

It should be noted that for membranes to achieve a point score greater than zero they should be:

- Sufficiently impervious to methane and carbon dioxide.
- Capable after installation of providing a complete barrier to the entry of the relevant gas.
- Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions.
- Sufficiently strong to withstand in service stresses (e.g., due to ground settlement if placed below a floor slab).
- Sufficiently strong to withstand the installation process and following construction activities until covered (e.g., penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, and dropping tools).
- Chemically resistant to degradation by other contaminants that might be present.
- Verified in accordance with CIRIA C735.

Verification of correct installation should be collected (including site photographs) for documenting in the site verification report.

7.5.1 Gas protection measures in buildings

Considering the CS determined for Plots NT02 and NT03 (CS2) and the proposed building type (Type B) a minimum point score of 3.5 will be required to achieve an adequate level of protection at this Plot. Solution scores are awarded for different of gas protection measures. BS8485 indicates the gas protection system should consist of at least two different elements from the list below to achieve the required gas protection score for a Type B building:

- structural barrier (floor slab/basement);
- ventilation measures;
- gas resistant membrane.

In order to achieve a score of 3.5, the recommended ground gas protection measures and method of construction is summarised in **Table 8** below.

Table 8: Recommended gas protection measures at Plots NT02 and NT03

Type of Gas Protection	Score
Cast in-situ monolithic reinforced ground bearing raft or reinforced cast in-situ suspended floor slab with minimal penetrations	1.5
Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions	2
Total	3.5

The site developers will be responsible for the detailed design of the proposed gas protection, including installation and verification proposals. The gas protection membrane

should be selected specifically to mitigate vapour ingress to buildings as well as from ground gases.

7.5.1.1 *Cast in-situ monolithic reinforced ground bearing raft or reinforced cast in situ suspected floor slab with minimal penetrations*

Contrary to segmental floor construction methods, well-constructed cast in-situ reinforced concrete raft foundations, which are monolithic with few joints can provide resistance for ground gas ingress into buildings. In order to achieve the required point score of 1.5, the following floor structures would be considered suitable:

- Cast in-situ ground bearing monolithic reinforced industrial floor slab with minimal services entering the slab and few perforations.
- Suspended or semi suspended floor slab constructed from reinforced dense cast in-situ reinforced structural concrete, with minimal perforations.

7.5.1.2 *Gas resistant membrane*

A suitably designed and installed gas resistant membrane would achieve a point score of 2. To achieve a point score greater than zero they should be:

- Sufficiently impervious to methane and carbon dioxide;
- capable after installation of providing a complete barrier to the entry of the relevant gas;
- sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;
- sufficiently strong to withstand in service stresses (e.g., due to ground settlement if placed below a floor slab);
- sufficiently strong to withstand the installation process and following construction activities until covered (e.g., penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, and dropping tools);
- chemically resistant to degradation by other contaminants that might be present, and
- verified in accordance with CIRIA C735.

It is recommended that membrane specification data sheets be provided to RSK for comment prior to installation of the membrane on site.

All joints and penetrations of the membrane (notably utility services) should be lapped and sealed in accordance with the membrane manufacturers' recommendations. The membrane should be placed continuously across the slab construction and lapped onto/extended through the cavity wall construction. The membrane should be placed onto a clean surface, which is free of any debris that could puncture the membrane.

The final performance requirements of the ground gas protection measures necessary should be confirmed as part of detailed design in consultation with a specialist contractor and in agreement with Building Control. All ground gas protection measures incorporated into the design of the buildings will need to be documented on-site by the Contractor in accordance with verification procedures outlined in CIRIA C7358 and C7489.

Visual inspection and photographic evidence prior to concrete pours of the general installation, taping and sealing of a membrane will be required, this may be carried out by RSK or another suitably qualified third party to provide documented evidence confirming robust installation for inclusion in the verification report.

A detailed design report (which this report is not) should be prepared for the proposed mitigation measures and should be provided to and agreed with the local authority and relevant warranty providers prior to construction works commencing. The design report should include a combination of the following:

- Gas conceptualisation (severity of gas regime and sensitivity of land use).
- Building and construction related details such as floor slab, wall construction, ground conditions and any complex detailing.
- Gas protection design sufficient to mitigate the gas risk and be practically installed given the building and construction related details. Likely to include venting calculations, product specifications, installation methodology and installer qualifications/experience.

Verification plan (prepared in accordance with CIRIA C735) to identify the verification tasks, frequency of such tasks and by whom they should be undertaken, regulatory requirement and contingency plans. The verification measures required will be dependent on a number of factors including the gas regime, the qualifications of the installers, the complexity of the design and the number of Plots.

7.5.1.3 Soil Gas Vapour

As previously mentioned, the TCE contamination area beneath the Plot NT02 portion of the site has the potential to generate volumes of SVOC and VOC vapour that could pose a risk to human health during the construction and operational phases of the development. The soil contamination zone affected by TCE and its daughter products will be subject to screening and removal in accordance with the re-use criteria outlined in this strategy for the protection of controlled waters.

It is considered the reduction or removal of VOC contaminants in soils will also significantly reduce the potential for soil gas vapour generation and ingress post completion of remediation works (and into the new structures on this part of the site). As such, the use of specific gas vapour resistant barriers within new buildings is not considered necessary. However, it will be necessary for contractors completing TCE remediation works to undertake validation gas monitoring on conclusion of soil treatment works. This monitoring should confirm what, if any, residual VOC vapour contamination may be present in site soils and confirm that there is still no requirement for gas vapour membranes within buildings.

There will be risks posed to construction workers during the primary TCE soil source removal phase. Due consideration should be given to the range of mitigation measures required for site operatives engaged in these works to reduce risk of chronic exposure to airborne VOC contaminants. This could include the use of disposable overalls, certified face masks or exclusion zones around the most grossly impacted soils reported during

the remediation process. Regular PID monitoring of soils would also be prudent to check levels of vapour release.

7.6 Remediation of Groundwater – contaminant linkage 4

Based on the results of previous site investigation works and the controlled waters DQRA model produced for Plot NT02 (ref. 11847 R01), a pollutant linkage is considered to exist between the TCE, DCE, VC and carbon tetrachloride soil source and dissolved phase plume extending beneath Plot NT02 and controlled waters via leaching/vertical migration through the unsaturated zone and/or lateral migration through dissolved phase to the wider principal aquifer of the CHES. The high density and low solubility of TCE can mean that the compound can often manifest as dense non-aqueous phase liquid (DNAPL) within the groundwater environment, however previous monitoring rounds completed as part of previous site investigation have not encountered any measurable DNAPL thickness. Due to the more cohesive nature of the MM mudstone underlying the CHES, it is likely that any DNAPL present would accumulate on the surface of the MM, though monitoring of the predicted lowest elevation point of the MM (based on estimated dip direction) at RBH502 did not detect any DNAPL.

In the absence of DNAPL and following removal of the soil source as detailed in **Section 7.2.1**, direct treatment of the groundwater within underlying soils and bedrock will be required across the southern area of NT02 and southwestern NT03 within the area of TCE contamination. The Remedial Target Values that groundwater should be monitored and tested against during any treatment process are provided in **Section 5** of the current strategy and should be used to support the design of remediation treatment works.

7.6.1 In-situ chemical oxidation/reduction

An initial appraisal of the remediation options for the treatment of TCE impacted groundwater was presented within the RSK Outline Remediation and Options Appraisal for the site (ref. 11834 R01 (00), dated August 2023). The appraisal considered in-situ chemical oxidation/reduction (ISCR) a viable treatment option for the VOC contaminated groundwater in the underlying principal aquifer of the CHES due to its successful operation at targeting chlorinated solvents, the minimal need for significant remedial plant and no requirement to quarantine areas of the site allowing other site activities to be undertaken around the remedial works. As a result of additional site investigation to increase confidence in the groundwater model and characterise the contamination plume, and production of the DQRA model, ISCR is now considered the preferred groundwater treatment option.

This technique involves the injection of oxidant (or reducing) chemicals into the contaminated groundwater to produce a strongly oxidising/reducing environment within the groundwater body, such that residual contaminants of concern are reduced to their ultimate daughter compounds through a combination of direct chemical reduction and aerobic/anaerobic degradation.

The spacing, frequency and ultimate depth of the treatment and monitoring wells should be designed by a specialist remediation contractor based on the estimated contamination plume dimensions and take into account of the topography of the underlying geological strata,

It is considered that use of reducing chemicals across the affected area would produce a strongly reducing environment within the groundwater body resulting in VOC compounds being reduced to their ultimate daughter compounds through a combination of direct chemical reduction and anaerobic degradation. The existing groundwater data and aquifer parameters indicates that the groundwater environment is currently aerobic within the plume and anaerobic on the edges of plume. This process would therefore force anaerobic conditions increasing the capability of biodegradation and faster reduction in concentrations within the aquifer and reduce the spread to the wider aquifers. The required injection frequency and dose concentration should be calculated by a specialist remediation contractor, relative to contaminant concentration and persistence.

Timescales for remediation are based on the on the size of the source area and will be estimated by the remediation specialist. It should be noted that treatment process can be slowed if contaminants are trapped in hard-to-reach areas such as rock fractures which is potentially the case within the CHES. There is also potential for contaminants to rebound following treatment, requiring further injection, this would be determined by ongoing groundwater monitoring and sampling. Once contaminant have decreased sufficiently, in cases where and the aquifer conditions allow, continued remediation of the plume could be implemented through monitored natural attenuation MNA.

7.6.2 Monitored natural attenuation

While it is common for MNA to be used in conjunction with other methods (such as ISCR) in to remediate the remnant lower contaminant concentrations, initial discussions with remediation specialists have indicated that there may be some potential to explore MNA (following soil source removal) as an alternative to ISCR to resolve VOC contamination within the groundwater. Whilst this alternative has not been explored in detail in this report, it may be worth further consideration during the detailed design of remediation work and collation of the remediation method statement (RMS).

7.7 Piling Risk Assessment – contaminant linkage 5

Given the proposed development loadings and existing ground conditions on site, it is anticipated that a piled foundation solution will be adopted for the proposed structures. The use of pile foundations for the new development will require completion of a Piling Risk Assessment in accordance with the Environment Agency guidance note on piling into contaminated sites. This assessment will require pile design information included the selected pile method, diameter, termination depth and strata. The piling risk assessment should also consider the nature of remediation works proposed (once agreed with the regulatory authorities) and should form part of the Remediation Method Statement document.

7.8 Management of unforeseen contamination (Discovery Strategy)

The site has been subject to multiple rounds of ground investigation works such that the characterisation and identification of the principal contaminants of concern and associated risk drivers for remediation process are well defined. However, it is also noted ground investigation works, by their very nature, can only provide a limited insight into the overall

ground model beneath the site, and that the presence of as yet unreported sources of contamination cannot be precluded as a result. Such issues may occur in areas where access for previous ground investigation works were limited, e.g. within occupied buildings, along site boundaries, in areas of dense vegetation or beneath/adjacent retaining structures.

With reference to the aforementioned planning consent for the development, and specifically Condition 17, Part 11, it is noted obligations are placed on the client and contractors with respect to the management of unforeseen contamination (henceforth known as the Discovery Strategy). This section provides an initial framework for the management of unexpected contamination via the adoption of a Discovery Strategy, further detail will be required regarding prior to the strategy being implemented by contractors. We encourage this is developed with EA consultation to avoid delay.

In order to comply with the requirements of this condition all contractors should adopt the following measures in all aspects of work that require below ground excavations, or that may break ground.

- 1) The briefing for all site operatives (aka toolbox talk) shall include commentary and advice on identifying potential sources of contamination that may be uncovered during earthworks. We have included a briefing note with examples of types of contamination within **Appendix G** of our current report as a guide.
- 2) During site works, in the event a new area of potential contamination is uncovered, it is recommended the following actions are taken.
 - All works within the affected area should cease with immediate effect. Any site operatives who have come into contact with contaminants should report to the site manager and any injuries, exposure or adverse effects recorded and appropriate medical treatment sought.
 - Excavations should be backfilled with arisings (including any contaminated spoil) and should be placed at the depth in which it was encountered. Photographic records should be obtained at this stage and the location of the affected area surveyed. An exclusion zone should then be set up around the area and site works re-programmed to accommodate.
 - As soon as safely and practicably possible, the site manager should contact the Environmental Consultant responsible for the verification of remediation works. The consultant should then attend site no later than 24hrs after the initial recorded incident to consider the issue further and next steps with respect to remediation. The Environmental Consultant shall also, following an initial inspection of the issue identified on site, notify Manchester City Council contaminated land officers and the Environment Agency of the occurrence and their preliminary findings.
 - This assessment should be completed in the context of the findings of all previous rounds of ground investigations work as well as the requirements of any remediation works that are currently being undertaken, to be undertaken, or previously undertaken across the site.

- Further investigation, sampling and chemical assessment of affected area will be required under the instruction of the environmental consultant to assess the issue. Any works will need to consider potential H&S implications of excavating contaminated spoil with appropriate mitigation measures (e.g. air monitoring, Visqueen sheeting, water dust suppression, additional PPE) employed.
 - Once investigations have been completed the Environmental Consultant shall revisit the site conceptual model and consider the implications of the new source (or sources) of contamination in the context of the proposed remediation works. Depending on the results of this assessment the scope of this remediation strategy may need to be revised and updated to include any additional treatment or management requirements.
 - For expedience, and once agreed with the client and contractors, the Environmental Consultant shall issue an addendum report to this strategy outlining details of new sources of contamination uncovered and modification or additional remedial treatment measures required. This report should be provided to the regulatory authorities (Manchester City Council and the Environment Agency) as soon as practicable for their consideration and comment, noting any remediation works completed with respect to the recently discovered contamination would be at risk until these authorities have reviewed and agree with the treatment proposals.
- 3) Any new sources of contamination that are reported and covered by the above Discovery Strategy should be subject to the same validation requirements of the wider remediation process, noting these validation works may require additional treatment measures or recording (over and above those described in this report) that should also be captured.
- 4) The validation should be included and referenced within the Phase 3b Site Validation report on conclusion of site works.

With reference to the findings of ground investigation works it is noted some anecdotal evidence relating to potential on site migration of Benzene and TPH was noted toward the sites southern and eastern boundaries. As such it would be prudent to give specific consideration as part of any watching brief or risk register to the potential presence of these contaminants. Similarly, the area of suspected TCE contamination should also be defined on site plans and risk registers as a location where grossly contaminated soils, vapour or groundwater may be reported (see Image 2 overleaf for further information).

It should be noted that the Discovery Strategy is applicable to all types of contamination, be it soil, or groundwater borne or in the event of the release of malodorous airborne contamination such as methane, carbon dioxide or SVOC/VOC vapour ingress. An abridged flow chart style version of this strategy has been provided within **Appendix G** of this report to further illustrate requirements.

A soil vapour ingress issue was noted during the formation of a borehole within the TCE plume area during previous investigation works, as such the use of PID equipment would be prudent during excavation works as a safety measure to confirm any gas release and potential risks to site operatives.

The Discovery Strategy may require revision and update following input from remediation contractors to suite specific remediation treatment methods. Any such modifications or updates should be outlined within the Remediation Method Statement to be provided prior to commencement of site works for the consideration and approval by regulatory authorities. The Remediation Method Statement should also include reference to, and an obligation upon, the implementation of the Discovery Strategy during site works and the strategy should also be applied to all earthworks operations by the Principal Contractors out with of remediation zones.

7.9 Contamination Contingency Plan

It is noted that sources of mobile contamination (principally TCE and its daughter products) have been identified beneath the Plot NT02 and parts of the Plot NT03 development sites, as denoted by the orange dashed line in **Image 2**. At present, the mobility of these contaminants within the primary soil source area is being impeded by the presence of building or concrete hard standing coverage, however in order to remediate soils and groundwater in this area, as well as across the wider site, this hard standing coverage will require removal.

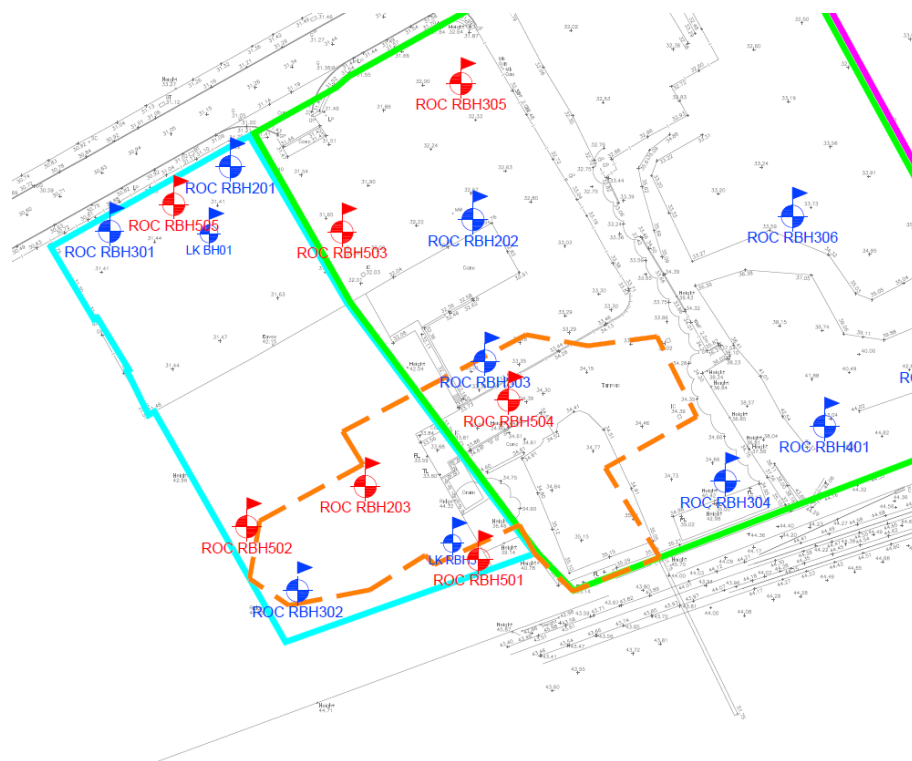


Image 2: Primary TCE contamination source area (denoted by orange dashed zone)

Similarly, the area in question, as noted on **Image 2** above, has a program of demolition proposed to remove existing warehouse buildings.

In order to mitigate against the risks posed by increased contaminant mobility during site clearance and remediation works it is recommended the following precautions are taken:

- 1) During building works, all hard standing and building floor slabs should be retained until such time as the soil remediation phases can be commenced. Similarly, care should be taken during the demolition process to prevent damage to existing site drainage networks (where possible).
- 2) Ideally the soil remediation works should be completed in a single phase, with hard standing and floor slabs left in place for as long as practicable during this process. Where possible, soils in the affected areas should be uncovered, assessed, removed and replaced (where required) in strips across the affected area so that the slabs can be left in situ for as long as practicable.
- 3) If this approach is not possible, the use of Visqueen sheeting should be employed across areas of un-remediated soils following slab removal. The sheeting should be laid and held in place using stockpiled clean uncontaminated soil with consideration given to drainage such that any surface water run off does not pass through the affected area.
- 4) It should also be noted that such measures can only be considered as a temporary mitigation to protect soils and that if works on site are delayed or reprogrammed, more robust measures may be required to prevent rainfall or surface water infiltration into the primary soil source area.

The movement of surface water should be appropriately managed throughout all phases of the construction works, particularly in the area of the primary soil source, to prevent overland flow and infiltration into site soils.

Stockpiled contaminated soil that is awaiting removal or treatment on site should be located (ideally) on areas of hardstanding away from drainage networks on top of chemically resistant Visqueen sheeting, with mounds also covered with sheeting that is secured at ground level.

7.10 On going monitoring

A number of groundwater monitoring wells are present across the site; the locations of which are indicated in the RoC Consulting drawing 4328-ROC-ZZ-XX-DR-ES-ES214 provided within **Appendix H**. These wells are sealed into various strata beneath the site and have the potential to act as a pathway between any near surface sources of contamination and the underlying natural soils and bedrock.

It is noted that on going monitoring of selected wells will be required to further refine the design of groundwater remediation works, and that further testing of groundwater and level monitoring will be required to support the collation of the Remediation Method Statement. The formation of further monitoring wells may also be required by remediation specialists to either support the design of remediation works or completed compliance monitoring during and following on from the remediation process.

At the time of writing, the specific details of these monitoring requirements are still to be confirmed and will be further outlined in the Remediation Method Statement. However, as an interim measure we would propose the following on going monitoring regime.

Part 1 : Well Removal Works

- 1) With reference to drawing 4328-ROC-ZZ-XX-DR-ES-ES214 provided within **Appendix H**, all monitoring wells shown in Blue should be removed and treated in accordance with the Environment Agency guidance Science Report SC020093.
- 2) The removal of these wells should be completed by appropriately qualified contractors and documented with a validation note provided with (inc photographic evidence) of the well removal process.
- 3) If these wells are to be retained in the short to medium term it is recommended that quarterly inspection visits are completed to confirm their current condition and that no damage has occurred that could compromise their integrity. As with the well removal works, these validation inspections should be documented, and a Well Condition survey report provided following each visit. This information, along with the documentation of well removal works, should be provided within the Phase 3b Site validation pack and may also be required in advance of remediation works by the regulatory authorities.
- 4) It is noted a number of the monitoring wells were buried during site operations that had taken place across the site. It is recommended the location of these wells are confirmed during any inspection or removal works and recorded in accompanying reports.

Part 2 : Well retention and monitoring works

The following RoC Consulting monitoring wells are to be retained to support the design and validation of remediation works:

- BH501
- BH502
- BH203
- BH503
- BH504
- BH505
- BH305
- LKBH1

The locations of these wells are known and accompanying coordinates have been surveyed in (and are included on accompanying log sheets). On going groundwater level gauging should be completed on these wells at monthly intervals up to issue of the Remediation Method Statement. The information obtained from these monitoring works should be documented in a brief letter report for distribution.

In addition to the monthly groundwater level gauging visits on these wells, it is recommended that water quality samples are obtained on a quarterly basis to support the design of groundwater remediation works prior to commencement of site construction works. This sampling should include for the analysis of the following determinands.

- Heavy Metals

- Poly Aromatic Hydrocarbons
- SVOC & VOC's
- TPHCWG
- Hardness, Dissolved Oxygen and pH values

Samples should be collected and dispatched to a suitably accredited UKAS testing facility with the results reported in a brief letter report. This report should also include a Tier 1 screen of water quality testing results against published UK DWS and EQS screening criteria, in line with assessment of water quality during previous investigation works. In the event the results of this sampling indicate a deterioration of water quality, it will be necessary to further consider the implications of this issue in the context of proposed remediation works.

The frequency of water quality sampling will likely increase during the course of soil and groundwater remediation works the scope of which should be further elaborated upon within the Remediation Method Statement. Of particular note in this regard will be the results from water quality testing data during the demolition and soil remediation phase, or following the removal of any hard standing, as it may indicate an increased mobility of contamination into the groundwater table that could require action.

Similarly, the monitoring wells indicated for retention and further monitoring/sampling have been agreed with the Environment Agency as part of the collation of this strategy. In the event that any of these wells are lost or damaged the contractor will be required to advise the EA of the damage and make good any associated repair or replacement.

Part 3 : Protection of monitoring wells

As previously discussed, additional monitoring wells (or the removal of those currently proposed for retention) may be required during the remediation process. The location and design of any additional monitoring wells should be described in the Remediation Method Statement and any wells that require removal subject to the same requirements of those outlined in Part 1 of this section.

The protection of monitoring wells during the course of remediation works, and following on from its conclusion, will be an essential requirement of the Principal Contractor. As such, we would recommend the following measures are adopted as part of the wider construction management plan.

- 1) The location of all monitoring wells should be displayed on notice boards in site cabins and other appropriate areas to increase awareness. Reference should be made to the presence of these wells during toolbox talks with an emphasis on their importance.
- 2) Wells currently comprise flush style covers; it is recommended that the well head gear be replaced with "top hat" style raised covers prior to commencement of demolition works on site to improve their visibility on site. Raised covers should be painted in bright colours to make them easy to identify when working on site.
- 3) Protective measures should also be employed around each well location to protect them from site works. A number of examples of such measures are provided within **Appendix H** for information.

It should be emphasized that the retained monitoring wells form a critical part of the overall remediation validation process and that failure to ensure their protection may result in the groundwater treatment process not being approved by regulatory authorities.

As such, any damaged wells will need to be repaired or, in the worst case, replaced. It is also important to note the validation monitoring period for the groundwater will extend beyond the physical treatment phase and could encroach into subsequent construction phases of the development process (further details of which will be outlined in the Remediation Method Statement).

7.11 Re-use of materials & Importation Requirements

At this stage it is estimated that the development is likely to produce moderate volumes of civils arisings (c. 37,537 m³) during earthworks associated with piled foundations, excavation of utility corridors, construction of a new piled retaining structure supporting adjacent Network Rail land to the south, and general cut to achieve formation levels (significantly the new undercroft plant and carparking space). It is understood that the intention is to reuse a portion of this site generated material elsewhere on site. Site generated material retained on site for re-use will be subject to additional chemical testing to confirm suitability for re-use.

Soils that are excavated are anticipated to be screened and sorted, and temporarily stockpiled and tested, where appropriate, to confirm suitability for the following categories of use:

- Material suitable for use as general fill material beneath proposed buildings, e.g., as backfill, as re-grade materials.
- Material suitable for inclusion within 600 mm of surface in landscaped areas (highly unlikely to be recovered in significant volumes on site).
- Material suitable for placing beneath single storey, overground car parks (i.e., not situated beneath building) and roadways.

Soils found unsuitable for any of the above purposes will be consigned for offsite disposal. It is possible that soils will be disposed off-site despite suitability for re-use if stockpiling is impracticable or a surplus volume of material is present. In addition to general excavations, aggregate may also be generated from processing of concrete slabs and old foundations to a suitable granular fill material.

The volume of imported material required as part of the development process will be relatively modest (excluding construction materials required in building and hard standing), relating primarily to clean natural subsoil and topsoil required as capping in the 600mm landscaping zones. The approximate volume of imported soils for use in these zones will be of the order of 2,000m³ divided between a mixture of discrete landscaping planters and larger more formal landscaping zones (such as the public realm space between Plots NT03 & 04) across the site.

Re-use of materials on site shall be subject to the provisions of a materials management plan (MMP).

7.12 Off-site disposal

It is likely that excess soils or soils unsuitable to remain on site (including landfill waste material within the vicinity of TP214 and soils heavily impacted by VOC contamination within the southern portion of NT02 and southwester portion of NT03) will be generated during the development.

Where this occurs, chemical testing to inform waste classification of the material may be undertaken although chemical test data is already available from the RoC site investigation, and this includes data from waste acceptance criteria (WAC) testing.

Waste soils will be taken to an appropriately licensed treatment or disposal facility and transported by an appropriately licensed carrier. Duty of care information to demonstrate this will be collected and maintained on site for inspection.

8 REQUIREMENTS FOR REMEDIATION VERIFICATION

8.1 Introduction

This section identifies the proposed form of verification and reporting that will be undertaken to demonstrate that the mitigation measures that are considered necessary have been implemented on site.

8.2 Site records

Site records will be maintained so that sufficient data are available for the purpose of compiling a robust verification report. In addition, where any contamination is being further investigated or where any proposed mitigation is required, details of this will be retained for inclusion in the site health and safety file as previously discussed. Records of any environmental monitoring (for asbestos, dust etc.) undertaken during the remediation programme shall also be retained so they can be included in the final verification report.

Chemical test data and visual confirmation of suitability will be recorded prior to confirming the imported soils as being suitable. As detailed in earlier sections of this RS, verification records of the remedial works will be collated in a verification report on completion of all site-works.

A record of all soil imports to site for will be maintained. This will include:

- Certificates of quality - material imported under the WRAP protocol will be accompanied by certificates of conformity that are less than two months old and relating to the material being imported.
- Invoices and lorry tickets – importation tickets should be completed in full and legible so the origin of the soil can be traced to the specific donor site.
- Chemical test data – all data obtained from the donor site or from site initiated chemical testing.
- Storage – the location of temporary storage or quarantine areas will be identified, and plans/photographs retained to show where the position and movement of stockpile at the site.
- Verification reports – reports that are generated following visits for the purpose of verification will be retained on site.

It is recommended that gas membrane specification data sheets be provided to the environmental consultant for comment prior to installation of the membrane on site. It is proposed that the principal contractor will undertake installation of the membrane and provide both the Site Manager and the environmental consultant with photographic evidence of the membrane installation to demonstrate that the level of workmanship is in accordance with the manufacturers specification.

The environmental consultant shall undertake 'spot checks' of the membrane installation at a frequency not less than 1 per Plot to verify the records provided by the contractor and confirm that the level of workmanship is to an acceptable standard.

8.3 Soil Sampling frequency

The type and frequency of confirmatory soil analysis will be in line with that in **Table 9**. Where appropriate chemical test data is not available, additional sampling will be undertaken once the material is received at site.

Imported soil material will either be quarantined in a temporary storage area where its use will await confirmation of chemical test data, or it will be placed directly into the final place of use. There is a risk that soils may need to be removed from site if the chemical test data shows it is not suitable. Any imported soils will be clearly demarked as awaiting clearance until suitable data confirms its acceptance.

Material arriving at the site will be visually assessed for suitability before it is either placed in quarantine or directly in the final location.

Table 9: Sampling and Testing Requirements

	Number of samples*	Testing schedule
Natural imported top soil (for use within below 600 mm clean cover system)	Minimum 3, or 1 per 200 m ³ (whichever is the greater)	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation), asbestos
Brownfield/screened soils (for use as general fill across the site or below any 600 mm landscape cover system)	Minimum 3 or 1 per 200 m ³ (whichever is the greater)	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation), SVOC, VOC, TPH (CWG banded), asbestos and any additional analysis depending on the history of the donor site
First generation i.e. quarried sand or stone to be used in subsoil/breaker layer	No testing required. Certification of material source is required.	
Recycled Stone (6F2 or similar, for use as general fill across the site or below any 600 mm landscape cover system)	Minimum 3 or 1 per 200 m ³ (whichever is the greater)	As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn, PAH (16 USEPA speciation), TPH (CWG banded), asbestos and any additional analysis depending on the history of the donor site

*Sample frequencies stated are based on requirements from Manchester City Council document "Planning & Contaminated Land Technical Guidance" (2021), Section 6.3, Table 2

In addition to assessing the chemical suitability of the imported material, measurements of the subsoil and topsoil thickness will also be confirmed by a third party. At least two verification locations will be selected in each area where soft landscaping is proposed, and the relevant measurements recorded; photographic evidence will also be obtained.

A drawing showing the layout of the buildings' footprints, the hard surfaced areas and the soft landscaping areas, together with the locations where the soils in the landscaped areas have been removed and replaced by imported material will be documented in the verification report.

8.4 Remedial criteria

As the proposed development is to comprise commercial units at ground level, with high rise residential units above, with external area predominantly surfaced with hardstanding and some communal soft landscaping, the remedial criteria for material reuse as general fill have typically been derived from RSK's GAC designed to be protective human health for a commercial end use (see **Table 10**). This approach has been discussed and agreed with Manchester City Council contaminated land department (a copy of the associated correspondence for which is provided within Appendix I.

Across Plots NT02 & NT03 testing of and screening for Trichloroethene (TCE), Carbon tetrachloride, Cis and trans-1,2-dichloroethene and Vinyl chloride will also be required on all site-won fill material to be used below buildings, hard stand or landscaped zones in accordance with the RTV values outlined in the DQRA (as noted in **Table 7**, in **Section 5**).

A copy of the proposed remedial criteria for site won material is described further in **Section 8.4.1** and **Table 10** below.

8.4.1 Re-use of material as general fill

The criteria in **Table 10** will be applicable to soils used as general engineered backfill to achieve final development contours but placed >600 mm below the final restoration level in soft cover areas or below hard surfacing (buildings, hardstanding etc.). The remedial criteria are based on the vapour inhalation pathway from GAC provided in **Appendix E**.

Table 10: Criteria for re-use of material as general fill beneath buildings & hardstanding

Compound	SSTL for Soil		
	SOM 1% (mg/kg)	SOM 2.5% (mg/kg)	SOM 6% (mg/kg)
Semi-volatile organic compounds			
Naphthalene	1,800	3,900	7,800
Trichloroethene (TCE)*	0.224	0.224	0.224
Carbon tetrachloride *	0.116	0.116	0.116
BTEX			
Benzene	27	50	98
Toluene	56,000	107,000	184,000
Ethylbenzene	6,000	13,000	27,000
Xylene - m	6,200	14,100	31,200
Xylene - o	6,600	15,000	33,000
Xylene - p	5,900	13,600	30,000
Total xylene	5,900	13,600	30,000

Compound	SSTL for Soil		
	SOM 1% (mg/kg)	SOM 2.5% (mg/kg)	SOM 6% (mg/kg)
Total Petroleum Hydrocarbons			
Aliphatic hydrocarbons (C ₅ -C ₆)	3,200	5,900	12,100
Aliphatic hydrocarbons (>C ₆ -C ₈)	7,800	17,400	39,600
Aliphatic hydrocarbons (>C ₈ -C ₁₀)	2,000	4,800	11,300
Aliphatic hydrocarbons (>C ₁₀ -C ₁₂)	9,700	22,900	47,300
Aliphatic hydrocarbons (>C ₁₂ -C ₁₆)	59,000	82,000	90,000
Aliphatic hydrocarbons (>C ₁₆ -C ₃₅)	-	-	-
Aliphatic hydrocarbons (>C ₃₅ -C ₄₄)	-	-	-
Aromatic hydrocarbons (>C ₈ -C ₁₀)	3,500	8,100	17,000
Aromatic hydrocarbons (>C ₁₀ -C ₁₂)	16,000	28,000	34,000
Aromatic hydrocarbons (>C ₁₂ -C ₁₆)	36,000	37,000	34,000
Aromatic hydrocarbons (>C ₁₆ -C ₂₁)	-	-	-
Aromatic hydrocarbons (>C ₂₁ -C ₃₅)	-	-	-
Aromatic hydrocarbons (>C ₃₅ -C ₄₄)	-	-	-

* Screening and testing required for protection of controlled waters for soils being left in situ beneath plots NT02 and NT03

By design, placement of soil >600 mm below the final restoration level in soft cover areas or below hard surfacing (buildings, hardstanding etc.) is sufficient to protect end-users from direct contact with soil contaminants. Thus, a remedial criterion for asbestos in soil is not applicable to soils destined for re-use as general fill.

8.4.2 Within 600 mm of soft landscaping cover level

A clean imported natural soil cover system is required for landscaping areas situated within made ground across the site. The cover system shall be a minimum of 600 mm thick and comprise a 150 mm minimum thickness of topsoil, overlying 450 mm of sub soil. A Terram marker layer should be placed between the cover system and any underlying made ground.

Given the longstanding history of the site and the fact that no significant deep excavations are proposed, it is likely that the quantity of clean natural site won material for use as clean cover will be limited. As such, it will be necessary to import clean natural sub and topsoil will be required to make up the clean cover area, provided it is tested and complies with the criteria set out in **Appendix E**. Imported sub and topsoil for use in landscaping should be from commercial merchants only and should not be sourced via CL:AIRE DoW CoP or other associated site to site material transfer protocols.

Where undisturbed (i.e., in situ) natural soil is present within 600 mm of the final surface of soft landscaping then as long as they comply with the criteria set out in **Appendix E** a Terram marker is not required.

The balance of material making up the level (be it site won natural re-used soils, or imported subsoil, and topsoil) should be compliant with the criteria in **Appendix E**. In addition, topsoil acceptability is subject to analyses and subsequent declaration as acceptable as multipurpose topsoil in accordance with the provisions of BS3882: 2015. Values indicated in **Appendix E** are based on RSK GAC values for soil placement under a "residential without home grown produce" end use scenario.

The following remedial criteria apply as the maximum concentrations allowable for cover system soils placed within areas of soft landscaping within 600 mm of the final ground level.

8.4.3 Site Validation Reporting Requirements

It will be necessary to produce a Phase 3b Site Validation report upon completion of site construction works. This report should include evidence of the completion of all remedial objectives as well as supporting site records, testing information, photographs etc. Gas membrane specification sheets and evidence of Asbestos mitigation and monitoring measures should also be provided for inclusion within this report.

Details of any additional remedial requirements (arising as a result of unexpected sources of contamination being discovered during site works), or deviations from the current strategy should also be provide for inclusion with this report.

The report will be required to be submitted to the Local Planning Authority (Manchester City Council) in order to discharge the associated pre-occupation planning conditions attached to the consent. As such it is essential construction contractors provide information required to collate the Validation Report in advanced on practical completion so that these final planning obligations can be resolved.

This is of particular importance where earthworks or enabling works may be phased or completed by different contractors. In such instance it is the responsibility of each contractor to record evidence of all aspects of the above testing and validation works, to be presented as a stand-alone report for incorporation into the "final" Phase 3b Site validation report for the entire site. Copies of all drawings, photographs, material movement records and chemical validation testing should be provided both bound in a PDF report and also as individual files and documents to the consultants preparing the final Phase 3b report for ease of inclusion.

8.4.4 Recommendations for further works

The current remediation strategy has been collared to provide details and specifications for the treatment and management of soil, groundwater and ground gas issues across the site. It should be provided to the local planning authority and Environment Agency for consideration and to support the discharge of associated pre-commencement planning conditions (with any comments fed back to RSK Geosciences for review and response).

Given the specialist nature of aspects of the remediation works it would be prudent to engage with remediation specialists to further develop the practical aspects of soil and groundwater treatment works.

This assessment may require the further sampling and testing of site soils and groundwater to confirm the remediation design and should be presented as a detailed design for the treatment works within a Remediation Method Statement. Input from the Principal Contractors into this design process would also be prudent so that the requirements for remediation works can be captured in the overall construction phase plan.

This Remediation Method Statement should be provided to the aforementioned regulatory authorities for review and to support the remaining pre-commencement conditions relating to ground contamination. Due consideration of any proposed site phasing, demolition or enabling works should also be considered and its implications discussed within the Remediation Method Statement.

A piling risk assessment should also be completed for the development in accordance with Environmental Agency guidance at such a time when the pile design, depth and extents are known. This assessment should consider the proposed remediation works and consider any potential interactions or implications of piling works on the overall effectiveness of soil and groundwater treatment methods.

As previously discussed in **Section 7.10**, the ongoing monitoring and sampling of retained groundwater monitoring wells should be continued to increase the baseline understanding of the hydrogeological regime beneath the site with any wells no longer required treated and removed in accordance with EA guidance. The monitoring program should remain as outlined in this strategy until such time as the remediation contractor is appointed, owing to the fact they may wish to amend or adjust sampling or groundwater level logging requirements.

9 REFERENCES

Model Procedures for the Management of Land Contamination. Contaminated Land Report 11 (CLR 11). Published by DEFRA and the Environment Agency, September 2004.

British Standards Institution (2013), BS8576:2013. Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs)

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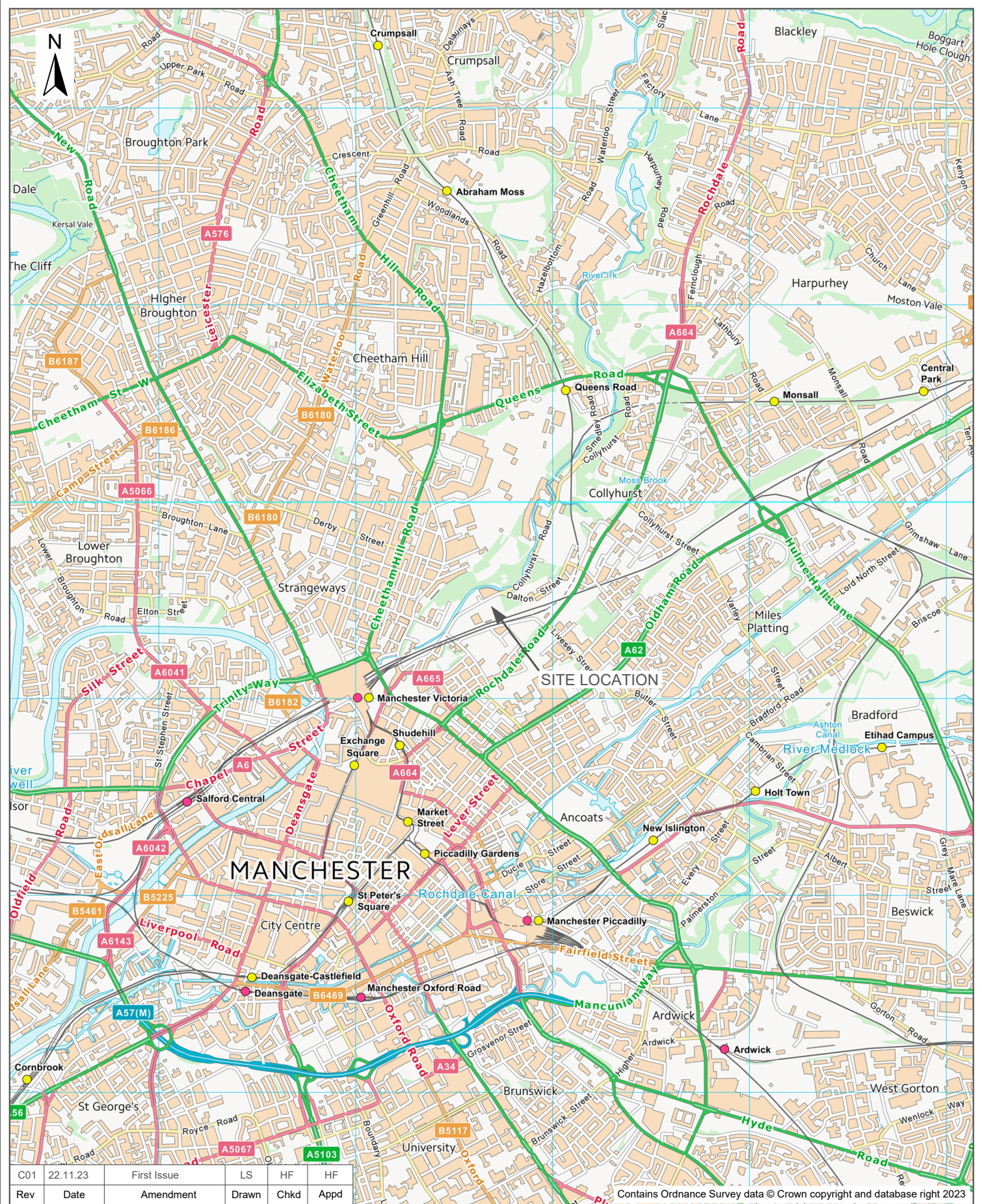
BS3882: 2015. Specification for topsoil and requirements for use. British Standards Institution, 2007

Ministry of Housing, Communities and Local Government (2023), *National Planning Policy Framework*, September 2023.

Part IIA of the Environmental Protection Act (Contaminated Land Regulations (England) 2002 (London: HMSO).

Land Contamination Risk Management (LCRM) - How to assess and manage the risks from Land Contamination, Env Agency, Oct 2020.

FIGURES



C01	22.11.23	First Issue	LS	HF	HF
Rev	Date	Amendment	Drawn	Chkd	Appd

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Client

Far East International Consortium

Project Name

Plots NT02, NT03, NT04 - Northern Gateway

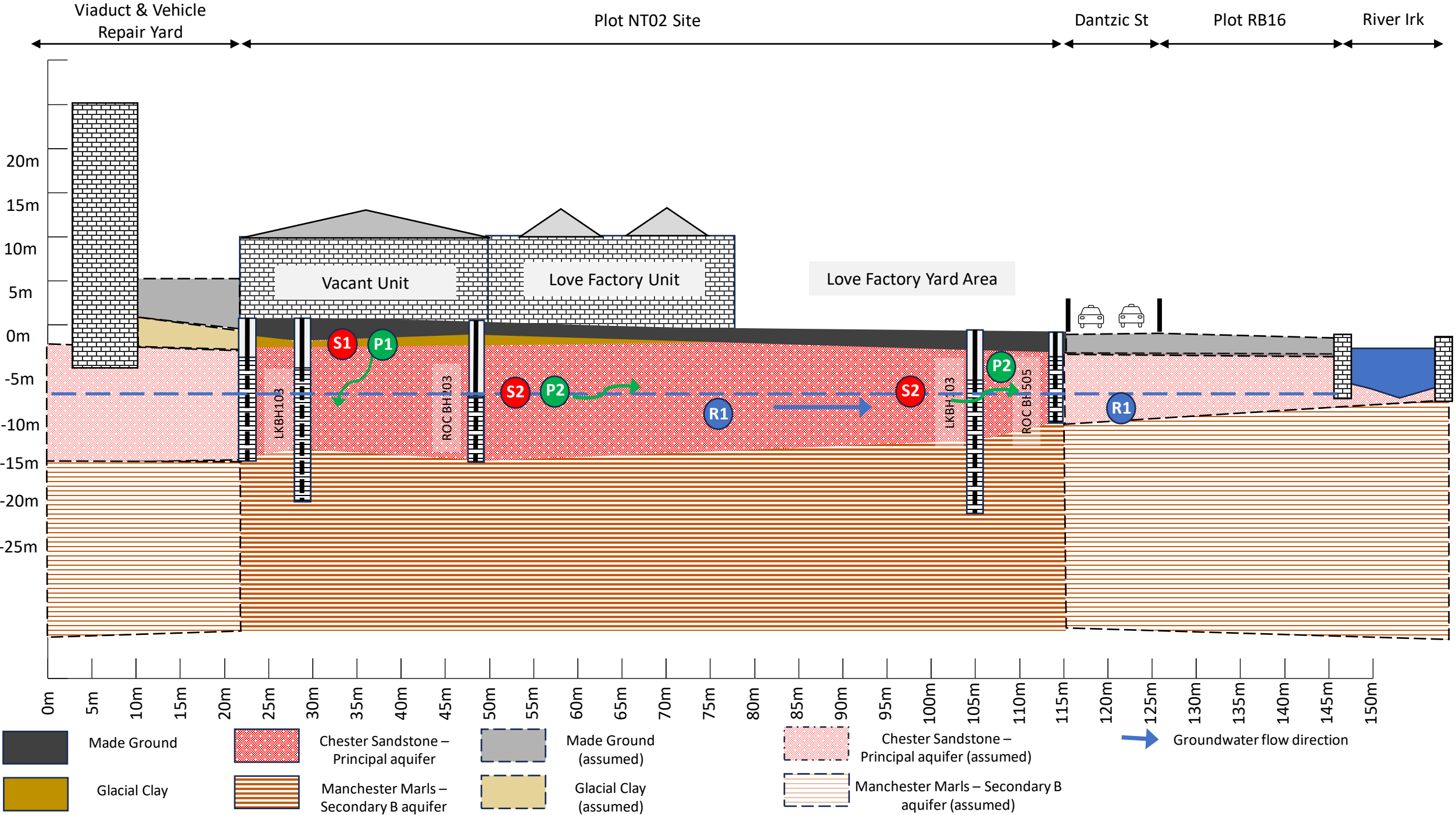
Description

Site Location Plan

Dimension	Size	Scale	Geolocation	Project ID	Drawing no.	Rev	File name
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FIGURE 1 SITE LOCATION PLAN



Sources

- S1

Chlorinated VOC including TCE in unsaturated soils
- S2

Chlorinated VOC including TCE and daughter products (DCE, VC) in dissolved phase in the Chester Sandstone

Pathways

- P1

Leaching / remobilisation of contamination from unsaturated soils
- P2

Lateral migration of dissolved phase contamination within the Chester Sandstone (CHES)

Receptors

- R1

Groundwater within the Chester Sandstone – Principal aquifer

Complete / Potentially Complete Pollution Linkages

- On-site chlorinated VOC including TCE contamination in unsaturated soils from historic bolt works – Principal aquifer via leaching/remobilization of contamination
- On-site dissolved phase chlorinated VOC plume including TCE and daughter products (DCE, VC) – Wider principal and secondary aquifers via vertical and lateral migration of dissolved phase

FIGURE 2 CSM CROSS SECTION

APPENDICES

APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for RSK Environment Limited (RSK) for RoC Consulting (the "Client") in accordance with the terms of a contract [RSK Environment Standard Terms and Conditions] between RSK and the Client. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas, persistent, bioaccumulative or toxic chemicals (including PFAS and related compounds) or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):

- a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.
- b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.
- c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.
11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.
12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

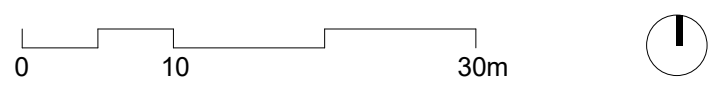
APPENDIX B

PROPOSED DEVELOPMENT DRAWING



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Do not scale from this drawing. Verify all dimensions on site. Drawing should be read in conjunction with information from all other design consultants and contractors. All drawings in digital format are for reference only, paper copies are available on request.



- Legend**
- Application boundary
 - Land owned or controlled by the applicant

P10.01	S0-Initial Status
P09.04	S0-Initial Status
P09.01	S0-Initial Status
P08.01	S0-Initial Status
P07.04	S0-Initial Status
Rev	Details

02/06/2023	Date
13/04/2023	Date
31/03/2023	Date
16/03/2023	Date
14/03/2023	Date

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Project
Red Bank NT04

Sheet Name
Site Plan

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The Netherlands
+31(0)10 443 96 60

Status
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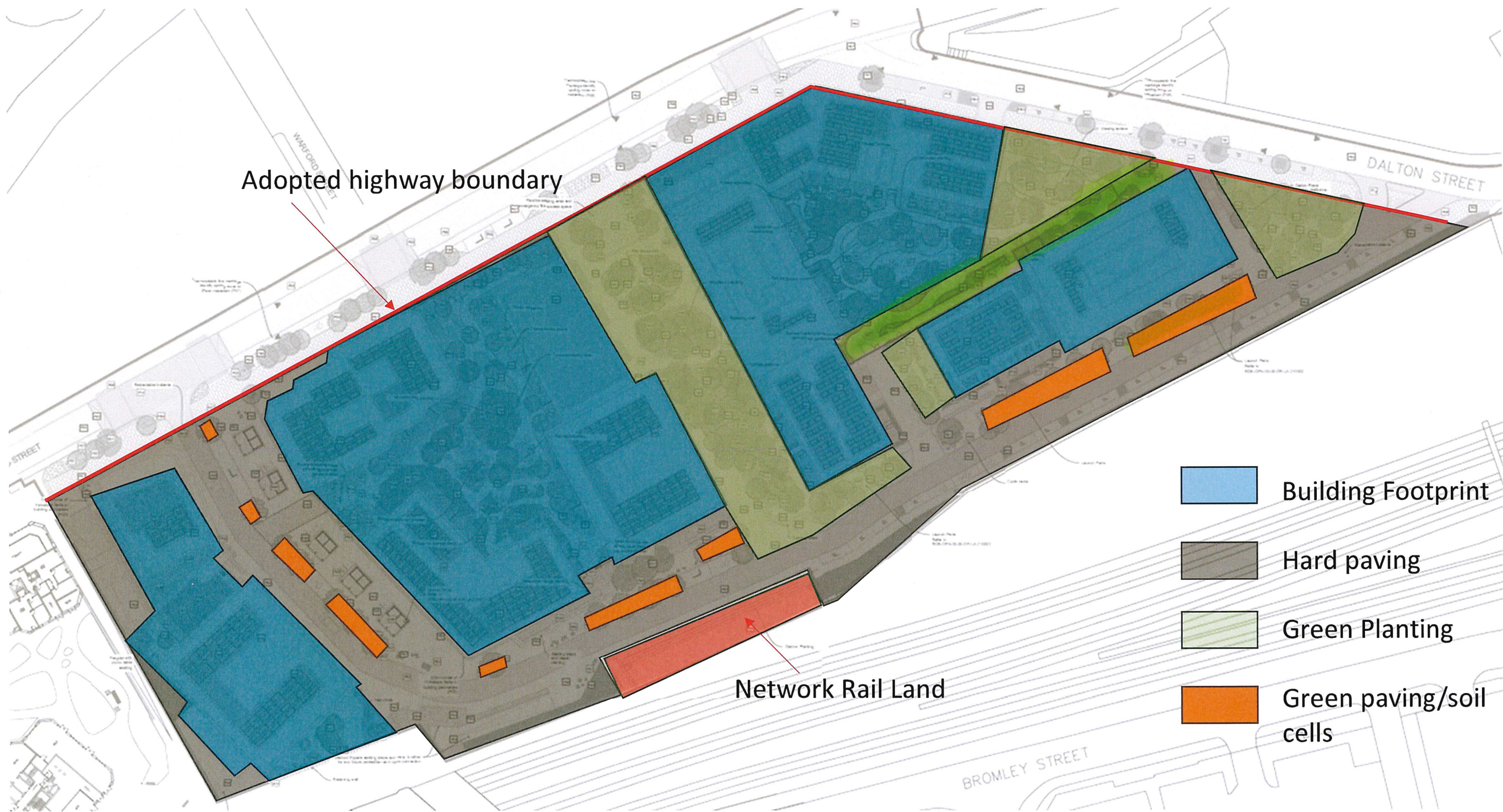
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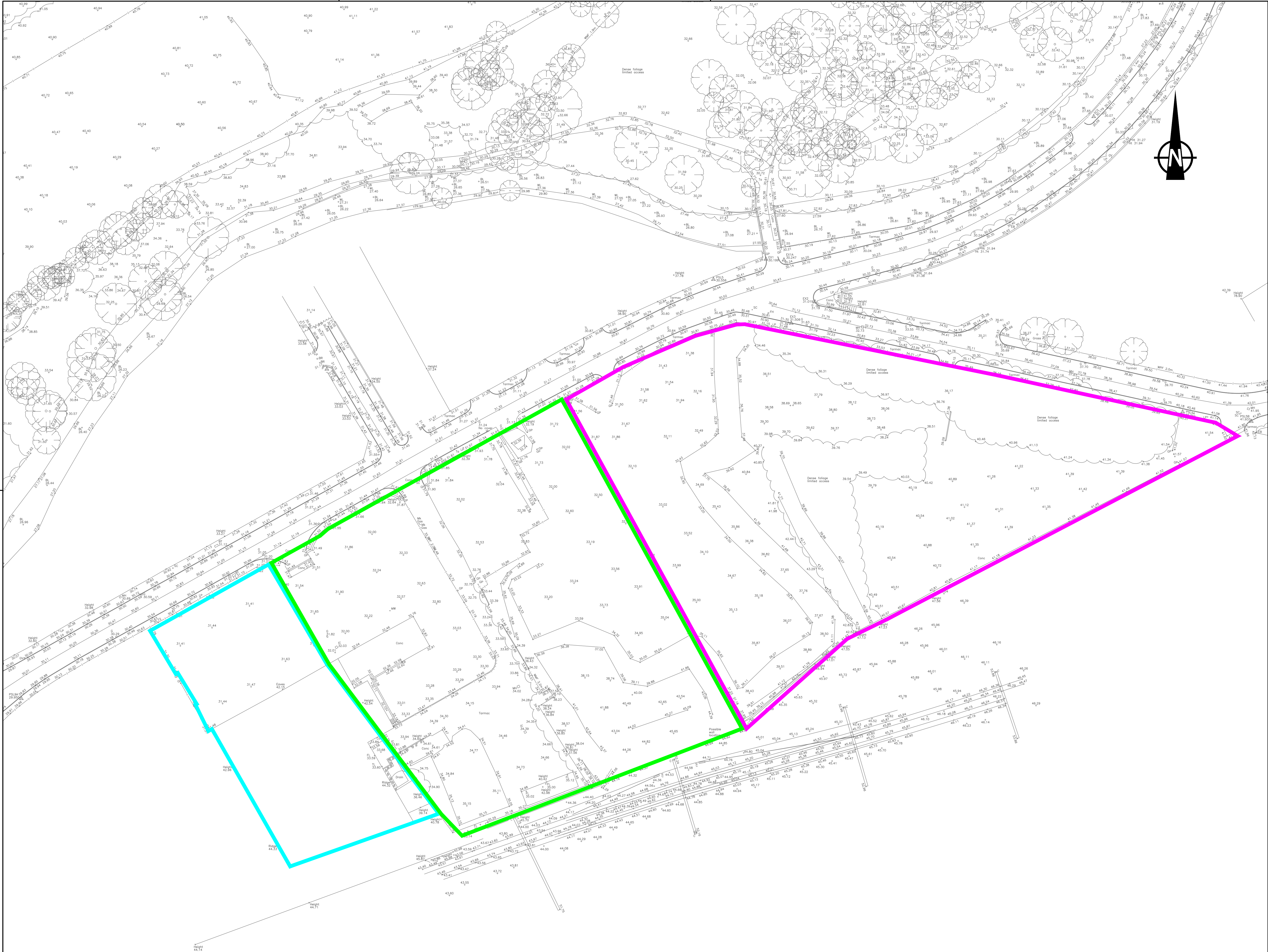
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APPENDIX C

SITE INVESTIGATION PLANS – ROC



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NOTES

SITE FEATURES

RIVER IRK

APPROX PLOT NTO2 BOUNDARY

APPROX PLOT NTO3 BOUNDARY

APPROX PLOT NTO4 BOUNDARY

DRAWING NOTES

- TO BE READ IN CONJUNCTION WITH ROC CONSULTING PHASE 1 DESKTOP STUDY REF: 4328-ROC-ZZ-XX-RP-ES-PH10TS AND PHASE 2 SITE INVESTIGATION REPORT REF: 4328-ROC-ZZ-XX-RP-ES-P2-101.
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FAR EAST CONSORTIUM INTERNATIONAL LTD				
PROJECT TITLE				
PLOTS NTO2, NTO3 & NTO4 NORTHERN GATEWAY				
DRAWING TITLE				
SITE LOCATION PLAN				
DRAWING No. 4328-ROC-ZZ-XX-DR-ES-ES200				REV. 01

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- LK RBHX LK CONSULT ROTARY BOREHOLE
- ROC RBH2XX ROC 2022 ROTARY BOREHOLE WITH INSTALL
- ROC WS2XX ROC 2022 WINDOW SAMPLE BOREHOLE WITH INSTALL
- ROC WS2XX ROC 2022 WINDOW SAMPLE BOREHOLE
- ROC TP2XX ROC 2022 TRIAL PIT
- ROC RBH3XX ROC 2023 ROTARY BOREHOLE (ENVIRONMENTAL OR COMBINED) WITH INSTALL
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- ROC WS3XX ROC 2023 WINDOW SAMPLE BOREHOLE
- ROC TP3XX ROC 2023 TRIAL PIT
- ROC SS3XX ROC 2023 SURFACE WATER SAMPLE
- ROC HP3XX ROC 2023 MOUND HANDPIT
- ROC RBH4XX ROC 2023 NR MOUND BOREHOLE
- ROC RBH5XX ROC 2023 ADDITIONAL TCE BOREHOLES

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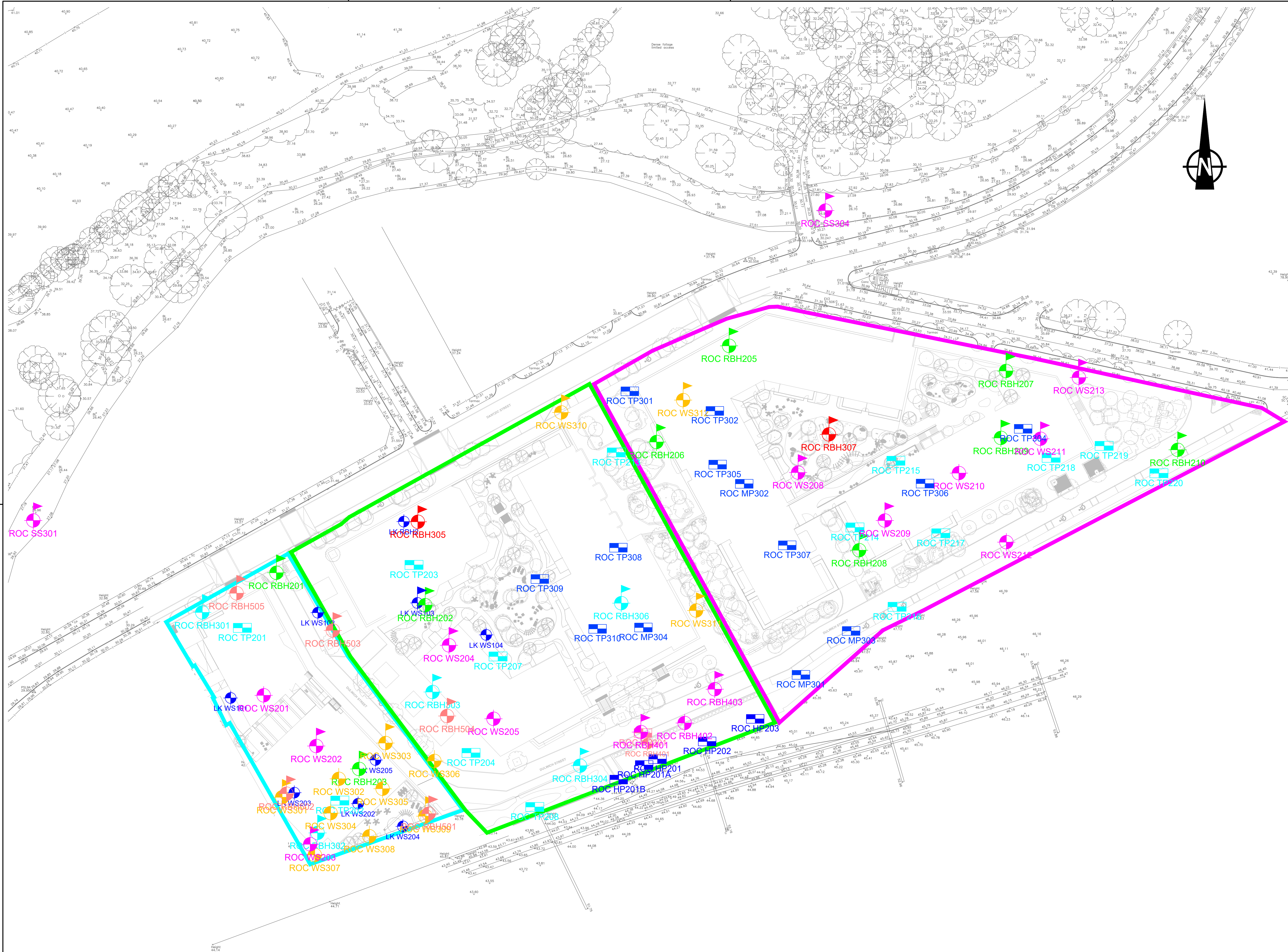
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HOLE LOCATIONS**

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PROJECT TITLE

PLOTS NTO2, NTO3 & NTO4 NORTHERN GATEWAY

DRAWING TITLE

ALL EXPLORATORY HOLE LOCATIONS MASTERPLAN OVERLAY

DRAWING No.	REV.
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- ROC RBH3XX ROC 2023 ROTARY BOREHOLE (ENVIRONMENTAL OR COMBINED)
- ROC RBH3XX ROC 2023 ROTARY BOREHOLE (GEOTECHNICAL ONLY)
- ROC WS3XX ROC 2023 WINDOW SAMPLE BOREHOLE
- ROC TP3XX ROC 2023 TRIAL PIT
- ROC HP301 ROC 2023 HAND PIT (MOUND)
- ROC RBH4XX ROC 2023 NR MOUND BOREHOLE
- ROC RBH5XX ROC 2023 ADDITIONAL TCE BOREHOLES
- SOIL ASSESSMENT AREA 1
- SOIL ASSESSMENT AREA 2
- SOIL ASSESSMENT AREA 3
- SOIL ASSESSMENT AREA 4
- SOIL ASSESSMENT AREA 5

DRAWING NOTES

- TO BE READ IN CONJUNCTION WITH ROC CONSULTING PHASE 1 DESKTOP STUDY REF: 4328-ROC-ZZ-XX-RP-ES-PH1-DTS AND PHASE 2 SITE INVESTIGATION REPORT REF: 4328-ROC-ZZ-XX-RP-ES-P2-101.
- EXPLORATORY HOLE LOCATIONS SHOWN AT APPROXIMATE EXTENTS.
- EXISTING SITE LEVEL INFORMATION TAKEN FROM PARAGON SURVEYS TOPOGRAPHICAL SURVEY REF: PS-2158-TS-00
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02	NOV 23	ADDITIONAL BH'S ADDED	IF	RM
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DRAWN RM	DATE JUN 23	SCALES 1:500
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PROJECT TITLE

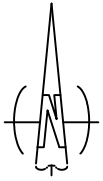
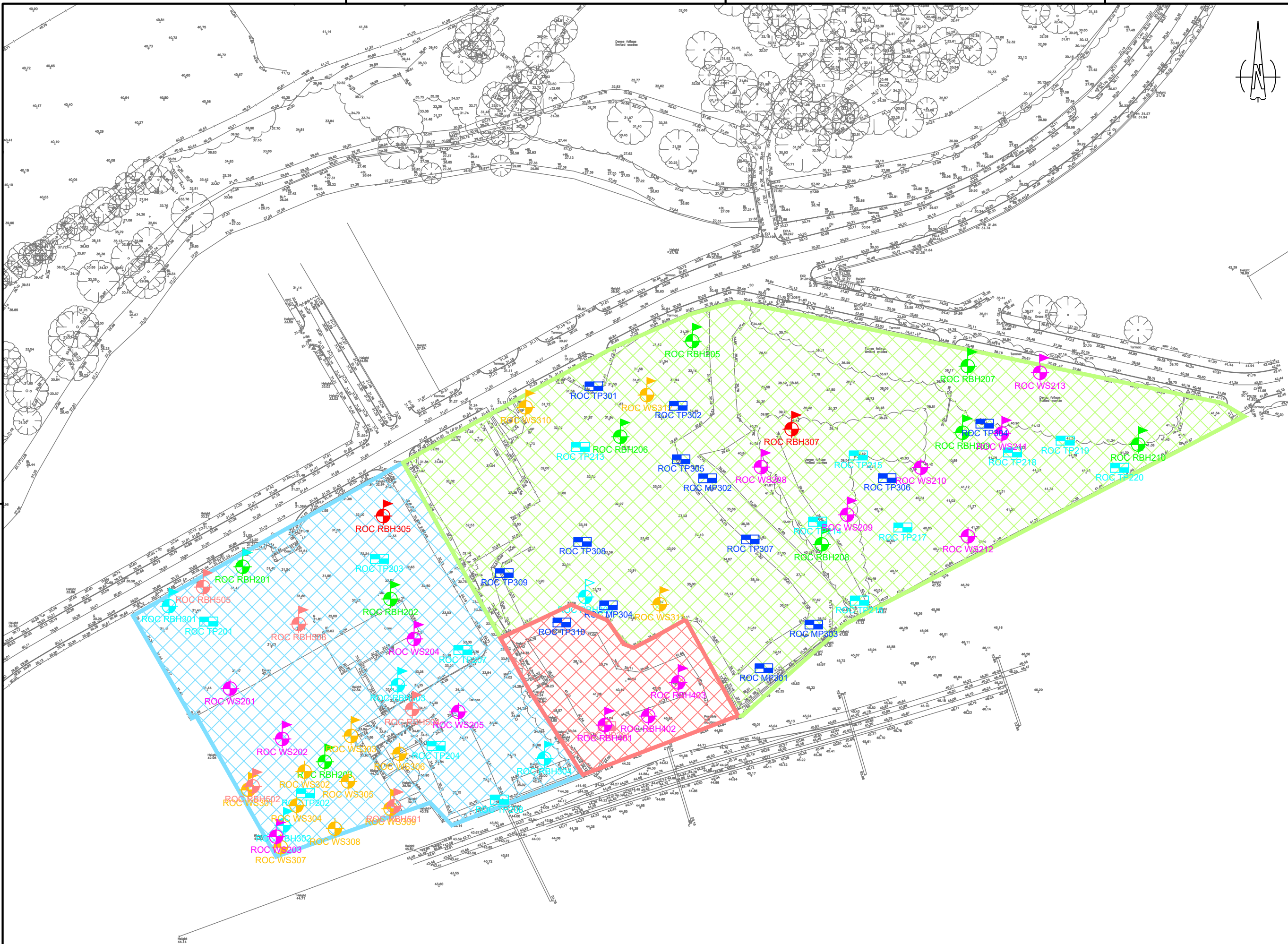
PLOTS NTO2, NTO3 & NTO4 NORTHERN GATEWAY

DRAWING TITLE

SOI. ASSESSMENT AREAS AND GRADING

DRAWING No. 4328-ROC-ZZ-XX-DR-ES-ES207	REV. 02
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NOTES

- ROC RBH5XX ROC 2023 TCE INVESTIGATION BOREHOLE
- ROC RBH4XX ROC 2023 NR MOUND BOREHOLE
- ROC RBH3XX ROC 2023 ROTARY BOREHOLE (ENVIRONMENTAL OR COMBINED)
- ROC RBH3XX ROC 2023 ROTARY BOREHOLE (GEOTECHNICAL ONLY)
- ROC RBH3XX ROC 2023 WINDOW SAMPLE BOREHOLE
- ROC TP3XX ROC 2023 TRIAL PIT
- ROC HP3XX ROC 2023 HAND PIT (MOUND)
- ROC RBH2XX ROC 2022 ROTARY BOREHOLE
- ROC RBH2XX ROC 2022 WINDOW SAMPLE BOREHOLE
- ROC TP2XX ROC 2022 TRIAL PIT
- LK WSX LK AS DUG WINDOW SAMPLE BOREHOLE
- LK RBHX LK CONSULT AS DUG ROTARY BOREHOLE

SITE FEATURES

- SCREENED FOR GAC VALUES "RESIDENTIAL WITHOUT PLANT UPTAKE"
- SCREENED FOR GAC VALUES "COMMERCIAL/INDUSTRIAL" TO SUIT RETAINING WALL END USE
- SCREENED FOR GAC VALUES "RESIDENTIAL WITHOUT PLANT UPTAKE" EXCEPT FOR CONTAMINANTS OF CONCERN WHICH ARE REPORTED IN THE PHASE 3A REMEDIATION STRATEGY COMPLETED BY RSK GEOSCIENCES

DRAWING NOTES

- TO BE READ IN CONJUNCTION WITH ROC CONSULTING PHASE 1 DESKTOP STUDY REF: 4328-ROC-ZZ-XX-RP-ES-PH1DTS AND PHASE 2 SITE INVESTIGATION REPORT REF: 4328-ROC-ZZ-XX-RP-ES-P2-101
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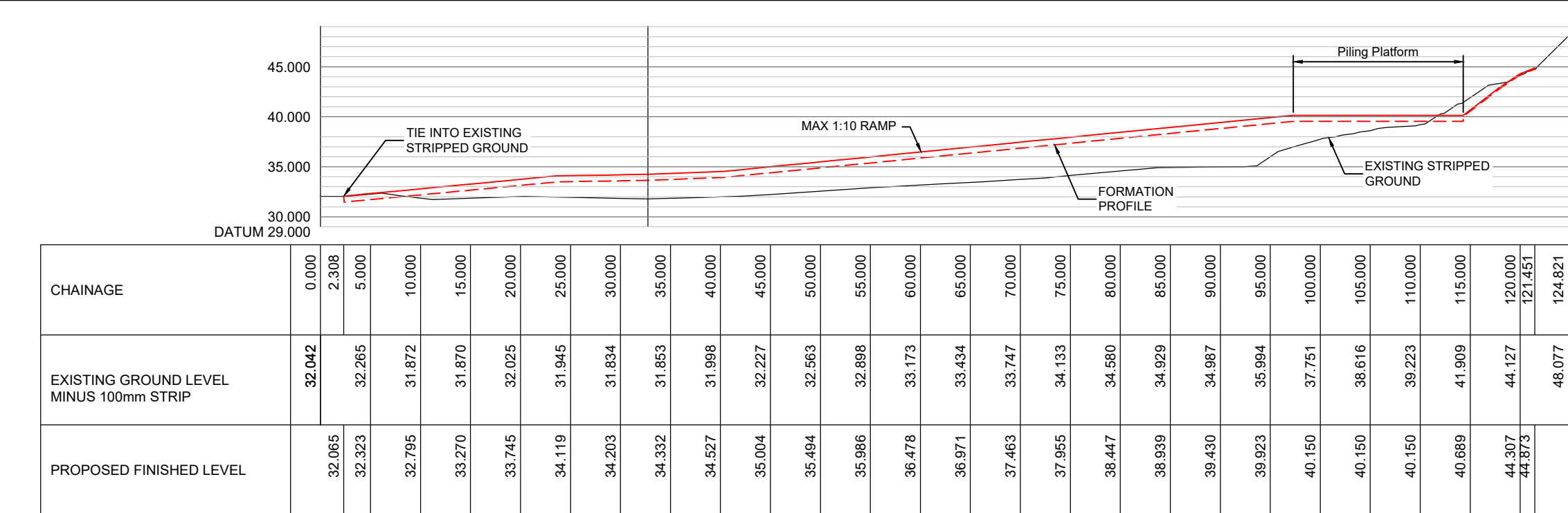
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PROJECT TITLE
PLOTS NTO2, NTO3 & NTO4 NORTHERN GATEWAY

DRAWING TITLE
SCREENING CRITERIA ZONES

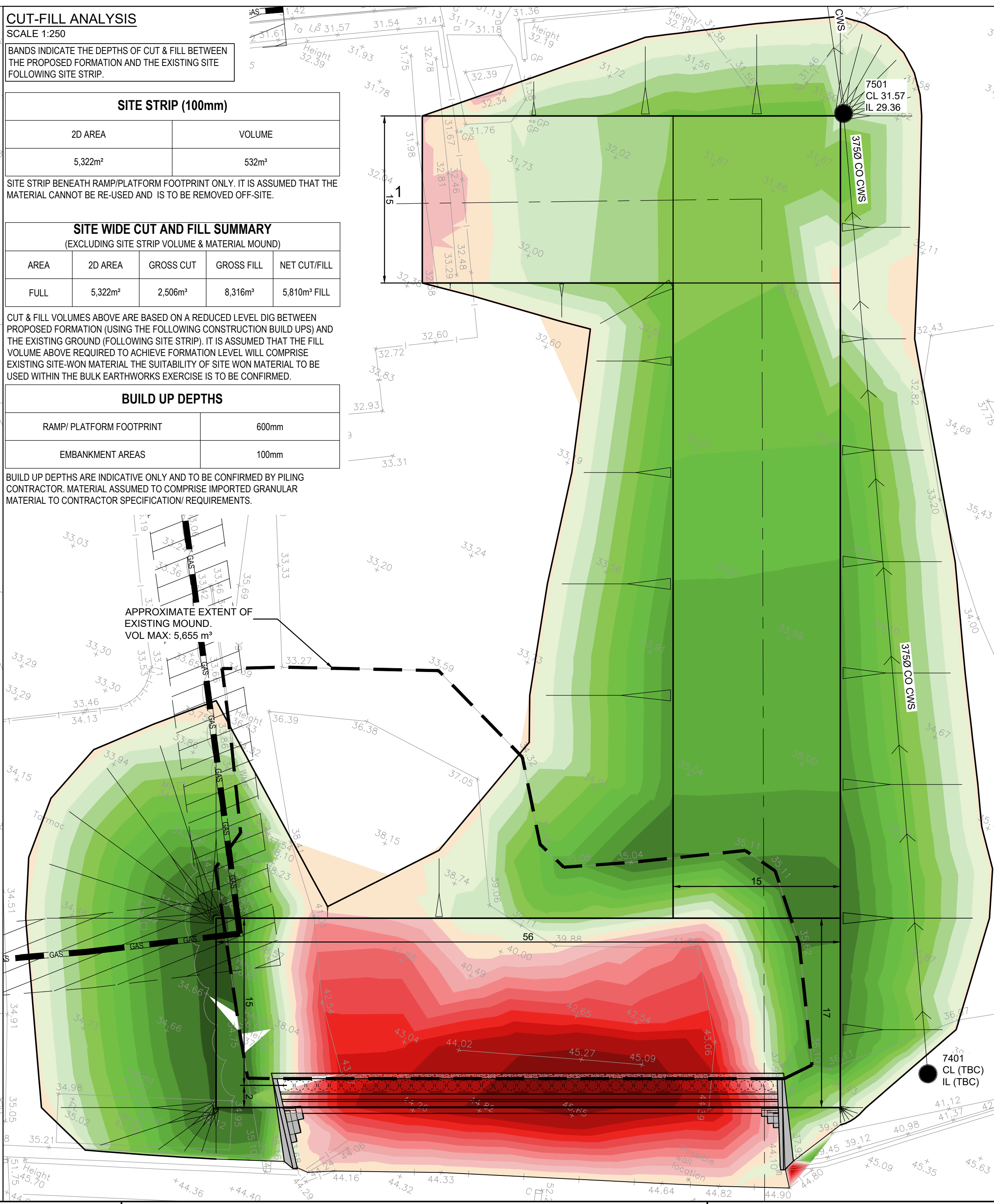
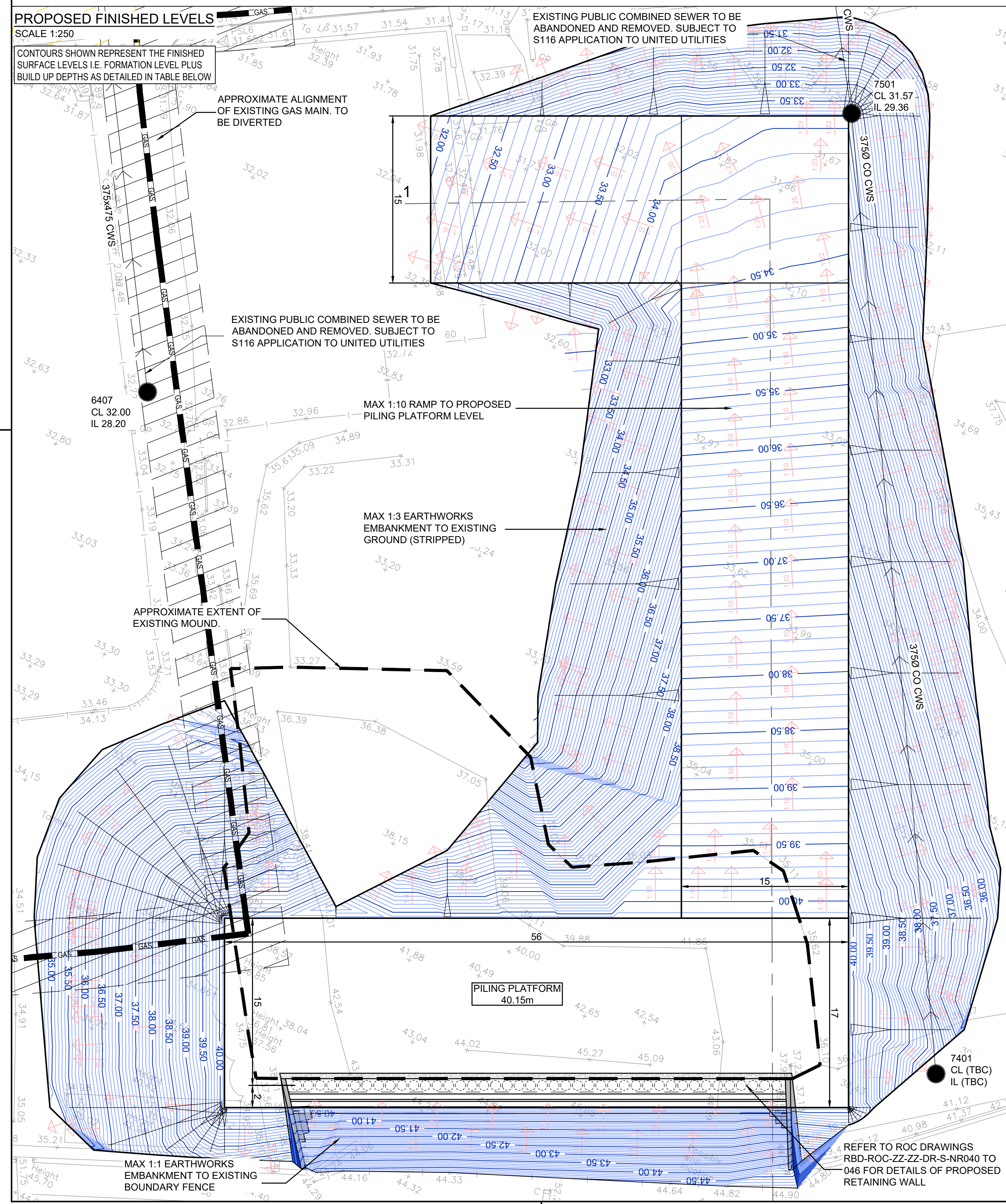
DRAWING No.	REV.
4328-ROC-ZZ-XX-DR-ES-ES212	01

APPENDIX D

EARTHWORKS DRAWINGS – ROC CONSULTING



1-1 RAMP/ PLATFORM LONG SECTION



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- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.

CUT / FILL BANDS

CUT	FILL
0.00 - 0.50m	0.00 - 0.50m
0.50 - 1.00m	0.50 - 1.00m
1.00 - 1.50m	1.00 - 1.50m
1.50 - 2.00m	1.50 - 2.00m
2.00 - 2.50m	2.00 - 2.50m
2.50 - 3.00m	2.50 - 3.00m
3.00 - 3.50m	3.00 - 3.50m
3.50 - 4.00m	3.50 - 4.00m
4.00 - 5.00m	4.00 - 5.00m
5.00 - 6.00m	5.00 - 6.00m

BANDS INDICATE THE DEPTHS OF CUT & FILL BETWEEN THE PROPOSED FORMATION AND THE EXISTING SITE FOLLOWING SITE STRIP.

THE SITE STRIP MATERIAL IS NOT CONSIDERED SUITABLE FOR RE-USE WITHIN THE BULK EARTHWORKS AND IS TO BE REMOVED FROM SITE.

THE SUITABILITY OF SITE WON MATERIAL TO BE USED WITHIN THE BULK EARTHWORKS EXERCISE IS TO BE CONFIRMED.

REV	DATE	DETAILS	ARJ	MN
P01	19.05.23	FIRST ISSUE	ARJ	MN

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STAGE 3

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Manchester M15 4PZ
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W rocconsulting.com

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CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE -DO NOT SCALE-
MN	MAY 23	

APPRVD.	DATE	EMAIL FOR DRAWINGS
MN	MAY 23	info@rocconsulting.com

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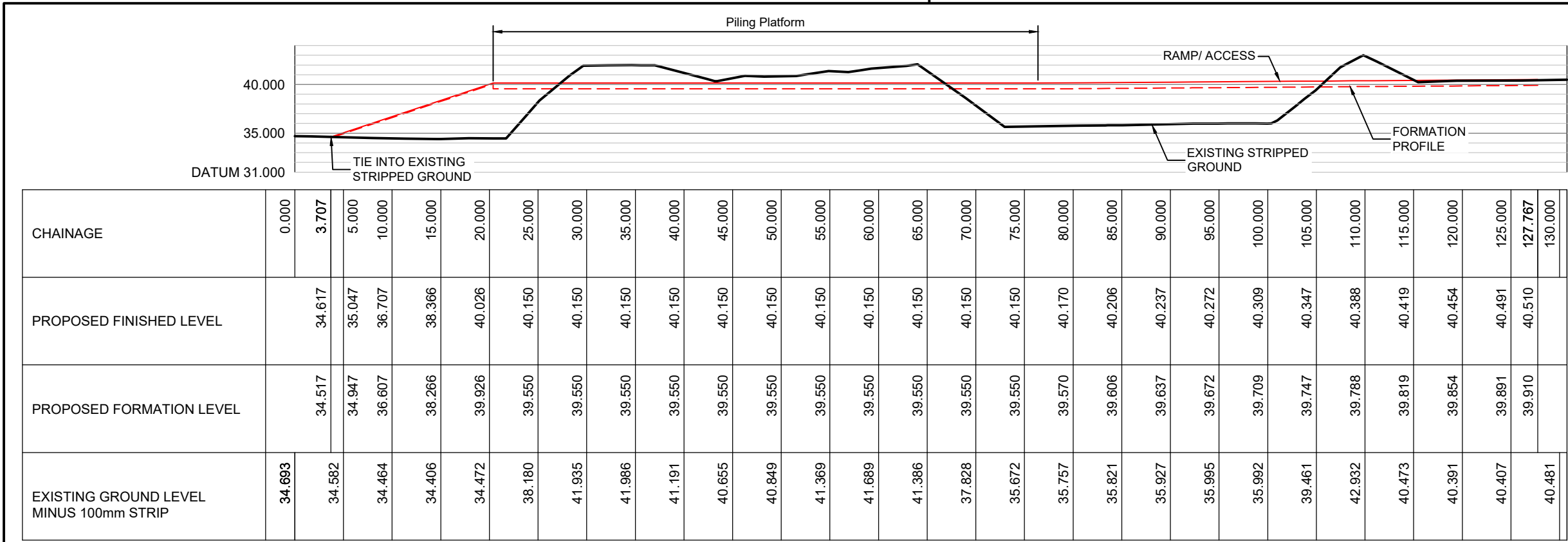
PLOTS NT02, NT03 & NT04 NORTHERN GATEWAY

DRAWING TITLE

NETWORK RAIL VIADUCT PILING PLATFORM OPTION 1 LEVEL & CUT-FILL ANALYSIS

DRAWING No.	REV.
RDB/ROC/ZZ/XX/DR/C/0610	P01

4328 © R&C Ltd.

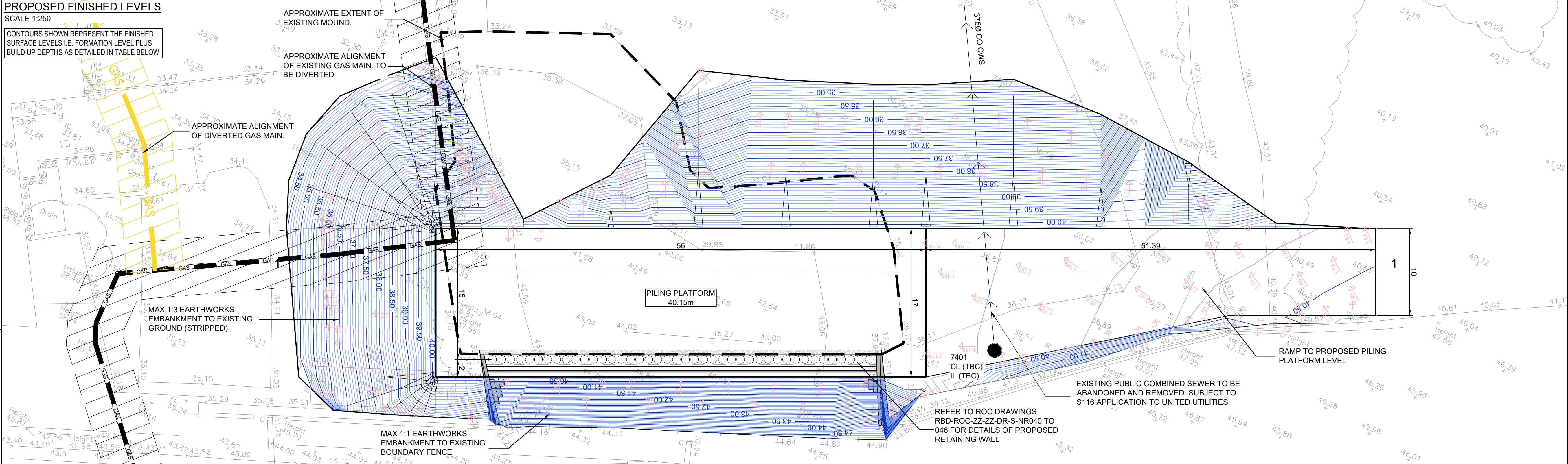


1-1 RAMP/ PLATFORM LONG SECTION

PROPOSED FINISHED LEVELS

SCALE 1:250

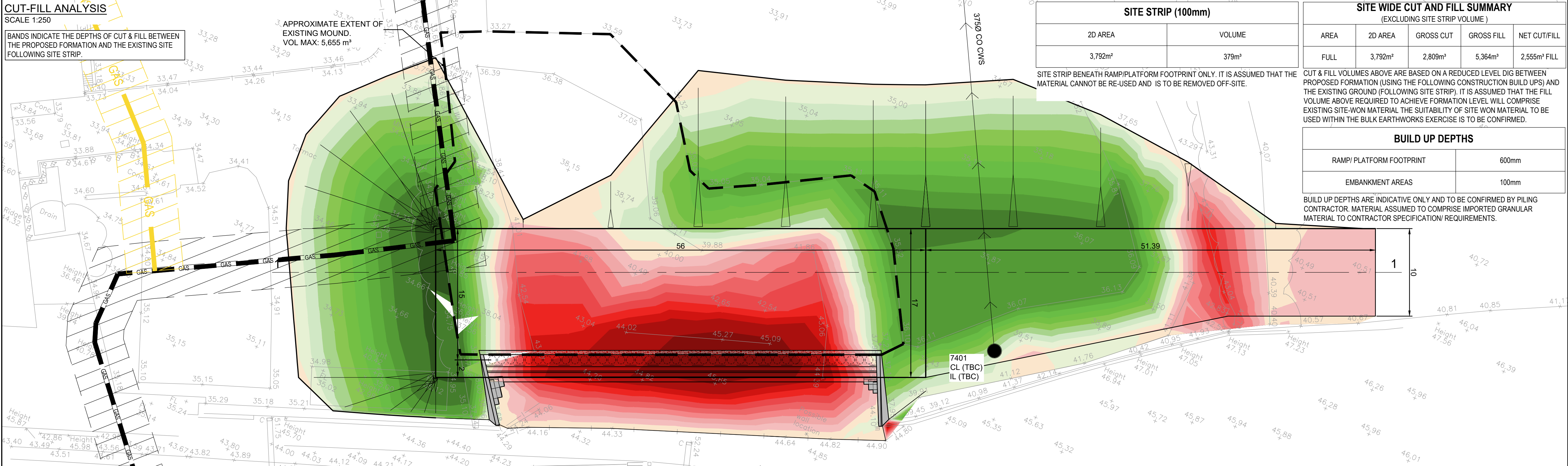
CONTOURS SHOWN REPRESENT THE FINISHED SURFACE LEVELS I.E. FORMATION LEVEL PLUS BUILD UP DEPTHS AS DETAILED IN TABLE BELOW



CUT-FILL ANALYSIS

SCALE 1:250

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CUT	FILL
0.00 - 0.50m	0.00 - 0.50m
0.50 - 1.00m	0.50 - 1.00m
1.00 - 1.50m	1.00 - 1.50m
1.50 - 2.00m	1.50 - 2.00m
2.00 - 2.50m	2.00 - 2.50m
2.50 - 3.00m	2.50 - 3.00m
3.00 - 3.50m	3.00 - 3.50m
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NORTHERN GATEWAY**

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**NETWORK RAIL VIADUCT
PILING PLATFORM OPTION 2
LEVEL & CUT-FILL ANALYSIS**
DRAWING No.
RDB/ROC/ZZ/XX/DR/C/0611
REV.
P01