

ABANDONED MINE FEATURES ASSESSMENT

YALGOO, WA REHABILITATION OPTIONS STUDY

July 2025

11715-G-R-002 Public Document



WML
Consulting Engineers

Document History and Status				
Revision	Prepared By	Reviewed By	Purpose of Issue	Date
-	IG	SM	Public Issue	21/07/2025

Issued to:	Department of Energy, Mines, Industry Regulation & Safety (DEMIRS)
WML Project Number:	11715
Document Name:	11715-G-R-002 Public Document

WML Consultants Pty Ltd

I Golijanin
Ivana Golijanin
Geotechnical Engineer
Author

Simon Maris
Simon Maris
Principal Geotechnical Engineer
Reviewer

For and on behalf of WML Consultants Pty Ltd

WML Consultants Pty Ltd
ISO 9001 | ISO 14001 | ISO 45001

Level 2, 91 Havelock St, West Perth, WA 6005 | 08 9722 3566
First Floor, 25A Stephen St, Bunbury, WA 6230 | 08 9722 3544
Suite 1, 45 Brookman St, Kalgoorlie, WA 6430 | 08 9021 1811

CONTENTS

1	INTRODUCTION	5
1.1	Client supplied information	5
1.2	Objectives of this report	5
2	REHABILITATION OPTIONS	7
2.1	Leave as is – no rehabilitation required	7
2.2	Blading the area to reduce steepness of slopes and soften the feature	8
2.3	Soil backfill	9
2.4	Controlled collapse and backfill	10
2.5	Controlled collapse with explosives and backfill	12
2.6	Reinforced earth backfill	14
2.7	Concrete plug	16
2.8	Concrete slab cap	17
2.9	Steel grate cap	19
2.10	Fence the area	21
2.11	Grout backfill	21
2.12	Rehabilitation options for select features	23
2.12.1	Feature S0113280 (Category 7)	23
2.12.2	Feature S0113339 (Emerald Reward Mine Open Pit)	23
2.13	Fill suitability	25
2.13.1	In-situ material quality	25
2.13.2	Imported fill	26
3	FEASIBILITY	27
3.1	Ranked rehabilitation options	27
3.1.1	Do not rehabilitate – leave as is	28
3.1.2	Backfill	30
3.1.3	Reinforced earth backfill	32
3.1.4	Controlled collapse and backfill	33
3.1.5	Concrete slab cap	34
4	CLOSURE	35

TABLES

Table 1: Blading rehabilitation options study	8
Table 2: Soil backfill rehabilitation recommended for selected features	9
Table 3: Soil backfill rehabilitation options study	9
Table 4: Controlled collapse and backfill rehabilitation recommended for selected features	11
Table 5: Controlled collapse and backfill rehabilitation options study	11
Table 6: Controlled collapse with explosives may be applicable for selected features	13
Table 7: Collapse with explosives and backfill rehabilitation options study	13
Table 8: Reinforced earth backfill rehabilitation recommended for selected features	14
Table 9: Reinforced earth backfill rehabilitation options study	15
Table 10: Concrete plug rehabilitation may be considered for selected features	16
Table 11: Concrete plug rehabilitation options study	16
Table 12: Concrete cap recommended for selected features	18
Table 13: Concrete slab cap rehabilitation options study	18
Table 14: Steel grate cap rehabilitation considered for selected features	19
Table 15: Steel grate cap rehabilitation options study	20
Table 16: Fence rehabilitation options study	21
Table 17: Grout backfill may be considered for selected features	22
Table 18: Grout backfill rehabilitation options study	22
Table 19: Open pit rehabilitation options study	23
Table 20: Excavatability of the slope walls	24
Table 21: WML Preferred Option: Do not rehabilitate	28
Table 22: WML Preferred Option: Backfill	30
Table 23: WML Preferred Option: Reinforced earth backfill	32
Table 24: WML Preferred Option: Controlled collapse and backfill	33
Table 25: WML Preferred Option: Concrete slab cap	34

FIGURES

Figure 1: Risk assessment of the open pit walls

APPENDICES

LIMITATIONS

APPENDIX A

Geotechnical Report

1 INTRODUCTION

The Department of Energy, Mines, Industry Rehabilitation & Safety (DEMIRS) engaged WML Consultants (WML) to undertake a geotechnical assessment and rehabilitation options study to support the rehabilitation of abandoned mine features within 1 km of the Yalgoo Primary School in Yalgoo, Western Australia. These include shafts, collapsed shafts, open stopes, adits, costeans, shallow workings, and rehabilitated features. Based on the non-intrusive and intrusive geotechnical investigations undertaken in September of 2024, a total of 72 abandoned mine features occurring below ground were assessed. 1 above ground infrastructure feature that comprised a concrete sump was also assessed, however, 18 other above ground features were not assessed as these included dumps, stockpiles, tailing storage facilities, buildings, and infrastructure, which do not present a below ground void safety risk. Rehabilitation options for the Emerald Reward open pit has also been included.

This report presents a rehabilitation options study, based on the findings of the accompanying geotechnical report, 11715-G-R-001, for thirteen (13) rehabilitation options. The options have been ranked based on suitability against each of the known features and includes detailed descriptions and discussions of each potential rehabilitation option.

The geotechnical study was authorised by DEMIRS via letter of acceptance DEMIRS24473, dated 26th July 2024.

This report and the information presented herein must be read in conjunction with the attached “*Report Limitations*”.

1.1 Client supplied information

The following information was made available from the Client for the purpose of this report:

- DMIRS24473 Request – ‘Geotechnical Engineering Services for Abandoned Mine Features, Yalgoo Phase 1’, prepared by DEMIRS.
- Drone aerial imagery and orthomosaics, 2022, prepared by DEMIRS.
- Abandoned Mines Inventory feature photographs at Yalgoo, prepared by DEMIRS.
- Feature survey data – photographs of features, 2022, prepared by DEMIRS.
- Abandoned mine feature data set in excel format, including inventory definitions and data field explanatory notes, prepared by DEMIRS.
- Shapefiles of abandoned mine features and 1 kilometre project area, prepared by DEMIRS.

1.2 Objectives of this report

The objectives of this rehabilitation options study are to provide the following for each option:

- Description and rationale.
- Plant and equipment required to do the works.
- Material specification where relevant (e.g. material type, sizing, density, moisture content) and volumes.
- Potential or likely sources of material.
- Timing and/or sequencing requirements.
- Potential risks to effective implementation including any impact from groundwater or unfavourable geochemistry where applicable.
- Post rehabilitation monitoring requirements.
- Personnel and specific technical expertise required.
- Suitability of each option against each known feature.

In addition, the rehabilitation options have been assessed against the following criteria:

1. Provide a permanent solution to mitigate safety and geotechnical risks associated with the features, including any lateral workings and subsidence risk zones.
2. Minimise risk to personnel during construction.
3. Require minimal ongoing monitoring or maintenance.
4. Be technically feasible and cost-effective.

5. Minimise disturbance to the existing environment and heritage values.

2 REHABILITATION OPTIONS

Several rehabilitation options have been assessed to potentially rehabilitate the 73 abandoned mining related features identified within 1 km of the Yalgoo Primary School. The following options will be detailed subsequently and include:

1. Leave as is – no rehabilitation required.
2. Blading the area to reduce steepness of slopes and soften the feature.
3. Soil backfill.
4. Controlled collapse and backfill.
5. Collapse with explosives & backfill.
6. Reinforced earth backfill.
7. Concrete plug.
8. Concrete slab cap.
9. Steel grate cap.
10. Fence.
11. Grout backfill.

The nine (9) feature categories identified in the accompanying geotechnical report, 11715-G-R-001, have been classified in accordance with observations made on site during both the intrusive and non-intrusive ground investigations and in terms of the risk posed to humans, vehicles, livestock, and pets. The recommendations below pertain to the features assigned to these categories. The potential option of rehabilitation of the open pit has also been assessed and included in this report.

The following recommendations are based on the results of the non-intrusive and intrusive site investigations undertaken in September of 2024. While the ground conditions appeared consistent across the site, the contractor should be aware the ground conditions may vary across the site and the excavatability of the natural strata may also vary due to variable depths of the extremely weathered rock layer. It should also be noted that whilst WML have attempted to identify voids and drives within each feature, the potential for unknown voids, drives and underground lateral workings may exist.

The rehabilitation of these abandoned mine features have not been designed to allow for future land use / redevelopment, therefore, WML recommend leaving the locations of the rehabilitations easily identifiable by way of leaving the surface proud with backfill material and / or using metal plaques, engravings, or identifiers on the concrete slab solutions to make the locations obvious for people walking or driving around the area. The intent of this is to further minimise risk by limiting the public's interaction with these rehabilitated features.

The following advice regarding construction equipment and timing is preliminary only, and the earthwork contractor should assess the site conditions to determine the exact requirements for machinery and construction equipment.

The rehabilitation options may require some modifications during construction pending observations of ground conditions and other variables; WML shall be on site during construction to advise and modify the methodology and rehabilitation specifics as required.

2.1 Leave as is – no rehabilitation required

Rehabilitation for Category 1 features is not considered necessary as they typically exist in the form of shallow workings, or minor depressions on the ground surface, generally indiscernible from the natural topography of the site. The risk of void collapse and presence of / proximity to lateral workings is very low. These features also pose very low risk of trips and falls to humans, livestock, or pets, and a 4x4 vehicle should be able to traverse these features when driven in a manner consistent with responsible and competent off-road driving practices.

Data obtained from the geophysical investigation indicates there are no lateral workings within the top 20 m and low risk of voids within the vicinity of these features.

The base conditions have been validated during the geotechnical investigation and are considered to be stable.

2.2 Blading the area to reduce steepness of slopes and soften the feature

This method is suited to rehabilitate Category 2 features. These features typically exist as shallow workings, minor depressions, costeans, and trenches on the ground surface, mostly indiscernible from the natural topography of the site, however, are generally deeper than Category 1 features. The risk of void collapse and presence of / proximity to lateral workings is very low. These features also pose low risk of trips and falls to humans, livestock, or pets, and a 4x4 vehicle should be able to traverse these features when driven in a manner consistent with responsible and competent off-road driving practices.

Data obtained from the geophysical investigation indicates there are no lateral workings within the top 20 m and low risk of voids within the vicinity of these features.

The base conditions have been validated during the geotechnical investigation and are considered to be stable.

This solution involves reducing the steepness of the existing features by softening and battering the feature walls with an excavator or a dozer. The outcome of this rehabilitation option is to resemble the surrounding natural topography and lower the consequence level of the risk of injury to personnel due to trips.

Table 1: Blading rehabilitation options study

Requirements	Description
Plant and equipment	Posi track, small dozer, or 5t+ excavator.
Material specification for imported fill	No imported material is required. It is recommended the feature be backfilled and softened using the spoil surrounding the berm of these features.
Quantity / volume of material	See Section 3.
Potential source of material	Spoil piles around the berm of these features.
Timing	It is anticipated a single feature could be rehabilitated in a space of anywhere between 1 hour to up to 1 day (for the larger costeans) pending the amount of vegetation and debris that needs to be removed from the base and pruning/clearing to gain access to the feature, size of the feature, and machinery chosen for the work.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment. Small trees may need to be removed in areas of dense vegetation to allow for a clear path for the equipment to access the feature locations. It is considered in most cases, small trees within and around the feature can be left in place as part of the rehabilitation process provided a suitable tree protection zone can be observed.
Potential risk to contractors and operators	At these features it has been determined that there is very low risk of underground features / lateral workings / subsidence. Therefore, these features pose very low additional risk to a competent earthwork contractor.
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	None required.

2.3 Soil backfill

Backfilling with soil has been selected as the rehabilitation option for Category 3 features, which have been classified as shallow shafts and trenches. The risk of void collapse and presence of / proximity to lateral workings is low. These features also pose medium risk of trips and falls to humans, livestock, or pets, and a 4x4 vehicle should not attempt to traffic these features. The base conditions have been validated during the geotechnical investigation and are considered to be stable.

Backfilling is also recommended for the Category 6b feature, which exists as a deep stope and has a medium risk of collapsing. The feature is a deep and steeply dipping stope and pose a high risk to human life as it is very deep and easily accessible. There is a high risk to children who may be inclined to crawl into the narrow stopes and tourists and prospectors who may be inclined to walk in to explore the depths of these stopes.

For Features S0113334 (Category 5) and S0113277 (Category 6a), WML recommend rehabilitating these features via lining the base and side walls with a geofabric prior to backfilling with site won or approved fill material. This lining will serve to prevent the backfill material being washed away into the stope during periods of heavy rainfall and reduce the risk of reopening of the void and subsidence of the backfilled material. These features require additional treatment and are indicated by the asterisk (*) in the table below.

Seven (7) features have been identified on site where this solution is the preferred rehabilitation treatment option:

Table 2: Soil backfill rehabilitation recommended for selected features

Feature Category	Feature Number
Category 3	S0113283
	Y-23
	Y-32
Category 5	S0113334*
Category 6a	S0113277*
Category 6b	S0113300 (S)
Infrastructure	S0113723 (concrete sump)

Table 3: Soil backfill rehabilitation options study

Requirements	Description
Plant and equipment	12t+ excavator. A dump truck (up to Volvo A40 size) or a medium sized front-end loader to bring fill from the stockpile locations to the feature. Additional equipment required if site-won material is deemed unsuitable for re-use: a tipper haul truck to import fill material to site.
Material specification for imported fill	No imported fill material is required as sufficient volume of backfill material exists in the surrounding spoil piles and stockpiles (predominantly situated around the open pit) on site. Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.
Quantity / volume of material	See Section 3.

Requirements	Description
Potential source of material	<p>There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill.</p> <p>If this material is confirmed to be unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material.</p> <p>The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.</p>
Timing	Rehabilitation may take between 1 – 4 hours per feature, however, up to 2 days for Feature S0113300 (S) depending on the plant available.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment. It is considered any small trees within and around the feature can be left in place as part of the rehabilitation process.
Potential risk to contractors and operators	The contractor needs to ensure the haulage routes from any stockpiles (site won or imported fill) are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 3 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, however, there is low risk of ground collapse due to lateral workings / subsidence / underground features. A 1 m setback distance from the edge of Feature S0113300 (S) must be maintained by personnel unless working at heights gear is worn.
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	These features have been identified to have very low risk of lateral / deep workings below a false base, therefore one site visit, two years after the rehabilitation is recommended to assess the performance of the rehabilitation solution. If there have been no changes to the rehabilitated features, then no further monitoring is required.

2.4 Controlled collapse and backfill

Breaking out and collapsing the feature as a method of rehabilitation is recommended for some Category 5 and Category 6a features. These features are shown in Table 4. Category 5 features are vertical trenches and shafts which dip away to form a slope, and the base conditions are unknown. The slopes within these features are likely to collapse however the deeper portions of these features (> 4 m depth) are not expected to cause significant surface subsidence based on rock mass observations and the narrow-mined lode widths evidenced during the geotechnical investigation, and the depth of the voids below the ground surface. The shallower portions of these slopes (\leq 4 m of the ground surface) are likely to collapse and are at higher risk of causing some noticeable surface subsidence.

Category 6a features exist as deep slopes with are steeply dipping and are situated within the fenced and gated area south-west quadrant of the project area. Some of these features exhibit wooden supports and residual rock pillars propping the walls of these slopes open. These features show signs that indicate collapse of the hanging walls of the slope.

As the risk of shallow lateral workings and / or stope collapse of these features is high, WML recommends breaking into the feature using a large excavator with a rock pick / rock breaker attachment to collapse the narrower stope portions to ensure the feature within 4 m of the ground surface is removed or backfilled.

Backfilling directly from the surface is not considered suitable as a rehabilitation method for these features as they comprise lateral workings and / or stopes dipping between approximately 45 – 60 degrees and fill material will not flow into the narrowest and deepest portions of the stopes to completely backfill the voids. WML has undertaken a stability assessment of the feature listed in Table 4 and has determined for the ground conditions and the stope sizes, voids located at least 4 m below the ground surface present very low subsidence risk. Therefore, this rehabilitation design involves the removal or backfilling of any voids within the top 4 m (inclusive) of the ground surface.

WML also recommend lining the base and side walls of these features with a geofabric prior to backfilling with site won or approved fill material. This lining will serve to prevent the backfill material being washed away into deeper portions of the stope during periods of heavy rainfall and reduce the risk of reopening of the void and subsidence of the backfilled material. The features indicated by the asterisk in Table 4 below do not require any lining with geofabric after the hanging rock bridges have been collapsed.

Seven (7) features have been identified where this solution presents itself:

Table 4: Controlled collapse and backfill rehabilitation recommended for selected features

Feature Category	Feature Number
Category 5	S0113274*
	S0113306*
	Y-29
Category 6a	S0113281
	S0113300 (N)
	S0113310
	S0113812

Table 5: Controlled collapse and backfill rehabilitation options study

Requirements	Description
Plant and equipment	40t+ excavator with a rock breaker and rock pick. The contractor should assess the reach of the excavator to ensure it can reach the base of these features. A small (up to 6t) dump truck to bring fill from the stockpiles across the site to the feature location. A loader or excavator to load the dump truck. If imported fill material is required: a tipper haul truck to import granular fill material to site.
Material specification for imported fill	No imported fill material is required as sufficient volume of backfill material exists in the surrounding spoil piles and stockpiles (predominantly situated around the open pit) on site. Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.
Quantity / volume of material	See Section 3.

Requirements	Description
Potential source of material	<p>There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill.</p> <p>If this material is unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material.</p> <p>The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.</p>
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. We assume a typical time allowance for each feature, depending on its size, should take approximately 1-2 days per feature.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment. Small trees may need to be removed in areas of dense vegetation to facilitate the collapsing of shallow stopes on the hanging wall side of the stopes.
Potential risk to contractors and operators	The contractor needs to ensure the haulage routes from stockpiled fill material (site won or imported) are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 3 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, and the potential risk of ground collapse due to lateral workings / subsidence / underground features. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	These features have been identified to have medium risk of lateral / deep workings below a false base, therefore one site visit, to conduct a visual assessment, 6 months after the rehabilitation has been completed, and flown surveys 2 years post rehabilitation and again 10 years post rehabilitation is recommended to assess the performance of the rehabilitation solution. If no deformation is observed 12 years post rehabilitation to the features, no further monitoring is required.

2.5 Controlled collapse with explosives and backfill

Alternative to the above solution (Section 2.4), for the features indicated in Table 6, controlled collapse with explosives may be considered to minimise the risk of uncontrolled collapse which may generate excessive surface subsidence. This solution involves drilling blast holes in the stope walls, roof or floor, where explosives may be placed and detonated in a controlled system. Once the target areas have been collapsed and inspected, the subsided area may be topped up using backfill material to raise the finish ground levels back to their original reduced levels (RLs).

This method may be an option for the following features:

Table 6: Controlled collapse with explosives may be applicable for selected features

Feature Category	Feature Number
Category 5	Y-29
Category 6a	S0113281
	S0113300 (N)
	S0113310
	S0113812

Table 7: Collapse with explosives and backfill rehabilitation options study

Requirements	Description
Plant and equipment	Drill rig, specialised blasting equipment, specialist blast designer, explosives, explosive management processes, vibration monitoring equipment, dilapidation surveys. A front-end loader or excavator to manage the movement of material from existing stockpiles near the open pit to the features. A dump truck will be required to transport material from the material stockpiles near the open pit to the features across the site.
Material specification for imported fill	There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles (predominantly around the open pit) which are considered geotechnically suitable for re-use. Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.
Quantity / volume of material	Volumes of the visible portions of the features are indicated in Section 3. However, additional fill may be required to backfill the resultant surface subsidence expression caused by collapsing the stopes and underground lateral workings as the exact volume of underground workings is unknown.
Potential source of material	There may exist sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill. If this material is unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material. The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.
Timing	Pending specialist contractor's advice.
Potential environmental risk, including groundwater, flora and fauna	This is expected to cause a fair amount of disturbance to the existing ground surface and surrounding environment, as entire areas shall be collapsed.

Requirements	Description
Potential risk to contractors and operators	<p>The contractor needs to ensure the haulage routes for any imported fill materials are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 4 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, specifically working from heights requirements. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.</p> <p>It is recommended that working at heights gear be utilised by personnel working around the features during the rehabilitation work.</p> <p>Temporary fencing should be used during the construction to limit interaction with members of the public.</p>
Personnel and technical expertise	Only drill and blast specialists who are qualified to design and undertake this work.
Post rehabilitation maintenance and monitoring	One site visit, 1 year after the rehabilitation is recommended to assess the performance of the rehabilitation solution. If there have been no changes to the rehabilitated features, then no further monitoring is required.

2.6 Reinforced earth backfill

This rehabilitation method has been selected for Category 4 features, which have been classified as shallow shafts with soft or unknown ground conditions at the base of these features. These features potentially contain a false floor and are at risk of voids opening up and collapsing. These features pose medium risk of trips and falling into shafts to humans, livestock, and pets, and a 4x4 vehicle should not attempt to traverse these features.

The base conditions assessed during the geotechnical investigation indicate instability and potential for a false floor. Potential small adits, burrows, or lateral workings may exist; these potential workings may cause loss of backfill material.

Soil backfill (as detailed in Section 2.3) is not considered suitable for these features as the base conditions of these features are unknown and have not been investigated. A reinforced earth backfill comprising geofabric is recommended to backfill the features. Some excavation and widening at the opening of the features may be required to ensure the reinforced backfill within the features cannot fall down the base of the feature or into any lateral / underground working in the event that a false floor collapses and a void opens up beneath the backfill. This solution ensures that minimal surface subsidence will be experienced. This method is suited for features where there exists concern that the floor may potentially give way and collapse, and where these features may extend deeper than they may appear.

Six (6) features have been identified within the site where this solution leads itself:

Table 8: Reinforced earth backfill rehabilitation recommended for selected features

Feature Category	Feature Number
Category 4	S0113278
	S0113285
	S0113296
	S0113308
	S0113338
	S0113823

Table 9: Reinforced earth backfill rehabilitation options study

Requirements	Description
Plant and equipment	<p>7-22t+ excavator. The contractor should assess the reach of the excavator to ensure it can reach the base of these features.</p> <p>A small (up to 6t) dump truck to bring fill from the stockpiles across the site to the feature location. A loader or excavator to load the dump truck.</p> <p>If imported fill material is required: a tipper haul truck to import granular fill material to site.</p>
Material specification for imported fill	<p>No imported fill material is required as sufficient volume of backfill material exists in the surrounding spoil piles and stockpiles (predominantly situated around the open pit) on site.</p> <p>Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.</p>
Quantity / volume of material	See Section 3.
Potential source of material	<p>There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill.</p> <p>If this material is unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material.</p> <p>The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.</p>
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. We assume a typical time allowance for each feature, depending on its size, should take approximately 1-2 days.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment.
Potential risk to contractors and operators	The contractor needs to ensure the haulage routes from stockpiled fill material (site won or imported) are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 3 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, and the potential risk of ground collapse due to lateral workings / subsidence / underground features. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.

Requirements	Description
Post rehabilitation maintenance and monitoring	These features have been identified to have medium risk of lateral / deep workings below a false base, therefore one site visit, to conduct a visual assessment, 6 months after the rehabilitation has been completed, and flown surveys 2 years post rehabilitation and again 10 years post rehabilitation is recommended to assess the performance of the rehabilitation solution. If no deformation is observed 12 years post rehabilitation to the features, no further monitoring is required.

2.7 Concrete plug

As an alternative option to the reinforced earth backfill solution (Section 2.6), a concrete plug may be poured into the features listed in Table 10 once they have been domed out to form conical shapes that taper and narrow down at depth. The concrete plug shall wedge into the features preventing any voids opening up in the event that the base of any potential false floors collapse. The concrete plug may be buried beneath the ground by 0.3 – 0.5 m of soil fill.

The dimensions of the concrete plug must be assessed at the detailed design stage should this option be selected.

Table 10: Concrete plug rehabilitation may be considered for selected features

Feature Category	Feature Number
Category 4	S0113278
	S0113285
	S0113296
	S0113308
	S0113338
	S0113823

Table 11: Concrete plug rehabilitation options study

Requirements	Description
Plant and equipment	7-22t+ excavator. The contractor should assess the reach of the excavator to ensure it can reach the base of these features. A small (up to 6t) dump truck to bring fill from the stockpiles across the site to the feature location. A loader or excavator to load the dump truck. Concrete truck and pump or cement mixer.
Material specification for imported fill	No imported fill material is required as sufficient volume of backfill material exists in the surrounding spoil piles and stockpiles (predominantly situated around the open pit) on site. Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.
Quantity / volume of material	See Section 3.
Potential source of material	There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill.

Requirements	Description
	<p>If this material is unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material.</p> <p>The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.</p>
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. We assume a typical time allowance for each feature, depending on its size, should take approximately 1-2 days.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment.
Potential risk to contractors and operators	<p>The contractor needs to ensure the haulage routes for imported material are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 3 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, and the potential risk of ground collapse due to lateral workings / subsidence / underground features.</p> <p>Personnel should maintain a minimum setback distance of 1 m from the edge of these features.</p>
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	<p>These features have been identified to have medium risk of lateral / deep workings below a false base, therefore one site visit, to conduct a visual assessment, 6 months after the rehabilitation has been completed, and flown surveys 2 years post rehabilitation and again 10 years post rehabilitation is recommended to assess the performance of the rehabilitation solution. If no deformation is observed 12 years post rehabilitation to the features, no further monitoring is required.</p>

2.8 Concrete slab cap

Category 8 and Category 9 features exist as deep shafts. These features pose high risk of trips and falling into shafts to humans, livestock, and pets and may result in fatal consequences.

A concrete slab solution is suitable for rectangular shaped shafts. Weathered rock of poor to fair rock mass quality was identified within the walls of these features. WML have undertaken a rock mass assessment during the site investigation, kinematic analysis, and global stability assessment; from this we have determined that the ground conditions comprise of a moderate strength and competent rock mass, overlain by a thin layer of clayey sandy gravel soils; and the ground surface, at a minimum distance of 0.5 m from the edge of the voids, are suitable for founding concrete slab. The stability of these shafts is evidenced also by the fact that these shafts have remained open for 130 years and have not caved.

Backfill (as detailed in Section 2.3) alone is not considered suitable for these features as they are deep, filled with water, potentially comprise a false floor, and are likely to comprise significant lateral workings. Any backfill material cast into these features has the potential to wash away into any lateral workings at depth due to presence of water, false floors,

or potential extensive unknown lateral workings, and cause subsidence as false floors have been identified within these shafts.

The concrete slabs may be designed to be buried by 0.3 m of soil, or they may remain uncovered and visible on the ground surface. Appropriate signposting and barricading / delineation of the area should be considered to limit the public's access to these rehabilitated capped shafts.

Three (3) features have been identified where a cap spanning the void is recommended:

Table 12: Concrete cap recommended for selected features

Feature Category	Feature Number
Category 8	Y-28
Category 9	S0113265
	S0113745

Table 13: Concrete slab cap rehabilitation options study

Requirements	Description
Plant and equipment	<p>22t+ excavator (with rock pick / breaker). A front-end loader or excavator to manage the movement of material from existing stockpiles near the open pit to Features S0113265 and Y-28. A dump truck will be required to transport material to Feature S0113745 from the material stockpiles near the open pit.</p> <p>Concrete truck and pump or cement mixer.</p> <p>If imported fill material is required: a tipper haul truck to import granular fill material to site.</p>
Material specification for imported fill	<p>There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles (predominantly around the open pit) which are considered geotechnically suitable for re-use as backfill.</p> <p>Any imported fill material should comprise a clean inert granular material with a fines content < 15% and no particles > 100 mm. The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm. See Section 2.12.</p>
Quantity / volume of material	See Section 3.
Potential source of material	<p>There exists sufficient material on-site in the form of surrounding spoil piles and stockpiles which are considered geotechnically suitable for re-use as backfill.</p> <p>If this material is unsuitable for re-use, imported fill material will be required. The nearest mine site is in Gullewa (approximately 60 km away) which may be a potential source of imported fill material.</p> <p>The contractor is to provide details of sustainable locally sourced, cost-effective fill material to the designer for approval. The fill needs to be a granular, clean, inert, natural material, however, there are no specific structural requirements of this material as it is simply backfilling an existing void. This can consist of spoil generated from nearby construction projects or be sourced commercially; however, the material must meet the specifications.</p>

Requirements	Description
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. It is anticipated that it shall take 3 days per feature to prepare the subgrade, place rebar and pour concrete.
Potential environmental risk, including groundwater, flora and fauna	Negligible negative environmental impacts are anticipated as a consequence of this rehabilitation solution.
Potential risk to contractors and operators	<p>The contractor needs to ensure the haulage routes for any imported fill materials are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 4 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, specifically working from heights requirements. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.</p> <p>It is recommended that working at heights gear be utilised by personnel working around these features during the rehabilitation work.</p> <p>Temporary fencing should be used during the construction to limit interaction with members of the public.</p>
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	One site visit, to conduct a visual assessment, 1 year after the rehabilitation has been completed, and once every 5 years post rehabilitation is recommended to visually assess the performance of the rehabilitation solution.

2.9 Steel grate cap

This is an alternative option to a concrete slab cap as detailed in Section 2.8. Several galvanized steel grid walkways or one whole steel grate may be used to cap the features. WML have provided a preliminary steel grate capping design only; details pertaining to final design of the steel grate cap can be provided if this option is selected as a rehabilitation option for these features.

Three (3) features have been identified where a steel grate spanning the void may be considered:

Table 14: Steel grate cap rehabilitation considered for selected features

Feature Category	Feature Number
Category 8	Y-28
Category 9	S0113265
	S0113745

Table 15: Steel grate cap rehabilitation options study

Requirements	Description
Plant and equipment	22t+ excavator (with rock pick / breaker). A crane and chains. A loader or excavator to manage the stockpiling and movement of material. A tipper haul truck to import granular fill material to site. Concrete truck and pump or cement mixer.
Material specification for imported fill	n/a
Quantity / volume of material	n/a
Potential source of material	Galvanized steel grate walkways are likely to be fabricated in Perth and transported to site.
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. We assume a typical time allowance for each feature, should take approximately 7 days.
Potential environmental risk, including groundwater, flora and fauna	This may cause some disturbance to the existing ground surface and surrounding environment.
Potential risk to contractors and operators	<p>The contractor needs to ensure the haulage routes for any imported fill materials are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 4 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, specifically working from heights requirements. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.</p> <p>It is recommended that working at heights gear be utilised by personnel working around these features during the rehabilitation work.</p> <p>Temporary fencing should be used during the construction to limit interaction with members of the public.</p>
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	One site visit, to conduct a visual assessment, 1 year after the rehabilitation has been completed, and once every 5 years post rehabilitation is recommended to visually assess the performance of the rehabilitation solution.

2.10 Fence the area

Fencing may also be considered as a rehabilitation option for individual features or localised areas to limit the public's interaction. Without ongoing inspection and maintenance, this would provide a short-term solution.

Table 16: Fence rehabilitation options study

Requirements	Description
Plant and equipment	Dependent on the type of fencing selected.
Material specification for imported fill	Not required.
Quantity / volume of material	n/a
Potential source of material	Perth or Geraldton.
Timing	The timing is dependent on the contractor's ability, personnel and equipment used. We assume a typical time allowance for each feature, should take approximately 1-3 days.
Potential environmental risk, including groundwater, flora and fauna	Minimal negative environmental impacts are anticipated as a consequence of this rehabilitation solution.
Potential risk to contractors and operators	The contractor needs to ensure the haulage routes for any imported materials are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 4 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, specifically working from heights requirements. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.
Personnel and technical expertise	Any competent and experienced fencing contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	Visual assessments should be undertaken every 6 months (at a minimum) to inspect the fence for vandalism. The fencing will likely need to be replaced every 10-20 years.

2.11 Grout backfill

A flowable cementitious grout backfill may be poured into the features identified in Table 17 as an alternative solution to those mentioned above. This shall serve to fill any underground lateral voids, stops and drives, to stabilise both lateral workings and vertical shafts. Estimated fill volumes required for features where stopes and lateral workings have been identified are unknown as the exact extent of these workings has not been determined.

This method may be an option for the following features:

Table 17: Grout backfill may be considered for selected features

Feature Category	Feature Number
Category 4	S0113278
	S0113285
	S0113296
	S0113308
	S0113338
	S0113823
Category 5	S0113334
	S0113274
	S0113306
	Y-29
Category 6a	S0113277
	S0113281
	S0113300 (N)
	S0113310
	S0113812

Table 18: Grout backfill rehabilitation options study

Requirements	Description
Plant and equipment	Concrete truck, mixing / batching plant and equipment, and imported sand and cement.
Material specification for imported fill	Specialised specification to be designed if this method is selected.
Quantity / volume of material	Any additional volumes beyond the areas scanned using the 3D LiDAR scanner cannot be determined as the extent of underground lateral workings is unknown.
Potential source of material	Geraldton or Perth.
Timing	Various – this will be depended on the extent of any underground lateral workings.
Potential environmental risk, including groundwater, flora and fauna	This is expected to cause minimal disturbance to the existing ground surface and surrounding environment.
Potential risk to contractors and operators	The contractor needs to ensure the haulage routes for any imported materials are safe and suitable. During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 4 m from the edge of these features. The contractor should be aware of slips, trips, and falls into these features, specifically working

Requirements	Description
	from heights requirements. Personnel should maintain a minimum setback distance of 1 m from the edge of these features.
Personnel and technical expertise	A suitable batching plant needs to be available.
Post rehabilitation maintenance and monitoring	One site visit, 7 days and 1 year after the rehabilitation is recommended to assess the performance of the rehabilitation solution. If there have been no changes to the rehabilitated features, then no further monitoring is required.

2.12 Rehabilitation options for select features

2.12.1 Feature S0113280 (Category 7)

Olfactory evidence of potential contamination within the base of the feature was detected via backhoe excavation during the disturbance investigation (potentially cyanide). The rehabilitation solution of this feature shall be dependent of the findings of the detailed contaminated site investigation recommended in the accompanying geotechnical report, 11715-G-R-001, to identify any potential contaminants within the feature. It is recommended the feature be cleared of waste and fill material via excavation and be placed in large skip bins, be assessed for contamination, and sent to an appropriate landfill for suitable disposal.

The final rehabilitation options shall be provided once this has been assessed.

2.12.2 Feature S0113339 (Emerald Reward Mine Open Pit)

WML have undertaken a risk assessment of the walls of the open pit in the accompanying geotechnical report, 11715-G-R-001. Where moderate to excessively steep slopes have been identified, indicated in orange and red in Figure 1 below, mild to severe injuries may be caused to people should they fall over the side of the open pit. The risk of children injuring themselves is high particularly as the open pit is situated directly opposite the Primary School and is likely to be a playground for local children, particularly as children's toys were observed to be scattered around the base of the pit.

WML recommend cutting 1V:3H batter slopes to reduce the steepness of the medium to high-risk slopes identified around the open pit and reduce the risk of injuries to humans and animals. The existing stockpiles around the perimeter of the open pit may need to be removed to allow for safe movement of machinery and excavation of the slope walls.

WML have not undertaken a cut/fill assessment of the open pit and are therefore, approximate volumes for the works have not been provided and the timing to undertake these works is unknown.

The excavatability of each section of the slope walls has also been identified and included in Table 20 and Figure 1.

Table 19: Open pit rehabilitation options study

Requirements	Description
Plant and equipment	40t+ excavator and rock pick / rock breaking equipment, D8 dozer, large front-end loader, Volvo A40 dump truck.
Material specification for imported fill	Not required.
Quantity / volume of material	Cut/fill volumes have not been determined.
Potential source of material	n/a

Requirements	Description
Timing	This will be depended on the plant and equipment used as well as the required cut/fill volumes. However, it is anticipated to take approximately 1-2 weeks excluding any revegetation work required.
Potential environmental risk, including groundwater, flora and fauna	This is expected to cause disturbance to the existing ground surface and surrounding environment. It is recommended to revegetate the area post rehabilitation.
Potential risk to contractors and operators	During the initial phases of the rehabilitation, we recommend machinery maintains a minimum setback distance of 3 m from the edge of the open pit at all times. The contractor should be aware of slips, trips, and falls into the open pit. Personnel should maintain a minimum setback distance of 1 m from the edge of the medium-high risk slopes.
Personnel and technical expertise	Any competent and experienced earthwork contractor should be able to undertake this work.
Post rehabilitation maintenance and monitoring	One site visit, 1 year after the rehabilitation is recommended to assess the conditions of the slope walls. If there have been no changes to the feature, then no further monitoring is required.

Table 20: Excavatability of the slope walls

Excavatability	Requirements
Easy	Material on the slopes may be freely dug with a 40t excavator.
Medium	Material on the slopes may require occasional use of a rock pick attached to a 40t excavator.
Hard	A rock pick attached to a 40t excavator shall be required to excavate the material on the slopes.

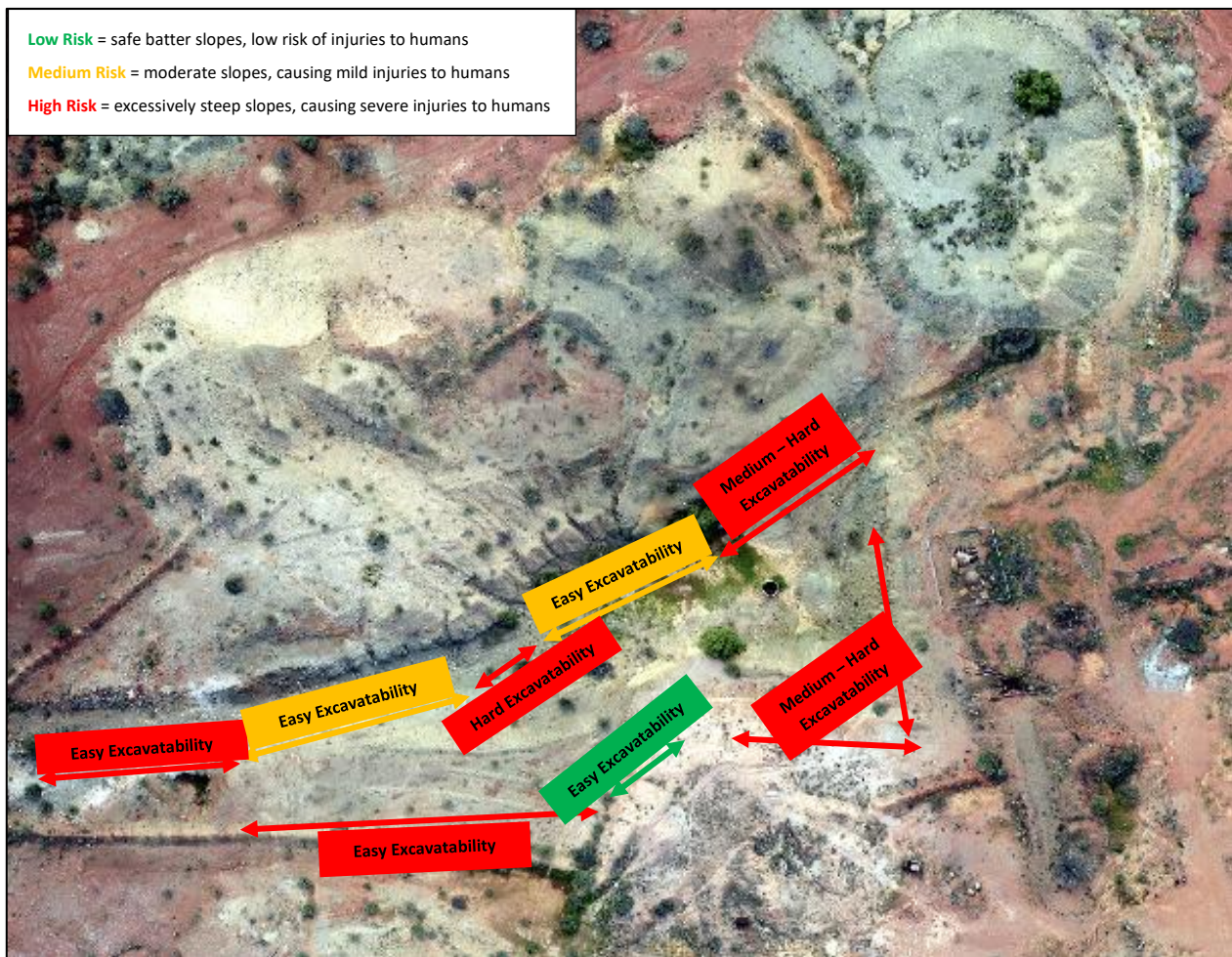


Figure 1: Risk assessment of the open pit walls

2.13 Fill suitability

2.13.1 In-situ material quality

The existing spoil piles and material stockpiles surrounding the features typically comprises of fine to coarse-grained gravelly SAND / sandy GRAVEL, which are also considered geotechnically suitable for re-use as fill material for rehabilitation works (subject to approval). This material may be re-used to permanently backfill any features that are situated above the groundwater levels and temporarily backfill the waterlogged shafts to allow for founding the concrete slabs. It is recommended that this material not be used within the final 300 mm of backfill unless any particles greater than 25 mm are removed, to promote regrowth of vegetation.

It is important to note that the dispersity of this material has not been tested, however, visual observations in the field suggested that this material is likely to be dispersive. Therefore, it is not considered suitable for re-use as permanent, long-term backfill in any deep waterlogged shafts where underground lateral workings are potentially present.

Reutilising the existing materials available on site in the form of spoil piles and material stockpiles scattered primarily around the Emerald Reward open pit, is a sustainable and cost-effective source of fill material for the rehabilitation options detailed in this report. Utilising the available local fill will eliminate the negative environmental factors and costs associated with hauling imported fill to Yalgoo. It will also reduce the quantity of stockpiled material across the site, which may result in a more aesthetically pleasing environment.

Where WML have stated these materials are subject to approval, this is only if this material yields a contaminated sites issue or is deemed to have heritage value.

Further contamination assessment and dispersity testing of the material stockpiles on site will be required for the available site won material to be approved for re-use during the rehabilitation works.

2.13.2 *Imported fill*

All imported fill material to be used should meet the following requirements:

- Clean inert, well-graded, granular fill material.
- With fines content < 15%.
- 75% passing the 25 mm sieve size.
- No particles > 250 mm.
- Less than 2% organics.
- No deleterious material.

The top 300 mm of backfill must include at least 50% material passing the 2.36 mm sieve size and no particles > 25 mm.

Imported fill material is to be approved by the WML site engineer prior to use.

3 FEASIBILITY

The nine (9) feature categories identified in the accompanying geotechnical report, 11715-G-R-001, have been classified in accordance with observations made on site during both the intrusive and non-intrusive ground investigations and in terms of the risk posed to humans, vehicles, livestock, and pets. The rehabilitation options presented in Section 2 have, therefore, been ranked based on feasibility and suitability of design and implementation against each feature. The approximate volumes of each feature have been provided within the subsequent tables to assist with determination of amount of required soil fill material.

The feasibility of each solution has been assessed in terms of long-term suitability, ongoing maintenance and monitoring, cost, risk to construction personnel, constructability, and environmental risk.

3.1 Ranked rehabilitation options

WML's preferred rehabilitation options alongside alternative solutions for each feature are detailed in the following tables.

3.1.1 Do not rehabilitate – leave as is

Table 21: WML Preferred Option: Do not rehabilitate

Features	Estimated Fill Volume (m³)	Risk Rating	Ranked Rehabilitation Options
Category 1: Shallow workings & minor / imperceptible depressions			
S0113263	5-8	Low	<p>WML Preferred Option – Leave as is.</p> <p>Rehabilitation of these features is not considered necessary as these features are typically indiscernible from the surrounding environment and pose low risk to humans/pets/vehicles. Leave as is. Do not rehabilitate.</p> <p>Alternative Option 1 – Blade the area.</p> <p>The surrounding spoil piles can be bladed back into the depression and the area can be bladed with a dozer to reduce steepness of slopes and soften the feature.</p> <p>Alternative Option 2 – Backfill with surrounding spoil and stockpile material.</p> <p>The features may be backfilled with existing surrounding spoil and stockpiled material.</p> <p>Alternative Option 3 – Backfill with imported fill.</p> <p>The features may be backfilled with imported fill material if the existing spoil and stockpiled material is deemed unsuitable for re-use.</p>
S0113264	N/A		
S0113272	N/A		
S0113275	N/A		
S0113276	N/A		
S0113284	N/A		
S0113286	N/A		
S0113322	N/A		
WML01	N/A		
WML03	N/A		
WML05	2		
WML06	N/A		
WML07	N/A		
WML08	N/A		
WML09	N/A		
WML10	N/A		
WML11	N/A		
WML12	N/A		
WML13	N/A		
WML14	N/A		
WML15	N/A		
WML16	N/A		
WML18	N/A		
WML21	20		
Y-07	N/A		
Y-13	N/A		
Y-17	2		
Y-18	N/A		
Y-19	N/A		
Y-20	N/A		
Y-22	N/A		

Features	Estimated Fill Volume (m³)	Risk Rating	Ranked Rehabilitation Options
Category 2: Small depressions / shallow workings / costeans / trenches			
S0113273	5-8	Low to Medium	<p>WML Preferred Option – Leave as is.</p> <p>Rehabilitation of these features is not considered necessary as these features are typically indiscernible from the surrounding environment and pose low risk to humans/pets/vehicles. Leave as is. Do not rehabilitate.</p> <p>Alternative Option 1 – Blade the area.</p> <p>These features are slightly deeper than Category 1 features; the surrounding spoil piles can be bladed back into the depression and the area can be bladed with a dozer to reduce steepness of slopes and soften the feature.</p> <p>Alternative Option 2 – Backfill with surrounding spoil and material stockpiles.</p> <p>The features may be backfilled with existing surrounding spoil and stockpiled material.</p> <p>Alternative Option 3 – Backfill with imported fill.</p> <p>The features may be backfilled with imported fill material if the existing spoil and stockpiled material is deemed unsuitable for re-use.</p>
S0113282	2-5		
S0113287	35-45		
S0113305	25-30		
S0113311	N/A		
S0113315	3-4		
S0113323	2.5		
S0113336	35		
WML02	1-2		
WML04	5		
WML17	5-8		
WML19	5		
WML20	1-2		
WML22	N/A		
WML23	5		
Y-09	N/A		
Y-16	2		
Y-21	N/A		

Table 22: WML Preferred Option: Backfill

Features	Estimated Fill Volume (m³)	Risk Rating	Ranked Rehabilitation Options
Category 3: Shallow shafts / trenches			
S0113283	30-40	Low to Medium	WML Preferred Option – Backfill with surrounding spoil and material stockpiles. These features pose low risk of false floors and surface subsidence due to stope collapse/lateral workings and medium risk of trips and falls to humans. The feature can be backfilled with existing surrounding spoil material. Alternative Option 1 – Backfill with imported fill. If the existing spoil and stockpiled material is deemed unsuitable for re-use, backfill with imported fill material. Alternative Option 2 – Fence. Individual features or localised clusters may be permanently fenced off.
Y-23	5-7		
Y-32	5-7		
Category 5: Deep shafts			
S0113334	15-18	Low to High	WML Preferred Option – Backfill with surrounding spoil and material stockpiles. This feature poses low risk of false floors and surface subsidence due to stope collapse/lateral workings and high risk of trips and falls to humans. The feature can be backfilled with existing surrounding spoil material. A geofabric should be placed to line the stope portion of the feature and the side walls prior to placement of backfill. Alternative Option 1 – Backfill with imported fill. If the existing spoil and stockpiled material is deemed unsuitable for re-use, backfill with imported fill material. A geofabric should be placed to line the stope portion of the feature and the side walls prior to placement of backfill. Alternative Option 2 – Fence. Individual features or localised clusters may be permanently fenced off.
Category 6a: Deep stopes (collapsing)			
S0113277	20-25	Medium to High	WML Preferred Option – Backfill with surrounding spoil and material stockpiles. This feature poses medium risk of surface subsidence due to stope collapse/lateral workings and high risk of trips and falls to humans. The feature can be backfilled with existing surrounding spoil material. The stope is relatively small compared to the other surrounding features and breaking and collapsing the stope in on itself is not considered necessary. A geofabric should be placed to line the stope portion of the feature and the side walls prior to placement of backfill.

Features	Estimated Fill Volume (m ³)	Risk Rating	Ranked Rehabilitation Options
			<p>Alternative Option 1 – Backfill with imported fill.</p> <p>If the existing spoil and stockpiled material is deemed unsuitable for re-use, backfill with imported fill material. A geofabric should be placed to line the slope portion of the feature and the side walls prior to placement of backfill.</p> <p>Alternative Option 2 – Fence.</p> <p>Individual features or localised clusters may be permanently fenced off.</p>
Category 6b: Deep slopes (stable)			
S0113300 (S)	150-175	Low to High	<p>WML Preferred Option – Backfill with surrounding spoil and material stockpiles.</p> <p>This feature poses low risk of surface subsidence due to slope collapse/lateral workings and high risk of trips and falls to humans. The feature can be backfilled with existing surrounding spoil material. The slope is very steeply dipping and does not display signs of collapse compared to the northern portion of the same feature. Breaking and collapsing the slope in on itself is not considered necessary.</p> <p>Alternative Option 1 – Backfill with imported fill.</p> <p>If the existing spoil material is deemed unsuitable for re-use, backfill with imported fill material.</p> <p>Alternative Option 2 – Fence.</p> <p>Individual features or localised clusters may be permanently fenced off.</p>
Infrastructure			
S0113723	1.5-2	Low to High	<p>WML Preferred Option – Demolish and backfill with surrounding spoil and material stockpiles or imported fill.</p> <p>This concrete sump may be demolished, removed and backfilled with existing surrounding spoil material. Imported fill material will be required if this material is unsuitable for re-use.</p> <p>Alternative Option 1 – Leave in place and backfill.</p> <p>Leave the concrete sump in place and directly backfill with material from the existing surrounding stockpiles or imported fill material.</p> <p>Alternative Option 2 – Grout / concrete backfill.</p> <p>The concrete sump may also be backfilled with grout/concrete.</p>

3.1.3 Reinforced earth backfill

Table 23: WML Preferred Option: Reinforced earth backfill

Features	Estimated Fill Volume (m ³)	Risk Rating	Ranked Rehabilitation Options
Category 4: Shallow shafts – soft / unknown base conditions			
S0113278	5-8	Medium	<p>WML Preferred Option – Reinforced earth backfill.</p> <p>These features pose medium risk of void collapse as base conditions are typically unknown and medium risk of trips and falls to humans. These features will require excavation work to widen the opening of the feature to facilitate the installation this solution. Soil backfill alone is not considered suitable as the base conditions have not been investigated and these features are potentially significantly deeper and more extensive than they appear. The existing spoil and stockpiled material located around the site may be utilised. Alternatively, imported fill will be required if site won material is unsuitable for re-use.</p> <p>Alternative Option 1 – Concrete plug.</p> <p>A fibre-reinforced concrete plug may also be utilised once the features have been domed out into more conical shapes.</p> <p>Alternative Option 2 – Concrete cap.</p> <p>These features may also be rehabilitated by installing a concrete slab to span the void opening.</p> <p>Alternative Option 3 – Fence.</p> <p>Individual features or localised clusters may be permanently fenced off.</p>
S0113285	5-8		
S0113296	7-10		
S0113308	15-18		
S0113338	35		
S0113823*	25		
<p><i>Note:</i> <i>*This feature requires partial backfilling of the narrow slope portion within its base prior to installation of the geofabric.</i></p>			

3.1.4 Controlled collapse and backfill

Table 24: WML Preferred Option: Controlled collapse and backfill

Features	Estimated Fill Volume (m³)	Risk Rating	Ranked Rehabilitation Options
Category 5: Deep shafts			
S0113274*	3-5	Low to High	WML Preferred Option – Controlled collapse and backfill. These features pose low risk of false floors, however, high risk of stope collapse / lateral workings and ground subsidence, and high risk of trips and falls to humans. These stope portions of these features may be caved in and collapsed with an excavator, lined with geofabric, and then backfilled with surrounding spoil and stockpiles materials. Alternatively, imported fill will be required if site won material is unsuitable for re-use. Alternative Option 1 – Fence. Individual features or localised clusters may be permanently fenced off. Alternative Option 2 – Grout backfill. Grout injection may be utilised to backfill all the narrow stopes and underground workings connected to this feature at depth, as well as any collapsed stopes. Alternative Option 3 – Collapse with explosives. Explosives may be utilised to collapse the stopes and mine workings at depth, to sink the entire affected area which shall leave very low risk of any future subsidence.
S0113306*	5-10		
Y-29	10		
<i>Note:</i> <i>*These features do not require geofabric.</i>			
Category 6a: Deep stopes (collapsing)			
S0113281	50-60	Low to High	WML Preferred Option – Controlled collapse and backfill. These features pose low risk of false floors, however, high risk of stope collapse / lateral workings, medium to high risk of ground subsidence, and high risk of trips and falls to humans. These stope portions of these features may be caved in and collapsed with an excavator, lined with geofabric, and then backfilled with surrounding spoil and stockpiles materials. Alternatively, imported fill will be required if site won material is unsuitable for re-use. Alternative Option 1 – Fence. Individual features or localised clusters may be permanently fenced off. Alternative Option 2 – Grout backfill. Grout injection may be utilised to backfill all the narrow stopes and underground workings connected to this feature at depth, as well as any collapsed stopes. Alternative Option 3 – Collapse with explosives. Explosives may be utilised to collapse the stopes and mine workings at depth, to sink the entire affected area which shall leave very low risk of any future subsidence.
S0113300 (N)	350-385		
S0113310	85-90		
S0113812	15-20		

Table 25: WML Preferred Option: Concrete slab cap

Features	Estimated Fill Volume (m³)	Risk Rating	Ranked Rehabilitation Options
Category 8: Deep shafts – shallow drives			
Y-28	5-7	Low to High	WML Preferred Option –Concrete cap. This feature poses low risk of surface subsidence due to the shallow drives, and high risk of injury due to falling into the feature. It may be rehabilitated by installation of a concrete slab to span the void opening. Alternative Option 2 – Steel cap. A galvanized steel grate capping solution is another possible solution for these features. Alternative Option 3 – Fence. Individual features or localised clusters may be permanently fenced off.
Category 9: Deep shafts – no shallow lateral workings			
S0113265	60-65	Low to Critical	WML Preferred Option – Concrete cap. These features pose low risk of surface subsidence due to the underground lateral workings, however critical risk of major injury due to falling into the feature. They may be rehabilitated by installation concrete slabs to span the void opening. Alternative Option 1 – Steel cap. A galvanized steel grate capping solution is another possible solution for these features. Alternative Option 2 – Fence. Individual features or localised clusters may be permanently fenced off.
S0113745	84		

4 CLOSURE

This report is intended for distribution to the public.

We trust that the information provided within this report satisfies your present requirements and meets with your approval. Should you have any queries, please do not hesitate to contact the author of this report.

We draw your attention to the attached "*Report Limitations*" included with this report. This information sheet is intended to provide additional information about this report and information included within it. This information is provided not to reduce the level of responsibility accepted by WML but to ensure that all parties that rely on this report, and the information contained herein, are aware of the responsibilities that each assumes in so doing.



LIMITATIONS



REPORT LIMITATIONS



This geotechnical report is provided for the sole use by the Client. This report must not be applied for any other purpose or project except the one originally contemplated without written authorisation from WML. WML accepts no responsibility for the use of this report / document, in whole or in part, in other contexts or for any other purpose.

WML have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, documents and information supplied, and previous experience. If changes occur in the nature or design of the project, however minor, it is recommended WML review this report to assess their impacts and provide additional recommendations, if any. WML does not assume any responsibility or liability for problems that arise due to developments on site of which we were not informed.

This report utilises data and information provided by third parties, including, but not limited to sub-consultants, published data, and the Client. This information has been assumed to be correct unless otherwise stated. WML assumes no responsibility for assessments made partly or entirely based on information provided by third parties or for the adequacy, incompleteness, inaccuracies, or reliability of any data provided by third parties.

It is the responsibility of the Client to transmit the information, recommendations, and limitations of this report to the appropriate organisations or people involved in design of the project, including, but not limited to developers, builders, owners, buyers, architects, engineers, and designers.

WML's opinions are based on upon information that existed at the time of the production of this report and ground conditions encountered at the time the site study was performed. This geotechnical report should not be relied upon if its adequacy has been affected by: the passage of time, by man-made events, such as construction on or adjacent to the site, or by natural events, such as floods, earthquakes, or groundwater fluctuations. In the event of the above changes, WML should be contacted to determine if this report is still reliable or whether additional testing is required.

The subsurface conditions identified within this report are based only upon investigation locations where subsurface tests have been conducted and / or samples obtained, which are explicitly representative of the specific sample or test location. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and unknowns or variations in ground conditions between test locations that cannot be inferred or predicted. Actual subsurface conditions may differ significantly from those indicated in this report. Specific warning is also given that many factors, either natural or artificial, may render ground conditions different from those which pertained at the time of the investigation. WML does not accept any responsibility for any variance in the ground conditions that may exist across the site. If unexpected subsurface conditions are encountered, WML shall be notified immediately to review those conditions and provide additional and/or modified recommendations, as necessary.

This geotechnical assessment is based upon judgment of the investigation data, visual observations of the site and materials encountered, along with the proposed land use and project specifications. The findings and recommendations presented within this report represent professional opinions and estimates and should not be taken as fact unless explicitly stated. In general, statements of fact are limited to what was done and / or what was observed on site.

The recommendations provided in this report are preliminary only; final recommendations can only be given after observing the actual subsurface conditions revealed during construction. WML does not assume responsibility or liability for the recommendations in this report if construction observation has not been performed by a WML geotechnical engineer.

Our services did not include any contamination or environmental assessment of the site or adjacent sites. The equipment and techniques used to perform a geoenvironmental study differ from those used to perform a geotechnical investigation. If you require any geoenvironmental information for your project, WML can advise on further steps to be undertaken.

WML have performed our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty, expressed or implied, is made as to the professional advice included in this report.



APPENDIX A

GEOTECHNICAL REPORT



ABANDONED MINE FEATURES ASSESSMENT

YALGOO PHASE 1 GEOTECHNICAL REPORT

July 2025

11715-G-R-001 Public Document



WML
Consulting Engineers

Document History and Status				
Revision	Prepared By	Reviewed By	Purpose of Issue	Date
-	IG	SM	Public Issue	21/07/2025

Issued to:	Department of Energy, Mines, Industry Regulation & Safety (DEMIRS)
WML Project Number:	11715
Document Name:	11715-G-R-001 Public Document

WML Consultants Pty Ltd

I Golijanin
Ivana Golijanin
Geotechnical Engineer
Author

Simon Maris
Simon Maris
Principal Geotechnical Engineer
Reviewer

For and on behalf of WML Consultants Pty Ltd

WML Consultants Pty Ltd
ISO 9001 | ISO 14001 | ISO 45001

Level 2, 91 Havelock St, West Perth, WA 6005 | 08 9722 3566
First Floor, 25A Stephen St, Bunbury, WA 6230 | 08 9722 3544
Suite 1, 45 Brookman St, Kalgoorlie, WA 6430 | 08 9021 1811

CONTENTS

1	INTRODUCTION	5
1.1	Site description	5
1.2	Client supplied information	5
1.3	Objectives of this report	6
2	HISTORICAL INFORMATION & DESKTOP STUDY.....	7
2.1	Published Geology	7
2.2	Historical mining	7
3	FIELD PROGRAMME.....	12
3.1	Non-intrusive fieldwork (Part 1)	12
3.1.1	<i>Field mapping, down hole scanning</i>	12
3.1.2	<i>Dimensions & groundwater readings</i>	12
3.1.3	<i>Gas monitoring</i>	12
3.1.4	<i>Dynamic Cone Penetrometer (DCP) testing</i>	12
3.1.5	<i>Geophysical survey</i>	13
3.2	Intrusive fieldwork (Part 2)	16
3.2.1	<i>Machine excavated test pits / ramming</i>	16
3.2.2	<i>Borehole drilling</i>	16
4	FINDINGS.....	17
4.1	Summary of known features.....	17
4.2	Summary & interpretation of geophysical data	18
4.3	Feature summary classifications.....	32
4.4	Risk assessment	39
4.4.1	<i>Emerald Reward Open Pit (Feature S0113339)</i>	43
5	CLOSURE.....	45
6	REFERENCES	46

TABLES

Table 1: Summary and interpretation of the desktop study	10
Table 2: Features excluded from the Feature Classification Summary	18
Table 3: Summary of geophysical assessment.....	19
Table 4: Summary classification of abandoned mine features	32
Table 5: Risk assessment matrix	39

FIGURES

Figure 1: Extract from the 10 miles to an inch scale Geological Sketch Map "Yalgoo and Murchison Goldfields" (1946)
Figure 2: Yalgoo Heritage Trail (Heritage Council of Western Australia, n.d.)
Figure 3: Mining leases on the Murchison & Yalgoo Goldfields, West Australia (1896)
Figure 4: Geophysical test locations – southern area
Figure 5: Geophysical test locations – central area
Figure 6: Geophysical test locations – northern area
Figure 7: ERT transects – Line 1 and Line 2
Figure 8: ERT transects – Line 3 and Line 3A
Figure 9: Electrical Resistivity Model Line 4 and Line 4A
Figure 10: Electrical Resistivity Model Line 5 and Line 5A
Figure 11: Electrical Resistivity Model Line 6 and Line 6A
Figure 12: Electrical Resistivity Model Line 7
Figure 13: Electrical Resistivity Model Line 8 and Line 9
Figure 14: Electrical Resistivity Model Line 10 and Line 11
Figure 15: Electrical Resistivity Model Line 12
Figure 16: Risk assessment of the open pit walls

APPENDICES

LIMITATIONS

DRAWINGS

APPENDIX A

- Field Notes
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5
- Category 6
- Category 7
- Category 8
- Category 9
- S0113723 & Y-34

APPENDIX B

- GBG Geophysical Report

APPENDIX C

- Desktop Study

1 INTRODUCTION

The Department of Energy, Mines, Industry Regulation & Safety (DEMIRS) engaged WML Consultants (WML) to undertake a geotechnical assessment and rehabilitation options study to support the rehabilitation of abandoned mine features within a 1 km radius of the Yalgoo Primary School, in Western Australia. These include shafts, open stopes, adits, costeans, and shallow workings. 49 abandoned mine features occurring below ground level, detailed on the provided DEMIRS feature database were assessed and 23 additional features were recorded by WML during the on-site investigation. The database provided by DEMIRS included an additional 19 above ground features such as infrastructure, dumps, buildings, material stockpiles, and tailings stockpiles which were not assessed as they do not present a below ground void safety risk. 1 above ground feature comprising a concrete sump present in the southern area of the site next to the old head workings has been assessed, and a risk assessment of 1 open pit has also been included in this report.

This report presents the results of the non-intrusive and intrusive geotechnical investigations and details the findings of the different types of features identified on site.

The geotechnical study was authorised by DEMIRS via letter of acceptance DEMIRS24473, dated 26th July 2024.

This report and the information presented herein must be read in conjunction with the attached “*Report Limitations*”.

1.1 Site description

The site is accessible off Henty Street via the connecting access tracks in Yalgoo, Western Australia. The abandoned mine features are easily accessible to the public and are located within a 1 km radius of the Yalgoo Primary School and the Yalgoo townsite. The ground surface across majority of the site is covered with low lying grass, weeds, wildflowers, and medium trees and small shrubs are scattered across the site. The ground surface is generally not highly vegetated across the site and is scarce around some of the features to the south. Unsealed access tracks are found around and throughout the site which connect to Henty Street.

The features located to the south are situated within a fenced area, which may be easily bypassed. Old head workings, infrastructure, and a tailings storage facility are present in this area, along with some old sheds. Some of the features have been individually fenced off with temporary construction fencing, notably the main shaft and the deep, narrow stope features.

There is an open pit within the old Emerald Reward mine working area, situated to the North of the primary school which is surrounded by large mine spoil piles that may form potential fill material for the rehabilitation works. Children’s toys were found to be scattered across the base of the open pit and presents an inviting playground for the local children. It is situated directly opposite the Yalgoo Primary School.

Many previously unidentified features were recorded by WML in the northern portion of the site at the old Star of Hope mine, in the area to the North of the Emerald Reward Claim and South of Lookout Hill.

Based on available topographical information, the existing ground surface appears to be lower lying along the direction of the site, with RLs ranging between 316 m AHD to 322 m AHD (sloping from west to east), and the RLs of the area on either side of the strike range between approximately 318 m AHD to 327 m AHD.

There are 2 distinct strikes positioned in a north easterly direction and a localised cluster of features in the south. The location of the mine features is shown on the feature site maps, 11715-G-D-001 to 11715-G-D-007.

It should be noted that WML have not assessed any tailings storage facilities, dumps, material stockpiles, buildings, or infrastructure as these do not present a below ground void safety risk.

1.2 Client supplied information

The following information was made available from the Client for the purpose of this report:

- DMIRS24473 Request – ‘Geotechnical Engineering Services for Abandoned Mine Features, Yalgoo Phase 1’, prepared by DEMIRS.

- Drone aerial imagery and orthomosaics, 2022, prepared by DEMIRS.
- Abandoned Mines Inventory feature photographs at Yalgoo, prepared by DEMIRS.
- Feature survey data – photographs of features, 2022, prepared by DEMIRS.
- Abandoned mine feature data set in excel format, including inventory definitions and data field explanatory notes, prepared by DEMIRS.
- Shapefiles of abandoned mine features and 1 kilometre project area, prepared by DEMIRS.

1.3 Objectives of this report

The objectives of the intrusive and non-intrusive geotechnical investigation were to assess the following characteristics:

- Geometric characteristics of the features, including any lateral workings (e.g. dimensions, volume, shape).
- Base conditions and presence of material or obstructions of the features.
- Structural stability and subsidence potential or risk zones.
- Underground connectivity between features.
- Presence of groundwater or hydrogeological features which may have an impact on rehabilitation.
- Surface hydrology flow which may impact upon features.
- The presence of flora and fauna within the features.
- Potential for noxious or flammable gases.

A risk assessment of each of the features has been undertaken in Section 4.4 of this report. The rehabilitation solutions for the features assessed on site will be further detailed in the accompanying rehabilitation report, 11715-G-R-002.

2 HISTORICAL INFORMATION & DESKTOP STUDY

2.1 Published Geology

Based on the information presented within the Department of Mines Annual Report (1946), the general landform of the Yalgoo area is a portion of Jutson's "old plateau", which has been intersected by the Murchison River, Greenough River, a number of smaller creeks and tributaries. The surface of the "old plateau" is gently undulating and comprises sands and laterite. The topography of the areas affected by mining is a result of the erosion of this plateau by streams and the shape of the hills in the areas of greenstone and metamorphosed sediments (Greenstone Series) are controlled by the strike of the rocks. The Greenstone Series primarily comprise fine to medium grained amphibolite derived from basic lavas, minor quantities of coarser grained amphibolite derived from basic intrusive, metamorphosed sediments, outcrops of schist, and minor quantities of metamorphosed ultramafic (i.e. ultrabasic) rocks.

The Geological Map 'Yalgoo and Murchison Goldfields' indicate that the site is underlain by the following geological unit:

- **Greenstone (G):** basic lavas with intrusive basic and acid rock, pyroclastics and minor quantities of sedimentary rocks.

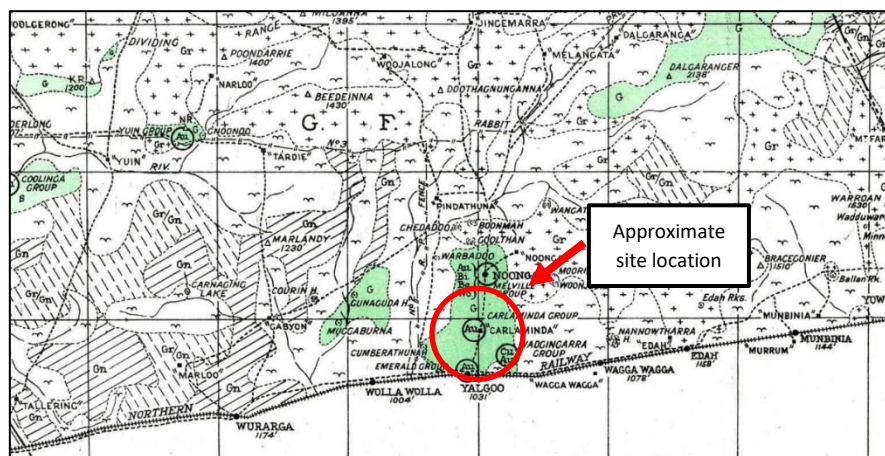


Figure 1: Extract from the 10 miles to an inch scale Geological Sketch Map "Yalgoo and Murchison Goldfields" (1946)

According to the available historical geological information, irregular quartz veins were generally orientated parallel to the strike and dip of country, while occasionally orientated transversely. The principal ores occurred at junctions of quartz porphyry and amphibolite. Younger dolerites intruded into quartz ore bodies. The strike of schistosity has been stated as between 330 to 360 degrees with an angle of dip between 45 to 70 degrees to the West.

2.2 Historical mining

In 1892, five prospectors were shown gold in a white stone by the local Indigenous people and the Emerald Reward Gold Mine was established, in the present-day town of Yalgoo, which led to its establishment. Throughout the early years of the mine's operation, an estimate 4000 oz of gold was mined from the surface. Majority of the gold was obtained from a 30 m wide by 3 m deep dyke. A total of 20, 000 oz of gold was mined from the Emerald Reward Gold Mine throughout its history. A 5 head stamp battery along with a cyanide plant was erected in 1895 by a new firm who acquired the mine from the original prospectors. Between the years of 1895 and 1923, the mine changed ownership 3 times, however, mining became increasingly difficult and little to no extension to the original structure of the mine was made.

Approximately 100 m north-west of the Emerald Gold Mine, and located at the base of Lookout Hill, the Star of Hope Gold Mine (lease 140) was established. The gold deposit was founded in 1894 when prospectors discovered a stone riddled with fine gold. Most of the gold mined at this site was invisible to the naked eye, and ore was initially crushed to extract 14.5 oz per tonne reducing to 5 oz per tonne in its later years. A 2 head battery was operating at the mine in 1895. The lease for the mine was approximately 4.8 hectares and mining activity is recorded until the year 1909,

however, it is thought to have extended longer than this. Mining works recommenced intermittently in the years 1909 and 1931, and from 1936 the shaft was used as a water source for the nearby railway yards. The Western Mail (May 1894) also reported that a reef measuring 18 in (0.45 m) to 2 ft 6 in (0.75 m) had been mined at the Star of Hope mine.

In Yalgoo, gold was primarily mined from rocks within the Greenstone Series and a small percentage was mined from areas comprising sedimentary rocks (Coolinga Group). Based on the information presented within the Department of Mines Annual Report (1946), very little mining activity had occurred in the Yalgoo area; all the old workings have been classified as “small” and did not exceed 60 m to 120 m in depth. Based on these records, production at the Emerald Consolidated Mine ran between the years 1897-1903 and 1905-1915. The maximum depth of the mine has been recorded as 200 ft (60.96 m) deep.

Figure 3 shows the location of the mining leases within the townsite of Yalgoo. Collectively, these leases are known as the Emerald Consolidated Mine. Based on the available historical records, mining from these individual leases appears to have occurred along independent seams following the strike of ore (aside from where connectivity is shown on the map below via dotted lines) and connectivity between these mines is not documented and has not been implied. In Alex Palmer’s book “Yalgoo”, he states that 7 shafts had been installed varying from 10 m to 15 m deep at the Emerald Reward Gold Mine (indicated in yellow on Figure 3); some shafts were vertically oriented, while others were positioned to follow the strike, and others the dip of the lode. The lode is said to have “pinched in and out and at times just disappeared”. A paper from May 1894 (Western Mail) reported that the Emerald Reward Mine had a solid body of stone 18 in (0.3 m) to 6 ft (1.8 m) wide showing coarse gold profusely all over at the time and was beginning to look more like a well-defined reef every day. No further information pertaining to the width of the mined ore has been found. The reef was found to dip very fast towards the Broken Drought Mine – it is possible a shaft approximately 60 ft (18 m) deep was sunk in this property to reach the ore. The shafts in the Emerald Reward Claim are expected to be shallower as groundwater was encountered at approximately 40 ft (12 m) (The Daily News, 4th June 1906) which impeded progress. The No. 5 shaft had been sunk to a depth of 38 ft (11.5 m) before striking water which ceased the progress of the mining in June 1895. A drive to the North was installed in hard diorite rock to connect with the main shaft. The main shaft was 16 ft (4.8 m) at the time, and it was intended to sink the main shaft until water was reached (Mount Magnet Miner and Lennonville Leader, 5th June 1895). A newspaper from 5th August 1911 (Mount Magnet Miner and Lennonville Leader) stated that the No. 3 shaft was sunk to a depth of 62 ft (18.8 m) and 16 ft (4.8 m) below groundwater, however, the shaft was not extended due to limited capabilities of the dewatering pumps on site. A crosscut was placed 12.8 m below the ground surface in quartz walls. This information was taken from a range of newspapers dating from 1895 to 1911.

The Gullewa Queen Claim (also known as Mindelgarra) mine was situated on the hill immediately behind the Warden’s office. Based on the information provided in the Register of Heritage Places Assessment Documentation (Heritage Council of Western Australia, 2011), the Warden’s Office was located on “Reserve 3226, a thirteen-acre site on Gibbon Street” which was “later known as the courthouse”. The location of the Court House Museum and old Warden’s Office is shown in Figure 2.

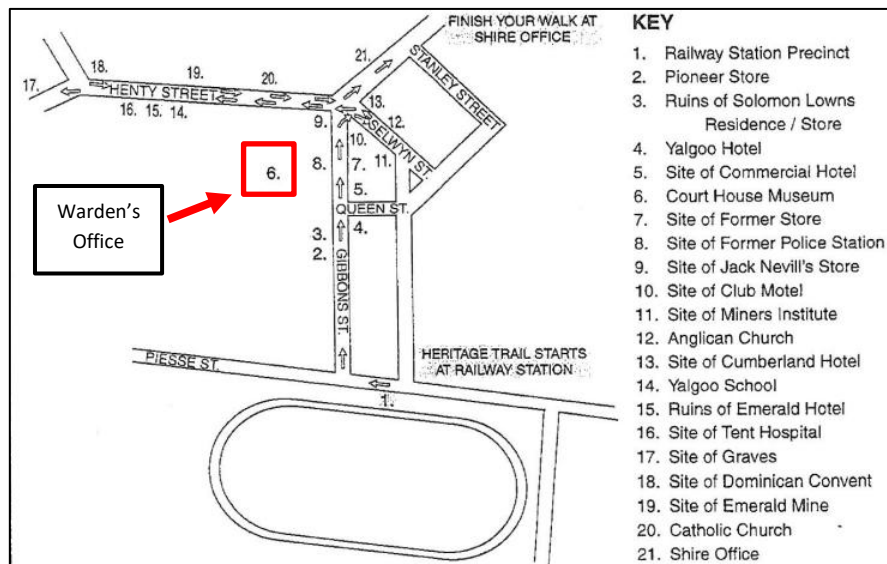


Figure 2: Yalgoo Heritage Trail (Heritage Council of Western Australia, n.d.)

The mine had a 10 head battery, and the main shaft (S0113745) went down to 38 m and 75 m of driving has been completed to reach the Emerald lode (Palmer, 1985).

No detailed drawings or mine working plans have been located during the desktop study and much of the information gathered has been taken from newspaper articles from that time period, the Department of Mines Annual Reports, and existing historical literature. While this information presented above primarily pertains to the early days of mining activities in Yalgoo, the evidence suggests that the lodes mined were relatively narrow and the country rock was very hard and competent (diorite). There exists evidence of some underground lateral workings and interconnectivity between the shafts, however, it is expected that these workings would only be as large as approximately the size of the mined ore as research has not unveiled the use of machinery at this site. Therefore, as the workings are expected to be relatively narrow, any collapse of underground workings at > 4 m deep would likely not be expressed on the ground surface subsidence due to material bulking factor as the rock would collapse in on itself and plug the void.

It should be noted that there exists the potential for some shafts to have been rehabilitated by the tenement owners due to external pressure from the Department of Mines to rehabilitate their shafts. These shafts would have typically been plugged 2 to 3 m bgl using tree branches onto which a sheet of tin was placed on top to form a cap, which was subsequently topped with soil and mine waste rock. When the Department of Mines would visit site to certify these shafts had been rehabilitated, no evidence of a shaft or any mining activity would remain at the site. No evidence has been found which explicitly relates to any of the leases in Yalgoo, however, the possibility that this rehabilitation work has been undertaken was considered during the geotechnical investigations to help identify and quantify risk and identify any unforeseen subsidence risk zones.

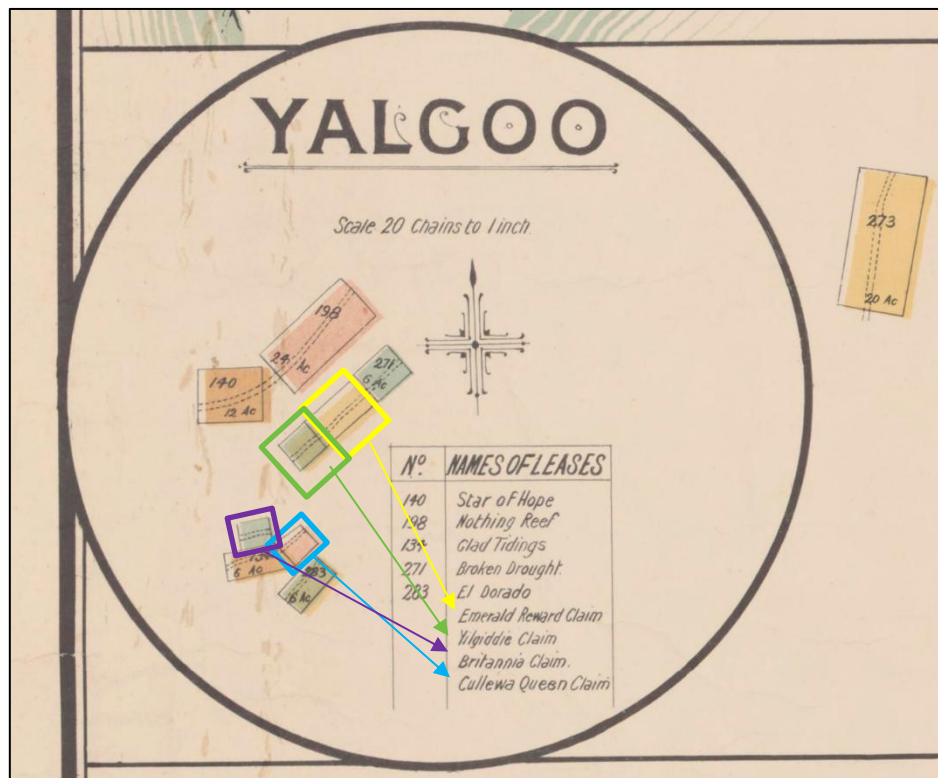


Figure 3: Mining leases on the Murchison & Yalgoo Goldfields, West Australia (1896)

A summary of the key findings of the desktop study in relation to the mapped features on site is included in the table below. This information from the desktop study has been utilised in our risk assessment in the subsequent sections and will inform our proposed rehabilitation options.

Table 1: Summary and interpretation of the desktop study

Mining Lease	Desktop Study	Potential Related Mining Features	Site Findings
Broken Drought	It is possible that an 18 m deep shaft has been sunk to reach the Emerald lode, however, this is unknown.	Y-19	Y-19 was observed to be a shallow depression, and it is unlikely that the feature was a deep shaft.
Emerald Reward	<ol style="list-style-type: none"> 1. A main shaft was sunk until water was reached. A drive to the south has been documented and connected to another feature. 2. An 11.5 m deep shaft was sunk with a drive in the northern direction and was connected to the main shaft. 3. 7 shafts were sunk in the area to depths of 10 m – 15 m. 	<ol style="list-style-type: none"> 1. S01133265 2. Potentially Y-32 – as there are no more features to the south of the main shaft that would indicate driving to the north to reach the main shaft. 3. These shafts are likely to have been excavated when the open pit was created. However, may also include features 	<ol style="list-style-type: none"> 1. Water was encountered at 8.6 m bgl, and the shaft extended to 21.5 m bgl (i.e. 12.9 m below the recorded water level). This desktop information was taken from a newspaper in 1895; it is likely that further progress had been made to dewater the shaft in later years. Any drives will be located below 8.6 m within the waterlogged portion of the feature. This presents low surface subsidence risk should the drives collapse. 2. Y-32 was observed to be a shallow shaft with no risk of false floors – it may be a well backfilled deep shaft.

	4. An 18.8 m deep shaft was sunk of which 4.8 m was situated below the water level. A crosscut was installed at 12.5 m bgl.	S0113338, Y-28, Y-32, and S0113265 (main shaft). 4. It is unknown where this shaft was located. It may have been excavated as part of the open pit. Potential for lateral workings below 12.5 m bgl exist in the lease area.	3. The open pit is approximately 12 - 15 m deep. It is likely that multiple shafts have been excavated as part of the formation of the open pit.
Gullewa Queen Claim	A 38 m deep main shaft was documented which comprised 75 m of driving northwest to reach the emerald lode.	S0113745	This feature was observed to be a main shaft which extends well beyond the visible scanned depth (> 8.5 m). No drives were noted within the top 8.5 m; therefore, the drive will be situated beyond this depth, presenting low surface subsidence risk in the event of void collapse.

3 FIELD PROGRAMME

3.1 Non-intrusive fieldwork (Part 1)

Fieldwork for the non-intrusive investigation was carried out between the 2nd and 6th of September 2024, by qualified WML geotechnical engineers and comprised:

- Field mapping to observe each of the existing mine features (e.g. measuring the geometry) and to take record photographs and videos.
- 3D LIDAR scanning of the features.
- Dynamic Cone Penetrometer (DCP) tests.
- Ground probing and prodding using a metal rod.
- Testing for presence of noxious and flammable gasses, at each feature location.
- Detection of groundwater at each feature location.

The fieldwork was undertaken in accordance with WML's Safety Management Plan.

3.1.1 Field mapping, down hole scanning

Features were field mapped by geotechnical engineers from WML to target evidence of voids and geotechnical deformation. LiDAR scanning was undertaken using 3D LiDAR scanner device. The data gathered from 3D scanning has been combined with existing data sets and the results of the geophysical investigations, to support the void risk assessments and rehabilitation recommendations.

3.1.2 Dimensions & groundwater readings

Each feature, where safe to do so, was investigated using hand tools to measure the voids and determine the ground conditions at both the base of the feature and of the surrounding area. The dimensions of the features were measured using a laser pointer measuring device and / or tape measures. A dip meter was also lowered down the features where water was observed via 3D scanning and / or visually (feature S0113265) to determine the presence and depth of water from the top of the surrounding ground level. Where the base conditions of features were observed to be dry, a dip meter was not lowered. At feature S0113265, the depth to the base of the shaft below the water level was also recorded by dropping a weighted rope.

3.1.3 Gas monitoring

All features, including shallow workings, were tested for presence of noxious and flammable gasses. Readings were taken to measure levels of CH₄, CO₂, H₂S, O₂, CO, and lower explosive limit (LEL), and the outputs are shown in the field notes attached in Appendix A.

It should be noted that no flammable gasses were detected during the investigation.

However, noxious gas (cyanide) was detected in feature S0113280 during backhoe excavation of the backfilled materials during the intrusive fieldwork stage.

3.1.4 Dynamic Cone Penetrometer (DCP) testing

The Dynamic Cone Penetrometer (DCP) test is an in-situ, manual penetration test that measures the penetration resistance of the soil and provides an indication of the relative density. The test is conducted by driving a cone-tipped rod into the ground surface using a 9 kg weight dropped from a standard height. The number of drops (called blows) is recorded for each 150 mm depth, and the process continues till the target depth is achieved. The number of blows is also correlated to a relative density and is used to describe the condition of the in-situ material. DCP testing was undertaken in accordance with AS 1289.6.3.2.

DCPs were undertaken within the base of the features, where safe and accessible to do so, to determine the base conditions and identify any areas of potential void risk.

DCP testing typically encountered shallow refusal on a weathered rock profile, overlain by a thin layer of sandy silty gravels / gravelly silts. Results are included on the feature summaries attached in Appendix A.

3.1.5 Geophysical survey

GBG undertook a geophysical survey, between the 16th and 20th of September 2024, to provide detailed spatial data pertaining to the voids and the surrounding ground profile, including lateral extent of voids directly below the survey lines.

A preliminary data collection of ground condition on Line 1 (see Figure 4) was conducted using Multi-Channel Analysis of Surface Waves (MASW) and Electrical Resistivity Tomography (ERT) to compare which investigations resulted in accurate data collection based on the ground conditions. This body of work was undertaken to determine the best method of identifying voids in the ground conditions present at Yalgoo. MASW was undertaken using a Geode (Geometrics instrument) multi-channel digital seismograph attached to a seismic land streamer consisting of 24 geophones set at 2 m increments. Seismic energy was generated using summed sledgehammer impacts onto a metal base plate with a trigger cable connecting the sledgehammer to the seismograph. The Geophone frequency used was set at 4.5 Hz and the record length duration was 2 seconds. The sample interval was 0.125 ms, source offset and sounding interval were both set at 4 m. This test was only carried out for line 1 and compared to the ERT data.

ERT was undertaken along 21 transects totalling to approximately 1,759 m at Yalgoo to obtain subsurface electrical resistivity models to a target depth of 20 m below ground level (bgl) to map potential underground mine workings around the identified shafts. The ERT transects were positioned to run parallel to the strikes of mineral deposits to assess whether mine tunnels extend laterally from the major strike. Additional ERT transects were positioned perpendicular to the strikes of mineral deposits to confirm the validity of the ERT method over areas most likely to feature horizontal tunnel workings. ERT data was acquired using Syscal Pro 72 (IRIS Instrument) resistivity which utilises a 54-electrode array with maximum 2,500 mA current output. Data acquisition was acquired using a 2 m or 3 m electrode spacing for a maximum single transect length of 145m. Resistivity measurements were made using a Dipole-Dipole array type for high vertical resolution and sensitivity to lateral variations. Spatial positioning of the acquired ERT transects were obtained using a differential Global Navigation Satellite System (GNSS) receiver with horizontal accuracy of better than +/-0.25 m for both the vertical and horizontal components.

A trial of comparison transects using ERT and MASW were undertaken to determine which method would be more suitable for the ground conditions on site. From the initial trial transect and preliminary analysis, GBG determined that ERT was more effective than MASW at the site, and as a result, ERT was utilised for the remainder of the transects to assist in determining the size and extent of the voids on site.

Ground Penetrating Radar (GPR) testing was undertaken within the top 5 m to assist with identifying shallow subsurface features such as potential mine workings and reworked ground within three critical zones, as identified on site by WML during the non-intrusive field investigation. GPR test locations are shown in blue, which were conducted alongside the geophysical transects (ERT), shown in pink in the Figures below.

Anomalous subsurface features which were discovered via both ERT and GPR testing methods are synonymous with potential underground mine voids and have been identified in the accompanying geophysical report attached in Appendix B. Based on the geophysical investigation results, the material on site has been identified as a relatively low resistivity rock, and where higher resistivities have been identified above the groundwater levels (i.e. > 5,000 Ω m above 8.5 m bgl), these may be interpreted as potential underground voids associated with historical mining activity.

Due to limitations associated with geophysical testing methods, it should be noted that the targeted areas identified within the accompanying geophysical report could either be interpreted as a void within rock where ore was mined, interference from the known mine shafts, or these targets may be indicative of localised zones of high strength rock. The abnormalities detected and targets presented within the attached geophysical report only consider mine voids located above the site groundwater levels. WML have additionally indicated several potential targets below the anticipated groundwater levels across the site in the Figures in Section 0 of this report.

Below the groundwater table, very low resistivity values may correspond to waterlogged void space or to the relatively rocky material encountered on site, as both substances display relatively low electrical resistivity properties. However, based on the historical information, the scale of the mining operations was relatively small, and the mined lodes were

known to be narrow, therefore, any voids below the water table depths (> 8.5 m) will not cause any surface subsidence expressions if any waterlogged voids were to collapse in the future.

The identified geophysical targets were cross-referenced against features known to comprise lateral workings as identified in the 3D LiDAR scans and as suggested by the available historical information. Areas of low conductivity typically represented voids within the areas of known mining activity.

Figure 4 to Figure 6 below have been extracted from the geophysical survey report which has been attached in Appendix B.

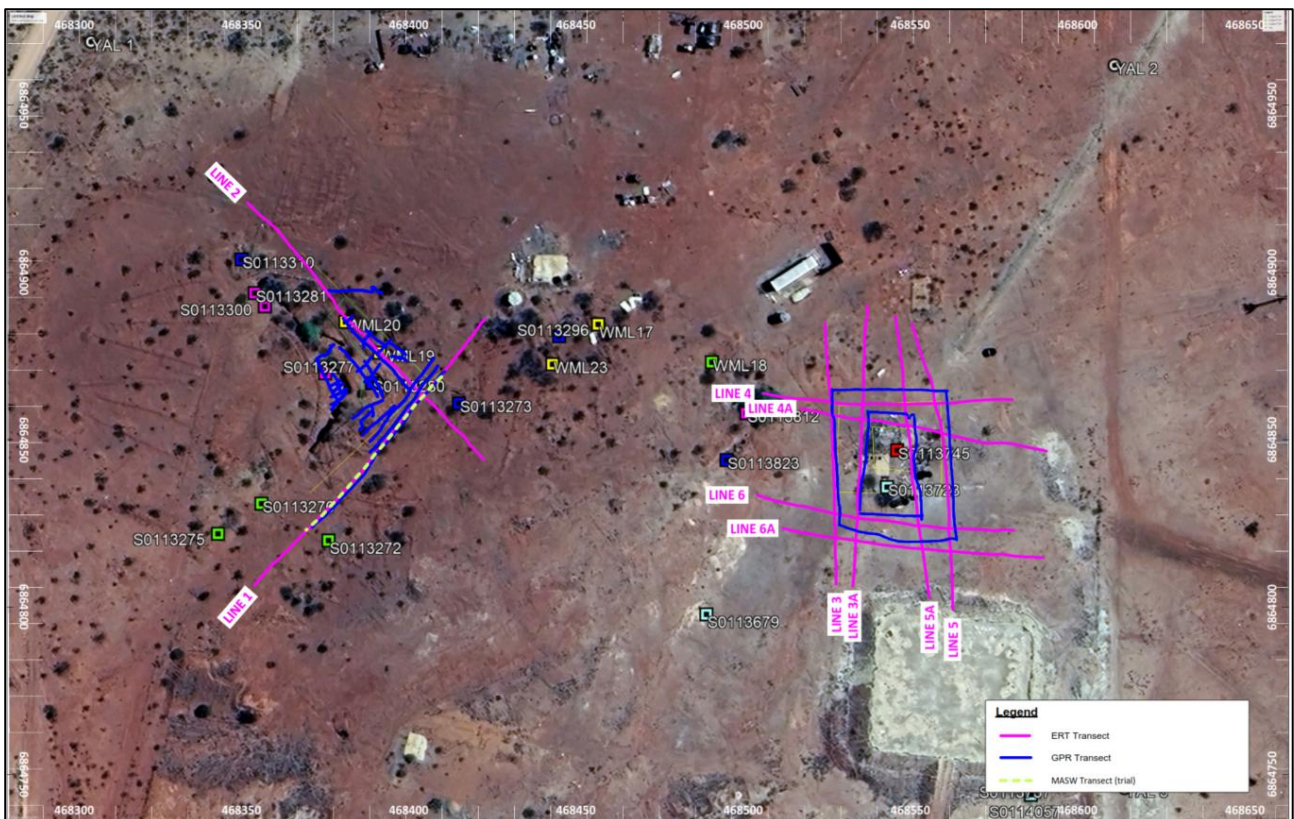


Figure 4: Geophysical test locations – southern area

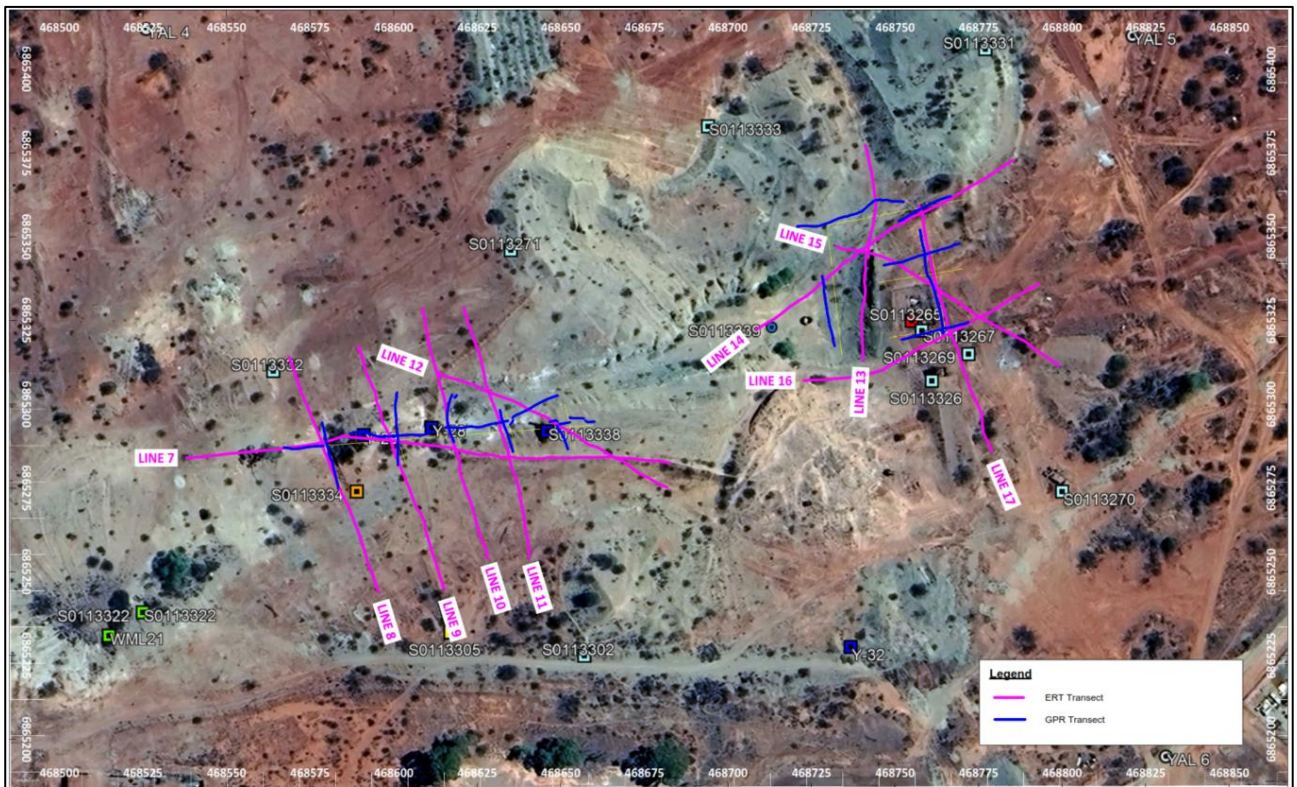


Figure 5: Geophysical test locations – central area



Figure 6: Geophysical test locations – northern area

3.2 Intrusive fieldwork (Part 2)

Fieldwork for the intrusive investigation was carried out on the 25th and 27th of September 2024, by qualified WML geotechnical engineers and comprised:

- Excavation of shallow test pits / ramming the base of features using a 10t backhoe (Cat 444F) with a 300 mm wide tooth bucket.
- Borehole drilling.

Each location for intrusive and non-intrusive ground investigation was checked for underground services against Dial-Before-You-Dig plans, prior to any excavations works.

The approximate test locations are presented on the site maps, 11715-G-D-009 to 11715-G-D-0012, and field observations are presented in Appendix A on the feature summary sheets.

3.2.1 Machine excavated test pits / ramming

A backhoe and operator were supplied by the Shire of Yalgoo to WML to undertake the test pitting works utilising a 10t backhoe with a 300 mm wide, toothed bucket for 2 days. The backhoe was used for ramming/prodding and scratching the base of all features where, to determine the presence of voids or collapsed ground. Ramming/prodding and light excavation of shallow test pits within the costeans and shallow workings was also undertaken to identify the depth of backfilled loose soil and shallow rock.

Test pitting in the base of features S0113276 and S0113275 uncovered presence of backfilled shafts. These shafts have been well backfilled, and the soils are reasonably compact. Scratching and excavations in the remainder of the features investigated, typically refused on shallow rock up to depths of 1 m below ground level (bgl). The results of the backhoe ramming and excavation are included on the feature summaries attached in Appendix A.

3.2.2 Borehole drilling

The results from the borehole drilling indicated that the subsurface soil conditions across the site were found to be relatively consistent and comprised a highly weathered rock profile. However, the ground profile was observed to have differing properties in the most northeastern corner of the site compared to the remainder of the site. The northeastern corner displayed very low strength and low-quality rock mass while the remainder of the site comprised a low strength and low to moderate quality rock mass, overlain by a thin layer of gravelly silty soils. This is based on the borehole drilling results, excavation results and visual observations of the feature walls. This poorer quality rock mass zone has been indicated on the borehole site maps, 11715-G-D-009 to 11715-G-D-0012.

This intrusive investigation method was selected due to the low dust generation (low risk of potential tailings contamination). Borehole drilling was undertaken wherever possible, as opposed to test pitting, to minimise ground disturbance. The boreholes were logged in accordance with AS 1726:2017 and approximate borehole test locations are shown on the site maps 11715-G-D-009 to 11715-G-D-0012.

4 FINDINGS

4.1 Summary of known features

A total of 72 mining features occurring below ground level and 1 above ground infrastructure feature that comprised a concrete sump were recorded and mapped during field investigations in September of 2024.

WML have assessed the presence of underground lateral workings via 3D LiDAR scanning, information obtained from the desktop study, and geophysical test results. 3D LiDAR scanning was within the features to investigate the potential for near surface underground lateral workings which may cause subsidence and ground collapse.

WML have undertaken an assessment of the rock mass quality of the features during the site investigation, drilled boreholes, ground prodded, rammed, and excavated the base of features. During the field investigations, the ground profile was observed to have differing properties in the most northeastern corner of the site from the remainder of the site. The northeastern corner displayed very low strength and low-quality rock mass while the remainder of the site comprised a low strength and low to moderate quality rock mass, overlain by a thin layer of gravelly silty soils.

Based on the poor to moderate quality rock mass identified on majority of the site, the 3D LiDAR scans, and the available historical information which suggests there are relatively narrow lodes, and therefore, narrow voids (this was also evidence through 3D LiDAR scanning) we have determined that the collapse of any voids below 4 m depth to be of very low risk to humans as minimal surface deformation / subsidence would be expressed. Therefore, the risk of ground movement from collapse of any underground stopes is deemed to be very low. Furthermore, these mine workings are more than 130 years old and are still stable.

Based on the 72 features observed on site, we have grouped the features into 9 distinct categories on a risk-rating basis as summarised in Table 4 below.

Feature S0113300 has been split into 2 sections based on the differing characteristics of the feature between the northern to the southern section which presents different risks.

The database provided by DEMIRS included 19 above ground features such as infrastructure, dumps, buildings, and tailings stockpiles, 18 of which were not assessed and are presented in Table 2. These have not been assessed or field mapped as rehabilitation of these features is outside of the scope of this assessment. It should be noted that while Feature S0113723 is an infrastructure feature, there exists a concrete sump approximately 2 m deep that requires rehabilitation. This feature has not been included in Table 4 below, however, summary notes have been appended, and rehabilitation options will be provided in the accompanying rehabilitation report: 11715-G-R-002.

Feature S0113339 is an open pit; this is not included in the classification table below, however, WML have undertaken a risk assessment of the open pit which is detailed in Section 4.4.1.

It should be noted that Feature Y-11 has been reclassified as S0113306 as we believe it is the same feature.

Feature S0113304 could not be located on site; it is likely that this feature has been bladed over in the last 24 years and no longer exists.

Y-34 has also been excluded from the subsequent classifications and assessments as this is not considered to be a mining feature and rehabilitation is not recommended as this may be of historical significance / importance and may have been part of the Dominican Chapel and existed as potentially a cold room or cellar as evidenced by the presence of stone steps. Field notes have been appended to this report for Feature Y-34.

Table 2: Features excluded from the Feature Classification Summary

S0113267	S0113317	S0113337
S0113269	S0113319	S0113679
S0113270	S0113321	S0113757
S0113271	S0113326	S0114057
S0113302	S0113331	Y-01 (reclassified as S0113287)
S0113304 (could not be located)	S0113332	Y-11 (reclassified as S0113306)
S0113314	S0113333	Y-34 (field mapped but not considered a mining feature)

4.2 Summary & interpretation of geophysical data

WML have reviewed the raw data provided by GBG based on the available historical information and visual observations via downhole 3D LiDAR scanning, to assess the validity of the targets indicated in the geophysical survey report, which represent geological anomalies (i.e. potential voids). As discussed in Section 3.1.5, the interpretation of the geophysical targets identified by GBG is dependent on the following:

1. Above the water table (approximately 8.5 m – 12 m across the site), high electrical resistivity targets may either be interpreted as very hard rock or air voids. However, the rocky material identified across the site displayed relatively low resistivity properties, therefore, the high resistivity targets are likely to be interpreted as voids at this site.
2. Below the water table, low electrical resistivity may be suggestive of waterlogged void space. However, as the rocky material on site typically displays relatively low electrical resistivity properties, the waterlogged void space and rocky material is undistinguishable. However, as any waterlogged voids and underground workings may be at depths below 8.5 m, at this stage of the interpretation there is considered to be very low risk of any surface subsidence expression occurring should these voids collapse in the future (based on the relatively narrow lodes mined and reasonably competent rock mass at depth). Further assessment of the collapse potential of these voids shall be undertaken at the detailed design phase to validate this assumption. Therefore, this limitation of the geophysical survey does not present a risk to the rehabilitation of these features.

The geophysical targets which represent geological anomalies (i.e. potential voids) that are of particular interest are summarised in Table 3 below and have been cross-referenced with their respective feature numbers. It should be noted that the scale of the electrical resistivity models is different, and the electrical resistivity colours do not necessarily align between each of the individual models. Scales are located on the geophysical report appended to this report.

Table 3: Summary of geophysical assessment

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
Electrical Resistivity Testing (ERT)					
<u>Line 1</u> Target 1	11.0	S0113300 (S)	As shown on Figure 7, a zone of very high electrical resistivity (100,000 Ω m), was detected at a depth of approximately 11 m bgl. This may potentially be a shadow resulting from interference from the known void (stopes) in the area.	This is evidenced by the 3D LiDAR scans and the available historical information suggesting relatively narrow mined stopes that do not extend far below the water table depth. Any voids in the area would likely be narrow. Alternatively, it may be very hard rock. As the available historical information suggests groundwater below 8.5 – 12 m, any voids at this target depth are likely to be waterlogged, which would display low electrical resistivity values; as such, this target is unlikely to be a void and is more likely to be interference. Relatively competent and hard rock mass was identified at depth.	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk). Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
<u>Line 2</u> Target 2	12.0	S0113300 (N) S0113280 S0113277	As shown on Figure 7, a zone of very high electrical resistivity (10,000 Ω m), was detected at a depth of approximately 12 m bgl. This may potentially be a shadow resulting from interference from the known void (stopes) in the area.	This is evidenced by the 3D LiDAR scans and the available historical information suggesting relatively narrow mined stopes that do not extend far below the water table depth). Any voids in the area would likely be narrow. Alternatively, it may be very hard rock. As the available historical information suggests groundwater below 8.5 – 12 m, any voids at this target depth are likely	The geophysical data does not suggest these targets to be air voids as the electrical resistivities do not correspond to air voids, and therefore, these targets pose very low to no risk of surface subsidence.

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
				<p>to be waterlogged, which would display low electrical resistivity values; as such, this target is unlikely to be a void and is more likely to be interference.</p> <p>Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).</p>	
<u>Line 3A</u> Target 3	12.0	S0113745	Figure 8 shows a zone of very low electrical resistivity at approximately 12.0 m bgl. This target is located below the water table and is indicative of a waterlogged underground mine void / lateral working. The relatively rectangular shape of the target is suggestive of an underground drive.	<p>This target has been identified beyond the depth of the shaft which was scanned with the 3D LiDAR scanner.</p> <p>This feature is a main shaft that extended to 38 m based on the historical information. Given the direction and dip of the mined ore, it is highly likely that lateral workings exist to the west of this feature and may have connected at depth to the other features in this area to the west.</p>	<p>Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).</p> <p>Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface subsidence expressions or ground collapse.</p> <p>However, the presence of lateral workings shall be considered during rehabilitation design.</p>
<u>Line 4</u> Target 4	12.0	S0113745	Figure 9 shows a zone of very low electrical resistivity at approximately 12.0 m bgl. This target is located below the water table and is indicative of a waterlogged underground mine void / lateral working.	<p>This target has been identified beyond the depth of the shaft which was scanned with the 3D LiDAR scanner.</p> <p>This feature is a main shaft that extended to 38 m based on the historical information.</p> <p>The available historical information also indicates that a 75 m long drive to the</p>	<p>Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).</p> <p>Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence</p>

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
				north of the feature was installed to reach the Emerald lode. Therefore, it is likely that this target is a waterlogged drive.	and pose very low risk of surface subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
Line 4A Line 5 Line 5A Line 6	0.5 – 1.5	S0113745	The shallow targets (located up to depths of 1.5 m bgl), as shown in Figure 9, Figure 10 and Figure 11, display relatively low electrical resistivity (ranging between 300 – 1,000 Ωm), which is not suggestive of air voids. It is likely that these targets are geological anomalies (hard rock zones). However, they may also be voids that have collapsed under the load of heavy mining truck traffic in the area, however, this is unlikely.	Borehole drilling in the area indicated that the ground conditions are relatively hard. No evidence of shallow driving or lateral workings has been documented in the historical information available.	The geophysical data in combination with all other data and knowledge does not suggest these targets to be voids as the electrical resistivities do not correspond to air voids, and therefore, these targets pose very low to no risk of surface subsidence. These are likely to be backfilled / collapsed.
Line 5A SE-17	1.5	S0113745	ERT testing undertaken in the south-western portion of the site detected numerous shallow anomalies around the main shaft. SE-17 may be suggestive of what may have been a trench sloping downwards into the shaft from the east in the older portion of the shaft.	No lateral workings were detected within the top 13 m of the shaft during the 3D LiDAR scan; therefore, the majority of the anomalies may be interpreted as localised zones of hard rock as opposed to voids.	The potential for a trench or shallow drive within the older shaft within this feature shall be considered during the rehabilitation design. Note that this was also detected during the 3D LiDAR scanning.
Line 5 Target 5	15.0	S0113745	Figure 10 shows a zone of very low electrical resistivity at approximately 15.0 m bgl to the south of the feature. This target is located below the water	This target has been identified beyond the depth of the shaft which was scanned with the 3D LiDAR scanner.	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
			table and is suggestive of a waterlogged underground mine void / lateral working.	This feature is a main shaft that extended to 38 m based on the historical information.	Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
<u>Line 7</u> CW-04	10.0	S0113334	As shown in Figure 12, a target with an electrical resistivity of approximately 600 Ωm, was identified at 10.0 m bgl. This is likely to be indicative of a collapsed and backfilled void, however, a void may also still exist at this location.	The 3D LiDAR scanning identified that the feature stopes towards the west. This target is strongly correlated to the known void identified during the geotechnical investigation at Feature S0113334.	The geophysical data does not suggest this target to be voids as the electrical resistivities do not correspond to air voids, and therefore, these targets pose very low risk of surface subsidence. This is likely to be backfilled / collapsed. However, there is a possibility that air voids still exist at this depth in this location. However, CW-04 is deep and narrow enough that it is unlikely to cause any significant surface subsidence in the event of collapse.
<u>Line 7</u> CW-05	2.8	Y-29	As shown in Figure 12, a target with an electrical resistivity of approximately 600 Ωm, was identified at 2.8 m bgl. This is likely to be indicative of a collapsed and backfilled void, however, a void may also still exist at this location.	The 3D LiDAR scanning identified that the feature stopes towards the west. This target is strongly correlated to the known void identified during the geotechnical investigation at Feature Y-29.	The geophysical data does not suggest this target to be voids as the electrical resistivities do not correspond to air voids, and therefore, these targets pose very low risk of surface subsidence. This is likely to be backfilled / collapsed. However, there is a possibility that air

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
					voids still exist at this depth in this location. The shallower depth of CW-05 shall be considered for the rehabilitation of this feature.
<u>Line 7</u> CW-06	4.6	Y-28	<p>As shown in Figure 12, a relatively high resistivity target (4000 Ωm), was identified 4.6 m bgl. This target is likely to be indicative of a void below the false floor identified on site during the geotechnical investigation.</p> <p>The target is located approximately 8.6 m to the southeast of the feature.</p>	<p>The 3D LiDAR scanning of feature Y-28 showed the presence of shallow lateral workings (< 4 m deep) as well as the presence of lateral workings tending to the west of the feature beneath a false floor.</p> <p>Due to obstructions, the southern and eastern portions of the feature below the false floor were not able to be LiDAR scanned, therefore, the geophysical target to the south below the depth of the false floor is very likely to be a void.</p>	Lateral workings identified to the southeast of Feature Y-28; however, they are small and deep enough such that they pose very low risk of surface subsidence expression in the event of void collapse.
<u>Line 7</u> CW-01 CW-03 CW-07 <u>Line 10</u> CW-15 CW-16 CW-18	1.0 – 1.2	S0113334 Y-29 S0113338	Figure 12 and Figure 14 suggest several shallow targets which may be shallow voids or hard rock associated with gold deposits. These targets are approximately 1.0 – 1.2 m bgl.	Borehole drilling in the area indicated that the ground conditions are relatively hard.	These targets pose very low to no risk of surface subsidence. These are likely to be hard rock anomalies. However, these targets may be investigated and rehabilitated by collapsing and backfilling, if necessary, during the rehabilitation stage.
<u>Line 8</u> CW-08	1.9	S0113334	Figure 13 shows that a relatively high resistivity target (5000 Ω m), was identified 1.9 m bgl which correlates to	Feature S0113334 stopes to the west and this target is indicative of the void scanned with the 3D LiDAR scanner during the geotechnical investigation.	The high risk of voids associated with this geophysical target shall be considered for the rehabilitation design of this feature.

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
			the results of the 3D LiDAR void scanning undertaken on site.		It should be noted that this void and stope is reasonably narrow and does not extend wider than what was identified via the 3D LiDAR scanning.
<u>Line 9</u> CW-12	4.3	Y-28 Y-29	Figure 13 shows that a relatively high resistivity target (3000 – 5000 Ωm), was identified 4.3 m bgl which correlates to the results of the 3D LiDAR void scanning undertaken on site of Feature Y-28 and may be connected to Y-29. CW-12 is likely to be indicative of a void below the false floor identified on site during the geotechnical investigation as it is west of Feature Y-29. It may be interconnected to Y-28.	The 3D LiDAR scanning of feature Y-28 showed the presence of lateral workings tending to the west of the feature beneath a false floor (3.5 m deep). Due to the false floor, the extent of the void was not able to be LiDAR scanned with greater accuracy and range, therefore, the geophysical targets are very likely to be voids linked to this feature. They may also be connected to Feature Y-28.	Lateral workings identified to the southeast of Feature Y-28; however, they are small and deep enough such that they pose very low risk of surface subsidence expression in the event of void collapse. The quality of the rock mass in the area is fair and any voids below 4.3 m deep pose low risk of surface subsidence in the event of void collapse.
<u>Line 9</u> Target 6	15.0	Y-29 S0113338	Figure 13 shows a zone of very low electrical resistivity at approximately 15.0 m bgl. This target is located below the assumed water table and is indicative of a waterlogged underground mine void / lateral working. The relatively rectangular shape of the target is suggestive of an underground drive. This target may also be a saturated backfilled / collapsed drive.	Based on the available historical information, several deep shafts were sunk in the Emerald Reward Claim, and these are likely to have been interconnected with lateral workings.	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).
<u>Line 10</u> Target 7 <u>Line 11</u>	12.0	Y-28 S0113338	Figure 14 suggests a zone of very low electrical resistivity at approximately 12.0 m bgl. These targets are located below the water table and may be	Y-28 is a shaft with a false floor was identified in the base during the geotechnical investigation. 3D LiDAR scanning picked up some lateral working	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk).

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
Target 8			indicative of a waterlogged underground mine voids / lateral workings and suggests interconnectivity of features Y-28 and S0113338 at depth. These targets may also be saturated backfilled / collapsed drives.	to the west of the feature, however, due to obstructions, a more accurate scan was not able to be undertaken. It is very likely that this feature extends much deeper and lateral workings and drives at depth may be expected.	Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
<u>Line 12</u> CW-19 CW-20	1.1 – 4.0	S0113338	As shown in Figure 15, higher resistivity targets (3000 – 5000 Ωm) have been identified around this feature at depths of approximately 1.1 m (CW-20) and 4 m bgl (CW-19).	S0113338 may be a backfilled shaft or stope, and the targets detected around this feature suggest high risk of voids based on the fact that more extensive workings had been undertaken in the Emerald Reward Claim and that several shafts once existed in the area. They likely comprised lateral workings and underground stopes and interconnectivity.	The high risk of voids associated with these geophysical targets shall be considered for the rehabilitation design of this feature.
<u>Line 12</u> Target 9	12.5	S0113338	Figure 15 suggests a zone of very low electrical resistivity at approximately 13.0 m bgl. This target is located below the water table and may be indicative of waterlogged underground mine void / lateral workings. This target may also be a saturated backfilled / collapsed drive.	S0113338 may be a backfilled shaft or stope, and the target detected at depth at this feature suggests high risk of voids based on the fact that more extensive workings are known to have been undertaken in the Emerald Reward Claim and that several shafts once existed in the area. They likely comprised lateral	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk). Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
				workings and underground stopes and interconnectivity.	subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
Line 13 Line 14 Line 15 Line 16	1.2 – 3.5	S0113265	The geophysical investigation around the main shaft at the Emerald Reward Claim Open Pit (Feature S0113265) was designed to identify any shallow lateral workings branching off from the main shaft. The geophysical reports indicate that targets picked up during the survey (CE-01, CE-02, CE-03, and CE-04) have very low potential to be voids as they display very low electrical resistivities.	Any shallow lateral workings associated with this feature may have been backfilled or excavated as part of the open pit mining or they are present at a depth beyond 20 m. In either case, the targets and any lateral workings associated with Feature S0113265 pose low risk of collapse or subsidence at the surface. However, the desktop study suggests that deeper lateral workings exist at this feature and was interconnected to a shaft to the south.	Any voids at this depth are unlikely to cause any significant surface subsidence expressions (very low risk). Based on the depth of these features, quality of the rock mass, and width of the mined lodes in the area, any below the target depths are not expected to cause any significant surface subsidence and pose very low risk of surface subsidence expressions or ground collapse. However, the presence of lateral workings shall be considered during rehabilitation design.
Ground Penetrating Radar (GPR)					
Northern Section	0.0 – 6.0	S0113308 S0113274 S0113306 S0113278	GPR testing in this area identified many subsurface anomalies in the area. Anomalies between these features were identified between depths of 3 – 5 m bgl, which was beyond the depth of the visible floors of these features. This may suggest either interconnectivity and underground lateral workings or backfilled / collapsed voids within this	The rock mass in this area was very poor and crumbly, almost soil-like, and interconnectivity between features S0113274 and S0113306 was identified within the 3D LiDAR scans.	The risk of voids in this area shall be considered during for the rehabilitation of these features as shallow voids in these ground conditions poses high risk of surface subsidence in the event of void collapse.

Geophysical Target ID	Depth of Target (m)	Feature	Geophysical Interpretation	Historic Data & Site Observations	Significance
			area. An anomaly deeper than 6 m was detected to the north of feature S0113278.		

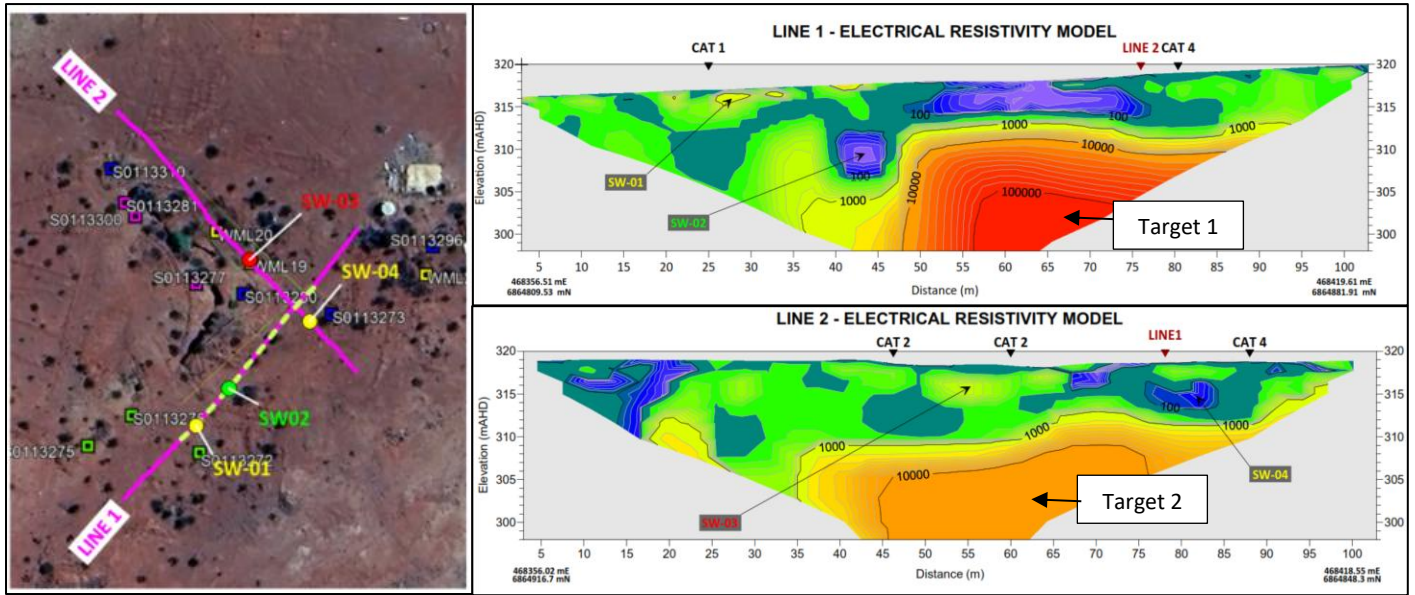


Figure 7: ERT transects – Line 1 and Line 2

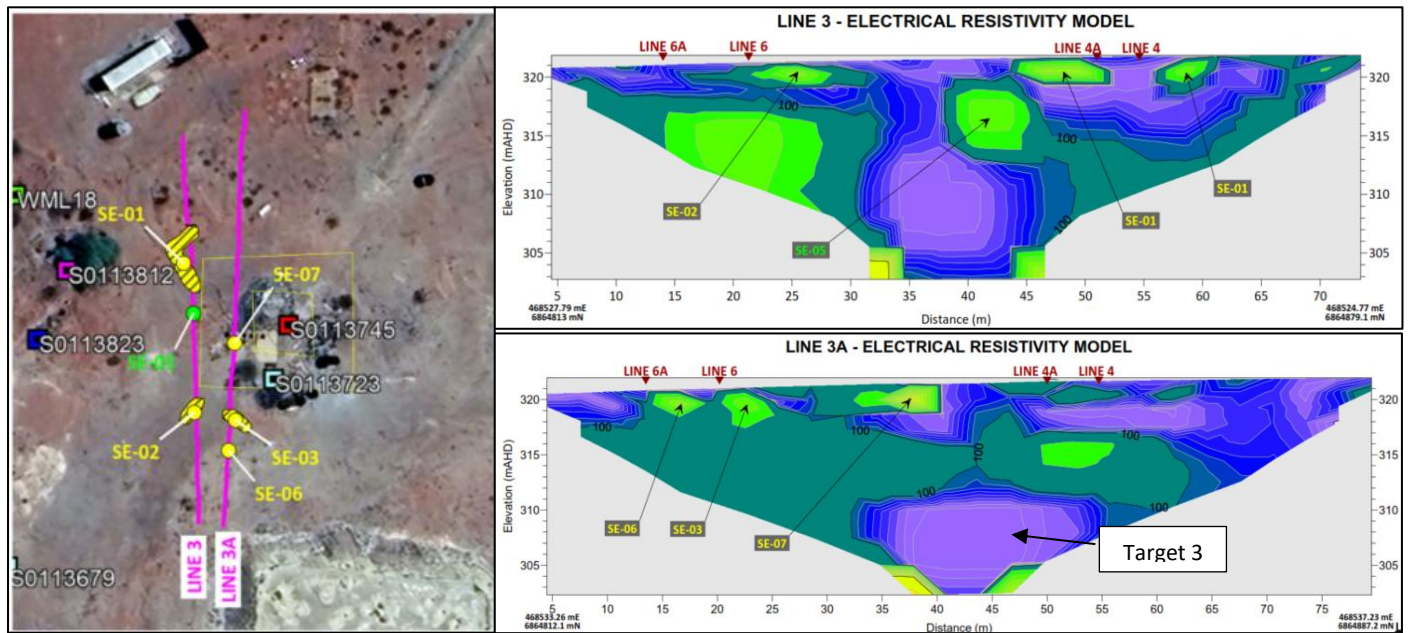


Figure 8: ERT transects – Line 3 and Line 3A

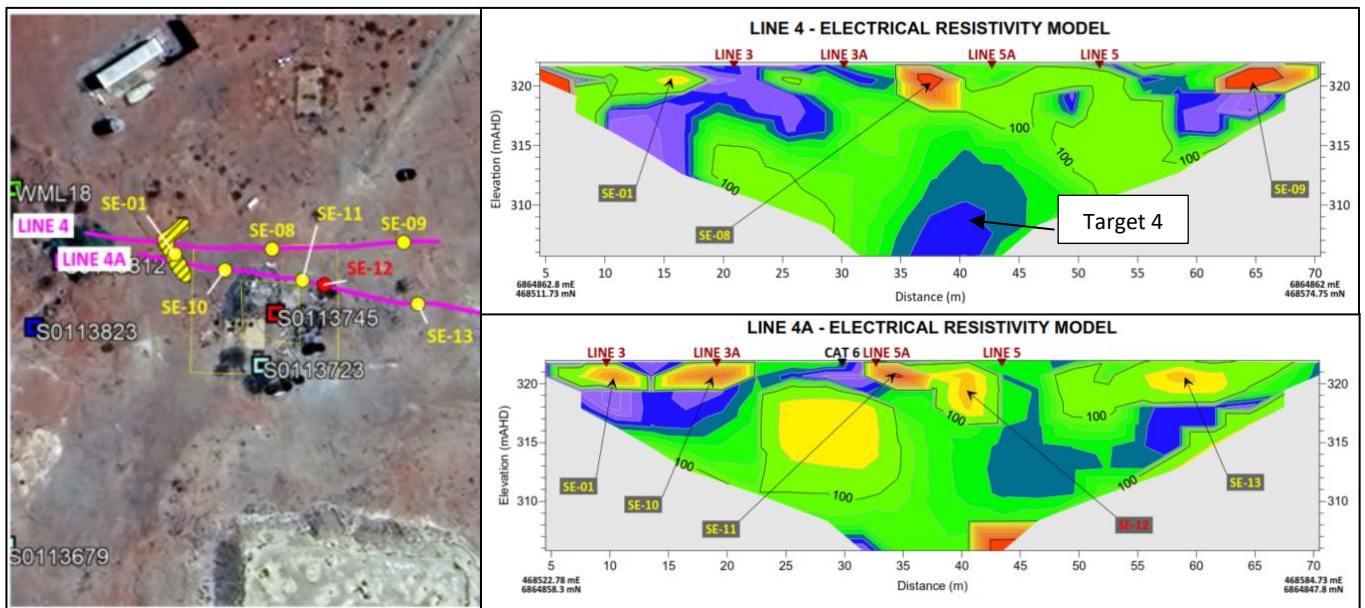


Figure 9: Electrical Resistivity Model Line 4 and Line 4A

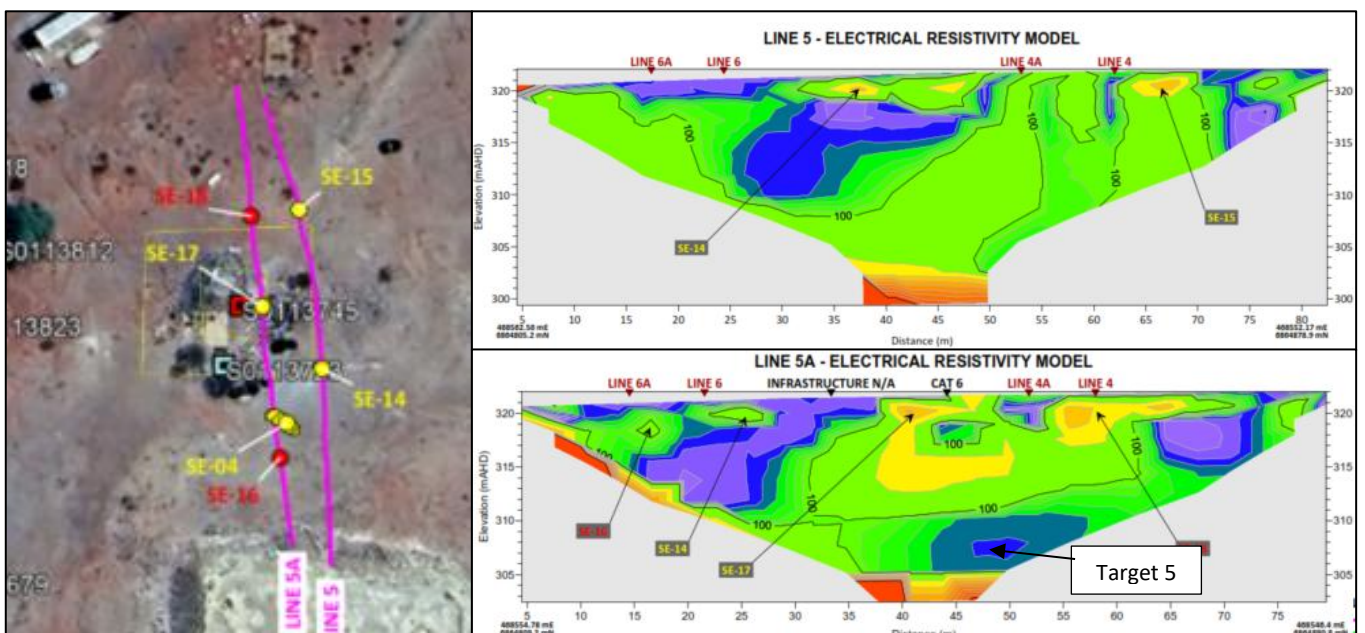


Figure 10: Electrical Resistivity Model Line 5 and Line 5A

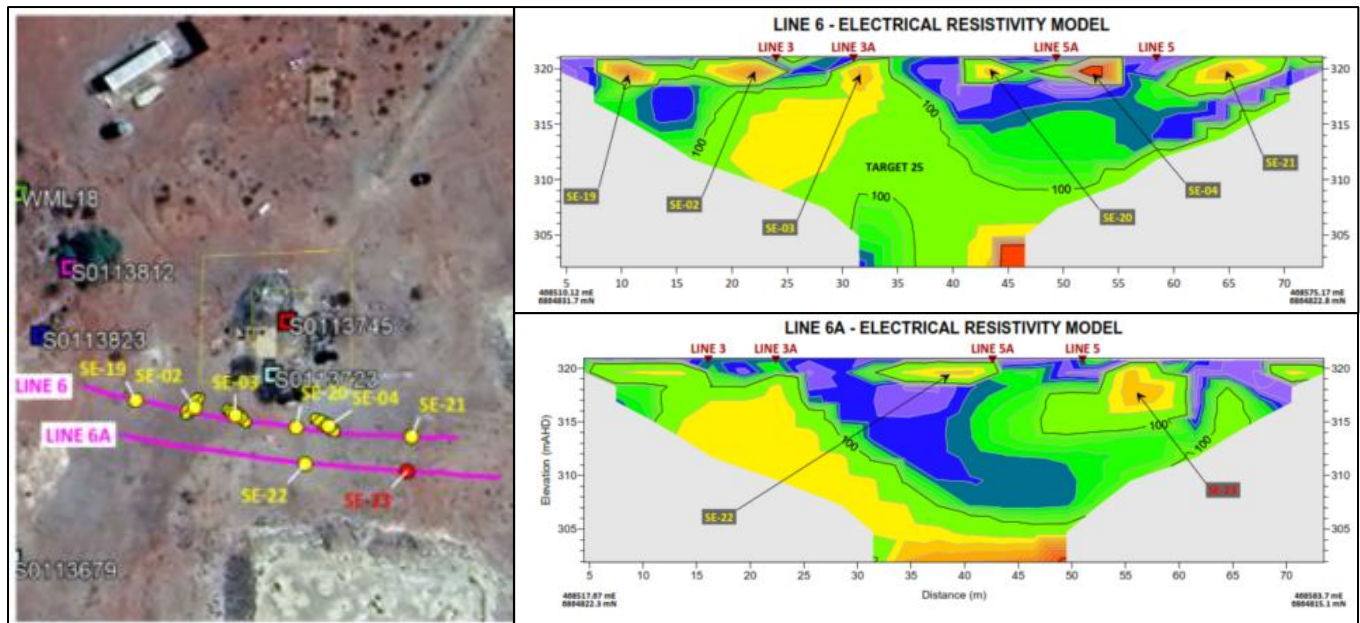


Figure 11: Electrical Resistivity Model Line 6 and Line 6A

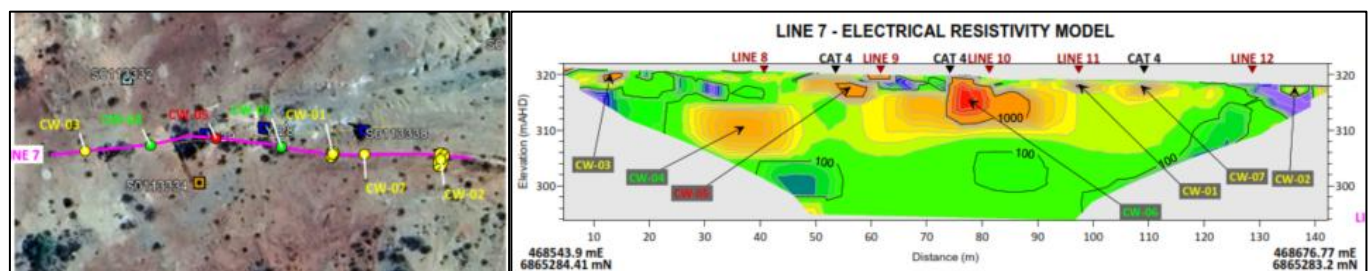


Figure 12: Electrical Resistivity Model Line 7

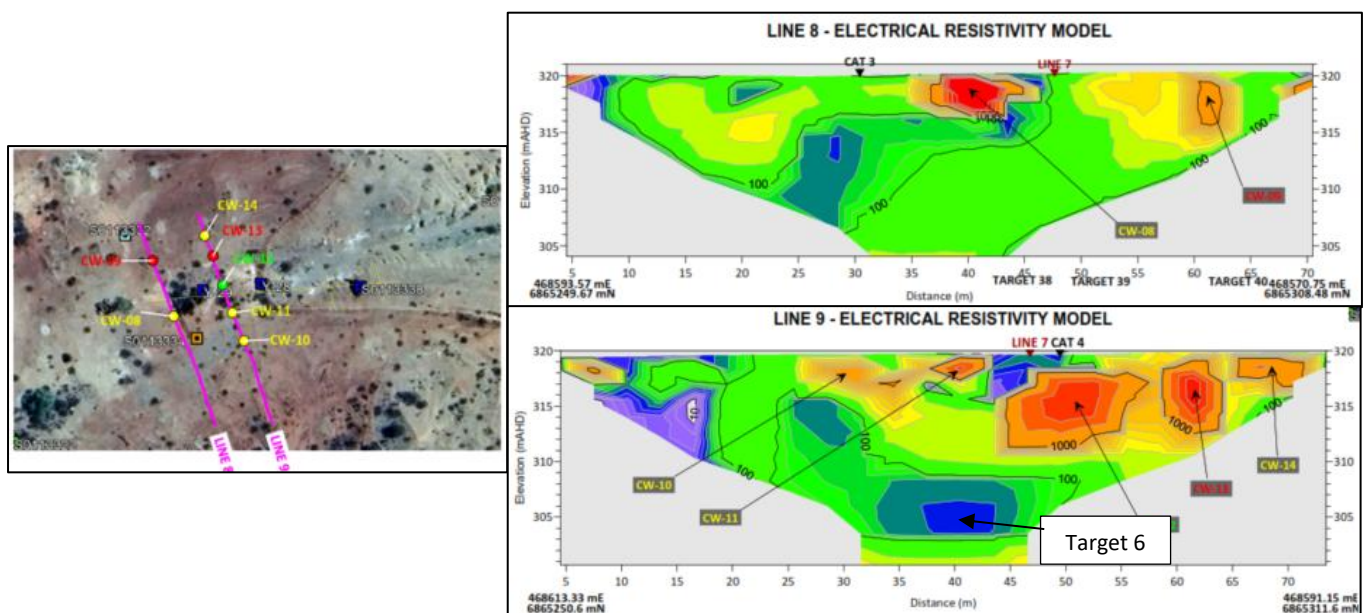


Figure 13: Electrical Resistivity Model Line 8 and Line 9

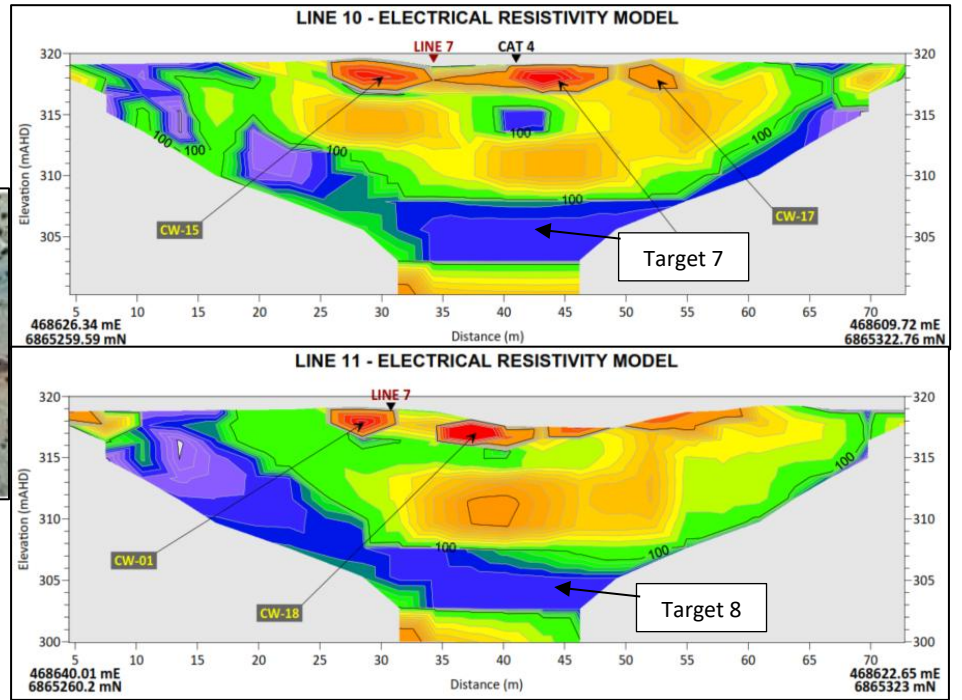
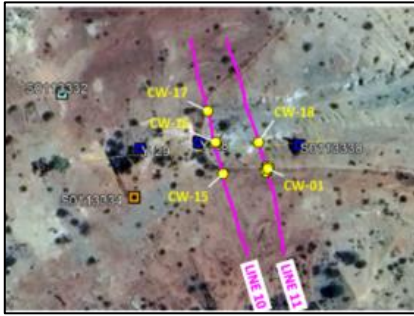


Figure 14: Electrical Resistivity Model Line 10 and Line 11

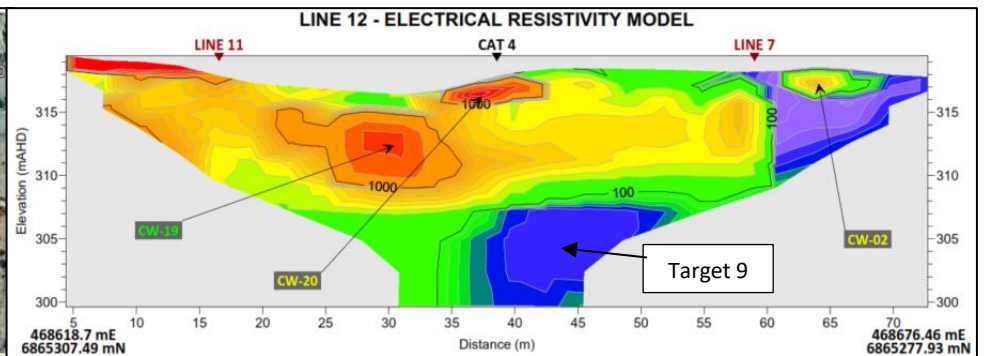
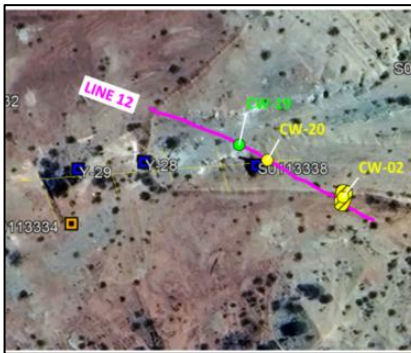


Figure 15: Electrical Resistivity Model Line 12

4.3 Feature summary classifications

Table 4: Summary classification of abandoned mine features

Description	Features		Risk Rating (see Section 4.4)
Category 1: Shallow workings & minor / imperceptible depressions			
Shallow workings and trenches/costeans that appears to be minor depressions within the ground surface, or imperceptible impressions. The investigation methods confirmed the stability of base conditions of the features. <i>*S0113263, S0113275, S0113276: These features have been rehabilitated via backfilling in the past and are performing well. No rehabilitation is required; however, monitoring is needed.</i>	S0113263*	WML11	Low to Negligible (risk of voids)
	S0113264	WML12	
	S0113272	WML13	Low (risk of trips and falls)
	S0113275*	WML14	
	S0113276*	WML15	
	S0113284	WML16	
	S0113286	WML18	
	S0113322	WML21	
	WML01	Y-07	
	WML03	Y-13	
	WML05	Y-17	
	WML06	Y-18	
	WML07	Y-19	
	WML08	Y-20	
	WML09	Y-22	
	WML10		

Description	Features		Risk Rating (see Section 4.4)
Category 2: Small depressions / shallow workings / costeans / trenches			
Shallow workings and trenches/costeans that exist as depressions within the ground surface. These features may have steeper wall slopes that may require rehabilitation to soften these areas. The investigation methods confirmed the stability of base conditions of the features.	S0113273	WML04	Low to Negligible (risk of voids)
	S0113282	WML17	
	S0113287	WML19	Medium (risk of trips and falls)
	S0113305	WML20	
	S0113311	WML22	
	S0113315	WML23	
	S0113323	Y-09	
	S0113336	Y-16	
WML02	Y-21		
Category 3: Shallow shafts / trenches			
Shallow shafts and trenches (less than 3 m deep). The investigation methods confirmed the stability of base conditions of the features. Data obtained from the geophysical investigation indicates there are no shallow lateral workings within the top 20 m and low risk of voids within the vicinity of these features. <i>*Feature Y-23 has small stopes / lateral workings that are collapsed and do not extend significantly.</i>	S0113283		Low to Negligible (risk of voids)
	Y-23*		
	Y-32		Medium (risk of trips and falls into holes, causing injury)

Description	Features		Risk Rating (see Section 4.4)
Category 4: Shallow shafts – soft / unknown base conditions			
<p>Shallow holes and shafts with soft / unknown base conditions. The base of these features may also be filled with loose soils, vegetation, rocky backfill material, etc.</p> <p>The investigation methods suggest the base conditions of these features are potentially unstable.</p> <p><u>Geophysical Summary: S0113338</u></p> <p>The geophysical survey at Feature S0113338 indicates voids and lateral workings may be present beyond the depth of localised backfilling. This feature extends and branches off to the north-west beneath the open pit entrance ramp. The geophysical model indicates the void is 4 m below ground level (CW-19 as per GBG report). Target CW-20 is also associated with this backfilled void.</p> <p><i>*Feature S0113296 likely stopes away at depth based on the characteristics of the features in the nearby surrounding area.</i></p>	S0113278 S0113285 S0113296* S0113308 S0113338 S0113823*		Medium (risk of failure of rehabilitation method, significant injury due to falling into a feature)
Category 5: Deep shafts			
<p>Vertical trenches and shafts which dip away to form a stope. The bases of these features are filled with collapsed rock, rubbish and vegetation.</p> <p>The stopes within these features are likely to collapse however the deeper portions of these features are not expected to cause significant surface subsidence based on rock mass observations and the narrow-mined lode widths evidenced in the LiDAR scans, and the depth of the voids below the ground surface.</p> <p>The shallower portions of these stopes are likely to collapse and cause significant surface subsidence.</p> <p><u>Geophysical Summary: S01133334</u></p> <p>Target CW-08 is associated with Feature S0113334 at the known void location. The resistivity recorded is greater than 1000 Ωm and correlates well with the known depth and location of the mapped void. The geophysics did not pick up any extension of the know void scanned by the LiDAR.</p> <p>Target CW-12 and CW-13 can be associated with Features Y-28 and Y-29. These voids are between 4.3 and 3.6 bgl, respectively. Due to the depth and the rock mass quality this is assumed to be low risk. This will be assessed further during the rehabilitation design phase. Approximate dimensions of the void 2 m wide and 2 m high.</p>	S0113334 S0113274 S0113306 Y-29		Low to Negligible (risk of voids in the base) High (risk of stope collapse) High (risk of trips and falls into holes, causing injury or death)

Description	Features	Risk Rating (see Section 4.4)
Category 6a: Deep stopes (collapsing)		
<p>Deep stopes which are steeply dipping and are situated within the fenced and gated area to the south. Three of these exist as a localized cluster of previously interconnected features (S0113277, S0113330, S0113310). Some of these features exhibit wooden supports and residual rock pillars propping the walls of these stopes open. There is evidence that these features have begun to collapse based on observations in the field.</p> <p>LIDAR scanning suggested that these stopes did not extent beyond what was visible in the scans and narrowed at depth.</p> <p>The available historical information suggests these typically extend to depth of approximately 10 m beneath the ground surface and was likely to have been surficial mine workings.</p>	<p>S0113277 S0113281 S0113300 (N) S0113310 S0113812</p>	<p>High (risk of wooden supports collapsing and the stope collapsing in on itself)</p> <p>High (risk of major injury due to falling into a feature)</p> <p>High (risk of voids)</p> <p>Medium (risk of surface subsidence)</p>

Description	Features		Risk Rating (see Section 4.4)
Category 6b: Deep stopes (stable)			
<p>Deep stope which is steeply dipping and is situated within the fenced and gated area to the south. This feature exists as part of a localised cluster of previously interconnected features. This feature exhibit wooden supports and residual rock pillars propping the walls of the stope open. This stope is more stable to the south and has a lower risk of stope collapse than the northern section of the same feature.</p> <p>LiDAR scanning suggested that these stopes did not extent beyond what was visible in the scans and narrowed off at depth.</p> <p>The available historical information suggests this feature typically extends to depth of approximately 10 m beneath the ground surface and was likely to be surficial mine workings.</p>	S0113300 (S)		<p>Medium (risk of wooden supports collapsing and the stope collapsing in on itself)</p> <p>High (risk of voids)</p> <p>Low (risk of surface subsidence)</p> <p>High (risk of major injury due to falling into a feature)</p>
Category 7			
<p>The feature is likely to be a backfilled stope (dipping approximately 45-70 degrees) situated within the fenced and gated area to the south. The surrounding features exist as a localised cluster of previously interconnected features, and it is likely that this feature displayed similar characteristics.</p> <p>The depth and extent of any stope is unknown.</p> <p>Olfactory evidence of potential contamination within the base of the feature was detected via backhoe excavation during the disturbance investigation (potentially cyanide).</p> <p>Data obtained from the geophysical investigation indicates there are no voids in the vicinity of these features within the top 4 m.</p>	S0113280		<p>Critical (risk of contaminants)</p> <p>High (risk of voids)</p> <p>Medium (risk of surface subsidence)</p>

Description	Features	Risk Rating (see Section 4.4)
Category 8: Deep shafts – shallow drives		
<p>Deep vertical shaft with underground lateral workings and shallow drives (< 4 m deep). The mined lode is narrow enough to not pose significant surface subsidence risk.</p> <p><u>Geophysical Summary: Y-28</u></p> <p>Target CW-06 is associated with Feature Y-28 which is located 8.6 m to the southeast of the shaft and is 4.6 m bgl. This geophysical assessment confirms that lateral workings from this feature are present. However, they are small and deep enough and present very low risk of subsidence in the event of void collapse.</p>	Y-28	<p>High (risk of major injury due to falling into a feature)</p> <p>High (risk of lateral workings)</p> <p>Low (risk of surface subsidence / collapse of drives)</p>

Description	Features	Risk Rating (see Section 4.4)
Category 9: Deep shafts – no shallow lateral workings		
<p>Deep shafts. The available historical information suggests these may be main shafts which extend to significant depths beneath the ground surface (> 13 m).</p> <p>It is unknown whether these comprise lateral workings / drives below depths of 8.5 m, however, any surface expression of collapse of underground lateral workings are likely to be minimal / insignificant.</p> <p>These features may extend to significant depths below what is scannable with the LiDAR device and may comprise false floors. The base conditions are unknown.</p> <p><u>Geophysical Summary:</u></p> <p>Data obtained from the geophysical investigation indicates there are no lateral workings within the top 20 m of Feature S0113265.</p> <p>Feature S0113745 may have waterlogged lateral mine workings trending towards the southwest at approximately 15 m deep. The associated lateral workings of these features are considered to have a low risk of ground collapse or subsidence.</p>	<p>S0113265</p> <p>S0113745</p>	<p>Critical (risk of major injury due to falling into a feature)</p> <p>Medium (risk of lateral workings)</p> <p>Low (risk of surface subsidence / collapse of drives)</p>

4.4 Risk assessment

The mining features are all situated within a 1 km radius of the Yalgoo Primary School, therefore, the risk to children playing in the area and exploring these features has been a particular consideration in the risk assessment. Children's toys were observed in the base of the open pit and many of these mining features comprise small openings and narrow tunnels that may be appealing to some to crawl through and explore. There are shallow and deep shafts in the area (one of which has water within), and if children or adults were to fall into, would result in severe injuries and death. The Yalgoo area also attracts many prospectors, and the risk these mining features pose to adventuring and exploring tourists is also noteworthy.

A risk assessment has been undertaken in general accordance with ISO 31000:2018, of each of the mining features identified on site, as they exist in their current conditions, and have been grouped via the 9 feature classifications as detailed in Table 4 and the risk assessment matrix is shown in Table 5.

Table 5: Risk assessment matrix

LIKELIHOOD	CONSEQUENCE					
		1. Insignificant – Dealt with by in house first aid	2. Minor – Treated by medical professionals, hospital outpatients	3. Moderate – Significant non- permanent injury overnight hospital stays	4. Major – Extensive permanent injury e.g. loss of fingers, extended hospital stays	5. Catastrophic – Death, permanent injury e.g. loss of hand, quadriplegia
	A. Almost certain to occur in most circumstances	MEDIUM 8	HIGH 16	HIGH 18	CRITICAL 23	CRITICAL 25
	B. Likely to occur frequently	MEDIUM 7	MEDIUM 10	HIGH 17	HIGH 20	CRITICAL 24
	C. Possibly and likely to occur at some time	LOW 3	MEDIUM 9	MEDIUM 12	HIGH 19	HIGH 22
	D. Unlikely to occur but could happen	LOW 2	LOW 5	MEDIUM 11	MEDIUM 14	HIGH 21
	E. May occur but only in rare circumstances	LOW 1	LOW 4	LOW 6	MEDIUM 13	MEDIUM 15

Category 1: Minor depressions / shallow workings / costeans

- The base conditions of these features have been validated during the geotechnical investigation and are stable. **1E = Low 1.**
- The features have been either identified as minor depressions within the ground surface or are typically indiscernible amongst the topography of the surrounding area. These features pose low risk to children and adults, livestock, and pets, as the likelihood of trips and falls are unlikely to occur but could happen which presents a minor consequence. **2D = Low 5.**
- These features pose no risk to vehicles as a 4x4 could traverse these. **1E = Low 1.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 2: Small depressions / shallow workings / costeans / trenches

- The base conditions of these features have been validated during the geotechnical investigation and are stable. **1E = Low 1.**
- The features have been either identified as small depressions and shallow workings within the ground surface and typically comprise of steeper wall slopes. These features pose risk of trips and falls (minor consequence) as the likelihood of this occurring is possibly and likely to occur at some time and can be considered medium risk to children and adults, and low risk to livestock and pets. **2C = Medium 9.**
- These features pose low risk to vehicles as a 4x4 could traverse these in the majority of cases. **1E = Low 1.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 3: Shallow shafts / trenches (low risk of false floors)

- The base conditions of these features have been validated during the geotechnical investigation and are stable. **3E = Low 6.**
- In Feature S0113334, the risk that the presence of lateral workings extending beyond what is visible in the 3D LiDAR scans is low. Therefore, there exists low risk of ground subsidence where the shaft begins to slope. **3E = Low 6.**
- The features are typically shallow shafts and trenches. These features, in their current state, may pose medium risk of injury to children and adults, livestock, and pets due to trips, falls, falling into the shafts. The likelihood of falling into a shaft is possibly and likely to occur at some time, which may yield moderate consequences. These features should not be trafficked with a 4x4 vehicle. **3C = Medium 12.**
- These shafts are deep enough such that children may not be able to make their way out of these shafts if fallen into and would require rescuing. It may take several days before they are found. **5C = High 22.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 4: Shallow shafts (soft / unknown / obstructed base conditions – risk of false floors)

- There exists a medium/potential risk of voids opening up and collapsing / subsidence due to the presence of soft base conditions as evidenced by the geotechnical investigation (e.g. potential for a false floor exists). The potential exists for a false floor at the base of these features and poses risk to the rehabilitation method and construction personnel. Should a void open up beneath the rehabilitated feature, this may cause small surface settlement or the reformation of the void, possibly generating moderate injuries to humans, and is considered a medium risk. **3C = Medium 12.**
- The results from the geotechnical investigation suggest no presence of lateral workings within the top 3 m of these features. There exists the potential for underground lateral workings below the depths which are visible, however, the likelihood of any significant surface expression if lateral workings were to collapse is low. **2D = Low 5.**
- The features are typically shallow shafts. These features, in their current state, may pose medium risk of injury to children, adults, livestock, and pets due to trips, falls, falling into the shafts. The likelihood of falling into a shaft is possibly and likely to occur at some time, which may yield moderate consequences. These features should not be trafficked with a 4x4 vehicle. **3C = Medium 12.**

- These shafts are deep enough such that children may not be able to make their way out of these shafts if fallen into and would require rescuing. It may take several days before they are found. **5C = High 22.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 5: Vertical trenches / shafts which dip away to form stopes

- The available historical information indicates the lodes are relatively narrow and do not extend below 10 m deep. There exists low risk of the shaft / trench opening up and collapsing as the features form into stopes. Should a void open up beneath the rehabilitated feature, this may cause small surface settlement or the reformation of the void, possibly generating moderate injuries to humans, and is considered a medium risk. **3E = Low 6.**
- These features pose medium risk to human life as falling down a shallow shaft may result in significant injury. Should the stope cave in on itself, this may result in death. While this event is unlikely to occur, it could happen as the stopes begin to collapse in on themselves over time. **5D = High 21.**
- These features are deep enough such that children may not be able to make their way out of these features if fallen into and would require rescuing. It may take several days before they are found. They also comprise narrow stopes which children may crawl into, and which may collapse. **5C = High 22.**
- The results from the geotechnical investigation suggest the presence of lateral workings (i.e. stopes) below depths of 4 m near these features. The likelihood of any significant surface expression if lateral workings were to collapse is low. **3E = Low 6.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 6a: Deep stopes (fenced and gated)

- These features are at least 4 m deep steeply inclined stopes situated within fenced off and gated areas. The results from the geophysical survey suggest no voids within the top 10 m of these areas, therefore, these features have a low risk of ground collapse associated with voids. However, working nearby visible open voids may cause roof collapse. This may result in some surface subsidence expression and minor injuries to humans and minor risk to construction personnel. **2A = High 16.**
- As these features currently lie within a gated / fenced area, the risk to humans, livestock, pets, and vehicles has been controlled as access is restricted / limited. However, there exists the risk of someone cutting or climbing over the fence or the fence failing with age, and tripping or walking into the stopes to explore the feature. Thus, these features pose high risk to human life (particularly to children crawling into the narrow stopes and explorers) as collapse of a deep stope may result in death should the wooden props give up and the walls of the feature cave in. This event is likely to occur as these stopes show evidence of collapse and the fences are easy to bypass and the wooden supports, propping the stopes will deteriorate. **5C = High 22.**
- The available historical information indicates the lodes are relatively narrow and do not extend below 10 m deep. It is likely that the stope has collapse and caved in on itself at depth. These features are held propped open by deteriorating wooden supports which shall undoubtedly fail at some point in the future and the stopes display evidence of collapse, however, these stopes are > 3 m below the ground. There exists a medium risk of subsidence on the hanging wall side of the feature, particularly under any machinery / vehicle loads. **3C = Medium 12.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 6b: Deep stopes (fenced and gated)

- These features are at least 6 m deep steeply inclined stopes situated within fenced off and gated areas. Due to the steepness of the void and no additional voids nearby were identified from the geophysical survey the risk of surface subsidence expressions and the impact to humans is considered low. **1A = Medium 8.**
- As these features currently lie within a gated / fenced area, the risk to humans, livestock, pets, and vehicles has been controlled as access is restricted / limited. However, there exists the risk of someone cutting or climbing over the fence or the fence failing with age, and tripping or falling into the stopes. Thus, these features pose high risk to human life (particularly to children crawling into the narrow stopes and explorers) as collapse

of a deep stope may result in death should the wooden props give up and the walls of the feature cave in. These stopes are stable and unlikely to cave in and collapse. Therefore, this event is unlikely to occur but could happen, especially as the fences are easy to bypass and the wooden supports will deteriorate. **5D = High 21.**

- The available historical information indicates the lodes are relatively narrow and do not extend below 10 m deep. It is likely that the stope has collapse and caved in on itself at depth and was likely held propped open with the wooden supports observed nearer to the surface. However, there exists the low risk of potential for a false floor at the visual shaft / trench base of these features. **3D = Medium 12.**
- These mining features have been open for over 130 years and based on the existing landform, have seemingly remained stable. These features are held propped open by deteriorating wooden supports which shall undoubtedly fail at some point in the future and the stopes display evidence of collapse, however, these stopes are > 3 m below the ground. There exists a medium risk of collapse on the hanging wall side of the feature, particularly under any machinery / vehicle loads. **3C = Medium 12.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 7: Backfilled stope (fenced and gated)

- This feature is likely to be a backfilled stope (dipping approximately 45-70 degrees) situated within the fenced and gated area to the south. The surrounding features exist as a localised cluster of previously interconnected features, and it is likely that this feature displayed similar characteristics. The poor backfilling may result in minimal surface subsidence expression and minor injuries to humans and minor risk to construction personnel. **2A = High 16.**
- Noxious gas was detected in the feature. Evidence of cyanide contamination was encountered in the base of the feature via backhoe excavation during the disturbance investigation. This poses critical risk to human health. **4A = Critical 23.**
- No flammable gasses were detected within these features. **1E = Low 1.**

Category 8: Deep shafts (shallow lateral workings < 4 m deep)

- This feature is a reasonably deep shaft that is located in a poorly lit area. The available historical information suggests this may extend to a significant depth beneath the ground surface and may comprise lateral working / drives at depth. The results from the geotechnical investigation indicate these shafts comprise of lateral workings / drives within the top 4 m and are relatively narrow. The depth of the shaft extent of any potential drives is unknown due to partial blockage of the visible base of this shaft, however the geophysical survey results indicate that there are lateral working below 4 m in the area. The lateral drives pose low risk to the rehabilitation method and construction personnel – should voids collapse in the area around the rehabilitated feature, this is unlikely to cause any surface settlement. **2E = Low 4.**
- These mining features have been open for over 130 years and based on the existing landform, has seemingly remained stable. The ground immediately surrounding the shaft is stable. **2D = Low 2.**
- This feature poses high risk to human life as falling down this deep shaft which may result in death due to presence of a false floor and unknown depths. Children and adults who fall down this feature would require rescuing which may take several days before they are found. This event is likely to occur due to the lack of fencing and may result in catastrophic consequences. **5C = High 22.**
- No noxious or flammable gasses were detected within these features. **1E = Low 1.**

Category 9: Deep shafts (fenced)

- These features are > 13 m deep shafts that are gated and fenced off to the public, located in poorly lit areas. The available historical information suggests these are main shafts and extends to a significant depth beneath the ground surface and may comprise lateral working / drives at depth. The results from the geotechnical investigation indicate these shafts do not comprise of lateral workings / drives within the top 8.5 m. The geophysical survey results suggest the limited presence of lateral workings within the top 20 m of these areas and thus a very low risk of ground collapse associated with any lateral workings. The depth and extent of any potential drives is unknown due to presence of water and blockage of the visible base of these shafts and poses

low risk to the rehabilitation method and construction personnel – should voids collapse in the area around the rehabilitated feature, this is unlikely to cause any surface settlement. These mining features have been open for over 130 years and based on the existing landform, has seemingly remained stable. The ground immediately surrounding the shaft is stable. **3E = Low 6.**

- As these features currently lie within a gated / fenced area, the risk to humans, livestock, pets, and vehicles has been controlled as access is restricted / limited. However, there exists the risk of someone cutting or climbing over the fence or the fence failing with age, and tripping or falling into the shaft. There is also evidence of people crawling underneath the fence (S0113265), and children would easily make their way underneath the fence. This event is likely to occur especially as the fences are easy to bypass. **5C = High 22.**
- These features are relatively deep shafts of unknown extent and pose high risk to human life as falling down a deep shaft may result in death, particularly as feature S0113265 was noted to have water in the base. Feature S0113265 was recorded as having > 10 m of water in the base, and it is expected that feature S0113745 is deeper than was scanned. Thus, these features pose high risk to human life as falling down a deep shaft would likely result in death due to presence of water in the base and the unknown depths. This event likely to occur, particularly at feature S0113265, which is situated directly opposite the Primary School and children are more liable to crawl underneath the fence and fall into the shaft. **5C = High 22.**
- No noxious or flammable gasses were detected within these features. Additionally, some of these features contain groundwater, displacing any potential gas. **1E = Low 1.**

4.4.1 Emerald Reward Open Pit (Feature S0113339)

WML have undertaken a risk assessment of the walls of the open pit feature and have identified which areas require work to batter the slopes to a safer steepness to reduce the risk of mild to severe injuries to humans should they fall down the slope. These are shown on Figure 16 below. The rehabilitation of this feature (including safe batter angles is detailed in the accompanying rehabilitation report, 11715-G-R-002. The excavatability of each section of the slope walls has also been identified and included on Figure 16. Where easy excavatability has been identified, material within the walls of the open pit may be freely dug with an excavator. Areas of hard excavatability will require use of rock picks and rock breaking equipment to facilitate the regrading of the open pit slope walls.

Children's toys were noted in the base of the open pit and the feature takes form of a playground for the local children, particularly as the open pit is situated directly opposite the Primary School.

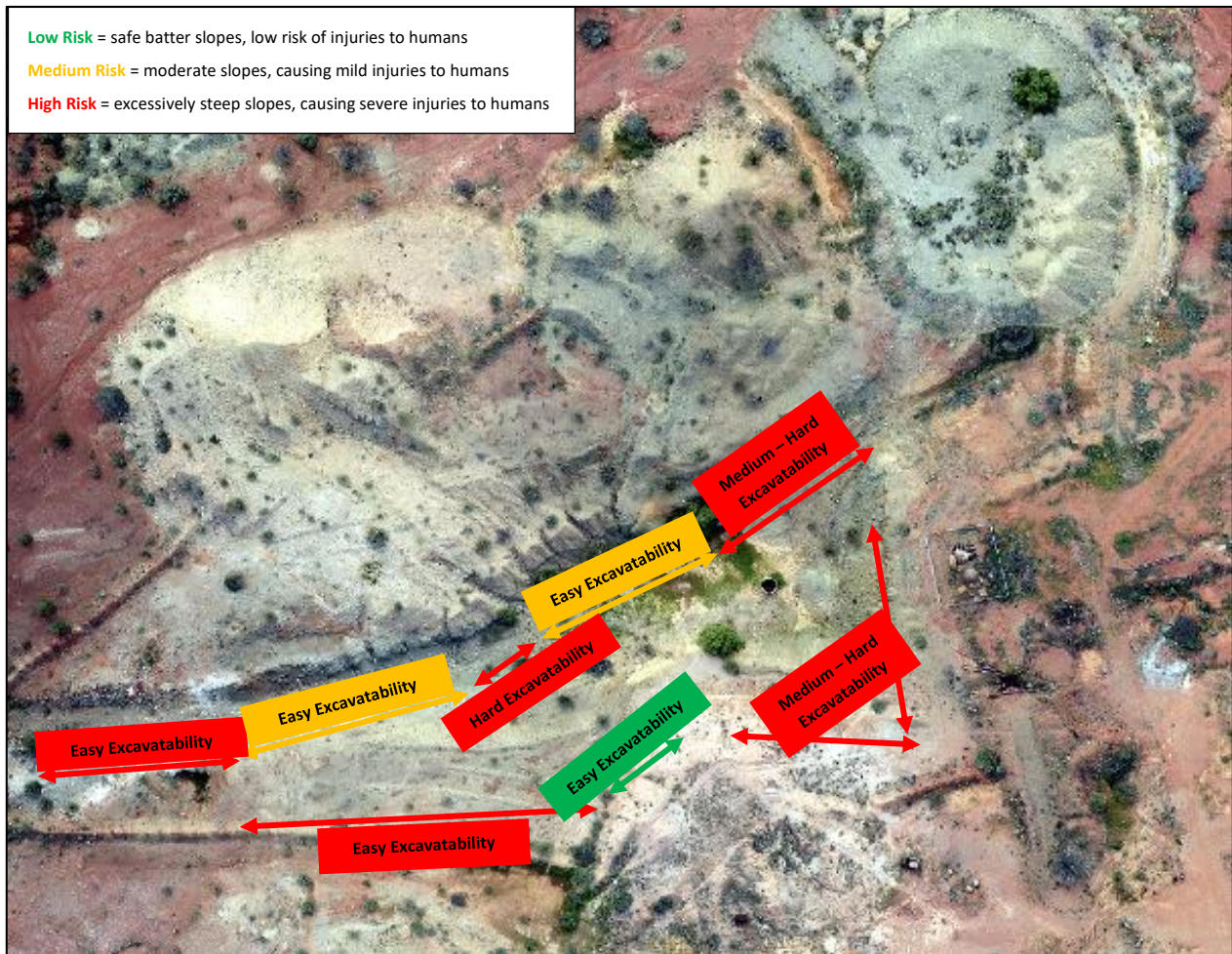


Figure 16: Risk assessment of the open pit walls

5 CLOSURE

This report is intended for distribution to the public.

We trust that the information provided within this report satisfies your present requirements and meets with your approval. Should you have any queries, please do not hesitate to contact the author of this report.

We draw your attention to the attached "*Report Limitations*" included with this report. This information sheet is intended to provide additional information about this report and information included within it. This information is provided not to reduce the level of responsibility accepted by WML but to ensure that all parties that rely on this report, and the information contained herein, are aware of the responsibilities that each assumes in so doing.

6 REFERENCES

1. 10 miles to an inch scale Geological Sketch Map, 'Yalgoo and Murchison Goldfields'. 1946
2. Alex Palmer. *Yalgoo*. Lap Industries. 1985.
3. Heritage Council of Western Australia. Register of Heritage Places. *Yalgoo Justice Precinct*. 1 April 2011.
4. Heritage Council of Western Australia. *Yalgoo Heritage Trail*. n.d. Source: https://www.yalgoo.wa.gov.au/profiles/yalgoo/assets/clientdata/document-centre/tourism/yalgoo_heritage_trail_.pdf
5. Mining leases on the Murchison & Yalgoo Goldfields, West Australia. London: West Australian Exploring & Finance Corporation Ltd., 1896.
6. Mount Magnet Miner and Lennonville Leader (WA: 1896 - 1926). Sat 5 Aug 1911. Page 2. *YALGOO – THE EMERALD*.
7. Report of the Department of Mines for the Year 1946, Western Australia. William H. Wyatt. Government's Printer. 1948.
8. Standards Australia. 2017. *Geotechnical Site Investigations*. AS 1726:2017. SAI Global.
9. The Daily News (Perth, WA: 1882 - 1955). Mon 4 Jun 1906. Page 8. *YALGOO MINING – THE EMERALD REWARD*.
10. Western Mail (Perth, WA: 1885 - 1954). Sat 19 May 1894. Page 14. *MINING AT YALGOO*.



LIMITATIONS



REPORT LIMITATIONS



This geotechnical report is provided for the sole use by the Client. This report must not be applied for any other purpose or project except the one originally contemplated without written authorisation from WML. WML accepts no responsibility for the use of this report / document, in whole or in part, in other contexts or for any other purpose.

WML have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, documents and information supplied, and previous experience. If changes occur in the nature or design of the project, however minor, it is recommended WML review this report to assess their impacts and provide additional recommendations, if any. WML does not assume any responsibility or liability for problems that arise due to developments on site of which we were not informed.

This report utilises data and information provided by third parties, including, but not limited to sub-consultants, published data, and the Client. This information has been assumed to be correct unless otherwise stated. WML assumes no responsibility for assessments made partly or entirely based on information provided by third parties or for the adequacy, incompleteness, inaccuracies, or reliability of any data provided by third parties.

It is the responsibility of the Client to transmit the information, recommendations, and limitations of this report to the appropriate organisations or people involved in design of the project, including, but not limited to developers, builders, owners, buyers, architects, engineers, and designers.

WML's opinions are based on upon information that existed at the time of the production of this report and ground conditions encountered at the time the site study was performed. This geotechnical report should not be relied upon if its adequacy has been affected by: the passage of time, by man-made events, such as construction on or adjacent to the site, or by natural events, such as floods, earthquakes, or groundwater fluctuations. In the event of the above changes, WML should be contacted to determine if this report is still reliable or whether additional testing is required.

The subsurface conditions identified within this report are based only upon investigation locations where subsurface tests have been conducted and / or samples obtained, which are explicitly representative of the specific sample or test location. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and unknowns or variations in ground conditions between test locations that cannot be inferred or predicted. Actual subsurface conditions may differ significantly from those indicated in this report. Specific warning is also given that many factors, either natural or artificial, may render ground conditions different from those which pertained at the time of the investigation. WML does not accept any responsibility for any variance in the ground conditions that may exist across the site. If unexpected subsurface conditions are encountered, WML shall be notified immediately to review those conditions and provide additional and/or modified recommendations, as necessary.

This geotechnical assessment is based upon judgment of the investigation data, visual observations of the site and materials encountered, along with the proposed land use and project specifications. The findings and recommendations presented within this report represent professional opinions and estimates and should not be taken as fact unless explicitly stated. In general, statements of fact are limited to what was done and / or what was observed on site.

The recommendations provided in this report are preliminary only; final recommendations can only be given after observing the actual subsurface conditions revealed during construction. WML does not assume responsibility or liability for the recommendations in this report if construction observation has not been performed by a WML geotechnical engineer.

Our services did not include any contamination or environmental assessment of the site or adjacent sites. The equipment and techniques used to perform a geoenvironmental study differ from those used to perform a geotechnical investigation. If you require any geoenvironmental information for your project, WML can advise on further steps to be undertaken.

WML have performed our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty, expressed or implied, is made as to the professional advice included in this report.



DRAWINGS





LEGEND

CATEGORY 1

CATEGORY 2

CATEGORY 3

CATEGORY 4

CATEGORY 5

CATEGORY 6

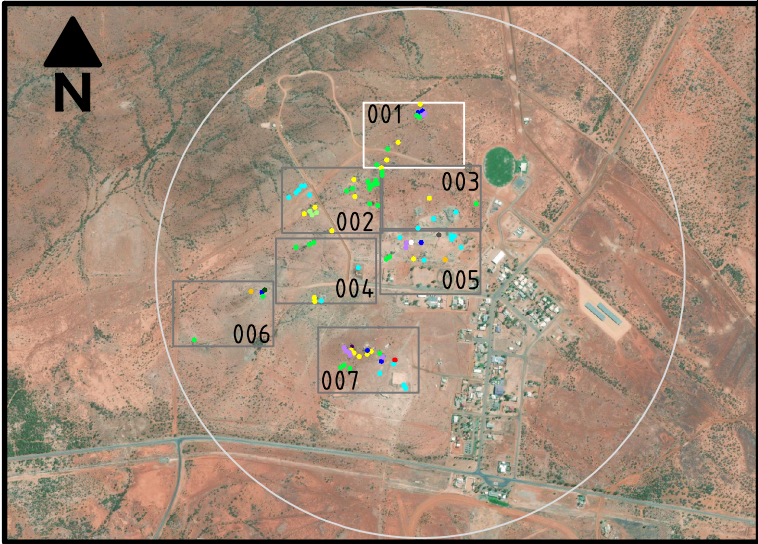
CATEGORY 7

CATEGORY 8

CATEGORY 9

OPEN PIT

ABOVE GROUND FEATURES



KEY PLAN

N.T.S.

150

140

130

120

110

100

90

80

70

60

50

40

30

20

10m

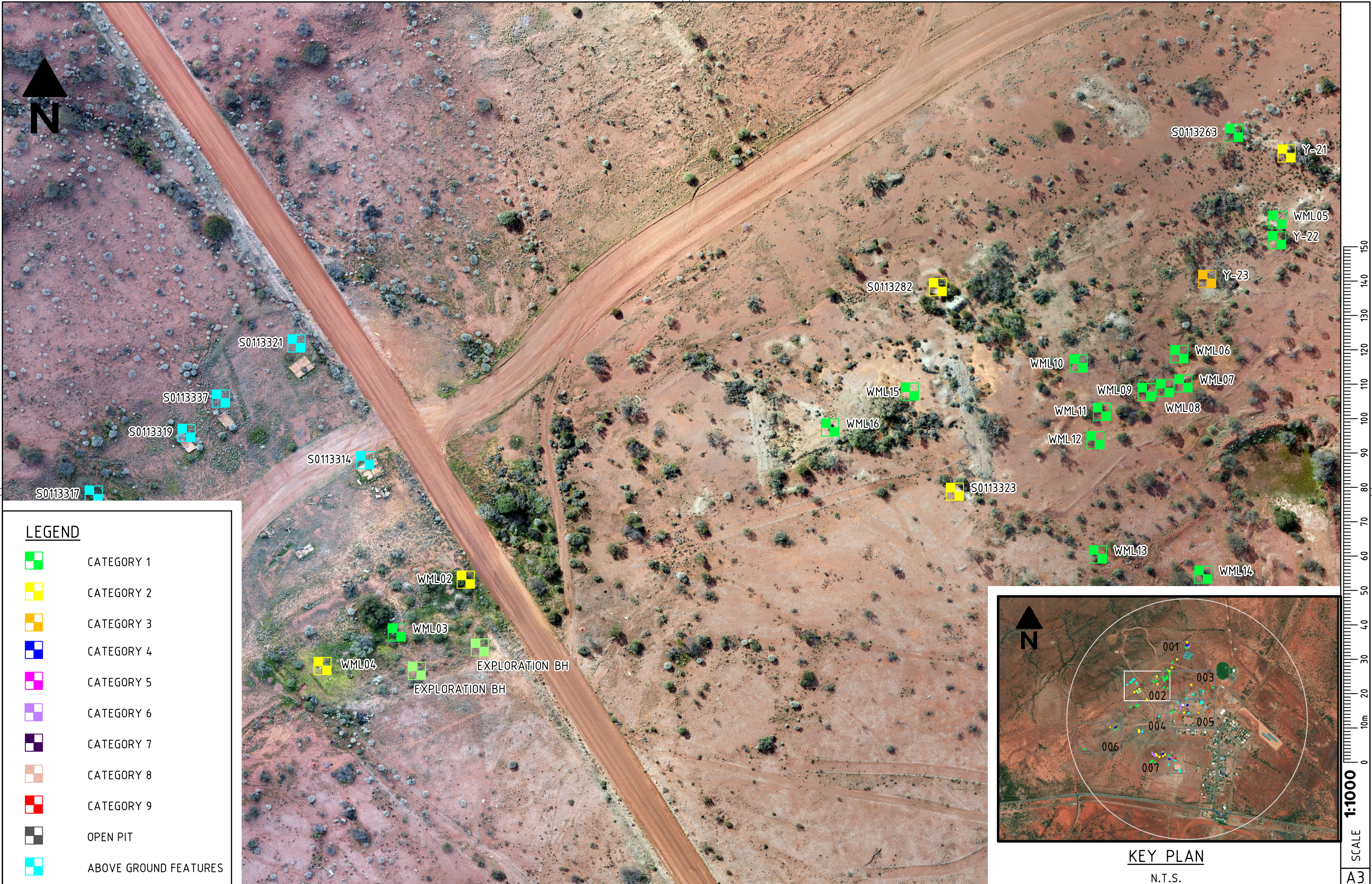
0

SCALE

1:1000

A3

<div><div>WML</div><div>Consulting Engineers</div><div>Civil Geotechnical Structural</div></div> <div><div>BUNBURY</div><div>+61 8 9722 3544</div><div>KALGOORLIE</div><div>+61 8 9021 1811</div><div>PERTH</div><div>+61 8 9722 3566</div><div>wml.com.au</div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
						DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED	I.G.	28.03.2025	C.H.	VERIFIED			PROJECT	YALGOO MINE VOID REHABILITATION	11715-G-D-001
	A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.						
Nº.	DESCRIPTION		APPROVED	DATE	DRAWN	APPROVED				MAP AREA SHEET 1	11715-G-D-001



LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES

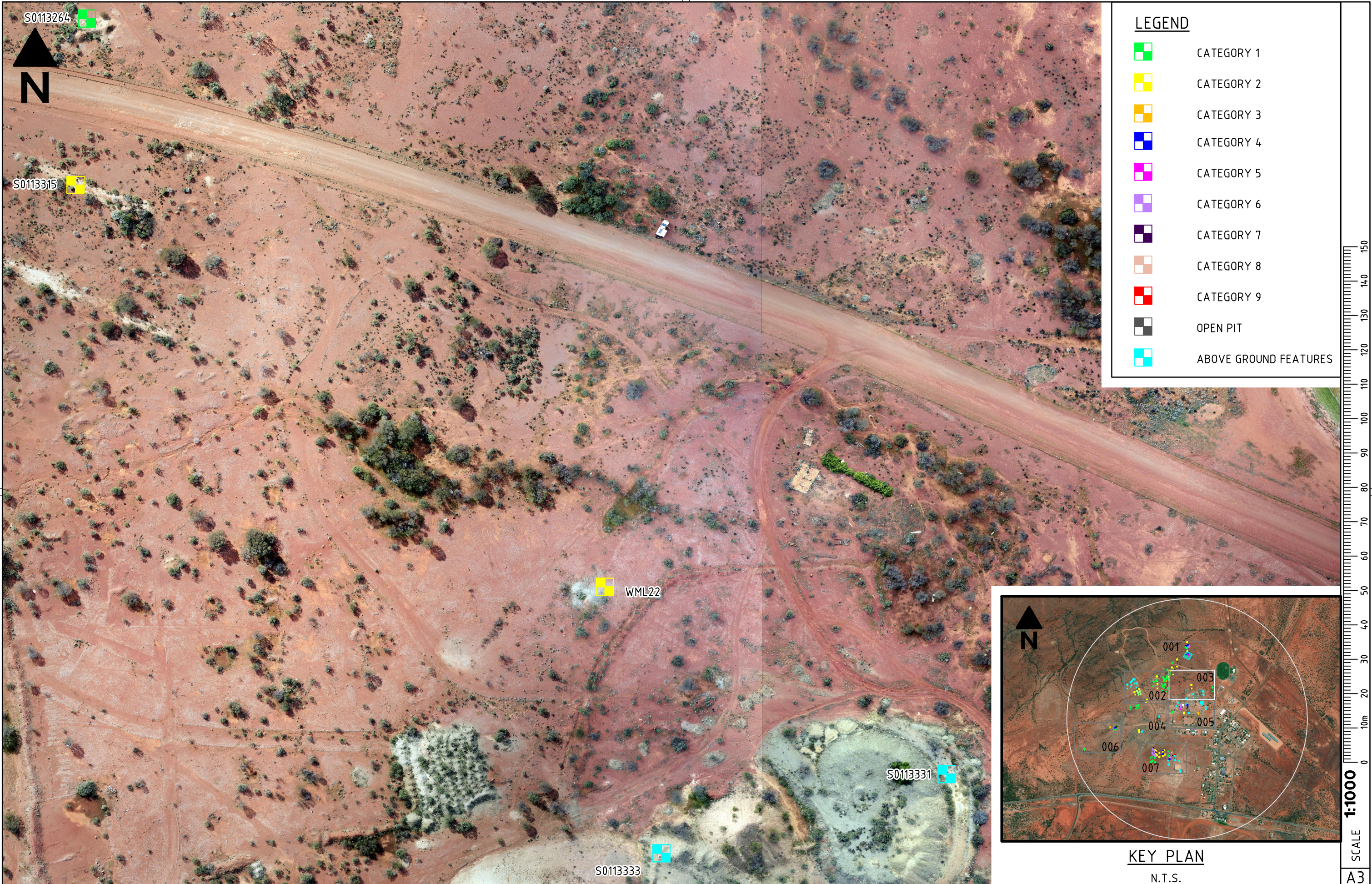
WML

Consulting Engineers

Civil | Geotechnical | Structural

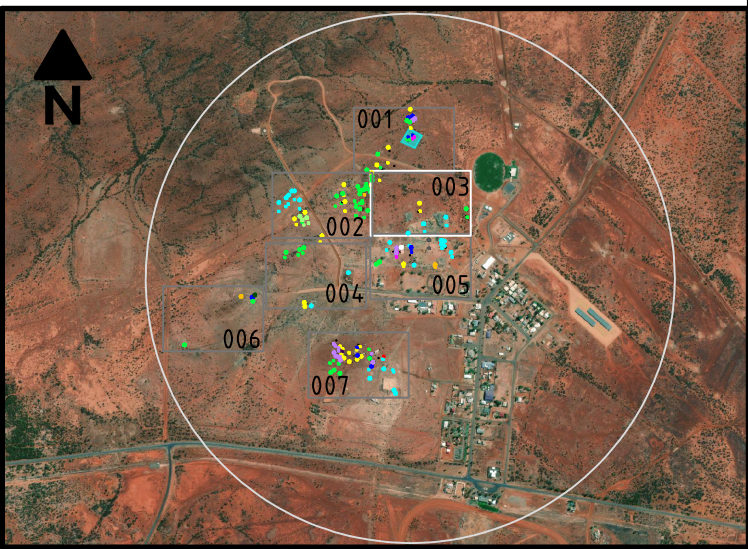
BUNBURY
+61 8 9722 3544
KALGOORLIE
+61 8 9021 1811
PERTH
+61 8 9722 3566
wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE YALGOO MINE REHABILITATION FEATURE CATEGORY MAP AREA SHEET 2	CONSULTANT DRAWING NUMBER 11715-G-D-002	
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		11715-G-D-002	
					DRAWN	C. HICK	NOV '24				
					VERIFIED						
B	FINAL ISSUED	I.G.	28.03.2025	C.H.				PROJECT	YALGOO MINE VOID REHABILITATION	11715-G-D-002	
A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.							
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED						



LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES



KEY PLAN

N.T.S.

SCALE 1:1000 A3

WML

Consulting Engineers

Civil | Geotechnical | Structural

BUNBURY
+61 8 9722 3544
KALGOORLIE
+61 8 9021 1811
PERTH
+61 8 9722 3566
wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE YALGOO MINE REHABILITATION FEATURE CATEGORY MAP AREA SHEET 3	CONSULTANT DRAWING NUMBER	
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		11715-G-D-003	
					DRAWN	C. HICK	NOV '24				
B	FINAL ISSUED		I.G.	28.03.2025	C.H.						
A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.					11715-G-D-003	
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED						



LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES

WML

Consulting Engineers

Civil | Geotechnical | Structural

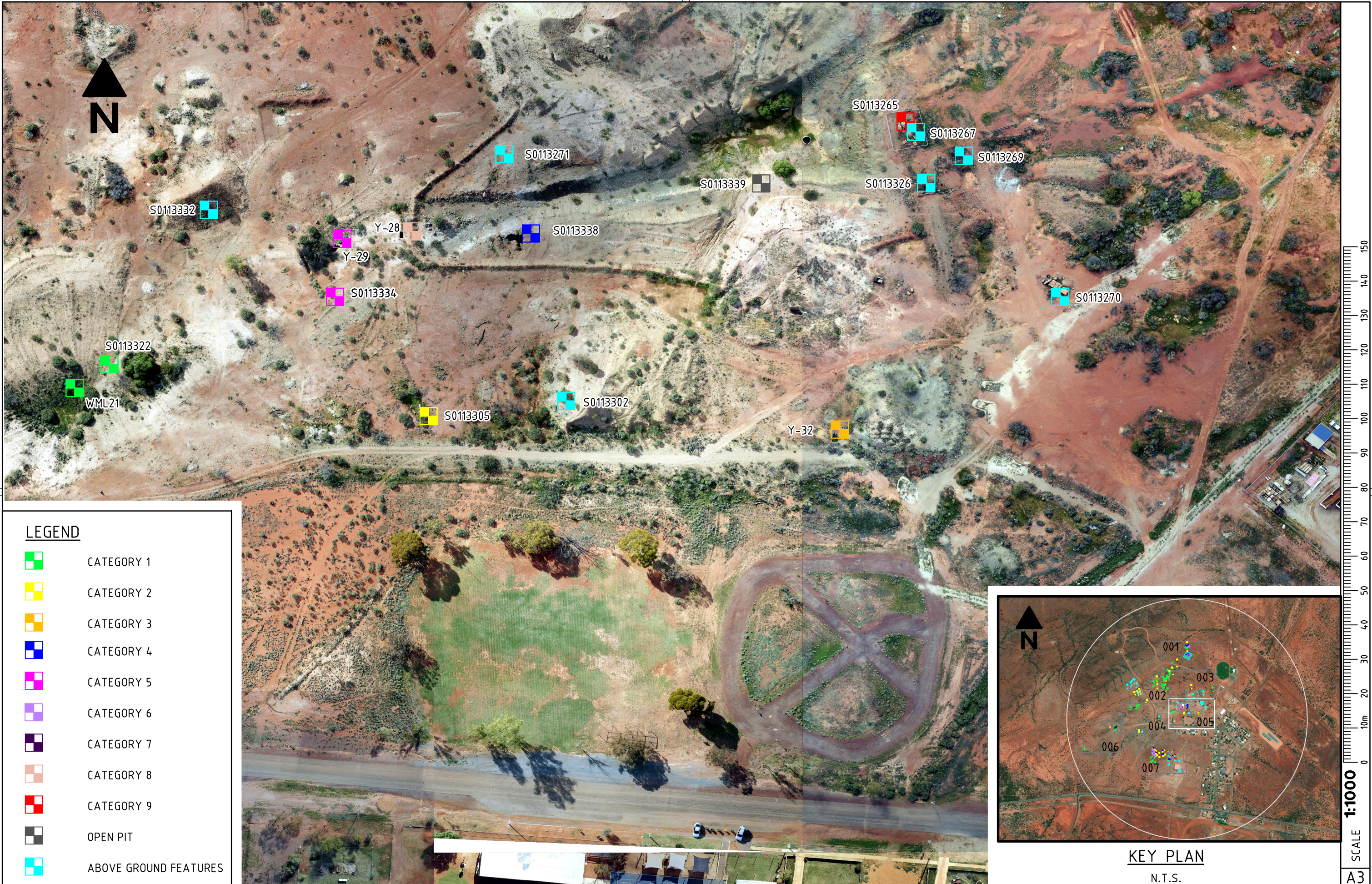
BUNBURY
+61 8 9722 3544

KALGOORLIE
+61 8 9021 1811

PERTH
+61 8 9722 3566

wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER	
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		11715-G-D-004	
					DRAWN	C. HICK	NOV '24		YALGOO MINE VOID REHABILITATION		
					VERIFIED					11715-G-D-004	
B	FINAL ISSUED		I.G.	28.03.2025	C.H.				YALGOO MINE REHABILITATION FEATURE CATEGORY MAP AREA SHEET 4		
A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.						
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED						



LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES

WML
Consulting Engineers
Civil | Geotechnical | Structural

BUNBURY
+61 8 9722 3544
KALGOORLIE
+61 8 9021 1811
PERTH
+61 8 9722 3566
wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER	
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		11715-G-D-005	
					DRAWN	C. HICK	NOV '24		YALGOO MINE VOID REHABILITATION		
					VERIFIED					11715-G-D-005	
B	FINAL ISSUED		I.G.	28.03.2025	C.H.				YALGOO MINE REHABILITATION FEATURE CATEGORY MAP AREA SHEET 5		
A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.						
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED						



LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES

WML

Consulting Engineers

Civil | Geotechnical | Structural

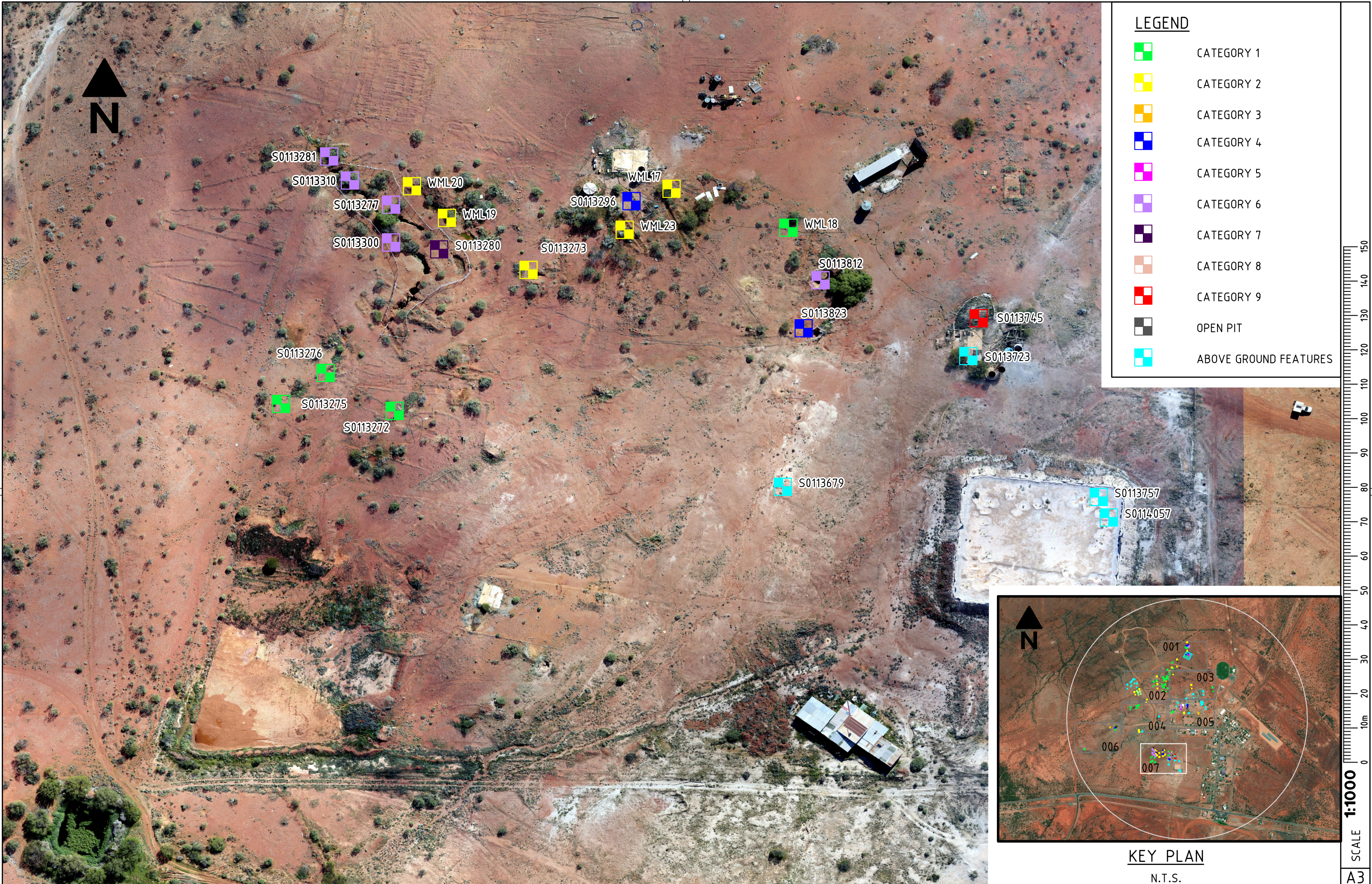
BUNBURY
+61 8 9722 3544

KALGOORLIE
+61 8 9021 1811

PERTH
+61 8 9722 3566

wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER	
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS	YALGOO MINE REHABILITATION FEATURE CATEGORY MAP AREA SHEET 6	11715-G-D-006	
					DRAWN	C. HICK	NOV '24				
B	FINAL ISSUED	I.G.	28.03.2025	C.H.	VERIFIED			PROJECT	YALGOO MINE VOID REHABILITATION		
A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.							
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED					11715-G-D-006	B



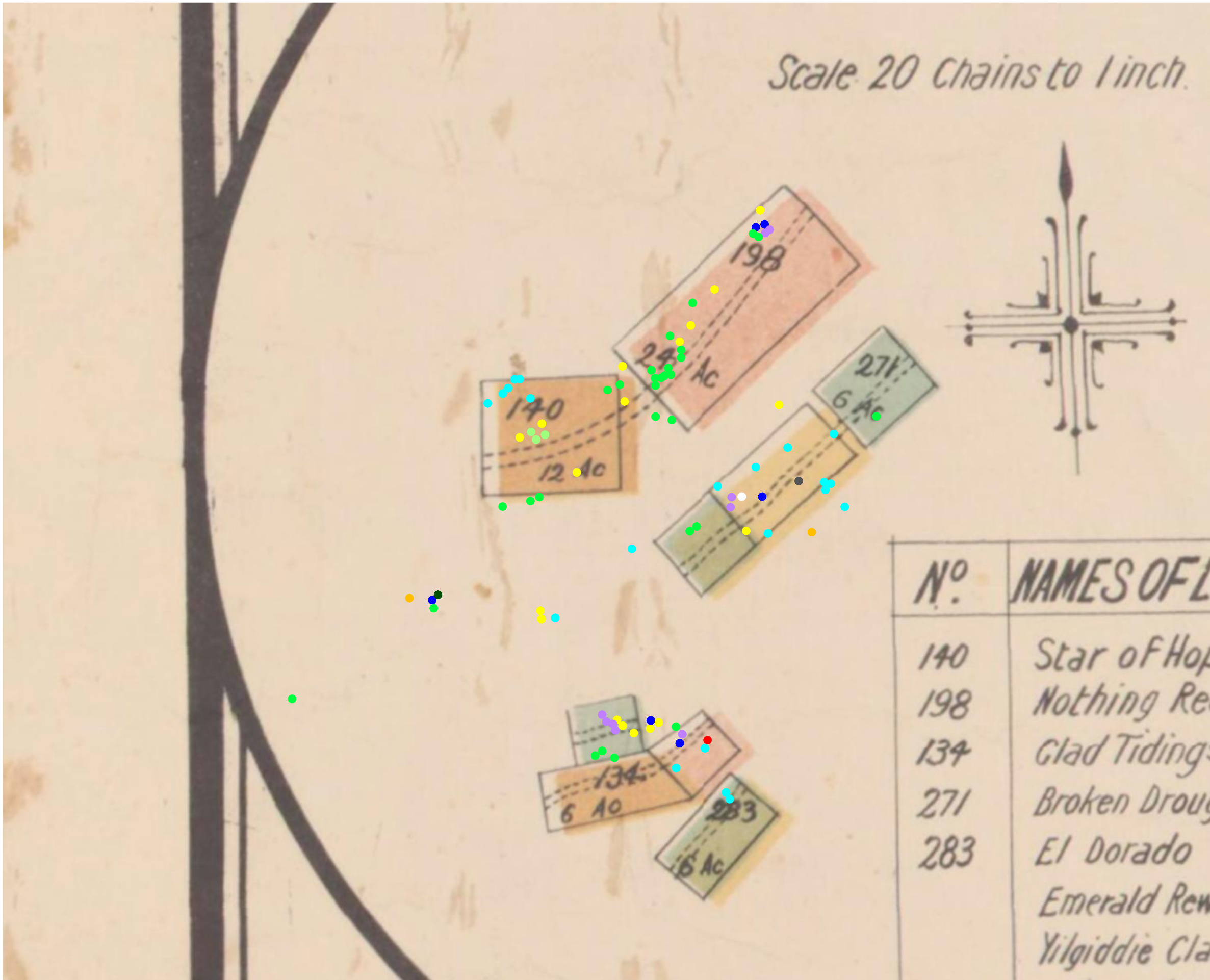
LEGEND

- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5
- CATEGORY 6
- CATEGORY 7
- CATEGORY 8
- CATEGORY 9
- OPEN PIT
- ABOVE GROUND FEATURES

KEY PLAN

N.T.S.

<div><div>WML</div><div>Consulting Engineers</div><div>Civil Geotechnical Structural</div></div> <div><div>BUNBURY</div><div>+61 8 9722 3544</div><div>KALGOORLIE</div><div>+61 8 9021 1811</div><div>PERTH</div><div>+61 8 9722 3566</div><div>wml.com.au</div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
						DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED		I.G.	28.03.2025	C.H.			PROJECT	YALGOO MINE VOID REHABILITATION	11715-G-D-007
	A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.	VERIFIED				
N°.		DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED				MAP AREA SHEET 7	11715-G-D-007



LEGEND	
	CATEGORY 1
	CATEGORY 2
	CATEGORY 3
	CATEGORY 4
	CATEGORY 5
	CATEGORY 6
	CATEGORY 7
	CATEGORY 8
	CATEGORY 9
	OPEN PIT
	ABOVE GROUND FEATURES

Nº	NAMES OF LEASES
140	Star of Hope
198	Nothing Reef
134	Glad Tidings
271	Broken Drought.
283	El Dorado
	Emerald Reward Claim
	Yilgiddie Claim

SCALE NTS
A3

WML

Consulting Engineers

Civil | Geotechnical | Structural

BUNBURY
+61 8 9722 3544

KALGOORLIE
+61 8 9021 1811

PERTH
+61 8 9722 3566

wml.com.au

REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
					DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS	YALGOO MINE REHABILITATION FEATURE CATEGORY HISTORICAL MAP SHEET 1	11715-G-D-008
					DRAWN	C. HICK	NOV '24			
B	FINAL ISSUED	I.G.	28.03.2025	C.H.	VERIFIED			PROJECT	YALGOO MINE VOID REHABILITATION	11715-G-D-008
A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.						
Nº.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED					

LEGEND

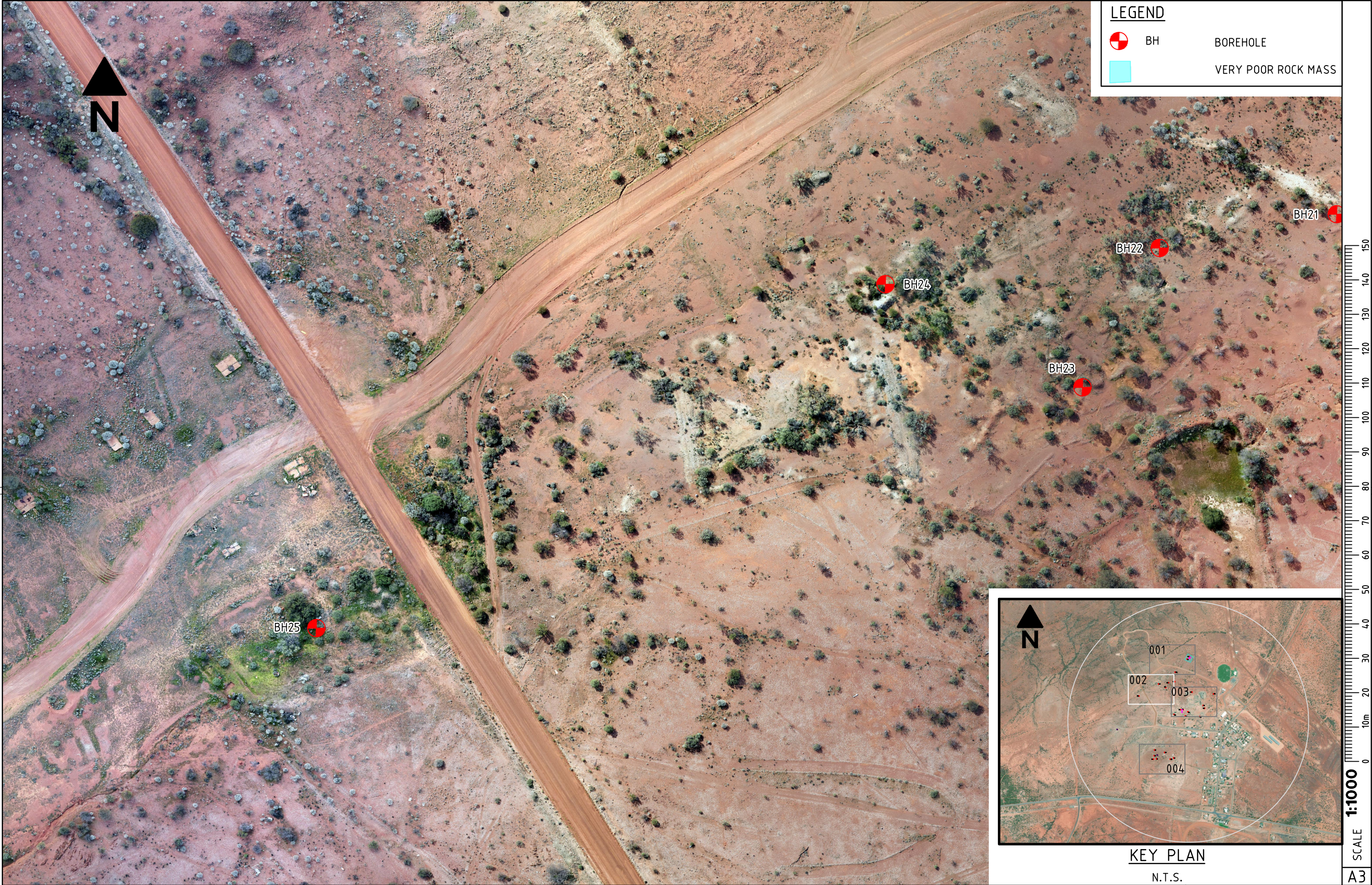
BH

BOREHOLE

VERY POOR ROCK MASS



<div><div>WML</div><div>Consulting Engineers</div><div>Civil Geotechnical Structural</div></div> <div><div>BUNBURY</div><div>+61 8 9722 3544</div><div>KALGOORLIE</div><div>+61 8 9021 1811</div><div>PERTH</div><div>+61 8 9722 3566</div><div>wml.com.au</div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
						DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED	I.G.	28.03.2025	C.H.	VERIFIED			PROJECT	YALGOO MINE VOID REHABILITATION SHEET 1	11715-G-D-009
	A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.				YALGOO MINE VOID REHABILITATION		
N°.	DESCRIPTION			APPROVED	DATE	DRAWN	APPROVED				11715-G-D-009



<div><div><div>WML</div><div>Consulting Engineers</div></div><div>Civil Geotechnical Structural</div></div> <div><div>BUNBURY +61 8 9722 3544 KALGOORLIE +61 8 9021 1811 PERTH +61 8 9722 3566 wml.com.au</div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT DEMIRS	DRAWING TITLE YALGOO MINE REHABILITATION BOREHOLE LOCATION PLAN SHEET 2	CONSULTANT DRAWING NUMBER 11715-G-D-010
						DESIGNED	I. GOLIJANIN	NOV '24			
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED	I.G.	28.03.2025	C.H.	VERIFIED			PROJECT YALGOO MINE VOID REHABILITATION	11715-G-D-010	B
	A	ISSUED FOR CLIENT REVIEW	I.G.	22.11.2024	C.H.						
	N°.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED					

LEGEND

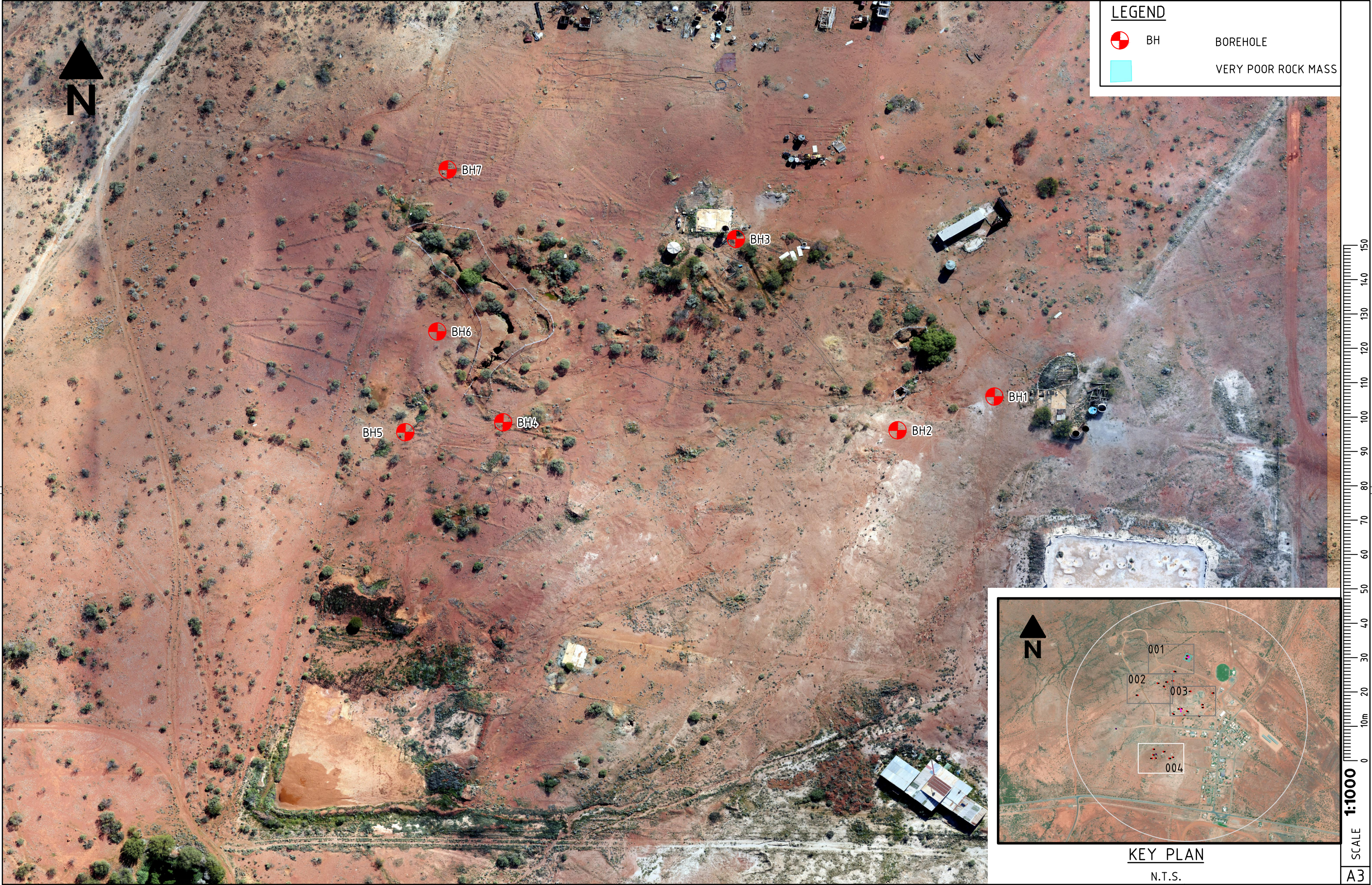
BH

BOREHOLE

VERY POOR ROCK MASS



<div><div><div>WML</div><div>Consulting Engineers</div><div>Civil Geotechnical Structural</div></div><div><div>BUNBURY +61 8 9722 3544 KALGOORLIE +61 8 9021 1811 PERTH +61 8 9722 3566 wml.com.au</div></div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
						DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		11715-G-D-011
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED		I.G.	28.03.2025	C.H.	VERIFIED		PROJECT	YALGOO MINE VOID REHABILITATION	11715-G-D-011
	A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.					
	N°.	DESCRIPTION	APPROVED	DATE	DRAWN	APPROVED					
	YALGOO MINE REHABILITATION BOREHOLE LOCATION PLAN SHEET 3										



LEGEND

BH

BOREHOLE

VERY POOR ROCK MASS

<div><div>WML</div><div>Consulting Engineers</div><div>Civil Geotechnical Structural</div></div> <div><div>BUNBURY</div><div>+61 8 9722 3544</div><div>KALGOORLIE</div><div>+61 8 9021 1811</div><div>PERTH</div><div>+61 8 9722 3566</div><div>wml.com.au</div></div>	REVISIONS					NAMES PRINTED IN FULL		DATE	CLIENT	DRAWING TITLE	CONSULTANT DRAWING NUMBER
						DESIGNED	I. GOLIJANIN	NOV '24	DEMIRS		
						DRAWN	C. HICK	NOV '24			
	B	FINAL ISSUED		I.G.	28.03.2025	C.H.	VERIFIED		PROJECT	YALGOO MINE REHABILITATION BOREHOLE LOCATION PLAN SHEET 4	11715-G-D-012
	A	ISSUED FOR CLIENT REVIEW		I.G.	22.11.2024	C.H.			YALGOO MINE VOID REHABILITATION		
Nº.	DESCRIPTION			APPROVED	DATE	DRAWN	APPROVED				11715-G-D-012

SCALE

1:1000

A3



APPENDIX A

FIELD NOTES





CATEGORY 1



FEATURE S0113263 & Y-21

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.335533 Longitude: 116.678391	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 7 x 1.1 x 0.9 (Y-21) Approximate Volume (m³): 5-8 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Y-21 is the middle of a rehabilitated trench S0113263. Spoil pile situated to the east of the unrehabilitated section of the trench. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	Blade in surrounding spoil material at Y-21. Spoil available may be suitable for re-use as backfill material – use mini excavator to avoid trees.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	3			
0.30 – 0.45	6			
0.45 – 0.60	9			
0.60 – 0.75	15R			
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113263 & Y-21	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113264

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.334984 Longitude: 116.678831	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 4 x 3.5 x 0.3 Spoil piles: 11 x 2.5 x 0.7 & 12.5 x 3 x 1.1 Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular small depression of a feature surrounded by significant sized spoil piles. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Appears to have been backfilled with waste rock. DCP early refusal. Feature is situated to the north of the access track. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk. Material that may be suitable for re-use as backfill available.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1R	2R	2R	
0.15 – 0.30				
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113264	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113272


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342445 Longitude: 116.677340	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 18.7 x 1.2 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a shallow costean. A small spoil pile is situated to the south of the feature. Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs. No LiDAR scan undertaken. No DCP undertaken due to presence of visible rock in the base of the feature.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible outcrops. Rocks along base of feature. Soils are red clays and gravels.	No remediation required. Feature poses no risk.

PHOTOGRAPHS



Figure 1

	Feature S0113272	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113275


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342426 Longitude: 116.677003	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse. Excavation with a backhoe indicated this feature is a backfilled shaft approx 1 x 1 x 1 in dimension.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.3 x 5 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a shallow depression imperceptible from natural ground surface. A very small spoil pile is situated to the north of the feature under a small tree. The base of the feature is highly vegetated – very green and overgrown compared to the surrounding landscape. Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Soils are red clays and gravels.	Well-backfilled shaft. No remediation required. Feature poses no risk.

PHOTOGRAPHS



Figure 1

	Feature S0113275	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113276

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342345 Longitude: 116.677136	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.9 x 1.8 x 0.3 Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a shallow depression. A waste rock and spoil pile is situated to the west of the feature.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>DCP undertaken in base met with shallow refusal indicating the base conditions are hard. However, excavation with a backhoe indicated this feature is a backfilled shaft approx 1 x 1 x 1 in dimension – reasonably compact backfill.</p> <p>No LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible rocky outcrops. Soils at the ground surface and base of feature are red clayey gravels.	Well-backfilled shaft. No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	3			
0.15 – 0.30	R			
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature S0113276	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113284

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.339973 Longitude: 116.673991	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.1 x 3.3 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, quartz, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small minor depression feature. Small spoil pile around brim. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Approximately 0.6 m of softer soils. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.8% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:


See approximate test locations noted on the sketch below.

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	4			
0.15 – 0.30	1			
0.30 – 0.45	1			
0.45 – 0.60	5			
0.60 – 0.75	8			
0.75 – 0.90	12			
0.90 – 1.05	10			
1.05 – 1.20	19			
1.20 – 1.35	40R			
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature S0113284	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113286

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.339802 Longitude: 116.674052	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.3 x 1.3 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, quartz, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small depression indiscernible feature. Small spoil pile around brim. A spoil pile from feature S0113285 lies to the west of the feature. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:


Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	4			
0.30 – 0.45	4			
0.45 – 0.60	5R			
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

Sketch of Feature:

PHOTOGRAPHS



Figure 1

	Feature S0113286	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113322


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338676 Longitude: 116.678871	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.8 x 2 x 0.5 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is covered with low lying grass.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a shallow circular depression. 300 mm of loose material over rock. Surrounding ground surface is highly vegetated with some low lying grass, wildflowers, and small trees / shrubs. The base of the feature exhibits hard ground conditions as evidenced by ground probing and excavator refusal. DCP not undertaken as probing indicated rock at base. LiDAR scan was not undertaken.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	No remediation required.

PHOTOGRAPHS



Figure 1

	Feature S0113322	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

FEATURE WML01

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338333 Longitude: 116.675278	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.2 x 2.3 x 0.4 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature and side walls.
Description / comments / observations:	Noxious / flammable gas readings:
Small rectangular depression. Minor spoil pile surrounding and larger quartz pieces. Tree branches at the base of feature. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk. Or blade in to soften edges.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	0			
0.15 – 0.30	4			
0.30 – 0.45	2			
0.45 – 0.60	6			
0.60 – 0.75	5			
0.75 – 0.90	8			
0.90 – 1.05	6			
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML01	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/21

FEATURE WML03

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.337111 Longitude: 116.675837	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2 x 1.6 x 0.4 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small circular depression. Minor spoil pile surrounding and larger quartz pieces. Grass and vegetation at the base of feature. Ground conditions at the base of the feature are generally good, as evidenced by DCP results. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk. Or blade in to soften edges.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	1			
0.30 – 0.45	6			
0.45 – 0.60	8			
0.60 – 0.75	5			
0.75 – 0.90	10			
0.90 – 1.05	11			
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML03	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML05

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.335758 Longitude: 116.678605	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 6.3 x 2.1 x 0.3 Approximate Volume (m³): 2 Depth to groundwater (m): n/a Hydrological Features: n/a	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small minor depression of a Costean with minor spoil heaps around the side of the feature. Grass and vegetation at the base of feature, notably greener in the depression along with some tin scrap metal. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	5			
0.15 – 0.30	4			
0.30 – 0.45	5			
0.45 – 0.60	7			
0.60 – 0.75	1R			
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML05	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML06-WML16

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Refer to spreadsheet for details on each feature.	The base of these features were prodded/rammed with a 6t backhoe and all appeared firm and unyielding. There exists low risk of voids opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1-3 x 1-3 x 0.1-0.3 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: n/a	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Series of small minor depressions, including shallow scratching, Costean, and depressions, typically almost imperceptible from the natural landscape. Ground surface is covered with quartz pieces. Grass and vegetation at the base of features, typically notably greener in the depressions. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Features pose no risk.

FEATURE WML18

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341967 Longitude: 116.678511	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 16 x 1.3 x 0.2 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: n/a	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Long narrow and shallow Costean with some spoil to the east of the feature. Grass and vegetation at the base of feature. Ground conditions at the surface around the opening and base of the feature are generally good as evidenced by excavator ramming and DCP refusal. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Red clayey gravel soils and crushed rock pieces.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	R	R		
0.15 – 0.30				
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML18	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML21

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338739 Longitude: 116.678767	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 9.5 x 10.4 x 0.4 Approximate Volume (m³): 20 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is covered with low lying grass.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a shallow depression between spoil piles. Surrounding ground surface is highly vegetated with some low lying grass, wildflowers, and small trees / shrubs. The base of the feature exhibits solid ground conditions as evidenced by DCP results. LiDAR scan was not undertaken.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	R	R		
0.15 – 0.30				
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML21	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

FEATURE Y-07

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	02/09/2024
Site Personnel:	SM, IG
Weather:	L 10 H 31. Sunny and clear. Light winds.

Coordinates	Sisturbance investigation:
Latitude: -28.341470 Longitude: 116.671372	Excavate base to determine any loose soils or false floors and ram base. The base of the feature was prodded/rammed after excavation with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 7 x 4 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: Surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified. Feature situated in a high and dry lying area.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and small trees/shrubs surround the feature. Potential rabbit burrows have been identified within the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Potentially backfilled feature. Loose soil identified in base. Small quartz rock spoil pile situated to the North. Quartz pieces on ground surface. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Top 0.6 m of loose soils. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Rock evidenced on ground surface around the feature. Orange red clayey gravels.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1	8		
0.15 – 0.30	1	11R		
0.30 – 0.45	5			
0.45 – 0.60	5			
0.60 – 0.75	8			
0.75 – 0.90	21			
0.90 – 1.05	14			
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-07	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-13

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333860 Longitude: 116.680066	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1 x 1 x 0.1 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and the surrounding area is relatively free of vegetation.
Description / comments / observations:	Noxious / flammable gas readings:
Indiscernible feature from surrounding landscape. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	7	5		
0.15 – 0.30	12	9		
0.30 – 0.45	R	R		
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-13	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-17

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338177 Longitude: 116.675966	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.9 x 3.3 x 0.6 Approximate Volume (m³): 2 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature and side walls.
Description / comments / observations:	Noxious / flammable gas readings:
Small circular depression. Minor spoil pile surrounding and larger quartz pieces. Tin metal at the base of feature. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Situated adjacent to the access track. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravels.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	3			
0.15 – 0.30	3R			
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature Y-17	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-18

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338247 Longitude: 116.675801	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.8 x 1.8 x 0.2 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees/shrubs surround the feature and side walls.
Description / comments / observations:	Noxious / flammable gas readings:
Small circular almost indiscernible depression. Minor spoil pile surrounding and larger quartz pieces. Tin metal at the base of feature. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Situated adjacent to the access track. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk. Is as large as the natural landscape.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	3	R		
0.15 – 0.30	R			
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature Y-18	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-19


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336880 Longitude: 116.682244	<p>Excavation uncovered the presence of porcelain tiles, concrete clasts and builders' rubble backfilled in the base of the feature.</p> <p>The base of the feature was prodded/rammed after excavation with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.</p>
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.6 x 3.6 x 0.3 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	<p>No evidence of fauna detected within or surrounding the feature. Ground surface at base and around the feature is relatively covered with low lying grass.</p>
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a shallow depression with potential for a false floor. However, very little amount of spoil surrounding the feature. Tin scrap metal and some household debris hidden in the base of the feature. The vegetation in the base is greener and thicker than surrounding landscape.</p> <p>Surrounding ground surface is moderately vegetated with some low lying grass, wildflowers, and small trees / shrubs. Small spoil pile around the perimeter of the feature. Scrap tin metal, broken glass and rock pieces in the waste piles.</p> <p>The base of the feature exhibits potential for a false floor. DCP not undertaken due to risk that base may give way.</p> <p>LiDAR scan was not undertaken.</p>	<p>CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm</p>
Rock mass / soil profile comments:	Preliminary remediation recommendations:
<p>No visible evidence of rocky outcrops. The ground surface comprises a thin layer of gravelly clay soils overlying rock.</p>	<p>No remediation required. Feature poses no risk.</p> <p>The desktop study suggested this may be an 18 m deep shaft, however it is unlikely it reached this depth.</p>

PHOTOGRAPHS



Figure 1

	Feature Y-19	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE Y-20

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333857 Longitude: 116.679963	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1 x 1 x 0.1 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and the surrounding area is relatively free of vegetation.
Description / comments / observations:	Noxious / flammable gas readings:
Indiscernible feature from surrounding landscape. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	5			
0.15 – 0.30	12			
0.30 – 0.45	R			
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-20	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-22


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.335812 Longitude: 116.678604	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 33 x 0.6 x 0.1-0.2 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees/shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Remediated Costean narrow and shallow, small spoil pile situated to the east of the feature. No DCP undertaken due to visible rock. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Rock fabric evident in base of feature. Red clayey gravel soils.	No remediation required. Feature poses no risk.

PHOTOGRAPHS



Figure 1

	Feature Y-22	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24



CATEGORY 2



FEATURE S0113273

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342076 Longitude: 116.677739	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 4.2 x 2.6 x 1 deep Approximate Volume (m³): 5-8 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a square shaped scratching with near vertical rock walls from the ground surface. A small spoil pile is situated to the west of the feature.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>Base of feature is relatively soft for the first 2.1 m before hard ground is encountered based on DCP test results and excavation with a backhoe.</p> <p>No LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor rock mass quality. Near vertical walls. Red clays and gravels at the ground surface.	Geotextile line and backfill with soil plug.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	1			
0.30 – 0.45	1			
0.45 – 0.60	1			
0.60 – 0.75	1			
0.75 – 0.90	1			
0.90 – 1.05	1			
1.05 – 1.20	1			
1.20 – 1.35	3			
1.35 – 1.50	2			
1.50 – 1.65	1			
1.65 – 1.80	3			
1.80 – 1.95	4			
1.95 – 2.10	5R			

PHOTOGRAPHS



Figure 1

	Feature S0113273	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113282


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336046 Longitude: 116.677533	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 4.5 x 2.7 x 0.7 deep Approximate Volume (m³): 2-5 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Rectangular feature. Base is filled with large pieces waste rock and vegetation and appears loose. Significant sized spoil pile size around the feature from size of depression. No DCP undertaken due to visible rock. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible rocky outcrops.	Blade in spoil surrounding the feature which may be suitable for re-use as backfill and rehabilitate.

PHOTOGRAPHS



Figure 1

	Feature S0113282	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113287

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.340167 Longitude: 116.676010	The base of the feature was prodded/rammed and excavated with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 26 x 1.9 x 1.6 (at deepest) Approximate Volume (m³): 35-45 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on high and dry lying ground; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees / shrubs surround the feature. The vegetation is denser surrounding the costean and along the spoil piles.
Description / comments / observations:	Noxious / flammable gas readings:
Costean shaped feature with mine rock waste spoil piles surrounding it. Feature Y-01 is a costean spoil pile. Ground conditions at the base of the feature are generally good, as evidenced by DCP results. Trees / shrubs cover the feature base and surrounding spoil piles. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	Waste rock spoil piles may be suitable for re-use as fill material elsewhere on site. No remediation required. Feature poses no risk. Alternatively, blade spoil piles into feature to flatten slopes.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	2	3	7	R
0.15 – 0.30	7	25	R	
0.30 – 0.45	R	R		
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature S0113287	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113305


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Notes for disturbance investigation:
Latitude: -28.338732 Longitude: 116.679810	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 7 x 4 x 1 Approximate Volume (m³): 25-30 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface at base and around the feature is covered with low lying grass and shrubbery.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a deeper costean with relatively steep walls. There is very little to no spoil surrounding the feature. The vegetation in the base is greener and thicker than surrounding landscape and there are some dead tree trunks within. Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs. The base of the feature is hard as evidenced by shallow refusal of the DCP. LiDAR scan was not undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass observed from the surface and western wall of the feature. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Blade perimeter to soften edges or backfill. Sides are reasonably steep.

PHOTOGRAPHS



Figure 1

	Feature S0113305	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE S0113311

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333461 Longitude: 116.680101	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1 x 3.1 x 0.55 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature and side walls.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Small shallow depression. Minor spoil pile surrounding and small amounts of quartz pieces surrounding the feature. Backfilled with surface runoff materials (fine grained, fills all void space). Base of feature comprises some red clayey gravels.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results.</p> <p>No LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	2			
0.15 – 0.30	2			
0.30 – 0.45	0			
0.45 – 0.60	1			
0.60 – 0.75	1			
0.75 – 0.90	12			
0.90 – 1.05	8			
1.05 – 1.20	4			
1.20 – 1.35	8			
1.35 – 1.50	10			
1.50 – 1.65	7			
1.65 – 1.80	7			
1.80 – 1.95	5			
1.95 – 2.10	5			
2.10 – 2.25	1			
2.25 – 2.40	5			
2.40 – 2.55	7			
2.55 – 2.70	6			
2.70 – 2.85	6			
2.85 – 3.00	4			
3.00 – 3.15	8			

PHOTOGRAPHS



Figure 1

	Feature S0113311	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113315

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.335372 Longitude: 116.678789	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 6 x 1 x 0.6 deep Approximate Volume (m³): 3-4 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Southern end of a rehabilitated / backfilled trench. Spoil pile situated to the north / unrehabilitated section of the trench.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results.</p> <p>No LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.8% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	Blade in surrounding spoil material to rehabilitate remaining portion of the trench.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	2	4		
0.15 – 0.30	10R	R		
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature S0113315	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113323


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336605 Longitude: 116.677561	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 6.8 x 1.3 x 0.6 Approximate Volume (m³): 2.5 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Shallow costean. Small sized spoil pile size to the north and south of the feature. Ground surface is covered with some quartz pieces.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by rock fabric in base.</p> <p>No DCP undertaken due to visible rock.</p> <p>LiDAR scan not undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass evidenced to southern end of trench. Red clayey gravel soils.	No remediation required. Feature poses no risk. Or blade in sides to soften the feature walls.

PHOTOGRAPHS



Figure 1

	Feature S0113323	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113336

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.340041 Longitude: 116.675990	Inaccessible for backhoe to ram.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 26.0 x 3 x 0.9 deep Approximate Volume (m³): 35 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on high and dry lying ground; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees / shrubs surround the feature. The vegetation is denser surrounding the costean.
Description / comments / observations:	Noxious / flammable gas readings:
Costean shaped feature with mine rock waste spoil piles surrounding it. Ground conditions at the base of the feature are generally good, as evidenced by DCP results. Trees / shrubs cover the feature base and surrounding spoil piles. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	Waste rock spoil piles may be suitable for re-use as fill material elsewhere on site. No remediation required. Feature poses no risk. Alternatively, blade spoil piles into feature to flatten slopes.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	5	12	5	
0.15 – 0.30	7	R	R	
0.30 – 0.45	R			
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113336		
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE WML02


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336973 Longitude: 116.676042	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.2 x 2 x 0.3 Approximate Volume (m³): 1-2 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small circular depression surrounded by large L shaped spoil pile of size 15 x 9 x 1.5 high No DCP undertaken due to water pipeline nearby. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk. Or blade in to soften edges.

PHOTOGRAPHS



Figure 1

	Feature WML02	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML04

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.337198 Longitude: 116.675617	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 16 x 1.3 x 0.35 Approximate Volume (m³): 5 Depth to groundwater (m): n/a Hydrological Features: A creek bed runs and joins to the south of the feature. Any fill placed may be washed away.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Shallow costean with minor spoil heaps on either side of the feature. Grass and vegetation at the base of feature. Ground conditions at the base of the feature are generally good, as evidenced by DCP results and auger refusal near the surface indicates hard ground conditions around the feature. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops.	No remediation required. Feature poses no risk.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	R			
0.15 – 0.30				
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature WML04	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML17


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341864 Longitude: 116.678164	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 22 x 1.3 x 0.1-0.7 deep Approximate Volume (m³): 5-8 Depth to groundwater (m): n/a Hydrological Features: n/a	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Long narrow and shallow Costean with some spoil around the feature. Grass and vegetation at the base of feature. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by visible rock on ground surface. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Red clayey gravel soils and crushed rock pieces.	No remediation required. Feature poses no risk.

PHOTOGRAPHS



Figure 1

	Feature WML17	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE WML19

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341939 Longitude: 116.677497	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 5.7 x 3.1 x 0.5 Approximate Volume (m³): 5 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively covered with low lying grass.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a shallow rectangular scratching. Rock is visible on the northern wall and is oriented approx 70-80 degrees to the horizontal.</p> <p>Surrounding ground surface is moderately vegetated with some low lying grass, wildflowers, and small trees / shrubs.</p> <p>The base of the feature exhibits relatively good ground conditions as evidenced by visible rock, excavator refusal and DCP results.</p> <p>LiDAR scan was not undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	No remediation required. Feature poses no risk. Large waste rock stockpile to the north which may be suitable for re-use as fill material elsewhere.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	4			
0.15 – 0.30	1R			
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML19	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE WML20

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341855 Longitude: 116.677394	Unable to access to ram with excavator.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.1 x 1.8 x 0.3 Approximate Volume (m³): 1-2 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively covered with low lying grass.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a shallow scratching. Rock is visible on the southern wall.</p> <p>Surrounding ground surface is moderately vegetated with some low lying grass, wildflowers, and small trees / shrubs.</p> <p>The base of the feature exhibits relatively good ground conditions as evidenced by visible rock and DCP results. LiDAR scan was not undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Do not rehabilitate. Large waste rock stockpile to the north may be suitable for re-use as fill elsewhere.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	4R			
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature WML20	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE WML22

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336671 Longitude: 116.680434	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.5 x 2.6 (brim) 1,8 x 1.8 of the shaft x 0.6 deep. Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is covered with low lying grass.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a small rectangular depression with a spoil pile around the brim and rock near vertical side walls.</p> <p>Surrounding ground surface is somewhat vegetated with some low lying grass, wildflowers, and small trees / shrubs.</p> <p>The base of the feature exhibits poor ground conditions and 2 m of loose soils are present as evidenced by low DCP blow count results. Excavation revealed stable base conditions.</p> <p>LiDAR scan was not undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Rock visible in walls of the feature. Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Backfill with surrounding spoil.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	2			
0.30 – 0.45	1			
0.45 – 0.60	0			
0.60 – 0.75	0			
0.75 – 0.90	4			
0.90 – 1.05	0			
1.05 – 1.20	2			
1.20 – 1.35	3			
1.35 – 1.50	2			
1.50 – 1.65	3			
1.65 – 1.80	0			
1.80 – 1.95	1			
1.95 – 2.10	3			
2.10 – 2.25	5			
2.25 – 2.40	R			

PHOTOGRAPHS



Figure 1

	Feature WML22	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

FEATURE WML23


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341971 Longitude: 116.678025	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 17.5 x 1.5 x 0.1-0.7 deep Approximate Volume (m³): 5 Depth to groundwater (m): n/a Hydrological Features: n/a	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Small Costean with some spoil heaps to the eastern and western side of the feature. Grass and vegetation at the base of feature, along with hard rock visible.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by visible rock on ground surface.</p> <p>No LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Hard rock identified within base of costean. Red clayey gravel soils.	Blade existing waste spoil material into the trench.

PHOTOGRAPHS



Figure 1

	Feature WML23	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE Y-09

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.334773 Longitude: 116.679246	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.3 x 3.1 x 0.4 Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular small depression of a feature surrounded by very small sized spoil piles. Ground conditions base of the feature comprise top 1.2 m of softer material before hard ground is encountered. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk. Or blade over to soften the edges. Spoil piles around the feature may be suitable for re-use as backfill.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	1			
0.15 – 0.30	2			
0.30 – 0.45	2			
0.45 – 0.60	8			
0.60 – 0.75	5			
0.75 – 0.90	3			
0.90 – 1.05	4			
1.05 – 1.20	4			
1.20 – 1.35	4R			
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-09	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE Y-16

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.337781 Longitude: 116.676662	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 4.2 x 3.3 x 0.4 Approximate Volume (m³): 2 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on the middle of a slope; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass and wildflowers, and trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Small minor depression. Minor spoil pile surrounding. Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by DCP results. Situated adjacent to the access track. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
No visible evidence of rocky outcrops. Red clayey gravel soils.	No remediation required. Feature poses no risk. Or blade in edges to soften sides.

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	2			
0.15 – 0.30	4			
0.30 – 0.45	6			
0.45 – 0.60	R			
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-16	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24



CATEGORY 3



FEATURE S0113283

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	02/09/2024
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.339836 Longitude: 116.673552	Feature is too narrow to ram with backhoe.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 10 x 2 (at widest) x 1 (at narrowest) x 3 deep. Approximate Volume (m³): 30-40 Depth to groundwater (m): n/a Hydrological Features: The feature is high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Feature walls covered by wildflowers, grass and. Ground surface covered by grass, and medium trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Narrow trench like feature with steep near vertical walls. Base of feature filled with waste soil and rock pieces with some tin scrap metal. Spoil pile 1 m high located to the southern and western wall of the feature.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, and comprise rock – DCP testing not undertaken.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.8% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate rock mass quality. Red silty gravel soils.	Likely to be a surficial scratching. Carve out side walls to create dome shape, line with high strength geotextile and backfill with spoil material that may be suitable for re-use.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113283	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

3D LIDAR SCANS

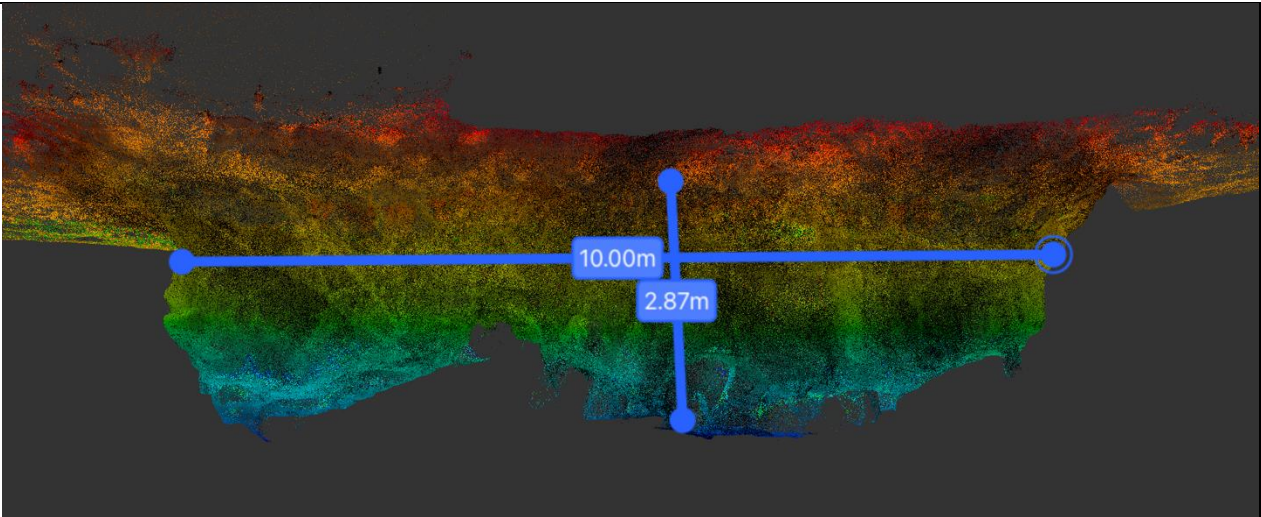


Figure 1

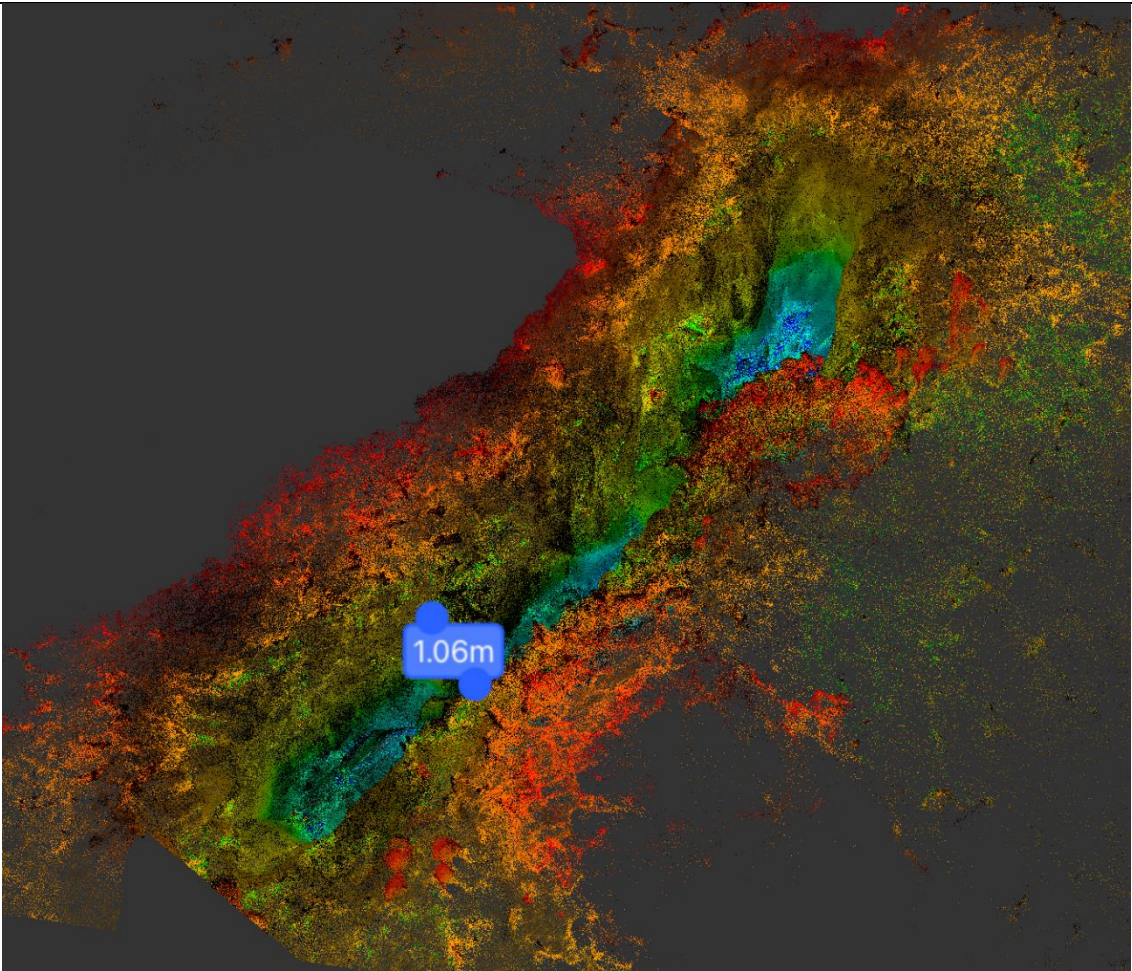



Figure 2

	Feature S0113283	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE Y-23


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.336020 Longitude: 116.678406	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.1 x 3 x 1.6 deep. Approximate Volume (m³): 5-7 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and some small trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
<p>Rectangular feature with near vertical rock walls from the surface. Void dips down at 45 degrees to the south and extends > 1.5 m beyond what is visible as evidenced by DCP probing. Base is filled with waste rock and vegetation. No significant spoil pile size around the feature.</p> <p>Ground conditions at the surface around the opening and base of the feature are generally good, as evidenced by rock fabric in base. No DCP undertaken due to visible rock.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass. Near vertical rock walls of feature. Red gravelly clay soils.	Crumble / break down wall at top to collapse drive and backfill to rehabilitate.

PHOTOGRAPHS



Figure 1

	Feature Y-23	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

3D LIDAR SCANS

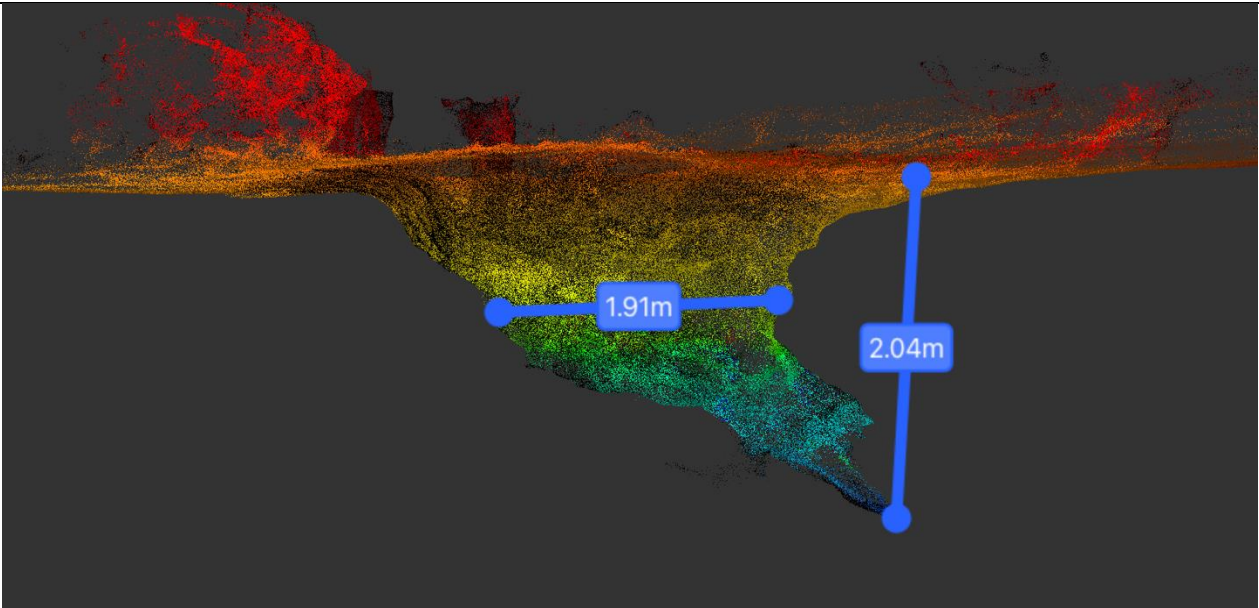



Figure 1

	Feature Y-23	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE Y-32


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338774 Longitude: 116.681031	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.8 x 3.4 x 1.8 deep Approximate Volume (m³): 5-7 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface at base and around the feature is covered with low lying grass and shrubbery. The surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a circular depression with potential for a false floor. There is some spoil piles surrounding the feature. The vegetation in the base is greener and thicker than surrounding landscape. Excavator ramming suggested hard base conditions. LiDAR scan was undertaken and shows this feature is a stope, the visible base is likely shallow and stable.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass. Walls of the feature are vertical. There exists approximately 0.5 m of spoil waste gravels overlying rock. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Break in to collapse drive and backfill. The desktop study suggests this may have been a shaft 11.5 m deep and may have a drive to the north connected to S0113338.

PHOTOGRAPHS



Figure 1

	Feature Y-32	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

3D LIDAR SCANS

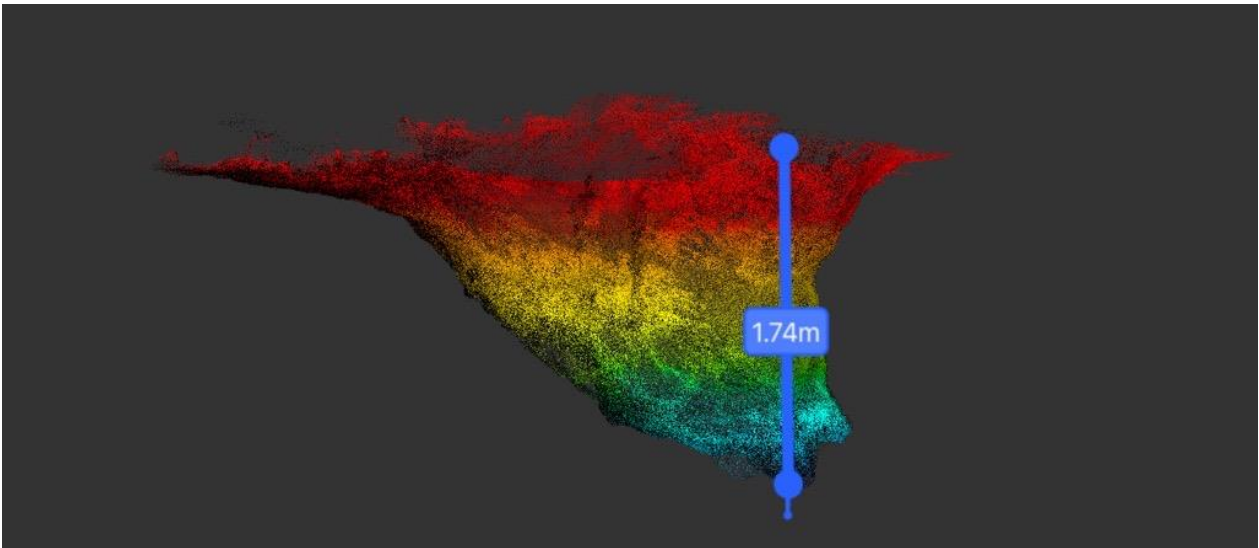



Figure 1

	Feature Y-32	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24



CATEGORY 4



FEATURE S0113278

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333771 Longitude: 116.680005	A shaft was uncovered during phase 2 works. The base of the feature was rammed after removing the dead tree branches apparently previously placed in the void, and appears firm, however, it appears the shaft may extend deeper. There is moderate risk of void collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2 x 1.2 x 2.5 Approximate Volume (m³): 5-8 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Tree / shrub branches fill the shaft to the brim. Ground surface covered by grass, and sparse vegetation surrounds the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular shaft feature filled with branches, tin scrap metal and waste gravel rock. Tree / shrub branches obscure view of base conditions at this stage. 1 m tall spoil pile surrounds the feature. Ground conditions at the surface around the opening of the feature are generally good, as evidenced by shallow borehole refusal. LiDAR scan undertaken after dead tree had been cleared out of the shaft.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass.	The shaft may have a false floor and risk of void collapse exists. Mirafi soil backfill plug.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113278	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

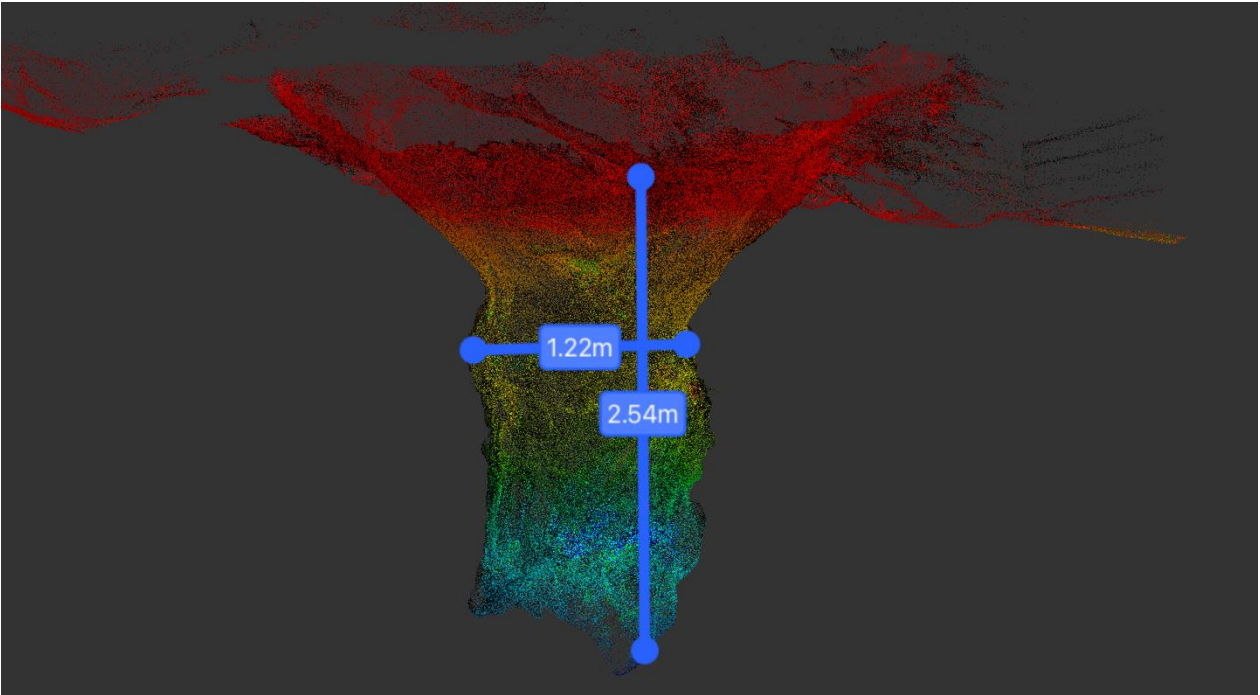


Figure 1

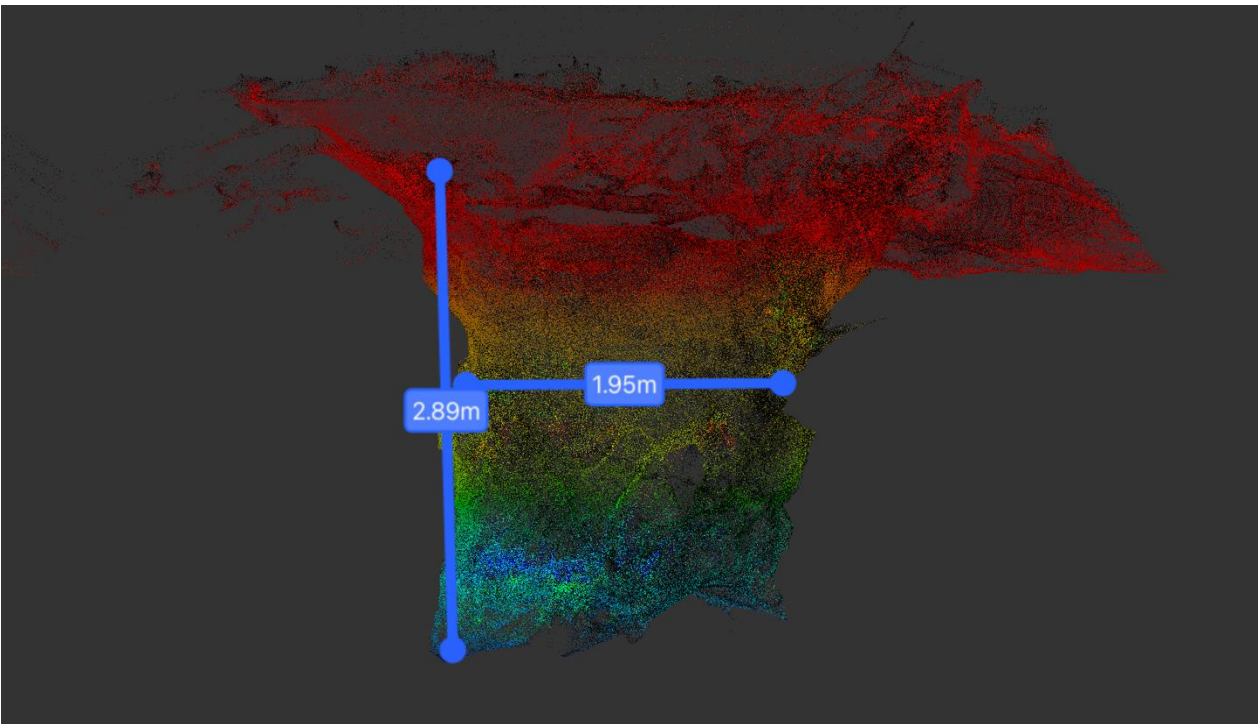



Figure 2

	Feature S0113278	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113285

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.339865 Longitude: 116.674022	The base of the feature was prodded/rammed with a 6t backhoe and appeared soft. There exists moderate risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.9 x 1.9 x 1.6 deep Approximate Volume (m³): 5-8 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by quartz, grass, wildflowers, and small trees / shrubs surround the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular shaft feature. Base is filled with waste crushed rock material and grass. DCP undertaken in base. Ground conditions at the surface around the opening are generally good, as evidenced by rock on surface. Very little spoil waste material surrounding the feature. LiDAR scan undertaken. There is a small drive however it doesn't extend more than 0.5 m.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Very poor and crumbly rock mass quality. Red clayey gravel soils.	Potentially mirafi plug soil backfill, dome out the feature to form a plug shape prior to backfill.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	0			
0.15 – 0.30	3			
0.30 – 0.45	8			
0.45 – 0.60	7			
0.60 – 0.75	12			
0.75 – 0.90	14			
0.90 – 1.05	17			
1.05 – 1.20	9			
1.20 – 1.35	14			
1.35 – 1.50	5			
1.50 – 1.65	7			
1.65 – 1.80	9			
1.80 – 1.95	19			
1.95 – 2.10	R			


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113285	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

3D LIDAR SCANS

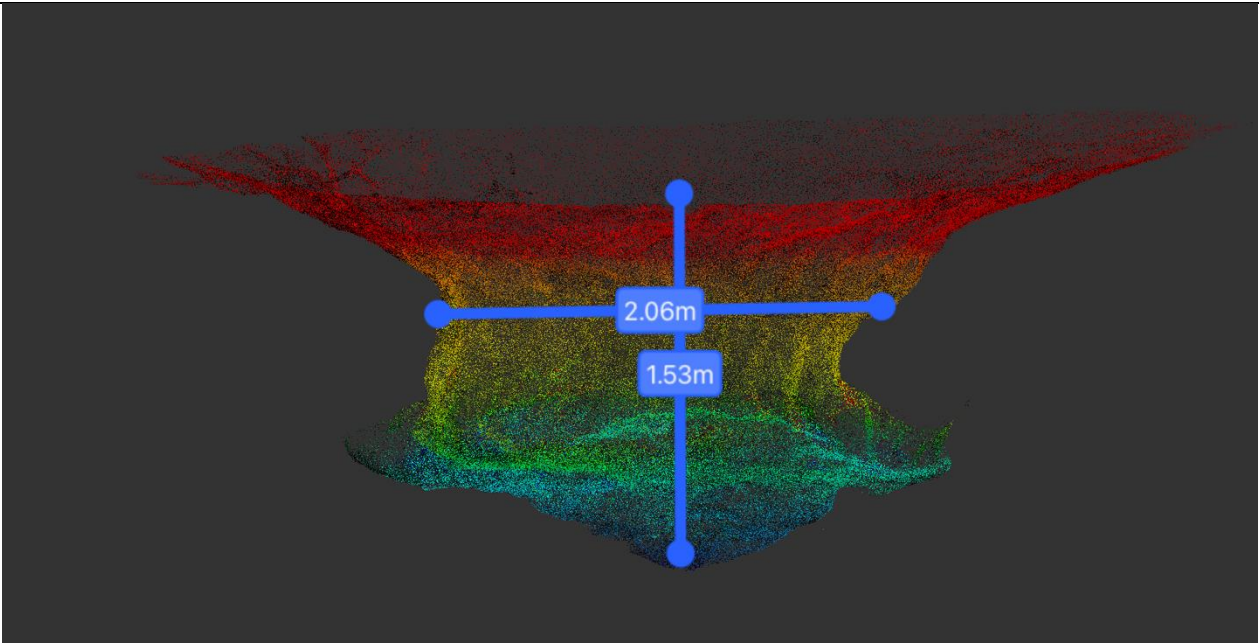



Figure 1

	Feature S0113285	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113296

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341896 Longitude: 116.678045	Shear sided rock – cannot ram with an excavator.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.3 x 2 x 3 Approximate Volume (m³): 7-10 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna within the feature. The feature is surrounded by trees / shrubs, low lying grass and small trees.
Description / comments / observations:	Noxious / flammable gas readings:
Approximately square in shape. Feature has a false floor. Potentially 60 m deep. Rubbish and loose soil, and vegetation in base of feature. Surrounding ground surface has some vegetation, with some small trees / shrubs. Rock evident from the ground surface. LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate rock mass quality. Near vertical walls.	Remove material from crest and backfill and cave in. Line with geotextile.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113296	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

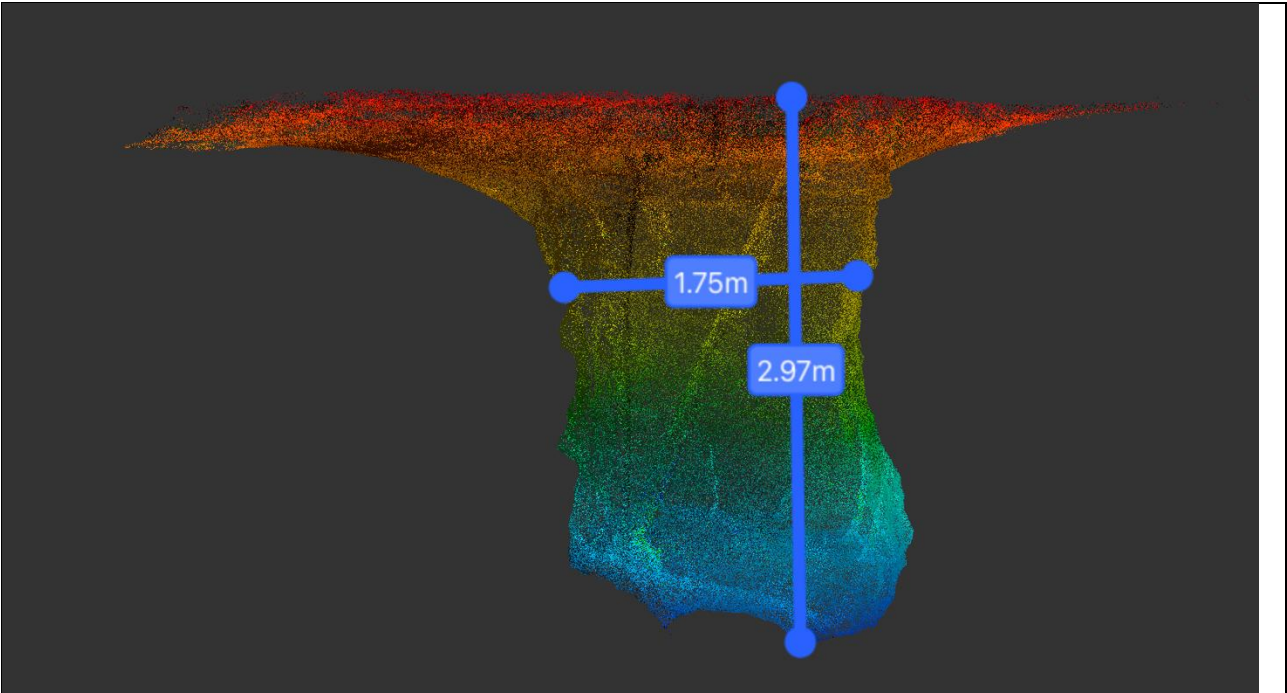


Figure 1

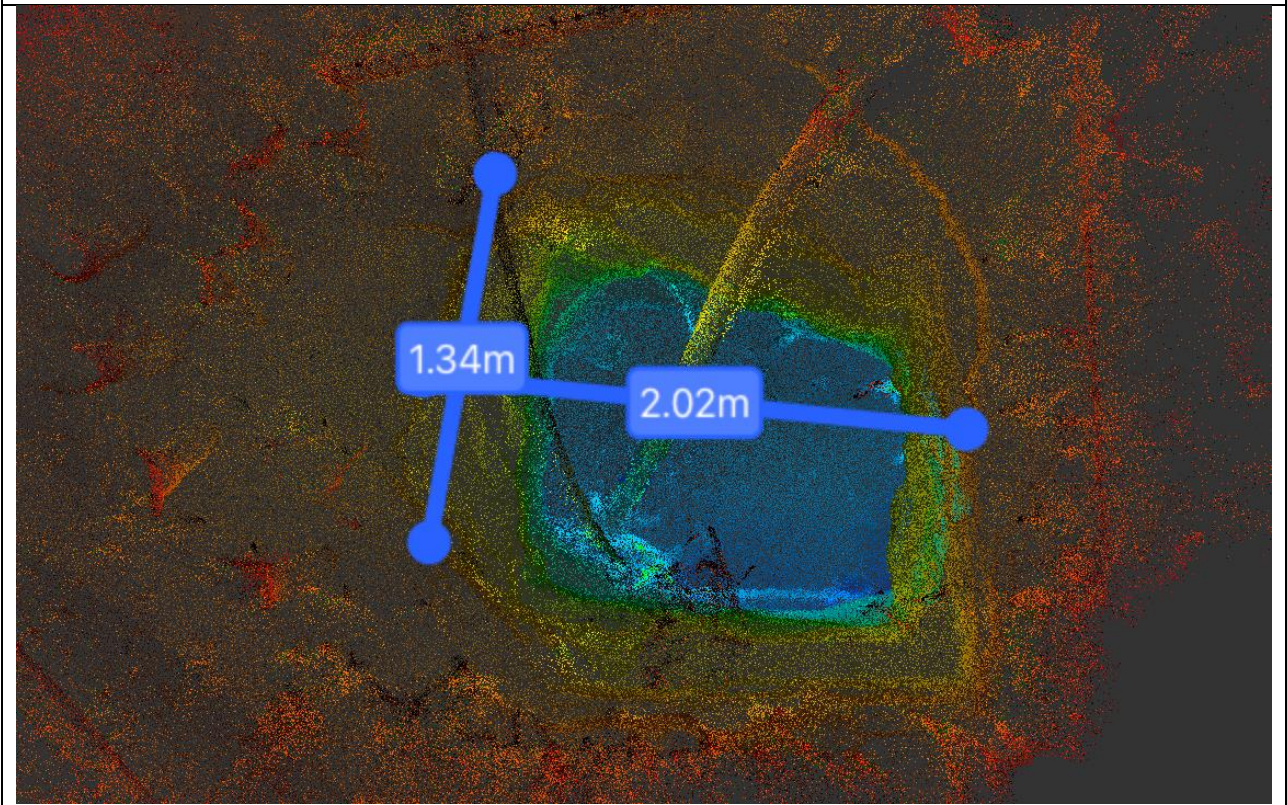



Figure 2

	Feature S0113296	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113308

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333705 Longitude: 116.680182	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse however presence of tin sheeting suggests the feature may have been much deeper in the past.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.9 m diameter x 1.8 m deep. Approximate Volume (m³): 15-18 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, minor vegetation surrounding the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular feature that bulges out at the base. The base is filled with waste rock sandy gravels and some tin sheet metal. Very small to no spoil around the feature. Ground conditions at the surface around the opening of the feature are generally good, as evidenced by shallow auger borehole refusal. LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Very poor rock quality mass. Near vertical walls.	Hollow out, dome and backfill with mirafi soil plug.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113308	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

3D LIDAR SCANS

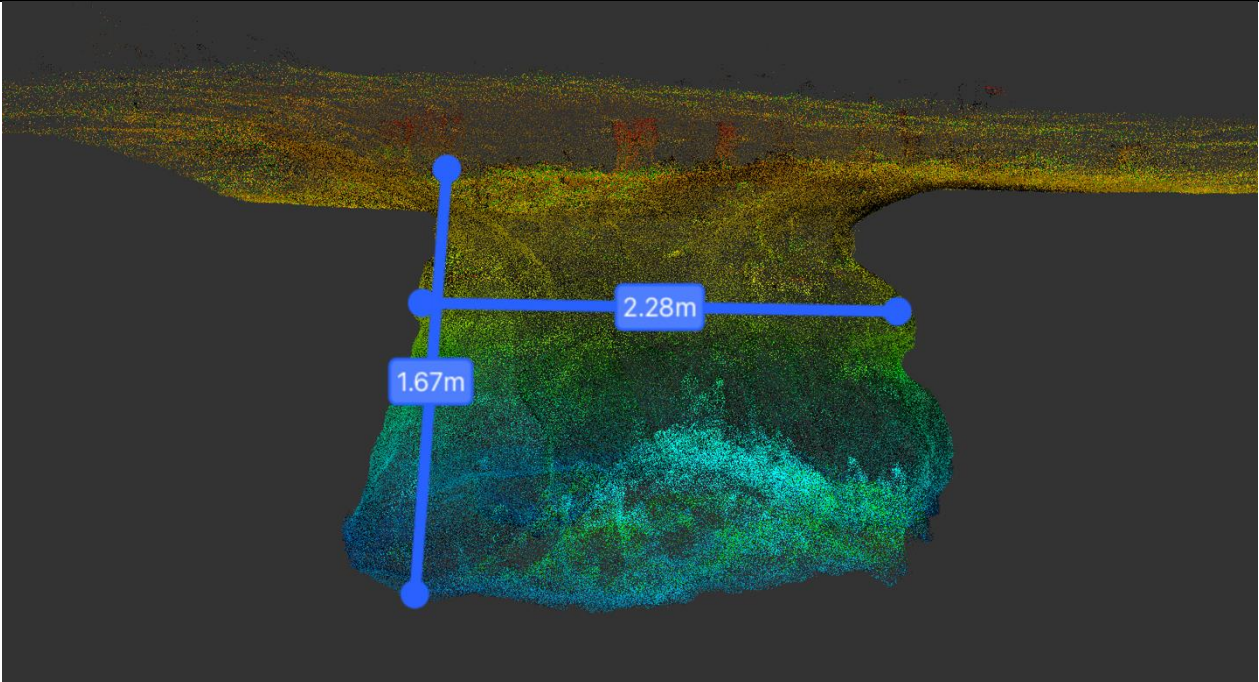



Figure 1

	Feature S0113308	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113338

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338191 Longitude: 116.680107	Too deep and steep & inaccessible for excavator to ram.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 5.7 x 6 x 2 Approximate Volume (m³): 35 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground around the feature is relatively free of vegetation and comprises waste spoil piles.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is an irregular shaped hole located amongst spoil piles and adjacent to the open pit.</p> <p>There is a potential for a false floor as the base is backfilled with soil.</p> <p>Surrounding ground surface is covered by spoil piles.</p> <p>The base of the feature exhibits potential for a false floor. DCP not undertaken due to risk false floor. LiDAR scan was undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate and hard quality rock mass. Walls of the feature are near vertical. The ground surface comprises a thin layer of gravelly clay spoil overlying rock.	<p>Potentially comprises an unstable base. Mirafi or concrete cone shaped plug?</p> <p>The desktop study suggests this may have been a shaft 10 – 15 m deep.</p>


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113338	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

3D LIDAR SCANS

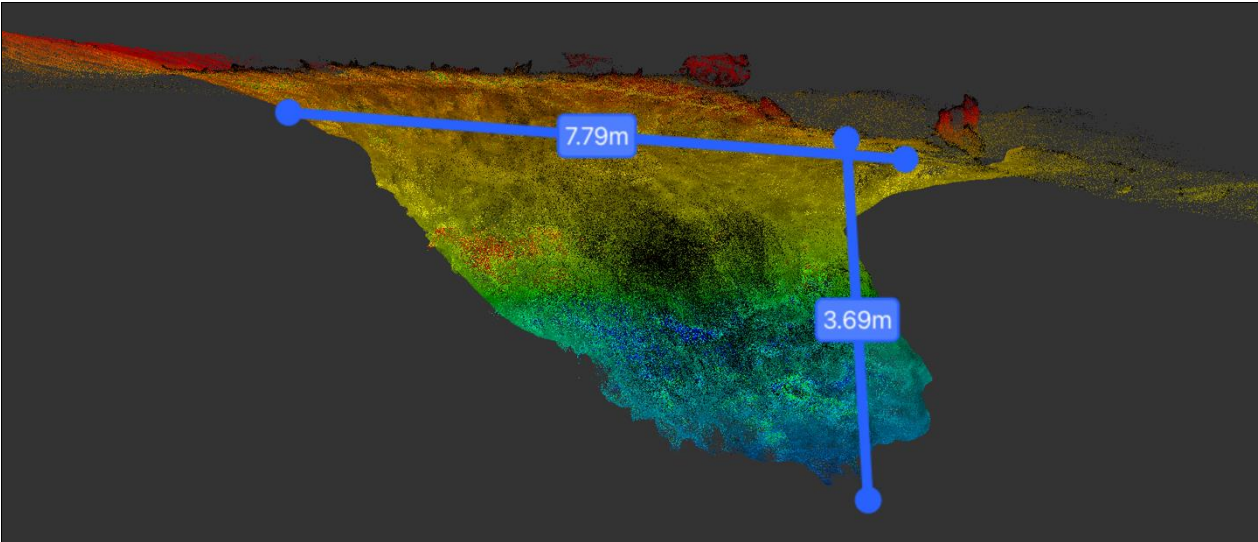


Figure 1

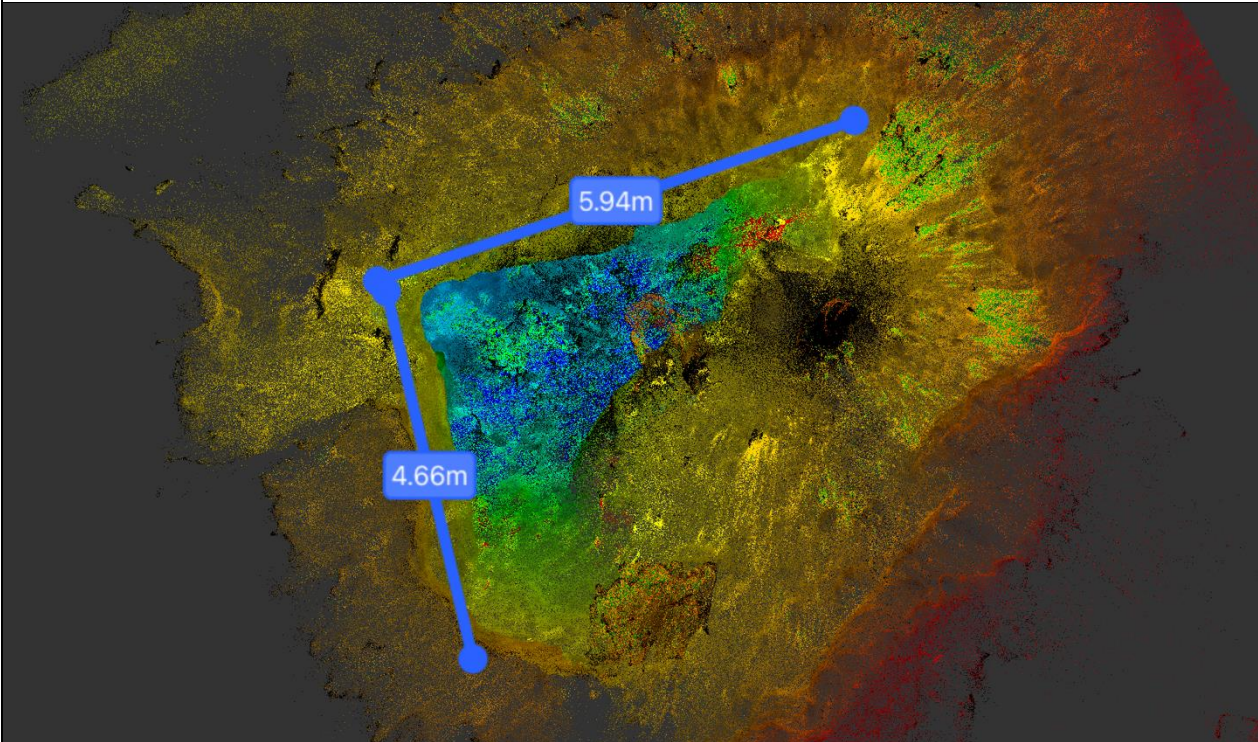



Figure 2

	Feature S0113338	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

FEATURE S0113823


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342231 Longitude: 116.678555	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.9 x 1.9 x 6 Approximate Volume (m³): 25 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface is relatively free of vegetation with some grass and some small trees / shrubs nearby the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Circular shaft feature that tapers and narrows down at depth. Rock from the surface of the feature. Base is filled with loose soil, rubbish and tin scrap metal. Surrounding ground surface is relatively free of vegetation, with some small trees / shrubs. LiDAR scan undertaken.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate rock mass quality. Near vertical walls. Red clay soils at the surface.	Dome out, high strength geotextile plug. Or concrete plug.

PHOTOGRAPHS



Figure 1

	Feature S0113823	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

3D LIDAR SCANS

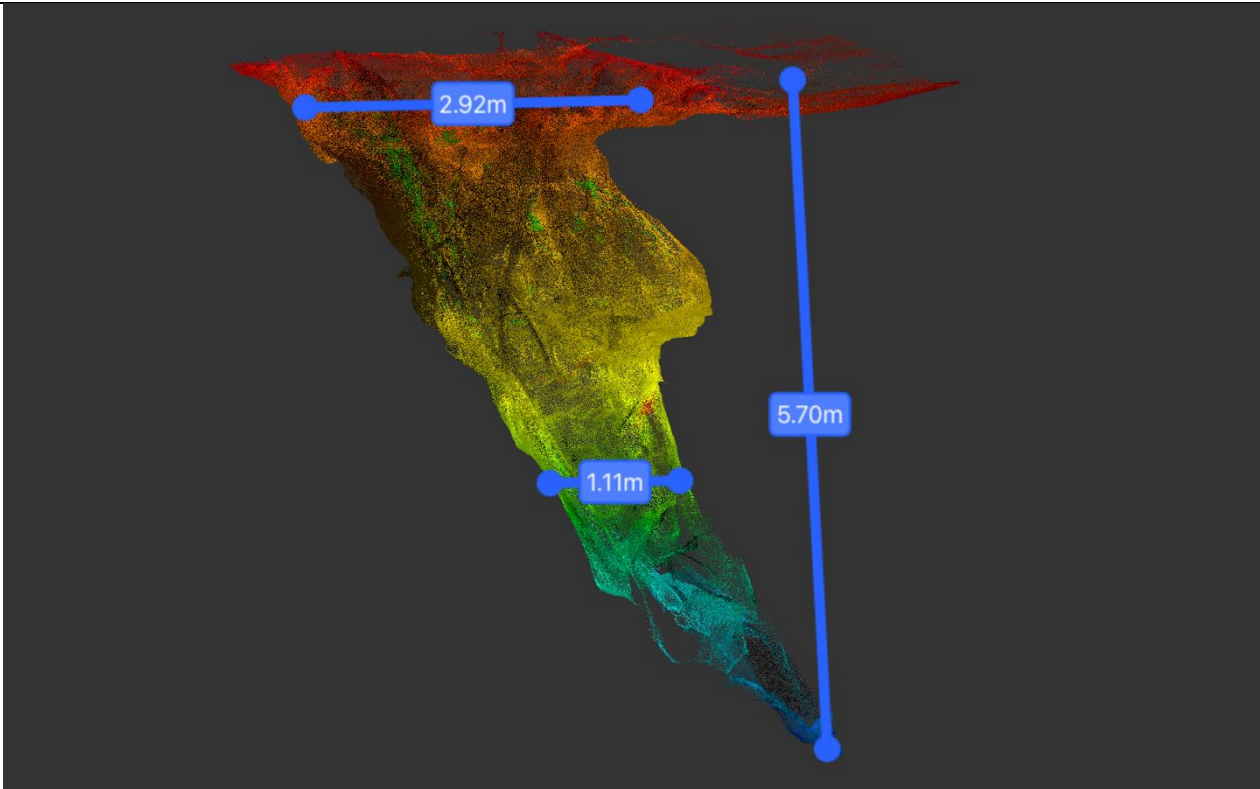



Figure 1

	Feature S0113823	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24



CATEGORY 5



FEATURE S0113274

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333776 Longitude: 116.680239	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists moderate risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.2 x 1.5 x 2.1 deep becoming deeper Approximate Volume (m³): 3-5 (excluding the drive) Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna or flora detected within or surrounding the feature. Ground surface covered by grass, and the ground surface is relatively free of vegetation surrounding the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Cylindrical feature with a hollow cave connected to feature S01453306. Base of feature is filled with rock waste. No spoil. There are two drives in opposite directions (one connected the S01453306). The opposite drive does not extend beyond the area scanned. Ground conditions at the surface around the opening of the feature are generally good, as evidenced by DCP results and auger refusal on the ground surface. LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Very poor quality rock mass.	Break out tunnel to collapse connected drive S01453306. Line with high strength geotextile, backfill on top to form plug.

SUMMARY OF FIELDWORK

Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	R			
0.15 – 0.30				
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113274	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

3D LIDAR SCANS

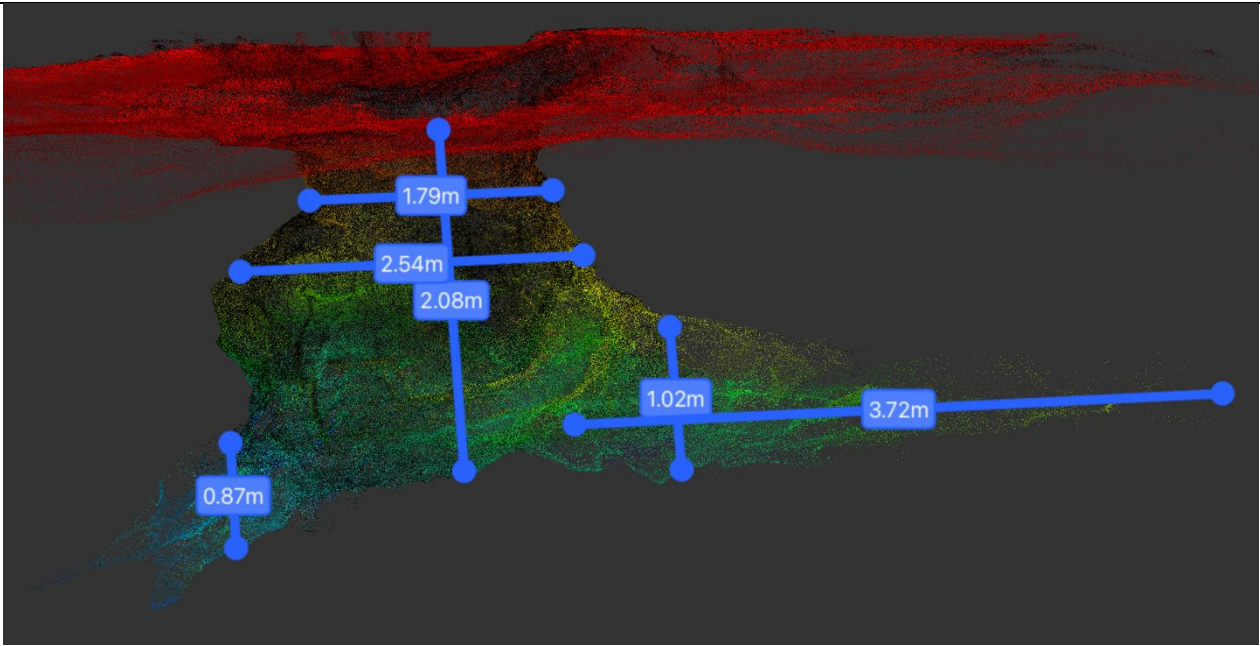


Figure 1

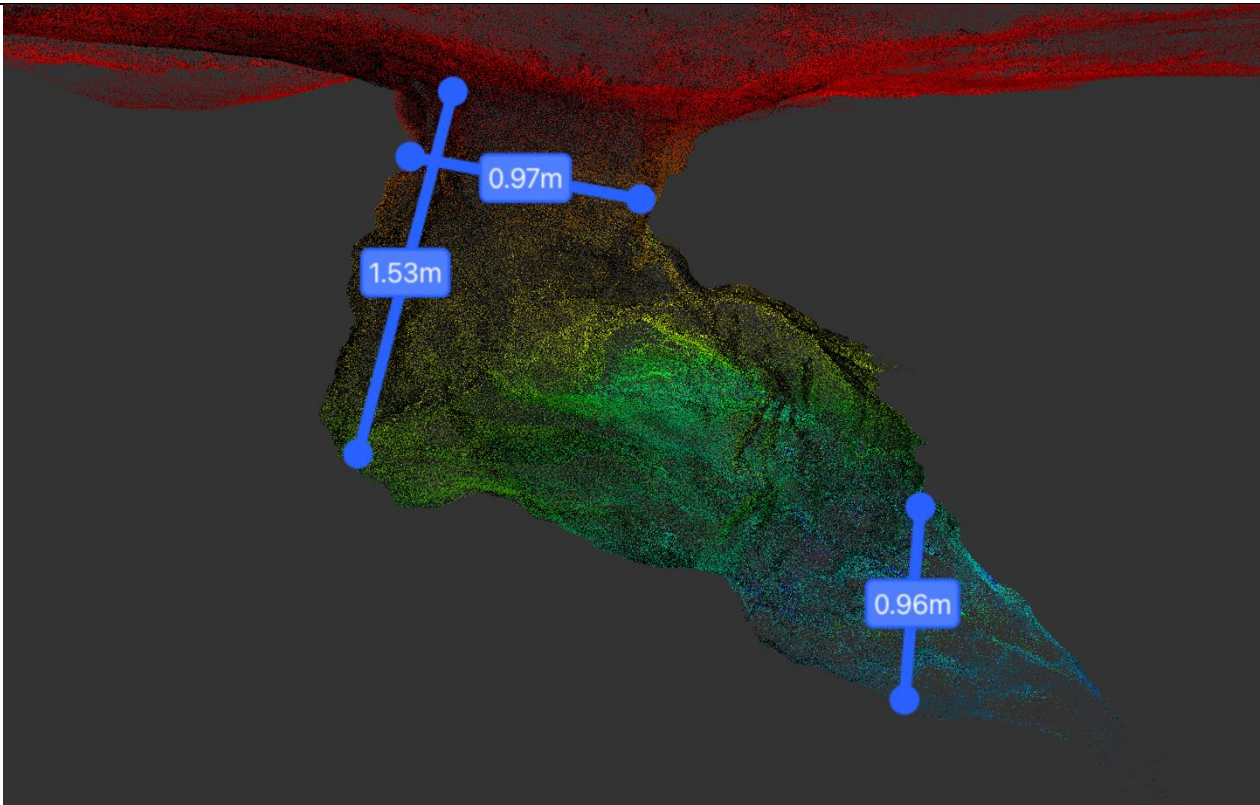



Figure 2

	Feature S0113274	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

3D LIDAR SCANS

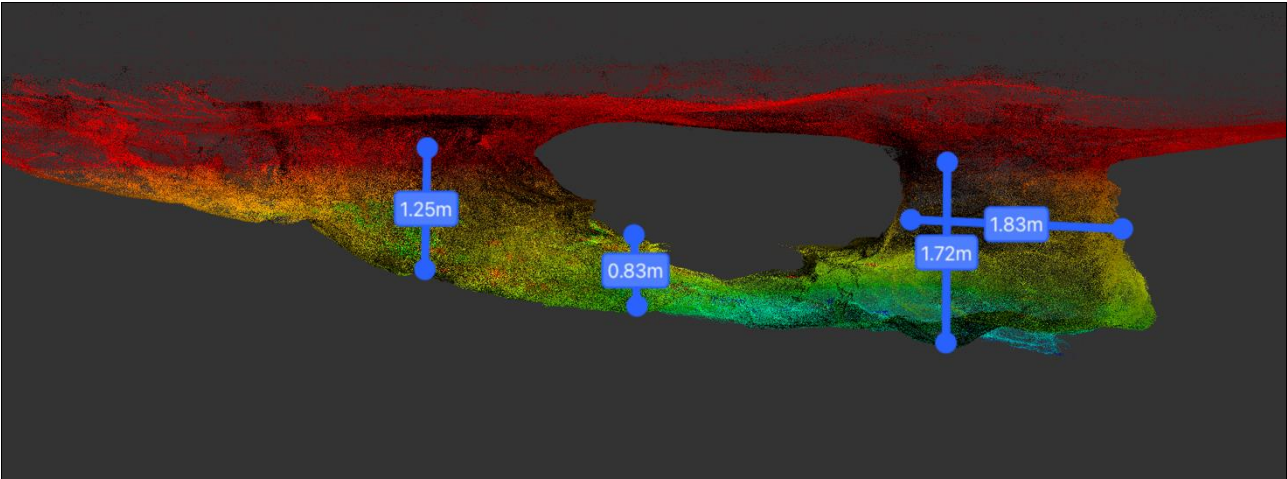


Figure 3

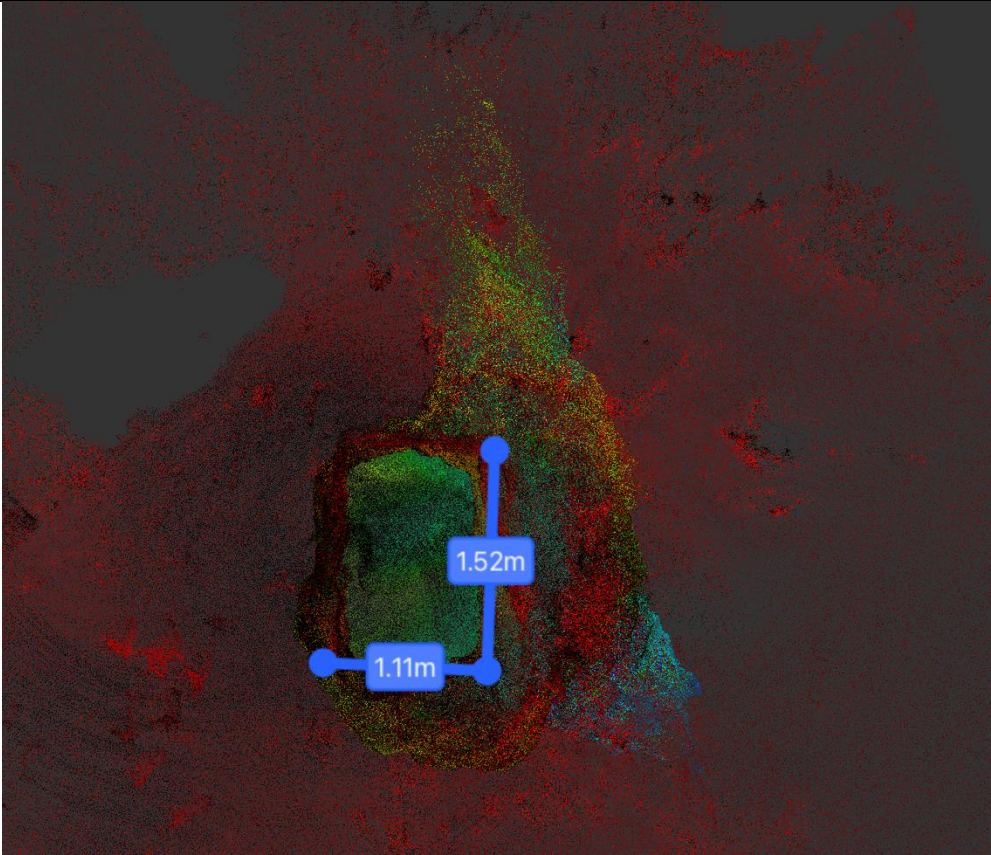



Figure 4

	Feature S0113274	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113306


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	2/9/24
Site Personnel:	SM, IG
Weather:	L 10 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.333822 Longitude: 116.680171	The base of the feature was prodded/rammed with a 6t backhoe and appeared firm and unyielding. There exists low risk of a void opening up / collapse.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 5 x 4.9 x 2 deep Volume (m³): 5-10 (excluding the drive) Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface covered by grass, and the ground surface is relatively free of vegetation surrounding the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Hollow cylindrical feature with a hollow cave connected to feature S0113274. Base of feature is filled with rock waste and vegetation. No spoil. Ground conditions at the surface around the opening of the feature are generally good, as evidenced by shallow borehole refusal. LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Very poor quality rock mass.	Break out tunnel to collapse connected drive. Line with high strength geotextile, backfill on top to form plug.

PHOTOGRAPHS



Figure 1

	Feature S0113306	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

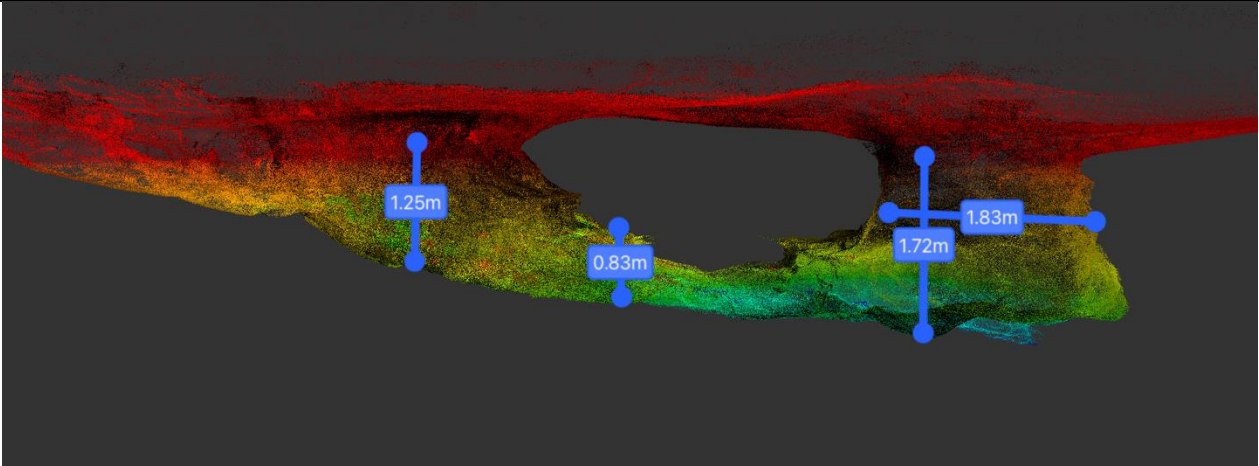


Figure 1

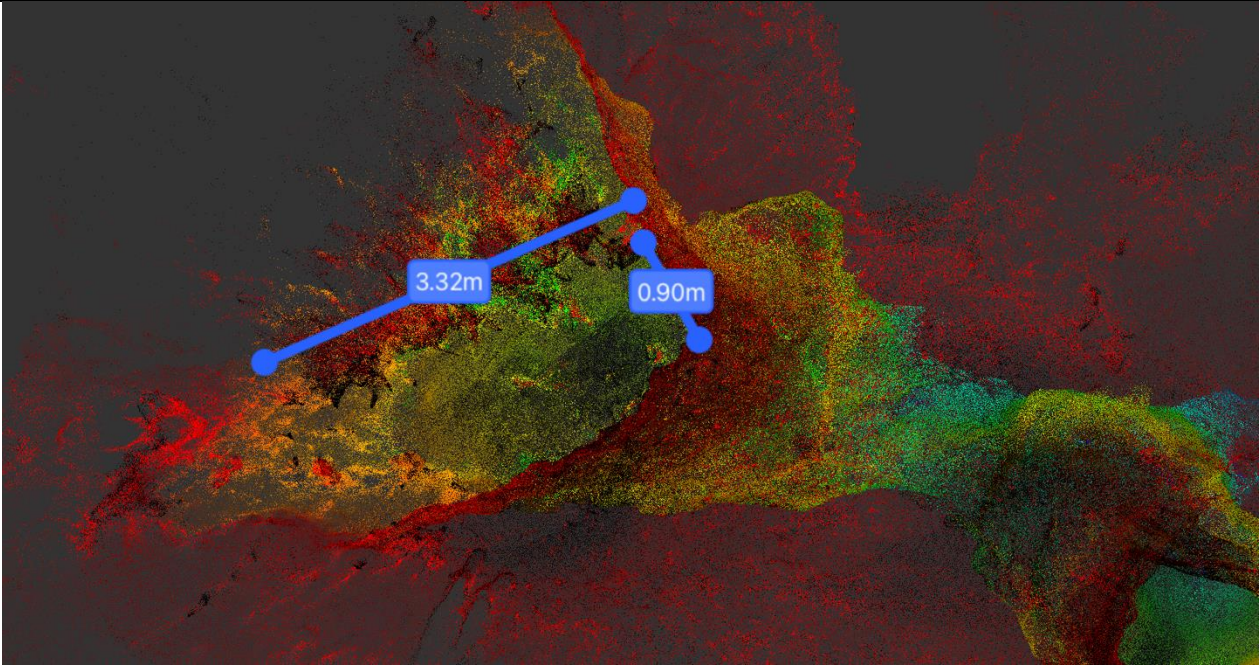



Figure 2

	Feature S0113306	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	2/9/24

FEATURE S0113334

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338352 Longitude: 116.679525	Too narrow to ram base with excavator and clear out.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 7 x 0.7 x 2.4 Approximate Volume (m³): 15-18 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground at side walls of the feature is covered with low lying grass. Trees / shrubs and some grass to the eastern side of feature along ground surface. Reasonably vegetated elsewhere.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a narrow trench with potential for a false floor. The LiDAR scans indicate lateral workings / drives dipping approx. 45 degrees to the west and 2.75 m bgl. There is no spoil surrounding the feature.</p> <p>Surrounding ground surface is somewhat vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>The base of the feature exhibits potential for a false floor. DCP not undertaken due to depth of feature.</p> <p>LiDAR scan was undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
<p>Poor quality rock mass. Walls of the feature are vertical.</p> <p>The ground surface comprises a thin layer of gravelly clay soils overlying rock.</p>	<p>Potentially comprises an unstable base and lateral workings based on LiDAR scans. Approx. 4 m deep excavation will be required to break out and cave the drive to the west followed by backfill.</p>

PHOTOGRAPHS

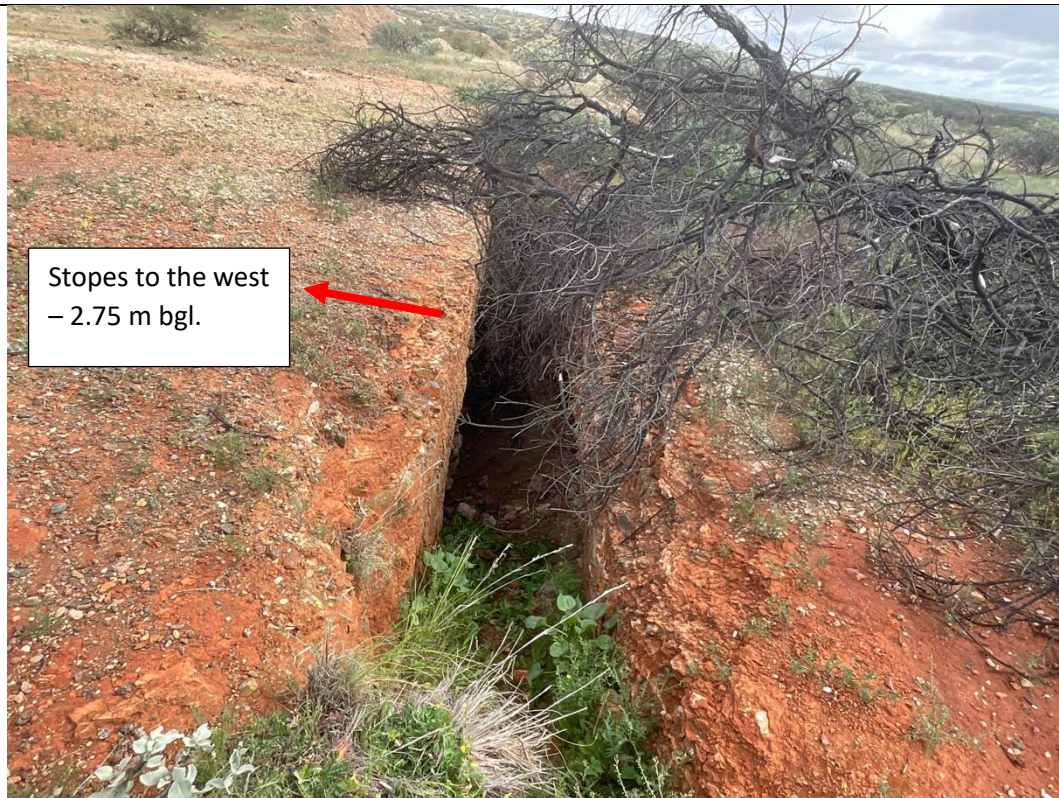



Figure 1

	Feature S0113334	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

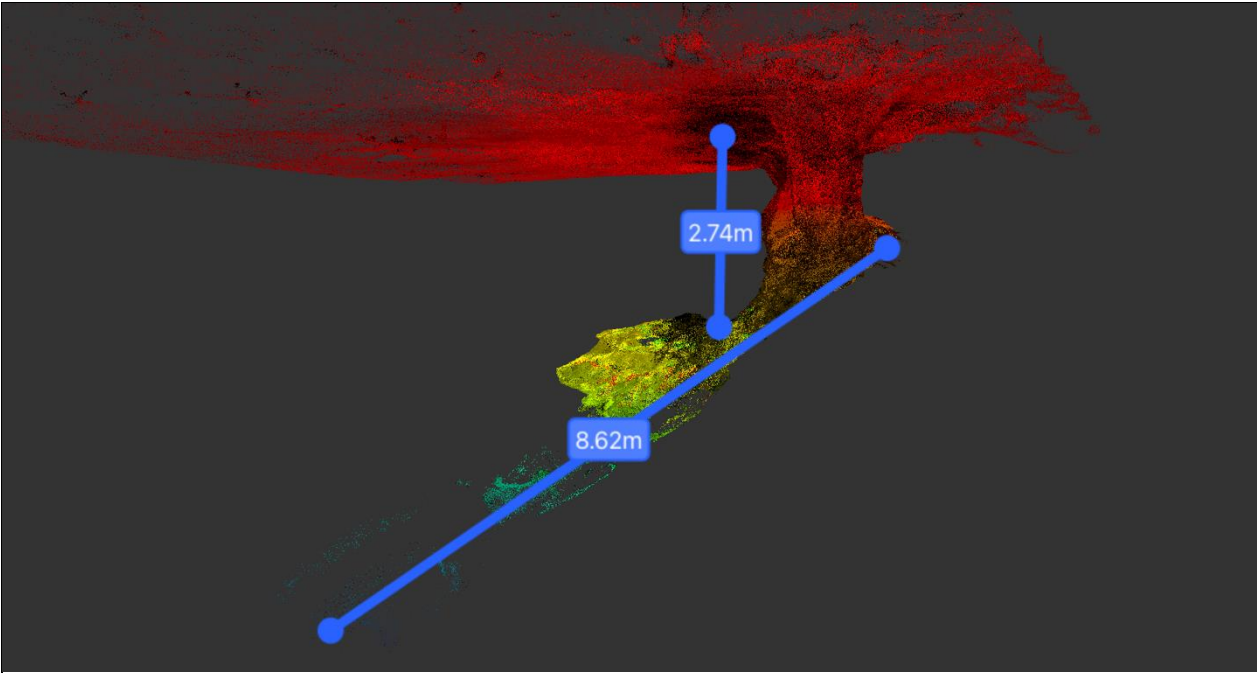


Figure 1

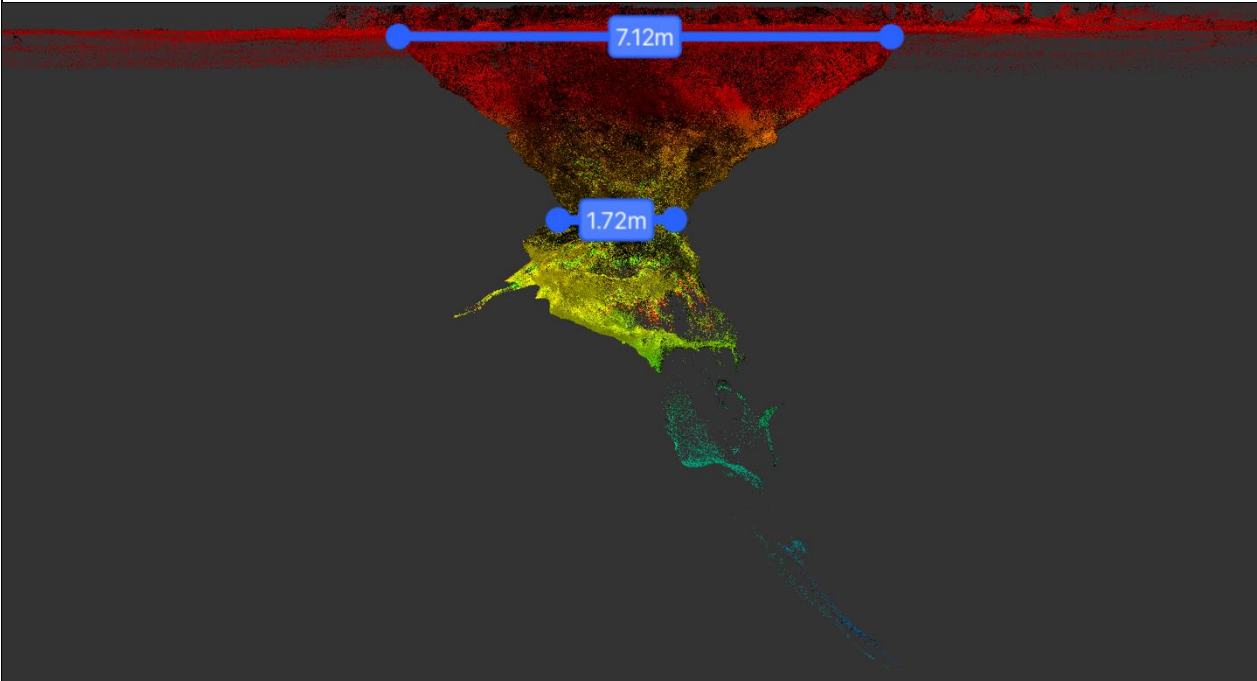



Figure 2

	Feature S0113334	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

3D LIDAR SCANS

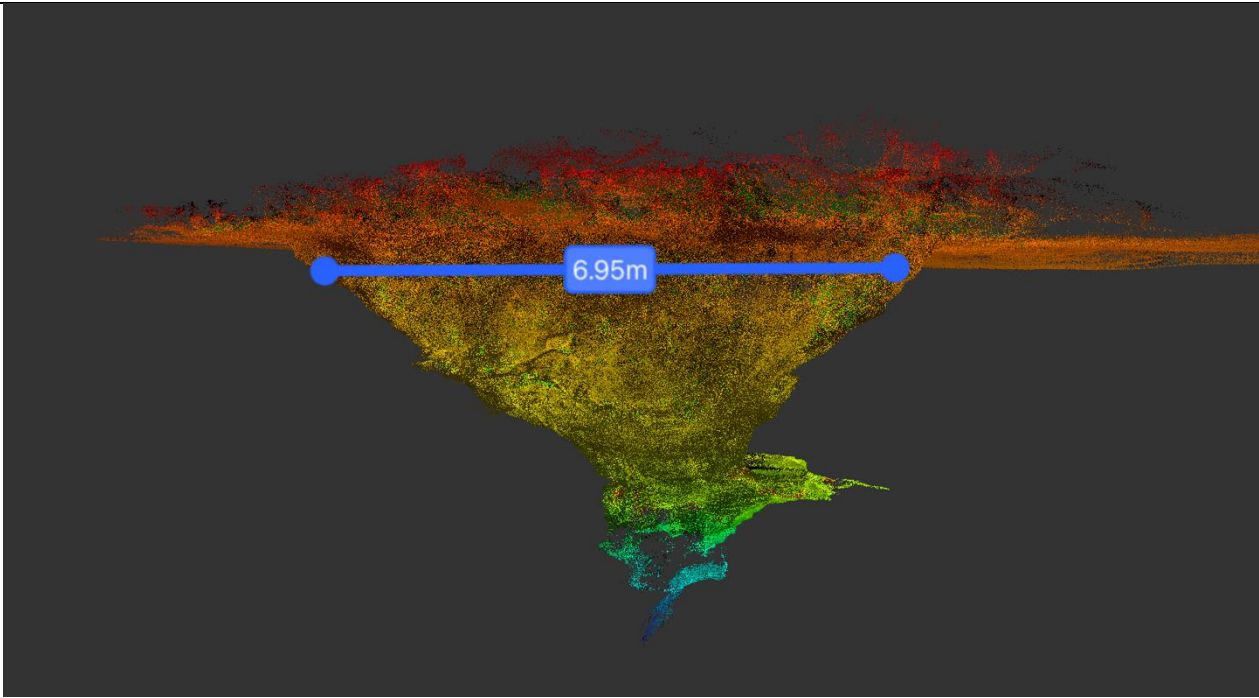



Figure 3

	Feature S0113334	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

FEATURE Y-29

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338200 Longitude: 116.679547	Potentially connected to S011334. Too narrow to ram with a backhoe.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.2 x 2.1 x 1.5 Approximate Volume (m³): 10 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground at northern side wall of the feature is covered with low lying grass, shrubs. Trees / shrubs and some grass to the western side of feature along ground surface. Ground surface is vegetated around the feature comprising low lying grass, wildflowers, and small trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is an irregular shaped cavity in the ground with potential for a false floor and some lateral workings are located within to the south west. The LiDAR scans indicate lateral workings / drives to the west for approx. 2 m and are 0.8 m tall, very narrow and 1.3 m bgl. There is no spoil surrounding the feature.</p> <p>The base of the feature exhibits potential for a false floor. DCP not undertaken due to potential for unstable base.</p> <p>LiDAR scan was undertaken.</p>	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor quality rock mass. Walls of the feature are dipping approx. 70 degrees to the south. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Potentially comprises an unstable base and lateral workings based on LiDAR scans. Approx. 2-3 m deep excavation will be required to break out and cave the drive to the west followed by backfill. Use fine grained soils to backfill after collapse of feature.

PHOTOGRAPHS

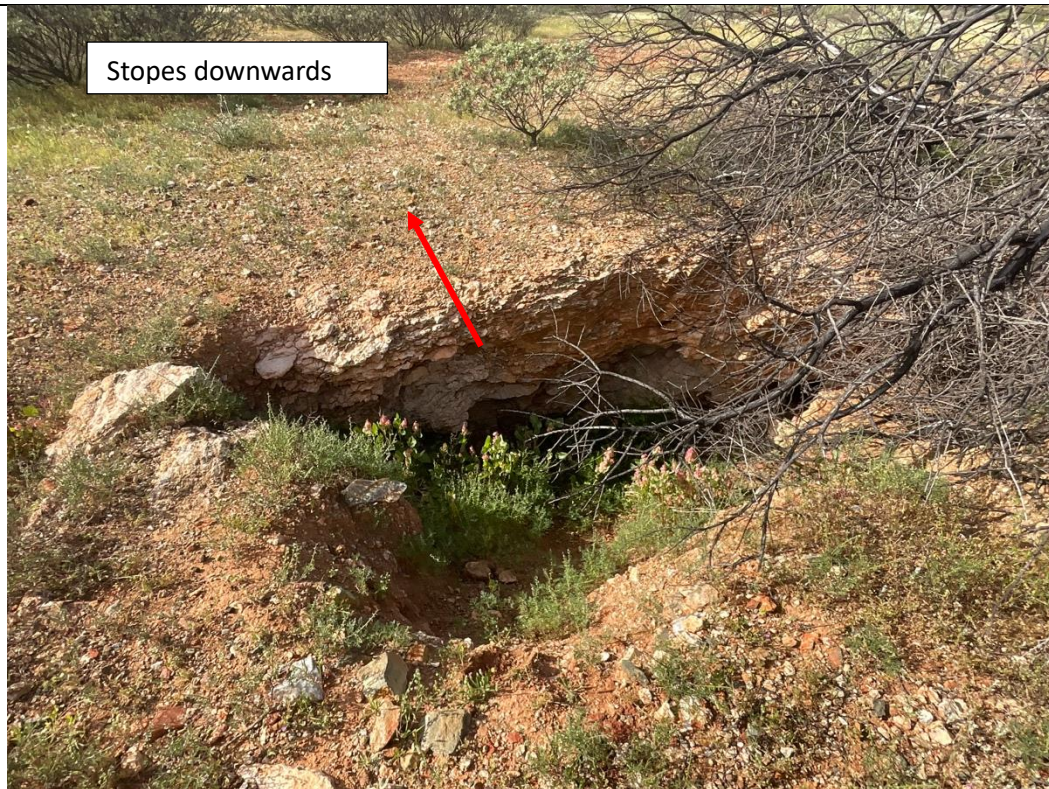



Figure 1

	Feature Y-29	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

3D LIDAR SCANS

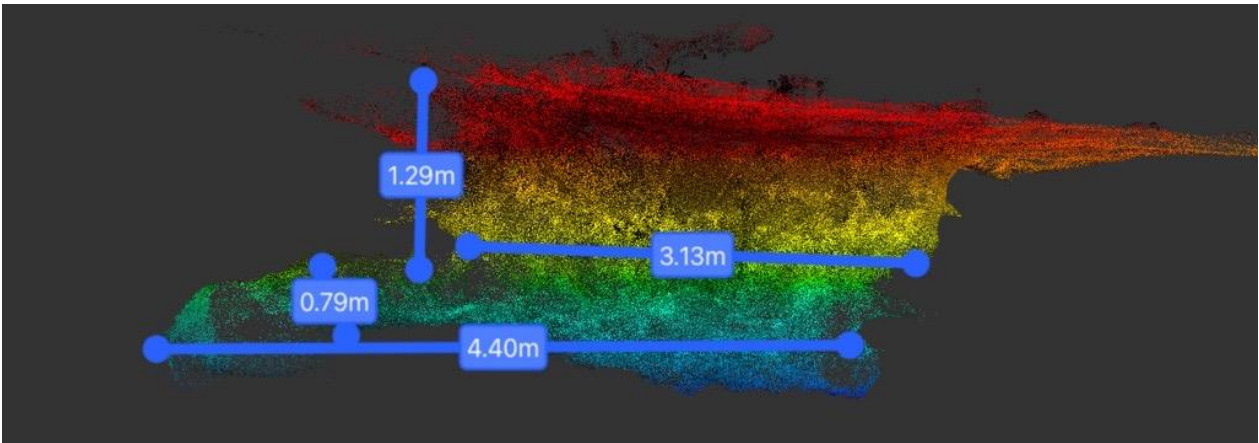


Figure 1

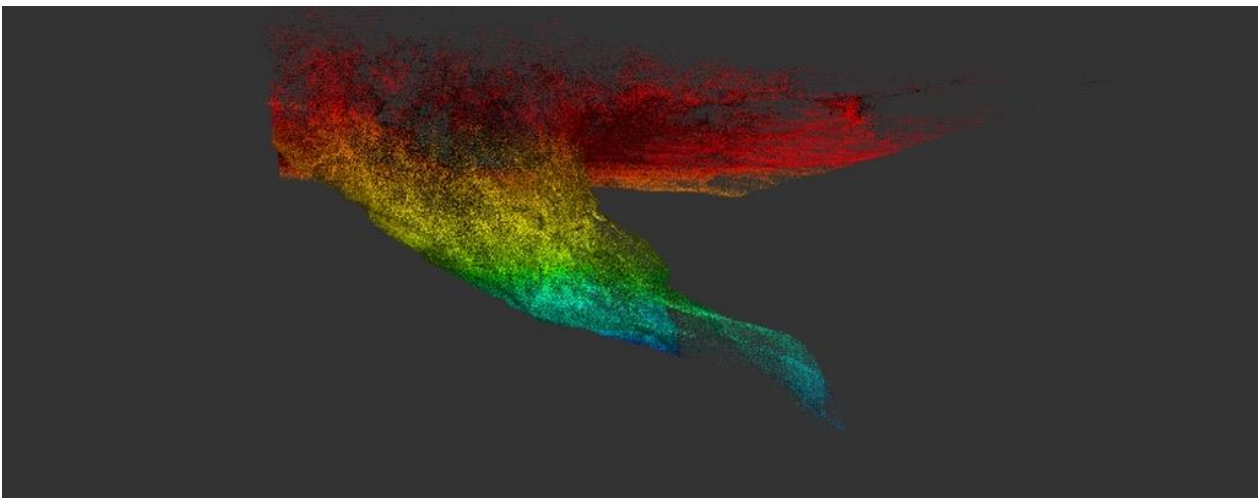



Figure 2

	Feature Y-29	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24



CATEGORY 6



FEATURE S0113310

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341832 Longitude: 116.677219	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.6 – 6 m deep x 0.7-1 m wide x 14.5 m long Approximate Volume (m³): 85-90 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively free of vegetation, however, the base and side walls comprise some small to medium sized trees / shrubs, and the base is lined with low lying grass in some areas.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a trench cliff style excavation with three interconnected holes. Remnant rock pillars remain propping the trench open (includes a small and thin rock bridge from the surface) Rock is visible on all the walls and is oriented 70-90 degrees from the horizontal. Base of feature is partially collapsed and contains some loose soils and waste rock within. The feature is partially hidden to the east with medium sized trees and shrubbery. There is a partially collapsed cave to the west.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Backfill and collapse – staged, lined longways with mirafi, buried a few meters deep, potentially bridge perpendicular with mirafi as well nearer to surface.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113310	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

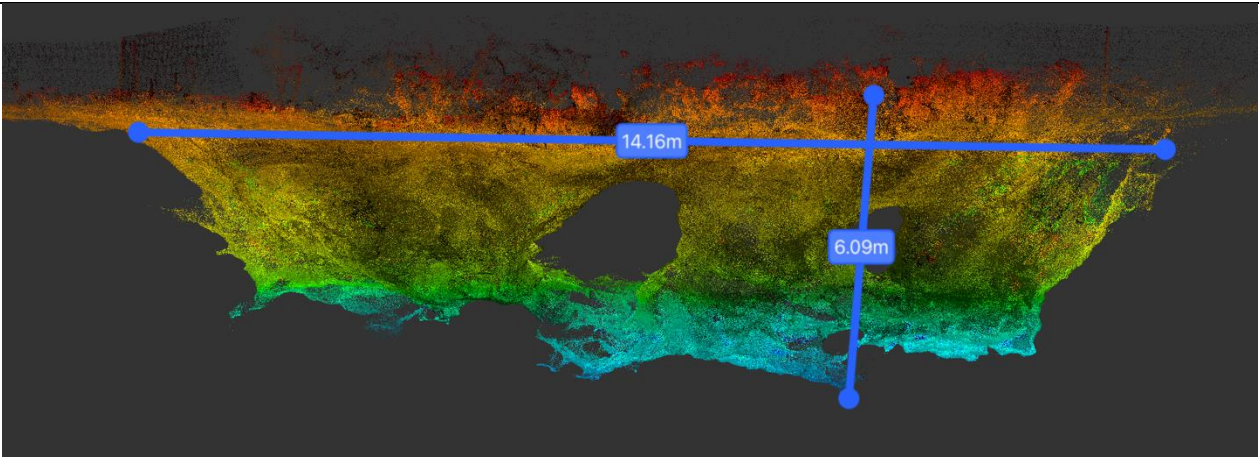


Figure 1

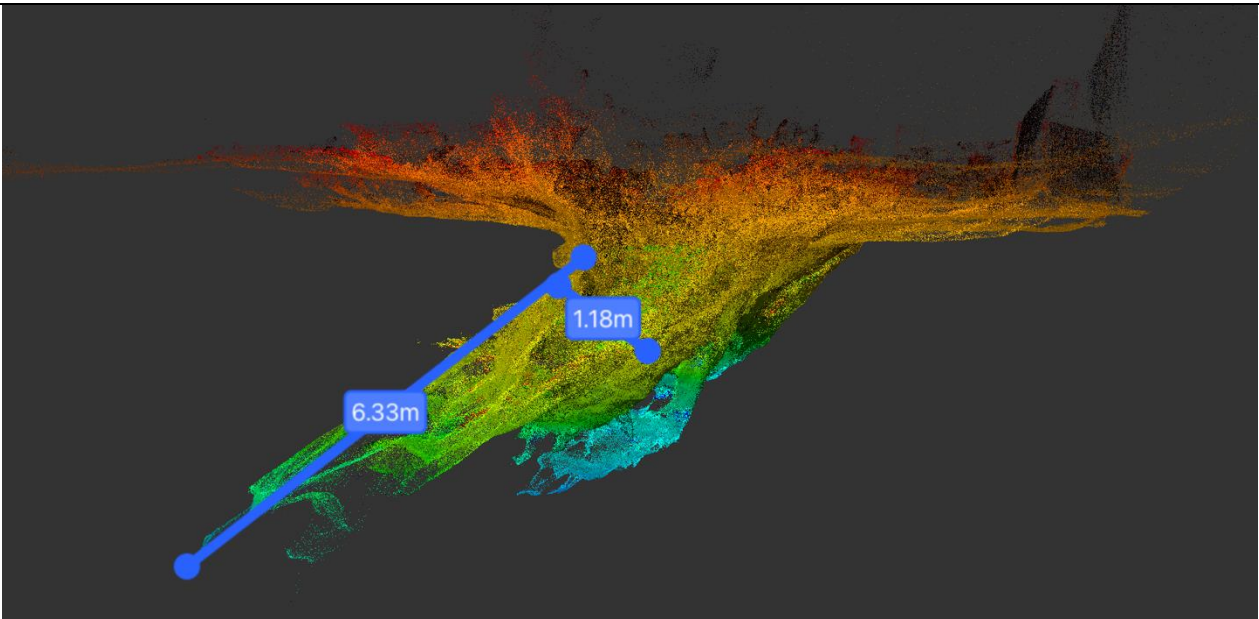



Figure 2

	Feature S0113310	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE S0113277

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341901 Longitude: 116.677335	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 15 x 0.66 – 2 m wide x 3.5 deep Approximate Volume (m³): 20-25 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively free of vegetation, however, the eastern and western side walls comprise some small to medium sized trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a trench cliff style excavation and is likely connected to S0113281 to the west beneath the dense vegetation. Rock is visible on all the walls and is oriented 70-90 degrees from the horizontal. Base of feature is partially collapsed. A shallow scratching circular in shape and approximately 3 x 2 x 0.6 m deep is situated to the east and a tree grows within.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Backfill – staged, lined longways with mirafi, buried a few meters deep, potentially bridge perpendicular with mirafi as well nearer to surface.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113277	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

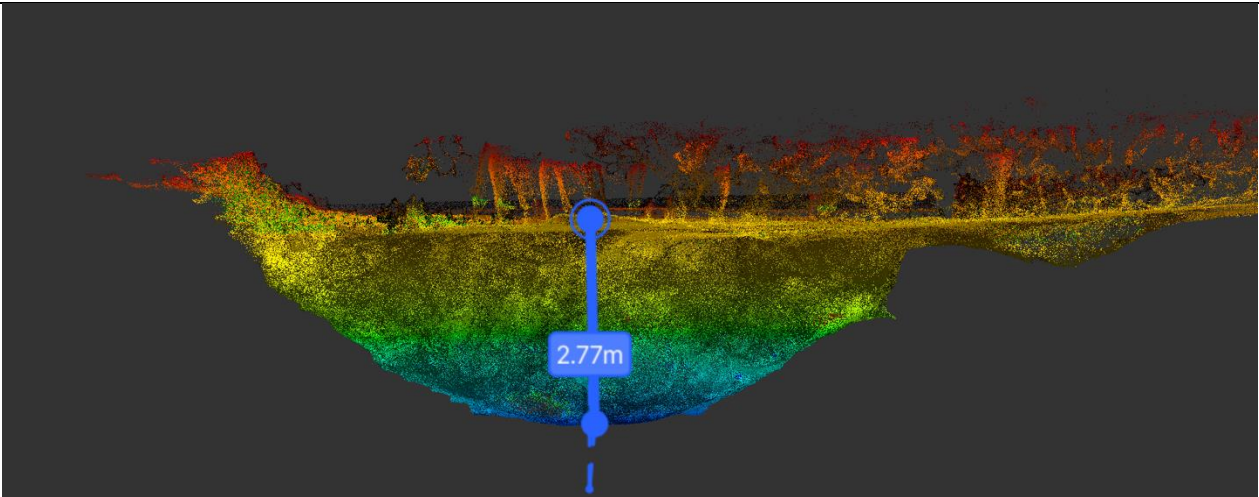


Figure 1

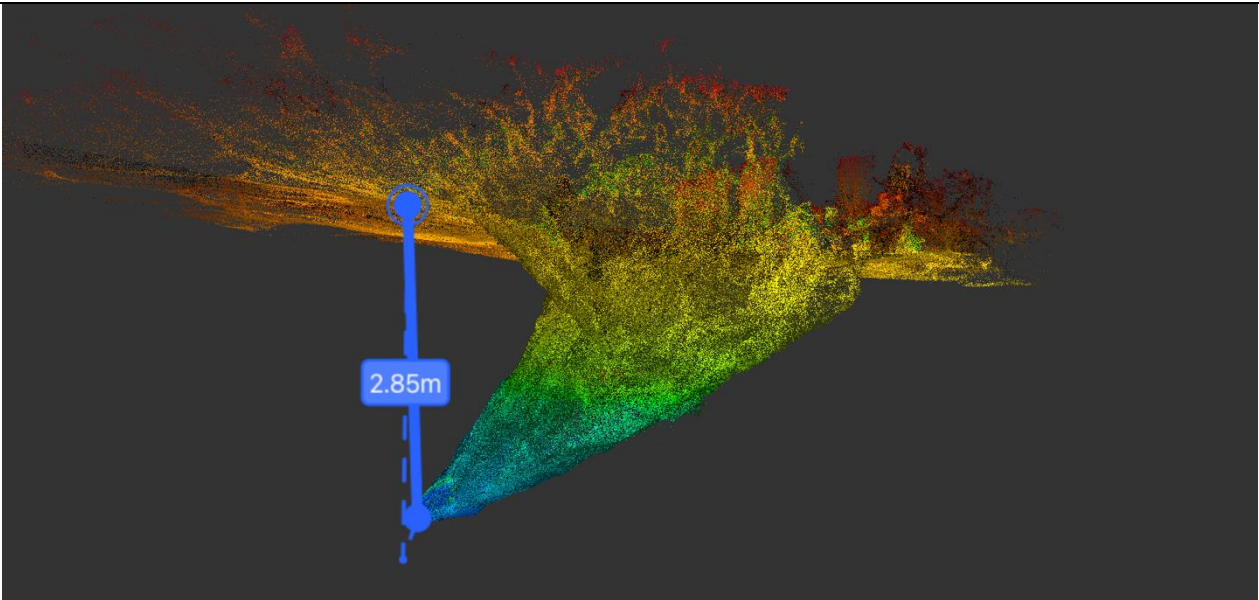



Figure 2

	Feature S0113277	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE S0113281


Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341768 Longitude: 116.677151	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.5 x 1.3-2.7 m wide, 3.7 x 9.5 deep (on diagonal) Approximate Volume (m³): 50-60 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively free of vegetation, however, the eastern side wall comprises some small to medium sized trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a cave style excavation that bulges out at the base. Rock is visible on all the walls. Base of feature is partially collapsed and comprises waste rock and loose soils. An excavator has ripped into the northern facing wall as evidenced by teeth marks. The base of the feature comprises broken wooden pillars which would have held open the roof of the cave which has now collapsed. Tin scrap metal and rubbish observed in the base. Drives approx. 1.3 m wide are located approx. 1.9 m bgl heading north and east to connect to the feature directly to the east.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Backfill by collapsing drives to cave it in on itself – staged, lined with mirafi, buried a few meters deep, potentially bridge perpendicular with mirafi as well nearer to surface.

PHOTOGRAPHS



Figure 1

	Feature S0113281	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

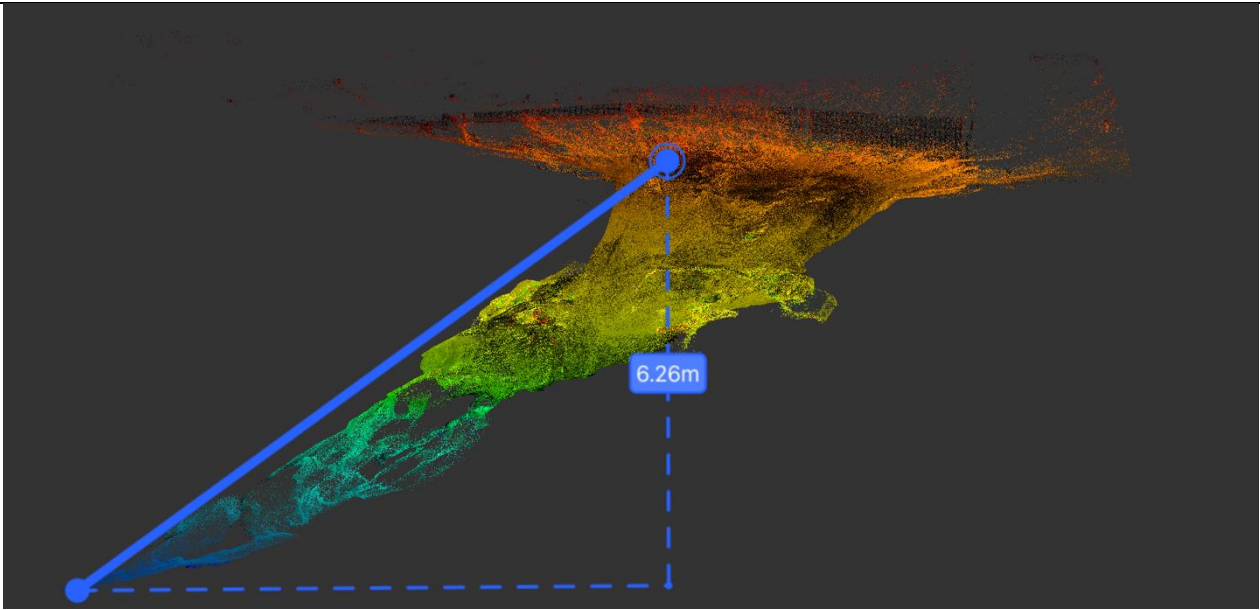


Figure 1

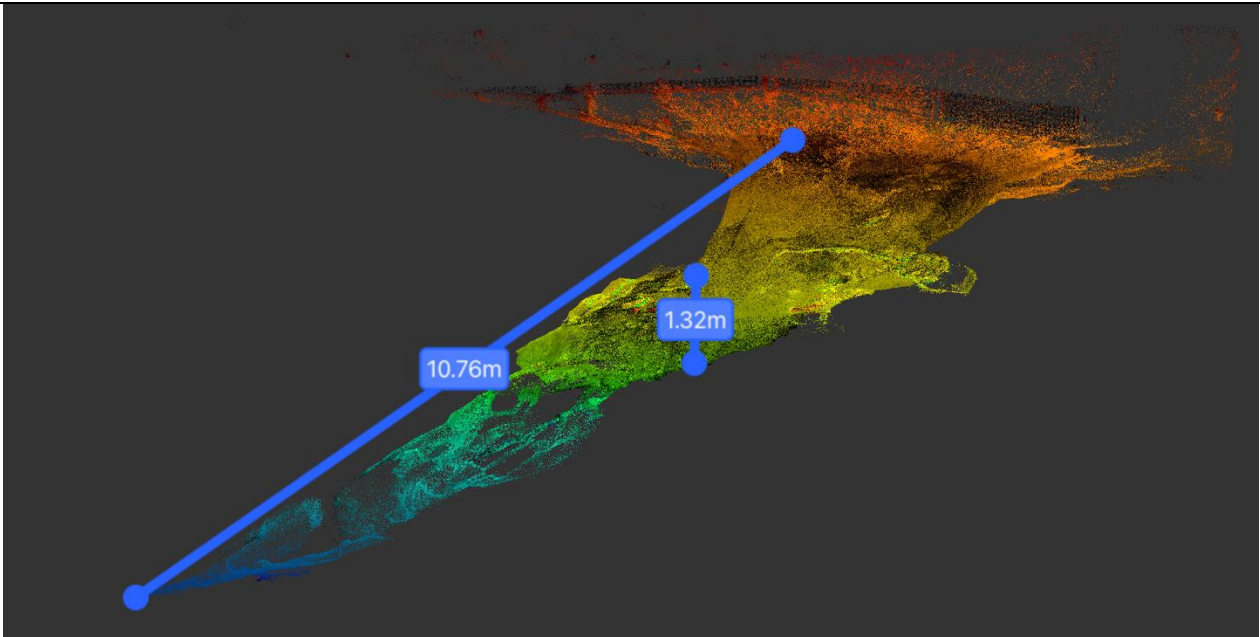



Figure 2

	Feature S0113281	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

3D LIDAR SCANS

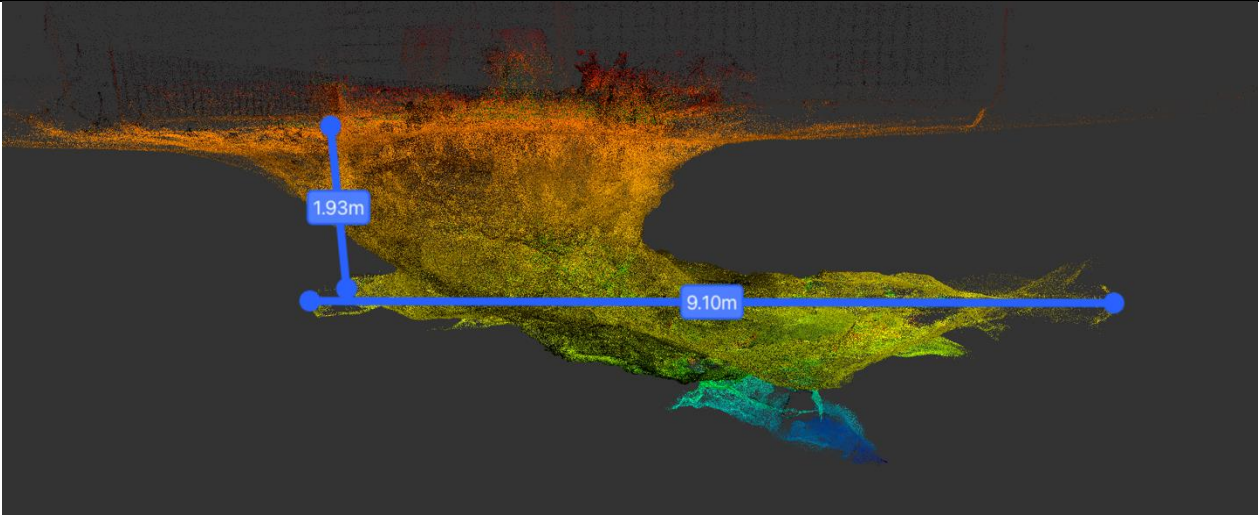



Figure 3

	Feature S0113281	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE S0113300

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.341994 Longitude: 116.677331	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 6-9.8 deep x 1.2-1.6 wide (19.6 eastern) (30 m western side). The circular cavity / hole (7 m deep) Approximate Volume (m³): 500-550 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively free of vegetation, however, the base and side walls comprise some small to medium sized trees / shrubs, and the base is lined with low lying grass in some areas.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is a trench cliff style excavation. Both wooden and remnant rock pillars remain propping the trench open (includes a small and thin rock bridge from the surface) Rock is visible on all the walls and is oriented 70-90 degrees from the horizontal. Base of feature is partially collapsed and contains some rubbish within. There is a circular cavity to the west of the trench approx. 7 m deep.</p> <p>Surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Backfill – staged, lined longways with mirafi, buried a few meters deep, potentially bridge perpendicular with mirafi as well nearer to surface.

PHOTOGRAPHS



Figure 1



Figure 2



Feature S0113300

Project No:

11715

Client: Department of Energy, Mines, Industry
Regulation and Safety (DEMIRS)

Date:

3/9/24


PHOTOGRAPHS



Figure 3



Figure 4

	Feature S0113300	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

3D LIDAR SCANS

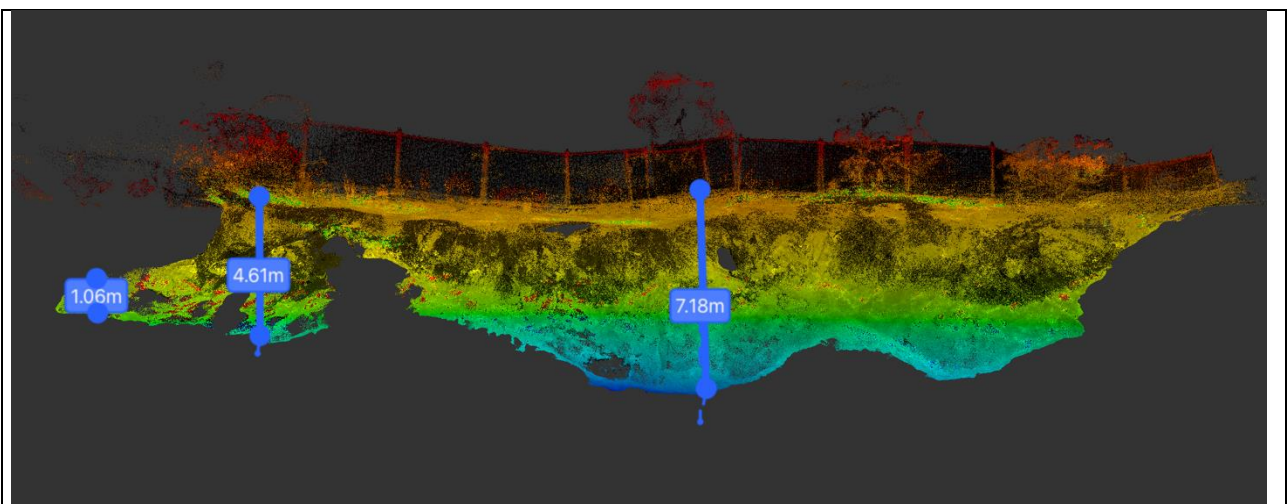



Figure 1

	Feature S0113300	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE S0113812

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342105 Longitude: 116.678616	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 10 x 15 m deep x 1.1 (2.2 at widest) Approximate Volume (m³): 15-20 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	<p>Swallows nests in the east of the feature. Trees / shrubs located to the east and grass covers the base of the feature.</p> <p>Surrounding ground surface is relatively free of vegetation, with some small trees / shrubs.</p>
Description / comments / observations:	Noxious / flammable gas readings:
<p>Trenched cliff style cutting with wooden pillars propping the walls open. Dead sheep, loose soil, and vegetation in base of feature. Rock on hanging wall is beginning to collapse. Curves around to form a circular small depression. The stope extends 11 m and is relatively narrow. Another surface trench visible connecting to nearby shaft feature.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate rock mass quality. Near vertical walls. Red clays and gravel soils.	Remove material from crest and backfill and cave in. Line with geotextile.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113812	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

3D LIDAR SCANS

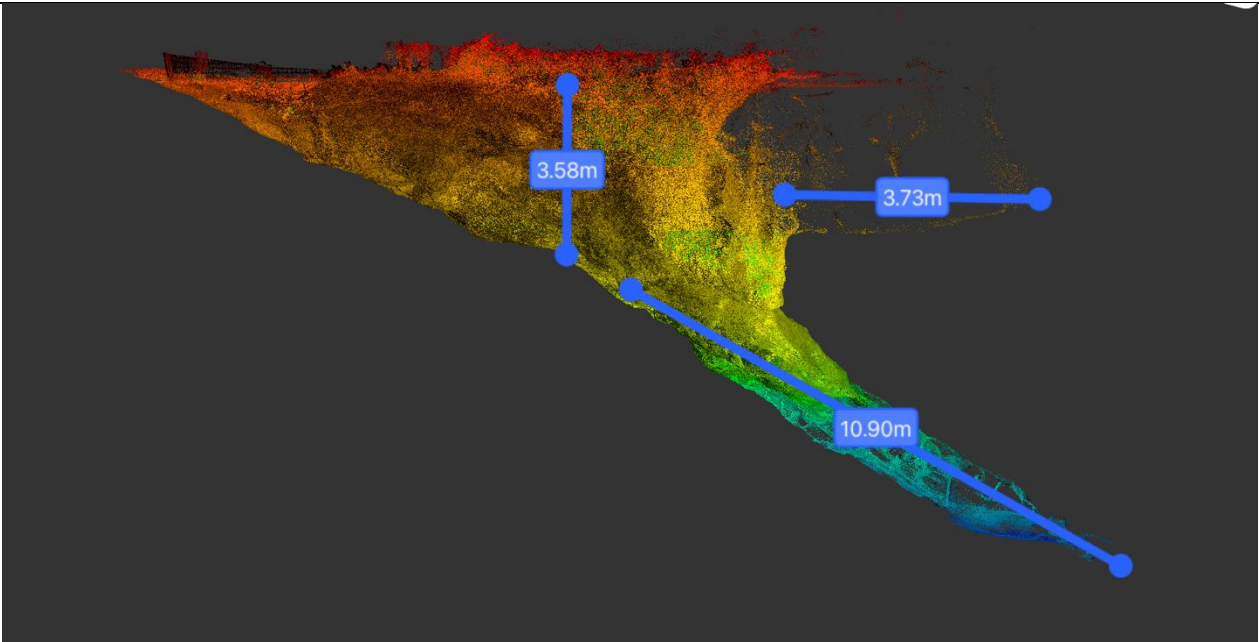



Figure 1

	Feature S0113812	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24



CATEGORY 7



FEATURE S0113280

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342021 Longitude: 116.677474	The base of the feature was prodded/rammed with a 6t backhoe however, digging was terminated due to potential presence of cyanide (sweet smelling) in the feature.
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 6.4 x 3.3 x 1 deep Approximate Volume (m³): n/a Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature is relatively free of vegetation, however, the eastern side wall comprises some small to medium sized trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is an open cut excavation that. Rock is visible on all the walls. Base of feature is filled with waste rock and some vegetation. The walls of the feature have some small shrubs. Surrounding ground surface is poorly vegetated with some low lying grass, wildflowers, and small trees / shrubs. No LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm <i>Note: Olfactory evidence of potential presence of cyanide detected in the feature during excavation works.</i>
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Potential contamination at this feature was identified which should be verified by further investigation. Ideally, rehabilitation would involve clearing feature of waste and fill material via excavation, to be placed in large skip bins, assessed for contamination, and sent to an appropriate landfill for suitable disposal. Potential for solution via laying down mirafi and forming a plug.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113280	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24



CATEGORY 8

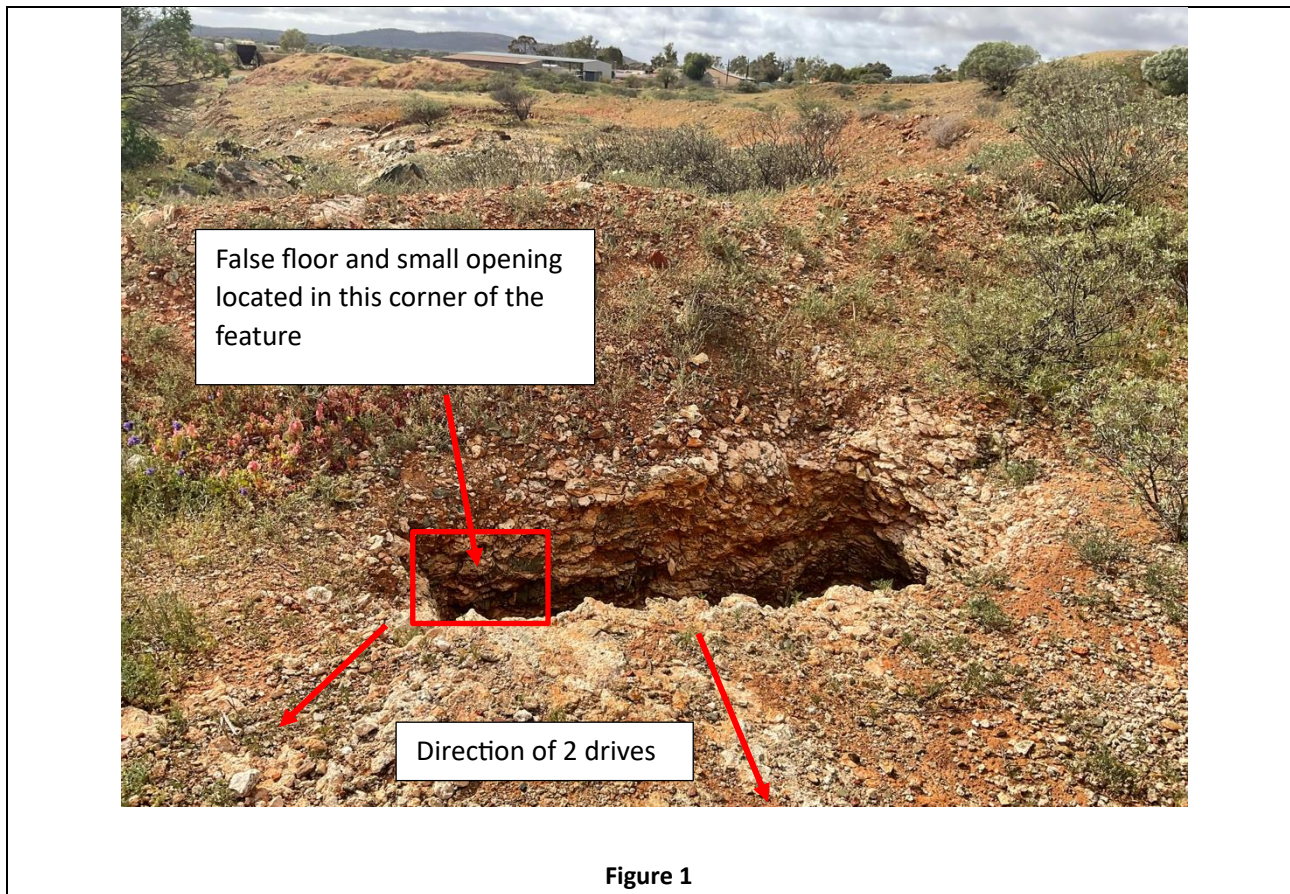



FEATURE Y-28

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.338181 Longitude: 116.679754	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.9 x 0.9 x 3.4 deep (to the false floor) at least 3.5 m beyond the visible false floor. Approximate Volume (m³): 5-7 (to the false floor) Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface is vegetated around the feature. The surrounding ground surface is vegetated with low lying grass, wildflowers, and small trees / shrubs.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a rectangular shaped shaft in the ground with potential for a false floor (a small hole in the northern corner of the shaft is visible, extending additional 2 m beyond the false floor) and potential for lateral workings. Based on LiDAR scans a drive, approx. 5 m long is located to the north west at approx. 45 degrees and 4 m deep and the width is approx. ½ the length of the shaft. The depth of the shaft is at least as twice as deep based on LiDAR scans. The scans indicate the height of the drive is very narrow, approx. 0.5 m wide and is potentially partially collapsed. There is also a second drive to the North with similar dimensions. The base of the feature exhibits a false floor. DCP not undertaken due to depth of feature. LiDAR scan was undertaken.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.7% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Crumbly and poor quality rock mass. Walls of the feature are near vertical. The ground surface comprises a thin layer of gravelly clay soils overlying rock.	Dig out and excavate drive, dig out false floor base, backfill and cone plug with concrete. Bury the concrete plug below ground. The desktop study suggests this may have been a shaft 10 – 15 m deep.

PHOTOGRAPHS



	Feature Y-28	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

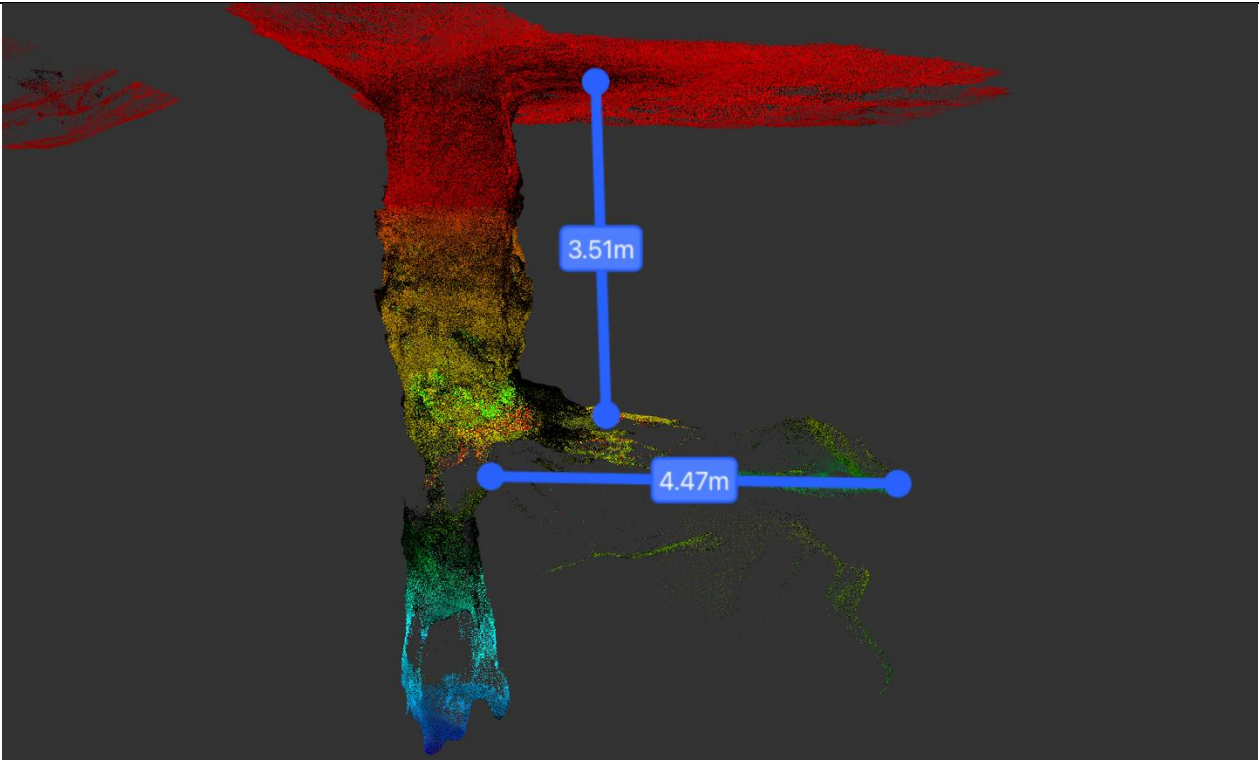


Figure 1

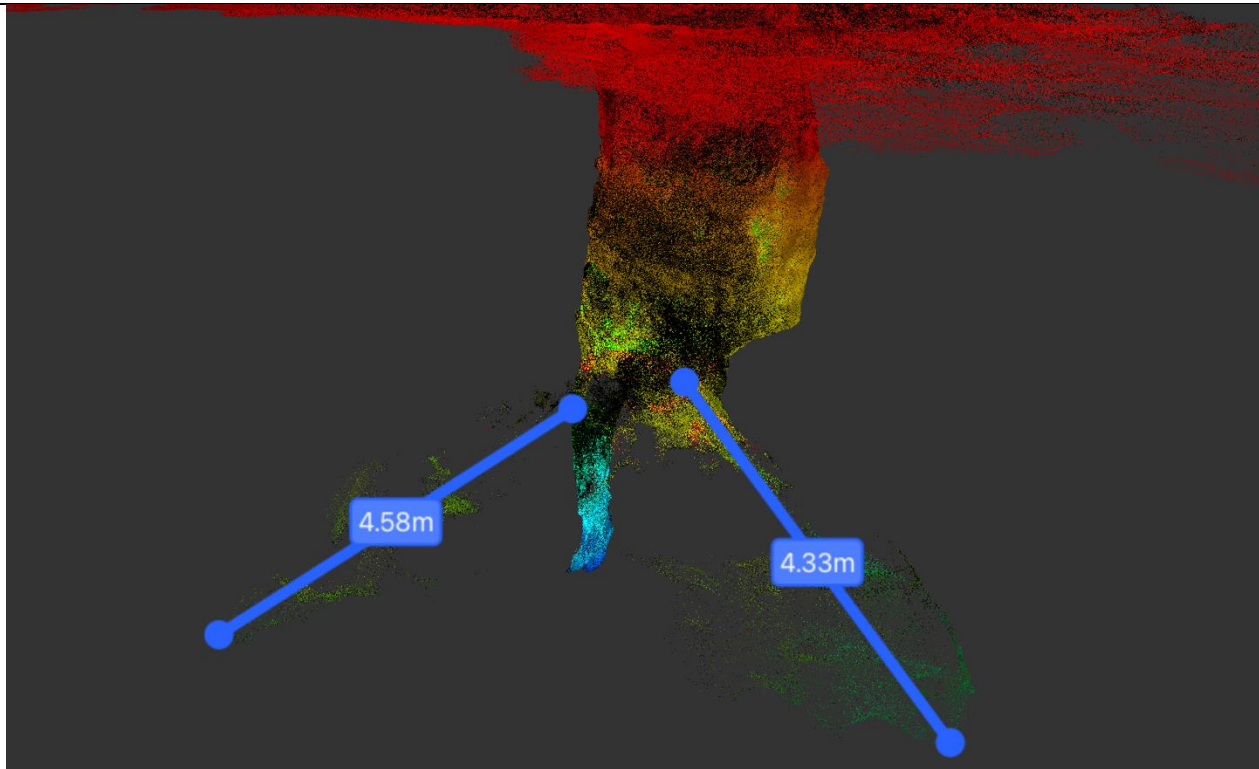



Figure 2

	Feature Y-28	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24



CATEGORY 9



FEATURE S0113265

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	4/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.337896 Longitude: 116.681220	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.1 x 4 x 8.6 (to top of water) 21.5 (to base of feature) Approximate Volume (m³): 60-65 Depth to groundwater (m): 8.6 Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna detected within or surrounding the feature. Ground surface around the feature comprises low lying vegetation, including shrubs and some small sized trees.
Description / comments / observations:	Noxious / flammable gas readings:
<p>The feature is rectangular main shaft situated to the west of the open pit. Rock is visible on all the walls. Base of feature is filled with water. Some wooden planks as props are visible within. A small spoil pile is heaped to the southern side of the feature along with infrastructure.</p> <p>Surrounding ground surface is vegetated with some low lying grass, wildflowers, and small trees / shrubs.</p> <p>LiDAR scan undertaken.</p>	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
<p>Moderate to poor quality rock mass (GSI = 20) – vertical walls of square feature. The ground surface comprises a thin layer of clayey gravel soils overlying rock.</p>	<p>Backfill with really coarse rock to above the water level. Line with mirafi and form plug to prevent fines migrating into the coarse rock and being washed away.</p> <p>The desktop information suggests the shaft terminated once water was reached, however, this was taken from a newspaper in 1895; it is likely that further progress had been made to dewater the shaft in later years. A drive to the south connected to a southern feature is also noted – and is likely situated below the water level.</p>


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113265	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

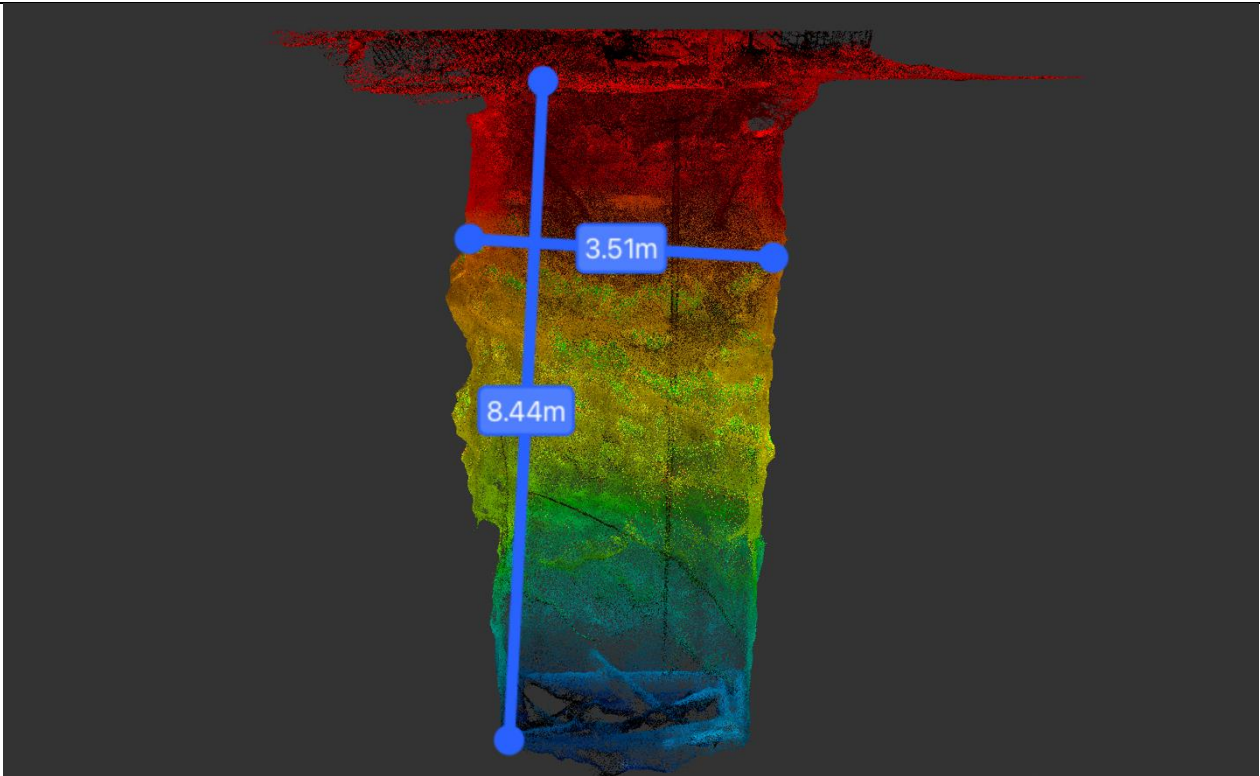


Figure 1

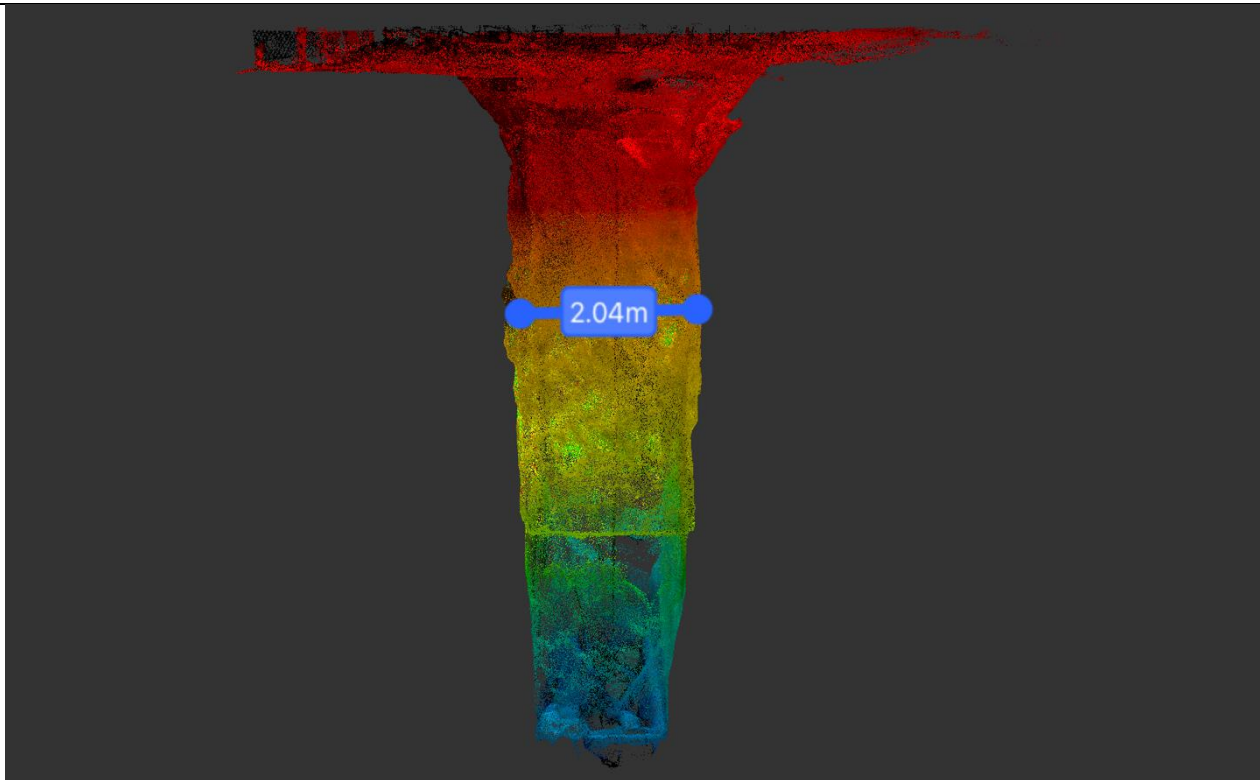



Figure 2

	Feature S0113265	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	4/9/24

FEATURE S0113745

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342206 Longitude: 116.679075	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 3.6 x 1.8 x 13 Approximate Volume (m³): 84 Depth to groundwater (m): n/a Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified.	No evidence of fauna detected within or surrounding the feature. Ground surface relatively free of vegetation with some low lying grass, shrubs, and some small trees further away from the feature.
Description / comments / observations:	Noxious / flammable gas readings:
Main shaft feature. Rectangular and L shaped at the surface, however, there is a newer and wooden supported shaft to the south of L shape and an older unlined shaft to the north which is covered by waste timber beams. The exact depths are unknown. Very little soil at the surface and 2 m tall spoil rock pile situated to the west of the shaft. LiDAR scan undertaken.	CH₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Moderate quality rock mass. Vertical slope walls. Suitable for founding concrete planks. Red clays and gravel soils around ground surface.	Cone out top 2 m, backfill shaft with rock fill material and cap with concrete cone cap. The desktop study suggests this is a 38 m deep main shaft which comprised 75 m of driving northwest to reach the emerald lode. It should be noted that a potential water pipeline may be located to the east of the feature (running North – South).

PHOTOGRAPHS

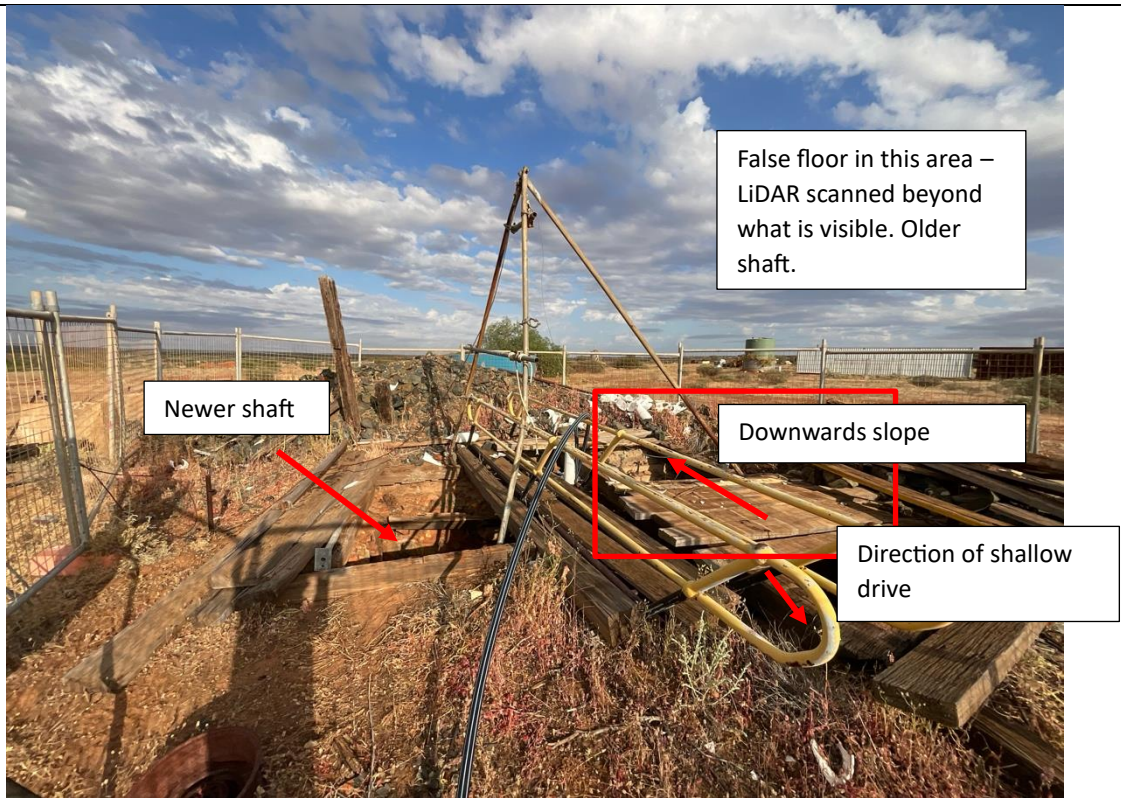



Figure 1



Figure 2

	Feature S0113745	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

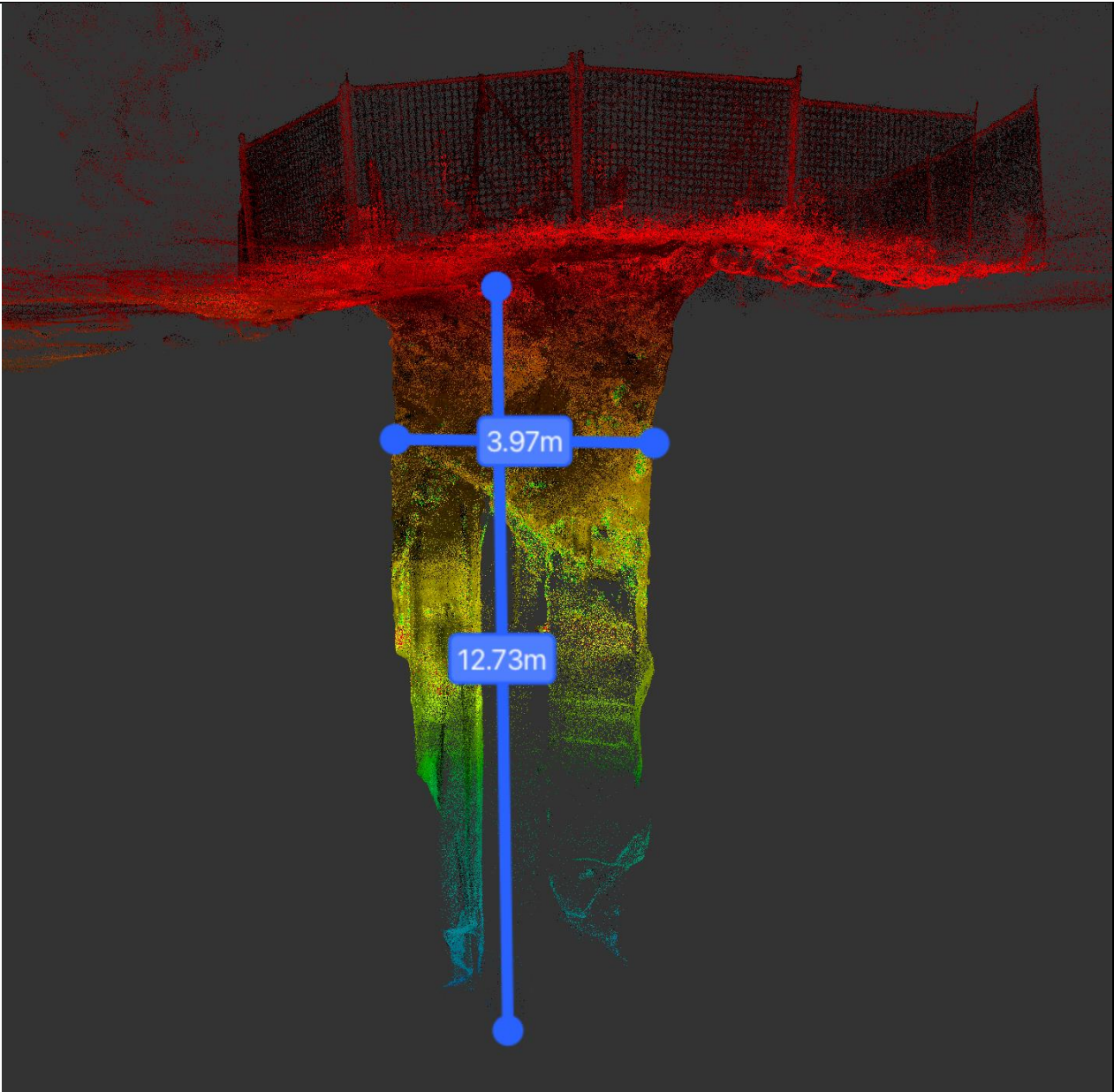



Figure 1

	Feature S0113745	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/2



S0113723 & Y-34



FEATURE S0113723

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	3/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.342305 Longitude: 116.679044	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 1.5 x 0.6 x 1.9 Approximate Volume (m³): 1.5-2 Depth to groundwater (m): n/a Hydrological Features: n/a	N/A
Description / comments / observations:	Noxious / flammable gas readings:
Concrete slab poses no risk. Leave as is. However, the sump should be remediated as it exists as a vertical excavation.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
N/A	Backfill the concrete sump.


PHOTOGRAPHS



Figure 1



Figure 2

	Feature S0113723	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	3/9/24

FEATURE Y-34

Project Name:	DEMIRS Mine Rehabilitation Void Assessment
Location:	Yalgoo, WA
Client:	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
Project Number:	11715
Date:	5/9/24
Site Personnel:	SM, IG
Weather:	L 11 H 30. Sunny and clear. Light winds.

Coordinates	Disturbance investigation:
Latitude: -28.339046 Longitude: 116.677673	N/A
Geometric characteristics:	Flora and fauna:
Approximate Dimensions (L x W x D): 2.8 x 2.8 x 1.6 Approximate Volume (m³): 5-8 Depth to groundwater (m): Hydrological Features: The feature is positioned on a high and dry lying area; surface run-off water is not considered risk for the remediation of this feature. No significant drainage issues were identified	No evidence of fauna or flora detected within or surrounding the feature.
Description / comments / observations:	Noxious / flammable gas readings:
The feature is a circular shaped cavity in the ground and is likely a well. There are stone spiral steps heading down. There is no spoil surrounding the feature. Dead tree branches found in the base of the feature. DCP undertaken in the base reveal hard ground. LiDAR scan was undertaken.	H₄: 0.0% CO₂: 0.0% H₂S: 0 ppm LEL: 0.0% O₂: 20.6% CO: 0 ppm
Rock mass / soil profile comments:	Preliminary remediation recommendations:
Poor rock mass quality evidenced in the side walls of the feature.	Unlikely to be a mining related feature and base poses no risk of collapse / false floors. Likely a cold room. Fence with white picket fence as a potential solution?

SUMMARY OF FIELDWORK


Dynamic Cone Penetrometer (DCP) Testing:

Depth (m)	Blows / 150 mm			
	DCP-1	DCP-2	DCP-3	DCP-4
0.00 – 0.15	3	R	2	
0.15 – 0.30	R		R	
0.30 – 0.45				
0.45 – 0.60				
0.60 – 0.75				
0.75 – 0.90				
0.90 – 1.05				
1.05 – 1.20				
1.20 – 1.35				
1.35 – 1.50				
1.50 – 1.65				
1.65 – 1.80				
1.80 – 1.95				
1.95 – 2.10				

PHOTOGRAPHS



Figure 1

	Feature Y-34	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24

3D LIDAR SCAN

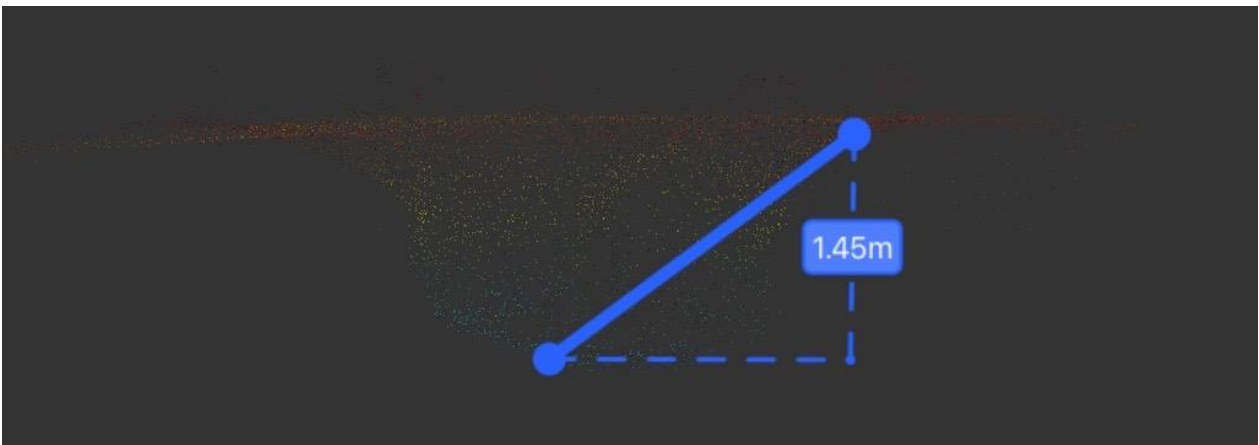



Figure 1

	Feature Y-34	Project No:	11715
	Client: Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Date:	5/9/24



APPENDIX B

GBG GEOPHYSICAL REPORT



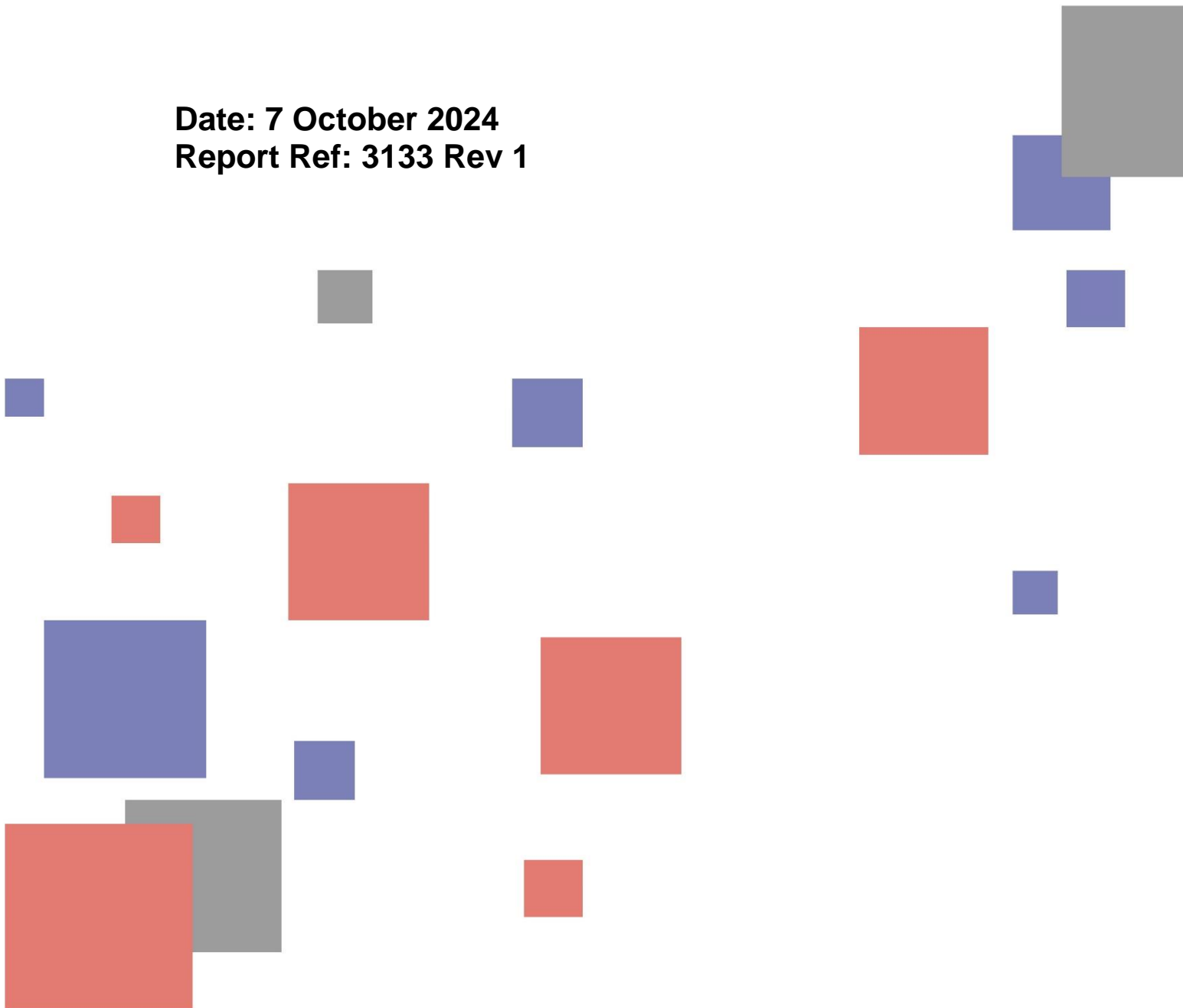
Report

Geophysical Investigation for Abandoned Mine Features.

Yalgoo, Shire of Yalgoo, WA.

Date: 7 October 2024

Report Ref: 3133 Rev 1



DOCUMENT HISTORY

DETAILS

Project number	3133
Document Title	Geophysical Investigation for Abandoned Mine Features
Site Address	Yalgoo, Shire of Yalgoo Western Australia
Report prepared for	WML Consulting Engineers

STATUS AND REVIEW

Revision	Prepared by	Reviewed by	Date issued
0	Peter Eccleston	Andrew Spyrou	7 October 2024
1	Andrew Spyrou	-	17 October 2024

DISTRIBUTION

Revision	Electronic	Paper	Issued to
0	1	0	Ivana Golijanin
1	1	0	Ivana Golijanin, Simon Maris

COMPANY DETAILS

Business name	GB Geotechnics (Australia) Pty Ltd
ABN	77 009 550 869
Business address	1/11 Gympie Way, Willetton WA 6155
Phone	0438 398 800
Web	gbg-group.com.au
Email	info@gbgoz.com.au

CONTENTS

1	INTRODUCTION	3
2	INVESTIGATION SITE	3
3	GEOPHYSICAL DATA ACQUISITION	5
3.1	SITE WORK LOGISTICS	5
3.2	ELECTRICAL RESISTIVITY TOMOGRAPHY	5
3.3	GROUND PENETRATING RADAR	6
3.4	MULTI-CHANNEL ANALYSIS OF SURFACE WAVES	6
3.5	SPATIAL POSITIONING	7
4	GEOPHYSICAL DATA PROCESSING	7
4.1	ELECTRICAL RESISTIVITY TOMOGRAPHY	7
4.2	GROUND PENETRATING RADAR	7
4.3	MULTI-CHANNEL ANALYSIS OF SURFACE WAVES	8
5	RESULTS AND INTERPRETATION	8
5.1	PRESENTATION OF RESULTS	8
5.2	MODELLED ELECTRICAL RESISTIVITY SECTIONS	9
5.3	GROUND PENETRATING RADAR	11
6	PROJECT SUMMARY	12
	APPENDIX A – INVESTIGATION SITE MAPS	14
	APPENDIX B – INTERPRETED GEOPHYSICAL SECTIONS.....	15
	APPENDIX C – INTERPRETED FEATURE MAPS.....	16

1 INTRODUCTION

At the request of WML Consulting Engineers, GBG Group carried out a geophysical investigation at Yalgoo in the Shire of Yalgoo, Western Australia.

During the investigation Electrical Resistivity Tomography (ERT) and Ground Penetrating Radar (GPR) datasets were acquired as a series of transects at specified locations around abandoned surface mine features. In addition to this, Multi-channel Analysis of Surface Waves (MASW) was trialled along 1 transect to compare outputs with the ERT testing.

The acquired ERT and GPR data was processed to obtain subsurface imagery to a target depth of approximately 10m Below Ground Level (BGL). The processed data was subsequently analysed for the detection and mapping of potential underground mine workings emanating from the identified surface mine features and to inform targeted intrusive testing of these features by WML.

The results of the geophysical investigation forms part of a broader scope geotechnical study by WML and commissioned by the Department of Mines, Industry Regulation and Safety for the Abandoned Mines Program.

2 INVESTIGATION SITE

An overview map of the sites within the Yalgoo site locations of recorded abandoned surface mine features is shown in Figure 1. Surface conditions at the sites were suitable for geophysical data acquisition and included sparse vegetation and open areas. The area included both open and fenced off remnant mining infrastructure. Photographs showing the typical site conditions are presented in Figure 2.



Figure 1: Map of Yalgoo sites (red polygons). Drawing from Google Earth pro.



Figure 2: Typical ground surface conditions at Yalgoo.

3 GEOPHYSICAL DATA ACQUISITION

3.1 SITE WORK LOGISTICS

The geophysical investigation site work was carried out over 5 days from the 16 to 20 September 2024 by a two-person team from GBG Group consisting of qualified geophysicists.

ERT data was acquired as 21 transects specified by the client and totalling 1759m, details of which are outlined in Table 1. MASW data was acquired along a 60m section of ERT transect T1.

GPR data was acquired as multiple transects within targeted and accessible areas, and also along the approximate locations of the ERT transects. Maps showing the extent of the acquired geophysical transects are provided in Appendix A drawings 3133-01, to -03.

Table 1: Acquired ERT Transects at Yalgoo (coordinates in GDA2020, Zone 50)

Transect ID	Length (m)	Start		End	
		Easting	Northing	Easting	Northing
T1	105	468356.50	6864809.53	468419.61	6864881.91
T2	104	468353.80	6864918.88	468420.49	6864846.29
T3	78	468527.79	6864812.95	468524.77	6864879.07
T3A	84	468533.26	6864812.11	468537.22	6864887.20
T4	75	468511.73	6864862.80	468574.75	6864862.01
T4A	75	468522.78	6864858.27	468584.73	6864847.84
T5	86	468562.56	6864805.18	468552.16	6864878.89
T5A	84	468554.78	6864809.18	468546.39	6864880.83
T6	78	468510.11	6864831.67	468575.16	6864822.83
T6A	78	468517.67	6864822.29	468583.70	6864815.06
T7	145	468543.90	6865284.41	468676.76	6865283.20
T8	75	468593.57	6865249.66	468570.75	6865308.48
T9	77	468613.32	6865250.56	468591.15	6865311.55
T10	77	468626.34	6865259.59	468609.72	6865322.76
T11	77	468640.01	6865260.17	468622.65	6865323.04
T12	77	468618.70	6865307.48	468676.46	6865277.92
T13	64	468740.23	6865318.78	468742.46	6865371.42
T14	92	468713.83	6865325.43	468780.38	6865369.71
T15	76	468737.76	6865346.10	468794.04	6865315.04
T16	76	468728.82	6865307.33	468788.09	6865333.20
T17	76	468776.50	6865291.38	468758.57	6865353.81

3.2 ELECTRICAL RESISTIVITY TOMOGRAPHY

ERT data was acquired using a Syscal Pro 72 (IRIS Instruments) resistivity receiver. ERT acquisition parameters are provided in Table 2.

Data acquisition involved hammering up to 54 electrodes into the ground along the transects at 2 or 3m increments with a maximum array length of 145m, and connecting these to the control unit situated at the centre of the array via multicore cables. To improve electrical contact, saline water was poured onto

the ground about the electrodes where required. A contact test was then run where the electrical resistance between pairs of electrodes was measured.

Following a successful contact test, a pre-programmed automated control sequence was run that controlled which pair of electrodes along the array was used for current injection with the resulting potential difference measured across multiple electrode pairs. Resistivity measurements were made using Dipole-Dipole array type providing both high vertical resolution and sensitivity to lateral variations. On completion of the control sequence the electrode array was moved to the next line where the processed was repeated.

Table 2: ERT Acquisition Parameters

Acquisition Parameter	Value
Max no. electrodes	54
Electrode spacing	2,3 m
Max array length	145 m
Array type	Dipole-Dipole
Injection on/off time	500 ms
Injection voltage	200 mV
Number of stacks	4
Quality factor	2%

3.3 GROUND PENETRATING RADAR

GPR data was acquired using a MALA Ground Explorer GX HDR system with an 80MHz ground coupled antenna. Acquisition parameters are provided in Table 3. Data acquisition was carried out by moving the cart-based system along transects over accessible portions of the ground surface.

Table 3: GPR Acquisition Parameters

Acquisition Parameter	Value
Antenna centre frequency	80MHz
Two-way travel time	300ns
Uncalibrated imaging depth	15m
Scans per metre	50
Sample number	542
Sample rate	32 bit
Radar wave velocity	0.12m/ns

3.4 MULTI-CHANNEL ANALYSIS OF SURFACE WAVES

MASW data was acquired using a Geode (Geometrics Instrument) multi-channel digital seismograph attached to a seismic land streamer consisting of 24 geophones set at 2m increments. Seismic energy was generated using summed sledgehammer impacts onto a metal base plate with a trigger cable connecting the sledgehammer to the seismograph. MASW acquisition parameters are provided in Table 4.

Table 4: MASW Acquisition Parameters

Acquisition Parameter	Value
Number of geophones	24
Geophone spacing	2 m
Geophone frequency	4.5 Hz
Record length	2 s
Sample interval	0.125 ms
Source offset	4 m
Source stacks	3
Sounding interval	4 m

3.5 SPATIAL POSITIONING

Spatial positioning of the acquired geophysical transects was achieved using a S631 (Hemisphere) GNSS receiver with Atlas L band satellite corrections returning an expected accuracy of better than +/- 0.25m for both vertical and horizontal components. Coordinates have been provided in GDA2020, MGA zone 50 for horizontal component and Australian Height Datum (mAHD) for vertical component.

For ERT, the spatial position (easting, northing and surface level) of each electrode location was surveyed whilst for GPR, the GNSS receiver was directly linked to the GPR data logger providing continuous spatial positions for each reading.

4 GEOPHYSICAL DATA PROCESSING

4.1 ELECTRICAL RESISTIVITY TOMOGRAPHY

The ERT data was processed using Prosys II (Iris Instruments) and Res2D (Seequent Software) to produce resistivity models.

The inverted resistivity models were compiled and gridded in Surfer (v28, Golden Software) to produce 2D geo-electrical sections. The resulting contoured cross-sections show the variation in the modelled electrical resistivity of the subsurface material in Ohm metres laterally along each of the transects and with elevation.

4.2 GROUND PENETRATING RADAR

The GPR data was processed using ReflexW V10.0 (Sandmeier Software, 2022) using standard data processing and filtering routine.

The processed GPR data was analysed for hyperbolic reflection anomalies related to shallow subsurface features such as potential open mine workings and previously excavated material. Examples of processed radar-grams from this investigation are shown in Figures 3 and 4.

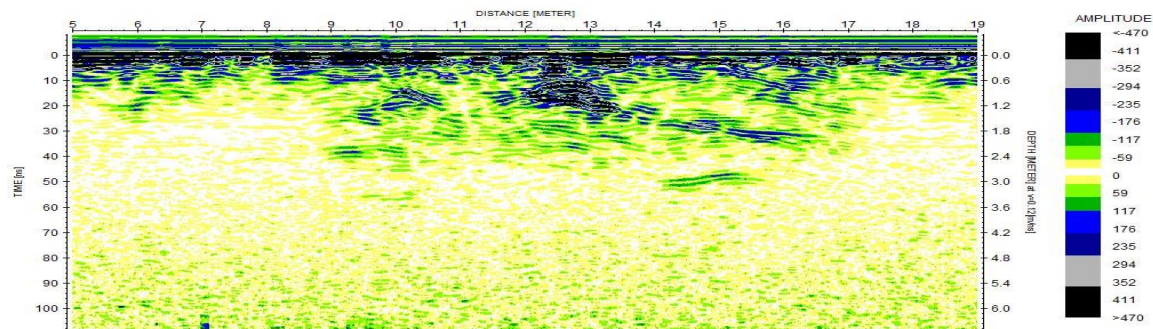


Figure 3: GPR radar-gram showing an anomaly at x=12.5m, y = 0.6m relating to a potential underground mine working.

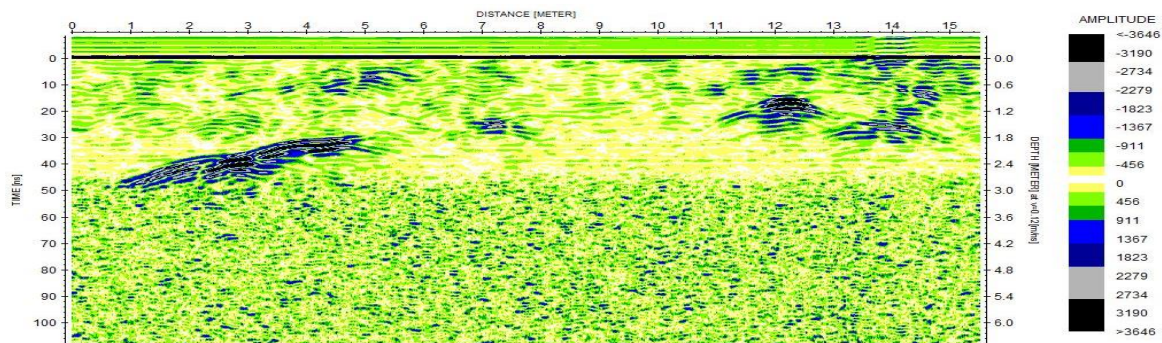


Figure 4: GPR radar-gram showing an anomaly at x=3m, y=2.4m relating to a potential underground mine working.

4.3 MULTI-CHANNEL ANALYSIS OF SURFACE WAVES

The acquired MASW data was processed using SurfSeis version 6++ (Kansas Geological Survey) for the generation of phase overtone images giving the percentage intensity of phase velocity versus frequency for each seismic record. A dispersion curve was then picked along each overtone image and inverted to calculate a 1D sounding, plotting the variation in S-wave velocity with depth. Multiple 1D soundings were compiled to model the seismic S-wave velocity distribution as a cross-section along the acquired transect.

5 RESULTS AND INTERPRETATION

5.1 PRESENTATION OF RESULTS

The results of the geophysical investigation carried out at Yalgoo are presented in Appendices A, B and C of this report as follows:

Appendix A – Investigation Site Maps

- **3133-01.** Yalgoo South - Site Map with ERT, MASW and GRP transect locations
- **3133-02.** Yalgoo North - Site Map with ERT and GRP transect locations
- **3133-03.** Yalgoo Central - Site Map with ERT and GRP transect locations

Appendix B – Interpreted Geophysical Sections

- **3133-04.** ERT Lines 1 and 2, and MASW Line 1 interpreted sections
- **3133-05.** ERT Lines 3 and 3a interpreted sections
- **3133-06.** ERT Lines 4 and 4a interpreted sections
- **3133-07.** ERT Lines 5 and 5a interpreted sections
- **3133-08.** ERT Lines 6 and 6a interpreted sections
- **3133-09.** ERT Line 7 interpreted section
- **3133-10.** ERT Lines 8 and 9 interpreted sections
- **3133-11.** ERT Lines 10 and 11 interpreted sections
- **3133-12.** ERT Line 12 interpreted section
- **3133-13.** ERT Lines 13 and 14 interpreted sections
- **3133-14.** ERT Lines 15 and 16 interpreted sections
- **3133-15.** ERT Line 17 interpreted section

Appendix C – Interpreted Feature Maps

- **3133-16.** Yalgoo South-West – Site map with identified subsurface anomalies
- **3133-17.** Yalgoo South-East – Site map with identified subsurface anomalies
- **3133-18.** Yalgoo Central-West – Site map with identified subsurface anomalies
- **3133-19.** Yalgoo Central-East – Site map with identified subsurface anomalies
- **3133-20.** Yalgoo North – Site map with identified subsurface anomalies

5.2 MODELLED ELECTRICAL RESISTIVITY SECTIONS

The sections for each ERT transect show the variation in modelled electrical resistivity of the subsurface material in Ohm metres ($\Omega\cdot m$). Dominant factors affecting the bulk electric resistivity of soil or rock are:

- Porosity and permeability including the presence of voids and cavities
- Degree of saturation – the fraction of pore space/fractures filled with fluid
- Fluid type, including salt content – the composition of the fluid filling the pore spaces/fractures
- Presence of clays with moderate to high cation exchange capacity (CEC)

For this investigation high rapidly increasing resistivity responses from the surrounding material have been interpreted as potential subsurface mine workings. Anomalies related to these have been marked on the ERT sections in drawings 3133-04 to -15 as well as overlayed onto site maps in drawings 3133-16 to -20. Details of the identified anomalies including spatial coordinates are presented in tables 5 to 8 for South West, South East, Central West and Central East sites. Note ERT data was not acquired for the Yalgoo Northern site.

A priority rating has been given for each Target including (1) high priority, typically shallow potential mine workings open or partially open within the remnant mining area, (2) moderate priority, typically

shallow potential workings infilled with limited extent, and (3) low priority, typically for the deepest potential workings.

Table 5: South-West Area - Identified Targets from Yalgoo Modelled Resistivity Sections

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
SW-01	1.0	468375.10	6864828.08	isolated	2
SW-02	7.8	468384.79	6864839.09	isolated	2
SW-03	2.6	468390.87	6864877.13	isolated	2
SW-04	1.2	468408.69	6864858.91	isolated	1

Table 6: South-East Area - Identified Targets from Yalgoo Modelled Resistivity Sections

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
SE-01	1.2	468524.73	6864859.42	Continuous	1
SE-02	1.2	468526.95	6864829.14	Continuous	1
SE-03	1.8	468535.32	6864827.55	Continuous	2
SE-04	1.4	468554.59	6864825.33	Continuous	2
SE-05	4.9	468526.77	6864849.23	isolated	2
SE-06	1.3	468533.89	6864821.44	isolated	2
SE-07	1.3	468535.14	6864843.17	isolated	1
SE-08	1.4	468545.29	6864860.45	isolated	1
SE-09	1.2	468573.08	6864861.87	isolated	1
SE-10	1.2	468535.32	6864856.00	isolated	1
SE-11	1.3	468551.70	6864853.86	isolated	1
SE-12	2.3	468556.33	6864852.97	isolated	2
SE-13	1.4	468576.10	6864848.87	isolated	2
SE-14	1.2	468561.12	6864835.32	isolated	1
SE-15	1.2	468556.92	6864864.60	isolated	1
SE-16	2.4	468553.43	6864818.93	isolated	2
SE-17	1.5	468550.18	6864846.78	isolated	1
SE-18	2.0	468548.04	6864863.39	isolated	1
SE-19	1.5	468514.75	6864830.68	isolated	1
SE-20	1.2	468547.90	6864825.07	isolated	1
SE-21	1.2	468571.77	6864823.13	isolated	1
SE-22	1.2	468549.74	6864817.51	isolated	1
SE-23	3.0	468570.79	6864816.00	isolated	1

Table 7: Central-West Area - Identified Targets from Yalgoo Modelled Resistivity Sections

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
CW-01	1.0	468635.13	6865284.10	Continuous	1
CW-02	1.2	468672.53	6865282.23	Continuous	1
CW-03	1.2	468549.45	6865285.14	Isolated	2
CW-04	10.0	468572.08	6865287.18	Isolated	2
CW-05	2.8	468594.71	6865289.54	Isolated	2
CW-06	4.6	468617.34	6865286.55	Isolated	2
CW-07	1.2	468646.10	6865284.04	Isolated	1
CW-08	1.9	468580.89	6865281.81	Isolated	1
CW-09	2.7	468573.56	6865301.21	Isolated	1
CW-10	1.7	468605.42	6865273.25	Isolated	1
CW-11	1.1	468601.39	6865283.07	Isolated	1
CW-12	4.3	468598.01	6865292.74	Isolated	2
CW-13	3.6	468594.63	6865302.88	Isolated	2
CW-14	1.5	468591.73	6865309.97	Isolated	1
CW-15	1.2	468619.75	6865282.27	Isolated	1
CW-16	1.0	468617.18	6865293.22	Isolated	2
CW-17	1.2	468614.44	6865304.01	Isolated	1
CW-18	1.0	468632.01	6865293.15	Isolated	1
CW-19	4.0	468640.59	6865298.36	Isolated	1
CW-20	1.1	468649.27	6865293.63	Isolated	1

Table 8: Central-East Area - Identified Targets from Yalgoo Modelled Resistivity Sections

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
CE-01	3.5	468744.11	6865362.01	Isolated	2
CE-02	1.2	468743.38	6865367.49	Isolated	1
CE-03	2.0	468739.34	6865308.49	Isolated	1
CE-04	1.6	468756.68	6865316.46	Isolated	1

The following limitations should be noted for interpretation of the electrical resistivity sections:

- It is assumed that the subsurface material modelled during this investigation sits above the local water table, and as such where present mine workings will have little to no water content. The presence of groundwater within voided or loose ground will alter the interpretation.
- For several transects, zones of high electrical resistivity especially where of significant extent may represent a fresh rock layer which exhibit similar electrical resistivity with open cavities.

- Due to vertical and lateral resolution of the ERT method which is primarily a function of the electrode spacing used during data acquisition, the Targets of interest displayed on the modelled sections may not be representative of their actual physical lateral and vertical dimensions.
- The approximate depths to the Targets of interest are based on the centre of the resistivity anomaly, the actual depth to the top of the physical features is likely to be shallower than this due to the lateral resolution of the ERT method.

5.3 GROUND PENETRATING RADAR

Analysis of the processed GPR dataset has identified a number of subsurface anomalies potentially related to shallow mine workings within the areas investigated which are presented in a site map in drawing 3133-09. It should be noted that GPR anomalies in the 3-5 mBLG range, particularly in the south-east of the site are likely to be due to edge effects from adjacent identified shafts.

5.4 MULTICHANNEL ANALYSIS OF SURFACE WAVES

The MASW seismic shear-wave velocity section has been included for a 60m portion of Line 1 at the South West area. Isolated low velocity zones are interpreted as potential subsurface mine workings of which SW-01 and to a lesser extent SW-02 correlated with the corresponding ERT section.

Following assessment of the results from the ERT and MASW methods along Line 1, it was determined that the ERT provided a greater contrast between potential mine workings and natural ground and as such this method was utilised for the remainder of the geophysical testing.

6 PROJECT SUMMARY

A geophysical subsurface investigation has been carried out as part of a broader scope geotechnical study by WML and commissioned by the Department of Mines, Industry Regulation and Safety for the Abandoned Mines Program.

During the investigation, ERT and GPR datasets and a trial MASW dataset were acquired as a series of transects extending around the perimeter of recorded abandoned surface mine features.

The acquired ERT dataset was inverted to model the electrical resistivity distribution of the subsurface material along the transects to a target depth of 10mBGL. The modelled electrical resistivity sections were subsequently analysed and interpreted for the presence of potential voids or cavities relating to underground mine workings. A number of targets have been provided which are recommended for further testing using intrusive methods to verify their condition and to calibrate the geophysical dataset.

The acquired GPR dataset was processed and analysed for features relating to shallow mine workings with a number of features being identified and relating to near surface previously worked ground.

The methods used during the investigation are geophysical and as such the results are based on indirect measurements and the processing and interpretation of electrical wave signals. At the time of the investigation, calibration of the geophysical results with intrusive geotechnical testing has not been carried out. The findings in this report represent the professional opinions of the authors, based on experience gained during previous similar investigations.

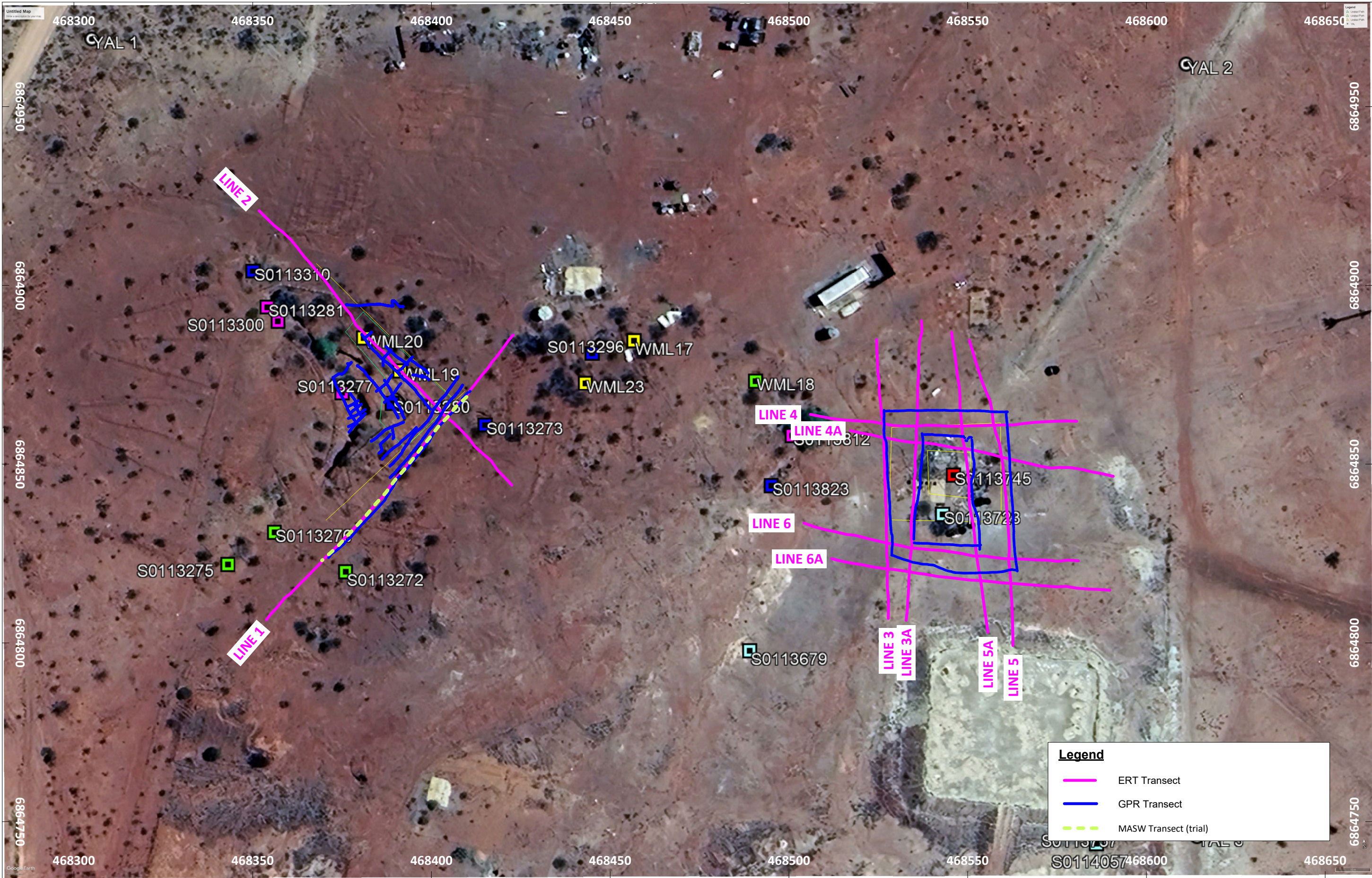
We trust that this report and the attached drawings provide you with the information required. If you require clarification on any points arising from this geophysical investigation, please do not hesitate to contact the undersigned on 08 9354 6300.

For and on behalf of
GBG GEOTECHNICS (AUSTRALIA)



PETER ECCLESTON
Senior Geophysicist

APPENDIX A – INVESTIGATION SITE MAPS



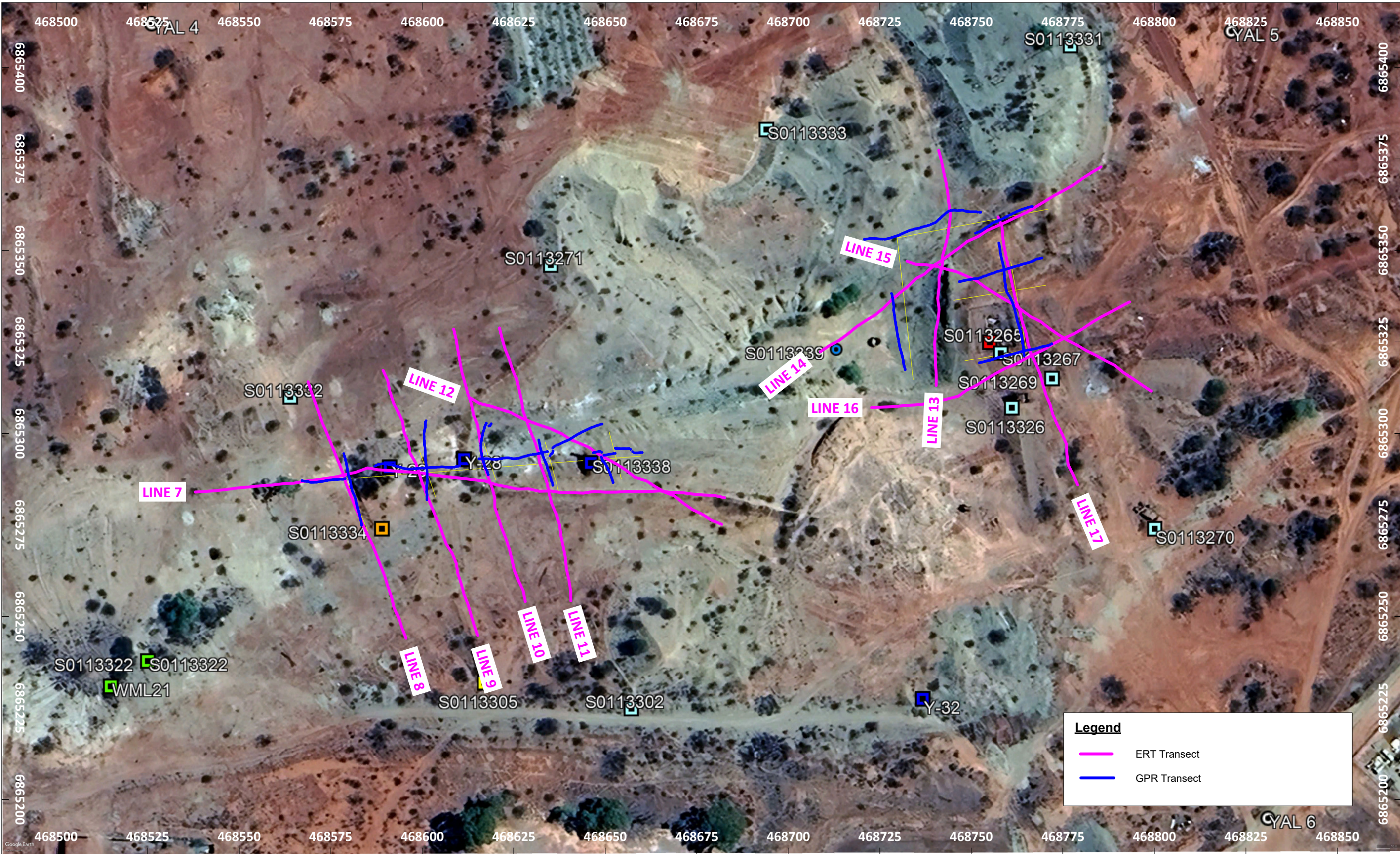
NOTES
Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Levels are given in Australian Height Datum (AHD).



CLIENT	WML
YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION - YALGOO, WESTERN AUSTRALIA	

Date	02 OCT 2024	Paper Size	A3
Scale	1:1000	Drawn	SMK
Drawing	3133-01	Revision	0

INVESTIGATION SITE MAP-YALGOO CENTRE




NOTES

Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Levels are given in Australian Height Datum (AHD).

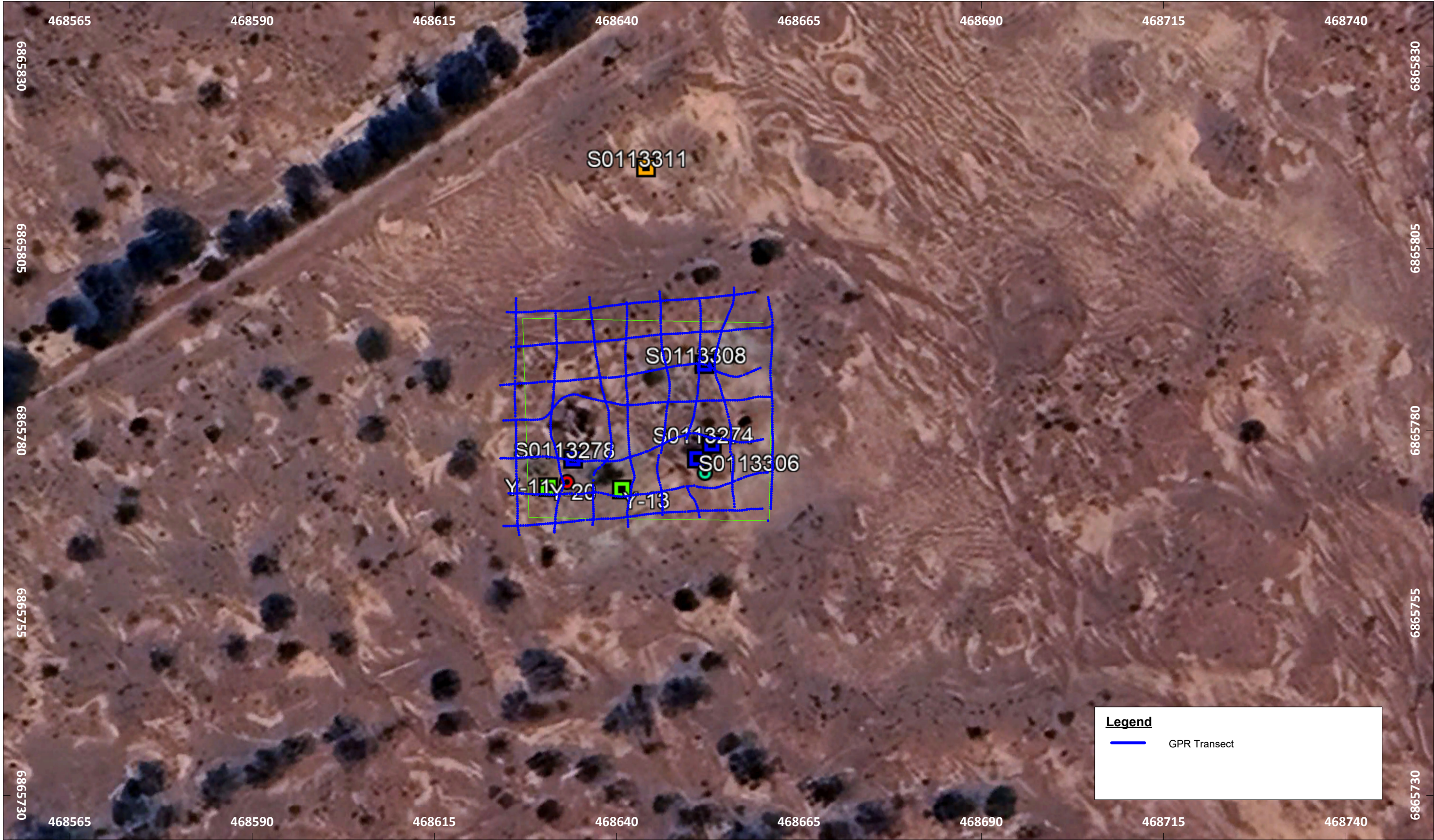


CLIENT	WML			Date	02 OCT 2024	Paper Size	A3
	YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION - YALGOO, WESTERN AUSTRALIA			Scale	1:1000	Drawn	SMK
				Drawing	3133-02	Revision	0




G B Geotechnics (Australia) Pty Ltd
1/11 Gympie Way Willetton WA 6155
ABN: 77 009 550 869
Telephone: 02 9890 2122
Email: info@gbgoz.com.au

INVESTIGATION SITE MAP-YALGOO NORTH



NOTES
Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Levels are given in Australian Height Datum (AHD).

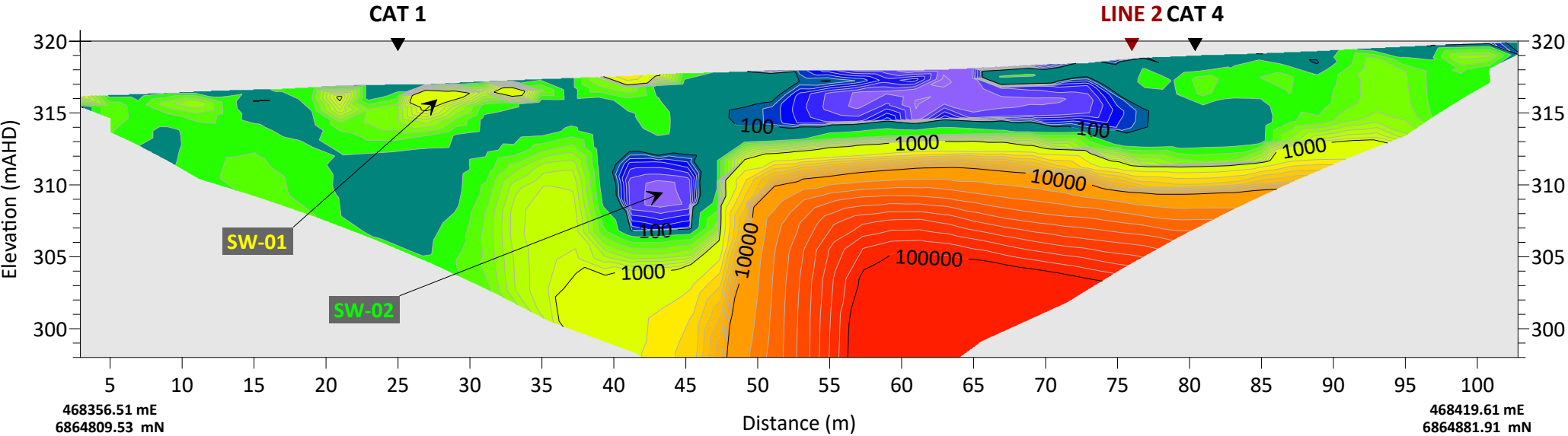


CLIENT	WML		Date	02 OCT 2024	Paper Size	A3		G B Geotechnics (Australia) Pty Ltd 1/11 Gympie Way Willetton WA 6155 ABN: 77 009 550 869 Telephone: 02 9890 2122 Email: info@gbgoz.com.au
	YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION - YALGOO, WESTERN AUSTRALIA		Scale	1:500	Drawn	SMK		
			Drawing	3133-03	Revision	0		

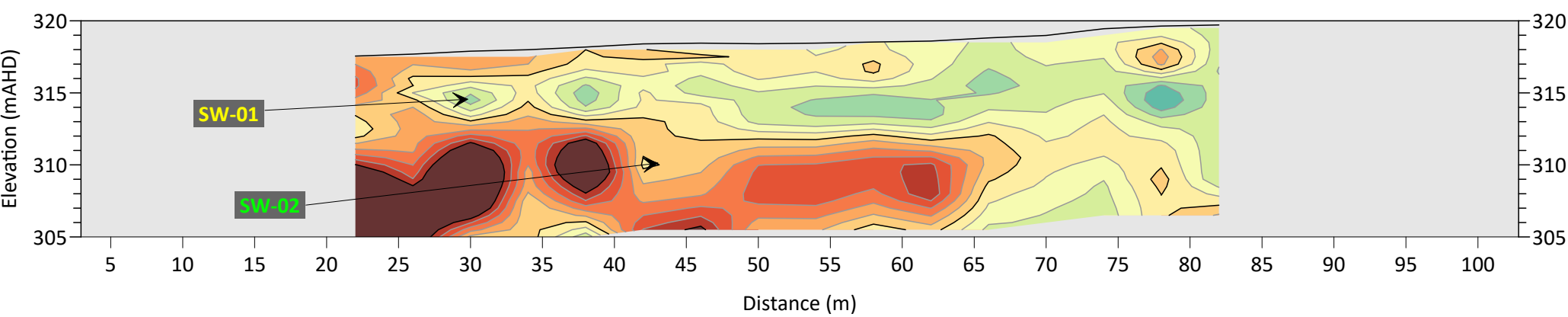
APPENDIX B – INTERPRETED GEOPHYSICAL SECTIONS

ELECTRICAL RESISTIVITY SECTIONS

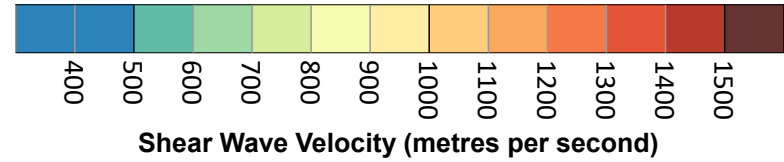
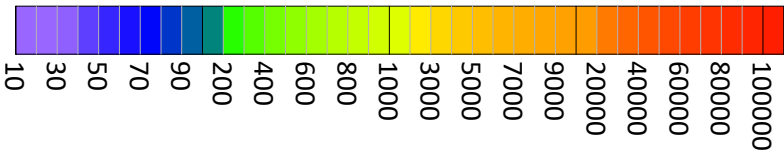
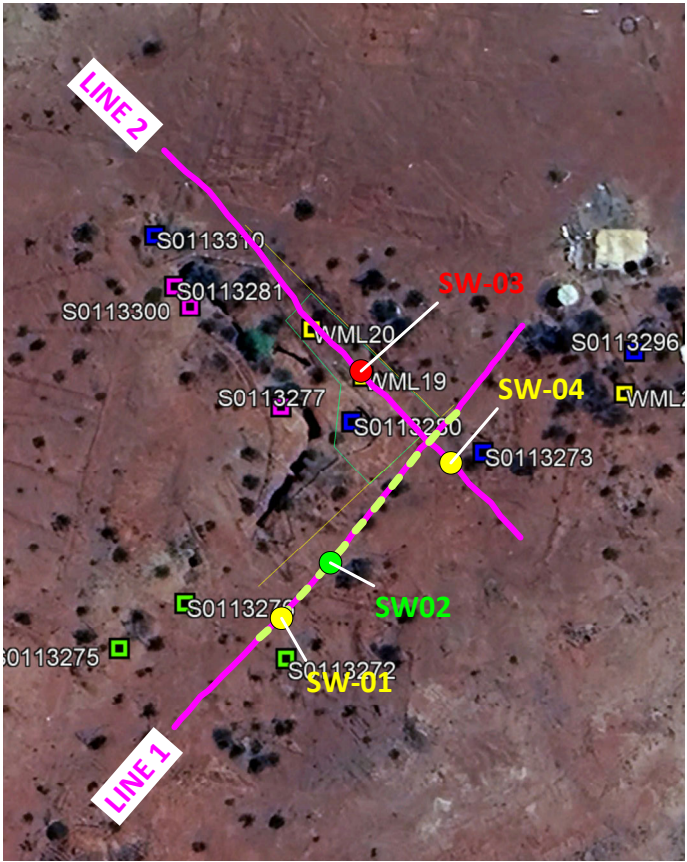
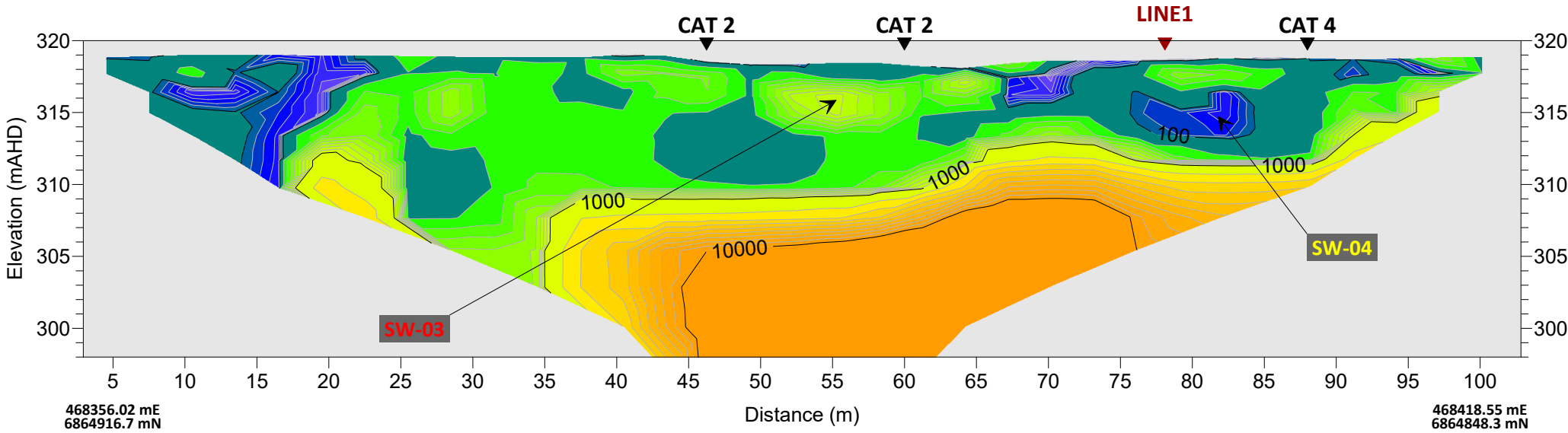
LINE 1 - ELECTRICAL RESISTIVITY MODEL



LINE 1 - SEISMIC SHEAR- WAVE VELOCITY MODEL



LINE 2 - ELECTRICAL RESISTIVITY MODEL



- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

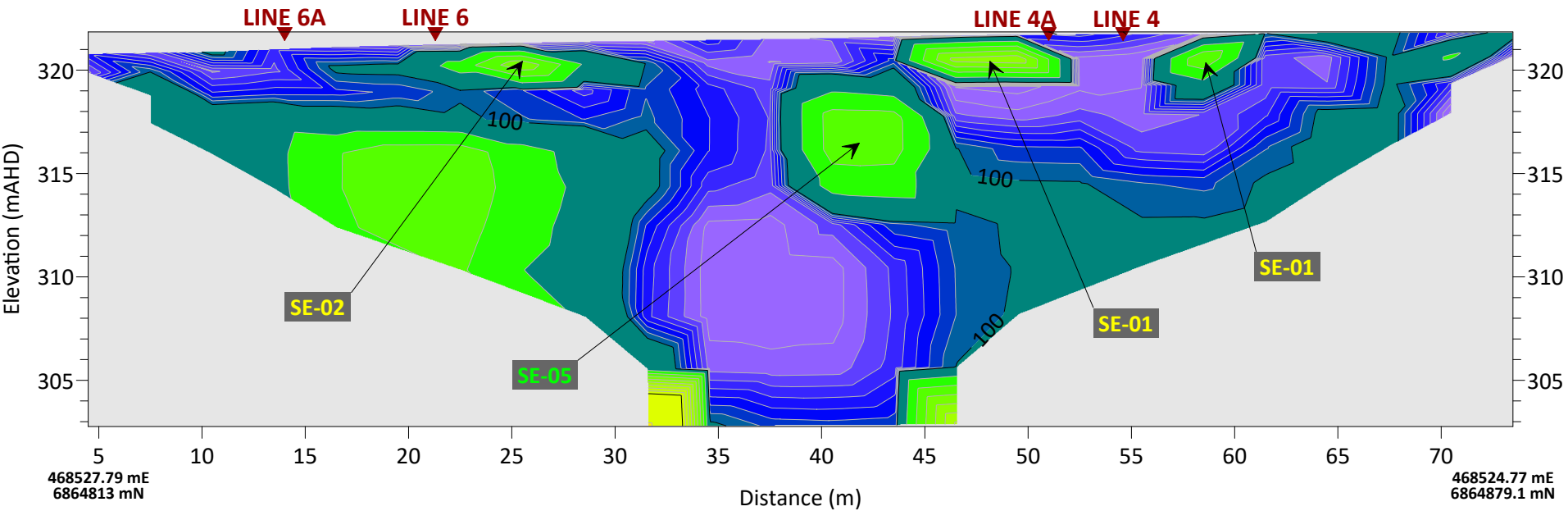
NOTES
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT
WML CONSULTING ENGINEERS
GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA

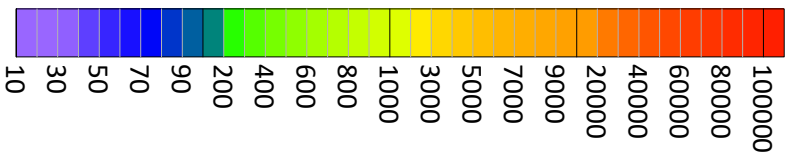
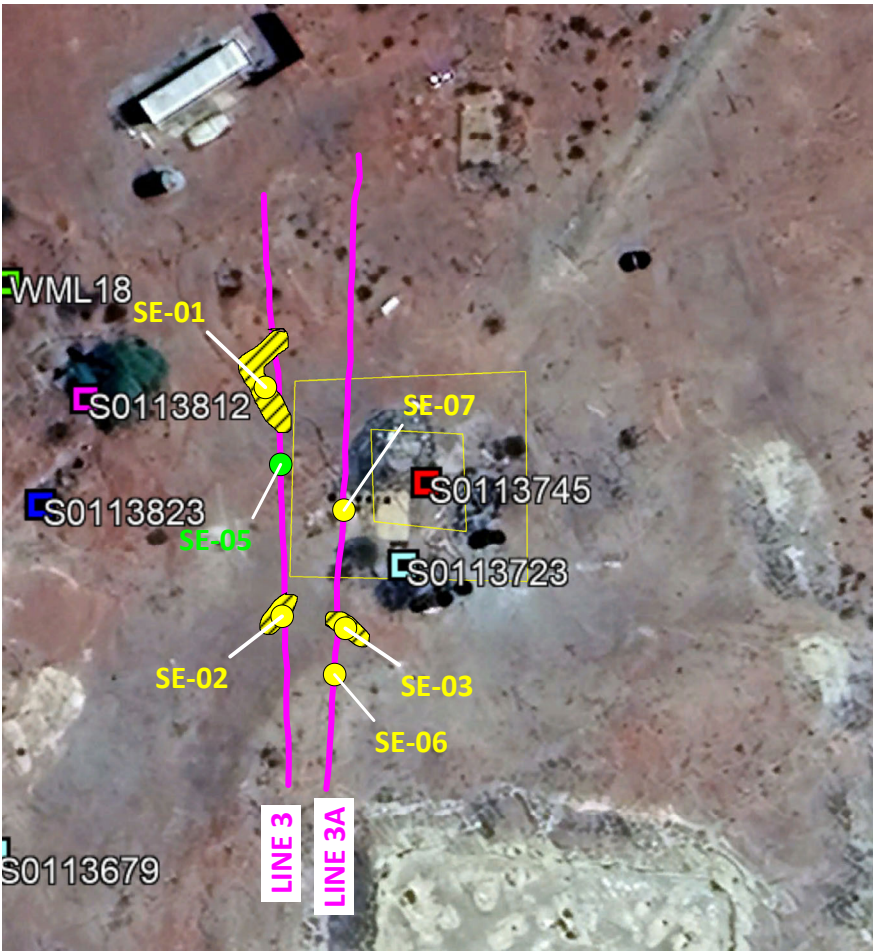
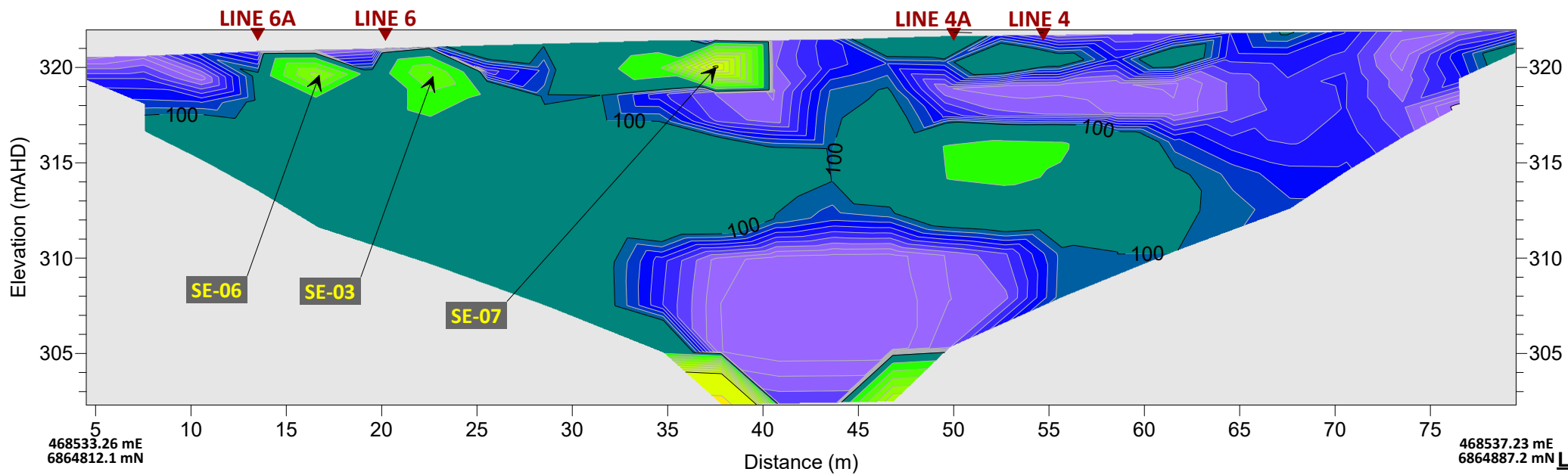
Date 16 October 2024
Scale 1:400
Drawing 3133-04
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 3 - ELECTRICAL RESISTIVITY MODEL



LINE 3A - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

NOTES
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

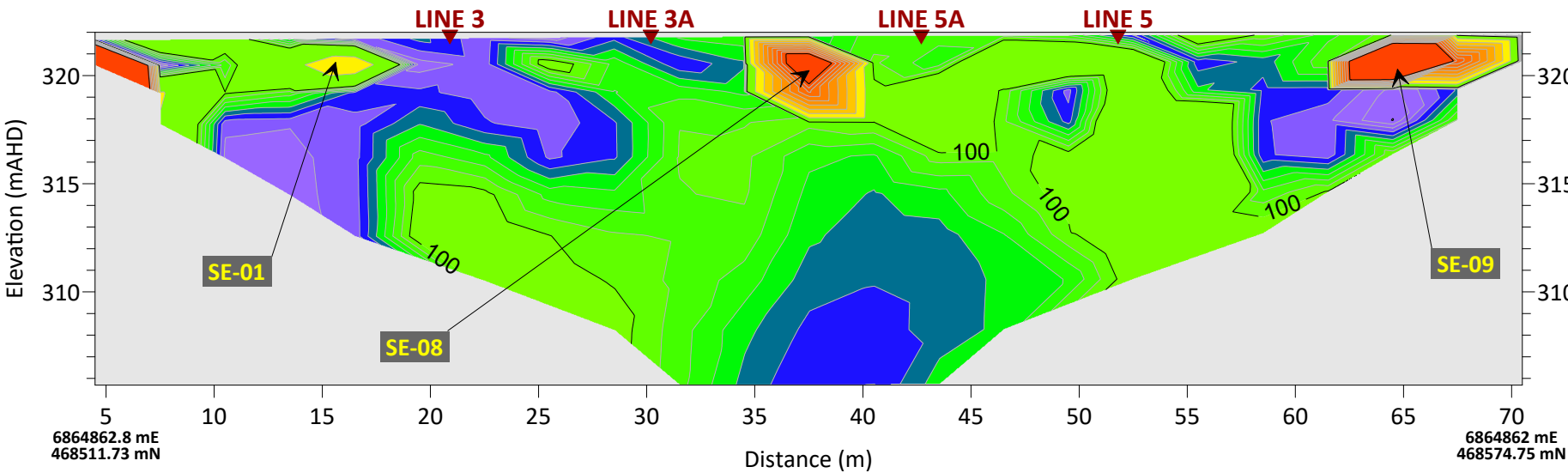
CLIENT
WML CONSULTING ENGINEERS
GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA

Date	16 October 2024
Scale	1:300
Drawing	3133-05

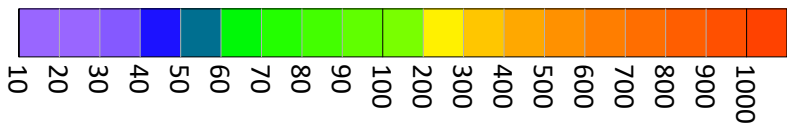
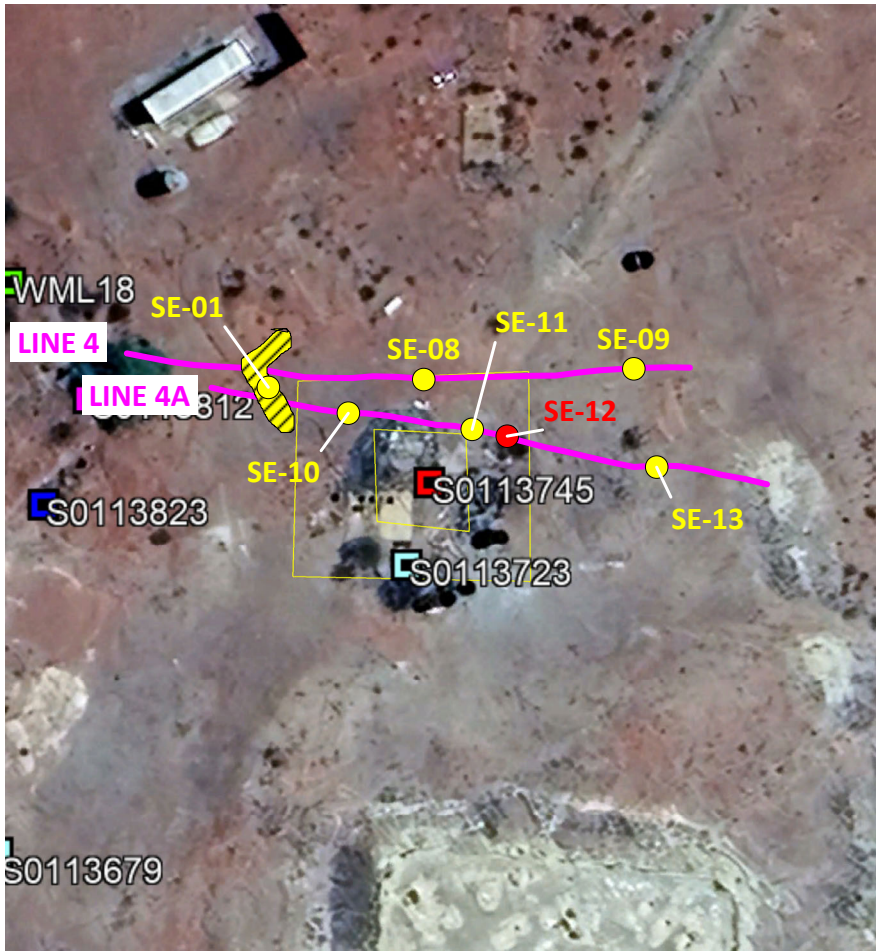
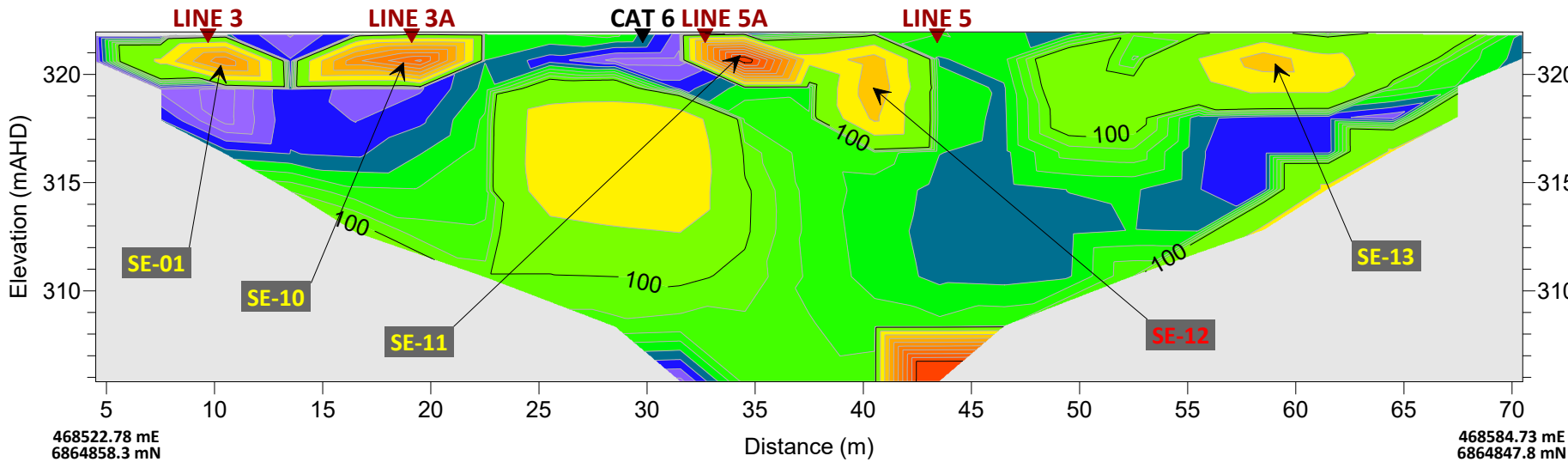
Paper Size	A3
Drawn	SMK
Revision	1

ELECTRICAL RESISTIVITY SECTIONS

LINE 4 - ELECTRICAL RESISTIVITY MODEL



LINE 4A - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- Target

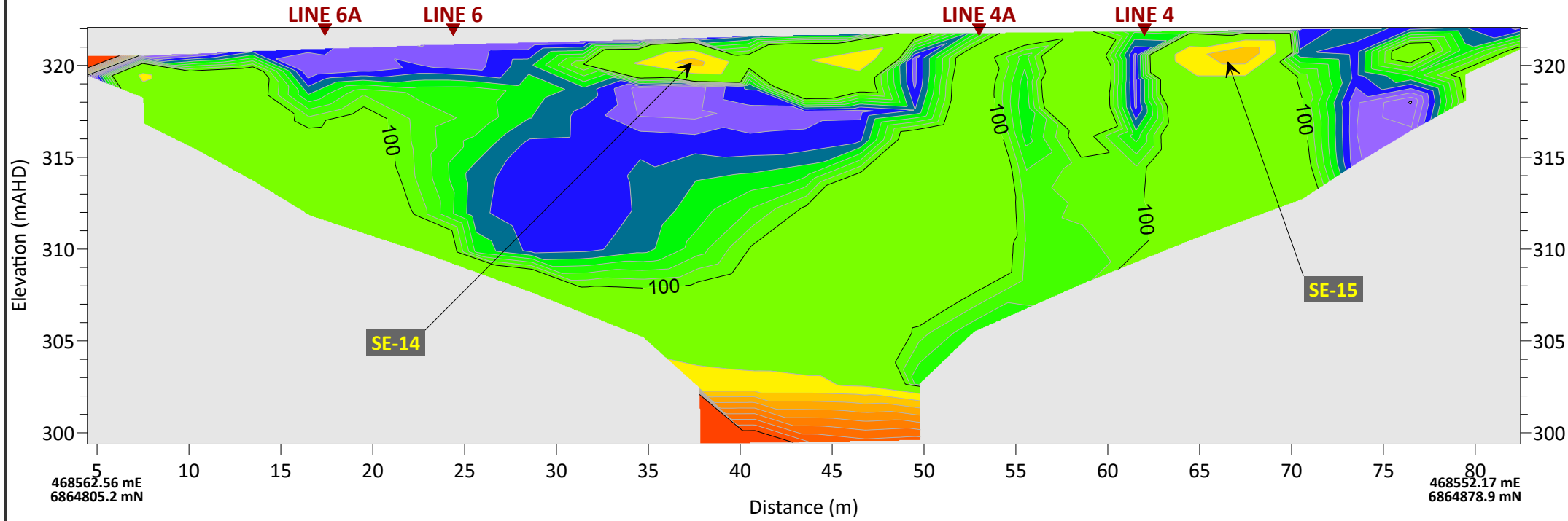
NOTES
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT
WML CONSULTING ENGINEERS
GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA

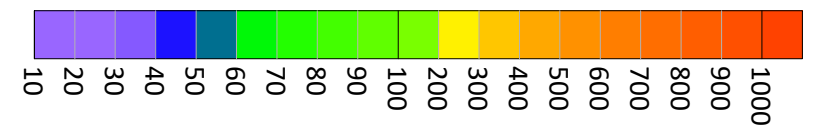
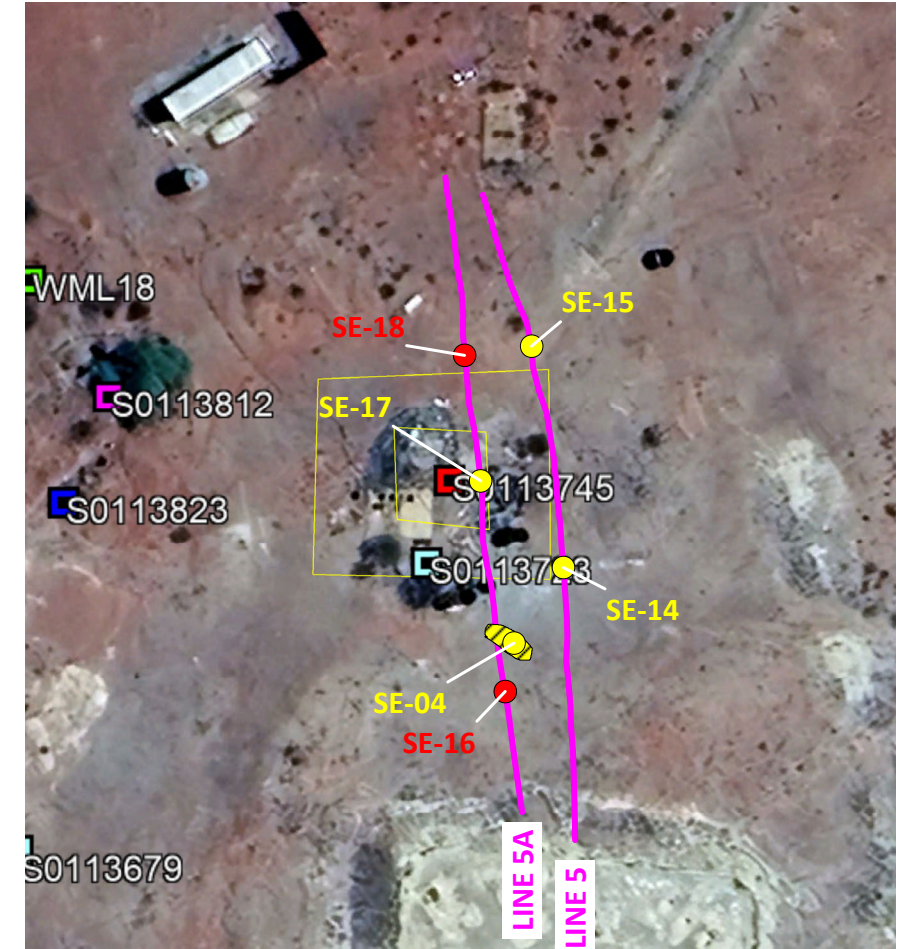
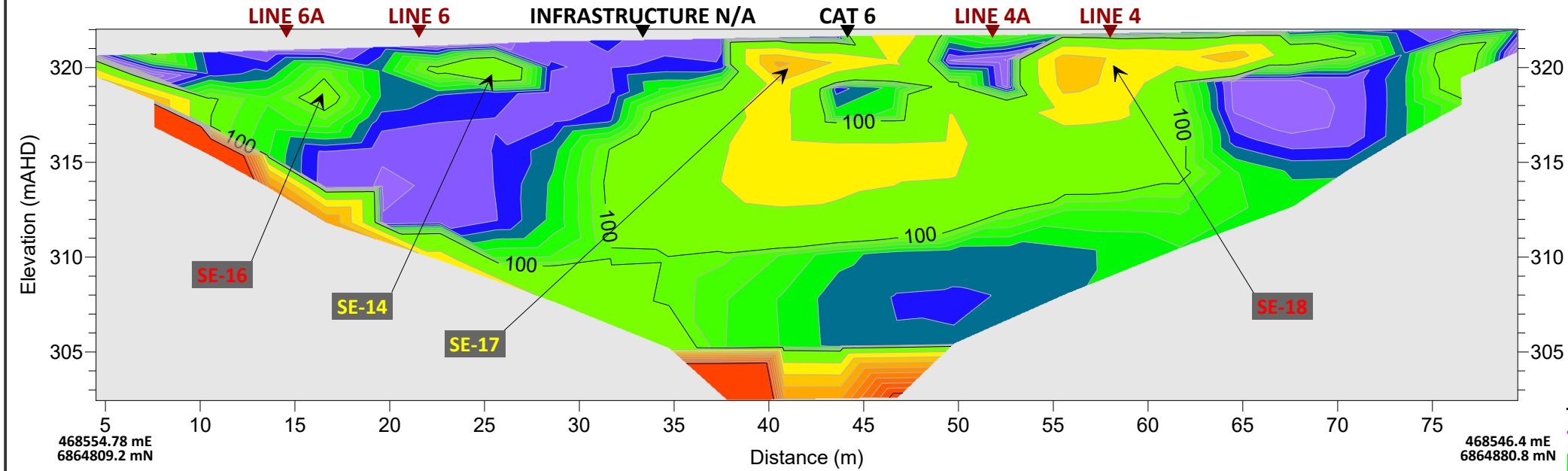
Date 16 October 2024
Scale 1:300
Drawing 3133-06
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 5 - ELECTRICAL RESISTIVITY MODEL



LINE 5A - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- ⊕ Target

NOTES

Drawing to be used in conjunction with Report 3133.
Map Projection: GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

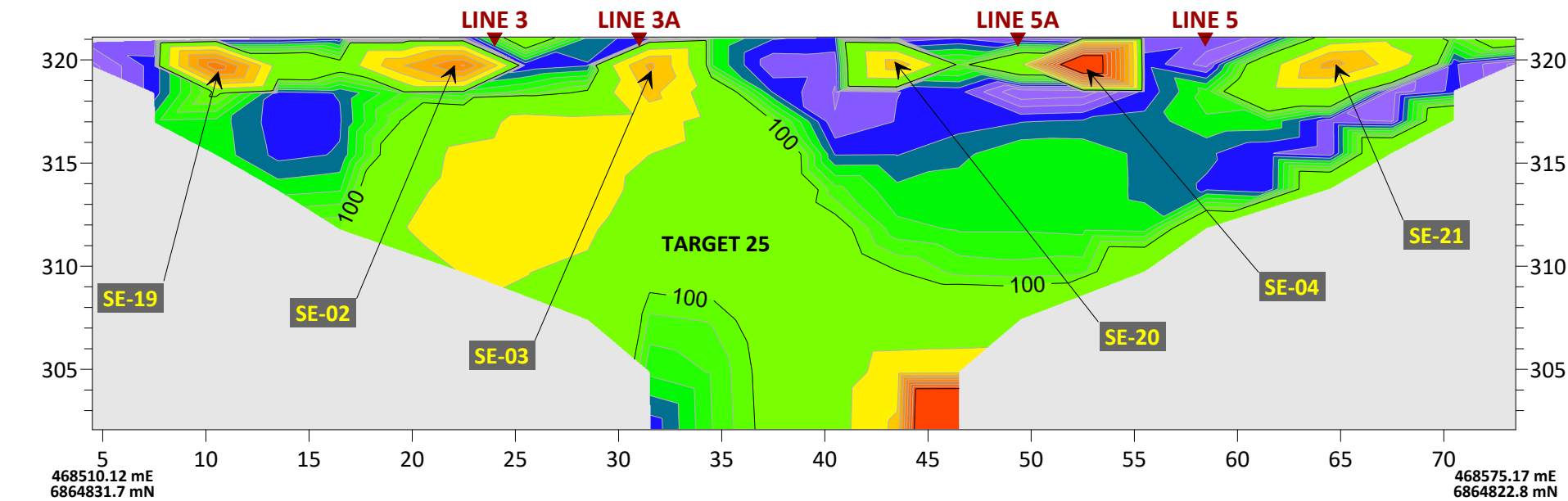
CLIENT
WML CONSULTING ENGINEERS
**GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA**

Date 16 October 2024
Scale 1:300
Drawing 3133-07

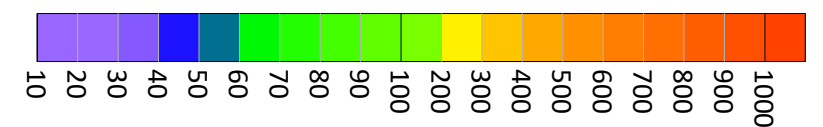
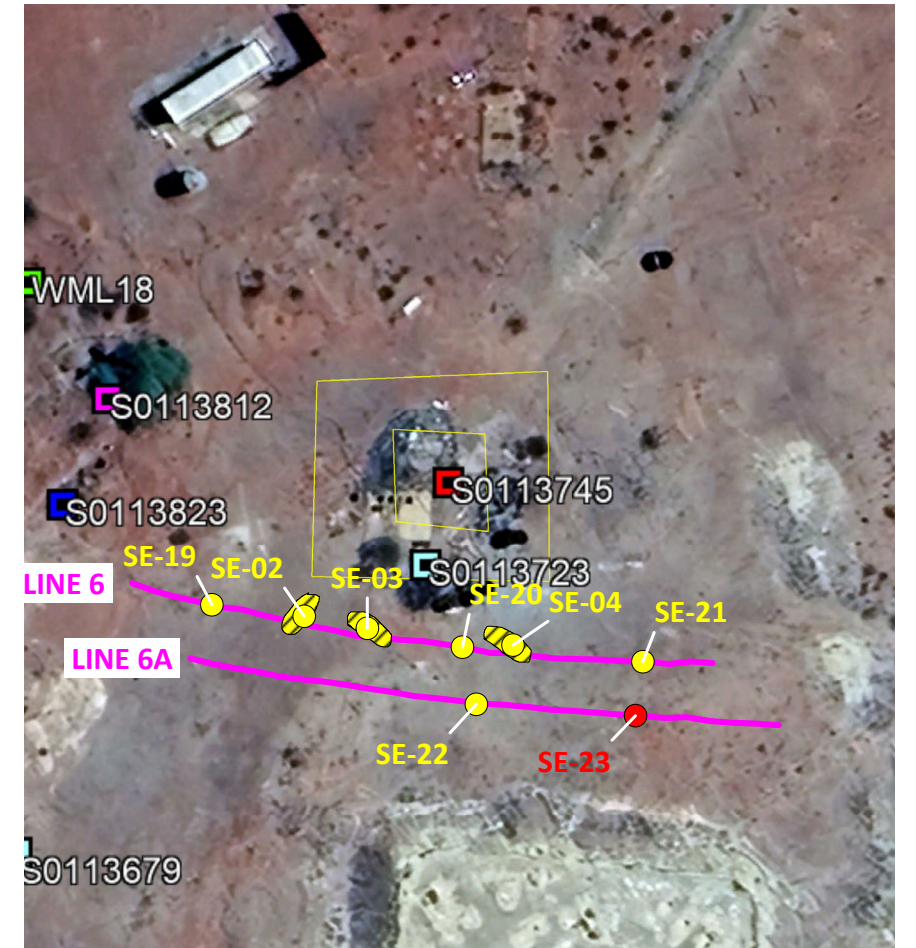
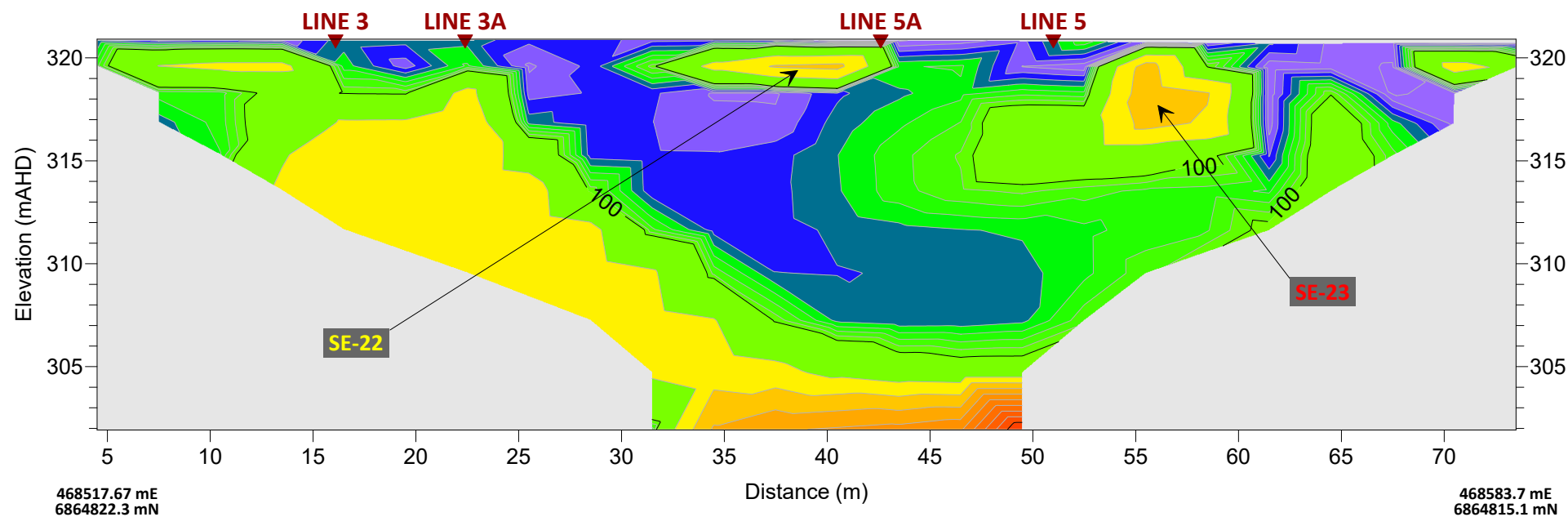
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 6 - ELECTRICAL RESISTIVITY MODEL



LINE 6A - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- ⊕ Target

NOTES

Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

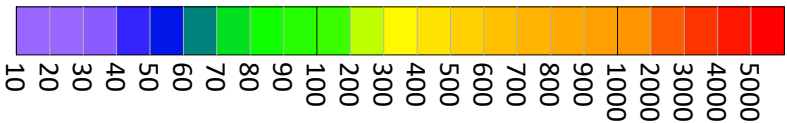
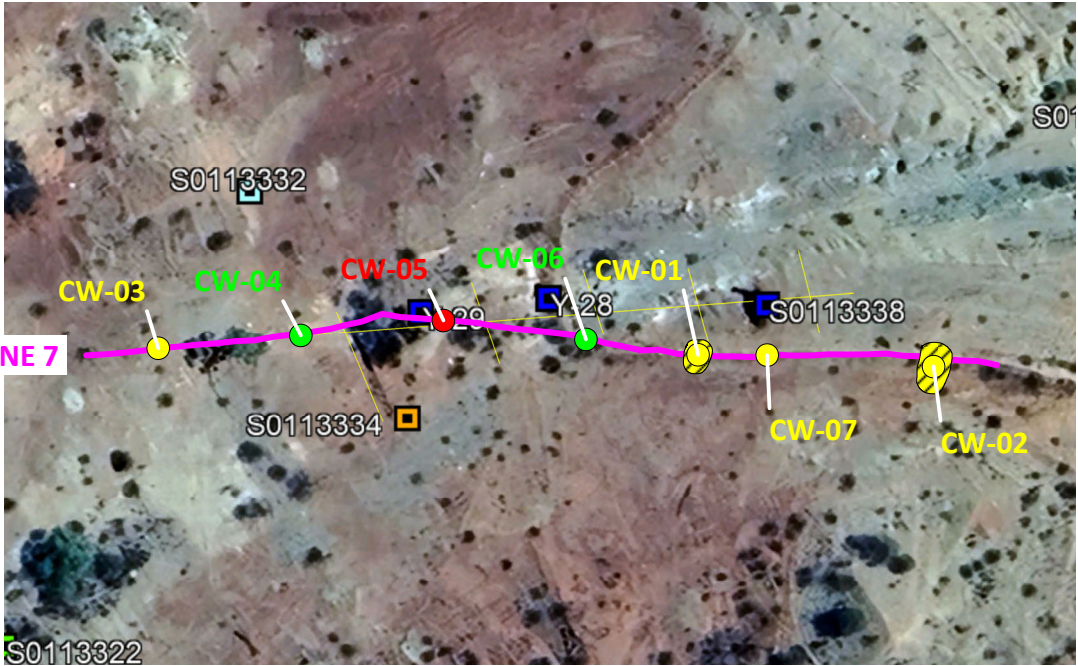
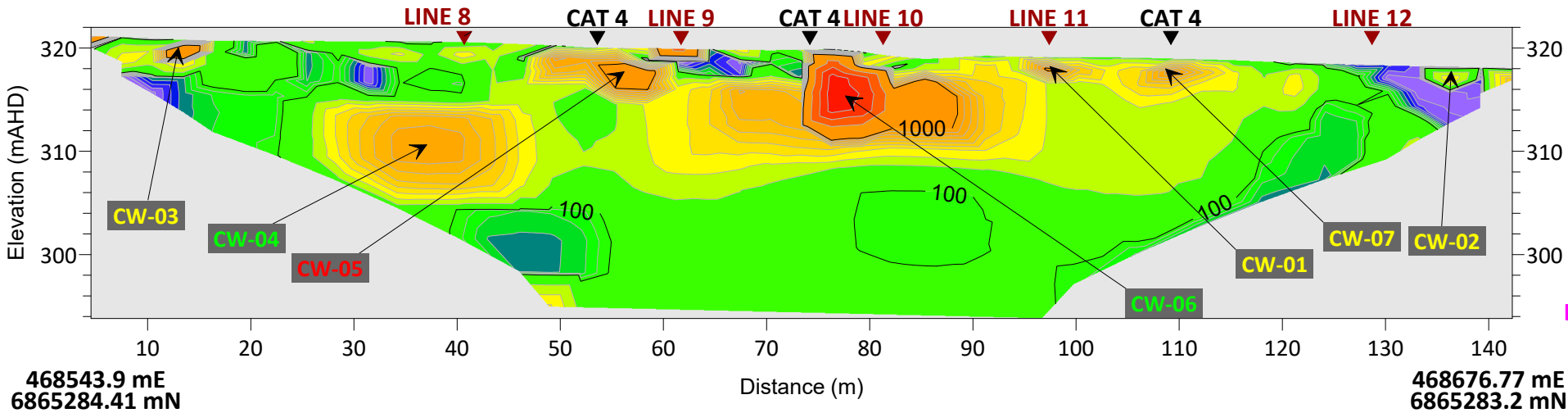
CLIENT **WML CONSULTING ENGINEERS**
**GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA**

Date 16 October 2024
Scale 1:300
Drawing 3133-08

Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 7 - ELECTRICAL RESISTIVITY MODEL

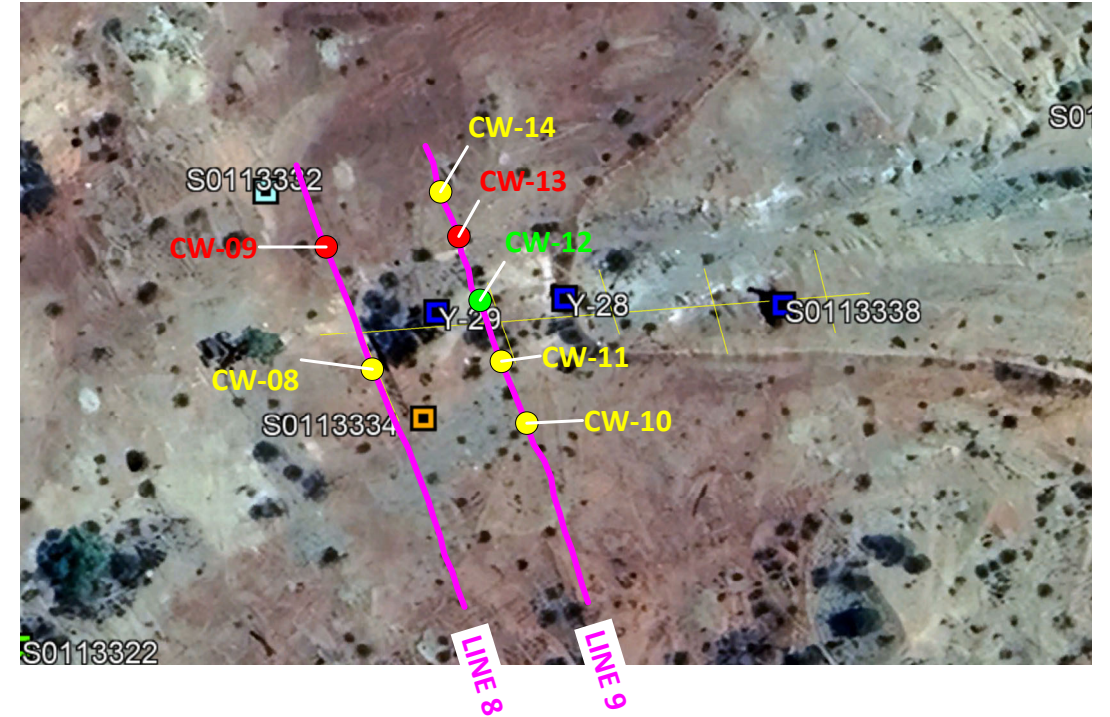
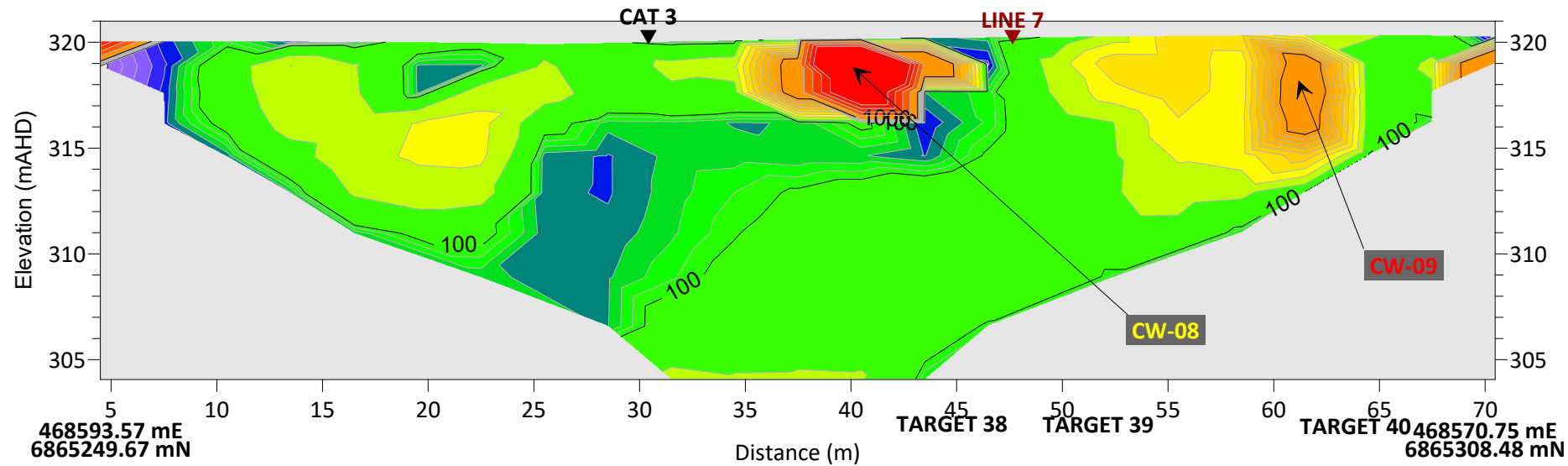


Electrical Resistivity (Ohm.metres)

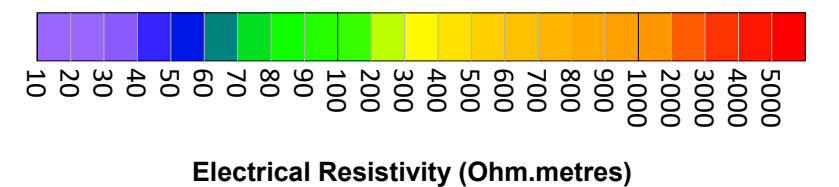
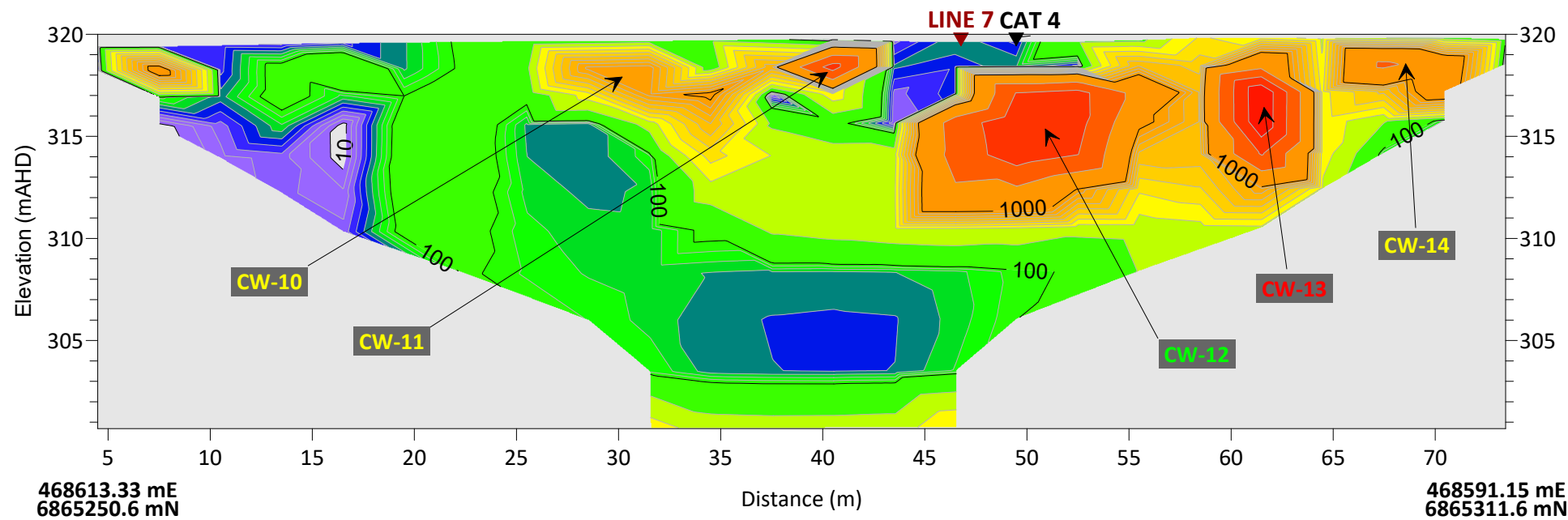
- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

ELECTRICAL RESISTIVITY SECTIONS

LINE 8 - ELECTRICAL RESISTIVITY MODEL



LINE 9 - ELECTRICAL RESISTIVITY MODEL



Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- ⊕ Target

NOTES

Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

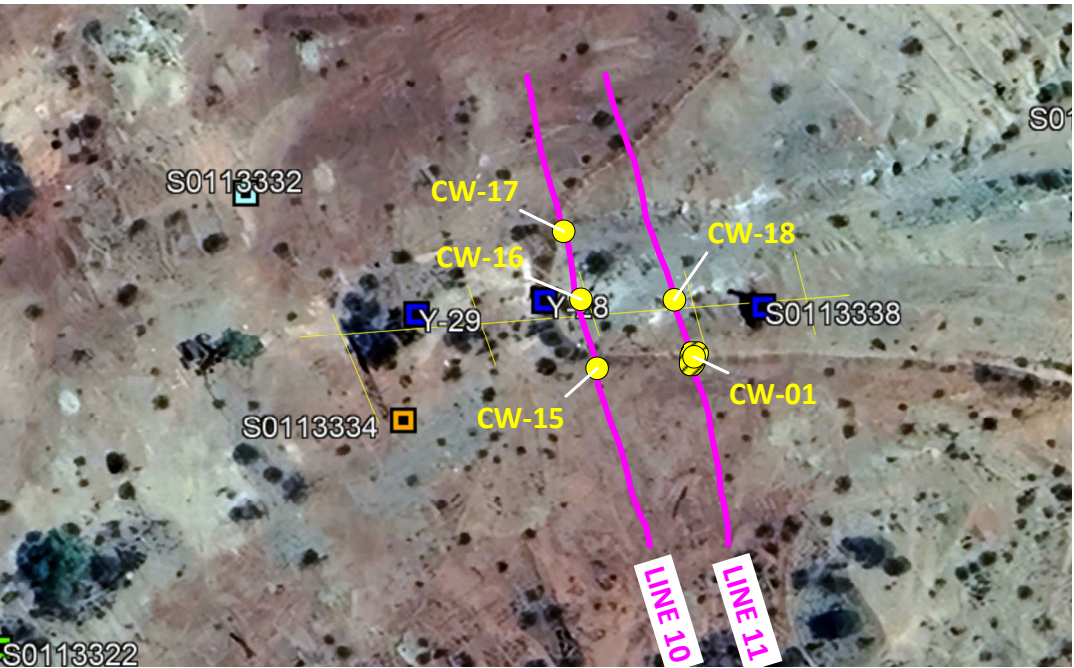
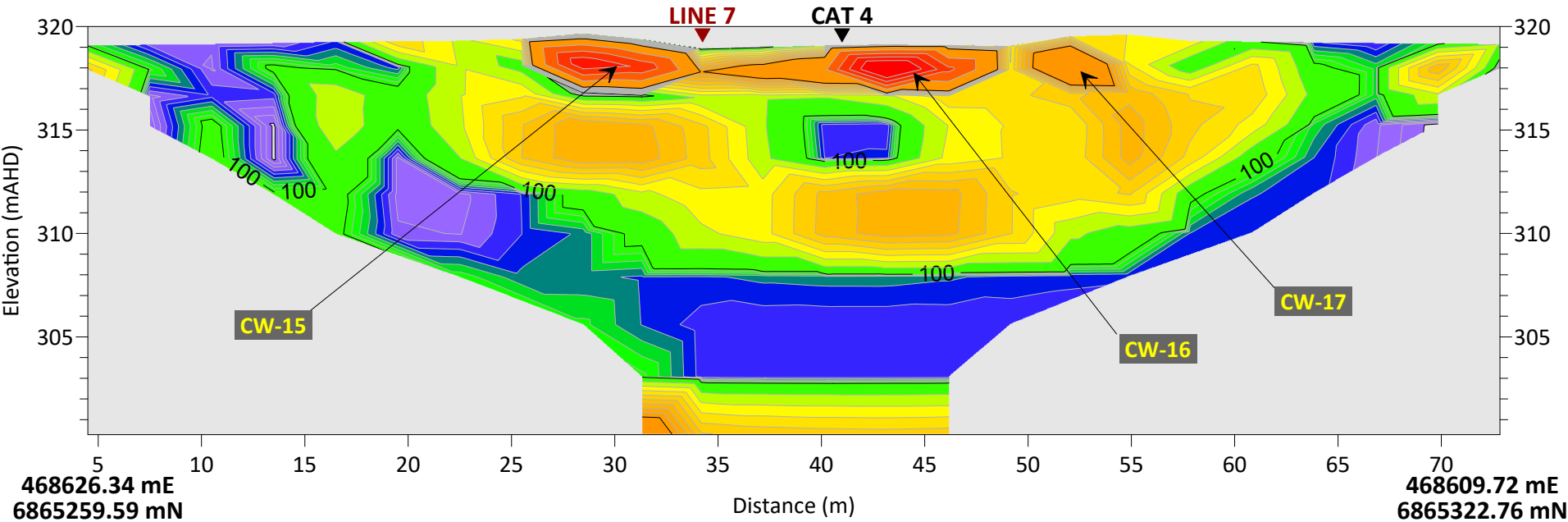
CLIENT **WML CONSULTING ENGINEERS**
**GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA**

Date 16 October 2024
Scale 1:300
Drawing 3133-10

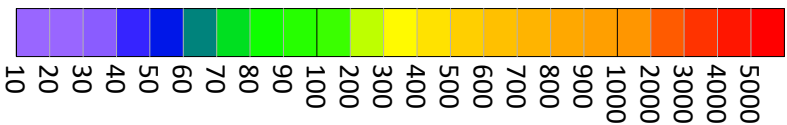
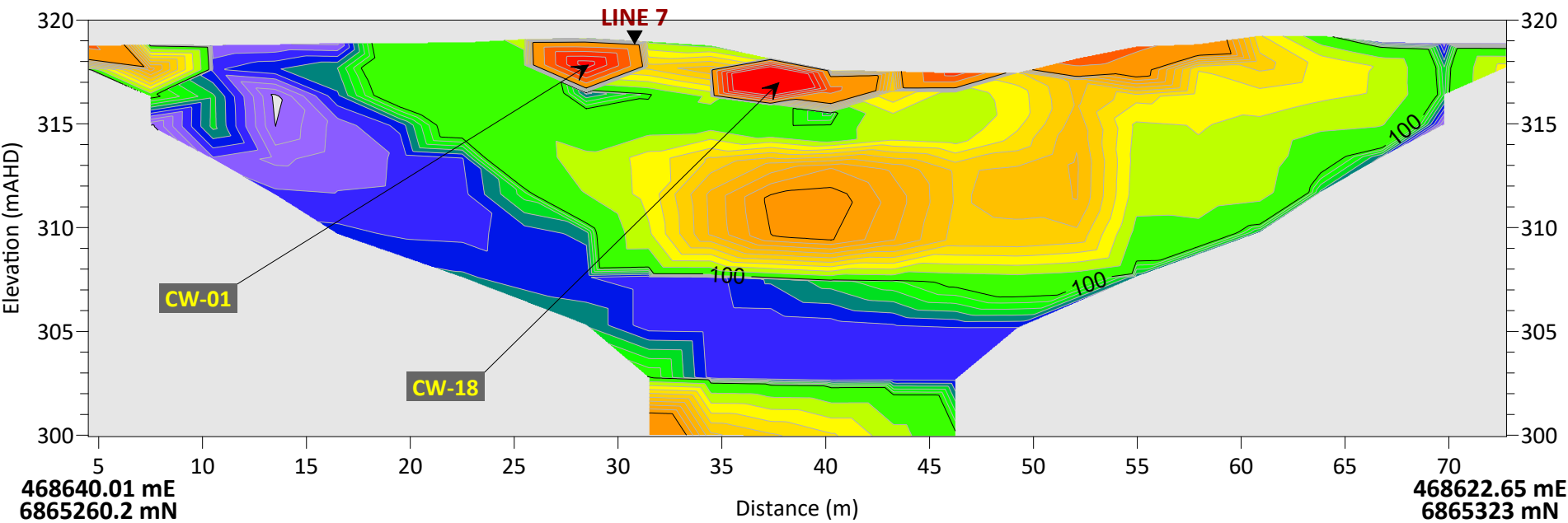
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 10 - ELECTRICAL RESISTIVITY MODEL



LINE 11 - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.m)res

- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

NOTES

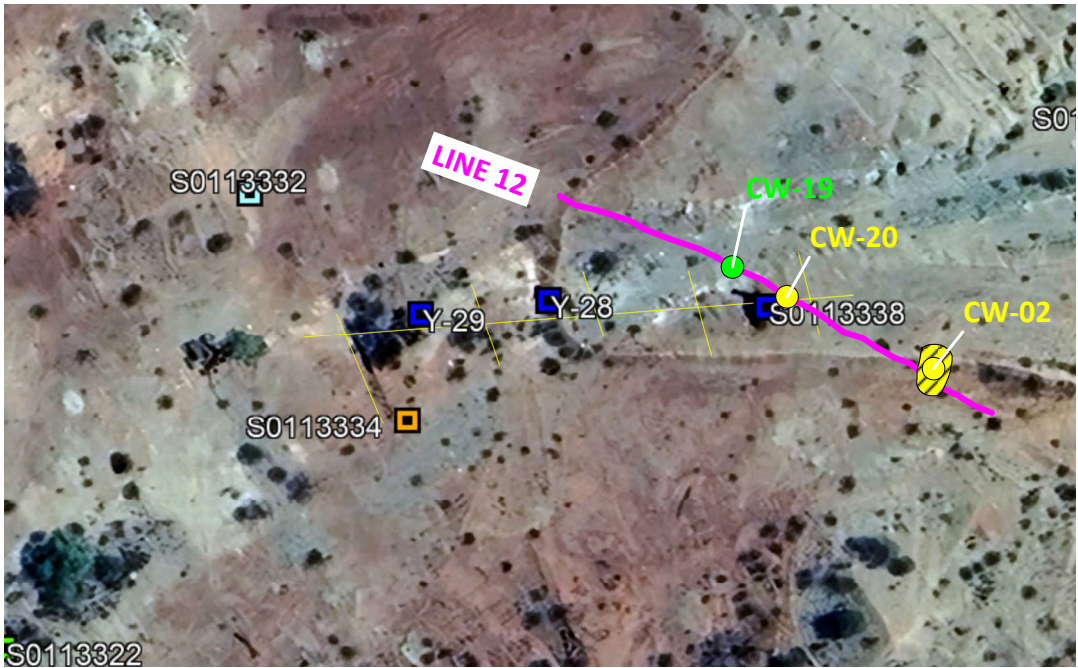
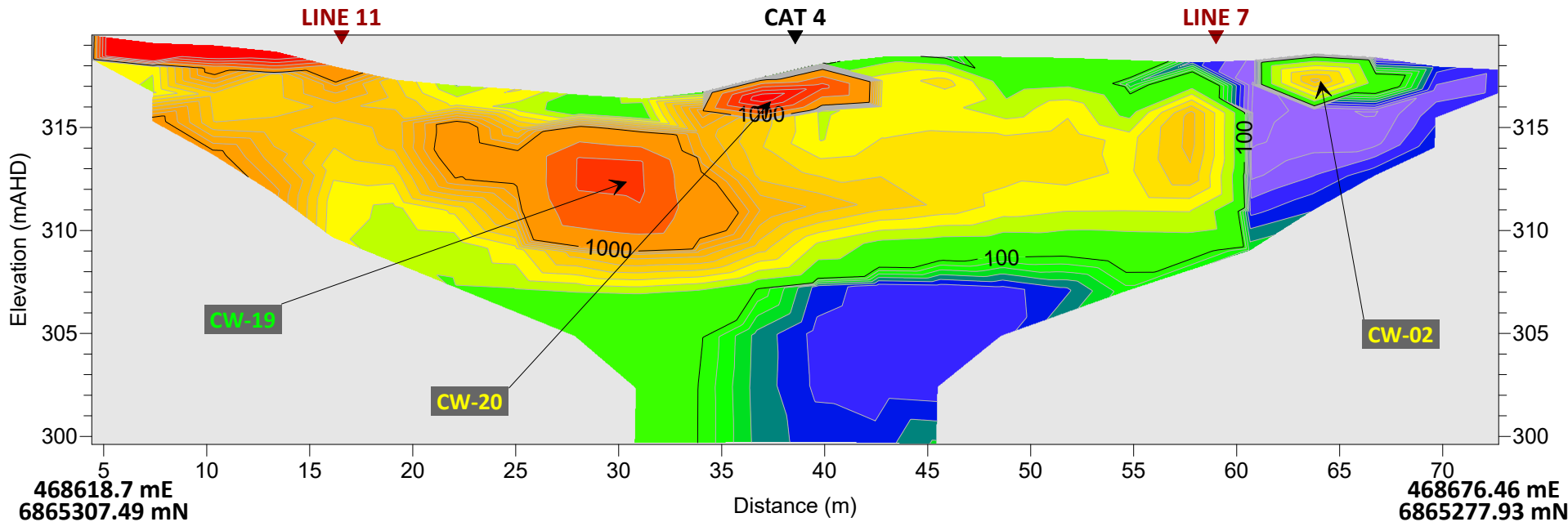
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT
WML CONSULTING ENGINEERS
**GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA**

Date 16 October 2024
Scale 1:300
Drawing 3133-11
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 12 - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- Target

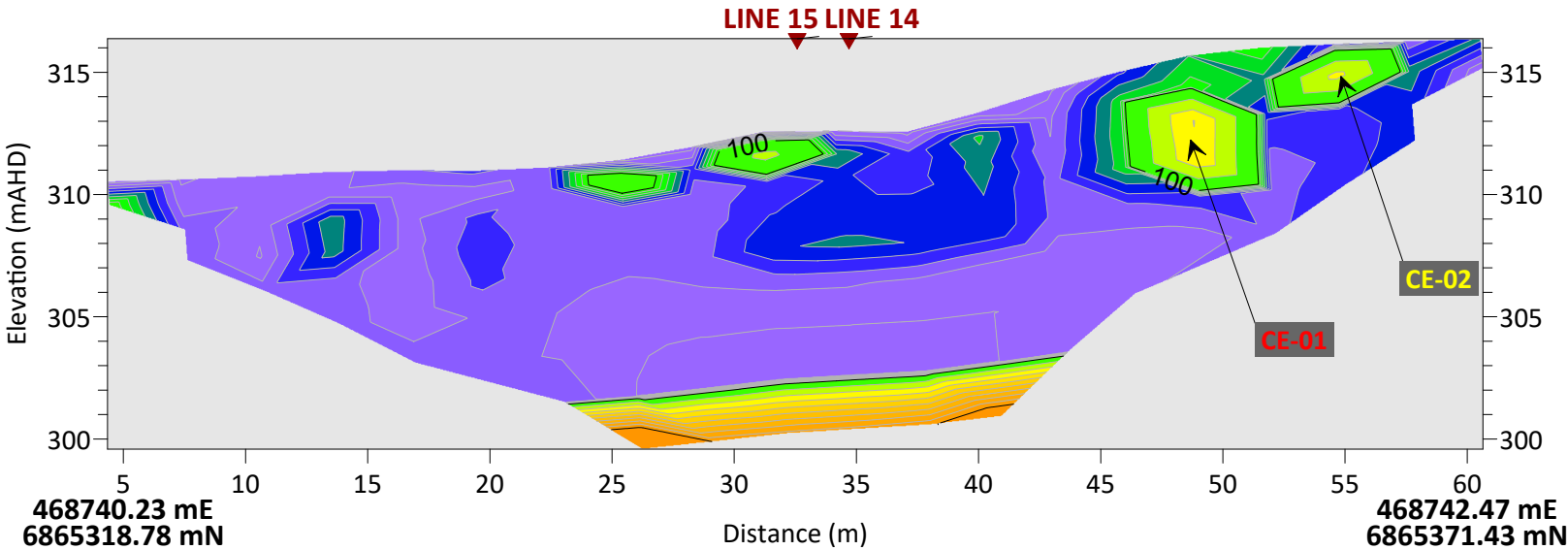
NOTES
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT
WML CONSULTING ENGINEERS
GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA

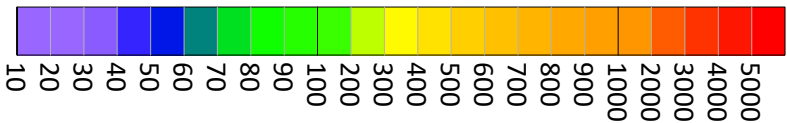
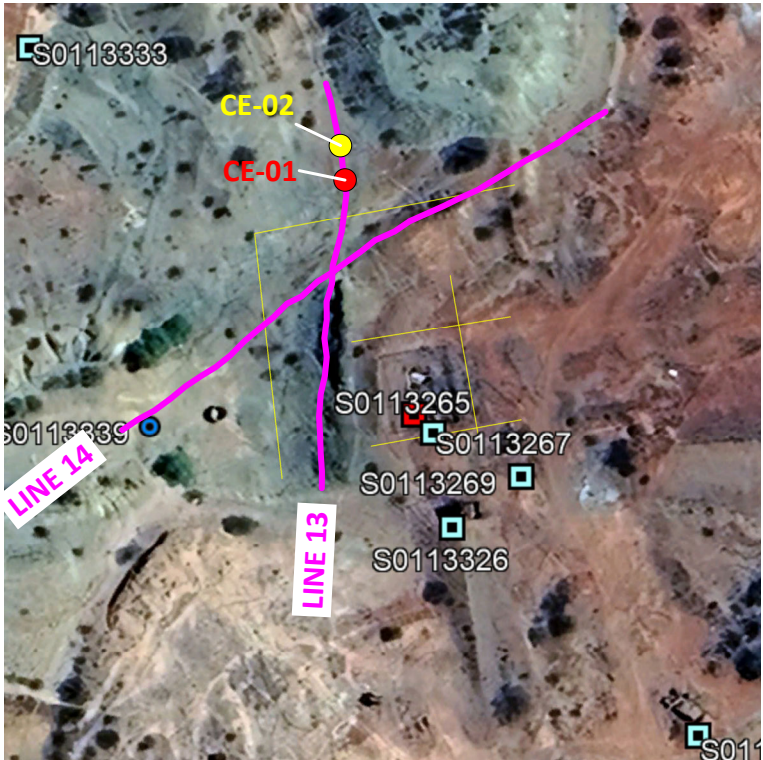
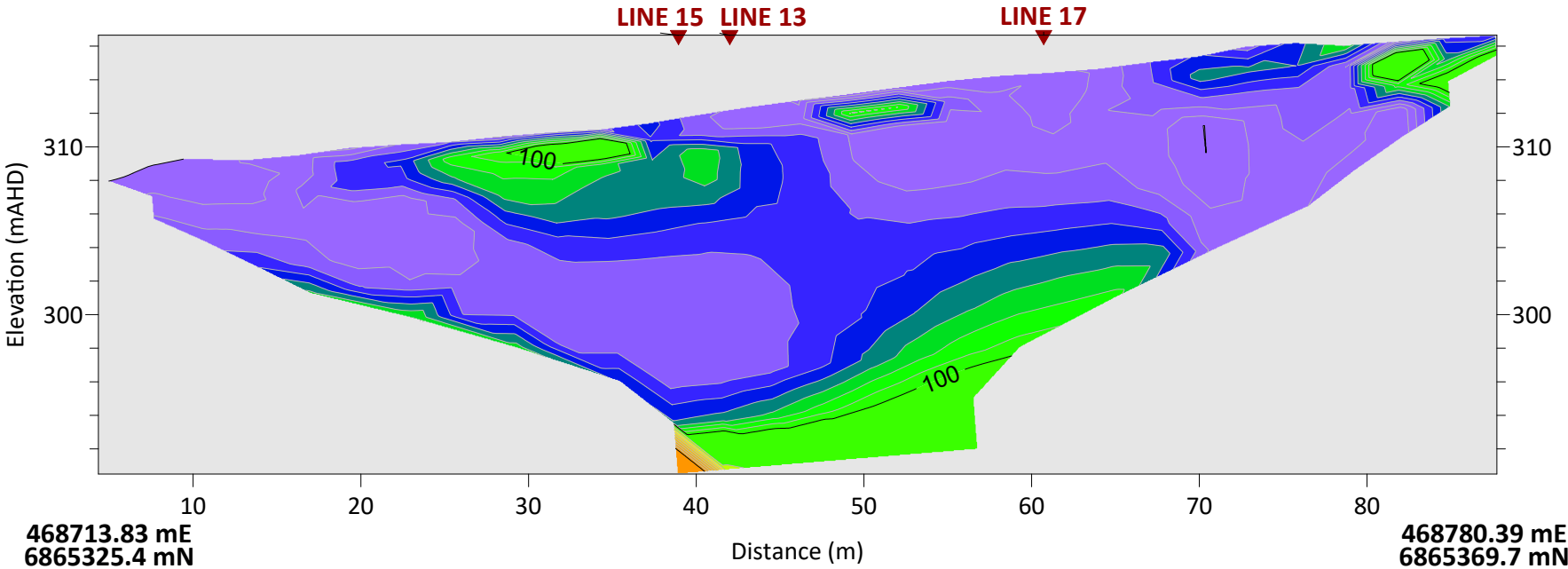
Date 16 October 2024
Scale 1:300
Drawing 3133-12
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 13 - ELECTRICAL RESISTIVITY MODEL



LINE 14 - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.meters)

- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

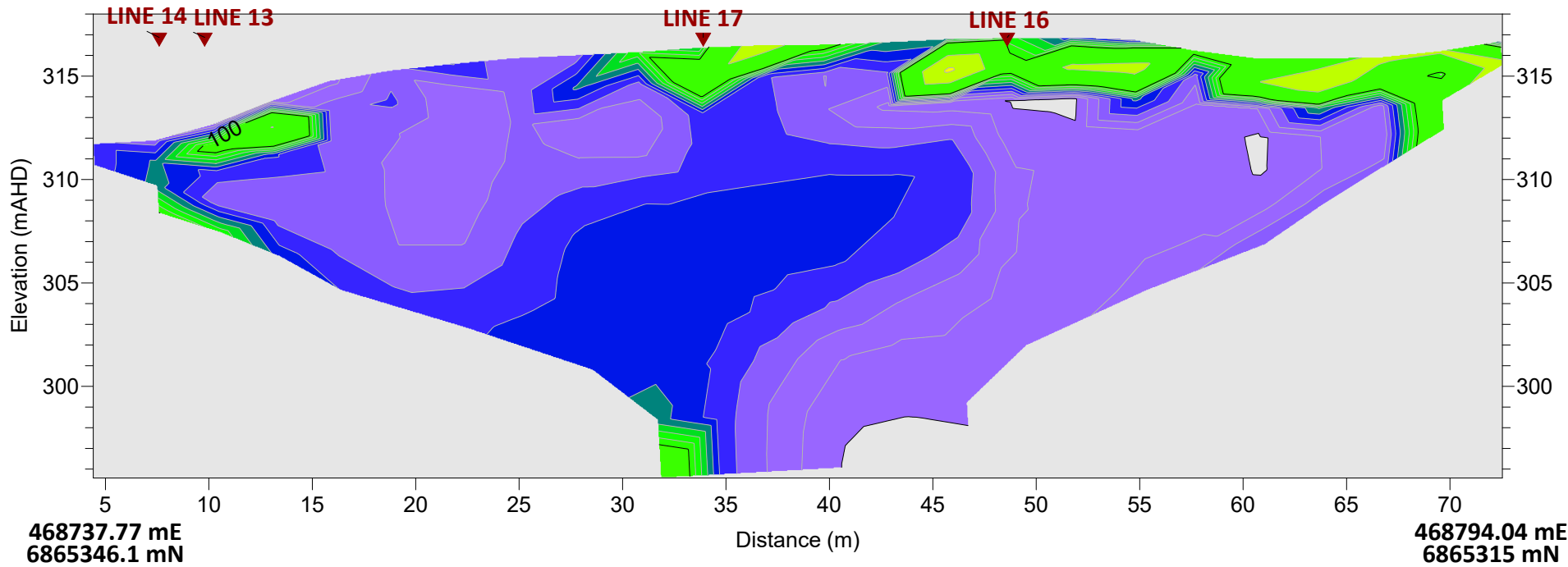
NOTES
Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT
WML CONSULTING ENGINEERS
GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA

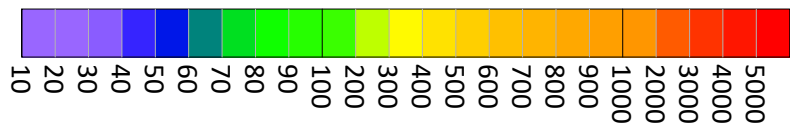
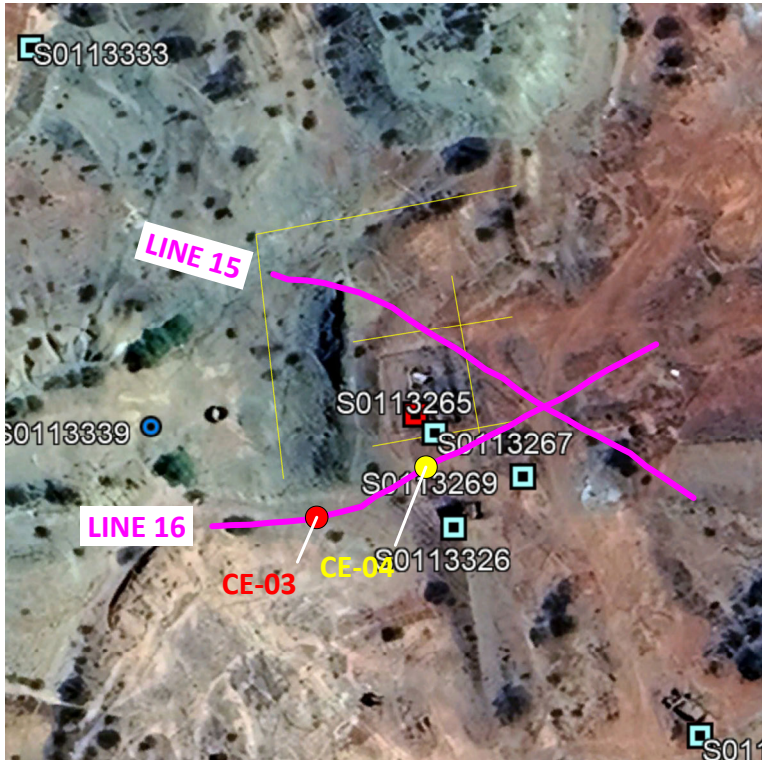
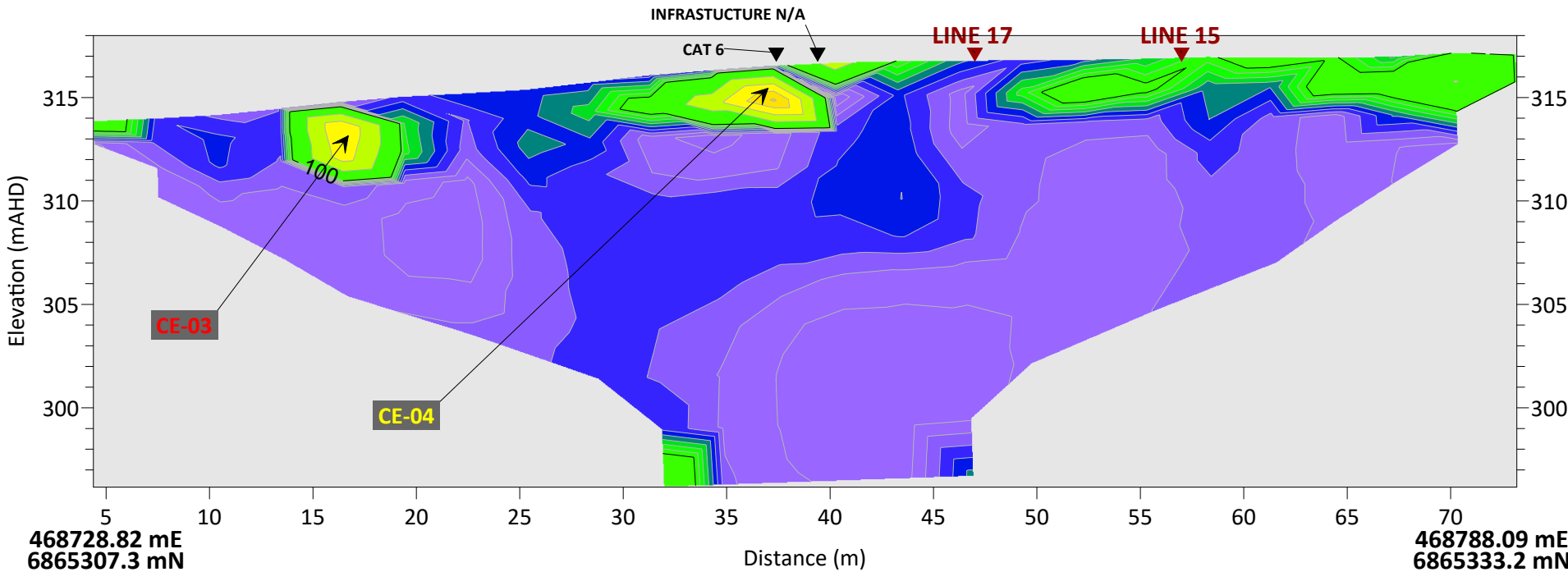
Date 16 October 2024
Scale 1:300
Drawing 3133-13
Paper Size A3
Drawn SMK
Revision 1

ELECTRICAL RESISTIVITY SECTIONS

LINE 15 - ELECTRICAL RESISTIVITY MODEL



LINE 16 - ELECTRICAL RESISTIVITY MODEL



Electrical Resistivity (Ohm.metres)

Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect (GRID PATTERN)
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- + Target

NOTES

Drawing to be used in conjunction with Report 3133.
Map Projection GDA2020 MGA Zone 50.
Aerial image from Google Earth Pro.

CLIENT

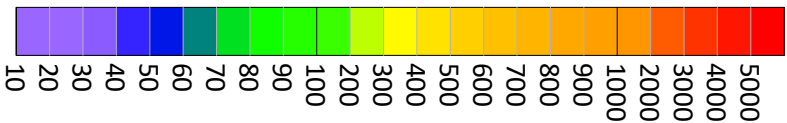
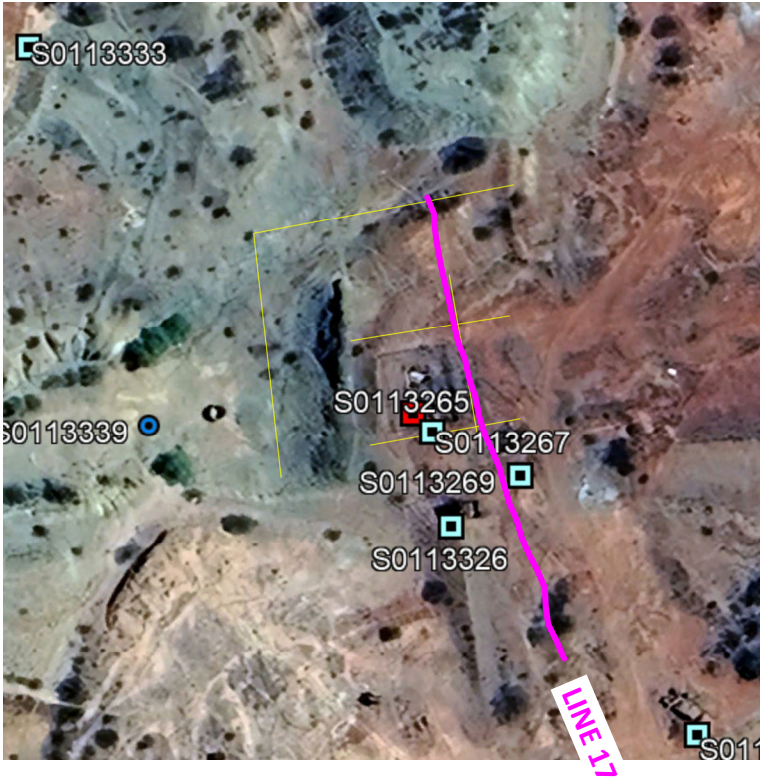
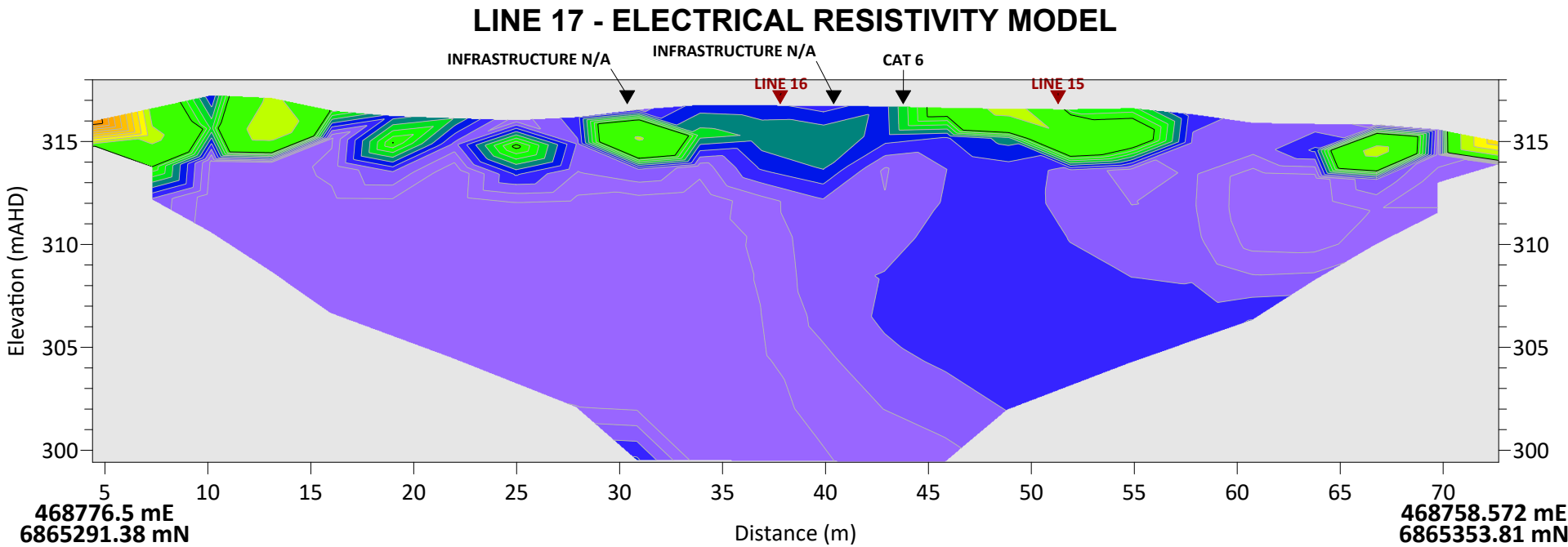
WML CONSULTING ENGINEERS

**GEOPHYSICAL INVESTIGATION FOR
ABANDONED MINE FEATURES
YALGOO, WA**

Date 16 October 2024
Scale 1:300
Drawing 3133-14

Paper Size A3
Drawn SMK
Revision 1

GEOPHYSICAL INVESTIGATION FOR ABANDONED MINE FEATURES, SHIRE OF YALGOO WESTERN AUSTRALIA.
ELECTRICAL RESISTIVITY SECTIONS

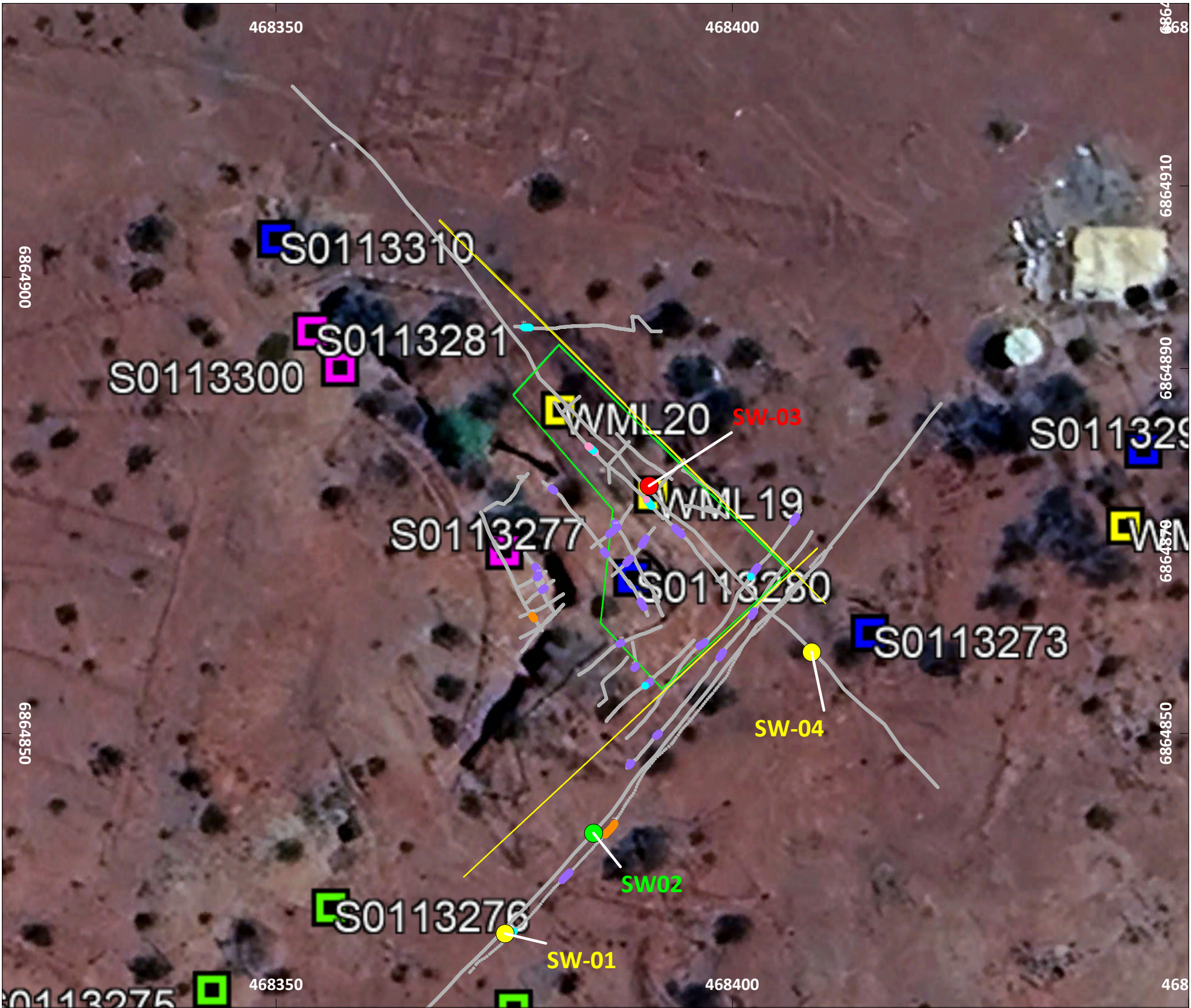


Electrical Resistivity (Ohm.m)

- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect (GRID PATTERN)
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

APPENDIX C – INTERPRETED FEATURE MAPS

INVESTIGATION SITE MAP WITH IDENTIFIED SUBSURFACE ANOMALIES - YALGOO SOUTH WEST



- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

- ERT Anomalies**
- 0 - 2mBGL
 - 2 - 4mBGL
 - > 4mBGL
- GPR Anomalies**
- 0 - 1mBGL
 - 1 - 2mBGL
 - 2 - 3mBGL
 - 3 - 5mBGL
 - > 6mBGL
- ID 3** Anomaly ID (Further details in report)

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
SW-01	1	468375.095	6864828.08	isolated	2
SW02	7.8	468384.786	6864839.09	isolated	2
SW-03	2.6	468390.872	6864877.13	isolated	2
SW-04	1.2	468408.691	6864858.91	isolated	1

NOTES
Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Depths given are based on current ground level.

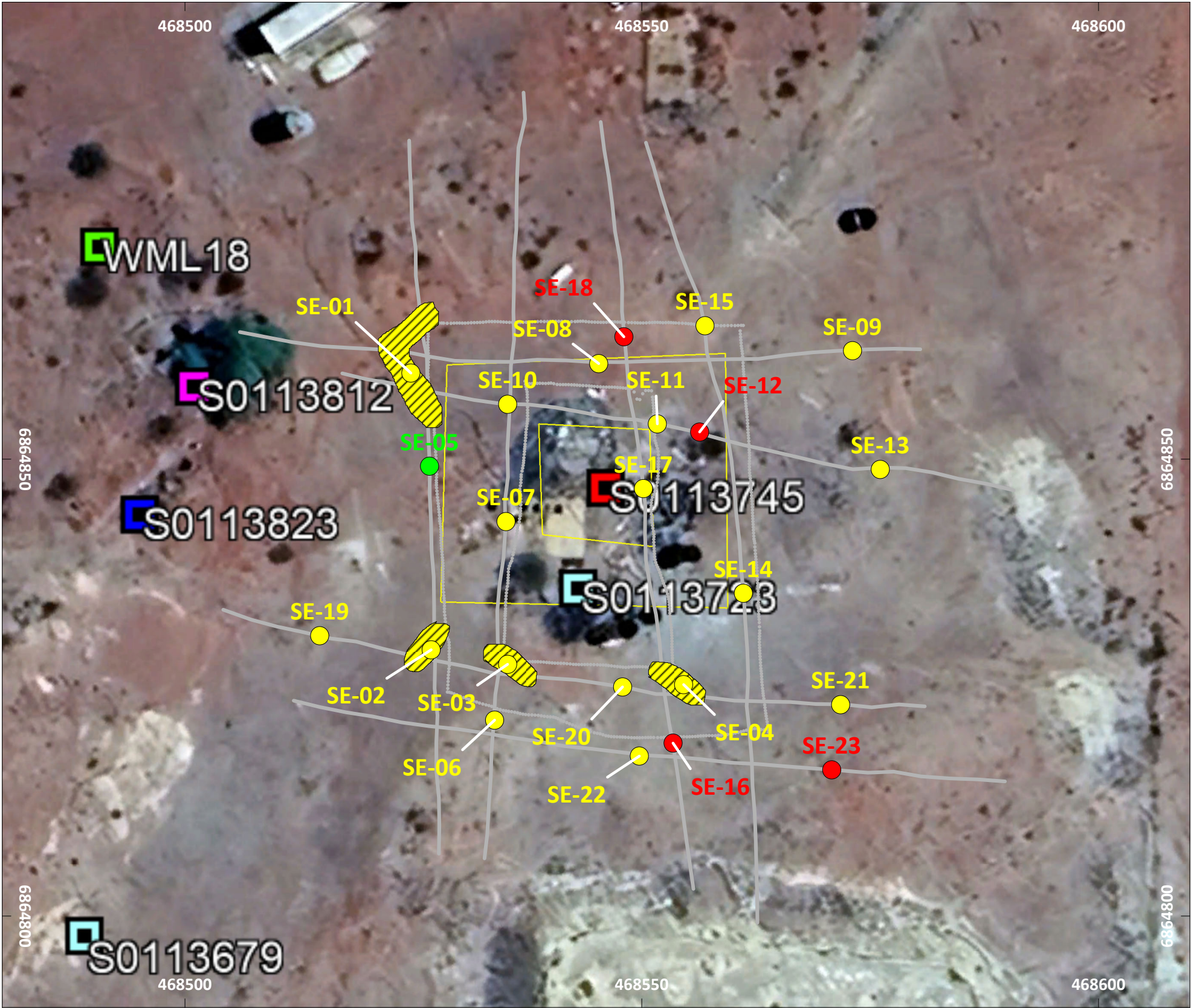


CLIENT
WML
YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION -
YALGOO, WESTERN AUSTRALIA

Date 07 OCT 2024
Scale 1:500
Drawing 3133-16

Paper Size A3
Drawn SMK
Revision 0

INVESTIGATION SITE MAP WITH IDENTIFIED SUBSURFACE ANOMALIES - YALGOO SOUTH EAST



- Legend**
- Acquired GPR and either MASW or ERT Transect
 - GPR Transect
 - Cat 1. Undiscernible features
 - Cat 2. Shallow features
 - Cat 3. Shaft / Stopes with no false floor
 - Cat 4. Shaft / Stopes with false floor and rubbish
 - Cat 5. Deep Stopes
 - Cat 6 Deep Shafts
 - Tailing, dumps, infrastructure - not assessed
 - Open Pit
 - Boreholes
 - Target

- ERT Anomalies**
- 0 - 2mBGL
 - 2 - 4mBGL
 - > 4mBGL
- GPR Anomalies**
- 0 - 1mBGL
 - 1 - 2mBGL
 - 2 - 3mBGL
 - 3 - 5mBGL
 - > 6mBGL
- Anomaly ID**
(Further details in report)

Target ID	Approximate Depth	Easting	Northing	Type	Priority
SE-01	1.2	468524.73	6864859.42	Continuous	1
SE-02	1.2	468526.95	6864829.14	Continuous	1
SE-03	1.8	468535.32	6864827.55	Continuous	2
SE-04	1.4	468554.59	6864825.33	Continuous	2
SE-05	4.9	468526.77	6864849.23	isolated	2
SE-06	1.3	468533.89	6864821.44	isolated	2
SE-07	1.3	468535.14	6864843.17	isolated	1
SE-08	1.4	468545.29	6864860.45	isolated	1
SE-09	1.2	468573.08	6864861.87	isolated	1
SE-10	1.2	468535.32	6864856.00	isolated	1
SE-11	1.3	468551.70	6864853.86	isolated	1
SE-12	2.3	468556.33	6864852.97	isolated	2
SE-13	1.4	468576.10	6864848.87	isolated	2
SE-14	1.2	468561.12	6864835.32	isolated	1
SE-15	1.2	468556.92	6864864.60	isolated	1
SE-16	2.4	468553.43	6864818.93	isolated	2
SE-17	1.5	468550.18	6864846.78	isolated	1
SE-18	2	468548.04	6864863.39	isolated	1
SE-19	1.5	468514.75	6864830.68	isolated	1
SE-20	1.2	468547.90	6864825.07	isolated	1
SE-21	1.2	468571.77	6864823.13	isolated	1
SE-22	1.2	468549.74	6864817.51	isolated	1
SE-23	3	468570.79	6864816.00	isolated	1

NOTES
Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Depths given are based on current ground level.

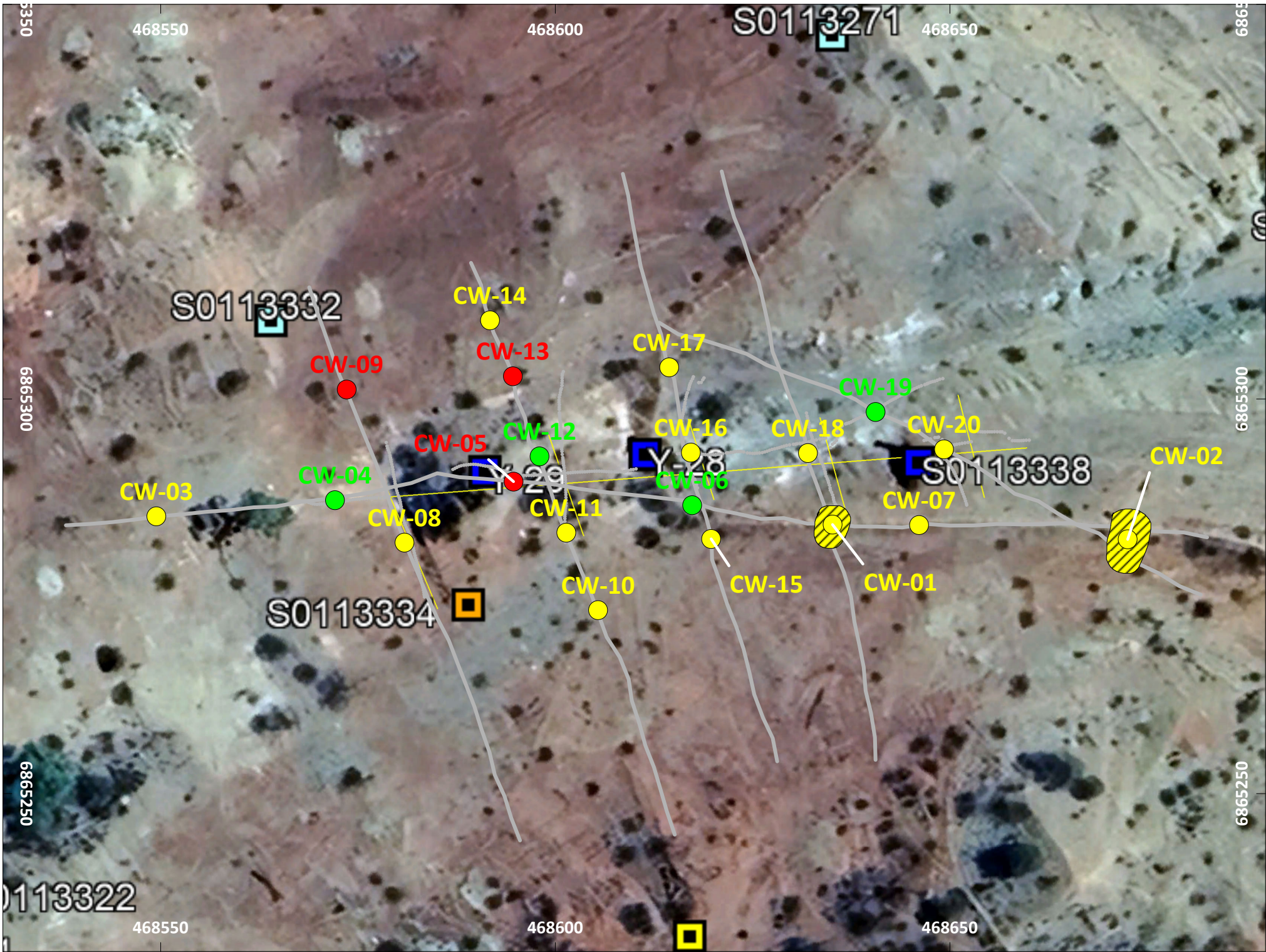


CLIENT
WML
**YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION -
YALGOO, WESTERN AUSTRALIA**

Date 07 OCT 2024
Scale 1:500
Drawing 3133-17

Paper Size A3
Drawn SMK
Revision 0

INVESTIGATION SITE MAP WITH IDENTIFIED SUBSURFACE ANOMALIES - YALGOO CENTRAL WEST



Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- Target

ERT Anomalies

- 0 - 2mBGL
- 2 - 4mBGL
- > 4mBGL

Anomaly ID
(Further details in report)

GPR Anomalies

- 0 - 1mBGL
- 1 - 2mBGL
- 2 - 3mBGL
- 3 - 5mBGL
- > 6mBGL

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
CW-01	1	468635.13	6865284.10	Continuous	1
CW-02	1.2	468672.5326	6865282.226	Continuous	1
CW-03	1.2	468549.453	6865285.14	Isolated	2
CW-04	10	468572.083	6865287.18	Isolated	2
CW-05	2.8	468594.713	6865289.54	Isolated	2
CW-06	4.6	468617.343	6865286.55	Isolated	2
CW-07	1.2	468646.102	6865284.04	Isolated	1
CW-08	1.9	468580.893	6865281.81	Isolated	1
CW-09	2.7	468573.564	6865301.21	Isolated	1
CW-10	1.7	468605.417	6865273.25	Isolated	1
CW-11	1.1	468601.391	6865283.07	Isolated	1
CW-12	4.3	468598.009	6865292.74	Isolated	2
CW-13	3.6	468594.626	6865302.88	Isolated	2
CW-14	1.5	468591.727	6865309.97	Isolated	1
CW-15	1.2	468619.751	6865282.27	Isolated	1
CW-16	1	468617.175	6865293.22	Isolated	2
CW-17	1.2	468614.437	6865304.01	Isolated	1
CW-18	1	468632.014	6865293.15	Isolated	1
CW-19	4	468640.591	6865298.36	Isolated	1
CW-20	1.1	468649.265	6865293.63	Isolated	1

NOTES

Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Depths given are based on current ground level.



CLIENT
WML
YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION -
YALGOO, WESTERN AUSTRALIA

Date
07 OCT 2024

Scale
1:600

Drawing
3133-18

Paper Size
A3

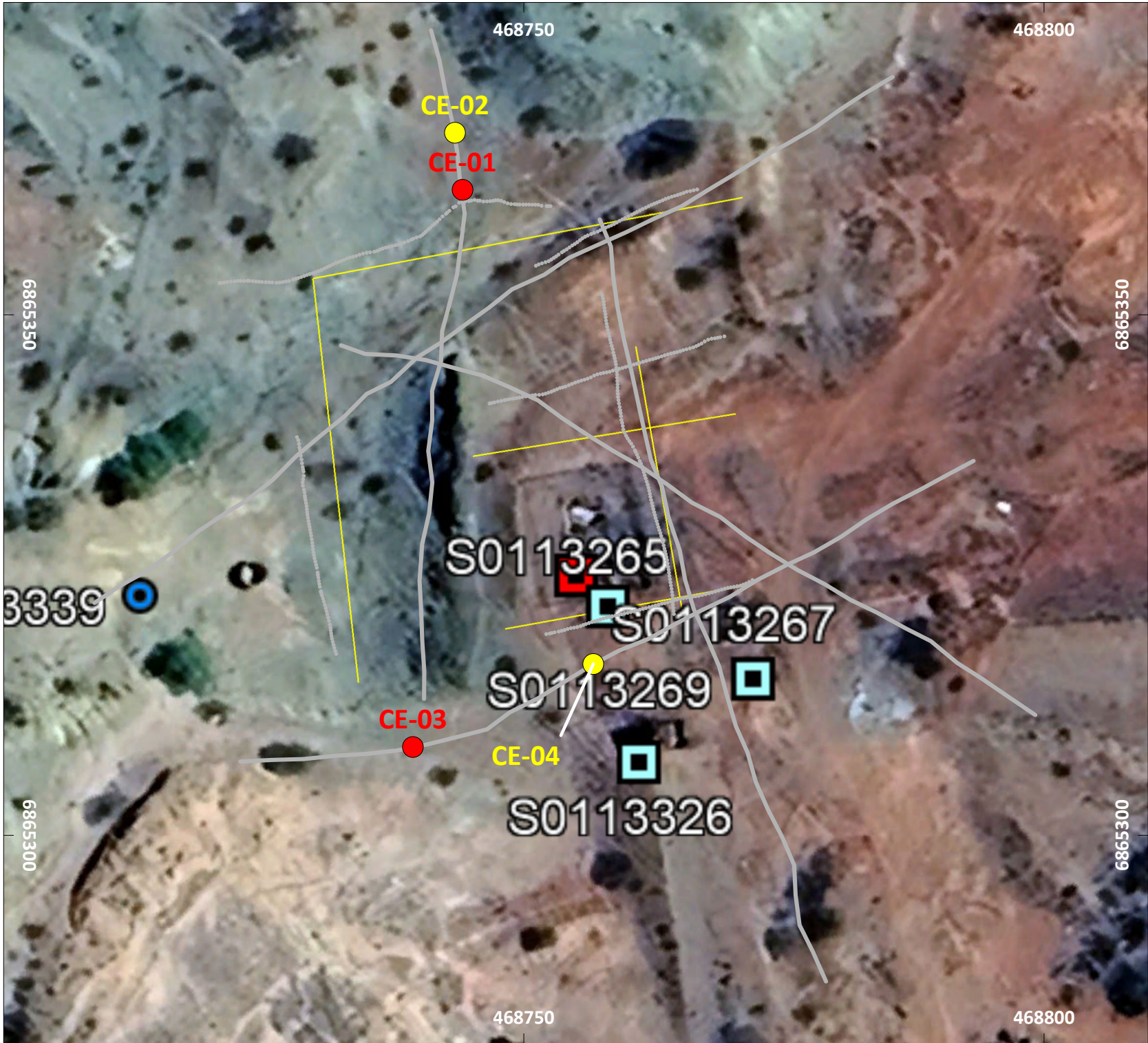
Drawn
SMK

Revision
0



G B Geotechnics (Australia) Pty Ltd
1/11 Gympie Way Willetton WA 6155
ABN: 77 009 550 869
Telephone: 02 9890 2122
Email: info@gbgoz.com.au

INVESTIGATION SITE MAP WITH IDENTIFIED SUBSURFACE ANOMALIES - YALGOO CENTRAL EAST



Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- Target

ERT Anomalies

- 0 - 2mBGL
- 2 - 4mBGL
- > 4mBGL
- Anomaly ID (Further details in report)

GPR Anomalies

- 0 - 1mBGL
- 1 - 2mBGL
- 2 - 3mBGL
- 3 - 5mBGL
- > 6mBGL

Target ID	Approximate Depth (mBGL)	Easting	Northing	Type	Priority
CE-01	3.5	468744.109	6865362.01	Isolated	2
CE-02	12	468743.378	6865367.49	Isolated	1
CE-03	2	468739.338	6865308.49	Isolated	1
CE-04	1.6	468756.677	6865316.46	Isolated	1

NOTES

Drawing to be used in conjunction with Report 3133.
Positioning is given in GDA2020 zone 50.
Depths given are based on current ground level.



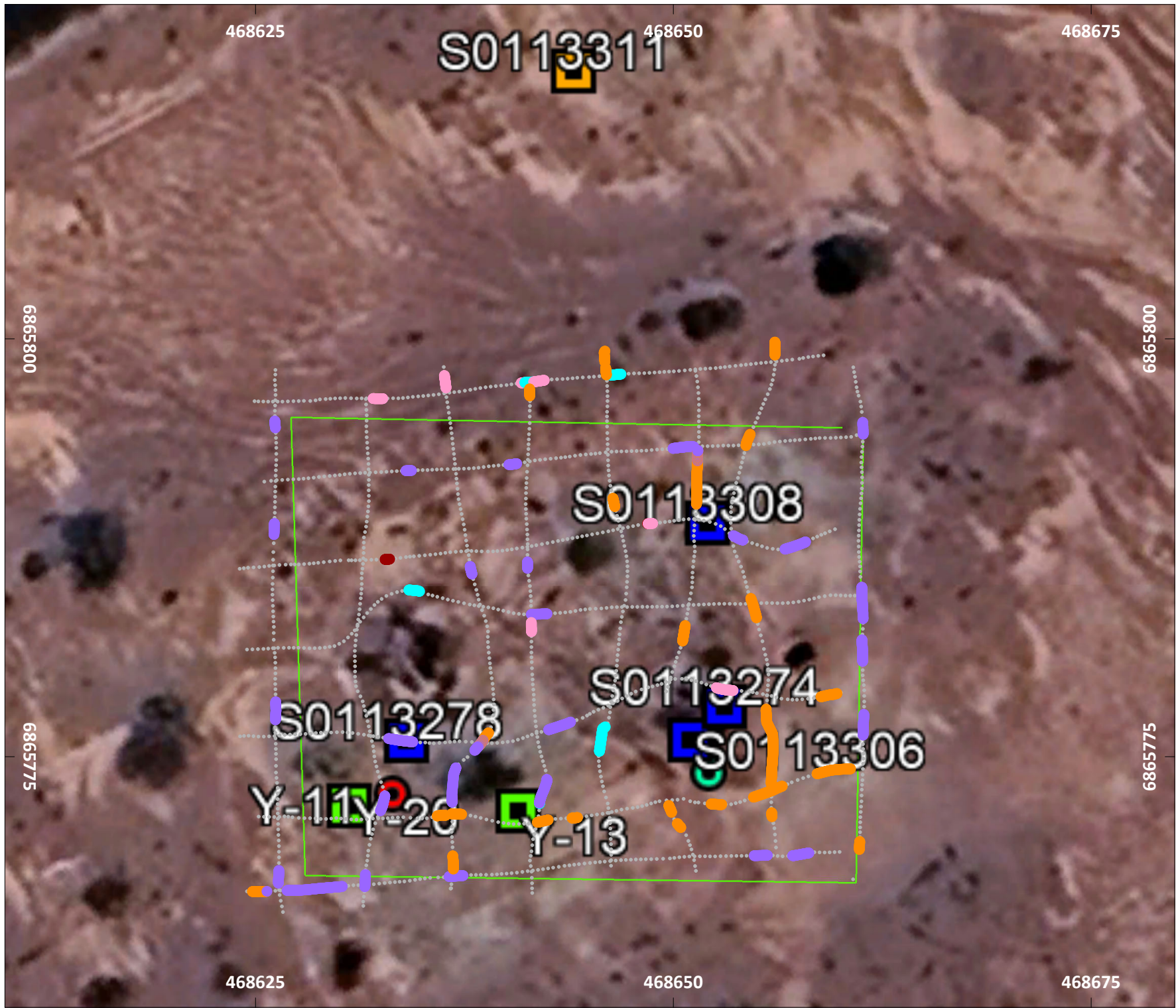
CLIENT
WML
YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION -
YALGOO, WESTERN AUSTRALIA

Date 07 OCT 2024
Scale 1:500
Drawing 3133-19
Paper Size A3
Drawn SMK
Revision 0



G B Geotechnics (Australia) Pty Ltd
1/11 Gympie Way Willetton WA 6155
ABN: 77 009 550 869
Telephone: 02 9890 2122
Email: info@gbgoz.com.au

INVESTIGATION SITE MAP WITH IDENTIFIED SUBSURFACE ANOMALIES - NORTH



Legend

- Acquired GPR and either MASW or ERT Transect
- GPR Transect
- Cat 1. Undiscernible features
- Cat 2. Shallow features
- Cat 3. Shaft / Stopes with no false floor
- Cat 4. Shaft / Stopes with false floor and rubbish
- Cat 5. Deep Stopes
- Cat 6 Deep Shafts
- Tailing, dumps, infrastructure - not assessed
- Open Pit
- Boreholes
- Target

ERT Anomalies

- 0 - 2mBGL
- 2 - 4mBGL
- > 4mBGL
- Anomaly ID (Further details in report)

GPR Anomalies

- 0 - 1mBGL
- 1 - 2mBGL
- 2 - 3mBGL
- 3 - 5mBGL
- > 6mBGL

NOTES

Drawing to be used in conjunction with Report 3133. Positioning is given in GDA2020 zone 50. Depths given are based on current ground level.



CLIENT	WML
YALGOO MINE WORKINGS GEOPHYSICAL INVESTIGATION - YALGOO, WESTERN AUSTRALIA	

Date	07 OCT 2024	Paper Size	A3
Scale	1:600	Drawn	SMK
Drawing	3133-20	Revision	0



APPENDIX C

DESKTOP STUDY



MINING AT YALGOO.

Capt. Mergan Williams and Mr. Hickson, who have recently arrived in Geraldton from Yalgoo, have supplied the following particulars respecting that district to the *Telegraph*.

EMERALD MINE.

When they left this mine had a solid body of stone 6ft. wide showing coarse gold profusely all over, and getting to look more like a well-defined reef every day. The stone is estimated to yield 30 ounces to the ton. It is intended to do away with the Huntingdon mill on account of the trouble it has given and erect a 5-head battery. In the prospecting shaft another lead of stone has been discovered. It has opened out from 8 in. to 16 inches, and some of it will yield 100 oz. to the ton. Several very good offers have been made for the property. From present appearances there is a great quantity of 6oz. stone to be operated upon. The last mentioned stone is making strongly towards two of the properties bought by Captain Williams lately for Yalgoo Marchison Prospecting Association, Melbourne, and the distance from one of the boundaries is only 41 yards. The reef is dipping very fast as it trends towards the last mentioned properties and probably the Association will have to sink a depth of 60ft. to strike it.

They have a 12 acre block immediately joining the Emerald northerly, and as it overlaps the Emerald claim considerably, going easterly, they cannot fail to catch that reef no matter what direction it takes.

STAR OF HOPE (LACEY'S).

In this mine they have a nice reef measuring from 18 in. to 2 ft. 6 in., out of which within the last fortnight they took a crushing which yielded over 5oz. to the ton, though they only expected 4oz. One of the shareholders mentioned that this mine had been taken in hand by the Hon. H. Clark, ex-Minister of Justice, New South Wales, who intended floating it into a company either in Sydney or London. The property consists of 12 acres, and has a very promising appearance.

OTHER REEFS.

There are several other reefs south-easterly of the Emerald Mine, viz., the Gallewa Queen, Glad Tidings, Shamrock, El Dorado and Britannia, in which very encouraging prospects are found.

Very little work is being done on these claims at present as those connected with them cannot get their stone crushed owing to the absence of a public crusher. In consequence of this there won't be an opening for wages men for some time to come.

McLeod is still working away at his new discovery. His prospects are also said to be very encouraging, and we have seen the stone from his claim, which will yield about 2oz. to the ton. This reef is said to vary from a foot to 3ft. in thickness.

Source: Western Mail (Perth, WA: 1885 - 1954). Sat 19 May 1894. Page 14. MINING AT YALGOO.

YALGOO.

THE EMERALD.

Mr. S. L. Parker, manager of the Emerald Option Co., Yalgoo, passed through Mt. Magnet on Wednesday en route to Cue, taking up on the same train a trial crushing from the above mine.

Good developments are reported in the No. 3 shaft at a depth of 62ft., below the surface, and 16ft. below water level. A crosscut put in 20ft. from the bottom of the shaft passes through lode matter carrying payable values. The quartz is going down strong underfoot, with every indication of permanency.

Along the footwall side of the lode a drive has been put in 31ft. both faces are in quartz carrying good values, from 30 to 40 dwts per ton.

In the bottom of the drive exceptionally rich stone is met with, showing gold freely and giving remarkably good prospects as high as 10oz. per ton. Unfortunately owing to the pump in use being unable to cope with the water, for the present all work has been stopped.

The continuation of the rich shoot, worked in the early days, has now been proved in three different shafts along the main line and the future prospects of the old Emerald are bright. It is simply a question of equipping the mine with proper machinery and further sinking to make it once more as famous as in the past.

We were shown a piece of ore taken out two feet below the level which is said to be an average sample, and it is very rich in fine gold, and should crush well. This class of stone has been traced below water for a length of 30ft.

Mr. James Oats' Hidden Treasure mine at Cue, comprising 12 acres, was sold to Messrs. Chesson and Heydon on Tuesday for the sum of £35,000.

Source: Mount Magnet Miner and Lennonville Leader (WA: 1896 - 1926). Sat 5 Aug 1911. Page 2. YALGOO - THE EMERALD.

YALGOO MINING

THE EMERALD REWARD

Mr. R. A. Thompson has secured a lease of 25 acres over the famous Emerald Reward at Yalgoo, Marchison. The mine has a great record, 20,000 odd oz. of gold having been won from about a quarter mile length on the reef, to a depth of 40ft. water level. Mr. Thompson, who was well known in the Ballarat, Maryborough and Steiglitz districts of Victoria, is negotiating for the supply of a suitable plant. He is at present at the mine, and will superintend the erection of the plant and mining matters generally. It is understood that the property will in all probability be taken over by a strong Melbourne proprietary.

Source: The Daily News (Perth, WA: 1882 - 1955). Mon 4 Jun 1906. Page 8. YALGOO MINING - THE EMERALD REWARD.