groundwater sampling has indicated concentration of dissolved contamination suggestive of diesel, preceding the known loss at the site, data does not suggest any significant source nor has recent testing over the last three months indicated any impact exceeding the screening criteria which might be attributed to a separate (not unleaded spill) related loss in any location.

The site reports that the wet stock management system has not indicated any unexplained variance, other than that reported during the leak from Tank 3..

It should be noted that given the age of the site and its history as an active Petrol Filling Station (PFS), that the presence of localised contamination around fuel storge and distribution infrastructure cannot be ruled out and should be given consideration during any redevelopment.

The made ground beneath the site was also analysed as part of these earlier site works, no concentrations of contaminants within this material exceed the Generic Assessment Criteria (stated earlier in this report) which are not considered to be sufficient to represent a potential contaminant source.

7.1.3 Ground Gas

Ground gas monitoring undertaken to assess the potential for ground gas hazard to be presented to future developments associated with harmful gases arising from infilled land categorises the risk as low. Monitoring reported the concentration of ground gas to be representative of a Characteristic Situation 1 scenario, requiring the incorporation of no ground gas protective measures into a new development.

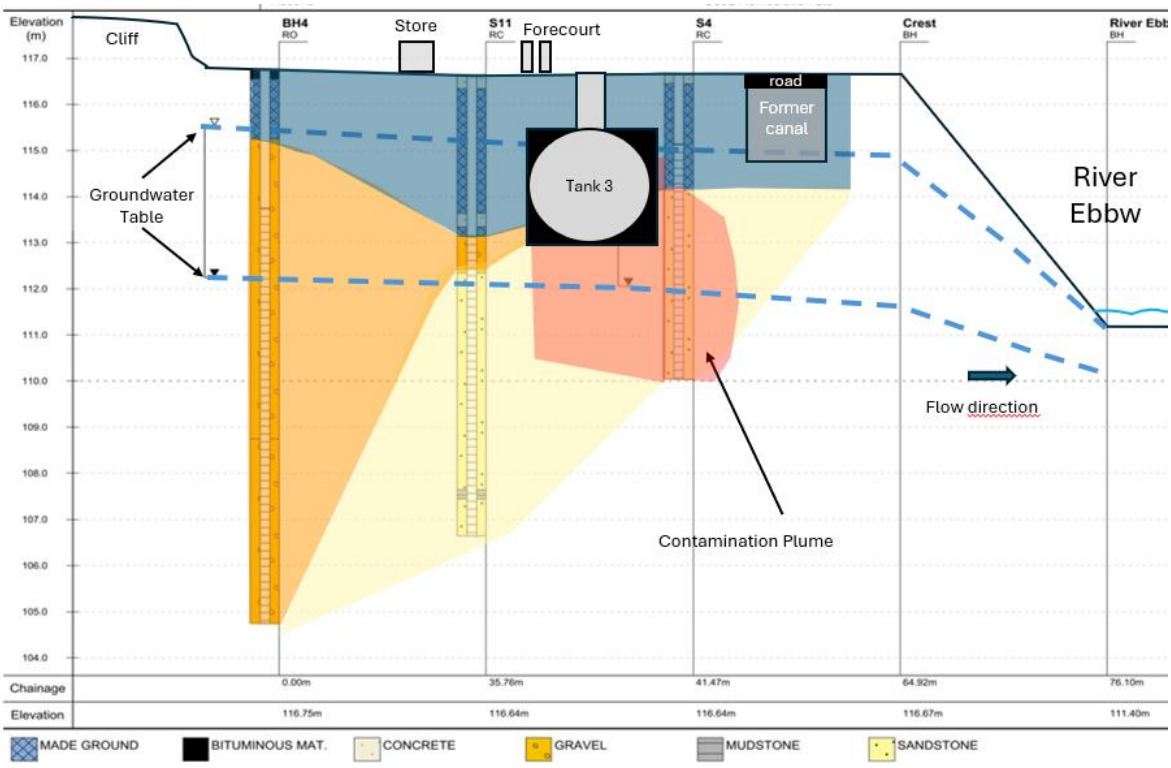


Figure D: Conceptual Site Model Illustration on Geological Cross Section

7.2 Significant Linkages

Table 4, below, summarises the relative significance of each contamination linkage deemed to present a possibility of significant harm. These linkages should be considered for remedial works in order to mitigate the identified risks.

Source	Pathway	Receptor	Potentially Unacceptable Risk
Range of contaminants associated with current and historical use of the site as a garage/PFS including the known release from Tank 3	Leaching to groundwater followed by migration within the aquifer.	Surface waters such as the River Ebbw.	✓
		The Secondary A Aquifer as a resource.	✓ Although treatment to resolve the potential risk to the River Ebbw will also reduce any detriment to the aquifer.
	Exposure to harmful vapours and tainting of water supply.	Site users, principally within buildings onsite.	✓ Potential risk remains in the area around the unsaturated source only.
	Direct contact and ingestion.	Neighbouring site users, principally within enclosed spaces.	✗
		Site users in future landscaped areas.	✗
Potential releases, leaks and spills associated with historical use of the neighbouring land as a garage and car wash.	Exposure to harmful vapours and tainting of water supply.	Current and future site users, principally within buildings onsite.	✗
	Direct contact and ingestion.	Site users in landscaped areas.	✗
Potential for the generation of ground gases from offsite infilled land.	Inhalation of vapours.	Current and future site users, principally within buildings onsite.	✗

Table 4. Updated Qualitative Risk Assessment

8.0 Remedial Objectives

8.1 Remediation Goals

This Remediation Strategy has been compiled in order to:

- Ensure that any residual land contamination risks are appropriately addressed to restore the ground to a pre spill condition, where practical to do so, and to comply with the conditions of the APWN, where feasible.
- Deliver a remediation ensuring source removal to address the failed tank and potential unsaturated impact and to effect plume treatment minimising damage to the aquifer.
- Outline working methodologies for the implementation of methods to reduce risk, and
- To ensure the works themselves are undertaken in such a fashion as to prevent the introduction of contaminated materials or may pose a risk to future site users, neighbours or the environment.
- Ensure that site redevelopment can be undertaken.
- Provide certainty to the regulators that this approach is capable of fully achieving the stated objectives.

8.2 Remediation Target Values

The values stated in Table 5 should be adopted as remedial target values for the relevant contaminants of concern at the site. Table 5 lists the adopted values as agreed with NRW based on using Environmental Quality Standards (EQS) as a surrogate for pre spill conditions.

These values are for comparison to any samples of soil or groundwater obtained in the future.

Geo^2 consider some of the remedial targets proposed to be potentially beyond the technical capabilities of any sustainable remediation, however it is proposed that these are adopted. In the event that remediation activities do not reach the desired targets, as evidenced by repeated sets of groundwater data indicating that improvements in groundwater condition have stalled either locally or across the plume, or that consistent rebound is occurring, the sustainability assessment presented herein should be reviewed to consider alternative approaches, taking into consideration principle as well as the SuRF UK Framework for sustainable remediation.

Any revision to the remediation end point should be agreed with the appropriate regulators.

Contaminant	Soils (mg/ kg)		Groundwater (mg/l)			EQS Target Values Exceeded
	Max Conc. Onsite	GAC (S4UL and C4SL) Commercial	Max Conc. Onsite	EQS Targets adopted as a surrogate pre spill condition	Source of Value	
Aliphatic C8-C10	1	2,000	1.41			BH7, S4
Aliphatic C10-C12	1	9,700	0.35			BH7
Aliphatic C12-C16	5	590,00	7.56			BH6,
Aromatic C5-C7	1	26,000	0.545	0.01	EQS (Benzene)	BH7, S3, S4, S12, S13
Aromatic C7-C8	3.5	56,000	5.63	0.074	EQS (Toluene)	BH7, S3, S4, S12
Aromatic C8-C10	446	3,500	21.1	0.03	EQS (Xylenes)	BH6, BH7, BH8, S3, S4, S11, S12, S13
Aromatic C10-C12	56	16,000	2.44			BH6, BH7, S3, S4, S11, S12, S13
Aromatic C12-C16	8	36,000	1.3			BH4, BH6, BH7, S4, S5,
Aromatic C16-C21	20	28,000	0.32			BH4, BH7,
Aromatic C21-C35	280	28,000	0.11			BH6, BH7, S4
Benzene	0.4	27	0.545	0.01	EQS (Benzene)	BH7, S3, S4, S12, S13
Toluene	3.5	56,000	5.63	0.074	EQS (Toluene)	BH7, S3, S4, S12
Xylenes (total)	21.8	5,900	1.37	0.0	EQS (Xylenes)	BH7, S3, S4, S11, S12, S13

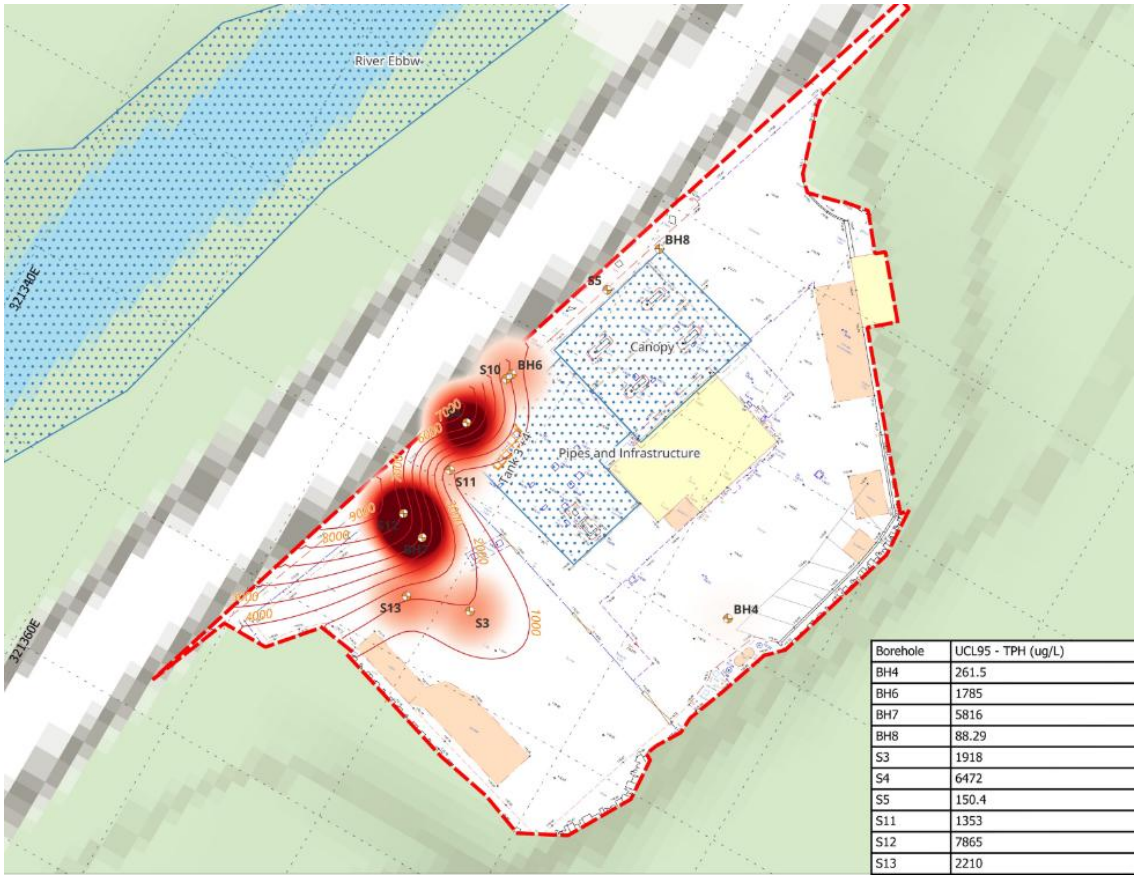
Table 5. Remediation Target Values

8.3 Sources of Values

Following discussion with NRW the target compounds have been condensed to those compounds with a surrogate hydrocarbon value and are drawn from the CL:AIRE Guidance 'Petroleum Hydrocarbons in Groundwater (2017)'.

8.4 Area of Unacceptable Risks

Figure E, below, shows the locations of monitoring wells containing contaminants of concern in excess of the target values, using a 95% confidence level representative dataset. This has been selected to provide a realistic worst-case interpretation of the contaminant distribution, whereas the actual data represents concentration fluctuations.



Borehole	UCL95 - TPH (ug/L)
BH4	261.5
BH6	1785
BH7	5816
BH8	88.29
S3	1918
S4	6472
S5	150.4
S11	1353
S12	7865
S13	2210

Figure E: Impacted Area

Principally the area around Tank 3, where petrol-range contamination forms a plume in groundwater, however, some elevated contaminant concentrations have been reported in older data sets that will require treatment as part of this programme of works.

8.5 Site Specific Constraints

As part of a voluntary remediation the objectives of the Client must be considered, and any relevant obstacles and constraints taken into consideration.

Key additional factors are as follows:

- The remediation works must be suitable for a commercial use a Petrol Filling Station (PFS) and to allow planning of the proposed redevelopment.
- The ideal solution must achieve regulatory approval and sign off and address the requirements of the APWN, which imposes time limits upon the remediation.
- Treated groundwater will be discharged back to the site using a dedicated discharge borehole/s or features, as the property has no connection to the foul sewer. It is not considered feasible given the remote setting of the site for a connection to be achieved.

9.0 Remedial Solutions Screening

This assessment has been undertaken in accordance with the UK LCRM statutory guidance (20 July 2023). The assessment below represents a preliminary, technical assessment of potentially viable remediation options to treat the identified contamination.

This assessment has been made to determine the most suitable feasible approaches to addressing the groundwater impact only. The stated development plan, which entails the removal of the existing fuel storage and distribution infrastructure, including Tank 3, can only meet the objectives through excavation and disposal of the infrastructure and any supporting cradle, or chamber, and grossly impacted unsaturated zone soils.

The model scores on a scale of 1-10 the effectiveness of each broad group of remediation techniques in a variety of settings, with a basic conceptual site model used to identify the factors relevant for this assessment. Factors considered include the nature of the contaminant, the source media, depth of the contamination source, nature of the geology, presence of Non-Aqueous Phase Liquids and the principal receptor under consideration (human health or the water environment / controlled waters).

The assessment is relatively simple and designed to identify broad remediation techniques to take forwards for detailed sustainability assessment (Step 2). Further, site-specific considerations are likely to be required, including detailed contaminant characteristics, the ground model, receptor and possible combinations of different remediation techniques that may offer the best overall solution.

This assessment represents a Tier 1 Assessment as outlined in the SuRF-UK Framework.

A full worksheet is included in Appendix B; however a summary of the highest scoring ,and therefore likely most technically feasible remediation approaches, are shown in Table 6, below.

Approach	Feasibility Score	Ranking
Pump and Treat	51	1
Hydraulic Barrier	43	2
Insitu Chemical Oxidation	42	3

Table 6. Shortlisted Technically Feasible Remediation Approaches

This evaluation will also include a monitored natural attenuation and a 'Do Nothing' option to reflect the fact that the sustainability implications of the remediation will inevitably reach a point at which they will exceed the benefits of undertaking further treatment. These approaches will not be sufficient to achieve the objectives of the APWN but will be included for context. In the event that subsequent rounds of sustainability assessments are considered necessary, subject to the performance of the remediation works, it would be expected that the viability and suitability of these approaches would increase.

10.0 Detailed Options Appraisal

The screening approach undertaken above has produced a shortlist of feasible techniques and approaches, each of which will be detailed below and scored to determine the most suitable tool to use.

The conceptual site model indicates that a substantial portion of the fuel lost remains around the UST, to address this any remediation must be able to demonstrate that this source has been addressed by removing the tank and associated soil source and any local LNAPL in the unsaturated zone.

This remediation will seek to address the fuel around the tank as part of the redevelopment.The following options appraisal is focussed upon addressing the risks to the River Ebbw within the deeper aquifer (which cannot be achieved by excavation due to the depth of the impact).

There is a significant overlap in the technologies required to achieve a pump and treat of a hydraulic barrier solution due to the limited size of the treatment area and the high conductivity and connectivity within the aquifer, evidenced by the pump test trials undertaken on the site. The required abstraction volumes for either approach would be the same, the area of influence would also be very similar and each approach would limit offsite migration of impacted groundwater, with the only difference being the borehole positioning. Geo^2 consider that the biggest differentiator in the effectiveness of these technologies is associated with the retention onsite and recirculation of groundwater versus offsite disposal of this liquid as a waste.

Treated water must either be reinjected into the ground or tankered offsite as there is no onsite drainage. The resulting sustainability assessment will consider both options.

In situ chemical oxidation will be considered separately.

10.1 Pump and Treat Barrier with Collection and Storage of Abstracted Water forOffsite Disposal via Tanker

10.1.1 Method

This approach would use a network of installed boreholes in and around the source area (the tank farm). Pumps would be installed into the permeable target strata, operating 24 hours a day to recover impacted groundwater. This technique would continuously abstract groundwater from a series of pumped boreholes, forming an interlocking network of cones of depression ensuring recovery of c groundwater within the identified plume of contamination. Groundwater abstractions would pump at a rate to limit offsite migration.

Pump testing undertaken by Geo^2 to allow more detailed design of remediation solutions has indicated that to achieve groundwater drawdown across the target area abstraction at a rate of up to 100m^3/ day would be required.

Where liquid waste is tankered offsite, the pumping will result in a more sustainable drawdown which will allow the formation of a smear zone resulting from floating hydrocarbon contamination become smeared through the aquifer as the water level falls. This results in a more significant rebound of contaminant concentrations as the groundwater regime reestablishes itself upon the shut down of the treatment system, this results in a lengthening of the treatment programme.

Based on the removal of the tank at the beginning of the treatment programme, treatment would typically last one to two years.

10.1.2 Onsite Delivery

This approach would require the installation of a network of boreholes, with pumps placed in three locations based on the demonstrated radius on influence established in earlier pilot testing.

Water accumulating in boreholes would be recovered by submersible pumps and pumped to a treatment plant prior to discharge. Operation and maintenance would be undertaken until such a point as recovered groundwater was found to no longer require treatment as it achieves the remedial target values.

A treatment plant would likely comprise an oil water and silt separator unit and three granular activated carbon (GAC) filters. This approach would require space be given for the treatment plant. The plant would operate 24 hours a day and function remotely, using a PLC controlled computer with level sensors and feedback mechanisms. This plant would require environmental permitting.

This approach would require a site electricity supply. Use of a generator is feasible but would present a significant cost and sustainability barrier to this approach (requiring approximately a 20kVa generator).

Offsite disposal of waste water via vacuum tanker would require the addition of treated water storage tanks with a total capacity of at least 200,000m^3 would be required initially, although likely to reduce over time (given the groundwater flux associated with rainfall). Based on the typical dimensions of such tanks (3No 70,000 litre tankers) this would require a footprint of 15m by 15m.

10.1.3 Pros and Cons

The advantage of this approach is that it ensures immediately that no further migration can occur as the hydraulic regime of the area is changed. Also, this approach can continue to operate for a sustained period which provides additional confidence in the efficacy of this approach.

The disadvantages of this approach are the cost of the installation and the duration of a maintained treatment plant onsite.

The cost implications of offsite disposal, even after treatment of groundwater which would attract a lower disposal charge, would still be anticipated at circa 5x 20m^3 tankers per day, with a cost based on local quotes would equate to £2,300/per tanker (£11,200/day).

Onsite storage of waste water requires a significant footprint, given the small size of the site, a 15m by 15m water storage compound, in addition to a 10m by 5m treatment compound prevent the planned redevelopment from occurring until completion of treatment, stifling economic growth.

10.2 Pump and Treat Barrier with Recirculation

10.2.1 Method

This approach would use a network of installed boreholes in and around the source area (the tank farm). Pumps would be installed into the permeable target strata, operating 24 hours a day to recover impacted groundwater. This technique would continuously abstract groundwater from a series of pumped boreholes, forming an interlocking network of cones of depression ensuring recovery of groundwater within the identified plume of contamination. Groundwater abstractions would pump at a rate of circa 100m^3/day to limit offsite migration and establish a radius of influence across the target area.

Treated water must be reinjected into the ground as there is no feasible offsite sewerage disposal route, however, following treatment reinjection can provide a means of flushing the water through the site to accelerate recovery of dissolved-phase contamination within the groundwater beyond that achievable where discharge to sewer can be undertaken. This approach will also limit the formation of a substantial smear zone reducing the potential for rebound.

Treatment would typically last six months to eighteen months, the shorter time frame is a result of the increased flushing which would be achieved.

10.2.2 Onsite Delivery

This approach would require the installation of a network of boreholes, with pumps placed in up to six locations, subject to radius of influence testing.

Water accumulating in boreholes would be recovered by submersible pumps and pumped to a treatment plant prior to discharge. Operation and maintenance would be undertaken until such a point as recovered groundwater was found to no longer require treatment as it achieves the remedial target values.

A treatment plant would likely comprise an oil water and silt separator unit and three granular activated carbon (GAC) filters. This approach would require space be given for the treatment plant and would also require a discharge agreement to be in place. The plant would operate 24 hours a day and function remotely, using a PLC controlled computer with level sensors and feedback mechanisms, it is likely that this plant would require environmental permitting.

This approach would require a site electricity supply. Use of a generator is feasible but would present a significant cost and sustainability barrier to this approach (requiring approximately a 20kVa generator).

10.2.3 Pros and Cons

The advantage of this approach is that it ensures immediately that no further migration can occur as the hydraulic regime of the area is changed. Also, this approach can continue to operate for a sustained period which provides additional confidence in the efficacy of this approach.

The disadvantages of this approach are the cost of the installation and the duration of a maintained treatment plant onsite, however, reinjection of the treated water will help speed up the treatment as reinjection will effectively push the impact towards the treatment pumps.

10.3 Chemical Oxidation

10.3.1 Method

This approach would look to use the existing well network to inject chemicals to destroy the organic hydrocarbon contamination within the bedrock on contact. Chemical oxidant compounds would be injected around the periphery of the target area, circling into the centre to prevent release from the target area.

Treatment would typically be completed within a month following the injection event, although a secondary more localised injection is likely to be required where unacceptable impact remains. Areas where risks remain around infrastructure would not be targeted as the chemical oxidants could attack the underground services such as tanks and fuel lines, resulting in damage, and have significant cost implications. Chemical oxidation also proves ineffective where LNAPL is present, and whilst not encountered, its presence should be considered likely.

10.3.2 Onsite Delivery

The site would be secured and an injection and dosing compound established; this would require site showers and decontamination facilities due the hazardous nature of the oxidants to be used.

An injection plant would be required to handle, manage and apply the oxidant mix safely for the period of the injection, during which time Geo^2 would require sole occupation of the site.

Each round of injection works is anticipated to last 2 weeks onsite, two months apart, with the oxidant typically active in the ground for up to 4 weeks, after which there would be no permanent onsite Geo^2 staff presence. A total delivery and active phase of 4 months. One month after the completion of the injection, validation testing should be undertaken to demonstrate the effectiveness of the treatment.

10.3.3 Pros and Cons

This approach is higher-cost in the short term but is likely to provide longer term cost savings as no ongoing maintenance and monitoring is required beyond the post treatment validation. This is the fastest and most aggressive available technique which can resolve the issue in the shortest time.

Injection works can provide a very rapid solution a dissolved phase impact, however, should any LNAPL remain within the aquifer, then the effectiveness of this approach is significantly reduced.

Chemical oxidant reaction in the ground typically has a desorptive effect mobilising soil sorbed contamination into the groundwater, this enhanced mobility of contamination within the water may result in more rapid migration.

Whilst chemical oxidation is an established and effective technique of degrading hydrocarbons in the ground and in the absence of LNAPL in the aquifer substantial and rapid improvements would be expected, the remediation targets are very stringent. This approach provides a lower level of confidence that these targets will be achieved in this timescale.

10.4 Do Nothing

10.4.1 Method

This approach is not recommended as cost implications would be significantly higher than other approaches as the DQRA report identified that the plume would reach the river in approximately 18 months. Should contamination reach the river, remediation from this point onwards would be more difficult as a larger plume would require treating which has already migrated offsite.

11.0 Evaluation

In line with the SuRF UK framework (March 2010) an assessment of the remediation options is undertaken qualitatively based on a series of sustainability indicators. These fall into three distinct groups.

- Environmental: Considering the impact to the air, soil, water, ecology, natural resources and wastes and intrusiveness.
- Social: Human health impacts and safety, ethical and equity consideration, neighbourhood impact, community involvement, compliance with policy, uncertainty.
- Economic: Direct cost, indirect cost, employment, project risks and flexibility.

Each of the above indicators has been scored (1-low to 10- high) for each of the following categories based upon balancing remedial objectives, the client's build programme and site-specific constraints. These scores are shown on Figure F below, the scoring matrix is included in Appendix B.

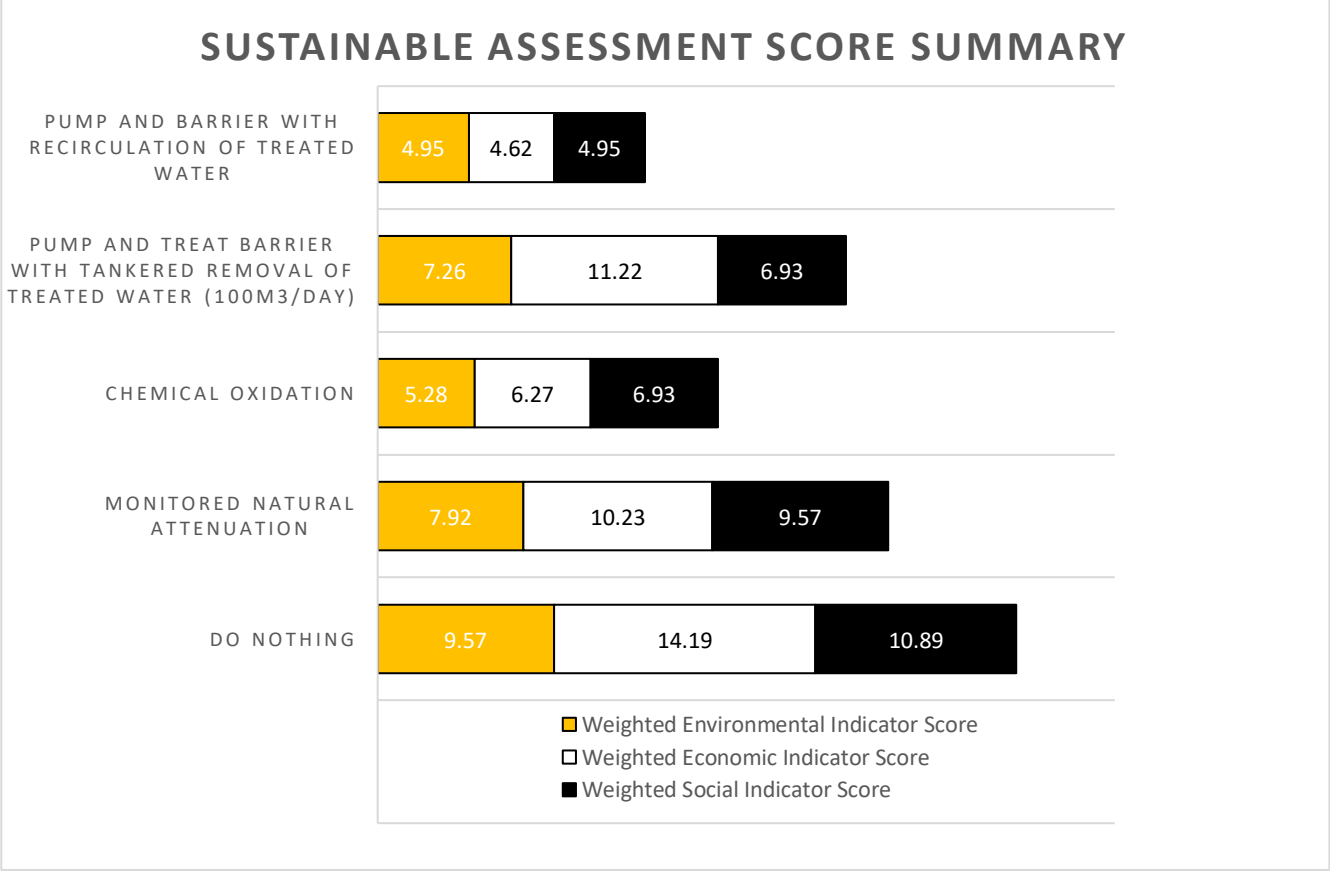


Figure F. Sustainability Assessment Score Summary (Low scores are better than high scores)

The sustainability assessment score for each of the considered approaches shows that the most appropriate remedial approach for this site is the Pump and Treat Barrier as this will prevent migration of contamination towards the river.

Having identified the most appropriate approach for treating this groundwater impact beneath the site, this remediation strategy will establish a roadmap to deliver the remediation.

12.0 Demolition Phase Tank Removal

Discussion with NRW has highlighted the concern that contamination may remain in the unsaturated zone around Tank 3 and would not be adequately treated by any insitu approach. To provide confidence in the strategy selected by this remediation options appraisal, the following section sets out a method by which tank removal and disposal of associated impacted unsaturated soils will mitigate any residual risk.

This strategy proposed to address the source area by removing all fuel storage and distribution infrastructure as part of the redevelopment.

12.1 Background

During the redevelopment or remediation of the site, the removal or safe retention of Underground Storage Tanks (UST), pumps, interceptors and other related infrastructure (hydraulic jacks or engine inspection pits) will be undertaken. This will include removing any fuel left in the tanks, removing the tanks and infrastructure from the ground, and making sure no contamination is left in the surrounding soils. Some sites may not require the total removal of historic tanks because of structural stability or planning issues.

Tank removal and decommissioning processes are an environmental risk. Pipework, tanks and old infrastructure can leak in the process of decommissioning if not removed by a competent contractor.

Images showing the different sorts of tank removal processes are shown below and on the following pages:

Figure G. The safe removal of a historic tank from the ground after excavation.

The work should be undertaken by a specialist contractor with suitable certificates, training and experience in carrying out tank decommissioning.

The key stages of tank and infrastructure removal are detailed below.

Figure H. Beware of bad practise! A dangerous tank removal in progress with tank contents leaking into the environment after removal.

12.2 Key Stages in Tank and Infrastructure Removal

Tanks (or other underground structures) are drained back and emptied of any residual water or oils by a specialist liquid waste disposal (hazardous waste vacuum tanker).

All infrastructure is safely isolated and disconnected.

Tanks (or other underground structures) are safely de-gassed and checked by a specialist contractor. Gas free certificates should be issued at this point.

Some tanks are installed in brick or concrete bunds or cradles, depending on the site, these should be removed where safe and practical to do so, it is anticipated that contaminated soils potentially including LNAPL will be encountered around Tank 3 and 4, and potentially other locations.

The excavation then needs inspecting by a Geo^2 Engineer to check for any notable contamination in the ground surrounding the tanks and inspect the waters which may pond in the base of the excavation. This process is described below.

Any liquids and LNAPLs present in the base of the excavation should be removed by pump or vacuum tanker. Liquid waste can be transferred directly into the treatment plant for remediation.

The area of tank removal needs to be securely fenced, protected and have appropriate signage.

Figure I. Steel tank inspected on the surface after tank pull.

Photographic and written records of the above process should be made by the supervising geo-environmental engineer. These records should include decommissioning certificates, locations of tanks removed, waste transfer notes, consignment notes and disposal notes of any tanks (steel or fibreglass) removed from site, waste transfer and disposal notes of any soils or liquids.

The information gathered is to be included in the Validation Report.

12.3 Underground Storage Tank and Contamination Removal Validation Sampling

The soils surrounding tanks, infrastructure or known areas of contamination must be inspected and validated, with special consideration for around Tanks 3 and 4, where the conceptual site model indicates that an unsaturated impact may remain in the soils and or around the tank itself. This is a key part of the process and provides evidence that the tank removal process has been completed in line with the agreed Remediation Strategy report and no risk remains to the site development, site end users or the local environment.

Note 1:

Along with photographs, all relevant decommissioning certificates, transfer notes and consignment notes associated with the tank removal works should be retained for inclusion in the Verification report.

During the lifetime of a tank, it is not uncommon that some fuel may have leaked or spilt from the tank or pumps and into the surrounding soil. This might be from everyday use of the pumps (e.g. fuel spills whilst filling up vehicles or filling up the tank itself) or from damages to the tank and infrastructure (e.g. holes in the tank or loose pipework and seals).

The purpose of a validation is to ensure that all fuel that may have leaked is present in the surrounding soils which might be a risk to human health or the environment in the future. This applies both to underground (UST) and above ground storage tank (AST) installations, along with known areas of contamination.

Validations should be supervised by a qualified geo-environmental engineer who will supervise the validation and provide a Validation Report, confirming that the tank and any remaining contamination was removed successfully.

The steps of the validation are described below:

- After the tank/contaminated material has been removed, the edges and base of the remaining hole should be excavated further, under the supervision of a Geo-environmental engineer, to remove any visual signs of contamination or odorous soils ensuring removal of the impact..
- Once the contamination has been sufficiently removed, soil samples should be taken from the sides and base of the excavation and sent to a laboratory where they can be analysed to see if any excessive concentrations of contamination remain.
- The number of soil samples collected for laboratory analysis varies depending on the size of the excavation. In general, a minimum of 1 sample should be taken from each side (approx. 1 per $5m^2$ face) of the excavation and 2 samples taken from the base.

A sample of any groundwater seeping into the base of the excavation is also to be collected for environmental chemical analysis at a suitable UKAS certified laboratory.

Figure I. Image of tank validation. The concrete cradle has been retained for structural reasons.

12.4 Excavated Material

Excavated soil should be temporarily stored upon an impermeable membrane and covered, or be stored directly within an appropriate skip, to stop any contamination run off affecting the surrounding environment.

Any material stored should be +8 metres away from drains and rivers; and fenced to prevent cross contamination or site users being harmed.

A Waste Acceptance Criteria (WAC & Solid Suite & Additional Analysis) sample should also be taken of the soils removed from excavations. This will allow an appropriately licenced waste facility to be identified.

The objective of the excavation is to remove soils impacted with hydrocarbons. No soils risk has been encountered in the investigation do date however it is anticipated that to demonstrate success, following the excavation of all visually and olfactorily impacts, soils and groundwater from the excavation samples should be analysed for TPH- CWG and BTEX. Results should be compared to residential GAC (S4UL, C4SL derived threshold concentrations), as shown in Table 5 the excavation can be backfilled. However, if the remaining contamination is considered significant (i.e., above GAC threshold concentrations), more excavation may be needed laterally and / or vertically, and additional samples collected to further validate the extended excavation.

12.5 Temporary or Permanent Infilling of the Excavation

Once the contaminated soil has been removed and all the validation side and base soil samples have been taken, the excavation needs to be backfilled. The soil test results will take several days to be completed, as the laboratory needs time to analyse the samples. Any backfill should be undertaken to the standards specified by the Client's engineer to ensure suitable compaction for the proposed redevelopment.

In some cases, it may be beneficial to backfill the excavation with the excavated soils to maintain stability in the interim, or leave the area secured with fencing.

12.6 Final Evidence

When Geo^2 produce their final Verification Report, key pieces of evidence should be collected to prove that any USTs have been removed appropriately, no risk remains to Commercial site end users or the local environment and the objectives of the APWN have been achieved.

Table 7 below is not an exhaustive list and provides examples of suitable data which would aid the verification process.

Evidence	Details Geo^2 need
Tank and Line Details	• The size capacity and location of the tanks / lines. • What material the tanks were made of and what did the tanks store? • When were the tanks installed and manner of its installation? If known • Were the tanks / line damaged (holes / cracks)? • Were the tanks filled directly or from an offset point? • When were the tanks last used? • Have spills or losses ever been recorded? • Any other details about the tanks, infrastructure or surrounding area.
Site Plan	• A map or drawing showing: • Tank location(s). • Associated pumps and infrastructure. • Excavation dimensions. • Locations of validation samples. • Locations and sizes of stockpiles of excavated material.
Photos	• A photo-log showing: • Photos of the areas before starting, including the wider site. • Photos of the tanks in the ground. • Photos of the areas once the tanks have been removed, including all sides and base of the excavation(s). • Photos of any obvious contamination. • Photos of the area once it has been filled with clean material.
Infill Materials	• Volume of material imported to site to infill the tank excavation(s). • Name and address of the location(s) where imported materials have been sourced from. • Environmental chemical laboratory results of the imported material(s), confirming the material does not present a risk to Commercial end users or the local environment.
Waste Transfer Notes	• Copies of all waste transfer notes and consignment notes detailing waste removed from site.
Laboratory Analysis	• Results of testing and accreditation certificates should be reported.

Table 7. Evidence Required for Tank Removal Verification Report.

13.0 Pump and Treat Barrier with Recirculation

The pump and treat approach will be installed in advance of the below ground demolition and infrastructure removal works, this allows for hydraulic control to be established in advance of ground works which may disturb or mobilise contamination from the unsaturated zone.

To facilitate the development whilst allowing ongoing operation of the treatment system it is proposed to deliver the remediation in the following stages:

- Install suitable recovery wells and pumps along the front of the site, outside of the area where excavation works will damage the infrastructure.
- Establish the treatment plant in the location of the current former car sales area of the site. Commence pumped recovery, treatment and reinjection.
- Undertake the demolition and excavation of the tanks, allowing excavation of soils and recovery of any LNAPL within the unsaturated zone.
- Move the treatment plant, retaining the same pumping boreholes, but shifting the plant to the rear of the site to allow the ongoing redevelopment to occur whilst deeper groundwater treatment continues.

13.1 Remediation Wells

An indicative layout plan is included in Figure J, overleaf. This illustration shows the groundwater flow modelled based upon abstraction of groundwater from S10 and S12, which currently exist, and also from S21, a proposed additional borehole (installed in the same way as S10 and S12) located in the west of the site.

Pumped at a rate of 100m^3/day (S10 – 30l/min, S12 and S21 20l/min), these wells form interlocking cones of depression preventing offsite migration, with an 'area of influence' encapsulating the saturated aquifer within the groundwater beneath the former Tanks 3 and 4 area ensuring that treatment will cover the target area.

All wells should be installed with a competent bentonite and concrete-capped seal to prevent surface water infiltration. It must be considered that the wells will be finished within an access chamber, to a depth of approximately 0.4m, to allow for connection to buried ducting to connect to the treatment plant.

Buried ducting and manhole chambers must be installed to take into consideration that the site will be trafficked by HGV vehicles and must be designed to withstand this loading.

Reinjection wells are to be placed at the rear of the site for discharge of treated water and to also increase the gradient and flow of groundwater towards the hydraulic control barrier.

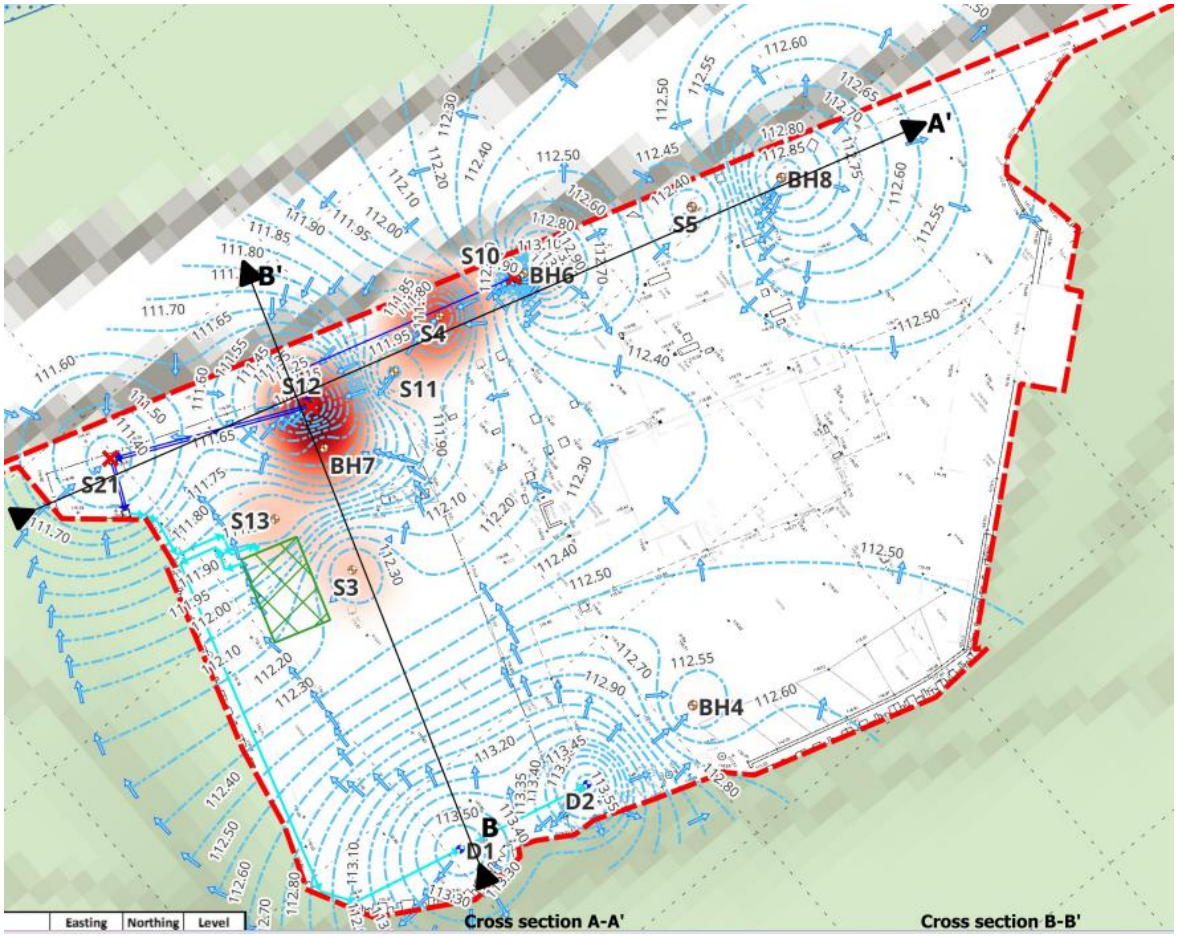


Figure J: Indicative Layout Plan of Treatment Plant and Boreholes

13.2 Hydraulic Control and Recirculation Plant

13.2.1 Deployed Plant

The following equipment may be used onsite; the system will have a capacity to extract up to 100m^3 of fluids per day from the impacted area.

- 1 20ft soundproofed container to house plant,
- 3 electrically driven Borehole Pumps
- 1 Oil Water Separator
- 1 Pump for water transfer from oil/water separator to the carbon units and discharge boreholes,
- 3 2m^3 capacity Granular Activated Carbon vessel for liquid-phase adsorption,
- Bunded Treatment area,

An example of the plant set up is present in Figure I.

Figure I: Example of plant setup.

13.2.2 Preliminary Location of Installation

As the site is to remain an active PFS, location of the plant is highly restricted to avoid impeding traffic flows and potentially tanker deliveries. As such, it is proposed to install the plant in a location to the south of the shop building close to the car sales area as shown on Figure J.

Figure J shows the routes of buried ducting (dark blue) which would allow trafficking of the site whilst pumping occurs, preventing uncontrolled migration during demolition whilst not impinging upon the access and demolition of the existing site.

All discharge line and connection line from the trenching (light blue) are shown running above ground along the side and rear of the site to established discharge wells, D1 and D2, to be installed at the rear of the site (hydraulically upgradient). The green hatched area represents the treatment plant.

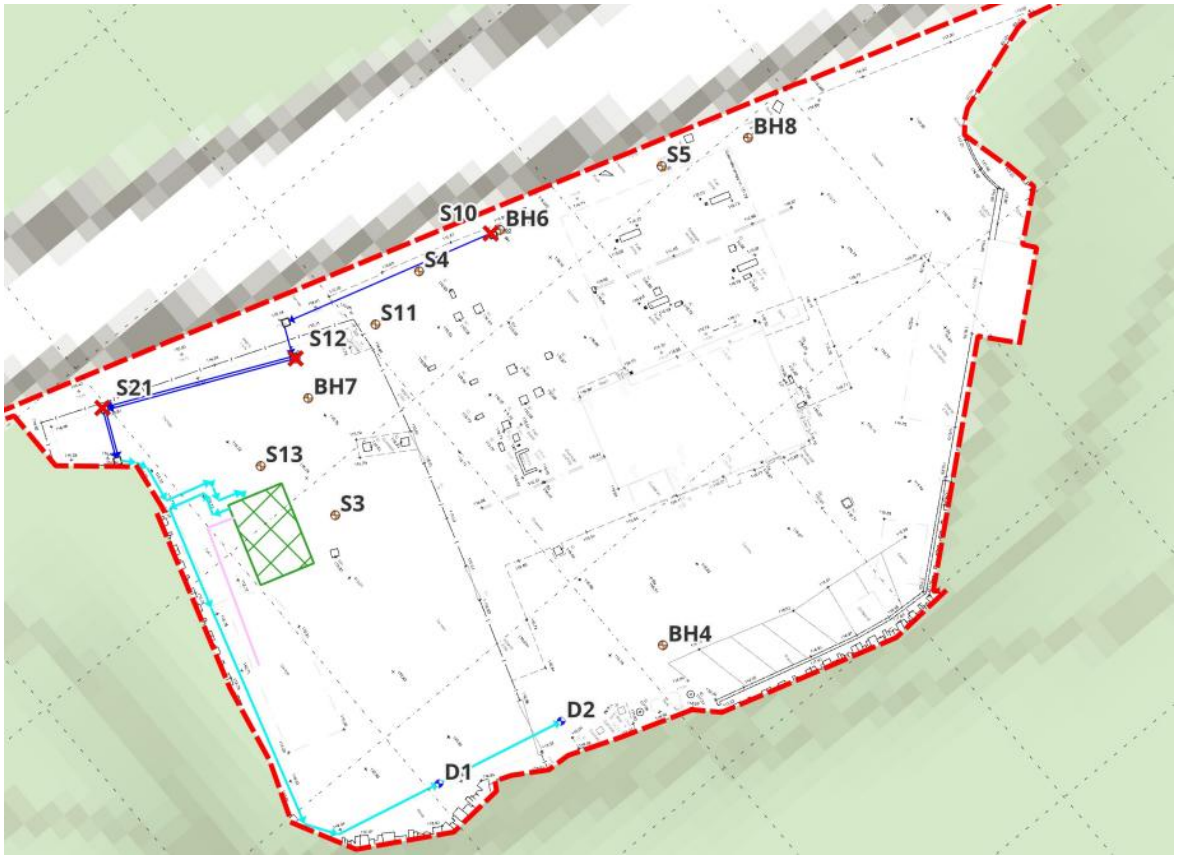


Figure J: Preliminary Plant Layout

The plant will occupy an area of up to two 20ft shipping containers, which can be orientated to suit.

13.2.3 Final Location of Installation

During the construction phase of the development the plant will be moved, however the abstraction and discharge locations will stay the same. All pipework and ducting will be buried below ground, as shown on Figure K, overleaf.

It is anticipated that the system can be moved and reestablished within a period of one week.

The green hatched area represents the treatment plant.

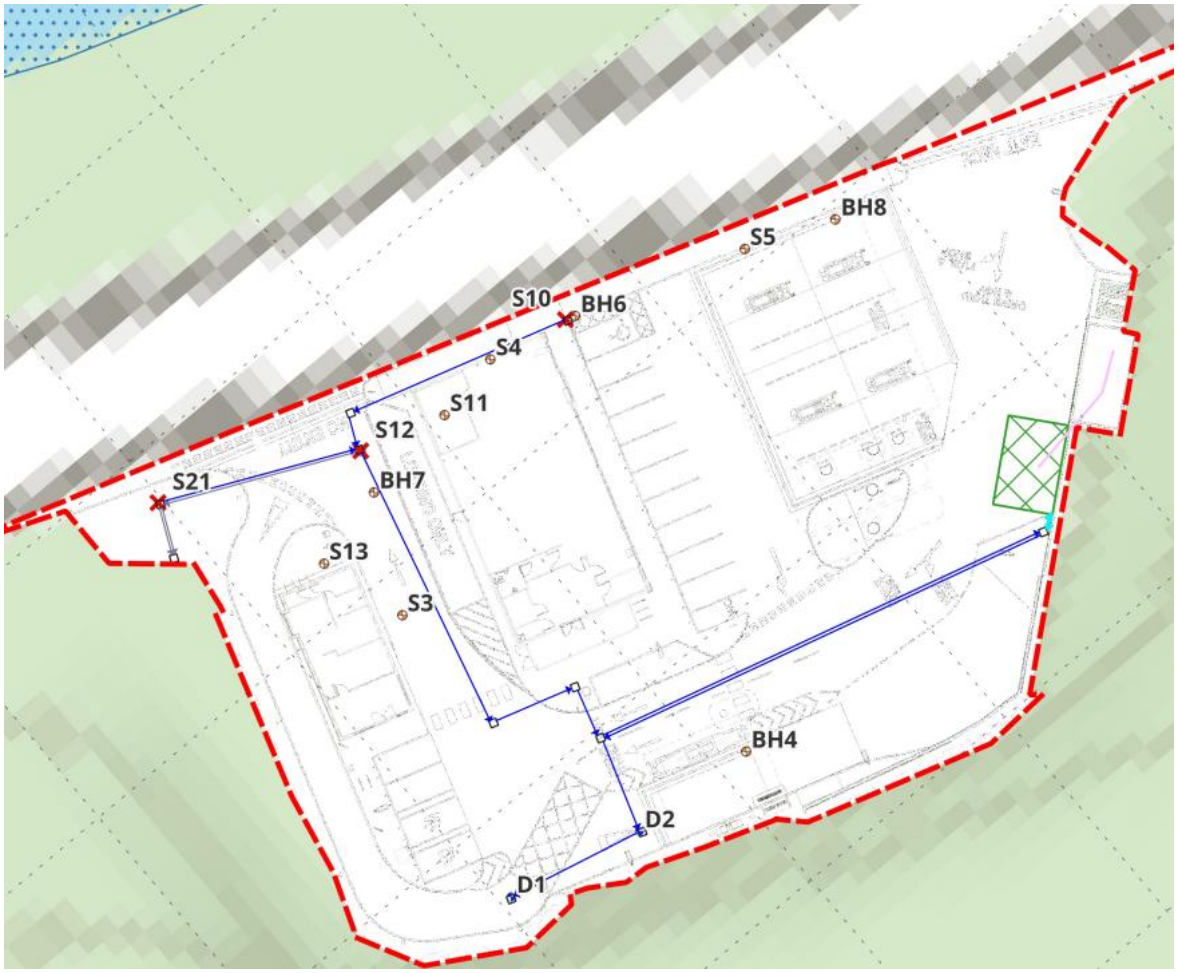


Figure K: Final Plant Layout

13.2.4 Utility Requirements

The plant will require the following utility connections:

- **Electricity**:The plant will require a 32 amp, 1-phase electricity connection.
- **Drainage**:The plant will generate treated wastewater; it is envisaged that this could be discharged into the into the site using dedicated discharge boreholes. (D1 and D2 on the plans). This discharge would be permitted.
- **Water Supply**:A 10mm water supply will be necessary to operate the plant.

13.2.5 Treatment Operation

Each abstraction well (S10, S21 and S12) will be installed with a borehole pump, set below the water table to reduce the groundwater level and act as a hydraulic barrier.

Following uplift from the wells via pumping, the liquid passes into an oil/water separator which will remove any phase-separated product and allow for silts to settle before being transferred to the GAC units for polishing prior to discharge via boreholes at the rear of the site.

Discharge wells will contain automatic high-level controls to prevent surface flooding, controlled by the PLC. Discharge of treated waste water must meet the requirements of the discharge consent, which will include treatment of water to a standard where concentrations of contaminants fall below the Minimum Laboratory Reporting Value (MRV), essentially where contamination is not detected in the effluent samples, a standard substantially higher than the remediation targets. This high standard of treatment will be achieved through the augmentation of the system to include a third 'polishing' carbon filter with close, monthly sampling.

Although LNAPL has not yet been encountered, if any is present within the aquifer it would be separated in the Oil Water Separator Unit and stored in separate secure barrels or a bunded tank, which would contain overfill protection and be emptied by a suitably licensed waste contractor, in accordance with Duty of Care procedures.

The treatment plant will operate automatically, 24 hours a day. The treatment plant will operate until the conditions presented in the Monitoring Plan have been met.

This plant must ensure that the presence of petrol vapours is considered, and appropriate controls installed to prevent explosive atmospheres or risk of explosion.

14.0 Operation, Maintenance and Monitoring Plan

To demonstrate the success of the works the following monitoring plan should be enacted.

1. Fortnightly visits to site to ensure the system is operating optimally. This would also involve the collection of a monthly (or other frequency to suit the requirements of the discharge consent) reinjection samples.

2. Environmental monitoring including noise, odour and volatiles and discharge sampling (subject to the requirements of a separate discharge consent) to ensure site users are not at risk from the system.

3. Where sampling of groundwater from designated monitoring wells, collected whilst the barrier remains operational, indicates that concentrations of contaminants within groundwater are below the adopted target levels for a period of at least three months (monthly sampling), then the barrier can be turned off temporarily to assess rebound.

4. Sampling of onsite wells to assess the concentrations of contaminants. The proposed development will require the replacement of certain wells (wells will be decommissioned prior to demolition). Ongoing monitoring will be undertaken from BH8, BH6, S11 and S13, or wells drilled to replace these locations where dictated by the development. These will be supplemented by a further new well, S22, to be located in the parking bays to the east of the new store building to plug a data gap and cover off ground and aquifer condition at the rear of the current tank farm (an area currently inaccessible).

5. Following three successive rounds of groundwater sampling (including within a spring or autumn period where rainfall is highest), with the treatment plant turned off (rebound assessment) where target values (as listed in Table 5) are met, a validation report will be issued to National Resources Wales for approval for the conclusion of the remediation works. In the event that target values are not met and laboratory testing is considered to demonstrate that further improvements are not being reported (as described in the Remediation Objectives Section 8.0), then a sustainability assessment will be undertaken to appraise the options.

6. Upon sign off, boreholes to be grouted up with bentonite to prevent potential pathways being opened up in the future, in accordance with the EA guidance (NRW adopted).

15.0 Permitting

The pump and treat system at the site would require the deployment of an Environmental Permit to undertake the remediation work. This will need to be applied for through National Resources Wales (NRW) and will last twelve months from the first day of remediation. This may need to be extended beyond one calendar year, the NRW local officer will be consulted in advance of 12 months of operation to review options.

Abstraction will occur at greater than 20m^3/day (expected circa 100m^3/day) and, as such, a separate abstraction licence will be required. At the time of writing this permit has been submitted and is duly made (PAN 029990).

Following discussion with NRW a Discharge Consent has also been applied for to permit the return of the 'Treated Groundwater' back into the site to achieve the recirculation. At the time of writing this permit has been submitted and is duly made (PAN 029991).

No other permits should be required.

16.0 Waste and Material Management

Geo^2 will require information on the wastes which have been produced on-site to form a part of the Remediation Strategy Verification report.

Wastes should be managed according to the waste hierarchy shown in Figure L below. The amount of waste created through a project should be minimised as much as possible. Materials on-site should be clearly separated into different waste streams to allow for re-use and recycling.

It is likely that from the hydraulic control barrier and recirculation system there will be oily wastes produced. These will need to be collected through the use of a licensed and approve waste contractor. Examples of wastes to be collected and oily water from the OWS, spent granular carbon and oily absorbents.

Figure L. Waste Hierarchy Diagram.

16.1 Key Documents

If material leaves a site, it will require either a waste transfer note or a hazardous waste consignment note. It is illegal for waste to be removed from a site without these documents.

Document	Link to download
Waste Transfer Note	https://www.gov.uk/government/publications/duty-of-care-waste-transfer-note-template
Hazardous Waste Consignment Note	https://www.gov.uk/government/publications/hazardous-waste-consignment-note

Table 8. Waste Transfer and Consignment Note Links.

All relevant waste transfer notes and consignment notes should be retained by the contractors for inclusion within the Verification Report by Geo^2, with Geo^2 requiring a full list of waste and materials removed from site. It is vital that any paperwork is stored securely and not lost from site. **It is a legal requirement to keep transfer notes and consignment notes**. Hard copies of waste tickets and digital scans of tickets should be retained (for up to 6 years).

16.2 Licence Haulier and Receiving Facility Check

The main contractor on site is responsible for the wastes that they produce, and also responsible for checking that the person removing waste from site is registered with the NRW to take the material.

To check if a business is registered with the NRW, follow this link:
https://naturalresources.wales/permits-and-permissions/waste-carriers-brokers-and-dealers-public-register/?lang=en .

https://environment.data.gov.uk/public-register/view/search-waste-operations

16.3 Ancillary Wastes

While none have been reported to date, if any invasive species are identified during the development works then treatment / removal of the infected area should be undertaken by a specialist contractor.

Any general waste generated during the works should be disposed of by the contractors.

All relevant waste transfer notes and consignment notes should be retained by the contractors for inclusion within the Verification Report.

17.0 Watching Brief for Unexpected Contamination

It is recommended that contractors should remain vigilant for encountering contaminated soils or waters during the preconstruction and construction works, including during installation of trenches and manholes for the remediation system. Contractors should be trained in identifying potential areas of contamination and briefed on areas of potential contamination in advance.

Unexpected contamination may comprise impacted sub-soil, or unexpected structures such as storage tanks, subsurface features, pipes, sumps or chambers with associated contamination observed during the redevelopment works.

As a guide, suspected contaminated sub-soils or waters may comprise visually impacted and strongly odorous material. Encountered odours could be petrol, diesel, solvents or oil-like. Should materials of this description, or other description following a site-specific briefing, be encountered and this material be considered to be previously unidentified, Geo^2 should be contacted. In such circumstances, the affected area should be isolated and work in the area stopped, pending the Geo^2 consultant visit to sample or assess the soil/water. The area should remain isolated whilst the samples are analysed at an appropriate laboratory and the mitigation measures are confirmed, if considered necessary.

Based on the results in comparison with adopted screening criteria, Geo^2 will assess whether the identified materials present an environmental risk. Should the soil need to be removed from site, or as a result of a risk-based analysis, validation samples will be collected from the edge and base of the excavation by a Geo^2 engineer. The number of validation samples required should be decided by the Geo^2 engineer, based upon the excavation size and depth.

All waste soils/materials should be appropriately isolated and stored to prevent spreading contamination across the site (such as placing on and being covered by plastic sheeting). Waste should then be appropriately classified and disposed of in accordance with the applicable waste management regulations under full duty of care documentation. Potential exists for hazardous waste to be present, and this should also be dealt with in accordance with the relevant legislation.

Should unidentified underground features be encountered, such as fuel tanks or chambers etc, that require removal in line with the proposed development, they should be appropriately decommissioned (refer to Section 13). Decommissioning may comprise pumping and removal of wastewater and any sediment in accordance with the applicable waste management regulations under full duty of care documentation. Water and sediment waste may need to be sampled and analysed to determine whether it needs to be disposed of as hazardous. Should suspected contaminated material be identified beneath or adjacent to the structure, Geo^2 should be contacted to undertake further sampling and analysis with the appropriate validation sampling undertaken. All results will be included in the Validation Completion Report.

Should any structure encountered remain in situ, Geo^2 should be contacted to ensure that any potential impact that may be associated with this feature can be appropriately addressed, if necessary. This process may entail additional sampling works, which would require the identified area to be isolated until a Geo^2 engineer is able to attend site.

All samples obtained by Geo^2 will be stored in appropriate containers for the required analysis and stored in controlled conditions prior to submission to an appropriately accredited laboratory. All samples will be obtained in line with standard industry guidance.

The relevant planning authorities should be notified should any unexpected contamination be identified and any remedial actions that are required as a result of encountered materials will be agreed prior to the work being carried out.

A method statement for a watching brief is included as Appendix C.

18.0 Health and Safety Considerations

The Principal Contractor is required to have appropriate risk assessments and method statements in place under the Construction (Design and Management) Regulations, 2015.

Health and safety factors that should be considered for the works include:

- **Welfare**: Welfare facilities will be assumed to be in the shop building, however, disposable PPE and overalls will be removed prior to entering the shop building.
- **Oily Waste:** Should any leaks or spillages occur from the operation of the system then oil absorbents shall be used to soak up any oil liquids. Used absorbents shall be placed in a sealed and labelled container within the treatment compound.

19.0 Verification Report

When Geo^2 produce their final Verification Report, key pieces of evidence should be collected to prove to Regulators that the known contamination has been treated appropriately, and no risk remains to Commercial site end users or the local environment.

Table 9 below is not an exhaustive list and provides examples of suitable data which would aid the verification process.

Evidence	Details required
Pump and Treat Control Barrier and Recirculation system	- Inspection records - Details of laboratory performance testing - System operation and maintenance. - Any changes and amendments. - Evidence to comply with Permits
UST Removal	- Size and condition of the tanks. - Photographic evidence of the excavation and soils excavated and stockpiled. - Laboratory results for the validation soil (and water) samples - Certificates provided by the specialist tank decommissioning contractor and WTN's for liquids removed from the tanks.
Site Plan	A map or drawing showing: - Infrastructure location. - Areas of known contamination. - Groundwater Flow Direction. - Locations of pumps - Locations of discharge points
Application Detail	Records should be maintained to demonstrate: - Permit and licence compliance for treatment and discharge. - Dates of site work
Monitoring Detail	Records should be maintained to demonstrate: - Results of all laboratory analysis and sampling methods. - Dip data (groundwater levelling).
Waste Transfer Notes	Copies of all WTN.

Table 9. Evidence Required for Verification Report.

20.0 Limitations

Geo^{2}s' conclusions, recommendations and opinions are based on information gathered at the time of the investigation from a variety of third-party sources and from observations made during site reconnaissance. Therefore, there may be conditions at the site that have not been taken into account which were not apparent at the time of investigation.

A portion of this report is based solely upon information provided by third parties. The information has not been independently verified by Geo^2. Whilst this report and the opinions given in it are accurate to the best knowledge of Geo^2, Geo^2 cannot guarantee the completeness or accuracy of any descriptions, opinions or conclusions based solely upon information that has not been independently verified.

The recommendations contained within this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices and hydrological and engineering practices at this time. As such they are not a guarantee that the site is free of hazardous materials or conditions.

Geo^2 prepared this report for our Client; any third parties using this report do so entirely at their risk. Geo^2 makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this report or its suitability for any purpose. Geo^2 assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from the use of this report or any information contained in this report by a third party.

21.0 References

British Standards Institute

BS10175:2011 “Investigation of potentially contaminated land sites – code of practice”.

CIRIA

C552 Contaminated Land Risk Assessment, a guide to good practise, 2001.

Environmental Agency

Land Contamination Risk Management (LCRM) Guidance, 2020.

Good Practise for Decommissioning Redundant Boreholes and Wells, 2012

Geo² Remediation Ltd

Geo², Phase I / II Contaminated Land Site Assessment, ref. 18/0816.1.1, November 2018

Geo², Deeper Drilling Investigation, ref. 23.0816.2.2, July 2023

Geo², Remediation Strategy, ref. 23/0816.3.1, December 2023 (now superseded)

Geo². Fuel Storage Risk Assessment Ref 816.4.2. May 2024

Geo². Groundwater Monitoring Reports. Between August 24 and Feb 25.

Geo², Detailed Quantitative Rosk Assessment.816.12.1. November 2024

Appendix A – Figures

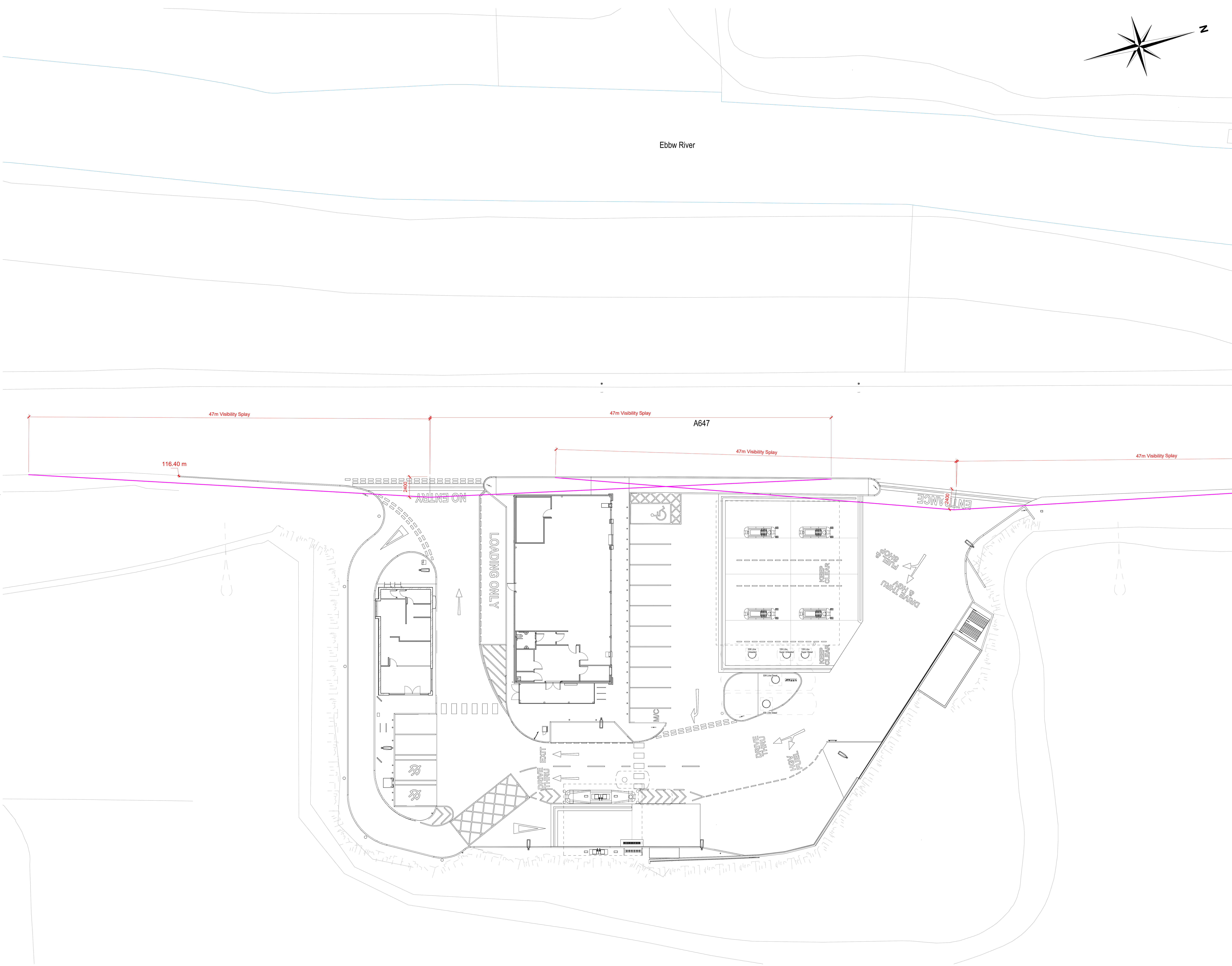
Figure 1 - Site Location

Figure 2 - Site Location

Ref: Google Maps

Figures 1 & 2 Site Location -
Enterprise Autos, Newbridge Bypass, Crumlin, Newport, NP11 4QJ

Geo² Remediation Limited, The Coniston, Louisa Street, Idle, West Yorkshire, BD10 8NE
Tel: (0113) 2575397 www.geo2.co.uk



NOTES

All dimensions to be verified on site, and the Architect informed of any discrepancy. All drawings and specifications should be read in conjunction with the Health and Safety Plan; all conflicts should be reported to the Principal Designer.

DO NOT CONSTRUCT FROM THIS DRAWING

Construction staff and operatives must ensure the principle contractor has provided thorough and accurate information on all health and safety aspects relating to the designs identified on this drawing include the review of:

- Designers/contractors risk assessments
- Method statement
- Permit to work
- Construction phase health and safety plan

The designers note that the following health and safety risk relating to this drawing have not been eliminated during the design process:

ref	residual risk

	revision	date	by	chk
C	Updated issue without jet wash	30/11/23	AMC	MRJ
B	Issue for costing	23/11/23	AMC	MRJ
A	Issue for building canopy design	06/11/23	AMC	MRJ

CLIENT

ASCONA

C+A Design

C+A Design Ltd. 2b - 3b Hathersage Business Park, Heather Lane, Hathersage, S32 1DP
Tel: 01433 652220 Web: www.cad-ltd.co.uk

DRAWING ISSUE

- ○ Preliminary
- ○ Planning
- ○ Costing
- ● Tender
- ○ Construction
- ○ Record

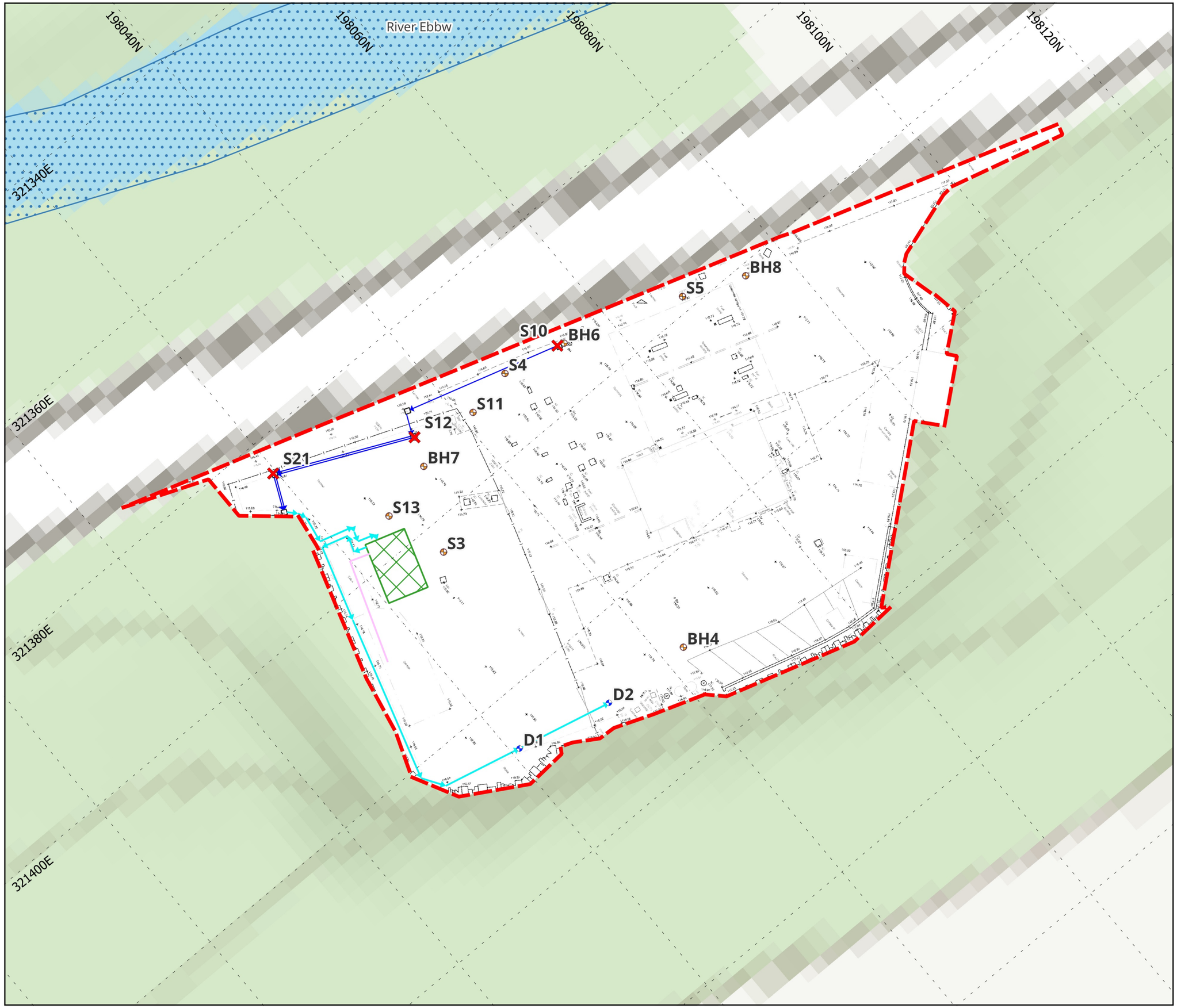
date	scale @ A1	drawn by	checked by
16/11/21	1 : 200	AMC	MRJ

Ascona Enterprise PFS
Newbridge By Pass, A467, Newport NP11 4QJ

Proposed Site Plan

role	originator	volume	levels	type	suitability
A	CA	S1	00	DR	

project number	drawing number	revision
20134EP	220_02	C



Legend

- Site Boundary
- Treatment and quarantine area
- Observation borehole
- Discharge borehole
- Pumping borehole
- Chambers (600mmx600mm)
- Above ground duct (200mm)
- Buried duct (150mm)
- Electricity duct (100mm)

0 10 20 m

Figure

Proposed layout for treatment plant prior site redevelopment.

Job

0816

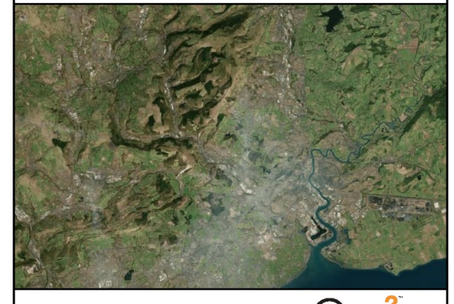
Client

Ascona

Figure No.	Revision	Date
33	1	10 September 2025
Drawn by	Checked by	Scale
R.D.	A.W	1:400

Job No.

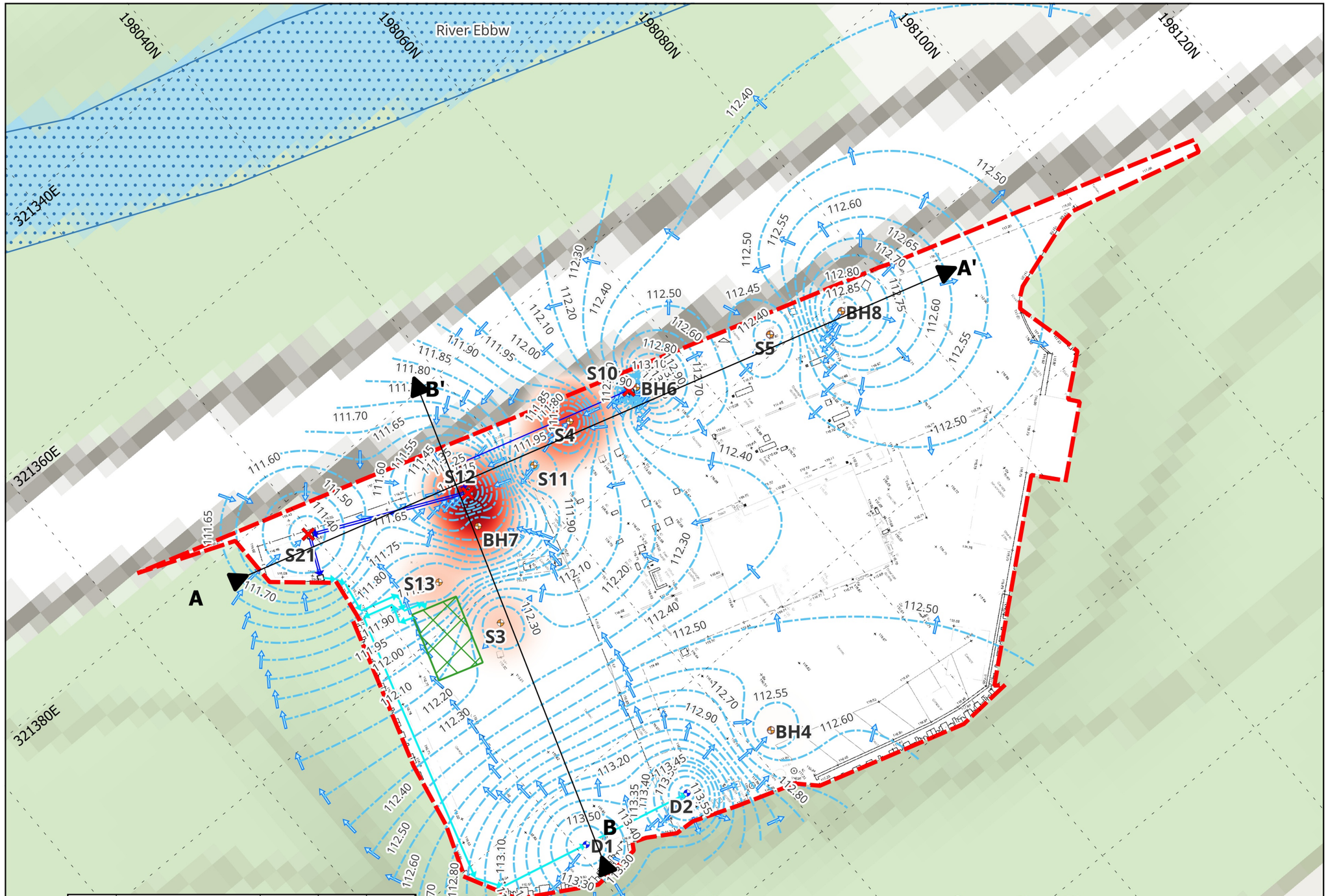
J-0861. En



DO NOT SCALE. NOT FOR CONSTRUCTION

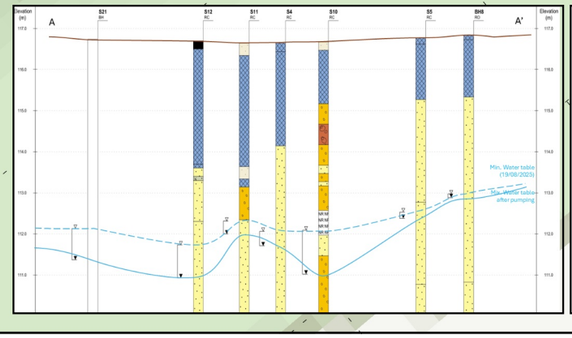
Site Plan Provided by Client 2025.

Microsoft Bing

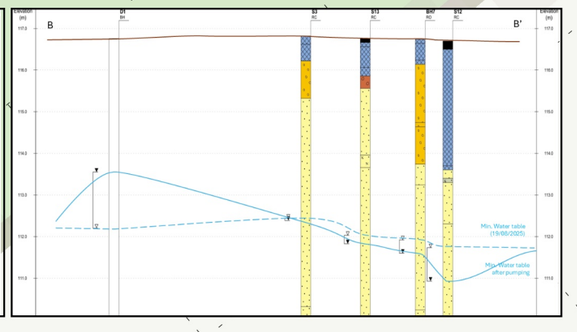


CODE	Borehole Type	Easting	Northing	Level
S10	Pumping Borehole (30 L/min)	321393.549	198053.6	116.671
S12	Pumping Borehole (20 L/min)	321391.089	198034.5	116.702
S21	Pumping Borehole (20 L/min)	321383.926	198019.6	116.740
BH4	Observation borehole	321428.927	198042.6	116.747
BH6	Observation borehole	321393.816	198054.4	116.684
BH7	Observation borehole	321394.287	198033.2	116.740
BH8	Observation borehole	321401.203	198075.1	116.825
S3	Observation borehole	321403.177	198028.7	116.820
S4	Observation borehole	321392.136	198047.1	116.639
S5	Observation borehole	321398.391	198068.1	116.769
S11	Observation borehole	321393.189	198041.4	116.644
S13	Observation borehole	321396.067	198026.6	116.756
D1	Discharge borehole (35L/min)	321425.782	198020.8	116.760
D2	Discharge borehole (35L/min)	321428.33	198032.1	116.770

Cross section A-A'



Cross section B-B'



Legend

- Site Boundary
- Treatment and quarantine area
- Observation borehole
- Discharge borehole
- Pumping borehole
- Chambers (600mmx600mm)
- Above ground duct (200mm)
- Buried duct (150mm)
- Estimated water table

0 10 20 m

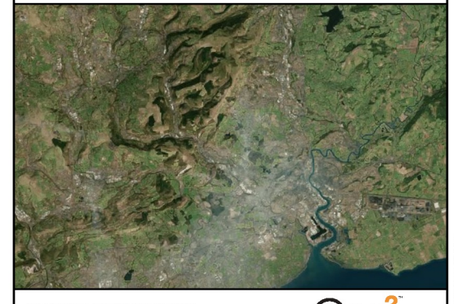
Figure: Estimated water table after 24-hour pumping considering minimum water table register

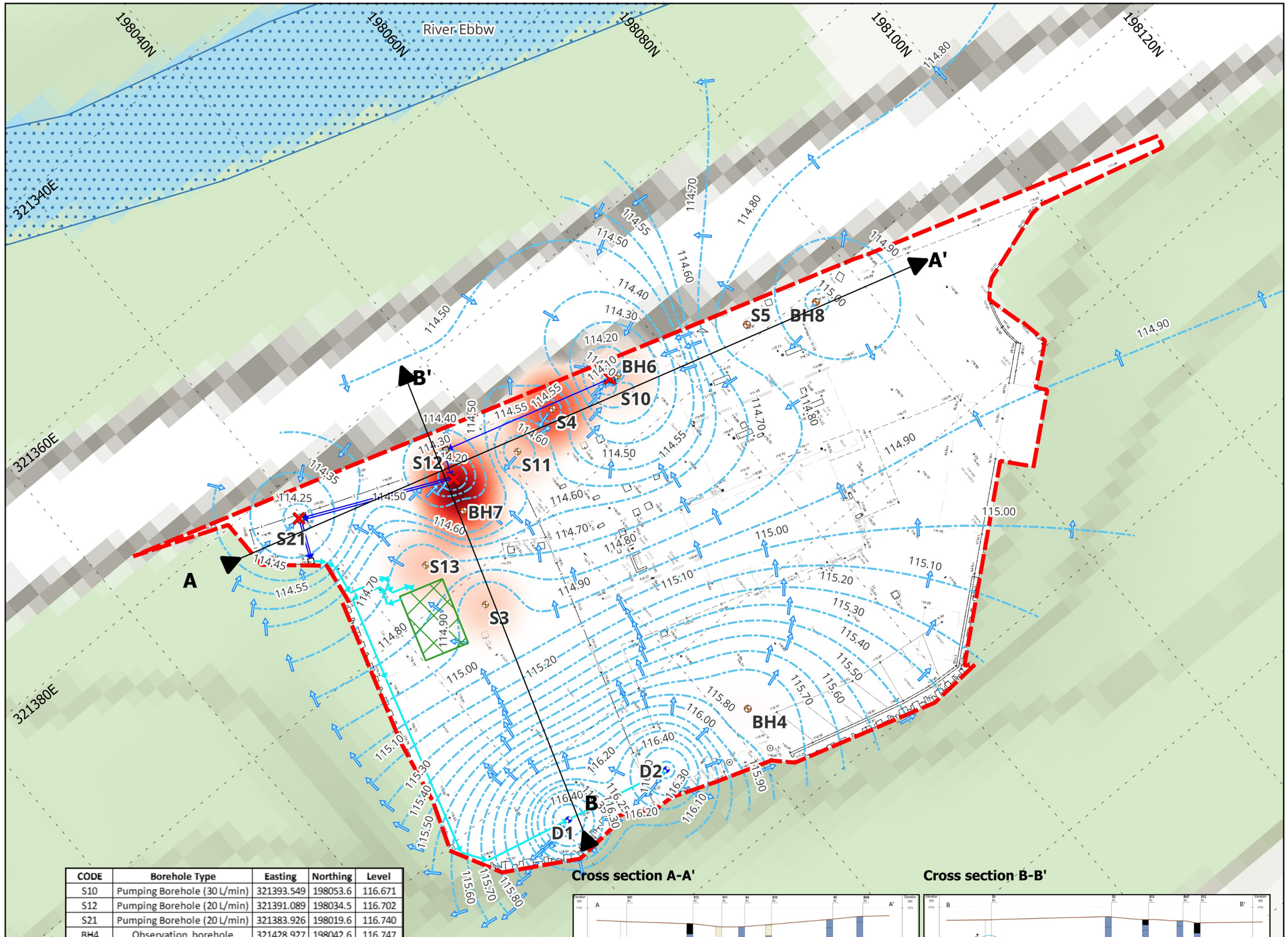
Job: 0816

Client: Ascona

Figure No.	Revision	Date
31	2	11 September 2025
Drawn by	Checked by	Scale
R.D.	A.W	1:400

Job No.: J-0861. En





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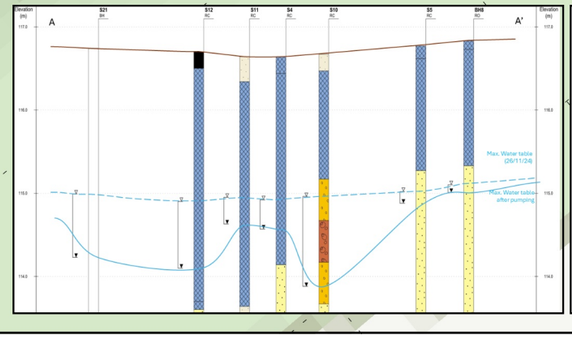
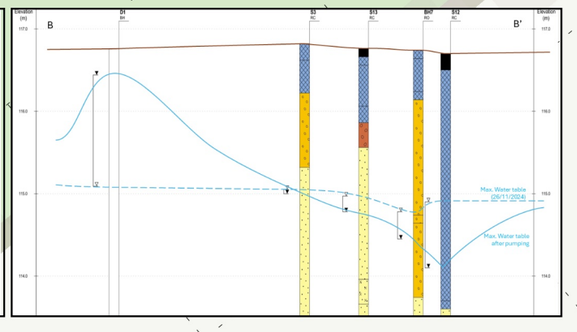
S5	Observation borehole	321398.391	198068.1	116.769
S11	Observation borehole	321393.189	198041.4	116.644
S13	Observation borehole	321396.067	198026.6	116.756
D1	Discharge borehole (35L/min)	321425.782	198020.8	116.760
D2	Discharge borehole (35L/min)	321428.33	198032.1	116.770

Cross section A-A'



Cross section B-B'



Legend

- Site Boundary
- Treatment and quarantine area
- Observation borehole
- Discharge borehole
- Pumping borehole
- Chambers (600mmx600mm)
- Above ground duct (200mm)
- Buried duct (150mm)
- Estimated water table

0 10 20 m

Figure: Estimated water table after 24-hour pumping considering maximum water table register

Job: 0816

Client: Ascona

Figure No.	Revision	Date
32	2	11 September 2025
Drawn by	Checked by	Scale
R.D.	A.W	1:400

Job No.: J-0861. En

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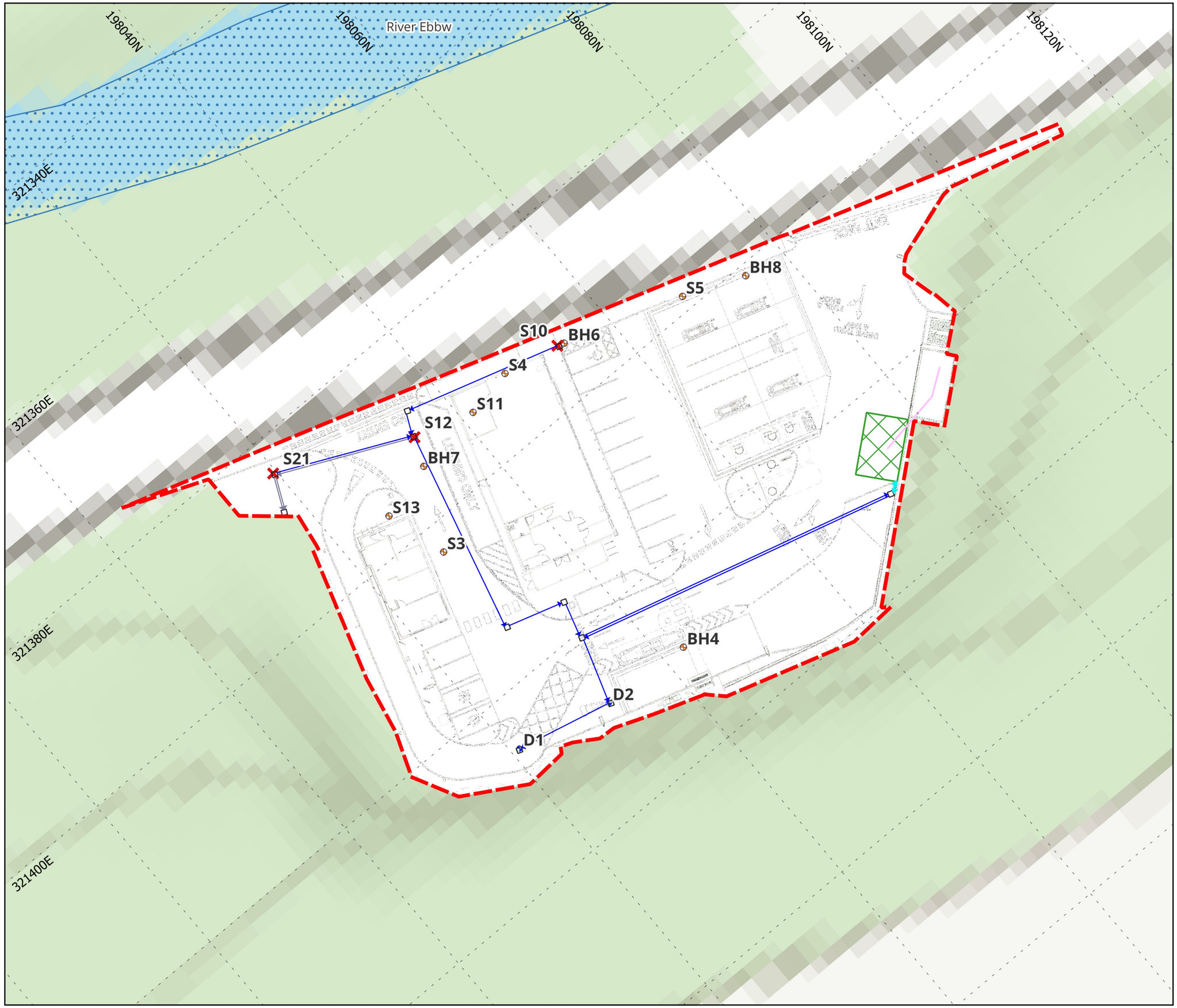
Site Plan Provided by Client 2025.

Microsoft Bing



Legend

- Site Boundary
- Observation borehole
- Discharge borehole
- Pumping borehole
- Chambers (600mmx600mm)
- Above ground duct
- Buried duct
- Unused buried duct
- Treatment and quarantine area

0 10 20 m

Figure

Proposed layout for treatment plant post site redevelopment.

Job

0816

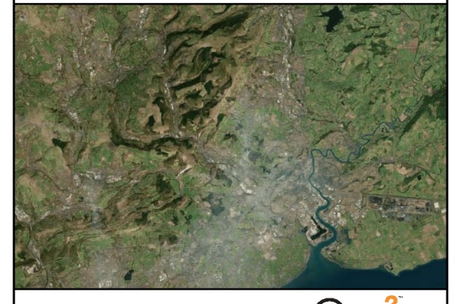
Client

Ascona

Figure No.	Revision	Date
34	1	10 September 2025
Drawn by	Checked by	Scale
R.D.	A.W	1:400

Job No.

J-0861. En



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Site Plan Provided by Client 2025.

Microsoft Bing

Appendix B – Remediation Options Assessment

Land Contamination Risk Management (LCRM) : Stage 2 Options Appraisal

Step 2: Detailed Sustainable Remediation Assessment

Geo^2 Sustainable Remediation Assessment

This assessment has been undertaken in general accordance with the UK Sustainable Remediation Forum (SuRF-UK) framework. SuRF-UK defines the process of sustainable remediation as "the practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impact, and that the optimum remediation solution is selected through the use of a balanced decision-making process" (CL:AIRE, 2010). Specific reference has been made to the following documents:

Supplementary Report 1(SR1) of the SuRF-UK Framework: A general Approach to Sustainability Assessment for Use in Achieving Sustainable Remediation (2020).
Supplementary Report (SR2) of the SuRF-UK Framework: Selection of Indicators/Criteria for Use in Sustainability Assessment for Achieving Sustainable Remediation (2020).

This assessment represents a Tier 1 Assessment as outlined in the SuRF-UK Framework.

Site Name:	Enterprise Autos
Project Number:	816
Client:	Ascona
Date Completed:	10.10.25
Author:	A Wilson
Reviewer:	P Stapleton
Remediation Objectives:	To address identified risks to controlled waters associated with contamaintion within the groundwater. Factoring in use of vacuum tankers, with and without a treatment system at a pump rate of 100m3/day.

Potential Remediation Options	Description
1	Do nothing
2	Monitored Natural Attenuation
3	Chemical Oxidation
4	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)
5	Pump and Barrier with Recirculation of Treated Water

The scoring of the indicators is done on a relative basis by applying a 1 to 5 scale, where 1 rep-resents the best score and 5 represents the worst score. Thus high scores represents the most negative impact or least positive impact, and the lowest score represents the least negative score or the most positive score, depending on the indicator.

Therefore, the best score can both represent the most positive impact of an indicator, e.g. the lowest amount of residual soil contamination (indicator ENV 2), or it can represent the least negative impact, e.g. the lowest greenhouse gas emission (indicator ENV 1) of the compared remediation strategies depending on the indicator being assessed.

Project stakeholders:	
Client	Ascona
Project investors	
Regulators	NRW, Local Env Health Officer
Neighbours	Residents
Environmental bodies / charities	
Other	

Indicator Weighting

Indicators			Weighting	Justification
Environmental Indicators		Description	0.33	To provide balance between environmental, economic and social factors.
ENV1	Emissions to air	Emissions to air divided into 3 indicators covering 1) greenhouse gas emissions, 2) emissions affecting the local air quality (NOx, VOCs and particulate matter) and 3) acidifying emissions.	1	Climate emergency.
ENV2	Soil and ground conditions	Impacts related to the upper part of the soil such as topsoil degradation and consumption, impact on ecosystem services and changes in geotechnical properties.	2	Soil impact relatively minor component of the site's contamination relative to groundwater.
ENV3	Groundwater and surface water	Impacts on groundwater quality and quantity such as mobilisation of contaminants, changes in hydrology and changes in chemical properties such as pH, redox conditions, oxygen content, dissolved metals or nutrients. It also covers the impact to water abstraction and recreational water use.	3	Controlled waters identified as principal receptor associated with the contamination source.
ENV4	Ecology	The impacts on plants and animals at the site. It also covers eco-logical and ecosystem effects such as changes in habitats, populations or food webs and the effect on landscape.	0	No statutory ecological receptors identified within immediate vicinity of the site. Existing ecological value of site low and to be redeveloped.
ENV5	Natural resources & waste	Natural resources - the use of 1) Virgin raw materials, e.g. sand, gravel, wa-ter and metals; 2) Fossil energy resources such as coal, oil and gas, and 3) Re-used or recycled materials for instance crushed concrete. Waste - the production of 1) non-hazardous waste and 2) hazardous waste. Hazardous waste also covers contaminated soil for disposal.	3	Potentially significant usage of resources depending on proposed remedial solution.
Economic Indicators		Description	0.33	To provide balance between environmental, economic and social factors.
ECON1	Direct economic costs and benefits	The direct costs of remediation, operation and monitoring associated with each remediation option, and the possible benefit associated with the increasing property value after remediation.	3	Financial implications of works may affect the overall viability of the scheme.
ECON2	Indirect economic costs and benefits	Indirect costs associated with potential residual liabilities, and indirect benefits associated with changes in neighbourhood reputation, as well as indirect impact to local businesses whether positive or negative.	1	Limited scale of the development will have less impact on the wider area.
ECON3	Employment and employment capital	Effects from the remediation project such as creation of new jobs, increase of skill levels for people involved in the remediation project, and the possibility for boosting innovation.	1	The developemnt works will provide employment duirng the construction phase of works.
ECON4	Induced economic costs and benefits	Economic effects on other projects and investments caused by the remediation project.	3	Failure to deliver the remdiation will prevent the regenertaion of the site and construction of new businesses.
ECON5	Project lifespan and flexibility	Covers various factors related to lifespan including: how long will the remediation programme last and potential impact on other operations (e.g. development); for how long is the risk management effective?; the need for institutional controls, and flexibility, i.e. how resilient is the remediation option to changing conditions such as heterogeneities in contamination or geology, climate changes and budget changes?	3	The timescale of the remediation will affect the feasibilty of the development and addressing the APWN.
Social Indicators		Description	0.33	To provide balance between environmental, economic and social factors.
SOC1	Human health & safety	The local health impacts related to emissions and dust from remediation work on the site. It also covers occupational risks related to remediation workers on site, or occupational risks related to the handling of contaminated materials and chemicals off site. Finally, it covers risks to the public due to remediation. This could for example be due to traffic and chemical storage at the site.	3	The potential impact to developers, neighbours and future site users is a key consideration for any remediation works at the site.
SOC2	Ethics and equity	Considerations of whether the impacts and benefits are disproportionately distributed between affected stakeholders or between generations (intragenerational equity) It also covers considerations of whether there are unethical issues related to any of the remediation options.	1	This is of limited impact to this development.
SOC3	Neighbourhoods & locality	Changes experienced by the neighbourhood, e.g. changes in site usage, changes in the built environment and the level of general nuisance due to remediation activities as experienced by people living at or near the site.	1	The size of the development limits the potential nusiance and impact apart from to the most local neighbours.
SOC4	Communities & community involvemen	Whether the remediation options allow for realisation of stakeholder views, and whether the remediation options support the local spatial planning objectives and plans.	2	The remediation must be able to meet the requirements of the EHO and NRW to facilitate the development.
SOC5	Uncertainty & evidence	Relates to the degree of uncertainty related to the performance of the specific remediation technology, and of the quality of available information for each technology and the need for additional data.	3	Whilst a substantial dataset is available for a site of this size, design contingency is essential to ensure that a satusfactory end point can be achived. Remedial approach based uncertainty has been factored in.

0 =	Not relevant / applicable
1 =	Minor project consideration
2 =	Moderate project consideration
3 =	Significant project consideration

Environmental Indicators			Options				
Indicator		Description	Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)	Pump and Barrier with Recirculation of Treated Water
ENV1	Emissions to air	Emissions to air divided into 3 indicators covering 1) greenhouse gas emission, 2) emission affecting the local air quality (NOx, VOCs and particulate matter) and 3) acidifying emissions.	1	1	2	2	1
ENV2	Soil and ground conditions	Impacts related to the upper part of the soil such as topsoil degradation and consumption, impact on ecosystem services and changes in geotechnical properties.	5	4	1	1	1
ENV3	Groundwater and surface water	Impacts on groundwater quality and quantity such as mobilisation of contaminants, changes in hydrology and changes in chemical properties such as pH, redox conditions, oxygen content, dissolved metals or nutrients. It also covers the impact to water abstraction and recreational water use.	5	4	2	1	1
ENV4	Ecology	The impacts on plants and animals at the site. It also covers ecological and ecosystem effects such as changes in habitats, populations or food webs and the effect on landscape.					
ENV5	Natural resources & waste	Natural resources - the use of 1) Virgin raw materials, e.g. sand, gravel, water and metals; 2) Fossil energy resources such as coal, oil and gas, and 3) Re-used or recycled materials for instance crushed concrete. Waste - the production of 1) non-hazardous waste and 2) hazardous waste. Hazardous waste also covers contaminated soil for disposal.	1	1	2	5	3
		Totals:	12	10	7	9	6

Economic Indicators			Options				
Indicator		Description	Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water	Pump and Barrier with Recirculation of Treated Water
ECON1	Direct economic costs and benefits	The direct costs of remediation, operation and monitoring associated with each remediation option, and the possible benefit associated with the increasing property value after remediation.	1	1	2	5	2
ECON2	Indirect economic costs and benefits	Indirect costs associated with potential residual liabilities, and indirect benefits associated with changes in neighbourhood reputation, as well as indirect impact to local businesses whether positive or negative.	5	5	1	4	2
ECON3	Employment and employment capital	Effects from the remediation project such as creation of new jobs, increase of skill levels for people involved in the remediation project, and the possibility for boosting innovation.	5	2	0	3	0
ECON4	Induced economic costs and benefits	Economic effects on other projects and investments caused by the remediation project.	5	3	1	3	1
ECON5	Project lifespan and flexibility	Covers various factors related to lifespan including: how long will the remediation programme last and potential impact on other operations (e.g. development); for how long is the risk management effective?; the need for institutional controls, and flexibility, i.e. how resilient is the remediation option to changing conditions such as heterogeneities in contamination or geology, climate changes and budget changes?	5	4	3	1	1
		Totals:	21	15	7	16	6

Social Indicators			Options				
Indicator		Description	Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)	Pump and Barrier with Recirculation of Treated Water
SOC1	Human health & safety	The local health impacts related to emissions and dust from remediation work on the site. It also covers occupational risks related to remediation workers on site, or occupational risks related to the handling of contaminated materials and chemicals off site. Finally, it covers risks to the public due to remediation. This could for example be due to traffic and chemical storage at the site.	1	1	2	2	2
SOC2	Ethics and equity	Considerations of whether the impacts and benefits are disproportionately distributed between affected stakeholders or between generations (intragenerational equity) It also covers considerations of whether there are unethical issues related to any of the remediation options.					
SOC3	Neighbourhoods & locality	Changes experienced by the neighbourhood, e.g. changes in site usage, changes in the built environment and the level of general nuisance due to remediation activities as experienced by people living at or near the site.	5	3	2	3	2
SOC4	Communities & community involvement	Whether the remediation options allow for realisation of stakeholder views, and whether the remediation options support the local spatial planning objectives and plans.	5	4	2	3	2
SOC5	Uncertainty & evidence	Relates to the degree of uncertainty related to the performance of the specific remediation technology, and of the quality of available information for each technology and the need for additional data.	5	5	3	2	1
		Totals:	16	13	9	10	7

Geo^2 Sustainable Remediation Assessment - Summary

Environmental Indicators		Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)	Pump and Barrier with Recirculation of Treated Water
ENV1	Emissions to air	1	1	2	2	1
ENV2	Soil and ground conditions	10	8	2	2	2
ENV3	Groundwater and surface water	15	12	6	3	3
ENV4	Ecology					
ENV5	Natural resources & waste	3	3	6	15	9
Weighted Environmental Indicator Score		9.57	7.92	5.28	7.26	4.95

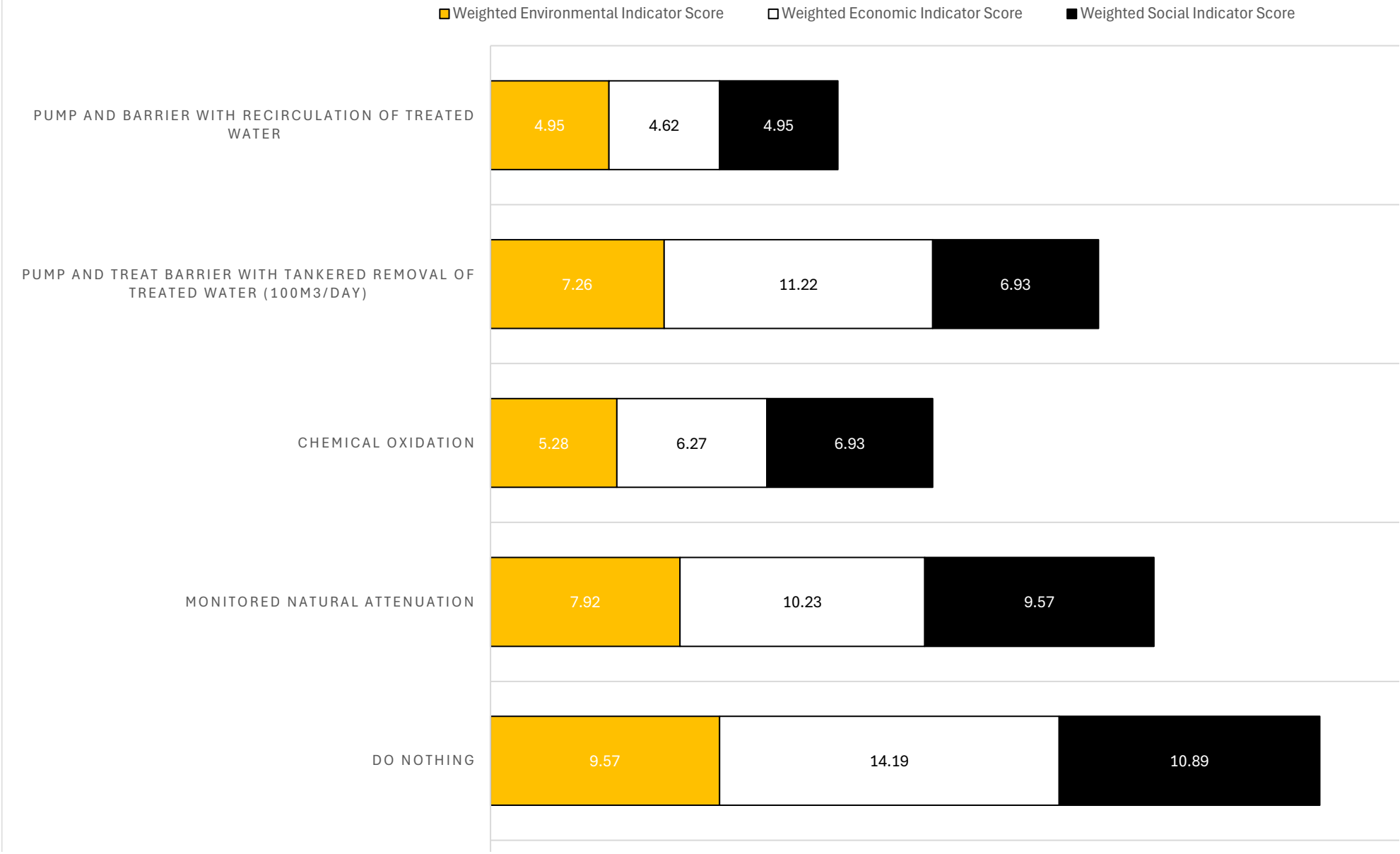
Economic Indicators		Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)	Pump and Barrier with Recirculation of Treated Water
ECON1	Direct economic costs and benefits	3	3	6	15	6
ECON2	Indirect economic costs and benefits	5	5	1	4	2
ECON3	Employment and employment capital	5	2		3	
ECON4	Induced economic costs and benefits	15	9	3	9	3
ECON5	Project liefspan and flexibility	15	12	9	3	3
Weighted Economic Indicator Score		14.19	10.23	6.27	11.22	4.62

Social Indicators		Do nothing	Monitored Natural Attenuation	Chemical Oxidation	Pump and Treat Barrier with tankered Removal of Treated Water (100m3/day)	Pump and Barrier with Recirculation of Treated Water
SOC1	Human health & safety	3	3	6	6	6
SOC2	Ethics and equity					
SOC3	Neighbourhoods & locality	5	3	2	3	2
SOC4	Communities & community involvement	10	8	4	6	4
SOC5	Uncertainty & evidence	15	15	9	6	3
	ted Social Indicator Score	10.89	9.57	6.93	6.	
	ainable Assessment Score	34.65	27.72	18.48	25	

Intelligent Ground Solutions

Geo2™

SUSTAINABLE ASSESSMENT SCORE SUMMARY



Geo² Sustainable Remediation Assessment

Land Contamination Risk Management (LCRM) : Stage 2 Options Appraisal

Step 1: Identify feasible remediation options

Site Name:	Enterprise Autos	Date Completed:	09.10.2025	Author:	A Wilson
Client:	Ascona	Project Number:	816	Reviewer:	P. Stapleton

This assessment has been undertaken in accordance with the UK LCRM statutory guidance (20 July 2023). The assessment below represents a preliminary, technical assessment of potentially viable remediation options to treat the identified contamination. Factors considered include; the nature of the contaminant, the source media, depth of the contamination source, nature of the geology, presence of Non Aqueous Phase Liquids and the principal receptor under consideration (human health or the water environment / controlled waters). The assessment is relatively simple and designed to identify broad remediation techniques to take forwards for detailed sustainability assessment (Step 2). Further, site-specific considerations are likely to be required, including detailed contaminant characteristics, the ground model, receptor and possible combinations of different remediation techniques that may offer the best overall solution.

Contaminants of Concern	Source Media	LNAPL Presence	DNAPL Presence	Geology	Impact Depth	Principal Receptor	Technical Feasibility Score	Rank
Fuels and Oils	Groundwater only	Concentrations suggestive of LNAPL	None	Fractured Bedrock	3-5m	Controlled Waters		
Dual Phase Vacuum or Multi Phase Extraction	7	6	7	4	7	10	41	4
Pump and Treat	10	8	7	8	8	10	51	**1**
Soil Vapour Extraction	0	6	7	6	8	5	32	10
In-situ Chemical Oxidation	8	4	7	5	8	10	42	**3**
Enhanced In-situ Bioremediation (Aerobic)	10	2	7	8	8	6	41	4
Thermal Remediation (in-situ)	0	6	7	2	6	6	27	14
In-situ Reductive Dechlorination	2	2	7	8	8	10	37	8
Hydraulic or Reactive Barriers	8	6	7	4	8	10	43	**2**
Capping or Cover System (Engineered Solutions)	0	6	7	10	6	0	29	12
Soil Washing	0	0	7	0	8	6	21	15
Ex-Situ Bioremediation	0	6	7	0	8	8	29	12
Soil Stabilisation and Solidification	0	8	7	0	7	10	32	10
Off Site Disposal	0	8	7	10	4	10	39	7
Phytoremediation	4	0	7	0	4	5	20	16
Enhanced In-situ Bioremediation (Anaerobic)	8	0	7	8	7	10	40	6
Natural Source Zone Depletion	10	0	0	8	7	10	35	9

Appendix C – Watching Brief Guidance

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Watching Brief Method Statement: Enterprise Autos, Newport

This method statement aims to establish a structure by which site works / development contractors will be able to effectively meet the requirements of a watching brief. A watching brief is frequently proposed as part of planning conditions imposed onto any brownfield site, or a site potentially affected by contaminants. This methodology proposed a strategy which allows the site workers to effectively undertake these works themselves without the need for a full time environmental specialist.

Requirements of a Nominated Competent Person (CP)

The party undertaking the site works will nominate a Competent Person (CP) who will be responsible for providing a watching brief over all excavation, soil handling works associated with construction and for ensuring site workers conform to appropriate PPE requirements at all times. The CP will be on-site during all enabling, and construction works.

The CP will be briefed by Geo^2 on environmental management during or in advance of the groundworks at an on-site meeting to be held prior to the commencement of works. This would typically address the following issues;

- A review of any existing site information with regard to areas of potential contamination both identified and unidentified,
- Types of contamination which may be encountered and also potential for unexpected contamination, and means of identification,
- Potential risks associated with contaminants, with regard to health and safety concerns of construction workers,
- Potential for waste disposal issues,
- Ensuring that the CP is confident and capable of undertaking the practical responsibilities identified,
- Any additional site specific concerns or factors which may prove relevant to works, such as any visual monitoring / inspection requirements (e.g. daily observations of adjacent streams etc).

The CP would be required to maintain records of any issues, as detailed above, which would be encountered during the programme of works. Records should detail the time and date, nature of any incident, or detail of potentially contaminated soils encountered, location of this material, where possible extent and the actions undertaken to ensure this was appropriately classified. These would be required to be submitted to the client and Geo^2 to ensure that an appropriate validation report

could be complied to enable the planning conditions to be lifted. Records should be available onsite at all times for inspection as required.

The CP is also responsible for contacting Geo^2 in the event of encountering situations requiring environmental management. A Geo^2 contact will be ascribed to each site, so suitable site specific advice will be available over the phone as necessary. Site visits can be arranged at short notice to assist with any potentially significant issues.

Unexpected Contamination

Unexpected contamination may comprise impacted sub-soil, or structures such as underground storage tanks (UST), subsurface features, pipes, sumps or chambers with associated contamination observed beneath the site during the redevelopment works.

Where apparently contaminated sub-soils (or waters) are encountered, the permanent nominated CP should be contacted for assessment.

As a guide, apparently contaminated sub-soils or waters may comprise visually impacted and strongly odorous material. Encountered odours could be petrol, diesel, solvents or oil-like. Should materials of this description, or other description following a site specific briefing, be encountered and this material be considered to be unidentified, Geo^2 should be contacted. In such circumstances, the affected area should be isolated and work in the area stopped, pending the Geo^2 consultant visit to sample or assess the soil. The area should remain isolated whilst the samples are analysed at an appropriate laboratory, if considered necessary.

Additionally, and in line with planning condition No12 (planning application ref. 2020/62/91865/E with Kirklees Council), the Local Planning Authority are to be informed in writing upon the contractor encountering unexpected contamination within 2 working days. Works are to stop in the area, with the exception of investigative works, until an updated Remediation Strategy can be updated, reissued and agreed by the LPA.

Based on the results and in comparison with adopted screening criteria, Geo^2 will determine whether the identified materials present a significant environmental risk. Should the soil need to be removed in line with the proposed development programme, or as a result of a risk based analysis, validation samples will be collected from the edge of the excavation by a Geo^2 site engineer.

All waste should be appropriately isolated and stored to prevent spreading contamination across the site. Waste should then be classified and disposed of in accordance with the applicable waste management regulations under full duty of care documentation. Potential exists for hazardous waste to be present, and this should also be dealt with in accordance with the relevant legislation.

Should unidentified underground features be encountered, such as tanks or fuel delivery lines, that require removal in line with the proposed development, they should be appropriately decommissioned. Decommissioning should comprise pumping and removal of waste water and any sediment in accordance with the applicable waste management regulations under full duty of care documentation. Water and sediment waste may need to be sampled and analysed to determine whether it needs to be disposed of as hazardous.

Should any structure encountered remain in situ, Geo^2 should be contacted to ensure that any potential impact that may be associated with this feature can be appropriately addressed, if

necessary. This process may entail additional sampling works, which would require the identified area to be isolated until Geo^2 site staff are able to attend site.

Following removal of any such structure, the CP should inspect the excavations for apparently impacted materials. Should apparently contaminated material be identified beneath or adjacent to the structure, Geo^2 should be contacted to undertake further sampling and analysis. All results will be included in the Validation Report.

The relevant planning authorities will be notified should any unexpected contamination be identified and any remedial actions that are required as a result of encountered materials will be agreed prior to the work being carried out.

Sampling Procedure

All samples obtained by Geo^2 will be stored in appropriate vessels for the required analysis and stored in controlled conditions prior to submission to an appropriately accredited laboratory. All samples will be obtained in line with standard industry guidance.

Validation Report

This typically forms the final part of any contaminated land planning condition and allows the client or local authority certainty that any contaminated land encountered during works has been appropriately addressed and the condition of remaining soils (and groundwater if applicable) is understood. This may be compiled by Geo^2 (typically in the event of unexpected contamination being encountered) or by the Client (this may take the form of a brief letter, stating the completed nature of the site and a brief description of conditions encountered).

Geo^2 Contact

A Geo^2 contact will be prescribed to the site upon implementation of the watching brief. If there are any other queries Geo^2 can be contacted on the office number at 0113 257 5397