Feasibility Study - Site South of Blue Circle:

Waurn Ponds Stabling & Maintenance Facility Report dated 15/07/16

Prepared by

Deleted - Confidential

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Future Land Use Assessment- Site South of Blue Circle Waurn Ponds

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Contents

1 Background

The Waurn Ponds area was selected some time ago as the most appropriate location in the Geelong Region for a future Train Stabling and Maintenance Facility. This decision was based on the principle that such a Facility should be beyond the outer reach of regular commuter services to and from Melbourne in order for trains to be efficiently "fleeted" into their starting position for morning trips to Melbourne and with the reverse process applying during late afternoons and evenings. Waurn Ponds station is expected to be the outer terminus for Geelong line commuter services for the foreseeable future.

The specific site requirements at Waurn Ponds were to provide sufficient site length for trains of maximum potential length (up to approximately 250 metres) to arrive in reasonably quick succession (e.g. at 5 -10 minute intervals) and be processed in a series progression through the necessary servicing facilities without the risk of queueing back onto the main running line.

Following servicing, in the ultimate layout, trains will need to be directed into as many as 20 (minimum) parallel stabling sidings. The longitudinal separation and required clearance between parallel tracks being the principal driver of desired site length and width. In addition, space is required for a separate maintenance workshop building with up to five internal tracks that would accommodate the maximum length of future rolling stock, together with indoor and outdoor storage for parts inventories. Areas for staff amenities including staff car parking, train crew administration, training rooms and dining area will also be required. A site located parallel to the Warrnambool main line was an important consideration because direct train access to the Facility is highly desirable. Initially, single line access will be adequate; however, full line duplication from Geelong to the Facility will be necessary to meet future timetable requirements.

A number of potential sites were studied for location of the Train Stabling and Maintenance Facility and after due consideration, Site G (refer Figure 1) was considered to be the preferred Site because it met most of the requirements detailed in the Concept of Operations Report, June 2015.

The Public Transport Victoria (PTV) recently engaged Opus Rail (OR) to undertake a Feasibility Study at Waurn Ponds on land identified as South of Blue Circle (refer Figure 1 highlighted in yellow) to establish whether or not the Site could be suitable for construction of the Waurn Ponds Train Stabling and Maintenance Facility. The Study is to be based upon the Waurn Ponds Concept of Operations Report and the requirements adopted for the concept design developed for Site G.

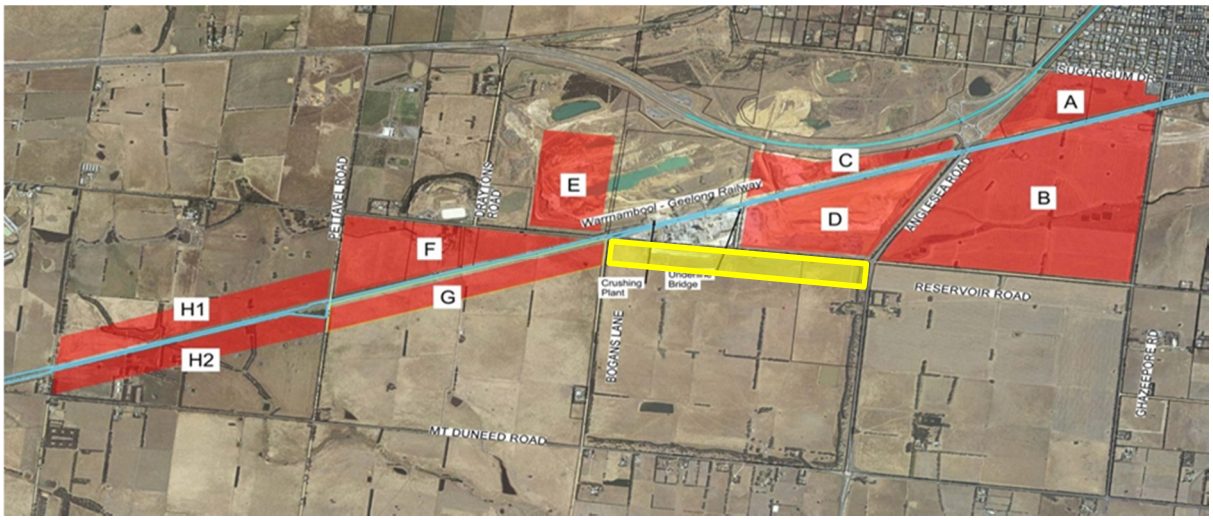


Figure 1: Waurn Ponds area sites assessed for suitability for a proposed Train Stabling and Maintenance Facility

Details of each of the above sites, their characteristics and assessment outcomes are set out in the Concept of Operations Report (COO) located in Appendix 1 of the Opus Rail Report dated 3 September 2015.

2 Scope of Work

Specifically for the study of the site South of Blue Circle, Opus Rail will:

- Develop the drawing provided by PTV (Option 1), which is the existing layout out concept design (Site G) to the new site South of Blue Circle to determine initial feasibility;

- Develop concept drawings for Option 1 to include track and facilities layout for the Ultimate Scheme;

- Provide sketch drawings of three other options specific to accessing the site South of Blue Circle;

    - Option 2A – Western end of Site: This option provides a loop line (single line) allowing direct access/egress to the Facility with grade separation of Reservoir Road (road over rail) and part closure of Bogan's lane.

    - Option 2B – Western end of Site: This option provides a loop line (single line) allowing direct access/egress to the Facility, avoids grade separation of Reservoir Road, but uses part of the farmers land (Site G) and creates a grade separation along Bogans Lane (or part closure of).

    - Option 3 - Eastern end of Site: This option provides access/egress to the Facility via a new alignment constructed (single line) beneath the recently constructed Anglesea Road Overpass with grade separation of Reservoir Road (road over rail) and the Anglesea Road intersection.

- Identify strengths and weaknesses of the four layouts compared with the preferred site (Site G):
- Provide a high level comment on the geotechnical issues of the site:
- Provide indicative cost estimates for the four Options, based on criteria used for the previous concept design cost estimates; and
- Prepare a brief report for PTV, which is required not later than 18 July 2016.

3 Site Information

The site South of Blue Circle presently under consideration for the proposed Train Stabling and Maintenance Facility is rectangular in shape approximately 1,600 metres long and identified on the aerial photograph (refer Figure 1 coloured yellow). It is located approximately 4km west of Waurn Ponds station, between Anglesea Road (east) and Bogans Lane (west), south of the Warrnambool main line, Reservoir Road and the recently abandoned Blue Circle Cement Works sidings.

Key aspects of the site include:

- The Site is some 150 metres distant from the main line;
- Access involves grade separation;
- The site slopes towards Anglesea Road;
- The VicTrack Telecom cable is located along the northern side of the site (south of the main line) and would need to be crossed for access to the site; and
- The VicTrack fibre optic cable is located along the northern side of the site and access to the site would be required.

The site dimensions are:

- Southern boundary 1632m;
- Eastern boundary 203m;
- Northern boundary 1620m; and
- Western boundary 68m.

This provides a total area of 28.742 hectares.

The site dimensions when buffered by an assumed 10 metre wide low earth bund and plantings on its perimeter are;

- Southern boundary 1571m;
- Eastern boundary 173m;
- Northern boundary 1536m; and
- Western boundary 41m.

This provides a total usable area inside the bunding of 22.972 hectares.

4 Feasibility of Site South of Blue Circle

4.1 Key Principles of Feasibility

When considering the feasibility of the site South of Blue Circle, it is most important to not just look at the site itself, but also how the Train Stabling and Maintenance Facility will complement the Geelong Region commuter train system both now and in the longer term – 50 years or more, as new technology trains come on-line and traction power options are considered. The Facility decided on now will be a key factor in providing an efficient and reliable service between Melbourne and Waurn Ponds station for the foreseeable future.

It is worth noting that the present single line sections in the 12km distance between Geelong and Waurn Ponds station already act as a constraint to service delivery, both in terms of corridor capacity and provision of a consistently reliable service. The current signalling and safeworking arrangements between Geelong and Waurn Ponds station are also fairly basic and do not allow for follow-on train movements except under very restrictive conditions. The provision of a first stage Train Stabling and Maintenance Facility at Waurn Ponds will extend the existing 12km single line to about 16km and will considerably add to the need for capacity enhancement. There must be provision to "fleet" trains from and to the facility in order to commence early morning services and to progressively wind services down during late afternoons and evenings. Ultimately, the line between Geelong and Waurn Ponds (and to the proposed maintenance facility) will require full duplication.

For the reasons outlined above, it is critical that the Waurn Ponds Facility must be located on a site where planning and construction of a Stage 1 development can proceed, but more importantly, that the chosen site allows for future development of track and facilities, including full duplication of the line between Geelong and the Facility.

The Concept of Operations (COO) provided by PTV for development of the track and facilities layout for Site G has a strong focus on developing a facility with a high level of functionality and efficiency, which includes track and infrastructure layout that facilitates best work practises. The concept design for the site South of Blue Circle follows the same principles.

4.2 Option 1 Feasibility

4.2.1 Engineering Impediments

Drawing 4890-C-0302 P1 clearly confirms the site itself would satisfactorily accommodate the proposed Facility layout and general engineering requirements; however, significant engineering impediments have been identified relative to development of the site, particularly associated with train access. These include:

- Train access and egress is only achieved via a reversing headshunt off the main line, west end of the Facility;
- When providing the reversing headshunt, it will be necessary to acquire approximately .2 ha of the farmer's land presently included in Site G;
- Train access/egress will cross Bogans Lane, either at grade or Bogans Lane could be closed at the northern end;
- The telecommunications cable is located on the south side of the Warrnambool main line and would be crossed by the reversing headshunt;

- The VicTrack Fibre Optic Cable is located on the north side of the Warrnambool main line and access to the cable would likely be required;
- A water main runs north/south on Bogans Lane and would be crossed by the reversing headshunt and would likely need to be "sleeved" for protection;
- There is no secondary (emergency) access / egress to or from the main line; and
- Road access for light and heavy vehicles is provided off Anglesea Road, which may require alterations for turning vehicles.

4.2.2 Train Operations Functional Impediments

The Concept Design Layout previously developed and approved for Site G could be accommodated within the site South of Blue Circle; however, significant train operations impediments exist which would significantly impact the functionality of both the Facility and the Waurn Ponds - Geelong – Melbourne regional train services. These include:

- Trains will access/egress the Facility via a reversing headshunt. This means that every train arriving or departing the Facility will be driven to the headshunt where the driver will apply the handbrake, close down the driving cab and commence to change ends. VLocity type trains used on the Geelong – Melbourne service mainly operate as 2x3 car units and there is no through access between the central ends of the three car units. The train driver will likely walk through the first three car unit, then climb to the ground to enable him to access the second three car unit. He will then walk through the cars to the driving cab (soon to be the leading cab), remove the handbrake, enable the train and proceed either via the main line turnout to Waurn Ponds station, or directly to the Facility. This manoeuvre is time consuming and does not facilitate efficient "fleeting" of trains. It is not recommended for a short headway, regional passenger service which is expected to increase train services over time.

- The location and layout of the site South of Blue Circle is such that only one access can be provided (via a reversing headshunt) which leaves the Facility and the Geelong train service vulnerable to cancellation and/or serious delays in the event of an infrastructure failure or incident that prevents use of the usual access point. Such a situation should be avoided in the development of a large train stabling and maintenance facility.
- Access to the Facility via a reversing headshunt reduces options for future duplication of the line between Waurn Ponds station and the Facility.

4.3 Option 2A Feasibility

This option provides direct access between the main line and the Facility via a loop line (single line) with grade separation of Reservoir Road (road over rail) and part closure of Bogan's lane.

4.3.1 Engineering Impediments

Drawing 4890-C-402 P1 clearly shows The Concept Design Layout previously developed and approved for Site G can be accommodated within the site South of Blue Circle; however, significant engineering and train operations impediments exist which will significantly impact the functionality of both the Facility and the Waurn Ponds – Geelong – Melbourne regional train services. These include:

- Direct access and egress is provided from the main line to the Facility via a loop track;
- The radius of the proposed access loop track is 150m which is the minimum acceptable radius for railway design;

- Grade separation of Reservoir Road is required (road over rail);
- Bogans Lane is closed at the north end;
- The loop access track with a 150m radius curve may result in above normal wheel and rail wear and generate wheel noise;
- The loop access track will limit train speed to 15km/h;
- The telecommunications cable is located on the southern side of the Warrnambool main line and is crossed by the loop track;
- The VicTrack Fibre Optic Cable is located on the northern side of the Warrnambool main line and access to the cable will likely be required;
- Road access for light and heavy vehicles is provided off Anglesea Road, which may require alterations for turning vehicles.
- A water main runs east / west along Reservoir Road and is crossed by the loop track. It would likely need to be "sleeved" for protection;
- The loop access is the only train access/egress point for the Facility;

4.3.2 Train Operations Functional Impediments

- Construction of a Train Stabling and Maintenance Facility with only one train access / egress point is not prudent planning, particularly when the Facility will have an ultimate capacity to stable 24 or more trains. The majority of trains utilised on the Melbourne – Waurn Ponds Regional Commuter Train System will be serviced, stabled and maintained at this Facility. Total reliance on a single access / egress point will leave the Melbourne - Geelong train service vulnerable to cancellation and/or serious delays in the event of an infrastructure failure, incident or derailment within the Facility that prevents use of the only access point;
- Access to the Facility via a loop track reduces options for future duplication of the line between Waurn Ponds station and the Facility.

4.4 Option 2B Feasibility

This option is similar to Option 2A; it provides a loop line (single line) allowing direct access between the main line and the facility, avoids grade separation of Reservoir Road, but uses 4.5 ha of the farmers land (Site G) and creates a grade separation along Bogans Lane (or part closure).

4.4.1 Engineering Impediments

Drawing 4890-C-502 P1 clearly shows The Concept Design Layout previously developed and approved for Site G could be accommodated within the site South of Blue Circle; however, significant engineering and train operations impediments exist which will significantly impact the functionality of both the Facility and the Waurn Ponds – Geelong – Melbourne regional train services. These are detailed below.

- Direct access is provided between the main line and the Facility via a loop track;
- The radius of the proposed access loop track is 150m which is the minimum acceptable radius for railway design;
- A 150m radius curve may result in above normal wheel and rail wear and wheel noise.
- Bogans Lane is grade separated or closed at the crossing point;
- The telecommunications cable is located on the southern side of the Warrnambool main line and would be crossed by the loop track;

- The VicTrack Fibre Optic Cable is located on the northern side of the Warrnambool main line and access to the cable would likely be required;
- Road access for light and heavy vehicles is provided off Anglesea Road, which may require alterations for turning vehicles.
- The loop access track will limit train speed to 15km/h.
- A water main runs north / south along Bogans Lane and is crossed by the loop track. It would likely need to be "sleeved" for protection;
- The loop access is the single access/egress point for the Facility;
- This Option requires acquisition of approximately 4.5 ha of the farmer's land (Site G).

4.4.2 Train Operations Functional Impediments

The train operational impediments for this option are the same as for Option 2A above, but are repeated here for ease of reference and reading.

- Construction of a Train Stabling and Maintenance Facility with only one train access / egress point is not prudent planning, particularly when the Facility will have an ultimate capacity to stable 24 or more trains. The majority of trains utilised on the Melbourne – Waurn Ponds Regional Commuter Train System will be serviced, stabled and maintained at this Facility. Total reliance on a single access / egress point will leave the Melbourne - Geelong train service vulnerable to cancellation and/or serious delays in the event of an infrastructure failure, incident or derailment within the Facility that prevents use of the only access point;
- Access to the Facility via a loop track reduces options for future duplication of the line between Waurn Ponds station and the Facility.

4.5 Option 3 Feasibility

This option provides access/egress to the facility via a new alignment constructed (single line) beneath the recently constructed Anglesea Road Overpass with grade separation of Reservoir Road (road over rail) and the Anglesea Road intersection.

4.5.1 Engineering Impediments

Drawing 4890-C-602 P1 clearly shows The Concept Design Layout previously developed and approved for Site G can be accommodated within the site South of Blue Circle; however, significant engineering and train operations impediments exist which will significantly impact the functionality of both the Facility and the Waurn Ponds – Geelong – Melbourne regional train services. These include:

- Direct access and egress from the main line to the facility is provided via a new alignment constructed (single line) commencing beneath the recently constructed Anglesea Road overpass continuing along the western side of Anglesea Road within the Blue Circle Cement land; with grade separation of Reservoir Road (road over rail) and the Anglesea Road intersection;
- There is a significant cost involved with the grade separation of Reservoir Road and alterations at the nearby intersection of Anglesea Road and Reservoir Road;
- Road access for light and heavy vehicles is provided off Bogans Lane, which would require minimum alteration;
- The VicTrack Fibre Optic Cable is located on the northern side of the Warrnambool main line and access to the cable would likely be required;

- The option provides only a single access/egress point for the Facility;
- This option requires acquisition of approximately 2.5 ha of land along Anglesea Road, presently owned by Blue Circle; and
- Approximately 1km of new track is required.

4.5.2 Train Operations Functional Impediments

The train operations functional impediments for this option relate only to a single access point and future duplication of the line between Geelong and the Waurn Ponds Facility.

- Construction of a Train Stabling and Maintenance Facility with only one train access / egress point is not prudent planning, particularly when the Facility will have an ultimate capacity to stable 24 or more trains. The majority of trains utilised on the Melbourne – Waurn Ponds Regional Commuter Train System will be serviced, stabled and maintained at this Facility. Total reliance on a single access / egress point will leave the Melbourne - Geelong train service vulnerable to cancellation and/or serious delays in the event of an infrastructure failure, incident or derailment within the Facility that prevents use of the only access point;
- Direct access to the Facility via Anglesea Road would need to consider future duplication of the line between Geelong and the Waurn Ponds Facility.

5 Flora Fauna and Geology

The flora, fauna and geology at the site South of Blue Circle is anticipated to be similar to that of Site G.

5.1 Flora and Fauna Considerations

There are remnant species of native vegetation along the northern boundary of the affected property. Careful planning and conduct of the works would minimise the impact on existing vegetation.

Similar fauna to those identified for Site G can be expected. They should not be directly impacted by works on the site South of Blue Circle.

5.2 Geology and Engineering Properties

The site South of Blue Circle is located on the southern side of Reservoir Road, between Bogans Lane and Anglesea Road, as shown below on the extract from the Geelong geological map.

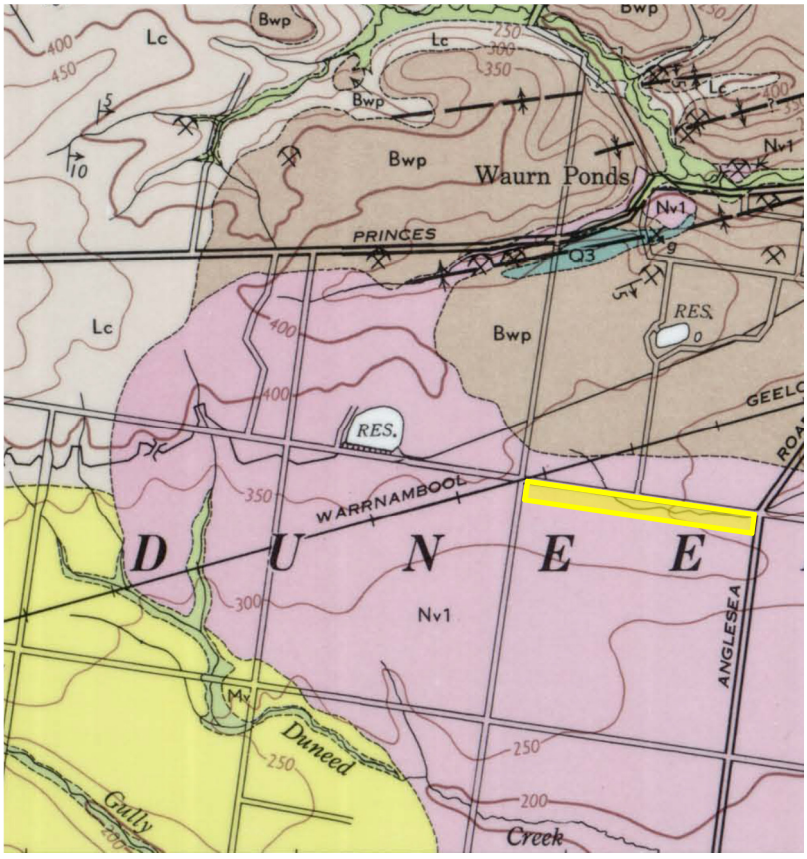
The area is covered by a newer volcanic basalt flow, which is characterised by basaltic clay soil overlying variably weathered basalt and fresh basalt rock. The upper soil layers could also contain some sedimentary deposits from the erosion of the Barrabool Hills. These deposits are likely to be intermixed with upper level basaltic clays and humus after years of farming.

Basalt boulders may be encountered in the soil, although farming of the area is likely to have removed the shallow boulders. The variously weathered basalt rock can range from highly decomposed basalt to slightly decomposed and fresh basalt. The surface of the basalt rock is likely to be irregular.

The basaltic clay that is expected to overlie the rock for a depth of one to two metres is likely to be reactive, i.e. moisture sensitive and prone to swelling and shrinkage as a result of seasonal changes in moisture content. The soil is likely to transition from completely decomposed basalt to moderately decomposed and fresh basalt at varying depths. Foundations for buildings on the site South of Blue Circle will have similar considerations to those at Site G, i.e. deep beam and slab foundations may be suitable to resist the swelling and shrinkage of the clay; alternatively, if the basalt rock surface is shallow, the rock surface can be regulated with blinding concrete for construction of slab foundations on rock. Reinforced concrete piers can be used if the rock profile is deep. The thickness of the basaltic soils and rock may be thinner than at site G, as the site is closer to the edge of the basaltic flow. Geotechnical investigation should confirm the relevant material depths.

Lime-stabilisation of the basaltic clay to a suitable depth on some parts of the site may be considered in order to minimise moisture sensitivity of the clay, or the basaltic clay can be removed. Excavated clay can be used to form mounds along the site boundaries for noise and visual screening. Untreated basaltic clay is not a suitable formation or subgrade material.

The basalt flow that covers the site overlies Tertiary Moorabool Sands and, more likely because of proximity, Waurn Ponds Limestone. The basalt flow is expected to be of the order of ten to 20+ metres thick in that area. The flow is likely to consist of solid rock at depths of one to two metres from the ground surface.



Legend:

Nv1	Nv1	Newer volcanic. *Iddingsite labradorite basalt, Olivine labradorite basalt, Olivine basalt (Ballan type)*
Mv	Mv	Moorabool Viaduct Sands. *Calcareous sand, clayey sand, quartzite, ferruginous sand and gravel (pelecypods, gasteropods, leaf impressions)*
Bwp	Bwp	Waurn Ponds Limestone. *Limestone, marl – richly fossiliferous pelecypods, gasteropods, polyzoa, foraminifera*

Lc	Lc	*Arkose, coarse felspathic, sandstone, shale, mudstone – containing plant fossils*
		Subject location of V/Line Waurn Ponds Maintenance and Stabling Facility, Site South of Blue Circle.

6 High Level Cost Estimates

6.1 General

6.1.1 Earthworks and Drainage

High level cost estimates have been undertaken in isolation of detailed survey and geotechnical information. It is recommended that a feature survey and geotechnical investigation of the site be undertaken to confirm the depths of excavation and the ground conditions.

Assumptions: The earthworks and drainage costs allow for the conditions that are likely to be encountered in the area. It is assumed that the selected area will be naturally well-drained and not swampy. The existing ground condition is suitable for construction of the proposed facility.

Earthworks: The basaltic clay that is expected to overlie the rock for a depth of one to two metres is likely to be reactive and either require removal or treatment. It might be economical to lime-stabilise the basaltic clay to a suitable depth on some parts of the site. Excavated clay can be used to form mounds along the site boundaries for noise and visual screening. Untreated basaltic clay is not a suitable formation or subgrade material. It is estimated that some fill material will be required to be brought in to balance the earthworks on site.

Drainage: The basis for the estimate is to provide:

- Open catch drains at top of batters;
- Open table drains at the toe of batters;
- Track subsurface drainage every second track;
- Kerb and channel on access roads and car parks if the fall requires. At this stage we have assumed kerb and channel on the edge of road and car park pavements; and
- An underground, piped, storm water drainage system.

All drainage, other than from roofs, will be fed into storm water drainage system. Allowance has been made for underground pipes along both long sides of the depot, a retention basin and sullage separation pit. Runoff from roofs is proposed to be collected in rainwater tanks for use in toilets and nearby gardens.

Excavation for storm water drainage pipes could encounter basalt rock material and the unit rate per metre of pipe has been raised in consideration of such conditions occurring below the nominal cut surface for the general yard.

6.1.2 Trackwork

Trackwork costs have been based on the use of new materials for ballast, sleepers, rail and turnouts. Some cost savings could be made if serviceable materials are available for use, instead of new.

The track estimates should be reasonably accurate and the 30% contingency should be a generous allowance for possible changes in the track layout, track lengths and turnout requirements.

6.1.3 Maintenance Facilities and Amenities

The maintenance facilities and amenities costs have been based on costs of previous similar facilities, including Ballarat East Depot, Geelong Loco Depot and South Dynon Carwash Facility.

6.1.4 Fuel Storage

It is noted that the storage at South Dynon comprises two 550,000 litre tanks; however the tanks are huge and would be difficult to screen or set below ground level with maintenance vehicle access.

The concept layout and estimated cost of the fuel storage facility are based on ten 100,000 litre tanks, each being 6.5 m diameter and 3.5 m high (height to diameter ratio yet to be optimised). Consideration could be given to setting the fuel storage partially below ground level on solid rock for safety and aesthetic reasons.

A suitable configuration needs to be resolved.

6.1.5 Estimated Costs

The high level cost estimates are included in Appendix 1. To be able to compare with those of previously reported sites, the cost estimates have been separated into Stage 1a, Stage 1b and Stage 2 (Ultimate). It should be noted the drawings for this feasibility study only reflect the Ultimate stage. The estimated cost to achieve the Ultimate Stage requires the summing of Stage 1a, Stage 1b and Stage 2. The total estimated cost for development of Stage 1b and Stage 2 is the same for all four options.

Total estimated cost for development of Option 1: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for development of Option 2a: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for development of Option 2b: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for development of Option 3: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for development of Stage 1b **for all options** (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for the Ultimate (Stage 2) extension **for all options** (including PTV standard on-costs) is Deleted - Confidential

The cost estimate does not include land acquisition.

In addition, the 24/7 almost continuous nature of activity at such a depot (and particularly at night) will require appropriate perimeter buffering to attenuate noise and lighting emissions.

APPENDIX 1

Cost Estimates

APPENDIX 2

Civil and Track Drawings

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