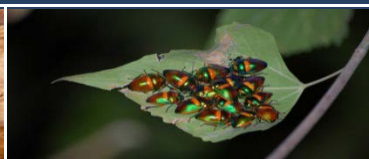
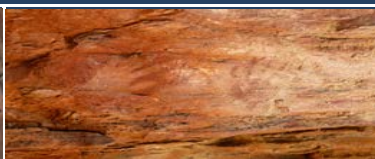




Chapter 2 Project Description



Sherwin Iron (NT) Pty Ltd
Sherwin Creek Iron Ore Project
Environmental Impact Statement



2013



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2 Project description

2.1 Introduction

Sherwin is currently undertaking a Bulk Sample program whereby direct shipping iron ore is being mined and transported via road to the Port of Darwin for export to China. This program allows steel mills to test the ore in their furnaces and ensures that Sherwin has a desirable and therefore marketable product.

The large global resources include high-grade zones as DSO, without any blending or beneficiation required. The total global resource is 488 million tonnes (Mt) at 42% Fe including 320 Mt of resource at 40.1% Fe at Sherwin Creek (Deposits A, B, and C) and 107 Mt of resource at 47.0% Fe at Hodgson Downs (Deposits X, W, and TUY) (Figure 2-1). The deposits are large hematite-goethite iron resources and exploration has shown that other extensive high-grade targets exist.

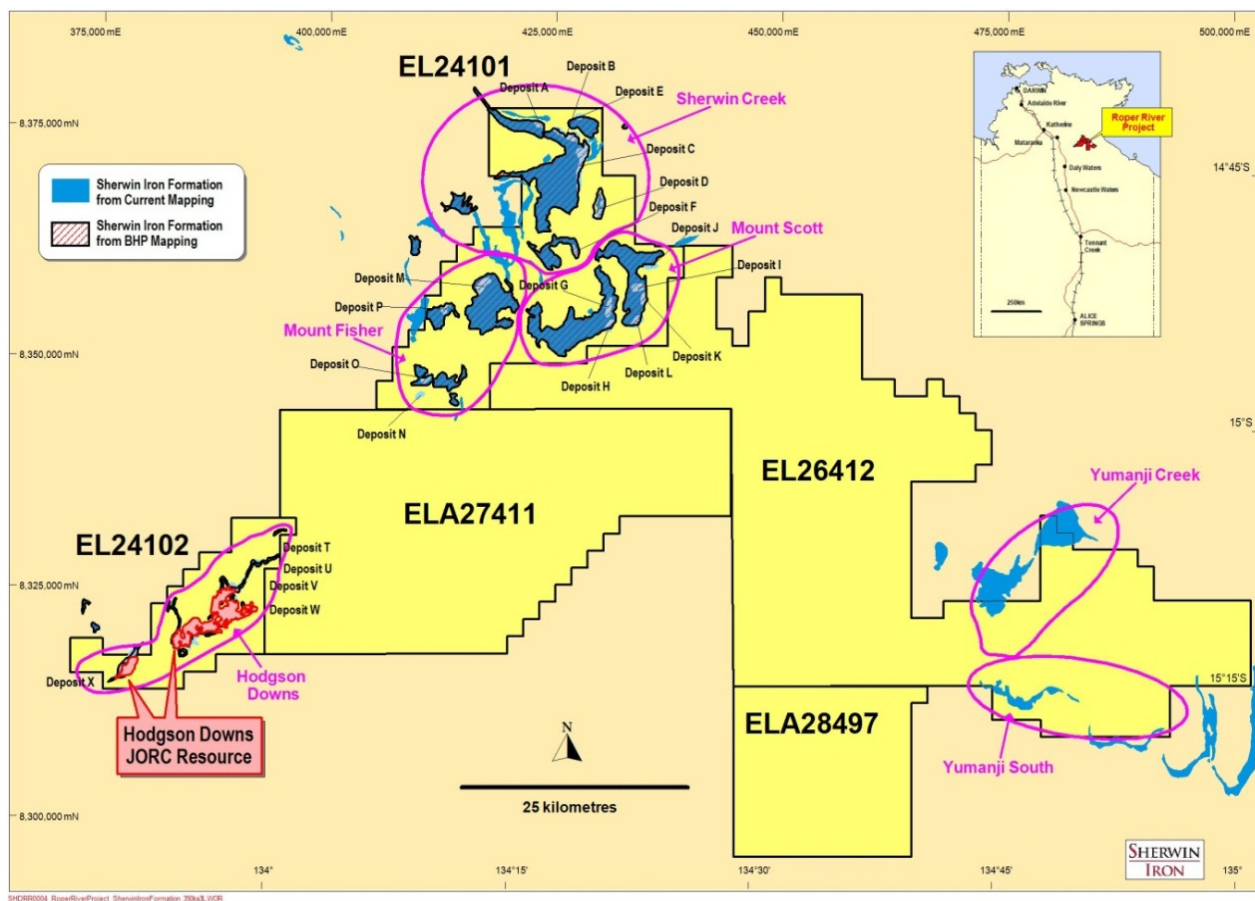


Figure 2-1. Sherwin Creek Iron Ore Project, Located Within the Roper River Iron Ore Project Tenements

The High Grade iron ore suitable for DSO includes a combined Indicated DSO Resource of 40.9 Mt @ 57.8% Fe including Deposit C (18.2 Mt @ 58.3% Fe) and Deposits X and W (22.7 Mt @ 57.5% Fe).

For the development strategy of Deposit C within the Sherwin Creek Iron Ore Project, Sherwin has identified and optimised for three groups of deposits:

- HG (High Grade) ore at +57% Fe for DSO
- LG (Low Grade) ore at +48% Fe, which can be beneficiated to 60% Fe product from current Metallurgical test work

- SG (Sub-Grade) at +40% Fe, which is currently not considered saleable.

In the initial stages, the project will involve the development of open pits to mine DSO at Sherwin Creek (Deposit C); the development of some infrastructure (workshops, office, laydown, magazine, drainage, others); an area for DSO stockpile at the mine (ROM); loading facility and stockpile at the Port of Darwin; Sub-Grade stockpile area and waste dump area at the mine site; haul road between pit and stockpiles; service roads within the project; and accommodation village.

DSO will be mined, crushed, and stockpiled at a ROM stockpile for blending if required, before it is transported by road train to the Port of Darwin. During mining, SG ore will be mainly stockpiled while mine waste material will be used to construct roads, laydown area, and stockpile area. An out of pit waste dump will be built during the initial mining stages for each pit. However, as the pit progresses, in-pit waste dumps and stockpiles will be utilised to minimise the environmental footprint.

The DSO is to be transported by road train to Darwin. There is a 4.5 km access road from the operation to the Roper Highway, then 150 km along Roper Highway to the Stuart Highway near Mataranka, with a further 420 km to the Port of Darwin.

2.2 Exploration history

Between 1955 and 1961, BHP Billiton (BHP) investigated iron ore prospects in the Roper River area and discovered 26 deposits (named A to Z) with potential economic significance, of which 15 are located within the current EL24101. The largest of these was Deposit C. BHP withdrew from the Roper area in the early 1960s following the discovery of Mt Whaleback in the Pilbara. No significant exploration was conducted from that time until the Northern Territory Geological Society (NTGS) carried out follow up check sampling in the 1990s. This sampling, reported in a publication by Ferenczi (1997), verified the existence and development potential of the BHP Deposits in the Roper River area.

Batavia Mining (the predecessor of Sherwin Iron) entered into an agreement on the Project with then owner North Australian Iron Ore (NAIO) in late 2009. The company immediately conducted due diligence and drilling on key BHP targets. Sherwin was buoyed by initial drill results and exercised its option to acquire the Project on 24th September 2010.

The Roper River Iron Ore Project now comprises several large Joint Ore Reserve Committee (JORC) Resources and significant exploration targets across its Exploration Licences totalling around 2735 km² in area. Mining Lease Applications cover high-grade resources and associated infrastructure needs.

2.3 Regional geological framework

The area of EL24101, which hosts the project, is dominated by the Roper River to the north and its extensive flood plains, which flow east into the Gulf of Carpentaria. Major drainages from the north include the Wilton, Mainoru, Jalboi and Moroak rivers and floodplains, whilst the Hodgson and Towns rivers provide the main drainage from the south, with the Hodgson River immediately south of the tenement. The EL lies within the Gulf Fall physiographic classification (Stuart 1954) where dissected Proterozoic sediments have produced an undulating topography of low hills and rubble covered ridges with several areas of alluvial and colluvial plains.

Semi-circular to arcuate shaped mesas up to 5 km in diameter and at least 50 m in height are typical within and adjacent to the tenement area. The mesas are generally steep sided and in places create gorge-like physiography where they adjoin. Cuesta-form ridges and broad flat floored valleys are typical.

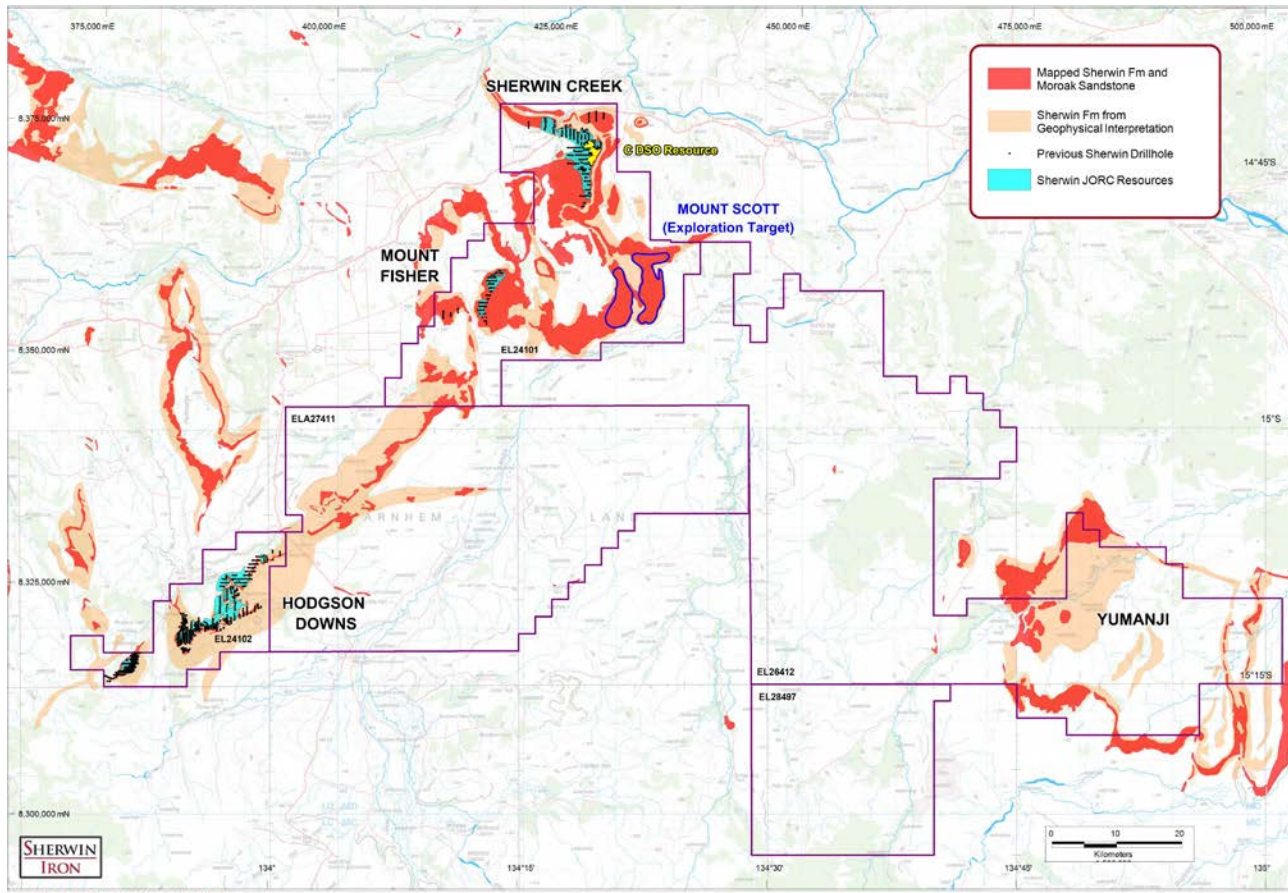


Figure 2-2. RRIOP showing prospective Sherwin formation (Sherwin formation outcrop is dark orange and under-cover is light orange)

2.4 Sherwin Creek Iron Ore Project geology

The Sherwin Creek Iron Ore Project is geologically confined to the Mesoproterozoic aged Roper Group Stratigraphy where iron ore is present within several levels of the Sherwin Formation. This is situated on the flank of the east-west trending Urupunga tectonic ridge, separating two troughs (Batten and Walker) of the McArthur Basin. North-South trending faults of the Showell Fault Zone transect the area and some extending NW-SE display a thrust component.

The Sherwin Formation includes quartz sandstone with interbedded micaceous siltstone, mudstone and locally ironstone as distinct units. Ironstones were deposited in marginal, shallow and deeper marine shelf environments reflecting alternating basin-wide sea level rises and falls. Tholeiitic dolerite and gabbro sills are locally present and mostly outside the area of the proposed DSO pit. These can be up to 50 m in thickness and were emplaced throughout the Roper Group soon after deposition but before regional deformation.

At least three significant ironstone horizons are identified in the Sherwin Formation: an oolitic hematitic ironstone unit at the base of the Formation, and three more sandy hematitic ironstone sequences at higher levels. Resources identified by Sherwin are all confined to these ironstone units within the Sherwin Formation.

Within EL24101, where Deposit C is located, the Sherwin Formation iron deposits extend along a 25 km sinuous ridge, exposed at the top of cliff faces throughout the area.

The geology is dominated by interbedded sandstone, siltstone and mudstone of the Sherwin Formation throughout, with extensive pisolitic ironstone lenses.

The sandstones within the proposed mining area are blocky and generally thick bedded. The siltstones and mudstones are thin to medium bedded. Sandstones are typically near vertically jointed and therefore near perpendicular to bedding. Importantly, bedding dips away from the pit face, effectively stabilising pit walls. There is little evidence from mapping and drilling of significant fault displacement or offsets, but may occur locally. Most variation in dip can be explained by undulations in underlying basement material. These observations are obtained from logging drill core, face mapping, trenching, and from pit walls in the current bulk sample extraction area.

Within EL24101 all three sandy ironstone units are variably present in the stratigraphy (Figure 2-4 and Figure 2-5). The Upper, Middle and Lower Ironstone beds are well represented at Deposit C at Sherwin Creek.

The ironstone and associated lithologies dip around 7° westerly, following the general dip of the mesas, typically 3 to 5 degrees in the same direction. In most cases they are shallow-dipping away from cliff face positions.

Within this part of the Sherwin Formation, the Upper (hematitic) Ironstone Unit is typically 1 to 2 m thick, the Middle unit is 8 to 12 m thick and the highest Fe grade Lower Ironstone Unit is also 8 to 12 m thick. The DSO high-grade iron ore to be mined is confined to the Lower Ironstone Unit and includes two zones, A and B.

Small exposures of rubbly dolerite sills (Derim Derim Dolerite) on adjoining plateau margins are exposed locally by drainage erosion near Deposit C at Sherwin Creek and elsewhere. The dolerite sills locally observed in deeper exploration drilling at Deposit C, intrude between the Lower Ironstone and the basal oolitic hematite unit and are therefore unlikely to be exposed in the DSO pit.

The ironstones are deeply oxidised, and at high grades become soft and friable (associated with reduced silica) and appear dark purple in colour. In drainage areas west of Sherwin's main tenements, dolerites are mapped as extensive flat lying sheets of red soil regolith with remnant ilmenite.

Sedimentary structures suggest Sherwin Formation to be deposited in a shallow marine, possibly extensive lacustrine environment. There is lateral continuity of oolitic iron rich beds, disrupted with thinning and minor faulting at margins likely to be local, related to uneven basement topography and soft sediment slumping.

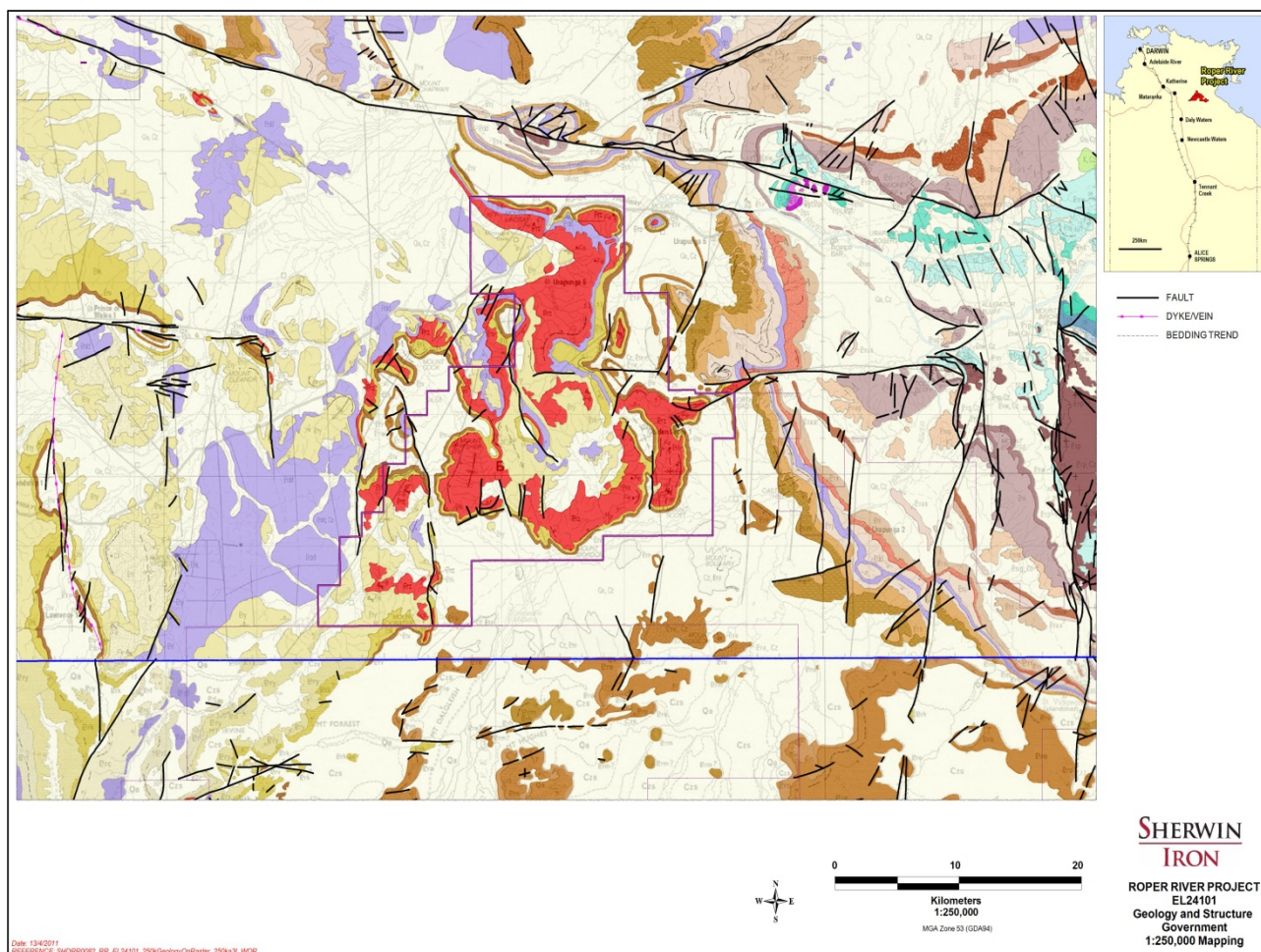


Figure 2-3. Geology and structure of EL24101 showing Sherwin Formation in red

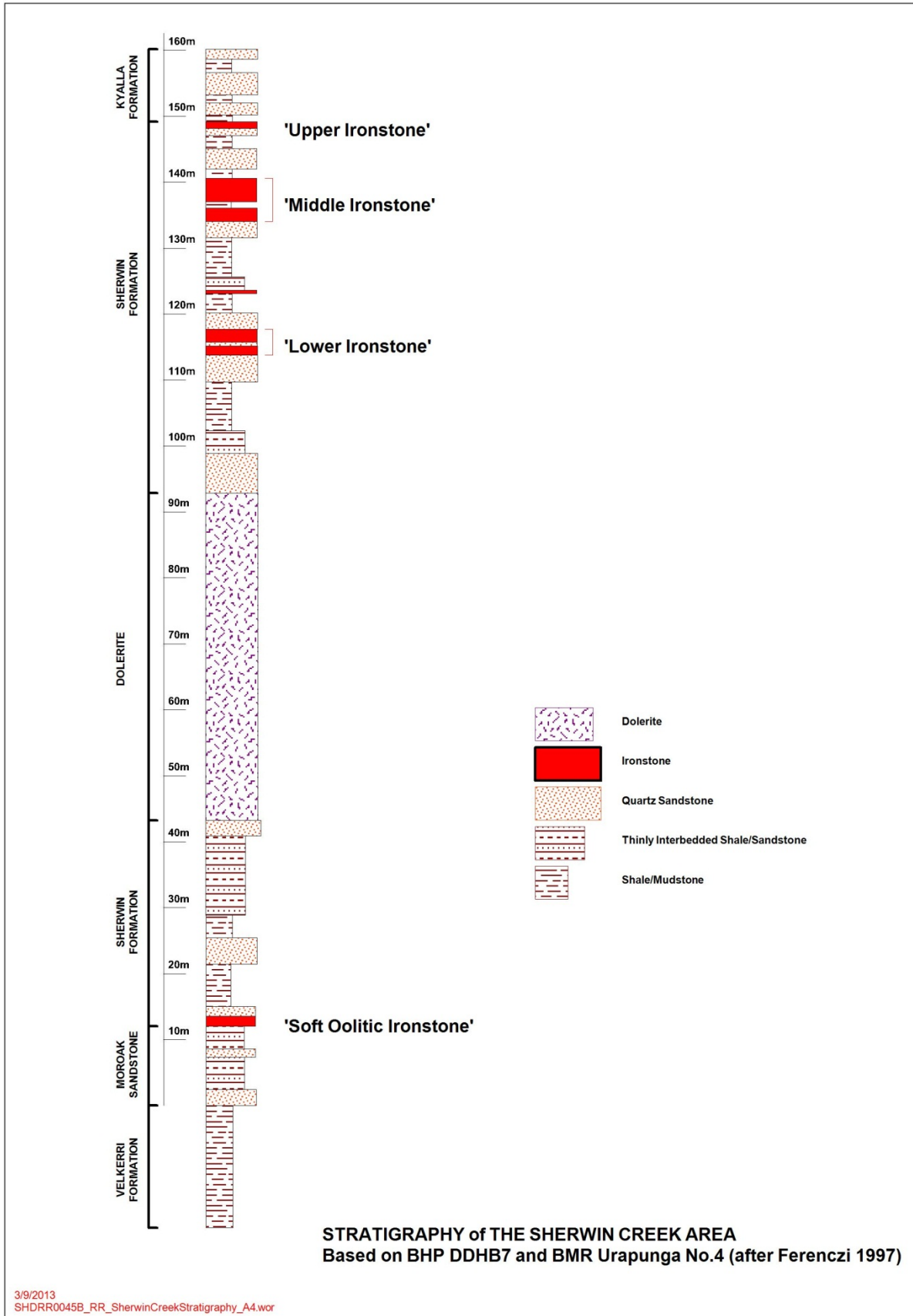


Figure 2-4. Sherwin Creek stratigraphy

Code	Description	Is_Active	Sort_Order
DDol	Derim Derim Dolerite	-1	1
Ky	Kyalla Formation: interbedded siltstone, sandstone and mudstone	-1	2
Sh	Undifferentiated Sherwin Formation - interbedded siltstone, sandstone, mudstone and ironstone	-1	11
ShSC_ULrs	Sherwin Formation: Sherwin Creek Upper Ironstone	-1	12
ShSC_04	Sherwin Formation: Sherwin Creek Unit 4 (Between Middle and Upper Ironstones)	-1	13
ShSC_Mlrs_U	Sherwin Formation: Sherwin Creek Middle Ironstone - Upper Horizon	-1	14
ShSC_Mlrs_W	Sherwin Formation: Sherwin Creek Middle Ironstone - Waste Horizon	-1	15
ShSC_Mlrs_L	Sherwin Formation: Sherwin Creek Middle Ironstone - Lower Horizon	-1	16
ShSC_Mlrs	Sherwin Formation: Sherwin Creek Middle Ironstone - Undifferentiated	-1	17
ShSC_03_U	Sherwin Formation: Sherwin Creek Unit 3 - Upper Part above Thin Ironstone Horizon	-1	18
ShSC_03_Irs	Sherwin Formation: Sherwin Creek Unit 3 - Thin Ironstone Horizon	-1	19
ShSC_03_L	Sherwin Formation: Sherwin Creek Unit 3 - Lower Part below Thin Ironstone Horizon	-1	20
ShSC_03	Sherwin Formation: Sherwin Creek Unit 3 (Between Middle and Lower Ironstones) - Undifferentiated	-1	21
ShSC_LLrs_U	Sherwin Formation: Sherwin Creek Lower Ironstone - Upper Horizon	-1	22
ShSC_LLrs_W	Sherwin Formation: Sherwin Creek Lower Ironstone - Waste Horizon	-1	23
ShSC_LLrs_L	Sherwin Formation: Sherwin Creek Lower Ironstone - Lower Horizon	-1	24
ShSC_LLrs	Sherwin Formation: Sherwin Creek Lower Ironstone - Undifferentiated	-1	25
ShSC_02	Sherwin Formation: Sherwin Creek Unit 2 (Between Lower Ironstone and Lower Soft Oolitic Ironstone)	-1	26
ShSC_LSlrs	Sherwin Formation: Sherwin Creek Lower Soft Oolitic Ironstone	-1	27
ShSC_01	Sherwin Formation: Sherwin Creek Unit 1 (Between ShSC_LSlrs and Moroak Sandstone)	-1	28
ShMF_02	Sherwin Formation: Mount Fisher Unit 2 (Above ShMF_Oir)	-1	46
ShMF_Oir	Sherwin Formation: Mount Fisher Oolitic Ironstone	-1	47
ShMF_01	Sherwin Formation: Mount Fisher Unit 1 (Between ShMF_Oir and Moroak Sandstone)	-1	48
ShHD_02	Sherwin Formation: Hodgson Downs Unit 2 (Above ShHD_Oir)	-1	36
ShHD_Oir	Sherwin Formation: Hodgson Downs Oolitic Ironstone	-1	37
ShHD_01	Sherwin Formation: Hodgson Downs Unit 1 (Between ShHD_Oir and Moroak Sandstone)	-1	38
Mo	Moroak Sandstone: bedded sandstone with quartz granule intervals	-1	100
Ve	Velkerri Formation: grey to black siltstone/mudstone with fine glauconitic sandstone	-1	101

SHERWIN CREEK AREA

MOUNT FISHER AREA

HODGSON DOWNS AREA

Figure 2-5. Stratigraphy Sherwin Formation within each resource area

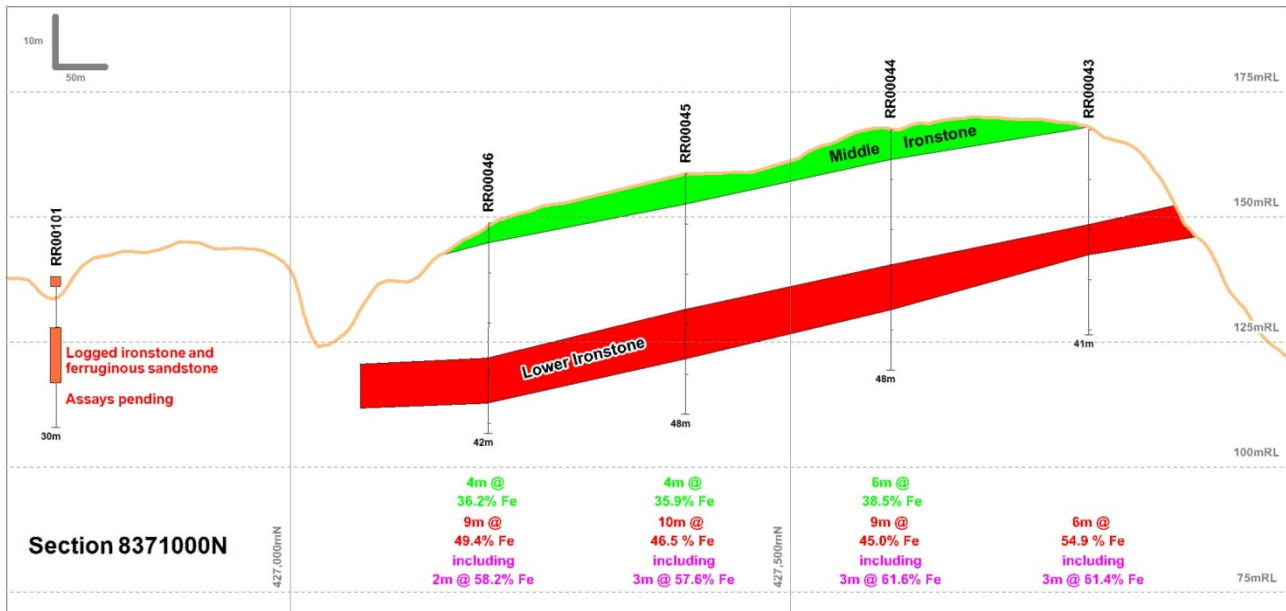


Figure 2-6. Cross section showing lower ironstone (5:1 exaggerated dip)

2.5 Studies to confirm resource in Deposit C

Below is a summary of key studies and surveys that were undertaken:

- Reverse Circulation (RC) and diamond drilling was conducted to enable resource estimates to be carried out
- Trenching (confirmed optimum location of bulk sample pit)
- Acid mine drainage (AMD) test work (completed)
- Metallurgical and crusher tests (Nagrom Laboratories)
- Mineralogical investigations to better understand metallurgical results.

2.5.1 RC and diamond drilling summary

Both RC and diamond drilling were carried out at Deposit C from reconnaissance to resource stage in order to estimate the tonnage and grade characteristics of the deposit. In total 297 RC holes for 11,199 m and 26 diamond holes for 837 m were drilled initially at 400 m x 200 m spacing to define a low grade global Inferred Resource. The diamond drilling provided both validation of the RC drilling results and geotechnical data associated with the rock mass mechanical behaviour for pit wall stability and other consideration. As part of this process, measurements of specific gravity were taken from drill core to determine tonnage from volume estimates.

High-grade areas in the Lower Ironstone Unit with limited overburden cover were targeted through pit optimisation studies for infill 200 m x 100 m RC drilling. This was aimed at defining a mineable DSO Indicated Resource within the global Inferred Resource. Down-hole sample spacing was reduced to 0.5 m from 1.0 m previously for improved grade estimation and boundary definition.

In addition, panel drilling to 50 m x 25 m was conducted in the most favourable area to identify a potential exploration bulk sample site with highest grade and minimal overburden to extract DSO grade for shipment.

The success of the infill drilling of high-grade areas resulted in a DSO Indicated Resource being defined with virtually total conversion from Inferred within the area infill drilled.

2.5.2 Trenching programme

Trenching was conducted in the panel drill area to obtain samples for grade comparison with the RC drilling of the high grade Lower Ironstone Horizon. A total of four trenches located close to existing drilling were excavated and sampled (Figure 2-7 and Figure 2-8). Trenching enabled increased confidence of the bulk sample exploration programme. Results are shown in Table 2-1 and Table 2-2.

Table 2-1. Trench Fe grades from laboratory XRF

Trench	From m	To m	Grade % Fe
2	1	1.5	59.8
2	1.5	2.0	64.9
2	2	2.5	64.3
2	2.5	3	58.3
3	1	1.5	52.1
3	1.5	2	58.9
3	2	2.5	61.9
3	2.5	3	63.1

Table 2-2. Summary of assaying and ironstone grades for the four bulk sample trenches

Fe % From	Fe % To	No of samples	Material	Approx. kg total	Fe%	SiO ₂ %	Al ₂ O ₃ %
0	40	19	Waste	380	34.01	40.48	5.55
40	45	12	MW	240	42.81	32.93	2.16
45	50	10	LG	200	47.83	26.68	1.95
50	55	46	LG	920	52.54	19.47	2.09
55	58	19	MG	380	56.54	13.69	1.94
58	70	57	HG	1120	61.25	8.25	1.35
Total All Material		163		3240	52.83	18.82	2.22
Strip Ratio – (Waste + MW + LG)/(MG + HG)				1.2			
Strip Ratio – (Waste + MW + LG + MG)/(HG)				1.9			

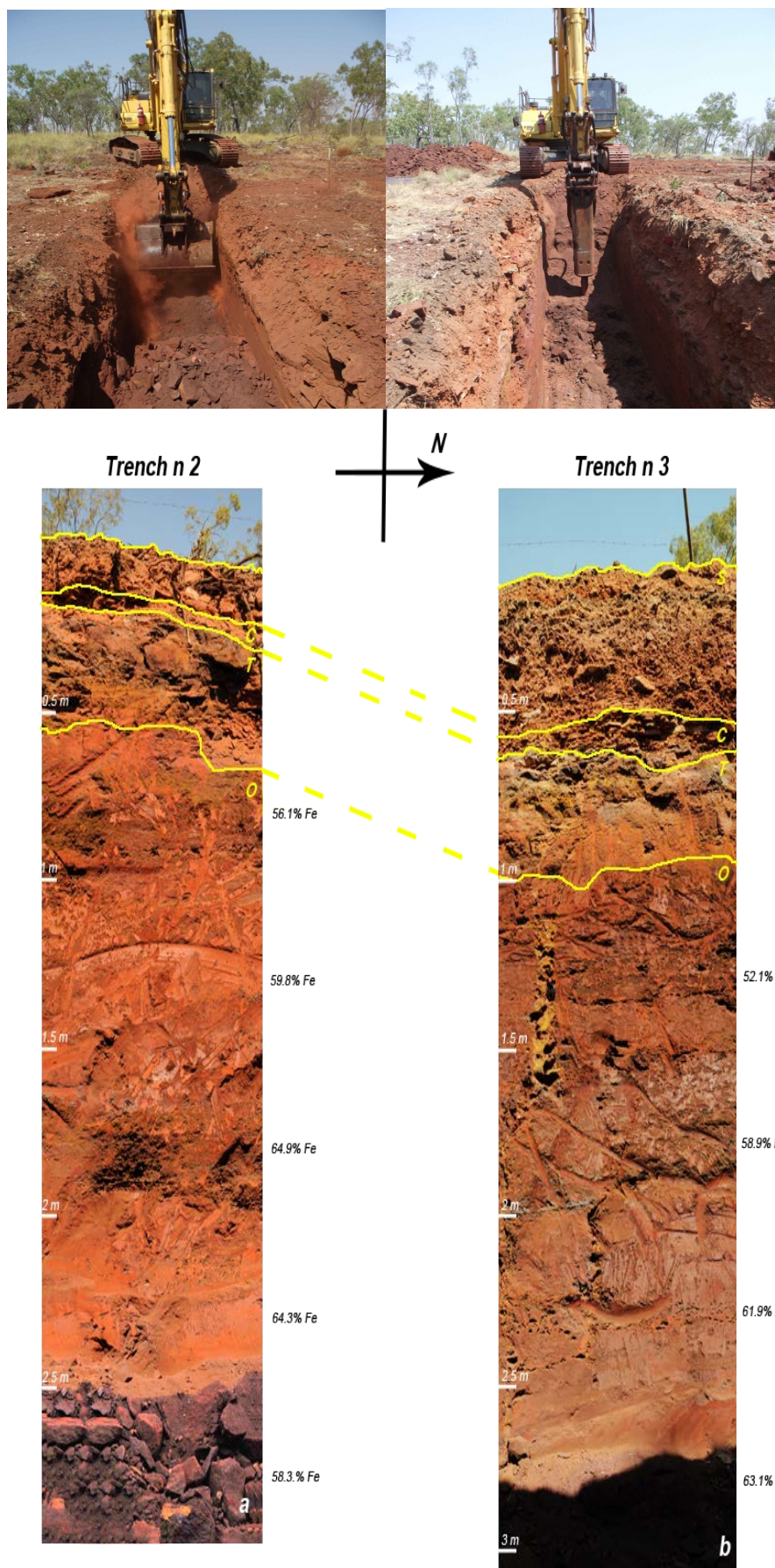


Figure 2-7. Trench photos and cross sections in exploration bulk sample area

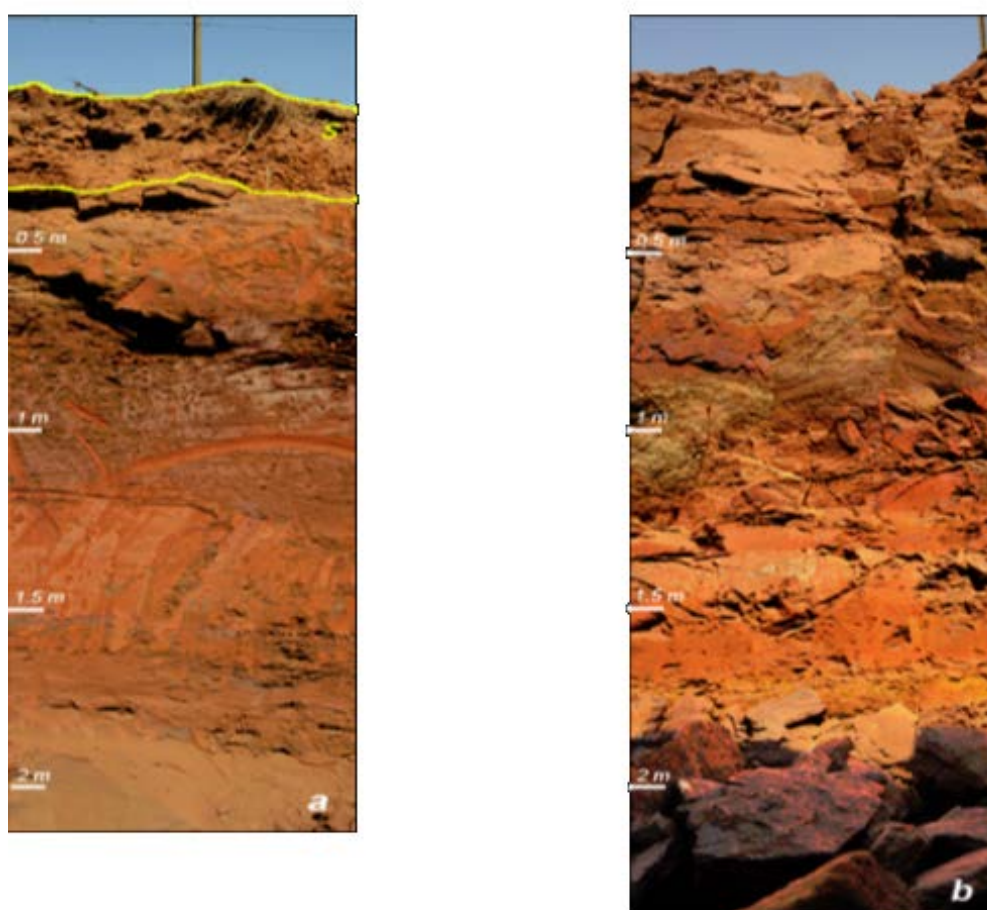


Figure 2-8. Trench 4 (low grade) (left) and Trench 1 (low grade) (right)

2.5.3 Metallurgical and crushing tests on Deposit C

Metallurgical test work was conducted using PQ size (large diameter) diamond drill core that was drilled throughout Deposit C in the initial Inferred Resource phase. Test work to date indicates that some silica can be removed from fine grinding but a proportion of the silica appears locked in with hematite at the lower Fe grade ranges. However, this test work is not directly applicable to DSO mining other than provision for mined low-grade material to be retained for possible future blending or beneficiation to maximise export revenue at a later time.

2.5.4 Mineralogical study

A mineralogical study conducted on Deposit C drill core was carried out to better understand the results of the metallurgical testing to date and to optimise silica reduction at minimal processing cost. Results of mineralogical studies show silica inclusions in hematite, and this supports metallurgical observations described above that interpret a proportion of silica being locked in hematite.

2.5.5 Acid Mine Drainage (AMD)

It was important to assess the potential for acid mine drainage (AMD) within the proposed DSO at Deposit C (see Appendix G). The study approach was to:

1. Develop a conceptual model.

This included a review of all available RC and diamond drilling XRF assay data on some 2,500 drill samples. The samples were collected from areas within and extending laterally beyond the DSO pit area and below the pit base. In summary, only 22 out of 2,541 (0.87%) drill samples contained Potentially Acid Forming (PAF) materials based upon on total sulphur S concentrations. Concentrations of S were predominantly low and have an average value of 0.03% ranging between 0.001% and 0.85%. The samples with elevated sulphur concentrations were almost all associated with dolerites below the ore body or sedimentary rocks below or that fall outside the DSO open pit.

2. Develop a supplementary AMD study comprising mineralogical, Acid Base Accounting (ABA), Net Acid Generating (NAG) and hydrogeochemical assessments to verify the conceptual model.

In general this study confirmed that:

- The great majority of wastes to be produced during mining is geochemically benign. This applies to mine waste materials derived from above and below the ore body.
- Disturbance of PAF material at the northern part of Deposit C will occur only when the pit expands from 30m to 40m below surface between years 4 and 6. Further site-specific characterisation, demarcation, prevention and remediation will commence in year 3.

2.6 Ore properties

The Lower Ironstone Unit is the unit to be mined as DSO grade material, subdivided into Zones A and B. Characterisation of the Lower Ironstone is shown in Table 2-3.

The hematitic sandy ore is only weakly oolitic in texture and fine grain size.

The ironstones are relatively massive; they lack structure apart from very rare veins or joints. The material is not as strong or brittle as the overlying siliceous rocks but with limited jointing and bedding there is no real parting for preferred grain alignment. There may be interbedded waste material consisting of iron bearing siltstones.

Table 2-3. Characterisation of lower ironstone with zones A and B

Stratigraphy	Lithology	Thickness	Description
Sherwin Creek Waste Unit 3	Sandstones/ Siltstones	Average 10m	OVERBURDEN: White to pale yellow. Siliceous quartz sandstones to siltstone and minor clays.
Sherwin Creek Lower Ironstone Upper Zone A	Hematite +58% Fe	Typically 4 to 5m	ZONE A ORE: High Grade Ironstone to +60% Fe. Siliceous 8% to 14% Si.
Inter seam Low Grade/ Waste horizon	Waste to low and medium grade	Typically 3 to 5m	LOW GRADE AND WASTE INTERBAND: Marker clay or shale band- Iron Bearing Siltstone to Low Grade Ironstone 30% - 56% Fe. It is yellow brown.
Sherwin Creek Lower Ironstone Lower Zone B	Hematite +40% Fe	Typically 3 to 5m	ZONE B ORE: High Grade Ironstone to +60% Fe. 8% - 15% Si.

Topsoil cover is typically 0.1 m thick on the mesa within Deposit C. It thickens in lower terrain to the west. Most topsoil is skeletal (< 0.1 m) actively eroded from heavy seasonal rainfall and sloping topography. The soil profile below this is largely remnant soil with mixed weathered bedrock grading to weathered bedrock only, with little if any soil.

Most of the overburden waste rock geology includes sandstones and siltstones highly weathered but relatively siliceous and therefore hard and blocky, with minor hematitic claystone layering in areas of iron oxide outcrop.

The ore zones are iron rich and relatively silica pore. They appear to be massive zones with no apparent structure apart from occasional mineralised joints that may be goethitic as opposed to hematitic.

From drilling and assaying of exploration holes and from specific acid mine drainage test work and reporting it is clear there is negligible likelihood of potential acid forming material or other harmful elements that could impact the mining operation. In the highly unlikely case that such material is identified it will be contained and isolated within a confined stockpile area.

There are no materials that represent apparent geotechnical issues i.e. that are unstable such as slaty rocks or boulder-like material. Jointed, blocky sandstones may be a minor issue in the pit. Bedding dips generally favourably down dip at shallow angles of 7°. This will be towards the advancing mining direction.

Significant faulting is unlikely within the area of the DSO pit, though minor offsets and gentle undulations in lithology dip may occur.

2.7 Project footprint

The project is located in the Northern Territory 570 km south-east of Darwin and 150 km east of Mataranka by road. The project is linked to Darwin and Katherine by the Roper and Stuart Highways and the nearby Darwin to Adelaide railway, which pass within 160 km of the tenements.

Deposit C represents a large global resource, approximately 5 km x 3 km in area. The area of the DSO pit within Deposit C lies along the western slope of a large mesa and is approximately 2.5 km x 1.0 km (Figure 2-9). The area of disturbance within the resource area will be approximately 350 ha.

It is intended that the iron ore from Deposit C will be transported by road to the Port of Darwin.

2.7.1 Location of resources

The locations of existing resource areas defined by Sherwin are shown in Figure 2-1. All resources to date are confined to Exploration Licenses 24101 and 24102. In addition, Mt Scott (also on EL24101) represents a significant exploration target.

Whereas exploration during 2011/12 was aimed at defining the overall project size potential, the corporate focus for 2012/13 was about defining the potential for early cash flow from high-grade mining. The table below shows the total resources as at November 2011 (Table 2-4) and a further DSO resource completed following infill drilling of high grade portions in 2012 (Figure 2-10 and Table 2-5) to facilitate selective high grade mining for an early cash flow.



Table 2-4. RRIOP: Global resources SRK Consulting: November 2011

	Classification	M (Tonnes)	Fe%	Al ₂ O ₃ %	P%	SiO ₂ %	Fe Cut%
EL24101							
Sherwin Creek (A, B, C)	Inferred	320.0	40.1	1.8	0.006	34.4	35
Mt Fisher (M)	Inferred	15.6	44.0	4.4	0.130	26.9	35
EL24101 Total	Inferred	335.6	40.3	1.9	0.0120	34.1	35
EL24102							
Hodgson (W)	Indicated	32.7	47.4	2.7	0.080	20.4	40
W	Inferred	50.8	45.5	2.5	0.070	19.7	40
X	Indicated	23.0	49.3	2.3	0.090	17.2	40
TUY	Inferred	46.0	39.9	2.8	0.070	19.0	35
EL24102 Total		152.5	44.8	2.6	0.080	20.5	
PROJECT TOTAL		488.1	41.7	2.1	0.030	29.9	

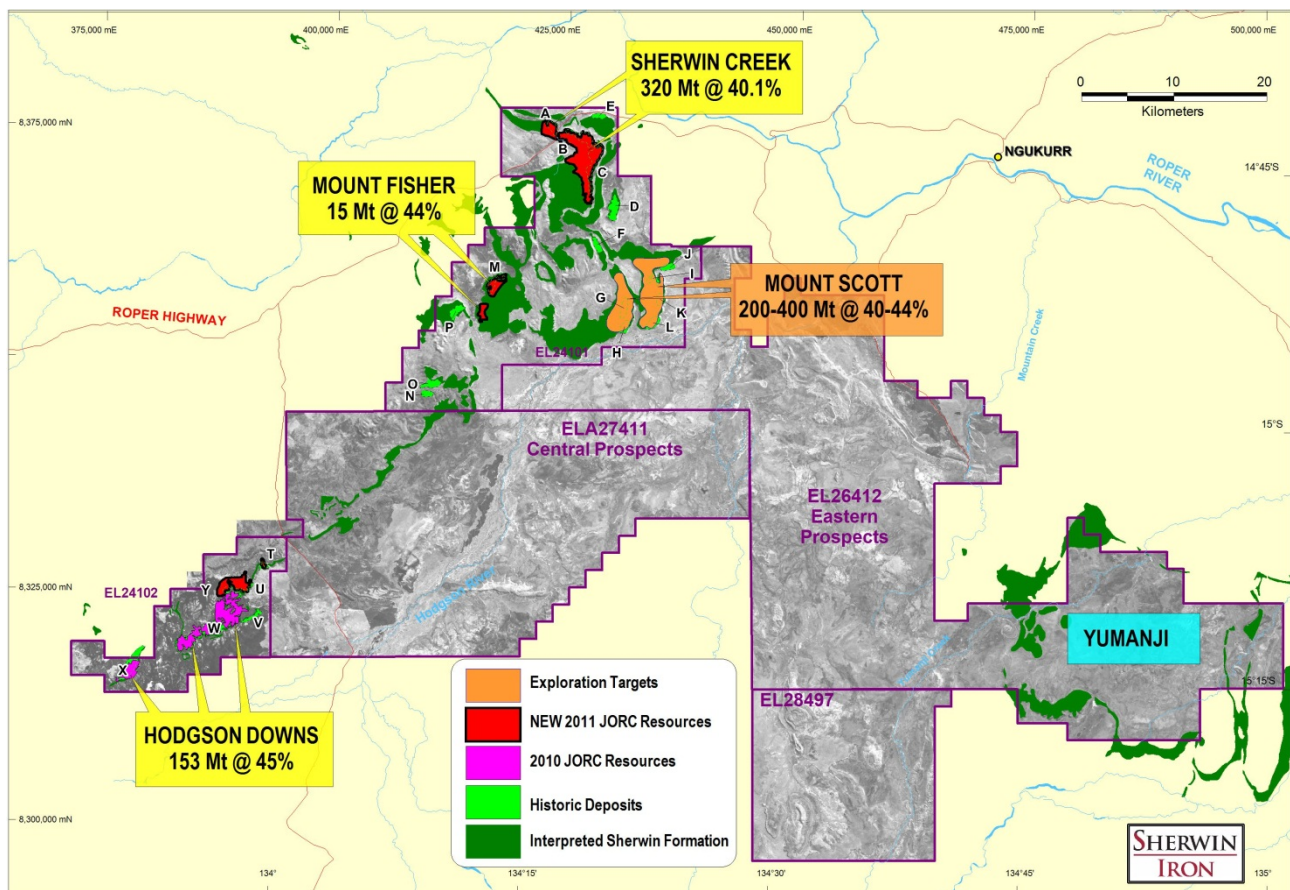


Figure 2-10. RRIOP: Total resources

Table 2-5. Total high grade JORC resources Sherwin Creek (Deposit C) Iron Ore

Roper River Iron Ore Project Sherwin Creek Deposit C Higher Grade Resources									
Deposit / Category	Category	Cut-off (Fe %)	Bulk Density	Tonnes (Mt)	Fe (%)	Al ₂ O ₃ (%)	SiO ₂ (%)	P (%)	LOI (%)
Sherwin Creek Deposit C	Indicated	55	2.68	18.34	58.3	1.07	12.36	0.03	2.47
Sherwin Creek Deposit C	Inferred	55	2.68	0.08	57.6	1.52	12.68	0.02	2.91
Higher Grade Total [#]	-	-	2.68	18.42	58.3	1.07	12.36	0.03	2.47

The following relates to Table 2-5, as required under the “JORC Code”:

Footnotes

Some rounding for totals.

The estimates are reported in accordance with the guidelines of the JORC Code (2004) by employees of Sherwin Iron Ltd and audited by Coffey Mining as at August 2012. They are based on the following parameters:

Grade drilling has been conducted by reverse circulation drilling techniques with sampling in and around the mineralised zones conducted at ½ metre intervals. Sample collection recoveries are assessed as acceptable. Drill pattern orientation is appropriate to the orientation of the iron bearing strata. Drill spacing is generally 100m x 200m for the Indicated Resources category with a small portion of the deposit assessed with a closely spaced panel of drillholes at 25m x 50m.

Sample preparation and analysis has been completed on the drill samples with independent quality monitoring. Quality monitoring for accuracy has returned generally acceptable results. A very local portion of the close spaced panel drilling returned some control results which required re-analysis. The re-analysed results were not used in this resource estimate and the confidence on grade has been constrained accordingly.

Survey data for topographic and drillhole definition is fit for the estimate confidence.

Interpretation of the geological and grade constraints for the modelled resource is justifiable and demonstrates sufficient continuity to support the resource categories.

Grade domains have been established using integrated field geology, grade and shape inputs. The spatial modelling technique honours the drilling data and remains within reasonable drilling support.

The grade estimation techniques are appropriate to the global resource definition of the mineralised, higher grade (+55% Fe) and lower grade (+40% Fe) portions of the deposit.

Dry bulk density has been assigned directly to higher grade and lower grade domains using values of 2.68 and 2.65 respectively. These values are based on direct measurement of representative diamond drilling core samples applied to earlier estimates. Representative metallurgical core samples tested since April 2012 have allowed slight modification to the assigned dry bulk density values.

No water table considerations are made with this resource estimate.

Mining assumptions influencing the deposit interpretation and estimate are generally suited to current methods for exploiting suitable selective mining unit volumes of the higher grade resources reported. Geotechnical aspects of open pit mining parameters do not influence the Mineral Resource classification but are not considered significant for this deposit style. Metallurgical assumptions are for simple processing methodologies to create a marketable product from the higher grade resources reported.

Competent Persons Statements

The information in the report that relates to the higher grade DSO mineral resource estimation summarised in Table 2 5 is based on work completed by Sherwin Iron, and assessed and compiled by Mr David MacDonald who is a member of the Australian Institute of Geoscientists. Mr MacDonald is a full time employee of Coffey Mining Pty Ltd and has sufficient experience relevant to the style of iron mineralisation and type of deposits under consideration to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves' (The 'JORC Code'). Mr MacDonald consents to the inclusion in the report of matters based on his information in the form and context in which it appears.

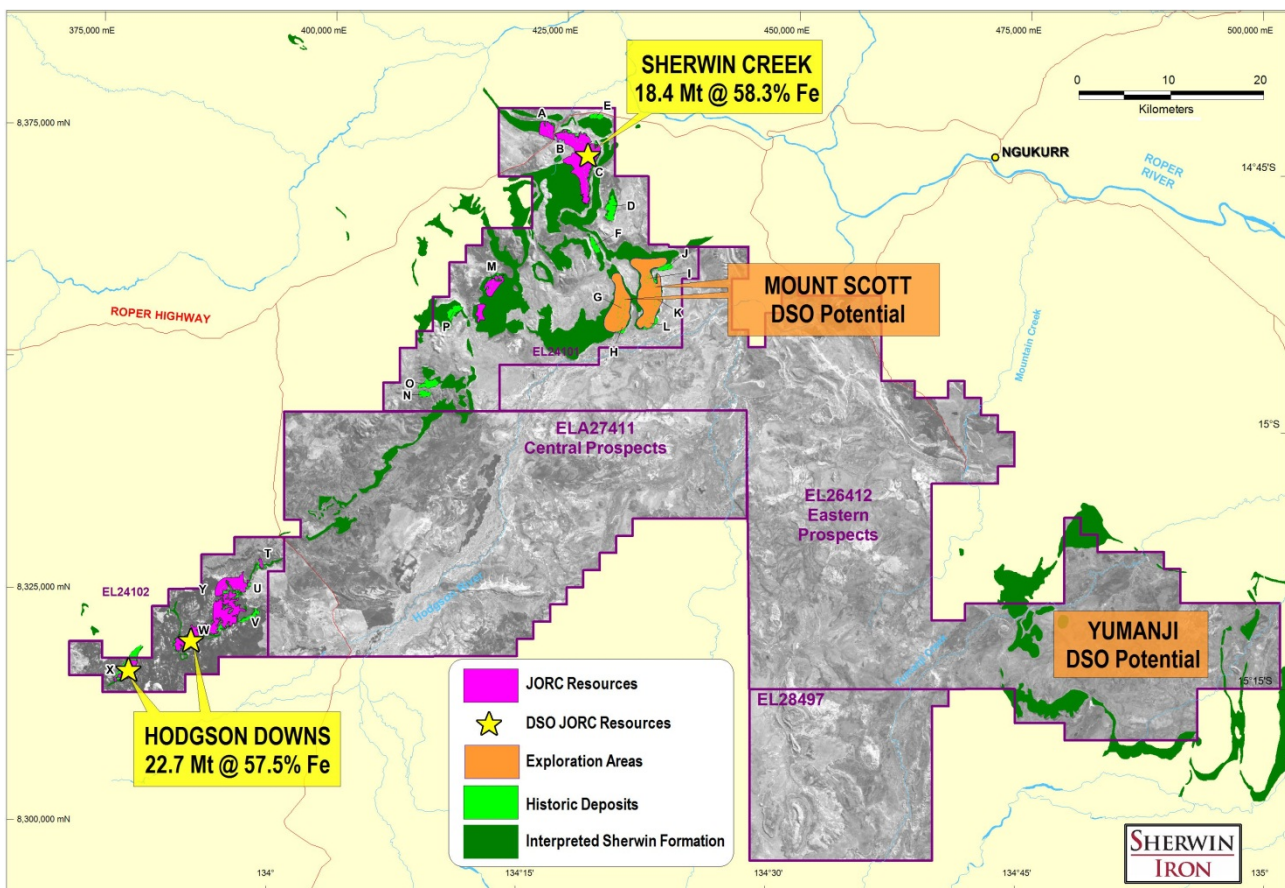


Figure 2-11. Roper River DSO JORC resources

2.7.2 Cleared areas

The site is currently undertaking a bulk sampling operation of DSO grade iron ore. The bulk sample pit is located toward the southern end of, and entirely within, the planned DSO pit, with associated temporary offices, workshop, ROM pad, crushing and screening area and road train loading area, some of which lie partially within the planned DSO pit which is the subject of this EIS.

The total disturbance area of bulk sampling is currently 34.6 ha. This area of disturbance was based on a survey by Vekta Surveys in June 2013. The survey identified the cleared area for the camp at 1.5 ha, and the access road from Roper Highway upgraded from the original exploration and Bulk Sample access track with 4.6 ha additional disturbance.

For this EIS, an allowance of 5.0 ha has been made for miscellaneous clearing, to allow for items which have not been exactly determined, but which are known to be required, such as water bores, drill pads, tracks etc.

An area of 10.9 ha outside the footprint of active mining areas has been allowed for clearing as storage area for topsoil. Additional areas will be required for storage of topsoil. This additional area can be accommodated on in-pit waste dump areas by the timely topsoil removal immediately prior to mining.

New disturbance from this submission, existing disturbance from bulk sampling, and total life-of-project disturbance are itemised for clarity. Table 2-6 below shows the total disturbance area associated with the DSO operations.

Table 2-6. Disturbance areas

Item	New disturbance Under This EIS (ha)	Bulk Sample Pit Disturbance Area (ha)	Life Of Mine Disturbance Area (ha)
Pit	165.4	24.4	189.8
Mine Offices	2.0	0.0	2.0
Camp	0.0	1.5	1.5
Workshop	7.9	0.0	7.9
Haul Roads	3.8	0.0	3.8
Magazine	1.2	0.0	1.2
Access Roads	5.1	4.6	9.7
Topsoil Storage	10.7	0.2	10.9
Mineralised Waste Stockpile (exposed)	76.3	3.0	79.3
Waste Dump (exposed)	38.2	1.1	39.3
Miscellaneous	5.0	0.0	5.0
TOTAL	315.6	34.8	350.4

2.7.3 Location of other works

The mine office, workshop, and area for equipment to park between shifts (go-line) will be located along the southern perimeter of the external waste dump, as shown in Figure 2-10. This area is easily accessible to the mine workings, and is sufficiently far from mine operations to be unaffected by blasting. As the area is on top of the external waste dump, it will not require any additional disturbance of native vegetation.

The camp, which was approved as part of the bulk sample program, is being located to the south of the access road, approximately 0.8 km from the Roper Highway.

Waste from the current bulk sample program is being placed within the area designated for the external waste dump. Additional waste from the first stage of mining the full DSO pit will be used to extend the

external waste dump to the north and to the edge of the pit, to form the full base for the sub-grade material stockpile (Figure 2-9).

Water supply will be a series of Turkey's Nests supplied from water bores; a miscellaneous allowance for disturbance of 5.0 ha has been included in total site disturbance to allow for further investigation and subsequent bore/pipeline installation.

Sherwin has permission to haul up to 1.5 Mtpa (million tonnes per annum) along the Roper Highway as part of the bulk sampling approval. An agreement in principle has been sought from Northern Territory Government (NTG) to upgrade sections of the Roper Highway from the mine site to the Stuart Highway from a single lane bitumen sealed highway to a dual lane sealed highway. This upgrade work would be completed prior to any increase above 1.5Mtpa by Sherwin. Roper Highway upgrade work does not form part of this submission.

There is an existing stockpile and transfer area 5 km south of Mataranka, beside the Stuart Highway, which is used for stockpiling current bulk sample product and subsequent re-handling and haulage to the Port of Darwin. No change to the infrastructure at Mataranka is anticipated.

Haulage from the Mataranka stockpile area will be along the Stuart Highway, which is the principal highway to Darwin. No additional clearance area, infrastructure work or operational activity other than road haulage is planned along this route.

The stockpile and ship loading facilities at the Port of Darwin are a government-owned and operated facility. Sherwin will be transporting ore by road train to this facility, with the Port Authority loading the ore onto customers' ships. No further works at the Port of Darwin are planned.

2.7.4 Other infrastructure

At the commencement of operations the infrastructure development will be related to facilities required for expanding the mining rate and transportation of DSO iron ore from the mine site to the Port of Darwin above the level of the previously approved and conducted bulk sampling. Other supporting facilities to be provided on site include a magazine, laboratory, offices, expanded camp, mess hall, wastewater treatment plant, lay-down area, dumping area, workshop, warehouse, power generation, water bores and pipelines.

Mobile crushing and screening facilities which have been used as part of the bulk sampling program are planned to be used for crushing and screening of the Deposit C mining operation.

The capital expenditure required for the Project is being minimised through the provision of on-site infrastructure by means of a contract mining operation. The mining contractor is providing the mining fleet, crushing and screening plant, maintenance facilities, mine offices, and warehouse for the duration of the project. The sample preparation and analysis facility has been set up by Sherwin for quality control and awareness during the bulk sample operation.

2.8 Project components

2.8.1 Mine

Timetable for construction and operation

The bulk sampling program that is being carried out is the first phase of the planned operation. Temporary offices and workshop facilities were put in place to meet the requirements of the bulk sampling program. The temporary office and workshop facilities will be superseded by the permanent facilities to be constructed following regulatory approval of the project and then either relocated or removed from site. The crushing and screening plant used for the bulk sampling program will be used for this project.

Sherwin intends to commence construction of required facilities and pre-strip of the proposed DSO pit immediately upon approval. This will hopefully allow for commencement of mining and crushing operations during the dry season of 2014, with 1.5 Mt of ore produced in 2014. Ore production rate will be

increased to 2.0 Mtpa from 2014, increasing in successive years to a peak of 3.0 Mtpa in 2016/17. The operation is scheduled for completion of mining in 2019. A summary of the project components and timeframe is shown in Table 2-7.

Table 2-7. Project components and timeframe

Component	Details and Timeframe
Proposed Construction Commencement	Early 2014
Proposed Operation Commencement	Q1 2014
Life of Mine	6 years
Estimated Year of Decommissioning	2019
Size of Orebody	39.2 Mt, including low grade ore
Ore Type	Oolitic Hematite
Estimated Total DSO Production	13.8 million tonnes at 58% Fe
Strip Ratio	7:1
Number of Pits	1
Depth of Pits	10m to 40m
Estimated Recoverable Topsoil	100,000 m ³ , average depth of 0.1 m
Crushing Rate	Up to 3 Mtpa
Ore Grade	58.0% Fe
Estimated Total Disturbance Footprint	350 Ha
Workforce During Construction	150
Workforce During Operations	100

Vegetation clearing and disposal

Areas to be cleared for mining and associated activities will be grubbed of trees and large vegetation, which will be collected and stored outside the footprint of all mining activity. Seed may be collected from this vegetation in preparation for mine closure rehabilitation. Before mining commences topsoil will be removed and stored in areas that are protected from natural or created erosion, and where necessary, protected with erosion and sediment control structures. These topsoil stockpiles will be stabilised to prevent excessive wind erosion.

Vegetation clearing and topsoil removal will be carried out shortly before cleared areas are required for mining. This will minimise the topsoil clearance area required.

Construction

Initial mine site infrastructure has been established for bulk sampling, which includes:

- Access road between the mine site and Roper Highway (this was an upgrade of an existing track)
- Bulk Sample pit and access road developed
- Temporary site office, ROM, stockpiles, workshop, camp and other infrastructure established
- Mobile crusher with 3.0 Mtpa capacity in operation
- An access road to the bulk sample pit has been established with mined waste, as part of bulk sampling.

The project is a very simple mining operation, which will be expanded in scale and extent from the current bulk sampling program, but will use the same working methods.

Conventional road formation methods using moisture content controlled and compacted fill will be employed on site, with a top layer of road-base for durability. A polymer will be applied where applicable to further reduce the need for water used in dust suppression, particularly in high-use areas.

The general surface topography is broadly quite flat, and with the exception of local shallow ravine formations, much road formation can be carried out without significant fill quantities being required. Any fill required is readily available from mined waste in the pit.

Plant and machinery requirements

Primary Mining Fleet

- 1 x Surface miner SM2500
- Excavators (number and size will vary during the life of the operation, initially there will be a 190 tonne excavator for waste overburden mining and a 75 tonne excavator for construction works in the first year, then an additional 250 tonne excavator will be utilised for overburden mining from the following year)
- Off highway haul trucks, expected to be between 100 tonne to 130 tonne trucks

Ancillary equipment

- Loaders (for picking up ore discharged from surface miners in pit, and for operating crushing and screening plant, number and size will vary during the life of the operation, but will be up to CAT 992 size)
- 1 x D10 dozer
- 1 x D8 dozer
- 1 x 40 tonne articulated water truck
- 1 x Service truck 10 kL fuel payload plus fluids/lubricant
- 12 x Light vehicles
- Production drills (for waste mining only)
- 1 x Blasting agent delivery truck
- 2 x Coaster bus 20 seat (for personnel transport).

Plant

- Diesel generators for workshop/offices, camp and remote infrastructure such as bores
- Workshop equipment
- Magazine
- Bulk explosive/blasting agent storage
- 1 x Crusher GIPO B 1385 Jaw crusher 600 tph
- 1 x Screen plant GIPO 20X7 800 tph.

Mining types and methods

The project will be an open pit operation expanding in scale and extent from the bulk sampling program, with the mining exploitation method utilised dependent on material properties. As encountered during bulk sampling, a significant proportion of waste will require drilling and blasting. The drilled and blasted waste material and the free-digging waste will be mined by conventional hydraulic excavator and haul truck combination. It is not anticipated that drilling and blasting of the ore-bearing horizon will be required where ore breakage will be carried out by a surface miner. Broken ore and sub-grade material will be discharged

onto the pit floor behind the miner, to be picked up by a loader and placed in trucks for haulage to the crushing and screening plant or sub-grade material stockpile, as appropriate.

Rock strength has been tested with rock hardness varying between 5 to 40 MPa. Waste drilling and blasting parameters are expected to continue as per existing parameters of the current bulk sample pit operation, with a 4 m by 4 m pattern using 115 mm diameter holes, and an average powder factor of 0.3 kg/m³. Risk of pit wall instability is expected to be minimal in the DSO mining operation, due to the shallow depth of the pit (generally 10 – 20 m depth, with less than 5% of pit wall perimeter between 20 to 40 m), and the outcropping rock formations having a reasonably good stability profile.

The selection of surface miner for ore mining in the expanded mining operation is considered appropriate as the deposits are sedimentary in nature, and from observations in test trenching and during bulk sampling the ore horizon is quite friable. Benefits of using the surface miner for ore mining are the reduced dilution from the highly selective nature of this mining method, increased recovery, reduction of ultra-fines material as there is no drilling and blasting, reduction of overall blasting requirements, and reduced crushing activity, when compared to mining by drill and blast and conventional hydraulic excavator. The operation will provide working areas of sufficient extent for the surface miner to work efficiently. This is an established and successful mining method at other mines currently operating within Australia.

The crushing and screening plant may also be used to generate road base for initial road capping and on-going road maintenance around the site.

The Deposit C pit will be mined in stages, with commencement in the immediate surroundings of the current bulk sampling area. The first areas mined will be south and west of the bulk sample pit, and then from the bulk sample pit towards the northern pit limit, as shown in Figure 2-12 below.

The void created at the southern end of the pit will be filled with mined waste from subsequent stages of the pit, leaving an area at the western pit wall unfilled, to act as a rainfall water catchment area. Sub-grade material will be stored on the external waste dump. The mobile crushing and screening facility will be progressively advancing north as mining in the pit progresses, located close to the current mining position. Total waste to be mined will be approximately 32.7 million bcm (bank cubic metres), with approximately 10 million lcm (loose cubic metres) to be placed on the external waste dump, with remaining waste disposed of within the mined-out section of the pit.

Mining of the Deposit C pit is to occur over approximately 6 years, with completion in 2019, as indicated in Figure 2-12.

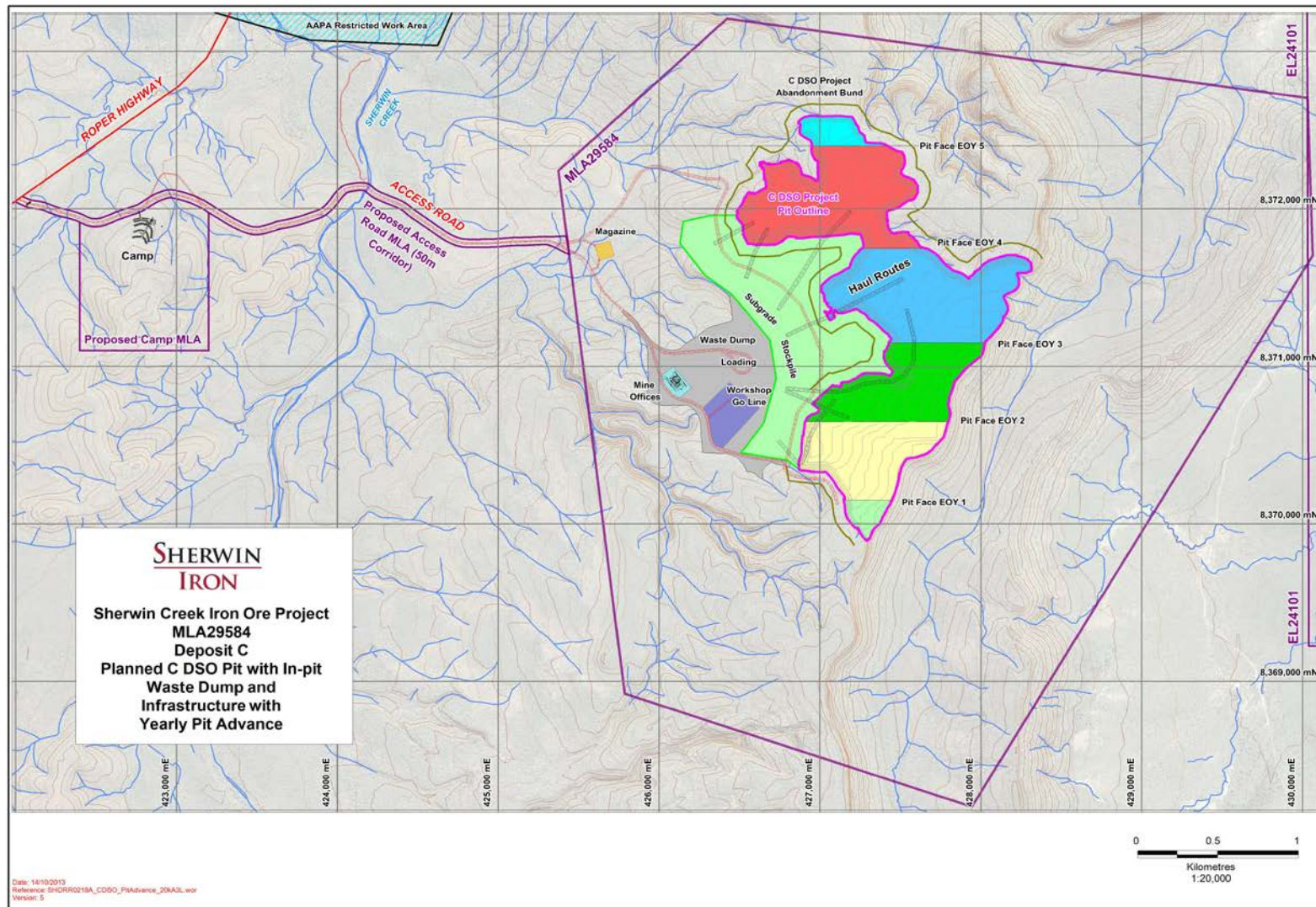


Figure 2-12. Yearly pit advance of Deposit C with in-pit waste dump and infrastructure

The mining sequence to be used for this operation is shown in Figure 2-13 and Figure 2-14 below, which contain a series of cross-sections at different northings within the pit, and a stylised north-south long-section of the pit showing the same sequencing. There are 5 phases in this mining sequence:

- Phase 1 – Pre-Mining

The natural surface is shown with the various material types to be mined, in relation to the pit design.

Based on iron grade, the materials are classified as High Grade Ore, Sub-Grade Material and Waste.

The various mining zones dip gently west at, or slightly steeper than, the general topography dip of approximately 7°.

- Phase 2 – Pre-Stripping

Waste overburden is removed from within the pit, and placed to the west of the pit in the external waste dump, where it will form the working base for subsequent ore storage and processing.

- Phase 3 – Ore Mining

Sub-grade overburden and then high-grade ore are progressively mined and stored on the external waste dump. The external batter angle of the waste dump will be 20°, whilst the internal batter will be at the rill angle of 37°. The steeper angle can be used to the east due to the dip in topography. To the west, a smaller angle must be used to prevent the down dip causing a collapse.

- Phase 4 – Ore Processing

High-grade ore is removed from the stockpile area and loaded to the crushing and screening plant, and then transported to market. The underlying sub-grade material in the pit is mined and placed onto the existing sub-grade stockpile on the waste dump.

- Phase 5 – In-Pit Waste Dumping

Waste from the adjacent mining area in the pit is used to back-fill the mined out pit in this section, to approximately the pre-mining natural surface mesa topography, with external dump faces being battered off to stable final landforms and rehabilitated.

An area inside the pit, along the pit edge, is left for temporary water storage. This is where rainwater will run-off from both the external dump face and the in-pit dump face and be collected. This will only occur during the wet season as it is expected to dry out during the dry season. As there is a very unlikely chance of AMD within the waste rock, the rainwater temporarily stored here will be uncontaminated.

The second section (8,371,900mN) in Figure 2-13 does not show in-pit waste dumping, as this section is a representation of the area that will not be backfilled (see Figure 2-9). This is also shown at the north end of the post mining sequence in Figure 2-14.

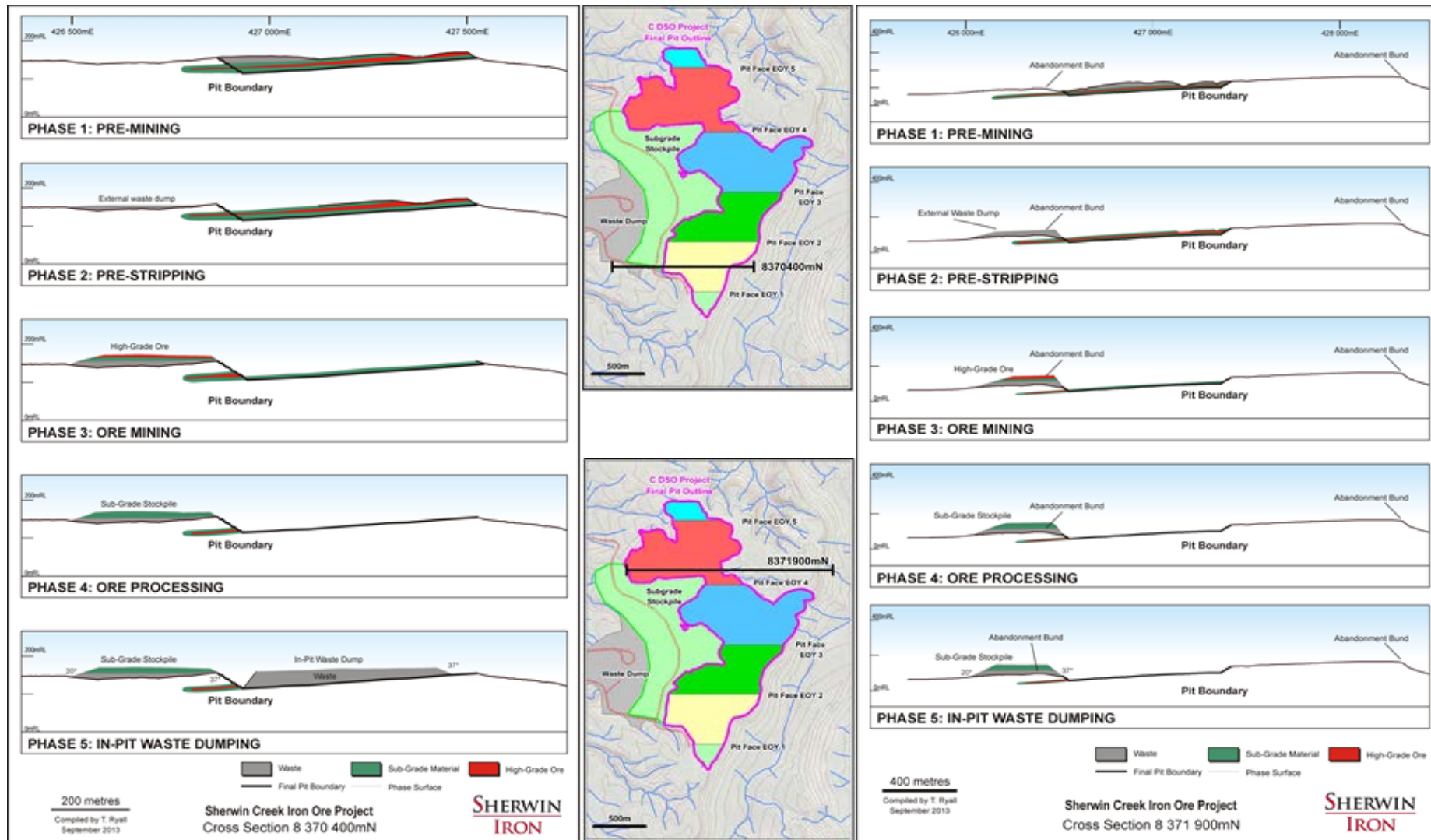


Figure 2-13. Cross-sections showing phase sequencing of proposed DSO operation (1:1 Scale)

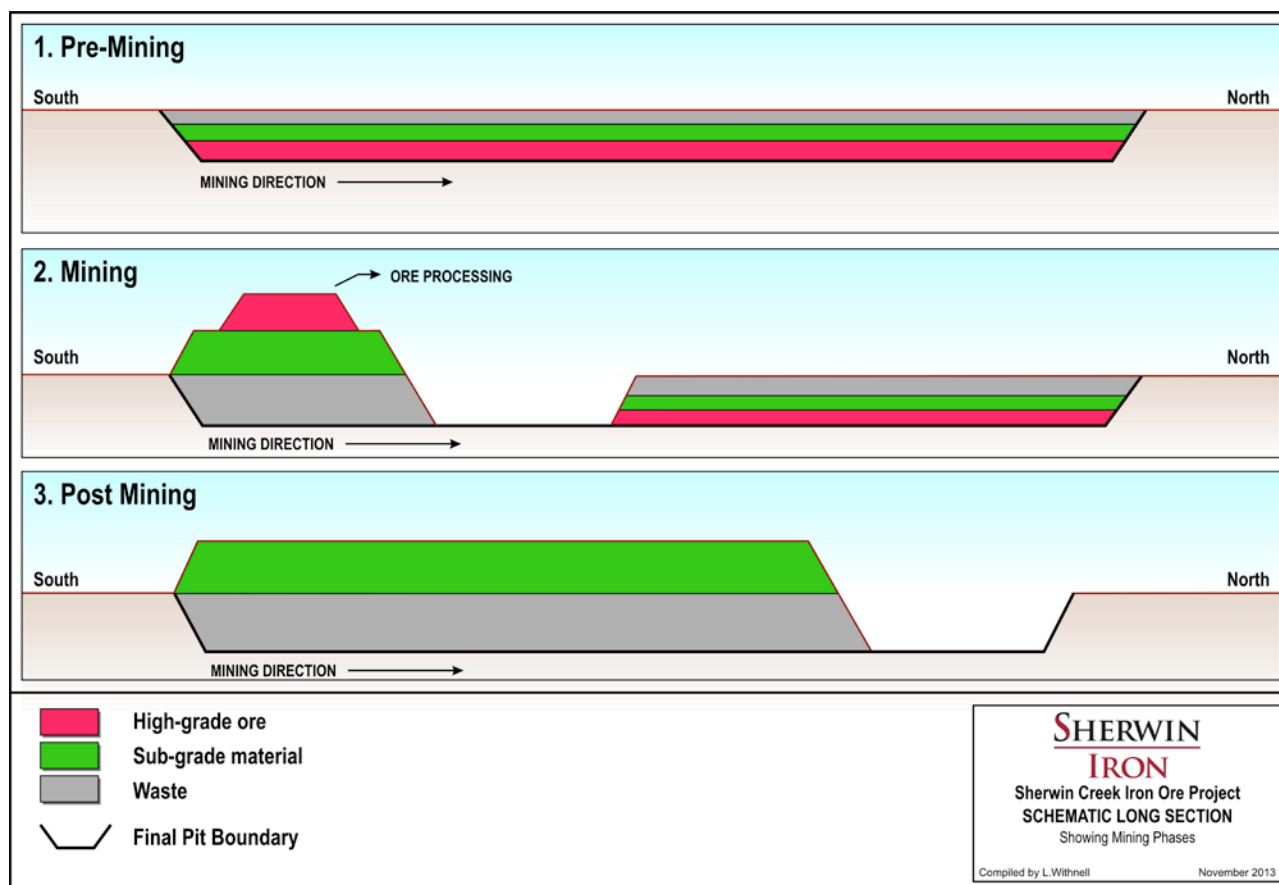


Figure 2-14. Schematic long-section showing phase sequencing of proposed DSO operation

Handling and stockpiling of topsoil

Areas to be cleared for mining and associated activities will be grubbed of trees and large vegetation, which will be collected and stored.

These areas will then have the topsoil stripped, and the topsoil stored in suitable flat areas clear of large run-off channels to avoid erosion of the topsoil stockpiles, as shown in Figure 2-9. Table 2-8 summarises the size of these areas required for topsoil storage. Areas will be stripped on a timely basis, with topsoil from later areas being stored on existing cleared areas, such as the in-pit waste dump. Where possible topsoil will be place directly on areas prepared for rehabilitation negating the need for stockpiling.

On the mesa formation there is a significant amount of outcropping rock, with very shallow depth of topsoil, in many cases less than 0.1 m. As such, the recoverable amount of topsoil will be low. It will be important during grubbing and topsoil stripping that as much topsoil as possible is recovered for subsequent mine rehabilitation capability.

Table 2-8. Topsoil stockpiles size (estimation)

Topsoil Stockpile	Area (ha)
1 – north-east	3.95
2 – south-east	3.94
3 – south-west	1.94
4 – north-west	1.05
TOTAL	10.89

Storage, disposal and use of mine waste material

The initial waste material mined from the pit will be used to construct roads and hardstand areas such as the magazine, with the remainder stored on the external waste dump. Some waste has already been placed in the external waste dump area intended for the mine offices and workshop as part of bulk sampling. After pit stage 1 has been completed and the external waste dump footprint has been filled to provide sub-grade material stockpile area, the remaining waste material mined will be dumped in the pit, with the fill face advancing north in the pit following the advancing ore and waste mining face. The sub-grade material stockpile will be extended along the external waste dump to the north, adjacent to the western pit.

The ore and waste to be mined from the pit have been characterised for potential AMD formation. A detailed report is located in Appendix G. Exploration drilling of several hundred holes has encountered only a very few intersections with traceable amounts of sulphurous material. All of these intersections lie either outside the perimeter of the planned pit, or below the pit floor boundary. A PAF cell is therefore not considered to be required. However, provision for containment of such material will be made in the very unlikely event that it is detected.

Quantity of material to be mined

The mining schedule for the project is shown in Table 2-9 below. Although there are a number of ore bodies surrounding the project area, this submission only relates to the mining, processing and transportation to market of DSO material from Deposit C.

The operation will commence mining ore, sub-grade and waste material from existing faces in the bulk sample pit, immediately upon approval.

A total of 108 Mt of material is planned to be mined during the course of operations, of which 13.7 Mt is high-grade or medium-grade ore. Sub-grade material will also be mined and stockpiled on the external waste dump, and comprises 22.8 Mt, with a total waste movement of 72.3 Mt, or 32.9 million bcm, assuming an average waste specific gravity (SG) of 2.2. It is possible that minor quantities of sub-grade material will be required for blending purposes.

The annual rates of total material movement peak during the second half of the operation at 25.5 Mtpa, with annual high grade and medium grade ore production peaking at 3.0 Mtpa in 2016/17.

Material of different grades will be blended to meet the required shipping grade, which for the bulk sampling program has been 58% Fe. Blending of high grade and medium grade products will see approximately 13.8 Mt of saleable ore produced.

Table 2-9. Mining schedule

Deposit C Schedule		Year 1 2013/14	Year 2 2014/15	Year 3 2015/16	Year 4 2016/17	Year 5 2017/18	Year 6 2018/19	Total
High Grade								
HG Tonnes	t	461,745	2,891,662	2,092,212	2,551,445	1,580,628	658,846	10,236,538
HG Grade - Fe	%	58.9	58.8	59.3	59.6	58.6	57.3	59.0
HG Grade - SiO₂	%	10.3	11.5	11.4	10.9	12.5	13.6	11.6
Medium Grade								
MG Tonnes	t	175,042	674,970	86,025	605,314	683,483	610,852	2,835,686
MG Grade - Fe	%	56.3	56.4	56.6	56.1	56.3	56.8	56.4
MG Grade - SiO₂	%	13.8	14.6	14.8	13.8	14.3	14.1	14.2
Low Grade								
LG Tonnes	t	45,860	208,215	55,540	182,947	160,160	0	652,723
LG Grade - Fe	%	51.5	51.9	50.3	51.6	50.7	0.0	51.4
LG Grade - SiO₂	%	20.7	19.9	21.0	21.0	22.3	0.0	21.0
Waste	t	3,867,352	16,295,154	23,386,223	22,210,294	23,125,729	6,226,315	95,111,067
Strip Ratio (Waste+MG+ LG)/HG		8.9	5.9	11.2	9.0	15.2	10.4	9.6
Strip Ratio ((Waste+LG)/ (HG+MG))		6.1	4.6	10.8	7.1	10.3	4.9	7.3
Strip Ratio (Waste/ (HG+MG+LG))		5.7	4.3	10.5	6.7	9.5	4.9	6.9
Total Mined	t	4,550,000	20,070,000	25,620,000	25,550,000	25,550,000	7,496,014	108,836,014

2.8.2 Crushing circuit

The crushing and screening plant which is currently in use for the bulk sampling program will be used for all crushing and screening requirements during the course of the project. The ore in Deposit C is very friable and readily breaks down during handling. Normal crushing and screening of bulk sampling product is yielding approximately 75% fines: 25% lump ore product. According to results from Universal Rock Strength testing for ore, strength values range between 5 to 40 MPa (where soft <30 MPa, hard >100 MPa).

This crushing and screening plant is a mobile unit, which is relocated quarterly to new locations on the external waste dump. The shortest haulage distance for ore from the pit to the crushing and screening plant will occur when the plant is moved to a location on the external waste dump that is immediately adjacent to the current ore mining location. As the ore mining location progresses north in the pit over the life of the operation the crushing and screening plant will traverse the length of the external waste dump to synchronise with the mining location at the time.

Stockpiling of sub-grade material will take place to the south of the crushing and screening plant, and will eventually form a continuous stockpile running the length of the external waste dump.

Crushing and screening of harder waste rock for road base using spare capacity of the crushing and screening plant is anticipated.

Process flow-sheets

Figure 2-15 shows how the ore will be processed before it is shipped to customers. Once the ore is mined, it will be stockpiled on the ROM and then crushed according to grade (high-grade or medium-grade). Crushing will produce five products:

- Fines:
 - o DSO Fines
 - o Fines 2.
- Lump:
 - o DSO Lump
 - o Lump 2
 - o Lump 3.

DSO Fines and Fines 2 will then be blended to form a product suitable for shipping to customers. The same will be done for the DSO Lump and Lump 2 product. Lump 3 product will be of lesser quality and will be stockpiled for potential future use.

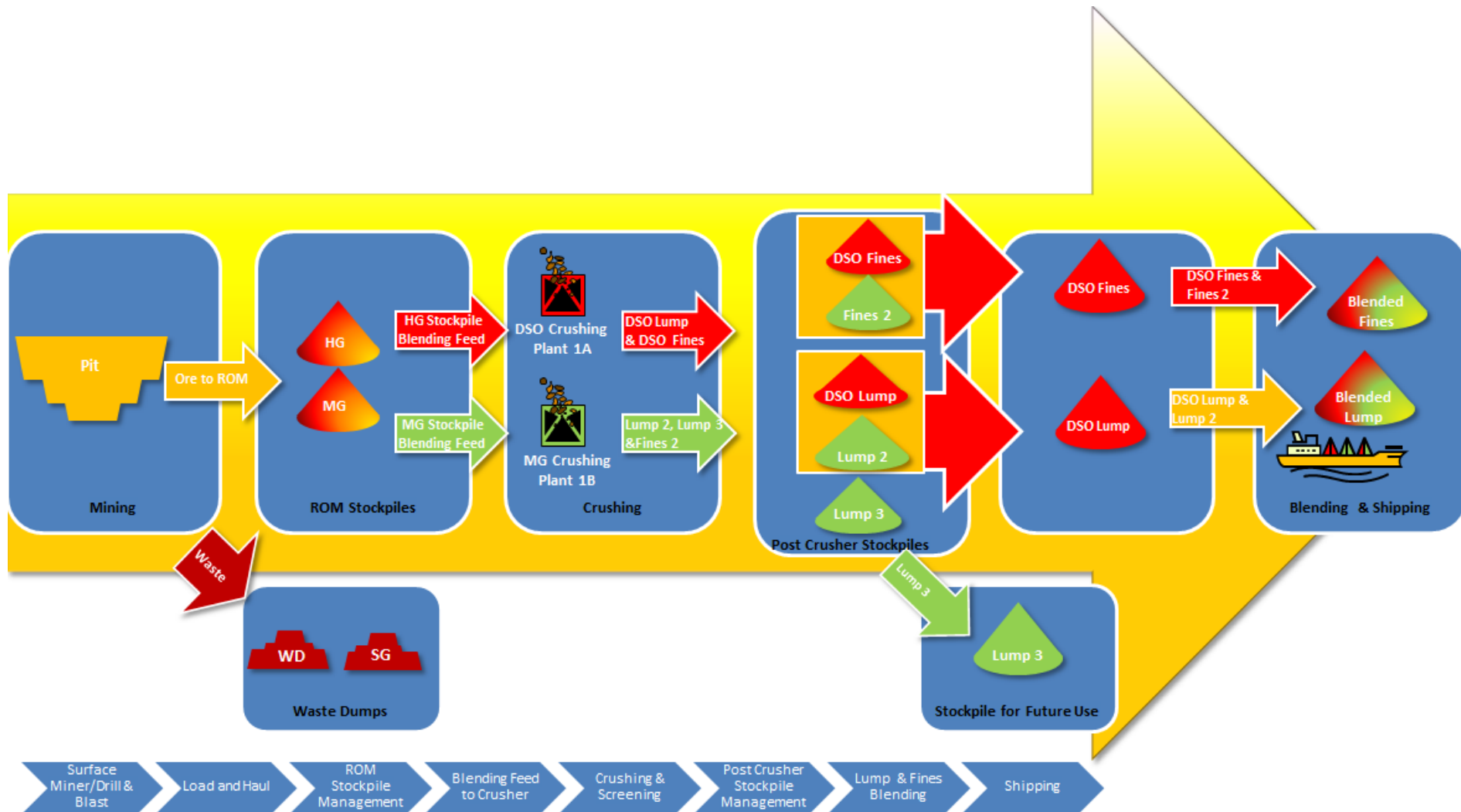


Figure 2-15. Process flow diagram

Quantities and characteristics of the product and reject streams

The high-grade ore, sub-grade material and waste material from the pit are benign in nature and composition. No detectable toxic or deleterious elements are contained within the ore.

The ore is quite soft and friable, and the existing bulk sampling mobile crushing and screening plant is capable of meeting throughput requirements of the expanded operation.

Mined materials have been characterised for AMD consideration. Only 20 drill samples of over 2000 assayed have record any trace levels of sulphurous material (between 0.2% to 2.0% S). These intersections almost exclusively lie either outside the pit perimeter or well below the base of the pit, associated with dolerite. As such, no special considerations are required during mining or processing.

Any rejection of material will be based on an economic cut-off only, rather than material type, with either sale of high-grade material, stockpiling of sub-grade material on the external waste dump or disposal of waste at the in-pit waste dump.

Chemicals to be used

Processing of the ore consists of simple crushing and screening, with no chemicals used in ore treatment. Normal lubricants and cleaning agents will be used for the mechanical equipment.

Chemicals and hydrocarbons to be used on site are limited, and relate to operation and maintenance of mobile mining equipment. Diesel fuel, engine oil, hydraulic oil, transmission oil, brake fluid, rock drill oil and degreaser are the main chemicals used on site. Cleaning fluids will be in use at the camp.

Suitable dust suppression agents (polymer) will be applied to roads for dust suppression around the mine, particularly in high use areas.

A complete materials safety data sheets (MSDS) register will be kept for all chemicals used on site.

Methods for handling and disposal of fines rejects

As all material to be mined is quite benign in nature and composition no special material disposal considerations are required.

Handling and storage of product

A run of mine (ROM) stockpile area with 400,000 tonne capacity will be established around the initial crushing and screening plant location at the southern end of the external waste dump to the west of the pit (see Figure 2-9). The ROM stockpile is designed with five streams of nominally 80,000 tonnes each to allow for blending. As mining in the pit progresses to the north the mobile crushing and screening plant and ROM stockpile will be relocated, with additional access from the pit to the crushing and screening location being created, to minimise the total haulage of ore material.

Sub-grade material will be stockpiled on the external waste dump, to the south of wherever the crushing and screening plant is located at the time.

Blending of product

Selective grade control during mining and processing will provide the operation with scope to blend products.

High-grade, medium-grade and low-grade ore will be mined and stockpiled separately on the ROM area which can be blended to provide smooth crusher feed and product grade.

This will maximise the saleable quantity of ore, by maintaining ore grade consistency and keeping ore contaminants within required specifications for sale.

2.8.3 Road transport

Transport systems and traffic management

Road trains will haul crushed/screened ore along the existing route used as part of the bulk sampling program, which is from the mine site along the access road to the Roper Highway, then along the Roper Highway to the stockpile area at Mataranka, where it will be off loaded and stockpiled. Stockpiling at Mataranka provides additional blending capability, and gives extra surety of haulage to Darwin port, with the Stuart Highway experiencing less interruption to traffic flow during peak wet season rain events than the Roper Highway.

Sherwin has approval as part of the bulk sampling program to haul up to 1.5 Mtpa along the Roper Highway in the current single lane sealed configuration, with vehicle movements of approximately 10 convoys each way (5 road trains for each convoy) per day, at average spacing of approximately 2 hours between each convoy of road trains.

It is anticipated that the Roper Highway from the mine site to Stuart Highway will eventually be upgraded from a single lane sealed surface to a double lane sealed surface. It is intended that the approvals and upgrade to a double lane sealed surface will occur within a timeframe to meet the mining and transport schedule of any forecast expansion to operations. Traffic management will be in accordance with applicable Standards and Codes.

Once construction of the double lane sealed surface has been completed for Roper Highway prior to any increase above 1.5Mtpa, trucking rate of road trains will be increased to 3.0Mtpa on Roper Highway (predicted from 2015) with vehicle movements of approximately 20 convoys each way (5 road trains for each convoy) per day, at average spacing of approximately 1 hour between each convoy of road trains.

The traffic management systems put in place for the bulk sampling program, in particular for ore haulage along the single lane sealed surface of the Roper Highway, with the approval of the Department of Transport, include:

- a) Roadside signage providing road users with awareness of frequent heavy vehicle traffic
- b) All vehicles are "branded" to provide a means for the public to identify vehicles and report incidents
- c) Leading escort vehicles are used, equipped with signage and flashing warning lights similar to those used when escorting wide loads
- d) Quad road trains travel in convoy in order to minimise the number of individual interactions with oncoming traffic and allow effective use of escort vehicles
- e) Radio call-up procedures using the public UHF CH40 radio system. This provides road users, particularly other heavy vehicle traffic, prior warning of the location of oncoming heavy vehicles. An example radio announcement would be "Heavy vehicles travelling west on Roper Highway approaching Elsey Creek 15 km from Stuart Highway"
- f) A stockpile area and road train decoupling and recoupling yard is in use near Mataranka as part of the bulk sampling program. As a result, a small group of drivers using the Roper Highway are managed in a well-controlled manner. A second group of drivers is used for the segment from Mataranka to Darwin. This assists in fatigue management
- g) Additional site specific training and induction procedures have been adopted for the drivers hauling ore on the Roper Highway during the bulk sampling program. This includes detailed familiarisation of the route and potential hazards, call-up procedures and emergency management procedures. This training, procedures, and familiarisation will continue to be used during the expanded mining operation
- h) Detailed Risk Assessment (RA), Safe Work Method Statements (SWMS) and Task Hazard Analysis (THA) have been adopted to identify, manage and control the risks associated with the Project.

These procedures have been documented in writing and each driver must formally agree to adhere to the standards set

- i) All road trains travelling the Roper Highway have IVMS (In Vehicle Management Systems) installed which provides tracking of location and speed of heavy vehicles. It also allows monitoring of driver behaviour and fatigue patterns, which are used to assess and audit adherence to the adopted procedures.

Light vehicle access to the accommodation camp will be via the 4.5 km access road from the Roper Highway.

There are numerous existing tracks around the mine site, which will be rehabilitated once the permanent site access roads are built, if they are not required for miscellaneous purposes such as borefield access.

Employee-related trips pose a minimal increase in load on the road network. Employee movement will be limited to twice weekly bus trips to Darwin. All other site contractor movements will be coordinated to align with the escorted managed transport runs by the transport coordinator.

Following this approval, the existing arrangement used to transport lump and fines DSO iron ore product from the mine site to Mataranka and from Mataranka to the government-owned port facility in Darwin will expand with production. Road trains consist of a prime mover plus four trailers, with a total payload of 100 tonnes per road train. Total truck requirements for 1.5 Mtpa will be four trips for 13 trucks between the mine and Mataranka, and two trips for 25 trucks between Mataranka and the Port of Darwin. To meet the peak production rate of 3.0 Mtpa, approximately 100 tonnes per load will be required (assuming that roads will be trafficable 300 days/year) involving four trips for 26 trucks from the mine to Mataranka and two trips for 50 trucks from Mataranka to the Port of Darwin.

Additional vehicles

1 x 40 tonne articulated water truck

3 x 992/988 loaders

Traffic generated by the project

Peak deliveries of materials and infrastructure occurred during the bulk sampling construction phase early in the project life, and included some wide loads.

The Roper Highway between the mine site and Stuart Highway will be upgraded to a double lane sealed surface in the future and before any increase beyond 1.5Mtpa. This upgrade work would be completed prior to any additional road train traffic occurring under the project.

Quadruple AAB road trains capable of transporting 100 tonne payload will be used to transport DSO iron ore from the mine site to Mataranka for stockpiling. Separate road trains will be used for re-handling this material to the Port of Darwin. Sherwin is currently transporting bulk sample DSO along this route. It is anticipated that bulk sample transportation would graduate seamlessly to the planned production levels nominated in the mining schedule.

Road train return trips occurring under the bulk sampling program are approximately 35 road train trips per day. Road train traffic associated with the mining operation will commence at 50 per day, with approximately 30 minute intervals between road trains, from the mine site to Mataranka. It should be noted that once the road has been upgraded, travelling in convoy will no longer be required. This increased frequency will also occur between Mataranka and Darwin. Additional vehicle movements will include delivery of fuel and lubricant, maintenance and general store supplies, gas, explosive/blasting agent and visiting personnel. Road train trailers are mechanically covered during haulage to minimise dust blow-off on public highways.

Currently under the bulk sampling program bus transport of personnel to and from Darwin occurs twice per week. One overnight delivery per week, plus four to six maintenance spares deliveries (hot shots) per year from Darwin are scheduled for the operation.

Times of travel

Road trains will operate 24 hours/day, 7 days/week.

Road infrastructure required

In-pit haul roads within the site for heavy equipment will be 20 – 22 m wide, with a v-drain at the side for precipitation run-off management. Where there is a drop-off beside the road, a continuous bund half the height of the wheel on the largest vehicle to traverse the road will be constructed. Normal ramp gradient will be no steeper than 1:10.

Access roads from the mine to Roper Highway will be 30 m wide, with a v-drain at the side for precipitation run-off management. Where there is a drop-off beside the road, a continuous bund half the height of the wheel on the largest vehicle to traverse the road will be constructed. Normal ramp gradient will be no steeper than 1:14.

The access road alignment to the site from the Roper Highway has been constructed as part of the bulk sampling program. The approved corridor width for the access road alignment has been set at 50 m, to allow for adequate bunding and earthworks, including culverts across creek beds, as well as possible future running of services alongside the road, including fibre optic cable for telecommunications, without the need for further approvals.

During the first year of operation a ring road will be established for road train traffic, as shown in Figure 2-10, diverging from the existing access road near the magazine, to create a clockwise one way circuit for road train traffic to the ore loading area, and minimise interaction between pit mining and road haulage traffic. The ring road will enter the mining area at the northern end, run parallel to the ore body to the southern end of the waste dump, and then link back to the existing access road back to the Roper Highway. This ring road will be accessible from various pit ramps along the length of the sub-grade material stockpile. These pit ramps will be constructed at various stages to provide access to the crushing and screening plant at the minimum haul distance as the centre of gravity of ore mining progresses north.

Signage will include, but not be limited to, site access, speed limit, personal protective equipment (PPE) requirements, site office contact details, and traffic management call points.

Use of public roads

Public roads used by the project include the Stuart and Roper Highways, as well as internal roads within Darwin to access the port area.

Light vehicles using the Roper Highway and Stuart Highway are limited, with the majority of personnel movement being by twice-weekly bus trips to Darwin. Personnel from local communities working at the operations will be using local road networks.

In addition, all materials and equipment used during construction of the operation, and subsequent operation, will be transported from Darwin along the Stuart and Roper Highways to site.

Hours of operation

The operation will run 24 hours/day, 7 days/week.

2.8.4 Water***Water source***

Several bores were drilled to ascertain the potential of ground water resources as a source of water to mining (see Appendix F2).

Three areas reasonably close to the DSO operation were identified as targets for ground water sources. Each area will pump and pipe to separate Turkey's Nests (nominally designed to be 75m x 75m and at least 3 metres deep):

- North of the magazine area (> 500m from magazine) near the new haul road access (to be supplied by bores located between the magazine and sub-grade stockpile area)
- Along the existing access road (to be supplied by bores located near Sherwin Creek, south of the Restricted Work Area)
- West of the proposed camp (to be supplied by bores located further west of the proposed camp).

The locations of the water bores and proposed Turkeys' Nests are shown in Figure 2-17.

Water requirements

Project water requirements include:

Potable Water Demand/Requirement	ML/a	L/s
Camp Site (100 occupants)	11	0.7
Mine Offices/Workshop/Site (65 personnel)	4	0.2
Total Potable Water Requirement	15	0.9
Water Demand/Requirement DSO Mining 3Mt/a		
Crushing and Screening	3	0.2
Workshop/Wash Bays	15	0.9
Haul Road/Open Pit Mining/ROM	17	1.0
Total Operational Water Requirement	35	3.9

Water management will include:

- Diversion of clean runoff and collection and settling of dirty runoff will be designed and constructed to ensure minimal alteration to existing surface drainage patterns and prevention of contamination to surface and ground water.
- Pre-existing roads and tracks will be used to minimise interference to natural drainage.
- Where possible, new disturbance areas will be located to avoid drainage lines and designed for minimal impact on surface drainage as far as practicable.
- Implement a Sediment and Erosion Control Plan (Appendix E).
- Develop and implement a Water Management Plan (Appendix F1) including water sampling procedures.
- The safe storage and handling of hazardous materials (to Australian Standards) to prevent hazards and contamination of water resources.
- Ground water abstraction, management and monitoring will be in accordance with approvals and licenses to be obtained from the NT Government.

Fire fighting capability

The offices and workshop main fire water storage tanks will be located on high ground adjacent to the offices and workshop. A pressure pump will be installed to give positive pressure to all discharge locations.

The accommodation camp is to be fitted with a dedicated pressurised fire water system, which would supply hydrants and hose reels throughout the facility. The fire water storage tank is being located at the services compound.

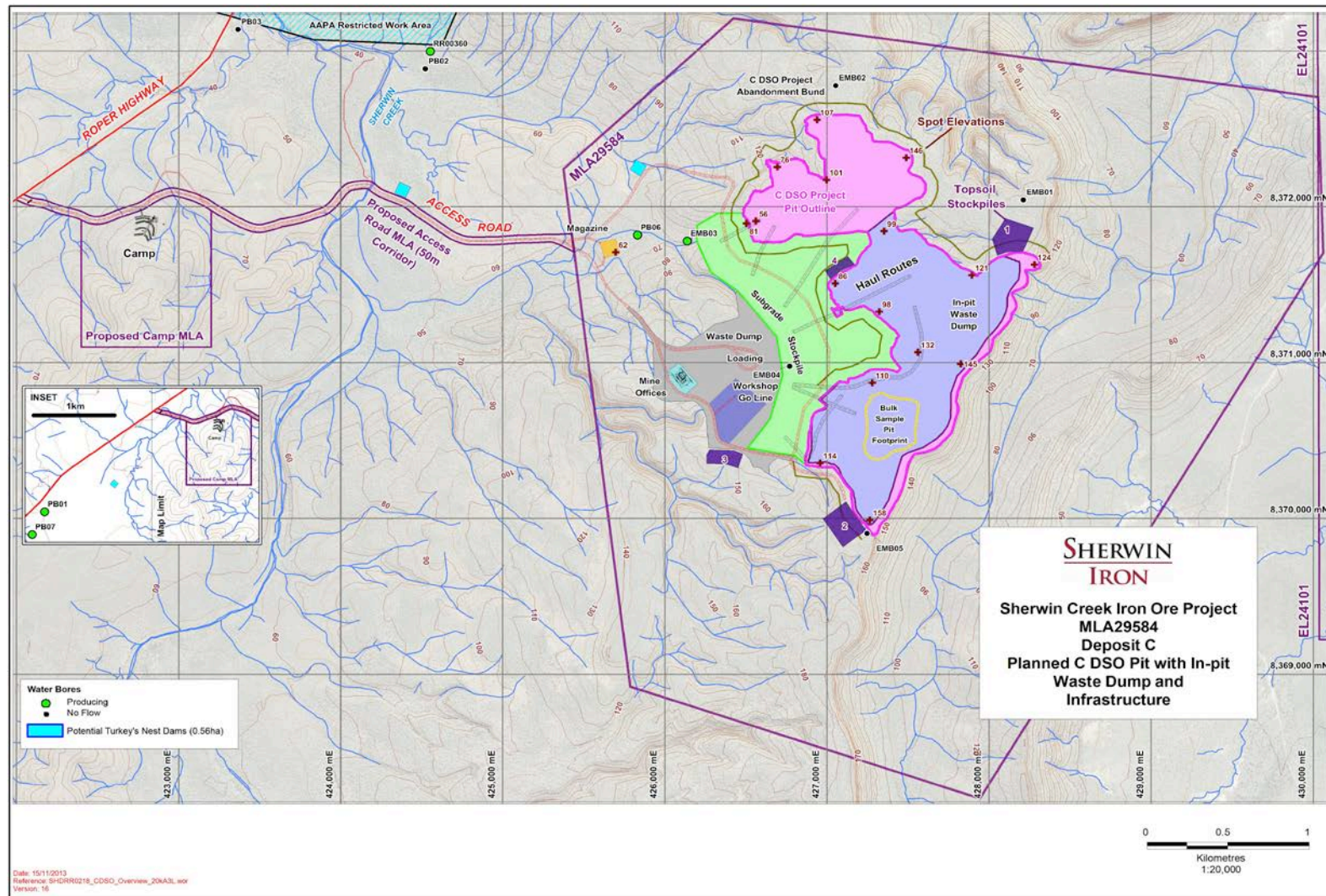


Figure 2-16. Water bore and proposed Turkey's Nests locations

The fire water storage tank reserve capacity in each location would be located in the lower portion of the respective raw water tanks. All other water consumption would be drawn from above the fire water reserve capacity. The fire water pumps would be a conventional system utilising an electrically driven duty and standby pump, with a diesel driven pump back-up.

Dust suppression

Existing access roads and haul roads have been constructed with road base processed from waste material from the mining operations. Material deemed suitable for top dressing the roads has been crushed and used to form a sustainable surface for the roads. Maintenance requirements for the roadway are expected to consist of routine grading.

Permanent haul and high use access roads will be treated with a bonding polymer, which will significantly reduce the maintenance of the roads and reduce the amount of water required for dust suppression.

Other road ways within the mine area will be watered regularly as required to control dust to acceptable levels. Water trucks will operate during production hours.

Drinking water

Where potable water is required for human consumption, the raw water supply will receive ultra-violet treatment and reverse osmosis filtration. Untreated water will be used for all other requirements, such as dust suppression, plant and equipment cleaning etc.

Crushing and screening plant

The crushing and screening plant is a dry process, with little on-going water requirement apart from small sprayers at transfer points. Roadways around the crushing and screening plant will require watering for dust suppression, or addition of a polymer if applicable.

Wetting of ore materials prior to hauling

Screened ore requires minimal wetting prior to loading and transport, with mechanically covered road train trailers for highway transport.

Mine pit dewatering

The pit is located at the top of the mesa and, as confirmed by preliminary drilling and hydrogeological studies (Appendix F2), no ground water is expected to be encountered within the pit.

The only anticipated mine pit dewatering requirement will consist of precipitation run-off occurring within the pit perimeter catchment. Significant rainfall only occurs in the wet season months of December to March. In-pit catchment water will be used for road surface dust suppression watering.

The mining sequence that will be employed allows for the base of the pit to be inundated during the wet season, with mining continuing in higher areas above the water line in the pit, and mining to the pit floor occurring during the dry season.

In addition, with the pit floor dipping to the west, a natural storage against the pit wall will occur once mining has been completed, which will have the capacity to meet the site's life-of-mine water storage and dewatering requirements. The mine schedule will incorporate early completion of mining in this area.

Recycling/treatment

The only treatment and recycling of water on site will be through the wastewater treatment plant, with treatment to a level where it can be safely used for irrigation of vegetation around the camp and dust suppression. A modular treatment plant ('OSMOMBR' - 500m³/day) will be installed.

Storm water drainage systems

The open pit mine will take in the crest of a mesa formation. Accordingly, there will be no upstream drainage traversing the mining operation, and the only storm water collection will be from within the open pit perimeter.

Non-contaminated storm water outside the pit perimeter will enter existing run-off channels and creek beds, ultimately joining the Sherwin Creek-Roper River drainage system, which flows into the Gulf of Carpentaria.

Discharge options

There will be no requirement for discharge from the site other than treated (i.e. by sedimentation basins) storm water.

2.8.5 Energy

Energy requirements

There is no electrical power generation and transmission infrastructure with capability to economically supply the project within reasonable distance of the site.

Power for mining, processing, offices and the accommodation camp will be supplied by on-site diesel generators and local power distribution. Separate generators will be installed to service the mine offices and workshop, magazine, and the accommodation camp services and facilities.

The power for the MOC (Sherwin's and the contractor's administration offices, workshop and store, crib room, first aid room, ablution blocks, sample prep and laboratory, potable and waste water treatment plants, water tank pumps, fuel tank area and general area lighting) will be supplied from a distribution switchboard centrally located to these areas, using a medium voltage system.

Each building and facility will have individual sub-boards supplying power to all final sub-circuits. All light and power circuits will be RCD protected and all electrical installations will conform to AS/NZS 3000:2000.

All office and accommodation buildings will be transportable, and as such will be pre-wired and tested, then only requiring external connections to power and data junction boxes. Potable water treatment, sewerage system and wastewater treatment, and the re-fuelling facility would be vendor supplied panels fed from the distribution switchboard.

Power requirements for the camp are estimated at up to 300kW (based on 3 kW per person) with the offices and workshop requirement estimated at 500kW.

The crushing and screening plant is a self-contained unit with on-board power generation. As such, it will require a substantial fuel supply from a mobile service truck.

Some local power generation units may be required for water bores, where small local diesel generators will be installed.

Power plant

Conventional diesel generators of various sizes will be used to provide the site's electrical power requirements. 2 x 150kva generators will be used at the camp on a load sharing basis giving up to 50% fuel savings in low demand periods. A combination of smaller generators ranging from 20kva to 150kva will be used at the mine office, service areas and bore pumps.

Supplementary solar power generation may be economically justified in the future.

Energy infrastructure requirements

The accommodation village will have a power requirement of approximately 300 kW, which will be supplied by diesel powered generator sets supplied by a 30,000 litre self-bunded storage tank. Camp generators will consist of a duty and standby set, which will provide redundancy in the event of generator failure. Camp cooking requirements will be supplied from a bulk gas storage tank.

The crushing and screening plant and MOC area will have two self-bunded 100,000 litre storage tanks with fast fill capability for heavy equipment and an LV fuel dispenser. Fuel will be transferred to the crushing and screening plant by the mobile service truck/fuel tank next to the crushing and screening plant.

2.8.6 Waste management

Waste streams

A Wastewater Treatment Plant with a capacity of 50 kL/day will be installed at the accommodation village. The treated product will be suitable for reticulating throughout the accommodation village landscaping and used for dust suppression, with surplus to be stored in a Turkey's Nest next to the camp (see Figure 2-16). All products resulting from the Wastewater Treatment Plant will be used in irrigation in accordance with relevant legislation and guidance material for minimum quality of water. The Wastewater Treatment Plant will undergo a 12 week verification period prior to re-use of the discharged water.

A Wastewater Treatment Plant with a capacity of 5 kL/day will also be installed at the MOC area. The treated product (to be at least grade A) will be stored in one of the Turkey's nests located near the MOC area, and will be utilised in dust suppression activities.

Hazardous wastes

The planned operation will consist of direct mining operations comprising drill and blast and mechanical excavation, with simple crushing and screening of the ore product. As such the only hazardous wastes generated will be from maintenance activities on mobile and mining equipment, comprising waste oil and filters, and sewerage from mine offices and the mine camp.

Waste oil and grease will be disposed of off-site by a licensed waste oil contractor. Sewerage and effluent products will be treated and rendered harmless, and disposed of in irrigation around the village or on road way dust suppression. Any accidental spills of hydrocarbons will be contained and cleaned up, with bioremediation of contaminated material as required.

2.8.7 Workforce and accommodation

Employees

The workforce will peak at approximately 150 personnel during initial construction, with approximately 100 personnel during normal operations.

Management and technical personnel will be employed by Sherwin, with supervision, mining, crushing and screening, road haulage operations and camp administration being undertaken by a contractor. Additional technical and specialist personnel will be externally sourced as required.

The contractor will provide trained personnel who are experienced in this type of operation, who would be either from a larger centre (e.g. Katherine, Darwin, or Interstate), or where possible drawn from local communities. These people will have extensive knowledge of open pit mining, crushing plants and heavy earth moving machinery operation and maintenance.

It is not anticipated that overseas personnel will be required for this project.

Transport for workers

Personnel will be working on a bus-in/bus-out basis from Darwin to the site. Employee movement will be limited to a twice weekly return trip from site to Darwin. Road transport to and from local communities will be required for locally engaged personnel.

Employee related trips will pose a minimal increase in load on the road network via strict event management and a Drive-In/Drive-Out (DIDO) roster.

The mining contractor will manage the additional traffic arising from DIDO rostered bus runs and runs to local communities. Any interaction between personnel transport and construction, mining and road transport activities will be carried out by the mining contractor's transport coordinator.

Mine camp

The mine camp being established as part of the bulk sampling program is located approximately 3 km from the mine site and 0.8 km from the Roper Highway, adjacent to the mine access road, as shown in Figure 2-9. This area has been approved and cleared as part of the bulk sampling operations.

The camp location has been selected to satisfy the following criteria:

- Adjacent to an existing access road
- Located within close proximity to the proposed mining operation
- Comprises a level area, elevated above any areas of likely inundation
- Offers a pleasant aspect for camp residents.

The camp will accommodate a peak construction workforce of up to 150 personnel, and an operational workforce of approximately 100 personnel. The village will include the following infrastructure:

- Offices
- First aid room
- Meeting room
- Four person accommodation units
- Ablutions
- Sewerage storage and treatment
- Raw water supply and storage
- Water treatment and potable water storage
- Power generation and fuel storage
- Gas storage
- Laundry
- Kitchen
- Cold storage
- Dry mess
- Access road
- Internal roads
- Light vehicle car park
- Heavy vehicle car park (for service delivery vehicles, semi-trailers, fuel tankers, water tankers, etc.)
- Communications
- Sporting and recreational facilities.

A strict fitness for work (FFW) policy will be implemented and enforced.

2.8.8 Ancillary infrastructure

The key ancillary infrastructure to be located on site are summarised below. The current proposed locations are indicative and may be revised based on potential environmental, cultural or other constraints.

Landfill

As a result of the project's remote location, an on-site landfill area will be required. Domestic and putrescible waste disposal requirements from the village and MOC are estimated at 3 kg per person per day. The landfill will be located in an approved area that will minimise visual and environmental impact to the surrounding area. Waste suitable for recycling will be managed by a licensed contractor and removed from site for recycling in an approved facility. Waste oil will be managed by a licensed contractor and removed from site for processing in an approved facility.

Bulk fuel storage

Bulk fuel storage facilities at the mine site will be located adjacent to the mine workshop, consisting of a bunded storage area with two 100,000 litre self-bunded diesel storage tanks for mining and crushing and screening operations and power generation. A smaller self-bunded diesel fuel storage tank of 20,000 litre capacity will be required to supply the camp diesel generator. All fuel and hydrocarbon storage areas will be constructed in accordance with relevant Australian Standards and legislation, including appropriate bunding and segregation of materials as required.

Explosives storage

A significant proportion of waste to be mined in the pit will require drilling and blasting, with other waste being free-digging in nature, while mechanical excavation using the surface miner will be used for all ore mining. Explosive, blasting agent and initiating device magazine storage capacity has been designed to match the mining schedule on this basis, with additional allowance for supply interruption during wet season road closures.

An approved magazine and blasting agent storage facility will be constructed adjacent to the access road, approximately 2.5 km from the Roper Highway, 1.0 km from the Mine Offices, and 1.0 km from the nearest point of the pit, as shown in Figure 2-9.

Storage, handling and use of explosives will be in accordance with the NT *Dangerous Goods Act*.

Warehouse

The general mining, maintenance and process warehouse facilities will be provided by a contractor, comprising a suitably sized steel structure founded on a concrete slab. The warehouse will contain shelving and storage racking with sufficient room for a small fork-lift to operate. The building will be accessed by both a personnel door and roller door. A battery storage area, hydraulic hose store, tool store and gas bottle storage area will be located in close proximity to the warehouse facility for control purposes. A security fenced open area compound will be provided adjacent to the warehouse.

Administration office

An administration office complex will be provided to facilitate on-site management activities during the implementation and operational phases of the project. The mine administration offices will accommodate the staff facilities required for the construction, commissioning and operational stages of the project. It is envisaged that the offices will comprise a number of transportable buildings, some interconnected, accommodating both Sherwin and contractor personnel.

The administration office complex will comprise the following elements:

- Administration offices consisting of an 18 m by 12 m building
- Meeting room and crib room facilities, including basic kitchen, consisting of a 9 m by 12 m building

- First aid, security and emergency response facilities, consisting of two 12 m by 3 m buildings, with basic medical facilities, a recovery bed, and basic security and emergency response equipment, staffed by a paramedic
- Ablution facilities, consisting of two 12 m by 3 m rooms, with male and female shower and toilets.

A sample preparation facility has been installed on-site as part of the bulk sampling program for the collection and processing of ore samples for both on-site size and moisture content analysis, and off-site assay preparation. Sherwin has established the laboratory facility, which is located adjacent to the sample preparation facility office, within the Sherwin administration centre.

Telecommunications

An existing Telstra fibre optic cable runs parallel to the Roper Highway less than 0.5 km from the camp. Connection may be made to the fibre optic network in the future if this becomes viable, to provide all external telephone, data and electronic communications from the site. Two-way radios will be used for operational communication within the mine site. Mobile telephone coverage and wireless capability will be installed to service the mine offices and camp. The camp will have satellite television service. Existing satellite telephones used during bulk sampling will be retained for emergency back-up communications. External communications will have battery back-up, for secure communications during emergency and in the event of a power failure.

Existing infrastructure

With the exception of some minor local tracks, and other infrastructure already established by Sherwin for the bulk sampling program, the project is entirely new, with no pre-existing infrastructure.

2.8.9 Closure and rehabilitation

Staging and timing

Mining will begin at the southern extremity of the DSO pit. Some of the waste from the initial mining will be utilised to form a base for the crushing and screening operation and for the sub-grade stockpile. After the ore has been mined from the southern extremity of the pit in-pit waste disposal will begin. Mined out areas will be filled to profile with waste and progressively rehabilitation carried out. Areas of the external waste dump not covered by the sub-grade stockpile will also be progressively rehabilitated.

The sub-grade dump will be rehabilitated to a stable landform during the course of open pit mining. Should sale of this sub-grade material prove economically viable it will be sold, subject to applicable statutory approvals.

Subsequent stages of the pit will be mined to full width, with the mine face advancing from south to north, and in-pit waste disposal following behind. The crushing and screening plant location will also move south to north to minimise haul distances. Similarly, the sub-grade stockpile will also advance south to north. Figure 2-13 shows the stages of mining and the resulting pit and stockpile layout at the end of mine life.

Progressive in-pit dumping will produce a final landform with a surface near original topography for the majority of the pit area. The final stage of mining, at the northern end of the pit (scheduled for completion in 2019) will not be back-filled. Water storage within this area during the wet season will help prevent sediment from the final pit and waste dump entering the surrounding environment. Further information on the staging and timing of rehabilitation and mine closure is contained within Appendix J.

Pit and stockpiling design

Figure 2-9 shows the site layout at the completion of mining. As the pit working area progresses to the north, the haul road from the pit working areas to the ROM and in-pit waste dumping areas will have multiple alignments and exit points. This will provide easy access to the pit and shortest haul routes for ore and sub-grade material to the mobile crushing and screening plant as well as to the sub-grade material stockpile. These accesses will require progressive rehabilitation, with some to occur at the end of the mine life.

Figure 2-13 shows a cross-section of the pit and waste dump at the completion of mining. The external and in-pit waste dumps will be battered off to a stable land form of 20° to the west and 37° to the east, as shown in the figure.

Soil profile

In order for the seed stored in the topsoil to remain viable, it is a requirement in the NT that topsoil be stored for no longer than two years. As progressive rehabilitation will take place in this operation, it is possible for Sherwin to ensure this criteria is met. The topsoil stripped at the commencement of operations will be spread over the profiled in-pit and external waste dumps, and over other disturbed areas.

With the significant lateral extent of the disturbed areas (up to 3 km), several discreet topsoil stockpiles will be formed to minimise the haul distance. Topsoil will be stripped and immediately spread on an area prepared for rehabilitation wherever possible. Re-vegetation (by direct seeding or transplanting of seedlings) will be carried out at the onset of the wet season allowing the prompt growth of native grasses to stabilise the topsoil and reduce wind and run-off erosion.

Final landform

At closure of mining operations the external waste dump established to the south-west of the pit with waste from early mining will be battered off to a stable landform at 20° and deep-ripped on contour to minimise erosion of the waste dump face.

The in-pit waste dump will be formed approximately to the pre-mining mesa landform, not rising above the surrounding intact landforms, and will carry minimal residual visual impact or detriment to visual amenity.

The sub-grade material dump lying on the external waste dump and along the western perimeter of the pit will rise 15 – 20 m above the pre-mining landform. This dump will be battered off to a stable landform at 20° and deep-ripped on contour to minimise erosion of the waste dump face.

Techniques

The faces of final landforms will be battered off to 20° and deep-ripped on contour to minimise erosion from surface run-off during peak rain events. High landform faces may have an intermediate berm.

After final landforms have been created topsoil will be truck-dumped along the crest of the landform, for spreading over the face of the landform by dozer. The landform face will then be deep-ripped on contour. It will be essential that this deep-ripping is done precisely on contour, to prevent run-off along the rip-line during peak rain events.

The nature of the waste material, in conjunction with the deep-ripping, will facilitate percolation of rainfall through the dump material rather than surface run-off over the landform face. Deep-ripping will also provide a safe haven for seed stock during first establishment after seeding.

Re-vegetation program

The rehabilitated areas will be seeded with local native grasses and vegetation. Local indigenous personnel will be consulted and engaged to carry out seed harvesting and seeding work. The skills, knowledge and operations of environmental and local indigenous personnel will be utilised for this re-vegetation.

Preparations

Existing species will be identified, and where possible seed harvesting will be carried out prior to disturbance. Seed may also be collected from those species in the surrounding area. Where appropriate to the germination of these plant types, re-vegetation will be either by direct seeding, or by seedling planting. Sowing of seeds, or transplanting of seedlings, will be carried out at the stage of seasons that will maximise vegetation establishment and growth rate.

Trials will commence in early rehabilitation areas to confirm that the material and methods proposed are suitable and effective.

Water supply

With the re-vegetation seeding being programmed to suit seasonal timing, it is not anticipated that water supply to rehabilitation areas will be required.

Mine closure plan

A Rehabilitation and Mine Closure Plan has been developed for Sherwin (refer to Appendix J). The draft plan is a preliminary document, developed to ensure that the rehabilitation and closure program is integrated into the mine plan and considered as part of the mining operation, rather than as a separate phase at the end of mine life.

Sherwin have identified that physical and financial resources will be provided to assist rehabilitation and closure, and the planning and studying of these activities from the beginning of operations.

Completion criteria are necessary to provide the basis on which successful rehabilitation and mine closure, and achievement of closure objectives, are determined. The criteria will be reviewed and refined throughout the development and operation of the project to respond to information from monitoring and research trials, and any other information or change, as appropriate. For more information, refer to Appendix J.

Removal of infrastructure

All buildings and infrastructure will be removed from the site at the conclusion of operations. All areas will be rehabilitated as per the detailed rehabilitation plan to be developed (refer to Appendix J).

Minimal concrete will be required for the project, as the mobile crushing and screening plant to be used requires no foundations. Any concrete used around the site will be removed and placed in landfill. Concrete paved areas, pathways, as well as cyclone rated concrete footings used for buildings will be removed and disposed of in industrial waste pits.

Where they will not be left for public amenity at closure, water bores will be decommissioned and capped to prevent entry by wildlife, and pipelines will be removed.

The camp buildings will be decommissioned and removed from site. The sewerage system is a fully contained re-treatment system, which will be removed from site. Drainage pipes and cabling within the camp will be removed as part of decommissioning.

Some infrastructure may be left in place, by agreement with local communities and regulatory authorities, for the use and amenity of local communities. This will be negotiated and formally agreed during the course of operations, and in any case prior to closure of the operation.

Future land use

Initial consultations with traditional Aboriginal owners and proprietors of Mt McMinn station have been held on the final land use for Deposit C at the Sherwin Creek Iron Ore Project. At this stage, "a return to natural values that continue to allow for periodic grazing by cattle" has been identified as a desirable objective. Sherwin are committed to ensure that the final landform and vegetation are sustainable, safe and non-polluting. Future tenure agreements are likely to result in Sherwin leases being absolved back to pastoral land. Further consultation will be undertaken prior to the end of the mine life, to reach a mutually agreeable outcome by all stakeholders. Stakeholders will be consulted regarding the closure criteria.

2.9 Alternatives

2.9.1 Not proceeding with the proposal

Not proceeding with this project will result in the following:

- Rehabilitation of the bulk sampling pit
- Avoidance of further environmental and heritage impacts

- The remaining deposit would be left undeveloped
- Loss of economic benefit from construction of the project, including approximately 150 jobs
- Loss of economic benefit from operation of the project, including approximately 100 jobs
- Loss of estimated royalties over the life of the project to the Northern Territory and Federal governments
- Financial benefits and training for the local community would not be realised.

It is not considered to be an option to not proceed with this proposal. The economics are favourable to Sherwin. There are no critical areas of risk identified within the area to be mined, either environmental or from a heritage perspective, that would necessitate the project not proceeding. The infrastructure by way of transport route and potential water supply are assured. Relevant negotiations and approvals from the various stakeholders and government authorities are to be provided so that the project can proceed with these agreements in place.

2.9.2 Options for ore haulage and export

Various options for transportation of mined DSO product to export to customers have been considered. These include:

- By road train to a rail siding, and then along rail to Darwin port
- By road train to a river head, and then transporting on a barge to a large shipping vessel
- By road train to the Port of Darwin.

The railway between Adelaide and Darwin runs roughly parallel to the Stuart Highway, and is an option that has been considered. Additional capital would be required for purchase of rolling stock, as well as unloading facilities in Darwin. Pursuing this option would cause significant delay to commencement of the project, with uncertain timeframes for regulatory approval and the lead time for rolling stock and rail spur construction. Sherwin has additional iron ore deposits that are subject to economic analysis, and rail transportation may form part of that larger project, however no rail operations form part of this proposal.

The site's proximity to the Gulf of Carpentaria creates the possibility of truck haulage of ore to a river head, with transfer of material onto barges for subsequent re-handling onto bulk carriers for large vessel shipping to customers. The regulatory approvals process duration for the barging option, along with the lead time for water transport infrastructure, are uncertain at this point in time. As with the rail option, Sherwin's additional iron ore deposits create the possibility of economies of scale, which may cause the barging option to become a more economic option for material transport to market in the future.

The option to use road trains to take the ore along the Stuart Highway to the Port of Darwin was considered the best option as it required a smaller timeframe and smaller capital to set up. The only construction required is the upgrading and sealing of Roper Highway to allow higher volumes of ore to be transported out of the mine to be stockpiled at Mataranka for subsequent re-handling and further transport to the Port of Darwin via road trains. This option is ideal for now, and does not close off the opportunity to develop one of the alternatives mentioned above, should one of Sherwin's additional iron ore deposits form a larger project in the future.

2.9.3 Site selection for mine components

The crushing and screening plant to be used for the operation is a mobile unit, and will be moved according to the mine's working schedule to provide the shortest ore haulage distances. The location of the crushing and screening plant will therefore be variable throughout the life of the mine and will be chosen on a case by case basis, as mining progresses.

The mine offices and workshop will be located on the external waste dump to the south-west of the operation. They will be outside the zone of influence from blasting for the duration of operations. Other sites

were considered, but did not provide the benefits of proximity of the chosen site while still being outside the zone of influence from blasting.

The camp location has been selected to satisfy the following criteria:

- Adjacent to an existing access road
- Located within close proximity to the proposed mining operation
- Comprises a level area, elevated above any areas of likely inundation
- Offers a pleasant aspect for camp residents.

The camp location is accessible to the mine and to Roper Highway along the same access road, preventing the need for further infrastructure. The camp can be accessed from Roper Highway without travelling through the mine site. Other locations for the camp were less accessible, and did not meet the criteria mentioned above.

2.9.4 Mining methods and management of wastes

There are two principle alternatives for mining the ore, these are:

- Standard drill and blast with dozer, excavator, and trucking
- Continuous miner system with surface miner, loader, and trucking.

The continuous miner system is preferable for this ore body as it is flat lying, predictable, and narrow in nature (as evidenced in bulk sampling). The area and extent of each pass also makes it amenable to a continuous miner approach. Using a continuous miner allows higher selectivity, minimal dilution and increased recovery of the ore when compared to the drill and blast method. This will guarantee a higher quality of product and minimise unsaleable product from this DSO operation. Using a surface miner reduces crushing activity. Continuous mining is safer than drill and blast as there is a reduction in overall blasting requirements, less explosives stored on site and minimal fly rock and ultra-fines material caused by the surface miner.

Mining of the waste rock will still use the conventional drill and blast method due to the hardness of the waste rock. In the unlikely case that areas of ore are found to be too hard for the surface miner to break, the drill and blast method will be required.

There were several options for the management of waste rock:

- Create one large waste dump
- Create a number of smaller waste dumps around the site
- Create one waste dump and backfill waste rock where possible.

Backfilling waste rock where possible was the preferred option for several reasons:

- Ability to re-establish the land form to closely match the original topography and therefore original drainage is less disturbed
- Requires less disturbance and clearance of area around the mine site
- Smaller surface area to rehabilitate, therefore smaller rehabilitation costs
- Allows for progressive rehabilitation
- Potential for water storage between the waste dump and final pit face.

2.9.5 Rehabilitation methods

The overall objective of rehabilitation is to create a stable safe and sustainable ecosystem. Not rehabilitating is not an option. To achieve this objective, the following must take place:

- Battering of pit and waste dump
- Contouring/ripping of all disturbed areas to Northern Territory and Commonwealth standards
- Topsoil distributed over the disturbed area
- Cleared vegetation placed over all disturbed areas to provide habitat for fauna
- Seed and seedling planting of rehabilitation areas.

It is highly unlikely that there will be acid mine drainage, tailings dam or other contaminated waste on site. Therefore, there is no alternative to the method mentioned above. Alternatives within this method that require consideration include:

- Timing
- Placement of topsoil
- Placement of vegetation and seeds (through direct seeding or transplanting of seedlings)
- Depth of topsoil placement.

Planting of seeds and seedlings will occur shortly before the onset of wet season. This will maximise regrowth and minimise the need for irrigation. To do otherwise may result in vegetation taking longer to establish and will require higher water use. A quicker establishment will stabilise topsoil and reduce wind and run-off erosion. Topsoil will be utilised as quickly as possible, as reducing stockpile time will maximise seed viability, maintain biological and chemical properties and reduce losses from erosion. The volume of recoverable topsoil is low so care will be taken to recover as much as possible.

Progressive rehabilitation will be possible as some areas of the in-pit waste dump will reach final profile prior to the completion of mining. This will allow evaluation of rehabilitation methods and time to refine and modify practices prior to closure.

2.9.6 Alternative sources of water

The following alternative sources of water were considered:

- Pump direct from Roper River.
- Construct a small earth dam in Sherwin Creek.
- Create water dams (can be internal – created through operation) to catch natural rainfall in wet season.

Pumping directly from Roper River would likely affect downstream communities and environments. In addition to environmental flows, the town of Ngukurr depends on the Roper River for its water supply. The Roper River flows perennially in most years but in particularly dry years, it has ceased to flow in some sections. Extraction of water from the river would therefore potentially pose a risk to maintaining flows to downstream users.

Impounding Sherwin Creek is unlikely to affect flows in the Roper River, as Sherwin Creek is non-perennial and a dam would intercept runoff during the wet season, when there are abundant surface flows available. However, impounding Sherwin Creek would likely require extensive negotiation and detailed assessments, designs and approvals for construction, all of which will require lengthy lead times.

2.9.7 Energy sources for power generation

As there are no nearby existing utility grids, there were two options for power generation:

- On-site power station
- On-site power generators.

After considering the amount of power required to run the mine (300 kW for the camp and 500 kW for the offices and workshop), it was not considered viable to use something as large as a power station. Power generators have a smaller capital cost, and are easier and cheaper to remove in the decommissioning phase. It was therefore considered a more suitable and cheaper option to use several conventional diesel generators of various sizes. Separate generators will be installed to service the mine offices and workshop, magazine, and the accommodation camp services and facilities.

2.9.8 Alternative processes

As the ore to be mined is DSO iron ore, there is no beneficiation required. The only options to be considered for the processing of the ore were:

- Crushing on site
 - o Fixed crusher
 - o Mobile crusher.
- Crushing off site.

Crushing on site is more convenient, viable, time efficient, and requires less re-handling of material and so is much more suited to this operation than crushing off site.

There were several factors for and against mobile and fixed crushers. A mobile crusher has the following advantages:

- Can be moved so that it is always the shortest distance practical from the pit
- Has a lower capital cost than a fixed crusher
- Requires no concrete as it has no need for foundations (cheaper in installation and rehabilitation phases)
- Easier and cheaper to remove in the decommissioning phase
- If, in the future, Sherwin mines other deposits in the area, the crusher can be easily moved to the new deposit
- Can be re-sold.

The advantages of a fixed crusher are:

- Reduced on-going costs
- No time lost in moving the crusher
- Once the infrastructure, stockpiles and haul roads are in place, nothing further needs to be done.

The time lost from moving a mobile crusher would most likely be less than time lost from the longer haul routes used to get to a fixed crusher. The shape of the ore body and the pit means that, if using a mobile crusher, instead of creating multiple discreet stockpiles, one long continuous stockpile can be created as the crusher moves. A lower capital cost would result in a faster positive cash flow, which is desirable for Sherwin. For these reasons, and the advantages mentioned above, a mobile crusher was chosen for this project.

After crushing, some blending of stockpiles will occur to ensure specifications are met for the customer. This will be done during re-handling of the ore between the crusher and the port. The alternative was to do this before crushing; however, there is no guarantee after crushing blended ore that it would be the desired product.

2.9.9 Consideration of alternative environmental management measures for key risks/impacts

There are minimal environmental impacts expected during the project as it is highly unlikely there will be AMD waste, tailings dams, or other hazardous waste to be stored on site. The main risks to the environment are:

- Effects on surrounding flora and fauna
- Weed management
- Noise and vibrations
- Dust
- Waste
- Effects on ground and surface water.

Continuous monitoring will be carried out on environmental performance. Monitoring of environmental changes is a crucial part of an environmental management system. Monitoring should focus on threats, pressures and opportunities. Sherwin will develop an environmental monitoring program and will include:

- Identification and monitoring of trends and threats
- Identification and monitoring of potential long term impacts/patterns
- Identification and exploration of emerging opportunities
- Monitoring of both direct and indirect impacts
- Strategies for assessing and measuring effectiveness of policies and/or projects
- Provision for updating policies, plans, strategies and projects.

If monitoring indicates that the desired level of protection is not being met, improved techniques or management methods will be initiated to guarantee the standard of protection expected by NT regulatory authorities. Since the risks are minimal, significant changes in management methods are not expected. A detailed report on the management plans to be put in place are covered in the Environmental Management Plan (EMP) documents for each of the listed risks (refer to Appendix D). Each EMP develops management strategies to:

- Completely avoid the impact if possible
- Substitute with a lesser impact
- Design rehabilitation and engineering solutions to reduce the degree and risk of impact
- Design operational controls and emergency response around reduction of impact.

Through monitoring of environmental changes, alternative environmental management measures will continually be considered throughout the life of the project to ensure relevant legislation and guidelines are always satisfied and environmental impacts are minimised.