GLEN IRIS ESTATE

APPENDIX 10
LOCAL WATER MANAGEMENT STRATEGY

This page has been left blank intentionally.

Glen Iris, Jandakot

Local Water Management Strategy

September 2021



Client: ECP Acquisitions 6 Pty Ltd

Contents

1. Introduction 6
- 1.1 Planning Background 6
- 1.2 Key Documents and Previous Studies 7

2. Proposed Development 8

3. Existing Environment 9
- 3.1 Site Conditions 9
- 3.2 Geotechnical 9
  - 3.2.1 Permeability Testing 10
  - 3.2.2 Acid Sulphate Soils 10
  - 3.2.3 Contaminated Sites 10
- 3.3 Wetlands 12
- 3.4 Jandakot Drinking Water Supply Area 12
- 3.5 Surface Water 12
  - 3.5.1 Existing Stormwater Management 12
  - 3.5.2 Surface Water Quality 13
- 3.6 Groundwater 15
  - 3.6.1 Groundwater Levels 15
  - 3.6.2 Groundwater Quality 16
- 3.7 Nutrient Input Assessment 18
- 3.8 Constraints and Opportunities 19

4. Design Criteria & Objectives 20

5. Water Use Sustainability 21
- 5.1 Water Efficiency Measures 21
- 5.2 Water Supply 21
- 5.3 Wastewater Management 21

6. Stormwater Management Strategy 22
- 6.1 Stormwater Event Modelling 22
- 6.2 Ecological Protection 26

7. Groundwater Management Strategy 27
- 7.1 Earthworks, Fill and Subsoil Drainage 27
- 7.2 Acid Sulphate Soils 27

8. Urban Water Management Plans 28

9. Monitoring 29
- 9.1 Pre Development 29

9.2 POST DEVELOPMENT 29

10. Implementation 31

11. References 32

Appendices

A. Better Urban Water Management Checklist
B. Geotechnical Report
C. Hyd2o Permeability Testing
D. Existing Stormwater System Plates
E. Survey of Existing Stormwater Storages & Outlets
F. Predevelopment Site Monitoring Data
G. Lithological Logs
H. DWER Groundwater Bore Data
I. UNDO Nutrient Modelling
J. Groundwater Licence & Water Register Extracts
K. Landscape Masterplan
L. Post Development Catchments & Runoff Estimation
M. Post Development Stormwater Modelling
N. Indicative Storage Cross Sections and Landscape Overlay
O. Engineering Drawings

Figures

1. Location Plan
2. Local Structure Plan
3. Site Conditions Plan
4. Geotechnical Plan
5. Environmental Plan
6. Surface Water Plan
7. Groundwater Plan
8. Post Development Stormwater Catchments
9. Stormwater Management Event Plan
10. Post Development Monitoring Sites

Tables

1. Integrated Planning and Urban Water Management Process
2. Permeability Test Results
3. Existing Surface Water Quality
4. DWER Bores AAMGL and MGL
5. Estimated Site Bores AAMGL and MGL
6. Existing Groundwater Quality
7. Design Criteria & Objectives
8. Post Development Stormwater Management Summary
9. BMP Water Quality Performance In Relation to Design Criteria
10. Post Development Monitoring Program
11. Contingency Planning
12. Implementation, Roles and Responsibilities

Disclaimer

This document is published in accordance with and subject to an agreement between Hyd2o and the Client for whom it has been prepared, and is restricted to those issues that have been raised by the Client in its engagement of Hyd2o. It has been prepared using the skill and care ordinarily exercised by hydrologists in the preparation of such documents.

Hyd2o recognise site conditions change and contain varying degrees of non-uniformity that cannot be fully defined by field investigation. Measurements and values obtained from sampling and testing in this document are indicative within a limited timeframe, and unless otherwise specified, should not be accepted as conditions on site beyond that timeframe.

Any person or organisation that relies on or uses the document for purposes or reasons other than those agreed by Hyd2o and the Client does so entirely at their own risk. Hyd2o denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be suffered as a consequence of relying on this document for any purpose other than that agreed with the Client.

Executive Summary

Hyd2o was commissioned by ECP Acquisitions 6 Pty Ltd to prepare this Local Water Management Strategy (LWMS) to support the proposed local structure plan (LSP) for land within former Glen Iris golf course (herein referred to as the site).

The LSP area is approximately 53.74 ha in size and located approximately 20 km south of the Perth central business district within the City of Cockburn. The proposed urban development consists of residential lots, roads, public open space, and commercial area.

This LWMS addresses stormwater management of the site including areas outside of the LSP area which currently discharge stormwater within the site. This document provides a comprehensive overall assessment of the existing water management system of the area and how it will be modified and integrated with the new development to improve water sensitive urban design outcomes as a result of the proposed land use change.

Understanding key hydrological considerations has informed the development of the LWMS for the site. The site has been a golf course since 1995, and is generally characterised as having high permeability soils, good clearance to groundwater, and low Acid Sulphate Soil (ASS) risk across the site. It contains a number of existing stormwater storages which accept flow from external council stormwater systems whose function will need to be maintained post development.

This document has been prepared in accordance with the principles and objectives of Better Urban Water Management (Western Australian Planning Commission, 2008). Key agencies ultimately involved with its implementation including the City of Cockburn, (CoC) and Department of Water and Environmental Regulation (DWER), have been consulted during this process.

Implementation of the strategy will be undertaken in accordance with Better Urban Water Management through the development and implementation of Urban Water Management Plans for individual stages of development within the site.

The Better Urban Water Management LWMS checklist is included as Appendix A.

Local Water Management Strategy Summary

Water Use Sustainability	
Water Efficiency	• Promotion of 6 star building standards (water efficient fixtures and fittings). • Mandatory use of water-wise plantings in POS and landscape rehabilitation areas. • Landscaping and LSP design to retain significant trees • Re-use of groundwater / infiltrated stormwater for POS irrigation. • Water efficient measures to be adopted during the construction phase.
Water Supply	• Lots: Water Corporation IWSS and rainwater tanks (encouraged). • POS: Groundwater via existing DWER licence. • Construction: Groundwater via existing DWER licence.
Wastewater	• Water Corporation reticulated sewerage.
Stormwater	
Design & Management Principles	• Water quality to be managed through biofiltration treatment of runoff generated by first 15mm of rainfall prior to infiltration. • Stormwater management for larger events to be via infiltration in distributed road reserves and POS areas within the site, for both new developed areas and existing areas outside the site which currently flow into the site. • Development levels to have suitable clearance above groundwater and 1% AEP flood levels.
Lot Scale Measures	• Soakwells sized to retain and infiltrate first 15 mm rainfall on site within lots. • Rainwater tanks (optional). • Water-wise landscaping to retain stormwater and minimise runoff
Street Scale Measures	• Biofiltration areas in specified locations, with additional areas identified at UWMP scale as necessary if required • Piped drainage minimised, with maximised use of opportunities for localised swales and/or underground storage within wider road reserves. • GPT's / trash racks where appropriate.
Estate Scale Measures	• Water quality treatment areas in POS for treatment of runoff from first 15mm rainfall via biolfitration. • Flood management storage areas within POS areas to infiltrate flows in accordance with agency requirements. • Post development groundwater, surface water, and system performance monitoring and annual reporting.
Groundwater	
Fill & Subsoil	• Use of cut/ fill across the site to to minimise import fill and establish levels to meet design criteria of clearance above groundwater and the 1% AEP level in POS infiltration areas. • Subsoil drainage unlikely to be required.
Acid Sulphate Soils	▪ Site has moderate to low risk of ASS. Acid sulphate soils will however be investigated as a separate process if required.
Implementation	
Process	• Predevelopment groundwater and stormwater monitoring program in progress to be completed end of winter 2021. Final results to develop water quality targets. • Future stages of planning consistent with BUWM including preparation of UWMP's. • Staging of stormwater to be detailed in the relevant UWMP's and implemented to ensure key hydrological performance criteria are maintained during transition.

1. Introduction

Hyd2o was commissioned by ECP Acquisitions 6 Pty Ltd to prepare this Local Water Management Strategy (LWMS) to support the proposed local structure plan (LSP) for land within former Glen Iris golf course (herein referred to as the site).

The LSP area is approximately 53.74 ha in size and located approximately 20 km south of the Perth central business district within the City of Cockburn (Figure 1). The proposed urban development consists of residential lots, roads, public open space, and commercial areas.

This LWMS addresses stormwater management of the site including areas outside of the LSP area which currently discharge stormwater within the site. This document provides a comprehensive overall assessment of the existing water management system of the area and how it will be modified and integrated with the new development to improve water sensitive urban design outcomes as a result of the proposed land use change.

This LWMS provides a total water cycle management approach to development and has been prepared in accordance with the principles and objectives of Better Urban Water Management (Western Australian Planning Commission, 2008). It provides the outcomes of detailed site specific analysis relating to groundwater and stormwater and provides a clear vision in terms of adopting best management practices to achieve water sensitive design.

A copy of the Better Urban Water Management (WAPC, 2008) LWMS Checklist for Developers is included as Appendix A to assist the Department of Water and Environmental Regulation (DWER) in review of this document.

Key stakeholders involved with its implementation of this strategy including the City of Cockburn and Department of Water and Environmental Regulation (DWER), have been consulted during this process. Given the size of the site and its likely development timeframe, ongoing consultation with these stakeholders will continue as planning progresses for the site.

1.1 Planning Background

Better Urban Water Management (Western Australian Planning Commission (WAPC), 2008) provides guidance on the implementation of State Planning Policy 2.9 Water Resources (Government of WA, 2003).

The site is currently zoned Urban under the Metropolitan Region Scheme (2021). This LWMS supports the preparation of a local structure plan for the site for residential development. The urban water management planning process for the site is shown in Table 1.

Table 1: Integrated Planning and Urban Water Management Process

Planning Phase	Planning Document	Urban Water Management Documents
Local Structure Plan	Local Structure Plan	Glen Iris Local Water Management Strategy **THIS DOCUMENT**
Subdivision	Subdivision Application	Urban Water Management Plan **FUTURE PREPARATION**

1.2 Key Documents and Previous Studies

The requirements for water protection and urban water management for the site are established in a range of publications including State Planning Policy 2.3 Jandakot Groundwater Protection (WAPC, 2017) and State Planning Policy 2.9 Water Resources (WAPC, 2006). Given the site's location within the Jandakot Ground Water Protection Area, these documents are used to guide the establishment of minimum development requirements and best practice water management.

This LWMS also uses the following additional documents to define its key principles, criteria, objectives, and implementation responsibilities:

- Decision Process for Stormwater Management in WA (DWER, 2017)
- Better Urban Water Management (WAPC, 2008)
- Stormwater Management Manual for WA (Department of Water, 2007)
- Land Use Compatibility Tables for Public Drinking Water Source Areas (Department of Water (2016)

2. Proposed Development

The local structure plan for the site is shown in Figure 2, providing a unique opportunity for urban infill in close proximity to the Perth Central Business District.

The LSP area covers 53.74 ha, with the proposed development consisting of residential lots, roads, linear connected public open space, grouped housing, and a commercial area adjoining Berrigan Drive.

The development will provide a vibrant and diverse residential community with a variety of housing choice and local amenities. The structure plan design aims to create better and safer transport routes for existing residents and introduce new landscaped areas for public recreation.

From a stormwater management perspective, the development will seek to provide significant improvements in management for existing and new systems, both from a water quality and public amenity viewpoint.

The development will also provide an opportunity to improve local environmental outcomes via a reduction in nutrient application and export and reduction in irrigation abstraction from the local superficial aquifer.

3. Existing Environment

3.1 Site Conditions

The site is located in the suburb of Jandakot in the City of Cockburn.

The site is the former Glen Iris Golf Course and is bound by existing urban development in most directions. The site straddles Berrigan Driver and has the Kwinana Freeway in close proximity to its western boundary (Figure 1).

Figure 3 shows an aerial photograph with existing land use and topography. In the area south of Berrigan Drive, with the exception of some excavated groundwater table lakes and sumps, site topography typically ranges between 27 mAHD and 31m AHD. In the area north of Berrigan Drive, topography typically ranges between 26 mAHD and 43 m AHD.

3.2 Geotechnical

According to the Perth Metropolitan Region 1:50 000 Environmental Geology Series Fremantle Pt Sheet 2033 I and 2o33 IV (Gozzard 1983), the site is characterised as Bassendean Sand (S8), described as very light grey at surface, yellow at depth, fine to medium grained, sub-rounded quartz, moderately well sorted, of eolian origin.

A geotechnical investigation for the site was undertaken by CMW Geosciences in November/December 2020.

The geotechnical report is included as Appendix B. This investigation included excavation of 55 test pits and 8 hand augered boreholes for infiltration testing. A Perth Sand Penetrometer (PSP) test was also undertaken at each test pit location. Test locations are shown on Figure 4 and Appendix B.

Based on the history of the site and surrounding land levels, some superficial depths of fill were anticipated. The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area.

The typical soil profile as described by CMW Geosciences (2020) is as follows:

- TOPSOIL: SAND / CLAYEY SAND dark grey, brown, fine to medium grained, subangular to subrounded sand with trace fines (>12% in TP48); trace organics; trace roots and rootlets; trace branches; trace vegetation, overlying;
- FILL: SAND (UNCONTROLLED) loose to very dense, fine to medium grained, subangular to subrounded; grey/pale yellow and orange-brown; trace fine grained limestone gravel (TP04, TP20); trace fines; trace organics; trace roots and rootlets; trace branches. Uncontrolled fill in the form of old reticulation pipe and bricks were found in TP04, TP18, TP28 and TP34. The reticulation pipe uncovered in TP28 and TP34 contained potential asbestos between depth of 0.5 and 1.6 mbgl, overlying;
- SAND (SP) loose to very dense, fine to medium grained, subangular to subrounded; grey/orange/yellow and white; trace fines; trace roots and rootlets, overlying;
- COFFEE ROCK very dense, fine to medium grained, subangular to subrounded, dark brown/black; weakly cemented. (Only found in TP03 TP06, TP12 and TP52). The coffee rock was typically found in or around low energy zones (lakes) located across the site where groundwater may be present.

During the investigation, which was completed in early-summer conditions, groundwater was not encountered within any of the investigation locations.

The site was classified as Class A in accordance with AS2870-2011, and considered suitable for stormwater infiltration at both lot and estate scale.

3.2.1 Permeability Testing

CMW Geosciences (2020) undertook eight in situ permeability tests within the site. Test locations are shown in Figure 4. The tests were performed using the falling head method within a hand augered borehole at a depth of approximately 1.4 m below ground surface. Results of the testing as analysed by CMW Geosciences (2020) are provided in Table 2.

Hyd2o also conducted permeability testing at the site in November/December 2020 and April 2021 to provide estimates of the field saturated hydraulic conductivity of the soils and assess their suitability for stormwater infiltration. Sixteen permeability tests were undertaken based on a constant head test at and adjacent to existing stormwater storage locations receiving flow from external catchments into the site. Test locations are shown in Figure 4 and results from the permeability tests are presented in Appendix C.

An average field saturated hydraulic conductivity rate of 40 m/day was observed by the Hyd2o testing with values ranging from approximately 4 to 139 m/day. Testing by CMW Geosciences (2020) was within a similar range.

Based on these results CMW Geosciences (2020) recommended a hydraulic conductivity of 5 m/day be used for modelling. This is considered a conservatively low value over much of the site even when applying a 50% reduction factor to account for long term clogging.

3.2.2 Acid Sulphate Soils

Acid Sulphate Soil (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. These naturally occurring iron sulfides are generally found in a layer of waterlogged soil or sediment and are benign in their natural state.

When disturbed and exposed to air, however, they oxidise and produce sulfuric acid, iron precipitates, and concentrations of dissolved heavy metals such as aluminium, iron and arsenic. Release of acid and metals as a result of the disturbance of ASS can cause significant harm to the environment and infrastructure.

WAPC's Bulletin 64 (WAPC, 2003) ASS risk mapping for the site indicates that the whole site is classified as having a moderate to low risk of ASS across the site less than 3 m from the surface.

3.2.3 Contaminated Sites

The site is not registered as a contaminated site on DWER's online Contaminated Sites Database.

CMW Geosciences (2020), indicated some asbestos may be present within the site following previous demolition of old infrastructure along the western site boundary near Hartwell Parade. During bulk earthworks any asbestos will need to be appropriately managed by a competent environmental consultant.

Table 2: Permeability Test Results

Test Site	Tested By	Test Depth Below Surface (m)	Permeability K_s m/day
GIGC1	Hyd2o	0.7	28.4
GIGC2	Hyd2o	0.7	3.7
GIGC3	Hyd2o	0.7	23.5
GIGC4	Hyd2o	0.7	53.9
GIGC5	Hyd2o	0.7	5.9
GIGC6	Hyd2o	0.7	51.1
GIGC7	Hyd2o	0.7	10.6
GIGC8	Hyd2o	0.7	121.3
GIGC9	Hyd2o	0.7	34.2
GIGC10	Hyd2o	0.7	9.7
GIGC11	Hyd2o	0.7	42.2
GIGC12	Hyd2o	0.7	40.9
GIGC13	Hyd2o	0.7	138.6
GIGC14	Hyd2o	0.7	24.0
GIGC15	Hyd2o	0.7	36.1
GIGC16	Hyd2o	0.7	15.2
Perm1	CMW Geoscieces	1.36	5.6-27.2
Perm2	CMW Geoscieces	1.42	25.8-105.0
Perm3	CMW Geoscieces	1.35	16.0-58.2
Perm4	CMW Geoscieces	1.38	8.7-36.8
Perm5	CMW Geoscieces	1.40	17.2-71.4
Perm6	CMW Geoscieces	1.40	14.5-43.6
Perm7	CMW Geoscieces	1.41	6.8-30.6
Perm8	CMW Geoscieces	1.41	16.1-71.9

CMW Geosciences Permeabilites based on two methods : CIRIA Method (higher value)and Horslev Method (lower value)

3.3 Wetlands

There are no conservation category wetlands, resource enhancement wetlands, multiple use wetlands, or natural waterways within the site (Figure 5).

There are a number of existing open water bodies previously within the site associated with the sites previous use as a golf course. Most of these water bodies are lined and ornamental while one in the south of the site is an excavation into the regional groundwater table. Some of the water bodies in the area north of Berrigan Drive also serve an existing drainage function.

3.4 Jandakot Drinking Water Supply Area

Part of the site is currently classified as a Priority 3 Groundwater Protection Area as shown on Figure 5, however this does not preclude residential development. The Department of Water (2016) Land Use Compatibility Tables for Public Drinking Water Source Areas Water Quality Protection Note No 25, detail urban residential as an acceptable land use within a Priority 3 area.

Three Water Corporation Jandakot Mound production bores are located adjacent to the eastern boundary of the site as shown in Figure 5.

Water Corporation bores have a 300 m radius wellhead protection zone (WPZ) in Public Drinking Water Source Area (PDWSA) Priority 2 and Priority 3 areas. All three bores have WPZs which extend within the site. A fourth Water Corporation bore which is located near the clubhouse is no longer used, however a WPZ also still exists for this disused bore.

Advice from DWER indicates urban development within WPZ areas is permitted consistent with underlying Priority 3 classification, although some restrictions/exclusions may apply such as locating a sewer pump station or petrol station in these areas.

3.5 Surface Water

3.5.1 Existing Stormwater Management

There is no overarching DWER regional or district stormwater strategy which covers the site. The site does not have a connection to any arterial drainage scheme and all stormwater that is generated on site is infiltrated.

The site currently provides stormwater storage and infiltration areas for adjacent externally developed areas. According to the City of Cockburn Intramaps system, there are currently 18 bubble up pit outlets from externally developed areas which drain into the site discharging into 15 separate drainage areas. These drainage areas range from wet basins to shallow informal depressions to fenced steep sided deep sumps.

Outlet locations and storages are shown in Figure 6, with plates contained as Appendix D. These locations provide a constraint to the future development layout of the site and post development the site will be required to continue to provide stormwater storage for the external catchment. Typically this would be provided in broadly similar locations, though some movement may be possible based on engineering design considerations.

Based on topographic mapping and drainage detail via the City of Cockburn Intramaps system, the contributing external catchment has been mapped at approximately 56 ha, broadly similar to the site area itself (53.74 ha).

External subcatchment areas contributing flow to each outlet in the site are shown in Figure 6. As the total external contributing catchment area of 56 ha is broadly similar to the site area, the area required for stormwater management within the site as a result of the external catchment is likely to be considerably more than would be otherwise required for the site itself.

Outlet locations and associated catchments have been used to inform the LSP for the site and its POS and stormwater infiltration area locations. This is further discussed in Section 6.

A details survey of all the outlet locations and existing storage volumes was conducted by MNG. Survey details are contained as Appendix E.

3.5.2 Surface Water Quality

Hyd2o commenced a pre development surface water quality monitoring program in June 2020. Sampling was undertaken at the outlets of the existing stormwater system into the site. Locations are shown in Appendix F.

Physical parameters (temperature, electrical conductivity, and pH) were measured in situ. Samples were sent to the NATA approved MPL Laboratory for total nitrogen, ammonia, nitrate, nitrite, total phosphorus, filterable reactive phosphorus, and heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury, and zinc).

Surface water quality results are summarised in Table 3 compared to ANZECC (2000) guideline trigger values. Full monitoring results are contained in Appendix F.

Key results are summarised as follows:

- Mean pH at all sites are within the ANZECC guideline range (6.5 – 8.0) except for the SW13 where the mean pH (5.56) was below the lower limit.
- Mean values for Electric Conductivity (EC) for each site ranged from 82 µS/cm to 252 µS/cm. All values fell within or below the ANZECC guideline range (120-300 µS/cm).
- Mean total nitrogen (TN) for all sites ranged from 0.13 to 0.70 mg/L, within the ANZECC 95% guideline limit (1.2 mg/L). The mean TN across all sites was 0.37 mg/L.
- Mean total phosphorus (TP) ranged from 0.05 to 0.26 mg/L with values ranging from below the ANZECC 95% guideline limit (0.065 mg/L) primarily in the northern areas of the site to exceeding the limit in the south. The mean TP across all sites was 0.09 mg/L.

With respect to metals, mean results were as follows relative to ANZECC guideline values:

- Arsenic, Cadmium, Mercury, Chromium, Lead, and Nickel were all within the 95% protection limit across all sites.
- Copper was within the 95% protection limit across all sites except SW5, SW13, SW15 and SW16, which fell within the 90% protection limit, and SW2 and SW4, which fell below the 80% protection limit, with only SW1 falling below the 80% protection limit.
- Zinc was highly variable across the sites, ranging from within the ANZECC 95% protection limit at SW3, SW5, SW7 and SW8, to below the 80% protection limit at SW10, SW12, SW13, SW14, SW15 and SW16.

Table 3: Existing Surface Water Quality

Surface Water Sample	Mean for Sampled Parameters							
	EC (µS/cm)	pH	TN (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TP (mg/L)	FRP (mg/L)
ANZECC	120-300	6.5-8.0	1.2	0.32 – 2.3 (99% - 80% protection)	0.017 – 17 (99% - 80% protection)	-	0.065	0.04
SW1	209	6.85	0.26	0.01	0.04	0.01	0.05	0.02
SW2	96	7.51	0.20	0.01	0.01	0.01	0.05	0.01
SW3	82	6.90	0.30	0.02	0.02	0.01	0.05	0.03
SW4	142	6.79	0.32	0.03	0.02	0.01	0.08	0.04
SW5	140	7.11	0.25	0.01	0.02	0.01	0.09	0.01
SW6	92	7.12	0.13	0.01	0.02	0.01	0.05	0.01
SW7	89	6.67	0.20	0.03	0.05	0.01	0.08	0.01
SW8	108	6.59	0.30	0.02	0.03	0.01	0.06	0.01
SW9	123	6.73	0.58	0.01	0.01	0.01	0.09	0.02
SW10	133	6.67	0.33	0.01	0.03	0.01	0.12	0.01
SW11	252	6.91	0.70	0.04	0.03	0.01	0.26	0.01
SW12	107	6.84	0.34	0.02	0.06	0.01	0.05	0.01
SW13	147	5.56	0.50	0.02	0.01	0.01	0.10	0.01
SW14	124	6.61	0.46	0.04	0.02	0.01	0.12	0.05
SW15	150	6.51	0.44	0.07	0.02	0.01	0.14	0.04
SW16	141	6.72	0.45	0.04	0.04	0.01	0.06	0.02
All Sites	138	6.76	0.37	0.03	0.03	0.01	0.09	0.02

3.6 Groundwater

3.6.1 Groundwater Levels

The Department of Water and Environmental Regulation's (DWER) online Perth Groundwater Map, shows that groundwater levels across the site range from approximately 21 mAHD to 23 mAHD with groundwater flow to the west toward the freeway and away from Water Corporation public water supply bores (Figure 7).

These groundwater levels are contoured May 2003 readings, and represent a typical minimum groundwater level at the end of summer. The Perth Groundwater Map also provides estimated historical maximum groundwater level contours which range from 23 mAHD to 26 mAHD across the site.

In the area south of Berrigan Drive, with the exception of some excavated groundwater table lakes and sumps, site topography typically ranges between 27mAHD and 31m AHD with an existing natural surface clearance above the historical maximum contours ranging from approximately 1.5 to 6 m. In the area north of Berrigan Drive, topography typically ranges between 26 mAHD and 43 m AHD with the existing natural surface clearance above the historical maximum contours ranging from 1.5 to 19 m.

To refine groundwater mapping at the site Hyd2o installed 9 bores within the site in June 2020, which are currently being monitored monthly for water levels and quarterly for water quality. Lithological logs are including in Appendix G.

The estimated average annual maximum groundwater levels (AAMGL) for the site based on these bores and collected data are shown in Figure 7. Hyd2o have calculated the AAMGL by adjusting levels at site bores based on the recorded level in DWER bores JM12, JM2, JM45A and J310 on 23 September 2020 referenced to their long term historical data (Table 4). Long-term hydrographs for DWER bores JM12, JM2, JM45A and J310 are provided in Appendix H. The data considered for the calculation is from the year 2000, considered representative of current climate conditions

The AAMGL for each groundwater bore based on this analysis is shown in Table 5.

AAMGL's across the site range from 22 mAHD at the northern end to 23.6 mAHD at the southern end while MGL's across the site range from 22.7 mAHD at the northern end to 24.3 mAHD at the southern end. Depth to the AAMGL across the site typically ranges from a minimum of approximately 2 m in southern of the site to in excess of 18 m in the north.

It is important to note the LWMS uses the terminology AAMGL to represent a valid statistical property of groundwater in the area, and not as a concept as per previous DWER policies. This LWMS presents details of the groundwater's seasonal variation, AAMGL, and its MGL all as measures of its seasonal, annual, and interannual behaviour.

Only presenting an MGL value is not considered adequate to represent the groundwater characteristics and behaviour of the site.

Table 4: AAMGL for DWER Bores

Bore	Period of Record Used	Groundwater Level (mAHD) 23/09/2020	AAMGL 2000-2020 (mAHD)	Correction Factor (m)	MGL (mAHD)	Correction Factor (m)
JM12	2000 – 2020	21.87	21.88	0.01	22.39	0.52
JM2	2000 – 2020	22.40	22.46	0.06	23.43	1.03
JM45A	2000 – 2020	24.39	24.36	-0.03	25.24	0.85
J310	2000 – 2020	24.05	24.13	0.08	24.64	0.59
Correction Factors for Site Bores				**+0.03**		**+0.75**

Table 5: AAMGL for Site Bores

Bore	Natural Surface (mAHD)	Groundwater Level (mAHD) 23/09/2020	AAMGL (mAHD)	MaxGL (mAHD)	Depth to AAMGL Below Natural Surface (m)
MW1	30.93	23.15	23.18	23.90	7.75
MW2	27.22	22.74	22.77	23.49	4.45
MW3	28.73	22.11	22.14	22.86	7.59
MW4	25.67	22.42	22.45	23.17	3.22
MW5	26.84	23.22	23.25	23.97	3.59
MW6	28.56	23.13	23.16	23.88	5.40
MW7	27.70	23.16	23.19	23.91	4.51
MW8	26.12	23.66	23.69	24.41	2.43
MW9	27.83	23.21	23.24	23.96	4.59

3.6.2 Groundwater Quality

Groundwater quality has been monitored quarterly at the 9 onsite groundwater bores by Hyd2o since June 2020. Bore locations in the site are shown in Figure 7 and Appendix F.

Physical parameters (temperature, electrical conductivity, and pH) were measured in situ. Samples were sent to the NATA approved MPL Laboratory for total nitrogen, ammonia, nitrate, nitrite, total phosphorus, filterable reactive phosphorus, and heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury, and zinc).

Groundwater water quality results are outlined in Table 6 compared to ANZECC (2000) guideline trigger values. Full results are contained in Appendix F.

Results are summarised as follows:

- Mean pH across the groundwater bores ranged between 4.43 and 6.19, all sites fell below the lower limit of the ANZECC guideline range (6.5 – 8.0).
- The mean EC across the groundwater bores ranged between 290 µS/cm and 890 µS/cm. All groundwater sites except MW8 exceeded the upper limit of the ANZECC guideline range (120-300 µS/cm). It is important to note that While EC values are above the ANZECC guideline range, the predevelopment EC levels recorded are a natural baseline condition of the aquifer in the area rather than a land use outcome.
- Mean TN values ranged from 0.72 mg/L to 4.66 mg/L, with the majority of bores exceeding the ANZECC guideline limit (1.2 mg/L). The bores within the limit included MW4, MW8 and MW9. The mean TN across all sites was 1.86 mg/L. TN groundwater concentrations were high than that of stormwater possibly due to fertiliser application on the golf course.
- Mean TP was within the ANZECC guideline limit of 0.065 mg/L across almost all sites. MW6 was the only exceedance with a mean value of 0.07 mg/L. The mean TP across all sites was 0.05 mg/L, lower than the TP level in stormwater.

With respect to metals, mean results were as follows relative to ANZECC guideline values:

- Arsenic, Cadmium, Nickel, Lead, and Mercury were within the 95% protection limit across all bores.
- Chromium was within the 95% protection limit across all bores except for MW6 and MW7 which fell within the 90% protection limit.
- Copper was within the 95% protection limit across all bores except for MW1, MW7, and MW9. MW7 fell within the 90% protection limit, while MW1 and MW9 fell below the 80% protection limit.
- Zinc was within the 95% protection limit across all bores except for MW5 which fell within the 90% protection limit, and MW1 which fell below the 80% protection limit.

Table 6: Existing Groundwater Quality

Groundwater Bore	Mean for Sampled Parameters							
	EC (µS/cm)	pH	TN (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TP (mg/L)	FRP (mg/L)
ANZECC	120-300	6.5-8.0	1.2	0.32 – 2.3 (99% - 80% protection)	0.017 – 17 (99% - 80% protection)	-	0.065	0.04
MW1	690	6.19	1.72	0.02	1.27	0.01	0.05	0.01
MW2	890	5.98	2.44	0.02	2.13	0.01	0.05	0.01
MW3	560	5.65	2.04	0.01	1.28	0.01	0.05	0.01
MW4	680	5.81	0.72	0.20	0.01	0.01	0.05	0.01
MW5	720	4.43	1.34	0.40	0.16	0.01	0.05	0.01
MW6	570	4.66	4.66	0.22	3.18	0.01	0.07	0.01
MW7	570	5.49	1.64	0.05	0.57	0.01	0.05	0.01
MW8	290	5.64	0.96	0.16	0.02	0.01	0.05	0.01
MW9	530	5.07	1.20	0.62	0.01	0.01	0.05	0.01
All Sites	610	5.43	1.86	0.19	1.01	0.01	0.05	0.01

3.7 Nutrient Input Assessment

The Urban Nutrient Decision Outcomes (UNDO) model is a conceptual decision support tool developed by DWER that evaluates nutrient reduction decisions for urban developments on the Swan Coastal Plain in south-west Western Australia. It is designed for ease-of-use by urban development proponents and for assessment by local and state government authorities.

The tool was developed to assess the nutrient impacts of urban development on the Swan Coastal Plain in a consistent and scientifically rigorous manner, and improve scientific understanding relating to nutrient issues, and efficiencies in the investment to manage nutrients.

The tool is web-based, and provides users with the ability to implement a range of structural or non-structural design options to evaluate and reduce nutrients exported from an urban development.

Modelling of the historical land use of the site as a golf course is detailed in Appendix I.

The results indicate nutrient inputs of 8704 kg/yr for TN and 368 kg/yr TP to the environment based on typical nutrient application rate estimates. The resultant nutrient export was 715 kg/yr of TN and 2.5 kg/yr of TP. This export estimate considers soil types, groundwater gradient and depth to groundwater in its calculations.

Post development nutrient input and export rates are addressed in Section 6.2.

3.8 Constraints and Opportunities

Based on the sites existing environment, the following key constraints and opportunities are identified to guide the development of the water management strategy and proactive management practices detailed in later sections of this report:

- The site has good clearance to groundwater and highly permeable soils suitable for infiltration of stormwater. All stormwater that is currently generated on site is infiltrated.
- The site provides stormwater storage for 56 ha of external development. There are 18 outlets which currently drain into the site into 15 drainage areas. The site will be required to continue to provide storage for the external catchment post development.
- Opportunities exist to improve the existing stormwater management and water quality treatment outcomes for these areas.
- There are no conservation category wetlands, resource enhancement wetlands, multiple use wetlands, or natural waterways within the site.
- Part of the site is currently classified as a PDWSA Priority 3 area, however this does not preclude residential development. Four Water Corporation bores have wellhead protection zones (WPZ) which extend into the site, however urban development within the WPZs will be permitted consistent with their underlying Priority 3 classification.

4. Design Criteria & Objectives

Key design principles and criteria for the site are shown in Table 7 and have been established consistent with the key reference documents previously detailed in Section 1.2, and reflect the site constraints and opportunities identified in Section 3.

These principles and criteria are used to formulate the water management strategy for the site to remain within the identified constraints and opportunities of the existing environment.

Table 7: Design Principles & Criteria

Strategy Elements	Method & Approach
Water Use Sustainability	
Water Efficiency	• Water efficiency implementation to be consistent with Building Codes of Australia requirements • Aim for less than 100 kL/person/year water use • Establish "Waterwise" Public Open Space • Maximise at source infiltration of stormwater
Water Supply	• Minimise overall use of scheme water for non-drinking purposes • Water Corporation IWSS for lots plus use of rainwater tanks (non mandated) • Irrigation of POS via existing groundwater licence
Wastewater	• Water Corporation reticulated sewerage
Stormwater	
Ecological Protection	• Lot soakwells (15mm event infiltration on site) • Establishment of distributed biofiltration areas within road reserves and POS areas for treatment of first 15mm road runoff.
Serviceability	• Minimise use of piped drainage systems • Piped drainage system (where required) sized to convey 20% AEP event
Flood Protection	• Overland flow paths within road reserves for safe conveyance of flows exceeding pipe drainage system capacity • Provide storage infiltration areas within POS for management of flows from both within and external to the site for events of to 1% AEP event • Establish minimum habitable floor levels at 0.5m above the 1% AEP flood level of infiltration areas
Groundwater	
Fill Requirement & Subsoil Drainage	• Development levels to establish an acceptable clearance to groundwater using cut to fill across the site and minimising imported fill (if required).
Acid Sulphate Soils & Contamination	• Management of Acid Sulphate Soils and any contamination to be handled as a separate process if required consistent with DoE (2004) requirements.

5. Water Use Sustainability

5.1 Water Efficiency Measures

The development of the site will lead to an overall increased demand for potable water and for irrigation of gardens and POS areas. Water conservation measures will be implemented to reduce scheme water consumption within the development will be consistent with Water Corporation's "Waterwise" land development criteria including:

- Promotion of use of waterwise practices including water efficient fixtures and fittings (taps, showerheads, toilets, rainwater tanks, waterwise landscaping).
- All houses to be built to 6 star building standards (water efficient fixtures and fittings).
- Mandatory use of water wise plantings in POS areas.
- Maximising on site retention and infiltration of stormwater.
- Use of high density residential zoning to reduce garden (ex-house) use of water and minimise fertiliser nutrient inputs.

5.2 Water Supply

The Water Corporation's Integrated Water Supply System (IWSS) will supply potable water to future homes on the site.

Rainwater tanks will not be implemented/mandated at estate scale to supplement the domestic water supply scheme however will be encouraged together with house design to allow for retrofitted tanks. Residents who wish to supplement scheme water supply with rainwater tanks will be provided for by individual builders during the building application process.

The site is located within the Jandakot Groundwater Area Airport Subarea in which the superficial aquifer is fully allocated.

The site has an existing licence for 325,000 kL/yr via the superficial aquifer, with the licence valid to 2023, which was transferred on purchase of the property. A copy of the irrigation licence is include as Appendix J. This volume represents an irrigation allocation of approximately 6000 kL/yr/ha across the total site area, which is more than adequate for the irrigation of future public open space.

Landscape masterplanning for the site prepared by Emerge is contained as Appendix K.

Preparation and agency approval of final landscape plans will be undertaken at UMWP stage based on final stormwater design requirements. The UWMP will also include detailed irrigation usage tables demonstrating water use and distribution at local scale.

Note the stormwater areas shown in Appendix K should be considered indicative only, with the final form of these areas undertaken at UWMP stage based on refined stormwater modelling and landscape design.

5.3 Wastewater Management

Wastewater will be reticulated sewerage with management by the Water Corporation.

6. Stormwater Management Strategy

This LWMS proposes a pro-active treatment train approach to achieve exemplary water quality management for the site through the adoption of both non- structural and structural control measures.

Stormwater management at the site has been designed in accordance with Better Urban Water Management (WAPC, 2008), City of Cockburn principles for water quality and quantity management, DWER requirements, and Stormwater Management Manual for Western Australia (DoW, 2007).

The system will consist of a series of lot soakwells, road drainage pits, piped drainage, overland flows paths, swales, and distributed bioretention and flood storages areas within POS and road reserves for water quality treatment and major event management.

A key element of the system will be the minimisation of pipe networks and the use of many small scale local catchments to treat and infiltrate stormwater runoff at source.

In some areas, underground storages may be required due to the constraints provided via the level of existing pipe inverts entering the site from external catchments, and the desire to achieve useable POS outcomes and tree retention.

Where appropriate additional local scale management measures such as tree pits, pervious paving, and rain gardens will be considered during more detailed local planning and engineering design and appropriately documented in UWMP's.

6.1 Stormwater Event Modelling

Stormwater modelling of proposed stormwater management areas was undertaken by Hyd2o using the PONDS shallow water table infiltration model. PONDS is a program specifically designed for modelling groundwater/surface water interactions for the design of stormwater infiltration areas based on the finite difference computer program MODFLOW developed by the US Geological Survey.

The design storms modelled by PONDS were calculated with reference to the methodology in Australian Rainfall and Runoff (ARR) and the Bureau of Meteorology Computerised Design IFD Rainfall System (CDIRS). The rainfall temporal pattern was assumed to be spatially uniform across the catchment. Storm durations modelled ranged from 1 hour to 72 hours.

To support an at-source approach to stormwater management, the site was delineated into many small catchments based on existing external catchments and flow paths, proposed earthworks, and the location of the proposed POS areas. All individual catchments are shown in Figure 8.

Various runoff coefficients applied to different land uses for each of the AEP's modelled were determined using Hyd2o's CUURV runoff rate calculator as detailed in Appendix L. These rates were then used to determine the equivalent impervious areas (EIA's) for each individual catchment. These EIA's are also detailed in Appendix L.

Note that for LWMS modelling purposes group housing sites have been assumed to contribute runoff to the catchment stormwater storages in which they are located. Opportunities for onsite stormwater retention of these areas will be examined at later

stages of planning, particularly where this may lead to better POS outcomes and enhanced tree retention. Similarly for larger lots, opportunities for increased lot retention of runoff will be explored to achieve increased at source infiltration and reduce downstream storage requirements.

Key modelling parameters for individual catchments are provided in Appendix M and the basis for the values used summarised as follows:

- A groundwater level equivalent to the AAMGL at the location of the proposed storage was adopted a baseline condition for the start of modelling. This is considered a conservative assumption as groundwater levels will be lower than the AAMGL at most times of the year.
- A maximum inundation depth of 0.3 m for biofiltration areas and management of the 15mm event.
- Batter side slopes of 1 in 6 for both biofiltration and major event flood storage area in POS and road reserves. Vertical side slopes were adopted for underground storages.
- A maximum storage depth of 1.2 m adopted for above ground storages in POS and a maximum depth of 0.8m for swales located adjacent to road reserves.
- Variable hydraulic conductivity adopted at individual storages based on local field permeability testing with allowance for long term clogging and considering acceptable City of Cockburn upper limits for design use. Note that for biofiltration areas a rate of 5 m/d for filter media was adopted, with a 50% clogging allowance.

Storage inverts are shown in Appendix M relative to the AAMGL and MGL at each storage location. This inverts should be considered indicative only, subject to detailed future earthworks design. It is important to note that at a few locations with lesser clearances to groundwater, this occurs due to the storage invert levels being dictated by the existing stormwater infrastructure levels from external catchments to current storages.

Opportunities to raising these existing outlet levels will be further examined in consultation with the City of Cockburn in due course however this will need to ensure the stormwater function of existing piped systems outside of the site are not compromised.

The proposed stormwater management system post development is shown in Figures 9a, 9b, and 9c showing key storage locations, volumes, and areas based on modelling outcomes using PONDS for various AEP events. A full set of modelling results detail all parameters and results for each individual catchments is provided in Appendix M, with an overlay of the stormwater management areas in relation to the landscape masterplan contained in Appendix N.

Table 9 provides a summary of the overall areas for stormwater management for the site to inform planning considerations:

- With respect to the 15mm (1 EY) event the total volume required within the site to manage this event is estimated as 1,486 m^3, with an area of 7,335 m^2 (based on ~0.3 m deep storage and 1:6 side slopes). Note that this area calculation excludes likely the likely area associated with underground storage for this event as this will not affect POS usability. The area equates to approximately 1.4 % of the total site area, which is larger than would normally be expected due to runoff from external catchments into the site.

- With respect to the 20% AEP event the total volume required within the site to manage this event is estimated as 5,688 m^3, with an area of 12,584 m^2 (inclusive of the 15mm / 1 EY event storage. This area excludes any potential underground storage. The area equates to approximately 2.4 % of the total site area.
- With respect to the 1% AEP event the total volume required within the site to manage this event is estimated as 12,385 m^3, with an area of 17,830 m^2 (inclusive of the 15mm / 1 EY event storage. This area equates to approximately 3.4 % of the total site area.

Note that the extent of inundation of POS areas shown in Figure 9 for various flood management events are shown to scale. The storage shapes and locations however should be considered indicative only for determination of area space requirements and the representation of storage areas required in relation to POS areas allocated in the local structure plan.

With respect to the existing stormwater storage areas, it should be noted that the sizing of the future stormwater management areas was not done by simply accepting and replicating the volume of the existing areas but was based on updated catchment mapping, local infiltration testing, and detailed modelling of each subcatchment. This is important as Hyd2o understand the City have previously experienced some flowing issue with some the existing storage areas.

Storage volumes shown in the LWMS therefore represent updated volumes for each catchment based on achieving current design guidelines and best practice outcomes. Continued liaison with the City of Cockburn over the development timeframe will ensure additional anecdotal information regarding performance is included and informs future detailed design.

The final flood attenuation area configuration (side slopes etc), locations, and elevations will be documented in future UWMPs and will be dependent on the refined final earthworks, drainage, and road design levels for the development.

Minor refinements to catchment areas shown in this report are considered likely to occur as detailed design proceeds, and stormwater modelling will be updated accordingly during the UWMP process.

.

Table 8: Post Development Stormwater Management Summary

	Site	External
Residential Lots R20 (ha)	24.09	40.27
Residential Lots R40 (ha)	0.86	-
Group Housing (ha)	4.60	-
Commercial (ha)	0.70	-
POS (ha)	10.45	0.88
Road Reserve / Laneways (ha)	11.77	15.09
Total Area (ha)	52.46	56.24
Equiv Imp Area (15mm event) (ha)	8.59	10.41
Equiv Imp Area (20% AEP/1% AEP) (ha)	17.72	20.17
Storages		
Total Number of Catchments	35	17
Total Combined Catchments/Storages	39	
Underground Storages (no.)	7	
POS Storages (no.)	17	
Swales (no.)	15	
Water Quality: 15mm Bioretention		
Total Volume (m^3)	1,486	
Top Water Level Area (m^2)	7,335	
Flood Storage: 20% AEP		
Total Volume (m^3) – inc Biofilters & Underground	5,688	
Top Water Level Area (m^2) - inc Biofilters & Underground	14,227	
Top Water Level Area (m^2) - inc Biofilters, excl Underground	12,584	
Flood Storage: 1% AEP		
Total Volume (m^3) – inc Biofilters & Underground	12,385	
Top Water Level Area (m^2) - inc Biofilters & Underground	19,473	
Top Water Level Area (m^2) - inc Biofilters, excl Underground	17,830	

6.2 Ecological Protection

Water quality management for the site will include non- structural as well as structural control measures:

- **Non-Structural Controls**
  Planning: POS and linear green space network, lot product, and subdivision layout.
  Maintenance: regular stormwater system maintenance including POS biofilter areas.
  Monitoring: Post development program and performance review.
- **Structural Controls**
  Catchment Scale Infrastructure: Bioretention areas, swales and storages (above and below ground) in POS areas and road reserves
  Local Scale Infrastructure: Soakwells
  Landscape: Maintaining existing mature trees, native plantings.

Measures adopted represent known best management practice as detailed in the Stormwater Management Manual for Western Australia (DoW, 2007). Table 9 details a summary from the Stormwater Management Manual for Western Australia (DoW, 2007) of expected pollutant removal efficiencies for various WSUD measures in relation to water quality design criteria. While DoW (2007) does not provide expected pollutant removal efficiencies for all BMP's, application of a treatment train approach using a combination of the non-structural and structural measures will achieve the design objectives for water quality treatment as detailed in Better Urban Water Management (WAPC, 2008).

Storm volumes for ecological protection based on water quality treatment of the 15mm event are provided in Table 8 and Figure 9. Appendix N provides typical storage cross sections showing biofilters in relation flood storage within POS, linear POS, and road reserve arrangements. Biofilters will be designed at UWMP stage consistent with the Adoption Guidelines for Stormwater Biofiltration Systems (CRC for Water Sensitive Cities, 2015).

Post development UNDO modelling of the site is detailed in Appendix I. The results indicate nutrient inputs of 3617 kg/yr for TN and 754 kg/yr TP post development. This indicates a 5088 kg/yr reduction in TN and 386 kg/yr increase in TP. The resultant nutrient export was 261 kg/hr/yr of TN and 6.2 kg/yr export of TP following development. This represents a 454 kg/yr reduction in TN and 3.7 kg/yr TP increase compared to existing. Note that these results exclude the additional benefit the new stormwater storages also provide in treating stormwater from the external catchment.

Table 9: BMP Water Quality Performance In Relation to Design Criteria

Parameter	Design Criteria via (WAPC, 2008) (required removal as compared to a development with no WSUD)	Structural Controls Nutrient Output Reduction (DoW,2007) [1]	
		Vegetated Swales/ Bioretention Systems	Infiltration Storages
Total Suspended Solids	80%	60-80%	65-99%
Total Phosphorus	60%	30-50%	40-80%
Total Nitrogen	45%	25-40%	50-70%
Gross Pollutants	70%	-	>90%

7. Groundwater Management Strategy

7.1 Earthworks, Fill and Subsoil Drainage

Development levels within the site are generally not dominated by fill requirements to achieve adequate separation to regional groundwater, given the proximity of groundwater levels to natural surface over much of the site.

It is envisaged that the site will broadly be a cut to fill operation with minimal imported fill required. No subsoil drainage will be needed.

Preliminary earthwork levels for the site prepared by JDSi are detailed in Appendix O. These earthwork levels have informed the establishment of catchment boundaries for the stormwater modelling detailed in Section 6.

Final design lot levels and fill specification are a detailed design issue to be addressed during the preparation of detailed engineering design drawings and preparation of the UWMP and will be ultimately submitted for council approval at that stage.

7.2 Acid Sulphate Soils

Acid sulphate soil mapping has been previously discussed in Section 3.2.1 as having moderate to low risk of ASS across the site less than 3 m from the surface.

If required, management of ASS will be addressed by a separate study by a suitably qualified environmental consultant, and any ASS management plan required will detail the actions to minimise and mitigate potential adverse environmental effects during the works.

All assessment and management of ASS will be conducted in accordance with the Acid Sulphate Soil Guideline Series Identification and Investigation of Acid Sulphate Soils (DoE, 2004). This will be conducted appropriately as a separate process to this LWMS.

8. Urban Water Management Plans

Consistent with processes defined in WAPC (2008), Urban Water Management Plans (UWMPs) will be developed and submitted to support subdivision applications for various stages of development within the site.

Preparation of the UWMP will be the responsibility of the developer. UWMPs will address:

- Demonstrated compliance with LWMS criteria and objectives to the satisfaction of the City of Cockburn and DWER.
- Agreed/approved measures to achieve water conservation and efficiencies of water use, including provision of POS irrigation water use distribution details.
- Detailed stormwater management design including the size, location and design of public open space areas, integrating major and minor flood management capability.
- Management of groundwater levels including proposed cut/fill levels.
- Specific structural and non-structural BMPs and treatment trains to be implemented including their function, location, maintenance requirements, expected performance and agreed ongoing management arrangements.
- Management of subdivisional works including development of a strategy for sediment control during construction.
- Implementation plan including roles, responsibilities, funding and maintenance arrangements.
- Specific monitoring and reporting to be undertaken for each UWMP area consistent with the monitoring program defined in the LWMS.
- Contingency plans (where necessary).

Further detail of the integration of stormwater within POS will be provided during the development of the relevant UWMP's covering those specific areas. This will include the refinement of stormwater modelling, preparation of detailed landscape plans (species selection and treatments), and detailed engineering design drawings.

Staging of stormwater changes will be detailed in the relevant UWMP's and implemented to ensure key hydrological performance criteria in relation to the receiving environment and key design objectives are maintained during the development process.

9. Monitoring

9.1 Pre Development

Baseline surface and groundwater monitoring of existing conditions commenced in June 2020 and is currently continuing within the site. Monthly groundwater levels and quarterly water quality are being recorded in addition to sampling of existing stormwater quality discharging into the site from City of Cockburn drainage systems.

This monitoring is ongoing and scheduled for completion following winter 2021. This information together with other previous historical monitoring data from the site will then be will analysed and used to refine predevelopment water quality estimates and water quality targets for the site.

9.2 Post Development

Department of Water (2012) indicates a minimum of 3 years post development monitoring is required, and defines post development as "from completion of first subdivision to five years after 80 per cent of the development (by land area) has been completed".

The post development monitoring program is summarised in Table 10. Post development groundwater monitoring is proposed in 9 groundwater monitoring bores as shown in Figure 10, to provide suitable coverage of the site. Locations have been selected based on maintaining existing sampling locations where possible.

The following frequency of monitoring is proposed:

- Monthly groundwater level measurements.
- Quarterly groundwater quality measurements.

Groundwater levels will also be measured in three nearby DWER bores JM45, JM12, and JM2 consistent with pre development monitoring.

Groundwater quality will be monitored quarterly (typically January, April, July, October) for physical parameters (pH, electrical conductivity), nutrients (total nitrogen, total Kjeldahl nitrogen, ammonia, nitrate, nitrite, total phosphorus, and filterable reactive phosphorus) and heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, aluminium, manganese, arsenic and lead). All water quality samples will be analysed at a NATA approved laboratory.

Stormwater quality sampling of key stormwater infiltration and biofiltration areas within the site once constructed will also be undertaken via grab sampling on up to 4 occasions each winter. Sampling parameters will be the same as groundwater monitoring.

Visual assessment of each of these areas will also be undertaken on a quarterly basis via a standardised proforma, to assess performance in relation to design.

The monitoring schedule will be undertaken for a three year period consistent with usual DWER requirements. An annual report will be prepared summarising the results of the program, with results compared to predevelopment monitoring data.

The program may need to be modified as data is collected to increase or decrease the monitoring effort in a particular area, or to alter the scope of the program itself. This will require agreement of all parties.

If required, contingency actions will include a review of all monitoring data to determine the likely cause of any significant changes in water quality, consideration of additional monitoring required to assist a determination, and consideration of remedial actions.

A contingency plan is presented in Table 11, which will be refined following the completion of predevelopment monitoring. Post development monitoring results will be compared to both pre-development monitoring outcomes and ANZECC guideline data. This approach is required as the local baseline condition may naturally be outside the recommended ANZECC range for some parameters.

Implementation of the post development monitoring program is the responsibility of the developer. Where staging aspects require any specific additional monitoring to be conducted, this will be appropriately detailed at UWMP stage.

Table 10: Post Development Monitoring Program

Monitoring	Parameter	Location	Method	Frequency and Timing
Groundwater level	Water level (m AHD)	9 bores within site area and 3 DWER bores	Electrical depth probe or similar	Monthly (12 occasions annually)
Groundwater quality	Physical, nutrients and heavy metals	9 bores within site area	Pumped bore sample	Quarterly (4 occasions annually)
Stormwater quality	Physical, nutrients and heavy metals	Biofilters & Infiltration storages	Collected grab samples of outflow	Max four occasions during each winter monitoring period
Stormwater System performance	Proforma	Biofilters & Infiltration storages	Visual Assessment	Max four occasions during each winter monitoring period

Table 11: Contingency Planning

Type	Criteria for Assessment	Frequency	Process & Possible Actions
Water Quality	Surface and groundwater quality significantly worse than: a) predevelopment water quality; and/or b) typical urban stormwater quality on the Swan Coastal Plain (Martens et al 2005) TN : 1.1 mg/l TP : 0.21 mg/l with reference to ANZECC guidelines [1]	Ongoing assessment following monitoring with annual review	**Process** 1. Assess spatial extent of occurrence. 2. Determine if due to development or other 3. Perform appropriate action as required 4. Record and report any breach and action 5. If necessary inform residents of any works 6. Inform and provide data to DWER/ CoC **Possible Actions** 1. Resample to determine if a true reading 2. Identify & remove point sources of pollution 3. Review operation & maintenance practices 4. Consider alterations to POS areas including landscape regimes and soil amendment. 5. Consider stormwater system modifications 6. Consider community based projects.

1. ANZECC guidelines to be used as a reference point only. ANZECC guidelines state that guidelines values are not intended to be directly applied to stormwater quality, however are applicable where the stormwater system are regarded as having conservation value. ANZECC guideline values are derived for unmodified or slightly modified ecosystems. ANZECC recommends the values only be applied where site specific values do not exist, or site specific targets cannot be derived.

10. Implementation

Table 12 details the roles, responsibilities and funding to implement the LWMS.

Monitoring outcomes will be used in a continual improvement capacity to review the implemented WSUD within the site and inform the planning and design approaches for subsequent stages of development.

Details of construction and maintenance activities and responsibilities will be appropriately detailed at UWMP stage, and will include details of any specific staging considerations, and the need for ongoing management of subsoil drainage to ensure its ongoing performance in accordance with design.

Monitoring outcomes will also be used to inform continual design and planning improvements as the development proceeds.

Table 12: Implementation, Roles and Responsibilities

Implementation Action	Responsibility		
	Developer	DWER	City of Cockburn
Review and approval of LWMS		✓	✓
Completion of predevelopment monitoring/reporting and target establishment	✓		
Preparation of a UWMP for individual development stages	✓		
Review and approval of UWMP		✓	✓
Construction of stormwater system and maintenance post construction until council handover	✓		
Long term stormwater system operation and maintenance			✓
Conduct post development monitoring program and annual reporting	✓		
Review of monitoring data and annual reports		✓	✓

11. References

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000), National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000.

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), (2016), Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia.

CMW Geosciences (2020), Proposed Residential Subdivison Glen Iris Golf Course, Jandakot, WA Geotechnical Investigation Report, December 2020

CRC for Water Sensitive Cities (2015), Adoption Guidelines for Stormwater Biofiltration Systems

Department of Environment (2004a), Acid Sulphate Soil Guideline Series Identification and Investigation of Acid Sulphate Soils, Perth, Western Australia.

Department of Environment (2003), General Guidance on Managing Acid Sulphate Soils. Acid Sulphate Soils Guideline Series Department of Environment (DoE), August 2003.

Department of Water (2007), Stormwater Management Manual for Western Australia.

Department of Water (2012a), Water Monitoring Guidelines for Better Urban Water Management Strategies and Plans.

Department of Water (2016), Land Use Compatibility Tables for Public Drinking Water Source Areas, Water Quality Protection Note No. 25 April 2016

Department of Water and Environmental Regulation (2017), Decision Process for Stormwater Management in WA.

Department of Water and Environmental Regulation (2021a), Perth Groundwater Map (online).

Department of Water and Environmental Regulation (2021b), Water Information Reporting (online).

Department of Water and Environmental Regulation (2021c), Water Register (online).

Department of Water and Environmental Regulation (2021d), Public Drinking Water Supply Area Mapping Tool (online)

Department of Water and Environmental Regulation (2021a), Contaminated Site Database Map (online).

Gozzard (1983), Fremantle Pt Sheet 2033 I and 2033 IV, 1:50,000 Environmental Geology Series. Geological Survey of Western Australia, Department of Minerals and Energy, Perth.

Hill, A.L, Semeniuk, C.A, Semeniuk, V and Del Marco, A. (1996), Wetlands of the Swan Coastal Plain Vol 12B: Wetland Atlas. Perth: Department of Environmental Protection; Water and Rivers Commission.

Institute of Public Works Engineering Australia (2016), Draft Specification on Separation Distances for Groundwater Controlled Urban Development.

Martens S, Davies JR, O'Donnell M. (2005), Monitoring for Total Water Cycle Management: The WESROC Experience. Institute of Public Works Engineering Australia Conference 2005.

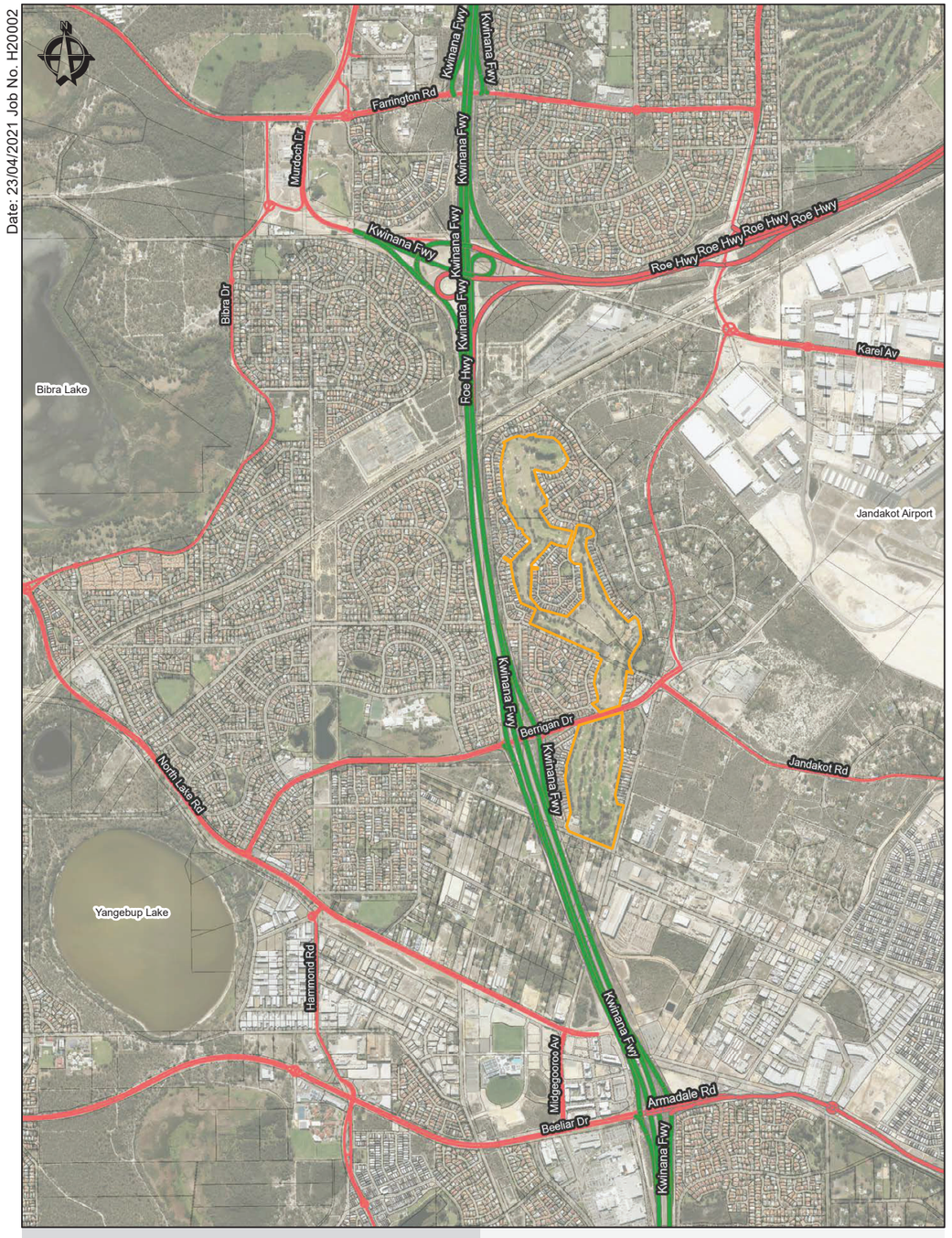
Western Australian Planning Commission, (2003), Planning Bulleting No. 64: Acid Sulphate Soils. Western Australian Planning Commission, November 2003.

Western Australian Planning Commission, (2017), State Planning Policy 2.3 Jandakot Groundwater Protection January 2017

Western Australian Planning Commission, (2006), State Planning Policy 2.9 Water Resources, December 2006

Western Australian Planning Commission. (2008), Better Urban Water Management, October 2008.

FIGURES



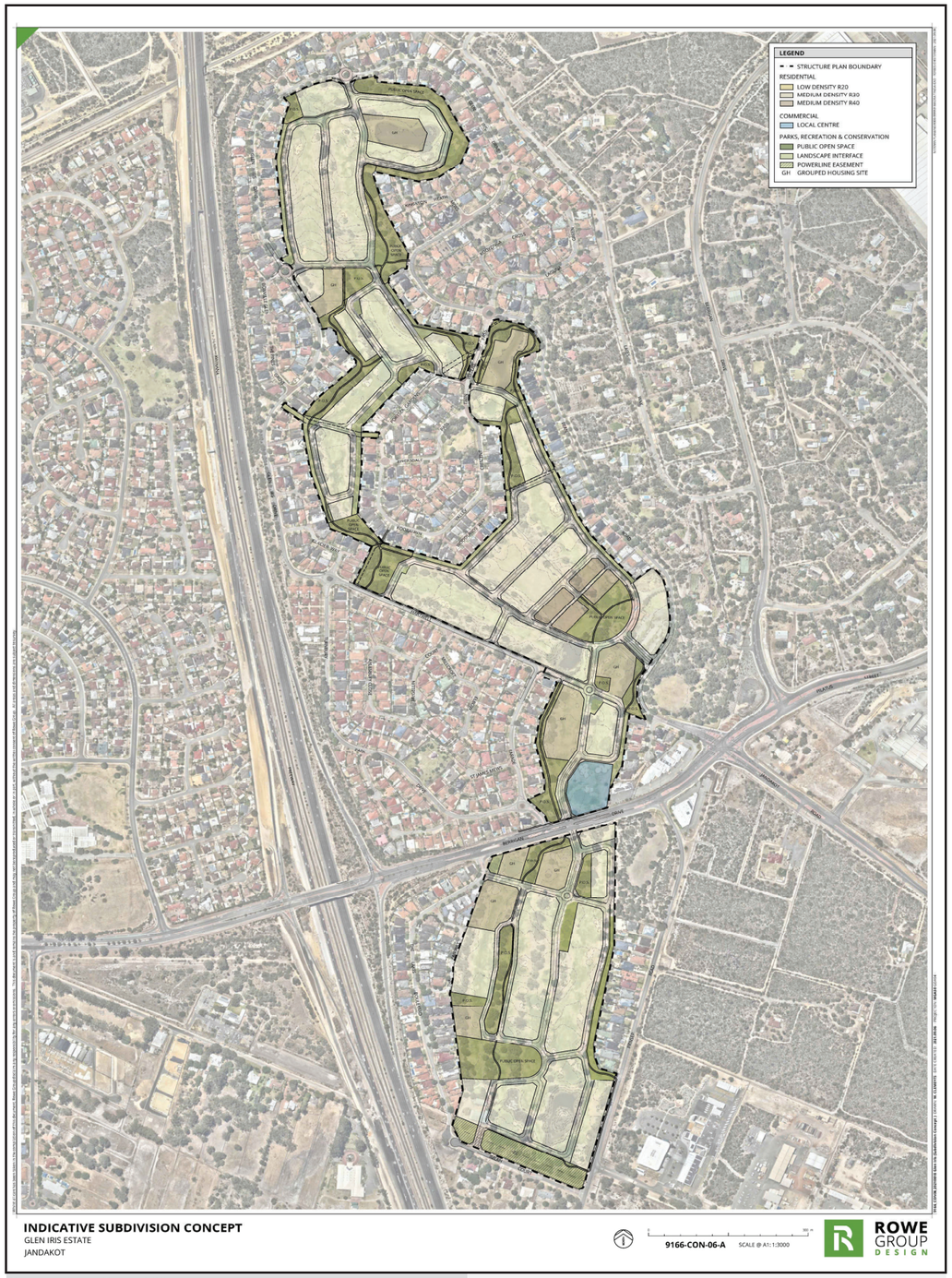
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Location Plan

Figure 1

Date: 15/09/2021 Job No H20002



Source: Rowe Group 2021

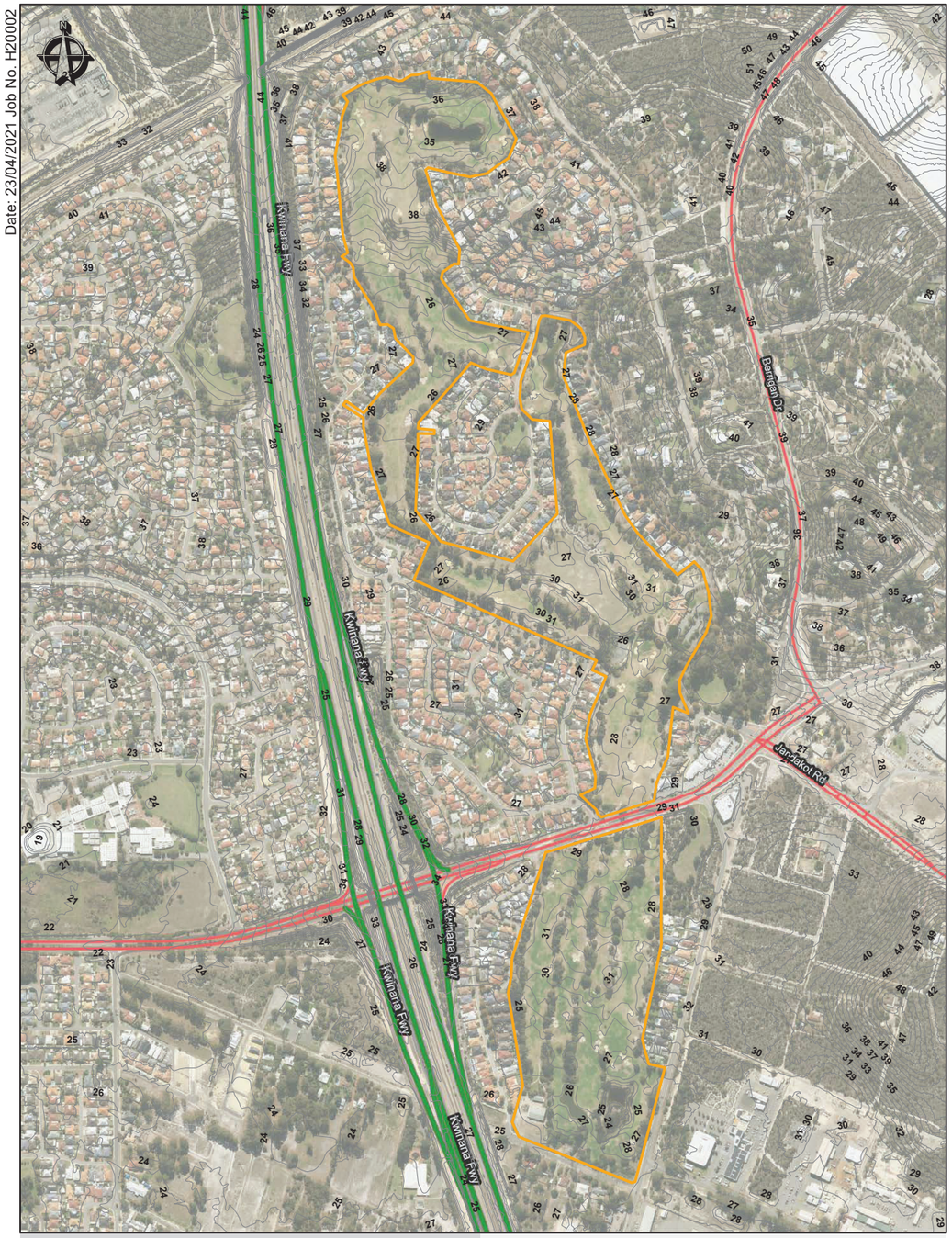
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Local Structure Plan

Figure 2

Date: 23/04/2021 Job No. H20002



Site Boundary

DWER LiDAR 1m Contours

0 90 180 270 360 Meters

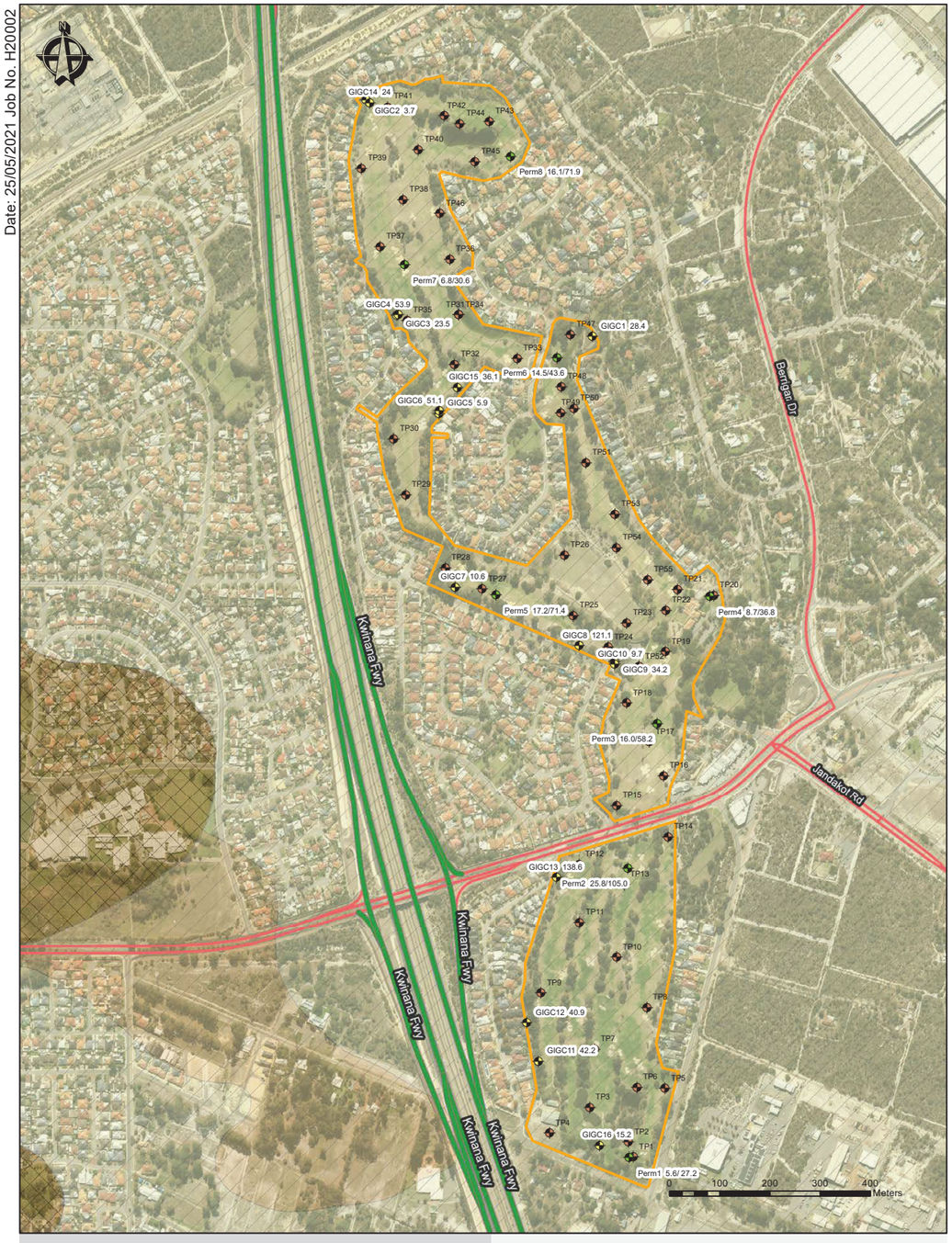
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Site Conditions Plan

Figure 3

Date: 25/05/2021 Job No. H20002



- Site Boundary
- Ms5 : Sand Silt
- S10 : Bassendean Sand over Guidford Formation
- S8 : Bassendean Sand
- ASS High to Moderate Risk
- ASS Moderate to Low Risk
- Hyd2o Permeability Sites (m/d)
- CMW Permeability Sites (m/d)
- CMW Geotech Pits

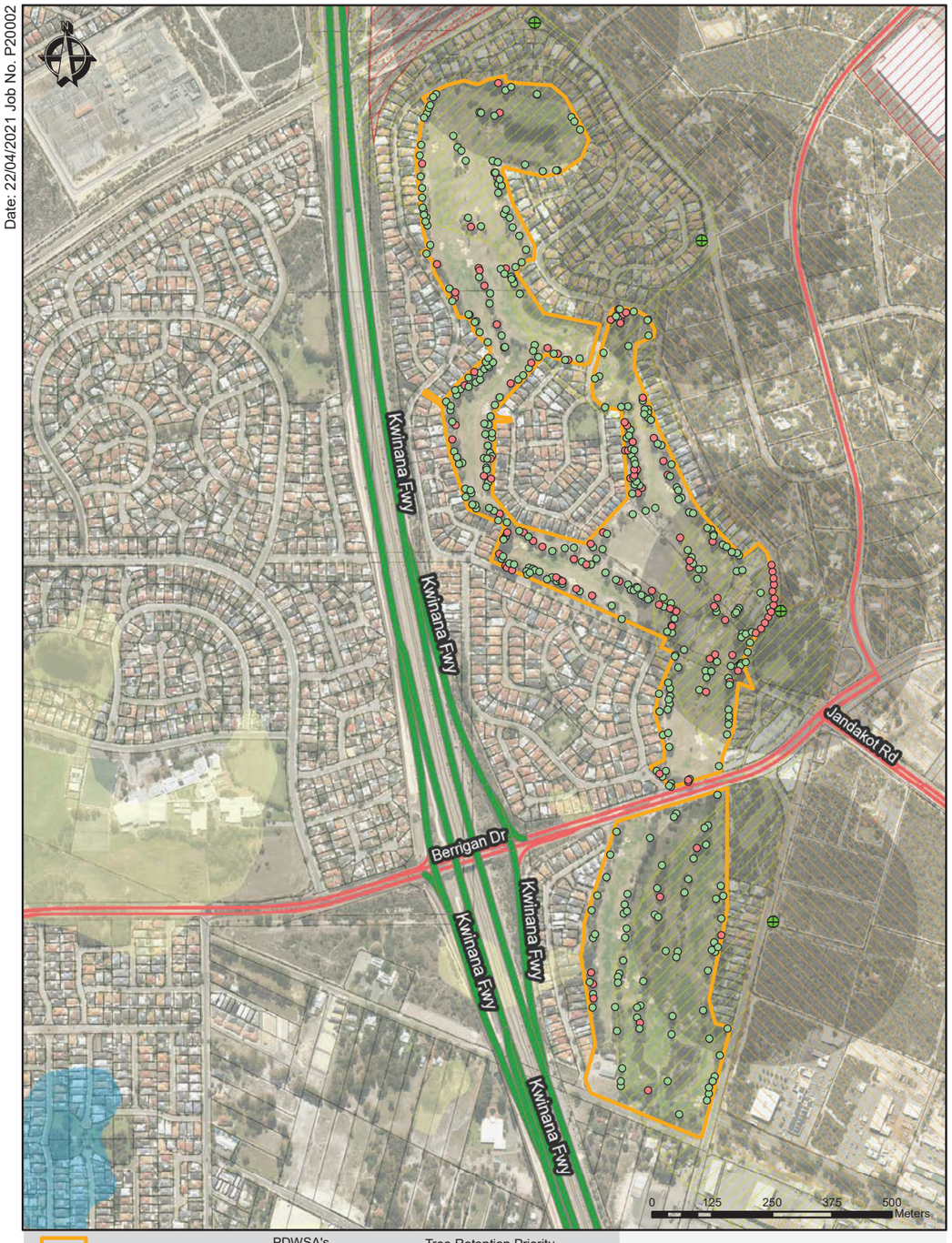
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Geotechnical Plan

Figure 4

Date: 22/04/2021 Job No. P20002



- Site Boundary
- Conservation Wetland
- Multiple Use Wetland
- Resource Enhancement
- Water Corp Bores

PDWSA's
- P1
- P2
- P3
- Wellhead Protection Zones

Tree Retention Priority
- High
- Medium

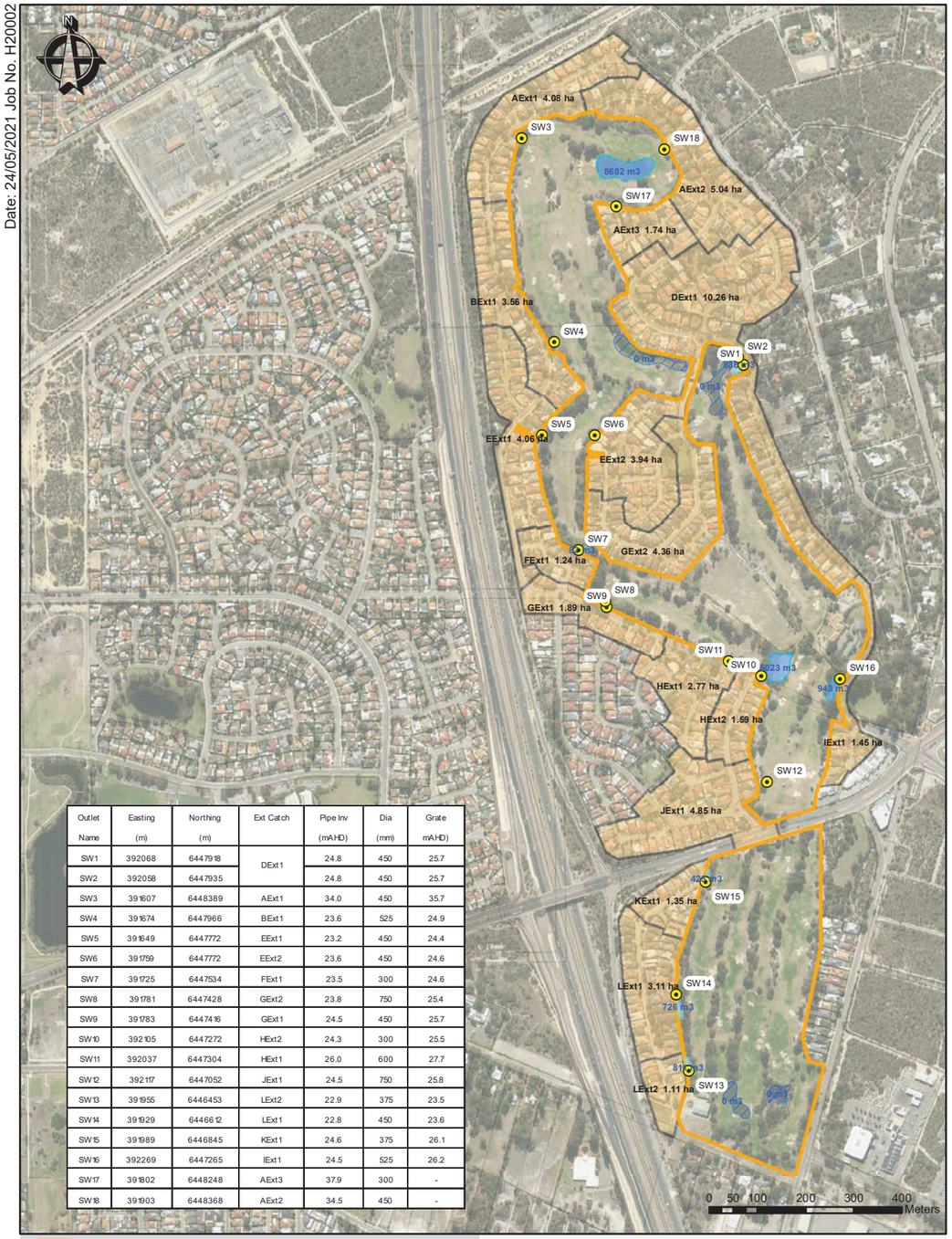
hyd2o

Glen Iris Jandakot LWMS

Environmental Plan

Figure 5

Date: 24/05/2021 Job No. H20002



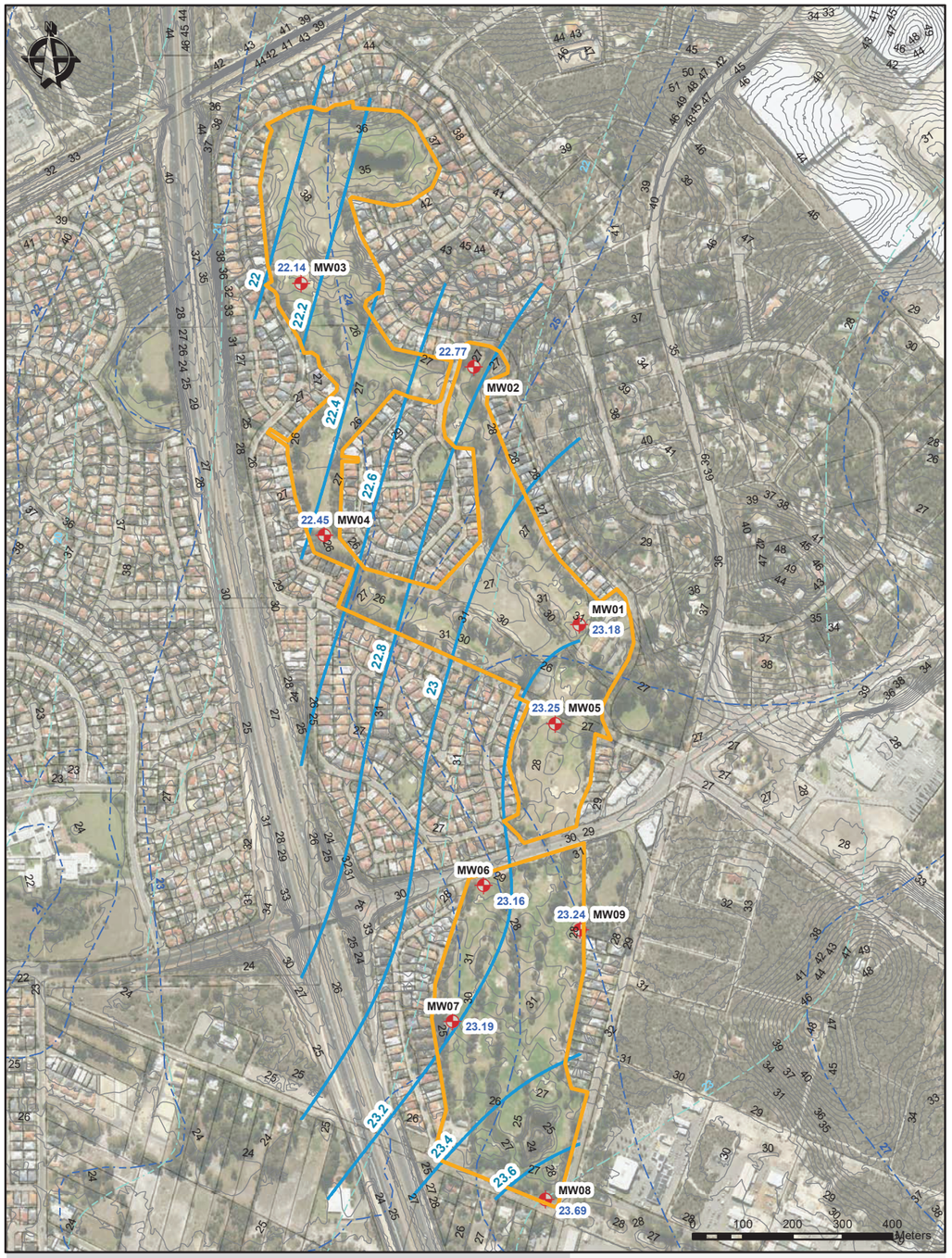
Outlet Name	Easting (m)	Northing (m)	Ext Catch	Pipe Inv (mAHD)	Dia (mm)	Grate mAHD)
SW1	392068	6447918	DExt1	24.8	450	25.7
SW2	392058	6447935		24.8	450	25.7
SW3	391607	6448389	AExt1	34.0	450	35.7
SW4	391674	6447966	BExt1	23.6	525	24.9
SW5	391649	6447772	EExt1	23.2	450	24.4
SW6	391759	6447772	EExt2	23.6	450	24.6
SW7	391725	6447534	FExt1	23.5	300	24.6
SW8	391781	6447428	GExt2	23.8	750	25.4
SW9	391783	6447416	GExt1	24.5	450	25.7
SW10	392105	6447272	HExt2	24.3	300	25.5
SW11	392037	6447304	HExt1	26.0	600	27.7
SW12	392117	6447052	JExt1	24.5	750	25.8
SW13	391955	6446453	LExt2	22.9	375	23.5
SW14	391929	6446612	LExt1	22.8	450	23.6
SW15	391989	6446845	KExt1	24.6	375	26.1
SW16	392269	6447265	IExt1	24.5	525	26.2
SW17	391802	6448248	AExt3	37.9	300	-
SW18	391903	6448368	AExt2	34.5	450	-

Site Boundary
Existing Outlets
External Subcatchments

Existing Storage Type
Other : Lined Lake
Other : Water Table Lake
Stormwater : Lined Storage
Stormwater : Shallow Depression
Stormwater : Sump

hyd2o
Glen Iris Jandakot Local Water Management Strategy
Surface Water Plan
Figure 6

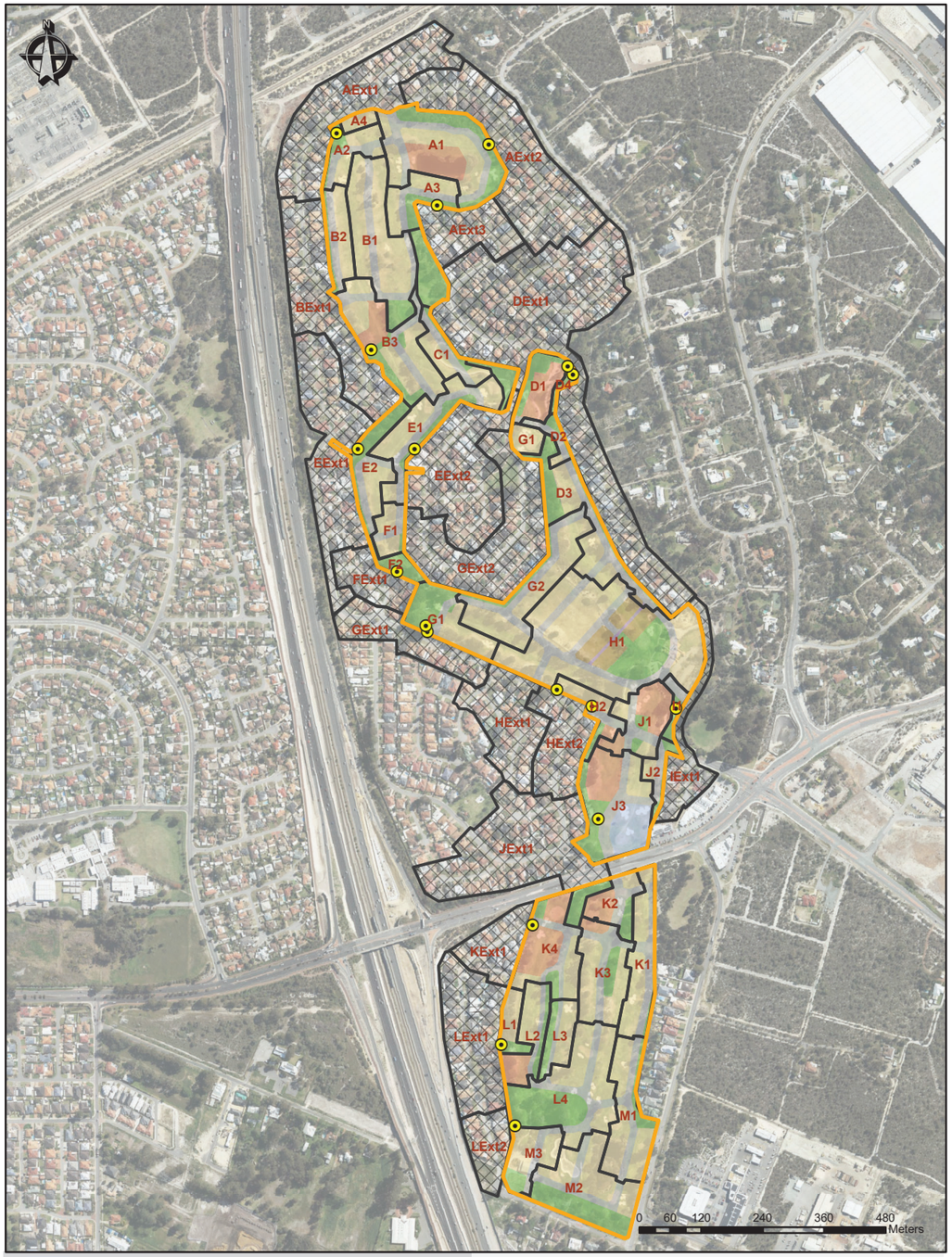
Date: 22/04/2021 Job No. P20002



Site Boundary
DWER LiDAR 1m Contours
AAMGL Contour (mAHD)
DWER Groundwater Historical Maximum (mAHD)
DWER Groundwater Historical Minimum (mAHD)
Site Bores AAMGL (mAHD)

hyd2o
Glen Iris Jandakot LWMS
Groundwater Plan
Figure 7

Date: 15/09/2021 Job No. H20002



Site
Catchments
External Catchments
Existing Outlet

Low Density Lots
Medium Density Lots
Group Housing
POS
Local Centre
Road Reserve

hyd2o

Glen Iris Jandakot Local Water Management Strategy

Post Development Stormwater Catchments

Figure 8

Date: 16/09/2021 Job No. H20002



Site Boundary
Catchments
Biofiltration Area
Basin/Swale Flood Storage
Underground Flood Storage

Low Density Lots
Medium Density Lots
Group Housing
POS
Road Reserve
Local Centre
Existing Pipework/ Outlet

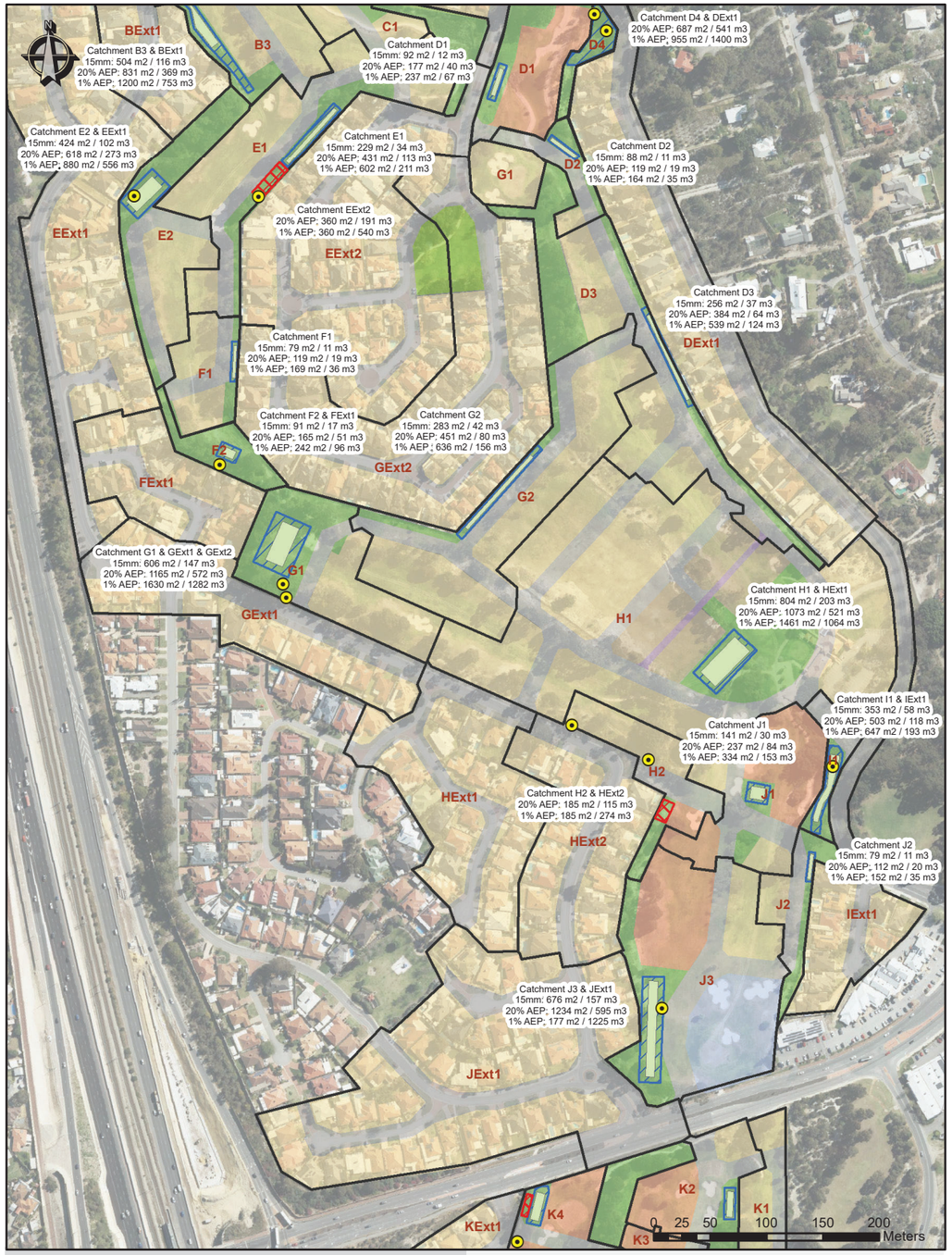
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Stormwater Management Event Plan: North

Figure 9a

Date: 16/09/2021 Job No. H20002



Site Boundary
Catchments
Biofiltration Area
Basin/Swale Flood Storage
Underground Flood Storage
Low Density Lots
Medium Density Lots
Group Housing
POS
Road Reserve
Local Centre
Existing Pipework/ Outlet

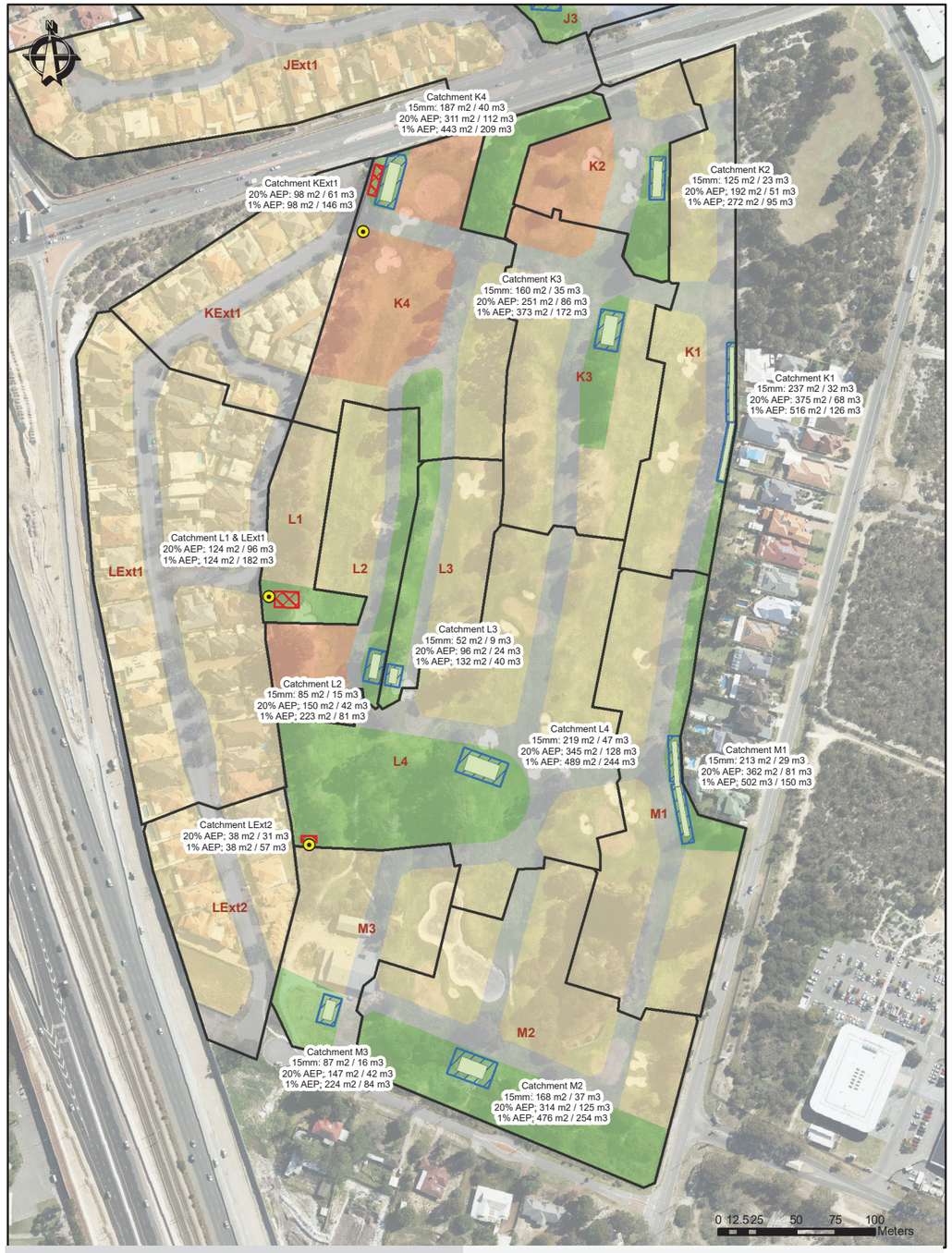
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Stormwater Management Event Plan: Central

Figure 9b

Date: 16/09/2021 Job No. H20002



Site Boundary
Catchments
Biofiltration Area
Basin/Swale Flood Storage
Underground Flood Storage
Low Density Lots
Medium Density Lots
Group Housing
POS
Road Reserve
Local Centre
Existing Pipework/ Outlet

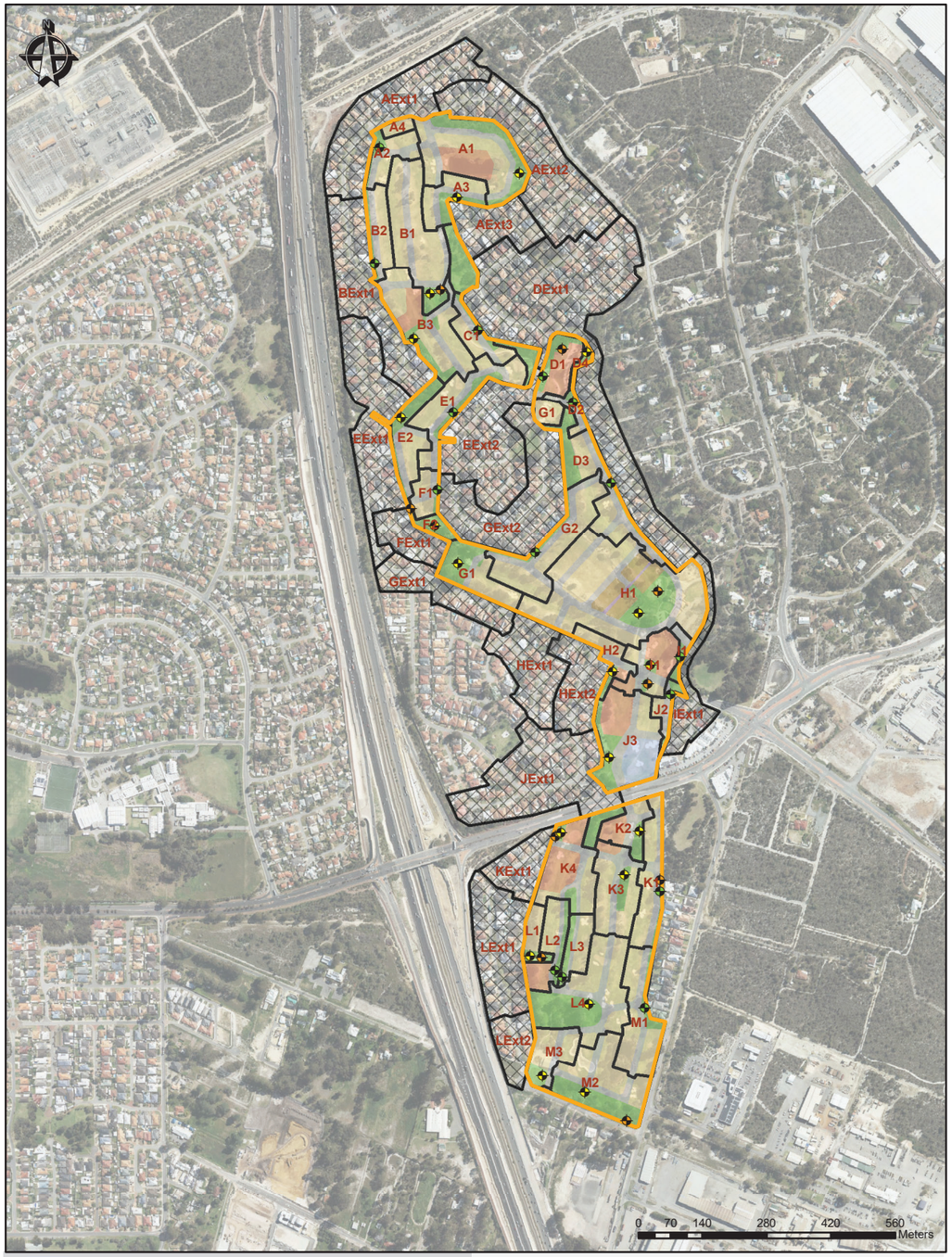
hyd2o

Glen Iris Jandakot Local Water Management Strategy

Stormwater Management Event Plan: South

Figure 9c

Date: 16/09/2021 Job No. H20002



Site
Catchments
External Catchments
Groundwater Bores
Stormwater Storages
Swales

hyd2o

Glen Iris Jandakot Local Water Management Strategy

Post Development Monitoring Sites

Figure 10

APPENDIX A
Better Urban Water Management Checklist

Better Urban Water Management LWMS Checklist

Local Water Management Strategy Item	Deliverable	✓	Comments
Executive summary			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1: design elements and requirements for BMP's and critical control points	☑	Executive Summary
Introduction			
Total water cycle management - principles and objectives Planning background Previous studies		☑	Chapter 1, Figure 1
Proposed development			
Structure plan, zoning and land use Key landscape features Previous land use	Site Context Plan Structure Plan	☑	Section 1.1, Section 2, Figure 2
Landscape - proposed POS areas, POS credits, water source, bore(s), lake details (if applicable), irrigation areas	Landscape plan	☑	Section 5.2, Appendix J
Design criteria			
Agreed design objective and source of objective		☑	Section 4, Table 7
Pre-development environment			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		☑	Section 3, Figures 3-7
Site conditions- existing topography/ contours, aerial photo underlay, major physical features	Site Condition plan	☑	Section 3.1, Figure 3
Geotechnical - topography, soils including acid sulfate soils and infiltration capacity, test pit locations	Geotechnical plan	☑	Section 3.2, Figure 4, Appendix B
Environmental- areas of significant flora and fauna, wetlands and buffers, waterways and buffers, contaminated sites	Environmental plan plus supporting data where appropriate	☑	Sections 3.3 & 3.4, Figures 5
Surface water- topography, 100 year floodways and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface water plan	☑	Section 3.5, Figure 6, Appendix D-F
Groundwater - topography, pre development groundwater levels and water quality, test bore locations	Groundwater plan plus details of groundwater monitoring and testing	☑	Section 3.6, Figure 7, Appendices F-H
Water use sustainability initiatives			
Water efficiency measures- private and public open spaces including method of enforcement		☑	Section 5.1
Water supply (fit- for-purpose strategy), agreed actions and implementation. If non-potable supply, support with water balance		☑	Section 5.2, Appendix I -J
Wastewater management		☑	Section 5.3
Stormwater management strategy			
Flood protection - peak flow rates, volumes and top water levels at control points, 100 year flow paths and 100 year detentions storage areas	100yr event plan Long section of critical points	☑	Section 6.1, Table 8, Figures 8 &9, Appendix K-M
Manage serviceability - storage and retention required for the critical 5 year ARI storm events Minor roads should be passable in the 5 year ARI event	5yr event plan	☑	Section 6.1, Table 8, Figures 8 & 9, Appendix K-M
Protect ecology - detention areas for the 1 yr 1 hr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1 yr event plan Typical cross sections	☑	Section 6.1, 6.2 Table 8 & 9, Figure 9, Appendix M

Local Water Management Strategy Item	Deliverable	✓	Comments
Groundwater management strategy			
Post development groundwater levels, fill requirements (including existing and likely final surface levels), outlet controls, and subsoil areas/exclusion zones	Groundwater/subsoil plan	☑	Section 7.1 Appendix N
Actions to address acid sulphate soils or contamination		☑	Section 7.2
The next stage - subdivision and urban water management plans			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design		☑	Section 8
Monitoring			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		☑	Section 9, Figure 10, Table 10 & 11
Implementation			
Developer commitments		☑	Section 10, Table 12
Roles, responsibilities, funding for implementation		☑	Section 10, Table 12
Review		☑	Section 10, Table 12

APPENDIX B
Geotechnical Report

23 December 2020

PROPOSED RESIDENTIAL SUBDIVISON
GLEN IRIS GOLF COURSE, JANDAKOT, WA
GEOTECHNICAL INVESTIGATION REPORT

Eastcourt Property Group

Ref. PER2020-0452AB Rev 0



PER2020-0452AB		
Date	Revision	Comments
23 December 2020	0	FINAL GEOTECHNICAL REPORT

Table of Contents

1 INTRODUCTION 1
2 SITE DESCRIPTION 1
3 PROPOSED DEVELOPMENT 2
4 FIELD INVESTIGATION 2
5 LABORATORY TESTING 2
6 GROUND MODEL 3
6.1 Geology 3
6.2 Subsurface Conditions 3
6.3 Groundwater 4
6.4 Permeability 4
7 LABORATORY TEST RESULTS 5
8 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS 5
8.1 General 5
8.2 Earthworks 5
8.2.1 Topsoil Strip and Subgrade Preparation 5
8.2.2 Bulk Earthworks 6
8.2.3 Retaining Wall Backfill 6
8.2.4 Excavatability 6
8.2.5 Earthworks Monitoring 6
8.2.6 Lake Remediation and Backfilling 7
8.3 Strip and Pad Foundations 7
8.4 Retaining Wall Design 8
8.5 Site Classification 8
8.6 Environmental 9
8.7 Pavement CBR 9
8.8 Drainage 9
9 CLOSURE 9
10 REFERENCES 1

Figures

Figure 01 – Site Investigation Plan

Appendices

Appendix A – Test Pit Logs, PSP Plots & Photos

Appendix B – Permeability Test Results

Appendix C – Laboratory Test Results

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by Mitch Dodson of Acumends Development Solutions on behalf of Eastcourt Property Group to carry out a geotechnical investigation of a proposed residential subdivision development site located at the Glen Iris Public Golf Course on Dean Road, Jandakot WA by way of email authorisation dated 16 November 2020. The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced *PER2020-0452AA, Rev 0*, dated 28 October 2020.

The purpose of this report is to describe the investigation completed, the ground conditions encountered and to provide recommendations with respect to geotechnical aspects of the proposed development including site preparation and earthworks, site classification, suitable foundation parameters, drainage, and the identification of geohazards and risks to the proposed development.

2 SITE DESCRIPTION

The proposed development site is approximately 53ha and will be located at the previous location of the Glen Iris Public Golf Course along Dean Road, Jandakot WA which has since been closed (refer to attached Site Investigation Plan – Figure No. 01).

For better understanding, the site has been split into three distinctive areas as seen in Figure 01. The first area, the most northern precinct is bound to the north, east and west by existing residential developments along Glen Iris Drive, and to the south by residential developments along Portsea Gardens and Twin Waterers Pass. Surface levels obtained from an imagery survey conducted by MNG (Ref. *102160-OPM-007-A*) on 09 April 2019 indicates this area is relatively steeply sloping from RL 43m AHD along the northern most boundary to RL 27m AHD along the southern boundary. The southeastern area also slopes gradually towards the centre of the northernmost lake (RL 34m AHD).

The central precinct is bound to the east by existing residential developments along Dean Road and Par Cresent which is further south, to the south by Berrigan Drive and to the west by residential developments along Hartwell Parade, Glacier Way, Eadie Cresent and Glen Iris Drive. In the centre of the precinct there are a large number of further residential developments linked by an array of roads and accessways connected to Twins Waters Pass. Near the southwestern corner of the area an existing single storey clubhouse development is located with associated carparking. Surface levels obtained from an imagery survey conducted by MNG indicates this area is relatively consistent, gently sloping from RL 27m along the northern boundary to RL 28m AHD along the southern boundary.

The southernmost precinct is bound to the north by Berrigan Drive, to the east by Prinsep Park and Prinsep Road, to the south by Imlah Cresent and to the west by residential dwellings along The Lakes Boulevard and The Fairway. In the southwestern most corner, there is two single story maintenance workshops with associated paved accessways. Surface levels obtained from an imagery survey conducted by MNG indicates this area is gently sloping from RL 26m AHD along the southern boundary to RL 29m along the northern boundary.

Surface levels are only indicative as there are numerous undulations, swales and isolated elevated areas, bunkers and fairways that mould the topographical profile of the entire site.

The site was previously used as a public golf course therefore the site contains relatively cleared areas. Vegetation cover comprises grass with some small to large sized trees lining the outsides of the fairways. There are also six manmade lakes located across the site.

It is believed the existing developments on the golf course will be demolished prior to the bulk earthworks for the proposed subdivision.

Aerial imagery from Landgate show that prior to the development of the golf course in 1965 the site was previously in use as agricultural lands. The surrounding areas have undergone significant land development and subdivision that appears to have affected the current golf course. In addition, the golf course layout has largely been man-made by earthworking. Because of this, there may be uncontrolled fill, very loose sands, buried topsoil or other unsuitable material present in areas of the site. In addition, there could be unsuitable material in the lake beds.

3 PROPOSED DEVELOPMENT

The plans supplied depict the area of approximately 53ha will be divided into approximately 600 to 800 residential lots with Public Open Space (POS), drainage basins plus associated accessways and roadways. At present, however, no specific engineering details of the proposed land development have been provided.

We anticipate that significant cut to fill earthworks will be required in order to form finished ground levels. The magnitude of the cut to fills assume the lots will be stepped from east to west. It is also understood that retaining walls will be constructed to assist with the development of the lots.

4 FIELD INVESTIGATION

The field investigation was carried out from 30 November 2020 to 02 December 2020, following a dial before you dig search. All fieldwork was carried out under the direction of CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform, site conditions and adjacent structures;
- 55 test pits, denoted TP01 to TP55, were excavated to depths of up to 2.2m using a JCB 8.5 tonne backhoe fitted with a 450mm wide toothed bucket to investigate the underlying soil conditions, facilitate sampling for laboratory testing and to assess excavatability and earthworks recommendations. Engineering logs of the test pits and photographs are presented in Appendix A;
- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit, in general accordance with AS1289.6.3.3, to depths of up to 2.1m to provide soil density/consistency profiles and to provide a subgrade CBR value for pavement design purposes. Graphical results of the PSP plots are presented on the test pit logs in Appendix A;
- 8 hand auger boreholes were drilled with a 100mm diameter auger to a depth of up to 1.42m to facilitate infiltration testing. Results of the permeability test are presented in Appendix B.

The approximate locations of the respective investigation sites referred to above are shown on the attached Site Investigation Plan (Figure No. 01). Test locations were selected by CMW with input from Steve Foley (JDSi) on specific areas to target/stay clear of during the investigation. Test locations were measured using a hand-held GPS to an accuracy of ±5m. Elevations were inferred from the imagery survey conducted by MNG (Ref. *102160-OPM-007-A*) on 09 April 2019.

5 LABORATORY TESTING

A small program of soil laboratory testing was carried out on representative soil samples generally in accordance with the requirements of the latest edition of AS1289 (where applicable).

Testing was carried out on samples selected by CMW and carried out by Western Geotechnical & Laboratory Services Pty Ltd (WGL), a NATA registered laboratory.

The following laboratory tests were carried out:

- 8 Organic Content Test (Loss on Ignition).

The laboratory test results, and associated certificates are provided in Appendix C.

6 GROUND MODEL

6.1 Geology

Published geological maps (Ref. Perth Metropolitan Region 1:50,000 Environmental Geology Series: Fremantle) and the CMW investigation database for the area depict the land as being underlain by Bassendean Sand overlying clayey and silty material of the Guildford Formation at depth.

Based on the known history of the site and surrounding land levels, some superficial depths of fill were also anticipated because of the previous agricultural use of the land.

6.2 Subsurface Conditions

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

TOPSOIL: SAND / CLAYEY SAND — dark grey, brown, fine to medium grained, subangular to subrounded sand with trace fines (>12% in TP48); trace organics; trace roots and rootlets; trace branches; trace vegetation, overlying;

FILL: SAND (UNCONTROLLED) — loose to very dense, fine to medium grained, subangular to subrounded; grey/pale yellow and orange-brown; trace fine grained limestone gravel (TP04, TP20); trace fines; trace organics; trace roots and rootlets; trace branches. Uncontrolled fill in the form of old reticulation pipe and bricks were found in TP04, TP18, TP28 and TP34. The reticulation pipe uncovered in TP28 and TP34 contained potential asbestos between depth of 0.5 and 1.6 mbgl, overlying;

SAND (SP) — loose to very dense, fine to medium grained, subangular to subrounded; grey/orange/yellow and white; trace fines; trace roots and rootlets, overlying;

COFFEE ROCK — very dense, fine to medium grained, subangular to subrounded, dark brown/black; weakly cemented. (Only found in TP03 TP06, TP12 and TP52). The coffee rock was typically found in or around low energy zones (lakes) located across the site where groundwater may be present.

Of the six manmade lakes located across the site, only TP48 was able to excavate the base of the lake due to the lake being empty. A green plastic liner was found approximately 0.5m below the base of the lake overlying the natural sand. It is assumed this liner is present at the base of all the other lakes at a similar depth. The liner was also found to be extending to the banks of the lakes evident in test pits TP34, TP44 and TP52 where the same plastic liner was uncovered just below the surface.

The distribution of the above units is summarised in Table 1 below:

Table 1: Summary of Soil Stratigraphy

Description	Depth to top of layer (m)		
	Minimum	Maximum	Average
TOPSOIL: SAND / CLAYEY SAND	0.00		
FILL: SAND (UNCONTROLLED)	0.02	0.20	0.11
SAND (SP)	0.10	1.90	1.00
COFFEE ROCK	>2.05		

6.3 Groundwater

A review of the Perth Groundwater Atlas indicates that groundwater levels are likely to be between RL 21m AHD and 26m AHD below existing ground levels. These levels equate to depths of approximately <1m below the lowest existing ground contours along the southern boundary of site.

During the investigation, which was completed in early-summer conditions (Nov/Dec 2020), groundwater was not encountered within any of the investigation locations.

6.4 Permeability

Tabulated results of the 8 in-situ falling head permeability tests carried out was used to estimate the soil coefficient of permeability in accordance with the methods described in Horslev (1951) (falling head test) and CIRIA Report No. 113 (falling head test).

Table summarises the results obtained. Complete results of the in-situ falling head tests are presented in Appendix B.

Table 2: Summary of Falling Head Permeability Tests

Standpipe ID	Bottom of Test Hole (mbgl)	Approximate Permeability			
		CIRIA (m/sec)	CIRIA (m/day)	Horslev (m/sec)	Horslev (m/day)
Perm 1	1.36	$3.15x10^{-04}$	27.22	$6.50x10^{-05}$	5.61
Perm 2	1.42	$1.22x10^{-03}$	105.00	$2.99x10^{-04}$	25.84
Perm 3	1.35	$6.73x10^{-04}$	58.18	$1.85x10^{-04}$	16.00
Perm 4	1.38	$4.25x10^{-04}$	36.75	$1.01x10^{-04}$	8.69
Perm 5	1.40	$8.26x10^{-04}$	71.39	$1.99x10^{-04}$	17.16
Perm 6	1.40	$5.05x10^{-04}$	43.61	$1.69x10^{-04}$	14.46
Perm 7	1.41	$3.54x10^{-04}$	30.55	$7.82x10^{-05}$	6.75
Perm 8	1.41	$8.32x10^{-04}$	71.89	$1.87x10^{-04}$	16.13

7 LABORATORY TEST RESULTS

The soil organic content laboratory test results are summarised in Table 3 below.

Table 3: Soil Organic Content Laboratory Results

Sample ID	Depth To and From (mbgl)	Ash Content (%)	Organic Content (%)
TP04	0.0 – 0.1	95.8	4.2
TP14	0.0 – 0.1	94.7	5.3
TP29	0.0 – 0.1	96.0	4.0
TP41	0.0 – 0.1	91.4	8.6
TP46	0.0 – 0.1	95.6	4.4
TP48	0.0 – 0.1	74.5	25.5
TP23	0.0 – 0.1	94.6	5.4
TP15	0.0 – 0.1	96.7	3.3

Note: TP48 was located at the base of a previous lake which may explain the abnormally high organic content.

8 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

8.1 General

Following our understanding of the preliminary development plans and our interpreted ground model, we consider that the site is suitable for supporting the proposed residential development, subject to the requirements of AS 2870-2011 and our specific earthworks recommendations detailed in Section 8.2 below.

8.2 Earthworks

Natural and uncontrolled fill sand is expected to be encountered throughout the full depth range of excavations (<1m depth) We anticipate that major cut to fill bulk earthworks will be required to form finished ground levels. This activity is considered appropriate for the site subject to the earthworks construction recommendations described below.

We note earthworks must be carried out in accordance with the recommendations provided in this report and AS3798-2007 *Guidelines on Earthworks for Commercial and Residential Developments*.

8.2.1 Topsoil Strip and Subgrade Preparation

- All vegetation must be stripped and removed from site;
- A 100mm topsoil strip should be considered appropriate for most of the site, however where thick root mats or otherwise unsuitable material is present to a greater depth then this should be removed and cut to waste or reused as fill within the POS areas;
- Existing trees must be removed and their root systems must be completely grubbed out. The soil beneath the root system must be proof rolled and backfilled to the specifications described below;

- Following the topsoil strip, the top 400mm of the soil profile should be tyned to bring any waste / uncontrolled fill to the surface. In some instances, the Earthworks Contractor may be required to excavate deeper to remove all waste / uncontrolled fill. Any organic (tree roots / stumps) or manmade waste observed should be removed from site. Alternatively, the fill material should be stockpiled for reuse as sand fill material following an inspection by a suitably qualified geotechnical engineer; and
- The upper 300mm of the exposed subgrade must be moisture conditioned with a water cart and compacted with a suitable roller to achieve at least 7 blows per 300mm penetration with a Perth Sand Penetrometer (PSP) excluding the top 150mm, which is equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.1.1). Any loose, soft, organic or manmade waste materials observed during this proof roll shall be removed and replaced with compacted clean sand fill.

8.2.2 Bulk Earthworks

We recommend the following during bulk earthworks:

- Material must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm with a suitable roller to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is approximately equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1);
- Site won material from proposed cut earthworks is considered suitable for use in bulk earthworks from a geotechnical perspective, subject to adequate placement and providing that similar and consistent fill materials are used for specific applications (i.e. entire fill pads are constructed of similar fill materials); and
- Imported sand bulk fill materials will need to be free of organic or deleterious inclusions with a fines content of less than 5% of the fill volume and a maximum particle size of 100mm. It must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP, which is equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1).

8.2.3 Retaining Wall Backfill

We recommend the following during retaining wall backfilling:

- Backfill layers should be placed in maximum 300mm thick loose layers, moisture conditioned to within ±3% of the optimum moisture content and compacted with a suitable vibrating plate compactor to achieve a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1).

The technical and control requirements for Engineered Fill, including site observation and compaction testing, are outlined in AS3798-2007. We recommend that this work is completed under the direction and control of a suitably experienced Geotechnical Engineer familiar with the contents of this report.

8.2.4 Excavatability

The loose to very dense natural sands and uncontrolled fill sand encountered across the site may be excavated using standard mechanical plant.

8.2.5 Earthworks Monitoring

Variations in ground conditions may occur between test locations. If conditions other than those described above are encountered, then further advice should be sought without delay. During earthworks, site visits should be made by a Geotechnical Engineer or Engineering Geologist who is familiar with the contents of this report to ensure that topsoil stripping is carried out adequately, proof

compaction and cut to fill earthworks are conducted in accordance with AS3798-2007, and to audit the compaction of earthworks. Earthworks control testing should be undertaken in accordance with the guidelines set out in AS3798-2007. CMW would be pleased to perform this function if required.

8.2.6 Lake Remediation and Backfilling

We recommend the following during lake remediation and backfilling:;

- Drain lakes to remove water. Note: Some lakes may require dewatering as the base of the lake is below groundwater;
- Remove all organics and fill material above the liner;
- Remove liner from base of lakes and along embankments; and
- Once the liner has been removed the lakes should be backfilled with clean sand fill or site won material as mentioned in 8.2.2 and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP, which is equivalent to a dry density ratio of 95% based on Modified Compaction (AS1289 5.2.1). Each layer of fill that is placed should be keyed (fill over cut) into the lake embankments to ensure each layer extends into intact foundation materials.

8.3 Strip and Pad Foundations

The design of available foundation bearing pressures for isolated strip and pad footings with 0.5m or 1.0m embedment depth has been carried out using the Terzaghi bearing capacity equation. Subject to completing the earthworks and foundation preparation recommendations provided in section 8.2 above, shallow strip or pad footings founded within medium dense near surface soils (<1m) or compacted fill material may be designed on the basis of the maximum allowable bearing pressures provided in Table 4.

Table 4: Summary of Shallow Footing Design Bearing Pressure

Embedment Depth (m)	Footing Width (m)	Footing Length (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	0.5 Strip		170	<5
	1 Strip		220	10-15
	1	1	200	5-10
	2	2	290	10-15
1.0	0.5 Strip		280	5-10
	1 Strip		330	15-20
	1	1	310	5-10
	2	2	400	20-25

These values are based on a geotechnical strength reduction factor of 0.5 and an average load factor of 1.5 (Factor of Safety = 3.0). It should be noted that these bearing pressures assume isolated vertical, non-eccentric loads. The assessment has been undertaken based on a static load and does not consider any dynamic or cyclic loading effects. It also does not consider any interaction of closely spaced foundations.

Subject to the earthworks and foundation preparation works being undertaken as described herein, it has been calculated that the total settlements of the footing configurations and design pressures outlined in Table 4 above is unlikely to exceed approximately 20mm to 25mm. Differential settlements are unlikely to exceed approximately one half of these values.

8.4 Retaining Wall Design

Localised cut and fill earthworks will be required along proposed property boundaries for subdivision layout and drainage purposes. All retaining wall footings will be founded on either reworked *in situ* or engineered sand fill material to depths of at least 0.5m. Based on this, recommended retaining wall design parameters are summarised in Table 5 below:

Table 5: Retaining Wall Design Parameters

Soil Unit	Y (kN/m^3)	Ø' (deg)	K_0	E' (MPa)	No wall friction		Wall friction = 2/3Ø	
					K_a	K_p	K_a	K_p
ENGINEERED FILL: SAND (medium dense)	18	34	0.441	60	0.283	3.537	0.254	8.952
SAND (medium dense)	18	34	0.441	60	0.283	3.537	0.254	8.952

Notes:
1. Refer to Table 1 for definition of soil unit levels.
2. Y – soil unit weight; Ø' - angle of internal soil friction; K_0 - coefficient of earth pressure at rest, K_a - coefficient of active earth pressure, K_p - coefficient of passive earth pressure; E' – long term Young's modulus.
3. Values of K_0 are based on initial conditions following construction of the walls.
4. The retaining wall designer must adopt the above set of K_a and K_p parameters relevant to the actual construction method adopted.
5. The above parameters are based on the condition of a horizontal ground surface behind the retaining structure. Applicable surcharge loads behind the wall must also be considered in the design.

Retaining structures should be designed in accordance with AS 4678-2002 "*Earth Retaining Structures*" or an alternate approved factor of safety approach. Should any fill be placed against the permanent retaining walls after construction, it is expected that the compaction induced pressures will be much greater than the above active earth pressures. The compaction equipment used to compact backfill behind the wall must be carefully selected and preferably light-weight compaction equipment should be used. The load on the retaining wall due to compaction equipment may be estimated from Figure J5 in AS4678-2002 *"Earth Retaining Structures"*.

It is noted that some ground movement will occur behind temporary or permanent retaining walls. By definition, movement of the wall must occur to fully mobilise the active and passive earth pressure coefficients provided in Table 5 above. The extent of this movement is dependent on the height of retaining wall, type of wall selected and construction methodology. This must be considered during the design and construction of the retaining walls to ensure adjacent facilities are not adversely affected.

Any ground anchors associated with retaining wall construction should be designed on the basis of the above effective stress soil parameters and using appropriate design standards such as BS8081.

8.5 Site Classification

A site classification of CLASS A in accordance with AS2870-2011 is recommended subject to the foundation preparation recommendations provided in Section 8.2 above.

8.6 Environmental

The National Acid Sulfate Soils Map shows that the site is located in a “low to moderate risk area for ASS occurring within 3m of natural surface”.

After discussions with Steve Foley (JDSi) during our site walkover, it was mentioned some asbestos may be present across the site following the demolition of old infrastructure. The area in question was along the western boundary of the central precinct by Hartwell Parade. Potential asbestos in the form of an old, fractured pipe was found in the upper 0.5m of this area in TP28 (pictured in the test pit photographs). The same pipe was also found in the upper 1.6m of TP34, on the edge of lake in the southeastern portion of the northern precinct.

During bulk earthworks asbestos will need to be appropriately managed by a competent environmental consultant.

8.7 Pavement CBR

Based on the field density testing undertaken using the PSP and our experience with similar materials, it is recommended that pavements be designed on the basis of a subgrade CBR value of 12% due to the sandy nature of the soils.

This design CBR value is subject to the exposed subgrade being moisture conditioned and compacted in accordance with the recommendations provided in Section 8.2 above. It is recommended that appropriate QA / QC testing be undertaken on subgrade and pavement materials during construction.

8.8 Drainage

It is recommended that soakwells and drainage basins be designed on the basis of a saturated soil coefficient of permeability of 5 m/day subject to them being located a distance of at least 3m away from any structure foundations. This does not allow for any clogging, silting or other design aspects of the soakwells.

9 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by Eastcourt Property Group in relation to the proposed Glen Iris Estate residential subdivision project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Eastcourt Property Group and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of
CMW Geosciences Pty Ltd



Mitchell Owen
Engineering Geologist

Reviewed by:



Alex Petty
Principal Geotechnical Engineer

Distribution: 1 copy to Eastcourt Property Group (electronic)
Original held by CMW Geosciences Pty Ltd

10 REFERENCES

- Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)
- AS 1170, *Structural design actions,* Standards Australia, Sydney, 2007
- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017
- AS 2870, *Residential slabs and footings,* Standards Australia, Sydney, 2011
- AS 3798 (inc. amendment 1), *Guidelines on earthworks for commercial and residential developments,* Standards Australia, Sydney, 2007
- AS 4678 (inc amendments 1 & 2), *Earth retaining structures,* Standards Australia, Sydney, 2002
- BS 1377-9:1990 Methods for test for soils for civil engineering purposes. In-situ tests.
- Department of Environment and Conservation (DEC), 2011, Treatment and management of soils and water in acid sulfate soil landscapes, Acid Sulfate Soils Guideline Series.
- *Guide to Residential Slabs and Footings in Saline Environments (CCAA T56),* Cement Concrete & Aggregates Australia, 2005
- Hvorslev J M, *Time lag and soil permeability in ground-water observations,* Bull. 36, 50 pp., U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951
- *Perth Groundwater Atlas,* Second Edition, Perth: Department of Environment, 2004
- *Fremantle, Sheet 2033 I & 2033 IV,* Perth Metropolitan Region Environmental Geology Series, Geological Survey of Western Australia, 1986
- Schmertmann, 1970 and Schmertmann et al, 1978.
- Terzaghi, K. (1943). Theoretical soil mechanics. 1st ed. New York: J. Wiley and Sons, Inc.
- WA Online Atlas, Shared Land Information Platform – ASS Risk Map, https://www2.landgate.wa.gov.au/bmvf/app/waatlas/.

GLEN IRIS ESTATE SUBDIVISON, JANDAKOT, WA – GEOTECHNICAL INVESTIGATION 23 DECEMBER 2020

Figure

CMW Geosciences Pty Ltd
Ref. PER2020-0452AB Rev 0



Appendix A

Test Pit Logs, PSP Plots and Photos

TEST PIT LOG - TP01

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392145m N.6446295m
Elevation: 28 m

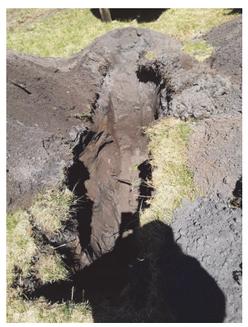
Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.		MD to D	6, 6, 6, 5, 6, 6	
				1			D to M			1.05m: PSP conducted within base of test pit
						... from 1.40m to 1.70m, trace branches		L to MD	1, 1, 3, 2, 3, 3	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP02

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392135m N.6446325m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located behind retaining wall of lake
						FILL: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.				
			27.6			*... at 0.20m, becoming pale yellow*				
						SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		L to MD	3, 4, 4, 3, 2, 3	
				1		*... at 0.60m, becoming grey brown with orange*	D to M			1.05m: PSP conducted within base of test pit
									2, 1, 3	
								MD to D	5, 6, 4	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP03

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392058m N.6446394m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located behind retaining wall of lake
			27.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey brown; trace fines; trace rootlets; trace organics.			7	
						FILL: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace root and rootlets; trace coffee rock.		MD to D	5	
									6	
						... at 0.90m, no longer rootlets			7	
			27.0	1		SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines.	D to M	VD	11	
			26.0	2		COFFEE ROCK: fine to medium grained, subangular to subrounded; dark brown; weakly cemented; trace fines.				
			26.0			Test pit terminated at 2.05 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP04

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391978m N.6446343m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		MD	4	
			25.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange grey; trace fines; trace rootlets; trace organics.			11	
						FILL: SAND: fine to medium grained, subangular to subrounded; trace gravel; pale yellow; trace fines; trace rootlets; trace cobbles; gravel and cobbles are limestone; trace uncontrolled fill (bricks, rubbish).		D to VD	10	
									8	
			25.2			SP: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace rootlets.	D to M		7	
				1					10	
						... at 1.10m, no longer rootlets			4	1.05m: PSP conducted within base of test pit
									5	
								MD to D	5	
									4	
									4	
			24.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP05

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392208m N.6446432m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace rootlets.		D to VD	5 7 7 9 9	
				1			D to M		10	1.05m: PSP conducted within base of test pit
						... at 1.30m, trace branches		D	5 5 6 5 5	
			26.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP06

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392152m N.6446434m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located next to lake
						SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		L	2 3 3	
						... at 0.30m, becoming pale grey		D to VD	5 8 8 3 5 6	
				1			D to M			1.05m: PSP conducted within base of test pit
			24.1			COFFEE ROCK: fine to medium grained, subangular to subrounded; black; weakly cemented; trace fines.		VD	10 20	
			24.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP07

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392068m N.6446510m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
			26.7			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets; trace organics.			4	
						... at 0.20m, becoming pale grey with orange		MD to D	5	
						SP: SAND: fine to medium grained, subangular to subrounded; black with dark grey; trace fines; trace root and rootlets; trace branches.			4	
						... at 0.50m, becoming grey			5	
				1			D to M		6	1.05m: PSP conducted within base of test pit
									3	
								L to MD	3	
									3	
									3	
									4	
			25.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP08

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392172m N.6446593m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
						SP: SAND: fine to medium grained, subangular to subrounded; dark orange with brown; trace fines; trace rootlets.			5	
						... at 0.50m, becoming orange		D	6	
									5	
									6	
				1			D to M		5	1.05m: PSP conducted within base of test pit
									2	
								L to MD	3	
									3	
									3	
									4	
			27.0	2		Test pit terminated at 2.00 m			3	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP09

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391961m N.6446622m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			5	
						SP: SAND: fine to medium grained, subangular to subrounded; grey with black orange; trace fines; trace root and rootlets; trace branches.			6	
									6	
									5	
						... at 0.80m, no longer branches				
				1			D to M	D to VD		1.05m: PSP conducted within base of test pit
						... at 1.40m, becoming orange			4	
									7	
									8	
									8	
									8	
			26.0	2		Test pit terminated at 2.00 m			9	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP10

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6446693m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			4	
						SP: SAND: fine to medium grained, subangular to subrounded; grey with black orange; trace fines; trace rootlets.			4	
						... at 0.20m, becoming pale grey		D to VD	7	
									10	
						... at 0.80m, becoming orange			9	
				1			D to M		8	1.05m: PSP conducted within base of test pit
									2	
									3	
								L to MD	4	
									4	
									5	
			29.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP11

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392038m N.6446762m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace branches. *... at 0.30m, becoming orange with grey*			3 4 5	
			30.2					MD to D	5 4	
				1		SP: SAND: fine to medium grained, subangular to subrounded; grey and orange; trace fines; trace root and rootlets. *... at 0.90m, no longer roots and rootlets*	D to M		4	1.05m: PSP conducted within base of test pit
									5	
								VD	8 14	
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP12

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392037m N.6446878m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a green
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with orange; trace fines; trace rootlets. *... at 0.20m, becoming dark grey with black* *... from 0.21m to 0.35m, coffee rock, only found in discrete area*		D to VD	5 6	
			28.6			SP: SAND: fine to medium grained, subangular to subrounded; orange with grey; trace fines.			11 20	
				1			D to M			1.05m: PSP conducted within base of test pit
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP13

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392127m N.6446838m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						SP: SAND: fine to medium grained, subangular to subrounded; orange with pale grey; trace fines; trace root and rootlets.			6	
						... at 0.40m, becoming grey with orange and black			7	
									6	
									8	
									10	
				1			D to M	D to VD	8	1.05m: PSP conducted within base of test pit
						... at 1.20m, becoming black with grey and orange			4	
									7	
									11	
									9	
									8	
			26.0	2		Test pit terminated at 2.00 m			8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP14

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 02/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392214m N.6446932m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; dark grey with black; trace fines; trace root and rootlets.			3	
									4	
									4	
									5	
									4	
									4	
			30.0	1		SP: SAND: fine to medium grained, subangular to subrounded; pale grey with orange; trace fines; trace root and rootlets; trace branches.	D to M	MD to D		1.05m: PSP conducted within base of test pit
						... at 1.60m, no longer branches			3	
									4	
									6	
									5	
									6	
			29.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP15

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6446995m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	0.00m: test pit located on tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			11	
			28.5			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			12	
						... from 0.60m to 0.80m, becoming black			12	
						... at 0.80m, becoming yellow, no longer rootlets			10	
				1			D to M	D to VD	10	1.05m: PSP conducted within base of test pit
									4	
									5	
									10	
									22	
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP16

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392205m N.6447054m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			7	
						... at 0.30m, becoming pale yellow		D to VD	7	
			29.3			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.			7	
									8	
				1			D to M		7	1.05m: PSP conducted within base of test pit
									1	
								L	1	
									2	
									2	
									4	
			28.0	2		Test pit terminated at 2.00 m		D to VD	8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP17

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392177m N.6447122m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	29.8			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey black; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets. ... at 0.50m, becoming white. Not a homogenous layer			3	
			29.3						3	
						SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.	D to M	MD to D	5	
				1					6	
									6	1.05m: PSP conducted within base of test pit
									3	
									3	
									4	
									5	
									6	
			28.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP18

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392132m N.6447199m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets; trace branches; with some uncontrolled fill (old reticulation pipe, tree roots, bricks).			5	
									6	
								D to VD	5	
									5	
			27.1			SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines; trace root.	D to M		7	
				1		... at 1.10m, becoming grey				1.05m: PSP conducted within base of test pit
									9	
									20	
			26.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP19

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392209m N.6447301m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace rootlets.			5	0.00m: test pit located on green
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines.			10	
									17	
			28.0	1		SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.	D to M	D to VD	6	1.05m: PSP conducted within base of test pit
									8	
									10	
									12	
									16	
			27.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP20

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392305m N.6447413m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						FILL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey yellow; trace fines; trace rootlets; gravel is limestone.			4	
								D to VD	4	
									6	
			29.2	1		SP: SAND: fine to medium grained, subangular to subrounded; yellow; trace fines.	D to M		11	
									15	1.05m: PSP conducted within base of test pit
			28.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP21

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392233m N.6447425m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		MD to D	4 5 5	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with black; trace fines; trace rootlets.				
						... at 0.50m, no longer branches				
				1			D to M	L	2 2 2	1.05m: PSP conducted within base of test pit
									1 2 1 1 1 2 1	
			29.1			SP: SAND: fine to medium grained, subangular to subrounded; orange with grey.				
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP22

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392210m N.6447383m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace rootlets.		MD to D	4 4 5 4 4 3	
						... at 0.70m, no longer rootlets				
				1			D to M	L		1.05m: PSP conducted within base of test pit
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP23

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392132m N.6447358m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on driving range
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		MD to D	4, 3, 7	
			28.4			SP: SAND: fine to medium grained, subangular to subrounded; pale grey white; trace fines.		VD	10, 12, 10	
				1			D to M			1.05m: PSP conducted within base of test pit
								MD to D	3, 4, 5, 5, 6	
			27.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP24

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392095m N.6447310m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace branches; trace vegetation.				0.00m: test pit located on tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace rootlets.		MD to D	4, 6, 6, 5, 6, 4	
				1			D to M			1.05m: PSP conducted within base of test pit
						... at 1.30m, becoming dark grey		D to VD	6, 9, 10, 7, 6	
			28.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP25

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392026m N.6447373m
Elevation: 32 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			31.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; trace gravel; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace branches; trace vegetation.				0.00m: test pit located on mound
				1		FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with grey; trace fines; trace root and rootlets; trace branches. *... at 0.45m, no longer branches*	D to M	D	5, 6, 6, 7, 7, 7	1.05m: PSP conducted within base of test pit
								MD to D	2, 4, 5, 4, 5, 5	
			30.1			SP: SAND: fine to medium grained, subangular to subrounded; yellow.				
			30.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP26

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392008m N.6447494m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on driving range
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.		MD to D	3, 4, 5, 6, 6, 6	
			27.3	1		SP: SAND: fine to medium grained, subangular to subrounded; pale grey with black; trace fines; trace rootlets. *... at 0.90m, no longer rootlets*	D to M	L	1, 1	1.05m: PSP conducted within base of test pit
								MD	3, 3, 3, 4	
			25.8	2		*... at 2.10m, becoming pale brown*				
						Test pit terminated at 2.20 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP27

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391844m N.6447426m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace branches.			4	
			26.5			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines.	D to M	D to VD	7	
				1					9	
									10	
									10	1.05m: PSP conducted within base of test pit
									3	
								MD to D	5	
									5	
									6	
			25.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP28

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391771m N.6447468m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			4	0.00m: test pit located on green
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with pale yellow; trace fines; trace root and rootlets; trace branches; with some uncontrolled fill (tree roots, potential asbestos at 0.5m).		D to VD	6	
									6	
									4	
				1			D to M		4	
									4	1.05m: PSP conducted within base of test pit
								L	1	
									1	
									1	
									3	
								MD to D	7	
			26.0	2		Test pit terminated at 2.00 m			7	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP29

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391692m N.6447613m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on tee box
						SP: SAND: fine to medium grained, subangular to subrounded; grey with orange; trace fines; trace rootlets.				
						... at 0.45m, becoming pale grey		MD to D	3, 4, 4	
						... at 0.60m, no longer rootlets			7	
				1			D to M	VD	10, 9	1.05m: PSP conducted within base of test pit
						... at 1.80m, becoming brown orange		L to MD	2, 2, 3, 4, 4	
			25.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP30

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391668m N.6447725m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				0.00m: test pit located on a mound
						SP: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.				
				1		*... from 1.00m to 1.60m, high root content*	D to M	D to VD	7, 8, 7, 6, 6, 7	1.05m: PSP conducted within base of test pit
									3, 8, 14	
			24.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP31

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391798m N.6447972m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey with black; trace fines; trace root and rootlets; trace branches.			5	
						... at 0.40m, becoming pale grey		D	7	
									5	
									6	
				1		*... at 0.90m, no longer roots, rootlets or branches*	D to M		5	1.05m: PSP conducted within base of test pit
								L	2	
									2	
									3	
						Test pit terminated at 1.80 m		MD to D	4	
			24.0	2					4	
									5	
				3						

Termination Reason: Test pit walls collapsing
Remarks: Backfilled.





TEST PIT LOG - TP32

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391789m N.6447873m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 1.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			27.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; with organics; trace rootlets; trace vegetation.			5	0.00m: test pit located on green
			26.9			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace rootlets; trace organics.			9	
						SP: SAND: fine to medium grained, subangular to subrounded; orange.		D to VD	9	
						... at 0.60m, becoming black with grey			9	
									9	
				1		*... at 1.00m, becoming grey with black*	D to M		8	1.05m: PSP conducted within base of test pit
								L	2	
									4	
									6	
								MD to D	5	
									5	
			25.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP33

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391914m N.6447886m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 1.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			29.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; with organics; trace rootlets; trace vegetation.				0.00m: test pit located on green
			28.9			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets; trace organics.				
						SP: SAND: fine to medium grained, subangular to subrounded; grey with orange.			5	
									7	
								MD to D	7	
									4	
									4	
				1			D to M		5	1.05m: PSP conducted within base of test pit
									5	
									9	
								VD	10	
									12	
									11	
			27.0	2		Test pit terminated at 2.00 m			12	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP34

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391798m N.6447972m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			4	0.00m: test pit located next to lake
						FILL: SAND: fine to medium grained, subangular to subrounded; orange brown with black; trace fines; trace rootlets.		MD to D	5	0.20m: plastic liner
									6	
									6	
								VD	8	
				1			D to M		10	1.05m: PSP conducted within base of test pit
						... at 1.40m, increasing black colouration		VL to L	1	
									1	
									3	
						... at 1.60m, potential asbestos pipe			5	
			25.2			Test pit terminated at 1.80 m		D to VD	6	
				2					8	
				3						

Termination Reason: Test pit walls collapsing
Remarks: Backfilled.





TEST PIT LOG - TP35

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391695m N.6447961m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; dark grey; trace fines; trace root and rootlets.		D to VD	8	
						... at 0.50m, becoming pale grey			12	
									17	
				1			D to M			
				2						
			23.8			Test pit terminated at 2.20 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP36

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391780m N.6448083m
Elevation: 33 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			33.0			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; with organics; trace fines; trace rootlets; trace vegetation.			4	0.00m: test pit located on green
			32.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets; trace organics.			7	
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.		D to VD	10	
						... at 0.70m, becoming pale yellow with orange			10	
									12	
				1			D to M		14	1.05m: PSP conducted within base of test pit
				2						
			31.0			Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP37

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391641m N.6448108m
Elevation: 31 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			30.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			8	
						FILL: SAND: fine to medium grained, subangular to subrounded; pale grey orange; trace fines; trace rootlets.			9	
			30.5			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.		VD	10	
				1			D to M		11	
									14	1.05m: PSP conducted within base of test pit
			29.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP38

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391687m N.6448201m
Elevation: 40 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			39.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			3	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace root and rootlets.		L	2	
									3	
			39.2			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.			3	
				1			D to M		4	
								MD to D	4	
									6	
								VD	13	
			38.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP39

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391604m N.6448263m
Elevation: 39 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			38.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			6	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.		D to VD	7	
			38.4			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.			10	
									12	
									16	
				1			D to M			
			37.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP40

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391717m N.6448301m
Elevation: 37 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			36.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	
			36.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines; trace rootlets.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; orange with black; trace fines; trace rootlets.			6	
									6	
									7	
				1			D to M	D to VD		1.05m: DCP conducted within base of test pit
									5	
									8	
									9	
									9	
									8	
			35.0	2		Test pit terminated at 2.00 m			8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP41

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391656m N.6448386m
Elevation: 40 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	39.9	1		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.	D to M	D	5, 6, 6, 6, 7, 7	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow with black; trace fines; trace rootlets.				
			38.6			SP: SAND: fine to medium grained, subangular to subrounded; orange with black; trace fines; trace rootlets.		L	2, 3	1.05m: DCP conducted within base of test pit
								D to VD	6, 9, 15	
			38.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP42

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391769m N.6448368m
Elevation: 36 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			35.9	1		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.	D to M	D to VD	5, 7, 14	
			35.7			FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines; trace rootlets.				
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace root and rootlets.			5, 6, 6, 6, 5, 6	1.05m: DCP conducted within base of test pit
			34.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP43

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391858m N.6448357m
Elevation: 35 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			34.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.		MD	4	
						FILL: SAND: fine to medium grained, subangular to subrounded; grey orange; trace fines; trace rootlets.			4	
			34.4			SP: SAND: fine to medium grained, subangular to subrounded; orange with black white; trace fines; trace rootlets.			7	
									7	
									8	
				1			D to M	D to VD	12	1.05m: DCP conducted within base of test pit
									7	
									15	
			33.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP44

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391800m N.6448352m
Elevation: 35 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			34.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.		MD	3	0.00m: test pit located next to lake
			34.8			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets.			5	0.20m: plastic liner
						SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.			6	
								D to VD	9	
				1			D to M		9	
									9	
			33.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP45

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391830m N.6448277m
Elevation: 37 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			36.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on a tee box
						FILL: SAND: fine to medium grained, subangular to subrounded; grey with black; trace fines; trace rootlets.		D	6	
									6	
			36.4			SP: SAND: fine to medium grained, subangular to subrounded; orange with black white; trace fines; trace rootlets.			7	
				1			D to M		11	
								D to VD	17	1.05m: DCP conducted within base of test pit
									7	
									13	
			35.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP46

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.391760m N.6448174m
Elevation: 42 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
	0.0 - 0.1	D	41.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.			8	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace root and rootlets; trace branches.		MD to D	5	
									4	
			41.4			SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines; trace rootlets.			8	
				1			D to M		10	
								D to VD	9	1.05m: PSP conducted within base of test pit
									7	
									13	
			40.0	2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP47

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392020m N.6447932m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.	D to M	D to VD	7, 8, 9, 11	
			26.7			FILL: SAND: fine to medium grained, subangular to subrounded; brown orange; trace fines; trace root and rootlets.				
						SP: SAND: fine to medium grained, subangular to subrounded; white; trace fines; trace root and rootlets.				
						... at 0.90m, becoming orange				
				1				MD to D	3, 4, 5, 6, 6	1.05m: DCP conducted within base of test pit
			25.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP48

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392002m N.6447829m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.1	D	25.9			TOPSOIL: CLAYEY SAND: fine to medium grained, subangular to subrounded; clay, low plasticity; dark grey brown; with organics; trace roots and rootlets; very light, crusted material found at base of lake.	M	VL to L	1, 2, 3, 6, 6, 7	0.00m: test pit located on a previous lake
						FILL: SAND: fine to medium grained, subangular to subrounded; orange brown; trace fines.	W			
			25.5			SP: SAND: fine to medium grained, subangular to subrounded; white; trace fines.				0.50m: plastic liner
				1			M	MD to D	3, 5, 6, 7, 7, 7	1.05m: DCP conducted within base of test pit
				2		Test pit terminated at 2.00 m				
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP49

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

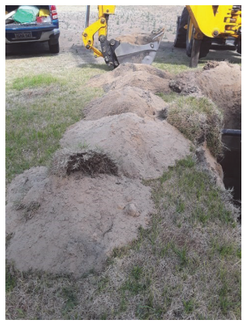
Position: E.392001m N.6447777m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9	1		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.	D to M	VD	8	0.00m: test pit located on a mound
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.			8	
									8	
						... at 0.70m, becoming pale yellow with black			9	
									10	
									9	1.05m: DCP conducted within base of test pit
								MD to D	3	
									5	
									5	
									4	
									3	
			26.0	2		Test pit terminated at 2.00 m			4	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP50

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392027m N.6447786m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9	1		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.	D to M	MD to D	5	1.05m: PSP conducted within base of test pit
			26.8			FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.			4	
						SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets; trace branches.			5	
						... at 0.70m, becoming orange			4	
									4	
									4	
									3	
									4	
									5	
									5	
									6	
			25.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP51

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 7

Logged by: MO
Checked by:AP

Position: E.392051m N.6447678m
Elevation: 27 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			26.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			6	
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace root and rootlets.			6	
								D	7	
			26.4			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace rootlets.			7	
				1			D to M		7	
									7	1.05m: PSP conducted within base of test pit
								L	2	
									3	
								MD	4	
									4	
									11	
			25.0	2		Test pit terminated at 2.00 m			11	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

TEST PIT LOG - TP52

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 01/12/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392157m N.6447272m
Elevation: 26 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			25.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; with gravel, coarse grained, subangular to subrounded; with cobbles and boulders, subangular to subrounded (surface); dark grey; trace fines; trace organics; trace roots and rootlets; trace vegetation and branches.		MD	3	0.00m: test pit located on edge of lake 0.10m: plastic liner on lake embankment
			25.7			SAND: FILL; fine to medium grained, subangular to subrounded; brown orange, trace roots and rootlets.			6	
						SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets.			8	
									8	
							D to M	D to VD	9	
						... at 0.90m, becoming orange			8	
			25.0	1		COFFEE ROCK: fine to medium grained, subangular to subrounded; dark brown; weakly cemented; trace fines.			4	1.05m: DCP conducted within base of test pit
								VD	20	
			24.3			Test pit terminated at 1.70 m				
				2						
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.





TEST PIT LOG - TP53

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392109m N.6447575m
Elevation: 28 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			27.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			5	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained, subangular to subrounded; grey; trace fines; trace rootlets.			7	
			27.6			SP: SAND: fine to medium grained, subangular to subrounded; pale grey; trace fines; trace root and rootlets.		D to VD	7	
									6	
				1			D to M		7	
									9	1.05m: PSP conducted within base of test pit
									4	
								MD to D	5	
									6	
									6	
									6	
			26.0	2		Test pit terminated at 2.00 m			6	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP54

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392112m N.6447508m
Elevation: 30 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			29.9			TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.			2	0.00m: test pit located on mound
						FILL: SAND: fine to medium grained; dark grey with black; trace fines; trace rootlets.			1	
									1	
								L	1	
									1	
				1			D to M		1	
									1	1.05m: PSP conducted within base of test pit
									2	
								MD	4	
									6	
			28.1						8	
			28.0	2		SP: SAND: fine to medium grained, subangular to subrounded; pale grey. Test pit terminated at 2.00 m		VD	8	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP55

Client: JDSi Consulting Engineers
Project: Glen Iris Estate
Location: Jandakot, WA
Project: PER2020-0452
Date: 30/11/2020

1:23 Sheet 1 of 1

Logged by: MO
Checked by:AP

Position: E.392174m N.6447445m
Elevation: 29 m

Plant: JCB 8 tonne backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 3.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm) 5 10 15	Structure & other observations
			28.9	0		TOPSOIL: SAND: fine to medium grained, subangular to subrounded; dark grey brown; trace fines; trace organics; trace roots and rootlets; trace vegetation.				
						FILL: SAND: fine to medium grained, subangular to subrounded; pale yellow; trace fines; trace rootlets.	D to M	D	6, 7, 7, 7, 7, 6	
			27.8	1		SP: SAND: fine to medium grained, subangular to subrounded; orange; trace fines.		MD to D	3, 3, 4, 5, 6	1.05m: PSP conducted within base of test pit
			27.0	2		Test pit terminated at 2.00 m			5	
				3						

Termination Reason: Target depth reached
Remarks: Backfilled.

This report must be read in conjunction with accompanying notes and abbreviations.

Appendix B

Permeability Test Results

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 1	DATE:	3/12/2020
		PROJECT:	PER2020-0452

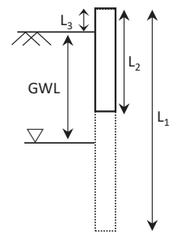
Specifications - Open-Ended Tube

Length L_1: 1.41 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.05 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.36 m BGL



Hydraulic Conductivity (k)

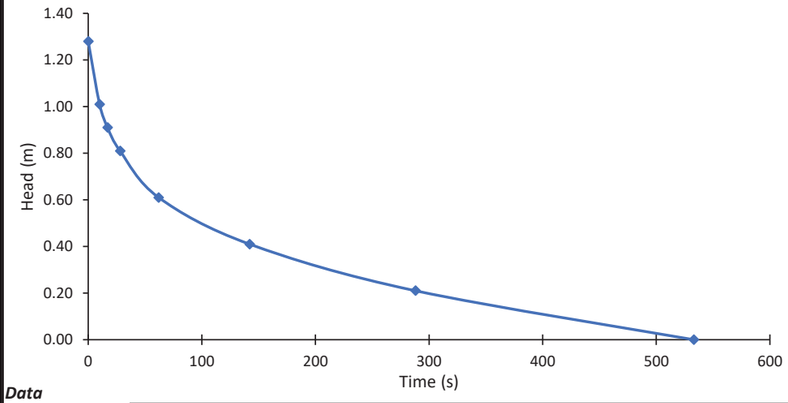
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.15E-04 ms^{-1} = 27.22 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 6.50E-05 ms^{-1} = 5.61 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.36m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.130	1.280					
10	0.400	1.010	1.145		5.55E-05	4.01E-04	
17	0.500	0.910	0.960		3.95E-05	2.49E-04	
28	0.600	0.810	0.860		3.02E-05	1.76E-04	
62	0.800	0.610	0.710		2.71E-05	1.39E-04	12.00
142	1.000	0.410	0.510		1.99E-05	8.19E-05	
288	1.200	0.210	0.310		2.44E-05	7.49E-05	
533	1.410	0.000	0.105		2.58E-04	1.08E-03	

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 2	DATE:	3/12/2020
		PROJECT:	PER2020-0452

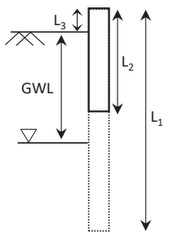
Specifications - Open-Ended Tube

Length L_1: 1.43 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.01 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.42 m BGL



Hydraulic Conductivity (k)

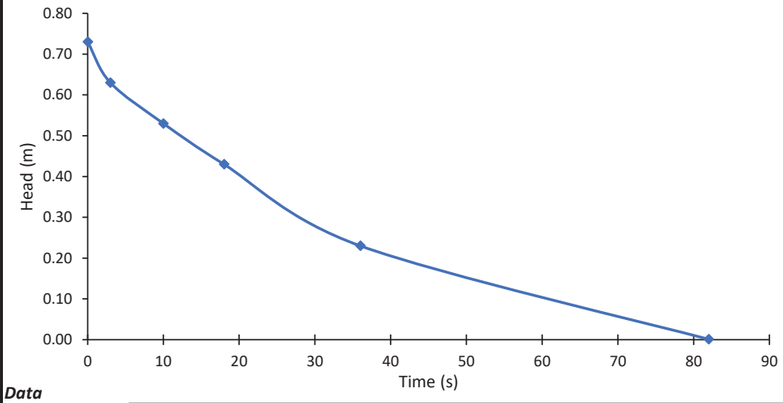
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.22E-03 ms^{-1} = 105.00 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 2.99E-04 ms^{-1} = 25.84 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.42m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.700	0.730					
3	0.800	0.630	0.680		1.64E-04	8.08E-04	
10	0.900	0.530	0.580		9.12E-05	4.03E-04	
18	1.000	0.430	0.480		1.09E-04	4.22E-04	
36	1.200	0.230	0.330		1.79E-04	5.68E-04	49.11
82	1.429	0.001	0.116		9.52E-04	3.87E-03	

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 3	DATE:	3/12/2020
		PROJECT:	PER2020-0452

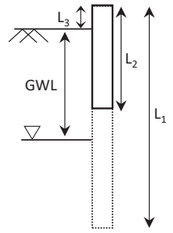
Specifications - Open-Ended Tube

Length L_1: 1.39 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.04 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.35 m BGL



Hydraulic Conductivity (k)

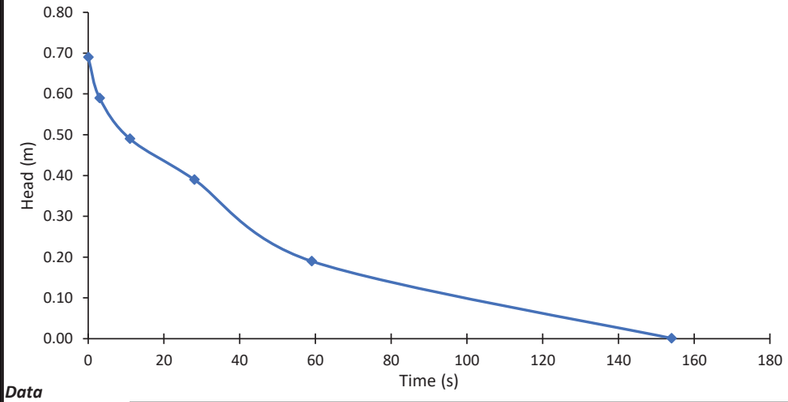
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

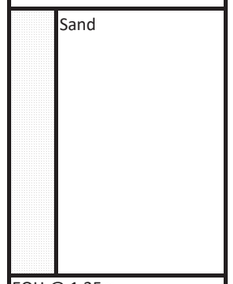
$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 6.73E-04 ms^{-1} = 58.18 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.85E-04 ms^{-1} = 16.00 m/day



STRATIGRAPHIC LOG



Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.700	0.690	0.640		1.81E-04	8.56E-04	
3	0.800	0.590	0.540		8.97E-05	3.77E-04	
11	0.900	0.490	0.440		5.87E-05	2.15E-04	
28	1.000	0.390	0.290		1.28E-04	3.80E-04	
59	1.200	0.190	0.095		4.68E-04	1.54E-03	
154	1.389	0.001					32.79

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 4	DATE:	3/12/2020
		PROJECT:	PER2020-0452

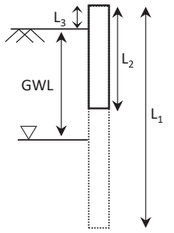
Specifications - Open-Ended Tube

Length L_1: 1.42 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.04 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.38 m BGL



Hydraulic Conductivity (k)

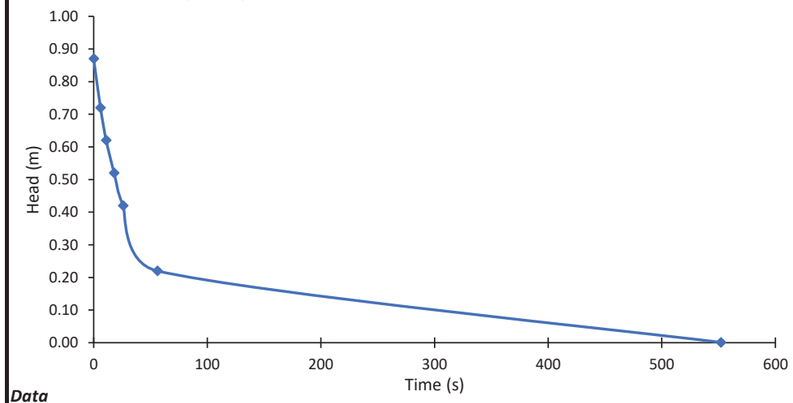
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

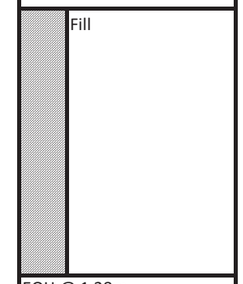
$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 4.25E-04 ms^{-1} = 36.75 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.01E-04 ms^{-1} = 8.69 m/day



STRATIGRAPHIC LOG



Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.550	0.870					
6	0.700	0.720	0.795		9.50E-05	5.25E-04	
11	0.800	0.620	0.670		1.01E-04	4.92E-04	
18	0.900	0.520	0.570		9.39E-05	4.10E-04	
26	1.000	0.420	0.470		1.12E-04	4.30E-04	
56	1.200	0.220	0.320		1.13E-04	3.52E-04	
552	1.419	0.001	0.111		8.87E-05	3.43E-04	37.18

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 5	DATE:	3/12/2020
		PROJECT:	PER2020-0452

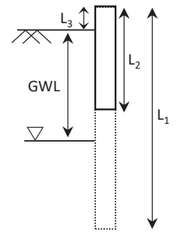
Specifications - Open-Ended Tube

Length L_1: 1.42 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.02 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.40 m BGL



Hydraulic Conductivity (k)

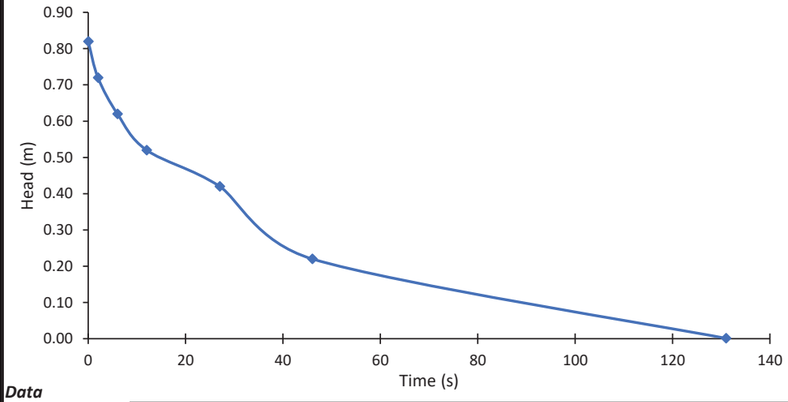
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 8.26E-04 ms^{-1} = 71.39 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.99E-04 ms^{-1} = 17.16 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.4m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.600	0.820	0.770		2.00E-04	1.08E-03	
2	0.700	0.720	0.670		1.26E-04	6.15E-04	
6	0.800	0.620	0.570		1.10E-04	4.78E-04	
12	0.900	0.520	0.470		5.99E-05	2.29E-04	
27	1.000	0.420	0.320		1.78E-04	5.56E-04	19.83
46	1.200	0.220	0.111		5.18E-04	2.00E-03	
131	1.419	0.001					

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 6	DATE:	3/12/2020
		PROJECT:	PER2020-0452

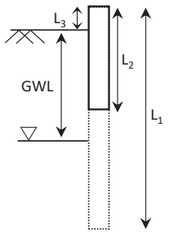
Specifications - Open-Ended Tube

Length L_1: 1.44 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.04 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.40 m BGL



Hydraulic Conductivity (k)

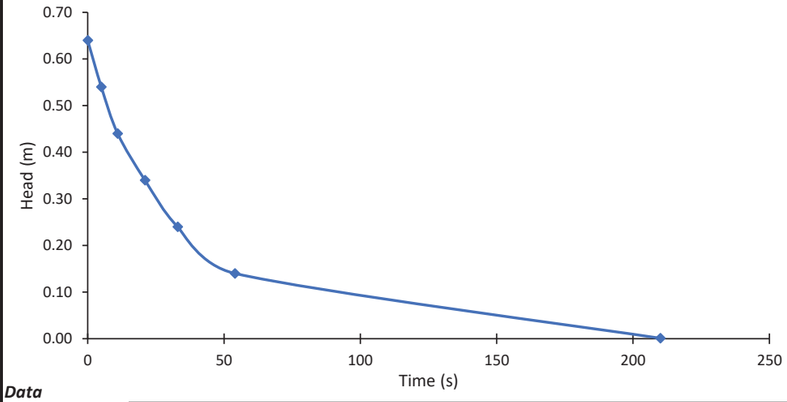
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 5.05E-04 ms^{-1} = 43.61 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.67E-04 ms^{-1} = 14.46 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.4m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.800	0.640	0.590		1.24E-04	5.55E-04	
5	0.900	0.540	0.490		1.40E-04	5.52E-04	
11	1.000	0.440	0.390		1.21E-04	4.10E-04	
21	1.100	0.340	0.290		1.60E-04	4.51E-04	38.92
33	1.200	0.240	0.190		1.73E-04	3.82E-04	
54	1.300	0.140	0.070		2.86E-04	6.80E-04	
210	1.439	0.001					

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 7	DATE:	3/12/2020
		PROJECT:	PER2020-0452

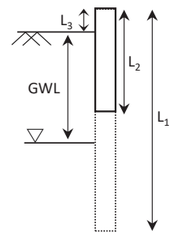
Specifications - Open-Ended Tube

Length L_1: 1.44 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.03 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.41 m BGL



Hydraulic Conductivity (k)

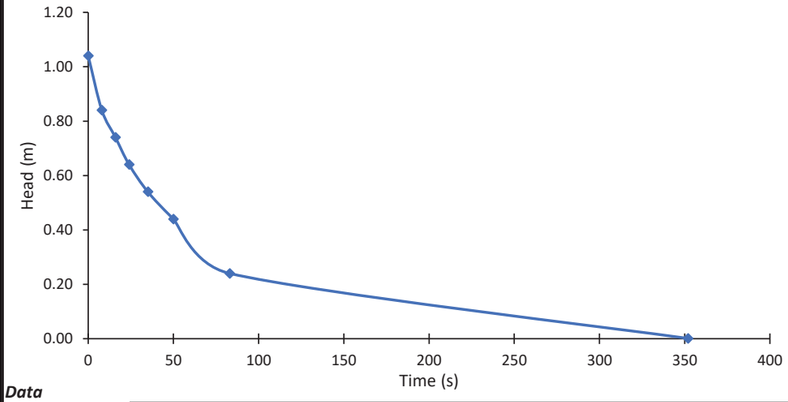
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

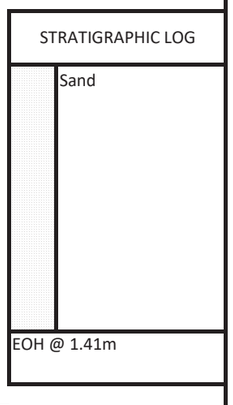
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.54E-04 ms^{-1} = 30.55 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 7.82E-05 ms^{-1} = 6.75 m/day





Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.400	1.040	0.940		7.18E-05	4.48E-04	
8	0.600	0.840	0.790		4.79E-05	2.63E-04	
16	0.700	0.740	0.690		6.00E-05	2.99E-04	
24	0.800	0.640	0.590		5.65E-05	2.52E-04	
35	0.900	0.540	0.490		5.60E-05	2.21E-04	
50	1.000	0.440	0.340		9.31E-05	3.00E-04	
83	1.200	0.240	0.121		1.62E-04	6.92E-04	
352	1.439	0.001					21.81

CMW Geosciences	CLIENT: JDSi Consulting Engineers	DESIGNER:	MO
	PROJECT: Glen Iris Estate Jandakot, WA	CHECKED:	AP
		REVISION:	1
	TITLE: Falling Head Permeability Test 8	DATE:	3/12/2020
		PROJECT:	PER2020-0452

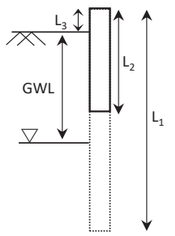
Specifications - Open-Ended Tube

Length L_1: 1.44 m
Diameter: 80 mm
Non-Perm L_2: m
Above Gnd L_3: 0.03 m

Ground Conditions

GWL: 3 m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 1.41 m BGL



Hydraulic Conductivity (k)

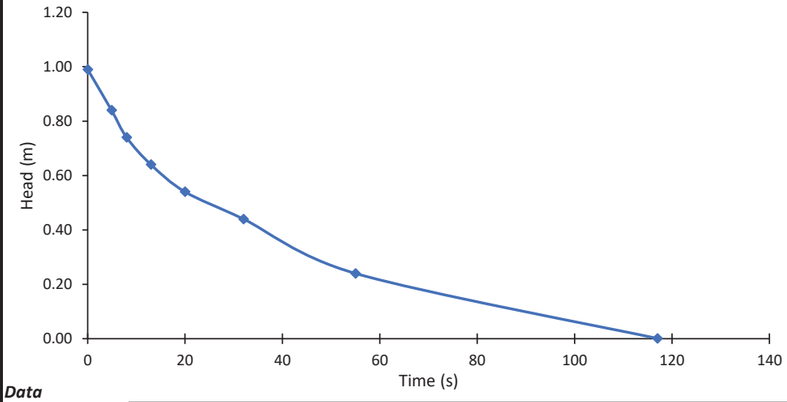
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

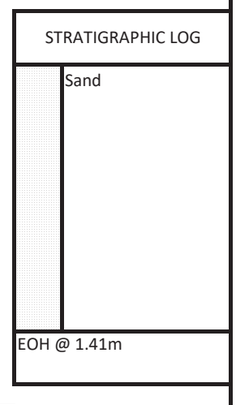
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 8.32E-04 ms^{-1} = 71.89 m/day

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

$$k = \frac{d^2 ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} ln\frac{H_1}{H_2} =$$ 1.87E-04 ms^{-1} = 16.13 m/day





Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})	
0	0.450	0.990					
4.9	0.600	0.840	0.915		9.18E-05	5.60E-04	
8	0.700	0.740	0.790		1.24E-04	6.78E-04	
13	0.800	0.640	0.690		9.60E-05	4.78E-04	
20	0.900	0.540	0.590		8.87E-05	3.97E-04	
32	1.000	0.440	0.490		7.00E-05	2.76E-04	
55	1.200	0.240	0.340		1.34E-04	4.31E-04	
117	1.439	0.001	0.121		7.03E-04	3.00E-03	

34.27

Appendix C

Laboratory Test Results

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - ASTM D2974-14 (Test Method C)

Client:	CMW Geosciences	*Ticket No.*	S2166
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11347-11354_1_OI
Project:	Geotechnical Investigation	*Sample No.*	WG20/11347-11354
Location:	Glen Iris Golf Course	*Date Sampled:*	Not Specified
Sample Identification:	Various - See Below	*Date Tested:*	4-12-2020

TEST RESULTS - Organic Content

Sampling Method: Sampled by Client, Tested as Received
Testing Completed By: WGLS - KT
Furnace Temperature (°C): 440

Sample Number	Sample Identification	Ash Content (%)	Organic Content (%)
WG20/11347	TP04 0.01m	95.8	4.2
WG20/11348	TP14 0.01m	94.7	5.3
WG20/11349	TP29 0.01m	96.0	4.0
WG20/11350	TP41 0.01m	91.4	8.6
WG20/11351	TP46 0.01m	95.6	4.4
WG20/11352	TP48 0.01m	74.5	25.5
WG20/11353	TP23 0.01m	94.6	5.4
WG20/11354	TP15 0.01m	96.7	3.3

Comments:

Approved Signatory:

Name: Brooke Elliott
Date: 05-December-2020

NATA WORLD RECOGNISED ACCREDITATION
Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

235 Bank Street, Welshpool WA 6106 | 08 9472 3465 | www.wgls.com.au

APPENDIX C
Hyd2o Permeability Testing

Borehole Permeameter : Field Result Analysis

hyd2o HYDROLOGY

Project/Site	Glen Iris Test Site 1
Soil Descrip	Yellow grey fine to medium sand
Location	392063 mE
	6447929 mN

TEST 1

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**4.5**	
5	**25.0**	20.5
10	**37.5**	12.5
15	**51.0**	13.5
20	**73.0**	22.0
		17.1
q (cm^3/s)		30.1

TEST 2

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**8.5**	
5	**33.0**	24.5
10	**44.0**	11.0
15	**64.0**	20.0
Avg Diff (cm)		18.5
q (cm^3/s)		32.6

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)
Avg Diff (cm)		
q (cm^3/s)		

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0316	Ks (cm/s)	0.0341	Ks (cm/s)	
Ks (m/day)	27.26	Ks (m/day)	29.45	Ks (m/day)	
Average (m/day)	**28.4**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	1808.4		1953.6 cm3/min		cm3/min
r (cm)	6		6.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.38		0.38		
-sqrt((r/H)^2+0.25)	-0.78		-0.78		
r/H	0.60		0.60		
Sum	0.20		0.20		
Sum*4.4*q	1577.21		1703.85		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	2.5		2.7		
Ksat (m/day)	36.15		39.05		
Average (m/day)	**37.6**				

Borehole Permeameter : Field Result Analysis

Project/Site: Glen Iris Test Site 2
Soil Descrip: Dark grey fine to medium sand
Location: 391613 mE, 6448399 mN

hyd2o HYDROLOGY

TEST 1

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**3.0**	
5	**7.5**	4.5
10	**12.0**	4.5
15	**16.0**	4.0
20	**19.5**	3.5
25	**23.2**	3.7
30	**23.2**	0.0
35	**26.5**	3.3
40	**26.5**	0.0
45	**29.5**	3.0
50	**32.0**	2.5
55	**36.3**	4.3
60	**36.3**	0.0
65	**39.5**	3.2
70	**40.0**	0.5
75	**40.0**	0.0
80	**40.0**	0.0
85	**40.0**	0.0
90	**45.0**	5.0
95	**45.0**	0.0
100	**49.0**	4.0
105	**56.5**	7.5
110	**56.5**	0.0
115	**60.5**	4.0
120	**64.0**	3.5
125	**64.0**	0.0
130	**67.0**	3.0
135	**67.0**	0.0
140	**71.0**	4.0
145	**74.0**	3.0
150	**74.0**	0.0

Avg Diff (cm): 2.4
q (cm³/s): 4.2

TEST 2

r	6.0	cm
H	10.0	cm
time step	10	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**6.3**	
10	**16.8**	10.5
20	**21.2**	4.4
30	**26.0**	4.8
40	**31.0**	5.0
50	**35.0**	4.0
60	**39.7**	4.7
70	**39.7**	0.0
80	**44.2**	4.5
90	**48.6**	4.4
100	**48.6**	0.0
110	**57.0**	8.4
120	**61.0**	4.0
130	**65.1**	4.1
140	**69.3**	4.2
150	**73.5**	4.2

Avg Diff (cm): 4.5
q (cm³/s): 3.9

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)

Avg Diff (cm):
q (cm³/s):

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0044	Ks (cm/s)	0.0041	Ks (cm/s)	
Ks (m/day)	3.77	Ks (m/day)	3.57	Ks (m/day)	

Average (m/day): **3.7**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	249.9		236.5 cm3/min		cm3/min
r (cm)	6		6.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.38		0.38		
-sqrt((r/H)^2+0.25)	-0.78		-0.78		
r/H	0.60		0.60		
Sum	0.20		0.20		
Sum*4.4*q	217.97		206.30		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	0.3		0.3		
Ksat (m/day)	5.00		4.73		

Average (m/day): **4.9**

Borehole Permeameter : Field Result Analysis

Project/Site: Glen Iris Test Site 3
Soil Descrip: Grey to dark grey fine to medium sand
Location: 391674 mE, 6447970 mN

hyd2o HYDROLOGY

TEST 1

r	5.0	cm
H	10.0	cm
time step	10	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**4.5**	
10	**28.0**	23.5
20	**50.2**	22.2
30	**71.5**	21.3

Avg Diff (cm): 22.3
q (cm³/s): 19.7

TEST 2

r	5.0	cm
H	8.0	cm
time step	5	secs
H/r	1.60	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**5.5**	
5	**24.0**	18.5
10	**34.0**	10.0
15	**41.0**	7.0
20	**51.2**	10.2
25	**58.5**	7.3
30	**66.0**	7.5

Avg Diff (cm): 10.1
q (cm³/s): 17.7

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)

Avg Diff (cm):
q (cm³/s):

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0256	Ks (cm/s)	0.0287	Ks (cm/s)	
Ks (m/day)	22.14	Ks (m/day)	24.83	Ks (m/day)	

Average (m/day): **23.5**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	1179.2		1064.8 cm3/min		cm3/min
r (cm)	5		5.0 cm		cm
H (cm)	10.0		8.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.44		0.37		
-sqrt((r/H)^2+0.25)	-0.71		-0.80		
r/H	0.50		0.63		
Sum	0.23		0.19		
Sum*4.4*q	1211.93		894.59		
$2*pi*H^2$	628.32		402.12		
Ksat (cm/min)	1.9		2.2		
Ksat (m/day)	27.78		32.04		

Average (m/day): **29.9**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 4
Soil Descrip	Grey to dark grey fine to medium sand
Location	391658 mE
	6447775 mN

TEST 1

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**2.5**	
5	**44.0**	41.5
10	**61.0**	17.0

	29.3
q (cm^3/s)	51.5

TEST 2

r	5.0	cm
H	9.0	cm
time step	5	secs
H/r	1.80	
C	0.83	

Time (sec)	Level (cm)	Diff (cm)
0	**5.0**	
5	**43.0**	38.0
10	**61.0**	18.0
15	**73.0**	12.0

Avg Diff (cm)	22.7
q (cm^3/s)	39.9

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)		Diff (cm)

Avg Diff (cm)	
q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0671	Ks (cm/s)	0.0578	Ks (cm/s)	
Ks (m/day)	57.98	Ks (m/day)	49.91	Ks (m/day)	
Average (m/day)	**53.9**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	3088.8		2393.6	cm3/min	cm3/min
r (cm)	5		5.0	cm	cm
H (cm)	10.0		9.0	cm	cm
0.5sinh^{-1}(H/2r)	0.44		0.40		
-sqrt((r/H)^2+0.25)	-0.71		-0.75		
r/H	0.50		0.56		
Sum	0.23		0.21		
Sum*4.4*q	3174.52		2238.71		
2*pi*H^2	628.32		508.94		
Ksat (cm/min)	5.1		4.4		
Ksat (m/day)	72.75		63.34		
Average (m/day)	**68.0**				

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 5
Soil Descrip	Grey fine to medium sand
Location	391757 mE
	6447775 mN

TEST 1

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**4.0**	
5	**8.1**	4.1
10	**12.1**	4.0
15	**16.0**	3.9
20	**20.2**	4.2
25	**23.5**	3.3
30	**27.0**	3.5
35	**31.1**	4.1
40	**34.8**	3.7
45	**39.0**	4.2
50	**43.0**	4.0
55	**43.0**	0.0
60	**46.9**	3.9
65	**52.2**	5.3
70	**52.2**	0.0
75	**56.2**	4.0
80	**60.2**	4.0
85	**65.0**	4.8
90	**69.0**	4.0
95	**69.0**	0.0
100	**73.5**	4.5

	3.5
q (cm^3/s)	6.1

TEST 2

r	6.0	cm
H	8.0	cm
time step	5	secs
H/r	1.33	
C	0.66	

Time (sec)	Level (cm)	Diff (cm)
0	**4.7**	
5	**9.5**	4.8
10	**13.7**	4.2
15	**17.6**	3.9
20	**21.5**	3.9
25	**25.0**	3.5
30	**29.2**	4.2
35	**29.2**	0.0
40	**33.5**	4.3
45	**37.4**	3.9
50	**43.1**	5.7
55	**43.1**	0.0
60	**47.0**	3.9
65	**52.3**	5.3
70	**52.3**	0.0
75	**56.4**	4.1
80	**62.0**	5.6
85	**62.0**	0.0
90	**65.9**	3.9
95	**71.0**	5.1

Avg Diff (cm)	3.5
q (cm^3/s)	6.1

TEST 3

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**4.5**	
5	**9.1**	4.6
10	**13.0**	3.9
15	**13.0**	0.0
20	**17.1**	4.1
25	**21.2**	4.1
30	**25.2**	4.0
35	**29.6**	4.4
40	**29.6**	0.0
45	**33.5**	3.9
50	**38.2**	4.7
55	**42.7**	4.5
60	**42.7**	0.0
65	**47.1**	4.4
70	**51.6**	4.5
75	**51.6**	0.0
80	**54.6**	3.0
85	**60.0**	5.4
90	**60.0**	0.0
95	**65.0**	5.0
100	**69.2**	4.2
105	**73.4**	4.2
110	**73.4**	0.0

Avg Diff (cm)	3.1
q (cm^3/s)	5.5

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0064	Ks (cm/s)	0.0085	Ks (cm/s)	0.0058
Ks (m/day)	5.53	Ks (m/day)	7.30	Ks (m/day)	4.99
Average (m/day)	**5.9**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	367.0		368.5	cm3/min	330.7 cm3/min
r (cm)	6		6.0	cm	6.0 cm
H (cm)	10.0		8.0	cm	10.0 cm
0.5sinh^{-1}(H/2r)	0.38		0.31		0.38
-sqrt((r/H)^2+0.25)	-0.78		-0.90		-0.78
r/H	0.60		0.75		0.60
Sum	0.20		0.16		0.20
Sum*4.4*q	320.05		261.34		288.44
2*pi*H^2	628.32		402.12		628.32
Ksat (cm/min)	0.5		0.6		0.5
Ksat (m/day)	7.33		9.36		6.61
Average (m/day)	**8.3**				

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 6
Soil Descrip	Grey to dark grey fine to medium sand
Location	391723 mE
	6447547 mN

TEST 1

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**5.0**	
5	**28.0**	23.0
10	**60.0**	32.0

Avg Diff (cm) 27.5
q (cm^3/s) 48.4

TEST 2

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**5.8**	
5	**46.0**	40.2
10	**54.0**	8.0

Avg Diff (cm) 24.1
q (cm^3/s) 42.4

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)

Avg Diff (cm)
q (cm^3/s)

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0631	Ks (cm/s)	0.0553	Ks (cm/s)	
Ks (m/day)	54.51	Ks (m/day)	47.77	Ks (m/day)	

Average (m/day) **51.1**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	2904.0		2545.0 cm3/min		cm3/min
r (cm)	5		5.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.44		0.44		
-sqrt((r/H)^2+0.25)	-0.71		-0.71		
r/H	0.50		0.50		
Sum	0.23		0.23		
Sum*4.4*q	2984.59		2615.59		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	4.8		4.2		
Ksat (m/day)	68.40		59.94		

Average (m/day) **64.2**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 7
Soil Descrip	Grey to dark grey fine to medium sand
Location	391790 mE
	6447430 mN

TEST 1

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**8.2**	
5	**15.6**	7.4
10	**21.0**	5.4
15	**29.4**	8.4
20	**29.4**	0.0
25	**36.1**	6.7
30	**39.4**	3.3
35	**46.0**	6.6
40	**50.0**	4.0
45	**53.5**	3.5
50	**60.5**	7.0
55	**67.0**	6.5
60	**71.0**	4.0
65	**75.0**	4.0

Avg Diff (cm) 5.1
q (cm^3/s) 9.0

TEST 2

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**5.0**	
5	**13.2**	8.2
10	**18.0**	4.8
15	**28.5**	10.5
20	**34.5**	6.0
25	**36.4**	1.9
30	**36.4**	0.0
35	**40.4**	4.0
40	**49.0**	8.6
45	**52.0**	3.0
50	**57.0**	5.0
55	**65.0**	8.0
60	**72.1**	7.1

Avg Diff (cm) 5.6
q (cm^3/s) 9.8

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)

Avg Diff (cm)
q (cm^3/s)

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0118	Ks (cm/s)	0.0128	Ks (cm/s)	
Ks (m/day)	10.19	Ks (m/day)	11.08	Ks (m/day)	

Average (m/day) **10.6**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	542.6		590.5 cm3/min		cm3/min
r (cm)	5		5.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.44		0.44		
-sqrt((r/H)^2+0.25)	-0.71		-0.71		
r/H	0.50		0.50		
Sum	0.23		0.23		
Sum*4.4*q	557.68		606.87		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	0.9		1.0		
Ksat (m/day)	12.78		13.91		

Average (m/day) **13.3**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 8
Soil Descrip	Grey to dark grey fine to medium sand
Location	392037 mE
	6447313 mN

	TEST 1	TEST 2	TEST 3
r (cm)	5.5	5.5	
H (cm)	10.0	10.0	
time step (secs)	5	5	
H/r	1.82	1.82	
C	0.83	0.83	

Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)
0	**7.5**		0	**9.0**				
5	**76.0**	68.5	5	**76.0**	67.0			
	Avg Diff (cm)	68.5		Avg Diff (cm)	67.0		Avg Diff (cm)	
	q (cm^3/s)	120.6		q (cm^3/s)	117.9		q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

	TEST 1	TEST 2	TEST 3
Ks (cm/s)	0.1417	0.1386	
Ks (m/day)	122.45	119.77	

Average (m/day) **121.1**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

	TEST 1	TEST 2	TEST 3	
q (cm3/min)	7233.6	7075.2		cm3/min
r (cm)	5.5	5.5		cm
H (cm)	10.0	10.0		cm
$0.5\sinh^{-1}(H/2r)$	0.41	0.41		
-sqrt((r/H)^2+0.25)	-0.74	-0.74		
r/H	0.55	0.55		
Sum	0.21	0.21		
Sum*4.4*q	6827.10	6677.61		
$2*pi*H^2$	628.32	628.32		
Ksat (cm/min)	10.9	10.6		
Ksat (m/day)	156.47	153.04		

Average (m/day) **154.8**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 9
Soil Descrip	Grey to dark grey fine to medium sand
Location	392107 mE
	6447280 mN

	TEST 1	TEST 2	TEST 3
r (cm)	6.0	6.0	
H (cm)	10.0	10.0	
time step (secs)	5	5	
H/r	1.67	1.67	
C	0.75	0.75	

Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)
0	**5.5**		0	**9.0**				
5	**28.0**	5.5	5	**29.5**	20.5			
10	**49.0**	28.0	10	**41.5**	12.0			
15	**74.0**	49.0	15	**57.0**	15.5			
			20	**71.0**	14.0			
	Avg Diff (cm)	27.5		Avg Diff (cm)	15.5		Avg Diff (cm)	
	q (cm^3/s)	48.4		q (cm^3/s)	27.3		q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

	TEST 1	TEST 2	TEST 3
Ks (cm/s)	0.0507	0.0286	
Ks (m/day)	43.78	24.68	

Average (m/day) **34.2**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

	TEST 1	TEST 2	TEST 3	
q (cm3/min)	2904.0	1636.8		cm3/min
r (cm)	6	6.0		cm
H (cm)	10.0	10.0		cm
$0.5\sinh^{-1}(H/2r)$	0.38	0.38		
-sqrt((r/H)^2+0.25)	-0.78	-0.78		
r/H	0.60	0.60		
Sum	0.20	0.20		
Sum*4.4*q	2532.75	1427.55		
$2*pi*H^2$	628.32	628.32		
Ksat (cm/min)	4.0	2.3		
Ksat (m/day)	58.05	32.72		

Average (m/day) **45.4**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 10
Soil Descrip	Grey to dark grey fine to medium sand
Location	392118 mE
	6447046 mN

TEST 1

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**6.3**	
5	**15.2**	8.9
10	**20.2**	5.0
15	**20.2**	0.0
20	**24.4**	4.2
25	**31.0**	6.6
30	**43.0**	12.0
35	**37.6**	-5.4
40	**40.9**	3.3
45	**45.2**	4.3
50	**49.5**	4.3
55	**54.1**	4.6
60	**60.0**	5.9
65	**65.6**	5.6
70	**71.0**	5.4
75	**71.0**	0.0
80	**76.0**	5.0
	4.4	
q (cm^3/s)	7.7	

TEST 2

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**4.7**	
5	**12.0**	7.3
10	**18.0**	6.0
15	**26.0**	8.0
20	**31.2**	5.2
25	**39.5**	8.3
30	**42.9**	3.4
35	**51.1**	8.2
40	**55.0**	3.9
45	**59.1**	4.1
50	**68.0**	8.9
55	**75.0**	7.0
Avg Diff (cm)	6.4	
q (cm^3/s)	11.2	

TEST 3

r	6.0	cm
H	10.0	cm
time step	5	secs
H/r	1.67	
C	0.75	

Time (sec)	Level (cm)	Diff (cm)
0	**4.8**	
5	**15.2**	10.4
10	**19.8**	4.6
15	**29.5**	9.7
20	**32.6**	3.1
25	**41.2**	8.6
30	**50.0**	8.8
35	**57.0**	7.0
40	**66.0**	9.0
45	**72.5**	6.5
Avg Diff (cm)	7.5	
q (cm^3/s)	13.2	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0080	Ks (cm/s)	0.0118	Ks (cm/s)	0.0139
Ks (m/day)	6.94	Ks (m/day)	10.17	Ks (m/day)	11.98
Average (m/day)	**9.7**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	460.0		674.9	cm3/min	794.3	cm3/min
r (cm)	6		6.0	cm	6.0	cm
H (cm)	10.0		10.0	cm	10.0	cm
$0.5\sinh^{-1}(H/2r)$	0.38		0.38		0.38	
-sqrt((r/H)^2+0.25)	-0.78		-0.78		-0.78	
r/H	0.60		0.60		0.60	
Sum	0.20		0.20		0.20	
Sum*4.4*q	401.21		588.60		692.80	
$2*pi*H^2$	628.32		628.32		628.32	
Ksat (cm/min)	0.6		0.9		1.1	
Ksat (m/day)	9.20		13.49		15.88	
Average (m/day)	**11.3**					

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 11
Soil Descrip	Fine to medium grey sand
Location	391956 mE
	6446486 mN

TEST 1

r	4.5	cm
H	10.0	cm
time step	5	secs
H/r	2.22	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**4.5**	
5	**26.0**	21.5
10	**50.4**	24.4
15	**64.0**	13.6
	19.8	
q (cm^3/s)	34.9	

TEST 2

r	4.5	cm
H	10.0	cm
time step	5	secs
H/r	2.22	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**13.0**	
5	**41.1**	28.1
10	**52.3**	11.2
Avg Diff (cm)	19.7	
q (cm^3/s)	34.6	

TEST 3

r	4.5	cm
H	10.0	cm
time step	5	secs
H/r	2.22	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**5.5**	
5	**28.0**	22.5
10	**52.2**	24.2
15	**74.8**	22.6
Avg Diff (cm)	23.1	
q (cm^3/s)	40.7	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0464	Ks (cm/s)	0.0460	Ks (cm/s)	0.0540
Ks (m/day)	40.09	Ks (m/day)	39.72	Ks (m/day)	46.70
Average (m/day)	**42.2**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	2094.4		2075.0	cm3/min	2439.4	cm3/min
r (cm)	4.5		4.5	cm	4.5	cm
H (cm)	10.0		10.0	cm	10.0	cm
$0.5\sinh^{-1}(H/2r)$	0.48		0.48		0.48	
-sqrt((r/H)^2+0.25)	-0.67		-0.67		-0.67	
r/H	0.45		0.45		0.45	
Sum	0.26		0.26		0.26	
Sum*4.4*q	2361.15		2339.32		2750.05	
$2*pi*H^2$	628.32		628.32		628.32	
Ksat (cm/min)	3.8		3.7		4.4	
Ksat (m/day)	54.11		53.61		63.03	
Average (m/day)	**53.9**					

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 12	
Soil Descrip	Fine to medium brown grey sand	
Location	391933	mE
	6446563	mN

	TEST 1		TEST 2		TEST 3	
r	5.5	cm	5.5	cm	5.5	cm
H	10.0	cm	10.0	cm	10.0	cm
time step	5	secs	5	secs	5	secs
H/r	1.82		1.82		1.82	
C	0.83		0.83		0.83	

Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)
0	**4.5**		0	**3.6**		0	**4.2**	
5	**28.5**	24.0	5	**27.7**	24.1	5	**37.5**	33.3
10	**47.3**	18.8	10	**46.8**	19.1	10	**52.8**	15.3
15	**68.4**	21.1	15	**75.0**	28.2	15	**75.0**	22.2
		21.3		Avg Diff (cm)	23.8		Avg Diff (cm)	23.6
	q (cm^3/s)	37.5		q (cm^3/s)	41.9		q (cm^3/s)	41.5

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0441	Ks (cm/s)	0.0492	Ks (cm/s)	0.0488
Ks (m/day)	38.08	Ks (m/day)	42.55	Ks (m/day)	42.19

Average (m/day) **40.9**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

	Test 1	Test 2	Test 3	
q (cm3/min)	2249.3	2513.3	2492.2	cm3/min
r (cm)	5.5	5.5	5.5	cm
H (cm)	10.0	10.0	10.0	cm
$0.5\sinh^{-1}(H/2r)$	0.41	0.41	0.41	
-sqrt((r/H)^2+0.25)	-0.74	-0.74	-0.74	
r/H	0.55	0.55	0.55	
Sum	0.21	0.21	0.21	
Sum*4.4*q	2122.88	2372.04	2352.11	
$2*pi*H^2$	628.32	628.32	628.32	
Ksat (cm/min)	3.4	3.8	3.7	
Ksat (m/day)	48.65	54.36	53.91	

Average (m/day) **51.5**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 13	
Soil Descrip	Fine to medium sand. Grey to white.	
Location	391992	mE
	6446852	mN

	TEST 1		TEST 2		TEST 3	
r	5.0	cm	5.0	cm		cm
H	10.0	cm	10.0	cm		cm
time step	5	secs	5	secs		secs
H/r	2.00		2.00			
C	0.91		0.91			

Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)	Time (sec)	Level (cm)	Diff (cm)
0	**9.0**		0	**3.2**				
5	**76.0**	67.0	5	**76.0**	72.8			
		67.0		Avg Diff (cm)	72.8		Avg Diff (cm)	
	q (cm^3/s)	117.9		q (cm^3/s)	128.1		q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.1537	Ks (cm/s)	0.1670	Ks (cm/s)	
Ks (m/day)	132.81	Ks (m/day)	144.31	Ks (m/day)	

Average (m/day) **138.6**

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

	Test 1	Test 2	Test 3	
q (cm3/min)	7075.2	7687.7		cm3/min
r (cm)	5	5.0		cm
H (cm)	10.0	10.0		cm
$0.5\sinh^{-1}(H/2r)$	0.44	0.44		
-sqrt((r/H)^2+0.25)	-0.71	-0.71		
r/H	0.50	0.50		
Sum	0.23	0.23		
Sum*4.4*q	7271.55	7901.03		
$2*pi*H^2$	628.32	628.32		
Ksat (cm/min)	11.6	12.6		
Ksat (m/day)	166.65	181.08		

Average (m/day) **173.9**

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 14
Soil Descrip	Grey to yellow, fine to medium grain sand
Location	391620 mE
	6448394 mN

TEST 1

r	4.0	cm
H	10.0	cm
time step	5	secs
H/r	2.50	
C	1.06	

Time (sec)	Level (cm)	Diff (cm)
0	**4.5**	
5	**17.0**	12.5
10	**25.8**	8.8
15	**37.0**	11.2
20	**50.5**	13.5
25	**57.0**	6.5
30	**73.4**	16.4
35	**76.0**	2.6
	Avg Diff (cm)	10.2
	q (cm^3/s)	18.0

TEST 2

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**4.1**	
5	**18.6**	14.5
10	**31.3**	12.7
15	**41.5**	10.2
20	**54.0**	12.5
25	**72.5**	18.5
30	**76.0**	3.5
	Avg Diff (cm)	12.0
	q (cm^3/s)	21.1

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)
	Avg Diff (cm)	
	q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0280	Ks (cm/s)	0.0275	Ks (cm/s)	
Ks (m/day)	24.22	Ks (m/day)	23.75	Ks (m/day)	
Average (m/day)	**24.0**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	1078.6		1265.4 cm3/min		cm3/min
r (cm)	4		5.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.52		0.44		
-sqrt((r/H)^2+0.25)	-0.64		-0.71		
r/H	0.40		0.50		
Sum	0.28		0.23		
Sum*4.4*q	1345.41		1300.56		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	2.1		2.1		
Ksat (m/day)	30.83		29.81		
Average (m/day)	**30.3**				

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 15
Soil Descrip	Fine to medium sand. Grey to dark grey.
Location	391795 mE
	6447827 mN

TEST 1

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**3.0**	
5	**41.0**	38.0
10	**47.0**	6.0
15	**65.0**	18.0
20	**76.0**	11.0
	Avg Diff (cm)	18.3
	q (cm^3/s)	32.1

TEST 2

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**3.2**	
5	**34.0**	30.8
10	**53.0**	19.0
15	**70.0**	17.0
20	**76.0**	6.0
	Avg Diff (cm)	18.2
	q (cm^3/s)	32.0

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)
	Avg Diff (cm)	
	q (cm^3/s)	

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0419	Ks (cm/s)	0.0418	Ks (cm/s)	
Ks (m/day)	36.18	Ks (m/day)	36.08	Ks (m/day)	
Average (m/day)	**36.1**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	1927.2		1921.9 cm3/min		cm3/min
r (cm)	5		5.0 cm		cm
H (cm)	10.0		10.0 cm		cm
$0.5\sinh^{-1}(H/2r)$	0.44		0.44		
-sqrt((r/H)^2+0.25)	-0.71		-0.71		
r/H	0.50		0.50		
Sum	0.23		0.23		
Sum*4.4*q	1980.68		1975.26		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	3.2		3.1		
Ksat (m/day)	45.39		45.27		
Average (m/day)	**45.3**				

Borehole Permeameter : Field Result Analysis

Project/Site	Glen Iris Test Site 16	
Soil Descrip	Fine to medium sand. Grey to dark grey.	
Location	392078	mE
	6446319	mN

TEST 1

r	4.0	cm
H	10.0	cm
time step	5	secs
H/r	2.50	
C	1.06	

Time (sec)	Level (cm)	Diff (cm)
0	**9.2**	
5	**20.1**	10.9
10	**28.4**	8.3
15	**36.5**	8.1
20	**45.4**	8.9
25	**45.4**	0.0
30	**53.0**	7.6
35	**60.0**	7.0
40	**64.0**	4.0
45	**67.0**	3.0
		6.4
q (cm^3/s)		11.3

TEST 2

r	5.0	cm
H	10.0	cm
time step	5	secs
H/r	2.00	
C	0.91	

Time (sec)	Level (cm)	Diff (cm)
0	**7.0**	
5	**18.0**	11.0
10	**27.2**	9.2
15	**34.4**	7.2
20	**40.0**	5.6
25	**48.0**	8.0
30	**58.4**	10.4
35	**66.5**	8.1
40	**75.0**	8.5
45	**76.0**	1.0
Avg Diff (cm)		7.7
q (cm^3/s)		13.5

TEST 3

r		cm
H		cm
time step		secs
H/r		
C		

Time (sec)	Level (cm)	Diff (cm)
Avg Diff (cm)		
q (cm^3/s)		

METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0176	Ks (cm/s)	0.0176	Ks (cm/s)	
Ks (m/day)	15.23	Ks (m/day)	15.20	Ks (m/day)	
Average (m/day)	**15.2**				

METHOD 2 : Talsma and Hallam Method (for low Ks only <2.9)

q (cm3/min)	678.2		809.6	cm3/min	cm3/min
r (cm)	4		5.0	cm	cm
H (cm)	10.0		10.0	cm	cm
$0.5\sinh^{-1}(H/2r)$	0.52		0.44		
-sqrt((r/H)^2+0.25)	-0.64		-0.71		
r/H	0.40		0.50		
Sum	0.28		0.23		
Sum*4.4*q	845.92		832.07		
$2*pi*H^2$	628.32		628.32		
Ksat (cm/min)	1.3		1.3		
Ksat (m/day)	19.39		19.07		
Average (m/day)	**19.2**				

APPENDIX D
Existing Stormwater System Plates

PLATES



PLATE 1:



PLATE 2:



PLATE 3:



PLATE 4:



PLATE 5:



PLATE 6:



SW1



SW2



SW3



SW8

PLATE 7-10: Various Existing Stormwater Outlets



SW10



SW11



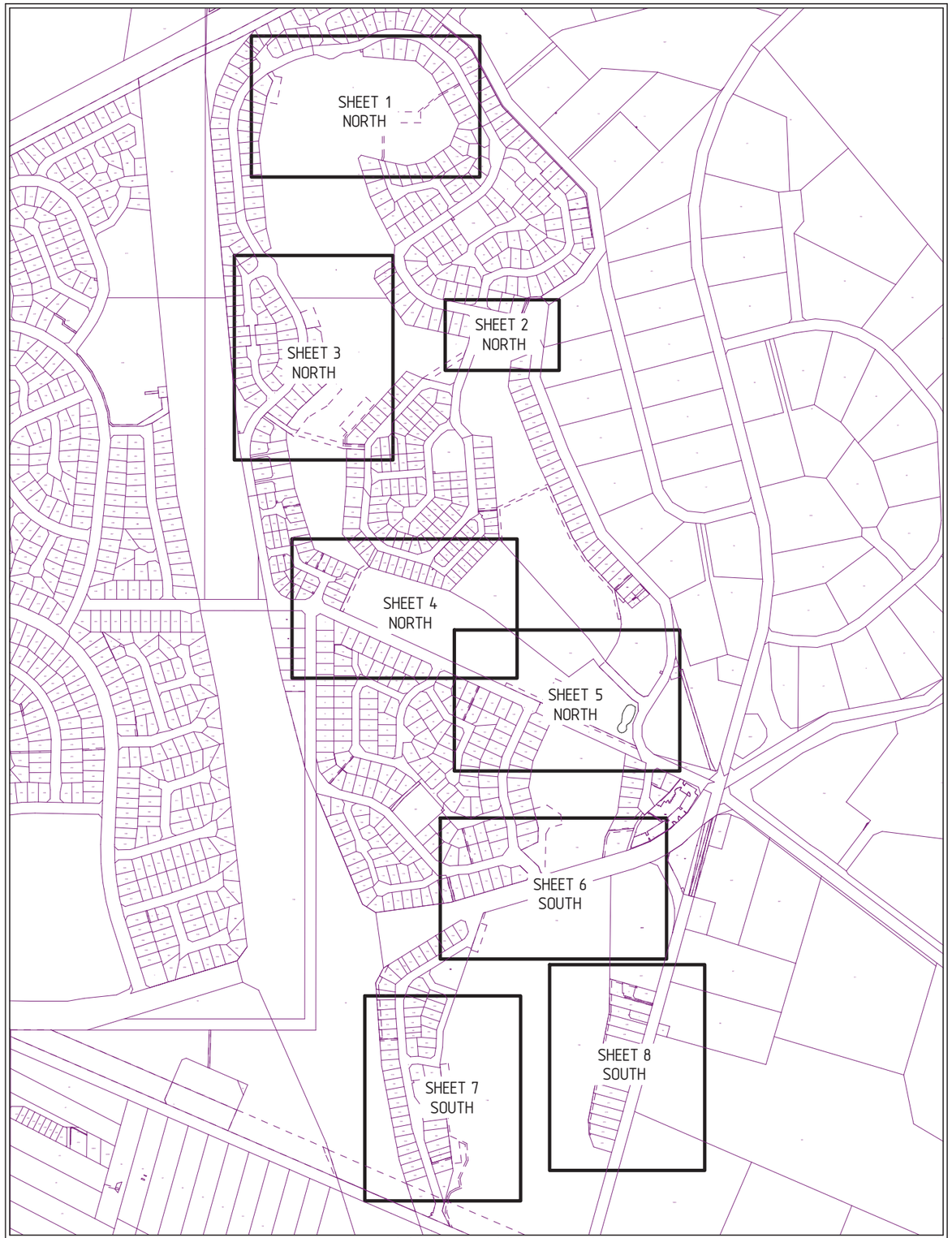
SW13



SW15

PLATE 11-14: Various Existing Stormwater Outlets

APPENDIX E
Survey of Existing Stormwater Storages & Outlets



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	16/2/2021	KEN

SCALE 16000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE
SCDB

ISO 9001 - ASNZS 4801 - ISO 14001
Global-Mark.com.au ®

N

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
INDEX SHEET

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

MNG
MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley | South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

Project Mngr	Datum	PCG94 / AHD
KEN SELLERS		

Job Number	Type	Plan Number	Revision
102160	AS	015	A

GLEN IRIS DRIVE

GLEN IRIS DRIVE

DMH = DRAINAGE MANHOLE
SEP = SIDE ENTRY PIT
RCP = REINFORCED CONCRETE PIPE

DRAINAGE SUMP
WATER LEVEL = 32.90m
AS AT
27/01/2021 12:00PM

VOLUME OF DETENTION BASIN
8,682m³ AS CALCULATED FROM
TOP OF RETAINING WALL

OUTLET STRUCTURE NOT FOUND
THICK WETLAND REEDS/VEGETATION

SUB MERGRED
CONCRETE PLATE
RL 32.2

GRATE

MANHOLE NOT FOUND

KINGSTON HEATH MEWS

Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	15/2/2021	KEN

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE SCDB

ISO 9001 - AS/NZS 4801 ISO14001
Global-Mark.com.au ®

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA

Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
NORTH - SHEET 1

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number - Type - Plan Number - Revision

13
12
11
700
1
612
613
7
614
DEAN ROAD
TWIN WATERS PASS
DEAN ROAD
SEP
SEP
2xSEP
2xSEP
GRATE
GRATE
DMH
2xSEP
450 Ø RCP
300 Ø RCP
IL 26.12
IL 26.25
IL 26.03
IL 25.79
IL 25.73
IL 24.77
IL 26.54
IL 26.45
IL 26.45
IL 26.43
IL 26.41
IL 26.44
IL 26.46
IL 24.84
IL 25.57
IL 25.57
IL 25.47
IL 25.58
IL 25.58
IL 25.32
27.33
27.13
25.49
25.08
27.54
27.10
27.53
VOLUME OF DETENTION BASIN
836m^3 AS CALCULATED FROM
TOP OF BATTER
DRAINAGE BASIN
NO WATER
DMH = DRAINAGE MANHOLE
SEP = SIDE ENTRY PIT
RCP = REINFORCED CONCRETE PIPE

Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	15/2/2021	KEN

SCALE 1:500 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE SCDB

ISO 9001, AS/NZS 4801, ISO 45001
Global-Mark.com.au ©

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA

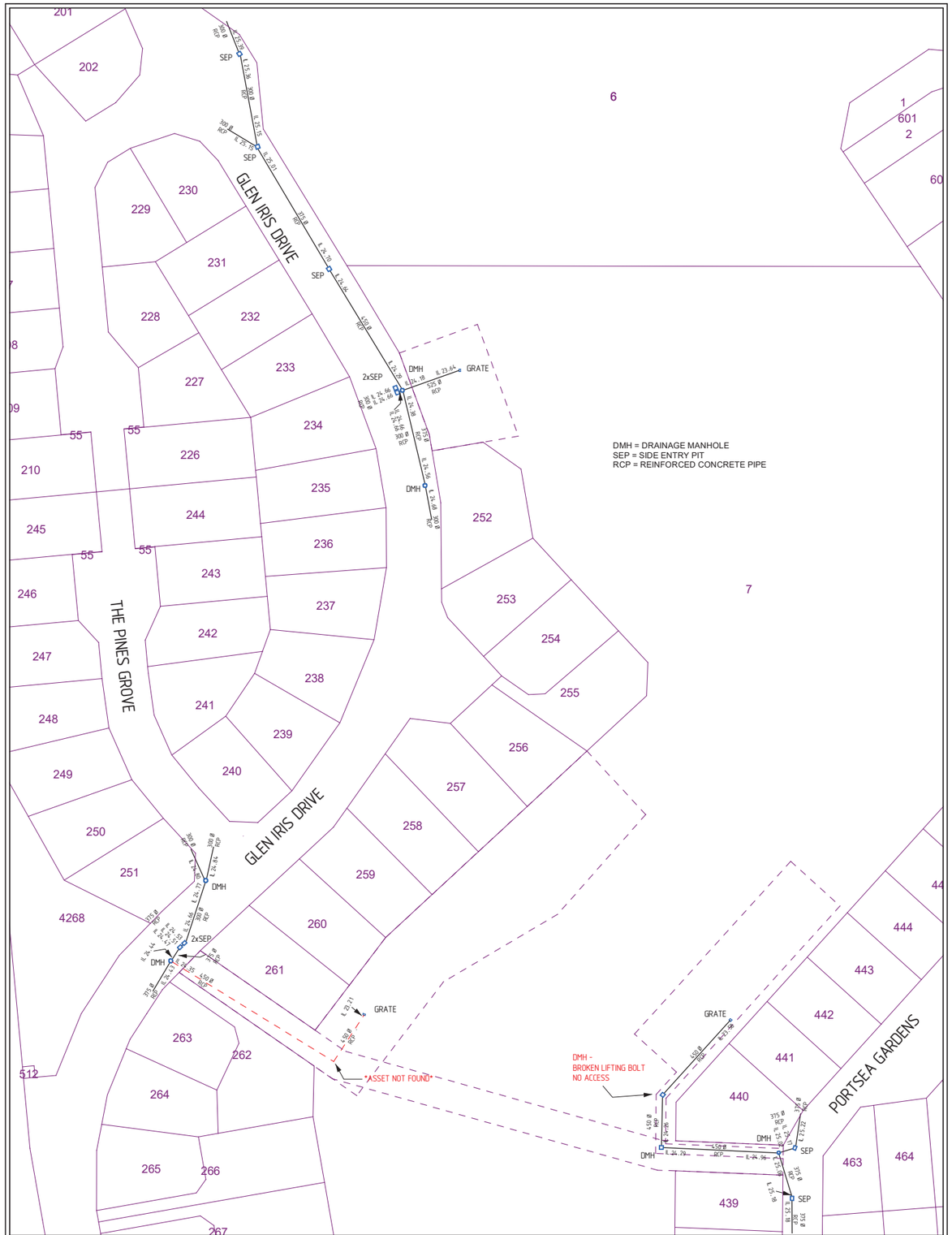
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
NORTH - SHEET 2

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number - Type - Plan Number - Revision



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	16/2/2021	KEN

Surveyor- TM
Survey Date- 11/1/2021
Precal/Cad- LANDGATE SCDB

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
NORTH - SHEET 3

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number - Type - Plan Number - Revision

VOLUME OF DETENTION BASIN
82m³ AS CALCULATED FROM
TOP OF BATTER

KOORALBYN VALLEY CRESCENT

GLACIER WAY

HARTWELL PARADE

DMH = DRAINAGE MANHOLE
SEP = SIDE ENTRY PIT
RCP = REINFORCED CONCRETE PIPE

Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	15/2/2021	KEN

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE SCDB

ISO 9001:AS/NZS 4801 : ISO14001
Global-Mark.com.au ©

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

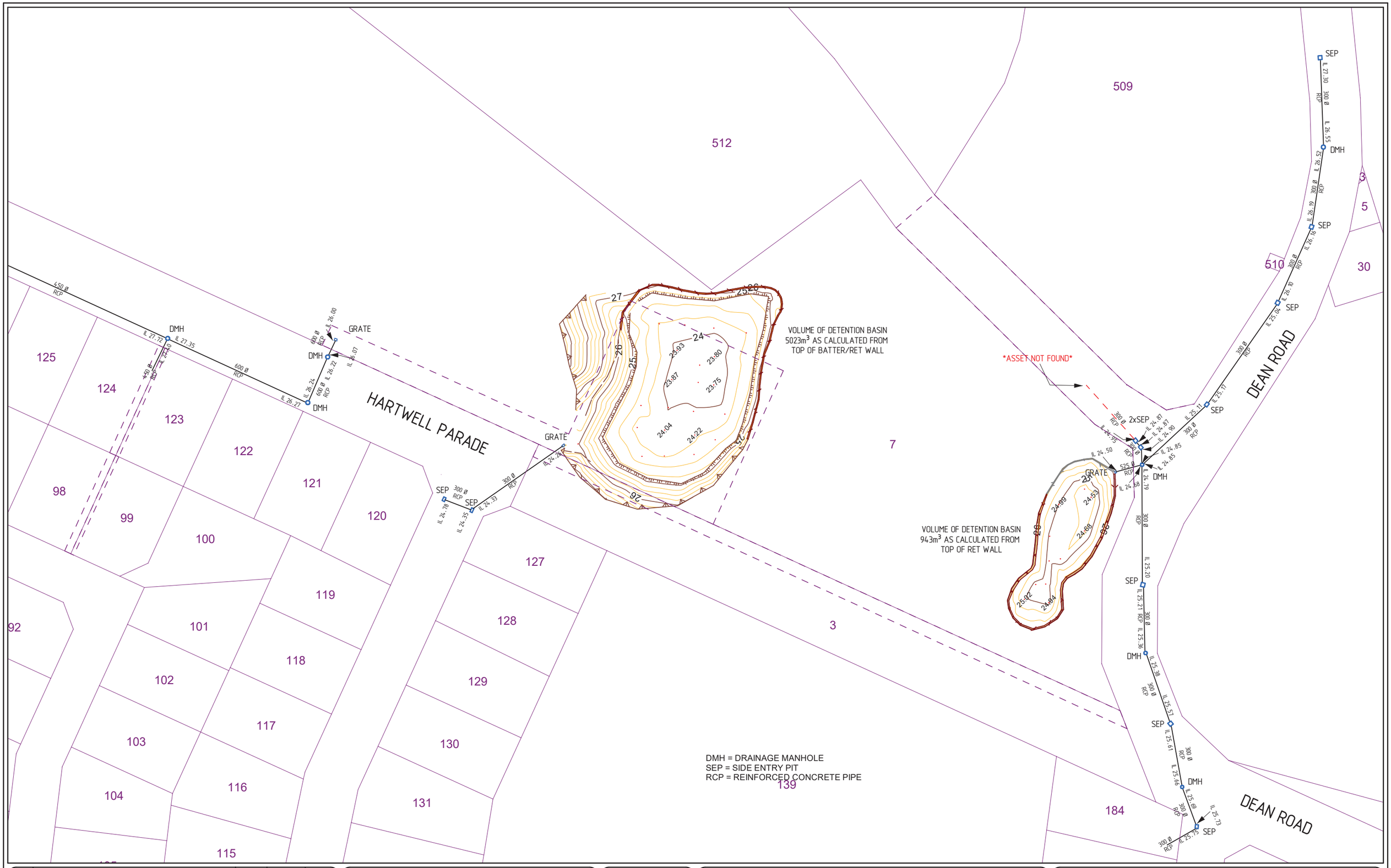
MNG
MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
NORTH - SHEET 4

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number | Type | Plan Number | Revision



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	15/2/2021	KEN

SCALE 1:1000 @ A3

0 10 20 30 40 50

ALL DISTANCES ARE IN METRES

For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE SCDB

ISO 9001 - AS/NZS 4801 - ISO 45001 Global-Mark.com.au ©

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

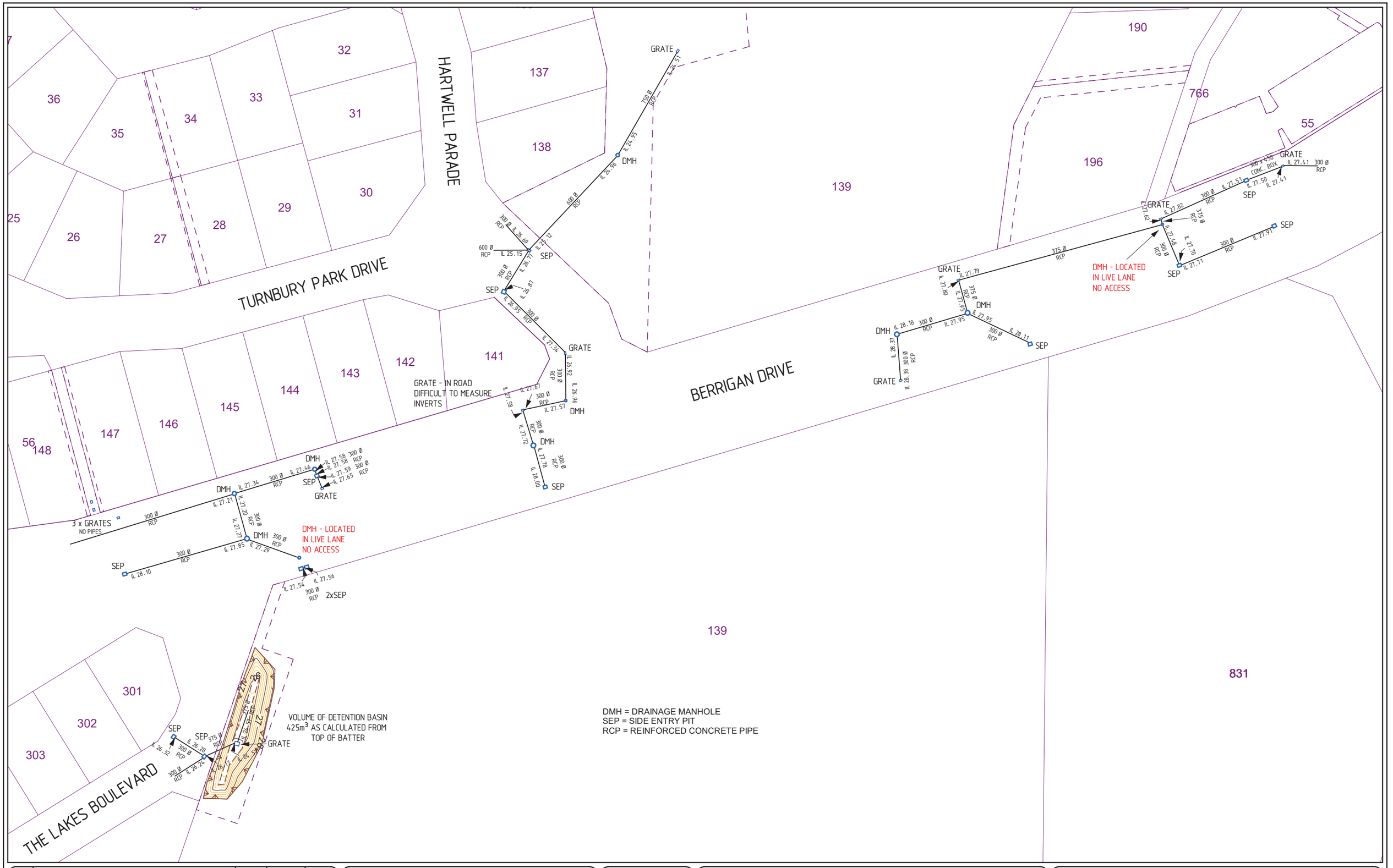
MNG.
MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
NORTH - SHEET 5

CLIENT: *ACUMEN DEVELOPMENT SOLUTIONS*

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number - Type - Plan Number - Revision



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	15/2/2021	KEN

SCALE 1:1000 @ A3

0 10 20 30 40 50

ALL DISTANCES ARE IN METRES

For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TM
Survey Date:- 11/1/2021
Precal/Cad:- LANDGATE SCDB

ISO 9001, AS/NZS 4801, ISO14001
Global-Mark.com.au ®

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA

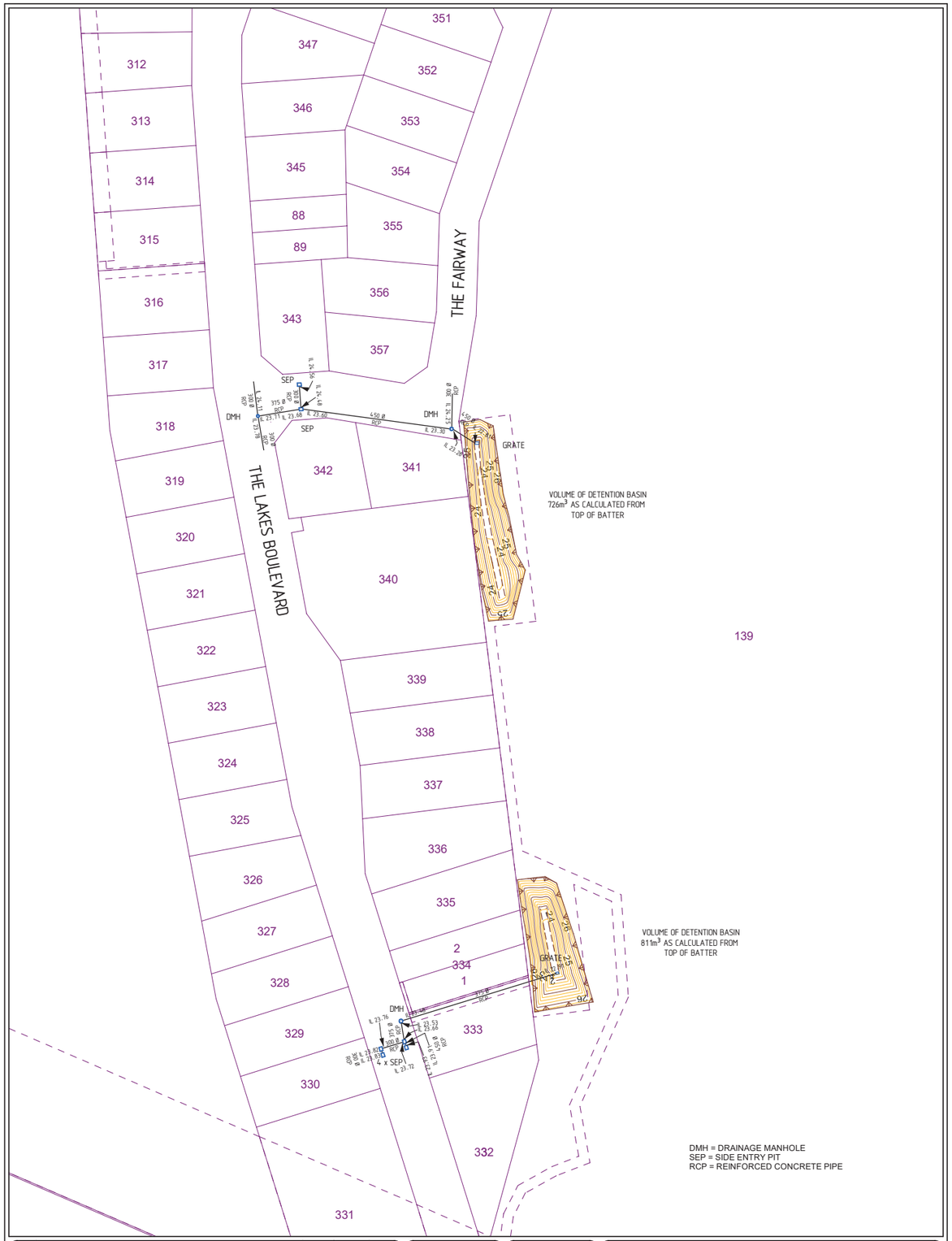
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
SOUTH - SHEET 6

CLIENT:
ACUMEN DEVELOPMENT SOLUTIONS

Project Mngr	KEN SELLERS	Datum	PCG94 / AHD

102160 - AS - 015 - A
Job Number - Type - Plan Number - Revision



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	16/2/2021	KEN

Surveyor– TM
Survey Date– 11/1/2021
Precal/Cad– LANDGATE SCDB

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
SOUTH - SHEET 7

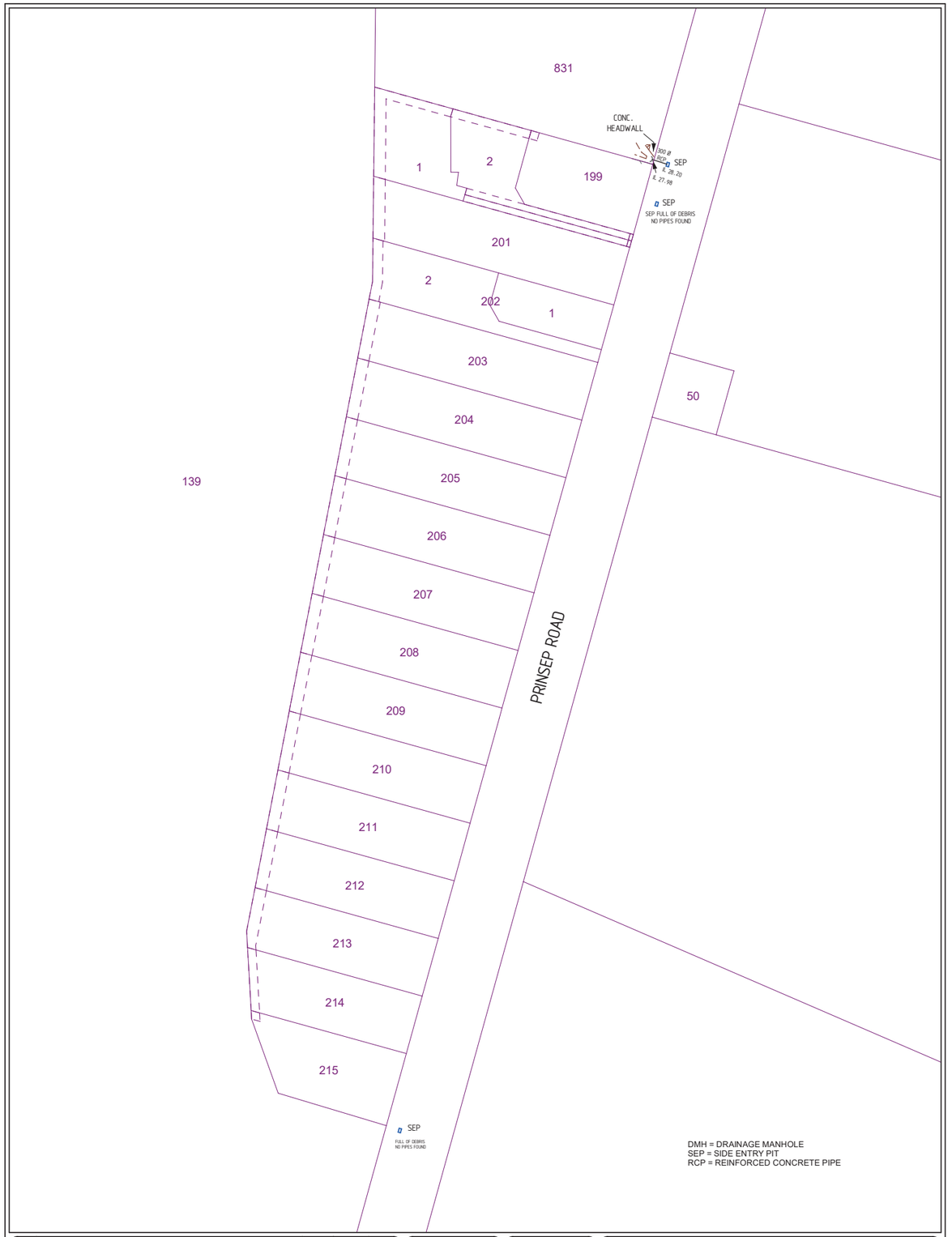
CLIENT: *ACUMEN DEVELOPMENT SOLUTIONS*

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

Project Mngr	Datum	PCG94 / AHD
KEN SELLERS		

Job Number	Type	Plan Number	Revision
102160	AS -	015	A



Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TM	16/2/2021	KEN

Surveyor– TM
Survey Date– 11/1/2021
Precal/Cad– LANDGATE SCDB

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

DRAINAGE INVESTIGATION
GLEN IRIS GOLF COURSE
SOUTH - SHEET 8

CLIENT: *ACUMEN DEVELOPMENT SOLUTIONS*

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley| South West WA
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

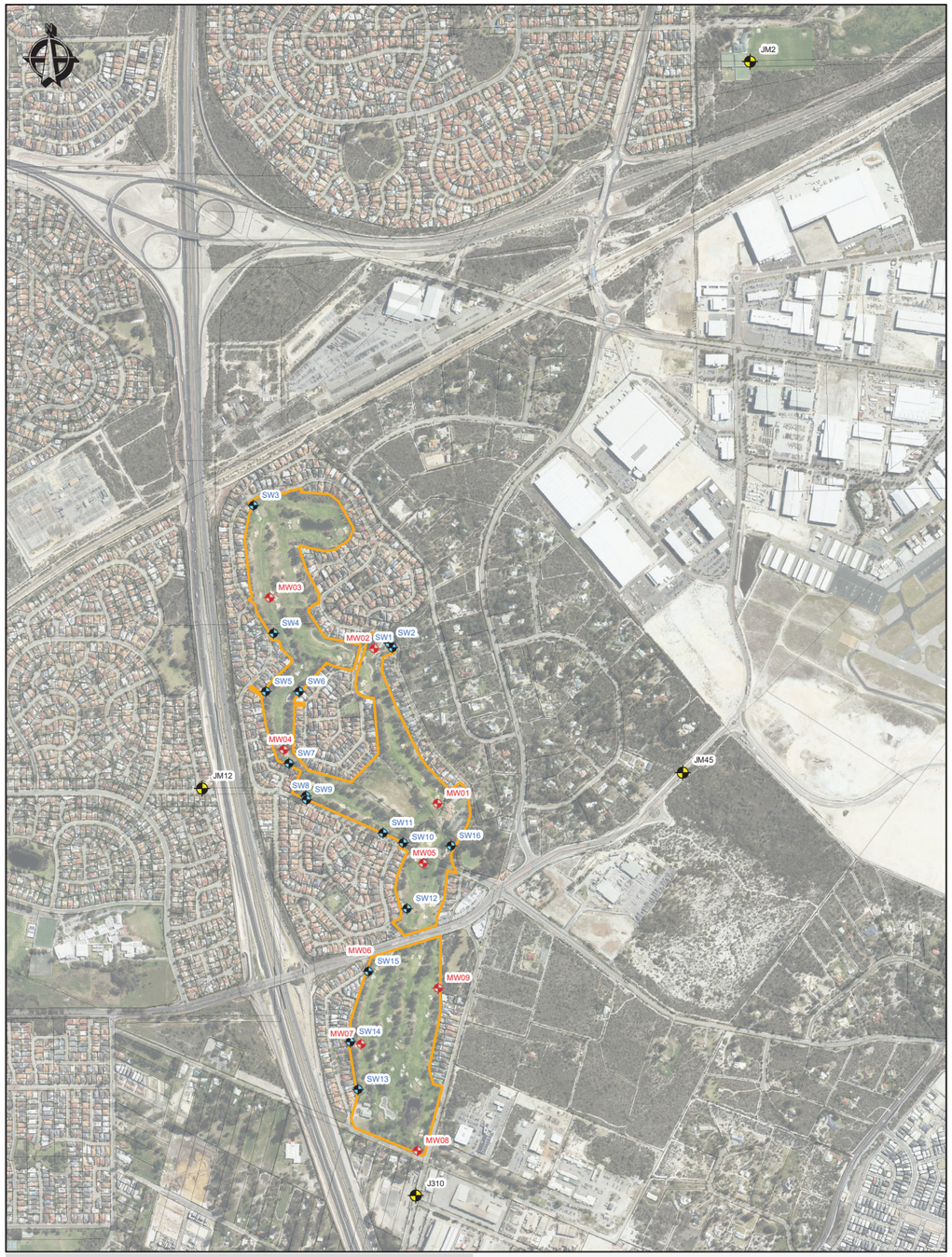
Project Mngr	Datum	PCG94 / AHD
KEN SELLERS		

Job Number	Type	Plan Number	Revision
102160	AS -	015	A

APPENDIX F
Predevelopment Site Monitoring Data



Date: 16/09/2021 Job No. H20002



Site Boundary
Stormwater Monitoring Sites
Site Groundwater Bores
DWER Groundwater Bores

0 150 300 450 600 Meters

hyd2o
Glen Iris Jandakot Local Water Management Strategy
DWER Groundwater Monitoring Bore Locations
Appendix F2

H20002 Glen Iris GC

Aggregated Data for All Sites
Groundwater

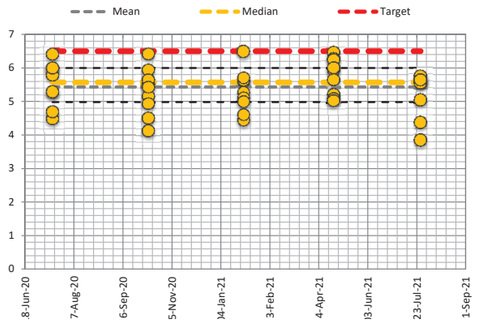
Data Analysis Period Start Date: 01-06-20
Data Analysis Period End Date: 01-09-21

hyd2o HYDROLOGY

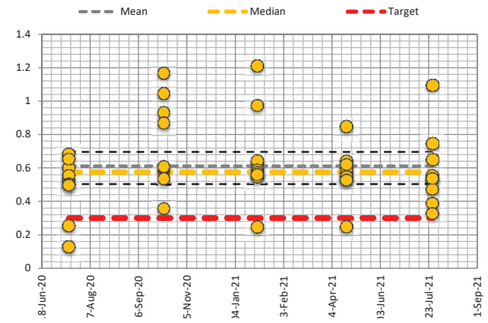
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	182	2.49	3.99	6.13	**5.51**	8.38	13.39		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	182	21.29	22.09	22.74	**22.73**	23.35	24.78		✓ 0
T	Temperature	°C	45	17.00	18.98	20.88	**21.20**	22.52	26.00		✓ 0
EC	Electrical Conductivity	mS/cm	45	0.13	0.50	0.61	**0.58**	0.70	1.21	0.30	✗ 41
pH	pH	pH	45	3.85	4.98	5.43	**5.57**	6.00	6.49	6.50	✓ 0
DO%	Dissolved Oxygen	%	44	10.50	22.22	31.40	**31.40**	36.78	72.80		✓ 0
TN	Total Nitrogen	mg/L	45	0.30	0.80	1.86	**1.40**	2.20	13.00	1.20	✗ 27
TKN	Total Kej Nitrogen	mg/L	45	0.10	0.40	0.82	**0.80**	1.30	1.50		✓ 0
NH3-N	Ammonia as N	mg/L	45	0.01	0.01	0.19	**0.11**	0.32	0.69	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	45	0.01	0.01	1.01	**0.19**	1.82	11.00	0.70	✗ 17
NO2-N	Nitrite as N	mg/L	45	0.01	0.01	0.01	**0.01**	0.01	0.05		✓ 0
TP	Total Phosphorous	mg/L	45	0.05	0.05	0.05	**0.05**	0.05	0.15	0.07	✗ 1
PO4-	Phosphate as P	mg/L	45	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	45	0.00100	0.00100	0.00189	**0.00100**	0.00100	0.01000	0.02400	✓ 0
Cd	Cadmium	mg/L	45	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	45	0.00100	0.00100	0.00109	**0.00100**	0.00100	0.00200	0.00100	✗ 4
Cu	Copper	mg/L	45	0.00100	0.00100	0.00716	**0.00100**	0.00120	0.10000	0.00140	✗ 9
Pb	Lead	mg/L	45	0.00100	0.00100	0.00129	**0.00100**	0.00120	0.00400	0.00340	✗ 1
Hg	Mercury	mg/L	45	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	45	0.00100	0.00100	0.00173	**0.00100**	0.00100	0.01100	0.01100	✓ 0
Zn	Zinc	mg/L	45	0.00100	0.00100	0.01102	**0.00200**	0.01000	0.08900	0.00800	✗ 10
Nox	Nox	mg/L	45	0.01	0.01	1.02	**0.20**	1.82	11.00	0.15000	✗ 23

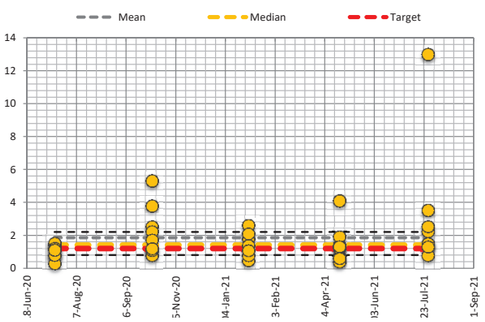
pH



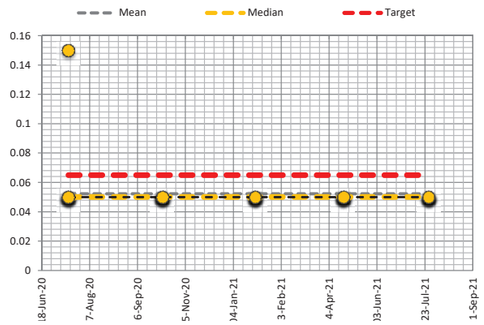
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

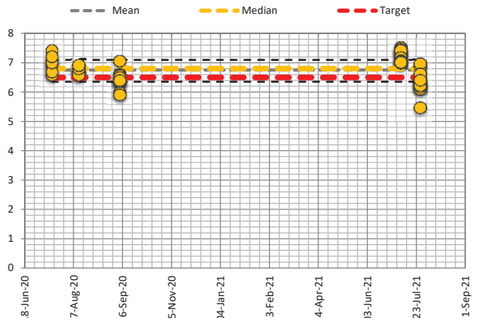
Aggregated Data for All Sites
Surface Water

Data Analysis Period Start Date: 01-06-20
Data Analysis Period End Date: 01-09-21

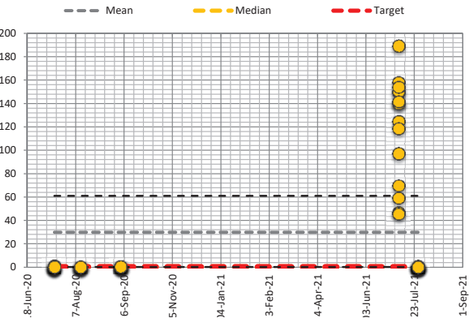
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	60	11.40	14.48	15.66	**15.40**	16.82	23.50		0
EC	Electrical Conductivity	mS/cm	60	0.04	0.07	29.80	**0.15**	61.06	188.80	0.30	17
pH	pH	pH	60	5.47	6.36	6.76	**6.80**	7.10	7.51	6.50	43
DO%	Dissolved Oxygen	%	60	6.20	35.54	55.91	**64.55**	72.44	82.60		0
TN	Total Nitrogen	mg/L	60	0.10	0.20	0.37	**0.30**	0.50	1.90	1.20	3
TKN	Total Kej Nitrogen	mg/L	60	0.01	0.20	0.35	**0.20**	0.40	1.90		0
NH3-N	Ammonia as N	mg/L	60	0.01	0.01	0.03	**0.01**	0.03	0.26	1.90	0
NO_3-N	Nitrate as N	mg/L	60	0.01	0.01	0.03	**0.02**	0.05	0.12	0.70	0
NO2-N	Nitrite as N	mg/L	60	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	60	0.05	0.05	0.09	**0.05**	0.09	0.50	0.07	15
PO4-	Phosphate as P	mg/L	60	0.00	0.01	0.02	**0.01**	0.02	0.19	0.04	6
As	Arsenic	mg/L	60	0.00100	0.00100	0.00102	**0.00100**	0.00100	0.00200	0.02400	0
Cd	Cadmium	mg/L	60	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	60	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	60	0.00100	0.00100	0.00307	**0.00100**	0.00200	0.10000	0.00140	17
Pb	Lead	mg/L	60	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	60	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	60	0.00100	0.00100	0.00108	**0.00100**	0.00100	0.00600	0.01100	0
Zn	Zinc	mg/L	60	0.00200	0.00700	0.03260	**0.01300**	0.04440	0.30000	0.00800	41
Nox	Nox	mg/L	60	0.01	0.01	0.03	**0.02**	0.05	0.12	0.15000	0

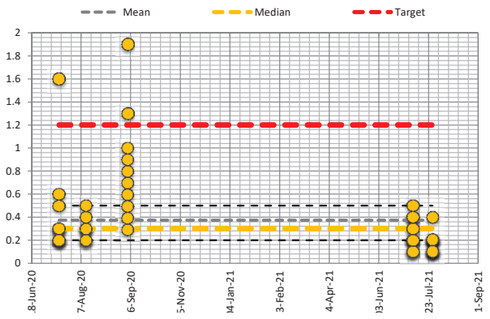
pH



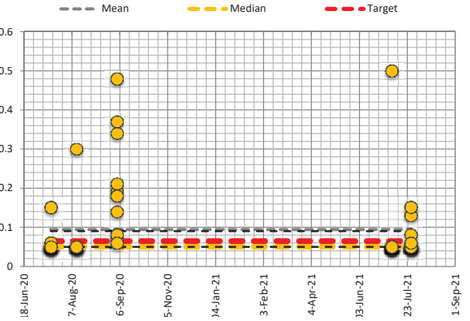
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

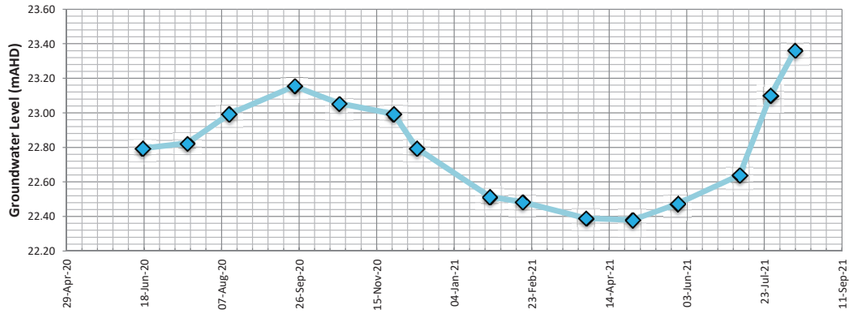
MW1 Site Monitoring Bore 1

Data Analysis Period Start Date: 01-06-20
Data Analysis Period End Date: 01-09-21

Easting: 392219
Northing: 6447400

Natural Surface (mAHD): 30.93
Top of Casing (m AHD): 31.53
End of Hole (mAHD):

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	8.74	22.79	8.14
16-07-20	8.71	22.82	8.11
12-08-20	8.54	22.99	7.94
23-09-20	8.38	23.15	7.78
22-10-20	8.48	23.05	7.88
26-11-20	8.54	22.99	7.94
11-12-20	8.74	22.79	8.14
27-01-21	9.02	22.51	8.42
17-02-21	9.05	22.48	8.45
30-03-21	9.14	22.39	8.54
29-04-21	9.15	22.38	8.55
28-05-21	9.06	22.47	8.46
07-07-21	8.89	22.64	8.29
27-07-21	8.43	23.10	7.83
12-08-21	8.17	23.36	7.57

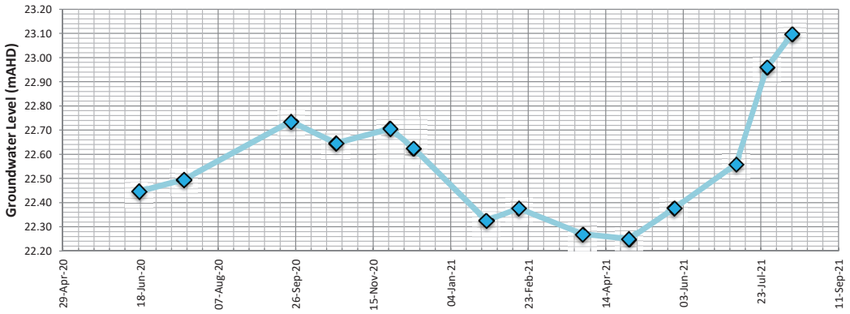
Minimum Recorded Level (mAHD): 22.38
Maximum Recorded Level (mAHD): 23.36

H20002 Glen Iris GC

MW2 Site Monitoring Bore 2

Data Analysis Period Start Date	01-06-20	Easting	392008	Natural Surface (mAHD)	27.22
Data Analysis Period End Date	01-09-21	Northing	6447916	Top of Casing (m AHD)	27.82
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	5.37	22.45	4.77
16-07-20	5.32	22.50	4.72
23-09-20	5.08	22.74	4.48
22-10-20	5.17	22.65	4.57
26-11-20	5.11	22.71	4.51
11-12-20	5.19	22.63	4.59
27-01-21	5.49	22.33	4.89
17-02-21	5.44	22.38	4.84
30-03-21	5.55	22.27	4.95
29-04-21	5.57	22.25	4.97
28-05-21	5.44	22.38	4.84
07-07-21	5.26	22.56	4.66
27-07-21	4.86	22.96	4.26
12-08-21	4.72	23.10	4.12

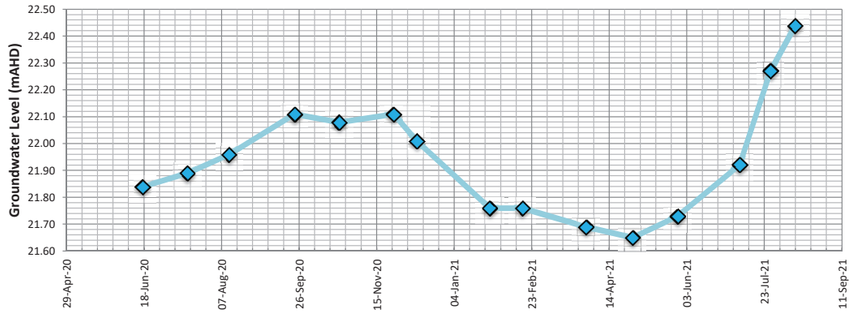
Minimum Recorded Level (mAHD)	22.25
Maximum Recorded Level (mAHD)	23.10

H20002 Glen Iris GC

MW3 Site Monitoring Bore 3

Data Analysis Period Start Date	01-06-20	Easting	391661	Natural Surface (mAHD)	29.73
Data Analysis Period End Date	01-09-21	Northing	6448084	Top of Casing (m AHD)	30.33
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	8.49	21.84	7.89
16-07-20	8.44	21.89	7.84
12-08-20	8.37	21.96	7.77
23-09-20	8.22	22.11	7.62
22-10-20	8.25	22.08	7.65
26-11-20	8.22	22.11	7.62
11-12-20	8.32	22.01	7.72
27-01-21	8.57	21.76	7.97
17-02-21	8.57	21.76	7.97
30-03-21	8.64	21.69	8.04
29-04-21	8.68	21.65	8.08
28-05-21	8.60	21.73	8.00
07-07-21	8.41	21.92	7.81
27-07-21	8.06	22.27	7.46
12-08-21	7.89	22.44	7.29

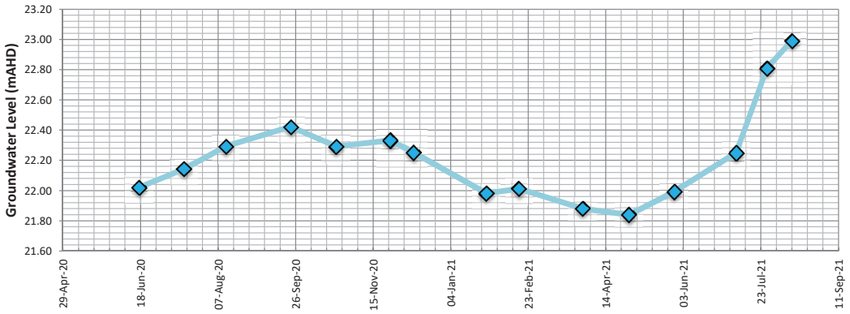
Minimum Recorded Level (mAHD)	21.65
Maximum Recorded Level (mAHD)	22.44

H20002 Glen Iris GC

MW4 Site Monitoring Bore 4

Data Analysis Period Start Date	01-06-20	Easting	391708	Natural Surface (mAHD)	25.67
Data Analysis Period End Date	01-09-21	Northing	6447579	Top of Casing (m AHD)	26.27
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	4.25	22.02	3.65
16-07-20	4.13	22.14	3.53
12-08-20	3.98	22.29	3.38
23-09-20	3.85	22.42	3.25
22-10-20	3.98	22.29	3.38
26-11-20	3.94	22.33	3.34
11-12-20	4.02	22.25	3.42
27-01-21	4.29	21.98	3.69
17-02-21	4.26	22.01	3.66
30-03-21	4.39	21.88	3.79
29-04-21	4.43	21.84	3.83
28-05-21	4.28	21.99	3.68
07-07-21	4.02	22.25	3.42
27-07-21	3.46	22.81	2.86
12-08-21	3.28	22.99	2.68

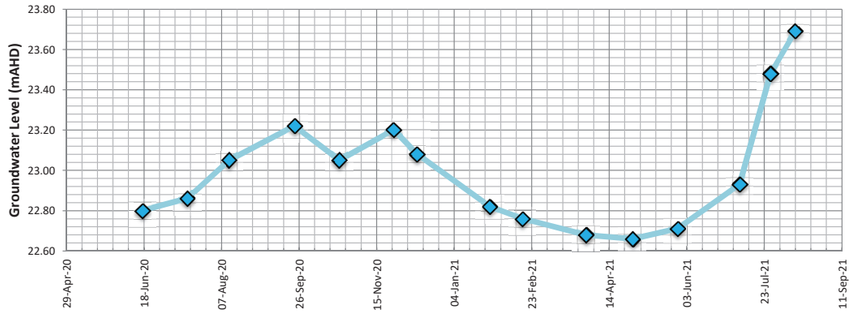
Minimum Recorded Level (mAHD)	21.84
Maximum Recorded Level (mAHD)	22.99

H20002 Glen Iris GC

MW5 Site Monitoring Bore 5

Data Analysis Period Start Date	01-06-20	Easting	392170	Natural Surface (mAHD)	26.84
Data Analysis Period End Date	01-09-21	Northing	6447202	Top of Casing (m AHD)	27.44
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	4.64	22.80	4.04
16-07-20	4.58	22.86	3.98
12-08-20	4.39	23.05	3.79
23-09-20	4.22	23.22	3.62
22-10-20	4.39	23.05	3.79
26-11-20	4.24	23.20	3.64
11-12-20	4.36	23.08	3.76
27-01-21	4.62	22.82	4.02
17-02-21	4.68	22.76	4.08
30-03-21	4.76	22.68	4.16
29-04-21	4.78	22.66	4.18
28-05-21	4.73	22.71	4.13
07-07-21	4.51	22.93	3.91
27-07-21	3.96	23.48	3.36
12-08-21	3.75	23.69	3.15

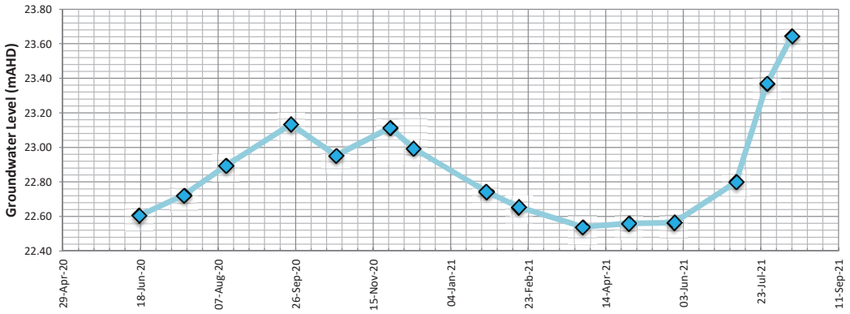
Minimum Recorded Level (mAHD)	22.66
Maximum Recorded Level (mAHD)	23.69

H20002 Glen Iris GC

MW6 Site Monitoring Bore 6

Data Analysis Period Start Date	01-06-20	Easting	392027	Natural Surface (mAHD)	28.56
Data Analysis Period End Date	01-09-21	Northing	6446878	Top of Casing (m AHD)	29.16
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	6.56	22.60	5.96
16-07-20	6.44	22.72	5.84
12-08-20	6.27	22.89	5.67
23-09-20	6.03	23.13	5.43
22-10-20	6.21	22.95	5.61
26-11-20	6.05	23.11	5.45
11-12-20	6.17	22.99	5.57
27-01-21	6.42	22.74	5.82
17-02-21	6.51	22.65	5.91
30-03-21	6.62	22.54	6.02
29-04-21	6.60	22.56	6.00
28-05-21	6.60	22.56	6.00
07-07-21	6.36	22.80	5.76
27-07-21	5.79	23.37	5.19
12-08-21	5.52	23.64	4.92

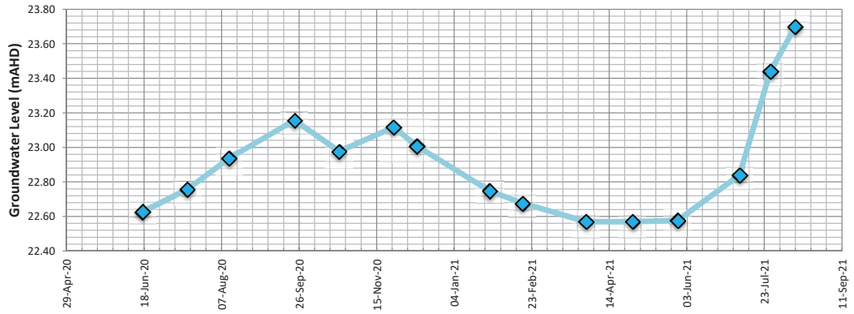
Minimum Recorded Level (mAHD)	22.54
Maximum Recorded Level (mAHD)	23.64

H20002 Glen Iris GC

MW7 Site Monitoring Bore 7

Data Analysis Period Start Date	01-06-20	Easting	391965	Natural Surface (mAHD)	27.70
Data Analysis Period End Date	01-09-21	Northing	6446606	Top of Casing (m AHD)	28.30
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	5.67	22.63	5.07
16-07-20	5.54	22.76	4.94
12-08-20	5.36	22.94	4.76
23-09-20	5.14	23.16	4.54
22-10-20	5.32	22.98	4.72
26-11-20	5.18	23.12	4.58
11-12-20	5.29	23.01	4.69
27-01-21	5.55	22.75	4.95
17-02-21	5.62	22.68	5.02
30-03-21	5.73	22.57	5.13
29-04-21	5.73	22.57	5.13
28-05-21	5.72	22.58	5.12
07-07-21	5.46	22.84	4.86
27-07-21	4.86	23.44	4.26
12-08-21	4.60	23.70	4.00

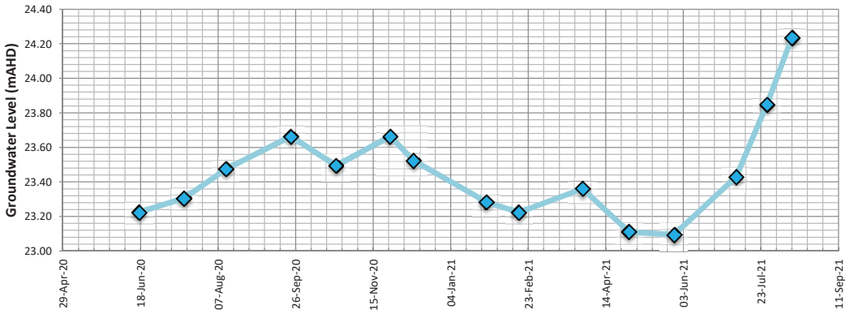
Minimum Recorded Level (mAHD)	22.57
Maximum Recorded Level (mAHD)	23.70

H20002 Glen Iris GC

MW8 Site Monitoring Bore 8

Data Analysis Period Start Date	01-06-20	Easting	392151	Natural Surface (mAHD)	26.12
Data Analysis Period End Date	01-09-21	Northing	6446249	Top of Casing (m AHD)	26.72
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	3.50	23.22	2.90
16-07-20	3.42	23.30	2.82
12-08-20	3.25	23.47	2.65
23-09-20	3.06	23.66	2.46
22-10-20	3.23	23.49	2.63
26-11-20	3.06	23.66	2.46
11-12-20	3.20	23.52	2.60
27-01-21	3.44	23.28	2.84
17-02-21	3.50	23.22	2.90
30-03-21	3.36	23.36	2.76
29-04-21	3.61	23.11	3.01
28-05-21	3.63	23.09	3.03
07-07-21	3.29	23.43	2.69
27-07-21	2.87	23.85	2.27
12-08-21	2.49	24.23	1.89

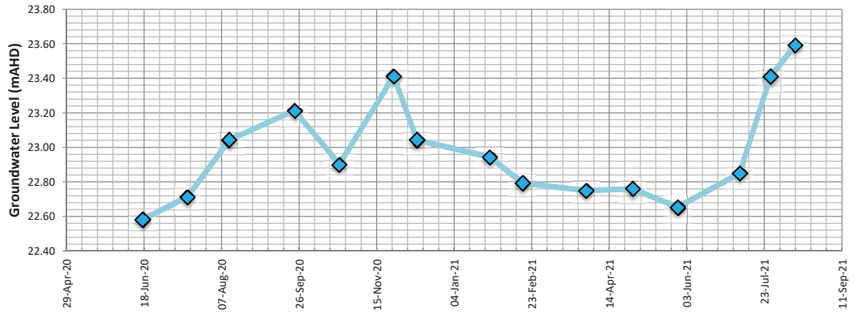
Minimum Recorded Level (mAHD)	23.09
Maximum Recorded Level (mAHD)	24.23

H20002 Glen Iris GC

MW9 Site Monitoring Bore 9

Data Analysis Period Start Date	01-06-20	Easting	392221	Natural Surface (mAHD)	27.83
Data Analysis Period End Date	01-09-21	Northing	6446790	Top of Casing (m AHD)	28.43
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	5.85	22.58	5.25
16-07-20	5.72	22.71	5.12
12-08-20	5.39	23.04	4.79
23-09-20	5.22	23.21	4.62
22-10-20	5.53	22.90	4.93
26-11-20	5.02	23.41	4.42
11-12-20	5.39	23.04	4.79
27-01-21	5.49	22.94	4.89
17-02-21	5.64	22.79	5.04
30-03-21	5.68	22.75	5.08
29-04-21	5.67	22.76	5.07
28-05-21	5.78	22.65	5.18
07-07-21	5.58	22.85	4.98
27-07-21	5.02	23.41	4.42
12-08-21	4.84	23.59	4.24

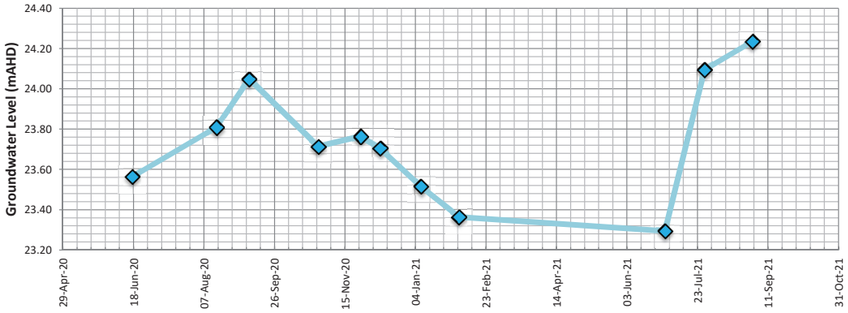
Minimum Recorded Level (mAHD)	22.58
Maximum Recorded Level (mAHD)	23.59

H20002 Glen Iris GC

J310 DWER Bore 1

Data Analysis Period Start Date	01-06-20	Easting	396862	Natural Surface (mAHD)	
Data Analysis Period End Date	01-09-21	Northing	6442071	Top of Casing (m AHD)	26.69
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	3.13	23.56	
16-08-20	2.89	23.81	
08-09-20	2.65	24.05	
27-10-20	2.98	23.71	
26-11-20	2.93	23.76	
10-12-20	2.99	23.70	
08-01-21	3.18	23.51	
04-02-21	3.33	23.36	
30-06-21	3.40	23.29	
28-07-21	2.60	24.09	
31-08-21	2.46	24.23	

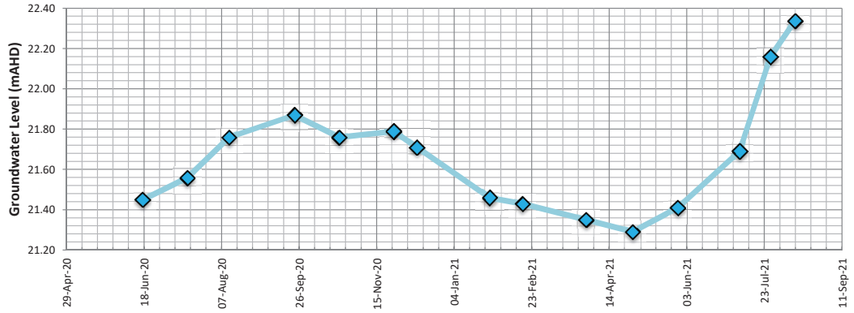
Minimum Recorded Level (mAHD)	23.29
Maximum Recorded Level (mAHD)	24.23

H20002 Glen Iris GC

JM12 DWER Bore 4

Data Analysis Period Start Date	01-06-20	Easting	391437	Natural Surface (mAHD)	34.51
Data Analysis Period End Date	01-09-21	Northing	6447453	Top of Casing (m AHD)	34.68
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	13.23	21.45	13.06
16-07-20	13.12	21.56	12.95
12-08-20	12.92	21.76	12.75
23-09-20	12.81	21.87	12.64
22-10-20	12.92	21.76	12.75
26-11-20	12.89	21.79	12.72
11-12-20	12.97	21.71	12.80
27-01-21	13.22	21.46	13.05
17-02-21	13.25	21.43	13.08
30-03-21	13.33	21.35	13.16
29-04-21	13.39	21.29	13.22
28-05-21	13.27	21.41	13.10
07-07-21	12.99	21.69	12.82
27-07-21	12.52	22.16	12.35
12-08-21	12.34	22.34	12.17

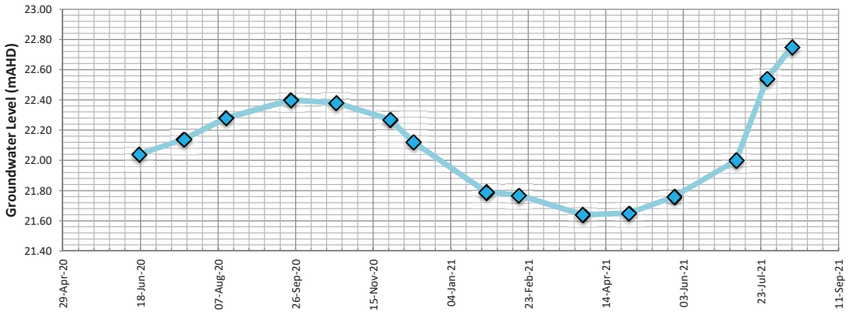
Minimum Recorded Level (mAHD)	21.29
Maximum Recorded Level (mAHD)	22.34

H20002 Glen Iris GC

JM2 DWER Bore 3

Data Analysis Period Start Date	01-06-20	Easting	393255	Natural Surface (mAHD)	27.79
Data Analysis Period End Date	01-09-21	Northing	6449864	Top of Casing (m AHD)	28.23
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	6.19	22.04	5.75
16-07-20	6.09	22.14	5.65
12-08-20	5.95	22.28	5.51
23-09-20	5.83	22.40	5.39
22-10-20	5.85	22.38	5.41
26-11-20	5.96	22.27	5.52
11-12-20	6.11	22.12	5.67
27-01-21	6.44	21.79	6.00
17-02-21	6.46	21.77	6.02
30-03-21	6.59	21.64	6.15
29-04-21	6.58	21.65	6.14
28-05-21	6.47	21.76	6.03
07-07-21	6.23	22.00	5.79
27-07-21	5.69	22.54	5.25
12-08-21	5.48	22.75	5.04

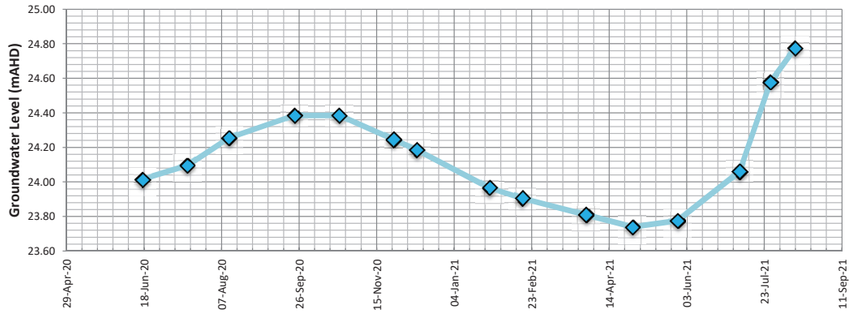
Minimum Recorded Level (mAHD)	21.64
Maximum Recorded Level (mAHD)	22.75

H20002 Glen Iris GC

JM45A DWER Bore 2

Data Analysis Period Start Date	01-06-20	Easting	393033	Natural Surface (mAHD)	27.50
Data Analysis Period End Date	01-09-21	Northing	6447505	Top of Casing (m AHD)	27.93
				End of Hole (mAHD)	

Report Date : 16-09-21



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
17-06-20	3.91	24.02	3.48
16-07-20	3.83	24.10	3.40
12-08-20	3.67	24.26	3.24
23-09-20	3.54	24.39	3.11
22-10-20	3.54	24.39	3.11
26-11-20	3.68	24.25	3.25
11-12-20	3.74	24.19	3.31
27-01-21	3.96	23.97	3.53
17-02-21	4.02	23.91	3.59
30-03-21	4.12	23.81	3.69
29-04-21	4.19	23.74	3.76
28-05-21	4.15	23.78	3.72
07-07-21	3.87	24.06	3.44
27-07-21	3.35	24.58	2.92
12-08-21	3.15	24.78	2.72

Minimum Recorded Level (mAHD)	23.74
Maximum Recorded Level (mAHD)	24.78

H20002 Glen Iris GC

MW1 Site Monitoring Bore 1

Easting 392219 | Northing 6447400

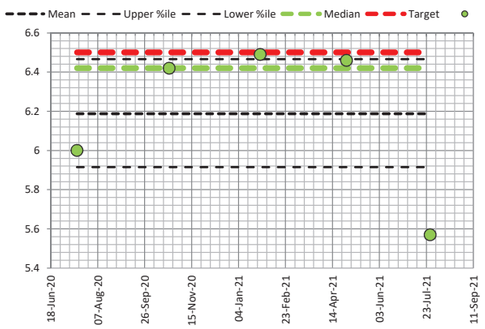
Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

hydro HYDROLOGY

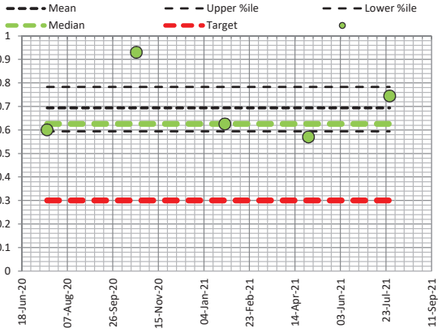
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	8.17	8.47	8.74	**8.74**	9.05	9.15		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	22.38	22.48	22.80	**22.79**	23.06	23.36		✓ 0
T	Temperature	°C	5	19.10	19.34	21.24	**21.40**	22.10	24.90		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.57	0.59	0.69	**0.63**	0.78	0.93	0.30	✗ 5
pH	pH	pH	5	5.57	5.91	6.19	**6.42**	6.47	6.49	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	18.20	27.16	30.48	**32.30**	35.50	37.50		✓ 0
TN	Total Nitrogen	mg/L	5	0.40	0.72	1.72	**1.40**	2.52	3.80	1.20	✗ 3
TKN	Total Kej Nitrogen	mg/L	5	0.40	0.40	0.46	**0.40**	0.46	0.70		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.02	**0.01**	0.03	0.05	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.34	1.27	**1.00**	2.06	3.10	0.70	✗ 3
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00900	0.05200	**0.07200**	0.08080	0.10000	0.00140	✗ 4
Pb	Lead	mg/L	5	0.00100	0.00180	0.00240	**0.00200**	0.00320	0.00400	0.00340	✗ 1
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00580	0.00660	**0.00700**	0.00780	0.01100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00800	0.05200	0.06240	**0.06500**	0.08740	0.08900	0.00800	✗ 4
Nox	Nox	mg/L	5	0.01	0.34	1.27	**1.00**	2.06	3.10	0.15	✗ 4

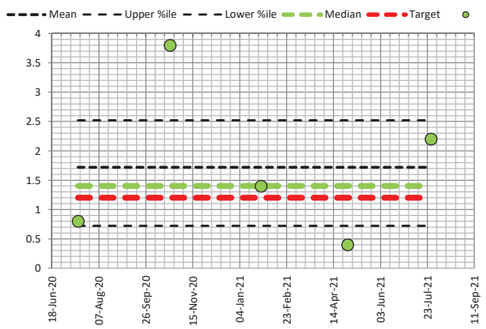
pH



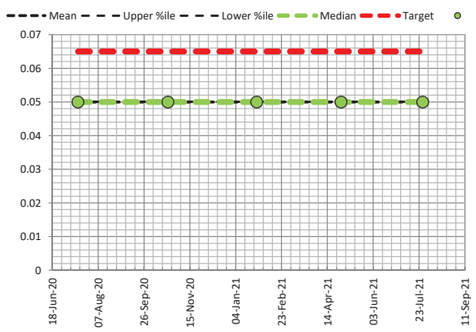
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE

Field Data Analysis & Evaluation System

H20002 Glen Iris GC

MW2 Site Monitoring Bore 2

Easting 392008 | Northing 6447916

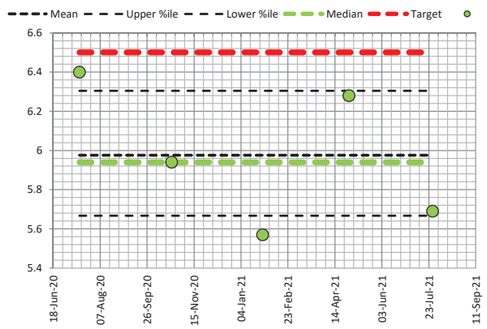
Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

hydro HYDROLOGY

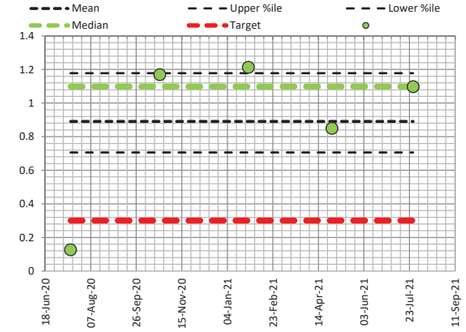
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	14	4.72	5.10	5.26	**5.29**	5.46	5.57		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	14	22.25	22.36	22.56	**22.53**	22.72	23.10		✓ 0
T	Temperature	°C	5	18.00	18.80	20.08	**20.60**	21.16	21.80		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.13	0.71	0.89	**1.10**	1.18	1.21	0.30	✗ 4
pH	pH	pH	5	5.57	5.67	5.98	**5.94**	6.30	6.40	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	13.10	17.18	24.56	**24.40**	32.86	34.70		✓ 0
TN	Total Nitrogen	mg/L	5	0.30	1.50	2.44	**2.50**	3.62	4.10	1.20	✗ 4
TKN	Total Kej Nitrogen	mg/L	5	0.10	0.26	0.30	**0.30**	0.40	0.40		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.02	**0.01**	0.03	0.05	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.03	1.05	2.13	**2.20**	3.28	4.00	0.70	✗ 4
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	✓ 0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00200	0.00200	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00120	**0.00100**	0.00120	0.00200	0.00800	✓ 0
Nox	Nox	mg/L	5	0.04	1.05	2.13	**2.20**	3.28	4.00	0.15	✗ 4

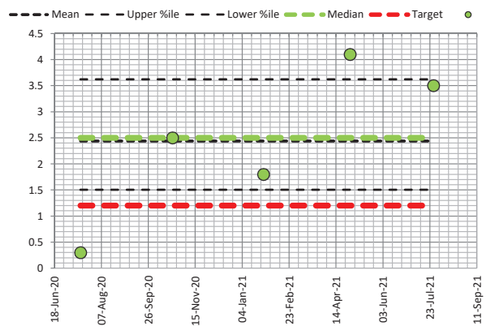
pH



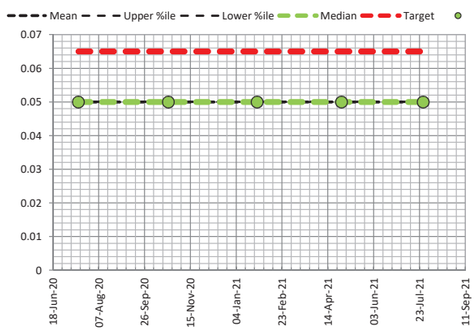
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE

Field Data Analysis & Evaluation System

H20002 Glen Iris GC

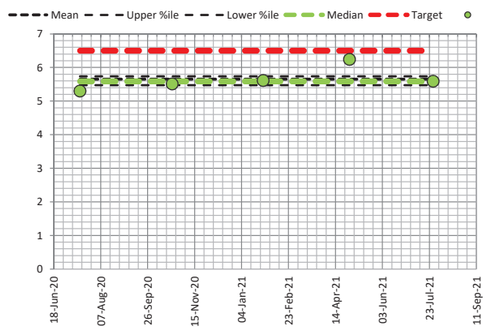
MW3 Site Monitoring Bore 3

Easting	391661	Data Analysis Period Start Date	01-06-20
Northing	6448084	Data Analysis Period End Date	01-09-21

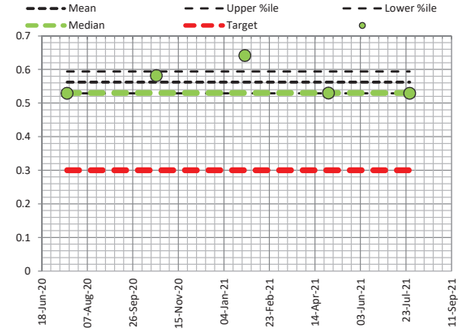
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	7.89	8.22	8.38	**8.41**	8.58	8.68		0
GWL mAHD	Groundwater Level mAHD	mAHD	15	21.65	21.75	21.95	**21.92**	22.11	22.44		0
T	Temperature	°C	5	19.10	19.18	20.88	**21.10**	22.44	22.60		0
EC	Electrical Conductivity	mS/cm	5	0.53	0.53	0.56	**0.53**	0.59	0.64	0.30	5
pH	pH	pH	5	5.30	5.47	5.65	**5.59**	5.74	6.24	6.50	0
DO%	Dissolved Oxygen	%	5	41.60	51.36	59.06	**61.60**	66.96	72.80		0
TN	Total Nitrogen	mg/L	5	1.40	1.48	2.04	**2.20**	2.52	2.60	1.20	5
TKN	Total Kej Nitrogen	mg/L	5	0.20	0.20	0.26	**0.20**	0.32	0.40		0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	0
NO_3-N	Nitrate as N	mg/L	5	1.20	1.28	1.78	**1.90**	2.22	2.30	0.70	5
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00300	**0.00200**	0.00400	0.00800	0.00800	0
Nox	Nox	mg/L	5	1.20	1.28	1.78	**1.90**	2.22	2.30	0.15	5

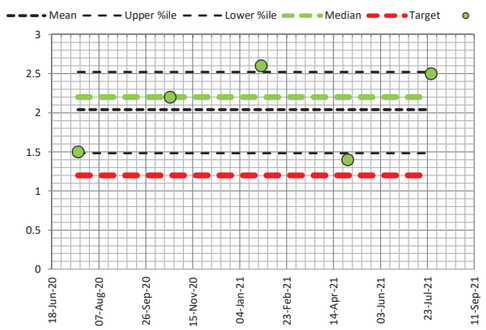
pH



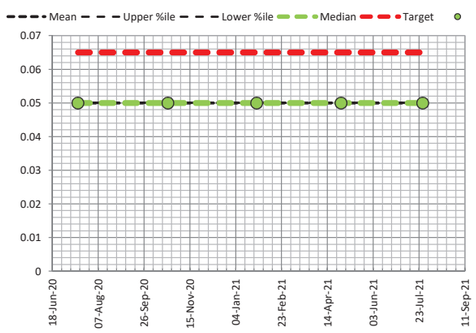
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

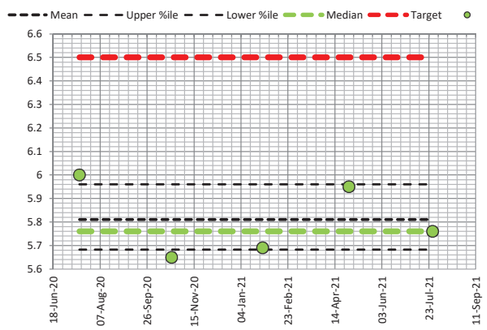
MW4 Site Monitoring Bore 4

Easting	391708	Data Analysis Period Start Date	01-06-20
Northing	6447579	Data Analysis Period End Date	01-09-21

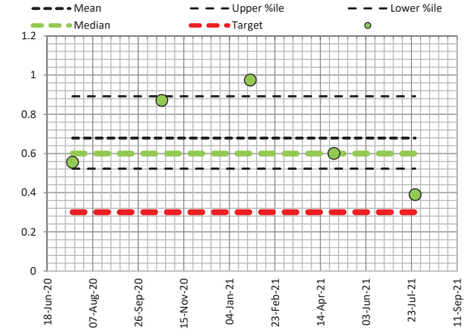
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	3.28	3.92	4.04	**4.02**	4.28	4.43		0
GWL mAHD	Groundwater Level mAHD	mAHD	15	21.84	21.99	22.23	**22.25**	22.35	22.99		0
T	Temperature	°C	5	19.10	19.26	21.38	**22.20**	23.12	23.20		0
EC	Electrical Conductivity	mS/cm	5	0.39	0.52	0.68	**0.60**	0.89	0.98	0.30	5
pH	pH	pH	5	5.65	5.68	5.81	**5.76**	5.96	6.00	6.50	0
DO%	Dissolved Oxygen	%	5	14.20	22.28	25.82	**27.70**	31.42	31.50		0
TN	Total Nitrogen	mg/L	5	0.50	0.66	0.72	**0.80**	0.80	0.80	1.20	0
TKN	Total Kej Nitrogen	mg/L	5	0.70	0.78	0.86	**0.80**	0.88	1.20		0
NH3-N	Ammonia as N	mg/L	5	0.10	0.13	0.20	**0.21**	0.26	0.28	1.90	0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.05	0.70	0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.05		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	0
As	Arsenic	mg/L	5	0.00400	0.00400	0.00720	**0.00900**	0.00920	0.01000	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00180	**0.00200**	0.00220	0.00300	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00220	**0.00200**	0.00260	0.00500	0.00800	0
Nox	Nox	mg/L	5	0.01	0.01	0.02	**0.01**	0.02	0.05	0.15	0

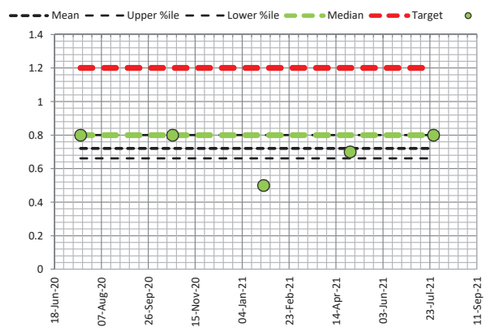
pH



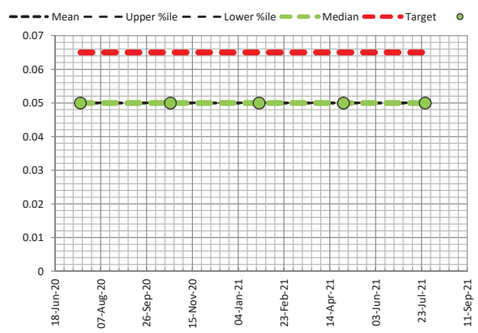
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

MW5 Site Monitoring Bore 5

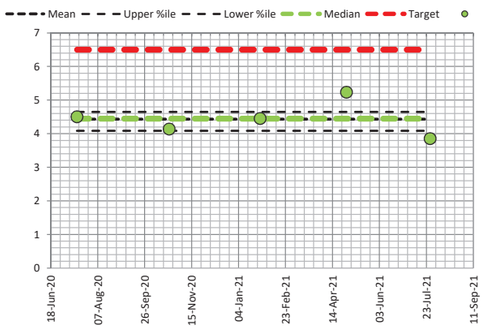
Easting 392170 | Northing 6447202

Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

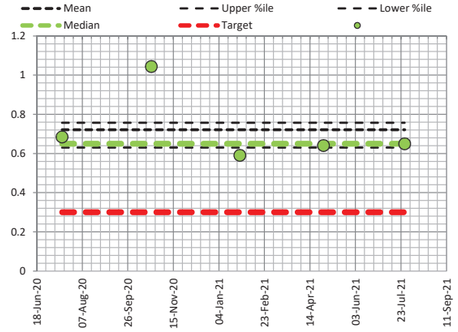
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	3.75	4.24	4.44	**4.51**	4.69	4.78		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	22.66	22.75	23.00	**22.93**	23.21	23.69		✓ 0
T	Temperature	°C	5	17.90	18.70	20.48	**21.40**	21.92	22.40		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.59	0.63	0.72	**0.65**	0.76	1.04	0.30	✗ 5
pH	pH	pH	5	3.85	4.08	4.43	**4.45**	4.65	5.23	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	13.30	19.62	27.08	**32.60**	33.82	34.70		✓ 0
TN	Total Nitrogen	mg/L	5	1.20	1.20	1.34	**1.40**	1.42	1.50	1.20	✗ 3
TKN	Total Kej Nitrogen	mg/L	5	0.90	0.98	1.18	**1.20**	1.40	1.40		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.27	0.33	0.40	**0.43**	0.46	0.49	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.16	**0.01**	0.27	0.59	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	✓ 0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00180	**0.00100**	0.00240	0.00400	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00900	**0.00100**	0.01200	0.03600	0.00800	✗ 1
Nox	Nox	mg/L	5	0.01	0.01	0.16	**0.01**	0.28	0.60	0.15	✗ 2

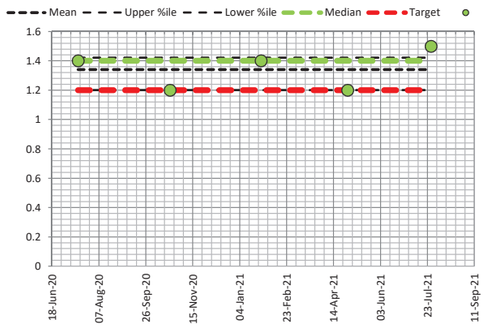
pH



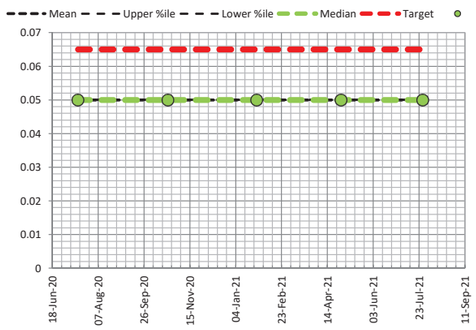
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

MW6 Site Monitoring Bore 6

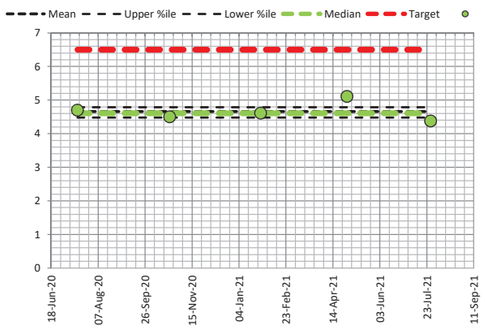
Easting 392027 | Northing 6446878

Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

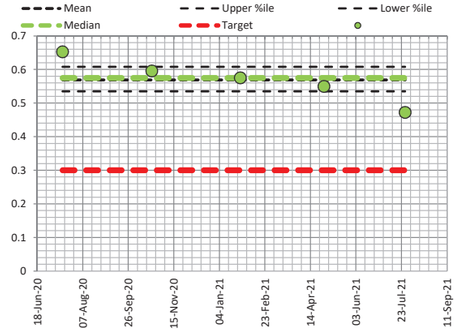
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	5.52	6.05	6.28	**6.36**	6.57	6.62		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	22.54	22.60	22.89	**22.80**	23.12	23.64		✓ 0
T	Temperature	°C	5	18.20	18.76	20.56	**21.20**	21.80	23.00		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.47	0.53	0.57	**0.58**	0.61	0.65	0.30	✗ 5
pH	pH	pH	5	4.38	4.48	4.66	**4.61**	4.78	5.11	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	13.10	23.58	29.02	**28.50**	34.30	45.90		✓ 0
TN	Total Nitrogen	mg/L	5	1.40	1.48	4.66	**2.10**	6.84	13.00	1.20	✗ 5
TKN	Total Kej Nitrogen	mg/L	5	1.20	1.28	1.34	**1.30**	1.42	1.50		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.19	0.22	**0.26**	0.30	0.31	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.22	3.18	**0.81**	5.24	11.00	0.70	✗ 3
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.07	**0.05**	0.07	0.15	0.07	✗ 1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00280	**0.00300**	0.00420	0.00500	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00200	0.00200	0.00100	✗ 2
Cu	Copper	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00200	0.00200	0.00140	✗ 2
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00120	**0.00100**	0.00120	0.00200	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00580	**0.00200**	0.00800	0.02000	0.00800	✗ 1
Nox	Nox	mg/L	5	0.01	0.22	3.18	**0.81**	5.24	11.00	0.15	✗ 4

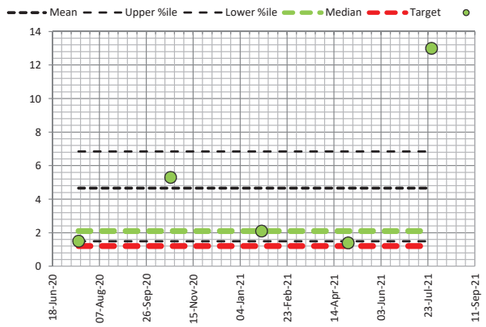
pH



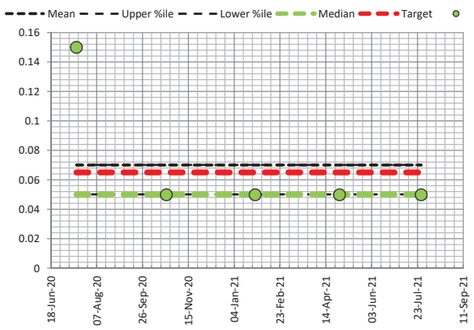
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

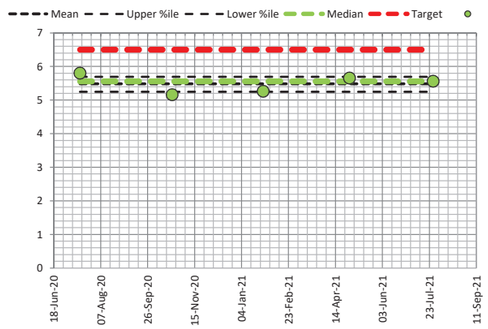
MW7 Site Monitoring Bore 7

Easting	391965	Data Analysis Period Start Date	01-06-20
Northing	6446606	Data Analysis Period End Date	01-09-21

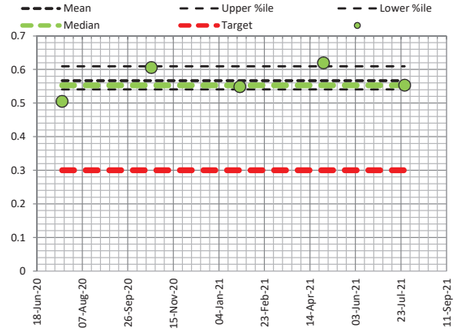
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	4.60	5.17	5.38	**5.46**	5.68	5.73		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	22.57	22.62	22.91	**22.84**	23.13	23.70		✓ 0
T	Temperature	°C	5	17.00	18.52	20.38	**21.40**	22.18	22.50		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.51	0.54	0.57	**0.55**	0.61	0.62	0.30	✗ 5
pH	pH	pH	5	5.16	5.24	5.49	**5.56**	5.69	5.80	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	10.50	22.98	29.52	**33.90**	36.24	42.40		✓ 0
TN	Total Nitrogen	mg/L	5	1.20	1.28	1.64	**1.70**	1.94	2.10	1.20	✗ 4
TKN	Total Kej Nitrogen	mg/L	5	0.70	0.70	1.10	**1.20**	1.42	1.50		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.03	0.05	**0.05**	0.08	0.11	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.02	0.40	0.57	**0.51**	0.91	0.93	0.70	✗ 2
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.02	0.02		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00200	0.00200	0.00100	✗ 2
Cu	Copper	mg/L	5	0.00100	0.00100	0.00180	**0.00100**	0.00240	0.00400	0.00140	✗ 2
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00600	**0.00300**	0.01100	0.01500	0.00800	✗ 2
Nox	Nox	mg/L	5	0.01	0.01	0.48	**0.52**	0.93	0.94	0.15	✗ 3

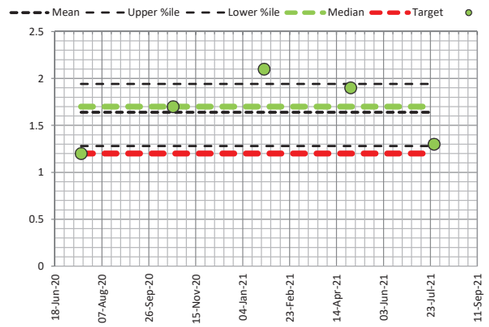
pH



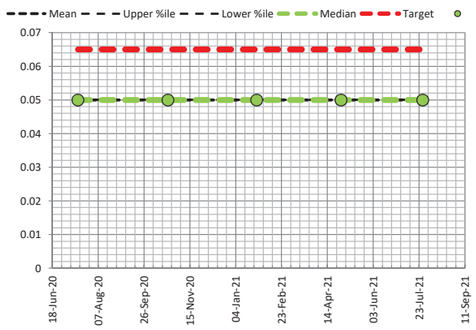
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

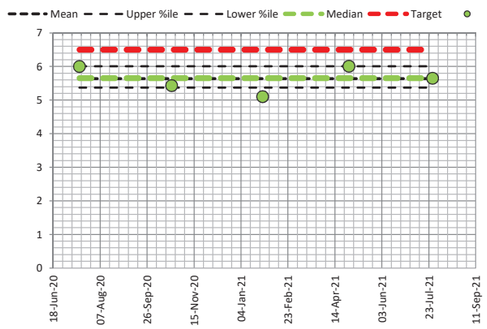
MW8 Site Monitoring Bore 8

Easting	392151	Data Analysis Period Start Date	01-06-20
Northing	6446249	Data Analysis Period End Date	01-09-21

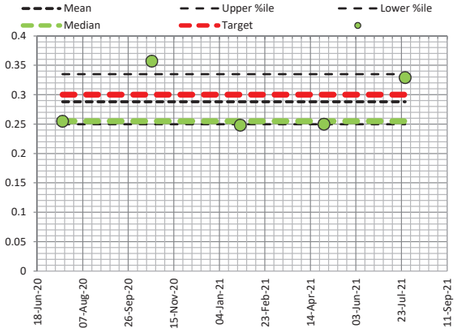
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	2.49	3.06	3.26	**3.29**	3.50	3.63		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	23.09	23.22	23.46	**23.43**	23.66	24.23		✓ 0
T	Temperature	°C	5	17.70	19.78	21.56	**21.10**	23.36	26.00		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.25	0.25	0.29	**0.26**	0.33	0.36	0.30	✗ 2
pH	pH	pH	5	5.10	5.36	5.64	**5.65**	6.00	6.01	6.50	✓ 0
DO%	Dissolved Oxygen	%	5	12.50	22.02	25.78	**26.90**	30.30	36.30		✓ 0
TN	Total Nitrogen	mg/L	5	0.60	0.76	0.96	**0.80**	1.18	1.50	1.20	✗ 1
TKN	Total Kej Nitrogen	mg/L	5	0.60	0.76	0.92	**0.80**	1.14	1.30		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.06	0.11	0.16	**0.15**	0.23	0.25	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.02	**0.01**	0.02	0.07	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	✓ 0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00520	**0.00500**	0.00740	0.01300	0.00800	✗ 1
Nox	Nox	mg/L	5	0.01	0.01	0.12	**0.02**	0.15	0.50	0.15	✗ 1

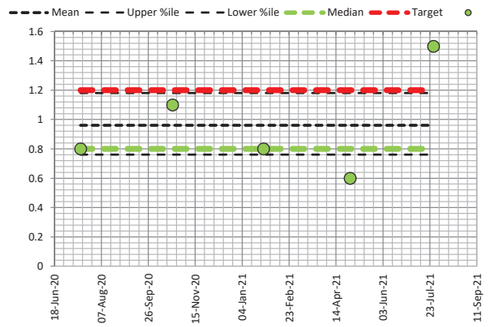
pH



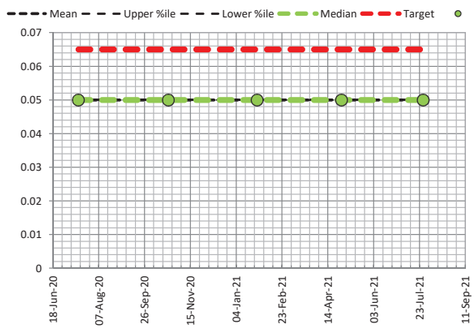
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

MW9 Site Monitoring Bore 9

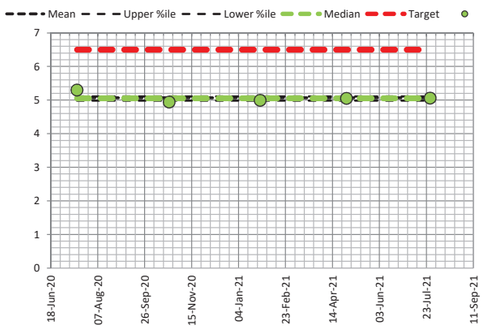
Easting 392221 | Northing 6446790

Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

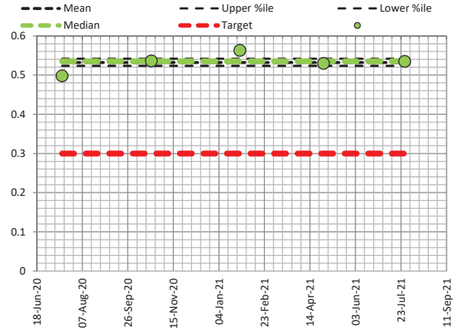
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	15	4.84	5.18	5.45	**5.53**	5.69	5.85		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	15	22.58	22.74	22.98	**22.90**	23.25	23.59		✓ 0
T	Temperature	°C	5	18.70	19.58	21.36	**21.30**	23.26	23.90		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.50	0.52	0.53	**0.54**	0.54	0.56	0.30	✗ 5
pH	pH	pH	5	4.94	4.98	5.07	**5.05**	5.11	5.30	6.50	✓ 0
DO%	Dissolved Oxygen	%	4	22.90	26.98	31.20	**31.95**	35.72	38.00		✓ 0
TN	Total Nitrogen	mg/L	5	1.10	1.10	1.20	**1.20**	1.30	1.30	1.20	✗ 2
TKN	Total Kej Nitrogen	mg/L	5	0.20	0.92	0.98	**1.10**	1.22	1.30		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.54	0.56	0.62	**0.62**	0.67	0.69	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00420	**0.00100**	0.00420	0.01700	0.00140	✗ 1
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00100	0.00100	0.00440	**0.00400**	0.00680	0.01000	0.00800	✗ 1
Nox	Nox	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	0.15	✓ 0

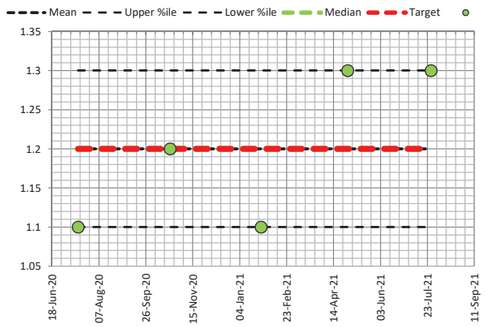
pH



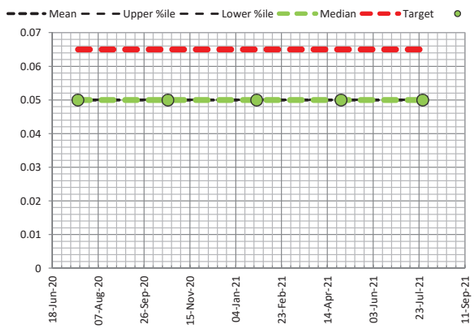
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

SW1 Surface Water Monitoring Site 1

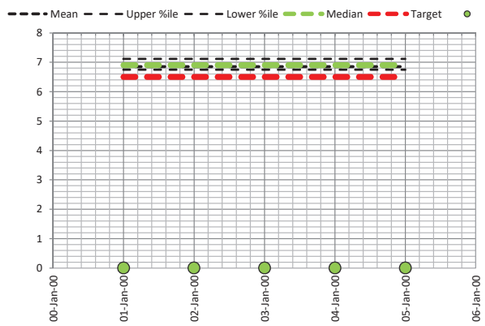
Easting 392068 | Northing 6447918

Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

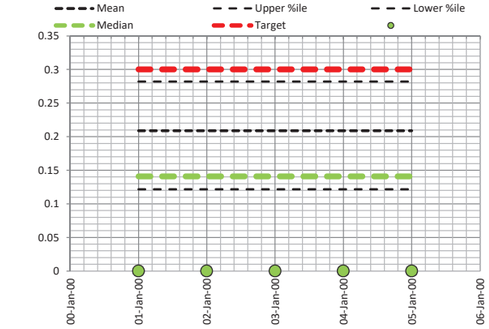
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	5	11.40	13.88	15.16	**15.80**	16.60	17.80		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.05	0.12	0.209	**0.14**	0.28	0.49	0.30	✗ 1
pH	pH	pH	5	6.11	6.74	6.85	**6.90**	7.11	7.30	6.50	✗ 4
DO%	Dissolved Oxygen	%	5	52.50	56.90	65.62	**67.10**	71.08	82.20		✓ 0
TN	Total Nitrogen	mg/L	5	0.20	0.20	0.26	**0.30**	0.30	0.30	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	5	0.20	0.20	0.22	**0.20**	0.22	0.30		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.04	**0.03**	0.06	0.10	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.07	0.07	✗ 1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.02	**0.01**	0.02	0.04	0.04	✗ 1
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.02180	**0.00300**	0.02320	0.10000	0.00140	✗ 3
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00200	**0.00100**	0.00200	0.00600	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00200	0.01000	0.02160	**0.01600**	0.02700	0.05900	0.00800	✗ 4
Nox	Nox	mg/L	5	0.01	0.01	0.05	**0.04**	0.07	0.11	0.15	✓ 0

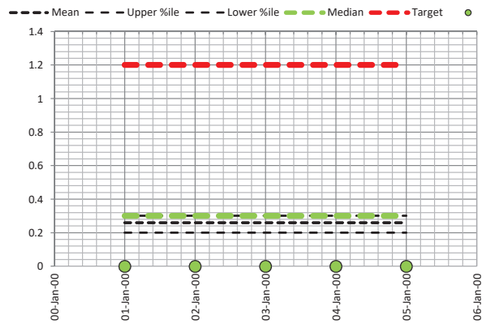
pH



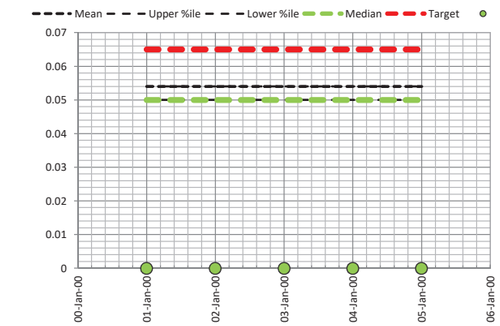
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

SW2 Surface Water Monitoring Site 2

Easting 392058 | Northing 6447935

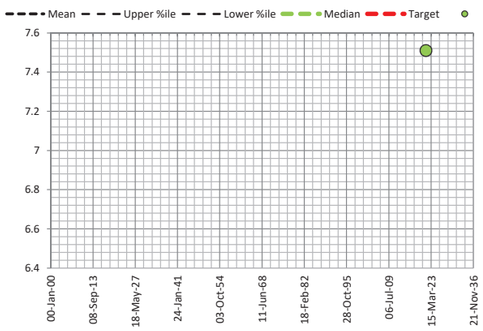
Data Analysis Period Start Date **01-06-20** | Data Analysis Period End Date **01-09-21**

hydro HYDROLOGY

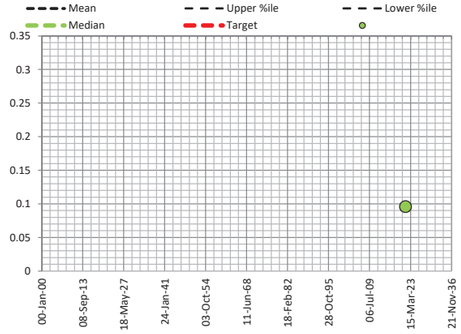
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	1	15.10	15.10	15.10	**15.10**	15.10	15.10		✓ 0
EC	Electrical Conductivity	mS/cm	1	0.10	0.10	0.096	**0.10**	0.10	0.10	0.30	✓ 0
pH	pH	pH	1	7.51	7.51	7.51	**7.51**	7.51	7.51	6.50	✗ 1
DO%	Dissolved Oxygen	%	1	80.50	80.50	80.50	**80.50**	80.50	80.50		✓ 0
TN	Total Nitrogen	mg/L	1	0.20	0.20	0.20	**0.20**	0.20	0.20	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	1	0.20	0.20	0.20	**0.20**	0.20	0.20		✓ 0
NH3-N	Ammonia as N	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	1	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	1	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	1	0.00200	0.00200	0.00200	**0.00200**	0.00200	0.00200	0.00140	✗ 1
Pb	Lead	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	1	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	1	0.01200	0.01200	0.01200	**0.01200**	0.01200	0.01200	0.00800	✗ 1
Nox	Nox	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01	0.15	✓ 0

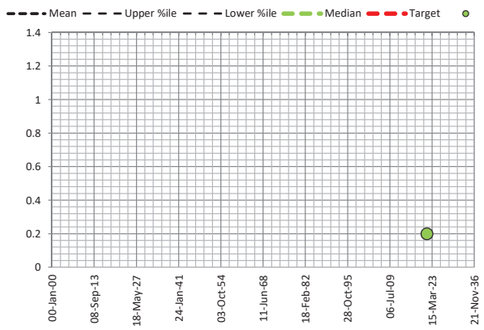
pH



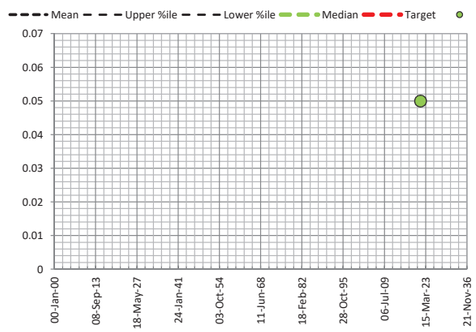
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

SW3 Surface Water Monitoring Site 3

Easting 391607 | Northing 6448389

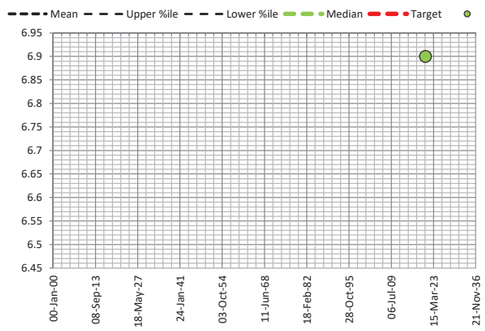
Data Analysis Period Start Date **01-06-20** | Data Analysis Period End Date **01-09-21**

hydro HYDROLOGY

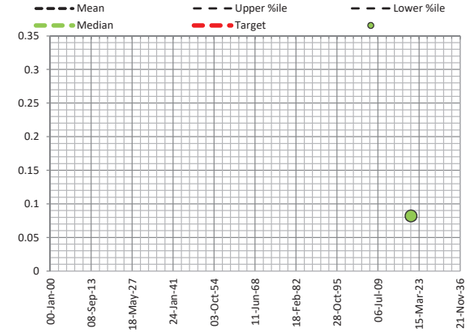
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	1	17.00	17.00	17.00	**17.00**	17.00	17.00		✓ 0
EC	Electrical Conductivity	mS/cm	1	0.08	0.08	0.082	**0.08**	0.08	0.08	0.30	✓ 0
pH	pH	pH	1	6.90	6.90	6.90	**6.90**	6.90	6.90	6.50	✗ 1
DO%	Dissolved Oxygen	%	1	74.00	74.00	74.00	**74.00**	74.00	74.00		✓ 0
TN	Total Nitrogen	mg/L	1	0.30	0.30	0.30	**0.30**	0.30	0.30	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	1	0.30	0.30	0.30	**0.30**	0.30	0.30		✓ 0
NH3-N	Ammonia as N	mg/L	1	0.02	0.02	0.02	**0.02**	0.02	0.02	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	1	0.02	0.02	0.02	**0.02**	0.02	0.02	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	1	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	1	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	1	0.03	0.03	0.03	**0.03**	0.03	0.03	0.04	✓ 0
As	Arsenic	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	1	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	✓ 0
Pb	Lead	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	1	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	1	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	1	0.00500	0.00500	0.00500	**0.00500**	0.00500	0.00500	0.00800	✓ 0
Nox	Nox	mg/L	1	0.03	0.03	0.03	**0.03**	0.03	0.03	0.15	✓ 0

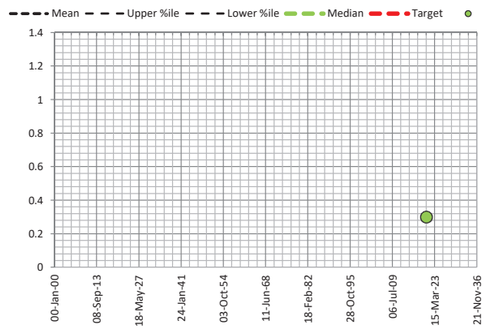
pH



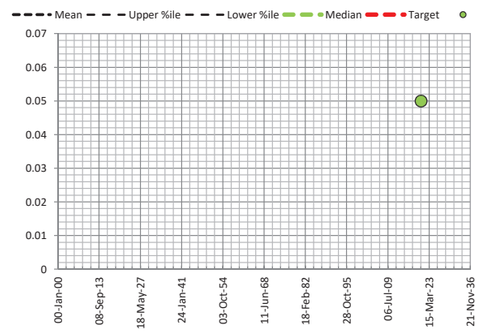
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

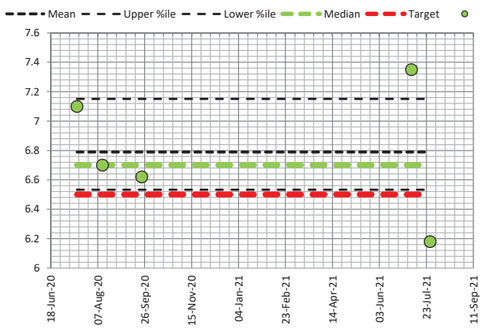
SW4 Surface Water Monitoring Site 4

Easting 391674 | Northing 6447966 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

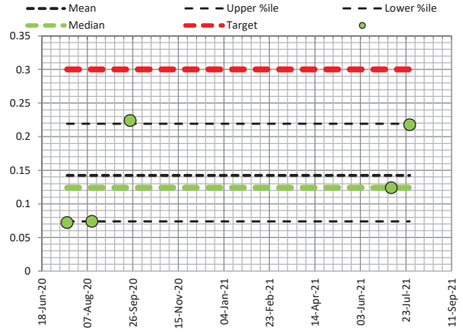
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	5	14.30	14.62	15.76	**15.50**	16.46	18.30		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.07	0.07	0.142	**0.12**	0.22	0.22	0.30	✓ 0
pH	pH	pH	5	6.18	6.53	6.79	**6.70**	7.15	7.35	6.50	✗ 4
DO%	Dissolved Oxygen	%	5	13.60	22.16	50.18	**68.40**	71.82	73.10		✓ 0
TN	Total Nitrogen	mg/L	5	0.20	0.20	0.32	**0.30**	0.36	0.60	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	5	0.20	0.20	0.32	**0.30**	0.36	0.60		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.03	**0.01**	0.04	0.11	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.04	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.08	**0.05**	0.08	0.19	0.07	✗ 1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.04	**0.04**	0.06	0.11	0.04	✗ 2
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00200	**0.00200**	0.00240	0.00400	0.00140	✗ 3
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00400	0.00640	0.00980	**0.00900**	0.01360	0.01600	0.00800	✗ 3
Nox	Nox	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.04	0.15	✓ 0

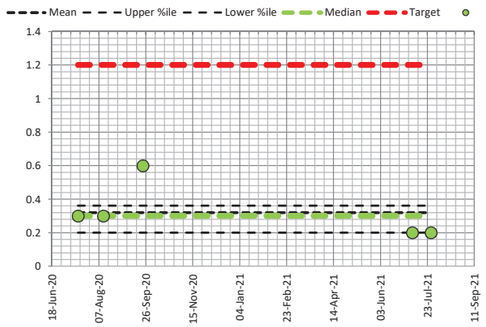
pH



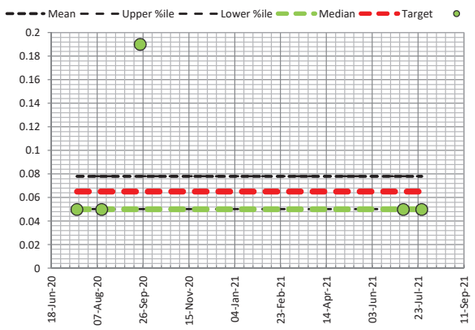
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

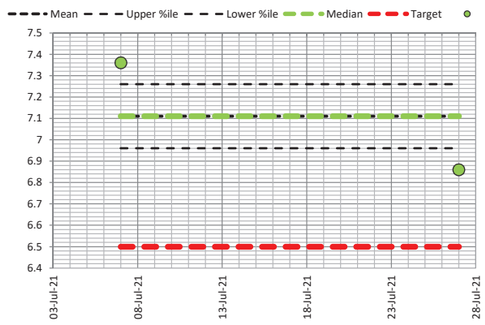
SW5 Surface Water Monitoring Site 5

Easting 391649 | Northing 6447772 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

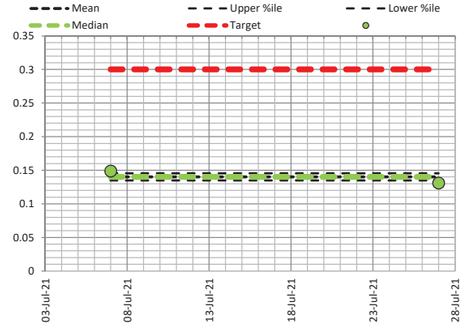
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	2	15.80	15.84	15.90	**15.90**	15.96	16.00		✓ 0
EC	Electrical Conductivity	mS/cm	2	0.13	0.13	0.140	**0.14**	0.15	0.15	0.30	✓ 0
pH	pH	pH	2	6.86	6.96	7.11	**7.11**	7.26	7.36	6.50	✗ 2
DO%	Dissolved Oxygen	%	2	59.50	60.54	62.10	**62.10**	63.66	64.70		✓ 0
TN	Total Nitrogen	mg/L	2	0.20	0.22	0.25	**0.25**	0.28	0.30	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	2	0.20	0.22	0.25	**0.25**	0.28	0.30		✓ 0
NH3-N	Ammonia as N	mg/L	2	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	2	0.02	0.02	0.02	**0.02**	0.02	0.03	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	2	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	2	0.05	0.07	0.09	**0.09**	0.11	0.13	0.07	✗ 1
PO4-	Phosphate as P	mg/L	2	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	2	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	2	0.00100	0.00120	0.00150	**0.00150**	0.00180	0.00200	0.00140	✗ 1
Pb	Lead	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	2	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	2	0.00600	0.00660	0.00750	**0.00750**	0.00840	0.00900	0.00800	✗ 1
Nox	Nox	mg/L	2	0.02	0.02	0.02	**0.02**	0.03	0.03	0.15	✓ 0

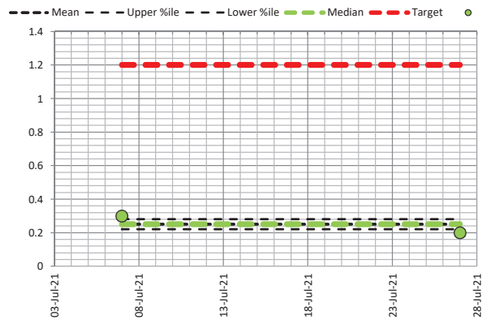
pH



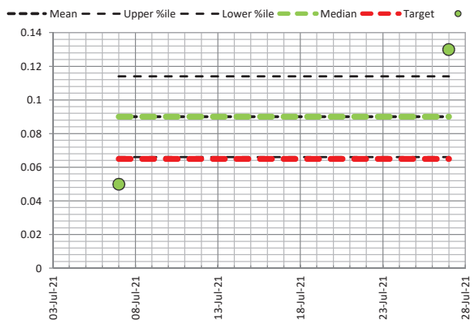
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

SW6 Surface Water Monitoring Site 6

Easting 391759 | Northing 6447772

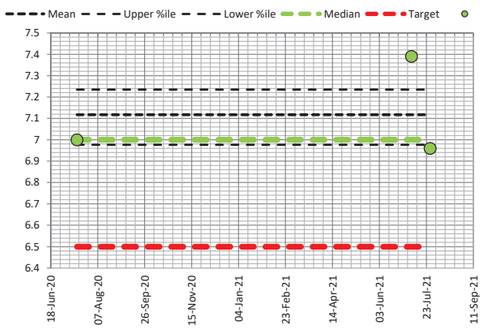
Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

hydro HYDROLOGY

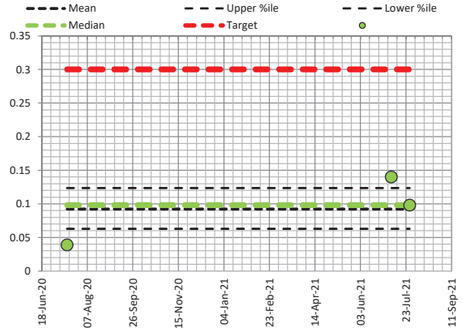
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	3	11.60	13.00	14.30	**15.10**	15.76	16.20		✓ 0
EC	Electrical Conductivity	mS/cm	3	0.04	0.06	0.092	**0.10**	0.12	0.14	0.30	✓ 0
pH	pH	pH	3	6.96	6.98	7.12	**7.00**	7.23	7.39	6.50	✗ 3
DO%	Dissolved Oxygen	%	3	71.40	71.80	74.70	**72.40**	77.14	80.30		✓ 0
TN	Total Nitrogen	mg/L	3	0.10	0.10	0.13	**0.10**	0.16	0.20	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	3	0.10	0.10	0.10	**0.10**	0.10	0.10		✓ 0
NH3-N	Ammonia as N	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.02	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	3	0.01	0.01	0.02	**0.01**	0.03	0.04	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	3	0.05	0.05	0.05	**0.05**	0.05	0.05	0.07	✓ 0
PO4-	Phosphate as P	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	✓ 0
As	Arsenic	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	3	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	3	0.00100	0.00100	0.00133	**0.00100**	0.00160	0.00200	0.00140	✗ 1
Pb	Lead	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	3	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	3	0.00300	0.00300	0.00533	**0.00300**	0.00720	0.01000	0.00800	✗ 1
Nox	Nox	mg/L	3	0.01	0.01	0.02	**0.01**	0.03	0.05	0.15	✓ 0

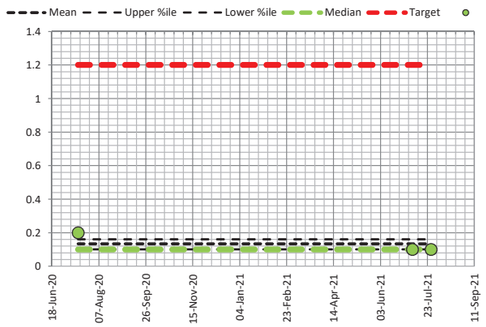
pH



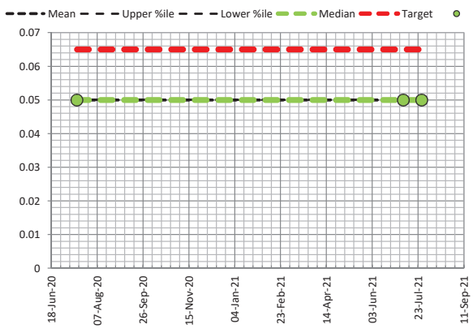
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE

Field Data Analysis & Evaluation System

H20002 Glen Iris GC

SW7 Surface Water Monitoring Site 7

Easting 391725 | Northing 6447534

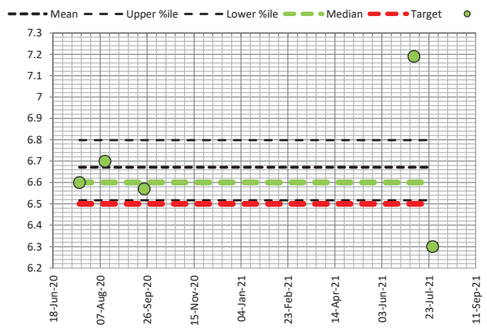
Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

hydro HYDROLOGY

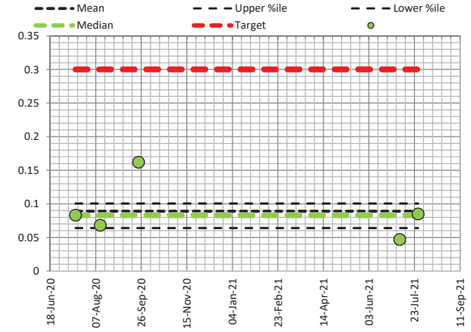
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	5	14.50	14.90	15.70	**15.40**	16.74	16.90		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.05	0.06	0.089	**0.08**	0.10	0.16	0.30	✓ 0
pH	pH	pH	5	6.30	6.52	6.67	**6.60**	6.80	7.19	6.50	✗ 4
DO%	Dissolved Oxygen	%	5	11.40	30.92	46.70	**41.50**	67.60	80.40		✓ 0
TN	Total Nitrogen	mg/L	5	0.10	0.10	0.20	**0.20**	0.24	0.40	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	5	0.01	0.08	0.18	**0.20**	0.24	0.40		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.03	**0.01**	0.04	0.10	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.02	0.03	0.05	**0.05**	0.06	0.07	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.08	**0.05**	0.08	0.18	0.07	✗ 1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.02	0.04	0.04	✗ 1
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00120	**0.00100**	0.00120	0.00200	0.00140	✗ 1
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.00500	0.00660	0.00940	**0.00700**	0.00980	0.02100	0.00800	✗ 1
Nox	Nox	mg/L	5	0.03	0.03	0.05	**0.05**	0.07	0.08	0.15	✓ 0

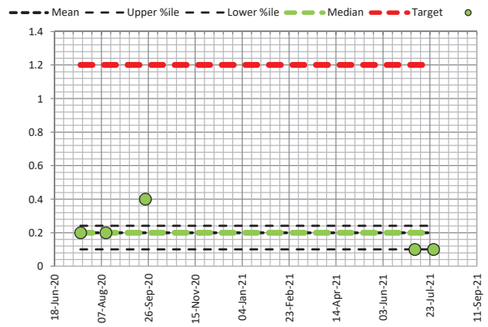
pH



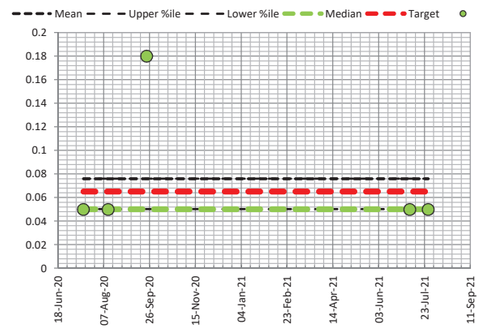
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE

Field Data Analysis & Evaluation System

H20002 Glen Iris GC

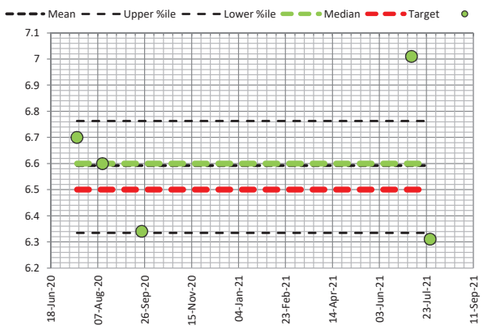
SW8 Surface Water Monitoring Site 8

Easting 391781 | Northing 6447428 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

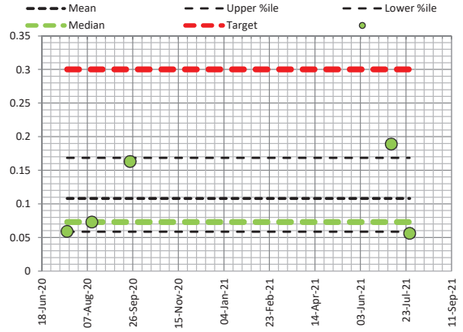
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	5	13.00	14.92	15.62	**15.50**	16.74	17.70		0
EC	Electrical Conductivity	mS/cm	5	0.06	0.06	0.108	**0.07**	0.17	0.19	0.30	0
pH	pH	pH	5	6.31	6.33	6.59	**6.60**	6.76	7.01	6.50	3
DO%	Dissolved Oxygen	%	5	11.40	28.84	49.54	**59.90**	65.00	82.60		0
TN	Total Nitrogen	mg/L	5	0.10	0.18	0.30	**0.20**	0.50	0.50	1.20	0
TKN	Total Kej Nitrogen	mg/L	5	0.10	0.10	0.28	**0.20**	0.50	0.50		0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.02	**0.01**	0.03	0.09	1.90	0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.03	**0.04**	0.04	0.04	0.70	0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.06	**0.05**	0.06	0.08	0.07	1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.02	0.04	0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00500	0.00580	0.00800	**0.00600**	0.01060	0.01300	0.00800	2
Nox	Nox	mg/L	5	0.01	0.01	0.03	**0.04**	0.04	0.05	0.15	0

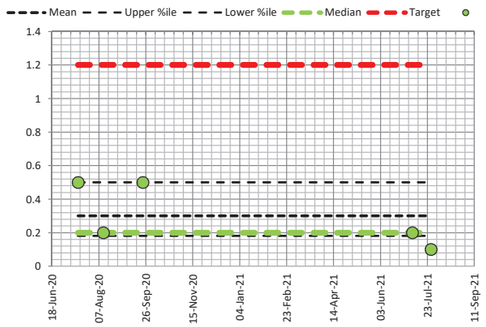
pH



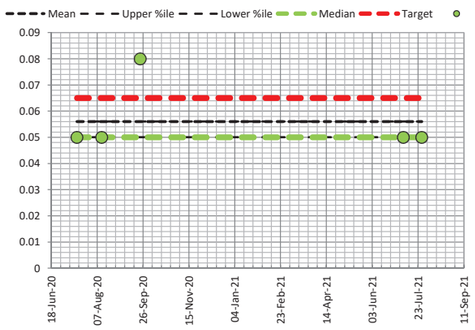
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

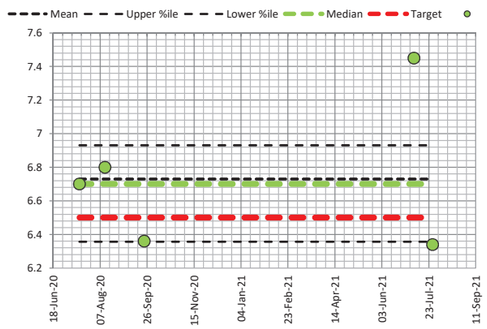
SW9 Surface Water Monitoring Site 9

Easting 391783 | Northing 6447416 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

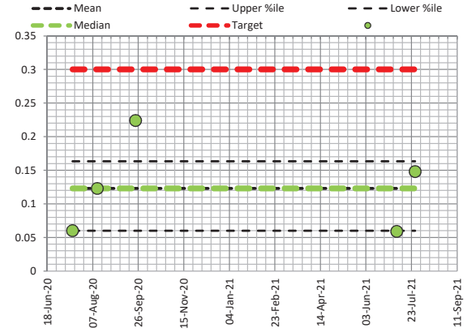
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	5	14.10	14.18	15.12	**14.80**	15.98	16.70		0
EC	Electrical Conductivity	mS/cm	5	0.06	0.06	0.123	**0.12**	0.16	0.22	0.30	0
pH	pH	pH	5	6.34	6.36	6.73	**6.70**	6.93	7.45	6.50	3
DO%	Dissolved Oxygen	%	5	6.20	16.20	47.86	**64.00**	71.24	81.80		0
TN	Total Nitrogen	mg/L	5	0.10	0.10	0.58	**0.30**	0.96	1.60	1.20	1
TKN	Total Kej Nitrogen	mg/L	5	0.01	0.08	0.56	**0.30**	0.96	1.60		0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.02	0.03	0.70	0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.09	**0.05**	0.14	0.15	0.07	2
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.03	0.04	0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00500	0.00660	0.01000	**0.01200**	0.01300	0.01300	0.00800	3
Nox	Nox	mg/L	5	0.01	0.01	0.01	**0.01**	0.02	0.03	0.15	0

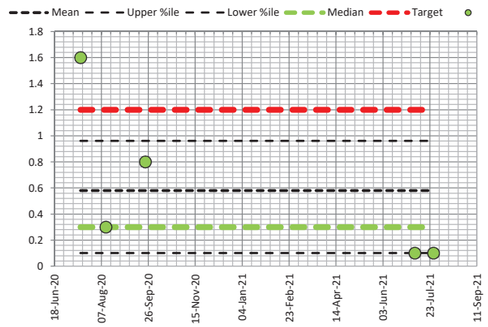
pH



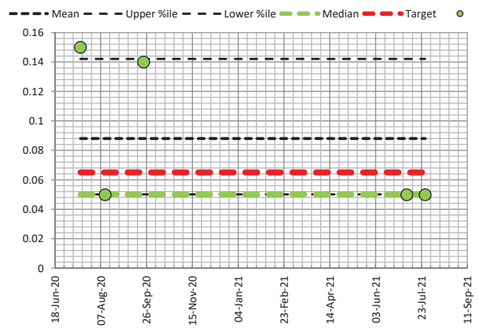
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

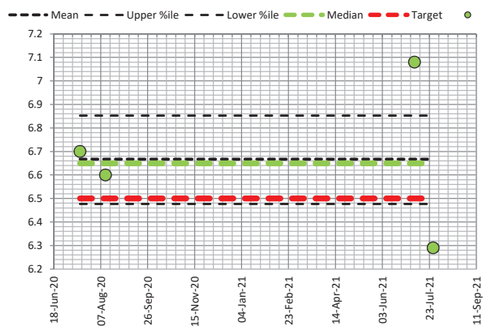
SW10 Surface Water Monitoring Site 10

Easting 392105 | Northing 6447272 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

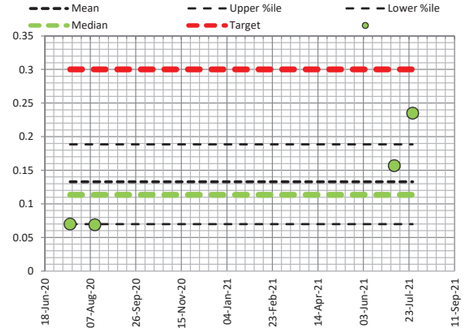
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	4	11.40	13.62	14.63	**15.15**	15.84	16.80		0
EC	Electrical Conductivity	mS/cm	4	0.07	0.07	0.133	**0.11**	0.19	0.24	0.30	0
pH	pH	pH	4	6.29	6.48	6.67	**6.65**	6.85	7.08	6.50	3
DO%	Dissolved Oxygen	%	4	36.70	41.44	54.23	**55.15**	67.38	69.90		0
TN	Total Nitrogen	mg/L	4	0.20	0.20	0.33	**0.25**	0.42	0.60	1.20	0
TKN	Total Kej Nitrogen	mg/L	4	0.20	0.20	0.30	**0.20**	0.36	0.60		0
NH3-N	Ammonia as N	mg/L	4	0.01	0.01	0.01	**0.01**	0.01	0.01	1.90	0
NO_3-N	Nitrate as N	mg/L	4	0.01	0.01	0.03	**0.01**	0.04	0.08	0.70	0
NO2-N	Nitrite as N	mg/L	4	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	4	0.05	0.05	0.12	**0.07**	0.17	0.30	0.07	2
PO4-	Phosphate as P	mg/L	4	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	0
As	Arsenic	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	4	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	4	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	4	0.00700	0.02860	0.03850	**0.04750**	0.05200	0.05200	0.00800	3
Nox	Nox	mg/L	4	0.01	0.01	0.03	**0.01**	0.04	0.08	0.15	0

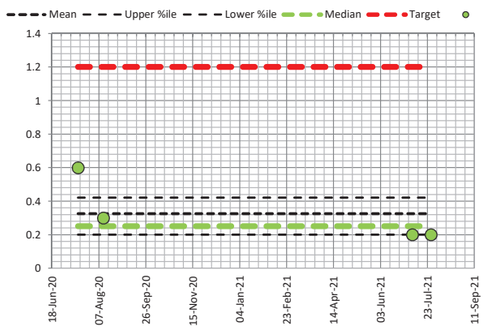
pH



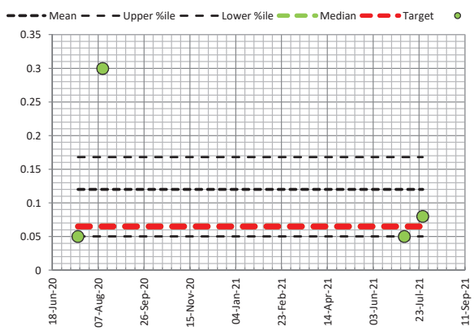
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

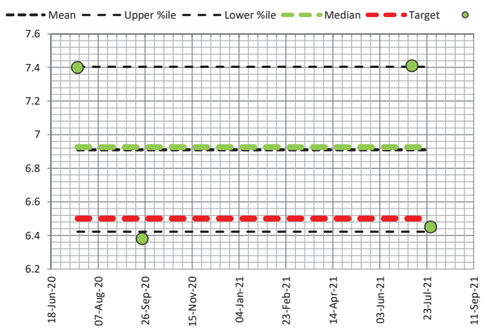
SW11 Surface Water Monitoring Site 11

Easting 392037 | Northing 6447304 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

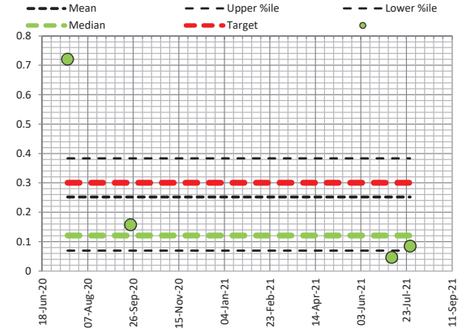
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	4	14.80	14.98	16.45	**16.30**	17.86	18.40		0
EC	Electrical Conductivity	mS/cm	4	0.05	0.07	0.252	**0.12**	0.38	0.72	0.30	1
pH	pH	pH	4	6.38	6.42	6.91	**6.93**	7.40	7.41	6.50	2
DO%	Dissolved Oxygen	%	4	10.00	43.12	55.23	**68.35**	72.58	74.20		0
TN	Total Nitrogen	mg/L	4	0.20	0.26	0.70	**0.35**	1.00	1.90	1.20	1
TKN	Total Kej Nitrogen	mg/L	4	0.20	0.20	0.65	**0.25**	0.94	1.90		0
NH3-N	Ammonia as N	mg/L	4	0.01	0.01	0.04	**0.01**	0.06	0.13	1.90	0
NO_3-N	Nitrate as N	mg/L	4	0.02	0.02	0.03	**0.03**	0.04	0.06	0.70	0
NO2-N	Nitrite as N	mg/L	4	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	4	0.05	0.11	0.26	**0.25**	0.40	0.50	0.07	3
PO4-	Phosphate as P	mg/L	4	0.01	0.01	0.01	**0.01**	0.01	0.01	0.04	0
As	Arsenic	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	4	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00140	0
Pb	Lead	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	4	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	4	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	4	0.01200	0.01320	0.02500	**0.01950**	0.03460	0.04900	0.00800	4
Nox	Nox	mg/L	4	0.02	0.02	0.03	**0.03**	0.05	0.06	0.15	0

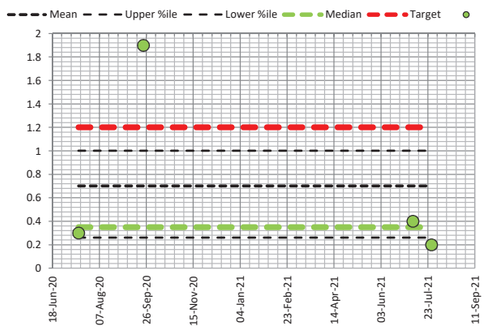
pH



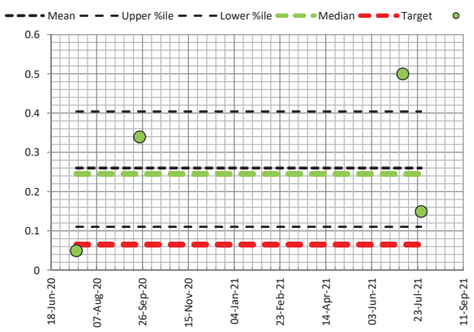
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

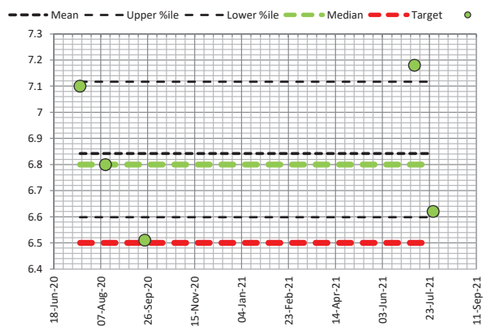
SW12 Surface Water Monitoring Site 12

Easting 392117 | Northing 6447052 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

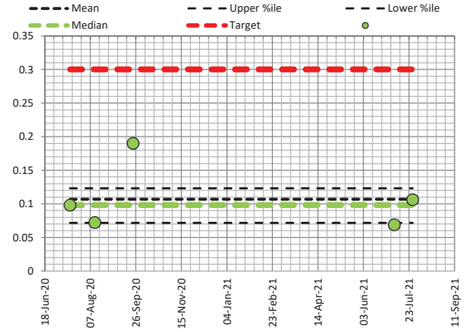
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	5	14.60	14.92	17.04	**15.50**	17.98	23.50		✓ 0
EC	Electrical Conductivity	mS/cm	5	0.07	0.07	0.107	**0.10**	0.12	0.19	0.30	✓ 0
pH	pH	pH	5	6.51	6.60	6.84	**6.80**	7.12	7.18	6.50	✗ 5
DO%	Dissolved Oxygen	%	5	34.50	44.90	59.22	**70.10**	71.64	72.60		✓ 0
TN	Total Nitrogen	mg/L	5	0.10	0.18	0.34	**0.30**	0.46	0.70	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	5	0.10	0.18	0.26	**0.20**	0.34	0.50		✓ 0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.06	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	5	0.03	0.04	0.06	**0.05**	0.07	0.12	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.05	**0.05**	0.05	0.06	0.07	✓ 0
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.02	0.04	✓ 0
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00140	0.00300	0.00140	✗ 1
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	5	0.01200	0.01840	0.07640	**0.02600**	0.09120	0.28000	0.00800	✗ 5
Nox	Nox	mg/L	5	0.03	0.04	0.06	**0.05**	0.08	0.12	0.15	✓ 0

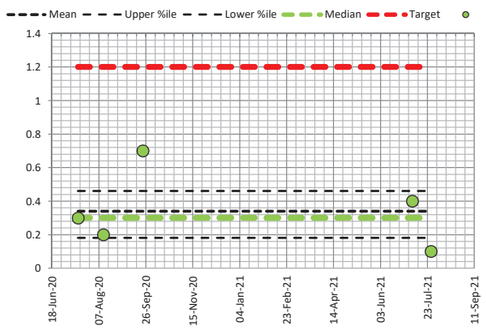
pH



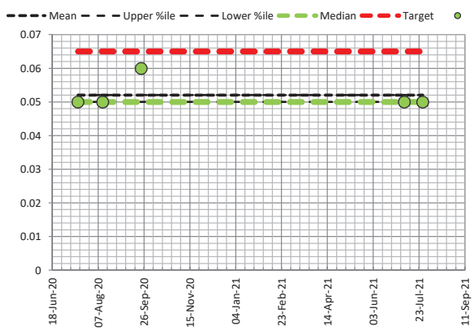
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

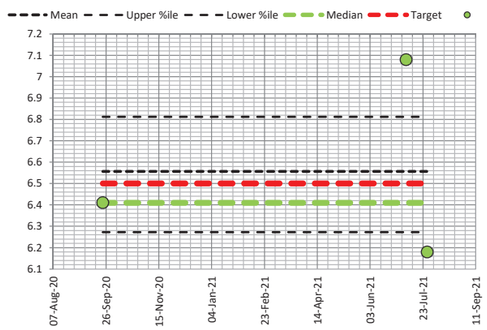
SW13 Surface Water Monitoring Site 13

Easting 391955 | Northing 6446453 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

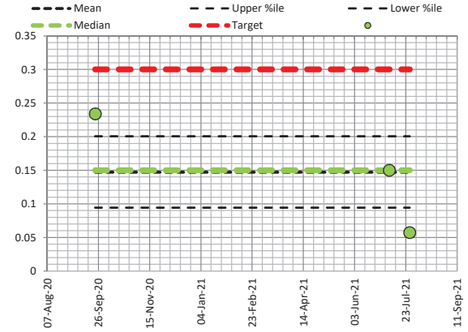
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		✓ 0
T	Temperature	°C	3	14.30	14.46	16.87	**14.70**	18.84	21.60		✓ 0
EC	Electrical Conductivity	mS/cm	3	0.06	0.09	0.147	**0.15**	0.20	0.23	0.30	✓ 0
pH	pH	pH	3	6.18	6.27	6.56	**6.41**	6.81	7.08	6.50	✗ 1
DO%	Dissolved Oxygen	%	3	16.80	38.52	53.07	**71.10**	71.22	71.30		✓ 0
TN	Total Nitrogen	mg/L	3	0.20	0.28	0.50	**0.40**	0.70	0.90	1.20	✓ 0
TKN	Total Kej Nitrogen	mg/L	3	0.20	0.28	0.47	**0.40**	0.64	0.80		✓ 0
NH3-N	Ammonia as N	mg/L	3	0.01	0.01	0.02	**0.01**	0.03	0.05	1.90	✓ 0
NO_3-N	Nitrate as N	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.01	0.70	✓ 0
NO2-N	Nitrite as N	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.01		✓ 0
TP	Total Phosphorous	mg/L	3	0.05	0.05	0.10	**0.05**	0.15	0.21	0.07	✗ 1
PO4-	Phosphate as P	mg/L	3	0.00	0.01	0.01	**0.01**	0.02	0.02	0.04	✓ 0
As	Arsenic	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	✓ 0
Cd	Cadmium	mg/L	3	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	✓ 0
Cr	Chromium	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	✓ 0
Cu	Copper	mg/L	3	0.00100	0.00100	0.00200	**0.00100**	0.00280	0.00400	0.00140	✗ 1
Pb	Lead	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	✓ 0
Hg	Mercury	mg/L	3	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	✓ 0
Ni	Nickel	mg/L	3	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	✓ 0
Zn	Zinc	mg/L	3	0.01000	0.02280	0.11733	**0.04200**	0.19680	0.30000	0.00800	✗ 3
Nox	Nox	mg/L	3	0.01	0.01	0.01	**0.01**	0.01	0.01	0.15	✓ 0

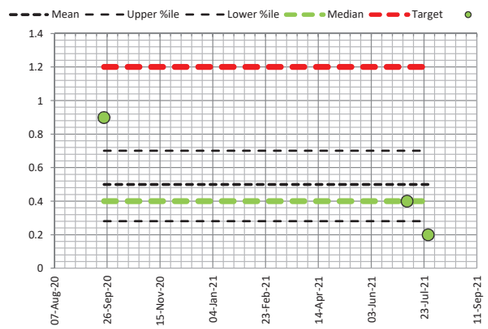
pH



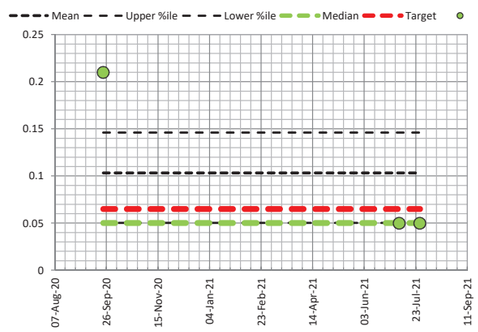
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

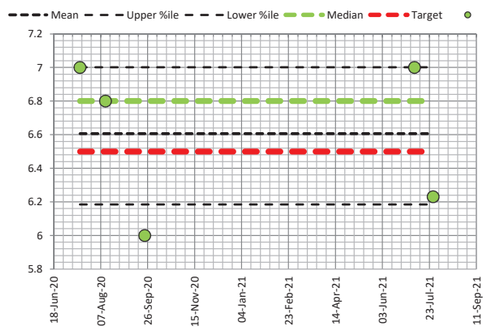
SW14 Surface Water Monitoring Site 14

Easting 391929 | Northing 6446612 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

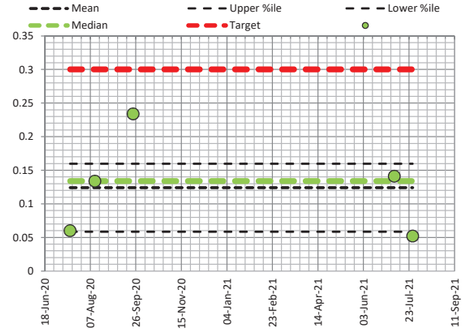
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	5	14.10	14.34	15.76	**15.70**	17.18	17.50		0
EC	Electrical Conductivity	mS/cm	5	0.05	0.06	0.124	**0.13**	0.16	0.23	0.30	0
pH	pH	pH	5	6.00	6.18	6.61	**6.80**	7.00	7.00	6.50	3
DO%	Dissolved Oxygen	%	5	19.60	40.64	51.38	**53.20**	61.90	81.10		0
TN	Total Nitrogen	mg/L	5	0.20	0.20	0.46	**0.40**	0.60	1.00	1.20	0
TKN	Total Kej Nitrogen	mg/L	5	0.20	0.20	0.44	**0.40**	0.52	1.00		0
NH3-N	Ammonia as N	mg/L	5	0.01	0.02	0.04	**0.03**	0.06	0.08	1.90	0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.06	0.70	0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.12	**0.05**	0.12	0.37	0.07	1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.05	**0.01**	0.06	0.18	0.04	1
As	Arsenic	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00140	**0.00100**	0.00200	0.00200	0.00140	2
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00800	0.01200	0.05260	**0.03600**	0.06880	0.16000	0.00800	4
Nox	Nox	mg/L	5	0.01	0.01	0.02	**0.02**	0.03	0.07	0.15	0

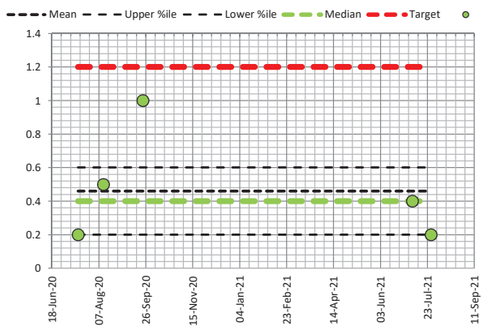
pH



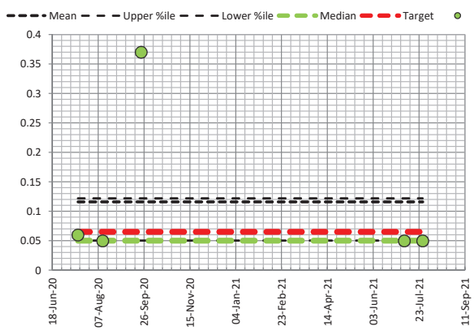
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

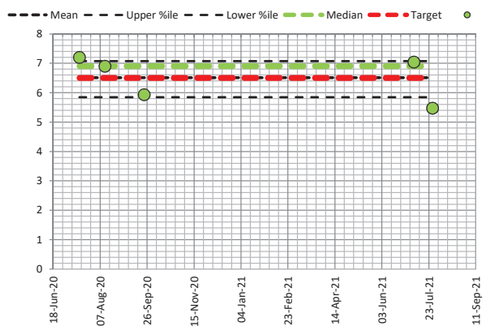
SW15 Surface Water Monitoring Site 15

Easting 391989 | Northing 6446845 | Data Analysis Period Start Date 01-06-20 | Data Analysis Period End Date 01-09-21

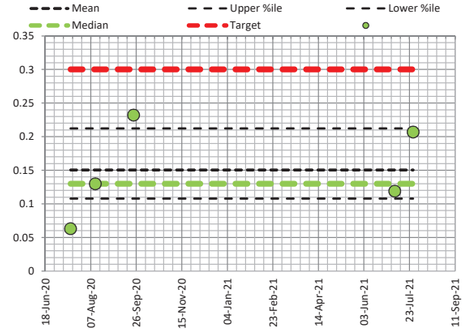
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	5	14.40	14.96	15.80	**15.30**	16.38	18.30		0
EC	Electrical Conductivity	mS/cm	5	0.06	0.11	0.150	**0.13**	0.21	0.23	0.30	0
pH	pH	pH	5	5.47	5.84	6.51	**6.90**	7.07	7.20	6.50	3
DO%	Dissolved Oxygen	%	5	13.10	43.50	55.96	**64.10**	72.60	81.00		0
TN	Total Nitrogen	mg/L	5	0.10	0.18	0.44	**0.20**	0.58	1.30	1.20	1
TKN	Total Kej Nitrogen	mg/L	5	0.10	0.18	0.42	**0.20**	0.50	1.30		0
NH3-N	Ammonia as N	mg/L	5	0.01	0.01	0.07	**0.03**	0.10	0.26	1.90	0
NO_3-N	Nitrate as N	mg/L	5	0.01	0.01	0.02	**0.01**	0.03	0.07	0.70	0
NO2-N	Nitrite as N	mg/L	5	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	5	0.05	0.05	0.14	**0.05**	0.14	0.48	0.07	1
PO4-	Phosphate as P	mg/L	5	0.01	0.01	0.04	**0.01**	0.04	0.19	0.04	1
As	Arsenic	mg/L	5	0.00100	0.00100	0.00120	**0.00100**	0.00120	0.00200	0.02400	0
Cd	Cadmium	mg/L	5	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	5	0.00100	0.00100	0.00160	**0.00100**	0.00220	0.00300	0.00140	2
Pb	Lead	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	5	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	5	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	5	0.00700	0.04220	0.05740	**0.05300**	0.08560	0.09200	0.00800	4
Nox	Nox	mg/L	5	0.01	0.01	0.03	**0.01**	0.03	0.09	0.15	0

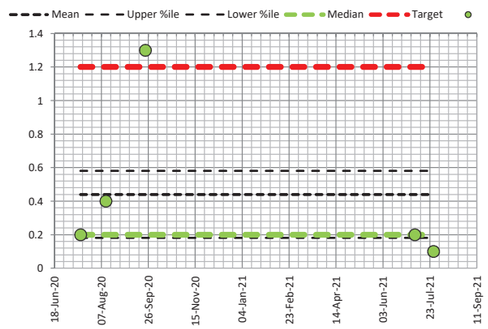
pH



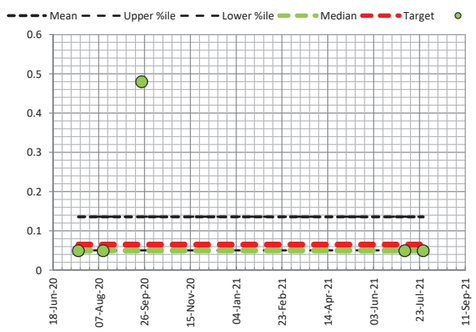
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

H20002 Glen Iris GC

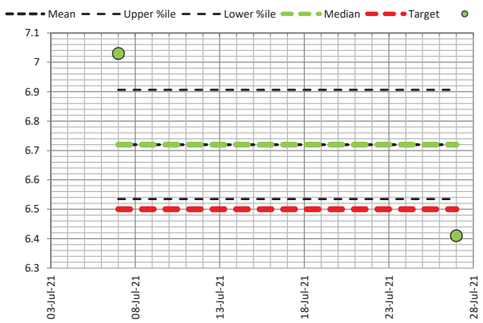
SW16 Surface Water Monitoring Site 16

Easting		Data Analysis Period Start Date	01-06-20
Northing		Data Analysis Period End Date	01-09-21

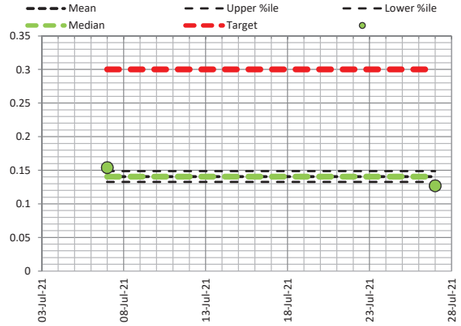
Report Date : 16-09-21

Parameter	Description	Units	Samples	Minimum	Low %ile 20	Mean	Median	High %ile 80	Maximum	Target ANZECC 95%	Times Exceeded
GWL bTOC	GW Level below Top of Casing	mBTOC	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
GWL mAHD	Groundwater Level mAHD	mAHD	0	0.00	0.00	0.00	**0.00**	0.00	0.00		0
T	Temperature	°C	2	13.60	13.82	14.15	**14.15**	14.48	14.70		0
EC	Electrical Conductivity	mS/cm	2	0.13	0.13	0.141	**0.14**	0.15	0.15	0.30	0
pH	pH	pH	2	6.41	6.53	6.72	**6.72**	6.91	7.03	6.50	1
DO%	Dissolved Oxygen	%	2	50.60	54.88	61.30	**61.30**	67.72	72.00		0
TN	Total Nitrogen	mg/L	2	0.40	0.42	0.45	**0.45**	0.48	0.50	1.20	0
TKN	Total Kej Nitrogen	mg/L	2	0.40	0.40	0.40	**0.40**	0.40	0.40		0
NH3-N	Ammonia as N	mg/L	2	0.03	0.03	0.04	**0.04**	0.04	0.04	1.90	0
NO_3-N	Nitrate as N	mg/L	2	0.02	0.03	0.04	**0.04**	0.06	0.07	0.70	0
NO2-N	Nitrite as N	mg/L	2	0.01	0.01	0.01	**0.01**	0.01	0.01		0
TP	Total Phosphorous	mg/L	2	0.05	0.05	0.06	**0.06**	0.06	0.06	0.07	0
PO4-	Phosphate as P	mg/L	2	0.01	0.01	0.02	**0.02**	0.02	0.02	0.04	0
As	Arsenic	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.02400	0
Cd	Cadmium	mg/L	2	0.00010	0.00010	0.00010	**0.00010**	0.00010	0.00010	0.00020	0
Cr	Chromium	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00100	0
Cu	Copper	mg/L	2	0.00100	0.00120	0.00150	**0.00150**	0.00180	0.00200	0.00140	1
Pb	Lead	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.00340	0
Hg	Mercury	mg/L	2	0.00005	0.00005	0.00005	**0.00005**	0.00005	0.00005	0.00060	0
Ni	Nickel	mg/L	2	0.00100	0.00100	0.00100	**0.00100**	0.00100	0.00100	0.01100	0
Zn	Zinc	mg/L	2	0.03200	0.03440	0.03800	**0.03800**	0.04160	0.04400	0.00800	2
Nox	Nox	mg/L	2	0.03	0.03	0.05	**0.05**	0.06	0.07	0.15	0

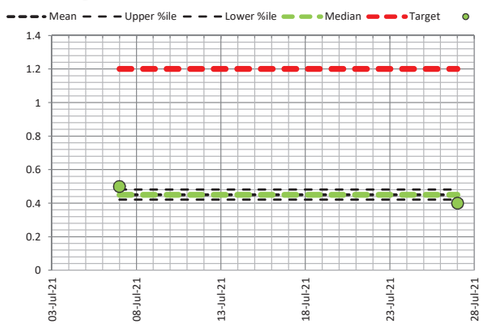
pH



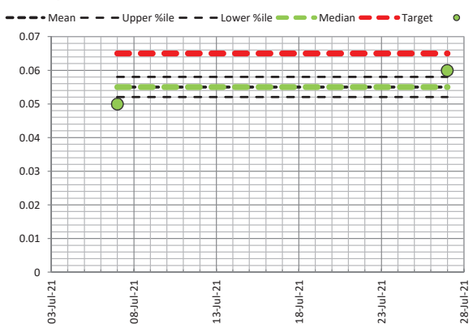
Electrical Conductivity



Total Nitrogen



Total Phosphorous



FieldDAE
Field Data Analysis & Evaluation System

FieldDAE
Field Data Analysis & Evaluation System

Water Quality Monitoring Data

	Site Name/Type	GW ToC mAHD	GW EoH mAHD	calcGWL mAHD	Date	Site	Monitored By	Monitoring Comment	GWL bTOC mBTOC	GWL mAHD mAHD	T °C	EC mS/cm	pH pH	DO% %	TN mg/L	TKN mg/L	NH3-N mg/L	NO_3-N mg/L	NO2-N mg/L	TP mg/L	PO4- mg/L	As mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Pb mg/L	Hg mg/L	Ni mg/L	Zn mg/L	Nox mg/L
1	Site Monitoring Bore 1	31.53		22.79	17-06-2020	MW1	SO		8.74	22.79																				
2	Site Monitoring Bore 2	27.82		22.45	17-06-2020	MW2	SO		5.37	22.45																				
3	Site Monitoring Bore 3	30.33		21.84	17-06-2020	MW3	SO		8.49	21.84																				
4	Site Monitoring Bore 4	26.27		22.02	17-06-2020	MW4	SO		4.25	22.02																				
5	Site Monitoring Bore 5	27.44		22.80	17-06-2020	MW5	SO		4.64	22.80																				
6	Site Monitoring Bore 6	29.16		22.60	17-06-2020	MW6	SO		6.56	22.60																				
7	Site Monitoring Bore 7	28.30		22.63	17-06-2020	MW7	SO		5.67	22.63																				
8	Site Monitoring Bore 8	26.72		23.22	17-06-2020	MW8	SO		3.50	23.22																				
9	Site Monitoring Bore 9	28.43		22.58	17-06-2020	MW9	SO		5.85	22.58																				
10	DWER Bore 1	26.69		23.56	17-06-2020	J310	SO		3.13	23.56																				
11	DWER Bore 2	27.93		24.02	17-06-2020	JM45A	SO		3.91	24.02																				
12	DWER Bore 3	28.23		22.04	17-06-2020	JM2	SO		6.19	22.04																				
13	DWER Bore 4	34.68		21.45	17-06-2020	JM12	SO		13.23	21.45																				
14	Site Monitoring Bore 1	31.53		22.82	16-07-2020	MW1	SO and SS		8.71	22.82	19.10	0.600	6.00	18.2	0.800	0.400	0.012	0.420	0.007	0.050	0.005	0.001	0.0001	0.001	0.011	0.002	0.00005	0.007	0.063	0.427
15	Site Monitoring Bore 2	27.82		22.50	16-07-2020	MW2	SO and SS		5.32	22.50	19.00	0.127	6.40	18.2	0.300	0.300	0.005	0.031	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.002	0.00005	0.001	0.002	0.036
16	Site Monitoring Bore 3	30.33		21.89	16-07-2020	MW3	SO and SS		8.44	21.89	19.10	0.529	5.30	72.8	1.500	0.200	0.005	1.300	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	1.305
17	Site Monitoring Bore 4	26.27		22.14	16-07-2020	MW4	SO and SS		4.13	22.14	19.30	0.555	6.00	24.3	0.800	0.800	0.210	0.005	0.005	0.050	0.005	0.010	0.0001	0.001	0.001	0.001	0.00005	0.001	0.002	0.010
18	Site Monitoring Bore 5	27.44		22.86	16-07-2020	MW5	SO and SS		4.58	22.86	18.90	0.684	4.50	33.6	1.400	1.400	0.490	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.036	0.010
19	Site Monitoring Bore 6	29.16		22.72	16-07-2020	MW6	SO and SS		6.44	22.72	18.90	0.653	4.70	28.5	1.500	1.200	0.300	0.270	0.005	0.150	0.005	0.004	0.0001	0.001	0.002	0.001	0.00005	0.001	0.020	0.275
20	Site Monitoring Bore 7	28.30		22.76	16-07-2020	MW7	SO and SS		5.54	22.76	18.90	0.505	5.80	34.7	1.200	0.700	0.110	0.510	0.008	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.015	0.518
21	Site Monitoring Bore 8	26.72		23.30	16-07-2020	MW8	SO and SS		3.42	23.30	20.30	0.255	6.00	28.8	0.800	0.800	0.150	0.011	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.005	0.016
22	Site Monitoring Bore 9	28.43		22.71	16-07-2020	MW9	SO and SS		5.72	22.71	19.80	0.498	5.30	29.7	1.100	1.100	0.620	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.010	0.010
23	DWER Bore 1	26.69			16-07-2020	J310	SO and SS																							
24	DWER Bore 2	27.93		24.10	16-07-2020	JM45A	SO and SS		3.83	24.10																				
25	DWER Bore 3	28.23		22.14	16-07-2020	JM2	SO and SS		6.09	22.14																				
26	DWER Bore 4	34.68		21.56	16-07-2020	JM12	SO and SS		13.12	21.56																				
27	Surface Water Monitoring Site 1				16-07-2020	SW1	SO and SS	Flowing			15.80	0.047	6.90	82.2	0.200	0.200	0.014	0.028	0.007	0.050	0.011	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.002	0.035
28	Surface Water Monitoring Site 3				16-07-2020	SW3	SO and SS	Flowing			17.00	0.082	6.90	74.0	0.300	0.300	0.016	0.020	0.005	0.050	0.026	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.005	0.025
29	Surface Water Monitoring Site 4				16-07-2020	SW4	SO and SS	Bubble up pond			16.00	0.072	7.10	73.1	0.300	0.300	0.022	0.037	0.006	0.050	0.044	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.004	0.043
30	Surface Water Monitoring Site 6				16-07-2020	SW6	SO and SS	Bubble up pond			16.20	0.039	7.00	72.4	0.200	0.100	0.005	0.042	0.005	0.050	0.008	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.003	0.047
31	Surface Water Monitoring Site 7				16-07-2020	SW7	SO and SS	Bubble up pond			16.90	0.083	6.60	41.5	0.200	0.200	0.020	0.049	0.005	0.050	0.012	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.005	0.054
32	Surface Water Monitoring Site 8				16-07-2020	SW8	SO and SS	Bubble up pond			16.50	0.059	6.70	60.6	0.500	0.500	0.005	0.037	0.005	0.050	0.009	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.006	0.042
33	Surface Water Monitoring Site 9				16-07-2020	SW9	SO and SS	Flowing			15.80	0.060	6.70	81.8	1.600	1.600	0.005	0.013	0.005	0.150	0.023	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.013	0.018
34	Surface Water Monitoring Site 10				16-07-2020	SW10	SO and SS	Bubble up pond			16.80	0.070	6.70	69.9	0.600	0.600	0.005	0.014	0.006	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.020
35	Surface Water Monitoring Site 11				16-07-2020	SW11	SO and SS	Bubble up pond			17.50	0.721	7.40	65.2	0.300	0.200	0.006	0.033	0.005	0.050	0.007	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.012	0.038
36	Surface Water Monitoring Site 12				16-07-2020	SW12	SO and SS	Flowing			16.60	0.098	7.10	72.6	0.300	0.200	0.024	0.062	0.007	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.012	0.069
37	Surface Water Monitoring Site 14				16-07-2020	SW14	SO and SS	Bubble up pond			17.50	0.060	7.00	81.1	0.200	0.200	0.019	0.015	0.005	0.060	0.034	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.013	0.020
38	Surface Water Monitoring Site 15				16-07-2020	SW15	SO and SS	Bubble up pond			18.30	0.063	7.20	81.0	0.200	0.200	0.029	0.015	0.006	0.050	0.008	0.002	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.021
39	Site Monitoring Bore 1	31.53		22.99	12-08-2020	MW1	SO		8.54	22.99																				
40	Site Monitoring Bore 2	27.82			12-08-2020	MW2	SO																							
41	Site Monitoring Bore 3	30.33		21.96	12-08-2020	MW3	SO		8.37	21.96																				
42	Site Monitoring Bore 4	26.27		22.29	12-08-2020	MW4	SO		3.98	22.29																				
43	Site Monitoring Bore 5	27.44		23.05	12-08-2020	MW5	SO		4.39	23.05																				
44	Site Monitoring Bore 6	29.16		22.89	12-08-2020	MW6	SO		6.27	22.89																				
45	Site Monitoring Bore 7	28.30		22.94	12-08-2020	MW7	SO		5.36	22.94																				
46	Site Monitoring Bore 8	26.72		23.47	12-08-2020	MW8	SO		3.25	23.47																				
47	Site Monitoring Bore 9	28.43		23.04	12-08-2020	MW9	SO		5.39	23.04																				
48	DWER Bore 1	26.69		23.81	16-08-2020	J310	SO		2.89	23.81																				
49	DWER Bore 2	27.93		24.26	12-08-2020	JM45A	SO		3.67	24.26																				
50	DWER Bore 3	28.23		22.28	12-08-2020	JM2	SO		5.95	22.28																				
51	DWER Bore 4	34.68		21.76	12-08-2020	JM12	SO		12.92	21.76																				
52	Surface Water Monitoring Site 1				12-08-2020	SW1	SO				16.30	0.141	6.90	52.5	0.300	0.200	0.014	0.056	0.005	0.050	0.009	0.001	0.0001	0.001	0.003	0.001	0.00005	0.001	0.012	0.061
53	Surface Water Monitoring Site 4				12-08-2020	SW4	SO				14.70	0.074	6.70	24.3	0.300	0.300	0.005	0.013	0.005	0.050	0.039	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.009	0.018
54	Surface Water Monitoring Site 7				12-08-2020	SW7	SO				15.00	0.068	6.70	35.8	0.200	0.200	0.014	0.056	0.005	0.050	0.009	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.061
55	Surface Water Monitoring Site 8				12-08-2020	SW8	SO				15.40	0.073	6.60	33.2	0.200	0.100	0.011	0.044	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.006	0.049
56	Surface Water Monitoring Site 9				12-08-2020	SW9	SO				14.20	0.123	6.80	18.7	0.300	0.300	0.005	0.005	0.005	0.050	0.016	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.010
57	Surface Water Monitoring Site 10				12-08-2020	SW10	SO				15.20	0.069	6.60	36.7	0.300	0.200	0.007	0.076	0.005	0.300	0.012	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.043	0.081
58	Surface Water Monitoring Site 12				12-08-2020	SW12	SO				15.50	0.072	6.80	47.5	0.200	0.200	0.011	0.049	0.005	0.050	0.012	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.044	0.054
59	Surface Water Monitoring Site 14				12-08-2020	SW14	SO				15.70	0.134	6.80	45.9	0.500	0.400	0.052	0.060	0.008	0.050	0.013	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.046	0.068
60	Surface Water Monitoring Site 15				12-08-2020	SW15	SO				15.30	0.130	6.90	51.1	0.400	0.300	0.056	0.074	0.011	0.050	0.006	0.001	0.0001	0.001	0.003	0.001	0.00005	0.001	0.051	0.085
61	Site Monitoring Bore 1	31.53		23.15	23-09-2020	MW1	SO and ASM		8.38	23.15																				
62	Site Monitoring Bore 2	27.82		22.74	23-09-2020	MW2	SO and ASM		5.08	22.74																				
63	Site Monitoring Bore 3	30.33		22.11	23-09-2020	MW3	SO and ASM		8.22	22.11																				
64	Site Monitoring Bore 4	26.27		22.42	23-09-2020	MW4	SO and ASM		3.85	22.42																				
65	Site Monitoring Bore 5	27.44		23.22	23-09-2020	MW5	SO and ASM		4.22	23.22																				
66	Site Monitoring Bore 6	29.16		23.13	23-09-2020	MW6	SO and ASM		6.03	23.13																				
67	Site Monitoring Bore 7	28.30		23.16	23-09-2020	MW7	SO and ASM		5.14	23.16																				
68	Site Monitoring Bore 8	26.72		23.66	23-09-2020	MW8	SO and ASM		3.06	23.66																				
69	Site Monitoring Bore 9	28.43		23.21	23-09-2020	MW9	SO and ASM		5.22	23.21																				
70	DWER Bore 1	26.69		24.05	8-09-2020	J310	SO and ASM		2.65	24.05																				
71	DWER Bore 2	27.93		24.39	23-09-2020	JM45A	SO and ASM		3.54	24.39																				
72	DWER Bore 3	28.23		22.40	23-09-2020	JM2	SO and ASM		5.83	22.40																				
73	DWER Bore 4	34.68		21.87	23-09-2020	JM12	SO and ASM		12.81	21.87																				
74	Surface Water Monitoring Site 1				23-09-2020	SW1	SO and ASM				17.80	0.231	7.06	58.0	0.300	0.200	0.011	0.100	0.005	0.070	0.042	0.001	0.0001	0.001	0.100	0.001	0.00005	0.006	0.059	0.110
75	Surface Water Monitoring Site 4				23-09-2020	SW4	SO and ASM				18.30	0.224	6.62	13.6	0.600	0.600	0.110	0.005	0.005	0.190	0.110	0.001	0.0001	0.001	0.004	0.001	0.00005	0.001	0.016	0.005
76	Surface Water Monitoring Site 7				23-09-2020	SW7	SO and ASM				16.70	0.162	6.57	11.4	0.400	0.400	0.100	0.068	0.013	0.180	0.043	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.007	0.081

FieldDAE
Field Data Analysis & Evaluation System

Water Quality Monitoring Data

	Site Name/Type	GW ToC mAHD	GW EoH mAHD	calcGWL mAHD	Date	Site	Monitored By	Monitoring Comment	GWL bTOC mBTOC	GWL mAHD mAHD	T °C	EC mS/cm	pH pH	DO% %	TN mg/L	TKN mg/L	NH3-N mg/L	NO_3-N mg/L	NO2-N mg/L	TP mg/L	PO4- mg/L	As mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Pb mg/L	Hg mg/L	Ni mg/L	Zn mg/L	Nox mg/L
77	Surface Water Monitoring Site 8				23-09-2020	SW8	SO and ASM				17.70	0.163	6.34	11.4	0.500	0.500	0.094	0.005	0.005	0.080	0.017	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.010	0.005
78	Surface Water Monitoring Site 9				23-09-2020	SW9	SO and ASM				16.70	0.224	6.36	6.2	0.800	0.800	0.013	0.005	0.005	0.140	0.033	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.012	0.005
79	Surface Water Monitoring Site 11				23-09-2020	SW11	SO and ASM				18.40	0.157	6.38	10.0	1.900	1.900	0.130	0.019	0.005	0.340	0.010	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.049	0.024
80	Surface Water Monitoring Site 12				23-09-2020	SW12	SO and ASM				23.50	0.190	6.51	34.5	0.700	0.500	0.061	0.120	0.005	0.060	0.023	0.001	0.0001	0.001	0.003	0.001	0.00005	0.001	0.280	0.120
81	Surface Water Monitoring Site 13				23-09-2020	SW13	SO and ASM				21.60	0.234	6.41	16.8	0.900	0.800	0.050	0.014	0.005	0.210	0.022	0.001	0.0001	0.001	0.004	0.001	0.00005	0.001	0.300	0.014
82	Surface Water Monitoring Site 14				23-09-2020	SW14	SO and ASM				17.10	0.234	6.00	19.6	1.000	1.000	0.078	0.005	0.005	0.370	0.180	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.160	0.005
83	Surface Water Monitoring Site 15				23-09-2020	SW15	SO and ASM				15.90	0.232	5.93	13.1	1.300	1.300	0.260	0.005	0.005	0.480	0.190	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.053	0.005
84	Site Monitoring Bore 1	31.53		23.05	22-10-2020	MW1	SG and SO		8.48	23.05	24.90	0.930	6.42	32.3	3.800	0.700	0.018	3.100	0.005	0.050	0.005	0.001	0.0001	0.001	0.072	0.004	0.00005	0.007	0.089	3.100
85	Site Monitoring Bore 2	27.82		22.65	22-10-2020	MW2	SG and SO		5.17	22.65	21.80	1.169	5.94	34.7	2.500	0.300	0.005	2.200	0.006	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	2.200
86	Site Monitoring Bore 3	30.33		22.08	22-10-2020	MW3	SG and SO		8.25	22.08	22.60	0.582	5.51	53.8	2.200	0.200	0.005	1.900	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.002	1.900
87	Site Monitoring Bore 4	26.27		22.29	22-10-2020	MW4	SG and SO		3.98	22.29	23.10	0.871	5.65	31.4	0.800	0.800	0.280	0.005	0.005	0.050	0.005	0.009	0.0001	0.001	0.001	0.001	0.00005	0.001	0.002	0.005
88	Site Monitoring Bore 5	27.44		23.05	22-10-2020	MW5	SG and SO		4.39	23.05	21.80	1.044	4.14	32.6	1.200	1.000	0.270	0.190	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.004	0.006	0.200
89	Site Monitoring Bore 6	29.16		22.95	22-10-2020	MW6	SG and SO		6.21	22.95	21.20	0.596	4.50	45.9	5.300	1.500	0.240	3.800	0.005	0.050	0.005	0.003	0.0001	0.002	0.001	0.001	0.00005	0.001	0.005	3.800
90	Site Monitoring Bore 7	28.30		22.98	22-10-2020	MW7	SG and SO		5.32	22.98	22.10	0.606	5.16	42.4	1.700	0.700	0.070	0.930	0.013	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.003	0.940
91	Site Monitoring Bore 8	26.72		23.49	22-10-2020	MW8	SG and SO		3.23	23.49	21.10	0.357	5.43	24.4	1.100	1.100	0.120	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.013	0.005
92	Site Monitoring Bore 9	28.43		22.90	22-10-2020	MW9	SG and SO		5.53	22.90	23.10	0.536	4.94	34.2	1.200	1.200	0.690	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.017	0.001	0.00005	0.001	0.004	0.005
93	DWER Bore 1	26.69			22-10-2020	J310	SG and SO																							
94	DWER Bore 2	27.93		24.39	22-10-2020	JM45A	SG and SO		3.54	24.39																				
95	DWER Bore 3	28.23		22.38	22-10-2020	JM2	SG and SO		5.85	22.38																				
96	DWER Bore 4	34.68		21.76	22-10-2020	JM12	SG and SO		12.92	21.76																				
97	Site Monitoring Bore 1	31.53		22.99	26-11-2020	MW1	SO		8.54	22.99																				
98	Site Monitoring Bore 2	27.82		22.71	26-11-2020	MW2	SO		5.11	22.71																				
99	Site Monitoring Bore 3	30.33		22.11	26-11-2020	MW3	SO		8.22	22.11																				
100	Site Monitoring Bore 4	26.27		22.33	26-11-2020	MW4	SO		3.94	22.33																				
101	Site Monitoring Bore 5	27.44		23.20	26-11-2020	MW5	SO		4.24	23.20																				
102	Site Monitoring Bore 6	29.16		23.11	26-11-2020	MW6	SO		6.05	23.11																				
103	Site Monitoring Bore 7	28.30		23.12	26-11-2020	MW7	SO		5.18	23.12																				
104	Site Monitoring Bore 8	26.72		23.66	26-11-2020	MW8	SO		3.06	23.66																				
105	Site Monitoring Bore 9	28.43		23.41	26-11-2020	MW9	SO		5.02	23.41																				
106	DWER Bore 1	26.69			26-11-2020	J310	SO																							
107	DWER Bore 2	27.93		24.25	26-11-2020	JM45A	SO		3.68	24.25																				
108	DWER Bore 3	28.23		22.27	26-11-2020	JM2	SO		5.96	22.27																				
109	DWER Bore 4	34.68		21.79	26-11-2020	JM12	SO		12.89	21.79																				
110	Site Monitoring Bore 1	31.53		22.79	11-12-2020	MW1	SO and ASM		8.74	22.79																				
111	Site Monitoring Bore 2	27.82		22.63	11-12-2020	MW2	SO and ASM		5.19	22.63																				
112	Site Monitoring Bore 3	30.33		22.01	11-12-2020	MW3	SO and ASM		8.32	22.01																				
113	Site Monitoring Bore 4	26.27		22.25	11-12-2020	MW4	SO and ASM		4.02	22.25																				
114	Site Monitoring Bore 5	27.44		23.08	11-12-2020	MW5	SO and ASM		4.36	23.08																				
115	Site Monitoring Bore 6	29.16		22.99	11-12-2020	MW6	SO and ASM		6.17	22.99																				
116	Site Monitoring Bore 7	28.30		23.01	11-12-2020	MW7	SO and ASM		5.29	23.01																				
117	Site Monitoring Bore 8	26.72		23.52	11-12-2020	MW8	SO and ASM		3.20	23.52																				
118	Site Monitoring Bore 9	28.43		23.04	11-12-2020	MW9	SO and ASM		5.39	23.04																				
119	DWER Bore 1	26.69			11-12-2020	J310	SO and ASM																							
120	DWER Bore 2	27.93		24.19	11-12-2020	JM45A	SO and ASM		3.74	24.19																				
121	DWER Bore 3	28.23		22.12	11-12-2020	JM2	SO and ASM		6.11	22.12																				
122	DWER Bore 4	34.68		21.71	11-12-2020	JM12	SO and ASM		12.97	21.71																				
123	Site Monitoring Bore 1	31.53		22.51	27-01-2021	MW1	SO		9.02	22.51	21.40	0.626	6.49	29.4	1.400	0.400	0.011	1.000	0.005	0.050	0.005	0.001	0.0001	0.001	0.076	0.002	0.00005	0.007	0.065	1.000
124	Site Monitoring Bore 2	27.82		22.33	27-01-2021	MW2	SO		5.49	22.33	21.00	1.213	5.57	13.1	1.800	0.400	0.048	1.300	0.007	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	1.300
125	Site Monitoring Bore 3	30.33		21.76	27-01-2021	MW3	SO		8.57	21.76	22.40	0.642	5.61	41.6	2.600	0.400	0.005	2.200	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	2.200
126	Site Monitoring Bore 4	26.27		21.98	27-01-2021	MW4	SO		4.29	21.98	23.20	0.975	5.69	14.2	0.500	1.200	0.260	0.005	0.005	0.050	0.005	0.009	0.0001	0.001	0.001	0.003	0.00005	0.001	0.001	0.005
127	Site Monitoring Bore 5	27.44		22.82	27-01-2021	MW5	SO		4.62	22.82	22.40	0.590	4.45	13.3	1.400	1.400	0.450	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
128	Site Monitoring Bore 6	29.16		22.74	27-01-2021	MW6	SO		6.42	22.74	23.00	0.575	4.61	13.1	2.100	1.300	0.260	0.810	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.810
129	Site Monitoring Bore 7	28.30		22.75	27-01-2021	MW7	SO		5.55	22.75	22.50	0.549	5.26	10.5	2.100	1.200	0.040	0.910	0.024	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.930
130	Site Monitoring Bore 8	26.72		23.28	27-01-2021	MW8	SO		3.44	23.28	26.00	0.248	5.10	12.5	0.800	0.800	0.250	0.005	0.005	0.050	0.007	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
131	Site Monitoring Bore 9	28.43		22.94	27-01-2021	MW9	SO		5.49	22.94	23.90	0.563	4.99		1.100	1.100	0.540	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
132	DWER Bore 1	26.69			27-01-2021	J310	SO																							
133	DWER Bore 2	27.93		23.97	27-01-2021	JM45A	SO		3.96	23.97																				
134	DWER Bore 3	28.23		21.79	27-01-2021	JM2	SO		6.44	21.79																				
135	DWER Bore 4	34.68		21.46	27-01-2021	JM12	SO		13.22	21.46																				
136	Site Monitoring Bore 1	31.53		22.48	17-02-2021	MW1	SO		9.05	22.48																				
137	Site Monitoring Bore 2	27.82		22.38	17-02-2021	MW2	SO		5.44	22.38																				
138	Site Monitoring Bore 3	30.33		21.76	17-02-2021	MW3	SO		8.57	21.76																				
139	Site Monitoring Bore 4	26.27		22.01	17-02-2021	MW4	SO		4.26	22.01																				
140	Site Monitoring Bore 5	27.44		22.76	17-02-2021	MW5	SO		4.68	22.76																				
141	Site Monitoring Bore 6	29.16		22.65	17-02-2021	MW6	SO		6.51	22.65																				
142	Site Monitoring Bore 7	28.30		22.68	17-02-2021	MW7	SO		5.62	22.68																				
143	Site Monitoring Bore 8	26.72		23.22	17-02-2021	MW8	SO		3.50	23.22																				
144	Site Monitoring Bore 9	28.43		22.79	17-02-2021	MW9	SO		5.64	22.79																				
145	DWER Bore 1	26.69			17-02-2021	J310	SO																							
146	DWER Bore 2	27.93		23.91	17-02-2021	JM45A	SO		4.02	23.91																				
147	DWER Bore 3	28.23		21.77	17-02-2021	JM2	SO		6.46	21.77																				
148	DWER Bore 4	34.68		21.43	17-02-2021	JM12	SO		13.25	21.43																				
149	Site Monitoring Bore 1	31.53		22.39	30-03-2021	MW1	SO		9.14	22.39																				
150	Site Monitoring Bore 2	27.82		22.27	30-03-2021	MW2	SO		5.55	22.27																				
151	Site Monitoring Bore 3	30.33		21.69	30-03-2021	MW3	SO		8.64	21.69																				
152	Site Monitoring Bore 4	26.27		21.88	30-03-2021	MW4	SO		4.39	21.88																				

FieldDAE
Field Data Analysis & Evaluation System

Water Quality Monitoring Data

	Site Name/Type	GW ToC mAHD	GW EoH mAHD	calcGWL mAHD	Date	Site	Monitored By	Monitoring Comment	GWL bTOC mBTOC	GWL mAHD mAHD	T °C	EC mS/cm	pH pH	DO% %	TN mg/L	TKN mg/L	NH3-N mg/L	NO_3-N mg/L	NO2-N mg/L	TP mg/L	PO4- mg/L	As mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Pb mg/L	Hg mg/L	Ni mg/L	Zn mg/L	Nox mg/L
153	Site Monitoring Bore 5	27.44		22.68	30-03-2021	MW5	SO		4.76	22.68																				
154	Site Monitoring Bore 6	29.16		22.54	30-03-2021	MW6	SO		6.62	22.54																				
155	Site Monitoring Bore 7	28.30		22.57	30-03-2021	MW7	SO		5.73	22.57																				
156	Site Monitoring Bore 8	26.72		23.36	30-03-2021	MW8	SO		3.36	23.36																				
157	Site Monitoring Bore 9	28.43		22.75	30-03-2021	MW9	SO		5.68	22.75																				
158	DWER Bore 2	27.93		23.81	30-03-2021	JM45A	SO		4.12	23.81																				
159	DWER Bore 3	28.23		21.64	30-03-2021	JM2	SO	Corrected Reading	6.59	21.64																				
160	DWER Bore 4	34.68		21.35	30-03-2021	JM12	SO		13.33	21.35																				
161	Site Monitoring Bore 1	31.53		22.38	29-04-2021	MW1	SO & GR		9.15	22.38	21.40	0.570	6.460	35.000	0.400	0.400	0.053	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.100	0.003	0.00005	0.011	0.087	0.005
162	Site Monitoring Bore 2	27.82		22.25	29-04-2021	MW2	SO & GR		5.57	22.25	20.60	0.850	6.280	24.400	4.100	0.100	0.005	4.000	0.009	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	4.000
163	Site Monitoring Bore 3	30.33		21.65	29-04-2021	MW3	SO & GR		8.68	21.65	21.10	0.530	6.240	61.600	1.400	0.200	0.005	1.200	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.008	1.200
164	Site Monitoring Bore 4	26.27		21.84	29-04-2021	MW4	SO & GR		4.43	21.84	22.20	0.600	5.950	27.700	0.700	0.700	0.100	0.050	0.050	0.050	0.005	0.004	0.0001	0.001	0.001	0.002	0.00005	0.001	0.001	0.050
165	Site Monitoring Bore 5	27.44		22.66	29-04-2021	MW5	SO & GR		4.78	22.66	21.40	0.640	5.230	21.200	1.200	1.200	0.430	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
166	Site Monitoring Bore 6	29.16		22.56	29-04-2021	MW6	SO & GR		6.60	22.56	21.50	0.550	5.110	26.200	1.400	1.400	0.310	0.005	0.005	0.050	0.005	0.005	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
167	Site Monitoring Bore 7	28.30		22.57	29-04-2021	MW7	SO & GR		5.73	22.57	21.40	0.620	5.660	26.100	1.900	1.400	0.005	0.490	0.017	0.050	0.005	0.001	0.0001	0.002	0.004	0.001	0.00005	0.001	0.001	0.005
168	Site Monitoring Bore 8	26.72		23.11	29-04-2021	MW8	SO & GR		3.61	23.11	22.70	0.250	6.010	26.900	0.600	0.600	0.220	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.500
169	Site Monitoring Bore 9	28.43		22.76	29-04-2021	MW9	SO & GR		5.67	22.76	21.30	0.530	5.050	22.900	1.300	1.300	0.670	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.005
170	DWER Bore 2	27.93		23.74	29-04-2021	JM45A	SO & GR		4.19	23.74																				
171	DWER Bore 3	28.23		21.65	29-04-2021	JM2	SO & GR		6.58	21.65																				
172	DWER Bore 4	34.68		21.29	29-04-2021	JM12	SO & GR		13.39	21.29																				
173	Site Monitoring Bore 1	31.53		22.47	28-05-2021	MW1	SO & GR		9.06	22.47																				
174	Site Monitoring Bore 2	27.82		22.38	28-05-2021	MW2	SO & GR		5.44	22.38																				
175	Site Monitoring Bore 3	30.33		21.73	28-05-2021	MW3	SO & GR		8.60	21.73																				
176	Site Monitoring Bore 4	26.27		21.99	28-05-2021	MW4	SO & GR		4.28	21.99																				
177	Site Monitoring Bore 5	27.44		22.71	28-05-2021	MW5	SO & GR		4.73	22.71																				
178	Site Monitoring Bore 6	29.16		22.56	28-05-2021	MW6	SO & GR		6.60	22.56																				
179	Site Monitoring Bore 7	28.30		22.58	28-05-2021	MW7	SO & GR		5.72	22.58																				
180	Site Monitoring Bore 8	26.72		23.09	28-05-2021	MW8	SO & GR		3.63	23.09																				
181	Site Monitoring Bore 9	28.43		22.65	28-05-2021	MW9	SO & GR		5.78	22.65																				
182	DWER Bore 2	27.93		23.78	28-05-2021	JM45A	SO & GR		4.15	23.78																				
183	DWER Bore 3	28.23		21.76	28-05-2021	JM2	SO & GR		6.47	21.76																				
184	DWER Bore 4	34.68		21.41	28-05-2021	JM12	SO & GR		13.27	21.41																				
185	Surface Water Monitoring Site 1				7-07-2021	SW1	SO & GR				11.40	140.00	7.30	67.100	0.300	0.30	0.005	0.005	0.005	0.050	0.011	0.001	0.0001	0.001	0.004	0.001	0.00005	0.001	0.019	0.006
186	Surface Water Monitoring Site 2				7-07-2021	SW2	SO & GR				15.10	96.80	7.51	80.500	0.200	0.20	0.005	0.006	0.005	0.050	0.006	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.012	0.008
187	Surface Water Monitoring Site 4				7-07-2021	SW4	SO & GR				14.30	124.40	7.35	71.500	0.200	0.20	0.007	0.015	0.005	0.050	0.015	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.017
188	Surface Water Monitoring Site 5				7-07-2021	SW5	SO & GR				16.00	149.10	7.36	64.700	0.300	0.30	0.005	0.018	0.005	0.050	0.009	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.009	0.020
189	Surface Water Monitoring Site 6				7-07-2021	SW6	SO & GR				11.60	139.70	7.39	80.300	0.100	0.10	0.005	0.009	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.010	0.010
190	Surface Water Monitoring Site 7				7-07-2021	SW7	SO & GR				14.50	47.10	7.19	80.400	0.100	0.010	0.005	0.024	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.021	0.025
191	Surface Water Monitoring Site 8				7-07-2021	SW8	SO & GR				13.00	188.80	7.01	82.600	0.200	0.20	0.005	0.008	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.013	0.009
192	Surface Water Monitoring Site 9				7-07-2021	SW9	SO & GR				14.80	59.00	7.45	68.600	0.100	0.010	0.005	0.028	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.005	0.029
193	Surface Water Monitoring Site 10				7-07-2021	SW10	SO & GR				11.40	157.70	7.08	65.700	0.200	0.20	0.005	0.005	0.005	0.050	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.052	0.005
194	Surface Water Monitoring Site 11				7-07-2021	SW11	SO & GR				14.80	45.70	7.41	74.200	0.400	0.30	0.013	0.061	0.005	0.50	0.007	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.025	0.061
195	Surface Water Monitoring Site 12				7-07-2021	SW12	SO & GR				14.60	69.30	7.18	71.400	0.400	0.30	0.015	0.039	0.005	0.050	0.006	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.026	0.04
196	Surface Water Monitoring Site 13				7-07-2021	SW13	SO & GR				14.70	150.00	7.08	71.100	0.400	0.40	0.008	0.012	0.005	0.050	0.010	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.042	0.013
197	Surface Water Monitoring Site 14				7-07-2021	SW14	SO & GR				14.40	141.40	7.00	53.200	0.400	0.40	0.028	0.019	0.005	0.050	0.009	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.036	0.02
198	Surface Water Monitoring Site 15				7-07-2021	SW15	SO & GR				15.10	118.70	7.04	70.500	0.200	0.20	0.005	0.010	0.005	0.050	0.005	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.092	0.014
199	Surface Water Monitoring Site 16				7-07-2021	SW16	SO & GR				14.70	153.70	7.03	72.000	0.500	0.40	0.044	0.065	0.005	0.050	0.008	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.044	0.067
200	Site Monitoring Bore 1	31.53		22.64	7-07-2021	MW1	SO & GR		8.89	22.64																				
201	Site Monitoring Bore 2	27.82		22.56	7-07-2021	MW2	SO & GR		5.26	22.56																				
202	Site Monitoring Bore 3	30.33		21.92	7-07-2021	MW3	SO & GR		8.41	21.92																				
203	Site Monitoring Bore 4	26.27		22.25	7-07-2021	MW4	SO & GR		4.02	22.25																				
204	Site Monitoring Bore 5	27.44		22.93	7-07-2021	MW5	SO & GR		4.51	22.93																				
205	Site Monitoring Bore 6	29.16		22.80	7-07-2021	MW6	SO & GR		6.36	22.80																				
206	Site Monitoring Bore 7	28.30		22.84	7-07-2021	MW7	SO & GR		5.46	22.84																				
207	Site Monitoring Bore 8	26.72		23.43	7-07-2021	MW8	SO & GR		3.29	23.43																				
208	Site Monitoring Bore 9	28.43		22.85	7-07-2021	MW9	SO & GR		5.58	22.85																				
209	DWER Bore 2	27.93		24.06	7-07-2021	JM45A	SO & GR		3.87	24.06																				
210	DWER Bore 3	28.23		22.00	7-07-2021	JM2	SO & GR		6.23	22.00																				
211	DWER Bore 4	34.68		21.69	7-07-2021	JM12	SO & GR		12.99	21.69																				
212	Site Monitoring Bore 1	31.53		23.10	27-07-2021	MW1	SO & GR		8.43	23.10	19.40	0.745	5.57	37.500	2.2	0.4	0.008	1.800	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.008	1.800
213	Site Monitoring Bore 2	27.82		22.96	27-07-2021	MW2	SO & GR		4.86	22.96	18.00	1.098	5.69	32.400	3.5	0.4	0.029	3.100	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.002	0.00005	0.001	0.001	3.100
214	Site Monitoring Bore 3	30.33		22.27	27-07-2021	MW3	SO & GR		8.06	22.27	19.20	0.529	5.59	65.500	2.5	0.3	0.005	2.300	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.003	2.300
215	Site Monitoring Bore 4	26.27		22.81	27-07-2021	MW4	SO & GR		3.46	22.81	19.10	0.390	5.76	31.500	0.8	0.8	0.140	0.005	0.005	0.05	0.005	0.004	0.0001	0.001	0.001	0.002	0.00005	0.001	0.005	0.005
216	Site Monitoring Bore 5	27.44		23.48	27-07-2021	MW5	SO & GR		3.96	23.48	17.90	0.649	3.85	34.700	1.5	0.9	0.350	0.590	0.011	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.002	0.001	0.600
217	Site Monitoring Bore 6	29.16		23.37	27-07-2021	MW6	SO & GR		5.79	23.37	18.20	0.472	4.38	31.400	13.0	1.3	0.010	11.000	0.005	0.05	0.005	0.001	0.0001	0.002	0.002	0.001	0.00005	0.002	0.002	11.000
218	Site Monitoring Bore 7	28.30		23.44	27-07-2021	MW7	SO & GR		4.86	23.44	17.00	0.553	5.56	33.900	1.3	1.5	0.045	0.015	0.005	0.05	0.005	0.001	0.0001	0.002	0.002	0.001	0.00005	0.001	0.010	0.015
219	Site Monitoring Bore 8	26.72		23.85	27-07-2021	MW8	SO & GR		2.87	23.85	17.70	0.329	5.65	36.300	1.5	1.3	0.058	0.067	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.006	0.067
220	Site Monitoring Bore 9	28.43		23.41	27-07-2021	MW9	SO & GR		5.02	23.41	18.70	0.535	5.06	38.000	1.3	0.2	0.560	0.005	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.006	0.005
221	DWER Bore 2	27.93		24.58	27-07-2021	JM45A	SO & GR		3.35	24.58																				
222	DWER Bore 3	28.23		22.54	27-07-2021	JM2	SO & GR		5.69	22.54																				
223	DWER Bore 4	34.68		22.16	27-07-2021	JM12	SO & GR		12.52	22.16																				
224	Surface Water Monitoring Site 1				27-07-2021	SW1	SO & GR				14.50	0.486	6.11	68.300	0.2	0.2	0.005	0.012	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.016	0.013
225	Surface Water Monitoring Site 4				27-07-2021	SW4	SO & GR				15.50	0.218	6.18	68.400	0.2	0.2	0.008	0.030	0.005	0.05	0.009	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.013	0.031
226	Surface Water Monitoring Site 5				27-07-2021	SW5	SO & GR				15.80	0.131	6.86	59.500	0.2	0.2	0.014	0.026	0.005	0.13	0.007	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.006	0.028
227	Surface Water Monitoring Site 6				27-07-2021	SW6	SO & GR				15.10	0.098	6.96	71.400	0.1	0.1	0.016	0.009	0.005	0.05	0.005	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.003	0.010
228	Surface Water Monitoring Site 7				27-07-2021	SW7	SO & GR				15.40	0.085	6.30	64.400	0.1	0.1	0.005	0.029	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.007	0.030

FieldDAE
Field Data Analysis & Evaluation System

Water Quality Monitoring Data

	Site Name/Type	GW ToC mAHD	GW EoH mAHD	calcGWL mAHD	Date	Site	Monitored By	Monitoring Comment	GWL bTOC mBTOC	GWL mAHD mAHD	T °C	EC mS/cm	pH pH	DO% %	TN mg/L	TKN mg/L	NH3-N mg/L	NO_3-N mg/L	NO2-N mg/L	TP mg/L	PO4- mg/L	As mg/L	Cd mg/L	Cr mg/L	Cu mg/L	Pb mg/L	Hg mg/L	Ni mg/L	Zn mg/L	Nox mg/L
229	Surface Water Monitoring Site 8				27-07-2021	SW8	SO & GR				15.50	0.056	6.31	59.900	0.1	0.1	0.005	0.041	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.005	0.042
230	Surface Water Monitoring Site 9				27-07-2021	SW9	SO & GR				14.10	0.148	6.34	64.000	0.1	0.1	0.005	0.005	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.013	0.005
231	Surface Water Monitoring Site 10				27-07-2021	SW10	SO & GR				15.10	0.235	6.29	44.600	0.2	0.2	0.005	0.005	0.005	0.08	0.008	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.052	0.005
232	Surface Water Monitoring Site 11				27-07-2021	SW11	SO & GR				15.10	0.085	6.45	71.500	0.2	0.2	0.005	0.015	0.005	0.15	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.014	0.016
233	Surface Water Monitoring Site 12				27-07-2021	SW12	SO & GR				15.00	0.106	6.62	70.100	0.1	0.1	0.005	0.026	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.020	0.027
234	Surface Water Monitoring Site 13				27-07-2021	SW13	SO & GR				14.30	0.057	6.18	71.300	0.2	0.2	0.009	0.005	0.005	0.05	0.003	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.010	0.005
235	Surface Water Monitoring Site 14				27-07-2021	SW14	SO & GR				14.10	0.052	6.23	57.100	0.2	0.2	0.005	0.005	0.005	0.05	0.014	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.008	0.005
236	Surface Water Monitoring Site 15				27-07-2021	SW15	SO & GR				14.40	0.207	5.47	64.100	0.1	0.1	0.005	0.005	0.005	0.05	0.005	0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.084	0.005
237	Surface Water Monitoring Site 16				27-07-2021	SW16	SO & GR				13.60	0.127	6.41	50.600	0.4	0.4	0.030	0.023	0.005	0.06	0.023	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.032	0.025
238	Site Monitoring Bore 1	31.53		23.36	12-08-2021	MW1	SO & GR		8.17	23.36																				
239	Site Monitoring Bore 2	27.82		23.10	12-08-2021	MW2	SO & GR		4.72	23.10																				
240	Site Monitoring Bore 3	30.33		22.44	12-08-2021	MW3	SO & GR		7.89	22.44																				
241	Site Monitoring Bore 4	26.27		22.99	12-08-2021	MW4	SO & GR		3.28	22.99																				
242	Site Monitoring Bore 5	27.44		23.69	12-08-2021	MW5	SO & GR		3.75	23.69																				
243	Site Monitoring Bore 6	29.16		23.64	12-08-2021	MW6	SO & GR		5.52	23.64																				
244	Site Monitoring Bore 7	28.30		23.70	12-08-2021	MW7	SO & GR		4.60	23.70																				
245	Site Monitoring Bore 8	26.72		24.23	12-08-2021	MW8	SO & GR		2.49	24.23																				
246	Site Monitoring Bore 9	28.43		23.59	12-08-2021	MW9	SO & GR		4.84	23.59																				
247	DWER Bore 2	27.93		24.78	12-08-2021	JM45A	SO & GR		3.15	24.78																				
248	DWER Bore 3	28.23		22.75	12-08-2021	JM2	SO & GR		5.48	22.75																				
249	DWER Bore 4	34.68		22.34	12-08-2021	JM12	SO & GR		12.34	22.34																				
250	DWER Bore 1	26.69		23.71	27-10-2020	J310	WC		2.98	23.71																				
251	DWER Bore 1	26.69		23.76	26-11-2020	J310	WC		2.93	23.76																				
252	DWER Bore 1	26.69		23.70	10-12-2020	J310	WC		2.99	23.70																				
253	DWER Bore 1	26.69		23.51	8-01-2021	J310	WC		3.18	23.51																				
254	DWER Bore 1	26.69		23.36	4-02-2021	J310	WC		3.33	23.36																				
255	DWER Bore 1	26.69		23.29	30-06-2021	J310	WC		3.40	23.29																				
256	DWER Bore 1	26.69		24.09	28-07-2021	J310	WC		2.60	24.09																				
257	DWER Bore 1	26.69		24.23	31-08-2021	J310	WC		2.46	24.23																				

APPENDIX G
Lithological Logs

hyd2o HYDROLOGY

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**	Job Number :	H20002
Client :	**ECP Acquisitions 6 Pty Ltd**	Start Hole :	**9.30 am**
Project:	**Glen Iris LWMS**	End Hole :	**10 am**
Easting	**392219**	Logged by :	**SO**
Northing	**6447400**	Total Depth :	**12 m**
Datum:	AHD	RL Top of Casing	**31.53 mAHD**
Drill type:	Drill Rig Hollow Auger	RL Nat Surface :	**30.93 mAHD**
Hole diameter:	2.5 Inch		

Bore Name

MW1

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)				2.0m	Yellow Grey	Fine to Medium	Sand	Nil	Slightly Moist	
					Light Yellow					
				4.0m	Light Yellow Brown					
					Orange Brown					
				6.0m	Light Orange Brown					
					Yellow					
		▽		8.0m	Yellow Grey					
				10.0m	Light Yellow Grey				Moist	Slight Traces of Coffee Rock but Not Cemeneted
					Dark Brown					
				12.0m						

COLOUR :	Black, White, Biege Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue Composition : Solid , Blemish, Mottle
PARTICLE SIZE :	Fine, Medium, Course
TEXTURE :	Sand, Loamy Sand, Clayey Sand Silt, Loam, Sandy Loam, Clayey Loam Clay, Sandy Clay
ORGANICS :	High, Medium, Low
MOISTURE :	Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**392008**
Northing	**6447916**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**10.15 am**
End Hole :	**10.45 am**
Logged by :	**SO**
Total Depth :	**9.5 m**
RL Top of Casing	**27.82 mAHD**
RL Nat Surface :	**27.22 mAHD**

Bore Name

MW2

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)				1.0m	Dark Grey Brown			Low		
				2.0m	Grey Brown					
				3.0m	Light Yellow Grey					
				4.0m	Light Grey				Slightly Moist	
				5.0m	Light Grey	Fine to Medium	Sand	Nil		
				6.0m	White					
				7.0m						
				8.0m	Light Grey				Moist	
				9.0m						
				10.0m	White					

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**391661**
Northing	**6446084**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**11.00 am**
End Hole :	**11.30 am**
Logged by :	**SO**
Total Depth :	**11 m**
RL Top of Casing	**30.33**
RL Nat Surface :	**29.73**

Bore Name

MW3

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)				2.0m	Light Yellow	Fine to Medium	Sand	Nil	Dry	
				4.0m	Orange	Mostly Fine				
				6.0m	Light Yellow	Fine to Medium				
				8.0m	Yellow				Slightly Moist	
				10.0m	Orange					
				12.0m	Yellow					
					Light Yellow				Moist	
					White					

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

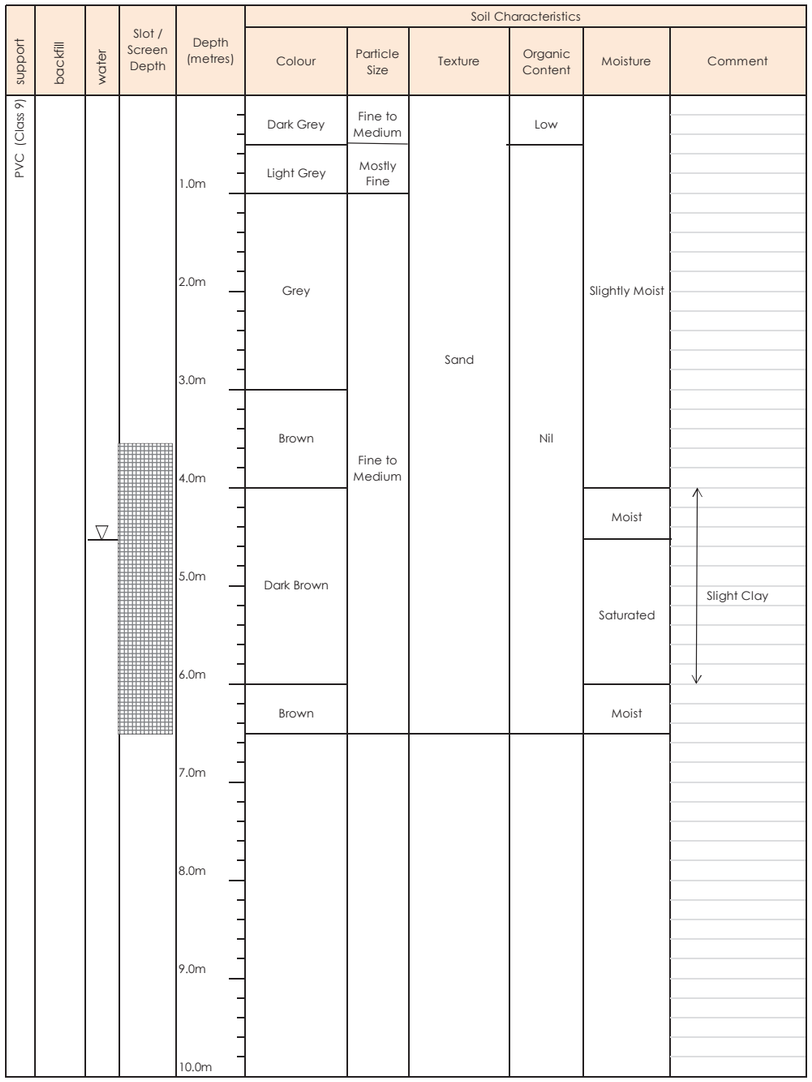
PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**391708**
Northing	**6447579**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**11.45 am**
End Hole :	**12.15 pm**
Logged by :	**SO**
Total Depth :	**6.5 m**
RL Top of Casing	**26.27**
RL Nat Surface :	**25.67**

Bore Name

MW4



COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

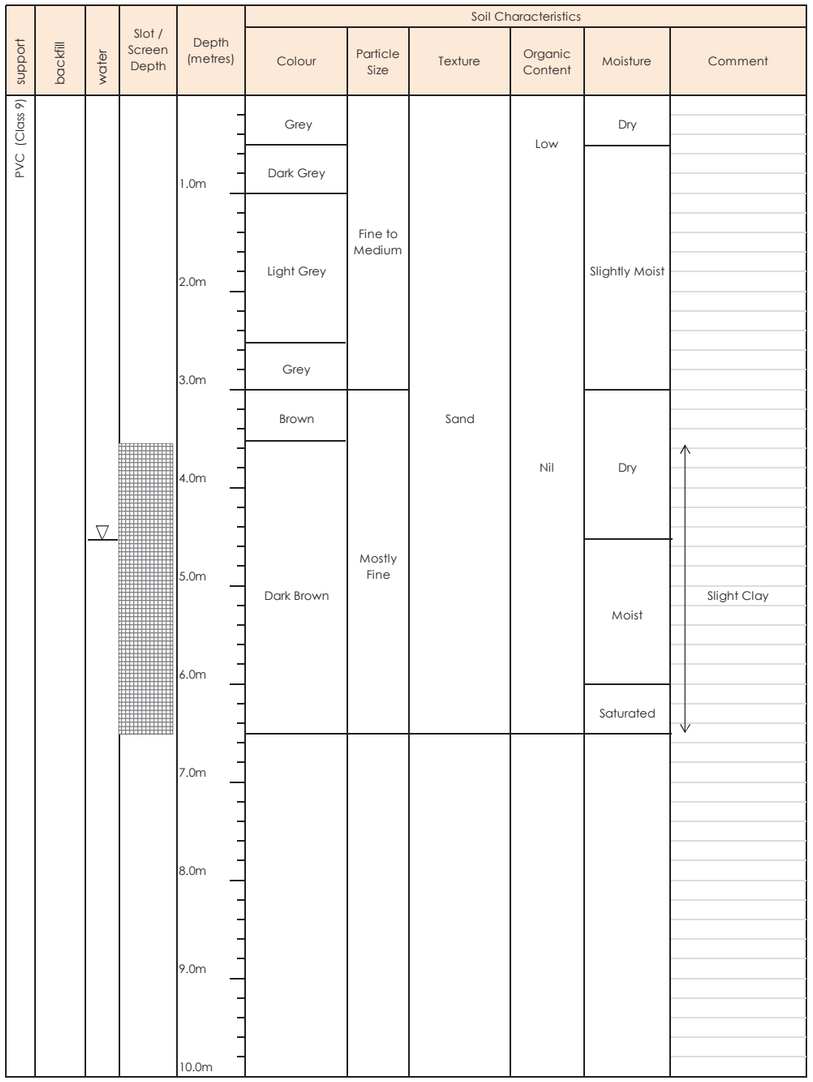
PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**392170**
Northing	**6447202**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**12.30 pm**
End Hole :	**1.00 pm**
Logged by :	**SO**
Total Depth :	**6.5 m**
RL Top of Casing	**27.44**
RL Nat Surface :	**26.84**

Bore Name

MW5



COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

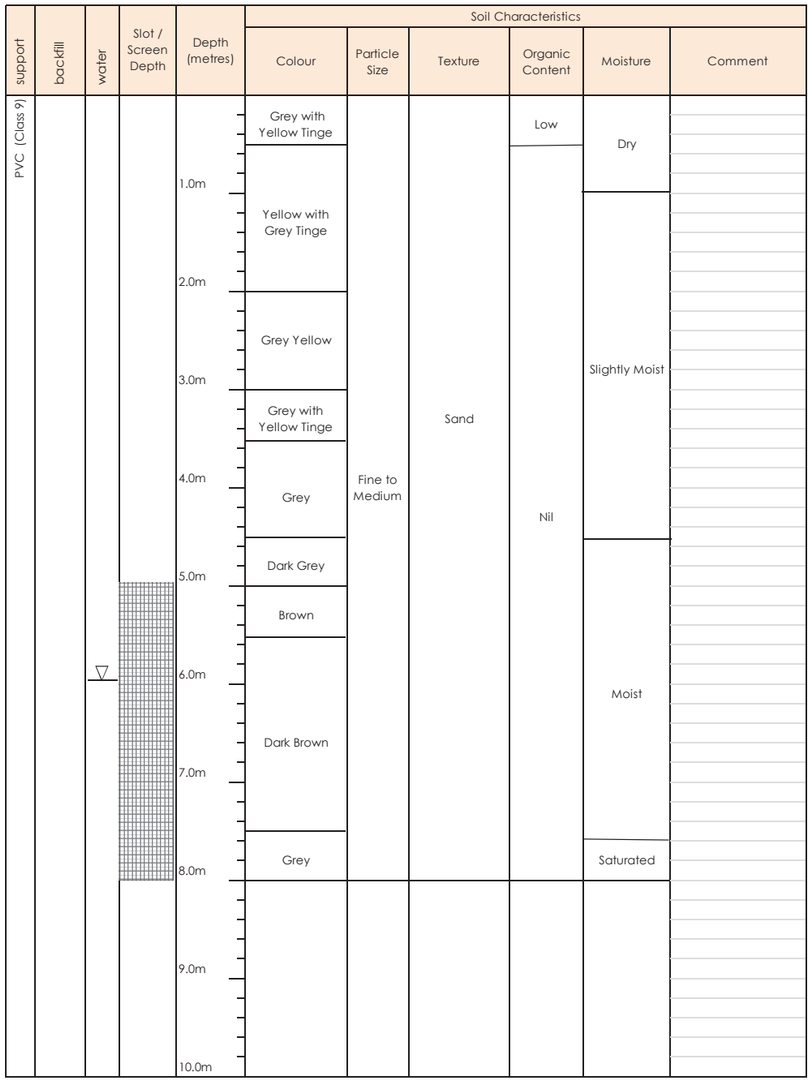
PO Box 1055
Subiaco WA 6904

Date :	**4/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**392027**
Northing	**6446878**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**8.30 am**
End Hole :	**9.00 am**
Logged by :	**SO**
Total Depth :	**8 m**
RL Top of Casing	**29.16**
RL Nat Surface :	**28.56**

Bore Name

MW6



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

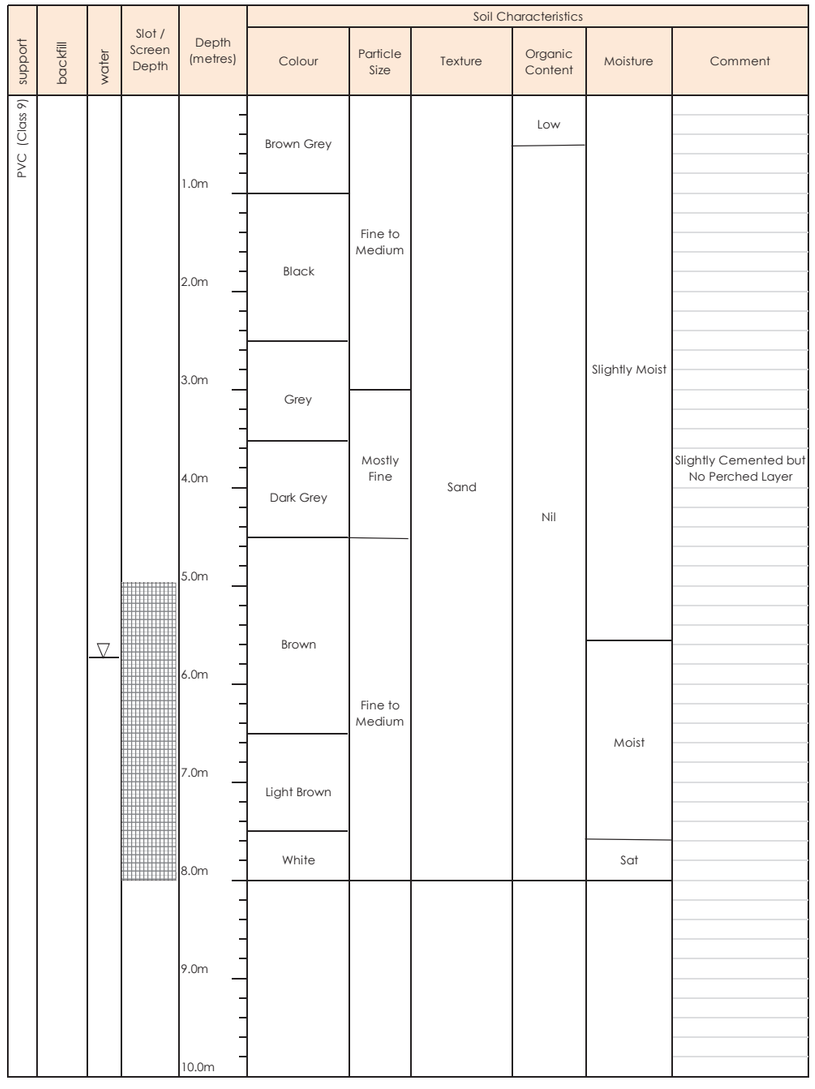
PO Box 1055
Subiaco WA 6904

Date :	**4/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**391965**
Northing	**6446606**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**7.45 am**
End Hole :	**8.15 am**
Logged by :	**SO**
Total Depth :	**8 m**
RL Top of Casing	**391965**
RL Nat Surface :	**6446606**

Bore Name

MW7



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

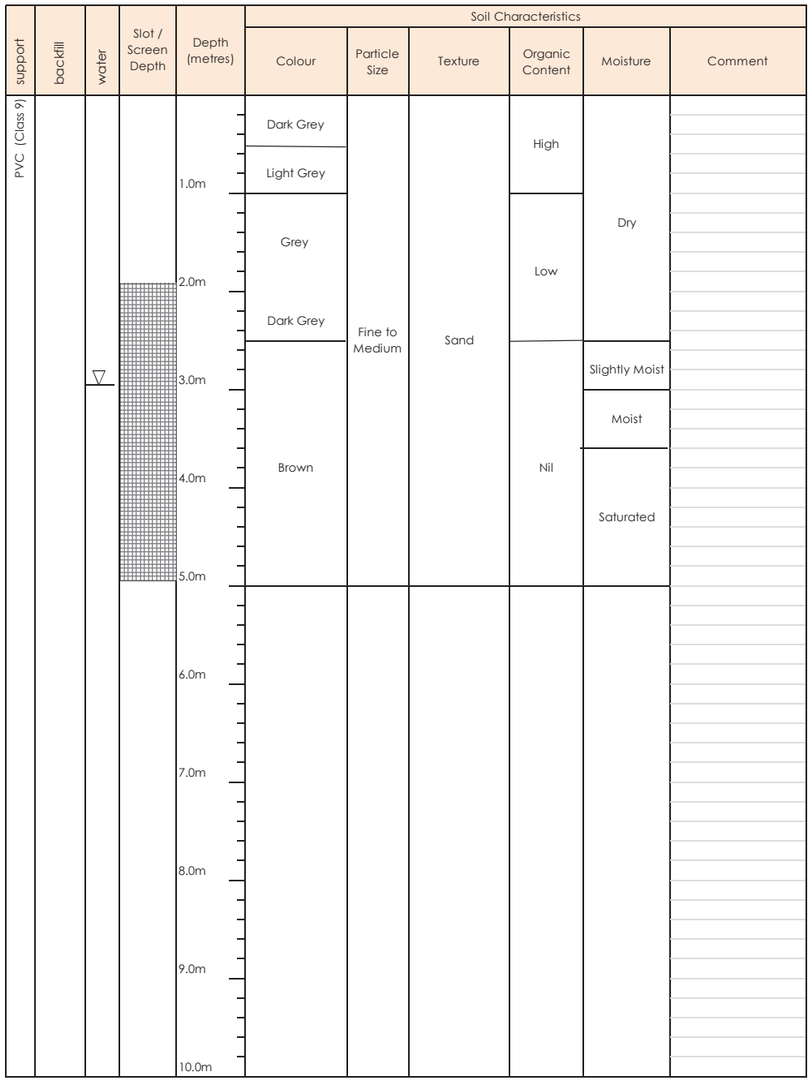
PO Box 1055
Subiaco WA 6904

Date :	**4/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**392151**
Northing	**6446249**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**1.15 pm**
End Hole :	**1.45 pm**
Logged by :	**SO**
Total Depth :	**5 m**
RL Top of Casing	**26.72**
RL Nat Surface :	**26.12**

Bore Name

MW8



COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 6B 103 Rokeby Rd
Subiaco, WA 6008

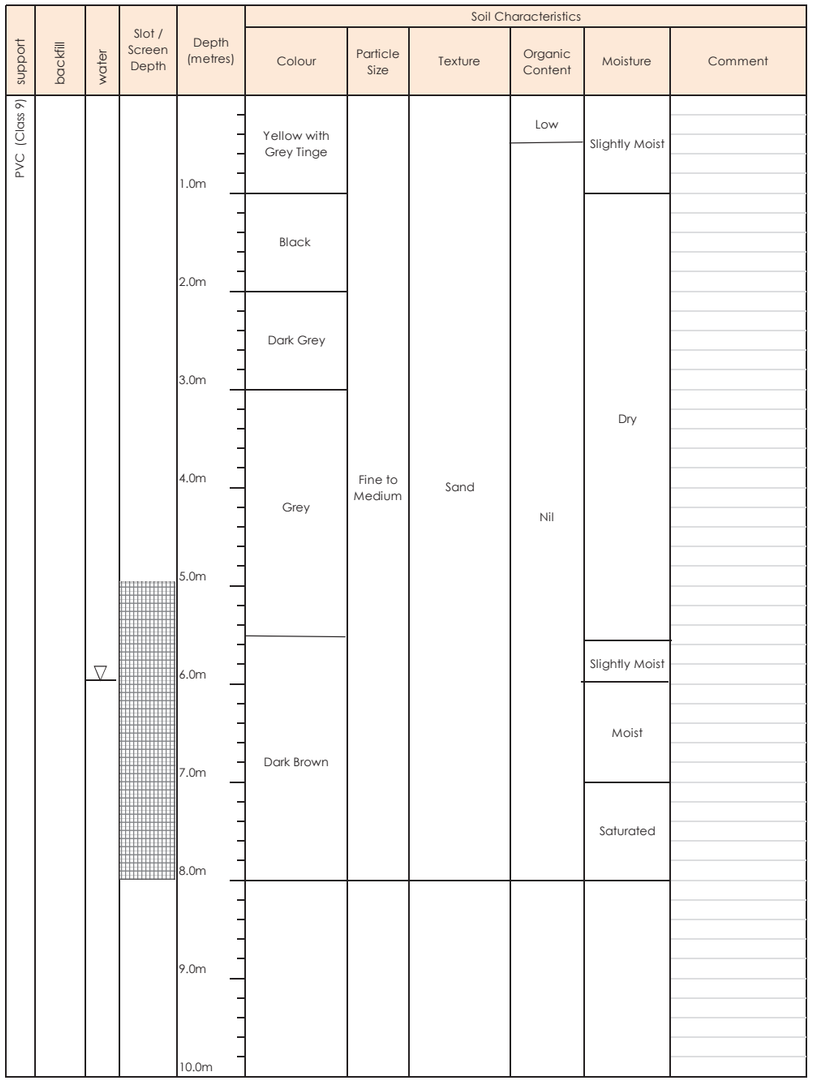
PO Box 1055
Subiaco WA 6904

Date :	**3/06/2020**
Client :	**ECP Acquisitions 6 Pty Ltd**
Project:	**Glen Iris LWMS**
Easting	**392221**
Northing	**6446790**
Datum:	AHD
Drill type:	Drill Rig Hollow Auger
Hole diameter:	2.5 Inch

Job Number :	H20002
Start Hole :	**9.15 am**
End Hole :	**9.45 am**
Logged by :	**SO**
Total Depth :	**8 m**
RL Top of Casing	**28.43**
RL Nat Surface :	**27.73**

Bore Name

MW9



COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

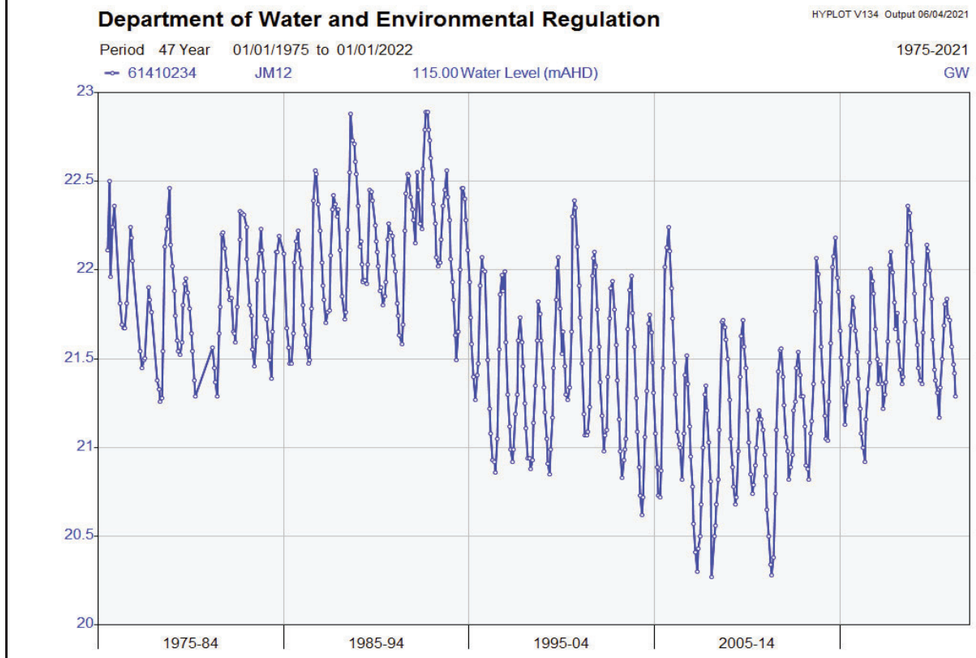
MOISTURE : Dry, Slightly Moist, Moist, Saturated

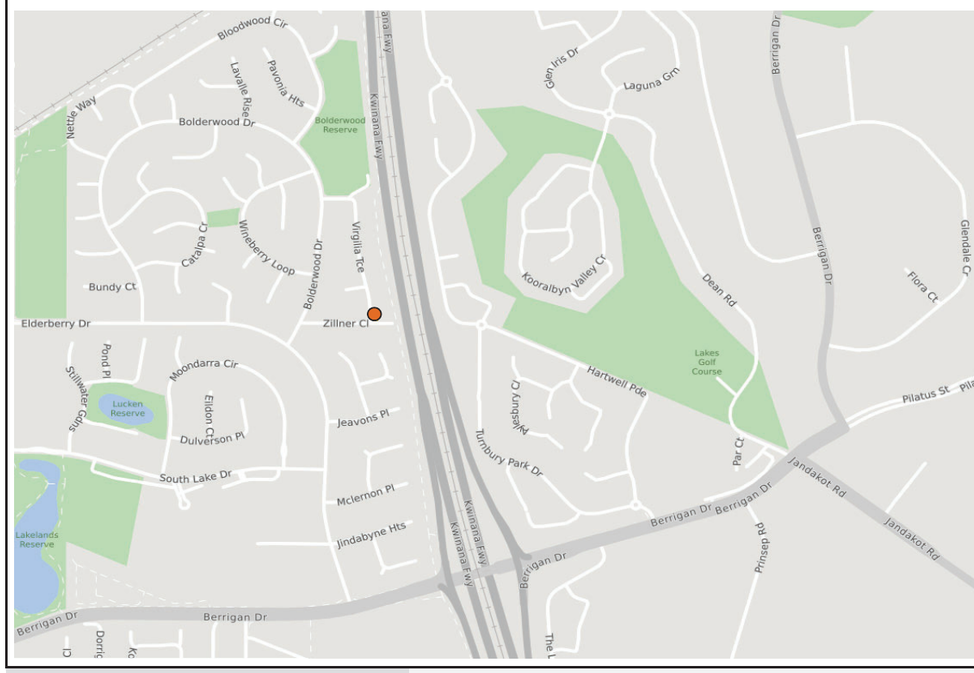
Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

APPENDIX H
DWER Groundwater Monitoring Data

Date: 23/04/2020 Job No. H20002





Source: Department of Water and Environmental Regulation (2021)

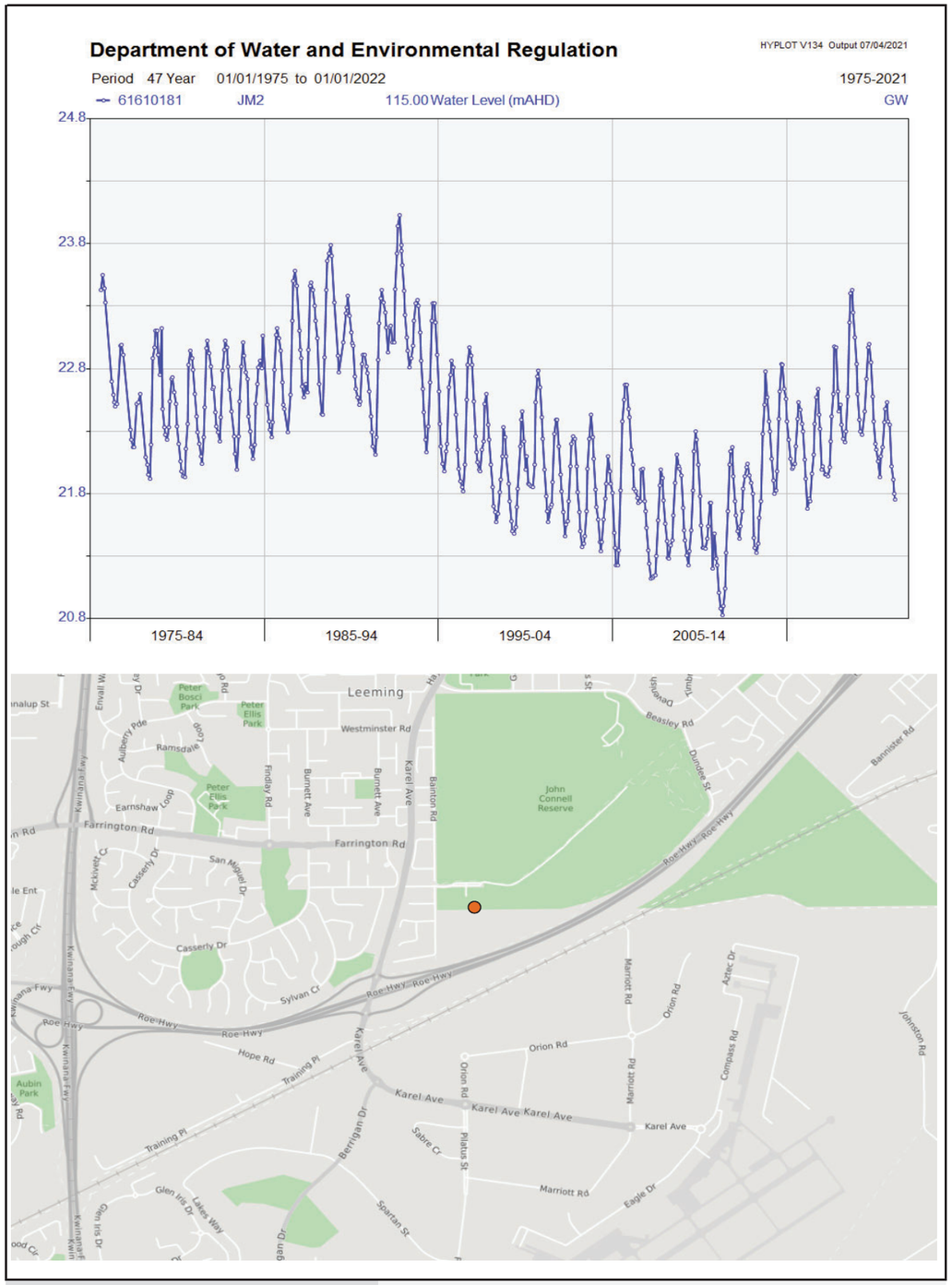
hyd2o

Glen Iris Jandakot Local Water Management Strategy

DWER Bore Hydrographs : JM12

Appendix H1

Date : 23/04/2021 Job No. H20002



Source: Department of Water and Environmental Regulation (2021)

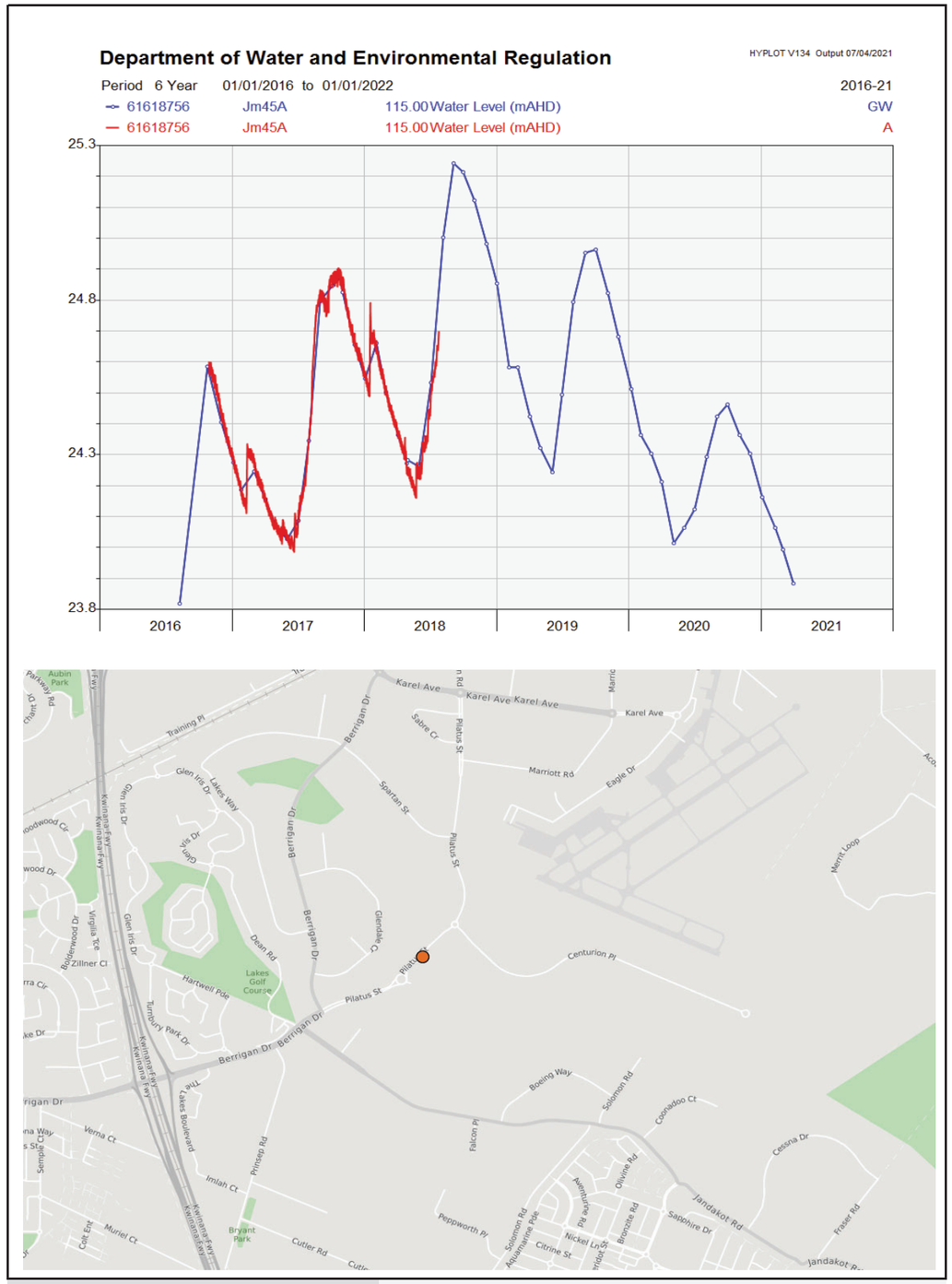
hyd2o

Glen Iris Jandakot Local Water Management Strategy

DWER Bore Hydrographs : JM2

Appendix H2

Date : 23/04/2021 Job No. H20002



Source: Department of Water and Environmental Regulation (2021)

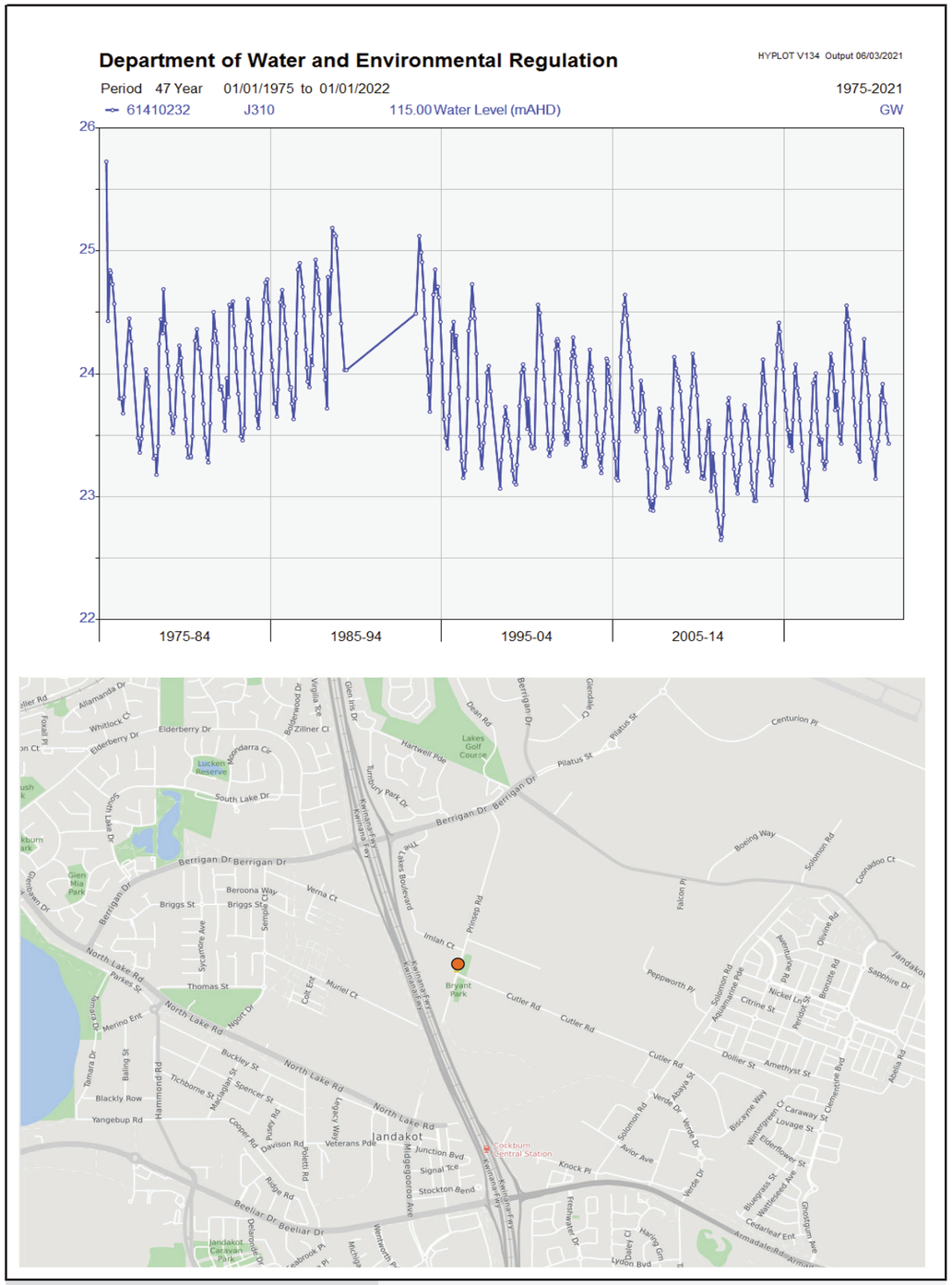
hyd2o

Glen Iris Jandakot Local Water Management Strategy

DWER Bore Hydrographs : JM45A

Appendix H3

Date : 23/04/2021 Job No. H2002



Source: Department of Water and Environmental Regulation (2021)

hyd2o

Glen Iris Jandakot Local Water Management Strategy

DWER Bore Hydrographs : J310

Appendix H4

APPENDIX I
UNDO Nutrient Modelling

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Project: Glen Iris Pre Development

Date: 26/04/2021

Version: Version 1.2.0.19289

Subregion name: Existing Golf Course

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	0	0.00	0.00	0.00
Industrial, commercial & schools	0	0.00	0.00	0.00
Rural living	0	0.00	0.00	0.00
Public open space	100	53.00	8427.00	360.40
Road reserve	0	0.00	0.00	0.00

Total area (ha)	Total percent (%)
53.00	100

Nitrogen input (kg/yr)	Phosphorus input (kg/yr)
8704.19	368.35

Nitrogen export (kg/yr)	Phosphorus (kg/yr)
656.38	2.46

Public Open Space (POS)

Landuse	Percent (%)	Area (ha)
Native gardens	0	0.00
Non-native gardens	0	0.00
Not fertilised	0	0.00
Nature	0	0.00
Sport	0	0.00
Recreation	0	0.00
Golf course	100	53.00
Bowling green	0	0.00
Impervious	0	0.00
Water body	0	0.00

Total area (ha)	Total percent (%)
53.00	100

Nitrogen input (kg)	Phosphorus input (kg)
8427.00	360.40

Soil and drainage information

Type of drainage	**Infiltration**	**Does it contain imported fill?**	**No**
Soil type	**Bassendean**	**Does subregion contain onsite sewage diposal system?**	**No**
Depth to groundwater (m)	**10**		
Groundwater slope (%)	**0.15**		
Soil PRI	**5.0**		

Note: Please attach the results of soil tests to this report when submitting.

Summary: Nutrient stripping devices

Treatment	Name	Size (m²)	Treated area (ha)	Treating	N removed (kg/yr)	P removed (kg/yr)
Load removed					**0.00**	**0.00**
Net export					**715.09**	**2.46**

Summary: Nutrient load exports

Region	Area (ha)	P export (kg/yr)	N export (kg/yr)
Existing Golf Course	53.00	2.46	656.38

PRE-TREATMENT LOAD (kg/yr)		LOAD REMOVED (kg/yr)		NET LOAD EXPORT (kg/yr)	
NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS
656.38	2.46	0.00	0.00	715.09	2.46

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Project: Glen Iris Post Development

Date: 26-Apr-21

Version: Version 1.2.0.19289

Subregion name: Lots & POS

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	68	27.03	2342.78	629.10
Industrial, commercial & schools	2	0.80	20.99	5.09
Rural living	0	0.00	0.00	0.00
Public open space	30	11.93	660.65	71.85
Road reserve	0	0.00	0.00	0.00

Total area (ha)	Total percent (%)
39.75	75

Nitrogen input (kg/yr)	Phosphorus input (kg/yr)
3232.31	712.00

Nitrogen export (kg/yr)	Phosphorus (kg/yr)
243.75	4.76

Residential

Size (m²)	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
<400	16	4.32	101.60	29.77
400-500 m²	0	0.00	0.00	0.00
501-600 m²	84	22.71	2241.18	599.34
601-730 m²	0	0.00	0.00	0.00
>730 m²	0	0.00	0.00	0.00
Multiple dwellings	0	0.00	0.00	0.00

Total area (ha)	Total percent (%)
27.03	68

Nitrogen input (kg)	Phosphorus input (kg)
2342.78	629.10

Commercial, Industry and Schools

Landuse	Percent (%)	Area (ha)
Light industrial	0	0.00
Heavy industrial	0	0.00
Commercial / Offices	100	0.80
Schools	0	0.00
Public buildings	0	0.00

Total area (ha)	Total percent (%)
0.80	2

Nitrogen input (kg)	Phosphorus input (kg)
20.99	5.09

Public Open Space (POS)

Landuse	Percent (%)	Area (ha)
Native gardens	25	2.98
Non-native gardens	20	2.39
Not fertilised	0	0.00
Nature	0	0.00
Sport	0	0.00
Recreation	50	5.96
Golf course	0	0.00
Bowling green	0	0.00
Impervious	5	0.60
Water body	0	0.00

Total area (ha)	Total percent (%)
11.93	30

Nitrogen input (kg)	Phosphorus input (kg)
660.65	71.85

Soil and drainage information

Type of drainage	**Infiltration**	**Does it contain imported fill?**	**No**
Soil type	**Bassendean**	**Does subregion contain onsite sewage diposal system?**	**No**
Depth to groundwater (m)	**10**		
Groundwater slope (%)	**0.15**		
Soil PRI	**5.0**		

Note: Please attach the results of soil tests to this report when submitting.

Subregion name: Roads

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	0	0.00	0.00	0.00
Industrial, commercial & schools	0	0.00	0.00	0.00
Rural living	0	0.00	0.00	0.00
Public open space	0	0.00	0.00	0.00
Road reserve	100	13.25	315.35	40.35

Total area (ha)	Total percent (%)
13.25	25

Nitrogen input (kg/yr)	Phosphorus input (kg/yr)
384.65	42.33

Nitrogen export (kg/yr)	Phosphorus (kg/yr)
23.34	1.98

Road reserve

Landuse	Percent (%)	Area (ha)
Roads	40	5.30
Road reserve - impervious	30	3.98
Road reserve - native garden	5	0.66
Road reserve - non-native garden	0	0.00
Road reserve - turf	20	2.65
Road reserve - not fertilised	5	0.66

Total area (ha)	Total percent (%)
13.25	100

Nitrogen input (kg)	Phosphorus input (kg)
315.35	315.35

Soil and drainage information

Type of drainage	**Piped drainage**	**Does it contain imported fill?**	**No**
Soil type	**Bassendean**	**Does subregion contain onsite sewage diposal system?**	**No**
Depth to groundwater (m)	**10**		
Groundwater slope (%)	**0.15**		
Soil PRI	**5.0**		

Note: Please attach the results of soil tests to this report when submitting.

Summary: Nutrient stripping devices

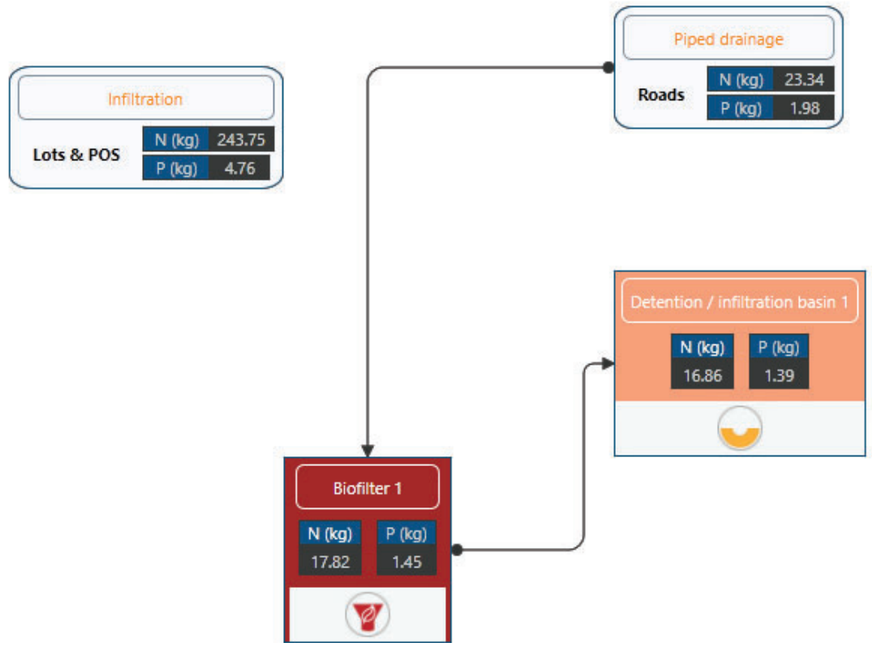
Treatment	Name	Size (m²)	Treated area (ha)	Treating	N removed (kg/yr)	P removed (kg/yr)
Biofilter	Biofilter 1	5300.00	13.25	Sandy soils – Runoff only (infiltration on lots)	5.52	0.53
Detention / infiltration basin	Detention / infiltration basin 1	15900.00	13.25	Sandy soils – Runoff only (infiltration on lots)	0.96	0.06
Load removed					**6.48**	**0.59**
Net export					**260.61**	**6.15**

Summary: Nutrient load exports

Region	Area (ha)	P export (kg/yr)	N export (kg/yr)
Lots & POS	39.75	4.76	243.75
Roads	13.25	1.98	23.34

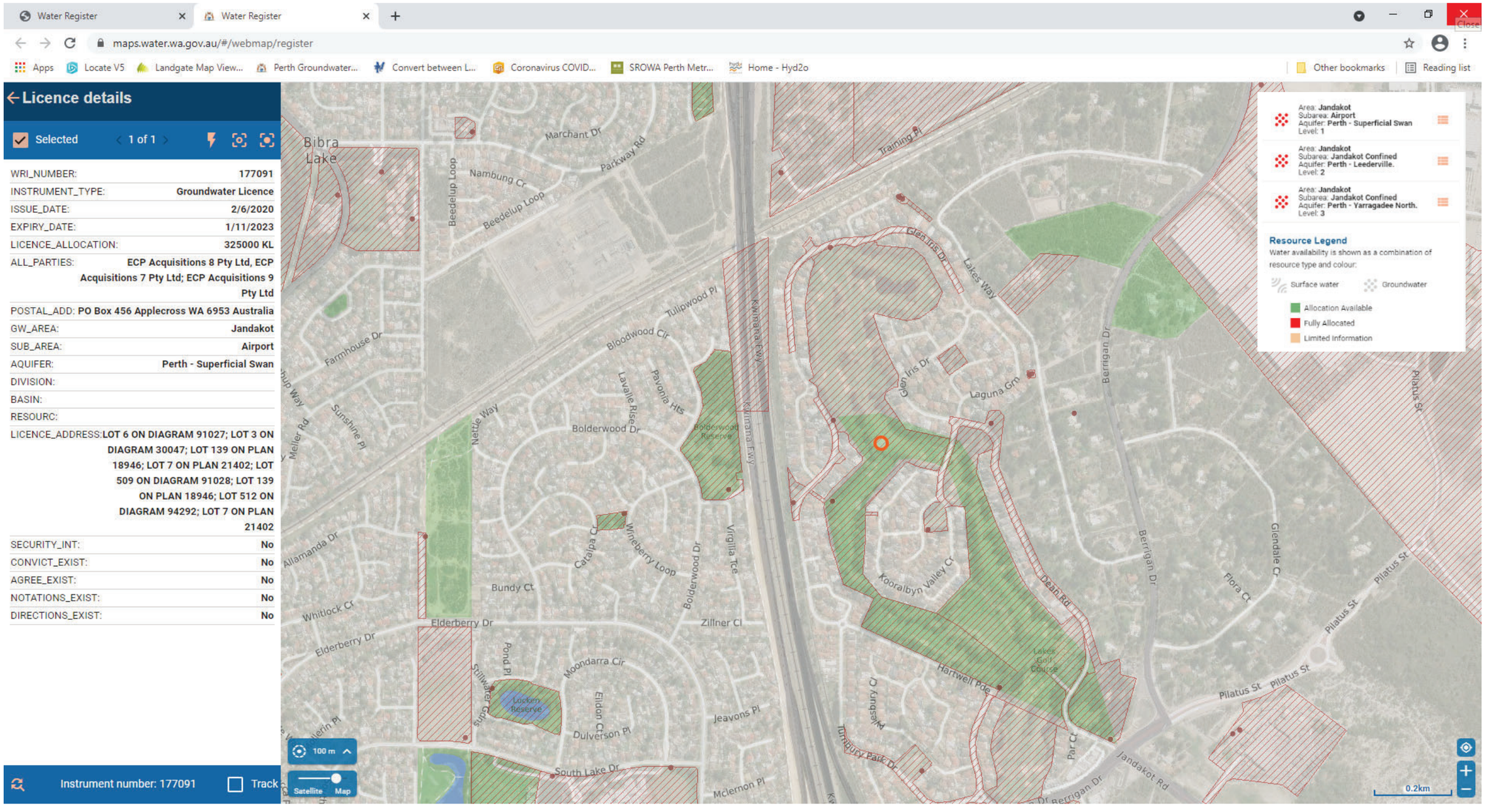
PRE-TREATMENT LOAD (kg/yr)		LOAD REMOVED (kg/yr)		NET LOAD EXPORT (kg/yr)	
NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS
267.09	6.74	6.48	0.59	260.61	6.15

Treatment diagram



APPENDIX J
Groundwater Licence & Water Register Extracts

DWER WATER REGISTER EXTRACT



File No:
DWERVT5684

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Instrument No. GWL177091(2)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	ECP Acquisitions 8 Pty Ltd ECP Acquisitions 7 Pty Ltd ECP Acquisitions 9 Pty Ltd		
Description of Water Resource	Jandakot Perth - Superficial Swan	**Annual Water Entitlement**	325,000kL
Location of Water Source	Lot 139 On Plan 18946 Volume/Folio 1947/547 Lot 139 Imlah Ct Jandakot Back Nine Lot 7 On Plan 21402 Volume/Folio 2195/189 Lot 7 Jandakot Hartwell Paw		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Irrigation of up to 29 ha of golf course	LOT 139 ON PLAN 18946 - Volume/Folio 1947/547 - Lot 139 Lot 139 On Plan 18946 Volume/Folio 1947/547 Lot 139 Imlah Ct Jandakot Back Nine LOT 3 ON DIAGRAM 30047 - Volume/Folio 2190/500 - Lot 3 DEAN RD JANDAKOT LOT 509 ON DIAGRAM 91028 - Volume/Folio 2183/871 - Lot 509 DEAN RD JANDAKOT LOT 512 ON DIAGRAM 94292 - Volume/Folio 2183/872 - Lot 512 LOT 6 ON DIAGRAM 91027 - Volume/Folio 2765/992 - Lot 6 LOT 7 ON PLAN 21402 - Volume/Folio 2195/189 - Lot 7 Lot 7 On Plan 21402 Volume/Folio 2195/189 Lot 7 Jandakot Hartwell Paw
Duration of Licence	From 2 June 2020 to 1 November 2023	

This Licence is subject to the following terms, conditions and restrictions:

1. The annual water year for water taken under this licence is defined as 1 July to 30 June.

2. The licensee shall not use water for irrigation between 9 am and 6 pm except for the establishment of newly planted areas. For newly planted areas water may be used within these hours for a period of up to 28 consecutive days, commencing from the date of planting.

3. Between 1 June and 31 August in any year, the licence-holder must not water a lawn, garden, or grass-covered area ("turf") by reticulation, provided always that this restriction shall not apply; watering with a hand held hose; or watering, by way of reticulation: golf course tees and greens, turf wickets, bowling greens and active sporting areas; newly planted areas for a period of up to 28 days from the date of planting; for renovating turf; or for maintenance of reticulation systems

End of terms, conditions and restrictions

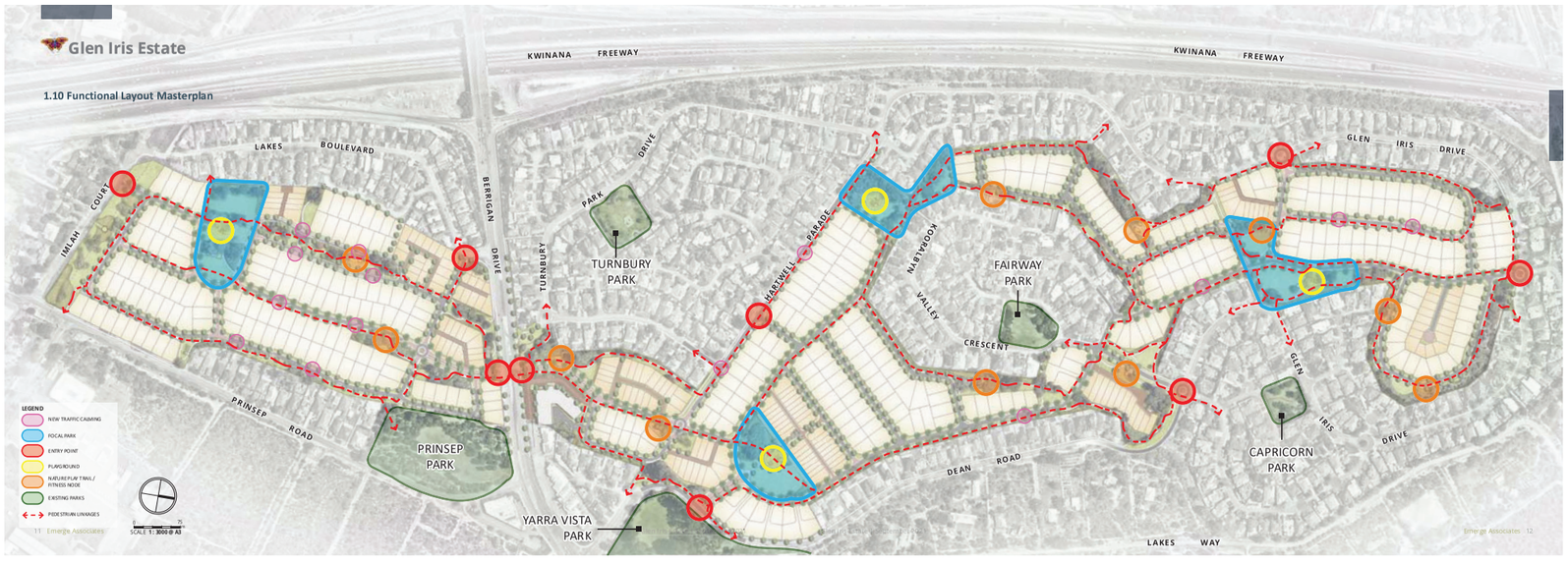
This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000.

APPENDIX K
Landscape Masterplan

Glen Iris Estate

1.9 Landscape Masterplan





APPENDIX L
Post Development Catchments & Runoff Rate Estimation

Land Use Breakdown and EIA's for Individual Subcatchments - Modelling Purposes

Internal Catchments

		Area (ha)									
		Lots (R20)	Group Housing (R30)	Lots (R40)	Commercial	POS	Road Res	Indicative GH Roads / Lanes	Total	15mm EIA	1% AEP EIA
1	A1	1.00	0.53	0.00	0.00	0.83	0.71	0.15	3.22	0.61	1.21
2	A2	0.42	0.00	0.00	0.00	0.17	0.26	0.00	0.85	0.18	0.31
3	A3	0.55	0.00	0.00	0.00	0.27	0.25	0.00	1.07	0.17	0.34
4	A4	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.04
5	B1	1.84	0.00	0.00	0.00	0.25	0.66	0.00	2.75	0.46	0.92
6	B2	0.52	0.00	0.00	0.00	0.11	0.25	0.00	0.88	0.17	0.32
7	B3	1.17	0.31	0.00	0.00	0.39	0.56	0.05	2.49	0.43	0.90
8	C1	0.44	0.00	0.00	0.00	0.13	0.25	0.00	0.82	0.17	0.31
9	D1	0.00	0.43	0.00	0.00	0.33	0.05	0.12	0.93	0.13	0.35
10	D2	0.05	0.00	0.00	0.00	0.11	0.17	0.00	0.33	0.12	0.17
11	D3	0.76	0.02	0.00	0.00	0.25	0.55	0.01	1.59	0.38	0.64
12	D4	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.16	0.00	0.02
13	E1	1.61	0.00	0.00	0.00	0.34	0.50	0.00	2.45	0.34	0.75
14	E2	0.41	0.00	0.00	0.00	0.52	0.29	0.00	1.22	0.20	0.38
15	F1	0.33	0.00	0.00	0.00	0.08	0.16	0.00	0.57	0.11	0.20
16	F2	0.01	0.00	0.00	0.00	0.33	0.00	0.00	0.34	0.00	0.04
17	G1	0.89	0.00	0.00	0.00	0.59	0.13	0.04	1.65	0.12	0.37
18	G2	1.46	0.00	0.00	0.00	0.19	0.61	0.00	2.25	0.42	0.80
19	H1	3.28	0.00	0.86	0.00	0.88	1.29	0.09	6.40	1.42	2.35
20	H2	0.35	0.08	0.00	0.00	0.10	0.18	0.00	0.71	0.12	0.26
21	I1	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.28	0.09	0.13
22	J1	0.21	0.59	0.00	0.00	0.12	0.29	0.12	1.33	0.29	0.62
23	J2	0.13	0.00	0.00	0.00	0.18	0.15	0.00	0.46	0.11	0.17
24	J3	0.28	0.47	0.00	0.70	0.51	0.53	0.12	2.60	0.46	0.84
25	K1	0.93	0.00	0.00	0.00	0.11	0.50	0.00	1.54	0.34	0.60
26	K2	0.10	0.28	0.00	0.00	0.17	0.28	0.03	0.86	0.22	0.41
27	K3	1.03	0.10	0.00	0.00	0.19	0.46	0.02	1.80	0.33	0.65
28	K4	0.49	0.72	0.00	0.00	0.10	0.37	0.16	1.84	0.38	0.83
29	L1	0.36	0.00	0.00	0.00	0.14	0.00	0.00	0.50	0.00	0.08
30	L2	0.40	0.27	0.00	0.00	0.23	0.17	0.04	1.11	0.15	0.38
31	L3	0.43	0.00	0.00	0.00	0.21	0.12	0.00	0.77	0.09	0.21
32	L4	1.40	0.00	0.00	0.00	1.08	0.64	0.00	3.13	0.44	0.92
33	M1	1.16	0.00	0.00	0.00	0.25	0.44	0.00	1.85	0.30	0.61
34	M2	1.16	0.00	0.00	0.00	0.82	0.49	0.00	2.48	0.34	0.72
35	M3	0.63	0.00	0.00	0.00	0.17	0.24	0.00	1.04	0.16	0.33
	Total	24.02	3.82	0.86	0.70	10.45	11.67	0.95	52.46	9.26	18.17

External Catchments

		Area (ha)					
		Lots (R20)	POS	Road Res	Total	15mm EIA	1% AEP EIA
1	AExt1	3.30	0.00	0.99	4.29	0.68	1.44
2	AExt2	3.85	0.00	1.12	4.97	0.77	1.64
3	AExt3	1.33	0.01	0.41	1.75	0.28	0.59
4	BExt1	2.63	0.00	0.94	3.57	0.65	1.27
5	EExt1	2.92	0.01	1.08	4.01	0.75	1.44
6	EExt2	2.71	0.18	1.02	3.92	0.70	1.38
7	ExtD1	7.04	0.34	2.76	10.14	1.91	3.65
8	ExtI1	0.72	0.00	0.67	1.39	0.46	0.70
9	ExtJ1	3.40	0.00	1.44	4.84	0.99	1.84
10	ExtK1	0.91	0.07	0.42	1.40	0.29	0.53
11	ExtL1	2.39	0.00	0.70	3.09	0.48	1.02
12	ExtL2	0.80	0.00	0.31	1.11	0.21	0.41
13	FExt1	0.98	0.01	0.25	1.24	0.17	0.39
14	GExt1	1.11	0.00	0.76	1.87	0.52	0.84
15	GExt2	3.04	0.25	1.04	4.33	0.72	1.46
16	HExt1	1.80	0.00	0.69	2.49	0.48	0.91
17	HExt2	1.33	0.00	0.51	1.84	0.35	0.67
	Total	40.27	0.88	15.09	56.24	10.41	20.17

CURRV

Calculator for Urban Runoff Rates & Volumes
16/09/2021

Project: Glen Iris Jandakot LWMS

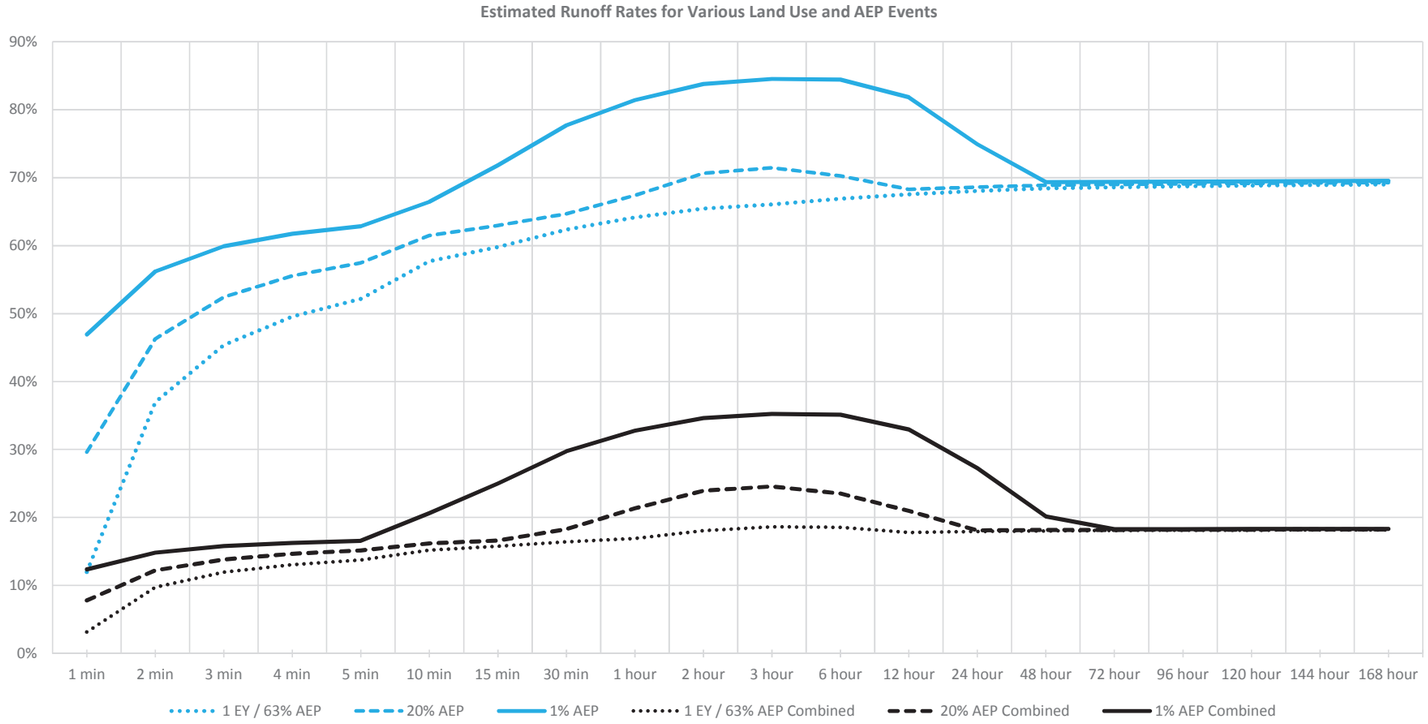
	Land Use Description	Area (ha)	Use in Calc	Imperv Initial Loss mm	Perv Initial Loss mm	Perv Continue Loss mm/hr	On Site Soak (mm)	Empty (days)	AR&R EIA/TIA System Connect Ratio	Roof %	Ext Imp %	Ext Perv %	Comment
1	Residential Lots : R20	24.02	Yes	1.5	20.0	4.0	15.0	0.25	60%	23.5	6.5	20	Soakwells, Assume only Front of Lot Runoff Contribution
2	Group Housing	3.82	Yes	1.5	20.0	4.0	15.0	0.25	60%	65	20	15	Soakwells with Overflow Connection Assumed (R30 Equiv)
3	Residential Lots : R40	0.86	Yes	1.5	20.0	4.0	0.0	0.25	60%	70	20	10	Lot Connections Assumed - Conservative
4	Commercial	0.70	Yes	1.5	20.0	4.0	0.0	0.25	0%	60	35	5	Assumed Water Managed On Site - No Contribution to Estate Storages
5	Public Open Space	10.45	Yes	1.5	20.0	4.0	0.0	0.25	20%	0	5	95	Impervious Allowance for Paths/Hardstand Areas
6	Road Reserve	11.67	Yes	1.5	20.0	4.0	0.0	0.25	100%	0	70	30	
7	Indicative GH Roads & Laneways	0.95	Yes	1.5	20.0	4.0	0.0	0.25	100%	0	80	20	
8	External Catchment : Lots	40.27	Yes	1.5	20.0	4.0	15.0	0.25	60%	23.5	6.5	20	Existing Developed Area
9	External Catchment : Road Reserve	15.09	Yes	1.5	20.0	4.0	0.0	0.25	100%	0	70	30	Existing Developed Area
10	External Catchment : POS	0.88	Yes	1.5	20.0	4.0	0.0	0.25	20%	0	5	95	Existing Developed Area
	Total Area :	108.71											

EIA : Effective Impervious Area, TIA : Total Impervious Area

Land Use Graph Selector: **6**

(11 - combined total)

Road Reserve



Rainfall IFD Data (via Bureau of Meterology)
Annual Exceedence Probability / ARI

	Duration	63.2% 1.00	50% 1.44	20% 4.48	10% 10	5% 20	2% 50	1% 100
1	1 min	1.8	2.0	2.6	3.0	3.5	4.1	4.6
2	2 min	3.2	3.5	4.4	5.1	5.8	6.8	7.6
3	3 min	4.3	4.7	6.0	6.9	7.9	9.3	10.4
4	4 min	5.1	5.6	7.3	8.5	9.7	11.3	12.7
5	5 min	5.9	6.5	8.4	9.8	11.2	13.1	14.7
6	10 min	8.5	9.4	12.3	14.4	16.5	19.4	21.6
7	15 min	10.3	11.4	14.9	17.4	19.9	23.3	26.1
8	30 min	13.7	15.1	19.7	22.9	26.2	30.7	34.3
9	1 hour	17.9	19.6	25.3	29.4	33.6	39.6	44.4
10	2 hour	23.0	25.1	32.2	37.6	43.2	51.4	58.2
11	3 hour	26.6	29.0	37.3	43.6	50.4	60.3	68.8
12	6 hour	34.0	37.0	47.9	56.4	65.6	79.5	91.5
13	12 hour	42.9	47.0	61.1	72.2	84.2	102.0	118.0
14	24 hour	53.5	58.6	76.4	89.8	104.0	125.0	143.0
15	48 hour	65.9	72.3	93.2	108.0	123.0	144.0	161.0
16	72 hour	74.7	82.0	105.0	120.0	134.0	155.0	171.0
17	96 hour	82.5	90.3	114.0	130.0	145.0	165.0	181.0
18	120 hour	89.7	98.1	123.0	140.0	155.0	177.0	193.0
19	144 hour	96.9	106.0	133.0	150.0	167.0	190.0	207.0
20	168 hour	104.0	114.0	143.0	161.0	179.0	205.0	224.0

Estimated Runoff Rates
Annual Exceedence Probability / ARI

	63.2% 1.00	50% 1.44	20% 4.48	10% 10	5% 20	2% 50	1% 100
Maximum of All Events	2%	3%	8%	11%	14%	16%	18%
Residential Lots : R20	5%	9%	19%	25%	30%	35%	38%
Group Housing	53%	53%	53%	54%	55%	56%	56%
Residential Lots : R40	0%	0%	0%	0%	0%	0%	0%
Commercial	1%	1%	4%	6%	8%	10%	11%
Public Open Space	69%	69%	71%	76%	79%	82%	85%
Road Reserve	79%	79%	80%	83%	85%	87%	89%
Indicative GH Roads & Laneways	2%	3%	8%	11%	14%	16%	18%
External Catchment : Lots	69%	69%	71%	76%	79%	82%	85%
External Catchment : Road Reserve	1%	1%	4%	6%	8%	10%	11%
External Catchment : POS	**19%**	**20%**	**25%**	**28%**	**31%**	**33%**	**35%**
combined total							

Event Selector: **1** — 1 min

Residential Lots : R20	0%	0%	0%	0%	0%	0%	0%
Group Housing	0%	0%	0%	0%	0%	0%	0%
Residential Lots : R40	9%	14%	23%	27%	31%	34%	36%
Commercial	0%	0%	0%	0%	0%	0%	0%
Public Open Space	0%	0%	0%	1%	1%	1%	1%
Road Reserve	12%	18%	30%	35%	40%	44%	47%
Indicative GH Roads & Laneways	14%	20%	34%	40%	45%	51%	54%
External Catchment : Lots	0%	0%	0%	0%	0%	0%	0%
External Catchment : Road Reserve	12%	18%	30%	35%	40%	44%	47%
External Catchment : POS	0%	0%	0%	1%	1%	1%	1%
combined total	**3%**	**5%**	**8%**	**9%**	**10%**	**12%**	**12%**

APPENDIX M
Post Development Stormwater Modelling

Post Development Stormwater Modelling Detailed Results : Individual Catchments

							15mm Event : Water Quality Treatment						20% AEP Event							1% AEP Event					
	Contributing Catchments	Storage Type	Storage Invert (mAHD)	AAMGL (mAHD)	MGL (mAHD)	Inv above AAMGL (m)	EIA (ha)	K (m/d)	Flood Rise (m)	Top Water Level (mAHD)	TWL Area (m2)	Reqd Volume (m3)	20%/1% AEP EIA (ha)	Effective K (m/d)	Flood Rise (m)	Top Water Level (mAHD)	TWL Area (m2)	Reqd Volume (m3)	Critical Duration (hr)	Effective K (m/d)	Flood Rise (m)	Top Water Level (mAHD)	TWL Area (m2)	Reqd Volume (m3)	Critical Duration (hr)
S1	A1	Basin	34.6	22.4	23.1	12.2	0.61	2.5	0.30	34.90	298	67	1.21	8.8	0.59	35.19	460	177	1	12.1	0.89	35.49	654	343	12
S2	A2	Swale	36.7	19.9	20.6	16.8	0.18	2.5	0.29	36.99	105	18	0.31	4.9	0.51	37.21	186	49	1	5.5	0.71	37.41	272	95	12
S3	AExt1 & A4	Undergound	34.0	19.9	20.6	14.1	0.69	-	-	-	-	-	1.48	6.9	0.46	34.46	495	228	1	6.9	1.45	35.45	495	718	12
S4	AExt2	Undergound	33.5	22.4	23.1	11.1	0.77	-	-	-	-	-	1.64	20.0	0.50	34.00	343	172	1	20.0	1.48	34.98	343	508	12
S5	AExt3 & A3	Basin	36.7	22.2	22.9	14.5	0.45	2.5	0.30	37.00	244	48	0.93	9.0	0.54	37.24	394	124	1	11.0	0.80	37.50	575	250	12
S6	B1	Basin	25.4	22.3	23.0	3.1	0.46	2.5	0.29	25.69	212	48	0.92	7.5	0.61	26.01	342	135	12	9.4	0.94	26.34	507	275	12
S7	B2	Swale	26.8	22.1	22.8	4.7	0.17	2.5	0.29	27.09	117	16	0.32	8.0	0.43	27.23	181	37	1	9.4	0.62	27.42	279	81	12
S8	B3 & BExt1	Basin	24.4	22.4	23.1	2.0	1.08	2.5	0.30	24.70	504	116	2.17	6.4	0.68	25.08	831	369	1	8.1	1.06	25.46	1200	753	12
S9	C1	Swale	25.9	22.4	23.1	3.5	0.17	2.5	0.30	26.20	121	18	0.31	8.9	0.41	26.31	172	34	1	10.5	0.60	26.50	268	75	12
S10	D1	Swale	26.8	22.8	23.5	4.0	0.13	2.5	0.27	27.07	92	12	0.35	10.3	0.48	27.28	177	40	1	13.6	0.61	27.41	237	67	12
S11	D2	Swale	27.0	22.8	23.5	4.2	0.12	2.5	0.26	27.26	88	11	0.17	6.8	0.34	27.34	119	19	1	9.4	0.45	27.45	164	35	12
S12	D3	Swale	26.0	22.9	23.6	3.1	0.38	2.5	0.29	26.29	256	37	0.64	9.8	0.34	26.34	384	64	1	11.9	0.47	26.47	539	124	12
S13	D4 & DExt1	Basin	25.5	22.8	23.5	2.7	1.91	-	-	-	-	-	3.67	14.0	0.93	26.43	687	541	12	14.0	1.98	27.48	955	1400	12
S14	E1	Swale	24.7	22.5	23.2	2.2	0.34	2.5	0.30	25.00	229	34	0.75	6.1	0.54	25.24	431	113	1	8.1	0.73	25.43	602	211	12
S15	E2 & EExt1	Basin	24.5	22.3	23.0	2.2	0.95	2.5	0.29	24.79	424	102	1.82	8.8	0.62	25.12	618	273	1	11.4	1.00	25.50	880	556	12
S16	EExt2	Underground	23.0	22.5	23.2	0.5	0.70	-	-	-	-	-	1.38	11.0	0.53	23.53	360	191	1	11.0	1.50	24.50	360	540	12
S17	F1	Swale	26.0	22.5	23.2	3.5	0.11	2.5	0.28	26.28	79	11	0.20	9.6	0.34	26.34	119	19	1	12.0	0.46	26.46	169	36	12
S18	F2 & FExt1	Basin	25.7	22.5	23.2	3.2	0.17	2.5	0.28	25.98	91	17	0.42	10.7	0.55	26.25	165	51	1	13.4	0.77	26.47	242	96	12
S19	G1 & GExt1 & GExt2	Basin	25.3	22.7	23.4	2.6	1.36	2.5	0.28	25.58	606	147	2.67	3.7	0.62	25.92	1165	572	3	4.1	1.13	26.43	1630	1282	12
S20	G2	Swale	26.0	22.9	23.6	3.1	0.42	2.5	0.30	26.30	283	42	0.80	10.2	0.36	26.36	451	80	1	12.2	0.50	26.50	636	156	12
S21	H1 & HExt1	Basin	25.3	23.2	23.9	2.1	1.90	2.5	0.29	25.59	804	203	3.26	7.5	0.63	25.93	1073	521	1	10.5	1.06	26.36	1461	1064	12
S22	H2 & HExt2	Underground	23.7	23.2	23.9	0.5	0.47	-	-	-	-	-	0.93	17.0	0.62	24.32	185	115	1	17.0	1.48	25.18	185	274	1
S23	I1 & IExt1	Swale	24.7	23.2	23.9	1.5	0.56	2.5	0.27	24.97	353	58	0.83	6.3	0.41	25.11	503	118	1	10.6	0.54	25.24	647	193	12
S24	J1	Basin	25.6	23.2	23.9	2.4	0.29	2.5	0.29	25.89	141	30	0.62	9.7	0.58	26.18	237	84	1	13.2	0.82	26.42	334	153	12
S25	J2	Swale	26.0	23.2	23.9	2.8	0.11	2.5	0.28	26.28	79	11	0.17	7.5	0.38	26.38	112	20	1	10.5	0.49	26.49	152	35	12
S26	J3 & JExt1	Basin	25.3	23.2	23.9	2.1	1.45	2.5	0.30	25.60	676	157	2.67	3.7	0.74	26.04	1234	595	6	4.1	1.16	26.46	1777	1225	12
S27	K1	Swale	27.0	23.2	23.9	3.8	0.34	2.5	0.27	27.27	237	32	0.60	8.6	0.37	27.37	375	68	1	11.0	0.50	27.50	516	126	12
S28	K2	Basin	26.8	23.2	23.9	3.6	0.22	2.5	0.28	27.08	125	23	0.41	8.9	0.46	27.26	192	51	1	12.2	0.65	27.45	272	95	12
S29	K3	Basin	26.6	23.3	24.0	3.3	0.33	2.5	0.30	26.90	160	35	0.65	9.7	0.55	27.15	251	86	1	12.2	0.83	27.43	373	172	12
S30	K4	Basin	26.6	23.1	23.8	3.5	0.38	2.5	0.30	26.90	187	40	0.83	9.6	0.59	27.19	311	112	1	13.1	0.85	27.45	443	209	12
S31	KExt1	Underground	24.5	23.1	23.8	1.4	0.29	-	-	-	-	-	0.53	20.0	0.62	25.12	98	61	1	20.0	1.50	26.00	98	146	1
S32	L1 & LExt1	Undergound	23.6	23.2	23.9	0.4	0.48	-	-	-	-	-	1.10	20.0	0.77	24.37	124	96	1	20.0	1.47	25.07	124	182	1
S33	L2	Swale	25.7	23.2	23.9	2.5	0.15	2.5	0.29	25.99	85	15	0.38	11.4	0.52	26.22	150	42	1	13.9	0.73	26.43	223	81	12
S34	L3	Swale	25.8	23.2	23.9	2.6	0.09	2.5	0.29	26.09	52	9	0.21	10.2	0.50	26.30	96	24	1	13.7	0.64	26.44	132	40	12
S35	L4	Basin	25.6	23.4	24.1	2.2	0.44	2.5	0.28	25.88	219	47	0.92	8.9	0.57	26.17	345	128	1	12.3	0.85	26.45	489	244	12
S36	LExt2	Undergound	23.5	23.3	24.0	0.2	0.21	-	-	-	-	-	0.41	20.0	0.81	24.31	38	31	1	20.0	1.50	25.00	38	57	1
S37	M1	Swale	24.8	23.4	24.1	1.4	0.30	2.5	0.28	25.08	213	29	0.61	7.3	0.46	25.26	362	81	1	9.4	0.62	25.42	502	150	12
S38	M2	Basin	24.5	23.6	24.3	0.9	0.34	2.5	0.30	24.80	168	37	0.72	5.2	0.67	25.17	314	125	6	6.0	1.00	25.50	476	254	12
S39	M3	Basin	24.7	23.4	24.1	1.3	0.16	2.5	0.29	24.99	87	16	0.33	8.1	0.51	25.21	147	42	1	9.8	0.74	25.44	224	84	12
										Total	**7335**	**1486**				Total	**14227**	**5688**					Total	**19473**	**12385**	
																Total (ex UG)	**12584**	**4794**					Total (ex UG)	**17830**	**9960**	

Underground storage inverts dictated by surveyed inverts of existing pipework

Effective K shown in table above represents a combination of K for the biofilter area and K for the larger flood area , considering the relative areas of inundation

APPENDIX N
Indicative Storage Cross Sections & Landscape Overlay

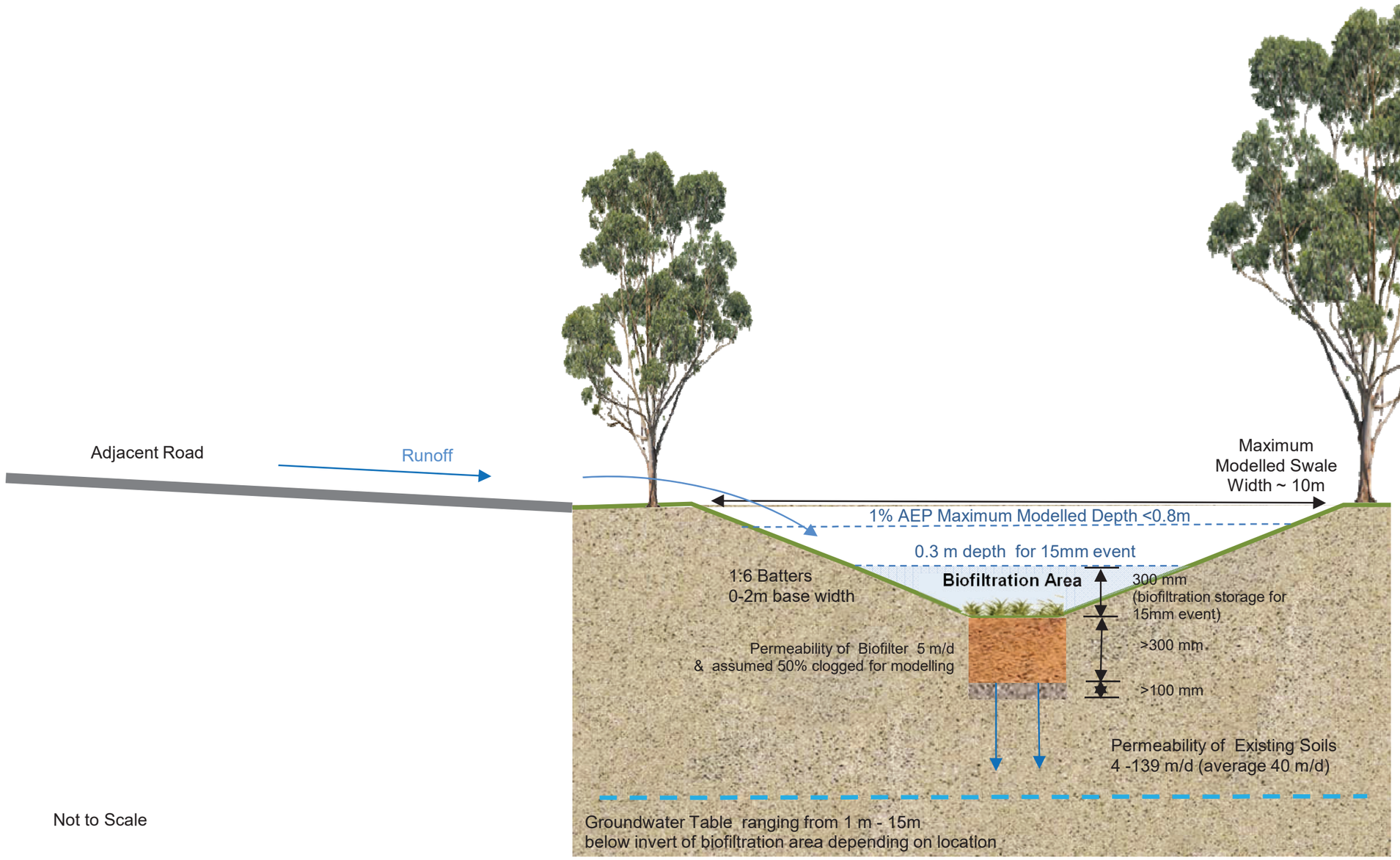
Date: 16/09/2021 Job No. H20002



Site Boundary
Catchments
Biofiltration Area
Basin/Swale Flood Storage
Underground Flood Storage
Existing Pipework/ Outlet

hyd2o
Glen Iris Jandakot Local Water Management Strategy
Stormwater Management Landscape Overlay
Appendix N

Date: 25/5/2021 Job No H20002



Not to Scale

Swale cross section shown indicative for modelling purposes
Actual depth and width to vary based on individual detailed design requirements at each location at UWMP stage

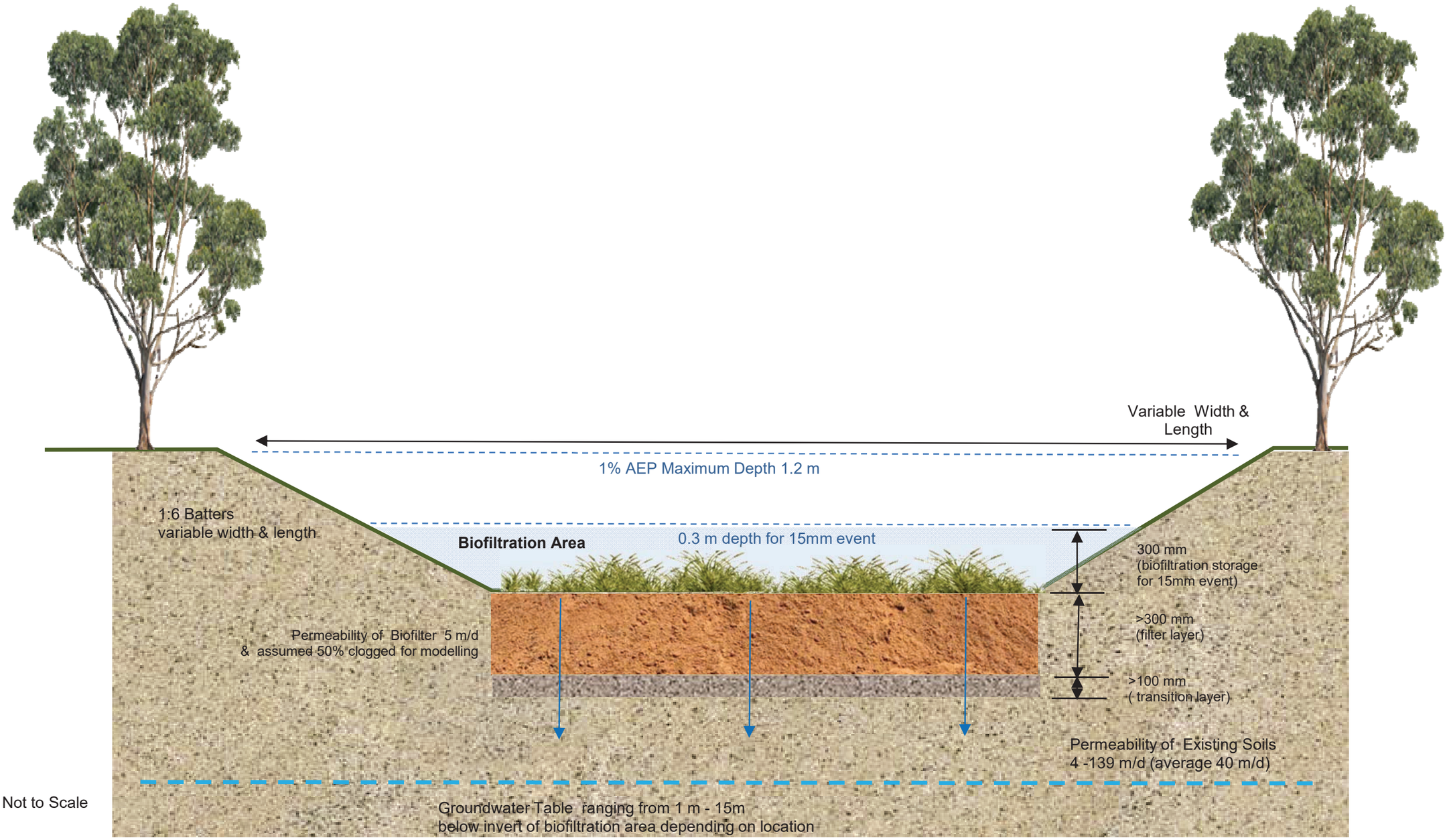
hyd$_2$o

Glen Iris Jandakot Local Water Management Strategy

Typical Modelled Swale Cross Section

Appendix N1

Date: 25/5/2021 Job No H20002



Not to Scale

Basin cross section shown indicative for modelling purposes
Actual depth and width to vary based on individual detailed design requirements at each location at UWMP stage

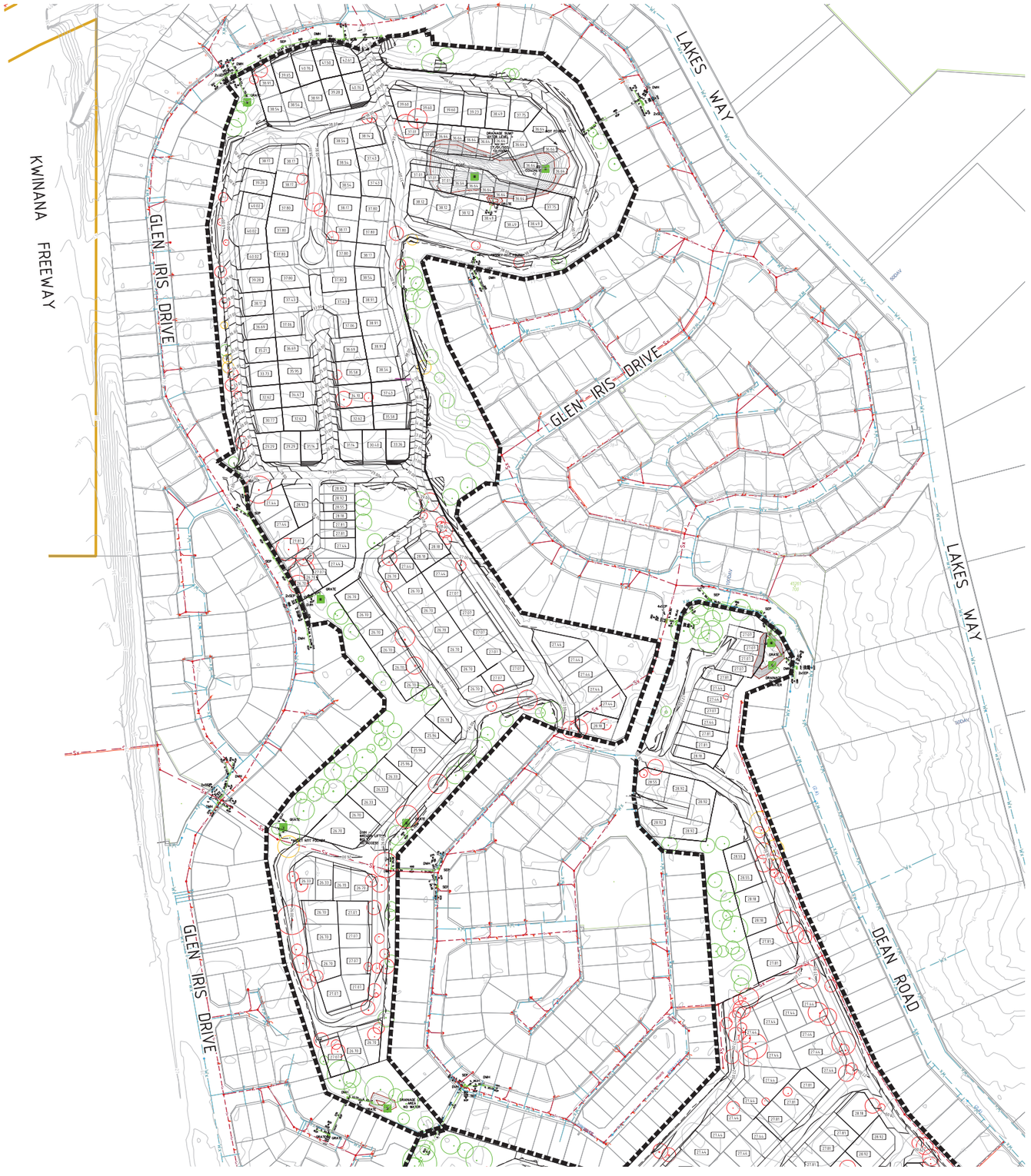
hyd$_2$o

Glen Iris Jandakot Local Water Management Strategy

Typical Modelled Basin Cross Section

Appendix N2

APPENDIX O
Engineering Drawings



LEGEND

- LIMIT OF WORKS
- 43.15 PROPOSED LOT LEVEL
- PROPOSED CONTOURS (0.25m INTERVAL)
- EXISTING CONTOURS (0.25m INTERVAL)
- PROPOSED RETAINING WALL
- PROPOSED ROAD
- EXISTING EMBANKMENT
- PROPOSED BATTER
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- EXISTING TREE POSSIBLY REMAIN
- Sx EXISTING SEWER
- Rx EXISTING RISING MAIN
- Wx EXISTING WATER
- Dx EXISTING DRAINAGE
- NBNx EXISTING NBN
- Gx EXISTING GAS
- Ex EXISTING UNDERGROUND POWER
- HVx EXISTING HV UNDERGROUND POWER
- OHx EXISTING OVERHEAD POWER

0 20 40 80 120m
SCALE 1:2000 @ ORIGINAL SHEET SIZE A1

REV	DATE	DRAWN	CHECKED	APPROVED	
A		MS			ISSUED FOR INFORMATION

COPYRIGHT
This drawing is copyright and the property of JDSi Pty Ltd (JDSi). Use without written permission from JDSi constitutes an infringement of copyright.
This document and the information are solely for the use of the authorised recipient and may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by JDSi.

NOTE
This drawing shall be preliminary only until it is Issued for Construction.
Certified Quality System to ISO 9001

JDSi CONSULTING ENGINEERS
Workzone, Level 6, 1 Nash Street, Perth WA 6000
P: (08) 9227 0595 F: (08) 9227 8617

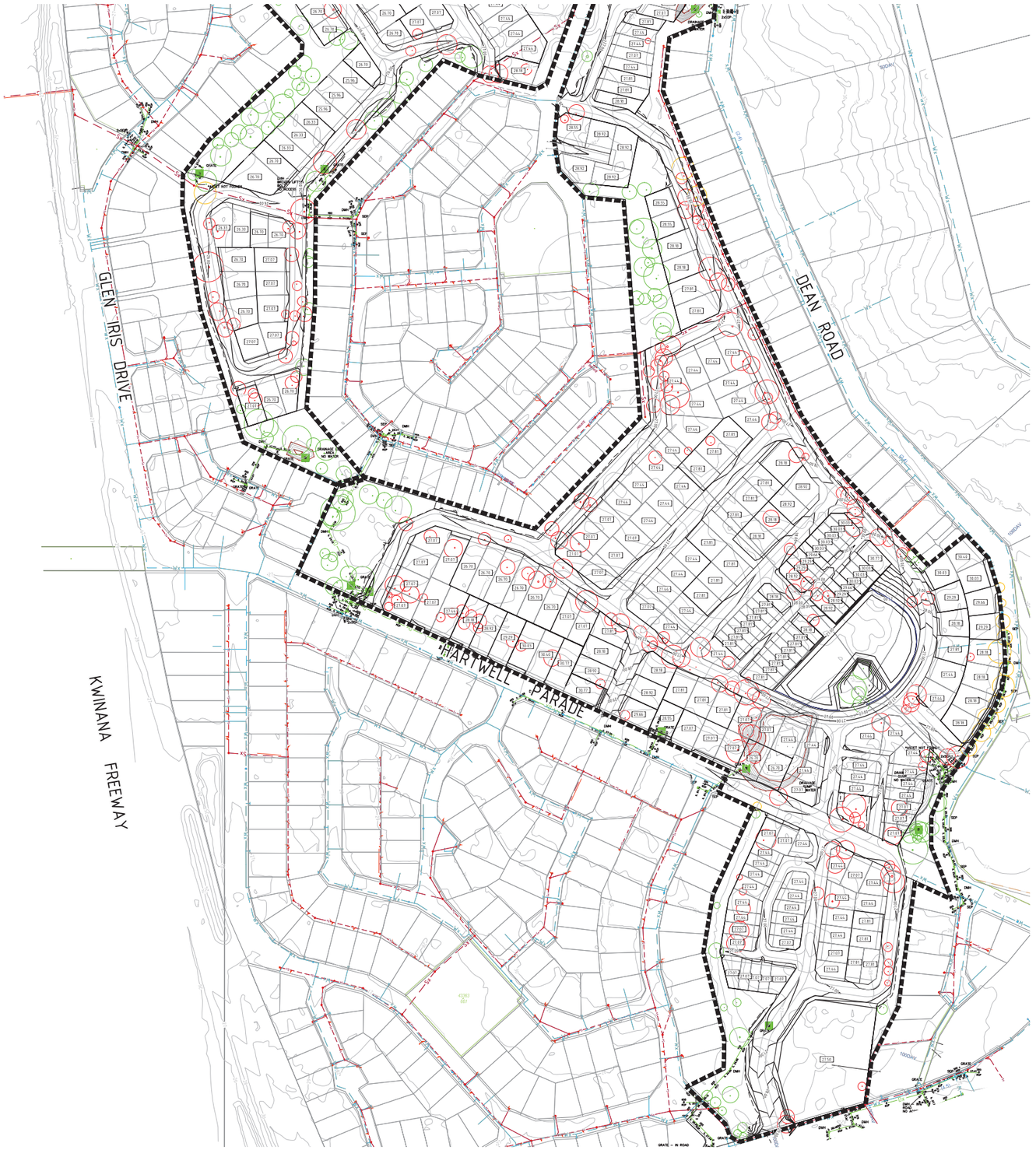
CLIENT: EASTCOURT

PROJECT: GLEN IRIS ESTATE

DRAWING TITLE: EARTHWORKS PLAN SHEET 1 OF 3

DRAWN: M. SMITHERS	WAPC No.
DESIGNED: B. TREW	SCALE @ A1: 1:2000
PROJECT MANAGER: S. FOLEY	DATUM: AHD / CO-ORDS: PCG94
JDSI PROJECT No.: JDS201817	DRAWING No.: SK103 / REVISION: A

Plotted By: jjones Plot Date: 12/04/21 - 14:46 Cad File: I:\JDS201817\02 CIVIL\Drawings\Sketches\JDS201817_SK103-105.dwg



LEGEND

- LIMIT OF WORKS
- 43.15 PROPOSED LOT LEVEL
- PROPOSED CONTOURS (0.25m INTERVAL)
- EXISTING CONTOURS (0.25m INTERVAL)
- PROPOSED RETAINING WALL
- PROPOSED ROAD
- EXISTING EMBANKMENT
- PROPOSED BATTER
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- EXISTING TREE POSSIBLY REMAIN
- Sx EXISTING SEWER
- Rx EXISTING RISING MAIN
- Wx EXISTING WATER
- Dx EXISTING DRAINAGE
- NBNx EXISTING NBN
- Gx EXISTING GAS
- Ex EXISTING UNDERGROUND POWER
- HVx EXISTING HV UNDERGROUND POWER
- OHx EXISTING OVERHEAD POWER

0 20 40 80 120m
SCALE 1:2000 @ ORIGINAL SHEET SIZE A1

REV	DATE	DRAWN	CHECKED	APPROVED	
A		MS			ISSUED FOR INFORMATION

COPYRIGHT
This drawing is copyright and the property of JDSi Pty Ltd (JDSi). Use without written permission from JDSi constitutes an infringement of copyright.
This document and the information are solely for the use of the authorised recipient and may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by JDSi.

NOTE
This drawing shall be preliminary only until it is Issued for Construction.
Certified Quality System to ISO 9001

JDSi CONSULTING ENGINEERS
Workzone, Level 6, 1 Nash Street, Perth WA 6000
P: (08) 9227 0595 F: (08) 9227 8617

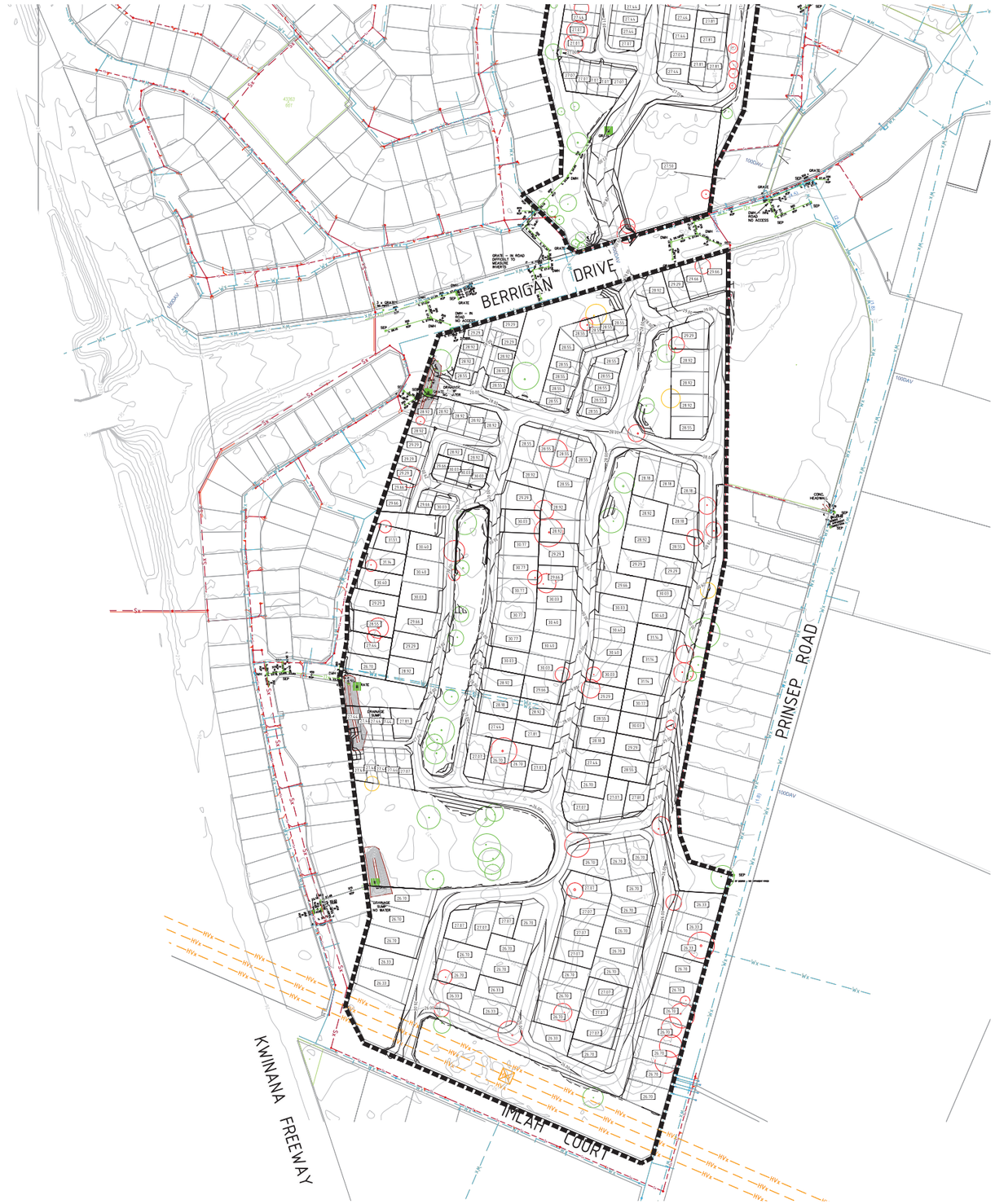
CLIENT: EASTCOURT

PROJECT: GLEN IRIS ESTATE

DRAWING TITLE: EARTHWORKS PLAN SHEET 2 OF 3

DRAWN: M. SMITHERS	WAPC No.
DESIGNED: B. TREW	SCALE @ A1: 1:2000
PROJECT MANAGER: S. FOLEY	DATUM: AHD / CO-ORDS: PCG94
JDSI PROJECT No.: JDS201817	DRAWING No.: SK104 / REVISION: A

Plotted By: jjones Plot Date: 12/04/21 - 14:46 Cad File: I:\JDS201817\02 CIVIL\Drawings\Sketches\JDS201817_SK103-105.dwg



LEGEND

- LIMIT OF WORKS
- 43.15 PROPOSED LOT LEVEL
- PROPOSED CONTOURS (0.25m INTERVAL)
- EXISTING CONTOURS (0.25m INTERVAL)
- PROPOSED RETAINING WALL
- PROPOSED ROAD
- EXISTING EMBANKMENT
- PROPOSED BATTER
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- EXISTING TREE POSSIBLY REMAIN
- Sx EXISTING SEWER
- Rx EXISTING RISING MAIN
- Wx EXISTING WATER
- Dx EXISTING DRAINAGE
- NBNx EXISTING NBN
- Gx EXISTING GAS
- Ex EXISTING UNDERGROUND POWER
- HVx EXISTING HV UNDERGROUND POWER
- OHx EXISTING OVERHEAD POWER

0 20 40 80 120m
SCALE 1:2000 @ ORIGINAL SHEET SIZE A1

REV	DATE	DRAWN	CHECKED	APPROVED	
A		MS			ISSUED FOR INFORMATION

COPYRIGHT
This drawing is copyright and the property of JDSi Pty Ltd (JDSi). Use without written permission from JDSi constitutes an infringement of copyright.
This document and the information are solely for the use of the authorised recipient and may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by JDSi.

NOTE
This drawing shall be preliminary only until it is issued for Construction.
Certified Quality System to ISO 9001

JDSi CONSULTING ENGINEERS
Workzone, Level 6, 1 Nash Street, Perth WA 6000
P: (08) 9227 0595 F: (08) 9227 8617

CLIENT: EASTCOURT

PROJECT: GLEN IRIS ESTATE

DRAWING TITLE: EARTHWORKS PLAN SHEET 3 OF 3

DRAWN: M. SMITHERS	WAPC No.
DESIGNED: B. TREW	SCALE @ A1: 1:2000
PROJECT MANAGER: S. FOLEY	DATUM: AHD / CO-ORDS: PCG94
JDSI PROJECT No.: JDS201817	DRAWING No.: SK105 / REVISION: A

Plotted By: jjones Plot Date: 12/04/21 - 14:46 Cad File: I:\JDS201817\02 CIVIL\Drawings\Sketches\JDS201817_SK103-105.dwg