Feasibility Study

Sites D, I and J:

Waurn Ponds Stabling & Maintenance Facility

Feasibility Study of Sites D, I and J at Waurn Ponds

Prepared by

Deleted - Confidential

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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 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.

PTV expects services on the Warrnambool line to increase and for commuter type services to operate between Colac and Geelong in the foreseeable future. Provision for access to the main line towards Colac, together with servicing and stabling, for such trains is required in the planning of the Train Stabling and Maintenance Facility at Waurn Ponds.

The specific site requirements at Waurn Ponds include provision of sufficient site length for trains of maximum potential length (up to approximately 250 metres) to arrive in reasonably quick succession from Waurn Ponds Station (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. Servicing includes, but is not limited to, fuelling, toilet extraction, watering, internal cleaning, external train wash and bio-wash.

One track with roof and side platform access is required where scheduled internal heavy cleaning will be undertaken.

A closed in building with access to the Workshop is required to accommodate a wheel-lathe.

The ultimate layout will provide for trains after servicing 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 to accommodate the maximum length of future rolling stock, together with indoor and outdoor storage for parts inventories. Areas for administration, staff amenities (maintenance and train crew) training rooms, stand-by, meal preparation and dining areas will also be required. Adequate staff car parking will be planned with scope for extension.

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, future line duplication from Geelong to Waurn Ponds station is proposed and duplication to the Train Stabling and Maintenance Facility will be a consideration to meet future timetable requirements.

The feasibility of Sites C and E (refer Figure 1) for location of the Train Stabling and Maintenance Facility was initially considered and rejected for a number of reasons that included previous mining activities and the need to rehabilitate the sites, the cost and time associated with the land rehabilitation, as well as topography and serious operational constraints to achieve train access to the sites.

In 2010 a Feasibility Study was undertaken on land now referred to as Site G. After due consideration, Site G (refer Figure 1) was generally accepted as the preferred Site because it enabled direct train access to the facility at both ends; it met most of the requirements detailed in the Concept of Operations Report, June 2015 and had minimal impact on nearby roads and

other properties. The Site has since been adopted as the Base Case for more recent studies on Sites identified as B, F, and X, as well as the present Study of Sites D, I, an J.

In recent times Boral Mining who own land in near proximity to Site G has ceased mining operations at Waurn Ponds. The land owned by Boral, which includes Site D, I, and J, could provide further options for development of the Waurn Ponds Train Stabling and Maintenance Facility, providing the sites are suitable for purpose.

Public Transport Victoria (PTV) engaged Opus Rail to undertake a Feasibility Study at Waurn Ponds on land identified as Sites D, I and J (refer Figure 1) to establish if one of these sites, or a combination of these sites, could be suitable for construction of the Waurn Ponds Train Stabling and Maintenance Facility. The Study is based upon the Waurn Ponds Concept of Operations Report and the requirements adopted for the concept design developed for Site G.

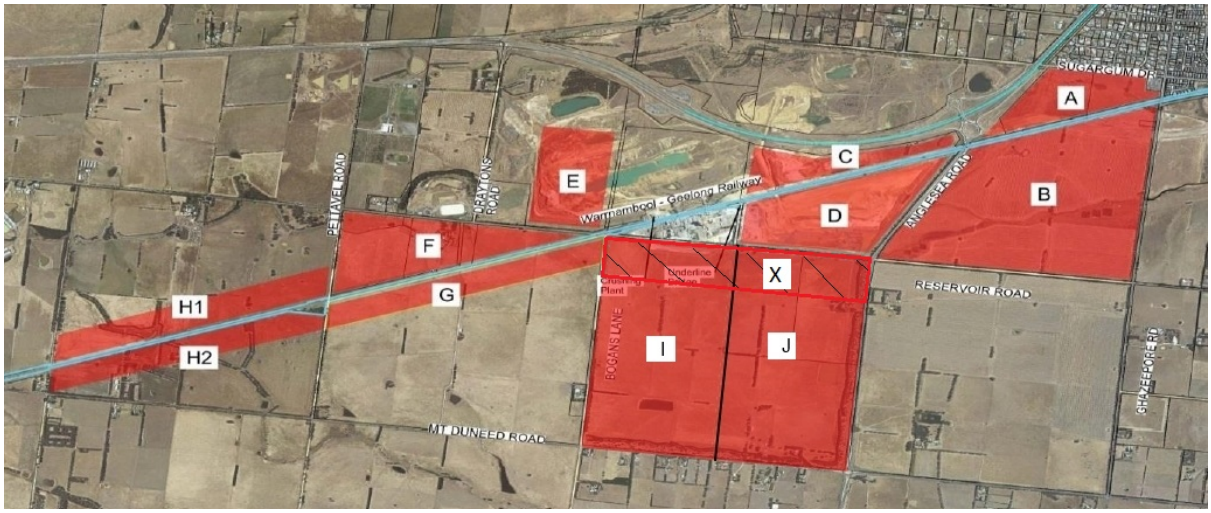

Figure 1: Waurn Ponds area sites assessed for suitability for a proposed Train Stabling and Maintenance Facility

The three new sites included in this Feasibility Study are indicated in Figure 1 above and can best be described as;

- **Site D**: Previous location of Boral mining operations bound by the Warrnambool railway corridor to the north, Reservoir Road to the south, Anglesea Road to the east, and the mining plant to the west.
- **Site I**: A site south of the mining plant currently used for livestock grazing and bound to the north by Reservoir Road, Mt Duneed Road to the south, and Bogans Lane to the west.
- **Site J**: A site south of Site D and east of Site I, currently used for livestock grazing and bound to the north by Reservoir Road, Mt Duneed Road to the south, and Anglesea Road to the east.

2 Scope of Work

Specifically for the study of sites D, I and J, Opus is required to:

- Use the proposed facility requirements determined for Site G as the basis of the design and layout for the three new sites. PTV at this time is unable to advise the actual type, make-up or length of trains that will be accommodated at this facility, therefore Opus is required to allow for the functional and safe management of trains up to 250 metres long, including tracks for servicing and replenishment, maintenance, cleaning and stabling.

- Identify the land required to accommodate the ultimate Train Stabling and Maintenance Facility for 250m long trains with allowance in the train stabling area for servicing (an alternative) and future options, such as electrification. The Train Maintenance Workshop footprint is required to accommodate 250m long trains, as well as provide for all likely administration buildings, and car parking;

- Provide for connections between the main line and the site, in the direction of both Waurn Ponds station and Colac, identifying the most functional alignment, as well as any necessary grade separations;

- Give consideration in the track layout design to degraded operations when normal access/egress routing is unavailable due to point failure, derailment, etc. The objective is to minimise the number of trains locked in the facility and therefore unavailable to meet peak Waurn Ponds – Geelong - Melbourne scheduled services;

- Develop a concept drawing on an aerial photo clearly showing the facility layout that confirms feasibility;

- Develop the concept drawings to include track and facilities layout for the ultimate scheme;

- Develop a construction cost estimate to the same standard as previously undertaken for site assessments;

- Identify strengths and weaknesses of the three sites compared with the preferred site (Site G);

- Provide high level comment on the geotechnical / remediation issues associated with the sites; and

- Prepare a draft report for PTV that is required by Friday 23 December 2016.

3 Site Assessment and Feasibility

When considering the feasibility of the sites D, I and J, Opus considered not just the sites concerned, but also how the Train Stabling and Maintenance Facility will complement the Geelong Region commuter train system both now and for the foreseeable future as new technology trains come on-line and traction power options are considered and likely to change. The land chosen now for this critical Facility will be a key factor in providing an efficient and reliable service between Melbourne and Waurn Ponds station for the futuristic expansion – 30 years and beyond.

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 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 or part duplication.

For the reasons outlined above, it is critical that the Waurn Ponds Facility 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 or part 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 same principles have been adopted for the development of concept designs for Sites I and J.

A site visit was undertaken in the first week of work, which was arranged by PTV and hosted by the Boral Site Manager. This was important and facilitated familiarisation with the sites concerned.

3.1 Site D

Site D is the location of the limestone quarry. The most westerly section of this site up to the under-track crossing is still virgin ground. This area is used for material stockpiling. The area in the south west is a (recently constructed) concreted batching area. The under-track crossing from the southern to northern quarry areas is substantial, at 8.9m height clearance.

The quarry is up to approximately 50m deep towards the north east along Anglesea Rd. This area also has water at its base. The centre of the quarry is an island of overburden, the northern face has been rehabilitated to 1 in 5 batters, the Anglesea Rd face is almost vertical. There is a 5m high bund that follows the Reservoir Rd and Anglesea Rd boundaries.

Site D has been extensively quarried, millions of cubic metres of material has been removed and the site is not suitable for development without substantial rehabilitation and should not be further considered for this project.

However, at the west end of Site D (not part of this study) there is a triangular plot where Boral site offices, plant and equipment, and car parking are located. A small section of this area would be required to provide track alignment access to Sites I and J. It is worth noting at this stage that whilst Boral has ceased mining on their land, they still operate from both Site D and the triangular plot. The likely difficulties associated with gaining access to this area should not be underestimated.

Figure 2: The Quarry

In the course of developing feasibility of both Sites I and J, Opus identified two options for each site and these are provided for comparison and consideration by PTV. Because the plots of land associated with Sites I and J are very similar, the differences are mainly to do with identification and evaluation of train access to each particular site.

3.2 Site I

Site I (refer Figure 1) is currently grazing land, understood to be owned by Boral and leased to a local farmer. It is rectangular in shape approximately 1,600 metres long, located approximately 4km west of Waurn Ponds station and is bound to the north by Reservoir Road, to the south by Mt Duneed Road and to the west by Bogans lane.

Drawings 4890-C-0703 P1 and 4890-C-0704 P1 (refer to Appendix B) clearly confirm that Site I could accommodate the proposed Facility layout and general engineering requirements. However, some issues associated with land availability and the cost of constructing the access alignment will need consideration.

There are two access options for consideration as indicated in the above referenced drawings. Each option requires grade separation of Reservoir Road.

3.2.1 Site I - Option 1 (Ref: 4890-C-0703 P1)

Key aspects of site I – Option 1 include:

- It is approximately 150 metres distant from the main line;
- Any rail access to the site will involve grade separation of Reservoir Road;

- The site slopes towards Mt Duneed Road;
- A communications cable is located along the northern side of the site and would need to be crossed for access to the site; and
- A water main is located along the northern side of the site and would need to be crossed for access to the site.

Site dimensions are:
- Southern boundary 540m;
- Eastern boundary 1620m;
- Northern boundary 535m; and
- Western boundary 1623mm.

This provides a total area of 87.127 hectares.

Site dimensions when buffered by an assumed 10 metre wide low earth bund and plantings on its perimeter are:
- Southern boundary 509m;
- Eastern boundary 1518m;
- Northern boundary 509m; and
- Western boundary 1521m.

This provides a total usable area inside the bunding of 77.367 hectares.

Option 1 provides rail access via an extension of the existing holding siding west of Waurn Ponds station (refer to Appendix B drg 4890-C-0700). This necessitates construction of a new bridge (same for each option) adjacent to the existing private underpass on the main line, which Boral has been using for access between their properties north and south of the main line.

This access is not ideal because it cuts through the triangular plot west of Site D still occupied by Boral for their site offices, plant and equipment, and car parking. This is exacerbated by any future connection to Colac.

Advantages
- Direct access from existing siding;
- No new mainline turnouts;
- Future connection to Colac is achievable into the existing siding loop;
- Existing bunding and trees at southern end of boundary;
- Site can be future proofed with room for additional 16 sidings; and
- Direct road access from Mount Duneed road.

Disadvantages
- **There would be a number of different stakeholders to deal with including, but not limited to Boral, Vic Roads and community;**
- Grade separation required of Reservoir Road will block entrance to the Boral site and finishes close to the Reservoir Road level crossing;
- Rail access requires a large part of the still used Boral plant area, site office and carpark; and
- Position of existing dam requires tracks to run on a slight diagonal across the site.

Summary
This Option is not recommended for reasons outlined above. Further, the likely difficulties associated with a number of different stakeholders should not be underestimated.

3.2.2 Site I - Option 2 (Ref: 4890-C-0704 P1)

Key aspects of site I - Option 2 include:

- It is approximately 300 metres distant from the main line;
- Access involves grade separation of Reservoir Road;
- The site slopes towards Mt Duneed Road;
- A communications cable is located along the northern side of the site and would need to be crossed for access to the site; and
- A water main is located along the northern side of the site and access to the site.

Site dimensions are:

- Southern boundary 405m;
- Eastern boundary 1622m;
- Northern boundary 399m; and
- Western boundary 1624mm.

This provides a total area of 65.200 hectares.

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

- Southern boundary 378m;
- Eastern boundary 1521m;
- Northern boundary 373m; and
- Western boundary 1521m.

This provides a total usable area inside the bunding of 57.108 hectares.

Similar to Option 1, Option 2 provides train access via an extension of the existing holding siding west of Waurn Ponds station (refer to Appendix B drg 4890-C-0700). This necessitates construction of a new bridge (same for each option) adjacent to the existing private underpass on the main line, which Boral has been using to access their properties north and south of the main line.

Option 2 train access (refer to Appendix B drg 4890-C-0704 P1) cuts through the triangular plot west of Site D, which is still occupied by Boral, but does not impact their site offices or, car parking. Plant, buildings and equipment likely to be impacted appear to have been decommissioned but are yet to be demolished. The future Colac access track is similarly confined.

Advantages

- Direct access from loop extension;
- No new mainline turnouts ;
- Future connection to Colac into existing siding loop;
- Existing bunding and trees at southern end of boundary;
- Site can be future proofed with room for additional 16 sidings; and
- Direct road access from Mount Duneed road.

Disadvantages

- Grade separation of Reservoir Road will block the entrance to the existing operational concrete plant (a new road is required);
- Rail access cuts through existing Boral Site, plant and buildings; and
- The future Colac connection will cut through existing Boral Site, plant and buildings.

Summary

Although Option 2 is the preferred access arrangement for Site I, it cannot be recommended for reasons outlined above.

At this time, we are aware that Boral has ceased mining at Waurn Ponds; however the company continues to operate from offices and facilities in the area where access tracks would be required. Gaining access to this area of Boral's operation will be problematic.

3.3 Site J

Drawings 4890-C-0701 P1 and 4890-C-0702 P1 (refer to Appendix B) clearly confirm that Site J could accommodate the proposed Facility layout and general engineering requirements; however, some issues associated with land availability and cost of constructing the access alignment will need consideration.

There are two access options for consideration for Site J as indicated in the above referenced drawings. Each option requires grade separation of Reservoir Road.

3.3.1 Site J - Option 1 (Ref: 4890-C-0701 P1)

Key aspects of Site J – Option 1 include:

- It is approximately 1200 metres distant from the main line;
- Access involves grade separation of Reservoir Road;
- The site slopes towards Mt Duneed Road;
- A high pressure gas pipe is located along the southern side of the mainline and would need to be crossed for access to the site;
- A water main is located along the northern side of the site and would need to be crossed for access to the site;
- A fibre optic cable is located along the southern side of the of the main line with access required to the Facility; and
- A communications cable is located along the southern side of the site and would need to be crossed to gain access to the site.

Site dimensions are:

- Southern boundary 374m;
- Eastern boundary 1622m;
- Northern boundary 406m; and
- Western boundary 1626m.

This provides a total area of 64.966 hectares.

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

- Southern boundary 319m;
- Eastern boundary 1553m;
- Northern boundary 322m; and

- Western boundary 1558m.

This provides a total usable area inside the bunding of 49.846 hectares.

Option 1 provides train access via a new mainline turnout and a new siding track along the western and southern boundaries of Site D (refer to Appendix B drg 4890-C-0700); the emergency access towards Colac would be achieved via a new siding track along the southern and eastern boundaries of site D connecting into the existing siding track.

Advantages

- Future connection to Colac via existing siding loop;
- Existing bunding and trees along eastern boundary of Anglesea Road;
- Site can be future proofed with room for additional 8 sidings; and
- Direct road access from Mount Duneed road.

Disadvantages

- **This option, similar to others will involve a number of different stakeholders including Vic Roads, Boral and community;**
- New mainline turnout / signalling required;
- Approximately 1.2km new track from entrance along eastern boundary of Site D;
- Grade separation required of Reservoir Road is 150m longer than other options;
- Grade separations finishes close to Anglesea Road intersection;
- Future connection to Colac is 700m from entrance to Facility;
- Land acquisition of parcels of land in Site D for access tracks and the Colac connection;
- Existing dam in middle of site; and
- Land undulating may require more earthworks

Summary

This Option is not recommended for reasons outlined above.

3.3.2 Site J - Option 2 (Ref: 4890-C-0702 P1)

Key aspects of site J – option 2 include:

- The Site is some 400 metres distant from the main line;
- Access involves grade separation of Reservoir Road;
- The site slopes towards Mt Duneed Road;
- A high pressure gas pipe is located along the southern side of the main line and would need to be crossed for access to the site;
- A water main is located along the northern side of the site and would need to be crossed for access to the site; and
- A communications cable is located along the northern side of the site and would need to be crossed for access to the site.

The site dimensions are:

- Southern boundary 405m;
- Eastern boundary 1624m;
- Northern boundary 410m; and
- Western boundary 1625m.

This provides a total area of 66.193 hectares.

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

- Southern boundary 380m;
- Eastern boundary 1550m;
- Northern boundary 384m; and
- Western boundary 1524m.

This provides a total usable area inside the bunding of 58.623 hectares.

Site J - Option 2 provides train access via an extension of the existing holding siding west of Waurn Ponds station (refer to Appendix B drg 4890-C-0700); however, (same as for other options) this would necessitate construction of a new bridge adjacent to the existing rail over bridge on the main line which Boral has been using to access their properties north and south of the main line. Grade separation of Reservoir Road is required.

Advantages

- Direct access is achieved from existing siding;
- Less disruption to Boral site (through stockpiles of clinkers);
- No new mainline turnouts ;
- Future connection to Colac is achievable via the existing siding loop;
- Existing bunding and trees at southern end of boundary;
- Site can be future proofed with room for additional 16 sidings;
- Direct road access is from Mount Duneed road; and
- Grade separation of Reservoir Road does not impact Anglesea Road or the Reservoir Road level crossing.

Disadvantages

- **Similar to other options, this option will involve a number of different stakeholders and the likely difficulties should not be underestimated;**
- The site is 400 metres distance from the main line;
- Planning for Degraded operations (emergency access to the main line) is not possible unless and until access to Colac is constructed:
- Grade separation of Reservoir Road will block entrance to existing operational concrete plant (new road in required); and
- New rail-bridge is required for the new siding track.

Summary

The Opus Rail investigation of feasibility of Sites I and J has clearly confirmed that either Site could accommodate the proposed Facility layout and general engineering requirements; however, train access to each site presents difficulties associated with land availability, particularly with respect to that which is still being used by Boral. Cost of constructing the access alignment is also a concern. These difficulties are less for Site J than for Site I.

Of the Sites investigated here, Site J – Option 2 is the preferred site because it provides more acceptable train operations functionality for train access and results in the minimum disruption to existing Boral operations. However, it will be necessary to deal with a number of stakeholders and the likely difficulties should not be under estimated. Also, the cost associated with the required infrastructure is a concern.

3.4 Comparison Site G and Site J

A comparison of Site G and Site J highlights the following differences.

Advantages of Site G

- **The site is well located parallel to the Warrnambool main line;**
- Direct access from and to the mainline at both ends is achievable within the site; No road grade separation is required;
- Stakeholder involvement is significantly reduced; and
- The site can be planned and constructed to provide a high level of capacity and operational functionality for the foreseeable future.

Disadvantages of Site G

- Significant signalling of the mainline is required;
- Road access is off a gravel road (Bogans Lane);
- Availability of the land required;
- Arrangements will be required that allow the landowner (Farmer) to move his livestock between his property north and south of the Facility.

Table 1: Comparison of sites

Assessments	Site			
	D	I	J	G
Advantages:				
• Direct access is achieved from existing siding/mainline;	Y	Y	Y	Y
• Less disruption to Boral site (through stockpiles of clinker);	-	Y	Y	Y
• No new mainline turnouts ;	-	Y	N	N
• Direct access from and to the mainline at both ends is achievable;	Y	Y	Y	Y
• Existing bunding and trees at boundary;	Y	Y	Y	N
• Site can be future proofed with room for additional sidings;	-	Y	Y	Y
• Direct road access is available from adjacent road.	-	Y	Y	Y
Disadvantages:				
• Multiple Stakeholder involvement:	Y	Y	Y	N
• New mainline turnout / signalling required;	N	N	Y	Y
• Approximately 1.2km new track from entrance along eastern boundary of Site D;	Y	N	Y	N
• Grade separation required;	-	Y	Y	N
• Future connection to Colac is a large distance from entrance to Facility;	Y	Y	Y	N
• Land acquisition of parcels of land in Site D or Triangular plot, for access tracks and the Colac connection;	Y	Y	Y	N
• Existing dam/quarry in middle of site; and	Y	Y	Y	N
• Land undulating may require more earthworks.	N	N	Y	N
• New Rail Bridge Required	N	N	Y	N
• Arrangements for movement of livestock required.	N	N	N	Y
Feasibility:	N	Y	Y	Y

3.5 Recommendation

Opus Rail has been involved over time investigating possible sites in the Waurn Ponds area that could be acceptable for constructing a Train Stabling and Maintenance Facility PTV in 2015 provided a Concept of Operations that clearly established the overall requirements of the site with respect to train size, length of stabling sidings and servicing tracks, workshop footprint and operational functionality.

At that time, Site G was carefully considered and bench marked against the Concept of Operations. As a result, Concept Design Drawings were developed and initial consultation occurred with V/Line maintenance personnel. Opus has since used Site G as the base requirements when investigating feasibility of other potential sites.

With due consideration of the different sites investigated over the time, Opus considers Site G to be the preferred site and recommends accordingly.

Alternative I J Option

Considering one of the main advantages of Site G is the fact that no grade separation is required, an additional option that seeks to avoid a grade separation at Sites D, I and J has been prepared (refer to Appendix C drg 4890-SKT_C0100).

This option will require the relocation and realignment of Reservoir Road, but could provide better access/egress to the facility and does not require a grade separation. The realigned Reservoir Road provides a buffer for redevelopment on the southern side, be it residential or commercial.

This option has been included as a point for discussion, and will require further investigation to determine feasibility if PTV wish for it to be pursued.

4 Flora Fauna and Geology

The flora, fauna and geology at Sites D, I and J is anticipated to be similar to that of Site G where the same basalt lava flow overlies an extensive limestone deposit. The basalt flow covers Sites I and J and encroaches into Site D.

4.1 Flora and Fauna Considerations

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

Site D has been consumed by a deep limestone quarry that affects most of the site except for the borders which accommodate earth mounds and a 15m to 30m verge that abuts the quarry. Dense screening plantations have been established on the adjacent road reserves.

Similar fauna to those identified for Site G can be expected. They should not be directly impacted by works on the areas south of Reservoir Road.

4.2 Geology and Engineering Properties

The Sites I and J are 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 (refer to Figure 3).

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 Sites I and J 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.

Basaltic clay should be removed from site, however lime-stabilisation to a suitable depth on some parts of the site may be considered in order to minimise moisture sensitivity of the clay. The 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.

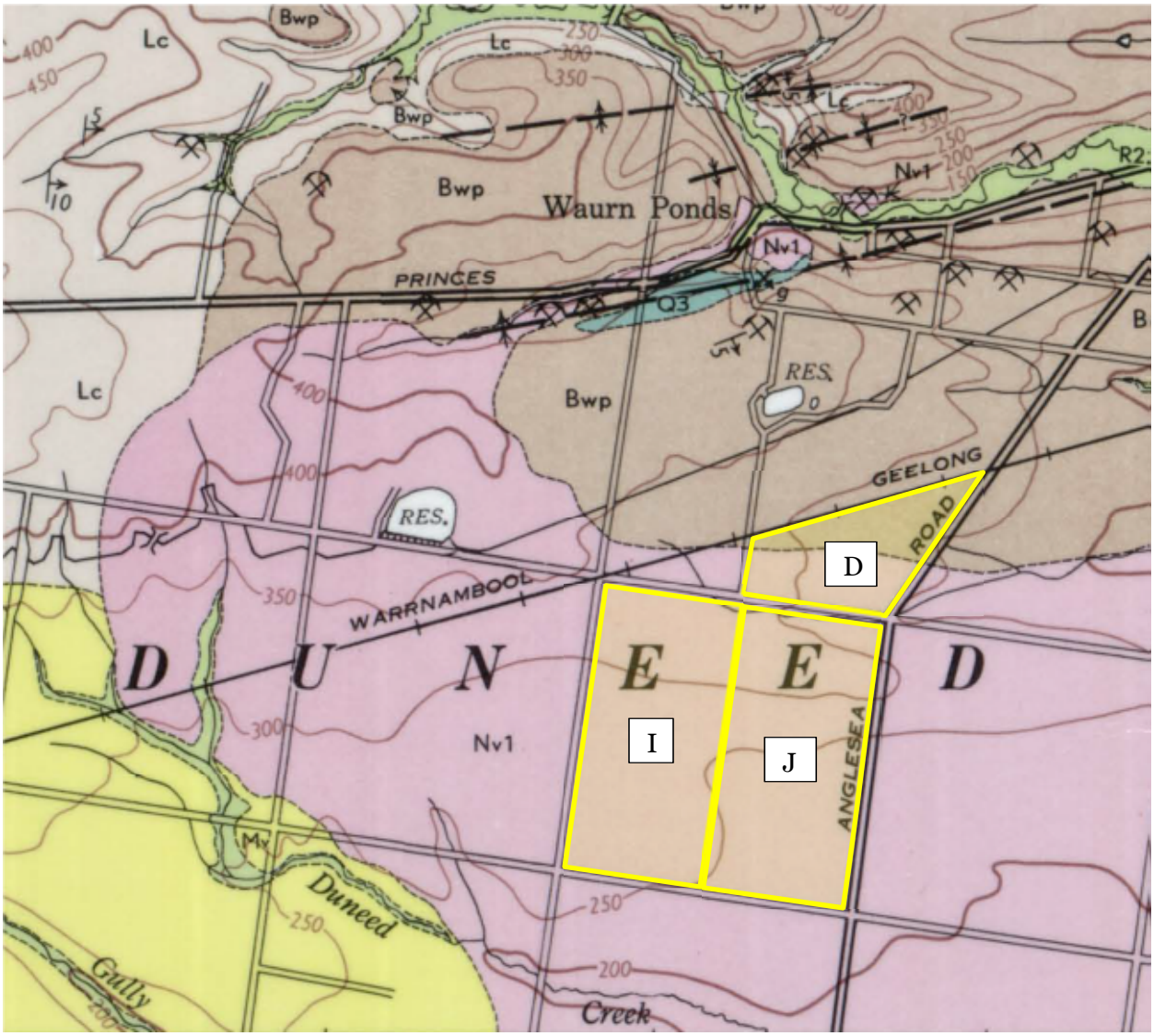

Figure 3: Geological Map

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.

5 High Level Cost Estimates

5.1 General

5.1.1 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 the 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.

5.1.2 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.

5.1.3 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.

5.1.4 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.

5.1.5 Estimated Costs

The high level cost estimates for Sites I, J, and Base Case G 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 Site I – Option1: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

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

Total estimated cost for development of Site J – Option1: Stage 1a (including PTV standard on-costs) is Deleted - Confidential

Total estimated cost for development of Site J – Option2: Stage 1a (including PTV standard on-costs) isDeleted - Confidential

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

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

As a comparison to the Base Case Site G;

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

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

Total estimated cost for the Site G Ultimate extension (including PTV standard on-costs) is Deleted - Confidential Deleted - Confidential

The cost estimates do 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 A: Cost Estimates

APPENDIX B: Civil and Track Drawings

APPENDIX C: Alternative I J Option

(Drg 4890-SKT_C0100)

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