PENRITH
CITY COUNCIL

MAJOR ASSESSMENT REPORT

Application number:	DA20/0782
Proposed development:	Torrens Title Subdivision into 88 Residential Lots, 1 Public Reserve Lot, 1 Drainage Corridor Lot & 3 Residue Lots including Bulk Earthworks, Construction of New Roads, Landscaping in Roads & Riparian Corridor, Retaining Walls, Stormwater Management Works & New Services (Stages 7-8, Precinct H, Glenmore Park Stage 2)
Property address:	2000 Bradley Street, GLENMORE PARK NSW 2745 445 Hereford Avenue, GLENMORE PARK NSW 2745 19 Middlebrook Rise, GLENMORE PARK NSW 2745 Gunyah Drive, GLENMORE PARK NSW 2745 Gunyah Drive, GLENMORE PARK NSW 2745 Riverflat Drive, GLENMORE PARK NSW 2745 Riverflat Drive, GLENMORE PARK NSW 2745 Gunyah Drive, GLENMORE PARK NSW 2745 Gunyah Drive, GLENMORE PARK NSW 2745 Gunyah Drive, GLENMORE PARK NSW 2745
Property description:	Lot 2000 DP 1204777 Lot 445 DP 1268480 Lot 701 DP 1275647 Lot 702 DP 1275647 Lot 637 DP 1266411 Lot 638 DP 1266411 Lot 700 DP 1275647
Date received:	20 November 2020
Assessing officer	Lauren Van Etten
Zoning:	SEPP WSA - Affected by Obstacle Limitation SEPP WSA - Affected by Wildlife Buffer Zone C2 Environmental Conservation - LEP 2010 Zone R1 General Residential - LEP 2010 RE1 Public Recreation - LEP 2010 RU2 Rural Landscape - LEP 2010
Class of building:	N/A
Recommendations:	Approve

Executive Summary

The Minister for Planning has given directions under Section 9.1 of the *Environmental Planning and Assessment Act 1979* on development applications that are to be determined on behalf of Council by a

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

Local Planning Panel. These directions, dated 30 June 2020, include that development on Council owned land requires determination by a Local Planning Panel. The Penrith Local Planning Panel is therefore the determining authority for this development application.

Council is in receipt of a Development Application for a Torrens Title subdivision into 88 residential lots, 1 public reserve lot, 1 drainage corridor lot and 3 residue lots, including bulk earthworks, construction of new roads, landscaping in roads and riparian corridor, retaining walls, stormwater management works and new services at 19 Middlebrook Rise, and Lot 2000 Bradley Street, Glenmore Park.

The subject land is zoned mostly R1 General Residential with portions of land zoned C2 Environmental Conservation, RE1 Public Recreation and RU2 Rural Landscape under Penrith Local Environmental Plan (LEP) 2010. In accordance with Penrith LEP 2010, the subdivision of land and related works is permitted with consent. The application forms Stages 7-8 of Precinct H in the Glenmore Park Stage 2 release area.

Key issues identified throughout the assessment of the application include:

- Proposed variations to the Voluntary Planning Agreement (VPA) commitments regarding the design, timing and delivery of Pinnacle Park and planting works within the riparian corridor;
- Unsatisfactory biodiversity impacts, noting no Biodiversity Development Assessment Report (BDAR) had initially been provided;
- Insufficient information regarding vegetation management;
- Unsatisfactory landscaping within the riparian corridor and street verges;
- Inconsistencies in the approved estate Concept Plan and Development Control Plan 2014 (DCP) requirements for subdivision;
- Inadequate detail regarding stormwater management;
- Interface issues regarding boundary retaining walls proposed adjacent existing properties to the north;
- Insufficient information regarding geotechnical considerations;
- Insufficient information regarding road safety;
- Insufficient detail regarding acoustic impacts from surrounding major roads;
- Inadequate information regarding land contamination;
- Insufficient detail regarding viewshed impacts from The Northern Road; and
- Insufficient owner's consent for the proposed drainage works to an existing Council owned raingarden in the downstream riparian corridor off Bradley Street within Precinct E.

Council staff issued an initial request for information letter in February 2021. The applicant was advised by letter to withdraw the development application, however the applicant requested an opportunity to address the matters raised in Council’s correspondence which was agreed to by Council officers. Further letters were issued by Council staff in June and July 2021 in response to amendments received in April 2021. Project meetings were also held regularly during the assessment period.

Key amendments made, and documentation provided by the applicant that resolved the issues raised included:

- Biodiversity planting works and a corridor edge park are now included in the proposal generally as per the VPA commitments;
- Agreement was obtained from Council's Local Infrastructure Contributions Working Group and City Planning Team to vary the required size of Pinnacle Park due to subdivision design and existing road network constraints. In this regard, Pinnacle Park overall will reduce from 10,000m^2 to 9,545m^2, a shortfall of 455m^2 as a result of the proposed subdivision design, noting the park design is subject to a future application;
- An amended Biodiversity Development Assessment Report (BDAR) was provided addressing matters raised by Council's Biodiversity Officer;
- A widened street verge was proposed within proposed Road 113 to retain connectivity between the exiting vegetation in Pinnacle Park and Surveyor’s Creek to the east of the subdivision to avoid a serious and

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

irreversible impact to the Cumberland Plain Woodland and derived native grasslands;
- A vegetation management plan (VMP) was provided and found to be satisfactory;
- Landscape plans for the riparian corridor, street trees and sight mounds were altered appropriately;
- A revised bushfire report was provided in light of the amendments to the landscape plans and the VMP;
- Certain inconsistencies between the proposed subdivision design and the estate Concept Plan and DCP were removed, with justification provided for other variations that related to better outcomes - i.e. variations driven by existing road treatments and biodiversity values;
- Amendments were made to the stormwater design, associated infrastructure and civil and water quality plans and reports to effectively detain and treat likely stormwater run-off;
- Owner's consent was provided from Penrith City Council for the drainage works to the existing raingarden within Precinct E;
- A satisfactory Road Safety Audit was provided;
- An amended geotechnical report was provided with all associated appendices;
- An acoustic report was provided, including provision for adequate measures to dwelling facades to preserve future dwellings from road noise via an 88B instrument;
- A detailed site investigation was provided demonstrating that the site is not contaminated;
- Boundary retaining walls were removed along the northern interface with existing properties; and
- Sight line plans were provided, demonstrating the preservation of The Northern Road viewshed, subject to the proposed additional sight mounds.

The application has been advertised and notified to nearby and adjoining property owners and occupiers and was exhibited from 7 December 2020 to 1 February 2021. Council received two submissions opposing the proposal in response. The submissions raised questions regarding traffic impacts and retaining walls on boundaries with existing residential properties. These submissions are considered and addressed in this report.

The site is bushfire prone land and proposes works within 40m of a mapped watercourse. As such, the application is identified as integrated development in accordance with the requirements of Section 4.46 of the *Environmental Planning and Assessment Act 1979* requiring the issue of a bushfire safety authority from the Rural Fire Service (RFS) and general terms of approval from the Natural Resources Access Regulator (NRAR). General terms of approval (GTAs) were received from both relevant authorities during the assessment of the proposal.

It is also noted that a Satisfactory Arrangements Certificate for the proposed subdivision has been provided by the NSW Department of Planning, Industry and Environment (DPIE), as required by Clause 6.1 (Arrangements for designated State public infrastructure) of Penrith LEP 2010.

The proposed development is generally in accordance with the provisions of the LEP, DCP and estate Concept Plan endorsed by Council on 25 July 2016. The subdivision will contribute to the diversity and supply of housing, environmental restoration and open space delivery within the Glenmore Park Stage 2 release area.

An assessment of the proposal under Section 4.15 of the *Environmental Planning and Assessment Act 1979* has been undertaken and, based on this assessment, the application is recommended for approval, subject to recommended conditions.

Site & Surrounds

The subject site is situated within Precinct H at the south-eastern edge of the Glenmore Park Stage 2 release area. The Glenmore Park Stage 2 release area is located approximately 6km south of the Penrith City Centre.

Mulgoa Nature Reserve is located to the north-west of the Glenmore Park Stage 2 release area, with rural land holdings to the east and south. The M4 Motorway is located approximately 3km to the north and Penrith train station is approximately 7km to the north.

Precincts G and H are bordered by existing residential development to the north and a large rural property to the south and east. The Northern Road is located approximately 400m east of Precinct H. The overall precinct is approximately 25 hectares in area.

The existing landform slopes from east to west throughout the subject site, with the western tributary of Surveyors Creek forming the topographical low point. A north/south ridge exists along the eastern boundary of the site. Precincts G and H form the upper extent of the drainage catchment flowing to Surveyors Creek.

Surveyors Creek forms a major geographical feature of the Glenmore Park Stage 2 release area and is being progressively rehabilitated and incorporated into accessible linear open space for the local community. **The main tributary is located to the east of the site and will be referred to as the 'green corridor' throughout this report**. The western tributary of Surveyors Creek runs between Precincts G and H and adjoins the proposed subdivision to the west. This area is occupied by vegetation, a watercourse and stormwater basins associated with the development of Precinct G. **This western tributary of the creek will be referred to as the 'western riparian corridor' throughout this report**.

Recently completed subdivision works are located within Stages 1 to 4 to the west of the western riparian corridor and works for Stage 6, adjacent to the proposed subdivision to the north and west, are underway.

In terms of biodiversity, the area proposed for subdivision is predominantly occupied by grasslands. A patch of Cumberland Plain Woodland is located within the north of the site, adjacent an existing neighbourhood park, known as Pinnacle Park**.** This area forms the remaining portion of Pinnacle Park, with its embellishment to form part of a future separate Development Application. The western riparian corridor is predominantly comprised of ground cover with a mixture of exotic and native grasses. Surveyors Creek to the east (the green corridor) contains remnant native vegetation including scattered trees, shrubs, native grasses and forbs.

Background

An estate Concept Plan was prepared for Precincts G and H and was submitted with the approved Stage 1 and 2 Development Application (DA15/1469). The Concept Plan was prepared in accordance with the DCP requirements for Glenmore Park Stage 2 and provides a staged guide for the future urban development of Precincts G and H.

The Concept Plan addresses the urban structure, housing types, road hierarchy, open space, pedestrian and cycle paths, bus routes, view sheds from The Northern Road, staging and infrastructure delivery.

The proposed lot density as shown in the Concept Plan proposed an additional 24 lots for Precinct H, compared to the DCP, which equated to an increase of approximately 17%. The Concept Plan was endorsed at Council's Ordinary Meeting in July 2016.

Proposal

The proposed development involves:

- Subdivision of land into 88 residential allotments, ranging between 311m² and 569m²;
- Creation of two super lots for future small lot subdivision (residue Lots 822 and 832) and a residual land lot (residue Lot 834);
- Creation of an open space lot that will form part of Pinnacle Park (embellishment to be subject to a separate future application - Lot 700);
- Creation of a drainage corridor lot (Lot 833) for the western riparian corridor;
- Earthworks associated with the construction of roadways, servicing, stormwater devices and minor allotment grading;
- Construction of new roads;
- Delivery of stormwater management infrastructure including drainage works to an existing Council owned raingarden in the downstream riparian corridor at Lot 2000 Bradley Street;
- Construction of retaining walls;
- Landscaping of streetscape verges;
- Extension of exiting mounding south-east of the proposed subdivision to protect sight lines;
- Provision of required services;
- Environmental restoration and landscape embellishment works associated with both the Surveyors Creek corridor (eastern riparian corridor) and the western tributary corridor (western riparian corridor); and
- Dam de-watering adjacent to Pinnacle Park.

Regarding the works within Council land, an existing sediment basin (Basin E) located approximately 300m north of Stages 7-8 requires modification to increase capacity to account for increasing demand associated with Stages 7-8. The works within Basin E require an adjustment to a bund wall (raising it by 400mm).

Plans that apply

- Local Environmental Plan 2010
- Development Control Plan 2014
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (Western Sydney Aerotropolis) 2020
- State Environmental Planning Policy No 55—Remediation of Land
- Sydney Regional Environmental Plan No.20 - Hawkesbury Nepean River

Planning Assessment

- ### Section 1.7 - Application of Part 7 of Biodiversity Conservation Act 2016

  The proposed development has been assessed in accordance with the matters for consideration under Section 1.7 of the *Environmental Planning and Assessment Act 1979*, having specific regard to the Biodiversity Conservation (BC) Act 2016.

  Initially, Council's Biodiversity Officer noted there was inadequate information to ascertain the impacts. The site map indicated proposed works within a biodiversity values mapped area within the northern portion of the site. Under the Biodiversity Conservation Act 2016 and Regulation 2017, a Biodiversity Development Assessment Report (BDAR) was required and had not been submitted.

  A BDAR was subsequently submitted and reviewed by Council's Biodiversity Officer who raised several concerns. The BDAR identified there were significant indirect impacts associated with the subdivision and

fragmentation in relation to the Cumberland Plain Woodland (CPW) within Pinnacle Park. Firstly, there were edge effects from the subdivision layout. Secondly, regarding fragmentation, this patch of CPW would effectively become isolated, however the author of the BDAR assumed the patch is already isolated which is not the case based on existing conditions and the existence of derived native grasslands on the site. There were also no indications within the BDAR that the requirement to avoid impacts had been addressed. Further, the reference within the serious and irreversible impact (SAII) statement had not included the derived native grasslands, nor qualified the assertion that the grasslands are in a 'poor' condition.

The overall issue was that the proposal may have constituted potential for a significant and irreversible impact (SAII) to occur if the proposal was not amended. The nature of that amendment would likely require deletion and/or amendments to the proposed residential lots and creation of a new conservation corridor to protect the identified biodiversity, extending from Pinnacle Park to the green corridor to the east.

Section 7.16 of the BC Act 2016 states that *"(2) The consent authority must refuse to grant consent under Part 4 of the Environmental Planning and Assessment Act 1979, in the case of an application for development consent to which this Division applies (other than for State significant development), if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values"*.

A revised BDAR was subsequently submitted, as requested, and found to be satisfactory by Council's Biodiversity Officer with the following matters of note.

The subdivision layout was amended to provide a widened verge in proposed Road 113, in front of proposed Lots 707-714, in between Pinnacle Park and Surveyors Creek to the east. This 6m wide verge will provide a corridor for pollinators, fauna movement and prevent fragmentation. It is expected that long term linkages between the vegetation communities to be retained at, and adjacent to the site will be improved.

The majority of the proposed development will occur within the most highly disturbed areas of the site, which comprises exotic grassland (6.67 ha). A small amount of native vegetation will require removal, with core areas of Cumberland Plain Woodland (CPW) retained in-situ. The majority of affected vegetation currently experiences cattle grazing, slashing, under scrubbing and exposure to edge effects. A total of 0.86 ha of native vegetation comprising CPW derived grassland would be removed as a result of the proposed works. An additional 0.05 ha of CPW would be indirectly affected via edge effects. No direct impact on the patch of CPW will occur and this vegetation is retained in-situ within parkland. The impacts associated with the proposal, including the clearing of native vegetation, have been situated within specific areas in order to avoid impacts to better condition, more intact and more connected areas of native vegetation. In most cases, proposed lots are sited within areas of exotic vegetation.

Trees marked for removal were also formally assessed, as per Council's Biodiversity Officer's request. Three scattered trees are proposed for removal. The BDAR states that due to their isolated nature in the centre of cleared exotic grassland, habitat values associated with these trees are restricted to highly mobile species. The single paddock tree (Narrow-leaved Ironbark) to be removed contains two medium sized spout hollows which provide potential microbat roosting habitat. Loss of these hollows will be compensated for by removal of the hollows during tree removal, for translocation into the green corridor. All other materials will be salvaged for re-use within areas subject to a Vegetation Management Plan (VMP).

Council's Biodiversity Officer noted that the loss of these trees was considered acceptable given the priority to preserve the intact vegetation within the northern portion of the site.

The BDAR also surveyed protected native fauna that might be impacted by the proposed development. Four threatened species were recorded on site and three were assumed present since surveys were undertaken outside of the prescribed survey period for the species. The removal of habitat for the following species

(Species Credit Species) requires offsetting:

- Large Bent-winged Bat - Ecosystem Credit Species (recorded);
- Little Bent-winged Bat - Ecosystem Credit Species (recorded);
- Eastern Coastal Freetail Bat - Ecosystem Credit Species (recorded);
- Greater Broad-nosed Bat (recorded);
- Dillwynia tenuifolia - Species Credit Species (assumed present);
- Pterostylis saxicola - Species Credit Species (assumed present); and
- Pultenaea pedunculata - Species Credit Species (assumed present).

The proposed development of Stages 7-8 will result in the clearing of, or impacts to the habitat of the species listed above. Habitat on the site is of low value for all species listed above and habitat of the same or better value is present in the locality. In addition, the size of the dam being removed is only 195m^2 and is unlikely to represent a substantial foraging resource to microbats in a local context. Additional areas of forested vegetation adjacent to the site (inclusive of restoration areas such as Surveyors Creek) provide suitable foraging habitat. The retention and restoration of remnant vegetation to the north-east of the site (via the VMP) will retain and enhance foraging habitat, well into the future.

In addition, it is noted that the Asset Protection Zone (APZ) management requirements do not affect areas mapped for restoration. The Bushfire Assessment and RFS General Terms of Approval do not require any treatments within Pinnacle Park or the corridors. In addition, the bushfire consultant confirmed in an addendum that the public domain landscaping on proposed Road 113 is permissible under the Inner Protection Area standards as the landscaping is well removed from the hazard interface areas of the Surveyors Creek corridor and the riparian corridor to the west, and the landscaping is small in size and confined to compartmentalised sections along the road frontage.

The BDAR also included mitigation measures for the protection of native fauna prior to works commencing in relation to fencing, sediment and erosion control, weed management, pre-clearance survey and tree and fauna protection conditions.

Overall, the proposal had demonstrated in the correct legislated sequence that it will avoid, minimise, offset and mitigate impacts/potential impacts through the amended design, the Vegetation Management Plan, the retirement of the credit obligation and securing a habitat verge in proposed Road 13 to preserve and improve biodiversity values in perpetuity. These measures are considered to adequately address the likely biodiversity impacts of the proposed development, subject to recommended conditions of consent.

- ## Section 4.14 - Bushfire prone land assessment

The subject site is mapped as being bushfire prone land. The application was submitted with a Bushfire Protection Assessment, prepared by Peterson Bushfire. The document states that the bushfire risk posed to the future residential lots will be reduced to an acceptable level of risk through an appropriate combination of bushfire protection measures, including asset protection zones (APZ), and in relation to water supply, access, electricity and gas services, storage of hazardous materials and emergency evacuation planning. It is noted that the asset protection zone is largely contained within the perimeter road around the subdivision, with the exception being the 50m wide temporary APZ within the residual lot until it is developed in the future.

Originally, the bushfire report did not refer to the landscape plans, vegetation management plan and BDAR, nor was the existing vegetation within Pinnacle Park addressed. The bushfire report was re-submitted following the BDAR, VMP and landscape plan updates. The revised report addressed existing vegetation within Pinnacle Park and confirmed that the proposed corridor vegetation planting, street tree species and spacing are appropriate for bushfire prone land.

The application was referred to the Rural Fire Service (RFS) given the proposal is integrated development.

The RFS has raised no objections, subject to conditions, as set out in its final General Terms of Approval, dated 15 February 2022.

- **Section 4.15 - Evaluation**

The proposed development has been assessed in accordance with the matters for consideration under Section 4.15 of the *Environmental Planning and Assessment Act 1979*, and having regard to those matters, the following issues have been considered and addressed.

- **Section 4.46 - Integrated development**

Rural Fire Service

The proposed development is Integrated Development under Section 4.46 of the *Environmental Planning and Assessment Act 1979* requiring general terms of approval from the NSW Rural Fire Service (RFS) under Section 100B of the Rural Fires Act 1997 (residential subdivision of bushfire prone land). The RFS assessed the proposed development and raised no objections to the proposal via correspondence dated 11 August 2021. Further, on 15 February 2022, the RFS amended the GTAs to reflect the revised landscape plans and revised vegetation management plan. It is recommended that the conditions from the RFS are imposed in the consent.

Natural Resources Access Regulator

The proposed subdivision works are within 40m of a mapped watercourse. As such, an integrated development referral was sent to the Natural Resources Access Regulator (NRAR). Council was provided with NRAR's General Terms of Approval on 18 December 2020.

Section 4.15(1)(a)(i) The provisions of any environmental planning instrument

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

State Environmental Planning Policy (Infrastructure) 2007

Traffic Generating Development

Schedule 3 if the Infrastructure SEPP lists the criteria for the types of Development Applications that are considered to be 'Traffic Generating Development' of a scale which requires referral to the TfNSW. Under Schedule 3, residential subdivisions which seek approval to create in excess of 200 allotments are required to be referred to the TfNSW. The proposal seeks approval for subdivision of the site to create 88 residential allotments. As such, the application does not require referral to the TfNSW under Schedule 3 of the Infrastructure SEPP.

Noise Impacts

Clause 102 provides requirements in relation to road noise for residential development. Initially, the application did not address the potential noise impacts on the development associated with the traffic movements on The Northern Road, or the two collector roads that are part of the proposal (the East/West Collector Road - Road 108, or Riverflat Drive).

Given the potential traffic volumes to be carried by these roadways, as well as their proximity to future dwellings, an Acoustic Report was requested to address noise traffic intrusion on the proposed lots and future dwellings.

Subsequently, an Acoustic Report was provided, however it did not assess the two collector roads, nor consider potential future traffic volumes. A further revision to the Acoustic Report was provided and gave consideration to current and future traffic volumes, as well as anticipated dwelling construction and building footprints.

Council's Environmental Management Officer reviewed the revised report and found it satisfactory. Where external road traffic noise levels have been predicted to exceed the SEPP (Infrastructure) internal noise criteria (at the eastern and western extents of Stages 7 and 8), the acoustic report provides recommendations for building construction requirements and this is based on future 2031 forecast traffic volumes.

The design and construction requirements needed to achieve internal noise criteria for affected lots will need to be captured through a 'Restriction as to User' on the land title. A recommended condition will ensure that all future property owners are aware of the acoustic implications and requirements that apply to the residential development of those affected lots. The affected lots are proposed Lots 714, 727, 728, 743, 744, 745, 746, 811, 812, 813, 814, 822, 828, 829, 830, 831 and 832.

As such, the proposal is consistent with the provisions of Clause 102 of the SEPP (Infrastructure).

There are no other provisions of this policy relevant to the proposed development. The application is considered to be satisfactory having regard to the relevant provisions of this Policy.

State Environmental Planning Policy (Western Sydney Aerotropolis) 2020

Clause 21 - Wildlife hazards

The Aerotropolis SEPP contains a map that relates to wildlife buffer areas. This map is titled the "Wildlife Buffer Zone Map". The map shows that the subject site is within a 13 kilometre 'wildlife buffer zone' of the Western Sydney airport site.

The objective of Clause 21 is to regulate development on land surrounding the airport site where wildlife may present a risk to the operation of the airport. Certain types of development trigger the requirements for consideration under Clause 21. The proposed development is not one of the types of uses that warrants consideration under the SEPP with regard to wildlife and the operation of the airport.

Clause 24 - Airspace operations

The subject site is also identified as being located within the Obstacle Limitation Surface (OLS) Map area. Clause 24 of the SEPP relates to development that would penetrate the prescribed air space for the airport and be a 'controlled activity'. The proposed development does not penetrate the prescribed air space given the OLS height relative to ground level is 150.4m AHD whereas the proposed subdivision does not include any buildings and the ground elevation is 80.1 m AHD. The proposed development is also not a controlled activity. Therefore, the proposal does not trigger any considerations under this clause.

State Environmental Planning Policy No 55—Remediation of Land

Clause 7 of *State Environmental Planning Policy No. 55 - Remediation of Land* (SEPP 55) states that a consent authority must not consent to the carrying out of any development on land unless:

(a) It has considered whether the land is contaminated, and
(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

A Supplementary Detailed Site Investigation (DSI) was required to support the proposal as the DSI initially submitted did not address the whole of the development site. A Data Gap Investigation Report was subsequently submitted in response to this request. Council's Environmental Management Officer reviewed the additional information and noted the following.

The Data Gap Assessment (DGA) includes a review of existing environmental reports for the site and investigates soils in the southern and eastern portion of the site. The DGA references the previous site DSI undertaken in March and July 2018 by SESL Australia Pty Ltd for Stages 4 to 9 of the Highland Views development (Report Ref. J001039 Highland Views Stage 4-9 DSI 2.0, dated July 2018). The DGA supports the findings of that DSI and concludes that there is no area of environmental concern within the proposed Stages 7-8 development. The DGA concludes that the *"former data gaps associated with the increased extent of the development footprint to be addressed and considers the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision"*.

As such, Council's Environmental Management Officer supports the proposal in terms of site suitability, subject to recommended consent conditions, including the standard requirement regarding unexpected finds.

Therefore, the consent authority can be satisfied that the land is suitable for the proposed development.

Sydney Regional Environmental Plan No.20 - Hawkesbury Nepean River

Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River (No. 2 - 1997) (SREP 20) integrates planning with catchment management to protect the Hawkesbury-Nepean river system, requiring the impact of future land use to be considered in a regional context. The plan covers water quality and quantity, environmentally sensitive areas, riverine scenic quality, agriculture and urban and rural-residential development. It controls development that has the potential to impact on the river environment.

In relation to stormwater drainage, Precincts G and H fall towards the 40m wide western riparian corridor. The proposed stormwater drainage system allows for low flows (up to the 1 year ARI peak flow) to be directed into the existing detention basins to the west of Stages 7-8, while Surveyors Creek corridor was designed to convey the major flows.

Initially, the Stormwater Management Strategy Report required amendment given several stormwater options were included therein. It was subsequently amended to reflect Council's preferred option, being Option 1 for treating sub-catchments MU10 and MU11. It is noted that Option 1 was previously endorsed by Council's Development Engineering and Environmental Waterways Teams as part of the Construction Certificate/Subdivision Works Certificate (SWC) assessment for Highland Views Stage 4. The revised Stormwater Strategy includes the treatment and management of stormwater via a previously approved bio-retention basin (in Precinct E). As such, owner's consent was required and provided from Penrith City Council for the proposed drainage works to the existing raingarden in the downstream riparian corridor off Bradley Street.

The revised Stormwater Management Strategy for Precincts G and H comprises a treatment train consisting of on lot treatment, street level treatment and subdivision/development treatment measures. The structural elements proposed for the proposed development consist of:

- Proprietary GPT units at each stormwater discharge point into the Precinct G and H bio-retention raingardens located in the western riparian corridor;
- An on-line detention basin of a volume of 1,070 m^3 to treat the majority of the Precinct G and H site which has been constructed as part of previous stages within Precincts G and H; and
- Augmentations to enhance the existing Bradley Ridge Precinct E detention basin/raingarden to treat bypassing catchments from Precinct G and H, including increasing the EDZ of the Precinct E raingarden by 0.1m and extending the detention basin storage by approximately 140 m^3, increasing the basin spillway weir by approximately 40mm and modifying the outlet configuration.

Council’s Development Engineering and Environmental Waterways Teams have reviewed the application and support the proposed development, subject to recommended conditions relating to stormwater drainage.

In addition, erosion and sediment control measures will ensure sediment as a result of the development is not deposited in the Hawkesbury-Nepean River. In particular, Council's Waterways Officer recommended a condition that an updated Maintenance Manual be provided prior to the issue of a Subdivision Works Certificate, including specific measures to monitor and demonstrate that Basin E will be safeguarded from erosion and sediment during the works.

Local Environmental Plan 2010

Provision	Compliance
Clause 2.3 Permissibility	Complies - See discussion
Clause 2.3 Zone objectives	Complies - See discussion
Clause 2.7 Demolition requires development consent	N/A
Clause 5.21 Flood planning	N/A
Clause 6.1 Arrangements for designated State public infrastructure	Complies - See discussion
Clause 6.2 Public utility infrastructure	Complies - See discussion
Clause 7.1 Earthworks	Complies - See discussion
Clause 7.4 Sustainable development	Complies
Clause 7.7 Servicing	Complies
Clause 7.16 Glenmore Park Stage 2	Complies - See discussion

Clause 2.3 Permissibility

The subject site is mostly zoned R1 General Residential with portions of land zoned C2 Environmental Conservation, RE1 Public Recreation and RU2 Rural Landscape under Penrith Local Environmental Plan 2010.

The proposal is defined as subdivision and related works which is permissible with consent, with no minimum lot size requirements applying to the R1 zoned land.

Part of the eastern extent of the proposed residential subdivision is zoned RU2 Rural Landscape. The proposal for this area only comprises road reserve areas, with roads permissible with consent in the RU2 zone. A small portion of the subject land is located within land zoned C2 Environmental Conservation. The small portion of C2 zoned land is within the western riparian corridor along part of the site's western edge and the green corridor along the site's eastern edge. The restoration works proposed within these corridors are permissible with consent, as is ancillary recreational use.

An area of RE1 Public Recreation zoned land is located in the north of the site and forms the extension of Pinnacle Park, with its design and form to be part of a future Development Application. A portion of the RE1 zone is within the proposed road reserve area, although roads are permissible with consent within the RE1 zone.

The proposed subdivision and associated works and uses are therefore permissible in the respective zones, with consent.

Clause 2.3 Zone objectives

Zone R1 General Residential
Objectives of zone
- *To provide for the housing needs of the community.*
- *To provide for a variety of housing types and densities.*
- *To enable other land uses that provide facilities or services to meet the day to day needs of residents.*
- *To ensure that a high level of residential amenity is achieved and maintained.*
- *To ensure that new development reflects the desired future character and dwelling densities of the area.*

The proposed residential subdivision achieves the objectives of the R1 zone through the provision of a range of lot typologies and lot areas which will accommodate a variety of housing types and densities in a residential area.

Zone RU2 Rural Landscape

Objectives of zone

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To maintain the rural landscape character of the land.*
- *To provide for a range of compatible land uses, including extensive agriculture.*
- *To minimise conflict between land uses within the zone and land uses within adjoining zones.*
- *To preserve and improve natural resources through appropriate land management practices.*
- *To ensure development is compatible with the environmental capabilities of the land and does not unreasonably increase the demand for public services or public facilities.*

Part of the eastern extent of the proposed residential subdivision is zoned RU2 Rural Landscape. The proposal for this area only comprises road reserve areas, with roads permissible with consent in the RU2 zone. The proposed road is not inconsistent with the rural landscape objectives as it creates a buffer between the proposed residential subdivision and the adjoining rural land, particularly with the street trees proposed that will provide an appropriate transition between the urban areas of Glenmore Park and the surrounding rural landscape, minimising land use conflict and maintaining rural landscape character.

Zone C2 Environmental Conservation

Objectives of zone

- *To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.*
- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.*
- *To protect, manage, restore and enhance the ecology, hydrology and scenic values of riparian corridors and waterways, wetlands, groundwater resources, biodiversity corridors, areas of remnant indigenous vegetation and dependent ecosystems.*
- *To allow for low impact passive recreational and ancillary land uses that are consistent with the retention of the natural ecological significance.*

A small portion of the subject land is located within land zoned C2 Environmental Conservation. The small portion of C2 zoned land is within the western riparian corridor along part of the site's western edge and the green corridor along the site's eastern edge. The proposed planting works are not inconsistent with the objectives the C2 zone as the works will restore this area to a high ecological value. The proposed recreation within the western riparian corridor is also not inconsistent with the zone objectives as the corridor edge park will allow for low impact passive recreational land uses via the seating and gym equipment provided.

Zone RE1 Public Recreation

Objectives of zone

- *To enable land to be used for public open space or recreational purposes.*
- *To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.*
- *To ensure that development is secondary and complementary to the use of land as public open space, and enhances public use, and access to, the open space.*
- *To provide land for the development of services and facilities by public authorities for the benefit of the community.*

An area of RE1 Public Recreation zoned land is located in the north of the site and forms the extension of

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Pinnacle Park, with its design and form to be part of a future Development Application. However, the proposed subdivision will re-define the shape of Pinnacle Park and reduce its size relative to the RE1 zoned area. In this regard, a portion of the RE1 zoned land is proposed as road reserve in order to align with the approved road network in the existing development to the north and west. Notwithstanding, roads are permissible in the RE1 zone with consent. The use of RE1 zoned land for roads is not considered inconsistent with the objectives of the zone, particularly in facilitating public access to this area of open space.

Clause 6.1 Arrangements for designated State public infrastructure

A Satisfactory Arrangements Certificate for the proposed subdivision of land in an urban release area has been provided by the NSW Department of Planning, Industry and Environment (DPIE), as required by Clause 6.1 (Arrangements for designated State public infrastructure) of Penrith LEP 2010.

Clause 6.2 Public utility infrastructure

Clause 6.2(1) of the LEP states the following:

"*Development consent must not be granted for development on land in an urban release area unless the Council is satisfied that any public utility infrastructure that is essential for the proposed development is available or that adequate arrangements have been made to make that infrastructure available when it is required.*

***public utility infrastructure**, in relation to an urban release area, includes infrastructure for any of the following—*
(a) the supply of water,
(b) the supply of electricity,
(c) the disposal and management of sewage."

Public utility infrastructure, as defined above, will be provided as part of the subdivision works and an appropriate condition has been recommended to ensure this outcome.

Clause 7.1 Earthworks

Clause 7.1 of the LEP requires the consent authority to consider the effect of proposed earthworks on the likely amenity of adjoining properties and the effect on the likely future use or re-development of the land.

As part of the revised proposal, amended site grading levels removed the need for retaining walls along the boundaries of lots adjacent to the northern interface of the proposed subdivision. Site benching will be undertaken as part of the subdivision works to produce whole of site solutions.

The proposed configuration of allotments has now minimised boundary retaining walls and any associated amenity impacts.

Council's Development Engineer reviewed the revised proposal in this regard and supported the proposal. Overall, it is considered that the proposal is consistent with Clause 7.1 of the LEP.

Clause 7.16 Glenmore Park Stage 2

The subject land is identified as part of “Glenmore Park Stage 2” on the Clause Application Map of the LEP and accordingly Clause 7.16 applies to the proposal. An objective of this clause is to provide for a transition of lot sizes between the urban areas of Glenmore Park and the surrounding rural landscape, which is satisfied by the proposal, and to restrict the maximum dwelling yield for certain land, although the dwelling cap does not apply to the subject land, applying to a different part of the release area.

In accordance with this clause, the height of future proposed dwellings must not have an adverse impact on views to or from The Northern Road, which the proposed development accommodates due to existing vegetation along The Northern Road which will screen the development, coupled with existing and proposed earth mounds.

Section 4.15(1)(a)(ii) The provisions of any draft environmental planning instrument

Draft Environment State Environmental Planning Policy

The Draft Environment SEPP was exhibited from 31 October 2017 to 31 January 2018. This consolidated SEPP proposes to simplify the planning rules for a number of water catchments, waterways, urban bushland and Willandra Lakes World Heritage Property.

Changes proposed include consolidating a total of seven existing SEPPs being:

- *State Environmental Planning Policy No. 19 – Bushland in Urban Areas*
- *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*
- *State Environmental Planning Policy No. 50 – Canal Estate Development*
- *Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment*
- *Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No. 2 - 1997)*
- *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*
- *Willandra Lakes Regional Environmental Plan No. 1 – World Heritage Property*

It is noted that the proposed changes to State Environmental Planning Policy No. 19 – Bushland in Urban Areas (SEPP 19) are not considered to impact the proposed development. In addition, the amendments to Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No. 2 - 1997) do not impact the proposed development. In this regard, the proposal is not inconsistent with the provisions of this draft instrument.

Draft Remediation of Land SEPP

The Department of Planning and Environment has announced a Draft Remediation of Land SEPP, which will repeal and replace the current State Environmental Planning Policy No. 55 - Remediation of Land. The proposed new land remediation SEPP will:

- Provide a state-wide planning framework for the remediation of land,
- Maintain the objectives and reinforce those aspects of the existing framework that have worked well,
- Require planning authorities to consider the potential for land to be contaminated when determining development applications and rezoning land,
- Clearly list the remediation works that require development consent, and
- Introduce certification and operational requirements for remediation works that can be undertaken without development consent.

It is also proposed that it will transfer the requirements to consider contamination when rezoning land to a direction under Section 9.1 of the Environmental Planning and Assessment Act 1979. The proposal is not inconsistent with the provisions of this draft instrument.

Section 4.15(1)(a)(iii) The provisions of any development control plan

Development Control Plan 2014

Provision	Compliance
C1 Site Planning and Design Principles	Complies
C2 Vegetation Management	Complies
C3 Water Management	Complies
C4 Land Management	Complies
C5 Waste Management	Complies
C6 Landscape Design	Complies
C7 Culture and Heritage	N/A
C8 Public Domain	Complies
C9 Advertising and Signage	N/A
C10 Transport, Access and Parking	Complies
C11 Subdivision	Complies
C12 Noise and Vibration	Complies
C13 Infrastructure and Services	Complies
E7 Glenmore Park controls	Does not comply - see Appendix - Development Control Plan Compliance

Section 4.15(1)(a)(iiia) The provisions of any planning agreement

Glenmore Park Stage 2 Voluntary Planning Agreement

The Glenmore Park Voluntary Planning Agreement (VPA) details that the landowner is to dedicate to Council any part of its land which comprises any part of the Surveyors Creek Corridor, provided that the relevant landowner has completed the last outstanding item of any part of the biodiversity corridor planting works to be dedicated. These areas are sketched within Annexures C and D of the VPA. The VPA also states that Development Applications are to be lodged for such works and such land is to be maintained by the developer for a number of years before handover to Council.

Biodiversity Corridor Planting Works

There are biodiversity corridor planting works outlined within Annexure D of the VPA that are required to be completed prior to the date on which a Subdivision Certificate is issued for the 225th residential lot in respect of any part of the land owned by Vianello (being the land subject to this application). Given the number of lots proposed in this application will result in the delivery of in excess of the 225th residential lot owned by Vianello, such re-vegetation works were requested to be incorporated into the subject application. In addition, a vegetation management plan (VMP) was required in relation to the aforementioned VPA requirements.

The re-vegetation works were subsequently incorporated into the application and a VMP was provided. This VMP also considered the bushfire report's Asset Protection Zone (APZ) requirements and implications on planting. Council's Biodiversity Officer reviewed the VMP and was satisfied with its content.

While the riparian corridor planting required by the VPA includes the full length of the western riparian

corridor to the southern boundary of the E2 zoned land, this has not been provided for in full. The applicant requested the southern most 20m of the corridor be deferred to accommodate a future possible rezoning (known as Glenmore Park Stage 3, for which a Planning Proposal is currently under consideration by Council). Council's Local Infrastructure Contributions Working Group and City Planning Team were consulted in this regard and raised no "in-principle" concerns with the minor VPA variation to effectively stage the riparian corridor planting works. However, due to the rigid wording within the VPA, the VPA will need to be amended to accommodate this variation. The applicant and landowner have confirmed in writing their intent to seek to amend the VPA accordingly, and as such, a recommended condition of consent will require that the amended VPA is executed by the relevant parties prior to the issue of a Subdivision Certificate for the 225th Vianello (Precinct H) lot.

Second Glenmore Park Stage 2 Voluntary Planning Agreement

Park Delivery Works

There are also works outlined within the Second Voluntary Planning Agreement (VPA) for Glenmore Park Stage 2 that are required to be undertaken prior to the issue of any Subdivision Certificate for a stage of development that either includes or is in immediate proximity to the relevant contribution works. These works are illustrated in Annexure C. Given the size and location of the proposed subdivision, the corridor edge park within the western riparian corridor and the neighbourhood park (Pinnacle Park) are both required to be delivered with the subdivision.

The corridor edge park within the western riparian corridor has been incorporated into the proposal and its design is considered satisfactory by Council's Landscape Architect. Pinnacle Park, however, has not been incorporated into the subject application. The applicant has requested that the design of the park be subject to a separate Development Application, albeit that it still must be delivered prior to the issue of any Subdivision Certificate. In addition, the overall size of Pinnacle Park, due to subdivision design and existing road network constraints, will fall short of the DCP 1 hectare requirement by 455m^2.

Given the shortfall in the overall provision of open space in Pinnacle Park, additional embellishment was proposed by the applicant to ensure future residents have access to higher quality open space based on an embellishment concept design given to Council for review. Council's Local Infrastructure Contributions Working Group and City Planning Team were consulted in this regard and advised as follows:

- Additional embellishment to off-set the land shortfall can be supported without the requirement of amending the VPA. This is on the provision that the applicant provide a signed letter confirming that they will not seek to recover the value of the additional embellishment funding from Council.
- The additional embellishment to Pinnacle Park shall be delivered in agreement with Council and is to be quantified.

In response, a letter has been provided by the applicant and landowner confirming they will not seek to recover the value of the additional embellishment funding from Council. Therefore, as per the above advice, the reduced park size is acceptable and a separate application can be lodged in this regard in relation to the park embellishment. Notwithstanding, a recommended condition of consent will require that the park is delivered prior to the issue of any Subdivision Certificate in accordance with the VPA requirements regarding the timing of delivery. It is noted that a VPA amendment is not warranted in this instance given the 1 hectare park size requirement is only stipulated in the DCP, not in the VPA.

Development Contributions

The Glenmore Park Stage 2 VPA also details monetary contributions to be levied for development in

association with Glenmore Park Stage 2. The VPA states that up to 140 lots/dwellings created in Precinct H are to be levied in accordance with the per lot contribution detailed in the VPA, with any additional lots created beyond this to be levied in accordance with the Penrith City District Open Space and Cultural Facilities Plans.

The subject application is for 88 lots, with 36 lots previously approved in Precinct H under DA18/0317. This totals 124 lots in the precinct to date. Therefore, the following contributions under the VPA apply to the subject proposal:

88 lots x $18,770 = $1,651,760.00

Section 4.15(1)(a)(iv) The provisions of the regulations

The proposed development complies with the applicable provisions of the Regulations. Further, the proposal was notified and advertised in accordance with the requirements of the Regulations.

Section 4.15(1)(b)The likely impacts of the development

Biodiversity Impacts

The application was accompanied by a Biodiversity Development Assessment Report (BDAR) prepared by Australian Wetlands Consulting, which was revised during the assessment process. The BDAR was examined by Council's Biodiversity Officer who has supported the final BDAR findings and the proposed subdivision. The impacts on derived native grasslands and Cumberland Plain Woodland are adequately mitigated by the widened street verge within proposed Road 113 which will act as a habitat connection from Pinnacle Park to Surveyors Creek to the east, mitigating fragmentation of Pinnacle Park's vegetation.

Three scattered trees are proposed for removal, one of which is identified as being a hollow bearing tree. Loss of these hollows will be compensated for by removal of the hollows during tree removal, for translocation into the green corridor. All other materials will be salvaged for re-use within areas subject to a Vegetation Management Plan. The revised subdivision design, coupled with the Vegetation Management Plan, will conserve biodiversity values by providing linkages between significant natural vegetation units within the area, and by restoring and enhancing the environmental values and functions of riparian corridors along Surveyors Creek and the western tributary of Surveyors Creek through the planting works proposed.

In addition, a recommended consent condition will ensure that the verge of proposed Road 113 is protected during dwelling construction and the landscape design amended to allow for access for maintenance around the perimeter. This is also necessary to protect fauna movement within the verge from maintenance works, kerbside parking and kerbside waste collection. A meeting was held with Council's Asset's Department in relation to the proposed design and no concerns were raised.

Bushfire Impacts

The widened verge along proposed Road 113 and its proposed landscaping has been reviewed by the bushfire consultant who noted that it can be maintained as an inner protection area as per the Rural Fire Service General Terms of Approval.

Open Space Provision

The edge park within the western riparian corridor will be appropriately located along the perimeter to ensure the corridor is not disrupted. The corridor will also be appropriately planted to not only assist with the corridor's restoration but also to ensure it is primarily of passive use, sympathetic to the adjoining riparian corridor, as per the Voluntary Planning Agreement (VPA) requirements.

The size of Pinnacle Park will fall short of the DCP 1 hectare requirement by 455m^2 as a result of subdivision design and existing road network constraints. However, the applicant has agreed to additional embellishment of the park to compensate for the shortfall, subject to a future Development Application and delivery of the park prior to the issue of any Subdivision Certificate. This additional embellishment is necessary to ensure quality open space is delivered as per the intentions of the relevant VPA.

Stormwater Drainage

The application was accompanied by a detailed precinct wide Stormwater Management Strategy. The civil engineering plans submitted with the application include details on stormwater management and demonstrate that stormwater flows are contained within drainage corridors. The on-lot treatment, street level treatment and subdivision/development treatment measures (detention basins) will ensure there are no adverse impacts on adjoining properties in relation to stormwater quantity or quality. This has been assessed by Council's Development Engineer, and subject to recommended conditions of consent, they have supported the proposal in this regard.

In addition, augmentation of the Precinct E raingarden is proposed to treat stormwater run-off which is generated by the portion of the site discharging into Precinct E. This has been assessed by Council's Waterways Officer, and subject to recommended conditions of consent, they have supported the proposal in this regard.

Acoustic Impacts

The application was accompanied by an Acoustic Report prepared by prepared by Renzo Tonin & Associates. The report found that the majority of the future dwellings within the development area are predicted to meet applicable internal noise criteria, with no specific acoustic dwelling facade treatment required. However, modelling did identify a number of future dwellings located along the eastern extent of the subdivision that will require some form of acoustic facade treatments to meet the Infrastructure SEPP internal noise criteria. Accordingly, the relevant treatments have been identified in a revised Acoustic Assessment and conditions have been recommended in this regard. Council's Environmental Management Officer has supported the proposal in this regard.

Salinity

A Salinity Management Plan has been developed for the precinct as part of previous development assessments. A recommended condition of consent will require the development to be carried out in accordance with the recommendations of the plan.

Contamination

The application has demonstrated that the site is suitable for a residential subdivision and public open space, and thus the proposal satisfies the provisions of Clause 7 of *State Environmental Planning Policy No. 55 - Remediation of Land*.

Earthworks

Proposed lot sizes and dimensions have taken into account site topography and reduced the need for earthworks and retaining wall construction as far as possible. The design was amended to ensure there are no privacy implications from the proposed earthworks.

Access, Parking and Traffic

Proposed road and intersection works are satisfactory in their design on safety and access grounds and will accommodate the anticipated traffic flows. Council's Development Engineer and Traffic Engineer support the proposed subdivision design, noting the recommendations of the revised Road Safety Audit have been addressed.

Social Impacts
The proposal will contribute to increased housing supply and public open space within the locality, and will generate substantial economic benefits.

Section 4.15(1)(c)The suitability of the site for the development

The application has demonstrated that the site is suitable for the proposed development. There are no significant natural or built environment constraints that will hinder the proposed development, and appropriate measures can be employed to mitigate any potential impacts. The site has been identified as being suitable for subdivision through local zoning provisions, and as such, the proposed development will contribute to achieving the strategic vision for the area.

Section 4.15(1)(d) Any Submissions

Community Consultation

In accordance with Council's Community Participation Plan, the proposed development was advertised and notified to nearby and adjoining properties and placed on public exhibition from 7 December 2020 to 1 February 2021. In response, Council received two submissions opposing the proposal. The application was also re-notified to the two submitters, who were provided the opportunity to comment on the final amended proposal from 31 January to 7 February 2022, although no follow-up submissions were received.

The matters raised have been considered in the assessment of the development proposal. A summary of submission issues and a response to each issue is provided below.

Matter Raised	Council Officer Response
Northern Interface Impacts *Request for plans to understand amenity impacts given the submitter lives immediately north of the proposed subdivision and wants to understand any overlooking and also any amended road layout.*	The property in question will not be affected by any retaining walls given no boundary retaining wall is proposed. While there will be earthworks, the proposal is relatively level adjacent to the subject site and the proposed earthworks will not exacerbate any level differences. Further, any future dwelling application will be subject to assessment against relevant guidelines to ensure that there are no overlooking impacts. Regarding the proposed road layout, an email was sent to the submitter with a link to Council's online DA tracker to view the plans as exhibited.

Traffic Impacts

Firstly, Middlebrook Rise has not been designed to carry a substantial amount of traffic. It is not very wide and already has issues with the current amount of traffic using it. Currently when cars are parked on either side of Middlebrook Rise, cars are held up in either direction having to wave cars on from the opposite direction. This is potentially dangerous when entering Middlebrook Rise from Bradley Street. In this instance you can be held up as you enter Middlebrook Rise while a vehicle is coming down, manoeuvring its way between parked vehicles.

Secondly, Riverflat Drive is designed to carry two lanes of traffic and have cars parked on either side, which is good. However, the issue is when trying to exit Riverflat Drive into Bradley Street. Vision is obscured on the left by the vegetation and railing. This necessitates the need to poke your vehicles nose partly into Bradley Street to see that it is safe to enter. I also add that Bradley Street has its issues with drivers using excessive speed and crossing the centre line near the sales office. I believe that with the extra traffic from the in progress development and future plans will exacerbate the current issues that residents are dealing with today. I believe there should be a review of the current traffic conditions followed by a further review of the proposed development's effects on road conditions prior to any approvals.

The issues noted regarding existing roads are separate matters to the subject proposal. Further investigation of such matters can be pursued through Council's Traffic Engineers.

Penrith Development Control Plan (DCP) 2014 outlines a clear road hierarchy and associated streetscape sections for the Glenmore Park Stage 2 development. The Council endorsed Precinct G and H Concept Plan refined the DCP road hierarchy based on a more detailed residential structure and urban layout. The proposed road layout is consistent with the principles and key road provisions within the Concept Plan and Glenmore Park Stage 2 chapter of the DCP.

The proposed road network is based on a modified grid layout and has been designed to respond to the topography of the land and ensure appropriate grades are achieved along each road. The modified grid layout maximises permeability and legibility for residents, providing connections for vehicles and pedestrians to open space within Precincts G and H and to local services within the Glenmore Park Stage 2 release area.

The proposed roads are designed to carry traffic alongside kerbside parking. Traffic modelling was undertaken to inform this road layout at the initial strategic planning phase as part of the zoning of Glenmore Park Stage 2 estate. The proposed road network has been examined by Council's Development Engineer and Traffic Engineer and has been found to be satisfactory. Council's Traffic Engineer in particular noted that there is adequate width and compliance with Council's road network requirements for safe circulation of traffic on the proposed lower order roads.

Referrals

The application was referred to the following stakeholders and their comments have formed part of the assessment:

Referral Body	Comments Received
Development Engineer	No objections - subject to conditions
Landscape Architect	No objections - subject to conditions
Environmental - Environmental management	No objections - subject to conditions
Environmental - Waterways	No objections - subject to conditions
Environmental - Biodiversity	No objections - subject to conditions
Traffic Engineer	No objection subject to conditions

Section 4.15(1)(e)The public interest

The proposed subdivision will facilitate housing densities consistent with the relevant concept plan approval and will contribute to housing diversity, green infrastructure, interconnected open spaces and amenity in Glenmore Park Stage 2. For these reasons, the proposed development is considered to be in the public interest.

Conclusion

The proposed development is generally consistent with the endorsed Concept Plan for Precinct H. Where potential impacts have been identified, mitigation measures have been incorporated into the proposed development's design or addressed through relevant recommended conditions.

The proposed development has been assessed against the relevant heads of consideration contained in Section 4.15 of the *Environmental Planning and Assessment Act 1979* and has been found to be satisfactory. The application is therefore recommended for approval, subject to the recommended conditions of consent.

Recommendation

That DA20/0782 for a Torrens Title subdivision into 88 residential lots, 1 public reserve lot, 1 drainage corridor lot and 3 residue lots, including bulk earthworks, construction of new roads, landscaping in roads and riparian corridor, retaining walls, stormwater management works and new services at 19 Middlebrook Rise, and Lot 2000 Bradley Street, Glenmore Park. be approved subject to the following recommended conditions.

CONDITIONS

General

1 A001

The development must be implemented substantially in accordance with the following plans stamped approved by Council, the application form, and any supporting information received with the application, except as may be amended in red on the approved plans and documents and by the following conditions.

Drawing	Drawing Ref.	Revision	Prepared By	Dated
Subdivision Plan	CCLGP-3-009-1	-	Design and Planning	20/12/2021
Landscaping Plans - Streetscape and Riparian Corridor				
Cover Sheet	LD-DA7000	H	Scott Carver	16/12/2021
Landscape Notes & Plant Schedule	LD-DA7001	H	Scott Carver	16/12/2021
Public Domain Plan - Stage 7	LD-DA7100	I	Scott Carver	16/12/2021
Public Domain Plan - Stage 8	LD-DA7101	G	Scott Carver	07/10/2021
Riparian Corridor Plan	LD-DA7104	F	Scott Carver	16/12/2021
Riparian Corridor Plan	LD-DA7105	F	Scott Carver	16/12/2021
Riparian Corridor Planting Schedules	LD-DA7106	F	Scott Carver	16/12/2021
Riparian Corridor Schedule and Detail	LD-DA7107	B	Scott Carver	16/12/2021
Public Domain Detail Plan - Stage 7	LD-DA7110	A	Scott Carver	16/12/2021
Public Domain Elevation	LD-DA7111	A	Scott Carver	16/12/2021
Sight Mounds Landscape Plan	LD-DA7200	A	Scott Carver	17/09/2021
Sight Mounds Canopy Cover Plan	LD-DA7201	A	Scott Carver	17/09/2021
Riparian Corridor Landscape Sections	LD-DA7300	F	Scott Carver	16/12/2021
Sight Mounds Landscape Sections	LD-DA7310	A	Scott Carver	17/09/2021
Basin E Plan	LD-DA7400	A	Scott Carver	29/10/2021
Basin E Schedule	LD-DA7401	A	Scott Carver	29/10/2021
Sight Mounds Typical Details	LD-DA7510	A	Scott Carver	17/09/2021
Engineering Plans				
Cover Sheet	9784-13 - DA001	C	J. Wyndham Prince	17/12/2021
Site Plan & Cut and Fill Plan	9784-13/DA002	C	J. Wyndham Prince	17/12/2021
Engineering Plan Sheets 1 and 2	97841-13/DA003-DA004	C	J. Wyndham Prince	17/12/2021
Soil & Water Management Plan	9784-13/DA005	D	J. Wyndham Prince	17/12/2021
Basin Plan	9784-13/DA006	B	J. Wyndham Prince	17/09/2021
Retaining Wall Plan	9784-13/DA007	B	J. Wyndham Prince	17/12/2021
Site Sections Sheet 1	9784-13/DA010	B	J. Wyndham Prince	15/04/2021
Site Sections Sheet 2	9784-13/DA011	B	J. Wyndham Prince	15/04/2021
Site Sections Sheet 3	9784-13/DA012	A	J. Wyndham Prince	19/11/2021
Site Sections Sheet 4	9784-13/DA013	A	J. Wyndham Prince	19/11/2021
Site Sections Sheet 5	9784-13/DA014	B	J. Wyndham Prince	15/04/2021
Typical Sections Sheet 1	9784-13/DA015	C	J. Wyndham Prince	17/12/2021
Typical Sections Sheet 2	9784-13/DA015A	A	J. Wyndham Prince	17/12/2021
Basin Top Longitudinal and Site Sections	9784-13/DA016	A	J. Wyndham Prince	15/04/2021
Road Longitudinal Sections Sheet 1	9784-13/DA020	C	J. Wyndham Prince	17/12/2021
Road Longitudinal Sections Sheet 2	9784-13/DA021	A	J. Wyndham Prince	19/11/2021
Road Longitudinal Sections Sheet 3	9784-13/DA022	B	J. Wyndham Prince	15/04/2021

Road Longitudinal Sections Sheet 4	9784-13/DA023	C	J. Wyndham Prince	17/12/2021
Retaining Wall Longitudinal and Standard Detail Sections Sheet 1	9784-13/DA024	B	J. Wyndham Prince	15/04/2021
Retaining Wall Longitudinal Sections Sheet 2	9784-13/DA025	B	J. Wyndham Prince	17/12/2021
Retaining Walls Sections Sheets 1 and 2	9784-13/DA026-9784-13/DA027	B	J. Wyndham Prince	17/09/2021 & 17/12/2021
The Northern Road Sight Lines Layout Sheets 1 and 2	9784-13/DA030 - 9784-13/DA031	B	J. Wyndham Prince	17/12/2021
Longitudinal Section of Sight Lines 1-20	9784-13/DA032-9784-13/DA053	A	J. Wyndham Prince	15/04/2021

Documents:

- Data Gap Investigation Highland Views, prepared by EDP, Reference S02624.DGI.001, dated February 2021
- Bushfire Protection Assessment prepared by Peterson Bushfire, Reference 17138, dated 8 April, 2021, and Addendum dated 20 December 2021
- Biodiversity Development Assessment Report prepared by Australian Wetlands Consulting Pty Ltd, Project No. 3-211373, Revision D, dated 16 December 2021
- Vegetation Management Plan prepared by Australian Wetlands Consulting Pty Ltd, Project No. 3-17857, Revision G, dated 14 December 2021
- Road Traffic Noise Impact Assessment prepared by Renzo Tonin & Associates, Revision 4, dated 25 October 2021
- Geotechnical and Salinity Assessment prepared by Geotechnique Pty Ltd, Job No. 13602/2-AA, dated 24/11/2020
- Review of Geotechnical and Salinity Assessment Report prepared by Ground Technologies Pty Ltd, Reference GT3231-ENG1, dated 23 February 2021
- Road Safety Audit for Road Network prepared by Transport & Urban Planning Pty Ltd, Reference 21011rsa, dated 24 June 2021
- Stormwater Management Strategy Report, prepared by J. Wyndham Prince, Issue B, dated 15 April 2021
- Waste Management Plan, prepared by Jason Stephenson, dated 18 November 2020
- Department of Primary Industries (Water) General Terms of Approval, Reference No. IDAS1130380, dated 18 December 2020
- NSW Rural Fire Service General Terms of Approval, Reference No. DA20201204004546-CL55-1, dated 15 February 2022

2 A005 - APPROVED BODYS CONSENT (FOR INTEGRATED DAS)

All requirements of the Office of Water and the Rural Fire Service's General Terms of Approval shall be satisfied **prior to the issue of any Subdivision Works Certificate and/or Subdivision Certificate,** as relevant.

3 A Special (BLANK)

Prior to the issue of a Subdivision Certificate for the 225th lot in Precinct H, the biodiversity corridor planting works, as approved, are to be completed in accordance with the *Glenmore Park Stage 2 Voluntary Planning Agreement* (VPA) and an amendment to the VPA providing for the deferral of the southern 20m of the corridor works shall be executed by the relevant parties.

Further, 2 years and 3 months after the completion of these works, Surveyors Creek, including the western tributary, within Highland Views is to be dedicated to Council.

Prior to the issue of any Subdivision Certificate, works to the corridor edge park and Pinnacle Park, as approved, are to be completed as per Annexure E of the *Second Glenmore Park Stage 2 Voluntary Planning Agreement.*

4 A Special (BLANK)

The recommendations and necessary works outlined in the letter prepared by Geotechnique dated 24 November 2015 in regards to salinity management shall be implemented for the development.

5 A Special (BLANK)

Prior to the issue of a Subdivision Certificate, a matrix table shall be submitted to, and endorsed by Penrith City Council detailing any infrastructure works, development contributions and/or land dedication required as a result of this development consent pursuant to the Glenmore Park Stage 2 Planning Agreement (No. 1), Second Council Planning Agreement and State Planning Agreement. All applicable infrastructure works, development contributions and/or land dedication shall be completed **prior to** (or concurrently with, in the case of land dedication) **the issue of a Subdivision Certificate or as detailed in the endorsed matrix table**.

6 A Special (BLANK)

Any proposed retaining walls shall be constructed of masonry or rock materials and to the heights specified on the approved plans. This detail shall be reflected on the Subdivision Works Certificate plans.

7 A Special (BLANK)

Prior to the issue of any Subdivision Works Certificate, the Highland Views Design Guidelines are to be amended to to detail steep lot controls and nominate affected lots. Further, the guidelines shall also be amended to include information regarding the restricted access and function of the widened verge area on Road 113 adjacent to Lots 708-713. Details in this regard shall be approved by Council.

Heritage/Archaeological relics

8 C003 - Uncovering relics

If any archaeological relics are uncovered during the course of the approved works, no further work shall be undertaken until further directed by Penrith City Council or the NSW Heritage Office.

The applicant is advised that depending on the possible significance of the relics, an archaeological assessment and an excavation permit under the Heritage Act 1977 may be required before any further work can be recommenced in that area of the site.

Environmental Matters

9 D- Dust

Dust suppression techniques are to be employed during works to reduce any potential nuisances to surrounding properties.

10 D002 Spraygrass

All land that has been disturbed by earthworks is to be spray grassed or similarly treated to establish a grass cover.

11 D006 - Submission of and implement waste management plan

A completed waste management plan shall be submitted to Council for consideration and approval prior to the issue of any Subdivision Works Certificate

The waste management plan shall address all waste materials likely to result from the proposed development, with details of the estimated waste volumes, onsite storage and management, proposed re-use of materials, designated waste contractors, recycling outlet and/or landfill site.

No waste materials are allowed to enter the natural areas, stormwater system or neighbouring properties.

Regular inspections of the natural areas must be conducted and adaptive management undertaken should a problem be identified.

The approved waste management plan must be implemented and adhered to with supporting documentation/receipts retained in order to verify the recycling and disposal of materials in accordance with the approved plan.

12 D009 - Covering of waste storage area

All waste materials stored on-site during construction works are to be contained within a designated area to ensure that no waste materials are allowed to enter the stormwater system or neighbouring properties. The designated waste storage areas are to be fully enclosed when the site is unattended.

13 D010 – Appropriate disposal of excavated or other waste

All excavated material and other wastes generated as a result of the development are to be disposed of at a lawful waste management facility. Where the disposal location or waste materials have not been identified in the waste management plan, details shall be provided to the Certifying Authority as part of the waste management documentation accompanying any Subdivision Works Certificate application.

All receipts and supporting documentation must be retained in order to verify lawful disposal of materials and are to be made available to Penrith City Council on request.

14 D026 - Liquid wastes

Only clean and unpolluted water is to be discharged into Penrith City Council's stormwater drainage system.

15 D038- Noise Construction Noise and Vibration

Prior to the issue of any Subdivision Works Certificate, a Construction Noise and Vibration Impact Assessment and Management Plan, prepared by a suitably qualified acoustic consultant, is to be prepared and submitted to Penrith City Council for approval. This assessment is to consider the noise and vibration impacts associated with the construction phase, as well as details of the construction program, construction methods, equipment and vehicles in association with the NSW Department of Environment and Climate Change's "Interim Construction Noise Guideline" 2009.

The recommendations of the Council approved Management Plan are to be implemented and adhered to during construction of the development.

{Note: For the purpose of this condition a suitably qualified acoustic consultant means a consultant who possesses the qualifications to render them eligible for membership of the Australian Acoustics Society, Institution of Engineers Australia or the Association of Australian Acoustic Consultants at the grade of member.}

16 D046- Sub Cert -Positive Covenant

The Subdivision Certificate application is to be supported by an 88B instrument creating a positive covenant burdening Lots 714, 727, 728, 743, 744, 745, 746, 811, 812, 813, 814, 822, 828, 829, 830, 831 and 832 that refers to the 'Highland Views Stages 7-8, Glenmore Park DA Acoustic Report' prepared by Renzo Tonin & Associates and dated 25 October 2021 [Ref. TL773-01F02 Road Traffic Noise Impact Assessment (r4)].

The covenant is to:

- stipulate the project noise criteria as outlined in Table 3 of the above Acoustic Report;
- provide advice on the mechanisms required for each lot to meet the noise criteria, as outlined in Appendix B of the Acoustic Report;
- provide advice to ensure ventilation requirements are met in accordance with the recommendations of the Acoustic Report; and
- ensure that the noise criteria be achieved through the implementation of the recommendations of the 'Highland Views Stages 7-8, Glenmore Park DA Acoustic Report' prepared by Renzo Tonin & Associates and dated 25 October 2021 [Ref. TL773-01F02 Road Traffic Noise Impact Assessment (r4)].

17 D06A – Approval for bulk earthworks/major filling operations (Use for bulk earthworks/ major filling operations)
No fill material shall be imported to the site until such time as a Validation Certificate (with a copy of any report forming the basis for the validation) for the fill material has been submitted to Council. The Validation Certificate shall:

- state the legal property description of the fill material source site,
- be prepared by an appropriately qualified person with consideration of all relevant guidelines (e.g. EPA, ANZECC, NH&MRC), standards, planning instruments and legislation,
- clearly indicate the legal property description of the fill material source site,
- provide details of the volume of fill material to be used in the filling operations,
- provide a classification of the fill material to be imported to the site in accordance with the Environment Protection Authority's "Environmental Guidelines: Assessment, Classification & Management of Non-Liquid Wastes" 1997, and
- (based on the fill classification) determine whether the fill material is suitable for its intended purpose and land use and whether the fill material will or will not pose an unacceptable risk to human health or the environment.

An appropriately qualified person/s shall:

- Supervise the filling works,
- (On completion of filling works) carry out an independent review of all documentation relating to the filling of the site, and shall submit a review findings report to Council and any Principal Certifying Authority,
- Certify by way of a Compliance Certificate or other written documentation that fill materials have been placed on the site in accordance with all conditions of this consent and that the site will not pose an unacceptable risk to human health or the environment. A copy of the Compliance Certificate or other documentation shall be submitted to Council and any Principal Certifying Authority.

The contact details of any appropriately qualified person/s engaged for the works shall be provided with the Notice of Commencement.

If the Principal Certifying Authority or Penrith City Council is not satisfied that suitable fill materials have been used on the site, further site investigations or remediation works may be requested. In these circumstances the works shall be carried out prior to any further approved works.

{Note: For the purpose of this condition, an appropriately qualified person is defined as "a person who, in the opinion of Council, has a demonstrated experience, or access to experience in hydrology, environmental chemistry, soilscience, eco-toxicology, sampling and analytical procedures, risk evaluation and remediation technologies. In addition, the person will be required to have appropriate professional indemnity and public risk insurance."}

18 D082 – Contamination – If unexpected finds occur during works
Should any "unexpected finds" occur during site excavation and earthworks including, but not limited to, the identification/finding of contaminated soils, buried building materials, asbestos, odour and/or staining, works are to cease immediately and Penrith City Council is to be notified. Any such "unexpected finds" shall be addressed by an appropriately qualified environmental consultant.

All remediation works within the Penrith Local Government Area are considered to be Category 1 works under State Environmental Planning Policy No. 55 - Remediation of Land. Should any contamination be found during development works and should remediation works be required, development consent is to be sought from Penrith City Council before the remediation works commence.

19 D Biodiversity Offset Requirements
Prior to the commencement of works (including clearing of native vegetation), the following ecosystem and species credits listed in the tables below must be retired.

The developer must purchase and retire credits which may be satisfied by sourcing credits from the Biodiversity Credit market or payment to the Biodiversity Conservation Trust of an amount equivalent to the class and number of ecosystem credits, as calculated by the Biodiversity Offset Payment Calculator (the amount payable to discharge an offset obligation will be determined at the time of payment).

Table 1: Ecosystem credits required to be retired

Impacted plant community type	Number of ecosystem credits	Offset option	IBRA subregion	Plant community type(s) that can be used to offset the impacts from development
PCT 849 Cumberland Plain Woodland in the Sydney Basin Bioregion	4	Like-for-like	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo Or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site	Cumberland Plain Woodland in the Sydney Basin Bioregion (3 credits for scattered trees, 2 x no HBT, 1x with HBT)

Table 2: Species credits required to be retired

Species credit	Number of species credits	Offset option	Approved variation species credit species that can be used to offset the impacts from the development	IBRA region
Dillwynia tenuifolia (Dillwynia tenuifolia)	1	Like-for-like	*Dillwynia tenuifolia* (Dillwynia tenuifolia) Or Any species with the same or higher category of listing under Part 4 of the BC Act	Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

Pterostylis saxicola (Sydney Plains Greenhood)	1	Like-for-like	*Pterostylis saxicola* (Sydney Plains Greenhood) Or Any species with the same or higher category of listing under Part 4 of the BC Act	Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site
Pultenaea pedunculata (Matted Bush-pea)	1	Like-for-like	*Pultenaea pedunculata* (Matted Bush-pea) Or Any species with the same or higher category of listing under Part 4 of the BC Act	Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site

A retirement certificate is required from the NSW Department of Planning, Industry & Environment and/or Statement confirming payment into the Biodiversity Conservation Trust to demonstrate compliance with this condition. This certificate is to be provided to Council's Manager Environmental Health & Compliance prior to the commencement of works.

20 D Dam dewatering and fauna management requirements

The dewatering of the dam is to be undertaken in accordance with the following requirements:

- Dam dewatering is to be planned and implemented by a qualified and experienced aquatic ecologist.
- Include an unexpected finds protocol should threatened species be identified during the process.
- The ephemeral dam is to be inspected for aquatic flora and fauna and dewatering is to be undertaken in accordance with current best practice.
- Receiving locations that provide for the persistence of the displaced fauna (and translocation of the aquatic native flora) are to be confirmed ahead of implementation. Receiving locations must be nearby to ensure appropriate conditions are available to ensure the long-term persistence of displaced individuals.
- Should water be present, it is to be slowly pumped from the dam in a manner to ensure rescue and relocation of protected native aquatic fauna.
- The dewatered dam/soil bed must be inspected for fauna which may be buried in the sediments on the bottom of the dam.
- Rescued fauna is to be released at a suitable nearby location or if injured, taken for veterinary attention, and then placed into the care of a registered wildlife carer (at the cost of the proponent). All displaced fauna must be released at a protected waterbody nearby to the site.
- At any time during the dewatering dam process, if threatened species are identified, works are to cease immediately, to ensure the individuals are protected from harm, rescued and appropriately relocated.
- The aquatic Ecologist is to ensure that any native species are captured and relocated to the receiving location, and that pest species (such as carp and mosquito fish) are humanely removed and euthanised in a manner consistent with the *Prevention of Cruelty to Animals Act 1979*.

21 D Fauna protection - Pre clearance survey and activities

One week prior to any removal of vegetation (including but not limited to native vegetation and the small dam located at the north of the development site), a pre-clearance survey is required to be undertaken by a qualified and experienced Fauna Ecologist (with a license to remove and handle native wildlife) to:

- Review final areas of native vegetation and individual trees approved for removal;
- Prepare a rescue plan/protocol - no individuals are to be translocated off-site. All displaced wildlife is to be relocated to adjacent natural areas (i.e. the green corridor), except for injured wildlife that must be treated by an experienced wildlife veterinarian, with costs met by the proponent. Wildlife displaced from the scattered trees are to be relocated to the green corridor (not Pinnacle Park). This is due to the limited carrying capacity of this patch of vegetation;
- Prepare an unexpected finds protocol. Should threatened species be identified during the pre-clearance survey or during clearing activities, a stop work order must be enacted;
- Assess receiving locations with preference given to the green corridor for terrestrial wildlife and the dam within the corridor for aquatic fauna;
- Clearly identify/mark native vegetation for removal;
- Inspect all areas of habitat and provide pre-clearing recommendations to avoid harm or mortality of protected native fauna. This may include removal of identified fauna prior to works commencing or at the time of tree removal;
- Implement pre-clearance survey and rescue plan/protocol;
- Record displaced/injured fauna; and
- Implement controls to ensure exclusion of displaced fauna from the development site.

Should there be any concerns, unexpected finds or incidents, Penrith City Council's Biodiversity Officer is to be contacted.

The survey results and actions taken during clearing activities are to be reported to Penrith City Council’s Manager Environmental Health & Compliance, within 1 month of clearing works.

22 D Fencing protection to part of site or adjoining property

Prior to works commencing (including the removal of native vegetation), protection fencing must be installed to the following requirements:

- Pinnacle Park: permanent fencing shall consists of low bollard or similar installed no less than 1m from the dripline of the outer edge trees within this patch of vegetation. Temporary signage shall be installed to indicate that this is a 'No-Go Zone - Threatened species protection zone'.
- Green Corridor: permanent fencing shall be installed at the outer edge of this zone.
- Basin E: temporary fencing shall be installed at the perimeter of the area subject to works and be maintained throughout the period of works at this location. Temporary signage shall be installed to indicate that the area beyond the fence is a 'No-Go Zone - no stockpiles, no heavy machinery to be stationed'.
- Surveyors Creek West Riparian Corridor: temporary protection fencing shall be installed adjacent to the native vegetation. Temporary signage must be installed to indicate that the area beyond the fencing is a No-Go zone to avoid impact on the native vegetation.

Protection fencing must be maintained for the duration of works.

Staff inductions shall include reference to No-Go Zones and provide education on the importance of the sensitive natural areas associated with the development.

Protection fencing must be inspected by Council's Biodiversity Officer prior to works commencing.

23 D Sediment and erosion control measures

Erosion and sediment control measures shall be installed **prior to the commencement of works on site** including approved clearing of site vegetation. The erosion and sediment control measures are to be maintained in accordance with the approved erosion and sediment control plan(s) for the development and the Department of Housing's “Managing Urban Stormwater: Soils and Construction” 2004.

The approved sediment and erosion control measures are to be installed prior to and maintained throughout the construction phase of the development until the land, that was subject to the works, has been stabilised and grass cover established. These measures shall ensure that mud and soil from vehicular movements to and from the site is not deposited on roadways during the construction of the development.

Specific areas for protection include, but are not limited to:

- Pinnacle Park and specifically the full extent of the patch of Cumberland Plain Woodland;
- Green corridor;
- The area surrounding works at Basin E;
- The drainage line and waterbody directly to the east of the development site;
- The area surrounding the screening mounds;
- Native vegetation along the eastern perimeter of the site boundary; and
- Native vegetation north of the current works area within the riparian corridor to the west of subject stage of the development.

24 D Site management - protection of native vegetation

During works, no construction activities are to be undertaken within the identified natural areas to be protected in accordance with the approved Biodiversity Development Assessment Report, including within the green corridor, Pinnacle Park, Surveyors Creek West Riparian Corridor and Basin E.

25 D Translocation of threatened species

Prior to work commencing (including the removal of native vegetation), the project bushland regenerator shall inspect the *Dillwynia tenuifolia, Pterostylis saicola* and *Pultenaea pedunculata* and native vegetation for removal from Basin E for the opportunity to translocate specimens on site.

Where the specimens are translocated within or adjacent to the site into Pinnacle Park or the green corridor as appropriate to the receiving vegetation community, a scientific licence will not be required. The specimens must not be removed from the site.

Relocation is to conform to the Office of Environment and Heritage’s Translocation Operational Policy (2019) and current best practice. Records of translocation efforts are to be included in the first year's annual reporting for the VMP.

Alternatively, should this not be feasible, an appropriately liscensed native nursery within the local area should be contacted in an effort to translocate the specimens prior to works commencing.

26 D Tree protection measures

No fill, machinery or materials are to be placed or stored within the drip line of any tree that is to be retained. All trees that are required to be retained as part of the development are to be protected in accordance with the minimum tree protection standards as outlined in Australian Standard 4970-2009 'Protection of Trees on Development Sites'.

27 D Tree removal and fauna protection

To mitigate and ameliorate the impact of vegetation removal on resident fauna, the following is required to be satisfied:

(a) Tree and Vegetation Removal

During any tree removal, an experienced and qualified Ecologist is to be present to re-locate any displaced fauna that may be disturbed during this activity. The following is to be undertaken to mitigate the impacts on resident fauna:

- Prior to clearing habitat trees, all non-habitat vegetation shall be cleared first to allow appropriate space for the felling of habitat trees and retrieval of any fauna that may be present within the habitat trees.
- Trees with hollows shall be lopped in a way that the risk of injury or mortality to fauna is minimised, such as top-down lopping, with lopped sections gently lowered to the ground, or by lowering whole trees to the ground with the 'grab' attachment of a machine.
- Any injured fauna is to be appropriately treated, cared for and released on site when rehabilitated.

(b) Salvage of Habitat Features

- Hollows must be sectionally dismantled from felled hollow-bearing trees and attached to a retained tree in retained bushland within the green corridor according to best practice and in a manner that will not compromise the health and safety of the host tree. This is to be done by a qualified and experienced climbing Arborist under the direction of the project Ecologist.
- Logs shall be salvaged from the development area and cut into 3m lengths. A minimum of one log per 1,000m² is required to be introduced into the green corridor. Logs are to be relocated into the VMP area under the direction of the project Ecologist. Logs from the largest diameter cohort are to be used where they can be installed without damaging native vegetation, under the direction of the project bush regenerator.
- Suitable upper tree branches are to be salvaged and evenly distributed across the VMP area under the direction of the project bush regenerator.
- The remaining debris from the native vegetation is to be rigorously shaken to remove pollinators, prior to being mulched for use within the natural areas identified within the VMP.
- Exotic vegetation including controlled weed species must not be mulched with native vegetation, to prevent the spread of weeds on site.

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

28 D Vegetation Management Plan

Prior to works commencing, an updated Vegetation Management Plan (VMP) is to be submitted to, and approved by Council incorporating the following modifications:

- Survey for and conduct translocations of threatened and native vegetation as appropriate to the project bush regenerator.
- Controlled weeds are to be removed to an authorised waste transfer facility and a receipt for disposal provided with the relevant reporting requirements.
- An additional strategy to import certified topsoil from same or similar PCT (for all areas under treatment) is required to achieve the stated outcomes. This is required particularly where the previous topsoil had a high weed/weed seed bank. Include a statement of use in the reporting requirements.
- Mulch must be native, certified weed and pathogen free from the same or similar PCT. Adjust accordingly and include statement of use in the reporting requirements.
- Plant purchase shall ensure structure and diversity is achieved, with priority given to long term on ground outcomes. Plants must be inspected prior to purchase and on delivery and must be weed and pathogen free.
- Within Sections 3.1.4 and 3.1.8, include the timing of when the work must commence.
- The requirement to use herbicides as appropriate to areas adjacent to waterways shall be specified in Section 3.1.6.
- Monitoring shall occur to inform watering requirements and the application shall be adjusted to suit prevailing conditions.
- Where the VMP does not achieve its objectives for any specified area, the evaluation report at the 3 year anniversary of the VMP must indicate the additional term 19 requirements to achieve the on-ground objectives.
- Permanent fencing requirements to the green corridor and Pinnacle Park shall be installed prior to works commencing within the vicinity of these areas. Signage is to indicate the biodiversity values of the area and additional temporary signage to indicate the areas are No-Go Zones for construction impacts.
- Through all phases of works and during the maintenance period, staff inductions shall include education and controls for works within VMP areas and include clear communication of No-Go Zones.
- Green corridor works shall be carried out by qualified professional bush regenerators with a minimum qualification of a Certificate III in Natural Area Restoration or equivalent, and a minimum of 5 years with the same or similar PCT's within Greater Western Sydney.
- For other areas, specify who is to undertake the works and who is responsible for the works being completed, for example the site supervisor or the project manager.
- Specify monitoring and reporting responses to incidents or unexpected events. When that adaptive management is required outside of standard monitoring and reporting intervals, contractors shall consult with the project Ecologist (VMP author) for consideration of remedial actions. Council must be notified of incidents and proposed responses.
- Protection measures for each area during the construction phase shall be specified.
- Specify who is responsible for the controlled burns and specify the minimum qualifications, experience and insurances the lead contractor must hold. The mowing requirements (with full specifics for the contractor) are to be detailed to achieve the desired objectives, should the burns not proceed.
- Where material from native vegetation has been removed from the site, all salvaged material must be re-used on site within one or more of the areas under treatment (i.e. within the green corridor or Pinnacle Park) under the direction of the bushland regenerator. This will include, but not be limited to, hollows, logs and mulch material.
- At Table 3-3, indicate re-seeding, as required.
- Contractors for weed control - specify requirements throughout the main body of the VMP, as well as in the appendices.
- Update the performance criteria (at page 56) to be consistent with the main body of the VMP.

29 D Vegetation Management Plan implementation and Handover

The works outlined in the final approved Vegetation Management Plan must be completed to Council's satisfaction, **prior to the issue of any relevant Subdivision Certificate**. A statement certifying compliance must be provided by the author of the approved Vegetation Management Plan or an equally qualified and experienced person.

Handover of the assets to Council cannot occur until Council is satisfied that the planting works are in accordance with the approved plans, conditions of approval and once vegetation has been maintained for a period of three (3) years and a performance-based inspection has been undertaken with Council.

During the 3 year maintenance period, the developer is to submit to Council's Biodiversity and Asset Management Department, a quarterly report outlining all maintenance activities undertaken as per the Vegetation Management Plan. This is to be prepared by a suitably qualified ecologist/horticulturalist with 5 years relevant experience.

30 D Weed management

Prior to works commencing (including the removal of vegetation), in accordance with the *Biosecurity Act 2015*, a weed and plant pathogen management plan for the duration of works must be prepared in consultation with and approved by Hawkesbury River County Council, and submitted to Council for endorsement.

Any weed plan approved in accordance with this condition shall be implemented throughout the duration of the associated works.

Utility Services

31 G001 - Installation of services and Service Clearances (subdivision)

All services (water, sewer, electricity, telephone and gas), including the provision of service conduits and stub mains, are to be installed within the proposed public roads before final inspection of the engineering works.

Prior to the issue of a Subdivision Certificate, the following service authority clearances shall be obtained:

- a Section 73 Compliance Certificate under the Sydney Water Act 1994 shall be obtained from Sydney Water;
- a Notification of Arrangement Certificate from Endeavour Energy stating that satisfactory arrangements have been made for electricity supply to all proposed allotments in the subdivision, including any necessary easements; and
- a certificate from an approved telecommunications service provider that satisfactory arrangements have been made for underground telephone services to all proposed allotments in the subdivision, including any necessary easements.

These clearances are to be submitted to the Principal Certifying Authority **prior to the issue of a Subdivision Certificate**.

32 G006 -

Prior to the issue of any Subdivision Works Certificate, the Principal Certifying Authority shall be satisfied that telecommunications infrastructure may be installed to service the premises which complies with the following:

- The requirements of the Telecommunications Act 1997;
- For a fibre ready facility, the NBN Co's standard specifications current at the time of installation; and
- For a line that is to connect a lot to telecommunications infrastructure external to the premises, the line shall be located underground.

Unless otherwise stipulated by telecommunications legislation at the time of construction, the development must be provided with all necessary pits and pipes, and conduits to accommodate the future connection of optic fibre technology telecommunications.

Prior to the issue of a Subdivision Certificate, written certification from all relevant service providers that the telecommunications infrastructure is installed in accordance with the requirements above and the applicable legislation at the time of construction, must be submitted to the Principal Certifying Authority.

Construction

33 H001 - Stamped plans and erection of site notice

Stamped plans, specifications, a copy of the development consent, the Subdivision Works Certificate and any other Certificates to be relied upon shall be available on site at all times during construction.

The following details are to be displayed in a maximum of 2 signs to be erected on the site:

- the name of the Principal Certifying Authority, their address and telephone number,
- the name of the person in charge of the work site and telephone number at which that person may be contacted during work hours,
- that unauthorised entry to the work site is prohibited,
- the designated waste storage area must be covered when the site is unattended, and
- all sediment and erosion control measures shall be fully maintained until completion of the construction phase.

Signage but no more than 2 signs stating the above details is to be erected:

- at the commencement of, and for the full length of the, construction works on site, and
- in a prominent position on the work site and in a manner that can be easily read by pedestrian traffic.

All construction signage is to be removed when the Subdivision Certificate has been issued for the development.

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

34 H002 - All forms of construction

Prior to the commencement of construction works:

(a) Toilet facilities at or in the vicinity of the work site shall be provided at the rate of one toilet for every 20 persons or part of 20 persons employed at the site. Each toilet provided must be:

- a standard flushing toilet connected to a public sewer, or
- if that is not practicable, an accredited sewage management facility approved by Council, or
- alternatively, any other sewage management facility approved by Council.

(b) All excavations and backfilling must be executed safely and in accordance with the appropriate professional standards. All excavations associated with the erection or demolition of a building must be properly guarded and protected to prevent them from being dangerous to life or property.

(c) If an excavation extends below the level of the base of the footings of a building on an adjoining allotment of land, the person causing the excavation to be made:

- must preserve and protect the building from damage, and
- if necessary, must underpin and support the building in an approved manner, and
- must, at least 7 days before excavating below the level of the base of the footings of a building on an adjoining allotment of land, give notice of intention to do so to the owner of the adjoining allotment of land and furnish particulars of the excavation to the owner of the building being erected or demolished.The owner of the adjoining allotment of land is not liable for any part of the cost of work carried out for the purposes of this condition, whether carried out on the allotment of land being excavated or on the adjoining allotment of land (includes a public road and any other public place).

(d) If the work is likely to cause pedestrian or vehicular traffic in a public place to be obstructed or rendered inconvenient, or involves the enclosure of a public place, a hoarding or fence must be erected between the work site and the public place:

- if necessary, an awning is to be erected, sufficient to prevent any substance from, or in connection with, the work falling into the public place,
- the work site must be kept lit between sunset and sunrise if it is likely to be hazardous to persons in the public place, and
- any such hoarding, fence or awning is to be removed when the work has been completed.

35 H041 - Hours of work (other devt)

Construction works or subdivision works that are carried out in accordance with an approved consent that involve the use of heavy vehicles, heavy machinery and other equipment likely to cause offence to adjoining properties shall be restricted to the following hours in accordance with the NSW Environment Protection Authority Noise Control Guidelines:

- Mondays to Fridays, 7am to 6pm
- Saturdays, 7am to 1pm if inaudible on neighbouring residential premises, otherwise 8am to 1pm
- No work is permitted on Sundays and Public Holidays.

Other construction works that do not involve the use of equipment that emits noise are not restricted to the hours stated above.

The provisions of the Protection of the Environment Operations Act 1997 in regulating offensive noise also apply to all construction works.

Engineering

36 K101 - Works at No Cost to Council

All roadworks, stormwater drainage works, signage, line marking, associated civil works and dedications required to effect the consented development shall be undertaken by the applicant at no cost to Penrith City Council.

37 K201 - Infrastructure Bond

An Infrastructure Restoration Bond is to be lodged with Penrith City Council for development involving works around Penrith City Council's Public Infrastructure Assets. The bond is to be lodged with Penrith City Council prior to commencement of any works on site or prior to the issue of any Subdivision Works Certificate, whichever occurs first. The bond and applicable fees are in accordance with Council's adopted Fees and Charges.

An application form together with an information sheet and conditions are available on Council's website.

Contact Penrith City Council's Asset Management Department on 4732 7777 or visit Penrith City Council's website for more information.

38 K202 - S138 Roads Act - Minor Works in the Public Road

Prior to the issue of any Subdivision Works Certificate, a Section 138 Roads Act application, including payment of application and inspection fees together with any applicable bonds, shall be lodged with and approved by Penrith City Council (being the Roads Authority for any works required in a public road). These works may include but are not limited to the following:

a) Vehicular crossings (including kerb reinstatement of redundant vehicular crossings)
b) Concrete footpaths and/or cycleways
c) Road opening for utilities and stormwater (including stormwater connection to Penrith City Council roads and other Penrith City Council owned drainage)
d) Road occupancy or road closures (including temporary construction work zones and tower crane operation)
e) The placement of hoardings, structures, containers, waste skips, signs, etc in the road reserve
f) Temporary construction access

All works shall be carried out in accordance with the Roads Act approval, the development consent, including the stamped approved plans and Penrith City Council's specifications, guidelines and best engineering practice.

Contact Penrith City Council's Asset Management Department on 4732 7777 or visit Penrith City Council's website for more information.

Note:

- Where Penrith City Council is the Certifier for the development, the Roads Act approval for the above works may be issued concurrently with the Subdivision Works Certificate.
- All works associated with the Roads Act approval must be completed prior to the issue of any Subdivision Certificate.

39 K205 - S68 Local Government Act - Stormwater Drainage Works

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that an application under Section 68 of the Local Government Act, including payment of application and inspection fees, has been lodged with and approved by Penrith City Council for modification of the existing bioretention basin within the downstream riparian corridor off Bradley Street, Glenmore Park.

Engineering plans are to be prepared in accordance with the development consent, Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments, Engineering Construction Specification for Civil Works, Austroads Guidelines, and best engineering practice.

Applications under Section 68 of the Local Government Act are now lodged via the NSW Planning Portal. Further information on the lodgement process can be found on the NSW Planning Portal website. Please contact Penrith City Council's Development Engineering Department on 4732 7777 to obtain a formal fee proposal prior to lodgement on the Portal or if you require any assistance with the lodgement process.

Note:

- All works associated with the Section 68 Local Government Act approval must be completed prior to the issue of any Subdivision Certificate.

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

40 K206 - Subdivision Works Certificate for Subdivision Works

A Subdivision Works Certificate (previously a Construction Certificate) is to be approved by the Certifier for the provision of any subdivision works (roads, drainage, earthworks and other subdivision works).

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that engineering plans are consistent with the stamped approved plans prepared by J. Wyndham Prince, Project No. 9784-13, and that all subdivision works have been designed in accordance with the development consent, Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments, Engineering Construction Specification for Civil Works, Austroad Guidelines and best engineering practice.

The subdivision works may include but are not limited to the following:

- Public and private roads
- Stormwater management (quantity and quality)
- Interallotment drainage
- Private access driveways
- Sediment and erosion control measures
- Flood control measures
- Overland flow paths
- Traffic facilities
- Earthworks, bridges, culverts, retaining walls and other structures
- Landscaping and embellishment works

The Subdivision Works Certificate must be supported by engineering plans, calculations, specifications and any certification relied upon.

Note:

- Subdivision Works Certificates are now lodged via the NSW Planning Portal. Further information on the lodgement process can be found on the NSW Planning Portal website. Council's Development Engineering Department can provide this service and can be contacted on 4732 7777 to obtain a formal fee proposal prior to lodgement on the Portal or if you require any assistance with the lodgement process.

41 K207 - Road Design Criteria Table

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that the proposed roads have been designed in accordance with Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments, Engineering Construction Specification for Civil Works and the following criteria:

Road No.	Road Reserve Width	Carriageway Width	Verge Width	Footpath Width
Road 112 (CH 270 - 387)	16.8m	12.0m	3.8m (eastern side) 1.0m (western side)	1.5m footpath (ea
Road 112 (CH 387 - 455)	16.8m	12.0m	3.8m (eastern side) 1.0m (western side)	1.5m footpath (2.5m shared path (western sic
Road 113 (CH 102 - 140.7)	15.6m	8.0m	3.8m (both sides)	1.5m footpath
Road 113 (CH 140.7 - 193.6)	12.8m	8.0m	1.0m (northern side) 3.8m (southern side)	1.5m footpath (sou
Road 113 (CH 193.6 - 345)	18.2m	8.0m	6.4m (northern side) 3.8m (southern side)	1.5m footpath (sou
Road 115 (Middlebrook Rise)	12.8m	8.0m	1.0m (eastern side) 3.8m (western side)	1.5m footpath (we
Road 116 (Capstone Terrace)	12.8m	8.0m	3.8m (eastern side) 1.0m (western side)	1.5m footpath (eas
Road 117 (Highdale Terrace)	15.6m	8.0m	3.8m (both sides)	1.5m footpath
Road 118	15.6m	8.0m	3.8m (both sides)	1.5m footpath
Road 119	15.6m	8.0m	3.8m (both sides)	1.5m footpath
Road 120	15.6m	8.0m	3.8m (both sides)	1.5m footpath (nor
Road 121	15.6m	8.0m	3.8m (both sides)	1.5m footpath (we

A copy of the pavement design prepared and certified by a suitably qualified geotechnical engineer must accompany the application for a Subdivision Works Certificate.

42 K208 - Road Safety Audit

A Stage 3 Detailed Design Road Safety Audit (RSA) shall be undertaken in accordance with Austroads Guide to Road Safety, Part 6: Road Safety Audit on the proposed roadworks by an accredited auditor who is independent of the design consultant. A copy of the RSA shall accompany the design plans submitted with the Subdivision Works Certificate.

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that the recommendations of the RSA have been considered in the final design, through review of the Road Safety Audit Checklist, including Findings, Recommendations and Corrective Actions.

A copy of the Road Safety Audit shall be submitted to Penrith City Council by the applicant or Certifier for information purposes.

43 K209 - Stormwater Concept Plan

The stormwater management system shall be provided generally in accordance with the approved plans prepared by J. Wyndham Price, plan numbers 9784-13-DA001-DA0100, Revision C, dated 17/12/2021, commitments made in the Stormwater Management Strategy for Glenmore Park Precincts G and H for Vianello Holdings Pty Ltd, prepared by J. Wyndham Prince, Issue B, dated 15/04/2021, and commitments made in the Vegetation Management Plans prepared by AWC Consulting, project number 3-17857, Revision G, dated 14/12/2021.

Engineering plans and supporting calculations are to be prepared by a suitably qualified engineer and shall accompany the application for a Subdivision Works Certificate.

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that the stormwater management systems have been designed in accordance with Penrith City Council's Stormwater Drainage for Building Developments and Water Sensitive Urban Design (WSUD) Policies.

44 K222 - Access, Car Parking and Manoeuvring - General

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that vehicular access, circulation, manoeuvring, pedestrian and parking areas associated with the subject development are in accordance with Penrith Development Control Plan, AS 2890.1, AS 2890.2 and AS 2890.6.

45 K225 - Performance Bond

Prior to the issue of a Section 68 Local Government Act approval, a Performance Bond is to be lodged with Penrith City Council for modification of the existing bioretention basin within the downstream riparian corridor off Bradley Street, Glenmore Park.

The value of the bond shall be determined in accordance with Penrith City Council's adopted fees and charges.

Note:

- Contact Penrith City Council's Development Engineering Department on 4732 7777 for further information relating to bond requirements.

46 K303 - Matters to be Addressed Prior to Commencement of Subdivision Works

Work on the subdivision shall not commence until:

- a Subdivision Works Certificate (if required) has been issued;
- a Certifier has been appointed for the project, and;
- any other matters prescribed in the development consent for the subdivision and the Environmental Planning and Assessment Act and Regulation have been satisfied.

A Notice of Commencement of works is to be submitted to Penrith City Council five (5) days prior to commencement of engineering works or clearing associated with the subdivision.

47 K402 - Street Lighting

Street lighting is to be provided for all new roads within the proposed subdivision to Penrith City Council's standards.

48 K403 - Major Filling / Earthworks

All earthworks shall be undertaken in accordance with AS 3798 and Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments and Engineering Construction Specification for Civil Works.

The level of testing shall be determined by the Geotechnical Testing Authority/Superintendent in consultation with the Principal Certifier.

49 K404 - Soil Testing - Subdivisions

Soil testing is to be carried out to enable each lot to be classified according to AS 2870 Residential Slabs and Footings. The results shall be submitted to Penrith City Council prior to the issue of any Subdivision Certificate.

50 K405 - Turf to Verge

Upon completion of all works in the road reserve, all verge areas fronting and within the development are to be turfed. The turf shall extend from the back of kerb to the property boundary, with the exception of concrete footpaths, service lids or other infrastructure which is not to be turfed over. Turf laid up to concrete footpaths, service lids or other infrastructure shall finish flush with the edge.

51 K406 - Underground Services

All existing (aerial) and proposed services for the development, including those across the frontage of the development, are to be located or relocated underground in accordance with the relevant authority's regulations and standards.

52 K501 - Penrith City Council Clearance - Roads Act / Local Government Act

Prior to the issue of any Subdivision Certificate, the Principal Certifier shall ensure that all works associated with any Section 138 Roads Act approval and Section 68 Local Government Act approval have been inspected and signed-off by Penrith City Council.

53 K502 - Completion of Subdivision Works

Prior to the issue of any Subdivision Certificate, the Principal Certifier shall ensure that all subdivision works required by this consent have been satisfactorily completed or that suitable arrangements have been made with Penrith City Council for any outstanding works.

54 K509 - Signage & Line Marking

Prior to the issue of any Subdivision Certificate and installation of regulatory/advisory signage and line marking, plans are to be lodged with Penrith City Council and approved by the Local Traffic Committee.

Note:

- Contact Penrith City Council's Engineering Services Department on 4732 7777 for further information on this process.

55 K512 - Street Naming

Prior to the issue of any Subdivision Certificate, an application for proposed street names must be lodged with and approved by Penrith City Council and the signs erected on-site.

The proposed names must be in accordance with Penrith City Council's Street Naming Policy.

Note:

- Contact Penrith City Council's Engineering Services Department on 4732 7777 for advice regarding the application process and applicable fees.
- Allow eight (8) weeks for notification, advertising and approval.

56 K513 - Bond for Final AC

Prior to the issue of any Subdivision Certificate, a bond for the final layer of outstanding asphalt works (AC Bond) is to be lodged with Penrith City Council.

The final layer of asphalt on all roads shall not to be placed without the written consent of Penrith City Council (consent will generally be provided when 80% of the housing within the subdivision has been completed).

The value of the bond shall be determined in accordance with Penrith City Council's adopted fees and charges.

Note:

- Contact Penrith City Council's Development Engineering Department on 4732 7777 for further information relating to bond requirements.

57 K515 - Maintenance Bond

Prior to the issue of any Subdivision Certificate, a Maintenance Bond is to be lodged with Penrith City Council for all subdivision works.

The value of the bond shall be determined in accordance with Penrith City Council's adopted fees and charges.

Note:

- Contact Penrith City Council's Development Engineering Department on 4732 7777 for further information relating to bond requirements.

58 K516 - Subdivision Compliance Documentation

Prior to the issue of any Subdivision Certificate, the following compliance documentation shall be submitted to the Principal Certifier. A copy of the following documentation shall be provided to Penrith City Council where Penrith City Council is not the Principal Certifier.

a) Works-as-executed (WAE) drawings of all civil works. The WAE drawings shall be marked in red on copies of the stamped Subdivision Works Certificate drawings and be signed, certified and dated by a registered surveyor or the design engineer. The WAE drawings shall be prepared in accordance with Penrith City Council's Engineering Construction Specification for Civil Works.

b) The WAE drawings shall clearly indicate the 1% Annual Exceedance Probability flood lines (local and mainstream flooding).

c) The WAE drawings shall be accompanied by plans indicating the depth of cut / fill for the entire development site. The survey information is required to show surface levels and site contours at 0.5m intervals. All levels are to be shown to AHD.

d) CCTV footage in DVD format to Penrith City Council's requirements and a report in "SEWRAT" format for all drainage identified as Council's future assets. Any damage that is identified is to be rectified in consultation with Penrith City Council.

e) A copy of all documentation, reports and manuals required by Section 2.6 of Penrith City Council's WSUD Technical Guidelines for handover of stormwater management facilities to Penrith City Council.

f) Surveyor's Certificate certifying that all pipes and services are located wholly within the property or within appropriate easements and that no services encroach boundaries, private or public lands.

g) Documentation for all road pavement materials used demonstrating compliance with Penrith City Council's Engineering Construction Specification for Civil Works.

h) A Geotechnical Report certifying that all earthworks and road formation has been completed in accordance with AS 3798 and Penrith City Council's Design Guidelines and Construction specifications. The report shall include:

- Compaction reports for road pavement construction
- Compaction reports for bulk earthworks and lot regrading
- Soil classification for all residential lots
- Statement of Compliance

i) Structural Engineer's construction certification of all structures.

j) A slope junction plan for inter-allotment drainage lines indicating distances to boundaries and depths where applicable.

k) Soil testing for each lot to be classified according to AS 2870 Residential Slabs and Footings.

59 K518 - Dedication of Open Space

Prior to the issue of any Subdivision Certificate or prior to the dedication of any public reserve or drainage reserve to Penrith City Council, the Principal Certifier shall ensure that a Deed of Agreement for the upkeep and maintenance of any public reserve or drainage reserve, including Basin E, has been entered into between the proponent and Penrith City Council. Contact Council's Asset Management Department on 4732 7777 for a model Deed of Agreement.

60 K - Waterways - Commissioning and Handover

Prior to the handover of vegetated stormwater management assets, Council requires that each of the following requirements be satisfied:

- The WSUD assets/measures are constructed and operate in accordance with the approved design specifications/parameters and any other specific design agreements previously entered into with Council.
- The performance of the WSUD measure(s) shall be validated, which must include the provision of a Performance Validation Report supporting the performance of the WSUD measure .
- Where applicable, the build-up of sediment shall not resulted in more than a 10% reduction in operational volume.
- Asset inspections for defects shall be completed, and if any defects are found, rectified to the satisfaction of Council.
- The WSUD infrastructure shall be to the satisfaction of Council, structurally and geotechnically sound (this will require the submission of documents demonstrating that such infrastructure has been certified by suitably qualified persons).
- Design drawings shall be supplied in a format acceptable to Council.
- Works-as-executed (WAE) drawings shall be supplied for all infrastructure in a format and level of accuracy acceptable to Council.
- Other relevant digital files shall be provided (e.g. design drawings, surveys, bathymetry, models, etc).
- Landscape designs shall be supplied, particularly those detailing the distribution of functional vegetation - i.e. vegetation that plays a role in water quality improvement (clearance certificates from a landscape architect will need to be supplied).
- The condition of the infrastructure associated with the land shall comply with the approved design specification.
- Vegetation densities in bioretention systems and surrounding vegetated areas (i.e. batters) shall have a coverage of >95% and be >95% weed free. This is to be certified by a suitably qualified ecologist or horticulturalist with 5 years relevant experience.
- Filter media infiltration rates shall be within 10% of the rates of the design parameters for the filtration system concerned (Practice Note 1 of the FAWB guidelines and Council's Bioretention System specifications).
- Comprehensive operation and maintenance manuals (including indicative costs) shall be provided. The manual should include details on the following:

i. Site description (area, imperviousness, land use, annual rainfall, topography, etc)
ii. Approved water quality objectives
iii. Likely pollutant types, sources and estimated loads
iv. Water quality monitoring procedures and frequency
v. Site access description
vi. Locations, types and descriptions of measures proposed
vii. Operation and maintenance responsibility
viii. Inspection methods (including inspection checklists)
ix. Maintenance methods (frequency, equipment and personnel requirements)
x. Landscape and weed control requirements
xi. Operation and maintenance costs
xii. Waste management and disposal options
xiii. Reporting

61 K - Waterways - Handover of Vegetated Stormwater Management Systems

Handover of vegetated stormwater management assets to Council cannot occur until Council is satisfied that they are constructed in with the approved plans, conditions of approval and all certification requirements have been satisfied as follows:

- Vegetated systems (e.g. bioretention measures / riparian corridors, etc) are required to remain 'on maintenance' for a minimum period of three (3) years or as otherwise approved and a performance-based inspection has been undertaken with Council.
- The on-maintenance period for all vegetated systems can be considered as on-maintenance once 80% of the development is substantially completed within the development sub-catchment associated with the relevant treatment measure.
- Certification is required to be provided for the installation of the filter media to demonstrate that the media complies with the approved specifications. At a minimum compliance is required with the "Guidelines for Soil Filter Media in Bioretention Systems" (Facility for Advancing Water Biofiltration).
- Photographs of the construction of the vegetated system are required as part of the certification process. A minimum of one labelled, date stamped photograph is required to be provided following each of the following construction phases:

i. Installation of the overflow pit and bulking out / trimming profiling
ii. Installation of under drainage
iii. Installation of cleanout points
iv. Installation of drainage layer
v. Installation of transition layer
vi. Installation of filtration media
vii. Final planting

- A licensed surveyor is required to undertake an 'as constructed' survey of the bioretention device elements. The survey data is to demonstrate that design grades and levels have been achieved to the required tolerances. A copy of the survey is required to be lodged as part of the certification process.
- During the establishment and maintenance period, regular maintenance must be undertaken on the stormwater treatment measures by suitably qualified contractors (i.e. horticulturists/ecologists) in accordance with an approved maintenance schedule.
- During the 3 year maintenance period, the developer is to submit to Council's Asset Management Department, a quarterly report outlining all maintenance activities undertaken on the stormwater treatment measures. This is to be prepared by a suitably qualified engineer or ecologist/horticulturalist with 5 years relevant experience.

62 K - Waterways - Stormwater Management - Sediment Basin

The bio-retention basin is to be maintained by the proponent as a sediment basin until 80% of housing construction is completed and retained in the ownership of the proponent. After 80% of housing has been constructed, the sediment basin is to be decommissioned and the bio-retention basins completed. After completion of the bio-retention basin has occurred, the proponent is to maintain the bio-retention basin for a period of 3 years after which time handover is permitted.

63 K Special (BLANK)

The Certifying Authority shall ensure that sight lines for vehicles at intersections are in accordance with Austroad Guidelines, Australian Standards and best engineering practice.

64 K Special (BLANK)

Future dwelling driveway locations shall not be altered to be situated within 10m of intersections.

65 K Special (BLANK)

The vehicular crossovers for Lots 708-714 shall be constructed as part of the subdivision works in conjunction with the landscaping works within the extended verge area on Road 113. Prior to the issue of any Subdivision Certificate, the Principal Certifier shall ensure that the vehicular crossovers have been installed in accordance with the stamped approved plans.

66 K Special (BLANK)

Prior to the issue of any Subdivision Certificate, the Principal Certifier shall ensure that the landscaping works within the extended verge area on Road 113 have been completed to Penrith City Council's satisfaction. The works shall be undertaken by a suitably qualified bush regeneration contractor. Temporary cyclone fencing and signage shall be installed around the landscaped area for the duration of the establishment period in accordance with the plans approved by Penrith City Council. Signage shall read "Do not disturb. Native vegetation area" or similar.

67 K Special (BLANK)

The landscaping works within the extended verge area on Road 113 will be subject to a three (3) year establishment period at the proponent's cost from the date of issue of the Subdivision Certificate. Prior to the issue of a Subdivision Certificate, the proponent shall enter into a Deed of Agreement with Penrith City Council for the upkeep and maintenance of this area during the establishment period. Contact Council's Asset Management Department on 4732 7777 for a model Deed of Agreement.

68 K Special (BLANK)

Prior to the issue of any Subdivision Certificate, the following compliance documentation shall be submitted to Penrith City Council for the landscaping works within the extended verge area on Road 113:

- Landscape Implementation Report confirming that the landscaping works have been completed in accordance with the plans approved by Penrith City Council.
- Maintenance schedule and costings for the establishment and future maintenance of the landscaped area.

69 K Special (BLANK)

Prior to the issue of any Subdivision Certificate, a separate maintenance bond for the landscaping works within the extended verge area on Road 113 is to be lodged with Penrith City Council.

The value of the bond shall be determined in accordance with Penrith City Council's adopted Fees and Charges

Note:

Contact Penrith City Council's Development Engineering Department on 4732 7777 for further information relating to bond requirements.

70 K Special (BLANK)

Retaining wall 14 shall be relocated behind the footpath within Lot 700 site with adequate provision for fencing. Prior to the issue of any Subdivision Works Certificate, the civil plans shall be amended in this regard.

71 K Special Condition

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that pram ramps are provided on Road 121 for future connection.

72 K Special Condition

Prior to the issue of a Subdivision Works Certificate, a draft site-specific Operation and Maintenance Manual for the approved stormwater treatment measures shall be submitted to Council for approval. The manual should include details of on the cleaning/maintenance requirements as well as provide details on the estimated annual and lifecycle costs associated with the proposed treatment measures. The plan should include details on the following:

- Site description (area, imperviousness, land use, annual rainfall, topography, etc)
- Site access description
- Likely pollutant types, sources and estimated loads
- Locations, types and descriptions of measures proposed
- Operation and maintenance responsibility
- Inspection methods (including inspection checklists)
- Maintenance methods (frequency, equipment and personnel requirements)
- Landscape and weed control requirements
- Operation and maintenance costs
- Waste management and disposal options
- Reporting

The Maintenance Manual shall also provide specific detail on the proposed measures to safeguard Basin E during the construction works as well as include details of proposed monitoring, including hydraulic conductivity testing both prior to and following the works to demonstrate the integrity of the basin and that limited blockage of the filter media has occurred as a result on the works.

Landscaping

73 L001 - General

All landscape works are to be constructed in accordance with the stamped approved plans.

Landscaping shall be maintained:

- in accordance with the approved plans, and
- in a healthy state, and in perpetuity by the existing or future owners and occupiers of the land.

If any of the vegetation comprising that landscaping dies or is removed, it is to be replaced with vegetation of the same species and, to the greatest extent practicable, the same maturity as the vegetation which died or was removed.

74 L002 - Landscape construction

The approved landscaping for the development must be constructed by a suitably qualified and experienced landscape construction professional.

75 L005 - Planting of plant

All plant material associated with the construction of approved landscaping is to be planted and maintained during establishment in accordance with Council's Park and Street Tree Management Plan, available on Council's website.

76 L008 - Tree PreservationOrder

No native trees or other vegetation (including shrubs and other understory vegetation) are to be removed, ringbarked, cut, topped, lopped, slashed or wilfully destroyed (other than those approved under the final and approved Biodiversity Development Assessment Report) without the prior consent of Penrith City Council and in accordance the Biodiversity Conservation Act 2016 and associated regulations and Council's Tree Preservation Policy.

77 L Special

Prior to the issue of any Subdivision Works Certificate, the Certifier shall ensure that amended landscaping plans are submitted to, and approved by Penrith City Council for the extended verge area on Road 113. The plans shall be amended to address the following:

- The trees shall be centralised within the landscaped area and reduced in number in accordance with the IPA requirements of the Rural Fire Service.
- Three (3) tree species shall be provided from the list below.

(a) Eucalyptus moluccana (Grey Box)
(b) Eucalyptus tereticornis (Forest Red Gum)
(c) Eucalyptus crebra (Narrow-leaved Iornbark)
(d) Eucalyptus fibrosa (Broad-leaved Ironbark)
(e) Corymbia maculata (Spotted Gum)
(f) Angophora floribunda (Rough-barked Apple)
(g) Eucalyptus eugenioides

- The white feather honey myrtle shall be replaced with Pultenaea microphylla, Dillwynia sieberi, or Dodonaea viscosa subsp. cuneata.
- The blue flax lilly groundcover shall be replaced with three (3) of the following from the list below.

(a) Hardenbergia violacea
(b) Pratia purpurascens
(c) Dichondra repens
(d) Glycine clandestina
(e) Glycine microphylla
(f) Glycine tabacina
(g) Goodenia hederacea subsp. hederacea

78 L Special

Prior to the issue of any Subdivision Works Certificate, the Lemon Scented Myrtle shall be deleted from the street tree plan and replaced with Blueberry Ash. All street trees are provided at a minimum size of 100 litres and fitted with tree guards.

Subdivision

79 M008 - Linen Plan

Prior to the issue of a Subdivision Certificate, the following is to be submitted:

(a) An original plan of subdivision and associated administration sheets. The plan of subdivision must indicate, where relevant:

- All drainage easements, rights of way, restrictions and covenants.
- All proposed dedications of roads/drainage/public reserve, which are to be undertaken at no cost to Penrith City Council.

(b) The following information is to be shown on one (1) copy of the plan:

- The location of all buildings and/or other permanent improvements shall comply with any statutory boundary clearances or setbacks as defined by the Building Code of Australia and Council's resolutions.
- All existing services are wholly contained within the lot served and/or covered by an appropriate easement.

Prior to lodgement of the Subdivision Certificate application, street address numbering must be obtained/approved by Penrith City Council's Rates Team. Proposed street addresses can be forwarded to council@penrith.city for approval.

80 M009 - 88B Instrument

The Subdivision Certificate application is to be supported by an 88B instrument creating the following encumbrances:

(a) Easements for support - the provision of an easement for support to cover any retaining walls or embankments that extend into the lots if the batters are steeper than 5:1.
(b) Residue allotments restriction - no development or building shall be allowed or be permitted to remain on the named lot unless satisfactory arrangements have been made with Penrith City Council for services (water, sewer, electricity and telephone), any outstanding contributions or consolidation with adjoining lots.
(c) Easements for maintenance and repair 900mm wide benefitting lots with zero lot lines.
(d) Restriction on the use of land for Lots 708-714 that restricts the driveway location for each lot to the location approved and constructed as part of the subdivision works due to the landscaping within the extended verge area on Road 113 that cannot be altered or disturbed.
(e) Restriction regarding future housing compliance with the Highland Views Design Guidelines and regarding nomination of lots requiring steep lot designs.
(f) Restriction regarding single storey construction on lots along Roads 120 and 121 to provide a suitable transition at the rural interface.
(g) A positive covenant regarding acoustic construction requirements for certain lots as outlined within Condition 16.
(h) Easements and/or positive covenants in relation to required permanent and temporary bushfire Asset Protection Zones.
(i) Right of carriageway benefitting Penrith City Council over the temporary cul-de-sac head at the eastern end of Road 113.
(j) Easement for drainage over any inter-allotment drainage. Easement widths shall be in accordance with Penrith City Council's Stormwater Drainage Specification for Building Developments Policy.
(k) Restriction on the use of land outlining that the landform, levels and vegetation for the earth mounds adjacent The Northern Road shall not be altered in any way in order to maintain The Northern Road view shed in perpetuity.

Council shall be nominated as the only authority permitted to modify, vary or rescind such encumbrances.

81 M013 - Street trees

Prior to the issue of a Subdivision Certificate, street trees are to be planted in accordance with the stamped approved plans.

82 M014 - Surveyors certificate

A Surveyor's Certificate is to be lodged with the application for a Subdivision Certificate that certifies that all pipes and services are located wholly within the property or within appropriate easements and that no services encroach boundaries.

Development Contributions

83 N001 - Section 94 contribution (apply separate condition for each Contribution Plan)

This condition is imposed in accordance with the ***Glenmore Park Stage 2 Voluntary Planning Agreement No. 2.*** Based on the current rates detailed in the accompanying schedule attached to this Notice, $1,651,760.00 is to be paid to Council **prior to a Subdivision Certificate being issued** for this development (the rates are subject to quarterly reviews). If not paid within the current quarterly period, this contribution will be reviewed at the time of payment in accordance with the VPA.

Council should be contacted prior to payment to ascertain the rate for the current quarterly period. The invoice accompanying this consent should accompany the contribution payment.

Payment of Fees

84 P001 - Costs

All roadworks, dedications and drainage works are to be carried out at the applicant’s cost.

85 P002 - Fees associatedwith Council land (Applies to all works & add K019)

Prior to the commencement of any works on site, all fees associated with Penrith City Council-owned land and infrastructure shall be paid to Council. These fees include Road Opening fees and Infrastructure Restoration fees.

Certification

86 Q01F - Notice of Commencement & Appointment of PCA2 (use for Fast Light only)

Prior to the commencement of any earthworks or construction works on site, the proponent is to:
(a) employ a Principal Certifying Authority to oversee that the said works carried out on the site are in accordance with the development consent and related Subdivision Works Certificate issued for the approved development, and with the relevant provisions of the Environmental Planning and Assessment Act and accompanying Regulation, and
(b) submit a Notice of Commencement to Penrith City Council.

The Principal Certifying Authority shall submit to Council an "Appointment of Principal Certifying Authority" in accordance with Section 81A of the Environmental Planning and Assessment Act 1979.

Information to accompany the Notice of Commencement

Five (5) days before any earthworks or construction/demolition works are to commence on site (including the clearing site vegetation), the proponent shall submit a "Notice of Commencement" to Council in accordance with Section 81A of the Environmental Planning and Assessment Act 1979.

87 Q08F - Subdivision Certificate

A Subdivision Certificate is to be obtained **prior to the release of the final plan of subdivision**. The Subdivision Certificate will not be issued if any of the conditions in this consent are outstanding.

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Appendix - Development Control Plan Compliance

Development Control Plan 2014

Part C - City-wide Controls

Retaining Walls and Privacy Implications

In accordance with the DCP, lots with a front to back slope exceeding 9% and/or a side slope exceeding 5' must respond to the slope of the land with either split level, drop edge beam, or bearer and joist design (or a combination of these) dwelling design. The majority of lots proposed do not exceed this slope, however, initi there were lots where the slope could not be calculated given the batters shown on the plans.

The plans were updated to show the longitudinal and cross falls on each lot, and include elevations of each retaining wall. There are no lots with a longitudinal grade in excess of 9%. There are no two tier retaining wa proposed and the majority of retaining walls are no greater than 1m in height.

In addition, the majority of lots do not exceed a side slope of 5%, however proposed Lots 708, 727 728 and marginally exceed a slope of 5%. A recommended condition of consent will require the Highland Views Desi Guidelines to detail steep lot controls for the affected lots. While it is acknowledged that there may be overlooking as a result, particularly by any first floors, upper floors are required to be passive low use areas a detailed design can ensure that window placement does not adversely affect visual and acoustic amenity of neighbouring properties.

Regarding Stage 7A, sections were requested showing the level differences along the northern interface of th subdivision given there are existing boundary retaining walls. In addition, the applicant was requested to re-adjust the proposed earthworks so there is no need for additional retaining walls along the northern boundari This was due to concerns regarding tiered retaining walls impacting available open space, likely shadows du orientation and visual amenity impacts. In addition, levels of the adjoining properties to the north were reques on the civil plans in order to understand the interface level differences and likely impacts.

Updated engineering plans were provided, including a revised survey of existing retaining walls on adjoining properties. Further, sections of each proposed retaining wall, including those along the northern boundary of site, were provided. Given there are no retaining walls proposed adjacent to existing residential properties to north in the revised plans, there are no privacy concerns in this regard.

Initially, retaining walls were proposed along certain street frontages and this was considered inappropriate. addition, the retaining walls initially shown surrounding proposed Lots 709-711 indicated an inappropriate response to topography and the layout was requested to be adjusted. The plans were subsequently amende remove retaining walls along most road frontages.

Overall, additional information was provided and the design amended to ensure there are no privacy implicati from the proposed earthworks.

Traffic, Access and Parking

The DCP outlines a clear road hierarchy and associated streetscape sections for the Glenmore Park Stage development. The Council endorsed Precinct G and H Concept Plan refined the DCP road hierarchy based o more detailed residential structure and urban layout. The proposed road layout is consistent with the princip and key road provisions within the Concept Plan and Glenmore Park Stage 2 chapter of the DCP. The main point of access to the site will be achieved by extending the existing collector road adjacent to Surveyors Cr (Riverflat Drive) southwards. Additional access points will be provided through the extension of the local road from Precinct E to the north.

The proposed road network is based on a modified grid layout and has been designed to respond to the topography of the land and ensure appropriate grades are achieved along each road. The modified grid layou maximises permeability and legibility for residents providing connections for vehicles and pedestrians to ope space within Precincts G and H and local services within the Glenmore Park Stage 2 release area.

Council's Traffic Engineer reviewed the proposal and noted that
there is adequate width and compliance with Council's road network requirements for safe circulation of traffi the proposed lower order roads. As part the Subdivision Works Certificate process, the detailed subdivision design will ensure sight lines for vehicles exiting intersections are not compromised by crests and are in accordance with Austroad Guidelines, Australian Standards and best engineering practice.

E7 Glenmore Park

7.4.1.5 Concept Plans

A Concept Plan is required to be lodged with, and approved by Council prior to, or with, the first subdivision application for each precinct. The Concept Plan for Precinct G and H was endorsed by Council on 25 July 2016.

There are inconsistencies between the proposed subdivision and the Concept Plan. Many of these inconsistencies are a result of detailed design work and changes necessitated as a result of previous approvals. Further detail is provided below.

- *Concept Plan Road 11:* The north/south road along the eastern boundary of the site has been amended to incorporate a straighter alignment. The proposed alignment is considered to provide extended sight lines north and south, enabling safe vehicle turns from the east/west roads of the subdivision. Notwithstanding this minor departure, the proposed road alignment will still provide road connectivity to the future residential community, as envisaged by the Concept Plan.

- *East/West Road Alignments:* The proposed street block arrangement implements modified, curvilinear east/west street blocks. While this arrangement differs slightly from the Concept Plan, which proposed an L-shaped cell block alignment, it maintains the Concept Plan’s east/west connectivity between the Riverflat Drive collector road extension and the eastern north/south road.

- *Integration with Stage 6:* The Concept Plan envisaged an L-shaped cell block arrangement for the Stage 6 area. However, previous subdivision approvals within the Stage 6 area have resulted in an amended alignment. Specifically, the L-shaped cell block arrangement has been removed and replaced with a more traditional grid pattern, with a T-intersection at Road 2 of the Concept Plan and Clearview Drive. This change in the design has required further design changes, particularly with the alignment of the east/west road (Road 2 in the Concept Plan) and connectivity of the north/south local road network, including Middlebrook Rise, Captsone Terrace and Highdale Terrace. Notwithstanding, the north/south and east/west connectivity is maintained in line with principles of the Concept Plan.

- *Lot Sizes:* The proposed subdivision also differs from the concept plan as residential lot depths across all stages have reduced. Clarification was sought as to whether this causes steep slopes. The plans were then updated to show the longitudinal and cross falls on each lot, and to include elevations of each retaining wall. There are no lots with a longitudinal grade in excess of 9%. There are no two tier retaining walls proposed and the majority of retaining walls are no greater than 1m in height. The majority of lots do not exceed a slope of 5%, however proposed Lots 708, 727 728 and 805 marginally exceed a slope of 5%. A recommended condition of consent will require the Highland Views Design Guidelines to detail steep lot controls for the

affected lots. In addition, while lot sizes for the proposed built-to-boundary and detached dwellings do not entirely match the Concept Plan, they reflect the DCP requirement for those housing types.

- *Terraces and Semi-Detached Lots:* Lots with rear access have been removed to reflect a more conventional front loaded product that is more amenable to the market. The DCP does not require terraces to incorporate a rear laneway. Section 7.4.5.2 of the DCP establishes the delivery of a laneway for terraces as a performance measure, not as a development control. As such, the attached product investigation will consider a number of different access arrangements. Diverse housing forms are therefore still provided within the precinct overall. Thus, the objectives of the dwelling diversity controls are still considered to be achieved via the subject proposal.

In summary, the proposed subdivision has been designed with regard to the design principles established as part of the Concept Plan identified above. The Concept Plan was intended to serve as a guide for the development of each precinct and as such it is a broad brush approach to the indicative layout of a precinct that is subject to detailed design. The proposed roads are generally consistent with the hierarchy endorsed by Council and have been designed in accordance with the configuration requirements set out under the Glenmore Park Stage 2 DCP. The proposed residential subdivision is also generally consistent with the distribution of lot types in the Concept Plan. The proposed subdivision incorporates a variety of lot sizes and types to accommodate open space and different forms of dwelling products, and contributes to achieving the dwelling yield and diversity targets established by the Concept Plan and Glenmore Park Stage 2 DCP. Therefore, the proposed subdivision is considered to be generally in accordance with the requirements of the Concept Plan.

7.4.2.3 Dwelling Yield and 7.4.2.4 Dwelling Diversity

	Precinct	Apartments & Studios	Terraces/Live Works and Semi-Detached	Built-to-Boundary	Detached	Total
DCP	G	4	21	45	102	172
	H	4	18	40	78	140
	Sub-Total	**8**	**39**	**85**	**180**	
					TOTAL:	**312**
Concept Plan	G	-	23	94	91	208
	H	-	16	88	60	164
	Sub-Total		**39**	**182**	**151**	
					TOTAL:	**372**
Proposed	G	-	28	80	72	180
	H	-	13	15 (8 proposed in the subject DA)	109 (80 proposed in the subject DA)	137
	Sub-Total		**41**	**95**	**181**	
					TOTAL:	**317**

As is evident from the table above, the proposal complies with the DCP requirements for dwelling yield and diversity, however it falls short of the Concept Plan requirements. As Stage 9 is subject to a future application, the total yield and diversity of Precinct H is not yet known. Given diverse housing forms are still provided within the precinct overall, the objectives of the dwelling diversity controls are still

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

considered to be achieved.

Concern was initially raised as to the lot diversity implications of the proposed alternative subdivision configuration on the required terrace/semi-detached development typology. In accordance with Section 7.4.2.3, B, 4) of the DCP, any creation of ‘super lots’ and residue parcels should specify the minimum dwelling yield that those lots will be required to deliver. A detailed demonstration was requested that the proposed lot diversity will be suitably met as part of a future application (Section 7.4.2.3, B, 5). The applicant was requested to reiterate the overall intentions in regards to lot diversity for the precinct.

Additional information was subsequently provided in this regard. A concept plan within the Statement of Environmental Effects showed the residue super lots could provide up to 13 terraces that meet the minimum lot size for terraces within the DCP.

The proposal thus achieves a variety of allotment types to accommodate terrace and semi-attached dwellings, built-to-boundary dwellings and detached dwellings. The proposal achieves the intent of the DCP and Concept Plan by providing a mix of lot types which can accommodate a range of different dwellings.

7.4.3.1.1 Corridors

The DCP states that development shall conserve biodiversity by providing linkages between significant natural vegetation units within the City; ensure that important natural features inform the urban structure of the place; provide high amenity areas for residents; and protect, restore and enhance the environmental values and functions of watercourses and riparian corridors along Surveyors Creek and the western tributary of Surveyors Creek.

In accordance with Section 7.4.3.1.1 of the DCP, the landscape plan for the western riparian corridor required amendments to be fully structured with trees, shrubs and groundcovers at a density that would occur naturally, for defined widths. Initially, the tree planting was sparse and clustered. The revised plan included more trees and a more informal natural variation. The species diversity was also increased on request.

As is required, significant re-vegetation of the riparian corridor is proposed as part of the revised proposal. A minimum corridor width of 40m is provided within the western riparian corridor in accordance with the DCP.

A Vegetation Management Plan (VMP) has also been prepared, as is required, for the rehabilitation of the western riparian corridor running through the centre of the site, and the green corridor to the north-east of the site. The VMP also prescribes actions as part of rectification works to a stormwater detention basin (Basin E) to the north of the site. Council's Biodiversity Officer reviewed the VMP and recommended conditions to address minor required amendments. All remnant vegetation within the riparian corridor areas will be protected and rehabilitated, as reinforced through recommended conditions of consent.

7.4.3.1.6 The Northern Road View Shed

The DCP states that The Northern Road view shed shall be conserved by ensuring development in Glenmore Park Stage 2 is not visible from The Northern Road to maintain the green, undulating character of the area. Given the eastern portion of the proposed subdivision is the highest point in Precinct H and higher than the approved earth mounds along The Northern Road, the Stage 7 and 8 residential subdivision site would be visible from a number of locations along The Northern Road. As a

result, the mounding originally installed as part of the early phases of the development is to be extended with to retain the view shed from The Northern Road.

The amended plans included perspectives and sight lines of the proposed sight mounds along The Northern Road. Council's Landscape Architect has reviewed the amended plans and has supported the proposal in this regard. However, for the mound with the steeper slope (1 in 3 and 1 in 2), jute mats are required to ensure the longevity of the mound planting.

The proposal will be shielded by the existing and proposed earth mounds and additional landscaping. Further, a restriction on title is required as a recommended condition to restrict development along the precinct edges to single storey construction.

Regarding the anticipated future character of the area, it is noted that there is currently a Planning Proposal with Council to rezone 205 ha of land located immediately to the south of the subject precinct (known as Glenmore Park Stage 3). The Planning Proposal seeks to rezone the adjoining land to part R1 General Residential, B2 Local Centre, RE1 Public Recreation and C2 Environmental Conservation. It is anticipated that the adjoining site will provide approximately 3,000 new residential lots in a broad mix of housing types. The site will also include pedestrian and cycle links, open space, five playing fields, bushland and riparian corridors. A new school site and retail offering is proposed to be located adjacent the main playing field. The retail offering for the new neighbourhood is 7,800m^2 and is to be located at the main entry to the release area. It is noteworthy that the proposed setback to The Northern Road for the entire proposal is minimal and it is understood that this proposal is supported in broad terms and is expected to be endorsed.

The aforementioned anticipated change to the character of the rural gateway to Penrith and The Northern Road view shed is substantially greater than that which is proposed under the subject application. Moreover, the subject application will effectively be hidden from The Northern Road by Glenmore Park Stage 3. It is therefore worth noting that while the subject application will be appropriately screened to retain the existing character of the locality, it is also considered compatible with the likely future character of the area.

7.4.3.2.3 Public Transport

The estate bus route is required to be designed and constructed in accordance with the road profiles identified at Section 7.4.3.3.3 of the DCP. As part of DA18/0310, a bus shelter was proposed within the western verge of Riverflat Drive, adjacent Stage 6. The proposed bus route does not pass through Stages 7-9.

In accordance with Section 7.4.3.2.3 (1) of the DCP, all dwellings within the Surveyors Creek catchment are to be within a 400m distance from the designated bus route. It was not initially clear whether all future dwellings within Precinct H would be within 400m of this bus route, particularly towards the south-eastern rear of Stage 8. Additional information was provided demonstrating the furthest point in Stage 8 from a bus stop is 386m. Further, Stage 9 lots were excluded from the application, as amended. The proximity of a bus stop to Stage 9 lots will be addressed in conjunction with the delivery of Stage 9.

7.4.3.3.1 Landscape Character

In accordance with Section 7.4.3.3.1 of the DCP, streets are to be designed to establish or enhance the unique character of the precinct by responding to its topography, desirable views or local features. Further, species selection is to be appropriate to the character and constraints of the locality.

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

Initially, the species arrangement proposed was unclear. Regarding the east/west streets, one species was requested per street for consistency. The species design was amended accordingly, with exotic species removed and native species proposed.

However, the Lemon Scented Myrtle proposed is too large to be used in a verge with a standard width. An alternative species (Blueberry Ash) is required by Council's Landscape Architect via a recommended consent condition. Further, street trees are not proposed on the southern side of proposed Road 120, however they will be required via the recommended condition to ensure an appropriate interface with the edge of the estate and the surrounding rural area.

Regarding the proposed 6m street verge providing a habitat connection between Pinnacle Park and the green corridor, Council's Landscape Architect and Biodiversity Officer recommended a condition for further amendments to the species proposed and their spacing for sustainability and longevity. The trees proposed are to be centralised within the verge and a native variety of trees are to replace Black Wattles given the pollen and allergy issues associated with these wattles. There are also some inappropriate non-native groundcover species which are to be deleted, as required by a recommended condition. Further, the under storey is to be buffered by an 800mm wide strip of mulch provided at the back of kerb and beside driveways to enable alighting from vehicles and to minimise damage to the planting.

7.4.3.4.2 Neighbourhood Parks

The configuration of the southern portion of Pinnacle Park varies from the DCP (Figure E7.31) and the requirement to provide 1 hectare neighbourhood parks. The reconfiguration has resulted in the southern portion of Pinnacle Park having an area of 4,435m^2. The existing northern portion of Pinnacle Park has an area of approximately 5,110m^2. Together with the proposed southern portion of Pinnacle Park, the total area of the open space will be approximately 9,545m^2. This falls short of the DCP requirement of 10,000m^2 by 455m^2. This variation in size is necessitated by the already approved road network in the existing development to the north and west, specifically the alignments of Clearway Terrace, Middlebrook Rise, Capstone Terrace and Highdale Terrace. These approved roads have placed significant constraints on the ability to expand the park, without creating a poor movement network and urban outcome.

Council's Development Engineer confirmed that the existing and approved road alignments drive the proposed variation. The proposed road network is considered a minor variation to the Precinct G and H Concept Plan and the DCP requirement in the context of an evolving design process and the delivery of the best outcome is appropriate in this instance, noting the additional park embellishment proposed as an off-set.

7.4.3.4.3 Riparian Corridor Edge Parks

The pathway within the corridor edge park was not initially along the edges of the western riparian corridor as per Section 7.4.3.4.3 of the DCP. This was subsequently amended. In addition, the revised plan demonstrated that the paths through the park have had regard to Section 7.4.3.2.4 of the DCP, particularly to ensure they are accessible for all users, a minimum of 2.5m wide and aligned approximately parallel with the street to take advantage of the street lighting and allow for casual surveillance by residents and drivers.

Further, under the DCP, the park is to be provided with an open and low perimeter fence or bollard type barrier along the entire edge to prevent inadvertent damage to the western riparian corridor. The applicant requested no fence be provided to be more open and inviting. The open nature of the park is not dissimilar to other parks within Glenmore Park and was considered reasonable.

7.4.4.1 Subdivision

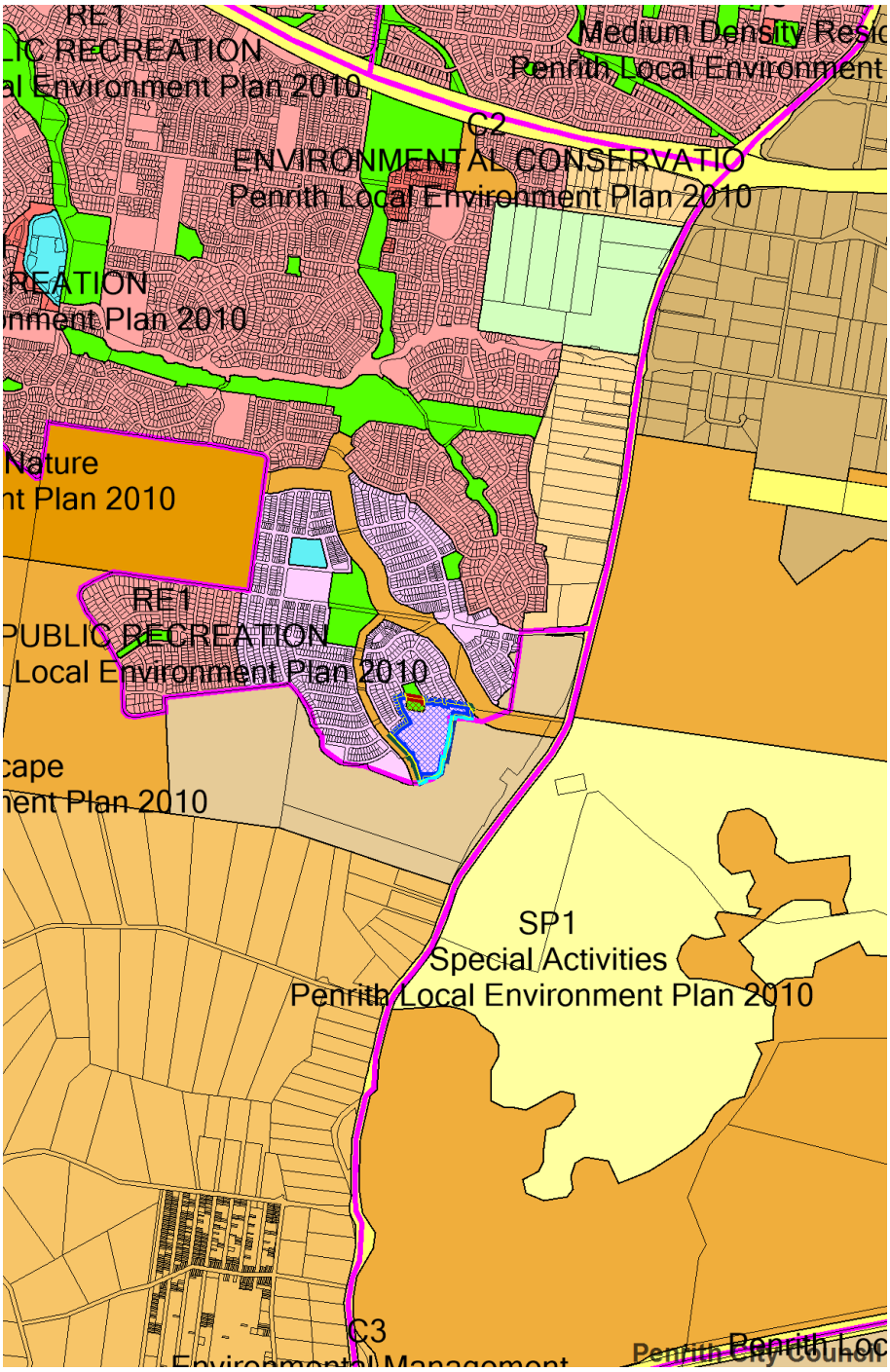
The proposal has considered the following in the proposed subdivision pattern:

- Corner blocks are designed to provide wider frontages.
- Lot sizes respond to site topography by providing larger lots on sloping land.
- Benching of sites has been undertaken at the subdivision stage and earthworks plans indicate positions of necessary retaining structures and associated drainage.
- Lot sizes and dimensions have taken into account site topography and reduce the need for earthworks and retaining wall construction.
- All lots are a minimum of 25m deep.
- All lots oriented with an east/west axis and have a minimum width of 12.5m for solar access.
- Retaining walls are to be constructed with appropriate masonry materials.
- Positions of necessary retaining structures and associated drainage are indicated on the plans.
- A concept landscape/street tree plan was provided in accordance with the DCP requirements. The species are in accordance with the bushfire report recommendations for vegetation.

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

PENRITH CITY COUNCIL

Map	Legend



Parcels

Suburbs

waterfeature

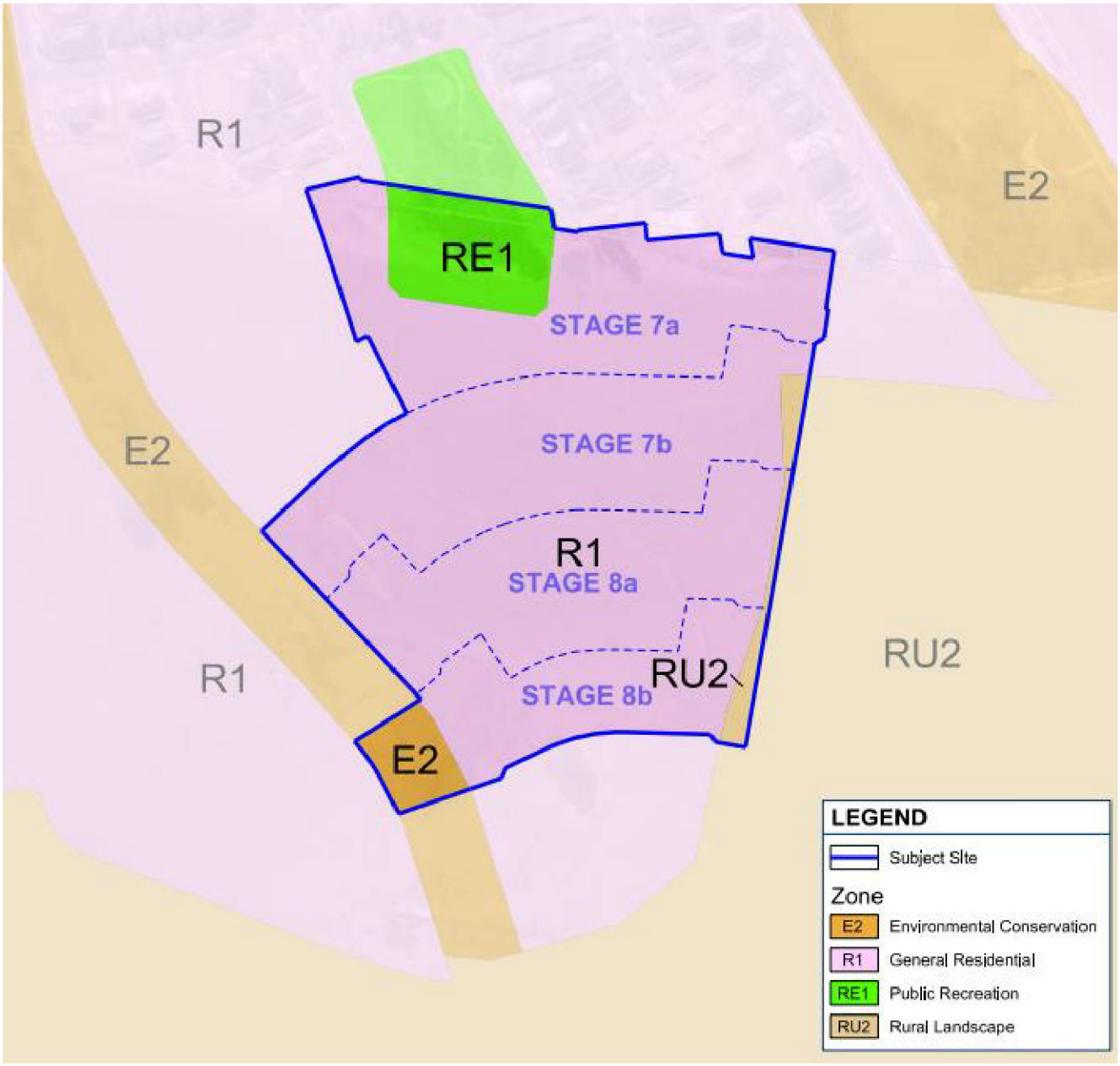
railway

LZN LEP Current Zoning Compilation

Map Scale: 1:35,070

About this Document	Disclaimer
This map has been created for the purpose of showing basic locality information. Property boundary line network data is supplied by State Government. Any error should be reported to the GIS Section.	This map is a representation of the information currently held. While every effort has been made to ensure the accuracy of the product, we accept no responsibility for any errors or omissions.

Figure 4: Zoning Plan



Document Set ID: 9861746
Version: 1, Version Date: 27/02/2021

LEGEND

- Subject Site
- Stage Boundary
- Zone Boundary

LOT YIELD

Size	No. Lots	% Total Lots
301m² - 400m²	34	38.64%
401m² - 500m²	46	52.27%
501m² - 600m²	6	9.09%
Total	**88**	
Superlot	2	
Total Number of Lots	**90**	

Minimum Lot Size 311m² Average Lot Size 418m²
Maximum Lot Size 592m² Total Lot Area 36872m²

STAGE 6

STAGE 7a

STAGE 7b

STAGE 8a

STAGE 8b

Middlebrook Rise

Capstone Tce

Highdale Tce

Right of Carriageway

Open Space
700
4435m²

Riparian Corridor
833
4655m²

Residue Lot
834
9499m²

Lot 701
DP 1275647
45.163ha

Stage 7-8 Lot Layout Plan
HIGHLAND VIEWS

NORTH

5 0 10 20 30 40 50 60 70 metres

Ref: CCLGP-3-009-1	Date: 16/02/2022	Revision: N	Scale: 1:1,000@A2

Note: All areas and dimensions subject to detailed survey

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Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

HIGHLAND VIEWS STAGES 7-8
GLENMORE PARK NSW

STREETSCAPE, RIPARIAN CORRIDOR, SIGHT MOUNDS AND BASIN E
FOR DEVELOPMENT APPLICATION

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 16 December 2021

History

[Rev#]	[Description]	[Date]
A	FOR APPROVAL	19/11/2020
B	FOR APPROVAL	08/03/2021
C	FOR APPROVAL	12/03/2021
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E	FOR APPROVAL	14/04/2021
F	FOR APPROVAL	17/09/2021
G	FOR APPROVAL	29/10/2021
H	FOR APPROVAL	16/12/2021



KEY PLAN
NTS

LANDSCAPE DRAWING REGISTER

SHEET	SHEET NAME	REVISION
LD-DA7000	COVER SHEET	H
LD-DA7001	LANDSCAPE NOTES AND PLANT SCHEDULE	H
LD-DA7100	PUBLIC DOMAIN PLAN - STAGE 7	I
LD-DA7101	PUBLIC DOMAIN PLAN - STAGE 8	G
LD-DA7104	RIPARIAN CORRIDOR PLAN	F
LD-DA7105	RIPARIAN CORRIDOR PLAN	F
LD-DA7106	RIPARIAN CORRIDOR PLANTING SCHEDULES	F
LD-DA7107	RIPARIAN CORRIDOR SCHEDULE AND DETAIL	B
LD-DA7110	PUBLIC DOMAIN DETAIL PLAN - STAGE 7	A
LD-DA7111	PUBLIC DOMAIN ELEVATION	A
LD-DA7200	SIGHT MOUNDS LANDSCAPE PLAN	A
LD-DA7201	SIGHT MOUNDS CANOPY COVER PLAN	A
LD-DA7210	SIGHT MOUNDS PHOTOMONTAGE SHEET 1	A
LD-DA7211	SIGHT MOUNDS PHOTOMONTAGE SHEET 2	A
LD-DA7300	RIPARIAN CORRIDOR LANDSCAPE SECTIONS	F
LD-DA7310	SIGHT MOUNDS LANDSCAPE SECTIONS	A
LD-DA7400	BASIN E PLAN	A
LD-DA7401	BASIN E SCHEDULE	A
LD-DA7510	SIGHT MOUNDS TYPICAL DETAILS	A

NOT FOR CONSTRUCTION

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[Project] HIGHLAND VIEWS STAGES 7-8
[Client] VIANELLO HOLDINGS

[Ref] 20150139

COVER SHEET
[Dwg No] LD-DA7000 [Rev] H

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[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 16 December 2021

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F	FOR APPROVAL	17/09/21
G	FOR APPROVAL	07/10/21
H	FOR APPROVAL	16/12/21

LANDSCAPE NOTES

GENERAL

ALL LANDSCAPE RELATED WORKS ARE TO BE PERFORMED BY A QUALIFIED LANDSCAPE

CONTRACTOR AND/OR TRADESPERSON.

SITE ESTABLISHMENT
THE CONTRACTOR SHALL ESTABLISH SITE ACCESS AND COMPOUND IN POSITION AGREED WITH THE SUPERINTENDENT AND OR SUBJECT TO COUNCIL APPROVAL. THE CONTRACTOR SHALL BE TOTALLY RESPONSIBLE FOR PROTECTING THE SITE WORKS DURING CONSTRUCTION AND ESTABLISHMENT INCLUDING VEGETATION, PEDESTRIAN AND VEHICULAR MANAGEMENT. IMPLEMENT EROSION CONTROL AND SITE MANAGEMENT PRACTICES TO SECURE THE SITE AND TO COMPLY WITH ALL STATUTORY REQUIREMENTS.

EARTHWORKS & DRAINAGE

EARTHWORKS
THE LANDSCAPE CONTRACTOR SHALL ALLOW FOR MINOR EARTH TRIMMING AND PROFILING TO PREPARE LANDSCAPE AREAS TO ACCEPT THE NOMINATED TREATMENT. PROTECT EXPOSED EARTHWORKS WITH TEMPORARY EROSION MEASURES AND COORDINATE THE ON-SITE DISPOSAL OF EXCESS SPOIL WITH THE SUPERINTENDENT.

DRAINAGE
ALL LANDSCAPE AREAS SHALL BE FREE DRAINING WITH POSITIVE DRAINAGE TO STORMWATER OUTLETS OR NATURAL DRAINAGE SYSTEMS.

SOFT LANDSCAPE WORKS

SOILS
SOIL MIX AS PER PENRITH CITY COUNCIL'S SOIL MIX SPECIFICATION.

- SOIL TYPE A: BENEDICT'S SAND & GRAVEL PREMIUM ORGANIC GARDEN MIX - BS133 OR EQUIVALENT & TESTED TO AS 4419.
- SOIL TYPE B: 50% (MAX.) EXCAVATED SITE SOIL & 50% FINE WASHED SAND WITH LESS THAN 1% ORGANIC MATTER BY WEIGHT AND TESTED TO AS 4419. IF INSUFFICIENT QUANTITIES OF EXCAVATED SITE SOIL ARE AVAILABLE, FINE WASHED SAND EQUIVALENT TO BENEDICT'S FINE WASHED SAND MAY BE USED IN ITS PLACE.

ALL PLANTER AREAS SHALL HAVE A MINIMUM SOIL DEPTH OF 300MM AND 150MM TO TURF | GRASS AREAS WITH LANDSCAPE QUALITY SOIL THAT CONFORMS TO AS 4419 SOILS FOR LANDSCAPE AND GARDENS AND AS 445A COMPOST

ALL NEW PLANTINGS TO BE INSTALLED WITH TERRACOTTEM SOIL CONDITIONER (AS PER MANUFACTURER'S SPECIFICATION). SOIL CONDITIONER AND MULCH MUST BE FREE OF DELETERIOUS AND EXTRANEOUS MATTER SUCH AS SOIL, WEEDS, STICKS AND STONES. RECYCLED MULCH SHALL BE WEATHERED FOR A MINIMUM OF 12 WEEKS PRIOR TO DELIVERY AND SPREADING ONSITE AND CONTAIN NO LIVE FUNGAL PROPERTIES.

NEW TURF

ALL NEW TURF TO FINISH FLUSH WITH ADJACENT SURFACES. CULTIVATE TO A DEPTH OF 150MM. TURF TOPSOIL TO INCLUDE SOIL CONDITIONER AS SPECIFIED.

NEW PLANTING
REFER TO THE PLANT SCHEDULE. THE CONTRACTOR SHALL ENSURE THAT ALL PLANT MATERIALS ARE SECURED IMMEDIATELY UPON AWARD OF CONTRACT. FAILURE TO DO SO WILL NOT GIVE RISE TO SUBSTITUTIONS OR EXTENSIONS OF TIME. ALL STOCK SHALL BE GROWN IN OPEN AREAS WHICH ARE EXPOSED TO THE SUN AND WIND TO PROMOTE VIGOROUS PLANT GROWTH AND TO HARDEN PLANTS OFF. ALL PLANT MATERIAL SHALL BE PEST AND DISEASE FREE. ALL PLANT MATERIAL SHALL NOT BE ROOT BOUND OR DAMAGED. PLANT DENSITIES SHALL REFLECT ACCEPTED INDUSTRY STANDARDS AND COUNCILS GUIDELINES FOR LANDSCAPE WORKS AND BE SOURCED FROM AN ACCREDITED NURSERY.

ADVANCED TREES
PLANT STOCK SHALL HAVE A WELL DEVELOPED, CLEAR STRAIGHT STEM WITH TRI-BRANCHING STRUCTURE AND HEALTHY CANOPY TYPICAL TO THE SPECIES AND TO THE MINIMUM SIZES SCHEDULED.

ALL STREET TREES TO BE PLANTED IN ACCORDANCE WITH FIGURE 3 TYPICAL TREE PLANTING DETAIL - TREE IN TURF (WITH TIMBER EDGE) DETAILED WITHIN PENRITH CITY COUNCIL'S STREET AND PARK TREE MANAGEMENT PLAN APPENDIX.

TIMBER EDGE
TIMBER EDGES TO ALL NEW STREET TREE PLANTINGS. 90 X 15MM CCA TREATED PINE EDGE WITH 50 X 50 X 450 TIMBER PEGS TO CORNERS, SET 25MM BELOW TOP OF EDGE. TIMBER PEGS FIXED TO EDGING WITH GALVANISED NAILS. NO. 2 PER FIXING, SKEWED

EXCAVATE HOLE MINIMUM 500MM WIDER THAN THE ROOT BALL AND DEEP ENOUGH TO ACCEPT A MINIMUM 200MM OF TOPSOIL BELOW. BREAK UP THE BASE OF THE HOLE TO A FURTHER DEPTH OF 200MM AND LOOSEN COMPACTED SIDES OF THE HOLE AS NECESSARY TO PREVENT CONFINEMENT OF ROOT GROWTH TO THE HOLE. LOOSEN SIDES OF ROOT BALL TO PROMOTE GROWTH. BACKFILL WITH NOMINATED SOIL MIX, LIGHTLY TAMP AND WATER TO ELIMINATE AIR POCKETS. ENSURE POSITIVE DRAINAGE TO ALL TREE POSITIONS.

STAKES AND TIES
PROVIDE HARDWOOD STAKES THAT ARE STRAIGHT, FREE FROM KNOTS OR TWISTS, POINTED AT ONE END. DRIVE STAKES INTO THE GROUND AT LEAST ONE THIRD OF THEIR LENGTH, AVOIDING DAMAGE TO THE ROOT SYSTEM.

STAKE SIZES FOR ADVANCED TREES TO BE A MINIMUM 2 NO. X 50 X 50 X 1800MM HARDWOOD STAKES PER TREE IN PARALLEL FORMAT OR TRI-STAKING AS REQUIRED TO SUPPORT THE TREE. STAKING IS TO REFLECT PREVAILING SEASONAL WIND DIRECTIONS.

STABILISE NEW TREES WITH 50MM HESSIAN WEBBING INSTALLED AS PER COUNCIL'S DETAIL.

MULCH
SUPPLY AND PLACE SPECIFIED MULCH TO PLANTER AREAS AND TREE POSITIONS TO A MINIMUM DEPTH OF 75MM AND AS PER PENRITH CITY COUNCIL'S DETAIL.

REFERENCE DOCUMENTS

AUSTRALIAN STANDARDS

- AS 2303: 2018 TREE STOCK FOR LANDSCAPE USE
- AS 4454: 2012 COMPOSTS, SOIL CONDITIONERS AND MULCHES
- AS 4419: 2018 SOILS FOR LANDSCAPING AND GARDEN USE

TREE ESTABLISHMENT

TREE ESTABLISHMENT MAINTENANCE REGIME PERIOD TO FOLLOW DETAILS OUTLINED IN PENRITH CITY COUNCIL'S STREET AND PARK TREE MANAGEMENT REPORT: SECTION 8 TREE ESTABLISHMENT.

SHORT-TERM WATERING PROGRAM
ALL NEW PLANTING SHOULD BE MANUALLY WATERED ON INSTALLATION, SOAKING TO A DEPTH OF 150MM DAILY FOR THE FIRST 2 WEEKS AND THEN WEEKLY FOR THE FOLLOWING 4 WEEKS. CONTRACTOR TO PROVIDE A WATERING / MAINTENANCE REPORT/ SCHEDULE PRIOR TO PRACTICAL COMPLETION OF PLANTING WORKS AND APPROVAL.

WATER QUALITY
PH BETWEEN 5.5 AND 7.5. TOTAL SOLUBLE SALTS LESS THAN 1000 MG/LITRE.
NO SUBSTANCES THAT WOULD BE TOXIC TO PLANT GROWTH.

WATER RESTRICTIONS
COORDINATE THE WATER SUPPLY AND CONFIRM THE WATERING REGIME AGAINST STATE AND TERRITORY LEGISLATION AND RESTRICTIONS AT THE TIME.

PLANT SCHEDULE

REFER DA7100-101 FOR ALL PROPOSED STREET TREE PLANTING LOCATIONS

PLANTING SCHEDULE							
CODE	BOTANICAL NAME	COMMON NAME	INSTALLATION SIZE	INSTALLATION HEIGHT	PLANTING RATE	QUANTITY	MATURE HEIGHT
ACA dec	Acacia decurrens	Black Wattle	200L	4.0m	As Shown	6	8m
BAC cit	Backhousia citriodora	Lemon Scented Myrtle	200L	4.0m	As Shown	6	8m
CUP ana	Cupaniopsis anacardiodes	Tuckeroo	200L	4.0m	As Shown	19	8m
EUC cre	Eucalyptus crebra	Narrow-Leaved Ironbark	200L	4.0m	As Shown	8	25m
LOP con	Lophostemon confertus	Brush Box	100L	2.0m	As Shown	11	12m
MEL sty	Melaleuca styphelioides	Prickly Paperbark	100L	2.0m	As Shown	26	10m
TRI lau	Tristaniopsis laurina	Watergum	200L	4.0m	As Shown	16	10m
WAT flo	Waterhousea floribunda	Weeping Lilly Pilly	200L	4.0m	As Shown	37	12m

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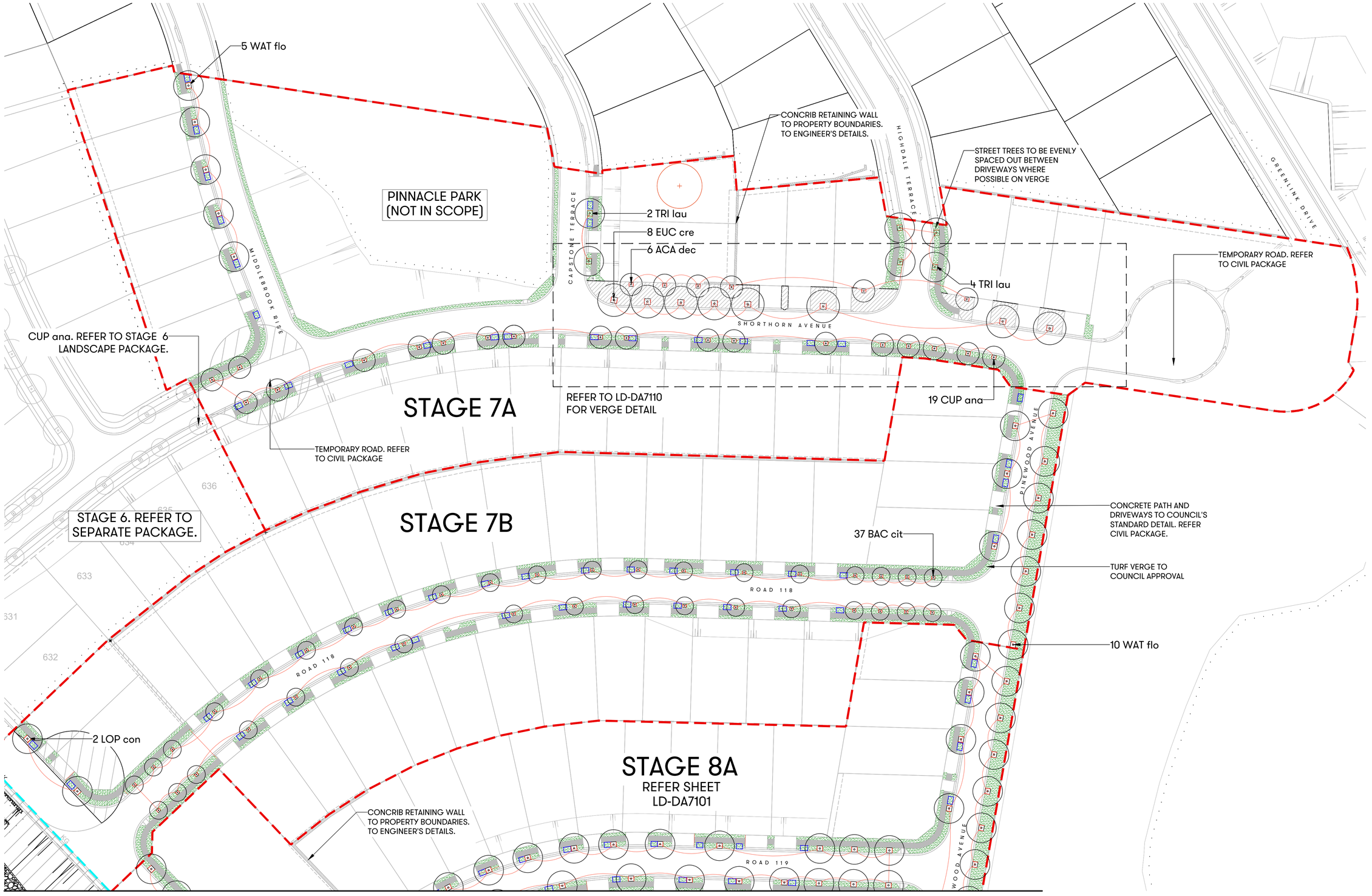
[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

LANDSCAPE NOTES AND PLANT SCHEDULE

[Ref] 20150139 [Dwg No] LD-DA7001 [Rev] H

Document Set ID: 9854744
Version: 1, Version Date: 27/02/2022



REFER LD-DA7101

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

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[Print Date] 16 December 2021

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F	FOR APPROVAL	17/09/21
G	FOR APPROVAL	07/10/21
H	FOR APPROVAL	14/10/21
I	FOR APPROVAL	16/12/21

LEGEND

- RIPARIAN CORRIDOR BOUNDARY
- STAGING BOUNDARY
- PROPOSED STREET TREES WITH TIMBER EDGE - REFER PLANT SCHEDULE DA7001
- TREES TO BE REMOVED
- NEW TURF
- BIN ALLOCATION

GENERAL NOTES:

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

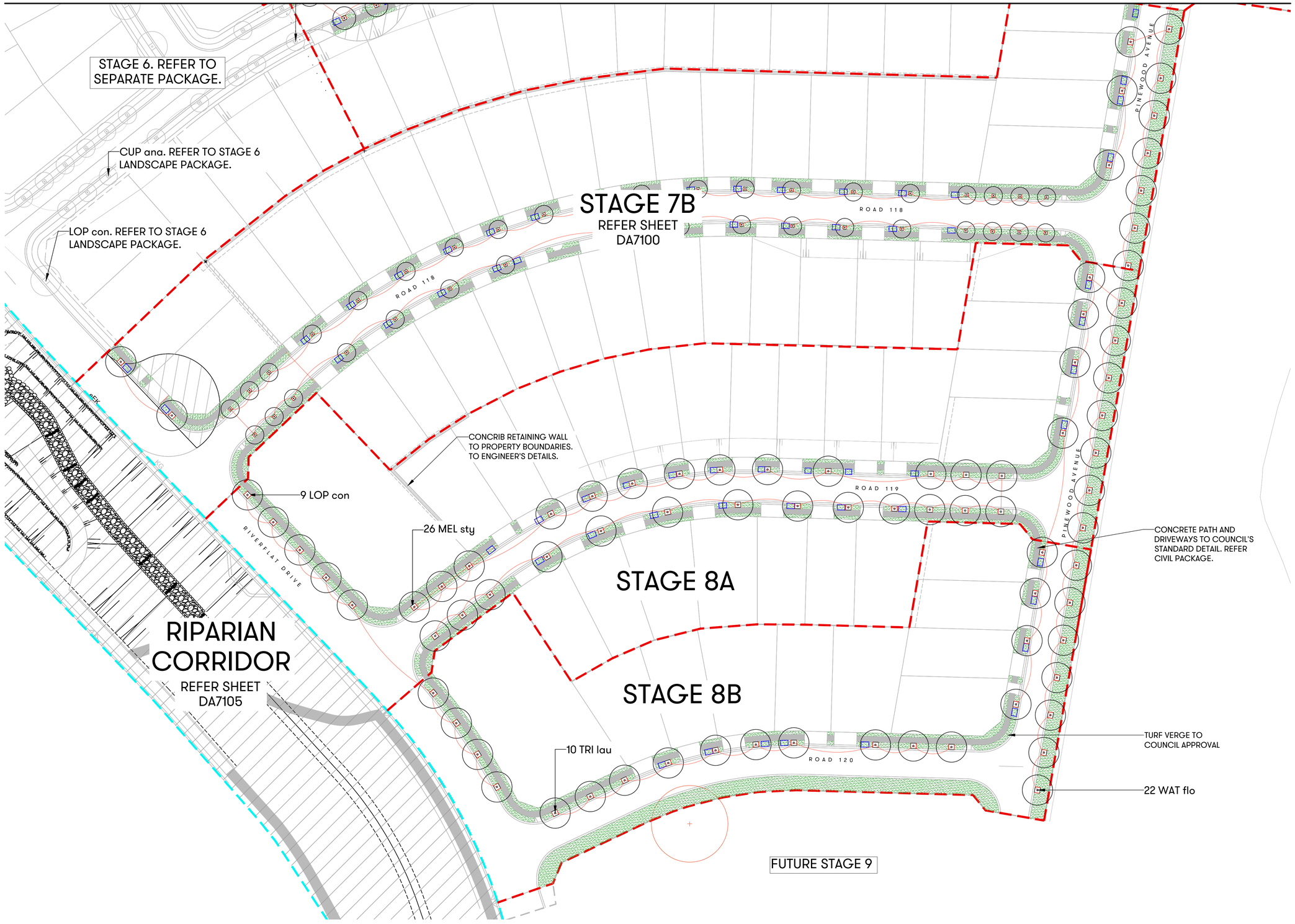
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STAGE 7 PUBLIC DOMAIN PLAN

[Ref] 20150139 [Dwg No] LD-DA7100 [Rev] I

REFER LD-DA7100



[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

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F	FOR APPROVAL	17/09/21
G	FOR APPROVAL	07/10/21

LEGEND

- RIPARIAN CORRIDOR BOUNDARY
- STAGING BOUNDARY
- PROPOSED STREET TREES WITH TIMBER EDGE - REFER PLANT SCHEDULE DA7001
- TREES TO BE REMOVED
- NEW TURF
- BIN ALLOCATION

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

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STAGE 8 PUBLIC DOMAIN PLAN

[Ref] 20150139 [Dwg No] LD-DA7101 [Rev] G



REFER LD-DA7105

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD100.DWG

[Print Date] 16 December 2021

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C	FOR APPROVAL	31/03/2021
D	FOR APPROVAL	14/04/2021
E	FOR APPROVAL	29/10/2021
F	FOR APPROVAL	16/12/2021

LEGEND

- RIPARIAN CORRIDOR DOWNSTREAM BOUNDARY
- RIPARIAN CORRIDOR UPSTREAM BOUNDARY
- STAGING BOUNDARY
- PROPOSED TREES
- RETAINED TREES
- ROCK RETAINING WALL. REFER TO CIVIL PACKAGE.
- BIORETENTION BATTER
- BIORETENTION FLOOR
- ZONE 1 - TERRESTRIAL PLANTING
- ZONE 2 - FEATURE SHRUBS
- ZONE 3 - SWALE PLANTING ZONE
- ZONE 4 - FEATURE GROUNDCOVERS (HEIGHT RESTRICTED)
- ZONE 5 - SHOULDER PLANTING MIX 1 (HEIGHT RESTRICTED)
- ZONE 6 - SHOULDER PLANTING MIX 2 (HEIGHT RESTRICTED)
- ZONE 7 - NATIVE MEADOWS (SEED)
- SEATING NODE (INSITU CONCRETE)
- FITNESS STATION (SOFTFALL) REFER TO FITNESS SCHEDULE ON LD-DA7107 FOR FITNESS EQUIPMENTS
- S1 SEAT
- BR BIKE RACK

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

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RIPARIAN CORRIDOR

[Ref] 20150139 [Dwg No] LD-DA7104 [Rev] F

REFER LD-DA7104



[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD100.DWG

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E	FOR APPROVAL	29/10/2021
F	FOR APPROVAL	16/12/2021

LEGEND

- RIPARIAN CORRIDOR DOWNSTREAM BOUNDARY
- RIPARIAN CORRIDOR UPSTREAM BOUNDARY
- STAGING BOUNDARY
- PROPOSED TREES
- RETAINED TREES
- ROCK RETAINING WALL. REFER TO CIVIL PACKAGE.
- BIORETENTION BATTER
- BIORETENTION FLOOR
- ZONE 1 - TERRESTRIAL PLANTING
- ZONE 2 - FEATURE SHRUBS
- ZONE 3 - SWALE PLANTING ZONE
- ZONE 4 - FEATURE GROUNDCOVERS (HEIGHT RESTRICTED)
- ZONE 5 - SHOULDER PLANTING MIX 1 (HEIGHT RESTRICTED)
- ZONE 6 - SHOULDER PLANTING MIX 2 (HEIGHT RESTRICTED)
- ZONE 7 - NATIVE MEADOWS (SEED)
- SEATING NODE (INSITU CONCRETE)
- FITNESS STATION (SOFTFALL) REFER TO FITNESS SCHEDULE ON LD-DA7107 FOR FITNESS EQUIPMENTS
- S1 SEAT
- BR BIKE RACK

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[Project] HIGHLAND VIEWS STAGES 7-8

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RIPARIAN CORRIDOR

[Ref] 20150139 [Dwg No] LD-DA7105 [Rev] F

DOWN STREAM PLANTING SCHEDULE

DOWNSTREAM BIO RETENTION BASIN PLANTING SCHEDULE											
Species Name	Common Name	Pot Size	Bioretention floor - 550m²			Ephemeral batter - 300m²					
			Density plants/m²	% Prop	QTY	Density plants/m²	% Prop	QTY			
*Carex appressa***	Tall Sedge	Tube	8	15%	672	8	15%	354			
Dianella caerulea	Blue Flax-lily	Tube	8	10%	448	8	10%	236			
Ficinia nodosa	Knobby Club-rush	Tube	8	10%	448	8	10%	236			
Juncus usitatus		Tube	8	10%	448	8	10%	236			
Imperata cylindrica	Blady Grass	Tube	8	25%	1120	8	25%	590			
Lomandra longifolia	Spiny-headed Mat-rush	Tube	8	10%	448	8	10%	236			
Poa sieberiana		Tube	8	10%	448	8	10%	236			
Melaleuca quinquenervia	Broad-leaved Paperbark	200mm				N/A	N/A	16			
Melaleuca styphelioides	Prickley Leaved Paperbark	200mm				N/A	N/A	11			
Themeda triandra	Kangaroo Grass	Tube	8	10%	448	8	10%	236			
		TOTAL		100%	4480		85%	2387			

ZONE 1 - TERRESTRIAL PLANTING SCHEDULE = 2162m²				
Species Name	Common Name	Plant /m²	% Prop	QTY
Tree Canopy Species (>6m)				
Angophora floribunda	Rough-barked apple	4	2.0%	173
Angophora subvelutina	Broad leaved Apple	4	2.0%	173
Casuarina glauca	Swamp Oak	4	1.0%	86
Eucalyptus amplifolia	Cabbage Gum	4	1.0%	86
Eucalptus crebra	Narrow-leaved Ironbark	4	1.0%	86
Eucalyptus moluccana	Grey Box	4	2.0%	173
Eucalyptus tereticornis	Forest Red Gum	4	1.0%	86
Small Tree / Shrub Species (0.5 - 6m)				
Acacia parramattensis	Parramatta Wattle	4	5%	432
Acacia decurrens	Black Wattle	4	3%	259
Bursaria spinosa	Blackthorn	4	4%	346
Leptospermum trinervium	Flaky-barked Tea-tree	4	2%	173
Leptospermum polygalifolium	Tantoon	4	2%	173
Indogofera australis	Astral Indigo	4	2%	173
Melaleuca decora	na	4	2%	173
Melaleuca linariifolia	Flax-leaved Paperbark	4	2%	173
Melaleuca styphelioides	Prickly-leaved Tea Tree	4	2%	173
Ozothamnus diosmifolius	Sago Bush	4	2%	173
Pultenaea villosa	Hairy Bush-pea	4	2%	173
Rubus rosifolium	West Indian Raspberry	4	2%	173
Sedges, Rushes, Reeds and Grasses				
Cymbopogon refractus	Barbed Wire Grass	4	4%	346
Dichelachne micrantha	Shorthair Plumegrass	4	4%	346
Echinopogon caespitosus	Bushy Hedgehog-grass	4	4%	346
Entolasia marginata	Bordered Panic	4	4%	346
Entolasia stricta	Wiry Panic	4	4%	346
Imperata cylindrica	Blady Grass	4	4%	346
Lomandra longifolia	Spiny-headed Mat-rush	4	4%	346
Microlaena stipoides	Weeping Grass	4	4%	346
Paspalidium distans	Shot Grass	4	4%	346
Themeda triandra	Kangaroo Grass	4	4%	346
Ground Layer Species (0 - 1.5m) Vines and Scramblers				
Aristida vagans	Threeawn Speargrass	4	1%	86
Cayratia clematidea	Native Grape	4	1%	86
Centella asiatica	Indian Pennywort	4	1%	86
Clematis aristata	Old Man's Beard	4	1%	86
Clematis glycinoides	Headache Vine	4	1%	86
Commelina cyanea	Scurvy weed	4	1%	86
Danthonia setacea	Bristly Wallaby-grass	4	2%	173
Desmodium varians	Slender Tic-trefoil	4	1%	86
Dianella longifolia	Spreading Flax	4	2%	173
Dichelachne micrantha	Short Hair Plum Grass	4	1%	86
Dichondra repens	Kidney Weed	4	1%	86
Dipodium punctatum	Blotched Hyacinth-orchid	4	1%	86
Goodenia hederacea	Forest Goodenia	4	1%	86
Einadia hastata	Berry Saltbush	4	1%	86
Einadia trigonos	Fishweed	4	0.05%	4
Entolasia stricta	Wiry Panic	4	0.05%	4
Opercularia diphylla	Stink Weed	4	0.05%	4
Pimelea curviflora	Curved Rice-flower	4	3.00%	259
Opercularia diphylla	na	4	0.05%	4
Persicaria decipiens	Slender Knotweed	4	0.05%	4
Rubus parvifolius	Native Raspberry	4	0.05%	4
Solanum prinophyllum	Forest Nightshade	4	0.05%	4
Wahlenberia gracilis	Australian Bluebell	4	1.00%	86
	Total		100%	8678
1 tree every 10m2, 1 shrubs every 5m				
All plants to be tube stock				

PARK FEATURE TREES					
Code	Species Name	Common Name	Density /m²	Pot size	QTY
AF	*Angophora floribunda*	Rough-barked apple	NA	100L	8
EA	*Eucalyptus amplifolia*	Cabbage Gum	NA	100L	6
EM	Eucalyptus moluccana	Grey Box	NA	100L	5
ET	Eucalyptus tereticornis	Forest Red Gum	NA	100L	5
				Total	24

ZONE 2 - FEATURE SHRUBS PLANTING - SCHEDULE = 444m²					
Species Name	Common Name	Type	Plant/m²	% Prop	QTY
Dianella longifolia	Spreading Flax	G	5	9%	200
Dichondra repens	Kidney Weed	G	5	7%	155
Einadia hastata	Berry Saltbush	G	5	5%	111
Goodenia hederacea	Forest Goodenia	G	5	3%	67
Grevillea juniperina	Grevillea juniperina Prostrate	S	5	4%	89
Einadia hastata	Berry Saltbush	G	5	6%	133
Indogofera australis	Astral Indigo	S	5	4%	89
Imperata cylindrica	Blady Grass	G	5	8%	178
Leptospermum polygalifolium	Tantoon	S	5	4%	89
Lomandra longifolia	Spiny-headed Mat-rush	G	5	8%	178
Pimelea curviflora	Curved Rice-flower	G	5	8%	178
Microlaena stipoides	Weeping Grass	G	5	8%	178
Ozothamnus diosmifolius	Sago Bush	S	5	4%	89
Pultenaea villosa	Hairy Bush-pea	S	5	4%	89
Themeda triandra	Kangaroo Grass	G	5	6%	133
Wahlenberia gracilis	Australian Bluebell	G	5	6%	133
Scaevola albida	white fan flowers	G	5	6%	133
		TOTAL		100%	2220
Plant 1 shrub per m2 with remaining plants grasses and groundcovers					
Plant in drifts of same species. 5 - 15 plants and alternate					

ZONE 3- SWALE PLANTING SCHEDULE = 432m²					
Species Name	Common Name	Type	Plant/m²	% Prop	QTY
Bolboschoenus caldwellii*	Club-rush	G	4	20%	346
Carex appressa	Tall Sedge	G	4	25%	432
Imperata cylindrica	Blady Grass	G	4	30%	518
Juncus usitatus	Common rush	G	4	25%	432
Lomandra longifolia	Spiny-headed Mat-rush	G	4	20%	346
		TOTAL		100%	1728
* Plant in wet location along swale					

Zone 4 - GROUND COVER PLANTING MIX 1 - SCHEDULE = 158m²					
Species Name	Common Name	Type	Plant/m²	% Prop	QTY
Clematis aristata	Old Man's Beard	G	6	5%	47
Dianella longifolia	Spreading Flax	G	6	15%	142
Dichondra repens	Kidney Weed	G	6	5%	47
Goodenia hederacea	Forest Goodenia	G	6	10%	95
Einadia hastata	Berry Saltbush	G	6	15%	142
Pimelea curviflora	Curved Rice-flower	G	6	15%	142
Wahlenberia gracilis	Australian Bluebell	G	6	10%	95
Scaevola albida	white fan flowers	G	6	15%	142
		G	6	10%	95
		TOTAL		100%	948
Plant in drifts of same species. 5 - 15 plants and alternate					

ZONE 5 - SHOULDER PLANTING MIX 1 - SCHEDULE = 281m²					
Species Name	Common Name	Type	Plant/m²	% Prop	QTY
*Austrostipa ramosissima**	Stout Bamboo Grass	G	6	5%	84
Carex appressa	Tall Sedge	G	6	15%	253
Dichelachne micrantha	Shorthair Plumegrass	G	6	5%	84
Einadia hastata	Berry Saltbush	G	6	10%	169
Imperata cylindrica	Blady Grass	G	6	15%	253
Lomandra longifolia *	Spiny-headed Mat-rush	G	6	15%	253
Microlaena stipoides	Weeping Grass	G	6	10%	169
Poa sieberiana		G	6	15%	253
Themeda triandra	Kangaroo Grass	G	6	10%	169
		TOTAL		100%	1686
* Plant at back of strip away from footpath					

ZONE 6 - SHOULDER PLANTING MIX 2 - SCHEDULE = 128m²					
Species Name	Common Name	Type	Plant/m²	% Prop	QTY
Chrysocephalum apiculatum	Yellow Buttons	G	6	15%	115
Dianella longifolia	Spreading Flax	G	6	25%	192
Dichondra repens	Kidney Weed	G	6	15%	115
Dichopogon fimbriatus	Chocolate lily	G	6	10%	77
Scaevola albida	white fan flowers	G	6	20%	154
Viola betonicifolia	Mountain violet	G	6	15%	115
		TOTAL		100%	768
* Plant at back of strip away from footpath					

UPSTREAM PLANTING SCHEDULE

UPSTREAM BIORETENTION BASIN PLANTING SCHEDULE								
Species Name	Common Name	Pot Size	Bioretention floor -			Ephemeral batter - 244m²		
			Density plants/	% Prop	QTY	Density plants/m²	% Prop	QTY
*Carex appressa***	Tall Sedge	Tube	8	15%	1696	8	15%	293
Dianella caerulea	Blue Flax-lily	Tube	8	10%	1130	8	10%	195
Ficinia nodosa	Knobby Club-rush	Tube	8	10%	1130	8	10%	195
Juncus usitatus		Tube	8	10%	1130	8	10%	195
Imperata cylindrica	Blady Grass	Tube	8	25%	2826	8	25%	488
Lomandra longifolia	Spiny-headed Mat-rush	Tube	8	10%	1130	8	10%	195
Poa sieberiana		Tube	8	10%	1130	8	10%	195
Melaleuca quinquenervia	Broad-leaved Paperbark	200mm				Na	Na	16
Melaleuca styphelioides	Prickley Leaved Paperbark	200mm				NA	Na	15
Themeda triandra	Kangaroo Grass	Tube	8	10%	1130	8	10%	195
		TOTAL		100%	11304		85%	1983
Refer to planting matrix for distribution								
No shrubs to be planted in bio filtration basin. Shrub species to planted on batter as indicated on sheet 05								
**Carex appressa concentrate along bottom of ephemeral batter								
Plant stock in clumps of 5 - 10 of the same species								

ZONE 1 - TERRESTRIAL PLANTING SCHEDULE = 1324m²				
Species Name	Common Name	Plant /m²	% Prop	QTY
Tree Canopy Species (>6m)				
Refer feature trees for quantities. Tree locations have been positioned minimum 2.5m from proposed retaining walls				
Small Tree / Shrub Species (0.5 - 6m)				
Acacia parramattensis	Parramatta Wattle	4	5%	265
Acacia decurrens	Black Wattle	4	3%	159
Bursaria spinosa	Blackthorn	4	4%	212
Leptospermum trinervium	Flaky-barked Tea-tree	4	2%	106
Leptospermum polygalifolium	Tantoon	4	2%	106
Indogofera australis	Astral Indigo	4	2%	106
Melaleuca decora	na	4	2%	106
Melaleuca linariifolia	Flax-leaved Paperbark	4	2%	106
Melaleuca styphelioides	Prickly-leaved Tea Tree	4	2%	106
Ozothamnus diosmifolius	Sago Bush	4	2%	106
Pultenaea villosa	Hairy Bush-pea	4	2%	106
Rubus rosifolium	West Indian Raspberry	4	2%	106
Sedges, Rushes, Reeds and Grasses				
Cymbopogon refractus	Barbed Wire Grass	4	5%	265
Dichelachne micrantha	Shorthair Plumegrass	4	5%	265
Echinopogon caespitosus	Bushy Hedgehog-grass	4	5%	265
Entolasia marginata	Bordered Panic	4	5%	265
Entolasia stricta	Wiry Panic	4	5%	265
Imperata cylindrica	Blady Grass	4	5%	265
Lomandra longifolia	Spiny-headed Mat-rush	4	5%	265
Microlaena stipoides	Weeping Grass	4	5%	265
Paspalidium distans	Shot Grass	4	5%	265
Themeda triandra	Kangaroo Grass	4	5%	265
Ground Layer Species (0 - 1.5m) Vines and Scramblers				
Aristida vagans	Threeawn Speargrass	4	2%	106
Cayratia clematidea	Native Grape	4	2%	106
Centella asiatica	Indian Pennywort	4	2%	106
Clematis aristata	Old Man's Beard	4	2%	106
Clematis glycinoides	Headache Vine	4	2%	106
Commelina cyanea	Scurvy weed	4	2%	106
Danthonia setacea	Bristly Wallaby-grass	4	1%	53
Desmodium varians	Slender Tic-trefoil	4	2%	106
Dianella longifolia	Spreading Flax	4	1%	53
Dichelachne micrantha	Short Hair Plum Grass	4	1%	53
Dichondra repens	Kidney Weed	4	2%	106
Dipodium punctatum	Blotched Hyacinth-orchid	4	1%	53
Goodenia hederacea	Forest Goodenia	4	1%	53
Einadia hastata	Berry Saltbush	4	1%	53
Einadia trigonos	Fishweed	4	0.05%	3
Entolasia stricta	Wiry Panic	4	0.05%	3
Opercularia diphylla	Stink Weed	4	0.05%	3
Pimelea curviflora	Curved Rice-flower	4	0.05%	3
Opercularia diphylla	na	4	0.05%	3
Persicaria decipiens	Slender Knotweed	4	0.05%	3
Rubus parvifolius	Native Raspberry	4	0.05%	3
Solanum prinophyllum	Forest Nightshade	4	0.05%	3
Wahlenberia gracilis	Australian Bluebell	4	0.05%	3
		Total	100%	5211
Species Proportion - Grasses/Groundcovers 55%, Shrubs 30%, Trees 15%				
All plants to be tube stock				

PARK FEATURE TREES					
Code	Species Name	Common Name	Density /m²	Pot size	QTY
AF	*Angophora floribunda*	Rough-barked apple	NA	100L	30
CG	*Casuarina glauca*	Swamp Oak	NA	100L	31
EA	*Eucalyptus amplifolia*	Cabbage Gum	NA	100L	14
EM	Eucalyptus moluccana	Grey Box	NA	100L	24
ET	Eucalyptus tereticornis	Forest Red Gum	NA	100L	21
				Total	120

ZONE 5 - SHOULDER PLANTING SCHEDULE = 3080m²					
Species Name	Common Name	Type	Plant /m²	% Prop	QTY
*Austrostipa ramosissima**	Stout Bamboo Grass	G	6	5%	924
Carex appressa	Tall Sedge	G	6	15%	2772
Dichelachne micrantha	Shorthair Plumegrass	G	6	5%	924
Einadia hastata	Berry Saltbush	G	6	10%	1848
Imperata cylindrica	Blady Grass	G	6	15%	2772
Lomandra longifolia *	Spiny-headed Mat-rush	G	6	15%	2772
Microlaena stipoides	Weeping Grass	G	6	10%	1848
Poa sieberiana		G	6	15%	2772
Themeda triandra	Kangaroo Grass	G	6	10%	1848
		TOTAL		100%	18480
* Plant at back of strip away from footpath.					
All plants to be tube stock					

ZONE 6 - SHOULDER PLANTING MIX 2 - SCHEDULE = 15m²					
Species Name	Common Name	Type	Plant/ m²	% Prop	QTY
Chrysocephalum apiculatum	Yellow Buttons	G	6	15%	14
Dianella longifolia	Spreading Flax	G	6	25%	24
Dichondra repens	Kidney Weed	G	6	15%	14
Dichopogon fimbriatus	Chocolate lily	G	6	10%	10
Scaevola albida	white fan flowers	G	6	20%	19
Viola betonicifolia	Mountain violet	G	6	15%	14
		TOTAL		100%	95

ZONE 7 - NATIVE MEADOW PLANTING SCHEDULE = 2928m²			
Species Name	Common Name	Kilogram	% Prop
Arthropodium milleflorum	Pale Vanilla-lily	0.12	2%
Aristida vagans	Threeawn Speargrass	0.12	2%
Asperula conferta	Common Woodruff	0.12	2%
Bothriochloa macra	Red Grass	0.35	5%
Brunoniella australis	Blue Trumpet	0.12	2%
Capillipedium spicigerum	Scented-top Grass	0.12	2%
Cheilanthes sieberi	Mulga Fern	0.12	2%
Chloris ventricosa	Plump Windmill Grass	0.35	5%
Chloris truncata	Windmill Grass	0.50	2%
Chorizema parviflorum	Eastern Flame Pea	0.50	3%
Cotula australis	Common Cotula	0.12	2%
Cymbopogon refractus	Barbed Wire Grass	0.40	5%
Oxytes brachypoda	Large Tick-trefoil	0.40	1%
Desmodium varians	Slender Tick-trefoil	0.40	1%
Dichelachne micrantha	Shorthair Plumegrass	0.13	2%
Dichelachne parva		0.13	2%
Dichondra repens	Kidney Weed	0.11	2%
Arthropodium strictum	Chocolate Lily	0.10	2%
Arthropodium fimbriatum	Nodding Chocolate Lily	0.10	2%
Digitaria diffusa	Open Summer-grass	0.10	1%
Echinochloa colona	Awnless Barnyard Grass	0.10	2%
caespitosus	Tufted Hedgehog-grass	0.15	3%
Echinopogon ovatus	Forest Hedgehog Grass	0.15	3%
Einadia hastata	Berry Saltbush	0.10	2%
Einadia polygonoides		0.10	2%
Eragrostis brownii	Brown's Lovegrass	0.10	2%
Eragrostis leptostachya	Paddock Lovegrass	0.10	2%
Eremophila debilis	Winter Apple	0.10	2%
Geranium solanderi var. *solanderi*	Native Geranium	0.10	2%
Microlaena stipoides var. *stipoides*	Weeping Grass	0.20	4%
Panicum effusum	Hairy Panic	0.15	2%
Paspalidium distans		0.25	5%
Poa labillardieri var. labillardieri	Tussock	0.25	5%
Lobelia purpurascens	Whiteroot	0.10	2%
Sorghum leiocladum	Wild Sorghum	0.10	2%
Sporobolus creber	Slender Rat's Tail Grass	0.12	2%
Themeda triandra	Kangaroo Grass	0.30	5%
Tricoryne elatior	Yellow Autumn-lily	0.12	2%
Wahlenbergia stricta var. *stricta*	Tall Bluebell	0.20	2%
Wahlenbergia gracilis	Australian Bluebell	0.20	2%
	Total	7.4	100%
Broad acre seeding apply via direct seeding, sown at 25kg per hectare.			
Seed species ratio may differ according to availability			

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins RLA | RUD #1053

[File] 20150139-LD-CD100.DWG

[Print Date] 16 December 2021

History

[Rev#]	[Description]	[Date]
A	FOR APPROVAL	08/03/2021
B	FOR APPROVAL	12/03/2021
C	FOR APPROVAL	31/03/2021
D	FOR APPROVAL	14/04/2021
E	FOR APPROVAL	29/10/2021
F	FOR APPROVAL	16/12/2021

NOTES

- PLANTING SCHEDULE TO BE READ IN CONJUNCTION WITH AWC HIGHLAND VIEWS VEGETATION MANAGEMENT PLAN AWC 3-13857 AND AWC HIGHLAND VIEWS RIPARIAN REHABILITATION PACKAGE AWC 3-17857.
- REFER TO AWC HIGHLAND VIEWS RIPARIAN REHABILITATION PACKAGE AWC 3-17857 FOR PLANTING NOTES, PLANTING SCHEDULE, BIORETENTION PLANTING MOSAIC AND ZONE 1-6 PLANTING MATRIX

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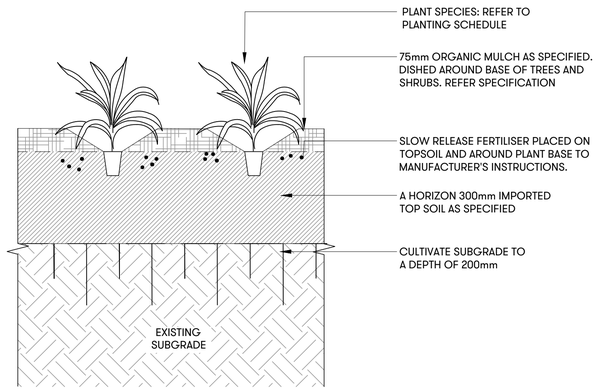
[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

RIPARIAN CORRIDOR PLANTING SCHEDULE

[Ref] 20150139 [Dwg No] LD-DA7106 [Rev] F

FITNESS STATION SCHEDULE				
CODE	**NAME**	**SOFTFALL AREA (m2)**	**SUPPLIER**	**CONTACT**
FITNESS STATION 1				
4641326	Slant Cap STD Leg press Pendulum Swing	14.7	Imagination Play	(03) 9738 1767
4641324	Slant Cap STD Leg Press - Fit Rider	17	Imagination Play	(03) 9738 1767
FITNESS STATION 2				
4641325	Slant Cap STD Ski Runner - Seated Rower	21.5	Imagination Play	(03) 9738 1767
4641093	Playdium Active Box Jump 0.60m	9.8	Imagination Play	(03) 9738 1767
FITNESS STATION 3				
4641287	Slant Cap Royal - Leg Press Step Up	17	Imagination Play	(03) 9738 1767
4641092	Playdium Active Box Jump 0.45m	9.8	Imagination Play	(03) 9738 1767
FITNESS STATION 4				
4641280	Slant Cap Fit Rider / Dip Bars	16.3	Imagination Play	(03) 9738 1767
4641095	Multi Dip Bench	16.1	Imagination Play	(03) 9738 1767



1 TYPICAL DETAIL - PLANTING
1:10 @ A1

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins RLA | RUD #1053

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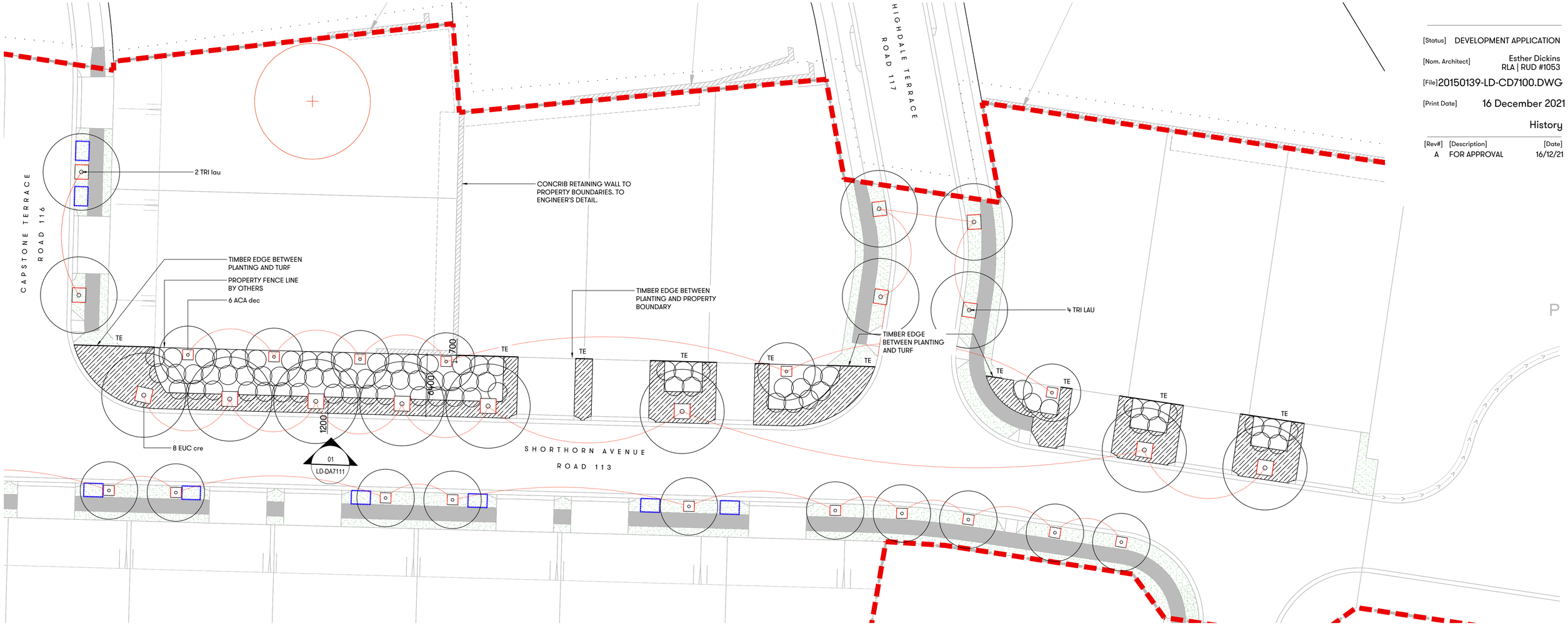
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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

RIPARIAN CORRIDOR SCHEDULE AND DETAIL

[Ref] 20150139 [Dwg No] LD-DA7107 [Rev] B



[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
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[File] 20150139-LD-CD7100.DWG

[Print Date] 16 December 2021

History

[Rev#]	[Description]	[Date]
A	FOR APPROVAL	16/12/21

PLANTING SCHEDULE

BOTANICAL NAME	COMMON NAME	POT SIZE	PLANTING RATE	PROPORTION OF MIX	MATURE SIZE	QUANTITY
UNDERSTORY MIX						
Bursaria spinosa	Sweet Bursaria	200mm	1/2m^2	0.3	3m x 2m	24
Indigofera australis	Australian indigo	200mm	1/2m^2	0.3	2m x 2m	24
Melaleuca decora	White Feather Honeymyrtle	200mm	1/2m^2	0.4	4m x 2m	31
GROUNDCOVER MIX						
Dianella longifolia	Blue Flax-Lily	150mm	4/m^2	0.15	0.5m x 1m	144
Dichondra repens	Kidney Weed	150mm	6/m^2	0.15	0.3m	216
Cynodon dactylon	Bermuda Grass	150mm	6/m^2	0.15	0.3m	216
Lomandra filiformis	Wattle Mat Rush	150mm	4/m^2	0.15	0.5m x 1m	144
Microlaena stipoides	Weeping Grass	150mm	6/m^2	0.15	0.5m x 0.5m	216
Themeda australis	Kangaroo Grass	150mm	4/m^2	0.15	1m x 1m	144
Wahlenbergia gracilis	Australian Bluebell	150mm	6/m^2	0.1	1m x 0.5m	150

LEGEND

- STAGING BOUNDARY
- PROPOSED STREET TREES WITH TIMBER EDGE
- TREES TO BE REMOVED
- NEW TURF
- TE — TIMBER EDGE
- UNDERSTORY MIX
- GROUNDCOVER MIX

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

0 1 2 3 4 5

[Scale] 1 : 100 @ A1

STAGE 7 PUBLIC DOMAIN DETAIL PLAN

[Ref] 20150139 [Dwg No] LD-DA7110 [Rev] A

Document Set ID: 9954747
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1 TYPICAL ELEVATION
1:200

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

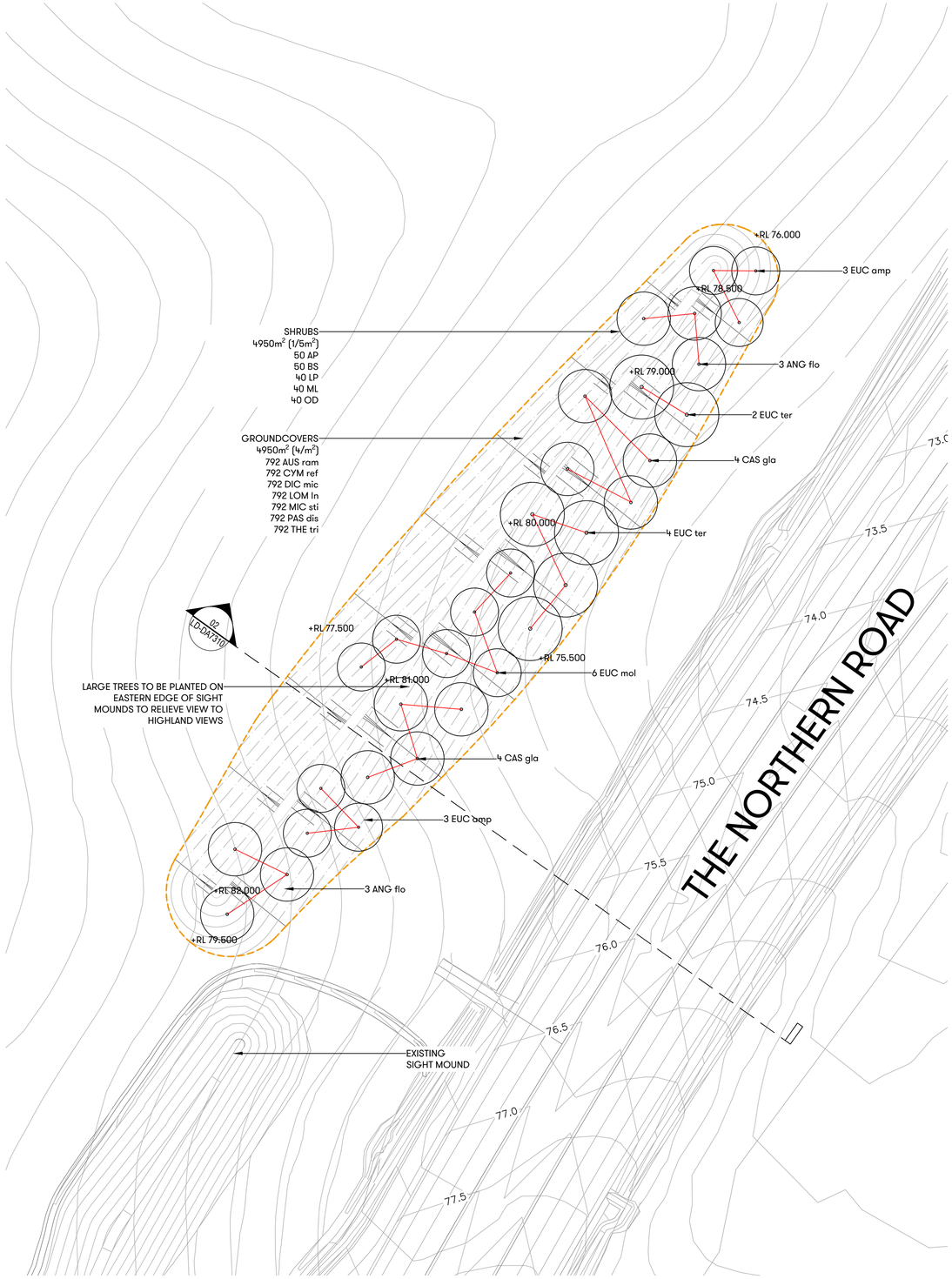
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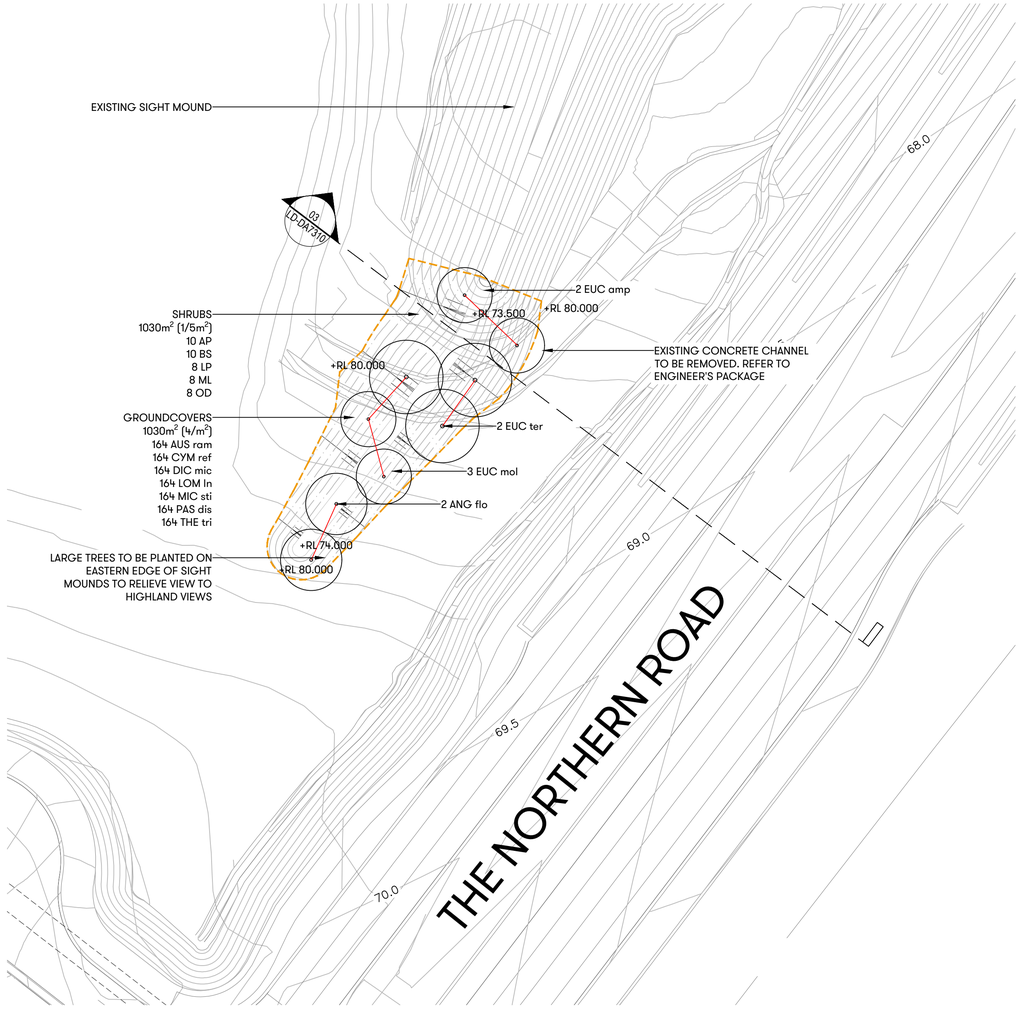
PUBLIC DOMAIN ELEVATION

[Ref] 20150139 [Dwg No] LD-DA7111 [Rev] A

Document Set ID: 9854744
Version: 1, Version Date: 21/02/2022



1 LANDSCAPE PLAN: MOUND A



2 LANDSCAPE PLAN: MOUND B

SIGHT MOUNDS PLANTING SCHEDULE							
Code	**Botanical Name**	**Common Name**	**Pot Size**	**Mature Height x Spread (m)**	**Density plants/m²**	**Proportion**	**Quantity**
TREES							
ANG flo	Angophora floribunda	Rough-barked apple	200mm	20 x 10	0.25	10%	8
CAS gla	Casuarina glauca	Swamp Oak	200mm	20 x 10	0.25	10%	8
EUC amp	Eucalyptus amplifolia	Cabbage Gum	200mm	20 x 8	0.25	10%	8
EUC mol	Eucalyptus moluccana	Grey Box	200mm	25 x 8	0.25	10%	8
EUC ter	Eucalyptus tereticornis	Forest Red Gum	200mm	25 x 12	0.25	10%	8
SMALL TREES / SHRUBS							
AP	Acacia parramattensis	Parramatta Wattle	150mm	10 x 5	0.5	5%	60
BS	Bursaria spinosa	Blackthorn	150mm	4 x 2	0.5	5%	60
LP	Leptospermum polygalifolium	Tantoon	150mm	5 x 2	0.5	4%	48
ML	Melaleuca linariifolia	Flax-leaved Paperbark	150mm	8 x 3	0.5	4%	48
OD	Ozothamnus diosmifolius	Sago Bush	150mm	2 x 1.5	0.5	4%	48
GROUNDCOVERS							
AUS ram	Austrostipa ramosissima	Stout Bamboo Grass	Hiko Tube	2 x 1	4	4%	956
CYM ref	Cymbopogon refractus	Barbed Wire Grass	Hiko Tube	1 x 0.5	4	4%	956
DIC mic	Dichelachne micrantha	Shorthair Plumegrass	Hiko Tube	1 x 0.5	4	4%	956
LOM lon	Lomandra longifolia	Spiny-headed Mat-rush	Hiko Tube	1 x 0.5	4	4%	956
MIC sti	Microlaena stipoides	Weeping Grass	Hiko Tube	1 x 0.5	4	4%	956
PAS dis	Paspalidium distans	Watercrown Grass	Hiko Tube	1 x 0.5	4	4%	956
THE tri	Themeda triandra	Kangaroo Grass	Hiko Tube	1 x 0.5	4	4%	956

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LEGEND

- EXTENT OF WORK
- EXISTING LEVELS.
- PROPOSED DESIGN LEVEL. REFER TO ENGINEER'S PACKAGE
- PROPOSED TREES - REFER PLANT SCHEDULE DA7200

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

0 5 10 15 20 25

[Scale] 1 : 500 @ A1

SIGHT MOUNDS LANDSCAPE PLAN

[Ref] 20150139 [Dwg No] LD-DA7200 [Rev] A



1 CANOPY COVER PLAN: MOUND A
1:500



2 CANOPY COVER PLAN: MOUND B
1:500

TOTAL CANOPY COVER: 55%

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
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[File] 20150139-LD-CD7100.DWG

[Print Date] 17 September 2021

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LEGEND

- EXTENT OF WORK
- EXISTING LEVELS.
- PROPOSED DESIGN LEVEL. REFER TO ENGINEER'S PACKAGE
- PROPOSED TREES - REFER PLANT SCHEDULE DA7200

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[Project] HIGHLAND VIEWS STAGES 7-8

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[Scale] 1 : 500 @ A1

SIGHT MOUNDS CANOPY COVER PLAN

[Ref] 20150139 [Dwg No] LD-DA7201 [Rev] A

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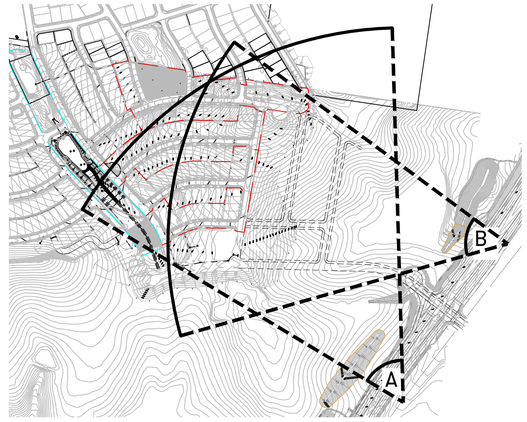
1 PHOTOMONTAGE: EXISTING VIEW A



HIGHLAND VIEWS STAGE 7-8

PROPOSED SIGHT MOUND. REFER TO LD-DA7200/1 FOR PLAN.

2 PHOTOMONTAGE: PROPOSED VIEW A AND SIGHT MOUND



KEY PLAN
NTS

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[Project] HIGHLAND VIEWS STAGES 7-8

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SIGHT MOUNDS PHOTOMONTAGE SHEET 1

[Ref] 20150139 [Dwg No] LD-DA7210 [Rev] A

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Version: 1, Version Date: 27/02/2022

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 17 September 2021

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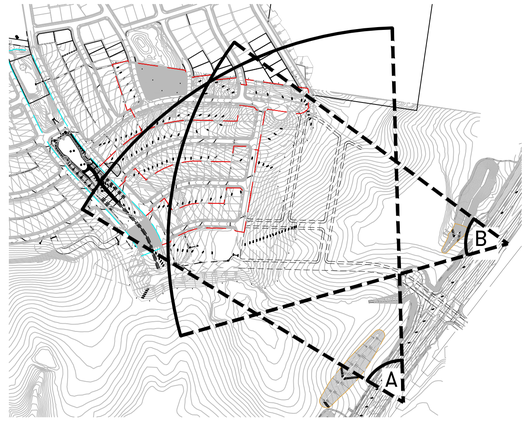
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1 PHOTOMONTAGE: EXISTING VIEW B



2 PHOTOMONTAGE: PROPOSED VIEW B AND SIGHT MOUND



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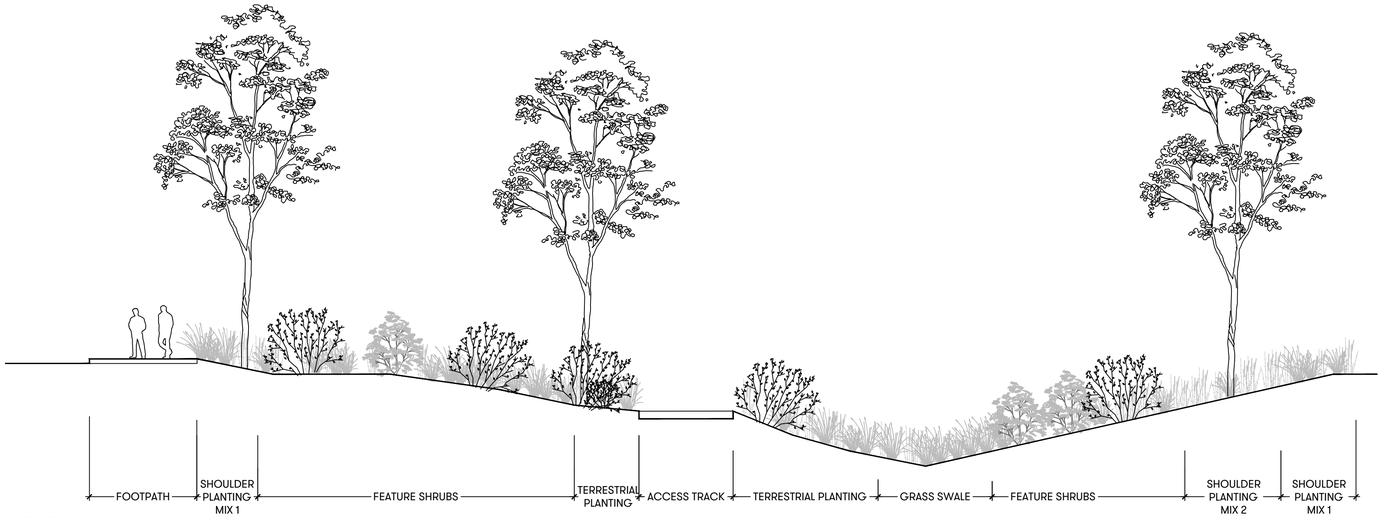
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[Client] VIANELLO HOLDINGS

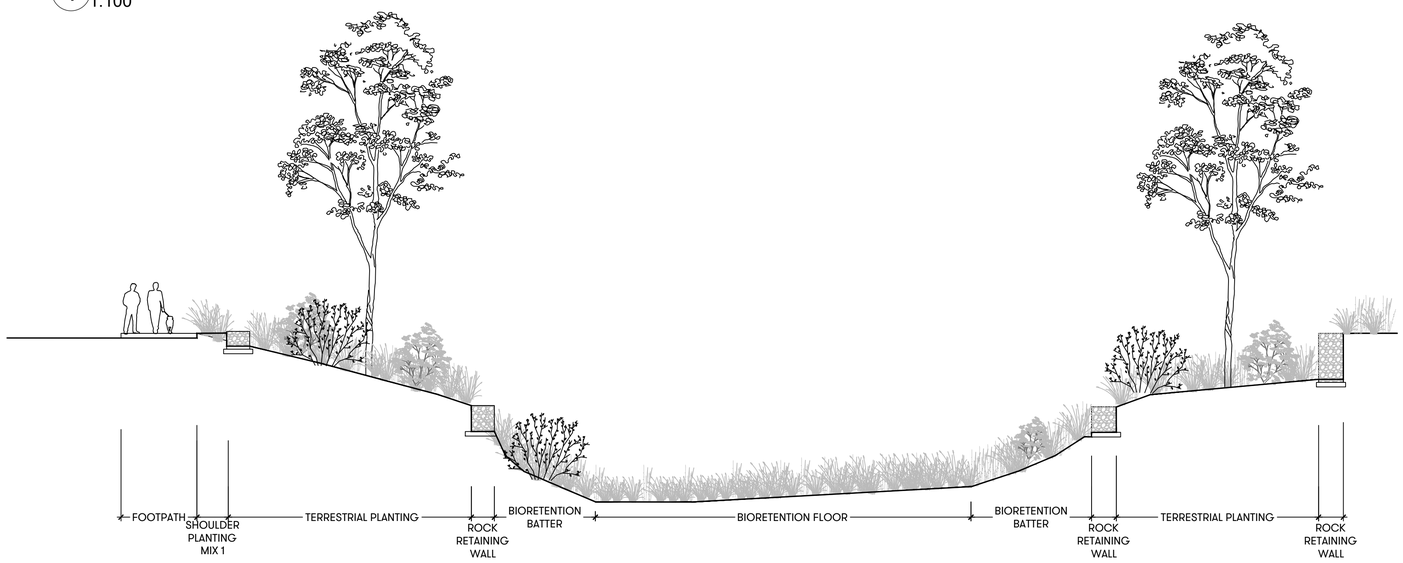
SIGHT MOUNDS PHOTOMONTAGE SHEET 2

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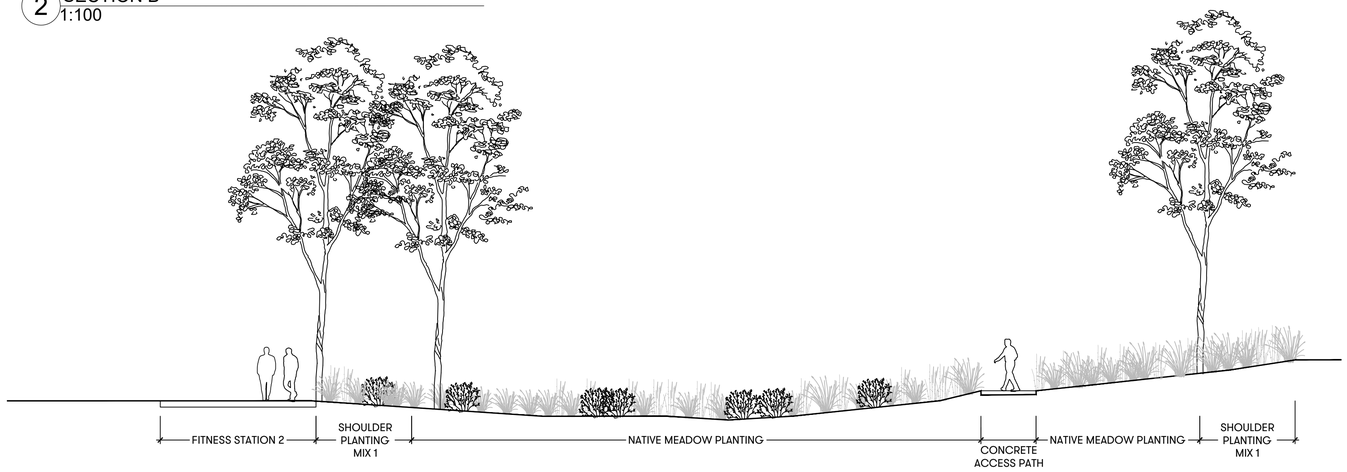
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1 SECTION A
1:100



2 SECTION B
1:100



3 SECTION C
1:100



KEY PLAN

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[File] 20150139-LD-CD100.DWG

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History

[Rev#]	[Description]	[Date]
A	FOR APPROVAL	08/03/2021
B	FOR APPROVAL	12/03/2021
C	FOR APPROVAL	31/03/2021
D	FOR APPROVAL	14/04/2021
E	FOR APPROVAL	29/10/2021
F	FOR APPROVAL	16/12/2021

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Version: 1, Version Date: 21/02/2022

[Project] HIGHLAND VIEWS STAGES 7-8

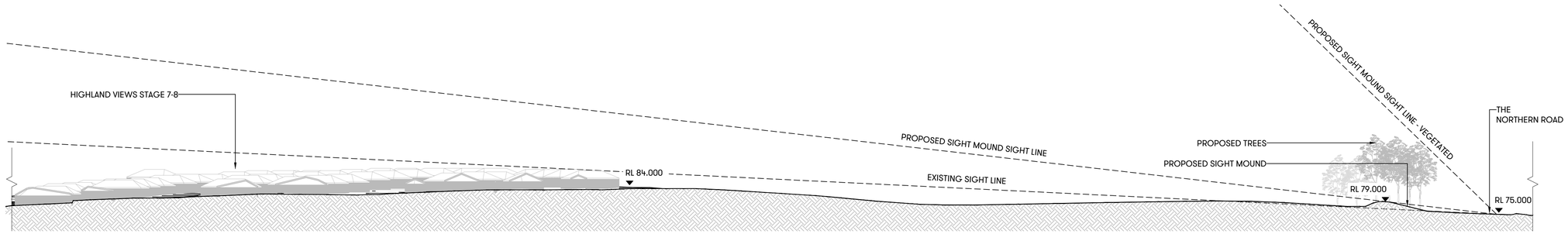
[Client] VIANELLO HOLDINGS

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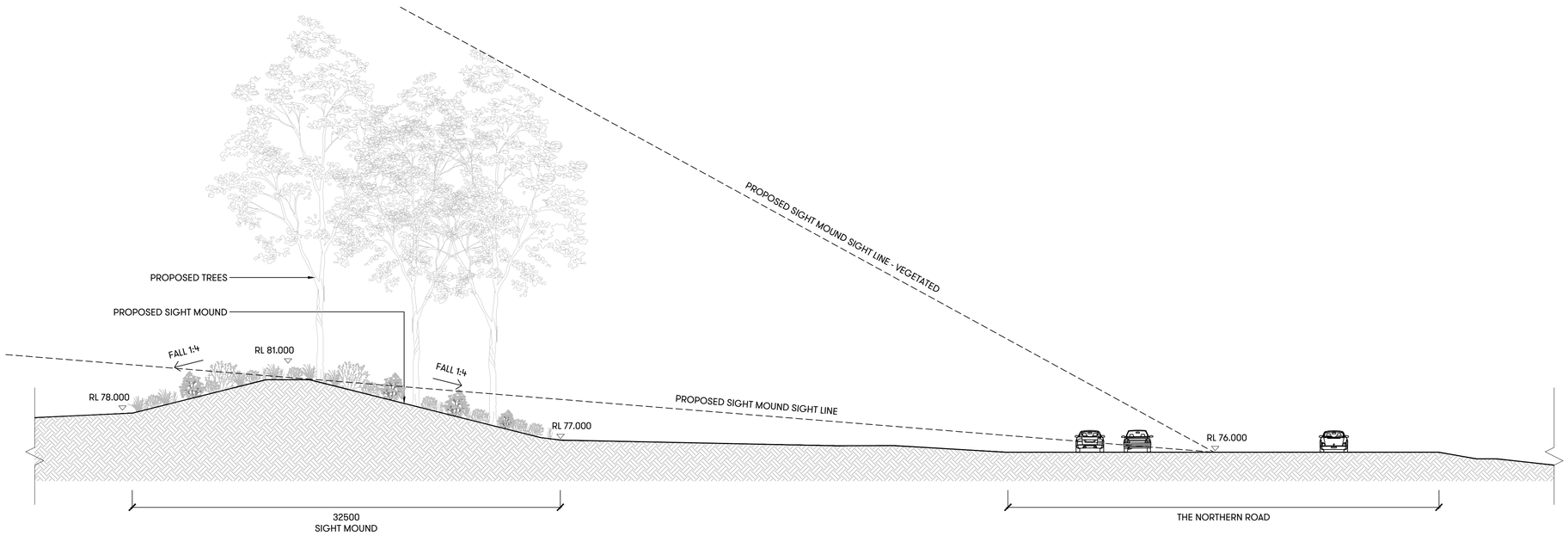
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LANDSCAPE SECTIONS

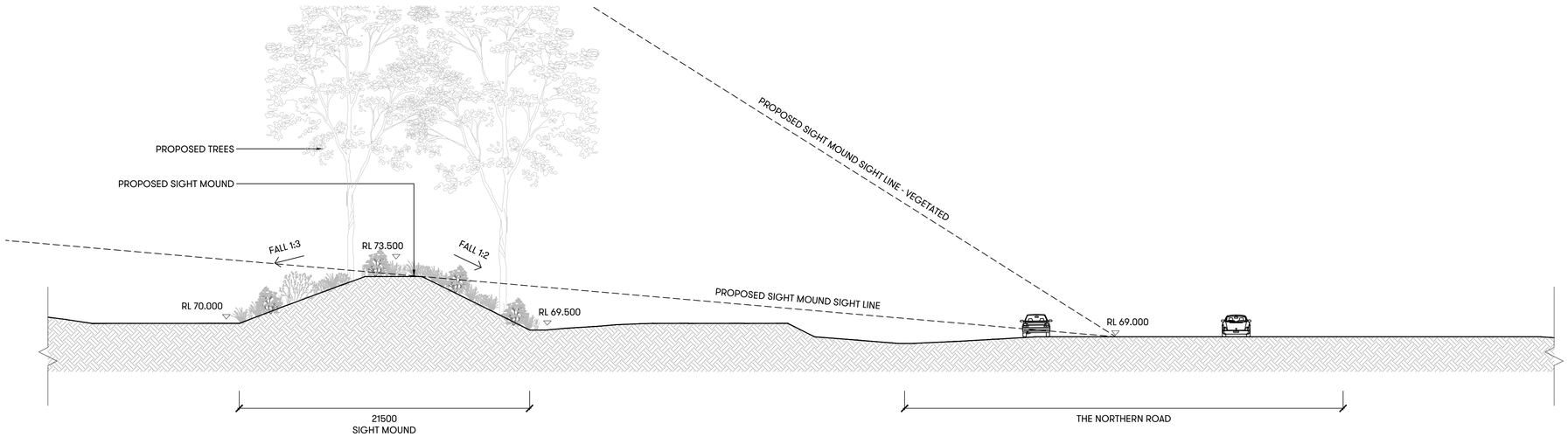
[Ref] 20150139 [Dwg No] LD-DA7300 [Rev] F



1 LANDSCAPE SECTION: SIGHT LINE
1:1000



2 LANDSCAPE SECTION: PROPOSED SIGHT MOUND A
1:200



3 LANDSCAPE SECTION: PROPOSED SIGHT MOUND B
1:200

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 17 September 2021

History

[Rev#]	[Description]	[Date]
A	FOR APPROVAL	17/09/21

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

[Scale] AS SHOWN

SIGHT MOUNDS LANDSCAPE SECTIONS

[Ref] 20150139 [Dwg No] LD-DA7310 [Rev] A

Document Set ID: 9984741
Version: 1, Version Date: 21/02/2022

[Status] DEVELOPMENT APPLICATION

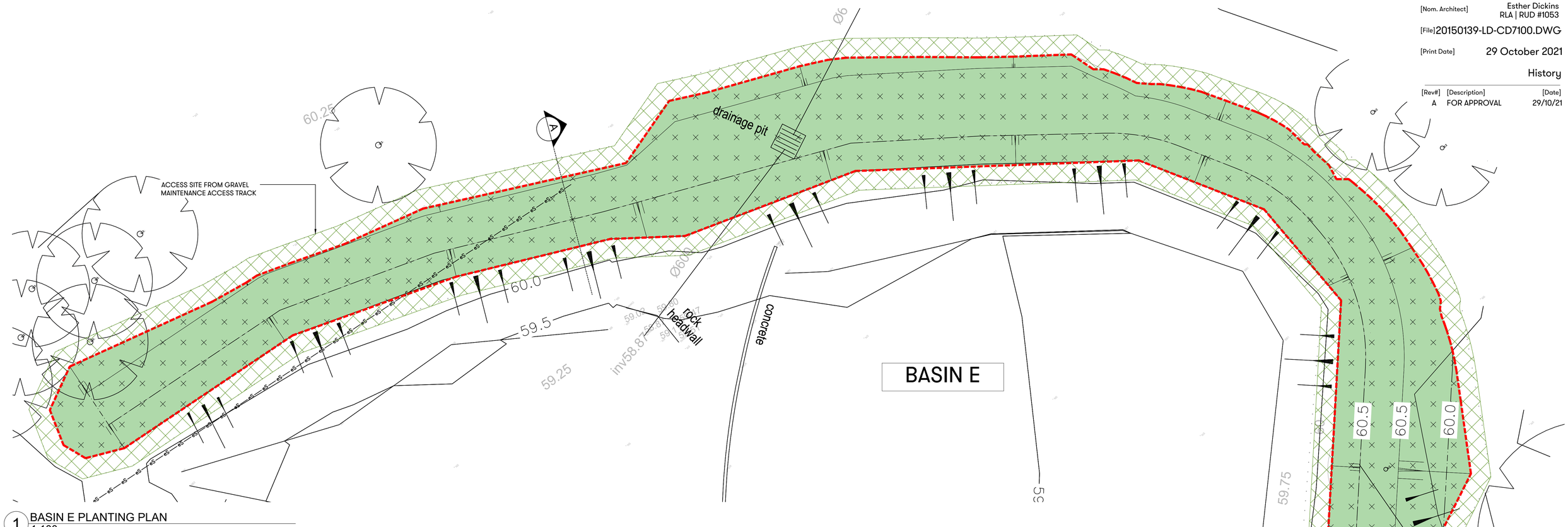
[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

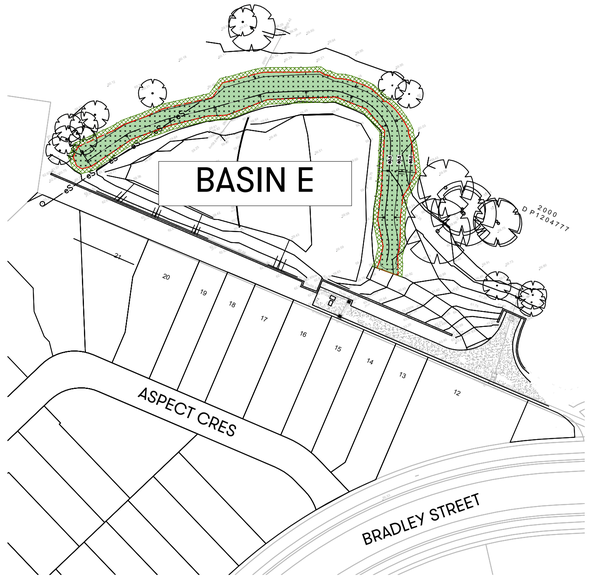
[Print Date] 29 October 2021

History

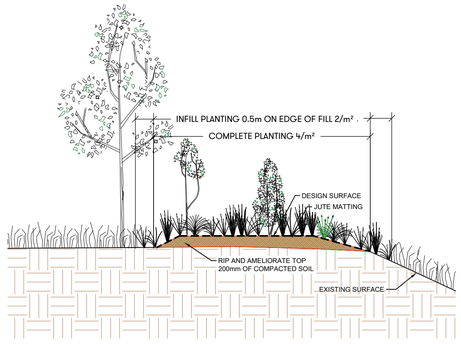
[Rev#]	[Description]	[Date]
A	FOR APPROVAL	29/10/21



1 BASIN E PLANTING PLAN
1:100



2 LOCATION PLAN
NTS



3 SECTION A
1:10

NOTES

- TO BE READ IN CONJUCTION WITH BASIN E RECTIFICATION PLAN-AWC: 3-211373_BASIN_E_01 AND 3-211373_BASIN_E_02

LEGEND

- FILL EXTENT
- BIORETENTION BATTER (COMPLETE REHABILITATION 4/M²) AREA = 511M
- BIORETENTION BATTER (INFILL PLANTING 2/M²) AREA = 220M²
- EXISTING TREES RETAIN AND PROTECT

GENERAL NOTES:

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[Project] HIGHLAND VIEWS STAGES 7-8

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0 1 2 3 4 5

[Scale] 1 : 100 @ A1

[Ref] 20150139

BASIN E PLAN

[Dwg No] LD-DA7400 [Rev] A

Document Set ID: 9854744
Version: 1, Version Date: 27/02/2022

ZONE 1 - BIORETENTION BATTER - COMPLETE REHABILATATION				AREA m2	511	
Species Name	**Common Name**	**Strata**	**Pot Size**	**Density plants/m²**	**% Prop**	**QTY**
Acacia parramattensis	Parramatta Wattle	Tree	Tube	4	1%	20
*Carex appressa***	Tall Sedge	Sedge	Tube	4	5%	102
Dianella caerulea	Blue Flax-lily	Groundcover	Tube	4	10%	204
Eucalyptus crebra	Narrow-leaved Ironbark	Tree	Tube	4	1%	20
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	4	1%	20
Ficinia nodosa	Knobby Club-rush	Sedge	Tube	4	10%	204
Hardenbergia violacea	Native Sarsparella	Ground cover	Tube	4	10%	204
Indogofera australis	Australian Indigo	Shrub	Tube	4	3%	61
Imperata cylindrica	Blady Grass	Grass	Tube	4	16%	327
Lomandra longifolia	Spiny-headed Mat-rush	Groundcover	Tube	4	14%	286
Melaleuca linariifolia	Flax Leaved Paperbark	Shrub	Tube	4	2%	41
Microlaena stripoides	Weeping Grass	Grass	Tube	4	13%	266
Themeda triandra	Kangaroo Grass	Grass	Tube	4	15%	307
			TOTAL		101%	2064

ZONE 2 - BIORETENTION BATTER - INFILL PLANTING				AREA m2	220	
Species Name	**Common Name**	**Strata**	**Pot Size**	**Density plants/m²**	**% Prop**	**QTY**
*Carex appressa***	Tall Sedge	Sedge	Tube	2	10%	44
Dianella caerulea	Blue Flax-lily	Groundcover	Tube	2	13%	57
Ficinia nodosa	Knobby Club-rush	Sedge	Tube	2	10%	44
Hardenbergia violacea	Native Sarsparella	Ground cover	Tube	2	15%	66
Imperata cylindrica	Blady Grass	Grass	Tube	2	13%	57
Lomandra longifolia	Spiny-headed Mat-rush	Groundcover	Tube	2	15%	66
Microlaena stripoides	Weeping Grass	Grass	Tube	2	12%	53
Themeda triandra	Kangaroo Grass	Grass	Tube	2	12%	53
			TOTAL		100%	440

Refer to planting matrix for distribution

*Carex appressa concentrate along inside batter

No Tree or shrubs to be planted in Zone 2 planting

NOTES

- TO BE READ IN CONJUCTION WITH BASIN E RECTIFICATION PLAN-AWC: 3-211373_BASIN_E_01 AND 3-211373_BASIN_E_02
- REFER TO BASIN E RECTIFICATION PLAN-AWC: 3-211373_BASIN_E_02 FOR PLANTING NOTES AND PLANTING MATRIX

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 29 October 2021

History

[Rev#]	[Description]	[Date]
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[Project] HIGHLAND VIEWS STAGES 7-8

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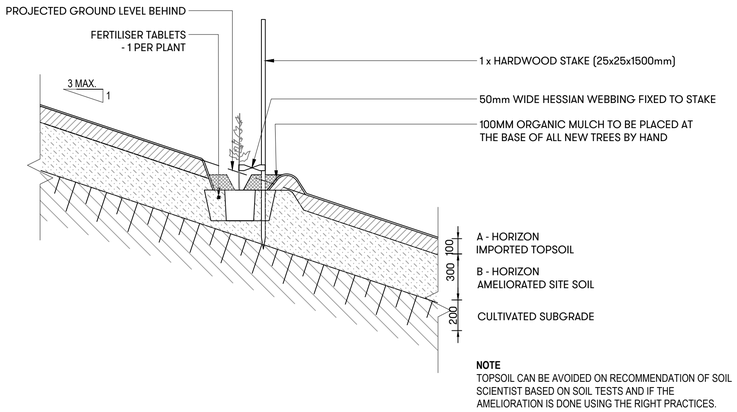
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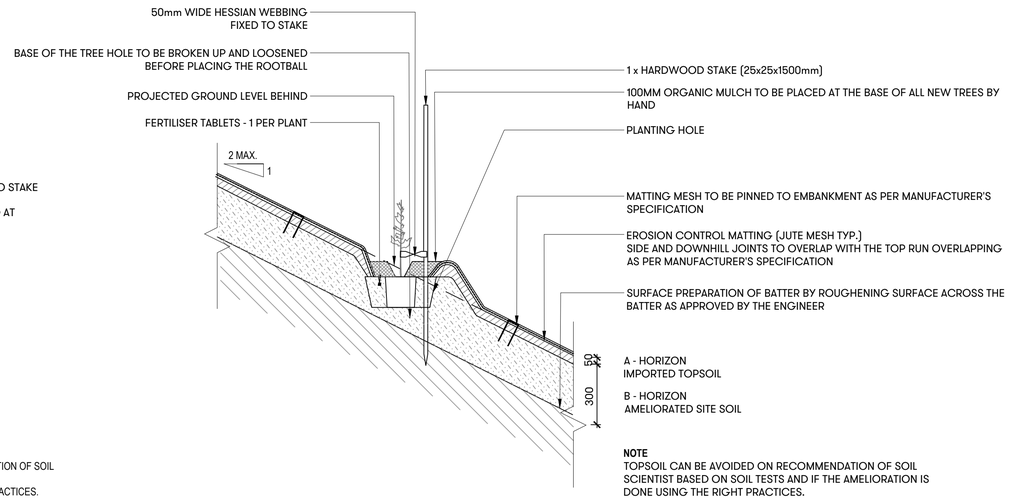
BASIN E SCHEDULE

[Dwg No] LD-DA7401 [Rev] A

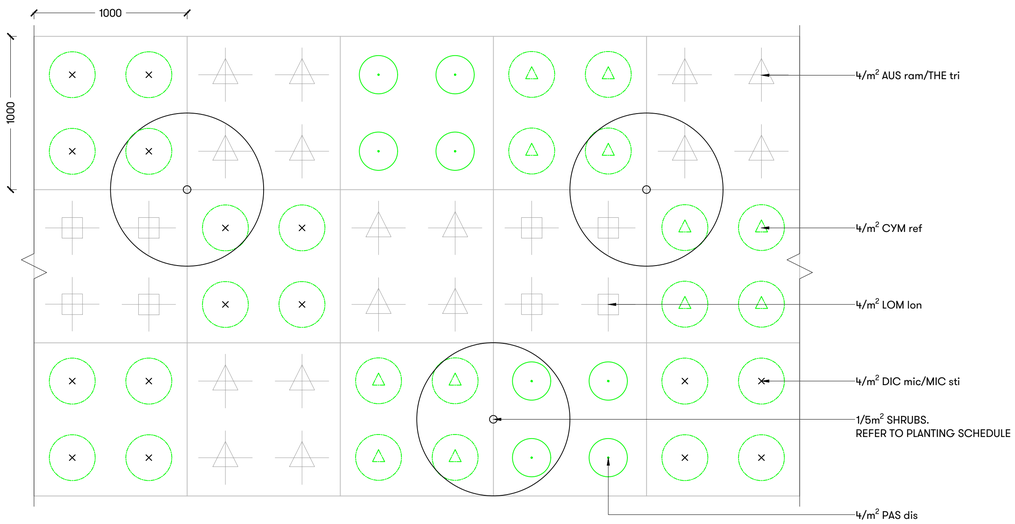
Document Set ID: 9854744
Version: 1, Version Date: 27/02/2022



1 TYPICAL TREE PLANTING ON EMBANKMENT (SLOPES <1:3)
1:20



2 TYPICAL TREE PLANTING ON EMBANKMENT (SLOPES>=1:3)
1:20



3 SIGHT MOUND PLANTING MATRIX - SHRUBS AND GROUNDCOVERS
1:20

[Status] DEVELOPMENT APPLICATION

[Nom. Architect] Esther Dickins
RLA | RUD #1053

[File] 20150139-LD-CD7100.DWG

[Print Date] 17 September 2021

History

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[Project] HIGHLAND VIEWS STAGES 7-8

[Client] VIANELLO HOLDINGS

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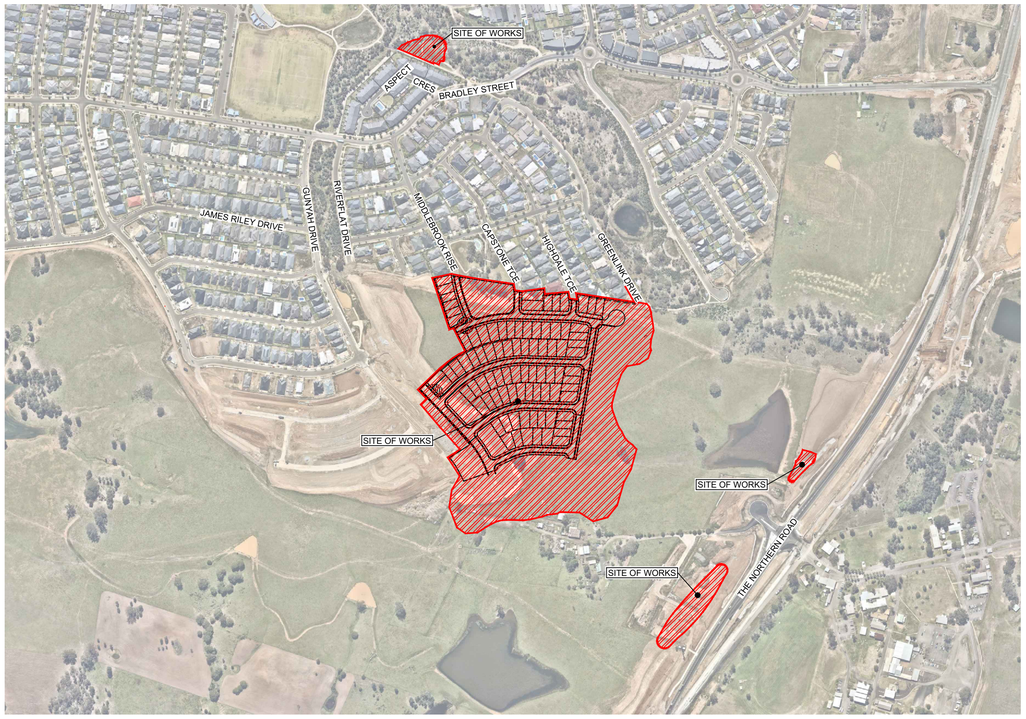
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SIGHT MOUNDS TYPICAL DETAILS

[Ref] 20150139 [Dwg No] LD-DA7510 [Rev] A

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GLENMORE PARK - PRECINCT H
STAGE 7 & 8
PROPOSED LOT, ROAD AND DRAINAGE WORKS
DEVELOPMENT APPLICATION



CIVIL PLAN INDEX

PLAN NO.	PLAN NAME	REV
9784-13-DA001	COVER SHEET	C
9784-13-DA002	SITE PLAN , CUT & FILL PLAN	C
9784-13-DA003	ENGINEERING PLAN SHEET 1	C
9784-13-DA004	ENGINEERING PLAN SHEET 2	C
9784-13-DA005	SOIL & WATER MANAGEMENT PLAN	D
9784-13-DA006	BASIN PLAN	B
9784-13-DA007	RETAINING WALL PLAN	B
9784-13-DA010	SITE SECTIONS SHEET 1	B
9784-13-DA011	SITE SECTIONS SHEET 2	B
9784-13-DA012	SITE SECTIONS SHEET 3	A
9784-13-DA013	SITE SECTIONS SHEET 4	A
9784-13-DA014	SITE SECTIONS SHEET 5	B
9784-13-DA015	TYPICAL SECTIONS SHEET 1	C
9784-13-DA015A	TYPICAL SECTIONS SHEET 2	A
9784-13-DA016	BASIN TOP LONGITUDINAL AND SITE SECTIONS	A
9784-13-DA020	ROAD LONGITUDINAL SECTIONS SHEET 1	C
9784-13-DA021	ROAD LONGITUDINAL SECTIONS SHEET 2	A
9784-13-DA022	ROAD LONGITUDINAL SECTIONS SHEET 3	B
9784-13-DA023	ROAD LONGITUDINAL SECTIONS SHEET 4	C
9784-13-DA024	RETAINING WALL LONGITUDINAL AND STANDARD DETAIL SECTIONS SHEET 1	B
9784-13-DA025	RETAINING WALL LONGITUDINAL SECTIONS SHEET 2	B
9784-13-DA026	RETAINING WALL SECTIONS SHEET 1	B
9784-13-DA027	RETAINING WALL SECTIONS SHEET 2	B
9784-13-DA030	NORTHERN ROAD SIGHT LINES LAYOUT PLAN SIGHT LINE ALIGNMENT 1 TO 10 (SHEET 1 OF 2)	B
9784-13-DA031	NORTHERN ROAD SIGHT LINES SIGHT LINE ALIGNMENT 11 TO 20 (SHEET 2 OF 2)	B
9784-13-DA032	LONGITUDINAL SECTION OF SIGHT LINE 1	A
9784-13-DA033	LONGITUDINAL SECTION OF SIGHT LINE 2	A
9784-13-DA034	LONGITUDINAL SECTION OF SIGHT LINE 3	A
9784-13-DA035	LONGITUDINAL SECTION OF SIGHT LINE 4	A
9784-13-DA036	LONGITUDINAL SECTION OF SIGHT LINE 5	A
9784-13-DA037	LONGITUDINAL SECTION OF SIGHT LINE 7	A
9784-13-DA038	LONGITUDINAL SECTION OF SIGHT LINE 7A SHEET 1 OF 2	A
9784-13-DA039	LONGITUDINAL SECTION OF SIGHT LINE 7A SHEET 2 OF 2	A
9784-13-DA040	LONGITUDINAL SECTION OF SIGHT LINE 8 SHEET 1 OF 2	A
9784-13-DA041	LONGITUDINAL SECTION OF SIGHT LINE 8 SHEET 2 OF 2	A
9784-13-DA042	LONGITUDINAL SECTION OF SIGHT LINE 9	A
9784-13-DA043	LONGITUDINAL SECTION OF SIGHT LINE 10	A
9784-13-DA044	LONGITUDINAL SECTION OF SIGHT LINE 11	A
9784-13-DA045	LONGITUDINAL SECTION OF SIGHT LINE 12	A
9784-13-DA046	LONGITUDINAL SECTION OF SIGHT LINE 13	A
9784-13-DA047	LONGITUDINAL SECTION OF SIGHT LINE 14	A
9784-13-DA048	LONGITUDINAL SECTION OF SIGHT LINE 15	A
9784-13-DA049	LONGITUDINAL SECTION OF SIGHT LINE 16	A
9784-13-DA050	LONGITUDINAL SECTION OF SIGHT LINE 17	A
9784-13-DA051	LONGITUDINAL SECTION OF SIGHT LINE 18	A
9784-13-DA052	LONGITUDINAL SECTION OF SIGHT LINE 19	A
9784-13-DA053	LONGITUDINAL SECTION OF SIGHT LINE 20	A
9784-13-DA100	TURNING PATH PLAN	C

C	INDEX REVISIONS AMENDED	CC	CC	PK	MS	17/12/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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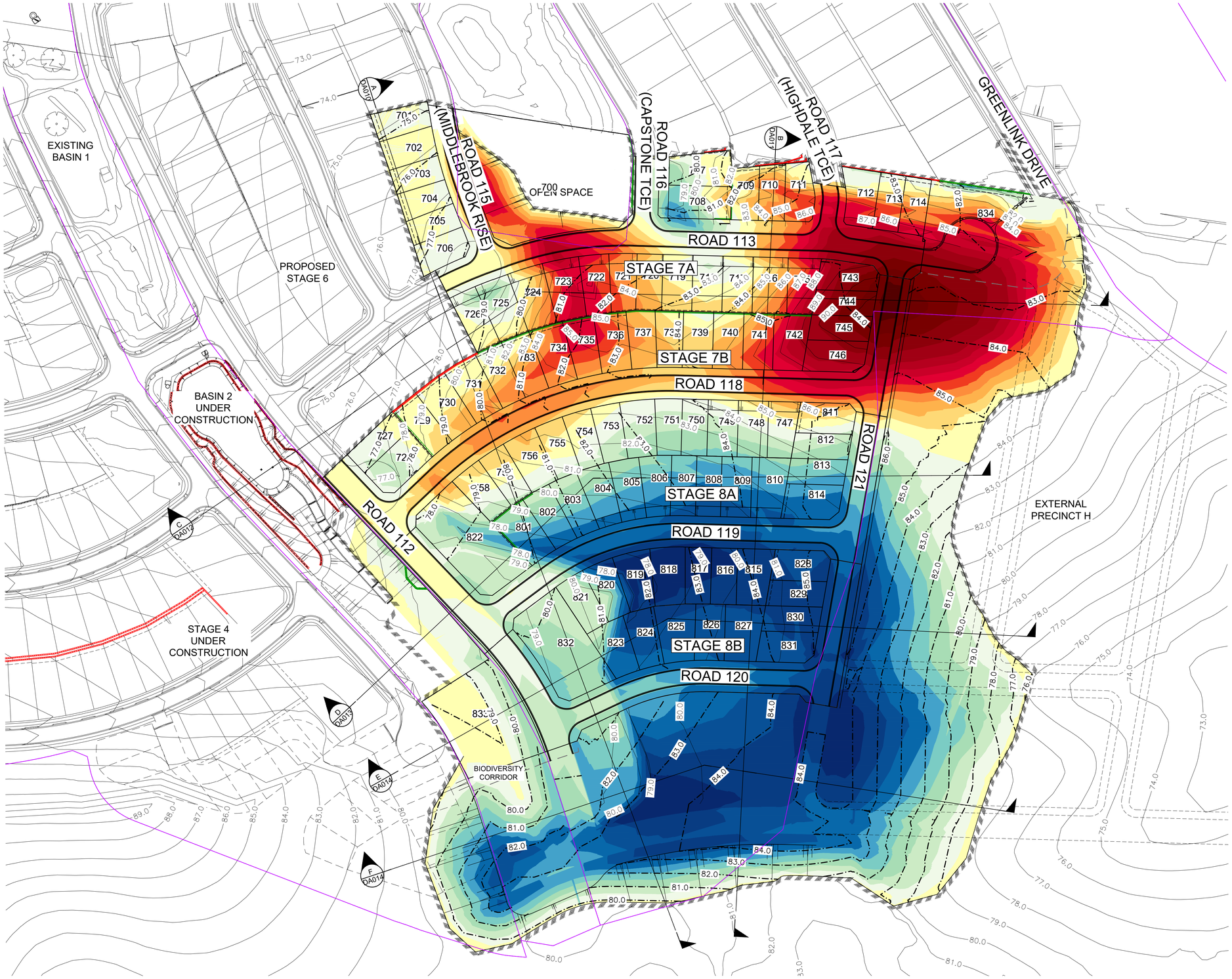
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
COVER SHEET

PROJECT No: 9784-13
SHEET No: DA001

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA001 | C

Plotted: 17 December , 2021 10:16:37 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CDI\Stage 7, 8, & 9\9784-13-DA001.dwg

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Version: 1, Version Date: 21/02/2022



LEGEND

Lower_value		Upper_value	Colour
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-8	to	-7	Meters
-7	to	-6	Meters
-6	to	-5	Meters
-5	to	-4	Meters
-4	to	-3.5	Meters
-3.5	to	-3	Meters
-3	to	-2.5	Meters
-2.5	to	-2	Meters
-2	to	-1.5	Meters
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1.	to	1.5	Meters
1.5	to	2	Meters
2	to	2.5	Meters
2.5	to	3	Meters
3	to	3.5	Meters
3.5	to	4	Meters
4	to	5	Meters
5	to	6	Meters

1:1000 (AT A1)
1:2000 (AT A3)

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METRES

C	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SITE PLAN , CUT & FILL PLAN

PROJECT No: 9784-13

SHEET No: DA002

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA002 | C

Plotted: 17 December , 2021 10:17:27 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CDDA\Stage 7, 8, & 9\9784-13-DA002.dwg

Document Set ID: 9954738
Version: 1, Version Date: 27/02/2022

ROAD 115 (MIDDLEBROOK RISE)
ROAD 116 (CAPSTONE TCE)
ROAD 117 (HIGHDALE TCE)
GREENLINK DRIVE
ROAD 113
ROAD 118
ROAD 119
ROAD 121
ROAD 112
RW 10
RW 11
RW 12
RW 13
RW 14
RW 1A
RW 1B
STAGE 7A
STAGE 7B
STAGE 8A
PROPOSED STAGE 6
700 OPEN SPACE
EXISTING RETAINING WALL TO REMAIN
RETAINING WALL TO BE BUILT BY RESIDENT AS PER DA20-0226
PROPOSED SWALE
PROPOSED TEMPORARY TURNING HEAD
TEMPORARY TURNING HEAD OUTSIDE PROPOSED PAVEMENT TO BE DEMOLISHED
TRANSITION EXISTING ELSHOLZ KERB FROM CH 290 TO KERB AND GUTTER AT CH 295
EXTERNAL PRECINCT H
1:5 BATTER
1:7 BATTER

REFER TO DRAWING DA004 FOR CONTINUATION

LEGEND

- PROPOSED DRAINAGE PITS
- PROPOSED DRAINAGE PIPE (5YR PIPE)
- DRAINAGE EASEMENT
- FLOW DIRECTION OVERLAND
- -70.0- DESIGN CONTOUR
- 70.0 EXISTING CONTOUR
- LIMIT OF WORKS
- PROPOSED RETAINING WALL
- EXISTING RETAINING WALL
- TREE TO BE REMOVED
- EXISTING TREE TO BE RETAINED
- SWALE / CATCHDRAIN
- STAGE BOUNDARY
- ZONE BOUNDARY
- eRL 75.12 EXISTING SURFACE RL
- RL 75.12 PROPOSED SURFACE RL

1:500 (AT A1)
1:1000 (AT A3)

10 0 10 20 30 40 50
METRES

C	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
ENGINEERING PLAN
SHEET 1

PROJECT No: 9784-13
SHEET No: DA003

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA003 | C

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Document Set ID: 9854738
Version: 1, Version Date: 21/02/2022

REFER TO DRAWING DA003 FOR CONTINUATION

LEGEND

- PROPOSED DRAINAGE PITS
- PROPOSED DRAINAGE PIPE (5YR PIPE)
- DRAINAGE EASEMENT
- FLOW DIRECTION OVERLAND
- 70.0 DESIGN CONTOUR
- 70.0 EXISTING CONTOUR
- LIMIT OF WORKS
- PROPOSED RETAINING WALL
- EXISTING RETAINING WALL
- TREE TO BE REMOVED
- EXISTING TREE TO BE RETAINED
- SWALE / CATCHDRAIN
- STAGE BOUNDARY
- ZONE BOUNDARY

ROAD 118
ROAD 112
ROAD 119
ROAD 120
ROAD 121
RW 10
RW14
STAGE 8A
STAGE 8B
TEMPORARY TURNING HEAD OUTSIDE PROPOSED PAVEMENT TO BE DEMOLISHED
TRANSITION EXISTING ELSHOLZ KERB FROM CH 290 TO KERB AND GUTTER AT CH 295
PROPOSED 1.5m MAX HIGH STACKED ROCK RETAINING WALL FOR SUBSTATION
PROPOSED KERB AND GUTTER FROM CH 295 TO CH 450
PROPOSED PIPE CROSSING
PROPOSED 2.5m FOOTPATH
STAGE 4 UNDER CONSTRUCTION
BIODIVERSITY CORRIDOR
PROPOSED TEMPORARY STUB CAPPING
PROPOSED TEMPORARY STUB CAPPING
1:7 BATTER
1:5 BATTER
20m NON-PLANTED AREA AS APPROVED BY PCC
EXTERNAL PRECINCT H

1:500 (AT A1)
1:1000 (AT A3)
10 0 10 20 30 40 50
METRES

C	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
ENGINEERING PLAN
SHEET 2

PROJECT No: 9784-13

SHEET No: DA004

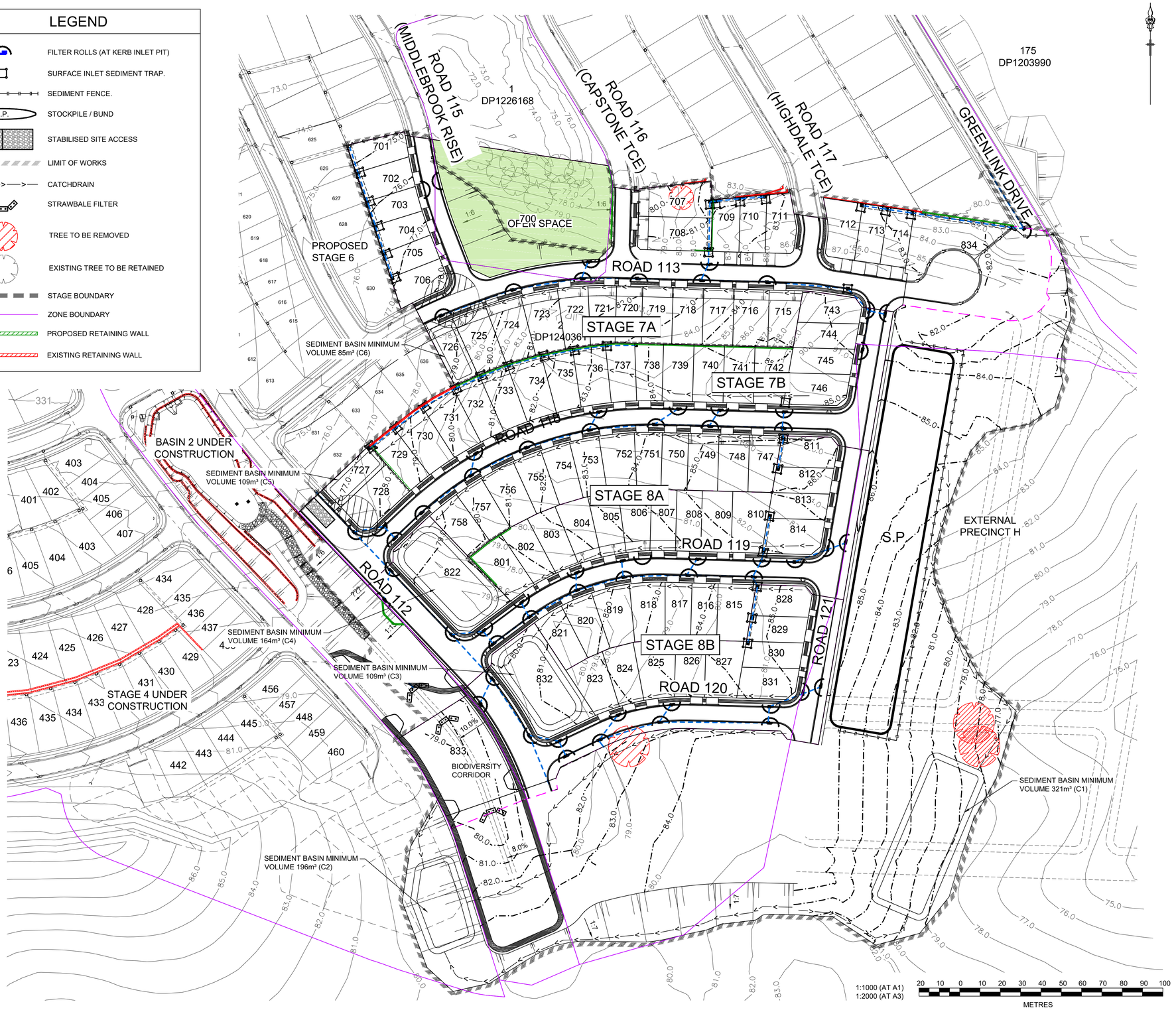
AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA004 | C

Plotted: 17 December , 2021 10:18:36 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CDD\AStage 7, 8, & 9\9784-13-DA004.dwg

Document Set ID: 9984738
Version: 1, Version Date: 21/02/2022

LEGEND

- FILTER ROLLS (AT KERB INLET PIT)
- SURFACE INLET SEDIMENT TRAP.
- SEDIMENT FENCE.
- S.P. — STOCKPILE / BUND
- STABILISED SITE ACCESS
- LIMIT OF WORKS
- CATCHDRAIN
- STRAWBALE FILTER
- TREE TO BE REMOVED
- EXISTING TREE TO BE RETAINED
- STAGE BOUNDARY
- ZONE BOUNDARY
- PROPOSED RETAINING WALL
- EXISTING RETAINING WALL



Note: These "Detailed Calculation" spreadsheets relate only to high erosion hazard lands as identified in figure 4.6 or where the designer chooses to use the RUSLE to size sediment basins. The "Standard Calculation" spreadsheets should be used on low erosion hazard lands as identified by figure 4.6 and where the designer chooses not to run the RUSLE in calculations.

1. Site Data Sheet

Site Name: Vianello

Site Location: Glenmore Park

Precinct: Stage 7 & 8

Description of Site: Temporary Sediment Basin for Stage 7 & 8

Site area	Sub-catchments						Remarks
	C1	C2	C3	C4	C5	C6	
Total catchment area (ha)	2.59	1.6	0.82	1.2	0.8	0.6	
Disturbed catchment area (ha)	2.59	1.6	0.82	1.2	0.8	0.6	

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D	D	D	D	From Appendix C
% sand (fraction 0.02 to 2.00 mm)	10	10	10	10	10	10	Soil texture should be assessed through
% silt (fraction 0.002 to 0.02 mm)	30	30	30	30	30	30	mechanical dispersion only. Dispersing
% clay (fraction finer than 0.002 mm)	60	60	60	60	60	60	agents (e.g. Calgon) should not be used
Dispersion percentage	100.0	100.0	100.0	100.0	100.0	100.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	75	75	75	75	75	75	See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D	D	D	Automatic calculation from above

Rainfall data

Design rainfall depth (days)	5	5	5	5	5	5	See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75	75	75	75	75	75	See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	21.8	21.8	21.8	21.8	21.8	21.8	See Section 6.3.4 (h)
Rainfall R-factor (if known)	2500	2500	2500	2500	2500	2500	See Appendix B
IFD: 2-year, 6-hour storm (if known)	10.2	10.2	10.2	10.2	10.2	10.2	See IFD chart for the site

RUSLE Factors

Rainfall erosivity (*R*-factor)	2500	2500	2500	2500	2500	2500	Auto-filled from above
Soil erodibility (*K*-factor)	0.038	0.038	0.038	0.038	0.038	0.038	
Slope length (m)	80	80	80	80	80	80	
Slope gradient (%)	4	3.6	4.8	5.5	5.3	6.1	RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	0.91	0.81	1.13	1.33	1.27	1.50	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1.3	1.3	1.3	1.3	

Calculations

Soil loss (t/ha/yr)	113	100	182	213	204	241	
Soil Loss Class	1	1	2	2	2	3	See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	87	77	140	164	157	185	
Sediment basin storage volume, m^3	38	21	19	33	21	19	See Sections 6.3.4(i) and 6.3.5 (e)

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{x\text{-day},\ y\text{-}\%ile}\ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day},\ y\text{-}\%ile}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)). However, on Soil Loss Classes 5, 6 and 7 lands, the zone must contain the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(iii).

Place an "X" in the box below to show the sediment storage zone design parameters used here:

	50% of settling zone capacity,
x	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day},\ y\text{-}\%ile}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
C1	0.50	21.8	2.59	282.31	38	320.31
C2	0.50	21.8	1.6	174.4	21	195.4
C3	0.50	21.8	0.82	89.38	19	108.38
C4	0.50	21.8	1.2	130.8	33	163.8
C5	0.50	21.8	0.8	87.2	21	108.2
C6	0.50	21.8	0.6	65.4	19	84.4

	AMENDMENT	DES	DRN	CKD	APR	DATE
D	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
D	STOCKPILE AMENDED	CC	NA	PK	MS	21/04/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SOIL & WATER MANAGEMENT PLAN

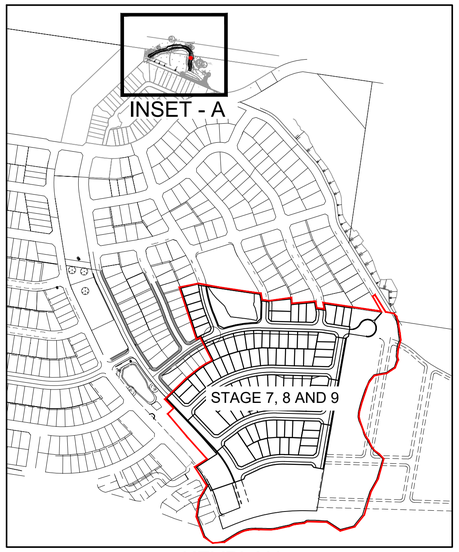
PROJECT No: 9784-13

SHEET No: DA005

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Version: 1, Version Date: 27/02/2022



KEYPLAN

LEGEND

- 70.0 DESIGN CONTOUR
- 70.0 EXISTING CONTOUR
- LIMIT OF WORKS
- TREE TO BE REMOVED
- EXISTING TREE TO BE RETAINED

BASIN E					
CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH
0	285761.45	6257115.54	56°12'46.64"		
10.66	285770.31	6257121.47			
19.16	285778.29	6257124.42			
28.17	285787.04	6257126.56			
41.48	285799.86	6257130.11			
48.16	285806.53	6257130.48			
54.66	285813.04	6257130.63	88°40'40.89"		
56.64	285815.04	6257130.67		10	3.95
58.61	285816.9	6257129.95	111°18'52.35"		
61.69	285819.76	6257128.83	111°18'52.35"		
64.17	285822.12	6257127.91		10	4.96
66.65	285823.76	6257125.98	139°44'12.97"		
67.25	285824.15	6257125.52	139°44'12.97"		
71.04	285826.72	6257122.48		10	7.59
74.83	285826.5	6257118.5	183°12'05.29"		
83.81	285826	6257109.53			
88.73	285825.39	6257104.65	187°09'57.53"		
90.38	285825.18	6257103.01		-10	3.28
92.02	285825.51	6257101.39	168°22'00.93"		
94.17	285825.95	6257099.27	168°22'00.93"		
96.31	285826.39	6257097.14		10	4.28
98.45	285825.9	6257095.03	192°52'22.52"		
99.67	285825.63	6257093.84	192°52'22.52"		

2000
D P1204777

INSET - A

1:200 (AT A1)
1:400 (AT A3)

4 2 0 4 8 12 16 20
METRES

AMENDMENT	DES	DRN	CKD	APR	DATE
B TREE TO BE REMOVED AMENDED	CC	CC	PK	DJ	17/09/21
A ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
BASIN PLAN

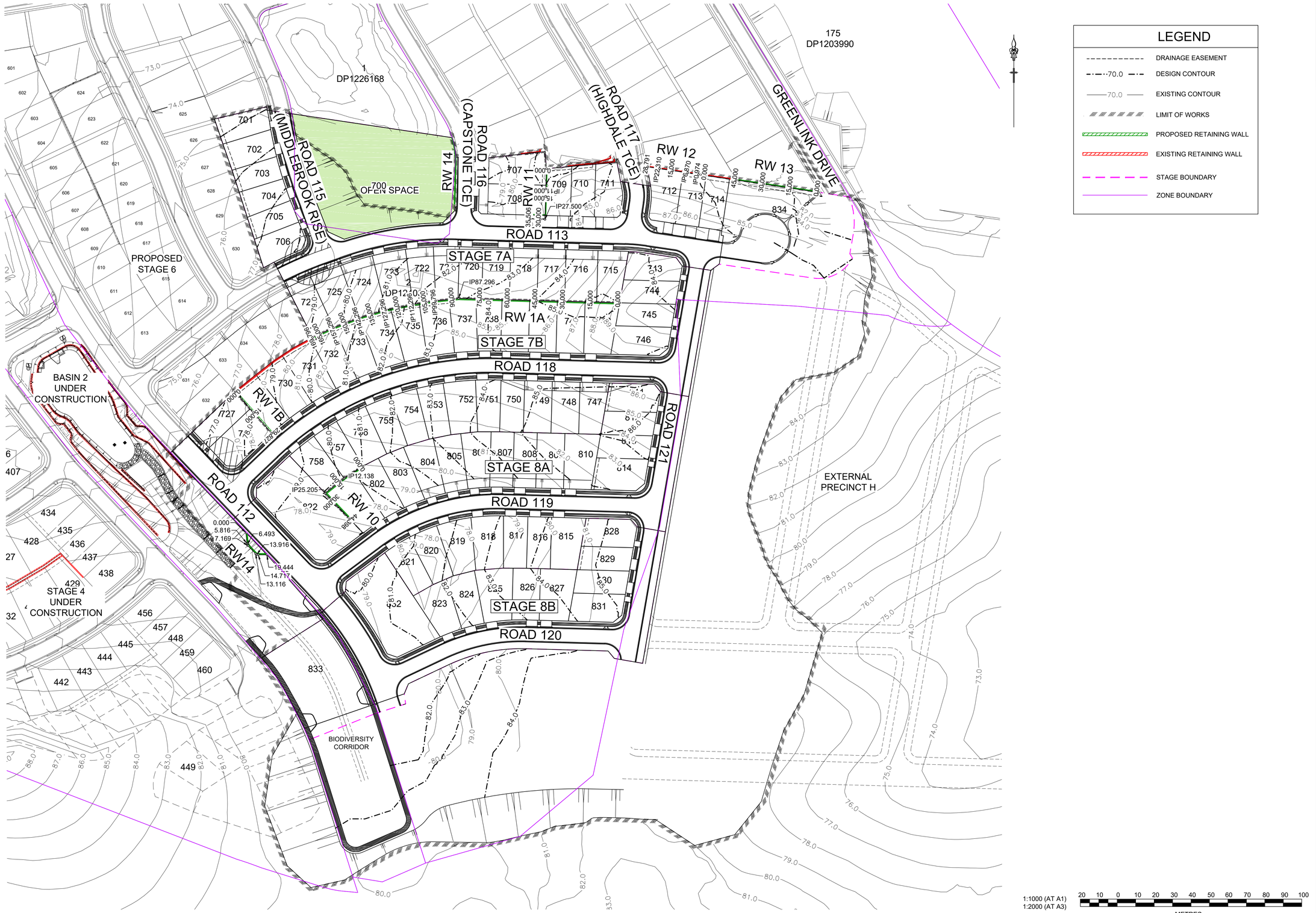
PROJECT No: 9784-13

SHEET No: DA006

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA006 | B

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B	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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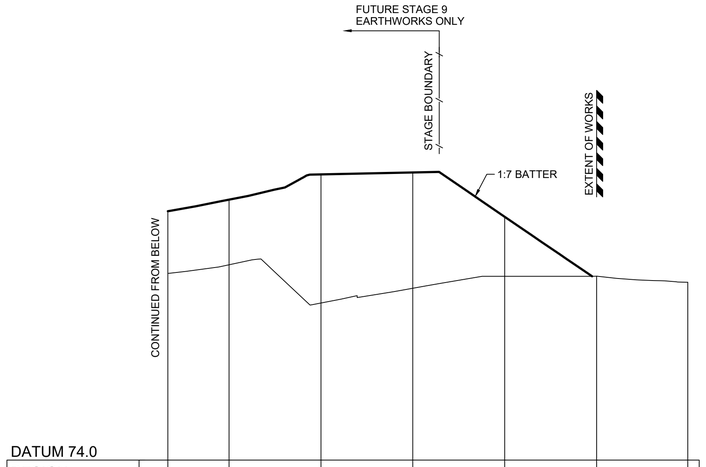
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
RETAINING WALL PLAN

PROJECT No: 9784-13

SHEET No: DA007

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA007 | B

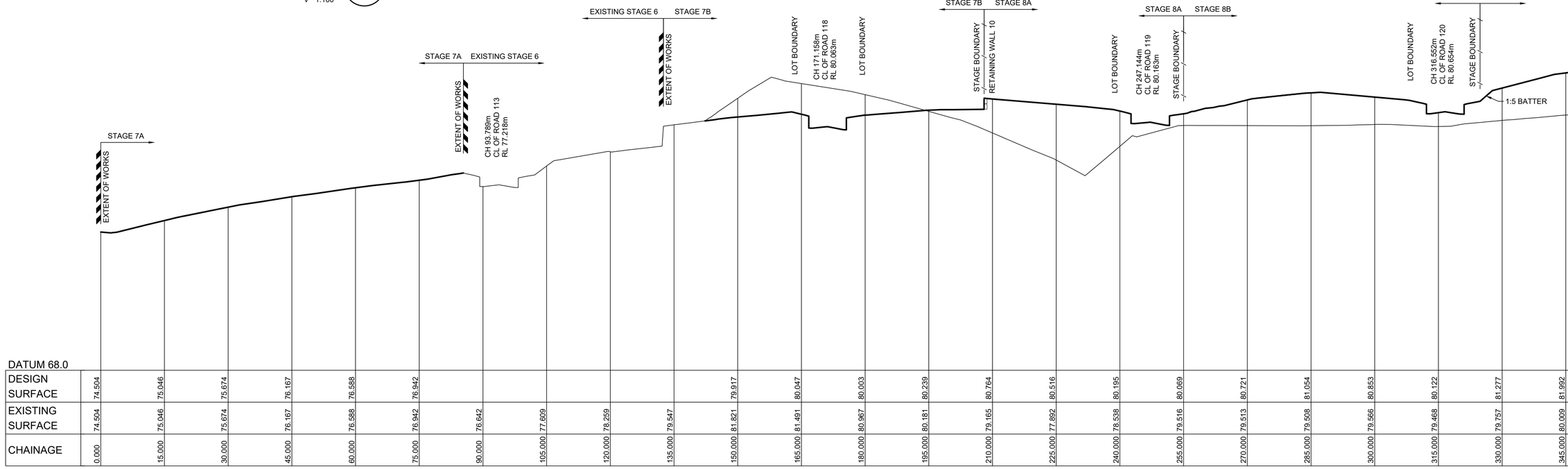
Document Set ID: 9864728
Version: 1, Version Date: 27/02/2022



DATUM 74.0

DESIGN SURFACE	82.124	82.503	83.324	83.388	81.942	79.899	
EXISTING SURFACE	80.092	80.375	79.126	79.611	80.000	80.004	79.803
CHAINAGE	350.000	360.000	375.000	390.000	405.000	420.000	434.881

SECTION A
SCALE H 1:500 V 1:100 DA002



DATUM 68.0

DESIGN SURFACE	74.504	75.046	75.674	76.167	76.588	76.942	79.917	80.047	80.003	80.239	80.764	80.516	80.195	80.069	80.721	81.054	80.853	80.122	81.277	81.992	82.124						
EXISTING SURFACE	74.504	75.046	75.674	76.167	76.588	76.942	76.642	77.609	78.259	79.547	81.821	81.491	80.967	80.181	79.165	77.892	78.538	79.516	79.513	79.508	79.566	79.468	79.757	80.009	80.092		
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	165.000	180.000	195.000	210.000	225.000	240.000	255.000	270.000	285.000	300.000	315.000	330.000	345.000	350.000		

SECTION A
SCALE H 1:500 V 1:100 DA002

H 1:500 (AT A1) 10 0 10 20 30 40 50 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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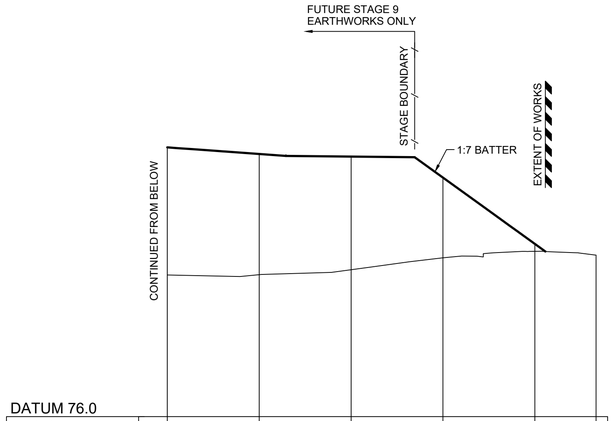
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SITE SECTIONS
SHEET 1

PROJECT No: 9784-13
SHEET No: DA010

AZIMUTH: M.G.A. DATUM: A.H.D. ORIGIN: PLAN No: 9784-13-DA010 B

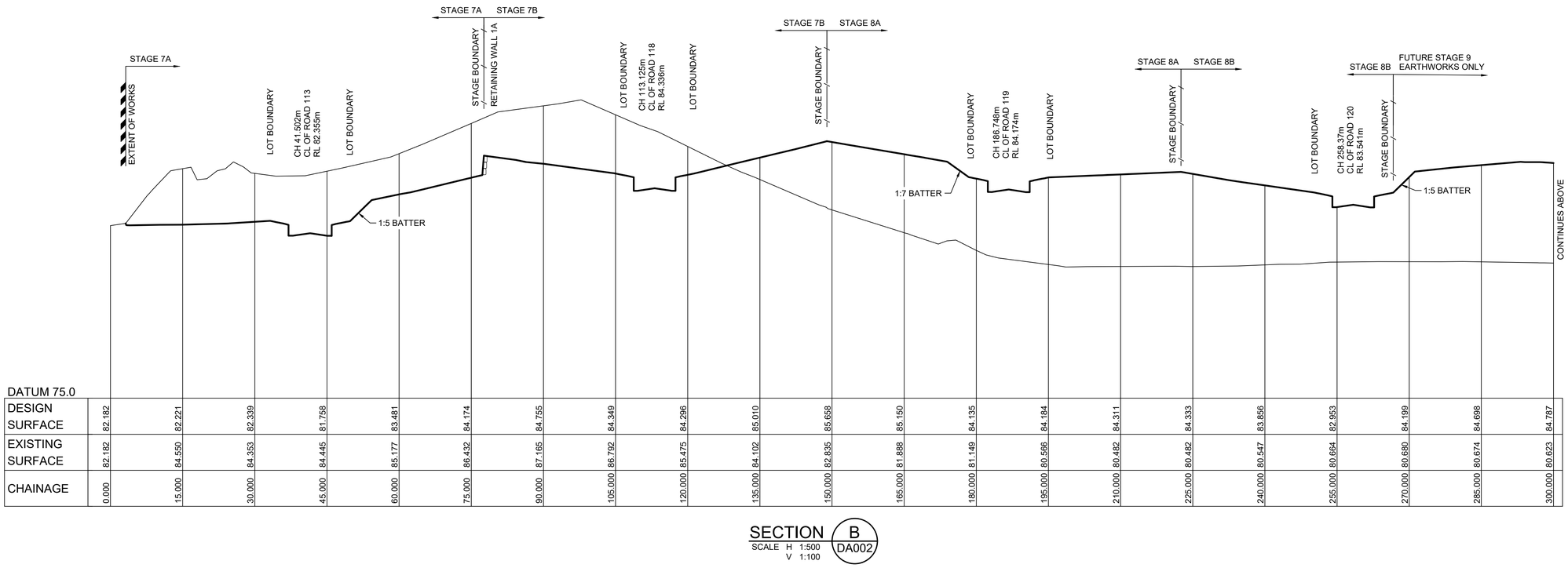
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Document Set ID: 9884738
Version: 1, Version Date: 27/02/2022



DATUM 76.0							
DESIGN SURFACE	84.787	84.572	84.488	83.800	81.636		
EXISTING SURFACE	80.623	80.633	80.794	81.182	81.394	81.270	
CHAINAGE	300.000	315.000	330.000	345.000	360.000	370.000	

SECTION B
SCALE H 1:500
V 1:100
DA002



DATUM 75.0																										
DESIGN SURFACE	82.182	82.221	82.339	81.758	83.481	84.174	84.755	84.349	84.296	85.010	85.658	85.150	84.135	84.184	84.311	84.333	83.856	82.953	84.199	84.698	84.787					
EXISTING SURFACE	82.182	84.550	84.353	84.445	85.177	86.432	87.165	86.792	85.475	84.102	82.835	81.888	81.149	80.586	80.482	80.482	80.547	80.664	80.680	80.674	80.623					
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	165.000	180.000	195.000	210.000	225.000	240.000	255.000	270.000	285.000	300.000					

SECTION B
SCALE H 1:500
V 1:100
DA002

H 1:500 (AT A1) 10 0 10 20 30 40 50 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SITE SECTIONS
SHEET 2

PROJECT No: 9784-13
SHEET No: DA011

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA011 | B

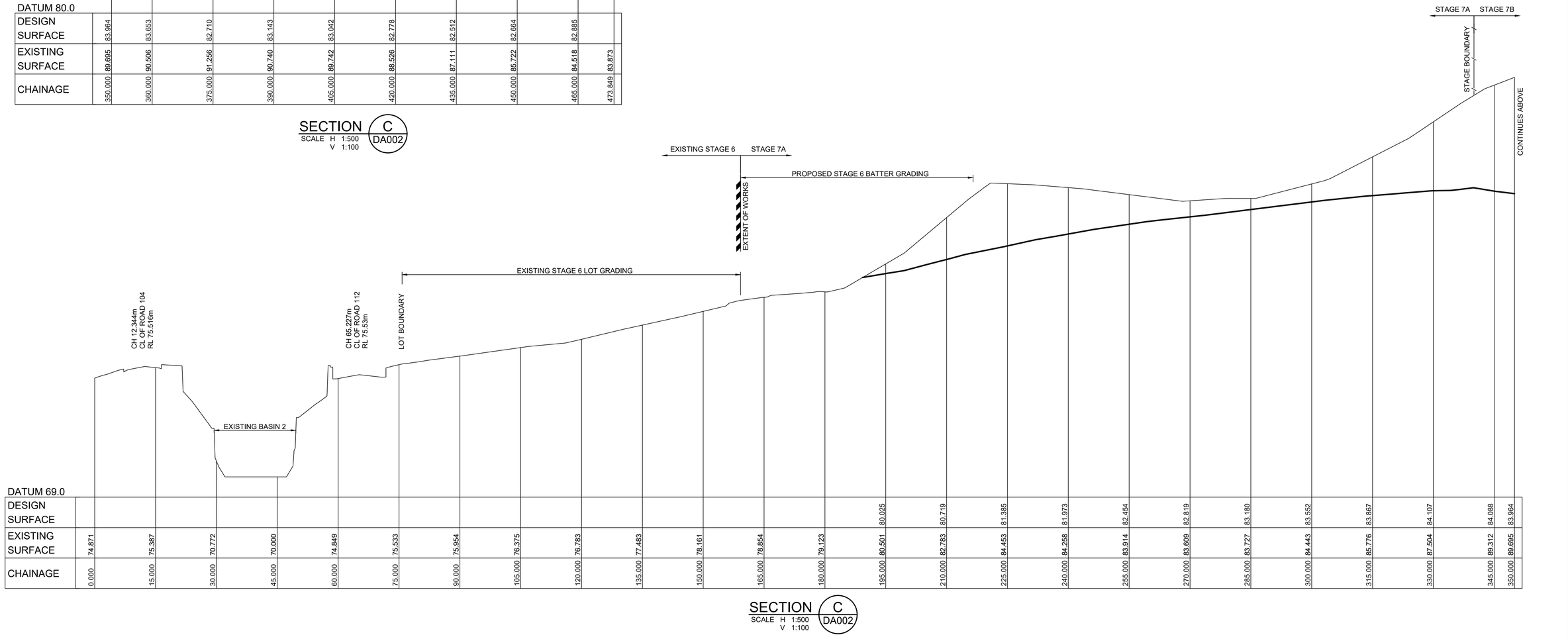
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Document Set ID: 9954738
Version: 1, Version Date: 27/02/2022

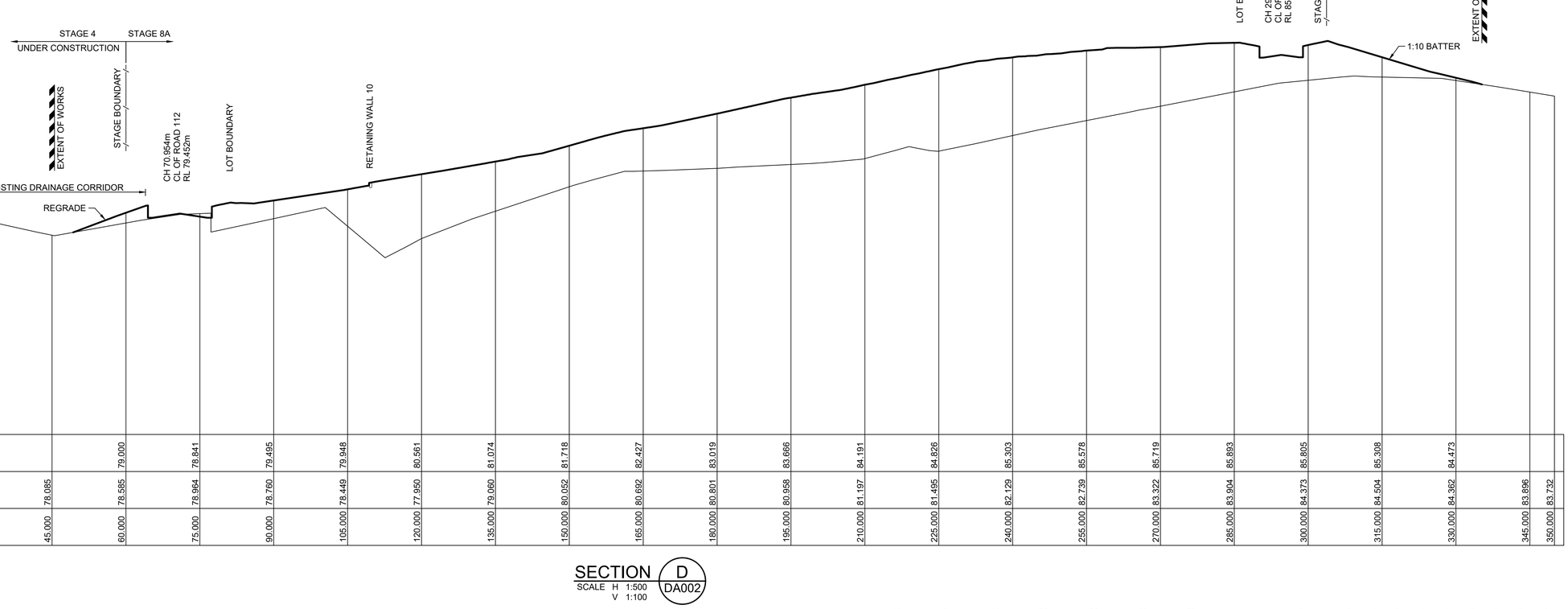


DATUM 80.0										
DESIGN SURFACE	83.964	83.653	82.710	83.143	83.042	82.778	82.512	82.664	82.885	
EXISTING SURFACE	89.695	90.506	91.256	90.740	89.742	88.526	87.111	85.722	84.518	83.873
CHAINAGE	350.000	360.000	375.000	390.000	405.000	420.000	435.000	450.000	465.000	473.849

SECTION C DA002
SCALE H 1:500
V 1:100



| DATUM 69.0 | | | | | | | | | |



DATUM 70.0

DESIGN SURFACE							79.000		78.841		79.495		79.948		80.561		81.074		81.718		82.427		83.019		83.666		84.191		84.826		85.303		85.578
EXISTING SURFACE	79.702		78.816		78.739		78.085		78.585		78.964		78.760		78.449		77.950		79.060		80.052		80.692		80.801		80.958		81.197		81.495		82.129		82.739
CHAINAGE	0.000		15.000		30.000		45.000		60.000		75.000		90.000		105.000		120.000		135.000		150.000		165.000		180.000		195.000		210.000		225.000		240.000		255.000

DESIGN SURFACE	85.719		85.893		85.805		85.308		84.473																						
EXISTING SURFACE	83.322		83.904		84.373		84.504		84.362		83.896		83.732																		
CHAINAGE	270.000		285.000		300.000		315.000		330.000		345.000		350.000																		

SECTION D
SCALE H 1:500 DA002
V 1:100

H 1:500 (AT A1) 10 0 10 20 30 40 50 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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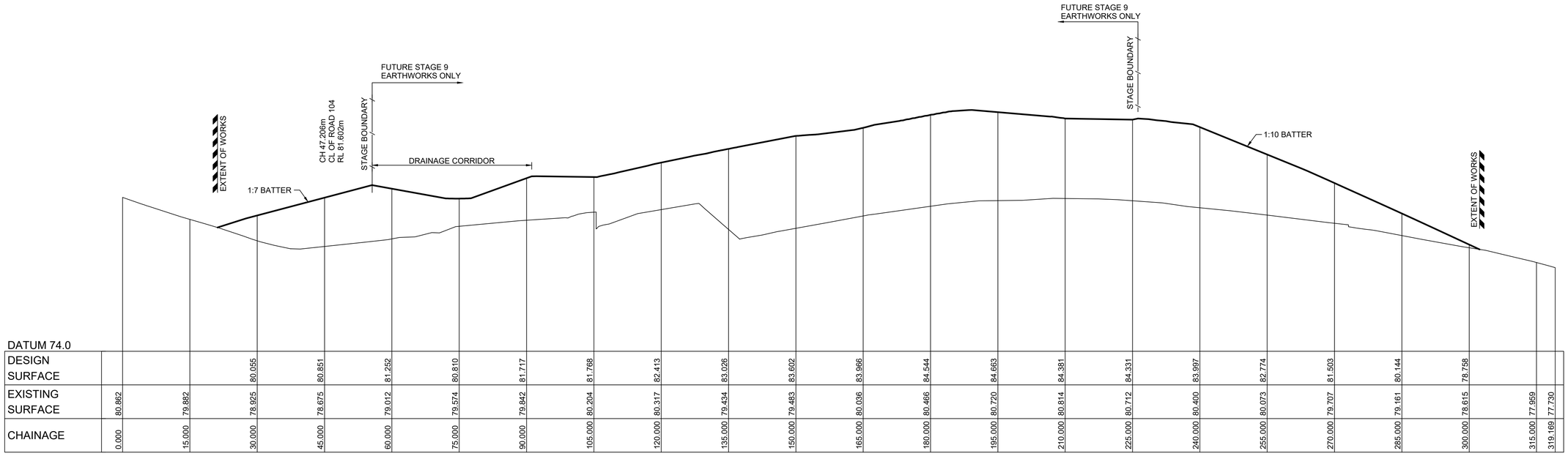
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SITE SECTIONS
SHEET 4

PROJECT No: 9784-13
SHEET No: DA013

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA013 | A

Plotted: 6 September, 2021 1:40:37 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA013.dwg

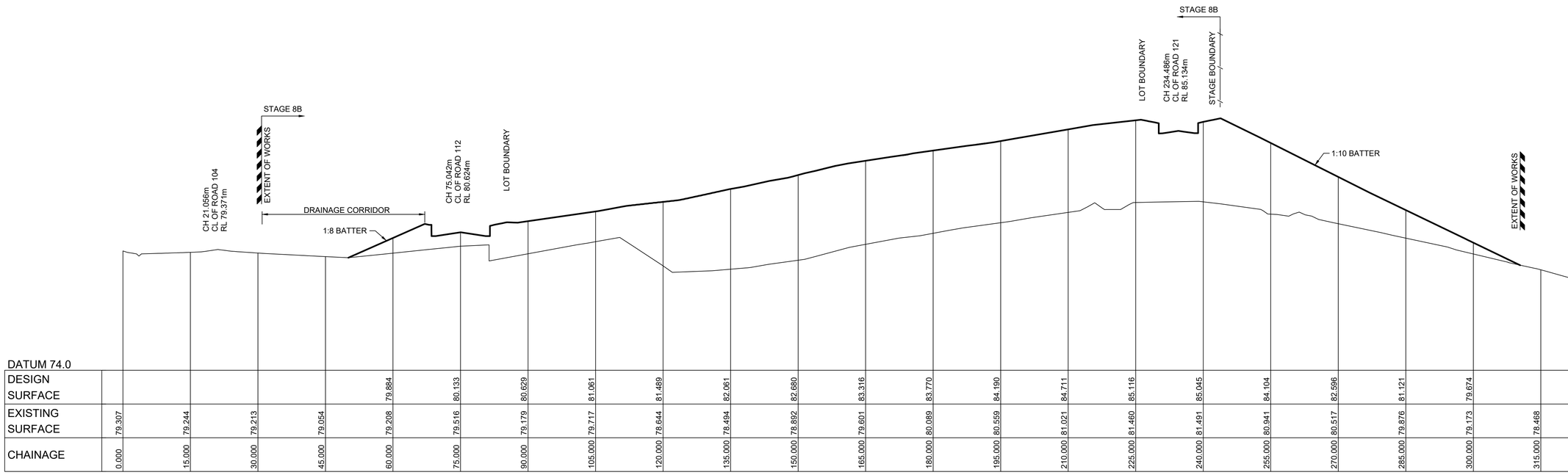
Document Set ID: 9864728
Version: 1, Version Date: 27/02/2022



DATUM 74.0

DESIGN SURFACE				80.055	80.851	81.252	80.810	81.717	81.768	82.413	83.026	83.602	83.966	84.544	84.663	84.381	84.331	83.997	82.774	81.503	80.144	78.758										
EXISTING SURFACE	80.862	79.882	79.925	78.675	79.012	79.574	79.842	80.204	80.317	79.434	79.483	80.036	80.466	80.720	80.814	80.712	80.400	80.073	79.707	79.161	78.615	77.959	77.730									
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	165.000	180.000	195.000	210.000	225.000	240.000	255.000	270.000	285.000	300.000	315.000	319.169									

SECTION F
SCALE H 1:500
V 1:100
DA002



DATUM 74.0

DESIGN SURFACE					79.884	80.133	80.629	81.061	81.489	82.061	82.680	83.316	83.770	84.190	84.711	85.116	85.045	84.104	82.596	81.121	79.674												
EXISTING SURFACE	79.307	79.244	79.213	79.054	79.208	79.516	79.179	79.717	78.644	78.494	78.892	79.601	80.089	80.559	81.021	81.460	81.491	80.941	80.517	79.876	79.173	78.468	77.535	77.095								
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	165.000	180.000	195.000	210.000	225.000	240.000	255.000	270.000	285.000	300.000	315.000	330.000	337.107								

SECTION E
SCALE H 1:500
V 1:100
DA002

H 1:500 (AT A1) 10 0 10 20 30 40 50 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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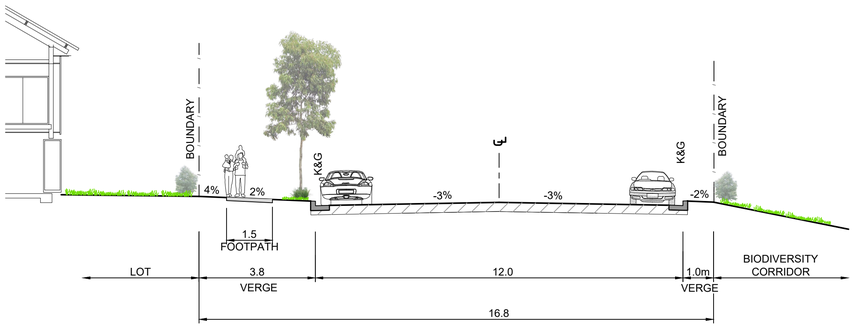
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
SITE SECTIONS
SHEET 5

PROJECT No: 9784-13
SHEET No: DA014

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA014 | B

Plotted: 6 September , 2021 1:41:18 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA014.dwg

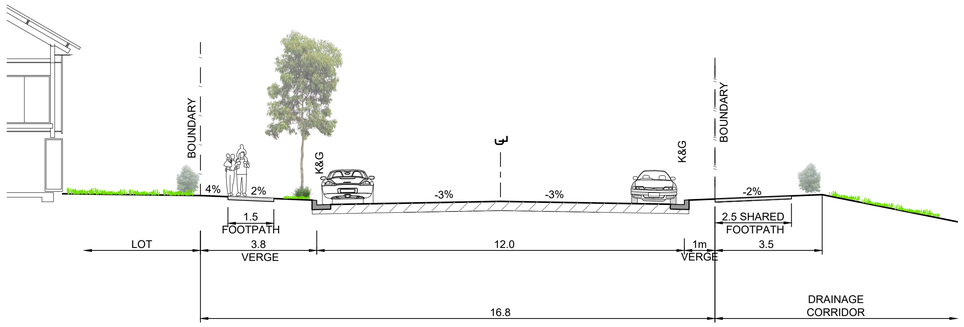
Document Set ID: 9864728
Version: 1, Version Date: 27/02/2022



TYPICAL CROSS SECTION

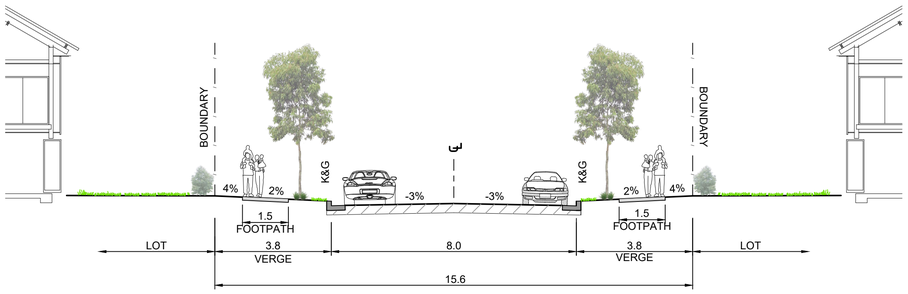
ROAD No.112
(CH 270.0 - CH 387.0)
SCALE 1:100 NAT

C



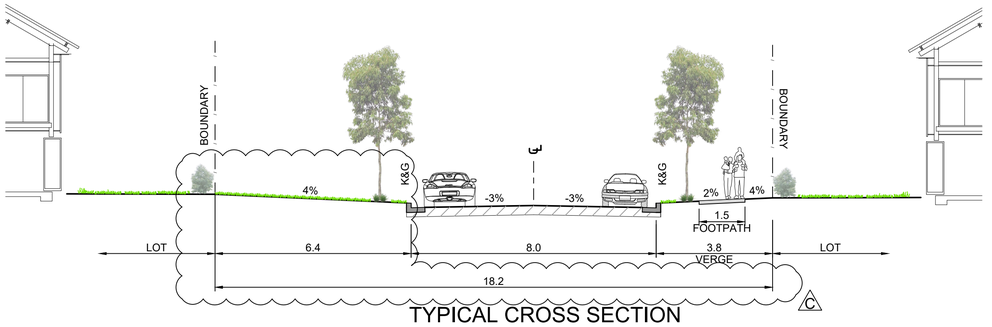
TYPICAL CROSS SECTION

ROAD No.112
(CH 387.0 - CH 455.0)
SCALE 1:100 NAT



TYPICAL CROSS SECTION

ROAD No.113
(CH 102.0-CH 140.7)
(CH 193.6 - 345.0)
ROAD NO. 117 (HIGHDALE TERRACE)
(CH 33.7 - END)
ROAD No.118,119
(START - END)
SCALE 1:100 NAT



TYPICAL CROSS SECTION

ROAD No.113
(CH 193.6 - 345.0)
SCALE 1:100 NAT

1:100 (AT A1)
1:200 (AT A3)

2 1 0 1 2 3 4 5 6 7 8 9 10
METRES

C	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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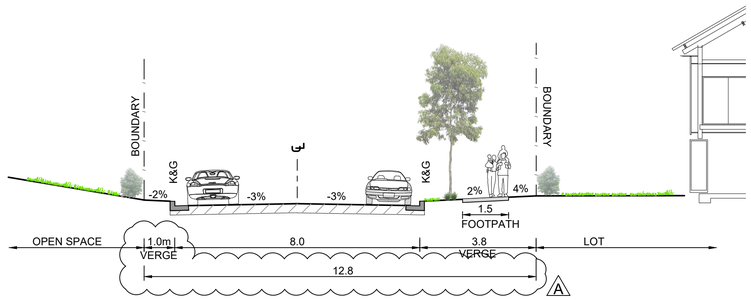
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
TYPICAL SECTIONS
SHEET 1

PROJECT No: 9784-13
SHEET No: DA015

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA015 | C

Plotted: 17 December 2021 10:19:34 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA015.dwg

Document Set ID: 9854738
Version: 1, Version Date: 27/02/2022



TYPICAL CROSS SECTION

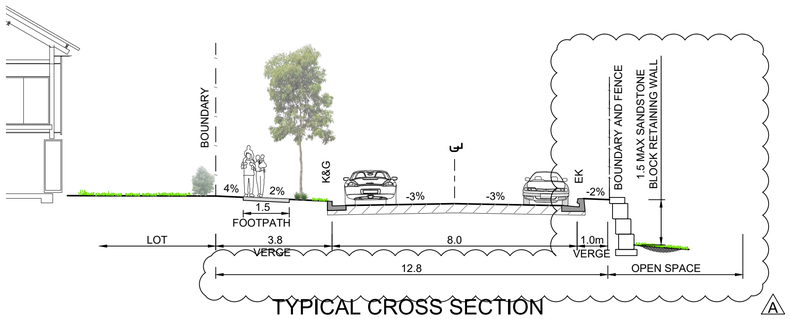
ROAD No. 115 (MIDDLEBROOK RISE)

(CH 30.0-END)

ROAD No. 113

(CH 140.7-193.6)

SCALE 1:100 NAT

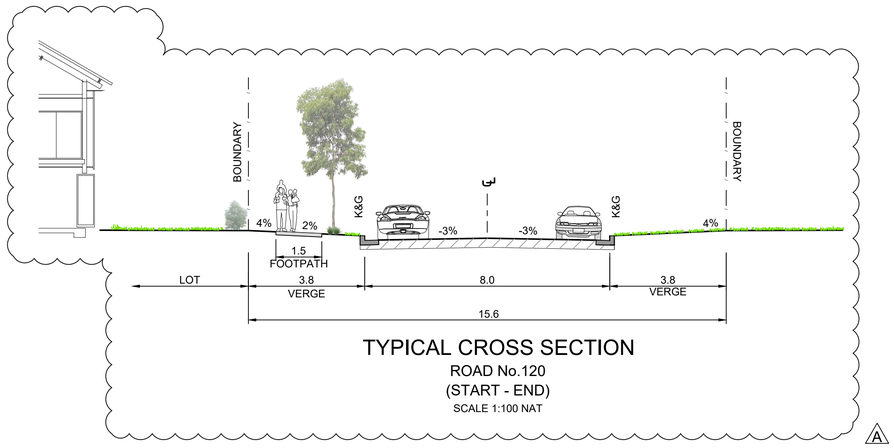


TYPICAL CROSS SECTION

ROAD No. 116 (CAPSTONE TERRACE)

(CH 12.13-END)

SCALE 1:100 NAT

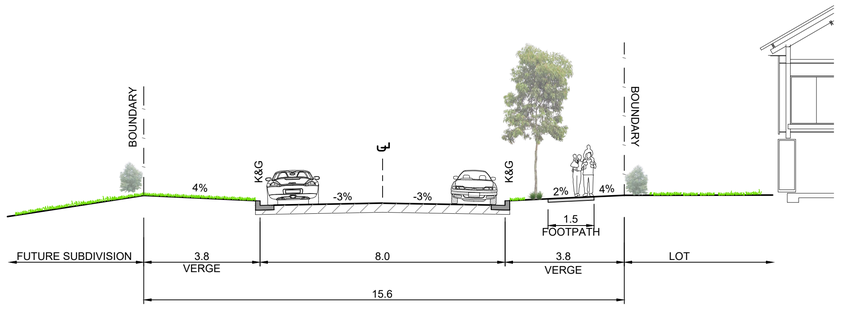


TYPICAL CROSS SECTION

ROAD No.120

(START - END)

SCALE 1:100 NAT



TYPICAL CROSS SECTION

ROAD No. 121

(START - CH 227.82)

SCALE 1:100 NAT

1:100 (AT A1)
1:200 (AT A3)

2 1 0 1 2 3 4 5 6 7 8 9 10

METRES

A	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
TYPICAL SECTIONS
SHEET 2

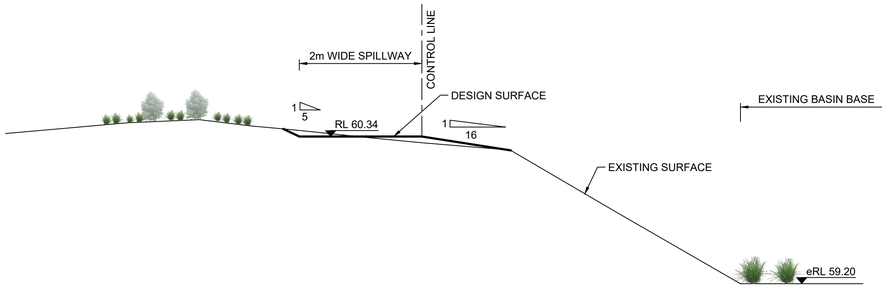
PROJECT No: 9784-13

SHEET No: DA015A

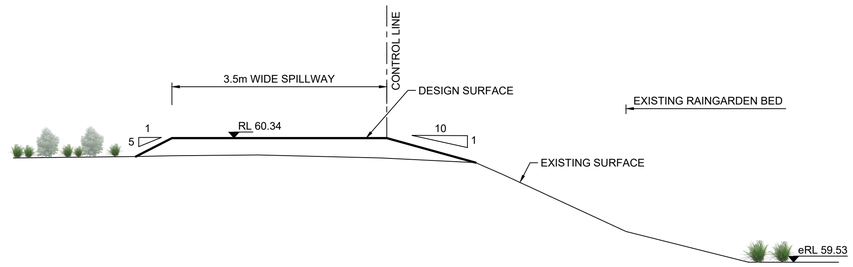
AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA015A | A

Plotted: 17 December , 2021 10:21:36 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA015A.dwg

Document Set ID: 9954738
Version: 1, Version Date: 27/02/2022



BASIN TOB SECTION A
SCALE H 1:50
V 1:20
DA006



BASIN TOB SECTION B
SCALE H 1:50
V 1:20
DA006

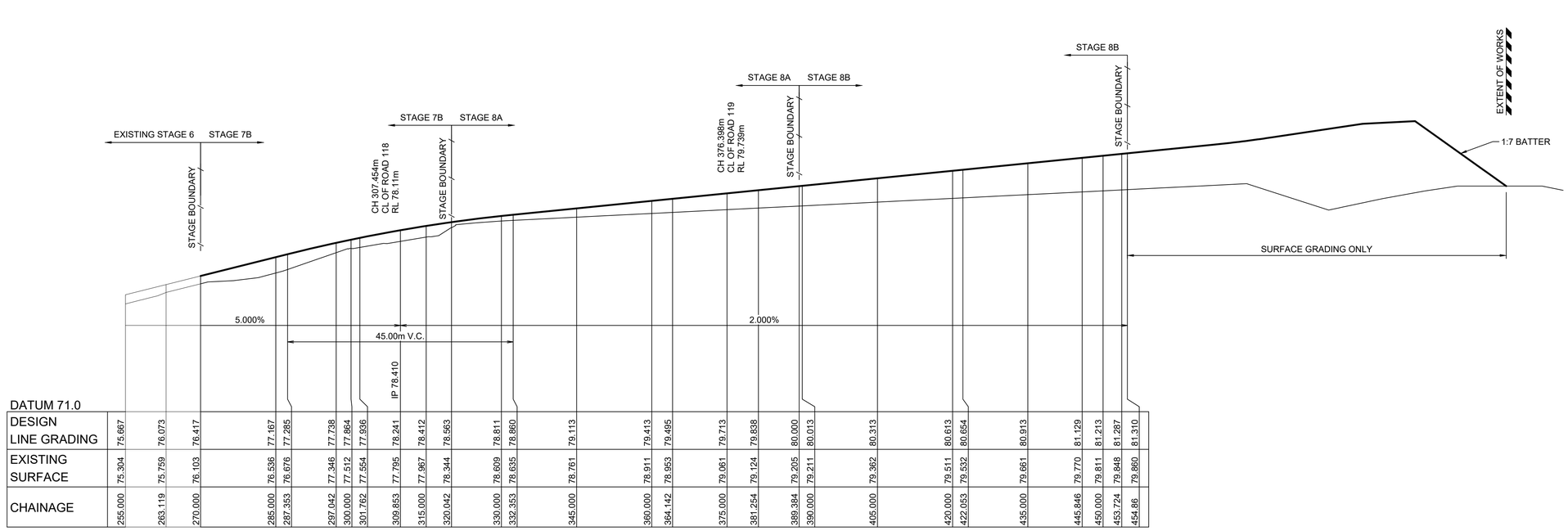
SPILLWAY

-2.000% | 0.000% | 2.000% | 0.000%

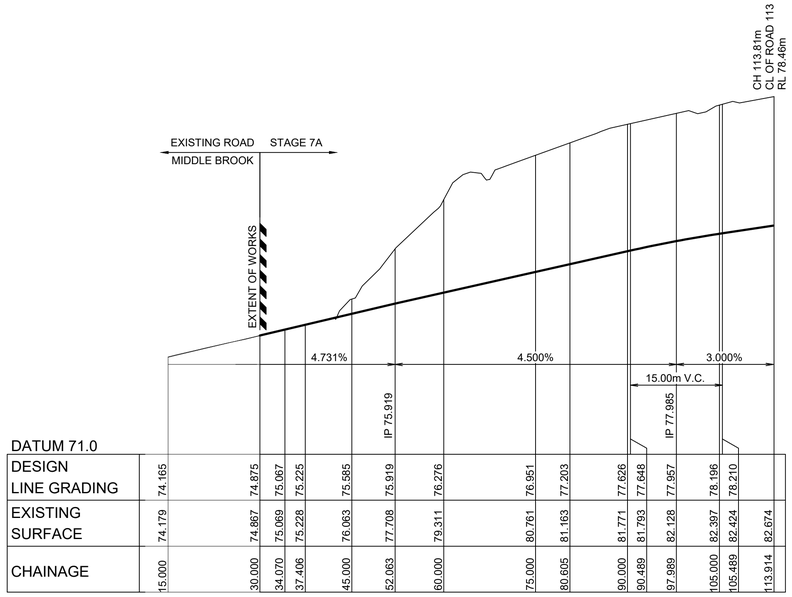
IP 60.340 | IP 60.340 | IP 60.500

DATUM 53.0

| | | |

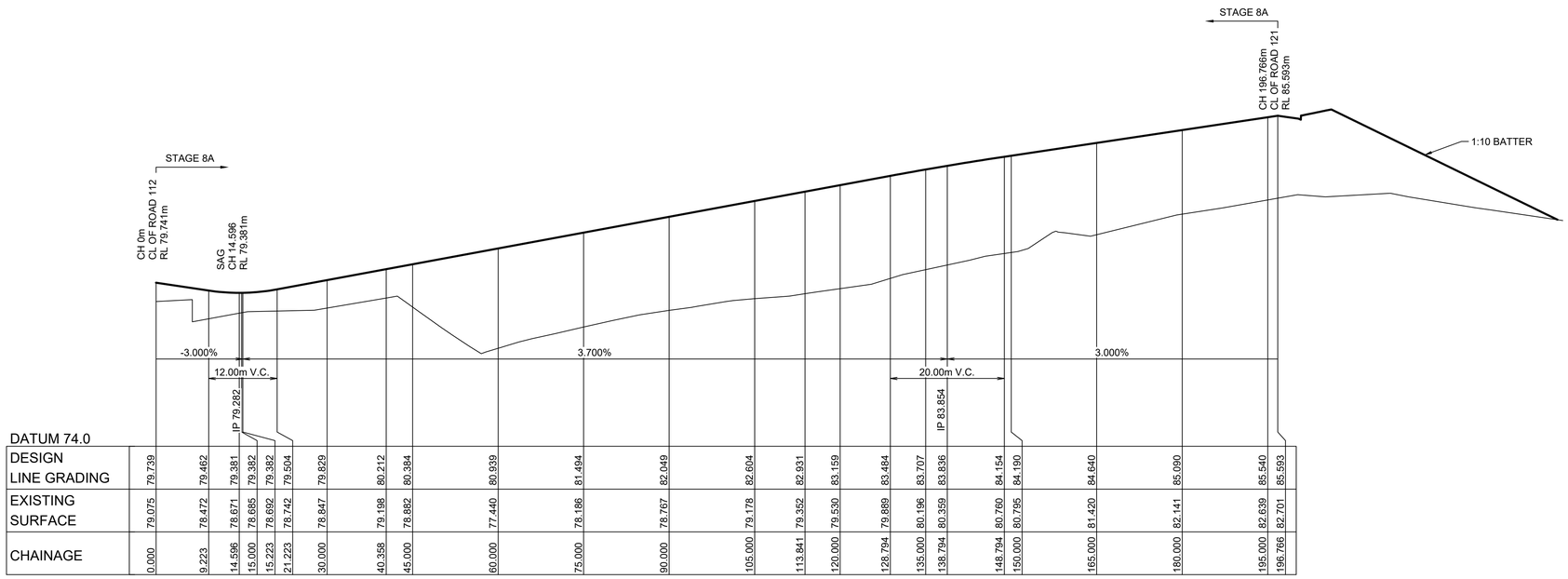

EXISTING STAGE 6
STAGE 7B
STAGE 8A
STAGE 8B
STAGE BOUNDARY
CH 307.454m
CL OF ROAD 118
RL 78.11m
CH 376.398m
CL OF ROAD 119
RL 79.739m
EXTENT OF WORKS
1:7 BATTER
SURFACE GRADING ONLY
5.000%
2.000%
45.00m V.C.
IP 78.410

| DATUM 71.0 | | |


EXISTING ROAD
MIDDLE BROOK
STAGE 7A
EXTENT OF WORKS
CH 113.81m
CL OF ROAD 113
RL 78.46m
4.731%
4.500%
3.000%
15.00m V.C.
IP 75.919
IP 77.985

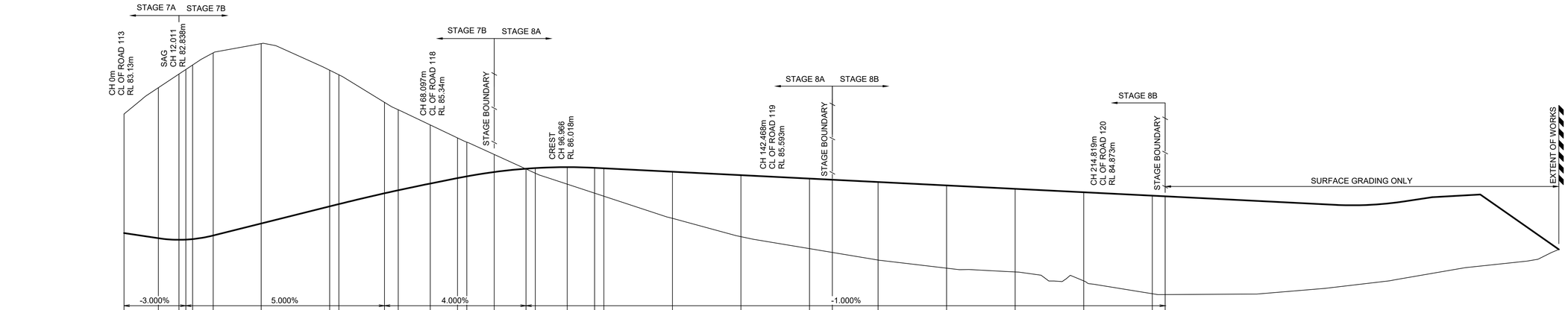
DATUM 71.0

| | | |


STAGE 8A
CH 196.766m
CL OF ROAD 121
RL 85.593m
1:10 BATTER
STAGE 8A
CH 0m
CL OF ROAD 112
RL 79.741m
SAG
CH 14.596
RL 79.381m
-3.000%
3.700%
3.000%
12.00m V.C.
20.00m V.C.
IP 79.282
IP 83.854

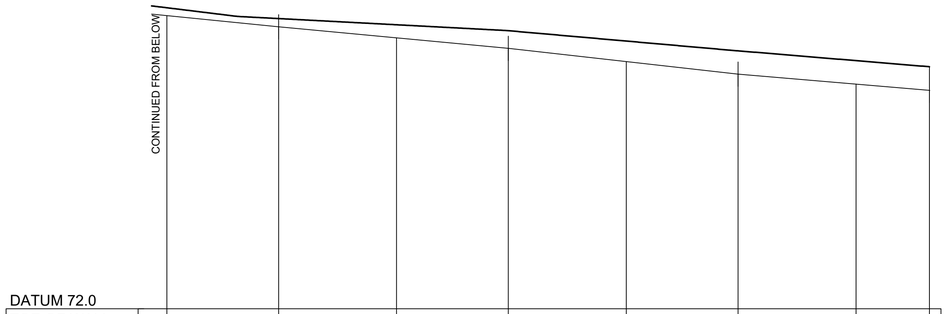
DATUM 74.0

| | | |


STAGE 7A
STAGE 7B
STAGE 8A
STAGE 8B
CH 0m
CL OF ROAD 113
RL 83.13m
SAG
CH 12.011
RL 82.838m
CH 68.097m
CL OF ROAD 118
RL 85.34m
STAGE BOUNDARY
CREST
CH 96.966
RL 86.018m
CH 142.468m
CL OF ROAD 119
RL 85.593m
CH 214.819m
CL OF ROAD 120
RL 84.873m
SURFACE GRADING ONLY
EXTENT OF WORKS
-3.000%
5.000%
4.000%
-1.000%
12.00m V.C.
20.00m V.C.
30.00m V.C.
IP 82.725
IP 84.899
IP 86.138

DATUM 77.0

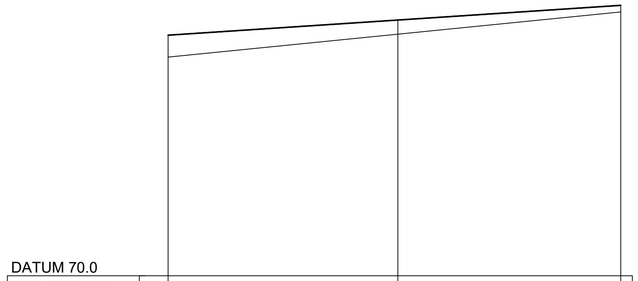
| | | |



DATUM 72.0								
TOE OF WALL GROUND LEVELS	81.568	81.201	80.840	80.498	80.066	79.656	79.330	79.126
TOP OF WALL GROUND LEVELS	81.824	81.471	81.269	81.076	80.737	80.418	80.098	79.899
CHAINAGE	120.000	127.304	135.000	142.296	150.000	157.296	165.000	169.796

LONGITUDINAL SECTION RETAINING WALL 1A

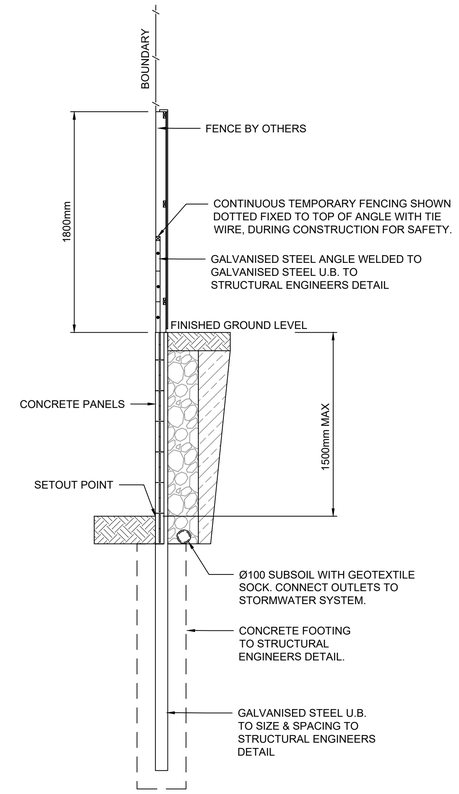
HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100



DATUM 70.0			
TOE OF WALL GROUND LEVELS	77.135	77.884	78.611
TOP OF WALL GROUND LEVELS	77.851	78.346	78.826
CHAINAGE	0.000	15.000	29.559

LONGITUDINAL SECTION RETAINING WALL 1B

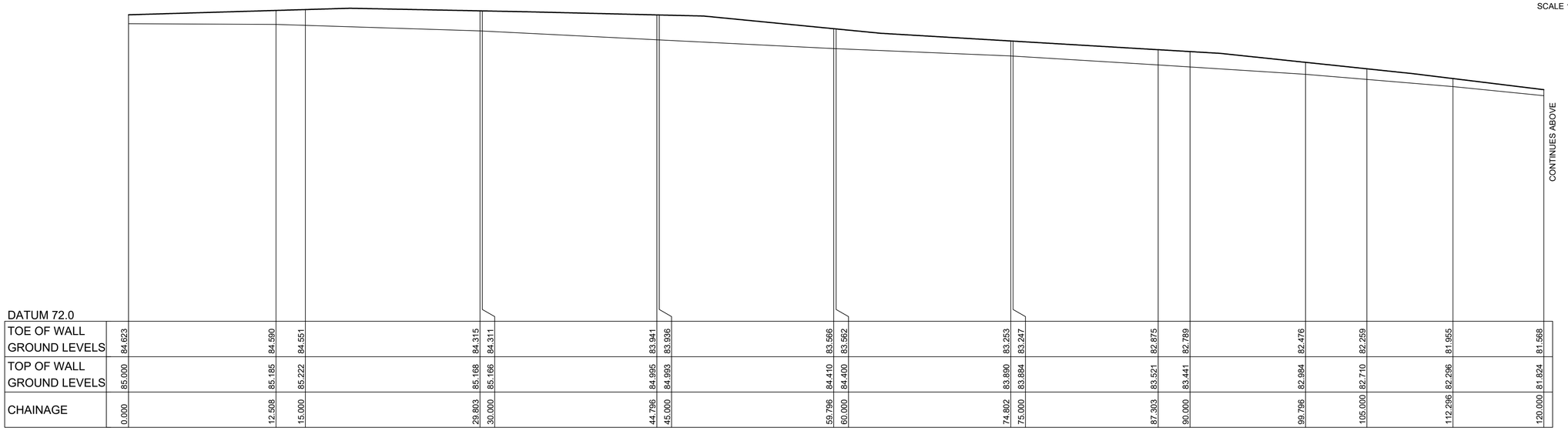
HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100



RETAINING WALL STANDARD DETAIL SECTION

SINGLE TIER CONCRETE I-BEAM

SCALE 1:25



DATUM 72.0																								
TOE OF WALL GROUND LEVELS	84.623	84.590	84.551	84.315	84.311	83.941	83.936	83.566	83.562	83.253	83.247	82.875	82.789	82.476	82.259	81.955	81.568							
TOP OF WALL GROUND LEVELS	85.000	85.185	85.222	85.168	85.166	84.995	84.993	84.410	84.400	83.890	83.884	83.521	83.441	82.984	82.710	82.296	81.824							
CHAINAGE	0.000	12.508	15.000	29.803	30.000	44.796	45.000	59.796	60.000	74.802	75.000	87.303	90.000	99.796	105.000	112.296	120.000							

LONGITUDINAL SECTION RETAINING WALL 1A

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100

H 1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

1:25(AT A1) 500 0 500 1000 1500 2000 2500 MILLIMETRES

B	ISSUED FOR DEVELOPMENT APPLICATION	CC	NA	MS	RO	15/04/21
A	ISSUED FOR CLIENT REVIEW	CC	NAF	MS	RO	19/11/20
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
RETAINING WALL LONGITUDINAL AND STANDARD DETAIL SECTIONS
SHEET 1

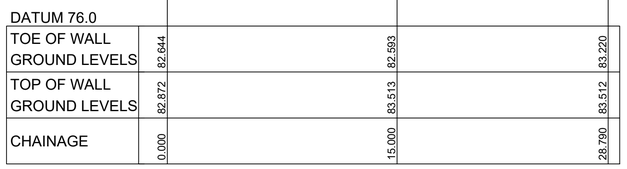
PROJECT No: 9784-13

SHEET No: DA024

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA024 | B

Plotted: 6 September , 2021 1:46:22 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA024.dwg

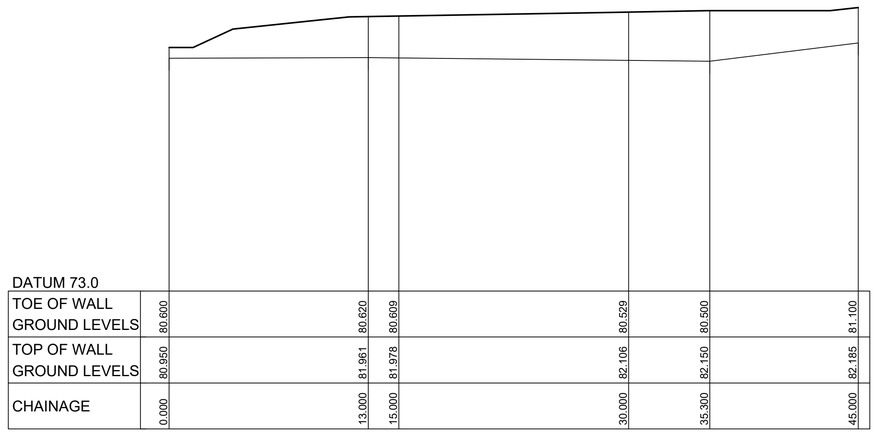
Document Set ID: 9854738
Version: 1, Version Date: 21/02/2022



DATUM 76.0			
TOE OF WALL GROUND LEVELS	82.644	82.593	83.220
TOP OF WALL GROUND LEVELS	82.872	83.513	83.512
CHAINAGE	0.000	15.000	28.790

LONGITUDINAL SECTION RW 12 (EXISTING)

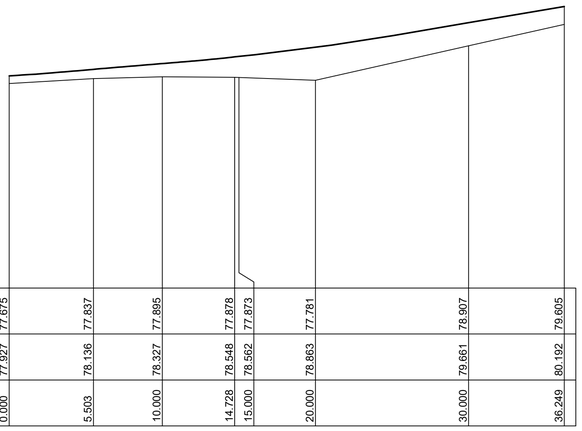
HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100



DATUM 73.0						
TOE OF WALL GROUND LEVELS	80.600	80.620	80.609	80.529	80.500	81.100
TOP OF WALL GROUND LEVELS	80.950	81.961	81.978	82.106	82.150	82.185
CHAINAGE	0.000	13.000	15.000	30.000	35.300	45.000

LONGITUDINAL SECTION RW 13 (EXISTING)

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100

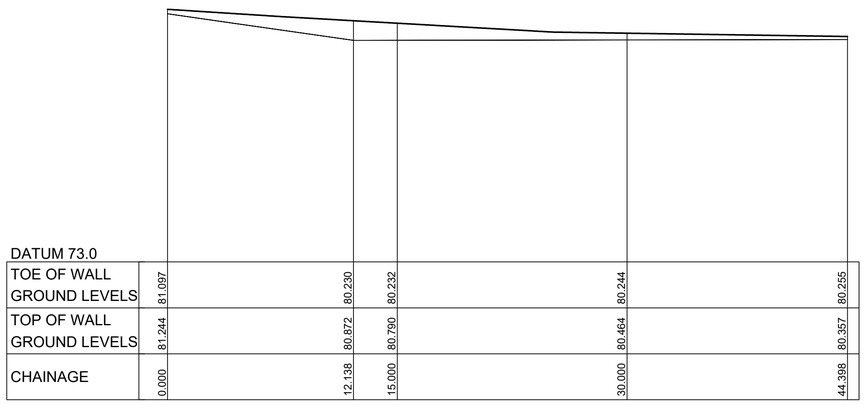


DATUM 71.0							
TOE OF WALL GROUND LEVELS	77.675	77.837	77.895	77.878	77.873	77.781	78.907	79.605
TOP OF WALL GROUND LEVELS	77.927	78.136	78.327	78.548	78.562	78.863	79.661	80.192
CHAINAGE	0.000	5.503	10.000	14.728	15.000	20.000	30.000	36.249

LONGITUDINAL SECTION RW 14

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100

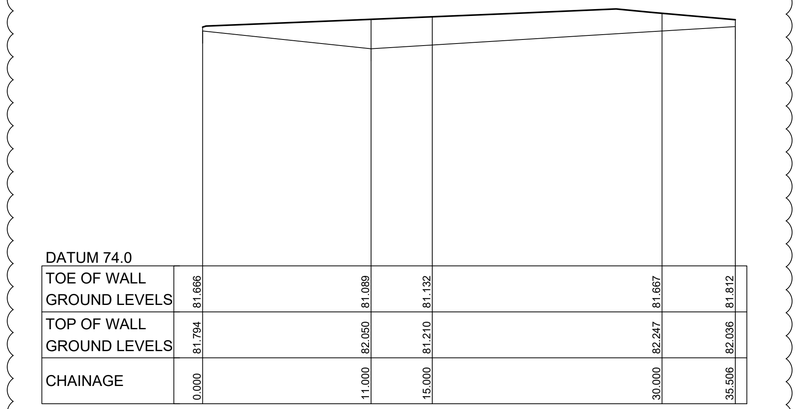
B



DATUM 73.0					
TOE OF WALL GROUND LEVELS	81.097	80.230	80.232	80.244	80.255
TOP OF WALL GROUND LEVELS	81.244	80.872	80.790	80.464	80.357
CHAINAGE	0.000	12.138	15.000	30.000	44.398

LONGITUDINAL SECTION RETAINING WALL 10

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100



DATUM 74.0					
TOE OF WALL GROUND LEVELS	81.666	81.089	81.132	81.667	81.812
TOP OF WALL GROUND LEVELS	81.794	82.050	81.210	82.247	82.036
CHAINAGE	0.000	11.000	15.000	30.000	35.506

LONGITUDINAL SECTION RETAINING WALL 11

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:100

B

H 1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

	AMENDMENT	DES	DRN	CKD	APR	DATE
B	RETAINING WALL 11 AMENDED AND RETAINING WALL 14 ADDED	CC	CC	PK	MS	17/12/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21

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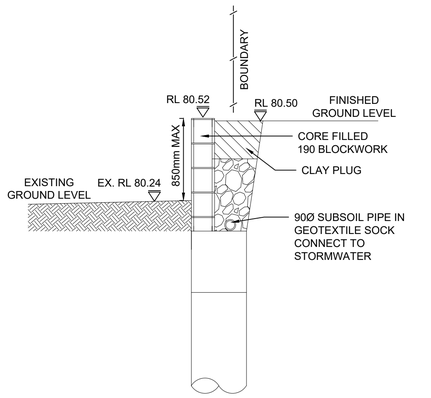
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
RETAINING WALL LONGITUDINAL SECTIONS
SHEET 2

PROJECT No: 9784-13
SHEET No: DA025

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA025 | B

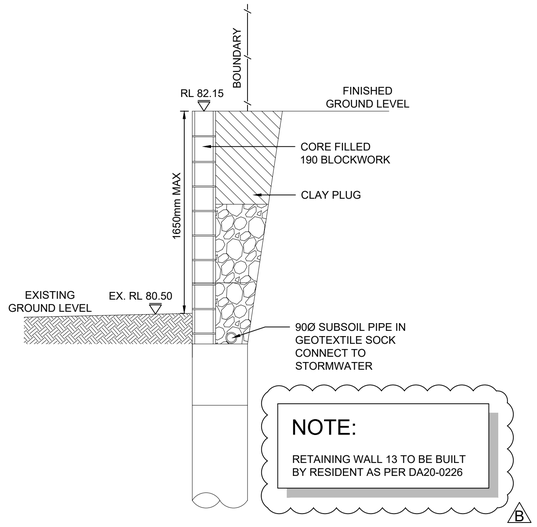
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Document Set ID: 9854738
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LOT 707 EXISTING RW SECTION 5 DA003
SCALE 1:25

B

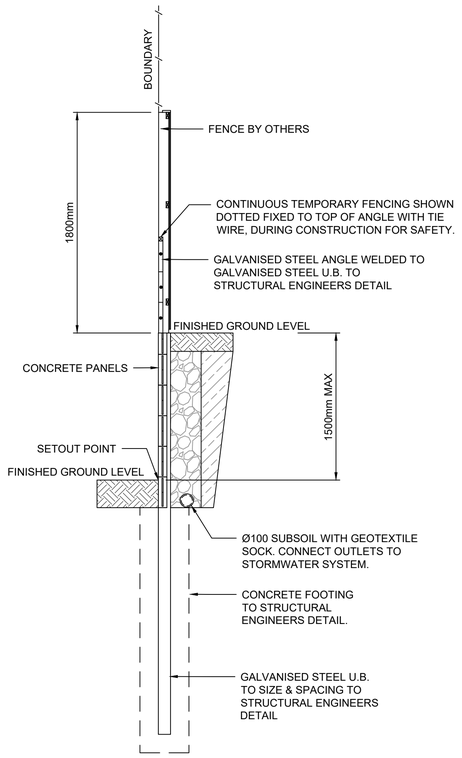


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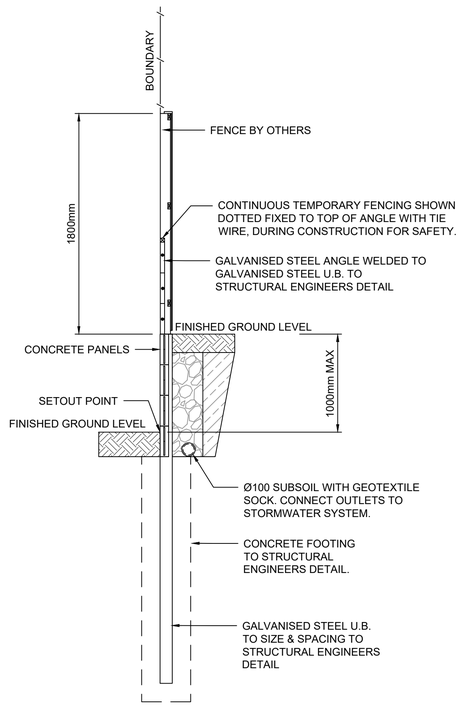
RETAINING WALL 13 TO BE BUILT BY RESIDENT AS PER DA20-0226

B

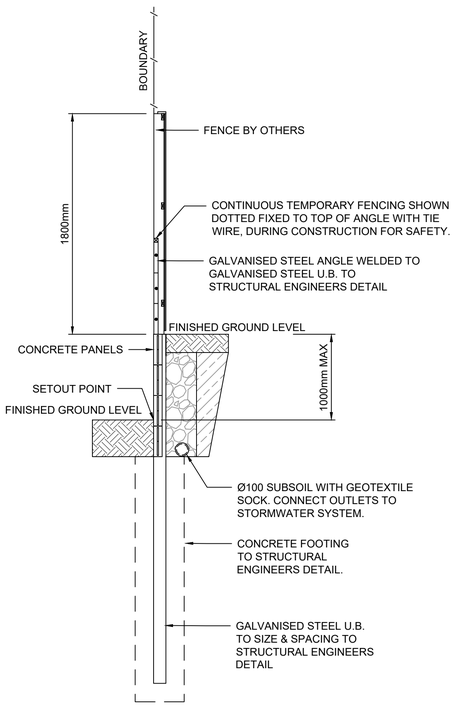
RW 13 SECTION 6 DA003
SCALE 1:25



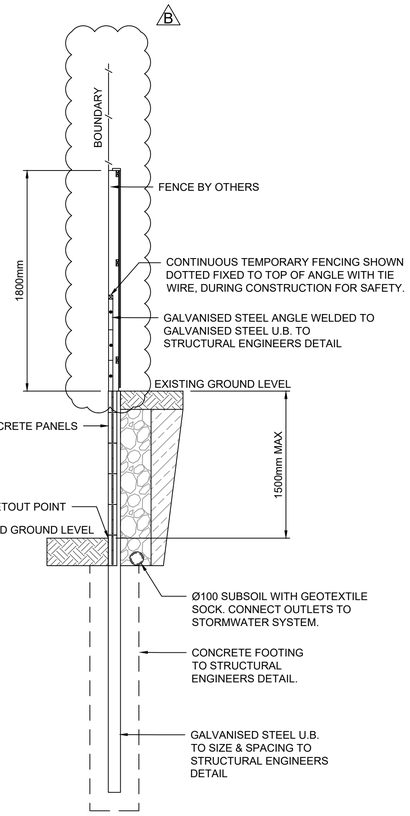
RW 1A SECTION 1 DA003
SCALE 1:25



RW 1B SECTION 2 DA003
SCALE 1:25



RW 10 SECTION 3 DA003
SCALE 1:25



RW 11 SECTION 4 DA003
SCALE 1:25

1:25(AT A1)

500 0 500 1000 1500 2000 2500
MILLIMETRES

B	LOT LAYOUT AMENDED	CC	NM	PK	DJ	17/09/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
RETAINING WALL SECTIONS
SHEET 1

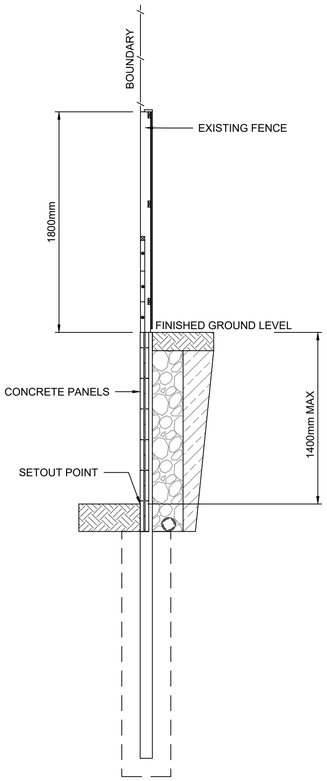
PROJECT No: 9784-13

SHEET No: DA026

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA026 | B

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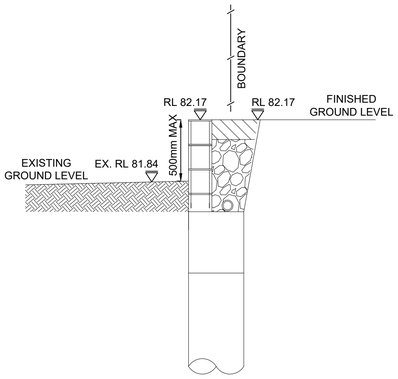
Document Set ID: 9854738
Version: 1, Version Date: 21/02/2022



EXISTING RETAINING WALL STANDARD DETAIL SECTION (7 / DA003)

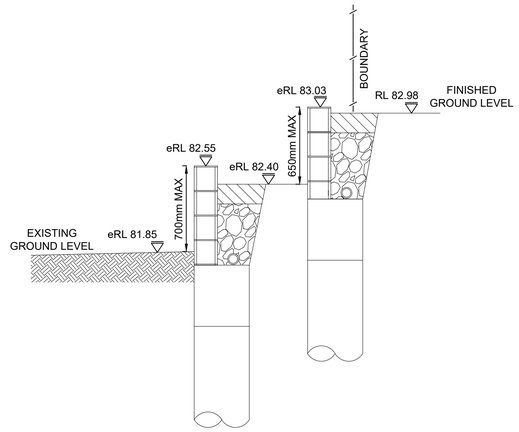
SINGLE TIER CONCRETE I-BEAM

SCALE 1:25



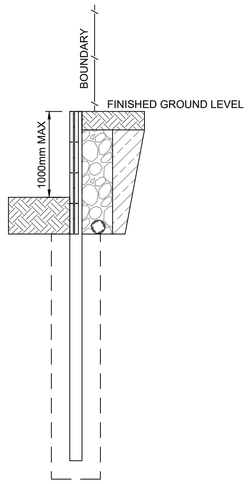
LOT 710 EXISTING RW SECTION (8 / DA003)

SCALE 1:25



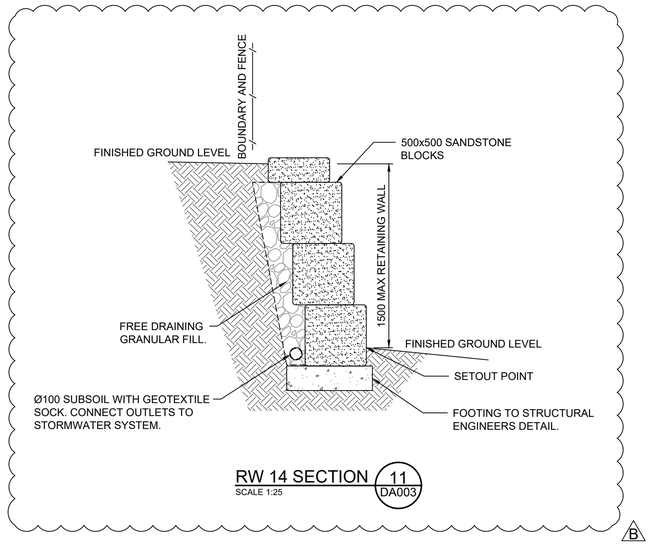
LOT 711 EXISTING RW SECTION (9 / DA003)

SCALE 1:25



EXISTING RW 12 SECTION (10 / DA003)

SCALE 1:25



RW 14 SECTION (11 / DA003)

SCALE 1:25

B

1:25(AT A1)

500 0 500 1000 1500 2000 2500

MILLIMETRES

B	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	17/12/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NM	PK	DJ	17/09/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
RETAINING WALL SECTIONS
SHEET 2

PROJECT No: 9784-13

SHEET No: DA027

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA027 | B

Plotted: 17 December , 2021 10:20:43 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA027.dwg

Document Set ID: 9984738
Version: 1, Version Date: 21/02/2022



NOTES:

1. SURFACES USED IN SHOWING THE CONTOURS ARE THE FOLLOWING:
   a. ALS
   b. THE NORTHERN ROAD WAE SURFACE PROVIDED ON 07/12/2020
   c. VMS SURVEY (07/08/2020)
   d. STAGE 3 DESIGN SURFACE
   e. VMS WAE SURVEY HV STAGE 4 (01/12/20)
   f. STAGE 6, 7, 8, & 9 DESIGN SURFACE
2. THE NORTHERN ROAD WAE LINEWORK INCLUDING MOUNDS WAS RECEIVED FROM TRANSPORT NSW ON 07/12/2020
3. MOUNDS MOVED DUE TO THE NORTHERN ROAD WORKS AND LEVELS AT THE NORTHERN ROAD CHANGED.

1:2000 (AT A1)
1:4000 (AT A3)

50 0 50 100 150 200
METRES

	AMENDMENT	DES	DRN	CKD	APR	DATE
B	LOT LAYOUT AMENDED	CC	NM	PK	MS	17/12/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
NORTHERN ROAD SIGHT LINES LAYOUT PLAN
SIGHT LINE ALIGNMENT 1 TO 10 (SHEET 1 OF 2)

PROJECT No: 9784-13
SHEET No: DA030

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA030 | B

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Document Set ID: 9954738
Version: 1, Version Date: 21/02/2022



LEGEND

- LIMIT OF WORKS
- VIANELLO BOUNDARY
- ZONE BOUNDARY
- PROPOSED MOUND
- EXISTING MOUND

NOTES:

1. SURFACES USED IN SHOWING THE CONTOURS ARE THE FOLLOWING:
   a. ALS
   b. THE NORTHERN ROAD WAE SURFACE PROVIDED ON 07/12/2020
   c. VMS SURVEY (07/08/2020)
   d. STAGE 3 DESIGN SURFACE
   e. VMS WAE SURVEY HV STAGE 4 (01/12/20)
   f. STAGE 6, 7, 8, & 9 DESIGN SURFACE
2. THE NORTHERN ROAD WAE LINEWORK INCLUDING MOUNDS WAS RECEIVED FROM TRANSPORT NSW ON 07/12/2020
3. MOUNDS MOVED DUE TO THE NORTHERN ROAD WORKS AND LEVELS AT THE NORTHERN ROAD CHANGED.

1:2000 (AT A1)
1:4000 (AT A3)

50 0 50 100 150 200
METRES

B	LOT LAYOUT AMENDED	CC	NM	PK	MS	17/12/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
NORTHERN ROAD SIGHT LINES
SIGHT LINE ALIGNMENT 11 TO 20 (SHEET 2 OF 2)

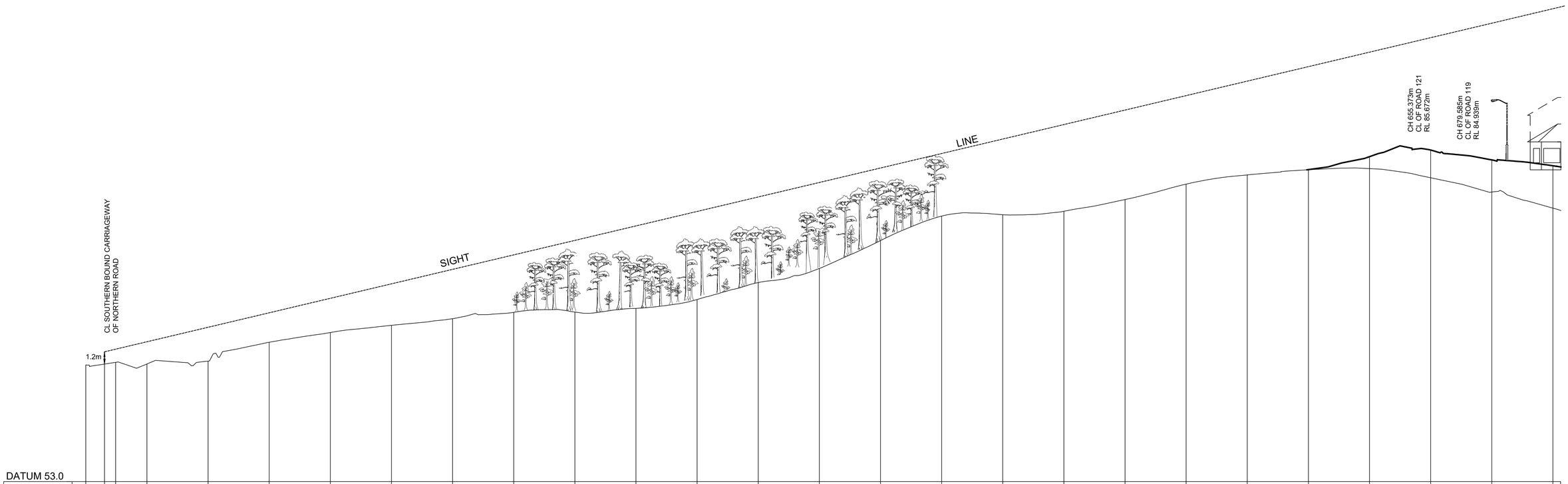
PROJECT No: 9784-13

SHEET No: DA031

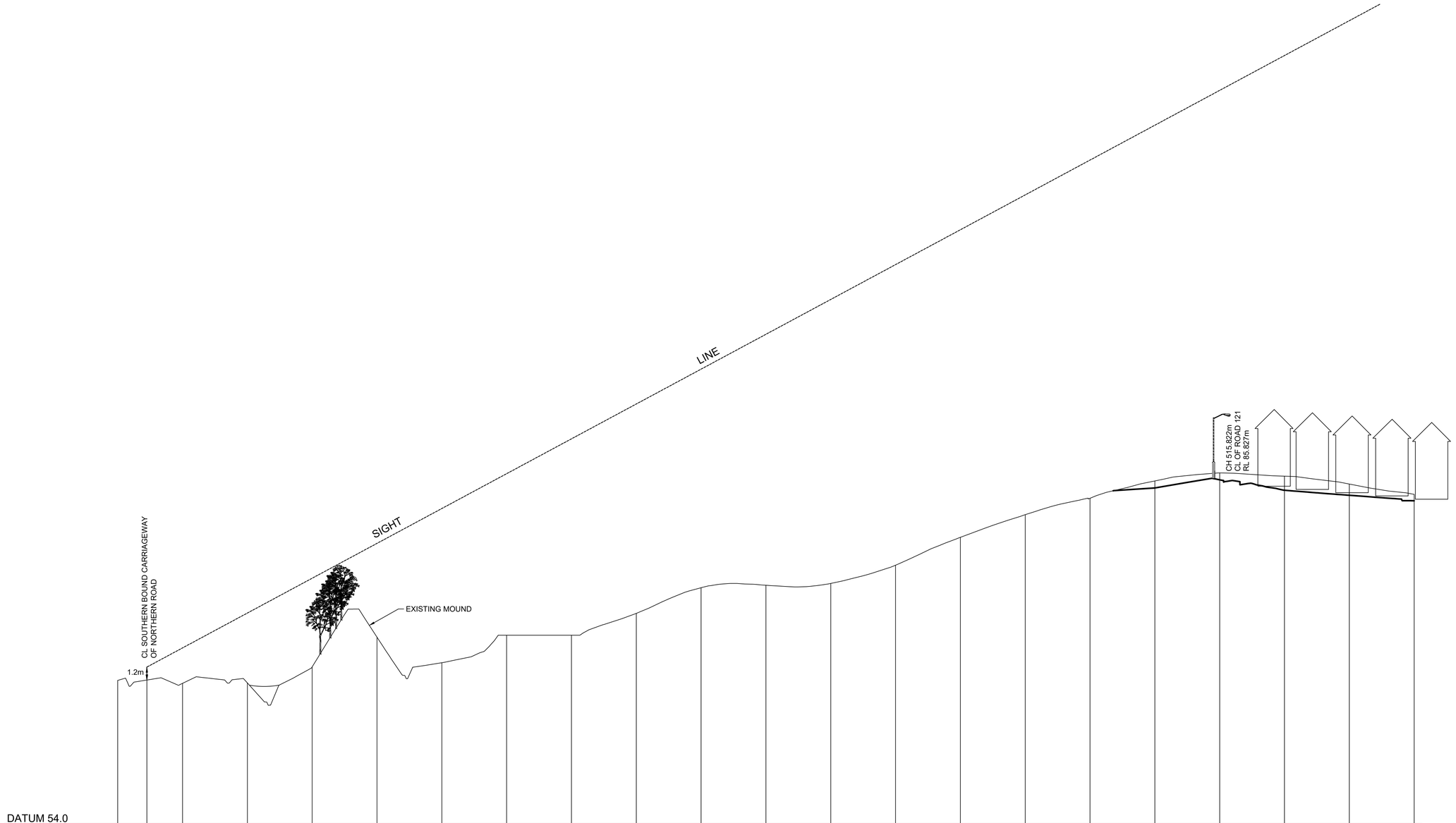
AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA031 | B

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LINE
SIGHT
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
1.2m
CH 655.373m
CL OF ROAD 121
RL 85.672m
CH 679.585m
CL OF ROAD 119
RL 84.939m

| DATUM 53.0 | | |



DATUM 54.0																								
DESIGN SURFACE																		85.136	85.888	84.925	84.455	83.943		
EXISTING SURFACE	67.319	67.352	67.045	67.088	68.575	71.321	68.953	71.500	71.500	73.525	75.900	76.129	76.295	77.980	80.563	82.658	84.174	85.780	86.527	86.222	85.493	84.535		
CHAINAGE	0.000	13.504	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000		

LONGITUDINAL SECTION SIGHT LINE 2

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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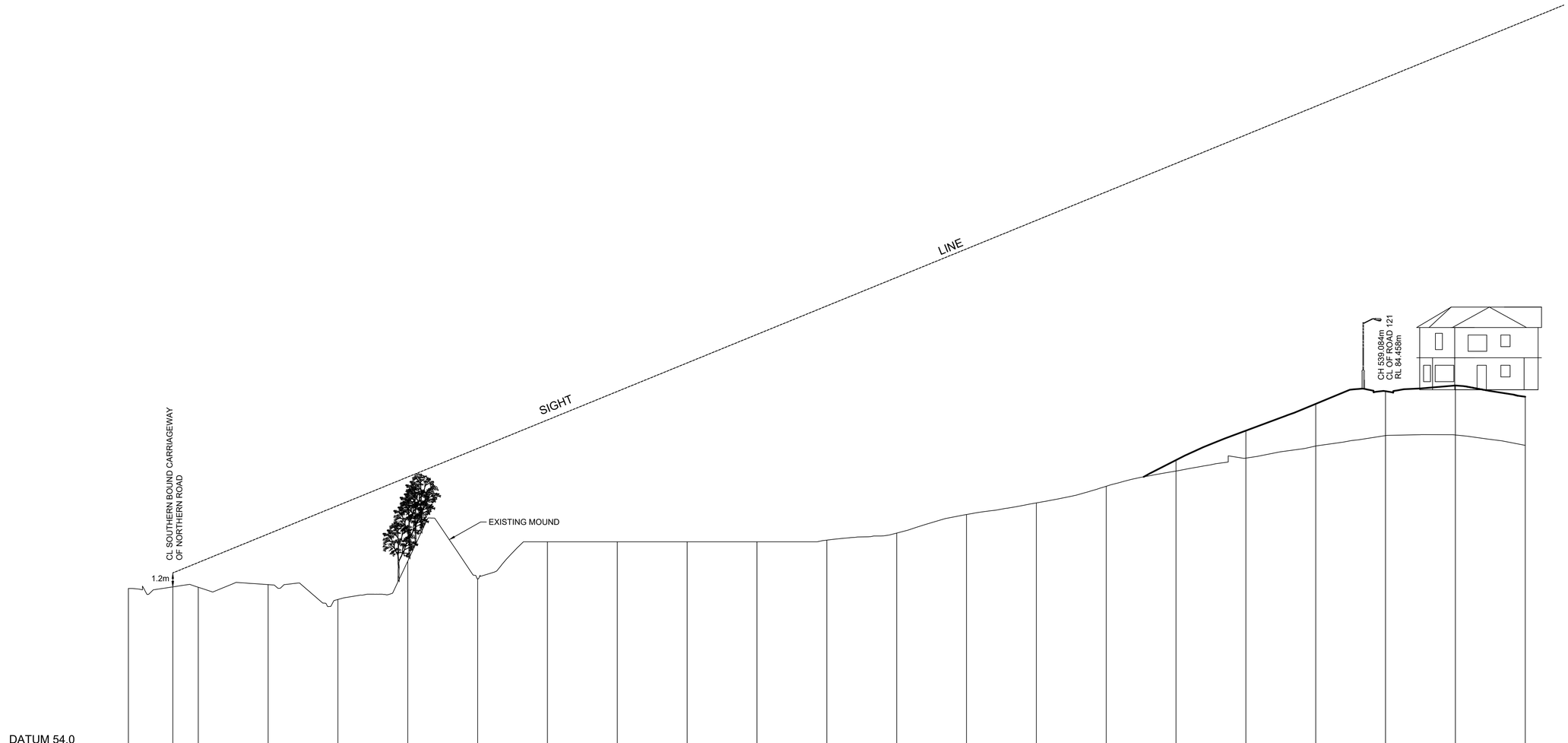
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 2

PROJECT No: 9784-13
SHEET No: DA033

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA033 | A

Plotted: 6 September , 2021 1:51:00 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA033.dwg

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Version: 1, Version Date: 27/02/2022



DATUM 54.0																							
DESIGN SURFACE																	78.516	81.044	83.346	84.429	84.918	83.955	
EXISTING SURFACE	67.500	67.632	67.603		67.827	66.556	69.847	68.322	71.500	71.500	71.500	71.500	71.647	72.251	73.848	74.842	76.269	77.576	78.684	79.720	80.623	80.674	79.781	
CHAINAGE	0.000	19.060	30.000		60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000	

LONGITUDINAL SECTION SIGHT LINE 3

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 3

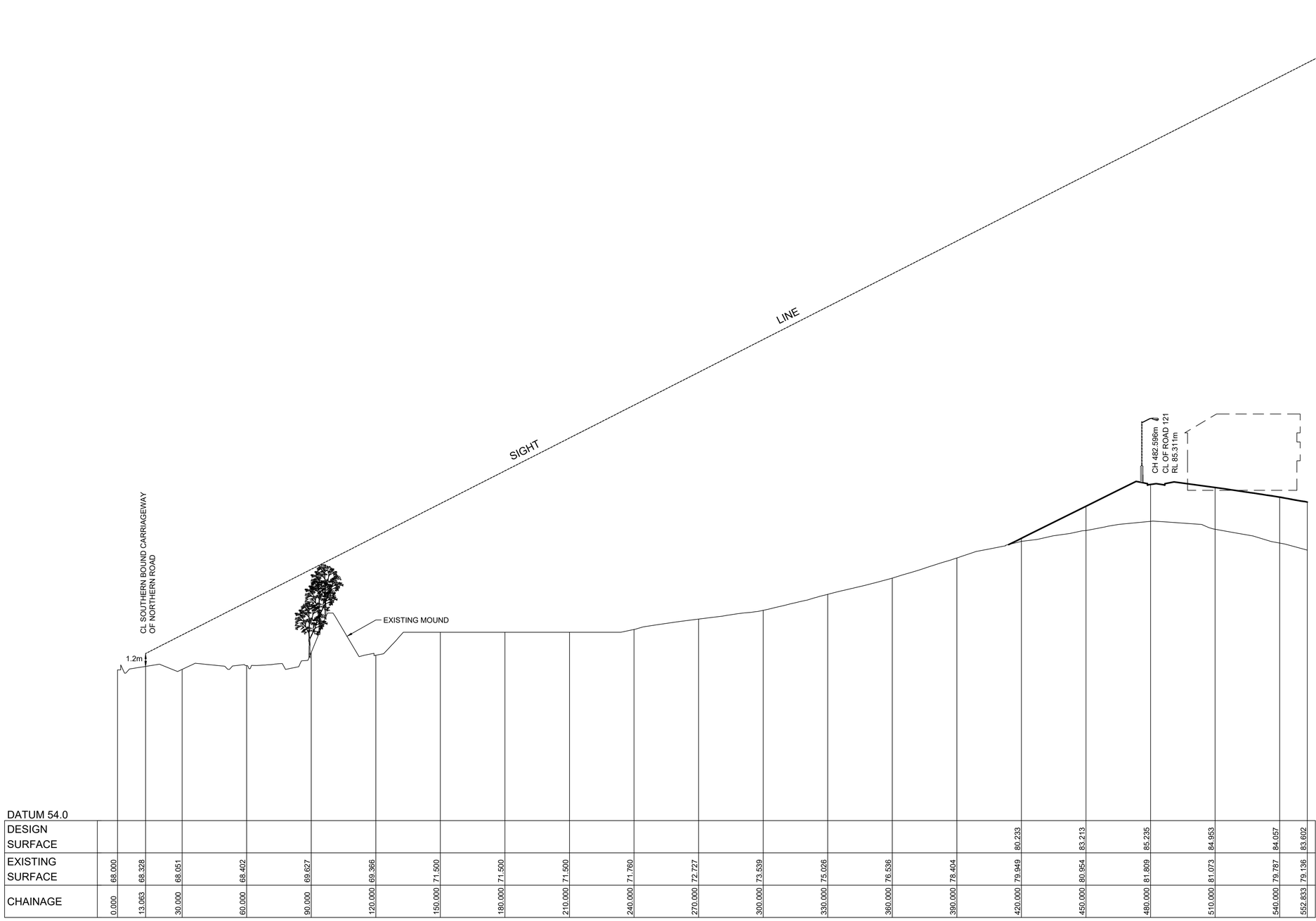
PROJECT No: 9784-13

SHEET No: DA034

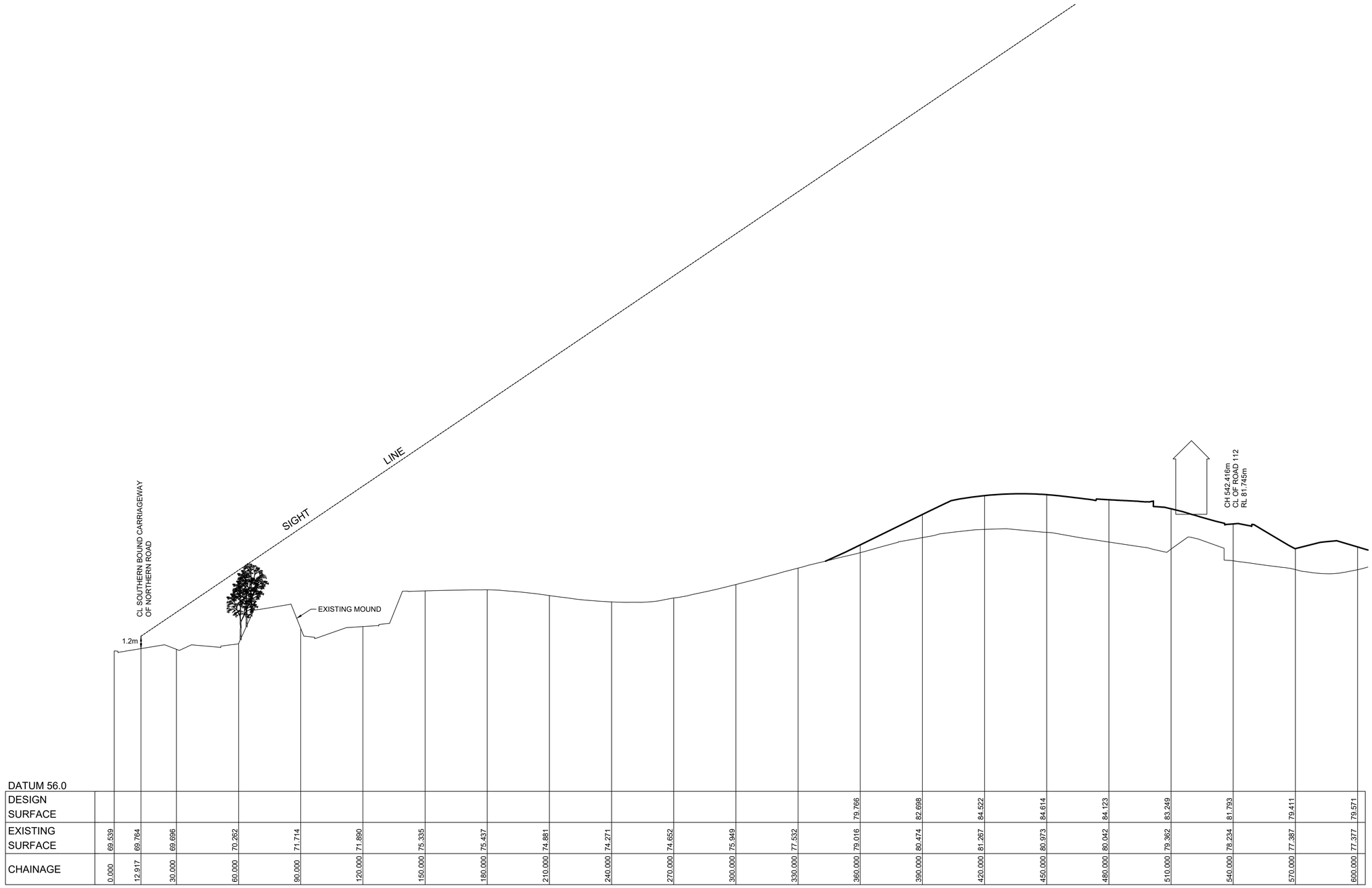
AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA034 | A

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SIGHT
LINE
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
1.2m
EXISTING MOUND
CH 482.596m
CL OF ROAD 121
RL 85.311m

| | | |



DATUM 56.0

DESIGN SURFACE															79.766	82.698	84.522	84.614	84.123	83.249	81.793	79.411	79.571		
EXISTING SURFACE	69.539	69.764	69.696	70.262	71.714	71.890	75.335	75.437	74.881	74.271	74.652	75.949	77.532	79.016	80.474	81.267	80.973	80.042	79.362	78.234	77.387	77.377		
CHAINAGE	0.000	12.917	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000		

LONGITUDINAL SECTION SIGHT LINE 5

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 5

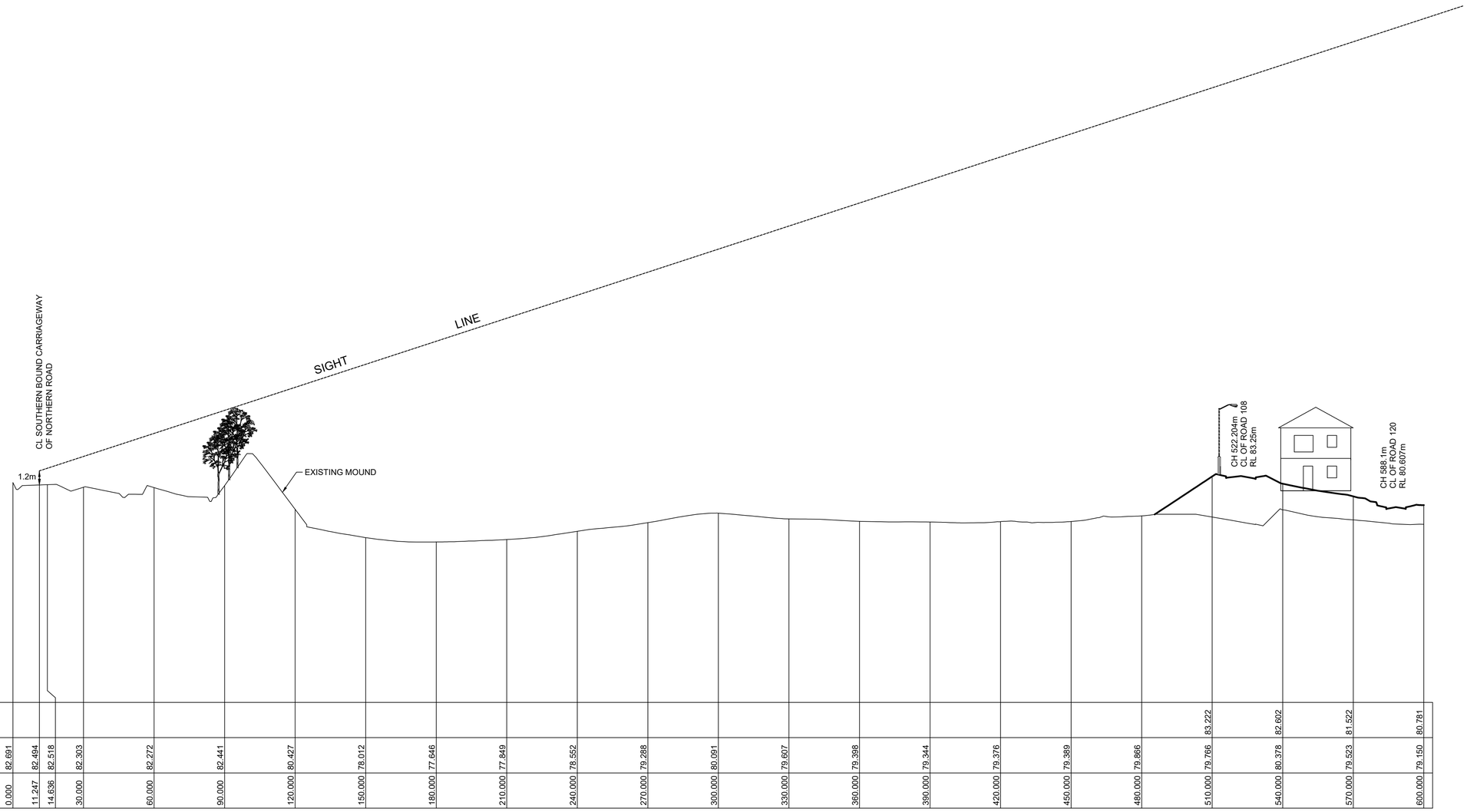
PROJECT No: 9784-13

SHEET No: DA036

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA036 | A

Plotted: 6 September , 2021 1:51:58 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA036.dwg

Document Set ID: 9884738
Version: 1, Version Date: 27/02/2022



DATUM 64.0																							
DESIGN SURFACE																				83.222		82.602		80.781
EXISTING SURFACE	82.691	82.494	82.518	82.303	82.272	82.441	80.427	78.012	77.646	77.849	78.552	79.288	80.091	79.607	79.398	79.344	79.376	79.389	79.866	79.766	80.378	79.523	79.150
CHAINAGE	0.000	11.247	14.636	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000

LONGITUDINAL SECTION SIGHT LINE 7

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300 W www.jwprince.com.au E jwp@jwprince.com.au

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 7

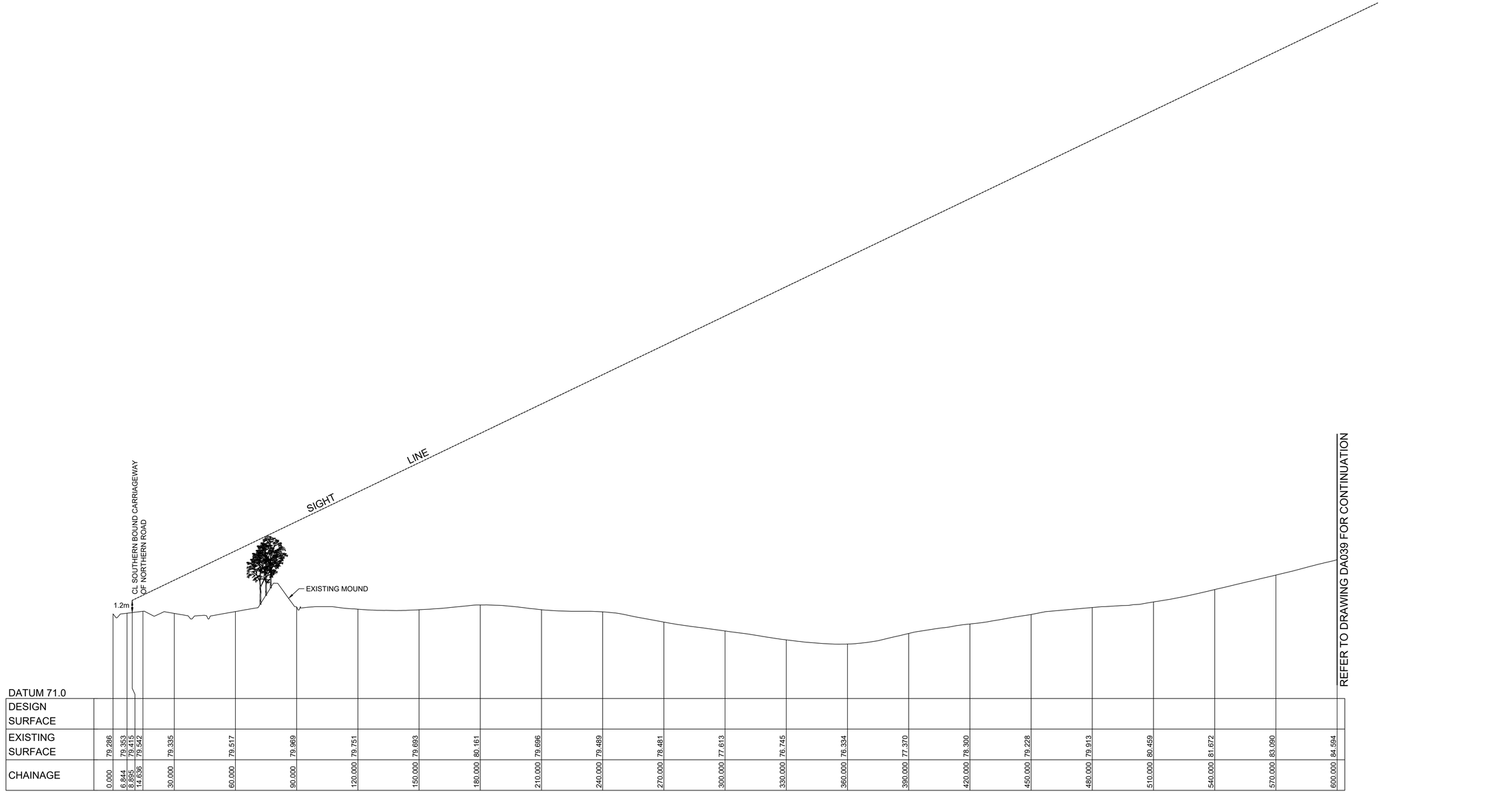
PROJECT No: 9784-13

SHEET No: DA037

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA037 | A

Plotted: 6 September , 2021 1:52:15 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA037.dwg

Document Set ID: 9884738
Version: 1, Version Date: 21/02/2022



DATUM 71.0																							
DESIGN SURFACE																							
EXISTING SURFACE	79.286	79.353	79.415	79.542	79.335	79.517	79.969	79.751	79.693	80.161	79.696	79.489	78.481	77.613	76.745	76.334	77.370	78.300	79.228	79.913	80.459	81.672	83.090	84.594
CHAINAGE	0.000	6.844	8.895	14.636	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000

LONGITUDINAL SECTION SIGHT LINE 7A

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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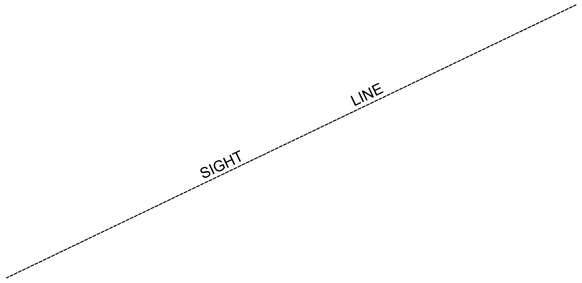
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 7A
SHEET 1 OF 2

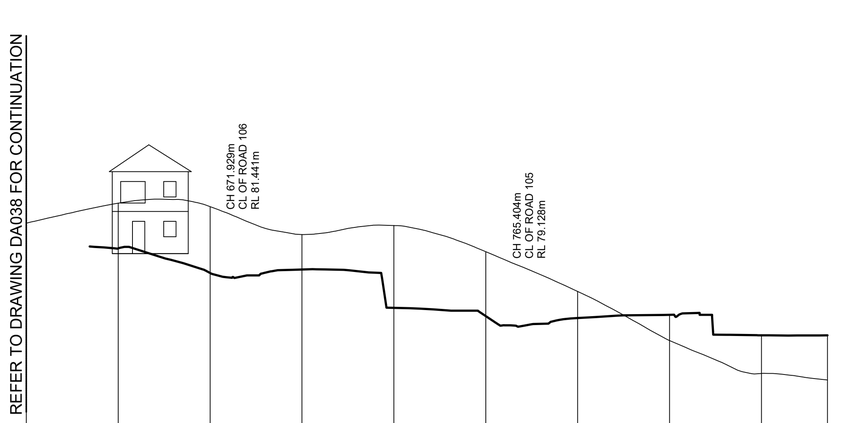
PROJECT No: 9784-13
SHEET No: DA038

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA038 | A

Plotted: 6 September , 2021 1:52:33 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA038.dwg

Document Set ID: 9884728
Version: 1, Version Date: 27/02/2022





DATUM 71.0											
DESIGN SURFACE		82.946	81.344	81.569	79.069	78.528	78.402	78.615	77.274	77.270	
EXISTING SURFACE	84.594	85.900	85.672	83.849	84.444	82.732	80.140	76.929	74.786	74.355	
CHAINAGE	600.000	630.000	660.000	690.000	720.000	750.000	780.000	810.000	840.000	861.550	

LONGITUDINAL SECTION SIGHT LINE 7A

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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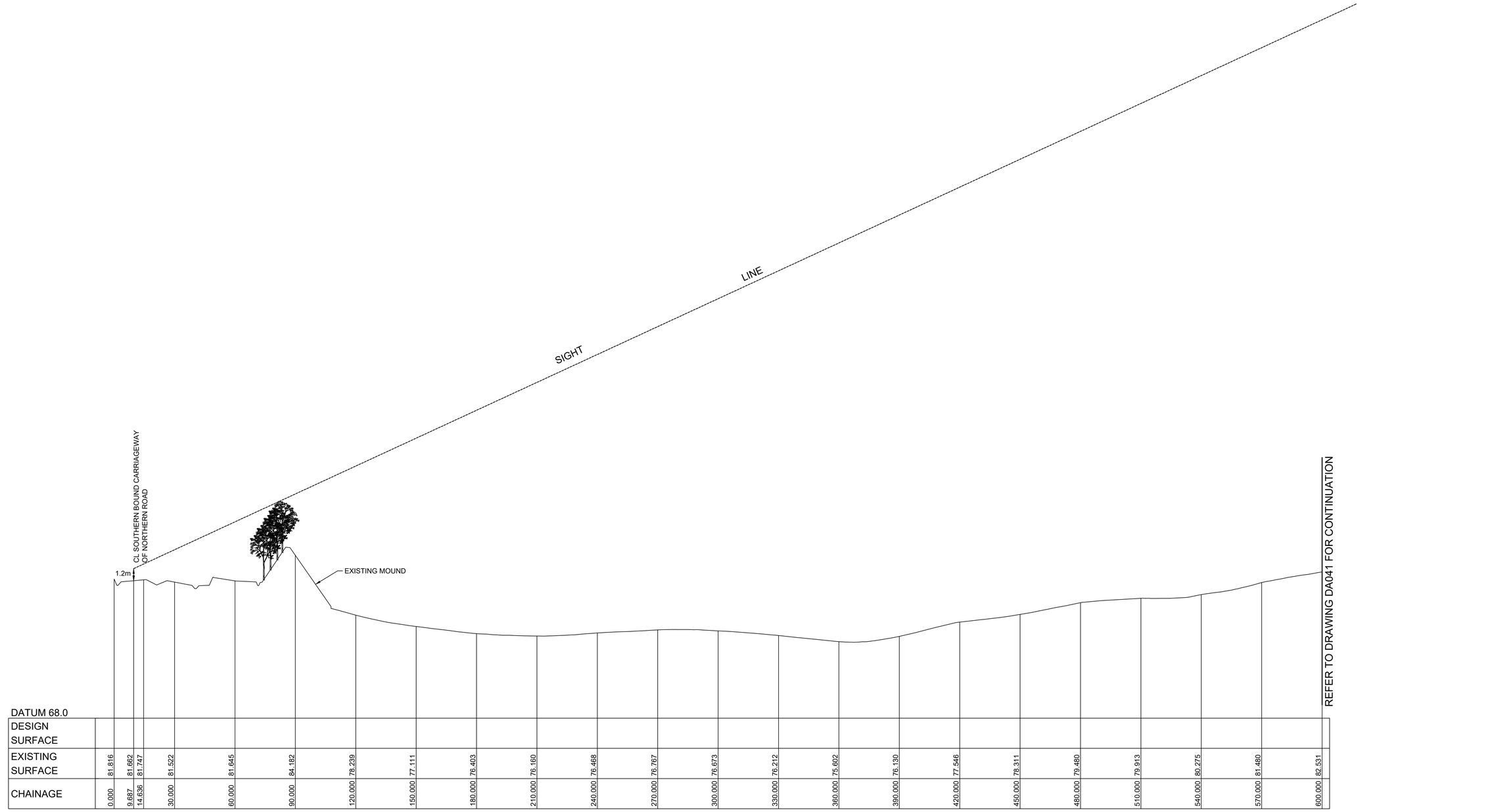
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 7A
SHEET 2 OF 2

PROJECT No: 9784-13
SHEET No: DA039

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA039 | A

Plotted: 6 September , 2021 1:52:53 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA039.dwg

Document Set ID: 9854728
Version: 1, Version Date: 27/02/2022



DATUM 68.0																							
DESIGN SURFACE																							
EXISTING SURFACE	81.816	81.692	81.747	81.522	81.645	84.182	78.239	77.111	76.403	76.160	76.468	76.767	76.673	76.212	75.602	76.130	77.546	78.311	79.480	79.913	80.275	81.480	82.531
CHAINAGE	0.000	9.887	14.636	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000

LONGITUDINAL SECTION SIGHT LINE 8

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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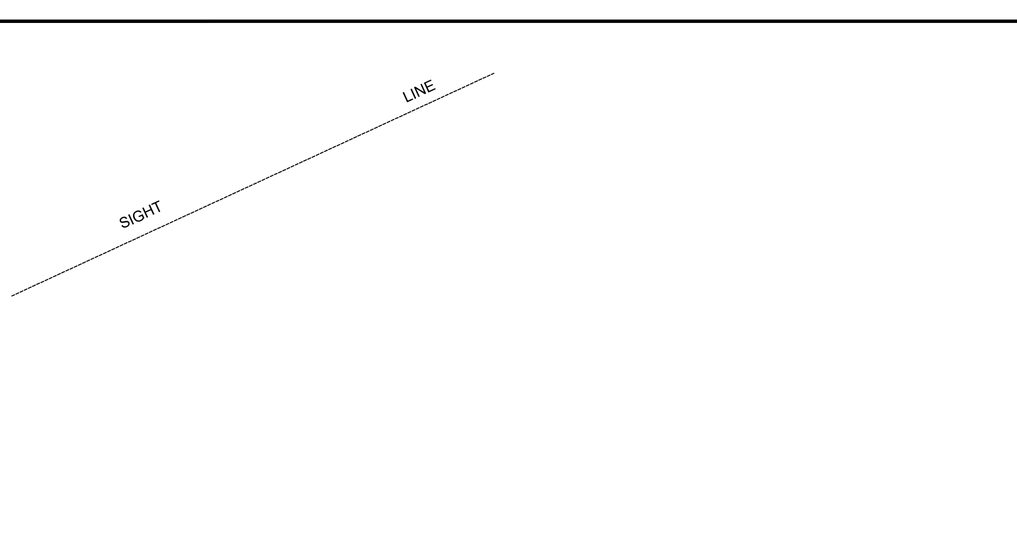
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 8
SHEET 1 OF 2

PROJECT No: 9784-13
SHEET No: DA040

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA040 | A

Plotted: 6 September , 2021 1:53:10 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA040.dwg

Document Set ID: 9884738
Version: 1, Version Date: 27/02/2022



DATUM 68.0

DESIGN SURFACE			81.080	79.538	79.461	76.773	76.143	75.323	73.645	73.867
EXISTING SURFACE	82.531	83.118	82.865	81.235	78.453	79.225	78.158	77.440	76.706	75.190
CHAINAGE	600.000	630.000	660.000	690.000	720.000	750.000	780.000	810.000	840.000	868.534

LONGITUDINAL SECTION SIGHT LINE 8

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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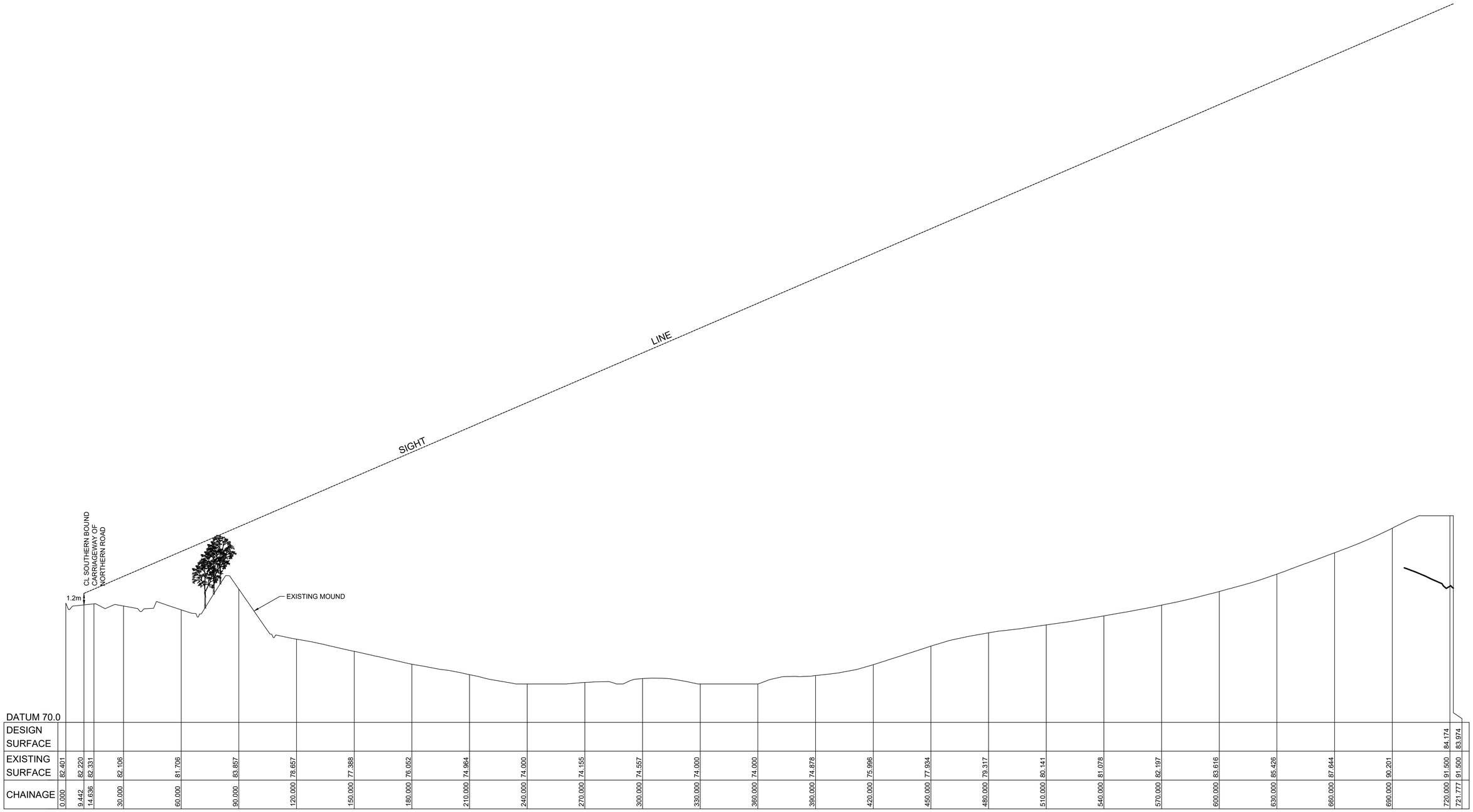
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 8
SHEET 2 OF 2

PROJECT No: 9784-13
SHEET No: DA041

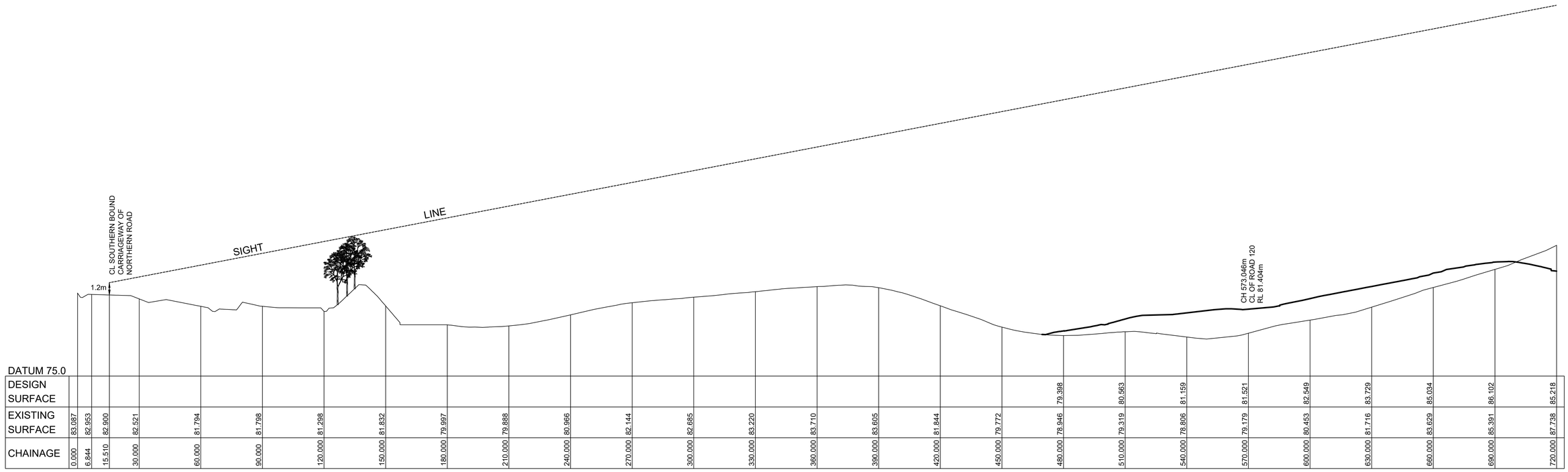
AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA041 | A

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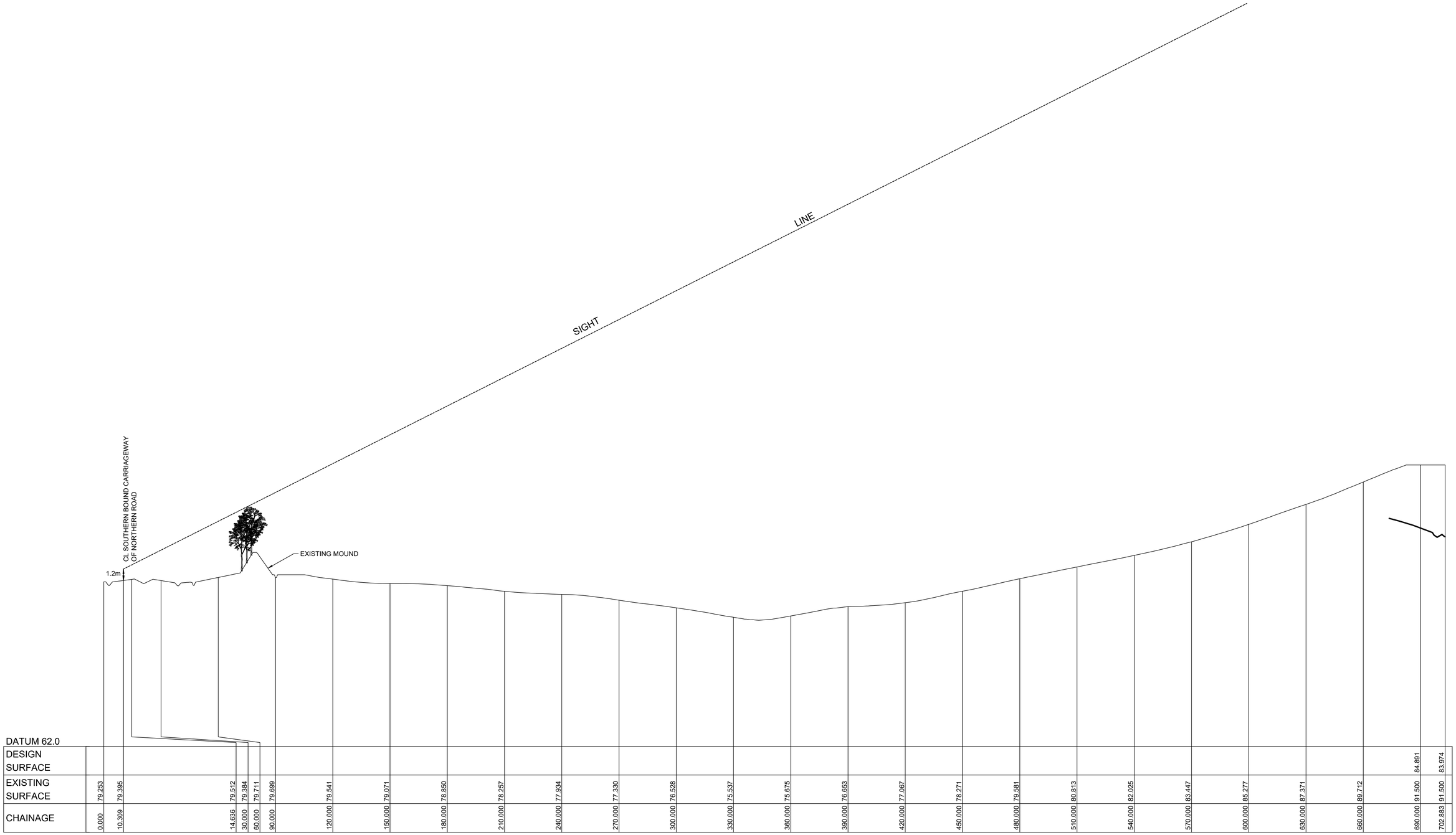
Document Set ID: 9854738
Version: 1, Version Date: 27/02/2022


SIGHT LINE
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
1.2m
EXISTING MOUND

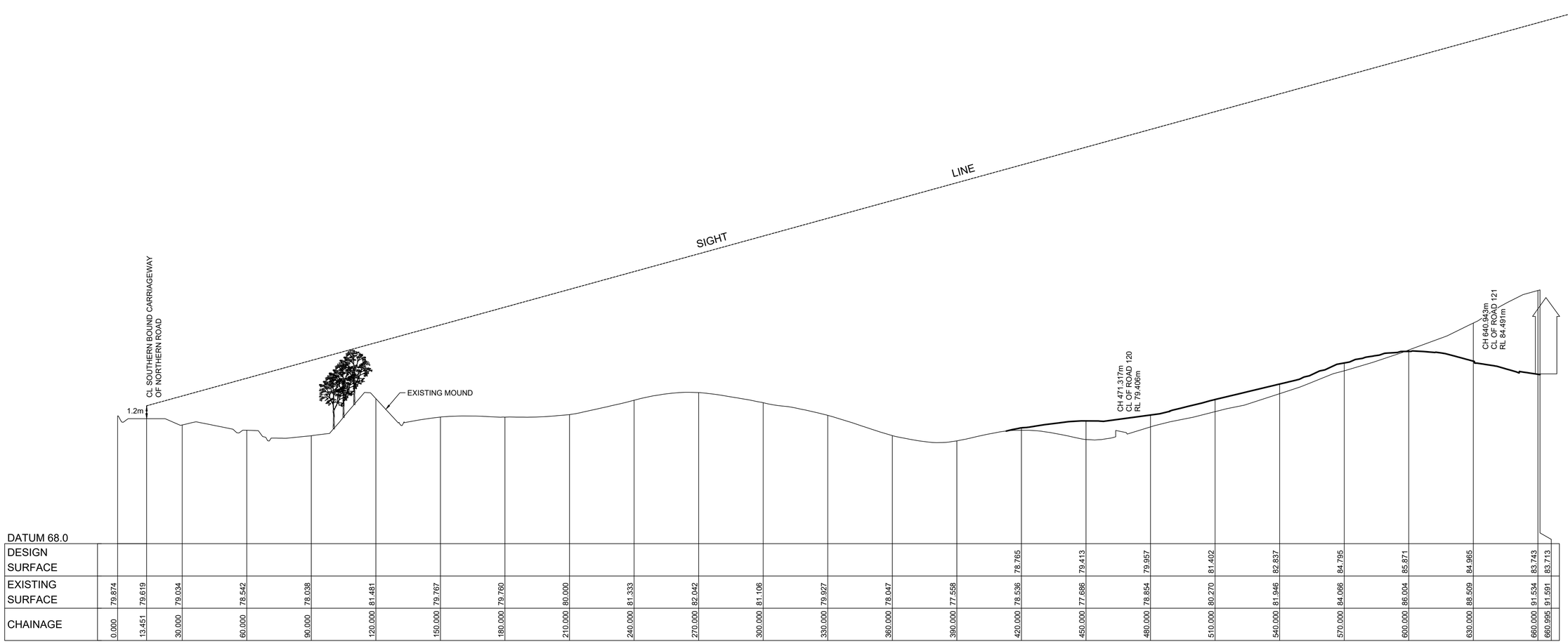
| | | |


SIGHT LINE
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
1.2m
CH 573.046m
CL OF ROAD 120
RL 81.404m

| | | |


SIGHT LINE
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
EXISTING MOUND
1.2m

| | | |



DATUM 68.0																																
DESIGN SURFACE																														78.765	79.413	79.957	81.402	82.837	84.795	85.671	84.965	83.743	83.713
EXISTING SURFACE	79.874	79.619	79.034	78.542	78.038	81.481	79.767	79.760	80.000	81.333	82.042	81.106	79.927	78.047	77.558	78.536	77.686	78.854	80.270	81.946	84.066	86.004	88.509	91.534	91.591							
CHAINAGE	0.000	13.451	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000	630.000	660.000	660.995							

LONGITUDINAL SECTION SIGHT LINE 12

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 12

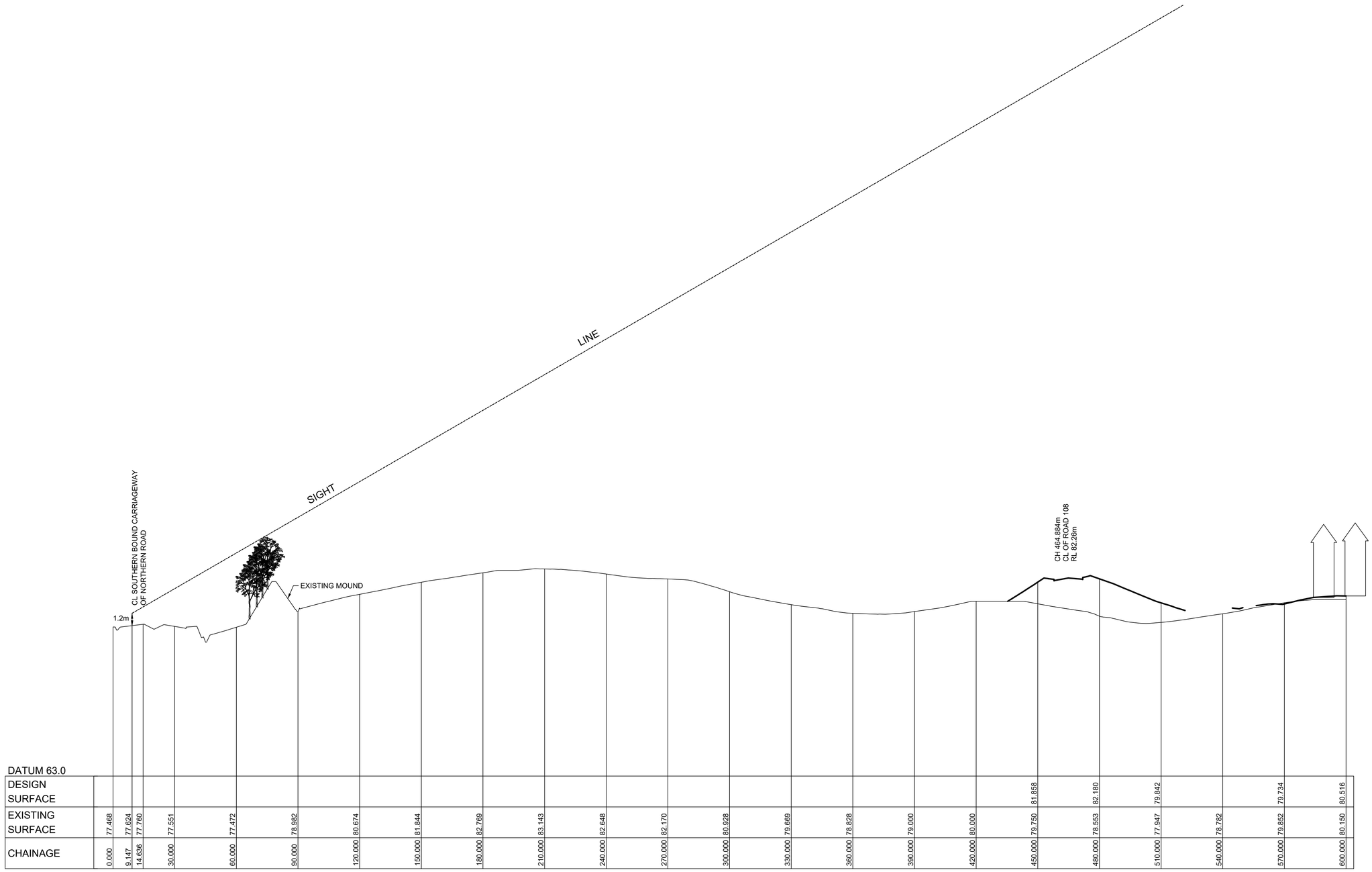
PROJECT No: 9784-13

SHEET No: DA045

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA045 | A

Plotted: 6 September , 2021 1:54:55 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CDD\DA\Stage 7, 8, & 9\9784-13-DA045.dwg

Document Set ID: 9854728
Version: 1, Version Date: 21/02/2022



DATUM 63.0																								
DESIGN SURFACE																			81.858	82.180	79.842		79.734	80.516
EXISTING SURFACE	77.468	77.624	77.760	77.551	77.472	78.982	80.674	81.844	82.769	83.143	82.648	82.170	80.928	79.669	78.828	79.000	80.000	79.750	78.553	77.947	78.782	79.852	80.150	
CHAINAGE	0.000	9.147	14.636	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000	

LONGITUDINAL SECTION SIGHT LINE 13

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 13

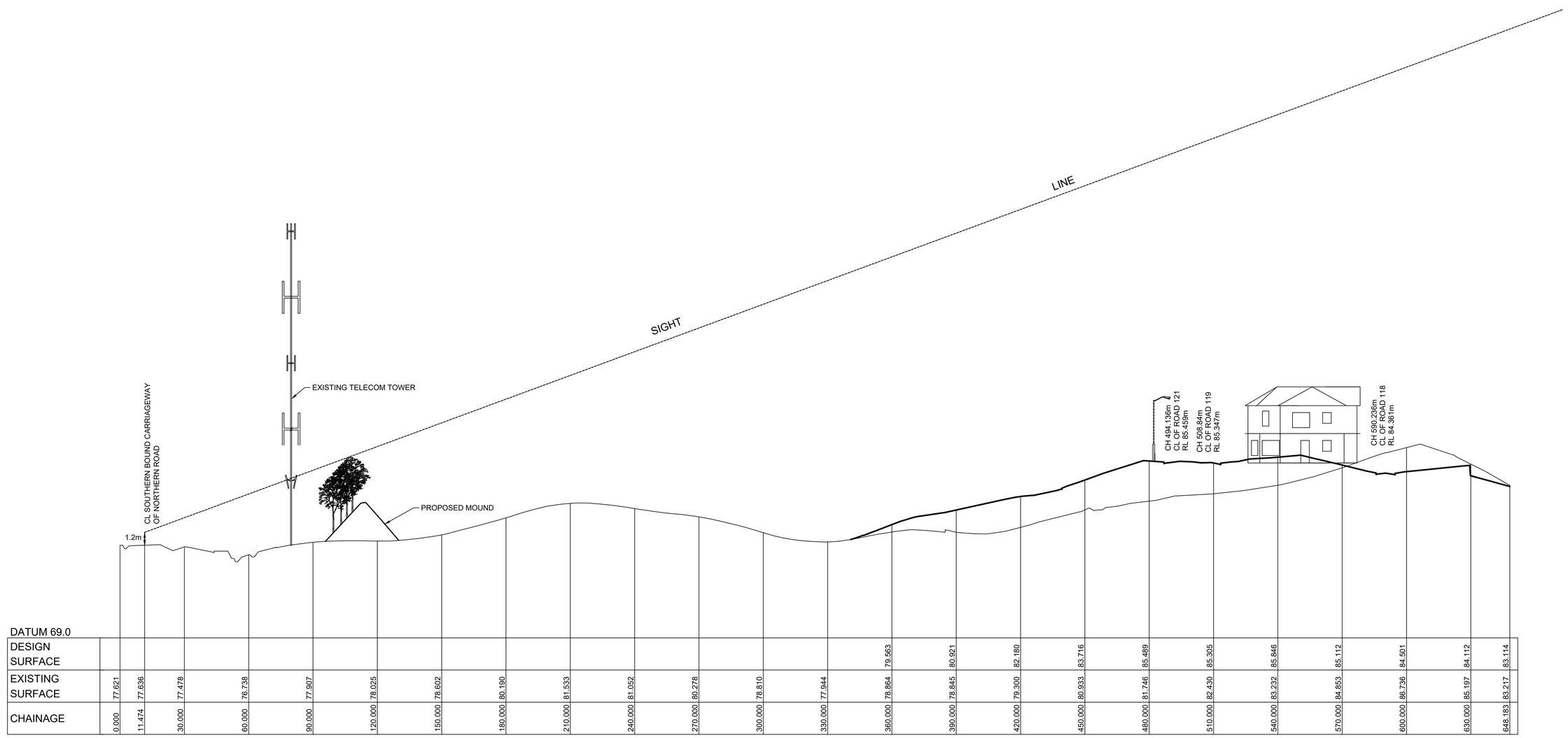
PROJECT No: 9784-13

SHEET No: DA046

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA046 | A

Plotted: 6 September 2021 1:55:15 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA046.dwg

Document Set ID: 9884738
Version: 1, Version Date: 27/02/2022



DATUM 69.0																								
DESIGN SURFACE														79.563	80.921	82.180	83.716	85.489	85.305	85.846	85.112	84.501	84.112	83.114
EXISTING SURFACE	77.621	77.636	77.478	76.738	77.907	78.025	78.602	78.190	81.533	81.052	80.278	78.810	77.944	78.864	78.845	79.300	80.933	81.746	82.430	83.232	84.853	86.736	85.197	83.217
CHAINAGE	0.000	11.474	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000	630.000	648.183

LONGITUDINAL SECTION SIGHT LINE 14

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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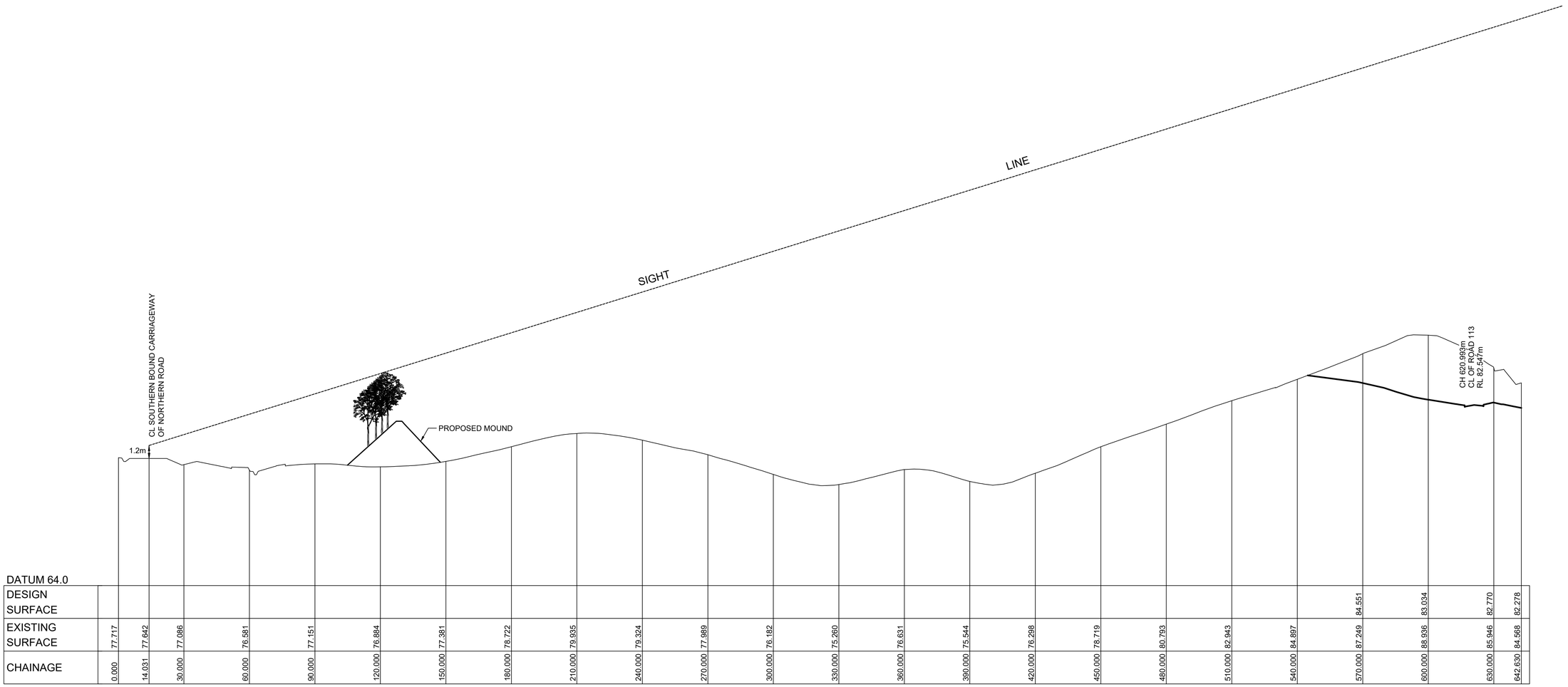
GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 14

PROJECT No: 9784-13
SHEET No: DA047

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA047 | A

Plotted: 6 September 2021 1:55:35 PM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA047.dwg

Document Set ID: 9854738
Version: 1, Version Date: 27/02/2022



DATUM 64.0																														
DESIGN SURFACE																											84.551	83.034	82.770	82.278
EXISTING SURFACE	77.717	77.642	77.086	76.581	77.151	76.884	77.381	78.722	79.935	79.324	77.989	76.182	75.260	76.631	75.544	76.298	78.719	80.793	82.943	84.897	87.249	88.936	85.946	84.568
CHAINAGE	0.000	14.031	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	540.000	570.000	600.000	630.000	642.630

LONGITUDINAL SECTION SIGHT LINE 15

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 15

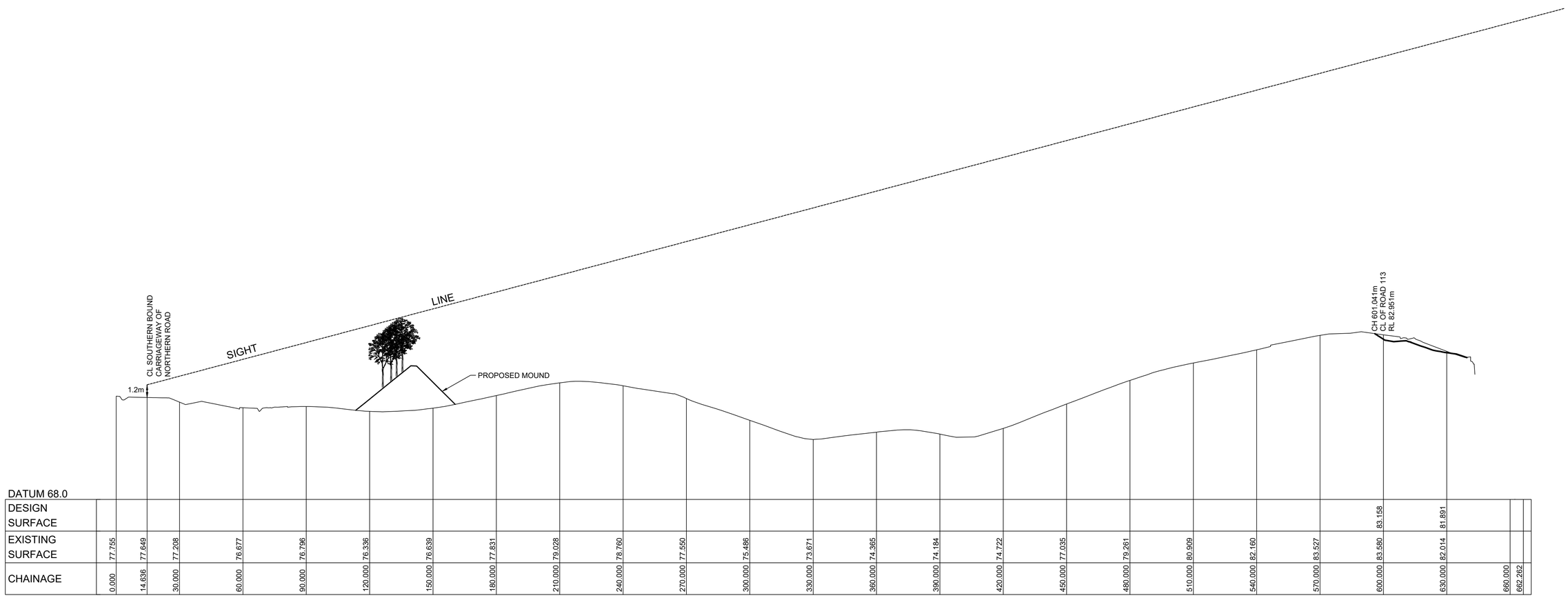
PROJECT No: 9784-13

SHEET No: DA048

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA048 | A

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LONGITUDINAL SECTION SIGHT LINE 16

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

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1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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P 02 4720 3300 W www.jwprince.com.au E jwp@jwprince.com.au

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 16

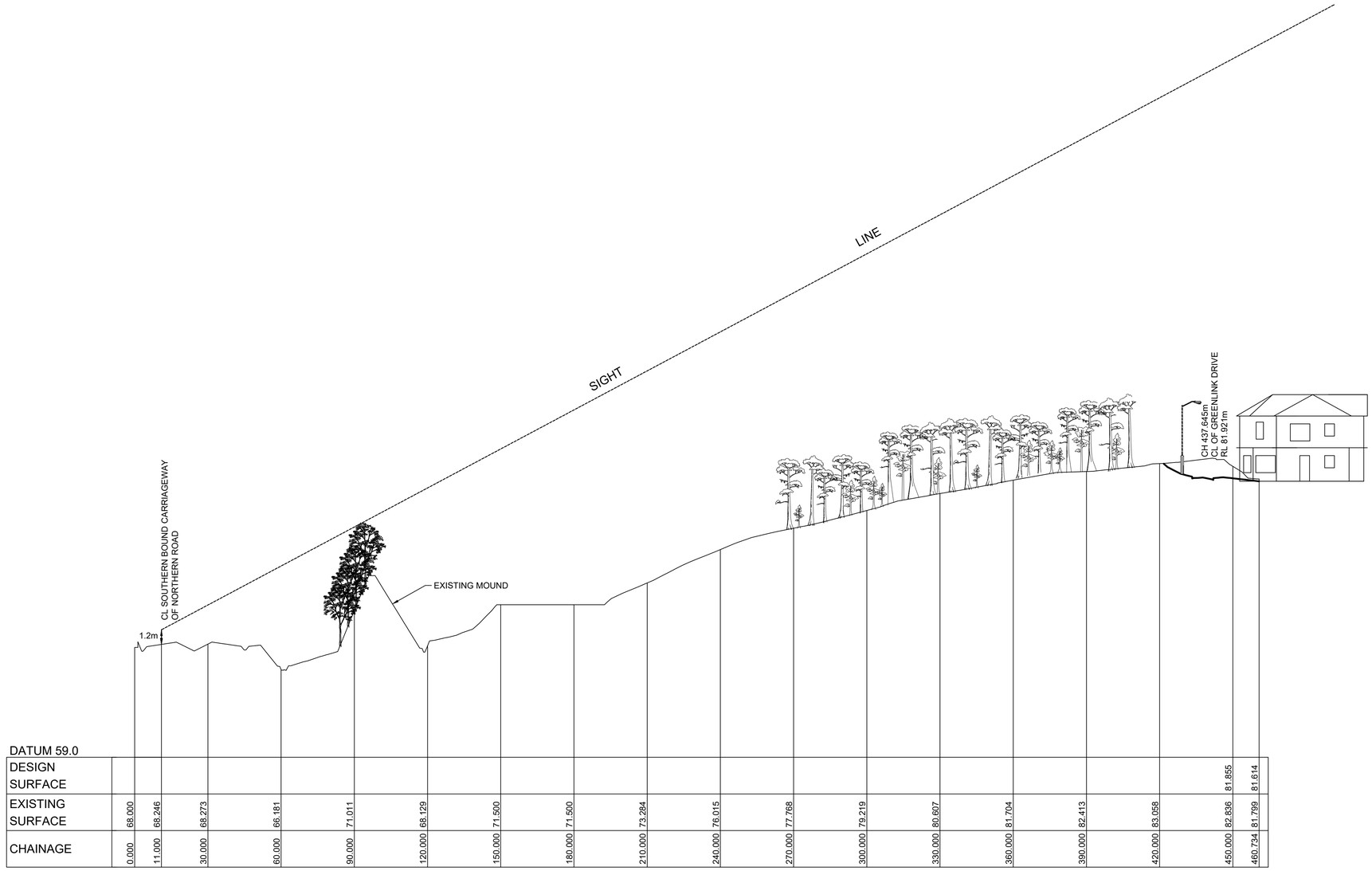
PROJECT No: 9784-13

SHEET No: DA049

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LONGITUDINAL SECTION SIGHT LINE 17

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

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A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 17

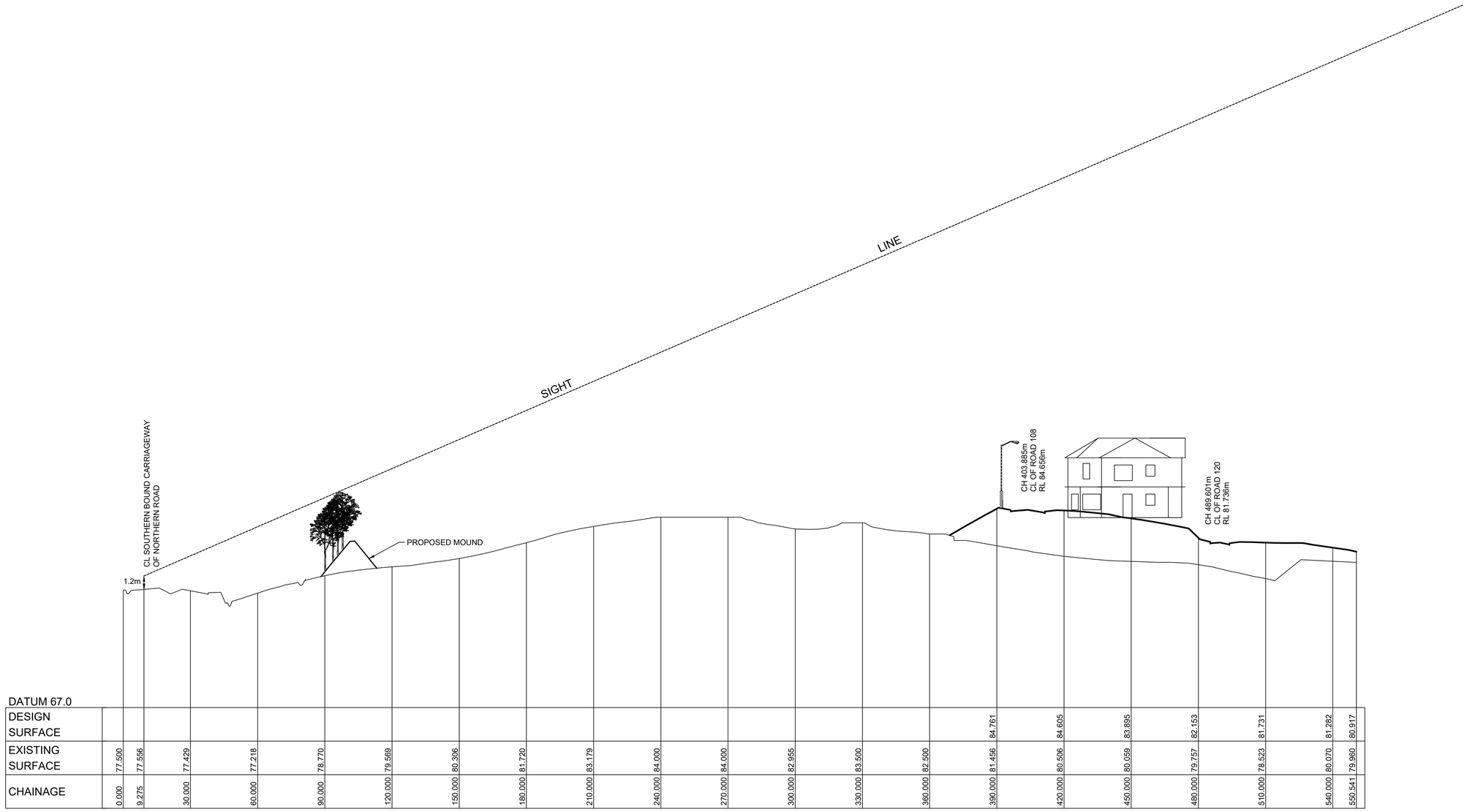
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SHEET No: DA050

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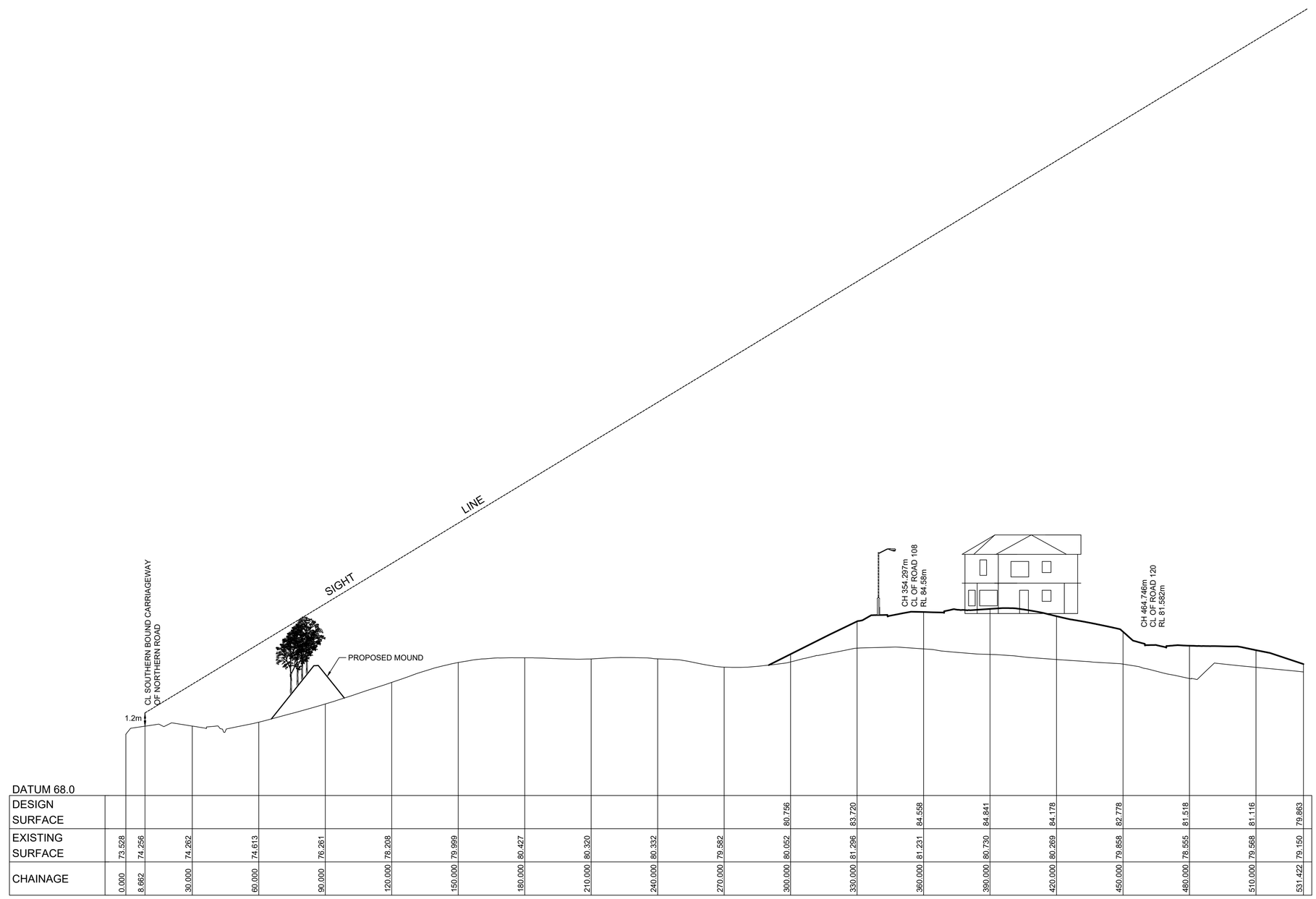
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Version: 1, Version Date: 27/02/2022


SIGHT
LINE
CL SOUTHERN BOUND CARRIAGEWAY
OF NORTHERN ROAD
1.2m
PROPOSED MOUND
CH 403.885m
CL OF ROAD 108
RL 84.656m
CH 489.601m
CL OF ROAD 120
RL 81.736m

DATUM 67.0

| | | |



DATUM 68.0

CHAINAGE	0.000	8.662	30.000	60.000	90.000	120.000	150.000	180.000	210.000	240.000	270.000	300.000	330.000	360.000	390.000	420.000	450.000	480.000	510.000	531.422
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DESIGN SURFACE												80.756	83.720	84.558	84.841	84.178	82.778	81.518	81.116	79.863

LONGITUDINAL SECTION SIGHT LINE 19

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

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1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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STAGE 7A, 7B, 8A AND 8B
LONGITUDINAL SECTION OF SIGHT LINE 19

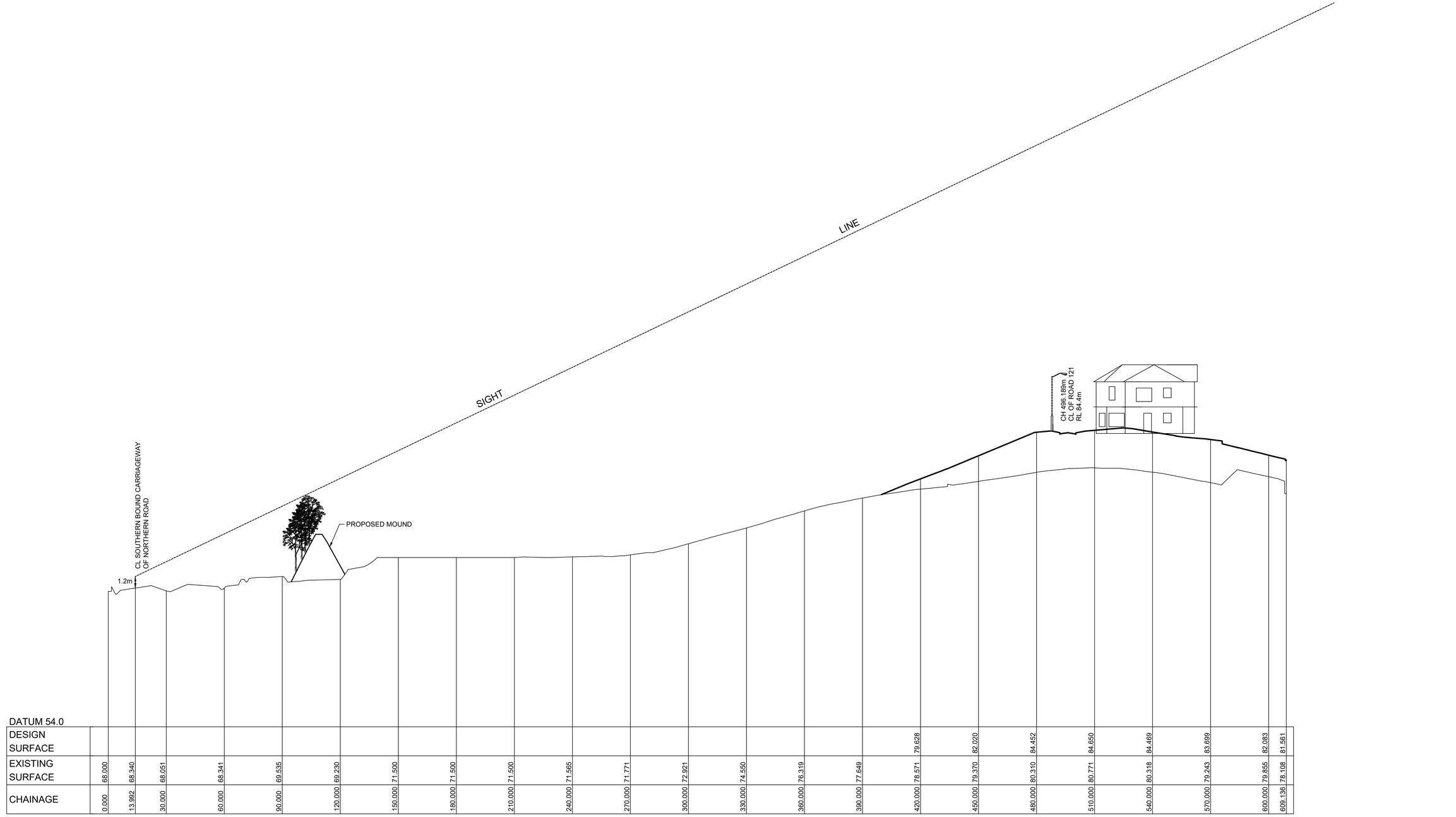
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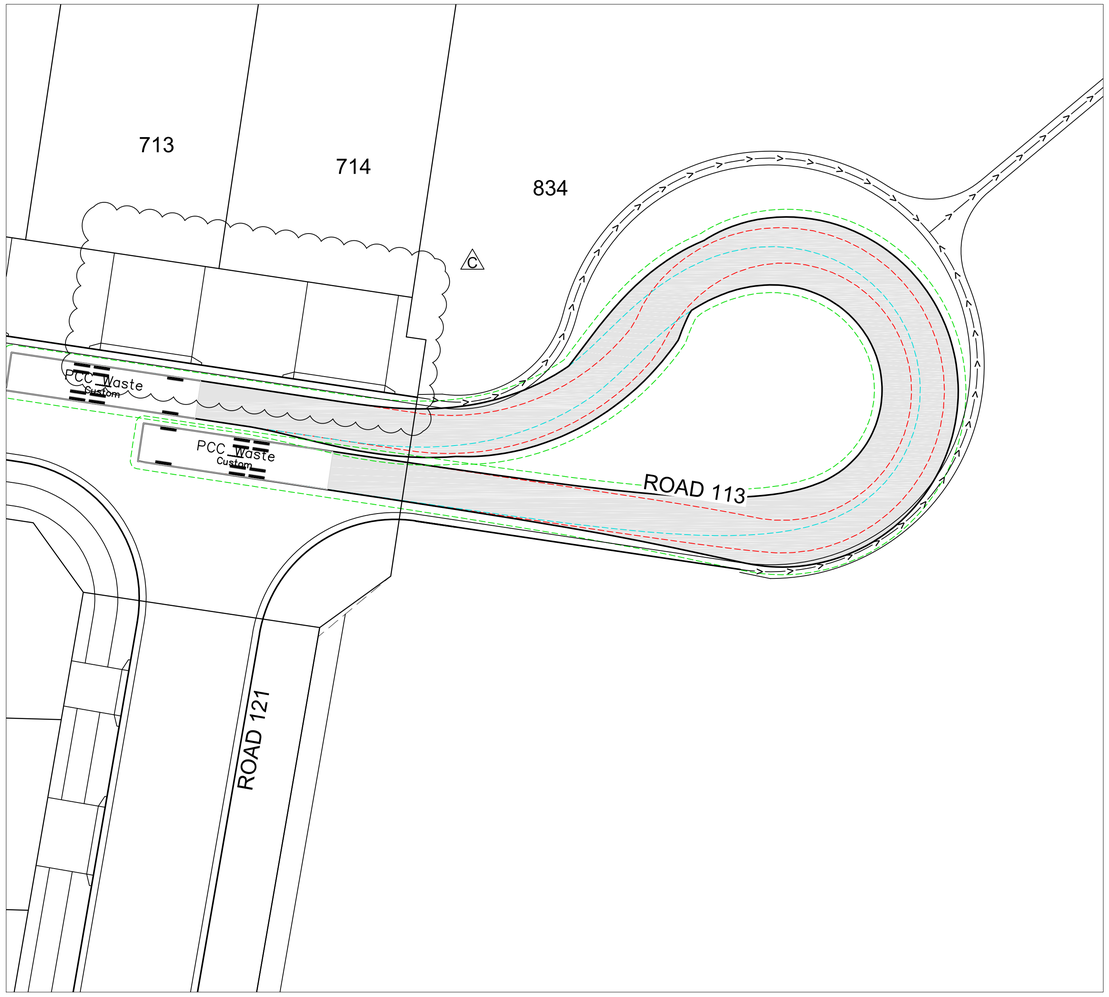
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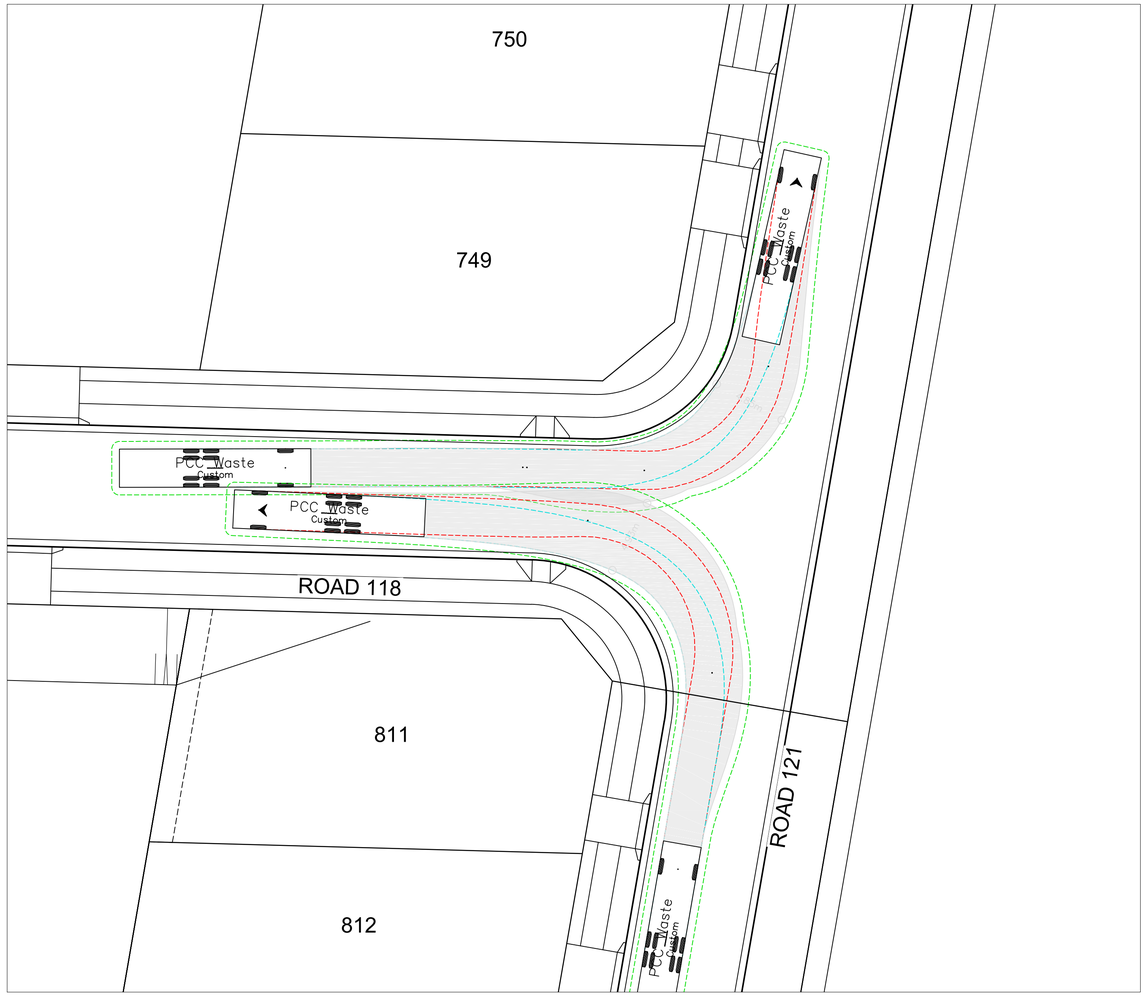

SIGHT
LINE
CH 496.189m
CL OF ROAD 121
RL 84.4m
CL SOUTHERN BOUND CARRIAGEWAY OF NORTHERN ROAD
1.2m
PROPOSED MOUND

| | | |



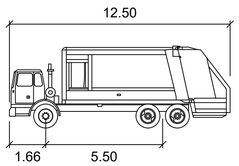
CUL-DE-SAC TURNING PATH PLAN

SCALE:1:200



TYPICAL INTERSECTION TURNING PATH PLAN

SCALE:1:200



PCC Waste

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 36.6

1:200 (AT A1)
1:400 (AT A3)

4 2 0 4 8 12 16 20

METRES

C	COUNCIL COMMENTS ADDRESSED	CC	CC	PK	MS	16/12/21
B	CUL-DE-SAC AMENDED	CC	NM	PK	DJ	17/09/21
A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

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GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
TURNING PATH PLAN

PROJECT No: 9784-13

SHEET No: DA100

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Highland Views Estate - Stages 7 to 8 Residential Subdivision

Biodiversity Development Assessment Report

Client	: CCL Development
Prepared by	: Australian Wetlands Consulting Pty Ltd
Project #	: 3-211373
Date	: December 2021

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Highland Views Estate - Stages 7 to 8 Residential Subdivision

Biodiversity Development Assessment Report

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Project control

Project name: **Highland Views Estate - Stages 7 to 8 Residential Subdivision**
Biodiversity Development Assessment Report

Project #: 3-211373
Client: CCL Development
Contact: Rachell Hewitt

Prepared by: Australian Wetlands Consulting Pty Ltd

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Bangalow NSW, 2479

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Date:	Revision:	Prepared by:	Reviewed by:	Distributed to:
11.03.2021	A	Hannah Reid	Jacqui Coughlan	Natalie Adamou
19.04.2021	B	Hannah Reid	Jacqui Coughlan	Natalie Adamou
08.10.2021	C	Hannah Reid	Ian Colvin	Rachell Hewitt
16.12.2021	D	Hannah Reid	Ian Colvin	Rachell Hewitt

Accredited Assessor Authorisation

This BDAR has been prepared in accordance with the requirements of (and information provided under) the biodiversity assessment method (BAM) 2020 as at 16/12/2021.

Assessor Name	Accreditation Number	Role	Signed
Hannah Reid	BAAS18114	Reporting, BAMC	
Jacqui Coughlan	BAAS18139	Field Work, Report Review, Project Manager	
Ian Colvin	BAAS18055	Report Review, Reporting	

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Version: 1, Version Date: 17/02/2022

Table of Contents

Project control iii

Table of Contents iv

1 Introduction and Background 1

1.1 Background 1
1.2 Location and site identification 3
1.3 Proposed Development 3

2 Landscape Context 7

2.1 Landscape Features 7
2.1.1 IBRA bioregions and IBRA subregions 7
2.1.2 NSW landscape regions (Mitchell Landscapes) 7
2.1.3 Landforms 7
2.1.4 Soils and Geology 7
2.1.5 Disturbance 8
2.2 Site Context 8
2.2.1 Native Vegetation Cover 8
2.2.2 Patch Size 8

3 Native Vegetation 13

3.1 Methods 13
3.2 Plant Community Types (PCTs) 13
3.3 Vegetation Zones 16
3.3.1 Condition classes, subcategories and areas 16
3.3.2 Vegetation integrity survey plots 16
3.3.3 Current and future integrity scores 16

4 Threatened Species 18

4.1 Introduction 18
4.2 Ecosystem credit species 18
4.3 Species credit species (Candidate Species) 20
4.4 Presence/absence of candidate species 23
4.4.1 Targeted Field Survey – Flora 23
4.4.2 Targeted Field Survey – Fauna 25

5 Streamlined Assessment 28

5.1 Scattered Tree Assessment 28
5.2 Planted Native Vegetation 29
5.2.1 Introduction 29
5.2.2 Decision making key 29
5.2.3 Methods 30

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

5.2.4 Results 30

6 Impact Assessment 33

6.1 Impact assessment 33
6.1.1 Vegetation clearing 33
6.1.2 Removal of threatened species habitat 33
6.1.3 Direct mortality of fauna 34
6.1.4 Spread of declared weeds 34
6.1.5 Fragmentation 34
6.1.6 Erosion and sedimentation 34
6.1.7 Disturbance from lighting 34
6.1.8 Noise, vibration and anthropogenic disturbances 34
6.2 Assessing additional prescribed biodiversity impacts 35

7 Avoiding and minimising impacts on biodiversity values 36

7.1 Avoidance of Impacts 36
7.2 Minimising and Mitigating impacts on Biodiversity Values 36
7.2.1 Restoration of CPW 36
7.2.2 Mitigation measures implemented for threatened species recorded onsite 37
7.3 Thresholds for the assessment and offsetting of impacts of development 37
7.3.1 Serious and Irreversible Impacts 37
7.3.2 Impacts which require an offset 45

8 Final Credit Calculations 46

8.1 Ecosystem Credits 46
8.2 Species Credits 46
8.3 Scattered Tree Assessment 46
8.4 Credit Costs 46

9 Statutory Assessment 47

9.1 Introduction 47
9.1.1 Environmental Planning and Assessment Act 1979 47
9.1.2 SEPP Coastal Management 2018 47
9.1.3 SEPP Koala Habitat Protection 2021 47
9.1.4 Biodiversity Conservation Act 2016 47
9.1.5 Fisheries Management Act 1994 48
9.2 Commonwealth 48
9.2.1 Environment Protection and Biodiversity Conservation Act 1999 48

10 References 51

Appendix A – CVs 52

Appendix B – Vegetation Plot Data 53

Appendix C – Site Flora Species List 54

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix D – Vegetation Plot Photos **57**

Appendix E – Anabat Report **60**

Appendix F – BAM Calculator Reports **61**

Appendix G – Protected Matters Search Tool (EPBC Act) **62**

List of Tables

Table 3.1 PCTs present on the Site and number of associated Vegetation Zones 14

Table 3.2 PCT 849 14

Table 3.3 Vegetation Integrity Score 17

Table 4.1 Ecosystem credit species 18

Table 4.2 Species credit species – assessment of habitat constraints 20

Table 4.3 Flora Survey Times 23

Table 4.4 Fauna Survey Effort and Threatened Species Results 25

Table 4.5 Fauna observed on site 26

Table 5.1 Scattered Tree Assessment 28

Table 6.1 Areas of each PCT to be cleared (Stage 7-8) 33

Table 6.2 Additional prescribed biodiversity impacts and their relevance to the Development Site. 35

Table 7.1 Impact assessment provisions for threatened ecological communities at risk of an SAII 39

Table 8.1 Ecosystem Credit Summary 46

Table 8.2 Species Credits 46

Table 8.3 Scattered Tree Credit requirements 46

Table 9.1 Assessment of MNES 49

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

List of Figures

Figure 1.1 Approved disturbance zone as per DA18/0310.03 2

Figure 1.2 The Site 4

Figure 1.3 Proposed development: Stages 7-8 5

Figure 1.4 Basin E Rectification Plan 6

Figure 2.1 Location Map (Mitchell Landscape and IBRA Subregion) 9

Figure 2.2 Native Vegetation Extent 10

Figure 2.3 Water Features 11

Figure 2.4 Soil Landscape 12

Figure 3.1 Plant Community Types and Zones 15

Figure 4.1 Flora Survey Effort 24

Figure 4.2 Fauna Survey Effort 27

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

1 Introduction and Background

1.1 Background

This Biodiversity Development Assessment Report (BDAR) has been undertaken to accompany a Development Application (DA) relating to the Highland Views Estate - Stages 7 to 8 Residential Subdivision. The study area is located wholly within the City of Penrith Local Government Area (LGA) and comprises a portion of Lot 700, part Lot 701, Lot 702 DP 1275647 Middlebrook Rise, Lot 445 DP 1268480 and and an existing sediment basin (Basin E) located within Lot 2000 DP1204777 Bradley Street.

This BDAR has been prepared by Hannah Reid, Accredited Assessor (BAAS18114) and reviewed by Accredited Assessors Jacqui Coughlan (BAAS18139) and Ian Colvin (BAAS18055) under the Biodiversity Conservation Regulation 2017 and is consistent with the Biodiversity Assessment Method ('BAM'; DPIE 2020a).

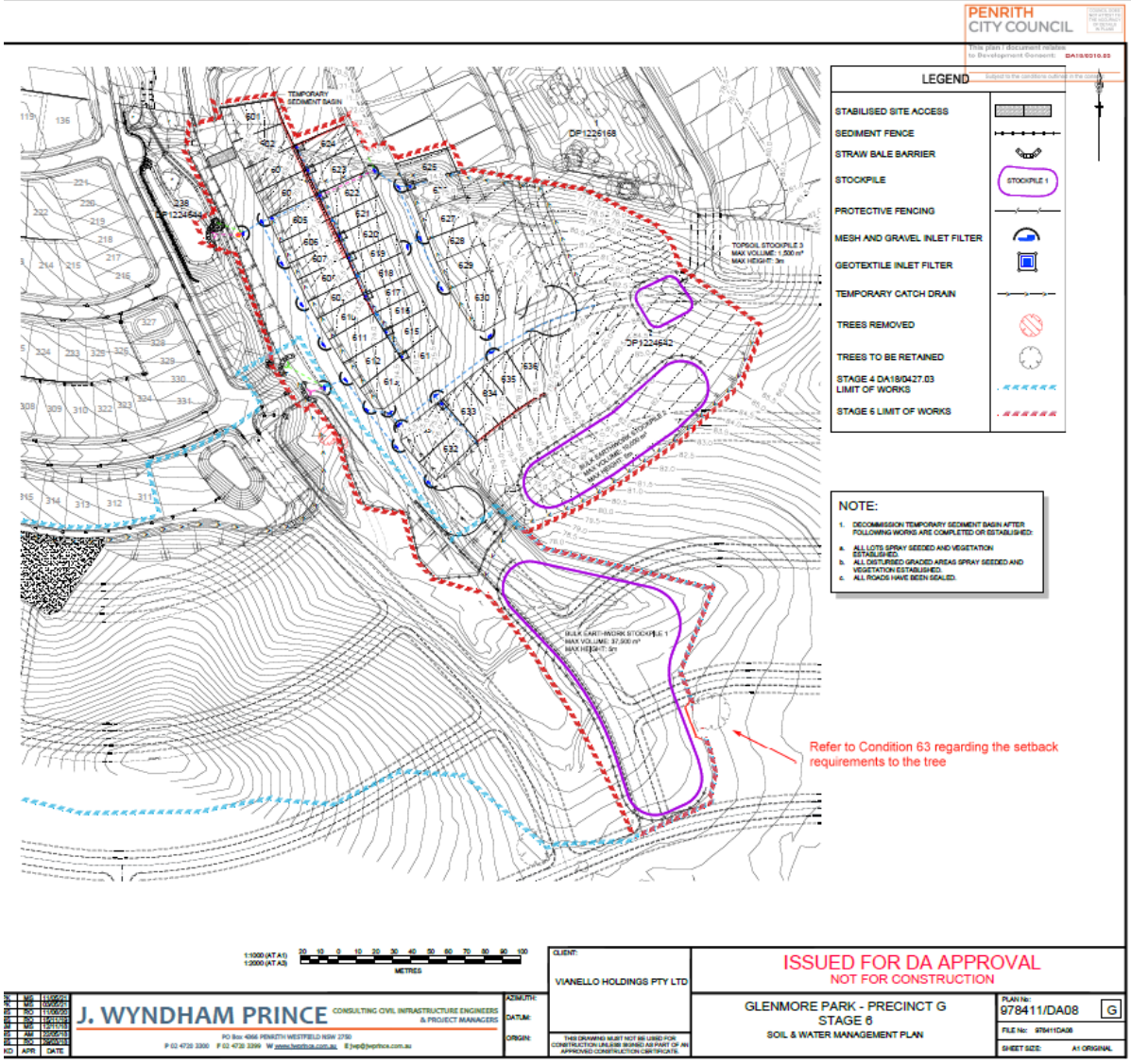
A previous version of this BDAR (Stages 7-9) was prepared and submitted as part of the development application to Penrith City Council. Following some correspondence, the BDAR has been revised to address some comments by Council, in addition addressing a reduced footprint for the development (Stage 9 has been omitted) and including vegetation clearing requirements for a constructed stormwater detention basin (Basin E).

NOTE: part of the site (known as Stage 6) was subject to a previous biodiversity assessment (assessed under the *Threatened Species Conservation Act 1995*) and approved in 2018 as DA18/0310. A modification to this DA for earthworks and stockpiles was approved 6 February 2019 as DA18/0310.03 and areas of Stage 6 have been subject to filling and stockpiling as per the consent. The approval defines a large area within the site as subject to the Stage 6 limit of works, as noted by the red dashed line in Figure 1.1.

On this basis, all vegetation within the red dashed line in Figure 1.1 are recognised as having approval for clearing and disturbance and on this basis are excluded from this BDAR in terms of vegetation impacts and entry of areas into the BAM-Calculator.

This approach was presented to Council at a progress meeting on 03/11/2021 and was accepted.

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1.2 Location and site identification

The land to which this application relates comprises a portion of Lot 700, part Lot 701, Lot 702 DP 1275647 Middlebrook Rise, Lot 445 DP 1268480 and an existing sediment basin (Basin E) located within Lot 2000 DP 1204777 Bradley Street (Figure 1.2). The site is located 2.8km south of the Western Motorway and ~7km south of Penrith Town Centre. The Nepean River runs south to north ~6km to the west and Mulgoa Nature Reserve occurs ~1.7km west of the site.

This BDAR comprises a regular BAM Assessment and Streamlined Assessment (Scattered Tree and Planted Native Vegetation modules). The Scattered Tree Assessment assesses a single tree at the southern section of the lots and a Planted Native Vegetation Assessment has been completed for an existing sediment basin (Basin E) which requires rectification works. The Streamlined Assessments are outlined in Section 5 of this report.

- The **Site** comprises:
  - Stages 7-8 (~6.8 ha) which includes all proposed lots, infrastructure (including roads and stormwater infrastructure), buffers and Asset Protection Zones (APZs). Note that 3 ha within Stages 7-8 has approval for filling and stockpiling under approved DA18/0310.03.
  - Two screening mounds to the east (0.64 ha).
  - Basin E to the north (~0.24 ha).

  On this basis, the Site totals approximately 7.68 ha, of which 4.68 ha is subject to assessment (due to 3 ha within Stages 7-8 being approved under DA18/0310.03).
- The **Study Area** comprises the whole of the Site and land within 50m of the Site.
- The **Locality** includes an area within a 1500 m buffer of the Site (as required by the BAM).

1.3 Proposed Development

This application seeks development consent for a proposed residential subdivision and associated recreation area (Pinnacle Park) within Stages 7-8, over an area of 6.8 ha (refer Figure 1.3). Stages 7 – 8 includes 88 residential lots and two 'superlots' in addition to an area of open space in the north (adjacent to the already established 'Pinnacle Park' to the north) and a small area of riparian corridor in the south-west. Figure 1.3 also shows the approved disturbance zone as per DA18/0310.03 (Figure 1.1).

Two screening mounds will also be constructed and landscaped along The Northern Road (to the east of the development) to provide screening from the newly constructed highway across to the residential development.

It is assumed that 100% of the trees within Pinnacle Park (assessment area) will be retained. The precautionary principle has been applied and the BAM Calculator (BAM-C) has assumed a 25% loss of understorey and ground cover vegetation within 20m of proposed works (subdivision), to account for any incidental damage and edge effects. This is reflected in the Management Zone (Park) in the BAM-C. Vegetation beyond 20m from the works footprint, will be retained.

An existing sediment basin (Basin E) located approx. 300m north of Stages 7-8 also requires modification to increase capacity to account for increasing demand associated with Stages 7-8. The works within Basin E require an adjustment to the bund wall (raising it by 400mm); refer Figure 1.4. Note that Figure 1.4 also shows a single planted tree to be removed (in red). Other planted trees occur along the bund (all of which require removal), but were not picked up by survey as they had a diameter at breast height of 200mm or less.

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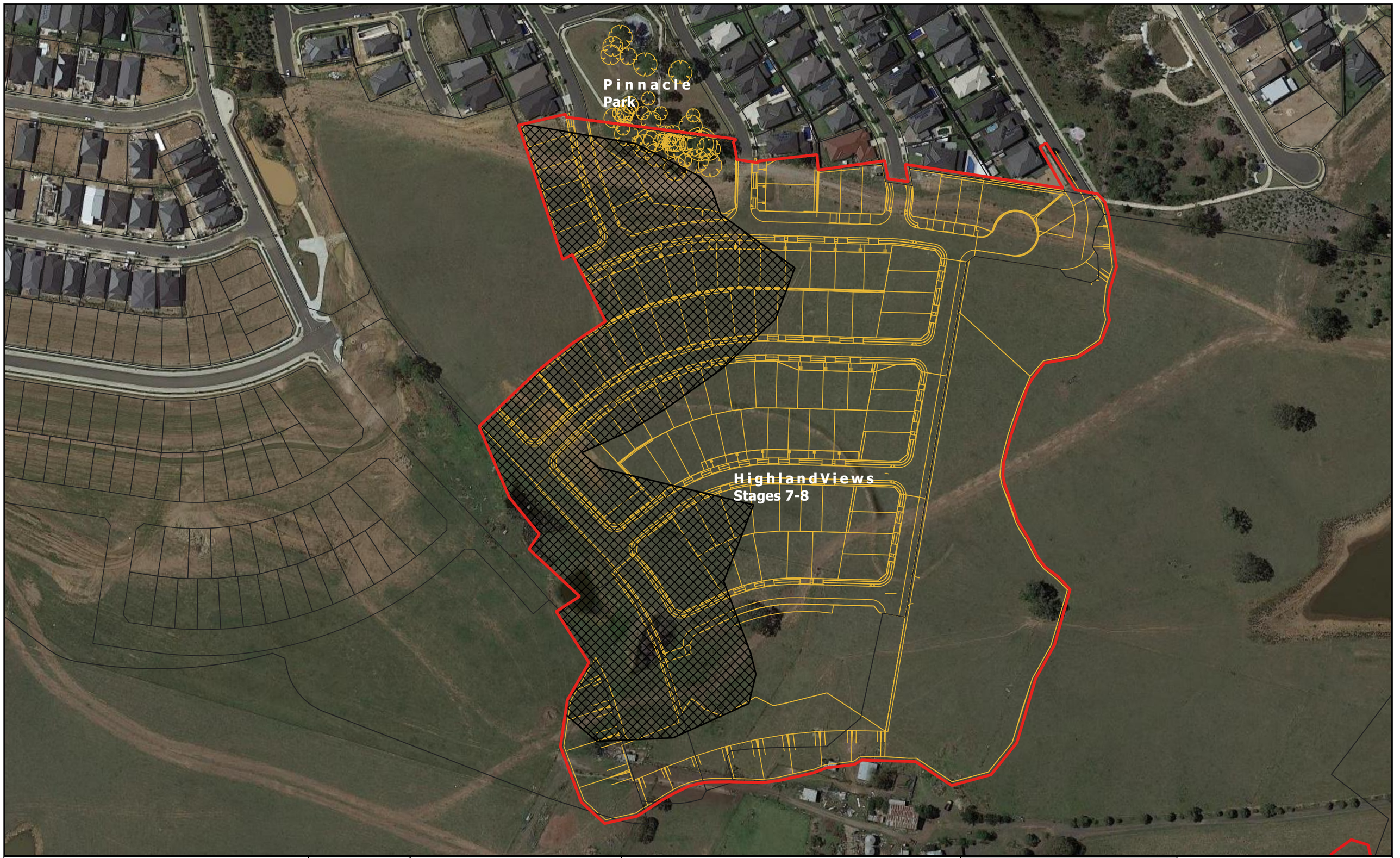
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Coordinate System: MGA 56 Projection: Transverse Mercator

Legend
- Site Boundary
- Approved Disturbance Area
- Cadastral

Figure 1.2

The Site

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Date	16/12/2021

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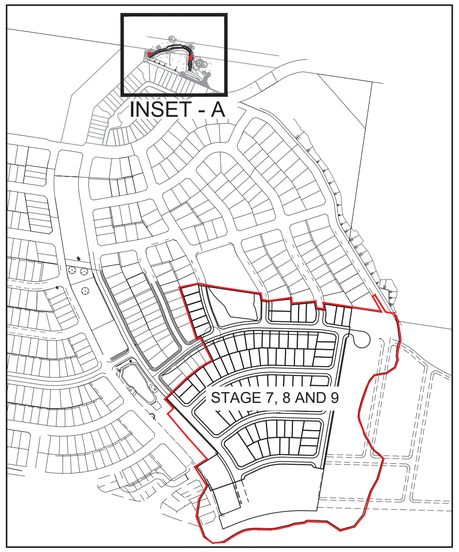
A3 Scale 1:2,000
Coordinate System: MGA 56 Projection: Transverse Mercator

Legend
- Site Boundary
- Approved Disturbance Area
- Cadastral
- Subdivision Layout

Figure 1.3

Proposed development: Stages 7-8

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Version: 1, Version Date: 21/02/2022



KEYPLAN

LEGEND

- DESIGN CONTOUR
- EXISTING CONTOUR
- LIMIT OF WORKS
- TREE TO BE REMOVED
- EXISTING TREE TO BE RETAINED

BASIN E					
CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH
0	285761.45	6257115.54	56°12'46.64"		
10.66	285770.31	6257121.47			
19.16	285778.29	6257124.42			
28.17	285787.04	6257126.56			
41.48	285799.86	6257130.11			
48.16	285806.53	6257130.48			
54.66	285813.04	6257130.63	88°40'40.89"		
56.64	285815.04	6257130.67		10	3.95
58.61	285816.9	6257129.95	111°18'52.35"		
61.69	285819.76	6257128.83	111°18'52.35"		
64.17	285822.12	6257127.91		10	4.96
66.65	285823.76	6257125.98	139°44'12.97"		
67.25	285824.15	6257125.52	139°44'12.97"		
71.04	285826.72	6257122.48		10	7.59
74.83	285826.5	6257118.5	183°12'05.29"		
83.81	285826	6257109.53			
88.73	285825.39	6257104.65	187°09'57.53"		
90.38	285825.18	6257103.01		-10	3.28
92.02	285825.51	6257101.39	168°22'00.93"		
94.17	285825.95	6257099.27	168°22'00.93"		
96.31	285826.39	6257097.14		10	4.28
98.45	285825.9	6257095.03	192°52'22.52"		
99.67	285825.63	6257093.84	192°52'22.52"		

2000
D P1204777

INSET - A

1:200 (AT A1)
1:400 (AT A3)

4 2 0 4 8 12 16 20
METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	CC	NAF	MS	RO	15/04/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300 W www.jwprince.com.au E jwp@jwprince.com.au

CLIENT: VIANELLO HOLDINGS PTY LTD

STATUS: ISSUE FOR DA APPROVAL

NOT FOR CONSTRUCTION

THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS PART OF AN APPROVED CONSTRUCTION CERTIFICATE.

GLENMORE PARK - PRECINCT H
STAGE 7A, 7B, 8A AND 8B
BASIN PLAN

PROJECT No: 9784-13

SHEET No: DA006

AZIMUTH: M.G.A. | DATUM: A.H.D. | ORIGIN: | PLAN No: 9784-13-DA006 | A

Plotted: 27 April , 2021 11:06:18 AM File Name: J:\9784 - Glenmore Park Vianello Masterplan\01 - Civil Design\CD\DA\Stage 7, 8, & 9\9784-13-DA006.dwg

Document Set ID: 9954734
Version: 1, Version Date: 27/02/2022

2 Landscape Context

2.1 Landscape Features

In accordance with the BAM, a number of features are assessed within and surrounding the subject site.

2.1.1 IBRA bioregions and IBRA subregions

Interim Biogeographic Regionalisation of Australia (IBRA) regions represent a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna species present. The subject land is located entirely within the Cumberland IBRA Subregion and within the Sydney Basin IBRA region.

2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject site occurs entirely within the Cumberland Plain NSW Mitchell Landscape, shown in Figure 2.1.

2.1.3 Landforms

Rivers, Streams and Estuaries

- A first order stream runs from south to north adjoining the site at Pinnacle Park, where it has been highly modified. Only the very southern extent of the stream falls within the site boundary. The stream provides minimal habitat and does not have a well defined top of bank (Figure 2.3).
- A small dam/wetland of 195m^2 supporting native aquatic vegetation occurs on the northern boundary of Lot 700 at the end of Capstone Terrace.

Caves/Rocky Escarpment

- There are no caves or rocky escarpments on the site.

2.1.4 Soils and Geology

Soils at the site have been mapped by Morand (1994) as belonging to the Luddenham Erosional (ERlu) and Blacktown Residual (REbt) soil landscapes as follows (Figure 2.4):

Luddenham (ERlu) – Main Site

- **Landscape—**undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief 50–80 m, slopes 5–20%. Narrow ridges, hillcrests and valleys. Extensively cleared tall open forest (wet sclerophyll forest).
- **Soils—**shallow (<100 cm) dark podzolic soils or massive earthy clays on crests; moderately deep (70–150 cm) red podzolic soils on upper slopes; moderately deep (<150 cm) yellow podzolic soils and prairie soils on lower slopes and drainage lines.
- **Limitations—**water erosion hazard, localised steep slopes, localised mass movement hazard, localised shallow soils, localised surface movement potential; localised impermeable highly plastic subsoil, moderately reactive.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Blacktown (REbt) – Basin E

- Landscape—gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared Eucalypt woodland and tall open-forest (dry sclerophyll forest).
- Soils—shallow to moderately deep (>100 cm) hardsetting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.
- Limitations—localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.

2.1.5 Disturbance

Pre-European vegetation at the site would most likely have comprised a combination of dry sclerophyll forest (Cumberland Plain Woodland), dominated by *Eucalyptus tereticornis*, *Eucalyptus moluccana* and *Eucalyptus crebra*. The site has experienced high levels of disturbance through clearing for agricultural purposes. Elevated portions of the site have been changed historically by drain and dam construction.

2.2 Site Context

2.2.1 Native Vegetation Cover

As per the BAM 2020 methodology (Section 4.3.2) a buffer of 1500 metres was established around the site and a calculation of native vegetation cover was derived using native vegetation mapping (NSW Native Vegetation Extent v1.2 2017) summing values of 'tree cover' and 'tree cover matrix' values. Approximately 470 ha of native vegetation was identified within 1500 m of the site, therefore a native vegetation cover of 56% applies.

The total area of the 1,500m buffer around the study area is 893ha, with the area of vegetation mapped within the buffer being 200ha (Figure 2.2). This comprises a native vegetation cover of 22%, falling in the 10-30% class, which was entered into the BAM-C.

2.2.2 Patch Size

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified and the updated native vegetation extent data layer prepared for the 1,500m buffer. Patch size is required to be assessed as one of four classes per vegetation zone mapped, being <5 ha, 5-24 ha, 25-100 ha or >100 ha.

One patch was identified for vegetation within the subject land. Based upon vegetation mapping and air photo interpretation beyond the subject land, the total area of this patch of native vegetation was calculated as <5ha.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Legend
Site Boundary
1500m buffer
MitchellLandscapes_v31
Cumberland Plain
IBRASubegion_Aust70
Cumberland

Source:	NearMap / Google Satellite
Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.
Date	15/12/2021

0 500 1,000 m

A3 Scale 1:14,000
Coordinate System: MGA 56 Projection: Transverse Mercator

Figure 2.1

Location Map (Mitchell Landscape and IBRA Subregion)

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Source:	Google Satellite NSW Native Vegetation Extent v1.2
Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.
Date	15/12/2021

0 250 500 750 1,000 1,250 m

A3 Scale 1:15,000
Coordinate System: MGA 56 Projection: Transverse Mercator

Legend

- Site Boundary
- 1500m buffer

NSW_Native_Vegetation_Extent_v1p2_5m_2017

- Native Vegetation Absent
- Native Vegetation Present

Figure 2.2

Native Vegetation Extent

Document Set ID: 9961731
Version: 1, Version Date: 21/02/2022

AWC

Source:	Google Satellite Streams - Six Maps
Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.
Date	16/12/2021

0 500 1,000 m

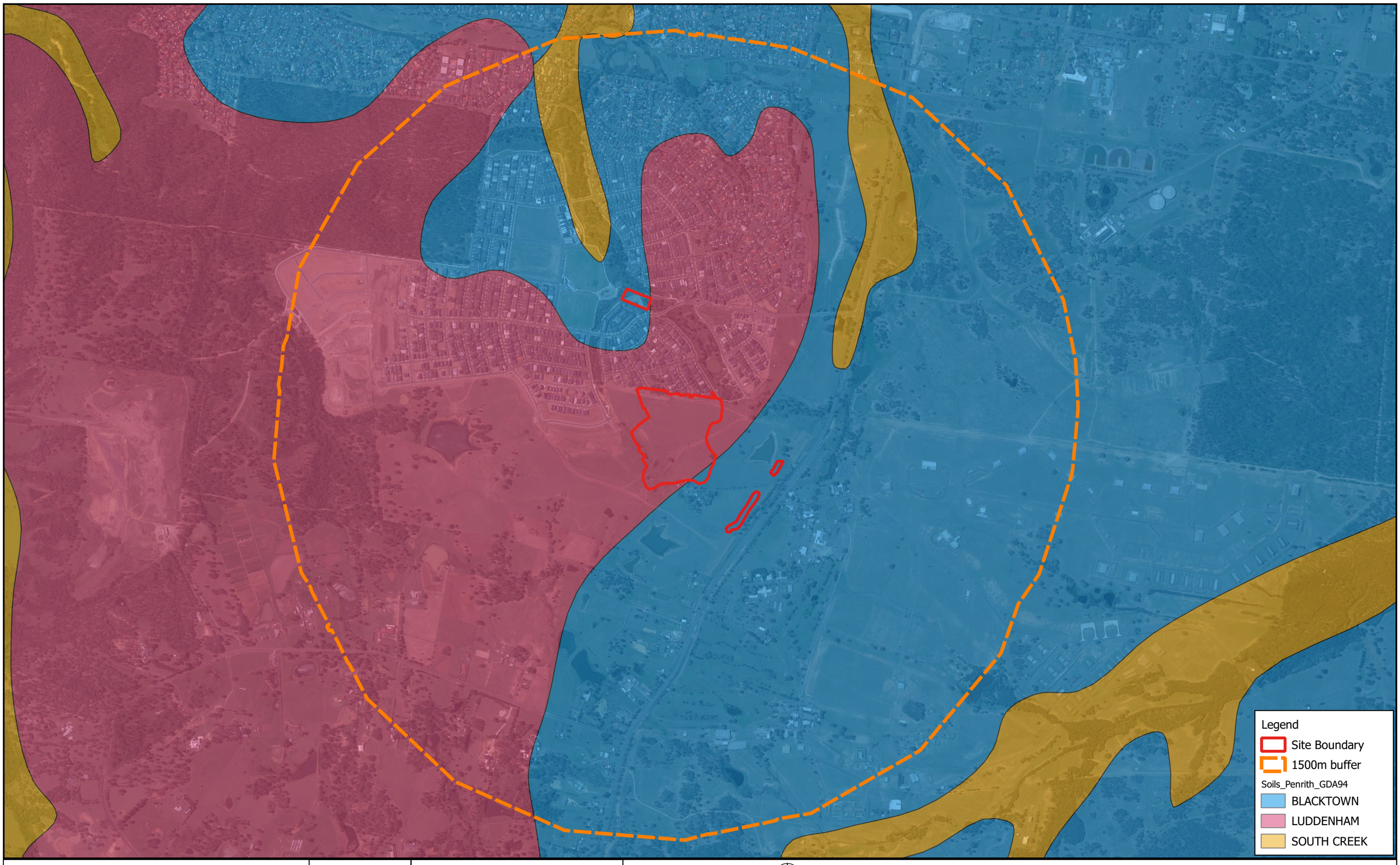
A3 Scale 1:14,000
Coordinate System: MGA 56 Projection: Transverse Mercator

Legend
- Site Boundary
- 1500m buffer
- Streams

Figure 2.3

Water Features

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022



AWC

Source:	NearMap / Google Satellite
Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.
Date	16/12/2021

0 500 1,000 m

A3 Scale 1:14,000
Coordinate System: MGA 56 Projection: Transverse Mercator

Figure 2.4

Soil Landscape

Document Set ID: 9961731
Version: 1, Version Date: 21/02/2022

3 Native Vegetation

3.1 Methods

Assessment and mapping of Plant Community Types (PCTs) was undertaken on the 19th February 2021. The study area was traversed to identify the vegetation structure and dominant species within patches of native vegetation. The extent of each patch of vegetation was traversed to sample any spatial variation within each polygon, identify boundaries between vegetation communities and to identify and map vegetation zones in accordance with the BAM (variation in the broad condition state of vegetation polygons).

Based upon the initial survey of the entire study area, vegetation communities present were identified, and their boundaries were mapped. The floristics of each of these vegetation communities were then sampled within vegetation plot surveys, consistent with Section 5.2.1.9 of the BAM. These are also the location of vegetation integrity plots in accordance with Section 5.3 of the BAM. The location of floristic vegetation plots were based upon randomly sampled areas of each vegetation community, whilst ensuring that the plot-based surveys included representative areas within each community and avoided, where possible, edge effects (i.e. located close to edges of vegetation extent) or ecotones with adjacent vegetation zones.

Identification of PCTs was in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. Determination of the most appropriate PCTs for vegetation communities within the study area used the BioNet Vegetation Classification database to identify PCT types which matched the geographic distribution (based upon IBRA subregions), vegetation formation and floristics of vegetation within the subject land.

3.2 Plant Community Types (PCTs)

Numerous studies have been conducted on the site, as such existing vegetation mapping was used to determine PCTs. Vegetation mapping by EcoLogical (2015) identified two vegetation types within the study area: Shale Plains Woodland (SPW) and Cleared land. SPW corresponds to the Threatened Ecological Community (TEC) 'Cumberland Plain Woodland in the Sydney Basin Bioregion' (CPW), listed as a critically endangered ecological community (CEEC) under the BC Act and EPBC Act.

Field assessment confirmed woody vegetation at the site is consistent with PCT 849 Cumberland shale plains woodland (refer Figure 3.1). A summary of the PCTs within the subject land including areas of vegetation zones, the percent cleared for the PCT and Serious and Irreversible Impact (SAII) candidate entities is included in Table 3.1.

Vegetation is shown in Figure 3.1. Vegetation that falls within the proposed works footprint and/or buffer and has been included in the BAMC includes:

- Zone 1 (20m buffer to account for edge effects, note that it is still intention to retain in situ)
- Zone 2 (direct impact).

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

For impacts on Planted Native Vegetation and Scattered Tree Assessment refer to Section 5.

Table 3.1 PCTs present on the Site and number of associated Vegetation Zones

Types (PCTs)	Vegetation Formation & class	Vegetation zones (footprint and buffer)	Area (Total)	Threatened Ecological Communities	SAII candidate entity
PCT 849 Cumberland shale plains woodland	Formation- Grassy Woodlands Class- Coastal Valley Grassy Woodlands	2 (plus scattered tree)	0.909*	Yes	Yes

* allowing for areas approved for filling and stockpiling under approved DA18/0310.03

Details of PCT 849 at the site (Zones 1 and 2) are provided at Table 3.2.

Table 3.2 PCT 849

Feature	Benchmark	Zone	
		1	2
		CPW_Moderate	Derived_Grassland
Canopy (Tree)	Richness: 5 Cover: 53% Species: *Eucalyptus moluccana, Eucalyptus tereticornis*	*E. tereticornis, E. crebra, E. moluccana*	N/A
Middle Stratum (Shrub)	Richness: 8 Cover: 16% Species: *Bursaria spinosa subsp. spinosa*	*Bursaria spinosa* subsp. *spinosa*	N/A
Ground Stratum (Grass, forb, fern)	Richness: 28 Cover: 68% Species: *Dichondra repens, Cheilanthes sieberi subsp. sieberi, Aristida vagans, Microlaena stipoides var. stipoides, Themeda australis, Brunoniella australis, Desmodium gunnii, Opercularia diphylla, Wahlenbergia gracilis, Paspalidium distans, Eragrostis leptostachya, Lomandra filiformis, Dianella longifolia, Oxalis perennans, Goodenia hederacea, Euchiton sphaericus, Aristida ramose, Arthropodium milleflorum, Cymbopogon refractus, Echinopogon caespitosus*	*Chloris gayana, Oplismenus aemulus, Bidens subalternans, Microlaena stipoides*	*Bothriochloa macra, Cynodon dactylon, Enteropogon acicularis, Plantago lanceolata*
Condition	-	Moderate Condition	Absent canopy, low condition, high abundance of native grasses. Weed presence is high. Experiences cattle grazing and slashing. Main native grass species (*Cynodon dactylon*) is not characteristic of this PCT

Document Set ID: 9961734
Version: 1, Version Date: 21/02/2022

Legend

- Site Boundary - Assessment Area
- Approved Disturbance Area
- Proposed Works 8.12.21

Vegetation Zones

- Zone 1 - PCT849 - CPW
- Zone 2 - PCT849 - Derived Grassland
- Scattered Tree
- Planted Native Vegetation
- Exotic Grassland
- PCT849 outside of footprint

AWC

Source:	NearMap / Google Satellite
Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.
Date	15/12/2021

0 100 200 300 m

A3 Scale 1:3300
Coordinate System: MGA 56 Projection: Transverse Mercator

Figure 3.1

Plant Community Types and Zones

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

PCT Justification

Definition: "The gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*) and ironbark (*Eucalyptus crebra/Eucalyptus fibrosa*). Localised patches of spotted gum (*Corymbia maculata*) may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community listed under the NSW TSC Act. Like the related community Cumberland Shale Hills Woodland (S_GW02) it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs. Tozer *et al.* (2010) define the primary habitat for the community as occurring at elevations less than 150 metres above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain."

Justification: The site comprises shale plains of western Sydney. Dominant canopy species comprise *Eucalyptus tereticornis*, *E. moluccana* and *E. crebra*. The understorey is sparse and dominated by *Bursaria spinosa, Breynia oblongifolia* and *Cheilanthes sieberi.* The dense ground cover comprises a mixture of grasses and forbs including: *Aristida ramosa, Arthropodium minus, Asperula conferta, Bothriochloa marra, Chloris truncata* and *Chloris ventricosa.*

3.3 Vegetation Zones

3.3.1 Condition classes, subcategories and areas

PCTs identified within the development footprint and buffer were classified into vegetation zones for credit calculation purposes. The vegetation zones are based on the condition descriptions above with the area of each vegetation zone shown in Table 3.3.

3.3.2 Vegetation integrity survey plots

Three vegetation integrity survey plots were completed on site (see Appendix B & C for data captured and Appendix D for photos); refer Figure 3.1. The number of plots surveyed within each vegetation zone is consistent with the requirements as outlined within Table 4 of the BAM.

3.3.3 Current and future integrity scores

Vegetation integrity scores were calculated based on the vegetation integrity survey plots collected for each vegetation zone assigned to a native PCT. Vegetation integrity scores are provided in Table 3.3. All vegetation zones within the immediate development footprint (with the exception of proposed Lot 700) will require complete clearing of all vegetation and the default future vegetation integrity score of 0 was retained. A 20m wide buffer area has been allowed between the development footprint and the vegetation adjacent to Pinnacle Park (proposed Lot 700) to account for indirect impacts arising from the construction and operation phases of the development (e.g. road edge effects, batters, edge effects, batters, weed invasion, trampling, machinery etc). Although no trees are proposed to be removed within this buffer a 75% loss in understorey and canopy (precautionary principle) has been assumed within the 20m buffer.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Table 3.3 Vegetation Integrity Score

Zone	PCT	Condition class	Management Zone	Area impacted (ha)	Plots	Veg integrity score – before	Veg integrity score – after development	Total change in integrity Score
1	849	CPW Moderate	Park – no trees, shrubs, understorey or ground cover to be removed. 50% loss in 20m buffer assumed for indirect impacts.	0.05	1	56.1	25.2	30.9
2	849	Derived Grassland	Lot Footprint – all vegetation to be lost	0.86	2	12.1	0	12.1

Document Set ID: 9861734
Version: 1, Version Date: 21/02/2022

4 Threatened Species

4.1 Introduction

Section 6 of the BAM details the process for determining the habitat suitability for threatened species. Under the BAM, threatened species are separated into two classes, 'ecosystem' and 'species' credit species. Those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which a targeted survey has a low probability of detection, are identified as 'ecosystem' credit species. Targeted surveys are not required for ecosystem species and potential impacts to these species are assessed in conjunction with impacts to PCTs.

Previous studies of the site as well as a preliminary site assessment conducted in February 2021 were used to form justifications prior to detailed field assessments.

4.2 Ecosystem credit species

Table 4.1 lists threatened species reliably predicted to utilise the site by the BAM-C. No surveys are required for these species because they are associated with the occurrence of a particular PCT, and ecosystem credits apply to these species.

Table 4.1 Ecosystem credit species

Common Name	Scientific Name	Plant Community Types (PCT)	Maintained as Ecosystem Credit Species	Justification/comment
Barking Owl	*Ninox connivens*	849-Cumberland shale plains woodland	Y	
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	849-Cumberland shale plains woodland	Y	
Diamond Firetail	*Stagonopleura guttata*	849-Cumberland shale plains woodland	Y	
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	849-Cumberland shale plains woodland	N	Insufficient suitable habitat, small patch of woodland with degraded understorey.
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	849-Cumberland shale plains woodland	Y	
Flame Robin	*Petroica phoenicea*	849-Cumberland shale plains woodland	N	Insufficient suitable habitat, small patch of woodland with degraded understorey.
Gang-gang Cockatoo	*Callocephalon fimbriatum*	849-Cumberland shale plains woodland	N	Insufficient suitable habitat, small patch of woodland with degraded understorey.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	849-Cumberland shale plains woodland	Y	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Common Name	Scientific Name	Plant Community Types (PCT)	Maintained as Ecosystem Credit Species	Justification/comment
Grey-headed Flying- fox	*Pteropus poliocephalus*	849-Cumberland shale plains woodland	Y	
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	849-Cumberland shale plains woodland	N	Insufficient suitable habitat, small patch of woodland with degraded understorey
Koala	*Phascolarctos cinereus*	849-Cumberland shale plains woodland	N	Very small isolated patch of woodland surrounded by urban environment and open paddocks. Not sufficient to sustain a Koala.
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	849-Cumberland shale plains woodland	Y	
Little Bent-winged Bat	*Miniopterus australis*	849-Cumberland shale plains woodland	Y	
Little Eagle	*Hieraaetus morphnoides*	849-Cumberland shale plains woodland	Y	
Little Lorikeet	*Glossopsitta pusilla*	849-Cumberland shale plains woodland	Y	
Masked Owl	*Tyto novaehollandiae*	849-Cumberland shale plains woodland	Y	
Painted Honeyeater	*Grantiella picta*	849-Cumberland shale plains woodland	N	Not recorded in the locality since 1989. No mistletoe.
Powerful Owl	*Ninox strenua*	849-Cumberland shale plains woodland	N	Site does not support prey habitat. Insufficient sheltered foraging habitat.
Regent Honeyeater	*Anthochaera phrygia*	849-Cumberland shale plains woodland	N	No dry woodland or riparian River She-oak woodland
Scarlet Robin	*Petroica boodang*	849-Cumberland shale plains woodland	N	Very small patch of woodland on site lacks open and grassy understorey.
Speckled Warbler	*Chthonicola sagittata*	849-Cumberland shale plains woodland	N	Preferred habitat not present, insufficient ground layer complexity
Spotted Harrier	*Circus assimilis*	849-Cumberland shale plains woodland	N	Habitat on site would not support preferred prey species. No prey habitat and no suitable foraging habitat.
Spotted-tailed Quoll	*Dasyurus maculatus*	849-Cumberland shale plains woodland	N	No denning and limited foraging habitat. Site surrounded by residential development and major roads.
Square-tailed Kite	*Lophoictinia isura*	849-Cumberland shale plains woodland	N	Site is insufficiently timbered.
Swift Parrot	*Lathamus discolor*	849-Cumberland shale plains	Y	

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

Common Name	Scientific Name	Plant Community Types (PCT)	Maintained as Ecosystem Credit Species	Justification/comment
		woodland		
Turquoise Parrot	*Neophema pulchella*	849-Cumberland shale plains woodland	N	No native grassy woodland on site.
Varied Sittella	*Daphoenositta chrysoptera*	849-Cumberland shale plains woodland	Y	
White-bellied Sea- Eagle	*Haliaeetus leucogaster*	849-Cumberland shale plains woodland	N	No large areas of open water, prey habitat or suitable perches.
White-throated Needletail	*Hirundapus caudacutus*	849-Cumberland shale plains woodland	Y	
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	849-Cumberland shale plains woodland	Y	

4.3 Species credit species (Candidate Species)

Species credit species are predicted in the BAM-C from assessment of geographic and habitat features in the credit calculator. Some species require further assessment of habitat constraints and/or geographic limitations before being confirmed as candidate species for assessment. Table 4.2 outlines species confirmed as a candidate species.

A candidate species that is not considered to have suitable habitat on the subject site (or specific vegetation zones) does not require further assessment on the subject site (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) must be documented.

The potential for each threatened species to occur was considered following review of location and date of records of threatened species, available habitat within the subject land, and the condition of such habitat. Table 4.2 outlines the predicted candidate species which were deemed to not have suitable habitat within the study area, including justification for this decision.

Table 4.2 Species credit species – assessment of habitat constraints

Species	Survey Timing	Maintained as Candidate Species	Justification/comment	SAII Candidate
Thesium australe Austral Toadflax	Nov - Feb	Y		
Persoonia bargoensis Bargo Geebung	All months	Y		
Cynanchum elegans White-flowered Wax Plant	All months	Y		
Eucalyptus benthamii Camden White Gum	All months	Y		
Acacia bynoeana Bynoe's Wattle	All months	Y		
Caladenia tessellata Thick Lip Spider Orchid	Sept-Oct	N	Unlikely to occur due to weed occurrence, sparseness of understory, past disturbance and isolated nature of the vegetation onsite.	Y

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

Species	Survey Timing	Maintained as Candidate Species	Justification/comment	SAII Candidate
Persicaria elatior Tall Knotweed	Dec - May	Y		
Dillwynia tenuifolia	Aug-Oct	Y		
Acacia pubescens Downy Wattle	All months	Y		
Dillwynia tenuifolia - endangered population *Dillwynia tenuifolia*, Kemps Creek	Aug-Oct	N	The endangered population occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. The site supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland. Portions of the site contain a form of Shale Gravel Transition Forest. Location and vegetation of the subject site do not fall within this description.	
Grevillea juniperina subsp. *juniperina* *Juniper-leaved Grevillea*	All months	Y		
Marsdenia viridiflora subsp. viridiflora - endangered population	Nov - Feb	Y		
Pultenaea pedunculata Matted Bush-pea	Sept - Nov	Y		
Pimelea curviflora var. *curviflora*	Oct - Mar	Y		
Pommerhelix duralensis Dural Land Snail	All months	Y		
Pimelea spicata Spiked Rice-flower	All months	Y		
Pterostylis saxicola *Sydney Plains Greenhood*	Oct	Y		
Meridolum corneovirens Cumberland Plain Land Snail	All months	Y		
Cercartetus nanus Eastern Pygmy-possum	Oct - Mar	N	No habitat on site, vegetation onsite degraded and isolated.	
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Oct - Jan	N	No suitable hollows on site.	
Litoria aurea Green and Golden Bell Frog	Nov - Mar	Y	Small amount of potential breeding habitat on site.	
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Oct - Dec	N	No breeding camps/breeding habitat present onsite.	
Phascolarctos cinereus Koala (breeding)	All months	N	Very small, isolated patch of woodland surrounded by urban environment and open paddocks. Not sufficient to sustain a Koala. Does not fall within areas identified as important habitat.	
Miniopterus orianae oceanensis	Dec - Feb	N	No breeding habitat onsite.	

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

Species	Survey Timing	Maintained as Candidate Species	Justification/comment	SAII Candidate
Large Bent-winged Bat (Breeding)				
Chalinolobus dwyeri Large-eared Pied Bat	Nov - Jan	N	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings. No caves, cliffs or other suitable roosting habitat on the site. The landscape on the site is dominated by cleared exotic pasture with one very small patch of woodland.	Y
Miniopterus australis Little Bent-winged Bat (Breeding)	Dec - Feb	N	No breeding habitat onsite (caves, tunnel, mine, culvert), numbers of individuals less than 500.	
Hieraaetus morphnoides Little Eagle (breeding)	Aug - Oct	N	No nest trees occur.	
Tyto novaehollandiae Masked Owl (breeding)	May - Aug	N	No large hollows occur.	
Ninox strenua Powerful Owl (breeding)	May - Aug	N	No large hollows occur.	
Ninox connivens Barking Owl (Breeding)	May - Aug	N	No large hollows occur.	
Anthochaera phrygia Regent Honeyeater (Breeding)	-	N	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The site is not a known breeding site, and no suitable breeding habitat exists onsite. No important area mapping is depicted on site.	
Myotis macropus Southern Myotis	Oct - Mar	Y	Potential foraging habitat present (dam).	
Lophoictinia isura Square-tailed Kite (Breeding)	Sept - Jan	N	No nest trees present onsite. Site degraded.	
Petaurus norfolcensis Squirrel Glider	All months	N	No suitable nest hollows or foraging habitat. Site lacks Acacia and Banksia understorey. Degraded and isolated nature of site makes it unsuitable.	
Lathamus discolor Swift Parrot (Breeding)	-	N	No important habitat mapping on the site.	Y
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Jul - Dec	N	No large areas of open water, prey habitat or suitable perches.	
Burhinus grallarius Bush Stone-curlew	All months	N	Habitat is highly degraded surrounded by residential development posing high risk of predation by domestic animals. Lack of fallen/standing dead timber.	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

4.4 Presence/absence of candidate species

Targeted surveys for species credit species were undertaken in accordance with Section 6.5 of the BAM, including undertaking surveys during the nominated survey period specified for each candidate species and in accordance with OEH threatened species survey guidelines. The survey effort, timing and locations for threatened flora and fauna are outlined in the following sections.

The following flora and fauna surveys were undertaken during February 2021 by Jacqui Coughlan and James Schlunke (CVs in Appendix A).

4.4.1 Targeted Field Survey – Flora

A targeted flora survey was conducted over two days (Table 4.3). The site was traversed in transects throughout the entire development footprint (with a focus on the Cumberland Plain Woodland in the north of the site). Searches were focused on areas of native vegetation; however, grassland and landscaped areas were also searched. Refer to Figure 4.1 for location of BAM plots in each vegetation zone.

No threatened flora species were recorded during the survey.

The following Candidate Species were assumed present, as survey was conducted outside of the dedicated survey time: *Dillwynia tenuifolia, Pterostylis saxicola, Pultenaea pedunculata.*

Table 4.3 Flora Survey Times

Date	PCT	Method
19 February 2021	849 – Cumberland Plain Woodland	BAM plots (1)
19 February 2021	849 –CPW derived grassland	BAM plots (2)
19 February 2021	Exotic Grassland	BAM plots (2)
19 February 2021	849 – Cumberland Plain Woodland	Targeted Flora transect x1
19 February 2021	849 – CPW derived grassland	Targeted Flora Transect x1
26 February 2021	849 – CPW derived grassland	Targeted Flora Transect x1

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022



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Date	16/12/2021

0 50 100 150 m

A3 Scale 1:2000
Coordinate System: MGA 56 Projection: Transverse Mercator

Figure 4.1

Flora Survey Effort

Document Set ID: 9961734
Version: 1, Version Date: 11/02/2022

4.4.2 Targeted Field Survey – Fauna

Targeted surveys for candidate threatened fauna species are outlined for each of the candidate threatened fauna species in Table 4.4 below. Fauna survey effort is depicted in Figure 4.2. Results of all fauna surveys are provided in Table 4.5. Four threatened species were detected during the survey: Large Bent-winged Bat, Little Bent-winged Bat, Eastern Coastal Freetail-bat and Greater Broad-nosed Bat. All of these species are ecosystem species credit species.

Table 4.4 Fauna Survey Effort and Threatened Species Results

Survey	Target Species	Person hours	Effort	Total Effort	Threatened Species Detected
Nocturnal Survey (Spotlight)	Grey-headed Flying Fox	2 Nights x 1 person	1 hour	2 hours	nil
Frog Survey – call playback	Green and Golden Bell Frog	2 Nights x 1 person	1 hour each survey	2 hours	nil
Microbat (Anabat Survey)	Southern Myotis	5 nights x 1 device	All night	5 nights	Large Bent-winged Bat Little Bent-winged Bat Eastern Coastal Freetail-bat Greater Broad-nosed Bat
Bird Survey	White-bellied Sea-eagle Swift Parrot			4 transects	nil
Raking of litter and logs	Cumberland Plain Land Snail Dural Land Snail			2 hours	nil
Opportunistic survey	All threatened fauna	All times while on site	All times while onsite	3 days	nil

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Table 4.5 Fauna observed on site

Scientific Name	Common Name	Survey
Birds		
Acridotheres tristis	Indian Mynah*	Bird Survey
Anas superciliosa	Black Duck	Opportunistic at dam
Cacatua galerita	Sulphur-crested cockatoo	Bird Survey
Cacatua sanguinea	Little Corella	Bird Survey
Cracticus torquatus	Grey Butcherbird	Bird Survey
Grallina cyanoleuca	Magpie-lark	Bird Survey
Gymnorhina tibicen	Australian Magpie	Bird Survey
Hirundo neoxena	Welcome Swallow	Bird Survey
Manorina melanocephala	Noisy Miner	Bird Survey
Ocyphaps lophotes	Crested Pigeon	Bird Survey
Psephotus haematonotus	Red-rumped Parrot	Bird Survey
Rhipidura leucophrys	Willie Wagtail	Bird Survey
Sturnus vulgaris	Common Starling*	Opportunistic
Mammals		
Austronomus australis	White striped Freetail Bat	Anabat Detection
Bos taurus	Cow*	Opportunistic
Chalinolobus gouldii	Gould's Wattled Bat	Anabat Detection
Chalinolobus morio	Chocolate Wattled Bat	Anabat Detection
Lepus europaeus occidentalis	Hare*	Opportunistic
Miniopterus australis	#Little Bent-winged Bat	Anabat Detection
Miniopterus orianae oceanensis	#Large Bent-winged Bat	Anabat Detection
Mormopterus ridei	Eastern Freetail Bat (sp. 2)	Anabat Detection
Mormopterus/Micronomus norfolkensis	#Eastern Coastal Freetail-bat	Anabat Detection
Nyctophilis spp.	Long-eared bats not identifiable to species.	Anabat Detection
Scoteanax rueppellii	#Greater Broad-nosed Bat	Anabat Detection
Scotorepens orion	Eastern Broad-nosed Bat	Anabat Detection
Vespadelus vulturnus	Little Forest Bat	Anabat Detection
Amphibians		
Litoria fallax	Eastern Dwarf Tree Frog	Frog survey at dam
Limnodynastes peronii	Striped Marsh Frog	Frog survey at dam
Reptiles		
Amphibolurus muricatus	Jacky Lizard	Opportunistic

** Introduced species; # Threatened species (BC Act)*

Anabat results are provided at Appendix E.

Document Set ID: 9961734
Version: 1, Version Date: 21/02/2022



AWC

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Date	16/12/2021

0 25 50 75 m

A3 Scale 1:2000
Coordinate System: MGA 56 Projection: Transverse Mercator

Figure 4.2

Fauna Survey Effort

Document Set ID: 9961731
Version: 1, Version Date: 21/02/2022

5 Streamlined Assessment

5.1 Scattered Tree Assessment

Three scattered 'paddock' trees are located within the exotic grassland adjacent to Stages 7-8 (refer Figure 3.1).

Due to their isolated nature in the centre of cleared exotic grassland, habitat values associated with these trees are restricted to highly mobile species. The trees provide nominal habitat for common bird species only and provide poor resources for fauna species that rely on dense understorey, complex ground layers or connectivity between habitat trees. Tree #1 supports two medium sized spout hollows; hollows are absent from other trees. However, given the isolation of tree #1 it is unlikely to provide nesting or denning habitat for arboreal mammals such as gliders given its isolation from any other trees (and limitations of glide distance of arboreal mammals). Swift Parrot (breeding) was not retained as a Candidate species, as no Swift Parrot Important Area is mapped over the scattered tree assessment area. Details of the Scattered Tree Assessment (as per Appendix B of the BAM) are summarised at Table 5.1.

Table 5.1 Scattered Tree Assessment

#	Species	PCT	TEC	DBH	Height	Habitat Features	Ecosystem Credit Species	Species Credit Species
1	*Eucalyptus crebra*	849	Yes	102cm	24m	Two medium sized spout hollows, some small hollows, nectar source, nesting habitat, refuge.	Spotted Harrier, Square-tailed Kite, Eastern False Pipistrelle, Little Lorikeet, Little Eagle, Swift Parrot, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail-bat	No species credit species. Swift Parrot was removed as there is no suitable habitat and important habitat is not mapped.
2	*Angophora floribunda*	849	Yes	100cm	18m	Nectar source, nesting habitat, refuge.		
3	*Angophora floribunda*	849	Yes	70cm	15m	Nectar source, nesting habitat, refuge.		

Based on the loss of three scattered trees, Table 11 of Appendix B indicates three credits are required to offset the tree loss; this has been included in the BAM-C (refer Section 8.3).

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

5.2 Planted Native Vegetation

5.2.1 Introduction

Modification of a constructed sediment basin (Basin E) located in Lot 2000 DP1204777 (approx. 300m north of Stages 7-8) is required in order to increase capacity required for Stages 7-8. Works in Basin E require an adjustment to the bund wall (raising it by 400mm); refer Figure 1.4. All planted vegetation on the bund wall (planted with a variety of native species) requires removal for the works. Note that Figure 1.3 also shows a single planted tree to be removed (in red). Other planted trees occur along the bund (all of which require removal) but were not picked up by survey as they had a diameter at breast height of 200mm or less.

Following the works the bund will be replanted with similar native species to that which presently occur. Details of revegetation works including species and planting locations are provided in the Vegetation Management Plan prepared by AWC (2021).

On this basis, vegetation impacts have been assessed as per the 'Planted Native Vegetation' module in Appendix D of the BAM.

5.2.2 Decision making key

Appendix D includes a decision making key in Section D.1. The vegetation within Basin E is planted for functional, aesthetic, horticultural or plantation forestry purposes, consistent with Criteria 5 of Section D.1. The decision-making key then directs the assessor to Section D.2 of Appendix D which states: *"The assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation. If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts. The steps taken to assess threatened species habitat and all reasonable measures proposed to be taken to mitigate or minimise impacts must be set out in the BDAR or BCAR".*

Decision making key

Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?

i. Yes …. The planted native vegetation must be allocated to the best-fit PCT and the BAM must be applied.

ii. No…… Go to 2. – All vegetation is planted, no remnant, cannot be allocated to a PCT.

2. Is the planted native vegetation: a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?

i. Yes …. The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.

ii. No…… Go to 3. – Purpose of planting is not for environmental rehabilitation or restoration under an obligation

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: a. a species recovery project b. Saving our Species project c. other types of government funded restoration project d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?

i. Yes …. The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.

ii. No…… Go to 4. No, vegetation has not been planted to provided threatened species habitat, translocation of threatened species etc.

4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?

i. Yes…… Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. No……. Go to 5 – vegetation was not planted for revegetation or environmental rehabilitation

5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?

i. Yes …. Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied). – Vegetation was planted for functional, aesthetic purposes (water retention basin) – D.2 applies

ii. No…… Go to 6.

5.2.3 Methods

Basin E was assessed 06/10/2021 over a period of 2.5 hours. Weather conditions were sunny and warm with little wind. The bund wall was walked on foot in addition to general investigation of adjacent vegetation within the basin and adjacent woodland. Field assessment focused on determining any signs of threatened species habitat within the planted native vegetation on the bund wall.

5.2.4 Results

Vegetation planted along the bund includes species such as *Lomandra longifolia*, *Hardenbergia violaceae*, *Indigofera australis*, *Melaleuca linariifolia* with occasional small trees such as *Eucalyptus crebra*, *Eucalyptus tereticornis*, and *Acacia parramattensis*. There is a significant occurrence of weed species including *Plantago lanceolata, Senecio madagascariensis*, *Diplotaxis muralis, Sonchus*

Document Set ID: 9961734
Version: 1, Version Date: 11/02/2022

oleraceus and *Cirsium vulgare*. Vegetation within the basin is largely dominated by *Carex appressa* with *Rumex crispus* intermixed. Photographs of planted vegetation are provided in Plates 5.1 - 5.3.

A variety of common fauna were observed including Crested Pigeon, Noisy Miner, Pied Currawong, Magpie-lark, Australian Magpie and White-faced Heron. Field assessment did not record any evidence that threatened species are using planted native vegetation on the bund as habitat, and as such Section 8.4 of the BAM does not apply to Basin E. No credits for the removal of planted vegetation are required.



Plate 5.1. Planted vegetation, top of bund

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

	*Plate 5.2. Planted vegetation, top of bund - Lomandra longifolia, Melaleuca linariifolia.*
	*Plate 5.3. Planted vegetation within detention basin, Carex appressa.*

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

6 Impact Assessment

6.1 Impact assessment

Biodiversity impacts which may result from development of the site are discussed below.

6.1.1 Vegetation clearing

Clearing of native vegetation within Stages 7-8 will include:

- Indirect impact on 0.05 ha of moderate quality native vegetation (PCT 849 – Zone 1) within the development footprint (integrity score of 56.1). It is intended that this community will be retained in situ, however the precautionary principle has been applied to a 20m buffer to account for edge effects and any incidental damage.
- Direct impact (complete removal) of 0.86 ha of low-quality vegetation (PCT 849 – Zone 2 [derived grassland]) within the development footprint (integrity score of 12.1). This vegetation has an absent/sparse canopy, is dominated by exotic pastoral grasses and obtained an integrity score < 20.
- Removal of 6.68 ha of exotic grassland.
- Removal of three scattered trees (1 x *E. crebra* and 2 x *Angophora floribunda*).

Refer to Table 6.1 for details of vegetation and PCTs to be cleared.

Note: planted vegetation removal for Basin E does not require compensation via the BAM-C so is not considered further. As noted, the basin will be replanted following works, so no net loss of native vegetation will occur. On this basis, works proposed for Basin E are not discussed further.

Table 6.1 Areas of each PCT to be cleared (Stage 7-8)

PCTs	Vegetation zones	Area – ha (Total)
849	1 – CPW Moderate	0.05
849	2 - Derived Grassland	0.86

The majority of the native vegetation to be cleared (0.91 ha) comprises derived grassland, with an absent canopy and mixture of exotic and native ground covers (Zone 2). This community is in low condition (integrity score of 12.1), is regularly slashed and provides very low habitat value.

6.1.2 Removal of threatened species habitat

Four threatened species were recorded on site and three were assumed present since surveys were undertaken outside of the prescribed survey period for the species:

- Large Bent-winged Bat – Ecosystem Credit Species (recorded)
- Little Bent-winged Bat – Ecosystem Credit Species (recorded)
- Eastern Coastal Freetail-bat - Ecosystem Credit Species (recorded)
- Greater Broad-nosed Bat (recorded)
- *Dillwynia tenuifolia* - Species Credit Species (assumed present)
- *Pterostylis saxicola* - Species Credit Species (assumed present)
- *Pultenaea pedunculata* - Species Credit Species (assumed present).

The proposed development of Stages 7-8 will result in the clearing or impacts to the habitat of the

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

species listed above. Habitat on the site is of low value for all species listed above and habitat of the same or better value is present in the locality.

6.1.3 Direct mortality of fauna

There is potential for direct mortality of fauna via clearing of habitat and destruction. However, clearing of vegetation for the proposed works will be minimal, as the majority of the development footprint is within highly disturbed area that does not support diverse fauna habitat. A qualified ecologist experienced in clearing supervision should be present for the removal of the three scattered trees (*E. crebra and Angophora floribunda*) in the south of the development footprint.

6.1.4 Spread of declared weeds

Disturbance of soil provides the opportunity for weed invasion. Weeds may also be transported to the site from vehicles, personnel and via construction materials. Weed invasion varies over the site. The majority of the proposed development is within cleared pastoral grassland which is already exposed to high levels of weed invasion. The outer edge of native vegetation is currently exposed to weed invasion as an edge effect. The proposed development is unlikely to increase weed occurrence throughout the site, however weed hygiene measures will be put in place during the works.

6.1.5 Fragmentation

Vegetation on the site comprises a small patch of CPW which is completely isolated from other areas of woody native vegetation. Restoration activities in the larger development area adjacent to the site will link the existing vegetation patches to the west to form corridors for fauna movement. The development of Stage 7-8 would be unlikely to have any significant impact on most local wildlife movements.

6.1.6 Erosion and sedimentation

Sedimentation and erosion impacts can occur at both the construction and built phases. Erosion/sedimentation may occur via erosion of fill material and disturbed soils, scouring of exposed soil, banks and habitats adjacent to the development area via directed flow (e.g. stormwater), or where runoff is concentrated. Works may increase sedimentation levels or affect water quality both during and following the completion of construction. Erosion and sedimentation issues arising from the proposed development are likely be minimal. All construction works will be guided by an erosion and sediment control plan prepared by an IECA certified practitioner.

6.1.7 Disturbance from lighting

The development may result in an overall increase in the amount and intensity of lighting compared to the existing condition which could disturb (or attract) native fauna and pest species. Increased lighting associated with the proposed development has the potential to increase negative effects on fauna such as disorientation and high exposure to predators. This risk will require consideration within the urban design and positioning of ecological buffers.

6.1.8 Noise, vibration and anthropogenic disturbances

Currently the main source of anthropogenic noise and disturbance comes from traffic along The Northern Road to the east, construction to the west and residential area to the north. During the development's establishment, noise will be highest during construction, but limited to day time and so would only impact diurnal birds and mammals. Following construction, the site will see an increase in disturbance from increased human presence, vehicle traffic and lighting. It is expected that the outskirts of vegetation will experience these to the greatest extent, with vegetation along the eastern extents of the site to experience the least amount of disturbance due increased size and reduced edge effects.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

6.2 Assessing additional prescribed biodiversity impacts

The BC Regulation (clause 6.1) identifies impacts which are to be assessed under the biodiversity offsets scheme, but which are not to be taken into account in calculating the number of credits required to offset biodiversity impacts. These impacts are assessed in Table 6.2.

Table 6.2 Additional prescribed biodiversity impacts and their relevance to the Development Site

Prescribed Biodiversity Impact	Relevance to Development Site
Impacts of development on the habitat of threatened species or ecological communities associated with: (i) karst, caves, crevices, cliffs and other geological features of significance, or (ii) rocks, or (iii) human made structures, or (iv) non-native vegetation	There are no karst, caves, crevices, cliffs and other geological features of significance, or rocks, human made structures that will be removed as a result of the proposed works. Exotic grassland will be removed as part of the proposed works. This vegetation is highly disturbed, experiences slashing and cattle grazing and provides little habitat for native fauna. The conversion of exotic grassland to residential estate may impact on the movement of some of the more mobile species such as Flying foxes and birds of prey that use the site as a fly over. No important habitat for these species will be impacted.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Exotic grassland will be removed as part of the proposed works. This vegetation is highly disturbed, experiences slashing and cattle grazing and provides little habitat for native fauna. The conversion of exotic grassland to residential estate may impact on the movement of some of the more mobile species such as Flying foxes and birds of prey that use the site as a fly over. No important habitat for these species will be impacted. Restoration activities associated with previous stages (outlined in the master plan) will aim to link the existing vegetation patches together to form corridors for fauna movement. It is expected that long term linkages between the vegetation communities to be retained at and adjacent the site will be improved.
Impacts of development on movement of threatened species that maintains their life cycle	The development should not result in restrictions of the movements of any threatened species to maintain their life cycle. A majority off habitat to be removed is in relatively poor condition. Additionally, restoration activities associated with previous stages (outline in master plan) aim to link the existing vegetation patches together to form corridors for fauna movement.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining	There is one small water body on the site (a constructed dam) that supports native aquatic vegetation and habitat for birds and frogs and provides minor foraging habitat for microbats. The dam will be removed for the development.
Impacts of wind turbine strikes on protected animals	N/A
Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	The potential for roadkill in an urban area with low speed roads is low.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

7 Avoiding and minimising impacts on biodiversity values

7.1 Avoidance of Impacts

The majority of the development occurs within the most highly disturbed areas of the site, which comprises exotic grassland (6.67 ha). A small amount of native vegetation will require removal, with core areas of PCT 849 retained in-situ. The majority of affected vegetation currently experiences cattle grazing, slashing, underscrubbing and exposure to edge effects. A total of 0.86 ha of native vegetation comprising Cumberland Plain Woodland derived grassland would be removed as a result of the proposed works. An additional 0.05 ha of CPW would be indirectly affected via edge effects.

The impacts associated with the proposal, including the clearing of native vegetation, have been situated within specific areas in order to avoid impacts to better condition, more intact and more connected areas of native vegetation. In most cases, lots are sited within areas of exotic vegetation or native vegetation in very low condition (all native vegetation to be directly removed falls within Vegetation Zone 2, scoring an integrity score of 12.1).

7.2 Minimising and Mitigating impacts on Biodiversity Values

The project is designed such that the impact on native vegetation and habitat is minimal with the majority of the subdivision occurring over cleared and grazed exotic pasture. No direct impact on the patch of CPW will occur and this vegetation is retained in situ within parkland. Indirect impacts are assumed on 50% of the 0.08 ha of CPW within the 20m buffer between the development footprint and this vegetation. Residual impacts on flora, fauna and fauna habitat will be minimised and mitigated as outlined below.

7.2.1 Restoration of CPW

Areas of CPW with existing canopy (including vegetation within Pinnacle park) will be retained in situ. A buffer has been established from the edge of the development footprint, into existing CPW (Zone 1), to account for any edge effects. The precautionary principle has been applied and as such any vegetation in Zone 1 that falls within 20m (0.05ha) of the proposed footprint has an assumed loss of 25% loss of understorey and ground cover. This is precautionary and the impact is actually expected to be less. CPW in the locality will be restored via a Vegetation Management Plan (refer AWC 2021) which will include:

- A corridor of CPW vegetation to the west of the site ('Surveyors Creek west') will be rehabilitated via planting and assisted regeneration techniques. Restoration of CPW will facilitate linkage to adjacent areas of CPW to the north.
- CPW within the site along the north eastern boundary ('Green Corridor) will be rehabilitated via planting and assisted regeneration techniques (refer to the VMP)
- Weed control and infill plantings within southern section of Pinnacle Park (extension to Pinnacle Park) for the isolated patch of CPW subject to this BDAR.

Woody vegetation within southern section of Pinnacle Park will be retained within open space which

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

will become part of the existing Pinnacle Park to the north. A separate Vegetation Management Plan will be prepared for this land and includes actions to manage weeds (grasses and forbs, African Boxthorn) within the stand of CPW and installation of protection measures to prevent mowing or human incursion (permanent fencing, vegetation buffers, which will include supplementary planting of understorey and groundcover species). Infill plantings of native groundcovers and shrubs (e.g. *Bursaria spinosa, Cymbopogon refractus, Daviesia ulicifolia, Dianella longifolia, Echinopogon ovatus, Hardenbergia violacea, Lomandra filiformis subsp. filiformis, Lomandra multiflora subsp. multiflora, Poa labillardieri var. labillardieri, Themeda triandra*) will be installed following weed control works.

7.2.2 Mitigation measures implemented for threatened species recorded onsite

Microchiropteran bats are likely to forage over the small dam in the north east of the site as well as along the edges and gaps in remnant woodland vegetation. The retention and restoration of remnant vegetation to the north east of the site (via the VMP) will retain and enhance foraging habitat. The size of the dam being removed is 195m^2 so is unlikely to represent a substantial foraging resource to microbats in a local context. Additional areas of forested vegetation adjacent to the site (inclusive of restoration areas such as Surveyors Creek) provide suitable foraging habitat. Some secondary foraging habitat within the development footprint would continue to be available post development as some species would forage along edges of remnant vegetation and along streetscapes, where street lighting may benefit some species.

The single paddock tree (Narrow-leaved Ironbark) to be removed contains two medium sized spout hollows which provide potential microbat roosting habitat. Loss of these hollows will be compensated for by the installation of microbat roost boxes within retained CPW within southern section of Pinnacle Park at a ratio of one roost box per hollow removed.

7.3 Thresholds for the assessment and offsetting of impacts of development

7.3.1 Serious and Irreversible Impacts

A serious and irreversible impact (SAII) is listed under the BC Act as an impact that is likely to contribute significantly to the risk of extinction of a threatened entity. The BAM requires additional information is provided for any impact that is a potential SAII (see Section 9.1 of the BAM).

<u>Cumberland Plain Woodland</u>

Cumberland Plain Woodland (CPW) is a community at risk of a SAII as it meets criteria listed under Principle 2 as per clause 6.7 of the BC Regulation 2017:

(2) An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

a) it will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or

b) it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or

Document Set ID: 9961734
Version: 1, Version Date: 11/02/2022

c) *it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or*

d) *the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

An SAII assessment has been undertaken for Cumberland Plain Woodland consistent with Section 9.1.1 of the BAM and with reference to the DPIE (2019) guideline '*Guidance to assist a decision-maker to determine a serious and irreversible impact'* (refer Table 7.1).

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Table 7.1 Impact assessment provisions for threatened ecological communities at risk of an SAII

Requirement (refer Section 9.1.1 of BAM 2020)	Response
1. *The assessor is required to provide further information in the BDAR or BCAR regarding the impacts on each TEC at risk of an SAII. This must include the action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR and BCAR.*	Good/moderate quality Cumberland Plain Woodland [CPW] (Zone 1) has been retained in-situ. The precautionary principle has been applied and as such any vegetation in Zone 1 that falls within 20m (0.05ha) of the proposed footprint has an assumed loss of 25% loss of understorey and ground cover. This is precautionary and the impact is actually expected to be less. This patch of CPW is small and isolated and the proposed development will not further fragment this community. A total of 0.86 ha of low quality (VI Score 12.1) CPW (derived grassland – Zone 2) will be removed. Due to the current management regime (cattle grazing/frequent slashing) and high weed occurrence, derived grassland CPW does not provide connectivity to other patches of CPW within the locality. And is of low biodiversity significance.
2. *The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:*	
a. *evidence of reduction in geographic distribution as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)*	As per the TBDC: Before European settlement CPW was extensive across the Cumberland Plain (western Sydney). Today, only 9% of the original extent remains intact, with the remnants scattered widely across the Cumberland Plain. As per the Final Determination (NSW Scientific Committee, 2009): *Cumberland Plain Woodland is restricted to the Sydney Basin Bioregion (sensu Thackway and Cresswell) and is currently known to occur within the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion. Using map data from Tozer (2003), Cumberland Plain Woodland was estimated to occur within an extent of occurrence of 2810 km², and an area of occupancy of just under 2 100 km² based on 2 x 2 km grid cells.* *Based on aerial photography flown in November 1998, Tozer (2003) estimated the total extent of woody vegetation referred to as Cumberland Plain Woodland was 11 054 (±1 564) ha (upper and lower plausible bounds, sensu Keith et al.*

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Requirement (refer Section 9.1.1 of BAM 2020)	Response
	2009), representing 8.8 (±1.2)% of the pre-European distribution of the community. Patches of the community lacking woody vegetation are very small in extent and can be considered to be included within the plausible bounds. For that part of the community's distribution to the east of the Hawkesbury-Nepean River, earlier mapping at coarser resolution by Benson & Howell (1990b) suggests a similar level of depletion, with an estimated 6 420 ha of 'Cumberland Plain Woodlands', representing 6% of the pre-European distribution east of the Hawkesbury-Nepean River. An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 ha, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008). These estimates indicate that the geographic distribution of the community has undergone a very large reduction over a time frame appropriate to the life cycle and habitat characteristics of its component species. *The reduction in the geographic distribution of Cumberland Plain Woodland was initially due to tree-felling for timber and clearing for crops and pastures (Benson & Howell 1990a). Benson & Howell (1990b) estimated that the community had been reduced to approximately half of its pre-European extent by 1850. Following World War II, there was a marked acceleration in urban and industrial development, which continues to deplete the distribution of the community to the present day. These trends appear likely to continue into the future as the urban area continues to expand to accommodate Sydney's increasing population, which is projected to grow by 1.0-1.1 million people during the 20 years 2007-2026 and 2.2-3.3 million during the 50 years 2007-2056 (Australian Bureau of Statistics 2008). Recent draft plans to develop growth centres in north-west and south-west Sydney, for example, identify staged release of land for residential and employment development over the next 25 years. These areas contain approximately 2000 ha (one-fifth) of the estimated remaining Cumberland Plain Woodland based on Tozer (2003), of which about two-thirds will be available for development, the loss of which is planned for offsetting through voluntary land acquisition and/or the establishment of conservation agreements on lands outside the Growth Centres (Growth Centres Commission 2007) for the primary purpose of biodiversity conservation.*

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Requirement (refer Section 9.1.1 of BAM 2020)	Response
b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes by: *i. change in community structure* *ii. change in species composition* *iii. disruption of ecological processes* *iv. invasion and establishment of exotic species* *v. degradation of habitat,* *vi. fragmentation of habitat*	The Final Determination (NSW Scientific Committee, 2009) notes that CPW has been subject to significant clearing fragmentation, burning, thinning and grazing which has resulted in a substantial reduction in ecological function. Changes in structure contribute to a significant reduction in the ecological function of CPW, with almost all of the remaining area of the community is regrowth forest and woodland from past clearing activities. CPW also includes 'derived' native grasslands which result from removal of the woody strata from woodlands and forests. Weed invasion also poses a major threat to CPW, while grazing by livestock and rabbits results in the decline and disappearance of palatable plant species, including shrubs and herbs, and compaction and erosion of topsoil. Remaining areas of CPW are severely fragmented, with half of all mapped patches of CPW being < 3 ha. The integrity and survival of small, isolated stands of CPW is impaired by the small population size of many species, enhanced risks from environmental stochasticity, disruption to pollination and dispersal of fruits or seeds, and likely reductions in the genetic diversity of isolated populations.
c. evidence of restricted geographic distribution, based on the TEC's geographic range in NSW according to the: *i. extent of occurrence* *ii. area of occupancy, and* *iii. number of threat-defined locations*	Cumberland Plain Woodland is restricted to the Sydney Basin Bioregion with an estimated extent of occurrence of 2810 km², and an area of occupancy of approximately 2 100 km². Only small areas of CPW occur within the reserves system; areas of CPW in private land are at continued threat from development, weed invasion, grazing, urban heat effects, Bell Miner associated dieback, pest animals (cats and foxes), mowing and disturbance.
d. evidence that the TEC is unlikely to respond to management	The TBDC indicates CPW has a very poor likelihood of a response to management (scores of zero).
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR or BCAR.	n/a - CPW is not noted as 'data deficient' in the TBDC.
4. In relation to the impacts from the proposal on the TEC at risk of an SAII, the assessor must include data and information on:	
a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:	The small stand of CPW will be retained in the development by inclusion within open space in proposed section of Pinnacle Park. This vegetation will not be

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Requirement (refer Section 9.1.1 of BAM 2020)	Response
i. in hectares, and *ii. as a percentage of the current geographic extent of the TEC in NSW.*	directly impacted. Edge effects have been assumed and a reduction of CPW values has been accounted for in the BAM-C with a 25% loss in understorey and ground cover (precautionary principle) assumed within a 20m buffer. On this basis no direct impacts to woody CPW would occur and any reduction in values via edge effects is negligible in terms of the current geographic extent of CPW in NSW. Similarly, the loss of 0.86 ha of CPW as low condition derived grassland which lacks any woody vegetation is negligible in terms of the current geographic extent of CPW in NSW, which is unlikely to capture low condition derived grasslands at a meaningful scale.
b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: *i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals* *ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:* • *distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and* • *estimated maximum dispersal distance for native flora species characteristic of the TEC, and* • *other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development* *iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.*	The proposed development would result in the loss of 0.86 ha of poor-quality derived grassland, in addition to potential for a minor increase in edge effects on the existing small stand of CPW which will be retained in open space within proposed Lot 700. Edge effects are already existing to retained CPW and it is anticipated that substantial further degradation of this community would be unlikely within an urban context, and where weeds will be actively managed and controlled. Areas of woody CPW mapped within 500m of the site are scattered, fragmented and small in area. The proposal has no potential to impact any of these areas. A disturbed areas of woody CPW occurs in the far east of the site and will be retained in-situ and rehabilitated as part of a green corridor (refer to VMP prepared by AWC, 2021). The patch of CPW (derived grassland) within the site is isolated from other patches of the community. The derived grassland at the site is of such low quality, it is not considered to provide connectivity to vegetation east of the site. Currently no genetic mixing of tree and shrub species is occurring throughout derived grassland at the site. A 360m stretch of derived grassland and exotic grassland exists between two patches of good/moderate quality CPW. Following development of the site, seed dispersal of native grasses would still occur within these communities via local vectors. As noted, derived grassland (to be removed) was allocated a very low VI score of 12.1 in the BAM-C, based on the following 'sub' scores:

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Requirement (refer Section 9.1.1 of BAM 2020)	Response
	• composition: 43.1 • structure: 41.5 • function: 0 These values clearly demonstrate the low condition of this community and its reduced biodiversity values. The woody stand of CPW to be retained was allocated a VI score of 56.1 in the BAM-C, based on the following 'sub' scores: • composition: 84.1 • structure: 31.8 • function: 66 All of the CPW that falls within the direct impact area comprises derived grassland, with an absent canopy and understorey. The ground cover comprises a mixture of native and exotic grasses including (*Bothriochloa macra, Cynodon dactylon, Enteropogon acicularis, Plantago lanceolata*, Setaria parviflora*, Paspalum dilatatum*, Sporobolus creber*). Of the seven most abundant species present within the derived grassland, only four are native and of these only two are characteristic of CPW, as listed in the Final Determination and none are characteristic of PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion. The average ground cover vegetation cover within the derived grassland is 79%. The most abundant species (*Cynodon dactylon, Enteropogon acicularis*), which comprise an average cover in the derived grassland of 60% are not characteristic of CPW or PCT 849. Of all of the 51 species recorded within the derived grassland, only four are characteristic of PCT 849 and make up an average 0.5% cover over both plots. Additionally, species characteristic of CPW (final determination) only comprise an average cover of 7.4% over the two plots. With such a low level of characteristic species, the community would not provide connectivity between the patch of good/moderate CPW on the site and other patches of better quality CPW east of the site. If management of the land is to continue as it currently is, it is expected that weed invasion within the derived grassland will continue to increase, until the community has transitioned into exotic grassland.
5. The assessor may also provide new information that demonstrates that the	n/a

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Requirement (refer Section 9.1.1 of BAM 2020)	Response
principle identifying that the TEC is at risk of an SAII is not accurate.	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

7.3.2 Impacts which require an offset

Impacts associated with PCT 849 and the scattered tree require offset under the BAM. The removal of habitat for the following species (Species Credit Species) requires offsetting under the BAM.

- *Dilwynia tenuifolia*
- *Pterostylis saxicola*
- *Pultenaea pedunculata*.

Further details regarding offsets are included in Section 8.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

8 Final Credit Calculations

8.1 Ecosystem Credits

Ecosystem credits required to offset the impacts of the proposal are provided in Table 8.1.

Table 8.1 Ecosystem Credit Summary

PCT	Zone	Area (ha)	Credits
849	1 – CPW_Moderate	0.05	1
849	2 – Derived_grassland	0.86	0
		TOTAL	**1**

8.2 Species Credits

Species credits are calculated for species observed onsite or assumed present and require offsetting due to the proposal (refer Table 8.2).

Table 8.2 Species Credits

Species	Area	Credits
Dilwynia tenuifolia	0.05	1
Pterostylis saxicola Sydney Plains Greenhood	0.05	1
Pultenaea pedunculata Matted Bush-pea	0.05	1
	TOTAL	**3**

8.3 Scattered Tree Assessment

Three isolated ('scattered') trees will be removed from within the exotic grassland. Credits required for the loss of these trees are included in Table 8.3.

Table 8.3 Scattered Tree Credit requirements

PCT	Contains hollows	Number of trees	Ecosystem Credits
849	True	1	1
849	False	2	2
		Total	**3**

*HBT = Hollow Bearing Tree

8.4 Credit Costs

The total cost of credits are to be advised by the Biodiversity Conservation Trust (BCT) should the BCT be used to offset the impacts. The proponent may also wish to purchase credits available on the market or may wish to pursue other offset sites as required.

BAM-C outputs are provided at Appendix F.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

9 Statutory Assessment

9.1 Introduction

The proposal has been examined in the context of the following environmental legislation (discussed at Sections 9.1.1 - 9.1.6 and Section 9.2):

- *The Environmental Planning and Assessment (EPA) Act 1979:*
  - *SEPP Coastal Management 2018*
  - *SEPP Koala Habitat Protection 2021*
- *The Biodiversity Conservation Act 2016,*
- *The Fisheries Management (FM) Act 1994,*
- *The EPBC Act 1999.*

9.1.1 Environmental Planning and Assessment Act 1979

The proposal is designated development under Part 4 of the *Environmental Planning and Assessment Act 1979* and requires an approval under the *Protection of the Environment Operations Act 1997.* Tests of Significance under Part 1, Section 1.7 of the *EP&A Act 1979* are not required for those threatened species having potential to be impacted. As the works trigger the BAM thresholds the proponent has applied the Biodiversity Offsets Scheme and a BDAR has been prepared.

9.1.2 SEPP Coastal Management 2018

The site is not within the coastal zone and as such the Policy does not apply.

9.1.3 SEPP Koala Habitat Protection 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 was made and commenced on 17 March 2021. The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW. At this stage:

- In nine of these LGAs – Metropolitan Sydney (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA – Koala SEPP 2021 applies to all zones.
- In all other identified LGAs, Koala SEPP 2021 does not apply to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry.

The City of Penrith is not an LGA listed in Schedule 1 of the Policy; therefore the Policy does not apply.

9.1.4 Biodiversity Conservation Act 2016

The BAM is triggered due to the following attributes: There is Biodiversity Values Mapping present on the site (within the impact area). The Biodiversity Assessment Methodology (BAM) has been applied to determine credit requirements.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

9.1.5 Fisheries Management Act 1994

The *FM Act 1994* lists a number of threatened species, populations and communities and lists a number of Key Threatening Processes (KTPs). Section 220ZZ of the *FM Act 1994* lists the factors requiring consideration when determining whether a proposed action (development) is likely to have a significant effect upon threatened species, populations or ecological communities, and their habitats, therefore determining if a SIS is required (as also required under Section 5C of the *EPA Act 1979*). An Assessment of Significance under the *FM Act* is not required as:

- No threatened species, populations or ecological communities and their habitats occur or would be likely to occur at the site; and
- The proposal is not characteristic of any KTP.

The proposed development is not within an area mapped as Key Fish Habitat.

9.2 Commonwealth

9.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act considers nine matters of national environmental significance (MNES):

- World heritage properties
- National heritage places
- Wetlands of international importance ('Ramsar' wetlands)
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Australian Government Minister for the Environment (the Minister). Based on the search results and site assessment, no significant impacts to any MNES would be likely to result from the proposal (refer to Table 9.1), therefore referral to the Minister for the Environment is not required.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Table 9.1 Assessment of MNES

MNES	Impact
Any impact on a World Heritage property?	
One World Heritage Properties (Greater Blue Mountains Area) occurs within a 5km radius of the site. This site would not be impacted by the proposal.	Nil
Any impact on National heritage places?	
One National Heritage Place (The Greater Blue Mountains Area) occurs within a 5km radius of the site. This site would not be impacted by the proposal.	Nil
Any impact on wetlands of international importance?	
No wetlands of international importance occur within five kilometres of the site.	Nil
Any impact on nationally threatened ecological communities?	
Eight listed Threatened Ecological Communities (TEC) occur in the locality: • Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion • Coastal Swamp Oak Forest of the NWS and SEQ • Cooks River/Castlereagh Ironbark Forest of the Sydney Bioregion • Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest • River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Vic • Shale Sandstone Transition Forest of the Sydney Basin Bioregion • Upland Basalt Eucalypt Forest of the Sydney Basin Bioregion • Western Sydney Dry Rainforest and Moist Woodland on Shale. Cumberland Plain Woodland (CPW) occurs within the development footprint; this patch comprises 0.86 ha of derived grassland. All of the CPW that falls within the direct impact area comprises derived grassland, with an absent canopy and understorey. The ground cover comprises a mixture of native and exotic grasses including (*Bothriochloa macra, Cynodon dactylon, Enteropogon acicularis, Plantago lanceolata*, Setaria parviflora*, Paspalum dilatatum*, Sporobolus creber*). Of the seven most abundant species present within the derived grassland, only four are native and of these only two are characteristic of CPW, as listed in the Final Determination. A small patch of woodland occurs in the very north of the site, within the proposed Pinnacle Park. In the woodland the understory and ground cover is highly degraded with many exotic species and tracks trampled by cattle. This section will be retained in situ.	Negligible
Any impact on nationally threatened ecological species?	
Search results indicate potential habitat for 43 threatened species occurs within a 5km radius of the site. The following species were recorded or have the potential to occur on site: • Grey-headed Flying-fox (records) • Large-eared Pied Bat (recorded). The proposed development will not have a significant impact on these species due to the minor habitat loss required and the retention of better quality habitat.	Negligible
Any impact on migratory species?	
Search results indicate potential habitat for 16 threatened species occurs within a 5km radius of the site. One listed migratory species (Rufous Fantail) was recorded; several other migratory species have potential to occur on an opportunistic and seasonal basis. Habitat loss arising from the proposal would not affect any migratory species based on the extent of habitat in the locality and the minor nature of the proposal.	Nil
Any impact on Commonwealth marine areas?	
No Commonwealth marine areas occur within 5 km of the site.	Nil
Any impact on the Great Barrier Reef Marine Park?	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

MNES	Impact
Not applicable.	Nil
Does the activity involve a nuclear action (including uranium mining)?	
The activity does not involve a nuclear action.	Nil
Any impact on a water resource from coal seam gas development or a large coal mining development?	
Not applicable.	Nil

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

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Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix A – CVs

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Jacqui Coughlan

Principal Ecologist

Capabilities

- Biodiversity survey and assessment
- Ecological impact assessment
- Field survey design, coordination & implementation
- Peer review of ecological assessments
- Preparation of Management Plans
- Monitoring and Research
- Provision of expert advice in the Land and Environment Court

Qualifications / Training

- Bachelor of Science (Hons Freshwater Ecology) (James Cook University, 1989)
- PhD Bird Ecology (James Cook University, 2000)
- Graduate Diploma Environmental Law (Sydney University, 2009)

Professional Experience

Jacqui's practical ecological skills in terrestrial and freshwater ecology have been developed over 30 years in several states. She has conducted and managed numerous fauna and flora surveys and impact assessments (EIS, SIS, SEE, REF) in New South Wales, ACT, Queensland and Western Australia and has a thorough working knowledge of State and Commonwealth environmental legislation.

She has a broad knowledge base of ecological issues and is able to provide clients with sound and practical advice regarding environmental legislation and assessment protocols. She is a committed environmental professional with 25+ years' experience in the industry. Her depth and breadth of knowledge is extensive, covering both terrestrial and aquatic flora and fauna. Jacqui has worked in a broad range of sectors including residential development, energy (coal, LNG, wind, solar, transmission lines), extractive industry, water and sewerage, transport (roads, rail), Defence and Local Government.

Jacqui provides high level technical advice and peer review for ecological projects. In her various roles as ecology team manager, Jacqui has been responsible for recruitment, resourcing, workload management, coordinating tenders, performance reviews and training, mentoring, coordination of interstate resources and staff.

From 1992 to 2000 Jacqui worked as an ecological consultant for the Australian Centre for Tropical Freshwater Research (ACTFR) and Sinclair Knight Merz (SKM) in north Queensland working on projects from Townsville north to Cape York and west to Mt Isa as well as offshore islands and Western Australia. This included dozens of REFs for Queensland Department of Main Roads and flora and fauna assessments for optic fibre cables, power lines, sand extraction, marinas and boat ramps. Jacqui has conducted ecological surveys and reporting on Curtis Island (off Gladstone) and Keswick Island (off Mackay).

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Key Projects - Renewable Energies - Wind / Solar Farms

› Jacqui is the Department of Planning Approved Expert for implementation of bird and bat monitoring for the Gullen Range and Boco Rock Wind Farms in NSW. She has prepared and implemented several Bird and Bat monitoring programs including threatened species monitoring and agency liaison.

› UPC Renewables. Central Highlands Energy Zone and Stubbo solar farm. Design BAM biodiversity assessments for 5000 ha solar hub and wind farm. Client liaison to inform layout as results emerged.

› Wind Prospects. Boco Rock Wind Farm – Department of Planning approved expert for implementation of post construction monitoring program. Preparation of adaptive Bird and Bat Management Plans and monitoring program, liaison with OEH, establishment of baseline monitoring sites and bird surveys with OEH personnel. Expert peer review of monthly reports and annual report.

› Goldwind. Gullen Range Wind Farm. Preparation of Bird and Bat Adaptive Management Plan. Expert technical advice – birds and bats. preparation of Powerful Owl Management plan and implementation of Powerful Owl monitoring and management plans, liaison with OEH, large scale surveys to determine Powerful Owl population, regular monitoring of onsite powerful owl breeding pair to assess risk.

› Epuron. Liverpool Windfarm Biodiversity Assessment. Project Director, field work, reporting, client liaison. Options assessment of 4 transmission line route options and placement of 270 turbines. Jacqui managed large field team and undertook field work and reporting.

› Epuron. Silverton Wind Farm. Targeted surveys for threatened Tawny Rock Dragon on the Barrier Range, western NSW as part of impact assessment studies for large wind farm.

› Bird Surveys and Impact Assessment for proposed wind farm in Xilinhot, Inner Mongolia, China. Jacqui designed and conducted bird and habitat surveys for an approved wind farm in Inner Mongolia according to AUSWEA standards. She led a team in the field including local experts and interpreters and driver and was responsible for all analyses and reporting. International client required assessment for financial investment decision.

› Origin Energy. Cullerin Range Wind Farm – Design and implementation of Bird and Bat Monitoring program to meet conditions of approval. Jacqui was responsible for conducting and managing bird and bat surveys, carcass searches and reporting in order to assess impacts of operational wind farm on birds and bats.

› Ratch Australia Corporation (RAC). Collector Wind Farm. Strategic advice and liaison with OEH regarding offsets.

› AGL. Nyngan Solar Farm (102MW). Biodiversity assessment including assessment of potential impacts to threatened bird species Grey-crowned Babbler.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Key Projects - Roads & Linear Infrastructure

› Transport for NSW – review and update of Vegetation Offset Guidelines (2016).

› RTA/RMS. Biodiversity Guidelines. Jacqui was the lead author of the RMS (2011) Best Practice Guidelines - Protection of Biodiversity During Construction and Maintenance on RTA projects.

› Lend Lease /Bilfiinger Berger/ Conneq – Long term monitoring of Squirrel Glider population (2008 to 2013) to determine impacts of Hume Highway Albury. Landscape scale assessment of population impacts.

› RTA. Camden Valley Way Ecological Assessment (REF) for widening of 10 km stretch of road. Bird and bat surveys, hollow bearing tree assessment, clearing supervision. Surveys, assessment and reporting of potential impacts for EPBC referral.

› RTA/Blake Dawson Waldron – Land and Environment Court expert witness – fauna ecology. Preparation of Statement of Evidence, joint conferencing and court appearance.

› NSW Roads and Traffic Authority. An investigation of the movements of Koalas in relation to major roads in north-east New South Wales (Buladelah to Coolongolook, Yelgun to Chinderah, Raleigh, Brunswick Heads). - Project Management, field work, koala capture, radio tracking, client liaison, meetings, presentations, monitoring reports.

› Queensland Hunter Gas Pipeline Biodiversity Survey and constraints analysis of proposed pipeline corridor (>600km). Coordination of large field team, vertebrate fauna survey, analyses reporting and impact assessment.

Key Projects - Residential Development

› Wakefield Ashurst Developments – Ecological impact assessment for 100 ha Mawsons Ridge site. Threatened species issues included Tetratheca juncea, Callistemon linearifolius, Rhodamnia rubescens, powerful owl, squirrel glider and microbats. All field surveys and reporting, engagement of specialist subconsultants, liaison with Lake Macquarie City Council and OEH.

› Wakefield Ashurst Developments – Ecological impact assessment for 40 ha Swansea Valley site. Threatened species issues included Diuris praecox, Cryptostylis hunteriana, masked owl, squirrel glider. All field work and reporting, engagement of specialist subconsultants, liaison with Lake Macquarie City Council and OEH.

› Stockland Developments. Breeding season surveys for Masked, Powerful and Sooty Owls over two years to document and map all breeding habitat and resident owls. Annual Reporting. Preparation of expert advice in relation to presence of Masked Owl on Wallarah Peninsula. Liaison with national owl experts.

› Stockland Developments. Preparation and implementation of 10 year Masked Owl Management Plan and monitoring program. Responsible for all monitoring and reporting.

› Stockland Developments. Preparation of multiple Section 96 amendments under Environmental Planning and Assessment Act 1979 for proposed residential developments on Wallarah Peninsula.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

› Stockland Developments. Preparation of Species Impact Statement for a proposed residential and commercial development on a 120 hectare site in Jervis Bay, NSW (Vincentia/Bayswood). Threatened species included Eastern Bristlebird, Ground Parrot, Yellow-bellied Glider, Glossy Black Cockatoo, Prasophyllum affine, Cryptostylis hunteriana

Key Projects - Defence

› Department of Defence. Kangaroo Management Plans – Defence Establishment Orchard Hills and HMAS Creswell (strategic advice, field work, review and client liaison).

› Department of Defence. Garden Island Western Australia (Fleet Base West). Jacqui undertook field and desktop surveys of the flora and fauna of Garden Island for input to Defence Heritage Management Plan as required to fulfil Defence's obligations under the EPBC Act 1999. The site is listed on the Register of the National Estate and the Commonwealth Heritage Register.

› Department of Defence. Baseline fauna assessment for a 220 hectare site within the Holsworthy Military area. Fauna survey for all terrestrial vertebrate fauna groups. Liaison with botanists at Wollongong University who were concurrently mapping vegetation of the area.

Affiliations / Memberships

› Birdlife Australia (formerly Birds Australia and RAOU) since 1991

› Australasian Network for Ecology and Transportation (ANET) since 2013

› Environment Institute of Australia and New Zealand (EIANZ)

› Royal Zoological Society of New South Wales (RZS)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Hannah Reid

Senior Ecologist

Capabilities

› Flora and fauna field surveys

› Targeted threatened species surveys

› Statutory ecological assessments and reports

› Scientific and environmental research and writing

› Natural resource analysis and management

› Statutory ecological assessments

› GIS desktop analysis, mapping and data management

› Water quality and soil sampling

› Project management

Qualifications / Training

› B Sci (Double Major - Biology & Marine Science) – University of Sydney 2012

› M EnvSci (University of Sydney, 2014)

› Accredited Assessor under the *Biodiversity Conservation Act 2016*

Professional Experience

Hannah has over 7 years experience in ecology and environmental consulting working extensively throughout New South Wales and Queensland. During this time Hannah has developed a broad range of professional skills including broad scale ecological assessments, targeted flora and fauna surveys, threatened species management and environmental monitoring.

Hannah has also been involved in preparing numerous reports for development approval submissions. These projects have required collaborative partnerships with council staff, heritage consultants, bushfire specialists, environmental scientists, engineers, developers and town planners.

Combining her experience working with and managing project teams, Hannah brings a strong suite of skills to best enable clients and project partners to deliver sustainable environmental solutions.

Key Projects

› Burnum Burnum Review of Environmental Factors (REF) - Environmental assessment for proposed boat ramp, car park and wetland upgrade

› South Golden Beach Review of Environmental Factors (REF) - Environmental assessment for proposed urban drainage and vegetation removal

› Port Macquarie Rural Subdivision - Threatened flora and fauna surveys, vegetation community mapping, Assessments of Significance, GIS mapping and report preparation

› Koala Plan of Management (KPoM) - SAT surveys, field assessments and spotlighting, mitigation measure development, Assessment of Significance and report preparation

› Proposed Quarry Development - Intensive field surveys including targeted frog surveys, Elliot and pitfall trapping, PIR camera trapping, visual and acoustic bird surveys, and call playbacks

› Carbon Farming Initiative - Detailed threatened species surveys, vegetation biomass and weed mapping surveys throughout western and northern NSW

› Aviation Wildlife Hazard Management Plans - Various Population Management Reports and associated trapping, baiting and pest dispersal field work

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

DR JAMES SCHLUNKE

4 Bedford Street Earlwood NSW 2206 | 0429198660 | james.schlunke@axisecological.com.au | ABN: 27720918015

I am a botanist and ecologist with over ten years of experience flora and fauna surveys throughout NSW, for both consulting and ecological research. My primary area of expertise is in botany, and I have extensive experience in plant and community identification, vegetation mapping, threatened species survey and analysis of plant community data using multivariate statistical techniques. I have experience throughout NSW, primarily in the Sydney, Hunter, Southern Highlands, South-west Slopes and Nandewar Range regions, with experience also in the Southern Tablelands and ACT, Central-western Plains and Murray. I have experience in a range of fauna survey techniques and field identification of vertebrate fauna, particularly birds and frogs. I have a background in bush regeneration and have a working knowledge of practical restoration ecology techniques and approaches. I am proficient in a range of statistical analysis techniques, including using the R statistical package. I have a working knowledge of invertebrate fauna and have a solid background in sampling, identification, and field experimentation with ants through my BSc (Hons) and PhD research. I am a BAM Accredited Assessor and a member of the NSW Ecological Consultants Association.

WORK EXPERIENCE

Axis Ecological Services (formerly James Schlunke Ecological Surveys)

Principal botanist/ecologist (sole trader) **2016-ongoing**

Since January 2016 I have operated as a sole trader botanist and ecologist. I have worked on a broad range of ecological projects across NSW, including:

- Extensive vegetation surveys (166 full-floristic vegetation plots) within the Wollondilly local government area for a Saving Our Species Koala monitoring and vegetation mapping project, for the Wollondilly Shire Council and NSW Office of Environment and Heritage;
- Extensive vegetation surveys (over 300 rapid and full-floristic plots) within the Wingecarribee local government area for a Saving Our Species Koala monitoring and habitat mapping project for the NSW Office of Environment and Heritage, Wingecarribee Shire Council and USyd;
- Population assessment surveys, production and implementation of of monitoring plans for several threatened plant species under the Saving Our Species program for Office of Environment and Heritage
- Landholder liaison, conducting site surveys and producing site values reports and Voluntary Conservation Agreements for the NSW Biodiversity Conservation Trust.
- Ecological monitoring (both flora and fauna) of numerous offset properties in the Northern Tablelands and North-west Slopes bioregions for AMBS Ecology and Heritage;
- Targeted threatened flora and fauna, due diligence, vegetation mapping and BioBanking assessment/BAM surveys for a range of projects across NSW for AMBS Ecology and Heritage;
- Baseline data collection for an ecological thinning trial within River Red Gum forests for the NSW Office of Environment and Heritage;
- Impact assessment surveys and report preparation, BioBanking and BAM impact and offset site surveys, and pre-clearance surveys for NGH Environmental;

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

- Flora and fauna assessment surveys, targeted threatened flora surveys, BioBanking and BAM assessment surveys, Kangaroo population estimation surveys (DISTANCE method), and report preparation for Ecoplanning;
- Threatened species and vegetation mapping surveys for EcoFocus Environmental Consulting;
- Monitoring of mine site rehabilitation for Koru Environmental;
- BAM and threatened flora surveys as part of the Snowy Hydro 2.0 project for EMM consulting; and
- Invertebrate sampling and identification as part of biodiversity monitoring of urban bushland reserves for Ryde Shire Council.

Australian Museum Consulting (now AMBS Ecology and Heritage)

Botanist/fauna ecologist (casual) **2013-2015**

I worked on a range of flora and fauna projects while completing my PhD, including:

- Extensive plant community data collection for remote vegetation mapping projects for NSW Office of Environment and Heritage, in the Central Western Plains, Southern Tablelands and South-west slopes bioregions, including the Hay Plains, Matakana mallee, Lachlan River-associated communities and Murray/Murrumbidgee sub-regions.
- Ecological monitoring (flora and fauna) of Biobanking offset properties in the Northern Tablelands and North-west Slopes bioregions; and
- Preparation of impact assessment reports for projects in the Sydney region.

Biosphere Environmental

Fauna ecologist (sub-contractor) **2012-2015**

I worked on a multi-year monitoring project tracking impacts of coal mining activities on the state and nationally listed Great Barred Frog (*Mixophes iteratus*) near Stroud NSW. This consisted of detailed population and habitat data collection, including frog microchipping.

Cumberland Ecology

Botanist/ecologist (casual) **2010-2014**

I continued to work for Cumberland Ecology for around 4.5 years as a casual ecologist while completing my PhD. In this role I was lead botanist on dozens of field surveys throughout NSW, particularly in the Sydney, Hunter Valley, North-west Slopes and Northern Tablelands regions. Projects have included community description, vegetation mapping and targeting threatened species searches. Much of this work has had a focus on the nationally listed Grassy Box Woodlands CEEC and associated communities of these regions. I have also carried out a number of fauna surveys in NSW and Queensland on a variety of vertebrate fauna groups.

University of Sydney

Lab/field Demonstrator **2010-2014**

I demonstrated in several undergraduate courses while completing my PhD, including *Australian Flora: Ecology and Conservation, Entomology* and *Terrestrial Field Ecology*. This has included providing lab instruction in identification of plants and insects and plant communities, and field instruction in a variety of sampling techniques for flora and fauna. I have also given lectures on ecological consultancy as part of the *Masters of Environmental Science* degree.

Cumberland Ecology

Botanist/ecologist/project manager (full-time) **2008-2010**

In this role I further developed my botanical survey, plant identification and vegetation mapping skills, conducting many surveys primarily within the Sydney and Hunter Valley regions of NSW, working in a range of vegetation communities. I also managed a range of projects, including production of impact assessment reports (7-part tests, EPBC referrals and Species Impact Statements) and Bushland Management Plans. I also produced numerous

Document Set ID: 9961734
Version: 1, Version Date: 21/02/2022

Kangaroo Management Plans for Department of Defence, incorporating long-term monitoring of effects of kangaroo grazing on plant community composition. I also developed a working knowledge of NSW and Commonwealth biodiversity conservation legislation.

National Trust of Australia
Bush regenerator **2007, 2010**
As a bush regenerator I developed plant identification skills and an understanding of plant communities in the Sydney region, working within a number of plant communities. I also developed a competency in the conceptual and practical process of bushland rehabilitation, including a variety of weed management techniques.

Bush Habitat Co-operative
Bush regenerator **2009**
Further bush regeneration, primarily in the East and Inner-west of Sydney.

EDUCATION

University of Sydney
Doctor of Philosophy (PhD)
Supervisors: Ass. Prof. Dieter Hochuli and Ass. Prof. Matthew Crowther. **2010-2015**

Thesis title: Disentangling the drivers of ant community composition: integrating structural, spatial and inter-specific competition at multiple scales. Submitted September 2015.
My project evaluated the strategy of using plant community surrogates (i.e. listed Threatened Ecological Communities) as a strategy for conserving cryptic fauna, using ants as a model system. This project was designed to utilize and compliment my existing skills in plant and invertebrate identification, while developing a range of new skills in multivariate analysis of community data in a range of statistical packages (including R), advanced survey techniques and analysis of spatial data using ArcGis. In this project I conducted extensive vegetation surveys in a variety of plant communities, including threatened ecological communities in the Sydney and South-west Slopes regions of NSW.

University of Sydney
Bachelor of Science (Honours Class I) **2004-2008**
I completed my science degree completed with a double biology major, focusing on ecology and zoology. For my Honours project I studied the impacts of natural regeneration of woodland on the process of ant-seed dispersal. This project encompassed a number of field survey and experimental procedures including ant pitfall trapping and application of burning treatments to buried seeds in the field.

OTHER RELEVANT QUALIFICATIONS

Current Remote First Aid certificate
RIIVEH305A 4wd certificate
QLD Blue Card (Green Card equivalent - valid for NSW)
Open Water Diver (PADI)

MEMBERSHIPS

Ecological Consultants Association of NSW
Birdlife Australia
Frog and Tadpole Study Group of NSW (FATS)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

REFEREES

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University of Sydney (Primary PhD supervisor)
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Katrina Wolf
Principal Ecologist
Cumberland Ecology
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Phone: 0405 615 350

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Ian Colvin

Principal Ecologist

Capabilities

- Vegetation survey and mapping
- Threatened flora surveys
- Fauna survey and assessment
- Biodiversity Assessment reporting
- Statutory Assessment
- Biodiversity Development Assessment Reports (BDARs) – accredited BAM Assessor
- Review of Environmental Factors (REF) reports
- Koala Plan of Management (KPoM) reports
- Vegetation Management Plans

Qualifications / Training

- B App Sci (Southern Cross University, 2001)
- Biodiversity Assessment Methodology Accreditation (BAAS18055) – March 2018
- Certificate II Bushland Regeneration
- WHS Construction Induction Training Certificate
- Planning for Bushfire Prone Areas

Professional Experience

Ian commenced work as a consulting ecologist in 2004 and has worked extensively within northern NSW and south-east Queensland during this time. As an experienced ecologist, Ian has extensive knowledge and practice in vegetation mapping and assessment, flora and fauna surveys,biodiversity reporting and statutory assessment and has worked on numerous projects for infrastructure, development and environmental management projects.

Ian is highly experienced in report preparation, ranging from development applications and REFs through to management and mitigation plans. Since commencement of the *Biodiversity Conservation Act 2016*, Ian has prepared several Biodiversity Development Assessment Reports (BDARs) using the Biodiversity Assessment Method (BAM), as an Accredited Biodiversity Assessor.

Ian possesses high level project-management and liaison skills (including consultation with Councils and government agencies) and has managed multidisciplinary teams.

Key Projects

- Koala Plan of Management (KPoM), mitigation measure development Assessment of Significance and report preparation. Bluesfest Site Tyagarah, Bluesfest
- Biodiversity Conservation Management Plan (BCMP) West Byron Urban Release Area
- Vegetation Managment Plan, Bayside Brunswick Heads, Clarence Property
- Species Impact Statement for Clarence Valley Council for Stage 1 of the Yamba Bypass
- Targeted flora and fauna assessment for the rezoning of land at Skennars Head 'Aureus'

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

› Vegetation Management Plan for Lockyer Valley Regional Council for a dedicated offset site at Balaam Hills

› Flora and Fauna Assessment and Review of Environmental Factors for Stage 2 of the Yamba Bypass

› Detailed fauna assessment and reporting for the East Coast Blues and Roots Festival for the 2011, 2012 and 2013 events

› Koala Plan of Management for a residential subdivision at Goonellabah, NSW

› Preparation of acid frog management plan for a large scale residential development at Caloundra, Sunshine Coast

› Frog monitoring and reporting for Moreton Bay Regional Council for the AFL precinct at Burpengary, Sunshine Coast

› Nerang River Estuary Health Plan - vegetation assessment, mapping and reporting for Gold Coast City Council

› Coolangatta Creek Catchment Management Plan – vegetation assessment and reporting for Gold Coast City Council

› Frog monitoring and reporting for Moreton Bay Regional Council for the AFL precinct at Burpengary, Sunshine Coast

› Detailed ecological assessment for the West Byron Urban Release Area (including targeted survey for acid frogs, koalas and cryptic orchids)

› Flora and fauna assessment for Tipplers Hub re-development, South Stradbroke Island

› Flora and fauna assessment (including targeted Koala survey) at Helensvale Waste Transfer station for Gold Coast City Council

› Detailed ecological assessment for the Cumbalum (Precinct B) Urban Release Area, including detailed surveys for Hairy Jointgrass

› Wetland flora monitoring at compensatory habitat site for the Ballina Bypass

› Iluka Bay flora survey, habitat assessment and reporting (Review of Environmental Factors, Soil and Water Management Plan, Construction Environment Management Plan) for Clarence Valley Council

› Tugun Bypass – detailed weed survey and landscape assessment

Affiliations / Memberships

› Member, Ecological Consultants Association of NSW Inc (since 2013)

› Scientific Investigation Licence holder (DPIE) - authorised to carry out native fauna research (trapping and releasing).

› Animal Research Authority, Issued by Director-General of NSW Dept Primary Industries

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix B – Vegetation Plot Data

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Bearing = 270° W

400 m² floristics plot:	Survey name	Plot identifier	Recorders
Date 19 / 2 / 2021	HV7 ~~3~~ 9	CPW1	JS + JC

	GF code	Species name Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover.	N, HTW or non-HTW	[2] Foliage cover	Abund-ance	Voucher	
				25			
1		Eucalyptus tereticornis	N	[illegible]	4		U
2		Eucalyptus crebra	N	1	5		~~U~~ M
3		Bursaria spinosa	N	10	500		M
4		Olea europea cuspidata	E	2	50		M
5		Lantana camara	E	0.2	3		M
6		Breynia oblongifolia	N	0.3	20		M
7		Hardenbergia violacea	N	0.1	3		M
8		Eucalyptus melucana	N	0.3	2		~~M~~ G
9		Oplismenus ~~undulatifolius~~ aemulus	N	[illegible]	2,1000		G
10		Enchiton sphaericus	N	0.1	20		G
11		Eragrostis curvula	N	0.4	500		G
12		Oxalis perrenans	N	0.1	50		G
13		Eragrostis leptostachya	N	0.1	20		G
14		Carex inversa	N	0.1	50		G
15		Desmodium varians	N	0.1	2		G
16		Vernonia cinerea	N	0.1	20		G
17		Brunoniella australis	N	0.1	20		G
18		Senecio madagascariensis	E	0.1	50		G
19		Bidens subalternans	E	4	>1000		G
20		Cheilanthes sieb. sieb.	N	0.1	20		G
21		Sida ~~spp~~ rhombifolia	E	0.1	50		G
22		Sigesbeckia orientalis orientalis	N	0.2	100		G
23		Setaria parviflora	E	6.2	100		G
24		Glycine tabacina	N	0.1	28		G
25		Commelina cyanea	N	0.1	20		G
26		Cyperus gracilis	N	0.1	50		G
27		Dichondra repens	N	0.1	50		G
28		Plantago lanceolata	E	0.1	20		G
29		Bidens pilosa	E	3	>1000		G
30		Paspalum dilatatum	E	1	500		G
31		Conyza sp.	E	0.1	6		G
32		Microlaena stip. stip.	N	2~~0~~	1000		G
33		Cirsium vulgare	E	0.1	1		G
34		Gomphocarpus fruticosus	E	0.1	1		M
35		Cynodon dactylon	N	0.2	50		G

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

GF Code: see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

* Plot running along fence - dissecting 20x20 into two halves. Grazed, shrubby section w/ surprisingly high native diversity, + ungrazed with high cover of Rhodes Grass + other weeds.

Document Set ID: 9861734
Version: 1, Version Date: 11/02/2022

400 m² floristics plot:	Survey name	Plot identifier	Recorders
Date 19 2 2021	HV7-9	CP1	JS + JC

GF code	Species name Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover.	N, HTW or non-HTW	[2] Foliage cover	Abund-ance	Voucher
	Lotus angustissimus	E	0.1	1	
	Medicla carolinicma	E	0.1	2	
	Euphorbia drummondii	N	0.1	3	
	Bothriochloa macra	N	0.1	20	
	Solanum sisymbriifolium	E	0.1	4	
	Urochloa panicoides	E	0.1	3	
	Enteropogon acicularis	N	0.1	20	
	Eriochloa pseudoatricha	N	0.1	20	
	Lomandra filiformis filiformis	N	0.1	2	
	Sporobolus creber	N	0.1	10	
	Chloris truncata	N	0.1	5	
	Wahlenbergia communis	N	0.1	20	
	Rumex brownii	N	0.1	4	
	Digitaria sanguinalis	E	0.1	3	
	Tricoryne elatior	N	0.1	5	
	Cymbonotus lawsonianus	N	0.1	2	
	Cyclospermum leptophyllum	E	0.1	1	
	Hydrocotyle sibthorpioides	N	0.1	1	
	Chloris gayana	E	5	500	
	Themeda triandra	N	0.2	20	
	Centella asiatica	N	0.1	6	
	Hypoxis hygrometrica	N	0.1	2	
	Hypochaeris albiflorus	E	0.1	2	
	Cenchrus clandestinum	E	0.3	20	
	Sonchus oleraceus	E	0.1	5	
	Aristida ramosa	N	0.1	2	
	Paspalidium distans	N	0.1	3	
	Desmodium (Oxytes) brachypodum	N	0.1	20	
	Hypochaeris radicata	E	0.1	1	
	Briza subaristata	E	0.1	2	
	Cyperus brevifolius	E	0.1	1	
	Taraxacum officionale	E	0.1	3	
	Arthropodium minus	N	0.1	6	
	Wahlenbergia gracilis	N	0.1	1	
	Sclerla machaulensis	N	0.1	5	

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

GF Code: see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

Document Set ID: 9964734
Version: 1, Version Date: 21/02/2022

400 m² floristics plot:	Survey name	Plot identifier	Recorders
Date 19 2 2021	HV 7-9	CPW1	JS + JC

	GF code	Species name Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover.	N, HTW or non-HTW	[2] Foliage cover	Abund-ance	Voucher
1		Aspevula conferta	N	0.1	10	
2		Hypericum gramineum	N	0.1	2	
3		Fimbristylis dichotoma	N	0.1	1	
4		Phyllanthus virgatus	N	0.1	2	
5		Verbonica plebia	N	0.1	2	
6		Chloris ventricosa	N	0.1	5	
7		Glycine microphylla	N	0.1	20	
8		Echinopogon ovatus	N	0.1	1	
9		Gomphrena celasioides	E	0.1	2	
10		Rytilospema racemosum subsp. racemosum	N	0.1	2	
11		Bromus catharticus	E	0.1	1	
12		Verbena bonariensis	E	0.3	20	
13		Cymbopogon refractus	N	0.1	3	
14		Araujia sericifera	E	0.1	1	
15		Ehrharta erecta	E	0.1	20	
16		Solanum pseudocapsicum	E	0.2	10	
17		Geranium solanderi solanderi	N	0.1	4	
18		Indigofera australis	N	0.2	2	M
19		Cyperus eragrostis	E	0.1	4	
20						
21						
22						
23						
24						
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26						
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35						

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

GF Code: see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

Site sheet # 1 of **Date** 9/22/ **Survey name** HIGHLAND VIEWS HV7-9 **Plot identifier** GRASSLAND GRC1.

Recorders Jacqui C James Schlunke. **IBRA region** SYD BASIN **Veg zone ID**

[1]Datum **Coordinate system** ☐ Projected ☐ Geographic **MGA zone** **[1]X coordinate** **[1]Y coordinate**

Location description

[1] Plot dimensions **[1] Orientation of midline from 0 m point** 105°E 105°E **Photo #** JC iphone

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

Vegetation Integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

Composition (400 m² plot)		Sum values	**Structure** (400 m² plot)		Sum values (%) (may sum to >100%)	**Function** (1000 m² plot) **[3]Tree stem size class (DBH)**	If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted
Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form)	Trees (TG)		Sum of **[2] foliage cover** of native plant species by growth form group	Trees (TG)		80 + cm	0
	Shrubs (SG)			Shrubs (SG)		50 – 79 cm	0
	Grasses etc. (GG)			Grasses etc. (GG)		30 – 49 cm	0
	Forbs (FG)			Forbs (FG)		20 – 29 cm	0
	Ferns (EG)			Ferns (EG)		10 – 19 cm	0
	Other (OG)			Other (OG)		5 – 9 cm	0
						[4]Tree regeneration <5 cm	
			Total high threat weed cover			[5] Length of fallen logs	
						[6] Hollow bearing trees	

Vegetation integrity - function cont. (five 1 m²) **plots)**	[7] Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	0 0 0 0 0			
Average of the 5 subplots				

These attributes require consideration of site observations and may be completed after field work:

Vegetation class **[8] Large tree benchmark size** 20/ 30/ 50/ 80 DBH Confidence H/ M/ L

Plant community type (PCT) **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

Morphological type	Landform element	Landform pattern	Microrelief
Lithology	Soil surface texture	Soil colour	Soil depth
Slope	Aspect	Site drainage	Distance to nearest water and type

Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood, CWD removal		
Grazing (id. native/stock)		
Fire damage		
Storm damage		
Weediness		

Brief site description or other notes

Emergents heights			Upper stratum heights			Middle stratum heights			Lower stratum heights		
Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom

Document Set ID: 9864734
Version: 1, Version Date: 27/02/2022

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

Site sheet # 1 of 2 **Date** 19/2/21 **Survey name** GR2 **Plot identifier** GR2

Recorders Jacqui C James Schumacher **IBRA region** SYD BASIN **Veg zone ID** grassland

[1]**Datum** **Coordinate system** ☐ Projected ☐ Geographic **MGA zone** **[1]X coordinate** 464WP **[1]Y coordinate**

Location description

[1] Plot dimensions **[1] Orientation of midline from 0 m point** 340°N **Photo #** JC 1pm

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). MGA Zone (for Projection coordinate system only): 56 (Coastal NSW), 55 (Central NSW) or 54 (Western NSW). X/Y coordinate: Long,Lat (for Projection coordinate system), Easting,Northing (for geographic coordinate system)

Vegetation integrity

Composition and structure data values may be completed after entry data are available. It is not required while in the field

Composition (400 m² plot)		Sum values	**Structure** (400 m² plot)		Sum values (%) (may sum to >100%)	**Function** (1000 m² plot) [3]Tree stem size class (DBH)	If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted
Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form)	Trees (TG)		Sum of [2] **foliage cover** of native plant species by growth form group	Trees (TG)		80 + cm	
	Shrubs (SG)			Shrubs (SG)		50 – 79 cm	
	Grasses etc. (GG)			Grasses etc. (GG)		30 – 49 cm	
	Forbs (FG)			Forbs (FG)		20 – 29 cm	
	Ferns (EG)			Ferns (EG)		10 – 19 cm	
	Other (OG)			Other (OG)		5 – 9 cm	
						[4]Tree regeneration <5 cm	
			Total high threat weed cover			[5]Length of fallen logs	
						[6]Hollow bearing trees	

Vegetation integrity - function cont. (five 1 m²) **plots)**

	[7]Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	0 0 0 0 0			
Average of the 5 subplots				

These attributes require considered on site observations and may be completed after field work

Vegetation class **[8]Large tree benchmark size** 20/ 30/ 50/ 80 DBH Confidence H/ M/ L

Plant community type (PCT) exotic dom. grassland/pasture. **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet system etc flora survey purposes.

Morphological type	Landform element	Landform pattern	Microrelief
Lithology	Soil surface texture	Soil colour	Soil depth
Slope	Aspect	Site drainage	Distance to nearest water and type

Disturbance	Severity code	Age code
Clearing (incl. logging)		
Cutting (incl. pasture)		
Soil erosion		
Fire (incl. CWD removal)		
Grazing (incl. native/stock)		
Fire damage		
Storm damage		
Weed cover		

Brief site description or other notes

Emergents heights			Upper stratum heights			Middle stratum heights			Lower stratum heights		
Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom

340° N - Bearing

400 m² floristics plot:	Survey name	Plot identifier	Recorders
Date 19 / 2 / 2021	BV7-9	CR2	JS + JC

GF code	Species name Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover.	N, HTW or non-HTW	[2] Foliage cover	Abund-ance	Voucher
	Paspalum dilatatum	E	50	>1000	
	Cynodon dactylon	N	30	>1000	
	Schkuhria pinnata abrotanoides	E	0.1	7	
	Setaria parviflora	E	4	1000	
	Sporobolus creber	N	2	500	
	Senecio madagascariensis	E	0.1	20	
	Urochloa panicoides	E	0.1	7	
	Chloris gayana	E	0.1	20	
	Conyza sp.	E	0.1	50	
	Elensine tristachya	E	0.2	100	
	Gamochaeta americana	E	0.1	20	
	Oxalis exilis	N	0.1	10	
	Eragrostis curvula	E	0.3	100	
	Fimbristylis dichotoma	N	0.2	500	
	Cyperus gracilis	N	0.1	50	
	~~Cyperus~~ Cyperus brevifolius	E	0.2	500	
	Axonopus fissifolius	E	0.1	10	
	Enteropogon acicularis	N	0.1	20	
	Eragrostis ~~leptostachya~~ parviflora	N	0.1	20	
	Hypochaeris albiflorus	E	0.1	2	
	Lepidium africanum	E	0.1	1	
	Solanum sisymbrifolium	E	0.1	3	
	Bothriochloa macra	N	0.2	100	
	Gomphrena celosioides	E	0.1	4	
	Sida rhombifolia	E	0.1	2	
	Paspalidium distans	N	0.1	5	
	Plantago lanceolata	E	0.1	10	
	Lysimachia arvensis	E	0.1	5	
	Cenchrus clandestina	E	0.1	3	
	Carex inversa	N	0.2	100	
	Briza subaristata	E	0.1	1	
	Portulaca oleracea	N	0.1	1	
	Centaurium tenuiflorum	E	0.1	1	
	Wahlenbergia gracilis	N	0.1	2	

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

GF Code: see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

30 cm = 10 dbh

125° SE

Scanned JC 22.2.21

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

Site sheet # 1 of **Date** 9/2/21 **Survey name** HV 7-9 **Plot identifier** CPW1

Recorders LS+JC **IBRA region** **Veg zone ID** CPW

[1]**Datum** **Coordinate system** ☐ Projected ☐ Geographic **MGA zone** [1]**X coordinate** [1]**Y coordinate**

Location description along fenceline Pinnacle park

[1] **Plot dimensions** [1] **Orientation of midline from 0 m point** 125° SE **Photo #**

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

Vegetation integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

Composition (400 m² plot)		Sum values	**Structure** (400 m² plot)		Sum values (%) (may sum to >100%)	**Function** (1000 m² plot) [3]Tree stem size class (DBH)	If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted
Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form)	Trees (TG)		Sum of [2] **foliage cover** of native plant species by growth form group	Trees (TG)		80 + cm	✓
	Shrubs (SG)			Shrubs (SG)		50 – 79 cm	[redacted] 61, 57
	Grasses etc. (GG)			Grasses etc. (GG)		30 – 49 cm	[redacted] 38, 46, 34, 42
	Forbs (FG)			Forbs (FG)		20 – 29 cm	[redacted] ✓
	Ferns (EG)			Ferns (EG)		10 – 19 cm	✓
	Other (OG)			Other (OG)		5 – 9 cm	✓
						[4]Tree regeneration <5 cm EUCS	✓
			Total high threat weed cover			[5]Length of fallen logs	5m+1+50
5, 15, 25, 35, 45						[6]Hollow bearing trees	

Vegetation integrity - function cont. (five 1 m²) **plots)**	[7]Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	0	0	0	0
~~Average of the 5 subplots~~				

These attributes require consideration of site observations and may be completed after field work.

Vegetation class [8]**Large tree benchmark size** 20/ 30/ 50/ 80 DBH ✓ Confidence H/ M/ L

Plant community type (PCT) CPW. **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes.

Morphological type	Landform element	Landform pattern	Microrelief
Lithology	Soil surface texture	Soil colour	Soil depth
Slope	Aspect	Site drainage	Distance to nearest water and type

Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (id. native/stock)		
Fire damage		
Storm damage		
Weediness		

Brief site description or other notes

Emergents heights			Upper stratum heights			Middle stratum heights			Lower stratum heights		
Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom

Document Set ID: 9864734
Version: 1, Version Date: 27/02/2022

400 m² floristics plot: | **Survey name** | **Plot identifier** | **Recorders**

Date 19 2 21 | HV7-9 | GR1 | JS + JC

GF code	Species name Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover.	N, HTW or non-HTW	[2] Foliage cover	Abund-ance	Voucher
	Bothriochloa macra	N	5	>1000	
	Aristida ramosa	N	0.3	500	
	Plantago lanceolata	E	10	>1000	
	Senecio madagascariensis	E	0.2	500	
	Aster subulata	E	0.1	2	
	Centaurium tenuiflorum	E	0.2	500	
	Enteropogon acicularis	N	30	>1000	
	Conyza sp.	E	0.2	500	
	Sporobolus creber	N	0.6	500	
	Dichanthium sericeum sericeum	N	0.1	5	
	Paspalum dilatatum	E	3	500	
	Glycine tabacina	N	0.1	100	
	Dichondra repens	N	0.1	50	
	Eragrostis curvula	E	2	500	
	Setaria parviflora	E	0.4	500	
	Chloris gayana	E	1	500	
	Phyllanthus virgatus	N	0.1	4	
	Oxalis ~~perennans~~ exilis	N	0.1	50	
	Cynodon dactylon	N	20	>1000	
	Solanum sisymbriifolium	E	0.1	3	
	Hypochaeris glabra	E	0.1	4	
	Lysimachia arvensis	E	0.1	20	
	Richardia stellaris	E	0.1	1	
	Cirsium vulgare	E	0.1	10	
	Chloris truncata	N	0.1	10	
	Euphorbia drummondii	N	0.1	50	
	Rytidosperma sp.	N	0.1	1	2-1
	Wahlenbergia ~~gracilis~~ communis	N	0.1	4	
	Cyperus gracilis	N	0.1	10	
	Chloris ventricosa	N	0.1	1	
	Wahlenbergia gracilis	N	0.1	7	
	Euchiton sphaericus	N	0.1	1	
	Leontodon saxatilis	E	0.1	2	
	Lotus angustissimus	E	0.1	2	
	Linum trigynum	E	0.1	2	
	Sida rhombifolia	E	0.1	1	

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

GF Code: see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* ~~Note the top 3 dominant native species within each GF group.~~

	Carex inversa	N	0.1	2	
	Gamochaeta americana	E	0.1	1	
	Paronychia brasiliana	E	0.1	20	
	Hypochaeris albiflora	E	0.1	2	
	Verbena bonariensis	E	0.1	1	

Document Set ID: 9864734
Version: 1, Version Date: 21/02/2022

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

Site sheet #	1 of	**Date**	19/2/21	**Survey name**	[redacted] HV7-9	**Plot identifier**	GR3.
Recorders	K + JS.			**IBRA region**		**Veg zone ID**	
[1]Datum		**Coordinate system**	□ Projected □ Geographic	**MGA zone**		**[1]X coordinate**	**[1]Y coordinate**
Location description	descriptive notes to locate site without grid reference						
[1] Plot dimensions	For composition & structure (400m²): 20 m x 20 m For function (1000m²): 20 m x 50 m			**[1] Orientation of midline from 0 m point**	Magnetic 140°SE	**Photo #**	

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

Vegetation integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

Composition (400 m² plot)		Sum values	**Structure** (400 m² plot)		Sum values (%) (may sum to >100%)	**Function** (1000 m² plot) [3] Tree stem size class (DBH)	If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted
Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form)	Trees (TG)		Sum of [2] **foliage cover** of native plant species by growth form group	Trees (TG)		80 + cm	Count
	Shrubs (SG)			Shrubs (SG)		50 – 79 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥50 cm, count
	Grasses etc. (GG)			Grasses etc. (GG)		30 – 49 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥ 30 cm, count
	Forbs (FG)			Forbs (FG)		20 – 29 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥ 20 cm, count
	Ferns (EG)			Ferns (EG)		10 – 19 cm	Count (best practice)/tick
	Other (OG)			Other (OG)		5 – 9 cm	Count (best practice)/tick
						[4]Tree regeneration <5 cm	Tick
			Total high threat weed cover		%	[5] Length of fallen logs	Tally space / Total m
						[6] Hollow bearing trees	Tick

Vegetation integrity - function cont. (five 1 m²) **plots)**	[7] Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	a 0 b 0 c 0 d 0 e 0	a b c d e	a b c d e	a b c d e
Average of the 5 subplots				

These attributes require consideration of site observations and may be completed after field work:

Vegetation class		[8] **Large tree benchmark size**	20/ 30/ 50/ 80 DBH	Confidence	H/ M/ L
Plant community type (PCT)		**EEC**	Tick	Confidence	H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

Morphological type		Landform element		Landform pattern		Microrelief	
Lithology		Soil surface texture		Soil colour		Soil depth	
Slope		Aspect		Site drainage		Distance to nearest water and type	

Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (id. native/stock)		
Fire damage		
Storm damage		
Weediness		

Brief site description or other notes

Emergents heights			Upper stratum heights			Middle stratum heights			Lower stratum heights		
Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom

PTO species list

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

HV7-9 GR3 19.2.21 140° NSEW

SPECIES	N/E/I/W	Foliage Cover	Abundance
Paspalum dilatatum	E	75	71000
Cynodon dactylon	N	10	71000
Sporobolus creber	N	2	1000
Conyza sp.	E	0.5	500
Senecio madagascariensis	E	2	1000
Hypochaeris albiflora	E	0.1	20
Leontodon saxatilis	E	0.2	500
Bothriochloa macra	N	0.5	500
Gamochaeta americana	E	0.1	3
Centaurium tenuiflorum	E	0.1	7
Cenchrus clandestina	E	1	50
Plantago lanceolata	E	0.3	500
Asperula conferta	N	0.1	1
Carex inversa	N	0.1	20
Malva parviflora	E	0.1	1
Solanum sisymbrifolium	E	0.1	20
Chloris gayana	E	1	50
Cymbonotus lawsonianus	N	0.1	1
Sida rhombifolia	E	0.1	6
Eragrostis curvula	E	0.2	20
Wahlenbergia gracilis	N	0.1	2
Setaria parviflora	E	2	500
Centella asiatica	N	0.1	20
Oxalis exilis	N	0.1	8
Lysimachia arvensis	E	0.1	5
Cirsium vulgare	E	0.1	10
Lepidium bonariense	E	0.1	1
Portulaca oleracea	N	0.1	5
Paronychia brasiliana	E	0.1	4
Solanum nigrum	E	0.1	1
Enteropogon acicularis	N	0.1	5
Verbena bonariensis	E	0.1	2
Trifolium repens	E	0.1	1
Cyperus brevifolius	E	0.1	4
Dichondra repens	N	0.1	7

Document Set ID: 9964734
Version: 1, Version Date: 27/02/2022

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

Site sheet #	1 of	**Date**	/ /	**Survey name**	~~GR4~~ HV7-9.	**Plot identifier**	GR4
Recorders	James Jacqui			**IBRA region**	SYD BASIN	**Veg zone ID**	
[1]Datum		**Coordinate system**	□ Projected □ Geographic	**MGA zone**		**[1]X coordinate** JC GPS	**[1]Y coordinate**
Location description	descriptive notes to locate site without grid reference						
[1] Plot dimensions	For composition & structure (400m²): 20 m x 20 m For function (1000m²): 20 m x 50 m			**[1] Orientation of midline from 0 m point**	Magnetic 78°E	**Photo #**	JC iphone

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW) or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

Vegetation integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

Composition (400 m² plot)		Sum values	**Structure** (400 m² plot)		Sum values (%) (may sum to >100%)	**Function** (1000 m² plot)	
Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form)	Trees (TG)		Sum of **[2] foliage cover** of native plant species by growth form group	Trees (TG)		[3] Tree stem size class (DBH)	If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted
	Shrubs (SG)			Shrubs (SG)		80 + cm	Count
	Grasses etc. (GG)			Grasses etc. (GG)		50 – 79 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥50 cm, count
	Forbs (FG)			Forbs (FG)		30 – 49 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥ 30 cm, count
	Ferns (EG)			Ferns (EG)		20 – 29 cm	Count (best practice)/tick. If [8] large tree benchmark size ≥ 20 cm, count
	Other (OG)			Other (OG)		10 – 19 cm	Count (best practice)/tick
						5 – 9 cm	Count (best practice)/tick
						[4]Tree regeneration <5 cm	Tick
			Total high threat weed cover		%	[5] Length of fallen logs	Tally space / Total m
						[6] Hollow bearing trees	Tick

Vegetation integrity - function cont. (five 1 m²) **plots)**	[7] Litter cover (%)	Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a b c d e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots																

These attributes require consideration of site observations and may be completed after field work:

Vegetation class		**[8] Large tree benchmark size**	20/ 30/ 50/ 80 DBH	Confidence	H/ M/ L
Plant community type (PCT)		**EEC**	Tick	Confidence	H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

Morphological type		Landform element		Landform pattern		Microrelief	
Lithology		Soil surface texture		Soil colour		Soil depth	
Slope		Aspect		Site drainage		Distance to nearest water and type	

Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (id. native/stock)		
Fire damage		
Storm damage		
Weediness		

Brief site description or other notes

Emergents heights			Upper stratum heights			Middle stratum heights			Lower stratum heights		
Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom	Top	Mid	Bottom

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

HV 7-9 19/2/2021 JS + JC

GR4 - in Native dominated low diversity GL

Species	E or N	Cover	Abund.
Enteropogon acicularis	N	50	>1000
Cynodon dactylon	N	20	>1000
Setaria parviflora	E	3	1000
Conyza sumatrensis	E	0.6	500
Bothriochloa macra	N	3	500
Plantago lanceolata	E	0.2	100
Sporobolus creber	N	4	71000
Paspalum dilatatum	E	2	500
Cenchrus clandestinus	E	0.1	20
Oxalis exilis	N	0.1	20
Wahlenbergia gracilis	N	0.1	8
Carex inversa	N	0.1	10
Senecio madagascariensis	E	0.2	50
Gamochaeta calviceps	E	0.1	20
Cyperus gracilis	N	0.1	20
Phyllanthus virgatus	N	0.1	50
Euphorbia drummondii	N	0.1	50
Paronychia brasiliana	E	0.1	20
Spergularia levis	E	0.1	3
Gamochaeta americana	E	0.1	20
Eleusine tristachya	E	0.1	20
Lysimachia arvensis	E	0.1	10
Einadia polygonoides	N	0.1	20
Glycine tabacina	N	0.1	8
Aristida ramosa	N	0.1	50
Leontodon saxatilis	E	0.1	50
Dichondra repens	N	0.1	4
Eragrostis curvula	E	0.7	50
Wahlenbergia communis	N	0.1	10
Cirsium vulgare	E	0.1	1
Portulaca oleracea	N	0.1	6
Cyperus brevifolius	E	0.1	7
Linum trigynum	E	0.1	1
Hypochaeris albiflorus	E	0.1	1
Schkuhria pinnata abrotanoides	E	0.1	1
Gomphrena celosioides	E	0.1	2
Solanum sisymbriifolium	E	0.1	4
Fimbristylis dichotoma	N	0.1	20

Document Set ID: 9964734
Version: 1, Version Date: 21/02/2022

Fenced off "restoration area" in NE of site

Scattered remnant large Euc. tereticornis, Euc. crebra + a few smaller Euc. melliodora, with abundant Euc. tereticornis regen + a few Euc. crebra regen.
Understorey patchy, ~~some~~ most areas dominated by Chloris gayana, Paspalum dilatatum, Setaria parviflora, but some areas dominated by Themeda triandra.
Some midstorey of Bursaria spinosa in patches. Abundant Euc. seedlings.

Also present

Briza subaristata
Fimbristylis dichotoma
Solanum sisymbrifolium
Senecio madagascariensis
Tricoryne elatior
Conyza sumatrensis
Euchiton ~~sphaericus~~ involucratus
Sida rhombifolia
Cyperus gracilis
Verbena bonariensis
Plantago lanceolata
Glycine microphylla

Document Set ID: 9961734
Version: 1, Version Date: 21/02/2022

Appendix C – Site Flora Species List

Scientific Name	Common Name	NSW Status	Comm. Status	Native	Exotic
Araujia sericifera	Moth Vine	Not Listed	Not Listed		YES
Aristida ramosa	Purple Wiregrass	Not Listed	Not Listed	YES	
Arthropodium minus	Small Vanilla Lily	Not Listed	Not Listed	YES	
Asperula conferta	Common Woodruff	Not Listed	Not Listed	YES	
Aster subulatus	Wild Aster	Not Listed	Not Listed		YES
*Axonopus fissifolius**	Narrow-leaved Carpet Grass	Not Listed	Not Listed		YES
Bidens pilosa	Cobbler's Pegs	Not Listed	Not Listed		YES
Bidens subalternans	Greater Beggar's Ticks	Not Listed	Not Listed		YES
Bothriochloa macra	Red Grass	Not Listed	Not Listed	YES	
Breynia oblongifolia	Coffee Bush	Not Listed	Not Listed	YES	
Briza subaristata		Not Listed	Not Listed		YES
Bromus catharticus	Prairie Grass	Not Listed	Not Listed		YES
Brunoniella australis	Blue Trumpet	Not Listed	Not Listed	YES	
Bursaria spinosa	Native Blackthorn	Not Listed	Not Listed	YES	
Carex inversa	Knob Sedge	Not Listed	Not Listed	YES	
Cenchrus clandestinus	Kikuyu Grass	Not Listed	Not Listed		YES
Centaurium tenuiflorum	Branched Centaury, Slender centaury	Not Listed	Not Listed		YES
Centella asiatica	Indian Pennywort	Not Listed	Not Listed	YES	
Cheilanthes sieberi	Rock Fern	Not Listed	Not Listed	YES	
Chloris gayana	Rhodes Grass	Not Listed	Not Listed		YES
Chloris truncata	Windmill Grass	Not Listed	Not Listed	YES	
Chloris ventricosa	Tall Chloris	Not Listed	Not Listed	YES	
Cirsium vulgare	Spear Thistle	Not Listed	Not Listed		YES
Commelina cyanea	Native Wandering Jew	Not Listed	Not Listed	YES	
Conyza Spp.		Not Listed	Not Listed		YES
Cyanthillium cinereum		Not Listed	Not Listed	YES	
Cyclospermum leptophyllum	Slender Celery	Not Listed	Not Listed		YES
Cymbonotus lawsonianus	Bear's Ear	Not Listed	Not Listed	YES	
Cymbopogon refractus	Barbed Wire Grass	Not Listed	Not Listed	YES	
Cynodon dactylon	Common Couch	Not Listed	Not Listed	YES	
Cyperus brevifolius		Not Listed	Not Listed		YES
Cyperus eragrostis	Umbrella Sedge	Not Listed	Not Listed		YES
Cyperus gracilis	Slender Flat-sedge	Not Listed	Not Listed	YES	
Desmodium brachypodum	Large Tick-trefoil	Not Listed	Not Listed	YES	
Desmodium varians	Slender Tick-trefoil	Not Listed	Not Listed	YES	
Dichanthium sericeum	Queensland Bluegrass	Not Listed	Not Listed	YES	
Dichondra repens	Kidney Weed	Not Listed	Not Listed	YES	
Digitaria sanguinalis	Crab Grass	Not Listed	Not Listed		YES
Echinopogon ovatus	Forest Hedgehog Grass	Not Listed	Not Listed	YES	
Ehrharta erecta	Panic Veldtgrass	Not Listed	Not Listed		YES
Einadia polygonoides	Knotweed Goosefoot	Not Listed	Not Listed	YES	
Eleusine tristachya	Goose Grass	Not Listed	Not Listed		YES
Enteropogon acicularis	Curly Windmill Grass	Not Listed	Not Listed	YES	
Eragrostis curvula	African Lovegrass	Not Listed	Not Listed		YES
Eragrostis leptostachya	Paddock Lovegrass	Not Listed	Not Listed	YES	
Eragrostis parviflora	Weeping Lovegrass	Not Listed	Not Listed	YES	

Document Set ID: 9961734
Version: 1, Version Date: 21/02/2022

Scientific Name	Common Name	NSW Status	Comm. Status	Native	Exotic
Eriochloa pseudoacrotricha	Early Spring Grass	Not Listed	Not Listed	YES	
Eucalyptus crebra	Narrow-leaved Ironbark	Not Listed	Not Listed	YES	
Eucalyptus moluccana	Grey Box	Not Listed	Not Listed	YES	
Eucalyptus tereticornis	Forest Red Gum	Not Listed	Not Listed	YES	
Euchiton sphaericus	Star Cudweed	Not Listed	Not Listed	YES	
Euphorbia drummondii	Caustic Weed	Not Listed	Not Listed	YES	
Fimbristylis dichotoma	Common Fringe-sedge	Not Listed	Not Listed	YES	
Gamochaeta americana	Purple Cudweed	Not Listed	Not Listed		YES
Gamochaeta calviceps	Cudweed	Not Listed	Not Listed		YES
Geranium solanderi	Native Geranium	Not Listed	Not Listed	YES	
Glycine microphylla	Small-leaf Glycine	Not Listed	Not Listed	YES	
Glycine tabacina	Variable Glycine	Not Listed	Not Listed	YES	
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	Not Listed	Not Listed		YES
Gomphrena celosioides	Gomphrena Weed	Not Listed	Not Listed		YES
Hardenbergia violacea	False Sarsaparilla	Not Listed	Not Listed	YES	
Hydrocotyle sibthorpioides		Not Listed	Not Listed	YES	
Hypericum gramineum	Small St John's Wort	Not Listed	Not Listed	YES	
Hypochaeris albiflora	White Flatweed	Not Listed	Not Listed		YES
Hypochaeris glabra	Smooth Catsear	Not Listed	Not Listed		YES
Hypochaeris radicata	Catsear	Not Listed	Not Listed		YES
Hypoxis hygrometrica	Golden Weather-grass	Not Listed	Not Listed	YES	
Indigofera australis	Australian Indigo	Not Listed	Not Listed	YES	
Lantana camara	Lantana	Not Listed	Not Listed		YES
Leontodon taraxacoides	Lesser Hawkbit	Not Listed	Not Listed		YES
Leontodon taraxacoides	Lesser Hawkbit	Not Listed	Not Listed		YES
Lepidium africanum	Common Peppercress	Not Listed	Not Listed		YES
Linum trigynum	French Flax	Not Listed	Not Listed		YES
Lomandra filiformis	Wattle Matt-rush	Not Listed	Not Listed	YES	
Lotus angustissimus	Slender Birds-foot Trefoil	Not Listed	Not Listed		YES
Lysimachia arvensis	Scarlet Pimpernel	Not Listed	Not Listed		YES
Microlaena stipoides	Weeping Grass	Not Listed	Not Listed	YES	
Modiola caroliniana	Red-flowered Mallow	Not Listed	Not Listed		YES
Olea europaea subsp. cuspidata	African Olive	Not Listed	Not Listed		YES
Oplismenus aemulus		Not Listed	Not Listed	YES	
Oxalis exilis		Not Listed	Not Listed	YES	
Oxalis perennans		Not Listed	Not Listed	YES	
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	Not Listed	Not Listed		YES
Paspalidium distans		Not Listed	Not Listed	YES	
Paspalum dilatatum	Paspalum	Not Listed	Not Listed		YES
Phyllanthus virgatus	Wiry Spurge	Not Listed	Not Listed	YES	
Plantago lanceolata	Lamb's Tongues	Not Listed	Not Listed		YES
Portulaca oleracea	Pigweed	Not Listed	Not Listed	YES	
Richardia stellaris		Not Listed	Not Listed		YES
Rumex brownii	Swamp Dock	Not Listed	Not Listed	YES	
Rytidosperma racemosum var. racemosum	Wallaby Grass	Not Listed	Not Listed	YES	
Rytidosperma spp.		Not Listed	Not Listed	YES	
Schkuhria pinnata	Dwarf Marigold	Not Listed	Not Listed		YES
Scleria mackaviensis		Not Listed	Not Listed	YES	
Senecio madagascariensis	Fireweed	Not Listed	Not Listed		YES

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Scientific Name	Common Name	NSW Status	Comm. Status	Native	Exotic
Setaria parviflora		Not Listed	Not Listed		YES
Sida rhombifolia	Paddy's Lucerne	Not Listed	Not Listed		YES
Sigesbeckia orientalis	Indian Weed	Not Listed	Not Listed	YES	
Solanum pseudocapsicum	Madeira Winter Cherry	Not Listed	Not Listed		YES
Solanum sisymbriifolium		Not Listed	Not Listed		YES
Sonchus oleraceus	Common Sowthistle	Not Listed	Not Listed		YES
Spergularia levis		Not Listed	Not Listed		YES
Sporobolus creber	Slender Rat's Tail Grass	Not Listed	Not Listed	YES	
Taraxacum officinale	Dandelion	Not Listed	Not Listed		YES
Themeda triandra		Not Listed	Not Listed	YES	
Tricoryne elatior	Yellow Autumn-lily	Not Listed	Not Listed	YES	
Urochloa panicoides	Urochloa Grass	Not Listed	Not Listed		YES
Verbena bonariensis	Purpletop	Not Listed	Not Listed		YES
Veronica plebeia	Trailing Speedwell	Not Listed	Not Listed	YES	
Wahlenbergia communis	Tufted Bluebell	Not Listed	Not Listed	YES	
Wahlenbergia gracilis	Sprawling Bluebell	Not Listed	Not Listed	YES	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix D – Vegetation Plot Photos

Plot	1	2
1A CPW		

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Plot	1	2
2A Grassland 1		

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Plot	1	2
2B – Grassland 4		

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix E – Anabat Report

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity Research Pty Ltd
trading as Biodiversity Monitoring Services
ACN 617 530 686

167 McKanes Falls Road
South Bowenfels, NSW 2790
E: andrew.lothian@biodiversitymonitoring.com.au
M: 0421 841 726

Date	A.aus	C.gou	C.mor	Mi.aus	Mi.ori	Mo.nor	Mo.rid	Ny. spp.	Scote.ru	Scoto.or	V.vul	Total Passes
25/2/2021	2(1)	4(1)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0)	0(0)	0(0)	0(0)	7
26/2/2021	1(0)	14(3)	3(0)	1(0)	4(3)	0(0)	2(2)	1(0)	0(0)	1(0)	8(0)	35
27/2/2021	0(0)	26(3)	2(0)	1(0)	1(0)	0(0)	8(4)	2(1)	0(0)	0(0)	3(0)	43
28/2/2021	1(0)	15(5)	1(0)	1(0)	1(0)	3(0)	1(0)	0(0)	1(0)	0(0)	2(0)	26
1/3/2021	4(2)	21(3)	0(0)	0(0)	5(2)	0(0)	1(0)	0(0)	0(0)	0(0)	1(0)	32

The number of echolocation calls identified to a high level of confidence to a species are marked in brackets. Species codes explained below, those in bold are listed as threatened.

A.aus = *Austronomus australis* **C.dwy = *Chalinolobus dwyeri*** C.gou = *Chalinolobus gouldii* C.mor = *Chalinolobus morio* **F.ta = *Falsistrellus tasmaniensis***
Mi.aus = Miniopterus australis **Mi.ori = *Miniopterus orianae oceanensis*** **Mo.nor = *Mormopterus norfolkensis***
Mo.rid = *Mormopterus ridei* **My.ma = *Myotis macropus*** R.meg = *Rhinolophus megaphyllus* **Sa.fla = *Saccolaimus flaviventris***
Nyctophilus spp. = bats from the following three species which are difficult to distinguish based on call:
N.cor = *Nyctophilus corbeni* N.geo = *Nyctophilus geoffroyi* N.gou = *Nyctophilus gouldii*
Scote.ru = *Scoteanax rueppellii* Scoto.or = *Scotorepens orion* V.dar = *Vespadelus darlingtoni* V.reg = *Vespadelus regulus* V.vul = *Vespadelus vulturnus*

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix F – BAM Calculator Reports

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00024108/BAAS18139/21/00024124

Proposal Name
Highland Views stage 7 to 9

BAM data last updated *
24/11/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
50

Proponent Names

Report Created
15/12/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	849-Cumberland shale plains woodland

Species
Nil

Additional Information for Approval

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

Name
Dasyurus maculatus / Spotted-tailed Quoll
Grantiella picta / Painted Honeyeater
Callocephalon fimbriatum / Gang-gang Cockatoo
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Hieraaetus morphnoides / Little Eagle
Haliaeetus leucogaster / White-bellied Sea-Eagle
Lophoictinia isura / Square-tailed Kite
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Neophema pulchella / Turquoise Parrot
Ninox strenua / Powerful Owl
Phascolarctos cinereus / Koala
Chthonicola sagittata / Speckled Warbler
Anthochaera phrygia / Regent Honeyeater
Circus assimilis / Spotted Harrier

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	7.6	0	1	1

849-Cumberland shale plains woodland

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_CPW_Moderate	No	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Derived_Grassland	No	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Exotic_Grassland	No	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Dillwynia tenuifolia / Dillwynia tenuifolia	**849_CPW_Moderate**	0.1	1.00
Pterostylis saxicola / Sydney Plains Greenhood	**849_CPW_Moderate**	0.1	1.00
Pultenaea pedunculata / Matted Bush-pea	**849_CPW_Moderate**	0.1	1.00

Credit Retirement Options

Like-for-like credit retirement options

Dillwynia tenuifolia / Dillwynia tenuifolia	Spp	IBRA subregion
	Dillwynia tenuifolia / Dillwynia tenuifolia	Any in NSW
Pterostylis saxicola / Sydney Plains Greenhood	Spp	IBRA subregion
	Pterostylis saxicola / Sydney Plains Greenhood	Any in NSW
Pultenaea pedunculata / Matted Bush-pea	Spp	IBRA subregion
	Pultenaea pedunculata / Matted Bush-pea	Any in NSW

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00024108/BAAS18139/21/00024124

Proposal Name

Highland Views stage 7 to 9

BAM data last updated *

24/11/2021

Assessor Name

Jacqueline Frances Coughlan

Assessor Number

BAAS18139

BAM Data version *

50

Proponent Name(s)

Report Created

15/12/2021

BAM Case Status

Open

Assessment Revision

0

Assessment Type

Part 4 Developments (General)

Date Finalised

To be finalised

BOS entry trigger

BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	849-Cumberland shale plains woodland

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Dasyurus maculatus / Spotted-tailed Quoll
Grantiella picta / Painted Honeyeater
Callocephalon fimbriatum / Gang-gang Cockatoo
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Hieraaetus morphnoides / Little Eagle
Haliaeetus leucogaster / White-bellied Sea-Eagle
Lophoictinia isura / Square-tailed Kite
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Neophema pulchella / Turquoise Parrot
Ninox strenua / Powerful Owl
Phascolarctos cinereus / Koala
Chthonicola sagittata / Speckled Warbler
Anthochaera phrygia / Regent Honeyeater
Circus assimilis / Spotted Harrier

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Variations)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	7.6	0	1	1.00

849-Cumberland shale plains woodland

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_CPW_Moderate	No	1	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Derived_Grassland	No	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Exotic_Grassland	No	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Dillwynia tenuifolia / Dillwynia tenuifolia	**849_CPW_Moderate**	0.1	1.00

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Pterostylis saxicola / Sydney Plains Greenhood	**849_CPW_Moderate**	0.1	1.00
Pultenaea pedunculata / Matted Bush-pea	**849_CPW_Moderate**	0.1	1.00

Credit Retirement Options

Like-for-like options

Dillwynia tenuifolia/ Dillwynia tenuifolia	Spp	IBRA region	
	Dillwynia tenuifolia/Dillwynia tenuifolia	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Pterostylis saxicola/ Sydney Plains Greenhood	Spp	IBRA region	
	Pterostylis saxicola/Sydney Plains Greenhood	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

	Flora	Endangered	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Pultenaea pedunculata/ Matted Bush-pea	Spp	IBRA region	
	Pultenaea pedunculata/Matted Bush-pea	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Candidate Species Report

Proposal Details

Assessment Id 00024108/BAAS18139/21/00024124	Proposal Name Highland Views stage 7 to 9	BAM data last updated * 24/11/2021
Assessor Name Jacqueline Frances Coughlan	Report Created 15/12/2021	BAM Data version * 50
Assessor Number BAAS18139	Assessment Type Part 4 Developments (General)	BAM Case Status Open
Assessment Revision 0	Date Finalised To be finalised	BOS entry trigger BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Cynanchum elegans White-flowered Wax Plant	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dillwynia tenuifolia Dillwynia tenuifolia	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus benthamii Camden White Gum	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Grevillea juniperina subsp. juniperina Juniper-leaved Grevillea	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria aurea Green and Golden Bell Frog	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Marsdenia viridiflora subsp. viridiflora - endangered population Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Meridolum corneovirens Cumberland Plain Land Snail	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Persoonia bargoensis Bargo Geebung	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pimelea curviflora var. curviflora Pimelea curviflora var. curviflora	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pimelea spicata Spiked Rice-flower	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pommerhelix duralensis Dural Land Snail	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pterostylis saxicola Sydney Plains Greenhood	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pultenaea pedunculata Matted Bush-pea	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Thesium australe Austral Toadflax	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat degraded Habitat constraints
Bynoe's Wattle	Acacia bynoeana	Habitat degraded
Dillwynia tenuifolia, Kemps Creek	Dillwynia tenuifolia - endangered population	Refer to BAR
Downy Wattle	Acacia pubescens	Habitat degraded
Eastern Pygmy-possum	Cercartetus nanus	Habitat degraded
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat degraded Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints

Document Set ID: 9961734
Version: 1, Version Date: 27/02/2022

Squirrel Glider	Petaurus norfolcensis	Habitat degraded
Swift Parrot	Lathamus discolor	Habitat constraints
Thick Lip Spider Orchid	Caladenia tessellata	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024108/BAAS18139/21/00024124	Highland Views stage 7 to 9	24/11/2021
Assessor Name	Report Created	BAM Data version *
Jacqueline Frances Coughlan	15/12/2021	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18139	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland shale plains woodland												
1	849_CPW_Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion	56.1	18.4	0.05	PCT Cleared - 93%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

2	849_Derived_Grassland	Cumberland Plain Woodland in the Sydney Basin Bioregion	12.1	12.1	0.86	PCT Cleared - 93%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
3	849_Exotic_Grassland	Cumberland Plain Woodland in the Sydney Basin Bioregion	9	9.0	6.7	PCT Cleared - 93%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
											Subtotal	**1**
											Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Dillwynia tenuifolia / Dillwynia tenuifolia (Flora)									
849_CPW_Moderate	18.4	18.4	0.05			Vulnerable	Not Listed	False	1
								Subtotal	**1**
Pterostylis saxicola / Sydney Plains Greenhood (Flora)									
849_CPW_Moderate	18.4	18.4	0.05			Endangered	Endangered	False	1
								Subtotal	**1**

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Pultenaea pedunculata / Matted Bush-pea (Flora)									
849_CPW_Moderate	18.4	18.4	0.05			Endangered	Not Listed	False	1
								Subtotal	**1**

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00024108/BAAS18139/21/00024124		0	15/12/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Jacqueline Frances Coughlan	BAAS18139	Highland Views stage 7 to 9	Open

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (General)	To be finalised	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**849 -** Cumberland shale plains woodland	1

Species list

Price calculated	Species	Credits
Yes	***Dillwynia tenuifolia*** (Dillwynia tenuifolia)	1
Yes	***Pterostylis saxicola*** (Sydney Plains Greenhood)	1
Yes	***Pultenaea pedunculata*** (Matted Bush-pea)	1

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	**849 -** Cumberland shale plains woodland	Yes	Cumberland Plain Woodland in the Sydney Basin Bioregion	18.83%	$ 1,097.37	1.6350	$ 33,697.42	1	$33,697.42

Subtotal (excl. GST)	**$33,697.42**
GST	**$3,369.74**
Total ecosystem credits (incl. GST)	**$37,067.16**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10226	***Dillwynia tenuifolia*** (Dillwynia tenuifolia)	Vulnerable	$54.59	20.6900%	$80.00	1	$145.88
10705	***Pterostylis saxicola*** (Sydney Plains Greenhood)	Endangered	$865.08	20.6900%	$80.00	1	$1,124.07
10716	***Pultenaea pedunculata*** (Matted Bush-pea)	Endangered	$1,730.17	20.6900%	$80.00	1	$2,168.14

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity payment summary report

	Subtotal (excl. GST)	**$3,438.09**
	GST	**$343.81**
Total species credits (incl. GST)		**$3,781.90**
	Grand total	**$40,849.06**

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024108/BAAS18139/21/00024124	Highland Views stage 7 to 9	24/11/2021
Assessor Name	Report Created	BAM Data version *
Jacqueline Frances Coughlan	15/12/2021	50
Assessor Number	Assessment Type	BAM Case Status
BAAS18139	Part 4 Developments (General)	Open
Assessment Revision	BOS entry trigger	Date Finalised
0	BOS Threshold: Biodiversity Values Map	To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	849-Cumberland shale plains woodland
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	849-Cumberland shale plains woodland
Diamond Firetail	Stagonopleura guttata	849-Cumberland shale plains woodland
Dusky Woodswallow	Artamus cyanopterus cyanopterus	849-Cumberland shale plains woodland
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	849-Cumberland shale plains woodland
Grey-headed Flying-fox	Pteropus poliocephalus	849-Cumberland shale plains woodland
Large Bent-winged Bat	Miniopterus orianae oceanensis	849-Cumberland shale plains woodland
Little Bent-winged Bat	Miniopterus australis	849-Cumberland shale plains woodland
Little Lorikeet	Glossopsitta pusilla	849-Cumberland shale plains woodland
Masked Owl	Tyto novaehollandiae	849-Cumberland shale plains woodland

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

Swift Parrot	Lathamus discolor	849-Cumberland shale plains woodland
Varied Sittella	Daphoenositta chrysoptera	849-Cumberland shale plains woodland
White-throated Needletail	Hirundapus caudacutus	849-Cumberland shale plains woodland
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	849-Cumberland shale plains woodland

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Flame Robin	Petroica phoenicea	849-Cumberland shale plains woodland
Gang-gang Cockatoo	Callocephalon fimbriatum	849-Cumberland shale plains woodland
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	849-Cumberland shale plains woodland
Koala	Phascolarctos cinereus	849-Cumberland shale plains woodland
Little Eagle	Hieraaetus morphnoides	849-Cumberland shale plains woodland
Painted Honeyeater	Grantiella picta	849-Cumberland shale plains woodland
Powerful Owl	Ninox strenua	849-Cumberland shale plains woodland
Regent Honeyeater	Anthochaera phrygia	849-Cumberland shale plains woodland
Scarlet Robin	Petroica boodang	849-Cumberland shale plains woodland
Speckled Warbler	Chthonicola sagittata	849-Cumberland shale plains woodland
Spotted Harrier	Circus assimilis	849-Cumberland shale plains woodland
Spotted-tailed Quoll	Dasyurus maculatus	849-Cumberland shale plains woodland
Square-tailed Kite	Lophoictinia isura	849-Cumberland shale plains woodland
Turquoise Parrot	Neophema pulchella	849-Cumberland shale plains woodland
White-bellied Sea-Eagle	Haliaeetus leucogaster	849-Cumberland shale plains woodland

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Predicted Species Report

Common Name	Scientific Name	Justification in the BAM-C
Flame Robin	Petroica phoenicea	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	Refer to BAR
Koala	Phascolarctos cinereus	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Painted Honeyeater	Grantiella picta	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Refer to BAR
Scarlet Robin	Petroica boodang	Refer to BAR
Speckled Warbler	Chthonicola sagittata	Refer to BAR
Spotted Harrier	Circus assimilis	Refer to BAR
Spotted-tailed Quoll	Dasyurus maculatus	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Turquoise Parrot	Neophema pulchella	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00024108/BAAS18139/21/00024124	Highland Views stage 7 to 9	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Jacqueline Frances Coughlan	15/12/2021	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18139	Part 4 Developments (General)	Open
Assessment Revision	**Date Finalised**	**BOS entry trigger**
0	To be finalised	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	849_CPW_Moderate	849-Cumberland shale plains woodland	CPW_Moderate	0.05	1	Park (0.05 ha)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

2	849_Derived_Grassland	849-Cumberland shale plains woodland	Derived_Grassland	0.86	1	
3	849_Exotic_Grassland	849-Cumberland shale plains woodland	Exotic_Grassland	6.68	3	

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Proposal Name
Highland Views Stages 7-9

BAM data last updated *
24/11/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
50

Proponent Names

Report Created
14/12/2021

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Scattered Trees

BAM Case Status
Open

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Ecosystem Credit Summary

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	HBT Cr	No HBT Cr	Credits
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	1	2	3

Credit classes for 849

Like-for-like options

TEC	Trading group	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion	-	Yes	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion	-	No	2	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Proposal Name
Highland Views Stages 7-9

BAM data last updated *
24/11/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
50

Proponent Name(s)

Report Created
14/12/2021

Assessment Type
Scattered Trees

Date Finalised
To be finalised

Assessment Revision
0

BAM Case Status
Open

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

PCT	TEC	HBT Cr	No HBT Cr	Credits
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	1	2	3

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Biodiversity Credit Report (Variations)

Credit classes for 849	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion	-	Yes	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion	-	No	2	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024108/BAAS18139/21/00024109	Highland Views Stages 7-9	24/11/2021
Assessor Name	Report Created	BAM Data version *
Jacqueline Frances Coughlan	14/12/2021	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18139	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
849-Cumberland shale plains woodland			
3	True	1.0	1
3	False	2.0	2
			3
			3

Species credits for threatened species

Nil

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00024108/BAAS18139/21/00024109		0	14/12/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Jacqueline Frances Coughlan	BAAS18139	Highland Views Stages 7-9	Open

Assessment Type	Date Finalised	BOS entry trigger
Scattered Trees	To be finalised	BOS Threshold: Biodiversity Values Map

PCT list

Include	PCT common name	Credits
Yes	**849 -** Cumberland shale plains woodland	3

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	**849 -** Cumberland shale plains woodland	$ 17,700.43	0.72141840	2.67146100	18.83%	$ 1,097.37	1.6350	$ 33,697.42	3	$101,092.26

Subtotal (excl. GST)	**$101,092.26**
GST	**$10,109.23**

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Biodiversity payment summary report

Total credits (incl. GST)	**$111,201.49**

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024108/BAAS18139/21/00024109	Highland Views Stages 7-9	24/11/2021
Assessor Name	Report Created	BAM Data version *
Jacqueline Frances Coughlan	14/12/2021	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18139	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name
Barking Owl	Ninox connivens
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae
Dusky Woodswallow	Artamus cyanopterus cyanopterus
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis
Eastern False Pipistrelle	Falsistrellus tasmaniensis
Flame Robin	Petroica phoenicea
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata
Koala	Phascolarctos cinereus
Little Eagle	Hieraaetus morphnoides
Little Lorikeet	Glossopsitta pusilla
Masked Owl	Tyto novaehollandiae
Painted Honeyeater	Grantiella picta
Scarlet Robin	Petroica boodang
Speckled Warbler	Chthonicola sagittata
Spotted Harrier	Circus assimilis
Swift Parrot	Lathamus discolor

Document Set ID: 9861734
Version: 1, Version Date: 17/02/2022

Varied Sittella	Daphoenositta chrysoptera
White-bellied Sea-Eagle	Haliaeetus leucogaster
White-throated Needletail	Hirundapus caudacutus
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Scattered Tree Report

Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Assessment name
Highland Views Stages 7-9

BAM data last updated *
24/11/2021

Assessor Name
Jacqueline Frances Coughlan

Report Created
14/12/2021

BAM Data version *
50

Assessor Number
BAAS18139

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Scattered Trees

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees

PCT code	PCT name	No. of trees	Species	DBHOB Category	Contain hollows	Class	Assessment required
849	Cumberland shale plains woodland	1	Eucalyptus crebra	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Scattered Tree Report

849	Cumberland shale plains woodland	2	Angophora floribunda	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Appendix G – Protected Matters Search Tool (EPBC Act)

Document Set ID: 9961734
Version: 1, Version Date: 17/02/2022

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

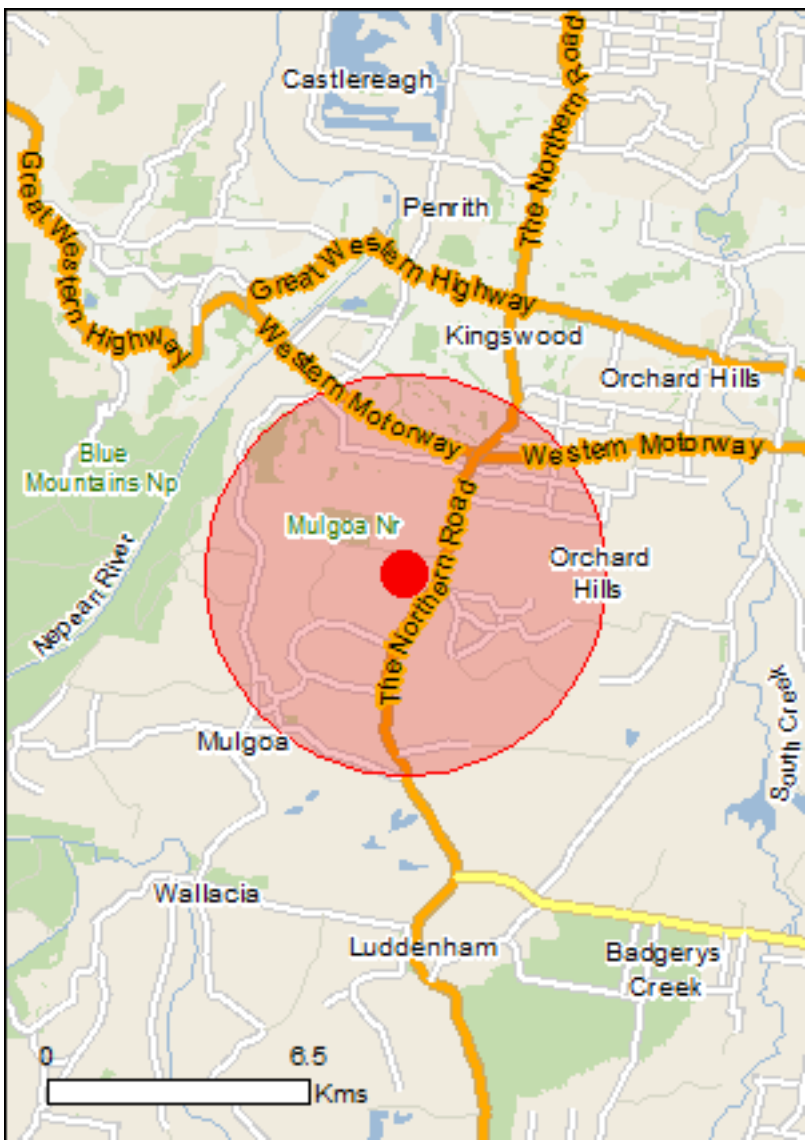
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/11/21 11:15:47

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

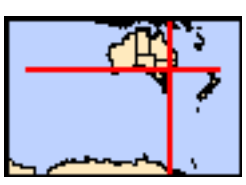
Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	43
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	6
Commonwealth Heritage Places:	1
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	49
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
Greater Blue Mountains Area	NSW	Declared property

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
The Greater Blue Mountains Area	NSW	Listed place

Listed Threatened Ecological Communities		[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Other		
Pommerhelix duralensis Dural Land Snail [85268]	Endangered	Species or species habitat likely to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat may occur within area
Allocasuarina glareicola [21932]	Endangered	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat may occur within area
Eucalyptus benthamii Camden White Gum, Nepean River Gum [2821]	Vulnerable	Species or species habitat may occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat known to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Persoonia nutans Nodding Geebung [18119]	Endangered	Species or species habitat may occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat may occur within area
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat known to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
[20307]		area
Thelymitra kangaloonica		
Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Defence - 1CAD ORCHARD HILLS KINGSWOOD
Defence - RANMME (DEOH)

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Orchard Hills Cumberland Plain Woodland	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
[Chrysococcyx osculans](#) Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Neophema chrysostoma](#) Blue-winged Parrot [726]		Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
[Rostratula benghalensis (sensu lato)](#) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Blue Mountains	NSW
Mulgoa	NSW

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur

Name	Status	Type of Presence within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.80835 150.68681

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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peterson bushfire.
expert consulting services

Bushfire Assessment

Residential Subdivision

Highland Views Stages 7-8, Glenmore Park

CCL Development

8 April 2021

(Ref: 17138)

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ABN 28 607 444 833

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Contents

1 Introduction 3
1.1 Background 3
1.2 Location and description of proposal 3
1.3 Assessment requirements 3

2 Bushfire hazard 7
2.1 Predominant vegetation 7
2.2 Effective slope 7

3 Bushfire protection measures 9
3.1 Asset Protection Zones (APZ) 9
3.2 Vegetation management 10
3.3 Access 10
3.4 Water supply and utilities 12

4 Conclusion and recommendations 13
4.1 Summary 13
4.2 Conclusion 13
4.3 Recommendations 13

References 14

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1 Introduction

Street or property name:	2183 The Northern Road		
Suburb, town or locality:	Glenmore Park	**Postcode:**	2745
Lot/DP no:	Lot 4 DP 1240361		
Local Government Area:	Penrith City Council		
Type of development:	Residential subdivision		

1.1 Background

CCL Development commissioned Peterson Bushfire to prepare a Bushfire Assessment Report for a proposed residential subdivision located within 'bush fire prone land'. This report presents the assessment and recommendations to ensure compliance with the relevant bushfire protection legislation and policy.

This bushfire assessment has been prepared by a consultant accredited by the Fire Protection Association of Australia's BPAD scheme (Accreditation No. BPD-L3-18882).

1.2 Location and description of proposal

The subject land consists of Stages 7 and 8 of the Highland Views residential development located at Glenmore Park as shown on Figure 1. The subject land can be accessed at multiple locations from earlier stages of the Highland Views development and Mulgoa Rise on the northern boundary of the subject land.

The proposal consists of subdivision of the subject land into low density residential lots, public roads and a continuation of a riparian corridor. The plan of subdivision is included as Figure 2.

1.3 Assessment requirements

The subject land is identified as 'bush fire prone land' as shown on Figure 3. Section 4.46 of the *Environmental Planning and Assessment Act 1979* requires a bushfire assessment of residential subdivision proposals on bush fire prone land following the process and methodology set out within Section 100B of the *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2013* and the NSW Rural Fire Service (RFS) document *Planning for Bush Fire Protection 2019* (referred to as 'PBP' throughout this report).

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Legend

Subject Land

N

DKGIS

Date: 8/04/2021

0 125 250

Metres

Figure 1: The Location of the Subject Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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Version: 1, Version Date: 28/04/2022



Legend

Stage Boundary
Road
Lots
Neighbouring Lots
Subject Land

N

DKGIS

Date: 8/04/2021

0 25 50

Metres

Figure 2: The Proposal

Coordinate System: GDA 1994 MGA Zone 56

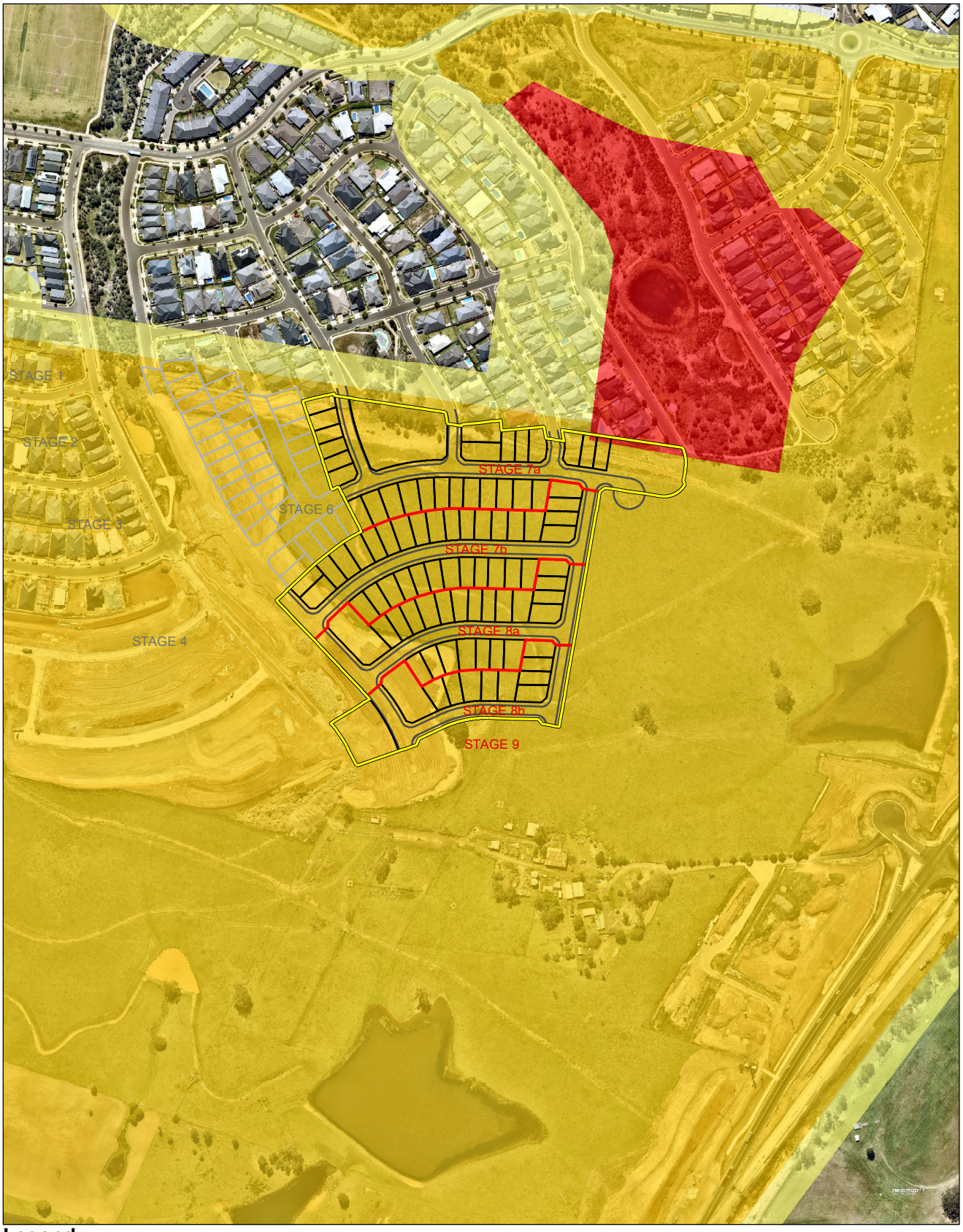
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Legend

- Stage Boundary
- Road
- Lots
- Neighbouring Lots
- Subject Land

Bushfire Prone Land

- Vegetation Buffer
- Vegeation Category 1
- Vegetation Category 2
- Vegetation Category 3

N

DKGIS

Date: 8/04/2021

0 125 250

Metres

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 3: Bushfire Prone Land

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2 Bushfire hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as Asset Protection Zone (APZ) location and dimension. The following sub-sections provide a detailed account of the vegetation communities (bushfire fuels) and the topography (effective slope) that combine to create the bushfire hazard that may affect bushfire behaviour at the site.

2.1 Predominant vegetation

The vegetation within 140 m of the subject land has been assessed in accordance with the methodology specified within PBP. As discussed below and mapped on Figure 4, there are three hazards that will adjoin the subdivision:

Woodland green corridor to the north-east: An existing green corridor approximately 95 m wide exists to the north-east of the subdivision opposite the extension of Greenlink Drive. The corridor has been revegetated with Cumberland Plain Woodland species and therefore classified by PBP as 'woodland' for the determination of Asset Protection Zones (APZ). The corridor will be extended in the east direction towards The Northern Road, away from the proposed subdivision.

Low hazard riparian corridor to the south-west: The existing Highland Views riparian corridor will be extended southwards as part of Stages 7-8. The revegetated corridor will be 40 m wide. Consistent with the existing portion of the corridor, it has been classified 'low hazard' vegetation as it is not wider than 50 m. This hazard classification applies regardless of the planting floristics and structure.

Grassland to the east and south: The paddocks within future stages of Highland Views adjacent to the east and south have the potential to act as a grassland hazard until such time that the grassland is removed with the construction of adjacent subdivisions.

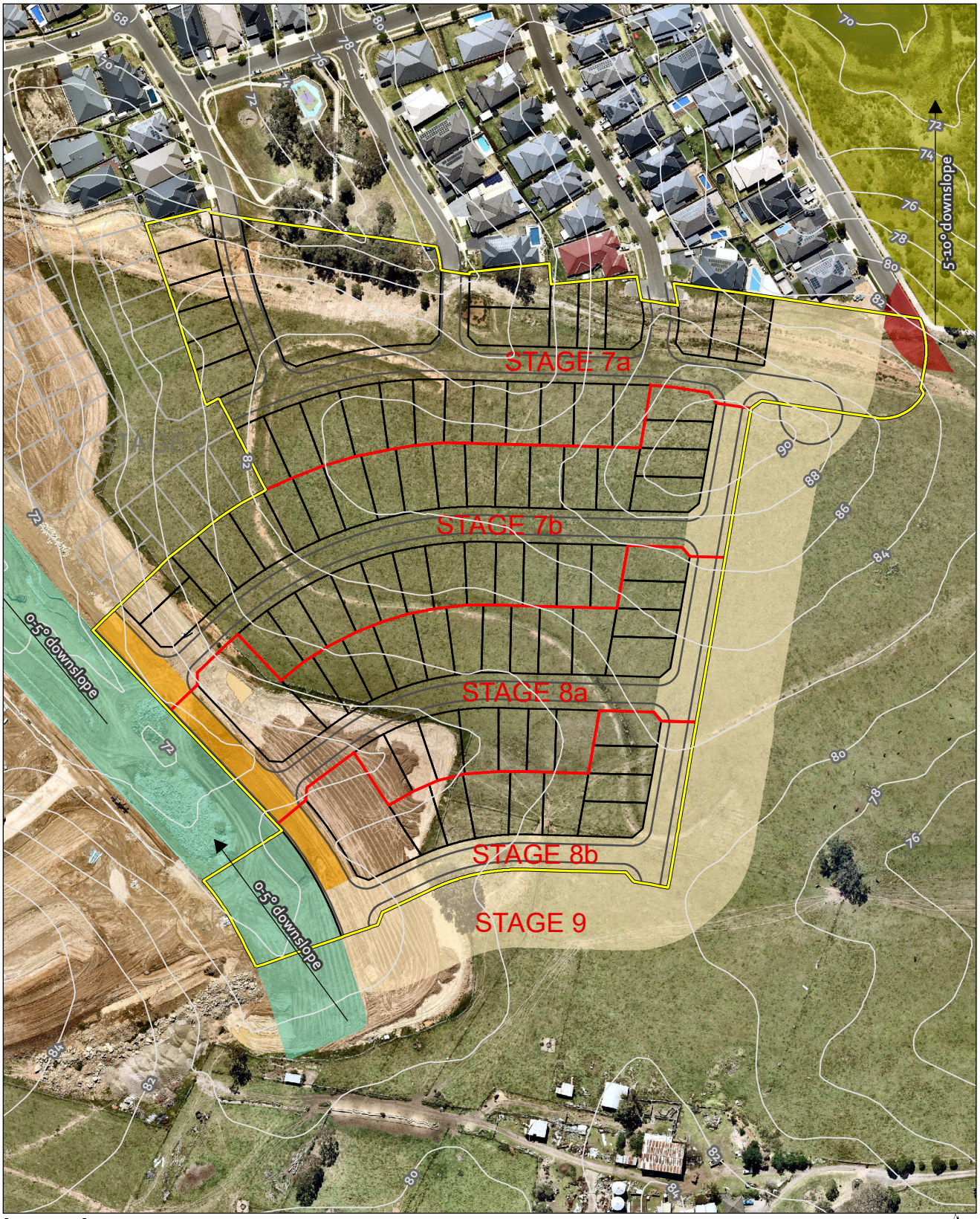
2.2 Effective slope

The 'effective slope' influencing fire behaviour has been assessed in accordance with the methodology specified within PBP. This is conducted by measuring the slope that would most significantly influence fire behaviour where the hazard occurs within 100 m of the subject land boundary. The slope was determined using a 2 m contour layer as shown on Figure 4.

The slope underneath the woodland corridor to the north-east is within the PBP slope class of 'downslope 5-10 degrees', whilst the low hazard corridor and grassland hazards are within the slope class of 'downslope 0-5 degrees'.

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Legend

- Contour - 2m
- Subject Land
- Stage Boundary
- Road
- Lots
- Neighbouring Lots

Vegetation Formation

- Low Hazard - Riparian Corridor
- Woodland

Asset Protection Zone

- Asset Protection Zone - 14m
- Asset Protection Zone - 20m
- Asset Protection Zone - 50m Temporary

N

DKGIS

Date: 8/04/2021

0 25 50

Metres

Figure 4: Bushfire Hazard Analysis and Asset Protection Zone

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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3 Bushfire protection measures

PBP requires the assessment of a suite of bushfire protection measures that in total provide an adequate level of protection for residential subdivision. The measures required to be assessed are listed in Table 1 below and are discussed in detail in the remainder of this section.

Table 1: PBP bushfire protection measures

Measures	Considerations
Asset Protection Zones (APZ)	Location and dimension of APZ building setbacks from vegetation including prescriptions of vegetation management within the APZ.
Access	Assessment to include access and egress, perimeter access and design standards of public roads.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions, and any static water supplies for fire-fighting.

3.1 Asset Protection Zones (APZ)

Using the vegetation and slope information presented in Section 2 and mapped on Figure 4, Asset Protection Zones (APZ) suitable for residential subdivision have been calculated. The APZ determination is listed in Table 2 below and the resulting APZ is mapped on Figure 4.

All required APZs are accommodated within the subdivision layout. A temporary 50 m APZ is proposed to the east and south into adjoining future stages of Highland Views. This APZ can be removed once earthworks commence for future stages. The temporary APZ will ensure unnecessary BAL compliance for future dwellings within Stages 7-8.

Table 2: APZ determination

Location[1]	Vegetation[2]	Slope[3]	Required APZ[4]	APZ provided[5]	How will the APZ be accommodated
North-east	Woodland	Downslope 5-10˚	20 m	>20 m	Greenlink Drive and residue lot
East and south	Grassland	Downslope 0-5˚	12 m	50 m	Road and adjoining future stages as temporary APZ
South-west	Low hazard	Downslope 0-5˚	14 m	>14 m	Perimeter road

[1] Direction of assessment from boundary of subject land. Refer to Figure 4.
[2] Predominant vegetation classification over 140 m from boundary of subject land.
[3] Effective slope assessed over 100 m from boundary of subject land where the bushfire hazard occurs.
[4] APZ required by Table A1.12.2 of Planning for Bush Fire Protection 2019.
[5] APZ provided by existing surrounding management or proposed measures.

Document Set ID: 9967039
Version: 1, Version Date: 28/04/2022

3.2 Vegetation management

Trees or vegetation do not need to be removed to comply with PBP. The construction of the subdivision will ensure the subject land complies with the performance objectives of an Inner Protection Area (IPA) as described by PBP.

Any landscaping proposed across the subdivision is to achieve the principles listed in Appendix 4 of *Planning for Bush Fire Protection 2019*. The public domain landscaping plans by Scott Carver (19th November 2020) have been reviewed and found to comply with the requirements.

The 50 m temporary APZ is to be regularly mown/slashed to ensure a grassland hazard does not eventuate.

3.3 Access

Alternate access and egress

PBP requires an access design that enables safe evacuation whilst facilitating adequate emergency and operational response. All bushfire prone areas should have an alternate access or egress option depending on the bushfire risk, the density of the development, and the chances of the road being cut by fire for a prolonged period.

The subdivision design provides a logical public road layout that will provide multiple access points to the north and east.

The subdivision layout satisfies PBP access objectives in relation to access and egress.

Perimeter access

A perimeter subdivision road has been placed between all identified hazards and proposed lots.

The subdivision layout satisfies PBP access objectives in relation to perimeter access.

Design and construction standards

The public roads are to be designed in accordance with the PBP Acceptable Solutions for the design and construction of roads for residential subdivision as required by PBP Table 5.3b. The requirements are repeated below.

<u>PBP design standards for roads servicing residential subdivision:</u>

- *Property access roads are two-wheel drive, all weather roads.*
- *Perimeter roads are provided for residential subdivisions of three or more allotments.*
- *Subdivisions of three or more allotments have more than one access in an out of the development.*
- *Traffic management devices are constructed to not prohibit access by emergency service vehicles.*

Document Set ID: 9967039
Version: 1, Version Date: 28/04/2021

- *Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.*
- *All roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end.*
- *Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.*
- *Where access/egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.*
- *The capacity of perimeter and non-perimeter road surfaces and any bridges and causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); Bridges/causeways to clearly indicate load rating.*
- *Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.*
- *Hydrants are provided in accordance with AS 2419.1:2005.*
- *There is suitable access for a Category 1 fire appliance to within 4 m of the static water supply where no reticulated supply is available.*
- *Perimeter roads are:*
    - *two-way sealed roads;*
    - *8 m carriageway width kerb to kerb;*
    - *parking is provided outside of the carriageway width;*
    - *hydrants are located clear or parking reserves;*
    - *there are through roads, and these are linked to the internal road system at an internal of no greater than 500 m;*
    - *curves of roads have a minimum inner radius of 6 m;*
    - *the maximum road grade is 15º and average grade is 10º;*
    - *the road crossfall does not exceed 3º;*
    - *a minimum vertical clearance of 4 m to any overhanging obstruction, including tree branches, is provided.*

Document Set ID: 9967039
Version: 1, Version Date: 28/04/2022

- *Non-perimeter roads are:*
    - *Minimum 5.5 m width kerb to kerb;*
    - *parking is provided outside of the carriageway width;*
    - *hydrants are located clear or parking reserves;*
    - *there are through roads, and these are linked to the internal road system at an internal of no greater than 500 m;*
    - *curves of roads have a minimum inner radius of 6 m;*
    - *the road crossfall does not exceed 3º;*
    - *a minimum vertical clearance of 4 m to any overhanging obstruction, including tree branches, is provided.*

3.4 Water supply and utilities

Water supply

The development will require fire hydrants to be installed to comply with *AS 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (AS 2419) so that all sides of a building envelope are within 70 m of a hydrant by lay of the hose (or 90 m with a tanker parked in-line maximum 20 m from the hydrant).

Electricity supply

The electricity supply will be provided underground and will therefore comply with PBP.

Gas supply

Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2014 The storage and handling of LP gas*.

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Version: 1, Version Date: 28/04/2022

4 Conclusion and recommendations

4.1 Summary

The proposal consists of the next stage of the Highland Views residential development in Glenmore Park. The bushfire hazard consists of a woodland green corridor within Mulgoa Rise to the north-east, a continuation of the low hazard riparian corridor throughout Highland Views and the potential for grassland hazard within adjoining future stages. The required APZs are accommodated within the subdivision layout.

4.2 Conclusion

This report presents an assessment of a residential subdivision at Stages 7-8 Highland Views, Glenmore Park. The assessment demonstrates that the proposal, together with the recommendations (see below), complies with s100B *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2013* and *Planning for Bush Fire Protection 2019* (refer to Section 3 – Bushfire Protection Measures).

4.3 Recommendations

The recommendations made within this assessment are repeated below:

1. A 50 m temporary APZ is to be managed to the east and south from the proposed lots into adjoining future stages of Highland Views. The APZ is to be regularly slashed/mown to ensure a grassland hazard does not eventuate until such time that the adjoining lands are developed within the affected 50 m area.

2. Any landscaping proposed across the subdivision is to achieve the principles listed in Appendix 4 of *Planning for Bush Fire Protection 2019*.

3. The public roads are to be designed in accordance with the PBP Acceptable Solutions for the design and construction of roads for residential subdivision as required by PBP Table 5.3b. The requirements are repeated below.

4. The subdivision will require fire hydrants to be installed to comply with AS 2419.1 – *2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (AS 2419).

5. Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2014 The storage and handling of LP gas*.



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Document Set ID: 9967039
Version: 1, Version Date: 28/04/2022

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Standards Australia. 2005. *Fire hydrant installations - System design, installation and commissioning,* AS2419.1, Fourth edition 2005, Standards Australia International Ltd, Sydney.

Standards Australia. 2014. *The storage and handling of LP Gas*, AS/NZS 1596-2014, Standards Australia International Ltd, Sydney.

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20 December 2021

CCL Development
Suite 2, 580 High Street
Penrith NSW 2750
Attn: Rachell Hewitt

Dear Rachell,

RE: Response to RFI - Highland Views Stage 7-8 (DA 20/0782)

Peterson Bushfire was commissioned to undertake reviews of the documentation listed below to ensure the vegetation management and landscaping strategies proposed within each are consistent with the Bushfire Assessment Report prepared by Peterson Bushfire (8th April 2021) and the requirements of 'Planning for Bush Fire Protection 2019'.

- BDAR Rev D December 2021
- VMP Rev G December 2021
- Landscape Plans December 2021

The strategies proposed in all three documents are consistent with the findings and recommendations of the Bushfire Assessment Report.

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Specifically:

- The vegetation retention and enhancement in the riparian corridor, Green Corridor and Pinnacle Park have been accounted for in the Bushfire Assessment Report. APZs have been prescribed to the riparian corridor and the Green Corridor, whilst an APZ is not required to the Pinnacle Park as the woodland area constitutes 'low threat vegetation – exclusion' as per Clause A1.10 of 'Planning for Bush Fire Protection 2019'.

- The public domain landscaping on Road 113 is permissible under the IPA standards as the landscaping is well removed from the hazard interface areas of the Green Corridor and riparian corridor, and the landscaping is small in size and confined to compartmentalised sections along the road frontage.

The strategies proposed within each of the above documents are consistent with the Bushfire Assessment Report prepared by Peterson Bushfire (8th April 2021). Amendments are not required to the report.

Yours sincerely,

David Peterson

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Highland Views

Vegetation Management Plan

Client	: CCL Development
Prepared by	: Australian Wetlands Consulting Pty Ltd
Project #	: 3-17857
Date	: December 2021

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Highland Views

Vegetation Management Plan

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Project control

Project name: Highland Views
VMP

Project #: 3-17857
Client: CCL Development
Contact: Rachell Hewitt

Prepared by: Australian Wetlands Consulting Pty Ltd

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Date:	Revision:	Prepared by:	Reviewed by:	Distributed to:
23.02.2021	A	Claire Hewitt	Jacqui Coughlan	CCL Development
08.04.2021	B	Claire Hewitt	Jacqui Coughlan	CCL Development
19.04.2021	C	Claire Hewitt	Jacqui Coughlan	CCL Development
20.04.2021	D	Claire Hewitt	Jacqui Coughlan	CCL Development
27.08.2021	E	Ian Colvin/Sam Steenholdt	Ian Colvin	CCL Development
27.10.2021	F	Ian Colvin/Sam Steenholdt	Ian Colvin	CCL Development
14.12.2021	G	Ian Colvin/Sam Steenholdt	Ian Colvin	CCL Development

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Table of Contents

Project control i

Table of Contents ii

1 Introduction and Background 1

1.1 The site and proposal 1
1.2 Glenmore Park Stage 2 Development Control Plan 2014 4
1.3 Scope and Objectives of VMP 6

2 Vegetation 10

2.1 Surveyors Creek West 10
2.1.1 Current vegetation 10
2.1.2 Threatened species and Communities 10
2.1.3 Vegetation Condition and Weeds 11
2.2 Green Corridor 11
2.2.1 Current vegetation 11
2.2.2 Threatened species 12
2.2.3 Threatened communities 12
2.2.4 Vegetation condition 12
2.2.5 Weeds 12
2.3 Pinnacle Park 12
2.3.1 Current vegetation 12
2.3.2 Threatened species 13
2.3.3 Threatened communities 13
2.3.4 Vegetation condition 13
2.3.5 Weeds 13
2.4 Basin E 13
2.4.1 Current vegetation 13
2.4.2 Threatened species and communities 14
2.4.3 Vegetation condition 14
2.4.4 Weeds 14

3 Rehabilitation Strategy 15

3.1 Surveyors Creek West 15
3.1.1 Introduction 15
3.1.2 Description - Downstream riparian corridor planting 16
3.1.3 Restoration methods – Downstream riparian corridor planting 16
3.1.4 Timing - Downstream riparian corridor planting 16
3.1.5 Description - Upstream riparian corridor planting 16
3.1.6 Restoration methods - Upstream riparian corridor planting (terrestrial rehabilitation zone, shoulder planting, feature trees and swale area) 17
3.1.7 Restoration methods – Native meadow area 17
3.1.8 Timing - Upstream riparian corridor planting 18
3.1.9 Description - Downstream raingarden planting 18

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

3.1.10 Restoration Methods – Downstream raingarden planting 18
3.1.11 Timing - Downstream raingarden planting 19
3.1.12 Description - Upstream raingarden planting 19
3.1.13 Restoration Methods – Upstream raingarden planting 19
3.1.14 Timing - Upstream raingarden planting 20
3.2 Green Corridor 20
3.2.1 Introduction 20
3.2.2 Description 21
3.2.3 Restoration Methods 21
3.2.4 Timing 21
3.3 Pinnacle Park 22
3.3.1 Introduction 22
3.3.2 Description 22
3.3.3 Restoration Methods 22
3.3.4 Timing 23
3.4 Basin E 23
3.5 Maintenance 23

4 Performance Criteria and Monitoring 29

4.1 Performance criteria 29
4.2 Monitoring requirements 30
4.3 Reporting requirements 30

5 Cost Estimates 31

6 References 32

Appendix A – Site Photographs 33

Appendix B – Flora Inventory (Ecological Australia, 2017 and AWC (2021) 35

Appendix C –BioNet Threatened Species List 38

Appendix D – Surveyors Creek West Planting Plans 40

Appendix E - Green Corridor Planting Plans 41

Appendix F – Basin E Planting Plans 42

Appendix G – Costings 43

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

List of Figures

Figure 1-1 Site Plan 3

Figure 1-2 Riparian corridor width plan (Figure E7.17 in the Glenmore Park Stage 2 DCP)..... 5

Figure 1-3 Riparian corridor profile plan (Figure E7.18 in the Glenmore Park Stage 2 DCP)..... 5

Figure 1-4 Riparian Corridor Profile Section (Figure E7.19 in Glenmore Park Stage 2 DCP) 6

Figure 1-5 Annexure D to the Planning Agreement - the Biodiversity Corridor Planting Works..... 7

List of Tables

Table 3-1 Summary of timing of works within the Green Corridor (VMP actions are shaded grey).. 22

Table 3-2 Maintenance requirements for Surveyors Creek West, the Green Corridor (except native meadow area) and Basin E 24

Table 3-3 Maintenance requirements for native meadow area at Surveyors Creek West 25

Table 3-4 Maintenance requirements for Pinnacle Park 27

Table 4-1 Rehabilitation objectives and performance criteria within the biodiversity corridor 29

Table 5-1 VMP Cost estimates..... 31

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

1 Introduction and Background

Australian Wetlands Consulting (AWC) has been engaged by CCL Development to complete the Vegetation Management Plan (VMP) for Highland Views ('the site') within the southern release area of Glenmore Park residential subdivision (known as Glenmore Park Stage 2 Release Area). The VMP is required under Annexure D of the *Glenmore Park Stage 2 Planning Agreement* (PA) between Penrith City Council and various property owners for the Glenmore Park subdivision. The VMP must also meet the specifications in the *Penrith Development Control Plan* (DCP) *2014 - Glenmore Park Stage 2*.

The aim of the VMP is to prescribe strategic actions for the restoration of vegetation within a section of the western tributary of the Surveyors Creek riparian corridor running through the centre of the site, and the green corridor to the north west of the site to comply with relevant requirements of Penrith DCP. The VMP also prescribes actions as part of rectification works to a stormwater detention basin ('Basin E') to the north of the site. In addition, this VMP provides guidance on the retention and enhancement of native vegetation to become part of Pinnacle Park in the north of the site. The applicant intends on lodging a separate DA for the Pinnacle Park landscaping and embellishments. A separate VMP will be prepared to support this DA.

The VMP shall be the primary document to guide restoration of the site and be used as the basis for the completion of any environmental works by contractors. The VMP has been prepared with reference to the *Guidelines for vegetation management plans on waterfront land* prepared by the NSW Office of Water (2012); however, the works are not triggered by the *Water Management Act 2000* nor is a *Controlled Activity Approval* required.

1.1 The site and proposal

Highland Views is located approximately 49 kilometres (km) west of the Sydney Central Business District, to the west of the Northern Road and south of Bradley Street, Glenmore Park, within the Penrith City Local Government Area (LGA).

Highland Views comprises multiple approved lots to the west of the western tributary of Surveyors Creek and future undeveloped stages (7-8) for which a development application will be submitted to Penrith City Council (refer to Figure 1-1).

Approved and future subdivision will result in:

- Numerous additional residential lots,
- establishment of a local road network,
- installation of urban sewage, stormwater drainage and water quality infrastructure,
- establishment of a riparian corridor of approximately 1.5 hectares (ha) along the western tributary of Surveyors Creek to protect and restore the riparian vegetation community, and
- enhancement and expansion of Pinnacle Park (Note: DA yet to be submitted).

In addition, a green corridor of approximately 2 ha will be restored to the east of the site to protect and enhance existing native vegetation.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

This VMP covers four areas within and adjacent to the site (refer Figure 1-1):

- Lots 443 & 444 DP1268480 Gunyah Drive (to become lots 637 & 638 DP1266411 as part of the stage 6 subdivision) and (part) Lot 601 DP1261921 The Northern Road (Surveyors Creek West),
- (part) Lot 601 DP1261921 The Northern Road (Green Corridor),
- (part) Lot 601 DP1261921 The Northern Road and Lot 1 DP1226168 Middlebrook Rise (Pinnacle Park), and
- Basin E, an existing stormwater basin within Lot 2000 DP1204777, approximately 300 m north of the site.

Surveyors Creek West is an ephemeral 1st order watercourse running from south east to north where it joins the eastern tributary of Surveyors Creek. On the site, the riparian corridor is approximately 1.5 hectares. The southern portion contains no remnant trees and is predominantly exotic groundcovers. The northern portion of the site contains scattered trees, a sparse mid storey and a mixture of exotic and native grasses and forbs and is highly disturbed. In the north of the area, a dam has been constructed adjacent to Surveyors Creek West.

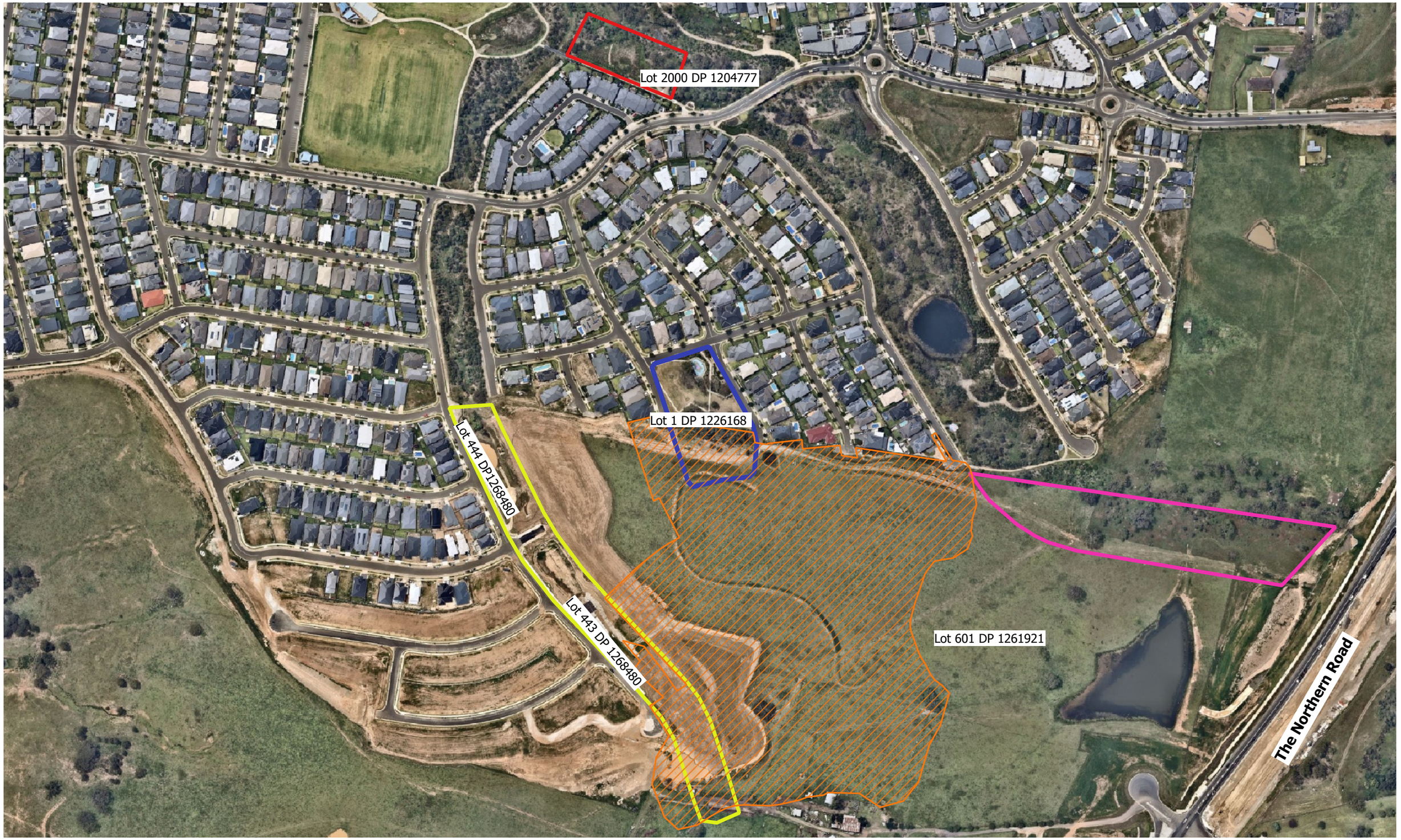
Note: A comprehensive *Flora and Fauna Assessment* of the site was completed by EcoLogical Australia in 2015 to inform the (now approved) development and a *Vegetation Management Plan* was completed by EcoLogical Australia in 2017 for a small section of the western tributary of Surveyors Creek.

The Green Corridor is situated to the east of the site. It contains remnant native vegetation, including scattered trees, shrubs, native grasses and forbs. The southern portion of the area has been cleared for agriculture and has been subject to heavy grazing by cattle. The Green Corridor links to 34 Bradley Street, Glenmore Park to the north west which has been landscaped and revegetated with native vegetation and was subject to the Vegetation Management Plan prepared by Australian Wetlands Consulting in January 2015.

Pinnacle Park is situated on the northern boundary of the site, between Surveyors Creek and the Green Corridor. The northern section of the park is already established and contains a children's recreation area, scattered and clumped native trees and shrubs, mown grass and planted trees and shrubs. The (undeveloped) southern section of the park contains a small patch of Cumberland Plain Woodland. Park establishment is planned to coincide with infrastructure and housing development to the south (Stages 7 to 9 of the Glenmore Park Stage 2 development).

Modification of the constructed sediment basin (Basin E) located in Lot 2000 DP1204777 is required in order to increase capacity required for Stages 7-8 of Highland Views. Works in Basin E require an adjustment to the bund wall (raising it by 400mm). All planted vegetation on the bund wall (planted with a variety of native species) requires removal for the works. An application for the removal of this vegetation has been included in a Biodiversity Development Assessment Report (BDAR) prepared by AWC (2021). Following the works the bund will be replanted with similar native species to that which presently occur. Details of revegetation works including species and planting locations are provided in the Planting Plan prepared by AWC (2021).

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022



AWC	**Source:**	Imagery: Nearmaps 2021 Management Zones: AWC	0 50 100 150 200 m A4 Scale 1:3,600 Coordinate System: MGA 56 Projection: Transverse Mercator	**Legend** Management Zones Basin E Pinnacle Park Surveyors Creek West Green Corridor Highland Views Stages 7-8	**Figure: 1-1** **Site Plan**
	Disclaimer:	Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown herein prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated.			Job No:3-17857 Drawn: ED Checked:IC/ SS Date:14-12-21

Document Set ID: 9864750
Version: 1, Version Date: 27/02/2022

1.2 Glenmore Park Stage 2 Development Control Plan 2014

The Penrith DCP provides specific objectives for Stage 2 of the overall Glenmore Park development, identifying the following management objectives for the biodiversity corridor:

- *To conserve biodiversity by providing linkages between significant natural vegetation units within the City.*
- *To ensure that important natural features inform the urban structure of the place.*
- *To provide high amenity areas for residents.*
- *To protect, restore and enhance the environmental values and functions of watercourses and riparian corridors along Surveyors Creek and the western tributary of Surveyors Creek.*

Objectives relating to the biodiversity corridors may be achieved where:

- *The natural drainage lines of Surveyors Creek and its western tributary are conserved as healthy and naturally functioning riparian corridors.*
- *Existing healthy remnant vegetation is retained within those corridors.*
- *Significant revegetation of the riparian corridors occurs as part of development.*
- *The corridors and other topographical features are represented as special places within the urban form.*
- *The design of the bridging structures over the corridor ensure the following:*
  - *use of open piered bridge structures.*
  - *1% AEP flood conveyance.*
  - *flora and fauna connectivity.*
  - *scour protection.*
  - *light penetration beneath structure.*
- *A Corridor Management Plan that identifies how the corridor will be established is prepared, developed and implemented on site as part of its development.*

Specific development controls for the biodiversity corridor are as follows:

- *A minimum corridor width of 100m is provided along the Surveyors Creek Corridor with an 80m Core Riparian Zone as represented in* Figure 1-2*.*
- *A minimum corridor width of 40m with 20m Core Riparian Zone is provided along the western tributary of Surveyors Creek as represented in* Figure 1-2*.*
- *The profile of the riparian corridors is consistent with that represented at* Figure 1-3 and Figure 1-4.
- *Riparian corridors are to be fully vegetated and provided in accordance in* Figure 1-2, 1-3 and 1-4.
- *A Vegetation Management Plan must be prepared for the rehabilitation of the riparian corridors in Glenmore Park Stage 2 in accordance with Department of Water and Energy guidelines.*
- *All remnant vegetation within the riparian corridors must be protected and rehabilitated.*
- *All riparian corridors are to be vegetated with appropriate local native vegetation (i.e. fully structured trees, shrubs and groundcovers) at a density that would occur naturally.*
- *An open and low perimeter fence or low bollard type barrier is to be provided along the entire perimeter of the riparian corridors to prevent inadvertent damage to riparian corridors.*

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

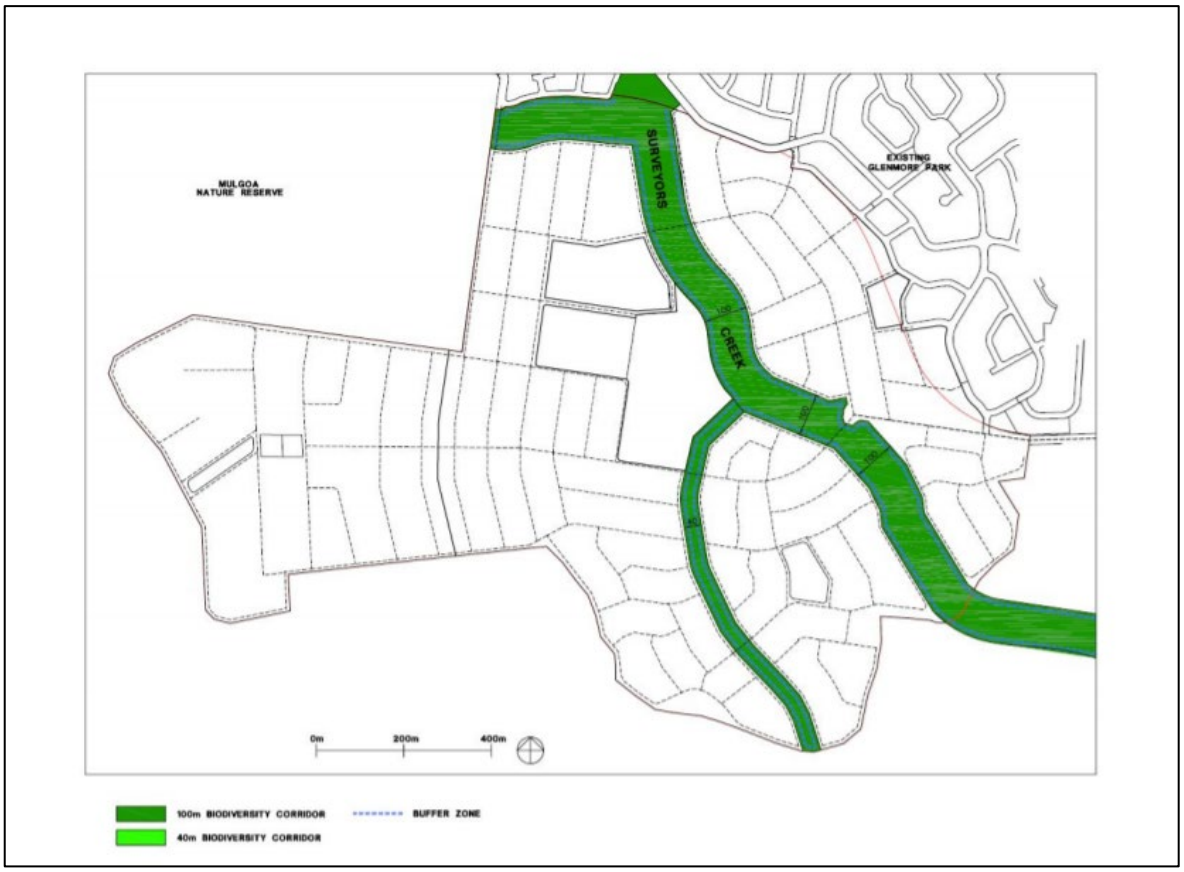


Figure 1-2 Riparian corridor width plan (Figure E7.17 in the Glenmore Park Stage 2 DCP)

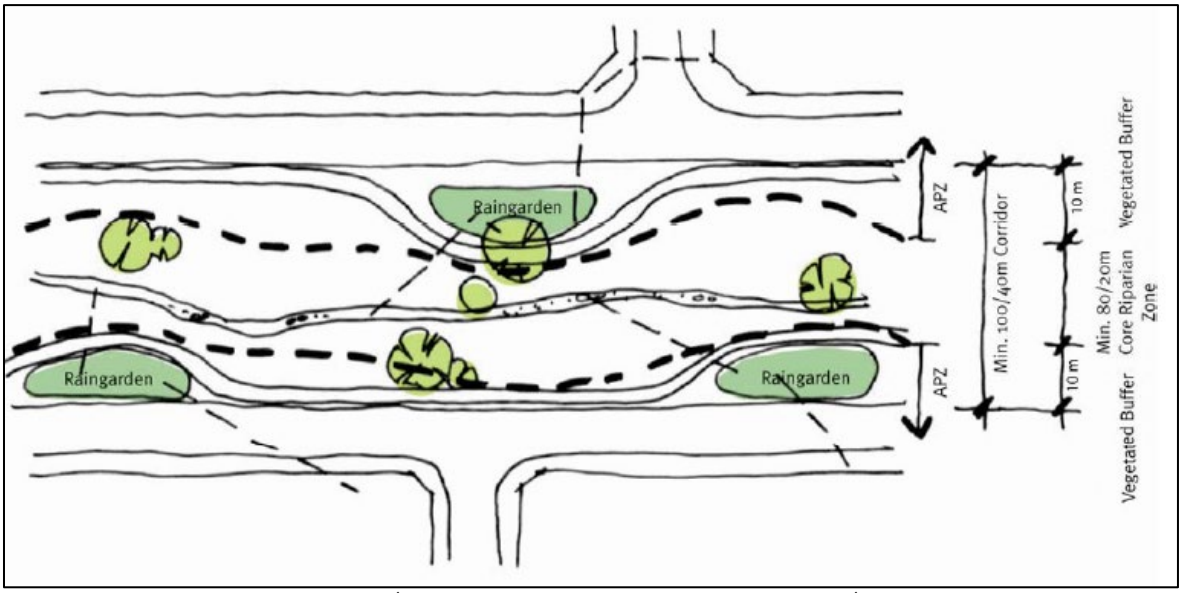


Figure 1-3 Riparian corridor profile plan (Figure E7.18 in the Glenmore Park Stage 2 DCP)

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

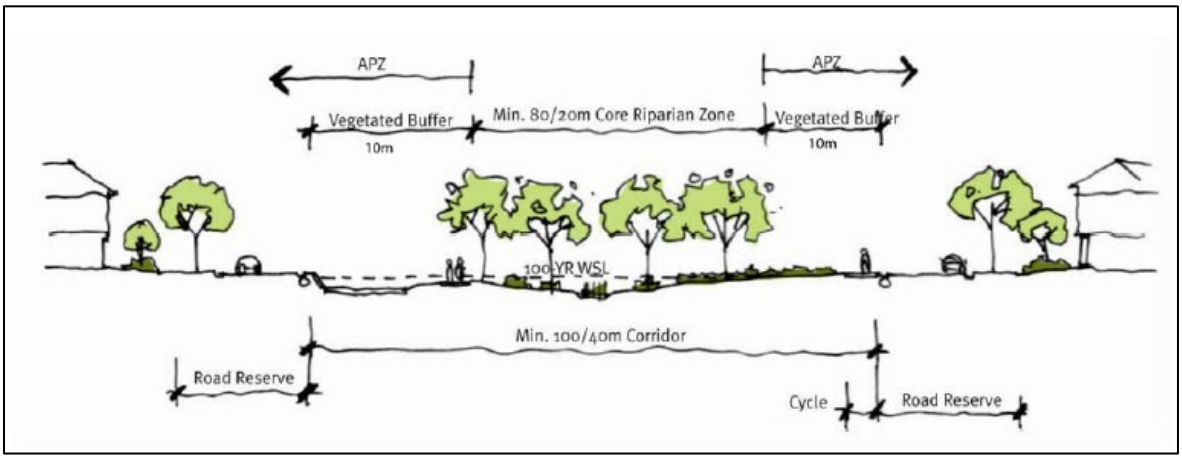


Figure 1-4 Riparian Corridor Profile Section (Figure E7.19 in Glenmore Park Stage 2 DCP)

Annexure D to the Glenmore Park Stage 2 Planning Agreement (PA) between Penrith City Council and the developers outlines the proposed biodiversity corridor planting works as depicted in Figure 1-5.

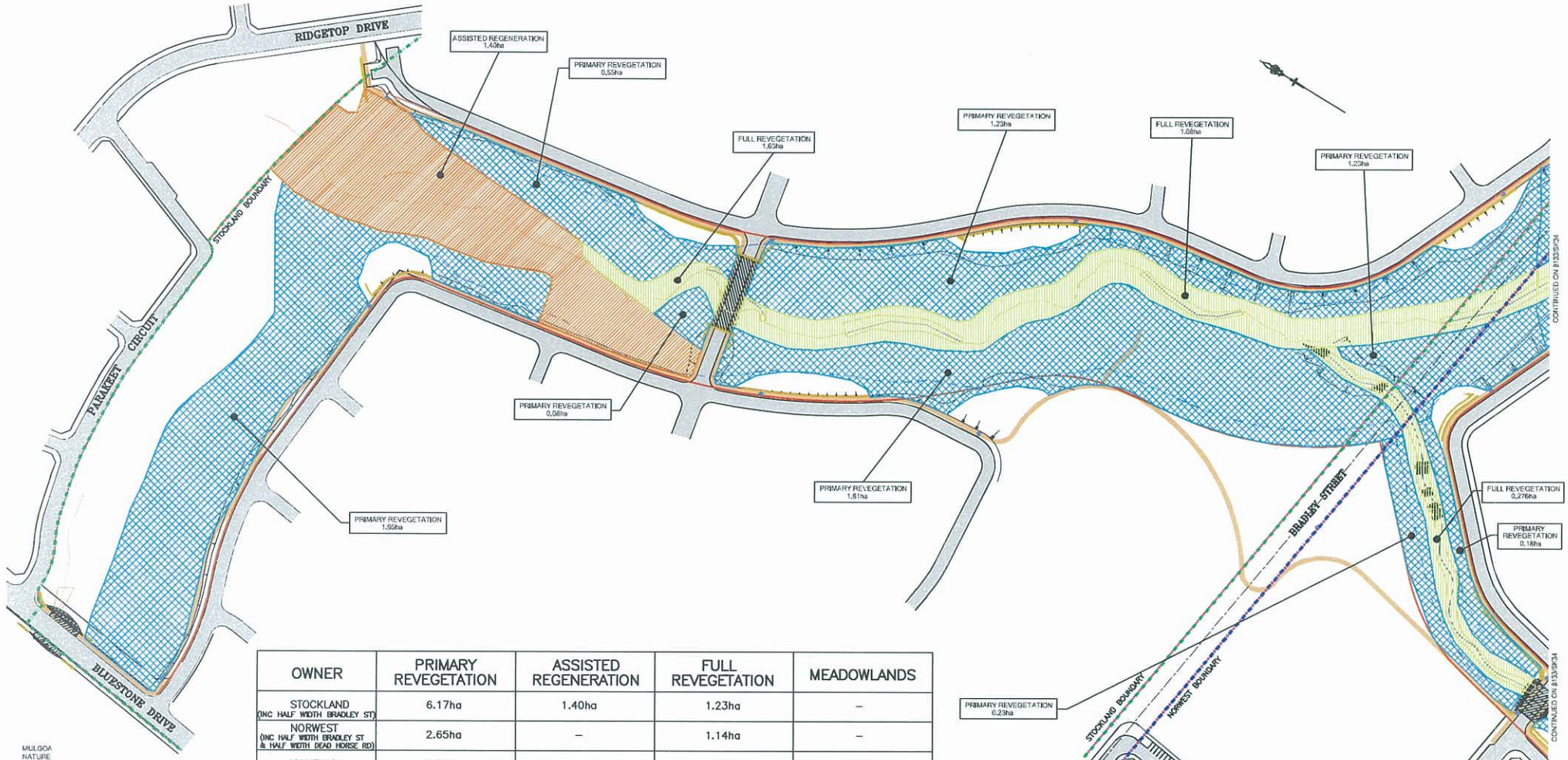
1.3 Scope and Objectives of VMP

This VMP will guide the bushland and riparian restoration of the specified section of Surveyors Creek West and the Green Corridor. It will also specify actions to protect the native vegetation in Pinnacle Park. The objectives of this VMP are to provide a guide to bush regeneration contractors or Penrith City Council employees to:

- Protect and regenerate remnant vegetation within Surveyors Creek West, the Green Corridor and Pinnacle Park.
- Control noxious and environmental weeds on within Surveyors Creek West, the Green Corridor and Pinnacle Park.
- Revegetate Surveyors Creek West, the Green Corridor and Basin E as prescribed below with appropriate, local provenance species
- Protect flora and fauna habitat in Surveyors Creek West, the Green Corridor and Pinnacle Park.

The maintenance period will run for a minimum of five years or until the objectives and performance criteria outlined in this VMP are met.

Document Set ID: 9861750
Version: 1, Version Date: 17/02/2022



OWNER	PRIMARY REVEGETATION	ASSISTED REGENERATION	FULL REVEGETATION	MEADOWLANDS
STOCKLAND (INC HALF WIDTH BRADLEY ST)	6.17ha	1.40ha	1.23ha	–
NORWEST (INC HALF WIDTH BRADLEY ST & HALF WIDTH DEAD HORSE RD)	2.65ha	–	1.14ha	–
VIANELLO (INC HALF WIDTH DEAD HORSE RD)	3.50ha	–	0.25ha	0.93ha
MINT HOLDINGS (INC HALF WIDTH DEAD HORSE RD)	2.23ha	–	0.18ha	–
DEAD HORSE ROAD	0.53ha	–	–	–
TOTAL	15.08ha	1.40ha	2.80ha	0.93ha

PRIMARY REVEGETATION
ESTABLISHMENT OF A SHRUB AND CANOPY LAYER IN AREAS OF EXISTING CLEARED PASTURE. PLANTING OF TUBE STOCK OF 1 PLANT PER 2m2

FULL REVEGETATION
FULLY STRUCTURED REVEGETATION WITH PLANTING OF TUBE STOCK AT A DENSITY OF 5 PLANTS PER m2 WITH JUTE MESH OR MATT.

MEADOWLANDS
PASSIVE RECREATION AREA - OPEN PARK WITH TREES IN GROUPS AND UNDERSTORY OF SELECTED GROUND COVERS, TURF OR GRASS SEEDING IN OPEN AREAS.

ASSISTED REGENERATION
AREAS OF EXISTING NATURAL VEGETATION TO BE REHABILITATED WITH BUSHLAND REVEGETATION METHODS AND SUPPLEMENTARY PLANTING OF 1 TUBE STOCK PER m2

SURFACED CYCLEWAY / FOOTPATH
2.5m WIDE - INDICATIVE LOCATION ONLY

CORRIDOR BOUNDARY

CORE RIPARIAN ZONE

ROCK WALLS

STOCKLAND BOUNDARY
NORWEST BOUNDARY
VIANELLO BOUNDARY
MINT HOLDING BOUNDARY

1:1250 @ A1
25 0 25 50 75 100 125
METRES

ADVANCE COPY ONLY
NOT FOR CONSTRUCTION

APPROVED: S.ANDERSON / P.MEHL DATE:
CHECKED: K.NAKKAN DATE:

J. WYNDHAM PRINCE PTY LTD
CIVIL ENGINEERS & PROJECT MANAGERS

NORWEST LAND

Stockland

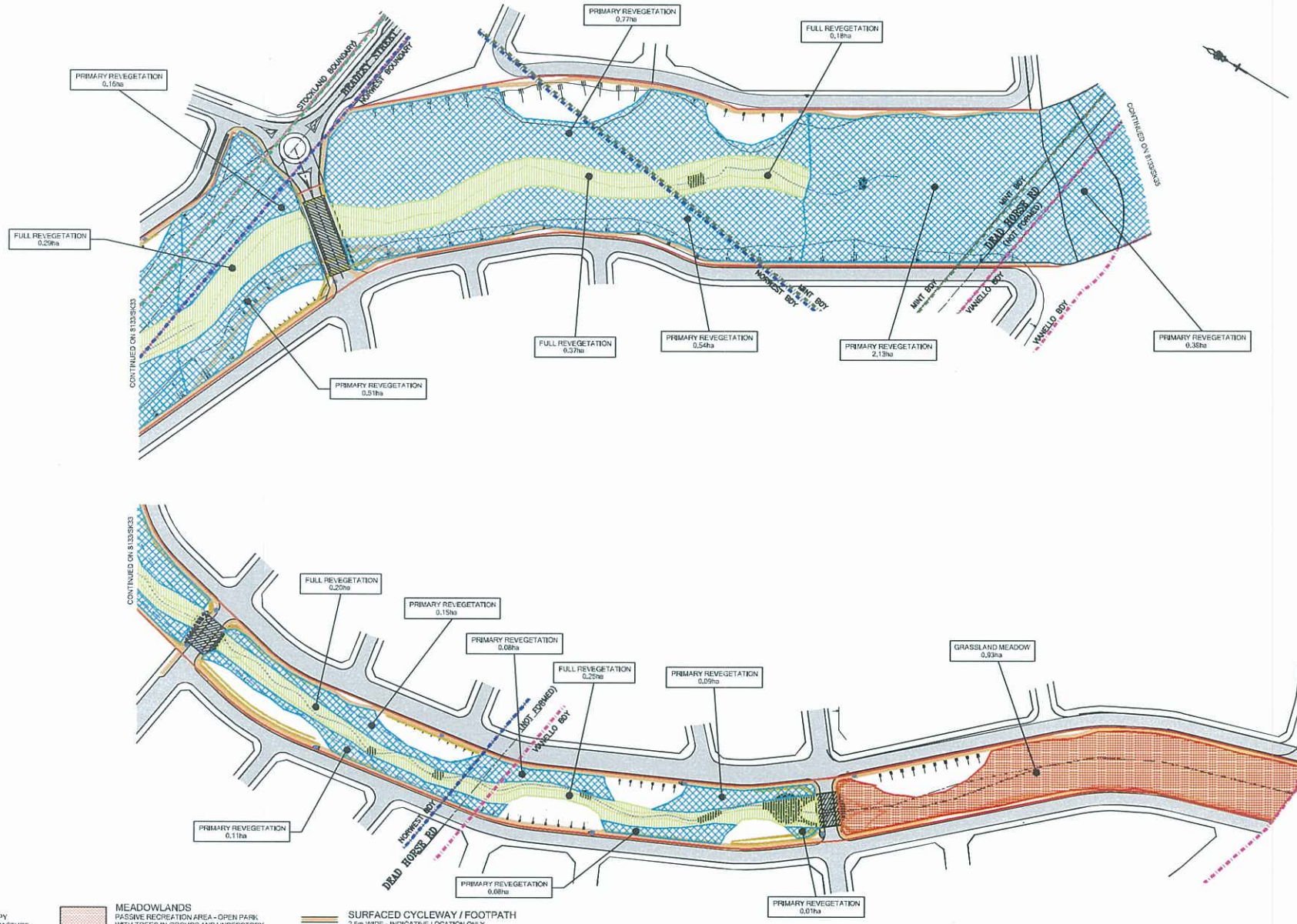
VIANELLO MINT HOLDINGS

Glenmore Park 8133 SK33B

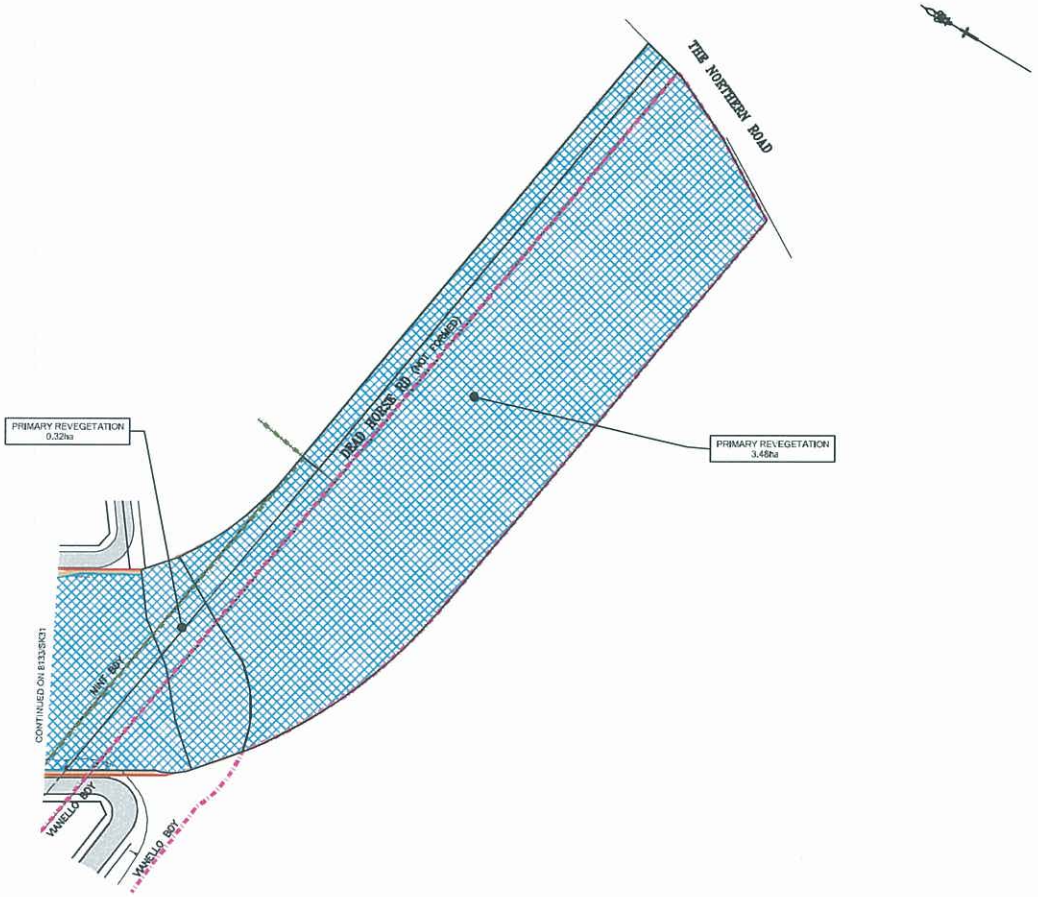
PROPOSED REVEGETATION STRATEGY September 08

Document Set ID: 9961750
Version: 1, Version Date: 27/02/2022

FIGURE 1-5 ANNEXURE D



Document Set ID: 9961750
Version: 1, Version Date: 27/02/2022



PRIMARY REVEGETATION
ESTABLISHMENT OF A SHRUB AND CANOPY LAYER IN AREAS OF EXISTING CLEARED PASTURE. PLANTING OF TUBE STOCK OF 1 PLANT PER 2m2

FULL REVEGETATION
FULLY STRUCTURED REVEGETATION WITH PLANTING OF TUBE STOCK AT A DENSITY OF 5 PLANTS PER m2 WITH JUTE MESH OR MATT.

MEADOWLANDS
PASSIVE RECREATION AREA - OPEN PARK WITH TREES IN GROUPS AND UNDERSTORY OF SELECTED GROUND COVERS. TURF OR GRASS SEEDING IN OPEN AREAS.

ASSISTED REGENERATION
AREAS OF EXISTING NATURAL VEGETATION TO BE REHABILITATED WITH BUSHLAND REVEGETATION METHODS AND SUPPLEMENTARY PLANTING OF 1 TUBE STOCK PER m2

SURFACED CYCLEWAY / FOOTPATH
2.5m WIDE - INDICATIVE LOCATION ONLY

CORRIDOR BOUNDARY

CORE RIPARIAN ZONE

ROCK WALLS

STOCKLAND BOUNDARY
NORWEST BOUNDARY
VIANELLO BOUNDARY
MINT HOLDING BOUNDARY

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25 0 25 50 75 100 125
METRES

ADVANCE COPY ONLY
NOT FOR CONSTRUCTION

APPROVED: S.ANDERSON / P.MEHL DATE:
CHECKED: K.NAKKAN DATE:

J. WYNDHAM PRINCE PTY LTD
CIVIL ENGINEERS & PROJECT MANAGERS

NORWEST LAND

Stockland

VIANELLO MINT HOLDINGS

Glenmore Park

8133 SK35B

PROPOSED REVEGETATION STRATEGY September 08

Document Set ID: 9961750
Version: 1, Version Date: 27/02/2022

2 Vegetation

2.1 Surveyors Creek West

2.1.1 Current vegetation

Ecological Australia (2017) described vegetation at Surveyors Creek West as comprising:

1. Cumberland Shale Plains Woodland,
2. Weeds and exotic vegetation, and
3. Cleared land.

As noted, the vegetation in the south of Surveyors Creek West is predominantly exotic groundcovers and contains no remnant trees. Scattered trees and some native and exotic groundcover species remain in the northern section. A dam is situated adjacent to the creek in the northern section of Surveyors Creek West.

Vegetation in the northern portion of Surveyors Creek West comprises a disturbed Cumberland Shale Plains Woodland community dominated by Forest Red Gum (*E. tereticornis*) and Narrow-leaved Ironbark (*E. crebra*) with infrequent Grey Box (*Eucalyptus moluccana*). The sparse mid-storey is almost exclusively dominated by Blackthorn (*Bursaria spinosa*). The ground layer is varied and comprises a mixture of native grasses, sedges and forbs, such as Kangaroo Grass (*Themeda triandra*), Red Grass (*Bothriochloa macra*), Longhair Plumegrass (*Dichelachne crinita*), Tall Sedge (*Carex appressa*) and Whiteroot *(Lobelia purpurascens*). Exotic grasses, rushes and broadleaf weeds are also scattered throughout the woodland area, such as Paspalum *(Paspalum dilatatum*), Sharp Rush (*Juncus acutus*), Plantain (*Plantago lanceolata*) and Spear Thistle (C*irsium vulgare*).

The area of weeds and exotic vegetation in the centre of Surveyors Creek West is dominated by Sharp Rush (*Juncus acutus*), Kikuyu Grass (*Cenchrus clandestinus*), African Lovegrass (*Eragrostis curvula*), Fireweed (*Senecio madagascariensis*) and Spear Thistle (*Cirsium vulgare*).

The cleared areas are either completely clear of vegetation and are subject to development work or contain a mixture of native and exotic species that are highly disturbed. Native species include Kangaroo Grass (*Themeda triandra*), Red Grass (*Bothriochloa macra*), and Whiteroot *(Lobelia purpurascens*). Exotic species include Paspalum (*Paspalum dilatatum*), Madeira Winter (*Solanum pseudocapsicum*), African Lovegrass (*Eragrostis curvula*) and Spear Thistle (*Cirsium vulgare*).

Photographs of vegetation at Surveyors Creek West are shown at Appendix A. The flora inventory prepared by Ecological Australia (2017) is attached at Appendix B.

2.1.2 Threatened species and Communities

No threatened flora species have been recorded at Surveyors Creek West. Nine threatened flora species listed under either the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified by BioNet as occurring within a 10 km radius of Surveyors Creek West. The list of threatened flora and fauna species recorded in BioNet is at Appendix C.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

The BC Act listed Critically Endangered Ecological Community (CEEC) *Cumberland Plain Woodland in the Sydney Basin Bioregion* occurs on site. This community is also listed as Critically Endangered under the EPBC Act.

2.1.3 Vegetation Condition and Weeds

Vegetation has been highly disturbed by former clearing for grazing, track creation and weed invasion and more recently for development works. There is no recruitment of canopy species.

The site has been significantly disturbed and therefore weeds are scattered throughout the area. Woody weeds include scattered shrubs of Madeira Winter (*Solanum pseudocapsicum*) and African Boxthorn (*Lycium ferosissimum*); grassland areas contain a number of introduced grasses and herbs, with the most common being African Lovegrass (*Eragrostis curvula*), Rhodes Grass (*Chloris gayana*), Kikuyu Grass (*Cenchrus clandestinus*), Paspalum (*Paspalum dilatatum),* Fireweed (*Senecio madagascariensis*), Fleabane species (*Conyza* spp.), Spear Thistle (*Cirsium vulgare*) and Plantain (*Plantago lanceolata*). The introduced sedge Sharp Rush (*Juncus acutus*) occurs as scattered tussocks around the northern portion of Surveyors Creek West.

2.2 Green Corridor

2.2.1 Current vegetation

The vegetation in the Green Corridor section comprises:

1. Cumberland Shale Plains Woodland, and
2. Cleared land.

As noted, the Green Corridor contains remnant native vegetation, including scattered trees, shrubs, native grasses and forbs. The southern portion of the area has been cleared for agriculture and has been subject to heavy grazing by cattle and track formation.

Vegetation in the northern portion of the Green Corridor comprises the Cumberland Shale Plains Woodland community dominated by Narrow-leaved Ironbark (*E. crebra*), Forest Red Gum (*E. tereticornis*) with scattered Rough-barked Apple (*Angophora floribunda*) and Grey Box (*Eucalyptus moluccana*). The mid-storey is a mixture of regenerating Narrow-leaved Ironbark and Forest Red Gum plus Blackthorn (*Bursaria spinosa*). The ground layer is varied and is dominated by Kangaroo Grass (*Themeda australis)* in patches but other patches are dominated by exotic grasses, such as Rhodes Grass (*Chloris gayana*), Setaria (*Setaria parviflora)* and Paspalum (*Paspalum dilatatum)*. Other native groundcovers include Common Fringe-sedge (*Fimbristylis dichotoma*), Yellow Autumn-lily (*Tricoryne elation*), Star Cudweed (*Euchiton involucratus*), Slender Flat-sedge (*Cyperus gracilis*) and Small-leaf glycine (*Glycine microphylla*).

The cleared area in the southern portion of the Green Corridor contains a mixture of native and exotic species that are highly disturbed through heavy grazing and track formation. Native species include Kangaroo Grass (*Themeda triandra*) and Common Fringe-sedge (*Fimbristylis dichotoma*). Exotic species include Kikuyu Grass (*Cenchrus clandestinus*), Paspalum (*Paspalum dilatatum*), African Lovegrass (*Eragrostis curvula*) and Rhodes Grass (*Chloris gayana*).

Photographs of vegetation within the Green Corridor are shown at Appendix A.

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

2.2.2 Threatened species

No threatened flora species have been recorded at the Green Corridor.

Nine threatened flora species listed under either the BC Act and/or the EPBC Act were identified by BioNet as occurring within a 10 km radius of the Green Corridor. The list of threatened flora and fauna species recorded on NSW BioNet is at Appendix C.

2.2.3 Threatened communities

The BC Act listed Critically Endangered Ecological Community (CEEC) *Cumberland Plain Woodland in the Sydney Basin Bioregion* occurs on site. This community is also listed as Critically Endangered under the EPBC Act.

2.2.4 Vegetation condition

In the northern portion of the Green Corridor, the woodland community is relatively undisturbed except for the dominance of some exotic grasses in patches. There is recruitment of canopy species in the mid-storey and as seedlings. There is a diverse range of native species and the area does not appear to be subject to grazing pressure. This area is fenced off from the southern portion of the Green Corridor.

In the southern portion of the Green Corridor, the vegetation has been highly disturbed by former clearing for grazing, track creation and weed invasion.

2.2.5 Weeds

The northern portion of the Green Corridor contains dominant patches of introduced grass species, including Rhodes Grass (*Chloris gayana*), Setaria (*Setaria parviflora)* and Paspalum (*Paspalum dilatatum)*. Other introduced species include Paddy's Lucerne (*Sida rhombifolia*), *Solanum sisymbriifolium*, Fireweed (*Senecio madagascariensis*), Fleabane species (*Conyza* spp.), and Plantain (*Plantago lanceolata*).

The southern portion of the Green Corridor is dominated by introduced grass species, including Kikuyu Grass (*Cenchrus clandestinus*), Paspalum (*Paspalum dilatatum*), African Lovegrass (*Eragrostis curvula*) and Rhodes Grass (*Chloris gayana*). Other introduced species include Fireweed (*Senecio madagascariensis*), Fleabane species (*Conyza* spp.) and Spear Thistle (*Cirsium vulgare*).

2.3 Pinnacle Park

2.3.1 Current vegetation

The vegetation in Pinnacle Park comprises the following:

1. Cumberland Shale Plains Woodland (a component of Cumberland Plain Woodland Critically Endangered Ecological Community),
2. Managed and planted vegetation.

As noted, the northern section of Pinnacle Park (Lot 1 DP1226168) is already established as a park and contains scattered and clumped native trees and shrubs, mown grass and managed planted trees and shrubs. This managed area is out of scope of this VMP.

Vegetation in the southern undeveloped portion of Pinnacle Park comprises a disturbed Cumberland Shale Plains Woodland community dominated by Forest Red Gum (*E. tereticornis*) and Narrow-leaved Ironbark (*E. crebra*) and scattered Grey Box (*Eucalyptus moluccana)*. The mid-storey is almost

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

exclusively dominated by Blackthorn (*Bursaria spinosa*) but Coffee Bush (*Breynia oblongifolia)* is also present. The ground layer is varied and comprises a mixture of native grasses and forbs, such as Kangaroo Grass (*Themeda triandra*), Red Grass (*Bothriochloa macra*), *Commelina cyanea and Carex inversa*. Woody and broadleaf weeds and exotic grasses are also scattered throughout the woodland area, such as African Olive (*Olea europaea* subsp. *cuspidata*), Lantana (*Lantana camara),* Paspalum *(Paspalum dilatatum*), Setaria (*Setaria parviflora*) and Rhodes Grass (*Chloris gayana*).

Photographs of vegetation at Pinnacle Park are shown at Appendix A. The flora inventory for the southern section of Pinnacle Park is attached at Appendix B.

2.3.2 Threatened species

No threatened flora species have been recorded at Pinnacle Park.

Nine threatened flora species listed under either the BC Act and/or the EPBC Act were identified by BioNet as occurring within a 10 km radius of the Surveyors Creek West. The list of threatened flora and fauna species recorded on NSW BioNet is at Appendix C.

2.3.3 Threatened communities

The BC Act listed Critically Endangered Ecological Community (CEEC) *Cumberland Plain Woodland in the Sydney Basin Bioregion* occurs on site. This community is also listed as Critically Endangered under the EPBC Act.

2.3.4 Vegetation condition

The vegetation in Pinnacle Park is landscaped and managed in the northern section and grasses are mown around the scattered remnant trees. The southern undeveloped section of the proposed park supports a patch of Cumberland Plain Woodland which is still accessible to cattle but contains a high diversity of native species including some large trees (*Eucalyptus crebra*, *E. moluccana* and *E. tereticornis*). The remainder of the park to the south of the woodland patch is more heavily grazed and lacks any shrub or tree layer and comprises a mixture of native and exotic grasses, herbs and forbs.

2.3.5 Weeds

As noted, introduced grass species are more dominant in the southern section of Pinnacle Park. In addition, woody weeds such as African Olive (*Olea europaea* subsp. *cuspidata*), *Solanum sisymbriifolium* and Lantana (*Lantana camara)* are found scattered throughout the southern woodland area in Pinnacle Park*.* Other introduced species include Fleabane (*Conyza* spp.) Fireweed (*Senecio madagascariensis*), Cobblers Pegs (*Bidens pilosa*) and Paddy's Lucerne (*Sida rhombifolia*).

The northern section of Pinnacle Park is managed, and weeds are removed on a regular basis.

2.4 Basin E

2.4.1 Current vegetation

Vegetation planted along the bund includes species such as *Lomandra longifolia, Hardenbergia violaceae, Indigofera australis, Melaleuca linariifolia* with occasional small trees such as *Eucalyptus crebra, Eucalyptus tereticornis* and *Acacia parramattensis*. There is a significant occurrence of weed species including *Plantago lanceolata, Senecio madagascariensis, Diplotaxis muralis, Sonchus oleraceus* and *Cirsium vulgare*. Vegetation within the basin is largely dominated by *Carex appressa* with *Rumex crispus* intermixed.

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

2.4.2 Threatened species and communities

Vegetation on the bund wall does not provide habitat for threatened flora and is not characteristic of any threatened ecological communities.

2.4.3 Vegetation condition

Vegetation is in moderate condition.

2.4.4 Weeds

A variety of weeds common to disturbed areas occur; woody weeds are absent.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

3 Rehabilitation Strategy

3.1 Surveyors Creek West

3.1.1 Introduction

Surveyors Creek West requires several strategic actions to meet criteria in the DCP, including weed control, rehabilitation, and planting. The corridor comprises four portions:

1. Downstream riparian corridor planting (northern section of Surveyors Creek West),
2. Upstream riparian corridor planting (central and southern section of Surveyors Creek West),
3. Downstream raingarden planting (northern section of Surveyors Creek West), and
4. Upstream raingarden planting (central section of Surveyors Creek West).

The components of the biodiversity corridor are shown in Appendix D and strategic actions are further discussed below.

Note 1: Primary works for the entire corridor area shall comprise weed control (and follow up if required). These actions will: • Control/eradicate weeds at the site Weed control must be undertaken by contractors that are experienced and trained in plant identification and weed removal techniques.
Note 2: the biodiversity corridor will include the following utilities/services (refer Appendix D): • two bioretention basins (floor and batter) The bioretention basin floors can be planted as raingardens once a minimum of 80% of construction within the riparian catchment area is completed. However, the internal bioretention batter can be planted in conjunction with the rehabilitation areas to progress the establishment of the vegetation.
Note 3: Prior to the corridor being revegetated, soil preparation must be undertaken due to the extensive earthworks undertaken in the area. This includes: • Soil ripping to a minimum depth of 200mm to reduce soil compaction (care must be taken around existing trees and underground services). • Soil testing and soil amelioration according to results from a NATA certified laboratory, adding organic matter and gypsum where required. • Reuse of any stockpiled topsoil to cover up sub-soils uncovered during earthworks phase.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

3.1.2 Description - Downstream riparian corridor planting

The downstream riparian corridor planting comprises the northern portion of Surveyors Creek West which runs to the north towards the eastern tributary of Surveyors Creek. This area contains most of the native scattered trees and shrubs (refer photographs at Appendix A) and patches of Sharp Rush and other exotic species. This west of this area contains one of the bioretention basins that is currently being used as a sediment basin but will become a raingarden once planted. Once rehabilitated this area will contain a shoulder planting to the east, south and west, a terrestrial rehabilitation zone covering most of the area, a swale or emergency spillway running south to north and a raingarden in the bioretention basin. Please refer to Appendix D for the planting plans and species schedules.

3.1.3 Restoration methods – Downstream riparian corridor planting

The principal restoration methods are:

- Control of introduced grasses and any infrequent woody weeds (e.g. African Boxthorn) by spraying with herbicide.
- Slashing of Sharp Rush to remove sharp points and seed heads then spraying with a non-specific herbicide formulated for use around water.
- Mulching of the terrestrial rehabilitation zone with native hardwood woodchip to 100mm depth. The mulch must be free of weeds or seed to prevent further weed incursion in the maintenance period. Mulch must be kept away from plant stems.
- The use of jute mat in the swale area in the downstream riparian corridor is to be confirmed by the engineers. If installed, jute mat of a minimum of 680gsm is to be used, the jute mat must be installed to the manufacturer's specifications and slits cut into the mat for planting.
- Plants may need to be pre-ordered in quantity with a suitable nursery prior to the planting schedule being undertaken. Placement of plants should be according to the drawings at Appendix D.
- The planting of the terrestrial rehabilitation zone should be undertaken with the species listed in Appendix D.
- The planting of the swale should be undertaken with the species listed in Appendix D.
- The planting of the shoulder should be undertaken with the species listed in Appendix D.
- Plantings should be undertaken in suitable weather conditions (i.e. avoid extreme weather), care should be taken to minimise disturbance to the root ball when removing the plant from the container and the plant should be placed with the top of the root ball plumb with the soil surface. All plantings should be watered in, fertilised with a slow release fertiliser and water crystals added, lightly tamped to eliminate air pockets and mulched (as described above).
- Watering may be required as plants become established
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.1.4 Timing - Downstream riparian corridor planting

Weed control, soil preparation and plantings of the downstream riparian corridor planting may be completed as soon as development earthworks have been completed and upon approval of this plan.

3.1.5 Description - Upstream riparian corridor planting

The upstream riparian corridor planting comprises the source of Surveyors Creek West which runs to the north towards the eastern tributary of Surveyors Creek. This area is predominantly cleared (refer to photographs at Appendix A) and vegetation is predominantly exotic groundcovers. North of this area contains the other bioretention basin currently being used as a sediment basin but will become a rain

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

garden once planted. At the southern end of the corridor a road will be constructed, a 20m width has been allowed to accommodate construction activities.

Once rehabilitated the upstream riparian corridor will consist of a shoulder planting surrounding most of the area, a terrestrial rehabilitation zone in the northern section of the area, a native meadow area, planted features trees (120 individual trees), a swale running south to north into the bioretention basin (no planting proposed for this area), and a raingarden in the bioretention basin.

3.1.6 Restoration methods - Upstream riparian corridor planting (terrestrial rehabilitation zone, shoulder planting, feature trees and swale area)

The principal restoration methods are:

- Control of introduced grasses and any infrequent woody weeds (e.g. African Boxthorn) by spraying with herbicide.
- Slashing of Sharp Rush to remove sharp points and seed head then spraying with a non-specific herbicide formulated for use around water.
- Mulching of the terrestrial rehabilitation zone and around the planted feature trees with native hardwood woodchip to 100mm depth. The mulch must be free of weeds or seed to prevent further weed incursion in the maintenance period. Mulch must be kept away from plant stems.
- At the southern end of the corridor where road construction works will occur, temporary erosion measures shall be installed (hydro seeding with soil binding agent and sterilised millet).
- Plants may need to be pre-ordered in quantity with a suitable nursery prior to the planting schedule being undertaken. Placement of plants should be according to the drawings at Appendix D.
- The planting of the terrestrial rehabilitation zone should be with tube stock and undertaken with the species listed in Appendix D.
- The planting of the shoulder area should be undertaken with tube stock and with the species listed in Appendix D.
- The feature trees to be planted should be with tube stock and are listed in Appendix D.
- Plantings should be undertaken in suitable weather conditions (i.e. avoid extreme weather), care should be taken to minimise disturbance to the root ball when removing the plant from the container and the plant should be placed with the top of the root ball plumb with the soil surface. All plantings should be watered in, fertilised with a slow release fertiliser and water crystals added, lightly tamped to eliminate air pockets and mulched (as described above).
- Watering may be required as plants become established
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.1.7 Restoration methods – Native meadow area

The principal restoration methods are:

- Control of introduced grasses, broadleaf weeds and any infrequent woody weeds by spraying with herbicide. Application of an appropriate herbicide to the area may be required more than once to ensure all weed species are removed.
- An alternative method to remove weeds from the soil is by soil scalping whereby a road grader is used to remove topsoil from the area to the depth to which weeds extend into the soil profile.
- The planting of the native meadow zone should be undertaken with the species listed in Appendix D. Please note that the quantities and type of seed for each listed species can be altered as long as sufficient diversity of species is maintained and the species selected are

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

suitable to the local environment.

- Seeds may need to be pre-ordered in quantity with a suitable nursery prior to the planting schedule being undertaken.
- Prior to sowing, native seed should be purity tested to determine the percentage (by mass) of the seed that is pure filled seed of the species, the percentage of impurities of other species seed (e.g. weeds) and the percentage of inert matter (e.g. stems and seed coverings).
- Seeding should be undertaken in suitable weather conditions (i.e. avoid extreme weather) and the soil should contain sufficient moisture to allow seeds to germinate.
- Seed should be applied to the soil using direct seeding with a tractor-mounted seed drill. Seed should be added with a bulking agent such as coarse vermiculite to reduce entanglement of some native grass seed species in the seed drill and enable free flow of the seed into the soil.
- The seed should be lightly raked to cover the seed and press it into the soil.
- The restoration of native meadow may be hampered by adjacent weed sources and seed banks in the soil, soil limitations, weather conditions and herbivory. Particular care must be taken when monitoring (see Section 4) to observe for these impacts and actions undertaken accordingly to reduce any negative impacts. For example, measures taken to exclude herbivores or chemical treatment to limit herbivory by insects.
- Regular watering may be required as plants become established.
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.1.8 Timing - Upstream riparian corridor planting

Weed control, soil preparation, hydro-seeding and plantings of the upstream riparian corridor planting may be completed as soon as development earthworks have been completed and upon approval of this plan. The native meadow area must only be sown once the soil moisture is sufficient to allow for germination.

3.1.9 Description - Downstream raingarden planting

The downstream bioretention basin or raingarden planting is located in the north west portion of Surveyors Creek West, adjacent to Gunyah Drive. The area is currently being used as a sediment basin but will become a raingarden once planted. An access track will allow pedestrian access from Gunyah Drive to the raingarden in the bioretention basin (850 m^2). Please refer to Appendix D for the planting plans. The engineering of the bioretention basin is out of scope of this VMP.

3.1.10 Restoration Methods – Downstream raingarden planting

The principal restoration methods are:

- The bioretention basin floor can be planted once a minimum of 80% of the construction within the catchment has been completed and engineering works for the basin floor have been undertaken.
- However, the internal bioretention batter can be planted when the terrestrial, swale and shoulder plantings are done to allow plant establishment in this area.
- Control of introduced grasses and other non-native species should be sprayed with a non-specific herbicide formulated for use around water.
- The bioretention batter areas should be top-dressed with 200mm of ameliorated site soil.
- Jute mat of a minimum of 680gsm is to be installed in the bioretention batter areas. The jute mat must be installed to the manufacturer's specifications and slits cut into the mat for planting.
- No mulch is required on the bioretention basin floor.
- Plants may need to be pre-ordered in quantity with a suitable nursery prior to the planting

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

schedule being undertaken.
- Placement of plants should be according to the drawings at Appendix D. Plant stock in clumps of 5 – 10 of the same species.
- The planting of the downstream bioretention basin should be undertaken with the species listed in Appendix D.
- No shrubs should be planted in the bioretention basin. All shrub species are to be planted on the bioretention batter areas.
- Plantings should be undertaken in suitable weather conditions (i.e. avoid extreme weather), care should be taken to minimise disturbance to the root ball when removing the plant from the container and the plant should be placed with the top of the root ball plumb with the soil surface.. All plantings should be watered in, fertilised with a slow release fertiliser and water crystals added, lightly tamped to eliminate air pockets and mulched (as described above).
- Watering may be required as plants become established
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.1.11 Timing - Downstream raingarden planting

Weed control, soil preparation and plantings of the internal bioretention batter planting may be completed as soon as development earthworks have been completed and upon approval of this plan.

The bioretention basin floor can be planted once a minimum of 80% of the construction within the catchment has been completed.

3.1.12 Description - Upstream raingarden planting

The upstream bioretention basin or raingarden planting is located in the central portion of Surveyors Creek West, between Gunyah Drive and Riverflat Drive. The area is currently being used as a sediment basin but will become a raingarden once planted. Please refer to Appendix D for the planting plans. The engineering of the bioretention basin is out of scope of this VMP.

3.1.13 Restoration Methods – Upstream raingarden planting

The principal restoration methods are:

- The bioretention basin floor can be planted once a minimum of 80% of the construction within the catchment has been completed and engineering works for the basin floor have been undertaken.
- However, the internal bioretention batter can be planted when the terrestrial, swale and shoulder plantings are done to allow plant establishment in this area.
- Control of introduced grasses and other non-native species should be sprayed with a non-specific herbicide formulated for use around water.
- The basin batters should be top-dressed with 200mm of ameliorated site soil.
- Jute mat of a minimum of 680gsm is to be installed in the bioretention batter areas. The jute mat must be installed to the manufacturer's specifications and slits cut into the mat for planting.
- No mulch is required on the bioretention basin floor.
- Plants may need to be pre-ordered in quantity with a suitable nursery prior to the planting schedule being undertaken.
- Placement of plants should be according to the drawings at Appendix D. Plant stock in clumps of 5 – 10 of the same species.
- The planting of the upstream bioretention basin should be undertaken with the species listed in Appendix D.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

- No shrubs should be planted in the bioretention basin. All shrub species are to be planted on the bioretention batter.
- Plantings should be undertaken in suitable weather conditions (i.e. avoid extreme weather), care should be taken to minimise disturbance to the root ball when removing the plant from the container and the plant should be placed with the top of the root ball plumb with the soil surface. All plantings should be watered in, fertilised with a slow release fertiliser and water crystals added, lightly tamped to eliminate air pockets and mulched (as described above).
- Watering may be required as plants become established
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.1.14 Timing - Upstream raingarden planting

Weed control, soil preparation and plantings of the internal bioretention batter planting may be completed as soon as development earthworks have been completed and upon approval of this plan. The bioretention basin floor can be planted once a minimum of 80% of the construction within the catchment has been completed.

3.2 Green Corridor

3.2.1 Introduction

The Green Corridor requires several strategic actions to meet criteria in the DCP, including weed control, assisted regeneration and planting. The corridor comprises two portions:

1. Cumberland Shale Plains Woodland (in the northern half), and
2. Cleared land (in the southern half).

The Cumberland Shale Plains Woodland will require assisted natural regeneration and the cleared land will require complete rehabilitation. Please refer to the planting plans at Appendix E.

Note 1: Primary works for the entire corridor area shall comprise weed control (and follow up if required) and completion of a cool burn. These actions will (in combination):

- Control/eradicate weeds at the site,
- Stimulate regeneration of native grasses and shrubs (e.g. Acacias). Fire is an important part of woodland ecology and it is unlikely that the site has been burnt in at least 30 years, and
- Provide an ash layer to release nutrients into the soil.

Prior to the burn being completed, any necessary permits must be obtained from NSW Rural Fire Service (RFS) and local bushfire authorities and Council should be informed several days prior to the burn. Burning must be completed by experienced practitioners and under appropriate conditions. Given the sites isolation from any extensive areas of bushland and its small size, the risks associated with burning are considered very minor. However, the Green Corridor slopes very gently towards The Northern Road in the east so care should be taken to avoid smoke being blown towards this busy road.

Note 2: The Green Corridor will require fencing to remove grazing pressure. Fencing is not within the scope of this VMP but will need to be undertaken following initial weed control and burning of the area. Following the completion of fencing, planting of the corridor can commence to reduce potential for damage/disturbance to planted areas.

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

3.2.2 Description

The Green Corridor comprises an area of Cumberland Shale Plains Woodland in the north in which natural regeneration is occurring of canopy species, but it is mainly dominated by exotic species in the ground layer. This area is 7,185m^2 and will require assisted natural regeneration to remove the exotic species and encourage a diversity of native species. The southern portion is cleared and is dominated by exotic grasses and broadleaf weeds. This area of 13,346m^2 will require full rehabilitation through plantings of canopy, mid-storey and ground layer plant species to ensure that each strata is represented in the restored vegetation community. Please refer to Appendix E for planting plans.

3.2.3 Restoration Methods

Restorations for woodland vegetation and rehabilitation areas include a combination of weed control/burning (as described previously), assisted regeneration and planting. As natural regeneration is already occurring in the northern portion of the Green Corridor, planting is not required in this area.

The principal restoration methods are:

- Control of introduced grasses and forbs by spraying with herbicide. Care must be taken to avoid any off-target impacts and to undertake follow-up weed control as required.
- Treatment of any woody weeds (e.g. African Boxthorn) by utilising targeted herbicide application such as the 'cut & paint' technique.
- Completion of a cool burn across the whole area with appropriate permits in place and by qualified practitioners. It is expected that a cool burn will stimulate regeneration of native species, possibly even in the cleared area. Careful observation and monitoring will be required to identify regeneration of native species in the cleared area.
- Mulching of the rehabilitation zone with native hardwood woodchip to 100mm depth. The mulch must be free of weeds or seed to prevent further weed incursion in the maintenance period. Mulch must be kept away from plant stems.
- Plants for the Green Corridor rehabilitation zone may need to be pre-ordered in quantity with a suitable nursery prior to the planting schedule being undertaken.
- The planting of the Green Corridor rehabilitation zone should be undertaken with the species listed in Appendix E.
- Tree and shrub plantings are one per two square metres as stipulated in the Glenmore Park Stage 2 Planning Agreement. As full rehabilitation is required, the density of ground layer plant species stipulated in Appendix E is greater than that of the tree and shrub species.
- Plantings should be undertaken in suitable weather conditions (i.e. avoid extreme weather), care should be taken to minimise disturbance to the root ball when removing the plant from the container and the plant should be placed with the top of the root ball plumb with the soil surface. All plantings should be watered in, fertilised with a slow release fertiliser and water crystals added, lightly tamped to eliminate air pockets and mulched (as described above).
- Watering may be required as plants become established
- Maintenance of the plantings should be undertaken at regular intervals for a five-year period (refer to Section 3.4 for more details).

3.2.4 Timing

The vegetation management works in the Green Corridor must be completed by an appropriately experienced bush regenerator under the supervision of the site superintendent. Liaison between contractors completing various works within the corridor will be required to ensure the timing of works is completed to avoid conflict between actions; the site superintendent shall oversee all works and ensure that this occurs.

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

The summary of timing of works in the Green Corridor is detailed in Table 3-1.

Table 3-1 Summary of timing of works within the Green Corridor (VMP actions are shaded grey)

Matter	Timing	Responsibility
Primary weed control	Upon approval of this Plan	Appointed bush regenerator
Cool burn	Following completion of primary weed control (and once notification/permits have been completed/obtained)	Appointed bush regenerator or specialist contractor
Fencing	Following completion of above	Appointed contractors
Secondary weed control	Following completion of fencing	Appointed bush regenerator
Plant-out of rehabilitation area	Following secondary weed control	Appointed bush regenerator
Planting maintenance and monitoring of all corridor components	Following plant-out for a 5-year period.	Appointed bush regenerator

3.3 Pinnacle Park

3.3.1 Introduction

Vegetation in Pinnacle Park (inclusive of proposed Lot 700) comprises the following:

1. Cumberland Shale Plains Woodland
2. Managed and planted vegetation.

As previously noted, the northern section of Pinnacle Park is already established as a park and hence is not within the scope of this VMP. The area of Cumberland Shale Plains Woodland within the u8ndeveloped portion of the park requires active management to control non-native species, assist natural regeneration and protect existing native vegetation. Since Pinnacle Park will be a managed recreation area once the Highland Views development is completed, prescribed management actions will aim to enhance and protect existing vegetation from recreational impacts.

3.3.2 Description

The Cumberland Shale Plains Woodland in Pinnacle Park predominantly occurs as a strip running east to west in the centre of the planned park. The canopy and mid-storey are predominantly native plant species but the ground layer is a mixture of native and exotic species. There are also scattered native canopy trees of this community in the developed portion of the park.

3.3.3 Restoration Methods

Restoration methods for the native vegetation in Pinnacle Park will include actions to protect native species from human activity and weed incursion and may include:

- Control of introduced grasses and forbs by spraying with herbicide.
- Treatment of any woody weeds (e.g. African Boxthorn) by utilising targeted herbicide application such as the 'cut & paint' technique.
- Installation of protection measures to prevent mowing or human incursion (eg. permanent fencing, vegetation buffers).
- Supplementary planting of understorey and groundcover species (e.g. *Bursaria spinosa, Cymbopogon refractus, Daviesia ulicifolia, Dianella longifolia, Echinopogon ovatus, Hardenbergia violacea, Lomandra filiformis subsp. filiformis, Lomandra multiflora subsp.*

Document Set ID: 9961750
Version: 1, Version Date: 11/02/2022

multiflora, Poa labillardieri var. labillardieri, Themeda triandra).

Management measures will be refined and developed in a separate site-specific VMP.

3.3.4 Timing

As noted, the applicant intends on lodging a separate DA for the Pinnacle Park landscaping and embellishments. A separate VMP will be prepared to support this DA.

3.4 Basin E

Rectification works require the removal of all planted vegetation on the bund wall within Basin E. A selection of native species will be replanted on the bund once rectification works are completed (refer to the planting plans at Appendix F).

As noted, vegetation removal for the works is the subject of a BDAR (AWC, 2021). Vegetation removal and replanting cannot commence until vegetation removal is approved by Council.

3.5 Maintenance

Surveyors Creek West, the Green Corridor and Basin E restoration works shall be maintained for a period of five years following the installation of plantings, as per the commitments summarised in Table 3-2. Maintenance commitments for the native meadow area in Surveyors Creek West are detailed in Table 3-3. At each maintenance inspection, any dead plants or plants failing to establish should be replaced. All trees/shrubs should be re-mulched annually. Criteria for monitoring maintenance and determining performance criteria are discussed in Section 4.

Please note that the preferred maintenance method for the native meadow area at Surveyors Creek West would be a late summer to autumn cool burn once the native species have finished flowering and have shed their seed. However, it is recognised that this may not be practical in the local environment due to the surrounding dwellings. If fire is to be used as a maintenance method, then prior to the burn being completed any necessary permits must be obtained from NSW Rural Fire Service (RFS) and local bushfire authorities, and Council should be informed several days prior to the burn. Burning must be completed by experienced practitioners and under appropriate conditions. One cool burn over the five year maintenance period is recommended.

Alternatively, if fire is not a practical option for maintenance of the native meadow area then mowing should be used. Mowing must only be done once the native species have established and set seed, i.e. at least a year after sowing. It is recommended that mowing is undertaken in late winter to benefit the growth of early flowering forb species and late summer to autumn to benefit autumn germinating forb species. All mown biomass must be raked and baled and removed from site to prevent it from smothering vegetation or restricting seed recruitment.

Pinnacle Park maintenance works will be determined by the schedule of works for park management for Penrith City Council managed open spaces; a suggested maintenance schedule is detailed in Table 3-4.

Document Set ID: 9861750
Version: 1, Version Date: 17/02/2022

Table 3-2 Maintenance requirements for Surveyors Creek West, the Green Corridor (except native meadow area) and Basin E

Maintenance/care Requirement	Rationale
Year 1	
At time of planting (Week 0)	
All stock planted at the site must be sun-hardened, in good health and sourced from a reputable nursery experienced in growing native species.	Plants have opportunity to strike and establish rapidly
All plants must be watered in and heavily mulched. If planting in dry conditions use of water crystals is recommended.	To maximise plant survival and establishment
For 2 weeks following planting (Week 0 -2)	
Plants are watered every three (3) days for 5 watering events	To maximise plant survival and establishment
For 3 weeks following initial watering (Week 2 -5)	
Plants are watered once weekly for 3 watering events	To maximise plant survival and establishment
3 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
6 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
9 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
12 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 1]	
Year 2	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 2]	
Year 3	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 3]	
Year 4	

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Maintenance/care Requirement	Rationale
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 4]	
Year 5	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 5]	
[END of MAINTENANCE PERIOD]	

Table 3-3 Maintenance requirements for native meadow area at Surveyors Creek West

Maintenance/care Requirement	Rationale
Year 1	
At time of planting (Week 0)	
All seed planted at the site must be in good health, sourced from a reputable seed stockist experienced in growing native species.	Seeds are more likely to germinate
All seeds must be sown in the correct seasonal conditions, using equipment that is clean and free of weed seed and vegetative matter. The soil moisture content must be sufficient to allow for germination. Seeds must be lightly raked into the soil, once sown.	To maximise plant survival and establishment
For 2 weeks following planting (Week 0 -2)	
Plants are lightly watered twice daily	To maximise plant survival and establishment
For 3 weeks following initial watering (Week 2 -5)	
Plants are watered once weekly for 3 watering events	To maximise plant survival and establishment
3 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
6 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
9 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
12 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
[END of YEAR 1]	
Year 2	
Month 3 – Biomass management	

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Maintenance/care Requirement	Rationale
Late summer / autumn mowing	To encourage grass and forb germination
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Biomass management	
Late winter mowing (if necessary, to reduce biomass)	To encourage grass and forb germination
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
[END of YEAR 2]	
Year 3	
Month 3 – Biomass management	
Late summer / autumn cool burn or mowing	To encourage grass and forb germination
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Biomass management	
Late winter mowing (if necessary, to reduce biomass)	To encourage grass and forb germination
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
[END of YEAR 3]	
Year 4	
Month 3 – Biomass management	
Late summer / autumn mowing	To encourage grass and forb germination
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Biomass management	
Late winter mowing (if necessary, to reduce biomass)	To encourage grass and forb germination
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
[END of YEAR 4]	
Year 5	
Month 3 – Biomass management	
Late summer / autumn mowing	To encourage grass and forb germination
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Biomass management	

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Maintenance/care Requirement	Rationale
Late winter mowing (if necessary, to reduce biomass)	To encourage grass and forb germination
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
[END of YEAR 5]	
[END of MAINTENANCE PERIOD]	

Table 3-4 Maintenance requirements for Pinnacle Park

Maintenance/care Requirement	Rationale
Year 1	
3 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
6 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
9 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
12 months following planting	
Weed control – spot spraying grasses and herbs	To maximise plant survival and establishment
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 1]	
Year 2	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 2]	
Year 3	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 12 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 3]	
Year 4	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Maintenance/care Requirement	Rationale
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[END of YEAR 4]	
Year 5	
Month 4 – Weed control	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Month 8 – Weed control and mulch	
Spot spraying grasses and herbs, woody weed control (if required)	To control emerging weeds and assist native regeneration
Re-mulch trees and shrubs	To limit weed incursion
[Ongoing maintenance as required for recreation area]	

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

4 Performance Criteria and Monitoring

4.1 Performance criteria

The aim of this VMP is to re-establish riparian vegetation around Surveyors Creek West in the centre of the site, to rehabilitate vegetation in the Green Corridor to the east of the site, to manage existing native vegetation in Pinnacle Park and revegetate Basin E following rectification works. To determine whether regeneration following the rehabilitation has been successful and will result in desired outcomes, performance criteria have been nominated based on the objectives in the DCP (refer Section 1.2); as summarised at Table 4-1.

Table 4-1 Rehabilitation objectives and performance criteria within the biodiversity corridor

Area	Performance criteria
Surveyors Creek West, Green Corridor, Basin E	**End of Year 1:** - 90% survival of plantings - Emergent weeds controlled and comprise <10% total cover
	End of Year 2: - 90% survival of plantings - 10% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <10% total cover
	End of Year 3: - 90% survival of plantings - 10% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover
	End of Year 4: - 90% survival of plantings - 20% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover
	End of Year 5: - 90% survival of plantings - 20% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover
Pinnacle Park	**End of Year 1:** - All native vegetation protected using appropriate exclusion method - Emergent weeds controlled and comprise <10% total cover
	End of Year 2: - 10% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <10% total cover
	End of Year 3: - 10% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover
	End of Year 4: - 20% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover
	End of Year 5: - 20% native ground cover achieved via natural regeneration - Emergent weeds controlled and comprise <5% total cover

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

The *Guidelines for vegetation management plans on waterfront land* state that following a two year minimum maintenance period, a minimum 80% survival rate for all plantings should be achieved, with a maximum 5% weed cover. **The performance criteria prescribed at Table 4-1 exceed these conditions for planting survival and meet these criteria for weed control.**

4.2 Monitoring requirements

Monitoring of all restoration zones would commence following approval of this Plan and the implementation of initial weed control. Initial monitoring to provide a basis for future comparison will require:

- Installation (and survey by GPS) of permanent photopoints at:
    - six sites at Surveyors Creek West (two in the downstream riparian corridor, two in the upstream riparian corridor and one in each raingarden), and
    - four sites at the Green Corridor,
    - one site at Pinnacle Park, and
    - two sites at Basin E.

- Photographs taken from fixed points and orientation at each point prior to works commencing (and then at 12-month intervals).

Annual monitoring of the works should occur (i.e. three monitoring events in total) and include:

- Estimates of plant survival,
- Estimates of regeneration by establishing 11 permanent quadrats of 5m x 5m (one adjacent to each photopoint location), and
- Preparation of a brief annual report including:
  - Comparison of photographs prior to and post works commencing
  - Results of the quadrat monitoring
  - A log of herbicide use
  - Results of any mortality and tree replacement
  - Recommendations for any other additional works (e.g. additional weed control etc).

4.3 Reporting requirements

Annual monitoring reports are to be completed and supplied to Penrith City Council and shall include the following information:

- The results of the monitoring assessment and whether performance criteria have been met,
- Photographs from fixed photopoints comparing the progress of the planting,
- Comments on the health of any mature retained trees,
- Comments on any problems (e.g. weeds, erosion etc.) and how these have been managed, and
- Any other relevant information (e.g. weed invasion, tree predation) or recommendations for future maintenance.

A final report should be prepared after 5 years of maintenance to evaluate whether the prescribed goals have been met and whether further maintenance requirements are necessary.

Document Set ID: 9861750
Version: 1, Version Date: 11/02/2022

5 Cost Estimates

Cost estimates have been based on the actions prescribed for each area over a five year period (refer Table 5-1). Note that estimates are broad in nature and have been completed as a guide for Council with regard to placing a bond on the works. It is recommended that detailed quotations are sought from experienced bush regeneration practitioners or contractors prior to completing the works.

Based on Appendix D (Surveyors Creek West), Appendix E (The Green Corridor), Figure 1-1 (Pinnacle Park) and Appendix F (Basin E), the following areas have been used in determining costs:

- Surveyors Creek West = 12,570 m²
- The Green Corridor = 20,531 m²
- Pinnacle Park = 4,203 m² (only the native vegetation areas)
- Basin E = 731 m².

Costs include a total estimate for each zone including weed control, plant installation (and mulch), watering and maintenance. A full inventory of costs is attached at Appendix G.

Exclusions:

- An allowance has not been made for the burning of the Green Corridor and native meadow area at Surveyors Creek West as this approach may not be supported by Council or other authorities. Two people for two full days at $72 / hour (i.e., $2,304 + GST) is a reasonable allowance to make for this item.
- No allowance has been made for annual reporting, although this may range from $720 - $1200 (excluding GST) per year, with five reports (one per year) required in total.
- No costs are allocated for soil ripping and amelioration at Surveyors Creek West as it is assumed that this will be completed as part of the infrastructure works.
- No costs are allocated for infrastructure works (bioretention basin and fencing) as it is assumed that this will be completed as part of the infrastructure works.
- No costs have been allocated for seed purity testing. Estimated costs of approximately $100 per kilogram of seed will apply.

Table 5-1 VMP Cost estimates

Zone	Estimated cost (ex-GST)
Surveyors Creek West	$130,692.87
The Green Corridor	$146,778.00
Pinnacle Park	$7,092.00
Basin E	$28,299.50
TOTAL	**$312,862.37**

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

6 References

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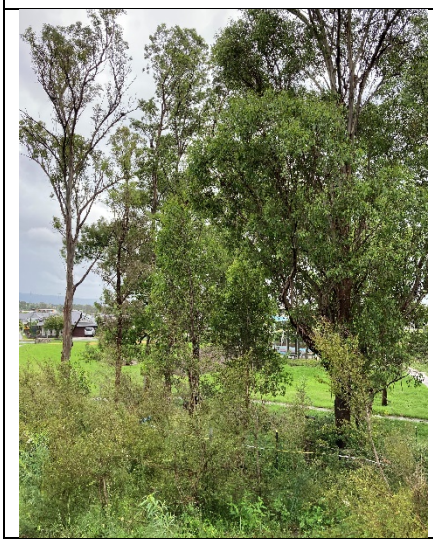
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Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Appendix A – Site Photographs

	*Plate 1. Surveyors Creek West – downstream riparian planting area, looking north*
	*Plate 2. Surveyors Creek West - upstream riparian planting area*
	*Plate 3. Green Corridor – remnant vegetation and regeneration*

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

	*Plate 4. Green corridor – scattered tree and grazed vegetation*
	*Plate 5. Pinnacle Park, looking north through native vegetation area*
	*Plate 6. Pinnacle Park, showing native vegetation and managed area*

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Appendix B – Flora Inventory (Ecological Australia, 2017 and AWC (2021)

Surveyors Creek West Species List - EcoLogical Australia 2017

Scientific name	Common name
Tree Canopy Species (>6m)	
Angophora floribunda	Rough-barked apple
Casuarina glauca	Swamp Oak
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Small Trees / Shrub Species (0.5 - 6m)	
Acacia parramattensis	Parramatta Wattle
Bursaria spinosa	Sweet Bursaria
Melaleuca decora	White feather Honeymyrtle
Melaleuca linariifolia	Flax-leaved Paperbark
Melaleuca styphelioides	Prickly-leaved Tea Tree
Ozothamnus diosmifolius	Ball Everlasting
Plectranthus parviflorus	Cockspur Flower
Sedges, Rushes, Reeds and Grasses	
Austrostipa ramosissima	Stout Bamboo Grass
Carex appressa	Tall Sedge
Cymbopogon refractus	Barbed Wire Grass
Dichelachne micrantha	Shorthair Plume Grass
Echinopogon caespitosus	Bushy Hedgehog-grass
Echinopogon ovatus	Forest Hedgehog Grass
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Imperata cylindrica var. *major*	Blady Grass
Lomandra longifolia	Ribbon Grass
Microlaena stipoides	Weeping Meadow Grass
Paspalidium distans	Spreading Panic Grass
Themeda australis	Kangaroo Grass
Ground layer Species (~0 - 1.5m) and Vines / Scramblers	
Cayratia clematidea	Native Grape
Centella asiatica	Indian Pennywort
Clematis aristata	Old Man's Beard
Clematis glycinoides	Headache Vine
Einadia hastata	Berry Saltbush
Einadia trigonos	Fishweed
Opercularia diphylla	Stinkweed
Oxalis perennans	Native Sorrel

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Scientific name	Common name
Persicaria decipiens	Slender Knotweed
Rubus parvifolius	Native Raspberry
Solanum prinophyllum	Forest Nightshade

Pinnacle Park and Green Corridor Species List – AWC 2021

Scientific name	Common name	Characteristic species on Cumberland Plains Woodland determination
Tree Canopy Species (>6m)		
Eucalyptus crebra	Narrow leaved Ironbark	Y
Eucalyptus moluccana	Grey Box	Y
Eucalyptus tereticornis	Forest Red Gum	Y
Small Trees / Shrub Species (0.5 – 6m)		
Breynia oblongifolia	Coffee Bush	
Bursaria spinosa	Sweet Bursaria	Y
Sedges, Rushes, Reeds and Grasses		
Aristida ramosa	Purple Wire Grass	Y
Bothriochloa macra	Red-leg Grass	
Chloris ventricosa		Y
Cymbopogon refractus	Barbed Wire Grass	
Cyperus gracilis	*Slender flat sedge*	Y
Dichondra repens	*Kidney Weed*	*Y*
Echinopogon ovatus	Forest Hedgehog Grass	Y
Entolasia marginata	Bordered Panic	Y
Enteropogon acicularis	Curly Windmill Grass	
Eriochloa pseudoacrotricha	Early Spring Grass	
Eragrostis leptostachya	Paddock Lovegrass	Y
Fimbristylis dichotoma	Common Fringe Sedge	
Lomandra filiformis subsp. *filiformis*	Wattle Mat Rush	Y
Microlaena stipoides	Weeping Meadow Grass	Y
Paspalidium distans	Spreading Panic Grass	
Sporobolus creber	Slender Rats Tail Grass	
Scleria mackaviensis	a tufted sedge	
Themeda australis	Kangaroo Grass	Y
Ground layer Species (~0 – 1.5m) and Vines / Scramblers		
Asperula conferta	Common Woodruff	Y
Arthropodium minus	Small Vanilla Lily	
Brunoniella australis		
Carex inversa		
Centella asiatica	Indian Pennywort	
Cheilanthes sieberi	Poison Rock Fern	
Cymbonotus lawsonianus	Bears Ear	
Commelina cyanea	Scurvy Weed	
Cyanthillium cinereum	Purple Fleabane	Y
Desmodium varians	Slender Tick-trefoil	
Euchiton sphaericus		

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Scientific name	Common name	Characteristic species on Cumberland Plains Woodland determination
Euphorbia drummondi	Caustic Weed	
Geranium solanderi	Native Geranium	
Glycine tabacina	Variable Glycine	
Glycine microphylla		
Hardenbergia violacea	Native Sarsparilla	Y
Hydrocotyle sibthorpioides		
Hypericum gramineum	*St John's Wort*	Y
Hypoxis hygrometrica	*Golden Weather-grass*	Y
Indogofera australis	*Australian Indigo*	Y
Oplismenus aemulus		Y
Oxalis perennans	Native Sorrel	Y
Oxytes bracypoda	Large Tick-trefoil	
Phyllanthus virgatus	Creeping Phyllanthus	
Rumex brownii	Swamp Dock	
Tricoryne elatior	Yellow Rush Lily	
Veronica plebeia	Creeping Speedwell	
Wahlenbergia gracilis	Australian Bluebell	Y

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Appendix C –BioNet Threatened Species List

Report generated on 19/02/2021 10:46 AM

Scientific Name	Common Name	NSW status	Commonwealth status	Number of Records
Animals				
Litoria aurea	Green and Golden Bell Frog	E,P	V	2
Hirundapus caudacutus	White-throated Needletail	P	V	1
Ephippiorhynchus asiaticus	Black-necked Stork	E,P		1
Botaurus poiciloptilus	Australasian Bittern	E,P	E	1
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		3
Lophoictinia isura	Square-tailed Kite	V,P		1
Burhinus grallarius	Bush Stone-curlew	E,P		2
Limosa	Black-tailed Godwit	V,P		1
Callocephalon fimbriatum	Gang-gang Cockatoo	V,P		1
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P		1
Lathamus discolor	Swift Parrot	E,P	CE	19
Ninox connivens	Barking Owl	V,P		1
Ninox strenua	Powerful Owl	V,P		1
Tyto novaehollandiae	Masked Owl	V,P		12
Tyto tenebricosa	Sooty Owl	V,P		1
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		1
Chthonicola sagittata	Speckled Warbler	V,P		10
Anthochaera phrygia	Regent Honeyeater	CE,P	CE	5
Daphoenositta chrysoptera	Varied Sittella	V,P		12
Artamus cyanopterus	Dusky Woodswallow	V,P		9
Melanodryas cucullata	Hooded Robin (south-eastern form)	V,P		1
Petroica boodang	Scarlet Robin	V,P		1
Petroica phoenicea	Flame Robin	V,P		3
Stagonopleura guttata	Diamond Firetail	V,P		1
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	2
Phascolarctos cinereus	Koala	V,P	V	7
Petaurus australis	Yellow-bellied Glider	V,P		1
Petaurus norfolcensis	Squirrel Glider	V,P		1
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	61

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Scientific Name	Common Name	NSW status	Commonwealth status	Number of Records
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		1
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P		13
Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V	5
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		1
Myotis macropus	Southern Myotis	V,P		13
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		5
Miniopterus australis	Little Bent-winged Bat	V,P		1
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P		16
Meridolum corneovirens	Cumberland Plain Land Snail	E		85
Plants				
Marsdenia viridiflora subsp. viridiflora	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	EP		522
Isotoma fluviatilis subsp. fluviatilis			X	1
Dillwynia tenuifolia		V		5
Pultenaea parviflora		E	V	47
Acacia pubescens	Downy Wattle	V	V	1
Eucalyptus benthamii	Camden White Gum	V	V	1
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	V		10
Persoonia nutans	Nodding Geebung	E,P	E	1
Pimelea spicata	Spiked Rice-flower	E	E	10

Legend				
V	Vulnerable		EP	Endangered Population
E	Endangered		CE	Critically endangered
P	Protected			

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Appendix D – Surveyors Creek West Planting Plans

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

HIGHLAND VIEWS
RIPARIAN CORRIDOR REHABILITATION PACKAGE

REV 6 **13.12.2021** **FINAL**

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MANAGEMENT AND DEVELOPMENT

DRAWING LIST

AWC 3 - 17857_00 - LOCALITY PLAN & DRAWING INDEX
AWC 3 -17857_01 - DOWNSTREAM RIPARIAN CORRIDOR PLANTING PLAN 01
AWC 3 -17857_02 - UPSTREAM RIPARIAN CORRIDOR PLANTING PLAN 02
AWC 3 -17857_03 - UPSTREAM RIPARIAN CORRIDOR PLANTING PLAN 03
AWC 3 -17857_04 - UPSTREAM RIPARIAN CORRIDOR PLANTING PLAN 04
AWC 3 -17857_05 - DOWNSTREAM RAINGARDEN PLANTING PLAN
AWC 3 -17857_06 - UPSTREAM RAINGARDEN PLANTING PLAN
AWC 3 -17857_07 - DOWNSTREAM RIPARIAN CORRIDOR - PLANT SCHEDULE
AWC 3 -17857_08 - UPSTREAM RIPARIAN CORRIDOR - PLANT SCHEDULE
AWC 3 -17857_09 - PLANT NOTES / DETAILS
AWC 3 -17857_10 - PLANT NOTES / DETAILS

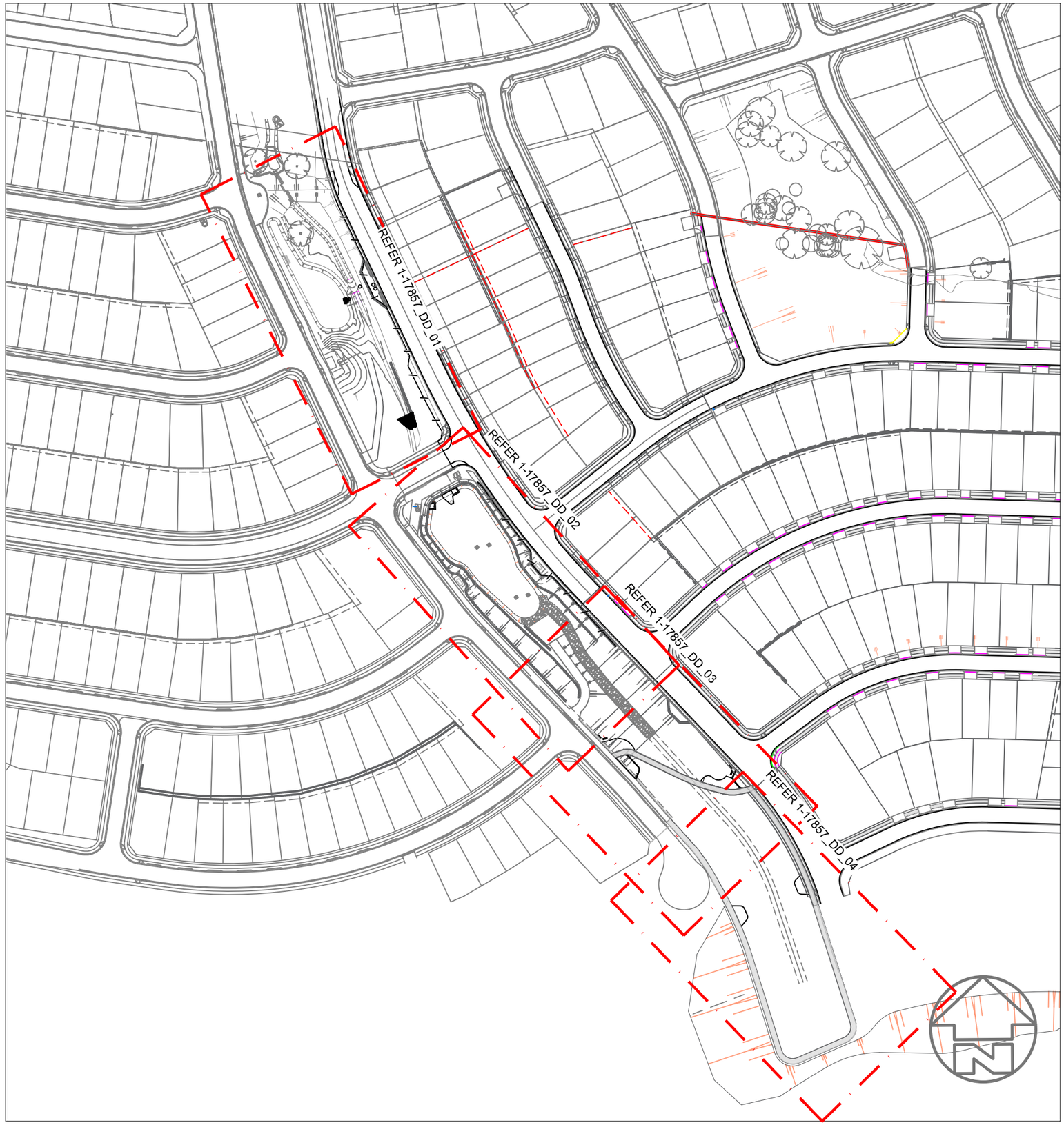
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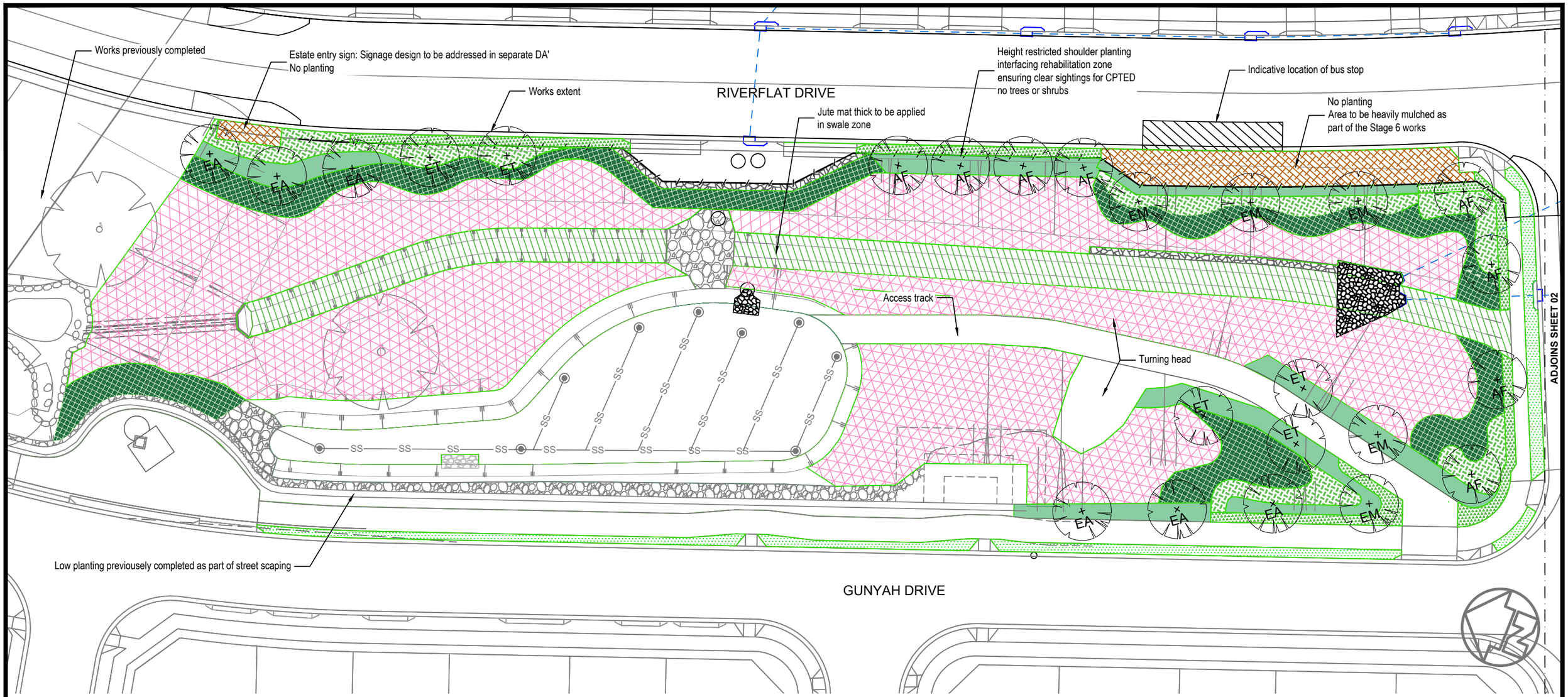
VEGETATION MANAGEMENT PLAN - AWC 3-13857 :
METHODOLOGY, TREATMENTS AND PERFORMANCE CRITERIA OF RIPARIAN CORRIDOR.
REFER 3-17857_HIGHLAND_VIEWS_VMP_REV_G

LANDSCAPE PACKAGE - SCOTT CALVER
REF - 20150139



LOCALITY PLAN - NTS

Document Set ID: 9861750
Version: 1, Version Date: 21/02/2022



TREATMENT ZONES

Zone 1 - Terrestrial Planting
Area = 2162m²

Zone 2 - Feature Shrubs
Area = 444m²

Zone 3 - Swale Planting Zone
Area = 432m²

Zone 4- Feature Groundcovers (Height restricted)
Area = 408m²

Zone 5 - Shoulder planting mix 1 (Height restricted)
Area = 281m²

Zone 6 - Shoulder planting mix 2 (Height restricted)
Area = 128m²

Existing Trees
Protect roots when conducting soil preparation

Feature trees
100L trees planted in height restricted planting zones

PLANTING NOTE:
Refer sheet 07 for planting schedule

PARK FEATURE TREES		
Code	**Species Name**	**Common Name**
AF	*Angophora floribunda*	Rough-barked apple
EA	*Eucalyptus amplifolia*	Cabbage Gum
EM	Eucalyptus moluccana	Grey Box
ET	Eucalyptus tereticornis	Forest Red Gum

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6	FINAL	13.12.2021

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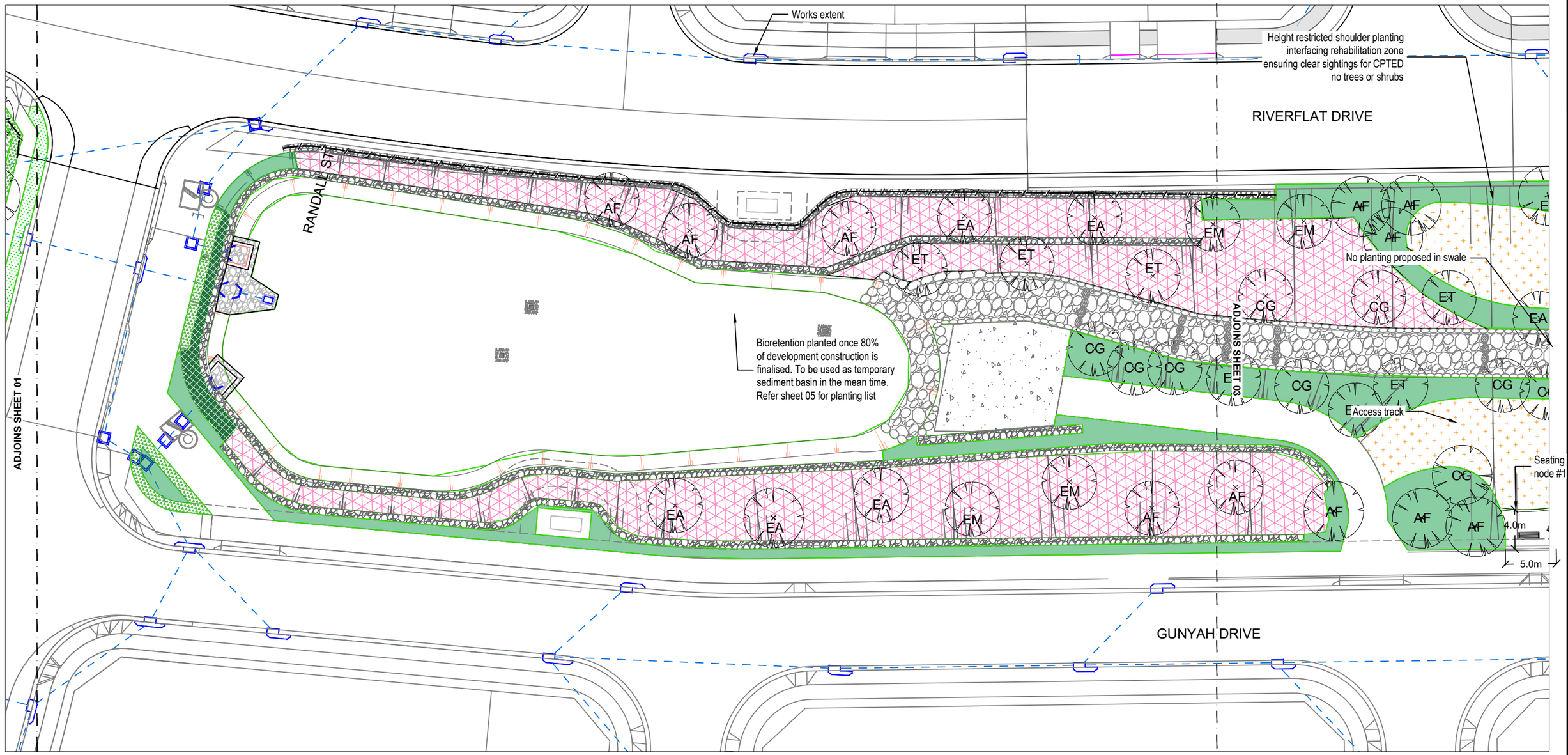
PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
DOWNSTREAM RIPARIAN PLANTING PLAN

DWG No. 3-17857A_DD_01
CAD FILE No. 3-17857_Highland_DD.dwg
REV. 6

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TREATMENT ZONES

Zone 1 - Terrestrial Planting
Area = 1352m²

Zone 2 - Feature Shrubs
Area = 444m²

Zone 5 - Shoulder planting mix 1 (Height restricted)
Area = 2266m²

Zone 6 - Shoulder planting mix 2 (Height restricted)
Area = 3080m²

Zone 7 - Native Meadows (Seed)
Area = 4313m²

Park Feature Trees
Qty = 97

PLANTING NOTE:
Refer sheet 08 for planting schedule

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6	FINAL	13.12.2021

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PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

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DRAWING
TREATMENT ZONES
PLANTING PLAN

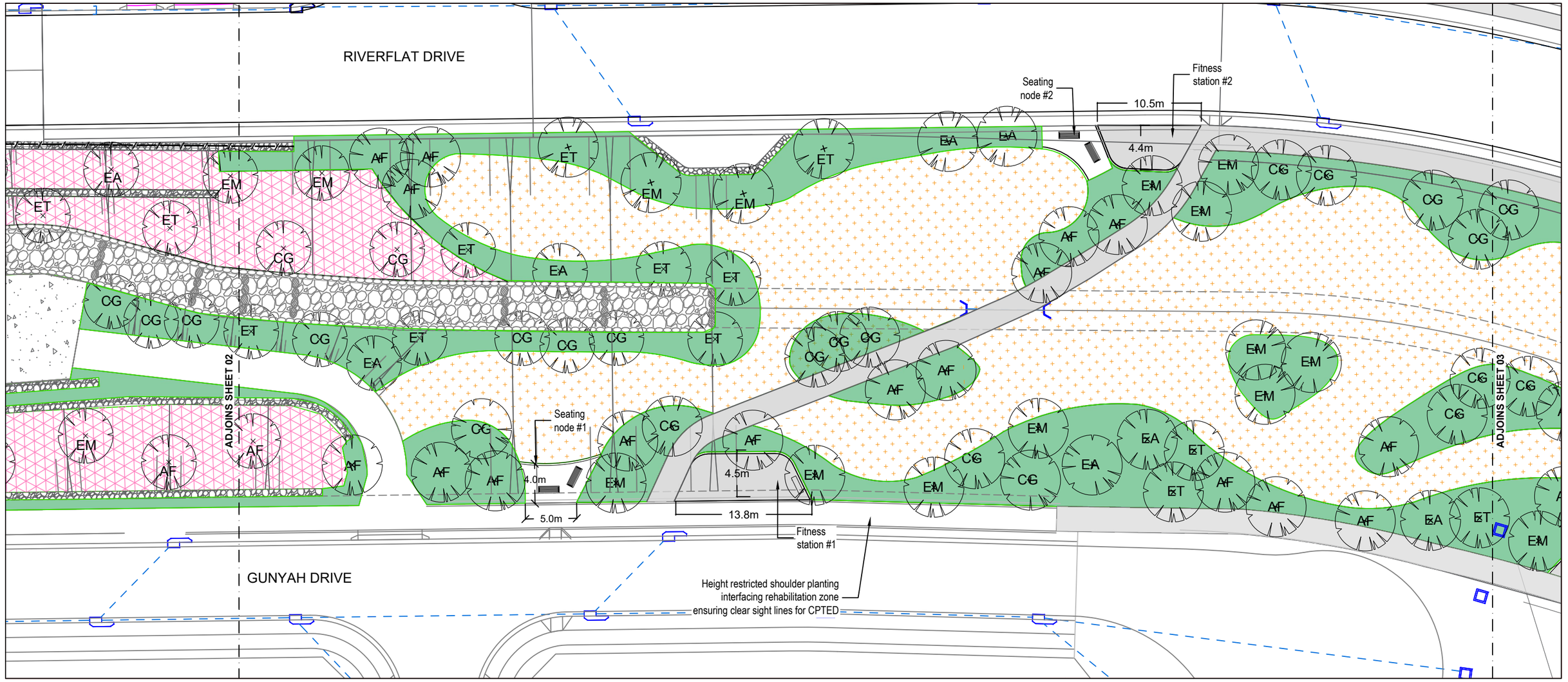
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TREATMENT ZONES

Zone 1 - Terrestrial Planting
Refer to sheet 02 for QTY

Zone 5 - Shoulder planting mix 1 (Height restricted)
Refer to sheet 02 for QTY

Zone 7 - Native Meadows (Seed)
Refer to sheet 02 for QTY

Park Feature Trees
Refer to sheet 02 for QTY

PLANTING NOTE:
Refer sheet 08 for planting schedule

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6	FINAL	13.12.2021

DESIGNED SS
DRAWN SS
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PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
TREATMENT ZONES
PLANTING PLAN

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CAD FILE No. 3-17857_Highland_DD.dwg
REV. 6

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TREATMENT ZONES

Zone 1 - Terrestrial Planting
Refer to sheet 02 for QTY

Zone 5 - Shoulder planting mix 1 (Height restricted)
Refer to sheet 02 for QTY

Zone 7 - Native Meadows (Seed)
Refer to sheet 02 for QTY

Park Feature Trees
Refer to sheet 02 for QTY

PLANTING NOTE:
Refer sheet 08 for planting schedule

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1	FOR DISCUSSION	20.11.2020
2	FOR APPROVAL	23.02.2021
3	FOR APPROVAL	15.04.2021
4	FOR APPROVAL	19.04.2021
5	FOR APPROVAL	25.10.2021
6	FINAL	13.12.2021

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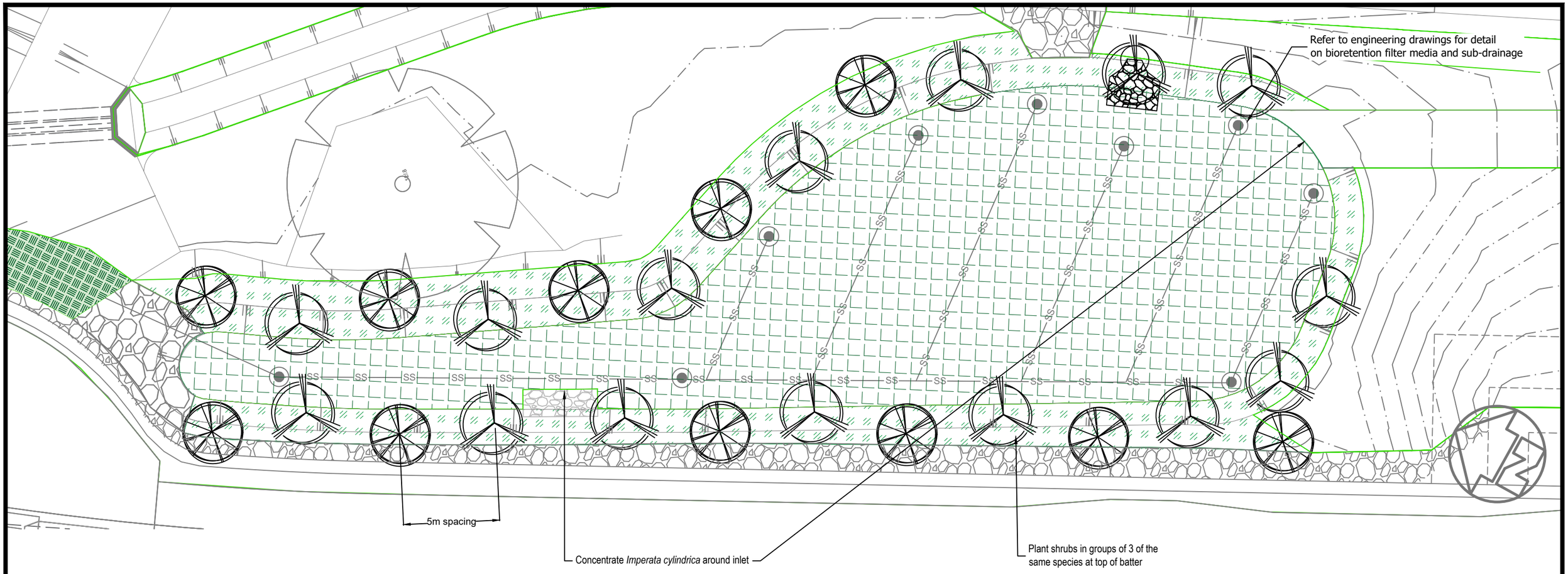
PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
TREATMENT ZONES
PLANTING PLAN

DWG No. 3-17857A_DD_04
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SCALE 1:400 @ A3 (0 10 20m)
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BIORETENTION PLANTING ZONES

Bioretention Batter
Area = 550m²

Bioretention Floor
Area = 300m²

Melaleuca quinquenervia
Quantities = 15

Melaleuca styphelioides
Quantities = 11

DOWNSTREAM BIO RETENTION BASIN PLANTING SCHEDULE

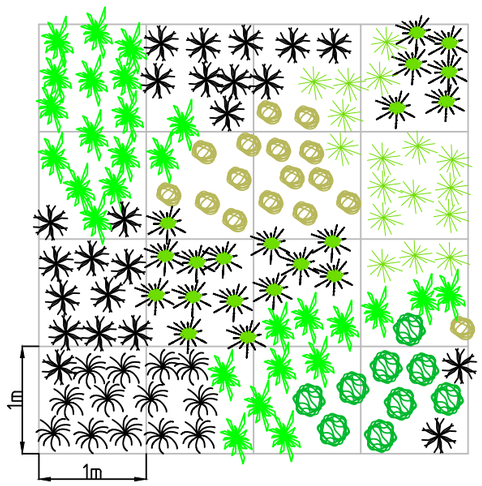
Species Name	Common Name	Pot Size	Bioretention floor - 550m²			Ephemeral batter - 300m²		
			Density plants/m²	% Prop	QTY	Density plants/m²	% Prop	QTY
*Carex appressa***	Tall Sedge	Tube	8	15%	672	8	15%	354
Dianella caerulea	Blue Flax-lily	Tube	8	10%	448	8	10%	236
Ficinia nodosa	Knobby Club-rush	Tube	8	10%	448	8	10%	236
Juncus usitatus		Tube	8	10%	448	8	10%	236
Imperata cylindrica	Blady Grass	Tube	8	25%	1120	8	25%	590
Lomandra longifolia	Spiny-headed Mat-rush	Tube	8	10%	448	8	10%	236
Poa sieberiana		Tube	8	10%	448	8	10%	236
Melaleuca quinquenervia	Broad-leaved Paperbark	200mm				N/A	N/A	16
Melaleuca styphelioides	Prickley Leaved Paperbark	200mm				N/A	N/A	11
Themeda triandra	Kangaroo Grass	Tube	8	10%	448	8	10%	236
		TOTAL		100%	4480		85%	2387

Refer to planting matrix for distribution

No shrubs to be planted in bio filtration basin. Shrub species to planted on batter as indicated on sheet 03

**Carex appressa concentrate along bottom of ephemeral batter

Plant stock in clumps of 5 - 10 of the same species



DETAIL 1 - BIORETENTION PLANTING MOSAIC

SPECIES LEGEND

- *Carex appressa* - Tall Sedge
- *Dianella caerulea* - Blue Flax - Lilly
- *Ficinia nodosa* - Knobby Club Rush
- *Juncus usitatus* - Common Rush
- *Lomandra longifolia* - Mat rush
- *Poa sieberiana* - Grey Tussock Grass
- *Themeda australis* - Kangaroo Grass

NOTE:
BIORETENTION BASIN FLOOR CAN BE PLANTED ONCE A MINIMUM OF 80% OF CONSTRUCTION WITHIN CATCHMENT IS COMPLETED.

PLANT INTERNAL BIORETENTION BATTER IN INITIAL PLANTING TO PROGRESS ESTABLISHMENT OF VEGETATION

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PROJECT
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GREEN CORRIDOR
GLENMORE PARK

SCALE
1:200 @ A3 0 5 10m

DRAWING
DOWNSTREAM RAINGARDEN
PLANTING PLAN

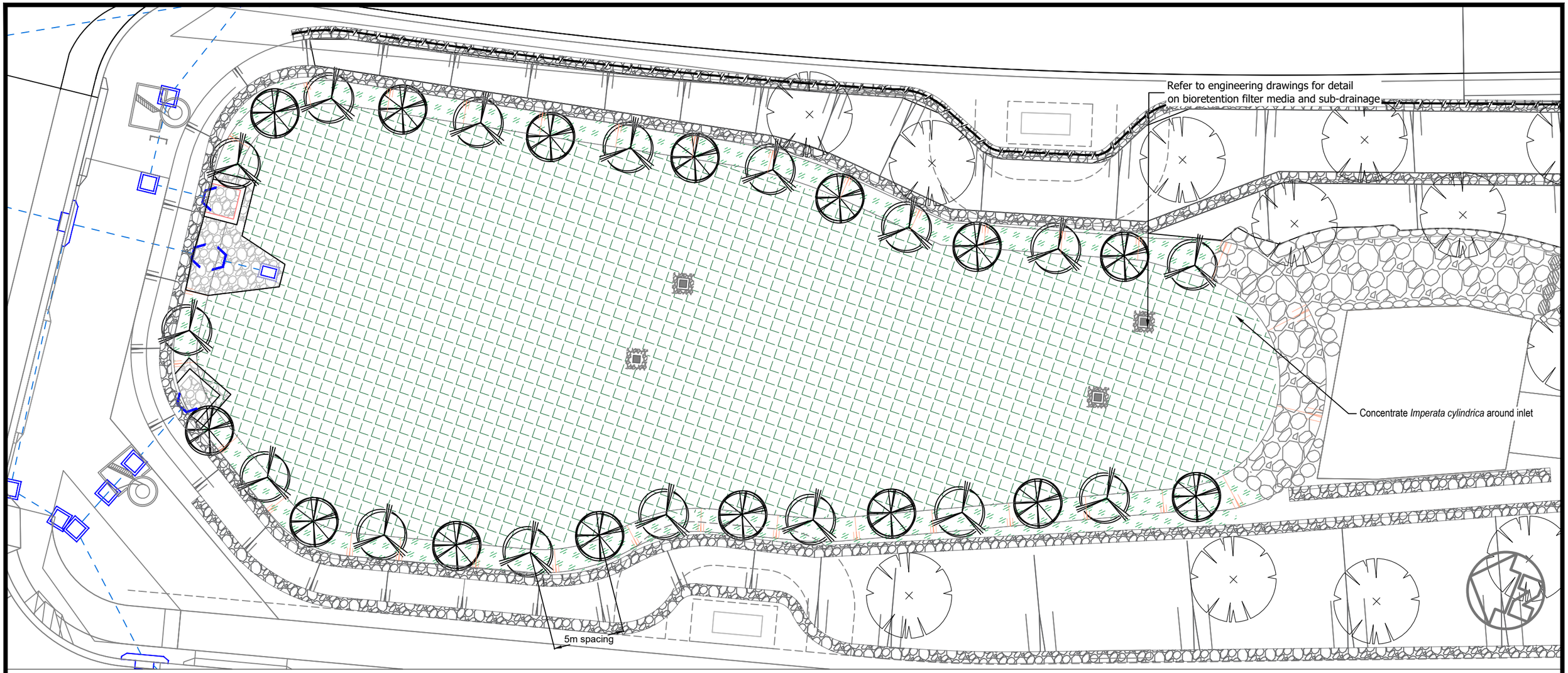
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REV.
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BIORETENTION PLANTING ZONES

Bioretention Batter
Area = 244m²

Bioretention Floor
Area = 1420m²

Melaleuca quinquenervia
Quantities = 16

Melaleuca styphelioides
Quantities = 15

NOTE:
REFER SHEET O2 FOR BIO RETENTION PLANTING MATRIX

NOTE:
BIORETENTION BASIN FLOOR CAN BE PLANTED ONCE A MINIMUM OF 80% OF CONSTRUCTION WITHIN CATCHMENT IS COMPLETED.

PLANT INTERNAL BIORETENTION BATTER IN INITIAL PLANTING TO PROGRESS ESTABLISHMENT OF VEGETATION

UPSTREAM BIORETENTION BASIN PLANTING SCHEDULE

Species Name	Common Name	Pot Size	Bioretention floor - 1420m²			Ephemeral batter - 244m²		
			Density plants/m²	% Prop	QTY	Density plants/m²	% Prop	QTY
*Carex appressa***	Tall Sedge	Tube	8	15%	1696	8	15%	293
Dianella caerulea	Blue Flax-lily	Tube	8	10%	1130	8	10%	195
Ficinia nodosa	Knobby Club-rush	Tube	8	10%	1130	8	10%	195
Juncus usitatus		Tube	8	10%	1130	8	10%	195
Imperata cylindrica	Blady Grass	Tube	8	25%	2826	8	25%	488
Lomandra longifolia	Spiny-headed Mat-rush	Tube	8	10%	1130	8	10%	195
Poa sieberiana		Tube	8	10%	1130	8	10%	195
Melaleuca quinquenervia	Broad-leaved Paperbark	200mm				Na	Na	16
Melaleuca styphelioides	Prickley Leaved Paperbark	200mm				NA	Na	15
Themeda triandra	Kangaroo Grass	Tube	8	10%	1130	8	10%	195
		TOTAL		100%	11304		85%	1983

Refer to planting matrix for distribution
No shrubs to be planted in bio filtration basin. Shrub species to planted on batter as indicated on sheet 05
**Carex appressa concentrate along bottom of ephemeral batter
Plant stock in clumps of 5 - 10 of the same species

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PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
UPSTREAM RAINGARDEN
PLANTING PLAN

DWG No. 3-17857A_DD_06
CAD FILE No. 3-17857_Highland_DD.dwg
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SCALE 1:200 @ A3 (0 5 10m)
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ZONE 1 - TERRESTRIAL PLANTING SCHEDULE = 2162m²				
Species Name	**Common Name**	**Plant /m²**	**% Prop**	**QTY**
Tree Canopy Species (>6m)				
Angophora floribunda	Rough-barked apple	4	2.0%	173
Angophora subvelutina	Broad leaved Apple	4	2.0%	173
Casuarina glauca	Swamp Oak	4	1.0%	86
Eucalyptus amplifolia	Cabbage Gum	4	1.0%	86
Eucalptus crebra	Narrow-leaved Ironbark	4	1.0%	86
Eucalyptus moluccana	Grey Box	4	2.0%	173
Eucalyptus tereticornis	Forest Red Gum	4	1.0%	86
Small Tree / Shrub Species (0.5 - 6m)				
Acacia parramattensis	Parramatta Wattle	4	5%	432
Acacia decurrens	Black Wattle	4	3%	259
Bursaria spinosa	Blackthorn	4	4%	346
Leptospermum trinervium	Flaky-barked Tea-tree	4	2%	173
Leptospermum polygalifolium	Tantoon	4	2%	173
Indogofera australis	Astral Indigo	4	2%	173
Melaleuca decora	na	4	2%	173
Melaleuca linariifolia	Flax-leaved Paperbark	4	2%	173
Melaleuca styphelioides	Prickly-leaved Tea Tree	4	2%	173
Ozothamnus diosmifolius	Sago Bush	4	2%	173
Pultenaea villosa	Hairy Bush-pea	4	2%	173
Rubus rosifolium	West Indian Raspberry	4	2%	173
Sedges, Rushes, Reeds and Grasses				
Cymbopogon refractus	Barbed Wire Grass	4	4%	346
Dichelachne micrantha	Shorthair Plumegrass	4	4%	346
Echinopogon caespitosus	Bushy Hedgehog-grass	4	4%	346
Entolasia marginata	Bordered Panic	4	4%	346
Entolasia stricta	Wiry Panic	4	4%	346
Imperata cylindrica	Blady Grass	4	4%	346
Lomandra longifolia	Spiny-headed Mat-rush	4	4%	346
Microlaena stipoides	Weeping Grass	4	4%	346
Paspalidium distans	Shot Grass	4	4%	346
Themeda triandra	Kangaroo Grass	4	4%	346
Ground Layer Species (0 - 1.5m) Vines and Scramblers				
Aristida vagans	Threeawn Speargrass	4	1%	86
Cayratia clematidea	Native Grape	4	1%	86
Centella asiatica	Indian Pennywort	4	1%	86
Clematis aristata	Old Man's Beard	4	1%	86
Clematis glycinoides	Headache Vine	4	1%	86
Commelina cyanea	Scurvy weed	4	1%	86
Danthonia setacea	Bristly Wallaby-grass	4	2%	173
Desmodium varians	Slender Tic-trefoil	4	1%	86
Dianella longifolia	Spreading Flax	4	2%	173
Dichelachne micrantha	Short Hair Plum Grass	4	1%	86
Dichondra repens	Kidney Weed	4	1%	86
Dipodium punctatum	Blotched Hyacinth-orchid	4	1%	86
Goodenia hederacea	Forest Goodenia	4	1%	86
Einadia hastata	Berry Saltbush	4	1%	86
Einadia trigonos	Fishweed	4	0.05%	4
Entolasia stricta	Wiry Panic	4	0.05%	4
Opercularia diphylla	Stink Weed	4	0.05%	4
Pimelea curviflora	Curved Rice-flower	4	3.00%	259
Opercularia diphylla	na	4	0.05%	4
Persicaria decipiens	Slender Knotweed	4	0.05%	4
Rubus parvifolius	Native Raspberry	4	0.05%	4
Solanum prinophyllum	Forest Nightshade	4	0.05%	4
Wahlenberia gracilis	Australian Bluebell	4	1.00%	86
	Total		100%	8678
1 tree every 10m2, 1 shrubs every 5m				
All plants to be tube stock				

ZONE 2 - FEATURE SHRUBS PLANTING - SCHEDULE = 444m²					
Species Name	**Common Name**	**Type**	**Plant/ m²**	**% Prop**	**QTY**
Dianella longifolia	Spreading Flax	G	5	9%	200
Dichondra repens	Kidney Weed	G	5	7%	155
Einadia hastata	Berry Saltbush	G	5	5%	111
Goodenia hederacea	Forest Goodenia	G	5	3%	67
Grevillea juniperina	Grevillea juniperina Prostrate	S	5	4%	89
Einadia hastata	Berry Saltbush	G	5	6%	133
Indogofera australis	Astral Indigo	S	5	4%	89
Imperata cylindrica	Blady Grass	G	5	8%	178
Leptospermum polygalifolium	Tantoon	S	5	4%	89
Lomandra longifolia	Spiny-headed Mat-rush	G	5	8%	178
Pimelea curviflora	Curved Rice-flower	G	5	8%	178
Microlaena stipoides	Weeping Grass	G	5	8%	178
Ozothamnus diosmifolius	Sago Bush	S	5	4%	89
Pultenaea villosa	Hairy Bush-pea	S	5	4%	89
Themeda triandra	Kangaroo Grass	G	5	6%	133
Wahlenberia gracilis	Australian Bluebell	G	5	6%	133
Scaevola albida	white fan flowers	G	5	6%	133
	TOTAL			100%	2220
Plant 1 shrub per m2 with remaining plants grasses and groundcovers					
Plant in drifts of same species. 5 - 15 plants and alternate					

ZONE 3- SWALE PLANTING SCHEDULE = 432m²					
Species Name	**Common Name**	**Type**	**Plant/ m²**	**% Prop**	**QTY**
Bolboschoenus caldwellii*	Club-rush	G	4	20%	346
Carex appressa	Tall Sedge	G	4	25%	432
Imperata cylindrica	Blady Grass	G	4	30%	518
Juncus usitatus	Common rush	G	4	25%	432
Lomandra longifolia	Spiny-headed Mat-rush	G	4	20%	346
	TOTAL			100%	1728
* Plant in wet location along swale					

Zone 4 - GROUND COVER PLANTING MIX 1 - SCHEDULE = 158m²					
Species Name	**Common Name**	**Type**	**Plant/ m²**	**% Prop**	**QTY**
Clematis aristata	Old Man's Beard	G	6	5%	47
Dianella longifolia	Spreading Flax	G	6	15%	142
Dichondra repens	Kidney Weed	G	6	5%	47
Goodenia hederacea	Forest Goodenia	G	6	10%	95
Einadia hastata	Berry Saltbush	G	6	15%	142
Pimelea curviflora	Curved Rice-flower	G	6	15%	142
Wahlenberia gracilis	Australian Bluebell	G	6	10%	95
Scaevola albida	white fan flowers	G	6	15%	142
		G	6	10%	95
	TOTAL			100%	948
Plant in drifts of same species. 5 - 15 plants and alternate					

ZONE 5 - SHOULDER PLANTING MIX 1 - SCHEDULE = 281m²					
Species Name	**Common Name**	**Type**	**Plant/**	**% Prop**	**QTY**
*Austrostipa ramosissima**	Stout Bamboo Grass	G	6	5%	84
Carex appressa	Tall Sedge	G	6	15%	253
Dichelachne micrantha	Shorthair Plumegrass	G	6	5%	84
Einadia hastata	Berry Saltbush	G	6	10%	169
Imperata cylindrica	Blady Grass	G	6	15%	253
Lomandra longifolia *	Spiny-headed Mat-rush	G	6	15%	253
Microlaena stipoides	Weeping Grass	G	6	10%	169
Poa sieberiana		G	6	15%	253
Themeda triandra	Kangaroo Grass	G	6	10%	169
	TOTAL			100%	1686
* Plant at back of strip away from footpath					

ZONE 6 - SHOULDER PLANTING MIX 2 - SCHEDULE = 128m²					
Species Name	**Common Name**	**Type**	**Plant/**	**% Prop**	**QTY**
Chrysocephalum apiculatum	Yellow Buttons	G	6	15%	115
Dianella longifolia	Spreading Flax	G	6	25%	192
Dichondra repens	Kidney Weed	G	6	15%	115
Dichopogon fimbriatus	Chocolate lily	G	6	10%	77
Scaevola albida	white fan flowers	G	6	20%	154
Viola betonicifolia	Mountain violet	G	6	15%	115
	TOTAL			100%	768
* Plant at back of strip away from footpath					

PARK FEATURE TREES					
Code	**Species Name**	**Common Name**	**Density**	**Pot size**	**QTY**
AF	*Angophora floribunda*	Rough-barked apple	NA	100L	8
EA	*Eucalyptus amplifolia*	Cabbage Gum	NA	100L	6
EM	Eucalyptus moluccana	Grey Box	NA	100L	5
ET	Eucalyptus tereticornis	Forest Red Gum	NA	100L	5
				Total	24
Refer Scott Carve Landscape Package #20150139 for final locations					

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SCALE

DRAWING
DOWNSTREAM RIPARIAN CORRIDOR
PLANTING SCHEDULE

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TERRESTRIAL PLANTING SCHEDULE = 1324m²				
Species Name	**Common Name**	**Plant /m²**	**% Prop**	**QTY**
Tree Canopy Species (>6m)				
Refer feature trees for quantities. Tree locations have been positioned minimum 2.5m from proposed retaining walls				
Small Tree / Shrub Species (0.5 - 6m)				
Acacia parramattensis	Parramatta Wattle	4	5%	265
Acacia decurrens	Black Wattle	4	3%	159
Bursaria spinosa	Blackthorn	4	4%	212
Leptospermum trinervium	Flaky-barked Tea-tree	4	2%	106
Leptospermum polygalifolium	Tantoon	4	2%	106
Indogofera australis	Astral Indigo	4	2%	106
Melaleuca decora	na	4	2%	106
Melaleuca linariifolia	Flax-leaved Paperbark	4	2%	106
Melaleuca styphelioides	Prickly-leaved Tea Tree	4	2%	106
Ozothamnus diosmifolius	Sago Bush	4	2%	106
Pultenaea villosa	Hairy Bush-pea	4	2%	106
Rubus rosifolium	West Indian Raspberry	4	2%	106
Sedges, Rushes, Reeds and Grasses				
Cymbopogon refractus	Barbed Wire Grass	4	5%	265
Dichelachne micrantha	Shorthair Plumegrass	4	5%	265
Echinopogon caespitosus	Bushy Hedgehog-grass	4	5%	265
Entolasia marginata	Bordered Panic	4	5%	265
Entolasia stricta	Wiry Panic	4	5%	265
Imperata cylindrica	Blady Grass	4	5%	265
Lomandra longifolia	Spiny-headed Mat-rush	4	5%	265
Microlaena stipoides	Weeping Grass	4	5%	265
Paspalidium distans	Shot Grass	4	5%	265
Themeda triandra	Kangaroo Grass	4	5%	265
Ground Layer Species (0 - 1.5m) Vines and Scramblers				
Aristida vagans	Threeawn Speargrass	4	2%	106
Cayratia clematidea	Native Grape	4	2%	106
Centella asiatica	Indian Pennywort	4	2%	106
Clematis aristata	Old Man's Beard	4	2%	106
Clematis glycinoides	Headache Vine	4	2%	106
Commelina cyanea	Scurvy weed	4	2%	106
Danthonia setacea	Bristly Wallaby-grass	4	1%	53
Desmodium varians	Slender Tic-trefoil	4	2%	106
Dianella longifolia	Spreading Flax	4	1%	53
Dichelachne micrantha	Short Hair Plum Grass	4	1%	53
Dichondra repens	Kidney Weed	4	2%	106
Dipodium punctatum	Blotched Hyacinth-orchid	4	1%	53
Goodenia hederacea	Forest Goodenia	4	1%	53
Einadia hastata	Berry Saltbush	4	1%	53
Einadia trigonos	Fishweed	4	0.05%	3
Entolasia stricta	Wiry Panic	4	0.05%	3
Opercularia diphylla	Stink Weed	4	0.05%	3
Pimelea curviflora	Curved Rice-flower	4	0.05%	3
Opercularia diphylla	na	4	0.05%	3
Persicaria decipiens	Slender Knotweed	4	0.05%	3
Rubus parvifolius	Native Raspberry	4	0.05%	3
Solanum prinophyllum	Forest Nightshade	4	0.05%	3
Wahlenberia gracilis	Australian Bluebell	4	0.05%	3
		Total	100%	5211
Species Proportion - Grasses/Groundcovers 55%, Shrubs 30%, Trees 15%				
All plants to be tube stock				

ZONE 2 - FEATURE SHRUBS PLANTING - SCHEDULE = 444m²					
Species Name	**Common Name**	**Type**	**Plant/ m²**	**% Prop**	**QTY**
Dianella longifolia	Spreading Flax	G	5	9%	7
Dichondra repens	Kidney Weed	G	5	7%	6
Einadia hastata	Berry Saltbush	G	5	5%	4
Goodenia hederacea	Forest Goodenia	G	5	3%	2
Grevillea juniperina	Grevillea juniperina Prostra	S	5	4%	3
Einadia hastata	Berry Saltbush	G	5	6%	5
Indogofera australis	Astral Indigo	S	5	4%	3
Imperata cylindrica	Blady Grass	G	5	8%	6
Leptospermum polygalifolium	Tantoon	S	5	4%	3
Lomandra longifolia	Spiny-headed Mat-rush	G	5	8%	6
Pimelea curviflora	Curved Rice-flower	G	5	8%	6
Microlaena stipoides	Weeping Grass	G	5	8%	6
Ozothamnus diosmifolius	Sago Bush	S	5	4%	3
Pultenaea villosa	Hairy Bush-pea	S	5	4%	3
Themeda triandra	Kangaroo Grass	G	5	6%	5
Wahlenberia gracilis	Australian Bluebell	G	5	6%	5
Scaevola albida	white fan flowers	G	5	6%	5
		TOTAL		100%	80
Plant 1 shrub per m2 with remaining plants grasses and groundcovers					
Plant in drifts of same species. 5 - 15 plants and alternate					

ZONE 5 - SHOULDER PLANTING SCHEDULE = 3080m²					
Species Name	**Common Name**	**Type**	**Plant /m²**	**% Prop**	**QTY**
*Austrostipa ramosissima**	Stout Bamboo Grass	G	6	5%	924
Carex appressa	Tall Sedge	G	6	15%	2772
Dichelachne micrantha	Shorthair Plumegrass	G	6	5%	924
Einadia hastata	Berry Saltbush	G	6	10%	1848
Imperata cylindrica	Blady Grass	G	6	15%	2772
*Lomandra longifolia**	Spiny-headed Mat-rush	G	6	15%	2772
Microlaena stipoides	Weeping Grass	G	6	10%	1848
Poa sieberiana		G	6	15%	2772
Themeda triandra	Kangaroo Grass	G	6	10%	1848
		TOTAL		100%	18480
* Plant at back of strip away from footpath.					
All plants to be tube stock					

ZONE 6 - SHOULDER PLANTING MIX 2 - SCHEDULE = 15m²					
Species Name	**Common Name**	**Type**	**Plant/ m²**	**% Prop**	**QTY**
Chrysocephalum apiculatum	Yellow Buttons	G	6	15%	14
Dianella longifolia	Spreading Flax	G	6	25%	24
Dichondra repens	Kidney Weed	G	6	15%	14
Dichopogon fimbriatus	Chocolate lily	G	6	10%	10
Scaevola albida	white fan flowers	G	6	20%	19
Viola betonicifolia	Mountain violet	G	6	15%	14
		TOTAL		100%	96

PARK FEATURE TREES					
Code	**Species Name**	**Common Name**	**Density /m²**	**Pot size**	**QTY**
AF	*Angophora floribunda*	Rough-barked apple	NA	100L	30
CG	*Casuarina glauca*	Swamp Oak	NA	100L	31
EA	*Eucalyptus amplifolia*	Cabbage Gum	NA	100L	14
EM	Eucalyptus moluccana	Grey Box	NA	100L	24
ET	Eucalyptus tereticornis	Forest Red Gum	NA	100L	21
				Total	120
Refer Scott Carve Landscape Package #20150139 for final locations					

ZONE 7 - NATIVE MEADOW PLANTING SCHEDULE = 4313m²			
Species Name	**Common Name**	**Kilogram**	**% Prop**
Arthropodium milleflorum	Pale Vanilla-lily	0.12	2%
Aristida vagans	Threeawn Speargrass	0.12	2%
Asperula conferta	Common Woodruff	0.12	2%
Bothriochloa macra	Red Grass	0.35	5%
Brunoniella australis	Blue Trumpet	0.12	2%
Capillipedium spicigerum	Scented-top Grass	0.12	2%
Cheilanthes sieberi	Mulga Fern	0.12	2%
Chloris ventricosa	Plump Windmill Grass	0.35	5%
Chloris truncata	Windmill Grass	0.50	2%
Chorizema parviflorum	Eastern Flame Pea	0.50	3%
Cotula australis	Common Cotula	0.12	2%
Cymbopogon refractus	Barbed Wire Grass	0.40	5%
Oxytes brachypoda	Large Tick-trefoil	0.40	1%
Desmodium varians	Slender Tick-trefoil	0.40	1%
Dichelachne micrantha	Shorthair Plumegrass	0.13	2%
Dichelachne parva		0.13	2%
Dichondra repens	Kidney Weed	0.11	2%
Arthropodium strictum	Chocolate Lily	0.10	2%
Arthropodium fimbriatum	Nodding Chocolate Lily	0.10	2%
Digitaria diffusa	Open Summer-grass	0.10	1%
Echinochloa colona	Awnless Barnyard Grass	0.10	2%
caespitosus	Tufted Hedgehog-grass	0.15	3%
Echinopogon ovatus	Forest Hedgehog Grass	0.15	3%
Einadia hastata	Berry Saltbush	0.10	2%
Einadia polygonoides		0.10	2%
Eragrostis brownii	Brown's Lovegrass	0.10	2%
Eragrostis leptostachya	Paddock Lovegrass	0.10	2%
Eremophila debilis	Winter Apple	0.10	2%
Geranium solanderi var. *solanderi*	Native Geranium	0.10	2%
Microlaena stipoides var. *stipoides*	Weeping Grass	0.20	4%
Panicum effusum	Hairy Panic	0.15	2%
Paspalidium distans		0.25	5%
Poa labillardieri var. labillardieri	Tussock	0.25	5%
Lobelia purpurascens	Whiteroot	0.10	2%
Sorghum leiocladum	Wild Sorghum	0.10	2%
Sporobolus creber	Slender Rat's Tail Grass	0.12	2%
Themeda triandra	Kangaroo Grass	0.30	5%
Tricoryne elatior	Yellow Autumn-lily	0.12	2%
Wahlenbergia stricta var. *stricta*	Tall Bluebell	0.20	2%
Wahlenbergia gracilis	Australian Bluebell	0.20	2%
	Total	7.4	100%
Broad acre seeding apply via direct seeding, sown at 25kg per hectare.			
Seed species ratio may differ according to availability			

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5	FOR APPROVAL	25.10.2021
6	FINAL	13.12.2021

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DRAWN SS
CHECKED JC

PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

SCALE

DRAWING
UPSTREAM RIPARIAN CORRIDOR
PLANTING SCHEDULE

DRAWING CREATED 18/07/2017

DWG No. 3-17857A_DD_08

CAD FILE No. 3-17857_Highland_DD.dwg

REV. 6

Document Set ID: 9[illegible]
Version: 1, Version Date: 27/02/2022

VEGETATION MANAGEMENT PLAN :
METHODOLOGY, TREATMENTS AND PERFORMANCE CRITERIA OF RIPARIAN CORRIDOR WITH VEGETATION MANAGEMENT PLAN SUPERSEDE THESE NOTES REFER 3-17857_HIGHLAND_VIEWS_VMP_REV_G

GENERAL NOTES

Witness points

Give sufficient notice so that inspection may be made at the following stages:

- Prior to weed control commencing
- Sub-grades cultivated or prepared for placing topsoil.
- Planting area set out
- Completion of planting establishment work
- Provide evidence of plant provenance

WEED CONTROL

Only contractors that are experienced and trained in plant identification and weed removal techniques shall be employed to remove vegetation and weeds

Juncus acutus

The predominant weed in this area is Juncus acutus (Spiny Rush). This species should be controlled by slashing to remove sharp points and seed head and then spraying with a non-specific herbicide formulated for use around water (eg. Roundup Biactive).

Mechanical removal may be considered for dense clumps.

SOIL PREPARATION

All top soil is to be stock piled and reused on site to cover exposed sup soils in bulk earthworks phase.

Rehabilitation Zones (Terrestrial)

Due to the high compaction of soil in the bulk earthworks phase all areas are required to be ripped at a minimum depths of 200mm.

Care must be taken around existing trees and underground services when ripping.

Conduct soil testing and ameliorate according to results from a NATA certified laboratory, adding organic matter and gypsum to soil where required.

Bioretention Basin / Batter

Basin Floor- Refer to engineering drawing for filter media specifications.

Basin batters - Top dress with 200mm of ameliorated site soil.

MULCH

Terrestrial

- Mulch Terrestrial zone with native hardwood woodchip 100mm depth.
- Mulch must be free of weeds or seed. If this is not enforced, weed control will most certainly become a problem in the maintenance period.
- Dish out mulch away from plant stems. Refer Detail 1 sheet 07.

Bioretention floor

- No much required

Swale / Bioretention batters

- Jute mat to be minimum 680gsm (e.g. maxjute-thick) and installed in accordance with manufacturers specifications.
- Cut slits into mat for plant installation. Refer to Sheet 02.

PLANTING NOTES

Pre-ordering

The contractor shall be responsible for ensuring that all plant material is available to sizes and species type nominated in the plant schedules.

For specimens in large quantities this will require the preordering and growing on of species by a selected nursery for an extensive period of time prior to their installation. Proposed pre ordered specimens are to be sourced and approved in consultation with the project Landscape Architect. No substitution of species or sizes will be accepted unless given in writing by the Landscape Architect or Site Superintendent.

Plants Species / provenance

Plant species - refer to table.

Final plant schedule is dependant on availability of species.

General: Provide provenance plants with the following characteristics:

- Large healthy root systems, with no evidence of root curl, restriction or damage.
- Vigorous, well established, free from disease and pests, of good form consistent with the species or variety.
- Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site.

Replacement: Replace damaged or failed plants with plants of the same type and size.

Plant containers

General: Supply plants in weed-free containers of the required size.

Labeling

Label at least one plant of each species or variety in a batch with a durable, readable tag.

Storage

Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

Locations

Final locations to be set out in on site to the satisfaction of the Superintendent. If it appears necessary to vary plant locations and spacing's to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

Planting conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Placing

Plants are to be installed as indicated in the drawings. Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil.

Fertilising and Water Crystals

Install slow release fertiliser in all terrestrial and bioretention basin plantings, place fertiliser pellets into the plant hole at the time of planting. Install water crystals with the fertiliser as per manufacturers recommendation.

See Deatil 1 sheet 01

Application rate (kg/ha): as recommended by manufacturer.

Backfilling

Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure that topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.

Watering

Depending on weather conditions installation of a temporary irrigation systems may be required in order to maintain plant health.

An allowance of 40mm per plant per week should be made in the absence of rainfall.

MAINTENANCE

Establishment Period (EP) -The Ep will begin from the Practical Completion of the landscape works for the period of 12 weeks.

Maintenance Period (MP) - Maintenance is to continue for a period of three years or until the following performance criteria can be demonstrated to be achieved:

Performance Criteria

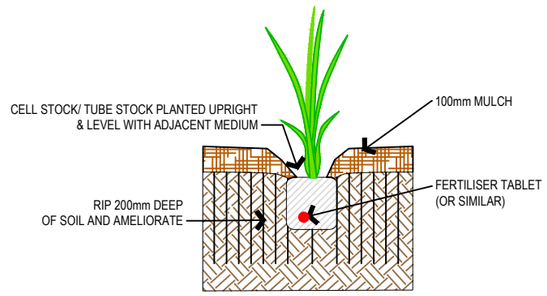
A minimum of 80% survival rate of the densities provided above for each strata (e.g. tree, shrub and groundcover), any localised plant failure within planting areas are addressed with no area larger than 2 m x 2 m without surviving plants at the end of each year. There must be maximum 5% weeds or less within the project extents.

REPORTING

DPI Approval, Section 22 requires the approval holder to provide a report on the implementation of the prescriptions detailed in the vegetation management plan (Ecological, 2016). This report is to include:

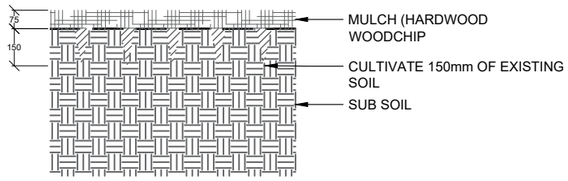
- a schedule and map showing location, density and planting date of species planted
- percentage cover (natives and weed species)
- problems encountered with establishment
- details of staged activities
- photographs

A report is to be provided at the completion of the revegetation works and at every twelve months up to the end of the maintenance period.

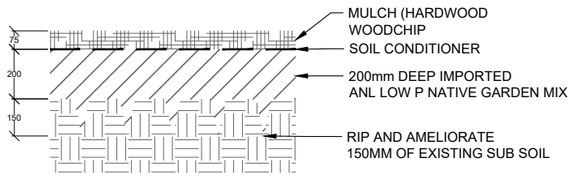


DETAIL 1 - TYPICAL PLANTING DETAIL (NTS)

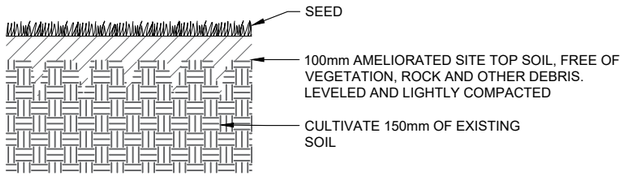
Areas of Jute matting do not require mulch



DETAIL 3 - SOIL PREPARATION - EXISTING SURFACE (NTS)



DETAIL 4 - SOIL PREPARATION - SURFACE IN CUT (NTS)



DETAIL 5 - SOIL PREPARATION - NATIVE MEDOW (NTS)

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4	FOR APPROVAL	19.04.2021
5	FOR APPROVAL	25.10.2021
6	FINAL	13.12.2021

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PROJECT: HIGHLAND VIEWS GREEN CORRIDOR GLENMORE PARK

DRAWING: PLANTING NOTE & SCHEDULE

DWG No. 3-17857A_DD_09

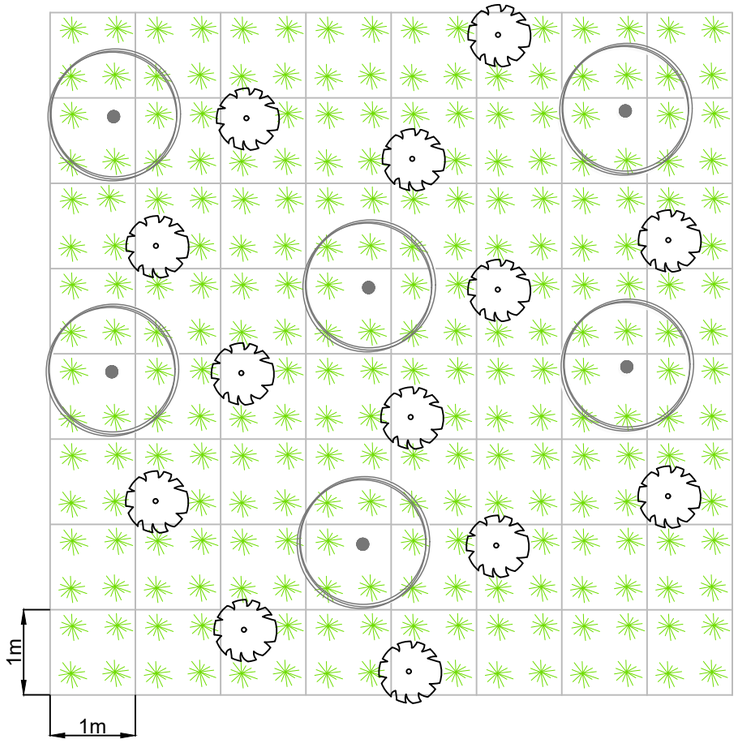
CAD FILE No. 3-17857_Highland_DD.dwg

SCALE

DRAWING CREATED 18/07/2017

REV. 6

Document Set ID: 9[illegible]
Version: 1, Version Date: 21/02/2022



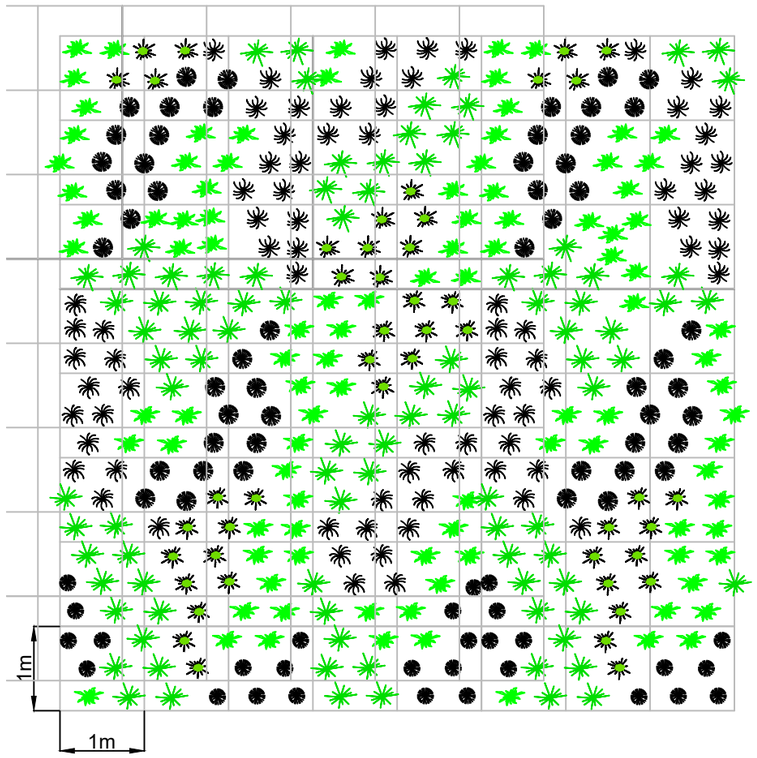
SPECIES LEGEND

GRASS/GROUNDCOVER - 4/m²

SHRUB - 1/5m²

TREE - 1/10m²

DETAIL 1 - TERRESTRIAL PLANTING MATRIX (NTS)

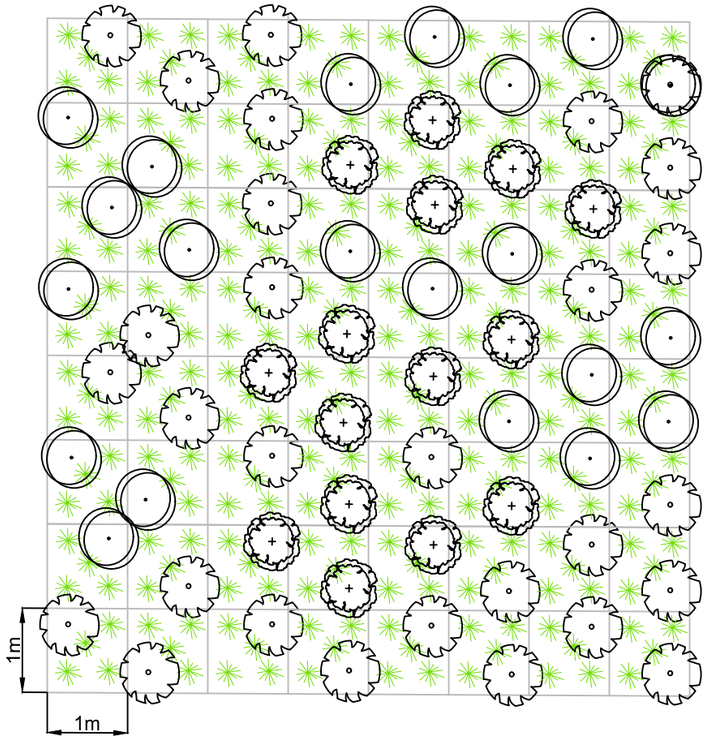


SPECIES LEGEND

GRASS/GROUNDCOVER - 6/m²

DETAIL 2 - ZONES 4 - 6 PLANTING MATRIX (NTS)

Plant in drifts of same species. 5 - 15 plants and alternate



SPECIES LEGEND

GRASS/GROUNDCOVER - 4/m²

SHRUB - 1/1m²

DETAIL 3 - ZONE 2 FEATURE SHRUBS PLANTING MATRIX (NTS)

Plant shrubs in groups of odd numbers of the same variety. 2, 5 or 7

DETAIL 2 - TERRESTRIAL PLANTING MATRIX (NTS)

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DESIGNED SS

DRAWN SS

CHECKED JC

PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

SCALE

DRAWING
PLANTING MATRIX AND DETAILS

DRAWING CREATED 18/07/2017

DWG No. 3-17857A_DD_10

CAD FILE No. 3-17857_Highland_DD.dwg

REV. 6

Document Set ID: 9[illegible]
Version: 1, Version Date: 21/02/2022

Appendix E - Green Corridor Planting Plans

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

HIGHLAND VIEWS
GREEN CORRIDOR REHABILITATION PLANS

REV 4 **19/04/21** **FOR APPROVAL**

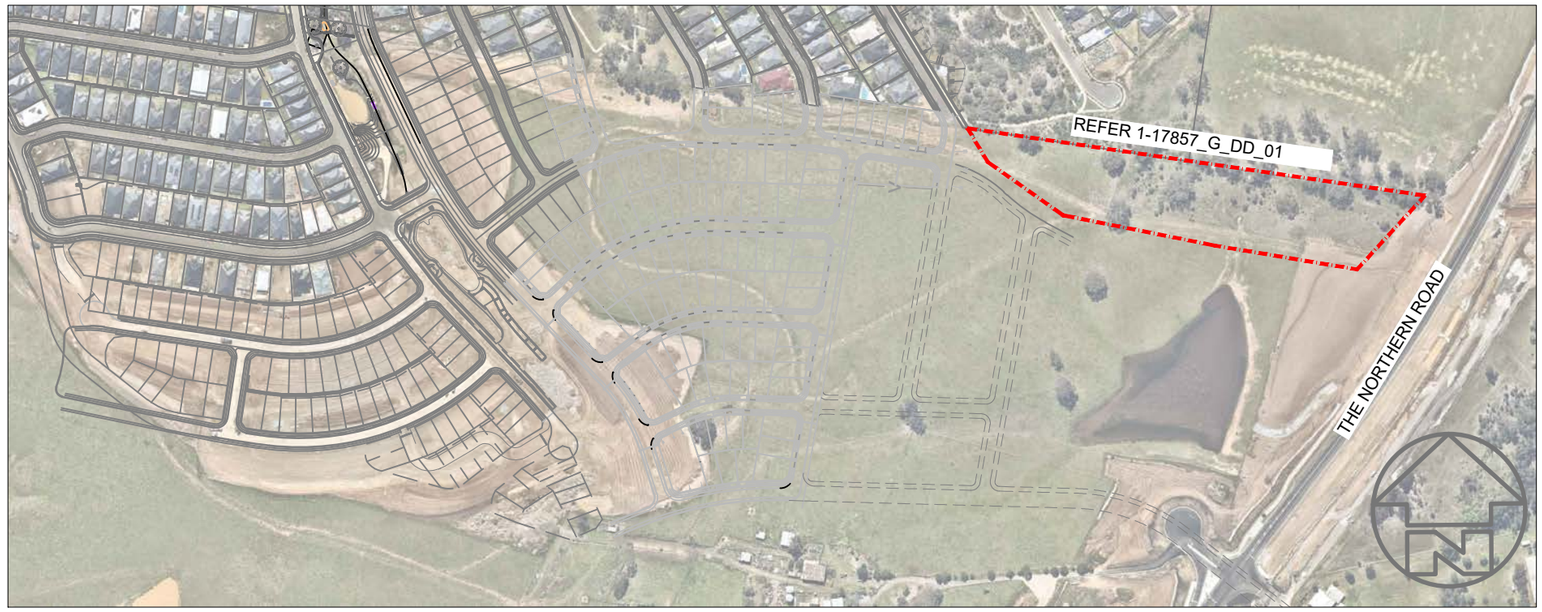
CLIENT:

CCL DEVELOPMENT PTY LTD
MANAGEMENT AND DEVELOPMENT

DRAWING LIST

AWC 3 - 17857_G_00 - LOCALITY PLAN & DRAWING INDEX
AWC 3 -17857_G_01 - PLANTING PLAN 01
AWC 3 -17857_G_02 - PLANTING PLAN 02
AWC 3 -17857_G_03 - PLANTING SCHEDULE

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LOCALITY PLAN - NTS

Document Set ID: 9861750
Version: 1, Version Date: 27/02/2022

Rehabilitation works are currently underway as part of the Bradely Heights Riparian Restoration

Approximate extent of corridor

ADJOINS SHEET 02

TREATMENT ZONES

REHABILITATION PLANTING 1/2m²
Area = 13346m²

ASSISTED NATURAL REGENERATION
Area = 7185m²

Existing Trees

APPROXIMATE REHABILITATION AREA

VEGETATION MANAGMENT PLAN :

REFER 3-17857_HIGHLAND_VIEWS_VMP_REV for Methodology and treatments for the rehabilitation of Highland Views Green Corridor, as part of the greater Biodiversity Corridor is currently produced by AWC.

The VMP is required under Annexure D of the the Voluntary Planning Agreement (VPA) between Penrith City Council and various property owners for the Highland Views subdivision. The VMP must also meet the specifications in the Penrith Development Control Plan (DCP) 2006.

The aim of the VMP is to prescribe strategic actions for the restoration of vegetation in the biodiversity corridor in the northeast of the site to comply with relevant requirements of Penrith DCP. The VMP shall be the primary document to guide restoration of the site and be used as the basis for any contractors completing environmental works.

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4	FOR APPROVAL	19.04.2021

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PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
PLANTING PLAN 01

DWG No. 3-17857_G_DD_01

CAD FILE No. 3-17857_Highland_DD.dwg

REV. 3

SCALE 1:500 @ A3

0 10 20m

DRAWING CREATED 18/07/2017

Document Set ID: 9084750
Version: 1, Version Date: 21/02/2022

ADJOINS SHEET 01

Approximate extent of corridor

TREATMENT ZONES

REHABILITATION PLANTING 1/2m²
Refer to sheet 01 for area

ASSISTED NATURAL REGENERATION
Refer to sheet 01 for area

Existing Trees
Protect roots when conducting soil preparation

APPROXIMATE REHABILITATION AREA

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DRAWN SS
CHECKED JC

PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
PLANTING PLAN 02

DWG No. 3-17857_G_DD_02
CAD FILE No. 3-17857_Highland_DD.dwg
REV. 3

SCALE 1:500 @ A3
0 10 20m

DRAWING CREATED 18/07/2017

Document Set ID: 9084750
Version: 1, Version Date: 21/02/2022

GREEN CORRIDOR REHABILITATION AREA = 13346m²				
Species Name	**Common Name**	**Density /m²**	**% Prop**	**QTY**
Tree Canopy Species (>6m)				
Angophora floribunda	Rough-barked apple	0.5	3%	200
Eucalptus crebra	Narrow-leaved Ironbark	0.5	4%	267
Eucalyptus moluccana	Grey Box	0.5	3%	200
Eucalyptus tereticomis	Forest Red Gum	0.5	5%	334
Small Tree / Shrub Species (0.5 - 6m)				
Acacia parramattensis	Parramatta Wattle	0.5	9%	601
Acacia decurrens	Black Wattle	0.5	7%	467
Bursaria spinosa	Blackthorn	0.5	7%	467
Exocarpos cupressiformis	Native cherry	0.5	7%	467
Sedges, Rushes, Reeds and Grasses				
Cymbopogon refractus	Barbed Wire Grass	4	4%	2135
Dichelachne micrantha	Shorthair Plumegrass	4	4%	2135
Echinopogon caespitosus	Bushy Hedgehog-grass	4	4%	2135
Entolasia marginata	Bordered Panic	4	4%	2135
Entolasia stricta	Wiry Panic	4	4%	2135
Imperata cylindrica	Blady Grass	4	4%	2135
Lomandra filiformis	Wattle Mat-rush	4	4%	2135
Microlaena stipoides	Weeping Grass	4	4%	2135
Paspalidium distans		4	4%	2135
Themeda triandra	Kangaroo Grass	4	4%	2135
Ground Layer Species (0 - 1.5m) Vines and Scramblers				
Centella asiatica	Indian Pennywort	2	3%	801
Clematis glycinoides	Headache Vine	2	2%	534
Einadia hastata	Berry Saltbush	2	2%	534
Einadia trigonos	Fishweed	2	2%	534
Opercularia diphylla		2	2%	534
Rubus parvifolius	Native Raspberry	2	2%	534
Solanum prinophyllum	Forest Nightshade	2	2%	534
	Sub Total			28358
Species Proportion - Grasses/Groundcovers 55%, Shrubs 30%, Trees 15%				
All plants to be tube stock				

VEGETATION MANAGEMENT PLAN :
METHODOLOGY, TREATMENTS AND PERFORMANCE CRITERIA OF RIPARIAN CORRIDOR.
REFER 3-17857_HIGHLAND_VIEWS_VMP_REV_A

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4	FOR APPROVAL	19.04.2021

DESIGNED SS
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CHECKED JC

PROJECT
HIGHLAND VIEWS
GREEN CORRIDOR
GLENMORE PARK

DRAWING
PLANTING SCHEDULE

DWG No. 3-17857_G_DD_03
CAD FILE No. 3-17857_Highland_DD.dwg
REV. 3

SCALE

DRAWING CREATED 18/07/2017

Document Set ID: 9[illegible]
Version: 1, Version Date: 27/02/2022

Appendix F – Basin E Planting Plans

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022



LOCALITY PLAN
SCALE NTS

AA
01
BUND RE-PROFILE SECTION
SCALE 1:10

TREATMENT ZONES

ZONE 1 - BIORETENTION BATTER (Complete Rehabilitation 4/m²)
Area = 511m²

ZONE 2 - BIORETENTION BATTER (Infill planting 2/m²)
Area = 220m²

FILL EXTENT

EXISTING TREES
Retain and protect

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8 GEORGES ST, BANGLOW NSW 2479
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CLIENT: CCL DEVELOPMENT

DRAWING: **PLANTING PLAN**

PROJECT: **BASIN E**
RECTIFICATION DRAWINGS
GLENMORE PARK, NSW, 2745

REV.	ISSUE / AMENDMENTS	DATE
A	*FOR APPROVAL*	*22.10.21*

DO NOT SCALE FROM PLANS, TO BE ADAPTED ON SITE BY CONTRACTOR & CONFIRMED BY THE PROJECT SUPERVISOR, SIZING, CALCULATIONS, STRUCTURES, & COMPACTION TO BE CONFIRMED BY ENGINEER OR SUITABLY QUALIFIED PERSONS. ENGINEERS CERTIFICATE BY OTHERS.

SCALE 0 5 10 REV. A

DESIGNED	SS	CAD FILE No. 3-211373.DWG
DRAWN	SS	
CHECKED	IC	DWG No. 3-211373_BASIN_E_01

Document Set ID: 9964750
Version: 1, Version Date: 27/02/2022

PLANTING ZONES

BIORETENTION BATTER - Complete rehabilitation 4/m²

Soil Amelioration

Due to the high compaction of soil in the bulk earthworks phase all areas are required to be ripped at a minimum depths of 200mm.

Conduct soil testing and ameliorate according to results from a NATA certified laboratory, adding organic matter and gypsum to soil where required.

Jute Matting

Install Jute Matting 750gsm with pre cut slits 6/m². Install as per manufacturers specification

ZONE 2 - BIORETENTION BATTER - Infill Planting 2/m²

Impact to existing vegetation is expected. 2/m² has been provided for infill planting between existing vegetation and fill bund.

Final location of plants to be determined by contractor.

PLANTING NOTES

Pre-ordering

The contractor shall be responsible for ensuring that all plant material is available to sizes and species type nominated in the plant schedules.

For specimens in large quantities this will require the preordering and growing on of species by a selected nursery for an extensive period of time prior to their installation. Proposed pre ordered specimens are to be sourced and approved in consultation with the project Landscape Architect. No substitution of species or sizes will be accepted unless given in writing by the Landscape Architect or Site Superintendent.

Plants Species / provenance

Plant species - refer to table.

Final plant schedule is dependant on availability of species.

General: Provide provenance plants with the following characteristics:

- Large healthy root systems, with no evidence of root curl, restriction or damage.
- Vigorous, well established, free from disease and pests, of good form consistent with the species or variety.
- Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site.

Replacement: Replace damaged or failed plants with plants of the same type and size.

Plant containers

General: Supply plants in weed-free containers of the required size.

Labeling

Label at least one plant of each species or variety in a batch with a durable, readable tag.

Storage

Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

Locations

Final locations to be set out in on site to the satisfaction of the Superintendent. If it appears necessary to vary plant locations and spacing's to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

Planting conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Placing

Plants are to be installed as indicated in the drawings. Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil.

Fertilising and Water Crystals

Install slow release fertiliser in each hole the time of planting. Install water crystals with the fertiliser as per manufacturers recommendation.

Application rate (kg/ha): as recommended by manufacturer.

Backfilling

Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure that topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.

Watering

Depending on weather conditions installation of a temporary irrigation systems may be required in order to maintain plant health.

An allowance of 40mm per plant per week should be made in the absence of rainfall.

MAINTENANCE

Establishment Period (EP) -The Ep will begin from the Practical Completion of the landscape works for the period of 12 weeks.

Maintenance Period (MP) - Maintenance is to continue for a period of 1 yr or until the following performance criteria can be demonstrated to be achieved:

Performance Criteria

A minimum of 80% survival rate of the densities provided above for each strata (e.g. tree, shrub and groundcover), any localised plant failure within planting areas are addressed. There must be maximum 5% weeds or less within the project extents.

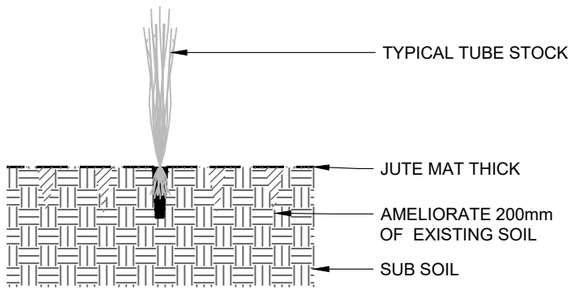
REPORTING

A progress report of works is required at the following points:

- Practical completion
- End of 12 week establishment period
- 6mth into 12mth maintenance period
- End of 12mth maintenance period

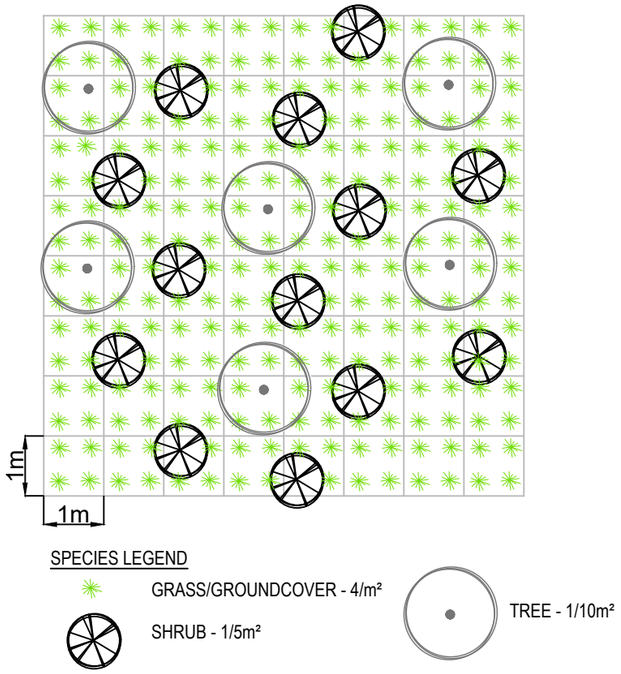
This report is to include:

- a schedule and map showing location, density and planting date of species planted
- percentage cover (natives and weed species)
- problems encountered with establishment
- details of staged activities
- photographs



DETAIL 1 - PLANTING & SOIL PREPARATION

ZONE 1 - BIORETENTION BATTER - COMPLETE REHABILITATION				AREA m2	511	
Species Name	**Common Name**	**Strata**	**Pot Size**	**Density plants/m²**	**% Prop**	**QTY**
Acacia parramattensis	Parramatta Wattle	Tree	Tube	4	1%	20
*Carex appressa**	Tall Sedge	Sedge	Tube	4	5%	102
Dianella caerulea	Blue Flax-lily	Groundcover	Tube	4	10%	204
Eucalyptus crebra	Narrow-leaved Ironbark	Tree	Tube	4	1%	20
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	4	1%	20
Ficinia nodosa	Knobby Club-rush	Sedge	Tube	4	10%	204
Hardenbergia violacea	Native Sarsparella	Ground cover	Tube	4	10%	204
Indigofera australis	Australian Indigo	Shrub	Tube	4	3%	61
Imperata cylindrica	Blady Grass	Grass	Tube	4	16%	327
Lomandra longifolia	Spiny-headed Mat-rush	Groundcover	Tube	4	14%	286
Melaleuca linariifolia	Flax-leaved Paperbark	Shrub	Tube	4	2%	41
Microlaena stipoides	Weeping Grass	Grass	Tube	4	13%	266
Themeda triandra	Kangaroo Grass	Grass	Tube	4	15%	307
			TOTAL		101%	2064
ZONE 2 - BIORETENTION BATTER - INFILL PLANTING				**AREA m2**	**220**	
Species Name	**Common Name**	**Strata**	**Pot Size**	**Density plants/m²**	**% Prop**	**QTY**
*Carex appressa**	Tall Sedge	Sedge	Tube	2	10%	44
Dianella caerulea	Blue Flax-lily	Groundcover	Tube	2	13%	57
Ficinia nodosa	Knobby Club-rush	Sedge	Tube	2	10%	44
Hardenbergia violacea	Native Sarsaparilla	Ground cover	Tube	2	15%	66
Imperata cylindrica	Blady Grass	Grass	Tube	2	13%	57
Lomandra longifolia	Spiny-headed Mat-rush	Groundcover	Tube	2	15%	66
Microlaena stipoides	Weeping Grass	Grass	Tube	2	12%	53
Themeda triandra	Kangaroo Grass	Grass	Tube	2	12%	53
			TOTAL		100%	440
Refer to planting matrix for distribution						
*Carex appressa concentrate along inside batter						
No Tree or shrubs to be planted in Zone 2 planting						



DETAIL 2 - PLANTING MATRIX

AWC
Australian Wetlands Consulting Pty Ltd
8 GEORGES ST, BANGLOW NSW 2479
P (02) 6685 5466 | 1300 998 514
www.awconsult.com.au

CLIENT: CCL DEVELOPMENT

DRAWING: **PLANTING NOTES**

PROJECT: **BASIN E**
RECTIFICATION DRAWINGS
GLENMORE PARK, NSW, 2745

REV.	ISSUE / AMENDMENTS	DATE
A	*FOR APPROVAL*	*22.10.21*

DO NOT SCALE FROM PLANS, TO BE ADAPTED ON SITE BY CONTRACTOR & CONFIRMED BY THE PROJECT SUPERVISOR, SIZING, CALCULATIONS, STRUCTURES, & COMPACTION TO BE CONFIRMED BY ENGINEER OR SUITABLY QUALIFIED PERSONS. ENGINEERS CERTIFICATE BY OTHERS.

SCALE

REV. **A**

DESIGNED	SS	CAD FILE No. **3-211373.DWG**
DRAWN	SS	DWG No. **3-211373_BASIN_E_02**
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Document Set ID: 9961750
Version: 1, Version Date: 27/02/2022

Appendix G – Costings

Surveyors Creek West (1.4 hectares)			
Task	**Cost/unit**	**Units**	**TOTAL**
Weed control / preparation	72	56	4032
Trees / shrubs	2.4	1006	2414.4
Groundcovers	1.2	44368	53241.6
Grass seed	127	8.41	1068.07
Herbicide	60	4	240
Mulch (100mm) / Jute Mat	12	784	9408
Planting	72	84	6048
Seed application	250	2	500
Water crystals	0.24	320	76.8
Initial watering (14 events)			
Watering	72	192	13824
Secondary watering (3 events)	72	84	6048
Maintenance			
Year 1			
Maintenance (spot spray) 1	72	9	648
Maintenance (spot spray) 2	72	9	648
Maintenance (spot spray) 3	72	9	648
Maintenance (spot spray & mulch) 4	72	9	648
Mulch (50 mm)	12	392	4704
Year 2			
Maintenance (spot spray) 1	72	9	648
Maintenance (spot spray) 2	72	9	648
Maintenance (spot spray & mulch) 3	72	9	648
Mulch (50 mm)	12	392	4704
Mowing	75	4	300
Year 3			
Maintenance (spot spray) 1	72	9	648
Maintenance (spot spray) 2	72	9	648
Maintenance (spot spray & mulch) 3	72	9	648
Mulch (50 mm)	12	392	4704
Mowing	75	4	300
Year 4			
Maintenance (spot spray) 1	72	9	648
Maintenance (spot spray & mulch) 2	72	9	648
Mulch (50 mm)	12	392	4704
Mowing	75	4	300
Year 5			
Maintenance (spot spray) 1	72	9	648

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Surveyors Creek West (1.4 hectares)			
Task	Cost/unit	Units	TOTAL
Maintenance (spot spray & mulch) 2	72	9	648
Mulch (50 mm)	12	392	4704
Mowing	75	4	300
		SUB-TOTAL	130692.87
		GST	13069.287
		TOTAL	143762.157

Green Corridor (2 hectares of which 1.3 ha for rehabilitation)			
Task	Cost/unit	Units	TOTAL
Weed control / preparation	72	80	5760
Trees / shrubs	2.4	3003	7207.2
Groundcovers	1.2	25355	30426
Herbicide	60	6	360
Mulch (100mm) (for rehabilitation area)	12	1335	16020
Planting (for rehabilitation area)	72	78	5616
Water crystals (for rehabilitation area)	0.24	520	124.8
Initial watering (5 events)			
Watering	72	130	9360
Secondary watering (3 events)	72	78	5616
Maintenance			
Year 1			
Maintenance (spot spray) 1	72	26	1872
Maintenance (spot spray) 2	72	26	1872
Maintenance (spot spray) 3	72	26	1872
Maintenance (spot spray & mulch) 4	72	26	1872
Mulch (50mm)	12	668	8016
Year 2			
Maintenance (spot spray) 1	72	26	1872
Maintenance (spot spray) 2	72	26	1872
Maintenance (spot spray & mulch) 3	72	26	1872
Mulch (50mm)	12	668	8016
Year 3			
Maintenance (spot spray) 1	72	26	1872
Maintenance (spot spray) 2	72	26	1872
Maintenance (spot spray & mulch) 3	72	26	1872
Mulch (50mm)	12	668	8016
Year 4			
Maintenance (spot spray) 1	72	26	1872
Maintenance (spot spray & mulch) 2	72	26	1872
Mulch (50mm)	12	668	8016
Year 5			
Maintenance (spot spray) 1	72	26	1872

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Green Corridor (2 hectares of which 1.3 ha for rehabilitation)			
Task	Cost/unit	Units	TOTAL
Maintenance (spot spray & mulch) 2	72	26	1872
Mulch (50mm)	12	668	8016
		SUB-TOTAL	146778
		GST	14677.8
		TOTAL	161455.8

Pinnacle Park (0.4 hectares of native vegetation protection)			
Task	**Cost/unit**	**Units**	**TOTAL**
Weed control	72	16	1152
Herbicide	60	1	60
Mulch (100mm) (around scattered trees and for exclusion zones)	12	100	1200
Maintenance			
Year 1			
Maintenance (spot spray) 1	72	4	288
Maintenance (spot spray) 2	72	4	288
Maintenance (spot spray) 3	72	4	288
Maintenance (spot spray & mulch) 4	72	4	288
Mulch (50mm)	12	50	600
Year 2			
Maintenance (spot spray) 1	72	4	288
Maintenance (spot spray) 2	72	4	288
Maintenance (spot spray & mulch) 3	72	4	288
Mulch (50mm)	12	50	600
Year 3			
Maintenance (spot spray) 1	72	4	288
Maintenance (spot spray) 2	72	4	288
Maintenance (spot spray & mulch) 3	72	4	288
Mulch (50mm)	12	50	600
Year 4			
Maintenance (spot spray) 1	72	4	288
Maintenance (spot spray & mulch) 2	72	4	288
Mulch (50mm)	12	50	600
Year 5			
Maintenance (spot spray) 1	72	4	288
Maintenance (spot spray & mulch) 2	72	4	288
Mulch (50mm)	12	50	600
		SUB-TOTAL	**9444**
		GST	**944.4**
		TOTAL	**10388.4**

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022

Basin E - Rectification Works					
Site preparation and planting					
Task	Description	Qty	Cost	Total	Comment
Soil cultivation	Rip 200mm of compacted topsoil , ameliorate with gypsum.	511	$ 4.50	$ 2,299.50	Undertake in areas of bare soil
Jute matting	Supply and install Install Jute Matting 750gsm with pre cut slits 6/m².	511	$ 8.00	$ 4,088.00	Undertake in areas of bare soil
Tube stock	Supply and install tube stock	2504	$ 3.00	$ 7,512.00	
Maintenance					
Establishment period	Weeding and watering plants for 12 weeks	12	$ 600.00	$ 7,200.00	2 workers 0.5 day a week
Maintenance period	Weeding and watering plants for 12 mths	12	$ 600.00	$ 7,200.00	3 workers 0.5 day a mth
			Total	$ 28,299.50	

Document Set ID: 9961750
Version: 1, Version Date: 17/02/2022



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RENZO TONIN & ASSOCIATES
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Acoustics
Vibration
Structural Dynamics

HIGHLAND VIEWS STAGES 7-8, GLENMORE PARK

DA Acoustic Report

25 October 2021

Vianello Holdings C/- CCL Development

TL773-01F02 Road Traffic Noise Impact Assessment (r4)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

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Association of Australian Acoustical Consultants

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Document details

Detail	Reference
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Prepared for:	Vianello Holdings C/- CCL Development
Address:	Suite 2, 580 High Street Penrith NSW 2750
Attention:	Rachell Hewitt

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
01.12.2020	Report issued to client for review	0	1	B. Carlyle	-	D. Suwandi
01.12.2020	Minor update	-	2	B. Carlyle	-	D. Suwandi
20.10.2021	Updated to address updated layout and Council RFI	-	3	B. Carlyle	-	D. Suwandi
25.10.2021	Minor amendment	-	4	B. Carlyle	-	-

File Path: R:\AssocSydProjects\TL751-TL800\TL773 ds Highland Views Stages 7-9\1 Docs\TL773-01F02 Road Traffic Noise Impact Assessment (r4).docx

Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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Document Set ID: 9641731
Version: 1, Version Date: 17/02/2022

Contents

1 Introduction 1
2 Project description 2
2.1 Site description and development overview 2
2.2 Assessment methodology 2
2.3 Reference material 2
3 Noise criteria 4
3.1 Penrith City Council RFI 4
3.2 Penrith City Council Development Control Plan 2014 4
3.3 NSW Road Noise Policy 6
3.3.1 Sensitive land use developments 6
3.4 State Environmental Planning Policy (Infrastructure) 2007 7
3.5 Department of Planning Publication "Development near Rail Corridors and Busy Roads - Interim Guideline" 7
3.5.1 Clarification of ISEPP noise limits 8
3.6 Project noise criteria 9
4 Traffic noise assessment 10
4.1 The Northern Road upgrade 10
4.1.1 Jacobs EIS The Northern Road upgrade: Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park, May 2017 (Jacobs EIS) 10
4.2 Riverflat Drive 10
5 Treatment recommendations 11
5.1 Noise results 11
5.2 Building treatments 11
5.3 Alternative ventilation 12
6 Conclusion 13
APPENDIX A Glossary of terminology 14
APPENDIX B ISEPP facade treatment categories 19
APPENDIX C Acoustic treatment categories 21

List of tables

Table 1: Road traffic noise assessment criteria for non-residential land uses 6
Table 2: ISEPP internal road traffic noise criteria 8
Table 3: ISEPP road traffic noise criteria for new residential development 8
Table 4: Indicative facade treatments 11

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

List of figures

Figure 1: Site and surrounds 3

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

1 Introduction

Renzo Tonin & Associates was engaged to support the Development Application (DA) for the proposed Highland Views Stages 7-8 residential subdivision in Glenmore Park.

This report quantifies the noise impacts from road traffic around the proposed site. The noise impacts have been assessed in accordance with the requirements of the relevant guidelines and assessed in detail in the respective report sections.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. APPENDIX A contains a glossary of acoustic terms used in this report.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

2 Project description

2.1 Site description and development overview

The site is located to the west of The Northern Road and bound by existing residential subdivisions to the north and west with future residential subdivisions to the east and south. The nearest lots within Stages 7 and 8 are respectively located approximately 410m and 340m from The Northern Road, which is considered an arterial road. A collector road, Riverflat Drive (Road 112) runs along the western edge of Stages 7 and 8.

Figure 1 shows the subject site and its surroundings.

2.2 Assessment methodology

In order to assess the potential noise impact on the subdivision site, the following methodology was used:

- Determine predicted road traffic noise levels impacting on-site from the information provided within the Jacobs *Environmental Impact Statement - The Northern Road Upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park - Noise and Vibration Assessment, May 2017* (Jacobs EIS);
- Determine the extent of noise impacts at proposed residential lots using the results within the Jacobs EIS;
- Determine predicted road traffic noise levels impacting the site from Riverflat Drive (Road 112) based on traffic volumes within Council's design specification for a collector road. Determine the extent of noise impacts at proposed residential lots.
- Identify where road traffic noise intrusion onto the site may exceed the relevant criteria;
- Where external noise levels are predicted to exceed the noise criteria, in-principle recommendations are provided for building envelope design in order to achieve internal noise criteria.

This report assumes all proposed dwellings are double storey and future lots located between Stages 7 to 8 and The Northern Road have not been built.

2.3 Reference material

The following documentation was referenced for this report:

- *Environmental Impact Statement - The Northern Road Upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park - Noise and Vibration*, Jacobs May 2017 (Jacobs EIS)

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Figure 1: Site and surrounds



Document Set ID: 9961731
Version: 1, Version Date: 27/02/2022

3 Noise criteria

3.1 Penrith City Council RFI

Penrith City Council have raised the following RFIs.

1. *The Acoustic Report assesses noise from The Northern Road. It states in section 3.5 that 'existing roads in and around the subdivision, including Gunyah Drive, currently carry a negligible amount of traffic volumes and are expected to have AADTs of much lower than 20,000 vehicles in the Year 2031. Therefore, projected traffic volumes along these roads have not been considered further'. The report does not comment or discuss collector roads associated with the subdivision, including the two roads identified in the initial Environment Team response and which the Environment Team sought an assessment of-these being the East West Road and Riverflat Drive.*

2. *Accordingly, an amended Acoustic Report is required, prepared by a suitably qualified acoustic consultant, that includes an assessment of the noise impacts associated with traffic movements on the collector roads associated with the subdivision (East West Collector Road - Road 108 and Riverflat Drive). The amended report is to identify the collector roads and consider potential future traffic volumes and anticipated dwelling construction and make recommendations to ensure future dwellings are not impacted by traffic noise. The report is to refer to (and include as reference) the most current proposed lot layout. (The latest version of lot layout plans submitted to Council indicate amendments to that included in the December 2020 version of the Acoustic Report).*

3.2 Penrith City Council Development Control Plan 2014

Section C12 *Noise and Vibration* of Penrith Development Control Plan (DCP) 2014 sets out the following with respect to road traffic noise:

12.1. Road Traffic Noise

A. Background

Currently, road traffic is the most widespread source of environmental noise. The controls below seek to minimise the impact of road traffic noise.

This Section of the DCP applies to all development that generates a significant level of traffic noise (as determined by Council) that has potential to impact upon residential and other sensitive land uses.

This Section is also applicable to any residential development, subdivision or other sensitive land uses, which propose to locate near existing areas of significant road traffic noise.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

B. Objectives

a) To ensure that the amenity of all residential development and other sensitive land uses is not significantly affected by road traffic noise;

b) To ensure that the traffic associated with development does not significantly impact upon the amenity of surrounding land uses;

c) To ensure that the traffic associated with development does not have a significant noise impact on the existing road network; and

d) To ensure that any subdivisions are designed to minimise the impact of road traffic noise on any residential development or other sensitive land uses.

C. Controls

1) Road traffic noise criteria including sensitive land uses

a) Council will not grant consent to development, particularly residential development, including subdivisions, unless the impact of traffic noise from freeway, arterial, designated or collector roads complies with the standards and guidelines for road traffic noise prepared by the relevant State Government authorities or agencies, as well as relevant Australian Standards.

b) Council will not grant consent to development for sensitive land uses unless it complies with the provisions and standards for road traffic noise prepared by the relevant State Government authorities or agencies, as well as relevant Australian Standards.

c) Sensitive land uses subject to road traffic noise criteria referred to in b) above include educational establishments (including schools), places of public worship, hospitals, and passive and active recreation areas.

Noise Impact Statements - Specific Requirements

a) Where a site is likely to be affected by unacceptable levels of road traffic noise, the applicant is required to provide a Noise Impact Statement prepared by a qualified acoustic consultant in accordance with the requirements set out in the DA Submission Requirements Appendix of this DCP.

b) The Noise Impact Statement should demonstrate acoustic protection measures necessary to achieve an indoor environment meeting residential standards, in accordance with EPA and Department of Planning Criteria, as well as relevant Australian Standards.

NOTE: *To determine whether your site is likely to be exposed to levels of road traffic noise that exceed residential standards:*

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

a) Contact Council regarding main road frontages known to exceed residential noise standards; and

b) Obtain detailed advice from a qualified acoustic consultant regarding appropriate planning and design measures.

3.3 NSW Road Noise Policy

The NSW Road Noise Policy (RNP) was introduced in July 2011 and replaced the NSW Environmental Criteria for Road Traffic Noise (ECTRN). Unlike the ECTRN, the RNP no longer sets external criteria for new developments affected by existing roads. Criteria for new developments affected by existing roads are now addressed through the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) and the associated NSW Department of Planning "Development Near Rail Corridors and Busy Roads – Interim Guideline".

3.3.1 Sensitive land use developments

The RNP also sets criteria for the assessment of traffic noise on sensitive land uses such as schools, hospitals, places of worship and recreation areas. The criteria are presented in Table 1 below.

Table 1: Road traffic noise assessment criteria for non-residential land uses

Existing sensitive land use	Assessment criteria, dB(A)		Additional considerations
	Day (7am-10pm)	Night (10pm-7am)	
1. Open space (active use)	$L_{Aeq,15hour}$ 60 (external) when in use		Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
2. Open space (passive use)	$L_{Aeq,15hour}$ 55 (external) when in use		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads.

It is generally accepted that most buildings provide a noise reduction of at least 10dB(A) when windows are left 20% open, without providing additional treatment. Therefore where the noise goals are internal, a 10dB(A) reduction from external noise levels to internal noise levels has been adopted to allow an external assessment.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

3.4 State Environmental Planning Policy (Infrastructure) 2007

The ISEPP came into force in NSW on 1 January 2008 to facilitate the effective delivery of infrastructure across the State. The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and services development fall and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development.

Clause 102 of the ISEPP states as follows:

102 Impact of road noise or vibration on non-road development

1. *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
   - *a building for residential use,*
   - *a place of public worship,*
   - *a hospital,*
   - *an educational establishment or child care centre.*
2. *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
3. *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
   - *in any bedroom in the building--35 dB(A) at any time between 10 pm and 7am,*
   - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway)-- 40 dB(A) at any time.*
4. *In this clause, "freeway", "tollway" and "transitway" have the same meanings as they have in the Roads Act 1993.*

3.5 Department of Planning Publication "Development near Rail Corridors and Busy Roads - Interim Guideline"

To support the Infrastructure SEPP, the NSW Department of Planning released the Development in *Rail Corridors and Busy Roads - Interim Guideline* (December 2008). The Guideline assists in the planning, design and assessment of developments in, or adjacent to, major transport corridors in terms of noise, vibration and air quality. Whilst the ISEPP applies only to roads with an Annual Average Daily Traffic

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

(AADT) greater than 40,000 vehicles, the guideline is also recommended for other road traffic noise affected sites.

3.5.1 Clarification of ISEPP noise limits

The Guideline clarifies the time period of measurement and assessment. As stated in the Guideline in Section 3.4 '*What Noise and Vibration Concepts are Relevant*' and Table 3.1 of Section 3.6.1, noise measurements are determined over the following relevant time periods:

- Daytime 7am-10pm $L_{Aeq(15hr)}$
- Night-time 10pm-7am $L_{Aeq(9hr)}$

L_{Aeq} is the Equivalent Continuous Noise Level and accounts for both the level of fluctuating noise and also the number of noise events over the time period. The noise criteria nominated in the ISEPP are internal noise levels with windows and doors closed and the requirements are stated in the following table.

Table 2: ISEPP internal road traffic noise criteria

Internal space	Time period	Noise metric	Internal criteria^
Bedrooms	7am - 10pm	$L_{Aeq(15hrs)}$	40*
	10pm to 7am	$L_{Aeq(9hrs)}$	35
Other Habitable Rooms	Any Time	$L_{Aeq(15hrs)}$ and $L_{Aeq(9hrs)}$	40

Notes: ^ With windows and doors closed.

* Whilst not specified in the ISEPP, daytime criteria for bedrooms are set to 40dB(A), as per the other habitable rooms.

The Guideline in Section 3.6.1 'Airborne Noise' states as follows:

> *"If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

As noise modelling is undertaken for external locations, the above criteria and guidelines have been used to establish equivalent external noise criteria. This external noise criterion is used to determine which building facades may require specific acoustic treatment to meet the requirements of the ISEPP. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the National Construction Code (NCC) 2019 requirements.

Table 3: ISEPP road traffic noise criteria for new residential development

Room	Location	$L_{Aeq,\ 15hr}$ Day 7am – 10pm	$L_{Aeq\ 9hr}$ Night 10pm – 7am
Living rooms*	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)^	60	60

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Room	Location	$L_{Aeq,\ 15hr}$ Day 7am – 10pm	$L_{Aeq\ 9hr}$ Night 10pm – 7am
Bedrooms*	Internal, windows closed	40	35
	Internal, windows open	50	45
	External free-field (allowing windows to remain open)^	60	55

Notes: * Requisite for 40,000AADT Roads only under ISEPP 2007.

^ ISEPP Guideline states that where internal noise criteria are exceeded by more than 10dB(A) with windows open mechanical ventilation is required. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the NCC 2019 requirements.

3.6 Project noise criteria

For the subject site, only The Northern Road would be considered under the ISEPP; and hence, the ISEPP noise goals should be adopted as they are considered the most current road traffic noise policy for new residential development in NSW. For any recreational space, reference is made to the RNP.

Existing roads in and around the subdivision, including Riverflat Drive (Road 112), currently carry a negligible amount of traffic volumes and are expected to have AADTs of much lower than 20,000 vehicles in the Year 2031. Therefore, projected traffic volumes along these roads typically does not warrant further consideration. However, to address the Penrith City Council RFI in Section 3.1, assessment has been undertaken for the collector road Riverflat Drive (Road 112). It is noted that Road 108 has been removed from this DA application and so assessment has not been undertaken for this road.

For any public open spaces potentially impacted by internal local/collector road noise, it is not expected that use of active and passive recreation areas would coincide with the peak traffic movements along the internal local/collector roads, and therefore, the likelihood of intrusive noise impacts is expected to be minimal.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

4 Traffic noise assessment

4.1 The Northern Road upgrade

Transport for NSW (TfNSW, formally NSW Roads and Maritime Services) is upgrading around 35 kilometres of The Northern Road between The Old Northern Road, Narellan and Jamison Road in South Penrith from a generally two to four-lane undivided road to a six to eight-lane divided road. The upgrade has been divided into various sections and EIS traffic noise studies have been conducted by others. Our review of the relevant EIS study is summarised below.

4.1.1 Jacobs EIS The Northern Road upgrade: Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park, May 2017 (Jacobs EIS)

A review of the REF traffic noise assessment found the following:

- 77 receivers qualified for consideration of additional noise mitigation
- As there are no groupings of four or more closely-spaced receivers of those eligible for consideration of mitigation, the use of noise barriers has not been identified as a mitigation measure for this project

4.2 Riverflat Drive

In order to address, the Council RFI in Section 3.1, assessment has been undertaken for Riverflat Drive (Road 112). In accordance with Council's design specification, Riverflat Drive is classified as a collector road with a design AADT of 2000-4000 vehicles. This assessment is based on the minimum of this range to reflect that the traffic in this area is assumed to be mainly residents of the Highland Views estate, as the adjoining land is currently zoned as rural.

The following assumptions were used:

- AADT of 2000 vehicles.
- The 15hr daytime volume is 85% of the 24hr volume.
    - While both 'day' and 'night' traffic noise goals are to be satisfied, the daytime traffic goals are more likely to be exceeded in a developed residential area. This corresponds with the assumed traffic distribution. Night-time road traffic noise levels are likely to create greater impact only where the night-time percentage of heavy vehicles is significantly higher than the daytime period.
- Percentage of heavy vehicles in traffic mix is assumed to be 5% for Riverflat Drive.
- Vehicle speed of 60km/h.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

5 Treatment recommendations

5.1 Noise results

The predicted 2031 daytime and night-time operational noise level results within Appendix I of the Jacobs EIS for the Northern Road and Council's design specification for a collector road (2000 AADT) for Riverflat Drive was adopted. This information was used to calculate internal noise levels within the future dwellings of Stages 7 to 8, based on standard building design assumptions contained with the ISEPP Guideline. Noise calculations were performed using acoustic design software which takes into account external noise levels, facade transmission loss and room sound absorption characteristics.

The following outcomes were determined:

- The majority of buildings are predicted to meet the ISEPP internal noise criteria with no specific acoustic facade treatment. These buildings can be of 'standard' construction and will not require mechanical ventilation for acoustic reasons.
- Some building facades located along the eastern extents of the subdivision will require some acoustic facade treatments to meet the ISEPP internal criteria (refer to Section 5.2 below).

5.2 Building treatments

Table 4 below indicates the indicative acoustic category treatments that would be required to meet the ISEPP internal criteria inside residences. These results assume no acoustic fencing or noise mound is installed between The Northern Road and the development. Where a lot is not listed, no acoustic treatments apply. A lot layout diagram showing indicative category treatments is shown in APPENDIX C for reference.

The typical construction details for each category treatments are provided in Table B 1. These construction details are in broadly line with the standard measures recommended in Appendix C of the ISEPP "Development near Rail Corridors and Busy Roads - Interim Guideline (December 2008)".

These treatments recommendations are for concept design and costing purposes. They should be confirmed during design development as more detail about the building facade locations, orientations, window sizes, etc. becomes available.

Table 4: Indicative facade treatments

Frontage	Stage	Buildings/location	Indicative Category Treatment (see Table B 1 for details)
The Northern Road	7 and 8	Eastern extents of Stages 7 and 8	1
Riverflat Drive	7 and 8	Western extents of Stages 7 and 8	1

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

5.3 Alternative ventilation

Where facades have been identified for acoustic treatment in Section 5.2 windows are to be kept closed to meet the internal noise goals. It is noted that windows are not required to be sealed shut/fixed and can be operable.

It is recommended that a mechanical engineer is consulted to ensure the ventilation requirements of the Building Code of Australia and Australian Standard 1668 "The use of ventilation and air-conditioning in buildings" are achieved. The internal noise goals are to be met with mechanical ventilation systems not operating.

Where alternative forms of ventilation are to be provided, it must be ensured that the solution does not provide a new noise leakage path into the dwelling and does not create a noise nuisance to neighbouring premises.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

6 Conclusion

Renzo Tonin & Associates has completed a road traffic noise assessment for the DA of the proposed Highland Views Stages 7-8 residential subdivision in Glenmore Park. The report has been prepared in accordance with the relevant project criteria detailed in Section 3 and utilised the operational noise predictions in the Jacobs EIS.

The findings of the report indicate that:

- Exceedances of the ISEPP criteria are predicted at the residential lots at the eastern and western extents of Stages 7 and 8 subdivision.
- For facades that are exposed to noise levels above the ISEPP, acoustic constructions for treatment are required to achieve the internal noise level criteria.
- If the internal criteria can only be achieved with windows closed, then mechanical ventilation or air conditioning that meets the requirements of the National Construction Code (previously Building Code of Australia) must also be provided to ensure fresh airflow inside the dwelling. It is important to ensure that mechanical ventilation does not provide a new noise leakage path into the dwelling and does not create a noise nuisance to neighbouring residential premises. It is noted that windows are not required to be sealed shut/fixed and can be operable.
- Noise mitigation measures are specified in Section 5 and APPENDIX C.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.		
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.		
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.		
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.		
Amenity	A desirable or useful feature or facility of a building or place.		
AS	Australian Standard		
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.		
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.		
Attenuation	The reduction in the level of sound or vibration.		
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.		
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.		
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.		
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.		
Berm	Earth or overburden mound.		
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.		
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.		
BS	British Standard		
CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		10 dB	Human breathing

Document Set ID: 9961731
Version: 1, Version Date: 27/02/2022

	almost silent	20 dB	
		30 dB	Quiet bedroom or in a quiet national park location
	generally quiet	40 dB	Library
		50 dB	Typical office space or ambience in the city at night
	moderately loud	60 dB	CBD mall at lunch time
		70 dB	The sound of a car passing on the street
	loud	80 dB	Loud music played at home
		90 dB	The sound of a truck passing on the street
	very loud	100 dB	Indoor rock band concert
		110 dB	Operating a chainsaw or jackhammer
	extremely loud	120 dB	Jet plane take-off at 100m away
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.		
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.		
Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.		
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.		

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1 hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24 hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmax.
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmin.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.
Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australa. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

APPENDIX B ISEPP facade treatment categories

Table B 1: Treatment categories

Category no.	Building element	Required acoustic rating of building element, R_W	Indicative construction	
1	Windows / sliding doors	24+	Openable with minimum 4mm monolithic glass and standard weather seals	
	Facade	38+	Cladding construction: 9mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm timber stud, R2 insulation batts in wall cavity, 10mm standard plasterboard internally	Brick veneer construction: 110mm brick, 90mm timber stud, minimum 40mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally
	Roof	40+	Pitched concrete or terracotta tile or metal sheet roof, 10mm plasterboard ceiling fixed to ceiling joists, bulk insulation in roof cavity	
	Door	28+	35mm solid core timber door fitted with full perimeter acoustic seals	
2	Windows / sliding doors	27+	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Facade	45+	Cladding construction: 9mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm timber stud, R2 insulation batts in wall cavity, 10mm standard plasterboard internally	Brick veneer construction: 110mm brick, 90mm timber stud, minimum 40mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally
	Roof	43+	Pitched concrete or terracotta tile or metal sheet roof, 10mm plasterboard ceiling fixed to ceiling joists, bulk insulation in roof cavity	
	Door	30+	40mm solid core timber door fitted with full perimeter acoustic seals	
3	Windows / sliding doors	32+	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Facade	52+	110mm brick, 90mm timber stud, minimum 40mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally	
	Roof	48+	Pitched concrete or terracotta tile or sheet metal roof, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, bulk insulation in roof cavity	
	Door	33+	45mm solid core timber door fitted with full perimeter acoustic seals	
4	Windows / sliding doors	35+	Openable with minimum 10.38mm laminated glass and full perimeter acoustic seals	
	Facade	55+	110mm brick, 90mm timber stud, minimum 40mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally	
	Roof	52+	Pitched concrete or terracotta tile or sheet metal, 2 layers of 13mm sound-rated plasterboard fixed to ceiling joists, bulk insulation in roof cavity	

Document Set ID: 9961731
Version: 1, Version Date: 27/02/2022

Category no.	Building element	Required acoustic rating of building element, R_W	Indicative construction
	Door	33+	45mm solid core timber door fitted with full perimeter acoustic seals
5	Windows / sliding doors	43+	Openable double glazing with separate panes: 5mm monolithic glass, 100mm air gap, 5mm monolithic glass with full perimeter acoustic seals
	Facade	55+	110mm brick, 90mm timber stud, minimum 40mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally
	Roof	52+	Pitched concrete or terracotta tile or sheet metal, 2 layers of 13mm sound-rated plasterboard fixed to ceiling joists, bulk insulation in roof cavity
	Door	40+	Special high performance acoustic door required

Notes:

- Where a room has different category recommendations on two or more facades, the roof recommendation for the highest category applies.
- Any wall, roof or ceiling penetrations shall be acoustically sealed so as not to reduce the acoustic performance of the element.
- The acoustic performance of glazed doors should be in accordance with the window glazing requirement of the applicable category.

The required acoustic rating is for the entire system. For example, for windows this includes the glass, frame and seals including the perimeter seal at the wall junction.

By way of explanation, the Sound Insulation Rating R_W is a measure of the noise reduction property of the glazing assembly, a higher rating implying a higher sound reduction performance.

Note that the R_W rating of systems measured as built on site (R'_W Field Test) may be up to 5 points lower than the laboratory result.

The client is advised not to commence detailing or otherwise commit to systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of systems and assemblies is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved. No responsibility is taken for use of or reliance upon untested systems, estimates or opinions. The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

NOTES FOR GLAZING CONSTRUCTIONS:

All openable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the R_W rating performance of the glazing to not be reduced.

The above glazing thicknesses should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading, etc.

GENERAL:

The sealing of all gaps in acoustic rated glazing assemblies and facades is critical in a sound rated construction. Use only sealer approved by the acoustic consultant.

Check design of all junction details with acoustic consultant prior to construction.

Check the necessity for HOLD POINTS with the acoustic consultant to ensure that all building details have been correctly interpreted and constructed.

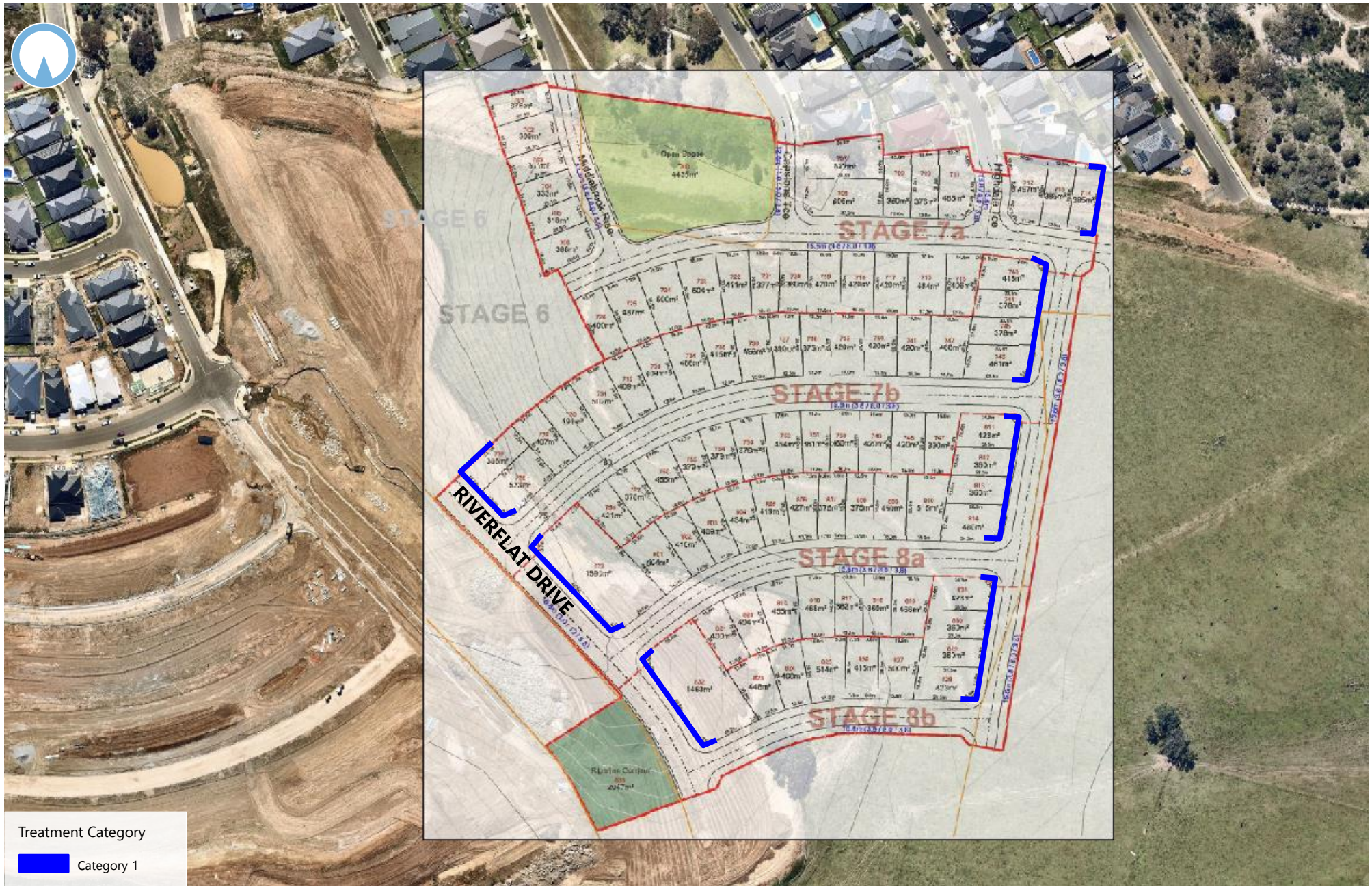
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Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

APPENDIX C Acoustic treatment categories

Document Set ID: 9961731
Version: 1, Version Date: 17/02/2022

Figure C 1: Facade treatment category recommendations



Document Set ID: 9961731
Version: 1, Version Date: 27/02/2022

STATEMENT OF ENVIRONMENTAL EFFECTS

RESIDENTIAL SUBDIVISION

STAGES 7 & 8

PRECINCT G & H

GLENMORE PARK STAGE 2

December 2021

Revision F

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

RESIDENTIAL SUBDIVISION

PRECINCT G & H

GLENMORE PARK STAGE 2

DECEMBER 2021

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Document Set ID: 9864746
Version: 1, Version Date: 21/02/2022

CONTENTS

1 BACKGROUND....1

1.1 Introduction....1
1.2 Site Location & Description....2
1.3 Glenmore Park Stage 2 Precinct G & H Concept Plan....2
1.3.1 Vision & Design Philosophy....2
1.4 Zoning....4

2 SITE ANALYSIS....5

2.1 Local Context....5
2.2 Site Analysis....5
2.3 Land Capability....6
2.4 Cultural Heritage....6
2.5 Viewscapes....6

3 PROPOSED DEVELOPMENT....10

3.1 Proposal....10
3.2 Concept Plan Design Modifications....11
3.3 Density & Lot Typology....12
3.4 Movement Network & Traffic Impact....15
3.5 Landscaping....17
3.6 Infrastructure Servicing Strategy....17
3.6.1 Drainage & Stormwater Strategy....17
3.6.2 Water Reticulation....18
3.6.3 Sewerage....18
3.6.4 Electricity....18
3.6.5 Telecommunications....18
3.6.6 Gas 18
3.7 Community Facilities....18
3.7.1 Pinnacle Park....18
3.7.2 Surveyors Creek Riparian Corridor....19

4 ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979....20

4.1 Section 4.10 – Designated Development....20
4.2 Section 4.46 – Integrated Development....20
4.2.1 National Parks & Wildlife Act 1974....20
4.2.2 Water Management Act 2000....20
4.2.3 Rural Fires Act 1997....21
4.3 Commonwealth and State Biodiversity Conservation Legislative Framework....21
4.3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999....21
4.3.2 Biodiversity Conservation Act 2016 (BC Act)....21

5 PLANNING CONTEXT (SECTION 4.15 EP&A ACT)....22

5.1 Environmental Planning Instruments....22
5.1.1 State Environmental Planning Policy (Major Development) 2005....22
5.1.2 State Environmental Planning Policy (Infrastructure) 2007....22
5.1.3 State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)....22
5.1.4 Sydney Regional Environmental Plan No 20 (SREP 20)....23
5.1.5 Penrith Local Environmental Plan 2010....23
5.2 Penrith Development Control Plan (Glenmore Park Stage 2) 2014....23
5.3 Impacts of Development....28
5.4 Site Suitability....29
5.5 Public Interest....29

6 SUMMARY AND CONCLUSION....30

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDICES

Appendix 1	Lot Layout & Lot Frontage Plan
Appendix 2	Engineering Plans
Appendix 3	Stormwater Management Strategy
Appendix 4	Landscape Plan Surveyors Creek Landscape Plan
Appendix 5	Bushfire Assessment
Appendix 6	Biodiversity Development Assessment Report
Appendix 7	Vegetation Management Plan
Appendix 8	Geotech Report/ Salinity Management Plan
Appendix 9	Supplementary Site Investigation Report
Appendix 10	Site Validation Report
Appendix 11	Acoustic Assessment
Appendix 12	Waste Management Plan
Appendix 13	SREP 20 Review

Document Set ID: 9961746
Version: 1, Version Date: 27/02/2022

1 BACKGROUND

1.1 Introduction

On behalf of Vianello Holdings, this Statement of Environmental Effects has been prepared to support a Development Application which seeks approval for residential subdivision, bulk earthworks, construction of new roads and street landscaping, open space, including vegetation regeneration works in the remainder of the Surveyors Creek riparian corridor, stormwater management infrastructure and provision of services within the Glenmore Park Stage 2 release area.

The subject site is wholly located with the remaining undeveloped area of Precinct H within Glenmore Park Stage 2 and forms part of existing Lot 4 on DP 1240361 (refer Figure 1). The subject site represents Stages 7 and 8 of Precinct H development area, with the approved Stage 6 subdivision (DA18/0310) adjoining the subject site to the north.

The proposal seeks approval for subdivision of the subject site to deliver 88 residential allotments ranging in size from 311m² to 642m², two superlots that will enable future small lot subdivision, one open space lot and the extension of the riparian corridor that forms part of the Surveyors Creek corridor. The proposal also incorporates construction of local roads, stormwater infrastructure and provision of services. The proposed allotments incorporate a variety of lot widths that will facilitate diversity of housing and interesting streetscapes.

The proposed residential structure and road network is generally consistent with the Precinct G and H Concept Plan and achieves the objectives of the Glenmore Park Stage 2 DCP. The proposed subdivision layout delivers a legible and permeable layout with allotments that facilitate activated streetscapes and a range of lot types to encourage diversity of housing.

The proposed residential subdivision has been designed to achieve a seamless connection with the existing development to the north. The proposed residential structure and road network is generally consistent with the Precinct G and H Concept Plan and the Glenmore Park Stage 2 DCP. The proposal extends the existing Riverflat Drive to continue this collector road south adjacent to the Surveyors Creek open space corridor.

The proposal incorporates street landscaping, augmentation of stormwater infrastructure and the provision of services. A detailed description of all works proposed under this application is provided under Section 3.0 of this report. In order to achieve even grades suitable for the proposed residential subdivision and associated civil works, the proposal also seeks approval for earthworks as detailed within the Civil Engineering Plans enclosed with this report.

Glenmore Park Stage 2 was rezoned in May 2009 under the Penrith Local Environmental Plan (Glenmore Park Stage 2) 2010 (LEP) with the associated Glenmore Park Stage 2 Development Control Pan (DCP) adopted in October 2007.

The site is predominantly zoned R1 General Residential under the Penrith Local Environmental Plan. A portion of the subject site is located within land zoned E2 Environmental Conservation and the RE1 Public Recreation.

This report has been prepared pursuant to provisions of the Environmental Planning and Assessment Act 1979 (EPAA 1979) and the Environmental Planning and Assessment Regulation 2000. The report addresses the heads of consideration listed under Section 4.15 of the EPAA 1979 as relevant to the proposed development.

The proposed subdivision forms part of a large residential development that will assist housing affordability in Sydney and make substantial contributions to improvements to the environment, increasing the number of public recreation and open space assets in the locality and delivering a legible road hierarchy that creates a pedestrian friendly residential environment.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

1.2 Site Location & Description

The subject site for the proposed residential subdivision (Stages 7 & 8) forms part of Precinct H within the Glenmore Park Stage 2 release area. The site occupies an area of approximately 6.72 hectares and forms part of a large rural land holding (refer to Figure 2). The subject site is located within existing Lot 4 on DP 1240361.

The subject site is located wholly within Precinct H. Existing residential development within Precinct E borders the subject site to the north, as well as existing development from Stage 6 of Precinct H. Land to the west and south comprises the existing rural landscape which is currently zoned RU2 Rural Landscape, however is subject to a Planning Proposal currently being considered by Council, which seeks to rezone the area for urban purposes. Land to the east comprises Stages 1, 2,3 and 4 of Precinct G, which is partially complete.

The existing Northern Road is located approximately 460m to the east, with the widening of this road currently under construction as part of the Northern Road upgrade. As part of The Northern Road upgrade, a new signalized intersection will be located south east of the subject site, with the collector road from this intersection forming the southern most road in the subject site, with the remainder of the road currently being considered as part of the Planning Proposal to rezone the balance of the Glenmore Park Release Area. The signalized intersection at the junction of Bradley Street and The Northern Road has been delivered, providing direct access to Riverflat Drive, which is to be extended south as part of this proposal, linking to the east west collector road in the south if the site.

Within the context of development envisioned for the area under the Precincts G and H Concept Plan, part of the western boundary of the subject site will be formed by the Surveyors Creek open space corridor.

The proposed development will facilitate a seamless extension of the existing residential development approved to the north and ensure that an integrated outcome is achieved with future stages of development. The proposed subdivision has considered the vision for Precincts G and H and ensures that residential development achieves a sensitive interface with the public domain including the Surveyors Creek open space corridor.

1.3 Glenmore Park Stage 2 Precinct G & H Concept Plan

A Concept Plan has been prepared for Precincts G and H and was submitted with the approved Stage 1 & 2 development application (DC 15/1469). The Concept Plan has been prepared in accordance with Clause 1.9 of the Glenmore Park Stage 2 DCP and provides a staged guide for the future urban development of Precincts G and H.

The Concept Plan addresses the urban structure, housing types, road hierarchy, open space, pedestrian and cycle paths, bus routes, view sheds from The Northern Road, staging and infrastructure delivery. A report and supporting documentation was also prepared which accompanies the Concept Plan.

The Concept Plan was endorsed by Penrith City Council at its Ordinary Meeting of 22 August 2016, subject to the requirement that footpaths be provided on both sides of all roads, apart from laneway verges and the road verges on the outer perimeter of Precincts G and H.

The proposed residential subdivision layout is generally consistent with the Concept Plan and Council report, achieving an integrated outcome with the existing development located to the north and ensuring the proposed subdivision can be connected to future Stages within Precincts G and H.

1.3.1 Vision & Design Philosophy

The vision for the site is to create a high-quality development in an environment that recognizes and interprets the landscape features of the site as well as the surrounding landscape. As demonstrated in the Concept Plan (**Figure 1**) and supporting documentation provided with this application, the proposed development is consistent with the vision for Precincts G and H which aims to deliver a high quality residential development as part of the Glenmore Park Stage 2 release area.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

In keeping with the Concept Plan, the proposed subdivision incorporates a mix of lot types to respond to the diverse needs of the future community and create variety and interest in streetscapes. It has been sensitively designed to enable the continued protection of view sheds from The Northern Road, whilst maximising views from residential allotments within the site and across the lineal open space.

The proposed subdivision reflects the urban design principles set out in the Concept Plan for Precincts G & H and is consistent with the Glenmore Park Stage 2 release area and the development outcomes included in the Glenmore Park Stage 2 DCP. The following key urban design elements underpin the design of the proposed residential subdivision:

- Delivery of a clear, permeable and legible road network that integrates with both the existing and future surrounding development and promotes access to open space areas including the Surveyors creek open space corridor.
- Delivery of a modified grid layout that is integrated with other residential development within Glenmore Park and encourages walking and cycling within the development and accommodates a bus route in the most suitable location.
- Delivery of a site responsive urban design outcome, which seeks to retain the unique natural identity and topography of the site and protect local viewsheds from surrounding corridors.
- Promotion of the open space corridor by providing higher density development adjacent to this area of high amenity.
- Promotion of a diverse range of housing types to meet the needs of the anticipated future community.
- Provision of regular rectangular shaped residential lots that respond to the topography of the site to achieve a climate sensitive design.
- Provide larger lot frontages on street corners to allow development to address both street frontages.

Figure 1: Precinct G & H Concept Plan



Document Set ID: 9864746
Version: 1, Version Date: 27/02/2022

1.4 Zoning

The Penrith LEP was gazetted on 22 September 2010 and rezoned the subject land to provide for future residential development. The subject area is zoned mostly R1 General Residential under Penrith Local Environmental Plan 2010. Part of the eastern boundary of the site is zoned RU2 Rural Landscape, with this area subject to a Planning Proposal currently being considered by Council, which seeks to rezone the remainder of the land for urban purposes. In relation to this application, the RU2 area only comprises road reserves, which are permissible in the zone.

A small portion of the subject site is located within land zoned E2 Environmental Conservation. The small portion of E2 land contains the intersection point of Riverflat Drive and the east-west collector road crossing Surveyors Creek in the south.

A small area of RE1 Public Recreation zone land is located in the north of the site and forms the remaining portion of Pinnacle Park, with its embellishment to form part of a future separate Development Application.

The zoning of the subject land holding is shown in **Figure 4**.

The proposed residential subdivision and associated works comply with the relevant standards under the LEP, as outlined under Section 5 of this report.

Document Set ID: 9861746
Version: 1, Version Date: 17/02/2022

2 SITE ANALYSIS

2.1 Local Context

The subject site is located in the Penrith Local Government Area within the Glenmore Park Stage 2 release area (refer Figure 2).

The Glenmore Park Stage 2 release area is located within Western Sydney, approximately 6km from the Penrith CBD (refer Figure 2). The Nepean River is located 5km to the west and the Blue Mountains National Park is located to the west of that. The Mulgoa Nature Reserve is located to the north-west of the Glenmore Park Stage 2 release area, with rural land holdings to the east and south. The site is well serviced by existing regional infrastructure with the M4 motorway located to the north and Penrith train station is approximately 7km to the north.

The Glenmore Park Stage 2 Release area will be predominately residential, incorporating a neighbourhood centre, as well as active and passive open space. Surveyors Creek forms a major geographical feature of the Glenmore Park Stage 2 release area and will be rehabilitated and incorporated into accessible linear open space for the future community. The western tributary of Surveyors Creek runs between Precincts G and H and adjoins the subject site to the west. The Glenmore Park Stage 2 area will also incorporate several pocket parks and playing fields, providing additional amenity and visual relief.

The Stages 7 & 8 residential subdivision site are the remaining stages of Precinct H with existing development located within Precinct E directly to the north and the western tributary of Surveyors Creek, forming part of the western boundary of the subject site. The Northern Road is located approximately 460m to the east and Bradley Street is located 200m to the north of the subject site, with direct access provided via Riverflat Drive which will be extended south as part of this proposal.

2.2 Site Analysis

The Stages 7 & 8 residential subdivision site occupies an area of approximately 7.2 hectares and has been cleared of vegetation and highly modified as a result of previous grazing and agricultural uses. Specific detail and analysis is provided as follows:

Landform The existing landform slopes from east to west throughout the subject site, with Surveyors Creek forming the topographical low point. A north-south ridge along the eastern boundary of the site.

Access Access to the site will be provided via an extension of the existing road network to the north. This extension incorporates a continuation of the existing collector road, Riverflat Drive, as well as extension of the existing local roads, including Middlebrook Rise, Capstone Terrace, Highland Terrace and Greenlink Drive to provide additional access points for the proposed allotments.

Vegetation The subject site occupies land which has been mostly cleared as a result of past grazing activities. No significant vegetation exists within the subject site. In addition to the Flora and Fauna Assessment undertaken as part of the initial rezoning of the Glenmore Park Stage 2 Release Area, an Ecological Assessment has been prepared for Precinct G and H and is enclosed with this report. The Assessment provides detail on the drainage and biodiversity works within the Surveyors Creek corridor. The proposed works are consistent with the recommendations of the Ecological Assessment.

Drainage The site drains to the western tributary of the Surveyor's Creek corridor which runs in a north south direction to the west of the subject site. Precincts G and H form the upper extent of the drainage catchment flowing to Surveyor's Creek.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

2.3 Land Capability

In 2001, URS prepared a Phase 2 Investigation Report, investigating the potential for site contamination. This formed part of the 2003 'Environment and Biodiversity LES Report' for the Glenmore Park Stage 2 urban release area. This included an assessment of the potential for the land to be contaminated and whether it was suitable for urban development.

No areas of environmental concern or contamination were identified within the subject site. A supplementary report by EDP Consultants Pty Ltd has been prepared and is included as Appendix 9 to this SEE. The assessment undertaken by EDP addresses matters raised by Council in relation to data gaps between previously prepared investigations and the area subject to this application. As part of the assessment, EDP reviewed the previous works as well as undertaking additional test bores. Based on their review and additional testing, EDP concluded that the former data gaps associated with the increased extent of the development footprint to be addressed and considered the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision.

In 2015, a Geotechnical Assessment was undertaken for the Precinct G and H area by Geotechnique and applies to the subject site. The report includes erodibility, aggressivity and salinity assessments and concludes the subject site is suitable for residential development.

Details on site preparation works including recommendations for the soil management plan are provided in the report which is enclosed with this Development Application.

2.4 Cultural Heritage

Detailed European and Aboriginal Heritage investigations were undertaken during preparation of the Local Environmental Plan for the Glenmore Park Stage 2 release area, as part of the Cultural Heritage Assessment carried out by Navin Officer Heritage Consultants. These studies identified a limited number of archaeological sites located within the Glenmore Park Stage 2 development area.

No items of Environmental Heritage were identified within the development area.

2.5 Viewscapes

The Concept Plan Report for Precincts G and H and supporting documentation endorsed by Penrith City Council on 22 August 2016 incorporates a comprehensive analysis of local viewsheds from the Northern Road.

As detailed in the Concept Plan, a Viewscape Analysis was prepared as part of a Development Application (DA No. 080537) for mounding adjacent to The Northern Road. The Concept Plan includes indicative sight line cross sections and a photo montage demonstrating development within Precinct G and H will be adequately screened from The Northern Road.

The indicative sight line cross sections included in the Viewscape Analysis demonstrated there was no additional mounding to DA No. 080537 required to screen the development within Precincts G and H. Notwithstanding, additional view analysis was undertaken, which identified that the proposed the Stage 7 & 8 residential subdivision site would be viewable from a number of locations along The Northern Road. As a result, the mounding originally installed as part of the early phase of the development will be extended to ensure that Council's view shed objectives when viewing the site from The Northern Road. The engineering plans provide additional detail of the location and extent to which the mounding will be modified.

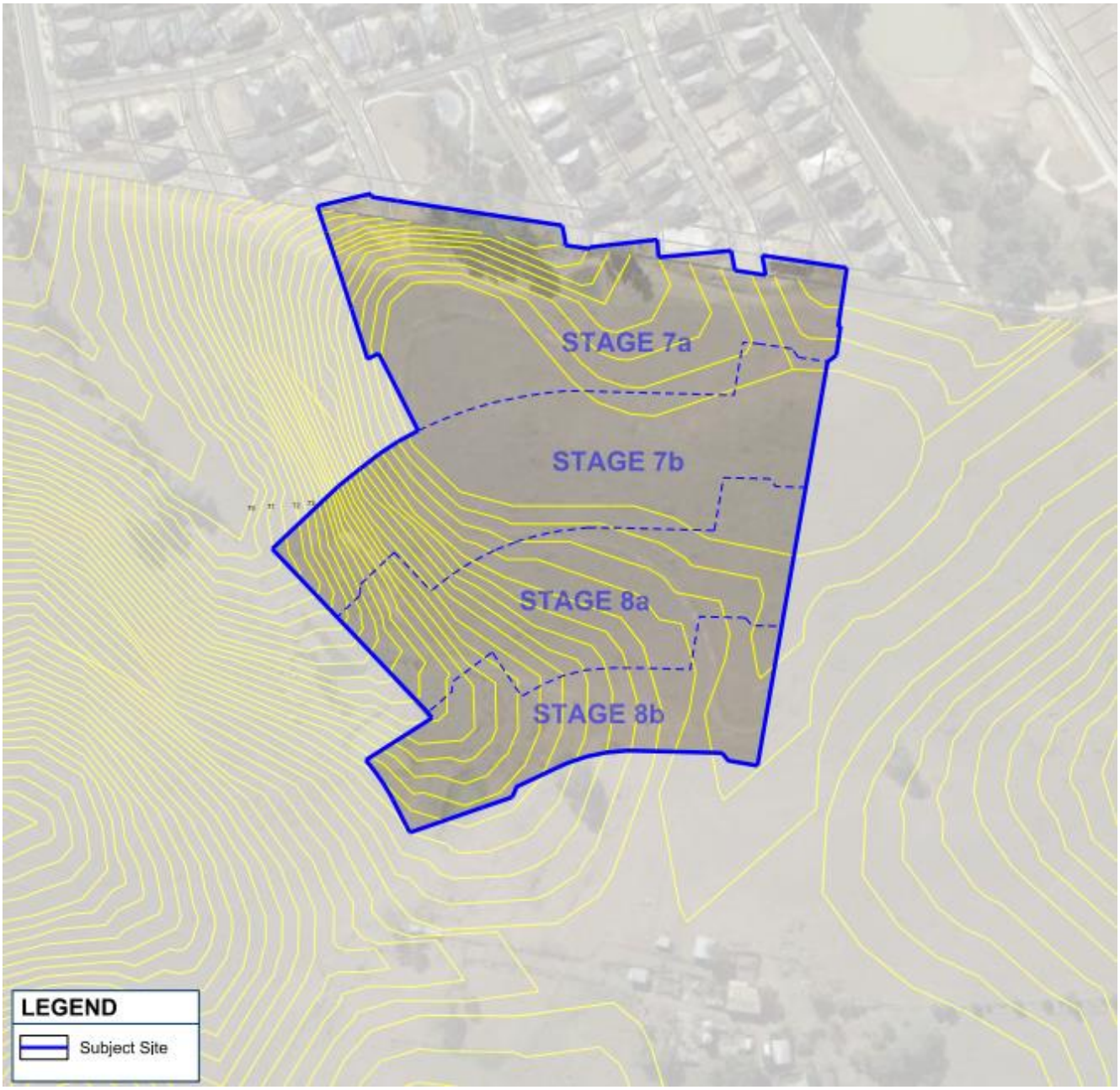
Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

Figure 2: Locality Plan



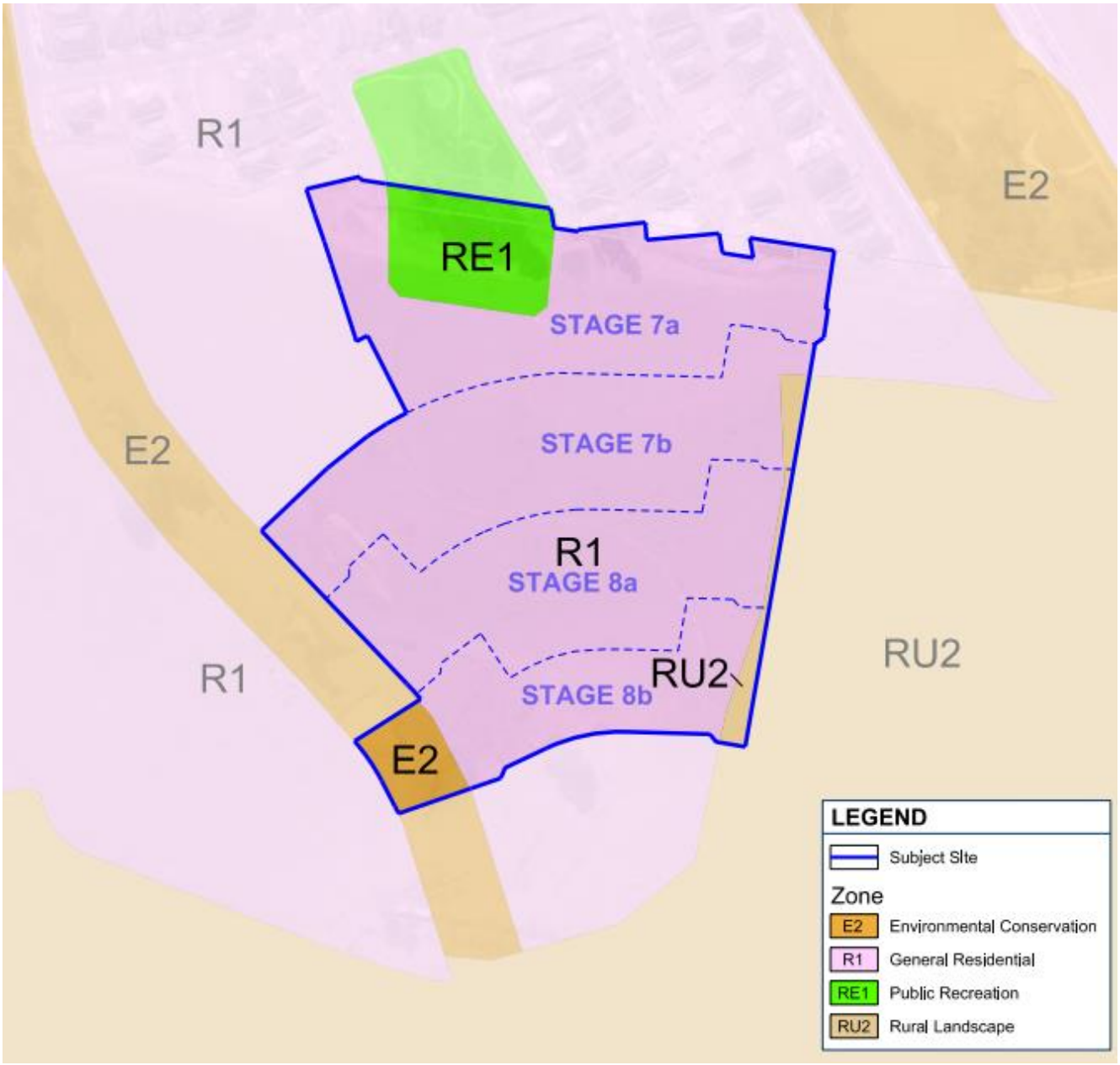
Document Set ID: 9964746
Version: 1, Version Date: 17/02/2022

Figure 3: Site Plan



Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

Figure 4: Zoning Plan



Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

3 PROPOSED DEVELOPMENT

3.1 Proposal

The proposal seeks approval for a subdivision of existing Lot 4 on DP 1240361 within Precinct H of the Glenmore Park Stage 2 release area. The proposed residential subdivision of the site will create a total of 88 residential allotments. The DA Plan and Lot Mix Plan submitted with this report provide detail on the proposed allotment typologies as well as road locations and reserve widths.

Also enclosed with this report as a separate document are the Civil Engineering Plans which provide construction details for the proposed works. A summary of the proposed residential subdivision is provided below:

- Creation of 88 residential allotments, ranging between 311m² and 642m².
- Creation of 2 superlots for future small lot subdivision.
- Creation of an open space lot that will form part of Pinnacle Park (embellishment to be subject to a separate future DA.
- Earth works associated with the construction of roadways, servicing, stormwater devices and minor allotment grading (refer Civil Engineering Plans for extent of cut and fill).
- Construction of new roads.
- Delivery of stormwater management infrastructure including an east-west overland flow path as shown on the Engineering Drawings.
- Construction of retaining walls.
- Landscaping of streetscape areas.
- Provision of required services.
- Extension of exiting mounding providing additional protections of sightlines.
- Environmental restoration works associated with the Surveyors Creek riparian corridor and Pinnacle Park.
- Landscape embellishment of Surveyors Creek.

The proposed residential subdivision layout achieves an integrated outcome with the existing residential development to the north, continuing the established residential block structure and ensuring that an accessible and legible subdivision layout is delivered.

The proposed allotments are generally consistent with the Concept Plan and, in combination with future Stages of development within Precinct G and H will contribute to achieving the dwelling yield and diversity targets established in the Concept Plan and meet the objectives of the Glenmore Park Stage 2 DCP.

Key aspects of the proposal are discussed in further detail below and an assessment against the relevant planning controls is provided in Chapter 4 of this Statement of Environmental Effects.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

3.2 Concept Plan Design Modifications

Consistent with the endorsed Concept Plan, the proposal incorporates extension of the Riverflat Drive to continue this collector road south adjacent to the Surveyors Creek open space corridor, providing a connection between Bradley Street in the north. Future subdivision of Stage 9 will facilitate connectivity to Precinct G and the future Glenmore Park Stage 3. Any future subdivision, post Stage 3 rezoning, will need to consider the Concept Plan and ensure that appropriate and safe road connections are provided. Continuation of the Riverflat Drive south allows for future bus services to access the area in accordance with the ultimate bus route plan submitted as part of the Concept Plan report.

There are a number of minor inconsistencies between the proposed subdivision and the Concept Plan. Many of these inconsistencies are a result of detailed design work and changes necessitated as a result of previous approvals. Further detail on the inconsistencies is provided below.

- **Concept Plan Road 11:** The north south road at the eastern boundary of the site, known as Road 11 on the Concept Plan, has been amended to incorporate a straighter alignment. The proposed alignment is considered to provide extended sight lines north and south, enabling safe vehicle turns from the east-west roads of the subdivision. Notwithstanding this minor departure, the proposed road alignment will still provide excellent road connectivity to the future residential community, as envisaged by the Concept Plan.

- **East West Road Alignments:** The street block arrangement in this application, proposes to implement a modified, curvilinear east-west street blocks. While this arrangement differs slightly from the Concept Plan, which proposed an L-shaped cell block alignment, it maintains the Concept Plan's east west connectivity between the Riverflat Drive collector extension and the eastern north-south (i.e. Road 11 in the Concept Plan).

- **Integration with Stage 6:** The Concept Plan envisaged an L-Shape cell block for the Stage 6 area. However, previous subdivision approvals within the Stage 6 area have resulted in an amended cell alignment. Specifically, the L-Shaped cell block has been removed and replaced with a more traditional grid pattern, with a T-intersection at Road 2 of the Concept Plan and Clearview Drive. This change in the design has required further design changes, particularly with the alignment of the east-west road (Road 2 in the Concept Plan) and connectivity of the north-south local road network, including Middlebrook Rise, Captsone Terrace and Highdale Terrace. Notwithstanding the need to amend the road alignment approved under the Concept Plan, north-south and east-west connectivity is maintained in line with principles of the Concept Plan.

- **Pinnacle Park:** The configuration of the southern portion of Pinnacle Park varies slightly from the Concept Plan. The reconfiguration has resulted in a variation in size has been necessitated by the already approved road network in the existing development to the north and east, specifically the alignments of Clearway Terrace, Middlebrook Rise, Capstone Terrace and Highdale Terrace. These approved roads have placed significant constraints on the ability to expand the park, without creating a poor movement network and urban outcome. These constrains are detailed below:

  - **Western Expansion Constraints:** There is no opportunity to increase the park to the west as the adjoining lots are already 25m deep. Decreasing lot depth to less that 25m will limit the ability to achieve a block size that would enable a reasonable housing product.

  - **Eastern Expansion Constraints:** Increasing the park to the east would create an intersection angles that would not provide a safe vehicular movement environment, in particularly, the alignment of intersections of Road 2 with Middlebrook Rise, Captsone Terrace and Highdale Terrace.

  - **Southern Expansion Constraints:** Increasing the park to the south would create a situation where Road 2 would not align with the road being constructed within Stage 6 to the west. As noted above, the approved road network that forms part of Stage 6 has necessitated a minor modification to the road network, particularly the east-west road to the south of Pinnacle Park (i.e. Road 2 on the Concept Plan

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

The constraints identified above has resulted in the southern portion of Pinnacle Park having an area of 4,435m^2, a shortfall of 565m^2 from the 5,000m^2 identified in the Concept Plan. The existing northern portion of Pinnacle Park has an area of approximately 5,110m^2. Together with the proposed southern portion of Pinnacle Park, the total area of the open space will be approximately 9,545m^2. The RE1 zoning that represents Pinnacle Park, measures an area of approximately 10,072m^2. The proposed total area of Pinnacle Park is therefore, 527m^2, which represents a variation of only 5%. Notwithstanding, it is proposed that the southern portion of Pinnacle Park, proposed by this application, incorporate additional embellishment that is intended to facilitate the delivery of additionally amenity within the park. It is proposed that the type and level of embellishment of the park will be undertaken in consultation with Council. As such, a separate application will be prepared for the embellishment of the park, enable appropriate consultation with Council to occur prior to the finalisation of the plans.

- **Terrace and Semi-Detached Lots:** The Concept Plan proposed two of the western street block ends, fronting the Surveyors Creek riparian corridor, to be allocated for terrace and semi-detached lot product between 7.5m to 10m in width and 213m^2 to 329m^2 in area. Additionally, these lots were identified as rear accessed. This application proposes the creation of two super lots that will accommodate small lot product as part of future subdivision applications. However, while small lot product is proposed, rear access has been removed to reflect a more conventional, front loaded, product that is more acceptable to the market and responsive to the topographical constraints of the site. It is considered that the proposed subdivision maintains the opportunity for small lot product fronting the Surveyors Creek riparian corridor, however, this has been done in a manner that is responsive to and reflective of market demand.

While a number of inconsistencies with the Concept Plan are identified above, the subject subdivision has been designed on the design principles established as part of the Concept Plan identified above. The proposed roads are generally consistent with the hierarchy endorsed by Council and have been designed in accordance with the configuration requirements set out under the Glenmore Park Stage 2 DCP and are discussed in further detail under Section 3.3 of this report.

The proposed residential subdivision is also generally consistent with the distribution of lot types in the Concept Plan. The proposed subdivision incorporates a variety of lot types to accommodate different forms of dwelling products and contributes to achieving the dwelling yield and diversity targets established by the Concept Plan and Glenmore Park Stage 2 DCP.

The proposed lot typology adjacent to the Surveyors Creek corridor achieves front loaded semi-detached and/or built to boundary outcome that ensures dwellings front the street and facilitate passive surveillance of the open space area. These allotments will also benefit from the amenity provided by Surveyors Creek.

The dwelling yield and diversity targets for Precinct G and H established in the Concept Plan and set out under the Glenmore Park Stage 2 DCP are discussed in further detail under Section 3.2 of this report.

3.3 Density & Lot Typology

The Concept Plan and supporting report endorsed by Penrith Council on 22 August 2016 provides detailed discussion on the dwelling yield and diversity targets for Precincts G and H.

In keeping with the Concept Plan, the proposed residential subdivision includes a variety of lot widths and sizes to encourage a diversity of housing types consistent with the intent of the Glenmore Park Stage 2 DCP.

The Concept Plan is generally consistent with the dwelling targets and lot mix identified in the DCP and incorporates a variety of lot types to meet market demand. The Concept Plan achieves a variety of allotment types to accommodate Terrace and Semi-attached dwellings, Built-to-Boundary dwellings and Detached dwellings. The Concept Plan achieves the intent of the DCP by providing a mix of lot types which can accommodate a range of different dwellings.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

Table 1 –Precinct G & H: DCP, Concept Plan and Approved Dwelling Comparison

	Precinct	Apartments and Studios	Terraces/Live-Works and Semi-Detached	Built to Boundary	Detached	Precinct Total
DCP	G	4	21	45	102	172
	H	4	18	40	78	140
	Sub-Total	***8***	***39***	***85***	***180***	**312**
					TOTAL:	
Concept Plan	G	-	23	94	91	208
	H	-	16	88	60	164
	Sub-Total	***-***	***39***	***182***	***151***	**372**
					TOTAL:	
Proposed	G	-	28*	80	72	180
	H	-	20*	16	116	152
	Sub-Total		***48****	***96***	***188***	**332**
					TOTAL	

Notes:

***** Yield based on dwelling yield in Table 2.

As demonstrated in the table above, the Concept Plan achieves a variety of allotment types to accommodate Terrace and Semi-attached dwellings, Built-to-Boundary dwellings and Detached dwellings. The Concept Plan achieves the intent of the DCP by providing a mix of lot types which can accommodate a range of different dwellings.

Table 1 indicates that the proposed dwelling yield for terrace and semi-detached dwellings is 10 dwellings over the Concept Plan yield. While this yield exceeds the Concept Plan yield, the terrace/semi-detached dwellings are proposed in location of high amenity, adjacent to open space. Table 1 also indicated that overall, the proposed dwelling yield is 40 dwelling short of the Concept Plan yield. It is anticipated that this yield will be met with the finalization of Stage 4 and part of Stage 7 of the overall development area.

Consistent with the Concept Plan and DCP, the proposal delivers a mix of allotments that can accommodate a range of dwelling types. Table 2 below shows the proposed lot mix for Stages 7 & 8 as well as the approved lot mix within Stages 1, 2, 3, 4 and 6 and indicative yield for Stage 9.

Table 2 – Proposed Stages 7 & 8 Lot Mix and Approved Stages 1, 2, 3, 4 & 6 Lot Mix

	Precinct	Apartments and Studios	Terraces/Live-Works and Semi-Detached	Built to Boundary	Detached	Total
Stage 1 & 2	G	0	1	48	27	75
Stage 3	G	0	6	15	24	39
Stage 4	G	0	21*	17	49	66
Stage 6	H	0	0	7	27	36
Stage 7	H	0	0	3	55	58*
Stage 8	H	0	13*	5	25	43*
Stage 9	H	0	7+	0	8+	15+

Notes:

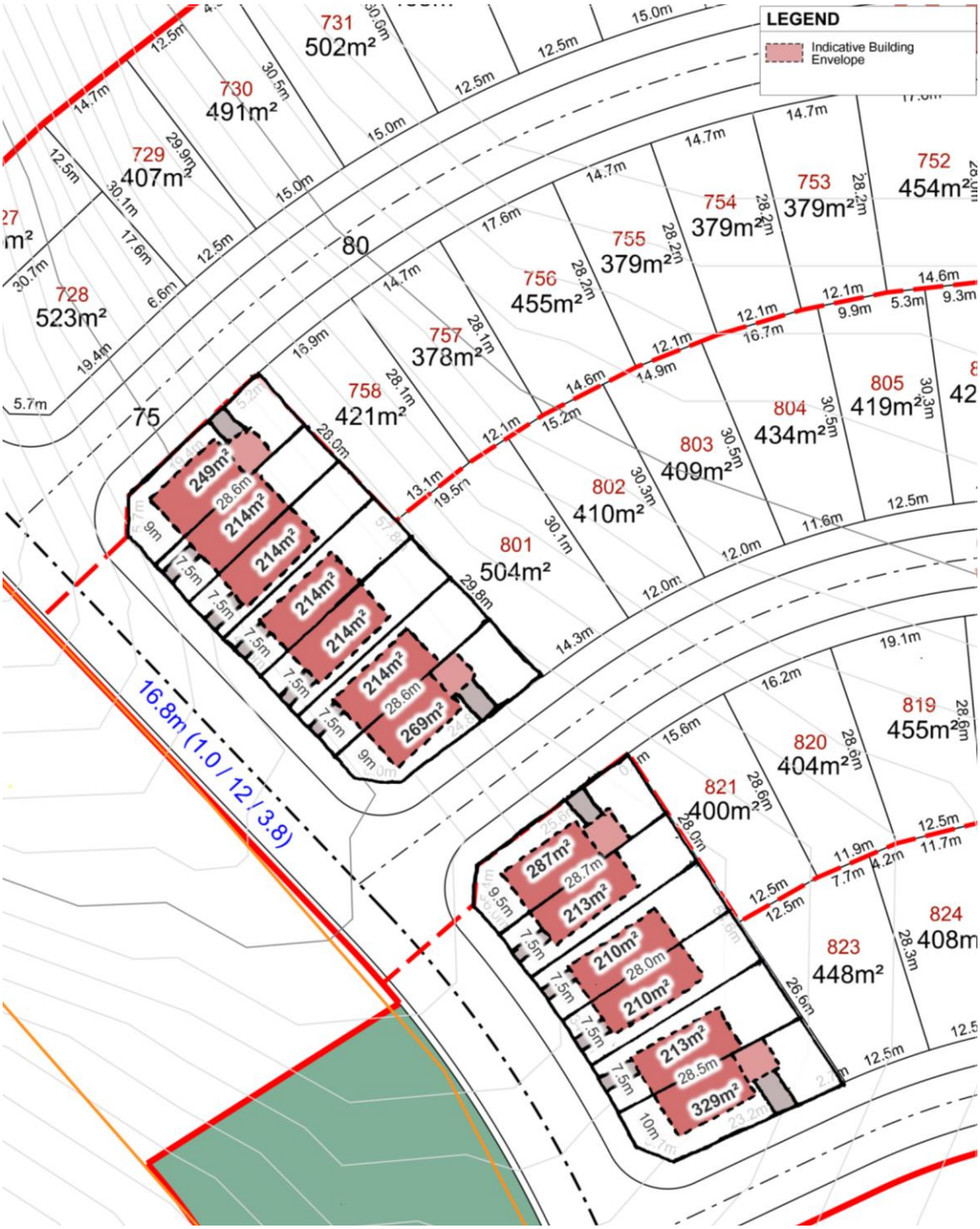
***** Yield subject to DA approval.

+ Yield indicative only and subject to DA approval.

Document Set ID: 9964746
Version: 1, Version Date: 17/02/2022

As shown on the Dwelling Type Plan submitted with this report, the proposed allotments have been categorised on whether the lot is to accommodate a 'build to boundary' dwelling type or 'detached' dwelling type. Utilising the Glenmore Park Stage 2 Development Control Plan categorisation of development types, the subject subdivision will enable the delivery of a mix of dwelling types, including build to boundary dwellings and detached dwellings. Future subdivision of the two superlots will provide the opportunity to deliver attached style development product. However, while small lot product is proposed in these superlots, lots with rear access has been removed to reflect a more conventional, front loaded, product that is more acceptable to the market. It is considered that the proposed subdivision maintains the opportunity for small lot product fronting the Surveyors Creek riparian corridor, however, this has been done in a manner that is responsive to and reflective of market demand. An indicative subdivision layout has been prepared to determine the likely development yield. The concept lot layout at Figure 5 identifies that a potential 14 dwellings can be delivered through terrace/semi-detached development typology. As noted above, this is an indicative design with further detailed design and subject to Council approval.

Figure 5: Indicative Superlot Layout Plan



Document Set ID: 9861746
Version: 1, Version Date: 21/02/2022

The built to boundary allotments are generally regular in shape and have areas less than 360m^2. These allotment types have been designed to accommodate the allotment requirements for built to boundary products as per the Concept Plan for Precincts G and H. In accordance with the endorsed Concept Plan, no studio or apartment style developments are proposed as part of this application.

The larger allotments will accommodate detached dwellings to achieve the lot mix targets for Precincts G and H. In accordance with the Glenmore Park Stage 2 DCP, these larger allotments have been located on street corners to allow for future dwellings to address both streets.

The proposal incorporates a mix of lot frontages that will contribute to encouraging diversity in housing and interesting streetscapes that balance consistency in lot shape with variety in size. The proposed subdivision layout ensures all allotments front the street, activating the public domain, including the interface with the Surveyors Creek open space corridor.

The proposed road layout and residential structure maintains the objectives of the Concept Plan, delivering allotments that front the Surveyors Creek open space area and facilitate passive surveillance of the open space area. These allotments will also benefit from the amenity provided by Surveyors Creek.

3.4 Movement Network & Traffic Impact

The Glenmore Park Stage 2 Development Control Plan was adopted by Penrith City Council on the 15th October 2007. This DCP outlined a clear road hierarchy and associated streetscape sections for the Glenmore Park Stage 2 development. The Council endorsed Precinct G and H Concept Plan refined the DCP Road Hierarchy based on a more detailed residential structure and urban layout.

The proposed road layout is consistent with the principals and key road provisions within the Glenmore Park Stage 2. The main point of access to the site will be achieved by extending the existing collector road adjacent to Surveyors Creek (Riverflat Drive) southwards. Additional access points will be provided through extension of the local roads from Precinct E to the north

The road network is based on a modified grid layout and has been designed to respond to the topography of the site and ensure appropriate grades are achieved along each road. The modified grid layout maximizes permeability and legibility for future residents providing connections for vehicles and pedestrians to open space within Precincts G and H and local services within Glenmore Park Stage 2 release area.

Riverflat Drive

The proposed section of Riverflat Drive incorporates a carriageway width of 12m, a 3.8m verge on the residential side and a reduced verge of 1m on the Surveyors Creek side, with a total road reserve width of 16.8m. Refer to Appendix 2 for further detail on the Riverflat Drive collector road reserve design.

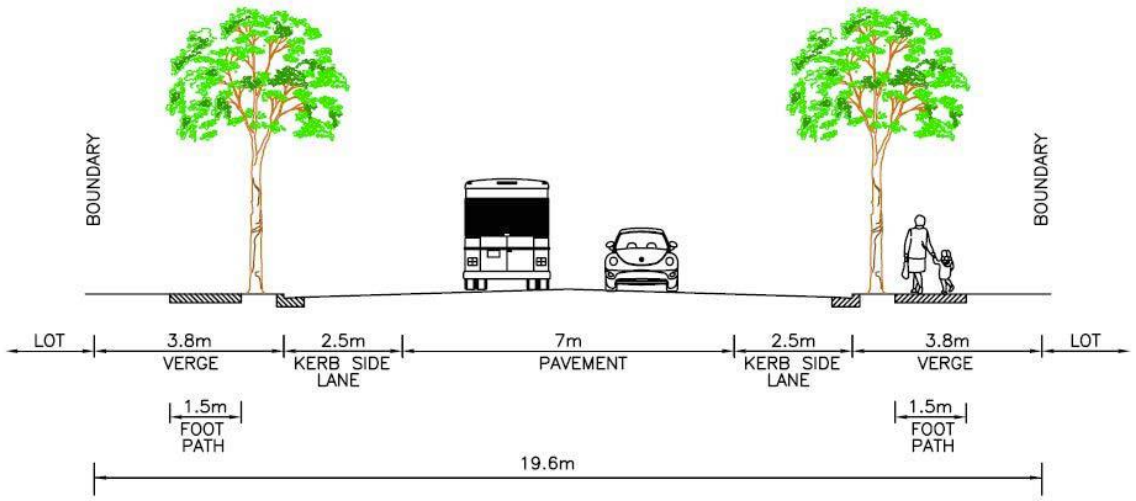
The proposed section of Riverflat Drive incorporates a reduced verge on the Surveyors Creek side as no services are required and this section of road does not form part of the sharepath network. Notwithstanding this, landscaping works within the Surveyors Creek open space corridor will incorporate the provision of a sharepath in accordance with figure E7.23 of the Glenmore Park Stage 2 DCP (refer to Figure 5 of this report).

In accordance with the cross section for a Collector Road, a 1.5m footpath is provided on the residential side within the 3.8m verge as well as landscaping and services. This configuration is also consistent with the existing section of this road to the north and the proposal ensures a seamless connection is achieved.

Riverflat Drive provides the main entry and exit point for the development and incorporates a bus capable carriageway. The most suitable location for a bus stop was identified in the Concept Plan, locating it within the Stage 6 area, at the Surveyors Creek riparian corridor crossing, located at the intersection of Randall Street and Riverlfat Drive.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

Figure 6 – DCP Collector Road Cross Section



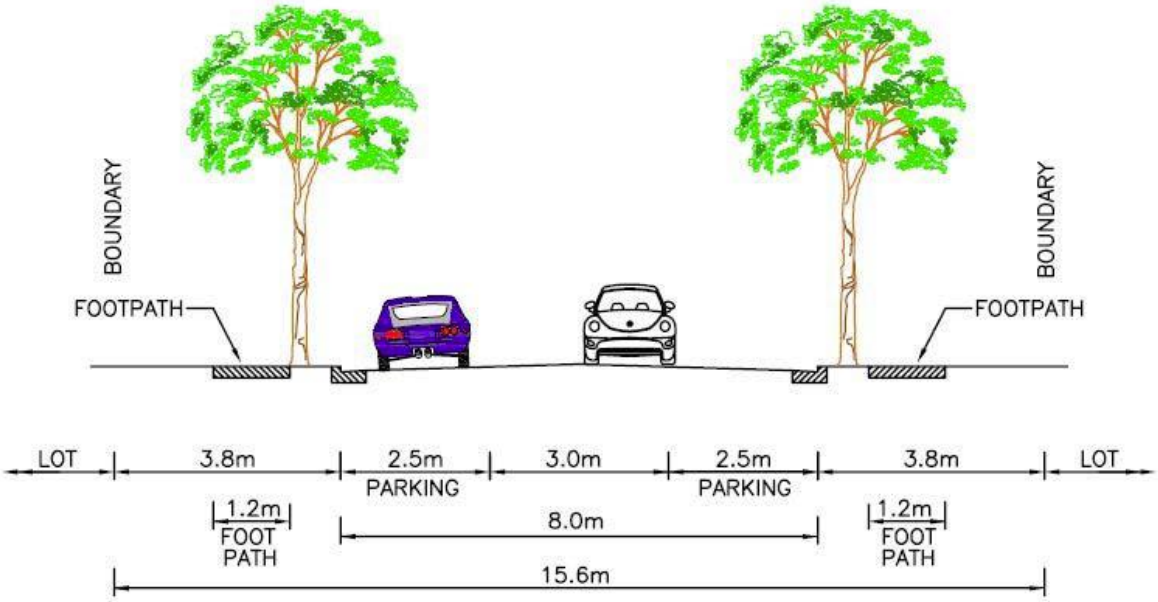
Minor Local Roads

The proposal incorporates extension of the existing minor local roads from Precinct E to provide additional access point for the subdivision area. Additional local roads will provide east west access through the Stage 7 & 8 development area, as well as the north south local road along the eastern boundary of the site.

The proposed minor local roads will facilitate a low-speed traffic environment within residential streets and ensure that roadways can operate as shared spaces encouraging pedestrian and cycle movements throughout the subdivision area. The proposed pedestrian pathways ensure that an integrated outcome is achieved with Riverflat Drive, Surveyors Creek.

As demonstrated in the enclosed Civil Engineering Plans, the proposed minor local roads are designed in accordance with the cross section shown under Figure E7.29 of the DCP (Figure 7 of this report), incorporating a pavement width of 8m, comprising parking and travel lanes and verge widths of 3.8m are provided. Refer to Appendix 2 for further detail on local road reserve design.

Figure 7 – DCP Minor Local Road Cross Section



Document Set ID: 9964746
Version: 1, Version Date: 17/02/2022

The majority of the site will incorporate a local road network consistent with the road reserve widths in the DCP. However, in recent discussions with Council, the northern verge of Road 113, from Capstone Terrace eastwards, (incorporating lots 708 to 714) has been identified for widening. The intent of the widening is to facilitate additional landscaping along the road frontage between Pinnacle Park and the Surveyors Creek corridor, providing a vegetated corridor between the two spaces. To facilitate this, a 6.8m wide verge on the northern side of Road 113 is proposed. The Lot Layout Plan and Dwelling Type Plan at Appendix 1 have been updated to reflect the proposed road verge increase.

Pedestrian and Cycle Networks

The proposal incorporates pedestrian pathways as an integrated element of the street network that promotes active and healthy transport options. The modified grid road layout aids the function of the proposed pedestrian paths, providing convenient and legible routes to share paths, open space and other key focal points within the release.

In accordance with the DCP cross sections for a collector road, the proposed works include a 1.5 metre foot path within the verge on the residential side and no footpath on the Surveyors Creek side as this section of road does not form part of the sharepath network. This configuration is also consistent with the existing section of this road to the north and the proposal ensures a seamless connection is achieved.

Notwithstanding this, landscaping works within the Surveyors Creek open space corridor will incorporate the provision of a sharepath in accordance with figure E7.23 of the Glenmore Park Stage 2 DCP.

Foot paths for the minor local road have been provided on both sides of the road in accordance with the DCP and outcomes of the Penrith Council Ordinary Meeting on 22 August 2016.

3.5 Landscaping

The proposal will deliver the street landscaping outcomes in accordance with the Street Tree Layout Masterplan submitted with the Council endorsed Concept Plan for Precinct G and H. Detailed tree locations will be submitted as part of the Construction Certificate application and in accordance with Penrith Development Control Plan 2014, the Construction Certificate Drawings will incorporate one (1) street tree for every 10m of lot frontage. It is acknowledged the Notice of Determination for this proposal will incorporate a condition of consent in relation to street tree requirements to be included in the Construction Certificate drawings.

A Vegetation Management Plan (VMP) has also been prepared for the Surveyors Creek corridor and Pinnacle Park (refer to Appendix 7). A landscape plan for embellishment works has been prepared for the Surveyors Creek riparian corridor and includes the installation of access paths, in addition to the regenerative works proposed (refer to Appendix 4). The VMP also includes details of vegetation management within Pinnacle Park. However, no landscape embellishment works within Pinnacle Park are proposed as part of this Application, with a separate application to be prepared as part of further discussions with Council regarding its embellishment.

3.6 Infrastructure Servicing Strategy

3.6.1 Drainage & Stormwater Strategy

A Stormwater Management Strategy for the Glenmore Park Stage 2 Precinct G & H development has been prepared to support the proposed Stages 7 & 8 development as well as the previously approved Stages within the Precinct G and H area. The Stormwater Management Strategy comprises a treatment train consisting on-lot treatment, street level treatment and subdivision / development treatment measures.

Provision of the water quality treatment devices included in the Stormwater Management Strategy will ensure that the post development stormwater discharges will meet Penrith City Councils' water quality objectives for the development.

The Stormwater Management Strategy details provision of WSUD elements within the development that will assist in minimising the impact of urbanisation on the waterway stability of Surveyors Creek. To this end, the vegetation restoration proposed in

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

Surveyors Creek, together with the Stormwater Management Strategy will ensure consistency with SREP 20, as well as the planning agreement.

The Stormwater Management Strategy which has been prepared for Precincts G and H and which applies to the subject site provides a basis for the detailed design and development of the site to ensure that the environmental, urban amenity, engineering and economic objectives for stormwater management and site discharge are achieved.

The Civil Engineering plans and report submitted with this application (refer to Appendix 2) provide details on stormwater management for the proposed subdivision works, including the provision of an overland flow path for stormwater.

3.6.2 Water Reticulation

Water mains for the subject site can be extended from the existing residential development to the north. An application to Sydney Water will be made concurrently with this Development Application.

3.6.3 Sewerage

Low infiltration sewer reticulation can be extended from the existing residential development to the north located within Precinct E and the existing sewer network constructed in this area.

3.6.4 Electricity

To service the proposed subdivision, electrical network will be required to be expanded from the existing residential development to the north located within Precinct E.

3.6.5 Telecommunications

Telecommunications will be extended from the approved, and partially developed Stage 4 area, via the road/bridge cross that has been delivered.

3.6.6 Gas

Gas services will be extended from the existing residential development to the north of the subject site.

3.7 Community Facilities

3.7.1 Pinnacle Park

In accordance with the Voluntary Planning Agreement for the Glenmore Park Stage 2 release area, the Concept Plan incorporates an area of Neighbourhood Open Space to serve the future community. This application seeks to deliver the open space, which will be an extension of Pinnacle Park. The embellishment of the pen space lot will form part of a future separate Development application.

An area of approximately 5,000m² was nominated on the Concept Plan. The subdivision design in this area of the site has needed to considered a number of factors, including:

- The need to seamlessly connect to the approved and built road network to the north, specifically Clearview Terrace, Middlebrook Rise and Capstone Terrace;
- Creation of adequately sized lots fronting the southern extension of Pinnacle Park; and
- Location of the east-west local road at the south of the Pinnacle Park extension as a result of topographical and bulk earthwork considerations.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

The open space lot proposed by this application measures a net area of 4,435m^2, which is marginally less that the 5,000m^2 identified in the Precinct G & H Concept Plan. Notwithstanding the minor inconsistency with the Concept Plan, the creation of the lot will facilitate the extension of Pinnacle Park, providing an overall open space area of approximately 9,545m^2.

The VPA requires that embellishment of Pinnacle Park is required prior to the issue of the Subdivision Certificate for the 120th lot or at a later time as agreed with Council. This application triggers the requirement for the embellishment of Pinnacle park. Discussions with Council have progressed in this regard, with a formal request to be submitted to Council seeking confirmation that a separate DA will be lodged. Additionally, given the shortfall in the overall provision of open space in this area, additional embellishment is proposed to ensure future resident have access to high quality open space. The separate application and landscape embellishment works will be prepared in consultation with Council to ensure the most appropriate open space outcome is achieved.

3.7.2 Surveyors Creek Riparian Corridor

The proposed central linear open space within the Surveyors Creek corridor provides a key community facility, significantly improving the amenity of the subdivision. Early works, including riparian revegetation works are proposed as part of this application, as well as embellishment works. A VMP has been prepared, as well as a landscape plan identifying the proposed works (refer to Appendix 7). The VMP and landscape plan identify a number of regenerative and embellishment works, including the addition of pathways to connect to the existing path network within Surveyors Creek.

It should be noted that the small remaining portion of the Surveyors Creek riparian corridor will be dealt with as part of a future separate application that will also include the subdivision of Stage 9 of Precinct H.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

4 ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979

4.1 Section 4.10 – Designated Development

Section 4.10 of the Environmental Planning and Assessment Act 1979 (EP&A Act) provides that development is considered to be Designated Development where declared as such by any Environmental Planning Instrument or the Regulations.

Schedule 3 of the EP&A Regulations 2000 outlines the criteria for development which is classified as Designated Development. Development classed as 'designated' requires particular scrutiny because of its nature or potential environmental impacts. Designated development includes development that has a high potential to have adverse impacts because of their scale or nature or because of their location near sensitive environmental areas, such as wetlands and coastal areas.

The proposed development does not satisfy the criteria within Schedule 3 of the EP&A Regulations 2000 and is therefore not considered to be Designated Development as defined under the Regulations.

4.2 Section 4.46 – Integrated Development

Section 4.46 of the Environmental Planning & Assessment (EP & A) Act 1979 outlines development which is considered to be Integrated Development, requiring concurrence/approval under a variety of Acts.

The proposal constitutes Integrated Development under Section 4.46 of the EP & A Act 1979 as follows:

4.2.1 National Parks & Wildlife Act 1974

Detailed reports were prepared during rezoning of the Glenmore Park Stage 2 development area which reviewed and identified Aboriginal and European sites and artefacts.

The Cultural Heritage Assessment prepared by Navin Officer Heritage Consultants, dated July 2003 identified that no items of Environmental Heritage were identified within the subject site.

Accordingly, the proposed works are not classified as Integrated Development in this instance.

4.2.2 Water Management Act 2000

Under Section 91 of the EP&A Act 1979, a proposal is Integrated Development if approval is required to undertake a controlled activity on waterfront land under Section 91 of the Water Management Act 2000.

A controlled activity under the Water Management Act is defined as:

> *(a) the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or*
>
> *(b) the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or*
>
> *(c) the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or*
>
> *(d) the carrying out of any other activity that affects the quantity or flow of water in a water source.*

The proposed residential subdivision involves works within 40m of an identified creek line or riparian corridor. This identified creek line is the western tributary of Surveyors Creek. The proposed works primarily relate to riparian restoration and revegetation works. A VMP and accompanying landscape plan has been prepared for the Surveyors Creek corridor and is attached with this application (refer to Appendix 7). A Landscape Plan for Surveyors Creek is attached at Appendix 4.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

Accordingly, the proposed works are integrated development and referral of this Development Application to the NSW Office of Water is required.

4.2.3 Rural Fires Act 1997

Section 91 of the EP & A Act identifies that residential subdivision of Bushfire Prone Land requires a Bush Fire Safety Authority is Integrated Development.

The site is identified as containing Bushfire Prone Land under Penrith Councils Bushfire Prone Land Map (November 2014).

A Bushfire Protection Review has been prepared to support the proposal and is submitted with this Development Application.

The review identified two bushfire vegetation classes occurring within the site:

- 'Low Hazard Vegetation' – which applies to the riparian style corridor; and
- 'Pasture' surrounding the site.

The Concept Plan has been designed in consideration of these findings and pursuant to the requirements set out in Planning for Bushfire Protection 2006.

Further review has been undertaken to determine the impact of the works proposed in the VMP and landscape plan for the Surveyors Creek corridor. The review has found that the proposed landscape works within Surveyors Creek corridor will not have an impact on the achievement of the APZ for this portion of the development, as it can still be met by Riverflat Drive.

Notwithstanding, the proposal is classified as Integrated Development and referral of this Development Application to the NSW Rural Fire Service is required.

4.3 Commonwealth and State Biodiversity Conservation Legislative Framework

Section 1.7 of the EP&A Act facilitates the protection of terrestrial and aquatic threatened species, populations and ecological communities, and their habitats through the Biodiversity Conservation Act 2016 and Fisheries Management Act 1994.

4.3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, any action (which includes a development, proposed development or activity) that is considered likely to have a significant impact on Matters of National Environmental Significance (MNES) must be referred to the Commonwealth Minister for the Environment.

The Biodiversity Development Assessment Report (BDAR) prepared by Australian Wetlands Consulting Pty Ltd (AWC) has undertaken an assessment of the MNES that may or may not occur within the site or in the vicinity of the site. The assessment has found no matters of MES are identified, with referral to the Federal Minister for the Environment unnecessary.

4.3.2 Biodiversity Conservation Act 2016 (BC Act)

The Biodiversity Conservation Act 2016 (BC Act) facilitates the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

The BDAR (refer to Appendix 6) has undertaken an assessment of the proposed development in accordance with the Biodiversity Assessment Methodology (BAM). The BDAR has identified plant community types within the site area, as well as a suite of recommendations in relation to the avoidance and mitigation of disturbance as a result of the development.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

5 PLANNING CONTEXT (SECTION 4.15 EP&A ACT)

5.1 Environmental Planning Instruments

5.1.1 State Environmental Planning Policy (Major Development) 2005

State Environmental Planning Policy (Major Development) 2005 (Major Development SEPP) seeks to identify development projects of a scale which necessitate review and assessment by either the Minister for Planning or a Joint Regional Planning Panel.

Part 3 of the Major Development SEPP outlines the criteria for the types of Development Applications that are considered to be 'Major Development' of a scale which requires determination by a Joint Regional Planning Panel (JRPP). Under Clause 13B, subdivisions which seek approval to create more than 250 allotments are considered to be a 'Major Development', and are required to be determined by the relevant JRPP.

The proposal seeks approval for subdivision of the site to create a total of 104 residential allotments, and as such is not classified as Major Development.

5.1.2 State Environmental Planning Policy (Infrastructure) 2007

Traffic Generating Development

Schedule 3 of SEPP (Infrastructure) 2007 provides guidance on the circumstances when the Roads and Traffic Authority (RTA) should be made aware of and provided the opportunity to make a representation on Development Applications.

Schedule 3 lists the criteria for the types of Development Applications that are considered to be 'Traffic Generating Development' of a scale which requires referral to the RTA. Under Schedule 3, residential subdivisions which seek approval to create in excess of 200 allotments are required to be referred to the RTA.

The proposal seeks approval for subdivision of the site to create 92 residential allotments. As such, the application does not require referral to the RTA under Schedule 3 of the Infrastructure SEPP.

Noise Impacts

Clause 102 of the ISEPP provides requirements in relation to road noise for residential development. Accordingly, and given the site's proximity to the Northern Road, an Acoustic Assessment has bee prepared (refer to Appendix 11). The Acoustic Assessment undertook a review of the potential noise impact on development within Stages 7 to 9 from The Northern Road, particularly since the road is undergoing upgrades.

Based on the assessment in accordance with the ISEPP criteria, the report found that the majority of the dwellings within the development area are predicted to meet the ISEPP internal noise criteria, with no specific acoustic facade treatment required. However, modelling did identify a number of dwellings located along the eastern extents of the subdivision will require some form of acoustic facade treatments to meet the ISEPP internal criteria. Accordingly, the relevant treatments have been identified in the Acoustic Assessment.

5.1.3 State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)

SEPP 55 is a NSW-wide planning instrument relating to the remediation of contaminated land. When considering a Development Application, the consent authority must observe the requirements of SEPP 55.

Under Clause 7, a consent authority must not consent to the carrying out of any development on land unless:

a) *It has considered whether the land is contaminated, and*

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

b) *If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable after remediation) for the purpose for which the development is proposed to be carried out, and*

c) *If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.*

In 2001, URS prepared a Phase 2 Investigation Report, investigating the potential for site contamination. This formed part of the 2003 'Environment and Biodiversity LES Report' for the Glenmore Park Stage 2 urban release area. This included an assessment of the potential for the land to be contaminated and whether it was suitable for urban development.

A supplementary report by EDP Consultants Pty Ltd has been prepared is included in this SEE (refer to Appendix 9). The assessment undertaken by EDP addresses matters raised by Council in relation to data gaps between previously prepared investigations and the area subject to this application. As part of the assessment, EDP reviewed the previous works as well as undertaking additional test bores. Based on their review and additional testing, EDP concluded that the former data gaps associated with the increased extent of the development footprint to be addressed and considered the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision.

5.1.4 Sydney Regional Environmental Plan No 20 (SREP 20)

SREP 20 applies to the entire Hawkesbury-Nepean River catchment and sets out policy framework to protect the environmental significance of the catchment. The relevant Section in SREP 20 is Clause 6 which includes policies and strategies that must be considered when considering development proposals within the catchment.

A detailed review of the proposal's compliance with SREP 20 is provided at Appendix 13 to this report.

5.1.5 Penrith Local Environmental Plan 2010

The Penrith LEP was gazetted on 22 September 2010. The subject area is zoned mostly R1 General Residential with a small portion E2 Environmental Conservation under Penrith Local Environmental Plan 2010. The proposed residential subdivision achieves the objectives of the R1 zone through the provision of a range of lot typologies and lot areas which will accommodate a variety of housing types and densities in residential areas.

Part of the eastern boundary of the site is zoned RU2 Rural Landscape, with this area subject to an active Planning Proposal (PP_2020_PENRI_002_00), seeking to rezone the remainder of the land for urban purposes. In relation to this application, the RU2 area only comprises road reserves, with roads permissible in the zone.

A small portion of the subject site is located within land zoned E2 Environmental Conservation. The small portion of E2 land contains the Surveyors Creek corridor along part of the site's western edge.

An area of RE1 Public Recreation zone land is located in the north of the site and forms the extension of Pinnacle Park, with its embellishment to form part of a future Development Application.

The proposed subdivision and associated land uses are consistent with the zoning boundaries and permissible land uses established under the Penrith LEP.

5.2 Penrith Development Control Plan (Glenmore Park Stage 2) 2014

Section 4.15 of the EP & A Act 1979 requires assessment of this Development Application under the provision of the Penrith Development Control Plan (Glenmore Park Stage 2) 2014 (the DCP). Table 3 below outlines design standards under the adopted DCP and the proposed design outcome:

With regard to Table 3, the proposed development achieves full compliance with the Penrith Development Control Plan 2014: Glenmore Park Stage 2.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

Table 3 Compliance with DCP

DCP	Proposed	Complies
7.4.2.3 Dwelling Yield		
• **The Precinct H area has a dwelling target of 140.**	The proposed development incorporates a total of 116 residential allotments within the Precinct H area. The proposed residential subdivision will achieve the dwelling targets for Precinct H. The proposed subdivision has been designed to be generally consistent with the Concept Plan for Precinct G and H.	Yes, development of the balance of Precinct H will achieve the dwelling targets for Precinct H.
7.4.2.4 Dwelling Diversity		
• **Section 7.4.2.4 outlines dwelling diversity targets for Precinct H.**	The proposed lot layout and mix is generally consistent with the Dwelling Diversity requirements for Precinct H and refined as part of the Council endorsed Concept Plan for Precincts G and H which is addressed in detail under Section 3.2 of this SEE. The proposal includes a variety of lot sizes and housing options, as well as the opportunity for smaller lot product options in the future..	Yes. The proposed lot mix is consistent with the adopted DCP and Council endorsed Concept Plan.
7.4.3.1.1 Corridors		
• **Provide Corridors and widths in accordance with Figure E7.17**	The proposed subdivision layout ensures that a 40m corridor width is achieved for the western tributary of the Surveyors Creek corridor which adjoins the subject site to the west.	Yes, the proposed corridor complies with the DCP.
7.4.3.1.2 Bushfire Hazard Management		
• **The indicative location and widths of APZ's to be provided in accordance with NSW RFS requirements.**	The proposed residential subdivision design for Stages 7 and 8 achieves the APZ requirements for Low Hazard Vegetation through delivery of a collector road at the interface between the Surveyors Creek open space corridor and the proposed subdivision area.	Yes. The proposal complies with the DCP control.
7.4.3.1.4 Flood Management		
• **Flood waters are managed within Riparian Corridors.** • **Preparation of a stormwater management plan**	The Civil Engineering Plans submitted with this application include details on stormwater management and demonstrate that flows are contained within drainage corridors. The Civil Engineering Plans are consistent with the Stormwater Management Strategy for the Glenmore Park Stage 2 Precinct G & H area.	Yes, the Civil Engineering Plans demonstrate compliance.
7.4.3.1.5 Trees		
• **Existing significant matured trees are maintained.**	As a result of the road layout, one isolated tree has been identified for removal (refer to Civil Engineering Plans).	No. However, the tree is not considered to have any significance given its isolation from surrounding vegetated areas.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

7.4.3.1.6 The Northern Road View shed		
• **Roofline of dwellings to be located below the eastern ridgeline when viewed from The Northern Road**	A Visual Analysis was been prepared and included with the Concept Plan for Precinct G and H and was submitted with the approved Stage 1 and 2 subdivision (DA 15/1469). The Visual Analysis demonstrates the residential subdivision area is not within an area of visual prominence. Further, the Visual Analysis demonstrates that mounding and urban design measures will ensure local viewsheds are protected as part of the Precinct G and H area. Notwithstanding, additional view analysis was undertaken, which identified that the proposed the Stage 7 & 8 residential subdivision site would be viewable from a number of locations along The Northern Road. As a result, the mounding originally installed as part of the early phase of the development will be extended to ensure that Council's view shed objectives when viewing the site from The Northern Road. The engineering plans provide additional detail of the location and extent to which the mounding will be modified.	The Visual Analysis submitted with the Concept Plan, together with the extension of the earth mounds will ensure compliance.
7.4.3.2.1 Urban Structure		
• **Modified grid street network that facilitates walking and cycling and enables direct local vehicle trips to local activity points.** • **Neighbourhood identity is reinforced by the location of mixed use and open space areas at focal points within convenient walking distance.**	The proposal incorporates a modified grid layout as required in the DCP and promotes access and view corridors to the Surveyors Creek open space corridor as a focal point. The proposed residential subdivision design promotes a walkable neighbourhood via a permeable modified grid layout and legible road hierarchy incorporating pedestrian pathways on both sides of all minor local roads providing pedestrian connections to the sharepath network and bus routes. The proposed collector road has been designed as a bus capable road in accordance with the configuration requirements set out in the Glenmore Park Stage 2 DCP and the alignment is consistent with the Council endorsed Concept Plan.	Yes. The proposed street network and pedestrian linkages comply with the DCP and reflect the principles of design set out in the Concept Plan for Precincts G and H submitted with this Development Application.
7.4.3.2.2 Vehicular Movement		
• **Street blocks have a maximum length of 300m and a maximum depth of 90m.** • **Cul-de-sacs are discouraged.**	Street blocks have a maximum length less than 300m. Block depths are less than 90m. The proposed residential subdivision design and road layout does not incorporate any cul-de-sacs.	The proposed street blocks comply with the endorsed Concept Plan the DCP. This clause is not applicable.
7.4.3.2.3 Public Transport		
• **All dwellings within the Surveyors Creek catchment are within 400m distance from the designated bus route as shown in Figure E7.22.**	The bus route plan submitted with the Concept Plan and DA 15/1469 demonstrates that all allotments within the Precinct G and H area are within 400 metres of a bus stop.	Yes. The proposal is consistent with the DCP requirements.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

7.4.3.2.4 Pedestrians and Cyclists		
• **A pathway network in accordance with Figure E7.23.** • **The minimum width for footpaths provided as part of a road reserve is 1.2m.** • **Pathways that form part of the open space network are a minimum of 2.5m.** • **Footpaths are to be provided to both sides of all roads.**	Plans and details submitted with the proposal demonstrate provision of footpaths on both sides of all minor local roads in accordance with the respective road section requirements. In accordance with the DCP cross sections for a collector road, the proposal includes a 1.5 metre foot path within the verge on the residential side and no footpath on the Surveyors Creek side as this section of road does not form part of the sharepath network and a sharepath will be provided within Surveyors Creek.	Yes. The proposal is consistent with the DCP requirements.
7.4.3.3.1 Landscape Character		
• **Street trees are provided at a rate of one tree for every 10m of site frontage.** • **Street trees are provided at minimum size of 75 litres and fitted with tree guards.** • **Species selection is appropriate to the character and constraints of the locality.**	A Landscape Masterplan has been prepared for the Precinct G and H Concept Plan and has been submitted with this Development Application. The Landscape Masterplan demonstrates the indicative location and species of street trees. The species detailed in the Landscape Masterplan have been selected from Council's Street Tree Planting list, with a mix of native and exotic species are used with a unique species for each street to assist with orientation and legibility of the neighbourhood. All species selected have been chosen for their size and form which is particularly important due to the verge widths, where large species will not be appropriate. Detailed tree locations will be submitted as part of the Construction Certificate application and in accordance with Penrith Development Control Plan 2014, the Construction Certificate Drawings will incorporate one (1) street tree for every 10m of lot frontage. It is acknowledged the Notice of Determination for this proposal will incorporate a condition of consent in relation to street tree requirements to be included in the Construction Certificate drawings.	Yes. The proposed streetscape and road sections are compliant with the DCP.
7.4.3.3.3 Road Sections		
• **Collector Streets are constructed in accordance with Figure E7.27.** • **Streets are constructed in accordance with the dimensions identified at Figure E7.29.**	The proposed collector road has been designed in accordance with Figure E7.27 as demonstrated in the Civil Engineering Plans prepared for the proposed works. The proposed minor local roads have been designed in accordance with Figure E7.27 as demonstrated in the DA Plan and the Civil Engineering Plans submitted with this proposal. Section 3.3 of this report addresses the proposed collector road and minor local roads against the DCP requirement E7.27 and E7.29. Specifically, Section 3.3 identifies the inclusion of a wider verge for Road 103, eastward of Capstone Terrace, to accommodate additional landscape planting and creation of a landscaped corridor between Pinnacle Park and the Surveyors Creek Corridor.	Yes, the proposed subdivision has been designed in accordance with the road cross sections for a collector road and minor local roads.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

7.4.4.1 Subdivision		
• **Higher density housing to be focussed around open space and areas of high amenity**	The proposed subdivision layout includes the creation of three superlots, which will enable the future subdivision for smaller lot product.	Yes. The proposed subdivision provides for the future subdivision of the superlots for small lot product.
• **Provide larger lot frontages on corner blocks**	Corner blocks have been designed to provide wider frontages and address each of the roads adjoining the allotment.	Yes. Corner blocks have been designed with wider frontages.
• **Lot sizes and dimensions to take account of site topography**	The subject application has been designed to provide lots in response to the topography and is generally consistent with the Concept Plan.	Yes, lot placement has given consideration to the site's topography.
• **Lots fronting open space to provide passive surveillance**	The proposed residential subdivision layout incorporates allotments that front the Surveyors Creek corridor to ensure high levels of passive surveillance.	Yes. Higher density lots are situated adjacent to Surveyors Creek.
• **Single dwelling lots are to be a minimum of 25m deep**	All lots exceed a minimum depth of 25m.	Yes. The proposed lots exceed 25m in depth.
• **Lots with an east-west axis should be 12m wide or more**	The proposal is consistent with the control, with lots with a east west orientation having a frontage of 12.5m.	Yes.

Document Set ID: 9864746
Version: 1, Version Date: 21/02/2022

5.3 Impacts of Development

Earthworks

This proposal incorporates earthworking across the subject site in relation to the construction of the Stages 7 & 8 subdivision and includes establishment of the final finished levels, road gradings and allotment gradings.

The proposed earthworks achieve an outcome that allows for future urban development to be delivered across land which is zoned for residential purposes whilst maintaining the existing characteristics of the landscape to achieve a site responsive design.

The Civil Engineering Plans submitted with this proposal (refer to Appendix 2) provide details on the proposed cut and fill, finished levels and include details on erosion and sediment control. Additional detail on the location and height of retaining walls is also provided, including cross sections in a number of key locations.

Salinity and Contamination

In 2001, URS prepared a Phase 2 Investigation Report, investigating the potential for site contamination. This formed part of the 2003 LES Report for the Glenmore Park Stage 2 urban release area and included an assessment of the potential for the land to be contaminated and whether it was suitable for urban development.

A supplementary report by EDP Consultants Pty Ltd has been prepared and is included as Appendix 9 to this SEE. The assessment undertaken by EDP addresses matters raised by Council in relation to data gaps between previously prepared investigations and the area subject to this application. As part of the assessment, EDP reviewed the previous works as well as undertaking additional test bores. Based on their review and additional testing, EDP concluded that the former data gaps associated with the increased extent of the development footprint to be addressed and considered the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision.

No areas of environmental concern or contamination were identified within the site as part of the LES. A Site Validation Report has been attached to this application at Appendix 10.

Flooding and Hydrology

The Stormwater Management Strategy which has been prepared for Precincts G and H and which applies to the subject site provides a basis for the detailed design and development of the site to ensure that the environmental, urban amenity, engineering and economic objectives for stormwater management and site discharge are achieved (refer to Appendix 3).

The Civil Engineering plans and report submitted with this application provide details on stormwater management for the proposed subdivision works (refer to Appendix 2). The Plans also provide detail on the location of the drainage pits, gross pollutant trap and the proposed drainage pipes directing water into the existing stormwater basin approved as part of the Stage 1 and 2 works (DA 15/1469).

The proposed stream improvement works, including revegetation within the Surveyors Creek central drainage channel will ensure that the revegetation can establish prior to the formal embellishment of the reek corridor.

As detailed on the enclosed Civil Engineering Plans, erosion and sediment control measures will be implemented prior to and during construction.

Biodiversity

The site map indicates proposed works within a biodiversity values mapped area. Under the *Biodiversity Conservation Act 2016* and *Regulations 2017*, a Biodiversity Assessment Report (BDAR), prepared by an accredited assessor, would typically be required to accompany this application. However, legal advice has been obtained which states there are sufficient grounds to apply for a certificate for exemption under clause 34a of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*. This is supported by the original ecological studies undertaken for GP2 rezoning and endorsed by Penrith City Council.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

Heritage

Detailed reports were prepared during rezoning of the Glenmore Park Stage 2 development area which reviewed and identified Aboriginal and European Heritage sites and artefacts. The Cultural Heritage Assessment prepared by Navin Officer Heritage Consultants, dated July 2003 did not identify any items of Environmental Heritage within the site.

5.4 Site Suitability

As outlined above, the subject site falls within the Glenmore Park Stage 2 release area at Mulgoa and is zoned R1 General Residential. As such, the site is suitable for urban development as proposed. The development generally complies with all State, regional and local Environmental Planning Instruments relevant to the site and also complies with the NSW Government's and Penrith Council's planning policies.

The site is appropriately zoned and the development area achieves the land use principles established under the Glenmore Park Stage 2 DCP through the provision of a variety of housing options and a safe and permeable street network.

Numerous environmental, economic and social studies and assessments have been conducted across the site as part of the LES prior to rezoning and in preparing the Concept Plan for Precinct G and H, as well as more detailed site investigations as part of this Development Application. The result of the studies and assessments demonstrate that the site is suitable and highly capable of being developed as promoted by this Development Application.

5.5 Public Interest

The proposed development meets the public interest. The site is within the Glenmore Park Stage 2 release area which has been comprehensively planned to accommodate urban growth and new housing in Greenfield areas.

Sydney has been experiencing high housing costs for many years which is mainly attributed to housing shortages caused by a shortfall in land for new housing. The proposal will prepare the site for future residential development that will expand the supply of housing in Sydney which will have a positive impact on housing affordability, and therefore, make home ownership more achievable for Sydney's residents.

The proposal forms part of a large development that will make substantial contributions to improvements to the environment, increasing the number of public recreation and open space assets in the locality, and the generation of employment and economic growth for Penrith and Western Sydney.

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

6 SUMMARY AND CONCLUSION

The Development Application seeks approval for a staged subdivision of existing Lot 4 on DP 1240361. The proposed residential subdivision of the site will create a total of 88 residential allotments and extend Riverflat Drive. The proposal also seeks approval for construction of stormwater infrastructure, streetscape landscaping and services. The proposed subdivision has been designed to achieve an integrated outcome with existing development to the north, extending the road network south and continuing the delivery of diverse low density residential allotments.

The proposed subdivision layout achieves the objectives of the Concept Plan for Precinct G and H which has been endorsed by Penrith City Council. The proposed development achieves a well-connected, site responsive urban design outcome that can be integrated with future stages of development within Precincts G and H.

The proposed works comply with all State and Local Environmental Planning Instruments relevant to the site, and largely complies with the NSW Government's and Camden Council's planning policies.

In light of the suitability of the development, we request that Penrith Council issue consent to this Development Application in a timely manner.

Document Set ID: 9864746
Version: 1, Version Date: 17/02/2022

APPENDIX 1

Lot Layout and Lot Frontage Plan

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 2

Engineering Plans

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 3

Stormwater Management Strategy

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 4

Street Tree and Surveyors Creek Landscape Plan

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 5

Bushfire Report

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 6

Biodiversity Development Assessment Report

Document Set ID: 9961746
Version: 1, Version Date: 27/02/2022

APPENDIX 7

Vegetation Management Plan

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 8

Geotech Report/ Salinity Management Plan

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 9

Supplementary Site Investigation Report

Document Set ID: 9961746
Version: 1, Version Date: 27/02/2022

APPENDIX 10

Site Validation Report

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 11

Acoustic Assessment

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 12

Waste Management Plan

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

APPENDIX 13

SREP 20 Review

Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

Clause 6 - Specific planning policies and recommended strategies

(1) Total catchment management

Policy: Total catchment management is to be integrated with environmental planning for the catchment.

Strategies:

(a) Refer the application or other proposal for comment to the Councils of each adjacent or downstream local government area which is likely to suffer a significant adverse environmental effect from the proposal.

(b) Consider the impact of the development concerned on the catchment.

(c) Consider the cumulative environmental impact of development proposals on the catchment.

Response:

(a) No downstream Local Government area will suffer any significant environmental impact.
(b) There will be minimal to no impact on the catchment from the development.
(c) There will be minimal to no cumulative impact on the catchment from the development.

(2) Environmentally sensitive areas

Policy: The environmentally quality of environmentally sensitive areas must be protected and enhanced through careful control of future land use changes and through management and (where necessary) remediation of existing uses.

Note. Environmentally sensitive areas in the Hawkesbury-Nepean catchment are: the river, riparian land, escarpments and other scenic areas, conservation area sub-catchments, national parks and nature reserves, wetlands, other significant flora and fauna habitats and corridors, and known and potential acid sulphate soils.

Strategies:

(a) Rehabilitate parts of the riverine corridor from which sand, gravel or soil are extracted so that attached aquatic plant beds are replaced and water quality and faunal habitats improved.

(b) Minimise adverse impacts on water quality, aquatic habitats, riverine vegetation and bank stability.

(c) Minimise direct and indirect impacts on land reserved or dedicated under the Forestry Act 1916 and conservation area sub-catchments in order to protect water quality and biodiversity.

(d) Protect wetlands (including upland wetlands) from future development and from the impacts of land use within their catchments.

(e) Consider the need to include buffer zones (such as adequate fire radiation zones) for proposals on land adjacent to land reserved or dedicated under the National Parks and Wildlife Act 1974 or the Forestry Act 1916.

Document Set ID: 9961746
Version: 1, Version Date: 27/02/2022

(f) Consider the views of the Director-General of National Parks and Wildlife about proposals for land adjacent to land reserved or dedicated under the National Parks and Wildlife Act 1974.

(g) Consideration should be given to the impact of the development concerned on the water table and the formation of acid sulphate soils.

(h) New development in conservation area sub-catchments should be located in areas that are already cleared.

Response:

(a) Not applicable.
(b) The proposal will not impact on water quality.
(c) Not applicable.
(d) Not applicable.
(e) Not applicable.
(f) Not applicable.
(g) The development will have a negligible impact.
(h) The site is not located within a conservation area and has been cleared of vegetation as a result of past agricultural uses.

(3) Water quality

Policy: Future development must not prejudice the achievement of the goals of use of the river for primary contact recreation (being recreational activities involving direct water contact, such as swimming) and aquatic ecosystem protection in the river system. If the quality of the receiving waters does not currently allow these uses, the current water quality must be maintained, or improved, so as not to jeopardise the achievement of the goals in the future. When water quality goals are set by the Government these are to be the goals to be achieved under this policy.

Note. Aquatic ecosystems and primary contact recreation have the same meanings as in the document entitled Australian Water Quality Guidelines for Fresh and Marine Waters, published in 1992 by the Australian and New Zealand Environment and Conservation Council.

Strategies:

(a) Quantify, and assess the likely impact of, any predicted increase in pollutant loads on receiving waters.

(b) Consider the need to ensure that water quality goals for primary contact recreation and aquatic ecosystem protection are achieved and monitored.

(c) Approve development involving primary contact recreation or the withdrawal of water from the river for human contact (not involving water treatment), such as showers, only in locations where water quality is suitable (regardless of water temperature).

(d) Do not carry out development involving on-site disposal of sewage effluent if it will adversely affect the water quality of the river or groundwater. Have due regard to the nature and size of the site.

(e) Develop in accordance with the land capability of the site and do not cause land degradation.

(f) Consider the need for an Erosion and Sediment Control Plan (to be in place at the commencement of development) where the development concerned involves the disturbance of soil.

(g) Minimise or eliminate point source and diffuse source pollution by the use of best management practices.

(h) Site and orientate development appropriately to ensure bank stability. Plant appropriate native vegetation along banks of the river and tributaries of the river, but not so as to prevent or inhibit the growth of aquatic plants in the river, and consider the need for a buffer of native vegetation.

(i) Consider the impact of the removal of water from the river or from groundwater sources associated with the development concerned.

(j) Protect the habitat of native aquatic plants.

Response:

(a) There is no predicted increase in pollutant loads on receiving waters.
(b) Water quality goals will be established and monitored in accordance with consultant findings.
(c) Not applicable.
(d) On-site disposal of sewage or effluent will not be conducted.
(e) Development will not result in land degradation.
(f) Adequate erosion and sediment controls are to be implemented as part of the works.
(g) Best management practices are to be employed.
(h) Proposed lots and road works will not compromise bank stability.
(i) Not applicable.
(j) This will be done in accordance with consultant findings.

(4) Water quantity

Policy: Aquatic ecosystems must not be adversely affected by development which changes the flow characteristics of surface or groundwater in the catchment.

Strategies:

(a) Future development must be consistent with the interim or final river flow objectives that are set for the time being by the Government.

(b) Ensure the amount of stormwater run-off from a site and the rate at which it leaves the site does not significantly increase as a result of development. Encourage on-site stormwater retention, infiltration and (if appropriate) reuse.

(c) Consider the need for restricting or controlling development requiring the withdrawal or impoundment of water because of the effect on the total water budget of the river.

(d) Consider the impact of development on the level and quality of the water table.

Response:

(a) Not applicable.

(b) The development will not increase stormwater run-off from a site and is consistent with the stormwater management strategy prepared for the site.

(c) Not applicable.

(d) Not applicable.

(5) Cultural Heritage

Policy: The importance of the river in contributing to the significance of items and places of cultural heritage significance should be recognised, and these items and places should be protected and sensitively managed and, if appropriate, enhanced.

Strategies:

(a) Encourage development which facilitates the conservation of heritage items if it does not detract from the significance of the items.

(b) Protect Aboriginal sites and places of significance.

(c) Consider an Aboriginal site survey where predictive models or current knowledge indicate the potential for Aboriginal sites and the development concerned would involve significant site disturbance.

(d) *Consider the extent to which heritage items (either identified in other environmental planning instruments affecting the subject land or listed in Schedule 2) derive their heritage significance from the river.*

Response:

As discussed in the main body of this report, a detailed site investigation relating to Aboriginal and European heritage issues has been previously undertaken. There are no such items within the site.

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Document Set ID: 9961746
Version: 1, Version Date: 17/02/2022

ROAD SAFETY AUDIT REPORT

STAGE 2 AUDIT OF CONCEPT DESIGN

FOR

ROAD NETWORK

STAGES 7 AND 8

PRECINCT G

GLENMORE PARK

Ref. 21011rsa

23 February 2021
Updated 24 June 2021

Prepared By

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Document Set ID: 9954841
Version: 1, Version Date: 06/12/2021

CONTENTS

AUDIT SUMMARY ii

1.0 INTRODUCTION 1

1.1 Auditors and Audit Process 1
1.2 Description of the Works 1
1.3 Audited Plans 2
1.4 Responding to the Audit Report 2

2.0 RECOMMENDATIONS FROM PREVIOUS STAGE AUDITS 4

3.0 AUDIT FINDINGS AND RECOMMENDATIONS 4

3.1 Findings and Risk Ranking 4

4.0 FORMAL STATEMENT 6

APPENDICES

Appendix 1 Documents Used during the Audit

Appendix 2 Austroads Risk Assessment Tables 4.1 to 4.4 Extract

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2022

ROAD SAFETY AUDIT
AUDIT SUMMARY

Audit No. 20088

Audited Project	*Stages 7 and 8 Precinct G Glenmore Park*
Audited Plans Prepared By	*J Wyndham Prince - Civil Engineers and Project Managers*
Address	*PO Box 4366* *Penrith Westfield* *NSW 2750*
Telephone	*02 4720 3359*
Audit Manager	*Paul Koen,* *Senior Project Manager, J Wyndham Prince*
Audit Team	*Terry Lawrence and Lisa Tulau*
Audit Type	*Stage 2 Concept Design Stage Audit*
Entrance Interview	*By email*
Audit Dates	*22 and 23 February 2021*
Exit Interview	
Previous Audits	*-*

Summary of Audit Findings

Findings are listed in Table 3.1, together with the Project Manager's response.

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

1.0 INTRODUCTION

1.1 Auditors and Audit Process

This report details the results of a Stage 2 Road Safety Audit of the Concept Design Plans of the Road Network for Stages 7 and 8, Precinct G at Glenmore Park.

The audited plans for the proposed subdivision road network were designed by J Wyndham Prince, on behalf of Vianello Holdings. The provision of a Stage 2 Road Safety Audit for the project was a requirement of Penrith City Council.

The audit was carried out by:

- Terry Lawrence - Accredited Level 3 Road Safety Auditor – Auditor ID: RSA-02-0002
- Lisa Tulau - Accredited Level 3 Road Safety Auditor – Auditor ID: RSA-02-0443

Neither of the auditors has had any involvement with the design or development of the subdivision.

The audit included a commencement briefing with the Project Manager, Paul Koen via email.

The proposed design is part of a new subdivision on a greenfield site. As such, the audit team did not consider that a site inspection was required, or would be beneficial in auditing the proposed concept design plans.

The plans were audited on 22 and 23 February 2021 and the Audit report prepared concurrently. Reference documents used during the audit are listed in **Appendix 1**.

The audit has been carried out following the procedures set out in the Austroad Guide to Road Safety Parts 6 and 6A. The audit examines the features of the proposed design which may affect road user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the findings in this report were to be addressed, this would not confirm that the proposed design is 'safe'; rather, adoption of any actions should improve the level of safety of the proposed road network.

1.2 Description of the Works

The proposed road network for Stages 7 and 8, Precinct G incorporates the following roads.

- Roads 112, 113, 118, 119, 120, 121 and parts of Roads 115 (Middlebrook Rise), 116 (Capstone Terrace), 117 (Highland Terrace) and Greenlink Drive.

Road 119 will connect to Greenlink Drive via a 90º degree bend.

Road 113, 117, 118, 119 and 120 will have an 8.0 metre wide road carriageway with two x 3.8 metre verges on each side, with sealed footpaths 1.5 metres wide.

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

Road 112 will have a 12.0 metre wide road carriageway with one 3.8 metre wide verge with a sealed footpath 1.5 metre wide and one 1.0 metre wide verge.

Roads 115 (Middlebrook Rise) and 116 (Capstone Terrace) will have an 8.0 metre wide road carriageway with one 3.8 metre wide verge with a sealed footpath 1.5 metres wide and one 1.0 metre wide verge.

Road 121 will have an 8.0 metre wide road carriageway with one verge 3.8 metres wide with a sealed footpath 1.5 metres wide and the other verge 3.8 metres wide.

All intersections are T junction intersections.

Road 115 (Middlebrook Rise) Road 116 (Capstone Terrace) and Road 117 (Highdale Terrace) form T junction intersections with Road 113.

Road 121 forms a T junction with Road 113.

Roads 118, 119 and 120 form T junction intersections with Road 112 at the western end and Road 121, at the eastern end.

Grades on the roads vary as follows;

- Road 112 - 2% to 5%
- Road 113 - -2% to 3%
- Road 115 - 3% to 4.73%
- Road 116 - 3% to 8.5%
- Road 117 - 3% to -6%
- Road 118 - -3% to 4.9%
- Road 119 - -3% to 3.7%
- Road 120 - 3.6% to -2.825%
- Road 121 - -3% to 5%
- Road 122 - 2% to 6.6%

1.3 Audited Plans

The following plans were viewed as part of the audit;

- The concept design plans for DA approval prepared by J Wyndham Prince -

Glenmore Park – Precinct G, Stages 7 and 8

Plan No's.

Project No. 978413. Plan Nos. DA001–DA005, DA010–DA015, DA020-DA024 – Issue A.

NB: Not all of the above plans were relevant to the audit.

1.4 Responding to the Audit Report

As set out in the road safety audit guidelines, responsibility for the road design always rests with the designer/project manager and not with the auditor. A project manager is under no obligation to accept any or all the audit recommendations. Also, it is not the role of the auditor to agree to or approve of the project manager's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

have them formally considered by the project manager, in conjunction with all other project considerations.

To assist with this, Table 3.1 (containing this audit's findings) contains a column for any response by the project manager.

The comments by the project manager on the audit findings are contained in Table 3.1.

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

2.0 RECOMMENDATIONS FROM PREVIOUS STAGE AUDITS

There were no previous Road Safety Audits carried out on Stages 7 and 8 of this subdivision.

3.0 AUDIT FINDINGS AND RECOMMENDATIONS

3.1 Findings and Risk Ranking

Table 3.1 below summarises those matters identified in the audit which require consideration by the design team.

Risks and potential safety issues have been identified and ranked using Austroads Risk Ranking method, based on frequency, severity, overall level of risk and treatment approach presented in Tables 4.1 to 4.4 in Guide to Road Safety Part 6: Road Safety Audit (See Appendix 2).

The risk rankings and Austroads suggested treatment approach are defined as follows:

- Intolerable - Must be corrected
- High - Should be corrected or the risk significantly reduced, even if the treatment cost is high
- Medium - Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high
- Low - Should be corrected or the risk reduced, if the treatment cost is low

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2022

TABLE 3.1

AUDIT FINDINGS

Item	Issue	Preliminary Risk Ranking	Response by Audit Manager
1	Ensure 90º degree bend where Greenlink Drive intersects with Road 113 is adequately treated with signposting and linemarking. This may include double barrier lines around bend, advisory signage including speed signage and No Stopping restrictions to maintain two way traffic flow.	High	Intersection has been deleted in amended subdivision plans.
2	Consider temporary signposting where Roads 112 and 121 terminate at Road 120.	High	Signposting will be included in the final design plans.
3	Crest at chainage 96.9 metres in Road 121 may affect sight distance to/from intersection with Road 118. Confirm Austroad sight distance requirements are met for assumed 50km/h speed limit.	High	Sight distance (SISD) is confirmed to be 89 metres. This is consistent with the SISD for a 50km speed, which is 90 metres based on a 1.5 second reaction time.
4	Give consideration to landscaping in future design phases to ensure; (i) Maintenance of adequate sight lines for 50km/h speed limit. (ii) Maintenance of adequate sight lines for drivers, pedestrians and cyclists at likely crossing locations for 50km/h speed limit. (iii) Clear zone issues and the size of the trunk of street trees when fully mature. (iv) Spread and density of tree canopy and effect on street lighting when trees are fully mature.	Medium (note: this is a future design requirement for landscaping plans)	These matters will be addressed in the detailed design of the civil, streetscape and landscape elements.

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

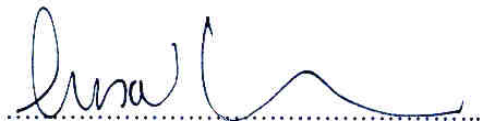
4.0 FORMAL STATEMENT

We have examined the plans detailed in Section 1.3 and we have audited these plans in accordance with the procedures set out in the Austroad Guide to Road Safety Parts 6 and 6A. The audit has been carried out for the sole purpose of identifying any features of the proposed design that could be altered or reconsidered to improve safety. The identified issues have been noted in this report in Table 3.1 and are put forward for consideration by the Project Manager.

The Project Manager's response is also shown in Table 3.1.



.....
Terry Lawrence
Lead Road Safety Auditor



Lisa Tulau
Road Safety Auditor

23 February, 2021

Updated 24 June, 2021

Document Set ID: 9954841
Version: 1, Version Date: 16/12/2021

APPENDIX 1

Documents Used During the Audit

1. Austroads Guide to Road Safety
   Part 1: Road Safety Overview
   Part 6: Managing Road Safety Audits
   Part 6A: Implementing Road Safety Audits

2. Austroads – Guide to Road Design

3. Austroads Guide to Traffic Management

4. RMS Supplements to Austroads Guides

Document Set ID: 9954741
Version: 1, Version Date: 16/12/2021

APPENDIX 2

Austroads Risk Assessment Tables 4.1 to 4.4 Extract

Document Set ID: 9954741
Version: 1, Version Date: 16/12/2021

How does the client decide whether or not to accept an audit finding or recommendation?

Part of the answer can lie at the start of the design process: could an audit have been undertaken earlier? Certainly, the earlier an audit is undertaken, the sooner a potential problem can be addressed. This generally means it will be easier or cheaper to resolve the problem.

Faced with an audit finding or recommendation that is difficult to resolve, the client needs to consider the:

- likelihood that the identified problem will result in harm
- severity of that harm
- effectiveness of a remedy in reducing the harm
- the designer's advice/response to the audit
- cost of remedying the problem (there may be several alternative treatments).

This requires engineering judgement and additional road safety engineering advice about managing the risk.

There may be occasions that the audit recommendations require consideration of issues outside the original scope of the project. This should not be an excuse to dismiss these and they still require consideration by the appropriate authority or person. It may be that the original scope of the project needs to be altered.

C. Risk ranking of safety issues

The following tables may be useful to provide an indication of the level of risk and how to respond to it. Determine into which category in Table 4.1 and Table 4.2 the issue best fits. From this select the risk category in Table 4.3 and its suggested treatment approach in Table 4.4. This is not a scientific system and professional judgement should be used. Section 9.3 provides an evidence based approach to prioritising the treatment of works emanating from road safety audits of existing roads.

Table 4.1: How often is the problem likely to lead to a crash?

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five or ten years
Improbable	Less often than once every ten years

Table 4.2: What is the likely severity of the resulting crash type?

Severity	Description	Examples
Catastrophic	Likely multiple deaths	High-speed, multi-vehicle crash on a freeway. Car runs into crowded bus stop. Bus and petrol tanker collide. Collapse of a bridge or tunnel.
Serious	Likely death or serious injury	High or medium-speed vehicle/vehicle collision. High or medium-speed collision with a fixed roadside object. Pedestrian or cyclist struck by a car.
Minor	Likely minor injury	Some low-speed vehicle collisions. Cyclist falls from bicycle at low speed. Left-turn rear-end crash in a slip lane.
Limited	Likely trivial injury or property damage only	Some low-speed vehicle collisions. Pedestrian walks into object (no head injury). Car reverses into post.

Document Set ID: 9954741
Version: 1, Version Date: 16/12/2021

Table 4.3: The resulting level of risk

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

Table 4.4: Treatment approach

Risk	Suggested treatment approach
Intolerable	Must be corrected.
High	Should be corrected or the risk significantly reduced, even if the treatment costs is high.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
Low	Should be corrected or the risk reduced, if the treatment cost is low.

D. Implementing the agreed changes

Once the corrective action report has been finalised, the agreed actions need to be implemented. The designer has to develop design changes that address the safety problems. If one is at the pre-opening stage, the actions need to be implemented as soon as possible on site. Temporary warning, delineation or other treatment may be needed until the agreed solution is implemented.

Actions taken should be recorded (for example, description of work, by whom and when). This is to fully close out the road safety audit finding as well as to factual record what works were completed. Reasons for any variations from the proposed action must also be set out in writing.

Framing responses to audit findings or recommendations

When an audit finding or recommendation is not accepted, or is accepted only in part, care should be taken about framing the corrective action report, bearing in mind that it may become a public document in the event of a crash occurring.

Consider the following responses to findings or recommendations made during a pre-opening audit of a project to widen the carriageway of a two-lane, two-way road to provide an overtaking lane:

- *Safety issues:*
  'Fixed objects within the new clear zone. These include a concrete bus shelter and stockpiles of aggregate and box culverts.' Three sections of guard fence are now nearer the edge line, but do not have safe end treatments.
- *Findings or recommendations*
  Take action to reinstate appropriate clear zones for this road. Pay attention to the guard fence.
- *Responses:*
  'The bus shelter was constructed before work on the overtaking lane. It is 4 m from the edge line. The expense of moving it is not considered justified. Most of this highway has objects within the clear zone, for example 3 km to the south there are 150 trees within 1.5 m to 6 m from the edge line. The stockpiles cannot be removed as there are few stockpile sites in the area. All the guard fence was constructed before construction of the overtaking lane. Compared with other guard fence in this region, it is not considered a priority and no action is planned to install the correct end treatment.'
  How might these responses be viewed by someone injured in a collision with the bus shelter, a stockpile or a guard fence end (or by a lawyer)? It would be of little comfort for drivers to know they would have been even worse off had the car veered off the road 3 km further on, or that the road authority had a problem finding stockpile sites, or that it's not the client's problem because the fixed objects were put in earlier by someone else. What these responses lack, and what any response needs, is a consideration of points in the previous inset ('How does the client decide whether or not to accept an audit finding or recommendation', in B above), an explanation of why action cannot be taken (for example, financial implications) and consideration of other possible options to reduce the risk associated with significant problem.

Document Set ID: 9954841
Version: 1, Version Date: 06/12/2021

GEOTECHNIQUE® PTY LTD

ABN 64 002 841 063

Job No: 13602/2
Our Ref: 13602/2-AA
4 December 2015

Vianello Holdings Pty Ltd
c/- CCL Development Pty Ltd
8 Boorea Street
BLAXLAND NSW 2774

Attention: Mr C Lamb

Dear Sir

re: **Proposed Residential Subdivision**
Part Lot 1 DP224861 & Lot 4 DP226490
Glenmore Park Precincts G & H, 2183 The Northern Road, Glenmore Park
Report on Geotechnical and Salinity Assessments

The report details the results of geotechnical and salinity assessments at the above site. The work was commissioned by Mr C Lamb of CCL Development Pty Ltd in a signed confirmation of engagement dated 20 October 2015, and was carried out as per our proposal Q7282-AB dated 12 October 2015.

Proposed Development
We understand that the site, totalling about 23ha, is proposed for a total of 375 lot subdivision in two precincts and nine stages.

Geotechnical and salinity assessments were required to determine existing sub-surface conditions, including depths to bedrock, quality, strength and rippability of the existing bedrock, and soil salinity across the site.

Field Work
Field work for the geotechnical and salinity assessments was carried out on 6 and 10 November 2015, in conjunction with the contamination assessment, and consisted of the following:

- OH&S and walkover survey to assess existing site conditions.
- Scanning test pit and boreholes locations for underground services so that excavation and drilling would not damage services.
- Excavating a total of eighteen test pits to depths ranging from 0.5m to 1.8m. The test pits were terminated due to refusal in bedrock.
- Drilling of four boreholes to depths of 2.7m to 5.9m, using a truck mounted drilling rig. These boreholes were located in the deepest cut areas. At V-bit refusal, boreholes were advanced using coring techniques.
- Groundwater and seepage measurement at the completion of excavation.
- Recovery of soil samples for visual assessment and laboratory further testing (Salinity, Sodicity, Point Load Strength Index and CBR).

Field work was carried out by an environmental scientist and a senior geotechnical engineer from this company, who were responsible for locating test pits, supervision, in-situ testing, sampling and preparation of logs.

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

Regional Geology

Based on the Geological Map of Penrith (1:100,000), the bedrock at the site is anticipated to be Bringelly Shale, belonging to the Wianamatta Group of rocks and comprising shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and rare coal.

Reference to the Salinity Potential in Western Sydney (2002) map indicates that most portions of the site have Moderate Salinity Potential and High Salinity Potential along the creek lines.

Site Description

The following site observations were made during field work:

- The proposed development is located to the south of Mulgoa Rise.
- The ground surface consists of rolling hills and is mostly covered with grass and isolated trees.
- There is a creek (Surveyors Creek) running north-south through the middle of the site.

Sub-surface Conditions

Sub-surface conditions encountered in the test pits are detailed in the attached engineering logs and summarised below in Table 1.

TABLE 1

TP/BH	Top RL (mAHD)	Termination Depth (m)	Topsoil (m)	Natural Soils (m)	Bedrock (m)
TP1	85.54	1.6	0.0 – 0.2	0.2 – 1.6	=>1.6
TP2	75.10	1.7	0.0 – 0.2	0.2 – 1.7	NE
TP3	82.72	1.6	0.0 – 0.2	0.2 –> 1.6	NE
TP4	86.06	1.2	0.0 – 0.2	0.2 –> 1.2	NE
TP5	69.1	1.5	0.0 – 0.2	0.2 –> 1.5	NE
TP6	86.17	1.6	0.0 – 0.2	0.2 –> 1.6	NE
TP7	75.42	1.7	0.0 – 0.2	0.2 –> 1.7	NE
TP8	86.89	1.4	0.0 – 0.2	0.2 – 1.4	=> 1.4
TP9	80.16	1.6	0.0 – 0.2	0.2 –> 1.6	NE
TP10	73.07	1.7	0.0 – 0.2	0.2 –> 1.7	NE
TP11	79.9	0.5	0.0 – 0.2	0.2 – 0.5	=> 0.5
TP12	82.28	1.1	0.0 – 0.2	0.2 – 1.1	=> 1.1
TP13	77.73	1.4	0.0 – 0.2	0.2 – 1.4	=> 1.4
TP14	84.63	1.8	0.0 – 0.2	0.2 –> 1.8	NE
TP15	85.57	1.3	0.0 – 0.2	0.2 –> 1.3	NE
TP16	86.82	1.6	0.0 – 0.2	0.2 –> 1.6	NE
TP17	80.54	1.1	0.0 – 0.2	0.2 –> 1.1	NE
TP18	80.77	1.5	0.0 – 0.2	0.2 –> 1.5	NE
BH18	84.15	5.8	0.0 – 0.1	0.1 – 1.9	1.9 –> 5.8
BH19	91.32	5.9	0.0 – 0.2	0.2 – 2.5	2.5 –> 5.9
BH20	92.46	5.6	0.0 – 0.1	0.1 – 1.7	1.7 –> 5.6
BH21	87.4	2.7	0.0 – 0.1	0.1 – 1.9	1.9 –> 2.7

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

Topsoil	Silty Clay, low plasticity, brown, with roots
Natural	Silty CLAY, medium to high plasticity, orange-grey, brown, with ironstone and shale gravel Clayey sandy SILT, low plasticity, grey and brown, with siltstone gravel
Bedrock	SHALE, dark grey, brown, extremely to distinctly weathered, extremely low to low strength SILTSTONE, grey, distinctly to slightly weathered and medium to high strength

Groundwater Conditions

Groundwater or seepage was not encountered to the terminated depths of the test pits and auger refusal depths of the boreholes. It should be noted that levels of groundwater or seepage might change due to changes in temperature, rainfall, and other factors not evident during the field work.

Laboratory Testing

California Bearing Ratio

Soaked CBR tests were conducted on three subgrade samples collected from the test pits, in the NATA accredited laboratory of Geotech Testing Pty Ltd. The Soaked CBR tests were carried out on specimens compacted to a target dry density ratio of 100% Standard (AS1289 5.4.1) at moisture content close to Standard Optimum. The CBR results are detailed on the attached certificate, and summarised below in Table 2.

TABLE 2

TP	Depth (m)	Summary Description	MDD (t/m^3)	OMC (%)	FMC (%)	Variation from OMC (%)	CBR (%)
1	1.0 – 1.5	(CI) Silty CLAY, medium plasticity, orange-brown, grey	1.82	14.8	13.2	1.6 Dry	4
5	1.0 – 1.5	(CI) Silty CLAY, medium plasticity, orange-brown, grey	1.78	17.4	17.3	0.1 Dry	4
14	1.5 – 1.6	(CI) Silty CLAY, medium plasticity, orange-brown, grey	1.82	16.3	15.4	0.9 Dry	5

MDD: Maximum Dry Density, FMC: Field Moisture Content, OMC: Optimum Moisture Content, CBR: California Bearing Ratio

Based on the laboratory test results, FMC of the subgrade soil was found to be 0.1% to 1.6% dry of OMC. Depending on the time of construction, moisture conditioning might be required to bring subgrade moisture close to OMC.

Point Load Strength Index

Rock cores recovered from the boreholes were photographed and tested for determination of point load strength index (I_{s50}). The point load strength indices for the rock cores and the assessed rock strength classes for axially loaded samples, in accordance with AS1726 “Geotechnical Site Investigations”, are summarised in Table 3.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

TABLE 3

Borehole No	Depth (m)	Diametral, $I_{s(50)}$ (MPa)	Axial $I_{s(50)}$ (MPa)	Axial Strength* (AS1726)
18	2.7-2.8	0.64	0.52	Medium
	3.7-3.8	0.68	1.58	High
	4.7-4.8	0.47	2.06	High
	5.7-5.8	0.78	3.11	Very High
19	4.1-4.2	0.29	0.18	Low
	5.1-5.2	0.39	0.21	Low
20	2.8-2.9	0.09	0.06	Very Low
	3.6-3.7	0.03	0.06	Very Low
	4.2-4.3	0.03	0.14	Low
	5.5-5.6	0.04	0.09	Very Low

** Estimated strength, $I_{s(50)}$: 0.03-0.1: Very Low , 0.1-0.3: Low, 0.3-1.0: Medium, 1.0-3.0: High, 3.0-10.0: Very High*

Salinity and Sodicity Testing

Soil samples collected from the test pits and boreholes were tested in the NATA accredited laboratory of SGS to determine Electrical Conductivity (EC), pH and Exchangeable Sodium Percentage (ESP). The tests results are detailed in the attached certificates and summarised below.

TABLE 4

Test Pit	Depth (m)	pH	EC (µS/cm)	MF	EC_e (dS/m)	ESP		
						mg/kg	meq/100g	%
TP1	0.1-0.2	6.3	26	7	0.18	160	0.68	4.2
TP1	1.0-1.1	9	450	7	3.15	-	-	-
TP2	0.5-0.6	4.7	690	7	4.83	-	-	-
TP2	1.5-1.6	4.5	790	7	5.53	810	3.5	24.8
TP3	0.5-0.6	5.7	600	7	4.20	-	-	-
TP3	1.5-1.6	5.6	590	7	4.13	670	2.9	24.5
TP4	0.1-0.2	5.7	23	7	0.16	-	-	-
TP4	1.0-1.1	8.6	680	7	4.76	770	3.4	17.2
TP5	0.1-0.2	5.8	12	7	0.08	-	-	-
TP5	1.0-1.1	7.8	1000	7	7.00	610	2.6	22.1
TP6	0.5-0.6	9.1	700	7	4.90	-	-	-
TP6	1.5-1.6	9.3	580	7	4.06	680	2.9	10.2
TP7	0.5-0.6	7.3	93	7	0.65	-	-	-
TP7	1.5-1.6	5.6	520	7	3.64	630	2.7	23.1
TP8	0.1-0.2	6.4	29	7	0.20	-	-	-
TP8	1.0-1.1	6.1	230	7	1.61	600	2.6	19.5
TP9	0.5-0.6	6.2	150	7	1.05	-	-	-
TP9	1.5-1.6	5	410	7	2.87	590	2.6	22.8
TP10	0.5-0.6	6.1	24	7	0.17	-	-	-
TP10	1.5-1.6	5.7	570	7	3.99	370	1.6	11.2
TP11	0.1-0.2	5.9	16	7	0.11	-	-	-
TP11	0.4-0.5	6.2	55	7	0.39	410	1.8	15.1
TP12	0.5-0.6	5.2	440	7	3.08	-	-	-

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

Test Pit	Depth (m)	pH	EC (µS/cm)	MF	EC_e (dS/m)	ESP		
						mg/kg	meq/100g	%
TP12	1.5-1.6	5.2	380	7	2.66	310	1.4	12.7
TP13	0.1-0.2	6.3	14	7	0.10	95	0.41	6.1
TP13	1.0-1.1	6.7	80	7	0.56	-	-	-
TP14	0.5-0.6	4.8	390	7	2.73	500	2.2	19.6
TP14	1.5-1.6	4.8	480	7	3.36	-	-	-
TP15	0.1-0.2	7	63	7	0.44	-	-	-
TP15	1.0-1.1	8.4	220	7	1.54	590	2.6	13.1
TP16	0.5-0.6	9.4	450	7	3.15	-	-	-
TP16	1.5-1.6	9.4	440	7	3.08	890	3.9	11.3
TP17	0.1-0.2	6.2	28	7	0.20	-	-	-
TP17	1.0-1.1	4.9	460	7	3.22	570	2.5	26.3
BH18	0.5-0.95	5.3	310	7	2.17	420	1.8	9.3
BH19	0.5-0.95	8.5	140	7	0.98	-	-	-
BH19	1.5-1.95	9.3	450	7	3.15	1400	6.0	16.3
BH20	0.5-0.95	6.5	40	7	0.28	280	1.2	7.8
BH20	1.5-1.95	8.2	78	7	0.55	-	-	-
BH21	0.3-0.5	5.6	24	7	0.17	-	-	-
BH21	2.0-2.2	8.6	140	7	0.98	210	0.92	2.0

EC : Electrical Conductivity; EC_e = Equivalent Electrical Conductivity; ESP : Exchangeable Sodium Percentage

Please note that EC_e is calculated assuming Multiplication Factor (MF) of 7. This value is based on the type of subsurface soils encountered at the site.

Discussion & Recommendations

Geotechnical Model

The eighteen test pits and four boreholes excavated at the site generally revealed 100mm to 200mm thick topsoil, overlying natural residual silty clays, overlying shale/siltstone bedrock. Depths to bedrock ranged from 0.5m to 2.5m.

Based on the test pits and boreholes, the following geotechnical model was developed:

TABLE 5

Depth Range (m)	Material Description
0.0 to 0.2	TOPSOIL
0.2 to 2.5	Silty CLAY, medium to high plasticity
0.5 to terminated depths	SHALE/SILTSTONE bedrock

Groundwater was not encountered up to the terminated depths of the test pits and to auger refusal depths of the boreholes.

Excavation Conditions

Based on the boreholes drilled at the site, depths to various strengths of shale/siltstone bedrock are shown below:

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

TABLE 6

Borehole	Depth to Extremely Low to Low Strength Shale/Siltstone	Depth to Medium to High Strength Shale/Siltstone
18	1.6	2.7
19	2.5	NE
20	1.7	5.2
21	2.7	NE

We anticipate that overburden soils (topsoil, fill and natural soils) and extremely low to low strength shale bedrock could be excavated using conventional earthmoving equipment such as excavators and dozers. For excavation in low strength bedrock, a 20t to 25t excavator with tiger teeth might be required.

If the excavation extends into medium to high strength shale bedrock, then large equipment such as Caterpillar D9 or D10 attached with rippers, rock hammer or saw cutter will be required.

Selection of excavation equipment should be based on site access, strength of sub-surface materials, and the likely impact of vibration to structures in the vicinity of the excavation. Contractors should make their own judgement when tendering for excavation works, using the engineering logs and core photographs attached to this report, and their own experience in such circumstances.

Acceptable vibration is based on the nature and state of neighbouring structures, which will have to be established by a dilapidation survey. As a general guide, the acceptable maximum peak particle velocity (PPV) in a residential area would range from about 5mm/s to 10mm/s.

Groundwater was not encountered to the termination depths of the test pits. We do not anticipate significant groundwater inflow during excavation. Any groundwater inflow during excavation could be adequately managed using a conventional pump and sump system. However, trafficability problems might arise locally during wet weather or if water is allowed to pond at the site. A layer of recycled gravel can be used to provide good working platform.

Site Preparation

The proposed development works might require fill placement to achieve designed grades. The following procedures are recommended for placement of controlled fill, where required:

- Strip existing topsoil and stockpile separately for possible future use.
- Undertake proof rolling (using an 8 to 10 tonnes roller) of the exposed natural soils to detect potentially weak spots (ground heave). Excavate areas of localised heaving to a depth of about 300mm and replace with granular fill, compacted as described below.
- Undertake proof rolling of the soft spots backfilled with granular fill, as described above. If the backfilled area shows movement during proof rolling, this office should be contacted for further recommendations.
- Place suitable fill materials on proof rolled areas. The fill should be placed in horizontal layers of 200mm to 250mm maximum loose thickness (depending on the size of equipment) and compacted to a Minimum Dry Density Ratio (MDDR) of 98% Standard, at moisture content within 2% of Standard Optimum Moisture Content (SOMC). The top 300mm of fill forming pavement subgrade should be compacted to at least 100% Standard.

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

- Controlled fill should preferably comprise non-reactive fill (e.g. crushed sandstone) with a maximum particle size not exceeding 75mm, or low plasticity clay. Natural soils and bedrock obtained from excavations within the site may be used in controlled fill after removal of unsuitable materials, if any, crushing to sizes finer than 75mm, proper mixing and moisture conditioning.
- Fill placement should be supervised to ensure that material quality, layer thickness, testing frequency and compaction criteria conform to the specifications. We recommend "Level 2" or better supervision, in accordance with AS3798-2007 (Reference 1). It should be noted that a Geotechnical Inspection and Testing Authority will generally only provide certification on the quality of entire compacted fill if Level 1 supervision and testing is carried out.

Safe Batters & Retaining Structures

Cut and fill during and after site excavation should be battered for stability or retained by engineered retaining structures. Where battered slopes in overburden soils and shale bedrock are possible, we recommend the following safe batters.

TABLE 7

Material Description	Temporary	Permanent
Fill and Natural Clays	1V:1H	1V:2.5H
Low strength shale bedrock	1V:1H	1V:2.0H

The above batter slopes are recommended, providing:

- Cut and fill slopes are at sufficient distance (at least 2m) from structures in the vicinity of the site.
- The excavation faces are protected appropriately from erosion.
- Adequate surface and sub-surface drainage is provided.
- Excavation faces are monitored regularly to observe any signs of movement so that appropriate remedial actions can be taken immediately.
- Collapse of excavation faces, if it occurs, is unlikely to pose a threat to the safety of people and structures in the vicinity.

Earth pressure for design for retaining wall, if required, could be calculated as recommended below.

Earth pressure distribution for non-anchored (cantilever) retaining walls is assumed triangular and estimated as follows:

$$p_h = \gamma k H$$

Where,

p_h = Horizontal active pressure (kN/m^2)
γ = Unit weight of materials to be retained (kN/m^3)
k = Coefficient of earth pressure (k_a or k_0)
H = Retained height (m)

For anchored retaining walls, earth pressure can be assumed trapezoidal and estimated as 5H kPa, where H is the retained height in metres. The pressure distribution should be nil at the surface, increasing to 5H at a depth of 0.25H and remaining constant to 0.75H, then decreasing to nil at the base of the excavation.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

For design of flexible retaining structures where some lateral movement is acceptable, an active earth pressure coefficient is recommended. If it is critical to limit the horizontal deformation of a retaining structure, use of an earth pressure coefficient at rest should be considered. Recommended parameters for the design of retaining structures are provided in the following Table 8.

TABLE 8

Founding Material	Unit Weight (kN/m^3), γ	Active Earth Pressure Coefficient, k_a	Passive Earth Pressure Coefficient*, k_p	At-Rest Earth Pressure Coefficient, k_0
Fill and Natural Clays	18	0.35	2.8	0.52
Extremely Low to Low Strength Shale/Siltstone bedrock	20	0.3	350kPa	0.45
Medium to High Strength Shale/Siltstone bedrock	23	0.1	1000kPa	0.2

** Appropriate safety factors should be applied for the recommended passive pressure values*

These coefficients are based on the assumption that ground level behind the retaining structure is horizontal and the retained material is effectively drained. If retained materials are subjected to groundwater pressure or other surcharge loads (structures or traffic in the vicinity of the site), additional earth pressures should also be allowed for in the design of retaining structures.

The design of any retaining structure should also be checked for bearing capacity, overturning, sliding and overall stability of the slope.

Site Classification

It is our assessment that the site is suitable for construction of residential buildings after completion of site preparation works.

At completion of site preparation (cut and fill) for the proposed development works, when building platforms and footing subgrade are ready for construction of residences, sub-surface profiles within the residential lots are anticipated to comprise either of the following:

- Controlled fill overlying, natural clays overlying shale bedrock; or
- Natural clays overlying shale bedrock; or
- Shale bedrock.

The magnitude of ground surface movement due to moisture variation, which is required for site classification, depends on shrink-swell index values and thickness of soils underlying the building slab. Based on the results of the investigation, natural clayey soils are generally medium to high plasticity. Hence, the natural soils and controlled fill are likely to be moderately to highly reactive. Shale bedrock would generally be non-reactive to slightly reactive.

Based on the type of clayey soils encountered at the site, site classifications for future residential lots across the site are expected to be Class “M” (Moderately reactive) or “H1” (Highly reactive), in accordance with AS2870-2011 “Residential Slabs and Footings”. In areas where shale bedrock will be exposed, the residential lots would generally be classified as “S” (Slightly reactive) as per AS2870-2011 (Reference 2).

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

Floor Slabs & Footings

Floor slabs for future residential buildings may be designed as ground bearing or suspended slabs supported by footings. If ground bearing floor slabs are preferred, slabs appropriate for site classes may be designed in accordance with AS2870-2011.

Site classification in accordance with AS2870-2011 is only applicable for the design of footing systems for a single dwelling, house, townhouse or similar structure that would be detached or separated by a party wall or common wall. AS2870 is not suitable for dwellings that are situated vertically above or below another dwelling, including buildings classified as Class 1 and Class 10a in the Building Code of Australia (BCA). Therefore, a geotechnical investigation will be required for other dwellings that would be classified in accordance with the BCA.

Foundation materials across the site will vary from controlled fill to natural clayey soils to bedrock, depending on the location of a building with regard to cut and fill profile. Therefore, assessment of foundation materials and allowable bearing pressure for a specific building should be reassessed after completion of site preparation works and during footing construction. For preliminary design, the following is recommended.

TABLE 9

Founding Material	Allowable End Bearing Capacity (kPa)	Shaft Adhesion (kPa)
Controlled fill	100	-
Stiff to very stiff natural clays	150	-
Extremely low to low strength shale/siltstone bedrock	700	50*
Medium to high strength shale/siltstone bedrock	3000	300*

** Bored Piers only*

Erodibility Assessment

Erosion is the detachment and movement of soil materials. Depending on the local landscape and weather conditions, erosion could be very slow or very rapid. Susceptibility of soils to erosion depends on dispersivity (and sodicity) of soils. Soil dispersivity is generally assessed by conducting chemical tests such as Exchangeable Sodium Percentage (ESP) and Sodium Absorption Ratio (SAR), and physical tests such as Emerson Class and Pinhole Dispersion. It should be noted that assessment of soil dispersibility based on these methods might differ from each other.

For the proposed work, only ESP for representative soil samples were determined. Soils with ESP values of 5% or more are considered sodic and those with ESP more than 15% are considered highly sodic (Reference 3). Sodic soils are susceptible to excessive erosion.

ESP values for the twenty one tested samples are presented in Table 4 and indicate ESP values ranging from 2% to 26.3%. Two samples showed ESP values less than 5%, eight samples showed ESP between 5% and 15%, and the remaining eleven showed ESP values of more than 15%. Therefore, it is our assessment that the soils across the site are generally dispersive and susceptible to excessive erosion.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

Salinity Assessment

Salinity refers to the presence of excess salt in the environment, either in soil or water. Salinity is a serious problem for any development due to the many environmental, economic and social impacts. Soil salinity is generally assessed by measuring EC of a soil sample made up of 1:5 soil water suspension. Thus, determined EC is multiplied by a factor varying from 6 to 10, based on the texture of the soil sample, to obtain Corrected Electrical Conductivity designated as EC_e (Reference 4). Alternatively, EC_e may be directly measured in soil saturation extracts. Soils are classified as saline if EC_e of the saturated extracts exceed 4.0dS/m. The criteria for assessment of soil salinity classes are shown in the following Table 10 (Reference 4).

TABLE 10

Classification	EC_e (dS/m)	Comments
Non-saline	<2	Salinity effects mostly negligible
Slightly saline	2 – 4	Yields of very sensitive crops may be affected
Moderately saline	4 – 8	Yields of many crops affected
Very saline	8 – 16	Only tolerant crops yield satisfactorily
Highly saline	>16	Only a few tolerant crops yield satisfactorily

EC values for the forty one representative soil samples recovered from across the site are summarised in Table 4. For the nature of soils encountered across the site, a multiplying factor of 7 is considered to be appropriate. Therefore, ECe for the soils across the site is anticipated to vary from 0.08 to 7dS/m.

Based on the above results, it is our assessment that the soils likely to be disturbed or excavated during the proposed development works are generally non-saline to moderately saline. Therefore, a Saline Soil Management Plan will be required to address soil erodibility issue at the site.

This salinity assessment was carried out in accordance with the Environment Protection Authority (EPA) guidelines on investigation and management of salinity. These guidelines are detailed in “Site Investigations for Urban Salinity”, and were prepared by the then Department of Land & Water Conservation in 2002. The publication refers to the following:

- AS3600: Concrete Structures.
- AS2159: Piling – Design and Installation.
- AS2870: Residential slabs and footings.

Concrete structures constructed in saline soils will require increased concrete strength, which is proportioned to the increase in soil salinity (Reference 2). In addition, the concrete cover and curing period should be increased depending on the degree of salinity of the soil.

Aggressivity Assessment

Aqueous solution of chlorides causes corrosion of iron and steel, including steel reinforcement in concrete. Corrosion damage by chlorides is only relevant to iron and steel. High acidity and soils with high sulphates and magnesium affect the integrity of concrete structures buried in the soil. Concrete structures constructed in aggressive soils will require increased concrete strength proportional to the increased soil aggressivity (Reference 2). In addition, the concrete cover and curing period should be increased depending on the degree of aggressivity of the soil.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

For this investigation, a total of thirty four samples were tested to determine pH values. The tests indicated pH values ranging from 4.5 to 9.4.

Based on the above results, subsurface materials encountered at the site, and as per AS2159-2009 (Reference 5), the soils at the site are generally non-aggressive to mildly aggressive to concrete. Therefore, we recommend use of construction materials appropriate to the assessed aggressivity.

Soil Management Plan

Laboratory tests indicated the soils at the site to be generally non-saline to slightly saline, and highly erodible. Therefore, we recommend that the Saline Soil Management Plan should be primarily aimed at minimising impacts of erosion while ensuring that the salinity level is maintained at about the existing level. The following should be considered in developing a Saline Soil Management Plan:

- Minimise erosion and sediment loss before, during and after construction.
- Minimise water pollution due to erosion, siltation and sedimentation.
- Reduce and manage salinity within the site so that impacts on future structures (including buildings, roads etc.) are minimised and acceptable.

As part of the Saline Soil Management Plan, we recommended the following during earthworks to manage impacts from erodible and saline soils:

- Develop the best use of the existing topography in order to minimise cut and fill operations.
- Construct a V-drain behind the crest of all slopes to divert water away from the slope face.
- Ensure that earthworks and construction activities do not affect the natural flow of groundwater. Where groundwater is intercepted during development works/excavation, the flow should be diverted to stormwater drains or creeks by providing appropriate surface and sub-surface drainage.
- Retaining walls for cut and fill slopes, where required, should be provided with adequate and appropriate drainage.
- Finished ground surface in each of future lots should be provided with adequate fall to the street or stormwater system to allow water run-off and prevent water ponding, waterlogging and infiltration of rainwater.
- Reduce groundwater recharge through appropriate land use and land management practices. This can be achieved by minimising deep infiltration by providing well compacted impermeable liners along surfaces of waterways (drains, channels, creeks etc.) and maximising vegetation cover, planting of deep rooted trees and use of salt tolerant plants.
- Erosion and Sediment Control Plans must be developed and implemented by the earthworks contractors, in accordance with recommendations provided by the NSW Department of Housing (Reference 6). All sediment and erosion controls proposed by the Erosion and Sediment Control Plan are to be installed prior to commencement of any construction works.
- Cut and fill batters should be provided with a secured turf overlay or shotcreting to guard against erosion.
- Utilise native and deep-rooted plants to minimise soil erosion. Where vegetation cover is not adequate to control erosion, improve soil resistance to erosion by stabilising dispersive soils with hydrated lime and gypsum. Exact proportions of lime and gypsum to be used can be determined on the basis of laboratory testing, but for preliminary planning purposes we suggest about 3% to 5% of lime and gypsum.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

- Select construction materials like concrete and steel that are appropriate for a non-aggressive site.

Pavement Design CBR

Three CBR tests conducted on the samples recovered from the proposed roads at the site showed CBR values of 4% and 5%.

For the purpose of pavement design, a design CBR of 4% can be used. Preliminary thicknesses for pavements for various types of roads are shown below :

TABLE 11

Traffic Loading (ESA)	Design CBR (%)	Asphaltic Concrete (AC10)* (mm)	Basecourse (DGB20) (mm)	Sub-basecourse (Sandstone) (mm)	Total Thickness (mm)
5×10^4	4.0	50	100	200	350
2×10^5	4.0	50	150	210	410
5×10^5	4.0	50	150	260	460
1×10^6	4.0	50	150	300	500

** Over single coat flush seal*

Limitations

The conclusions and recommendations of this report are based on results obtained from a total of eighteen test pits and four boreholes conducted across the site, and laboratory tests on recovered representative soil samples. Although we believe that the sub-surface profile presented in this report is indicative of the general profile across the site, it is possible that the sub-surface profile across the site could differ from that encountered in the test pits. We recommend that this company is contacted for further advice if actual site conditions encountered during construction differ from those presented in this report.

Yours faithfully
GEOTECHNIQUE PTY LTD

ZIAUDDIN AHMED
Associate Geotechnical Engineer

Attached *Drawing No 13602/1-AA2*
Test Pit Logs (1 to 18), Borehole Logs (BH18 to 21), Core Photos & Explanatory Notes
CBR Tests Results & SGS Laboratory Results

References

1. *Australian Standard AS3798-2007 - Guidelines on Earthworks for Commercial and Residential Developments, 2007.*
2. *Australian Standard AS2870-2011 "Residential Slabs and Footings".*
3. *Fell, R., MacGregor, P and Stapledon, D., Geotechnical Engineering of Embankment Dams, 1992.*
4. *Lillicrap, A and McGhie, S., Site Investigation for Urban Salinity, Department of Land and Water Conservation, 2002.*
5. *Standard Australia- AS2159-2009, Piling – Design and Installation, 2009.*
6. *NSW Department of Housing, Managing Urban Stormwater, Soils and Construction, 1998.*

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022



LEGEND

- Test Pit
- Borehole

Imagery ©2015 NearMap.com

0 60 120 180 240 300m

Scale 1:6000

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NOTES

1. This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
2. Site features are shown at approximate locations and are not to scale.

CCL Development Pty Ltd
Proposed Residential Development
Part Lot 1 in DP224861 & Lot 4 in DP226490
Glenmore Park Precincts G & H
2183 The Northern Road, Glenmore Park

Test Pit and Borehole Locations

Drawing No: 13602/1-AA2
Job No: 13602/1
Drawn By: MH
Date: 27 November 2015
Checked By: GC

File Ref: 13602-1
Layers: 0, AA2

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 1
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 85.54
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
			DS									
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
					0.5							
			DS		1							
			DB									
Dry					1.5							
								Test Pit No. 1 terminated at 1.6m due to refusal				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

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engineering log - excavation

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Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 2
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 71.1
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
					1							
Dry			DS		1.5							
								Test Pit No. 2 terminated at 1.7m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 3
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 82.72
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
Dry			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1.5							
								Test Pit No. 3 terminated at 1.6m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9164756
Version: 1, Version Date: 17/03/2022

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Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 4
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 86.06
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry			DS		0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1							
					1.5			Test Pit No. 4 terminated at 1.2m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 5
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 69.1
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry			DS		0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1							
			DB		1.5			Test Pit No. 5 terminated at 1.5m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 6
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 86.17
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
Dry			DS		1							
					1.5							
								Test Pit No. 6 terminated at 1.6m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

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Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 7
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 75.42
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
					1							
			DS		1.5							
Dry								Test Pit No. 7 terminated at 1.7m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9564756
Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 8
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 86.89
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry			DS		0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1							
					1.5			Test Pit No. 8 terminated at 1.4m due to refusal				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

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Project : Proposed Residential Development
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Job No : 13602/2
Pit No : 9
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 80.16
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
Dry			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1.5							
								Test Pit No. 9 terminated at 1.6m				

2
2.5
3
3.5
4
4.5

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 10
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 73.07
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
					1							
Dry			DS		1.5							
								Test Pit No. 10 terminated at 1.7m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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Document Set ID: 9564756
Version: 1, Version Date: 17/03/2022

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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 11
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 79.9
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
			DS									
Dry							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5			Test Pit No. 11 terminated at 0.5m due to refusal				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

GEOTECHNIQUE
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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 12
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 82.28
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
Dry			DS		1							
					1.5							
								Test Pit No. 12 terminated at 1.6m due to refusal				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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Version: 1, Version Date: 17/03/2022

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Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 13
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 77.73
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
			DS									
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
					0.5							
			DS		1							
dry												
					1.5			Test Pit No. 13 terminated at 1.4m due to refusal				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 14
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 84.63
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry			DS		0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		0.5							
					1							
					1.5							
								Test Pit No. 14 terminated at 1.8m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 15
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 85.57
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry			DS		0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
			DS		1							
					1.5			Test Pit No. 15 terminated at 1.3m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

GEOTECHNIQUE
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engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 16
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 86.82
Excavation dimensions : 1.5 **m long** 0.4 **m wide**
datum : AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
Dry			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown-grey, mixed with weathered shale				
			DS		1.5							
								Test Pit No. 16 terminated at 1.6m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9164756
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GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 17
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 80.54
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
			DS									
							CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
DRY					0.5							
			DS		1							
								Test Pit No. 17 terminated at 1.1m				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Road, Glenmore Park

Job No : 13602/2
Pit No : 18
Date : 06/11/2015
Logged/Checked by: GC/ZA

Equipment type and model: Backhoe
R.L. surface : 80.77
Excavation dimensions : 1.5 **m long** 0.4 **m wide** **datum :** AHD

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
					0			TOPSOIL: Silty Clay, low plasticity, brown, with roots				
			DS				CI-CH	Silty CLAY, medium to high plasticity, orange-grey, mixed with weathered shale				
Dry			DS		0.5							
			DB		1							
					1.5			Test Pit No. 18 terminated at 1.5m				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

Document Set ID: 9967056
Version: 1, Version Date: 17/03/2022

KEY TO SYMBOLS

Symbol Description

Strata symbols



Topsoil



Silty Clay
medium to high plasticity

Descriptions of various line types (solid, dotted, etc.)

____ Profile change

_ _ _ Gradual profile change

Notes:

1. **Exploratory borings were drilled between 06/11/2015 and 06/11/2015 using a 50, 100 and 125mm diameter continuous flight power auger.**

2. **These logs are subject to the limitations, conclusions and recommendations in this report.**

3. **Results of tests conducted on samples recovered are reported on the logs.**

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 18
Date : 10/11/2015
Logged/Checked by: AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 84.15

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION (soil type, plasticity or particle characteristic, colour, secondary and minor components.)	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
V-Bit	Dry					0			TOPSOIL: Silty Clay, low plasticity, dark brown, with root fibres				
								CI	Silty CLAY, medium plasticity, brown	M<PL	St		Residual
				DS	N=9 3,4,5	0.5		CI-CH	Silty CLAY, medium to high plasticity, grey mottled red-brown, traces of ironstone gravel	M<PL	St-VSt		
						1		CI	Silty CLAY, medium plasticity, grey and brown, with ironstone/shale gravel	M<PL	VSt-H		
				DS	N=Ref 28,5/0	1.5							
						2			SHALE, dark grey and brown, extremely low to low strength, extremely weathered, with silty clay band interbedded				Bedrock
						2.5			Refer to cored borehole				
						3							
						3.5							
						4							
						4.5							

Document Set ID: 9964756
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GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 18
Date : 10/11/2015
Logged/Checked by : AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 84.15
core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	DEFECT DETAILS defect spacing (mm) 2000 1000 500 300 100 50	DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Commenced coring at 2.4m					
		2.5		SHALE, dark grey and brown, with silty clay band interbedded	EW	EL-L			
				SILTSTONE, grey and brown	DW-SW	M-H			2.91m: Ds 3.12m: Jo=45°,Pl,Ro,St 3.17m: Jo=0°,Ir,Ro,cg 3.27m: Jo=30°,Pl,Ro,Cu 3.48m: Jo=5°,Cu,Ro,Cu 3.83m: Jo=0°,Pl,Ro,cg 4.15m: Jo=0°,Pl,Ro,Cu 4.33m: Jo=0°,Pl,Ro,Cu 4.44m: Jo=0°,Pl,Ro,cg 4.52m: Jo=5°,Pl,Sm,Cu 4.88m: Jo=0°,Pl,Sm,Cu 5.45m: Jo=0°,Pl,Ro,Sm 5.52m: Jo=0°,Un,Ro,Cu
		3 3.5 4 4.5 5 5.5							
		6 6.5 7		Borehole No. 18 terminated at 5.8m					

Document Set ID: 9964756
Version: 1, Version Date: 25/03/2022

GEOTECHNIQUE
PTY LTD

Job No 13602/2 BH18 Started Coring at 2.4m



BH18 terminated at 5.8m

ZA/03.12.2015

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 19
Date : 10/11/2015
Logged/Checked by: AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 91.32

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
V-Bit	Dry					0			TOPSOIL: Silty Clay, low plasticity, dark brown, with gravel and roots				
								ML	Clayey SILT, low plasticity, brown and grey	M<PL	St-VSt		Residual
				DS	N=10 3,3,7	0.5							
						1							
								CL-CI	Silty CLAY, low to medium plasticity, grey and brown, with ironstone/shale gravel	M<PL	VSt-H		
				DS	N=22 6,10,12	1.5							
						2							
						2.5			SHALE, dark grey and brown, extremely low to very low strength, extremely weathered, with silty clay band interbedded				Bedrock (soil property dominate over rock property)
				DS	N=36 9,12,24	3							
						3.5			Refer to cored borehole				
						4							
						4.5							

Document Set ID: 9964756
Version: 1, Version Date: 25/02/2022

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 19
Date : 10/11/2015
Logged/Checked by : AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 91.32
core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	DEFECT DETAILS defect spacing (mm) 2000 1000 500 300 100 50	DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Commenced coring at 3.5m					
		3.5		SHALE, grey and brown, with silty clay band interbedded	EW	EL-VL			
		4		SHALE, dark grey	EW-DW	VL			4.32m: Ds 4.4m: Ds 4.58m: Ds 4.81m: Jo=0°,Ir,Ro,cg 5.06m: Jo=0°,Ir,Ro,cg 5.45m: Jo=5°,Ir,Ro,cg 5.59m: Jo=0°,Ir,Ro,cg 5.6m: Jo=5°,Pl,Ro,Cu 5.8m: Jo=0°,Ir,Ro,cg
		4.5							
		5							
		5.5							
				Borehole No. 19 terminated at 5.9m					
		6							
		6.5							
		7							
		7.5							
		8							

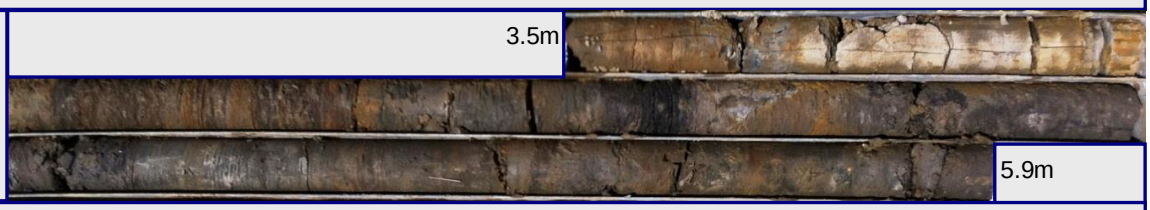
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Version: 1, Version Date: 25/01/2022

GEOTECHNIQUE
PTY LTD

Job No 13602/2 BH19 Started Coring at 3.5m

3m
4m
5m

3.5m



5.9m

BH19 terminated at 5.9m

ZA/03.12.2015

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 20
Date : 10/11/2015
Logged/Checked by: AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 92.46

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
V-Bit	Dry					0			TOPSOIL: Silty Clay, low to medium plasticity, dark brown, with root fibres				
								CI	Silty CLAY, medium plasticity, red-brown,	M<PL	St		
						0.5							
				DS	N=28 7,15,13			ML	Clayey Sandy SILT, low plasticity, grey and brown, with siltstone/ironstone gravel embedded	M<PL	St-VSt		Residual
						1							
						1.5							
				DS	N=24 8,12,12				SILTSTONE/SHALE, grey and brown, extremely low to very low strength, extremely weathered, with clayey silt layers interbedded				Bedrock (soil property dominate over rock property)
						2							
						2.5							
									Refer to cored borehole				
						3							
						3.5							
						4							
						4.5							

Document Set ID: 9964756
Version: 1, Version Date: 25/03/2022

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 20
Date : 10/11/2015
Logged/Checked by : AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 92.46
core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Commenced coring at 2.7m					
		3		SHALE/CLAYSTONE, grey and brown, with clay band	EW	EL-VL			Class - V 2.9m: EW zone 3.22m: Ds
		3.5							3.55m: Jo=0°,Un,Sm,cg 3.58m: Crushed zone=420mm
		4		SHALE/CLAYSTONE, grey and brown	DW	VL-L			Class - IV
		4.5							4.32m: Crushed zone=380mm
		5							5.08m: Crushed zone=60mm
					DW-SW	M			5.21m: Jo=0°,Un,Sm,cg 5.26m: Jo=0°,Un,Sm,cg 5.37m: Crushed zone=50mm
		5.5							
				Borehole No. 20 terminated at 5.6m					
		6							
		6.5							
		7							

Document Set ID: 9964756
Version: 1, Version Date: 25/01/2022

GEOTECHNIQUE
PTY LTD

Job No 13602/2 BH20 Started Coring at 2.7m

2m
3m
4m
5m

2.7m



Core Loss

5.6m

BH20 terminated at 5.6m

ZA/03.12.2015

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : CCL Development Pty Ltd
Project : Proposed Residential Development
Location : Part Lot 1 DP224861 & Lot 4 DP226490, Precincts G & H, 2183 The Northern Rd, Glenmore Park

Job No. : 13602/2
Borehole No. : 21
Date : 10/11/2015
Logged/Checked by: AI

drill model and mounting : Geo 305, Track Mounted **slope :** **deg.** **R.L. surface :** 87.4

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
V-Bit	Dry					0			TOPSOIL: Silty Clay, low to medium plasticity, dark brown, traces of gravel and roots				
								CI	Silty CLAY, medium plasticity, red-brown	M<PL	St		Residual
				DS		0.5		ML	Clayey Sandy SILT, low plasticity, grey and brown, with siltstone gravel embedded	M<PL	VSt-H		
						1							
						1.5							
				DS		2			SILTSTONE/SHALE, grey and brown, extremely low to very low strength, extremely weathered, with clayey silt layer interbedded				Bedrock
						2.5							
									Borehole No. 21 terminated at 2.7m				
						3							
						3.5							
						4							
						4.5							

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Version: 1, Version Date: 25/02/2022

KEY TO SYMBOLS

Symbol Description

Strata symbols



Topsoil



Silty Clay
medium plasticity



Silty Clay
medium to high plasticity



Shale



Clayey Silt
low plasticity



Silty Clay
low to medium plasticity



Clayey Sandy Silt
low plasticity



Siltstone / Shale

Descriptions of various line types (solid, dotted, etc.)

Profile change

Gradual profile change

Notes:

1. **Exploratory borings were drilled between 10/11/2015 and 10/11/2015 using a 50, 100 and 125mm diameter continuous flight power auger.**

2. **These logs are subject to the limitations, conclusions and recommendations in this report.**

3. **Results of tests conducted on samples recovered are reported on the logs.**

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

KEY TO SYMBOLS

Symbol Description

Strata symbols



Shale



Siltstone



Shale/Claystone

Misc. Symbols

Point Load Strength

Descriptions of various line types (solid, dotted, etc.)

Profile change

Gradual profile change

Notes:

1. **Exploratory borings were drilled between 10/11/2015 and 10/11/2015 using a 50, 100 and 125mm diameter continuous flight power auger.**

2. **These logs are subject to the limitations, conclusions and recommendations in this report.**

3. **Results of tests conducted on samples recovered are reported on the logs.**

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GEOTECH TESTING PTY LTD ®
ABN 71 076 676 321

CCL DEVELOPMENT PTY LTD
PO BOX 3008
BLAXLAND NSW 2774

GEOTECHNICAL & SALINITY ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT - PART LOT 1 IN DP224861 & LOT 4 IN DP226490, GLENMORE PARK PRECINCTS G & H, 2183 THE NORTHERN ROAD, GLENMORE PARK

CALIFORNIA BEARING RATIO TEST REPORT

CBR Test Procedure	Laboratory Compaction Method	Sampling Method	Date of Test
AS1289 6.1.1	AS1289 5.1.1	AS1289 1.2.1 Clause 6.5.4	20/11/2015
Job No: 13602/2	Tested By: AN	Checked By: AK	Lab Penrith

Laboratory Number		13602/2-1	13602/2-2	13602/2-3	
Drawing No		Test Pit 1 13602/2-AA1	Test Pit 5 13602/2-AA1	Test Pit 14 13602/2-AA1	
Sample No		1	2	3	
Depth (m)		1.0 - 1.5	1.0 - 1.5	1.5 - 1.6	
Date Sampled		06/11/2015	06/11/2015	06/11/2015	
Sample Description		(Cl) Silty CLAY, medium plasticity, orange-brown & grey	(Cl) Silty CLAY, medium plasticity, orange-brown & grey	(Cl) Silty CLAY, medium plasticity, orange-brown & grey	
Maximum Dry Density	t/m3	1.82	1.78	1.82	
Optimum Moisture Content	%	14.8	17.4	16.3	
Field Moisture Content	%	13.2	17.3	15.4	
% Retained 19mm		0	0	0	
Excluded (Yes / No / Not Applicable)		Not Applicable	Not Applicable	Not Applicable	

CBR TEST RESULTS

Dry Density t/m^3	Before soaking	1.83	1.79	1.81	
	After soaking	1.80	1.79	1.77	
Density Ratio %	Before soaking	100.5	100.5	99.5	
Moisture Content %	Before soaking	14.7	17.5	15.9	
	After soaking	18.7	19.0	18.9	
Moisture Ratio %	Before soaking	99.5	100.5	97.5	
Number of Days Soaked		4	4	4	
Surcharge	kg	9	9	9	
Moisture Content after test %	Top 30mm	20.7	19.7	20.4	
	Whole Sample	18.5	18.7	18.7	
Swell after soaking	%	2.0	Nil	2.0	
Penetration	mm	5.0	5.0	2.5	
CBR VALUE	**%**	**4**	**4**	**5**	

Form No R003 Version 04 06/13 - issued by ER

A Kench 23/11/2015
Approved Signatory

NATA
Nata Accreditation Number 2734
Corporate Site Number 2727

Accredited for compliance with ISO/IEC 17025.

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ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

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Project	**13602-2 - Glenmore Park**
Order Number	(Not specified)
Samples	36

LABORATORY DETAILS

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SGS Reference	**SE145808 R0**
Date Received	9/11/2015
Date Reported	16/11/2015

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

SIGNATORIES

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Senior Organic Chemist

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Metals/Inorganics Team Leader

Document Set ID: 9967056
Version: 1, Version Date: 23/02/2022

pH in soil (1:5) [AN101] Tested: 12/11/2015

PARAMETER	UOM	LOR	TP1 0.1-0.2 SOIL - 6/11/2005 SE145808.001	TP1 1.0-1.1 SOIL - 6/11/2005 SE145808.002	TP2 0.5-0.6 SOIL - 6/11/2005 SE145808.003	TP2 1.5-1.6 SOIL - 6/11/2005 SE145808.004	TP3 0.5-0.6 SOIL - 6/11/2005 SE145808.005
pH	pH Units	-	6.3	9.0	4.7	4.5	5.7

PARAMETER	UOM	LOR	TP3 1.5-1.6 SOIL - 6/11/2005 SE145808.006	TP4 0.1-0.2 SOIL - 6/11/2005 SE145808.007	TP4 1.0-1.1 SOIL - 6/11/2005 SE145808.008	TP5 0.1-0.2 SOIL - 6/11/2005 SE145808.009	TP5 1.0-1.1 SOIL - 6/11/2005 SE145808.010
pH	pH Units	-	5.6	5.7	8.6	5.8	7.8

PARAMETER	UOM	LOR	TP6 0.5-0.6 SOIL - 6/11/2005 SE145808.011	TP6 1.5-1.6 SOIL - 6/11/2005 SE145808.012	TP7 0.5-0.6 SOIL - 6/11/2005 SE145808.013	TP7 1.5-1.6 SOIL - 6/11/2005 SE145808.014	TP8 0.1-0.2 SOIL - 6/11/2005 SE145808.015
pH	pH Units	-	9.1	9.3	7.3	5.6	6.4

PARAMETER	UOM	LOR	TP8 1.0-1.1 SOIL - 6/11/2005 SE145808.016	TP9 0.5-0.6 SOIL - 6/11/2005 SE145808.017	TP9 1.5-1.6 SOIL - 6/11/2005 SE145808.018	TP10 0.5-0.6 SOIL - 6/11/2005 SE145808.019	TP10 1.5-1.6 SOIL - 6/11/2005 SE145808.020
pH	pH Units	-	6.1	6.2	5.0	6.1	5.7

PARAMETER	UOM	LOR	TP11 0.1-0.2 SOIL - 6/11/2005 SE145808.021	TP11 0.4-0.5 SOIL - 6/11/2005 SE145808.022	TP12 0.5-0.6 SOIL - 6/11/2005 SE145808.023	TP12 1.5-1.6 SOIL - 6/11/2005 SE145808.024	TP13 0.1-0.2 SOIL - 6/11/2005 SE145808.025
pH	pH Units	-	5.9	6.2	5.2	5.2	6.3

PARAMETER	UOM	LOR	TP13 1.0-1.1 SOIL - 6/11/2005 SE145808.026	TP14 0.5-0.6 SOIL - 6/11/2005 SE145808.027	TP14 1.5-1.6 SOIL - 6/11/2005 SE145808.028	TP15 0.1-0.2 SOIL - 6/11/2005 SE145808.029	TP15 1.0-1.1 SOIL - 6/11/2005 SE145808.030
pH	pH Units	-	6.7	4.8	4.8	7.0	8.4

PARAMETER	UOM	LOR	TP16 0.5-0.6 SOIL - 6/11/2005 SE145808.031	TP16 1.5-1.6 SOIL - 6/11/2005 SE145808.032	TP17 0.1-0.2 SOIL - 6/11/2005 SE145808.033	TP17 1.0-1.1 SOIL - 6/11/2005 SE145808.034
pH	pH Units	-	9.4	9.4	6.2	4.9

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

Conductivity and TDS by Calculation - Soil [AN106] Tested: 12/11/2015

PARAMETER	UOM	LOR	TP1 0.1-0.2 SOIL - 6/11/2005 SE145808.001	TP1 1.0-1.1 SOIL - 6/11/2005 SE145808.002	TP2 0.5-0.6 SOIL - 6/11/2005 SE145808.003	TP2 1.5-1.6 SOIL - 6/11/2005 SE145808.004	TP3 0.5-0.6 SOIL - 6/11/2005 SE145808.005
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	26	450	690	790	600

PARAMETER	UOM	LOR	TP3 1.5-1.6 SOIL - 6/11/2005 SE145808.006	TP4 0.1-0.2 SOIL - 6/11/2005 SE145808.007	TP4 1.0-1.1 SOIL - 6/11/2005 SE145808.008	TP5 0.1-0.2 SOIL - 6/11/2005 SE145808.009	TP5 1.0-1.1 SOIL - 6/11/2005 SE145808.010
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	590	23	680	12	1000

PARAMETER	UOM	LOR	TP6 0.5-0.6 SOIL - 6/11/2005 SE145808.011	TP6 1.5-1.6 SOIL - 6/11/2005 SE145808.012	TP7 0.5-0.6 SOIL - 6/11/2005 SE145808.013	TP7 1.5-1.6 SOIL - 6/11/2005 SE145808.014	TP8 0.1-0.2 SOIL - 6/11/2005 SE145808.015
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	700	580	93	520	29

PARAMETER	UOM	LOR	TP8 1.0-1.1 SOIL - 6/11/2005 SE145808.016	TP9 0.5-0.6 SOIL - 6/11/2005 SE145808.017	TP9 1.5-1.6 SOIL - 6/11/2005 SE145808.018	TP10 0.5-0.6 SOIL - 6/11/2005 SE145808.019	TP10 1.5-1.6 SOIL - 6/11/2005 SE145808.020
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	230	150	410	24	570

PARAMETER	UOM	LOR	TP11 0.1-0.2 SOIL - 6/11/2005 SE145808.021	TP11 0.4-0.5 SOIL - 6/11/2005 SE145808.022	TP12 0.5-0.6 SOIL - 6/11/2005 SE145808.023	TP12 1.5-1.6 SOIL - 6/11/2005 SE145808.024	TP13 0.1-0.2 SOIL - 6/11/2005 SE145808.025
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	16	55	440	380	14

PARAMETER	UOM	LOR	TP13 1.0-1.1 SOIL - 6/11/2005 SE145808.026	TP14 0.5-0.6 SOIL - 6/11/2005 SE145808.027	TP14 1.5-1.6 SOIL - 6/11/2005 SE145808.028	TP15 0.1-0.2 SOIL - 6/11/2005 SE145808.029	TP15 1.0-1.1 SOIL - 6/11/2005 SE145808.030
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	80	390	480	63	220

PARAMETER	UOM	LOR	TP16 0.5-0.6 SOIL - 6/11/2005 SE145808.031	TP16 1.5-1.6 SOIL - 6/11/2005 SE145808.032	TP17 0.1-0.2 SOIL - 6/11/2005 SE145808.033	TP17 1.0-1.1 SOIL - 6/11/2005 SE145808.034
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	450	440	28	460

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122] Tested: 12/11/2015

PARAMETER	UOM	LOR	TP1 0.1-0.2 SOIL - 6/11/2005 SE145808.001	TP2 1.5-1.6 SOIL - 6/11/2005 SE145808.004	TP3 1.5-1.6 SOIL - 6/11/2005 SE145808.006	TP4 1.0-1.1 SOIL - 6/11/2005 SE145808.008	TP5 1.0-1.1 SOIL - 6/11/2005 SE145808.010
Exchangeable Sodium, Na	mg/kg	2	160	810	670	770	610
Exchangeable Sodium, Na	meq/100g	0.01	0.68	3.5	2.9	3.4	2.6
Exchangeable Sodium Percentage*	%	0.1	4.2	24.8	24.5	17.2	22.1

PARAMETER	UOM	LOR	TP6 1.5-1.6 SOIL - 6/11/2005 SE145808.012	TP7 1.5-1.6 SOIL - 6/11/2005 SE145808.014	TP8 1.0-1.1 SOIL - 6/11/2005 SE145808.016	TP9 1.5-1.6 SOIL - 6/11/2005 SE145808.018	TP10 1.5-1.6 SOIL - 6/11/2005 SE145808.020
Exchangeable Sodium, Na	mg/kg	2	680	630	600	590	370
Exchangeable Sodium, Na	meq/100g	0.01	2.9	2.7	2.6	2.6	1.6
Exchangeable Sodium Percentage*	%	0.1	10.2	23.1	19.5	22.8	11.2

PARAMETER	UOM	LOR	TP11 0.4-0.5 SOIL - 6/11/2005 SE145808.022	TP12 1.5-1.6 SOIL - 6/11/2005 SE145808.024	TP13 0.1-0.2 SOIL - 6/11/2005 SE145808.025	TP14 0.5-0.6 SOIL - 6/11/2005 SE145808.027	TP15 1.0-1.1 SOIL - 6/11/2005 SE145808.030
Exchangeable Sodium, Na	mg/kg	2	410	310	95	500	590
Exchangeable Sodium, Na	meq/100g	0.01	1.8	1.4	0.41	2.2	2.6
Exchangeable Sodium Percentage*	%	0.1	15.1	12.7	6.1	19.6	13.1

PARAMETER	UOM	LOR	TP16 1.5-1.6 SOIL - 6/11/2005 SE145808.032	TP17 1.0-1.1 SOIL - 6/11/2005 SE145808.034
Exchangeable Sodium, Na	mg/kg	2	890	570
Exchangeable Sodium, Na	meq/100g	0.01	3.9	2.5
Exchangeable Sodium Percentage*	%	0.1	11.3	26.3

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

Moisture Content [AN002] Tested: 11/11/2015

PARAMETER	UOM	LOR	TP1 0.1-0.2 SOIL - 6/11/2005 SE145808.001	TP1 1.0-1.1 SOIL - 6/11/2005 SE145808.002	TP2 0.5-0.6 SOIL - 6/11/2005 SE145808.003	TP2 1.5-1.6 SOIL - 6/11/2005 SE145808.004	TP3 0.5-0.6 SOIL - 6/11/2005 SE145808.005
% Moisture	%w/w	0.5	19	11	13	14	11

PARAMETER	UOM	LOR	TP3 1.5-1.6 SOIL - 6/11/2005 SE145808.006	TP4 0.1-0.2 SOIL - 6/11/2005 SE145808.007	TP4 1.0-1.1 SOIL - 6/11/2005 SE145808.008	TP5 0.1-0.2 SOIL - 6/11/2005 SE145808.009	TP5 1.0-1.1 SOIL - 6/11/2005 SE145808.010
% Moisture	%w/w	0.5	11	20	11	17	15

PARAMETER	UOM	LOR	TP6 0.5-0.6 SOIL - 6/11/2005 SE145808.011	TP6 1.5-1.6 SOIL - 6/11/2005 SE145808.012	TP7 0.5-0.6 SOIL - 6/11/2005 SE145808.013	TP7 1.5-1.6 SOIL - 6/11/2005 SE145808.014	TP8 0.1-0.2 SOIL - 6/11/2005 SE145808.015
% Moisture	%w/w	0.5	13	11	15	13	20

PARAMETER	UOM	LOR	TP8 1.0-1.1 SOIL - 6/11/2005 SE145808.016	TP9 0.5-0.6 SOIL - 6/11/2005 SE145808.017	TP9 1.5-1.6 SOIL - 6/11/2005 SE145808.018	TP10 0.5-0.6 SOIL - 6/11/2005 SE145808.019	TP10 1.5-1.6 SOIL - 6/11/2005 SE145808.020
% Moisture	%w/w	0.5	10	17	11	32	16

PARAMETER	UOM	LOR	TP11 0.1-0.2 SOIL - 6/11/2005 SE145808.021	TP11 0.4-0.5 SOIL - 6/11/2005 SE145808.022	TP12 0.5-0.6 SOIL - 6/11/2005 SE145808.023	TP12 1.5-1.6 SOIL - 6/11/2005 SE145808.024	TP13 0.1-0.2 SOIL - 6/11/2005 SE145808.025
% Moisture	%w/w	0.5	18	15	15	18	18

PARAMETER	UOM	LOR	TP13 1.0-1.1 SOIL - 6/11/2005 SE145808.026	TP14 0.5-0.6 SOIL - 6/11/2005 SE145808.027	TP14 1.5-1.6 SOIL - 6/11/2005 SE145808.028	TP15 0.1-0.2 SOIL - 6/11/2005 SE145808.029	TP15 1.0-1.1 SOIL - 6/11/2005 SE145808.030
% Moisture	%w/w	0.5	15	12	12	20	11

PARAMETER	UOM	LOR	TP16 0.5-0.6 SOIL - 6/11/2005 SE145808.031	TP16 1.5-1.6 SOIL - 6/11/2005 SE145808.032	TP17 0.1-0.2 SOIL - 6/11/2005 SE145808.033	TP17 1.0-1.1 SOIL - 6/11/2005 SE145808.034
% Moisture	%w/w	0.5	11	12	20	12

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is refernced to Rayment and Higginson, 1992, sections 15D3 and 15N1.-

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions/General-Conditions-of-Services-English.aspx. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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Document Set ID: 9967056
Version: 1, Version Date: 23/02/2022

STATEMENT OF QA/QC PERFORMANCE

SE145808 R0

CLIENT DETAILS

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Project	**13602-2 - Glenmore Park**
Order Number	(Not specified)
Samples	36

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
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Email	au.environmental.sydney@sgs.com
SGS Reference	**SE145808 R0**
Date Received	09 Nov 2015
Date Reported	16 Nov 2015

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS Environmental Services' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Conductivity and TDS by Calculation - Soil	34 items
	Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)	17 items
	Moisture Content	34 items
	pH in soil (1:5)	34 items
Analysis Date	Conductivity and TDS by Calculation - Soil	34 items
	Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)	17 items
	pH in soil (1:5)	34 items
Duplicate	Conductivity and TDS by Calculation - Soil	1 item

SAMPLE SUMMARY

Sample counts by matrix	36 Soil	Type of documentation received	COC
Date documentation received	6/11/15@17:34	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	24.1°C
Sample container provider	Client	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	None	Samples clearly labelled	Yes
Complete documentation received	Yes		

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

HOLDING TIME SUMMARY

SE145808 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP1 0.1-0.2	SE145808.001	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP1 1.0-1.1	SE145808.002	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP2 0.5-0.6	SE145808.003	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP2 1.5-1.6	SE145808.004	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP3 0.5-0.6	SE145808.005	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP3 1.5-1.6	SE145808.006	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP4 0.1-0.2	SE145808.007	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP4 1.0-1.1	SE145808.008	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP5 0.1-0.2	SE145808.009	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP5 1.0-1.1	SE145808.010	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP6 0.5-0.6	SE145808.011	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP6 1.5-1.6	SE145808.012	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP7 0.5-0.6	SE145808.013	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP7 1.5-1.6	SE145808.014	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP8 0.1-0.2	SE145808.015	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP8 1.0-1.1	SE145808.016	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP9 0.5-0.6	SE145808.017	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP9 1.5-1.6	SE145808.018	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP10 0.5-0.6	SE145808.019	LB089535	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP10 1.5-1.6	SE145808.020	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP11 0.1-0.2	SE145808.021	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP11 0.4-0.5	SE145808.022	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP12 0.5-0.6	SE145808.023	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP12 1.5-1.6	SE145808.024	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP13 0.1-0.2	SE145808.025	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP13 1.0-1.1	SE145808.026	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP14 0.5-0.6	SE145808.027	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP14 1.5-1.6	SE145808.028	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP15 0.1-0.2	SE145808.029	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP15 1.0-1.1	SE145808.030	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP16 0.5-0.6	SE145808.031	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP16 1.5-1.6	SE145808.032	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP17 0.1-0.2	SE145808.033	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†
TP17 1.0-1.1	SE145808.034	LB089542	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2005	16 Nov 2015†

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP1 0.1-0.2	SE145808.001	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP2 1.5-1.6	SE145808.004	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP3 1.5-1.6	SE145808.006	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP4 1.0-1.1	SE145808.008	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP5 1.0-1.1	SE145808.010	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP6 1.5-1.6	SE145808.012	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP7 1.5-1.6	SE145808.014	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP8 1.0-1.1	SE145808.016	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP9 1.5-1.6	SE145808.018	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP10 1.5-1.6	SE145808.020	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP11 0.4-0.5	SE145808.022	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP12 1.5-1.6	SE145808.024	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP13 0.1-0.2	SE145808.025	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP14 0.5-0.6	SE145808.027	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP15 1.0-1.1	SE145808.030	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP16 1.5-1.6	SE145808.032	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†
TP17 1.0-1.1	SE145808.034	LB089491	06 Nov 2005	09 Nov 2015	04 Dec 2005	12 Nov 2015†	04 Dec 2005	16 Nov 2015†

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP1 0.1-0.2	SE145808.001	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP1 1.0-1.1	SE145808.002	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP2 0.5-0.6	SE145808.003	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP2 1.5-1.6	SE145808.004	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

HOLDING TIME SUMMARY

SE145808 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Moisture Content (continued)

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP3 0.5-0.6	SE145808.005	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP3 1.5-1.6	SE145808.006	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP4 0.1-0.2	SE145808.007	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP4 1.0-1.1	SE145808.008	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP5 0.1-0.2	SE145808.009	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP5 1.0-1.1	SE145808.010	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP6 0.5-0.6	SE145808.011	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP6 1.5-1.6	SE145808.012	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP7 0.5-0.6	SE145808.013	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP7 1.5-1.6	SE145808.014	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP8 0.1-0.2	SE145808.015	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP8 1.0-1.1	SE145808.016	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP9 0.5-0.6	SE145808.017	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP9 1.5-1.6	SE145808.018	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP10 0.5-0.6	SE145808.019	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP10 1.5-1.6	SE145808.020	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP11 0.1-0.2	SE145808.021	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP11 0.4-0.5	SE145808.022	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP12 0.5-0.6	SE145808.023	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP12 1.5-1.6	SE145808.024	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP13 0.1-0.2	SE145808.025	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP13 1.0-1.1	SE145808.026	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP14 0.5-0.6	SE145808.027	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP14 1.5-1.6	SE145808.028	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP15 0.1-0.2	SE145808.029	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP15 1.0-1.1	SE145808.030	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP16 0.5-0.6	SE145808.031	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP16 1.5-1.6	SE145808.032	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP17 0.1-0.2	SE145808.033	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015
TP17 1.0-1.1	SE145808.034	LB089379	06 Nov 2005	09 Nov 2015	20 Nov 2005	11 Nov 2015†	16 Nov 2015	12 Nov 2015

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP1 0.1-0.2	SE145808.001	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP1 1.0-1.1	SE145808.002	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP2 0.5-0.6	SE145808.003	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP2 1.5-1.6	SE145808.004	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP3 0.5-0.6	SE145808.005	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP3 1.5-1.6	SE145808.006	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP4 0.1-0.2	SE145808.007	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP4 1.0-1.1	SE145808.008	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP5 0.1-0.2	SE145808.009	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP5 1.0-1.1	SE145808.010	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP6 0.5-0.6	SE145808.011	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP6 1.5-1.6	SE145808.012	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP7 0.5-0.6	SE145808.013	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP7 1.5-1.6	SE145808.014	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP8 0.1-0.2	SE145808.015	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP8 1.0-1.1	SE145808.016	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP9 0.5-0.6	SE145808.017	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP9 1.5-1.6	SE145808.018	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP10 0.5-0.6	SE145808.019	LB089533	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP10 1.5-1.6	SE145808.020	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP11 0.1-0.2	SE145808.021	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP11 0.4-0.5	SE145808.022	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP12 0.5-0.6	SE145808.023	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP12 1.5-1.6	SE145808.024	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP13 0.1-0.2	SE145808.025	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP13 1.0-1.1	SE145808.026	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP14 0.5-0.6	SE145808.027	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†

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HOLDING TIME SUMMARY

SE145808 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

pH in soil (1:5) (continued) — **Method: ME-(AU)-[ENV]AN101**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP14 1.5-1.6	SE145808.028	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP15 0.1-0.2	SE145808.029	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP15 1.0-1.1	SE145808.030	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP16 0.5-0.6	SE145808.031	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP16 1.5-1.6	SE145808.032	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP17 0.1-0.2	SE145808.033	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†
TP17 1.0-1.1	SE145808.034	LB089534	06 Nov 2005	09 Nov 2015	13 Nov 2005	12 Nov 2015†	13 Nov 2015	16 Nov 2015†

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

SURROGATES

SE145808 R0

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Document Set ID: 9967056
Version: 1, Version Date: 28/02/2022

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Soil — Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) — Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Conductivity and TDS by Calculation - Soil — Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE145808.010	LB089535.013	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	1000	910.16803921	30	1
SE145808.019	LB089535.023	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	24	24.091780821	38	1
SE145808.029	LB089542.013	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	63	41.2248798521	34	42 ②

Moisture Content — Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE145786.010	LB089379.011	% Moisture	%w/w	0.5	14	14	37	2
SE145808.008	LB089379.022	% Moisture	%w/w	0.5	11	12	38	5
SE145808.018	LB089379.033	% Moisture	%w/w	0.5	11	11	39	2
SE145808.028	LB089379.044	% Moisture	%w/w	0.5	12	12	38	2
SE145808.034	LB089379.051	% Moisture	%w/w	0.5	12	12	39	1

pH in soil (1:5) — Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE145808.010	LB089533.012	pH	pH Units	-	7.8	7.8	31	1
SE145808.019	LB089533.022	pH	pH Units	-	6.1	6.2	32	2
SE145808.029	LB089534.012	pH	pH Units	-	7.0	6.5	31	7
SE145819.005	LB089534.023	pH	pH Units	-	8.429	8.513	31	1

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB089535.002	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	NA	303	85 - 115	99
LB089542.002	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	NA	303	85 - 115	102

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB089491.002	Exchangeable Sodium, Na	mg/kg	2	NA	390	80 - 120	94

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB089533.001	pH	pH Units	-	7.3	7.415	98 - 102	99
LB089534.001	pH	pH Units	-	7.3	7.415	98 - 102	99

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

MATRIX SPIKES

SE145808 R0

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

MATRIX SPIKE DUPLICATES

SE145808 R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Document Set ID: 9964756
Version: 1, Version Date: 28/04/2022

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

*	NATA accreditation does not cover tthe performance of this service.
-	Sample not analysed for this analyte.

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.

①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to Analytical Report comments for further information.

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source: M630_SR_20151110140106.pdf page: 3 SGS Ref: SE145808_COC

COC received 6/11/15 @5.34 pm

SGS Alexandria Environmental

SE145808 COC
Received: 09 – Nov – 2015

G EOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

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TO: SGS ENVIRONMENTAL SERVICES
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: 02 8594 0400 FAX: 02 8594 0499
ATTN: MS ANGELA MAMALICOS

Sampling By: Gabriel Chiong
Job No: 13602/2
Project: Proposed Residential Subdivision Precints G & H, Stage 2
Project Manager: ZA
Location: Glenmore Park

Results required by: Normal TAT

	Sampling details				Sample type											
	Location	Depth (m)	Date	Time	Soil	Water	EC	pH	ESP							KEEP SAMPLE
1	TP1	0.1 - 0.2	6/11/2015		DSP		✓	✓	✓							YES
2	TP1	1.0 - 1.1	6/11/2015		DSP		✓	✓								YES
3	TP2	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
4	TP2	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
5	TP3	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
6	TP3	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
7	TP4	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
8	TP4	1.0 - 1.1	6/11/2015		DSP		✓	✓	✓							YES
9	TP5	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
10	TP5	1.0 - 1.1	6/11/2015		DSP		✓	✓	✓							YES
11	TP6	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
12	TP6	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Ziauddin Ahmed	Ziauddin Ahmed	6/11/2015	Subra		09/11/15 @2:-

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sai	DSP	Disturbed soil sample (small plastic bag)	* Purge & Trap	@ mole H^+/tonne
WP	Water sample, plastic bottle	DSG	Disturbed soil samp	✓	Test required	# Geotechnique Screen	

Form No 4.7F2-5 SGS

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

G EOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161
email: info@geotech.com.au

TO: SGS ENVIRONMENTAL SERVICES
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: 02 8594 0400 **FAX:** 02 8594 0499
ATTN: MS ANGELA MAMALICOS

Sampling By: Gabriel Chiong
Job No: 13602/2
Project: Proposed Residential Subdivision Precints G & H, Stage 2
Project Manager: ZA
Location: Glenmore Park

Results required by: Normal TAT

	Sampling details				Sample type											
	Location	Depth (m)	Date	Time	Soil	Water	EC	pH	ESP							KEEP SAMPLE
13	TP7	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
14	TP7	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
15	TP8	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
16	TP8	1.0 - 1.1	6/11/2015		DSP		✓	✓	✓							YES
17	TP9	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
18	TP9	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
19	TP10	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
20	TP10	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
21	TP11	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
22	TP11	0.4 - 0.5	6/11/2015		DSP		✓	✓	✓							YES
23	TP12	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
24	TP12	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Ziauddin Ahmed	Ziauddin Ahmed	6/11/2015	Suba		09/11/15 @ 2.~

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sa	DSP	Disturbed soil sample (small plastic bag)	* Purge & Trap	@ mole H^+/tonne
WP	Water sample, plastic bottle	DSG	Disturbed soil samp	✓	Test required	# Geotechnique Screen	

Form No 4.7F2-5 SGS

Document Set ID: 9967056
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PH: 02 8594 0400 **FAX:** 02 8594 0499
ATTN: MS ANGELA MAMALICOS

Sampling By: Gabriel Chiong
Job No: 13602/2
Project: Proposed Residential Subdivision Precints G & H, Stage 2
Project Manager: ZA
Location: Glenmore Park

Results required by: Normal TAT

	Sampling details: Location	Depth (m)	Date	Time	Sample type: Soil	Water	EC	pH	ESP							KEEP SAMPLE
25	TP13	0.1 - 0.2	6/11/2015		DSP		✓	✓	✓							YES
26	TP13	1.0 - 1.1	6/11/2015		DSP		✓	✓								YES
27	TP14	0.5 - 0.6	6/11/2015		DSP		✓	✓	✓							YES
28	TP14	1.5 - 1.6	6/11/2015		DSP		✓	✓								YES
29	TP15	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
30	TP15	1.0 - 1.1	6/11/2015		DSP		✓	✓	✓							YES
31	TP16	0.5 - 0.6	6/11/2015		DSP		✓	✓								YES
32	TP16	1.5 - 1.6	6/11/2015		DSP		✓	✓	✓							YES
33	TP17	0.1 - 0.2	6/11/2015		DSP		✓	✓								YES
34	TP17	1.0 - 1.1	6/11/2015		DSP		✓	✓	✓							YES
35	TP15	0.1-0.2														YES
36	TP15	1.0-1.1														

Relinquished by: Name	Signature	Date	Received by: Name	Signature	Date
Ziauddin Ahmed	Ziauddin Ahmed	6/11/2015	Suba		9/11/15 @ 2pm

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sai	DSP	Disturbed soil sample (small plastic bag)	* Purge & Trap	@ mole H^+/tonne
WP	Water sample, plastic bottle	DSG	Disturbed soil samp	✓	Test required	# Geotechnique Screen	

Form No 4.7F2-5 SGS

Document Set ID: 9967056
Version: 1, Version Date: 28/04/2022

SAMPLE RECEIPT ADVICE

SE145808

CLIENT DETAILS

Contact	Ziauddin Ahmed
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	ziauddin@geotech.com.au
Project	**13602-2 - Glenmore Park**
Order Number	(Not specified)
Samples	36

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Mon 9/11/2015
Report Due	Mon 16/11/2015
SGS Reference	**SE145808**

SUBMISSION DETAILS

This is to confirm that 36 samples were received on Monday 9/ 11/2015. Results are expected to be ready by Monday 16/ 11/2015. Please quote SGS reference SE145808 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	36 Soil	Type of documentation received	COC
Date documentation received	6/11/15@17:34	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	24.1°C
Sample container provider	Client	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	None	Samples clearly labelled	Yes
Complete documentation received	Yes		

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

2 extra samples received: TP18 0.1-0.2, TP18 1.0-1.1

To the extent not inconsistent with the other provisions of this document and unless specifically agreed otherwise in writing by SGS , all SGS services are rendered in accordance with the applicable SGS General Conditions of Service accessible at http://www.sgs.com/en/Terms-and-Conditions/General-Conditions-of-Services-English.aspx as at the date of this document.
Attention is drawn to the limitations of liability and to the clauses of indemnification.

Document Set ID: 9967056
Version: 1, Version Date: 23/02/2022

SAMPLE RECEIPT ADVICE

SE145808

CLIENT DETAILS

Client Geotechnique

Project 13602-2 - Glenmore Park

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Soil	Exchangeable Cations and Cation Exchange Capacity	Moisture Content	pH in soil (1:5)
001	TP1 0.1-0.2	1	3	1	1
002	TP1 1.0-1.1	1	-	1	1
003	TP2 0.5-0.6	1	-	1	1
004	TP2 1.5-1.6	1	3	1	1
005	TP3 0.5-0.6	1	-	1	1
006	TP3 1.5-1.6	1	3	1	1
007	TP4 0.1-0.2	1	-	1	1
008	TP4 1.0-1.1	1	3	1	1
009	TP5 0.1-0.2	1	-	1	1
010	TP5 1.0-1.1	1	3	1	1
011	TP6 0.5-0.6	1	-	1	1
012	TP6 1.5-1.6	1	3	1	1
013	TP7 0.5-0.6	1	-	1	1
014	TP7 1.5-1.6	1	3	1	1
015	TP8 0.1-0.2	1	-	1	1
016	TP8 1.0-1.1	1	3	1	1
017	TP9 0.5-0.6	1	-	1	1
018	TP9 1.5-1.6	1	3	1	1
019	TP10 0.5-0.6	1	-	1	1
020	TP10 1.5-1.6	1	3	1	1
021	TP11 0.1-0.2	1	-	1	1
022	TP11 0.4-0.5	1	3	1	1
023	TP12 0.5-0.6	1	-	1	1
024	TP12 1.5-1.6	1	3	1	1

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

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Version: 1, Version Date: 23/02/2022

SAMPLE RECEIPT ADVICE

SE145808

CLIENT DETAILS

Client Geotechnique

Project 13602-2 - Glenmore Park

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Soil	Exchangeable Cations and Cation Exchange Capacity	Moisture Content	pH in soil (1:5)
025	TP13 0.1-0.2	1	3	1	1
026	TP13 1.0-1.1	1	-	1	1
027	TP14 0.5-0.6	1	3	1	1
028	TP14 1.5-1.6	1	-	1	1
029	TP15 0.1-0.2	1	-	1	1
030	TP15 1.0-1.1	1	3	1	1
031	TP16 0.5-0.6	1	-	1	1
032	TP16 1.5-1.6	1	3	1	1
033	TP17 0.1-0.2	1	-	1	1
034	TP17 1.0-1.1	1	3	1	1

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

Document Set ID: 9967056
Version: 1, Version Date: 23/02/2022

CCL Development Pty Ltd

Data Gap Investigation
Highland Views, Stages 7-9 Development
Glenmore Park NSW

Purpose:

To undertake a data gap investigation following a change in proposed development boundaries at the site.

Prepared for:

Natalie Adamou

Document Date:

February 2021

Reference:

S-02624.DGI.001

Author Name	Lochlan Browne
Mobile	0432 226 858
Email	Lochlan.browne@edp-au.com
Website	www.edp-au.com

CCL DEVELOPMENT
DEVELOPMENT & PROJECT MANAGEMENT SERVICES

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2021

DOCUMENT CONTROL

Project Details:	
Report Name:	Data Gap Investigation, Highland Views: Stages 7-9, Glenmore Park NSW
Client Name:	CCL Development Pty Ltd
Reference:	S-02624.SVA.001

Revision No.:	Revision Date:	Author:	Reviewer:	Approver:	Reason for Issue:
V1	01/03/2021	Lochlan Browne	Kim Femia	Ryan Jacka	First issue to client

Sign Off:		
Author:	Reviewer:	Approver:
Lochlan Browne	Kim Femia	Ryan Jacka
HSE Consultant	Senior Consultant	Environment Group Manager

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2022

STATEMENT OF LIMITATIONS

This document has been prepared in response to specific instructions from the Client to whom the report has been addressed (Client). The work has been undertaken with the usual care and thoroughness of the consulting profession. The work is based on generally accepted standards and practices of the time the work was undertaken. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The report has been prepared for the use by the Client. EDP advise that the report should only be relied upon by the Client and those parties expressly referred to in the introduction of the report. The report should not be separated or reproduced in part. EDP should be retained to assist other professionals who may be affected by the issues addressed in this report to ensure the report is not misused in any way.

EDP is not a professional quantity surveyor (QS) organisation. Any areas, volumes, tonnages or any other quantities noted in this report are estimates only. The services of a professional QS organisation should be engaged if quantities are to be relied upon.

Sampling Risks

The Client acknowledges that any scientifically designed sampling program cannot guarantee all subsurface contamination will be detected. Sampling programs are designed based on known or suspected site conditions and the extent and nature of the sampling and analytical programs will be designed to achieve a level of confidence in the detection of known or suspected subsurface contamination. The sampling and analytical programs adopted by EDP will be those that reasonably maximise the probability of identifying contaminants. The client must therefore accept a level of risk associated with the possible failure to detect certain subsurface contamination where the sampling and analytical program misses such contamination. EDP will detail the nature and extent of the sampling and analytical program used in the investigation in the investigation report provided.

Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Soil contamination can be expected to be non-homogeneous across the stratified soils where present on site, and the concentrations of contaminants may vary significantly within areas where contamination has occurred. In addition, the migration of contaminants through groundwater and soils may follow preferential pathways, such as areas of higher permeability, which may not be intersected by sampling events. Subsurface conditions including contaminant concentrations can also change over time. For this reason, the results should be regarded as representative only.

The client recognises that sampling of subsurface conditions may result in some cross contamination. All care will be taken and industry standards used to minimise the risk of such cross contamination occurring, however, the client recognises this risk and waives any claims against EDP and agrees to defend, indemnify and hold EDP harmless from any claims or liability for injury or loss which may arise as a result of alleged cross contamination caused by sampling.

Reliance on Information Provided by Others

EDP notes that where information has been provided by other parties in order for the works to be undertaken, EDP cannot guarantee the accuracy or completeness of this information. The Client waives any claim against the company and agrees to indemnify EDP for any loss, claim or liability arising from inaccuracies or omissions in information provided to EDP by third parties. No indications were found during our investigations that information contained in this report, as provided to EDP, is false.

Recommendations for Further Study

The industry recognised methods used in undertaking the works may dictate a staged approach to specific investigations. The findings therefore of this report may represent preliminary findings in accordance with these industry recognised methodologies. In accordance with these methodologies, recommendations contained in this report may include a need for further investigation or analytical analysis. The decision to accept these recommendations and incur additional costs in doing so will be at the sole discretion of the Client and EDP recognises that that the Client will consider their specific needs and the business risks involved. EDP does not accept any liability for losses incurred as a result of the Client not accepting the recommendations made within this report.

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2022

CONTENTS

1. Introduction 1
2. Background 1
3. Objective 1
4. Scope of Works 1
5. Technical Framework 2
6. Site Information 3
   - 6.1 Site Identification 3
   - 6.2 Site Description 3
   - 6.3 Surrounding Land Use 3
7. Environmental Setting 3
   - 7.1 Topography 3
   - 7.2 Surface and Groundwater 4
   - 7.3 Regional Geology 4
   - 7.4 Acid Sulfate Soils 4
   - 7.5 Public Records 4
     - 7.5.1 Contaminated Land Record 4
     - 7.5.2 NSW EPA Public Register 4
8. Previous Investigations 4
   - 8.1 Preliminary Site Investigation with Limited Sampling 4
   - 8.2 Preliminary Conceptual Site Model 4
   - 8.3 Detailed Site Investigation 5
   - 8.4 Remediation Action Plan 5
   - 8.5 Site Remediation and Validation Assessment 6
9. UPDATED Conceptual Site Model 6
   - 9.1 Potential Source of Contamination 6
   - 9.2 Potential Receptors and Exposure Pathways 7
10. Soil Assessment Criteria 7
11. Fieldwork Methodology 7
    - 11.1 Sample Location and Rationale 7
    - 11.2 Soil Excavation 8
    - 11.3 Soil Sampling 8
      - 11.3.1 Asbestos Field Screening 8
      - 11.3.2 Asbestos in Soil Sampling 9
12. Laboratory Analysis 9
13. Quality Assurance/Quality Control 9
14. Results 9
    - 14.1 Surface Observations 9

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

14.2 Subsurface Profile 10
14.3 Soil Field Screening 10
14.4 Screened Soil Results 10
14.5 Asbestos Soil Analytical Results 10
14.6 Analytical Results Summary 10
15. Discussion 10
16. Conclusions 11
Appendix A: Figures
Appendix B: Photographs
Appendix C: Summary Table of Results
Appendix D: Assessment Criteria
Appendix E: Quality Assurance / Quality Control
Appendix F: Laboratory Reports
Appendix G: Test Pit Logs
Appendix H: PID Calibration Certificate

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2021

EXECUTIVE SUMMARY

CCL Development Pty Ltd (CCL) engaged EDP Consultants Pty Ltd (EDP) to undertake data gap investigation (assessment) of Stages 7-9 of the proposed Highland Views Development in Glenmore Park NSW (the site). The objective of this assessment was to address data gaps relating to potential contamination status of the southern and eastern portions of the site (investigation area) following the increased extent of the development boundaries.

The legal description of the site is Lot 4 in Deposited Plan (DP) 124036 with a total land area of approximately 55.8 hectares (ha). The investigation area was limited to the soils within the southern and eastern portions of the site with an approximate area of 28,000 m^2.

To complete the objectives, EDP undertook the following:

- Review of the existing environmental reports for the site;
- Excavation of five systematic test pits across the investigation area to a maximum depth of 0.3 m below ground level (mbgl) using hand tools;
- Collection of five targeted surface samples from soils within the southern portion of the investigation area;
- Collection of 10 L volume soil samples at each test pit and surface sample location, which were screened through a 7 mm sieve in the field;
- Collection of suspected asbestos materials (>7 mm) for gravimetric measurement and analysis;
- Collection of 500 ml soil samples from each test pit location, for asbestos laboratory analysis;
- Comparison of soil analytical results against the adopted human health and ecological criteria for the site, in accordance with *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended in April 2013)* (NEPM 2013); and
- Preparation of this assessment report in accordance with relevant guidelines for contaminated land assessment.

In March 2018 and updated in July 2018, SESL Australia Pty Ltd undertook a Detailed Site Investigation (DSI) for Stages 4 to 9 of the Highland Views development (*Report Ref: J001039 Highland Views Stage 4-9 DSI 2.0 dated July 2018).* The DSI concluded that the sole area of environmental concern throughout Stages 4-9 was the presence of asbestos impacted fill material in the gully area on the eastern boundary of Stage 4 and the physical waste materials on the surface (discarded vehicles, building and farm waste, scrap metal). Physical waste was limited to the eastern boundary of Stage 4, predominately overlying asbestos impacted fill materials.

A review of the soil analytical results indicated that with the exception of minor concentrations of heavy metals, the concentrations of CoPC were less that the laboratory practical quantitation limits (PQLs) in all samples. Heavy metals concentrations were considered consistent with the expected background levels of the natural geology.

Field observations identified predominantly natural soils throughout the investigation area with minor amounts of surficial anthropogenic waste within the southern portion of the site. he findings of the analytical results supported the field observations and field screening and suggested there is a negligible contamination risk at the site. The soil criteria adopted, health screening level (HSL) health investigation level (HIL) HSL/HIL-A and ecological investigation levels (EILs), ecological screening levels (ESLs) ESL/EIL-A was deemed the most conservative criteria, and all results remained below the adopted criteria.

Based on a review of the information outlined in this report, observations made as part of the site inspection, and field and analytical results of the detailed sampling event, EDP concludes that the potential for significant gross or widespread contamination to exist within the investigation area at the site is considered to be low and that no further investigation or remedial action is necessary.

The findings of the assessment supported the conclusions outlined within the SESL DSI and as such EDP considers there to be no AEC present within the proposed stage 7-9 development.

EDP considers the former data gaps associated with the increased extent of the development footprint to be addressed and considers the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision.

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

1. INTRODUCTION

CCL Development Pty Ltd (CCL) engaged EDP Consultants Pty Ltd (EDP) to undertake data gap investigation (assessment) of Stages 7-9 of the proposed Highland Views Development in Glenmore Park NSW (the site). The objective of this assessment was to address data gaps relating to potential contamination status of the southern and eastern portions of the site (investigation area) following the increased extent of the development boundaries.

The legal description of the site is Lot 4 in Deposited Plan (DP) 124036 with a total land area of approximately 55.8 hectares (ha). The investigation area was limited to the soils within the southern and eastern portions of the site with an approximate area of 28,000 m^2.

The location of the site and investigation area is shown on **Figures 1-2** provided in **Appendix A**.

2. BACKGROUND

EDP understands that CCL were engaged as the project manager for the Highland Views development, involving the conversion of approximately 23 ha of the site into residential estate in nine stages. The development works are approaching Stages 7-9 and recently received feedback from Penrith City Council (Council) following the lodgement of development applications. Concern was raised by Council that the Detailed Site Investigation (DSI) for the site no longer addresses the areas of concern for Stages 7-9 due to the increased extent of the development footprint.

As such, it was requested that EDP undertake this assessment to address potential data gaps between the DSI and increased extent of the Stages 7-9 development.

3. OBJECTIVE

The objectives of the assessment were to:

- Characterise the soil contamination status of the investigation area in consideration of the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended in April 2013)* (NEPM 2013) and the previous environmental investigations undertaken at the site;
- Assess the potential for soil contamination to exist within the investigation area and where present, delineate and characterise the extent of contamination; and
- Determine the suitability of the soils within the investigation area for the proposed development, including any additional investigations or remedial actions that may be required.

4. SCOPE OF WORKS

To complete the objectives, EDP undertook the following:

- Review of the existing environmental reports for the site;
- Preparation of a Safe Work Method Statement (SWMS);
- Inspection of the site by EDP's qualified Environmental Consultants, to identify site characteristics that may be suggestive of site contamination;
- Excavation of five systematic test pits across the investigation area to a maximum depth of 0.3 m below ground level (mbgl) using hand tools;
- Collection of five targeted surface samples from soils within the southern portion of the investigation area;
- Collection of 10 L volume soil samples at each test pit and surface sample location, which were screened through a 7 mm sieve in the field;

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

- Collection of suspected asbestos materials observed during the screening process for gravimetric measurement and asbestos laboratory analysis in accordance with Section 11.3.1 and Table 7 in *Schedule B2 Guideline on Site Characterisation*, in the NEPM 2013;
- Collection of 500 ml soil samples from each test pit location, for asbestos laboratory analysis;
- Collection of soil samples for chemical characterisation at each test pit location, including collection of quality control (QC) samples;
- Field screening of soil samples using a calibrated photo-ionisation detector (PID) for assessment of potential volatile contamination;
- Analysis of samples for contaminants of potential concern (CoPC) at a National Associational of Testing Authorities, (NATA) Australia accredited laboratory, with the remainder on hold pending results;
- Comparison of soil analytical results against the adopted human health and ecological criteria for the site, in accordance with NEPM 2013;
- Development of an Updated Conceptual Site Model (CSM) to rectify data gaps that required additional environmental information; and
- Preparation of this assessment report in accordance with relevant contaminated land guidelines.

5. TECHNICAL FRAMEWORK

Works were undertaken in general accordance with the following:

- *NSW Work Health and Safety Act 2011*;
- *NSW Work Health and Safety Regulation 2017*;
- *Contaminated Land Management (CLM) Act 1997*;
- *CLM Amendment Act 2008*;
- NSW Environment Protection Agency (EPA) *Protection of the Environment Operations (POEO) Act 1997;*
- NSW EPA *Protection of the Environment Operations (Waste) Regulation 2014;*
- NSW EPA *State Environmental Planning Policy 55 – Remediation of Land (SEPP55) 1998*;
- National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure,* 1999 (April 2013) (NEPM 2013);
- NSW EPA *Waste Classification Guidelines: Part 1 – Classifying Waste*, 2014 (NSW Waste Classification Guidelines);
- NSW EPA *Sampling Design Guidelines 1995*;
- Western Australian Department of Health (DOH), Guidelines for the Assessment and Management of Asbestos-Contaminated Sites in Western Australia, May 2009 (DOH 2009); and
- *CRC Care Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater 2011* (CRC Care 2011);
- NSW EPA *Contaminated Land Guidelines*, *Guidelines for Consultants Reporting on Contaminated Land, April 2020*;
- Australian Standard (AS) 4482.1 *Guide to Investigation and Sampling of Sites with Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds 2005* (AS4482.1-2005)
- AS 4482.2 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 2: Volatile Substances 1999*; and
- AS 1726 *Geotechnical Site Investigations 1993*.

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2021

6. SITE INFORMATION

6.1 Site Identification

Site identification details are summarised in **Table 1** and the location of the site is shown on **Figure 1**, provided in **Appendix A**.

Table 1: Site Identification Details

Site Identification:	
Site Address:	Stage 7-9 Development Site, Highland Views, Glenmore Park NSW
Legal Identification:	Lot 4 in DP 124036
Local Government Authority:	Penrith City Council
Total Land Area:	Approximately 55.8 ha
Investigation Area:	28,000 m^2 located within the southern and eastern portions of the site.
Current Zoning:	RU2 Rural Landscape
Owner:	Vianello Holdings Pty Ltd
Current and Historical Land Use:	At the time of the assessment, the site comprised several large open paddocks used for grazing, prior to which the site was undeveloped land.

6.2 Site Description

The site description was based on visual observations made during fieldworks undertaken by EDP Environmental Consultants on the 16 February 2021:

- The site was accessible via an unsealed road leading to 2183 The Northern Road, Mulgoa;
- The site was characterised by open spaced paddocks, fence lines and two farming dams;
- A single residential property and structures used for agriculture were present within the southern portion of the site;
- The site topography at the time of the assessment was observed to be undulating and sloped towards the south east; and
- The site comprised predominantly grass with minor surficial rubbish and anthropogenic inclusions noted within the southern portion of the site.

Photographs taken during the site inspections are provided in **Appendix B.**

6.3 Surrounding Land Use

The surrounding land consisted of recently constructed low-density residential properties to the north with grazing paddocks to the south, east and west. A rural residential property was located to the south-east of the site.

7. ENVIRONMENTAL SETTING

7.1 Topography

The site topography was observed to be relatively undulating with a general slope in a south-easterly direction, towards the creek on the eastern boundary. The site had an elevation of between 70-90 m Australian Height Datum (AHD). Surface water flowed across the site, expected to be influenced by localised depressions across the undulating surface and flows across the surrounding areas were expected to drain into the creek bed on the eastern boundary of the site.

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2022

7.2 Surface and Groundwater

Two dams were observed during the site assessment. Surface flows across the site were expected to flow into the dams and via swales through the undulating site. Surveyor's Creek was the nearest drainage channel, located within 100 m from the northern boundary of the site.

A review of the NSW Department of Primary Industries (Water NSW) accessed 3 March 2021, indicated that there were no registered groundwater bores within a 500 m radius of the site.

7.3 Regional Geology

The Soil Landscapes Map of Penrith 1:100,000 Sheet (Bannerman and Hazelton 1989) indicated the site was within the Luddenham Soil Landscape group, characterised by erosional soils with undulating to rolling low hills on Wianamatta Group Ashfield and Bringelly Shales and/or Minchinbury Sandstone. Typical soil profiles on some areas of the slope include hardsetting brown clay loams overlying whole coloured strongly pedal clays.

7.4 Acid Sulfate Soils

A review of Acid Sulfate Soil information contained within the online Australian Soil Resource Information System (ASRIS) database (http://www.asris.csiro.au/index_ie.html), accessed on 23 February 2021, indicated there was an extremely low probability of acid sulfate soils occurring beneath the site.

7.5 Public Records

7.5.1 Contaminated Land Record

A search of the online NSW EPA Contaminated Land Record of Notices accessed on 23 February 2021 (https://apps.epa.nsw.gov.au/prclmapp/searchregister.aspx), indicated there were no recorded notices for the site, or land within 500 m of the site, under Section 58 of the CLM Act 1997.

7.5.2 NSW EPA Public Register

A search of the NSW EPA public register under the POEO Act 1997 online (http://www.epa.nsw.gov.au/prclmapp/searchregister.aspx), accessed 23 February 2021 indicated there were no registered licences, applications, notices, audits or pollution studies and reduction programs for the site or land within 500 m of the site.

7.5.3 PFAS Investigation Program

A review of the NSW EPA Per- and Polyfluoroalkyl Substances (PFAS) Investigation Sites indicated that at the time of the assessment, the site was not subject to NSW Government PFAS Investigation program.

8. PREVIOUS INVESTIGATIONS

8.1 Preliminary Site Investigation with Limited Sampling

A Preliminary Site Investigation (PSI) with limited sampling was conducted by Geotechnique in 2015 for the site encompassing the entire Highland Views development (*Report Ref*: 13602/*1-AA dated December 2015).* The primary areas of environmental concern (AEC) identified by Geotechnique were limited to the potential historical use of pesticides at the site.

8.2 Preliminary Conceptual Site Model

Due to data gaps in the PSI, it was determined that an additional assessment was required to confirm the contamination status of the site and determine any need for remedial works. A preliminary CSM was developed

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

by SESL for the Stages 4-9 development site, based on the information obtained prior to the DSI, including desktop review, site walkover and review of the PSI prepared for the site. The following CSM was developed with regards to the potential sources of impact, chemicals of concern, transport mechanism and receptors present.

This review of information prior to the DSI identified the following potential AEC:

- AEC 1: Surface soils impacted by former agricultural chemical use;
- AEC 2: Discarded vehicles and other scrap materials (waste drums) impacting surface soils; and
- AEC 3: Fill of unknown origin around dams and infilled gully within Stage 4.

8.3 Detailed Site Investigation

A DSI for the Stages 4-9 development site was prepared by SESL (*Report Ref: J679 Highland Views Stage 4-9 DSI dated March 2018*) in March 2018 and updated in July 2018 (*Report Ref: J001039 Highland Views Stage 4-9 DSI 2.0 dated July 2018)*. A total of 34 test pits were constructed within the Stage 4-9 area and 37 representative samples collected across two sampling events.

The DSI was limited to visual inspection and intrusive soil sampling to assess the AECs as identified in **Section 8.2**. In samples collected to assess AEC 1, Organochlorine pesticides (OCP) or organophosphate pesticides (OPP) compounds were determined to be below the laboratory detection limit. Additionally, low levels of metals were identified in all samples, indicating the potential for contamination from former use of agricultural chemicals was low. All results from samples collected and analysed to assess AEC 1 were below the Health Investigation Level – Residential A (HIL-A) criteria adopted from NEPM 2013.

Of the samples collected to investigate AEC 2, one single sample contained elevated total chromium concentrations within the Stage 4 footprint. Further analysis to determine the chromium species (trivalent or hexavalent) did not identify issues with total or hexavalent chromium (contaminants of concern). One single sample collected to assess AEC 2 had elevated lead concentrations. All analytes within AEC 2 samples were below the adopted HIL A criteria.

Samples to assess AEC 3 were collected from fill materials in the gully area within Stage 4 as identified in the CSM. Non-friable (bonded) asbestos-containing materials (ACM) were visually identified throughout fill materials and detected with six samples analysed. The presence of asbestos was above the Health Screening Level – Residential A (HSL-A) criteria adopted NEPM 2013. The samples collected from fill material around the dams contained low levels of metals with all other analytes below the detection limit.

The DSI concluded that the sole area of environmental concern throughout Stages 4-9 was the presence of asbestos impacted fill material in the gully area on the eastern boundary of Stage 4 and the physical waste materials on the surface (discarded vehicles, building and farm waste, scrap metal). Physical waste was limited to the eastern boundary of Stage 4, predominately overlying asbestos impacted fill materials. No AEC were identifed for Stages 7-9.

8.4 Remediation Action Plan

A Remedial Action Plan (RAP) was prepared by SESL in 2018 (*Report Ref: J001046 Highland Views Stage 4 RAP 2.0 dated July 2018*) which identified the remediation requirements to ensure the site was suitable for the proposed residential use. The RAP presented five remediation options, with the preferred option involving the combination of onsite treatment, onsite management of treated materials and excavation and disposal of foreign materials and the bulk of ACM.

Onsite treatment included the mechanical screening of impacted fill materials to remove the bulk of ACM and foreign materials. The removal of majority of ACM would reduce the risk the materials posed to human health. The removal of foreign material would allow the soil material to be compacted and reused on site as part of the onsite management.

Following the onsite treatment of impacted fill material, treated material is to be managed onsite by encapsulation in constructed containment area to be located under a proposed site road. The cell will not be accessible to site users and will be managed under a long-term Environmental Management Plan (EMP), should validation results

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

indicate contaminant levels above the site acceptance criteria. ACM and foreign materials separated out from soil during onsite treatment would be disposed of offsite to a facility licensed to accept the material.

Physical waste materials present outside of the impacted fill material footprint could be removed via excavation or handpicking and would be disposed of offsite to a licensed facility.

This remedial option was selected based on the following:

- The requirement to manage unacceptable health risks posed to current and future site users;
- The immobile nature of the identified soil contamination at the site;
- The requirements of key stakeholders for the future use of the site; and
- The extensive costs associated with the disposal of contaminated soils.

8.5 Site Remediation and Validation Assessment

A Site Remediation and Validation Report (SRVR) documenting the remedial works conducted between January 2020 and March 2020 for Stage 4 of the Highland Views Development was undertaken by EDP (*Report Ref: S-00573.SRVR.001, dated April 2020*). The validation assessment was conducted throughout the remediation of asbestos-impacted fill soils within the Stage 4 development. Remedial works included excavation, mechanical treatment and in-situ containment of impacted materials. Remediation works were undertaken at the site in accordance with the RAP for the site. Throughout the remedial works, validation assessment was undertaken to ensure appropriate implementation of the remediation design. EDP considered that through the remediation process, the identified CoPC were appropriately treated, encapsulated or removed from the site, and the risks associated with the contamination were mitigated.

EDP concluded that the site was considered suitable for the proposed land use (low density residential) and continuation of the proposed residential subdivision, however a LTEMP would need to be developed and recorded against the title associated with the road corridor.

9. UPDATED CONCEPTUAL SITE MODEL

9.1 Potential Source of Contamination

Based on a review of previous investigations undertaken at the site and visual observations made during the site inspection, AEC and associated CoPC are summarised in **Table2.**

Table 2: Contaminants of Potential Concern

AEC	Potential Source	CoPC
Surface soils across the site	Historic use of persistent pesticides	Heavy metals, TRH, BTEX, PAHs, OCP/OPP, PCB's and asbestos.
Southern portion of the site in area where minor amounts of stored rubbish was observed	Historical storage of materials	Heavy metals, TRH, BTEX, PAHs, OCP/OPP, PCB's and asbestos.

Heavy metals - Arsenic, chromium, cadmium, copper, lead, nickel, zinc, and mercury;
TRH - Total recoverable hydrocarbons;
BTEX - Benzene, toluene, ethylbenzene, and xylenes;
PAHs - Polycyclic aromatic hydrocarbons;
OCP/OPP - Organochlorine, organophosphate pesticides; and
PCBs - Polychlorinated biphenyls.

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

9.2 Potential Receptors and Exposure Pathways

Based on the proposed low-density residential land use and considering the planned soil disturbance during upcoming works the potential receptors from contamination, if present, were considered to comprise:

- Human health from direct contact (dermal and incidental ingestion) of CoPC in soil and water; and
- Terrestrial ecosystems from direct uptake and diffusion of CoPC in soil and groundwater.

The CSM developed for the investigation area was based on the review of previous investigations undertaken at the site, in light of the proposed low-density residential land use, is outlined in **Table 3**.

Table 3: Conceptual Site Model

Potential Receptors	Exposure Pathways	Potential exposure pathways	
		Historical agricultural activities	Historical storage of materials
Current and future site users	Dermal contact from potentially impacted soil	✓	✓
	Incidental ingestion of potentially impacted soil and dust	✓	✓
	Vapour intrusion and inhalation of volatile contaminants	✓	✓
Shallow maintenance and excavation workers on site	Dermal contact from potentially impacted soil	✓	✓
	Incidental ingestion of potentially impacted soil and dust	✓	✓
	Vapour intrusion and inhalation of volatile contaminants	✓	✓
Terrestrial and aquatic ecosystems	Leaching of contaminants through surface and groundwater flow and subsequent uptake	x	x
	Direct uptake from potentially impacted soil	✓	✓
	Direct uptake from potentially impacted surface water and groundwater	x	x

✓ Potential exposure pathway is complete. X Potential exposure pathway is not complete.

10. ASSESSMENT CRITERIA

To assess the significance of contaminant concentrations in soil, reference was primarily made to NEPM 2013, specifically 'Schedule B1 Guideline on Investigation Levels For soil and Groundwater' (Schedule B1) for the assessment investigation and screening levels, where available. Schedule B1 provides a framework for the use of investigation and screening levels based on human health and ecological risks. In the absence of relative investigation and screening levels in NEPM 2013, reference was made to other nationally or state endorsed guidelines.

Based on the objectives of the assessment, a low-density residential land use was deemed appropriate based on the proposed low-density residential use of the site. Details on the adopted assessment criteria are provided in **Appendix D**. The specific criteria adopted are outlined in **Table C1** in **Appendix C**.

11. FIELDWORK METHODOLOGY

Fieldwork was undertaken by EDP's experienced and qualified Environmental Consultants on 16 February 2021.

11.1 Sample Location and Rationale

The fieldwork for the assessment was devised to address potential data gaps between the DSI and increased extent of the Stages 7-9 development. The sampling objective was to gather information with regard to the type, location,

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

level and extent of potential contamination due to the historical land uses within the investigation area. This process provided sufficient supporting data to allow recommendations to be made on whether the possible site contamination status is compliant with the proposed land use and the environmental concerns.

A total of five test pits (denoted as TP01 to TP05) were excavated by hand within the investigation area. The selection of the sampling locations was formed based on a judgemental sampling pattern based on previous contamination investigations undertaken at the site. Samples were collected in locations accessible for sampling, with the sampling locations relatively well distributed across the site. Five surface soil samples (denoted as SS01-SS05), were also collected based on a targeted sampling pattern to target the CoPC within areas where stored materials were evident.

11.2 Soil Excavation

Test pits were excavated using a hand tools, to a maximum depth of 0.3 mbgl, to characterise the fill profile across the investigation area. This depth was considered appropriate as fill material was only identifed within one sample location (SS01) to a maximum depth of 0.1 mbgl. Soil samples were collected down the soil profile at various depths from each test pit location. Additionally soil samples were collected from the near surface soils 0-0.1 mbgl at five surface soil locations.

11.3 Soil Sampling

A total of 15 primary soil samples were collected from the test pit and surface sample locations across the investigation area. All samples were placed directly in laboratory-supplied glass jars/sample bags and transported on ice to an external NATA accredited laboratory, under standard Chain of Custody (COC) procedure. On completion of the intrusive assessment, the test pits were backfilled with displaced material, with nominal compaction and grass cover reinstated.

Soil samples were collected from near surface soils (surface samples) and down the soil profile (for test pits) based on visual and olfactory indicators of contamination within the soil material, as well as volatile organic compound (VOC) screening utilising a PID. A total of 10 representative soil samples were scheduled for analysis of CoPC based on spatial coverage and consistency of the material, as detailed in **Table 4.**

Sampling locations are shown on **Figure 2** provided **Appendix A**. The soil conditions encountered at each test pit are provided in the **Test Pit Logs** provided in **Appendix G**. Photographs taken during the assessment are also provided in **Appendix B.**

11.3.1 Asbestos Field Screening

Representative 10 L volume soil samples were collected at each sampling location (0.1 m) and down the fill profile for each test pit. The samples were collected in a known 10 L volume container, then sieved through a 7 mm sieve in the field, in accordance with Schedule B2 (Section 11.3.1 and Table 7) of the NEPM 2013.

If ACM and/or fibrous asbestos (FA) was observed within the field, the material was collected and gravimetrically weighed to calculate the asbestos in soil concentration for individual samples as outlined in Schedule B1, Section 4.10 of the NEPM 2013. If identified, representative ACM and/or FA samples were collected and analysed for confirmatory asbestos identification at an external NATA accredited laboratory. A specific bulking factor of 1.8 kg/L soil density was adopted to assess the volume of soil in kilograms that was excavated based on a gravelly sandy clay soil type. The percentage of asbestos was assumed based on known percentage concentrations relative to the differing types of asbestos manufactured products that were identified in the soil.

The asbestos in soil concentration was calculated using the formula shown below:

$$\% \text{ Soil Asbestos} = \frac{\% \text{ Asbestos Content x ACM/FA (kg)}}{\text{Soil Volume (L) x Soil Density (kg/L)}}$$

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

11.3.2 *Asbestos in Soil Sampling*

A total of 15 soil samples (500 ml volume) were collected across the investigation area in accordance with NEPM 2013 to provide an indication of the presence of asbestos fines (AF) within the soil. Ten representative soil samples (one per test pit/ surface sample location) were then scheduled for asbestos analysis in accordance with AS4964-2004 and NEPM 2013.

12. LABORATORY ANALYSIS

Envirolab Services Pty Ltd (ELS) were engaged as the NATA accredited laboratory for the investigation. Primary samples were submitted for analysis of CoPC as outlined in **Table 4.**

Table 4: Sample Analytical Schedule and Rationale

Medium	Quantity	Sampling Locations	CoPC	Rationale
Soil	10 collected / 5 analysed	TP01 – TP05	Heavy metals, TRH, BTEX, PAHs, OCP/OPP, PCBs and asbestos.	To determine the extent and nature of soil contamination associated with historical agricultural activities.
Soil	5 collected / 5 analysed	SS01 – SS05	Heavy metals, TRH, BTEX, PAHs, OCP/OPP, PCBs and asbestos.	To determine the extent and nature of potential soil contamination associated with the historical storage of materials.

13. QUALITY ASSURANCE/QUALITY CONTROL

EDP implements project specific quality assurance/quality control (QA/QC) procedures to improve transparency, consistency, comparability, completeness, and confidence in the data collected. The field and laboratory QA/QC procedures, results and compliance with data quality indicators (DQIs) define the acceptable level of error required for this assessment.

The field and laboratory QA/QC procedures adopted and summary of results for the assessments at the site are provided in **Appendix E**, with data quality objectives (DQOs), requirements and DQIs discussed.

14. RESULTS

14.1 Surface Observations

The following was noted based on a visual inspection of the exposed ground surface within the investigation area during the assessment:

- Surface cover comprised grass and was in good condition;
- No evidence of cut and fill activities were observed throughout the investigation area;
- No visible asbestos materials were observed across the exposed ground surface throughout the investigation area; and
- Minor amounts of anthropogenic inclusions were observed within the southern portion of the investigation area (scrap metal, asphalt and concrete) adjacent the residential property.

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

14.2 Subsurface Profile

With the exception of SS01, the soil profile was generally consistent across the investigation area, described as brown, loose, slightly moist silty clay loam topsoil with rootlets underlain by a brown/yellow and orange, firm clay with medium plasticity. No anthropogenic inclusions, asbestos materials, hydrocarbon odour or staining was evident.

The subsurface profile of SS01 located on the south extent of the investigation area was described as fill comprising a brown, loose, slightly moist silty clay loam with minor anthropogenic inclusions of asphalt and crushed concrete. No asbestos materials, hydrocarbon odour or staining was evident.

14.3 Soil Field Screening

The PID readings from soils investigated as part of this assessment were recorded between 0.0 and 0.4 ppm. This indicated a negligible presence of VOCs within the soil assessed as part of this investigation.

14.4 Screened Soil Results

Visible ACM or FA were not observed using the field screening technique within the 15 soil samples collected, therefore, concentrations did not exceed the adopted NEPM HSL-A for low-density residential land use (0.01% w/w and 0.001% w/w respectively).

14.5 Asbestos Soil Analytical Results

The laboratory results for the 10 soil samples analysed indicated that asbestos did not exceed the NATA accredited laboratory LOR (0.01% w/w). In addition, microscopic observations made during laboratory analysis of the soil samples did not indicate the presence of asbestos in any form, additionally, the laboratory provided comparison of results against the lower HSL, indicating that asbestos concentrations did not exceed the lower HSL for FA/AF (0.001% w/w).

14.6 Analytical Results Summary

A review of the chemical analytical results indicated that with the exception of minor concentrations of heavy metals, the concentrations of CoPC were less that the laboratory practical quantitation limits (PQLs) in all samples. Heavy metals were considered consistent with the expected background levels of the natural geology.

The laboratory reports for soil samples analysed are provided in **Appendix F** and the laboratory results from this investigation are summarised in **Table C1** provided in **Appendix C.**

Locations of the samples collected onsite are shown in **Figure 2** provided in **Appendix A.**

15. DISCUSSION

Field observations identified predominantly natural soils throughout the investigation area with no visible indicators of contamination and only minor amounts of surficial waste material within the southern portion of the site. The findings of the analytical results supported the field observations and field screening and suggested there is a negligible contamination risk at the site. The soil criteria adopted, health screening level (HSL) health investigation level (HIL) HSL/HIL-A and ecological investigation levels (EILs), ecological screening levels (ESLs) ESL/EIL-A was deemed the most conservative criteria, and all results remained below the adopted criteria.

The findings of the assessment supported the conclusions outlined within the SESL DSI and as such EDP considers there to be no AEC present within the proposed stage 7-9 development.

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2022

16. CONCLUSIONS

The objectives of this assessment were to characterise and delineate the extent of soil contamination within the investigation area as a result of the historical use of the site to address current data gaps in order to determine whether further assessment and/or a remedial response was required.

Based on a review of the information outlined in this report, observations made as part of the site inspection, and field and analytical results of the detailed sampling event, EDP concludes that the potential for significant gross or widespread contamination to exist within the investigation area at the site is considered to be low and that no further investigation or remedial action is necessary.

EDP considers the former data gaps associated with the increased extent of the development footprint to be addressed and considers the investigation area suitable to be incorporated into the proposed development footprint for the proposed residential subdivision.

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

Abbreviations

Acronym	Definition
AHD	Australian Height Datum
AMG	Australian Map Grid
ANZECC	Australian & New Zealand Environment & Conservation Council
AS	Australian Standard
COC	Chain of Custody
CoPC	Contaminant of Potential Concern
CLM	Contaminated Land Management
DBYD	Dial Before You Dig
DEC	Department of Environment and Conservation
DECCW	Department of Environment, Climate Change and Water
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
POEO	Protection of the Environment Operations
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
VENM	Virgin Excavated Natural Material

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

Appendix A: Figures

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021



Highland Views Stages 7-9, Glenmore Park NSW

SITE LOCATION & INVESTIGATION AREA

LEGEND:	
	Approximate site boundary
	Approximate investigation area location

Image from: Nearmap, 2021

DETAILS:	
Report Name:	Data Gap Investigation
Client Name:	CCL Development
EDP Reference:	S-02624.DGI.001
Figure Number:	1
Figure Name:	Site Location
Assessment Date:	Tuesday, 16 February 2021

Document Set ID: 9964755
Version: 1, Version Date: 28/02/2022



Highland Views Stages 7-9, Glenmore Park NSW

SAMPLING PLAN

LEGEND:	
	Approximate investigation area location
	Approximate previous investigation area
	Approximate test pit locations
	Approximate surface sample locations

Image from: Nearmap, 2021

DETAILS:	
Report Name:	Data Gap Investigation
Client Name:	CCL Development
EDP Reference:	S-02624.DGI.001
Figure Number:	2
Figure Name:	Sampling Plan
Assessment Date:	Tuesday, 16 February 2021

Document Set ID: 9964755
Version: 1, Version Date: 28/02/2022

Appendix B: Photographs

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

PHOTOGRAPHIC LOG

Site Details:	Highland Views Stages 7-9, Glenmore Park NSW
EDP Reference:	S-02626.DGI.001



Photo 1:	View of investigation area looking east.



Photo 2:	SS01 sample location.



Photo 3:	Asphalt layer at surface adjacent to SS03.



Photo 3:	Typical sieved soil sample.

Document Set ID: 9964735
Version: 1, Version Date: 28/04/2021

PHOTOGRAPHIC LOG

Site Details:	Highland Views Stages 7-9, Glenmore Park NSW
EDP Reference:	S-02626.DGI.001



Photo 5:	Natural clay soil at 0.3 m.



Photo 6:	Silty sandy soil at 0.1 m.

End of Photographic Log

Document Set ID: 9967055
Version: 1, Version Date: 27/04/2022

Appendix C: Summary Table of Results

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

TABLE C1: SUMMARY OF SOIL ANALYTICAL RESULTS

Analyte	Asbestos (%w/w)			BTEX (mg/kg)						Metals (mg/kg)								OCP (mg/kg)																		
	AS4964-2004 AF	Field screened ACM	Field screened FA	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	a-BHC	b-BHC	g-BHC (Lindane)	Heptachlor	d-BHC	Aldrin	Heptachlor epoxide	Endosulfan (I & II)	4,4-DDE	Dieldrin	Endrin	DDD	Endrin aldehyde	DDT	Endosulfan sulphate	Methoxychlor	DDT+DDE+DDD	Aldrin + Dieldrin	Chlordane
Practical Quantitation Limit (PQL)	0.01	-	-	0.2	0.5	1	2	1	3	4	0.4	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
NEPM 2013 Asbestos HSL-A Low-Density Residential	0.001	0.01	0.001																																	
NEPM 2013 Table 1A(1) Soil HIL-A Low-Density Residential										100	20	100	6000	300	40	400	7400				6				270			10					300	240	6	50
NEPM 2013 Table 1A(3) Soil HSLs A & B Residential for Vapour Intrusion (sand 0-<1m)				0.5	160	55			40																											
NEPM 2013 Table 1 B(7) Management Limits for Residential Parkland, Public Open Space (coarse soil)																																				
CRC CARE 2011 Table A4 Soil HSL-A for Direct Contact Low-Density Residential				100	14000	4500			12000																											
CRC CARE 2011 Table A4 Soil HSLs for Direct Contact Intrusive Maintenance Worker				1100	120,000	85,000			130,000																											
CRC CARE 2011 Table A3 Soil HSL-A Vapour Intrusion for Low-Density Residential (sand 0-<1m)				0.5	160	57			40																											
RC CARE 2011 Table A3 Soil HSLs Vapour Intrusion for Intrusive Maintenance Worker (Shallow Trench) (sand 0-<2m)				77																																
NEPM 2013 Table 1B (1-6) EILs/ESLs for Urban Residential/Public Open Space (coarse soil)				50	85	70			105	100		190	60	1100		30	70														180					
S-02624.001-TP01_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7	13	11	ND	11	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP02_0.3	16/02/2021	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	21	8	17	ND	7	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP03_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	9	14	14	ND	8	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP04_0.3	16/02/2021	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9	14	14	ND	8	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP05_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8	14	10	ND	5	46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS01	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	20	13	ND	13	42	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS02	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	ND	10	16	16	ND	8	45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS03	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	7	14	12	ND	9	37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS04	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	13	19	17	ND	9	63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS05	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	10	10	8	ND	4	38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Statistics	Minimum	-	-	-	-	-	-	-	-	-	4	-	7	8	8	-	4	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maximum	-	-	-	-	-	-	-	-	-	10	-	21	20	17	-	13	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mean	-	-	-	-	-	-	-	-	-	5.4	-	10.8	14.2	13.2	-	8.2	37.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Standard Deviation	-	-	-	-	-	-	-	-	-	1.8379	-	4.2635	3.6148	3.0111	-	2.6162	12.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CoV	-	-	-	-	-	-	-	-	-	0.3403	-	0.3948	0.2546	0.2281	-	0.319	0.3182	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	95% UCL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend:
ND = Non Detect
Coloured Concentration = Criteria Exceeded

Document Set ID: 9967055
Version: 1, Version Date: 28/02/2022

TABLE C1: SUMMARY OF SOIL ANALYTICAL RESULTS

Analyte	PAHs (mg/kg)																				PCB (mg/kg)								TRH (mg/kg)										
	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j+k)fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Total Positive PAHs	Benzo(a)pyrene TEQ calc (Zero)	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (PQL)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Total Positive PCBs	C6 - C9	C6-C10	C6-C10 less BTEX (F1)	C10 - C14	C15 - C28	C29-C36	C10-C16	F2-NAPHTHALENE	C16-C34 (F3)	C34-C40 (F4)
Practical Quantitation Limit (PQL)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.05	0.1	0.1	0.1	0.05	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	25	25	25	50	100	100	50	50	100	100
NEPM 2013 Asbestos HSL-A Low-Density Residential																																					
NEPM 2013 Table 1A(1) Soil HIL-A Low-Density Residential																300			3							1											
NEPM 2013 Table 1A(3) Soil HSLs A & B Residential for Vapour Intrusion (sand 0-<1m)	3																												45					110		
NEPM 2013 Table 1 B(7) Management Limits for Residential Parkland, Public Open Space (coarse soil)																													700					1000	2500	10000
CRC CARE 2011 Table A4 Soil HSL-A for Direct Contact Low-Density Residential	1400																											4400					3300		4500	6300
CRC CARE 2011 Table A4 Soil HSLs for Direct Contact Intrusive Maintenance Worker	29,000																											82,000					62,000		85,000	120,000
CRC CARE 2011 Table A3 Soil HSL-A Vapour Intrusion for Low-Density Residential (sand 0-<1m)	3																											44					110			
RC CARE 2011 Table A3 Soil HSLs Vapour Intrusion for Intrusive Maintenance Worker (Shallow Trench) (sand 0-<2m)																																					
NEPM 2013 Table 1B (1-6) EILs/ESLs for Urban Residential/Public Open Space (coarse soil)	170											0.7																	180					120	300	2800
Sample ID:	Sampled Date:	Depth (m):																																					
S-02624.001-TP01_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP02_0.3	16/02/2021	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP03_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP04_0.3	16/02/2021	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-TP05_0.1	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS01	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS02	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS03	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS04	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
S-02624.001-SS05	16/02/2021	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Statistics	Minimum	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maximum	-	-	-	-	-	-	-	-	-	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mean	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CoV	-	-	-	-	-	-	-	-	-	-	-	0.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	95% UCL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend:
ND = Non Detect
Coloured Concentration = Criteria Exceeded

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TABLE C2: QUALITY CONTROL SUMMARY TABLE

			Lab Report Ref:	Lab Ref: 261872-01	Lab Ref: 261872-16	
			Sample ID:	S-02624.001-TP01_0.1	S-02624.001-QC01	
			Sampled Date:	16/02/2021	16/02/2021	
Analyte		Units	PQL (Primary)			RPD**
BTEX	Benzene	mg/kg	0.2	ND	ND	-
	Ethylbenzene	mg/kg	1.0	ND	ND	-
	Toluene	mg/kg	0.5	ND	ND	-
	Xylene (m & p)	mg/kg	2.0	ND	ND	-
	Xylene (o)	mg/kg	1.0	ND	ND	-
	Total Xylene	mg/kg	3.0	ND	ND	-
Metals	Arsenic	mg/kg	4	ND	ND	-
	Cadmium	mg/kg	0.4	ND	ND	-
	Chromium (III+VI)	mg/kg	1	7	5	33
	Copper	mg/kg	1	13	9	36
	Lead	mg/kg	1	11	7	44
	Mercury	mg/kg	0.1	ND	ND	-
	Nickel	mg/kg	1	11	5	**75**
	Zinc	mg/kg	1	29	19	42
OCP	4,4-DDE	0.1	0.1	ND	ND	-
	a-BHC	0.1	0.1	ND	ND	-
	Aldrin	0.1	0.1	ND	ND	-
	b-BHC	0.1	0.1	ND	ND	-
	Chlordane	0.1	0.1	ND	ND	-
	d-BHC	mg/kg	0.1	ND	ND	-
	DDD	mg/kg	0.1	ND	ND	-
	DDT	mg/kg	0.1	ND	ND	-
	DDT+DDE+DDD	mg/kg	0.1	ND	ND	-
	Dieldrin	mg/kg	0.1	ND	ND	-
	Endosulfan (I & II)	mg/kg	0.2	ND	ND	-
	Endosulfan sulphate	mg/kg	0.1	ND	ND	-
	Endrin	mg/kg	0.1	ND	ND	-
	Endrin aldehyde	mg/kg	0.1	ND	ND	-
	g-BHC (Lindane)	mg/kg	0.1	ND	ND	-
	Heptachlor	mg/kg	0.1	ND	ND	-
	Heptachlor epoxide	mg/kg	0.1	ND	ND	-
	Methoxychlor	mg/kg	0.1	ND	ND	-
PAH/Phenols	Acenaphthene	mg/kg	0.1	ND	ND	-
	Acenaphthylene	mg/kg	0.1	ND	ND	-
	Anthracene	mg/kg	0.1	ND	ND	-
	Benzo(a)anthracene	mg/kg	0.1	ND	ND	-
	Benzo(a) pyrene	mg/kg	0.05	ND	ND	-
	Benzo(g,h,i)perylene	mg/kg	0.1	ND	ND	-
	Chrysene	mg/kg	0.1	ND	ND	-
	Dibenz(a,h)anthracene	mg/kg	0.1	ND	ND	-
	Fluoranthene	mg/kg	0.1	ND	ND	-
	Fluorene	mg/kg	0.1	ND	ND	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	ND	ND	-
	Naphthalene	mg/kg	0.1	ND	ND	-
	Phenanthrene	mg/kg	0.1	ND	ND	-
	Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	ND	ND	-
	Benzo(b+j+k)fluoranthene	mg/kg	0.2	ND	ND	-
	Pyrene	mg/kg	0.1	ND	ND	-
PCB	Arochlor 1016	mg/kg	0.1	ND	ND	-
	Arochlor 1221	mg/kg	0.1	ND	ND	-
	Arochlor 1232	mg/kg	0.1	ND	ND	-
	Arochlor 1242	mg/kg	0.1	ND	ND	-
	Arochlor 1248	mg/kg	0.1	ND	ND	-
	Arochlor 1254	mg/kg	0.1	ND	ND	-
	Arochlor 1260	mg/kg	0.1	ND	ND	-
	Total PCBs	mg/kg	0.1	ND	ND	-
TRH	C6-C10	mg/kg	25	ND	ND	-
	C10-C16	mg/kg	50	ND	ND	-
	C16-C34	mg/kg	100	ND	ND	-
	C34-C40	mg/kg	100	ND	ND	-
	C6-C10 less BTEX (F1)	mg/kg	25	ND	ND	-
	F2-NAPHTHALENE	mg/kg	50	ND	ND	-
	C10 - C14	mg/kg	50	ND	ND	-
	C6 - C9	mg/kg	25	ND	ND	-
	C15 - C28	mg/kg	100	ND	ND	-
	C29-C36	mg/kg	100	ND	ND	-

*ND = Non Detect

**RPDs have only been considered where a concentration is greater than 1 times the PQL.

**High RPDs are in bold

Document Set ID: 9967055
Version: 1, Version Date: 23/02/2021

TABLE C2: QUALITY CONTROL SUMMARY TABLE

			Lab Report Ref: Sample ID: Sampled Date:
Analyte		**Units**	**PQL (Primary)**
BTEX	Benzene	mg/kg	0.2
	Ethylbenzene	mg/kg	1.0
	Toluene	mg/kg	0.5
	Xylene (m & p)	mg/kg	2.0
	Xylene (o)	mg/kg	1.0
	Total Xylene	mg/kg	3.0
Metals	Arsenic	mg/kg	4
	Cadmium	mg/kg	0.4
	Chromium (III+VI)	mg/kg	1
	Copper	mg/kg	1
	Lead	mg/kg	1
	Mercury	mg/kg	0.1
	Nickel	mg/kg	1
	Zinc	mg/kg	1
OCP	4,4-DDE	0.1	0.1
	a-BHC	0.1	0.1
	Aldrin	0.1	0.1
	b-BHC	0.1	0.1
	Chlordane	0.1	0.1
	d-BHC	mg/kg	0.1
	DDD	mg/kg	0.1
	DDT	mg/kg	0.1
	DDT+DDE+DDD	mg/kg	0.1
	Dieldrin	mg/kg	0.1
	Endosulfan (I & II)	mg/kg	0.2
	Endosulfan sulphate	mg/kg	0.1
	Endrin	mg/kg	0.1
	Endrin aldehyde	mg/kg	0.1
	g-BHC (Lindane)	mg/kg	0.1
	Heptachlor	mg/kg	0.1
	Heptachlor epoxide	mg/kg	0.1
	Methoxychlor	mg/kg	0.1
PAH/Phenols	Acenaphthene	mg/kg	0.1
	Acenaphthylene	mg/kg	0.1
	Anthracene	mg/kg	0.1
	Benzo(a)anthracene	mg/kg	0.1
	Benzo(a) pyrene	mg/kg	0.05
	Benzo(g,h,i)perylene	mg/kg	0.1
	Chrysene	mg/kg	0.1
	Dibenz(a,h)anthracene	mg/kg	0.1
	Fluoranthene	mg/kg	0.1
	Fluorene	mg/kg	0.1
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1
	Naphthalene	mg/kg	0.1
	Phenanthrene	mg/kg	0.1
	Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5
	Benzo(b+j+k)fluoranthene	mg/kg	0.2
	Pyrene	mg/kg	0.1
PCB	Arochlor 1016	mg/kg	0.1
	Arochlor 1221	mg/kg	0.1
	Arochlor 1232	mg/kg	0.1
	Arochlor 1242	mg/kg	0.1
	Arochlor 1248	mg/kg	0.1
	Arochlor 1254	mg/kg	0.1
	Arochlor 1260	mg/kg	0.1
	Total PCBs	mg/kg	0.1
TRH	C6-C10	mg/kg	25
	C10-C16	mg/kg	50
	C16-C34	mg/kg	100
	C34-C40	mg/kg	100
	C6-C10 less BTEX (F1)	mg/kg	25
	F2-NAPHTHALENE	mg/kg	50
	C10 - C14	mg/kg	50
	C6 - C9	mg/kg	25
	C15 - C28	mg/kg	100
	C29-C36	mg/kg	100

*ND = Non Detect

**RPDs have only been considered where a concentration is greater than 1 times the PQL.

**High RPDs are in bold

Document Set ID: 9967055
Version: 1, Version Date: 28/02/2022

Appendix D: Assessment Criteria

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

ADOPTED ASSESSMENT CRITERIA

The soil data from the site was tabulated and compared against the relevant Tier 1 screening criteria as detailed below. This data is provided in **Table C1** in **Appendix C.**

Soil health investigation levels (HILs), health screening levels (HSLs), ecological investigation levels (EILs), ecological screening levels (ESLs) and petroleum hydrocarbon management limits were adopted from Schedule B1 of NEPM 2013 and CRC Care 2011.

Soil Assessment Criteria

Soil Health Investigation Levels (HILs)

Soil HILs were deemed applicable for assessing human health risk via relevant pathways of exposure for metals and organic substances. Based on the proposed low-density residential use of the site, soil HILs for low-density residential land use (HIL-A) were adopted for the assessment.

Soil Health Screening Levels (HSLs)

Soil HSLs were developed for selected petroleum compounds and fractions and were considered applicable to assessing human health risk via vapour intrusion and inhalation. The HSLs depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 mbgl. HSL-A relevant to a sandy soil type and a depth of 0 to <1 m was conservatively adopted for assessment.

Soil HSLs were also adopted from CRC Care 2011 to assess the exposure pathway of direct contact (oral ingestion, dermal contact and dust inhalation) for general public, shallow trench workers (maximum trench depth of 1 m) and vapour intrusion for intrusive maintenance workers. A sandy soil type and depth of 0 to <1 m was conservatively adopted for the assessment.

Petroleum Hydrocarbon Management Limits

Petroleum hydrocarbon management limits were considered applicable for validating petroleum hydrocarbons in soil to avoid or minimise the following potential effects of petroleum hydrocarbon contamination:

- Formation of observable light non-aqueous phase liquid;
- Fire and explosion hazards;
- Effects on buried infrastructure (i.e. penetration of, or damage to, in-ground services by hydrocarbons); and
- Aesthetics.

Management limits in coarse soils were conservatively adopted for the assessment.

Soil Ecological Criteria (EILs and ESLs)

EILs and ESLs were adopted for the assessment for urban residential/ public open space. EILs and ESLs are concentrations of contaminants above which further appropriate investigation and evaluation will be required. Generic EILs for arsenic, chromium (III+VI), copper, lead, nickel and zinc were adopted. ESLs were developed for select petroleum hydrocarbons; they depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2.0 m of soil. As a conservative approach, ESLs for coarse grained soils were adopted.

Health Screening Levels (HSLs) – Asbestos in Soil

Asbestos contamination can occur in a range of forms, sizes and degrees of deterioration. NEPM 2013 divides asbestos contamination into the following:

- Bonded asbestos-containing materials (ACM): asbestos bound in a matrix, and in sound condition e.g. vinyl floor tiles, cement sheeting;

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

- Fibrous asbestos (FA): friable asbestos material such as weathered ACM and loose fibrous material (insulation products); and
- Asbestos fines (AF): free fibres of asbestos, small fibre bundles, and ACM fragments that can pass through a 7 mm sieve.

NEPM 2013 (Schedule B1, Section 4.8 and Table 7) provides HSLs for the five exposure settings for asbestos, outlined below:

- HSL-FA/AF: 0.001% w/w asbestos for FA and AF – all site uses;
- HSL-A: 0.01% w/w asbestos for bonded ACM – residential, includes day care centres, preschools;
- HSL-B: 0.04% w/w asbestos for bonded ACM – residential with minimal soil access, such as high-density residential use;
- HSL-C: 0.02% w/w asbestos for bonded ACM – recreational, includes parks, public open spaces, playing fields; and
- HSL-D: 0.05% w/w asbestos for bonded ACM – commercial/industrial use, includes premises such as shops and offices as well as factories and industrial sites.

Additionally, surface soils (0.1 m) must be free of visible asbestos for all site uses.

For the purposes of this investigation, HSL of 0.01% w/w asbestos for bonded ACM was adopted to evaluate the significance of the ACM results to conduct the risk assessment based on the level of disturbance of the soils during the planned works and the planned ongoing low-density residential use of the site.

NEPM 2013 states a criterion of 0.001% for FA and AF for all site uses to screen the analytical results. This lower HSL was adopted where FA could be identified in the field with gravimetric measurement conducted. It should be noted for asbestos in soil analysis, in accordance with AS4964-2004 and NATA accreditation, the limit of reporting (LOR) for asbestos in soils is 0.1 g/kg (0.01%). This LOR is not sufficient for the risk assessment of AF, in accordance with NEPM 2013. Therefore, as part of the risk assessment additional comments of visual observations made during laboratory analysis relating to the presence of visible AF (if present) would be utilised with a qualitative criterion adopted to evaluate the significance of the laboratory analytical results. These observations were considered noteworthy, based on the weight of evidence approach, in accordance with NEPM 2013.

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Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

Appendix E: Quality Assurance / Quality Control

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

DATA QUALITY OBJECTIVES

Systematic planning and verification is critical to successful implementation of a validation assessment to ensure that the data is reliable and representative. A process for establishing DQOs for an investigation has been defined by the United States Environmental Protection Agency (US EPA). That process has been adopted by Australian Standard AS4482.1-2005 and referenced in NEPM 2013.

DQOs ensure that:

- The study objectives are set;
- Appropriate types of data are collected (based on potential sources of contamination and CoPC); and
- The tolerance levels are set for potential decision-making errors.

The DQO process is a seven-step iterative planning approach used to plan for environmental data collection activities. It provides a systematic approach for defining the criteria that a data collection design should satisfy, including when, where and how to collect samples or measurements, determination of tolerable decision error rates and the number of samples or measurements that should be collected. The seven-step process for this investigation is discussed and summarised in **Table E1.**

Table E1: Data Quality Objectives

Process	DQO
Step 1: State the Problem	There was the potential for contaminants to be present within soils within the investigation area, at concentrations that may pose a risk to human health and the environment.
Step 2: Identify the Decisions	The decisions to be made based on the results of the validation assessment were as follows: • Are CoPC present within soil, and if so, do they present an unacceptable risk to human health and the environment based the proposed soil disturbance during the planned earthworks and in light of the ongoing residential use? • If contamination is present, does the site require remediation and/or a management?
Step 3: Identify Inputs in the Decision	The inputs required to make the above decisions were as follows: • Site setting and available background information and previous analytical data; • Selection of appropriate Tier 1 soil assessment criteria; • Visual observations; and • Field and laboratory analytical results.
Step 4: Define Boundaries of the Study	The geographical limits appropriate for the data collection and decision making in this investigation comprised the soils within the investigation area as shown on **Figure 2** provided in **Appendix B**.
Step 5: Develop a Decision Rule	The adopted assessment criteria for the CoPC associated with the investigation area are presented in **Tables C1** provided in **Appendix C.** Based on the proposed land use of the site, criteria for low-density residential land use were deemed appropriate for this assessment. **Decision Rules** • Where the data sets for the assessment were not sufficiently populated to allow calculation of the 95% upper confidence limit (UCLmean) then the individual results must be less than the adopted criteria. If all the individual results are below the adopted criteria, then no additional assessment and/or management is required. Where individual results exceed that adopted criteria, then further assessment and/or management is required. • In accordance with the NEPM 2013, where 95% UCLmean of the average concentration for each soil analyte can be calculated, then the 95% UCLmean must be

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

Process	DQO
	below the adopted criteria; no single analyte concentration exceeds 250% of the adopted criteria; the standard deviation of the results must be less than 50% of the adopted criteria; and the normal distribution will only be used where the coefficient of variance is not greater than 1.2. • Allowances to these decision rules apply where alternative 95% UCL methods that are not based on normal or log-normal distributions are adopted. Where 95% UCLmean results exceed the aforementioned criteria, then further assessment and/or management is required. • Statistical analysis of asbestos concentration in soil was not undertaken with decisions based on individual results above the adopted criteria.
Step 6: Specify Limits on Decision Errors	The acceptable limits on decision errors applied during the assessment on the site and the manner of addressing possible decision errors were developed based on the DQIs of: • Accuracy: a quantitative measure of the closeness of reported data to the true value; • Comparability: a qualitative parameter expressing the confidence with which one data set can be compared with another; • Completeness: a measure of the amount of useable data (expressed as %) from a data collection activity; • Representativeness: the confidence (expressed qualitatively) that data are representative of each media present on the site; and • Precision: a quantitative measure of the variability (or reproducibility) of data. **Acceptance Limits for Decision Errors** The acceptable limits were as follows: • Individual or 95% UCLmean concentrations are below the adopted criteria; and • 95% of the data will satisfy the DQIs which were determined for completeness, representativeness, precision and accuracy of both field and laboratory data. Therefore, the limit on the decision error will be 5% that a conclusive statement may be incorrect.
Step 7: Optimise the Design	A targeted and systematic sampling pattern within the investigation area was designed based on the assessment findings of the desktop investigation. A suite of CoPC was selectively adopted for assessment to provide characterisation of the status of soil contamination based on the historical use of the site and the review of available site history information.

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

DATA QUALITY INDICATORS

The DQIs for the assessment are presented in **Table E2.**

Table E2: DQO, Requirements and DQI

DQO:	Requirement:	DQI:
Precision		
Standard Operating Procedures (SOPs) appropriate and complied	The sampling methods comply with industry standard and guidelines	Meet requirement
Field duplicates	1 per 10 primary samples analysed	Relative Percentage Differences (RPDs) < 50%
Laboratory duplicates	1 per batch per analyte	RPDs < 50%
Accuracy		
Trip blanks	1 per batch of samples	Results < PQL
Trip spikes	1 per batch of samples	Recoveries 70 to 130%
Rinsate blanks	1 per piece of equipment per day	Results < PQL
Laboratory matrix spikes	1 per batch per volatile/semi-volatile analyte	Recoveries 70 to 130%
Laboratory surrogate spikes	1 per volatile/semi-volatile analyte sample	Recoveries 70 to 130%
Laboratory control samples	At least 1 per batch per analyte tested	Result < PQL
Representativeness		
Sampling methodology – preservation	Appropriate for the sample type and analysis	Meet requirement
Samples extracted and analysed within holding times	Specific to each analyte	Meet requirement
Field equipment calibration	All field equipment calibrated, and calibration records provided	Meet requirement
Laboratory method blanks	At least 1 per batch per analyte tested	Result < PQL
Comparability		
Sampling approach	Consistent with each sample	Meet requirement
Analysis methodology	Consistent methodology for each sample	Meet requirement
Handling conditions and sampler	Consistent for each sample	Meet requirement
Field observations and analytical	Field observations support analytical results	Meet requirement
Consistent laboratory reporting limit	Consistent for each sample	Meet requirement
Completeness		
Sampling staff	Consistent sampling staff used	Meet requirement
Laboratory accreditation	NATA accredited laboratories and methods used	Meet requirement
Accredited methods	NATA accredited methods used appropriate for each analyte	Meet requirement
NEPM 2013 laboratory methods	Laboratory methods consistent with NEPM 2013	Meet requirement
Chain of custody documentation	Appropriately completed	Meet requirement
Field sampling decontamination	Appropriately completed	Meet requirement

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

QUALITY ASSURANCE/ QUALITY CONTROL

Field Quality Assurance Sampling Procedures

Fieldwork was undertaken by qualified and experienced EDP Environmental Consultants in accordance with EDP SOPs which are based on industry accepted standard practice and NEPM 2013.

Sampling, decontamination and storage works were conducted in accordance with the EDP SOPs. Soil were screened in the field for the presence of VOCs. Calibration certificate for the PID used is provided in **Appendix H.**

Soil samples were collected by hand tools which were decontaminated between each sample locations using phosphate free detergent and water. Soil samples were placed in laboratory supplied jars, bags and bottles with Teflon lined lids and preservative, where required. The samples were stored on ice before being transported to the laboratory along with chain of custody documentation, which is included in **Appendix F.**

Field Quality Control Samples

Field Duplicate Samples

The purpose of duplicate samples was to estimate the variability of a given characteristic or contaminant associated with a population.

Field duplicate soil samples were collected from soil immediately adjacent to the primary sample by placing approximately equal portions of the primary sample into two sample jars. Samples were labelled so as to conceal their relationship to the primary sample from the laboratory.

The blind duplicate sample analysed is outlined in **Table E3.**

Table E3: Field Duplicate Sample Analysed

Medium	Primary Sample	Blind Duplicate	Analysis
Soil	S-02624.001-TP01_0.1	S-02624.001-QC01	Metals, PAH, BTEX, TRH, OCP/OPP, PCBs

The quantity of duplicate samples analysed conformed to the frequency set in the DQI outlined in **Table E2.**

RPDs were calculated for each of the duplicate samples analysed. RPDs were calculated by dividing the difference between the primary sample and duplicate sample by the average of the two, as shown below:

$$RPD = \frac{(X_1 - X_2)}{(X_1 + X_2)/2} \times 100\%$$

Where: X_1 = Primary sample result; and

X_2 = Replicate sample result.

When calculating the RPDs, the following procedures were also considered:

- RPDs were only considered when a concentration was greater than the PQL; and
- In instances where results were greater than the PQL for one sample, but below the PQL for the corresponding primary or duplicate sample, a result equal to the PQL value was adopted where necessary in order to make a calculation possible.

RPDs for duplicate samples were calculated and the results are attached in **Table C2** in **Appendix C.** RPDs for primary and duplicate sample were generally found to be within the acceptable limits, as summarised in **Table E4.**

Table E4: Field Blind RPD Results

Medium	Primary Sample	Blind Duplicate	Results
Soil	S-02624.001-TP01_0.1	S-02624.001-QC01	RPD results were within the acceptable ranges set out in the DQIs with the exception of nickel (75%).

The RPDs of the duplicated sample pair were generally below the acceptable limits. The exceedance of RPDs were likely attributable to heterogeneity of the fill. The RPD exceedances were not deemed to indicate significant

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2021

deficiencies in the sampling methodology but rather related primarily to variations within soil samples, given the percentage of samples reported within acceptable ranges and that none of the deficiencies exceeded the adopted soil assessment criteria. Therefore, the elevated RPDs were not considered to affect the integrity of reliability of the overall results.

Blank and Spike Samples

Rinsate blanks, trip blanks and spikes were collected and submitted for laboratory analysis as outlined in **Table E5.**

Rinsate blanks consisted of pre-preserved bottles filled with laboratory prepared water that was passed over decontaminated field equipment and then collected in containers used for the sampling process. Rinsate blanks were preserved in a similar manner to the original samples. Rinsate blanks assess the effectiveness of decontamination procedures.

Trip blanks were used to assess the potential for cross contamination between transit from the site to the laboratory. Trip spikes were used to assess the potential loss of volatile constituents from samples whilst in transit from the site to the laboratory. Trip blank and spike samples were prepared by the primary laboratory, carried to the field unopened and subjected to the same preservation methods as the primary field samples. Samples were analysed for volatile compounds.

Table E5: Blank and Spike Analytical Schedule

Type/Medium	Sample	Date	Analysis	Results
Trip Blank (Soil)	S-02624.001-TB01	16/02/2021	TRH C_6 - C_9 TRH C_6 – C_{10}	Results <PQLs
Trip Spike (Soil)	S-02624.001-TS01	16/02/2021	BTEX	Recoveries within acceptable limits as outlined by the DQIs.
Rinsate Blank	S-02624.001-RB01	16/02/2021	Metals, PAH, BTEX, TRH, OCP/OPP, PCBs	Results < PQLs

The quantity of blank and spike samples analysed conformed to the frequency set in the DQIs outlined in **Table E2.**

Based on the results it can be considered that:

- Decontamination procedures were sufficient; and
- Cross contamination between transit of samples from the site to the laboratory was unlikely to have occurred.

Laboratory Quality Assurance/Quality Control

The laboratories conducted their own internal quality program for assessment of the repeatability of the analytical procedures and instrument accuracy under their NATA accreditation. This included analysis of laboratory blank samples, duplicate samples, spike samples, control samples and surrogate spikes. The laboratory QA/QC procedures and results are described within the laboratory reports presented in **Appendix F.**

The laboratory internal QA/QC sample results were reviewed and were consistent with the laboratory's NATA guidelines. Furthermore, the adoption of the general advisory ranges for specific recoveries has been used to screen laboratory data. Where recoveries were outside these ranges the data was assessed in relation to specific laboratory comments, published industry 'norms' for specific parameters and/or the likely impact on the interpretation of the meaning of the results.

Based on the reported laboratory QA/QC samples and methods used, the results were considered to be acceptable.

Quality Statement

The sampling methods (including equipment decontamination, sample preservation and transport procedures) and laboratory methods followed during the assessment were consistent with EDP SOPs and were found to meet the DQIs for this project. It was considered that the data was sufficiently precise and accurate and that the results can be relied upon for the purpose of this assessment.

Document Set ID: 9964035
Version: 1, Version Date: 28/04/2022

Appendix F: Laboratory Reports

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

SCB0169

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph 0406 350 706 / adelaide@envirolab.com.au

Client:	EDP Consultants
Contact:	Matthew Konza
PM:	Ryan Jacka
Sampler:	Matthew Konza
Address:	Suite 101, 52 Atchison Street, St Leonards NSW 2065
Phone:	**Mob:** 0411424530
Email:	matthew.konza@edp-au.com; lochlan.browne@edp-au.com; ryan.jacka@edp-au.com; bryson.lang@edp-au.com

Client Project Name / Number / Site etc (ie report title):	S-02624.001
PO No.:	
Envirolab Quote No. :	20SY005
Date results required:	
Or choose:	**Standard**
Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Report format: esdat / equis /	
Lab Comments:	

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 6	NEPM asbestos	TRH & BTEX	Combo 3	Hold	Comments
1	S-02624.001-TP01_0.1	0.1	16/02/2021	Soil	X	X				
2	S-02624.001-TP01_0.3	0.3	16/02/2021	Soil					X	
3	S-02624.001-TP02_0.1	0.1	16/02/2021	Soil					X	
4	S-02624.001-TP02_0.3	0.3	16/02/2021	Soil	X	X				
5	S-02624.001-TP03_0.1	0.1	16/02/2021	Soil	X	X				
6	S-02624.001-TP03_0.3	0.3	16/02/2021	Soil					X	
7	S-02624.001-TP04_0.1	0.1	16/02/2021	Soil					X	
8	S-02624.001-TP04_0.3	0.3	16/02/2021	Soil	X	X				
9	S-02624.001-TP05_0.1	0.1	16/02/2021	Soil	X	X				
10	S-02624.001-TP05_0.3	0.3	16/02/2021	Soil					X	
11	S-02624.001-SS01	0.1	16/02/2021	Soil	X	X				
12	S-02624.001-SS02	0.1	16/02/2021	Soil	X	X				
13	S-02624.001-SS03	0.1	16/02/2021	Soil	X	X				
14	S-02624.001-SS04	0.1	16/02/2021	Soil	X	X				
15	S-02624.001-SS05	0.1	16/02/2021	Soil	X	X				
16	S-02624.001-QC01		16/02/2021	Soil	X					
17	S-02624.001-QC02		16/02/2021	Soil					X	
18	S-02624.001-TS01		16/02/2021	Water			X			
19	S-02624.001-TB01		16/02/2021	Water			X			
20	S-02624.001-FB01		16/02/2021	Soil				X		
21	S-02624.001-RB01		16/02/2021	Water	X					

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 261872

Date Received: 16/02/2021
Time Received: 1430
Received By: KG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company):	EDP Consultants
Print Name:	Matthew Konza
Date & Time:	16/2/21
Signature:	
Received by (Company):	ELS Syd
Print Name:	K-Lowe
Date & Time:	16/02/2021 1430
Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 17 **(if applicable)**

Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	EDP Consultants Pty Ltd
Attention	Matthew Konza

Sample Login Details

Your reference	S-02624.001
Envirolab Reference	261872
Date Sample Received	16/02/2021
Date Instructions Received	16/02/2021
Date Results Expected to be Reported	23/02/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	18 Soil, 3 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	17
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	Metals in Water - Dissolved	On Hold
S-02624.001-TP01_0.1-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-TP01_0.3-0.3																✓
S-02624.001-TP02_0.1-0.1																✓
S-02624.001-TP02_0.3-0.3	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-TP03_0.1-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-TP03_0.3-0.3																✓
S-02624.001-TP04_0.1-0.1																✓
S-02624.001-TP04_0.3-0.3	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-TP05_0.1-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-TP05_0.3-0.3																✓
S-02624.001-SS01-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-SS02-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-SS03-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-SS04-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-SS05-0.1	✓	✓	✓	✓	✓	✓	✓	✓								
S-02624.001-QC01	✓	✓	✓	✓	✓	✓	✓									
S-02624.001-QC02																✓
S-02624.001-TS01									✓							
S-02624.001-TB01									✓							
S-02624.001-FB01	✓	✓	✓				✓									

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	Metals in Water - Dissolved	On Hold
S-02624.001-RB01									✓	✓	✓	✓	✓	✓	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 261872

Client Details

Client	EDP Consultants Pty Ltd
Attention	Matthew Konza
Address	Suite 6/52 Atchison St, ST LEONARDS, NSW

Sample Details

Your Reference	**S-02624.001**
Number of Samples	18 Soil, 3 Water
Date samples received	16/02/2021
Date completed instructions received	16/02/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	23/02/2021
Date of Issue	22/02/2021

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Panika Wongchanda, Nyovan Moonean
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Jaimie Loa-Kum-Cheung, Metals Supervisor
Lucy Zhu, Asbestos Supervisor
Manju Dewendrage, Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	99	113	109	111	105

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	81	121	122	120	115

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		261872-16	261872-20
Your Reference	UNITS	S-02624.001-QC01	S-02624.001-FB01
Depth		-	-
Date Sampled		16/02/2021	16/02/2021
Type of sample		Soil	Soil
Date extracted	-	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<3	<3
Surrogate aaa-Trifluorotoluene	%	117	128

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

svTRH (C10-C40) in Soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	97	94	97	96	95

svTRH (C10-C40) in Soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	99	94	96	96	97

Document Set ID: 9967055
Version: 1, Version Date: 23/04/2021

svTRH (C10-C40) in Soil			
Our Reference		261872-16	261872-20
Your Reference	UNITS	S-02624.001-QC01	S-02624.001-FB01
Depth		-	-
Date Sampled		16/02/2021	16/02/2021
Type of sample		Soil	Soil
Date extracted	-	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	94	97

Document Set ID: 9964055
Version: 1, Version Date: 28/04/2021

PAHs in Soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	115	116	118	117	116

Document Set ID: 9964755
Version: 1, Version Date: 23/04/2021

PAHs in Soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.08	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.08	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	114	119	114	113	117

Document Set ID: 9964755
Version: 1, Version Date: 23/04/2021

PAHs in Soil			
Our Reference		261872-16	261872-20
Your Reference	UNITS	S-02624.001-QC01	S-02624.001-FB01
Depth		-	-
Date Sampled		16/02/2021	16/02/2021
Type of sample		Soil	Soil
Date extracted	-	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	115	118

Document Set ID: 9964755
Version: 1, Version Date: 23/04/2021

Organochlorine Pesticides in soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	113	0	111	108	111

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

Organochlorine Pesticides in soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	110	111	114	108	110

Document Set ID: 9964755
Version: 1, Version Date: 23/04/2021

Organochlorine Pesticides in soil		
Our Reference		261872-16
Your Reference	UNITS	S-02624.001-QC01
Depth		-
Date Sampled		16/02/2021
Type of sample		Soil
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	111

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

Organophosphorus Pesticides in Soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	113	0	111	108	111

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

Organophosphorus Pesticides in Soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	110	111	114	108	110

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

Organophosphorus Pesticides in Soil		
Our Reference		261872-16
Your Reference	UNITS	S-02624.001-QC01
Depth		-
Date Sampled		16/02/2021
Type of sample		Soil
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	111

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

PCBs in Soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	113	111	108	111	110

PCBs in Soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	114	108	110	111

Document Set ID: 9967055
Version: 1, Version Date: 28/04/2022

PCBs in Soil		
Our Reference		261872-16
Your Reference	UNITS	S-02624.001-QC01
Depth		-
Date Sampled		16/02/2021
Type of sample		Soil
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	111

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

Acid Extractable metals in soil						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Arsenic	mg/kg	<4	6	6	<4	4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	21	9	9	8
Copper	mg/kg	13	8	14	14	14
Lead	mg/kg	11	17	14	14	10
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	11	7	8	8	5
Zinc	mg/kg	29	20	28	31	46

Acid Extractable metals in soil						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Arsenic	mg/kg	<4	10	6	5	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	10	7	13	10
Copper	mg/kg	20	16	14	19	10
Lead	mg/kg	13	16	12	17	8
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	8	9	9	4
Zinc	mg/kg	42	45	37	63	38

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

Acid Extractable metals in soil				
Our Reference		261872-16	261872-20	261872-22
Your Reference	UNITS	S-02624.001-QC01	S-02624.001-FB01	S-02624.001-QC01 - [TRIPLICATE]
Depth		-	-	-
Date Sampled		16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil
Date prepared	-	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	17/02/2021	17/02/2021	17/02/2021
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	5	2	6
Copper	mg/kg	9	1	11
Lead	mg/kg	7	<1	9
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	5	<1	6
Zinc	mg/kg	19	<1	24

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

Moisture						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Moisture	%	19	17	20	16	18

Moisture						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/02/2021	17/02/2021	17/02/2021	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021	18/02/2021	18/02/2021
Moisture	%	17	22	20	19	26

Moisture			
Our Reference		261872-16	261872-20
Your Reference	UNITS	S-02624.001-QC01	S-02624.001-FB01
Depth		-	-
Date Sampled		16/02/2021	16/02/2021
Type of sample		Soil	Soil
Date prepared	-	17/02/2021	17/02/2021
Date analysed	-	18/02/2021	18/02/2021
Moisture	%	18	3.3

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

Asbestos ID - soils NEPM - ASB-001						
Our Reference		261872-1	261872-4	261872-5	261872-8	261872-9
Your Reference	UNITS	S-02624.001-TP01_0.1	S-02624.001-TP02_0.3	S-02624.001-TP03_0.1	S-02624.001-TP04_0.3	S-02624.001-TP05_0.1
Depth		0.1	0.3	0.1	0.3	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	19/02/2021	19/02/2021	19/02/2021	19/02/2021	19/02/2021
Sample mass tested	g	804.84	665.25	578.22	754.47	803.1
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Document Set ID: 9967055
Version: 1, Version Date: 23/02/2021

Asbestos ID - soils NEPM - ASB-001						
Our Reference		261872-11	261872-12	261872-13	261872-14	261872-15
Your Reference	UNITS	S-02624.001-SS01	S-02624.001-SS02	S-02624.001-SS03	S-02624.001-SS04	S-02624.001-SS05
Depth		0.1	0.1	0.1	0.1	0.1
Date Sampled		16/02/2021	16/02/2021	16/02/2021	16/02/2021	16/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	19/02/2021	19/02/2021	19/02/2021	19/02/2021	19/02/2021
Sample mass tested	g	637.59	511.8	700.11	703.46	533.41
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Document Set ID: 9964755
Version: 1, Version Date: 23/02/2021

vTRH(C6-C10)/BTEXN in Water				
Our Reference		261872-18	261872-19	261872-21
Your Reference	UNITS	S-02624.001-TS01	S-02624.001-TB01	S-02624.001-RB01
Depth		-	-	-
Date Sampled		16/02/2021	16/02/2021	16/02/2021
Type of sample		Water	Water	Water
Date extracted	-	18/02/2021	18/02/2021	18/02/2021
Date analysed	-	18/02/2021	18/02/2021	18/02/2021
TRH C_6 - C_9	µg/L	[NA]	<10	<10
TRH C_6 - C_{10}	µg/L	[NA]	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	[NA]	<10	<10
Benzene	µg/L	103%	<1	<1
Toluene	µg/L	103%	<1	<1
Ethylbenzene	µg/L	104%	<1	<1
m+p-xylene	µg/L	100%	<2	<2
o-xylene	µg/L	103%	<1	<1
Naphthalene	µg/L	[NA]	<1	<1
Surrogate Dibromofluoromethane	%	101	103	102
Surrogate toluene-d8	%	97	100	99
Surrogate 4-BFB	%	94	92	92

Document Set ID: 9964755
Version: 1, Version Date: 23/04/2021

svTRH (C10-C40) in Water		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Surrogate o-Terphenyl	%	80

Document Set ID: 9964055
Version: 1, Version Date: 23/02/2021

PAHs in Water		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	80

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

Organochlorine Pesticides in Water		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
alpha-BHC	µg/L	<0.2
HCB	µg/L	<0.2
beta-BHC	µg/L	<0.2
gamma-BHC	µg/L	<0.2
Heptachlor	µg/L	<0.2
delta-BHC	µg/L	<0.2
Aldrin	µg/L	<0.2
Heptachlor Epoxide	µg/L	<0.2
gamma-Chlordane	µg/L	<0.2
alpha-Chlordane	µg/L	<0.2
Endosulfan I	µg/L	<0.2
pp-DDE	µg/L	<0.2
Dieldrin	µg/L	<0.2
Endrin	µg/L	<0.2
Endosulfan II	µg/L	<0.2
pp-DDD	µg/L	<0.2
Endrin Aldehyde	µg/L	<0.2
pp-DDT	µg/L	<0.2
Endosulfan Sulphate	µg/L	<0.2
Methoxychlor	µg/L	<0.2
Surrogate TCMX	%	81

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

OP Pesticides in Water		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
Dichlorvos	µg/L	<0.2
Dimethoate	µg/L	<0.2
Diazinon	µg/L	<0.2
Chlorpyriphos-methyl	µg/L	<0.2
Ronnel	µg/L	<0.2
Fenitrothion	µg/L	<0.2
Malathion	µg/L	<0.2
Chlorpyriphos	µg/L	<0.2
Parathion	µg/L	<0.2
Bromophos ethyl	µg/L	<0.2
Ethion	µg/L	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2
Surrogate TCMX	%	81

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

PCBs in Water		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date extracted	-	17/02/2021
Date analysed	-	18/02/2021
Aroclor 1016	µg/L	<2
Aroclor 1221	µg/L	<2
Aroclor 1232	µg/L	<2
Aroclor 1242	µg/L	<2
Aroclor 1248	µg/L	<2
Aroclor 1254	µg/L	<2
Aroclor 1260	µg/L	<2
Surrogate TCMX	%	81

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

Metals in Water - Dissolved		
Our Reference		261872-21
Your Reference	UNITS	S-02624.001-RB01
Depth		-
Date Sampled		16/02/2021
Type of sample		Water
Date digested	-	17/02/2021
Date analysed	-	17/02/2021
Arsenic - Dissolved	mg/L	<0.05
Cadmium - Dissolved	mg/L	<0.01
Chromium - Dissolved	mg/L	<0.01
Copper - Dissolved	mg/L	<0.01
Lead - Dissolved	mg/L	<0.03
Mercury - Dissolved	mg/L	<0.0005
Nickel - Dissolved	mg/L	<0.02
Zinc - Dissolved	mg/L	<0.02

Document Set ID: 9964755
Version: 1, Version Date: 18/04/2022

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

Method ID	Methodology Summary
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

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QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	106	107
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	106	107
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	105	107
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	106	107
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	109	109
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	106	107
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	104	107
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	115	1	99	120	19	120	120

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	16	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	16	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	16	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	16	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	16	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	16	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	16	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	16	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	16	117	107	9	[NT]	[NT]

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QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	124	118
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	88	85
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	92	87
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	124	118
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	88	85
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	92	87
Surrogate o-Terphenyl	%		Org-020	99	1	97	93	4	101	96

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	16	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	16	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	16	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	16	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	16	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	16	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	16	94	98	4	[NT]	[NT]

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Version: 1, Version Date: 28/04/2021

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			18/02/2021	1	18/02/2021	18/02/2021		18/02/2021	18/02/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	97
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	116
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	96
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	97	101
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	105
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	116	120
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	118	122
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	100	105
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	115	1	115	116	1	114	110

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	18/02/2021	18/02/2021		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	16	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	16	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	16	115	116	1	[NT]	[NT]

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QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			18/02/2021	1	18/02/2021	18/02/2021		18/02/2021	18/02/2021
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	101
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	92
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	89
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	103
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	110
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	108
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	97	103
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	88
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	99
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	109
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	108	1	113	113	0	108	112

Document Set ID: 9964755
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QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	18/02/2021	18/02/2021		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	16	111	111	0	[NT]	[NT]

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			18/02/2021	1	18/02/2021	18/02/2021		18/02/2021	18/02/2021
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	96
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	118
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	77
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	114
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	107
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	69	67
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	107
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	108	1	113	113	0	108	112

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	18/02/2021	18/02/2021		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	16	111	111	0	[NT]	[NT]

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date extracted	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			18/02/2021	1	18/02/2021	18/02/2021		18/02/2021	18/02/2021
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	90	90
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	108	1	113	113	0	108	112

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	18/02/2021	18/02/2021		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	16	111	112	1	[NT]	[NT]

Document Set ID: 9964055
Version: 1, Version Date: 28/04/2022

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	261872-4
Date prepared	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Date analysed	-			17/02/2021	1	17/02/2021	17/02/2021		17/02/2021	17/02/2021
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	96	99
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	92	97
Chromium	mg/kg	1	Metals-020	<1	1	7	7	0	91	103
Copper	mg/kg	1	Metals-020	<1	1	13	14	7	94	104
Lead	mg/kg	1	Metals-020	<1	1	11	12	9	91	97
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	114	74
Nickel	mg/kg	1	Metals-020	<1	1	11	9	20	92	102
Zinc	mg/kg	1	Metals-020	<1	1	29	30	3	96	95

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Date analysed	-			[NT]	16	17/02/2021	17/02/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	16	<4	4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	16	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	16	5	8	46	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	16	9	15	50	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	16	7	13	60	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	16	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	16	5	9	57	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	16	19	34	57	[NT]	[NT]

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2022

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	[NT]
Date analysed	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	110	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	110	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	109	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	102	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate toluene-d8	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-BFB	%		Org-023	94	[NT]	[NT]	[NT]	[NT]	98	[NT]

Document Set ID: 9964055
Version: 1, Version Date: 23/02/2021

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	[NT]
Date analysed	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	80	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	80	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
Surrogate o-Terphenyl	%		Org-020	81	[NT]	[NT]	[NT]	[NT]	108	[NT]

Document Set ID: 9964055
Version: 1, Version Date: 23/02/2021

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	261872-21
Date extracted	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	17/02/2021
Date analysed	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	18/02/2021
Naphthalene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	76	76
Acenaphthylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	81	67
Fluorene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	72	63
Phenanthrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	78	70
Anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	83	66
Pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	81	66
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	81	82
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	91	73
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	86	[NT]	[NT]	[NT]	[NT]	92	80

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

QUALITY CONTROL: Organochlorine Pesticides in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	261872-21
Date extracted	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	17/02/2021
Date analysed	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	18/02/2021
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	72	64
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	71	67
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	74
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	80	68
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	71
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	89	69
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	82
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	68
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	73	66
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	97	98
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	87	[NT]	[NT]	[NT]	[NT]	85	78

Document Set ID: 9964055
Version: 1, Version Date: 28/04/2021

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	261872-21
Date extracted	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	17/02/2021
Date analysed	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	18/02/2021
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	72	78
Dimethoate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	87	71
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	62	60
Malathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	95	88
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	71
Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	89	85
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	72
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	87	[NT]	[NT]	[NT]	[NT]	85	78

Document Set ID: 9964755
Version: 1, Version Date: 18/02/2021

QUALITY CONTROL: PCBs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	261872-21
Date extracted	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	17/02/2021
Date analysed	-			18/02/2021	[NT]	[NT]	[NT]	[NT]	18/02/2021	18/02/2021
Aroclor 1016	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	70	70
Aroclor 1260	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	87	[NT]	[NT]	[NT]	[NT]	83	78

Document Set ID: 9964055
Version: 1, Version Date: 23/04/2021

QUALITY CONTROL: Metals in Water - Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	[NT]
Date analysed	-			17/02/2021	[NT]	[NT]	[NT]	[NT]	17/02/2021	[NT]
Arsenic - Dissolved	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]
Cadmium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Chromium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	99	[NT]
Mercury - Dissolved	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	104	[NT]
Nickel - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	102	[NT]
Zinc - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	102	[NT]

Document Set ID: 9964055
Version: 1, Version Date: 18/02/2021

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Document Set ID: 9964055
Version: 1, Version Date: 28/04/2022

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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Version: 1, Version Date: 28/04/2022

Report Comments

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 261872-16 for Cu, Pb, Ni & Zn. Therefore a triplicate result has been issued as laboratory sample number 261872-22.

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Appendix G: Test Pit Logs

Document Set ID: 9964755
Version: 1, Version Date: 28/04/2021

ENVIRONMENTAL BOREHOLE / TESTPIT TP01

PROJECT NUMBER S-02624
PROJECT NAME Data Gap Investigation
CLIENT CCL Developments
SITE ADDRESS Stage 7-9 Highland Views, Glenmore Park NSW

DATE 16/02/2021
DRILLING METHOD Hand tools
TOTAL DEPTH 0.3

LOGGED BY LRB
CHECKED BY KFF

COMMENTS

Depth (m)	PID	Samples	Is Analysed?	Graphic Log	Material Description	Additional Observations
	0.0	TP01_0.1	Y		LOAM: Silty clay LOAM, brown, soft, loose, slightly moist with rootlets. No anthropogenic inclusions, asbestos materials, odour or staining evident.	QC01 @ TP01_0.1
0.1					CLAY: brown/yellow and orange CLAY, dry, firm with medium plasticity.	
0.2	0.0	TP01_0.3	N			
0.3					Termination Depth at 0.3 m at target depth in CLAY.	
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						

Disclaimer This log is intended for environmental not geotechnical purposes.

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ENVIRONMENTAL BOREHOLE / TESTPIT TP02

PROJECT NUMBER S-02624
PROJECT NAME Data Gap Investigation
CLIENT CCL Developments
SITE ADDRESS Stage 7-9 Highland Views, Glenmore Park NSW

DATE 16/02/2021
DRILLING METHOD Hand tools
TOTAL DEPTH 0.3

LOGGED BY LRB
CHECKED BY KFF

COMMENTS

Depth (m)	PID	Samples	Is Analysed?	Graphic Log	Material Description	Additional Observations
0.0	0.0	TP02_0.1	N		LOAM: Silty clay LOAM, brown, soft, loose, slightly moist with rootlets. No anthropogenic inclusions, asbestos materials, odour or staining evident.	
0.1					CLAY: brown/yellow and orange CLAY, dry, firm with medium plasticity.	
0.2	0.0	TP02_0.3	Y			
0.3					Termination Depth at 0.3 m at target depth in CLAY.	
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						

Disclaimer This log is intended for environmental not geotechnical purposes.

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ENVIRONMENTAL BOREHOLE / TESTPIT TP03

PROJECT NUMBER S-02624
PROJECT NAME Data Gap Investigation
CLIENT CCL Developments
SITE ADDRESS Stage 7-9 Highland Views, Glenmore Park NSW

DATE 16/02/2021
DRILLING METHOD Hand tools
TOTAL DEPTH 0.3

LOGGED BY LRB
CHECKED BY KFF

COMMENTS

Depth (m)	PID	Samples	Is Analysed?	Graphic Log	Material Description	Additional Observations
0.1	0.0	TP03_0.1	Y		LOAM: Silty clay LOAM, brown, soft, loose, slightly moist with rootlets. No anthropogenic inclusions, asbestos materials, odour or staining evident.	
0.2					CLAY: brown/yellow and orange CLAY, dry, firm with medium plasticity.	
0.3	0.0	TP03_0.3	N			
0.4					Termination Depth at 0.3 m at target depth in CLAY.	
0.5						
0.6						
0.7						
0.8						
0.9						

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ENVIRONMENTAL BOREHOLE / TESTPIT TP04

PROJECT NUMBER S-02624
PROJECT NAME Data Gap Investigation
CLIENT CCL Developments
SITE ADDRESS Stage 7-9 Highland Views, Glenmore Park NSW

DATE 16/02/2021
DRILLING METHOD Hand tools
TOTAL DEPTH 0.3

LOGGED BY LRB
CHECKED BY KFF

COMMENTS

Depth (m)	PID	Samples	Is Analysed?	Graphic Log	Material Description	Additional Observations
0.0	0.0	TP04_0.1	N		LOAM: Silty clay LOAM, brown, soft, loose, slightly moist with rootlets. No anthropogenic inclusions, asbestos materials, odour or staining evident.	
0.1					CLAY: brown/yellow and orange CLAY, dry, firm with medium plasticity.	
0.2	0.0	TP04_0.3	Y			
0.3					Termination Depth at 0.3 m at target depth in CLAY.	
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						

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ENVIRONMENTAL BOREHOLE / TESTPIT TP05

PROJECT NUMBER S-02624
PROJECT NAME Data Gap Investigation
CLIENT CCL Developments
SITE ADDRESS Stage 7-9 Highland Views, Glenmore Park NSW

DATE 16/02/2021
DRILLING METHOD Hand tools
TOTAL DEPTH 0.3

LOGGED BY LRB
CHECKED BY KFF

COMMENTS

Depth (m)	PID	Samples	Is Analysed?	Graphic Log	Material Description	Additional Observations
0.1	0.0	TP05_0.1	Y		LOAM: Silty clay LOAM, brown, soft, loose, slightly moist with rootlets. No anthropogenic inclusions, asbestos materials, odour or staining evident.	
0.2					CLAY: brown/yellow and orange CLAY, dry, firm with medium plasticity.	
0.3	0.0	TP05_0.3	N			
0.4					Termination Depth at 0.3 m at target depth in CLAY.	
0.5						
0.6						
0.7						
0.8						
0.9						

Disclaimer This log is intended for environmental not geotechnical purposes.

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Appendix H: PID Calibration Certificate

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Version: 1, Version Date: 28/04/2021

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-113990

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	PID	✓	10.6ev
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Low	High	TWA	STEL
50ppm	100ppm	N/A	N/A

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	SY355		99.2 ppm

Calibrated by: **Chris Edwards**

Calibration date: **16/02/2021**

Next calibration due: **15/08/2021**



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Office: +61 (02) 8484 5810

ABN: 13624867509

Document Set ID: 9964055
Version: 1, Version Date: 28/02/2022

WASTE MANAGEMENT PLAN
DEMOLITION, CONSTRUCTION AND USE OF PREMISES

If you need more space to give details, you are welcome to attach extra pages to this form.

PLEASE COMPLETE ALL PARTS OF THIS FORM THAT ARE RELEVANT TO YOUR DEVELOPMENT APPLICATION (DA).

IF YOU NEED MORE SPACE TO GIVE DETAILS, YOU ARE WELCOME TO ATTACH EXTRA PAGES TO THIS FORM.

Council will assess the information you provide on this form along with your attached plans. We will take into account the types and volumes of waste that could be produced as a result of your proposed development, and how you are planning to:

- minimise the amount of waste produced
- maximise re-use and recycling
- store, transport and dispose of waste safely and thoughtfully.

APPLICANT DETAILS

First name: Jason

Surname: Stephenson

Postal Address

Street No.: 2/580

Street name: High Street

Suburb: Penrith

Post code: 2750

Contact phone number: 0247021215

Email address: cameron@cccldevelopment.com.au

DETAILS OF YOUR PROPOSED DEVELOPMENT

Street No.: 2183

Street name: The Northern Road

Suburb: Glenmore Park

Post code: 2745

What buildings and other structures are currently on the site?

Nil

Briefly describe your proposed development

Subdivision works to deliver 104 residential lots, 3 super lots & public roads in 5 stages. Construction includes earthworks, roads and footpaths, stormwater, water, sewer, electricity, gas. retaining walls, sediment basins and landscaping.

Applicant Signature

Date: 18/11/2020

PENRITH CITY COUNCIL

Document Set ID: 9967052
Version: 1, Version Date: 18/02/2021

SECTION 1: DEMOLITION

*Please include details on the plans you submit with this form, for example location of on-site storage areas/ containers, vehicle access point/s.

Materials		Destination		
		Re-use and recycling		Disposal
Material	Estimated volume (m^2 or m^3)	ON-SITE* Specify proposed re-use or on-site recycling	OFF-SITE Specify contractor and recycling facility	Specify contractor and landfill site
Excavation (eg soil, rock)	N/A			
Green waste	N/A			
Bricks	N/A			
Concrete	N/A			
Timber (Please specify type/s)	N/A			
Plasterboard	N/A			
Metals (Please specify type/s)	N/A			
Other	N/A			

PENRITH CITY COUNCIL

Document Set ID: 9967052
Version: 1, Version Date: 28/04/2022

SECTION 2: CONSTRUCTION

*Please include details on the plans you submit with this form, for example location of on-site storage areas/ containers, vehicle access point/s.

Materials		Destination		
		Re-use and recycling		Disposal
Material	Estimated volume (m^2 or m^3)	ON-SITE* Specify proposed re-use or on-site recycling	OFF-SITE Specify contractor and recycling facility	Specify contractor and landfill site
Excavation (eg soil, rock)	117,500m3	Wholly reuse onsite for fill	Nil	
Green waste	5m3	Mulch and reuse onsite	Nil	
Bricks	N/A			
Concrete	N/A			
Timber (Please specify type/s)	N/A			
Plasterboard	N/A			
Metals (Please specify type/s)	N/A			
Other	N/A			

Document Set ID: 9967052
Version: 1, Version Date: 28/04/2022

SECTION 3: WASTE FROM ON-GOING USE OF PREMISES

If relevant, please list the type/s of waste that may be generated by on-going use of the premises after the development is finished.	Expected volume (average per week)
N/A	
N/A	
N/A	
N/A	

SECTION 4: ON-GOING MANAGEMENT OF PREMISES

If relevant, please give details of how you intend to manage waste on-site after the development is finished, for example through lease conditions for tenants or an on-site caretaker/manager. Describe any proposed on-site storage and treatment facilities. Please attach plans showing the location of waste storage and collection areas, and access routes for tenants and collection vehicles.

N/A

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Version: 1, Version Date: 28/04/2022

Report

Vianello Holdings Pty. Ltd.

Glenmore Park Precincts G & H

Stormwater Management Strategy Report

April 2021

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS

Document Set ID: 9964764
Version: 1, Version Date: 28/04/2021

Prepared by

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Prepared for

CCL development on behalf of
Vianello Holdings Pty. Ltd
Contact: Rebekah Lamb

Version control

Issue	Author	Reviewer	Approver	Date approved
A	Arham Soomro	Naomi Harris	David Crompton	17/05/19
B	Troy McLeod	David Crompton	David Crompton	15/04/21

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Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

TABLE OF CONTENTS

1. GLOSSARY IV

2. EXECUTIVE SUMMARY 1

3. EXISTING SITE CONDITIONS 3

4. PROPOSED DEVELOPMENT 4

5. PREVIOUS REPORTS & STUDIES 5

5.1. Stormwater Management Strategy – Glenmore Park Stage 2 (JWP, 2005) 5

5.2. Glenmore Park Stage 2 – Stormwater Management Strategy Addendum Report – Revised Water Quality Modelling & Stream Erosion Index Assessment (JWP, 2010) 5

5.3. Bradley Ridge Precincts D & E – Stormwater Management Strategy (JWP, 2010) 5

5.4. Glenmore Park Precincts G & H – Stormwater Management Strategy Report (JWP, 2015) 6

5.5. Glenmore Park Precincts G & H – Revised Detention Basin Design Stormwater Assessment (JWP, 2016) 7

6. RELEVANT DEVELOPMENT GUIDELINES 8

6.1. Penrith City Council Development Control Plan (PCC, 2014) 8

6.2. Penrith City Council Glenmore Park Stage 2 (PCC, 2006) 8

6.3. Penrith City Council Water Sensitive Urban Design Policy (PCC, 2013) 9

7. PROPOSED STORMWATER MANAGEMENT STRATEGY 10

7.1. Water efficiency 10

7.1.1 On lot treatment 10

7.2. Water quality measures 10

7.2.1 Street level treatments 10

7.3. Subdivision and Housing Construction Stage 11

7.4. Long Term Management 12

8. WATER QUALITY ANALYSIS 13

8.1. Catchments 13

8.2. Modelling inputs and assumptions 14

8.2.1 Results of modelling 16

8.3. Remodelling of Precinct E Water Quality Device 16

8.3.1 Modelling of Precinct E including Precinct G & H (MU10 & MU11) 18

8.4. Stream Erosion Index 20

9. WATER QUANTITY MANAGEMENT 21

9.1. Detention Basins 21

9.2. Hydrologic analysis 21

9.3. Sub-catchments (Pre and Post Development) 21

9.4. Detention Management 21

9.5. Results 22

9.5.1 Peak Flows Estimates 22

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

9.5.2 Basin Performance 22

10. SUMMARY AND CONCLUSION 23

11. REFERENCES 24

XP-RAFTS Parameters 27

Intensity-Frequency-Duration (I.F.D.) 27

PERN Values & Infiltration Losses 27

PLATES

Plate 2-1 – Site Locality 2

Plate 3-1 – Existing Site Conditions 3

Plate 4-1 – Proposed development 4

Plate 5-1 – Bradley Ridge Precinct E Raingarden Location (JWP, 2015) 6

Plate 5-2 – Glenmore Park Precincts G and H Stormwater Management Strategy (JWP, 2015) 7

Plate 7-1 – Vortex style GPT 10

Plate 7-2 – Typical bio-retention system after plant establishment 11

Plate 8-1 – MUSIC developed catchments 14

Plate 8-2 – Precinct G & H Catchments MU1-MU9 MUSIC Model Layout 15

Plate 8-3 – Precinct E w/ Precinct G & H Bypassing Catchments MU10 and MU11 MUSIC Model Layout 17

Plate 8-4 – ARQ Acceptable Range of Hydraulic Loading Rate 19

TABLES

Table 8-1 – Pollutant Removal Targets 13

Table 8-2 – Estimate Mean Annual Pollutant Loads 16

Table 8-3 – Precinct E Raingarden performance in MUSIC Model (V6.3) 17

Table 8-4 – Precinct E raingarden performance with Precinct G & H bypassing catchments 18

Table 8-5 – Total Target Residual Loads Limit for Precinct E and Precinct G & H 18

Table 8-6 – Total reduction achieved with Precinct E raingarden increase in EDZ 19

Table 9-1 – Summary of Peak Flows (1 EY Event) 22

Table 9-2 – Summary of Precinct E Basin Performance (1 EY Event) 22

APPENDICES

Appendix A Figures

Appendix B XP-Rafts model parameters

Appendix C Music-link reports

Appendix D Conditions of consent

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

1. GLOSSARY

Term	Definition
Airborne Laser Survey (ALS)	Is a technique for obtaining a definition of the surface elevation (ground, buildings, power lines, trees, etc.) by pulsing a laser beam at the ground from an airborne vehicle (generally a plane) and measuring the time taken for the laser beam to return to a scanning device fixed to the plane. The time taken is a measure of the distance which, when ground truthed, is generally accurate to ± 150mm.
Annual Exceedance Probability (AEP)	Is the chance or probability of a natural hazard event (usually a rainfall or flooding event) occurring annually and is usually expressed as a percentage.
Australian Rainfall and Runoff (AR&R)	Refers to the current edition of Australian Rainfall and Runoff published by the Institution of Engineers, Australia.
Dam Safety Committee (DSC)	Is a NSW statutory body aligned with Department of Primary Industries. Its function is to ensure the safety of dams within NSW.
Digital Terrain Model (DTM)	Is a spatially referenced three-dimensional (3D) representation of the ground surface represented as discrete point elevations where each cell in the grid represents an elevation above an established datum.
Exceedances per Year (EY)	Is the number of times a year that statistically a storm flow will be exceeded.
Floodplain Planning Level (FPL)	The FPL is a height used to set floor levels for property development in flood prone areas. It is generally defined as the 1% AEP flood level plus 0.5m freeboard.
Floodplain Development Manual (FDM) and Guidelines (April 2005)	The FDM is a document issued by the Department of Environment Climate Change and Water (DECCW) that provides a strategic approach to floodplain management. The guidelines have been issued by the NSW Department of Planning (DoP) to clarify issues regarding the setting of FPL's. This document is also the framework for the development of Floodplain Risk Management Studies and Plans.
Floodplain Storage Areas	Parts of a floodplain that are important for the temporary storage of floodwaters during the passage of a flood. Loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.
Floodway	Is the areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
Hyetograph	Is the distribution of rainfall over time.
Hydrograph	Is a graph that shows how the stormwater discharge changes with time at any particular location.
Hydrology	The term given to the study of the rainfall and runoff process as it relates to the derivation of hydrographs for given floods.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

Term	Definition
J. Wyndham Prince Pty Ltd (JWP)	Consulting Civil Infrastructure Engineers and Project Managers undertaking these investigations.
Peak Discharge	Is the maximum stormwater runoff that occurs during a flood event.
Probable Maximum Flood (PMF)	Is the greatest depth of precipitation for a given duration meteorologically possible for a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends.
Triangular Irregular Network (TIN)	Is a technique used in the created DTM by developing a mass of interconnected triangles. For each triangle, the ground level is defined at each of the three vertices, thereby defining a plane surface over the area of the triangle.
TUFLOW	Is a computer program that provides two-dimensional (2D) and one dimensional (1D) solutions of the free surface flow equations to simulate flood and tidal wave propagation. It is specifically beneficial where the hydrodynamic behaviour, estuaries, rivers, floodplains and urban drainage environments have complex 2D flow patterns that would be awkward to represent using traditional 1D network models.
XP-RAFTS	Is a runoff routing model that uses the Laurenson non-linear runoff routing procedure to develop a sub catchment stormwater runoff hydrograph from either an actual event (recorded rainfall time series) or a design storm utilising Intensity-Frequency-Duration data together with dimensionless storm temporal patterns as well as standard AR&R 1987 data.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

2. EXECUTIVE SUMMARY

J Wyndham Prince (JWP) has been engaged by CCL Development on behalf of Vianello Holdings to prepare an amended Stormwater management Strategy report for Precinct G & H in order to address Penrith City Council's (PCC) Conditions of Consent for DA18/0427 (See Appendix D), primarily Condition 11 which states:

> *"Prior to the issue of a Construction Certificate, the Overarching Precinct G & H Stormwater Management Strategy Report prepared by J. Wyndham Prince dated December 2015 shall be amended and re-submitted to Council for approval".*

Subsequent to Councils initial review of this strategy it was determined that the preferred approach for the management of catchments draining through the existing Precinct E is to increase the extended detention zone in the existing raingarden for water quality management and increase the weir level in the existing basin for water quantity management. Councils preference is outlined in the preliminary advice for DA20/0782 which is also provided in Appendix D.

The primary objective of this report is to prepare an updated Stormwater Management Strategy to support both current Stages 4 and 6 application and future Stages 7, 8 and 9 Development Applications (DA). The stormwater strategy developed builds upon the Precinct Wide Strategy previously approved by Penrith City Council (PCC) for the Precinct G & H (JWP, 2016).

This report presents a summary of the results of previous studies and nominates the specific locations and sizes of the water management elements required to meet the performance objectives specified in the Glenmore Park Stage 2 Release Area Development Control Plan (DCP) and PCC guidelines.

The investigation involved the following specific tasks:

- Prepare an *XP-RAFTS* hydrologic model for Precincts G and H under "existing" and "developed" conditions to reflect the latest development layout and sub-catchment boundaries.
- Determine the storage requirements to manage the 1 Exceedances per Year (EY) peak flows to pre-development levels.
- Undertake water quality modelling in *MUSIC* to confirm the size and location of devices required to achieve water quality targets.
- Prepare a Stormwater Management Strategy Report to support the development application for the development, detailing the investigations, findings, calculations and design details.

Plate 2.1 below illustrates the location of Precinct G & H with the Mulgoa Stage 2 development precinct.

The updated strategy and the supporting modelling in this report has concluded the water management elements for the preferred management approach are:

- Maintain the constructed (Stage 1-2) and future (Stage 4 & 6) water quality and quantity basins with the environmental corridor.
- The existing Precinct E raingarden and detention basin located in Surveyors Creek corridor be amended to include an extended detention zone over the existing raingarden of 0.4 m and the outlet control and basin spillway level be increased by 40 mm in order to achieve the required flow management outcomes.

This strategy provides an alternative management option for the Precinct E Stormwater management device and provides the necessary support for the development of Precinct G & H and address PCC's condition of consent.

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Version: 1, Version Date: 28/04/2022

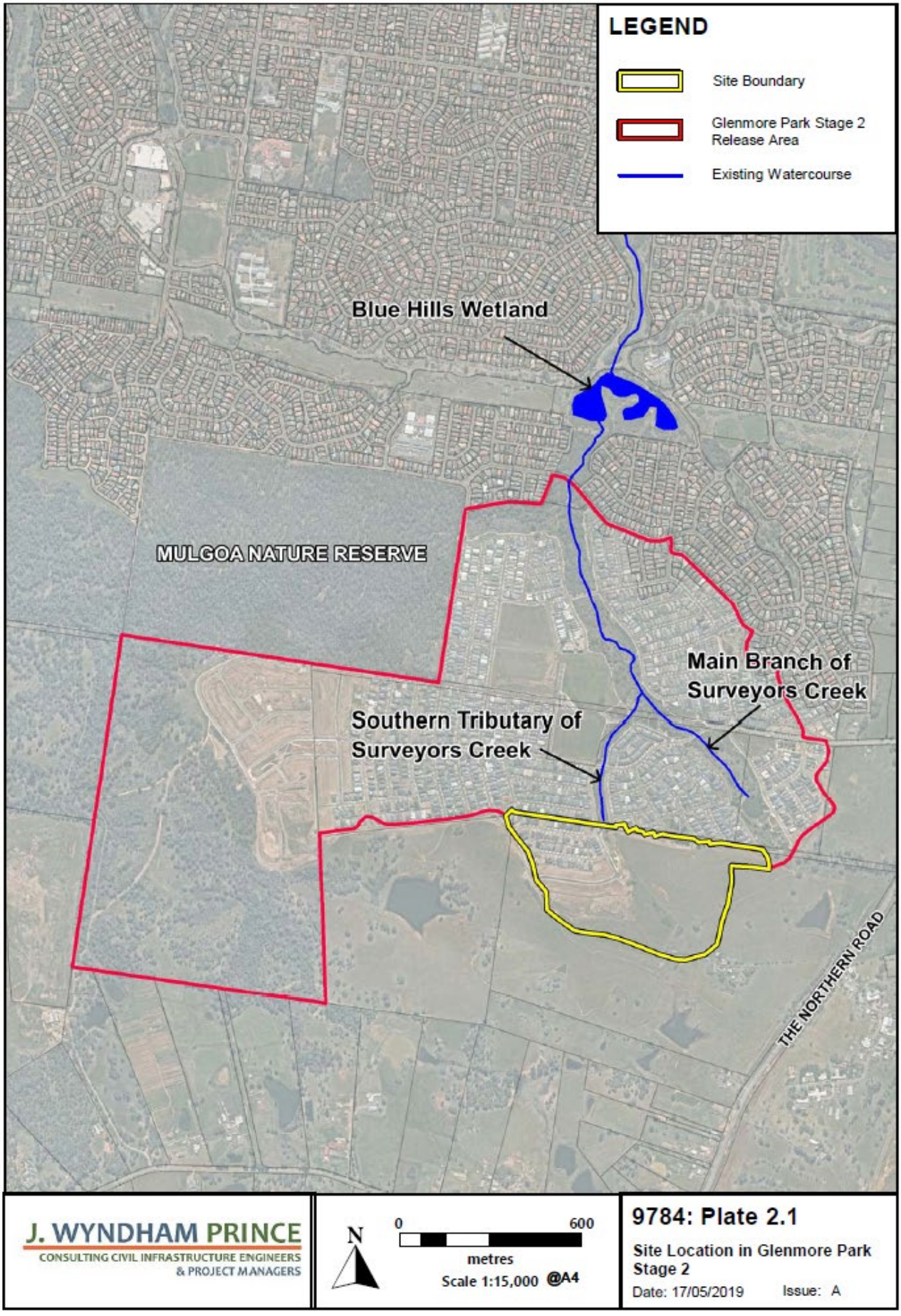


Plate 2-1 – Site Locality

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

3. EXISTING SITE CONDITIONS

The subject site is approximately 26 hectares in area and is located within the south-eastern portion of the Glenmore Park Stage 2 Release Area. The site is located in the upper portion of the catchment of the Southern Tributary of Surveyors Creek and borders the Bradley Ridge Precinct D & E development (to the north). A portion of the site, located to the east, drains towards the Main Branch of Surveyors Creek. Refer to Plate 3.1 below.

In order to achieve optimal stormwater management in this catchment, we have reassessed the existing conditions (pre-development) model completed as part of the Glenmore Park Stage 2 rezoning process to determine the appropriate targets for this assessment.

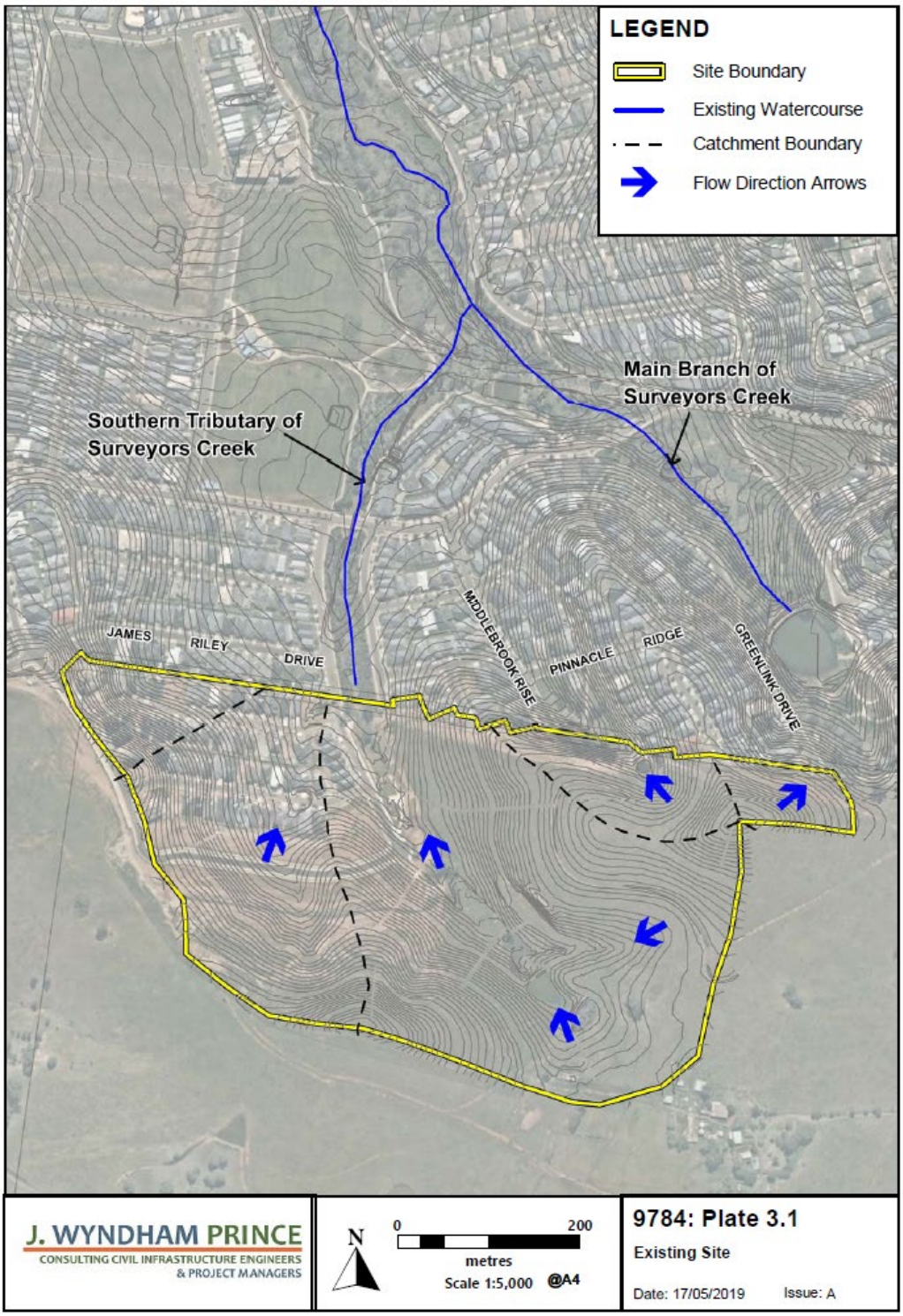


Plate 3-1 – Existing Site Conditions

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Version: 1, Version Date: 28/04/2022

4. PROPOSED DEVELOPMENT

The proposed Precincts G and H development includes approximately 380 residential lots and an environmental corridor which bisects the site. The development is separated into nine (9) stages (see Plate 4.1 for Stage boundaries). With Stages 1-3 already approved and under construction the delivery of an on-line detention basin and raingarden built in the environmental corridor will be achived. The development will also include 0.4 ha of open space for use by the incoming residents.

The environmental corridor is upstream of the Southern Tributary of Surveyors Creek and is proposed to convey flows up to the 1% Annual Exceedance Probability (AEP) event from the development.



Plate 4-1 – Proposed development

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5. PREVIOUS REPORTS & STUDIES

5.1. Stormwater Management Strategy – Glenmore Park Stage 2 (JWP, 2005)

In 2005, J. Wyndham Prince completed the *"Glenmore Park Stage 2 Stormwater Management Strategy"* for the Glenmore Park Expansion Land Area Owners Group. This report presented the results of the investigations undertaken in developing a Stormwater Management Strategy that incorporated the principles of Water Sensitive Urban Design (WSUD) to integrate with and support the development planning process for the Glenmore Park Stage 2 Release Area.

The water quality strategy proposed in this investigation allowed for the provision of bio-retention systems, Enviropod pit inserts and rainwater tanks, which were modelled as a pond node due to the rainwater tank node not being included in earlier versions of the MUSIC water quality modelling software. The results of the modelling showed that the treatment train was adequate to achieve the applicable water quality targets at the time, with scope to be refined in subsequent investigations.

The stormwater management strategy proposed detention storage to restrict 1 Exceedances per Year (EY) post development peak flows to pre-development levels for local catchments within Glenmore Park Stage 2. This was consistent with the requirements of the Glenmore Park Stage 2 DCP. Detention incorporated within the existing Blue Hills Wetland provides adequate storage to restrict post development flows to pre-development levels for all storms up to and including the 1% Annual Exceedance Probability (AEP) event.

5.2. Glenmore Park Stage 2 – Stormwater Management Strategy Addendum Report – Revised Water Quality Modelling & Stream Erosion Index Assessment (JWP, 2010)

In 2010, J. Wyndham Prince completed the "Glenmore Park Stage 2 – Stormwater Management Strategy Addendum Report – Revised Water Quality Modelling & Stream Erosion Index Assessment" (Addendum Report) for the Landowners Group. This assessment revised the previous strategy for the Glenmore Park Stage 2 Release Area (JWP, 2005) to address updates to the development layout, PCC's design requirements and MUSIC modelling software.

Results of this investigation showed that the provision of rainwater tanks provided for each allotment and raingardens 0.55% of catchment within the development will ensure that the post development stormwater discharges will meet the DCP's water quality objectives for the Glenmore Park Stage 2. This assessment was undertaken in MUSIC version 3.01. The inclusion of rainwater tanks as an additional node in the new MUSIC model has allowed raingarden areas derived in the 2005 study to be reduced from 1% to 0.55% relative to the catchments they service.

5.3. Bradley Ridge Precincts D & E – Stormwater Management Strategy (JWP, 2010)

In 2010, J. Wyndham Prince completed the *"Bradley Ridge Precincts D & E – Stormwater Management Strategy"* for Norwest Land Pty Ltd.

As part of the stormwater management strategy, a combined bio-retention raingarden and detention basin system was proposed at the discharge location of both precincts to provide the required level of treatment of stormwater runoff from the site.

At the discharge location of Precinct E, the proposed bio-retention raingarden (as per Construction Certificate Information) adopted a filter area of 798 m^2 and an overall detention storage volume of 740 m^3. The sizing of the filter area was based on 0.55% of the catchment area draining to it (equating to approximately 14.5 ha), which is consistent with the findings of the *Addendum Report* (JWP, 2010). Refer Plate 5.1.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

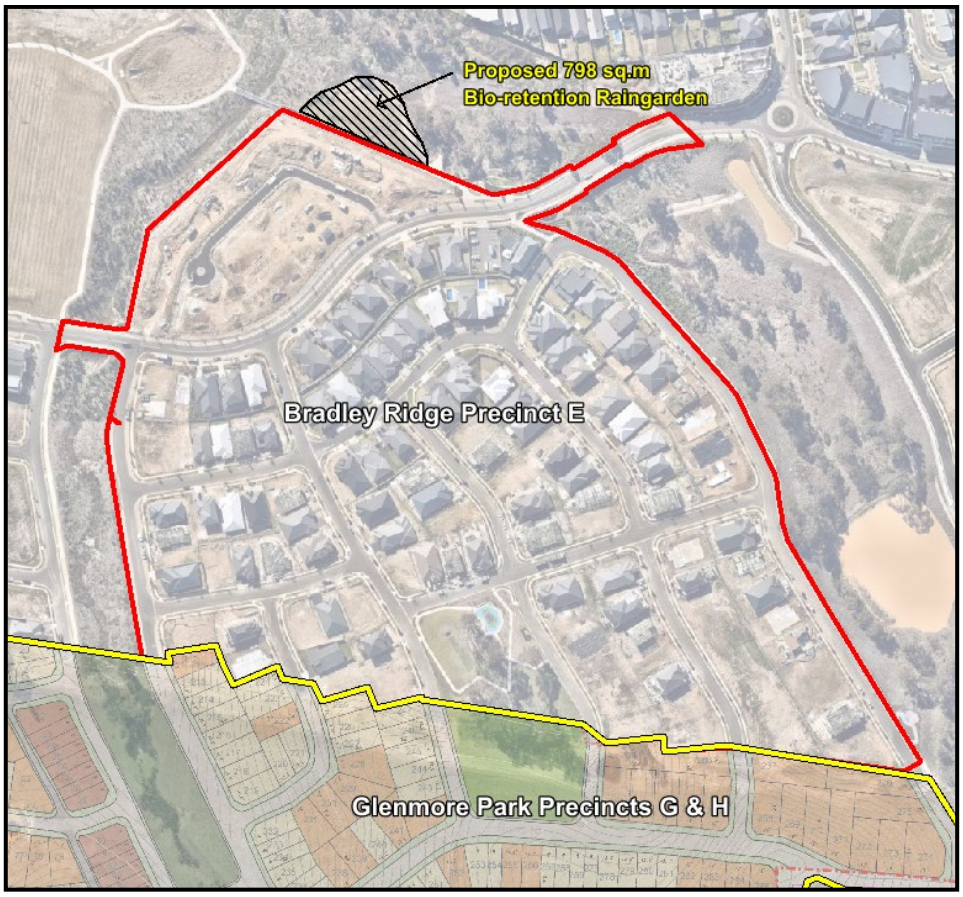


Plate 5-1 – Bradley Ridge Precinct E Raingarden Location (JWP, 2015)

Results of this investigation showed that the provision of rainwater tanks, Gross Pollutant Traps (GPTs) and bio-retention raingardens within the development will ensure that the post development stormwater discharges will meet the DCP's water quality objectives at the time. This assessment was undertaken in MUSIC version 3.01.

5.4. Glenmore Park Precincts G & H – Stormwater Management Strategy Report (JWP, 2015)

In 2015, J. Wyndham Prince completed the "Glenmore Park Precincts G & H – Stormwater Management Strategy report for Vianello Holdings Pty Ltd. The report was prepared to support the development of Stages 1 and 2 and future Development Applications.

The Stormwater Management Strategy comprised of a treatment train consisting of on lot treatment, street level treatment and subdivision / development treatment measures. The MUSIC version 6.1 was used to carry out the water quality assessment. The structural elements consisted of:

- Proprietary GPT units at each stormwater discharge point into the proposed bio-retention gardens.
- An on-line detention basin of approximately total volume of 1,220 m^3.
- A proposed bio-retention raingarden of total area 550 m^2 (as per Construction Certificate Information) located in Precinct G & H environmental corridor.
- A proposed bio-retention raingarden of total area 890 m^2 located in Precinct G & H corridor.
- A proposed extension of the Bradley Ridge Precinct E bio-retention raingarden of 140 m^2.
- A proposed extension to the Bradley Ridge Precinct E detention basin of 160 m^3.

Refer to Plate 5.2 for further detail of this strategy.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

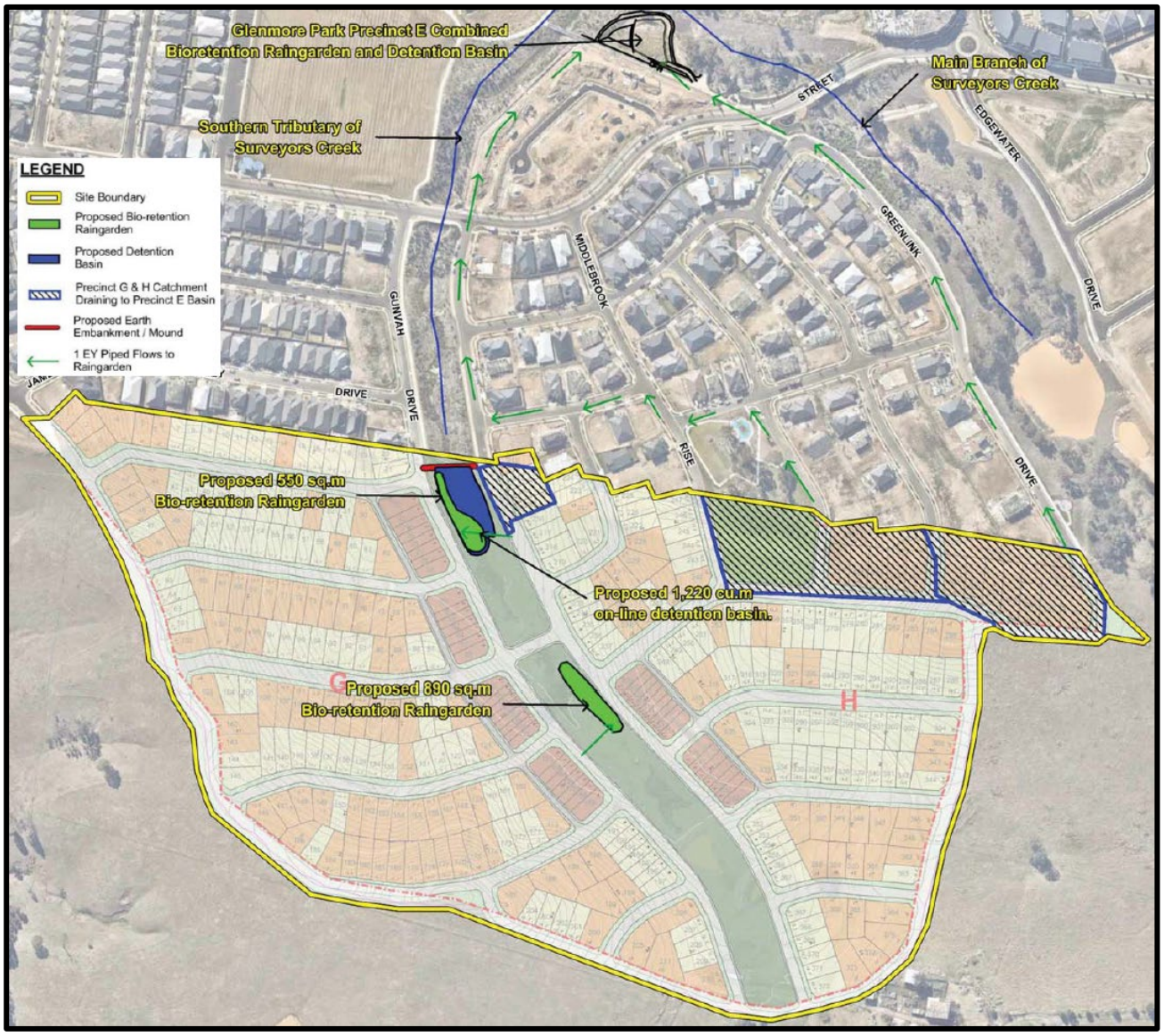


Plate 5-2 – Glenmore Park Precincts G and H Stormwater Management Strategy (JWP, 2015)

Furthermore, the peak discharge flow rate from the Precinct E site under "existing" conditions of 1.13 m^3/s in the 1 EY event was adopted which was determined from Bradley Ridge Precinct D & H Stormwater management Strategy (JWP, 2010).

5.5. Glenmore Park Precincts G & H – Revised Detention Basin Design Stormwater Assessment (JWP, 2016)

In 2016, J. Wyndham Prince completed a stormwater assessment to support the Construction Certificate (CC) approval for Stages 1 and 2 development at Glenmore Park Precincts G & H. The primary objective of this report was to address a number of conditions provided in PCC's *"Notice of Determination"* (dated 31st August 2016).

The detention basin arrangement, which was presented in the original *"Glenmore Park Precincts G and H Stormwater Management Strategy"* (J. Wyndham Prince, 2015), that was approved as part of the original DA submission for the Stages 1 and 2 development (ref: DA15/1469), was amended to satisfy Council's conditions.

Results of the assessment indicated that a 1,070 m^3 of total detention was required to maintain post-development runoff from the site. In addition, the water quality treatment train was consistent with the original 2015 strategy and comprised of rainwater tanks, gross pollutant traps and two (2) bio-retention raingardens.

This strategy also maintained the treatment measures for the North Eastern portion of the site being treated as part of an amended Precinct E raingarden and basin located on the bank of the Surveyors Creek.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

6. RELEVANT DEVELOPMENT GUIDELINES

6.1. Penrith City Council Development Control Plan (PCC, 2014)

The stormwater management strategy has been prepared to comply with *Penrith City Council's Development Control Plan* (DCP) (PCC, 2014). Part E of the DCP, which relates to the Glenmore Park Release Area, identifies the Water Management and Flood Management objectives and development controls as follows:

Water Management

- To ensure Mulgoa Creek and Surveyors Creek are able to function as healthy, natural riparian corridors.
- To maintain the stability and integrity of the finished creek profile.
- To ensure the quality of water leaving the urban areas does not adversely impact upon the health of Mulgoa Creek and Surveyors Creek.
- To reduce the volume of stormwater run-off from the site.
- To ensure stormwater runoff is adequately treated before it enters the riparian corridors.

Flood Management

- To manage the risk to life and property assets from flooding events.
- To allow the riparian corridor to function as a naturally occurring waterway.
- To manage most flood waters within the site.
- Stormwater detention is provided to reduce 1 year ARI post development flows to pre development levels.
- Stormwater events larger than the 1 year ARI will be managed within the existing Blue Hills Wetland.

6.2. Penrith City Council Glenmore Park Stage 2 (PCC, 2006)

The Glenmore Park Stage 2 DCP (Reference 2) identifies the Water Management and Flood Management objectives as follows:

- To ensure Mulgoa Creek and Surveyors Creek are able to function as healthy, natural riparian corridors.
- To maintain the stability and integrity of the finished creek profile.
- To ensure the quality of water leaving the urban areas does not adversely impact upon the health of Mulgoa Creek and Surveyors Creek.
- To reduce the volume of stormwater run-off from the site.
- To ensure stormwater runoff is adequately treated before it enters the riparian corridors.
- To manage the risk to life and property assets from flooding events.
- To allow the riparian corridor to function as a naturally occurring waterway.
- To manage most flood waters within the site.

This document nominates the mean pollutant load reductions as follows:

- Total Suspended Solids (TSS): 80%
- Total Phosphorous (TP): 45%
- Total Nitrogen (TN): 45%

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

6.3. Penrith City Council Water Sensitive Urban Design Policy (PCC, 2013)

Penrith City Council's Water Sensitive Urban Design (WSUD) Policy (PCC, 2013) identifies the following objectives for consideration with regard to stormwater management:

- Protect and enhance natural water systems such as creeks and rivers in the Penrith LGA.
- Treat urban stormwater to meet water quality objectives for reuse and/or discharge to receiving waters.
- Match the natural water runoff regime as closely as possible (where appropriate).
- Reduce potable water demand through water efficient fittings and appliances, rainwater harvesting and water reuse.
- Minimise wastewater generation and treatment of wastewater to a standard suitable for effluent reuse opportunities.
- Integrate stormwater management into the landscape so as to maximise the visual and recreational amenity of urban development.
- Provide objectives and controls for specific WSUD elements including water conservation, stormwater quality and waterway stability management.
- To safeguard the environment by improving the quality of stormwater run-off entering receiving waters.

This document nominates the mean pollutant load reductions as follows:

- Gross Pollutants: 90% for loads greater than 5mm
- Total Suspended Solids (TSS): 85%
- Total Phosphorous (TP): 60%
- Total Nitrogen (TN): 45%

This policy is supported by Penrith City Council's "WSUD Technical Guidelines" (PCC, 2015), which sets out the key parameters that are required to be used in sizing all Stormwater Treatment Measures in MUSIC.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

7. PROPOSED STORMWATER MANAGEMENT STRATEGY

The Stormwater Management Strategy proposed for the Precinct G & H development has been prepared with consideration of the statutory requirements and guidelines listed in Section 6 of this report. The strategy focuses on mitigating the impacts of the development on the total water cycle and maximising the environmental, social and economic benefits that may be achieved through the use of technically viable and sustainable stormwater management practices.

The proposed strategy for the Precincts G and H site will consist of the following elements.

7.1. Water efficiency

7.1.1 On lot treatment

- Implementation of water efficient fittings and appliances in all dwellings (dual flush toilet, AAA shower heads, water efficient taps and plumbing).
- Minimisation of impervious areas through acceptable development controls.
- The provision of rainwater tanks on each allotment, along with the implementation of the above water efficient devices, will satisfy the requirements of BASIX. The connection of water tank to service internal uses will ensure any requirements are met and additional benefits are realised.



7.2. Water quality measures

7.2.1 Street level treatments

Gross Pollutant Traps (GPTs)

GPT devices are typically provided at the outlet of stormwater pipes just upstream of bio-retention raingardens. These systems operate as a primary treatment to remove litter, vegetative matter, free oils and grease and coarse sediments prior to discharge to downstream (Secondary and Tertiary) treatment devices. They can take the form of trash screens or litter control pits, pit filter inserts or wet sump gross pollutant traps.

Proprietary vortex style GPTs will be provided at each stormwater discharge point to the bio-retention raingardens within the Precinct G & H development.

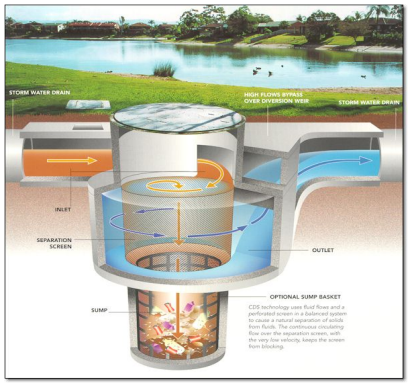


Plate 7-1 – Vortex style GPT

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

Bio-retention systems (raingardens)

Two (2) bio-retention raingarden systems are proposed to treat stormwater runoff generated within the Precincts G and H development. These bio-retention systems will be located within the environmental corridor bisecting the site. In addition, an augmentation to the Precinct E raingarden is proposed to treat stormwater runoff which is generated by the portion of the site discharging into Precinct E.

The systems will be appropriately sized to achieve the nutrient reduction targets outlined in *Penrith City Council's WSUD Policy* (2013). The bio-retention systems will also attenuate first flush flows to reduce the risk of stream erosion within the downstream watercourse. The location of the bio-retention systems is shown on Figure 8.1. Refer to Section 8 for further discussion and detailed water quality assessment.



Plate 7-2 – Typical bio-retention system after plant establishment

7.3. Subdivision and Housing Construction Stage

Erosion and sediment control measures are to be implemented during the construction phase in accordance with the requirements of Penrith City Council and the guidelines set out by Landcom (the "Blue Book", 2004).

As the operation of "bio-retention" (raingarden) type water quality treatment systems are sensitive to the impact of sedimentation, construction phase controls should generally be maintained until the majority of site building works (approximately 80%) are complete. Alternatively, a very high level of at source control on individual allotments during the building and site landscaping works, which are regularly inspected by Council officers, would be required.

Controls will be implemented throughout the subdivision during the construction phase such as:

- Filter rolls at kerb inlet pits
- Sediment traps at surface inlet pits
- Sediment fences surrounding the perimeter of works
- Stockpile/bunds
- Strawbale filters

Catchments that do not drain towards the temporary sediment basin will be managed by the at source controls that will be implemented throughout the subdivision (including allotment and pit controls). It is anticipated that the small proportion of catchments that bypass the basin can be sufficiently managed by these measures and do not warrant the construction of a separate sediment basin.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

7.4. Long Term Management

Regular maintenance of the stormwater quality treatment devices is required to control weeds, remove rubbish, and monitor plant establishment and health. Some sediment build-up may occur on the surface of the raingardens and within the swales and may require removal to maintain the high standard of stormwater treatment.

Proper management and maintenance of the water quality control systems will ensure long-term, functional stormwater treatment. It is strongly recommended that a site-specific Operation and Maintenance (O & M) Manual is prepared for the system. The O & M manual will provide information on the Best Management Practices (BMP's) for the long-term operation of the treatment devices. The manual will provide site-specific management procedures for:

- Maintenance of the GPT structures, including rubbish and sediment removal.
- Management of the raingarden, including plant monitoring, replanting guidelines, monitoring and replacement of the filtration media and general maintenance (i.e. weed control, sediment removal).

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

8. WATER QUALITY ANALYSIS

The stormwater quality analysis for this study was undertaken using the Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*). This water quality modelling software was developed by the Cooperative Research Centre (CRC) for Catchment Hydrology which is based at Monash University and was first released in July 2002. Version 6.3 was adopted for this study.

The model provides a number of features relevant for the development:

- It is able to model the potential nutrient reduction benefits of gross pollutant traps, constructed wetlands, grass swales, bio-retention systems, sedimentation basins, infiltration systems, ponds and it incorporates mechanisms to model stormwater re-use as a treatment technique.
- It provides mechanisms to evaluate the attainment of water quality objectives.

The *MUSIC* modelling was undertaken to demonstrate that the stormwater management system proposed for the Precinct G & H development will deliver the required pollutant reduction targets specified in PCC's current guidelines. The pollutant reductions are shown in Table 8.1 and have been used throughout this assessment.

Penrith City Council has established default parameters for use in *MUSIC* models to represent the generation of various pollutants by different land uses. The parameters used in the MUSIC modelling are presented in the MUSC link report in Appendix C.

The Water Quality assessment and strategy is consistent with the approved Precinct G & H Stormwater Management Strategy and Precinct G & H Revised Detention Basin Design Stormwater Assessment. The parameters adopted in MUSIC model are also consistent with the parameters adopted in these studies.

Pollutant	Target Reduction Required
Total Suspended Solids (TSS)	85%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

Table 8-1 – Pollutant Removal Targets

8.1. Catchments

A *MUSIC* model was established to represent the proposed development. One (1) model for a portion of Precinct G & H that drains in the adjacent Precinct E and a second model for the remainder of the Precinct G & H. The development has been split into sub catchments (see Plate 8.1).

Under 'Developed' condition, all urbanised catchments within the site adopted a percentage imperviousness of 65% which is consistent with previous stormwater management strategies, including the *Addendum Report* (JWP, 2010) and the Precinct G & H Stormwater Management Strategy (JWP, 2016). The catchments were split into roofs, roads, other impervious area and pervious areas, as appropriate to represent the post development catchment.

Sub catchments MU1-MU4 and MU7-MU9 drain into the two (2) bio-retention raingardens in the environmental corridor. Sub catchments MU5, MU6 and MU12 bypass any treatment devices and have been compensated for in bioretention basins 1 and 2. Sub catchment MU10 & 11 drain into the existing Bradley Ridge Precinct E development to be treated within the Precinct E bioretention raingarden within the Surveyor Creek corridor.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

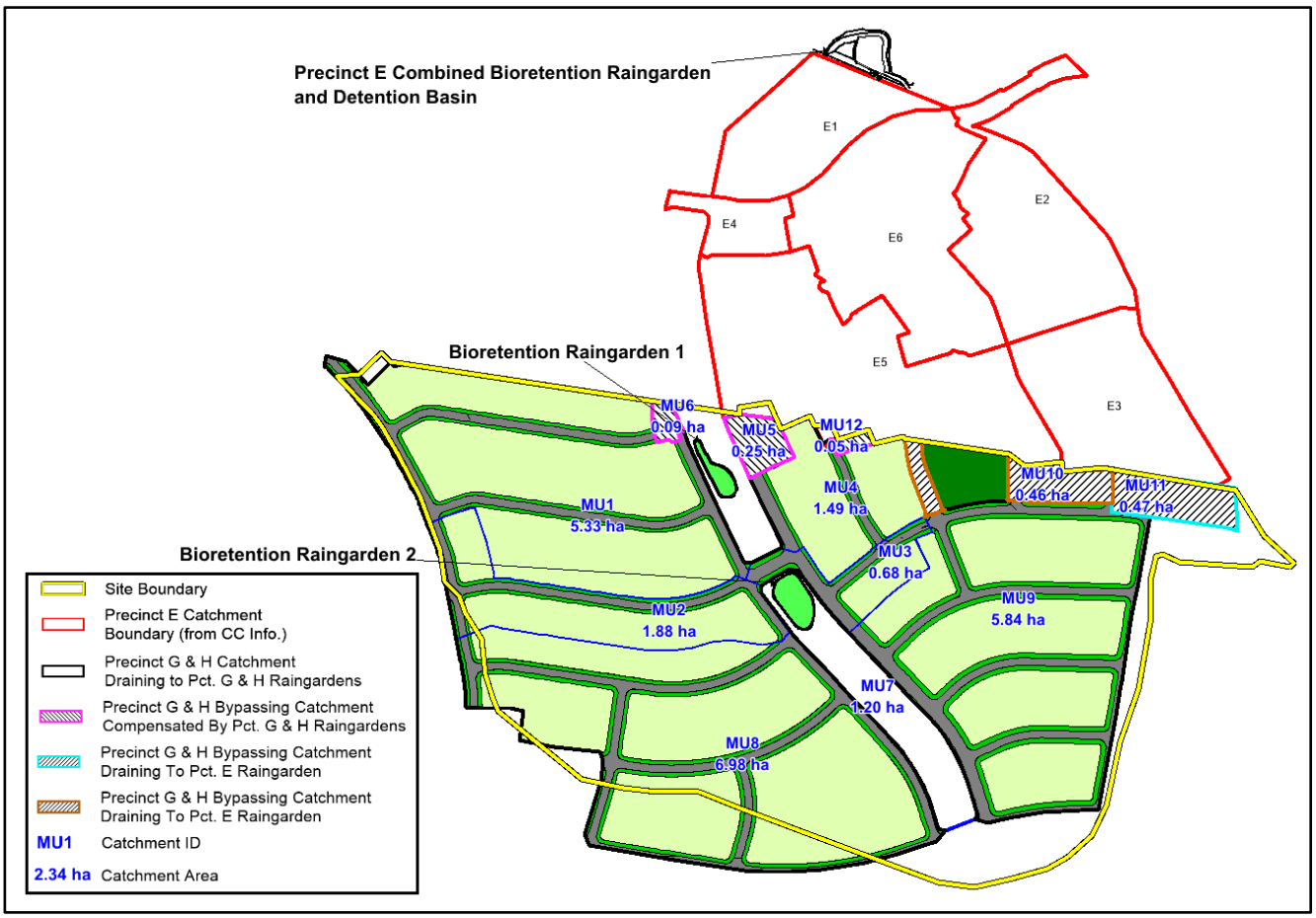


Plate 8-1 – MUSIC developed catchments

8.2. Modelling inputs and assumptions

The following assumptions and parameters have been adopted in the *MUSIC* model for the Precinct G & H development:

- The average roof area adopted for low and medium density lots are 250 m^2 and 150 m^2 respectively, based on the approximate average roof area within similar developments in Glenmore Park. It is assumed that 50% of the total roof area will be connected to the rainwater tanks.
- The average rainwater tank size adopted in the investigation was 3000 litres. It is assumed that the rainwater tanks will be topped up by the potable water supply once the level in the tank drops below 20%. Therefore, the volume available for stormwater top up was assumed to be 2400 litres.
- The average internal reuse amount adopted in the investigation was 0.1 kL per household per day, with outdoor reuse adopted to be 50 kL per household per year. This is consistent with PCC's *WSUD Technical Guidelines* (PCC, 2015).
- Local drainage throughout the development should be filtered by means of Gross Pollutant Traps prior to discharge into the downstream drainage systems, raingardens and the riparian corridors. It is assumed that trash and gross sediments will be effectively removed prior to entering the raingardens by the proposed GPT units.
- Bio-retention raingardens consist of a filtration bed with either gravel or sandy loam media and an extended detention zone of 300 mm – 500 mm deep, designed to detain and treat the first flush flows from the upstream catchment. The media beds of the raingardens are 500 mm deep. The location of the raingardens servicing the Precincts G & H development are shown on Figure 9.1.
- It is noted that the open space has been excluded from the assessment, as the land use in this area will not change as part of the proposed development.

The MUSIC model layout for the portion of Precinct G & H development draining into the environmental corridor is shown in Plate 8.2.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

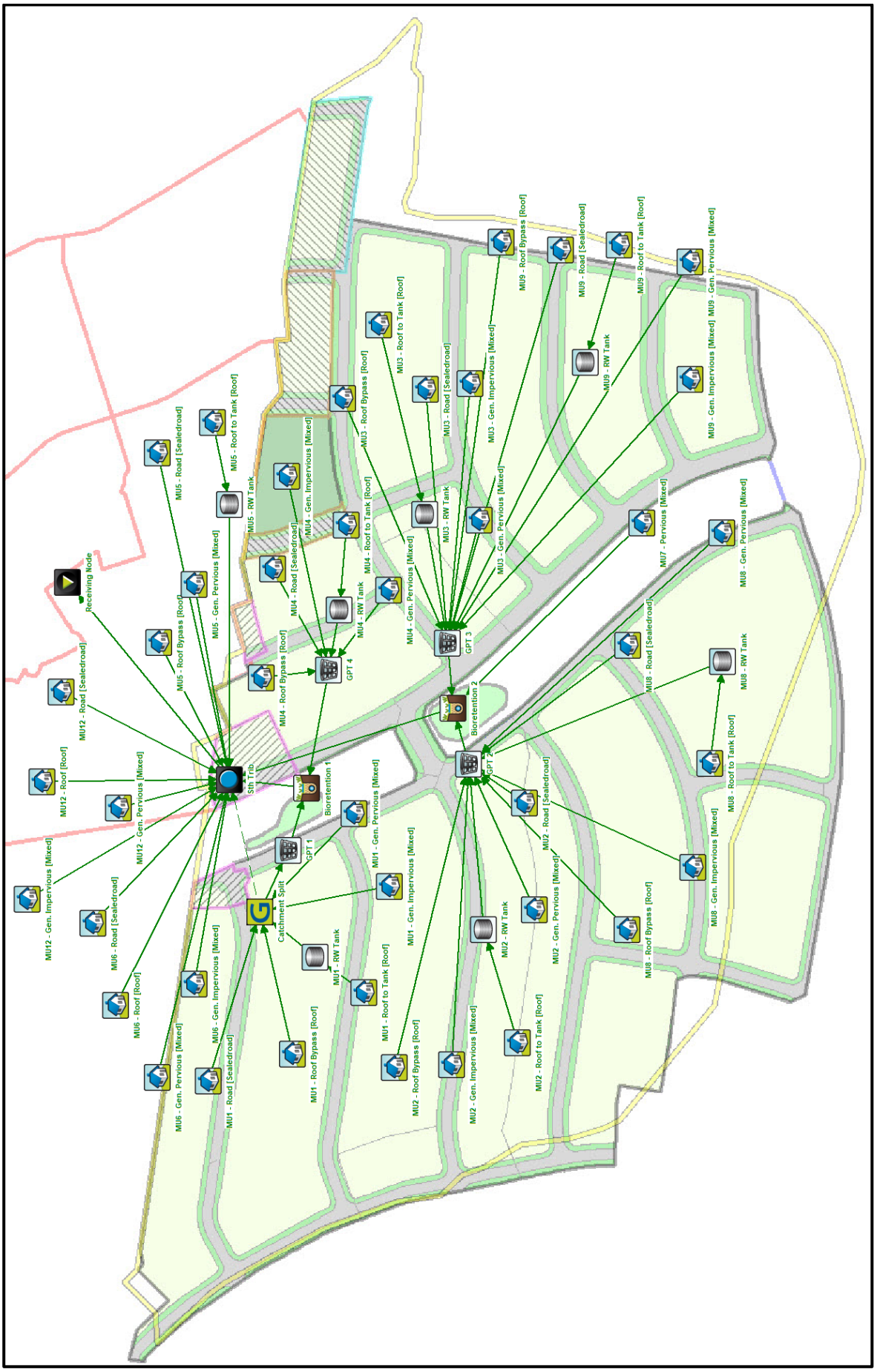


Plate 8-2 – Precinct G & H Catchments MU1-MU9 MUSIC Model Layout

Model Ref: 9784_MU01_Pct G & H_Consolidated GPTs

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

8.2.1 Results of modelling

The performance of the proposed water quality management strategy and estimated annual pollutant load reductions for the Precinct G & H development, as determined through a stochastic MUSIC assessment, is summarised in Table 8.2.

The results demonstrate that the proposed strategy which includes Bio-retention raingarden 1 with the filter area of **550 m²** which has been approved and built as part of the Stages 1-3 together with a Bio-retention raingarden 2 with a filter area of **1350 m²** will achieve the reduction targets specified by Penrith City Council at the site discharge point for this portion of the catchment.

A copy of the MUSIC-Link report is included in Appendix C.

Pollutant	Total Developed Source Loads	Minimum Reduction Required	Total Residual Load From Site	Total Reduction Achieved	Target Reduction Required	Total Reduction Achieved
	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)	(%)	(%)
TSS	12200	10370	1760	10440	85%	86%
TP	26.3	15.780	8.91	17.39	60%	66%
TN	213	95.85	93.8	119.2	45%	56%
GP	2440	2196.0	37.2	2402.8	90%	98%

Table 8-2 – Estimate Mean Annual Pollutant Loads

8.3. Remodelling of Precinct E Water Quality Device

As part of finalising this update strategy, PCC raised concerns with the proposed treatment approach for MU10 and MU11 (i.e. modification to Precinct E basin and bio retention raingarden) that was present and approved by PCC in the 2016 Strategy. At a meeting with the PCC staff on 27 March 2019, it was agreed that two (2) additional smaller devices within MU10 and MU11 (see Plate 8.1 for catchment locations) adjacent to the Precinct G & H boundary was not the preferred management outcome as it would increase the maintenance burden on PCC and would not provide a good urban outcome.

It was later indicated by PCC officers that the preferred management option within Precinct E for the treatment of catchment MU10 ad MU11 is to increase the extended detention zone (EDZ) of the existing raingarden to 0.4 m.

The MUSIC model completed for this portion of Precinct G & H uses the parameters consistent with the previous strategy with the model updated to include existing Bradley Ridge Precinct E catchments.

It is noted that the Stormwater Management Strategy for Precinct E was completed in 2010, and the raingarden was designed to meet Penrith City Council's (PCC) 2006 pollution target requirements.

Review of the existing Precinct E basin's WAE survey and aerial photos indicate that the Precinct E raingarden as constructed is approximately 815 m^2 in size. Therefore, this size has been adopted for Precinct E raingarden assessment.

The MUSIC model layout with the inclusion of Precinct G and H catchments MU10 and MU11 is shown in Plate 8.3.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

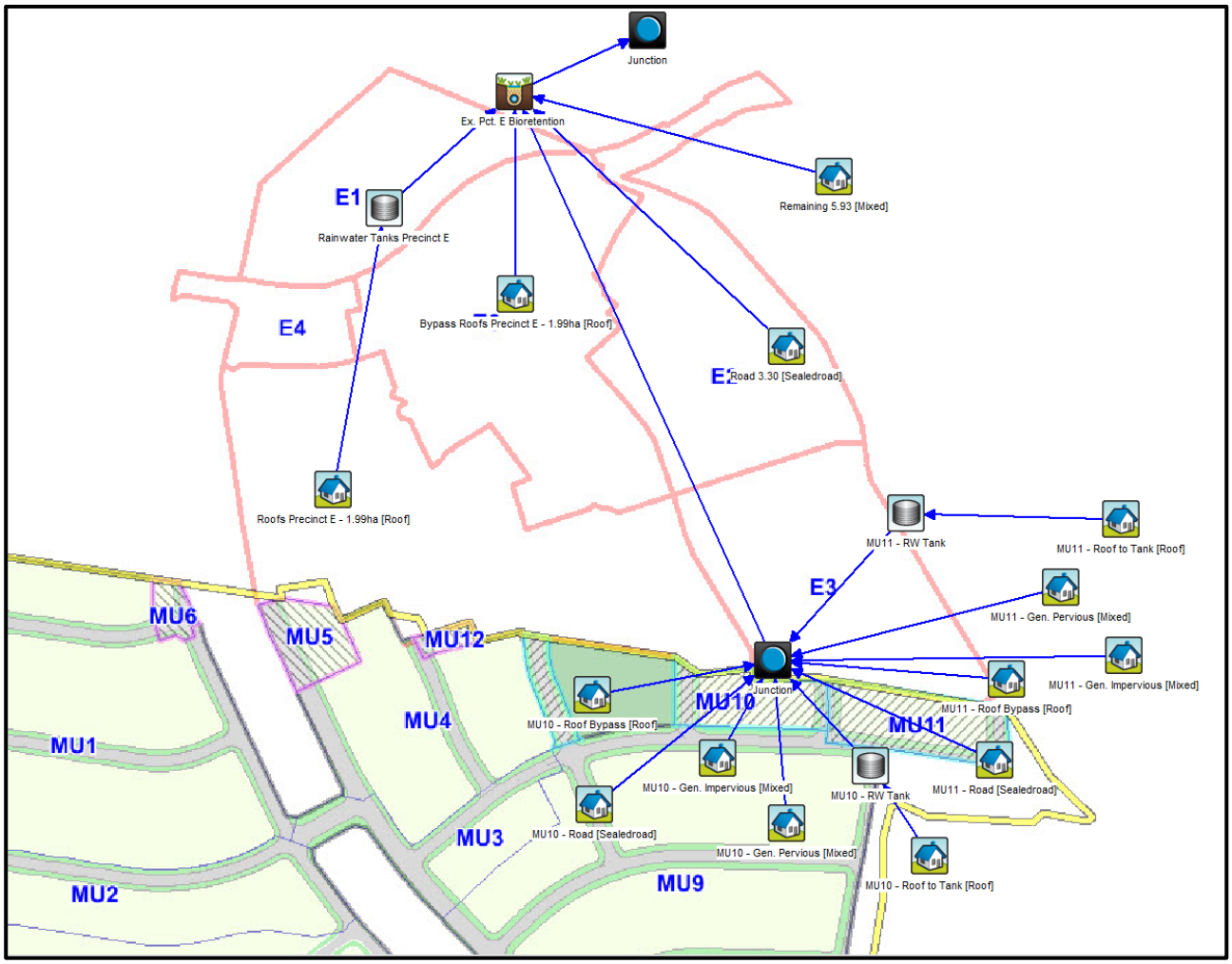


Plate 8-3 – Precinct E w/ Precinct G & H Bypassing Catchments MU10 and MU11 MUSIC Model Layout

Model Ref: 9784_MU01_Bypassing Catchments to Pct E

The performance of Precinct E raingarden without the addition of MU10 and MU11 is shown in Table 8.3 below.

Pollutant	Total Developed Source Loads	Minimum Reduction Required	Total Residual Load From Site	Total Reduction Achieved	Current Target Reduction Required by PCC	Total Reduction Achieved
	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)	(%)	(%)
TSS	9290	7896.50	2100	7190	85%	77.4%
TP	18.2	10.92	7.08	11.12	60%	61.1%
TN	129	58.05	69.40	59.6	45%	46.2%
GP	1750	1575.0	92.5	1657.5	90%	94.7%

Table 8-3 – Precinct E Raingarden performance in MUSIC Model (V6.3)

It is important to note that while the performance of the existing Precinct E raingarden met PCC's 2006 target pollution requirements as part of its approval back in 2010, it does not achieve the current PCC requirements, particularly for total suspended solids (TSS) .

Therefore, unfortunately, there is no 'buffer' available in this raingarden that could be used to cater for Precinct G & H bypassing catchments MU10 and MU11. The proposed amendment is, therefore, necessary to achieve PCC desired outcome of a consolidated water quality treatment measure within Precinct E to treat this portion of Precinct G & H.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

8.3.1 Modelling of Precinct E including Precinct G & H (MU10 & MU11)

Precinct G & H bypassing catchments MU10 and MU11 have been added to the unchanged Precinct E model. Performance of Precinct E raingarden with Precinct G & H bypassing catchments is shown in Table 8.4.

Pollutant	Total Developed Source Loads	Minimum Reduction Required	Total Residual Load From Site	Total Reduction Achieved	Current Target Reduction Required by PCC	Total Reduction Achieved
	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)	(%)	(%)
TSS	9920	8432	2290	7630	85%	76.9%
TP	19.4	11.640	7.680	11.72	60%	60.4%
TN	137	61.65	75.5	61.5	45%	44.9%
GP	1850	1665.0	67.2	1782.8	90%	96.4%

Table 8-4 – Precinct E raingarden performance with Precinct G & H bypassing catchments

Given the poor performance of the Precinct E raingarden against the current water quality target, it is not the responsibility of Precinct G & H development to ensure existing infrastructure is upgraded to achieve new increased water quality targets.

Therefore, we have completed an assessment to determine the required reduction in load or kg/yr of pollutants that catchment MU10 and MU11 would need to achieve to ensure that PCC current water quality objectives are achieved.

Table 8.5 illustrates the pollutant removal requirements for MU10 and MU11 together with the residual loads from Precinct E device.

Pollutant	Precinct E Developed Source Loads	Precinct E Actual Residual Load	Precinct G & H Site Developed Source Nodes	Precinct G & H permitted residual Loads	Total Target Residual Permitted
	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)
TSS	9290	2100.00	616	92.40	2192.40
TP	18.2	7.08	1.16	0.46	7.54
TN	129	69.40	7.88	4.33	73.73
GP	1750	92.50	78	7.80	100.30

Table 8-5 – Total Target Residual Loads Limit for Precinct E and Precinct G & H

In order to achieve the total target residual load outlined in Table 8.5, the extended detention zone (EDZ) in the existing Precinct E raingarden has been increased from 300mm to 400mm.

The current MUSIC model adopts an extended detention depth (EDZ) of 0.3 m for the raingarden which is in line with the Council's current requirements. Given that the raingarden is located within a detention basin, the raingarden will be subject to depth of inundation of up to 1.2m during a regular 12 EY event.

This will result in the raingarden planting being inundated for approximately 2 hours during 12 EY events. The plant species used in the raingarden are designed to be inundated, and this minor increase in EDZ of 0.1 m which during the design event (i.e 4 EY event) would treat stormwater runoff for approximately 60 mins longer than the current situation. The results of the EDZ increase from the current 0.3m to 0.4m is provided in Table 8.6 below.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

Pollutant	Total Permitted Residual Loads Limit	Total Residual Loads Achieved	Total Reduction Achieved
	(kg/yr)	(kg/yr)	(kg/yr)
TSS	2192.40	2130	62.40
TP	7.54	7.31	0.23
TN	73.73	71.7	2.03
GP	100.30	67.2	33.10

Table 8-6 – Total reduction achieved with Precinct E raingarden increase in EDZ

Adopting the approach to treat the Precinct G and H bypassing catchments (MU10 and MU11) in the Precinct E raingarden has the following benefits:

1. Small isolated water quality devices which would be needed with catchment MU10 and MU11 within Precinct G & H are consolidated into a single device.
2. Council will ultimately be responsible for maintaining one (1) device instead of potentially three (3).
3. The EDZ extension would have minimal impact on the surrounding Surveyor Creek corridor and would result in the least amount of construction works within this recently completed device.
4. The final media area remains unchanged, resulting in a reduced cost of replacement of the media bed at the end of the raingardens expected life (15 + years) thus reducing the long maintenance burden of Council.
5. The hydraulic loading rate for this arrangement increases to 40 $m^3/m^2/yr$ from a hydraulic loading rate of 36.5 $m^3/m^2/yr$ for the treatment of Precinct E alone.

   This loading rate is quite low in comparison to our recent work we have completed for Blacktown City Council which delivered raingardens that have hydraulic loading rates range from 50 $m^3/m^2/yr$ to 133 $m^3/m^2/yr$.

   Furthermore, Australian Runoff Quality (ARQ) indicates that the acceptable range of hydraulic loading for infiltration systems (including raingardens) is 5 ~ 1000 m/yr (See Plate 8.4 below).

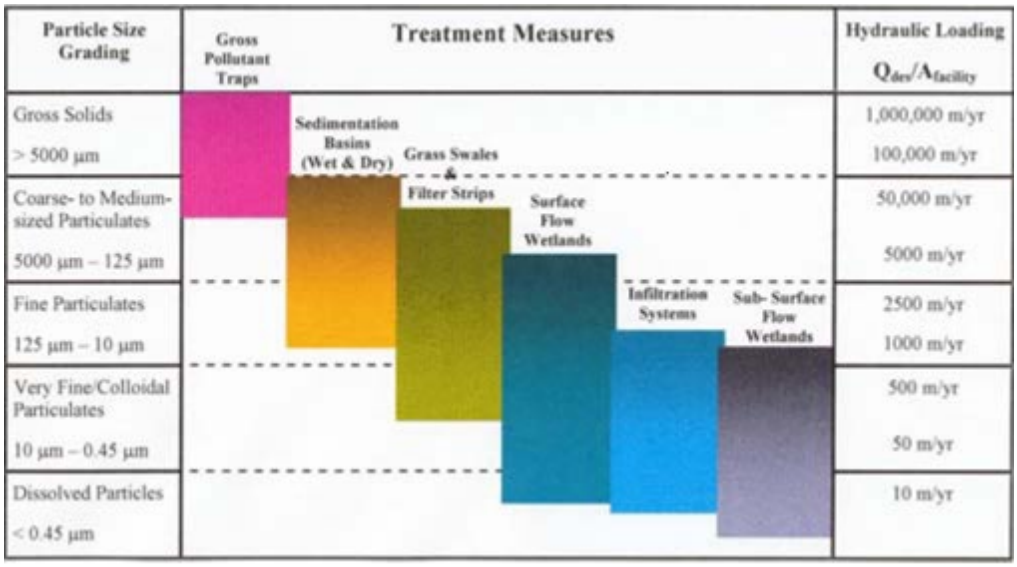


Plate 8-4 – ARQ Acceptable Range of Hydraulic Loading Rate

Therefore, there would be no impact on the long term performance of the raingarden, there will be no impact on plant health as the device is a basin and subject to frequent inundation, and this arrangment is the less disruptive for the local area.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

8.4. Stream Erosion Index

A Stream Erosion Index (SEI) assessment was prepared as part of the Glenmore Park Stage 2 revised Stormwater Management Strategy (see Section 5.2). As part of regional assessment, Glenmore Park Stage 2 Precinct G & H was considered untreated, and an appropriate SEI management delivered elsewhere in the catchment. Therefore, a separate SEI assessment is not required to support the updated Precinct G & H Strategy.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

9. WATER QUANTITY MANAGEMENT

9.1. Detention Basins

In 2016, J. Wyndham Prince completed a stormwater assessment to support Construction Certificate (CC) approval for Stages 1 and 2 within the Precincts G & H. The detention basin proposed in the environmental corridor is now complete and provides peak storm flow attenuation up to the 1 EY event.

Additionally, the Bradley Ridge Precinct E detention basin is proposed to be extended as part of this strategy in order to manage flows up to the 1 EY event for the bypassing portion (Catchment MU10 and MU11 as detailed in Section 8.3) of Precinct G & H.

9.2. Hydrologic analysis

The hydrologic analysis for this study was undertaken using the rainfall – runoff flood routing model XP-RAFTS (Runoff and Flow Training Simulation with XP Graphical Interface) for pre and post development conditions. Modelling has built upon the approved Glenmore Park Precincts G & H – Revised Detention Basin Design Stormwater Assessment (JWP, 2016).

9.3. Sub-catchments (Pre and Post Development)

The sub-catchment breakup for the site was developed based on detailed survey information of the site in existing conditions and approved/future design information for both with the Precinct G & H and for Bradley Ridge Precinct E development. Catchment boundaries for the existing and developed areas contributing to the drainage system are shown in Figures 9.1 and 9.2, respectively in Appendix A.

The 'existing' case model was updated from the previous strategy (JWP 2016) to incorporate the Precinct E development. Precinct E basin is proposed to be augmented to cater for the additional catchment that Precinct G & H will now deliver to this device.

Under "Developed" Conditions, all urbanised catchments within the Precinct adopted a percentage imperviousness of 65%, which is consistent with previous stormwater management strategies, including the Addendum Report (JWP, 2010), for the Glenmore Park Stage 2 Release Area.

Refer to Appendix B for the XP-RAFTS model parameters adopted for the assessment.

9.4. Detention Management

The detention management for Precinct G & H site is consistent with the approved Glenmore Park Precincts G & H – revised Detention Basin Design Stormwater Assessment (JWP, 2016).The on-line detention basin in the environmental corridor will restrict flows for majority of Precinct G & H site and has been constructed as part of Stages 1 and 2 and does not require amendment as part of the strategy updated.

As discussed in section 8.3, a 1.28 ha of developed catchment from Precinct G & H will be directed downstream into Precinct E. Consistent with the water quality approach, augmentation of the existing Precinct E raingarden will be required to achieve PCC's detention management outcomes. The proposed arrangement aligns with the anticipated changes that will be required in order to support the required water quality outcomes.

The water quality strategy includes an additional 0.1m of EDZ in the raingarden, which in turn changes the available storage in the Precinct E detention basin. The discharge controls and spillway levels have also been amended to deliver the required flow management outcomes.

The amended design results in an increase in the spillway level by 40 mm and provides an increase in the available basin storage by approximately 140 m^3. This combination of increased storage and outlet amendment delivered the required flows management targets original achieved for the Precinct E basin.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

9.5. Results

Discharge estimates were derived for the existing and developed catchments for the 1 EY event. A range of storm durations from 10 minutes to 24 hours were analysed to determine the critical duration for each sub-catchment.

Please note that this assessment continues to use 1987 Australian Rainfall and Runoff (ARR) methodologies consistent with the approved 2016 strategy.

Peak discharges at key locations in the catchment were determined for the existing site and developed site both with and without detention provided below. Refer to Appendix B for further details.

9.5.1 Peak Flows Estimates

The peak flows for the Precinct G & H basin, and the augmented Precinct E basin are presented in Table 9.1 below.

Node	Existing		Developed (Without Detention Basin)		Developed (With Detention Basin)	
	Flow (m^3/s)	Dur. (min)	Flow (m^3/s)	Dur. (min)	Flow (m^3/s)	Dur. (min)
Pct G&H	1.38	120	3.13	90	1.36	120
Pct E Basin	0.72	120	1.92	25	0.72	120
Outlet	2.16	120	5.04	90	2.08	120

Table 9-1 – Summary of Peak Flows (1 EY Event)

9.5.2 Basin Performance

The existing Precinct G & H basin within the environmental corridor remains consistent with the approved Glenmore Park Precincts G & H Stormwater Management Strategy (JWP, 2016) and these basins do not require any changes as a result of this strategy update.

Details of the performance of the Precinct E basin is provided below in Table 9.2.

Node	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Basin Volume Used (m^3)	Depth of Ponding (m)	TWL (m) AHD
Pct E Basin	1.92	0.72	880	1.2	60.33

Table 9-2 – Summary of Precinct E Basin Performance (1 EY Event)

Document Set ID: 9967764
Version: 1, Version Date: 28/04/2022

10. SUMMARY AND CONCLUSION

This updated Stormwater Management Strategy for the Glenmore Park Precinct G & H development has been prepared to support the precinct as a whole and to address PCC condition of consent. The strategy has been prepared to conform with the statutory requirements and industry best practice for stormwater management in this catchment.

The Stormwater Management Strategy for Precinct G & H comprises a treatment train consisting of on lot treatment, street level treatment and subdivision / development treatment measures. The structural elements proposed the for the development consist of:

- Proprietary GPT units at each stormwater discharge point into the Precinct G & H bio-retention raingardens located in the environmental corridor.
- An on-line detention basin of a volume of 1,070 m^3 to treat the majority of Precinct G & H site which has been constructed as part of stage 1 and 2.
- Augmentations to enhance the existing Bradley Ridge Precinct E detention basin/raingarden to treat bypassing catchments from Precinct G & H, including:
  - Increasing the EDZ of the Precinct E raingarden by 0.1 m
  - Extending the detention basin storage by approximately 140 m^3, increasing of basin spillway weir by approximately 40 mm and modifying the outlet configuration.

These water quality and flow management measures achieve outcomes consistent with PCC stormwater management objectives.

The proposed updated Stormwater Management Strategy for the developed site provides a basis for the detailed design and development of the site to ensure that the environmental, urban amenity, engineering and economic objectives for stormwater management and site discharge are achieved.

The Stormwater Management Strategy proposed for the development site is functional; delivers the required technical performance; lessens environmental degradation and pressure on downstream ecosystems and infrastructure, and provides for a ‘soft’ sustainable solution for stormwater management within the Precinct.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

11. REFERENCES

J. Wyndham Prince Pty Ltd (2010). *Bradley Ridge Precincts D & E – Stormwater Management Strategy*

J. Wyndham Prince Pty Ltd (2005). *Stormwater Management Strategy, Glenmore Park Stage 2*.

J. Wyndham Prince Pty Ltd (2010). *Glenmore Park Stage 2 Stormwater Management Strategy, Addendum Report, Revised Water Quality Modelling Stream Erosion Index Assessment*.

J. Wyndham Prince Pty Ltd (2015). *Glenmore Park Precincts G & H - Stormwater Management Strategy Report*

J. Wyndham Prince Pty Ltd (2016). *Glenmore Park Precincts G & H – Revised Detention Basin Design Stormwater Assessment*

Penrith City Council (2013) *Water Sensitive Urban Design Policy*

Penrith City Council (2014) *Development Control Plan, Section E4 – Glenmore Park*

Penrith City Council (2015) *WSUD Technical Guidelines*

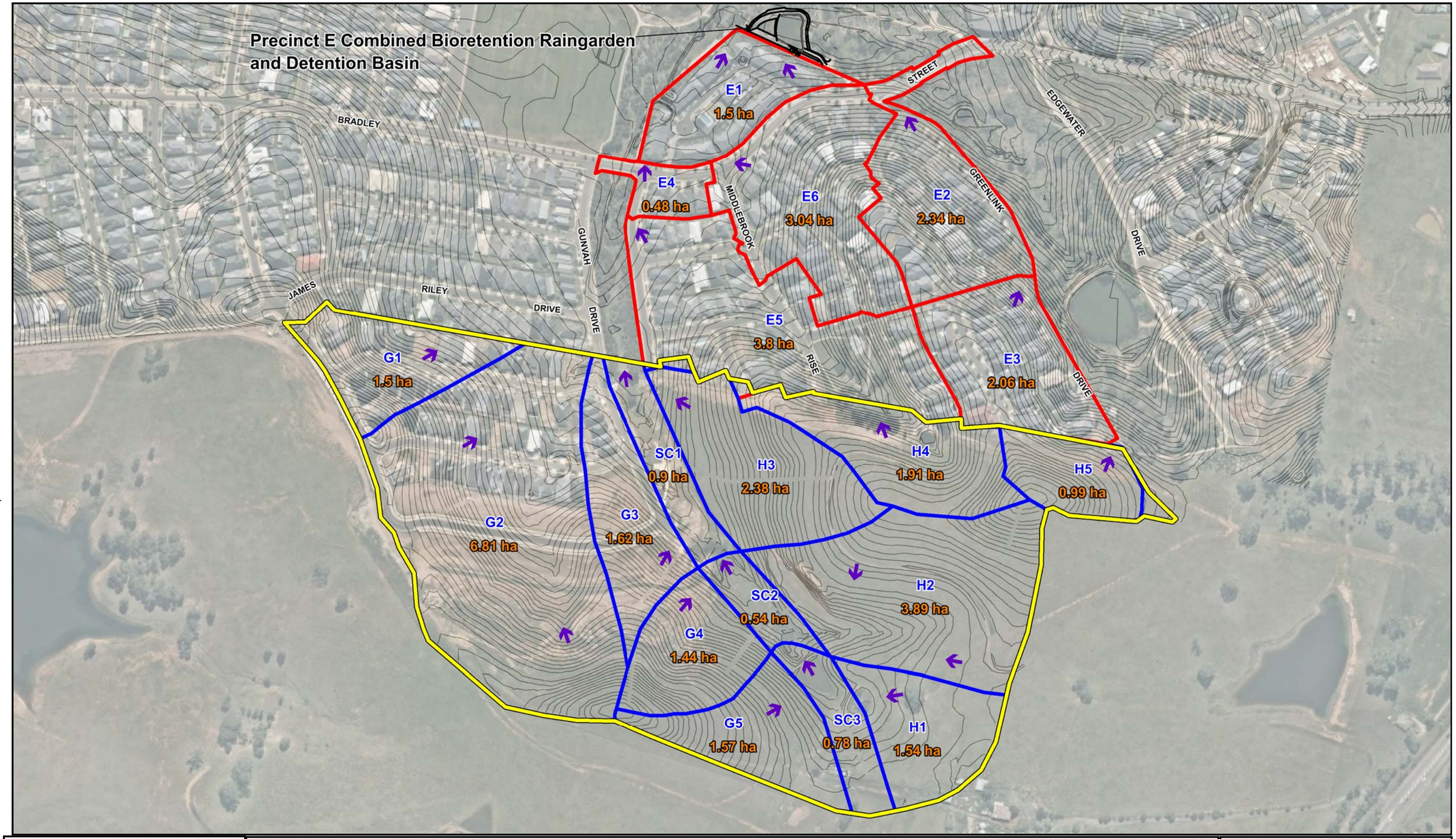
Penrith City Council (2006) *Glenmore Park Stage 2 – Penrith Development Control Plan 2006 Amendment*

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

APPENDIX A
FIGURES

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

Map-1



N

0 144

metres

Scale 1:3,600

Projection: GDA 1994 MGA Zone 56

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LEGEND

- Site Boundary
- Precinct E Catchment Boundary (from CC Info.)
- Precinct G & H Existing Catchment Boundary
- E3 — Catchment ID
- 2.34 ha — Catchment Area
- Flow Direction

Figure 9.1

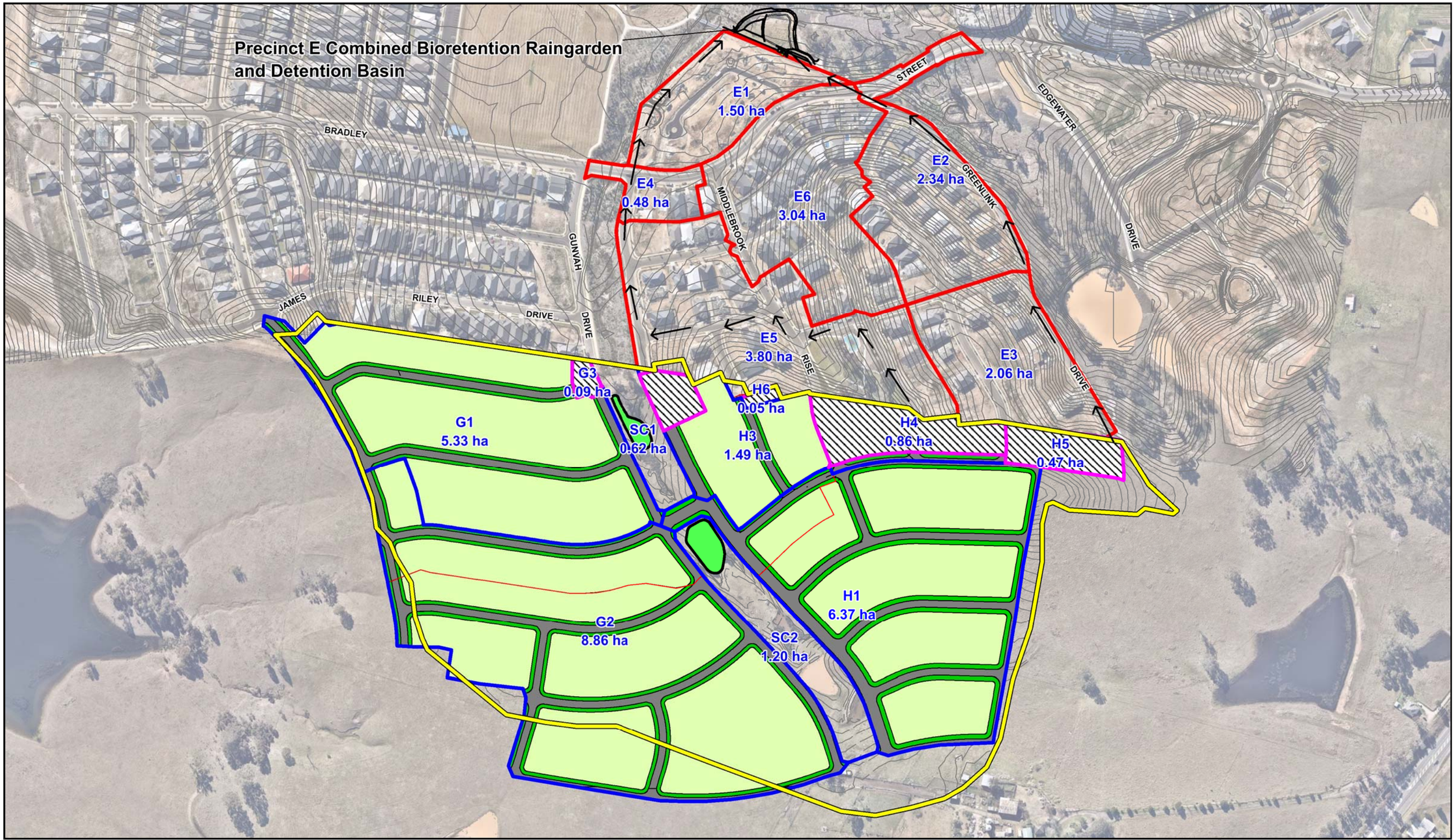
Glenmore Park Precincts G & H

Existing Catchments

Date: 14.05.2019 Issue: A

Document Set ID: 9967071
Version: 1, Version Date: 28/02/2022

Map-1



N

0 144

metres

Scale 1:3,600

Projection: GDA 1994 MGA Zone 56

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LEGEND

- Site Boundary
- Precinct E Catchment Boundary (from CC Info.)
- Precinct G & H Proposed Catchment Boundary
- Precinct G & H Bypassing Catchment
- E3 — Catchment ID
- 2.34 ha — Catchment Area
- Flow Direction

Figure 9.2

Glenmore Park Precincts G & H

Developed Catchments

Date: 14.05.2019 Issue: A

Document Set ID: 9964064
Version: 1, Version Date: 28/02/2022

APPENDIX B

XP-RAFTS MODEL PARAMETERS

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

XP-RAFTS Parameters

Intensity-Frequency-Duration (I.F.D.)

Design rainfall intensity-frequency-duration (I.F.D.) data for the site was adopted from the *Addendum Report* (JWP, 2010), which is consistent with the stormwater management strategies prepared for the Glenmore Park Stage 2 Precincts. The rainfall intensities adopted in the *XP-RAFTS* model are provided in Table B.1. The critical storm durations were determined using these values for each sub-catchment.

Table B.1 – Adopted Rainfall Intensities

AEP	Duration (hours)		
	1	12	72
50%	29.5	6.8	1.9
2%	59.5	13.5	4.5

PERN Values & Infiltration Losses

The PERN Manning's 'n' values and initial and continuing loss rate parameters adopted for the catchments in the *XP-RAFTS* modelling are listed in Table B.2 and Table B.3 respectively.

Table B.2 – XP-RAFTS Pern Values

Catchment Condition	PERN
Pervious	0.035
Urban Pervious	0.025
Impervious	0.015

Table B.3 –Infiltration Losses

Catchment Condition	Loss
Pervious Catchment	
Initial Loss	10.0 mm
Continuing Loss	2.5 mm/hr
Impervious Catchment	
Initial Loss	1.0 mm
Continuing Loss	0.0 mm/hr

Refer to Plates B.1 and B.2 for the *XP-RAFTS* model layouts for existing and developed conditions respectively.

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Version: 1, Version Date: 28/04/2022

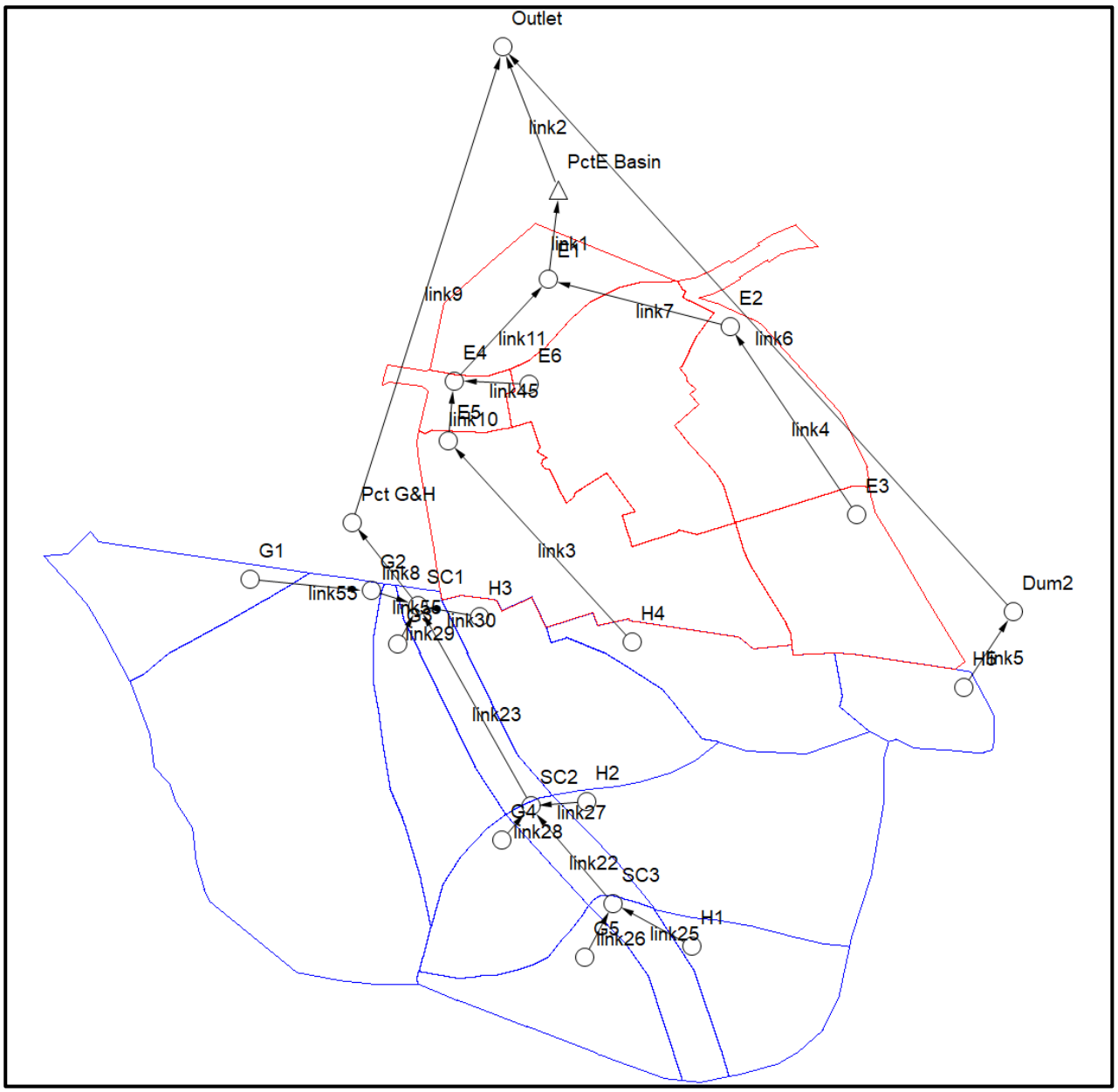


Plate B.1 – Existing Conditions XP RAFTS Model

(ref: 9784RA3_Exi.xp)

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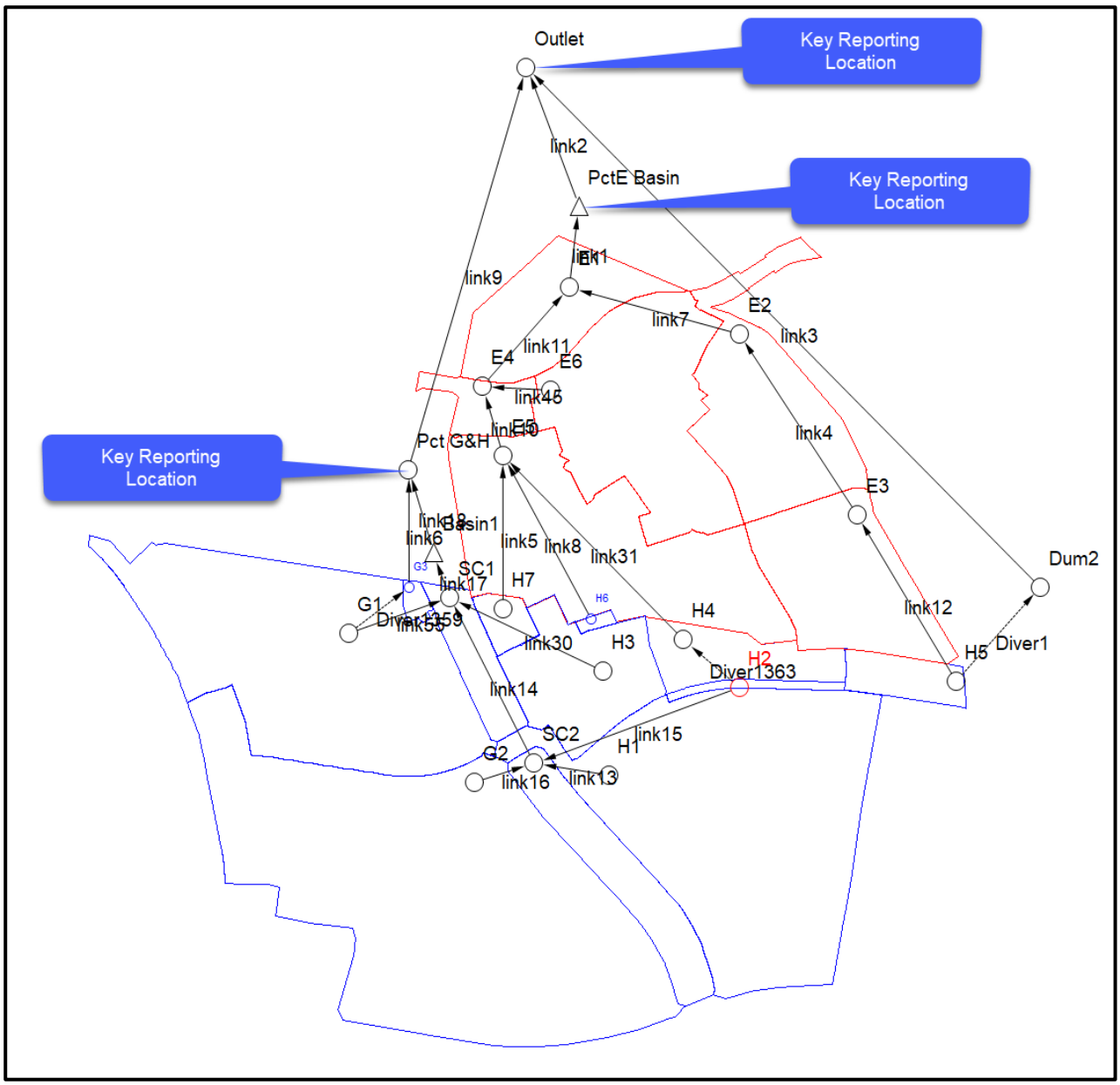


Plate B.2 – Developed Conditions XP RAFTS Model

(ref: 9784RA2_Dev_05.xp)

APPENDIX C
MUSIC-LINK REPORTS

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Version: 1, Version Date: 28/04/2022

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MUSIC-*link* Report

Project Details		Company Details	
Project:	Pct G and H	**Company:**	JWP
Report Export Date:	25/02/2021	**Contact:**	Troy McLeod
Catchment Name:	9784_MU01_Pct G & H_Consolidated GPTs	**Address:**	77 Union Road Penrith
Catchment Area:	23.836ha	**Phone:**	47203392
Impervious Area*:	76.35%	**Email:**	tmcleod@jwprince.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	18%	Bio Retention Node	2	Urban Source Node	43
TSS	85.5%	Rain Water Tank Node	7		
TP	66.2%	GPT Node	4		
TN	56%	Generic Node	1		
GP	98.5%				

Comments

80% rainwater tank re-use is not required for residential development as per Penrith City Council WSUD Technical Guidelines

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2021

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Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention 1	Hi-flow bypass rate (cum/sec)	None	99	1.02
Bio	Bioretention 1	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 2	Hi-flow bypass rate (cum/sec)	None	99	2.23
Bio	Bioretention 2	PET Scaling Factor	2.1	2.1	2.1
GPT	GPT 1	Hi-flow bypass rate (cum/sec)	None	99	0.41
GPT	GPT 2	Hi-flow bypass rate (cum/sec)	None	99	0.66
GPT	GPT 3	Hi-flow bypass rate (cum/sec)	None	99	0.47
GPT	GPT 4	Hi-flow bypass rate (cum/sec)	None	99	0.12
Receiving	Receiving Node	% Load Reduction	None	None	18
Receiving	Receiving Node	GP % Load Reduction	90	None	98.5
Receiving	Receiving Node	TN % Load Reduction	45	None	56
Receiving	Receiving Node	TP % Load Reduction	60	None	66.2
Receiving	Receiving Node	TSS % Load Reduction	85	None	85.5
Urban	MU1 - Gen. Impervious	Area Impervious (ha)	None	None	0.46
Urban	MU1 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU1 - Gen. Impervious	Total Area (ha)	None	None	0.46
Urban	MU1 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU1 - Gen. Pervious	Area Pervious (ha)	None	None	1.87
Urban	MU1 - Gen. Pervious	Total Area (ha)	None	None	1.87
Urban	MU1 - Road	Area Impervious (ha)	None	None	0.66
Urban	MU1 - Road	Area Pervious (ha)	None	None	0
Urban	MU1 - Road	Total Area (ha)	None	None	0.66
Urban	MU1 - Roof Bypass	Area Impervious (ha)	None	None	1.18
Urban	MU1 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU1 - Roof Bypass	Total Area (ha)	None	None	1.18
Urban	MU1 - Roof to Tank	Area Impervious (ha)	None	None	1.18
Urban	MU1 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU1 - Roof to Tank	Total Area (ha)	None	None	1.18
Urban	MU12 - Gen. Impervious	Area Impervious (ha)	None	None	0.01
Urban	MU12 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU12 - Gen. Impervious	Total Area (ha)	None	None	0.01
Urban	MU12 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU12 - Gen. Pervious	Area Pervious (ha)	None	None	0.02
Urban	MU12 - Gen. Pervious	Total Area (ha)	None	None	0.02
Urban	MU12 - Road	Area Impervious (ha)	None	None	0.01
Urban	MU12 - Road	Area Pervious (ha)	None	None	0
Urban	MU12 - Road	Total Area (ha)	None	None	0.01
Urban	MU12 - Roof	Area Impervious (ha)	None	None	0.01
Urban	MU12 - Roof	Area Pervious (ha)	None	None	0
Urban	MU12 - Roof	Total Area (ha)	None	None	0.01

Only certain parameters are reported when they pass validation

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	MU2 - Gen. Impervious	Area Impervious (ha)	None	None	0.43
Urban	MU2 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU2 - Gen. Impervious	Total Area (ha)	None	None	0.43
Urban	MU2 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU2 - Gen. Pervious	Area Pervious (ha)	None	None	0.66
Urban	MU2 - Gen. Pervious	Total Area (ha)	None	None	0.66
Urban	MU2 - Road	Area Impervious (ha)	None	None	0.34
Urban	MU2 - Road	Area Pervious (ha)	None	None	0
Urban	MU2 - Road	Total Area (ha)	None	None	0.34
Urban	MU2 - Roof Bypass	Area Impervious (ha)	None	None	0.23
Urban	MU2 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU2 - Roof Bypass	Total Area (ha)	None	None	0.23
Urban	MU2 - Roof to Tank	Area Impervious (ha)	None	None	0.23
Urban	MU2 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU2 - Roof to Tank	Total Area (ha)	None	None	0.23
Urban	MU3 - Gen. Impervious	Area Impervious (ha)	None	None	0.07
Urban	MU3 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU3 - Gen. Impervious	Total Area (ha)	None	None	0.07
Urban	MU3 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU3 - Gen. Pervious	Area Pervious (ha)	None	None	0.24
Urban	MU3 - Gen. Pervious	Total Area (ha)	None	None	0.24
Urban	MU3 - Road	Area Impervious (ha)	None	None	0.24
Urban	MU3 - Road	Area Pervious (ha)	None	None	0
Urban	MU3 - Road	Total Area (ha)	None	None	0.24
Urban	MU3 - Roof Bypass	Area Impervious (ha)	None	None	0.06
Urban	MU3 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU3 - Roof Bypass	Total Area (ha)	None	None	0.06
Urban	MU3 - Roof to Tank	Area Impervious (ha)	None	None	0.06
Urban	MU3 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU3 - Roof to Tank	Total Area (ha)	None	None	0.06
Urban	MU4 - Gen. Impervious	Area Impervious (ha)	None	None	0.13
Urban	MU4 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU4 - Gen. Impervious	Total Area (ha)	None	None	0.13
Urban	MU4 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU4 - Gen. Pervious	Area Pervious (ha)	None	None	0.52
Urban	MU4 - Gen. Pervious	Total Area (ha)	None	None	0.52
Urban	MU4 - Road	Area Impervious (ha)	None	None	0.17
Urban	MU4 - Road	Area Pervious (ha)	None	None	0
Urban	MU4 - Road	Total Area (ha)	None	None	0.17
Urban	MU4 - Roof Bypass	Area Impervious (ha)	None	None	0.34

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Node Type	Node Name	Parameter	Min	Max	Actual
Urban	MU4 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU4 - Roof Bypass	Total Area (ha)	None	None	0.34
Urban	MU4 - Roof to Tank	Area Impervious (ha)	None	None	0.34
Urban	MU4 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU4 - Roof to Tank	Total Area (ha)	None	None	0.34
Urban	MU5 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU5 - Gen. Pervious	Area Pervious (ha)	None	None	0.09
Urban	MU5 - Gen. Pervious	Total Area (ha)	None	None	0.09
Urban	MU5 - Road	Area Impervious (ha)	None	None	0.07
Urban	MU5 - Road	Area Pervious (ha)	None	None	0
Urban	MU5 - Road	Total Area (ha)	None	None	0.07
Urban	MU5 - Roof Bypass	Area Impervious (ha)	None	None	0.05
Urban	MU5 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU5 - Roof Bypass	Total Area (ha)	None	None	0.05
Urban	MU5 - Roof to Tank	Area Impervious (ha)	None	None	0.05
Urban	MU5 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU5 - Roof to Tank	Total Area (ha)	None	None	0.05
Urban	MU6 - Gen. Impervious	Area Impervious (ha)	None	None	0.01
Urban	MU6 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU6 - Gen. Impervious	Total Area (ha)	None	None	0.01
Urban	MU6 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU6 - Gen. Pervious	Area Pervious (ha)	None	None	0.03
Urban	MU6 - Gen. Pervious	Total Area (ha)	None	None	0.03
Urban	MU6 - Road	Area Impervious (ha)	None	None	0.04
Urban	MU6 - Road	Area Pervious (ha)	None	None	0
Urban	MU6 - Road	Total Area (ha)	None	None	0.04
Urban	MU6 - Roof	Area Impervious (ha)	None	None	0.01
Urban	MU6 - Roof	Area Pervious (ha)	None	None	0
Urban	MU6 - Roof	Total Area (ha)	None	None	0.01
Urban	MU7 - Pervious	Area Impervious (ha)	None	None	0
Urban	MU7 - Pervious	Area Pervious (ha)	None	None	1.196
Urban	MU7 - Pervious	Total Area (ha)	None	None	1.196
Urban	MU8 - Gen. Impervious	Area Impervious (ha)	None	None	0.58
Urban	MU8 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU8 - Gen. Impervious	Total Area (ha)	None	None	0.58
Urban	MU8 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU8 - Gen. Pervious	Area Pervious (ha)	None	None	2.45
Urban	MU8 - Gen. Pervious	Total Area (ha)	None	None	2.45
Urban	MU8 - Road	Area Impervious (ha)	None	None	0.96
Urban	MU8 - Road	Area Pervious (ha)	None	None	0

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Node Type	Node Name	Parameter	Min	Max	Actual
Urban	MU8 - Road	Total Area (ha)	None	None	0.96
Urban	MU8 - Roof Bypass	Area Impervious (ha)	None	None	1.5
Urban	MU8 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU8 - Roof Bypass	Total Area (ha)	None	None	1.5
Urban	MU8 - Roof to Tank	Area Impervious (ha)	None	None	1.5
Urban	MU8 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU8 - Roof to Tank	Total Area (ha)	None	None	1.5
Urban	MU9 - Gen. Impervious	Area Impervious (ha)	None	None	0.27
Urban	MU9 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU9 - Gen. Impervious	Total Area (ha)	None	None	0.27
Urban	MU9 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU9 - Gen. Pervious	Area Pervious (ha)	None	None	2.04
Urban	MU9 - Gen. Pervious	Total Area (ha)	None	None	2.04
Urban	MU9 - Road	Area Impervious (ha)	None	None	1.03
Urban	MU9 - Road	Area Pervious (ha)	None	None	0
Urban	MU9 - Road	Total Area (ha)	None	None	1.03
Urban	MU9 - Roof Bypass	Area Impervious (ha)	None	None	1.25
Urban	MU9 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU9 - Roof Bypass	Total Area (ha)	None	None	1.25
Urban	MU9 - Roof to Tank	Area Impervious (ha)	None	None	1.25
Urban	MU9 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU9 - Roof to Tank	Total Area (ha)	None	None	1.25

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Document Set ID: 9964764
Version: 1, Version Date: 28/04/2022

PENRITH CITY COUNCIL

MUSIC-link

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Rain	MU1 - RW Tank	% Reuse Demand Met	80	None	42.36
Rain	MU2 - RW Tank	% Reuse Demand Met	80	None	42.6644
Rain	MU3 - RW Tank	% Reuse Demand Met	80	None	41.5154
Rain	MU4 - RW Tank	% Reuse Demand Met	80	None	42.30
Rain	MU5 - RW Tank	% Reuse Demand Met	80	None	42.18
Rain	MU8 - RW Tank	% Reuse Demand Met	80	None	42.18
Rain	MU9 - RW Tank	% Reuse Demand Met	80	None	42.3823

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Document Set ID: 9964764
Version: 1, Version Date: 28/04/2022

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MUSIC-*link* Report

Project Details		Company Details	
Project:	Highland Views Precinct G & H & PCT E	**Company:**	J. Wyndham Prince
Report Export Date:	17/05/2019	**Contact:**	David Crompton
Catchment Name:	9784_MU01_Bypassing Catchments to Pct E	**Address:**	77 Union Road Penrith
Catchment Area:	0.94ha	**Phone:**	47203379
Impervious Area*:	64.89%	**Email:**	dcrompton@jwprince.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.30		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Junction	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	10.2%	Rain Water Tank Node	3	Urban Source Node	14
TSS	1.9%	Bio Retention Node	1		
TP	5.1%				
TN	10.2%				
GP	22.8%				

Comments

80% rainwater tank re-use is not required for residential development as per Penrith City Council WSUD Technical Guidelines

NOTE:

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Ex. Pct. E Bioretention	Hi-flow bypass rate (cum/sec)	None	99	0.89
Bio	Ex. Pct. E Bioretention	PET Scaling Factor	2.1	2.1	2.1
Urban	Bypass Roofs Precinct E - 1.99ha	Area Impervious (ha)	None	None	1.99
Urban	Bypass Roofs Precinct E - 1.99ha	Area Pervious (ha)	None	None	0
Urban	Bypass Roofs Precinct E - 1.99ha	Total Area (ha)	None	None	1.99
Urban	MU10 - Gen. Impervious	Area Impervious (ha)	None	None	0.1
Urban	MU10 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU10 - Gen. Impervious	Total Area (ha)	None	None	0.1
Urban	MU10 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU10 - Gen. Pervious	Area Pervious (ha)	None	None	0.16
Urban	MU10 - Gen. Pervious	Total Area (ha)	None	None	0.16
Urban	MU10 - Road	Area Impervious (ha)	None	None	0.1
Urban	MU10 - Road	Area Pervious (ha)	None	None	0
Urban	MU10 - Road	Total Area (ha)	None	None	0.1
Urban	MU10 - Roof Bypass	Area Impervious (ha)	None	None	0.05
Urban	MU10 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU10 - Roof Bypass	Total Area (ha)	None	None	0.05
Urban	MU10 - Roof to Tank	Area Impervious (ha)	None	None	0.05
Urban	MU10 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU10 - Roof to Tank	Total Area (ha)	None	None	0.05
Urban	MU11 - Gen. Impervious	Area Impervious (ha)	None	None	0.05
Urban	MU11 - Gen. Impervious	Area Pervious (ha)	None	None	0
Urban	MU11 - Gen. Impervious	Total Area (ha)	None	None	0.05
Urban	MU11 - Gen. Pervious	Area Impervious (ha)	None	None	0
Urban	MU11 - Gen. Pervious	Area Pervious (ha)	None	None	0.17
Urban	MU11 - Gen. Pervious	Total Area (ha)	None	None	0.17
Urban	MU11 - Road	Area Impervious (ha)	None	None	0.08
Urban	MU11 - Road	Area Pervious (ha)	None	None	0
Urban	MU11 - Road	Total Area (ha)	None	None	0.08
Urban	MU11 - Roof Bypass	Area Impervious (ha)	None	None	0.09
Urban	MU11 - Roof Bypass	Area Pervious (ha)	None	None	0
Urban	MU11 - Roof Bypass	Total Area (ha)	None	None	0.09
Urban	MU11 - Roof to Tank	Area Impervious (ha)	None	None	0.09
Urban	MU11 - Roof to Tank	Area Pervious (ha)	None	None	0
Urban	MU11 - Roof to Tank	Total Area (ha)	None	None	0.09
Urban	Remaining 5.93	Area Impervious (ha)	None	None	2.368
Urban	Remaining 5.93	Area Pervious (ha)	None	None	3.561
Urban	Remaining 5.93	Total Area (ha)	None	None	5.93
Urban	Road 3.30	Area Impervious (ha)	None	None	2.640
Urban	Road 3.30	Area Pervious (ha)	None	None	0.659

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Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

PENRITH CITY COUNCIL

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Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Road 3.30	Total Area (ha)	None	None	3.3
Urban	Roofs Precinct E - 1.99ha	Area Impervious (ha)	None	None	1.99
Urban	Roofs Precinct E - 1.99ha	Area Pervious (ha)	None	None	0
Urban	Roofs Precinct E - 1.99ha	Total Area (ha)	None	None	1.99

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Document Set ID: 9964764
Version: 1, Version Date: 28/04/2022

PENRITH CITY COUNCIL

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Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Rain	MU10 - RW Tank	% Reuse Demand Met	80	None	42.18
Rain	MU11 - RW Tank	% Reuse Demand Met	80	None	42.6452
Rain	Rainwater Tanks Precinct E	% Reuse Demand Met	80	None	19.98

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Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

APPENDIX D
CONDITIONS OF CONSENT

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

PENRITH
CITY COUNCIL

NOTICE OF DETERMINATION

DESCRIPTION OF DEVELOPMENT

Application number:	DA18/0427
Description of development:	Torrens Title Subdivision x 45 Residential Lots, 5 Residue Lots & Public Roads & Site Remediation Works
Classification of development:	N/A

DETAILS OF THE LAND TO BE DEVELOPED

Legal description:	Lot 239 DP 1224644
Property address:	100 Darug Avenue, GLENMORE PARK NSW 2745

DETAILS OF THE APPLICANT

Name & Address:	CCL Development PO Box 4099 PENRITH PLAZA NSW 2750

DECISION OF CONSENT AUTHORITY

In accordance with Section 4.18(1)(a) of the Environmental Planning and Assessment Act 1979, consent is granted subject to the conditions listed in Attachment 1.

Please note that this consent will lapse on the expiry date unless the development has commenced in that time.

Date from which consent operates	13 December 2018
Date the consent expires	13 December 2023
Date of this decision	23 November 2018

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

POINT OF CONTACT

If you have any questions regarding this determination you should contact:

Assessing Officer:	Lauren Van Etten
Contact telephone number:	+612 4732 8222

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

NOTES

Reasons
The conditions in the attached schedule have been imposed in accordance with Section 4.17 of the Environmental Planning and Assessment Act 1979 (as amended).

Conditions
Your attention is drawn to the attached conditions of consent in Attachment 1.

Certification and Advisory Notes
You should also check if this type of development requires a Construction Certificate in addition to this development consent.

It is recommended that you read any Advisory Note enclosed with this Notice of Determination.

Review of Determination
The applicant may request Council to review its determination pursuant to Section 8.2 of the Environmental Planning and Assessment Act 1979 within six months of receiving this Notice of Determination.

These provisions do not apply to designated development, complying development or crown development pursuant to Section 8.2(2) of the Environmental Planning and Assessment Act 1979.

Appeals in the Land and Environment Court
The applicant can appeal against this decision in the Land and Environment Court within six months of receiving this Notice of Determination.

There is no right of appeal to a decision of the Independent Planning Commission or matters relating to a complying development certificate pursuant to Section 8.6(3) of the Environmental Planning and Assessment Act 1979.

Designated Development
If the application was for designated development and a written objection was made in respect to the application, the objector can appeal against this decision to the Land and Environment Court within 28 days after the date of this notice.

If the applicant appeals against this decision, the objector(s) will be given a notice of the appeal and the objector(s) can apply to the Land and Environment Court within 28 days after the date of this appeal notice to attend the appeal and make submissions at that appeal.

Sydney Western City Planning Panel
If the application was decided by the Sydney Western City Planning Panel, please refer to Section 2.16 of the Environmental Planning and Assessment Act 1979 (as amended) for any further regulations.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

OTHER APPROVALS

APPROVAL BODIES

APPROVAL BODY NAME	DATE OF GENERAL TERMS OF APPROVAL	REF. NO.	NO. OF PAGES	RELEVANT LEGISLATION
Natural Resources Access Regulator	2 October 2018	IDAS1106746	3	Water Management Act 2000
NSW Rural Fire Service	31 May 2018	D18/5480	3	Rural Fires Act 1997

The approval bodies listed above have provided General Terms of Approval for this development in accordance with the relevant legislation. A copy of these General Terms of Approval is provided with this development consent notice. Compliance with the relevant State Government departments' General Terms of Approval is required in conjunction with the following conditions listed in Attachment 1: Conditions of Consent issued by Penrith City Council.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

ATTACHMENT 1: CONDITIONS OF CONSENT

General

1 The development must be implemented substantially in accordance with the following plans stamped approved by Council, the application form, and any supporting information received with the application, except as may be amended in red on the approved plans and by the following conditions.

Drawing	Drawing Ref.	Revision	Prepared By	Dated
Subdivision Plan	-	F	Design & Planning	01/08/18
Landscape Plans	DA101- DA600	1	Scott Carver	27/07/18
Engineering Plans Cover Sheet	978410/DA01	B	J. Wyndham Prince	-
Site Plan & Cut & Fill Plan	978410/DA02	B	J. Wyndham Prince	31/07/2018
Engineering Plan	978410/DA03	B	J. Wyndham Prince	30/07/2018
Site Sections	978410/DA04	B	J. Wyndham Prince	30/07/2018
Typical Sections	978410/DA05	B	J. Wyndham Prince	30/07/2018
Road Longitudinal Sections	978410/DA06	B	J. Wyndham Prince	30/07/2018
Road Longitudinal Sections	978410/DA07	B	J. Wyndham Prince	30/07/2018
Road Longitudinal Sections	978410/DA08	B	J. Wyndham Prince	30/07/2018
Basin Plan	978410/DA09	B	J. Wyndham Prince	30/07/2018
Basin Sections	978410/DA10	B	J. Wyndham Prince	30/07/2018
Soil & Water Management Plan	978410/DA11	B	J. Wyndham Prince	31/07/2018

2 All relevant requirements of the Natural Resources Access Regulator and the Rural Fire Service's General Terms of Approval shall be satisfied **prior to the issue of a Construction Certificate and/or a Subdivision Certificate**, as relevant.

3 A **Construction Certificate** shall be obtained prior to the commencement of any engineering works.

4 The approved subdivision configuration should in no way be seen as pre-empting the separate consideration or approval of the future subdivision pattern for residue Lot 449. In this regard, a continuous perimeter road may still be required in accordance with the adopted Glenmore Park Stage 2 Precinct G Concept Plan should adjoining land not be available for development

5 The recommendations and necessary works outlined in the letter prepared by Geotechnique dated 24 November 2015 in regards to salinity management shall be implemented for the development.

6 **Prior to the issue of a Subdivision Certificate,** a matrix table shall be submitted to and endorsed by Penrith City Council detailing any infrastructure works, development contributions and/or land dedication required as a result of this development consent pursuant to the Glenmore Park Stage 2 Planning Agreement (No. 1), Second Council Planning Agreement and State Planning Agreement. All applicable infrastructure works, development contributions and/or land dedication shall be completed **prior to** (or concurrently with, in the case of land dedication) **the issue of a Subdivision Certificate or as detailed in the endorsed matrix table**.

7 Any proposed retaining walls shall be constructed of masonry or rock materials. This detail shall be reflected on the Construction Certificate plans.

Document Set ID: 9967061
Version: 1, Version Date: 28/02/2022

8 Prior to the issue of a Construction Certificate, the Highland Views design guidelines are to be amended to detail steep lot controls and nominate affected lots. Details in this regard shall be approved by Council.

9 Dust suppression techniques are to be employed during works to reduce any potential nuisances to surrounding properties.

10 Mud and soil from vehicular movements to and from the site during works must not be deposited on the road.

11 **Prior to the issue of a Construction Certificate,** the Overarching Precinct G & H Stormwater Management Strategy Report prepared by J. Wyndham Prince dated December 2015 shall be amended and re-submitted to Council for approval. The amended report shall show the updated stormwater treatment strategy for Stage 4 in the precinct.

Heritage/Archaeological relics

12 If any archaeological relics are uncovered during the course of the approved works, no further work shall be undertaken until further directed by Penrith City Council or the NSW Heritage Office.

The applicant is advised that depending on the possible significance of the relics, an archaeological assessment and an excavation permit under the Heritage Act 1977 may be required before any further work can be recommenced in that area of the site.

Environmental Matters

13 Erosion and sediment control measures shall be installed **prior to the commencement of works on site** including approved clearing of site vegetation. The erosion and sediment control measures are to be maintained in accordance with the approved erosion and sediment control plan(s) for the development and the Department of Housing's “Managing Urban Stormwater: Soils and Construction” 2004.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

14 No fill material shall be imported to the site until such time as a Validation Certificate (with a copy of any report forming the basis for the validation) for the fill material has been submitted to, considered and approved by Council.

The Validation Certificate shall:

- state the legal property description of the fill material source site,
- be prepared by an appropriately qualified person (as defined in Penrith Contaminated Land Development Control Plan) with consideration of all relevant guidelines (e.g. EPA, ANZECC, NH&MRC), standards, planning instruments and legislation,
- clearly indicate the legal property description of the fill material source site,
- provide details of the volume of fill material to be used in the filling operations,
- provide a classification of the fill material to be imported to the site in accordance with the Environment Protection Authority's "Environmental Guidelines: Assessment, Classification & Management of Non-Liquid Wastes" 1997, and
- (based on the fill classification) determine whether the fill material is suitable for its intended purpose and land use and whether the fill material will or will not pose an unacceptable risk to human health or the environment.

{Note: Penrith Development Control Plan 2014 defines an appropriately qualified person as "a person who, in the opinion of Council, has a demonstrated experience, or access to experience in hydrology, environmental chemistry, soil science, eco-toxicology, sampling and analytical procedures, risk evaluation and remediation technologies. In addition, the person will be required to have appropriate professional indemnity and public risk insurance."}.

If the Principal Certifying Authority or Penrith City Council is not satisfied that suitable fill materials have been used on the site, further site investigations or remediation works may be requested. In these circumstances the works shall be carried out prior to any further approved works.

15 Where a building is to take place on any land that is to be filled, such filling is to be compacted in accordance with AS 3798-1996. Certification is to be submitted to the Principal Certifying Authority by a Geotechnical Engineer verifying that the work has been undertaken prior to the commencement of the construction of any building.

If Penrith City Council is not the Principal Certifying Authority, a copy of the certification is to be submitted to Council for their reference.

16 All waste materials stored on-site during works are to be contained within a designated area such as a waste bay or bin to ensure that no waste materials are allowed to enter the stormwater system or neighbouring properties. The designated waste storage areas shall provide at least two waste bays / bins so as to allow for the separation of wastes, and are to be fully enclosed when the site is unattended.

17 All excavated material and other wastes generated as a result of the development are to be re-used, recycled or disposed of in accordance with the approved waste management plan.

Waste materials not specified in the approved waste management plan are to be disposed of at a lawful waste management facility. Where the disposal location or waste materials have not been identified in the waste management plan, details shall be provided to the Certifying Authority as part of the waste management documentation accompanying the Construction Certificate application.

All receipts and supporting documentation must be retained in order to verify lawful disposal of materials and are to be made available to Penrith City Council on request.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

18 The operating noise level of plant and equipment shall not exceed 5dB(A) above the background noise level when measured at the boundaries of the premises. The provisions of the Protection of the Environment Operations Act 1997 apply to the development, in terms of regulating offensive noise.

19 Only clean and unpolluted water is to be discharged into Penrith City Council's stormwater drainage system. Liquid wastes suitable for discharge to the mains sewerare to be discharged in accordance with Sydney Water requirements.

If mains sewer is not available or if Sydney Water will not allow disposal to the sewer, then a licensed waste contractor is to remove the liquid waste from the premises to an appropriate waste facility.

The waste contractor and waste facility are to hold the relevant licences issued by the NSW Environment Protection Authority.

20 Should any "unexpected finds" occur during site excavation and earthworks, including, but not limited to, the identification/finding of contaminated soils, buried building materials, asbestos, odour and/or staining, works are to cease immediately and Council notified. Any such "unexpected finds" shall be addressed by an appropriately qualified environmental consultant.

All remediation works within the Penrith Local Government Area are considered to be Category 1 works under State Environmental Planning Policy No. 55 - Remediation of Land. Should any contamination be found during development works and should remediation be required, development consent is to be sought from Penrith City Council before the remediation works commence.

21 Site remediation works shall be carried out generally in accordance with the Remedial Action Plan, Highland Views, Stage 4, Mulgoa NSW (dated July 2018, ref J001046) as well as Penrith Development Control Plan, the ANZECC and NHMRC Guidelines (1992) and the applicable NSW Environment Protection Authority Guidelines.

On completion of the site remediation works, the following documentation is to be submitted for approval to the Principal Certifying Authority and Penrith City Council, if Council is not the Principal Certifying Authority:

- Written notification that the site remediation works have been completed is to be submitted **within 30 days of the said works having been completed**.
- A Validation Report, prepared by an appropriately qualified person as defined in Penrith Development Control Plan 2014, is to be submitted **before any engineering works can commence on the remediated site**. The report shall certify that the remediation works have been carried out in accordance with the approved Remedial Action Plan, relevant NSW Environment Protection Authority requirements and Penrith Development Control Plan 2014.

22 An appropriately qualified person/s (as defined in Penrith Development Control Plan 2014) shall:

a) Supervise the remediation works.

b) Supply Council with a copy of any relevant documentation for further testing carried out during the remediation works.

c) Address off site impacts and proposed management strategies where relevant.

d) (After completion of works) Certify by way of a Compliance Certificate or other written documentation that remediation works have been carried out in accordance with all conditions of this consent and that the site will not pose an unacceptable risk to human health or the environment (this information can be included in the Validation Report). A copy of the Compliance Certificate or other written documentation is to be submitted to the Principal Certifying Authority (PCA) and Penrith City Council if it is not the PCA.

The contact details of any appropriately qualified person/s engaged for the works shall be **provided with**

Document Set ID: 9964764
Version: 1, Version Date: 28/04/2021

the notice of commencement.

23 Contaminated topsoil shall not be mixed with uncontaminated underlying natural soils.

24 **Prior to works commencing on site**, a Construction Noise Impact Assessment and Management Plan is to be prepared and submitted to Council for approval. This assessment is to consider (at minimum) the details of the construction program, construction methods, equipment and vehicles in association with the NSW Department of Environment and Change's "Interim Construction Noise Guideline" 2009.

The recommendations of the approved Management Plan are to be implemented and adhered to during the construction of the development.

Utility Services

25 All services (water, sewer, electricity, telephone and gas), including the provision of service conduits and stub mains, are to be installed within the proposed public roads before final inspection of the engineering works.

Prior to the issue of a Subdivision Certificate, the following service authority clearances shall be obtained:

- a Section 73 Compliance Certificate under the Sydney Water Act 1994 shall be obtained from Sydney Water;
- a Notification of Arrangement Certificate from Endeavour Energy stating that satisfactory arrangements have been made for electricity supply to all proposed allotments in the subdivision, including any necessary easements; and
- a letter from an approved telecommunications service provider that satisfactory arrangements have been made for underground telephone services to all proposed allotments in the subdivision, including any necessary easements.

These clearances are to be submitted to the Principal Certifying Authority prior to the issue of a Subdivision Certificate.

26 **Prior to the issue of a Subdivision Certificate,** the Principal Certifying Authority shall be satisfied that telecommunications infrastructure may be installed to service the subdivision which complies with the following:

- The requirements of the Telecommunications Act 1997;
- For a fibre ready facility, the NBN Co's standard specifications current at the time of installation; and
- For a line that is to connect a lot to telecommunications infrastructure external to the premises, the line shall be located underground.

Unless otherwise stipulated by telecommunications legislation at the time of construction, the development must be provided with all necessary pits and pipes, and conduits to accommodate the future connection of optic fibre technology telecommunications.

Prior to the issue of a Subdivision Certificate, written certification from all relevant service providers that the telecommunications infrastructure is installed in accordance with the requirements above and the applicable legislation at the time of construction, must be submitted to the Principal Certifying Authority.

Document Set ID: 9967064
Version: 1, Version Date: 28/02/2022

Construction

27 Stamped plans, specifications, a copy of the development consent, the Construction Certificate and any other Certificates to be relied upon shall be available on site at all times during construction.

The following details are to be displayed in a maximum of 2 signs to be erected on the site:

- the name of the Principal Certifying Authority, their address and telephone number,
- the name of the person in charge of the work site and telephone number at which that person may be contacted during work hours,
- that unauthorised entry to the work site is prohibited,
- the designated waste storage area must be covered when the site is unattended, and
- all sediment and erosion control measures shall be fully maintained until completion of the construction phase.

Signage but no more than 2 signs stating the above details is to be erected:

- at the commencement of, and for the full length of the, construction works onsite, and
- in a prominent position on the work site and in a manner that can be easily read by pedestrian traffic.

All construction signage is to be removed when the Subdivision Certificate has been issued for the development.

Document Set ID: 9967061
Version: 1, Version Date: 28/04/2021

28 Prior to the commencement of construction works:

(a) Toilet facilities at or in the vicinity of the work site shall be provided at the rate of one toilet for every 20 persons or part of 20 persons employed at the site.Each toilet provided must be:

- a standard flushing toilet connected to a public sewer, or
- if that is not practicable, an accredited sewage management facility approved by Council, or
- alternatively, any other sewage management facility approved by Council.

(b) All excavations and backfilling associated with the erection or demolition of a building must be executed safely and in accordance with the appropriate professional standards. All excavations associated with the erection or demolition of a building must be properly guarded and protected to prevent them from being dangerous to life or property.

(c) If an excavation associated with the erection or demolition of a building extends below the level of the base of the footings of a building on an adjoining allotment of land, the person causing the excavation to be made:

- must preserve and protect the building from damage, and
- if necessary, must underpin and support the building in an approved manner, and
- must, at least 7 days before excavating below the level of the base of the footings of a building on an adjoining allotment of land, give notice of intention to do so to the owner of the adjoining allotment of land and furnish particulars of the excavation to the owner of the building being erected or demolished.The owner of the adjoining allotment of land is not liable for any part of the cost of work carried out for the purposes of this condition, whether carried out on the allotment of land being excavated or on the adjoining allotment of land (includes a public road and any other public place).

(d) If the work involved in the erection or demolition of a building is likely to cause pedestrian or vehicular traffic in a public place to be obstructed or rendered inconvenient, or involves the enclosure of a public place, a hoarding or fence must be erected between the work site and the public place:

- if necessary, an awning is to be erected, sufficient to prevent any substance from, or in connection with, the work falling into the public place,
- the work site must be kept lit between sunset and sunrise if it is likely to be hazardous to persons in the public place, and
- any such hoarding, fence or awning is to be removed when the work has been completed.

29 Construction works or subdivision works that are carried out in accordance with an approved consent that involve the use of heavy vehicles, heavy machinery and other equipment likely to cause offence to adjoining properties shall be restricted to the following hours in accordance with the NSW Environment Protection Authority Noise Control Guidelines:

- Mondays to Fridays, 7am to 6pm
- Saturdays, 7am to 1pm if inaudible on neighbouring residential premises, otherwise 8am to 1pm
- No work is permitted on Sundays and Public Holidays.

Other construction works carried out inside a building/tenancy that do not involve the use of equipment that emits noise are not restricted to the construction hours stated above.

The provisions of the Protection of the Environment Operations Act 1997 in regulating offensive noise also apply to all construction works.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

Engineering

30 All roadworks, stormwater drainage works, associated civil works and dedications, required to effect the consented development shall be undertaken at no cost to Penrith City Council.

31 An Infrastructure Restoration Bond is to be lodged with Penrith City Council for development involving works around Penrith City Council's Public Infrastructure Assets. The bond is to be lodged with Penrith City Council prior to commencement of any works on site or prior to the issue of any Construction Certificate, whichever occurs first. The bond and applicable fees are in accordance with Council's adopted Fees and Charges.

An application form together with an information sheet and conditions are available on Council's website.

Contact Penrith City Council's City Works Department on (02) 4732 7777 or visit Penrith City Council's website for more information.

32 Prior to the issue of any Construction Certificate, a Section 138 Roads Act application, including payment of application and inspection fees, shall be lodged with and approved by Penrith City Council (being the Roads Authority for any works required in a public road). These works may include but are not limited to the following:

a) Vehicular crossings (including kerb reinstatement of redundant vehicular crossings)
b) Concrete footpaths and/or cycleways
c) Road opening for utilities and stormwater (including stormwater connection to Penrith City Council roads and other Penrith City Council owned drainage)
d) Road occupancy or road closures
e) The placement of hoardings, structures, containers, waster skips, signs, etc in the road reserve
f) Temporary construction access

All works shall be carried out in accordance with the Roads Act approval, the development consent, including the stamped approved plans, and Penrith City Council's specifications, guidelines and best engineering practice.

Contact Penrith City Council's City Works Department on (02) 4732 7777 or visit Penrith City Council's website for more information.

Note:

a) Where Penrith City Council is the Certifying Authority for the development, the Roads Act approval for the above works may be issued concurrently with the Construction Certificate.

b) All works associated with the Roads Act approval must be completed prior to the issue of any Occupation Certificate or Subdivision Certificate as applicable.

33 A Construction Certificate is to be approved by the Certifying Authority for the provision of engineering works (roads, drainage, earthworks and other subdivision works).

Prior to the issue of any Construction Certificate, the Certifying Authority shall ensure that the engineering plans are consistent with the stamped approved concept plans prepared by J. Wyndham Prince, Plan No.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

978410/DA01 to 978410/DA11, revision B, dated 30/07/2018 and 31/07/2018, and that all subdivision works have been designed in accordance with the development consent, Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments, Engineering Construction Specification for Civil Works, Austroads Guidelines and best engineering practice.

The subdivision works may include but are not limited to the following:

- Public and private roads
- Stormwater management (quantity and quality)
- Interallotment drainage
- Private access driveways
- Sediment and erosion control measures
- Flood control measures
- Overland flow paths
- Traffic facilities
- Earthworks
- Bridges, culverts, retaining walls and other structures
- Landscaping and embellishment works

The Certifying Authority shall ensure that the engineering plans address the following requirements:

a) Provision of concrete turnaround facility for the basin access track to ensure Council's service vehicles can enter and exit the public road in a forward direction. The turnaround facility shall be designed to accommodate an 8.8m service vehicle.
b) Provision of temporary cul-de-sac heads at the ends of Road 104 and Road 105 for circulation of Council's waste collection vehicles. The turning heads shall be designed to accommodate Council's 12.5m heavy rigid vehicle with a minimum diameter of 20m and provision of guide posts around its perimeter.

The Construction Certificate must be supported by engineering plans, calculations, specifications and any certification relied upon.

Note:

a) Council's Development Engineering Department can provide this service. Contact Penrith City Council's Development Engineering Department on (02) 4732 7777 or visit Penrith City Council's website for more information.

34 Prior to the issue of any Construction Certificate, the Certifying Authority shall ensure that the proposed roads have been designed in accordance with Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments, Engineering Construction Specification for Civil Works and the following criteria:

Road No.	**Road Reserve Width**	**Carriageway Width**	**Verge Width**	**Footpath / Cycleway Width**	**ESA**
Road 101A (Ch 330 - End)	14.0m	12.0m	1.0m (both sides)	No footpath inside road boundary (both sides)	5×10^5

Document Set ID: 9964764
Version: 1, Version Date: 28/04/2021

Road 104 (Ch 214 - Ch 402)	12.8m	8.0m	1.0m (eastern side) 3.8m (western side)	No footpath inside road boundary (eastern side) 1.5m footpath (western side)	5 x 10^4
Road 105 (Ch 47.4 - End)	15.6m	8.0m	3.8m (both sides)	1.5m footpath (both sides)	5 x 10^4
Road 106 (Start - End)	15.6m	8.0m	3.8m (both sides)	1.5m footpath (both sides)	5 x 10^4

A copy of the pavement design prepared and certified by a suitably qualified geotechnical engineer must accompany the application for Construction Certificate.

35 A Stage 3 (detailed design) Road Safety Audit (RSA) shall be undertaken in accordance with Austroads Guide to Road Safety, Part 6: Road Safety Audit on the proposed roadworks by an accredited auditor who is independent of the design consultant. A copy of the RSA shall accompany the design plans submitted with the Construction Certificate or Roads Act application.

Prior to the issue of a Construction Certificate or Section 138 Roads Act approval, the Certifying Authority shall ensure that the recommendations of the RSA have been considered in the final design, through review of the Road Safety Audit Checklist, including Findings, Recommendations and Corrective Actions.

A copy of the Road Safety Audit shall be submitted to Penrith City Council by the applicant or Certifying Authority for information purposes.

36

The stormwater management system shall be provided generally in accordance with the Stormwater Compliance Letter prepared by J Wyndham Prince, reference 109784-10-Stage 4, dated 10 May 2018; the Highland Views updated MUSIC modeling dated 8 October 2018; and associated concept plan/s lodged for development approval, prepared by J. Wyndham Price, drawings 978410/DA01 to 978410/DA11, Revision B, dated 30 July and 31 July 2018 and **as amended in red**.

Engineering plans and supporting calculations for the stormwater management systems are to be prepared by a suitably qualified person and shall accompany the application for a Construction Certificate.

Where Council is not the certifying authority, an independent engineering consultant is to assess the final drainage plans and certify the stormwater quality requirements including MUSIC modelling meet the requirements of Council's WSUD Technical Guidelines.

Prior to the issue of a Construction Certificate, the Certifying Authority shall ensure that the stormwater management system has been designed in accordance with Council's Stormwater Drainage for Building Developments and Water Sensitive Urban Design Policies.

37 Prior to commencement of any works associated with the development, sediment and erosion control measures shall be installed in accordance with the approved Construction Certificate and to ensure compliance with the Protection of the Environment Operations Act 1997 and Managing Urban Stormwater series from the Office of Environment and Heritage.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

The erosion and sediment control measures shall remain in place and be maintained until all disturbed areas have been rehabilitated and stabilised.

38 Work on the subdivision shall not commence until:

- a Construction Certificate (if required) has been issued,
- a Principal Certifying Authority has been appointed for the project, and
- any other matters prescribed in the development consent for the subdivision and the Environmental Planning and Assessment Act and Regulation have been complied with.

A Notice of Commencement of works is to be submitted to Penrith City Council five (5) days prior to commencement of engineering works or clearing associated with the subdivision.

39 Street lighting is to be provided for all new and existing streets within the proposed subdivision to Penrith City Council's standards.

40 All earthworks shall be undertaken in accordance with AS 3798 and Penrith City Council's Design Guidelines for Engineering Works for Subdivisions and Developments and Engineering Construction Specification for Civil Works.

The level of testing shall be determined by the Geotechnical Testing Authority/Superintendent in consultation with the Principal Certifying Authority.

41 Soil testing is to be carried out to enable each lot to be classified according to AS 2870 "Residential Slabs and Footings". The results shall be submitted to Penrith City Council prior to the issue of the Subdivision Certificate.

42 Upon completion of all works in the road reserve, all verge areas fronting and within the development are to be turfed. The turf shall extend from the back of kerb to the property boundary, with the exception of concrete footpaths, service lids or other infrastructure which is not to be turfed over. Turf laid up to concrete footpaths, service lids or other infrastructure shall finish flush with the edge.

43 Prior to the issue of a Subdivision Certificate, the Principal Certifying Authority shall ensure that all works associated with a Section 138 Roads Act approval or Section 68 Local Government Act approval have been inspected and signed off by Penrith City Council.

44 Prior to the issue of a Subdivision Certificate, the Principal Certifying Authority shall ensure that all subdivision works required by this consent have been satisfactorily completed or that suitable arrangements have been made with Penrith City Council for any outstanding works.

45 Prior to the issue of a Subdivision Certificate, the Principal Certifying Authority shall ensure that the:

a) Stormwater management systems (including on-site detention and water sensitive urban design)

- Have been satisfactorily completed in accordance with the approved Construction Certificate and the

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

requirements of this consent.

- Have met the design intent with regard to any construction variations to the approved design.
- Any remedial works required to been undertaken have been satisfactorily completed.

Details of the approved and constructed system/s shall be provided as part of the Works-As-Executed drawings.

46 The Subdivision Certificate 88b instrument shall include a restriction as to user and positive covenant relating to the:

a) Stormwater management systems (including on-site detention and water sensitive urban design)

The restriction as to user and positive covenant shall be in Penrith City Council's standard wording as detailed in Penrith City Council's Stormwater and Drainage for Building Developments policy.

47 Prior to the issue of a Subdivision Certificate, and installation of regulatory / advisory linemarking and signage, plans are to be lodged with Penrith City Council and approved by the Local Traffic Committee.

Note:

a) Contact Penrith City Council's Engineering Services Department on (02) 4732 7777 for further information on this process.

b) Allow eight (8) weeks for approval by the Local Traffic Committee.

c) Applicable fees are indicated in Council's adopted Fees and Charges.

48 Prior to the issue of a Subdivision Certificate, an application for proposed street names must be lodged with and approved by Penrith City Council and the signs erected on-site.

The proposed names must be in accordance with Penrith City Council's Street Naming Policy.

Note:

a) Contact Penrith City Council's Engineering Services Department on (02) 4732 7777 for advice regarding the application process and applicable fees.

b) Allow eight (8) weeks for notification, advertising and approval.

49 Prior to the issue of a Subdivision Certificate, a bond for the final layer of outstanding asphalt works (AC Bond) is to be lodged with Penrith City Council.

The final layer of asphalt on all roads shall not to be placed without the written consent of Penrith City Council (consent will generally be provided when 80% of the housing within the subdivision has been completed).

The value of the bond shall be determined in accordance with Penrith City Council's adopted Fees and Charges.

Note:

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

a) Contact Penrith City Council's Engineering Services Department on (02) 4732 7777 for further information relating to bond requirements.

50 Prior to the issue of a Subdivision Certificate, an Outstanding Works Bond for the construction, landscaping and implementation of Basin 2 is to be lodged with Penrith City Council.

The Outstanding Works bond will be refunded once the stormwater management system works have been completed to Penrith City Council's satisfaction and a separate Maintenance Bond has been lodged with Penrith City Council.

The value of the bonds shall be determined in accordance with Penrith City Council's adopted Fees and Charges

Note:

a) Contact Penrith City Council's Engineering Services Department on (02) 4732 7777 for further information relating to bond requirements.

51 Prior to the issue of a Subdivision Certificate, a Maintenance Bond is to be lodged with Penrith City Council for all subdivision works.

The value of the bond shall be determined in accordance with Penrith City Council's adopted Fees and Charges.

Note:

a) Contact Penrith City Council's Engineering Services Department on (02) 4732 7777 for further information relating to bond requirements.

52 Prior to the issue of a Subdivision Certificate, the following compliance documentation shall be submitted to the Principal Certifying Authority. A copy of the following documentation shall be provided to Penrith City Council where Penrith City Council is not the Principal Certifying Authority:

a) Works As Executed (WAE) drawings of all civil works. The WAE drawings shall be marked in red on copies of the stamped Construction Certificate drawings signed, certified and dated by a registered surveyor or the design engineer. The WAE drawings shall be prepared in accordance with Penrith City Council's Engineering Construction Specification for Civil Works.

b) The WAE drawings shall clearly indicate the 1% Annual Excedence Probability flood lines (local and mainstream flooding).

c) The WAE drawings shall be accompanied by plans indicating the depth of cut / fill for the entire development site. The survey information is required to show surface levels and site contours at 0.5m intervals. All levels ate to be shown to AHD.

d) CCTV footage in DVD format to Penrith City Council's requirements and a report in "SEWRAT" format for all drainage as identified as Council's future assets. Any damage that is identified is to be rectified in

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

consultation with Penrith City Council.

e) A copy of all documentation, reports and manuals required by Section 2.6 of Penrith City Council's WSUD Technical Guidelines for handover of stormwater management facilities to Penrith City Council.

f) Surveyor's Certificate certifying that all pipes and services are located wholly within the property or within appropriate easements and that no services encroach boundaries, private or public lands.

g) Documentation for all road pavement materials used demonstrating compliance with Penrith City Council's Engineering Construction Specification for Civil Works.

h) A Geotechnical Report certifying that all earthworks and road formation have been completed in accordance with AS 3798 and Penrith City Council's Design Guidelines and Construction specifications. The report shall include:

- Compaction reports for road pavement construction
- Compaction reports for bulk earthworks and lot regarding.
- Soil classification for all residential lots
- Statement of Compliance

i) Structural Engineer's construction certification of all structures

j) A slope junction plan for interallotment drainage lines indicating distances to boundaries and depths.

k) Soil testing for each lot to be classified according to AS 2870 "Residential Slabs and Footings".

53 Prior to handover of WSUD assets, Council requires all of the following conditions to be met:

- The WSUD assets / measures are constructed and operate in accordance with the approved design specifications / parameters and any other specific design agreements previously entered into with Council
- The performance of the WSUD measure(s) has been validated, which must include the provision of a Performance Validation Report supporting the performance of the WSUD measure
- Where applicable, the build up of sediment has resulted in no more than a 10% reduction of operational volume asset inspections for defects have been completed and, if any defects are found, rectified to the satisfaction of Council
- The WSUD infrastructure is to the satisfaction of Council, structurally and geotechnically sound (this will require the submission of documents demonstrating that such infrastructure has been certified by suitably qualified persons)
- Design drawings have been supplied in a format acceptable to Council
- Works-as-executed (WAE) drawings have been supplied for all infrastructure in a format and level of accuracy acceptable to Council
- Other relevant digital files have been provided (e.g. design drawings, surveys, bathymetry, models, etc)
- Landscape designs have been supplied, particularly those detailing the distribution of functional vegetation, i.e. vegetation that plays a role in water quality improvement (clearance certificates from the landscape architect will need to be supplied)
- The condition of the infrastructure associated with the land complies with the approved design specification
- Filter media infiltration rates are within 10% of the rates of the design parameters for the filtration system concerned
- Comprehensive operation and maintenance manuals (including indicative costs) have been provided. The plan should include details on the following:

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

i. Site description (area, imperviousness, land use, annual rainfall, topography, etc)

ii. Site access description

iii. Likely pollutant types, sources and estimated loads

iv. Locations, types and descriptions of measures proposed

v. Operation and maintenance responsibility

vi. Inspection methods (including inspection checklists)

vii. Maintenance methods (frequency, equipment and personnel requirements)

viii. Landscape and weed control requirements

ix. Operation and maintenance costs

x. Waste management and disposal options

xi. Reporting

54 The bio-retention basin is to be maintained by the proponent as a sediment basin until 80% of housing construction is completed and retained in the ownership of the proponent during this period. After 80% of housing has been constructed the sediment basin is to be decommissioned and the bio-retention basin completed. After completion of the bio-retention basin has occurred, the proponent is to maintain the bio-retention basin for a period of 3 years after which time handover is permitted (see separate conditions relating to handover).

55 **Prior to the issue of a Construction Certificate**, the following information is to be submitted to Council for review:

- A detailed operation and maintenance manual which includes estimated costing
- Detailed construction plans including all calculations, drawings and designs which are consistent with the design parameters used in the modelling and approved concept designs from the Development Application

56 Handover of assets to Council will not occur until Council is satisfied that they are constructed in with the approved plans, conditions of approval and all certification requirements have been complied with:

a) Vegetated systems (e.g. bioretention measure/s) are required to remain 'on maintenance' for a minimum period of three (3) years or as otherwise approved and a performance-based inspection has been undertaken with Council.
b) The on-maintenance period for all vegetated systems can be considered as on-maintenance once 80% of dwellings are substantially completed within the development sub-catchment associated with the relevant treatment measure.
c) Certification is required to be provided for the installation of the filter media to demonstrate that the media complies with the approved specifications. At a minimum compliance is required with the "Guidelines for Soil Filter Media in Bioretention Systems" (Facility for Advancing Water Biofiltration).
d)Photographs of the construction of the vegetated system are required as part of certification. A minimum of one labelled, date stamped photograph is required to be provided following each of the following construction phases:

i. Installation of the overflow pit and bulking out / trimming profiling

ii. Installation of under drainage

iii. Installation of cleanout points

iv. Installation of drainage layer

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2021

v. Installation of transition layer

vi. Installation of filtration media

vii. Laying of geofabric protection for build-out phase

viii. Laying of turf temporary protection layer

ix. Final planting

A licensed surveyor is required to undertake an 'as constructed' survey of the bioretention device elements. The survey data is to demonstrate that design grades and levels have been achieved to the required tolerances. A copy of the survey is required to be lodged as part of the certification.

57 Sight lines at road intersections are not to be compromised by crests in adjacent future subdivision stages and are to be in accordance with Austroads Guidelines and Australian Standards.

58 Future dwelling construction must ensure that driveways are not situated within 10m of intersections.

59 Prior to the issue of a Subdivision Certificate, an Outstanding Works Bond is to be lodged with Penrith City Council for the construction of a shared path on the southern side of Road 106 from approximately Ch 75 to Ch 190, in accordance with the Development Control Plan for Glenmore Park Stage 2. The bond shall be refunded when the rezoning proposal for Glenmore Park Stage 3 is approved and the amended shared path network for the subdivision finalized. If the rezoning proposal is not approved, the shared path shall be constructed in accordance with the current Development Control Plan for Glenmore Park Stage 2.

Landscaping

60 All landscape works are to be constructed in accordance with the stamped approved plans and Sections C6 Landscape Design of Penrith Council's Development Control Plan 2014.

61 The approved landscaping for the site must be constructed by a suitably qualified and experienced landscape professional.

62 All plant material associated with the construction of approved landscaping is to be planted in accordance with the Tree Planting Specification prescribed in Penrith Development Control Plan 2014.

63 All landscape works are to meet industry best practice and the following relevant Australian Standards:

- AS 4419 Soils for Landscaping and Garden Use,
- AS 4454 Composts, Soil Conditioners and Mulches, and
- AS 4373 Pruning of Amenity Trees.

Document Set ID: 9964764
Version: 1, Version Date: 28/04/2022

Subdivision

64 **Prior to the issue of a Subdivision Certificate**, the original Linen Plan and six (6) copies shall be submitted. The Linen Plan must indicate that:

a) It is intended to dedicate all new roads to the public as road.

All required drainage easements, rights of way, restrictions and covenants are to be included on the linen plan.

All dedications of roads/drainage are to be undertaken at no cost to Penrith City Council.

The following information is to be shown on one (1) copy of the plan.

- The location of all buildings and/or other permanent improvements shall comply with any statutory boundary clearances or setbacks as defined by the Building Code of Australia and Council's resolutions.
- All existing services are wholly contained within the lot served and/or covered by an appropriate easement.

65 The linen plan of subdivision is to be supported by an 88B instrument creating the following:

a) Easements for support - the provision of an easement for support to cover any retaining walls or embankments that extend into the lots if the batters are steeper than 5:1.
b) Residue allotments restriction - no development or building shall be allowed or be permitted to remain on the named lot unless satisfactory arrangements have been made with Penrith City Council for services water, sewer, electricity and telephone, any outstanding contributions or consolidation with adjoining lots.
c) Easements for maintenance and repair 900mm wide benefitting lots with zero lot lines.
d) Restriction regarding future housing compliance with the Highland Views Design Guidelines.
e) Restriction regarding nomination of lots requiring stepped building designs as per the Highland Views Design Guidelines.
f) Restriction regarding single storey construction on Lots 442-451to provide a suitable transition at the rural interface.

66 **Prior to the issue of a Subdivision Certificate,** street trees are to be planted in accordance with the stamped approved plans.

67 A Surveyor's Certificate is to be lodged with the application for a Subdivision Certificate that certifies that all pipes and services are located wholly within the property or within appropriate easements and that no services encroach boundaries.

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

Section 94

68 This condition is imposed in accordance with the ***Glenmore Park Stage 2 Voluntary Planning Agreement No. 2.*** Based on the current rates detailed in the accompanying schedule attached to this Notice, $796,725.00 is to be paid to Council **prior to a Subdivision Certificate being issued** for this development (the rates are subject to quarterly reviews). If not paid within the current quarterly period, this contribution will be reviewed at the time of payment in accordance with the VPA.

Council should be contacted prior to payment to ascertain the rate for the current quarterly period. The invoice accompanying this consent should accompany the contribution payment.

Payment of Fees

69 All roadworks, dedications and drainage works are to be carried out at the applicant's cost.

70 Prior to the commencement of any works on site, all fees associated with Penrith City Council-owned land and infrastructure shall be paid to Council. These fees include Road Opening fees and Infrastructure Restoration fees.

Certification

71 A Subdivision Certificate is to be obtained **prior to the release of the linen plan of subdivision**. The Subdivision Certificate will not be issued if any of the conditions in this consent are outstanding.

72 Prior to the commencement of any earthworks or construction works on site, the proponent is to:
(a) employ a Principal Certifying Authority to oversee that the said works carried out on the site are in accordance with the development consent and related Construction Certificate issued for the approved development, and with the relevant provisions of the Environmental Planning and Assessment Act and accompanying Regulation, and
(b) submit a Notice of Commencement to Penrith City Council.

The Principal Certifying Authority shall submit to Council an "Appointment of Principal Certifying Authority" in accordance with Section 81A of the Environmental Planning and Assessment Act 1979.

Information to accompany the Notice of Commencement
Five (5) days before any earthworks or construction/demolition works are to commence on site (including the clearing site vegetation), the proponent shall submit a "Notice of Commencement" to Council in accordance with Section 81A of the Environmental Planning and Assessment Act 1979.

Document Set ID: 9967061
Version: 1, Version Date: 28/04/2021

SIGNATURE

Name:	Lauren Van Etten
Signature:	

For the Development Services Manager

Document Set ID: 9967064
Version: 1, Version Date: 28/04/2022

PENRITH
CITY COUNCIL

Our Reference: DA20/0782
Contact: Lauren Van Etten
Telephone: +612 4732 8222

1 February 2021

Vianello Holdings Pty Ltd
PO Box 4099
PENRITH PLAZA NSW 2750

Dear Sir/Madam

Development Application No.: DA20/0782
Proposed: Torrens Title Subdivision into 104 Residential Lots, 1 Public Reserve Lot, 1 Drainage Corridor Lot, 3 Residue Lots, including Bulk Earthworks, Construction of New Roads, Landscaping in Street and Riparian Corridor, Retaining Walls, Stormwater Management Works and New Services (Stages 7-9, Precinct H, Glenmore Park Stage 2)
Address: 2183 The Northern Road MULGOA NSW 2745

A preliminary assessment of your Development Application has been undertaken and I wish to advise that the following issues have arisen for your consideration and action:

Planning Matters

1. There are biodiversity corridor planting works within Annexure D of the Glenmore Park Stage 2 Voluntary Planning Agreement that are required to be completed prior to the date on which a subdivision certificate is issued for the 225th residential lot in respect of any part of the land owned by Vianello. Given the number of said lots with this application exceeds the 225th residential lot, such revegetation works shall be incorporated into the subject application.
2. A vegetation management plan is required to provide the a revegetation plan of the corridor in relation to the aforementioned VPA requirements and in accordance with the NSW Office of Water guidelines (7.4.3.1.1 (5) of the DCP). This VMP shall consider the bushfire report's APZ's as well and any implications this has on planting. Refer to the biodiversity comments below for further details.
3. There are also works within Annexure E of the Second Voluntary Planning Agreement that are required to be undertaken prior to the issue of any Subdivision Certificate for a stage of development that either includes or is in immediate proximity to the relevant contribution works. These works include but are not exclusive to the corridor edge park and neighbourhood (pinnacle) park. Such works shall also be incorporated into the subject application's plans.
4. The proposed subdivision is not considered to be generally in accordance w the requirements of the concept plan. The road pattern design differs from th concept plan with a reduction resulting within both the riparian corridor and th neighbourhood park. The riparian/open space reductions have not been fully addressed in the application and the reduction is inconsistent with the Volunt Planning Agreement and not supported.

Document Set ID: 9567761
Version: 1, Version Date: 03/02/2021

5. The proposed subdivision also differs from the concept plan as residential lo depths across all stages have reduced. This causes the steep slopes further discussed below, warrants a number of retaining walls and indicates the num of lots is an overdevelopment and warrants a reduction and redesign.
6. The concept plan variation is also particularly concerning for the proposed su lots given their potential to accommodate a number of terraces has now reduced. In accordance with 7.4.2.3, B, 4) of the DCP, any creation of 'super lots' and residue parcels will specify the minimum dwelling yield that those lo will be required to deliver. Given these are the last stages of Highland Views detailed demonstration is required that the proposed lot diversity will be suita met as part of a future development application (7.4.2.3, B, 5).
7. It is noted that the number of apartments/studios provided across Precincts G and H as a whole will not comply with the concept plan and you are requested reiterate your overall intentions in this regard.
8. Lot 753 and 719 are inconsistent with the concept plan and not supported for the following reasons. While they relate to plans regarding the GP3 planning proposal, it is noted that this is at gateway stage and the plans are not yet finalized. Therefore to plan around the draft GP3 layout is premature and not supported. Further, in bushfire prone areas, the perimeter of a subdivision is typically a road for bushfire protection and the bushfire report submitted even recommends one. In addition, to retain a perimeter road and associated stre tree planting will retain view sheds form The Northern Road.
9. Clarification is sought as to where the bus stop required by the DCP will be located within Precinct H.
10. There are a number of lots that have a side slope in excess of 5% (including not exclusive to 701, 702, 706, 708, 715, 716, 764). In accordance with the DCP, 2.1.3, lots with a front to back slope exceeding 9% or a side cross slop exceeding 5%, must respond to the slope of the land with either split level, dr edge beam, or bearer and joist design (or a combination of these). You are requested to reconfigure the subdivision layout and/or remove lots to reduce slope on steep lots. In addition, there are other lots where the slope cannot b calculated given the batters shown on the plans. A plan without the batter leve shall be provided to clarify the precise slopes.
11. Regarding Stage 7A, sections are required showing the level differences alo the northern interface given there are existing boundary retaining walls. In addition, given retaining walls are proposed and a tiered arrangement is like to result, you are requested to readjust the proposes earthworks so there is r need for additional retaining walls along the northern boundaries. This is due concerns regarding tiered retaining walls affecting available open space, like shadows due to orientation and the visual amenity impacts. In addition, levels the adjoining properties to the north are requested on the civil plans in order understand the interface level differences and likely impacts.
12. The retaining walls proposed along street frontages are inappropriate and sh be removed. In addition, the retaining walls surrounding 709-711 indicate an inappropriate response to topography and the layout here shall be adjusted and/or remove a lot.
13. Any remaining retaining walls in the amended design shall be shown in secti form to detail their heights.
14. In accordance with 7.4.3.2.4, B, c) of the DCP, separate pathways will operate within parks and open spaces areas as well as the locations identified at Figure E7.23. These pathways shall be shown on the plans. In addition, j) bicycle racks are to be provided as part of all developments that attract significant public patronage. Pedestrian paths and cycleways that are located within the riparian corridor must be in accordance with the Department of Water and Energy's 'Design and Construction of Paths, Cycleways and Accessways along Watercourses and Riparian Area Guideline 2007'.
15. Clarification is sought from the bushfire consultant confirming that the corridor vegetation planting, tree species and spacing are appropriate in bushfire prone land.

Document Set ID: 9567761
Version: 1, Version Date: 08/02/2021

16. The asset protection zone will need to be revised to reflect works within the riparian corridor and pinnacle park and outline any APZ's required west of the corridor as well as east. In addition, the revised asset protection zone shall not encroach upon any E2 zoned land. This is raised regarding the north-eastern E zoned land as shown in the bushfire report.
17. A site plan is required which shows the current earth mound levels along The Northern Road in relation to the proposed subdivision levels, in order to understand the visibility of the subdivision from The Northern Road. View line analysis are also requested in this regard**,** noting what was submitted at concept plan stage did not accurately reflect the detailed design submitted as part of this application.
18. A plan is requested showing all street tree species that have been planted in Precincts G and H in order to understand the relation between what is proposed and what has been actually planted.

Biodiversity Matters

- The site map indicates proposed works within a biodiversity values mapped area. Under the Biodiversity Conservation Act 2016 and Regulations 2017, a Biodiversity Assessment Report (BDAR) prepared by an accredited assessor must accompany this application.
- Within this report, in the onward Biodiversity assessment of this application priority will need to be given to the strategy to avoid additional biodiversity impacts. It is recommended that this take into account the full extent of the mapped vegetation to the northern boundary of the subject site. Connecting the planned restoration area to the east and Pinnacle Park.
- Both trees marked for removal will require formal assessment, with the aim that they also be avoided and protection measures outlined in the BDAR.
- On biodiversity grounds, further infrastructure or works should not be planned or approved within an E2 zone.
- The dam to the south of the subject site is also mapped on the Biodiversity Values Map. Indirect and prescribed impacts on this area will need to be assessed and mitigation measures clearly outlined.
- The BDAR will also need to assess the extent of native vegetation within the subject site, including native grasses and ground cover affected by the plans, in addition to surveying for protected native fauna that might be impacted by the proposed development. The assessment will need to cater for the full extent of the construction footprint. The APZ management requirements cannot impact on areas mapped for restoration. Redesign may be required to ensure the management of these areas are not in conflict.
- The full extent of APZ requirements, subject to the RFS GTAs will need to be taken into consideration.
- The BDAR should include mitigation measures for the protection of native fauna prior to works commencing.
- The Vegetation Management Plan, associated with both the riparian corridor and the vegetation corridor along the northern boundary will need to be submitted for review for onward assessment. It is recommended that the first stage of treatments be planned to implementation prior to works commencing. The plan will need to be prepared by and later implemented by an appropriately qualified professional for a minimum of 5 years, with maintenance in perpetuity. Annual reporting and an evaluation at the end of the first 5 years to confirm the prescribed goals have been met. Should this not be the case, a second term of 5 years will need to be allowed for.
- Measures to protect the remnant native vegetation within Pinnacle Park will also need to be considered.
- There is also concern that the current treatment of the waterway through Surveyors Creek is in contradiction to earlier indications for the restoration of the riparian corridor. Consideration of the storm water and pollutants

Document Set ID: 9567761
Version: 1, Version Date: 08/02/2021

entering this system, relative to SREP 20 will also require consideration, in addition to sediment controls to protect all water bodies during works.

Stormwater Drainage

1. The Stormwater Management Strategy Report shall be amended to reflect Council's preferred option being Option 1 for treating sub-catchments MU10 & MU11 (note: Option 1 was previously endorsed by Development Engineering and Waterways as part of the CC/SWC assessment for Highland Views Stage 4). The works associated with Option 1 shall also be noted on the engineering plans.
2. The soil and water management plan (Sheet No. DA005) shall be amended to show the proposed location/s of temporary sediment basins for the subdivision works as the existing Basin 2 is already online as a detention basin, or demonstrate how the existing Basin 2 can be used as a sediment basin.

Waterways

1. The stormwater report and associated Operation and Maintenance Manual should be updated to include details as to how the existing constructed raingarden will be safeguarded from sedimentation during the proposed development works as well as details around the monitoring of any adverse impacts to the raingarden.
2. The latest electronic version of the MUSIC Modeling should be submitted in support of this application.

Traffic & Access

1. A Stage 2 Road Safety Audit shall be submitted with the application.
2. Elsholz kerb shall be provided on the western side of Road 112 if the risk score is higher than 1.5 due to the batter within the riparian corridor in accordance with Autroads Guide to Road Design. This is consistent with the current CC/SWC assessment for Highland Views Stage 6.
3. Batter grades shall be provided for the batters within the drainage corridor adjoining Road 112 and Road 108 for clarity.
4. The limit of works at the southern end of Road 122 shall be extended to allow a vehicle to reverse out of Lot 719.
5. Most pram ramps are located too far from kerb returns and shall be located in accordance with Council standard drawing SD1002 whilst maintaining a desirable 1.0m clearance from any stormwater lintels.
6. The pram ramp crossing on Road 118 at approximately Ch 116 shall be deleted.
7. A pram ramp shall be provided on the north side of Road 113 at approximately Ch 147.
8. Pram ramps shall be provided at the intersections of Road 113 / Road 122 and Road 108 / Road 121 for future connection.
9. A footpath shall be provided on the western side of Road 112 unless the applicant can provide sufficient justification for deleting the footpath. It appears this was overlooked on previous stages, however it's unclear why the footpath has been omitted.
10. A footpath link shall be provided at the southern end of the drainage corridor on the north side of Road 108 for future connection. A pram ramp crossing shall also be provided at the intersection of Road 112 and Road 108.
11. Please clarify the reason for a 7.3m wide carriageway instead of a 7.0m wide carriageway on Road 108.
12. A temporary cul-de-sac head shall be provided at the southern end of Road 122 for circulation of Council's waste collection vehicle with a minimum diameter of 20m.

Document Set ID: 9567761
Version: 1, Version Date: 08/02/2021

1. An updated Geotechnical and Salinity Assessment Report shall be submitted with the application as the report by Geotechnique Pty Ltd is 5 years old. As a minimum, the geotechnical engineer shall undertake a site inspection to confirm that the findings of the report are still valid and update the report accordingly.
2. The Geotechnical Report by Geotechnique Pty Ltd is missing attachments, including Drawing No. 13602/1-AA1, CBR test results and SGS laboratory results. Please provide all attachments with the updated report.
3. Written owner's consent shall be provided for the proposed retaining walls on existing residential boundaries. Even though the walls are wholly located within the development site, the footings may encroach the neighbouring properties and access will be required to the neighbouring properties to construct the walls. As such, owner's consent is required as part of the development application.
4. It's unclear if the label for retaining wall 11 (RW11) on the engineering plans is for the northern boundary of Lot 707 or the rear boundaries of Lots 707 & 708. Please amend or clarify.

Land Contamination

1. The Statement of Environmental Effects outlines that reports were prepared in 2001 and 2003, and that no areas of concern were found within the site and refers to a Validation Report that has been prepared and submitted with the application.
2. This Validation Report, titled 'Site Remediation and Validation Report Highland Views: Stage 4, Glenmore Park NSW', documents the findings of investigations carried out to validate remediation works carried out in Stage 4, which included encapsulating asbestos impacted materials in a containment cell located adjacent to land that is the subject of the current application.
3. The Validation Report also made reference to a number of historic reports that were prepared for parts of Glenmore Park Stage 2, including a Preliminary Contamination Assessment (PCA) (prepared by Geotechnique Pty Ltd, dated 14 December 2015), and a Detailed Site Investigation (prepared by SESL Australia Pty Limited, dated 23 March 2018, and dated 2 July 2018) that addressed Stages 4 to 9 of Highland Views.
4. The findings of the Detailed Site Investigation did satisfactorily address the areas of concern identified as relevant to Stages 7, 8 and 9. However, the area that was investigated does not entirely correspond to the area to be developed as a part of this application, shown as the red hashed area marked as 'Site of Works' on the Cover Sheet (Plan No. 9784-13-DA001) of the plans submitted.
5. Therefore, a Detailed Site Investigation is required to prepared by a suitably qualified environmental consultant that addresses that area of Stages 7, 8 and 9 that has not yet been assessed (as noted above). This investigation is to consider the relevant EPA guidelines and the National Environment Protection (Assessment of Site Contamination) Measure 2013, and confirm that the site is suitable for the proposed residential land use.
6. Should remediation works be found to be required, then this application is to seek consent for these works, with a Remedial Action Plan prepared by a suitably qualified environmental consultant also required to be prepared and submitted to Council for approval prior to determination.

Acoustic Impacts

Document Set ID: 9857761
Version: 1, Version Date: 08/02/2021

1. The Statement of Environmental Effects does not address the potential noise impacts on the development associated with the traffic movements on the Northern Road, or the two collector roads that are part of this proposal (the East West Collector Road - Road 108, or Riverflat Drive).
2. Given the potential traffic volumes to be carried by these roadways, as well as their proximity to future dwellings, the application is to be supported by an Acoustic Report prepared by a suitably qualified acoustic consultant that addresses noise traffic intrusion on the proposed lots. The report is to give consideration to current and future traffic volumes, as well as anticipated dwelling constructions and building footprints, and make recommendations to ensure that future dwellings are not impacted by traffic noise.
3. Further to the above, I note that a Construction Noise & Vibration Assessment and Management Plan will be sought through conditions of consent to address the potential impacts associated with the construction works proposed as a part of the application.

Outstanding Referrals

1. Once a response from the Rural Fire Service is received you will be contacted as soon as possible.
2. No submissions have been received to date. The adjoining properties to the south have been notified for an additional two weeks given they were not sent notification initially as an administrative error. If any submissions are received by 1 March you will be advised.

Given the requests above warrant substantial redesign and extensive additional documentation, including but not exclusive to a detailed park design, a vegetation management plan, a road safety audit, an acoustic report and a detailed site investigation, you are requested to withdraw the application until such time as all aforementioned issues are resolved. A meeting can be held to discuss these matters as well. You are requested to withdraw the application by **1 March 2021**. Should this application not be withdrawn by this date, Council will proceed to determine the development application based on the information already submitted, resulting in a refusal.

Should you have any further queries on this matter, please contact me on +612 4732 8222.

Yours sincerely

Lauren Van Etten
Environmental Planner

Document Set ID: 9567761
Version: 1, Version Date: 23/02/2021

NSW RURAL FIRE SERVICE

Penrith City Council
PO Box 60
PENRITH NSW 2751

Your reference: DA20/0782 (CNR-15349)
Our reference: DA20201204004546-CL55-2

ATTENTION: Penrith City Council

Date: Tuesday 15 February 2022

Dear Sir/Madam,

Integrated Development Application
s100B – Subdivision – Torrens Title Subdivision
2183 The Northern Road Mulgoa NSW 2745, 601//DP1261921

I refer to your correspondence dated 02/02/2022 seeking general terms of approval for the above Integrated Development Application.

The New South Wales Rural Fire Service (NSW RFS) has reviewed the submitted amended information. General Terms of Approval are now re-issued, under Division 4.8 of the *Environmental Planning and Assessment Act 1979*, and a Bush Fire Safety Authority, under section 100B of the *Rural Fires Act 1997*, are now issued subject to the following conditions.

Asset Protection Zones
The intent of measures is to provide sufficient space and maintain reduced fuel loads so as to ensure radiant heat levels of buildings are below critical limits and to prevent direct flame contact with a building. To achieve this, the following conditions shall apply:

1. At the issue of a subdivision certificate, and in perpetuity to ensure ongoing protection from the impact of bush fires, the entirety of the proposed residential lots within Stage 7a, 7b, 8a and 8b of Precinct H within the Glenmore Park Stage 2 release area, must be managed as an inner protection area (IPA) in accordance with the requirements of Appendix 4 of *Planning for Bush Fire Protection 2019*. When establishing and maintaining an IPA the following requirements apply:

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2 metres above the ground;
- tree canopies should be separated by 2 to 5 metres;
- preference should be given to smooth barked and evergreen trees;
- large discontinuities or gaps in vegetation should be provided to slow down or break the progress of fire towards buildings;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and

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NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address
NSW Rural Fire Service
4 Murray Rose Ave
SYDNEY OLYMPIC PARK NSW 2127

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www.rfs.nsw.gov.au

Document Set ID: 9913701
Version: 1, Version Date: 16/02/2022

- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

2. At the issue of a subdivision certificate, and in perpetuity to ensure ongoing protection from the impact of bush fires, asset protection zones must be provided as shown in Figure 4: Bushfire Hazard Analysis and Asset Protection Zone of the bushfire assessment report prepared by Peterson Bushfire (Ref: 17138, dated 8 April 2021). A restriction to the land use pursuant to section 88B of the *Conveyancing Act 1919* shall be placed on any undeveloped part of the Residue Lot 701 surrounding the subdivision for the purpose of a 50 metre wide temporary asset protection zone (APZ) in accordance with Appendix 4 of *Planning for Bush Fire Protection 2019*. The restriction to land use for the purpose of a temporary asset protection zone may be extinguished upon commencement of future development over the affected areas. The name of authority empowered to release, vary or modify any instrument shall be Penrith City Council.

The APZ must be managed as an inner protection area (IPA). When establishing and maintaining an IPA the following requirements apply:

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2 metres above the ground;
- tree canopies should be separated by 2 to 5 metres;
- preference should be given to smooth barked and evergreen trees;
- large discontinuities or gaps in vegetation should be provided to slow down or break the progress of fire towards buildings;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

3. At the issue of a subdivision certificate, and in perpetuity to ensure ongoing protection from the impact of bush fires, the southern portion of Pinnacle Park within Stage 7a of Precinct H within the Glenmore Park Stage 2 release area, must be managed in accordance with the Vegetation Management Plan (prepared by Australian Wetlands Consulting, Job no. 3-17857, revision G, dated 14 December 2021).

Access – Public Roads

The intent of measures is to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area. To achieve this, the following conditions shall apply:

4. Access roads must comply with the following general requirements of Table 5.3b of *Planning for Bush Fire Protection 2019* and the following:

- are two-way sealed roads with minimum 8 metre carriageway width kerb to kerb;
- a minimum vertical clearance of 4 metre to any overhanging obstructions, including tree branches, is provided;
- are through roads, and these are linked to the internal road system at an interval of no greater than 500 metre;
- parking is provided outside of the carriageway width;
- subdivisions of three or more allotments have more than one access in and out of the development;
- traffic management devices are constructed to not prohibit access by emergency services vehicles;
- maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient;
- curves of roads have a minimum inner radius of 6 metre;

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Document Set ID: 9913709
Version: 1, Version Date: 16/02/2022

- the capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles; bridges/causeways are to clearly indicate load rating.
- hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression; and
- hydrants are provided in accordance with the relevant clauses of *AS 2419.1:2005 - Fire hydrant installations System design, installation and commissioning*.

5. At each stage of the subdivision, temporary turning heads must be provided to temporary dead end roads incorporating either a minimum 12 metre radius turning circle or turning heads compliant with A3.3. Vehicle turning head requirements of *Planning for Bush Fire Protection 2019*. The turning areas may be removed upon opening of future proposed through roads.

Water and Utility Services

The intent of measures is to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building. To achieve this, the following conditions shall apply:

6. The provision of water, electricity and gas must comply with the following in accordance with Table 5.3c of *Planning for Bush Fire Protection 2019*:

- reticulated water is to be provided to the development where available;
- all above-ground water service pipes are metal, including and up to any taps;
- where practicable, electrical transmission lines are underground;
- where overhead, electrical transmission lines are proposed as follows:

a. lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and
b. no part of a tree is closer to a power line than the distance set out in accordance with the specifications in *ISSC3 Guideline for Managing Vegetation Near Power Lines*.

- reticulated or bottled gas is installed and maintained in accordance with *AS/NZS 1596:2014* and the requirements of relevant authorities, and metal piping is used.

General Advice – Consent Authority to Note

- Development applications lodged on lots created within this subdivision may be subject to further assessment under the *Environmental Planning & Assessment Act 1979*. Future dwellings on bush fire prone land are required to address the requirements of *Planning for Bush Fire Protection 2019*.

- The revegetation within Surveyors Creek Riparian Corridor and Green Corridor to the northeast of Stage 7a must be managed in accordance with the Vegetation Management Plan (prepared by Australian Wetlands Consulting, Job no. 3-17857, revision G, dated 14 December 2021). It is advised that the proposed revegetation within these corridors must maintain the fuel loads equivalent to Woodland i.e. 10.5 and 20.2 t/ha in perpetuity.

- This assessment has reviewed the Stage 7 and 8 Public Domain Plans (prepared by Scott Carver, Ref: 20150139, dated 16 December 2021) and raises no objection subject to the above recommended conditions.

This letter is in response to an assessment of the application based on the submitted further information and supersedes our previous general terms of approval dated 11/08/2021.

For any queries regarding this correspondence, please contact Rohini Belapurkar on 1300 NSW RFS.

Yours sincerely,

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Document Set ID: 9913709
Version: 1, Version Date: 16/02/2022

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Document Set ID: 9913709
Version: 1, Version Date: 16/02/2022

NSW RURAL FIRE SERVICE

BUSH FIRE SAFETY AUTHORITY

Subdivision – Torrens Title Subdivision
2183 The Northern Road Mulgoa NSW 2745, 601//DP1261921
RFS Reference: DA20201204004546-CL55-2
Your Reference: DA20/0782 (CNR-15349)

This Bush Fire Safety Authority is issued on behalf of the Commissioner of the NSW Rural Fire Service under s100b of the Rural Fires Act (1997) subject to the attached General Terms of Approval.

This authority supersedes the previous Bush Fire Safety Authority DA20201204004546-CL55-1 issued on 11/08/2021 and confirms that, subject to the attached reissued General Terms of Approval being met, the proposed development will meet the NSW Rural Fire Service requirements for Bush Fire Safety under *s100b of the Rural Fires Act 1997.*

DRAFT

Kalpana Varghese
Supervisor Development Assessment & Plan
Built & Natural Environment

Tuesday 15 February 2022

Document Set ID: 9913709
Version: 1, Version Date: 16/02/2022

Natural Resources Access Regulator

Contact: Gina Potter
Phone:
Email: Gina.Potter@nrar.nsw.gov.au

Our ref: IDAS1130380
Our file: CNR-15349 A-17762
Your ref: DA20/0782

General Manager
Penrith City Council
Att: The General Manager
PO Box 60
PENRITH NSW 2751

Attention: concurrence.referral@penrith.city

18 December 2020

Dear Sir/Madam

Re: Integrated Development Referral – General Terms of Approval
Dev Ref: DA20/0782
Description: Torrens Title Subdivision into 104 Residential Lots, 1 Public Reserve Lot, 1 Drainage Corridor Lot, 3 Residue Lots, including Bulk Earthworks, Construction of New Roads, Landscaping in Street and Riparian Corridor, Retaining Walls, Stormwater Management Works and New Services (Stages 7-9, Precinct H, Glenmore Park Stage 2)
Location: 2183 THE NORTHERN ROAD GLENMORE PARK 2745

I refer to your recent letter regarding an integrated Development Application (DA) proposed for the above location. Attached, please find Natural Resources Access Regulator's General Terms of Approval (GTA) for part of the proposed development requiring a Controlled Activity approval under the *Water Management Act 2000* (WM Act), as detailed in the subject DA.

Please note Council's statutory obligations under section 4.47 of the *Environmental Planning and Assessment Act 1979* (EPA Act) which requires a consent, granted by a consent authority, to be consistent with the general terms of any approval proposed to be granted by the approval body.

If the proposed development is approved by Council, NRAR requests these GTA be included (in their entirety) in Council's development consent. Please also note NRAR requests notification:

- if any plans or documents are amended and these amendments significantly change the proposed development or result in additional works or activities (i) in the bed of any river, lake or estuary; (ii) on the banks of any river lake or estuary, (iii) on land within 40 metres of the highest bank of a river lake or estuary; or (iv) any excavation which interferes with an aquifer.

  NRAR will ascertain from the notification if the amended plans require review of or variation/s to the GTA. This requirement applies even if the amendment is part of Council's proposed consent conditions and do not appear in the original documentation.

Document Set ID: 9024730
Version: 1, Version Date: 21/12/2020

Document Set ID: 9424730
Version: 1, Version Date: 27/02/2020

- if Council receives an application under s96 of the EPA Act to modify the development consent and the modifications change the proposed work or activities described in the original DA.
- of any legal challenge to the consent.

As the proposed work or activity cannot commence before the applicant applies for and obtains an approval, NRAR recommends the following condition be included in the development consent:

The attached GTA issued by NRAR do not constitute an approval under the *Water Management Act 2000*. The development consent holder must apply to NRAR for a Controlled Activity approval **after consent** has been issued by Council **and before** the commencement of any work or activity.

A completed application form must be submitted to NRAR together with any required plans, documents, application fee, security deposit or bank guarantee (if required) and proof of Council's development consent. Finalisation of an approval can take up to eight (8) weeks from the date the application and all required supporting documentation is received.

Application forms are available from the NRAR website at:

www.industry.nsw.gov.au › Water › Licensing & Trade › Approvals.

NRAR requests that Council provide a copy of this letter to the development consent holder.

NRAR also requests a copy of the determination for this development application be provided by Council as required under section 91A (6) of the EPA Act.

Yours Sincerely

David Zerafa
Senior Water Regulation Officer
Water Regulatory Operations
Natural Resources Access Regulator

Document Set ID: 9424730
Version: 1, Version Date: 27/02/2020

Natural Resources Access Regulator

General Terms of Approval

for proposed development requiring approval under s89, 90 or 91 of the Water Management Act 2000

Reference Number:	IDAS1130380
Issue date of GTA:	18 December 2020
Type of Approval:	Controlled Activity
Description:	Torrens Title Subdivision into 104 Residential Lots, 1 Public Reserve Lot, 1 Drainage Corridor Lot, 3 Residue Lots, including Bulk Earthworks, Construction of New Roads, Landscaping in Street and Riparian Corridor, Retaining Walls, Stormwater Management Works and New Services (Stages 7-9, Precinct H, Glenmore Park Stage 2)
Location of work/activity:	2183 THE NORTHERN ROAD GLENMORE PARK 2745
DA Number:	DA20/0782
LGA:	Penrith City Council
Water Sharing Plan Area:	Greater Metropolitan Region Unregulated River Water Sources

The GTA issued by NRAR do not constitute an approval under the *Water Management Act 2000*. The development consent holder must apply to NRAR for the relevant approval **after development consent** has been issued by Council **and before** the commencement of any work or activity.

Condition Number	Details
	Design of works and structures
GT0009-00010	Before commencing any proposed controlled activity on waterfront land, an application must be submitted to Natural Resources Access Regulator, and obtained, for a controlled activity approval under the Water Management Act 2000.
	Erosion and sediment controls
GT0006-00001	The following plan(s): - Erosion and Sediment Controls Plan must be: A. prepared in accordance with Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004), as amended or replaced from time to time, and B. submitted with an application for a controlled activity approval.
GT0014-00007	A. The consent holder must ensure that any proposed materials or cleared vegetation, which may: i. obstruct water flow, or ii. wash into the water body, or iii. cause damage to river banks, are not stored on waterfront land, unless in accordance with a plan held by Natural Resources Access Regulator as part of a controlled activity approval. B. When the carrying out of the controlled activity has been completed, surplus materials must be removed from waterfront land.
GT0021-00004	The proposed erosion and sediment control works must be inspected and maintained throughout the construction or operation period of the controlled activity and must not be removed until the site is fully stabilised.
	Plans, standards and guidelines
GT0002-00680	A. This General Terms of Approval (GTA) only applies to the proposed controlled activity(s) described in the plans and associated documents found in Schedule 1, relating to Development Application as provided by Council to Natural Resources Access Regulator. B. Any amendments or modifications to the proposed controlled activity(s) may render the GTA invalid. If the proposed controlled activity is amended or modified, Natural Resources Access Regulator, Parramatta Office, must be notified in writing to determine if any variations to the GTA will be required.
GT0003-00019	The application for a controlled activity approval must include the following

Document Set ID: 9022730
Version: 1, Version Date: 21/12/2020

Reference Number:	IDAS1130380
Issue date of GTA:	18 December 2020
Type of Approval:	Controlled Activity
Description:	Torrens Title Subdivision into 104 Residential Lots, 1 Public Reserve Lot, 1 Drainage Corridor Lot, 3 Residue Lots, including Bulk Earthworks, Construction of New Roads, Landscaping in Street and Riparian Corridor, Retaining Walls, Stormwater Management Works and New Services (Stages 7-9, Precinct H, Glenmore Park Stage 2)
Location of work/activity:	2183 THE NORTHERN ROAD GLENMORE PARK 2745
DA Number:	DA20/0782
LGA:	Penrith City Council
Water Sharing Plan Area:	Greater Metropolitan Region Unregulated River Water Sources

	document(s): - outlet structures; Erosion and Sediment Control Plan; Vegetation Management Plan.
GT0010-00006	All documents submitted to Natural Resources Access Regulator as part of an application for a controlled activity approval must be prepared by a suitably qualified person.
GT0012-00004	Any proposed controlled activity must be carried out in accordance with plans submitted as part of a controlled activity approval application, and approved by Natural Resources Access Regulator.
GT0030-00006	The application for a controlled activity approval must include plans prepared in accordance with Natural Resources Access Regulator's guidelines located on the website https://www.industry.nsw.gov.au/water/licensing-trade/approvals/controlled-activities.

Rehabilitation and maintenance

GT0007-00001	When the proposed controlled activity is completed, and the rehabilitation plan has been implemented, maintenance of the site must be carried out for a period of 2 years in accordance with that rehabilitation plan submitted as part of the controlled activity approval, and approved by DPI Water.

Reporting requirements

GT0020-00004	The consent holder must inform Natural Resources Access Regulator in writing when the proposed construction of the controlled activity has been completed.

Document Set ID: 9022730
Version: 1, Version Date: 21/12/2020

SCHEDULE 1

The plans and associated documentation listed in this schedule are referred to in general terms of approval (GTA) issued by NRAR for integrated development associated with DA20/0782 as provided by Council:

- SEE
- Plans

Document Set ID: 9424730
Version: 1, Version Date: 27/02/2020



LEGEND

Subject Site

Lot Mix

Lot Type	Frontage	No. of Lots	%
Terrace + Semi-Detached	6.5m-9m	39	10%
Built to Boundary	9m-12.5m	182	49%
Detached Dwelling	15m-17m	151	41%
Total		**372**	**100%**

Precinct G + H Concept Plan
VIANELLO

NORTH

10 0 20 40 60 80 100 120 140 metres

Ref: CCLGP-1-001 | Date: 09/12/2015 | Revision: H | Scale: 1:1,000@A0

Note: All areas and dimensions subject to detailed survey

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Document Set ID: 9906021
Version: 1, Version Date: 29/08/2020

CCL DEVELOPMENT
specialist development management

WEDNESDAY, FEBRUARY 16, 2022

Lauren Van Etten
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M | PO Box 60, PENRITH NSW 2751

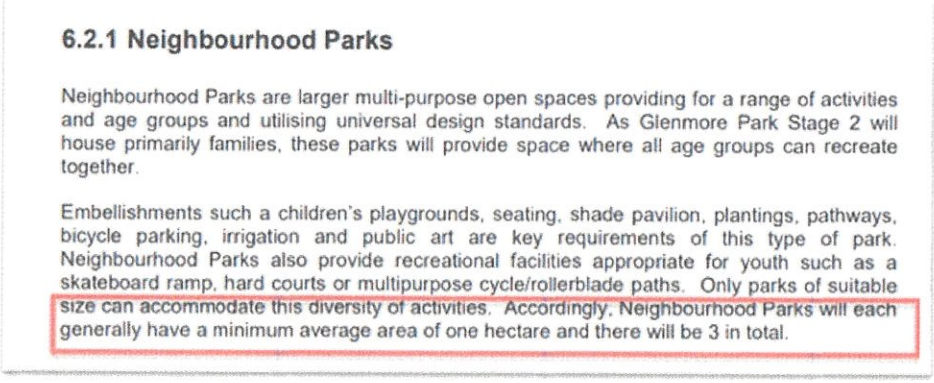
HIGHLAND VIEWS STAGES 7 & 8 – DA20/0782
PINNACLE PARK LAND SHORTFALL – ADDITIONAL EMBELLISHMENTS

Dear Lauren,

We are writing with regards to the Pinnacle Park design to be finalised for Highland Views, Glenmore Park Zone 2.

Pursuant to section 6.2.1. of the Contributions Plan, we note that the average size of neighbourhood parks should generally be 1ha. Our current design for the Pinnacle Park (south) will result in a land shortfall as follows:

- Existing Pinnacle Park (north): Lot 1 DP 1226168 – 0.5109 ha
- Proposed Pinnacle Park (south): 0.4435 ha
- **Land shortfall: 456sqm**



6.2.1 Neighbourhood Parks

Neighbourhood Parks are larger multi-purpose open spaces providing for a range of activities and age groups and utilising universal design standards. As Glenmore Park Stage 2 will house primarily families, these parks will provide space where all age groups can recreate together.

Embellishments such a children's playgrounds, seating, shade pavilion, plantings, pathways, bicycle parking, irrigation and public art are key requirements of this type of park. Neighbourhood Parks also provide recreational facilities appropriate for youth such as a skateboard ramp, hard courts or multipurpose cycle/rollerblade paths. Only parks of suitable size can accommodate this diversity of activities. Accordingly, Neighbourhood Parks will each generally have a minimum average area of one hectare and there will be 3 in total.

Further to ongoing discussions with the Local Infrastructure Contributions Working Group, we note that a VPA amendment is not required in this instance as the requirement of 1ha of parkland is not explicitly noted in the VPA agreements. A valuation has been completed for the shortfall of 456sqm by Cushman Wakefield dated 17 December 2021. This is for the sum of $160,000. We confirm that additional embellishment will be provided to Pinnacle Park for this value over and above the standard VPA requirements. We also confirm that Vianello Holdings will not seek to recover these costs from Council at the completion of works.

Please find enclosed supporting documentation related to this matter. Should you have any queries regarding the above, please contact the undersigned directly.

Kind regards,

Rachell Hewitt
DEVELOPMENT MANAGER

Emilio Vianello
VIANELLO HOLDINGS PTY LTD

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APPENDIX 1 – CUSHMAN WAKEFIELD VALUATION, DATED 17 DECEMBER 2021

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17 December 2021

Rachell Hewitt
Development Manager
CCL Development
580 High Street
Penrith NSW 2750

Via Email to: rachell@ccldevelopment.com.au

Dear Rachelle,

Matter: Pinnacle Park, Glenmore Park
Market Value of Dedication Land Shortfall (456m2)

Reliance & Purpose

This advice has been prepared for the private and confidential use of CCL Development and Penrith City Council for development contributions purposes.

It should not be relied on for any other purpose or by any other party not named herein and should not be reproduced in whole or part without the express written consent of Cushman & Wakefield.

Instructions

- Market Value assessment for the Pinnacle Park, Glenmore Park land area shortfall of 456m2.
- The valuation methodology and results to be consistent with IPART information paper – Contributions Plan Assessment: land costs, July 2020.

Information Provided

We have been provided with the following information.

- *Existing Land Zoning Map Penrith LEP 2010;*
- *Pinnacle Park Concept Design and;*
- *Pinnacle Park Correspondence with Penrith City Council; and*
- *Email from CCL Development of 27 August 2021.*

Property Specific Critical Assumptions and Conditions

1. Critical conditions/assumptions that we have made (or been instructed to make) which are specific to this advice, include, but are not limited to:

2. No environmental reports have been provided. Our assessment is made subject to the critical condition that the land to be transferred to Council is not contaminated.

Overview

3. The subject land was proposed to be included within Pinnacle Park, however it has now been identified that less park will be created and a shortfall of 456m2 will result.

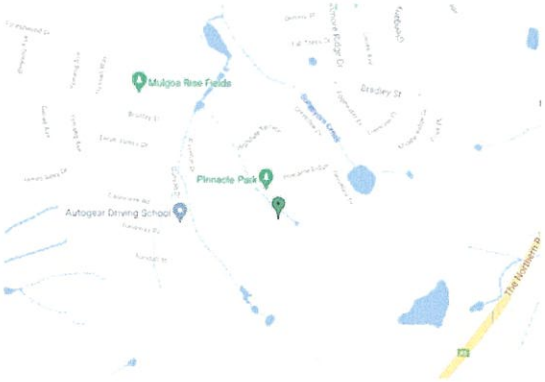
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Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

4. A pictorial indication as to the location of the subject property is shown by the locality maps below.



Source: Nearmap.com



Source: Nearmap.com

5. Glenmore Park is a predominantly residential locality situated to the south of the main Penrith CBD and is a master planned precinct commenced in the early 1990's.

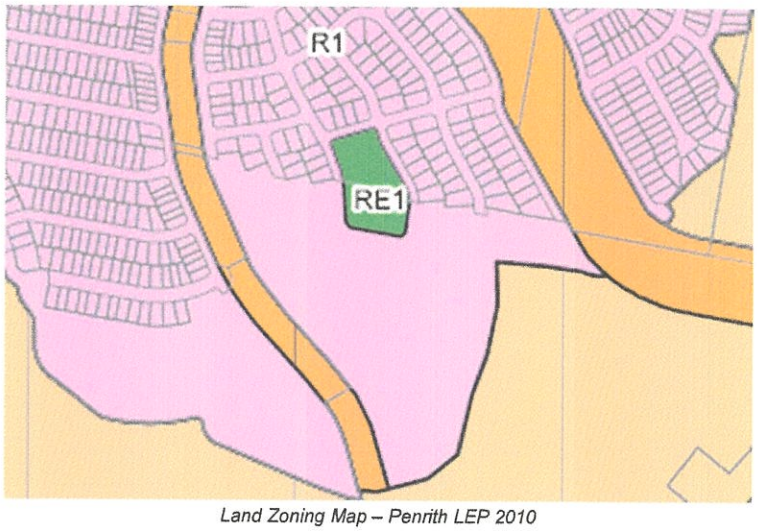
6. The locality is well located in close proximity to the CBD and major arterial roads being The Northern Road, Great Western Highway and M4 Motorway providing access to the wider metropolitan area, the Blue Mountains and South-Western Sydney.

7. Minor retail services are provided in Glenmore Park.

8. Major retail services including Westfield are provided in the Penrith CBD.

9. Local bus transport services the area, with heavy rail at Penrith Railway Station.

10. An extract of the current zoning map with the subject land situated within the green RE1 zone and the surrounding land zoned R1 General Residential is as follows.



Land Zoning Map – Penrith LEP 2010

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

11. An extract from the *Pinnacle Park Concept Design* is reproduced as follows.



Pinnacle Park Concept Plan

Town Planning (Absent the Public Purpose)

12. Based upon our review of the zoning map and park plan, we have adopted the following town planning controls for the subject land, absent the public purpose.

Municipality and Planning Scheme

- Municipality of Penrith controlled under the provisions of Penrith LEP 2010.

Zoning

Zone R1 General Residential

1 Objectives of zone

- To provide for the housing needs of the community.
- To provide for a variety of housing types and densities.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To ensure that a high level of residential amenity is achieved and maintained.
- To ensure that new development reflects the desired future character and dwelling densities of the area.

2 Permitted without consent

Home occupations

3 Permitted with consent

Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dwelling houses; Emergency services facilities; Environmental protection works; Exhibition homes; Exhibition villages; Flood mitigation works; Group homes; Home-based child care; Home businesses; Home industries; Hostels; Information and education facilities; Multi dwelling housing; Neighbourhood shops; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Recreation areas; Residential accommodation; Residential flat buildings; Respite day care centres; Roads; Semi-detached dwellings; Seniors housing; Shop top housing; Tank-based aquaculture

4 Prohibited

Rural workers' dwellings; Any other development not specified in item 2 or 3

Other Planning Controls

• FSR/Density:	Not specified
• Minimum Lot Size:	Not specified

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

- Maximum Height of Buildings: Not specified

Heritage Controls

- The Parent Land/Acquisition Land is not listed as an Item of Environmental Heritage. The Stations of the Cross to the north across Narellan Road is a listed item.

NOTIFICATION TO RELIANCE PARTY/PARTIES: *The above information was obtained via publicly available sources and should verification be required, an application to Council may be obtained for a Planning Certificate. Should such Certificate not confirm the abovementioned zoning and development guidelines, the matter should be referred immediately to the valuer for consideration and review of the valuation, if appropriate.*

Valuation Methodology

13. The subject property comprises a shortfall in land for addition to the adjoining Pinnacle Park.

14. We have been instructed to undertake a market value assessment for the 456m2 of shortfall land having regard to the IPART methodology.

15. The specific land is not identified but rather is an overall shortfall as such we have ascribed an englobo rate to the subject land, by direct comparison method on a $/m2 of site area basis assuming an underlying zoning of R1 General Residential assuming low density residential development commensurate with Highland Views.

16. Land value rates have been ascribed on an englobo basis assuming serviced i.e. the land value reflects forgone ready to develop sites at the time of dedication with development consent in place.

Sales Evidence

17. In the course of our assessment we have had regard to the following transactions. Whilst contract documents have not been sighted, we understand the salient figures to be accurate.

Table 1

Sales Evidence				
Item	**1**	**2**	**3**	**4**
Suburb	Glenmore Park	Austral	Austral	Austral
Address	2027 The Northern Road	45-49 Boyd Street	95 Boyd Street	115 Gurner Avenue
Zoning	E4	R2	R2	R2
Sale Date	Jun-21	Sep-21	Jun-21	Apr-21
Settlement Date	Yet to settle	Oct-21	Jul-21	Jun-21
Sale Price	$3,000,000	$8,040,000	$12,125,000	$13,800,000
Site Area (m²)	16,300	20,200	40,500	39,500
$/m² of Site Area	$184	$398	$299	$349
Improvements Value	$0	$0	$0	$0
Land Value	$3,000,000	$8,040,000	$12,125,000	$13,800,000
Land Value ($/m² of Site Area)	$184	$398	$299	$349

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

Market Value Assessment

18. Having regard to the sales evidence tabulated above, we have adopted the following land value rate.

Table 2

Dedication Land - Market Value Assessment				
Current Zone	**Underlying Zone**	**Area (m2)**	**$/m2 of Site Area**	**Market Value**
RE1	R1	456	$350	$159,600
			Say	$160,000

Conclusive Opinion

19. In accordance with our instructions we have ascribed a market value under IPART Guidelines to the Pinnacle Park land shortfall of **$160,000 (exclusive of GST).**

Thank you for your instructions. We remain available to discuss our conclusions.

General Limitations, Conditions & Qualifications

This advice is current at the date of this advice only. The timing and extent of market movements is impossible to accurately predict, and we do not attempt to do so. The assessed advice provided herein may change significantly and unexpectedly over a relatively short period as a result of general market movements, or factors specific to the subject property identified herein. We do not accept any duty to protect your financial interests against such movements.

This advice is not intended to be used as financial advice, express or implied, and we confirm that the undersigned and Cushman & Wakefield are not licensed to provide financial product advice under the Corporations Act 2001.

Unless otherwise stated, all amounts stated herein are net of GST, are on a before tax basis and are before acquisition or selling expenses.

The counter-signatory verifies that this advice is genuine and issued and endorsed by Cushman & Wakefield. The value range expressed in this report, however, has been arrived at by the prime signatory acting as the valuer.

We trust that the above satisfies your immediate requirements, however, should you have any queries in respect of our advice, please do not hesitate to contact the undersigned.

Yours sincerely
Cushman & Wakefield (Valuations) Pty Ltd

Nicholas Garnsey AAPI
Certified Practising Valuer
Associate Director

Robert Timmermans
Director
(Counter-signatory only)

Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

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WEDNESDAY, FEBRUARY 16, 2022

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HIGHLAND VIEWS STAGES 7 & 8 – DA20/0782
BIODIVERSITY CORRIDOR PLANTING WORKS – VPA AMENDMENT

Dear Lauren,

Pursuant to the First Voluntary Planning Agreement for Glenmore Park Zone 2, we are writing to inform you that it is our intention to request a VPA amendment to modify the extent of the biodiversity corridor planting works as per Item 5 (c) of the current agreement. The current agreement notes the following:

ITEM 5. BIODIVERSITY CORRIDOR PLANTING WORKS The Biodiversity Corridor Planting Works means those works referred to in section 5.2 of the Glenmore Park Stage 2 Development Contributions Plan 2007, being those works detailed on the concept sketches set out in Annexure D and to be carried out by Lensworth, Norwest, Vianello and Mint Holdings.	(c) in respect of any Biodiversity Corridor Planting Works to be carried out on that part of the Land owned by Vianello, by Vianello prior to the date on which a Subdivision Certificate is issued that refers to the 225th Residential Lot to be created in respect of any part of the Land owned by Vianello; and

Item 5 (c) requires planting to the southern zone boundary. DA20/0782 initially proposed the delivery of stages 7 – 9 which would have completed the road layout originally proposed in the Vianello Holdings GP2 concept plan. However, Council have requested that stage 9 be removed from this DA to allow for flexibility in future rezoning. Furthermore, whilst the Local Infrastructure Contributions Working Group has confirmed that a 20m buffer from the southern zone boundary would be permissible, they have since noted that a VPA amendment will need to be made to facilitate this.

In summary, our VPA amendment will result in the following:
- Reduction of the planting area to reflect the 20m from the zone boundary as approved by LICWG
- Further reduction in planting to allow for the future east-west road reserve for Road 108 (stage 9 southern road)

It is our intention to deliver DA20/0782 in substages being 7A, 7B, 8A, 8B. By seeking a subdivision certificate for 7A only, the trigger for the biodiversity planting will not yet be applicable (this will reach 213 lots and the trigger is 225). This will allow sufficient time to finalise the VPA amendment prior to a subdivision certificate being issued for lot 225 (triggered by stage 7B).

Please find enclosed supporting documentation related to this matter. Should you have any queries regarding the above, please contact the undersigned directly.

Kind regards,

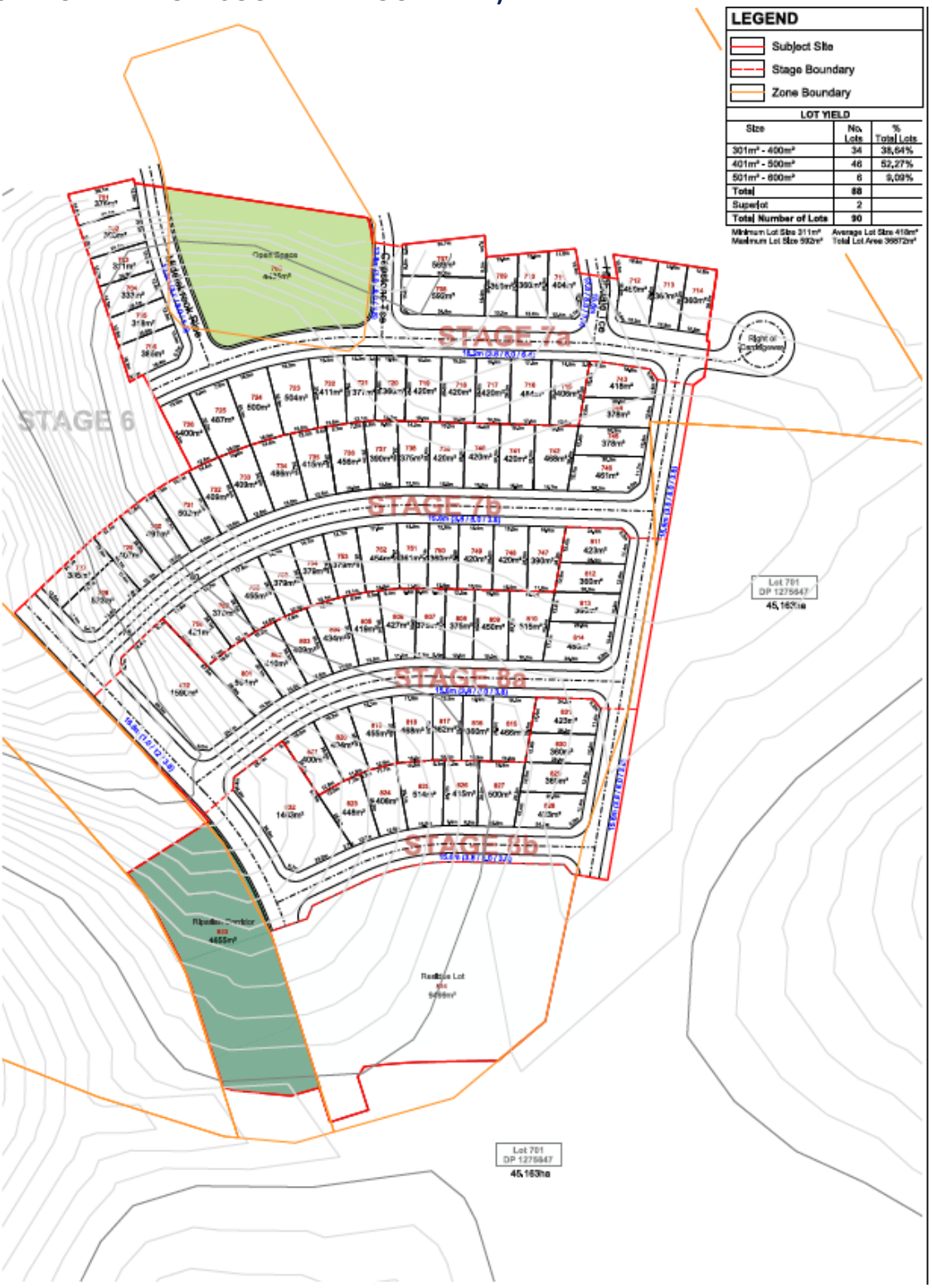
Rachell Hewitt
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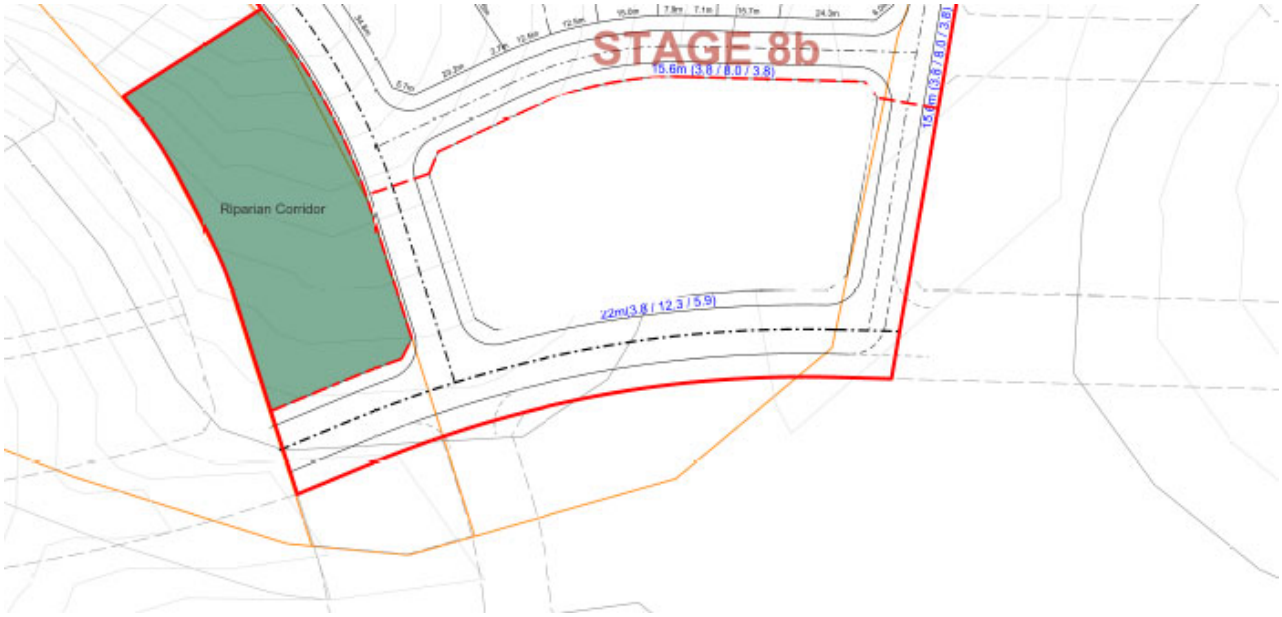
APPENDIX 1 – DA20/0782_CURRENT SUBDIVISION PLAN (20M BUFFER FROM SOUTHERN BOUNDARY)



Document Set ID: 9914771
Version: 1, Version Date: 17/02/2022

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APPENDIX 2 – DA20/0782_PROPOSED VPA AMENDMENT (20M BUFFER FROM SOUTHERN BOUNDAY & REDUCTION OF FUTURE EAST-WEST ROAD)



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