

# Technical Note

|                       |                                                                                |                  |                  |
|-----------------------|--------------------------------------------------------------------------------|------------------|------------------|
| <b>Project:</b>       | P18-669 Llanwern – Phase 4B & 5D                                               |                  |                  |
| <b>Subject:</b>       | Phase 4B & 5D Controlled Waters Detailed Quantitative Risk Assessment Addendum |                  |                  |
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## 1 Introduction

### 1.1 General

Rodgers Leask Ltd (RLL) has been commissioned by Revantage Real Estate Ltd (Revantage) to develop a phase specific addendum Controlled Waters Detailed Quantitative Risk Assessment (CWDQRA) to assess the potential risk to Controlled Waters for Phase 4B & 5D of the Glan Llyn development at Llanwern, Newport (herein referred to as the Site).

In July 2024 the Client, St Modwen Developments were rebranded to be called Revantage Real Estate. Any reference to the previous company name in this report should be referred to accordingly.

### 1.2 Purpose

This report has been prepared to support the discharge of Planning Condition 27 of the Outline Planning Permission Reference 06/0471 for the proposed development of residential development Phase 4B & 5D as part of a wider mixed-use development at Llanwern, Newport.

Planning Condition 27 states the following.

*“(27) Prior to the commencement of each phase of development as defined by Condition 03 (or at such other date or stage in development or for such specified activities or works as may be agreed in writing with the Local Planning Authority), the following components of a scheme to deal with the risks associated with contamination relating to that phase or activity shall each be submitted to and approved, in writing, by the Local Planning Authority:*

- (1) A preliminary risk assessment which has identified:
  - (a) all previous uses;*
  - (b) potential contaminants associated with those uses;*
  - (c) a conceptual model of the site indicating sources, pathways and receptors;*
  - (d) potentially unacceptable risks arising from contamination at the site.**
- (2) A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.*
- (3) The site investigation results and the detailed risk assessment (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.*
- (4) A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in (3) are complete and identifying any requirements for longer term monitoring of pollutant linkages, maintenance and arrangements for contingency action. Any changes to these components require the express consent of the Local Planning Authority.*

*Reason: To ensure that the proposed development will not cause pollution of the environment or harm to human health."*

### **1.3 Objectives and Scope**

The objectives and scope of this report are to assess the soil chemical testing results obtained during previous ground investigations, within the Site, against the soil re-use criteria presented in H F Consulting's Soils Validation Strategy and to discuss the suitability of the soils for retention as part of the proposed remedial works.

### **1.4 Sources of Information**

The following documents have been reviewed in preparation of this technical note, and should be read in conjunction with it:

- RLL, Updated Controlled Waters Detailed Quantitative Risk Assessment, Glan Llyn, ref. 18669-RLE-19-RP-O-0006, dated June 2022
- RLL, Phase 4B & 5D Desk Study & Phase 2 Geo-Environmental Report, ref. 18669-RLL-22-XX-RP-O-0328 \_P03, dated June 2025.
- H F Consulting, Glan Llyn: Soils validation strategy for protection of controlled waters (30937 R2), dated December 2024.

## 2 Site Information

### 2.1 Site Setting

The Site is located within the Glan Llyn development at the former Llanwern Steelworks, approximately 4km to the east of Newport City Centre at approximate National Grid Reference 335990E, 186950N. The wider Glan Llyn development covers approximately 250 hectares and is proposed to be redeveloped for residential, commercial and open space use.

The eastern part of Phase 4B & 5D formed part of a separate contract managed by Vertase FLI and approved under planning application references 23/1127 (PC27) and 24/0468 (PC28). This area is not included in this study area.

The Site covers an area of approximately 3.10ha and is located in the approximate centre of the wider Glan Llyn development. The Site historically housed a bag filter plant, conveyors, hoppers and a travelling boom. The Site was partially demolished by 2004 and fully demolished by 2021.

The Site boundary is shown on drawing 18669-RLL-22-X-DR-O-0323-P02, the site masterplan is presented on Drawing ref. 8111-08-A012, both presented in **Appendix A**.

### 2.2 Geology

Information pertaining to the underlying ground conditions at the Site has been obtained via the BGS Onshore Geoindex<sup>1</sup>. The published geological information shows the Site to be void of Made Ground. However, due to the Site's history, Made Ground is likely to be present associated with the previous development and subsequent demolition.

Superficial deposits are shown to comprise Tidal Flat Deposits.

Tidal Flat Deposits are described by the BGS as *'unconsolidated sediment, mainly mud and/or sand. They may form the top surface of a deltaic deposit. Normally a consolidated soft silty clay, with layers of sand, gravel and peat.'*

The underlying bedrock is shown to be the Mercia Mudstone Group.

The Mercia Mudstone Group is described by the BGS as comprising *'predominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite bearing units in some basinal areas. Thin beds of gypsum/anhydrite are widespread; sandstones are also present'*.

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<sup>1</sup> <http://mapapps2.bgs.ac.uk/geoindex/home.html>

There is an inferred fault approximately 500m north-east of the Site which trends roughly north to south and extends northwards away from Site.

### 2.3 Encountered Ground Conditions

One ground investigation has been undertaken by RLL in 2021 which covered the wider Glan Llyn development and included the current Site boundary. As part of this ground investigation 35 trial pits were excavated within the Site area. Detailed information is available in the RLL Phase 4B & 5D Desk Study and Ground Investigation Report (**Appendix C**).

The following table provides a summary of the exploratory holes that were situated within the Site boundary.

| Table 2.1: Summary of Historical Exploratory Holes within the Site Boundary |                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Report                                                                      | Exploratory Holes                                                                                                                                                                                |
| RLL (2021)                                                                  | 35 Trial Pits (U14, U12, T14, S15, S14, R18, R15, R14, Q17, Q14, P16, P15, P14, V21, V20, V19, V18, V17, V16, V14, V13, V12, V11, V10, U19, U16, U15, U11, U10, T18, T15, T13, T12, T10 and S16) |

The RLL ground investigation found the Site to be underlain by Made Ground overlying Tidal Flat Deposits, encountered from 1.20m to 2.30m depth.

The Made Ground comprised sandy gravelly clay to sandy gravel of slag with occasional to frequent cobbles. Gravel and cobble constituents typically comprised sandstone, mudstone, shale, concrete, brick, and slag, as well as occasional fragments of plastic, timber, iron ore and metal.

Tidal Flat Deposits were generally described as very soft to firm, bluish grey to grey, occasionally mottled black and occasionally peaty clay.

The Mercia Mudstone Group bedrock was not encountered during the intrusive investigation.

### 2.4 Post-construction ground conditions

The following table provides an anticipated post-construction ground model.

| Post-Development Ground Conditions                                        |                       |                                                   |
|---------------------------------------------------------------------------|-----------------------|---------------------------------------------------|
| Unit                                                                      | Approximate Thickness | Description                                       |
| Impermeable Construction Materials/<br>Housing Sub-base/Permeable Topsoil | 0.6m                  | Imported clean topsoil/<br>construction materials |
| Piling Mat*                                                               | 0.5m                  | Imported 6F2 (*may be included                    |

|                                 |             |                                         |
|---------------------------------|-------------|-----------------------------------------|
|                                 |             | within 600mm of construction materials) |
| Made Ground                     | 1.5 – 2.0m  | Excavated and re-compacted Made Ground  |
| Tidal Flat Deposits             | 7.0 – 10.0m | No change from current conditions       |
| Bedrock (Mercia Mudstone Group) | >1,350m     | No change from current conditions       |

In accordance with the assumptions of the 2019 RLL CWDQRA, further mitigation to promote lateral flow is the provision of a drainage blanket to cap the reengineered material (including piling mat) which will increase the fall from the centre of a plot to periphery.

## 2.5 Historical Groundwater Monitoring and Wider Site Hydrogeology

A summary of pre-reclamation groundwater levels is presented in the Phase 4B & 5D Desk Study & Phase 2 Geo-Environmental Report. Groundwater levels recorded during the pre-reclamation ground investigations across the development suggest that the groundwater is present beneath the wider Glan Llyn development as follows:

- Shallow/ perched groundwater within the Made Ground (shallow boreholes); and
- Groundwater within the Tidal Flat Deposits (confined to the basal sand layers) and Mercia Mudstone (deep boreholes).

The shallow perched groundwater described above was recorded during pre-reclamation conditions. The earthworks on the phase include the reengineering of the Made Ground, this shallow perched groundwater shall no longer be present.

Groundwater monitoring within the deep boreholes was considered to be primarily derived from the bedrock geology, and hydraulic continuity between the upper perched shallow groundwater and 'regional' groundwater was considered likely to be limited. Post-development, the excavation and re-compaction of the Made Ground was recognised as likely to reduce its permeability, lowering still further, the hydraulic continuity.

## 3 Controlled Waters Detailed Quantitative Risk Assessment

### 3.1 Introduction

In 2019 RLL were commissioned by St Modwen to prepare a Controlled Waters Detailed Quantitative Risk Assessment (CWDQRA) for the wider Glan Llyn development, report reference 18669-RLE-19-RP-O-0006, dated June 2022. This assessment was considered to be an update to and further development of Atkins Limited (Atkins), CWDQRA, Document Reference: 5111373-LLA-OUT-0257, Version: 3, dated February 2017.

The principal objectives of the 2019 RLL CWDQRA, as practicably as possible, was to provide compliant future surface water flow contributions from private drainage system on the wider Glan Llyn development (following the redevelopment for mixed residential and commercial end use) upon entry into the Monks' Ditch. It was also to improve sustainability and further limit the amount of material which requires off-site removal by virtue of its contaminative potential towards local Controlled Waters.

With the aim generating a streamlined and consistent process for the Phase-by-Phase reporting process, in 2024 H Fraser Consulting Ltd. were commissioned to build on the findings of the CWDQRA and produce a Soils Validation Strategy for the Protection of Controlled Waters (30937 R2).

A summary of the reporting relating to controlled waters on the development are presented in the following sections.

The area of the development this assessment covers, which includes the Site, are presented on RLL drawing reference 18669-RLE-19-XX-DR-O-0004 in **Appendix A**.

### 3.2 RLL CWDQRA Summary

In 2019 RLL prepared a Controlled Waters Detailed Quantitative Risk Assessment (CWDQRA) for the wider Glan Llyn development site. This assessment incorporated a comprehensive dataset of concentrations of contamination recorded in soils across the development, included data taken from the 2018 investigations within the Site. Screening analysis of soil, soil leachate, groundwater and surface water data revealed potential moderate to low levels of inorganic and organic contamination present onsite in line with contaminants associated with former steelworks sites. Made Ground comprising clayey sandy gravels with local slag, burnt shale, tarmac, concrete, brick and mudstone was found to be a potential source of contamination. Calculation of representative re-use criteria for a commercial end use was undertaken using a dilution assessment methodology based on the site-wide water balance, incorporating site specific permeability and infiltration parameters. No allowance was made for dilution of

discharged waters within Monks' Ditch itself as part of this calculation as, this being the receptor, it is proposed that the water quality in this Controlled Water be maintained (as far as possible) at EQS values.

Comparison of re-use criteria against available soil chemical testing established that the much of the Made Ground was likely to be suitable for re-use onsite, however, localised source materials existed containing higher concentrations of contamination (particularly elevated concentrations of iron, manganese and vanadium), and ammoniacal and cyanide components, may require remediation, or offsite disposal.

Further modelling of these contaminants was undertaken using Remedial Target Methodology (RTM) to assess the potential extent of attenuation of these specific determinands within the ground where these soils may be placed, with the receiving surface waters being assumed to be existing blueways (reens), which were considered as the Compliance Points. The compliance point for the Business Park is at the pumping station and will require an enacted permit for discharge to occur.

Initial modelling was carried out by Atkins (Glan Llyn, Llanwern Controlled Waters Detailed Quantitative Risk Assessment dated February 2017), with this approach being adopted within later revisions of this Report in the Rodgers Leask, Controlled Waters Detailed Quantitative Risk Assessment, Glan Llyn (sitewide) Update (2019), using the Equation presented in the EA Table 5.2 – soil-water partitioning of the EA Remedial Targets Methodology Guidance (2006) where a pore-water concentration ( $C_p$ ) was determined from soil concentration analyses to derive soil reuse criteria at the site as a whole. Subsequently, and purely to gauge the potential distance that re-engineered Made Ground could be placed from the respective Compliance Point(s), further modelling was carried out for specific determinands using the EA RT Excel Worksheets, based on maximum and average soils concentrations determined within samples of re-engineered Made Ground and available site derived data.

Further modelling was carried out for specific determinands (including specific PAHs) using the EA Remedial Target Excel Worksheets, based on maximum and average soils concentrations did indicate that there was little attenuation of the initial porewater PAH concentrations on migration within the re-engineered Made Ground toward the nearest reen Receptors. However, the presence of elevated porewater PAH concentrations were only theoretical and based on calculated values derived using the Equation presented in the EA Table 5.2 – soil-water partitioning of the EA Remedial Targets Methodology Guidance (2006). Actual PAH concentrations determined more recently in groundwater samples recovered (where sufficient groundwater was available for sampling purposes), were generally lower, and potentially significantly lower, than the calculated values which were derived using soils analyses data. Additionally, as previously mentioned, there was little evidence obtained of hydraulically continuous groundwater horizon(s) within the re-engineered Made Ground beneath areas proposed for residential and commercial development. Therefore, there have been no proven PAH (or other contaminant) migration pathways towards the reens.

As the data used within the CWDQRA has utilised ground investigation data taken from within the Site, it is therefore considered that the findings of this assessment are representative of the Site and therefore adoption of the calculated re-use criteria and recommendations presented within the CWQRA are appropriate.

### **3.3 HFCL Glan Llyn: Soils Validation Strategy for Protection of Controlled Waters**

Following queries from Natural Resources Wales (NRW), H Fraser Consulting Limited (HFCL) were commissioned by RLL to assist with NRW liaison and reporting pursuant to the discharge of PC28. Following discussion with NRW, RLL and the developer, HFCL prepared a revised methodology for the validation of soils in relation to the protection of controlled waters.

The assessment does not rely on groundwater analysis, being dependent rather on soil re-use values. It included distance specific remedial targets that model the attenuation of contaminants in the saturated zone allowing for advection, dispersion, retardation and decay during transport. In addition to the inclusion of distance specific remedial targets, further statistical and spatial analysis was carried out on contaminants of concern.

More detail is provided in the HFC Glan Llyn: Soils Validation Strategy for the Protection of Controlled Waters (30937 R2).

## 4 Comparison of Phase 4B & 5D and CWDQRA Dataset

The dataset utilised in the RLL CWDQRA was taken from soil samples from the wider Glan Llyn development site which did not include the Site area. Therefore, a comparison of the residential CWDQRA dataset with the soil samples taken from within the Site has been undertaken.

The purpose of this comparison is to establish if the residential dataset used in the CWDQRA is representative of concentrations of contamination present within Site and therefore whether the derived re-use criteria and recommendations of this assessment are applicable to the Site or whether further assessment is required.

### 4.1 Phase 4B & 5D Sampling

60 soil samples were collected from the Site during the 2021 RLL ground investigation for contamination testing, all of which were taken from the Made Ground. The works comprised trial pitting to collect soil samples for chemical and geotechnical testing.

The samples were tested for heavy metals, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbon (TPH), gasoline range organics (GROs), BTEX, pH, soil organic matter (SOM), cyanide, phenols, ammoniacal nitrogen and select samples were also tested for asbestos.

### 4.2 Comparison of Results

| Determinand                     | Samples from Phase 4B & 5D<br>– Residential Area   |                                                |                                                                       | Samples from CWDQRA -<br>Residential Area     |                                                |                                                                    | Considered<br>Representativ<br>e of CWDQRA<br>data<br>(Yes/No) |
|---------------------------------|----------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|
|                                 | Maximu<br>m<br>Soil<br>Sample<br>Value*<br>(mg/kg) | Average<br>Soil<br>Sample<br>Value*<br>(mg/kg) | 95 <sup>th</sup><br>Percentile<br>Soil<br>Sample<br>Value*<br>(mg/kg) | Maximum<br>Soil<br>Sample<br>Value<br>(mg/kg) | Average<br>Soil<br>Sample<br>Value*<br>(mg/kg) | 95 <sup>th</sup><br>Percentile<br>Soil Sample<br>Value*<br>(mg/kg) |                                                                |
| Inorganic Metals and Metalloids |                                                    |                                                |                                                                       |                                               |                                                |                                                                    |                                                                |
| Arsenic                         | 78.60                                              | 7.75                                           | 13.46                                                                 | 397.00                                        | 12.18                                          | 21.89                                                              | Y                                                              |
| Cadmium                         | 2.19                                               | 0.54                                           | 1.71                                                                  | 31.30                                         | 0.65                                           | 2.37                                                               | Y                                                              |
| Chromium                        | 783.00                                             | 130.81                                         | 523.20                                                                | 3090.00                                       | 138.89                                         | 590.80                                                             | Y                                                              |
| Copper                          | 71.70                                              | 19.73                                          | 44.31                                                                 | 1790.00                                       | 25.19                                          | 52.07                                                              | Y                                                              |
| Iron                            | 232000                                             | 61542                                          | 154400                                                                | 2390000                                       | 103039                                         | 277000                                                             | Y                                                              |
| Lead                            | 408.00                                             | 44.67                                          | 143.15                                                                | 4220.00                                       | 91.58                                          | 231.85                                                             | Y                                                              |
| Manganese                       | 93900                                              | 10324                                          | 28785                                                                 | 408000                                        | 9574                                           | 33520                                                              | Y                                                              |
| Mercury                         | 2.13                                               | 0.94                                           | 1.40                                                                  | 6.24                                          | 0.68                                           | 1.40                                                               | Y                                                              |
| Nickel                          | 50.80                                              | 12.47                                          | 30.01                                                                 | 313.00                                        | 25.73                                          | 44.90                                                              | Y                                                              |
| Selenium                        | 71.30                                              | 10.23                                          | 15.20                                                                 | 51.70                                         | 6.09                                           | 16.67                                                              | N                                                              |
| Vanadium                        | 680.00                                             | 154.81                                         | 473.10                                                                | 2880.00                                       | 206.93                                         | 693.10                                                             | Y                                                              |

| Determinand                       | Samples from Phase 4B & 5D - Residential Area |                                    |                                                        | Samples from CWDQRA - Residential Area |                                    |                                                        | Considered Representative of CWDQRA data (Yes/No) |
|-----------------------------------|-----------------------------------------------|------------------------------------|--------------------------------------------------------|----------------------------------------|------------------------------------|--------------------------------------------------------|---------------------------------------------------|
|                                   | Maximum Soil Sample Value* (mg/kg)            | Average Soil Sample Value* (mg/kg) | 95 <sup>th</sup> Percentile Soil Sample Value* (mg/kg) | Maximum Soil Sample Value (mg/kg)      | Average Soil Sample Value* (mg/kg) | 95 <sup>th</sup> Percentile Soil Sample Value* (mg/kg) |                                                   |
| Zinc                              | 482.00                                        | 100.19                             | 292.60                                                 | 13300.00                               | 291.45                             | 784.75                                                 | Y                                                 |
| <b>Other Inorganics</b>           |                                               |                                    |                                                        |                                        |                                    |                                                        |                                                   |
| Ammoniacal Nitrogen               | 30.60                                         | 12.37                              | 12.00                                                  | 1590.00                                | 60.97                              | 263.00                                                 | Y                                                 |
| Cyanide                           | 20.90                                         | 1.69                               | 4.44                                                   | 272.00                                 | 2.32                               | 4.05                                                   | Y                                                 |
| <b>Organics</b>                   |                                               |                                    |                                                        |                                        |                                    |                                                        |                                                   |
| Benzene                           | 1.8                                           | 0.37                               | 1.8                                                    | 0.12                                   | 0.04                               | 0.04                                                   | N                                                 |
| Toluene                           | 2.41                                          | 0.31                               | 1.40                                                   | 0.07                                   | 0.01                               | 0.02                                                   | N                                                 |
| Ethylbenzene                      | 0.80                                          | 0.16                               | 0.80                                                   | 0.02                                   | 0.01                               | 0.01                                                   | N                                                 |
| Xylene                            | 2.00                                          | 0.41                               | 2.00                                                   | 0.11                                   | 0.01                               | 0.01                                                   | N                                                 |
| Phenol                            | 1.00                                          | 0.24                               | 1.00                                                   | 1.21                                   | 0.02                               | 0.03                                                   | N                                                 |
| <b>TPH Criteria Working Group</b> |                                               |                                    |                                                        |                                        |                                    |                                                        |                                                   |
| Aliphatics >C5-C6                 | 0.07                                          | 0.01                               | 0.03                                                   | 0.92                                   | 0.03                               | 0.04                                                   | Y                                                 |
| Aliphatics >C6-C8                 | 0.36                                          | 0.04                               | 0.15                                                   | 3.32                                   | 0.04                               | 0.09                                                   | Y                                                 |
| Aliphatics >C8-C10                | 0.30                                          | 0.04                               | 0.16                                                   | 74.20                                  | 0.20                               | 0.12                                                   | Y                                                 |
| Aliphatics >C10-C12               | 52.30                                         | 2.58                               | 5.83                                                   | 987.00                                 | 2.55                               | 0.35                                                   | Y                                                 |
| Aliphatics >C12-C16               | 186.00                                        | 9.81                               | 26.21                                                  | 514.00                                 | 5.26                               | 16.47                                                  | Y                                                 |
| Aliphatics >C16-C21               | 811.00                                        | 28.78                              | 65.05                                                  | 3530.00                                | 26.92                              | 83.07                                                  | Y                                                 |
| Aliphatics >C21-C35               | 778.00                                        | 49.43                              | 126.10                                                 | 2980.00                                | 64.53                              | 174.70                                                 | Y                                                 |
| Aliphatics >C35-C44               | 188.00                                        | 14.88                              | 45.37                                                  | 913.00                                 | 20.37                              | 68.99                                                  | Y                                                 |
| Aromatics >EC5-EC7                | 0.09                                          | 0.01                               | 0.02                                                   | 5.26                                   | 0.03                               | 0.04                                                   | Y                                                 |
| Aromatics >EC7-EC8                | 0.12                                          | 0.01                               | 0.03                                                   | 20.30                                  | 0.05                               | 0.04                                                   | Y                                                 |
| Aromatics >EC8-EC10               | 0.20                                          | 0.03                               | 0.11                                                   | 49.50                                  | 0.14                               | 0.10                                                   | Y                                                 |
| Aromatics >EC10-EC12              | 26.80                                         | 2.14                               | 4.74                                                   | 658.00                                 | 1.71                               | 0.24                                                   | N                                                 |
| Aromatics >EC12-EC16              | 151.00                                        | 7.42                               | 21.08                                                  | 5280.00                                | 13.62                              | 24.72                                                  | Y                                                 |
| Aromatics >EC16-EC21              | 265.00                                        | 19.45                              | 77.24                                                  | 9800.00                                | 56.85                              | 165.55                                                 | Y                                                 |
| Aromatics >EC21-EC35              | 317.00                                        | 43.19                              | 137.25                                                 | 9010.00                                | 122.76                             | 440.85                                                 | Y                                                 |
| Aromatics >EC35-EC44              | 52.90                                         | 5.81                               | 39.05                                                  | 1580.00                                | 40.69                              | 150.00                                                 | Y                                                 |
| <b>Polyaromatic Hydrocarbons</b>  |                                               |                                    |                                                        |                                        |                                    |                                                        |                                                   |
| Acenaphthylene                    | 14.10                                         | 0.64                               | 1.84                                                   | 2100.00                                | 3.08                               | 3.18                                                   | Y                                                 |
| Acenaphthene                      | 0.88                                          | 0.10                               | 0.67                                                   | 193.00                                 | 0.47                               | 0.41                                                   | Y                                                 |
| Anthracene                        | 20.90                                         | 1.07                               | 2.83                                                   | 1860.00                                | 3.608                              | 5.48                                                   | Y                                                 |
| Benz(a)anthracene                 | 20.30                                         | 1.82                               | 6.40                                                   | 1150.00                                | 4.64                               | 1.61                                                   | Y                                                 |
| Benzo(a)pyrene                    | 15.30                                         | 1.42                               | 5.18                                                   | 714.00                                 | 3.73                               | 10.58                                                  | Y                                                 |
| Benzo(b)fluoranthene              | 20.80                                         | 2.25                               | 9.05                                                   | 1110.00                                | 5.28                               | 15.87                                                  | Y                                                 |
| Benzo(k)fluoranthene              | 7.62                                          | 0.76                               | 7.62                                                   | 373.00                                 | 2.08                               | 5.96                                                   | Y                                                 |
| Benzo(g,h,i)perylene              | 10.00                                         | 1.02                               | 3.60                                                   | 333.00                                 | 2.51                               | 7.27                                                   | Y                                                 |
| Chrysene                          | 16.90                                         | 1.65                               | 5.68                                                   | 1090.00                                | 4.22                               | 11.47                                                  | Y                                                 |
| Dibenzo(a,h)anthracene            | 2.12                                          | 0.26                               | 1.02                                                   | 177.00                                 | 0.74                               | 1.86                                                   | Y                                                 |
| Indeno(1,2,3-cd)pyrene            | 12.20                                         | 1.20                               | 4.25                                                   | 374.00                                 | 2.61                               | 7.46                                                   | Y                                                 |
| Fluoranthene                      | 58.30                                         | 4.54                               | 13.35                                                  | 2940.00                                | 11.59                              | 29.56                                                  | Y                                                 |
| Fluorene                          | 16.50                                         | 0.67                               | 1.91                                                   | 1890.00                                | 2.81                               | 2.72                                                   | Y                                                 |
| Naphthalene                       | 24.10                                         | 1.59                               | 7.17                                                   | 4680.00                                | 10.98                              | 5.66                                                   | Y                                                 |
| Phenanthrene                      | 60.80                                         | 3.87                               | 12.27                                                  | 3810.00                                | 9.79                               | 18.03                                                  | Y                                                 |
| Pyrene                            | 39.10                                         | 3.21                               | 9.68                                                   | 1.95                                   | 0.01                               | 0.03                                                   | N                                                 |

A review of the datasets has shown that the contaminants largely show similar or lower concentration ranges for the Site and for the wider Glan Llyn development site; with the

exception of selenium, benzene, toluene, ethylbenzene, xylene, phenol, aromatics >EC10-EC12 and pyrene.

Selenium shows higher maximum and average concentrations when compared to the CWDQRA dataset, but has a lower 95<sup>th</sup> percentile concentration and therefore can be considered comparable to the CWDQRA data. Similarly, aromatic >EC10-EC12 TPH shows a higher 95<sup>th</sup> percentile concentration but lower maximum and average concentrations when compared to the wider site CWDQRA dataset and can be considered comparable. Laboratory concentrations of selenium and aromatic >EC10-EC12 TPH were all below the residential soil re-use criteria for controlled waters.

Benzene, toluene, ethylbenzene, xylene, phenol and pyrene from within the Site present higher maximum, average and 95<sup>th</sup> percentile concentrations when compared to the wider site CWDQRA dataset. However, the detection limits for these contaminants within the sample pool on the Site have concentrations that are greater than the respective concentrations presented within the wider CWDQRA and this causes a significant skew in the results. The true concentrations for these contaminants are likely to be significantly lower than their respective values. Laboratory concentrations of benzene, toluene, ethylbenzene, xylene, phenol and pyrene were all below the residential soil re-use criteria for controlled waters.

Given the values were lower than the relevant reuse criteria this shouldn't have a detrimental impact on the conclusions of the CWDQRA.

#### 4.3 Comparison to RLL CWDQRA Reuse Criteria for 40% Infiltration Rainfall

The samples collected for the Site, as part of the RLL ground investigation, have subsequently been assessed against the RLL CWDQRA Reuse Criteria for 40% Infiltration Rainfall values for a residential end use as outlined in the RLL CWDQRA.

A summary of exceedances is presented in the table below, and the chemical screening results are presented in full in **Appendix B**.

| Summary of Exceedances of RLL CWDQRA Reuse Criteria for 40% Infiltration Rainfall for Residential End Use |                    |                                                                                                  |                                 |                 |
|-----------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|---------------------------------|-----------------|
| Contaminant                                                                                               | No. of Exceedances | Location of Exceedances (Depth in m)                                                             | Exceedance Concentration Range  | Screening Value |
| Cyanide, Total                                                                                            | 7                  | P14-2 (1.80), Q14-1 (0.50), Q17-1 (0.30), U16-1 (1.00), V10-2 (1.50), V12-2 (1.60), V18-1 (0.50) | 2.35 mg/kg – 20.90 mg/kg        | 2.313 mg/kg     |
| Manganese                                                                                                 | 1                  | P16-1 (1.30)                                                                                     | 93900.00 mg/kg                  | 38175.69 mg/kg  |
| Phenanthrene                                                                                              | 2                  | Q17-2 (1.50), T10-1 (0.30)                                                                       | 44400.00 µg/kg – 60800.00 µg/kg | 31077.00 µg/kg  |

| Summary of Exceedances of RLL CWDQRA Reuse Criteria for 40% Infiltration Rainfall for Residential End Use |                    |                                                                                                  |                                |                 |
|-----------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|--------------------------------|-----------------|
| Contaminant                                                                                               | No. of Exceedances | Location of Exceedances (Depth in m)                                                             | Exceedance Concentration Range | Screening Value |
| Fluoranthene                                                                                              | 7                  | P15-2 (2.20), Q14-1 (0.50), Q17-2 (1.50), R15-2 (1.20), T10-1 (0.30), T10-3 (2.90), V10-1 (0.30) | 7750.00 µg/kg – 58300.00 µg/kg | 7614.00 µg/kg   |
| Benzo(b)fluoranthene                                                                                      | 7                  | P15-2 (2.20), Q14-1 (0.50), Q17-2 (1.50), R15-2 (1.20), T10-1 (0.30), T10-2 (1.00), V10-1 (0.30) | 4010.00 µg/kg – 20800.00 µg/kg | 3914.00 µg/kg   |
| Benzo(k)fluoranthene                                                                                      | 2                  | Q14-1 (0.50), Q17-2 (1.50)                                                                       | 6690.00 µg/kg – 7620.00 µg/kg  | 5790.00 µg/kg   |

The results show that with the exception of total cyanide, manganese, phenanthrene, fluoranthene, benzo(b)fluoranthene and benzo(k)fluoranthene, there are no exceedances of the RLL reuse criteria recorded during the 2021 ground investigation. The location of exceedances are shown on RLL Drawing 18669-RLL-24-XX-DR-O-0751-P02, **Appendix A**.

The re-use criteria in the above assessment were presented within the RLL CWDQRA, however following review by H F Consulting, slight calculation adjustments were made, and they were updated and re-produced within their Soils Validation Strategy for the Protection of Controlled Waters.

Following this assessment, recorded exceedances shall be managed, via the earthworks operation, in accordance with the HFC Glan Llyn: Soils Validation Strategy for the Protection of Controlled Waters.

Soil chemical testing certificates are presented within the RLL Phase 4B & 5D Desk Study and Ground Investigation Report (18669-RLL-22-XX-RP-O-0328-P03).

#### 4.4 Visual and Olfactory Evidence of Contamination

During the 2021 intrusive investigation, visual or olfactory evidence of contamination was recorded in nine locations within the Made Ground, ranging from slight hydrocarbon sheens on water to sulphurous and hydrocarbon odours; and in one location a slight biofilm on water. Given the low number of locations where visual or olfactory evidence of hydrocarbon contamination was identified, the presence of significant gross contamination unsuitable for retention within the wider development is considered unlikely. No further evidence of a source of the visual or olfactory contamination was encountered. During the proposed turnover within Phase 4B & 5D a watching brief will be maintained.

## 5 Conclusion

In 2021 RLL submitted a CWDQRA for the wider Glan Llyn development site. This assessment incorporated a comprehensive dataset of concentrations of contamination recorded in soils across the development. Further assessment has been undertaken comparing soil concentrations recorded within the Site area with those of the wider residential Glan Llyn development site used in the CWDQRA.

This assessment has concluded that the dataset used in the CWDQRA is largely representative of the levels of contamination present within the Site and therefore adoption of the calculated re-use criteria and recommendations presented within the CWDQRA are appropriate for the Site.

Following an assessment of soil chemical testing data from within the Site, exceedances of the reuse criteria for cyanide, manganese, phenanthrene, fluoranthene, benzo(b)fluoranthene and benzo(k)fluoranthene have been identified that may represent a risk to Controlled Waters.

The soil reuse criteria have been conservatively calculated considering only dilution of contamination by intercepted surface water from the finished development. In reality subsurface degradation and attenuation will occur as these contaminants migrate laterally through the ground, further reducing their concentrations prior to dilution within the on-site private drainage system.

It is recommended that further delineation and assessment of the identified exceedances of cyanide, manganese, phenanthrene, fluoranthene, benzo(b)fluoranthene and benzo(k)fluoranthene (as shown on RLL Drawing 18669-RLL-25-XX-RP-O-0751-P03) are undertaken as part of the remediation works, with unsuitable material being removed as necessary, in order to ensure that they do not present a risk to controlled waters.

A Remediation Strategy has been prepared for Phase 4B & 5D (18669-RLL-24-XX-RP-O-0587-P03) outlining required remedial measures for the Site.

## Appendix A: Drawings



**GENERAL NOTES**

NO DIMENSIONS TO BE SCALED OFF THIS DRAWING.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.

ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

**KEY:**

 **Approximate Site Boundary**

|     |            |                                                 |     |     |
|-----|------------|-------------------------------------------------|-----|-----|
|     |            |                                                 |     |     |
|     |            |                                                 |     |     |
| P02 | 10/09/2024 | Update to site boundary, excluding Vertase Area | AMS | CW  |
| Rev | Date       | Amendments                                      | By  | Chk |



Client  
**St Modwen Developments**

Project  
**P18-669 Llanwern Reclamation**

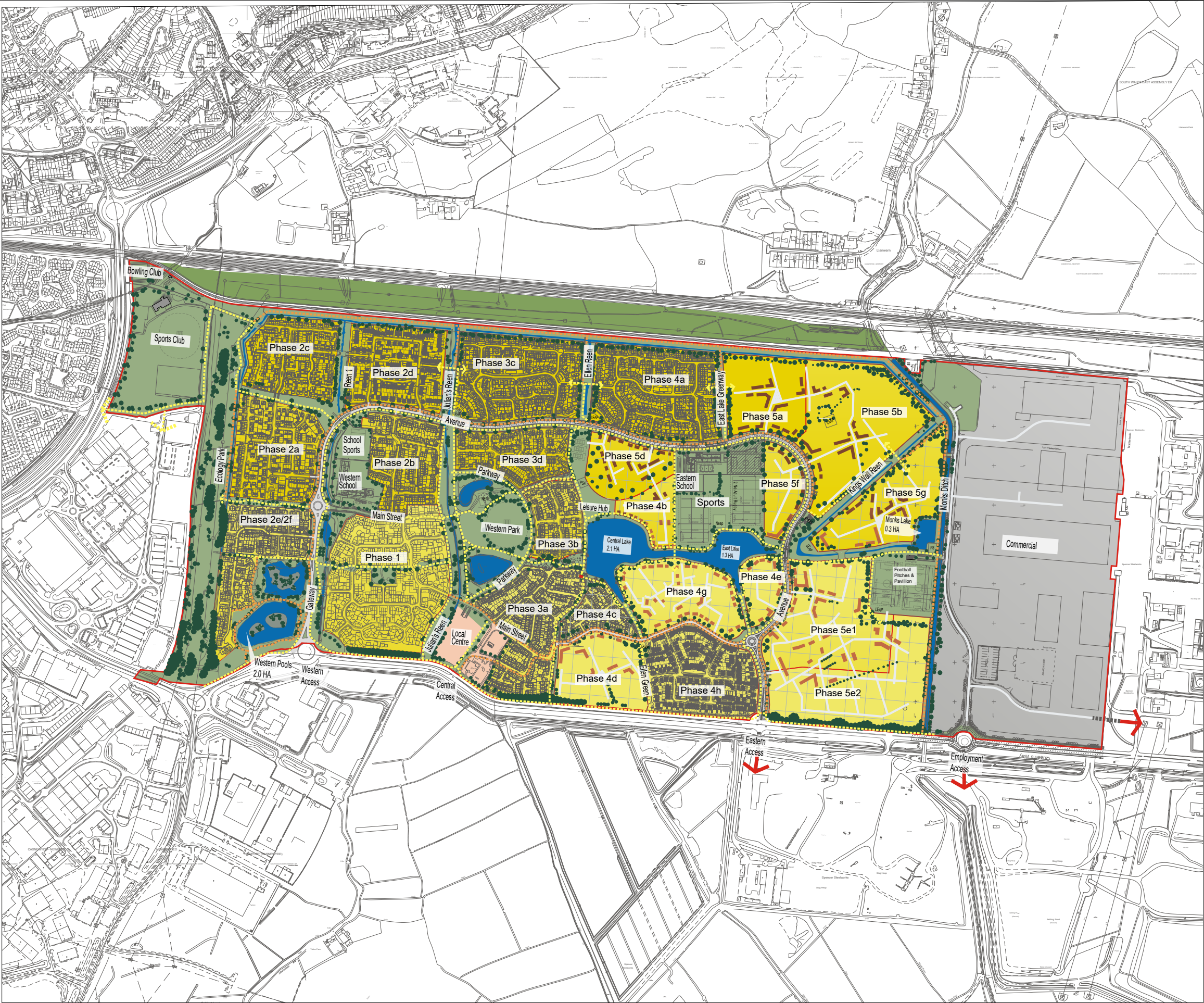
Drawing Title  
**Phase 4b & 5d  
Site Location Plan**

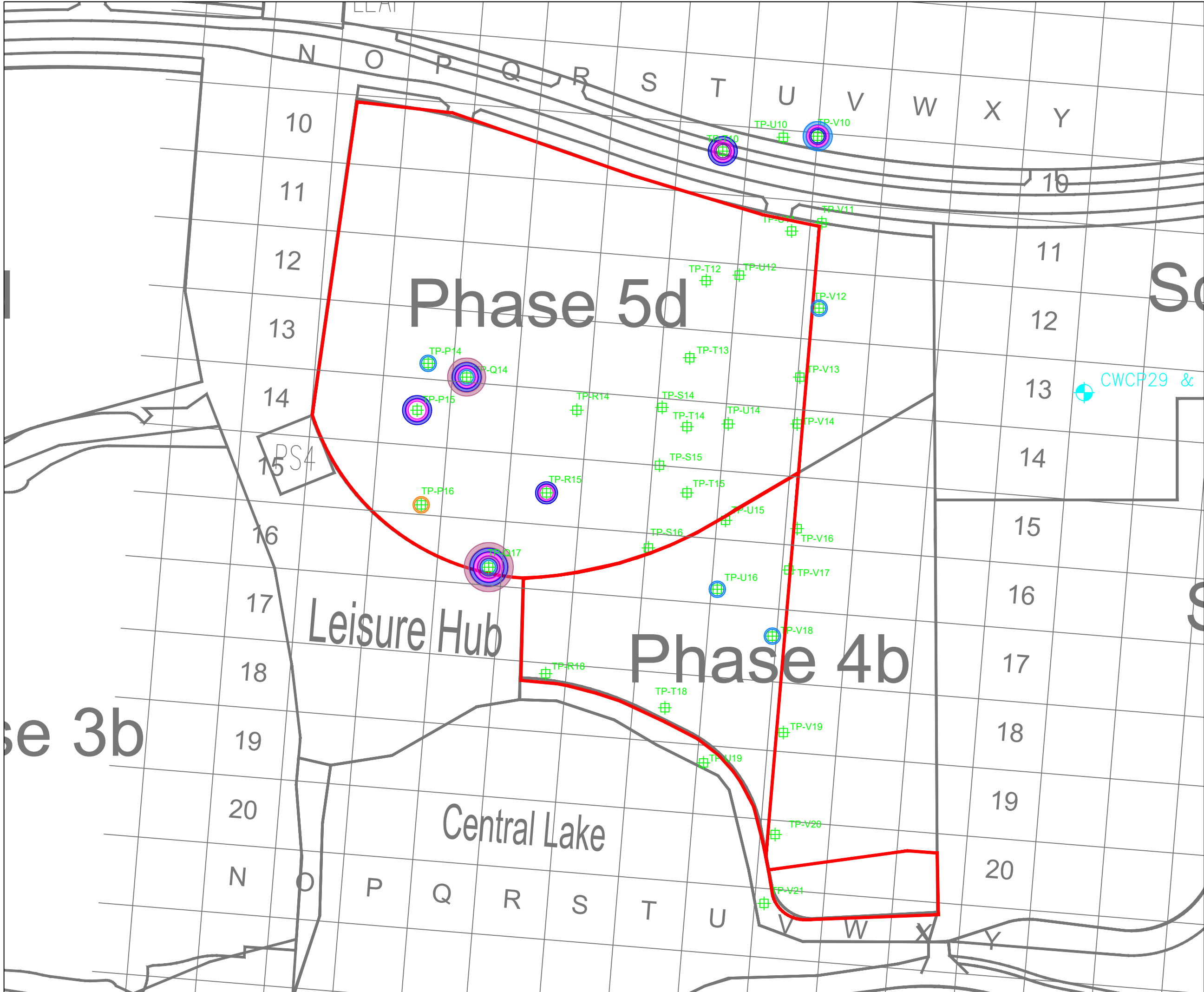
**INFORMATION**

|                           |       |         |          |
|---------------------------|-------|---------|----------|
|                           | Drawn | Checked | Date     |
| 1:1250 @ A1               | SR    | CW      | 06.09.22 |
| Drawing No.               | Rev.  |         |          |
| 18669-RLL-22-XX-DR-O-0323 | P02   |         |          |

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Glan Llyn -ESAMP Indicative Masterplan





**GENERAL NOTES**

NO DIMENSIONS TO BE SCALED OFF THIS DRAWING.  
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ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.  
ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

**KEY:**

-  Site Boundary
-  Rodgers Leask GI 2020/21
-  CWRA Borehole
-  Cyanide Exceedance Location
-  Benzo(b)fluoranthene Exceedance Location
-  Benzo(k)fluoranthene Exceedance Location
-  Fluoranthene Exceedance Location
-  Phenanthracene Exceedance Location
-  Manganese Exceedance Location

|     |            |                          |     |     |
|-----|------------|--------------------------|-----|-----|
|     |            |                          |     |     |
| P02 | 04/12/2025 | Updated screening values | AMS | CW  |
| P01 | 09/06/2025 | First Issue              | AMS | CW  |
| Rev | Date       | Amendments               | By  | Chk |



Client  
Revantage Real Estate

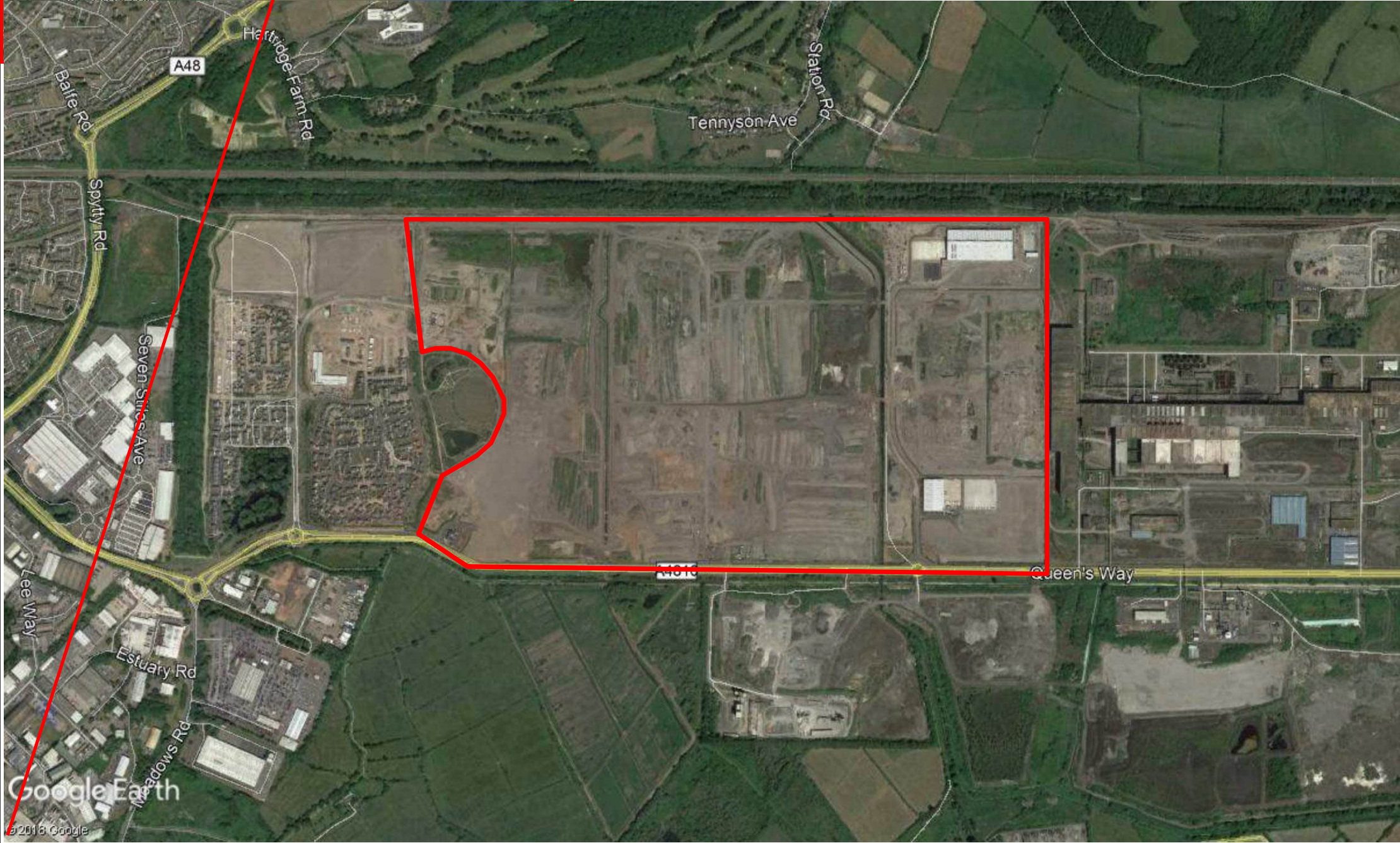
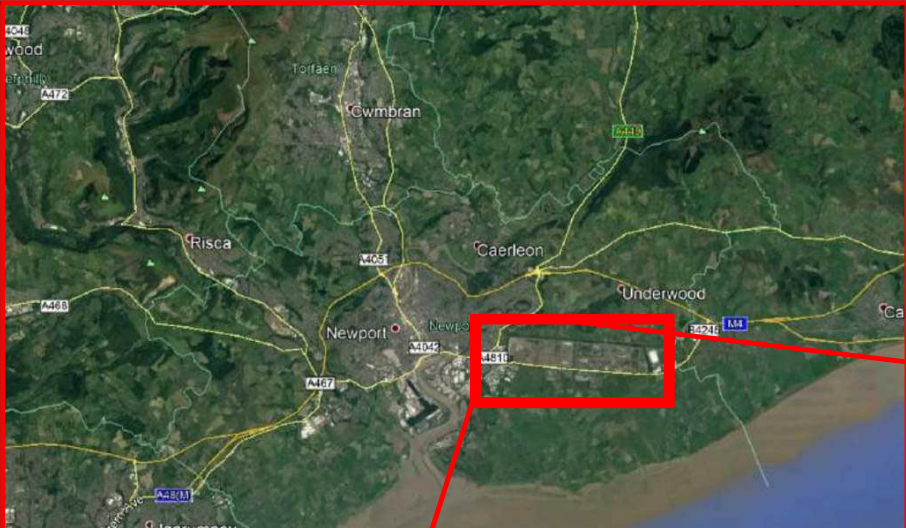
Project  
P18-669 Llanwern Reclamation  
Phase 4B & 5D

Drawing Title  
Exceedance Location Plan  
RLL CWDQRA Soil Re-Use Values

**INFORMATION**

|                           | Drawn | Checked | Date     |
|---------------------------|-------|---------|----------|
| NTS                       | AMS   | CW      | 09/06/25 |
| Drawing No.               | Rev.  |         |          |
| 18669-RLL-25-XX-DR-O-0751 | P02   |         |          |

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**GENERAL NOTES**

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ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY

**Key**

 Redline boundary



**CLIENT**

**ST. MODWEN DEVELOPMENTS**

**PROJECT**

**LLANWERN SITE LOCATION PLAN**

**STATUS**

**FOR INFORMATION**

|                |                           |            |
|----------------|---------------------------|------------|
| DRAWN          | CHECKED                   | DATE       |
| ET             | CW                        | 19/08/2019 |
| PROJECT NUMBER | DRAWING NUMBER            | REV.       |
| P18-669        | 18669-RLE-19-XX-DR-O-0004 |            |

## Appendix B: Chemical Screening

| Client: Rodriguez Leoni Environmental |      | Customer Sample ID |           | Depth     | Sample Date | Sample Type | Number of Extractions | Minimum Concentration Check | Minimum Concentration Detection | 9th Percentile Concentration | 9th Percentile Check | Maximum Concentration | Average Concentration | Minimum Concentration | P161      | P162      | P163      | P164      | P165      | P166      | P167      | P168      | P169      | P170      | P171      | P172      | P173      | P174      | P175      | P176      | P177      | P178      | P179      | P180      | P181      | P182      | P183      | P184      | P185      | P186      | P187      | P188      | P189      | P190      | P191      | P192      | P193      | P194      | P195      | P196      | P197      | P198      | P199      | P200      | P201      | P202      | P203      | P204      | P205      | P206      | P207      | P208      | P209      | P210      | P211      | P212      | P213      | P214      | P215      | P216      | P217      | P218      | P219      | P220      | P221      | P222      | P223      | P224      | P225      | P226      | P227      | P228      | P229      | P230      | P231      | P232      | P233      | P234      | P235      | P236      | P237      | P238      | P239      | P240      | P241      | P242      | P243      | P244      | P245      | P246      | P247      | P248      | P249      | P250      | P251      | P252      | P253      | P254      | P255      | P256      | P257      | P258      | P259      | P260      | P261      | P262      | P263      | P264      | P265      | P266      | P267      | P268      | P269      | P270      | P271      | P272      | P273      | P274      | P275      | P276      | P277      | P278      | P279      | P280      | P281      | P282      | P283      | P284      | P285      | P286      | P287      | P288      | P289      | P290      | P291      | P292      | P293      | P294      | P295      | P296      | P297      | P298      | P299      | P300      | P301      | P302      | P303      | P304      | P305      | P306      | P307      | P308      | P309      | P310      | P311      | P312      | P313      | P314      | P315      | P316      | P317      | P318      | P319      | P320      | P321      | P322      | P323      | P324      | P325      | P326      | P327      | P328      | P329      | P330      | P331      | P332      | P333      | P334      | P335      | P336      | P337      | P338      | P339      | P340      | P341      | P342      | P343      | P344      | P345      | P346      | P347      | P348      | P349      | P350      | P351      | P352      | P353      | P354      | P355      | P356      | P357      | P358      | P359      | P360      | P361      | P362      | P363      | P364      | P365      | P366      | P367      | P368      | P369      | P370      | P371      | P372      | P373      | P374      | P375      | P376      | P377      | P378      | P379      | P380      | P381      | P382      | P383      | P384      | P385      | P386      | P387      | P388      | P389      | P390      | P391      | P392      | P393      | P394      | P395      | P396      | P397      | P398      | P399      | P400      | P401      | P402      | P403      | P404      | P405      | P406      | P407      | P408      | P409      | P410      | P411      | P412      | P413      | P414      | P415      | P416      | P417      | P418      | P419      | P420      | P421      | P422      | P423      | P424      | P425      | P426      | P427      | P428      | P429      | P430      | P431      | P432      | P433      | P434      | P435      | P436      | P437      | P438      | P439      | P440      | P441      | P442      | P443      | P444      | P445   | P446 | P447 | P448 | P449 | P450 | P451 | P452 | P453 | P454 | P455 | P456 | P457 | P458 | P459 | P460 | P461 | P462 | P463 | P464 | P465 | P466 | P467 | P468 | P469 | P470 | P471 | P472 | P473 | P474 | P475 | P476 | P477 | P478 | P479 | P480 | P481 | P482 | P483 | P484 | P485 | P486 | P487 | P488 | P489 | P490 | P491 | P492 | P493 | P494 | P495 | P496 | P497 | P498 | P499 | P500 | P501 | P502 | P503 | P504 | P505 | P506 | P507 | P508 | P509 | P510 | P511 | P512 | P513 | P514 | P515 | P516 | P517 | P518 | P519 | P520 | P521 | P522 | P523 | P524 | P525 | P526 | P527 | P528 | P529 | P530 | P531 | P532 | P533 | P534 | P535 | P536 | P537 | P538 | P539 | P540 | P541 | P542 | P543 | P544 | P545 | P546 | P547 | P548 | P549 | P550 | P551 | P552 | P553 | P554 | P555 | P556 | P557 | P558 | P559 | P560 | P561 | P562 | P563 | P564 | P565 | P566 | P567 | P568 | P569 | P570 | P571 | P572 | P573 | P574 | P575 | P576 | P577 | P578 | P579 | P580 | P581 | P582 | P583 | P584 | P585 | P586 | P587 | P588 | P589 | P590 | P591 | P592 | P593 | P594 | P595 | P596 | P597 | P598 | P599 | P600 | P601 | P602 | P603 | P604 | P605 | P606 | P607 | P608 | P609 | P610 | P611 | P612 | P613 | P614 | P615 | P616 | P617 | P618 | P619 | P620 | P621 | P622 | P623 | P624 | P625 | P626 | P627 | P628 | P629 | P630 | P631 | P632 | P633 | P634 | P635 | P636 | P637 | P638 | P639 | P640 | P641 | P642 | P643 | P644 | P645 | P646 | P647 | P648 | P649 | P650 | P651 | P652 | P653 | P654 | P655 | P656 | P657 | P658 | P659 | P660 | P661 | P662 | P663 | P664 | P665 | P666 | P667 | P668 | P669 | P670 | P671 | P672 | P673 | P674 | P675 | P676 | P677 | P678 | P679 | P680 | P681 | P682 | P683 | P684 | P685 | P686 | P687 | P688 | P689 | P690 | P691 | P692 | P693 | P694 | P695 | P696 | P697 | P698 | P699 | P700 | P701 | P702 | P703 | P704 | P705 | P706 | P707 | P708 | P709 | P710 | P711 | P712 | P713 | P714 | P715 | P716 | P717 | P718 | P719 | P720 | P721 | P722 | P723 | P724 | P725 | P726 | P727 | P728 | P729 | P730 | P731 | P732 | P733 | P734 | P735 | P736 | P737 | P738 | P739 | P740 | P741 | P742 | P743 | P744 | P745 | P746 | P747 | P748 | P749 | P750 | P751 | P752 | P753 | P754 | P755 | P756 | P757 | P758 | P759 | P760 | P761 | P762 | P763 | P764 | P765 | P766 | P767 | P768 | P769 | P770 | P771 | P772 | P773 | P774 | P775 | P776 | P777 | P778 | P779 | P780 | P781 | P782 | P783 | P784 | P785 | P786 | P787 | P788 | P789 | P790 | P791 | P792 | P793 | P794 | P795 | P796 | P797 | P798 | P799 | P800 | P801 | P802 | P803 | P804 | P805 | P806 | P807 | P808 | P809 | P810 | P811 | P812 | P813 | P814 | P815 | P816 | P817 | P818 | P819 | P820 | P821 | P822 | P823 | P824 | P825 | P826 | P827 | P828 | P829 | P830 | P831 | P832 | P833 | P834 | P835 | P836 | P837 | P838 | P839 | P840 | P841 | P842 | P843 | P844 | P845 | P846 | P847 | P848 | P849 | P850 | P851 | P852 | P853 | P854 | P855 | P856 | P857 | P858 | P859 | P860 | P861 | P862 | P863 | P864 | P865 | P866 | P867 | P868 | P869 | P870 | P871 | P872 | P873 | P874 | P875 | P876 | P877 | P878 | P879 | P880 | P881 | P882 | P883 | P884 | P885 | P886 | P887 | P888 | P889 | P890 | P891 | P892 | P893 | P894 | P895 | P896 | P897 | P898 | P899 | P900 | P901 | P902 | P903 | P904 | P905 | P906 | P907 | P908 | P909 | P910 | P911 | P912 | P913 | P914 | P915 | P916 | P917 | P918 | P919 | P920 | P921 | P922 | P923 | P924 | P925 | P926 | P927 | P928 | P929 | P930 | P931 | P932 | P933 | P934 | P935 | P936 | P937 | P938 | P939 | P940 | P941 | P942 | P943 | P944 | P945 | P946 | P947 | P948 | P949 | P950 | P951 | P952 | P953 | P954 | P955 | P956 | P957 | P958 | P959 | P960 | P961 | P962 | P963 | P964 | P965 | P966 | P967 | P968 | P969 | P970 | P971 | P972 | P973 | P974 | P975 | P976 | P977 | P978 | P979 | P980 | P981 | P982 | P983 | P984 | P985 | P986 | P987 | P988 | P989 | P990 | P991 | P992 | P993 | P994 | P995 | P996 | P997 | P998 | P999 | P1000 |
|---------------------------------------|------|--------------------|-----------|-----------|-------------|-------------|-----------------------|-----------------------------|---------------------------------|------------------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--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| 0.20-0.30                             | P162 | 0.20-0.30          | 0.20-0.30 | 0.20-0.30 | 0.20-0.30   | 0.20-0.30   | 0.20-0.30             | 0.20-0.30                   | 0.20-0.30                       | 0.20-0.30                    | 0.20-0.30            | 0.20-0.30             | 0.20-0.30             | 0.20-0.30             | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0.30 | 0.20-0 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |

| Date/Time | Customer Sample ID | Depth | T1 |  | T2 |  | T3 |  | T4 |  | T5 |  | T6 |  | T7 |  | T8 |  | T9 |  | T10 |  | T11 |  | T12 |  | T13 |  | T14 |  | T15 |  | T16 |  | T17 |  | T18 |  | T19 |  | T20 |  | T21 |  | T22 |  | T23 |  | T24 |  | T25 |  | T26 |  | T27 |  | T28 |  | T29 |  | T30 |  | T31 |  | T32 |  | T33 |  | T34 |  | T35 |  | T36 |  | T37 |  | T38 |  | T39 |  | T40 |  | T41 |  | T42 |  | T43 |  | T44 |  | T45 |  | T46 |  | T47 |  | T48 |  | T49 |  | T50 |  | T51 |  | T52 |  | T53 |  | T54 |  | T55 |  | T56 |  | T57 |  | T58 |  | T59 |  | T60 |  | T61 |  | T62 |  | T63 |  | T64 |  | T65 |  | T66 |  | T67 |  | T68 |  | T69 |  | T70 |  | T71 |  | T72 |  | T73 |  | T74 |  | T75 |  | T76 |  | T77 |  | T78 |  | T79 |  | T80 |  | T81 |  | T82 |  | T83 |  | T84 |  | T85 |  | T86 |  | T87 |  | T88 |  | T89 |  | T90 |  | T91 |  | T92 |  | T93 |  | T94 |  | T95 |  | T96 |  | T97 |  | T98 |  | T99 |  | T100 |  | T101 |  | T102 |  | T103 |  | T104 |  | T105 |  | T106 |  | T107 |  | T108 |  | T109 |  | T110 |  | T111 |  | T112 |  | T113 |  | T114 |  | T115 |  | T116 |  | T117 |  | T118 |  | T119 |  | T120 |  | T121 |  | T122 |  | T123 |  | T124 |  | T125 |  | T126 |  | T127 |  | T128 |  | T129 |  | T130 |  | T131 |  | T132 |  | T133 |  | T134 |  | T135 |  | T136 |  | T137 |  | T138 |  | T139 |  | T140 |  | T141 |  | T142 |  | T143 |  | T144 |  | T145 |  | T146 |  | T147 |  | T148 |  | T149 |  | T150 |  | T151 |  | T152 |  | T153 |  | T154 |  | T155 |  | T156 |  | T157 |  | T158 |  | T159 |  | T160 |  | T161 |  | T162 |  | T163 |  | T164 |  | T165 |  | T166 |  | T167 |  | T168 |  | T169 |  | T170 |  | T171 |  | T172 |  | T173 |  | T174 |  | T175 |  | T176 |  | T177 |  | T178 |  | T179 |  | T180 |  | T181 |  | T182 |  | T183 |  | T184 |  | T185 |  | T186 |  | T187 |  | T188 |  | T189 |  | T190 |  | T191 |  | T192 |  | T193 |  | T194 |  | T195 |  | T196 |  | T197 |  | T198 |  | T199 |  | T200 |  | T201 |  | T202 |  | T203 |  | T204 |  | T205 |  | T206 |  | T207 |  | T208 |  | T209 |  | T210 |  | T211 |  | T212 |  | T213 |  | T214 |  | T215 |  | T216 |  | T217 |  | T218 |  | T219 |  | T220 |  | T221 |  | T222 |  | T223 |  | T224 |  | T225 |  | T226 |  | T227 |  | T228 |  | T229 |  | T230 |  | T231 |  | T232 |  | T233 |  | T234 |  | T235 |  | T236 |  | T237 |  | T238 |  | T239 |  | T240 |  | T241 |  | T242 |  | T243 |  | T244 |  | T245 |  | T246 |  | T247 |  | T248 |  | T249 |  | T250 |  | T251 |  | T252 |  | T253 |  | T254 |  | T255 |  | T256 |  | T257 |  | T258 |  | T259 |  | T260 |  | T261 |  | T262 |  | T263 |  | T264 |  | T265 |  | T266 |  | T267 |  | T268 |  | T269 |  | T270 |  | T271 |  | T272 |  | T273 |  | T274 |  | T275 |  | T276 |  | T277 |  | T278 |  | T279 |  | T280 |  | T281 |  | T282 |  | T283 |  | T284 |  | T285 |  | T286 |  | T287 |  | T288 |  | T289 |  | T290 |  | T291 |  | T292 |  | T293 |  | T294 |  | T295 |  | T296 |  | T297 |  | T298 |  | T299 |  | T300 |  | T301 |  | T302 |  | T303 |  | T304 |  | T305 |  | T306 |  | T307 |  | T308 |  | T309 |  | T310 |  | T311 |  | T312 |  | T313 |  | T314 |  | T315 |  | T316 |  | T317 |  | T318 |  | T319 |  | T320 |  | T321 |  | T322 |  | T323 |  | T324 |  | T325 |  | T326 |  | T327 |  | T328 |  | T329 |  | T330 |  | T331 |  | T332 |  | T333 |  | T334 |  | T335 |  | T336 |  | T337 |  | T338 |  | T339 |  | T340 |  | T341 |  | T342 |  | T343 |  | T344 |  | T345 |  | T346 |  | T347 |  | T348 |  | T349 |  | T350 |  | T351 |  | T352 |  | T353 |  | T354 |  | T355 |  | T356 |  | T357 |  | T358 |  | T359 |  | T360 |  | T361 |  | T362 |  | T363 |  | T364 |  | T365 |  | T366 |  | T367 |  | T368 |  | T369 |  | T370 |  | T371 |  | T372 |  | T373 |  | T374 |  | T375 |  | T376 |  | T377 |  | T378 |  | T379 |  | T380 |  | T381 |  | T382 |  | T383 |  | T384 |  | T385 |  | T386 |  | T387 |  | T388 |  | T389 |  | T390 |  | T391 |  | T392 |  | T393 |  | T394 |  | T395 |  | T396 |  | T397 |  | T398 |  | T399 |  | T400 |  | T401 |  | T402 |  | T403 |  | T404 |  | T405 |  | T406 |  | T407 |  | T408 |  | T409 |  | T410 |  | T411 |  | T412 |  | T413 |  | T414 |  | T415 |  | T416 |  | T417 |  | T418 |  | T419 |  | T420 |  | T421 |  | T422 |  | T423 |  | T424 |  | T425 |  | T426 |  | T427 |  | T428 |  | T429 |  | T430 |  | T431 |  | T432 |  | T433 |  | T434 |  | T435 |  | T436 |  | T437 |  | T438 |  | T439 |  | T440 |  | T441 |  | T442 |  | T443 |  | T444 |  | T445 |  | T446 |  | T447 |  | T448 |  | T449 |  | T450 |  | T451 |  | T452 |  | T453 |  | T454 |  | T455 |  | T456 |  | T457 |  | T458 |  | T459 |  | T460 |  | T461 |  | T462 |  | T463 |  | T464 |  | T465 |  | T466 |  | T467 |  | T468 |  | T469 |  | T470 |  | T471 |  | T472 |  | T473 |  | T474 |  | T475 |  | T476 |  | T477 |  | T478 |  | T479 |  | T480 |  | T481 |  | T482 |  | T483 |  | T484 |  | T485 |  | T486 |  | T487 |  | T488 |  | T489 |  | T490 |  | T491 |  | T492 |  | T493 |  | T494 |  | T495 |  | T496 |  | T497 |  | T498 |  | T499 |  | T500 |  | T501 |  | T502 |  | T503 |  | T504 |  | T505 |  | T506 |  | T507 |  | T508 |  | T509 |  | T510 |  | T511 |  | T512 |  | T513 |  | T514 |  | T515 |  | T516 |  | T517 |  | T518 |  | T519 |  | T520 |  | T521 |  | T522 |  | T523 |  | T524 |  | T525 |  | T526 |  | T527 |  | T528 |  | T529 |  | T530 |  | T531 |  | T532 |  | T533 |  | T534 |  | T535 |  | T536 |  | T537 |  | T538 |  | T539 |  | T540 |  | T541 |  | T542 |  | T543 |  | T544 |  | T545 |  | T546 |  | T547 |  | T548 |  | T549 |  | T550 |  | T551 |  | T552 |  | T553 |  | T554 |  | T555 |  | T556 |  | T557 |  | T558 |  | T559 |  | T560 |  | T561 |  | T562 |  | T563 |  | T564 |  | T565 |  | T566 |  | T567 |  | T568 |  | T569 |  | T570 |  | T571 |  | T572 |  | T573 |  | T574 |  | T575 |  | T576 |  | T577 |  | T578 |  | T579 |  | T580 |  | T581 |  | T582 |  | T583 |  | T584 |  | T585 |  | T586 |  | T587 |  | T588 |  | T589 |  | T590 |  | T591 |  | T592 |  | T593 |  | T594 |  | T595 |  | T596 |  | T597 |  | T598 |  | T599 |  | T600 |  | T601 |  | T602 |  | T603 |  | T604 |  | T605 |  | T606 |  | T607 |  | T608 |  | T609 |  | T610 |  | T611 |  | T612 |  | T613 |  | T614 |  | T615 |  | T616 |  | T617 |  | T618 |  | T619 |  | T620 |  | T621 |  | T622 |  | T623 |  | T624 |  | T625 |  | T626 |  | T627 |  | T628 |  | T629 |  | T630 |  | T631 |  | T632 |  | T633 |  | T634 |  | T635 |  | T636 |  | T637 |  | T638 |  | T639 |  | T640 |  | T641 |  | T642 |  | T643 |  | T644 |  | T645 |  | T646 |  | T647 |  | T648 |  | T649 |  | T650 |  | T651 |  | T652 |  | T653 |  | T654 |  | T655 |  | T656 |  | T657 |  | T658 |  | T659 |  | T660 |  | T661 |  | T662 |  | T663 |  | T664 |  | T665 |  | T666 |  | T667 |  | T668 |  | T669 |  | T670 |  | T671 |  | T672 |  | T673 |  | T674 |  | T675 |  | T676 |  | T677 |  | T678 |  | T679 |  | T680 |  | T681 |  | T682 |  | T683 |  | T684 |  | T685 |  | T686 |  | T687 |  | T688 |  | T689 |  | T690 |  | T691 |  | T692 |  | T693 |  | T694 |  | T695 |  | T696 |  | T697 |  | T698 |  | T699 |  | T700 |  | T701 |  | T702 |  | T703 |  | T704 |  | T705 |  | T706 |  | T707 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|  | T808 |  | T809 |  | T810 |  | T811 |  | T812 |  | T813 |  | T814 |  | T815 |  | T816 |  | T817 |  | T818 |  | T819 |  | T820 |  | T821 |  | T822 |  | T823 |  | T824 |  | T825 |  | T826 |  | T827 |  | T828 |  | T829 |  | T830 |  | T831 |  | T832 |  | T833 |  | T834 |  | T835 |  | T836 |  | T837 |  | T838 |  | T839 |  | T840 |  | T841 |  | T842 |  | T843 |  | T844 |  | T845 |  | T846 |  | T847 |  | T848 |  | T849 |  | T850 |  | T851 |  | T852 |  | T853 |  | T854 |  | T855 |  | T856 |  | T857 |  | T858 |  | T859 |  | T860 |  | T861 |  | T862 |  | T863 |  | T864 |  | T865 |  | T866 |  | T867 |  | T868 |  | T869 |  | T870 |  | T871 |  | T872 |  | T873 |  | T874 |  | T875 |  | T876 |  | T877 |  | T878 |  | T879 |  | T880 |  | T881 |  | T882 |  | T883 |  | T884 |  | T885 |  | T886 |  | T887 |  | T888 |  | T889 |  | T890 |  | T891 |  | T892 |  | T893 |  | T894 |  | T895 |  | T896 |  | T897 |  | T898 |  | T899 |  | T900 |  | T901 |  | T902 |  | T903 |  | T904 |  | T905 |  | T906 |  | T907 |  | T908 |  | T909 |  | T910 |  | T911 |  | T912 |  | T913 |  | T914 |  | T915 |  | T916 |  | T917 |  | T918 |  | T919 |  | T920 |  | T921 |  | T922 |  | T923 |  | T924 |  | T925 |  | T926 |  | T927 |  | T928 |  | T929 |  | T930 |  | T931 |  | T932 |  | T933 |  | T934 |  | T935 |  | T936 |  | T937 |  | T938 |  | T939 |  | T940 |  | T941 |  | T942 |  | T943 |  | T944 |  | T945 |  | T946 |  | T947 |  | T948 |  | T949 |  | T950 |  | T951 |  | T952 |  | T953 |  | T954 |  | T955 |  | T956 |  | T957 |  | T958 |  | T959 |  | T960 |  | T961 |  | T962 |  | T963 |  | T964 |  | T965 |  | T966 |  | T967 |  | T968 |  | T969 |  | T970 |  | T971 |  | T972 |  | T973 |  | T974 |  | T975 |  | T976 |  | T977 |  | T978 |  | T979 |  | T980 |  | T981 |  | T982 |  | T983 |  | T984 |  | T985 |  | T986 |  | T987 |  | T988 |  | T989 |  | T990 |  | T991 |  | T992 |  | T993 |  | T994 |  | T995 |  | T996 |  | T997 |  | T998 |  | T999 |  | T1000 |  | T1001 |  | T1002 |  | T1003 |  | T1004 |  | T1005 |  | T1006 |  | T1007 |  | T1008 |  | T1009 |  | T1010 |  | T1011 |  | T1012 |  | T1013 |  | T1014 |  | T1015 |  | T1016 |  | T1017 |  | T1018 |  | T1019 |  | T1020 |  | T1021 |  | T1022 |  | T1023 |  | T1024 |  | T1025 |  | T1026 |  | T1027 |  | T1028 |  | T1029 |  | T1030 |  | T1031 |  | T1032 |  | T1033 |  | T1034 |  | T1035 |  |
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