ROADMILES

Consulting Civil & Traffic Engineers

MEDCALF LONG HAUL ROAD

Medcalf Project Site to Esperance Rail

SCOPING INFORMATION FOR THE DESIGN AND CONSTRUCTION OF A PRIVATE LONG DISTANCE HEAVY HAULAGE ROAD

AUDALIA RESOURCES

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1. INTRODUCTION

This report provides the findings of a pre-feasibility concept design assessment for the route for a private heavy haulage road between the Medcalf Project area and a future rail transport loading facility south of Norseman.

The study was commissioned by Audalia Resources.

The Medcalf resource site is approximately 95km west of the Norseman town site. The potential plant / processing area is being considered on the western side of the Esperance rail line about 35km south of Norseman.

2. DESIGN AND CONSTRUCTION POTENTIAL

The construction of a suitable long haul road has been shown to be possible in this concept design.

The essential design elements of low gradients and large radii curves are achievable without very deep excavations or fill embankments.

3. TOPOGRAPHY

The terrain along the route would be considered as rolling hills with some flat areas.

The terrain model has been constructed based upon a 30m spot height grid. Therefore micro detail of sharp, localised height changes are not identified at this time. Such changes do influence final design and construction costs.

Specifics of water channels, creeks, lake edges are not identified.

The alignment does cross several water courses. Details will be established during a feasibility detailed road design at a later time.

4. SURVEY

The survey data available at this time is digital information from a year 2000 Space Shuttle radar topographic mission.

The option exists for the feasibility study road design to be based upon this data if the potential road constructor acknowledges the potential for localised latent conditions arising from the limitations on this survey. It is expected the construction contractor would allow about an additional 5% variation in total volumes of material moved to compensate for the cost of any latent changes encountered.

The alternate option is for a LIDAR and photographic flight survey be done along the route to improve the survey base and reduce the potential for latent conditions relating to the natural surface.

5. ROAD CORRIDOR

The final road corridor could be 200m wide.

This allows for the potential to have drainage discharge areas away from the edge of road.

There is the possibility that local widenings will be required where suitable construction materials are located.

6. SERVICES

At this time no overhead or underground services have been identified.

7. GEOTECHNICAL

There has been no geotechnical survey of the soil types, strengths or suitability for road construction along the route.

8. ENVIRONMENTAL

An environmental survey will be considered separately from this road alignment pre-feasibility study.

9. DESIGN LOADING

9.1. Annual product tonnage

The mine project may generate a single ore type or multiple ore types. It is expected that up to 2MTPA of product will be carted annually.

9.2. Operational life

The initial design life is to be between 10 to 20 years.

9.3. Design Vehicle

The intent is to use as a design vehicle a triple trailer vehicle at 2.5m wide capable of loads between 200 to 221 tonnes similar to the configuration shown in Figure 1.

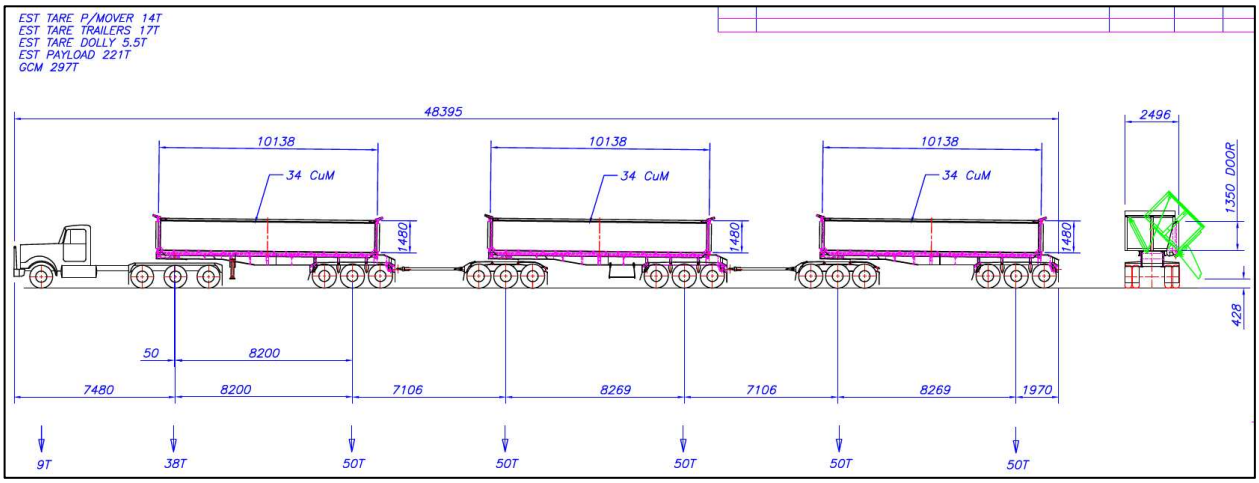

Figure 1 - A Typical Medium Load Mass Vehicle Configuration

The unloaded mass of this combination is 76 tonnes and the gross loaded mass potential is 297 tonnes allowing a load capacity up to 221 tonnes.

10. DESIGN STANDARDS

The design standards for the unsealed long haul road are as shown in Table 1.

Pavement Widths	11m at top edge
Trafficable area	2 by 4.5m “lanes” (unsealed)
Shoulder widths	2 by 1.0m
Crossfall	5% (unsealed)
Superelevation	5% if used – not essential
Grades	Eastbound – 2.2% maximum, 0.2% minimum Westbound – 4.9% max., 0.2% min.
Batters	1 in 6 for fill, side of pavement. 1 in 4 for general cut, back of table drains.
Design Speed	Design for 100km/h for sight distances and curve transitions.

	Operational speed expected to be posted at 80km/h.
Pavement Depth	Basecourse of 400mm compacted imported gravel. Subbase of 300mm compacted natural soils.
Design Vehicle	300 tonne gross mass triple trailer roadtrain.
Drainage - culverts	Minimum flow for 10 year Australian Rainfall Intensity event.
Floodways	Minimum flow for 20 year Australian Rainfall Intensity event, plus where possible low flow pipes for 1 in 5 year Australian Rainfall Intensity event.
Table drains	Minimum grades 1 in 500 (0.2%).

11. CONSTRUCTION MATERIALS

Material supply along the route has to be subject to a detailed field investigation. The route has been aligned through areas where it is expected there may be surface deposits of gravel material close to the road.

There will be sections where road pavement material will have to be transported about 10km.

A mass-haul computation will be provided for indicative costing purposes only at this time.

From the topography it is expected that road construction bores will be able to be established about every 10km along the route.

12. ADDITIONAL DESIGN FEATURES

There are several specific design areas that have been identified from the initial study of the alignment that may be near exposed sheet rock. The alignment needs to be examined on site to identify if modifications are required. Rock removal or disturbance of potential heritage sites is to be avoided..

13. WEATHER

Meteorological records are not available for precisely this area.

Rainfall records for Norseman airport and Salmon Gums Research Station are available and the Evaporation records for Salmon Gums are available.

In the wettest year in the past 15 years rain occurred on 49 occasions varying from 1 to 5 days. The highest single event delivered 72mm of rainfall mostly in one day.

The weather affects both the road construction and the haulage operation.

The road design must allow for the longest period of operation each year without major drainage structures being constructed.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1999												4.6	
2000	93.6	57.0	149.8	47.4	1.2	6.6	14.0	19.2	10.0	11.2	16.8	10.0	436.8
2001	80.0	136.8	0.0	0.2	12.8	11.6	41.8	18.0	10.2	23.2	45.2	30.2	410.0
2002	15.4	15.2	10.0	40.8	2.4	13.8	11.0	21.8	2.6	6.8	17.2	79.8	236.8
2003	6.6	44.0	10.2	71.0	45.0	13.2	33.0	45.4	52.4	15.4	51.0	3.6	390.8
2004	27.2	40.8	40.8	26.0	8.8	15.6	28.2	25.2	18.4	7.2	6.2	2.6	247.0
2005	0.0	2.2	7.2	29.4	43.2	36.0	6.2	48.0	42.8	20.8	11.0	0.8	247.6
2006	42.0	17.4	37.6	51.0	23.0	6.4	6.2	7.4	18.8	14.6	9.6	31.2	265.2
2007	71.4	5.6	0.6	43.0	13.4	16.2	11.8	15.8	8.6	12.6	0.6	41.8	241.4
2008	8.0	25.6	5.0	10.6	6.4	1.4	23.6	16.2	71.8	67.2	32.8	55.6	324.2
2009	76.2	7.6	11.4	2.4	5.6	31.4	39.8	12.0	27.4	4.6	25.6	6.8	250.8
2010	4.4	28.2	11.0	18.0	32.0	9.0	13.6	19.2	12.2	8.6	4.4	22.8	183.4
2011	47.8	12.8	19.0	15.8	42.6	12.0	15.2	12.8	9.0	37.2	14.8	41.2	280.2
2012	27.2	8.4	65.8	0.0	5.4	26.6	15.8	10.6	9.0	1.0	92.2	13.6	275.6
2013	38.6	3.8	112.0	6.6	47.6	18.4	55.2	26.8	21.2	33.2	81.8	9.0	454.2
2014	72.8	13.2	8.6	25.6	14.0	9.0	27.4	17.2	42.2	76.0	71.8	12.6	390.4
2015	0.0	6.4	25.2	29.4	2.4	20.6							

Figure 2 - Rainfall Statistics for Norseman (source BOM)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highest Daily	53.0 21st 2001	50.0 24th 2001	76.0 11th 2000	39.0 1st 2003	30.4 18th 2011	7.8 23rd 2004	21.0 31st 2001	17.2 9th 2013	55.0 27th 2008	43.8 19th 2014	42.0 27th 2013	71.0 28th 2002

Figure 3 - Rainfall Summary for Norseman

The evaporation rate is important for the effect on drying the road pavement after rain events and also during construction with loss of moisture during compaction. The quantity of water required for construction has to allow for evaporation loss.

Mean daily evaporation (mm) for years 1932 to 2015	
January	7.9
February	6.7
March	5.1
April	3.3
May	1.8
June	1.4
July	1.5
August	2.0
September	3.1
October	4.5
November	6.1
December	7.2

Figure 4 - Evaporation Statistics for Salmon Gums (source BOM)

14. CONSTRUCTION TRAFFIC MANGEMENT

The construction site is to be operated as a closed site.

No through traffic is to be allowed until all road and drainage construction is complete.

Traffic management and signage are to be installed and maintained to retain the closed road condition.

The Medcalf site can be accessed using the Lake King-Norseman Road a few kilometres to the south.