Dr Bill Freeland
Chair,
Northern Territory Environmental Protection Authority

Your ref: EN2011/0250

Re: Direction for further information Sherwin Creek Iron Ore Project

Dear Bill,

On the 11th April, you contacted me asking for further information about the above project. In particular, you requested information regarding:

- Ore haulage on the Roper Highway
- Erosion and sediment control
- Water availability for dust control.

This response addresses each of these components separately. Section 1 talks about the ore haulage transport on the Roper Highway. Sherwin Iron Pty Ltd (Sherwin) has made substantial process in developing an agreement with the NT Department of Transport (DoT) to use the Roper Highway to transport iron ore from the mine site to Darwin. Furthermore, Sherwin has already spent over $1 million upgrading the Roper Highway. Section 1 gives specific detail about this agreement and outlines where this $1 million has been spent. I should also mention that the final agreement with the DoT is less than a few weeks away.

Section 2 discusses the erosion and sediment control incident describing the incident and Sherwin's response as well as presenting the outcome of the water quality sampling.

Section 3 provides more detail on how the required groundwater source will be found and developed and how any environmental risks with be mitigated including through a comprehensive assessment of sustainable extraction rates and mapping of ground water dependent ecosystems.

If you have any questions please do not hesitate in contacting me.

Yours sincerely

Barry Coulter

22/04/2014

1. Ore haulage on the Roper Highway: Status of Agreements

1.1 Introduction and Background

Sherwin Iron Pty Ltd (Sherwin) recently submitted its Supplementary Environmental Impact Statement (SEIS) to the NT Environmental Protection Authority (EPA). The SEIS process gives an opportunity for the public and government to ask further information about issues that they believe were not fully addressed in the EIS. Understandably, many of the submissions were about the use of vehicles transporting iron ore from the mine along the Roper Highway, indeed of the 148 responses 27 of related specifically to transport/traffic management.

Sherwin has been in discussion with NT Department of Transport (DoT) for some time regarding the use of the Roper Highway and ways to mitigate risk and inconvenience to users of the highway. Sherwin is now in a position to elaborate on the nature and the results of these discussions noting the agreement will be finalised soon. Furthermore, Sherwin has spent over $1 million upgrading the Roper Highway. This document presents the specific detail of the road works that Sherwin has agreed to as well as the work that Sherwin has already completed on the Roper Highway and the other commitments that Sherwin has made regarding this part of the Project.

Sherwin Iron Pty Ltd (Sherwin) has made substantial progress in developing an agreement with the NT Department of Transport (DoT) to use the Roper Highway to transport iron ore from the mine site to Darwin. Furthermore, Sherwin has already spent over $1 million upgrading the Roper Highway

The attached document gives specific detail about this agreement and outlines where this $1 million has been spent. I should also mention that the final agreement with the DoT is less than a few weeks away.

1.2 Work to date

Sherwin has already completed some work upgrading the Roper Highway; this includes:

- Shoulder restoration on narrow bitumen section over a 50 km distance from 2km west of Moroak Station turn off going East to just west of Flying Fox Station. Was completed in October 2013. Cost $260,000,
- On-going 24 HR dust suppression on dirt section of Roper Hwy & Maintenance grading from end of tarmac to Minesite turnoff. Cost $480,000,
- Road rebuild of 7km of dirt section of Hwy during wet season on instructions from DoT. Cost $45,714 per km, total Cost $ 319,000, All these works have been carried out between July 2013 through to February 2014,
- Current ongoing 24 HR dust suppression is continuing on dirt section as well as maintenance grading.

1.3 Agreement with DoT

The agreement with the DoT includes location specific works as well as guidelines and standards to comply with regarding road building.

Broadly, this includes upgrading the Roper Highway between the intersection of the Roper Highway with the Stuart Highway by:

strengthening of road pavements and shoulders, seal and pavement widening to a two-lane sealed carriageway and improved line of sight, construction of overtaking lanes, upgrades of bridges and culverts, road safety improvements including provision of heavy vehicle rest areas and repairs and maintenance of the Roper Highway.

More specifically this work comprises widening the existing pavement to provide a dual lane sealed road on the Roper Highway at locations nominated below (Table 1) by:

- Rip existing shoulders and topping up with type 2 gravel, stabilised with 3% cement and compact to achieve a 200mm compacted thickness with 100%MMDD with a grade of 3%
- Prime and single seal of new work only. Existing pavement to remain.
- Extent of work is to achieve a 7.2m primed and 7m sealed roadway.

Figure 1 gives the cross section of the road showing current width and proposed widening.

1.4 Funding

Funding information is provided in

Table 2 below. Essentially, the Northern Territory Government will contribute $1 million and Sherwin $3,730,000 over two tranches.

Table 1. Work plan

Chainage from (km)	Chainage to (km)	Length (km)	Location / Description	Priority
28.7	30.4	1.7	Start from end of existing 2 lane seal to 900 metres past Elsey Station turnoff	1
26.0	27.6	1.6	Start 300 metres before Jilkmingan turnoff to connect with existing 2 lane seal	2
73.0	73.7	0.7	Widen through curves	3
73.7	74.5	0.8	Widen through curves	3
95.3	97.5	2.2	Widen through crests and curves to connect with existing 2 lane sections	3
98.1	99.1	1.0	Widen through crests and curves to connect with existing 2 lane sections	3
52.9	53.7	0.8	Widen through curves to Cattle Grid	4
55.3	58.0	2.7	Widen through crests and curves	4
68.4	69.5	1.1	Widen over crest	4

Table 2. Funding and contribution

Party	Amount (exclusive of GST)
Northern Territory Government	$1,000,000.00
Contributions by Sherwin Iron	At commencement of Agreement: $500,000.00 Later: $3,230,000.00
(d) Total Amount for Works	**$4,730,000.00**

1.5 Ongoing Commitments

As part of the environmental approvals process Sherwin has made a number of commitments to ensure safe use of the Roper Highway. These are:

- Conducting a condition survey of the Roper Highway
- Sherwin will undertake a safety audit in accordance with the Ausroad publication (Road Safety Audit)
- Upgrading the Roper Highway in consultation with DoT (discussed above)
- Development of a Traffic Management Plan that will be designed by a Northern Territory accredited Traffic Management Plan Designer and be in conformance with the requirements of AS 1742 – 'Manual of uniform traffic control devices Part 3: Traffic control devices for works on roads'. Opus Consultants have been engaged to do this work.
- Engaging a Transport Coordinator who will implement all aspects of the highway use agreement.

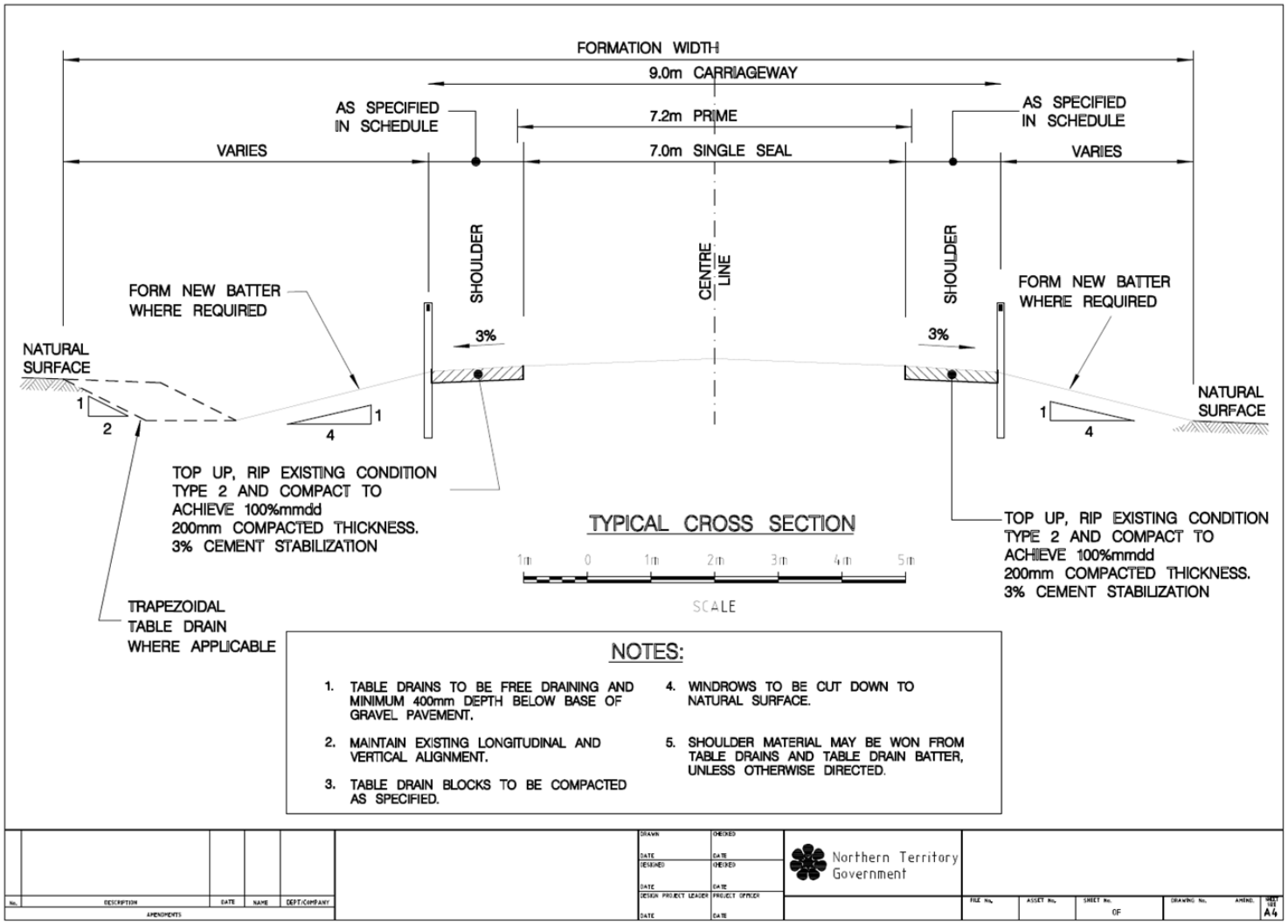


Figure 1. Road cross section diagram

2. Erosion and sediment control

The following is a letter that is to be sent to Peter Wagiatt the Director Mining Compliance, Department of Mines and Energy outlining the haul road incident, Sherwin Iron's response and presenting the outcome of water quality monitoring.

Mr Peter Waggitt
Director Mining Compliance
Department of Mines and Energy
GPO Box 4550
Darwin NT 0801

Dear Peter

Re: Sherwin Iron Project – Investigation Report on Haul road failure 14 February 2014.

In response to your letter dated 1 April 2014, Sherwin Iron Limited (Sherwin) has completed an investigation on the events resulting in the failure of the Bulk Sample Project access road on 12 April 2014, following a significant and sustained rain event and actions taken since the incident.

Some actions remain ongoing or are yet to be completed, but do not present any additional or ongoing risk of contamination to the Sherwin Creek. These are detailed below.

BACKGROUND

Throughout January and February 2014, the Sherwin Iron project, located on Mt McMinn Station approximately 130 km east of Mataranka on the Roper Highway, encountered consistent and significant rainfall which lead to a significant amount of water being contained behind the main access road to the Bulk Sample Project.

On Monday 10th February 2014, site personnel reported that the volume of water stored behind the haul road was approaching the running surface of the road, and creating hazardous road conditions. Activities onsite were suspended and the site access road barricaded and sign posted to prevent inadvertent access. Sentries were also posted on the main access gate to prevent inadvertent access.

Sherwin personnel continued monitored the road condition and also implemented visual monitoring of the Sherwin creek.

On Wednesday 12th February 2014, the storm water topped the main access road and commenced eroding the side walls and top of the access road. Sherwin maintained visual and photographic monitoring of the situation from a safe distance. Sherwin continued to monitor the increased flow in to the Sherwin Creek but was unable to access the area to install any form of breakwater, due to the volume of flow in the creek. Access to heavy earth moving equipment onsite was also prevented due to loss of access across the access road.

Access to site was restored for light vehicles on Thursday 13th February once the flow rate in the Sherwin Creek had significantly reduced.

DETAIL

The main access road to Sherwin Iron's Bulk Sample Project was designed with adequate provision of stormwater piping to handle the anticipated flows in the Sherwin Creek during the wet season.

Unfortunately, the culvert pipes were not delivered to site at the time of construction of the main access road. However, it was always Sherwin's intention to install the culvert pipes at the earliest possible time.

During the incident, a large section of the access road was washed out, sending local rock used to construct the access road down the Sherwin Creek causing temporary discolouration.

Post the access road flooding incident, significant effort has been employed to ensure that all facets of the original access road design in addition to all corrective actions from the onsite investigation are implemented without delay.

Below are photographs of the access road affected by the flooding event plus water sample analysis result taken at the incident site, up-stream and also down-stream from the affected area.

A Civil Engineer is currently confirming, and if required redesigning the access road including stormwater management parameters. This activity has yet to be received by Sherwin, however culvert pipes in excess of the anticipated capacity have been delivered to the site and shall be installed once the final engineering redesign is received.
A review of the site did not identify any other infrastructure or sites affected by the incident.

Significant run-off from creeks and tributaries and small valleys above the Bulk Sample pit resulted in a significant volume of water being collected in the Bulk parcel excavation. This acted as a form of silt trap, as well as a water collection point, preventing further environmental damage down dip of the excavation. This water was subsequently used for dust suppression around the Bulk Sample excavation and haul roads.

WATER SAMPLE COLLECTION

Immediately following the incident, Sherwin personnel contacted EcOz Environmental Services to assist with sampling methodology, correct sample collection technique, sample storage and analysis. Due to the Roper Highway being cut from flooding EcOz personnel were not able to attend the site in a reasonable timeframe so sample collection was undertaken by Sherwin Personnel. Samples were then transported directly to ALS laboratories for analysis, and results reviewed by EcOz personnel.

Diagram 1 shows the water sampling locations; Pictures 1 to 4 show the haul road after the incident.

EcOz completed a review of the water sample analysis results and indicated that there is no evidence of contamination in the up-stream or down-stream samples taken post the incident.

CONCLUSION

Sherwin Iron incurred significant damage to the access road in to the Bulk Sample project on Wednesday 12th February 2014. As a result of a section of the haul road being washed out, road building material was washed in to the Sherwin Creek, causing temporary discolouration. Samples collected up and down stream of the incident site show no evidence of contamination to the Sherwin Creek.

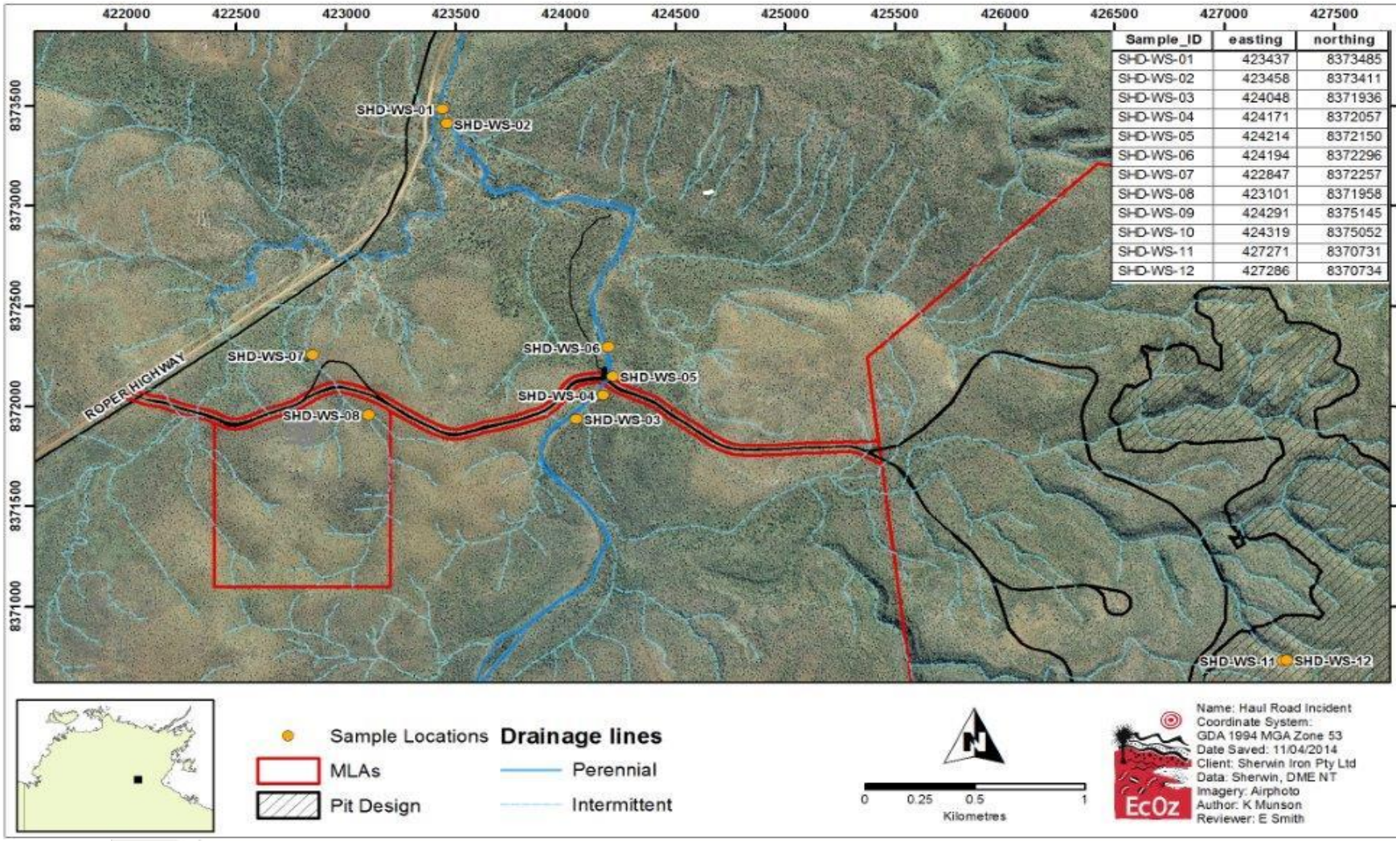
Rectification work commenced as soon as the heavy rainfall subsided to minimize further environmental impact to the Sherwin Creek and surrounding areas.

Stormwater pipes have been delivered to site in preparation for installation, once an engineering redesign is completed. These stormwater pipes have been over-sized to ensure future stormwater can travel unimpeded down the Sherwin Creek and prevent a reoccurrence of this incident.

The access road is yet to be prepared, until such time as we have an approved engineered design for the access road, and confirmation that the stormwater pipes are suitably over designed.

A follow-up report is planned to the NT EPA once the stormwater pipes are installed and the access road is reconstructed.

All other road crossings where there is the potential for natural water flow to be significantly impeded during storm events have been audited onsite and no other site present this risk.



Sample_ID	easting	northing
SHD-WS-01	423437	8373485
SHD-WS-02	423458	8373411
SHD-WS-03	424048	8371936
SHD-WS-04	424171	8372057
SHD-WS-05	424214	8372150
SHD-WS-06	424194	8372296
SHD-WS-07	422847	8372257
SHD-WS-08	423101	8371958
SHD-WS-09	424291	8375145
SHD-WS-10	424319	8375052
SHD-WS-11	427271	8370731
SHD-WS-12	427286	8370734

Diagram 1. Location of water sample collection sites

Picture 1. Sample collection process

Picture 2. Water sampling at the access road incident site

Picture 3. Actual location of access road failure

Picture 4. Storm water culverts delivered to Sherwin site awaiting installation

Attachment 1: Water quality sample results

This attachment presents the water quality data; the 12 sampling locations on the header row of the following table are shown in Diagram 1.

The following points are noted:

- Sites SHD-WS-11 and SHD-WS-12 are from the pits, the rest are from streams (as per map).

- No field measurements were made as Sherwin does not have any pH, EC, DO meters etc on site.

- All results are laboratory tested.

- pH was only measured in the pits as this parameter has an extremely short holding time and the stream samples took several days to reach the labs due to the road being cut.

- Not all parameters requested by DME to be analysed were analysed because the appropriate bottles with preservative were not available onsite during sampling.

- Only total metals were analysed as no filtering equipment was available onsite during sampling to obtain dissolved metal analysis.

	Units	LOR	*ANZECC 2000 95% Species Protection Freshwater*	SHD-WS-01	SHD-WS-02	SHD-WS-03	SHD-WS-04	SHD-WS-05	SHD-WS-06	SHD-WS-07	SHD-WS-08	SHD-WS-09	SHD-WS-10	SHD-WS-11	SHD-WS-12
Date Sampled				14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	21/02/2014	21/02/2014
EA005P: pH by PC Titrator															
pH Value	pH Unit	0.01	-	-	-	-	-	-	-	-	-	-	-	4.83	4.72
EA010P: Conductivity by PC Titrator															
Electrical Conductivity @ 25°C	µS/cm	1	-	32	178	58	50	51	50	132	17	52	52	39	39
EA015: Total Dissolved Solids															
Total Dissolved Solids @180°C	mg/L	10	-	100	177	80	74	74	63	198	97	74	91	54	54
EA025: Suspended Solids															
Suspended Solids (SS)	mg/L	5	-	26	-	-	-	-	-	-	-	-	24	7	<5
EA045: Turbidity															
Turbidity	NTU	0.1	-	83	84.6	47.6	51.1	54.3	67.5	101	256	82.5	82.4	98.5	94.6
EG020T: Total Metals by ICP-MS															
Aluminium	mg/L	0.01	*0.055*	1.82	1.72	1.45	1.37	1.7	1.64	4.01	5.67	1.78	1.58	0.16	0.14
Antimony	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	-	0.013	0.016	0.014	0.012	0.026	0.014	0.021	0.031	0.016	0.014	0.017	0.017
Beryllium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.05	*0.37*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0001	*0.0002*	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001
Cerium	mg/L	0.001	-	0.002	0.003	0.001	0.002	0.002	0.002	0.003	0.007	0.002	0.001	0.002	0.002
Chromium	mg/L	0.001	-	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.005	0.002	0.001	<0.001	<0.001
Cobalt	mg/L	0.001	-	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	0.002
Copper	mg/L	0.001	*0.0014*	0.001	0.006	0.002	0.002	0.002	0.002	0.006	0.004	0.001	<0.001	<0.001	<0.001
Dysprosium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Europium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gadolinium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001
Hafnium	mg/L	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Holmium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.05	-	2.06	2.86	2.46	2.01	2.59	2.25	5.07	5.76	2.24	1.77	0.55	0.5
Lanthanum	mg/L	0.001	-	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.003	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.001	*0.0034*	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.005	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	0.001	-	0.002	0.002	0.002	0.002	0.002	0.003	0.004	0.005	0.003	0.002	<0.001	<0.001

	Units	LOR	*ANZECC 2000 95% Species Protection Freshwater*	SHD-WS-01	SHD-WS-02	SHD-WS-03	SHD-WS-04	SHD-WS-05	SHD-WS-06	SHD-WS-07	SHD-WS-08	SHD-WS-09	SHD-WS-10	SHD-WS-11	SHD-WS-12
Date Sampled				14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	21/02/2014	21/02/2014
Lutetium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	*1.9*	0.056	0.068	0.182	0.063	0.055	0.055	0.027	0.112	0.042	0.024	0.206	0.21
Molybdenum	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	mg/L	0.001	-	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.003	0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.001	*0.011*	<0.001	<0.001	0.001	0.001	0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001
Praseodymium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	mg/L	0.001	-	0.009	0.009	0.006	0.006	0.007	0.008	0.019	0.026	0.009	0.007	0.002	0.002
Samarium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.01	*0.011*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.001	*0.00005*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	mg/L	0.001	-	0.006	0.006	0.014	0.009	0.009	0.008	0.004	0.006	0.009	0.008	0.002	0.001
Tellurium	mg/L	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Terbium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	mg/L	0.01	-	0.03	0.03	0.03	0.02	0.04	0.02	0.06	0.08	0.03	0.02	<0.01	<0.01
Uranium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.005	*0.008*	<0.005	0.005	0.793	<0.005	0.487	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	<0.005
Zirconium	mg/L	0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EA065: Total Hardness as CaCO3															
Total Hardness as CaCO3	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
ED037P: Alkalinity by PC Titrator															
Bicarbonate Alkalinity as CaCO3	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Hydroxide Alkalinity as CaCO3	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Total Alkalinity as CaCO3	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA															
Sulfate as SO4 - Turbidimetric	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
ED045G: Chloride Discrete analyser															
Chloride	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	6	6

	Units	LOR	*ANZECC 2000 95% Species Protection Freshwater*	SHD-WS-01	SHD-WS-02	SHD-WS-03	SHD-WS-04	SHD-WS-05	SHD-WS-06	SHD-WS-07	SHD-WS-08	SHD-WS-09	SHD-WS-10	SHD-WS-11	SHD-WS-12
Date Sampled				14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	14/02/2014	21/02/2014	21/02/2014
ED093F: Dissolved Major Cations															
Calcium	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Magnesium	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Potassium	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	<1	<1
Sodium	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	4	4
EN055: Ionic Balance															
Total Anions	meq/L	0.01	-	-	-	-	-	-	-	-	-	-	-	0.17	0.17
Total Cations	meq/L	0.01	-	-	-	-	-	-	-	-	-	-	-	0.17	0.17

3. Water availability for dust control

3.1 Background

Sherwin committed in the EIS to identify an adequate groundwater source, and to have an engineering solution for delivery of water to operations, in the Mine Management Plan (MMP). The MMP is intended for submission following finalisation of the EIS assessment. This document provides more detail on how the required groundwater source will be found and developed.

As part of feasibility study work completed in 2013 and related environmental studies (discussed in the draft Water Management Plan, Appendix B of the SEIS), project water demand was estimated by consultants Pendragon Environmental Solutions to total 87 Megalitres per year (ML/a). The bulk of this demand (85%) would be for use in dust suppression, mostly on roads. Whilst engineering work to reduce this requirement is ongoing, Sherwin has committed to identify a minimum supply of 87 ML/a from groundwater aquifers only, in order to reduce any potential impacts on other activities in the region. As the region is regarded as generally poor in groundwater, this commitment was recognised as requiring a substantial effort in exploration for, and development of, groundwater resources.

The estimated 87 ML/a total equates to a continuous draw of about 2.8 litres per second, however given the seasonal nature of demand, and the intention to pump bores for only 8 to 12 hours per day in the interests of aquifer sustainability, peak demand was estimated by Pendragon to be around 12 litres/second (L/s). Ground geophysical surveys, drilling and testing successful bores, able to satisfy this nominated peak demand of 12 L/s, is the aim of the groundwater exploration program currently underway.

Sophisticated software to analyse pump and slug test data (FC Method, Institute for Groundwater Studies, South Africa, specifically developed for fractured rock aquifers, in combination with Aquifer Test 2013.1 which employs traditional analytical solutions and techniques such as Theis, Hantush, Neuman, Boulton) coupled with aquifer modelling (FeFLOW and/or MODFLOW models) will be undertaken to ascertain the hydraulic parameters of the bores and aquifers. Consequently, vertical and lateral drawdowns in response to abstraction rates are calculated and where required interferences with other nearby bores, groundwater dependent ecosystems (GDEs) and the like. Safe long-term sustainable abstraction rates, taking due cognisance of rates of recovery measured during testing and recharge from rainfall, are then set/allocated to prevent over-exploitation and impacts on other nearby sources by also limiting the duration of abstraction to generally less than 12 hours per day to facilitate recovery of the ground water regime that will ensure that there is no potential detrimental impacts on the aquifer and any dependent ecosystems.

Furthermore, a survey for GDE in the area within the aquifer will be occur and monitoring put in place to ensure that GDE are not affected by water extraction.

The conceptual target is a single large aquifer with good annual recharge, ideally located within about 25 kilometres of the operations centre at Deposit C. Multiple bores are likely to be required, feeding a pipeline to the operations site, with supply buffered by at least one turkey's nest storage dam at the delivery point.

Target selection has considered not just geological prospectivity and any existing drilling results, but also possible impacts on other groundwater users, any cultural issues, as well as proximity of any groundwater-dependent ecosystems.

3.2 Previous Work

Apart from historical water bores, the main recent and relevant work is the 2013 drilling campaign conducted by Sherwin to complete water-monitoring bores and some exploration production bores around the proposed operations. Drilling was by Allwell Drilling Services. Six monitoring bores (SEMB01-06) were drilled in and around the proposed operations site to evaluate potential impacts of open cut mining activities on the groundwater table. This work showed conclusively that the standing water table is well below the proposed final depth of mining with no impacts expected.

A further 5 exploration bores (SPB01, 02, 03, 06 and 07) were drilled within 6 kilometres of the proposed operations site. Airlift yields of up to 1.3 l/sec were achieved but after pump-testing, modelled long-term sustainable yields were disappointing, just 2 bores showing projected long-term yields of 0.8 and 0.1 l/sec respectively. These two bores were nearly 7 km apart, one in a small alluvial system, the better bore in Sherwin Ironstones down-dip from the Deposit C orebody.

The conclusion from this work was that rock porosity and permeability in the immediate vicinity of the proposed operation is generally low. Recrystallisation and silicification of rocks has occurred probably related to regional metamorphism, and no major regional structures transect the area to impart secondary permeability. The probability of identifying a suitable aquifer in this area was therefore considered to be low. Consequently, desktop work evaluating more distant, structurally favourable targets was initiated.

3.3 Target Selection Criteria

A broad assessment of water resources in the Roper River area was completed by the NT Government in 2009 (Gulf Water Study – Roper River Region, U Zaar, report 16/2009D). Many bores have been drilled in the region over past decades for pastoral and town supply purposes, and much other anecdotal information exists within both European and indigenous histories.

Three main possible aquifer hosts exist in the area:

1. Superficial alluvials and regolith-hosted aquifers
2. Fractured and weathered carbonate rocks
3. Fractured and weathered clastic rocks

Alluvial and regolith-hosted aquifers are small and poorly developed as the region exhibits a generally “stripped” weathering profile with shallow basement rocks and very limited development of surficial deposits, even along major drainage systems such as the Roper River. Much alluvial material forms black soil profiles with limited aquifer potential. Rare sandy alluvial-hosted aquifers can often give high initial yields due to excellent porosity and permeability, but these yields are usually not sustainable due to the highly localised nature of these aquifers.

Of the three types, carbonate rocks are the most prospective and host large, proven productive aquifers such as that supplying the township of Ngukurr. Sustainable individual bore yields range from 0.5 l/sec up to as much as 30 l/sec. However, there are no known carbonate rocks within 25 km of Sherwin’s proposed operation at Deposit C.

Coarse clastic rocks, typically terriginous sandstones within the Upper Proterozoic Roper Group, do occur in the area and some thick, continuous units offer obvious targets. However, recrystallisation and silicification has variably destroyed primary porosity and permeability. The most promising targets in the area therefore require combinations of coarse clastic rock units, and cross-cutting regional structures which impart secondary permeability.

The most friable and therefore most prospective unit for water is historically regarded as being the Bessie Creek Sandstone, which reaches thicknesses of between 30-60 metres.

The most significant regional structural directions are west-north-west, west-south-west, and north. Many of these structures exhibit displacements in excess of 500 metres and appear to have been active over long periods of time. Fracturing of host rocks can extend many hundreds of metres from cross-cutting structures, and in addition there is some evidence of more pervasive fracturing along bedding due to strike-slip movement along some key units such as the Bessie Creek Sandstone member, a result of deformation during folding events. Bore yields up to about 5 l/sec have been obtained from this unit in the area.

Accordingly, the main selection criteria for areas targeted for further investigation as part of this proposal therefore include:

- Gently-dipping sequences of Bessie Creek Sandstone
- Cross-cutting major regional structures
- Suitable geomorphology such as large open valleys with large upstream catchment and recharge areas
- Absence of other users, cultural sites and groundwater dependent ecosystems
- Within 25 km of the proposed operation and reasonably accessible.

Figure 2 shows the provisional geophysical survey targets.

3.4 Work Proposed

A detailed plan to find and develop an adequate groundwater supply for operations has been scheduled and costed. Specific phases of work include the following;

- Desktop work, including interpretation of airmagnetic and radiometric data by Applied Scientific Services & Technology Pty Ltd (ASST), on combined structural and lithological targets by Pendragon Environmental Solutions, Graham Ride and Sherwin staff (completed)
- Initial ground reconnaissance and preliminary identification of best geophysical targets by Graham Ride and Sherwin staff (completed)
- Final ground reconnaissance by Pendragon, ASST and Sherwin with confirmation of geophysical targets, physical and land tenure access
- Ground geophysical surveys (electrical resistivity imaging or ERI) by ASST over identified target zones to pinpoint the best location for test holes. Geophysical equipment has been dispatched to Darwin to commence with ground surveys shortly.
- A nominal 3 week, 10-12 hole water drilling program by Darwin-based Allwell Drilling Services (licensed water driller Allan Davey) resulting in development of 4-6 production bores, supervised primarily by Sherwin, under direction from Pendragon, with subsequent aquifer test analyses, modeling and technical sign-off by Pendragon
- Surveying for, and development of plans by EcOz for monitoring of any groundwater-dependent ecosystems which could potentially be affected by drawing on the specific aquifer identified;
- Finalising design work on the borefield equipment, pipeline and site turkey's nest dams;
- Obtaining any necessary permitting for operation of the borefield.

This work is focussing on possible larger but also more distant aquifers compared with the similar-sized program close to the proposed operations site last year, which was fairly unsuccessful. The intention is to have certified pump tests and aquifer modelling results showing a long-term sustainable yield of >12 l/sec is available, by late May or early June.

Contractors are being directly managed by Sherwin site personnel. Work will comply with Sherwin's commitments in the current Exploration and Bulk Sampling MMPs on OH&S, environmental and sustainability matters.

3.5 Budget

Firm quotes based on detailed scopes of work have been received from four suitable contractors to execute the proposed program, as follows;

- Pendragon Environmental Solutions - $107,800
- Ride Consulting - $10,235
- ASST Pty Ltd - $37,267
- Allwell Drilling Services - $297,500

All quotes are exclusive of GST. The total of $452,802 is for immediate work only, does not include a recommended 15% contingency ($68,000) for additional drilling which may be required beyond the total of 1,000 metres budgeted (which includes an allowance for 5-7 unsuccessful bores), any Sherwin costs including supervision, accommodation, fuel, and other chargeable drilling consumables, or the cost of ongoing work subsequent to successful pump testing and aquifer modelling.

3.6 Timing

Desktop work was completed in February and March 2014. Initial field reconnaissance was completed by G Ride and Sherwin personnel in the week 7-11th April. Pastoral leaseholders were notified of the proposed work between the 8th and 10th of April. Five preliminary targets for geophysics were identified by the 15th April (see attached map), with final confirmation by Pendragon planned after Easter and geophysical traverses by ASST to start on the 24th April. Exploratory drilling by Allwell is planned to commence in the first week of May, with drilling, development, pump testing and subsequent aquifer modelling expected to take 3-4 weeks.

Finalisation of the MMP will not occur until a suitable aquifer has been identified and modelling results showing long-term sustainable yields exceeding 12 L/sec have been demonstrated. At that point, the following subsequent activities will also be initiated:

- Surveying for, and development of plans for monitoring of any groundwater-dependent ecosystems which could potentially be affected by drawing on the specific aquifer identified;
- Finalising design work on the borefield equipment, pipeline and site turkey's nest dams;
- Obtaining permitting for operation of the borefield, should any permitting be required. As water is required for a mining operation, the Mines Act is the relevant legislation to be complied with.

Note that if the identified aquifer is to the north or north-west of the proposed operation site, additional turkey's nest dams and standpipes could be installed at strategic points along the pipeline to provide more convenient supply points for roadway dust suppression.

Results of ongoing engineering work aimed at reducing site water requirements, including refinements to overall site layout and design, will also be included in the MMP to allow finalisation of the site water balance. Details of water supply infrastructure design will depend on that work, as well as clearly, the actual location and geometry of the aquifer identified.

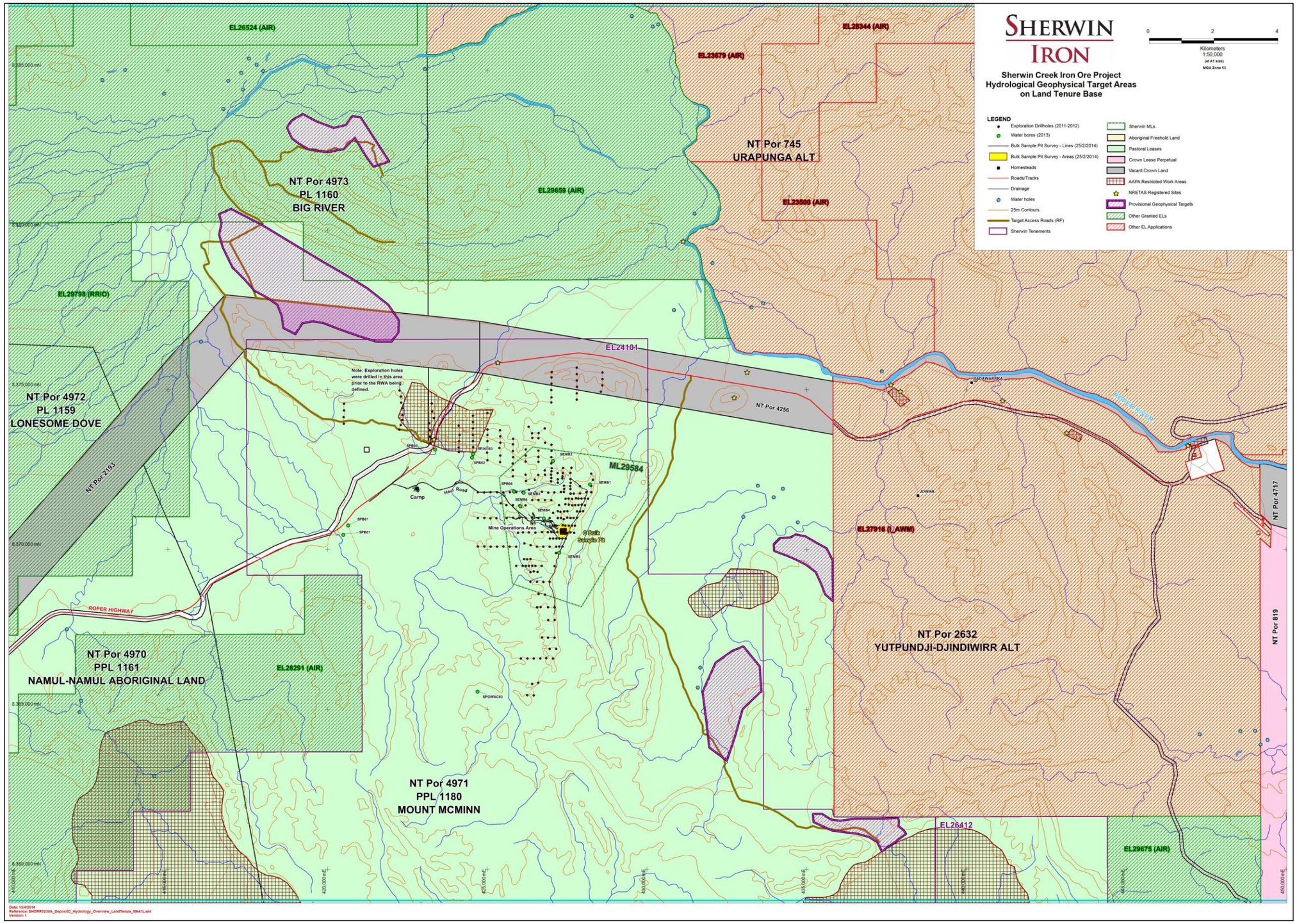


Figure 2. Map of provisional geophysical survey targets