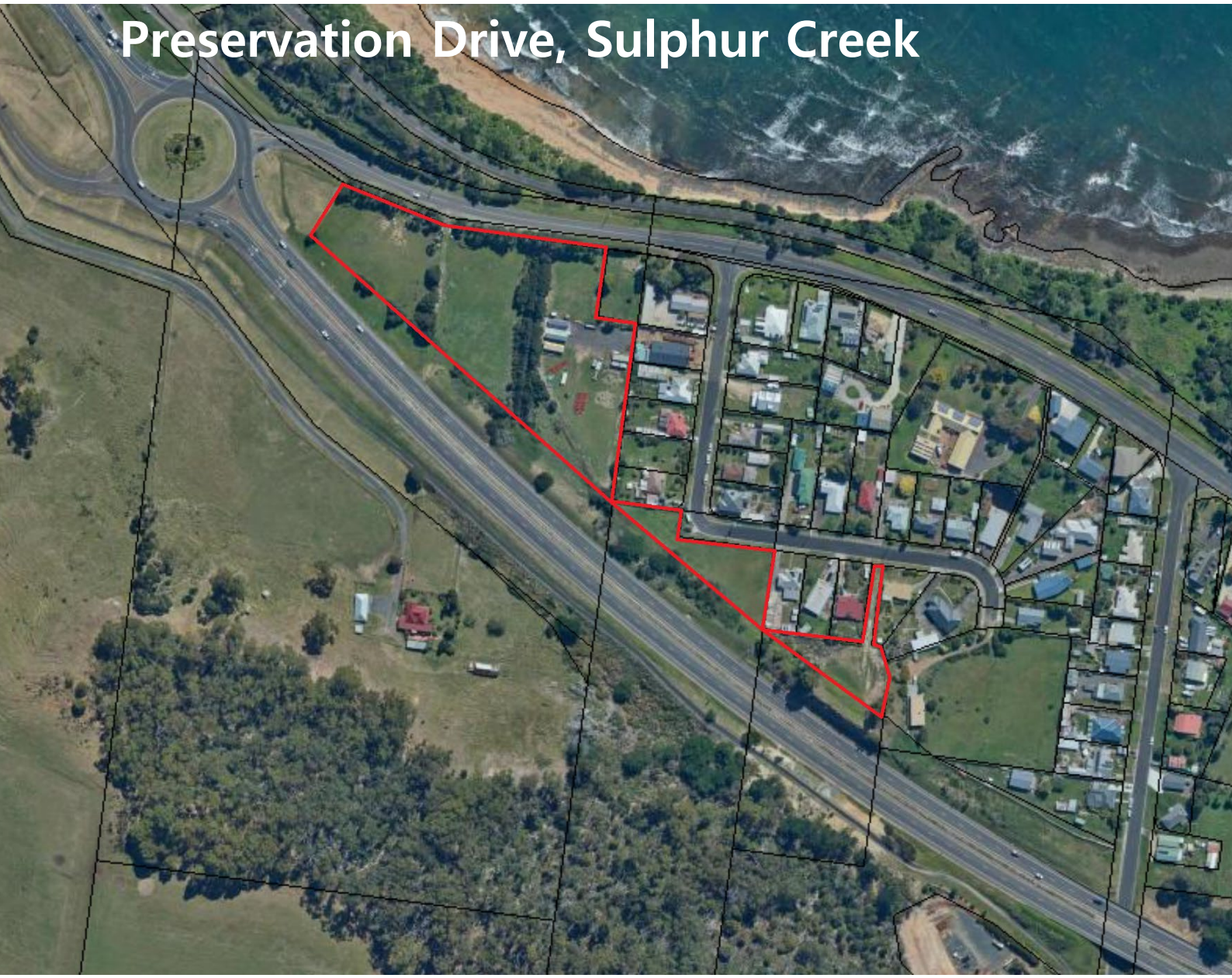
AllUrbanPlanning PTY LTD

Planning Submission

Housing Land Supply Act

Preservation Drive, Sulphur Creek



Date 23 November 2025

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Introduction

The following submission has been prepared by All Urban Planning Pty Ltd for Homes Tasmania in support of a housing land supply order under the *Housing Land Supply Act 2018* (HLSA). The proposed order is to rezone an area of land (the subject land) at Sulphur Creek, adjacent to the Howth roundabout from Utilities zoning to General Residential under the *Tasmanian Planning Scheme – Central Coast Local Provisions Schedule (planning scheme).*

1. PART 1 – DETAILS OF THE LAND

1.1. Site information

The proposal relates to 18,368m² of Crown land forming part of three parcels managed by the Department of State Growth adjacent to the Howth roundabout on the Bass Highway at Sulphur Creek. The subject land is shown in Figures 1 and 2 below and detailed in the following table. For ease of reference, these parcels are referred to as Parcels 1–3 in this report.

Parcel Ref.	***Address***	***Old Title Reference***	***New Title Reference***	***Title Area***	***Suburb***	***Owner***
1	Acquired road (390 Preservation Drive)	Part of CT 123065/3	CT 188961/1	1.464ha	Sulphur Creek	The Crown (DSG)
2	Acquired road (2-6 Glenburn Crescent)	Part of CT 199745/1	CT 188961/2	2116m^2	Sulphur Creek	The Crown (DSG)
3	Acquired road (14 Glenburn Crescent)	Part of CT 87389/34	CT 188961/3	1612m^2	Sulphur Creek	The Crown (DSG)

Please Note: Since the HLSO consent from the Secretary for DSG was obtained, and the HLSO report and accompanying technical reports were compiled, new titles have been issued for these parcels. The Table above shows the old and new title references.

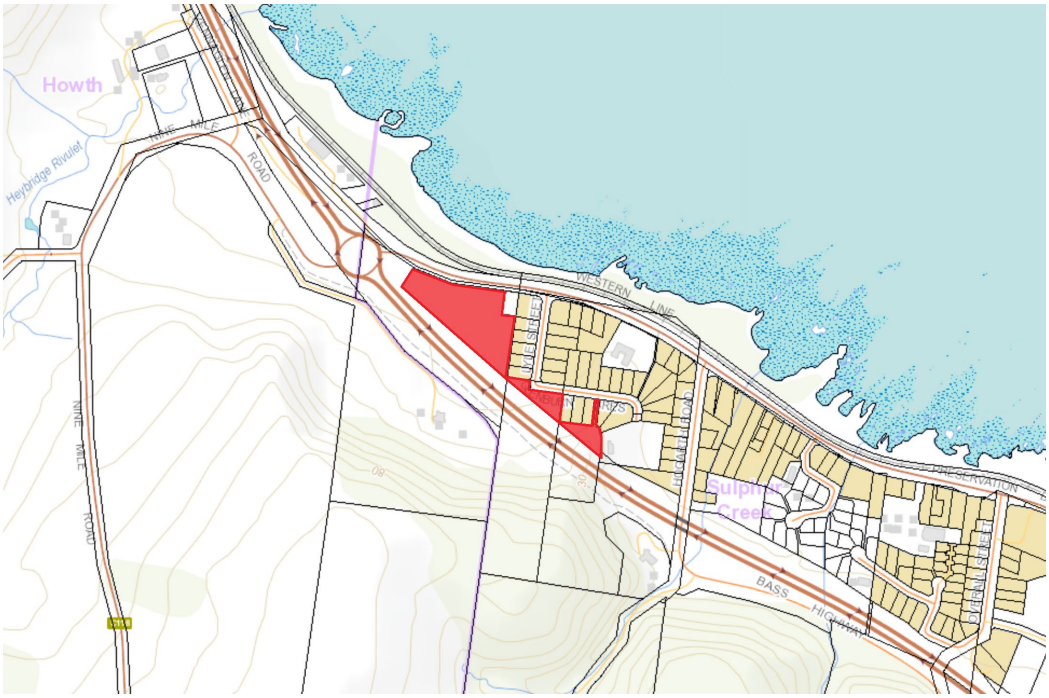

Figure 1 – Location Plan (source: annotated 1:25000 plan from theList)

Figure 2 - The subject land (red outlined area) forms part of CT 123065/3, CT 199745/1 and CT 87389/34 (source: annotated aerial photos and cadastre plan from theList)

The land is located within the municipality of Central Coast and is subject to the *Tasmanian Planning Scheme – Central Coast Local Provisions Schedule (planning scheme).*

The subject land is vacant other than an existing truck storage and maintenance activity (see Figure 12) and lies between the Bass Highway and Preservation Drive.

Parcels 2 and 3 have direct access to Glenburn Crescent with Parcel 3 being accessed via an approximate 6m wide fee simple access strip.

Parcel 1 is closest to the roundabout and has a formed access to Preservation Drive.

The subject land and the surroundings are described in the plans in Figures 1 and 2 and the photos in Figures 3 -21 below.

The Parcels 1 and 2 are relatively flat with an elevation of 5-8m AHD. Parcel 3 is elevated and sits atop a small hill of 30mAHD behind the properties on the southern side of Glenburn Crescent. There is a natural depression on the western-most part of Parcel 1 next to the roundabout.

The land is relatively clear of most vegetation, consisting mostly of modified grassland, with small shrubs and trees along some former fence lines and alongside the highway and on Preservation Drive. A natural values assessment prepared by ECOTas, 15 November 2021 accompanies the proposal and is Appendix D to this report.

Figure 3 – View looking south from the Preservation Drive access to Parcel 1. The distant house (red roof) is on the opposite side of Bass Highway.

Figure 4 – view looking west on Parcel 1 towards the Howth roundabout. The extent of the site to be rezoned is the fenced area towards the camera. The visible cars are on the Bass Highway. The trees on the right of picture are inside the fence line on the Preservation Drive frontage of the site.

Figure 5 – view looking west over Parcel 1 inside the Preservation Drive frontage of the site.

Figure 6 -View looking west towards the Howth roundabout at the western end of Parcel 1.

Figure 7 – View looking east on Parcel 1

Figure 8 –View looking south east along the Bass Highway frontage of the site. The extent of the land to be rezoned is on the left of the fenceline.

Figure 9 –View looking south east on Parcel 1. An earthen berm separating the site from the Bass Highway is visible on the right of picture. The house with the red roof is on the opposite/southern side of Bass Highway.

Figure 10 – view from inside the Preservation Drive frontage of Parcel A looking south showing the existing open drainage channel that runs north south through Parcel A.

Figure 11 – View looking east along the Preservation Drive frontage of the site in front of Parcel 1. The Western Line railway runs along the coast on the opposite side of the road. The waters of Bass Strait are visible beyond.

Figure 12 – View from the Preservation drive frontage towards the eastern end of Parcel 1 looking south. The existing truck wash bay associated with the truck repair garage at 2 Lyle Street is visible in the midground.

Figure 13 – View of the existing truck repair garage, Dazeley Engineering at 2 Lyle Street looking north west. The existing truck wash on Parcel 1 (see Figure 12) is an extension of this business.

Figure 14 – view looking east at the corner of Glenburn Crescent and Lyle Street. Parcel 2 is on the right of picture and reflects the existing fenced area. The Bass Highway is behind the existing vegetated embankment on the right of picture. The house on the left of the picture is 8 Glenburn Crescent.

Figure 15 – view looking west over Parcel 2. The Bass Highway is on the left of picture behind the vegetated embankment. The garage and shed on the right of picture relate to an existing house on a double block at 8-10 Lyle Street.

Figure 16 – View looking north on Lyle Street from the frontage of Parcel 2 towards Bass Strait.

Figure 17 – View looking east along the Glenburn Crescent frontage of the site. Parcel 2 is to the right of the fence. The house on the right of the picture is 8 Glenburn Crescent adjacent to the east of Parcel 2.

Figure 18 – View from the Glenburn Crescent frontage looking south over the access strip to Parcel 3 that runs between 12 and 16 Glenburn Crescent.

Figure 19 – View looking north towards Bass Strait from Parcel 3.

Figure 20 – View looking west from Parcel 3. Parcel 2 is visible as the grass area in the centre of picture. The existing houses at 6 and 8 Glenburn Crescent are visible on the right of picture. The Bass Highway is visible on the left of picture.

Figure 21 – View looking south from the top of Parcel 3. The Bass Highway formation is in significant cut at this location and well below the existing ground level of Parcel 3.

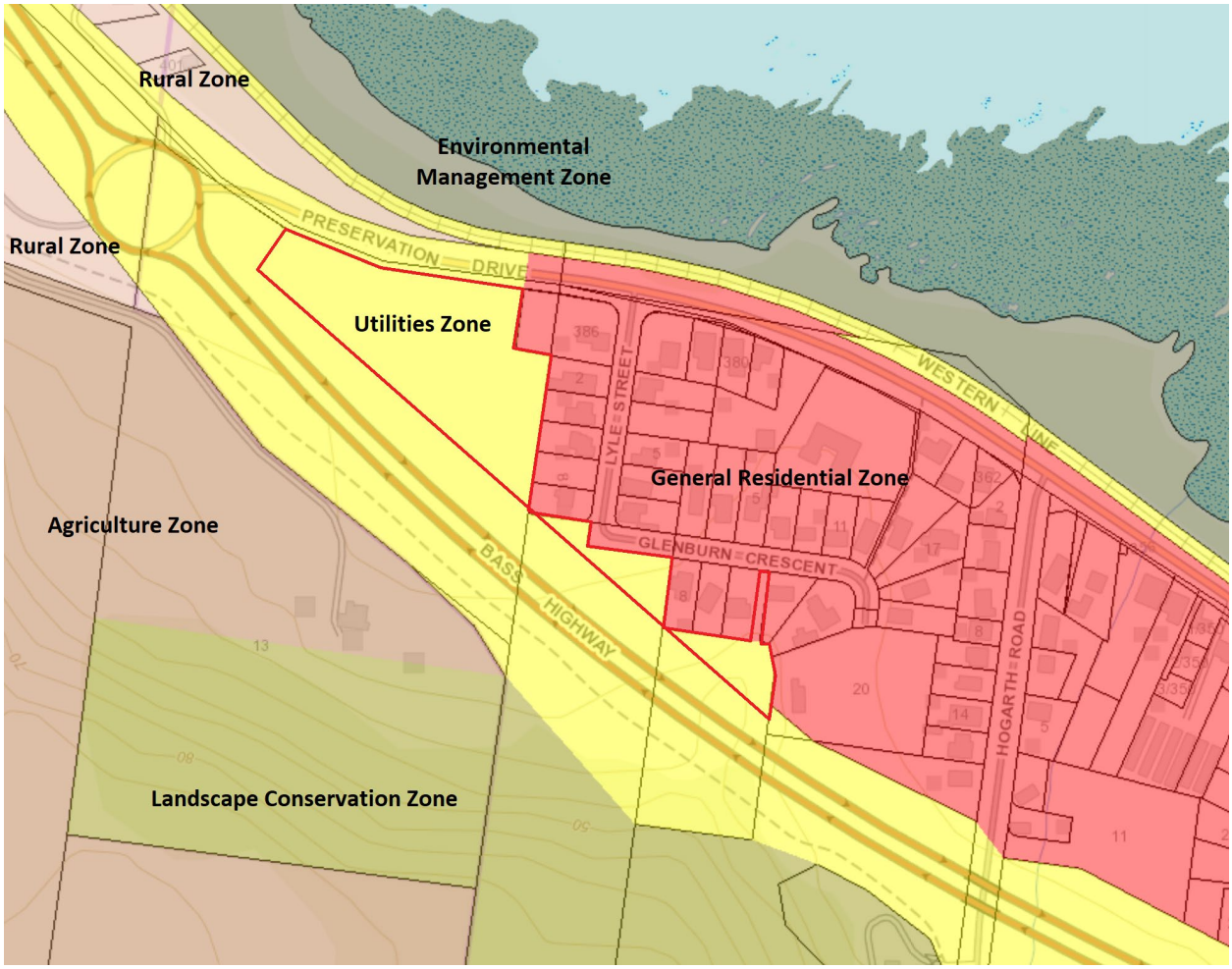

Figure 22 - Existing Zoning (Source: theList)

As shown in Figure 22 above, the site is currently zoned Utilities except for the access strip of Parcel 3 which is already zoned General Residential. The Utilities Zone is also applied to the Bass Highway road reserve, Preservation Drive road reserve to the north of Parcel 1 and the Western Line rail line.

The residential areas of Sulphur Creek to the northeast of the site are zoned General Residential. The coastal areas on the northern side of Preservation Drive and the Western Line rail line are zoned Environmental Management and the areas to the south of Bass Highway are zoned Rural, Agriculture and Landscape Conservation.

A concept site layout for residential subdivision of the site has been prepared by Flussig to test the viability of development and is included as Figures 23 and 24 below.

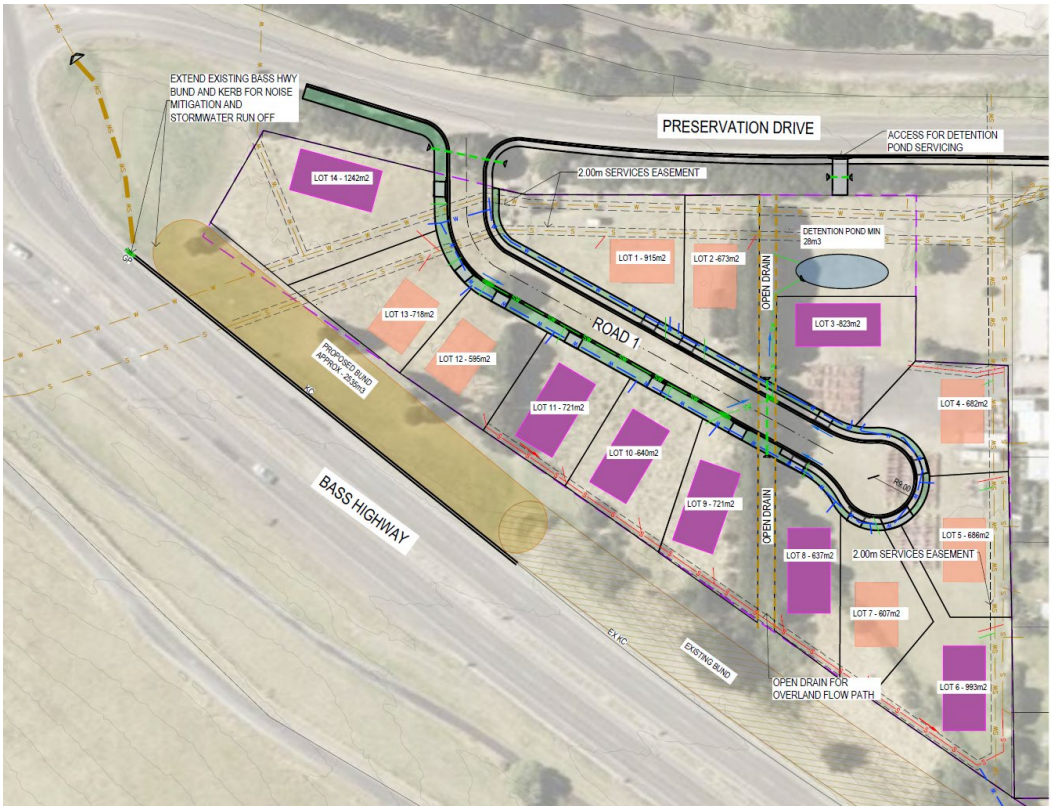

Figure 23 - Concept site plan for residential subdivision (Source: Flussig Engineers)

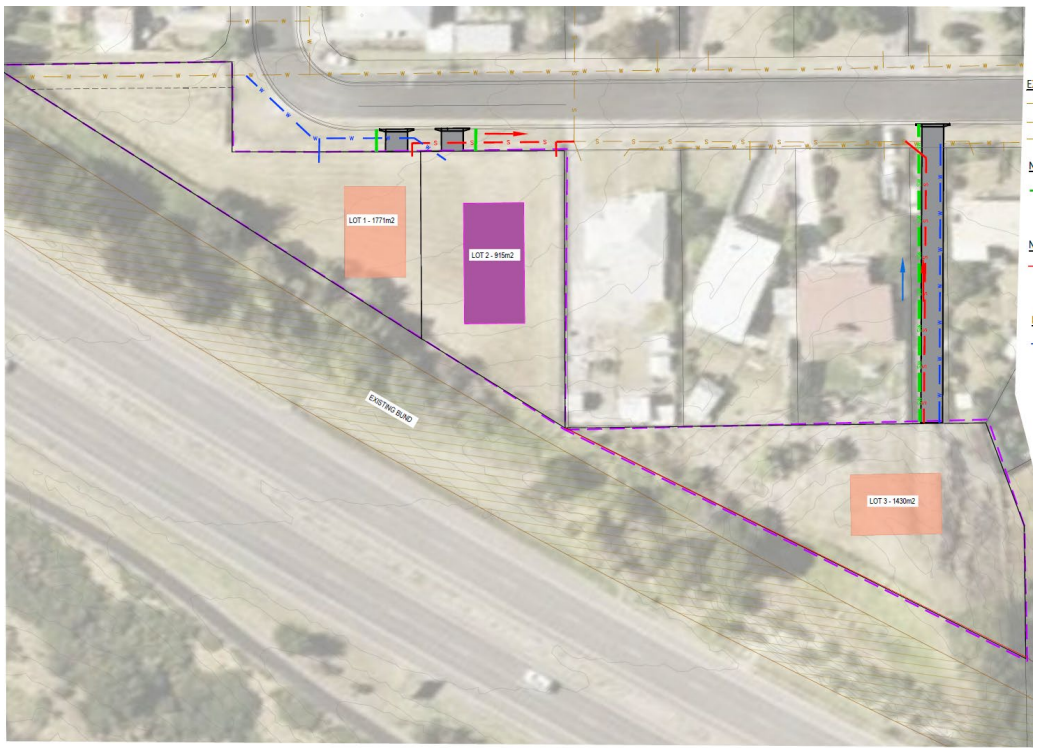

Figure 24 – Concept site plan for residential subdivision (Source: Flussig Engineers)

1.2. Description of Housing Land Supply Order

It is proposed that the Minister make a housing supply order under the HLSA:

1. to declare the subject land housing supply land in accordance with Section 4(1); and
2. include an order in accordance with Section 6 to declare the area of land shown in the site plan in Appendix A to be zoned General Residential under the Central Coast Local Provisions Schedule.

2. PART 2 – CONSIDERATION OF THE LAND

2.1. Government land (Section 5(1) HLSA)

The land is eligible government land pursuant to Section 5(1) of the Act in that:

- it is government land owned by the Crown and managed by the Department of State Growth; and
- the land was government land on the commencement date of the HLSA 20 July 2018.

And the land is not:

- reserved land under the *Nature Conservation Act 2002*;
- managed under the *National Parks and Reserves Management Act 2002*;
- managed under the *Wellington Park Act 1993*;
- permanent timber production zone land, within the meaning of the *Forest Management Act 2013*;
- future potential production forest land, within the meaning of the *Forestry (Rebuilding the Forest Industry) Act 2014; or*
- owned in fee simple by the body corporate continued under section 4 of the *Tasmanian Development Act 1983.*

2.2. Need for the land (Sections 5(2)a) HLSA)

Consistent with the Purpose under s.5(2)(a) of the *Homes Tasmania Act 2022* there is a need for the land to be made available to enable the provision of housing assistance to eligible persons to assist in reducing the incidence of housing stress and homelessness in Tasmania.

As of 30 September 2025, there were 208 applicants (3.9 per cent) on the Housing Register seeking accommodation in the Central Coast LGA as their first preference.

There is currently limited residential land on offer in Sulphur Creek, especially lots suitably sized for building of affordable housing through the MyHome scheme.

It is intended that the land will be developed to provide affordable housing outcomes. This will include new home ownership opportunities for eligible persons and persons on low and moderate incomes consistent with the Purposes of the *Homes Tasmania Act 2022*, the Tasmanian Housing Strategy 2023-2043 and Tasmanian Housing Action Plan 2023-2027.

2.3. Suitability of the land (Section 5(2)b) HLSA)

The land fulfills the requirements of ss.5(2)(b) of the HLSA in that it is considered suitable to provide for home ownership or leasehold opportunities for eligible persons or persons on low or moderate income to live in safe and secure housing. The land is located in close proximity to public and

commercial services and opportunities for employment within Penguin and the Northwest Coast more broadly as shown in Figures 25 and 26 including the following:

- 5.5km to the Penguin town centre to the east via Preservation Drive
- 6km to the Penguin District School to the southeast
- 6.5km to the Penguin sports complex to the southeast
- 4.5km to the light industrial precinct at Enterprise Avenue to the east
- 7.5km to the light industrial precinct at South Road to the east
- 8km to Burnie
- 15km to Ulverstone
- 24km to Wynyard

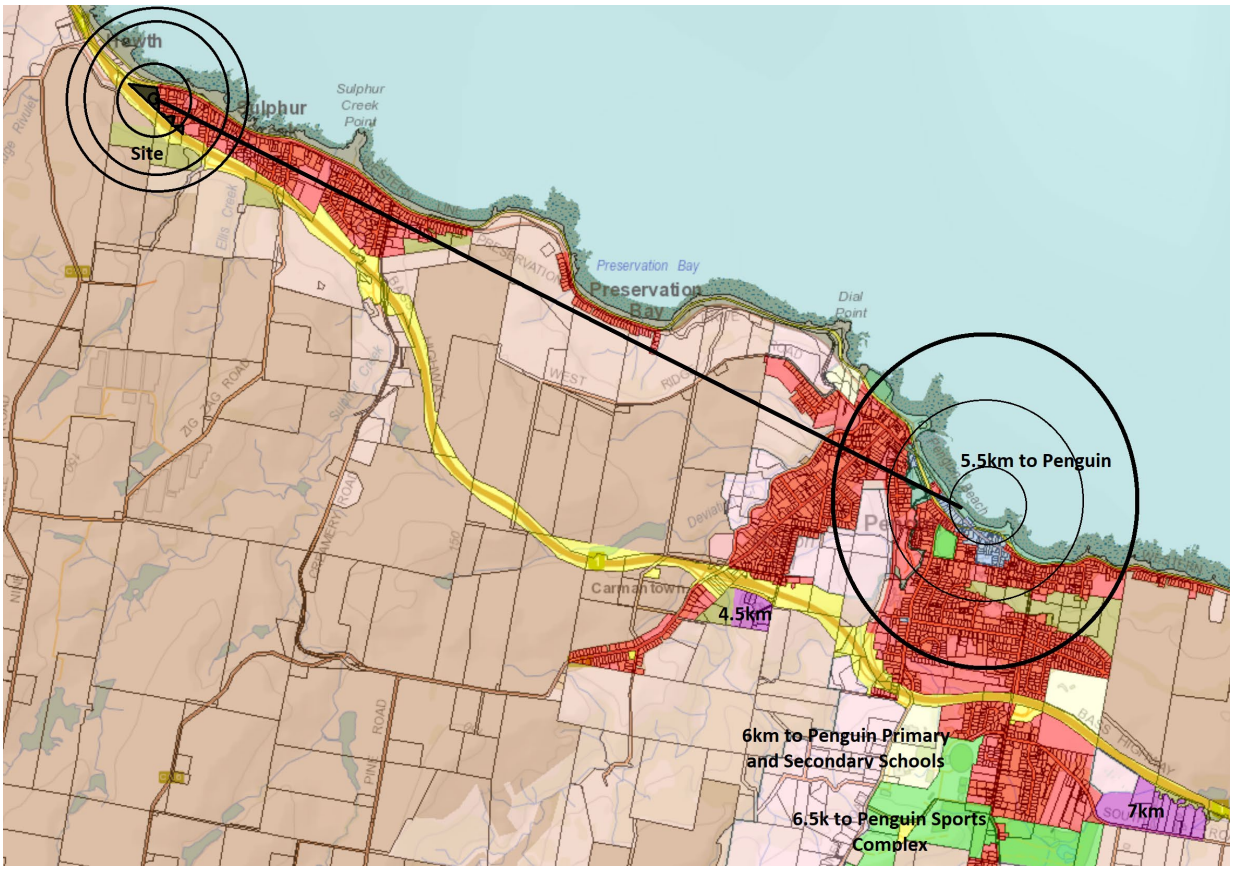

Figure 25 - Proximity to public, commercial services and employment opportunities in the Penguin locality

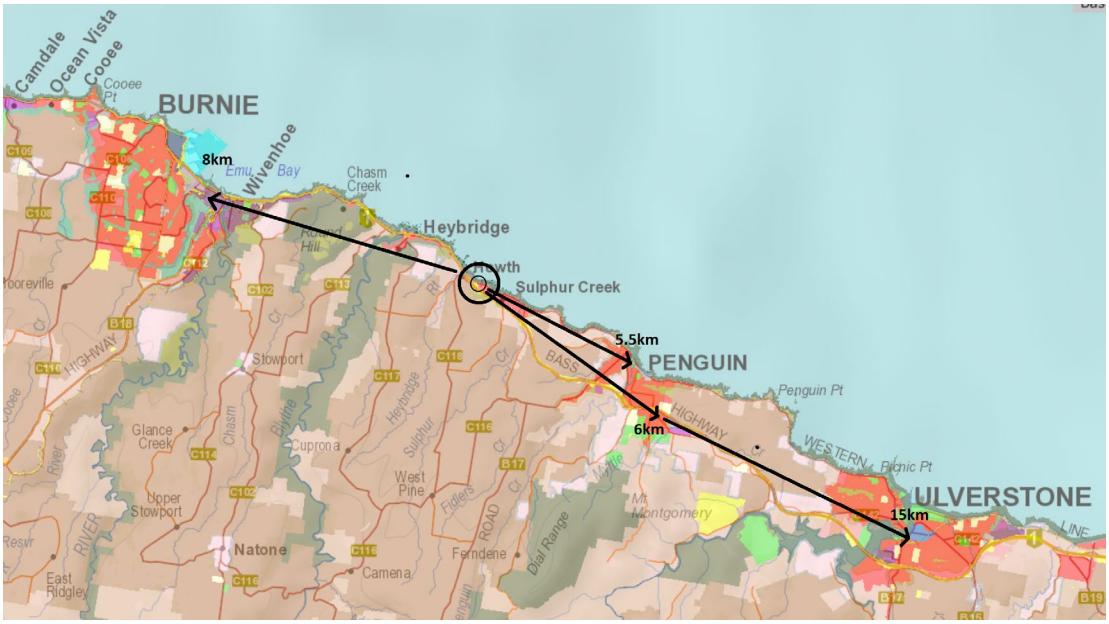

Figure 26 - Proximity to public, commercial services and employment opportunities on the Northwest Coast

2.4. Accessibility to Public Transport (Section 5(2)b) HLSA)

The Metro, public transport bus route 190 passes the site on Preservation Drive to the north (See Figure 27 below). This route travels between Ulverstone and Burnie with 5 trips between 7.30am and 5pm Monday to Friday and two services at 10.30am and 2pm Saturday.

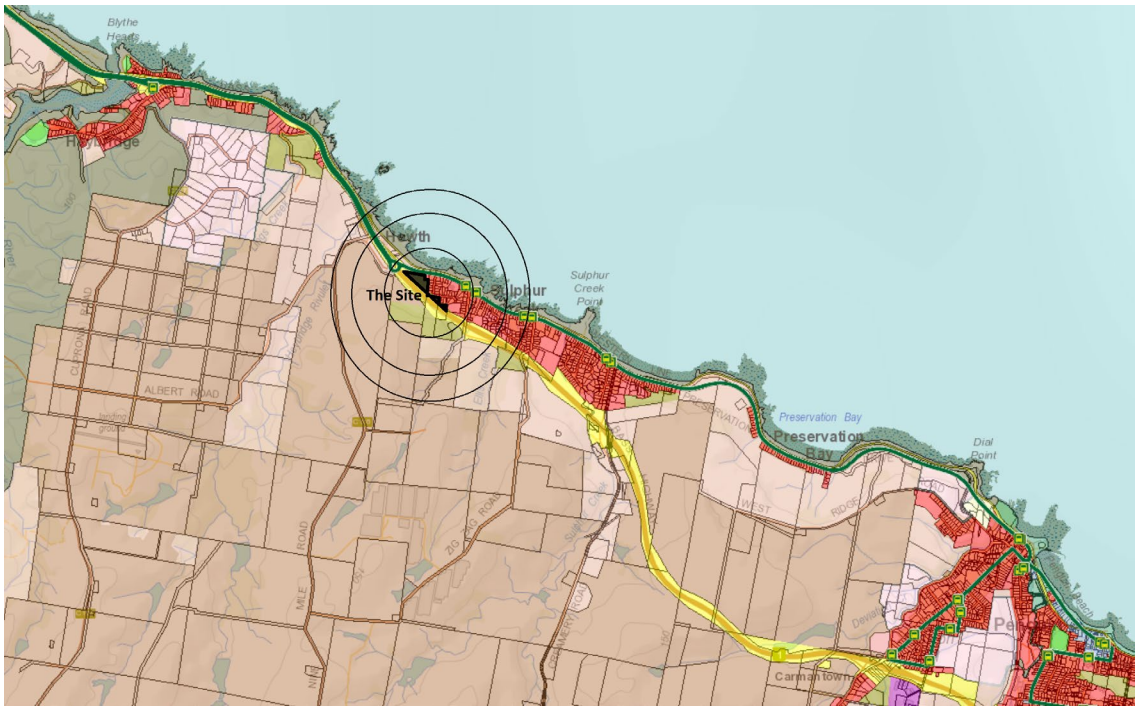

Figure 27 - The site is located on Metro bus route 190 that runs between Burnie, Penguin and Ulverstone past the Preservation Road frontage of the subject land (Source: theList)

2.5. Owners Consent (Section 5(3) & (4) HLSA)

The submission is accompanied by the following consents in Appendix B:

- Secretary for the Department State Growth; and
- Minister for Crown Land

Consent from the Chief Executive Officer of Homes Tasmania also accompanies the submission in Appendix B.

2.6. The proposal is consistent with State Policies and the Cradle Coast Regional Land Use Strategy 2010-2030 (Section 6(1)a) HLSA)

The proposed zoning is considered consistent with State Policies and the relevant Regional Land Use Strategy as set out in the following sections:

2.6.1. State Policies

The following State Policies are made under the *State Policies and Projects Act 1993*:

- *State Policy on the Protection of Agricultural Land 2009*;
- *State Policy on Water Quality Management 1997*; and
- *Tasmanian State Coastal Policy 1996*.

The National Environmental Protection Measures are automatically adopted as State Policies under the *State Policies and Projects Act 1993*.

The following section examines the State Policies as they apply to this proposal.

2.6.2. State Policy on the Protection of Agricultural Land 2009

The purpose of the *State Policy on the Protection of Agricultural Land 2009* is:

> *"to conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land".*

Comment

The proposal relates to an isolated parcel of Class 4[1] land that is adjacent to residential use and development and severed from surrounding agricultural land to the south by the Bass Highway. It is adjacent to General Residential zoned land to the east and north (parcels 2 and 3). The land is not well suited to agricultural use particularly given its separation from other agricultural land, its small size, and proximity to existing residential use. The proposal therefore will not result in the loss of prime or significant agricultural land. The proposal does not conflict with this Policy.

2.6.3. State Coastal Policy 1996

The *State Coastal Policy 1996* is created under the *State Policies and Projects Act 1993*.

Comment

The Policy applies in that the subject land is located within the coastal zone and approximately 100m of the shore of Bass Strait.

[1] Class 4 land meaning - Land primarily suitable for grazing but which may be used for occasional cropping

The proposed development is adjacent to the established Sulphur Creek settlement. It will make efficient use of an isolated parcel of acquired road that is surplus to DSG's requirements and will provide for the logical containment of the Sulphur Creek settlement, east of the Howth roundabout.

The proposal is considered consistent with the desired Outcomes for *Urban and Residential Development* under the *State Coastal Policy* and in particular Outcome 2.4.2 that:

> *Urban and residential development in the coastal zone will be based on existing towns and townships. Compact and contained planned urban and residential development will be encouraged in order to avoid ribbon development and unrelated cluster developments along the coast.*

2.6.4. State Policy on Water Quality Management 1997

The *State Policy on Water Quality Management* is concerned with achieving 'sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of Tasmania's Resource management and Planning System'.

Comment

As demonstrated in the accompanying development concept prepared by Flussig, the zoning will allow for suitable stormwater treatment to be incorporated in future development as required by the Planning Scheme and *Urban Drainage Act 2013*. Such measures will ensure the long-term quality of stormwater runoff is efficiently managed to protect water quality consistent with this Policy.

2.6.5. National Environment Protection Measures

The National Environmental Protection Measures relate to:

- Ambient air quality;
- Ambient marine, estuarine and fresh water quality;
- The protection of amenity in relation to noise;
- General guidelines for assessment of site contamination;
- Environmental impacts associated with hazardous wastes; and
- The re-use and recycling of used materials.

Comment

Other than consideration of the potential for contamination or noise as discussed below, the listed NEPMs do not raise specific matters that are relevant to the proposed zoning.

The protection of amenity in relation to noise

The land is located adjacent to the Bass Highway which is a Category 1 State Road with a speed limit of 110km per hour. It is also located within 25m of the Western Line rail line. The subject land is therefore within both *road* and *railway attenuation* areas as defined under Clause C3.3 of the State Planning Provisions (SPPs).

Future development on the land for residential use will be subject to consideration under Clause C3.6.1 of the Road and Railway Assets Code of the SPPs and in particular Clause C3.6.1 *Habitable buildings for sensitive uses within a road or railway attenuation area and C3.7.1 Subdivision for sensitive uses within a road or railway attenuation area*.

It is noted that the rail line already passes close by the residential areas of Sulphur Creek and Penguin and development of the subject land would be no closer and in most cases further from the rail line than existing sensitive residential uses in the vicinity.

In relation to the setback to the Bass Highway, there is an existing earthen berm along the southern side of Parcel 2 (Figure 14) and the eastern side of the southern boundary of Parcel 1 (Figure 9). The Bass Highway is in a significant cut adjacent to the rear of Parcel 3 (Figure 21). These characteristics would appear to provide effective mitigation from highway noise to the majority of the subject land.

Although the western end of Parcel 1 does not currently benefit from any existing features that would attenuate noise impacts, noise attenuation measures can be addressed at the subdivision phase by incorporating elements such as acoustic fencing or landscaped berms along the western boundary. Additionally, the orientation of dwellings and placement of buildings can be planned to minimise noise exposure to sensitive interior spaces, helping to reduce the overall impact of external noise on future residents.

Potentially contaminated land

Homes Tasmania commissioned an environmental site assessment to confirm whether the potentially contaminating activities on and adjacent to the site including the truck mechanical repair and servicing activity may have affected the suitability of the site for future residential use. This report by Environmental Service and Design is provided as Appendix C and confirms that potentially contaminating activities that occurred on the site or nearby offsite did not cause contamination on the site.

The report concludes that:

- the risk to human health and the environment is acceptable
- the site is suitable for the proposed residential use and development
- no management measures are required for excavation on the site.

Tasmanian Planning Policies

There are no relevant Tasmanian Planning Policies.

Cradle Coast Regional Land Use Strategy
The relevant regional strategy is the Cradle Coast Regional Land Use Strategy 2010-2035, 28 February 2024 (CCRLUS).

Land Use Policies for Managing Growth and Development (4.3)

Urban Settlement Areas (4.3.1)

Comments in relation to the relevant policies of the CCRLUS are setout in the following table:

CCRLUS Policy	***Comment***
4.3.1 Urban Settlement Areas	
a. Promote established settlement areas as the focus for growth and development	This proposal seeks to meet an identified demand for housing on the Central Coast on surplus Utilities land at Sulphur Creek.
b. Promote optimum use of land capability and capacity of available and planned infrastructure service	The land adjoins land zoned General Residential and can connect to existing reticulated water and sewer services.

c. Match land supply to need and provide sufficient land within designated urban settlement boundaries of each centre to meet forecast need for a time horizon of not less than 10 years but not exceeding 20 years	As discussed in Section 2.2, as at 31 July 2024, there were 214 applicants (4.5 per cent) on the Housing Register seeking accommodation in the Central Coast LGA as their first preference. There is a projected need for 10 616 dwellings in the Central Coast by 2041 based on previous 2022 Treasury population projections and modelling for the Tasmanian Housing Strategy, ranking the Central Coast in the top 10 LGAs in Tasmania with greatest housing need for social and affordable housing. There is currently limited residential land on offer in Sulphur Creek, especially lots suitably sized for building of affordable housing through the MyHome scheme.
d. Accommodate growth and development for each of the settlements as identified in Table 4.3	Table 4.3 of the CCRLUS sets out a settlement management strategy for the Region and identifies nearby Penguin for *a stable* strategy and for a Low Growth scenario. The concept of *stable* restricts new development to existing land supply within the designated urban boundary without priority for intensification. In the case of Sulphur Creek there is no designated urban boundary. It is considered however that the circumstances of this proposal to rezone existing serviced Utilities land adjacent to existing General Residential zoned land at Preservation Drive and contained to the north east of the Bass Highway formation is consistent with the strategy of confinement to the boundaries of the existing settlement. The concept subdivision plan prepared by Flussig and provided in Appendix F indicated potential for 17 residential lots. This is considered a modest increase and consistent with this *Stable* and *Low Growth* strategy
e. Notwithstanding the categorisation listed in Table 4.3, where a contemporary land supply and demand analysis indicates that additional land should be made available to accommodate growth, the designated growth scenario or settlement strategy may be varied subject to the considerations in parts i-vii	The proposal involves approximately 1.8ha^2 of land and the estimated potential for 17 residential lots (as shown in the concept subdivision plan in Figures 23 and 24 above). It will not constitute a significant increase in land zoned for urban development at Sulphur Creek and is considered consistent with the intended Low Growth scenario and Stable Settlement Strategy for Sulphur Creek.

f. Provide a pattern of settlement which maintain – i. Separated towns, villages and communities ii. Visual and functional transitional space between each individual centre iii. Absence of linear development or expansion aligned to coastline, ridgeline, or river or road frontage.	The proposal relates to land adjacent to existing residential properties at Preservation Drive on the northern side of the Bass Highway, east of the Howth roundabout. It will not compromise this policy objective to avoid linear expansion of settlements
4.4 Land Use Policies for protecting people and property	
The policy is to direct the places where people live and work from areas where there is an unacceptable level of risk for the health and safety of people, property, and the environment from natural or man-made hazards	The accompanying reports confirm that the site is suitable for the intended residential use and development.
4.5 Land Use Policies for facilitating access to business and community services	
Livability of the Region is dependent in part on local or convenient and equitable access to a range of business and community services to meet both daily and specialist requirements.	As discussed in Section 2.3 above the subject land intended for affordable rather than social housing outcomes is located in close proximity to commercial and community services on the Northwest Coast including local services at Penguin and higher order regional services at Burnie, 8km west and Ulverstone 15km east.
4.7 Land Use Policies for Housing Land – places to live	
Land use planning promotes equitable provision, choice and distribution of housing which is adequate, affordable and suitable to meet the requirements of the Region.	The proposal intended for affordable housing outcomes is well located for access to educational and community services and is considered suitable to meet the requirements of the Region.
4.8 Land Use Policies for Healthy and Educated Communities	
Livability requires access to facilities which enable opportunity for an active, healthy, informed and inclusive community	The site has a pleasant coastal setting and is in close proximity to the educational, recreational, community and commercial services of Penguin within approximately 6km of the site.
4.9 Land Use Policies for Active Communities	
Land use planning assists provision of active, connected and healthy places which are attractive to residents and visitors.	As discussed in Section 2.3, the site is located with convenient access to schools and recreational facilities of Penguin.
5.3 Land use Policies for Integrated Land Use and Infrastructure Planning	
Land Use planning is linked to infrastructure planning and provision by directing new development to areas where there is capacity in infrastructure and promoting compact and	The subject land can connect to existing reticulated water and sewer and does not exceed the capacity of existing infrastructure.

contained settlements to assist which climate adaption and optimized public investment.	

2.7. The site is not significantly restricted by any code that applies to the land –(Section 6(1)b) HLSA)

Other than the road and rail attenuation areas discussed above the subject land is not significantly restricted by any other code overlays under the planning scheme.

The following mapped planning scheme code overlays apply to parts of the subject land:

- C7.0 Natural Assets Code
- C15.0 Landslip Hazard Code

The C7.0 Natural Assets Code (Priority Vegetation Area) applies to approximately 0.67 ha of Parcels 2 and 3 behind Glenburn Crescent as shown Figure 28.

The accompanying Natural Values Assessment and letter from ECOtas, 23 December 2023 in Appendix D to this report confirms that there are no priority vegetation values that would prevent development of the land.

Figure 28 - Priority Vegetation Overlay (Source: theList Planning Scheme Code Overlay - Priority Vegetation)

An area of Medium Landslip Hazard covers a portion of the southern embankment of Parcel 2 and a small corner of Parcel 3 as shown in Figure 29 below.

The accompanying Landside Risk Assessment provided in Appendix E confirms that subject to appropriate hillside design, geotechnical investigation and footing design the landslide risk is low to very low. It is considered that these matters will be adequately addressed as part of a future subdivision application under the Landslip Hazard Code and with development specific geotechnical and engineering advice as part of subsequent world under the *Building Act 2016*.

Figure 29 -Mapped Medium Landslip Hazard Area (Source: theList – planning scheme code overlays)

2.8. The Intended zoning would further the objectives of Schedule 1 of LUPAA (Section 6(1)c) HLSA)

The proposed zoning is considered to further the objectives of Schedule 1 of the Act as follows:

Part 1 Objectives

(a) To promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity;

Comment

The proposal promotes the objectives for sustainable development of land through allowing for the efficient use of serviced land for residential use and development directly adjacent to established areas of Sulphur Creek. The subject land is essentially cleared and will not require vegetation clearing or impact on ecological processes. It is considered to further this Objective.

(b) To provide for the fair, orderly and sustainable use and development of air, land and water;

Comment

The proposal for greenfield development to support affordable housing outcomes on this underutilised site is considered fair, orderly and sustainable use and development and will further this objective.

(c) To encourage public involvement in resource management and planning;

Comment

Consideration of the proposal will involve notice to interested persons and the right to make submissions for consideration by the Minister before the proposed order is laid before both Houses of Parliament. The proposal will encourage public involvement consistent with the processes set out under the HLSA and will further this objective.

(d) To facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c) above.

Comment

As stated above, the proposal represents consolidated urban development with access to existing road, reticulated and community infrastructure. It avoids sensitive environmental areas and will facilitate affordable housing and economic development outcomes. Rezoning of the land for residential purposes allows for economic development including the construction phase of site development and by providing affordable housing options. For these reasons the proposal is considered to further this Objective.

(e) To promote sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.

Comment

The proposal will be referred to interested persons for comment including Council, TasWater, Aboriginal Heritage Tasmania and as well as the Heads of relevant Agencies as required by s.11 of the HLSA. The proposal is considered to further this Objective.

2.8.1. Schedule 1 Part 2

(a) To require sound strategic planning and co-ordinated action by State and local Government;

Comment

As demonstrated throughout this assessment the proposal is consistent with the CCRLUS and represents sound strategic planning that will further this Objective.

(b) To establish a system of planning instruments to be the principal way of setting objectives, policies and controls for the use, development and protection of land;

Comment

The proposal will apply the General Residential Zone under the planning scheme that will set the objectives, policies and controls for the site consistent with this Objective.

(c) To ensure the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land;

Comment

The proposal is considered to further this Objective in that it relates to cleared land that will avoid significant environmental values. It will also contribute to broader social, environmental and economic benefits as a result of the proposed efficient use of underutilised serviced land.

(d) To require land use and development planning and policy to be easily integrated with environmental, social, economic, conservation and resource management policies at State, regional, and municipal levels;

Comment

As discussed above the proposal will further strategic planning policies and is consistent with this Objective.

(e) To provide for the consolidation of approvals for land use or development and related matters, and to co-ordinate planning approvals with related approvals;

Comment

The proposal does not conflict with this objective.

(f) To secure a pleasant, efficient and safe working, living and recreational environment for all Tasmanians and visitors to Tasmania;

Comment

The proposal will assist in the provision of a diversity of affordable housing outcomes within close proximity to surrounding services. It furthers this objective.

(g) To conserve those buildings, areas or other places which are of scientific, aesthetics, architectural or historical interest, or otherwise of special cultural value;

Comment

There are no listed historic or cultural values on the site that would be affected by the proposal.

(h) To protect public infrastructure and other assets and enable the orderly provision and co-ordination of public utilities and other facilities for the benefit of the community;

Comment

The land is within an existing serviced area and supported by a constructability report prepared by Flussig and provided as Appendix F to this report. The proposal will be referred to TasWater for comment pursuant to Section 11(c) of the HLSA. Consultation with the Department of State Growth has confirmed that the land is not required as part of the road network. The proposal will further affordable housing outcomes for the benefit of the community consistent with this Objective.

(i) To provide a planning framework which fully considers land capability;

Comment

The proposal relates to land adjacent to an established residential area and separated from surrounding agricultural land by the Bass Highway corridor.

It is considered appropriate for future residential use and development subject to the normal planning scheme considerations of the General Residential Zone and the provisions of the relevant Codes of the planning scheme.

2.9. The proposed zoning is consistent with the Purpose of the General Residential Zone and the section 8A guidelines of the Land Use Planning and Approvals Act (Section 6(1)d) HLSA)

The proposal to rezone the land to General Residential is consistent with the Purpose of the General Residential Zone:

- *To provide for residential use or development that accommodates a range of dwelling types where full infrastructure services are available or can be provided.*
- *To provide for the efficient utilisation of available social, transport and other service infrastructure.*
- *To provide for non-residential use that:*
    - *primarily serves the local community; and*
    - *does not cause an unreasonable loss of amenity through scale, intensity, noise, activity outside of business hours, traffic generation and movement, or other off site impacts.*
- *To provide for Visitor Accommodation that is compatible with residential character.*

The proposal is assessed against the Section 8A Zone Application Guidelines of the Local Provisions Schedule of the Tasmanian Planning Scheme as follows:

> *GRZ 1 The General Residential Zone should be applied to the main urban residential areas within each municipal area which:*
>
> *(a) are not targeted for higher densities (see Inner Residential Zone); and*
>
> *(b) are connected, or intended to be connected, to a reticulated water supply service and a reticulated sewerage system.*

Assessment

Reticulated water and sewer services are available to the site.

> *GRZ 2 The General Residential Zone may be applied to green-field, brown-field or grey-field areas that have been identified for future urban residential use and development if:*
>
> *(a) within the General Residential Zone in an interim planning scheme;*
>
> *(b) within an equivalent zone under a section 29 planning scheme; or*
>
> *(c) justified in accordance with the relevant regional land use strategy, or supported by more detailed local strategic analysis consistent with the relevant regional land use strategy and endorsed by the relevant council; and*

(d) is currently connected, or the intention is for the future lots to be connected, to a reticulated water supply service and a reticulated sewerage system,

Assessment

The existing Utilities Zoned land is surplus to the needs of the transport network and the truck maintenance activity will vacate the site by February 2026. The proposal represents efficient use of serviced land adjacent to the existing Sulphur Creek settlement and furthers the Policies of the CCRLUS.

GRZ 3 The General Residential Zone should not be applied to land that is highly constrained by hazards, natural values (i.e. threatened vegetation communities) or other impediments to developing the land consistent with the zone purpose of the General Residential Zone, except where those issues have been taken into account and appropriate management put into place during the rezoning process

Assessment

Reticulated water and sewer are available to service the site. As discussed above, the accompanying natural values and landslide hazard assessment confirm that there are no specific issues that would prevent development. Any residual matters will be able to be appropriately managed through the application of the relevant codes as part of the assessment of a future application for a planning permit and approval under the *Building Act 2016*.

2.10. Consideration of any environmental, economic and social impacts (Section 6(1)e) HLSA)

The rezoning of the land will allow for residential development which would facilitate affordable housing and associated economic development including an increase in housing stock.

Positive social impacts from the proposal include an increase in the supply of affordable residential land, which contributes to avoiding homelessness and housing stress. The General Residential Zone includes high standards of development and residential amenity.

The proposal will further objectives for urban consolidation and affordable housing that will contribute to broader social, environmental and economic benefits consistent with this requirement.

2.11. Consideration of the effect on Aboriginal and cultural heritage (Section 6(1)e) HLSA)

The proposal relates to vacant land on the periphery of the Sulphur Creek settlement. An Aboriginal Heritage Desktop Review was completed for the site and is at Appendix G. The Record of Advice returned no known Aboriginal heritage recorded within the proposed rezoning footprint. The proposal will be referred to Aboriginal Heritage Council for comment pursuant to ss.11(g) of the HLSA.

2.12. Consideration of land use conflict on the site and on land adjacent to the site (Section 6(1)f) HLSA)

The proposed rezoning is consistent with the existing General Residential zoning adjoining the site to the east.

There is an existing light industrial truck repair garage adjacent to the site at 2 Lyle Street which also has an existing short term lease with DSG to accommodate a truck wash on Parcel 1 of the subject land. Assuming the proposed rezoning progresses the truck servicing activity will vacate the site by February 2026.

The site is adjacent to the Bass Highway and the Western Line railway. As discussed above in section 2.6.5 future residential use on the site may require noise mitigation measures such as a continuation of the existing earthen berm along the south western side of parcel 1. It is considered that these matters could be appropriately addressed as part of an application for subdivision and assessment under Clause 3.6 or C3.7 of the Road and Railway Assets Code of the planning scheme.

2.13. Dwelling and lot density conformity to suburban density (Section 6(2)a HLSA)

The proposal will apply the provisions for the General Residential Zone under the State Planning Provisions.

2.14. Other zones intended for the site (Section 6(2)b) HLSA)

The circumstances of this land do not require the application of any other complimentary zones. It is considered appropriate that the General Residential Zone apply across the full extent of the subject land and that the Utilities Zone remain for the balance of the three titles.

2.15. Modified planning provisions (Section 7(1) & (2) HLSA)

It is not considered that the circumstances of this land warrant modification of a relevant housing provision.

2.16. Consultation with interested persons(Section 10 HLSA)

Interested persons (s.10 - s.12)

The interested persons in the case of this land are considered to be:

- Central Coast Council
- Heads of Agency that have an interest in whether or the manner in which the land ought be used and or developed including the Department of State Growth;
- TasWater;
- Tas Networks;
- TasRail;
- The owner sand operators of Dazeley Engineering at 2 Lyle Street that also have an existing truck wash facility on Parcel 1 of the subject land.
- the owners and occupiers of the residential properties in the vicinity including 1,2,3,4,6,7,9 and 10-10 Lyle Street, 1,3,5,7,,8,9,10,11,12,13, 15,16,17,18,19,20 and 21 Glenburn Crescent and 384, 386 and 388 Preservation Drive.
- The owner of the agricultural land on the southern side of Bass Highway opposite the site at 13 Nine Mile Road
- Tasmania Fire Service;
- Tasmanian Heritage Council;
- Aboriginal Heritage Council

Appendix A

Site Plan

(Rezoning area defined is approximate and is subject to final survey plan)

N

LEGEND:

- TITLE BOUNDARIES

- PROPOSED 'GENERAL RESIDENTIAL' ZONE

AREA '1', '2', '3', '4', '5', '6', '7', AND '8' (±1.464ha) TO BE REZONED FROM 'UTILITIES' TO 'GENERAL RESIDENTIAL

MGA94 COORDINATES		
POINT	EASTING	NORTHING
1	417001.4	5450846.9
2	417055.2	5450826.0
3	417061.5	5450823.8
4	417111.5	5450817.4
5	417152.5	5450811.9
6	417147.5	5450773.3
7	417170.1	5450769.4
8	417156.9	5450667.6
9	416983.4	5450819.0

NOVA LAND CONSULTING

156 George Street,
Launceston 7250
132 Davey Street,
Hobart 7000

Phone (03) 6709 8116
Email: info@novaland.com.au

SITE PLAN

PRESERVATION DRIVE SULPHUR CREEK
C.T. 123065/3, C.T.199745/1, C.T.87389/34

File name
L250208_Rezone_070425.dwg

Notes:
- HORIZONTAL BEARING DATUM IS PLANE BASED ON MGA94 PER RTK GNSS
- BOUNDARIES WERE CALCULATED TO TASMANIAN CADASTRAL STANDARDS
- COORDINATES ARE PLANE BASED ON MGA94 PER SPM10624

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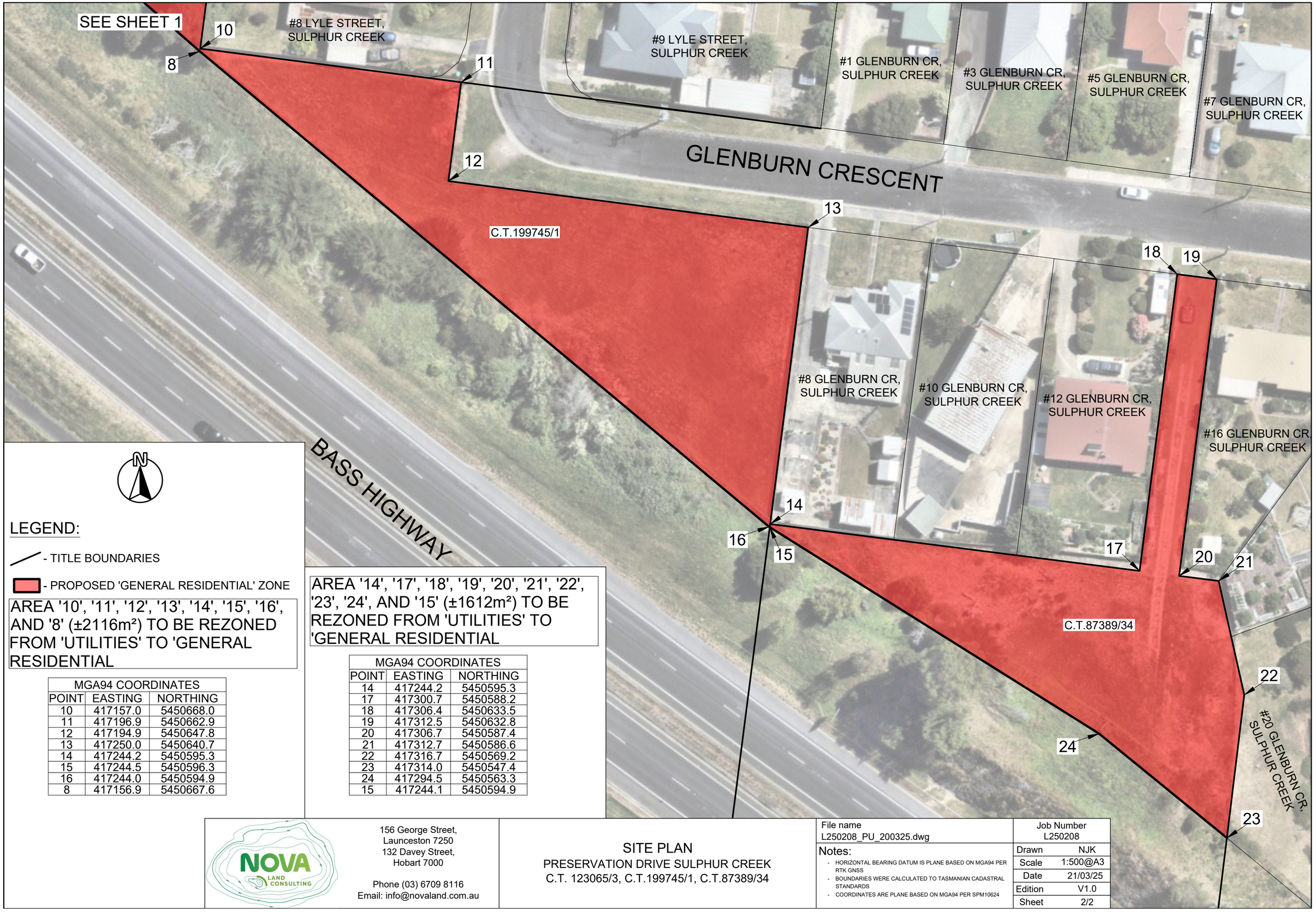
Date	21/03/25
Edition	V1.0
Sheet	1/2



N

LEGEND:

- TITLE BOUNDARIES

- PROPOSED 'GENERAL RESIDENTIAL' ZONE

AREA '10', '11', '12', '13', '14', '15', '16', AND '8' (±2116m²) TO BE REZONED FROM 'UTILITIES' TO 'GENERAL RESIDENTIAL

MGA94 COORDINATES		
POINT	EASTING	NORTHING
10	417157.0	5450668.0
11	417196.9	5450662.9
12	417194.9	5450647.8
13	417250.0	5450640.7
14	417244.2	5450595.3
15	417244.5	5450596.3
16	417244.0	5450594.9
8	417156.9	5450667.6

AREA '14', '17', '18', '19', '20', '21', '22', '23', '24', AND '15' (±1612m²) TO BE REZONED FROM 'UTILITIES' TO 'GENERAL RESIDENTIAL

MGA94 COORDINATES		
POINT	EASTING	NORTHING
14	417244.2	5450595.3
17	417300.7	5450588.2
18	417306.4	5450633.5
19	417312.5	5450632.8
20	417306.7	5450587.4
21	417312.7	5450586.6
22	417316.7	5450569.2
23	417314.0	5450547.4
24	417294.5	5450563.3
15	417244.1	5450594.9

NOVA LAND CONSULTING

156 George Street,
Launceston 7250
132 Davey Street,
Hobart 7000

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Email: info@novaland.com.au

SITE PLAN

PRESERVATION DRIVE SULPHUR CREEK
C.T. 123065/3, C.T.199745/1, C.T.87389/34

File name
L250208_PU_200325.dwg

Notes:
- HORIZONTAL BEARING DATUM IS PLANE BASED ON MGA94 PER RTK GNSS
- BOUNDARIES WERE CALCULATED TO TASMANIAN CADASTRAL STANDARDS
- COORDINATES ARE PLANE BASED ON MGA94 PER SPM10624

Job Number	L250208
Drawn	NJK
Scale	1:500@A3
Date	21/03/25
Edition	V1.0
Sheet	2/2

Appendix B

Consents

Department of State Growth

Salamanca Building, Parliament Square
4 Salamanca Place, Hobart TAS 7000
GPO Box 536, Hobart TAS 7001 Australia
Phone 1800 030 688 Fax (03) 6173 0287
Email info@stategrowth.tas.gov.au Web www.stategrowth.tas.gov.au
Your Ref: D25/239197/3/ Our Ref: D25/146459

Tasmanian Government

Eleri Morgan-Thomas
CEO
Homes Tasmania
Email: exec.services@homes.tas.gov.au

Dear Ms Morgan-Thomas

Subject **Housing Land Supply Order**
Preservation Drive (Glenburn Crescent), Sulphur Creek

Thank you for your letter of 22 May 2025 seeking my consent to include land at Preservation Drive (Glenburn Crescent) to be the subject of a Housing Land Supply Order to enable the rezoning for housing supply land.

Pursuant to s.5(3)(b) of the *Housing Land Supply Act 2018*, I, Craig Limkin, as the Secretary to the Department of State Growth, hereby provide consent for the land listed in the table below, to be the subject of an order under the *Housing Land Supply Act 2018.*

Title Reference	**Street Address**	**Suburb**
Part of CT 123065/3	Preservation Drive	Sulphur Creek
Part of CT 199745/1	Glenburn Crescent	Sulphur Creek
Part of CT 87389/34	Glenburn Crescent	Sulphur Creek

Regarding your request for agreement for the possible extension to the existing adjacent bund, the Department of State Growth's preference is that any further sound mitigation be located outside the road reservation as the extension of the bund may have maintenance, drainage and sight distance implications. However, we are willing to continue to work with Homes Tasmania on possible noise abatement options when you are ready to have these conversations.

Please contact Claire Armstrong, Senior Strategic Planner, by email at claire.armstrong@stategrowth.tas.gov.au or telephone on (03) 6166 4484 for more information.

Yours sincerely

Craig Limkin
Secretary

5 June 2025

Eleri Morgan-Thomas
CEO
Homes Tasmania
GPO Box 65
HOBART TAS 7001
Email: exec.services@homes.tas.gov.au

Subject **Housing Land Supply Order**
Preservation Drive (Glenburn Crescent), Sulphur Creek

Pursuant to s.5(3)(b) of the *Housing Land Supply Act 2018*, I, Nick Duigan, as the Minister administering the *Crown Lands Act 1976*, hereby provide consent for the land listed in the table below, to be the subject of an order under the *Housing Land Supply Act 2018.*

Title Reference	Street Address	Suburb
CT 188961/1	Preservation Drive	Sulphur Creek
CT 188961/2	Glenburn Crescent	Sulphur Creek
CT 188961/3	Glenburn Crescent	Sulphur Creek

Nick Duigan
Minister for Parks,

22/12/2025

Appendix C

Environmental Site Assessment, ES&D

Contamination Assessment

Preservation Drive Sulphur Creek (Glenburn Crescent), 7316

Project No: 9126

Date: 19/01/2024

ABN: 97 107 517 144
74 Minna Road
Heybridge TAS 7316
Ph: (03) 6431 2999

ACN: 107 517 144
PO Box 651
Burnie TAS 7320
www.esandd.com.au

Document Control

Prepared & published by:	ES&D
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Prepared For:	Homes Tasmania

Version:			Date:
Draft 1	Nicholas Plats	ES&D	12/02/2024
Review	Samuel Smith	ES&D	12/02/2024
FINAL	Rod Cooper	ES&D	13/02/2024

Contents

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1 Introduction

Environmental Service and Design (ES&D) were commissioned by their client Homes Tasmania to undertake a Contamination Assessment on the proposed development at Glenburn Cresent, Sulphur Creek.

The objective of the ESA was to conduct a site inspection and collate historical site information to determine whether activities have occurred on or near the site which may result in contamination of the land and if so, whether the level of risk will increase with the proposed development.

2 Scope of Works

The scope of the preliminary site investigation included:

- Desktop review of the site and surrounding land use history;
- Obtaining information from Work Safe Tasmania (WST) regarding potential storage of dangerous substances in the area surrounding the property;
- Determination of potential contaminants of concern;
- Field investigations and site visit;
- Identification of potential human and ecological receptors and consideration of risks to identified receptors;
- Development of a Conceptual Site Model (CSM); and,
- Preparation of the assessment report.

3 Basis for Assessment

As a State Policy for the purposes of State policies and Procedures Act 1993, the *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM) as amended* was the guideline used for the assessment.

The assessment included elements of a Preliminary Environmental Site Assessment as defined in NEPM Schedule B2. NEPM advises that if a thorough preliminary investigation shows a history of non-contaminating activities and there is no other evidence or suspicion of contamination, further investigation is not required (Schedule B2 and Section 2.1).

4 Information Sources

- Historic Dangerous Substances license information associated with WorkSafe Tasmania, Department of Justice;
- (the LIST) Land Information System Tasmania (www.thelist.tas.gov.au);
- National Environment Protection (assessment of Site Contamination) Amendment Measure 2013 (no. 1).
- Google Earth Pro accessed 19/01/2024.
- Site visit conducted on 23/01/2024.

5 Site Details

5.1 Site Identification

The site comprises the following properties (table 1):

Table 1: Site Details

Street Address	Property ID	Title Reference	App. Area (m2)
Glenburn Cresent, Sulphur Creek	0	123065/3	21,700

The subject site is a parcel of land adjacent to the Howth roundabout and is owned by the Tasmanian Government Department of State Growth. The site details are presented in Table 1.

Figure 1: Site Aerial Photography

5.2 Zoning

The site is currently zoned as “Utilities” (Tasmanian Planning Scheme – Burnie Local Provisions Schedule), Figure 23. A “General Residential” zone exists on the eastern boundary of the site. Further to the south of the site a “Agricultural” zone is present. As part of the proposed development, the site will be rezoned as a “General Residential zone.

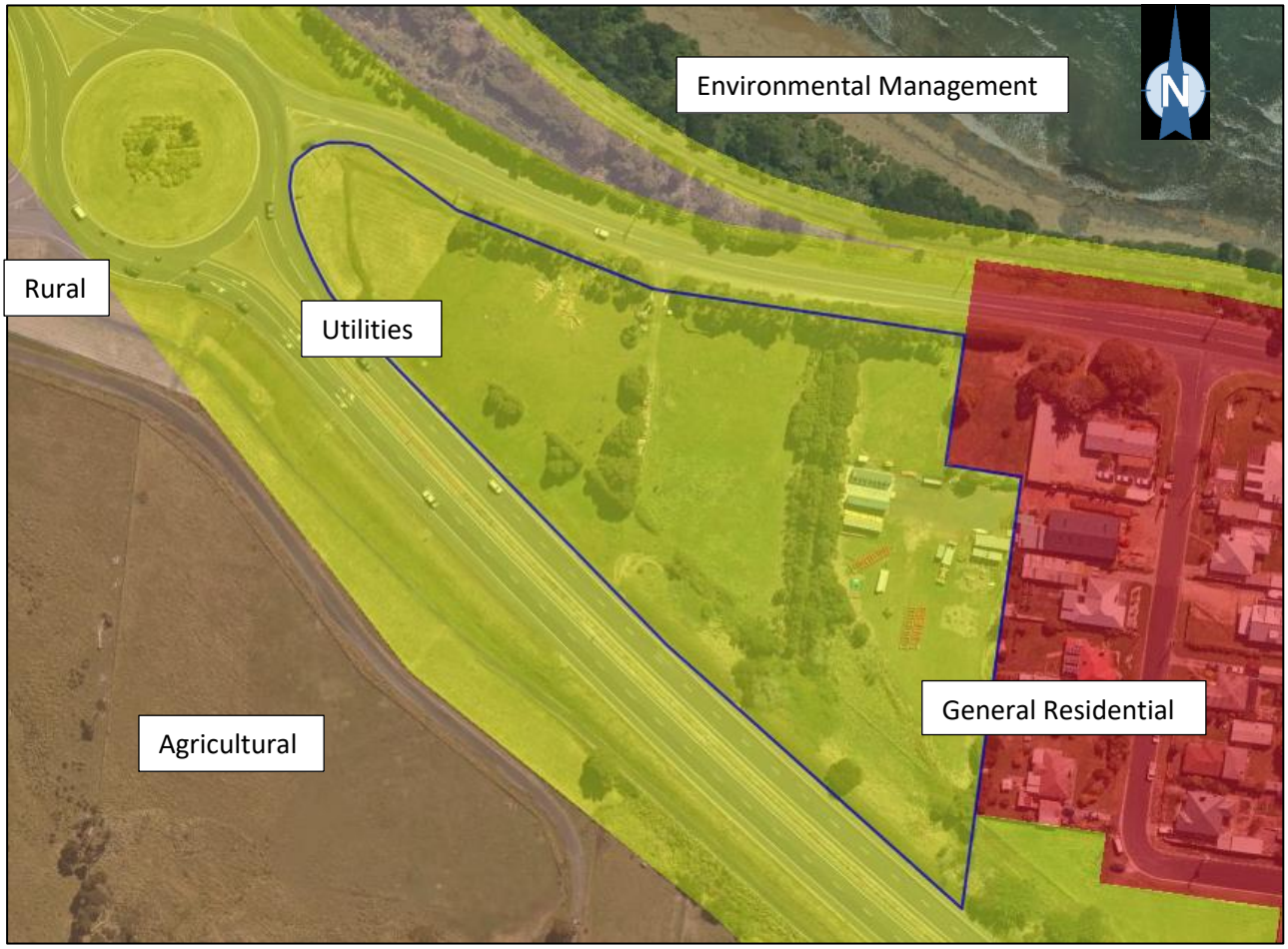

Figure 2: Zoning

6 Site Description

The subject site is listed as a utility zone at Sulphur Creek, Tasmania located north of the Bass Highway, which runs along the southern boundary. The site has an area of 21,700 m^2 and is currently grassland with small tree communities present. Approximately 5,230 m2 is being leased by a neighbouring business and is being used as a storage area/ semi-rigid trailer service area.

7 Geology, Hydrology and Hydrogeology

7.1 Topography

Site visits and a review of Google Earth indicates the local topography is relatively flat, with an average elevation of 2 m. The site has a northern aspect. Minor modifications will likely be made to topography including construction of drainage lines and stormwater redirection.

7.2 Surface Water

The closest major surface water body, Bass Strait, is situated to the north and is located less than 100 metres from the site. There are multiple small drains running across the site which are directed toward stormwater.

7.3 Regional Geology

The regional geology of the site consists of predominantly of older aeolian sands of coastal plain. (Calver *et al.*, 2010)

7.4 Regional Hydrogeology

Based on the topography and elevation contours of the greater area, groundwater is likely to flow north toward Bass Strait. A representation of likely groundwater flow direction according to changes in topography is presented as Figure 4.

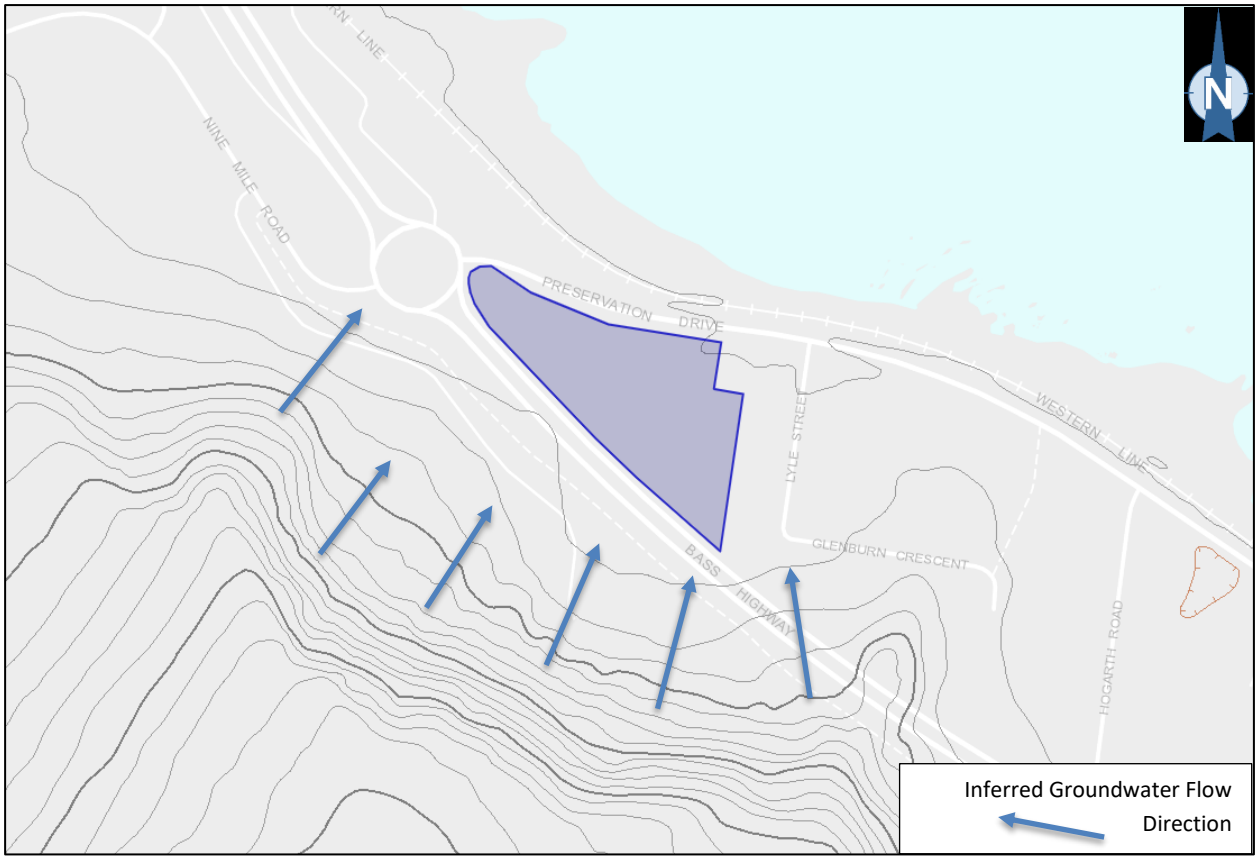

Figure 3: Inferred Groundwater Flow Direction

7.5 Acid Sulphate Soils

Review of the LIST (Land Information System Tasmania) indicates that the site has "Low" potential for acid sulphate soils based on geology and soil type of the site. Based on this, no management for acid sulphate soils is required.

8 Site History

The following information has been reviewed to determine the historical land use and assess the likelihood of potentially contaminating activities occurring on the site:

- WorkSafe Tasmania Dangerous Goods Records;
- Historical aerial photographs

8.1 WorkSafe Tasmania Dangerous Goods Licenses

A search of the Historic WorkSafe Tasmania Dangerous Goods Licenses information was conducted. WorkSafe Tasmania did not contain any dangerous good records for the site.

A review of The LIST contaminated sites in Tasmania found that there were no contaminated sites in close proximity to the subject site.

8.2 Historical Aerial photography

A review of historical aerial photographs available on the Land Tasmania Aerial Photo Viewer was undertaken to identify any historical potentially contaminating land uses in the area. Photos from 1946, 1976, 1997, 1998 and 2023 are shown in Figures 4-8 below.

Figure 4: Aerial 1946 (Source: Land Aerial Photo Viewer)

Figure 5: Aerial 1976 (Source: Land Aerial Photo Viewer)

Figure 6: Aerial 1997 (Source: Land Aerial Photo Viewer)

Figure 7: Aerial 1998 (Source: Land Aerial Photo Viewer)

Figure 8: Aerial 2023 (Source: Land Aerial Photo Viewer)

9 Site History Summary

A summary of aerial photos is provided in table 2.

Table 2: Aerial Photography Summary

Date	Description
1946	1946 is the earliest year aerial photography is clearly available for the site. The site appears to be used as farmland. The land is mostly grassland with some trees present. Glenburn Cresent has not yet been developed.
1976	The site is still being used as farmland in 1976. Some trees have been removed and a driveway has been installed. Glenburn Crescent has been developed adjacent to the site now.
1997	Works have been carried out on the current southern boundaries of the site and groundwork for the Howth Roundabout and new Bass Highway are in progress. The land would no longer be used as farmland and instead would have been purchased by the state government as crown land.
1998	Development around the site appears to have finished. The site now resembles its current shape. A single shed is present on the site and may indicate when the current leasee started using the site for storage purposes.
2023	The site still remains undeveloped and consists of mostly grassland and trees. Storage of equipment and gear from the neighbouring business has increased significantly.

10 Site Visit

A site inspection by Environmental Service and Design was conducted on January 23rd, 2024. Site photographs are provided below in figures 9-13.

11 Potential Site Contamination

11.1 Onsite sources

The site has not been previously developed. Prior to becoming Crown Land, it appears to have been used for agriculture. Currently the easternmost section is being used as a storage area and semi-trailer service area for an engineering workshop. No trucks or diesel-powered equipment are serviced on site. No fuel staining of the ground was observed during the site visit.

Contaminates which can be associated with workshops, similar to what is seen on the subject site, are heavy metals and petroleum hydrocarbons (TPH, TRH, PAH and BTEXN).

Figure 9: Storage Area

Figure 10: Tire Storage Area

Figure 11: Inside trailer service area

11.2 Offsite Sources

11.2.1 Dazeley Engineering

Adjacent to the site is the welding and manufacturing workshop which leases a section of the site. Semi-trailers are manufactured on site and servicing of trailers is conducted next door on the subject site. No trucks or diesel-powered equipment are serviced on site. There is an above ground fuel tank and fuel trailer located on site. Concrete below the fixed standing fuel tank is in poor condition which exposes local groundwater to risk of contamination from spillage. However, there was minimal fuel staining observed on the concrete below the tank.

Contaminates which can be associated with workshops are heavy metals and petroleum hydrocarbons (TPH, TRH, PAH and BTEXN). These same contaminates also apply to fuel storage systems, such as the fuel trailer and above ground fuel tank observed on site.

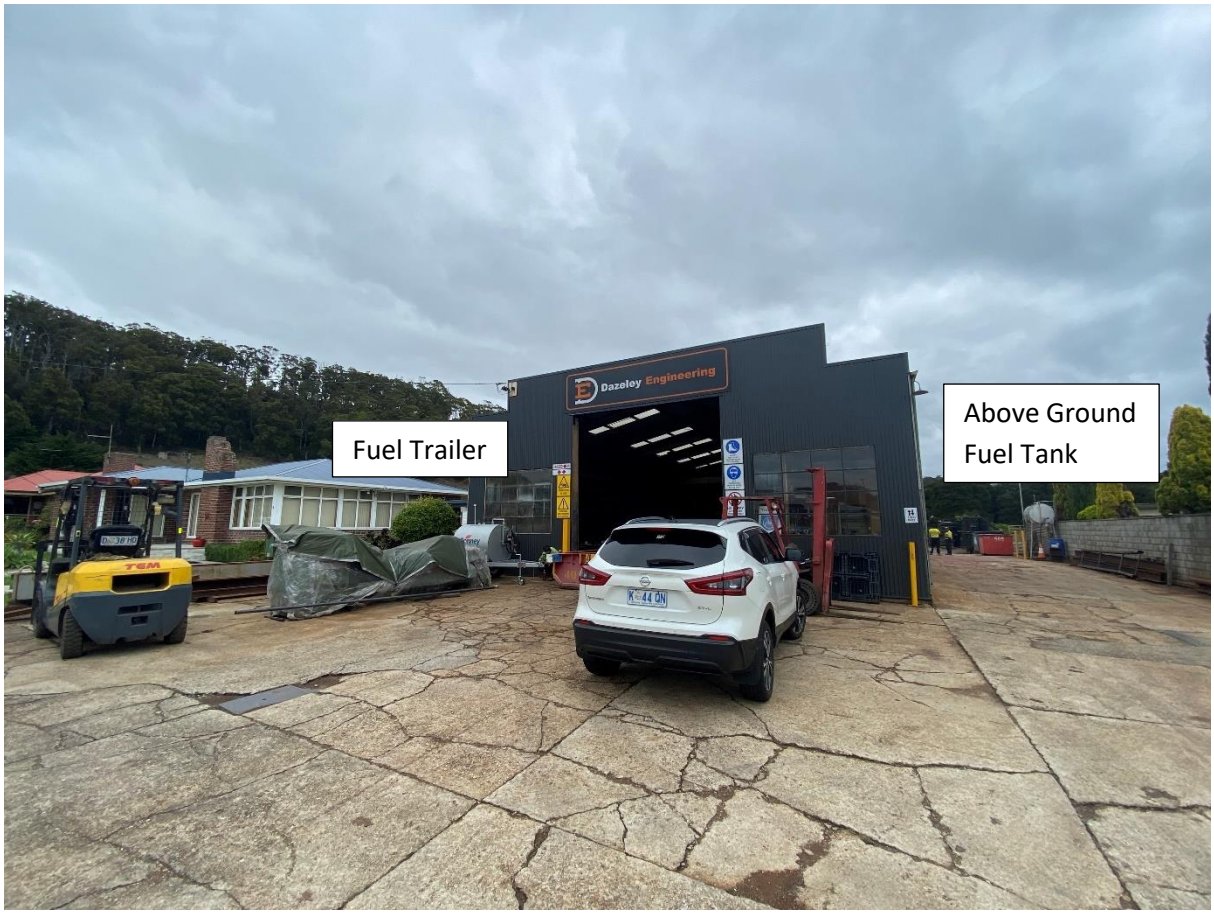

Figure 12: Dazeley Engineering

Figure 13: Fuel storage tank on broken concrete slab

12 Potential Receptors

A final Conceptual Site Model (CSM) (Table 3) was developed after consideration of risks to potential human and ecological receptors as outlined below.

12.1 Human Health

Risks to human health from hydrocarbon contamination can arise via the inhalation route when people are exposed to vapours for extended periods, including from vapour intrusion into built spaces, and/or by direct contact with contaminated soil, surface water or groundwater (e.g., ingestion, dermal contact, ocular or oral exposure). Vapour risk is of most concern when built spaces are constructed directly over contamination plumes. Earthworks and development of the site will increase the risk of dermal contact with potentially contaminated soil to subsurface workers as well as other future site users.

Future workers involved in the construction of the development were considered in the preliminary CSM, along with subsurface workers and future commercial/industrial site users.

12.2 Ecological Receptors

Due to the proximity of Bass Strait to the site, there is a likely risk to ecological receptors. This would arise from any potential contaminants in surface runoff from the site entering waterways and being transported from the site.

13 Results

During the site visit, judgmental sampling was undertaken in four locations around the work area of the site. A field duplicate was also taken for quality assurance and quality control purposes. The sampling plan is shown below in figure 14. Results from soil sampling are shown in Table 3 and water sampling results are displayed in Table 4.

Figure 14: Sample plan

Table 3: 23/01/2023 Soil sampling results

Laboratory Report EM2401069			Sample Points			
Analyte grouping/Analyte	Units	Limit of Reporting (LOR)	Internal Drain Line	West of Mechanical Shed	FD	NEPM 2013 Residential A HIL
EA055: Moisture Content (Dried @ 105-110Â°C)						
Moisture Content	%	1	12.4	29.5	27.9	
EG005(ED093)T: Total Metals by ICP-AES						
Arsenic	mg/kg	5	<5	<5	<5	100
Barium	mg/kg	10	100	240	210	
Beryllium	mg/kg	1	<1	<1	<1	60
Boron	mg/kg	50	<50	<50	<50	4500
Cadmium	mg/kg	1	<1	<1	<1	20
Chromium	mg/kg	2	19	56	66	
Cobalt	mg/kg	2	20	14	12	100
Copper	mg/kg	5	28	60	38	6000
Lead	mg/kg	5	26	38	25	300
Manganese	mg/kg	5	279	105	101	3800
Nickel	mg/kg	2	8	28	35	400
Selenium	mg/kg	5	<5	<5	<5	200
Vanadium	mg/kg	5	12	40	52	
Zinc	mg/kg	5	96	190	140	7400
EG035T: Total Recoverable Mercury by FIMS						
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	40
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons						
Naphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	<0.5	
Acenaphthene	mg/kg	0.5	<0.5	<0.5	<0.5	
Fluorene	mg/kg	0.5	<0.5	<0.5	<0.5	
Phenanthrene	mg/kg	0.5	<0.5	<0.5	<0.5	
Anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	
Chrysene	mg/kg	0.5	<0.5	<0.5	<0.5	
Benzo(b+j)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	
Dibenz(a.h)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	
Benzo(g.h.i)perylene	mg/kg	0.5	<0.5	<0.5	<0.5	
Sum of polycyclic aromatic hydrocarbons	mg/kg	0.5	<0.5	<0.5	<0.5	300
Benzo(a)pyrene TEQ (zero)	mg/kg	0.5	<0.5	<0.5	<0.5	3
Benzo(a)pyrene TEQ (half LOR)	mg/kg	0.5	0.6	0.6	0.6	3
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	1.2	1.2	1.2	3
EP080/071: Total Petroleum Hydrocarbons						
C6 - C9 Fraction	mg/kg	10	<10	<10	<10	
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	
C15 - C28 Fraction	mg/kg	100	300	<100	<100	
C29 - C36 Fraction	mg/kg	100	420	<100	<100	
C10 - C36 Fraction (sum)	mg/kg	50	720	<50	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						
C6 - C10 Fraction	mg/kg	10	<10	<10	<10	
C6 - C10 Fraction minus BTEX (F1)	mg/kg	10	<10	<10	<10	45
>C10 - C16 Fraction	mg/kg	50	<50	<50	<50	
>C16 - C34 Fraction	mg/kg	100	610	<100	<100	
>C34 - C40 Fraction	mg/kg	100	190	<100	<100	
>C10 - C40 Fraction (sum)	mg/kg	50	800	<50	<50	
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50	<50	<50	<50	110
EP080: BTEXN						
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	0.5
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	160
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	55
meta- & para-Xylene	mg/kg	0.5	<0.5	<0.5	<0.5	
ortho-Xylene	mg/kg	0.5	<0.5	<0.5	<0.5	
Total Xylenes	mg/kg	0.5	<0.5	<0.5	<0.5	40
Sum of BTEX	mg/kg	0.2	<0.2	<0.2	<0.2	
Naphthalene	mg/kg	1	<1	<1	<1	3

Table 4: 23/01/2024 Surface water results

Laboratory Report EM2401069			Sample Points		ANZECC 2000 Guidelines 95% Protection
Analyte grouping/Analyte	Units	Limit of Reporting (LOR)	U/S	D/S	
EG020T: Total Metals by ICP-MS					
Arsenic	mg/L	0.001	0.002	<0.001	
Beryllium	mg/L	0.001	<0.001	<0.001	
Barium	mg/L	0.001	0.012	0.009	
Cadmium	mg/L	0.0001	<0.0001	<0.0001	0.0002
Chromium	mg/L	0.001	0.003	0.001	
Cobalt	mg/L	0.001	0.004	0.002	
Copper	mg/L	0.001	**0.007**	**0.005**	0.0014
Lead	mg/L	0.001	0.002	0.001	0.0034
Manganese	mg/L	0.001	0.445	0.4	1.9
Nickel	mg/L	0.001	**0.019**	0.009	0.0011
Selenium	mg/L	0.01	<0.01	<0.01	0.011
Vanadium	mg/L	0.01	<0.01	<0.01	
Zinc	mg/L	0.005	**0.02**	**0.014**	0.008
Boron	mg/L	0.05	<0.05	<0.05	0.37
Mercury	mg/L	0.0001	<0.0001	<0.0001	0.0006
Polynuclear Aromatic Hydrocarbons					
Naphthalene	µg/L	1	<1.0	<1.0	16
Acenaphthylene	µg/L	1	<1.0	<1.0	
Acenaphthene	µg/L	1	<1.0	<1.0	
Fluorene	µg/L	1	<1.0	<1.0	
Phenanthrene	µg/L	1	<1.0	<1.0	
Anthracene	µg/L	1	<1.0	<1.0	
Fluoranthene	µg/L	1	<1.0	<1.0	
Pyrene	µg/L	1	<1.0	<1.0	
Benz(a)anthracene	µg/L	1	<1.0	<1.0	
Chrysene	µg/L	1	<1.0	<1.0	
Benzo(b+j)fluoranthene	µg/L	1	<1.0	<1.0	
Benzo(k)fluoranthene	µg/L	1	<1.0	<1.0	
Benzo(a)pyrene	µg/L	0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	µg/L	1	<1.0	<1.0	
Dibenz(a.h)anthracene	µg/L	1	<1.0	<1.0	
Benzo(g.h.i)perylene	µg/L	1	<1.0	<1.0	
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5	<0.5	<0.5	
Benzo(a)pyrene TEQ (zero)	µg/L	0.5	<0.5	<0.5	
EP080/071: Total Petroleum Hydrocarbons	µg/L				
C6 - C9 Fraction	µg/L	20	<20	<20	
C10 - C14 Fraction	µg/L	50	<50	<50	
C15 - C28 Fraction	µg/L	100	<100	150	
C29 - C36 Fraction	µg/L	50	<50	<50	
C10 - C36 Fraction (sum)	µg/L	50	<50	150	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions	µg/L				
C6 - C10 Fraction	µg/L	20	<20	<20	
C6 - C10 Fraction minus BTEX (F1)	µg/L	20	<20	<20	
>C10 - C16 Fraction	µg/L	100	<100	<100	
>C16 - C34 Fraction	µg/L	100	<110	160	
>C34 - C40 Fraction	µg/L	100	<100	<100	
>C10 - C40 Fraction (sum)	µg/L	100	<100	160	
>C10 - C16 Fraction minus Naphthalene (F2)	µg/L	100	<100	<100	
EP080: BTEXN	µg/L				
Benzene	µg/L	1	<1	<1	950
Toluene	µg/L	2	<2	<2	
Ethylbenzene	µg/L	2	<2	<2	
meta- & para-Xylene	µg/L	2	<2	<2	
ortho-Xylene	µg/L	2	<2	<2	350
Total Xylenes	µg/L	2	<2	<2	
Sum of BTEX	µg/L	1	<1	<1	
Naphthalene	µg/L	5	<5	<5	16

14 Sampling QA/QC

Samples were analysed by ALS Laboratory located in Springvale, Victoria. ALS is National Association of Testing Authorities (NATA) certified for the analyses completed and supplies comprehensive QC reports with each COA. QC reports are appended with the COA.

Field duplicates to be collected and analysed at a rate of 1 in every 20 primary samples. Normal cleaning of equipment and rinsing occurred. Duplicated samples to be labelled so as to conceal their relationship to the primary sample from the laboratory. Techniques used to prevent cross contamination of samples and ensure the integrity of samples were as follows:

- use of calibrated field instruments (water probe);
- individual samples were collected by hand with single use disposable nitrile gloves;
- soil samples were packed into jars ensuring no headspace remained, in accordance with AS/NZS 4482.1 :2005;
- Surface water samples were collected in accordance with AS/NZS 5667.1 :1998;
- each soil and surface water sample was rapidly collected into ALS supplied analyte appropriate bottles, individually labelled, placed in an esky with freezer packs and despatched for overnight delivery to the laboratory with an accompanying chain of custody document

RPD limits were calculated using ALS Laboratory's LOR-based method so the lab and field duplicates can be comparable. RPD limit rules are given in Table 5. Table 6 shows field duplicate results. There were no RPD exceedances. Based on the QC results the laboratory data is valid for the purposes of the assessment.

Table 5: ALS RPD Limits

Result	***RPD Limit***
<10x LOR	No limit
10X – 20X LOR	50%
>20x LOR	20%

Table 6: RPD Duplicate Analysis

Laboratory Report No.	EM2401069				
Sample Details	LOR	West of Mechanical Shed	FD	RPD%	RPD Limit
Parameter		mg/kg			
Arsenic	5	<5	<5		
Barium	10	240	210	3.333333	**20%**
Beryllium	1	<1	<1		
Boron	50	<50	<50		
Cadmium	1	<1	<1		
Chromium	2	56	66	-4.09836	**20%**
Cobalt	2	14	12		
Copper	5	60	38	11.22449	**50%**
Lead	5	38	25	10.31746	**50%**
Manganese	5	105	101	0.970874	**20%**
Nickel	2	28	35	-5.55556	**50%**
Selenium	5	<5	<5		
Vanadium	5	40	52	-6.52174	**50%**
Zinc	5	190	140	7.575758	**20%**
Mercury	0.1	<0.1	<0.1		
Naphthalene	0.5	<0.5	<0.5		
Acenaphthylene	0.5	<0.5	<0.5		
Acenaphthene	0.5	<0.5	<0.5		
Fluorene	0.5	<0.5	<0.5		
Phenanthrene	0.5	<0.5	<0.5		
Anthracene	0.5	<0.5	<0.5		
Fluoranthene	0.5	<0.5	<0.5		
Pyrene	0.5	<0.5	<0.5		
Benz(a)anthracene	0.5	<0.5	<0.5		
Chrysene	0.5	<0.5	<0.5		
Benzo(b+j)fluoranthene	0.5	<0.5	<0.5		
Benzo(k)fluoranthene	0.5	<0.5	<0.5		
Benzo(a)pyrene	0.5	<0.5	<0.5		
Indeno(1.2.3.cd)pyrene	0.5	<0.5	<0.5		
Dibenz(a.h)anthracene	0.5	<0.5	<0.5		
Benzo(g.h.i)perylene	0.5	<0.5	<0.5		
Sum of polycyclic aromatic hydrocarbons	0.5	<0.5	<0.5		
Benzo(a)pyrene TEQ (zero)	0.5	<0.5	<0.5		
Benzo(a)pyrene TEQ (half LOR)	0.5	0.6	0.6	0	No Limit
Benzo(a)pyrene TEQ (LOR)	0.5	1.2	1.2	0	No Limit
C6 - C9 Fraction	10	<10	<10		
C10 - C14 Fraction	50	<50	<50		
C15 - C28 Fraction	100	<100	<100		
C29 - C36 Fraction	100	<100	<100		
C10 - C36 Fraction (sum)	50	<50	<50		
C6 - C10 Fraction	10	<10	<10		
C6 - C10 Fraction minus BTEX (F1)	10	<10	<10		
>C10 - C16 Fraction	50	<50	<50		
>C16 - C34 Fraction	100	<100	<100		
>C34 - C40 Fraction	100	<100	<100		
>C10 - C40 Fraction (sum)	50	<50	<50		
>C10 - C16 Fraction minus Naphthalene (F2)	50	<50	<50		
Benzene	0.2	<0.2	<0.2		
Toluene	0.5	<0.5	<0.5		
Ethylbenzene	0.5	<0.5	<0.5		
meta- & para-Xylene	0.5	<0.5	<0.5		
ortho-Xylene	0.5	<0.5	<0.5		
Total Xylenes	0.5	<0.5	<0.5		
Sum of BTEX	0.2	<0.2	<0.2		

15 Discussion

Results for soil samples collected during the site visit on 23/1/2024 are displayed in Table 4. Results were compared to guidelines as set out in the NEPM 2013, Table 1A – Schedule B1. As the proposed development is residential housing, health investigation levels for soil contaminates (HIL) – Residential A was selected for the assessment. The results from soil sampling detected no exceedances of the HIL – Residential A guidelines.

Results for surface water samples taken on 23/01/2024, are displayed in Table 5 and were compared to the ANZECC 2000 Guidelines – Trigger values for freshwater for 95% protection of species. The results show that there were exceedances for copper and zinc in both upstream and downstream samples collected and an exceedance in the upstream sample for nickel. The results also show that for all metallic analytes which returned results above the limit of reporting, concentrations were lower in the downstream sample than in the upstream sample. The upstream sample was taken on the upgradient boundary of the site and indicative of the quality of water entering the site. Based on the trends reflected in the results, exceedances in copper, zinc and nickel, exceedances appear to not originate onsite, and rather have been transported from offsite and possibly background.

F1 and F2 hydrocarbon fractions were below the limit of reporting in both soil and surface water sample, as were volatile organic compounds (BTEXN). Polynuclear aromatic hydrocarbons (PAH) were also found to be less than the limit of reporting.

15.1 Conceptual Site Model

Table 7: Final Conceptual Site Model

Contamination Source	COPC	Pathway	Receptor
Mechanical Workshop (Onsite)	• Total Petroleum Hydrocarbons (TPH) • Total Recoverable Hydrocarbons (TRH) • BTEX • PAH's • Phenols • Heavy Metals	**VAPOUR PATHWAY – CoPC are below the analytical limit of reporting. RISK IS ACCEPTABLE.** **DERMAL CONTACT - CoPC are below the analytical limit of reporting. RISK IS ACCEPTABLE.**	• Future occupants • Subsurface workers • Surrounding environment
Mechanical Workshop (Offsite) and above ground Fuel storage tank	• Total Petroleum Hydrocarbons (TPH) • Total Recoverable Hydrocarbons (TRH) • BTEX • PAH's • Phenols	**GROUNDWATER INTRUSION – Source site is not upgradient from site and no pathway is present for potentially contaminated groundwater to enter site. RISK IS ACCEPTABLE.**	• Future occupants • Subsurface workers • Surrounding environment

16 Conclusions and Recommendations

Environmental Service and Design (ES&D) were commissioned by their client, Homes Tasmania, to conduct an Environmental Site Assessment for the proposed development at Preservation Drive on crown land (Property ID: 0, Title Reference: 123065/3).

The results of the environmental site assessment, based on the site visit, site history, soil and water sampling and desktop assessment (including a search of WorkSafe Dangerous Goods Records) indicated that potentially contaminating activities have occurred on the site.

Additionally, offsite sources which may pose a risk to receptors at the site include mechanical workshop adjacent to the site at 2 Lyle Street, Sulphur Creek.

Based on the analytical results, a CSM was constructed and is shown in Table 7. A risk assessment was then conducted according to the principles and methodology contained within the NEPM. The results of the NEPM based risk-assessment found that there is an acceptable risk to human health and environmental receptors for the development to proceed.

An assessment by a suitable qualified person found that potentially contaminating activities that occurred on the site or nearby offsite did not cause contamination on the site. Thus, in response to planning requirement the risk is acceptable, and the site is suitable for the proposed development. No management measures are required for excavation on the site.

Yours sincerely,

Rod Cooper BSc., CEnvP Site Contamination

Principal Consultant ES&D

17 Limitations

ES&D has prepared this report in accordance with the care and thoroughness of the consulting profession for Homes Tasmania. It was based on accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined.

This report was prepared in February 2024 and is based on the conditions encountered and information reviewed at the time of preparation. ES&D disclaims the responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for any use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice.

Subsurface conditions can vary across a site and cannot be explicitly defined by these investigations. It is unlikely therefore that the results and estimations expressed in this report will represent the extreme conditions within the site.

The information in this report is accurate at the date of issue and is in accordance with conditions at the site at the dates sampled.

This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of the report.

No warranty or guarantee of property conditions is given or intended.

References

Tasmanian Planning Scheme Burnie Local Provisions Schedule 2020

National Environmental Protection (Assessment of Site Contamination) Measure, *Guideline on the Investigation Levels for Soil and Groundwater*, Schedule B (1), (1999) as amended 2013

Land Information System Tasmania (the List): www.thelist.tas.gov.au

Department of Primary Industries, Parks, Water and Environment (DPIPWE) Groundwater Information Access Portal: http://wrt.tas.gov.au/groundwater-info/

Calver, C.R., Everard, J.L., Green, D.C., Seymour, D.B., Stevenson, M.D. and Vicary, M.J. (compilers) 2010: Map 3, Burnie − Geology. Tasmanian Landslide Map Series. Mineral Resources Tasmania, Department of Infrastructure Energy and Resources, Hobart.

Appendices

Appendix 1 – NATA Laboratory Results

CERTIFICATE OF ANALYSIS

Work Order	: **EM2401069**	Page	: 1 of 9
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: SAMUEL SMITH	Contact	: Hannah White
Address	: 74 Minna Road Heybridge	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6431 2999	Telephone	: +61-3-8549 9600
Project	: 9126 Contamination Assessment - Howth Roundabout	Date Samples Received	: 24-Jan-2024 11:30
Order number	: ----	Date Analysis Commenced	: 29-Jan-2024
C-O-C number	: ----	Issue Date	: 01-Feb-2024 17:20
Sampler	: S.S		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG035T: EM2401008-002 shows poor matrix spike recovery for Mercury due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EG005-T : EM2401069 #4 and #5 results for total metals have been confirmed by re-digestion and re-analysis.
- EP071: EM2401069_001 >C16-C34 Fraction has LOR raised due to laboratory background.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Internal Drain Line	West of Mechanical Shed	FD	----	----
				Sampling date / time	23-Jan-2024 11:42	23-Jan-2024 11:48	23-Jan-2024 12:00	----	----
Compound	CAS Number	LOR	Unit		EM2401069-003	EM2401069-004	EM2401069-005	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**12.4**	**29.5**	**27.9**	**----**	**----**
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	**----**	**----**
Barium	7440-39-3	10	mg/kg		**100**	**240**	**210**	**----**	**----**
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	**----**	**----**
Boron	7440-42-8	50	mg/kg		<50	<50	<50	**----**	**----**
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	**----**	**----**
Chromium	7440-47-3	2	mg/kg		**19**	**56**	**66**	**----**	**----**
Cobalt	7440-48-4	2	mg/kg		**20**	**14**	**12**	**----**	**----**
Copper	7440-50-8	5	mg/kg		**28**	**60**	**38**	**----**	**----**
Lead	7439-92-1	5	mg/kg		**26**	**38**	**25**	**----**	**----**
Manganese	7439-96-5	5	mg/kg		**279**	**105**	**101**	**----**	**----**
Nickel	7440-02-0	2	mg/kg		**8**	**28**	**35**	**----**	**----**
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	**----**	**----**
Vanadium	7440-62-2	5	mg/kg		**12**	**40**	**52**	**----**	**----**
Zinc	7440-66-6	5	mg/kg		**96**	**190**	**140**	**----**	**----**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	**----**	**----**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Internal Drain Line	West of Mechanical Shed	FD	----	----
				Sampling date / time	23-Jan-2024 11:42	23-Jan-2024 11:48	23-Jan-2024 12:00	----	----
Compound	CAS Number	LOR	Unit		EM2401069-003	EM2401069-004	EM2401069-005	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		**300**	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		**420**	<100	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		**720**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		**610**	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		**190**	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**800**	<50	<50	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Internal Drain Line	West of Mechanical Shed	FD	----	----
				Sampling date / time	23-Jan-2024 11:42	23-Jan-2024 11:48	23-Jan-2024 12:00	----	----
Compound	CAS Number	LOR	Unit		EM2401069-003	EM2401069-004	EM2401069-005	--------	--------
					Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		85.4	97.3	90.7	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		89.0	99.2	92.9	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		90.5	98.0	91.4	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		92.1	96.9	92.6	----	----
Anthracene-d10	1719-06-8	0.5	%		114	113	106	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		105	113	104	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		103	116	86.5	----	----
Toluene-D8	2037-26-5	0.2	%		70.6	84.4	59.1	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		86.0	104	68.9	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	U/S	D/S	----	----	----
				Sampling date / time	23-Jan-2024 12:05	23-Jan-2024 11:55	----	----	----
Compound	CAS Number	LOR	Unit		EM2401069-001	EM2401069-002	--------	--------	--------
					Result	Result	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.012**	**0.009**	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L		**0.004**	**0.002**	----	----	----
Chromium	7440-47-3	0.001	mg/L		**0.003**	**0.001**	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.007**	**0.005**	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.445**	**0.400**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.019**	**0.009**	----	----	----
Lead	7439-92-1	0.001	mg/L		**0.002**	**0.001**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.020**	**0.014**	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	U/S	D/S	----	----	----
				Sampling date / time	23-Jan-2024 12:05	23-Jan-2024 11:55	----	----	----
Compound	CAS Number	LOR	Unit		EM2401069-001	EM2401069-002	--------	--------	--------
					Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	**150**	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	**150**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<110	**160**	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	**160**	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	U/S	D/S	----	----	----
				Sampling date / time	23-Jan-2024 12:05	23-Jan-2024 11:55	----	----	----
Compound	CAS Number	LOR	Unit		EM2401069-001	EM2401069-002	--------	--------	--------
					Result	Result	----	----	----
EP080: BTEXN - Continued									
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**38.3**	**36.8**	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		**65.5**	**65.2**	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		**102**	**109**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**86.6**	**86.3**	----	----	----
Anthracene-d10	1719-06-8	1.0	%		**96.9**	**98.5**	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		**82.4**	**84.4**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**106**	**112**	----	----	----
Toluene-D8	2037-26-5	2	%		**94.4**	**103**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**104**	**108**	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

QUALITY CONTROL REPORT

Work Order	: **EM2401069**	Page	: 1 of 13
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: SAMUEL SMITH	Contact	: Hannah White
Address	: 74 Minna Road Heybridge	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6431 2999	Telephone	: +61-3-8549 9600
Project	: 9126 Contamination Assessment - Howth Roundabout	Date Samples Received	: 24-Jan-2024
Order number	: ----	Date Analysis Commenced	: 29-Jan-2024
C-O-C number	: ----	Issue Date	: 01-Feb-2024
Sampler	: S.S		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC
* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5566817)									
EM2401008-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	16	16	0.0	0% - 50%
		EG005T: Barium	7440-39-3	10	mg/kg	760	730	4.7	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	2	2	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	71	70	0.0	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	23	23	0.0	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	575	568	1.2	0% - 20%
		EG005T: Copper	7440-50-8	5	mg/kg	2560	2540	1.2	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	13500	13400	1.0	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	97	96	1.7	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	19	19	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	6	6	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	3490	3450	1.1	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	90	90	0.0	No Limit
EM2401008-010	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	10	10	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	1080	1050	2.9	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	85	84	0.0	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	32	32	0.0	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	453	448	1.1	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5566817) - continued									
EM2401008-010	Anonymous	EG005T: Copper	7440-50-8	5	mg/kg	1700	1680	1.4	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	6620	6570	0.8	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	198	196	1.1	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	14	14	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	12	12	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	1780	1760	0.9	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	70	70	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5566783)									
EM2401008-001	Anonymous	EA055: Moisture Content	----	0.1	%	17.4	17.1	1.9	0% - 20%
EM2401068-001	Anonymous	EA055: Moisture Content	----	0.1 (1.0)*	%	3.9	4.2	7.3	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5566820)									
EM2401008-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	2.7	2.5	10.4	0% - 20%
EM2401008-010	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	1.2	1.5	17.4	0% - 50%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5568128)									
EM2400945-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2401069-003	Internal Drain Line	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5568128) - continued									
EM2401069-003	Internal Drain Line	EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5566455)									
EM2401068-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EM2401083-003	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5568129)									
EM2400945-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EM2401069-003	Internal Drain Line	EP071: C15 - C28 Fraction	----	100	mg/kg	300	290	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	420	390	6.3	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5566455)									
EM2401068-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EM2401083-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5568129)									
EM2400945-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EM2401069-003	Internal Drain Line	EP071: >C16 - C34 Fraction	----	100	mg/kg	610	580	4.6	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	190	180	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 5566455)									
EM2401068-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 5566455) - continued									
EM2401068-001	Anonymous	EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EM2401083-003	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020T: Total Metals by ICP-MS (QC Lot: 5572793)									
EM2400942-006	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0001	0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	0.020	0.021	5.2	0% - 50%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.025	0.028	8.9	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.010	0.010	0.0	0% - 50%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.103	0.111	7.8	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EM2400993-010	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 5572793) - continued									
EM2400993-010	Anonymous	EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5565558)									
EM2401017-009	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2401061-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5565097)									
EM2401017-002	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	<1.0	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5565095)									
EM2400988-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	440	410	5.4	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	80	60	27.5	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	80	80	0.0	No Limit
EM2401017-002	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	1190	1190	0.0	0% - 50%
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	470	480	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5569800)									
EM2401107-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EM2401069-002	D/S	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5565095)									
EM2400988-001	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	150	130	17.2	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	420	400	3.2	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5565095) - continued									
EM2401017-002	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	1520	1520	0.0	0% - 50%
		EP071: >C34 - C40 Fraction	----	100	µg/L	150	150	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5569800)									
EM2401107-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EM2401069-002	D/S	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5569800)									
EM2401107-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EM2401069-002	D/S	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5566817)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	123 mg/kg	104	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	102	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.67 mg/kg	107	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	75.6	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	116	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	101	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	103	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	99.6	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	590 mg/kg	101	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	111	70.0	130
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	61.3 mg/kg	104	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	162 mg/kg	83.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5566820)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.64 mg/kg	96.1	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5568128)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	104	85.7	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	107	81.0	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	106	83.6	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	104	81.3	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	106	79.4	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	108	81.7	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	108	78.3	124
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	107	79.9	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	109	76.9	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	110	80.9	130
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	115	70.0	121
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	101	80.4	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	109	70.2	123

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5568128) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	106	67.9	122
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	106	65.8	123
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	107	65.8	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5566455)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	93.8	58.6	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5568129)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	860 mg/kg	102	75.0	128
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2770 mg/kg	102	82.0	123
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1520 mg/kg	109	82.4	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5566455)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	92.8	59.3	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5568129)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1130 mg/kg	101	77.0	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3730 mg/kg	104	81.5	120
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	260 mg/kg	103	73.3	137
EP080: BTEXN (QCLot: 5566455)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	94.9	61.6	117
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	85.5	65.8	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	84.1	65.8	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	91.8	64.8	134
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	95.6	68.7	132
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	94.4	61.8	123

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 5572793)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	89.2	115
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	98.1	86.0	115
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	101	87.2	117
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.5	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.2	86.9	112
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	97.9	87.7	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.8	86.9	111

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 5572793) - continued								
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.9	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	100	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.0	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	100	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.4	86.7	117
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	98.7	89.3	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5565558)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	101	73.4	119
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5565097)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	95.2	42.8	114
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	93.3	48.6	119
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	96.0	47.0	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	93.1	49.5	119
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	100	49.4	121
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	90.9	48.4	122
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	93.4	50.3	124
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	101	50.0	126
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	95.9	49.4	127
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	91.6	48.7	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	98.2	54.5	134
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	91.6	56.1	134
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	96.0	55.6	135
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	101	54.4	126
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	105	54.5	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	97.2	54.4	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5565095)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4840 µg/L	105	47.2	122
EP071: C15 - C28 Fraction	----	100	µg/L	<100	15400 µg/L	113	52.9	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8450 µg/L	107	50.4	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5569800)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	88.7	66.2	134
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5565095)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5565095) - continued								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6590 µg/L	112	49.1	125
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	20400 µg/L	112	51.6	128
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	114	47.2	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5569800)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	93.8	66.2	132
EP080: BTEXN (QCLot: 5569800)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	97.4	68.8	127
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	95.6	72.9	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	95.7	71.7	130
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	95.4	72.3	136
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	98.8	75.9	134
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	98.0	68.3	131

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5566817)							
EM2401008-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	# Not Determined	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	108	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	97.7	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	# Not Determined	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	# Not Determined	80.0	120
		EG005T: Nickel	7440-02-0	50 mg/kg	96.9	78.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	# Not Determined	80.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5566820)							
EM2401008-002	Anonymous	EG035T: Mercury	7439-97-6	0.5 mg/kg	# 70.4	76.0	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5568128)							
EM2400950-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	104	77.2	116

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Acceptable Limits (%) Low	Acceptable Limits (%) High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5568128) - continued							
EM2400950-001	Anonymous	EP075(SIM): Pyrene	129-00-0	3 mg/kg	105	65.5	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5566455)							
EM2401068-002	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	75.9	33.4	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5568129)							
EM2400947-001	Anonymous	EP071: C10 - C14 Fraction	----	860 mg/kg	100	71.2	125
		EP071: C15 - C28 Fraction	----	2770 mg/kg	98.7	75.6	122
		EP071: C29 - C36 Fraction	----	1520 mg/kg	104	78.0	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5566455)							
EM2401068-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	72.4	30.8	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5568129)							
EM2400947-001	Anonymous	EP071: >C10 - C16 Fraction	----	1130 mg/kg	98.7	72.2	128
		EP071: >C16 - C34 Fraction	----	3730 mg/kg	99.2	76.5	119
		EP071: >C34 - C40 Fraction	----	260 mg/kg	101	66.8	138
EP080: BTEXN (QCLot: 5566455)							
EM2401068-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	95.0	54.4	127
		EP080: Toluene	108-88-3	2 mg/kg	84.3	57.1	131

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Acceptable Limits (%) Low	Acceptable Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 5572793)							
EM2400942-006	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	109	82.0	123
		EG020A-T: Beryllium	7440-41-7	1 mg/L	107	79.0	126
		EG020A-T: Barium	7440-39-3	1 mg/L	108	80.0	120
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	106	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	107	78.9	119
		EG020A-T: Cobalt	7440-48-4	1 mg/L	105	80.7	121
		EG020A-T: Copper	7440-50-8	1 mg/L	109	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	108	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	112	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	108	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	108	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	110	74.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5565558)							
EM2401017-010	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	106	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5565097)							
EM2401017-005	Anonymous	EP075(SIM): Acenaphthene	83-32-9	5 µg/L	101	39.3	123

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5565097) - continued							
EM2401017-005	Anonymous	EP075(SIM): Pyrene	129-00-0	5 µg/L	106	44.0	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5565095)							
EM2400988-002	Anonymous	EP071: C10 - C14 Fraction	----	4840 µg/L	97.7	48.0	126
		EP071: C15 - C28 Fraction	----	15400 µg/L	101	51.7	132
		EP071: C29 - C36 Fraction	----	8450 µg/L	99.6	50.5	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5569800)							
EM2401107-004	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	86.4	33.9	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5565095)							
EM2400988-002	Anonymous	EP071: >C10 - C16 Fraction	----	6590 µg/L	95.0	48.0	128
		EP071: >C16 - C34 Fraction	----	20400 µg/L	104	50.4	130
		EP071: >C34 - C40 Fraction	----	1500 µg/L	111	47.4	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5569800)							
EM2401107-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	85.8	34.0	122
EP080: BTEXN (QCLot: 5569800)							
EM2401107-004	Anonymous	EP080: Benzene	71-43-2	20 µg/L	110	56.3	133
		EP080: Toluene	108-88-3	20 µg/L	104	60.4	132

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2401069**	Page	: 1 of 8
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: SAMUEL SMITH	Telephone	: +61-3-8549 9600
Project	: 9126 Contamination Assessment - Howth Roundabout	Date Samples Received	: 24-Jan-2024
Site	: ----	Issue Date	: 01-Feb-2024
Sampler	: S.S	No. of samples received	: 5
Order number	: ----	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005(ED093)T: Total Metals by ICP-AES	EM2401008--002	Anonymous	**Arsenic**	7440-38-2	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	EM2401008--002	Anonymous	**Copper**	7440-50-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	EM2401008--002	Anonymous	**Lead**	7439-92-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	EM2401008--002	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG035T: Total Recoverable Mercury by FIMS	EM2401008--002	Anonymous	**Mercury**	7439-97-6	70.4 %	76.0-116%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
Internal Drain Line, FD	West of Mechanical Shed,	**23-Jan-2024**	**----**	----	**----**	**29-Jan-2024**	06-Feb-2024	✓
EG005(ED093)T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
Internal Drain Line, FD	West of Mechanical Shed,	**23-Jan-2024**	**30-Jan-2024**	21-Jul-2024	✓	**30-Jan-2024**	21-Jul-2024	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
Internal Drain Line, FD	West of Mechanical Shed,	**23-Jan-2024**	**30-Jan-2024**	20-Feb-2024	✓	**30-Jan-2024**	20-Feb-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**30-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	10-Mar-2024	✓
FD								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**29-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓
FD								
Soil Glass Jar - Unpreserved (EP071)								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**30-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	10-Mar-2024	✓
FD								
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080)								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**29-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓
FD								
Soil Glass Jar - Unpreserved (EP071)								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**30-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	10-Mar-2024	✓
FD								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
Internal Drain Line,	West of Mechanical Shed,	**23-Jan-2024**	**29-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓
FD								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)								
U/S,	D/S	**23-Jan-2024**	**31-Jan-2024**	21-Jul-2024	✓	**31-Jan-2024**	21-Jul-2024	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)								
U/S,	D/S	**23-Jan-2024**	**----**	----	**----**	**29-Jan-2024**	20-Feb-2024	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
U/S,	D/S	**23-Jan-2024**	**29-Jan-2024**	30-Jan-2024	✓	**31-Jan-2024**	09-Mar-2024	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
U/S,	D/S	**23-Jan-2024**	**29-Jan-2024**	30-Jan-2024	✓	**30-Jan-2024**	09-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
U/S,	D/S	**23-Jan-2024**	**31-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
U/S,	D/S	**23-Jan-2024**	**29-Jan-2024**	30-Jan-2024	✓	**30-Jan-2024**	09-Mar-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
U/S,	D/S	**23-Jan-2024**	**31-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
U/S,	D/S	**23-Jan-2024**	**31-Jan-2024**	06-Feb-2024	✓	**31-Jan-2024**	06-Feb-2024	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

Appendix D

Natural Values Assessment, ECOTas

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ABN 83 464 107 291

Homes Tasmania
ATTENTION: Lisa Nelson (Senior Project Officer, Land Supply)
Level 4 134 Macquarie Street
Hobart TAS 7000

23 December 2023

Dear Lisa

RE: Potential Housing Development Area
Howth Roundabout, Sulphur Creek

Preamble

Environmental Consulting Options Tasmania (herein ECO*tas*) was engaged by Communities Tasmania in 2021 to assess the natural values associated with a potential housing development area at the Howth Roundabout, Sulphur Creek, Tasmania, the findings of which were reported in:

> ECO*tas* (2021). *Natural Values Assessment of Potential Housing Development Area, Howth Roundabout, Sulphur Creek, Tasmania.* Report by Environmental Consulting Options Tasmania (ECO*tas*) for Housing, Disability & Community Services, Communities Tasmania, 15 November 2021.

Subsequent to this, Homes Tasmania has requested confirmation of the natural values findings and an opinion on whether an updated assessment is warranted.

Re-assessment

The assessment in 2021 was undertaken in full accordance with the *Guidelines for Natural Values Surveys – Terrestrial Development Proposals* (DPIPWE 2015).

I acknowledge that the *Guidelines* state:

> Survey reports are generally regarded as current for up to two years from the date of the field survey, provided no significant changes have occurred on or around the survey area and no new, relevant information has become available. Beyond two years, the information provided may be out of date and will usually need to be re-verified on the site.

In my opinion, these statements should be treated carefully and considered on a case-by-case merit basis. Previous versions of the *Guidelines* set the currency limit at three years, which was principally related to the currency of surveys for wedge-tailed eagle nests undertaken through the commercial wood production sector. When the three year eagle survey was reduced to two years, it appears the *Guidelines* also updated the "generally regarded as current" statement to

the same. In the case of the present proposal, there was no predicted eagle nesting habitat requiring assessment (ECO*tas* 2021) so this is moot.

In relation to other natural values, the two year currency limit should be considered in the context of land use and what changes have occurred. For example, in a two year period, no change to vegetation classification or condition is expected, except perhaps if a fire runs through the area. Similarly, there should be no expectation of novel threatened flora being present, again unless there has been some event that may stimulate such species to appear (e.g. fire and orchids).

In this case, I have driven past the assessment site on numerous occasions in the last two years, the last time on 24 November 2023 at which time I deliberately re-examined the site from vantage points on the roads on either side of the site.

Conclusion

It is very clear to me that there have been no material changes to the site since it was assessed and reported on in ECO*tas* (2021). On this basis, I find that there is no need for an updated natural values assessment and that the findings in ECO*tas* (2021) remain entirely valid.

Please do not hesitate to contact me further if additional information is required.

Kind regards

Mark Wapstra
Senior Scientist/Manager

NATURAL VALUES ASSESSMENT OF POTENTIAL HOUSING DEVELOPMENT AREA, HOWTH ROUNDABOUT, SULPHUR CREEK, TASMANIA

Environmental Consulting Options Tasmania (ECO*tas*) for Housing, Disability & Community Services, Communities Tasmania

15 November 2021

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CITATION

This report can be cited as:

ECO*tas* (2021). *Natural Values Assessment of Potential Housing Development Area, Howth Roundabout, Sulphur Creek, Tasmania.* Report by Environmental Consulting Options Tasmania (ECO*tas*) for Housing, Disability & Community Services, Communities Tasmania, 15 November 2021.

AUTHORSHIP

Field assessment: Brian French

Report production: Brian French, Mark Wapstra

Habitat and vegetation mapping: Brian French

Base data for mapping: LISTmap

Digital and aerial photography: Brian French, LISTmap

ACKNOWLEDGEMENTS

Jeff Krafft (Communities Tasmania) provided background information on the study area.

DISCLAIMER

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the author(s) and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report.

COVER ILLUSTRATION

View southeast across the study area.

Please note: the blank pages in this document are deliberate to facilitate double-sided printing.

CONTENTS

SUMMARY

General

Communities Tasmania engaged Environmental Consulting Options Tasmania (ECO*tas*) to undertake an assessment of the natural values associated with a potential development area for housing, Howth Roundabout, Sulphur Creek, primarily to ensure that the requirements of the identified ecological values are appropriately taken into account during further study planning under local, State and Commonwealth government approval protocols.

Site assessment

The study area was assessed by Brian French on 28 Oct. 2021.

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or Tasmanian *Threatened Species Protection Act 1995* (TSPA), are known from database information, or were detected as a consequence of field assessment, from the study area.

Threatened fauna

- No fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or Tasmanian *Threatened Species Protection Act 1995* (TSPA), are known from database information, or were detected as a consequence of field assessment, from the study area.
- Potential habitat is present for:
  - *Sarcophilus harrisii* (Tasmanian devil);
  - *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll);
  - *Dasyurus viverrinus* (eastern quoll);
  - *Perameles gunnii* subsp. *gunnii* (eastern barred bandicoot); and
  - *Astacopsis gouldi* (giant freshwater crayfish).

Vegetation types

- The study area supports the following TASVEG mapping units:
  - agricultural land (FAG);
  - permanent easements (FPE);
  - extra-urban miscellaneous (FUM); and
  - regenerating cleared land (FRG).
- These mapping units do not equate to threatened ecological communities listed on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act*

1999 and are not listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.

Weeds

- Two species classified as declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were detected from the study area.

Plant disease

- No evidence of plant disease (*Phytophthora cinnamomi*, rootrot fungus), myrtle wilt or myrtle rust was detected from the study area.

Animal disease (chytrid)

- The study area supports habitat only marginally conducive to the frog chytrid pathogen in the form of the constructed ephemeral drainage lines present.

Recommendations

The recommendations provided below are a summary of those provided in relation to each of the ecological features described in the main report. The main text of the report provides the relevant context for the recommendations. It is assumed that the phrasing below will be modified in planning documents for the study. It is essential that machinery operators and other contractors are made aware of the reasons for undertaking the recommended actions.

Weeds and plant disease

It is recommended that:

- management actions should aim to minimise the risk of distributing weed species to other parts of the municipality;
- vegetation debris and topsoil be treated as "contaminated" with weed propagules and managed accordingly, which may include on- or off-site disposal; and
- if off-site disposal is undertaken, this will need to be in accordance with municipal regulations and the provisions of the Tasmanian *Weed Management Act 1999* in relation to declared weeds.

Legislation and policy

No formal referral to the relevant Commonwealth government agency under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* should be required.

A permit under the Tasmanian *Threatened Species Protection Act 1995* is not required.

It is assumed a development application will be required to be prepared under the provisions of the *Tasmanian Planning Scheme – Central Coast*.

INTRODUCTION

Purpose

Communities Tasmania engaged Environmental Consulting Options Tasmania (ECO*tas*) to undertake an assessment of the natural values associated with a potential development area for housing, Howth Roundabout, Sulphur Creek, primarily to ensure that the requirements of the identified ecological values are appropriately taken into account during further study planning under local, State and Commonwealth government approval protocols.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species (under the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant and animal disease management issues;
- weed management issues; and
- a discussion of some of the policy and legislative implications of the identified ecological values.

This report follows the government-produced *Guidelines for Natural Values Surveys – Terrestrial Development Proposals* (DPIPWE 2015) in anticipation that the report (or extracts of it) may be used as part of various approval processes that may be required for works at the site.

The report format should also be applicable to other assessment protocols as required by the Commonwealth Department of Agriculture, Water and the Environment (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*), and under the local planning scheme (*Tasmanian Planning Scheme – Central Coast*).

Limitations

The ecological assessment was undertaken on 28 Oct. 2021. Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason. However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording most species present (particularly those of conservation significance). Late spring and into summer is usually regarded as the most suitable period to undertake most botanical assessments. While some species have more restricted flowering periods, a discussion of the potential for the site to support these is presented.

The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded. However, a consideration is made of threatened species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence.

Surveys for threatened fauna were practically limited to an examination of "potential habitat" (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs.

Permit

Any plant material was collected under DPIPWE permits TFL 21138 (in the names of Mark Wapstra & Brain French). Relevant data will be entered into DPIPWE's *Natural Values Atlas* database by the authors. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

No vertebrate or invertebrate material was collected. A permit is not needed to undertake habitat-level surveys of the type indicated.

STUDY AREA

The study area occurs at Howth Roundabout (refer Figures 1 & 2). The area is bound by the Bass Highway to the south, Preservation Drive to the north and the residential area of Sulphur Creek to the east.

The study area is Crown land and is entirely zoned as Utilities under the *Tasmanian Planning Scheme – Central Coast*. The study area is subject to a Medium Landslip Hazard Band overlay and a Priority Vegetation Area overlay in the east. No further overlays are present under the *Scheme*.

Topographically, the study area is very flat with a small rise in the east. The west of the area has artificial drains present. The southern boundary consists of an artificial embankment associated with the Bass Highway. Elevation varies from ca. 3-30 m a.s.l.

The study area is entirely modified with weed species dominating the embankment along the Bass Highway, agricultural land that is subject to a Crown lease for stock agistment, and an equipment storage area associated with a commercial business in Lyle Street. Amenity plantings occur along the Bass Highway, which is generally weed invaded.

Historically, the study area was part of a large farm prior to the division of the property by the realignment of the Bass Highway. The original access to the farm still exists on Preservation Drive in the north of the study area with concrete/blockwork pillars still present and the gravel access road visible. The gravel access road is visible leading directly to the farmhouse that now occurs on the southern side of the highway. This reflects the past land use history and the proximity to the Sulphur Creek and that the area is surrounded by urban development, agricultural land and major highway developments.

Geologically, the study area is mapped as Neoproterozoic "unmetamorphosed quartzwacke turbidite sequences (Burnie and Oonah Formations and correlates)" (geocode: Lo). The geology is mentioned because of its potential influence on the classification of vegetation and supporting threatened flora (and to a lesser extent threatened fauna, usually through the geological influence on vegetation structure and composition).

PROPOSAL

The proposal is to determine the suitability of the study area as a potential site for residential housing development (the final site plan has not been determined at the time of this report).

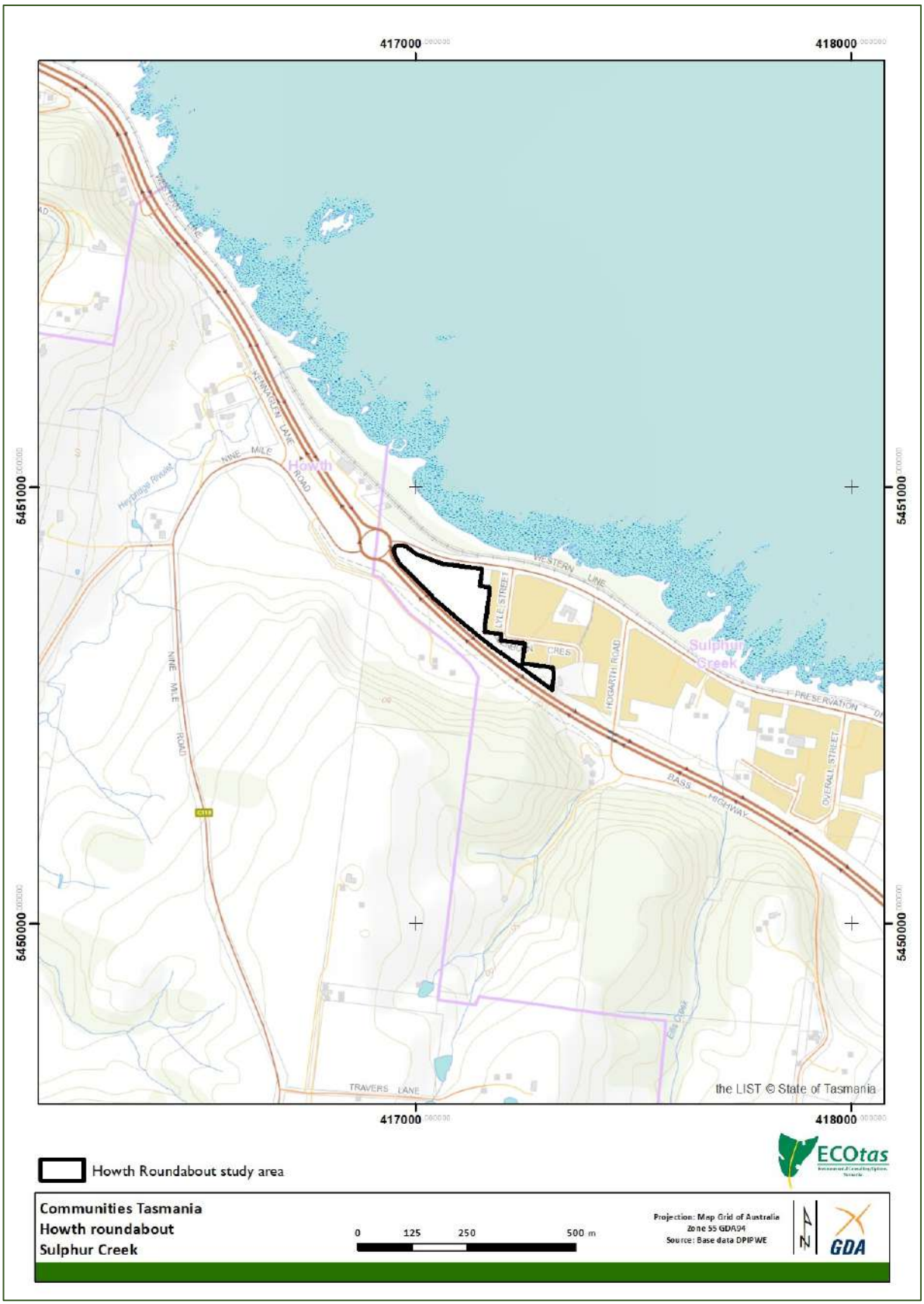

Figure 1. General location of the study area – topographic features shown

Figure 2. Detail of the study area – title boundaries, topographic features and aerial imagery shown

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated.

Vascular species nomenclature follows de Salas & Baker (2021) for scientific names and Wapstra et al. (2005+) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* reports (DPIPWE 2021).

Vegetation classification follows TASVEG 4.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation (*Kitchener & Harris 2013+).

Preliminary investigation

Available sources of threatened flora records, vegetation mapping and other potential environmental values were interrogated. These sources include:

- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* records for threatened flora and fauna (GIS coverage maintained by the author current as at date of report);
- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas Report ECOtas_CommunitiesTas_Howth* for a polygon defining the extent of the study area, buffered by 5 km, dated 25 Oct. 2021 (DPIPWE 2021) – Appendix D;
- Forest Practices Authority's *Biodiversity Values Database* report, specifically the species' information for grid reference centroid 417115mE 5450734mN, buffered by 2 km and 5 km for records of threatened flora and fauna, respectively, hyperlinked species' profiles and predicted range boundary maps, dated 25 Oct. 2021 (FPA 2021) – Appendix E;
- Commonwealth Department of Agriculture, Water and the Environment's *Protected Matters Search Tool Report* for a point feature defining the approximate centre of the study area, buffered by 5 km, dated 25 Oct. 2021 (CofA 2021) – Appendix F;
- the TASVEG 4.0 vegetation coverage (as available through a GIS coverage);
- GoogleEarth and LISTmap aerial orthoimagery; and
- other sources listed in tables and text as indicated.

Field assessment

A detailed site assessment was undertaken by Brian French on 28 Oct. 2021.

<u>Botanical survey – vegetation classification</u>

Vegetation classification follows TASVEG 4.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013+). Vegetation was classified by waypointing vegetation transitions using hand-held GPS (Garmin Dakota 10) for later comparison to aerial imagery. The structure and composition of the vegetation types was described using

nominal 30 m radius plots at a representative site within the vegetation types and compiling "running" species lists between plots and vegetation types.

Botanical survey – threatened flora

The study area was assessed for the presence of threatened flora by slow-walking the entire area. Further methods are not provided because no such species were detected.

Zoological survey – general

Surveys for threatened fauna were practically limited to an examination of "potential habitat" (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs, except as indicated below.

Declared and environmental weeds

The presence of declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* or "environmental weeds" (authors' opinion and as included in *A Guide to Environmental and Agricultural Weeds of Southern Tasmania*, NRM South 2017) was also assessed.

Where weeds were detected, hand-held GPS (Garmin Dakota 10) was used to waypoint the extent of the populations.

Plant and animal disease

The potential presence of plant disease, including *Phytophthora cinnamomi* (rootrot, PC), myrtle wilt and myrtle rust, was assessed by reference to field symptoms in susceptible vegetation types and plant species.

The potential presence of animal disease (chytrid) was assessed by reference to the presence of habitats conducive to supporting populations of amphibians such as waterbodies and drainage features.

FINDINGS

Vegetation types

Comments on TASVEG mapping

This section, which comments on the existing TASVEG 4.0 mapping for the study area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop mapping exercise

based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale. An examination of existing vegetation mapping is usually a useful pre-assessment exercise to gain an understanding of the range of habitat types likely to be present and the level of previous botanical surveys.

TASVEG 4.0 maps the study area as (Figure 3):

- agricultural land (TASVEG code: FAG)

  Most of the study area is mapped as FAG.
- extra-urban miscellaneous (TASVEG code: FUM)

  The Bass Highway easement is mapped as FUM.
- urban areas (TASVEG code: FUR)

  The existing urban areas of Sulphur Creek including paddock areas associated with the study area are mapped as FUR.

Vegetation types recorded as part of the present study

Vegetation types have been classified according to TASVEG 4.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013+). Table 1 provides information on each of the vegetation mapping units identified from the study area, with example locations, which are further described in images provided in Appendix A. Figure 4 indicates the revised vegetation mapping of the study area.

Table 1. Vegetation mapping units present in the study area

[conservation status: NCA – as per Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, using units described by Kitchener & Harris (2013+); EPBCA – as per the listing of ecological communities on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, relating to communities as described under that Act, but with equivalencies to TASVEG units]

TASVEG mapping unit (Kitchener & Harris 2013+)	**Conservation priority** NCA *EPBCA*	**Comments**
agricultural land (FAG)	not threatened *not threatened*	FAG dominates a large portion of the study area, which is currently used for stock grazing (agistment) with small remnant paddock areas in the east near Glenburn Crescent.
permanent easements (FPE)	not threatened *not threatened*	FPE occurs in the west and south of the study area associated with the Bass Highway. This area is managed to control weeds, is regularly mown and amenity plantings occur along the highway margins.
regenerating cleared land (FRG)	not threatened *not threatened*	FRG occupies 0.18 ha, occurring along artificial drainage lines in the west of the study area including the drain associated with Preservation Drive. Along the drainage lines, *Melaleuca ericifolia* (swamp paperbark) has invaded along with numerous weed species. Within the area mapped as FRG, there are straight drainage channels present with fence lines occurring within the now vegetated drains. The area of this community has doubled since 2008 (Google Earth imagery). FRG is in poor condition with numerous weed species dominating the understory.
extra-urban miscellaneous (FUM)	not threatened *not threatened*	FUM can be used to map any areas that are modified to such an extent that they cannot be reasonably mapped as a native vegetation mapping unit but do not represent other modified land mapping units such as agricultural land (TASVEG code: FAG) or urban areas (TASVEG code: FUR). FUM represents the modified areas are managed for fire risk and utilised for equipment storage and other miscellaneous use. The only vegetation present in these areas is introduced weedy grass and herb species.

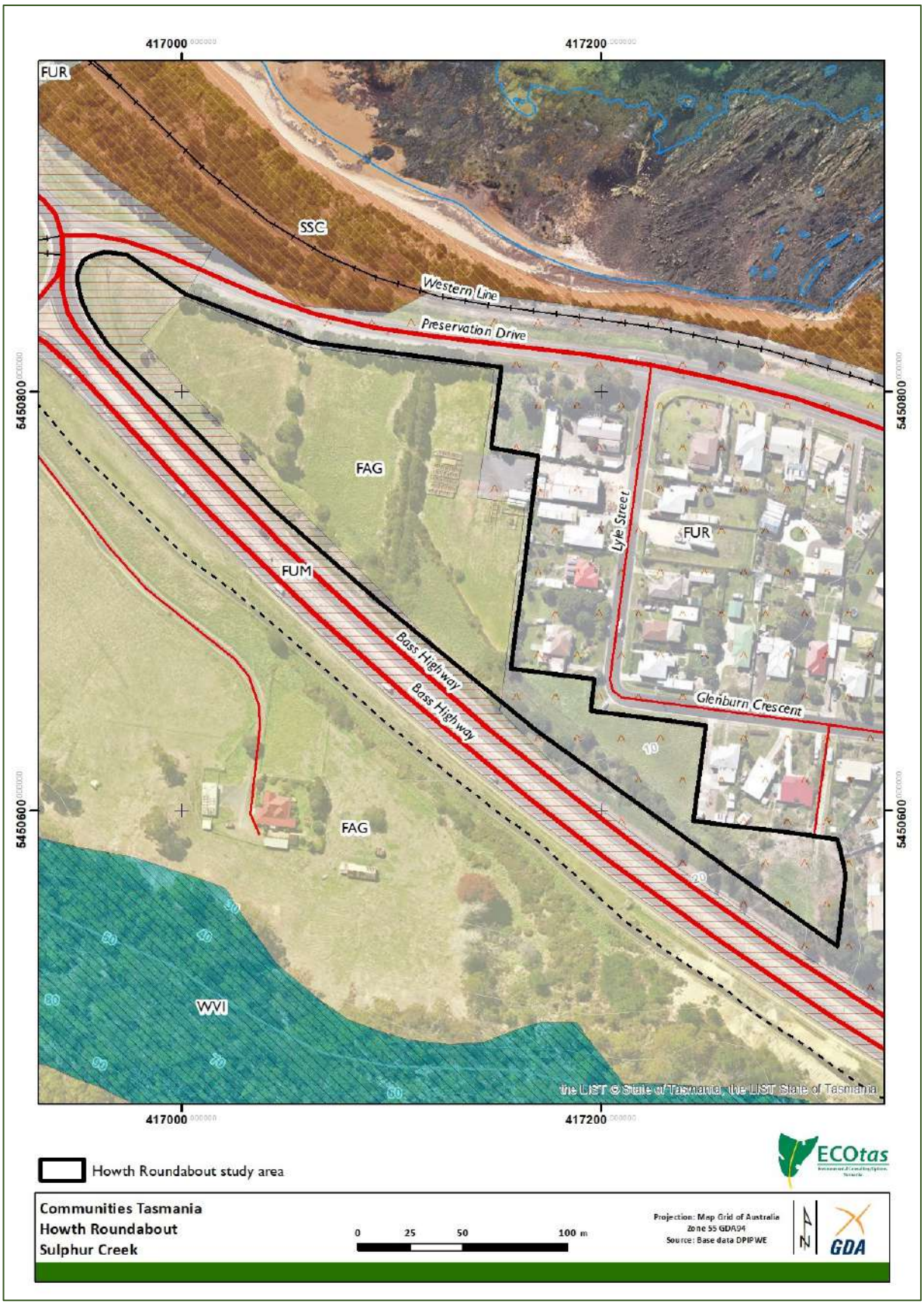

Figure 3. Existing TASVEG 4.0 vegetation mapping for the study area (refer to text for codes)

Figure 4. Revised vegetation mapping for the western section of the study area (refer to text for codes)

Technically, the area mapped as FRG (0.18 ha in total) could be classified as *Melaleuca ericifolia* swamp forest (TASVEG code: NME), which is classified as threatened on Schedule 3A of the Tasmanian *Nature Conservation Act 2002.* However, given the very small area, the dominance of weeds and the occurrence along artificial drains, this community cannot be considered a native vegetation community and as such special management recommendations are not recommended.

Conservation status of identified vegetation types

None the vegetation types recorded equate to threatened ecological communities listed on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999. Melaleuca ericifolia* swamp forest (TASVEG code: NME) is classified as threatened on Schedule 3A of the Tasmanian *Nature Conservation Act 2002* but note that the areas potentially classifiable as this unit have actually been mapped as a modified land mapping unit (FRG), reflecting the land use history and status of the tiny patches.

Plant species

General information

Native vascular plant species are limited to *Melaleuca ericifolia* (swamp paperbark) that has invaded the drains within the study area. Amenity plantings of Tasmanian native plant species such as *Bursaria spinosa* and *Acacia longifolia* var. *sophorae* occur along the artificial embankment parallel with Bass Highway. Weed species generally dominate the entire area.

Threatened flora species recorded from the study area

No flora species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) were detected from the study area.

Threatened flora species potentially present

Figure 5 indicates threatened flora records close to the study area and Table B1 (Appendix B) provides a listing of threatened flora from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Note that the field assessment was not restricted to the species listed in Table B1 but considered any threatened flora with the potential to be present. While the database analysis utilises a nominal buffer of 5,000 m, the authors' own experience of the vegetation and flora of the general study area combined with database interrogation, meant that the specific potential for numerous other species previously recorded from the wider area were taken into account.

Figure 5. *Natural Values Atlas* threatened flora records adjacent to the study area

Fauna species

Threatened fauna species recorded from the study area

No fauna species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) were detected from the study area.

Threatened fauna species potentially present

Figure 6 indicates threatened fauna records close to the study area and Table C1 (Appendix C) provides a listing of threatened fauna from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Potential habitat (to some degree) is present for some species, as follows:

- *Sarcophilus harrisii* (Tasmanian devil);
- *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll);
- *Dasyurus viverrinus* (eastern quoll); and
- *Perameles gunnii* subsp. *gunnii* (eastern barred bandicoot).

Further information on these species is provided below.

- marsupial carnivores

Three species (*Sarcophilus harrisii*, Tasmanian devil; *Dasyurus maculatus* subsp. *maculatus*, spotted-tailed quoll; and *Dasyurus viverrinus*, eastern quoll) are considered collectively because they have broadly similar habitat and management requirements.

There are database records within 5 km of the study area with the closest records representing road-kill records and opportunistic sightings. These species have broad ranges and can occupy a wide variety of habitats. Within (and close to) the area, it is likely that these species may use the greater area for opportunistic foraging. The assessment did not note any potential den sites such as suitable hollow logs, cliffs with small caves or wombat burrows or any evidence of these species such as distinctive scats.

- *Perameles gunnii* (eastern barred bandicoot)

The study area and the greater region is good habitat for this species including urban gardens and the weed infested areas along Penguin Creek. There are records in the area; however, no evidence of this species was noted (such as distinctive diggings).

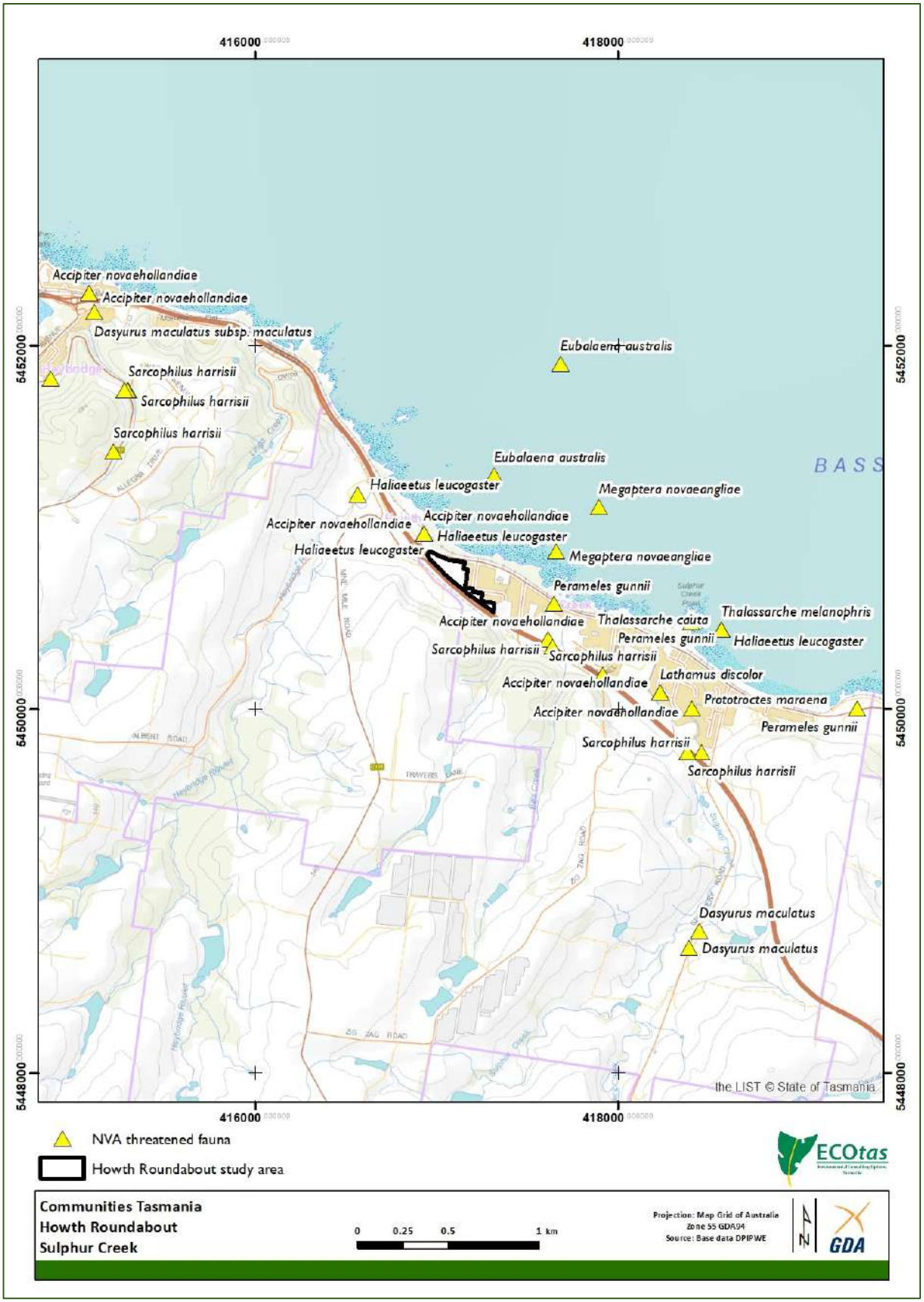

Figure 6. *Natural Values Atlas* threatened fauna records close to the study area

Other ecological values

Weed species

Two plant species, *Ulex europaeus* (gorse) and *Rubus anglocandicans* (blackberry), classified as declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were recorded within the study area. *Ulex europaeus* (gorse) is localised to small areas generally associated with the Bass Highway embankment and *Rubus anglocandicans* (blackberry) is localised to fence lines and the highway embankment. The recommended management actions below are applicable for all the weed species present.

Any management actions should aim to minimise the risk of distributing these invasive weed species to other parts of the municipality, although it is recognised that these species already occur commonly in the greater area. The key management issue will be centred on treating vegetation debris and topsoil as "contaminated" with weed propagules and managing this product accordingly. This may include on- or off-site disposal and for on-site burial and/or burning. If off-site disposal is undertaken, this will need to be in accordance with municipal regulations and the provisions of the Tasmanian *Weed Management Act 1999* in relation to declared weeds.

Several planning manuals provide guidance on appropriate management actions, which can be referred to develop site-specific prescriptions for any proposed works along the easement. These manuals include:

- Allan, K. & Gartenstein, S. (2010). *Keeping It Clean: A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens*. NRM South, Hobart;
- Rudman T. (2005). *Interim* Phytophthora cinnamomi *Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water & Environment, Hobart;
- Rudman, T., Tucker, D. & French, D. (2004). *Washdown Procedures for Weed and Disease Control*. Edition 1. Department of Primary Industries, Water & Environment, Hobart; and
- DPIPWE (2015). *Weed and Disease Planning and Hygiene Guidelines - Preventing the Spread of Weeds and Diseases in Tasmania*. Department of Primary Industries, Parks, Water & Environment, Hobart.

Rootrot pathogen, *Phytophthora cinnamomi*

Phytophthora cinnamomi (PC) is widespread in lowland areas of Tasmania, across all land tenures. However, disease will not develop when soils are too cold or too dry. For these reasons, PC is not a threat to susceptible plant species that grow at altitudes higher than about 700 m or where annual rainfall is less than about 600 mm (e.g. Midlands and Derwent Valley). Furthermore, disease is unlikely to develop beneath a dense canopy of vegetation because shading cools the soils to below the optimum temperature for the pathogen. A continuous canopy of vegetation taller than about 2 m is sufficient to suppress disease. Hence PC is not considered a threat to susceptible plant species growing in wet sclerophyll forests, rainforests (except disturbed rainforests on infertile soils) and scrub e.g. teatree scrub (Rudman 2005; FPA 2009).

None of the vegetation types present are recognised as being susceptible to PC. No evidence of the pathogen was observed. Special management should not be required if machinery and vehicles have come from a disease-free site and have been cleaned.

Note that the publications listed under Weed species provide relevant planning information related to management of *Phytophthora cinnamomi* (PC).

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle beech (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events such as windthrow and wildfire.

The study area does not support *Nothofagus cunninghamii*. No special management is required.

Myrtle rust

Myrtle rust is a disease limited to plants in the Myrtaceae family. This plant disease is a member of the guava rust complex caused by *Austropuccinia psidii*, a known significant pathogen of Myrtaceae plants outside Australia. Infestations are currently limited to NSW, Victoria, Queensland and Tasmania (DPIPWE 2015).

No evidence of myrtle rust was noted. The longer-term management issue for the site is to ensure that any ornamental plantings source plants from a reputable nursery free from the pathogen (such businesses are already subject to strict biosecurity conditions).

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Batrachochytrium dendrobatidis* (chytrid frog disease), *Mucor amphibiorum* (platypus mucor disease) and the freshwater algal pest *Didymosphenia geminata* (didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas.

The study area is within ca. 12 km of known records in the North Motton area to the southeast. Due to the presence of frog species in the greater area, it is recommended to assume that the disease is absent and to manage the area to minimise the risk of introducing the pathogen. At this site, the following specific action is recommended:

- ensure that vehicles, machinery, equipment, materials and personnel adhere to the general hygiene protocols provided in *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* (Allan & Gartenstein 2010).

Additional "Matters of National Environmental Significance"

The EPBCA *Protected Matters Area* report (CofA 2021) indicates that the Threatened Ecological Communities Giant Kelp Marine Forests of South East Australia (listed as Endangered), Tasmanian White Gum (*Eucalyptus viminalis*) Wet Forest (listed as Critically Endangered) and Tasmanian Forests and Woodlands dominated by Black Gum or Brookers Gum (*Eucalyptus ovata / E. brookeriana*) (listed as Critically Endangered), may occur within the area. These ecological communities are not present within or adjacent to the study area.

DISCUSSION

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or Tasmanian *Threatened Species Protection Act 1995* (TSPA), are known from database information, or were detected as a consequence of field assessment, from the study area.

Threatened fauna

- No fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or Tasmanian *Threatened Species Protection Act 1995* (TSPA), are known from database information, or were detected as a consequence of field assessment, from the study area.
- Potential habitat is present for:
  - *Sarcophilus harrisii* (Tasmanian devil);
  - *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll);
  - *Dasyurus viverrinus* (eastern quoll);
  - *Perameles gunnii* subsp. *gunnii* (eastern barred bandicoot); and
  - *Astacopsis gouldi* (giant freshwater crayfish).

Vegetation types

- The study area supports the following TASVEG mapping units:
  - agricultural land (FAG);
  - permanent easements (FPE);
  - extra-urban miscellaneous (FUM); and
  - regenerating cleared land (FRG).
- These mapping units do not equate to threatened ecological communities listed on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and are not listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.

Weeds

- Two species classified as declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were detected from the study area.

Plant disease

- No evidence of plant disease (*Phytophthora cinnamomi*, rootrot fungus), myrtle wilt or myrtle rust was detected from the study area.

Animal disease (chytrid)

- The study area supports habitat only marginally conducive to the frog chytrid pathogen in the form of the constructed ephemeral drainage lines present.

Legislative and policy implications

Some commentary is provided below with respect to the key threatened species, vegetation management and other relevant legislation. Note that there may be other relevant policy instruments in addition to those discussed. The following information does not constitute legal advice, not represent the views of relevant agencies, and it is recommended that independent advice is sought from the relevant agency/authority.

Tasmanian *Threatened Species Protection Act 1995*

Threatened flora and fauna on this Act are managed under Section 51, as follows:

> 51. Offences relating to listed taxa
>
> (1) Subject to subsections (2) and (3), a person must not knowingly, without a permit –
>
> (a) take, keep, trade in or process any specimen of a listed taxon of flora or fauna; or
>
> (b) disturb any specimen of a listed taxon of flora or fauna found on land subject to an interim protection order; or
>
> (c) disturb any specimen of a listed taxon of flora or fauna contrary to a land management agreement; or
>
> (d) disturb any specimen of a listed taxon of flora or fauna that is subject to a conservation covenant entered into under Part 5 of the *Nature Conservation Act 2002*; or
>
> (e) abandon or release any specimen of a listed taxon of flora or fauna into the wild.
>
> (2) A person may take, keep or process, without a permit, a specimen of a listed taxon of flora in a domestic garden.
>
> (3) A person acting in accordance with a certified forest practices plan or a public authority management agreement may take, without a permit, a specimen of a listed taxon of flora or fauna, unless the Secretary, by notice in writing, requires the person to obtain a permit.
>
> (4) A person undertaking dam works in accordance with a Division 3 permit issued under the *Water Management Act 1999* may take, without a permit, a specimen of a listed taxon of flora or fauna.

The simplest interpretation of this is that any activity that results in a specimen (i.e. individual) of listed flora or fauna being "knowingly taken" would require a permit to be issued through Conservation Assessments, DPIPWE, through a formal application process. Note that the Act does not make reference to "potential habitat" such that activities that result in loss of/disturbance to potential habitat (but not known sites) – which mainly refers to threatened fauna – would not require a permit. In this case, a permit will not be required as no listed threatened flora or fauna were found or are known to be present.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

Matters of national environmental significance considered under the EPBCA include:

- listed threatened species and communities

- listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- world heritage properties;
- national heritage places;
- the Great Barrier Reef Marine Park;
- nuclear actions; and
- a water resource, in relation to coal seam gas development and large coal mining development.

The Commonwealth Department of Agriculture, Water and the Environment provides a policy statement titled *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (CofA 2013, herein the *Guidelines*), which provides overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBCA.

The *Guidelines* define a **significant impact** as:

> *"…an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts"*

and note that:

> *"…all of these factors [need to be considered] when determining whether an action is likely to have a significant impact on matters of national environmental significance".*

The *Guidelines* provide advice on when a significant impact may be likely:

> *"To be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.*
>
> *If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment".*

The *Guidelines* provide a set of Significant Impact Criteria, which are "intended to assist…in determining whether the impacts of [the] proposed action on any matter of national environmental significance are likely to be significant impacts". It is noted that the criteria are "intended to provide general guidance on the types of actions that will require approval and the types of actions that will not require approval…[and]…not intended to be exhaustive or definitive".

Listed ecological communities

The study area does not support any such communities.

Threatened flora

The study area does not support populations of EPBCA-listed flora, nor significant potential habitat of such species.

Threatened fauna

The study area may support populations of threatened fauna listed on the Act, most notably the Tasmanian devil, spotted-tailed quoll, eastern quoll, eastern barred bandicoot and giant freshwater crayfish. Note that the study area is within the range of several other species listed on the Act but it is unlikely that any proposal will result in a significant impact on these species (this includes wide-ranging species such as the masked owl and wedge-tailed eagle).

The *Guidelines* consider a "significant impact" to comprise loss that is likely to lead to a long-term decrease in the size of an important population of a species; reduce the area of occupancy of an important population; fragment an existing important population into two or more populations (unlikely); adversely affect habitat critical to the survival of a species; disrupt the breeding cycle of an important population; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat; introduce disease that may cause the species to decline; or interfere substantially with the recovery of the species.

With respect to the aforementioned species, it is difficult to anticipate a scenario in which a referral to the Commonwealth Department of Agriculture, Water and the Environment would be become necessary at the scale of the proposal.

Tasmanian *Nature Conservation Act 2002*

Schedule 3A of the Act lists vegetation types classified as threatened within Tasmania. The study does not support any communities listed on the Act (see previous discussion on NME vs. FRG).

Tasmanian *Land Use Planning and Approvals Act 1993*

The applicable planning scheme for the title area is the *Tasmanian Planning Scheme – Central Coast*. The study area is zoned as General Residential in the north, a small section in the centre as Rural and as Rural Living in the south. The study area is subject to a Medium Landslip Hazard Band overlays and a Priority Vegetation Area overlay in the east. No further overlays are present under the *Scheme*.

Regarding the Priority Vegetation Area overlay (Figure 7), this area occurs in the east of the study area that is pasture, an embankment associated with the Bass Highway and a miscellaneous storage area. This overlay extends across the suburban area of Sulphur Creek including the major easement of the Bass Highway to the south. Within the study area, no native vegetation communities are present (see discussion on NME vs. FRG). The reason for the allocation of the overlay is not understood, with the recently-developed overlay based primarily on the Regional Ecosystem Model, in turn based on TASVEG 3.0 vegetation mapping (which did not indicate any native vegetation present).

It is understood that a detailed planning application will be made and that the present report will inform the relevant responses to various provisions of the *Scheme*. Further detailed analysis of the *Scheme* provisions is not made at this juncture.

Tasmanian *Wildlife (General) Regulations 2010*

While the assessment of the study area indicated the presence of species listed on schedules of the *Regulations* (i.e. "specially protected wildlife", "protected wildlife", "partly protected wildlife"), no individuals, or products (e.g. nests, dens, etc.), of these species, are likely to be directly physically affected by any proposal.

Figure 7. *Tasmanian Planning Scheme – Central Coast* Priority Vegetation Area overlay

Tasmanian *Weed Management Act 1999*

Two plant species, *Ulex europaeus* (gorse) and *Rubus anglocandicans* (blackberry), classified as declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* occur within the study area. Under the Statutory Weed Management Plans for these species (see www.dpipwe.tas.gov.au), Central Coast municipality is classified as "Zone B" for management purposes. Under the Plans, "containment is the most appropriate management objective for Zone B municipalities which have problematic infestations but no plan and/or resources to undertake control actions at a level required for eradication" and "the management outcome for Zone B municipalities is ongoing prevention of the spread of the species from existing infestations to areas free or in the process of becoming free of the species".

As such, any management actions should aim to minimise the risk of distributing these invasive weed species to other parts of the municipality, although it is recognised that these species already occur commonly in the greater area. The key management issue will be centred on treating vegetation debris and topsoil as "contaminated" with weed propagules and managing this product accordingly. This may include on- or off-site disposal and for on-site burial and/or burning. If off-site disposal is undertaken, this will need to be in accordance with municipal regulations and the provisions of the Tasmanian *Weed Management Act 1999* in relation to declared weeds.

Recommendations

The recommendations provided below are a summary of those provided in relation to each of the ecological features described in the main report. The main text of the report provides the relevant context for the recommendations. It is assumed that the phrasing below will be modified in planning documents for the study. It is essential that machinery operators and other contractors are made aware of the reasons for undertaking the recommended actions.

Weeds and plant disease

It is recommended that:

- management actions should aim to minimise the risk of distributing weed species to other parts of the municipality;
- vegetation debris and topsoil be treated as "contaminated" with weed propagules and managed accordingly, which may include on- or off-site disposal; and
- if off-site disposal is undertaken, this will need to be in accordance with municipal regulations and the provisions of the Tasmanian *Weed Management Act 1999* in relation to declared weeds.

Legislation and policy

No formal referral to the relevant Commonwealth government agency under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* should be required.

A permit under the Tasmanian *Threatened Species Protection Act 1995* is not required.

It is assumed a development application will be required to be prepared under the provisions of the *Tasmanian Planning Scheme – Central Coast*.

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APPENDIX A. Annotated images of vegetation types from study area

The images below provide basic descriptions of the vegetation types identified from the study area. Refer to Table 1 and associated text for more details.

Plate A1. Agricultural land (FAG) to the left and vegetated permanent easement (FPE) associated with the Bass Highway in the middle background

Plate A2. View east of FAG (left) and FPE (Bass Highway) (right) in the west of the study area

Plate A3. View south with FUM in the foreground and FRG along the drain in the right of the image

Plate A4. FAG in the west with weeds dominating the highway embankment in the foreground and *Melaleuca ericifolia* invading'the drain on the right

Plate A5. FAG" in the west with clumps of gorse on the left

Plate A6. FAG in the centre-north at the gates of the original farm entrance being utilised for miscellaneous storage

APPENDIX B. Analysis of database records of threatened flora

Table B1 provides a listing of threatened flora from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Note that the field assessment was not restricted to the species listed in Table B1 but considered any threatened flora with the potential to be present. While the database analysis utilises a nominal buffer of 5,000 m, the authorss own experience of the vegetation and flora of the greater study area combined with database interrogation, meant that the specific potential for numerous other species previously recorded from the wider area were taken into account.

Table B1. Threatened flora records from within 5,000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2021) and other sources where indicated. Habitat descriptions are taken from FPA (2016), FPA (2017) and TSS (2003), except where otherwise indicated. Species marked with # are listed in CofA (2021).

Scientific name **Common name**	**Status** TSPA EPBCA	**Tasmanian habitat description (and distribution)**	**Comments on study area and database records**
Baumea gunnii slender twigsedge	r -	*Baumea gunnii* inhabits wet moors, creeks and riverbanks (often in rocky sections) throughout the State. It can extend to poorly-drained sedgy/grassy forest and woodland dominated by *Eucalyptus ovata* or *E. rodwayi*.	Potential habitat absent.
Caladenia caudata tailed spider-orchid	v VU # only	*Caladenia caudata* has highly variable habitat, which includes the central north: *Eucalyptus obliqua* heathy forest on low undulating hills; the northeast: *E. globulus* grassy/heathy coastal forest, *E. amygdalina* heathy woodland and forest, *Allocasuarina* woodland; and the southeast: *E. amygdalina* forest and woodland on sandstone, coastal *E. viminalis* forest on deep sands. Substrates vary from dolerite to sandstone to granite, with soils ranging from deep windblown sands, sands derived from sandstone and well-developed clay loams developed from dolerite.	Potential habitat absent.
Caladenia patersonii patersons spider-orchid	v -	*Caladenia patersonii* favours coastal and near-coastal areas in northern Tasmania, growing in low shrubby heathland and heathy forest/woodland in moist to well-drained sandy and clay loam.	Potential habitat absent.
Caladenia pusilla tiny fingers	r -	*Caladenia pusilla* occurs mainly in heathland, shrubland, woodland and open eucalypt forest in near-coastal areas. It has been recorded from sandy loam, sandy peat, granite gravel and rocky ground. It is most frequent on well-drained soils but can extend to sites with impeded drainage.	Potential habitat absent.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
Epilobium pallidiflorum showy willowherb	r -	*Epilobium pallidiflorum* occurs in wet places (e.g. natural wetlands amongst forest, margins of *Melaleuca ericifolia* swamp forest, scrubby-sedgy *E. ovata* woodland on heavy soils, etc.) mostly in the north and northwest of the State.	Potential habitat is present within the numerous drains in the west of the study area. This distinctive herb species was not recorded (no constraint on detection and/or identification).
Persicaria decipiens slender waterpepper	v -	*Persicaria decipiens* occurs on the banks of rivers and streams, mostly in the north of the State, including King Island. The species may colonise farm dams.	Potential habitat is present within the numerous drains in the west of the study area. This distinctive herb species was not recorded. (no constraint on detection and/or identification).
Pterostylis ziegeleri grassland greenhood	v VU # only	*Pterostylis ziegeleri* occurs in the State's south, east and north, with an outlying occurrence in the northwest. In coastal areas, the species occurs on the slopes of low stabilised sand dunes and in grassy dune swales, while in the Midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt.	Potential habitat absent.
Senecio psilocarpus swamp fireweed	e VU # only	*Senecio psilocarpus* is known from six widely scattered sites in the northern half of the State, including King and Flinders islands. It occurs in swampy habitats including broad valley floors associated with rivers, edges of farm dams amongst low-lying grazing/cropping ground, herb-rich native grassland in a broad swale between stable sand dunes, adjacent to wetlands in native grassland, herbaceous marshland and low-lying lagoon systems.	Potential habitat absent.
Thelymitra jonesii skyblue sun-orchid	e EN # only	*Thelymitra jonesii* occurs in moist coastal heath on sandy to peaty soils and in *Eucalyptus obliqua* forest in deep loam soil over dolerite.	Potential habitat absent.

APPENDIX C. Analysis of database records of threatened fauna

Table C1 provides a listing of threatened fauna from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Table C1. Threatened fauna records from 5,000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2021), Bryant & Jackson (1999) and FPA (2021). Wholly marine and pelagic species are excluded from the list below. Littoral and migratory species are included (see after Table D1 for information on migratory shorebirds). Species marked with # are listed in CofA (2021).

Scientific name **Common name**	**Status** TSPA EPBCA	**Tasmanian habitat description (and distribution)**	**Comments on study area and database records**
Accipiter novaehollandiae grey goshawk	e -	Potential habitat is native forest with mature elements below 600 m altitude, particularly along watercourses. Significant habitat may be summarised as areas of wet forest, rainforest and damp forest patches in dry forest, with a relatively closed mature canopy, low stem density, and open understorey in close proximity to foraging habitat and a freshwater body (i.e. stream, river, lake, swamp, etc.).	Potential nesting habitat absent. There are few sightings of the species in the vicinity of the study area. The species is likely to be observed occasionally within the broader study area. The proposal should not deleteriously affect potential habitat.
Alcedo azurea subsp. *diemenensis* Tasmanian azure kingfisher	e EN # only	Potential foraging habitat is primarily freshwater (occasionally estuarine) waterbodies such as large rivers and streams with well-developed overhanging vegetation suitable for perching and water deep enough for dive-feeding. Potential breeding habitat is usually steep banks of large rivers (a breeding site is a hole (burrow) drilled in the bank).	Potential habitat absent Note that CofA (2021) lists the species as *Ceyx azureus* subsp. *diemenensis*.
Aquila audax subsp. *fleayi* Tasmanian wedge-tailed eagle	e EN #	Potential habitat comprises potential nesting habitat and potential foraging habitat. Potential foraging habitat is a wide variety of forest (including areas subject to native forest silviculture) and non-forest habitats. Potential nesting habitat is tall eucalypt trees in large tracts (usually more than 10 ha) of eucalypt or mixed forest. Nest trees are usually amongst the largest in a locality. They are generally in sheltered positions on leeward slopes, between the lower and mid sections of a slope and with the top of the tree usually lower than the ground level of the top of the ridge, although in some parts of the State topographic shelter is not always a significant factor (e.g. parts of the northwest and Central Highlands). Nests are usually not constructed close to sources of	Potential nesting habitat absent. There are few sightings of the species in the vicinity of the study area. Nesting habitat is absent. The species is likely to be observed occasionally within the broader study area, but the proposal should not deleteriously affect potential habitat.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
		disturbance and nests close to disturbance are less productive. More than one nest may occur within a territory but only one is used for breeding in any one year. Breeding failure often promotes a change of nest in the next year.	
Astacopsis gouldi Giant freshwater crayfish	v VU #	Potential habitat for the giant freshwater crayfish is freshwater streams of all sizes. Characteristics of potential habitat include a combination of well-shaded flowing and still waters, deep pools, decaying logs and undercut banks. Riparian vegetation needs to be native and predominantly intact to provide shade, nutrient, energy and structural inputs into streams. Smaller juveniles inhabit shallow fast-flowing streams favouring habitats with rocks or logs that are large enough to be stable but not embedded in finer substrates, but overlie coarser substrates and/or have a distinct cavity underneath. Perennial headwater streams have substantially higher juvenile densities than non-perennial headwater streams.	Potential habitat absent.
Botaurus poiciloptilus Australasian bittern	- EN # only	Potential habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. *Phragmites*, *Cyperus*, *Eleocharis*, *Juncus*, *Typha*, *Baumea*, *Bolboschoenus*) or cutting grass (*Gahnia*) growing over a muddy or peaty substrate (TSSC 2011).	Potential habitat absent.
Dasyurus maculatus subsp. *maculatus* spotted-tailed quoll	r VU #	Potential habitat is coastal scrub, riparian areas, rainforest, wet forest, damp forest, dry forest and blackwood swamp forest (mature and regrowth), particularly where structurally complex and steep rocky areas are present, and includes remnant patches in cleared agricultural land. Significant habitat is all potential denning habitat within the core range of the species. Potential denning habitat includes: (1) any forest remnant (>0.5 ha) in a cleared or plantation landscape that is structurally complex (high canopy, with dense understorey and ground vegetation cover), free from the risk of inundation, or (2) a rock outcrop, rock crevice, rock pile, burrow with a small entrance, hollow logs, large piles of coarse woody debris and caves.	Refer to **FINDINGS *Fauna species*** for more detail.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
Dasyurus viverrinus eastern quoll	- EN	Potential habitat is a variety of habitats including rainforest, heathland, alpine areas and scrub. However, it seems to prefer dry forest and native grassland mosaics which are bounded by agricultural land.	Refer to **FINDINGS *Fauna species*** for more detail.
Galaxiella pusilla eastern dwarf galaxiid	v VU #	Potential habitat is slow-flowing and still waters such as swamps, shallow pools, lagoons, drains or backwaters of streams, often (but not always) with aquatic vegetation. It may also be found in temporary waters that dry up in summer for as long as 6-7 months, especially if burrowing crayfish burrows are present. Habitat may include forested swampy areas but does not include blackwood swamp forest.	There are no known records in the greater area and is listed based on potential habitat only. Potential habitat is marginally present along the artificial drains in the west of the area. However, as the study area is well outside of the recognised occupied range, any proposal should not have a deleterious impact on the species.
Haliaeetus leucogaster white-bellied sea-eagle	v - #	Potential habitat comprises potential nesting habitat and potential foraging habitat. Potential foraging habitat is any large waterbody (including sea coasts, estuaries, wide rivers, lakes, impoundments and even large farm dams) supporting prey items (fish). Potential nesting habitat is tall eucalypt trees in large tracts (usually more than 10 ha) of eucalypt or mixed forest within 5 km of the coast (nearest coast including shores, bays, inlets and peninsulas), large rivers (class 1), lakes or complexes of large farm dams. Scattered trees along river banks or pasture land may also be used.	Potential nesting habitat absent and no known nests within 500 m or 1 km of the study area (nominal buffer widths often applied to management). The species may use the greater area for opportunistic foraging. Any proposal should not have a deleterious impact on the species.
Hirundapus caudacutus white-throated needletail	- VU #	This species is mostly aerial, from heights of less than 1 m up to more than 1,000 m above the ground. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest.	Potential habitat present. However, as this species rarely lands or roosts (and does not breed) on the Australian migration, any proposal should not have a deleterious impact on the species.
Lathamus discolor swift parrot	e CR #	Potential habitat comprises potential foraging habitat and potential nesting habitat. Potential foraging habitat comprises *Eucalyptus globulus* (blue gum) or *Eucalyptus ovata* (black gum) trees that are old enough to flower. For management purposes, potential nesting habitat is considered to comprise eucalypt forests that contain hollow-bearing trees.	Potential habitat absent.
Limnodynastes peroni striped marsh frog	e -	Potential habitat is natural and artificial coastal and near-coastal wetlands, lagoons, marshes, swamps and ponds (including dams), with permanent freshwater and abundant marginal, emergent and submerged aquatic vegetation.	There are no known records in the greater area and is listed based on potential habitat only. Potential habitat is marginally present along the artificial drains in the west of the area. However, as the study area is well outside of the known occupied range, any proposal should not have a deleterious impact on the species.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
Litoria raniformis green and golden frog	v VU #	Potential habitat permanent and temporary waterbodies, usually with vegetation in or around them, including features such as natural lagoons, permanently or seasonally inundated swamps and wetlands, farm dams, irrigation channels, artificial water-holding sites such as old quarries, slow-flowing stretches of streams and rivers and drainage features.	There are no known records in the greater area. Potential habitat is marginally present along the artificial drains in the west of the area.
Myiagra cyanoleuca satin flycatcher	Migratory Terrestrial Species # only	Potential habitat is any forest or woodland.	Potential habitat absent.
Oreisplanus munionga subsp. *Larana* marrawah skipper	e VU	Potential habitat for the Marrawah skipper is any vegetation type, including forest (native and plantation) and non-forest native and non-native types, with an understorey either dominated by *Carex appressa* or supporting *Carex appressa* in patches (as small as 20 square metres).	Potential habitat absent.
Perameles gunnii subsp. *gunnii* eastern barred bandicoot	- VU #	Potential habitat is open vegetation types including woodlands and open forests with a grassy understorey, native and exotic grasslands, particularly in landscapes with a mosaic of agricultural land and remnant bushland. Significant habitat is dense tussock grass-sagg-sedge swards, piles of coarse woody debris and denser patches of low shrubs (especially those that are densely branched close to the ground providing shelter) within the core range of the species.	Refer to **FINDINGS *Fauna species*** for more detail.
Prototroctes maraena Australian grayling	v VU #	Potential habitat is all streams and rivers in their lower to middle reaches. Areas above permanent barriers (e.g. Prosser River dam, weirs) that prevent fish migration, are not potential habitat.	Potential habitat absent.
Pseudemoia pagenstecheri tussock skink	v -	Potential habitat is grassland and grassy woodland (including rough pasture with paddock trees), generally with a greater than 20% cover of native grass species, especially where medium to tall tussocks are present.	Potential habitat absent.
Sarcophilus harrisii Tasmanian devil	e EN #	Potential habitat is all terrestrial native habitats, forestry plantations and pasture. Devils require shelter (e.g. dense vegetation, hollow logs, burrows or caves) and hunting habitat (open understorey mixed with patches of dense vegetation) within their home range (427 km^2). Significant habitat is a patch of potential denning habitat where three or more entrances (large enough for a devil to pass through) may be found within 100 m of one another, and where no other potential denning	Refer to **FINDINGS *Fauna species*** for more detail.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
		habitat with three or more entrances may be found within a 1 km radius, being the approximate area of the smallest recorded devil home range. Potential denning habitat is areas of burrowable, well-drained soil, log piles or sheltered overhangs such as cliffs, rocky outcrops, knolls, caves and earth banks, free from risk of inundation and with at least one entrance through which a devil could pass.	
Theclinesthes serpentata chequered blue	r -	Potential habitat for the chequered blue butterfly is saltmarshes, and beach and coastal habitats, supporting food plants including *Rhagodia candolleana* (coastal saltbush) and species of *Atriplex*.	Potential habitat absent within the study area. Potential habitat occurs on the northern (coastal) side of Preservation Drive. The proposal will not affect any life stage of this species.
Tyto novaehollandiae subsp. *castanops* Tasmanian masked owl	e VU #	Potential habitat is all areas with trees with large hollows (≥15 cm entrance diameter). In terms of using mapping layers, potential habitat is considered to be all areas with at least 20% mature eucalypt crown cover (PI type mature density class 'a', 'b', or 'c'). Remnants and paddock trees (in any dry or wet forest type) in agricultural areas may constitute potential habitat. Significant habitat for the masked owl is any areas within the core range of native dry forest with trees over 100 cm dbh with large hollows (≥15 cm entrance diameter).	Potential habitat absent.

APPENDIX D. DPIPWE's *Natural Values Atlas* report for study area

Appended as pdf file.

APPENDIX E. Forest Practices Authority's *Biodiversity Values Atlas* report for study area

Appended as pdf file.

APPENDIX F. CofA's *Protected Matters* report for study area

Appended as pdf file.

Appendix E

Landslide Hazard Assessment, Geoton Pty Ltd

GEOTON Pty Ltd
Geotechnical Consultants

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27 February 2024

Reference No. GL23782Ab

Homes Tasmania
GPO Box 65
HOBART TAS 7001

Attention: Mr Anthony Reid

Dear Sir

RE: Landslide Risk Assessment
Howth Roundabout Subdivision, Howth

We have pleasure in submitting herein our report detailing the results of the geotechnical investigation conducted at the above site.

Should you require clarification of any aspect of this report, please contact Bassam AL-Sinayyid on 03 6326 5001.

For and on behalf of Geoton Pty Ltd

Tony Barriera

Director – Principal Geotechnical Engineer

Rev No.	Date	Written By	Reviewed By	Description
Ab	27/02/2024	B AL-Sinayyid	M. Street	Original

Contents

Attachments:

Appendices

1 INTRODUCTION

At the request of Homes Tasmania, Geoton Pty Ltd has carried out a landslide risk assessment for a proposed residential subdivision at Howth Roundabout, Howth.

A review of the Land Information System Tasmania (LIST) website shows the site is partially located within a medium landslide hazard band, i.e. an area of doubtful stability. As such, a landslide risk assessment is required to satisfy the Landslide Hazard Code of the Tasmanian Planning Scheme – Central Coast Council (Section C15.6.1 - Building and works within a landslip hazard area and C15.7.1 - Subdivision within a landslip hazard area).

The investigation has been conducted to provide the following:

- A landslide risk assessment to determine if each lot located within the medium landslide hazard band (i.e. Lot 1, Lot 2 and Lot 3), contain a building envelope suitable for residential development in accordance with AS1726 – Geotechnical Site Investigation and Australian Geomechanics Society 2007 – Guidelines on Landslide Risk Management; and
- Recommendations on guidelines for good hillside practices to maintain or possibly lower the landslide risks.

1.1 Proposed Development

Concept plans of the proposed subdivision were provided prepared by Flussig Engineers, drawing no. G-001, C-100, C-200, C210 and C211 (Project no FE-22114, dated 20 October 2022 and revised on 6 February 2024).

We understand that the proposed subdivision will consist of 17 lots (Area 1 and Area 2). However, this report is to address the landslide hazards located within Area 2 (i.e. Lot 1, Lot 2 and Lot 3). The remainder of the lots within Area 1 are not mapped within a Landslide Hazard Band.

1.2 Assessment Methodology

The assessment presented herein is based on the methodology promoted by the Australian Geomechanics Society, AGS (2007) Landslide Risk Management.

By way of an extract from AGS (2007a) "Guideline for Landslide Susceptibility, Hazard and Risk Zoning for Land Use Planning":

> ***"Landslide Risk Zoning*** *takes the outcomes of hazard mapping and assesses the potential damage to persons (annual probability the person most at risk loses his or her life) and to property (annual value of property loss) for the elements at risk, accounting for probability and vulnerability."*

The methodology adopted for this assessment was to:

- Develop a landslide inventory for the site, employing the publicly available landslide mapping carried out by the Mineral Resources Tasmania (MRT);
- Undertake assessments of the landslides relating to the site in terms of historical likelihood; and

- Undertake risk assessments, in terms of both risk-to-property and risk-to-life for critical structures within the site and relevant surrounding areas.

2 BACKGROUND

2.1 Geology

The Mineral Resources Tasmania (MRT) Digital Geological Atlas 1:25,000 Series, indicates the western portion of the site (Lot 1 and part of Lot 2) is underlain by Quaternary period older stabilised aeolian sand of predominantly coastal plain. The remainder of the site, including Lot 3, is predominantly underlain by Proterozoic period quartzwacke.

2.2 Landslide Hazards

Examination of the Land Information System Tasmania (LIST) Landslide Planning Map – Hazard Bands Overlay, indicates that the southern portion of Lot 1 and Lot 2 is within a mapped medium landslide hazard band. A small portion within the western corner of Lot 3 is also within a mapped medium landslide hazard band.

2.3 Landslide Inventory

Examination of the Mineral Resources Tasmania (MRT) Tasmanian Landslide Map Series, Ulverstone – Landslide Inventory Map, 1:25,000 scale, indicates that a landslide with an unknown activity (Landslide ID. 2760) is mapped within the site. A number of possible landslides with recent or active activity are mapped within 120m to the west to the site. An extract of the Landslide Inventory Map is provided as Figure 1.

2.4 Geomorphology

Examination of the MRT Tasmanian Landslide Map Series, Ulverstone – Geomorphology Map, 1:25,000 scale, indicates the following:

- The site is predominantly located within the colluvial footslopes of a north facing hillslope;
- The southern portion of Lot 1 and Lot 2 is mapped within the displaced mass of a past landslide; and
- The western corner of Lot 3 is mapped within the displaced mass of a past landslide.

An extract of the Geomorphology Map is provided as Figure 2.

2.5 Landslide Susceptibility

Examination of the MRT Tasmanian Landslide Hazard series, Ulverstone – Deep-Seated Landslide Susceptibility Map, 1:25,000 scale, indicates that the site is partially mapped within the susceptibility zone for landslide reactivation. An extract of the Deep-Seated Landslide Susceptibility Map is provided as Figure 3.

Examination of the MRT Tasmanian Landslide Map Series, Ulverstone – Shallow Slide and Flow Susceptibility Map, indicates that the site is not mapped within a susceptibility

zone for shallow landslides. An extract of the Shallow Slide and Flow Susceptibility Map is provided as Figure 4.

Examination of the MRT Tasmanian Landslide Map Series, Ulverstone – Rockfall Susceptibility, indicated that the site is not mapped within rockfall hazard zone. An extract of the Rockfall Susceptibility Map is provided as Figure 5.

2.6 Aerial Imagery

A review of historical aerial imagery covering the site and immediate surrounds was conducted using Google Earth. Historical images from 2008 up to 2023 via Google Earth were available for review. The review of the images was primarily to look at any recent spring and landslide activities, in addition to gaining a general understanding of the recent history of the site.

Generally, no recent spring or landslide activities were observed, and no significant changes were identifiable at the site.

3 FIELD INVESTIGATION

The field investigation was conducted on 30 January 2024 and involved a site walkover and the drilling of 4 boreholes by 4WD mounted auger rig to the refusal or investigated depths of 0.6m to 3.0m.

Insitu vane shear strength tests were conducted in the clay layers encountered in the investigation, with samples of these soils being obtained for subsequent laboratory testing.

The logs of the boreholes are included in Appendix A with their locations shown in Figure 6 attached.

4 SITE CONDITIONS

4.1 Site Description

The site is located along the toe of a predominantly north facing hill slope and is currently vacant.

The ground surface within Lot 1 and Lot 2 generally has a moderate slope up towards northwest of between 10° and 12°, becoming gentle with slope of 2° to 3° within the northern portion of the site (see Plate 1). A fill batter of 22° to 28° runs along the southern most boundary of Lot 1 and Lot 2, parallel to Bass Highway (see Figure 6).

Lot 3 generally has a steep slope up towards northwest of between 12° and 25° (see Plate 2 and Plate 5). Lot 3 has been altered by past fill earthworks across the site. A steep fill batter slope is located along the proposed driveway for Lot 3 (see Figure 6 and Plate 4). A road cut batter is located parallel to the southern boundary of Lot 3 (see Plate 3 and Plate 5). The road cut batter consists of insitu bedrock overlain by a thin topsoil layer.

The vegetation across the site generally comprises a medium cover of grass. Along the southern boundary of Lot 1 and Lot 2 the area is heavily vegetated with trees and shrubs.

Overall, the slopes within the site and surrounds are typically smooth and convex with only minor subdued undulations. The slopes within the site do not show any distinct sign of any recent landslide activity.

Furthermore, no springs or seeps were observed on the site. Also, no springs or seeps were observed upslope or downslope of the proposed building sites.

A site plan, annotated with site observations, is presented in Figure 6, with photographs attached as Plates 1 to 6.

4.2 Subsurface Conditions

The investigation indicated that the subsurface conditions varied across the site.

Full details of soil conditions encountered are presented on the borehole logs.

4.2.1 Lot 1 and Lot 2

Boreholes BH1 and BH3 encountered sandy silt topsoil to depths of 0.2m to 0.3m, overlying sandy silt to depths of 0.6m and 1.2m, underlain by silty clay to the investigated or refusal depths of 2.3m and 3.0m.

Borehole BH2 encountered sandy silt topsoil to a depth of 0.2m, overlying sandy silt to the refusal depths of 0.6m.

Auger refusal encountered in Boreholes BH1 and BH2 was inferred to be on cobbles/boulders.

Boreholes BH1 and BH3 encounter groundwater seepage at depths of 1.6m and 1.9m, respectively.

4.2.2 Lot 3

Borehole BH4 encountered clayey silt fill to a depth of 0.3m, underlain by natural sandy gravel to the refusal depth of 1.1m on inferred bedrock.

The borehole did not encounter any signs of groundwater seepage over the investigated depths.

5 LABORATORY RESULTS

The results of laboratory tests conducted on soil samples are summarised in Table 1 as follows:

Table 1: Laboratory Test Results

Sample I.D.	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Classification
BH1 1.8m-2.0m	51	25	26	12	CH

Laboratory Atterberg Limits and Linear Shrinkage tests conducted on clay samples from the site indicate that the clay soils at this site possess a moderate to high shrink/swell potential.

Empirical correlations sourced from Figure D1 of AS 4678 – 2002 Earth-retaining Structures indicate that the high plasticity silty clay soils at the site would generally have effective internal friction angle (Φ') values of between 28° and 30° (for undisturbed clays), and a remoulded friction angle of between 20° and 22°.

The laboratory test certificates are provided in Appendix B.

6 GEOLOGICAL MODEL

From the MRT database combined with the subsurface conditions and geomorphology mapping the upper southern portion of the site is mapped within the toe of a past landslide.

Generally, the site consists of shallow colluvial deposits, underlain by relatively shallow bedrock (quartzwacke).

7 LANDSLIDE RISK ASSESSMENT

Based on the geological and geomorphological settings of the site, the following possible landslide scenarios are identified for the site.

- Reactivation of Landslide ID No.2760 affecting the proposed development; and
- Shallow/small-scale Landslide occurs within the Neoproterozoic Period sediments, affecting the proposed development.

The findings of the investigation relevant to assessing the above landslide scenarios are as follows:

- The site did not contain any recent landslide features;
- The average slopes within Lot 1 and Lot 2 are relatively shallow (approximately 2^{O} to 12^{O}) and are significantly less than the determined peak strength angle of internal friction value of the soils (approximately 28^{O});
- Lot 3 is underlain by shallow insitu bedrock;
- The soils were typically very stiff;
- The moisture contents of the clayey silt soils (both residual soils and landslide deposits) were typically less than or equal to the plastic limit of the soils;
- No soft or saturated soils were encountered. Furthermore, no slickensides were observed within the soil profile; and
- No springs or seeps were observed within the proposed development area.

The qualitative likelihood, consequence and risk terms used in this report for risk to the property are given in Appendix C. The risk terms are defined by a matrix that brings together different combinations of likelihood and consequence. Risk matrices help to communicate the results of risk assessment, rank risks, set priorities and develop

transparent approaches to decision making. The notes attached to the tables and terms and the comments on the response to risk in Appendix C are intended to help explain the risk assessment and management process.

Accordingly, the likelihoods estimated for the possible landslide scenarios are summarised in Table 2 as follows.

Table 2: Summary of Estimated Landslide Hazard

Possible Landslide Scenarios	Indicative Annual Probability (pa)	Indicative Recurrence Interval (yrs)	Descriptor (AGS 2007c)
Reactivation of Landslide ID No.2760 affecting the proposed development	10^{-6}	1,000,000	Barely Credible
Shallow/small-scale landslide occurs within the Neoproterozoic Period sediments affecting the proposed development	10^{-5}	100,000	Rare

7.1 Incremental Landslide Hazards

The alterations to the site as a result of the proposed development can generally be classified into two categories:

- Disturbance to the site due to the proposed development; and
- Introduction of additional water into the ground affecting the groundwater regime.

It is considered that the proposed development would not adversely impact on the site and immediate surrounds nor significantly increase the pre-existing landslide hazard, provided that the development adheres to the principles of good hillside practice and the recommendations provided below.

Geoton Pty Ltd understands that the stormwater and wastewater collected onsite will be discharge to the existing council infrastructure, and thus no additional water will be introduced into the ground within the subdivision.

7.2 Landslide Consequences

The proposed development is the element at risk for this assessment. The landslide consequences for different scenarios are summarised in Table 3 as follows.

Table 3: Summary of Consequences for Different Landslide Scenarios

Possible Landslide Scenarios	Assessed Landslide Consequences	Descriptor (AGS 2007c)
Reactivation of Landslide ID No.2760 affecting the proposed development	The landslide may significantly displace the footing system of the proposed development causing major damage	Major
Shallow/small-scale landslide occurs within the Neoproterozoic Period sediments affecting the proposed development	The landslide may displace the footing system of the proposed development causing medium damage	Medium

7.3 Landslide Risk to Property

Based on the outcomes of the landslide hazard and landslide consequence assessments detailed above, the assessed landslide risks to property are summarised in Table 4 as follows.

Table 4: Summary of Assessed Landslide Risks to Property (AGS 2007c)

Possible Landslide Scenarios	Assessed Landslide Hazards	Assessed Landslide Consequences	Qualitative Landslide Risk to Property
Reactivation of Landslide ID No.2760 affecting the proposed development	Barely Credible	Major	**Very Low**
Shallow/small-scale landslide occurs within the Neoproterozoic Period sediments affecting the proposed development	Rare	Medium	**Low**

The qualitative landslide risks at the site is therefore assessed as **LOW to VERY LOW**.

According to Table C10 of AGS 2007d, the **acceptable** qualitative risk to property criteria suggested by AGS is **LOW**, given that the element at risk is a proposed residential dwelling.

7.4 Landslide Risk to Life

The person most at risk is considered to be one living in the future development. The landslide risk to life for the identified person most at risk is calculated in Table 5 as follows.

Table 5: Landslide Risk to Life for Person Most at Risk

Possible Landslide Scenarios	Adopted Annual Landslide Probability, P(H)	Spatial Probability of Landslide Impacting Buildings at Risk, P(S:H)	Temporal Spatial Probability of Person Most at Risk at Buildings at Risk, P(T:S)	Vulnerability of Person Most at Risk, V(D:T)	Risk to Life, R(LoL)
Reactivation of Landslide ID No.2760 affecting the proposed development	10^{-6}	1.0 (Spatial Probability has been considered in the landslide hazards)	0.67 (16hrs/day)	0.5 (Building suffers major damage but is unlikely to collapse; may cause injury but death is unlikely)	3.3×10^{-7}
Shallow/small-scale landslide occurs within the Neoproterozoic Period sediments, affecting the proposed development	10^{-5}			0.05 (Building suffers medium damage but is highly unlikely to collapse; may cause injury but death is highly unlikely)	3.3×10^{-7}
					Total: 6.6×10^{-7}

The tolerable risk to life criteria for the person most at risk suggested by AGS is 10^{-5}, given that the development is a new development located on an existing slope. Acceptable risks are usually considered to be one order of magnitude lower than the tolerable risks, which in this case is 10^{-6}. However, AGS suggests that, for most development in existing urban areas, criteria based on Tolerable Risk Level is applicable.

Therefore, subject to compliance with the recommendations within Section 8 of this report, the corresponding quantitative risk to life posed by landslides as a result of the proposed development is assessed as **TOLERABLE**.

8 DISCUSSION AND RECOMMENDATIONS

8.1 General

The outcomes of the assessments for landslide risk to property (Section 7.3) and landslide risk to life (Section 7.4) only apply if the principles of good hillside practice and the recommendations provided herein are adhered to.

Information sheet entitled "Some Guidelines for Hillside Construction" adapted from the Journal of the Australian Geomechanics Society, volume 42, Number 1, dated March 2007, is presented in Appendix D.

Therefore, provided the development of the site is in accordance with good hillside practice and the recommendations within our report, we consider that a tolerable level

of risk can be achieved in accordance with Section C15.6.1 (Building and works within a landslip hazard area) and with Section C15.7.1 (Subdivision within a landslip hazard area) of the Landslide Hazard Code of the Tasmanian Planning Scheme – Central Coast with the following Performance Criteria:

- **C15.6.1 - P1.1** - Building and works within a landslip hazard area must minimise the likelihood of triggering a landslip event and achieve and maintain a tolerable risk from landslip: **A tolerable level of risk can be achieved for the proposed works, provided the works of the site are in accordance with the recommendations Sections 8.2 to 8.4;**
- **C15.6.1 - P1.2** - A landslip hazard report also demonstrates that the buildings and works do not cause or contribute to landslip on the site, on adjacent land or public infrastructure: **It is considered that the works would not adversely impact on the site and immediate surrounds, including land or public infrastructure, provided that the development adheres to the principles of good hillside practice and the recommendations provided in Sections 8.2 to 8.4;**
- **C15.6.1 - P1.3** - If landslip reduction or protection measures are required beyond the boundary of the site the consent in writing of the owner of that land must be provided for that land to be managed in accordance with the specific hazard reduction or protection measures: **Will not be required as part of the development.**
- **C15.7.1 - P1** - Each lot, or a lot proposed in a plan of subdivision, within a landslip hazard area must not create an opportunity for use or development that cannot achieve a tolerable risk from landslip: **a tolerable level of risk can be achieved for the proposed works, provided the works of the site are in accordance with the recommendations Sections 8.2 to 8.4.**

An Engineering Certificate addressing the Landslide Code is provided in Appendix E.

8.2 Buildings

- Further geotechnical investigation, including site-specific subsurface investigation and a Landslide Risk Assessment, shall be carried out for the proposed lots within the medium landslide hazard band (Lot 1 and Lot 2) in accordance with the AGS (2007) to provide site-specific recommendations for the design and construction of houses within these lots;
- Further geotechnical investigation shall be carried out for Lot 3 to determine a Site Classification in accordance with AS 2870 – 2011 Residential Slabs and Footings, and provide parameters and recommendations for footings design. All footings will be required to be founded within the natural ground (i.e. not within the fill);
- Buildings should adhere to good hillside practice; and
- Footings shall be designed by suitably qualified structural engineers with consideration of the possible lateral loading of moving soil and the proposed structure.

8.3 Cuts and Fills

- Cuts across the site should be minimised and should be limited to less than 1.0m in height and battered at slope angles no steeper than 1 vertical to 2.5 horizontal (1V:2.5H) or alternatively should be retained;
- Fill within the site should be limited to a maximum depth of 1.5m;
- Any proposed cuts and fills greater than outlined above should be reviewed by an experienced geotechnical practitioner; and
- Surface water cut-off drains should be provided uphill of any structures (the cut/fill batters) to direct surface water runoff from these slopes. The collected water should be piped to the council stormwater system or the street drainage system.

8.4 Drainage

- Collected stormwater drainage should be piped to the council stormwater or street drainage system;
- Should any seepage or groundwater be encountered during site or footing excavations, it is recommended that subsoil drainage be provided to discharge to the stormwater system; and
- No uncontrolled discharge of water onto the ground surface or through absorption trenches is permitted without a further geotechnical assessment.

9 LIMITATIONS

Although the borehole data provide an indication of subsurface conditions at the site, variations in soil conditions may occur in areas of the site not specifically covered by the field investigation.

The findings contained in the report are the result of discrete/specific sampling methodologies used in accordance with normal practices and standards, with some variations as indicated in the report. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site at the locations where boreholes were drilled. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points within the site.

10 REFERENCES

Australian Geomechanics Society (2007) – Practice note guidelines for landslide risk management 2007, Australian Geomechanics Journal, Vol 42, No. 1

AS 1726 - 2017 Geotechnical Site Investigation

AS 2870 - 2011 Residential Slabs and Footings

Land Information System Tasmania (LIST).
https://maps.thelist.tas.gov.au/listmap/app/list/map

Mineral Resources Tasmania (2013) – Tasmanian Information on Geoscience and Exploration Resources (TIGER) System.

http://www.mrt.tas.gov.au/portal/database-searches

ELVIS - Elevation and Depth - Foundation Spatial Data
http://elevation.fsdf.org.au/

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Geotechnical Consultants - Limitations of report

These notes have been prepared to assist in the interpretation and understanding of the limitations of this report.

Project specific criteria

The report has been developed on the basis of unique project specific requirements as understood by Geoton and applies only to the site investigated. Project criteria are typically identified in the Client brief and the associated proposal prepared by Geoton and may include risk factors arising from limitations on scope imposed by the Client. The report should not be used without further consultation if significant changes to the project occur. No responsibility for problems that might occur due to changed factors will be accepted without consultation.

Subsurface variations with time

Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. In the event of significant delays in the commencement of a project, further advice should be sought.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and at the time they are taken. All available data is interpreted by professionals to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, as it is virtually impossible to provide a definitive subsurface profile which includes all the possible variabilities inherent in soil and rock masses.

Report Recommendations

The report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until earthworks and/or foundation construction is almost complete and therefore the report recommendations can only be regarded as preliminary. Where variations in conditions are encountered, further advice should be sought.

Specific purposes

This report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by others

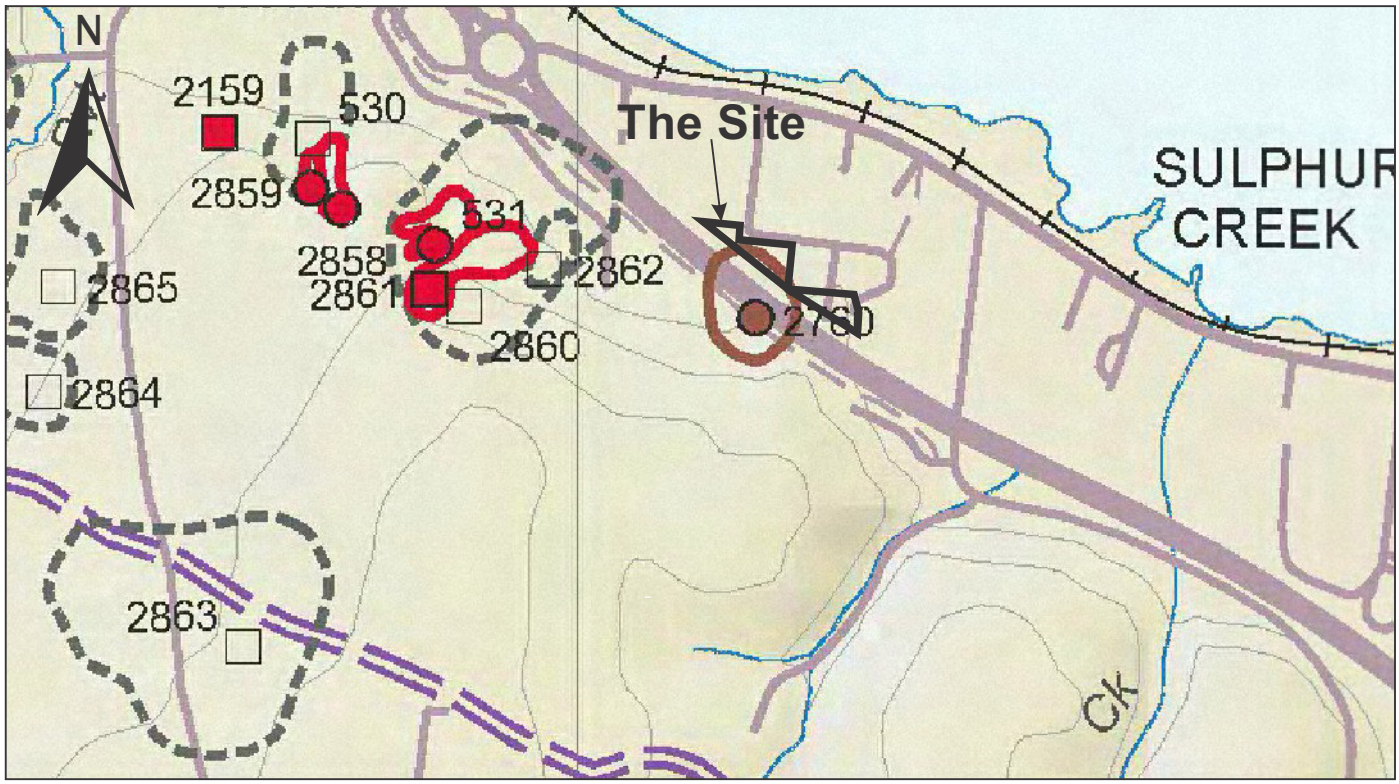
Geoton will not be responsible for interpretations of site data or the report findings by others involved in the design and construction process. Where any confusion exists, clarification should be sought from Geoton.

Report integrity

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Geoenvironmental issues

This report does not cover issues of site contamination unless specifically required to do so by the client. In the absence of such a request, Geoton take no responsibility for such issues.



Approximate Scale (m)

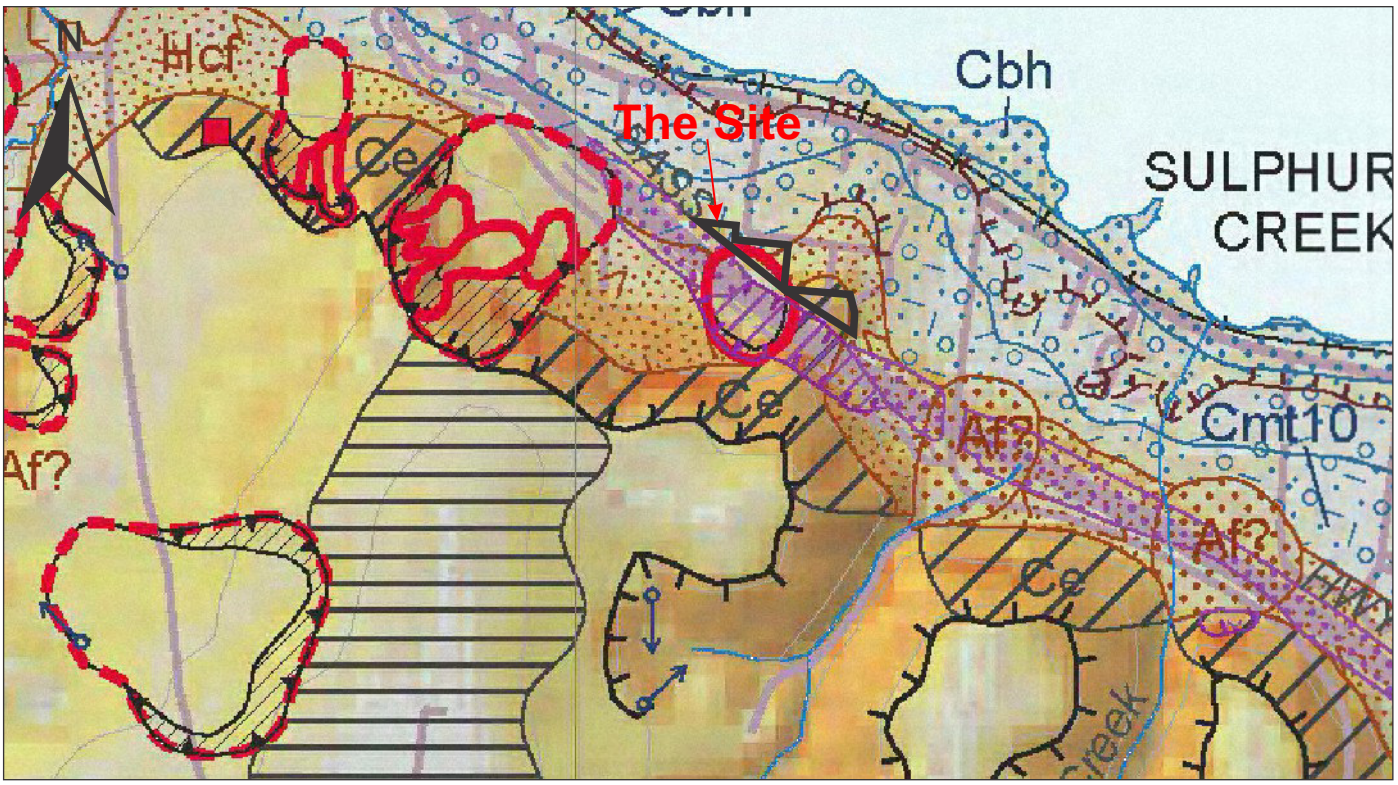
100 0 100 200 300 m

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE MAP SERIES : ULVERSTONE - LANDSLIDE INVENTORY

Landslide Features

Landslide, recent or active	Recent or active earth or debris flow.	Earth or debris flow, activity unknown.
Landslide, activity unknown	Recent or active rock or soil slide.	Rock or soil slide, activity unknown
Possible landslide	Recent or active rock fall.	Rock fall, activity unknown.
	Recent or active unclassified.	Unclassified type, activity unknown.
	Possible landslide, activity not specified.	Block or complex spread, activity unknown.

GEOTON Pty Ltd				client:	HOMES TASMANIA
				project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH
date	27/02/2024	drawn	BA		
scale	As Shown	approved	TB	title:	LANDSLIDE INVENTORY SHEET
original size	A4	rev		project no: GL23782A	figure no. 1



Approximate Scale (m)

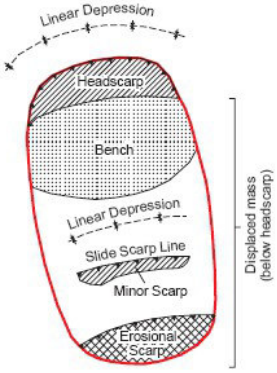
100 0 100 200 300 m

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE MAP SERIES: ULVERSTONE - GEOMORPHOLOGY

Hill Country Units

- Hcf — Colluvial footslope
- Fvffp — Valley floor and floodplain
- Cut
- Fill
- Ce — Abandoned coastal cliff

Landslide Components



- Affected area of landslide
- Affected area of Possible Landslide
- Landslide shown as a point where too small for map's scale (eg. small earth and debris flows)

Slope Categories

- 0-2 degrees
- 2-7 degrees
- 7-13 degrees
- 13-35 degrees
- 35-42 degrees
- >42 degrees

Linear Geomorphic Features

- Major convex break in slope
- Minor or rounded convex break in slope
- Spring or seep (may be concealed under dam or fill)

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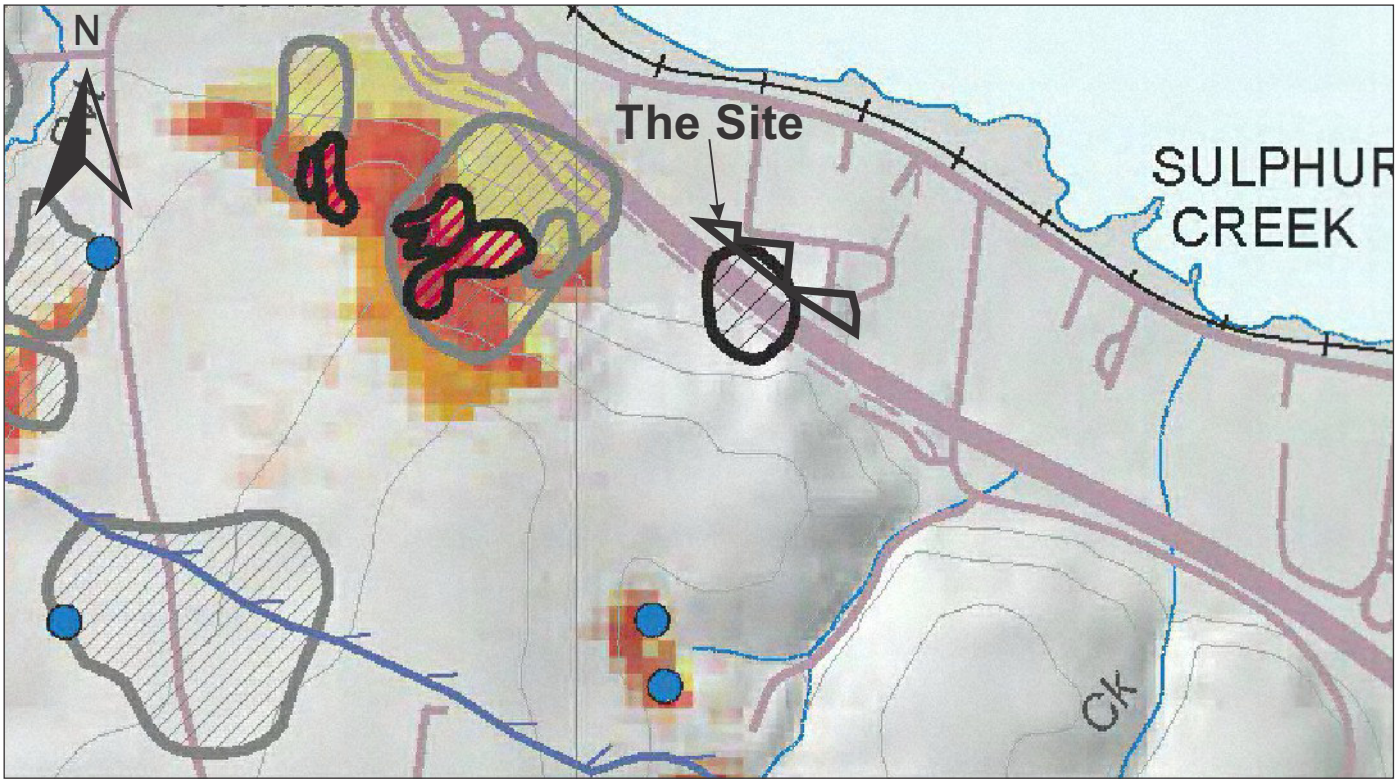
original size	A4	rev	
title:	GEOMORPHOLOGY		
project no:	GL23782A	figure no.	2



Approximate Scale (m)

100 0 100 200 300 m

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE MAP SERIES : ULVERSTONE - DEEP-SEATED LANDSLIDE SUSCEPTIBILITY

Susceptibility Zones for First Time Failure

Regression area

Source area

Runout area

Regression area: An area up-slope of a source area that could fail following a deep-seated landslide movement (a.k.a retrogression or set-back area)

Source area: An area of hillside with the potential to form a slope failure, identified largely on the basis of slope angle and geology

Runout area: An area down-slope of a source area where the moving earth, debris or rock can potentially travel

Susceptibility Zones for Landslide Reactivation

Landslide, recent or active

Landslide, activity unknown

Possible landslide, activity unknown

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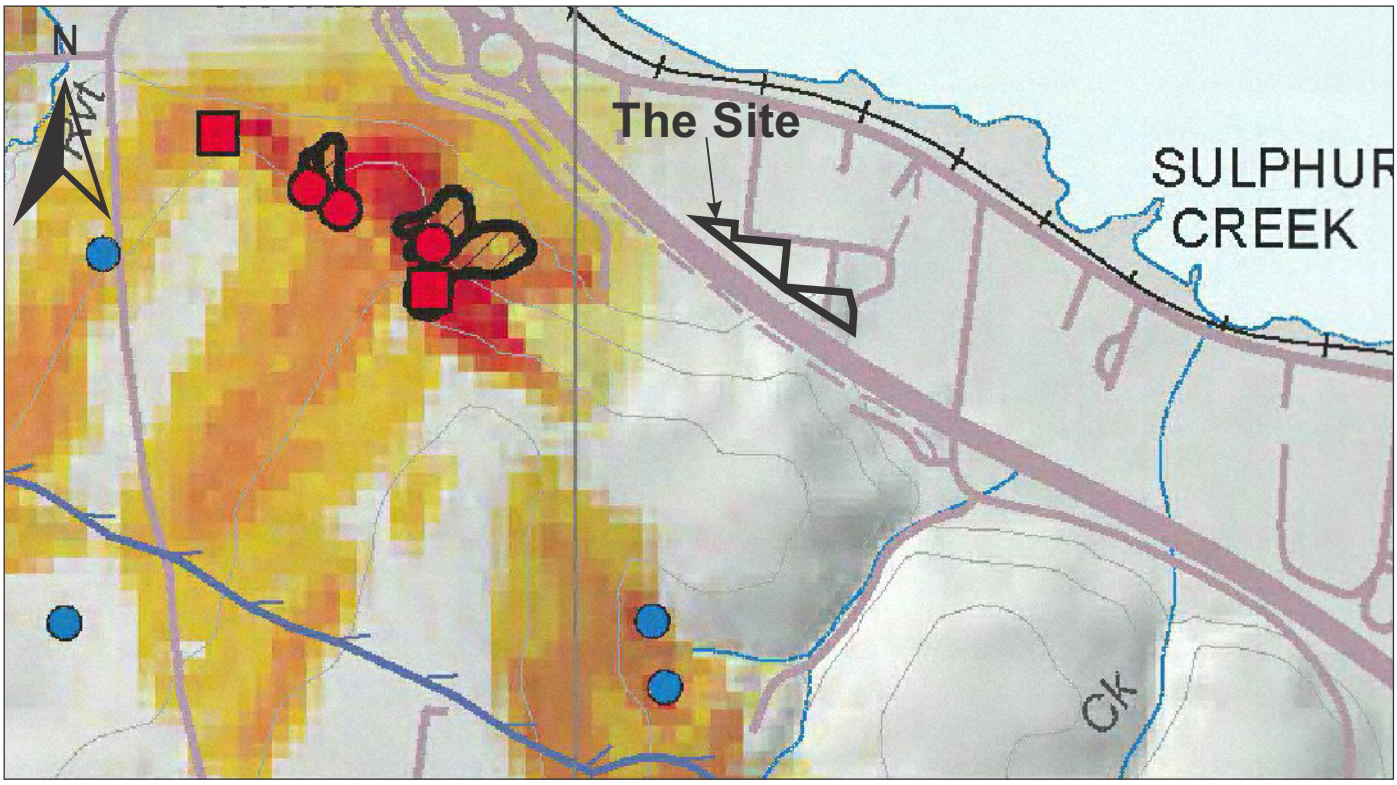
				project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH
date	27/02/2024	drawn	BA		
scale	As Shown	approved	TB	title:	DEEP-SEATED LANDSLIDE SUSCEPTIBILITY
original size	A4	rev		project no: GL23782A	figure no. 3



Approximate Scale (m)

100 0 100 200 300 m

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE MAP SERIES : ULVERSTONE - SHALLOW SLIDE AND FLOW SUSCEPTIBILITY

Susceptibility Zones

- **High susceptibility source area**
- **Moderate susceptibility source area**
- **Low susceptibility source area**
- **Flow runout area**

Source area: An area of hillside with the potential to form a slope failure, identified largely on the basis of slope angle and geology

Runout area: An area down-slope of a source area where the moving earth, debris or rock can potentially travel

Shallow Slide or Flow Features

- **Shallow slide or flow affected area**
- **Shallow slide, recent or active**
- **Shallow slide, activity unknown**
- **Earth or debris flow, recent or active**
- **Earth or debris flow, activity unknown**
- **Unclassified shallow slides or flows**
- **Spring or seep - which have a known association with landslides in many cases**

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		project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH
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scale	As Shown	approved	TB
original size	A4	rev	
		title:	SHALLOW SLIDE AND FLOW SUSCEPTIBILITY
		project no:	GL23782A
		figure no.	4

Approximate Scale (m)

100 0 100 200 300 m

MAP EXTRACT FROM - MRT TASMANIAN LANDSLIDE MAP SERIES : ULVERSTONE - ROCKFALL SUSCEPTIBILITY

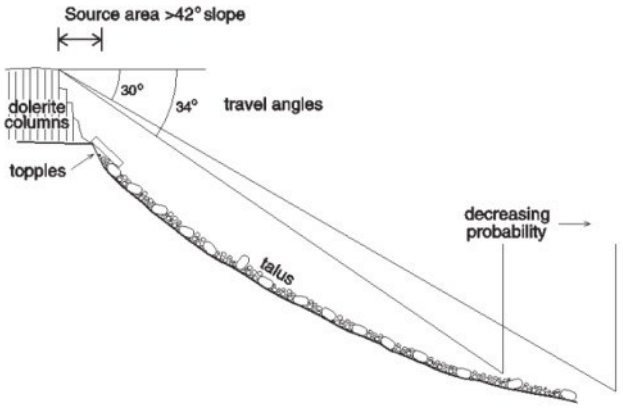
Modelled Rockfall Hazard Zones

Source areas.

Runout area – travel angle 34 degrees. (more likely)

Runout area – travel angle 30 degrees. (less likely)

Conceptual diagram illustrating Rockfall modelling technique



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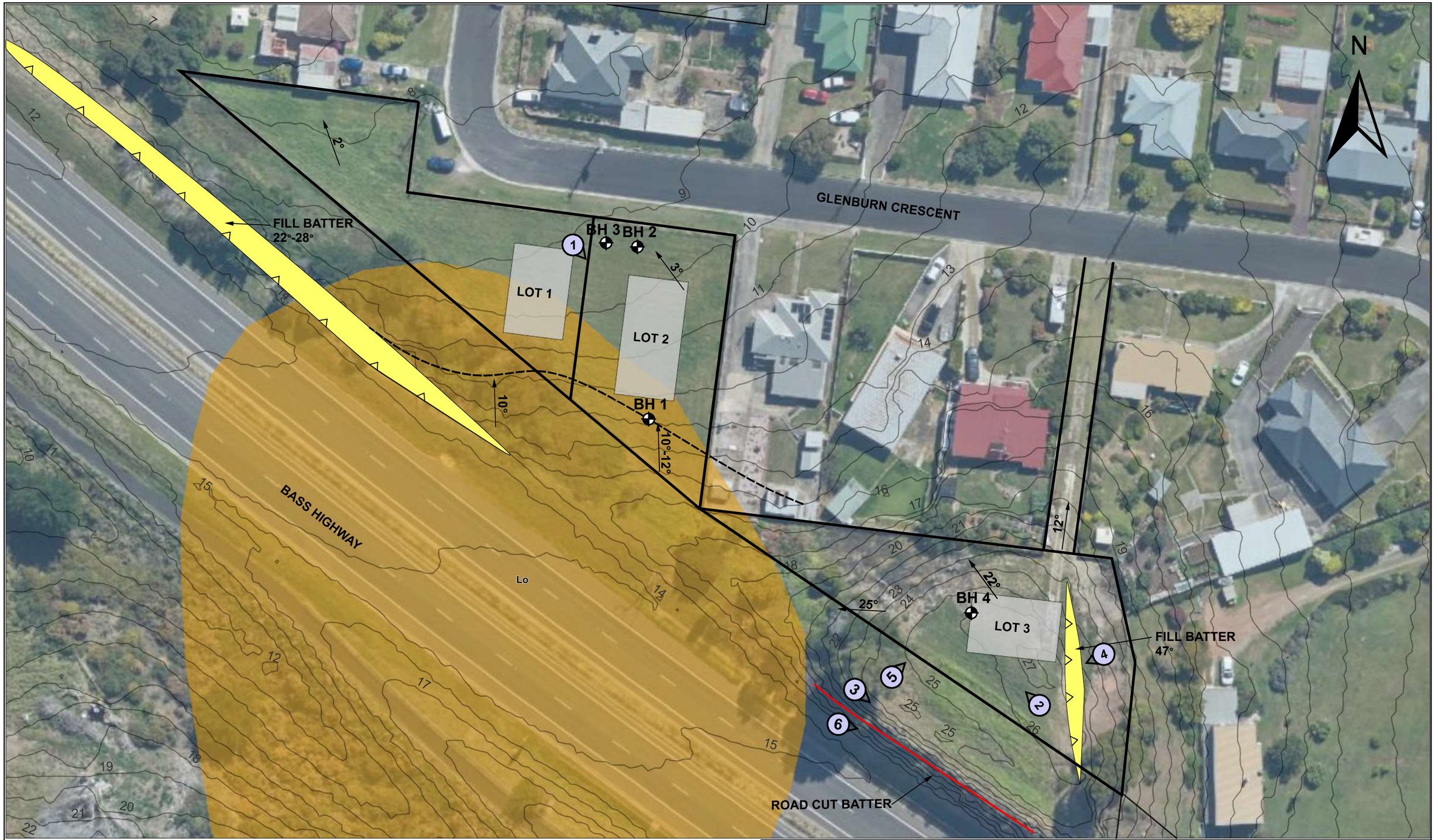
				Project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH
Date	27/02/2024	Drawn	BA		
Scale	As Shown	Approved	TB	Title:	ROCKFALL SUSCEPTIBILITY SHEET
Original size	A4	Rev		Project no: GL23782A	Figure no. 5



Legend

- BH 1 — Approximate borehole location
- Change in slope
- Proposed Title Boundary
- Contour in Metres (LiDAR Derived)
- 5° — Approximate slope angle in degrees
- Medium Landslide Hazard Band (LIST)
- Cut batter
- 6 — Approximate photograph location
- Building envelope
- Fill batter

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Date	27/02/2024	Drawn	BA
Scale	As Shown	Approved	TB
Original size	A3	Rev	

Client: HOMES TASMANIA

Project: HOWTH ROUNDABOUT SUBDIVISION
HOWTH

Title: SITE PLAN

Project no: GL23782A

Figure no. 6

PLATE 1 - View of Lot 1 and Lot 2 looking to the southeast

PLATE 2 - View of Lot 3 looking to the west

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Title:	PHOTOGRAPH			Project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH	
Date:	30/01/2024	Original Size	A4	Project no:	GL23782A	Figure no. PLATES 1 & 2

PLATE 3 - View of the road cut batter below Lot 3 along Bass Highway. Cut batter consists of insitu bedrock with a thin topsoil layer

PLATE 4 - View of the fill batter within the eastern portion of Lot 3, looking to the west

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Title:	PHOTOGRAPH			Project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH	
Date:	30/01/2024	Original Size	A4	Project no: GL23782A		Figure no. PLATES 3 & 4

PLATE 5 - View of Lot 3 looking to the north

PLATE 6 - View of the cut batter below Lot 3 from Bass Highway, looking to the northeast

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				Project:	HOWTH ROUNDABOUT SUBDIVISION HOWTH
Title:	PHOTOGRAPH				
Date:	30/01/2024	Original Size	A4	Project no: GL23782A	Figure no. PLATES 5 & 6

Appendix A

Borehole Logs

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REPORT OF BOREHOLE: BH1

Job No	: GL23782A	Easting	: 417,239.00	Sheet	: 1 OF 1
Client	: Homes Tasmania	Northing	: 5,450,607.00	Logged	: BA
Project	: Landslide Risk Assessment	UTM	: 55G	Logged Date	: 30/01/2024
Location	: Howth Roundabout Subdivision, Howth	Drill Rig	: GDR Mk1	Checked	: MS
Contractor	: Geoton	Inclination	: -90 deg	Checked Date	: 04/03/2024

Drilling Method	Drilling (0 1 2 3 4)	Water	Samples: D	Testing: V (kPa)	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Structure, Additional Observations
					0.3		SM	Topsoil- Sandy SILT- low plasticity, dark grey, fine grained sand, trace fine sized gravel.	D	FR	
					0.6		SM	Natural- Sandy SILT- low plasticity, pale grey, fine grained sand, trace fine sized gravel.	D	St	
				refusal (very stiff)							
					1		CH	Natural- Silty CLAY- high plasticity, brown orange, with fine sized gravel.	M	VSt	
				>140							
		▼		>140							
			1.8-2 m: LL=51% PL=25% PI=26% LS=12%		1.8		CH	Becoming orange mottled grey.	M	VSt	
				refusal	2						
								BH1 refusal at 2.3m (Auger refusal @ 2.3m on inferred cobbles/boulders)			

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REPORT OF BOREHOLE: BH2

Job No	: GL23782A	Easting	: 417,239.00	Sheet	: 1 OF 1
Client	: Homes Tasmania	Northing	: 5,450,607.00	Logged	: BA
Project	: Landslide Risk Assessment	UTM	: 55G	Logged Date	: 30/01/2024
Location	: Howth Roundabout Subdivision, Howth	Drill Rig	: GDR Mk1	Checked	: MS
Contractor	: Geoton	Inclination	: -90 deg	Checked Date	: 04/03/2024

Drilling Method	Drilling (0 1 2 3 4)	Water	Samples	Testing: V (kPa)	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Structure, Additional Observations
							SM	Topsoil- Sandy SILT- low plasticity, dark grey, fine grained sand, trace fine sized gravel.	D	FR	
					0.2		SM	Natural- Sandy SILT- low plasticity, grey, fine grained sand, with fine sized gravel, trace cobble/boulder.	D	St	
				refusal							
								BH2 refusal at 0.6m (Auger refusal @ 0.6m on inferred cobbles/boulders)			
					1						
					2						

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REPORT OF BOREHOLE: BH3

Job No	: GL23782A	Easting	: 695,748.27	Sheet	: 1 OF 1
Client	: Homes Tasmania	Northing	: 5,918,420.98	Logged	: BA
Project	: Landslide Risk Assessment	UTM	: 55G	Logged Date	: 30/01/2024
Location	: Howth Roundabout Subdivision, Howth	Drill Rig	: GDR Mk1	Checked	: MS
Contractor	: Geoton	Inclination	: -90 deg	Checked Date	: 26/02/2024

Drilling Method	Drilling (0 1 2 3 4)	Water	Samples: D	Testing: V (kPa)	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Structure, Additional Observations
					0		SM	Topsoil- Sandy SILT- low plasticity, dark grey, fine grained sand, trace fine sized gravel, root fibres.	D	FR	
					0.2		SM	Natural- Sandy SILT- low plasticity, grey, fine grained sand, trace fine sized gravel.	D	VSt	
				refusal (very stiff)							
			0.8-1 m: D								
				>140	1						
					1.2		CH	Natural- Silty CLAY- high plasticity, pale grey.	M	VSt	
				130							
					2						
								BH3 Terminated at 3m			

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REPORT OF BOREHOLE: BH4

Job No	: GL23782A	Easting	: 0.00	Sheet	: 1 OF 1
Client	: Homes Tasmania	Northing	: 0.00	Logged	: BA
Project	: Landslide Risk Assessment	UTM	:	Logged Date	: 30/01/2024
Location	: Howth Roundabout Subdivision, Howth	Drill Rig	: GDR Mk1	Checked	: MS
Contractor	: Geoton	Inclination	: -90 deg	Checked Date	: 04/03/2024

Drilling Method	Drilling (0 1 2 3 4)	Water	Samples	Testing	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Structure, Additional Observations
					0.3		ML	FILL- Clayey SILT, low plasticity, brown and pale grey, with fine to medium sized gravel.	D	F-St	FILL
					1		GW	Natural- Sandy GRAVEL- fine to medium sized, fine grained sand, grey.	D	MD	NATURAL
					2			**BH4 refusal at 1.1m (Auger refusal @ 1.1m on inferred bedrock)**			

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Investigation Log Explanation Sheet

METHOD – BOREHOLE

TERM	Description
AS	Auger Screwing*
AD	Auger Drilling*
RR	Roller / Tricone
W	Washbore
CT	Cable Tool
HA	Hand Auger
DT	Diatube
B	Blank Bit
V	V Bit
T	TC Bit

* Bit shown by suffix e.g. ADT

METHOD – EXCAVATION

TERM	Description
N	Natural exposure
X	Existing excavation
H	Backhoe bucket
B	Bulldozer blade
R	Ripper
E	Excavator
HT	Hand Tools

SUPPORT

TERM	Description
M	Mud
N	Nil
C	Casing
S	Shoring

PENETRATION

1	2	3	4	
				No resistance ranging to Refusal

WATER

Symbol	Description
	Water inflow
	Water outflow
	17/3/08 water on date shown

NOTES, SAMPLES, TESTS

TERM	Description
U_{50}	Undisturbed sample 50 mm diameter
U_{63}	Undisturbed sample 63 mm diameter
U_{81}	Undisturbed sample 81 mm diameter
D	Disturbed sample
N	Standard Penetration Test (SPT)
N*	SPT – sample recovered
N_C	SPT with solid cone
V	Vane Shear
PP	Pocket Penetrometer
P	Pressumeter
B_S	Bulk sample
E	Environmental Sample
R	Refusal
DCP	Dynamic Cone Penetrometer (blows/100mm)
PL	Plastic Limit
LL	Liquid Limit
LS	Linear Shrinkage

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION

Based on AS 1726:2017

MOISTURE

TERM	Description
D	Dry
M	Moist
W	Wet

CONSISTENCY/DENSITY INDEX

TERM	Description
VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fr	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	Very dense

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Soil Description Explanation Sheet (1of 2)

DEFINITION

In engineering terms, soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL AND SOIL NAME

Soils are described in accordance with the AS 1726: 2017 as shown in the table on Sheet 2.

PARTICLE SIZE DEFINITIONS

NAME	SUBDIVISION	SIZE (mm)
BOULDERS		>200
COBBLES		63 to 200
GRAVEL	Coarse	19 to 63
	Medium	6.7 to 19
	Fine	2.36 to 6.7
SAND	Coarse	0.6 to 2.36
	Medium	0.21 to 0.6
	Fine	0.075 to 0.21
SILT		0.002 to 0.075
CLAY		<0.002

MOISTURE CONDITION

Coarse Grained Soils

Dry Non-cohesive and free running.

Moist Soil feels cool, darkened in colour. Soil tends to stick together.

Wet As for moist but with free water forming when handling.

Fine Grained Soils

Moist, dry of Plastic Limited – w < PL
Hard and friable or powdery.

Moist, near Plastic Limit – w ≈ PL
Soils can be moulded at a moisture content approximately equal to the plastic limit.

Moist, wet of Plastic Limit – w > PL
Soils usually weakened and free water forms on hands when handling.

Wet, near Liquid Limit - w ≈ LL

Wet, wet of Liquid Limit - w > LL

CONSISTENCY TERMS FOR COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	≤12	Exudes between the fingers when squeezed in hand
Soft	12 to 25	Can be moulded by light finger pressure
Firm	25 to 50	Can be moulded by strong finger pressure
Stiff	50 to 100	Cannot be moulded by fingers
Very Stiff	100 to 200	Can be indented by thumb nail
Hard	>200	Can be indented with difficulty by thumb nail
Friable	–	Can be easily crumbled or broken into small pieces by hand

RELATIVE DENSITY OF NON-COHESIVE SOILS

TERM	DENSITY INDEX (%)
Very Loose	≤15
Loose	15 to 35
Medium Dense	35 to 65
Dense	65 to 85
Very Dense	> 85

DESCRIPTIVE TERMS FOR ACCESSORY SOIL COMPONENTS

DESIGNATION OF COMPONENT	IN COARSE GRAINED SOILS		IN FINE GRAINED SOILS	TERM
	% Fines	% Accessory coarse fraction	% Sand/ gravel	
Minor	≤5	≤15	≤15	Trace
	>5, ≤12	>15, ≤30	>15, ≤30	With
Secondary	>12	>30	>30	Prefix

SOIL STRUCTURE

ZONING		CEMENTING	
Layer	Continuous across the exposure or sample.	Weakly cemented	Easily disaggregated by hand in air or water.
Lens	Discontinuous layer of different material, with lenticular shape.	Moderately cemented	Effort is required to disaggregate the soil by hand in air or water.
Pocket	An irregular inclusion of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely Weathered material	Material is weathered to such an extent that it has soil properties. Structure and/or fabric of parent rock material retained and visible.
Residual soil	Structure and/or fabric of parent rock material not retained and visible.

TRANSPORTED SOILS

Aeolian soil	Carried and deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Soil and rock debris transported downslope by gravity.
Estuarine soil	Deposited in coastal estuaries, and including sediments carried by inflowing rivers and streams, and tidal currents.
Fill	Man-made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Lacustrine soil	Deposited in freshwater lakes.
Marine soil	Deposited in a marine environment.

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Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)						**GROUP SYMBOL**	**PRIMARY NAME**
COARSE GRAINED SOIL More than 65% of soil excluding oversize fraction is larger than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to naked eyes)	GRAVEL More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVEL (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes		GW	GRAVEL
				Predominantly one size or a range of sizes with some intermediate sizes missing		GP	GRAVEL
			GRAVEL WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML and MH below)		GM	Silty GRAVEL
				Plastic fines (for identification procedures see CL, CI and CH below)		GC	Clayey GRAVEL
		SAND More than half of coarse fraction is smaller than 2.36 mm	CLEAN SAND (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes		SW	SAND
				Predominantly one size or a range of sizes with some intermediate sizes missing		SP	SAND
			SAND WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML and MH below)		SM	Silty SAND
				Plastic fines (for identification procedures see CL, CI and CH below)		SC	Clayey SAND
FINE GRAINED SOIL More than 35% of soil excluding oversize fraction is smaller than 0.075 mm		IDENTIFICATION PROCEDURES ON FRACTIONS <0.075 mm					
			DRY STRENGTH	**DILATANCY**	**TOUGHNESS**		
		SILT & CLAY (low to medium plasticity, LL ≤ 50)	None to Low	Slow to Rapid	Low	ML	SILT
			Medium to High	None to Slow	Medium	CL, CI	CLAY
			Low to Medium	Slow	Low	OL	ORGANIC SILT
		SILT & CLAY (high plasticity, LL > 50)	Low to Medium	None to Slow	Low to Medium	MH	SILT
			High to Very High	None	High	CH	CLAY
			Medium to High	None to Very Slow	Low to Medium	OH	ORGANIC CLAY
		Highly Organic Soil	Readily identified by colour, odour, spongy feel and frequently by fibrous texture.			Pt	PEAT

● LL – Liquid Limit.

COMMON DEFECTS IN SOILS

TERM	**DEFINITION**	**DIAGRAM**
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (e.g. bedding). May be open or closed.	
FISSURE	A surface or crack across which the soil has little or no tensile strength, but which is not parallel or sub parallel to layering. May be open or closed. May include desiccation cracks.	
SHEARED SEAM	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting fissures which divide the mass into lenticular or wedge-shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	**DEFINITION**	**DIAGRAM**
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter.	
TUBE CAST	An infilled tube. The infill may be uncemented or weakly cemented soil or have rock properties.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open defects.	

Appendix B

Laboratory Test Results

Material Test Report

Rare Earth CMT Laboratories Pty Ltd
Launceston Laboratory
23/16 - 18 Goodman Court Invermay Tasmania 7248
Phone: 0439 351 452
Email: arlen@rareearthcmt.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Cuthbertson
Laboratory Manager
NATA Accredited Laboratory Number: 20328

Report Number:	**RE24/239-7**
Issue Number:	1
Date Issued:	14/02/2024
Client:	Geoton Pty Ltd
	25, 16-18 Goodman Court, Invermay TAS 7248
Contact:	Bassam
Project Number:	RE24/239
Project Name:	Material Evaluation
Project Location:	Howth Roundabout Subdivision
Client Reference:	GL23782A
Work Request:	1429
Sample Number:	S1429A
Date Sampled:	01/02/2024
Dates Tested:	01/02/2024 - 13/02/2024
Sample Location:	**BH # 1 , Depth: 1.8-2.0m**
Material:	Brown Silty Clay

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	51		
Plastic Limit (%)	25		
Plasticity Index (%)	**26**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**12.0**		
Cracking Crumbling Curling	Cracking & Curling		

Appendix C

Qualitative Terminology for Use in Assessing Risk to Property

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

QUALITATIVE MEASURES OF LIKELIHOOD

Approximate Annual Probability		Implied Indicative Landslide Recurrence Interval		Description	Descriptor	Level
Indicative Value	Notional Boundary					
10^{-1}	5x10-2	10 years	20 years	The event is expected to occur over the design life.	ALMOST CERTAIN	A
10-2	5x10-3	100 years	200 years	The event will probably occur under adverse conditions over the design life.	LIKELY	B
10-3	5x10-4	1000 years	2000 years	The event could occur under adverse conditions over the design life.	POSSIBLE	C
10-4	5x10-5	10,000 years	20,000 years	The event might occur under very adverse circumstances over the design life.	UNLIKELY	D
10-5	5x10-6	100,000 years	200,000 years	The event is conceivable but only under exceptional circumstances over the design life.	RARE	E
10-6		1,000,000 years		The event is inconceivable or fanciful over the design life.	BARELY CREDIBLE	F

Note: (1) The table should be used from left to right; use Approximate Annual Probability or Description to assign Descriptor, not *vice versa*.

QUALITATIVE MEASURES OF CONSEQUENCES TO PROPERTY

Approximate Cost of Damage		Description	Descriptor	Level
Indicative Value	Notional Boundary			
200%	100%	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage.	CATASTROPHIC	1
60%	40%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage.	MAJOR	2
20%	10%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage.	MEDIUM	3
5%	1%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.	MINOR	4
0.5%		Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a notional boundary of 0.1%. See Risk Matrix.)	INSIGNIFICANT	5

Notes: (2) The Approximate Cost of Damage is expressed as a percentage of market value, being the cost of the improved value of the unaffected property which includes the land plus the unaffected structures.

(3) The Approximate Cost is to be an estimate of the direct cost of the damage, such as the cost of reinstatement of the damaged portion of the property (land plus structures), stabilization works required to render the site to tolerable risk level for the landslide which has occurred and professional design fees, and consequential costs such as legal fees, temporary accommodation. It does not include additional stabilisation works to address other landslides which may affect the property.

(4) The table should be used from left to right; use Approximate Cost of Damage or Description to assign Descriptor, not vice versa

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

LIKELIHOOD		CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost of Damage)				
	Indicative Value of Approximate Annual Probability	1: CATASTROPHIC 200%	2: MAJOR 60%	3: MEDIUM 20%	4: MINOR 5%	5: INSIGNIFICANT 0.5%
A – ALMOST CERTAIN	10^{-1}	VH	VH	VH	H	M or L (5)
B - LIKELY	10^{-2}	VH	VH	H	M	L
C - POSSIBLE	10^{-3}	VH	H	M	M	VL
D - UNLIKELY	10^{-4}	H	M	L	L	VL
E - RARE	10^{-5}	M	L	L	VL	VL
F - BARELY CREDIBLE	10^{-6}	L	VL	VL	VL	VL

Notes: (5) For Cell A5, may be subdivided such that a consequence of less than 0.1% is Low Risk.
(6) When considering a risk assessment it must be clearly stated whether it is for existing conditions or with risk control measures which may not be implemented at the current time.

RISK LEVEL IMPLICATIONS

Risk Level		Example Implications (7)
VH	VERY HIGH RISK	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.
H	HIGH RISK	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	MODERATE RISK	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	LOW RISK	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

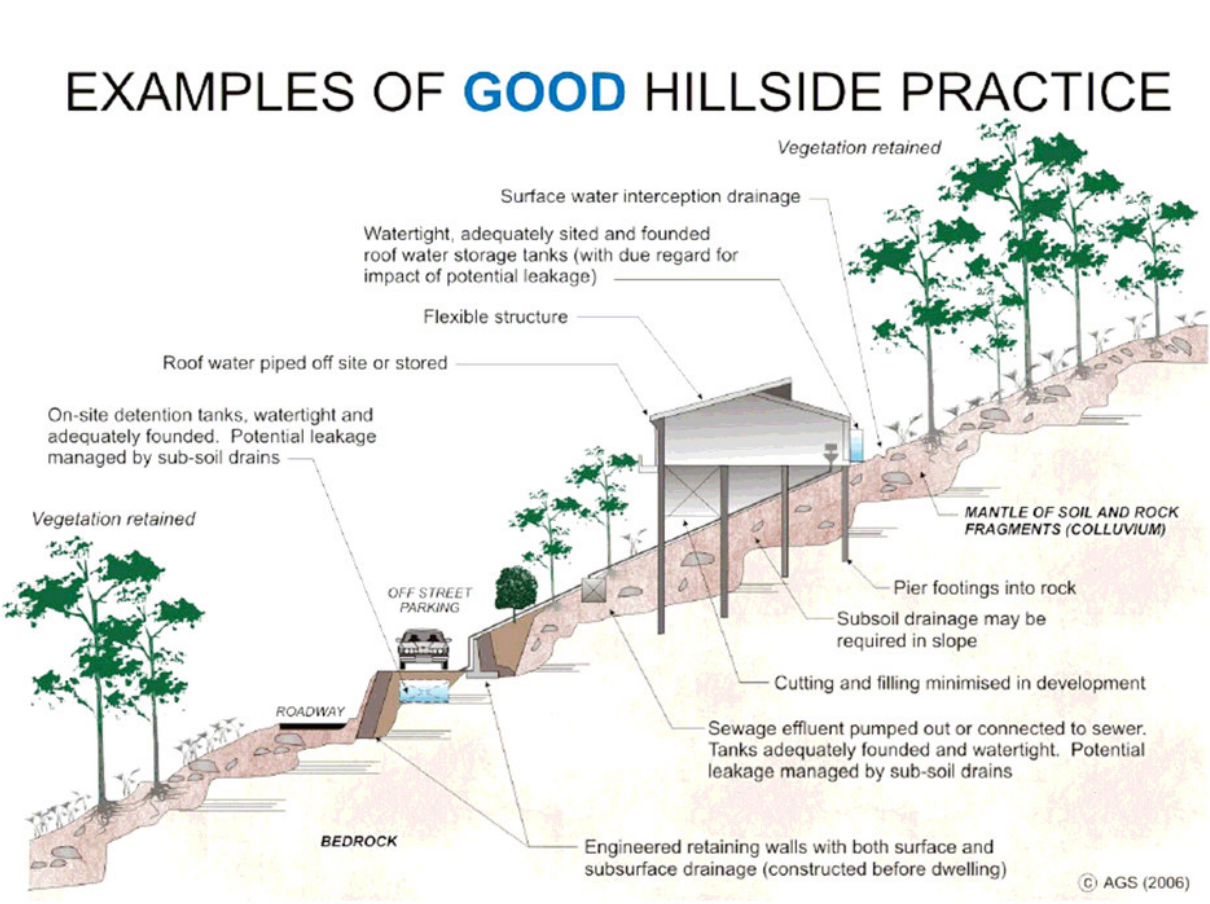
Note: (7) The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; these are only given as a general guide

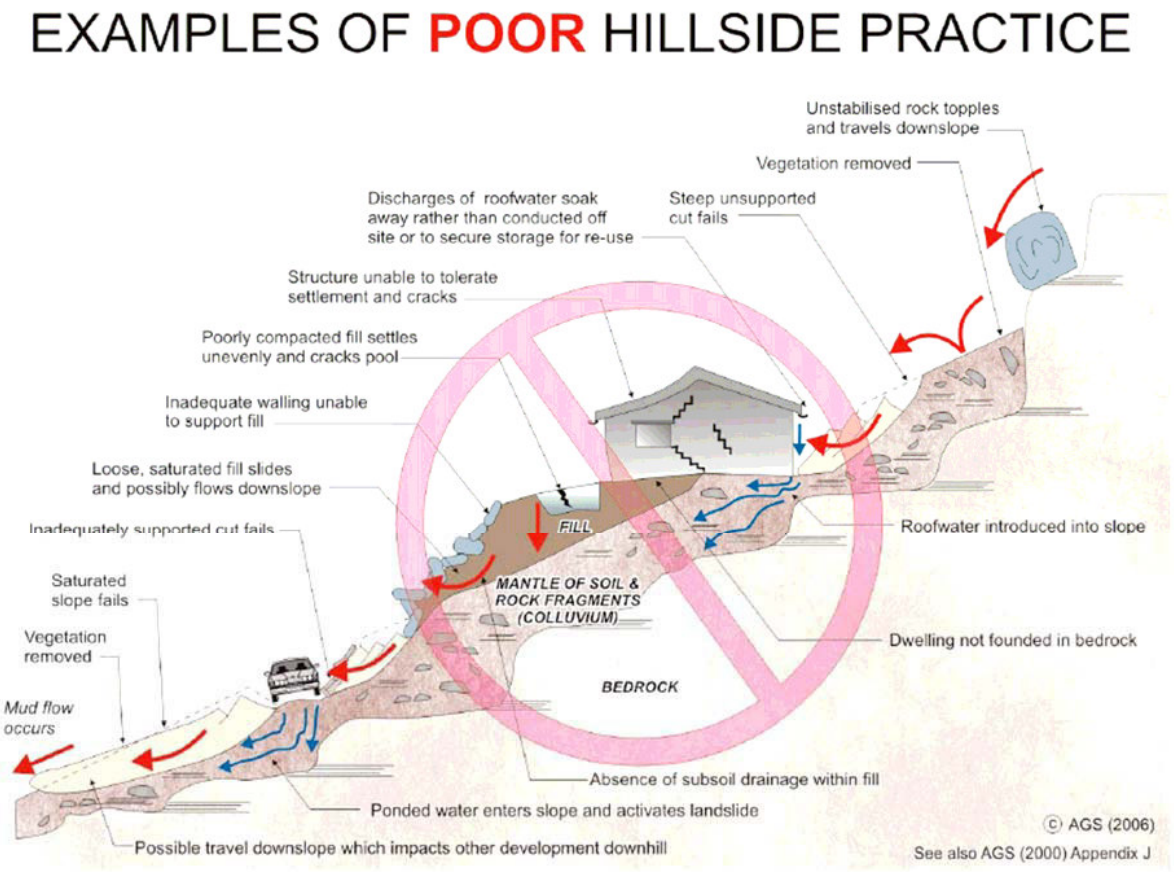
Appendix D

Some Guidelines for Hillside Construction

APPENDIX - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	


EXAMPLES OF GOOD HILLSIDE PRACTICE
Vegetation retained
Surface water interception drainage
Watertight, adequately sited and founded roof water storage tanks (with due regard for impact of potential leakage)
Flexible structure
Roof water piped off site or stored
On-site detention tanks, watertight and adequately founded. Potential leakage managed by sub-soil drains
Vegetation retained
OFF STREET PARKING
ROADWAY
BEDROCK
MANTLE OF SOIL AND ROCK FRAGMENTS (COLLUVIUM)
Pier footings into rock
Subsoil drainage may be required in slope
Cutting and filling minimised in development
Sewage effluent pumped out or connected to sewer. Tanks adequately founded and watertight. Potential leakage managed by sub-soil drains
Engineered retaining walls with both surface and subsurface drainage (constructed before dwelling)
© AGS (2006)


EXAMPLES OF POOR HILLSIDE PRACTICE
Unstabilised rock topples and travels downslope
Vegetation removed
Discharges of roofwater soak away rather than conducted off site or to secure storage for re-use
Steep unsupported cut fails
Structure unable to tolerate settlement and cracks
Poorly compacted fill settles unevenly and cracks pool
Inadequate walling unable to support fill
Loose, saturated fill slides and possibly flows downslope
Inadequately supported cut fails
FILL
Roofwater introduced into slope
Saturated slope fails
MANTLE OF SOIL & ROCK FRAGMENTS (COLLUVIUM)
Vegetation removed
Dwelling not founded in bedrock
BEDROCK
Mud flow occurs
Absence of subsoil drainage within fill
Ponded water enters slope and activates landslide
Possible travel downslope which impacts other development downhill
© AGS (2006)
See also AGS (2000) Appendix J

Appendix E

Certificate Forms

GEOTON Pty Ltd
Geotechnical Consultants

Engineering Certificate

To:	Homes Tasmania		*Owner /Agent*
	GPO Box 65		*Address*
	HOBART TAS	7001	*Suburb/postcode*

Certifier details:

From:	Geoton Pty Ltd		
Address:	PO Box 522	Phone No:	(03) 6326 5001
	Prospect 7250	Fax No:	
Accreditation No: *(if applicable)*		Email address:	tbarriera@geoton.com.au
Or qualifications and Insurance details:	Tony Barriera – BEng, MSc, CPEng, NER – IEAust 471929 Civil, Geotechnical Certain Underwriters at Lloyd's- ENG 22 000330		*(description from Column 4 of the Director of Building Control's determination)*
Speciality area of expertise:	Geotechnical Engineering Landslide Risk Assessments		*(description from Column 5 of the Director of Building Control's determination)*

Details of work:

Address:	Howth Roundabout Subdivision	Lot No:	1, 2, 3
	Howth TAS	Certificate of title No:	199745/1 87389/34
The work related to this certificate:	Landslide Risk Assessment		*(description of the work or part work being certified)*

Certificate details:

Certificate type:	Geotechnical	*(description from Column 2 of the Director of Building Control's determination)*

In issuing this certificate the following matters are relevant –

Documents:	Geoton Pty Ltd, Report Reference No. GL23782Ab, dated 27/02/2024.
Relevant calculations:	Refer to report
References:	Australian Geomechanics Society – Practice Note Guidelines for Landslide Risk Management, 2007

Substance of Certificate:

GEOTON Pty Ltd
Geotechnical Consultants

Findings and recommendations of report (Report Reference No. GL23782Ab).

From the Tasmanian Planning Scheme (TPS) the site is partially mapped within a Medium Landslide Hazard Band. As such, a landslide risk assessment is required to determine if a tolerable risk can be achieved and maintained for the type, scale and intended life of use of the development.

The landslide risk assessment was conducted in accordance with Australian Geomechanics Society (AGS) – Practice Note Guidelines for Landslide Risk Management, 2007. Our report concluded that the qualitative landslide risk for the site is at worst a LOW risk provided the development of the site is in accordance with the recommendations within our report. In our experience, regulating authorities allow developments to proceed with VERY LOW to LOW risk.

Therefore, provided the development of the site is in accordance with the recommendations within our report, then we consider that a tolerable level of risk can be achieved for the development of the site in accordance with section C15.6.1 (Building and works within a landslip hazard area) and C15.7.1 (Subdivision within a landslip hazard area) of the Landslide Hazard Code of the TPS. That is, the level of likely risk from exposure to the natural hazard (landslide) is considered to be tolerable for the proposed residential development.

Scope or Limitations

The report provides a qualitative landslide risk assessment which identifies the landslide risks at the site and provides recommendations to maintain, improve and possibly reduce the risk of landslides so as not cause or contribute to the risk of landslides on the site and lands in the locality.

The site is within an area of inherent doubtful slope stability and landslides are a natural ongoing geological process. There will be always some level of landslide risk within an area of inherent doubtful slope stability. The recommendations of the report are provided to maintain, improve and possibly reduce the risk of landslides on the site and lands in the locality.

The recommendations for the design of the proposed works are in accordance with prevailing geological conditions described in the report for the site, assessed landslide risks and recommended good hillside practices.

I certify the matters described in this certificate.

	Signed:	*Date:*	*Certificate No.*
Certifier:		27/02/2024	GL23782Ab

Appendix F

Constructability Report, Flussig

8th March 2022
FE_22023-03

HOWTH ROUNDABOUT, SULPHUR CREEK CONSTRUCTABILITY REPORT

Prepared for: Communities Tasmania

flüssig ENGINEERS

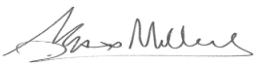
Level 4 - 116 Bathurst Street
HOBART TASMANIA 7000

ABN 16 639 276 181

Document Information

Title	Client	Document Number	Project Manager
Howth Roundabout, Sulphur Creek – Housing Constructability Report	Communities Tasmania	FE_22023-03	Max W. Möller *BEng,FIEAust,EngExec,CPEng,NER,APEC Engineer, IntPE(Aus)* *Managing Director / Principal Hydraulic Engineer*

Document Initial Revision - DRAFT

	Staff Name	Signature	Date
Prepared by	Christine Moller-Foster		28/02/2022
Prepared by	Max W. Moller		03/03/2022
GIS Mapping	Damon Heather		21/02/2022
Reviewed by	John Holmes		04/03//2022
Authorised by	Max W. Möller		07/03/2022

Document Revision History

Rev No.	Description	Reviewed by	Authorised by	Date

CONTENTS

1 INTRODUCTION

1.1 Background

Flussig Engineers have been engaged by Communities Tasmania to undertake a civil and hydraulic assessment on an allotment of land between Preservation Drive and the Bass Highway near the roundabout in Sulphur Creek, in view of its suitability for the potential construction of housing. The site is currently listed as Crown Land and lies within the Central Coast Council (CCC).

Sulphur Creek is a small residential locality just off the Bass Highway, approximately 6km to the township of Penguin to the east and 11km to Burnie to the west.

1.2 Site Overview

The study site extends from the roundabout on the Bass Hwy in Howth, encompassing the vacant land to the east between the highway and Preservation Drive and extending behind Lyle and Glenburn Street to the small hill behind number 20 Glenburn Crescent.

The property title references included in this report are: CT 123065/3, 199745/1 and 87389/34.

1.3 Objectives

This report will undertake an assessment of the land off Preservation Drive in Sulphur Creek next to the Howth Roundabout to provide information regarding existing site conditions in relation to civil infrastructure and its suitability to service a potential housing development, taking into consideration local planning regulations.

Based on the findings in this report, recommendations will be made where appropriate, including possible road connections in accordance with state and federal requirements, as well as potential upgrades to existing civil infrastructure that would be required to use the site for residential development.

1.4 Scope

This report will provide an assessment of the existing infrastructure of the study area to provide guidance on the site's suitability for the development of residential housing, including sewer, water and stormwater infrastructure, identification of existing and potential road connections in line with state and federal requirements, site requirements for internal infrastructure services.

2 SITE ASSESSMENT

2.1 Site Description

The study site is located on the vacant land next to the Howth Roundabout from the corner of Preservation Drive extending 490m along the Bass Highway to include the land behind Lyle Street and Glenburn Crescent. The study site location is identified in Figure 1.

The land is relatively flat across most of the study site at 5-8 mAHD, before a slight inclination towards a small hill of 30mAHD behind the properties on the southern side of Glenburn Crescent. There is a natural depression on the western-most point of the study area next to the roundabout.

The land is relatively cleared of most vegetation, consisting mostly of modified grassland, with small shrubs and trees along some former fence lines and alongside the highway and on Preservation Drive.

Figure 1. Roundabout at Bass Highway and Preservation Drive, Sulphur Creek

2.2 Site Visit

A site visit was conducted on the 8th February 2022. The site was found to be relatively flat and clear of tall trees in the western area. There are some remnant structures and farm equipment on parts of the site from Preservation Drive which may be as a result of the land acquisition for the Bass Highway from the original allotment. There is also a small industrial engineering business at 2 Lyle Street that may be storing some equipment behind their lot on the study area.

Along the length of the study site adjacent to the highway is mostly flat until a small hill is reached in the eastern most point of the study site behind Glenburn Crescent. A view of the study site from the roundabout looking south-east towards the Bass Highway is shown in Figure 2 and is indicative of the low-lying areas.

Figure 2. South-east facing Bass Highway from the roundabout

2.3 Zoning

The entire study area is zoned as Utilities, but the area immediately to the east is zoned General Residential Figure 3. The area to the south of the Bass Highway is zoned Rural. The zones are shown in Figure 3.

Figure 3. Tasmanian Planning Scheme Zones

2.4 Site Overlays

The following site overlays are applicable to the site:

- C7.0 Natural Assets Code
- C15.0 Landslip Hazard Code

C7.0 Natural Assets Code (Priority Vegetation Area) applies to approximately 0.67 ha of land on the eastern side of the study area behind Glenburn Crescent as shown Figure 4.

Advise should be sought from Council regarding application of this code and if an exemption could be applied if development was proposed in the area where this overlay occurs.

C15.0 Landslip Hazard Code is discussed in more detail in Section 2.5 Geology.

Figure 4. Natural Assets Code Overlay (blue shaded)

2.5 Geology

The north-western area of the study site is predominantly older aeolian sand of coastal plain, with the area between Glenburn Crescent and the Bass Highway described as quartzwacke turbidites (Vicary et. al. 2008).

Figure 5 shows that there are also some areas in this quartzwacke turbidite formation designated as medium landslip hazard.

Excavation and construction in a medium landslip hazard category should be avoided and any works in a low category should be monitored over the construction period and permanent mitigation measures must be designed and constructed to prevent future landslip failures.

Figure 5. Landslide hazard bands (DPAC)

3 SERVICES & INFRASTRUCTURE

3.1 Stormwater

As the site gently slopes from east to west, there is a natural overland flow path that could cause flooding in a storm event. Inundation could occur in the areas closest to the roundabout where there is a natural depression and no outlet or culvert currently present to discharge under the roads. This area would be considered not suitable for construction and a full flood analysis should be undertaken to determine the flood depths and extents during a 1% AEP storm.

The Stormwater Management Code regulates stormwater quality and quantity from developments. GIS data provided by the Central Coast Council shows a minor stormwater pipeline behind the properties on the western side of Lyle Street exiting on the foreshore.

A subdivision proposal will need to be supported by stormwater analysis that demonstrates how the proposed stormwater system will achieve water quality and quantity standards in accordance with the *State Stormwater Strategy 2010.* Consideration must be given to water sensitive urban design principles, which may include measures such as onsite detention tanks, basins/wetlands and bioretention swales as necessary to achieve the relevant targets.

The Stormwater Management Code requires that:

- major stormwater system be designed to accommodate a storm with an ARI of 100 years; and,
- minor stormwater system be designed to accommodate a storm with an ARI of 20 years.

Figure 6. Current stormwater services at Preservation Drive

3.2 Sewer

The study area is service by an existing network of 150mm PVC-U gravity mains that run along the north-western side of the study area parallel to Preservation Drive, the rear of the properties on the western side of Lyle Street including a section of sewer main on Glenburn Crescent. It is feasible that any potential housing in the study site could connect to this existing gravity fed network. The existing sewer network is shown in Figure 7.

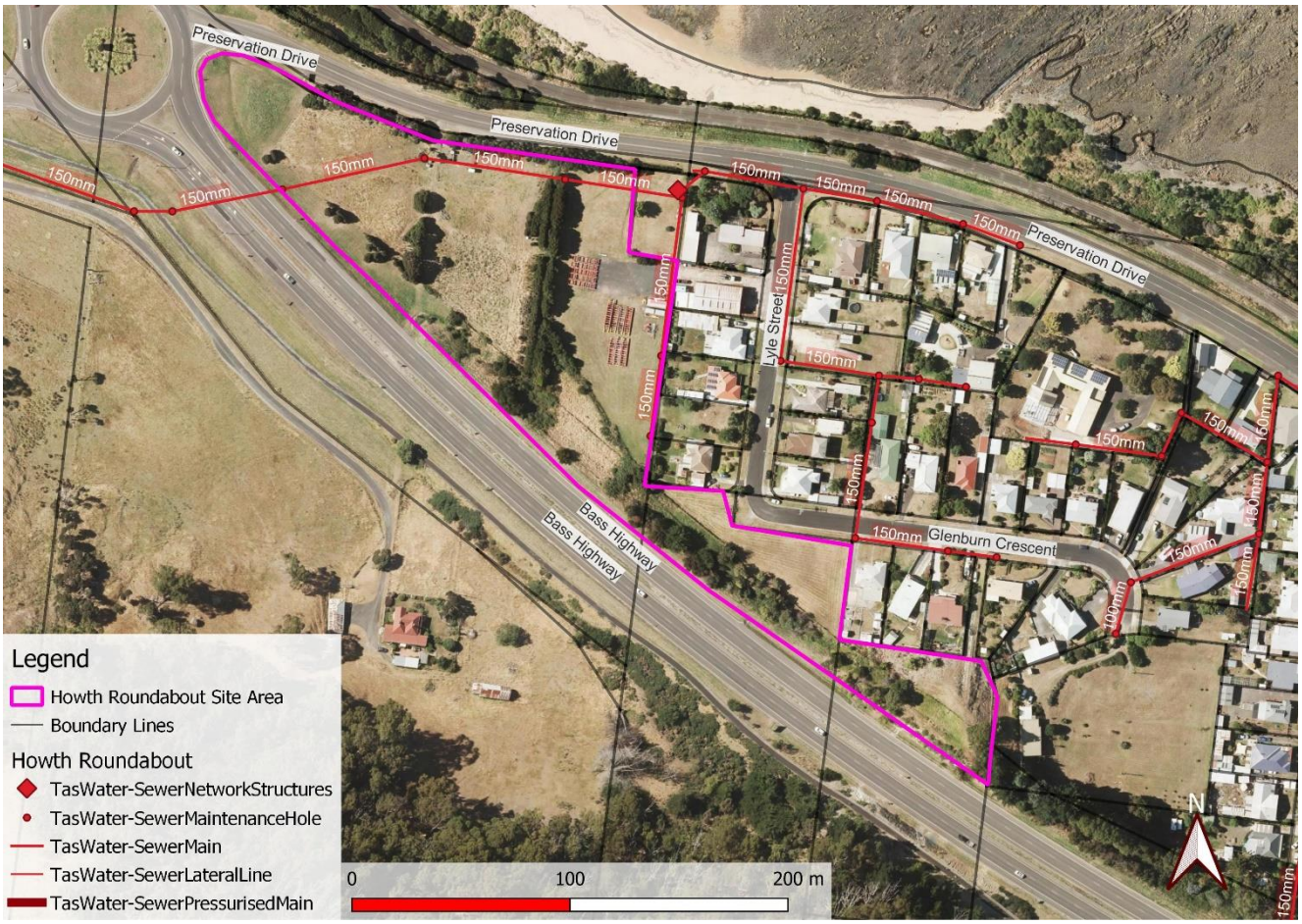


Figure 7. Current sewer network in the vicinity of the Howth Roundabout study area.

3.3 Water

As shown in Figure 8, there is a 200mm critical water main along the northern area of Preservation Drive. The nearest connection point would be the existing DN100 water main located at the intersection of Preservation Drive and Lyle Street.

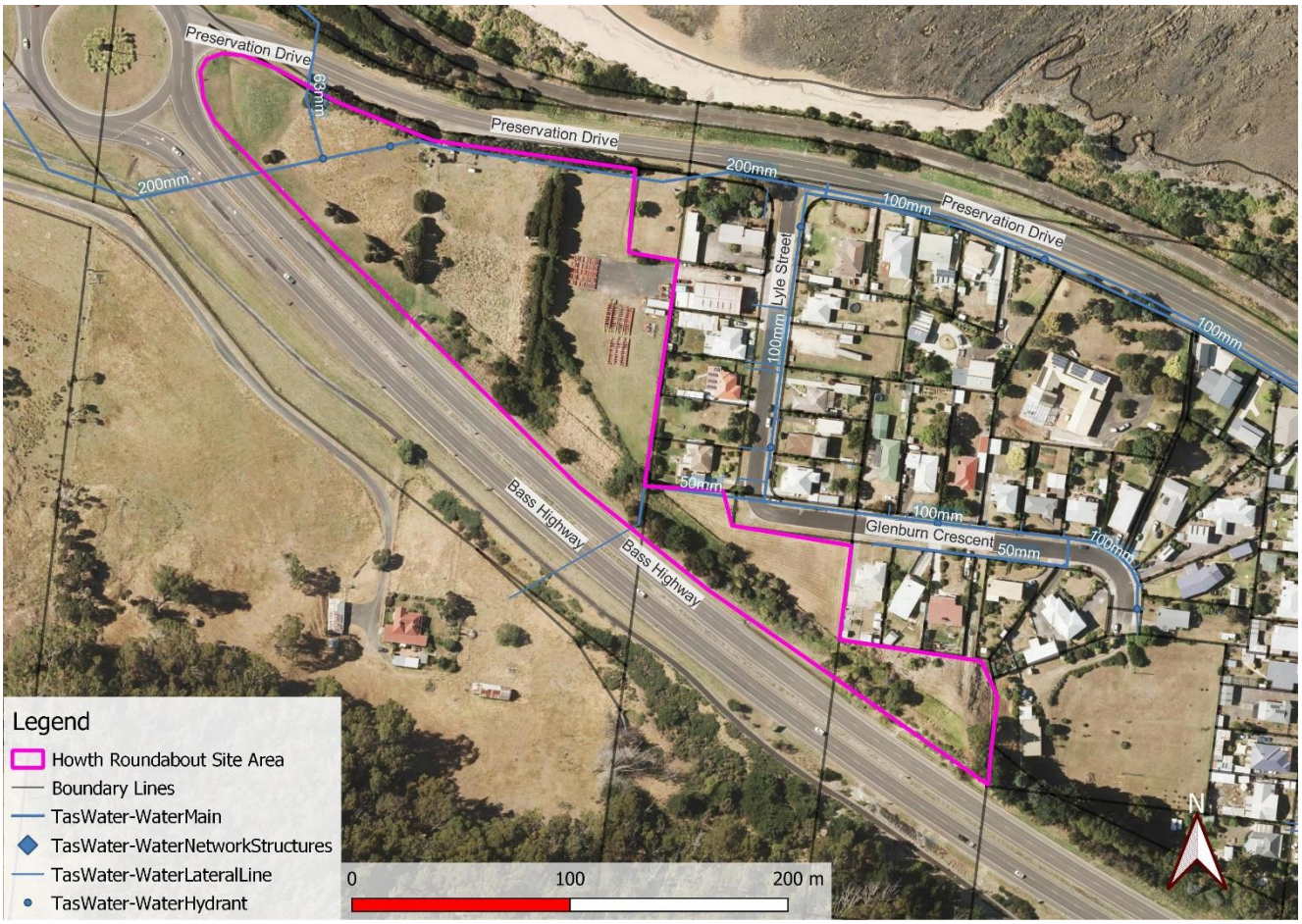


Figure 8. TasWater network structures through and in the vicinity of Howth Roundabout study area

3.4 Power and Communications

Power and communication networks were identified around the study site and access to those services would be a standard connection for future lots to be constructed.

3.5 Natural Gas

There is no natural gas connection available in the Burnie/ Penguin area.

3.6 Site Access

Considering the above section regarding access to civil services and site overlays, there are three distinct sections of the study site that may be suitable for construction which are shown in Appendix A – Site Maps.

The study site at Sulphur Creek is bordered by the Bass Highway on the southern edges, so access to the largest potential area for housing is from Preservation Drive which is currently at a speed limit of 70 km/h.

Access to houses off the corner of Lyle Street and Glenburn Crescent could be accommodated from the street which are 50 km/h. Due to the consideration of the medium landslip zone as shown in Figure 5, it is likely that only single dwellings may only be possible where construction of a driveways directly from the street may be suitable.

There is a right of way of Glenburn Crescent that accesses the land at the eastern boundary of the study site. This could be utilised as a driveway for a single lot in this area. The three potential access points are shown in Figure 9.

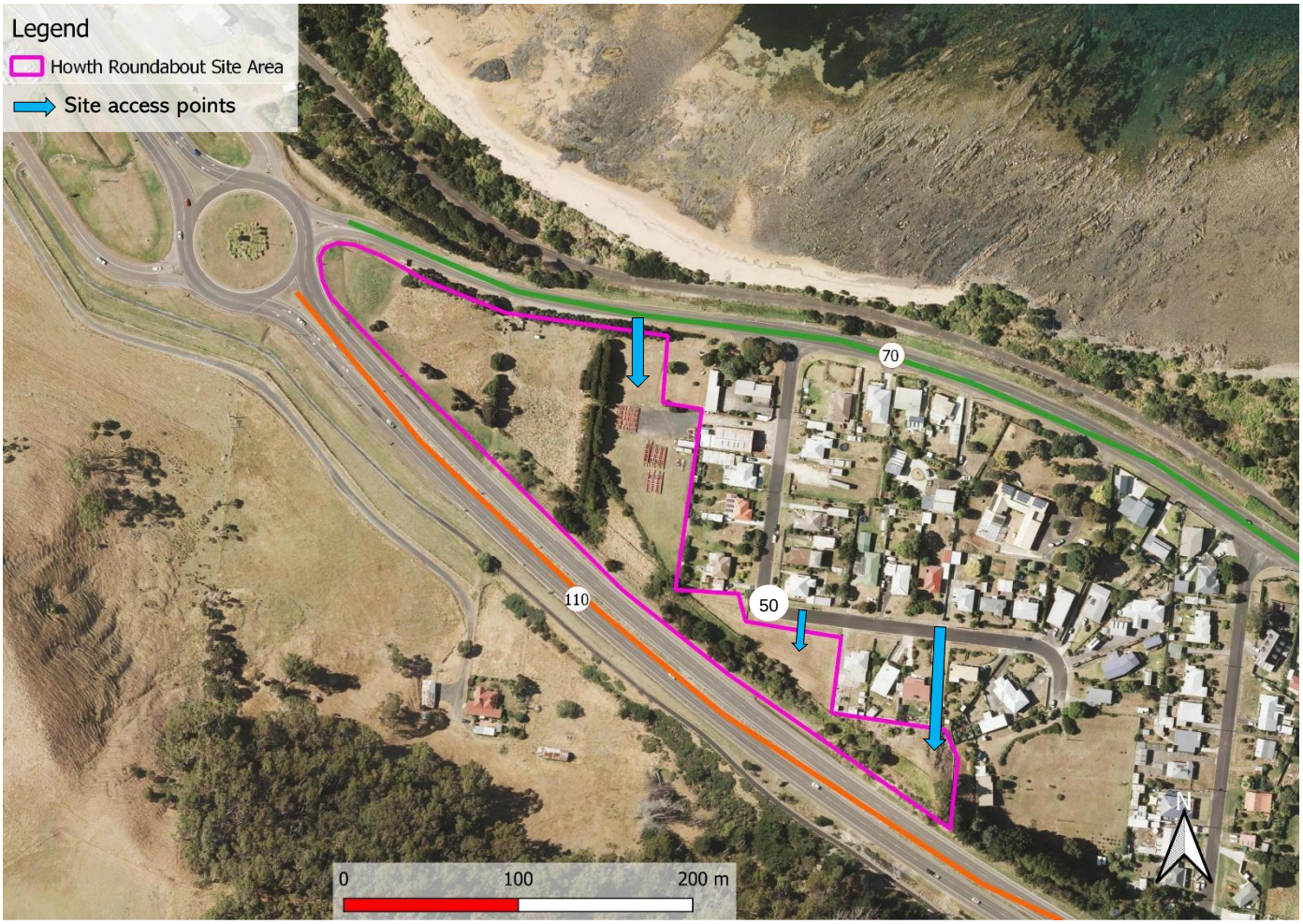


Figure 9. Howth Roundabout study site surrounding speed limits

3.7 Accessibility to public services

The community of Sulphur Creek is a small residential area (pop. <1000) that hugs the coastline. There is little in the way of shops in the area, with a small convenience store in the centre of town near a small public town hall and basic recreation area.

Penguin (pop. 3850) is located 5.5km to the east that has more shops and services, including IGA supermarkets, chemist, post office, general practices etc. The closest schools are the Penguin District School (K-12) and North West Christian School 8 km from the Howth Roundabout study area. There is also a private Christian school in the Burnie suburb of Wivenhoe which is also 8km to the west.

The town centre of Burnie (pop. 27000) is located 11km from Sulphur Creek where there are all major services including a public hospital.

Public transport in the study area is accessed by Metro bus services where there are bus stops on Preservation Drive near Hogarth Road, 300m from the Lyle Street intersection. These buses travel between Burnie and Ulverstone in the east, via the Penguin town centre.

3.8 Aesthetic Assessment

The study site at Sulphur Creek is relatively low-lying in close proximity to the coast. It is surrounded by predominantly single storey residential houses on relatively large allotments (800 – 1200m^2). Most of the buildings appear to be constructed from the 1950's onwards, with some newer house developments on Preservation Drive further to the eastern side of Sulphur Creek. Being in a seaside location, there are very few tall trees, and most of the vegetation is small trees and shrubs.

There may be some noise generated from the close proximity to the Bass Highway, particularly being close to an intersection where vehicles would be braking and accelerating, and there is little natural or man-made buffer between this major road and the proposed housing site. There is also an active freight train line that runs parallel to Preservation Drive between the road and the waterfront that may have some noise impacts.

4 AREA IMAGES

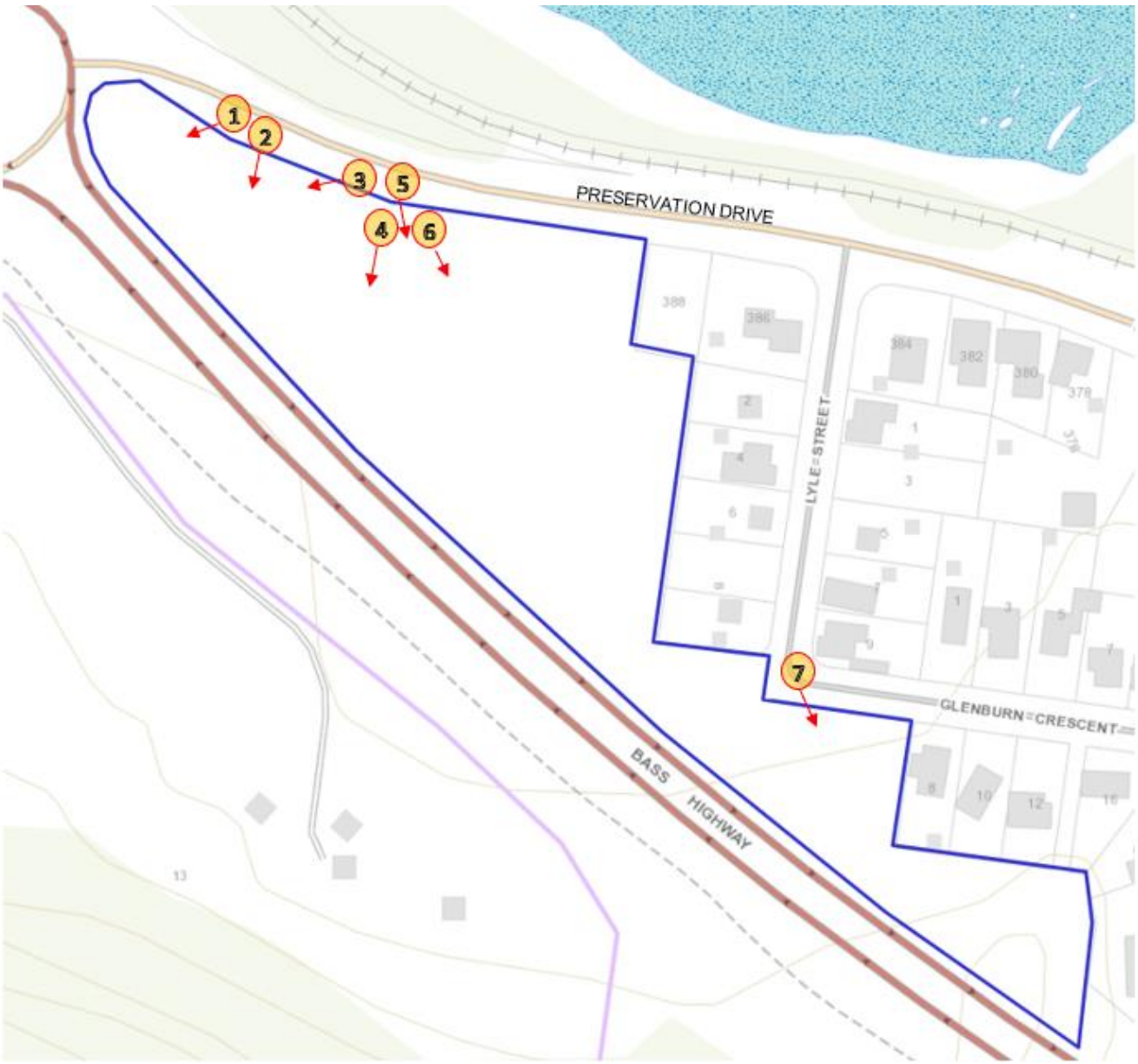


Figure 10. Image location reference with shot direction as indicated

Ref	Image
1	
2	

3	
4	

5	
6	

7	

5 CONCLUSION

Preliminary advice is that there are sections of the Howth Roundabout site that could be developed for housing. The section of the western side of Lyle Street would be suited to multiple dwellings, with the centre and eastern sections possibly suited to single to a few dwellings or strata units following geotechnical assessment of the landslip zone.

There is access to services, such as sewer, water, and stormwater networks and sites in the area that are feasible to access any proposed lots.

It is noted from a liveability perspective, that the site at Howth Roundabout would provide advantages for multiple housing due to it being within easy access to major town centres and public transport.

There is no consideration of legal conveyancing, marketing, real estate sales or financial costs in this assessment, as again, these are variable and likely to be negotiated in the future by the owner.

6 RECOMMENDATIONS

- Concept design layout for a potential lot subdivision
- Water pressure testing for minimum pressure required
- Sewer analysis for flow capacity of the existing main. It's possible that the existing sewer main will not have enough capacity to service the feasible area, thus a full pipe system upgrade should be considered.
- Stormwater detention calculations for storage
- Stormwater WSUD analysis
- Overland flow path analysis for the major rainfall events
- Traffic assessment for access feasibility
- Geotechnical investigation for existing ground conditions

7 LIMITATIONS

Any reference to geology, vegetation, biodiversity and other attributes not listed in the scope of this report are for reference and discussed as informative only.

8 REFERENCES

- ECO*tas* (2021). *Natural Values Assessment of Potential Housing Development Area, Preservation Drive, Penguin, Tasmania.* Report by Environmental Consulting Options Tasmania (ECO*tas*) for Housing, Disability & Community Services, Communities Tasmania, 15 November 2021.
- White, M.P., Alcock, I., Grellier, J. et al. (2019) *Spending at least 120 minutes a week in nature is associated with good health and wellbeing*. Sci Rep 9, 7730
- Department of Premier and Cabinet (2013) *Landslide Planning Report*
- Vicary, M.J., Calver, C.R., Everard, J.L. & Seymour, D.B. (2008) Digital Geological Atlas 1:25 000 Scale Series. Sheet 4244. Ulverstone. Mineral Resources Tasmania.

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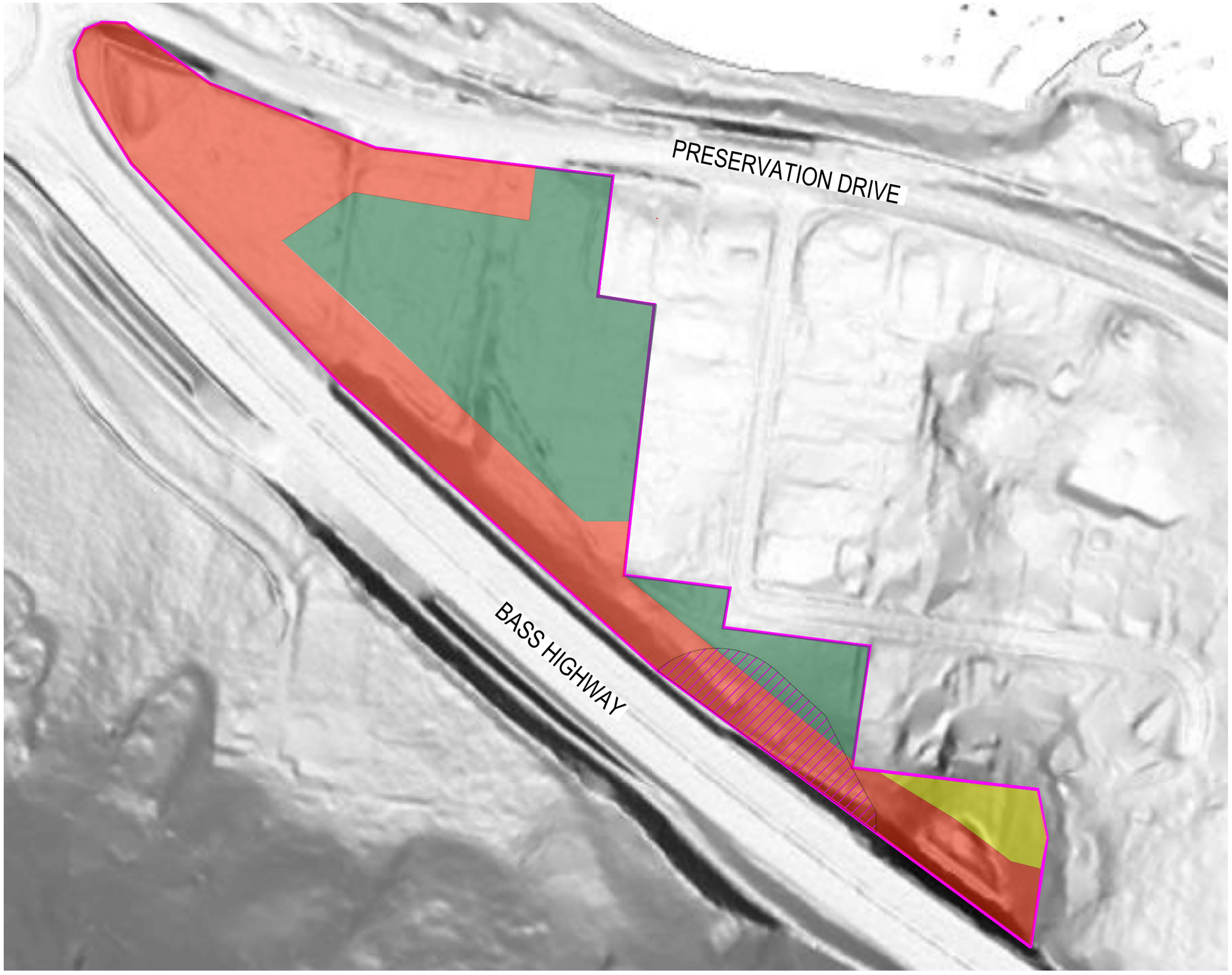
9 APPENDIX A – SITE MAPS



N

AREA FEASIBLE FOR DEVELOPMENT
SUBJECT TO EXISTING OPEN CHANNEL MODIFICATIONS

AREA FEASIBLE FOR DEVELOPMENT
SUBJECT TO ACCESS ROAD, SERVICES AND EARTHWORKS

AREA NO-FEASIBLE FOR DEVELOPMENT
SUBJECT TO INUNDATION AND OVERLAND FLOW PATH AND CONSTRUCTABILITY CONSTRAINS

MEDIUM LANDSLIDE HAZARD ZONE

HOWTH ROUNDABOUT

SCALE: 1:1500

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SITE: PEGUIN

TITLE: HOWTH ROUNDABOUT

PROJECT: CONSTRUCTABILITY ASSESSMENT

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:1500	25/02/22	DH	MM

PROJECT NO:	DRAWING NO:	REVISION:
FE-22023	C-120	-

9,960 m2
AREA FEASIBLE FOR DEVELOPMENT
WITH MINOR WORKS

1,000 m2
AREA FEASIBLE FOR DEVELOPMENT
WITH MAJOR WORKS

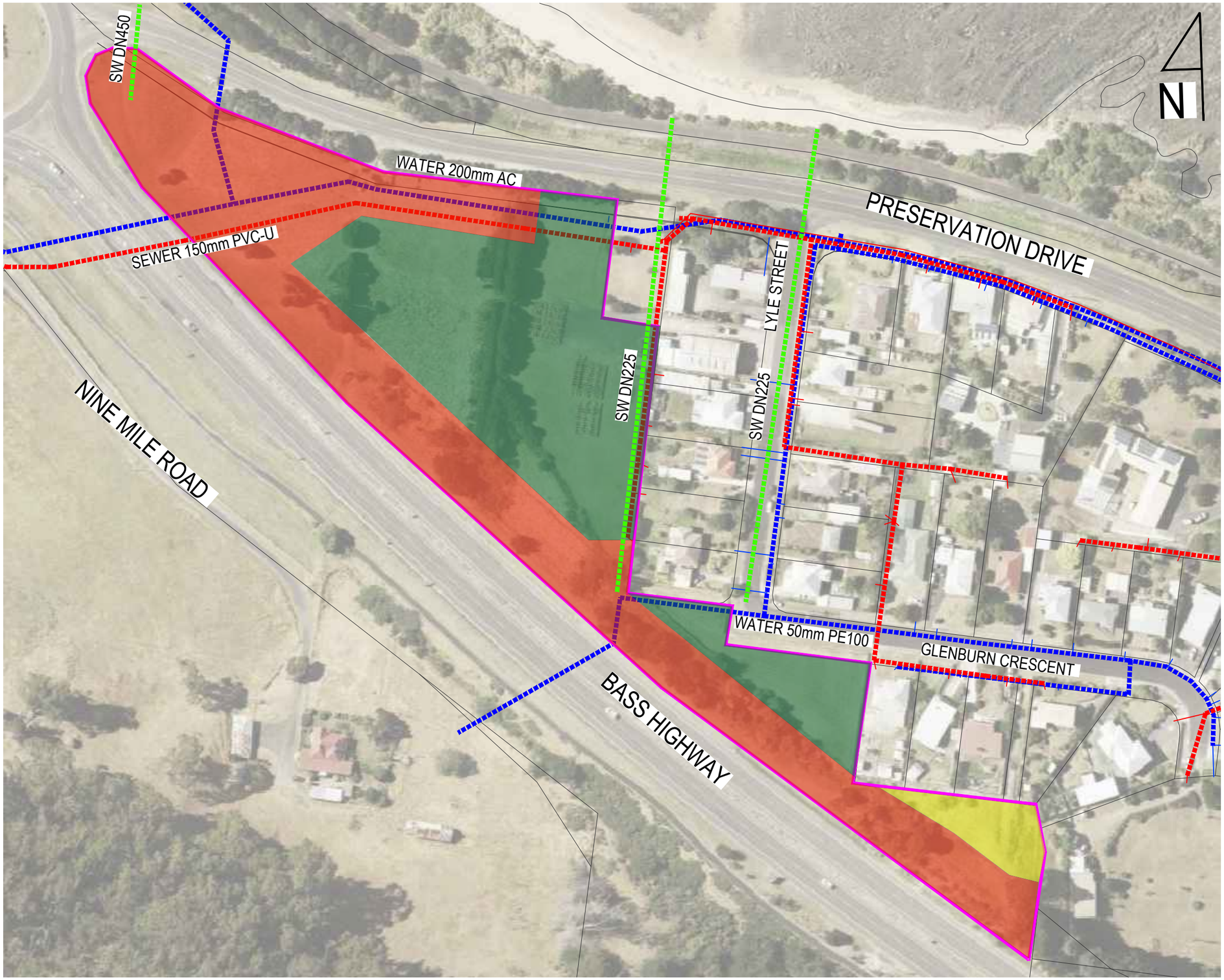
14,500 m2
AREA NO-FEASIBLE FOR DEVELOPMENT

LEGEND:

EXISTING STORMWATER MAIN

EXISTING WATER MAIN

EXISTING SEWER MAIN



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Contact Project Manager: **Max Möller**

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A: Level 4, 116 Bathurst Street, Hobart
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HOWTH ROUNDABOUT SUBDIVISION CONCEPT

AREA OF WORKS

DRAWING LIST		
DRAWING NUMBER	**TITLE**	REVISION
G-001	COVER SHEET	00
C-100	SITE PLAN AREA 1	00
C-200	SITE PLAN AREA 2	00
C-210	NOISE ATTENUATION AREAS AREA 1	00
C-211	NOISE ATTENUATION AREAS AREA 2	00

GENERAL NOTES:

DRAWINGS G-001, C-100 & C-200 PRESENT A PRELIMINARY CONCEPT FOR THE DEVELOPMENT OF THE LAND IN QUESTION (INDICATED AS AREA 1 AND AREA 2 ON THE DRAWINGS)
FURTHER PREPARATION OF THIS CONCEPT PROPOSAL WILL REQUIRE DETAILED INVESTIGATION/ ASSESSMENTS OF OTHER ISSUES SUCH AS:

- A THOROUGH AND DETAILED LAND SURVEY
- A GEOTECH ASSESSMENT OF THE SITE
- A DRAINAGE AND FLOOD HAZARD ASSESSMENT
- EARLY CONSULTATION AND DISCUSSION WITH STATE ROADS (DSG) WILL BE NECESSARY TO DETERMINE ANY OF THEIR REQUIREMENTS IN THE DEVELOPMENT OF THE SITE
- CONSULTATION WITH TASWATER TO DISCUSS WATER AND SEWER CAPACITIES WITH THE PROPOSED DEVELOPMENT.
- AN ENVIRONMENTAL ASSESSMENT/IMPACT REPORT
- TRAFFIC IMPACT ASSESSMENT/ REPORT
- NOISE MITIGATION ASSESSMENT

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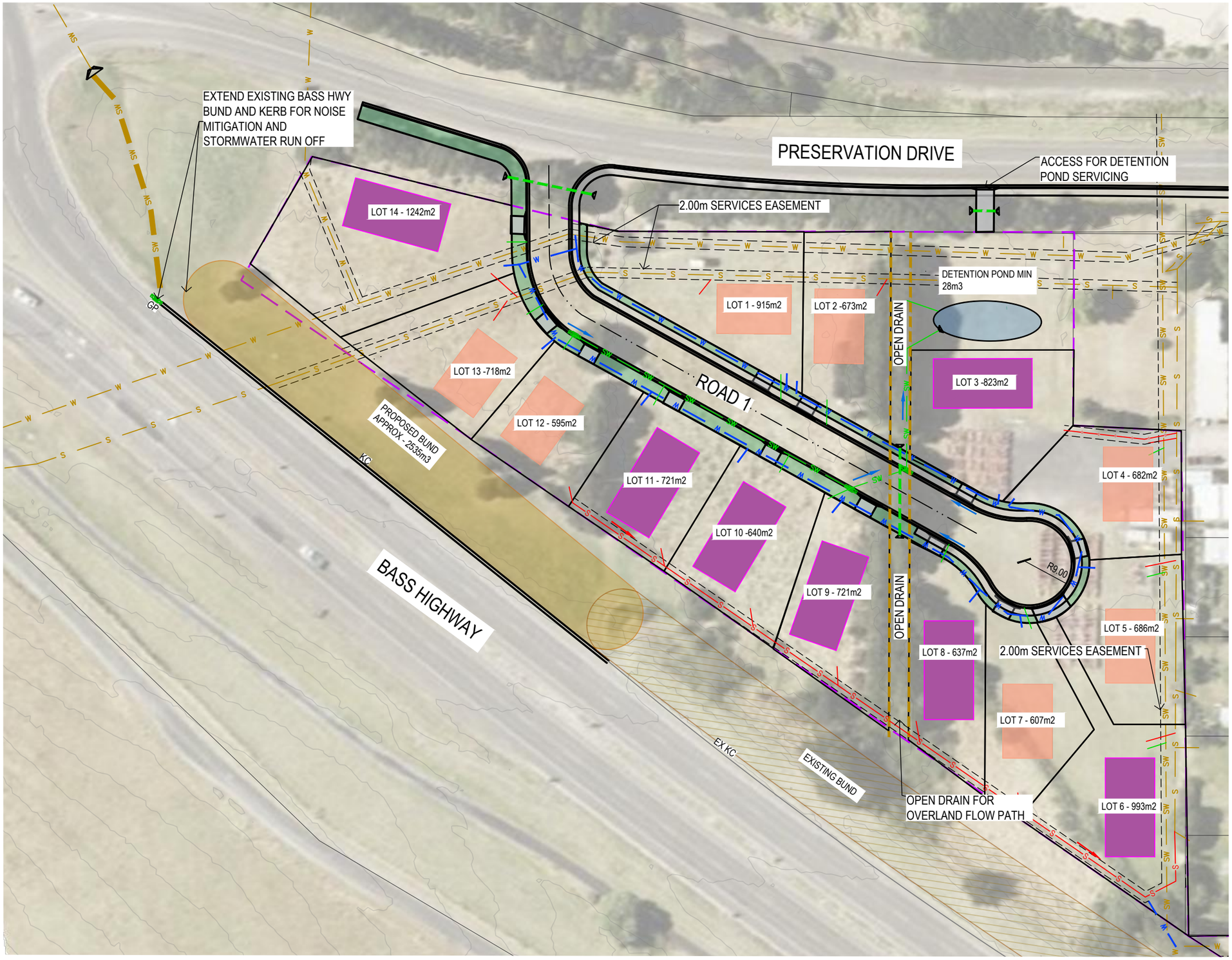

LEGEND

- DEVELOPMENT BOUNDARY
- NEW SERVICES EASEMENT

EXISTING SERVICES

- STORM WATER DRAIN
- WATER SUPPLY LINE
- SEWERAGE DRAIN

NEW STORMWATER SERVICES

- SEP 3 - SIDE ENTRY PIT TO BE IN GENERAL ACCORDANCE WITH SIDE ENTRY PIT TYPE 3 ON TSD-SW09-v2
- STORWATER PIPES
- STORWATER PIPES DN450
- STORMWATER FLOW DIRECTION

NEW SEWER SERVICES

- SEWERAGE PIPE PVC SN8
- SEWER FLOW DIRECTION

NEW WATER SERVICES

- WATER SUPPLY LINE
- 150m2 BUILDING ENVELOPE
- 200m2 BUILDING ENVELOPE

NOTES:

- EACH LOT WILL REQUIRE ITS OWN STORMWATER DETENTION

NOISE MITIGATION NOTES:

- NOISE MITIGATION FROM THE BASS HWY WILL BE NEEDED.

SITE AREA 1

SCALE 1:800

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TITLE:	SITE PLAN AREA 1

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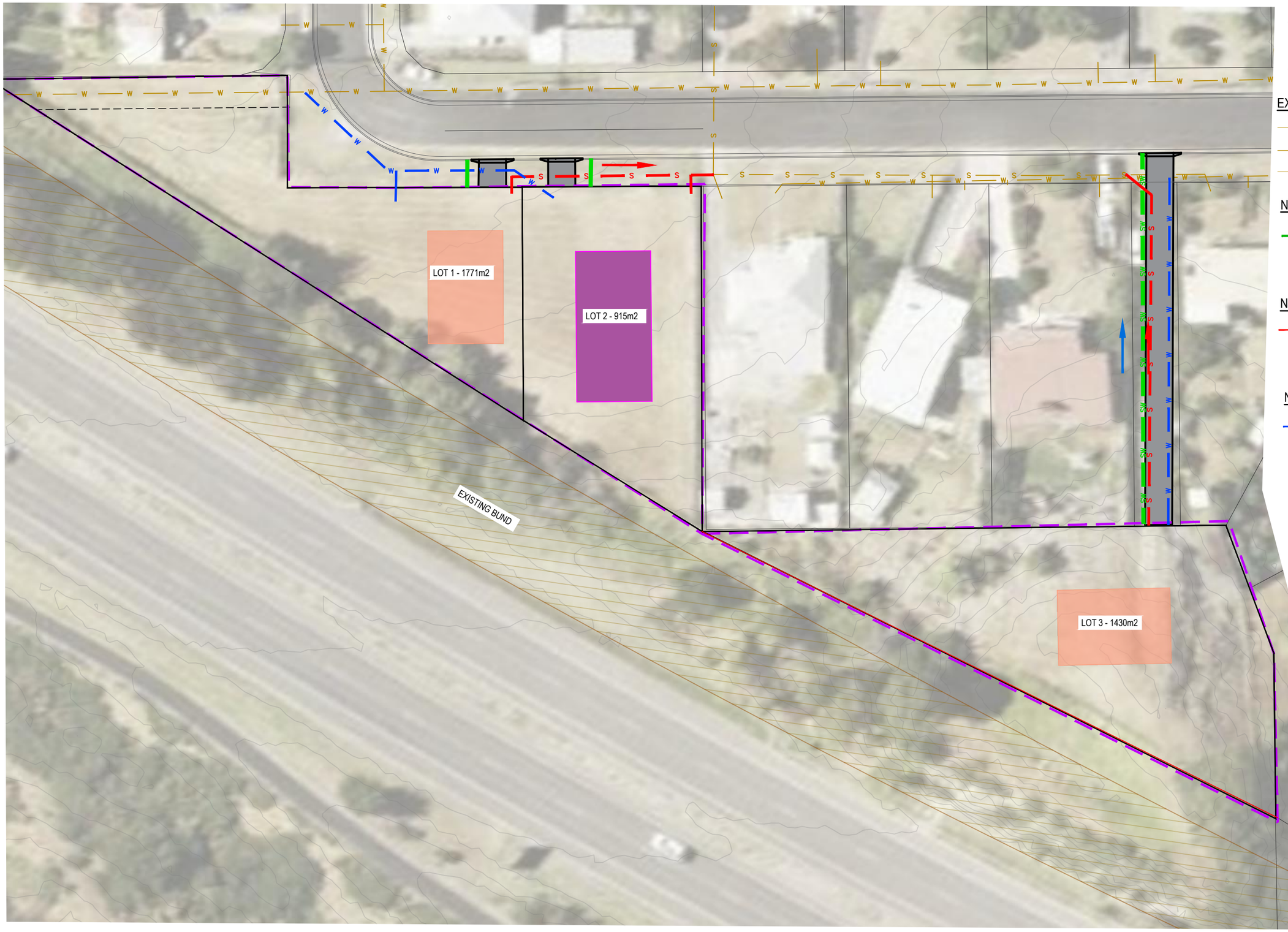

LEGEND

DEVELOPMENT BOUNDARY

NEW SERVICES EASMENT

EXISTING SERVICES

STORM WATER DRAIN

WATER SUPPLY LINE

SEWERAGE DRAIN

NEW STORMWATER SERVICES

STORWATER PIPES

STORMWATER FLOW DIRECTION

NEW SEWER SERVICES

SEWERAGE PIPE PVC SN8

SEWER FLOW DIRECTION

NEW WATER SERVICES

WATER SUPPLY LINE

150m2 BUILDING ENVELOPE

200m2 BUILDING ENVELOPE

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SITE: HOWTH ROUNDABOUT, PENGUIN

TITLE: SITE PLAN AREA 2

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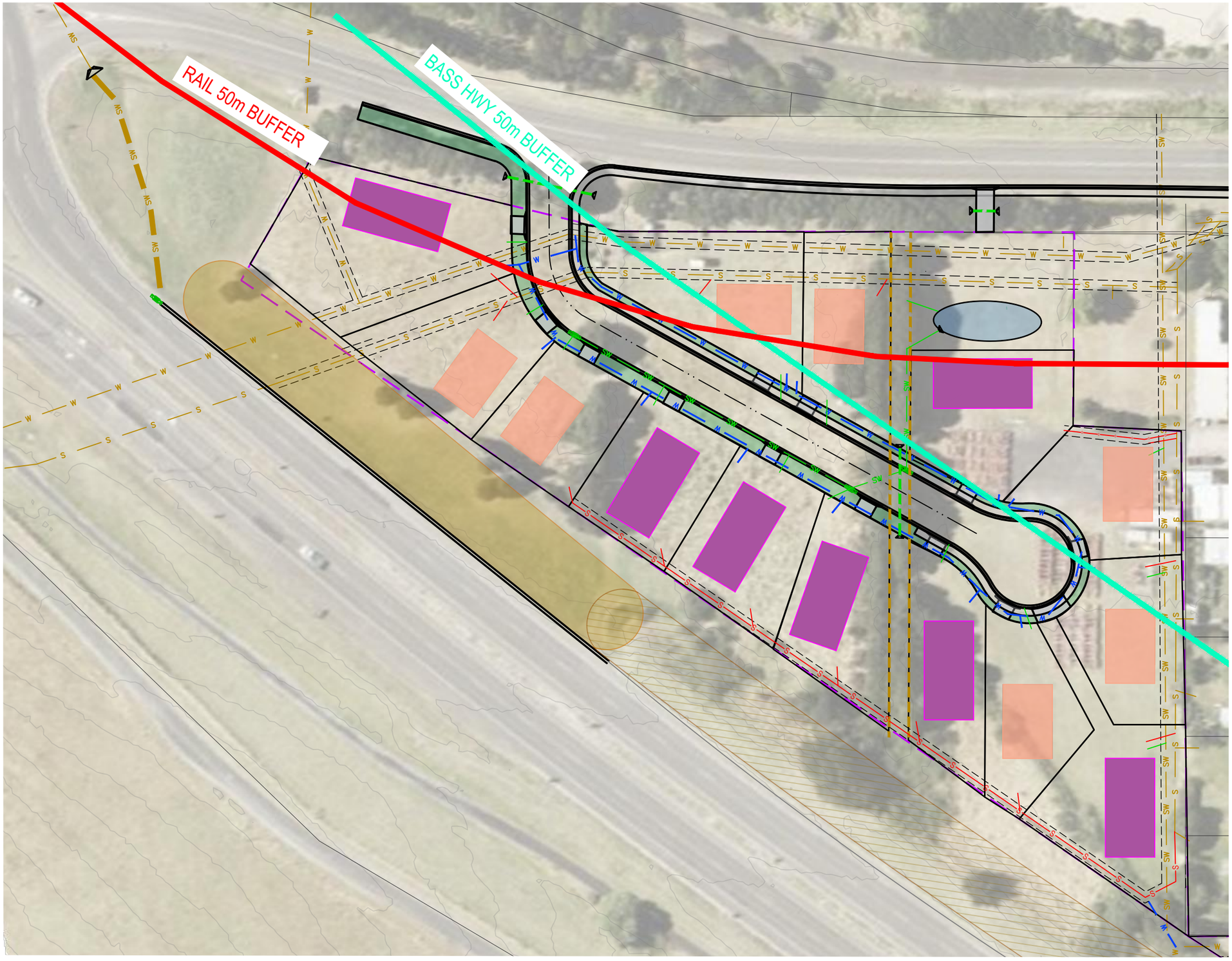

LEGEND

- BASS HWY 50m BUFFER
- RAIL 50m BUFFER

SITE AREA 1

SCALE 1:800

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SITE: HOWTH ROUNDABOUT, PENGUIN

TITLE: NOISE ATTENUATION AREAS

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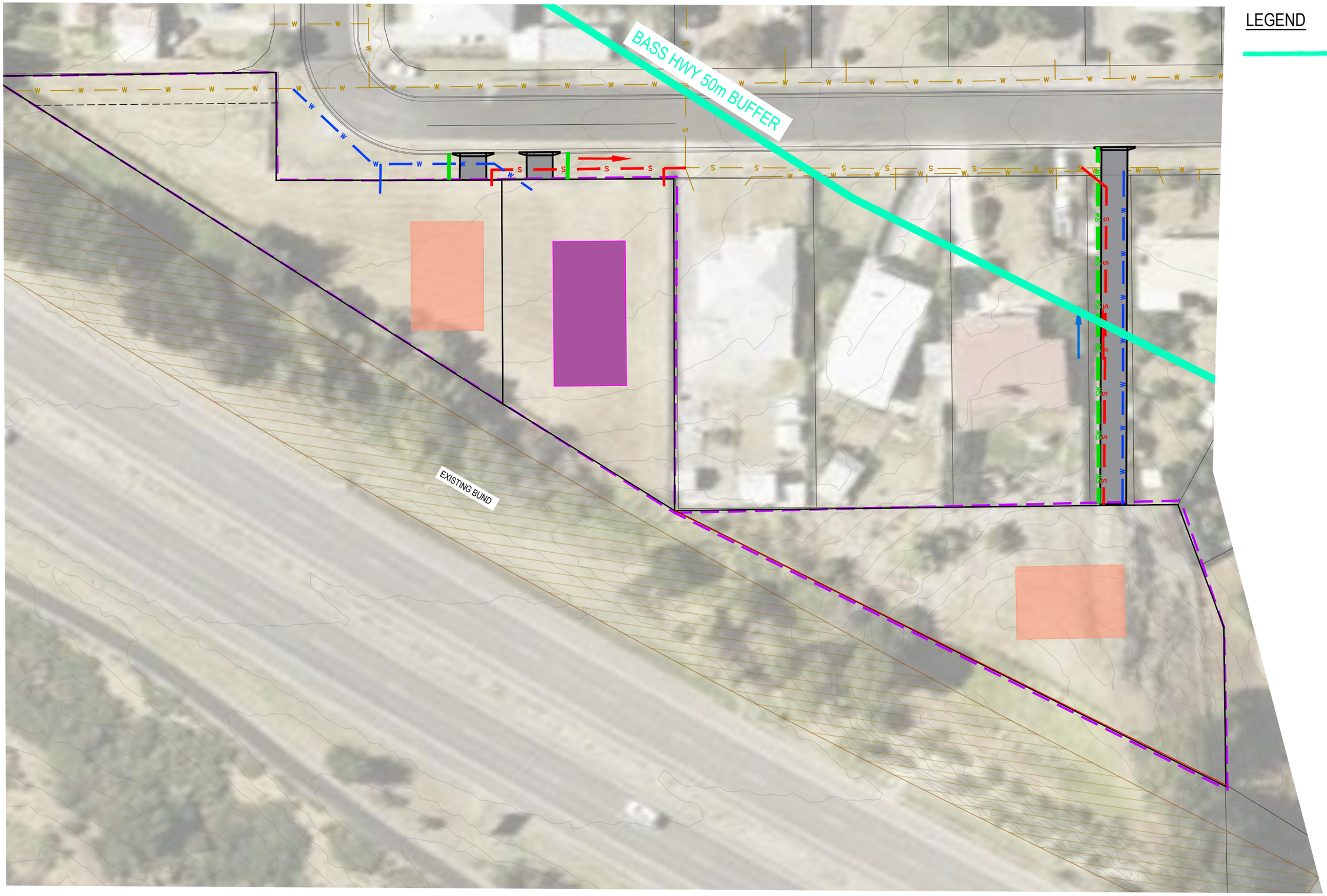

LEGEND

BASS HWY 50m BUFFER

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PROJECT: HOWTH ROUNDABOUT SUBDIVISION

SITE: HOWTH ROUNDABOUT, PENGUIN

TITLE: SITE PLAN AREA 2

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
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PROJECT NO:	DRAWING NO:	REVISION:
FE-22114	C-211	00

Appendix G

Desktop record of Advice Aboriginal Heritage Tasmania

AHR Instrument: AHDR7727

Applicant: Lisa Nelson (Homes Tasmania)

Date: 30 November 2023

RECORD OF ADVICE FROM ABORIGINAL HERITAGE TASMANIA

This document provides a record of advice relating to an application submitted in accordance with the *Aboriginal Heritage Standards and Procedures*, as adopted by the Guidelines issued under section 21A of the *Aboriginal Heritage Act 1975*.

Activity: Residential Rezoning - Howth Roundabout, Sulphur Creek

Advice: There is no known Aboriginal heritage recorded within the proposed rezoning footprint, however there are Aboriginal heritage sites recorded along the nearby foreshore, including shell middens.

It is understood that this request is for rezoning purposes only, and there are currently no plans for development on the property. If in future there are any plans for development within the property, please contact AHT for advice.

All Aboriginal heritage is protected under the *Aboriginal Heritage Act 1975*. It is an offence to destroy, damage, deface, conceal, or otherwise interfere with a relic (Aboriginal heritage) without a permit granted by the Minister. If at any time Aboriginal heritage is suspected, the process outlined in the Unanticipated Discovery Plan should be followed as there is an obligation to report findings of Aboriginal heritage as soon as practicable.

As explained in the Guidelines, obtaining this record of advice does not exempt a person from their obligations under the Act but is an important element of the actions summarised in the Guidelines. To be sure that you have "in so far as is practicable … complied with the guidelines" (s.21(1) of the *Aboriginal Heritage Act 1975*), be sure to read the relevant part and take any other action that may be relevant to your situation.

This advice is valid for 12 months and only for the activity as described in the Aboriginal Heritage Desktop Review application.

Please contact Aboriginal Heritage Tasmania on 1300 487 045 or aboriginalheritage@dpac.tas.gov.au if you require further information.

BL11948