COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE

LOTS 1 EASTERN CREEK DRIVE, EASTERN CREEK 2766 NSW

LANDSCAPE MANAGEMENT PLAN

17.10.2023
ISSUE D

FOR:

Charter Hall

SSD 30923027

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1.0 INTRODUCTION

This Landscape Management Plan has been prepared by Habit8 on behalf of Charter Hall. It accompanies the supporting documents prepared and submitted under State Significant Development SSD30923027 for the redevelopment of Lot 1 Eastern Creek Drive, Eastern Creek 1766 NSW.

The development site's baseline can be described as a general industrial area. The site has minimal slope from west to east with the Eastern Creek tributary catchment to the east. There are no significant woodland areas within the site but is near a riparian habitat corridor to the north.

There are no current statutory designations within the LEP which attribute Landscape or Environmental value to the site, but the site falls within the WSEA (Western Sydney employment lands area). This area is called the Eastern Creek Precinct lands as indicated in the figure below. The Western Sydney Employment Area provides businesses in the region with land for industry and employment. This can include transport, logistics, warehousing and office space. The ongoing management of the site landscape is therefore fundamental in reinforcing the canopy cover and screening of the development to surrounding land uses.

This Landscape Management Plan has been developed to manage the revegetation and landscaping works on-site. The Plan:

- details the species to be planted on-site
- describes the monitoring and maintenance measures to manage revegetation and landscaping works; and
- is consistent with and implements management and mitigation measures from Appendix 2 of SSD30923027.

1.1 The Site

The site is located at Lot 1 Eastern Creek Drive, Eastern Creek, Blacktown, NSW (Lot 1 DP1274322). Currently, it sits within the WSEA SEPP Application Area and zoned as IN1 (General Industrial) shown in Figure 2. It is bound by Eastern Creek Drive to the south west, which has around 55m road frontage, and bound by industrial land uses around the site. The overall site is around 4.8ha. The site in context to the surrounding locality is shown in Figure 1.

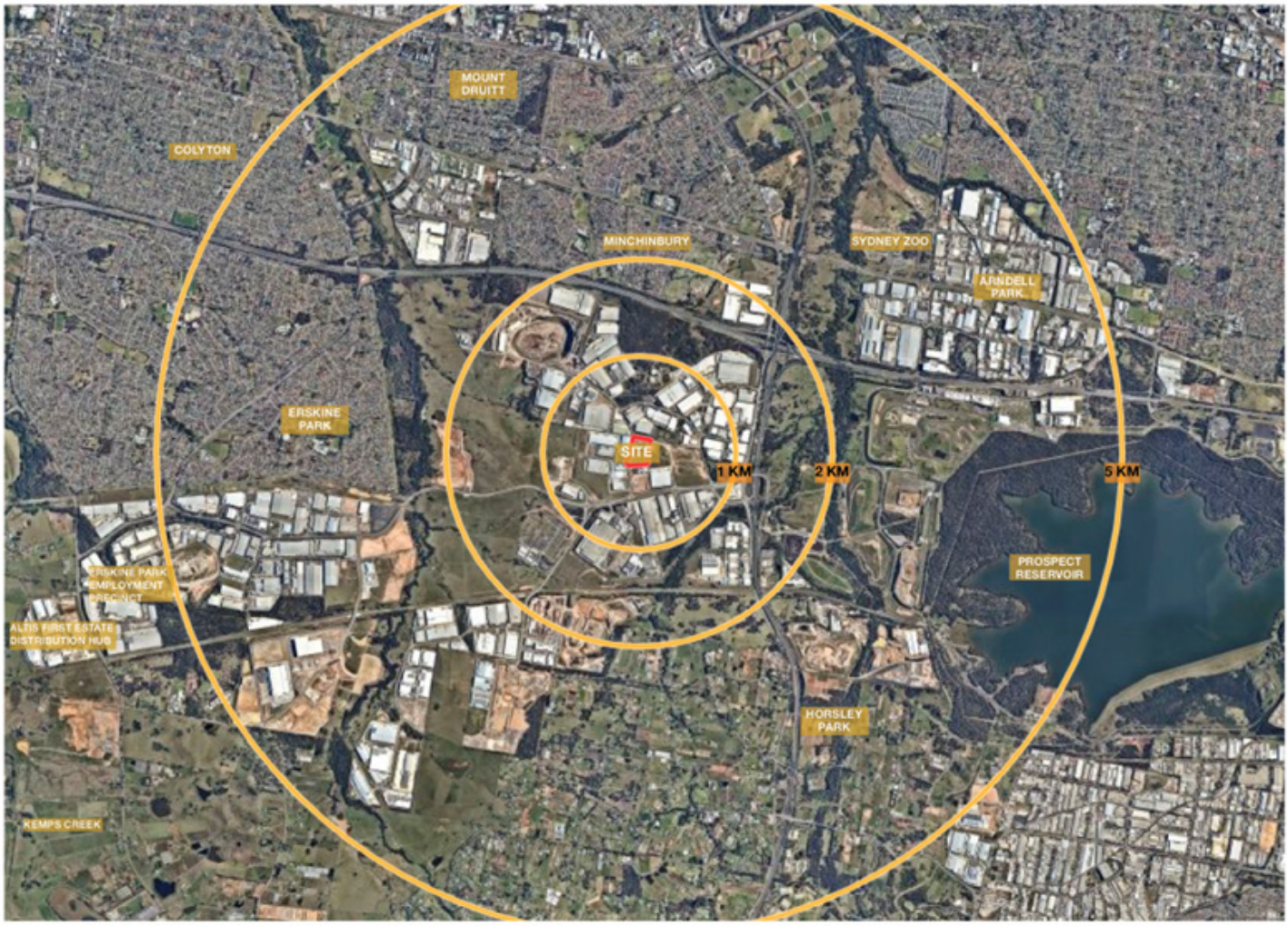


Figure 1: Regional Context

The site is located within the Eastern Creek Precinct and is accessible via the regional road network including both the M4 and M7 Motorways. It has minimal sloping from west to east with scattered trees and shrubs with basin within the property boundary. It is also near a riparian habitat and corridor on the east. It is essential to note that the locality is developing towards becoming a key industrial logistics precinct.

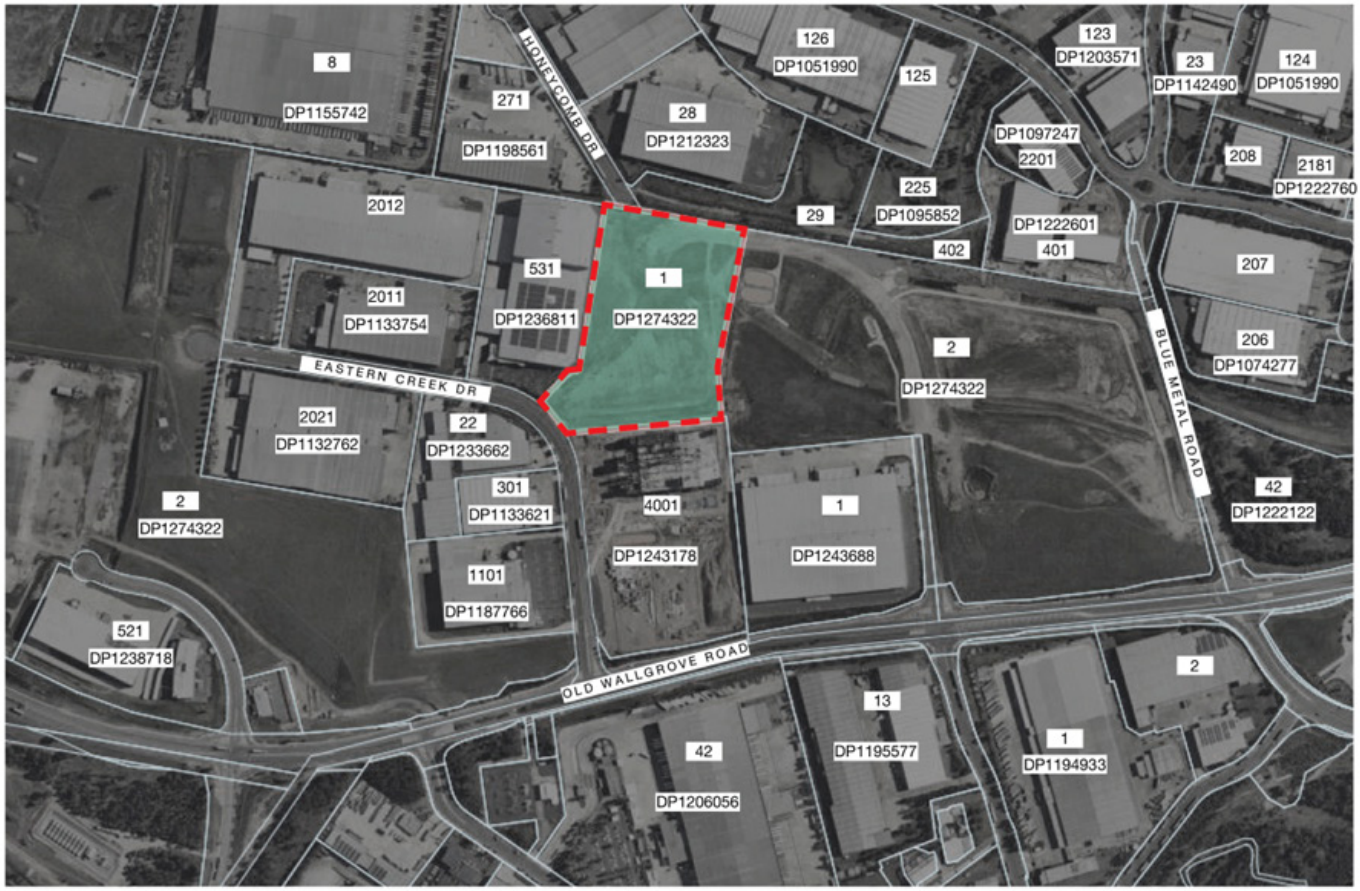


Figure 2: Site Context

Figure 3: Site Zoning

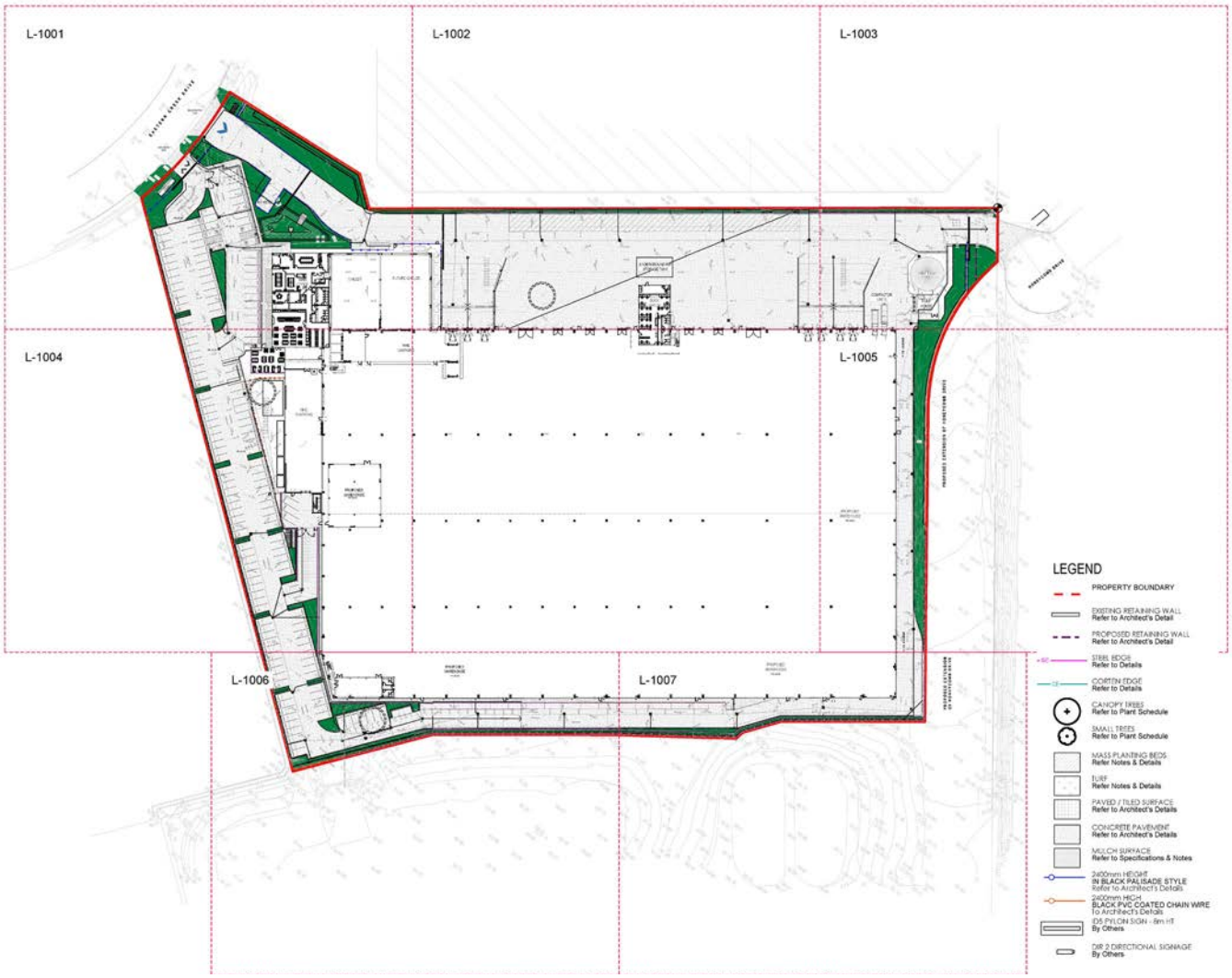


Figure 4: Landscape Masterplan

LOT	FEATURES
South	General industrial lands (IN 1); Eastern Creek Drive Frontage at South West
North	General industrial lands (IN 1)
East	General industrial lands (IN 1)
West	General industrial lands (IN 1)

2.0 MONITORING AND MAINTENANCE MEASURES

2.1 Landscape Management Principles

The following landscape management principles have been identified as being consistent with the Landscape Plans;

- Minimise environmental impacts that may result from landscape management activities and utilise environmentally sustainable practices
- Preserve, enhance and improve the landscape character of the industrial estate
- For new and replacement plantings, the use of endemic plant species where appropriate
- Provide a safe environment, minimising potential risks to people, buildings and property
- Apply best practise landscape maintenance in landscape areas
- Target noxious weeds and feral animals through the use of integrated pest management approaches
- Maintain high quality outdoor spaces and streetscapes
- Maintain high quality passive recreation areas
- Appropriate funding, planning and management of landscape maintenance to provide a measurable improvement of the landscape appearance, safety and amenity.

Below is a summary of general maintenance and ongoing management requirements for revegetation and landscaping works.

2.2 Tree Protection

Avoid whipper-snipping grass at the base of trees as this can cause ring-barking and tree death. Clip around the base by hand where trees are planted into grass. Where trees are planted in paved areas, adjacent to the trunk, use:

- Ground covers
- Gravel
- Permeable paving surrounds
- Tree grates.

2.3 Fertilizing, Composting and Mulching

All trees whether native or exotic will perform better when the soil conditions are healthy. Building healthy soils is the key to achieving the long-term maintenance goals or landscape areas. Soil health is primarily achieved with regular applications of organic soil conditioners such as animal manures, decomposed green waste or proprietary blends of compost.

Fertilizing and composting are not critical maintenance activities except where there are obvious deficiencies but should be assessed on an annual basis by observation and leaf analysis.

Maintain an adequate level of mulch in planter beds in order to maximize water conservation and suppress weeds.

MAINTENANCE ACTION REQUIRED	FREQUENCY
Where obvious deficiencies are evident 60 grams/plant (trees) controlled release fertiliser such as Nutricote;	Only to be applied if the plant is noticeably under stress and the plant will benefit from the application of the fertiliser. Inspect annually; however apply in late spring if required.
3 x 20 grams slow release fertiliser tablet per plant N;P;K ratio – 18:3:10	Only to be applied if the plant is noticeably under stress and the plant will benefit from the application of the fertiliser. Inspect annually; however, apply in late spring if required.
Where soils are dry, hydrophobic and as a regular maintenance procedure, top up all garden beds with 30-50mm depth of soil conditioner as composted animal manure.	Bi-annually, applied at any time of the year
Maintain mulch to a depth of 75mm by periodic applications. Use the same mulch as originally specified in the Landscape Plan	As required, generally once per year

2.4 Pruning

All pruning shall be carried out by a qualified arborist AQF Level 3 and to be in accordance with AS 4373-2007 Pruning of Amenity Trees. Pruning will be an ongoing process, which will require the periodic removal of unsightly, dead wood, hazardous branches and view obstructing branches.
Prune trees to maintain driver sight lines, remove dead wood from over hanging paths and carparks to maintain vegetation health and to remove branches that are likely to pose a risk to public safety.

Suitable timing for pruning should be determined by the arborist so as to maintain vegetation health, however all trees should be inspected regularly and especially after high winds to determine if any action is required.

Suggested Inspection times:
Start of Spring (September)
Start of Autumn: (March)

Proposed avenue style tree planting along the internal roads and driveways will require under pruning to accommodate site lines. This should be achieved over a period of time to lift the crown and provide a clear trunk to a maximum height of 3 metres with a desirable height of 2m.

Dead limbs containing hollows should not be removed unless there is a risk to public safety; limbs with hollows that are pruned from trees should be left in a suitable location on the ground to provide habitat.

Removed timber and native vegetation, unless diseased, should be considered for re-use on-site either as habitat logs in bushland areas where appropriate, or mulched in garden beds.

2.5 Soil Management for Trees

Wherever trees are to be planted it is important to understand whether the existing in situ topsoil can be used as backfill, whether new topsoil, soil mix, soil conditioner or amendments needs to be imported, or if a mix of the above is best.
In general, the greater the soil/subsoil depth (the effective root depth) - the larger the tree that can be supported with minimal maintenance. The ideal soil profile for trees will have at least 3 horizons where the “A” horizon is the topsoil, the “B” horizon is Subsoil and the “C” horizon is the Subgrade. The minimum recommended topsoil depth for trees is 250mm with a minimum subsoil depth of 200mm. This will provide the tree with the minimum moisture/nutrient reserve and anchorage capacity.
In addition to a physical inspection of the soil to be used to assess field texture and structure and drainage capability, soils should also be analysed by a soil laboratory for the following properties at a minimum:

- pH
- Salinity (electrical conductivity)
- Cation exchange properties and exchangeable cations
- Major and minor nutrients
- Organic matter (%).

Where tree specimens in container sizes 25 litres or larger are to be planted, the subsoil should also be tested for:

- pH
- Salinity (electrical conductivity)
- Cation exchange properties and exchangeable cations
- Aggregate stability.

The most common amendments used to bring soils up to a standard suitable for plant growth are:

- Lime or dolomite to make acid pH soils more alkaline.
- Lime or Gypsum to enhance exchangeable calcium and eliminate sodicity
- Gypsum to make clay soils more friable
- Composts and/or manures to improve organic matter and nutrients levels
- Single or complete fertilisers often with trace elements to correct a particular deficiency or multiple deficiencies.

It is important that the backfill soil is returned in the layers in which it was excavated so that topsoil with organic content is placed back near the top 300mm of the backfill. Where the existing site topsoil backfill is unsuitable or insufficient it can be made up with:

Sandy loam or site won topsoil mixed with;	70-100% by volume	Eg. 8 parts washed sand/2 parts sandy loam/1 part compost.
Composted soil conditioner conforming with AS 4454	0-30% by volume	Amendments as reported by the soil test results.

Where the tree pit is deeper than 300mm (usually for trees in containers over 45 litres) and the existing site subsoil is unsuitable or insufficient a topsoil medium low in organic matter is required so that the organic matter does not “sour” at depths where there is less oxygen, It can be made up with a sandy, well-drained medium which contains low organic matter An example of the components may be:

Sandy loam	60-80% by volume
On-site clay loam or clay topsoil or subsoil Composted soil conditioner conforming with AS 4454	20-30% by volume

2.6 Tree Replacement

To ensure that the density, species and design intent of established tree plantings is maintained, any trees that die should be replaced immediately with the largest specimen that can be reasonably procured and practically handled into position. All trees supplied are to conform to the recommendations of AS 2303 and be true-to-species and type, and free of disease, fungus, infection and/or any other impediment to their future growth and that they have been fully acclimatized for the conditions of the site. Trees are to be supplied from an accredited plant supplier that will need approval from the project superintendent.
(Please refer to Appendix A for the Landscape documentation and plant schedules.)

Supply trees with the following properties:

- Free from injury.
- With calliper at any given point on the stem greater than the calliper at any higher point on the stem.
- Health: Foliage size, texture and colour at time of delivery consistent with that of healthy specimens for the nominated species.
- Vigour: Extension growth consistent with that exhibited in vigorous specimens of the species nominated.
- Damage: Free from damage and from restricted habitat due to growth in nursery rows.
- Stress: Free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development.
- Site environment: Grown and hardened off to suit anticipated site conditions at the time of delivery.
- Tree stock in containers less than 45 L: Self-supporting at dispatch.
- Indication of north: Trees in containers greater than 100 L or of Size Index greater than 140: Label the northerly aspect during growth in the nursery and maintain during transit.
- Root development: Grown in their final containers for the following periods:
- Plants < 25 L size: More than 6 weeks.
- Plants > 25 L size: More than 12 weeks.
- Pests and disease: Free from attack by pests or disease.
- Native species with a history of attack by native pests: Restrict plant supply to those with evidence of previous attack to less than 15% of the foliage and ensure absence of actively feeding insects.

REPLACEMENT PLANTING	FREQUENCY
Replace failed or damaged plantings.	As required
Water replacement plantings for a minimum of 12 weeks after planting	As required to ensure survival

2.7 Tree Surrounds and Stakes

Stakes and ties are used to support plants and avoid trampling. Developing plants exposed to high winds may require staking. Replace tree stakes when damaged and/or remove them when no longer required and the plant is self-supporting. All stakes to be installed as per the landscape construction details in the landscape set – Appendix A.

2.8 Planting Areas

In general mass planted beds are either planted with native species or exotic or combination of both. The key difference in the management of native plants are their requirements for low- phosphorous fertilisers and a lower fertiliser rate than exotic species generally.

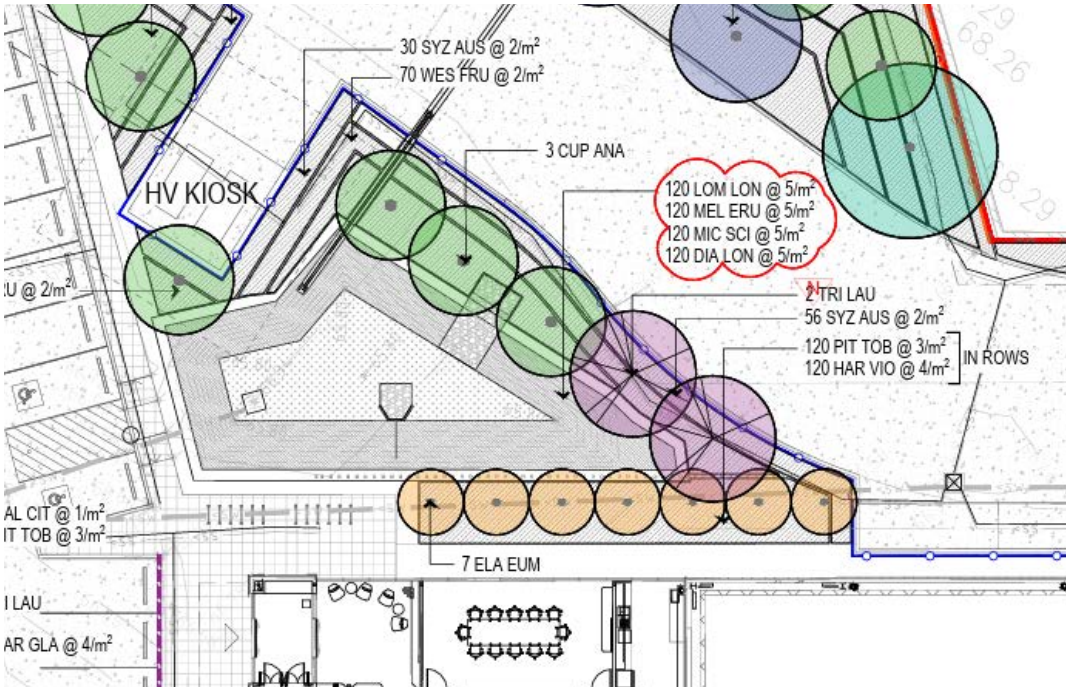
Natives also have lower water requirements in comparison to exotics and are adapted to the harsher Australian conditions. Endemic native plants will tolerate site soils without amendment better than exotics, and if no fertilisers are added there may be a lesser invasion by exotic weeds. Therefore, for the long-term landscape management, endemic plant species should always be considered first for any new gardens.
The edges of the beds will be defined by garden edging as specified in the landscape documentation in Appendix A. Beds shall be weed free and mulched annually to suppress weed growth and maintain moisture content within the soil. Where irrigation is not present, gardens beds should be watered during dry spells to remove undue plant stress and the potential for die-back.

Pruning will be carried out on shrubs that require it, according to species, to remove the dead and damaged branches and to retain natural shape. Pruning will encourage good flowering to improve health and vigor.

Where die-back is present, new plants are to be planted as soon as possible, using species originally specified in the landscape documentation (Appendix A) or where there are no plants specified then replaced with endemic species where appropriate.

2.9 Bio-rentention Basin

The bio-retention basin should be planted out with reeds and rushes as specified to aid in water quality. The basin is to be designed and constructed to the details provided under Appendix C in this LMP.



2.10 Pruning of Planted Areas

Ground covers and shrubs should be maintained as a maximum height of 0.5m along path edges. Remove dead or dying plants from mass planted areas as required. This may become necessary as plantings mature, after damage or adverse environmental conditions.

PRUNING MASS PLANTED AREAS	FREQUENCY
For low shrub species as per appropriate type; Tip prune to encourage density to 50- 100mm.	As required after flowering
For low shrub species as per appropriate type; Prune evenly to a height of 500mm above ground along path edges. Prune away from paths where required.	Every 4 years after flowering

2.11 Replacement Planting

Plants that have died or failed shall be replaced with the same species and variety as the closest commercially available size. This is to ensure that the density and species of the established plant material within mass planted areas is maintained.

REPLACEMENT PLANTING IN MASS PLANTED AREAS	FREQUENCY
Replace failed or damaged plantings.	As required
Water replacement plantings for a minimum of 12 weeks after planting	As required to ensure survival

2.12 Planting Conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

Remove the plant from the container with minimum disturbance to the root ball. Make sure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil.

In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting. Application rate as per manufacturers details.

Backfill with topsoil mixture. Tamp lightly and water to eliminate air pockets. Make sure that topsoil is not placed over the top of the root ball, so the plant stem remains the same height above ground as it was in the container.

2.13 Mulching

Place mulch to the required depth of 75mm, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds, and not closer to the stem than 50 mm in the case of gravel mulches.

- In mass planted areas: Place after the preparation of the planting bed but before planting and other work.
- In smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.
- Extent: Provide mulch to 750 mm diameter, to surrounds of plants planted in riplines and grass areas. Depths: Spread organic mulch to a depth of 75 mm, and gravel mulch to a depth of 50 mm.

2.14 Weed Management

It is important that weeds are not allowed to establish nor spread to other areas. Weeds are highly invasive species and have the potential to invade newly disturbed sites. A noxious weed is a plant declared to be noxious under the NSW Noxious Weeds Act 1993. Noxious weeds can be agricultural weeds, environmental weeds or have a direct impact on human health. Under the Biosecurity Act 2015, noxious weeds must be controlled. On private land, the responsibility lies with the owner/occupier of that land.

Environmental weeds are non-local plants that can invade and change natural areas and threaten the survival of native plants and animals. After land clearing, environmental weeds are considered to be the next greatest threat to our indigenous biological diversity.

Environmental weeds have the potential to readily invade garden beds and potentially impact on adjacent areas of bushland. In addition to the environmental hazards posed by weeds, weeds occurring in mass planted areas growing from the base of trees and pavements can be unsightly and presents an untidy appearance.

Weed monitoring and hand weeding will be required to be undertaken on a regular basis. The management and control will depend on the species of weeds present and the appropriate measures for mitigating any impacts caused by its management on native species. Generally, weed control measures will include:

- Observation of landscape areas to check for weeds and hand weeding of any weeds identified
- Development and implementation of an eradication plan applicable to the circumstances, which may include manual removal and spot spraying
- Regular contact with neighbouring property owners to attempt to eradicate weeds species from the surrounding area
- Regular mulching to help suppress weeds.

MAINTENANCE ACTION REQUIRED	FREQUENCY
Prevent reproduction of weeds by destroying seedlings and established weeds before they set seed or other propagules form. Remove by hand where infestations are low. Ensure that the entire weed including all roots are removed. Dispose of the weeds off site.	As required
Remove by Herbicide any weeds that cannot be controlled by hand removal. Herbicide application must occur before weed has set seed. Non-targeted species and areas must be reinstated if damaged by herbicide application. Herbicide to be used in accordance with regulation rates and manufacturers recommendations and Safety Data Sheets. After spraying, lop and dead weeds flush with the ground surface and dispose of the cuttings. Use of bio- degradable herbicide is mandatory.	Do not spray in windy conditions or if rain is forecasted within the next 24 hours.

2.15 Lawn Areas

Lawn/grassed areas have high demands for maintenance and require significant resources particularly in irrigation, fertilising and mowing. The level of maintenance required for particular lawn areas should be considered within the context of their intensity of use.

Maintenance and access for mowing of grass on grade is a potential occupational health and safety risk. Embankments steeper than 3:1 should be considered for planting. Restrict the provision of high quality, well maintained lawn to sports fields and premium passive use areas. Aim to reduce the amount of resources dedicated to maintaining lawn and grass areas. Clippings should remain where they fall under most circumstances and should not be raked up and removed. In low use areas, irrigation, fertilisation and maintenance should be reduced.

Mowing and trimming measures may include:

- Litter: Remove litter and fallen branches before mowing.
- Height: Consistent with the growth habit of the grass variety and maintained at 25 mm to 40 mm throughout the year.
- Program: Weekly during the mowing season, November to March, and at bi-weekly intervals during April to October. Do not mow under wet conditions.
- Raking: Once every month before mowing, during the mowing season, with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.
- Edges: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Ensure trees and shrubs are not damaged.
- Clippings distribution: To be used as compost where possible.

Where compaction of turf areas cannot be managed through prevention, and the quality of turf is declining, special machines that remove cores of soil, make slits or grooves or spike holes must be used. Perform when turf is in active growth in summer but not when temperatures are extreme or there are very drying winds.

Topdressing is applying a thin layer of growing media to the turf. Components are usually sand but it must always be more free-draining that the media under the turf and should always have the same consistency over consecutive applications. Topdressing properly applied will fill hollows and provide a smooth finish. The addition of free-draining sand will also improve drainage and infiltration and therefore improve turf health. Topdressing material for remediation of depressions or irregularities: Apply coarse or medium soil to AS 4419 suitable for application to turf or grass seeded areas.

2.16 Irrigation

A fully automatic irrigation system is to be installed as per the irrigation design documentation attached in Appendix B.

3.0 PROTECTIVE MEASURES

3.1 Protection of Existing Vegetation

Existing vegetation and newly planted areas need protection during construction and establishment. During construction and establishment periods, temporary fencing should be placed at the extent of area to be protected, preferably beyond the drip-line of trees to be protected.

The fencing methods should include flagging tape, stakes and temporary fencing, clearly identifying the area to be protected and restricting pedestrian and vehicular access to the protected zone.
Following completion of the construction period (including establishment), all temporary works should be removed when they are no longer required.

3.2 Tree Protection

Tree protection on all development sites within the City of Blacktown must comply with Australian Standard 4970 – 2009 Protection of trees on development sites.

The relevant Australian Standards are:

- AS 4970 Protection of trees on development sites.
- AS 4687 Temporary fencing and hoardings.

Compliance with Tree protection requirements of Blacktown City Council is mandatory.

This section is only relevant to sites with existing trees are to be retained.

3.3 Erosion, Contamination and Sedimentation Control

During construction, all precautions necessary should be undertaken to prevent erosion, contamination, and sedimentation of the site, surrounding areas and drainage systems, including but not limited to the following:

- Construction of temporary drains and catch drains
- Diversion and dispersal of concentrated flows to points where the water can pass through the site without detrimental impacts
- Construction and maintenance of silt traps to prevent discharge of scoured material to downstream areas
- Stabilisation of exposed soil surfaces (e.g. through sterile grass seeding, erosion control meshing, or mulching using vegetative material removed from the study area)
- Use of erosion and sediment control measures to collect sediment and to reduce flow velocities
- Construction of temporary fencing
- Regular monitoring and maintenance of all erosion and sediment control structures throughout the construction and operational phases of the development to ensure their effective function.

3.4 Tree Removal and Disposal of Vegetation on Site

All significant trees removed as a result of construction works are to be replaced by the same species and planted in a suitable location corresponding with the relevant vegetation community.

For any significant trees removed for construction works, consideration should be given to retaining the woody parts whole or in sections, and placed on the ground to provide habitat for native fauna.

All other native vegetation that is identified for removal should be chipped for use as mulch. All weed material is to be separated and removed from the cleared material prior to chipping. Mulch should be stockpiled at approved locations around the site and be used in locations from where it was derived to ensure any seed stock located within the mulch will be located in appropriate site conditions.

Any vegetation, topsoil or other materials not identified for re-use shall be either disposal of off-site or in an area where the material will not wash into existing vegetation or onto roads or surrounding creeks.

4.0 MONITORING AND REPORTING

Regular inspections of all landscape areas should be undertaken by the Assets Team to ensure that maintenance is carried out according to the plan. The inspections should not be less frequent than three (3) monthly (or immediately after high rainfall/wind/heat events) with the objective that all areas are visited at least once within that period and an inspection checklist prepared and filled out during each inspection and a Three Monthly Maintenance Audit Form Submitted. (Refer to Appendix B). The inspection should include the ongoing protection of all existing vegetation and new revegetation works during its establishment period.

Maintenance staff should receive the audit form and carry out any remediation work required.

5.0 BUSHFIRE PROTECTION

5.1 Asset Protection Zones

In creating and maintaining a garden that is part of an APZ, the following should be considered:

- Sparse planting in the APZ is acceptable provided that they are well spread out and do not form a continuous path to the warehouse facilities. It should also not retain dead material or deposit quantities of ground fuel in a short or dangerous period. It must also be located far enough from the building so that plants will not ignite the building by direct flame contact or radiant heat emission.
- Plant or clear vegetation into clumps rather than in continuous rows in areas of risk. To prevent ground fire from spreading into trees, pruning of low branches two metres from ground is advised.
- Plant selection should preferably include local endemic species. Remove flammable species especially those with rough, flaky or stringy barks. Remove all noxious and environmental weeds as well.
- Ensure that planting is not positioned directly adjoining built structure. Where this does occur, gardens should contain low-flammability plants and non-flammable ground cover such as pebbles and crushed tile.
- Remove or locate away from the structure items like woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. These items should have no direct contact with bush fire hazard vegetation.
- Take advantage of existing or proposed protective features as part of the property's APZ. These features are as follows: turf areas, fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts, vegetable gardens.
- Rows of trees can serve as wind break that will trap embers and flying debris that could otherwise reach the structure. These trees should be planted the same distance away from the structure as their maximum height.

5.2 Plants for Bush Fire Prone Gardens

In designing the landscape garden, it is essential to consider the type of plant species and their flammability aside from their arrangement and placement in the garden. In general, all plants will eventually burn, however there are plants that are less flammable than others.

Trees with loose, fibrous or stringy barks are flammable. These can easily ignite and encourage the ground fire to spread up to the crown of trees, thus should be avoided. When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into the garden as it will cause greater long-term environmental damage.

Features of a less flammable plant:
- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without "ribbons" hanging from branches or trunks; and
- dense crown and elevated branches.

5.3 Inner Protection Areas

The area closest to the building that acts as a defendable space is called the IPA. Vegetation within this area should be kept to a minimum level and litter fuels should be discontinuous and kept below 1cm in height. The IPA consists of a mown lawn and well-maintained gardens.

Tree requirements within IPA:
- Tree canopy cover should be less than 15% at maturity and should not touch or overhang the building.
- Should be pruned to a height of 2m above the ground
- Tree canopies should be 2m to 5m apart
- Smooth barked and evergreen trees are preferred.

Shrubs requirements within IPA:
- Should have large gaps in the vegetation to slow down the threat of fire towards the building.
- Should not be located under trees and not form more than 10% of ground cover
- Should be away from exposed windows and doors at least twice the maturity height of the vegatation.

Grass requirements within IPA:
- Should be kept mown and not be more than 100mm in height.
- Should be clean of leaves and vegetation debris.

5.4 Outer Protection Areas

Located between the IPA and unmanaged vegetation is the OPA and only applicable in forest vegetation. Understories are managed in this area, with some separation in the canopies. It aims to decrease the intensity of an approaching fire on the IPA.

Tree requirements within OPA:
- Tree canopy cover should be less than 30% at maturity
- Tree canopies should be 2m to 5m apart.

Shrubs requirements within OPA:
- Should have large gaps in the vegetation to slow down the threat of fire towards the IPA.
- Should not form more than 20% of ground cover.

Grass requirements within OPA:
- Should be kept mown and not be more than 100mm in height.
- Should be clean of leaves and vegetation debris.

An APZ should be maintained at all times to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE

LOT 1 EASTERN CREEK DRIVE
EASTERN CREEK 2766 NSW

FOR TENDER

DRAWING REGISTER

GENERAL NOTES

1.0 These drawings must be read in conjunction with the drawing package from the consultant team including all engineering drawings.

2.0 Do not scale from these drawings - use figured dimensions (or CAD files)

3.0 SERVICES
Verify the 'as built' location of all existing services before excavation works are started. Services shown are indicative only.

4.0 FALLS
All pavement, planting & turf areas to be graded evenly. Ponding is unacceptable.

5.0 SURFACE LEVELS
Bulk surface levels to be verified on site post Civil Contractor works. All adjacent surfaces are to be level and flush unless stated or documented otherwise.

6.0 PLANT STOCK
Landscape Architect to approve plant stock prior to delivery on site.

7.0 PLANT SET OUT
Landscape Architect to approve plant set out on site prior to planting.

NOT FOR CONSTRUCTION

ISSUE	DATE	PURPOSE
A	28.11.21	CLIENT REVIEW
B	06.12.21	SSD SUBMISSION
C	04.02.22	SSD SUBMISSION
D	11.02.22	SSD SUBMISSION
E	10.05.22	SSD SUBMISSION
F	25.05.22	SSD SUBMISSION
G	30.06.22	SSD SUBMISSION
H	30.08.22	SSD SUBMISSION
I	14.11.22	ISSUED FOR TENDER
J	23.11.22	ISSUED FOR TENDER
K	30.11.22	ISSUED FOR TENDER
L	17.03.23	ISSUED FOR TENDER
M	13.04.23	FOR CONSTRUCTION
N	17.10.23	FOR CONSTRUCTION

APPENDIX A: LANDSCAPE DOCUMENTATION

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
COVER SHEET

N

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-0000	N

LANDSCAPE ARCHITECT:

HABIT8
Landscape Architecture & Urbanism
Level 57, MLC Centre
19-29 Martin Place,
Sydney, NSW 2000
32/24 Scott St,
Byron Bay, NSW 2481
www.habit8.com.au
M: 0425 206 047

ISSUE	DATE	PURPOSE
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LEGEND

- PROPERTY BOUNDARY
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- SMALL TREES — Refer to Plant Schedule
- MASS PLANTING BEDS — Refer Notes & Details
- TURF — Refer Notes & Details
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- 2400mm HIGH BLACK PVC COATED CHAIN WIRE — To Architect's Details
- ID5 PYLON SIGN - 8m HT — By Others
- DIR 2 DIRECTIONAL SIGNAGE — By Others

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
SITE PLAN

SCALE
1:600 @ A1 / 1:1200 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-0001	N

LANDSCAPE ARCHITECT:
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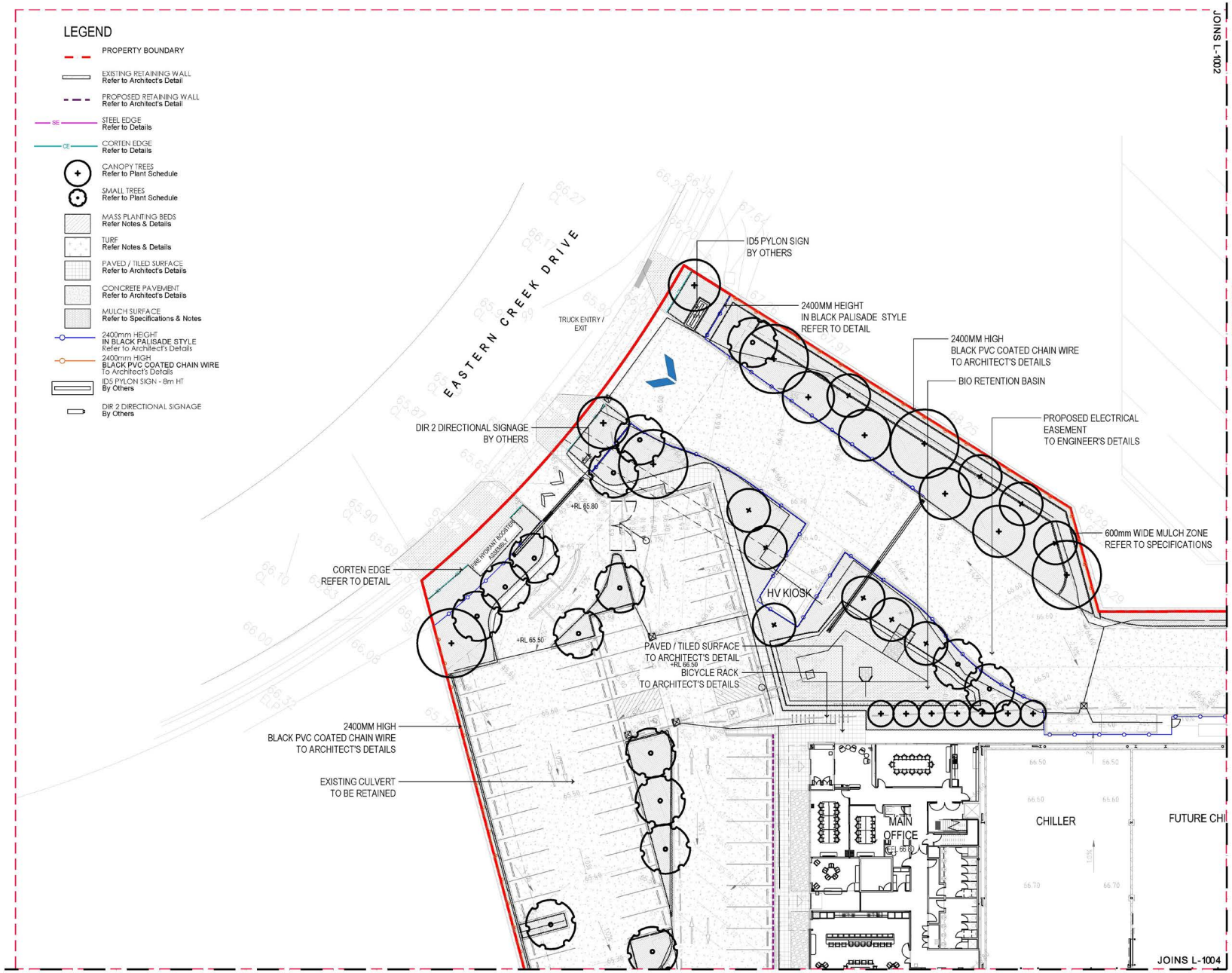

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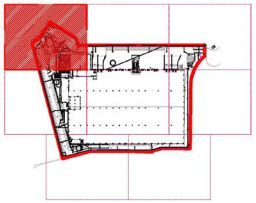

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT PLAN 1 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1001	N

LANDSCAPE ARCHITECT:

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JOINS L-1001

JOINS L-1003

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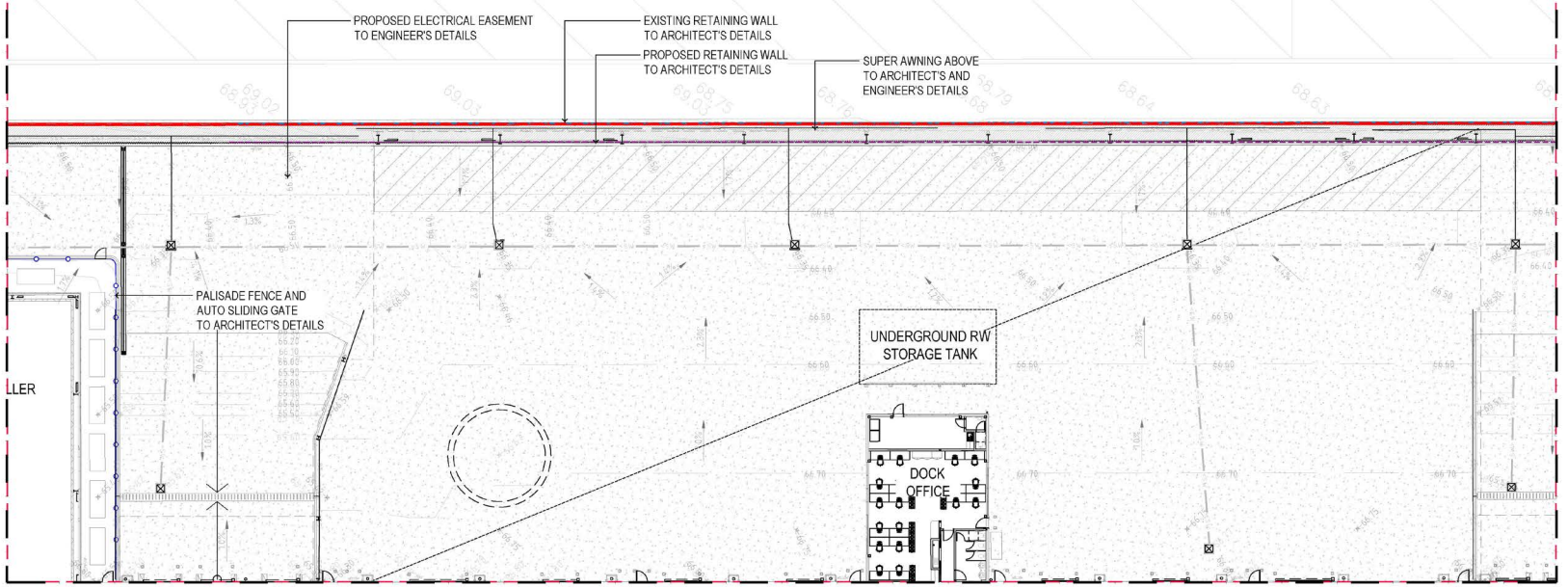

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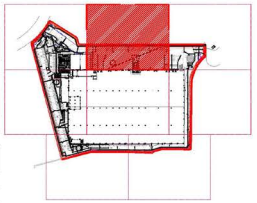

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 2 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1002	N

LANDSCAPE ARCHITECT:

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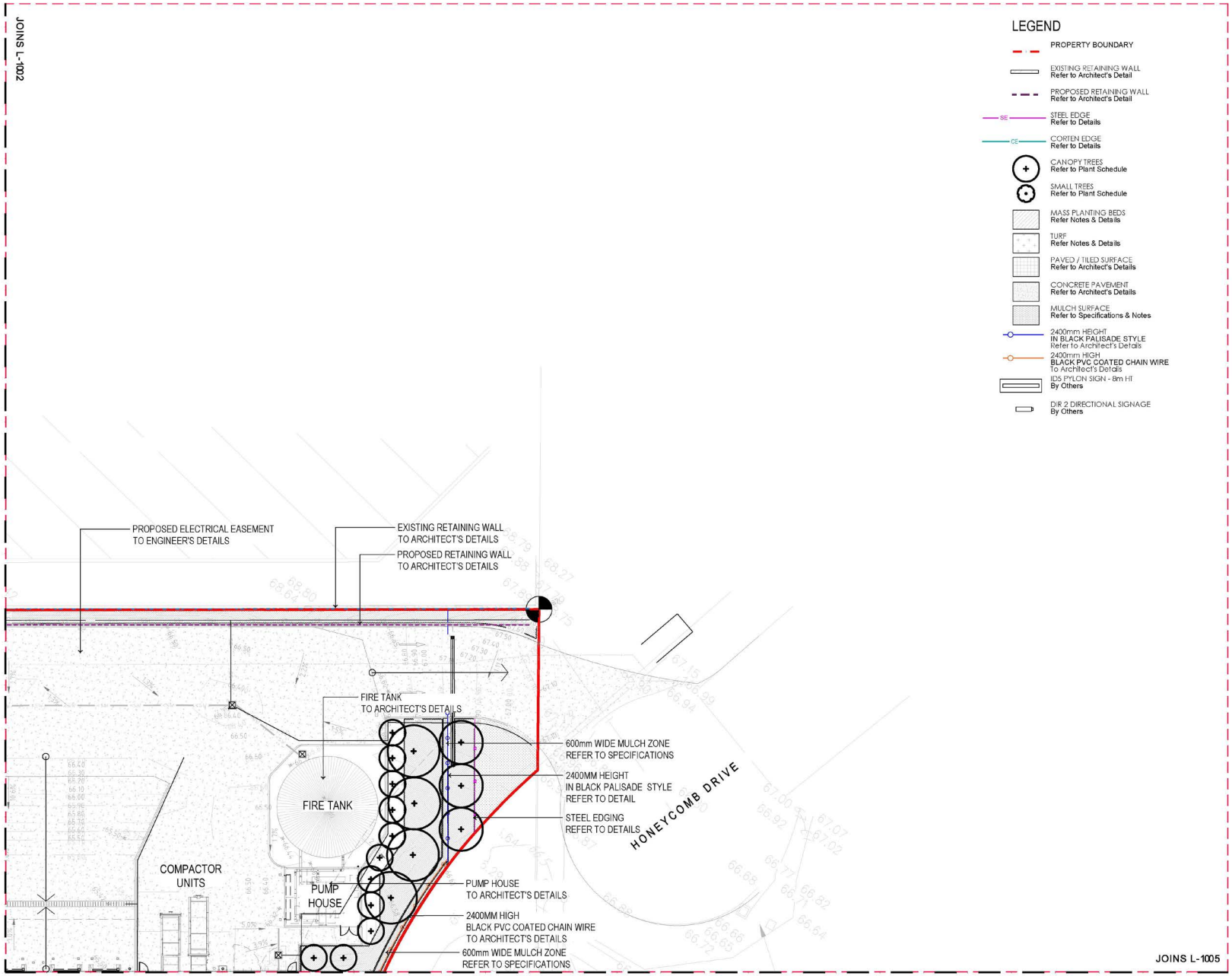
JOINS L-1002



JOINS L-1005

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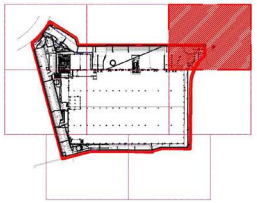

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 3 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1003	N

LANDSCAPE ARCHITECT:

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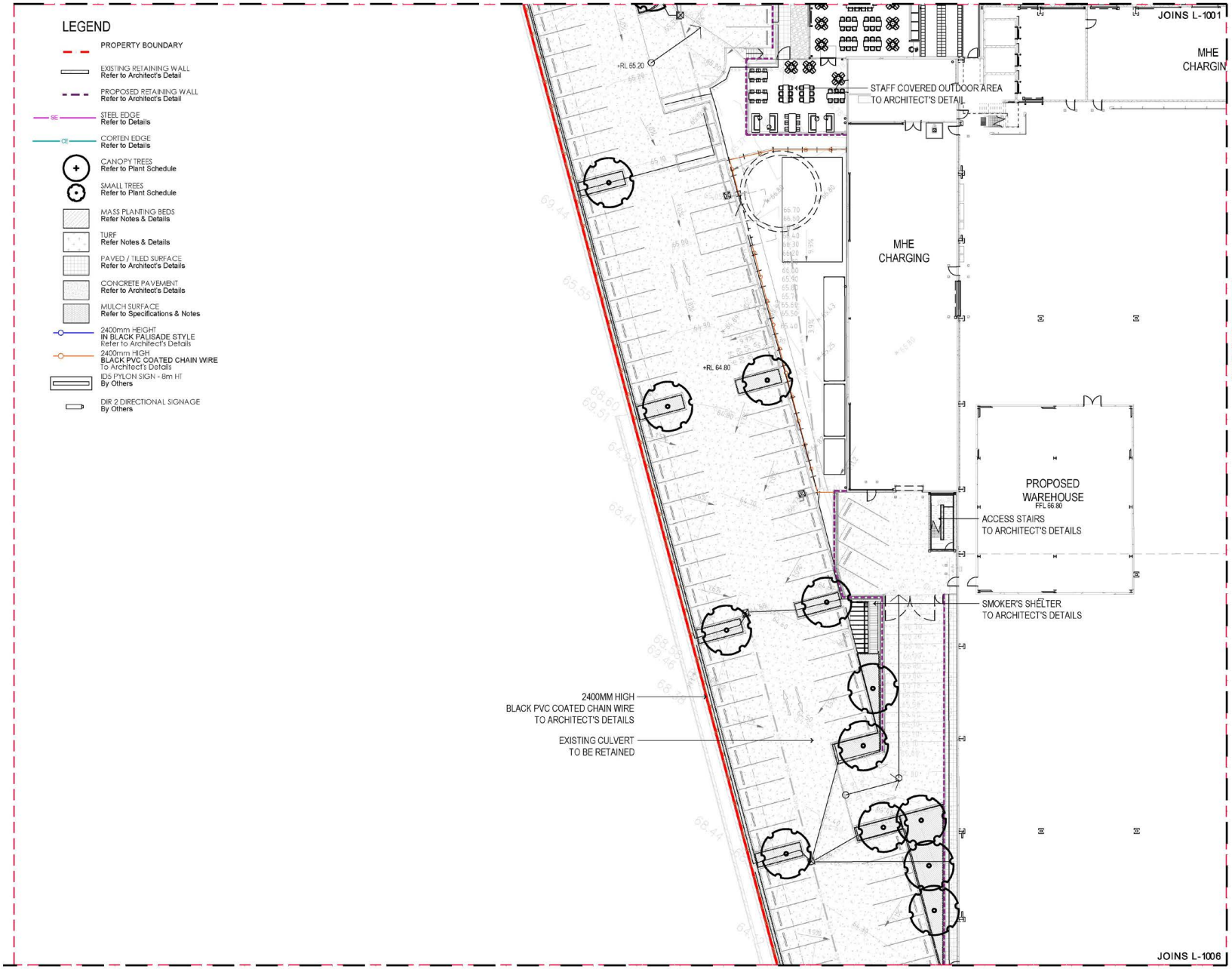

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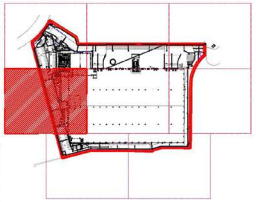

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE &
DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 4 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1004	N

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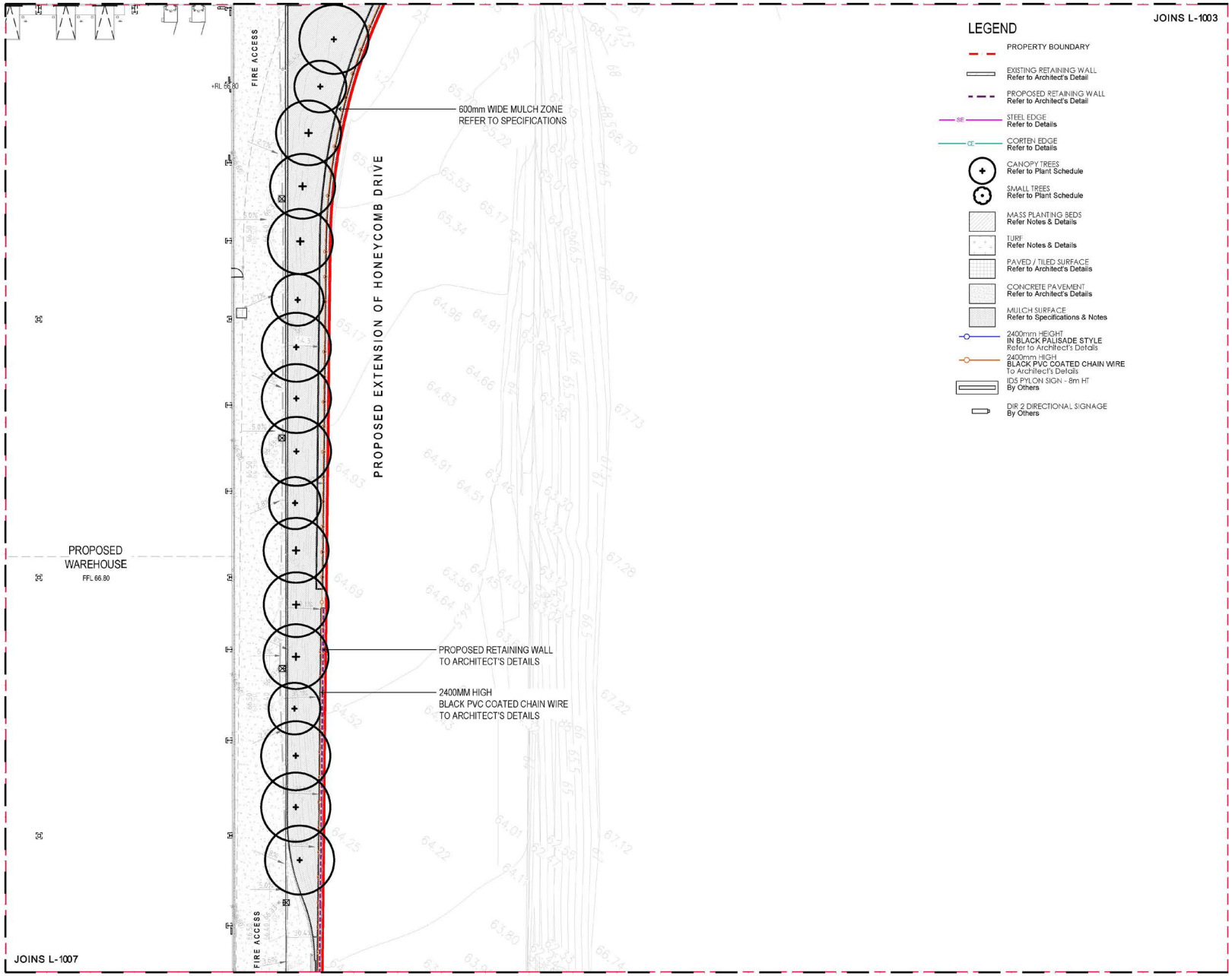

JOINS L-1003

LEGEND

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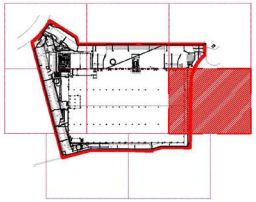

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 5 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1005	N

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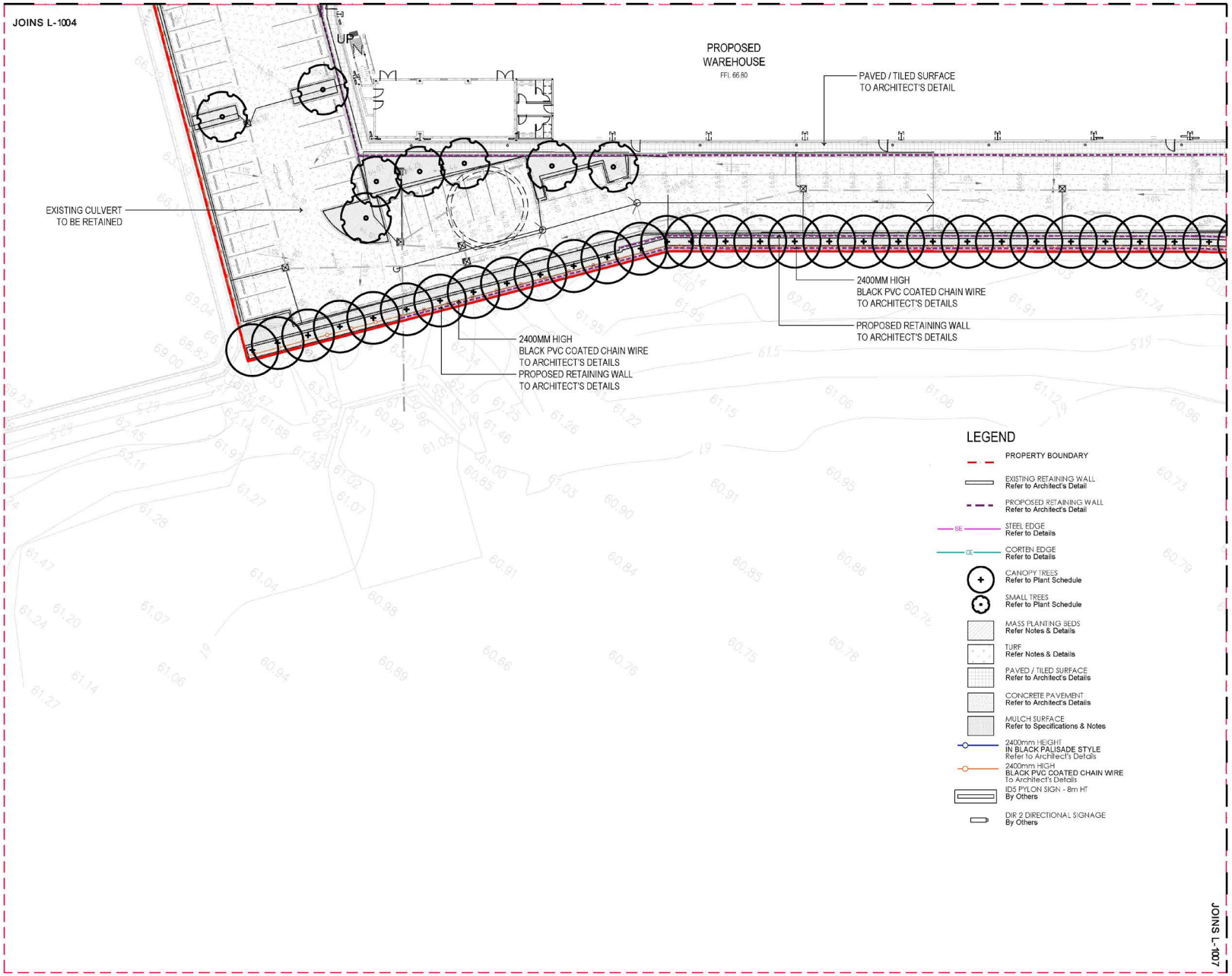

JOINS L-1007

ISSUE	DATE	PURPOSE
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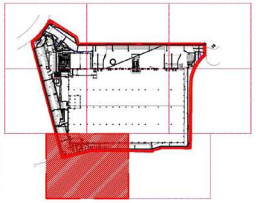

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 6 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1006	N

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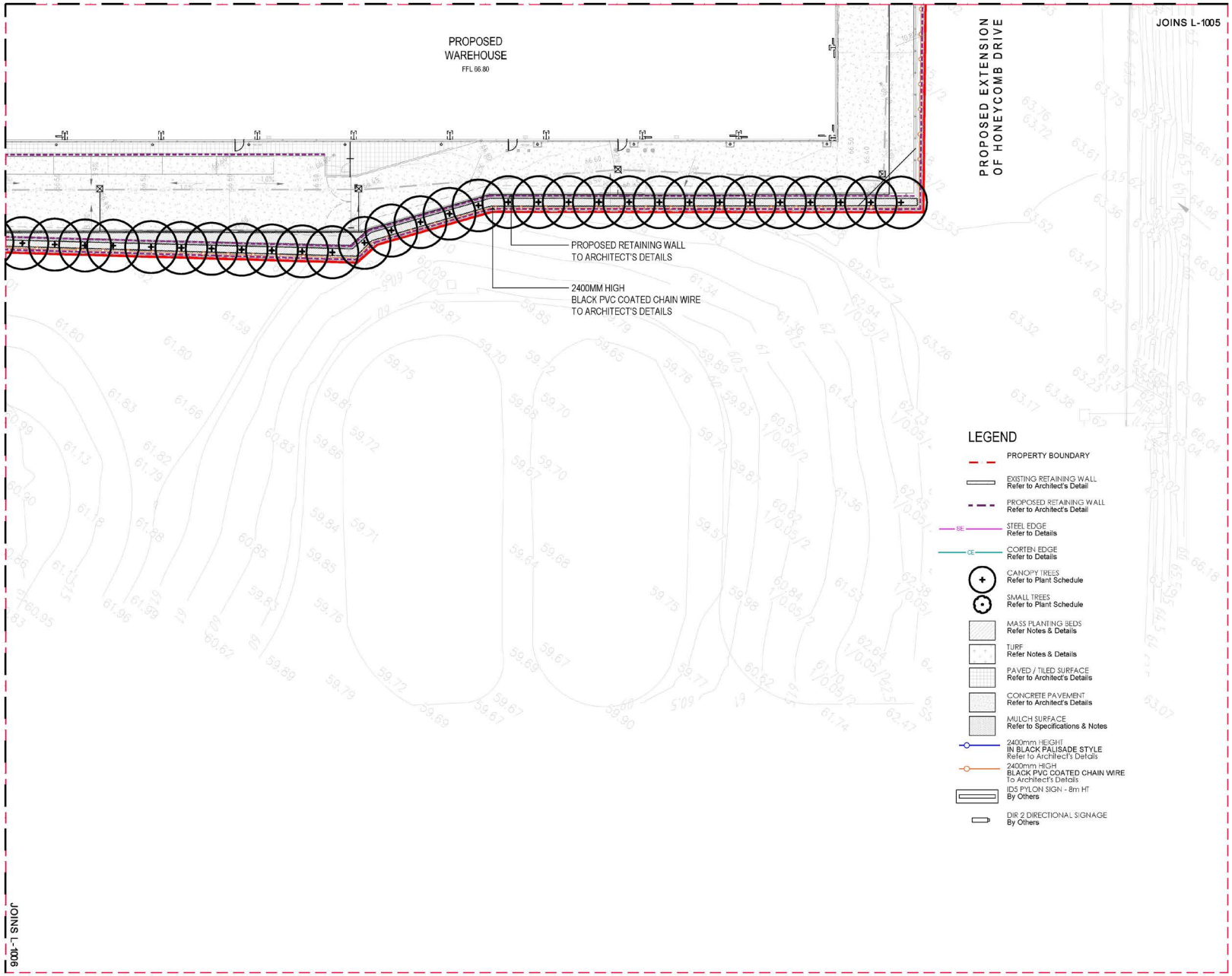

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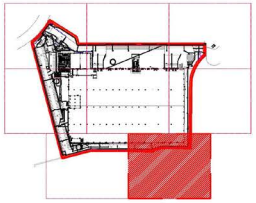

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
GENERAL ARRANGEMENT
PLAN 7 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-1007	N

LANDSCAPE ARCHITECT:

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PLANT IMAGES

TREES


COR MAC


CUP ANA


ANG COS


MAG GRA


ELA EUM


TRI LAU


FIC FLA


JAC MIM


EUC MOL


WAT FLO


BAN INT

BIO BASIN PLANTING


LOM TAN


ISO NOD


HIB SCA


DIA LON

SHRUBS & GROUNDCOVERS


ACM SMI


PIT TOB


NAN SP


CAL CIT


GRE SUP


SYZ AUS


WES FRU


AGA ATT


CAL CAP


PHO TEN


HAR VIO


CAR GLA


SEN SER

PLANT SCHEDULE

CODE	BOTANICAL NAME	POT SIZE	DENSITY	QUANTITY
TREES				
COR MAC	CORYMBIA maculata	100L	As Shown	7
CUP ANA	CUPANIOPSIS anacardioides	100L	As Shown	13
ANG COS	ANGOPHORA costata	100l	As Shown	5
MAG GRA	MAGNOLIA grandiflora 'Coolwyn Gloss'	200L	As Shown	7
ELA EUM	ELAEOCARPUS eumundii	100L	As Shown	18
TRI LAU	TRISTANIOPSIS laurina	200L	As Shown	16
FIC FLA	FICUS 'Flash'	200L	As Shown	8
JAC MIM	JACARANDA mimosifolia	200L	As Shown	9
EUC MOL	EUCALYPTUS moluccana	75L	As Shown	3
WAT FLO	WATERHOUSEA floribunda	100L	As Shown	6
BAN INT	BANKSIA integrifolia	75L	As Shown	60
SHRUBS				
ACM SMI	ACMENA smithii 'Minor'	300mm	1/m²	95
PIT TOB	PITTOSPORUM tobira 'Miss Muffet	200mm	3/m²	568
PIT TOB	PITTOSPORUM tobira 'Miss Muffet	150mm	3/m²	568
NAN SP	NANDINA 'Blush'	200mm	2/m²	126
CAL CIT	CALLISTEMON citrinus 'White Anzac'	200mm	1/m²	224
SYZ AUS	SYZIGIUM australe 'Southern Form'	200mm	2/m²	348
SYZ AUS	SYZIGIUM australe 'Southern Form'	300mm	2/m²	348
WES FRU	WESTRINGIA fruticosa	200mm	2/m²	540
AGA ATT	AGAVE attenuata	200mm	2/m²	4
PHO TEN	PHORMIUM tenax	140mm	2/m²	5
CAL CAP	CALLISTEMON citrinus 'Captain Cook'	200mm	1/m²	64
GRE SUP	GREVILLEA 'Superb'	150mm	4/m²	200
GROUNDCOVERS				
CAR GLA	CARPOBROTUS glaucescens	150mm	4/m²	777
CAR GLA	CARPOBROTUS glaucescens	TUBESTOCK	4/m²	777
HAR VIO	HARDENBERGIA violacea	150mm	4/m²	210
HAR VIO	HARDENBERGIA violacea	TUBESTOCK	4/m²	210
SEN SER	SENECIO serpens	150mm	4/m²	152

PLANT SCHEDULE: BIO BASIN

BASIN				
CODE	BOTANICAL NAME	POT SIZE	DENSITY	QUANTITY
SEDGES + GRASSES				
LOM LON	LOMANDRA longifolia	TUBESTOCK	5/m²	120
MEL ERU	MELALEUCA erubescens	TUBESTOCK	5/m²	120
MIC STI	MICROLAENA stipoides	TUBESTOCK	5/m²	120
DIA LON	DIANELLA longifolia	TUBESTOCK	5/m²	120

NOTE:
1.0 Large pot sizes to be positioned at site entry and around site office.

2.0 Landscape architect to approve plant set out prior to planting.

ISSUE	DATE	PURPOSE
A	28.11.21	CLIENT REVIEW
B	06.12.21	SSD SUBMISSION
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D	11.02.22	SSD SUBMISSION
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G	30.06.22	SSD SUBMISSION
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J	23.11.22	ISSUED FOR TENDER
K	30.11.22	ISSUED FOR TENDER
L	17.03.23	ISSUED FOR TENDER
M	13.04.23	FOR CONSTRUCTION
N	17.10.23	FOR CONSTRUCTION

CLIENT
Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
PLANT PALETTE

SCALE
NTS

DRAWN
KM

CHECKED
DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2000	N

LANDSCAPE ARCHITECT:
HABIT8
Landscape Architecture & Urbanism
Level 57, MLC Centre, 19-29 Martin Place, Sydney, NSW 2000
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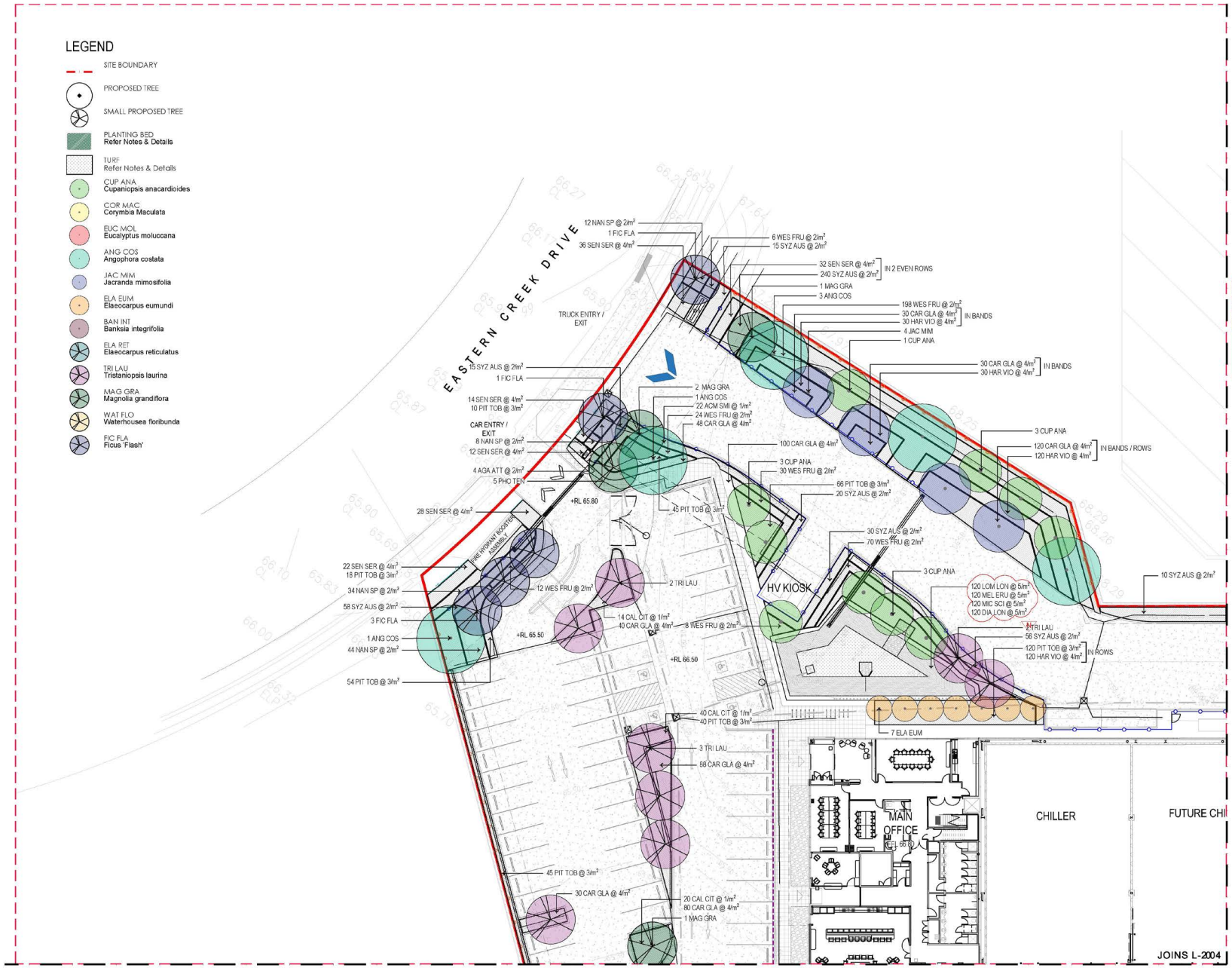
M: 0425 206 047



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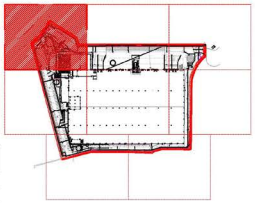

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING PLAN 1 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2001	N

LANDSCAPE ARCHITECT:

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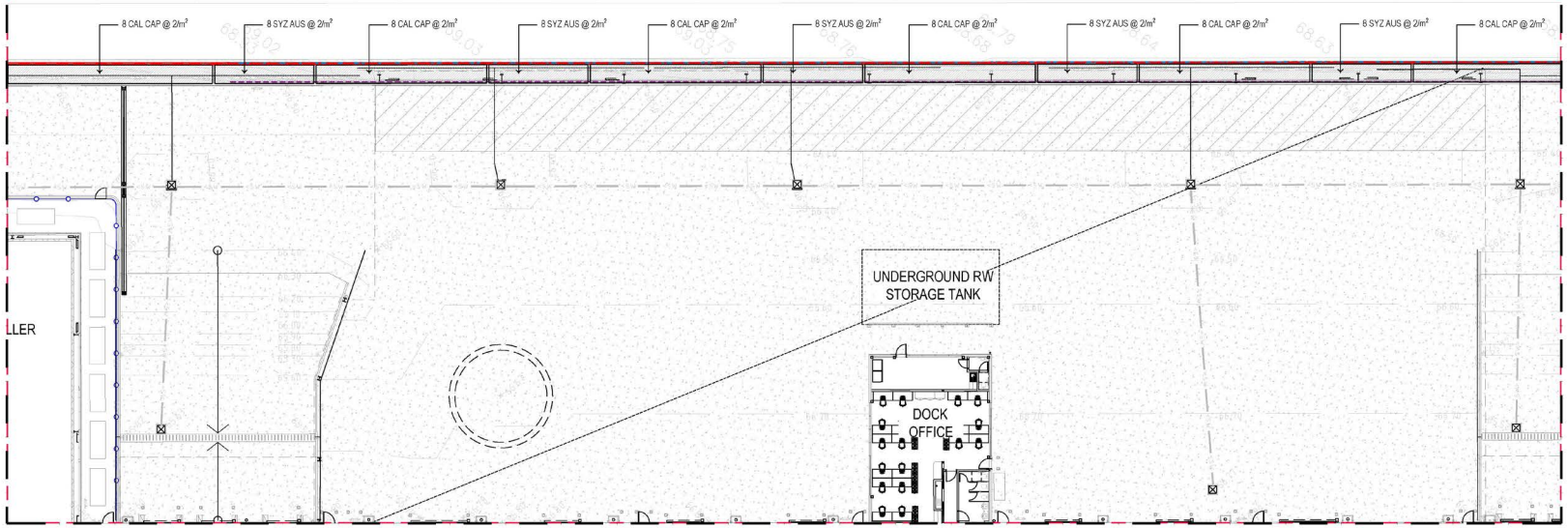
JOINS L-2001

JOINS L-2003

LEGEND

- SITE BOUNDARY
- PROPOSED TREE
- SMALL PROPOSED TREE
- PLANTING BED
  Refer Notes & Details
- TURF
  Refer Notes & Details
- CUP ANA
  Cupaniopsis anacardioides
- COR MAC
  Corymbia Maculata
- EUC MOL
  Eucalyptus moluccana
- ANG COS
  Angophora costata
- JAC MIM
  Jacranda mimosifolia
- ELA EUM
  Elaeocarpus eumundi
- BAN INT
  Banksia integrifolia
- ELA RET
  Elaeocarpus reticulatus
- TRI LAU
  Tristaniopsis laurina
- MAG GRA
  Magnolia grandiflora
- WAT FLO
  Waterhousea floribunda
- FIC FLA
  Ficus 'Flash'



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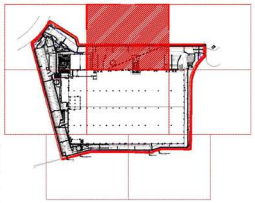

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING
PLAN 2 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2002	N

LANDSCAPE ARCHITECT:

HABIT8
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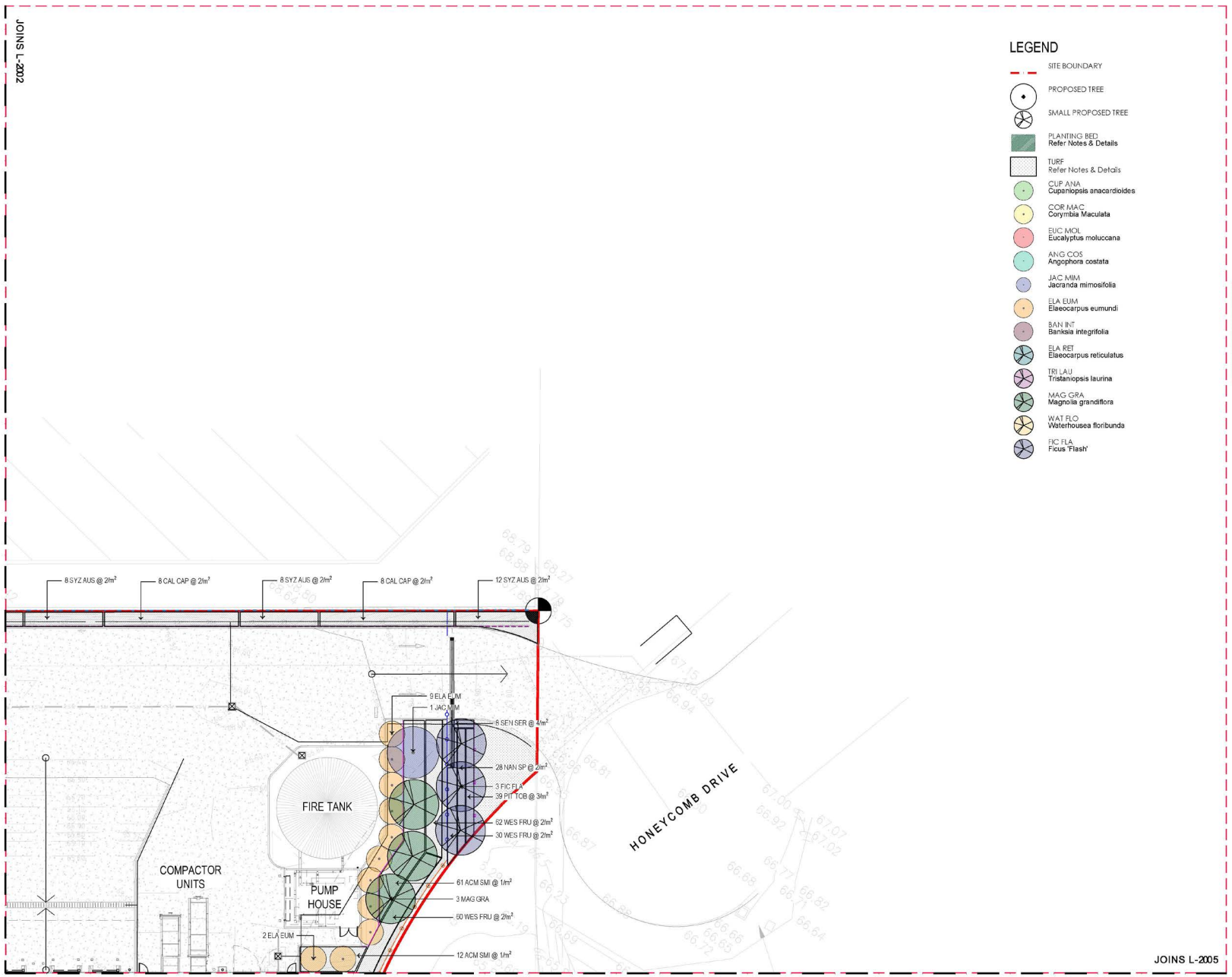
JOINS L-2002



JOINS L-2005

LEGEND

- SITE BOUNDARY
- PROPOSED TREE
- SMALL PROPOSED TREE
- PLANTING BED Refer Notes & Details
- TURF Refer Notes & Details
- CUP ANA Cupaniopsis anacardioides
- COR MAC Corymbia Maculata
- EUC MOL Eucalyptus moluccana
- ANG COS Angophora costata
- JAC MIM Jacranda mimosifolia
- ELA EUM Elaeocarpus eumundi
- BAN INT Banksia integrifolia
- ELA RET Elaeocarpus reticulatus
- TRI LAU Tristaniopsis laurina
- MAG GRA Magnolia grandiflora
- WAT FLO Waterhousea floribunda
- FIC FLA Ficus 'Flash'

ISSUE	DATE	PURPOSE
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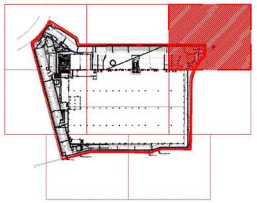

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING
PLAN 3 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2003	N

LANDSCAPE ARCHITECT:

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LEGEND

- SITE BOUNDARY
- PROPOSED TREE
- SMALL PROPOSED TREE
- PLANTING BED — Refer Notes & Details
- TURF — Refer Notes & Details
- CUP ANA — Cupaniopsis anacardioides
- COR MAC — Corymbia Maculata
- EUC MOL — Eucalyptus moluccana
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- JAC MIM — Jacranda mimosifolia
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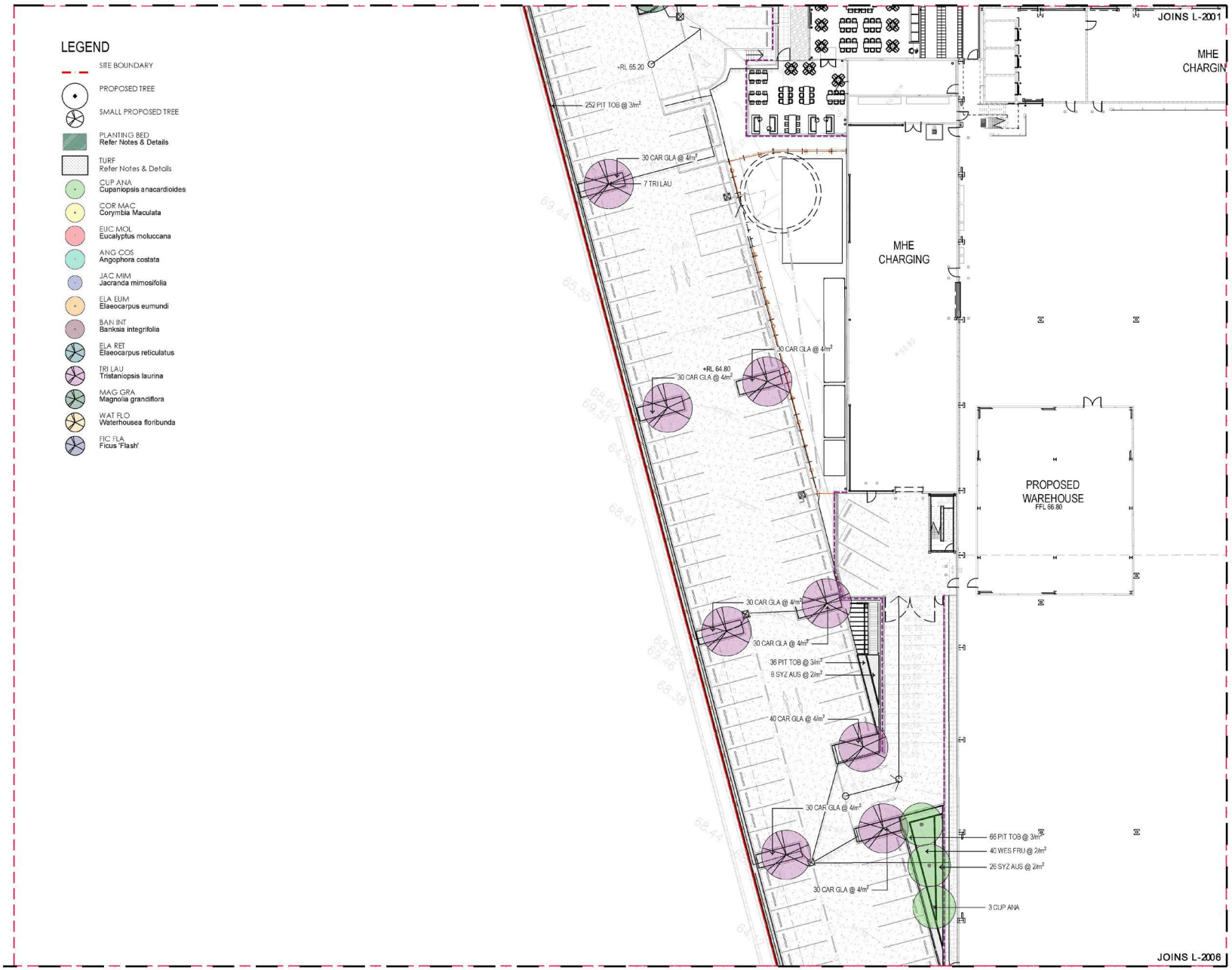
- FIC FLA — Ficus 'Flash'



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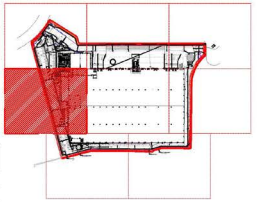

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING PLAN 4 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2004	N

LANDSCAPE ARCHITECT:

HABIT8
Landscape Architecture & Urbanism
Level 57, MLC Centre, 19-29 Martin Place, Sydney, NSW 2000
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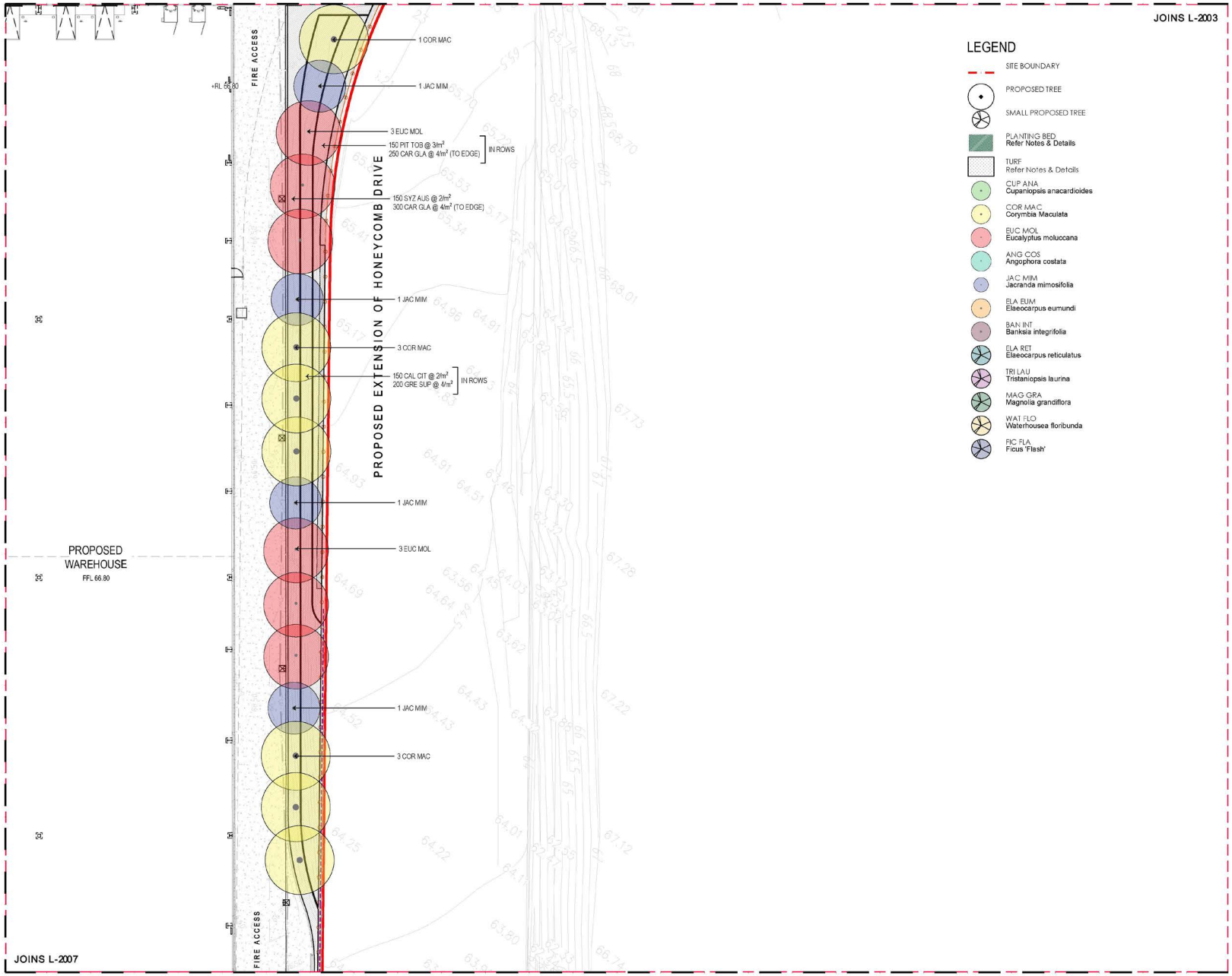

LEGEND

- SITE BOUNDARY
- PROPOSED TREE
- SMALL PROPOSED TREE
- PLANTING BED Refer Notes & Details
- TURF Refer Notes & Details
- CUP ANA Cupaniopsis anacardioides
- COR MAC Corymbia Maculata
- EUC MOL Eucalyptus moluccana
- ANG COS Angophora costata
- JAC MIM Jacranda mimosifolia
- ELA EUM Elaeocarpus eumundi
- BAN INT Banksia integrifolia
- ELA RET Elaeocarpus reticulatus
- TRI LAU Tristaniopsis laurina
- MAG GRA Magnolia grandiflora
- WAT FLO Waterhousea floribunda
- FIC FLA Ficus 'Flash'

ISSUE	DATE	PURPOSE
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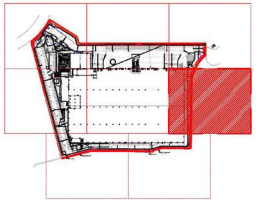

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING
PLAN 5 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2005	N

LANDSCAPE ARCHITECT:

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Landscape Architecture & Urbanism
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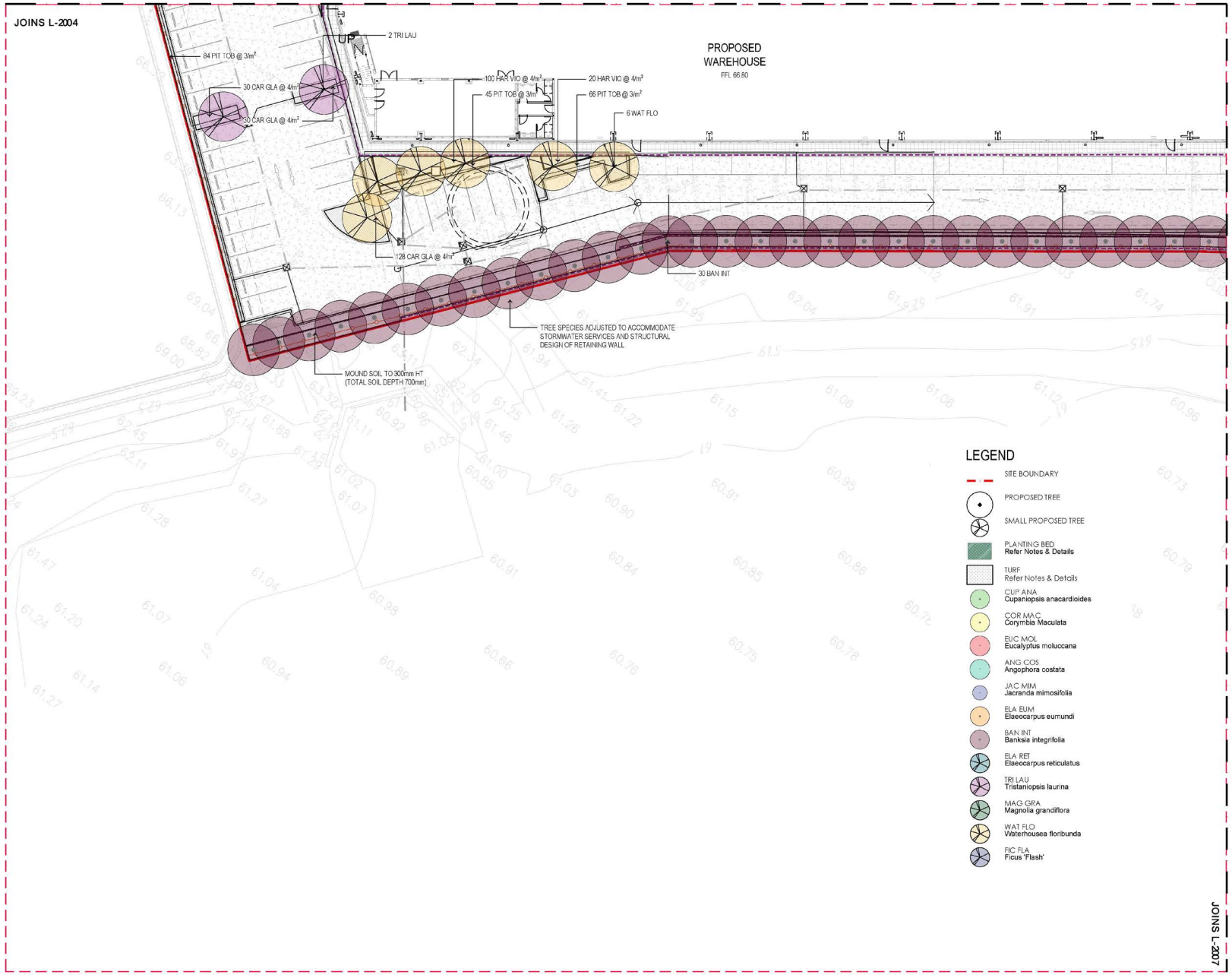
JOINS L-2004



LEGEND

- SITE BOUNDARY
- PROPOSED TREE
- SMALL PROPOSED TREE
- PLANTING BED — Refer Notes & Details
- TURF — Refer Notes & Details
- CUP ANA — Cupaniopsis anacardioides
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- WAT FLO — Waterhousea floribunda
- FIC FLA — Ficus 'Flash'

JOINS L-2007

ISSUE	DATE	PURPOSE
A	28.11.21	CLIENT REVIEW
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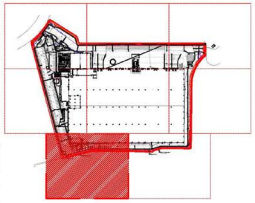

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING PLAN 6 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2006	N

LANDSCAPE ARCHITECT:

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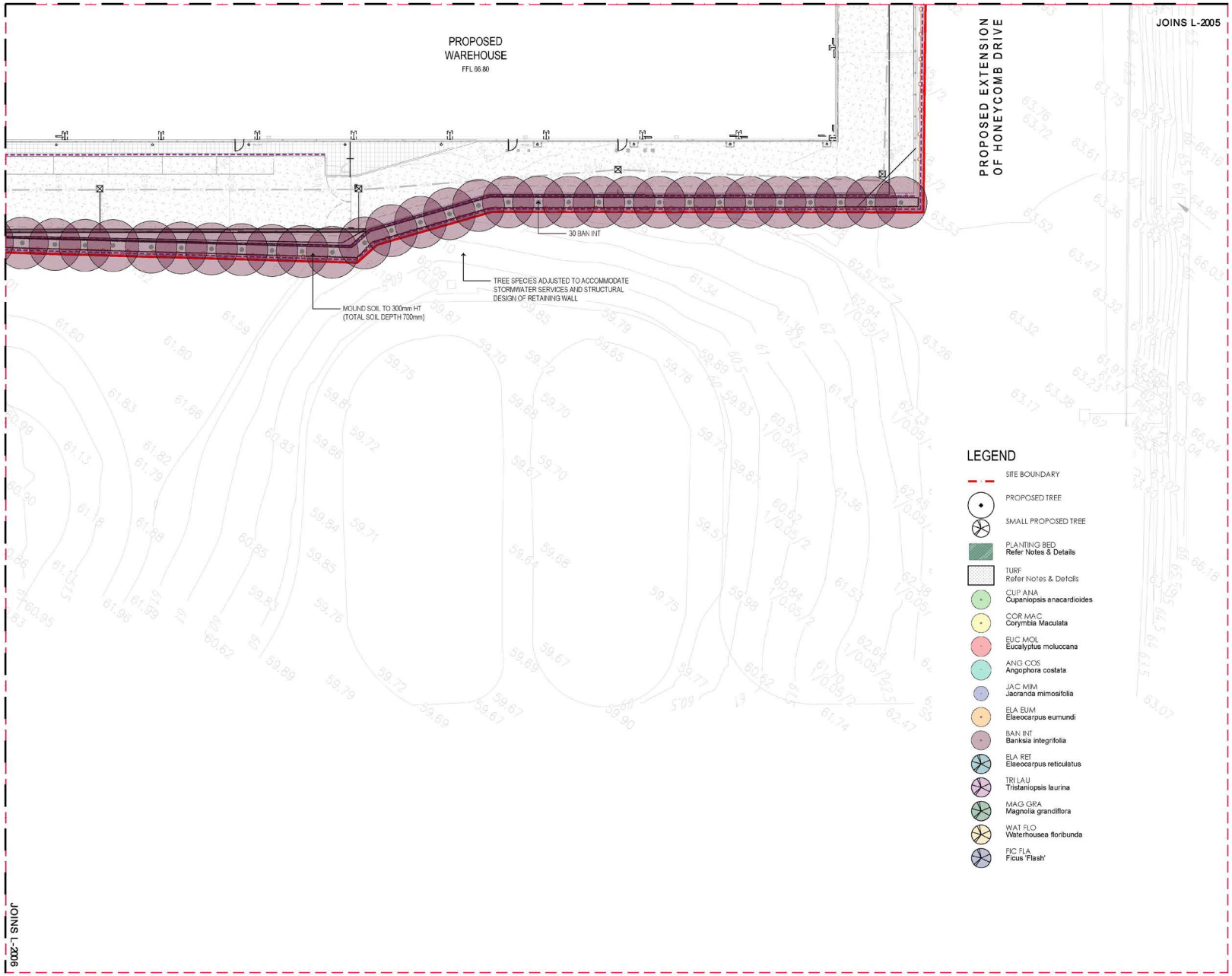

ISSUE	DATE	PURPOSE
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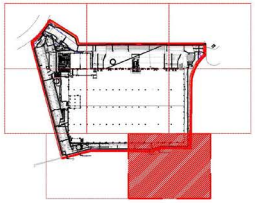

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE &
DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE PLANTING
PLAN 7 OF 7

SCALE
1:200 @ A1 / 1:400 @ A3

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-2007	N

LANDSCAPE ARCHITECT:

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SPECIFICATION NOTES (TYPICAL)

The Charter Hall and Sprout KOP Annexure G is to be the over-riding document in any instance.

- A high standard of mature landscaping is expected leading to the customer entry. A fully designed low maintenance landscape plan with no turf shall be provided after reviewing the most recent copy of the Charter Hall Kit of Parts, to then be sent to Charter Hall for review and approval.
- The landscaping design consider ongoing maintenance, clear lines of sight and general tidiness. For example - preference to gravel beds in car park landscaping. All stone products are to be environmentally friendly ie no river rocks.
- The D&C Contractor shall provide an automatic watering system, connected to the rain water tanks and mains water back up, for the site with all landscaping and irrigation as per the applicable landscape drawings but not less than one tap per major garden bed and one within 30m of minor beds for hose access The Landscape Architect is to review irrigation design to ensure it is a performance based specification and adequate.
- Irrigation to be linked to the water re-use system.
- The contractor is to allow for all turfing and landscaping in the nature strip as required by Council.
- 12 months' full maintenance is required after PC including a 3 month plant warranty.
- All new trees shall be staked and tied. Existing trees deemed to remain shall be protected during construction and documented with an arborist report.
- A follow up arborist report shall be undertaken prior to the conclusion of the 12 month defects liability period.
- Landscape beds are to be clear of builders rubble which is not to be disposed of throughout the site.
- Soil inside of the landscape beds are to be raised to a level that allows for importation of topsoil. Costs to remove excess filling to allow suitable topsoil placement will be charged to the builder.

SERVICES
Landscaping is to be completed to Authority requirements. Building & Estate Landscaping to be in line with the Charter Hall landscape specification and Assets Presentation Guidelines Annexure G
Remove all weed and other debris from planter beds and areas to be landscaped. Remove rocks and branches larger than 75mm.

Before landscape work is commenced the Landscape Contractor is to establish the position of all service lines and ensure tree planting is carried out at least 3 metres away from these services. Service lids, vents and hydrants shall be left exposed and not covered by any landscape finishes (turfing, paving, garden beds etc.) Finish adjoining surfaces flush with pit lids.

PLANTING MIXTURE
Imported Garden Mix.
Type: Premium Garden Soil Mix by ANL

MULCH
APPLICATION: Place mulch to the required depth, (refer to drawings) clear of plant stems, and rake to an even surface finishing 25mm below adjoining levels. Ensure mulch is watered in and tamped down during installation.
MULCH TYPE:
Pine bark: From mature trees, graded in size from 15mm to 30mm, free from wood slivers. Dark brown in colour and texture.

COMPOST
Shall be "GO Compost" as available from Soilco or approved equal.

PLANT MATERIAL
All plants supplied are to conform with those species listed in the Plant Schedule on the drawings. Generally plants shall be vigorous, well established, hardened off, of good form consistent with species or variety, not soft or forced, free from disease or insect pests with large healthy root systems and no evidence of having been restricted or damaged. Trees shall have a leading shoot. Immediately reject dried out, damaged or unhealthy plant material before planting. All stock is to be container grown for a minimum of six (6) months prior to delivery to site.

- All plant material shall be obtained from an approved reputable nursery/supplier where plants are exposed and have been hardened-off in the open.
- Plants are to be healthy, well-grown specimens, free of pest, injury and diseases.
- Carry out the supply and installation of all planting as specified including preparation of tree holes, back filling, planting of trees, staking and tying and planting of garden beds as set out and scheduled on the Drawings.
- It is the Contractors responsibility to adequately protect and maintain vegetative material against any adverse or damaging climatic conditions before and during the planting procedure.
- Hardwood stakes, as per details are to be installed immediately after tree planting. Stakes are to be driven 600mm into the ground or deep enough to ensure that the stake will remain stable and vertical. Tie tree to stakes using 2 "figure eight" ties of canvas or approved equivalent.

FERTILISER
MASS PLANTING AREAS: Fertiliser shall be 'Nutricote' or approved equivalent in granule form intended for slow release of plant nutrients over a period of approximately nine months. Thoroughly mix fertiliser with planting mixture at the recommended rate, prior to installing plants.
TURF: Shall be Shirleys No. 17 or approved equal thoroughly mixed into the topsoil prior to placing turf.
SUPER ADVANCED TREES: Pellets shall be in the form intended to uniformly release plant food elements for a period of approximately nine months equal to Shirleys Kokei pellets, analysis 6.3:1.8:2.9. Kokei pellets shall be placed at the time of planting to the base of the plant, 50mm minimum from the root ball at a rate of two pellets per 300mm of top growth to a maximum of 8 pellets per tree.

STAKING AND TYING
Stakes shall be straight hardwood, free from knots and twists, pointed at one end and sized according to size of plants to be staked.
a. 5-15 litre size plant 1x(1200x25x25mm)
b. 35-75 litre size plant 2x(1500x38x38mm)
c. 100-greater than 200litre 3x(1800x50x50mm)
Ties shall be 50mm wide hessian webbing or approved equivalent nailed or stapled to stake. Drive stakes a minimum one third of their length, avoiding damage to the root system, on the windward side of the plant.

TURF
Obtain turf from a specialist grower of cultivated turf. turf shall be of even thickness, free from weeds and other foreign matter; lay in stretcher pattern with joints staggered and close butted, perpendicular to gradient of FSL. Water immediately after laying.
TURF TYPE: Kikuyu (Confirm with Council)

- All turf to be laid within 24hrs after delivery to site.
- Roll soil to achieve an even and firm but not compacted surface before laying of turf. Finish topsoil so as to be 15mm below adjoining pavement surfaces to allow for turf thickness. Stagger joins in each new row and make sure all joints are tightly butt jointed together. Immediately water turf after laying of turf. On gradients, turf to be laid diagonally across the slope, peg turf in areas with slopes greater than 1:3. Ensure pegs are removed after turf has established.
- Water turf a minimum once a day for the first 7 days of installation and every 2 days thereafter from day 8-21 of installation. Additional hand sprigging will be required to any areas that have failed or where coverage is noticeably inconsistent.
- Turfing is undertaken between the months of November and March, ensure grassing is watered daily (at a minimum) for the first two weeks subsequent to laying.

LANDSCAPE MAINTENANCE PROGRAM (GENERAL)

Maintenance shall mean the care and maintenance of the landscape works by accepted horticultural practice as rectifying any defects that become apparent in the landscape works under normal use. This shall include, but shall not be limited to, watering, mowing, fertilising, re-seeding, returfing, weeding, pest and disease control, staking and tying, replanting, cultivation, pruning, aerating, renovating, top dressing, maintaining the site in a neat and tidy condition as follows:-

GENERAL
The landscape contractor shall maintain the landscape works for the term of the maintenance (or Plant establishment) period to the satisfaction of the council. The landscape contractor shall attend to the site on a weekly basis. The maintenance period shall commence at practical completion and continue for a period of twenty six (26) weeks.

WATERING
Grass, trees and garden areas shall be watered regularly so as to ensure continuous healthy growth.

RUBBISH REMOVAL
During the term of the maintenance period the landscape contractor shall remove rubbish that may occur and reoccur throughout the maintenance period. This work shall be carried out regularly so that at weekly intervals the area may be observed in a completely clean and tidy condition.

REPLACEMENTS
The landscape contractor shall replace all plants that are missing, unhealthy or dead at the Landscape Contractor's cost. Replacements shall be of the same size, quality and species as the plant that has failed unless otherwise directed by the Landscape Architect. Replacements shall be made on a continuing basis not exceeding two (2) weeks after the plant has died or is seen to be missing.

STAKES AND TIES
The landscape contractor shall replace or adjust plant stakes, and tree guards as necessary or as directed by the Landscape Architect. Remove stakes and ties at the end of the maintenance period if so directed.

PRUNING
General: Prune to reflect the natural growth flowering and regrowth habit of the individual species.
Shrubs: Prune after flowering - Spring and Summer and on a spot basis as required.
Hedge trimming: Schedule trimming at times which will maintain the character and design of hedges. Allow up to three times per season.
Tip pruning: To encourage development of new shoots during the active growing season. Do not remove buds before the flowering season in those plants that have terminal flowers.
Radical pruning: To maintain a hedge or formal shape or when a particular problem, growth habit, damage, or disease requires branch removal.
Trees: Prune to eliminate diseased or damaged growth, avoid inter-branch contact and thin out crowns in a natural manner, maintain sight lines to signs and lights, or maintain visibility for personal security. Tree branch removal to AS 4373. Give notice and engage a suitably qualified 'arborist'.

MULCHED SURFACES
All mulched surfaces shall be maintained in a clean and tidy condition and be reinstated if necessary to ensure that a depth of 75mm is maintained. Ensure mulch is kept clear of plant stems at all times. Remove all mulching materials off lawn or paved areas and maintain a clean and tidy appearance when viewed on a weekly basis.

PEST AND DISEASE CONTROL
The landscape contractor shall spray against insect and fungus infestation with all spraying to be carried out in accordance with the manufacturer's directions. Report all instances of pests and diseases (immediately that they are detected) to the Landscape Architect.

GRASS AND TURF AREAS
The landscape contractor shall maintain all grass and turf areas by watering, weeding, re-seeding, rolling, mowing, trimming or other operations as necessary. Seed and turf species shall be the same as the original specified mixture. Grass and turf areas shall be sprayed with approved selective herbicide against broad leafed weeds as required by the Landscape Architect and in accordance with the manufacturer's directions. Grass and turf areas shall be fertilised once a year in autumn with "Dynamic Lifter" for lawns at a rate of 20kg per 100m2. Fertiliser shall be watered in immediately after application. Irregularities in the grass and turf shall be watered in immediately after application.
Grass and turf areas shall be kept mown to maintain a healthy and vigorous sward. Mowing height: 30-50mm.

WEED ERADICATION
Eradicate weeds by environmentally acceptable methods using a non-residual glyphosate herbicide (eg. 'Roundup') in any of its registered formulae, at the recommended maximum rate. Regularly remove by hand, weed growth that may occur or recur throughout grassed, planted and mulched areas. Remove weed growth from an area 750mm diameter around the base of trees in grassed areas. Continue eradication throughout the course of the works and during the maintenance period.

SOIL SUBSIDENCE
Any soil subsidence or erosion which may occur after the soil filling and preparation operations shall be made good by the landscape contractor at no cost to the client.

MAINTENANCE PERIOD:
The maintenance period for all landscaping is 12 months from Practical Completion and an establishment warranty period of 3 months from Practical Completion.
During the maintenance period:

- The Contractor is responsible for the satisfactory establishment of all soft works and parts thereof prior to the issuance of the Final Completion Certificate.
- Establishment shall mean the care and maintenance of the contract area by accepted horticultural practices, as well as rectifying any defects that may become apparent in the Works under normal use within 14 days of the defect being noted.
- Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection on request.

During the warranty period:

- The Landscape Contractor is responsible for all losses of plant material due to nursery stock failure or improper horticultural care during the landscape maintenance / plant establishment period. If plants die as a result of poor horticultural practice, they are to be replaced within 48 hours. If plants die or are removed for other reasons, such as theft or vandalism, the Contractor is to notify the Superintendent immediately and replace the effected planting within 48 hours.

IRRIGATION (PERFORMANCE SPECIFICATION)

IRRIGATION OVERVIEW - Confirm with Project Manager at tender stage.

EXTENT
All mass planting landscape areas and trees are to have full coverage by a fully automatic irrigation system. The design, materials and installation are to be in accordance with Sydney Water Codes and all relevant Australian Standards.

1. An automatic irrigation system is to be installed to all turf and garden bed areas.
2. The irrigation system shall be designed and installed by a licensed contractor to relevant Australian standards and Sydney water guidelines.
3. The irrigation system shall be connected into the rainwater tank system and pump.

DRIPLINE
Provide 13mm dripline to all garden bed areas with appropriate 13mm joiners. Dripline to be Toro drip or similar with 400mm centre drippers. Install line at 500mm spacings with the first line to be 150mm in from edge.
Install dripline after planting and prior to mulching to allow for an adequate mulch cover.
Anchor at 1.5m maximum intervals with u-shaped stakes. Dripline pattern to suit planting.

CONTROL VALVES
24v solenoid actuated hydraulic valve with flow control. Control valves to be Toro ezflow series solenoids 25mm or approved equal. Provide a gate valve of the same size immediately upstream of each valve. House both valves in a high impact plastic valve box with a high impact plastic cover at finished ground level. Support the box with bricks on each side.
Controller to be Toro greenkeeper or approved equal with a rain switch.
Install a master valve/pressure regulating valve equal to Toro p220 with exreg pressure regulation valve. Filter to be installed equal to Toro y filter 75mm screen filter.

CONTROL WIRES
Connect the control valves and soil moisture sensor to the controller with double insulated underground cables laid alongside piping where possible. Lay intertwined for their full length without joints except at the valves and branches off common wires. Provide waterproof connectors.

Provide a backflow prevention device to Sydney water standards AS 3500.

DEFECTS LIABILITY PERIOD
The irrigation system shall be subject to a 12 month defects and liability period.

RELEVANT AUSTRALIAN STANDARDS

Soil: AS4419, AS3743, AS4454
Mulch: AS4454
Tree: AS2303
Pruning: AS4373
Tree Protection: AS4970
Contractor to comply with the above Australian Standards

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CLIENT
Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE SPECIFICATION & MAINTENANCE NOTES

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3001	N

LANDSCAPE ARCHITECT:
HABIT8
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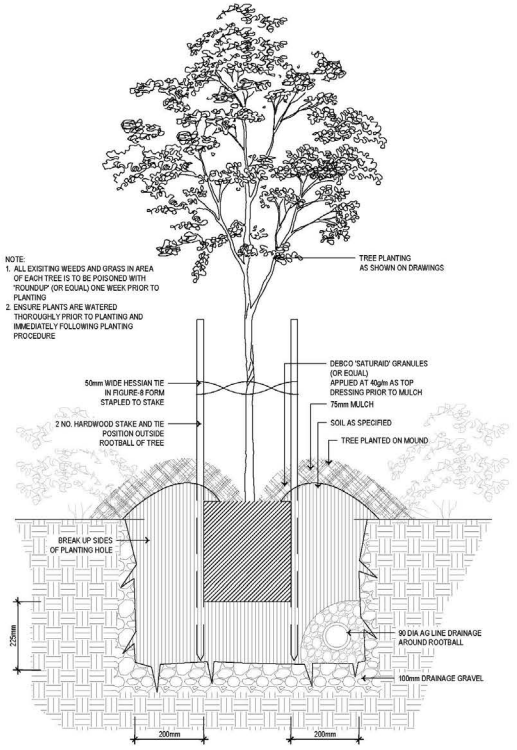
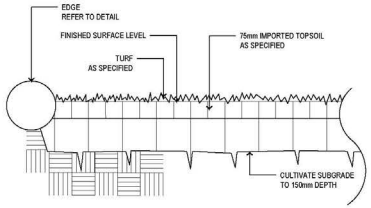
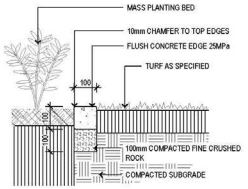


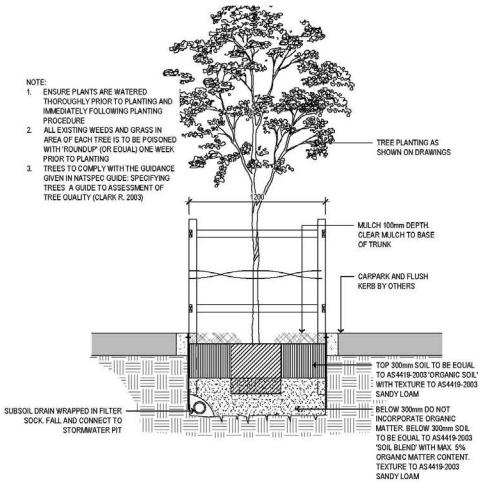
01 TREE PLANTING DETAIL (100L+)
SCALE 1: 10



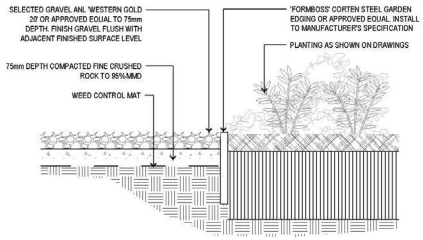
03 TURF DETAIL
SCALE 1: 10



06 CONCRETE EDGE DETAIL
SCALE 1: 10



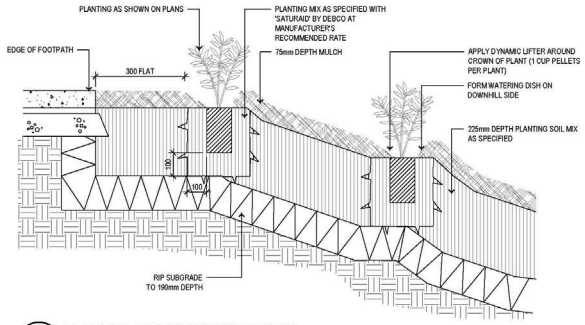
04 TREE PLANTING IN CARPARK DETAIL
SCALE 1: 20



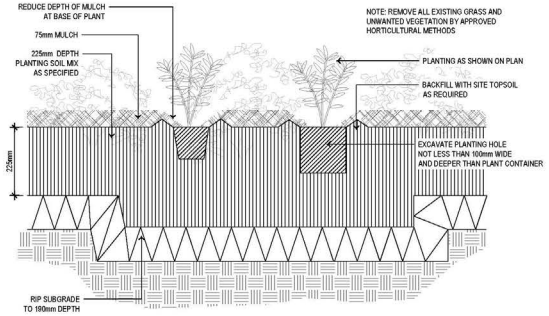
07 STEEL EDGE DETAIL
SCALE 1: 10

PRUNING NOTES:

TREES	PRUNING HEIGHT
LARGE SHRUBS (E.G. SYZ AUS)	2m
MEDIUM SHRUBS (E.G. WES FRU)	1m
SMALL SHRUBS (E.G. PIT TOB, NAN SP)	600mm
TREES	• 2m CLEAR TRUNK • PLEACHED CANOPIES



02 PLANTING ON EMBANKMENT DETAIL
SCALE 1: 10



05 MASS PLANTING DETAIL
SCALE 1: 10

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A	28.11.21	CLIENT REVIEW
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CLIENT
Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE DETAILS 01

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3002	N

LANDSCAPE ARCHITECT:

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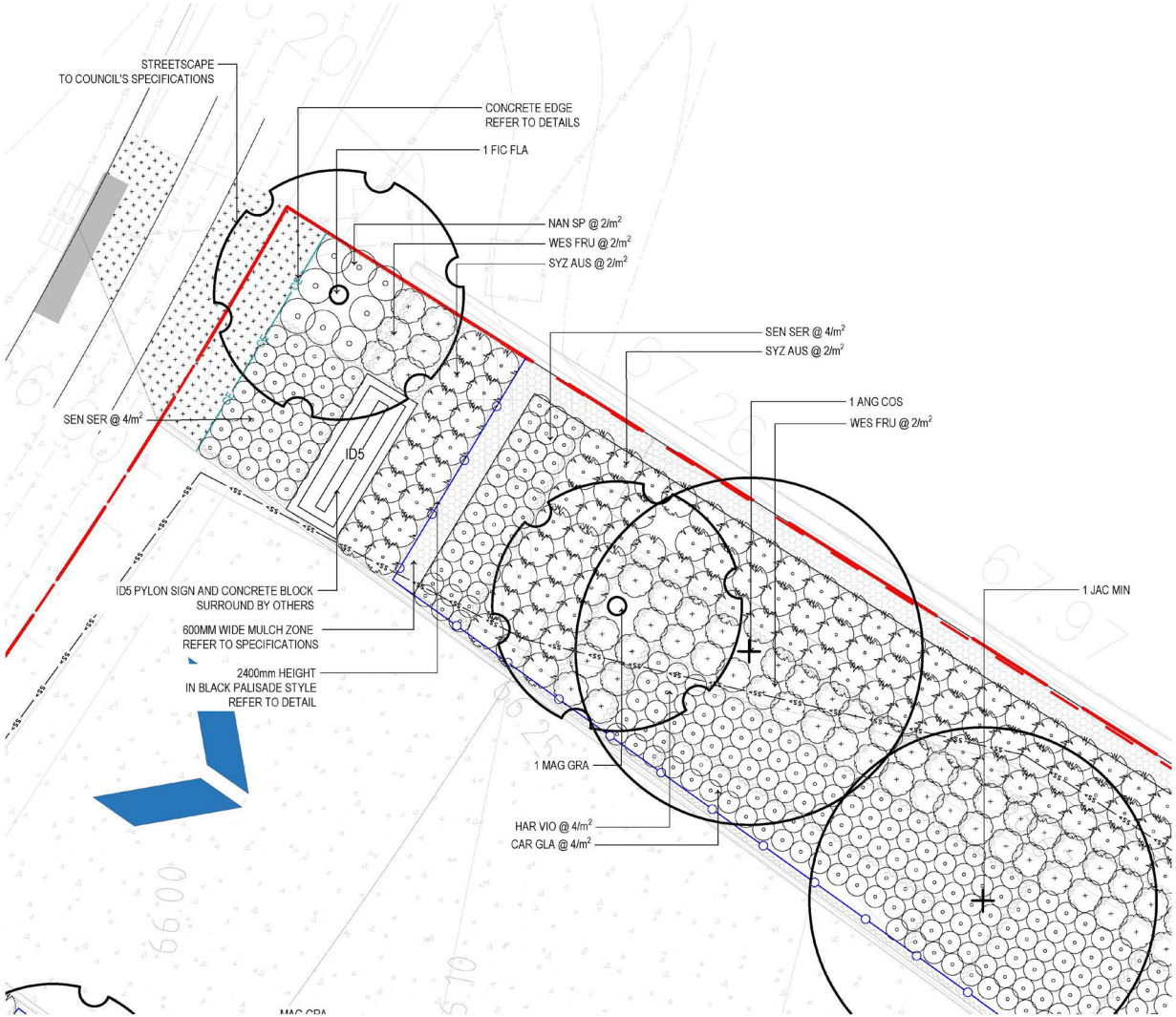
LEGEND

- PROPERTY BOUNDARY
- EXISTING RETAINING WALL — Refer to Architect's Detail
- CE — CONCRETE EDGE — Refer to Details
- CANOPY TREES — Refer to Plant Schedule
- SMALL TREES — Refer to Plant Schedule
- TURF — Refer Notes & Details
- PAVED / TILED SURFACE — TO ARCHITECT'S DETAILS
- CONCRETE PAVEMENT — TO ARCHITECT'S DETAILS
- MULCH SURFACE — REFER TO SPECIFICATION NOTES
- 2400mm HEIGHT IN BLACK PALISADE STYLE — Refer to Detail
- 2400mm HIGH BLACK PVC COATED CHAIN WIRE — To Architect's Details
- ID5 PYLON SIGN - 8m HT — By Others



01 ENTRY STATEMENT
SCALE 1 : 50 @A1 / 1 : 100 @A3

ISSUE	DATE	PURPOSE
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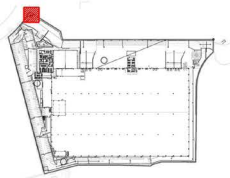

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE DETAILS 02
(CHARTER HALL STANDARD)

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3003	N

LANDSCAPE ARCHITECT:

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- IDS PYLON SIGN - 8m HT — By Others

01 FRONT SETBACK PLANTING
SCALE 1 : 50 @A1 / 1 : 100 @A3

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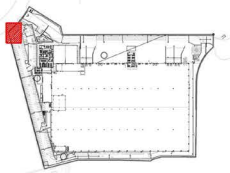

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE DETAILS 03
(CHARTER HALL STANDARD)

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3004	N

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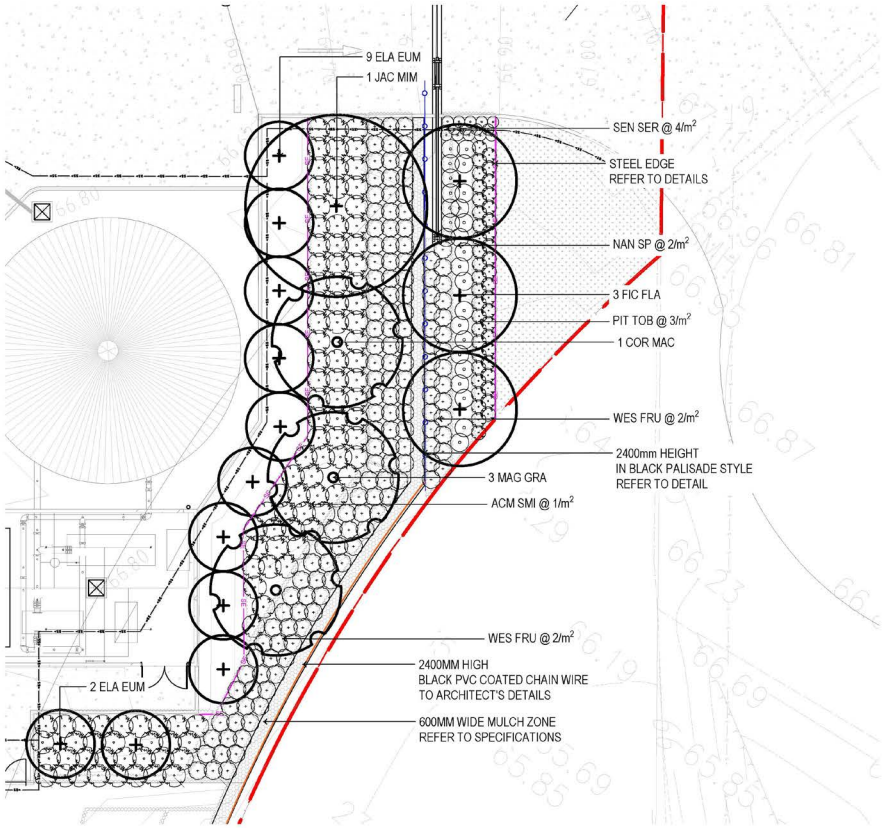

01 HONEYCOMB DRIVE EXIT
SCALE 1: 50 @A1 / 1: 100 @A3

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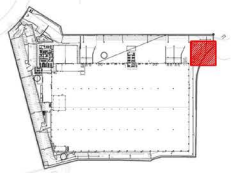

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE DETAILS 04
(CHARTER HALL STANDARD)

N

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3005	N

LANDSCAPE ARCHITECT:

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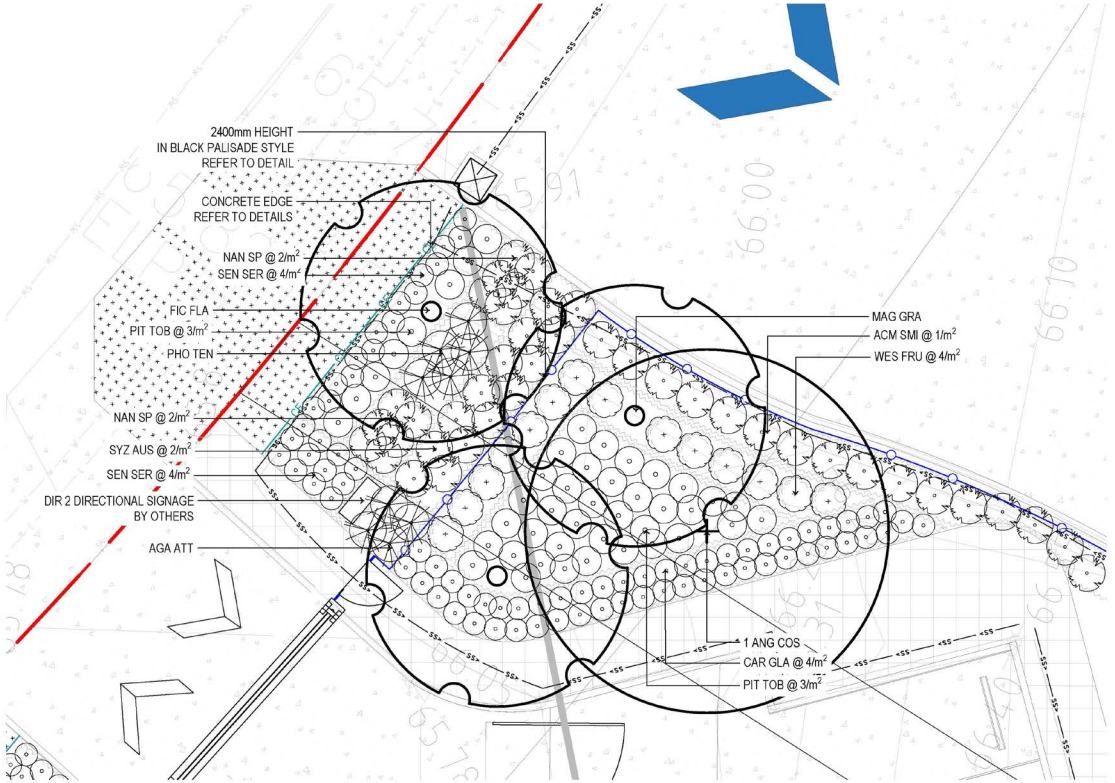

01 FRONT SETBACK PLANTING
SCALE 1:50 @A1 / 1:100 @A3

ISSUE	DATE	PURPOSE
A	28.11.21	CLIENT REVIEW
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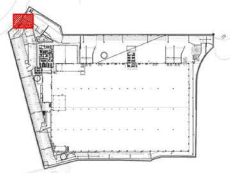

KEY PLAN

CLIENT

Charter Hall

PROJECT
COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE
LOT 1 EASTERN CREEK DRIVE, EASTERN CREEK

DRAWING TITLE
LANDSCAPE DETAILS 05
(CHARTER HALL STANDARD)

SCALE
AS SHOWN

DRAWN	CHECKED
KM	DV

PROJECT NO.	DRAWING NO.	REVISION
H8-21054	L-3006	N

LANDSCAPE ARCHITECT:

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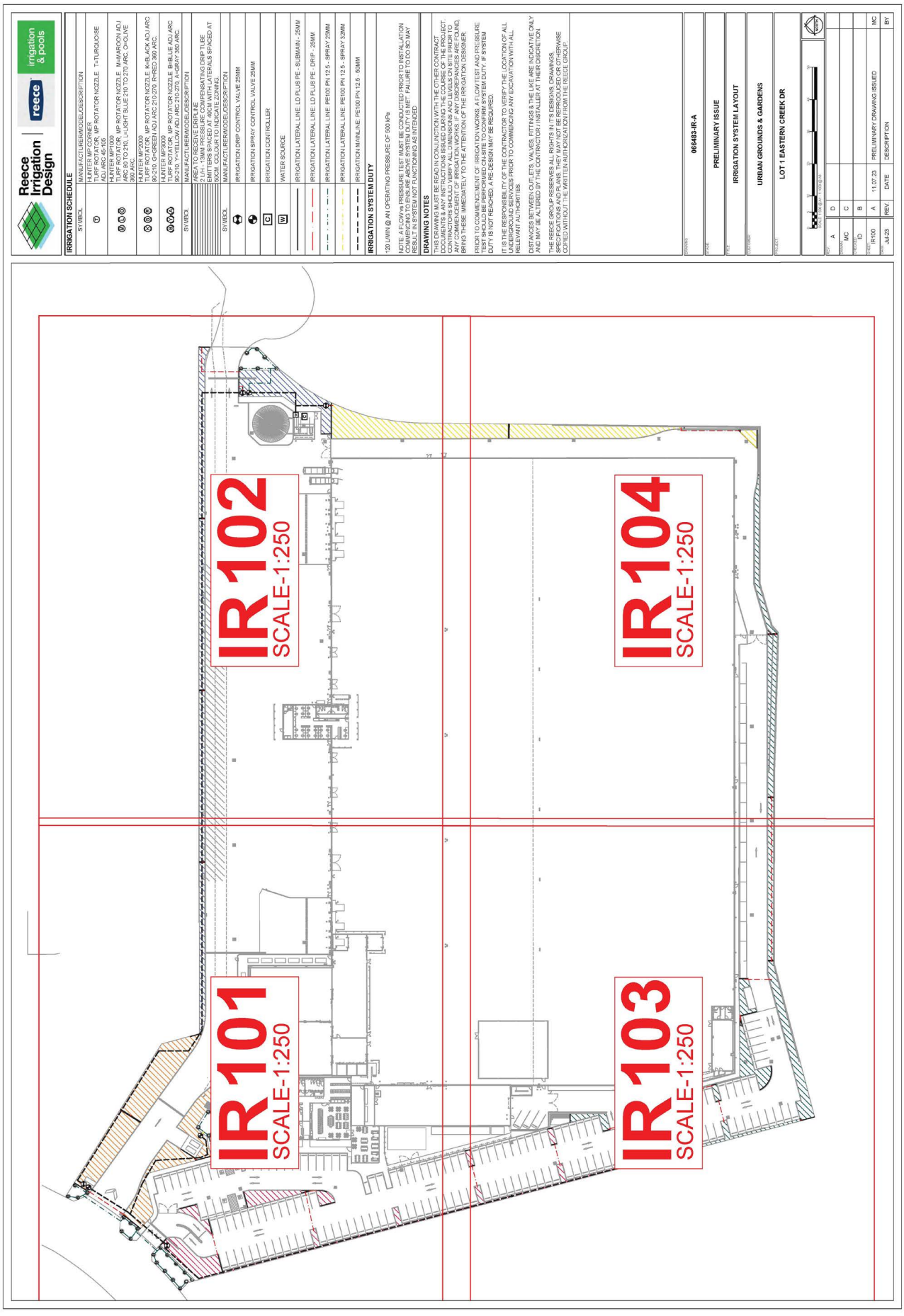
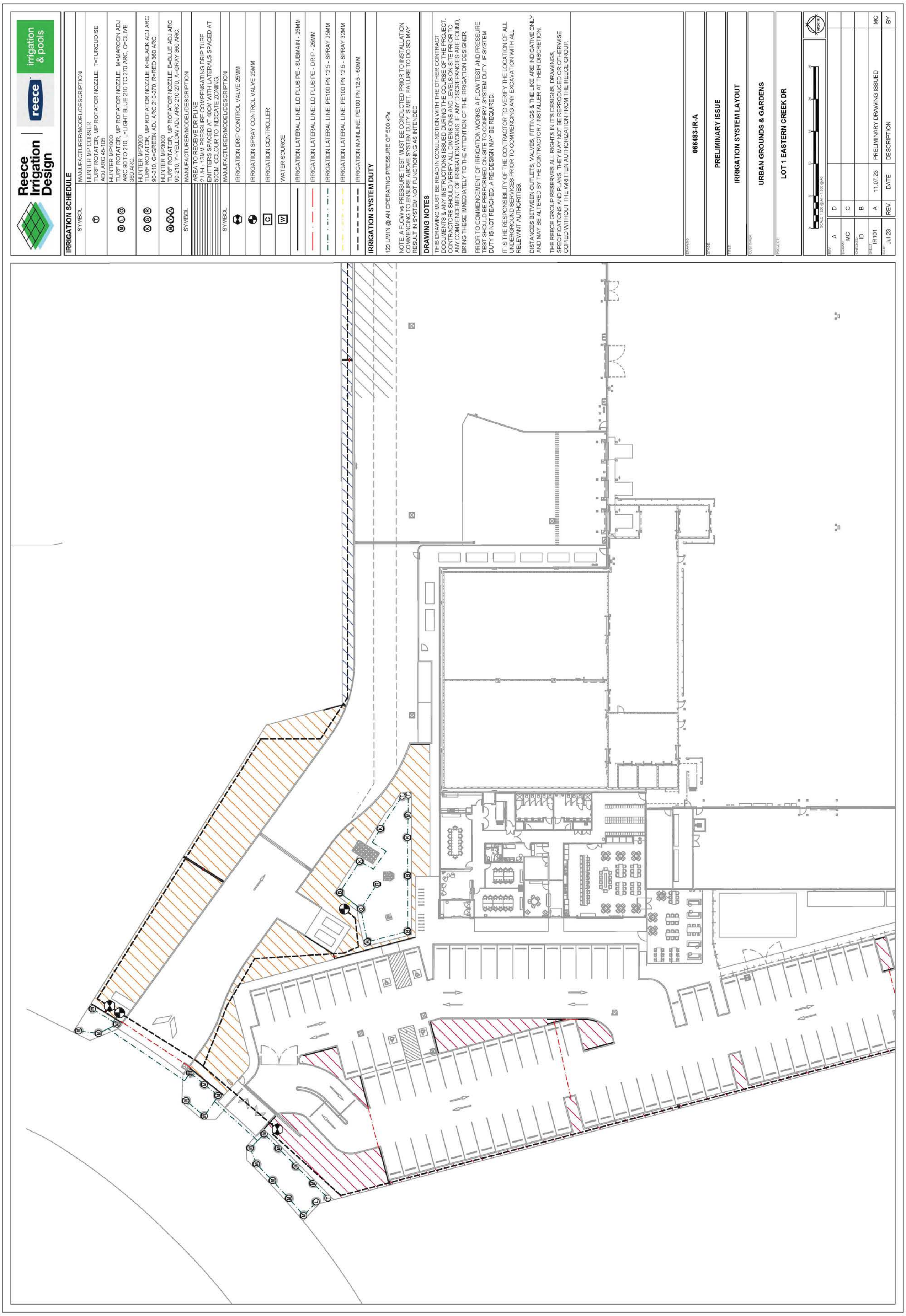
APPENDIX B: LANDSCAPE IRRIGATION DOCUMENTATION




Reece Irrigation Design
reece
irrigation & pools
IRRIGATION SCHEDULE
SYMBOL
MANUFACTURER/MODEL/DESCRIPTION
HUNTER MP CORNER TURF ROTATOR, MP ROTATOR NOZZLE. T=TURQUOISE ADJ ARC 45-105
HUNTER MP1000 TURF ROTATOR, MP ROTATOR NOZZLE. M=MAROON ADJ ARC 90 TO 210, L=LIGHT BLUE 210 TO 270 ARC, O=OLIVE 360 ARC.
HUNTER MP2000 TURF ROTATOR, MP ROTATOR NOZZLE. K=BLACK ADJ ARC 90-210, G=GREEN ADJ ARC 210-270, R=RED 360 ARC.
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IRRIGATION DRIP CONTROL VALVE 25MM
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IRRIGATION CONTROLLER
WATER SOURCE
IRRIGATION LATERAL LINE: LD PLUS PE - SUBMAIN - 25MM
IRRIGATION LATERAL LINE: LD PLUS PE - DRIP - 25MM
IRRIGATION LATERAL LINE: PE100 PN 12.5 - SPRAY 25MM
IRRIGATION LATERAL LINE: PE100 PN 12.5 - SPRAY 32MM
IRRIGATION MAINLINE: PE100 PN 12.5 - 50MM
IRRIGATION SYSTEM DUTY
120 L/MIN @ AN OPERATING PRESSURE OF 500 kPa
NOTE: A FLOW vs PRESSURE TEST MUST BE CONDUCTED PRIOR TO INSTALLATION COMMENCING TO ENSURE ABOVE SYSTEM DUTY IS MET. FAILURE TO DO SO MAY RESULT IN SYSTEM NOT FUNCTIONING AS INTENDED
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THE REECE GROUP RESERVES ALL RIGHTS IN IT'S DESIGNS, DRAWINGS, SPECIFICATIONS AND PLANS. THEY MAY NOT BE REPRODUCED OR OTHERWISE COPIED WITHOUT THE WRITTEN AUTHORIZATION FROM THE REECE GROUP.
066483-IR-A
PRELIMINARY ISSUE
IRRIGATION SYSTEM LAYOUT
URBAN GROUNDS & GARDENS
LOT 1 EASTERN CREEK DR
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A 11.07.23 PRELIMINARY DRAWING ISSUED MC
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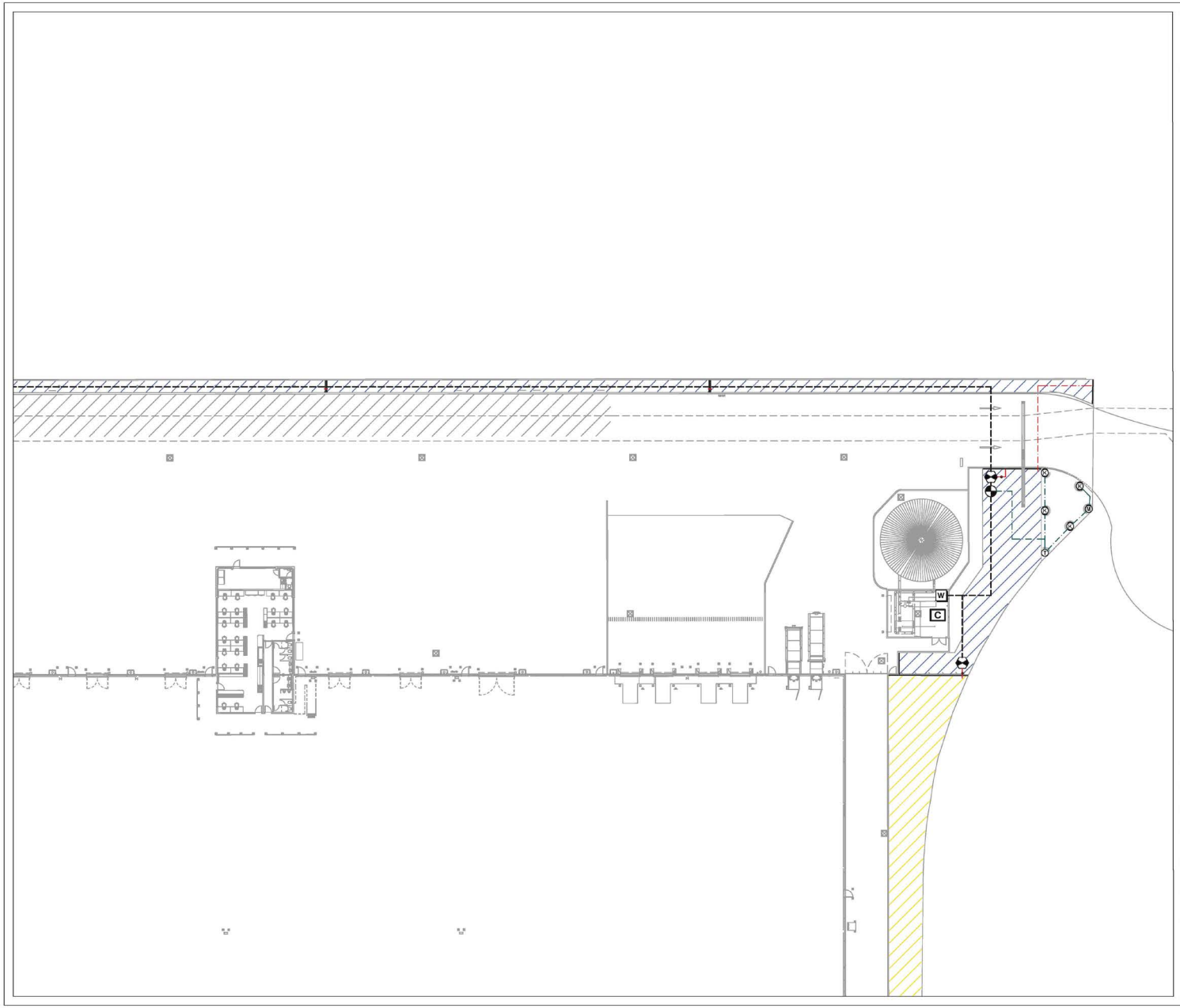

Reece Irrigation Design | reece irrigation & pools

IRRIGATION SCHEDULE

SYMBOL	MANUFACTURER/MODEL/DESCRIPTION
T	HUNTER MP CORNER TURF ROTATOR, MP ROTATOR NOZZLE. T=TURQUOISE ADJ ARC 45-105
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DRAWING: 066483-IR-A

STAGE: PRELIMINARY ISSUE

UNIT: IRRIGATION SYSTEM LAYOUT

CUSTOMER: URBAN GROUNDS & GARDENS

PROJECT: LOT 1 EASTERN CREEK DR

SCALE 1:250 @ A1 - 1:500 @ A3

NORTH

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DRAWN: MC	C			
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SHEET: IR102	A	11.07.23	PRELIMINARY DRAWING ISSUED	MC
DATE: Jul-23	REV.	DATE	DESCRIPTION	BY

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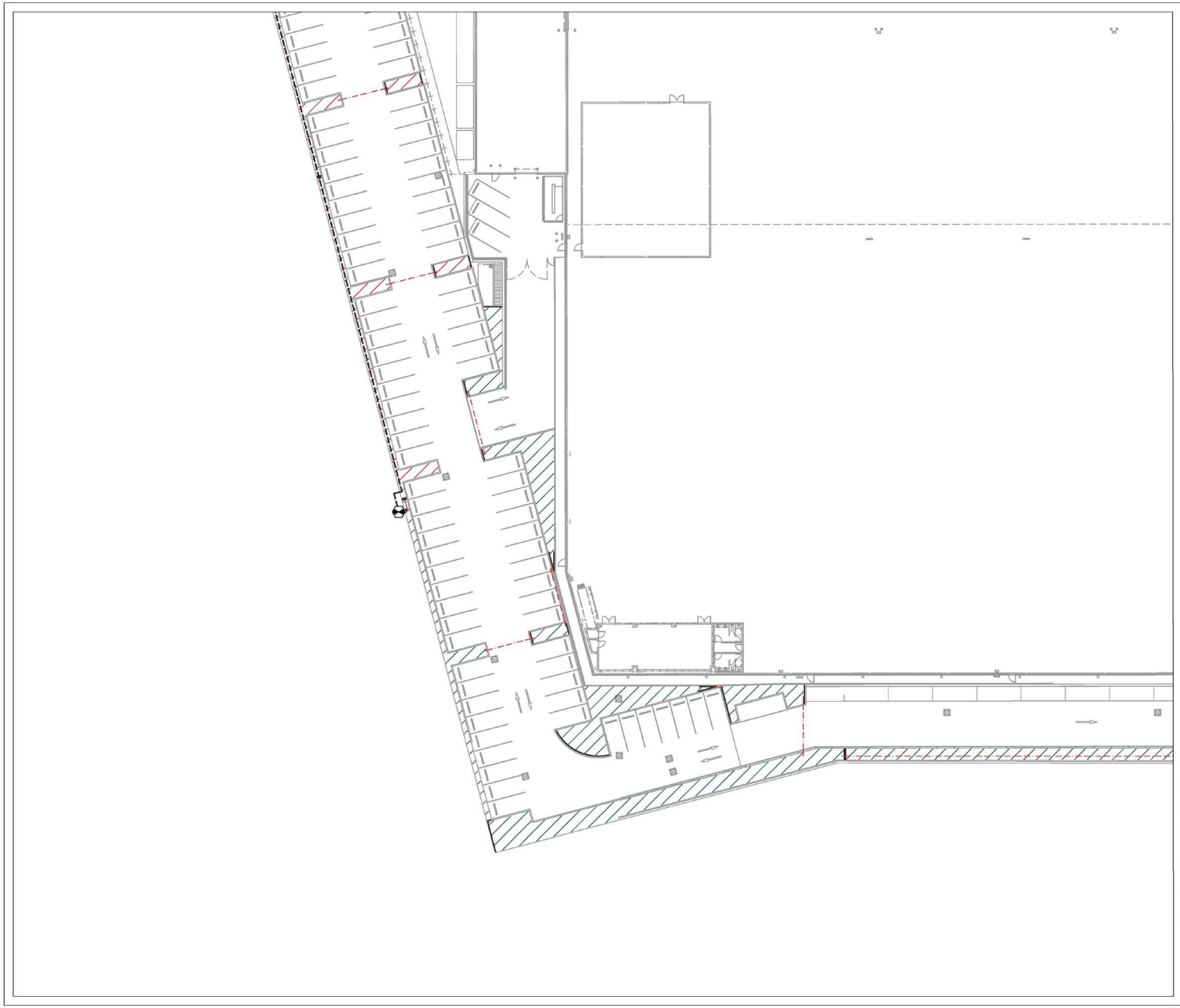

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DRAWING: 066483-IR-A

STAGE: PRELIMINARY ISSUE

TITLE: IRRIGATION SYSTEM LAYOUT

CUSTOMER: URBAN GROUNDS & GARDENS

PROJECT: LOT 1 EASTERN CREEK DR

SCALE 1:250 @ A1 - 1:500 @ A3

NORTH

REV: A	D			
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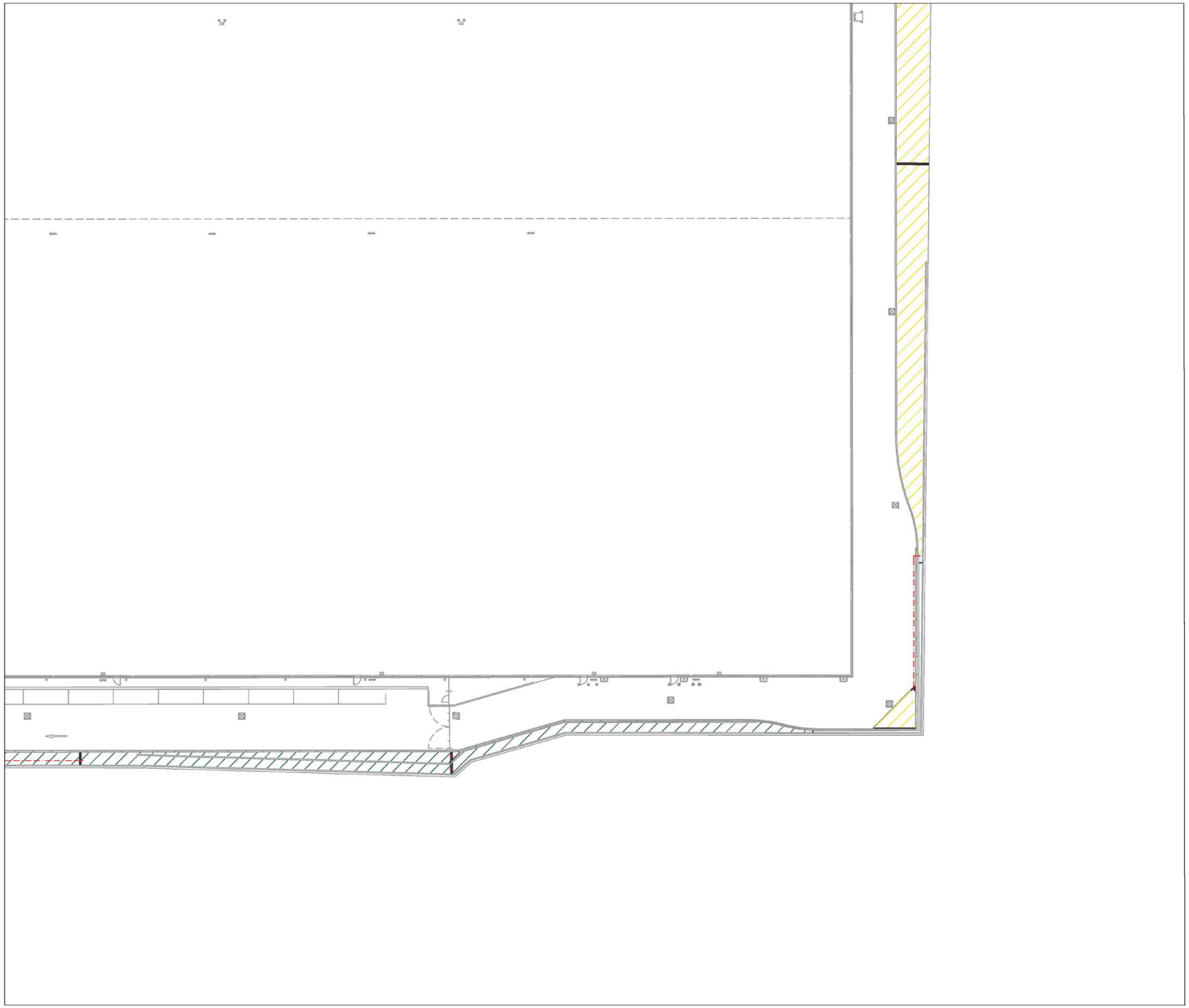
SHEET: IR103	A	11.07.23	PRELIMINARY DRAWING ISSUED	MC
DATE: Jul-23	REV.	DATE	DESCRIPTION	BY



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DRAWING: 066483-IR-A

STAGE: PRELIMINARY ISSUE

PLAN: IRRIGATION SYSTEM LAYOUT

CUSTOMER: URBAN GROUNDS & GARDENS

PROJECT: LOT 1 EASTERN CREEK DR

SCALE 1:250 @ A1 - 1:500 @ A3

NORTH

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SHEET: IR104	A	11.07.23	PRELIMINARY DRAWING ISSUED	MC
DATE: Jul-23	REV.	DATE	DESCRIPTION	BY

BLACKTOWN CITY COUNCIL

WATER SENSITIVE URBAN DESIGN (WSUD) STANDARD DRAWINGS

DRAWING SCHEDULE

DRAWING SHEET	DRAWING TITLE
01	COVER SHEET
02	BIORETENTION – STANDARD NOTES
03	BIORETENTION – GENERAL ARRANGEMENT
04	BIORETENTION – DETAILS
05	BIORETENTION – SMALL BIORETENTION SYSTEMS
06	BIORETENTION – INLET DIVERSION STRUCTURES
07	BIORETENTION – INLET STRUCTURES
08	BIORETENTION – OUTLET STRUCTURES
09	BIORETENTION – OUTLET SCOUR PROTECTION
10	BIORETENTION – RAINGARDEN SYSTEM LESS THAN 30m²
11	BIORETENTION – WITHIN FLOOD DETENTION BASIN
12	BIORETENTION – LANDSCAPING
13	BIORETENTION – CONSTRUCTION WORKS STAGING – 1
14	BIORETENTION – CONSTRUCTION WORKS STAGING – 2
15	VEGETATED SWALES – FLAT SITES
16	VEGETATED SWALES – STEEP SITES
17	POROUS PAVING
18	BIORETENTION – TOWN CENTRES
19	TREE PIT BIORETENTION – STREET
20	OSD – REQUIREMENTS
21	OSD – ABOVE GROUND STORAGE
22	OSD – UNDERGROUND STORAGE
23	OSD – COMBINED OSD & FILTER CARTRIDGES
24	OSD – DEEMED TO COMPLY SOLUTION
25	RAINWATER TANKS – CHARGED LINE SYSTEMS & MUSIC MODELLING REQUIREMENTS

GENERAL NOTES

A. THE PURPOSE OF THESE DRAWINGS IS TO PROVIDE GENERAL DESIGN GUIDANCE ON KEY DETAILS HOWEVER THEY ARE NOT A STAND ALONE DESIGN RESOURCE. THEY SHOULD BE READ IN CONJUNCTION WITH OTHER DESIGN GUIDELINES INCLUDING:
   - WSUD HANDBOOK
   - BLACKTOWN CITY COUNCIL'S ENGINEERING GUIDE FOR DEVELOPMENT
   - BLACKTOWN CITY COUNCIL'S WORKS SPECIFICATIONS CIVIL
   - BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION (DRAFT)
   - OTHER RELEVANT GUIDELINES AS REFERENCED.

B. THESE DRAWINGS ARE INTENDED TO PROVIDE A LIST OF COMPLYING SOLUTIONS THAT COUNCIL ACCEPTS. THEY SHALL NOT BE USED TO STIFLE INNOVATION OR REPLACE SOUND ENGINEERING JUDGEMENT. ALTERNATIVE SOLUTIONS WILL BE ADDRESSED BY COUNCIL ON A MERITS BASED APPROACHED.

C. THE OSD DRAWINGS INCLUDED IN THIS SET ARE TO BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. WHILE THE ONLINE DEEMED TO COMPLY TOOL WILL HELP SIZE OSD SYSTEMS, THESE SYSTEMS WILL NEED TO BE CONSTRUCTED AND DESIGNED IN ACCORDANCE WITH THESE DRAWINGS.

D. THE BIORENTENTION DRAWINGS IN THIS SET MAY BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. THE TOOL IS APPLICABLE TO DEVELOPMENTS UP TO 4ha.

E. WHERE THERE IS A CLASH BETWEEN THESE DRAWINGS AND COUNCIL'S BIORETENTION SPECIFICATION, THE CONTRACTOR SHALL SEEK CLARIFICATION FROM COUNCIL.

F. THE STANDARD DRAWINGS SHOWN HEREIN MAY REQUIRE MODIFICATION TO SUIT LOCAL TOPOGRAPHY, SOILS, LANDSCAPE, SERVICES & SITE CONDITIONS. DESIGNS SHOULD INTEGRATE TREATMENT SYSTEMS INTO THE SURROUNDING LANDSCAPE.

G. WSUD SYSTEMS WITH STRUCTURAL ELEMENTS (e.g. RETAINING WALLS) REQUIRE SITE SPECIFIC STRUCTURAL DESIGN INPUT.

H. ALL WATER QUALITY AND QUANTITY MANAGEMENT MEASURES SHALL BE DESIGNED TO ENSURE:
   - EASE OF MAINTENANCE
   - ACCESS FOR MAINTENANCE
   - SAFE WORK PRACTICES
   - PUBLIC SAFETY AND HEALTH
   - COMPLIANCE WITH DESIGN CRITERIA

REFERENCES

- ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS (CRCWSC, 2015)
- WATER BY DESIGN 2014 "BIORETENTION TECHNICAL DESIGN GUIDE"
- CATCHMENTS & CREEKS, FACT SHEETS (VARIOUS)

ABBREVIATIONS

NSL	– NATURAL SURFACE LEVEL	CL	– COVER LEVEL
FSL	– FINISHED SURFACE LEVEL	RL	– REDUCED LEVEL
U/S	– UPSTREAM	RCP	– REINFORCED CONCRETE PIPE
D/S	– DOWNSTREAM	NTS	– NOT TO SCALE
IL	– INVERT LEVEL	EDD	– EXTENDED DETENTION DEPTH
RRJ	– RUBBER RING JOINT	HGL	– HYDRAULIC GRADE LINE
UNO	– UNLESS NOTED OTHERWISE	NOM	– NOMINAL
TYP	– TYPICAL	TWL	– TOP WATER LEVEL
EY	– EXCEEDANCES PER YEAR	K_{SAT}	– SATURATED HYDRAULIC CONDUCTIVITY RATE
HDPE	– HIGH DENSITY POLYETHYLENE		
PSD	– PARTICLE SIZE DISTRIBUTION		

PREPARED BY:

ISS	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '21	AMENDMENTS TO SHEETS 1, 2 & 11	CR	KH	DEC '21
C	FEB '17	PEER REVIEWED FOR ADOPTION	SJH	TN	FEB '17
B	DEC '16	FINAL DRAFT	MS	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	MS	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER/LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council

COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD, BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE (02) 9839 6000 FAX: (02) 9831 3561
DX 8117 BLACKTOWN

PLAN: 1:000 @ A1
LONG SECTIONS/HORIZ:
VERT:
CROSS SECTIONS:

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: COVER SHEET
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ASSET DESIGN

1 OF 25
REV D

BIORETENTION SYSTEMS ARE FULLY VEGETATED FILTERS. THE ABILITY OF A BIORETENTION SYSTEM TO DETAIN AND INFILTRATE INCOMING STORMWATER IS A FUNCTION OF THE FILTER SURFACE AREA, EXTENDED DETENTION (PONDING) DEPTH, INFILTRATION RATE OF THE SURFACE AND THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA.

BLACKTOWN CITY COUNCIL REQUIRES **'SATURATED SYSTEMS'**. THE CONFIGURATION OF THE OUTLET IS SUCH THAT THE SYSTEM RETAINS WATER IN A 'SATURATED' ZONE. THIS IMPROVES WATER TREATMENT THROUGH BETTER PLANT SURVIVAL. THE RECOMMENDED MINIMUM DEPTH OF THIS ZONE IS 400mm, IN LARGE SYSTEMS THE TOP OF THE SATURATED ZONE SHOULD BE 200mm BELOW THE BOTTOM OF THE FILTER MEDIA LAYER, WITHIN THE TRANSITION LAYER. THIS MAY BE REDUCED IN SMALL SYSTEMS SUBJECT TO HGL CALCULATIONS.

SATURATED SYSTEMS MUST BE LINED TO PREVENT EXFILTRATION & RETAIN WATER.

MEDIA PROPERTIES

A TYPICAL BIORETENTION SYSTEM HAS 3 LAYERS; A DRAINAGE LAYER, A TRANSITION LAYER AND THE FILTER MEDIA LAYER. GEOFABRIC IS **NOT** TO BE PLACED BETWEEN THE LAYERS OF MEDIA, OR SOCKS PLACED ON SUB-SOIL DRAINAGE.

THE MEDIA SHOULD BE PLACED IN LIFTS NO DEEPER THAN 250mm THICK AND LIGHTLY COMPACTED. A MAXIMUM OF ONE PASS WITH A SMALL VIBRATING COMPACTOR OR EQUIVALENT. EQUIPMENT SHOULD NOT BE USED FOR MEDIA PLACEMENT THAT WOULD INADVERTANTLY COMPACT THE LAYERS AND AFFECT THE INFILTRATION RATES OF WATER THROUGH THE MEDIA.

FILTER MEDIA SPECIFICATIONS

THE FILTER MEDIA IS THE TOP LAYER AND THE GROWING MEDIUM. MEDIA SHALL BE IN ACCORDANCE WITH THE PROPERTIES LISTED IN TABLE 3 *ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS* (CRC FOR WSC, 2015). AS MODIFIED BELOW:

DEPTH	500mm TYP BUT VARIES DEPENDING ON SYSTEM SCALE AND SIZE
MATERIAL	EITHER AN ENGINEERED MATERIAL - A WASHED, WELL GRADED SAND - OR NATURALLY OCCURRING SAND, A MIXTURE IS PERMITTED. IT SHOULD BE FREE OF RUBBISH AND WEEDS AND NOT BE HYDROPHOBIC. AN APPROVED FILTER MEDIA IS THE (M165) MEDIA FROM BENEDICT SAND AND GRAVEL OR APPROVED EQUIVALENT.
HYDRAULIC CONDUCTIVITY	HYDRAULIC CONDUCTIVITY: A TARGET, AS BUILT OR IN-SITU SATURATED HYDRAULIC CONDUCTIVITY RATE OF THE FILTER MEDIA SHALL BE A MINIMUM OF 100mm/Hr. THE EX-SITU (EX BIN) RATE SHALL BE A MINIMUM OF 250mm/Hr AND VERIFIED, WITH INDEPENDENT NATA REGISTERED LABORATORY TEST DATA NO LONGER THAN ONE MONTH OLD. FOR ALL MUSIC MODELS ADOPT THE IN-SITU RATE OF 100mm/Hr. TESTING OF MEDIA SHALL CONFORM TO ASTM-F1815-11. EVERY 100m³ OF MEDIA SHALL BE TESTED FOR COMPLIANCE WITH ALL SPECIFIED CRITERIA IN THIS TABLE.
PH	5.5 - 7 AS SPECIFIED FOR "NATURAL SOILS AND BLENDS" (PH : IN WATER)
ELECTRICAL CONDUCTIVITY	<1.2 DS/M AS SPECIFIED FOR "NATURAL SOILS AND BLENDS"
NUTRIENT CONTENT	LOW NUTRIENT CONTENT TOTAL NITROGEN (TN) < 1000 mg/kg NITROGEN DRAWDOWN > 0.5 (NDI) AVAILABLE PHOSPHATE (COLWELL) < 80mg/kg ORTHOPHOSPHATE < 40 mg/kg (IN BOTH STANDARD OR SATURATED SYSTEMS)
GRADING OF PARTICLES	SMOOTH GRADING - ALL PARTICLE SIZE CLASSES SHOULD BE REPRESENTED ACROSS SIEVE SIZES FROM THE 0.05mm TO THE 3.4mm SIEVE AS PER ASTM F 1632-03 (2010). ACCEPTABLE RANGE (%W/W) RETAINED CLAY & SILT < 3% (< 0.05 mm) VERY FINE SAND 5-30% (0.05 - 0.15 mm) FINE SAND 10-30% (0.15 - 0.25 mm) MEDIUM SAND 40-60% (0.25 - 0.5 mm) COARSE SAND < 25% (0.5 - 1.0 mm) VERY COARSE SAND 0-10% (1.0 - 2.0 mm) FINE GRAVEL < 3% (2.0 - 3.4 mm) ORGANIC CONTENT ≤ 5% IMMEDIATELY PRIOR TO DELIVERY TO SITE A PSD TEST (AS1141) SHALL BE UNDERTAKEN. IF THE PSD DOES NOT COMPLY A HYDRAULIC CONDUCTIVITY TEST SHALL BE UNDERTAKEN. DELIVERY SHALL NOT BE APPROVED UNTIL THE MEDIA IS APPROVED. THERE SHOULD BE NO GAP IN THE PARTICLE SIZE GRADING AND THE COMPOSITION SHOULD NOT BE DOMINATED BY A SMALL PARTICLE SIZE RANGE. ORGANIC MATTER CONTENT SHALL BE 3% TO 5% TO SUPPORT VEGETATION.

TO AVOID MIGRATION OF THE FILTER MEDIA INTO THE TRANSITION LAYER THE PARTICLE SIZE DISTRIBUTION SHOULD BE ASSESSED TO MEET BRIDGING CRITERIA. THE SMALLEST 15%(D_{15}) OF THE TRANSITION LAYER PARTICLES MUST BE NO GREATER THAN 5 TIMES THE SIZE OF THE LARGEST 15%(D_{15}) OF THE FILTER MEDIA PARTICLES. THAT IS:

D_{15}(TRANSITION) ≤5 x D_{15}(FILTER)

ALTERNATIVE MEDIA MAY BE APPROVED AT THE DISCRETION OF COUNCIL, AS A MINIMUM DETAILED MATERIAL TESTING AND DEMONSTRATED PERFORMANCE WILL BE REQUIRED. IF ANY RECYCLED MATERIAL IS TO BE USED IT MUST BE DEMONSTRATED AT THE CONTRACTOR'S EXPENSE THAT THE MATERIAL IS BOTH INERT AND FREE OF CONTAMINANTS.

THE CONTRACTOR SHALL ARRANGE FOR IN-SITU TESTING OF THE SPECIFIED HYDRAULIC CONDUCTIVITY AT A RATE OF 2 TESTS PER 50m² OR PART OF & 1 TEST PER 200m² THEREAFTER OF FILTER MEDIA AREA FOR COMPLIANCE WITH THE ABOVE SPECIFICATION

BATTERS:

BATTERS SHALL BE SCARIFIED WITH A ROTARY HOE. A SOIL FERTILITY REPORT SHALL BE UNDERTAKEN BY A NATA REGISTERED LAB AND QUALIFIED HORTICULTURIST / SOIL SCIENTIST. BATTERS SHALL BE AMELIORATED TO IMPROVE FERTILITY IN ACCORDANCE WITH SOIL FERTILITY REPORT.

ALTERNATIVELY REMOVE TOP 200mm OF TOPSOIL AND REPLACE WITH AN IMPORTED TOPSOIL COMPLIANT WITH AS4419.

TRANSITION LAYER (MIDDLE) SPECIFICATION

THE PURPOSE OF THE TRANSITION LAYER IS TO PREVENT THE MIGRATION OF THE FILTER MEDIA INTO THE DRAINAGE LAYER. IT CREATES A LAYER BETWEEN THE FILTER MEDIA AND THE DRAINAGE LAYER. THE LAYER DEPTH IS TO BE A MIN OF 400mm THICK, IN A SATURATED SYSTEM.

THE MATERIAL MUST BE CLEAN, WELL GRADED SAND/COARSE MATERIAL CONTAINING LITTLE OR NO FINES. USE OF WELL WASHED RECYCLED GLASS IS ACCEPTABLE. AN INDICATIVE PARTICLE SIZE DISTRIBUTION IS BETWEEN 0.5mm AND 1.4mm. FINE PARTICLE CONTENT <2% IN ADDITION TO BRIDGING CRITERIA, THE D_{15} (TRANSITION) ≥ D_{15} (FILTER) x 5, THIS CRITERIA ENSURES GREATER HYDRAULIC CONDUCTIVITY OF THE TRANSITION LAYER THAN THE MEDIA.

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m² OF FILTER MEDIA AREA.

DRAINAGE LAYER SPECIFICATION

THIS LAYER COLLECTS STORES AND CONVEYS TREATED STORMWATER INTO A SLOTTED COLLECTION PIPE BEDDED INTO THE DRAINAGE LAYER. IT CONSISTS OF A CLEAN GRAVEL 5-7mm WASHED SCREENINGS (NOT SCORIA). THE LAYER DEPTH SHALL MAINTAIN A MINIMUM 50mm COVER OVER THE SUB SURFACE DRAINAGE PIPE. RECYCLED CONCRETE OR BRICK PRODUCTS WILL NOT BE ACCEPTED.

BRIDGING CRITERIA AS FOLLOWS APPLIES: THE D_{15} (DRAINAGE LAYER) ≤ 5 x D_{15} (TRANSITION LAYER)
HYDRAULIC CONDUCTIVITY CRITERIA APPLIES AS FOLLOWS: THE D_{15} (DRAINAGE LAYER) ≥ D_{15} (TRANSITION) x 5

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m² OF FILTER MEDIA AREA & AND MINIMUM OF 1 TEST.

SUB SURFACE DRAINAGE PIPES

SYSTEMS > 60m LONG NEED INTERMEDIATE FLUSHING POINTS AND RISERS. THE PIPES WITHIN THE BIORETENTION SYSTEM SHOULD BE A MINIMUM 90mm (UNO) DIAMETER UPVC SLOTTED PIPE (CONSISTENT WITH AS/NZS 1254) WITH MINIMUM 1,500mm² OPENINGS/M. JOINTS TO BE RUBBER RING JOINT, BENDS SHOULD BE 45° TO ENSURE THAT THE PIPE CAN BE FLUSHED. SLOTS SHALL BE A MAXIMUM OF 4MM WIDE.

CORRUGATED PLASTIC PIPE (I.E. 'AG' PIPE) IS NOT ACCEPTABLE DUE TO THE RISK OF COMPRESSION FAILURE AND ROOT PENETRATION. THE PIPES SHALL BE:

1. SPACED AT A MAXIMUM OF 3m CENTRES.
2. DESIGNED TO CONVEY A MINIMUM FLOW OF 4.4S/S/100m² OF FILTER AREA. THIS WAS CALCULATED USING DARCY'S LAW AND ASSUMED EDD OF 0.3m AND FILTER MEDIA DEPTH OF 0.5m AND K_{SAT} OF 100mm/Hr.

FOR LARGE SYSTEMS, THE STANDARD DRAWINGS ADOPT DIA 150mm PIPES SPACED AT 3m CENTRES WHICH MEETS THIS CRITERIA. FOR SMALLER SYSTEMS DIA 90mm PIPES MY BE USED SUBJECT TO CONFIRMATION THE HGL REMAINS BELOW THE FILTER MEDIA (AT MAXIMUM DESIGN FLOW). HGL CALCULATIONS SHALL CONSIDER DEPTH OF WEIR FLOW (REFER DETAIL 11 &13 SHEET 8), FRICTION & FITTING LOSSES ALONG THE LENGTH OF THE SUBSOIL DRAINAGE PIPE. ASSUME 50% OF THE DESIGN FLOW CONVEYED AT MID POINT OF PIPE.

LINERS

ALL BIORETENTION SYSTEMS ARE TO BE LINED TO RETAIN WATER. LINING CAN INCLUDE CLAY LINING (MIN. 300mm COMPACTED THICKNESS), HDPE WATERTIGHT MEMBRANE 1.5mm THICK, GEOSYNTHETIC CLAY LINERS (I.E. BENTOFIX). THE LINER IS TO EXTEND TO THE SURFACE OF THE MEDIA LAYER WHERE NO BUILDINGS ARE LOCATED NEXT TO THE SYSTEM. IF BUILDINGS ARE LOCATED NEXT TO THE SYSTEM THE LINER IS TO BE ATTACHED 100mm ABOVE THE EXTENDED DETENTION DEPTH TO THE SIDE OF THE BUILDING.

INSTALL A LAYER OF NON-WOVEN NEEDLE PUNCHED GEOFABRIC, SUCH AS BIDIM A34 OR APPROVED EQUIVALENT, UNDER AND OVER HDPE LINERS, TO MINIMISE THE RISK OF DAMAGE CAUSED BY ROCKS IN THE SUBSOIL. ALL HDPE LINERS SHALL HAVE WELDED WATER TIGHT JOINTS.

GROSS POLLUTANT TRAPS (GPTs)

A GPT IS REQUIRED UPSTREAM OF ALL BIORETENTION BASINS WHERE THE UPSTREAM CATCHMENT >2000m². IT MUST BE LOCATED AWAY FROM UNDERGROUND SERVICES WITH MAINTENANCE ACCESS. IF LOCATED ON PRIVATE LAND AN EASEMENT OR COVENANT WILL BE REQUIRED.

GPTs SHALL HAVE CONCRETE SURROUNDS WITH CLEAR ACCESS FOR EDUCTOR TRUCKS. THE DIMENSIONS OF THE CONCRETE SURROUND SHALL BE DETERMINED IN CONSULTATION WITH COUNCIL.

SCOUR PROTECTION:

OUTLET PIPES FROM BIORETENTION BASINS WHICH DISCHARGE TO A WATERWAY SHALL HAVE OUTLET PROTECTION IN ACCORDANCE WITH THE DETAILS SHOWN IN THESE DRAWINGS.

BIORETENTION SIZES & DIMENSIONS:

MAX FILTER AREA TO BE 1000m². IF A FILTER > 1000m² IS REQUIRED , USE TWO OR MORE CELLS LINKED IN PARALLEL. CELLS SHALL NOT BE IN SERIES.

TYPICAL BIORETENTION SIZES

SCALE	AREA	TYP. MAXIMUM CATCHMENT SIZE	APPLICABLE SHEETS
RAINGARDENS	<30m²	2000m²	4, 10, 12
SMALL	30m² – 100m²	6500m²	4, 5, 6, 8, 12, 13, 14
LARGE	>100m²	6.5ha PER 1000m² CELL	3, 4, 5, 7, 8, 12, 13, 14

THE MAX WIDTH OF LARGE BIORETENTION SYSTEMS IS TO BE 15m (IF ACCESS IS AVAILABLE FROM BOTH SIDES) OR A MAXIMUM 7.5m WIDTH IF ONLY ACCESSIBLE FROM ONE SIDE. DESIGN ACCESS TRACKS IN ACCORDANCE WITH AUSTROADS PUBLICATION (AP-G34-13) FOR A 9m SERVICE VEHICLE AND AN EXCAVATOR WITH 9m REACH. ALL PARTS OF THE BASIN MUST BE REACHABLE BY EXCAVATOR.

VEGETATION, SHADING AND MULCHING

PLANTS ARE AN ESSENTIAL COMPONENT OF THE BIORETENTION SYSTEM, REMOVING POLLUTANTS AND MAINTAINING THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA. PLANTS MUST BE CAPABLE OF SURVIVING IN THE FILTER MEDIA ENVIRONMENT (SANDY SOIL, DRY PERIODS WITH INTERMITTENT INUNDATION). A LIST OF SUITABLE SPECIES IS INCLUDED.

PLANTS IN 50mm TUBES OR HIKO CELLS ARE SUITABLE FOR PLANTING IN BIORETENTION SYSTEMS. ESTABLISHMENT WATERING WILL BE REQUIRED.

PLANTS WILL NEED TO BE PRE-ORDERED EARLY IN THE DESIGN PROCESS TO ENSURE THEY ARE AVAILABLE AT THE DESIRED TIME. ALL PLANTS SHALL BE VIGOROUS AND HEALTHY AND FREE FROM ROOT BALLING AND WEEDS. THE PLANTS SHALL BE POTTED ON IF A DELAY OCCURS.

DESIGNS MUST CONSIDER SUNLIGHT AVAILABILITY FOR THE PLANTS. THE ORIENTATION OR DEPTH OF THE SYSTEM CAN CAUSE EXCESSIVE PLANT SHADING, ESPECIALLY IN WINTER.

BIORETENTION SYSTEMS SHALL **NOT** BE MULCHED. IF MULCH IS USED ON ADJACENT BATTERS IT SHALL BE PLACED SO THAT IT WILL NOT BE WASHED INTO THE BIORETENTION SYSTEM.

DURING ESTABLISHMENT EROSION OF THE BOTTOM OF ACCESS RAMPS & AROUND ALL SURCHARGE PITS SHALL BE CONTROLLED USING JUTE.

ACCESS

ACCESS FOR MAINTENANCE IS AN ESSENTIAL PART OF SYSTEM DESIGN AND OPERATION. ALL DESIGNS SHALL ENSURE EASE OF ACCESS WITHOUT UNDUE RISK TO MAINTENANCE PERSONNEL. DEEP BIORETENTION SYSTEMS SHALL INCLUDE AN ACCESS SYSTEM THAT ENSURES MAINTENANCE CREWS CAN EASILY AND SAFELY CARRY OUT REMOVAL OF LITTER, DEBRIS, SEDIMENT, REPLANTING, WEEDING AND REPLACEMENT OF THE FILTER MEDIA.

ESTABLISHMENT / STAGING OF WORKS

IT IS RECOMMENDED THAT BIORETENTION SYSTEMS BE ESTABLISHED OFF-LINE WHEREVER POSSIBLE. THIS ALLOWS VEGETATION TO ESTABLISH WITHOUT BEING IMPACTED BY HIGH STORMWATER FLOWS. DESIGN DRAWINGS SHALL SHOW TEMPORARY WORKS FOR THE ESTABLISHMENT PHASE, SUCH AS A TEMPORARY COVER ON AN INLET, TEMPORARY IRRIGATION AND TEMPORARY EROSION CONTROL. REFER TO BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION FOR FURTHER INFORMATION. STAGES AS FOLLOWS:

WHEN INCORPORATING WATER QUALITY CONTROLS IN A SUBDIVISION DEVELOPMENT, COUNCIL REQUIRES A STAGED IMPLEMENTATION. STAGES TYPICALLY INCLUDE:

1. DURING BULK EARTHWORKS PHASE A SEDIMENT BASIN IN PLACE OF THE FINAL BIORETENTION.
2. FOLLOWING COMPLETION OF BULK EARTHWORKS A SACRIFICIAL BASIN SHOULD BE CONSTRUCTED TO HAVE THE SUBDIVISION CERTIFICATE / LINEN PLANS RELEASED.
3. ONCE 90% OF CATCHMENT DEVELOPMENT IS COMPLETE A FULLY FUNCTIONAL BIORETENTION SYSTEM IS MADE OPERATIONAL. THIS IS AT THE DISCRETION OF COUNCIL WHO MAY VARY THIS REQUIREMENT.

INSPECTION/HOLD POINTS

DURING CONSTRUCTION, IT IS CRITICAL THAT THE DESIGNER UNDERTAKE INSPECTIONS AT KEY POINTS, TO ENSURE THAT BIORETENTION SYSTEMS ARE INSTALLED ACCORDING TO THEIR DESIGN INTENT. THE FOLLOWING MINIMUM HOLD POINTS ARE REQUIRED:

STAGE	INSPECTION AND HOLD POINTS
2	COMPLETION OF BASIN BULK EARTHWORKS AND INSPECTION OF SUBGRADE INCLUDING REMOVAL OF ALL SEDIMENT.
2	INSTALLATION OF GEOTEXTILE AND LINER AS APPROPRIATE.
2	INSTALLATION OF INLET PITS AND PIPES.
2	INSTALLATION OF OUTLET PIT AND PIPES.
2	INSTALLATION OF SLOTTED PIPES AND FLUSHING POINTS.
2	PRIOR TO PURCHASE OF BIORETENTION MEDIA, TRANSITION AND DRAINAGE LAYER, PROVIDE TEST RESULTS, INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
2	INSTALLATION OF DRAINAGE LAYER, INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF TRANSITION LAYER (250mm), INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF GEOTEXTILE A16 OR SIMILAR.
3	INSTALLATION OF SACRIFICIAL MEDIA LAYER & TURF.
3	REMOVAL OF SACRIFICIAL LAYER AND GEOTEXTILE.
3	INSTALLATION OF UPFLOW PITS.
3	INSTALLATION OF PERMEABLE CONCRETE PIPES.
3	INSTALLATION OF REMAINING 200mm OF TRANSITION LAYER, INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF FILTER MEDIA.
3	COMPLETED WORKS, INCLUDING SCOUR PADS.
3	INSITU TESTING OF FILTER MEDIA HYDRAULIC CONDUCTIVITY USING DOUBLE RING INFILTROMETER BY NATA REGISTERED OR AN APPROVED TESTER.
3	PLACEMENT OF JUTE MAT AND PLANTING.
3	CERTIFICATION OF PLANT SPECIES AND DENSITY BY HORTICULTURIST / ECOLOGIST / LANDSCAPE ARCHITECT / ENVIRONMENTAL ENGINEER.

AT EACH STAGE, CHECK THE FINISHED LEVELS AS WELL AS THE QUALITY OF COMPLETED WORK. THE SUPERINTENDENT SHALL PROVIDE CERTIFICATION VERIFYING INSTA[illegible] COMPLIANCE AT EACH STAGE.

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '21	AMENDMENTS TO SHEETS 3, 4 & 11	CR	KW	DEC '21
C	FEB '17	PEER REVIEWED FOR ADOPTION	ELH	TN	FEB '17
B	DEC '16	FINAL DRAFT	MIL	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	MIL	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA PIT
HYDRANT	GAS VALVE	TELSTRA PILLAR
STOP VALVE	ELECTRICITY	TELSTRA POLE
WATER METER	ELECTRICITY PIT	STORMWATER PIT
WATER TAP	POWER POLE	
SEWER	POWER LIGHT POLE	
SEWER MANHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council
COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
DX: 8117 BLACKTOWN

PLAN V/MAP @ A1
LONG SECTION/HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – STANDARD NOTES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

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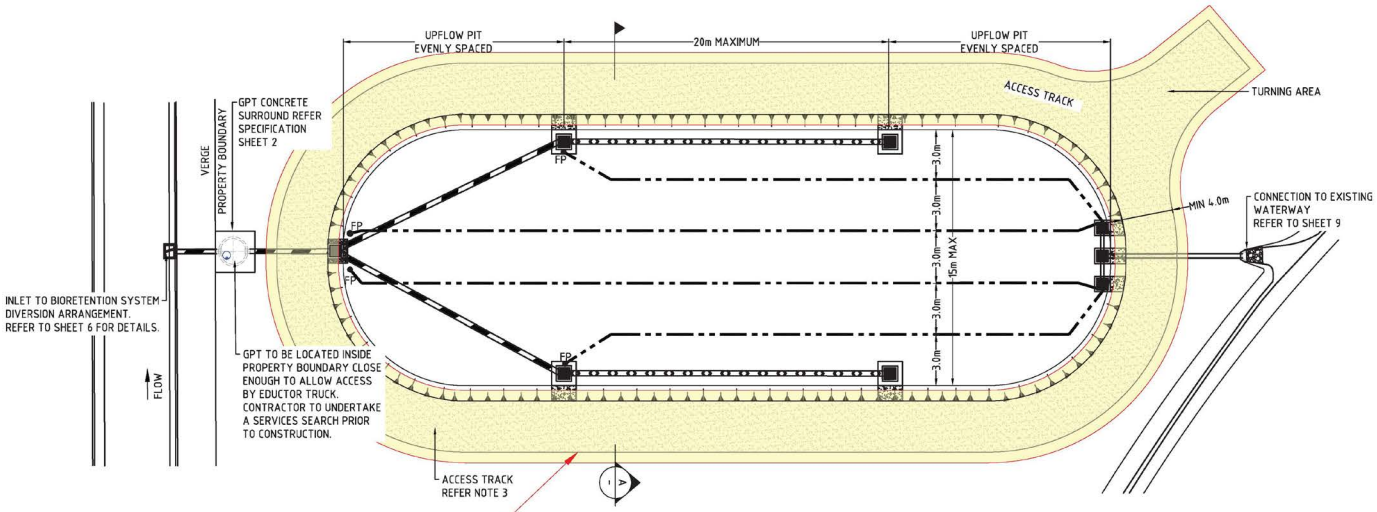


LEGEND

- DISTRIBUTION PIPE Φ300mm, RCP RRJ
- PERMEABLE CONCRETE PIPE. REFER NOTE 9
- SUBSOIL DRAINAGE PIPE REFER DETAIL 4, SHEET 4.
- SUBSOIL FLUSHING POINT REFER DETAIL 4 & 7, SHEET 4.
- UPFLOW PIT TO BE IN ACCORDANCE WITH SHEET 7 DETAIL 9
- SYSTEM INLET PIT TO BE IN ACCORDANCE WITH SHEET 7 DETAIL 10
- OUTLET PIT AND PIPE REFER TO SHEET 8

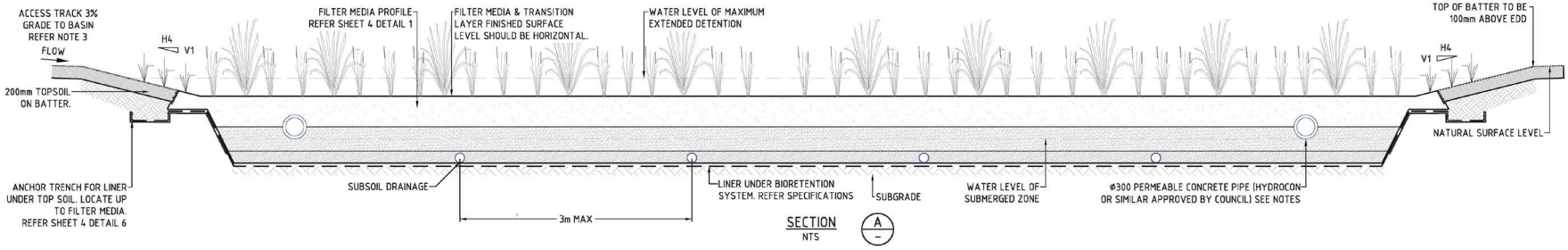
PLAN 1
TYPICAL BIORETENTION SYSTEM
NTS

CHANGES AS OF DECEMBER 2021:

1. BIORETENTION DESIGN LAYOUT IS CURRENTLY UNDER REVIEW TO IMPROVE THE INTEGRATION OF SYSTEMS INTO THE PARKLAND LANDSCAPE. PLEASE DISCUSS WITH COUNCIL AT EARLY STAGE OF DEVELOPMENT FOR GUIDANCE AS TO THE CHANGES. SEE PLAN 7 ON PAGE 11 FOR MORE INFORMATION.
2. AS PER DESIGN NOTE 3, THE MAINTENANCE TRACK DETAIL 5 ON PAGE 4 HAS ALSO CHANGED. COUNCIL'S PREFERENCE IS TO REMOVE VEHICLE ACCESS INTO THE PARKLAND SETTING AS TOP PRIORITY. SEEK COUNCIL GUIDANCE FOR MORE DETAIL.

DESIGN NOTES:

1) BIORETENTION SYSTEMS SHALL BE DESIGNED TO ACCEPT ONLY LOW FLOWS WITH A HIGH FLOW BYPASS DIVERTED AROUND THE BIORETENTION SYSTEM.
2) GENERALLY BIORETENTION SYSTEMS ARE DESIGNED TO TREAT THE 6 MONTH PEAK FLOW BEING APPROXIMATELY THE 0.75 x 1 YEAR ARI.
3) THE ACCESS TRACK SHALL BE 4m WIDE AND GRADED WITH A 3% CROSSFALL REFER DETAIL 5 SHEET 4. ACCESS TRACKS SHALL BE DESIGNED FOR ACCESS BY A 9m SERVICE VEHICLE. EVERY PART OF THE BASIN SHALL BE REACHABLE BY AN EXCAVATOR WITH A 9m REACH. A FILTER MEDIA WIDTH OF 15m WILL ACHIEVE THIS OBJECTIVE.
4) SUBSOIL AND PERMEABLE CONCRETE PIPES SHALL BE LAID HORIZONTAL.
5) DESIGNERS SHALL CONSIDER DEPTH OF PIPES & SPECIFY APPROPRIATE PIPE CLASSES.
6) OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.
7) THE OVERFLOW/OUTLET PIT SHALL BE SIZED TO CONVEY THE DESIGN INFLOW SUCH THAT THE DEPTH OF FLOW, H, ABOVE THE PIT INLET LEVEL IS LIMITED TO LESS THAN 100mm USING THE WEIR EQUATION. THE DESIGNER SHALL ASSUME THAT ONLY 50% OF THE WEIR LENGTH IS AVAILABLE AND THE REMAINING 50% IS BLOCKED.
8) FOR BIORETENTION SYSTEMS UP TO 600 m^2, 2 OFF UPFLOW PITS SHALL BE USED. FOR BIORETENTION SYSTEMS > 600 m^2, 4 OFF UPFLOW PITS SHALL BE PROVIDED WITH PERMEABLE CONCRETE PIPES AS SHOWN.
9) PERMEABLE CONCRETE PIPE WITH A MINIMUM IMPEDED EXFILTRATION RATE OF 0.6L/s/m OF PIPE SHALL BE PROVIDED AT A RATE OF 4m OF PIPE PER 100m^2 OF FILTER AREA. . CURRENTLY HYDROCON PIPES SATISFY THIS CRITERIA.
10) UPFLOW PITS SHALL BE LOCATED ON EDGE OF FILTER MEDIA AS SHOWN AND SPACED TO ALLOW AN EVEN DISTRIBUTION OF WATER INTO THE BIORETENTION SYSTEM WITH A MAXIMUM SPACING OF 20m.
11) LINER TO BE IN ACCORDANCE WITH DETAIL 6. SHEET 4.



SECTION
NTS

PREPARED BY:

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D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KM	DEC '21
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PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
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DATUM AHD | GRID MGA | SHEET SIZE A1 | TITLE BLOCK VERSION A

SURVEYED – | DESIGNED – | CADD AJ | VERIFIED ML | DATE FEB '17

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Blacktown City Council
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PLAN 1:1000 @ A1
LONG SECTION-HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – GENERAL ARRANGEMENT
CAD FILE: A(BS)175M.dwg | FILE No: N/A | PLAN No: A(BS)175M

ISO 9001 International Standards Certification
Lic No.QAC/9651/0123
ASSET DESIGN

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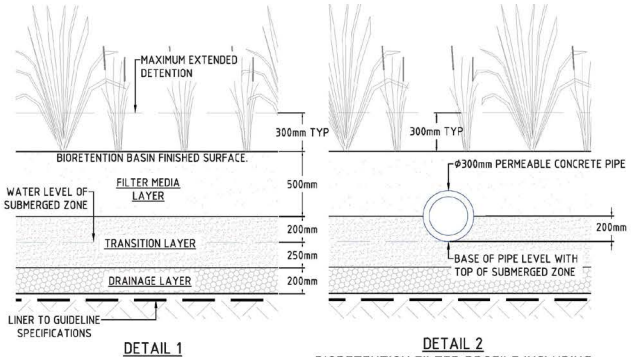
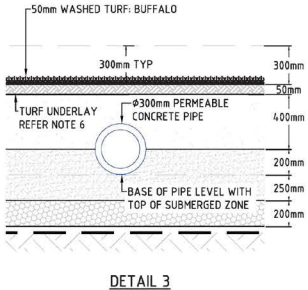
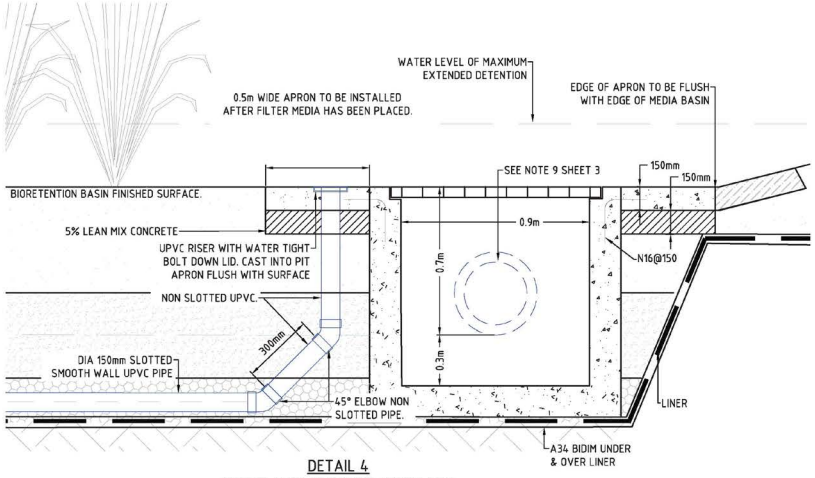


DETAIL 1
TYPICAL BIORETENTION FILTER PROFILE
NTS

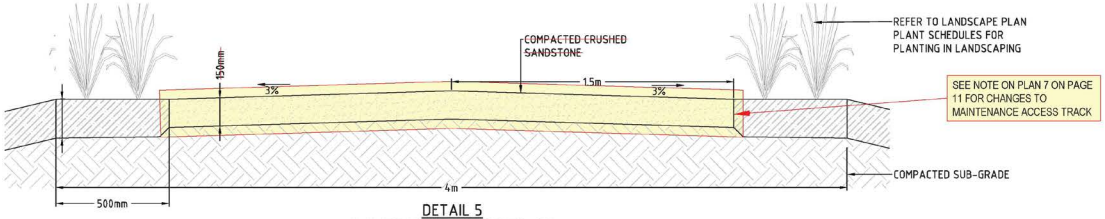
DETAIL 2
BIORETENTION FILTER PROFILE INCLUDING PERMEABLE CONCRETE PIPE
NTS



DETAIL 3
FILTER PROFILE FOR GRASSED SYSTEMS INCLUDING PERMEABLE CONCRETE PIPE
NTS



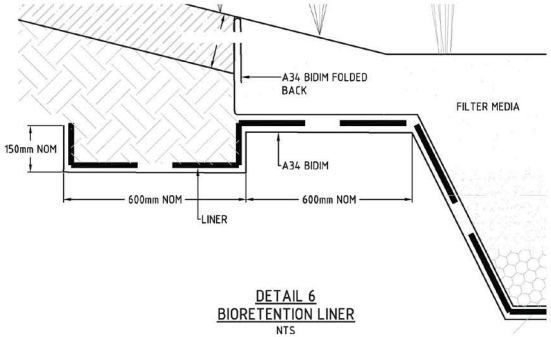
DETAIL 4
UPFLOW PIT, FLUSHING POINT AND DISTRIBUTION PIPE TYPICAL SECTION
NTS



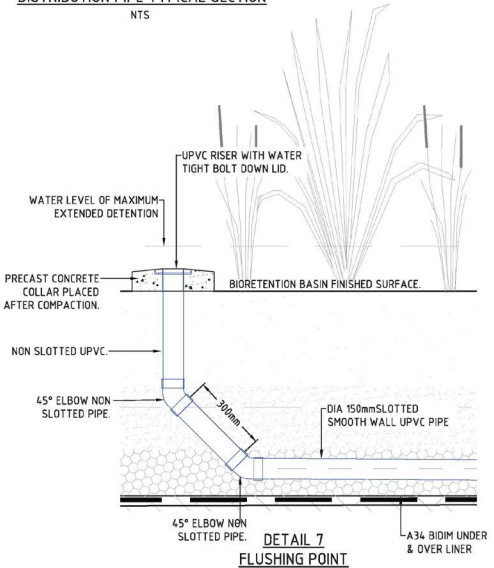
DETAIL 5
MAINTENANCE ACCESS TRACK
NTS

DESIGN NOTES:

1. EDD MAY BE INCREASED TO 500MM WHERE REQUIRED.
2. GEOTEXTILE FABRICS MUST NOT BE USED BETWEEN THE FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS IN BIORETENTION SYSTEMS DUE TO THE RISK OF CLOGGING. THE SOIL SPECIFICATIONS ARE DESIGNED TO LIMIT THE MIGRATION OF PARTICLES THROUGH THE SYSTEM.
3. NO GEOTEXTILE SOCKS TO BE INSTALLED ON THE SLOTTED DRAINAGE PIPES.
4. THE TOP LEVEL OF THE SATURATED ZONE MUST BE LOCATED WITHIN THE TRANSITION LAYER 200mm BELOW THE FILTER MEDIA. THE HEIGHT OF THE SATURATED ZONE IS CONTROLLED BY THE OUTLET LEVEL. REFER SHEET 8
5. FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS SHALL BE PROVIDED IN ACCORDANCE WITH THE SPECIFICATION ON SHEET 2.
6. TURF UNDERLAY SHALL BE A 70:30 SAND:TOPSOIL MIX. SAND SHALL COMPLY WITH THE TRANSITION LAYER SPECIFICATION ON SHEET 2.
7. TOPSOIL SHALL COMPLY WITH AS4419. SITE TOPSOILS MAY BE REUSED PROVIDED THEY HAVE BEEN ASSESSED BY A QUALIFIED HORTICULTURIST OR SOIL SCIENTIST AND AMELIORATED ACCORDING TO THEIR RECOMMENDATIONS.
8. TURF SHALL BE WATERED IMMEDIATELY AFTER LAYING UNTIL UNDERLAY IS MOISTENED TO FULL DEPTH. CONTINUE WATERING AS REQUIRED TO MAINTAIN GROWTH RATES FREE OF STRESS FOR 6 WEEKS.
9. ONCE TURF HAS ESTABLISHED (4-6 WEEKS TYP.) TOP DRESS WITH FILTER MEDIA TO CREATE A LEVEL FINISH, TWO OR MORE ADDITIONAL TOP DRESSES MAY BE REQUIRED DEPENDING ON THE EXTENT OF SETTLEMENT.



DETAIL 6
BIORETENTION LINER
NTS



DETAIL 7
FLUSHING POINT
NTS

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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
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PLAN 1:1000 @ A1
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SHEET TITLE: BIORETENTION – DETAILS
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certification
Lic No.QAC/9651/0103
ASSET DESIGN

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REV D

HABITAT

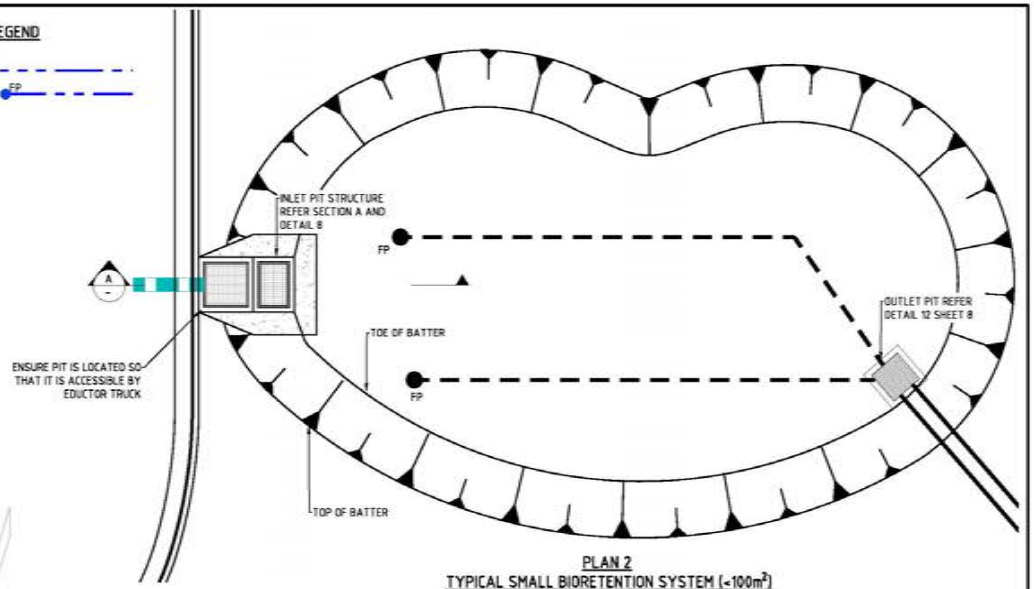
DESIGN NOTES:

1. THIS APPROACH IS TO BE USED FOR BIORETENTION SYSTEMS >30m² AND <100m². FOR SYSTEMS >30m² REFER TO SHEET 10. FOR SYSTEMS LARGER THAN 100m² REFER TO LARGE SYSTEMS DETAILS SHOWN ON SHEET 3 ONWARDS.
2. MAXIMUM LENGTH TO BE 20m.
3. FOR CATCHMENTS UP TO 2000m² THE MINIMUM REQUIREMENT IS FOR A RAINGARDEN SEDIMENT PIT.
4. FOR CATCHMENTS GREATER THAN 2000m², EITHER
   - 4.1. PROVIDE SYSTEM INLET WITH SEDIMENT PIT PLUS A PROPRIETARY GPT TARGETING 90% ANNUAL GROSS POLLUTANT AND HYDROCARBONS REMOVAL AND SIZED FOR 0.75 x 1YR ARI PEAK FLOWS. OR;
   - 4.2. PROVIDE A 200 MICRON ENVIROPOD OR STORMSACK OR APPROVED EQUIVALENT TO EVERY SURFACE INLET PIT OR TRENCH GRATE AND DESIGN THE BIORETENTION FOR 400mm EXTENDED DETENTION DEPTH. TO TREAT HYDROCARBONS.
5. ENSURE THE HGL IN ALL UPSTREAM PITS IS ABOVE THE EDD HEIGHT TO PREVENT UPWELLING ELSEWHERE IN THE SYSTEM & DIRECT ALL OVERLAND FLOWS TOWARDS THE BASIN
6. WHERE THE BIORETENTION FORMS PART OF A DETENTION SYSTEM THE SUBSOIL FLOWS ARE TO DISCHARGE DOWNSTREAM OF THE DISCHARGE CONTROL PIT.
7. AS AN ALTERNATIVE TO THE ARRANGEMENT SHOWN HERE, SMALL SYSTEMS MAY BE CONFIGURED AS LARGE SYSTEMS (REFER SHEETS 3&4) USING PERMEABLE PIPES AND SURCHARGE PITS TO DISTRIBUTE THE FLOW.

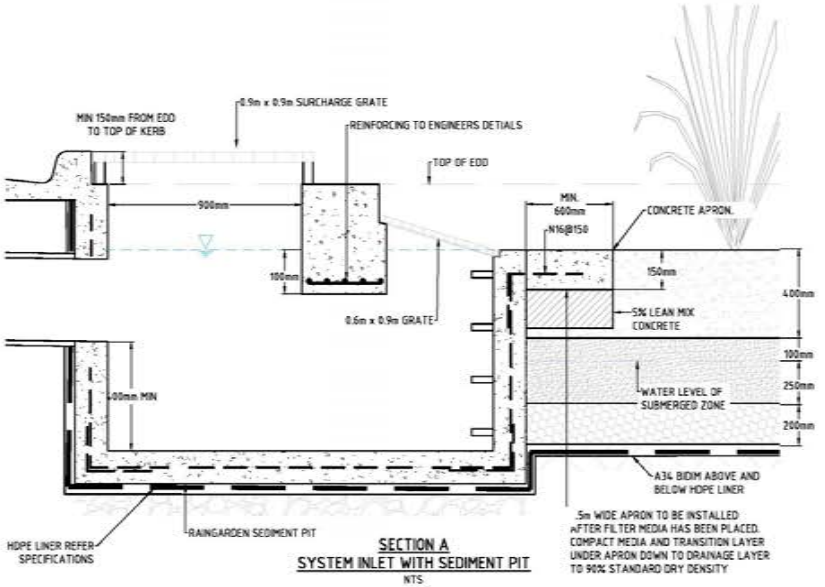
LEGEND

SUBSOIL DRAINAGE PIPE REFER DETAIL 7, SHEET 4.

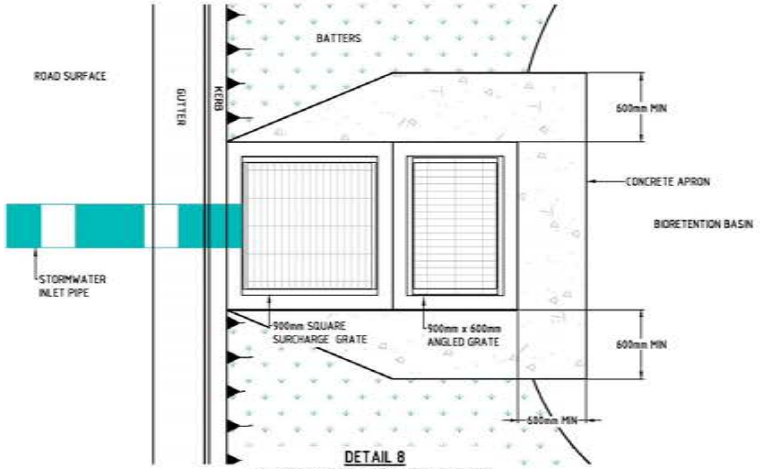
SUBSOIL FLUSHING POINT REFER DETAIL 7, SHEET 4. FP



PLAN 2
TYPICAL SMALL BIORETENTION SYSTEM (<100m²)
NTS



SECTION A
SYSTEM INLET WITH SEDIMENT PIT
NTS



DETAIL 8
SYSTEM INLET WITH SEDIMENT PIT AND SCOUR PROTECTION
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CH	KW	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	ELM	TN	FEB '17
B	DEC '16	FINAL DRAFT	MIL	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	MIL	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council
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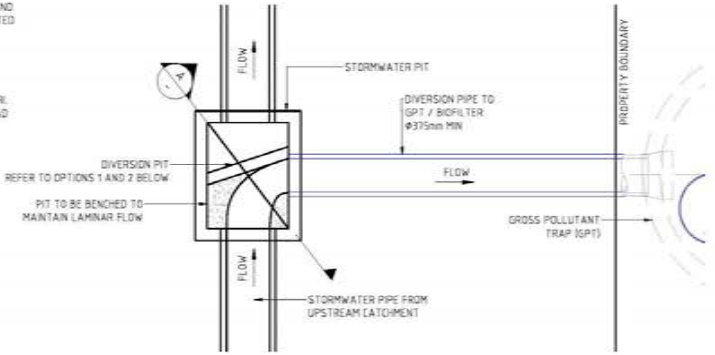
PLAN: 1/000 @ A1
LONG SECTION/HORIZ:
VERT:
CROSS SECTIONS:

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: SMALL BIORETENTION SYSTEMS
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

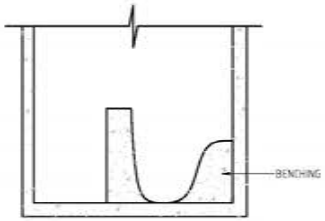
5 OF 25
REV D

DESIGN NOTES:

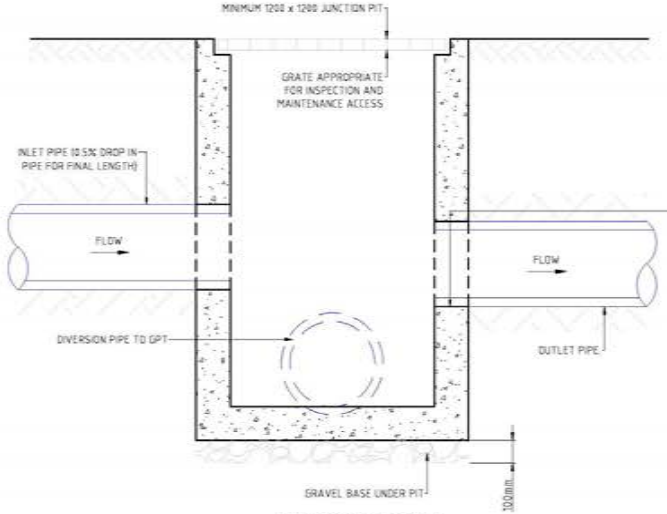
1. DIVERSION PITS ARE KEY POINTS WHERE MAINTENANCE IS OFTEN REQUIRED - CONSIDER ACCESS AND MAINTENANCE TECHNIQUES. SUMPS WILL REQUIRE PERIODIC MAINTENANCE TO REMOVE ACCUMULATED MATERIAL.
2. WEIRS CAN ALSO BE USED TO DIVERT FLOWS WITHIN STORMWATER PITS, HOWEVER CHECK THE HYDRAULIC GRADE LINE TO AVOID IMPACTS ON HYDRAULIC GRADES UPSTREAM.
3. THE MINIMUM SIZE OF DIVERSION PIPE SHALL BE ϕ375mm TO REDUCE BLOCKAGE RISK.
4. THE GRADE AND LEVEL OF THE DIVERSION PIPE SHALL BE DETERMINED BY HYDRAULIC DESIGN. TYPICALLY SYSTEMS SHOULD BE DESIGNED FOR 6 MONTH PEAK FLOW BEING THE 0.75 x 1 YEAR ARI.
5. GPTs SHALL BE DESIGNED TO TREAT 0.75 x 1YR ARI PEAK FLOW & REMOVE 50% ANNUAL TSS LOAD



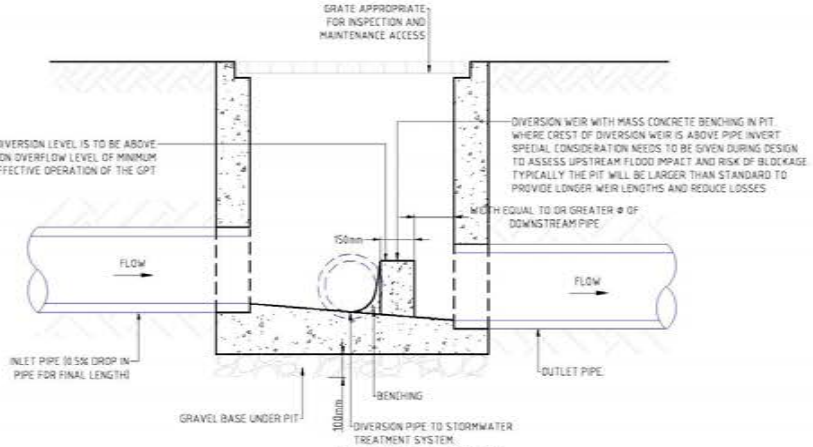
PLAN 3
TYPICAL DIVERSION STRUCTURE FOR PIPED FLOWS
NTS



SECTION A
OPTION 2 BENCHING DETAIL
NTS



DIVERSION PIT OPTION 1
NTS



DIVERSION PIT OPTION 2
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	LB	KM	DEC '23
C	FEB '17	PLANS REVIEWED FOR ADOPTION	SJM	TN	FEB '17
B	DEC '16	FINAL DRAFT	WL	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	WL	TN	MAY '16

PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM	AHD
GRID	MGA
SHEET SIZE	A1
TITLE BLOCK VERSION	A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council

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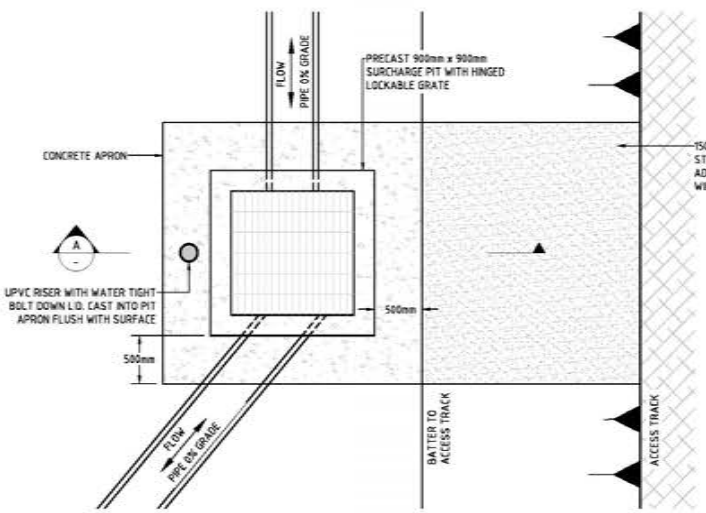
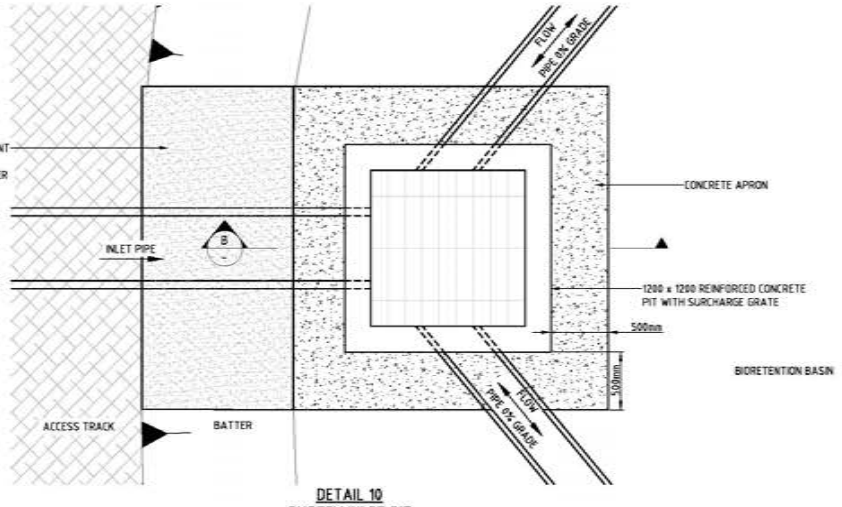
PLAN 1:1000 @ A1
LONG SECTIONS HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – INLET DIVERSION STRUCTURES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

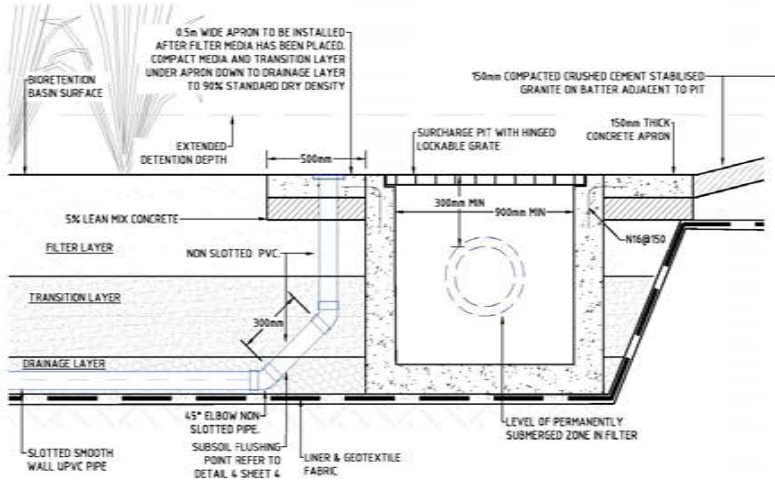
6 OF 25
REV D



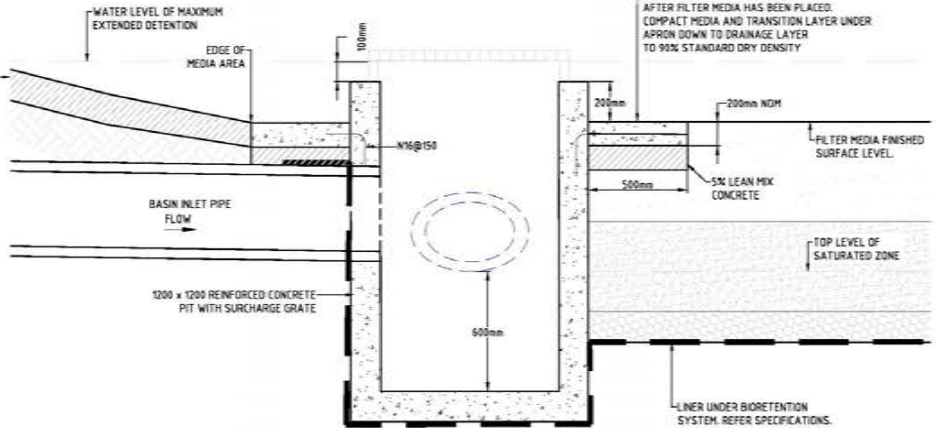
DETAIL 9
TYPICAL UPFLOW PIT OUTLET FOR INSIDE OF BIORETENTION BASIN
NTS



DETAIL 10
SYSTEM INLET PIT
NTS



SECTION A
NTS



SECTION B
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 7	CB	KW	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	ELM	TN	FEB '17
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WATER TAP	POWER POLE	STORMWATER PIT
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SEWER MANHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
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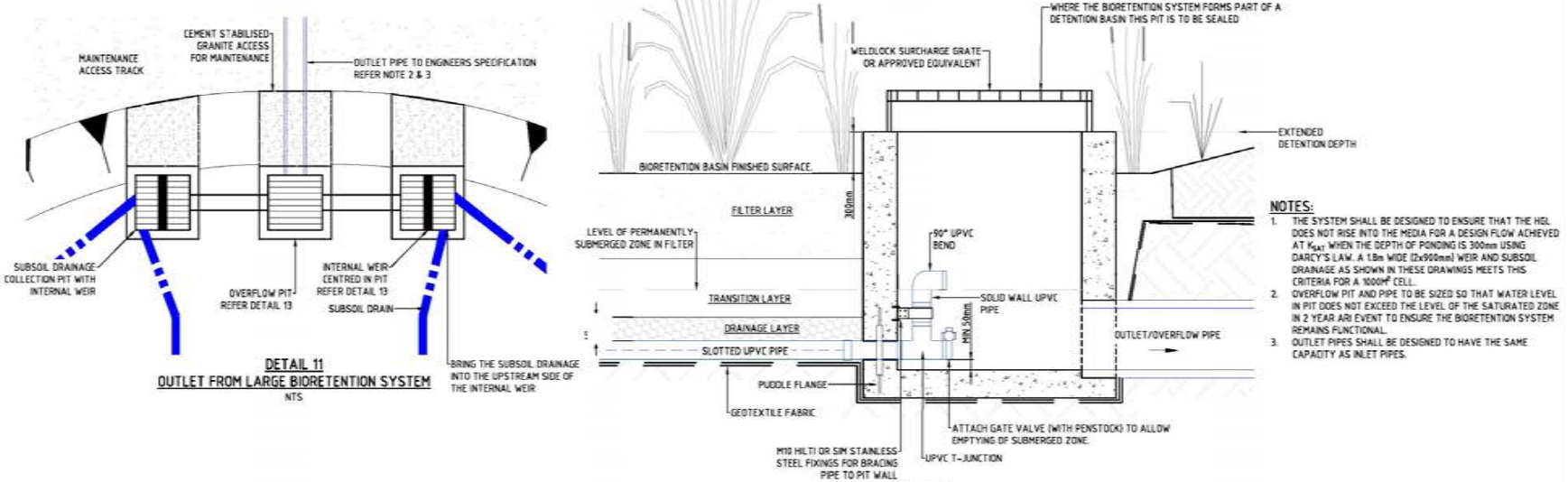
DX: 8117 BLACKTOWN

PLAN: 1/1000 @ A1
LONG SECTIONS/HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – INLET STRUCTURES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ASSET DESIGN

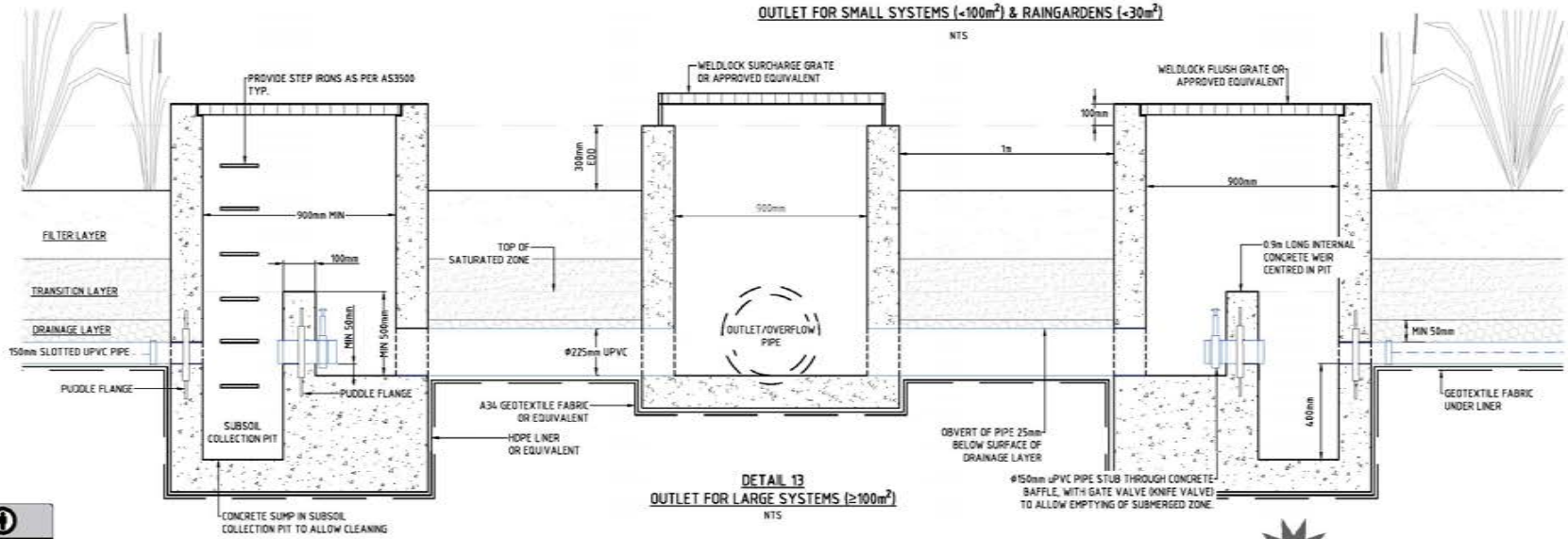
7 OF 25
REV D



DETAIL 11
OUTLET FROM LARGE BIORETENTION SYSTEM
NTS

NOTES:
1. THE SYSTEM SHALL BE DESIGNED TO ENSURE THAT THE HGL DOES NOT RISE INTO THE MEDIA FOR A DESIGN FLOW ACHIEVED AT K_{SAT} WHEN THE DEPTH OF PONDING IS 300mm USING DARCY'S LAW. A 1.8m WIDE (2x900mm) WEIR AND SUBSOIL DRAINAGE AS SHOWN IN THESE DRAWINGS MEETS THIS CRITERIA FOR A 1000m^2 CELL.
2. OVERFLOW PIT AND PIPE TO BE SIZED SO THAT WATER LEVEL IN PIT DOES NOT EXCEED THE LEVEL OF THE SATURATED ZONE IN 2 YEAR ARI EVENT TO ENSURE THE BIORETENTION SYSTEM REMAINS FUNCTIONAL.
3. OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.

DETAIL 12
OUTLET FOR SMALL SYSTEMS (<100m^2) & RAINGARDENS (<30m^2)
NTS



DETAIL 13
OUTLET FOR LARGE SYSTEMS (≥100m^2)
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KW	DEC '23
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SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council
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ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
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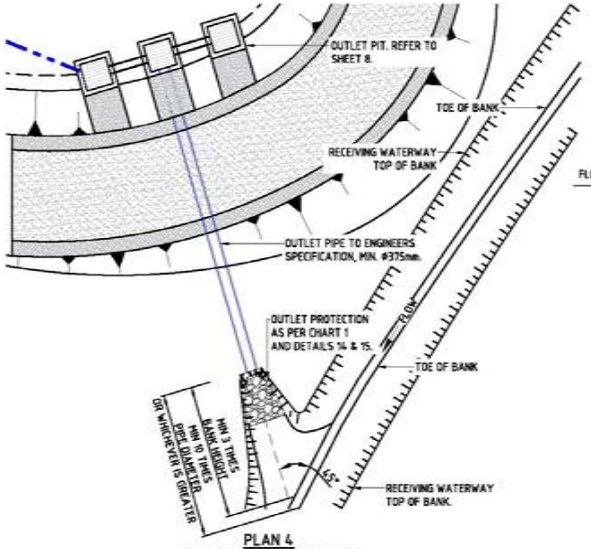
DX: 8117 BLACKTOWN

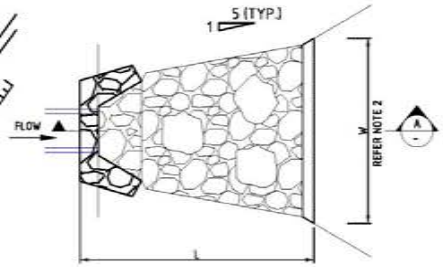
PLAN: 1/1000 @ A1
LONG SECTION/GRADE: 1/1000
VERT: 1/100
CROSS SECTIONS: 1/100

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – OUTLET STRUCTURES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN
REV: D

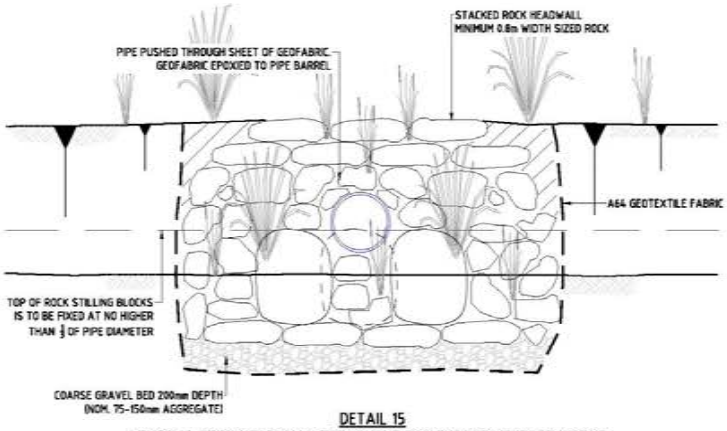
8 OF 25



PLAN 4
OUTLET TO WATERWAYS
NTS



DETAIL 14
TYPICAL ROCK OUTLET PAD LAYOUT
NTS



DETAIL 15
TYPICAL ROCK HEADWALL TREATMENT FOR CHANNEL OUTLET WORKS
NTS

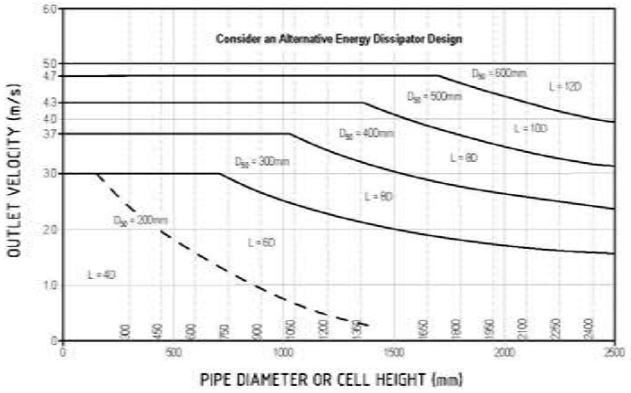


CHART 1
SIZING OF STORMWATER OUTLET SCOUR PROTECTION
NTS

NOTES:

1. READ 'L' FROM CHART 1, LEFT.
2. W = 3 TIMES PIPE DIAMETER 'D'.
3. THE MEDIAN ROCK SIZE D_{50} AND LENGTH (L) OF ROCK SCOUR PROTECTION DOWNSTREAM OF STORMWATER OUTLETS IS TO BE DETERMINED USING CHART 1. MIN. D_{50} = 200mm
4. ROCK IS TO BE GRADED IN ACCORDANCE WITH THE ROCK SIZE DISTRIBUTION TABLE AS SHOWN BELOW
5. IN THE EVENT THE WIDTH OF THE OUTLET CHANNEL IS LESS THAN THE DESIGN WIDTH OF THE ROCK APRON, THE ROCK SCOUR PROTECTION SHALL EXTEND UP TO THE BANK TO EITHER THE HEIGHT OF THE OBVERT OF PIPE OR CULVERT OR TO THE DESIGN TAILWATER LEVEL.
6. REFER TO 'BCC ENGINEERING GUIDE FOR DEVELOPMENT' TO ASSESS CHANNEL HYDRAULICS.

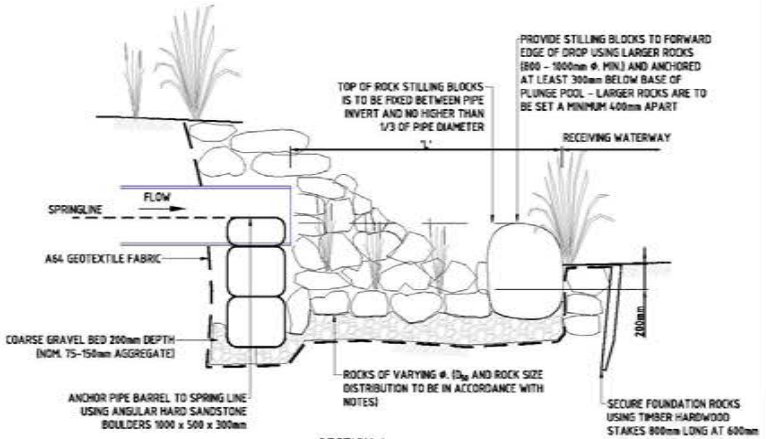
REFERENCES:

- BRISBANE CITY COUNCIL (BCC) 2003 "STORMWATER OUTLETS IN PARKS AND WATERWAYS"
- NSW OFFICE OF WATER: GUIDELINE FOR OUTLET STRUCTURES ON WATERFRONT LANDS.

ROCK SIZE DISTRIBUTION TABLE

D_{100}/D_{50} - 2.0	D_{10}/D_{50} - 0.50
D_{90}/D_{50} - 1.8	D_{05}/D_{50} - 0.45
D_{70}/D_{50} - 1.5	D_{01}/D_{50} - 0.20
D_{50}/D_{50} - 1.3	
D_{30}/D_{50} - 0.65	

D_x = NOMINAL ROCK DIAMETER OF WHICH x% OF THE ROCKS IS SMALLER



SECTION A
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
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DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council
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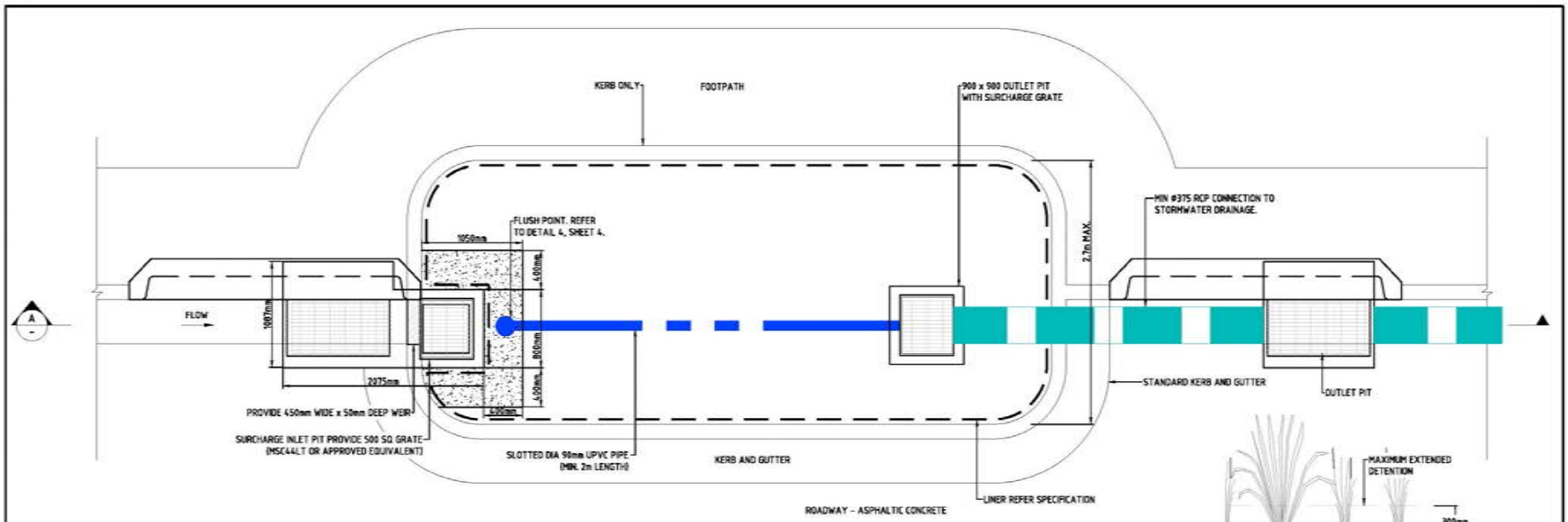
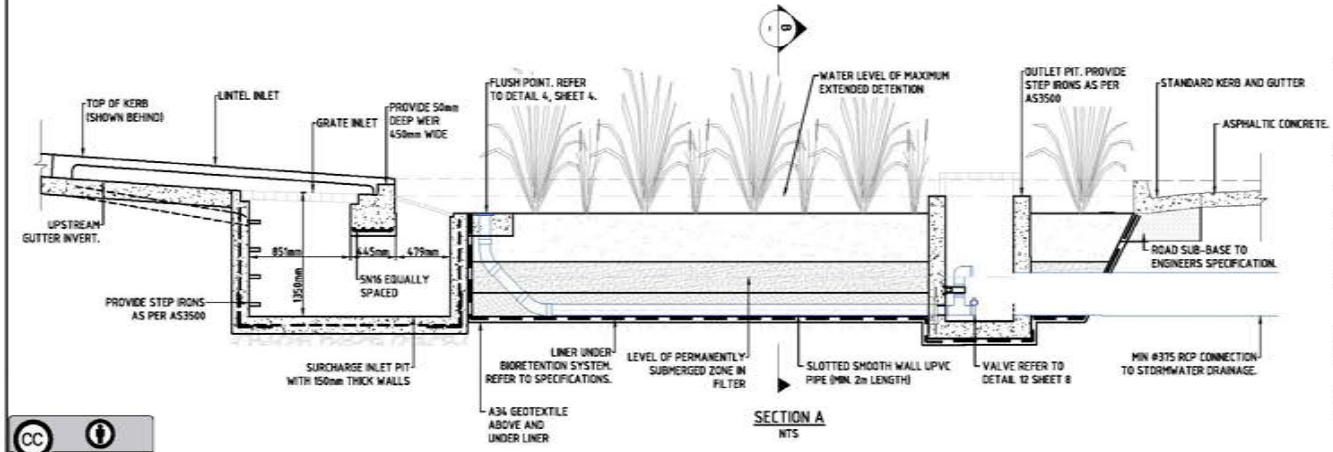
PLAN 1:1000 @ A1
LONG SECTION/GRADE
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - OUTLET SCOUR PROTECTION
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN
REV: D

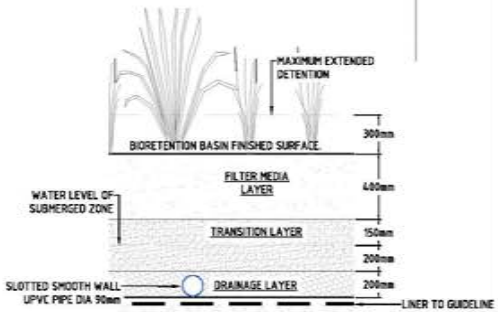
9 OF 25



PLAN 6
BIORETENTION SYSTEM – ROADWAY / TRAFFIC CALMING DEVICE
NTS



SECTION A
NTS



SECTION B
NTS

DESIGN NOTES:

1. THIS DESIGN APPROACH SHALL BE USED WHERE THE RAINGARDEN IS < 30m² FOR CATCHMENTS UP TO 2000m²
2. FOR APPLICATIONS NOT IN A ROADWAY THE ARRANGEMENT SHALL BE MODIFIED TO SUIT SITE CONDITIONS.
3. IN THE ROADWAY THE KEY CONSIDERATIONS ARE TRAFFIC AND DRAINAGE.
4. USE STANDARD KERB & GUTTER TO EXCLUDE VEHICLES.
5. THE ROAD IS OFTEN A MAJOR OVERLAND FLOWPATH. ESTIMATE DESIGN FLOWS AND VELOCITIES AND CONSIDER HOW THESE FLOWS WILL BE ACCOMMODATED.
6. CONSIDER IMPACT OF VEGETATION ON VISUAL SIGHT DISTANCE.
7. THE DRAWINGS SHOW THE TYPICAL LOCATION OF STORMWATER DRAINAGE PIPES WITHIN THE STREET, HOWEVER OTHER SERVICES ARE ALSO OFTEN LOCATED WITHIN THE ROADWAY. CONSIDER EXISTING UTILITY LOCATIONS AND/OR ALLOCATIONS FOR FUTURE WORKS WHEN LOCATING WSUD MEASURES.
8. A LINER IS REQUIRED TO PREVENT EXFILTRATION.
9. EMPLOY BICYCLE FRIENDLY DESIGN PRINCIPLES. REFER RMS(2005).
10. KERBS AND FOOTINGS IN THE ROADWAY MUST BE DESIGNED TO WITHSTAND VEHICLE IMPACT.

REFERENCES:

- CITY OF SYDNEY'S STANDARD DRAWING 7.2.9 "RAINGARDENS – SURCHARGE INLET PIT"

PREPARED BY:

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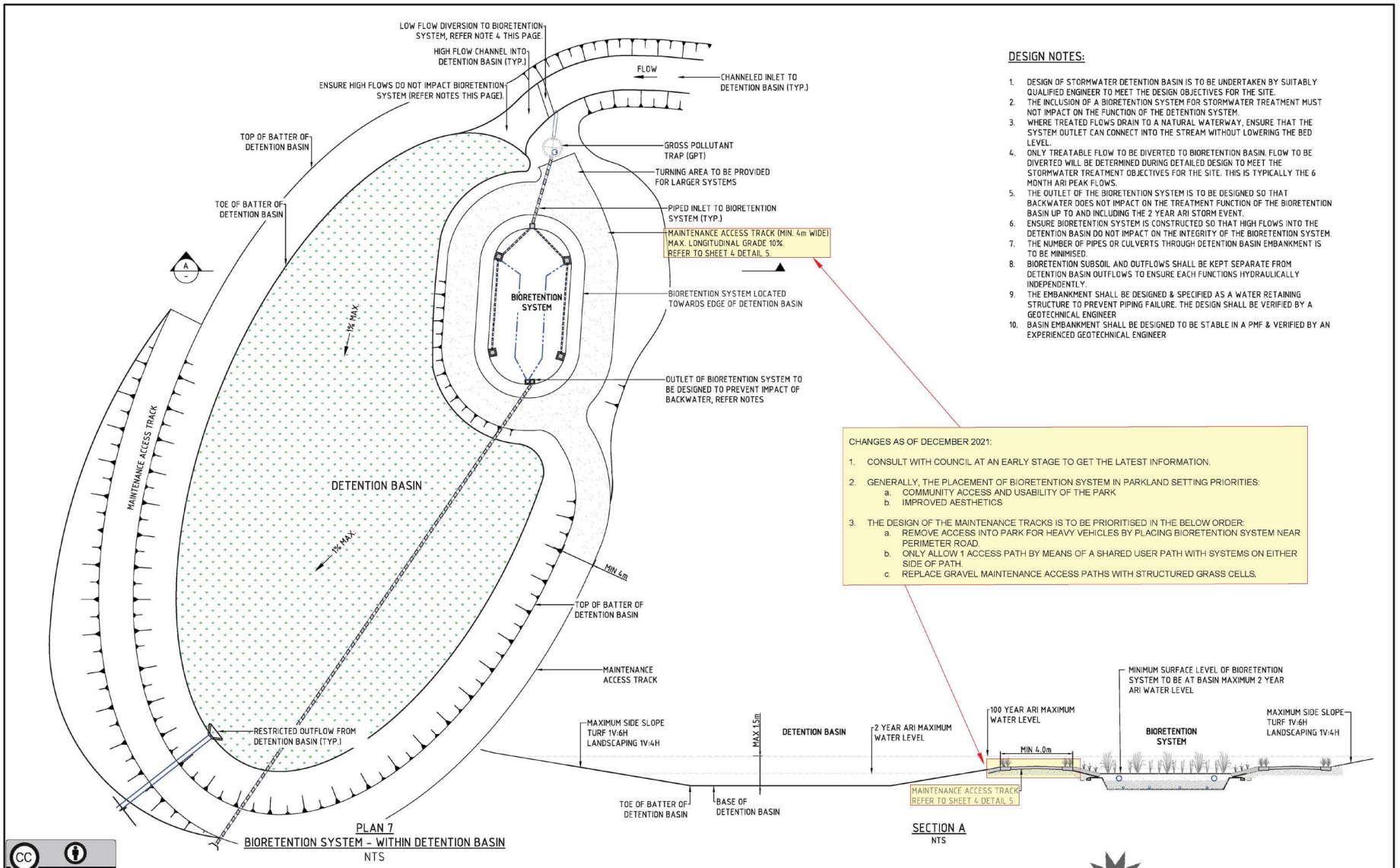
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – RAINGARDEN SYSTEM LESS THAN 30m²

CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ASSET DESIGN

10 OF 25
REV D



DESIGN NOTES:

1. DESIGN OF STORMWATER DETENTION BASIN IS TO BE UNDERTAKEN BY SUITABLY QUALIFIED ENGINEER TO MEET THE DESIGN OBJECTIVES FOR THE SITE.
2. THE INCLUSION OF A BIORETENTION SYSTEM FOR STORMWATER TREATMENT MUST NOT IMPACT ON THE FUNCTION OF THE DETENTION SYSTEM.
3. WHERE TREATED FLOWS DRAIN TO A NATURAL WATERWAY, ENSURE THAT THE SYSTEM OUTLET CAN CONNECT INTO THE STREAM WITHOUT LOWERING THE BED LEVEL.
4. ONLY TREATABLE FLOW TO BE DIVERTED TO BIORETENTION BASIN. FLOW TO BE DIVERTED WILL BE DETERMINED DURING DETAILED DESIGN TO MEET THE STORMWATER TREATMENT OBJECTIVES FOR THE SITE. THIS IS TYPICALLY THE 6 MONTH ARI PEAK FLOWS.
5. THE OUTLET OF THE BIORETENTION SYSTEM IS TO BE DESIGNED SO THAT BACKWATER DOES NOT IMPACT ON THE TREATMENT FUNCTION OF THE BIORETENTION BASIN UP TO AND INCLUDING THE 2 YEAR ARI STORM EVENT.
6. ENSURE BIORETENTION SYSTEM IS CONSTRUCTED SO THAT HIGH FLOWS INTO THE DETENTION BASIN DO NOT IMPACT ON THE INTEGRITY OF THE BIORETENTION SYSTEM.
7. THE NUMBER OF PIPES OR CULVERTS THROUGH DETENTION BASIN EMBANKMENT IS TO BE MINIMISED.
8. BIORETENTION SUBSOIL AND OUTFLOWS SHALL BE KEPT SEPARATE FROM DETENTION BASIN OUTFLOWS TO ENSURE EACH FUNCTIONS HYDRAULICALLY INDEPENDENTLY.
9. THE EMBANKMENT SHALL BE DESIGNED & SPECIFIED AS A WATER RETAINING STRUCTURE TO PREVENT PIPING FAILURE. THE DESIGN SHALL BE VERIFIED BY A GEOTECHNICAL ENGINEER
10. BASIN EMBANKMENT SHALL BE DESIGNED TO BE STABLE IN A PMF & VERIFIED BY AN EXPERIENCED GEOTECHNICAL ENGINEER

CHANGES AS OF DECEMBER 2021:

1. CONSULT WITH COUNCIL AT AN EARLY STAGE TO GET THE LATEST INFORMATION.
2. GENERALLY, THE PLACEMENT OF BIORETENTION SYSTEM IN PARKLAND SETTING PRIORITIES:
   a. COMMUNITY ACCESS AND USABILITY OF THE PARK
   b. IMPROVED AESTHETICS
3. THE DESIGN OF THE MAINTENANCE TRACKS IS TO BE PRIORITISED IN THE BELOW ORDER:
   a. REMOVE ACCESS INTO PARK FOR HEAVY VEHICLES BY PLACING BIORETENTION SYSTEM NEAR PERIMETER ROAD.
   b. ONLY ALLOW 1 ACCESS PATH BY MEANS OF A SHARED USER PATH WITH SYSTEMS ON EITHER SIDE OF PATH.
   c. REPLACE GRAVEL MAINTENANCE ACCESS PATHS WITH STRUCTURED GRASS CELLS.

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KM	DEC '21
C	FEB '17	PEER REVIEWED FOR ADOPTION	GJH	TN	FEB '17
B	DEC '16	FINAL DRAFT	M.L	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	M.L	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council
COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
DX : 8117 BLACKTOWN

PLAN 1:1000 @ A1
LONG SECTION-HORIZ
VERT
CROSS SECTIONS

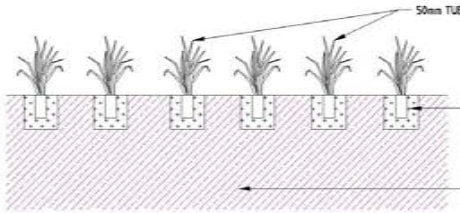
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – WITHIN FLOOD DETENTION BASIN
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certification
Lic No.DAC/0651/0103
ASSET DESIGN

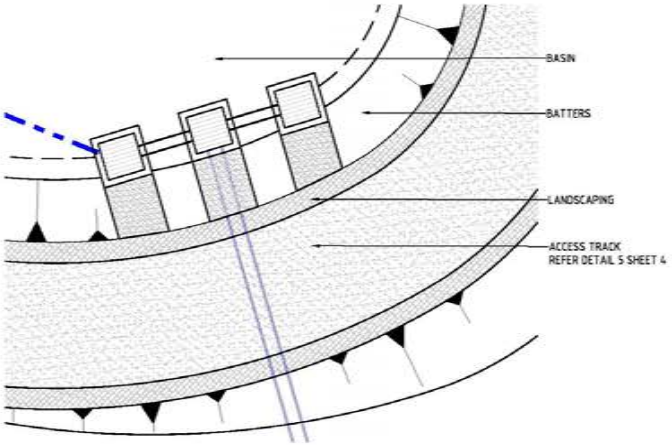
11 OF 25
REV D

DESIGN NOTES:

1. VEGETATION COVER IS AN ESSENTIAL FUNCTIONAL COMPONENT OF THE BIORETENTION BASIN
2. PLANTS ARE TO BE 25mm HIKO CELLS OR 50mm TUBESTOCK
3. PLANTING SHOULD OCCUR NO LATER THAN 14 DAYS AFTER INSTALLATION OF THE FILTER MEDIA. AFTER PLANTING THE SOIL SHOULD BE RE-INSTATED TO A FLAT SURFACE.
4. THE PLANTS SHALL BE PLANTED AS A MATRIX ENSURING A DIVERSE COVERAGE.
5. PLANTING SHOULD INCORPORATE SEVERAL TYPES OF VEGETATION INCLUDING SHRUBS AND GRASSES AND TUFTED PLANTS FROM THE PLANTING LIST.
6. A MINIMUM OF 4 DIFFERENT SPECIES IS REQUIRED FOR RAINGARDENS (<30m^2), A MIN OF 6 FOR SMALL SYSTEMS < 100m^2 & 10 OR MORE FOR LARGE SYSTEMS (>100m^2).
7. PLANT ESTABLISHMENT AND WATERING IS REQUIRED FOR 12 MONTHS FROM PLANTING.
8. NO SURFACE MULCHING OF BIORETENTION BASINS IS PERMITTED.
9. NO WEED MAT OR HYDRO-MULCH IS TO BE APPLIED TO THE SURFACE OF THE BIORETENTION BASIN FOLLOWING THE CONSTRUCTION PHASE (I.E. IN ITS FINAL DESIGN FORM, VEGETATED AS PER PLANTING SCHEDULE), AS THIS WILL HINDER FILTRATION OF STORMWATER THROUGH THE FILTER MEDIA. JUTE MATTING IS PERMITTED.
10. 40% OF COVERAGE SHALL COMPRISE OF THE PLANTS MARKED WITH ***
11. PLANTS FROM THE PREFERRED PLANTING LIST SHALL BE PLANTED IN PREFERENCE TO PLANTS FROM THE ALTERNATIVE PLANTING LIST. PLANTS FROM THE ALTERNATIVE PLANTING LIST CAN BE USED WHERE PREFERED PLANTS ARE COMMERCIALLY UNAVAILABLE.
12. PLANTING SHALL IDEALLY OCCUR FROM OCTOBER TO MARCH TO IMPROVE VIABILITY OF JURENILE PLANTS.
13. ALL PLANTS SHALL BE HARDENED PRIOR TO PLANTING.
14. SOME PLANTS MAY NOT BE AVAILABLE COMMERCIALLY & MAY NEED TO BE GROWN FROM SEED. THIS CAN TAKE UP TO 12 MONTHS. PLANNING OF PLANTING STAGE SHALL TAKE LONG LEAD IN TIMES INTO ACCOUNT.
15. THE FINAL PLANTING LIST SHALL BE APPROVED BY COUNCIL.



DETAIL 17
TYPICAL PLANTING
NTS



PLAN 8
BIORETENTION PLANTING ZONES
NTS

PREFERED PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Tall Sedge ***	*Carex appressa*	Tufted short rhizomatous, 1.2 h	8-10	Basin
Blue Flax-Lily	*Dianella revoluta*	Tufted perennial herb, 1 h	8-10	Basin
Wallaby Grass ***	*Rytidosperma tenuior, Austrodanthonia tenuior, Danthonia tenuior*	Tufted perennial grass, 1.2 h	8-10	Basin
Common Rush ***	*Juncus usitatus*	Tufted short rhizomatous, 1 h	8-10	Basin
Kangaroo Grass ***	*Themeda triandra, Themeda australis*	Densely tufted leafy perennial, 1.2 h	8-10	Basin
Knobby Club Rush ***	*Ficina nodosa*	Rhizomatous perennial, 1 h	8-10	Basin
Eskdale, Tussock Grass	*Poa labillardieri*	Densely tufted perennial grass, 0.6 h	8-10	Basin
Gorse Bitter Pea	*Daviesia ulicifolia*	Small shrub, 2 h	1 per 2 m^2	Basin & Batters
Pink Honey Myrtle	*Melaleuca erubescens*	Hard, rough barked shrub, 2 m	1 per 2 m^2	Basin & Batters
Blueberry Lily	*Dianella longifolia*	Perenial rhizomatous tufted herb, 1 h	8-10	Batters & Landscape
Wattle Mat-rush	*Lomandra filiformis*	Perennial tussock, 0.5 h	8-10	Batters & Landscape
Tanika, Spiny Mat-rush	*Lomandra longifolia*	Perennial weeping tussock, 0.7 h	8-10	Batters & Landscape
Weeping Grass	*Microlaena stipoides*	Slender, tufted perennial grass, 0.7 h	8-10	Batters & Landscape
Pale Rush	*Juncus pallidus*		8-10	Basin
Sea Rush	*Juncus kraussii*	Tussock, rhizomatous perennial, 1 m	8-10	Basin
N/A	*Lachnagrostis filiformis*	Erect perennial grass, 0.7 h	8-10	Basin
N/A	*Lachnagrostis billardierei*	Erect perennial grass, 0.7 h	8-10	Basin
Chaffy Saw-sedge	*Gahnia filum*	Tussock forming perennial, 1 h	8-10	Basin
N/A	*Cyperus polystachyos*	Tufted perennial, short rhizome, 0.6 h	8-10	Basin
N/A	*Austrostipa stipoides*	Tufted perennial grass, 1.2 h	8-10	Basin
Tassel Sedge	*Carex fascicularis*	Tufted rhizomatous perennial, 1 h	8-10	Basin
Swamp Foxtail Grass	*Pennisetum alopecuroides*	Clumping tussocks perennial, 1.5 h	8-10	All
N/A	*Baloskion / Restio pallens*	Dioecious perennial herb, 1 h	8-10	Basin
N/A	*Schoenoplectus mucronatus*	Tufted perennial, 1 h	8-10	Basin
Marsh Clubrush	*Bolboschoenus fluviatilus*	Rhizomatous tufted perrenial, 2.5 h	8-10	Basin
N/A	*Bolboschoenus caldwellii*	Rhizomatous tufted perrenial, 1 h	8-10	Basin

THE PLANTS IN THIS LIST HAVE BEEN SELECTED SPECIFICALLY FOR WESTERN SYDNEY CONDITIONS BY HUNTER & SAINTY
h REFERS TO MATURE HEIGHT (m)

ALTERNATIVE PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Corkscrew Grass	*Austrostipa setacea*	Tufted perennial grass, 0.8h	8-10	Basin
Barbed Wire Grass	*Cymbopogon refractus*	Tufted perennial grass, 1 h	8-10	Basin
Shorthair Plume Grass	*Dichelachne micrantha*	Tufted perennial grass, 1.2 h	8-10	Basin
Forest Hedgehog Grass	*Echinopogon ovatus*	Rhizomatous perennial, 1.2 h	8-10	Basin
Wiry Panic Grass	*Entolasia stricta*	Shrubby rhizomatous perennial, 0.8 h	8-10	Basin
Paddock Lovegrass	*Eragrostis leptostachya*	Loosely tufted perennial, 1 h	8-10	Basin
Hop Goodenia	*Goodenia ovata*	Erect, ascending or prostate shrub, 2 h	1 per 2 m^2	Basin & Batters
Sticky Hop Bush	*Dodonaea viscosa*	Small shrub to tree, 8 m	1 per 2 m^2	Batters & Landscape
N/A	*Cyperus laevigatus*	Rhizomatous perennial, 0.6 h	8-10	Basin
Queensland Bluegrass	*Dichantheum sericeum*	Tufted warm season perennial, 1.2 h	8-10	Basin

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '24	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KW	DEC '24
C	FEB '17	PEER REVIEWED FOR ADOPTION	ELM	TN	FEB '17
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A	MAY '16	ISSUED FOR CONSULTATION	MG	TN	MAY '16

PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council
CIVIC CENTRE, FLUSCOMBE ROAD, BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 3921
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PLAN 1/2000 @ A1
LONG SECTIONS HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – LANDSCAPING
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

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REV D

HABIT8

STAGING OF BIORETENTION CONSTRUCTION WORKS

DESIGN NOTES:

1. WHERE THE UPSTREAM CATCHMENT HAS NOT ACHIEVED 90% OF FINAL CONSTRUCTION, INCLUDING LANDSCAPING, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITH A SACRIFICIAL LAYER.
2. ONCE THE 90% TARGET HAS BEEN ACHIEVED, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITHIN 6 MONTHS. CAPTURED SEDIMENT AND SATURATED SOIL IS TO BE REMOVED AND THE BIORETENTION SYSTEM CONSTRUCTED AS PER THE DESIGN.
3. THE MAINTENANCE PERIOD OF THE SYSTEM IS TO EXTEND FOR MINIMUM 36 MONTHS FROM WHEN THE BIORETENTION SYSTEM IS FULLY PLANTED BEFORE HANDOVER TO ANY FINAL CUSTODIAN.
4. BIORETENTION SYSTEMS SHALL ACHIEVE A MINIMUM DENSITY OF 8 PLANTS PER m^2 AT 36 MONTHS AND BE VIGOROUS, HEALTHY AND FREE OF WEEDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADVISE COUNCIL IF THIS DENSITY IS NOT ACHIEVED AT 24 MONTHS AND TO REPLANT SO THAT ALL PLANTS HAVE BEEN GROWING A MINIMUM OF 12 MONTHS AT THE SPECIFIED DENSITY AT HAND OVER.
5. ANY REQUIREMENT OF FENCING OR OTHER MEASURE TO ENSURE PUBLIC SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE MAINTAINED IN ACCORDANCE WITH COUNCIL OR OTHER REQUIREMENTS FOR THE DURATION OF THE CONSTRUCTION AND ESTABLISHMENT PERIOD.

REFER TO HOLD AND INSPECTION POINTS ON SHEET 2
CONSTRUCTION ACTIVITIES CAN GENERATE LARGE SEDIMENT LOADS IN RUNOFF WHICH CAN SMOTHER VEGETATION AND CLOG BIORETENTION FILTER MEDIA. BIORETENTION BASINS ARE BEST CONSTRUCTED IN STAGES, IN CONJUNCTION WITH OTHER DEVELOPMENT ACTIVITIES:

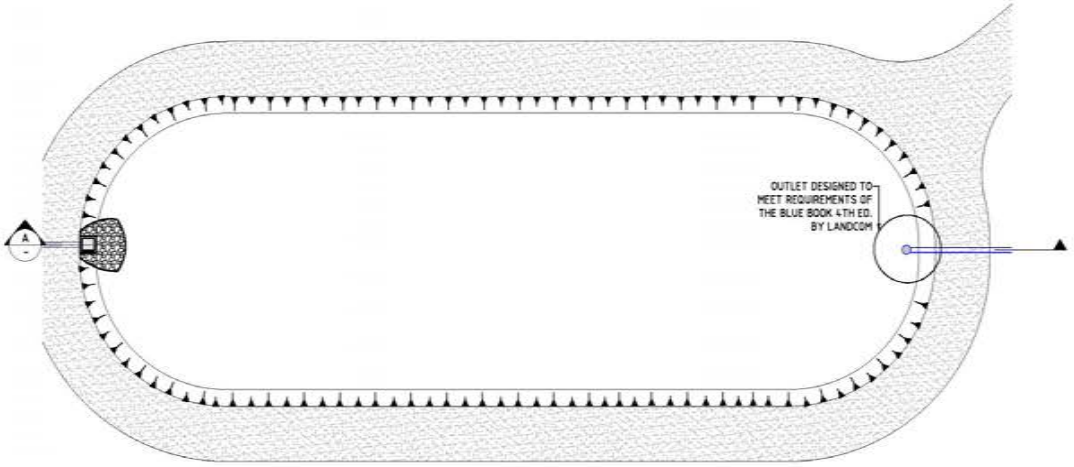
STAGE 1:
TEMPORARY SEDIMENT BASIN - EXCAVATE BULK EARTHWORKS, INSTALLATION OF OUTLET TO MEET REQUIREMENTS OF BLUE BOOK, INSTALLATION OF SYSTEM INLET PIT, SURROUNDED EACH SIDE BY TEMPORARY ROCK DISSIPATOR. DISSIPATOR SHALL EXTEND A MINIMUM OF 2m AROUND THE INLET PIT AND HAVE A D_{50} = 300mm.

STAGE 2:
FUNCTIONAL INSTALLATION OF SACRIFICIAL BIORETENTION - ONCE UPSTREAM CATCHMENTS BULK EARTHWORKS ARE COMPLETE AND HAVE EFFECTIVELY BEEN SEALED A SACRIFICIAL FILTER SYSTEM SHALL BE CONSTRUCTED. THIS INCLUDES:

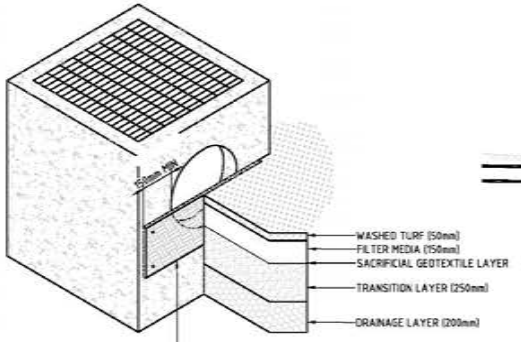
- REMOVAL OF TEMPORARY ROCK DISSIPATOR AT SYSTEM INLET PIT.
- REMOVAL OF ALL SEDIMENT
- INSTALLATION OF GEOTEXTILE AND LINERS UNDER
- INSTALLATION OF SUBSOIL DRAINS AND DRAINAGE LAYERS. TEMPORARY SUPPORT FLUSHING POINTS
- INSTALLATION OF 250mm OF TRANSITION LAYER
- INSTALLATION OF UPFLOW PITS, CONNECTING PIPES AND TEMPORARY SOIL BARRIERS
- LOCALISED MOUNDING OVER PIPES
- INSTALLATION OF TEMPORARY GEOTEXTILE AND 150mm MEDIA OR COARSE SAND LAYER
- INSTALLATION OF WASHED TURF OVER THE SACRIFICIAL MEDIA LAYER

STAGE 3:
OPERATIONAL ESTABLISHMENT ONCE 90% DEVELOPMENT HAS OCCURRED- REMOVAL OF TURF, SACRIFICIAL MEDIA LAYER AND TEMPORARY GEOTEXTILE INSTALLATION OF:

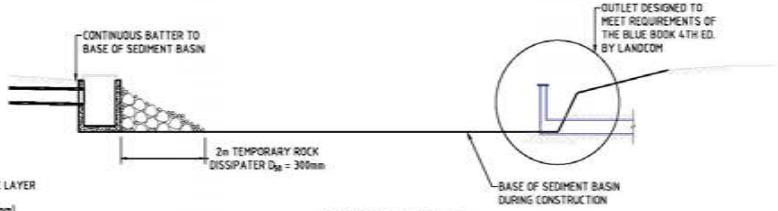
- REMAINING UPFLOW PITS
- PERMEABLE CONCRETE PIPE
- UPPER 200mm OF TRANSITION LAYER
- FILTER MEDIA LAYER
- PLANTING
- REMOVAL OF ALL SEDIMENT FROM PIPES, INLETS AND OUTLETS.



STAGE 1
NTS



DETAIL 18
STAGE 2 TEMPORARY SOIL BARRIER ON UPFLOW PIT
NTS



SECTION A (STAGE 1)
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KW	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	ELM	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	ML	TN	MAY '16

PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER MANHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

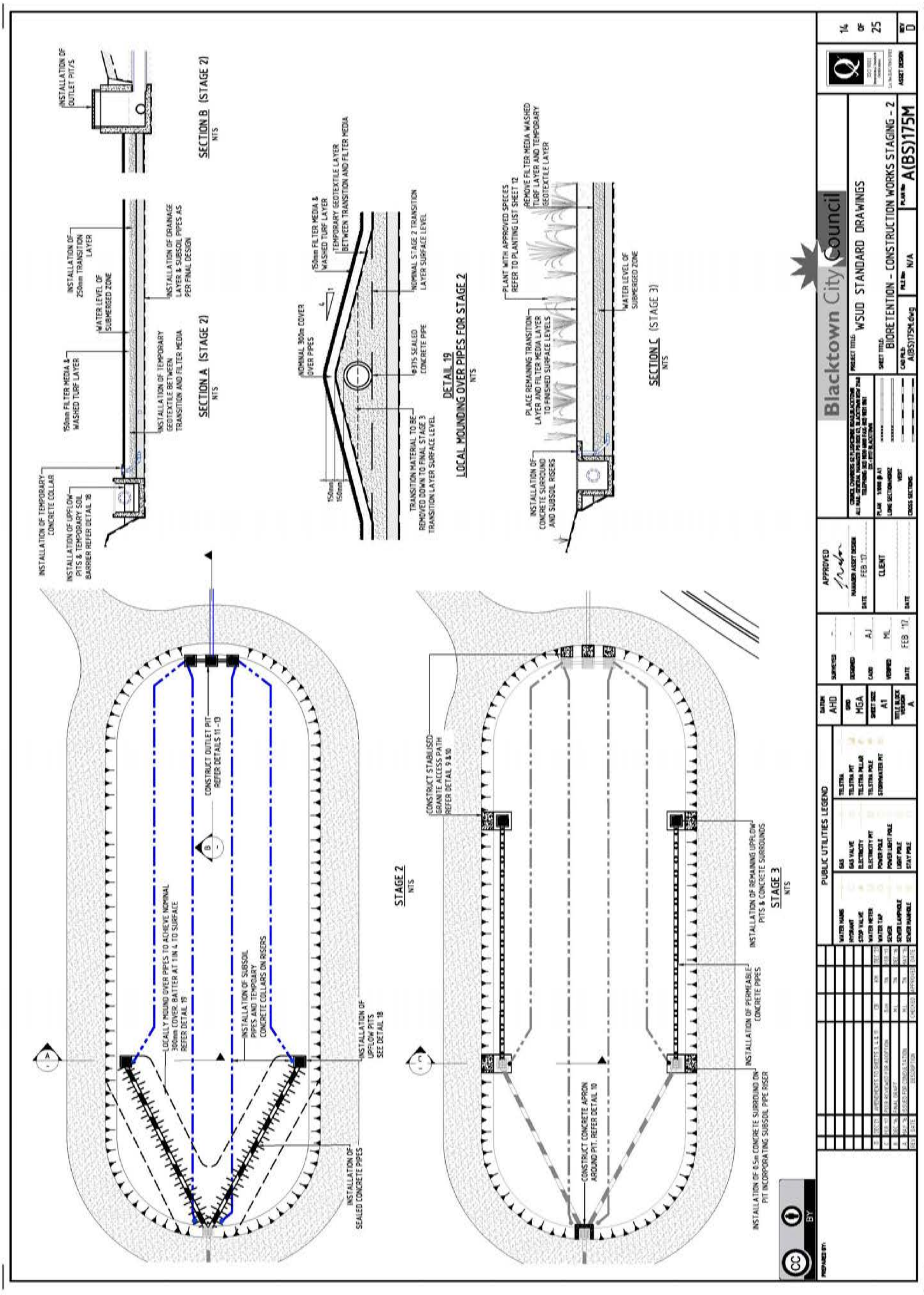
Blacktown City Council
COUNCIL CHAMBERS 62 FLACKCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE (02) 9839 6000 FAX: (02) 9839 6061
DX: 8117 BLACKTOWN

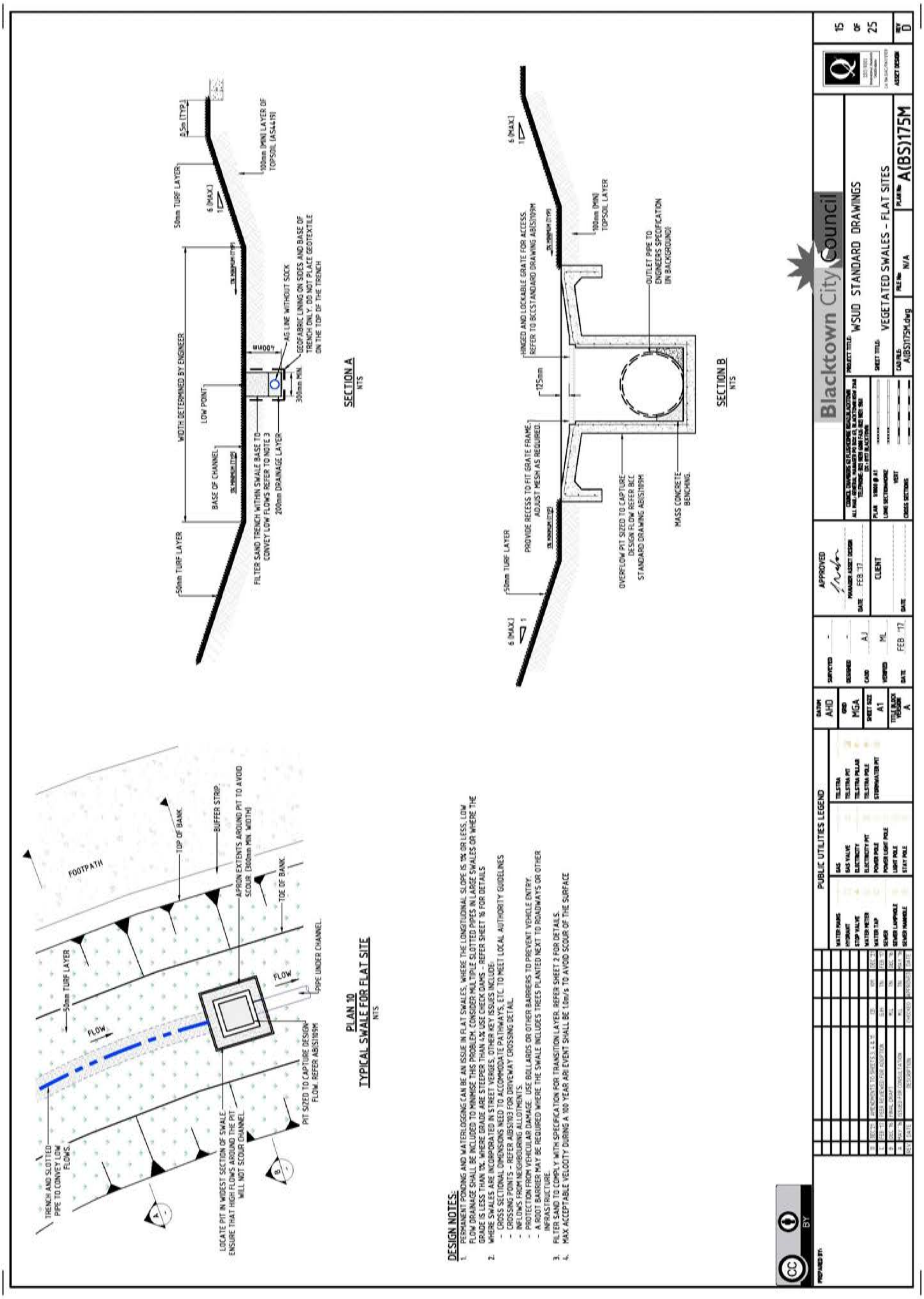
PLAN 1/1000 @ A1
LONG SECTIONS/RCE
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - CONSTRUCTION WORKS STAGING - 1
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

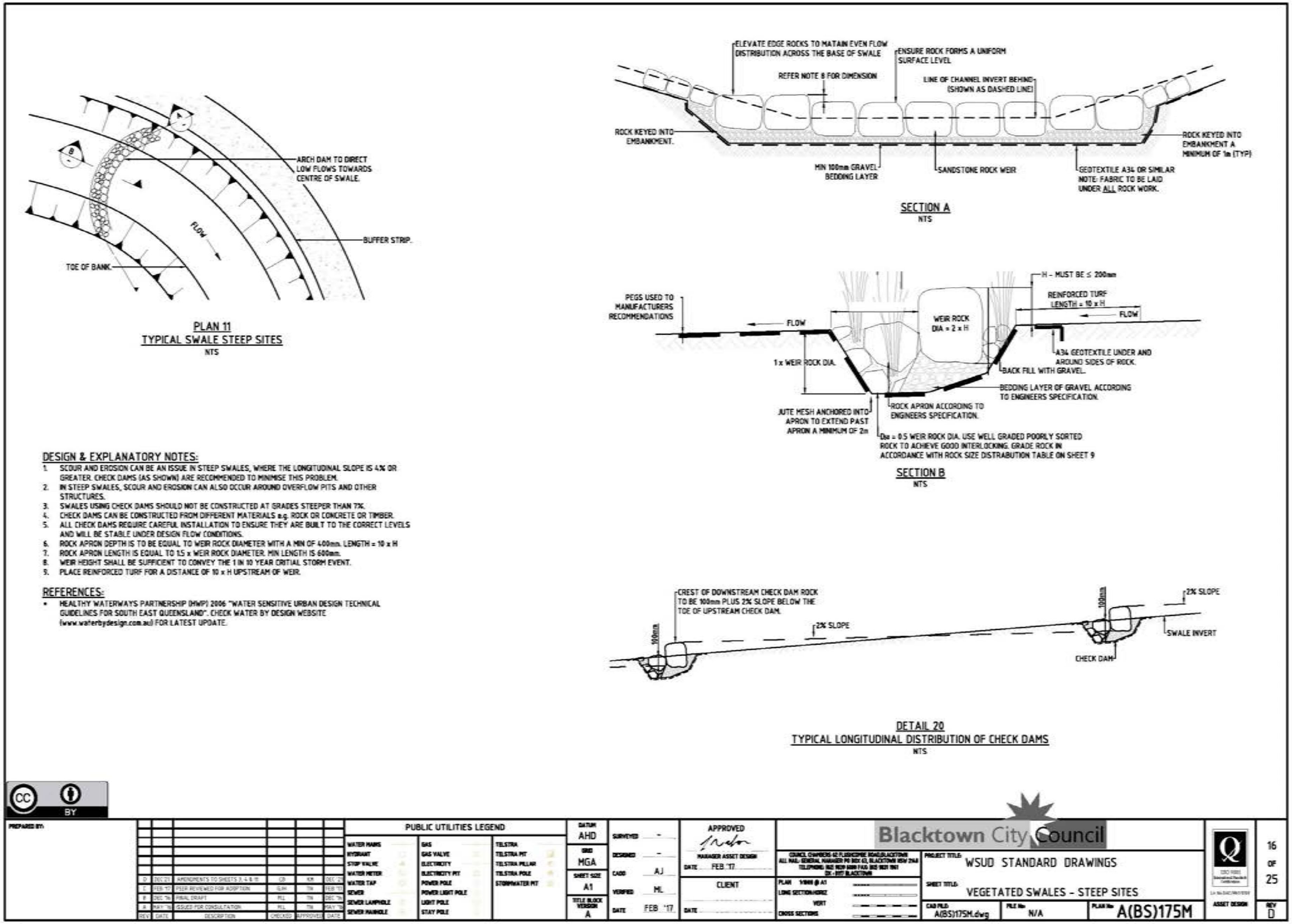
ASSET DESIGN

13 OF 25
REV D

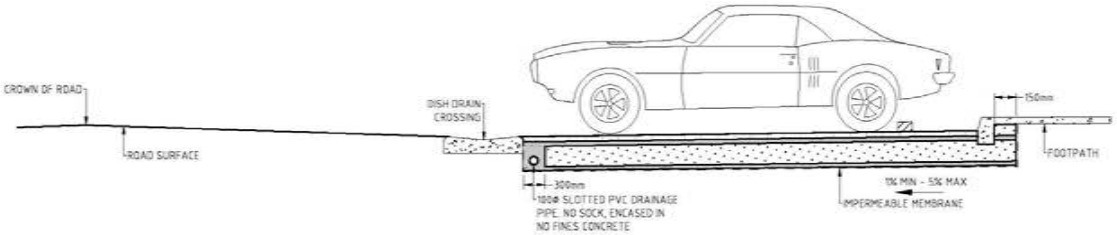

STAGE 2
STAGE 3
SECTION A (STAGE 2)
SECTION B (STAGE 2)
SECTION C (STAGE 3)
DETAIL 19
LOCAL MOUNDING OVER PIPES FOR STAGE 2
PUBLIC UTILITIES LEGEND
Blacktown City Council
WSUD STANDARD DRAWINGS
BIORETENTION - CONSTRUCTION WORKS STAGING - 2
A(BS)175M


TRENCH AND SLOTTED PIPE TO CONVEY LOW FLOWS.
50mm TURF LAYER
FLOW
FOOTPATH
TOP OF BANK.
BUFFER STRIP.
LOCATE PIT IN WIDEST SECTION OF SWALE. ENSURE THAT HIGH FLOWS AROUND THE PIT WILL NOT SCOUR CHANNEL.
APRON EXTENTS AROUND PIT TO AVOID SCOUR. (300mm MIN. WIDTH)
TOE OF BANK.
PIT SIZED TO CAPTURE DESIGN FLOW. REFER AB(S)109M
PIPE UNDER CHANNEL.
PLAN 10
TYPICAL SWALE FOR FLAT SITE
NTS
50mm TURF LAYER
WIDTH DETERMINED BY ENGINEER
0.5m (TYP.)
BASE OF CHANNEL
LOW POINT
6 (MAX.)
1
FILTER SAND TRENCH WITHIN SWALE BASE TO CONVEY LOW FLOWS REFER TO NOTE 3
200mm DRAINAGE LAYER
400mm
300mm MIN.
AG LINE WITHOUT SOCK
GEOFABRIC LINING ON SIDES AND BASE OF TRENCH ONLY. DO NOT PLACE GEOTEXTILE ON THE TOP OF THE TRENCH
100mm (MIN) LAYER OF TOPSOIL (AS4419)
SECTION A
NTS
DESIGN NOTES:
1. PERMANENT PONDING AND WATERLOGGING CAN BE AN ISSUE IN FLAT SWALES, WHERE THE LONGITUDINAL SLOPE IS 1% OR LESS. LOW FLOW DRAINAGE SHALL BE INCLUDED TO MINIMISE THIS PROBLEM. CONSIDER MULTIPLE SLOTTED PIPES IN LARGE SWALES OR WHERE THE GRADE IS LESS THAN 1%. WHERE GRADE ARE STEEPER THAN 4% USE CHECK DAMS - REFER SHEET 16 FOR DETAILS
2. WHERE SWALES ARE INCORPORATED IN STREET VERGES, OTHER KEY ISSUES INCLUDE:
- CROSS SECTIONAL DIMENSIONS NEED TO ACCOMMODATE PATHWAYS, ETC. TO MEET LOCAL AUTHORITY GUIDELINES
- CROSSING POINTS - REFER AB(S)103 FOR DRIVEWAY CROSSING DETAIL.
- INFLOWS FROM NEIGHBOURING ALLOTMENTS.
- PROTECTION FROM VEHICULAR DAMAGE. USE BOLLARDS OR OTHER BARRIERS TO PREVENT VEHICLE ENTRY.
- A ROOT BARRIER MAY BE REQUIRED WHERE THE SWALE INCLUDES TREES PLANTED NEXT TO ROADWAYS OR OTHER INFRASTRUCTURE.
3. FILTER SAND TO COMPLY WITH SPECIFICATION FOR TRANSITION LAYER. REFER SHEET 2 FOR DETAILS.
4. MAX ACCEPTABLE VELOCITY DURING A 100 YEAR ARI EVENT SHALL BE 1.0m/s TO AVOID SCOUR OF THE SURFACE
6 (MAX.)
1
50mm TURF LAYER
PROVIDE RECESS TO FIT GRATE FRAME. ADJUST MESH AS REQUIRED.
125mm
HINGED AND LOCKABLE GRATE FOR ACCESS. REFER TO BCCSTANDARD DRAWING AB(S)109M
100mm (MIN) TOPSOIL LAYER
OVERFLOW PIT SIZED TO CAPTURE DESIGN FLOW REFER BCC STANDARD DRAWING AB(S)109M
OUTLET PIPE TO ENGINEERS SPECIFICATION (IN BACKGROUND)
MASS CONCRETE BENCHING.
SECTION B
NTS
PREPARED BY:
PUBLIC UTILITIES LEGEND
DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A
SURVEYED -
DESIGNED -
CADD AJ
VERIFIED ML
DATE FEB '17
APPROVED
MANAGER ASSET DESIGN
DATE FEB '17
CLIENT
Blacktown City Council
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: VEGETATED SWALES - FLAT SITES
CAD FILE: A(BS)175M.dwg
FILE No N/A
PLAN No A(BS)175M
ASSET DESIGN
15 OF 25
REV D

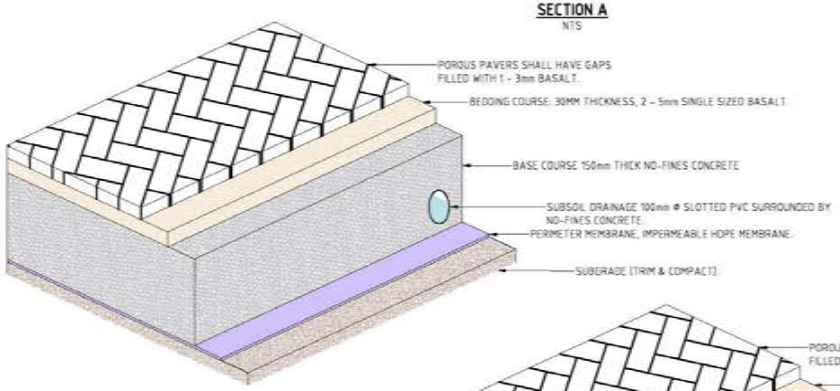
HABIT8



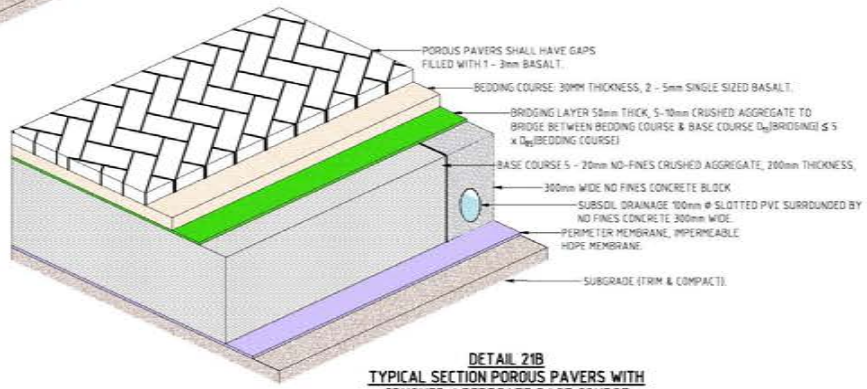
ELEVATE EDGE ROCKS TO MATAIN EVEN FLOW DISTRIBUTION ACROSS THE BASE OF SWALE
ENSURE ROCK FORMS A UNIFORM SURFACE LEVEL
REFER NOTE 8 FOR DIMENSION
LINE OF CHANNEL INVERT BEHIND (SHOWN AS DASHED LINE)
ROCK KEYED INTO EMBANKMENT.
ROCK KEYED INTO EMBANKMENT A MINIMUM OF 1m (TYP)
MIN 100mm GRAVEL BEDDING LAYER
SANDSTONE ROCK WEIR
GEOTEXTILE A34 OR SIMILAR NOTE: FABRIC TO BE LAID UNDER ALL ROCK WORK.
SECTION A
NTS
ARCH DAM TO DIRECT LOW FLOWS TOWARDS CENTRE OF SWALE.
FLOW
BUFFER STRIP.
TOE OF BANK.
PLAN 11
TYPICAL SWALE STEEP SITES
NTS
H - MUST BE ≤ 200mm
REINFORCED TURF LENGTH = 10 x H
FLOW
PEGS USED TO MANUFACTURERS RECOMMENDATIONS
WEIR ROCK DIA = 2 x H
1 x WEIR ROCK DIA.
A34 GEOTEXTILE UNDER AND AROUND SIDES OF ROCK.
BACK FILL WITH GRAVEL.
BEDDING LAYER OF GRAVEL ACCORDING TO ENGINEERS SPECIFICATION.
ROCK APRON ACCORDING TO ENGINEERS SPECIFICATION.
JUTE MESH ANCHORED INTO APRON TO EXTEND PAST APRON A MINIMUM OF 2m
Da = 0.5 WEIR ROCK DIA. USE WELL GRADED POORLY SORTED ROCK TO ACHIEVE GOOD INTERLOCKING. GRADE ROCK IN ACCORDANCE WITH ROCK SIZE DISTRABUTION TABLE ON SHEET 9
SECTION B
NTS
DESIGN & EXPLANATORY NOTES:
1. SCOUR AND EROSION CAN BE AN ISSUE IN STEEP SWALES, WHERE THE LONGITUDINAL SLOPE IS 4% OR GREATER. CHECK DAMS (AS SHOWN) ARE RECOMMENDED TO MINIMISE THIS PROBLEM.
2. IN STEEP SWALES, SCOUR AND EROSION CAN ALSO OCCUR AROUND OVERFLOW PITS AND OTHER STRUCTURES.
3. SWALES USING CHECK DAMS SHOULD NOT BE CONSTRUCTED AT GRADES STEEPER THAN 7%.
4. CHECK DAMS CAN BE CONSTRUCTED FROM DIFFERENT MATERIALS e.g. ROCK OR CONCRETE OR TIMBER.
5. ALL CHECK DAMS REQUIRE CAREFUL INSTALLATION TO ENSURE THEY ARE BUILT TO THE CORRECT LEVELS AND WILL BE STABLE UNDER DESIGN FLOW CONDITIONS.
6. ROCK APRON DEPTH IS TO BE EQUAL TO WEIR ROCK DIAMETER WITH A MIN OF 400mm. LENGTH = 10 x H
7. ROCK APRON LENGTH IS EQUAL TO 1.5 x WEIR ROCK DIAMETER. MIN LENGTH IS 600mm.
8. WEIR HEIGHT SHALL BE SUFFICIENT TO CONVEY THE 1 IN 10 YEAR CRITIAL STORM EVENT.
9. PLACE REINFORCED TURF FOR A DISTANCE OF 10 x H UPSTREAM OF WEIR.
REFERENCES:
• HEALTHY WATERWAYS PARTNERSHIP (HWP) 2006 "WATER SENSITIVE URBAN DESIGN TECHNICAL GUIDELINES FOR SOUTH EAST QUEENSLAND". CHECK WATER BY DESIGN WEBSITE (www.waterbydesign.com.au) FOR LATEST UPDATE.
CREST OF DOWNSTREAM CHECK DAM ROCK TO BE 100mm PLUS 2% SLOPE BELOW THE TOE OF UPSTREAM CHECK DAM.
2% SLOPE
100mm
SWALE INVERT
CHECK DAM
DETAIL 20
TYPICAL LONGITUDINAL DISTRIBUTION OF CHECK DAMS
NTS
PREPARED BY:
PUBLIC UTILITIES LEGEND
DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A
SURVEYED -
DESIGNED -
CADD AJ
VERIFIED ML
DATE FEB '17
APPROVED
MANAGER ASSET DESIGN
DATE FEB '17
CLIENT
Blacktown City Council
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: VEGETATED SWALES - STEEP SITES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
16 OF 25
REV D
D DEC '21 AMENDMENTS TO SHEETS 3, 4 & 11
C FEB '17 PSER REVIEWED FOR ADOPTION
B DEC '16 FINAL DRAFT
A MAY '16 ISSUED FOR CONSULTATION
REV DATE DESCRIPTION CHECKED APPROVED DATE



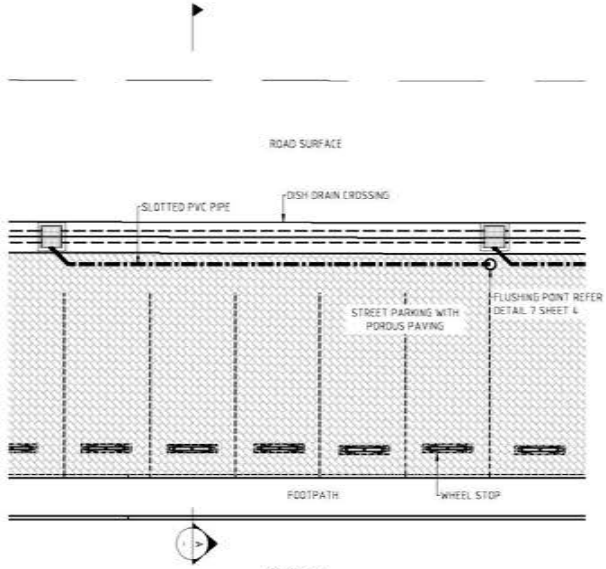
SECTION A
NTS



DETAIL 21A
TYPICAL SECTION POROUS PAVERS WITH NO-FINES CONCRETE BASE COURSE
NTS



DETAIL 21B
TYPICAL SECTION POROUS PAVERS WITH CRUSHED AGGREGATE BASE COURSE
NTS



PLAN 12
USE OF POROUS PAVING IN ON STREET PARKING
NTS

DESIGN NOTES:

1. PERMEABLE PAVEMENT IS MOST SUITABLE TO PEDESTRIAN OR LOW TRAFFIC AREAS.
2. PERMEABLE PAVEMENT SHALL NOT BE USED IN AREAS WITH HEAVY TRAFFIC OR WHERE HEAVY VEHICLES ARE TURNING.
3. CLAY SOILS IN BLACKTOWN RESTRICT INFILTRATION. SUBSOIL DRAINAGE SHALL BE USED.
4. PERMEABLE PAVEMENTS SHALL HAVE NO RUN-ON WATERFLOW.
5. ANY PERMEABLE PAVEMENTS SHALL BE DESIGNED BY AN EXPERIENCED, QUALIFIED CIVIL, GEOTECHNICAL OR STRUCTURAL ENGINEER.
6. ONLY POROUS PAVERS SHALL BE USED.
7. IF THE BASE COURSE IS TO BE NO-FINES CONCRETE THEN THE BRIDGING LAYER IS NOT REQUIRED.
8. SUBSOIL DRAIN LINES ARE TO HAVE FLUSHING POINTS EVERY 20m NOMINAL.
9. CLEANING & OR RENEWAL REQUIRED WHERE WATER PONDS FOR MORE THAN 1 HOUR AFTER RAINFALL.

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
E	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 17	CR	KK	DEC '23
C	FEB '17	FOR REVIEWED FOR ADOPTION	EJM	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	ML	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council

COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: CENTRAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 3981
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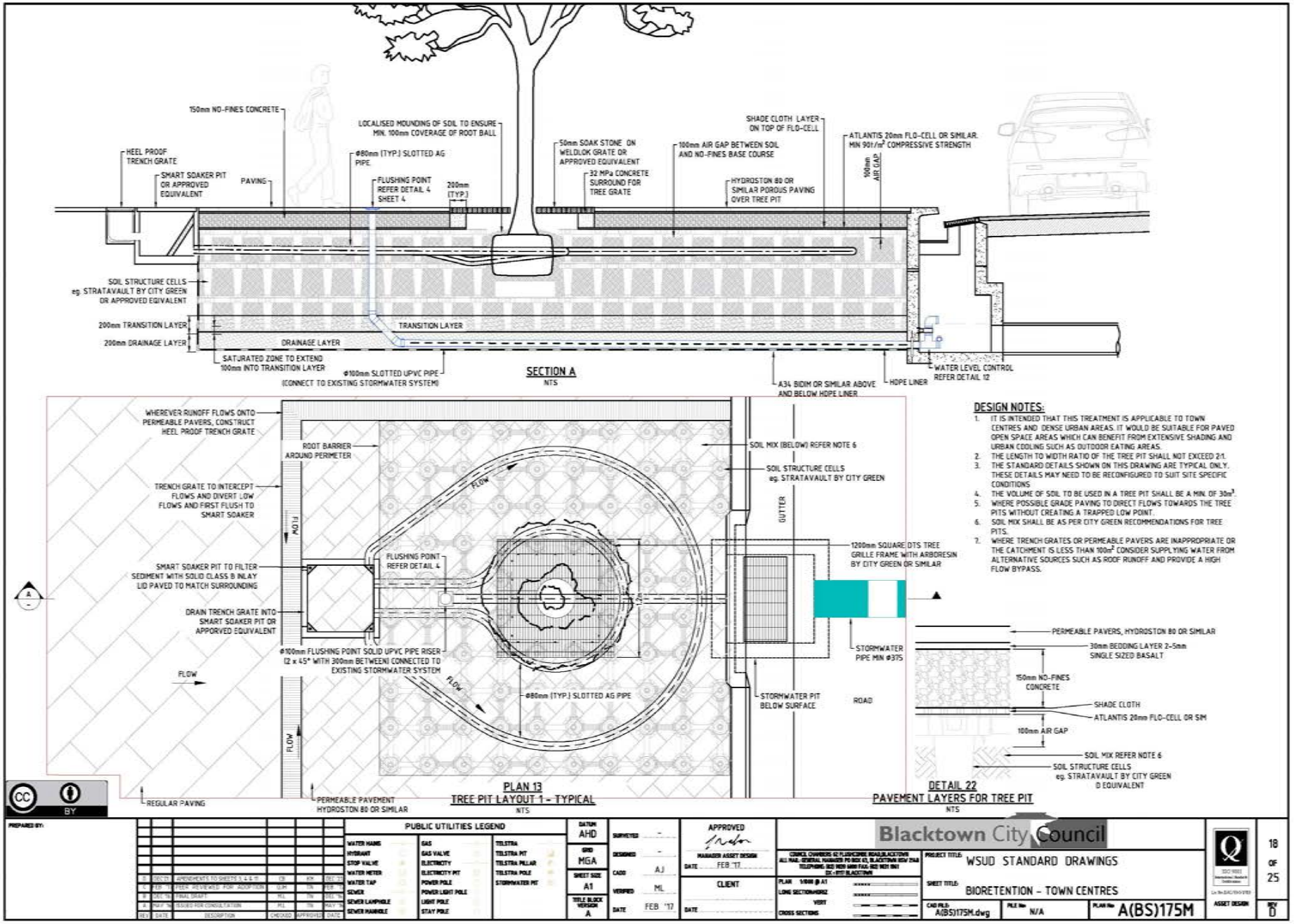
PLAN VSHN @ A1 1:100
LONG SECTION HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: POROUS PAVING
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

17 OF 25
REV D



PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KW	DEC '23
C	FEB '17	FINAL REVIEWED FOR ADOPTION	GJM	TN	FEB '17
B	DEC '16	FINAL DRAFT	MG	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	MG	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER MANHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

SURVEYED -
DESIGNED -
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council
COUNCIL CHAMBERS 62 FLACKCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 3981
DX: 8117 BLACKTOWN

PLAN 1/1000 @ A1
LONG SECTIONS/HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - TOWN CENTRES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN
REV D

18 OF 25

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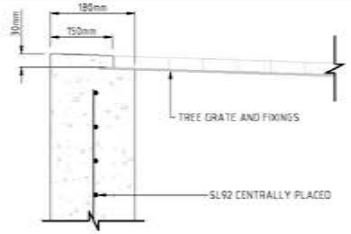
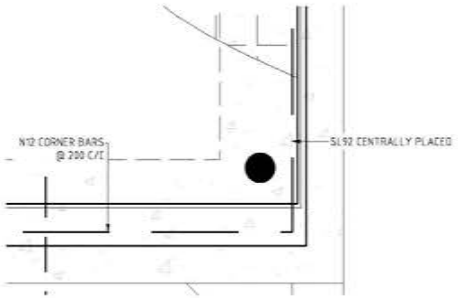
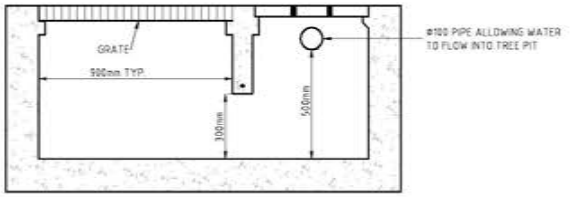


DETAIL 23
TREE PIT WALL DETAIL
NTS



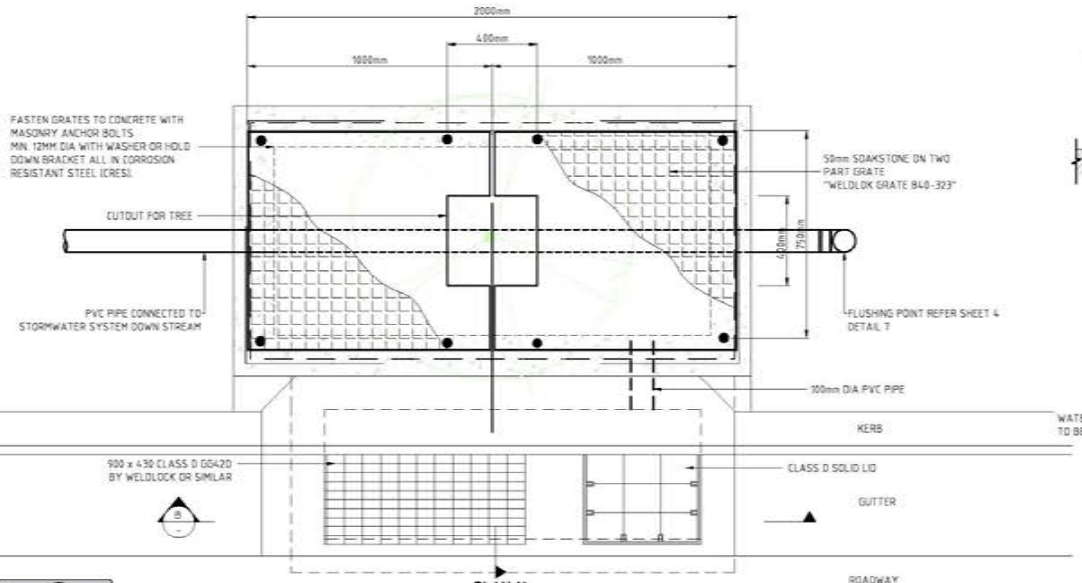
DETAIL 24
TREE PIT CORNER REINFORCEMENT
NTS



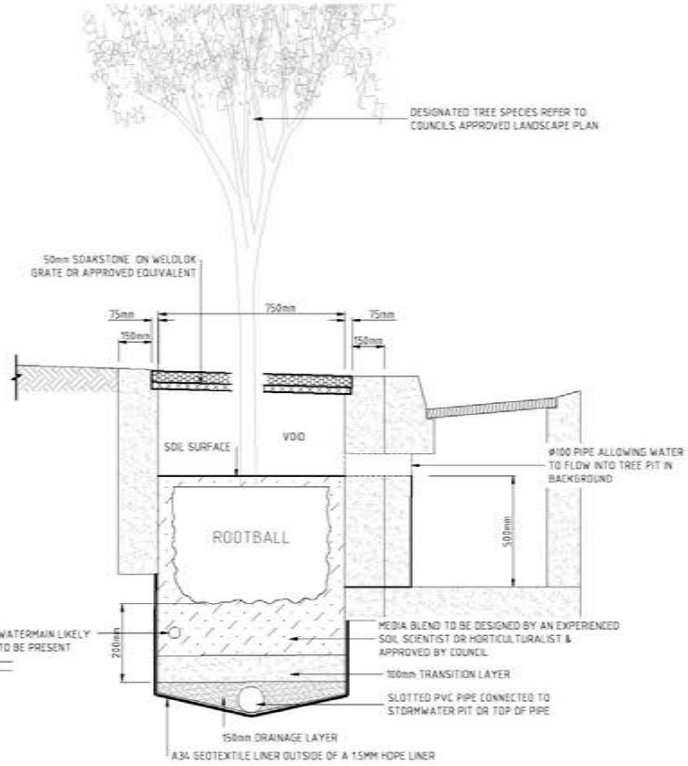
SECTION B
NTS

DESIGN NOTES:

1. ALL CONCRETE KERBS AND GRATES TO BE FLUSH WITH SURROUNDING PAVEMENT AND KERB.
2. FOOTPATHS TO BE REINSTATED AS PER COUNCIL STANDARD (WHERE REQUIRED).
3. BIORETENTION TREE PITS SHOULD NOT BE PLACED ON CRESTS WHERE THEY DO NOT RECEIVED ADEQUATE HYDRAULIC LOADING.
4. CARE SHOULD BE TAKEN WHEN LOCATING PITS IN SAGS. ENSURE THAT:
   - 4.1. THE TREE PIT IS NOT OVERLOADED HYDRAULICALLY
   - 4.2. THE SAG IS NOT TRAPPED WHICH COULD RESULT IN SURFACE PONDING.



PLAN 14
TYPICAL TREE PIT LAYOUT 2 - ADJACENT TO KERB
NTS



SECTION A
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
B	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CR	KK	DEC '23
C	FEB '17	FOR REVIEWED FOR ADOPTION	EJH	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	ML	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council

COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: CENTRAL MARKETS PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 7961
DX 8117 BLACKTOWN

PLAN V5MM @ A1
LONG SECTION/HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: TREE PIT BIORETENTION - STREET
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

19 OF 25
REV D

DESIGN NOTES:

1. ALL SYSTEMS SHALL USE AT LEAST 2 ORIFICE PLATES TO CONTROL FLOWS.
   - THE 1.5 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 40 L/s/ha.
   - THE 100 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 190 L/s/ha.
2. STORAGE SHALL BE PROVIDED AS FOLLOWS:
   - VOLUME UP TO 1.5 YEAR ARI TWL = 300m³/ha
   - VOLUME UP TO 100 YEAR ARI TWL = 455m³/ha
3. ORIFICE FLOW RATES WILL BE ADJUSTED FOR BYPASS WITH A MAXIMUM SITE BYPASS OF 15%.

TOTAL OSD BYPASS	ENVIRONMENTAL DISCHARGE (1.5 YEAR ARI ORIFICE) (L/s/ha)	ENVIRONMENTAL STORAGE (BELOW 1.5 YEAR ARI WEIR) (m³/ha)	FLOOD DISCHARGE (100 YEAR ARI ORIFICE) (L/s/ha)	FLOOD STORAGE (BELOW EMERGENCY WEIR) (m³/ha)
0%	40.0	300	190	455
2.5%	38.5	300	176	455
5%	37.0	300	162	455
7.5%	35.5	300	148	455
10%	34.0	300	134	455
12.5%	32.5	300	120	455
15%	31.0	300	106	455

4. STORAGE VOLUMES WILL BE ADJUSTED FOR DROWNED ORIFICES.
5. ALL PITS GREATER THAN 1.2m SHALL BE FITTED WITH COUNCIL APPROVED STEP IRONS AT nom 300mm C/C IN A STAGGERED CONFIGURATION AND IN ACCORDANCE WITH AS 4198-1994.
6. MINIMUM PIT SIZE 900mm x 900mm. ALL PITS DEEPER THAN 1.2m SHALL BE A MINIMUM SIZE OF 1200mm X 1200mm.
7. FOR ORIFICE DIAMETERS:
   - LESS THAN 150mm:
     PROVIDE MAXI-MESH TRASH SCREEN WITH SURFACE AREA 50 TIMES THAT OF THE ORIFICE OPENING.
   - GREATER THAN 150mm:
     PROVIDE WELDLOK F42/203 TRASH SCREEN WITH SURFACE AREA 20 TIMES THAT OF THE ORIFICE OPENING.
8. CONCRETE BENCHING INSIDE THE PITS SHALL BE CARRIED OUT POST INSTALLATION OF THE ORIFICE PLATES.
9. ALL REDUCED LEVELS AND DIAMETERS, DIMENSIONS OR TOLERANCES ARE TO BE NOMINATED BY THE DESIGNER.
10. THE ORIFICE PLATE SHALL BE 3mm THICK STAINLESS STEEL FOR ORIFICE SIZES < 150mm OR FOR ORIFICES > 150mm USE 5mm THICK STAINLESS STEEL WITH SHARP EDGES MACHINED TO 0.5mm ACCURACY - FASTENED TO PIT WALL USING "HILTI" (OR APPROVED EQUIVALENT) STAINLESS HSI-R(R) - M6x40 BOLTS.
11. THE DOWNSTREAM PIPE DIAMETER SHALL BE AT LEAST 3x ORIFICE DIAMETER. MINIMUM Ø100mm & HAVE A MIN CAPACITY OF 2 x ORIFICE FLOW.
12. REFER TO UPRCT "ON-SITE STORMWATER DETENTION HANDBOOK" 4th EDITION DECEMBER 2005.

DESIGN NOTES:

13. THE BASE OF THE DETENTION STORAGE TANK IS TO BE BENCHED TO FALL @ 2% TO THE INVERT OF THE OUTLET POINT.
14. OWNERS MUST BE ABLE TO INSPECT CRITICAL PARTS OF THE STORAGE TANK FROM THE SURFACE WITHOUT HAVING TO REMOVE HEAVY ACCESS COVERS. ALL SECTIONS OF THE OSD SHALL HAVE GRATED ACCESS POINTS.
15. FOR PITS:
    - LESS THAN THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 900mm x 900mm
    - GREATER THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 1.2m x 1.2m
16. FOR ALL OTHER ACCESS POINTS TO THE DETENTION TANK THE MINIMUM OPENING SIZE IS 900mm x 900mm.
17. ALL OPENINGS SHALL BE COVERED BY A HINGED GALVANISED MILD STEEL GRATE AND FRAME AND FITTED WITH CHILD PROOF LOCKS.
18. DETENTION STORAGE ACCESS GRATES TO THE BELOW GROUND OSD ARE TO BE POSITIONED SUCH THAT THE MAXIMUM REACH FROM ANY POINT IN THE TANK TO THE NEAREST GRATE IS DETERMINED BY THE TABLE BELOW:

DEPTH OF TANK	LENGTH OF REACH
0.5m - 0.7m	1.5m
0.7m - 1m	2m
1m - 1.5m	3m
1.5m - 2m	4m
>2m	6m

19. FOR BELOW GROUND OSD TANKS AS SHOWN ON SHEET 22 THE MINIMUM INTERNAL HEIGHT IS TO BE A MINIMUM OF 0.5m FOR EASE OF MAINTENANCE AND SAFE WORK SPACE REQUIREMENTS.
20. THE SAME ACCESS REQUIREMENTS AS IN NOTE 18. APPLY TO FILTER STORAGE AREAS WHERE USED. SEE SHEET 23.
21. THE MINIMUM ORIFICE SIZE SHALL BE 25mm DIA.
22. STRUCTURAL DESIGN OF OSD STORAGE TO BE DESIGNED BY A QUALIFIED ENGINEER.
23. CONFINED SPACE ENTRY REQUIREMENTS APPLY.
24. UNDERGROUND OSD EMERGENCY OVERFLOW WEIR SHALL BE DESIGNED TO CONVEY 100 YEAR ARI, 5 MINUTE STORM EVENT AND BE A MINIMUM HEIGHT OF 100mm.

CONFINED SPACE DANGER SIGN

NOTES:

1. A CONFINED SPACE DANGER SIGN SHALL BE PLACED NEXT TO EACH AND EVERY ACCESS POINT SO THAT THEY ARE VISIBLE TO PERSONS ENTERING ANY BELOW GROUND TANK OR PIT.
2. COLOURS:
   - "DANGER" AND BACKGROUND - WHITE
   - ELLIPTICAL AREA - RED
   - RECTANGLE CONTAINING ELLIPSE - BLACK
   - LETTERING AND BORDER - BLACK
3. MINIMUM DIMENSIONS OF THE SIGN:
   - LARGE ENTRIES: - 300mm x 450mm
   - SMALL ENTRIES: - 250mm x 180mm
4. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

ON SITE STORMWATER DETENTION WARNING SIGN

NOTES:

1. SIGN SHALL BE PLACED IN A CLEAR AND VISIBLE LOCATION AT EACH DETENTION BASIN.
2. COLOURS:
   - TRIANGLE AND "WARNING" - RED
   - WATER - BLUE
   - FIGURE AND LETTERING - BLACK
3. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
4. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

ON SITE STORMWATER DETENTION SYSTEM SIGN

NOTES:

1. CORNERS SQUARE.
2. COLOURS:
   ETCHED AND FILLED BLACK LEDGEND ON A NATURAL SILVER BACKGROUND.
3. CONSTRUCTED FROM ALUMINIUM 0.9mm MILL.
4. THIS SIGN SHALL BE PLACED IN A VISIBLE LOCATION NEAR A DISCHARGE CONTROL PIT OR AT THE ACCESS TO ONE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
E	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CR	KK	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	S.H	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	ML	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

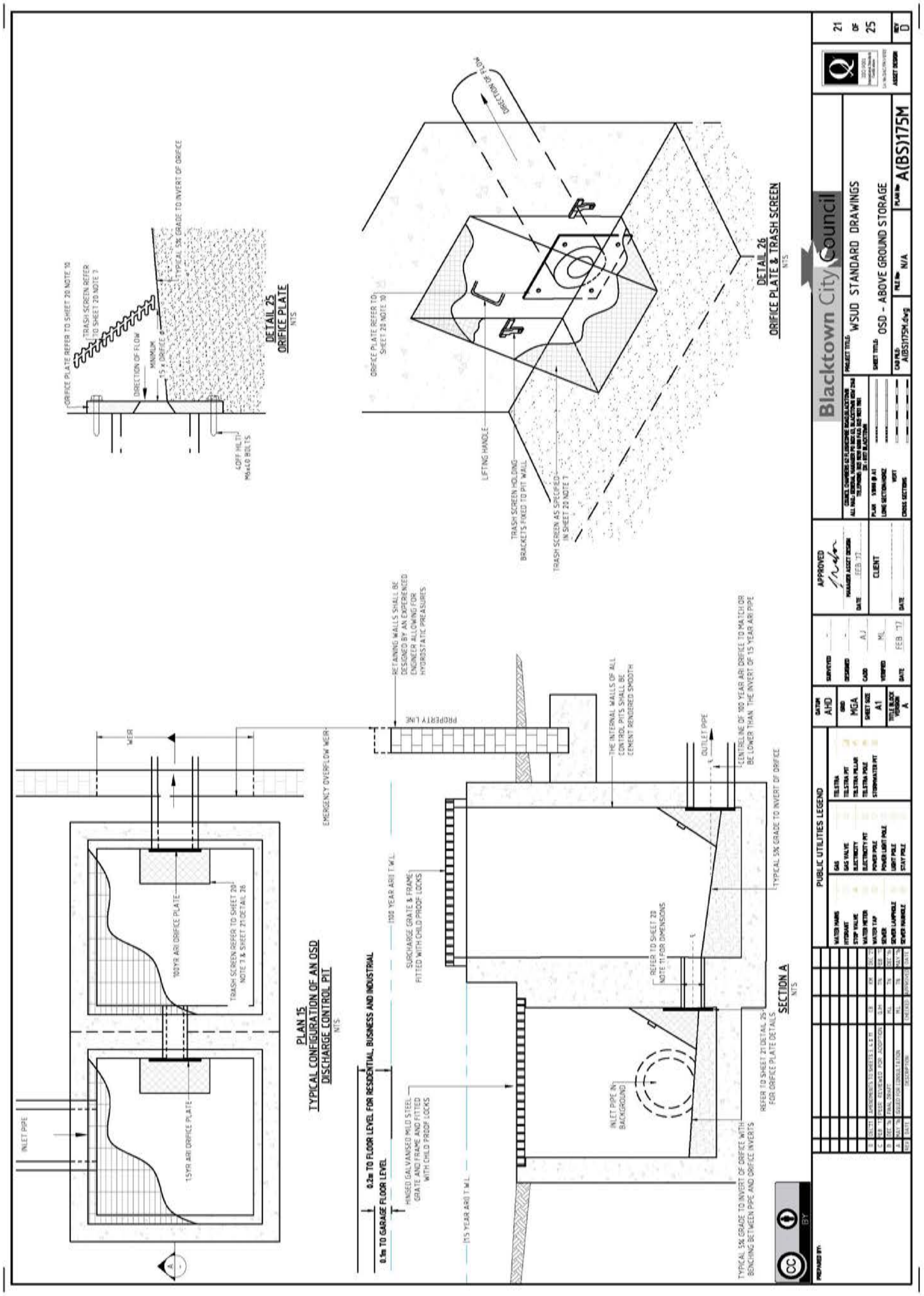
Blacktown City Council

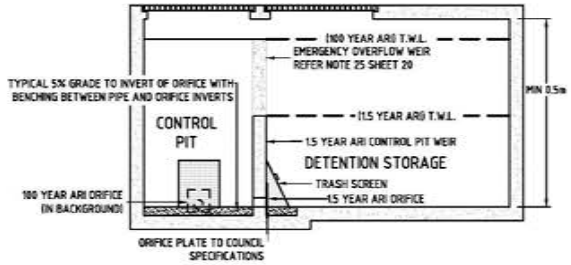
COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: CENTRAL MARKETS PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 7961
DX 8117 BLACKTOWN

PLAN V/mm @ A1
LONG SECTION/HORIZ
VERT
CROSS SECTIONS

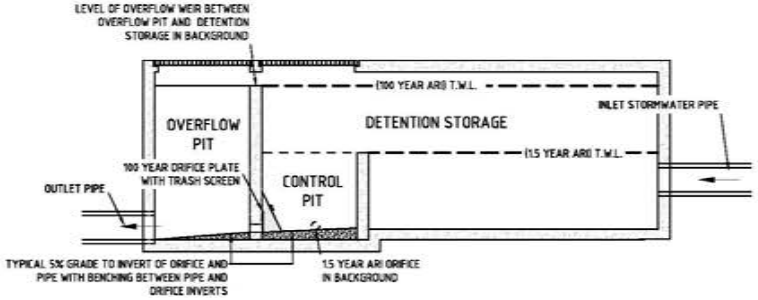
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD - REQUIREMENTS
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN
REV: D

20 OF 25


DETAIL 25
ORIFICE PLATE
NTS
DETAIL 26
ORIFICE PLATE & TRASH SCREEN
NTS
PLAN 15
TYPICAL CONFIGURATION OF AN OSD
DISCHARGE CONTROL PIT
NTS
SECTION A
NTS
Blacktown City Council
WSUD STANDARD DRAWINGS
OSD - ABOVE GROUND STORAGE
A(BS)175M



SECTION A
NTS



SECTION B
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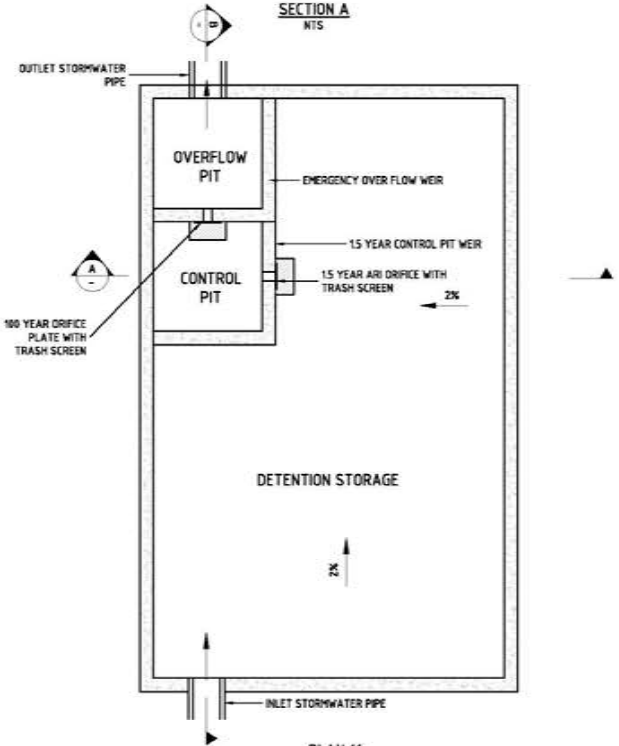


PLAN 16
DISCHARGE CONTROL PIT WITH EMERGENCY OVERFLOW
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	LB	KM	DEC '21
C	FEB	REVIEW REVIEWED FOR ADOPTION	ELM	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	ML	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

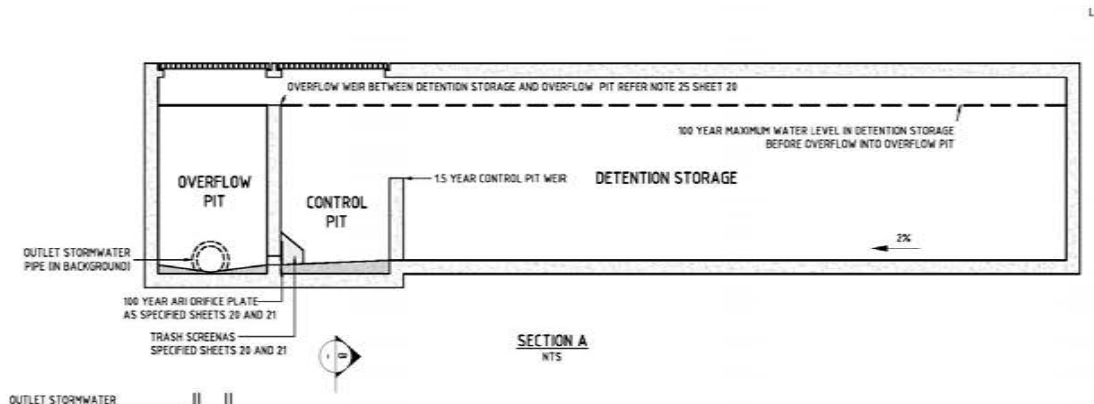
CLIENT
DATE:

Blacktown City Council
COUNCIL CHAMBERS 62 FLACKSMORE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9839 7961
DX: 8117 BLACKTOWN

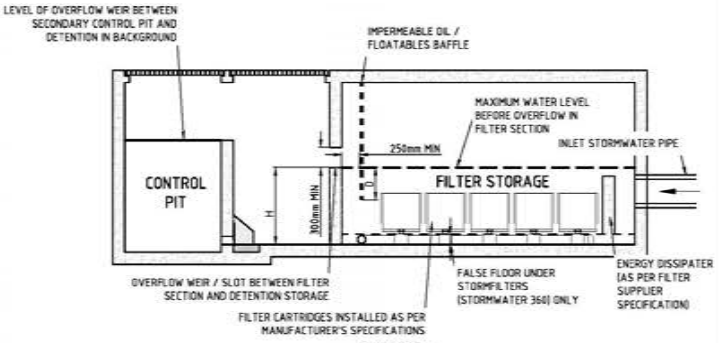
PLAN 1:1000 @ A1
LONG SECTION/GRADE
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD - UNDERGROUND STORAGE
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

22 OF 25
REV D



SECTION A
NTS



SECTION B
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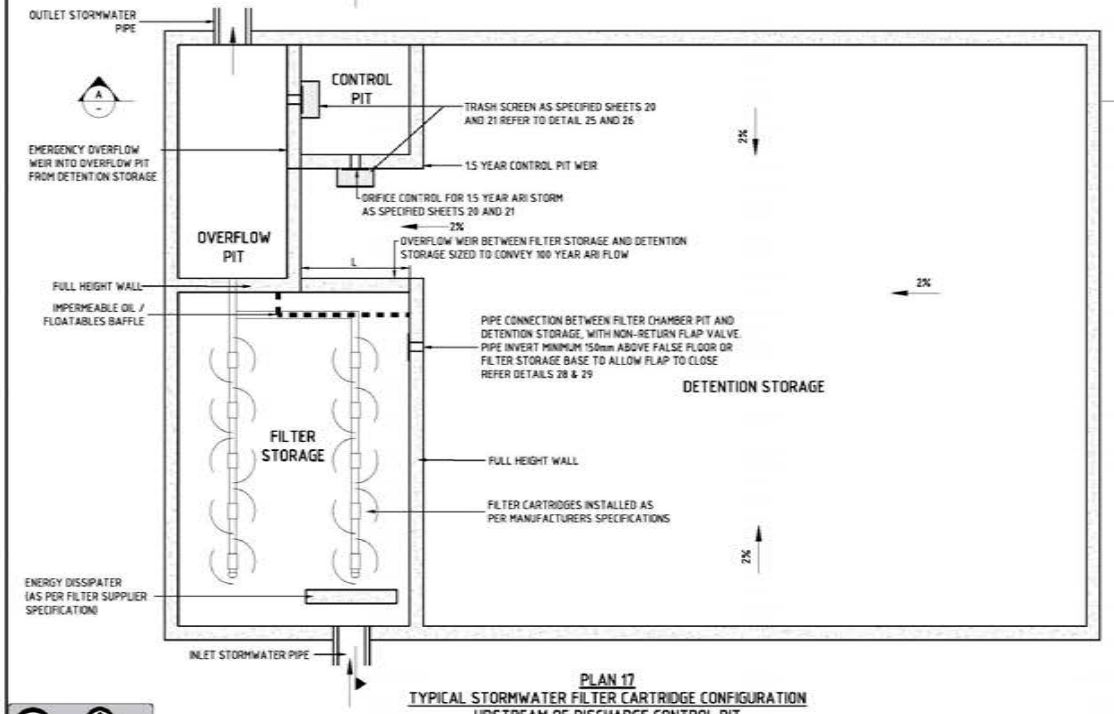


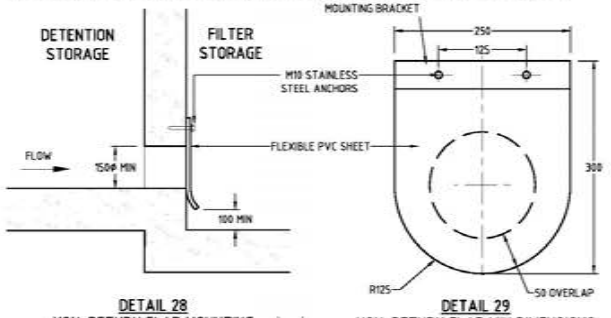
PLAN 17
TYPICAL STORMWATER FILTER CARTRIDGE CONFIGURATION
UPSTREAM OF DISCHARGE CONTROL PIT
NTS

DESIGN NOTES:

1. THE FILTER TANK STORAGE IS CONSIDERED AS PART OF THE 1.5 YEAR ARI DETENTION STORAGE.
2. COMBINED OSD & FILTER CARTRIDGE SYSTEMS SHALL COMPLY WITH THE STORAGE VOLUME AND DISCHARGE REQUIREMENTS DOCUMENTED ON SHEET 20. THIS REQUIRES THAT ORIFICES BE ADJUSTED TO ACCOUNT FOR THE COMBINED FLOW FROM THE CARTRIDGES AND THE ORIFICES.
3. THE SIZING OF THE 1.5 YEAR ARI ORIFICES NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER THROUGH THE UNDERDRAIN FROM THE FILTER STORAGE USING THE MANUFACTURERS NOMINAL DESIGN FLOW RATES (REFER MANUFACTURER'S SPECIFICATIONS). IF THE MINIMUM ORIFICE SIZE NEEDS TO BE LESS THAN 15mm.
4. IN THE EVENT THAT THE NOMINAL DISCHARGE FROM THE FILTER STORAGE EXCEEDS THE 1.5 YEAR ARI FLOW THEN OMIT THE 1.5 YEAR ARI ORIFICE CONTROL AND GRADE FLOOR OF OSD TANK TO NON-RETURN FLAP.
5. THE SIZING OF THE 100 YEAR ARI ORIFICE NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER FROM THE FILTER CARTRIDGES, THE CARTRIDGE FLOW WILL EXCEED THE NOMINAL DESIGN FLOW RATES DURING EVENTS LARGER THAN A 1.5 YEAR ARI STORM DUE TO ADDITIONAL HEAD ON EACH CARTRIDGE. CONTACT THE MANUFACTURER FOR THE REVISED CARTRIDGE FLOW AT THE 100 YEAR TOP WATER LEVEL.
6. THE ADJUSTED ORIFICE SIZES WILL BE MANUALLY CALCULATED USING THE DIFFERENCE BETWEEN THE FLOW RATES FROM SHEET 20 AND THE CARTRIDGE FLOW RATE.
7. DETAILED DESIGN OF THE DETENTION AND FILTER CARTRIDGE SYSTEM IS TO BE DONE IN ACCORDANCE WITH SPECIFICATIONS FOR ONSITE DETENTION AND THE DETAILED DESIGN SPECIFICATIONS FROM THE CARTRIDGE MANUFACTURER.
8. DIMENSIONS D, H AND WEIR LENGTH (L) IN METRES FOR FLOW (Q=m³/s) (REFER SECTION B ABOVE). FOR DETENTION TANKS Q IS 100 YEAR ARI HOWEVER FOR OFF LINE TREATMENT MINIMUM Q IS 0.75 x 1 YEAR ARI.

FILTER CARTRIDGE	D	H	L
STORMFILTER (690)	400mm	770mm + FALSE FLOOR THICKNESS	10.0 x Q
STANDARD STORMFILTER (460)	300mm	540mm + FALSE FLOOR THICKNESS	13.2 x Q
SMALL STORMFILTER (310)	200mm	390mm + FALSE FLOOR THICKNESS	17.8 x Q
SPEL FILTER EMC - 45N (STANDARD)	450mm	850mm	10.0 x Q
SPEL FILTER EMC - 45L (LOW)	250mm	530mm	13.2 x Q

9. ALL SECTIONS OF THE OSD SYSTEM SHALL HAVE GRATED ACCESS POINTS. MINIMUM 900mm x 900mm AS PER AS3500



DETAIL 28
NON-RETURN FLAP MOUNTING
NTS

DETAIL 29
NON-RETURN FLAP MIN DIMENSIONS
NTS

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KW	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	GJH	TN	FEB '17
B	DEC '16	FINAL DRAFT	ML	TN	DEC '16
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PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
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DATUM	AHD
GRID	MGA
SHEET SIZE	A1
TITLE BLOCK VERSION	A

SURVEYED	-
DESIGNED	-
CADD	AJ
VERIFIED	ML
DATE	FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council

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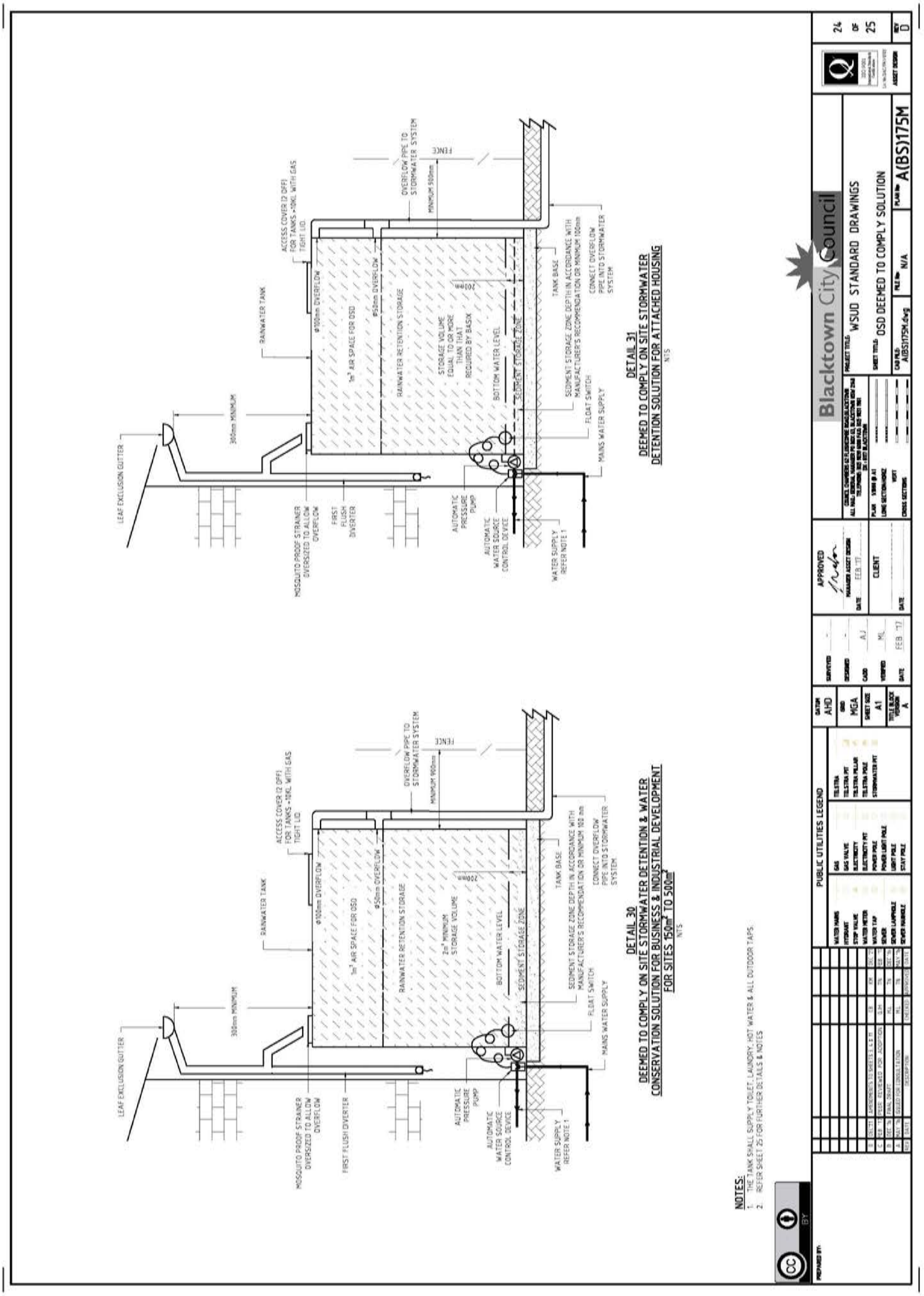
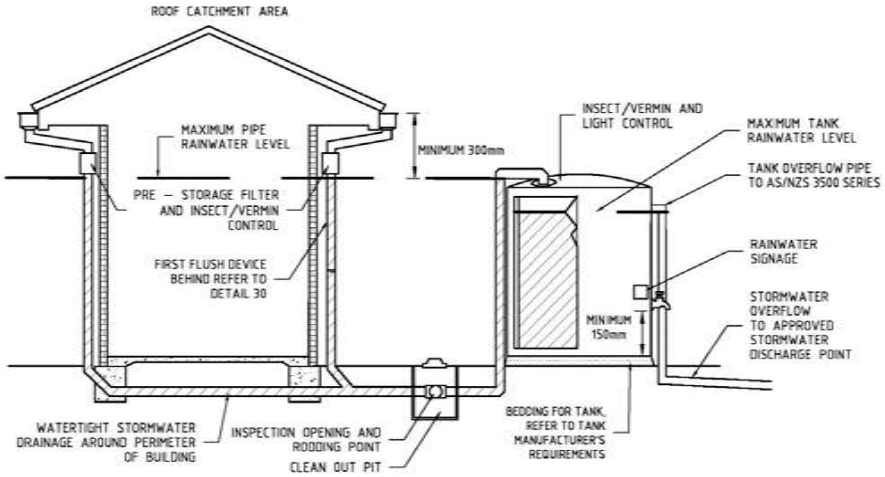
PLAN 1/000 @ A1
LONG SECTION/GRADE
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD - COMBINED OSD & FILTER CARTRIDGES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M
ASSET DESIGN

23 OF 25
REV D


DETAIL 30
DEEMED TO COMPLY ON SITE STORMWATER DETENTION & WATER CONSERVATION SOLUTION FOR BUSINESS & INDUSTRIAL DEVELOPMENT FOR SITES 150m² TO 500m²
NTS
DETAIL 31
DEEMED TO COMPLY ON SITE STORMWATER DETENTION SOLUTION FOR ATTACHED HOUSING
NTS
LEAF EXCLUSION GUTTER
300mm MINIMUM
RAINWATER TANK
ACCESS COVER (2 OFF) FOR TANKS >10KL WITH GAS TIGHT LID
OVERFLOW PIPE TO STORMWATER SYSTEM
FENCE
MINIMUM 900mm
Ø100mm OVERFLOW
Ø50mm OVERFLOW
1m³ AIR SPACE FOR OSD
RAINWATER RETENTION STORAGE
2m³ MINIMUM STORAGE VOLUME
STORAGE VOLUME EQUAL TO OR MORE THAN THAT REQUIRED BY BASIX
200mm
BOTTOM WATER LEVEL
SEDIMENT STORAGE ZONE
TANK BASE
SEDIMENT STORAGE ZONE DEPTH IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION OR MINIMUM 100mm
CONNECT OVERFLOW PIPE INTO STORMWATER SYSTEM
FLOAT SWITCH
MAINS WATER SUPPLY
MOSQUITO PROOF STRAINER OVERSIZED TO ALLOW OVERFLOW
FIRST FLUSH DIVERTER
AUTOMATIC PRESSURE PUMP
AUTOMATIC WATER SOURCE CONTROL DEVICE
WATER SUPPLY REFER NOTE 1
NOTES:
1. THE TANK SHALL SUPPLY TOILET, LAUNDRY, HOT WATER & ALL OUTDOOR TAPS.
2. REFER SHEET 25 FOR FURTHER DETAILS & NOTES
PUBLIC UTILITIES LEGEND
Blacktown City Council
WSUD STANDARD DRAWINGS
OSD DEEMED TO COMPLY SOLUTION
A(BS)175M
24 OF 25
APPROVED
CLIENT
DATUM AHD
MGA
A1
FEB '17



DETAIL 32
RAINWATER TANK WITH CHARGED LINE
NTS

DESIGN NOTES FOR CHARGED SYSTEMS:

1. CHARGE LINES ARE TO USE TYPE 'P' PRESSURE RATED SOLVENT.
2. SOLVENT SEALED TO UNDERSIDE OF EAVES. PAINT ALL EXPOSED SURFACES OR USE UV STABILISED PIPES.
3. FORCE LOW POINT IN CHARGE LINE TO CLEAN OUT PIT.
4. FOR ISOLATED PIT WITHOUT OUTLET PIPES PROVIDE 4 OFF 5mm Φ SEEPAGE HOLES IN BASE WITH GRAVEL UNDER.

NOTES FOR RAINWATER TANKS:

GENERAL:

1. THE TANK MAY SUPPLY TOILET, LAUNDRY, HOT WATER & ALL OUTDOOR TAPS.
2. OFF TAKE POINT IS TO BE A MINIMUM OF 150mm ABVOVE THE BASE OF THE TANK.
3. FLOAT SWITCH SHALL BE SET TO ACTIVATE MAINS SUPPLY WHEN WATER LEVEL IS 200mm ABOVE BASE OF TANK.

GENERAL MODELLING REQUIREMENTS:

THE FOLLOWING POINTS STIPULATE HOW RAINWATER TANKS ARE TO BE MODELLED IN MUSIC

4. WHERE IRRIGATION IS PROPOSED, IT IS TO BE SCALED USING POTENTIAL EVAPOTRANSPIRATION (PET) MINUS RAINFALL.
5. ALLOW FOR A LOSS OF 250mm FROM THE BASE OF EACH RAINWATER TANK TO ALLOW FOR SEDIMENT STORAGE SPACE , LOW LEVEL TOP UP AND OVERFLOW.

RESIDENTIAL MODELLING REQUIREMENTS:

6. RESIDENTIAL DEVELOPMENT IS SUBJECT TO BASIX AND HAS NO MINIMUM REUSE TARGET.
7. A MINIMUM OF 50% OF RUN OFF FROM THE ROOF AREA IS TO BE DIRECTED TO THE RAINWATER TANK UNLESS THE BASIX CERTIFICATE NOTES OTHERWISE.
8. FOR LOW DENSITY RESIDENTIAL SUBDIVISIONS, ALLOW FOR A TANK SIZE OF 2.25KL ON EACH ALLOTMENT, MODELLED AS A 2.0KL TANK IN MUSIC. ALLOW A SURFACE AREA OF 1.7m² FOR TANK PER DWELLING.
9. INDOOR AND OUTDOOR DEMANDS SHALL BE MODELLED IN ACCORDANCE WITH THE FOLLOWING TABLE:

RESIDENTIAL RAINWATER REUSE		
TYPE OF DWELLING & LAND SIZE	**INDOOR (L/DAY)**	**OUTDOOR (kL/YEAR)**
DETACHED HOUSE >730m²	100	55
DETACHED HOUSE >520m²,<730m²		45
DETACHED HOUSE >320m²,<520m²		32
DETACHED HOUSE <320m²		25
ROW HOUSES		20
TOWN HOUSES	20	0.4kL/YEAR/m² OF LANDSCAPED AREA
APARTMENTS / HOME UNITS		

BUSINESS AND INDUSTRIAL MODELLING REQUIREMENTS:

10. COUNCIL REQUIRES A MINIMUM OF 80% NON-POTABLE REUSE TO BE MET THROUGH THE PROVISION OF RAINWATER OR APPROVED NON-POTABLE SOURCES SUCH AS TREATED STORMWATER
11. INDOOR AND OUTDOOR DEMANDS SHALL BE MODELLED IN ACCORDANCE WITH THE FOLLOWING TABLE:

DEVELOPMENT BUSINESS AND INDUSTRIAL WATER USE RATES		
SIZE AND TYPE OF BUILDING	**INDOOR (L/DAY)**	**OUTDOOR (kL/YEAR)**
MOTELS	25L/DAY/TOILET IN PRIVATE ROOM 100L/DAY/TOILET IN PUBLIC AREAS	0.4kL/YEAR/m²
AGED CARE / HOSPITALS		
OTHER BUSINESS AND INDUSTRIAL	100L/DAY/TOILET OR URINAL	

PREPARED BY:

REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC '23	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KH	DEC '23
C	FEB '17	PEER REVIEWED FOR ADOPTION	JDH	TN	FEB '17
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SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM	AHD
GRID	MGA
SHEET SIZE	A1
TITLE BLOCK VERSION	A

SURVEYED	-
DESIGNED	-
CADD	AJ
VERIFIED	ML
DATE	FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council

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PLAN 1:1000 @ A1
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PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: RAINWATER TANK - CHARGED LINE SYSTEMS & MUSIC MODELING REQUIREMENTS

CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ASSET DESIGN

25 OF 25
REV D

APPENDIX D: MAINTENANCE AUDIT FORM

This form is to be completed by the Asset Manager responsible for landscape assets. Two copies of this completed form are required. One is to be issued to maintenance staff for action. The second is to be filed for records. Extra pages can be attached to the electronic record if needed

Date Of Inspection:_____

Inspected By:_____

LOCATION	LANDSCAPE TYPE / AREA	ISSUE	REMEDIATION WORKS REQUIRED	COST ESTIMATE	DATE TO BE COMPLETED	VARIATION / DEFECT?

Signed:_____ Date:_____