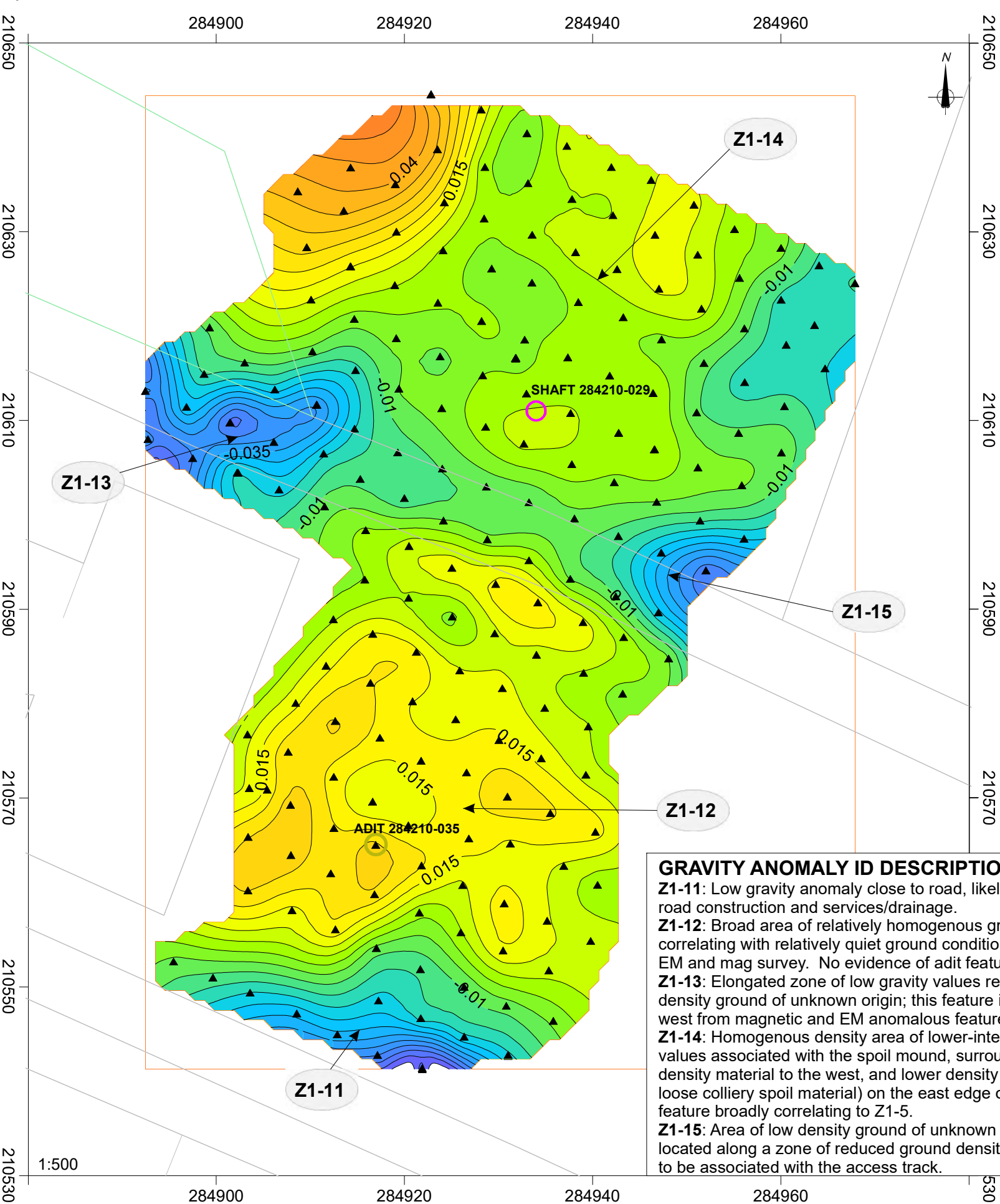


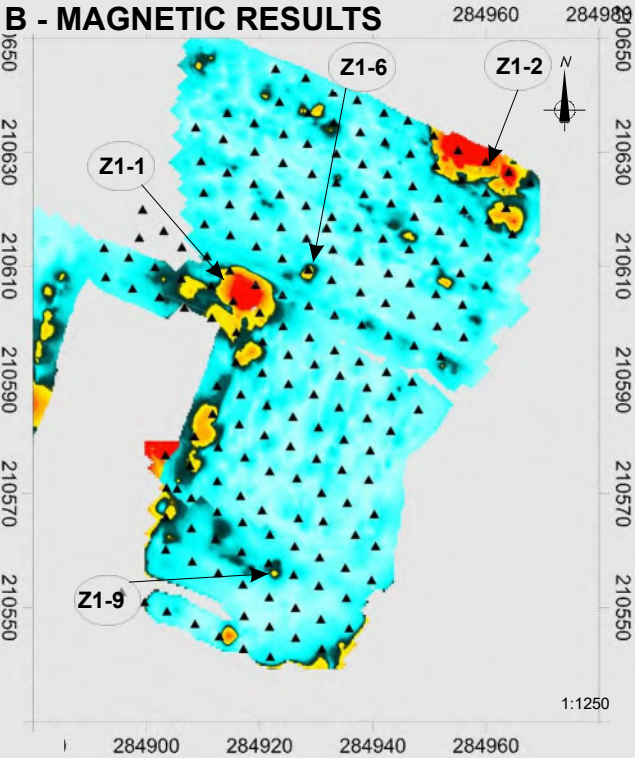
A) CORRECTED BOUGUER ANOMALY PLOT



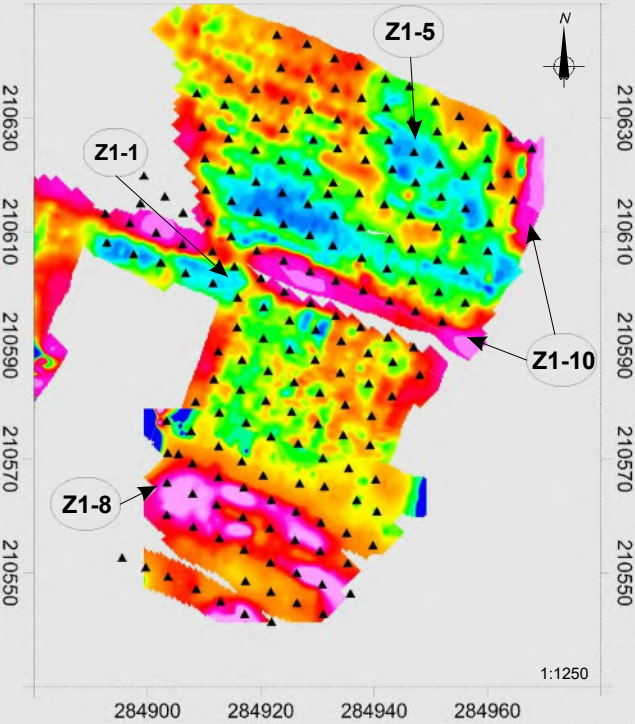
GRAVITY ANOMALY ID DESCRIPTION

Z1-11: Low gravity anomaly close to road, likely related to road construction and services/drainage.
Z1-12: Broad area of relatively homogenous ground density; correlating with relatively quiet ground conditions mapped in EM and mag survey. No evidence of adit feature.
Z1-13: Elongated zone of low gravity values representing low density ground of unknown origin; this feature is offset to the west from magnetic and EM anomalous feature (Z1-1).
Z1-14: Homogenous density area of lower-intermediate values associated with the spoil mound, surrounded by higher density material to the west, and lower density material (likely loose colliery spoil material) on the east edge of the mound; feature broadly correlating to Z1-5.
Z1-15: Area of low density ground of unknown origin that is located along a zone of reduced ground density that appears to be associated with the access track.

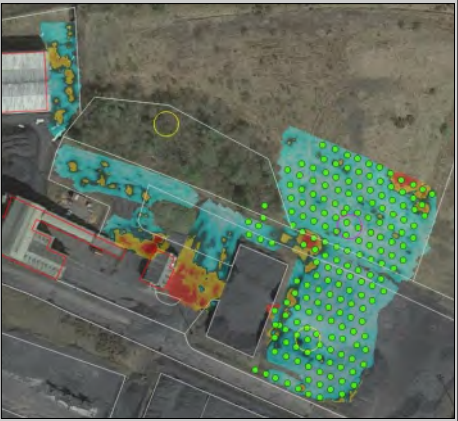
B - MAGNETIC RESULTS



C - ELECTROMAGNETIC RESULTS



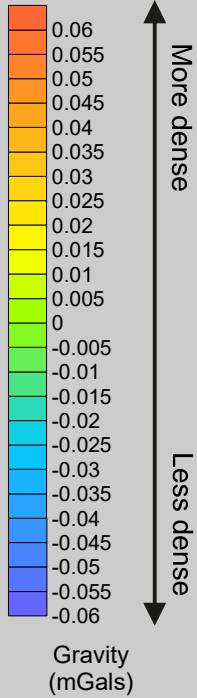
LOCATION MAP



KEY

- ▲ Gravity station and ID
- ▬ Simplified topographical plan
- Expected location of mineshaft
- Expected location of adit
- ID of detected feature

COLOUR SCALE



DATA NOTES

Reduction density used 1600 g/m³



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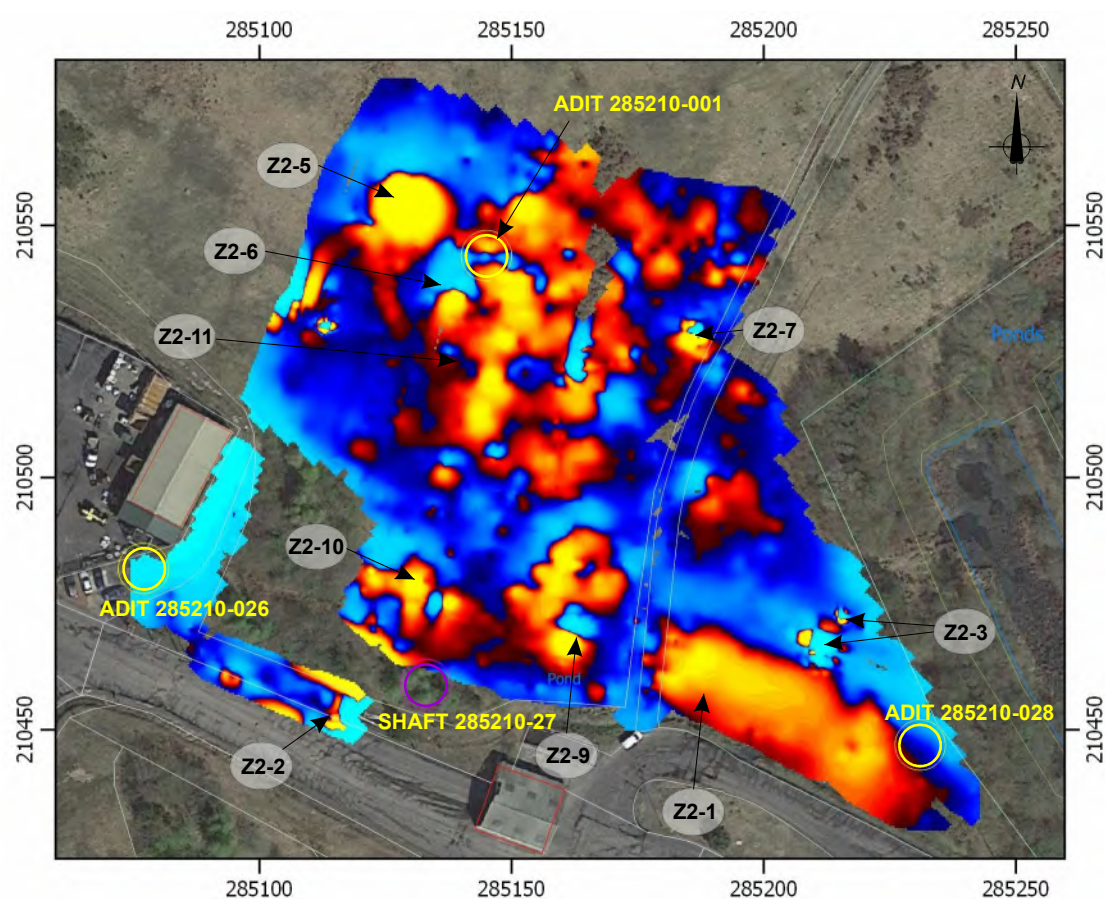
Title: **ZONE 1 - MICROGRAVITY SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

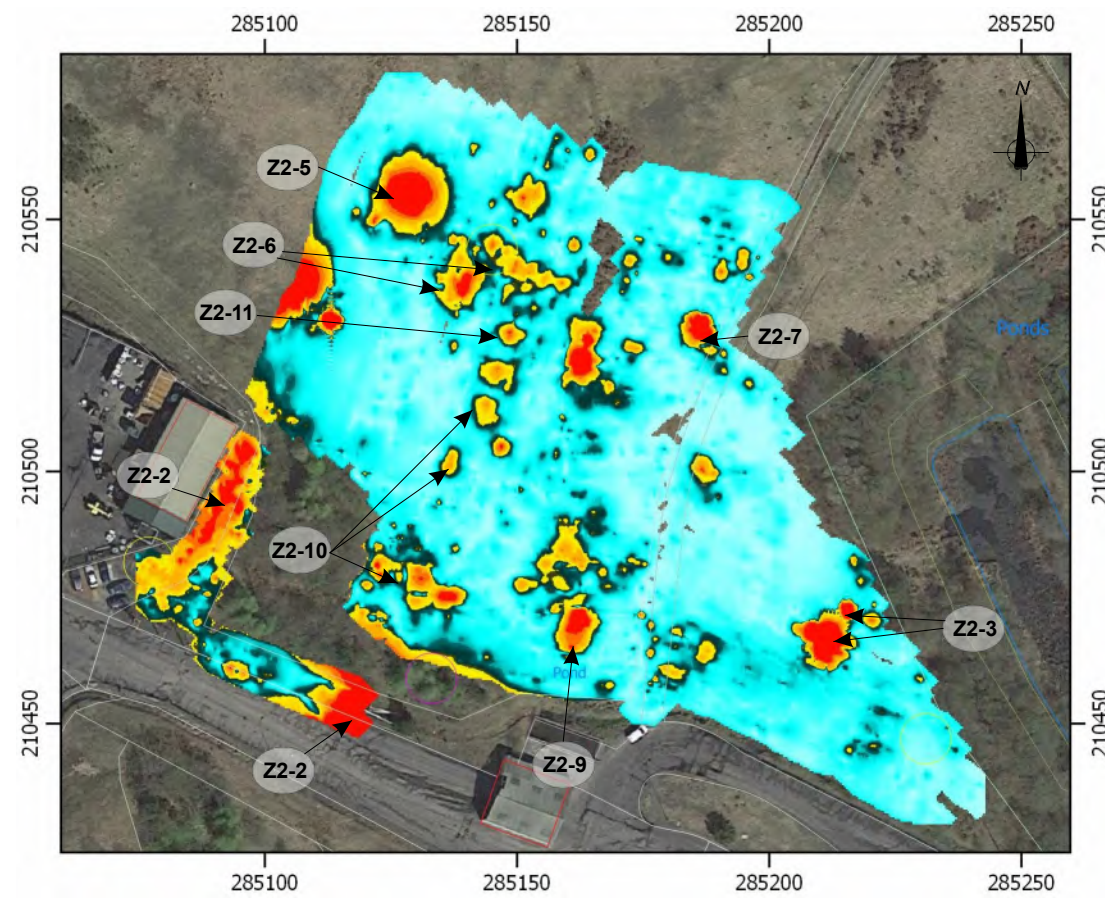
Scale: See individual plots
Drawn by/Ref: KZ&AL/7591/3
Date: December 2021

FIGURE 3

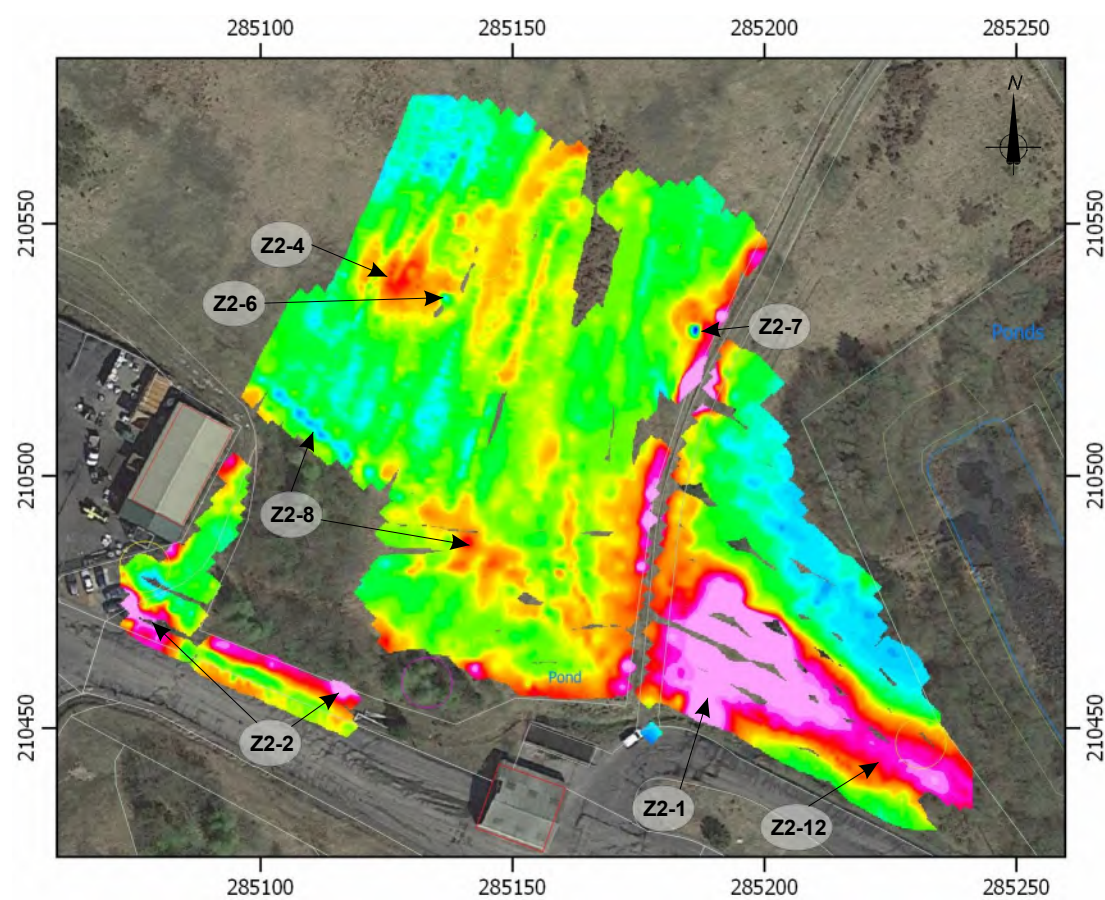
A) MAGNETIC TOTAL FIELD - Ferrous metal content



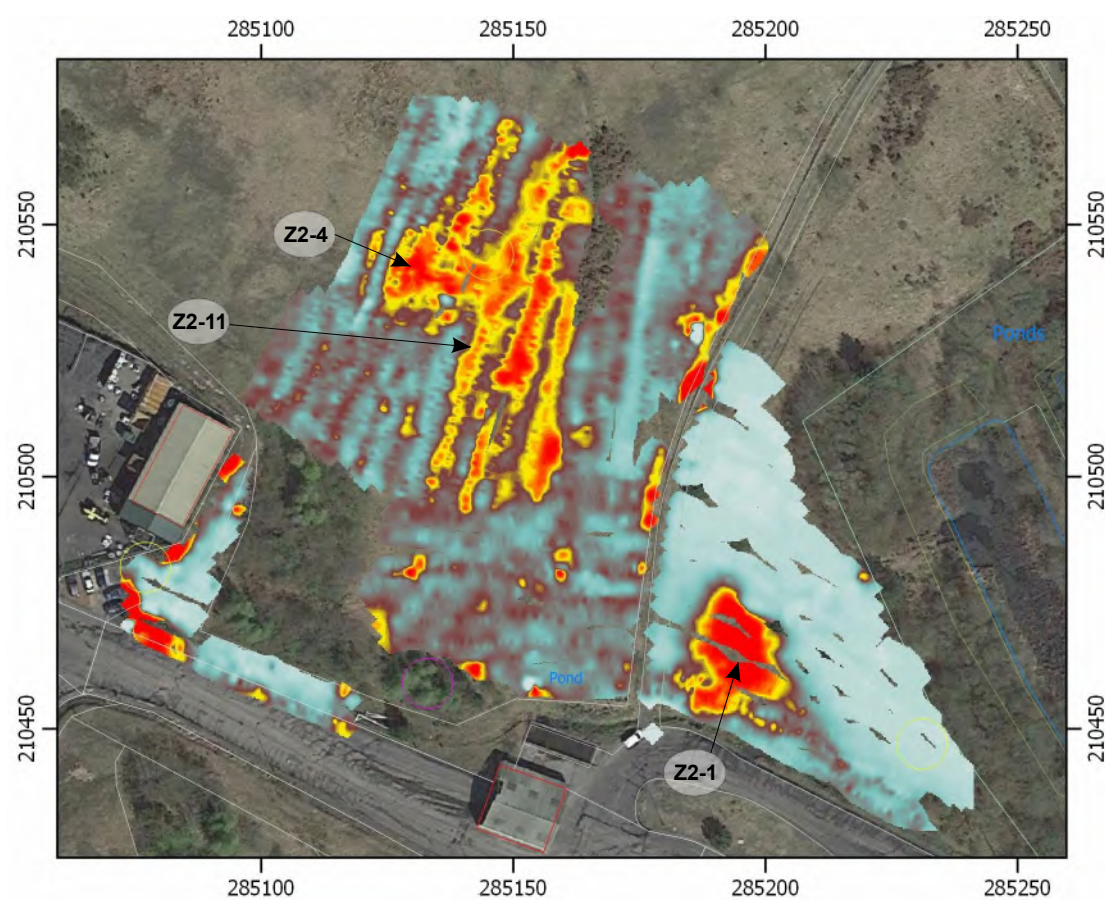
B) MAGNETIC ANALYTICAL SIGNAL - Significant ferrous metal anomalies



C) EM - GROUND CONDUCTIVITY

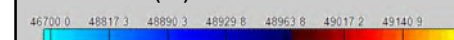


D) EM - IN-PHASE RESPONSE - Metal and cultural noise response

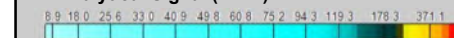


COLOUR SCALE

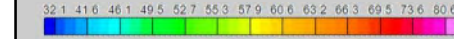
A - Total Field (nT)



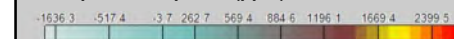
B - Analytical Signal (nT/m)



C - Electrical Conductivity (mS/m)



D - In-phase Response (ppm)



NOTES

The results of the magnetic and the electromagnetic survey correlate well and highlight different ground characteristics and potential structures or features buried in the subsurface. Areas that show extreme values or instrument overload indicate buried metal. The area of adit 285210-026 and mineshaft 285210-27 were only partially accessible. Metallic objects on the surface may mask subtle anomalous responses. There are a number of notable instrument responses in the zone of adit 285210-001, which are recommended to be intrusively investigated. There are some changes in response close to adit 285210-028 which indicate changes in the ground composition. Main features detected in the surveys are highlighted and described below.

ID DESCRIPTION

Z2-1: Broad area of increased magnetic and EM response, indicating high ferrous composition of the made-ground (colliery spoil).
Z2-2: High instrument responses close to the road, interference from metallic debris, road, fencing and services.
Z2-3: Two isolated dipolar magnetic responses in east area, indicating localised zone of ferrous material.
Z2-4: Circular zone of raised conductivity values in proximity to the expected adit location indicating localised change in made-ground composition - increase in clay and moisture content in the subsurface, potentially related to adit 285210-001.
Z2-5: Circular, high magnetic instrument response in proximity to the expected adit location, indicating localised concentration of ferrous material buried in the subsurface, potentially related to adit 285210-001.
Z2-6: Number of dipolar anomalous instrument responses in close proximity to the expected adit location; may be related to adit 285210-001.
Z2-7: Isolated dipolar response, indicating manhole/service.
Z2-8: Linear anomalous response detected in the EM survey indicating trench or service in the shallow subsurface.
Z2-9: Isolated dipolar anomaly, indicating ferrous material.
Z2-10: Zone of scattered high magnetic responses associated with ferrous material or debris in the subsurface.
Z2-11: Broad area of increased magnetic and in-phase responses, showing change in made-ground composition.
Z2-12: Linear zone of increased conductivity values, indicating change in made-ground composition - clay and moisture-rich material.

KEY

- Expected location of mineshaft
- Expected location of adit
- ID of detected feature

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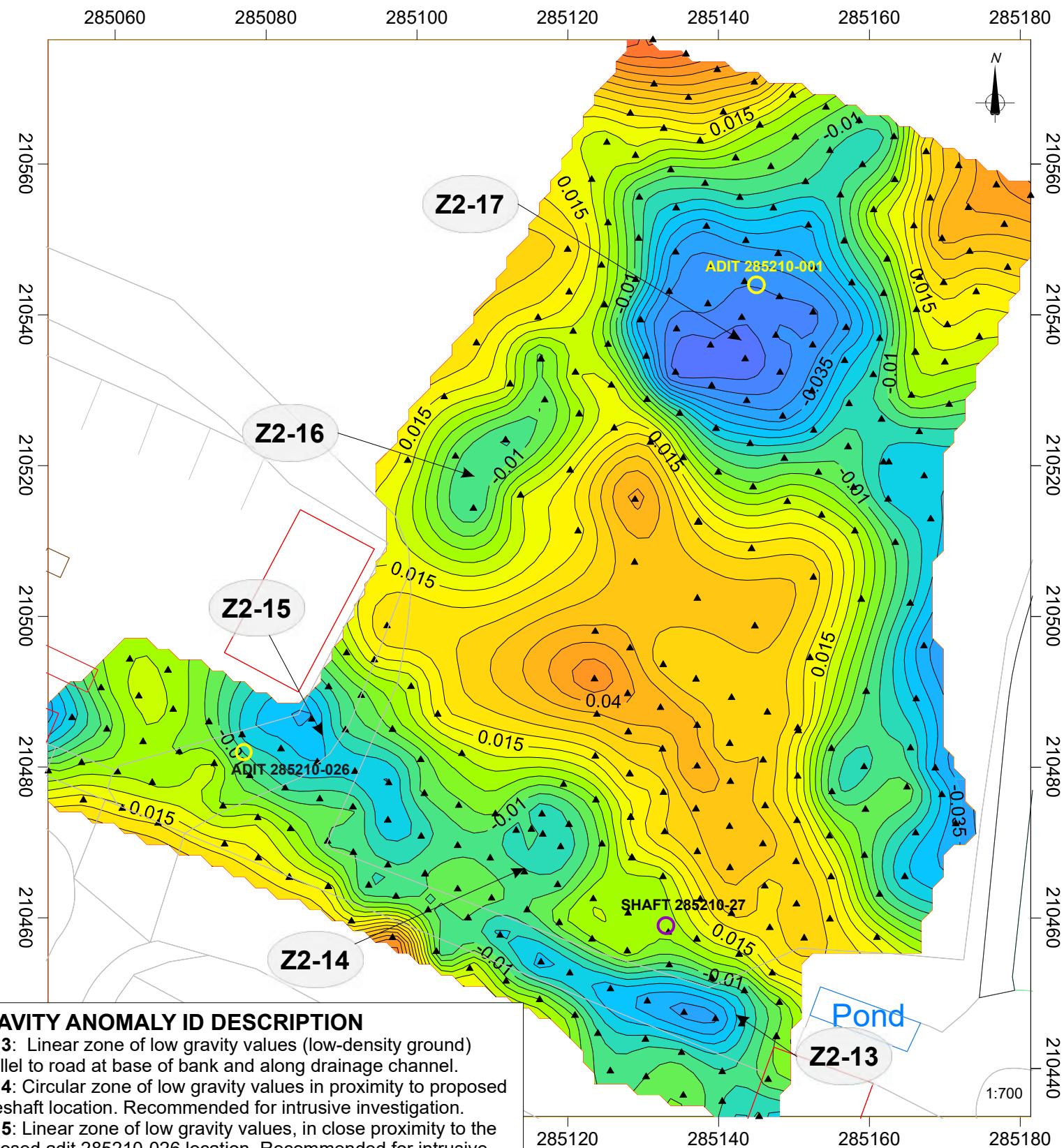
Title: **ZONE 2 - MAGNETIC AND ELECTROMAGNETIC SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

Scale: 1:1500 @ A3
 Drawn by/Ref: KZ&AL/7591/4
 Date: December 2021

FIGURE 4

A) CORRECTED BOUGUER ANOMALY PLOT ZONE 2A



GRAVITY ANOMALY ID DESCRIPTION

Z2-13: Linear zone of low gravity values (low-density ground) parallel to road at base of bank and along drainage channel.

Z2-14: Circular zone of low gravity values in proximity to proposed mineshaft location. Recommended for intrusive investigation.

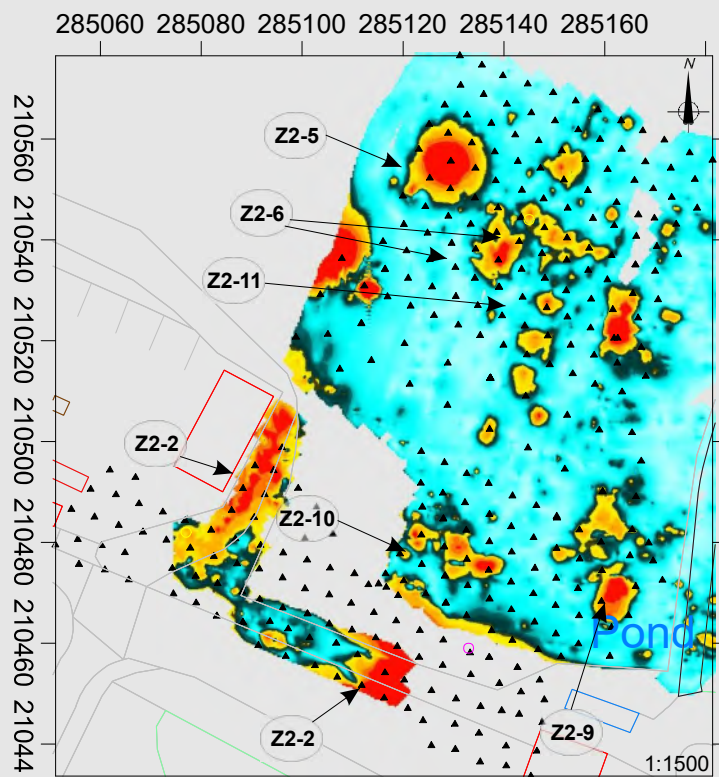
Z2-15: Linear zone of low gravity values, in close proximity to the proposed adit 285210-026 location. Recommended for intrusive investigation.

Z2-16: Isolated zone of decreased gravity values indicating unknown change in ground composition to less dense material.

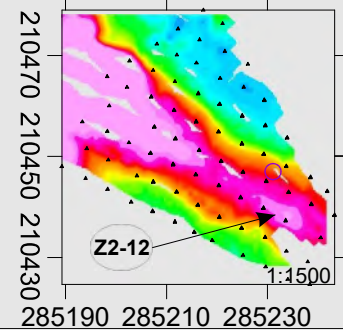
Z2-17: Distinct, large circular area of low gravity values, indicating lower density ground material. Due to its proximity to the proposed adit location and correlation with magnetic and EM anomalous features, it is recommended to ground-truth this area.

Z2-18: Linear zone of low gravity values coinciding with EM anomaly (Z2-12), in close proximity to proposed adit 285210-028 location. Recommended for intrusive investigation.

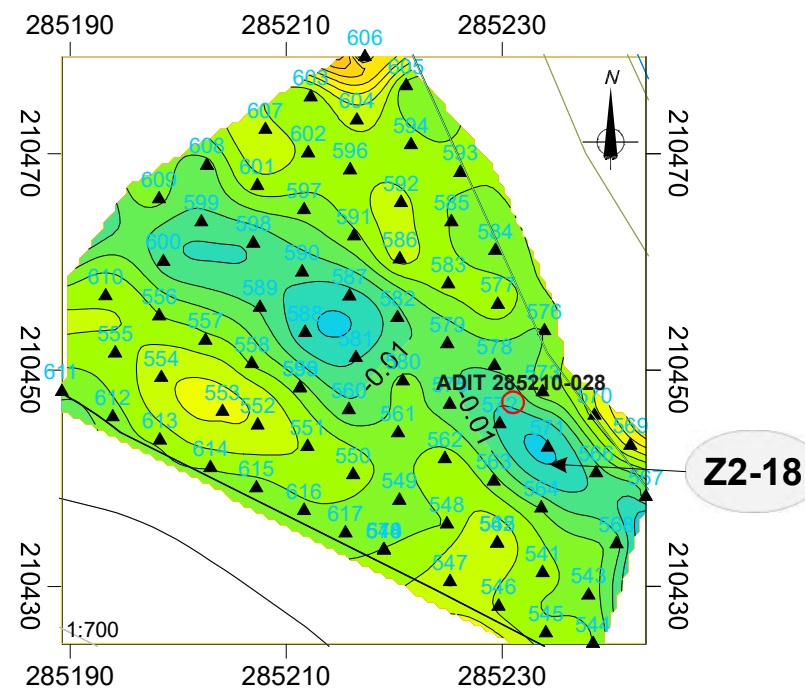
C - MAGNETIC RESULTS ZONE 2A



D - MAGNETIC RESULTS ZONE 2B



B - CORRECTED BOUGUER ANOMALY PLOT ZONE 2 B



LOCATION MAP

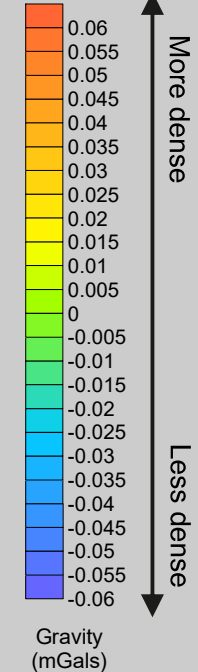


KEY

- ▲ Gravity station and ID
- ▬ Simplified topographical plan
- Expected location of mineshaft
- Expected location of adit
- ID of detected feature

COLOUR SCALE

A & B



DATA NOTES

Reduction density used 1600 g/m³



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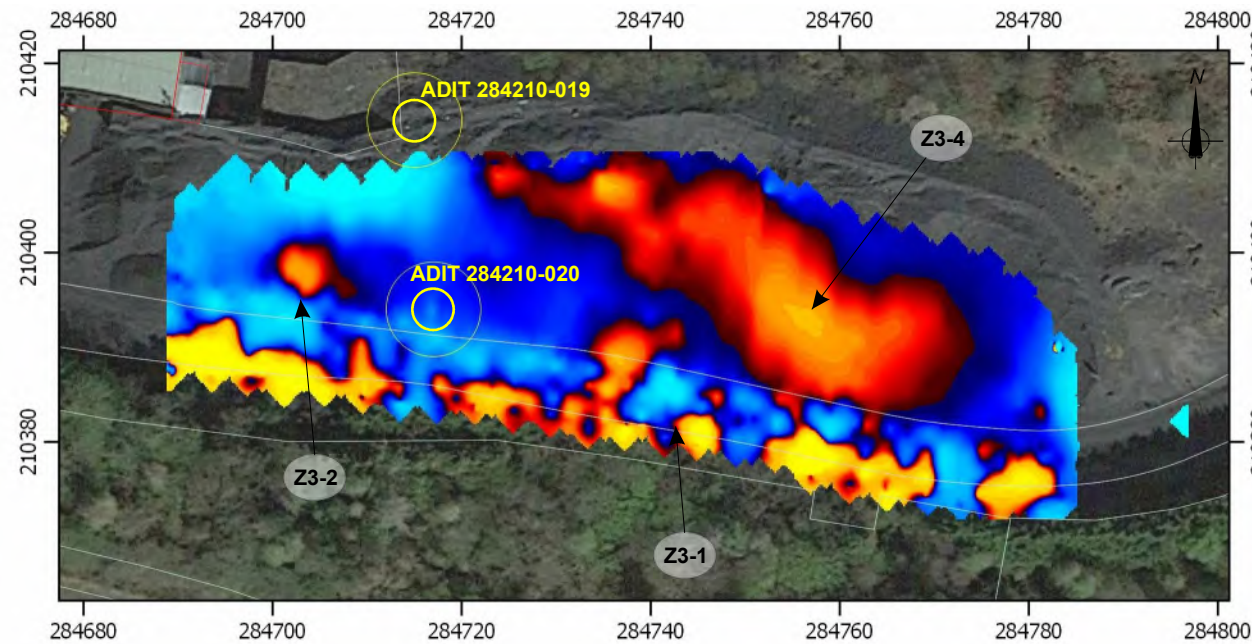
Title: **ZONE 2 - MICROGRAVITY SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

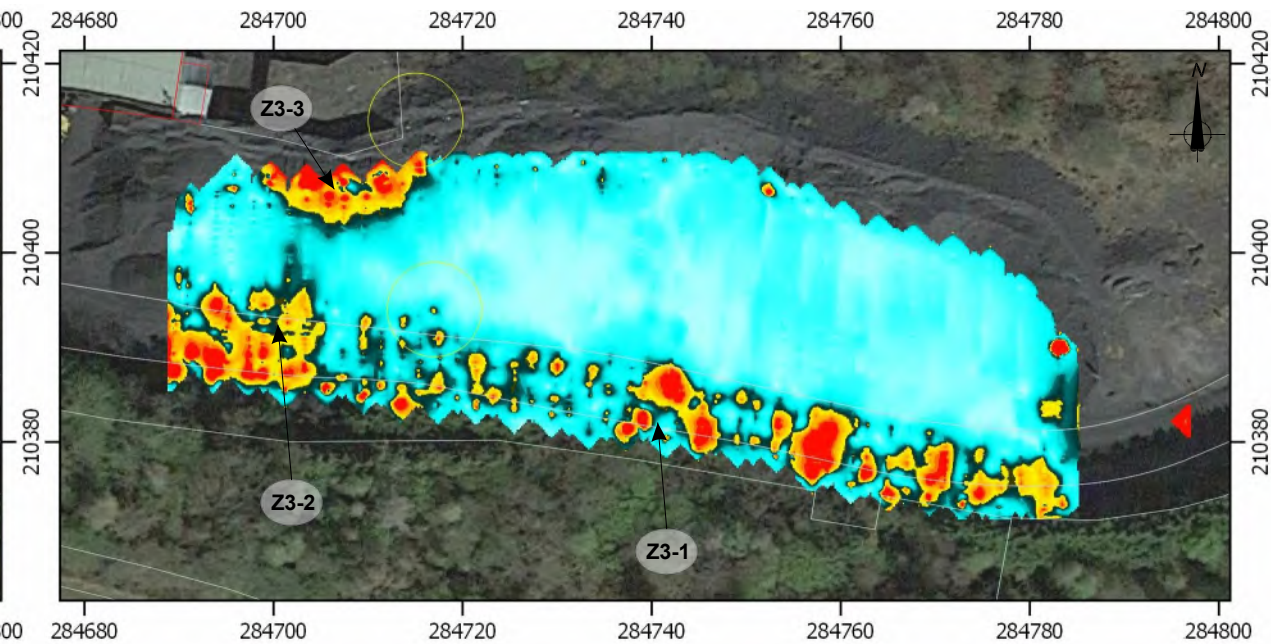
Scale: See individual plots
Drawn by/Ref: KZ&AL/7591/5
Date: December 2021

FIGURE 5

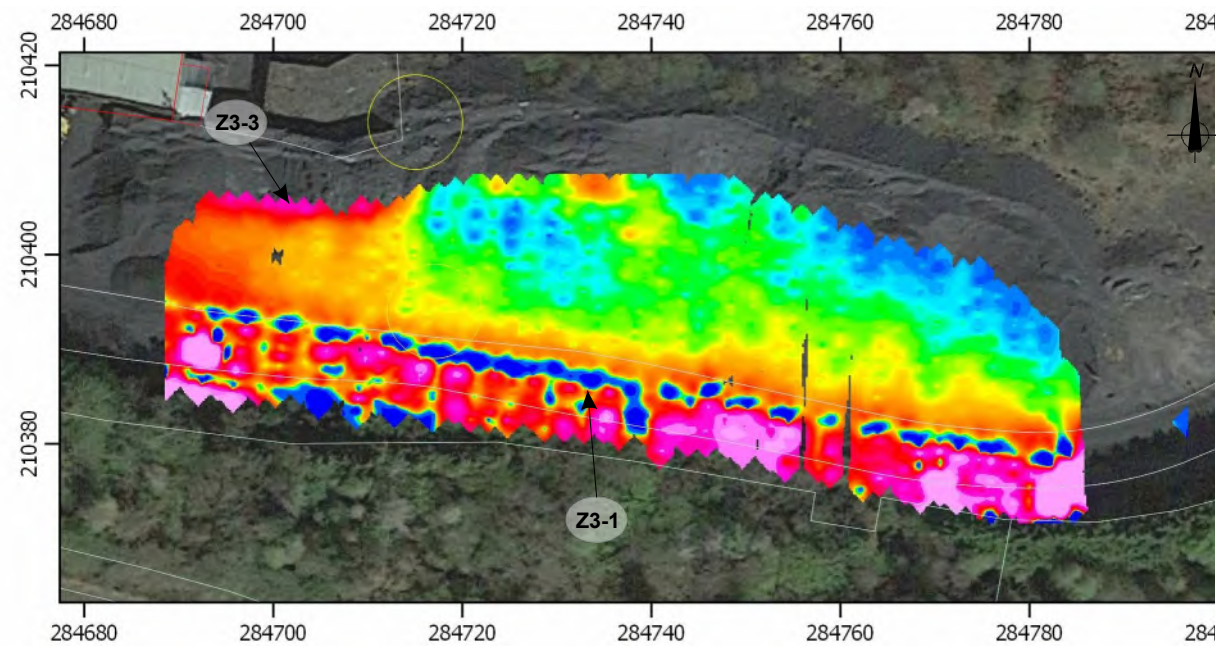
A) MAGNETIC TOTAL FIELD - Ferrous metal content



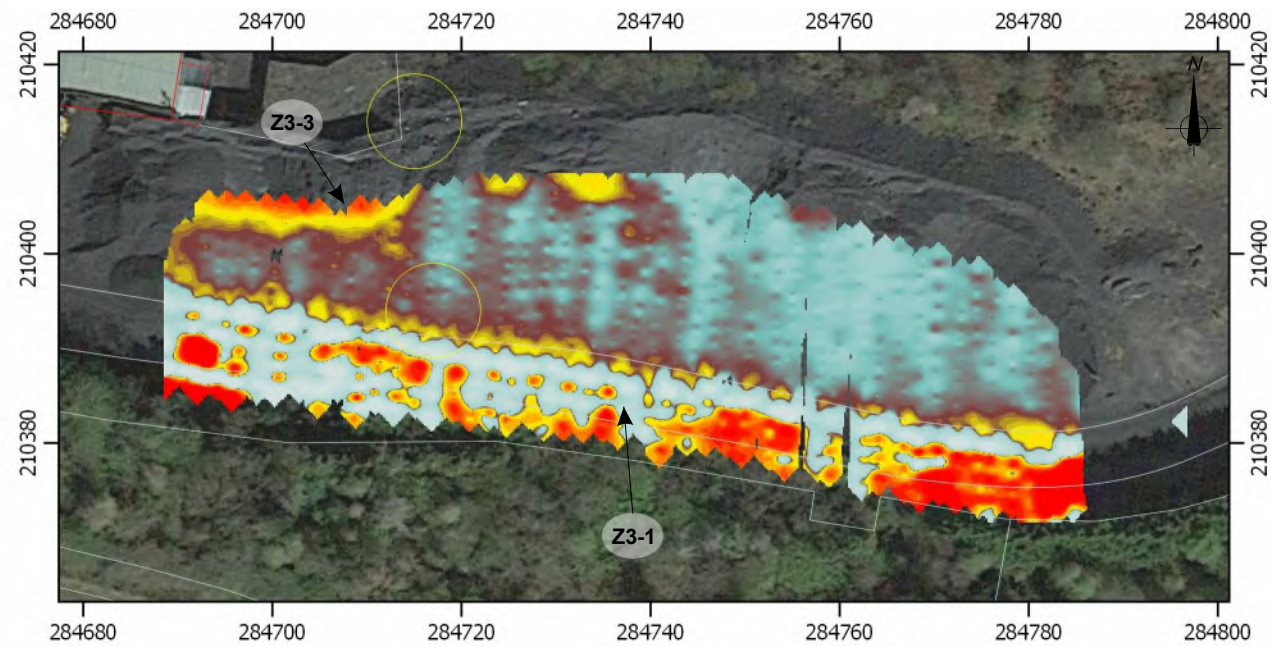
B) MAGNETIC ANALYTICAL SIGNAL - Significant ferrous metal anomalies



C) EM - GROUND CONDUCTIVITY



D) EM - IN-PHASE RESPONSE - Metal and cultural noise response



COLOUR SCALE

A - Total Field (nT)

46244.6 48321.6 48735.9 48864.1 48980.9 49112.9 49275.0

B - Analytical Signal (nT/m)

32.7 64.3 86.9 107.6 137.7 181.6 277.0 410.4 600.8 927.9

C - Electrical Conductivity (mS/m)

33.1 46.2 48.4 49.9 51.3 53.0 55.0 56.2 62.7 70.3 87.0 134.3 371.7

D - In-phase Response (ppm)

-19237.7 -284.5 255.1 472.8 700.0 993.6 1524.7 4681.0 31348.6

NOTES

Zone 3 can be divided into a lower lying flat area and sloped terrace base (north of steep slope), and a flat area usually covered in coal stock-piles in the south (approximately 8m higher than the north area). Due to an uneven surface, large boulders and vegetation on the slope in the north part of the zone, the magnetic and EM survey could not be undertaken on the slope. The flat, lower lying part of the north of Zone 3 was accessible in some parts, however, due to a large amount of metal interference (discarded rollers, rails and fencing), this area was not surveyed with the EM and magnetic techniques.

The expected location of adit 284210-020 was covered with all survey techniques; adit 284210-019 proposed location is on the break of slope with limited accessibility for the geophysical surveys.

The results of the magnetic and the electromagnetic surveys show relatively homogenous coal spoil material in this zone.

Main features detected in the surveys are highlighted and described below.

ID DESCRIPTION

Z3-1: High instrument response/overload associated with reinforced access road.
Z3-2: Increase in magnetic response adjoining access road; may be linked to road construction, service or similar. Due to the relative proximity to the proposed adit 284210-020 location, this feature may warrant further investigation.
Z3-3: Instrument interference from metal containers bordering the survey grid.
Z3-4: Increase in magnetic values, indicating increase in ferrous material/spoil in the subsurface.

KEY

- Expected location of mineshaft
- Expected location of adit
- Z1-1 ID of detected feature



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Title: **ZONE 3 - MAGNETIC AND ELECTROMAGNETIC SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

Scale: 1:800 @ A3

Drawn by/Ref: KZ&AL/7591/6

Date: December 2021

FIGURE 6

This topographic map displays the study area with contour lines indicating elevation. The map is bounded by coordinates 284685 to 284745 on the x-axis and 210385 to 210445 on the y-axis. A north arrow is located in the top right corner. The map shows several contour lines with values ranging from -0.01 to 0.04. Two specific features are highlighted: ADIT 284210-019 and ADIT 284210-020. A red rectangle labeled Z3-5 is also present. A steep slope is indicated by a series of black triangles. The map includes a scale bar at the bottom right indicating 1:300.

- ▲ Gravity station and ID
- ✏ Simplified topographical plan
- Expected location of mineshaft
- Expected location of adit
- Z1-1 ID of detected feature

Gravity (mGals)

0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06

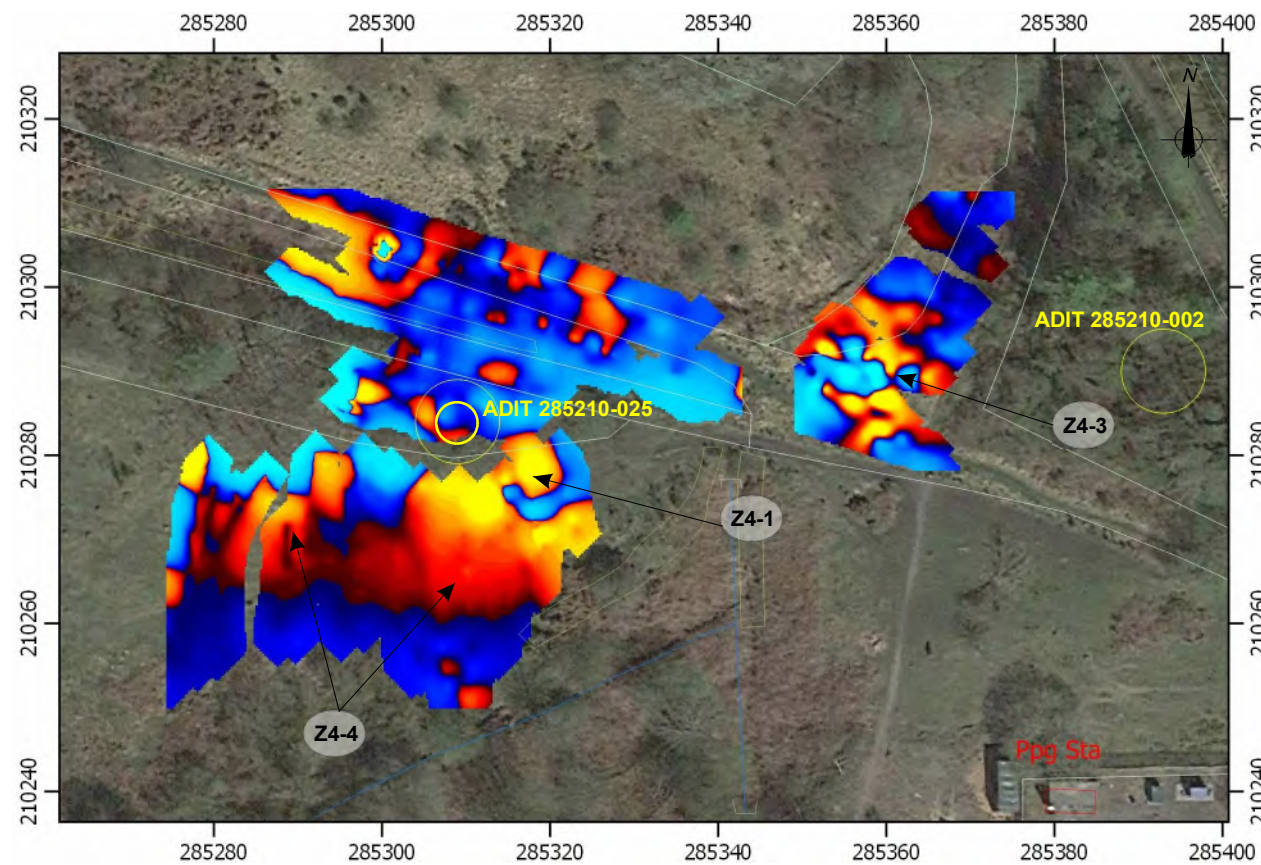
More dense

Less dense

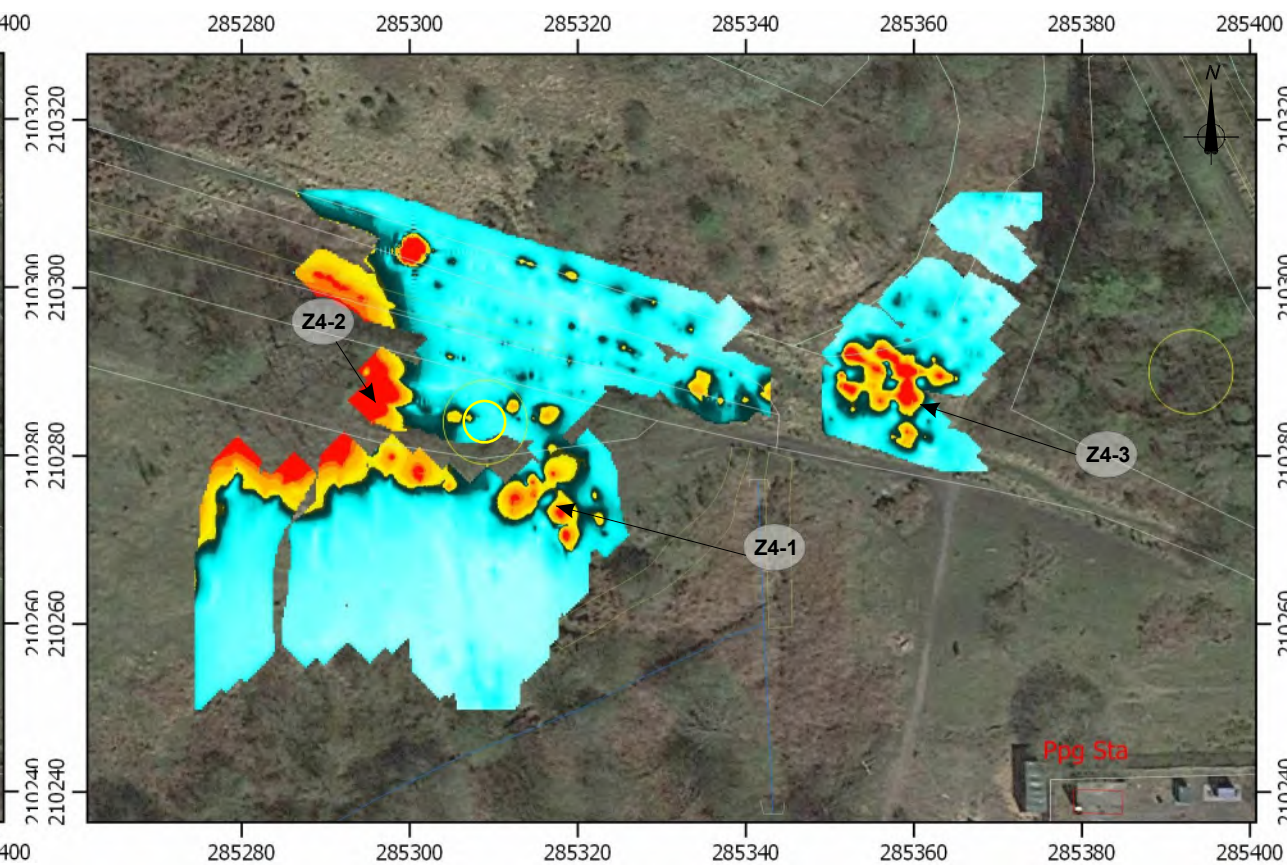
Z3-7: Subtle, localised decrease in ground density in proximity to proposed mine adit 284210-020 location. May warrant further investigation.

FIGURE 7

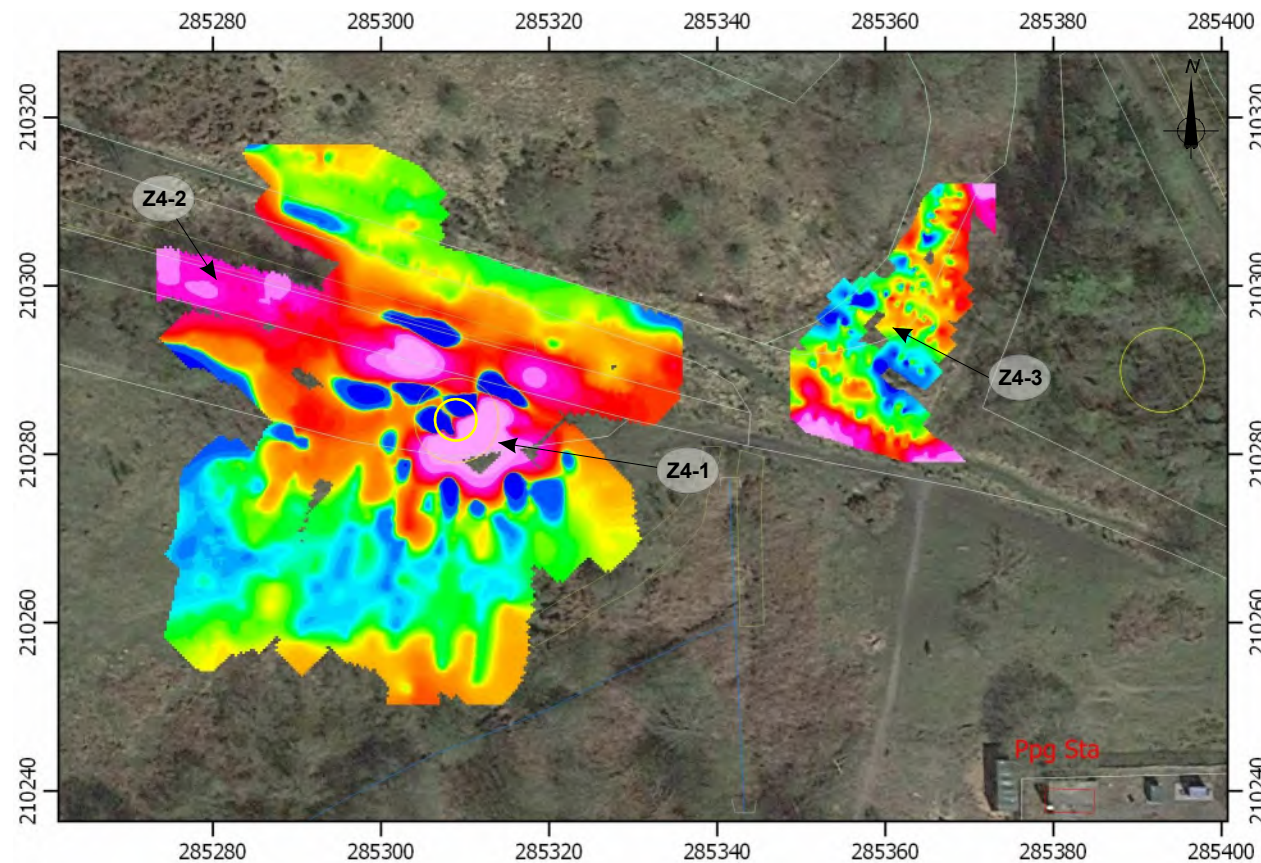
A) MAGNETIC TOTAL FIELD - Ferrous metal content



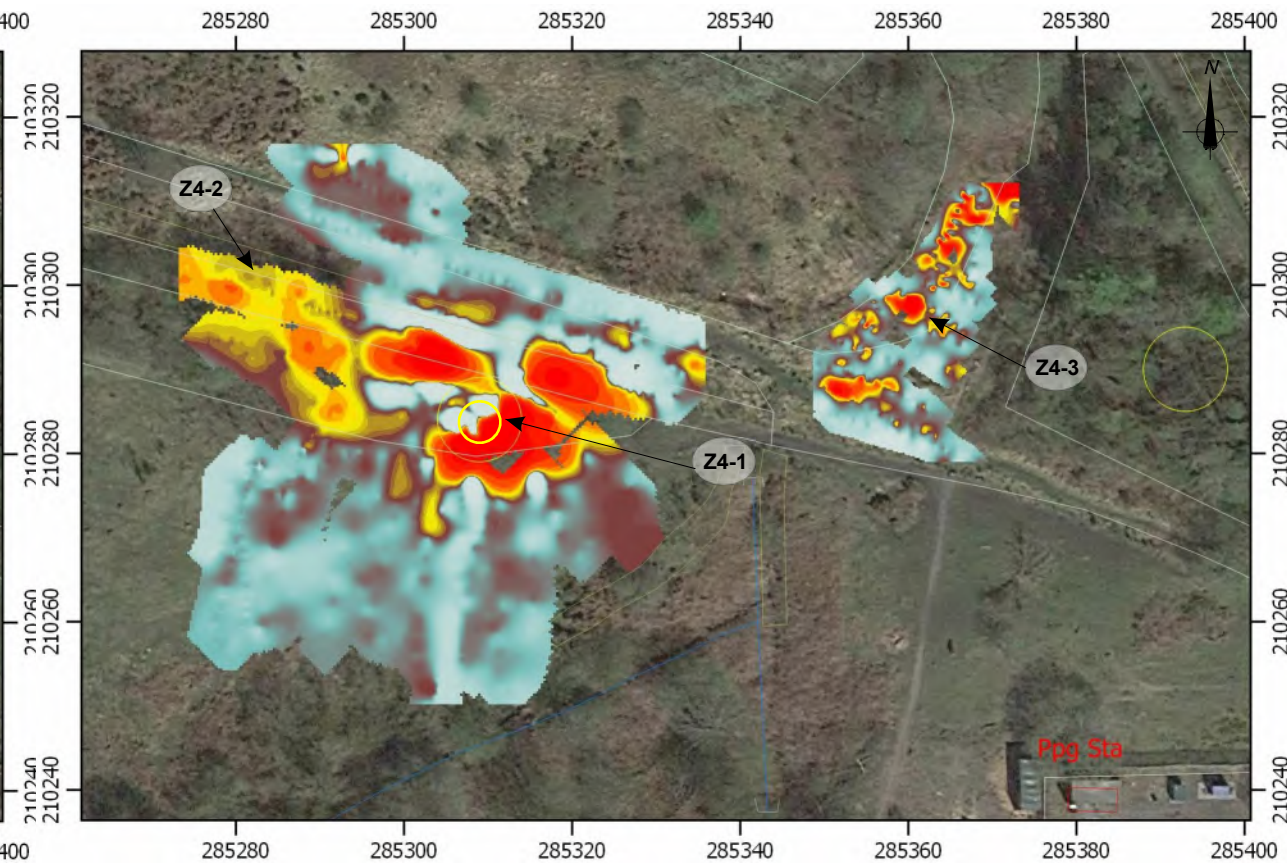
B) MAGNETIC ANALYTICAL SIGNAL - Significant ferrous metal anomalies



C) EM - GROUND CONDUCTIVITY

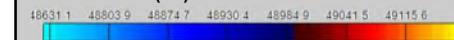


D) EM - IN-PHASE RESPONSE - Metal and cultural noise response

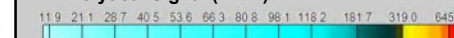


COLOUR SCALE

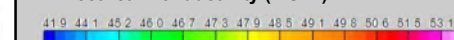
A - Total Field (nT)



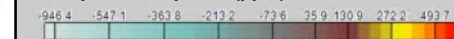
B - Analytical Signal (nT/m)



C - Electrical Conductivity (mS/m)



D - In-phase Response (ppm)



NOTES

This zone targets adits 285210-025 and 285210-002. Adit 285210-002 was located in the eastern part of Zone 4 and awaits tree clearance for the survey to be undertaken.

The area of adit 285210-025 was located within a narrow wooded zone, partially cleared for the survey to take place. The metallic fencing located within the survey area has caused some interference, however, large dipolar responses in close proximity to the adit may be related to the mine workings and are recommended for intrusive investigation.

The results of the magnetic and the electromagnetic survey correlate well and highlight different ground characteristics and potential structures or features buried in the subsurface. Areas that show extreme values or instrument overload indicate buried metal.

Main features detected in the surveys are highlighted and described below.

ID DESCRIPTION

- Z4-1:** Zone of large dipolar instrument responses near to proposed adit location.
- Z4-2:** Zone of high instrument response to the west of the expected adit location, indicating high concentration of ferrous material and increased ground conductivity.
- Z4-3:** Overgrown, difficult to access area, with scattered high instrument responses indicating metallic debris or ferrous rich colliery spoil in the shallow subsurface.
- Z4-4:** Increased magnetic responses in field likely indicates more ferrous rich colliery spoil.

KEY

- Expected location of mineshaft
- Expected location of adit
- ID of detected feature

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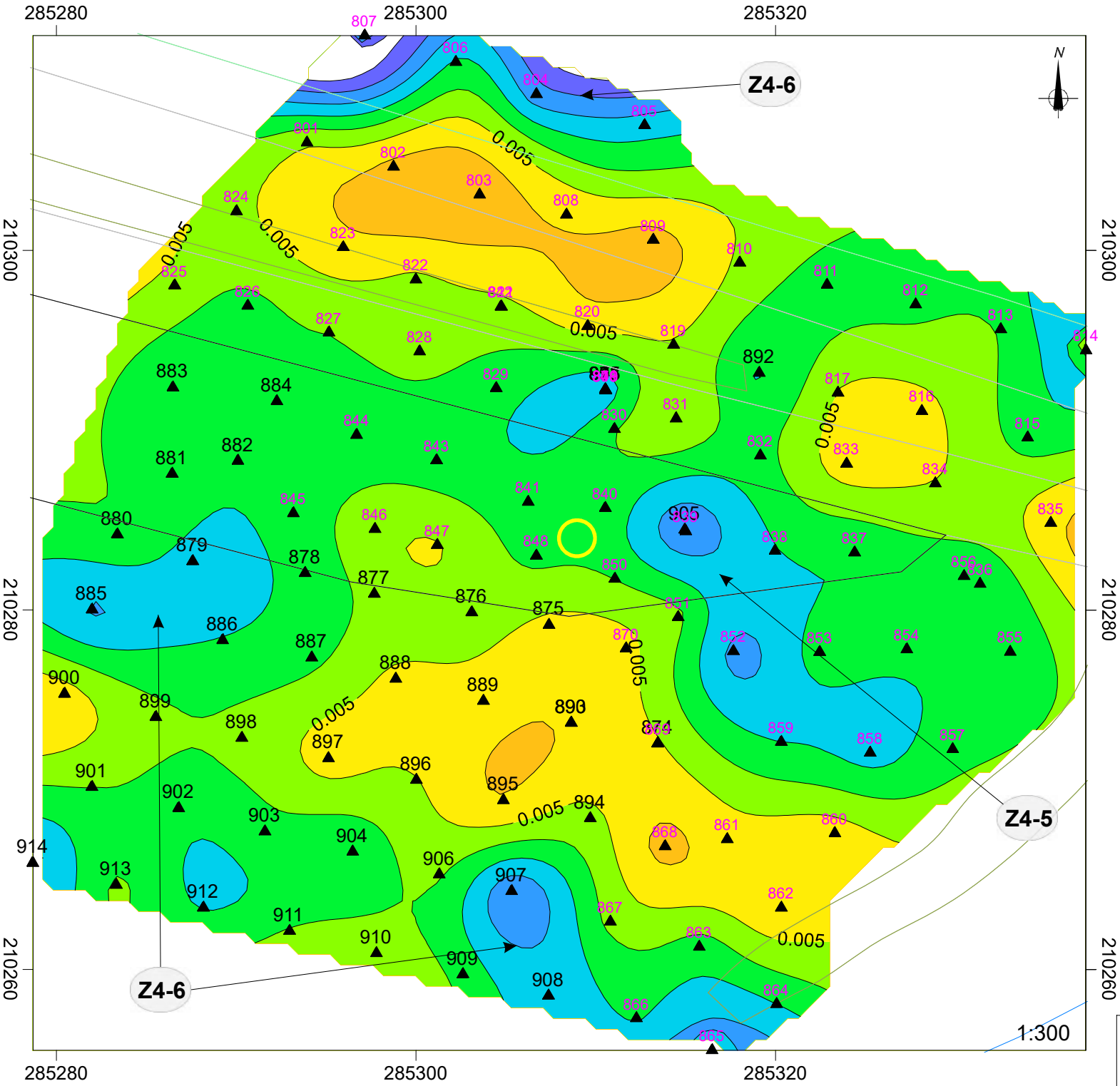
Title: **ZONE 4 - MAGNETIC AND ELECTROMAGNETIC SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

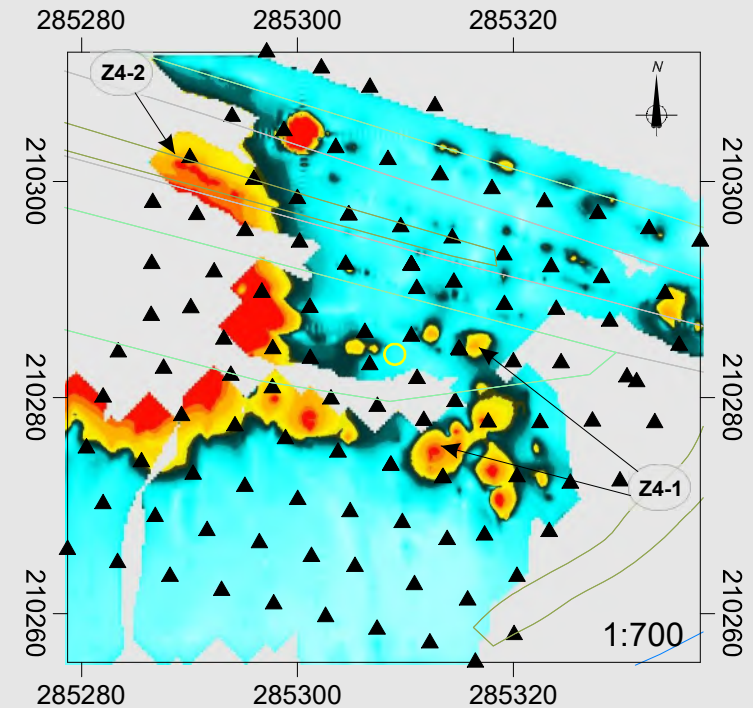
Scale: 1:900 @ A3
Drawn by/Ref: KZ&AL/7591/8
Date: December 2021

FIGURE 8

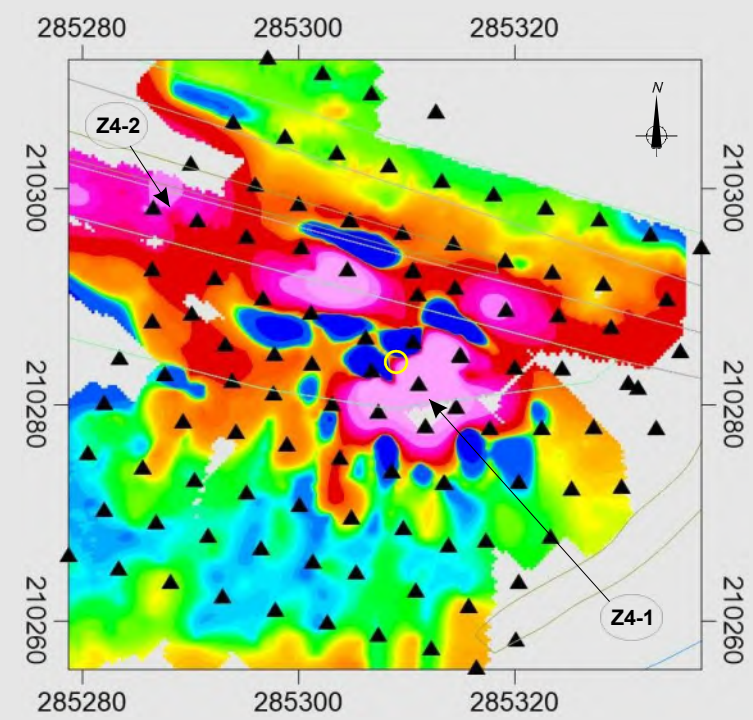
A) CORRECTED BOUGUER ANOMALY PLOT



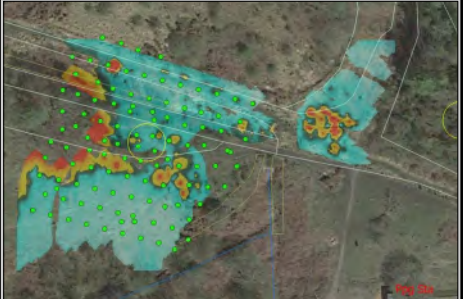
B - MAGNETIC RESULTS



C - GROUND CONDUCTIVITY



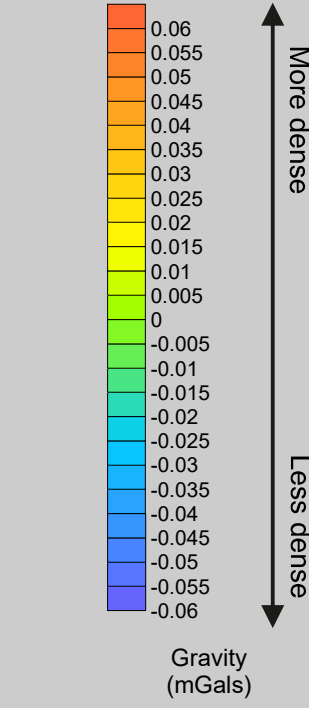
LOCATION MAP



KEY

- ▲ Gravity station and ID
- Simplified topographical plan
- Expected location of mineshaft
- Expected location of adit
- ID of detected feature

COLOUR SCALE



DATA NOTES

Reduction density used 1600 g/m³

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Title: **ZONE 4 - MICROGRAVITY SURVEY RESULTS**

Project: **ONLLWYN COAL WASHERY, NEATH-PORT TALBOT**

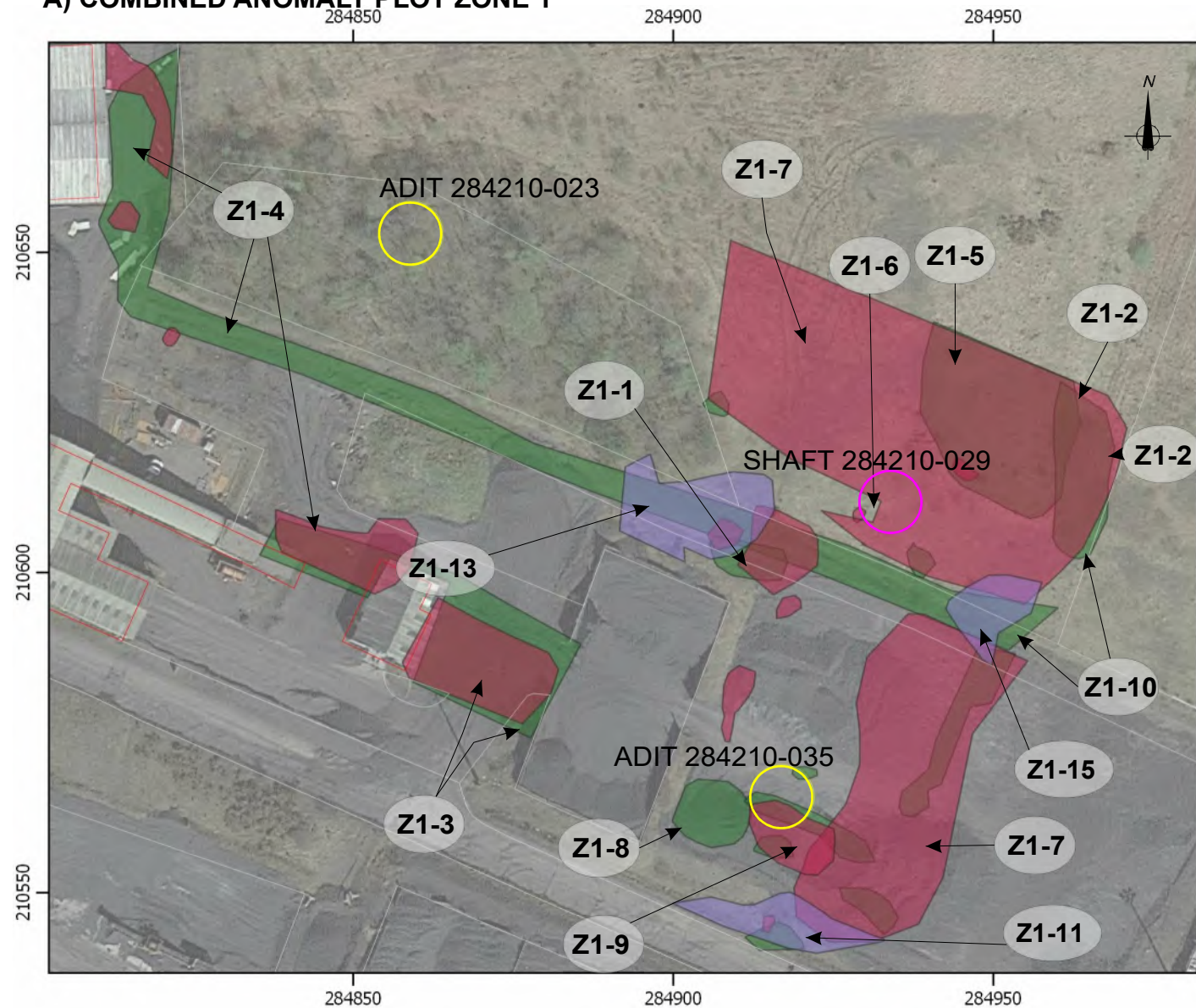
Scale: See individual plots
Drawn by/Ref: KZ&AL/7591/9
Date: December 2021

FIGURE 9

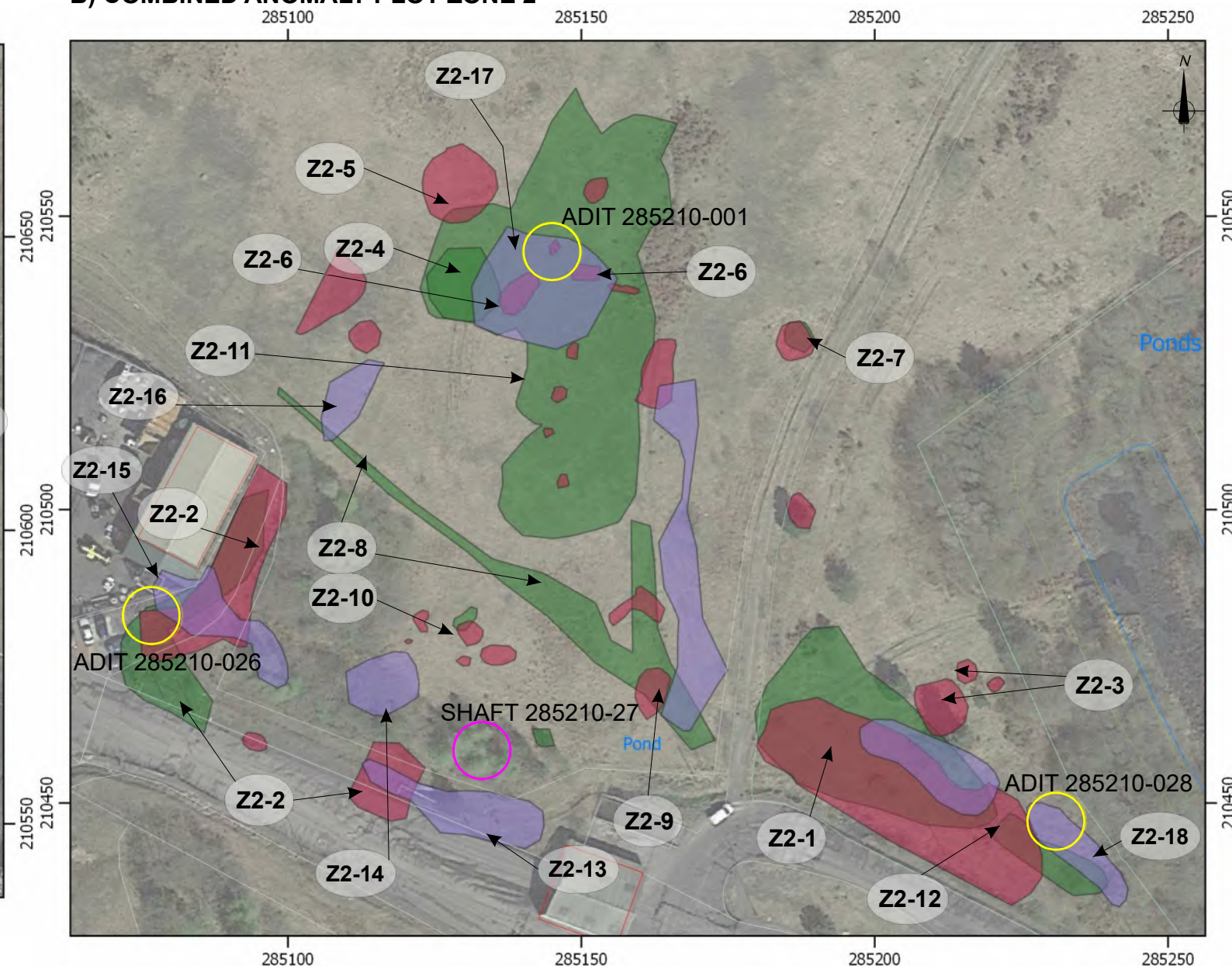
GRAVITY ID DESCRIPTION

Z4-5: Low gravity values close to the proposed adit location indicating less dense ground and correlating with a cluster of magnetic and EM anomalies. This area is recommended for intrusive investigation.
Z4-6: Low gravity zones likely indicates less dense areas of made-ground/colliery spoil.

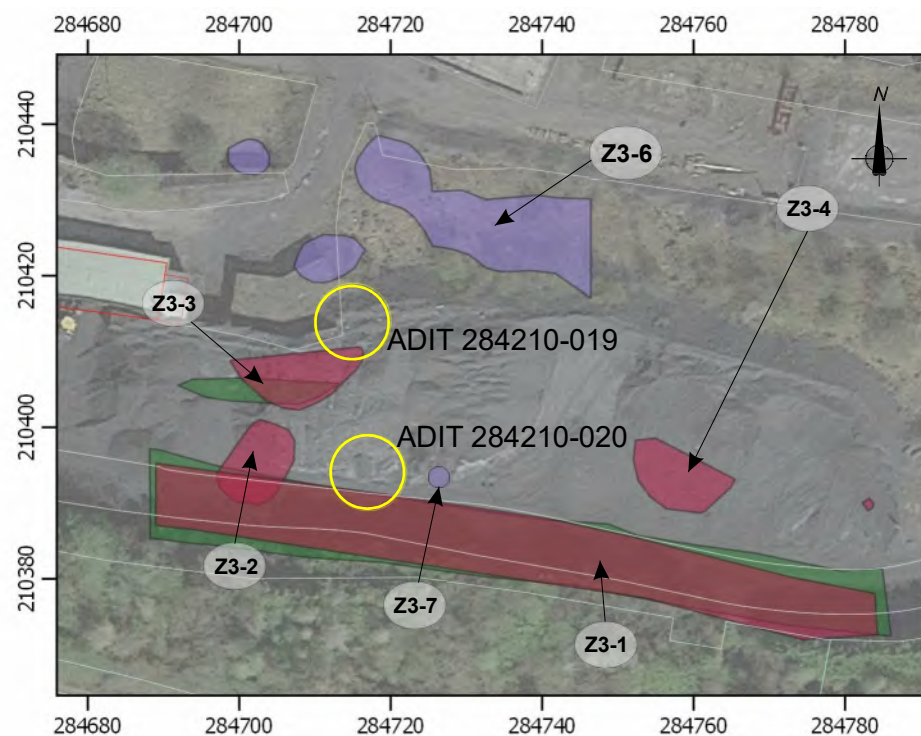
A) COMBINED ANOMALY PLOT ZONE 1



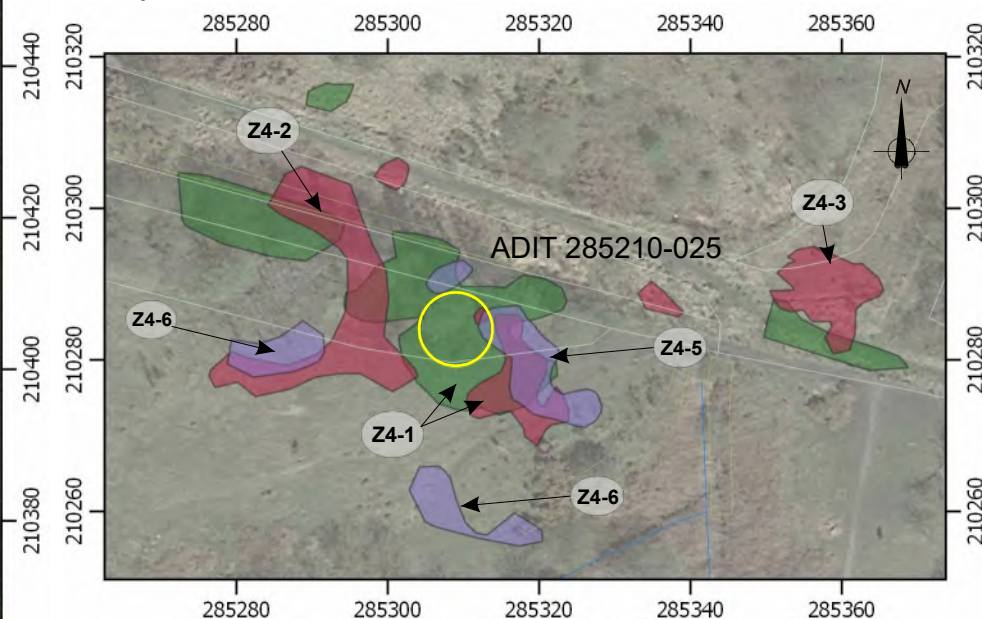
B) COMBINED ANOMALY PLOT ZONE 2



C) COMBINED ANOMALY PLOT ZONE 3



D) COMBINED ANOMALY PLOT ZONE 4



KEY

- Expected location of mineshaft
- Expected location of adit
- ID of detected feature
- Anomalous zone feature detected in magnetic survey
- Anomalous zone or feature detected in the EM survey
- Zone of mass decrease detected in the gravity survey

NOTES

Interpretive summary plots provide an overview of main features and anomalies detected in the surveys.

For detailed results and descriptions please refer to individual zones.

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SUMMARY SURVEY RESULTS

Project:
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NEATH-PORT TALBOT**

Scale: 1:1000 @ A3
Drawn by/Ref: KZ&AL/7591/10
Date: December 2021

FIGURE 10

Appendix

Appendix - Magnetic Survey

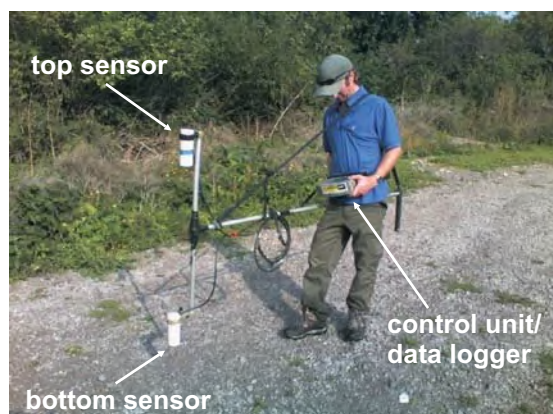
The magnetic survey technique is based on mapping localised variations in the Earth's magnetic field caused by sub-surface magnetic materials, which range from naturally occurring magnetic minerals to man-made ferrous objects. This leads to a wide range of applications from small-scale archaeology and engineering surveys to detect buried metallic objects, to large-scale surveys carried out to investigate regional geological trends or mineralisation.

Magnetic surveys are carried out using a man-portable instrument with readings taken on a regular grid or along selected traverse lines. The equipment functions by measuring the Earth's magnetic field to a very high precision at each survey station. Ferrous materials in the subsurface have an induced magnetic field that is superimposed on the Earth's field at that location creating a magnetic anomaly. The spacing of survey stations depends on the width of the expected anomaly, which broadens with the size, and depth of burial of the targeted feature. Continuous profiling methods may be used for a high-resolution dataset.

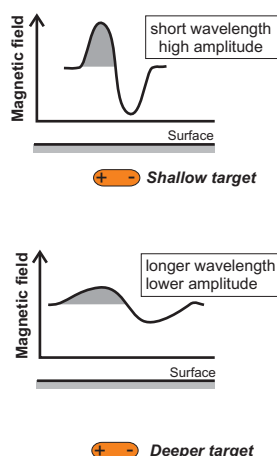
Magnetometer data are stored digitally by the survey instrument and downloaded to a field computer at the end of each day. The magnetic data are then processed to enhance any identifiable anomalies and presented on colour-contoured plots overlain with site maps (when available).

The results of the magnetic survey are usually presented as total field and analytical signal plots. The total field data may be used to observe the general character of the magnetic field across the survey area while the peak values (pink) displayed on the analytical signal plot indicate the source positions for dipole type magnetic anomalies. In general terms, the interpretation of a magnetic anomaly is based on observing the type (pole/dipole), amplitude and wavelength of the anomalous features.

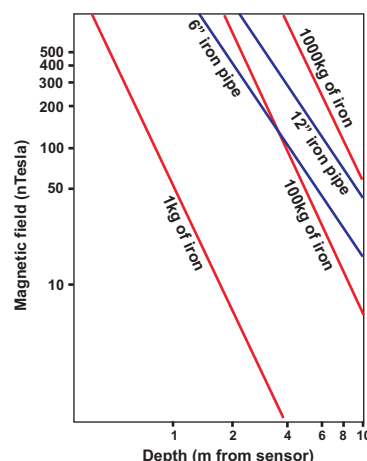
Gradiometer survey



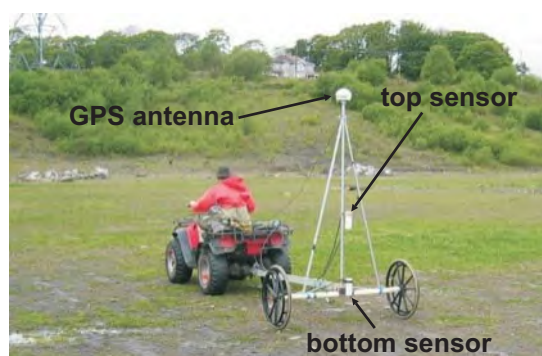
Magnetic anomalies



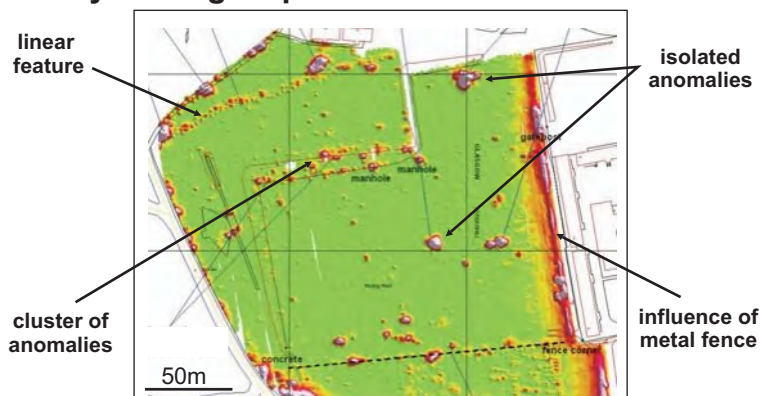
Guide to anomaly size



Towed gradiometer with dGPS



Analytical signal plot



Constraints

Metal objects or structures close to the survey area (fences, vehicles, debris etc.) produce a strong signal that can overshadow more subtle effects of sub-surface anomalies.

Appendix - Ground conductivity (EM) survey

A ground conductivity or electromagnetic (EM) survey involves the generation of an EM field at the surface and subsequent measuring of the response as it propagates through the subsurface. The main components of the instrument are a transmitter coil (to generate the primary EM field) and receiver coil (to measure the induced secondary EM field). The amplitude and phase-shift of the secondary field are recorded and are then converted into values for ground conductivity and in-phase component (metal indicator).

The ground conductivity (EM) instruments are either hand carried or mounted/towed behind a quad bike. Readings are usually taken on a regular grid or along selected traverse lines and positional control can be provided by dGPS if there is sufficient satellite coverage.

The selection of the particular EM instrument (EM-38/EM-31/GEM-2) is primarily based on the required penetration depth of the survey. However for most conductivity surveys the GEM-2 has replaced the more conventional EM-31 instrument due to its ability to simultaneously acquire data at different frequencies (i.e. different depth levels) and a greater depth of penetration. At the end of each survey, the survey data is downloaded to a field computer and corrected for instrument, diurnal and positional shifts. Additional editing may be carried out to remove any 'noisy' data values/positions.

The results from the EM survey can be presented as colour contoured plots of conductivity and inphase (metal response) data. In general terms, a relative increase in conductivity values usually indicates a local increase in clay content or water saturation. However, if there is a corresponding increase in the inphase response, the influence of some artificial source is likely (i.e. metal).



EM-38
Single frequency
Exploration depth ~1.5m

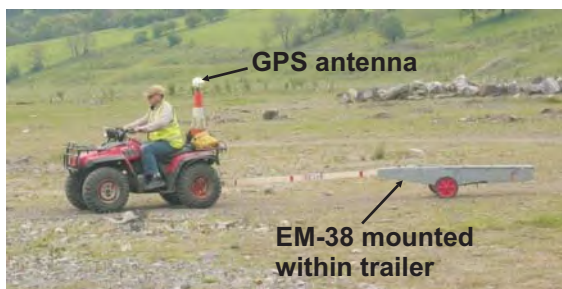


EM-31
Single frequency
Exploration depth ~3 to 5m

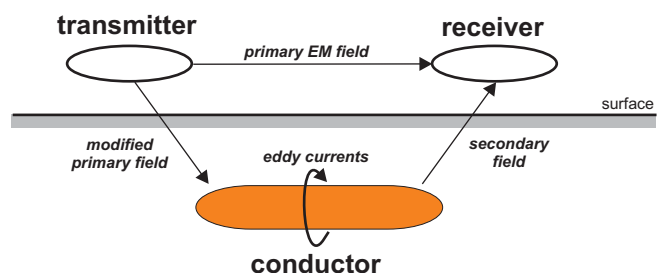


GEM-2
Multi-frequency
Exploration depth up to 10m

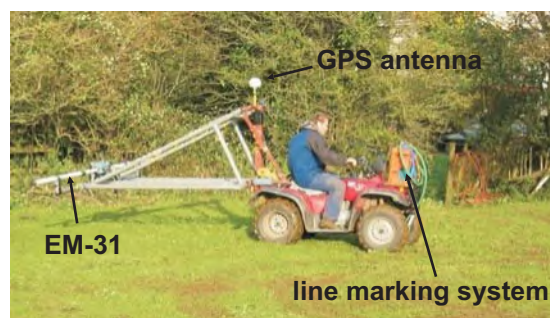
Towed EM-38 with dGPS



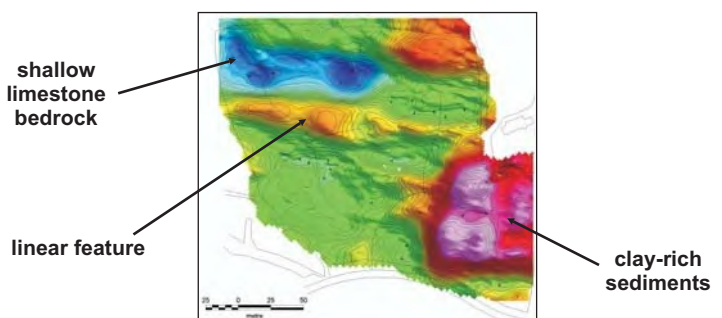
General principle of EM surveying



Mounted EM-31 with dGPS



Ground conductivity data plot



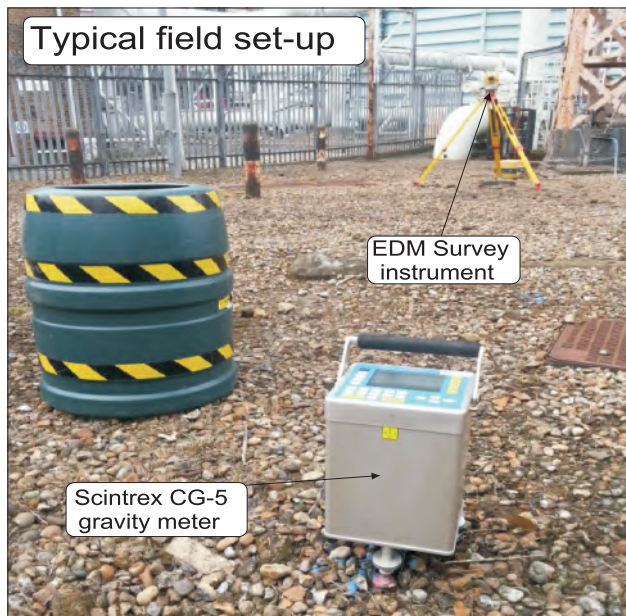
Constraints

Power lines, buildings, metal structures (fences, rebar, vehicles, debris etc.) and buried services can interfere with the electro-magnetic measurements.

Appendix - Gravity Survey

The gravity technique is based on measuring localised variations in the Earth's gravitational field which are caused by materials of different densities. The presence of an anomalously high (or low) density body in the subsurface causes a localised high (or low) anomaly in the measured gravitational field. The gravity effects described are extremely small, however, modern instrumentation and exhaustive data processing techniques enable detection of both geological and artificial structures or voids.

The CG-5 gravity meter is a semi-automated system that enables statistical averaging and filtering of readings taken every second over a fixed period of time (typically 2-3 minutes). The elevation of the gravity instrument was recorded to a 1mm precision ($<0.3\text{cm}$ error) at each survey station to facilitate accurate elevation correction. The results from the microgravity survey can be presented as a series of gravity profiles or colour contoured plot displaying the derived Bouguer Anomaly. Interpretation of the microgravity data is based on observing the shape, amplitude and wavelength of a particular anomaly and comparing it against the modelled gravity profile of a given target feature.



In order to remove (reduce) background gravitational effects i.e. those that do not originate from the target feature, the following processing steps were applied to the acquired dataset using a combination of internal CG-5 software and TerraDat proprietary software GRED.

Earth Tide, Temperature & Tilt Correction: Applied automatically by the gravity meter software.

Un-modelled Temporal Residual Correction: Obtained by least-squares fitting of a quadratic polynomial through the base station readings for each day. It is our normal practice to set the Bouguer anomaly at the base to zero so that the calculated values for the other stations are relative to a base station zero.

Latitude Correction: Calculated on the basis of the site latitude. Typically, due to the small latitude extent of the survey grid the correction is assumed to be linear per metre north.

Free-air Correction: Applied to the dataset based on the instrument elevations, which were recorded to a 1mm precision ($<0.3\text{cm}$ error) using an EDM survey system.

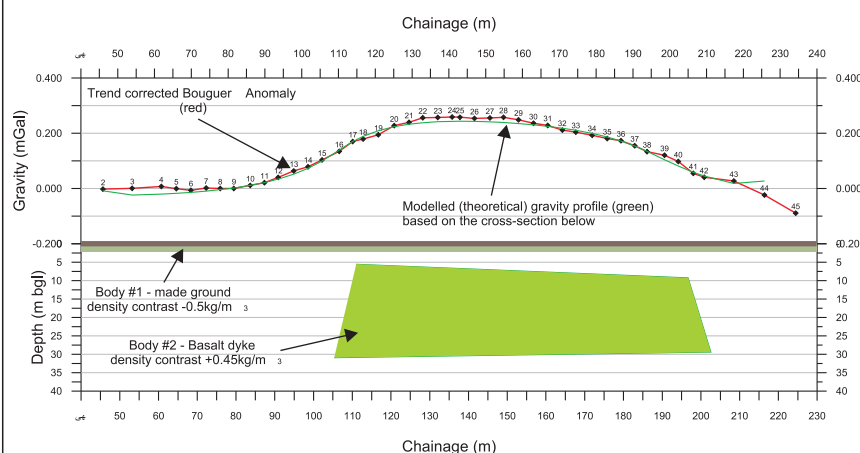
Terrain Correction: Based on the measured ground level at each gravity reading station and selected points beyond the survey grid.

Bouguer Correction: The selection of the reduction density is based on both site and geological consideration plus Nettleton's method where appropriate.

Constraints

The principal limitation on the use of gravity is the time required for careful acquisition and data processing. The detectability of a feature using the gravity methods is proportional to its size/depth ratio and its density contrast with the host material. There is a decrease in spatial resolution with increased depth of burial. In terms of site considerations, it is best to avoid sites with severe terrain or are have excessive vibrational noise.

Example - Gravity profile over basalt dyke



APPENDIX X – GROUND GAS & GROUNDWATER MONITORING RECORDS

Page 1 of 1

Project Name:	GCRE
Project No.:	Q0652
BH/TP No.:	BH07
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Analyser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
271.278	A	50mm	10.00	8.00-10.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
236.953	A	50mm	5.00	1.00-5.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
280.709	A	50mm	10.00	8.00-10.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
	A	50mm	28.20	25.20-28.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
213.006	A	50mm	34.00	29.00-34.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
257.707	A	50mm	49.20	39.20-49.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
210977	A	50mm	49.20	39.20-49.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	15.00	12.00-15.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.738	A	50mm	4.00	3.00-4.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
238.608	A	50mm	21.00	16.00-21.00
	B	19mm	5.00	1.00-5.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.745	A	50mm	17.50	12.50-17.50

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	20.00	15.00-20.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	13.00	11.00-13.00
	B	50mm	3.30	1.00-3.30

[illegible]



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Appendix G. Geo-environmental Screening

G.1. Soil Screening

[illegible]

[illegible]

G.2. Leachate Screening – Washery



Assessment Criteria :		Drinking Water Standard England and Wales/WHO																	
CaCO (mg/l):		0.00	pH		0.00														
Calcium (mg/l):		0.00	DOC (mg/l)		0.00		Catchment area:		Freshwater not listed										
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		BH32	BH33	BH30	BH29	BH34	TP01	TP02	TP06	TP09
									Sample ID		BH32	BH33	BH30	BH29	BH34	TP01	TP02	TP06	TP09
									Depth		0.2m	0.2m	0.2m	0.2m	1m	1m	1m	0.2m	1m
									Date		-	25/11/2021	-						
									Strata	Zone	GT-GLYGV	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL
Antimony	mg/l	0.00025	0.005	9	0.0025	0.0025	0							0.0025	0.0025				
Arsenic (Dissolved)	mg/l	0.0002	0.01	9	<0.0002	0.015	1	BH32, BH32, 0.2m, GT-GLYGV			0.015	<0.0002	0.00067	0.0021	0.0007				
Cadmium (Dissolved)	mg/l	0.00011	0.005	9	<0.00011	<0.00011	0				<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Chromium (Total)	mg/l	0.0005	0.05	9	0.0004	0.0025	0				0.0011	0.0004	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (Dissolved)	mg/l	0.0005	2	9	0.00001	0.0091	0				0.0091	0.003	0.00001	0.0087	0.0013	0.0056	0.0012	<0.0005	0.0014
Lead (Dissolved)	mg/l	0.0005	0.01	9	0.0005	0.0056	0				0.0056	<0.0005	<0.0005	0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005
Mercury (Dissolved)	mg/l	0.00005	0.001	9	<0.00005	<0.00005	0				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel (Dissolved)	mg/l	0.0005	0.02	9	<0.0005	2.2	1	BH33, BH33, 0.2m, MGR-FILL			0.0017	2.2	<0.0005	0.0008	0.0007	<0.0005	<0.0005	<0.0005	<0.0005
Selenium (Dissolved)	mg/l	0.0005	0.01	9	0.0005	0.0031	0				<0.0005	<0.0005	0.00068	0.0005	0.0008	<0.0005	<0.0005	<0.0005	0.0031
Zinc (Dissolved)	mg/l	0.0025	3	9	<0.00025	0.013	0				0.013	<0.0025	<0.00025	0.004	0.004	0.005	0.003	<0.003	0.003
Cyanide (Total)	mg/l	0.05	0.05	9	0.0014	<0.05	0				<0.05	0.0014	<0.05						
Chloride	mg/l	1	250	9	<1	2.1	0							2.1	<1	<1	<1	<1	<1
Dissolved Organic Carbon	mg/l	2.5	No WSV	9	<2.5	5.3	0							4.2	2.6	5.1	5.3	<2.5	3.9
Sulphate	mg/l	1	250	9	3.3	18	0							17	9.5	18	8.6	3.3	14
Phenol (aq)	mg/l	0.03	0.05	9	<0.03	0.35	1	TP02, TP02, 1m, MGR-FILL			<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.35	<0.03	<0.03
Acenaphthene	mg/l	0.00001	See BaP	9	<0.00001	<0.01	0				<0.00001	0.0013	<0.01						
Dibenz(a,h)Anthracene	mg/l	0.00001	See BaP	9	<0.00001	<0.01	0				<0.00001	<0.00001	<0.01						
Fluoranthene	mg/l	0.00001	See BaP	9	<0.00001	<0.01	0				<0.00001	0.0054	<0.01						
Fluorene	mg/l	0.00001	See BaP	9	<0.00001	<0.01	0				<0.00001	0.00093	<0.01						
Indeno(1,2,3-c,d)Pyrene	mg/l	0.00001	See PAH Sum of 4	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Phenanthrene	mg/l	0.00001	See BaP	9	<0.00001	0.0051	0				<0.00001	0.0051	<0.00001						
Pyrene	mg/l	0.00001	See BaP	9	<0.00001	0.0046	0				<0.00001	0.0046	<0.00001						
Naphthalene	mg/l	0.00001	See BaP	9	<0.00001	0.00067	0				<0.00001	0.00067	<0.00001						
Total PAH(16)	mg/l	0.0002	0.0001	9	<0.0002	0.028	1	BH33, BH33, 0.2m, MGR-FILL			<0.0002	0.028	<0.0002						
Acenaphthylene	mg/l	0.00001	See BaP	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Anthracene	mg/l	0.00001	See BaP	9	<0.00001	0.0014	0				<0.00001	0.0014	<0.00001						
Benzo[a]anthracene	mg/l	0.00001	See BaP	9	<0.00001	0.0024	0				<0.00001	0.0024	<0.00001						
Benzo[a]pyrene	mg/l	0.00001	0.00001	9	<0.00001	0.0018	1	BH33, BH33, 0.2m, MGR-FILL			<0.00001	0.0018	<0.00001						
Benzo[g,h,i]perylene	mg/l	0.00001	See PAH Sum of 4	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Benzo[b]fluoranthene	mg/l	0.00001	See PAH Sum of 4	9	<0.00001	0.0022	0				<0.00001	0.0022	<0.00001						
Benzo[k]fluoranthene	mg/l	0.00001	See PAH Sum of 4	9	<0.00001	0.0011	0				<0.00001	0.0011	<0.00001						
Chrysene	mg/l	0.00001	See BaP	9	<0.00001	0.0014	0				<0.00001	0.0014	<0.00001						
Barium	mg/l	0.0005	1.3	9	<0.0005	0.094	0							0.006	0.035	0.018	0.017	<0.0005	0.094
Fluoride	mg/l		1.5	9	0.078	0.29	0							0.18	0.08	0.29	0.21	0.078	0.19
Molybdenum	mg/l	0.002	0.07	9	<0.0002	0.0062	0							0.0013	0.0027	0.0011	0.0006	<0.0002	0.0062
Total Dissolved Solids	mg/l	10	No WSV	9	13	710	0							98	37	710	46	13	200



Assessment Criteria :		Manual SSAC																	
CaCO (mg/l):		0.00	pH		0.00														
Calcium (mg/l):		0.00	DOC (mg/l)		0.00	Catchment area:		Freshwater not listed											
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		BH32	BH33	BH30	BH29	BH34	TP01	TP02	TP06	TP09
									Sample ID		BH32	BH33	BH30	BH29	BH34	TP01	TP02	TP06	TP09
									Depth		0.2m	0.2m	0.2m	0.2m	1m	1m	1m	0.2m	1m
									Date		-	25/11/2021	-						
									Strata	Zone	GT-GLYGV	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL	MGR-FILL
Antimony	mg/l	0.00025	N/A	9	0.0025	0.0025	0							0.0025	0.0025				
Arsenic (Dissolved)	mg/l	0.0002	0.05	9	<0.0002	0.015	0				0.015	<0.0002	0.00067	0.0021	0.0007				
Cadmium (Dissolved)	mg/l	0.00011	0.00008	9	<0.00011	<0.00011	0				<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Chromium (Total)	mg/l	0.0005	0.0034	9	0.0004	0.0025	0				0.0011	0.0004	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (Dissolved)	mg/l	0.0005	0.001	9	0.00001	0.0091	7	BH32, BH32, 0.2m, GT-GLYGV; BH33, BH33, 0.2m, MGR-FILL; BH29, BH29, 0.2m, MGR-FILL; BH34, BH34, 1m, MGR-FILL; TP01, TP01, 1m, MGR-FILL; TP02, TP02, 1m, MGR-FILL; TP09, TP09, 1m, MGR-FILL			0.0091	0.003	0.00001	0.0087	0.0013	0.0056	0.0012	<0.0005	0.0014
Lead (Dissolved)	mg/l	0.0005	0.0012	9	0.0005	0.0056	1	BH32, BH32, 0.2m, GT-GLYGV			0.0056	<0.0005	<0.0005	0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005
Mercury (Dissolved)	mg/l	0.00005	0.00007	9	<0.00005	<0.00005	0				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel (Dissolved)	mg/l	0.0005	0.004	9	<0.0005	2.2	1	BH33, BH33, 0.2m, MGR-FILL			0.0017	2.2	<0.0005	0.0008	0.0007	<0.0005	<0.0005	<0.0005	<0.0005
Selenium (Dissolved)	mg/l	0.0005	N/A	9	0.0005	0.0031	0				<0.0005	<0.0005	0.00068	0.0005	0.0008	<0.0005	<0.0005	<0.0005	0.0031
Zinc (Dissolved)	mg/l	0.0025	0.0123	9	<0.00025	0.013	1	BH32, BH32, 0.2m, GT-GLYGV			0.013	<0.0025	<0.00025	0.004	0.004	0.005	0.003	<0.003	0.003
Cyanide (Total)	mg/l	0.05	N/A	9	0.0014	<0.05	0				<0.05	0.0014	<0.05						
Chloride	mg/l	1	250	9	<1	2.1	0							2.1	<1	<1	<1	<1	<1
Dissolved Organic Carbon	mg/l	2.5	No WSV	9	<2.5	5.3	0							4.2	2.6	5.1	5.3	<2.5	3.9
Sulphate	mg/l	1	400	9	3.3	18	0							17	9.5	18	8.6	3.3	14
Phenol (aq)	mg/l	0.03	0.0077	9	<0.03	0.35	1	TP02, TP02, 1m, MGR-FILL			<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.35	<0.03	<0.03
Acenaphthene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0013	0				<0.00001	0.0013	<0.00001						
Dibenz(a,h)Anthracene	mg/l	0.00001	N/A	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Fluoranthene	mg/l	0.00001	0.0000063	9	<0.00001	0.0054	1	BH33, BH33, 0.2m, MGR-FILL			<0.00001	0.0054	<0.00001						
Fluorene	mg/l	0.00001	N/A	9	<0.00001	0.00093	0				<0.00001	0.00093	<0.00001						
Indeno(1,2,3-c,d)Pyrene	mg/l	0.00001	Screen BaP only	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Phenanthrene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0051	0				<0.00001	0.0051	<0.00001						
Pyrene	mg/l	0.00001	N/A	9	<0.00001	0.0046	0				<0.00001	0.0046	<0.00001						
Naphthalene	mg/l	0.00001	0.002	9	<0.00001	0.00067	0				<0.00001	0.00067	<0.00001						
Total PAH(16)	mg/l	0.0002	N/A	9	<0.0002	0.028	0				<0.0002	0.028	<0.0002						
Acenaphthylene	mg/l	0.00001	Screen BaP only	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Anthracene	mg/l	0.00001	0.0001	9	<0.00001	0.0014	1	BH33, BH33, 0.2m, MGR-FILL			<0.00001	0.0014	<0.00001						
Benzo[a]anthracene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0024	0				<0.00001	0.0024	<0.00001						
Benzo[a]pyrene	mg/l	0.00001	0.00000017	9	<0.00001	0.0018	1	BH33, BH33, 0.2m, MGR-FILL			<0.00001	0.0018	<0.00001						
Benzo[g,h,i]perylene	mg/l	0.00001	Screen BaP only	9	<0.00001	<0.00001	0				<0.00001	<0.00001	<0.00001						
Benzo[b]fluoranthene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0022	0				<0.00001	0.0022	<0.00001						
Benzo[k]fluoranthene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0011	0				<0.00001	0.0011	<0.00001						
Chrysene	mg/l	0.00001	Screen BaP only	9	<0.00001	0.0014	0				<0.00001	0.0014	<0.00001						
Barium	mg/l	0.0005	N/A	9	<0.0005	0.094	0							0.006	0.035	0.018	0.017	<0.0005	0.094
Fluoride	mg/l		1	9	0.078	0.29	0							0.18	0.08	0.29	0.21	0.078	0.19
Molybdenum	mg/l	0.002	N/A	9	<0.0002	0.0062	0							0.0013	0.0027	0.0011	0.0006	<0.0002	0.0062
Total Dissolved Solids	mg/l	10	No WSV	9	13	710	0							98	37	710	46	13	200

G.3. Leachate Screening – Land at Nant Helen

G.4. Controlled Waters Screening

G.4.1. Washery Environmental Quality Standards

Assessment Criteria :		Manual SSAC																				
CaCO (mg/l):		0.00	pH		0.00																	
Calcium (mg/l):		0.00	DOC (mg/l)		0.00	Catchment area:		Freshwater not listed														
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery
									Sample ID		BH29	BH29	BH30	BH30	BH31	BH31	BH32	BH32	BH33	BH33	BH34	BH34
									Depth		0.76m	0.83m	3.03m	3.2m	4.5m	4.62m	4.28m	4.72m	0.12m	0.41m	4.76m	5.09m
									Date		01/02/2022	01/02/2022	01/02/2022	17/03/2022	01/02/2022	17/03/2022	01/02/2022	01/02/2022	17/03/2022	17/03/2022	01/02/2022	17/03/2022
									Strata		Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Alluvium/Coal Measure	Alluvium/Coal Measure		Coal Measures	Coal Measures	Coal Measures
									Zone													
Arsenic (Dissolved)	mg/l	<0.0002	0.05	12	<0.0002	0.0022	0				0.0011	0.0022	0.00055	0.00056	0.00039	0.00025	<0.0002	0.0014	0.00043	0.00083	<0.0002	<0.0002
Cadmium (Dissolved)	mg/l	<0.00011	0.00008	12	<0.00011	<0.00011	0				<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Calcium	mg/l	<2	N/A	12	10	120	0				36	40	110	68	120	63	62	43	46	47	10	11
Chromium (Dissolved)	mg/l	<0.0005	0.0034	12	<0.0005	0.0089	2	Washery, BH30, 3.2m, Coal Measures; Washery, BH32, 4.72m, Alluvium/Coal Measure			<0.0005	<0.0005	<0.0005	0.0089	<0.0005	<0.0005	<0.0005	0.0088	<0.0005	0.00066	<0.0005	<0.0005
Copper (Dissolved)	mg/l	<0.0005	0.001	12	<0.0005	0.0033	5	Washery, BH30, 3.03m, Coal Measures; Washery, BH30, 3.2m, Coal Measures; Washery, BH31, 4.5m, Coal Measures; Washery, BH32, 4.72m, Alluvium/Coal Measure; Washery, BH33, 0.41m, Coal Measures			<0.0005	0.00098	0.0011	0.0022	0.0024	0.00069	<0.0005	0.0033	<0.0005	0.0012	0.00055	0.00058
Cyanide (Total)	mg/l	<0.05	N/A	12	<0.05	<0.05	0				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead (Dissolved)	mg/l	<0.0005	0.0012	12	<0.0005	<0.0005	0				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium	mg/l	<0.2	N/A	12	11	38	0				11	11	38	16	38	30	32	13	18	18	26	28
Mercury (Dissolved)	mg/l	<0.00005	0.00007	12	<0.00005	<0.00005	0				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel (Dissolved)	mg/l	<0.0005	0.004	12	0.0006	0.0047	2	Washery, BH30, 3.03m, Coal Measures; Washery, BH31, 4.5m, Coal Measures			0.0006	0.0012	0.0047	0.0024	0.0044	0.0033	0.0012	0.0028	0.0016	0.002	0.0018	0.0033
Potassium	mg/l	<0.5	N/A	12	7.8	77	0				11	11	8.9	29	11	18	77	17	40	40	7.8	8.3
Selenium (Dissolved)	mg/l	<0.0005	N/A	12	<0.0005	0.0014	0				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	<0.0005	0.0014	<0.0005	<0.0005	<0.0005	<0.0005
Sodium	mg/l	<1.5	N/A	12	44	100	0				44	46	60	93	75	62	45	100	81	97	66	71
Zinc (Dissolved)	mg/l	<0.0025	0.0123	12	0.0053	0.034	6	Washery, BH29, 0.83m, Coal Measures; Washery, BH30, 3.2m, Coal Measures; Washery, BH31, 4.62m, Coal Measures; Washery, BH32, 4.72m, Alluvium/Coal Measure; Washery, BH33, 0.41m, Coal Measures; Washery, BH34, 4.76m, Coal Measures			0.0099	0.016	0.0053	0.017	0.011	0.034	0.0083	0.033	0.012	0.021	0.017	0.012
Ammonia (Free)	mg/l	<0.05	No WSV	12	<0.05	0.5	0				<0.05	<0.05	<0.05	0.081	0.073	<0.05	0.059	<0.05	<0.05	0.14	0.089	0.5
Sulphate	mg/l	<1	400	12	2.1	330	0				2.1	6.3	330	32	310	110	3	67	66	60	40	49
Fluoride	mg/l	<0.05	1	12	0.12	0.35	0				0.35	0.29	0.13	0.14	0.12	0.2	0.15	0.18	0.15	0.15	0.16	0.15
Chloride	mg/l	<1	250	12	16	250	0				18	16	38	170	49	33	250	51	16	17	28	28
o-Xylene	mg/l	<0.001	See Xylenes (total)	12	<0.001	<0.001	0				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Phenols	mg/l	<0.03	0.0077	12	<0.03	<0.03	0				<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Nitrate	mg/l	<0.5	N/A	12	<0.5	1.7	0				<0.5	1.7	1.5	<0.5	1.4	0.58	<0.5	0.88	<0.5	<0.5	<0.5	<0.5
Total Hardness as CaCO3	mg/l	<15	No WSV	12	130	450	0				140	140	440	240	450	280	290	160	190	190	130	140
Alkalinity (Bicarbonate)	mg CaCO3/l	<10	No WSV	12	230	440	0				320	310	360	300	370	410	230	340	380	440	270	320
pH	-	<0	6-9	12	7.2	8.4	0				7.7	8	7.2	8.2	7.9	7.8	7.6	8.2	7.7	8.3	7.8	8.4
Aromatic TPH >C5-C7	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C7-C8	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C8-C10	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C10-C12	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C12-C16	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C16-C21	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C21-C35	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aromatic TPH >C35-C44	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aliphatic TPH >C5-C6	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aliphatic TPH >C6-C8	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aliphatic TPH >C8-C10	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<							



Assessment Criteria :		Manual SSAC																				
CaCO (mg/l):		0.00	pH		0.00																	
Calcium (mg/l):		0.00	DOC (mg/l)		0.00	Catchment area:		Freshwater not listed														
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery
									Sample ID		BH29	BH29	BH30	BH30	BH31	BH31	BH32	BH32	BH33	BH33	BH34	BH34
									Depth		0.76m	0.83m	3.03m	3.2m	4.5m	4.62m	4.28m	4.72m	0.12m	0.41m	4.76m	5.09m
									Date		01/02/2022	01/02/2022	01/02/2022	17/03/2022	01/02/2022	17/03/2022	01/02/2022	01/02/2022	17/03/2022	17/03/2022	01/02/2022	17/03/2022
									Strata		Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Alluvium/Coal Measure	Alluvium/Coal Measure		Coal Measures	Coal Measures	Coal Measures
		Zone																				
PCB 138	mg/l	<0.000001	No WSV	12	<0.000001	<0.000001	0				<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	
PCB 180	mg/l	<0.000001	No WSV	12	<0.000001	<0.000001	0				<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	
PCB 90+101	mg/l	<0.000001	No WSV	12	<0.000001	<0.000001	0				<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	
Total PCBs (7 congeners)	mg/l	<0.000001	No WSV	12	<0.000001	<0.000001	0				<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	
Dissolved Organic Carbon	mg/l	<2	No WSV	12	57	100	0				61	65	71	62	82	78	57	73	92	100	64	67

G.4.2. Land at Nant Helen Environmental Quality Standards

Assessment Criteria :		Manual SSAC													
CaCO (mg/l):		0.00	pH		0.00										
Calcium (mg/l):		0.00	DOC (mg/l)		0.00		Catchment area:			Freshwater not listed					
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences		Locations of Exceedences	Strata	Location				
											Sample ID				
											Depth				
											Date				
											Zone				
pH	N/A		6-9	3	7.4	8.4	0					8.4	8.3	7.4	
Alkalinity (Bicarbonate)	mg CaCO3/l	10	No WSV	3	110	540	0					180	110	540	
Chloride	mg/l	1	250	3	10	22	0					10	10	22	
Fluoride	mg/l	0.05	1	3	0.11	0.17	0					0.14	0.11	0.17	
Ammonia (Free)	mg/l	0.05	No WSV	3	<0.05	<0.05	0					<0.05	<0.05	<0.05	
Nitrate	mg/l	0.5	N/A	3	<0.5	1.1	0					<0.5	1.1	0.88	
Sulphate	mg/l	1	400	3	18	86	0					34	18	86	
Cyanide (Total)	mg/l	0.05	N/A	3	0.05	0.05	0					0.05	<0.05	<0.05	
Calcium	mg/l	2	N/A	3	18	44	0					44	18	41	
Potassium	mg/l	0.5	N/A	3	0.71	31	0					0.71	5.8	31	
Magnesium	mg/l	0.2	N/A	3	14	28	0					16	14	28	
Sodium	mg/l	1.5	N/A	3	7.9	140	0					9.2	7.9	140	
Total Hardness as CaCO3	mg/l	15	No WSV	3	100	220	0					170	100	220	
Arsenic (Dissolved)	µg/l	0.2	0.05	3	<0.2	0.44	2	BH15 ; BH25				0.29	<0.2	0.44	
Cadmium (Dissolved)	µg/l	0.11	0.00008	3	<0.11	<0.11	0					<0.11	<0.11	<0.11	
Chromium (Dissolved)	µg/l	0.5	0.0034	3	9	14	3	BH15 ; BH16 ; BH25				14	9	9.6	
Copper (Dissolved)	µg/l	0.5	0.001	3	0.86	2.1	3	BH15 ; BH16 ; BH25				1.6	0.86	2.1	
Mercury (Dissolved)	µg/l	0.05	0.00007	3	<0.05	<0.05	0					<0.05	<0.05	<0.05	
Nickel (Dissolved)	µg/l	0.5	0.004	3	1.7	23	3	BH15 ; BH16 ; BH25				17	1.7	23	
Lead (Dissolved)	µg/l	0.5	0.0012	3	<0.5	<0.5	0					<0.5	<0.5	<0.5	
Selenium (Dissolved)	µg/l	0.5	N/A	3	<0.5	<0.5	0					<0.5	<0.5	<0.5	
Zinc (Dissolved)	µg/l	2.5	0.0123	3	9.6	54	3	BH15 ; BH16 ; BH25				48	9.6	54	
Dissolved Organic Carbon	mg/l	2	No WSV	3	26	120	0					100	26	120	
Aliphatic TPH >C5-C6	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C6-C8	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C8-C10	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C10-C12	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C12-C16	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C16-C21	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C21-C35	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aliphatic TPH >C35-C44	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Total Aliphatic Hydrocarbons	µg/l	5	No WSV	3	<5	<5	0					<5	<5	<5	
Aromatic TPH >C5-C7	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C7-C8	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C8-C10	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C10-C12	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C12-C16	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C16-C21	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C21-C35	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Aromatic TPH >C35-C44	µg/l	0.1	0.01	3	<0.1	<0.1	0					<0.1	<0.1	<0.1	
Total Aromatic Hydrocarbons	µg/l	5	No WSV	3	<5	<5	0					<5	<5	<5	
Total Petroleum Hydrocarbons	µg/l	10	No WSV	3	<10	<10	0					<10	<10	<10	
Benzene	µg/l	1	0.01	3	<1	<1	0					<1	<1	<1	
Toluene	µg/l	1	0.074	3	<1	<1	0					<1	<1	<1	
Ethylbenzene	µg/l	1	0.02	3	<1	<1	0					<1	<1	<1	
m & p-Xylene	µg/l	1	See Xylenes (total)	3	<1	<1	0					<1	<1	<1	
o-Xylene	µg/l	1	See Xylenes (total)	3	<1	<1	0					<1	<1	<1	
Naphthalene	µg/l	0.01	0.002	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Acenaphthylene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Acenaphthene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Fluorene	µg/l	0.01	N/A	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Phenanthrene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Anthracene	µg/l	0.01	0.0001	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Fluoranthene	µg/l	0.01	0.0000063	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Pyrene	µg/l	0.01	N/A	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Benzoanthracene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Chrysene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Benzo[b]fluoranthene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Benzo[k]fluoranthene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Benzo[a]pyrene	µg/l	0.01	0.00000017	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Indeno(1,2,3-c,d)Pyrene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Dibenz[a,h]Anthracene	µg/l	0.01	N/A	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Benzo[g,h,i]perylene	µg/l	0.01	Screen BaP only	3	<0.01	<0.01	0					<0.01	<0.01	<0.01	
Total Of 16 PAH's	µg/l	0.2	No WSV	3	<0.2	<0.2	0					<0.2	<0.2	<0.2	
PCB 28	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 52	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 90+101	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 118	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 153	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 138	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
PCB 180	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
Total PCBs (7 congeners)	µg/l	0.001	No WSV	3	<0.001	<0.001	0					<0.001	<0.001	<0.001	
Total Phenols	mg/l	0.03	No WSV	3	<0.03	<0.03	0					<0.03	<0.03	<0.03	

G.4.3. Washery Drinking Water Standards

Assessment Criteria :		Drinking Water Standard England and Wales/WHO																					
CaCO (mg/l):		0.00	pH		0.00																		
Calcium (mg/l):		0.00	DOC (mg/l)		0.00		Catchment area:										Freshwater not listed						
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	Washery	
									Sample ID		BH29	BH29	BH30	BH30	BH31	BH31	BH32	BH32	BH33	BH33	BH34	BH34	
									Depth		0.76m	0.83m	3.03m	3.2m	4.5m	4.62m	4.28m	4.72m	0.12m	0.41m	4.76m	5.09m	
									Date		01/02/2022	01/02/2022	01/02/2022	17/03/2022	01/02/2022	17/03/2022	01/02/2022	17/03/2022	17/03/2022	01/02/2022	17/03/2022		
									Strata		Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Coal Measures	Alluvium/Coal Measure	Alluvium/Coal Measure		Coal Measures	Coal Measures	Coal Measures	
		Zone																					
Arsenic (Dissolved)	mg/l	<0.0002	0.01	12	<0.0002	0.0022	0				0.0011	0.0022	0.00055	0.00056	0.00039	0.00025	<0.0002	0.0014	0.00043	0.00083	<0.0002	<0.0002	
Cadmium (Dissolved)	mg/l	<0.00011	0.005	12	<0.00011	<0.00011	0				<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	
Calcium	mg/l	<2	N/A	12	10	120	0				36	40	110	68	120	63	62	43	46	47	10	11	
Chromium (Dissolved)	mg/l	<0.0005	0.05	12	<0.0005	0.0089	0				<0.0005	<0.0005	<0.0005	0.0089	<0.0005	<0.0005	<0.0005	0.0088	<0.0005	0.00066	<0.0005	<0.0005	
Copper (Dissolved)	mg/l	<0.0005	2	12	<0.0005	0.0033	0				<0.0005	0.00098	0.0011	0.0022	0.0024	0.00069	<0.0005	0.0033	<0.0005	0.00055	0.00058	0.00058	
Cyanide (Total)	mg/l	<0.05	0.05	12	<0.05	<0.05	0				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Lead (Dissolved)	mg/l	<0.0005	0.01	12	<0.0005	<0.0005	0				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Magnesium	mg/l	<0.2	N/A	12	11	38	0				11	11	38	16	38	30	32	13	18	18	26	28	
Mercury (Dissolved)	mg/l	<0.00005	0.001	12	<0.00005	<0.00005	0				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Nickel (Dissolved)	mg/l	<0.0005	0.02	12	0.0006	0.0047	0				0.0006	0.0012	0.0047	0.0024	0.0044	0.0033	0.0012	0.0028	0.0016	0.002	0.0018	0.0033	
Potassium	mg/l	<0.5	N/A	12	7.8	77	0				11	11	8.9	29	11	18	77	17	40	40	7.8	8.3	
Selenium (Dissolved)	mg/l	<0.0005	0.01	12	<0.0005	0.0014	0				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	<0.0005	0.0014	<0.0005	<0.0005	<0.0005	<0.0005	
Sodium	mg/l	<1.5	200	12	44	100	0				44	46	60	93	75	62	45	100	81	97	66	71	
Zinc (Dissolved)	mg/l	<0.0025	3	12	0.0053	0.034	0				0.0099	0.016	0.0053	0.017	0.011	0.034	0.0083	0.033	0.012	0.021	0.017	0.012	
Ammonia (Free)	mg/l	<0.05	No WSV	12	<0.05	0.5	0				<0.05	<0.05	<0.05	0.081	0.073	<0.05	0.059	<0.05	<0.05	0.14	0.089	0.5	
Sulphate	mg/l	<1	250	12	2.1	330	2	Washery, BH30, 3.03m, Coal Measures; Washery, BH31, 4.5m, Coal Measures			2.1	6.3	330	32	310	110	3	67	66	60	40	49	
Fluoride	mg/l	<0.05	1.5	12	0.12	0.35	0				0.35	0.29	0.13	0.14	0.12	0.2	0.15	0.18	0.15	0.15	0.16	0.15	
Chloride	mg/l	<1	250	12	16	250	0				18	16	38	170	49	33	250	51	16	17	28	28	
o-Xylene	mg/l	<0.001	See Xylenes (total)	12	<0.001	<0.001	0				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Phenols	mg/l	<0.03	0.05	12	<0.03	<0.03	0				<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
Nitrate	mg/l	<0.5	50	12	<0.5	1.7	0				<0.5	1.7	1.5	<0.5	1.4	0.58	<0.5	0.88	<0.5	<0.5	<0.5	<0.5	
Total Hardness as CaCO3	mg/l	<15	No WSV	12	130	450	0				140	140	440	240	450	280	290	160	190	190	130	140	
Alkalinity (Bicarbonate)	mg CaCO3/l	<10	No WSV	12	230	440	0				320	310	360	300	370	410	230	340	380	440	270	320	
pH	-	<0	6.5-9.5	12	7.2	8.4	0				7.7	8	7.2	8.2	7.9	7.8	7.6	8.2	7.7	8.3	7.8	8.4	
Aromatic TPH >C5-C7	mg/l	<0.0001	0.01	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C7-C8	mg/l	<0.0001	0.7	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C8-C10	mg/l	<0.0001	0.3	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C10-C12	mg/l	<0.0001	0.09	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C12-C16	mg/l	<0.0001	0.09	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C16-C21	mg/l	<0.0001	0.09	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C21-C35	mg/l	<0.0001	0.09	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aromatic TPH >C35-C44	mg/l	<0.0001	N/A	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aliphatic TPH >C5-C6	mg/l	<0.0001	15	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aliphatic TPH >C6-C8	mg/l	<0.0001	15	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aliphatic TPH >C8-C10	mg/l	<0.0001	0.3	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aliphatic TPH >C10-C12	mg/l	<0.0001	0.3	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Aliphatic TPH >C12-C16	mg/l	<0.0001	0.3	12	<0.0001	<0.0001	0				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Appendix H. Site walkover memorandums

H.1. Geomorphology and mining

Technical Note

Project:	Global Centre of Rail Excellence (GCRE)		
Subject:	Geomorphological Walkover – entire proposed alignment		
Author:	Dickon Morris		
Date:	22/08/2022	Project No.:	5209796

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Factual Report of Walkover	D. Morris	L. Taylor	A. Hart	M. Kemp	22/08/2022

Client signoff

Client	Walters Group
Project	Global Centre of Rail Excellence (GCRE)
Project No.	5209796
Client signature / date	

1. Introduction

Atkins Limited (Atkins), part of the SNC-Lavalin Group, has been commissioned by Walters Group as their designer to undertake the detailed design of proposed earthworks for the redevelopment of the Nant Helen site, near Onllwyn, and Onllwyn Washery area as the Global Centre of Rail Excellence (GCRE), a rolling stock and rail infrastructure testing facility.

As part of these works, a Ground Investigation Report (GIR) has been prepared in accordance with CD 622 'Managing Geotechnical Risk'. As part of the risk management process a site walkover was undertaken by two Atkins engineering geologists on 14 and 16 June 2022 and 6 and 8 July 2022. The aim of the walkover was to undertake geomorphological mapping of the site and to identify features of interest / concern that are located close to and may have an effect on the proposed track alignment.

The slope to the north of the site was examined in particular detail as an embankment up to 41m high on sidelong ground is planned in this part of the site. Risks related to a slope stability hazard were identified due to the topography along with the presence of glacial till and an extensive history of mining activity in this area.

The westernmost part of the proposed loop was not examined as an opencast mine currently being restored. Therefore, it is expected that the site levels will change significantly prior to construction of the proposed rail loop.

The key features of concern are detailed in Table 1-1, while every feature of interest is listed in Table 1-2. Each of these features is numbered and these numbers correspond with the photos that follow the table.

The photo locations are noted on the geomorphological maps that follow the photographs.

Table 1-1 - Key features identified during the geomorphological walkover

Feature	Location / Photo ref	Easting	Northing	Description
		*Central point for larger features		
Area of hummocky ground.	3 - 6	283403	211736	Hummocky ground in area of known shallow mining likely to be representative of collapsed / backfilled bell pits.
Artificial pond	16 - 17	283072	211965	Presumed artificial pond located close to convex change in slope.
Western stream gully.	43	Various (see walkover plan)		This gully is >10m deep and steep sided with a slope angle of between 30 and 50 degrees. It is difficult to see clearly due to thick vegetation. It carries a significant water flow much of which comes from the collapsed mine adit at photo location 18.
Central stream gully.	44			The central stream gully appears to be of slightly smaller dimensions than the first although it is difficult to say for sure due to thick vegetation. It was carrying very little flow at the time of the walkover and is the outlet for the artificial pond mentioned above. It has also been engineered / reinforced with gabion baskets. The outflow from this gully is directed along the base of the former railway cutting into the western stream gully described above.
Eastern stream gully.	46			This gully is of similar dimensions to the western gully and carries a good water flow. It has been bridged to the immediate south of the former railway line (visible as a strip of grass running across the gully in the aerial photograph).

Railway cuttings	41, 42, 45, 47			Cuttings related to the former railway (now in use as a cycle track) as indicated on the walkover plan. These gradually increase in height from around 3m in the west to around 10m in the east. They are heavily vegetated and therefore difficult to examine in detail but have a slope angle of around 40 degrees with small sections of rock cut at the base noted to be around 60 degrees. The composition of the embankments was not possible to determine on the walkover due to the thick vegetation covering them although sandstone of the South Wales Coal Measures was noted at the base of the cut at its greatest elevation in the vicinity of photo location 47.
Settling ponds	55, 56, 58, 59	283299	210698	Two settling ponds on the proposed location of the delta junction built up above natural ground level in the area. There is also a stockpile of material to the immediate south of ponds which is presumed to be the material that was excavated during their construction. Soil creep was noted on the steep southern slope of this stockpile.
Overburden stockpile	63	281811	210441	The cutting in the southwest part of the site is expected to cut through the corner of the overburden stockpile which will significantly increase cutting height. However, it is considered likely that this material will have been placed back in the Nant Helen Extension opencast mine prior to the commencement of construction and that this will no longer be an issue.
Peat deposits	63, 67, 68	To south and west of overburden stockpile.		Peat around 50cm thick was observed in the cutting at the edge of the Nant Helen Extension Opencast. Based upon the vegetation visible at ground level it is considered likely that there are extensive peat deposits along the southern and western edges of the overburden stockpile.
Settling ponds	69, 70	282507	210765	'Valley' running from north to south between the overburden stockpile and Nant Helen backfill. Mine wastewater runs down the valley through a series of settling ponds. The proposed development will comprise a cut into this material.
Washery stockpiles	89, 95 - 100	285132	210378	A large number of vegetated stockpiles are apparent in the south and eastern part of the washery area. It is considered that were it not for the stockpiles the washery area would be mostly flat therefore there has been significant alteration of the natural ground levels following the industrial activity at the site.

Table 1-2 - Features encountered during the walkover

Location / photo ref	Easting	Northing	Location	Observation and Implication
1	283483.6	211797.8	South of access road in vicinity of backfilled Onllwyn opencast.	Possible small scarps noted on hillside at change in slope angle. May be indicative of slope instability.
2	283552.5	211763.3		Small terrace becoming drainage ditch running west to east. Ground sloping circa 10 degrees to north and northeast. Ground surface relatively featureless to east side of field. Indicative of opencast backfill and drainage ditch created following backfilling.
3	283454.4	211787.2		Shallow gully over hummocky ground. Ground sloping up to 15 degrees to the north. Disturbed ground indicative of former shallow mining activity.
4	283416.7	211767.3		Rushes in gully. Absence of rushes over slope but prevalent to northeast and south (top of slope). Rushes appear to coincide with natural ground and are absent where there is a history of coal mining.
5	283372.3	211764.7		Hollow within slope. Possible linear shaped depression that coincides with the location of an adit and likely to be collapsed mine adit. Subrounded boulders within soils.
6	283365.0	211699.1		Surface expression of possible collapsed / backfilled bell pit at concave break in slope.
7	283504.1	211769.3		Convex break in slope. Likely to be start of drainage feature tracking across Onllwyn colliery backfill.
8	283727.3	211733.5		Uprooted semi mature tree with colliery spoil evident beneath suggesting it is located on colliery backfill.
9	283734.6	211719.0		Dry artificial drainage channel surrounded by semi mature trees interpreted to have been planted after backfilling of Onllwyn opencast.
10	283796.2	211740.2		Culvert leading off to the east from engineered drainage channel. Suggesting that opencast backfill drainage is surface and underground.
11	283596.2	211872.0	North of access road on shallow eastern slopes.	Ground drops off from north side of colliery access road. Ground is soft underfoot with boulders in upper soil horizon. Representative of engineered road embankment which is likely to have been built from site won till.

Location / photo ref	Easting	Northing	Location	Observation and Implication
12	283624.7	211896.5		Tussocky grass underfoot with boulders and soft damp ground. Suggesting a poorly drained slope.
13	283602.8	211951.4		Ditch at base of the slope. Damp with occasional pools of water. Glacial Till soft to firm slightly sandy slightly gravelly CLAY with some boulders exposed at base. Indicating presence of till across the slope.
14	283528.6	211952.1		Field covered in sedge grass. Slope angle around 10 degrees. Suggesting poor drainage.
15	283313.4	211876.6		Small artificial scarp running along northern edge of field adjacent to spoil heap. Possibly related to former mining activity or subsequent landscaping by local farmers.
16	283090.2	211956.7		Pond, presumed artificial located on wooded break in slope.
17	283031.9	211982.6		Partially engineered outlet from pond.
18	282956.4	211905.1		Location of mapped mine adit within thicket of vegetation. No obvious surface expression other than gully with discoloured mine water issuing from small pool at back of gully.
19	282965.8	211881.4		Crown hole short distance north of mine adit. Likely to be related to the collapsed mine adit noted above.
20	282804.4	211866.3	On colliery spoil heap in centre of northern slope.	Looking east across northern slopes from top of spoil heap. This slope is relatively shallow (around 10 degrees).
21	282740.6	211794.3		Artificial pond (likely settling pond) located to the south east of spoil heap.
22	282761.1	211865.8		Looking west across western part of northern slope. This entire area is considered likely to be composed of colliery backfill. This colliery backfill is significantly steeper than the natural ground (around 20 degrees).
23	282622.0	211906.7		Washout in shallow gully on the slope showing the composition of the underlying ground (colliery spoil).
24	282408.0	212028.7	Within western area of backfilled opencast.	Area of open level ground with semi mature and mature vegetation. Likely to be former railway land / sidings.
25	282430.4	212105.1		Small stream with low flow rate running in approx. 1m deep channel. Heavily overgrown.

Location / photo ref	Easting	Northing	Location	Observation and Implication
26	282426.5	212058.9		Looking south from site of former railway towards backfilled opencast colliery. Note featureless nature of the slope suggesting its artificial origin.
27	282519.9	212037.7		Looking southeast towards backfilled opencast colliery with runoff channel visible in the centre of the image.
28	282285.4	212060.2		Trial pit scar showing colliery spoil with 300 – 400mm angular boulders. This is likely to be typical of the colliery backfill across the site.
29	282213.9	212001.9		Fallen tree showing the ground is composed of colliery spoil. This confirms the data from the former mine plans.
30	282240.4	211941.0		1m boulder within the colliery spoil.
31	282313.2	211869.5		Looking east across the colliery backfill on the northern slope. Note featureless nature of the ground.
32	282243.0	211743.6		Boundary ditch of currently active Nant Helen opencast site.
33	282058.9	211721.8		Slope failure in artificial slope composed of colliery spoil at angle of around 30 degrees showing the relatively low angles at which this poorly graded material can fail.
34	282039.0	211707.9		Debris within the slope failure. Note the poor sorting and weathered and degraded nature of the boulder in the left foreground of the picture.
35	282025.1	211702.6		Tension cracks noted west of main failure. Indicating that this slope is still metastable and that further failure is possible.
36	281953.6	211732.4		Looking northeast across western side of northern slope across heavily wooded colliery backfill.
37	281746.2	211809.2		Track running alongside edge of existing Nant Helen site in northwest corner of scheme. This marks the northern edge of the Nant Helen extension.
38	281962.8	212139.7	On track bed of former railway. Now in use as a cycle path.	Ancient woodland adjacent to course of former railway beyond northeast corner of the site.
39	282417.9	212098.0		Line of historic railway to the immediate north of cottages in Caehopkin. Note the lack of vegetation along the former trackbed.

Location / photo ref	Easting	Northing	Location	Observation and Implication
40	282588.8	212095.3		Hummocky ground dropping off steeply to the north from the former railway line.
41	282874.2	212051.0		Edge of colliery spoil heap adjacent to former railway. This material is presumed to have been placed following the construction of the railway and is not considered to be a cut slope related to the railway.
42	282838.5	212059.6		
43	282894.1	212049.0		Deep stream gully with moderate to strong water flow running beneath former railway.
44	283031.2	212028.4		Steep partially engineered stream gully with weak water flow. This drainage gully originates from the artificial pond at photo location 16.
45	283092.1	212033.1		Cut slope around 5m high to immediate south of former railway. The majority of this cut is 30 to 40 degrees while the lower part (which is partially rock cut) is steeper.
46	283167.6	212027.8		Steep partially engineered stream gully with culvert running under the former railway. There is also a large concrete crossing allowing the field above to bridge the gully to the immediate south of the railway line. This feature is surrounded by dense vegetation and does not come out well in photographs.
47	283260.4	212034.4		Cutting height increases to greater than 10m with rock exposure at base of cutting.
48	282578.2	212045.0	Within western area of backfilled opencast.	Drainage ditch through colliery spoil with low flow rate.
49	282423.2	212125.8	On southern edge of village of Caehopkin.	Yard and area of hardstanding with 1m high retaining wall running along the southern edge of the yard adjacent to former railway. This is around 50m from the toe of the proposed embankment and is not considered to be a significant risk to the proposed development.
50	282429.1	212136.4		Path leading up railway embankment.
51	282447.7	212132.4		Engineered slope to north of former railway. This is also around 50m to the north of the toe of the proposed embankment and is not considered to be a significant risk.

Location / photo ref	Easting	Northing	Location	Observation and Implication
52	283325.6	211168.7	Adjacent to Nant Helen site compound.	Drainage ditch running south from southeast corner of site compound. Dry at time of site visit although this was during the summer months.
53	283400.9	210749	In vicinity of proposed delta junction close to existing settling ponds.	Drainage ditch running west towards culvert leading under coal haul road. Part of the drainage system draining the backfilled Onllwyn opencast.
54	283410	210695.2		Exposure of coal measures bedrock at the surface. This indicates that there are no superficial deposits in this part of the site.
55	283364.4	210737.2		View across to earthwork retaining settling ponds. These are considerably elevated from supposed original ground level suggesting that considerable earthworks were required to create them.
56	283310.6	210743.1		View across settling ponds. Note cut slope at the rear suggesting that cut as well as fill was required to build the ponds.
57	283364.2	210623		Stock tunnel running under haul road.
58	283345.4	210616.3		Looking across stockpile of material to the south of the settling ponds.
58a	283348	210539		View towards a interpreted historic collapsed miner adit, now overgrown with vegetation
59	283212.3	210572.3		Southern face of stockpile. Note evidence of soil creep on stockpile and failures in steep stream gully below.
60	283212.3	210547.6		Tram road (scheduled ancient monument) running in an east west direction to the south of the site. This tramroad interacts with a proposed embankment in the southwest corner of the outer loop.
61	283103.1	210641		Looking west along southern edge of Nant Helen opencast backfill. Note change in vegetation at contact between opencast backfill and natural ground.
62	282727.4	210640.3	On backfilled Nant Helen opencast.	Small cliff composed of large siltstone boulders, presumed to be part of backfill.
63	282372.9	210367.4	On level boggy ground south of overburden stockpile.	View from tramroad across level boggy ground towards overburden stockpile. Based upon observations made to the west of the overburden stockpile it is considered likely that much of this boggy ground will be underlain by peat.

Location / photo ref	Easting	Northing	Location	Observation and Implication
64	282079.2	210307.3		Drainage ditch running from north to south to immediate south of settling ponds.
65	282017.2	210392.9		Settlement pond, part of ground adjacent to southwest corner of overburden stockpile.
67	281766.7	210451.8	On level boggy ground west of overburden stockpile.	Boggy ground to west of overburden stockpile. Likely to be significant quantities of peat in this area also.
68	281557.4	210717.6		Exposure of peat in cut at edge of Nant Helen extension opencast.
69	282467.5	210674.8	In 'valley' between overburden stockpile and backfilled Nant Helen opencast.	Looking into 'valley' from overburden stockpile. This is an artificial valley formed between these two artificial mining features.
70	282499.7	210723.5		Settling pond in 'valley'. This is one of a series of settling ponds running down the valley.
71	282541.3	210948.1	On backfilled Nant Helen opencast.	Looking along line of proposed inner loop cutting with borehole in middle ground of photograph. Note featureless, undulating nature of the ground.
72	282926.9	210962.2		View of drainage ditch (running from left to right in middle ground of photograph).
73	283844.8	211721.5	On backfilled Onllwyn opencast.	Shallow valley at eastern edge of Onllwyn opencast. The bottom of the valley is considered to mark the edge of the opencast. There is also a drainage run in the bottom of the valley.
74	283939	211573.1		Featureless landscape on backfilled Onllwyn opencast.
75	284012.8	211223.7		Drainage ditch on backfilled Onllwyn opencast. These drainage ditches are obvious on the aerial photograph but not from the ground due to the thick sedge grass across much of the backfill.
76	283890.3	210615.1	On undulating ground northeast of Onllwyn washery	Blind valley running from north to south. The hummocky nature of the ground indicating that it has been heavily mined in the past although the valley itself appears to be natural
77	283941.4	210558.6		Looking towards washery across the worked ground.
78	283782.8	210539.7		Capped mineshaft. Photograph taken from small spoil heap considered likely to be associated with the mineshaft.
79	283816.5	210391.3	Adjacent to haul road leading from	Embankment at southern edge of haul road. Considered to have been built during the construction of the haul road.

Location / photo ref	Easting	Northing	Location	Observation and Implication
80	283587.2	210455.3	Nant Helen to Onllwyn washery.	Low spoil heap southwest of haulroad. There appears to be a small bridge leading from the haul road to this area where spoil was placed.
80a	283404	210229	Stream adjacent to the southern boundary of the site.	Slope failure in existing 1m high existing railway embankment, exposing colliery spoil with small stream at the toe of the slope.
81	283700.3	210858.9	Southwest of backfilled Onllwyn opencast.	Featureless landscape along line of proposed cutting in southeast corner of proposed inner loop. This is natural ground but will doubtlessly have been altered to an extent due to its proximity to the backfilled Onllwyn opencast.
82	283737.6	210883.7		
83	283684.2	211469.4	On backfilled Onllwyn opencast.	Restored hedgerows and fields on opencast backfill. It is not obvious that this ground is backfill due to the quality of restoration.
84	283655.9	211576.2		
85	283421.2	211454.5	In vicinity of pond to west of backfilled Onllwyn opencast.	BH16 (adjacent to pond).
86	283366.2	211474.9		Pond located on natural ground to the west of the backfilled Onllwyn opencast. It is likely that this pond is an original feature dating from before the commencement of mining operations at the site.
87	283364.6	211447.5		Looking south along shallow valley.
88	283336.4	211417.6		Relatively small spoil heap northeast of Nant Helen site compound.
88a	283268	211756	Adjacent to the main haul road in the north of the site	1.5m deep 4m wide depression indicating a collapsed historic mine adit. Depression is significantly overgrown
88b	283420	212007	Adjacent to electrical substation	2m deep 4m wide depression indicating a collapsed historic mine adit. Depression is significantly overgrown
89	284471.8	210510.5	Onllwyn washery	Weighbridge with vegetated spoil heap behind.
90	284424.9	210602.8		Looking east from vegetated spoil heap seen in photograph 89. Washery transport conveyors visible in background.
91	284390.3	210666.2		Coal loading area.
92	284351.3	210635.7		Settling ponds which would have formerly been used to clean the process water from the coal washery.
93	284436.1	210661.3		

Location / photo ref	Easting	Northing	Location	Observation and Implication
94	284602.7	210709.5		Railway sidings with tracks concealed by fine coal and dust.
95	284824.7	210707.4		On top of stockpile in northeast corner of washery. This is a very extensive stockpile covering the majority of the northeastern corner of the washery area.
96	284921.5	210719.2		
97	284954.3	210620.4		
98	285074.3	210546.8		
99	285166.5	210503.2		
100	284826.9	210401.5		View along southern edge of washery site

Location, direction, and brief description.	Photo
1 <i>Looking southeast.</i> Break in slope.	

2 <i>Looking northeast.</i> Start of drainage ditch.	
3 <i>Looking west.</i> Shallow gully.	

4 <i>Looking west.</i> Close up of shallow gully.	
5 <i>Looking northwest.</i> Hummocky ground.	

6 Aerial shot showing backfilled mineshaft.	
7 Looking northeast towards drainage ditch.	

8 <i>Looking east.</i> Uprooted tree.	
9 <i>Looking north.</i> Drainage ditch in strip of trees.	

10 <i>Looking northeast.</i> Culvert taking water away from drainage ditch.	
11 <i>Looking southwest.</i> Bank to north of Nant Helen access road.	

12 Boggy ground in field to north of Nant Helen access road.	
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13 Glacial till exposed in ditch on edge of field to the north of Nant Helen access road.	
14 Looking west across field to north of Nant Helen access road.	

15 <i>Looking west along small artificial scarp.</i>	 A photograph showing two individuals, likely field researchers or students, in a grassy, hilly landscape. They are both wearing backpacks and are bent over, examining the ground. One person is holding a clipboard. The terrain appears to be a grassy slope or scarp.
16 <i>Looking northwest across small wooded artificial pond.</i>	 A photograph of a wooded area. In the foreground, there are several large, moss-covered tree trunks. In the background, a small, calm body of water (a pond) is visible, surrounded by dense trees and foliage. The scene is captured from a slightly elevated position, looking across the pond.

17 <i>Looking southeast.</i> Partially engineered drainage outlet from artificial pond described above.	
18 <i>Looking southeast.</i> Collapsed mine adit.	

19 <i>Looking southeast.</i> Crownhole to immediate south of collapsed mine adit.	 A photograph showing a person wearing a hat and a backpack sitting on a grassy slope. To their left is a small, rectangular, earthen crownhole. The background features a line of trees under a blue sky with white clouds.
20 <i>Looking east across eastern half of northern slope.</i>	 A wide-angle photograph of a grassy slope. The foreground is covered in tall grass and yellow wildflowers. In the middle ground, there is a dense line of green trees. The background shows rolling hills under a blue sky with scattered white clouds.

21 <i>Looking southeast across small settling pond.</i>	
22 <i>Looking west across western half of northern slope.</i>	

23 <i>Looking east.</i> Washout gully in opencast backfill.	
24 <i>Looking west.</i> Rough ground behind Caehopkin village.	

25 <i>Looking west along vegetated stream to immediate north of former railway trackbed.</i>	
26 <i>Looking north towards area of opencast backfill.</i>	

27 Looking southeast towards washout gully in opencast backfill.	
28 Location of trial pit.	

29 Uprooted tree in opencast backfill.	
30 Boulders in opencast backfill.	

31 <i>Looking east across opencast backfill from treeline.</i>	
32 <i>Looking southeast along drainage ditch on boundary of existing Nant Helen site.</i>	

33

Looking southwest towards slope failure in pile of colliery spoil.



34

Close up of
slope failure
material.



35 Tension cracks behind main scarp of slope failure.	
36 <i>Looking northeast across wooded colliery backfill.</i>	