238-240 Mona Vale Road, St Ives

Stormwater Management Report

March 2014

Bupa Care Services

Mott MacDonald

238-240 Mona Vale Road, St Ives

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A	14.03.13	A. Hilly	C. Avis	C. Avis	Draft for Review
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Content

1. Introduction

Mott MacDonald has been commissioned by Bupa Care Services to prepare a Stormwater Management Report for the proposed Residential Aged Care Facility (RACF) works at 238-240 Mona Vale Road, St Ives NSW. This report will be lodged with Ku-ring-gai Municipal Council (KMC) in support of the Development Application.

The advice as outlined in this report and documented on the Mott MacDonald drawings attached in Appendix A addresses the following engineering requirements:

- Water Quantity (refer to Section 4.1 of this report); and
- Water Quality Measures (refer to Section 4.2 of this report).

2. Site Description and Proposed Works

2.1 Existing Site

The subject site is located approximately 15 km north of the Sydney CBD at 238-240 Mona Vale Road, St Ives NSW, and falls within the Ku-ring-gai Municipal Council local government area (LGA). The proposed development is to be situated on the land formerly known as the Camellia Grove gardening nursery, adjacent to existing residential areas, on the north-western side of Mona Vale Rd between Killeaton Street and Link Road.

Figure 2.1: Existing Site

Source: www.nearmap.com

The site covers an area of approximately 0.70 ha and is bounded by:

- Mona Vale Road to the south-east;
- Link Road to the south-west; and,
- Killeaton Street to the north.

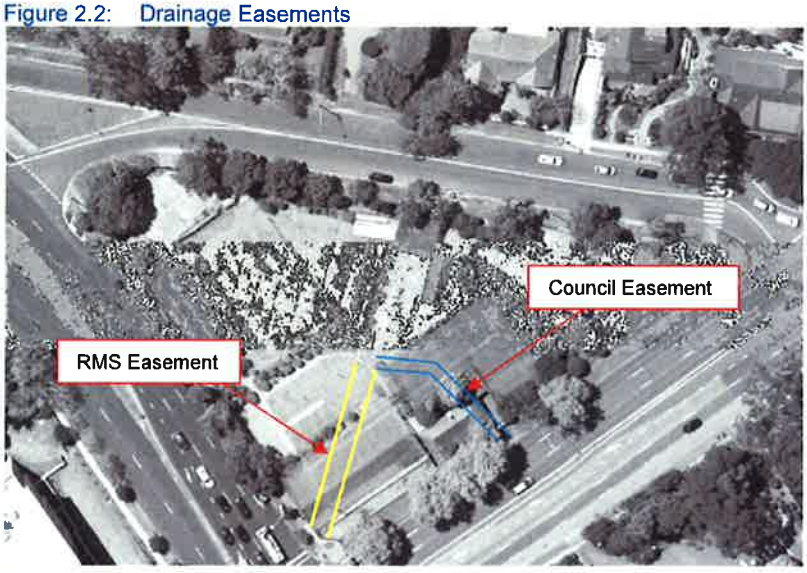
The site has a sloping topography from approximately RL 152.25m AHD at the intersection of Mona Vale Road and Link Road, to approximately RL 150.05m AHD at the northern boundary (at Killeaton Street). The Mona Vale Road frontage falls at a gradual grade down from the Killeaton Street intersection towards Link Road. Link Road is quite flat along the site frontage with an approximate level of RL152.15m AHD along the street kerb.

The Killeaton Street frontage falls to a sag point at the centre of the street from both Mona Vale Road and Link Road. The existing drainage

infrastructure located at this sag discharges to an existing creek to the north between the existing residential dwellings.

There are also two existing drainage easements (easements for drainage of water) located within the development area. The two easements are present over the existing drainage infrastructure within the subject site. The first easement is in favour of the Roads and Maritime Service (RMS) and the other is in favour of Ku-ring-gai Council. The existing easements converge from Mona Vale Road to the centre of the existing site. It is proposed that these easements be extinguished and relocated to provide a more favourable configuration for the proposed development. An analysis of the flooding characteristics of the site and recommendations for the proposed relocation of the easement is addressed in the Mott MacDonald Flood Assessment Report for this site.

Figure 2.2: Drainage Easements



Source: www.nearmap.com

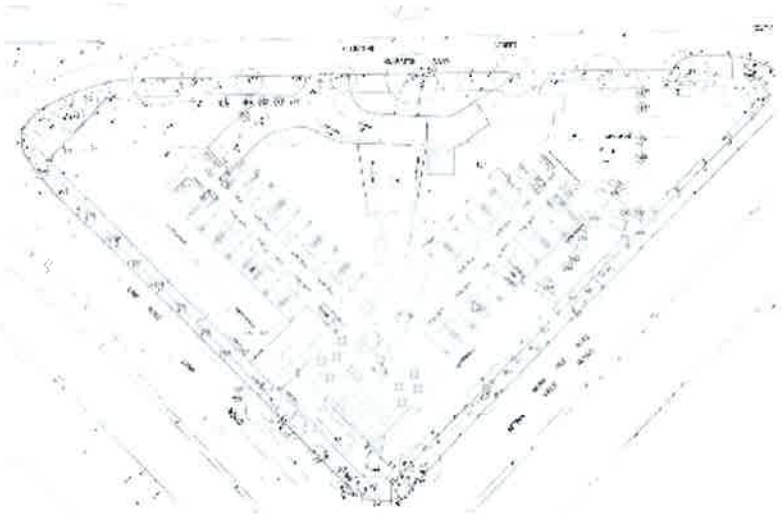
2.2 Proposed Works

The proposed development consists of a new aged care facility including;

- Entry from & exit to Killeaton St, connected to basement level car parking;
- Service vehicle loading area from Link Road;

- Three storey building (Ground Floor, Level 1 and Level 2);
- Access pathways, courtyards and landscaping around the building.

Figure 2.3: Architectural Layout



Source: DWP Suters Architects

Refer to the proposed Civil engineering plans attached in Appendix A, survey documentation by Usher & Company, and Architectural documentation by DWP Suters Architects.

3. Sediment and Erosion Control

Prior to any earthworks commencing on the site, erosion and sediment control measures are to be put into place generally in accordance with Ku-ring-gai Municipal Council requirements.

Control measures may include (but not be limited to):

- Installation of a 1.8m high chain wire fence covered with geo-textile filter fabric, to the perimeter of the work site area, where required;
- The use of sediment diverting methods to minimise sediment in Council's stormwater drainage using sandbagging kerb inlet pits and geo-fabric filter fabric around drop inlet pits;
- The provision of a sediment basin as required to the perimeter of the site through which stormwater runoff shall be channelled. The sediment basin will be located as required to suit the staging of the works; and
- The provision of a temporary truck wash down facility to service vehicles exiting the site during the construction stage.

Please refer to Sediment and Erosion Control Plan located in the drawing set attached in Appendix A.

4. Stormwater Management

4.1 Water Quantity

4.1.1 Stormwater Policy and Guidelines

The stormwater drainage for the proposed development has been designed to generally comply with the following guidelines with regards to *quantity* of water leaving the site:

- Australian Rainfall and Runoff (1987);
- Ku-ring-gai Council's *Water Management Development Control Plan – DCP 47 (Adopted April 2005)*; and,
- NSW Floodplain Development Manual 2005; and
- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, March 2004.

4.1.2 Stormwater Drainage

4.1.2.1 On-Site Stormwater Detention (OSD)

On-Site Stormwater Detention (OSD) will be required to control peak flow rates from the site by temporarily storing runoff from the site and releasing the stored runoff at a controlled rate in accordance with Chapter 6 of Ku-ring-gai Council's *DCP 47*.

Council requires the provision of OSD storage for the site, to limit the discharge of runoff from the site to the Permissible Site Discharge (PSD) as calculated in accordance with Ku-ring-gai Council's *DCP 47* (refer Appendix D for calculation sheet). A minimum Site Storage Requirement (SSR) volume has also been determined in a similar manner.

The system has been designed such that any overflow from any rainwater tank or flows not collected by the piped drainage system are directed towards the On-site Detention system and disposed of in accordance with Councils guidelines for stormwater discharge leaving the site (Chapter 5 of the Water Management DCP47).

OSD requirements for the proposed development are to be accommodated by the provision of below-ground storage facilities. Refer to Section 4.1.4 for details.

4.1.2.2 Property Drainage System

The property drainage system is the system of underground pipes, inlet and junction pits within a property that capture and convey stormwater

to the approved stormwater disposal system in accordance with the Ku-ring-gai Council local government area requirements.

The drainage system is comprised of the proposed below-ground pit and pipe network and is designed to control site flooding and enable effective stormwater management for the site. Council's policy requires that the piped property drainage system be designed to accommodate the calculated 50 year ARI storm event to the stormwater management/disposal system.

An OSD calculation sheet has been prepared in accordance with Councils requirements and can be found attached in Appendix D. A **PSD of 45.3L/s** and a **SSR of 102.3m^3** of on-site detention was calculated to be the requirement for the proposed development. In order to verify the design of this storage requirement the following DRAINS model has been prepared.

For the purposes of this report, DRAINS software is used to calculate flows exiting the site under the proposed scenario. Stormwater pipe capacities have been designed to convey the 50 year ARI storm event with safe overland flows for the 100year ARI storm event.

4.1.3 Hydrological Modelling

A hydrological model of the site's sub- catchments was formulated using the DRAINS software package and was analysed to determine appropriate pit and pipe sizes and to assess the safety of overland flow paths.

4.1.3.1 Model Parameters

In order to assess the performance of the proposed site pit and pipe network, a DRAINS base model was established with the following input parameters as described below:

Hydrological Model

- Paved (impervious) area depression storage = 1 mm
- Supplementary area depression storage = 0 mm
- Grassed (pervious) area depression storage = 5 mm
- Soil type = 3

DRAINS user guide describes soil type 3 as follows:

Type 3 (or C) slow infiltration rates (may have layers that impede downward movement of water).

Rainfall Data

- Antecedent Moisture Condition = 3

Table 4.1: DRAINS AMC Numbers

AMC Number	Description	Total Rainfall in 5 days preceding the storm (mm)
1	Completely Dry	0
2	Rather Dry	0 to 12.5
3	Rather Wet	12.5 to 25
4	Saturated	Over 25

AMC = 3 will generate higher runoff rates due to lower infiltration to soil compared to lower AMC numbers, therefore aiding in a conservative approach to inlet structure, pipe and stormwater detention design.

- Design storms using IFD data obtained from Appendix 10 of Ku-ring-gai Council's *Water Management Development Control Plan – DCP 47* were entered into DRAINS for the following durations for the 50 year and 100 year ARI storm events:

Storm durations: *5, 10, 15, 20, 25, 30, 45, 60, 90, 120, 180 minute.*

4.1.4 Proposed System

The DRAINS model (refer Appendix B) for the proposed site was developed based upon the following methodology:

- The proposed site pit and pipe network has been designed to drain to Council's street drainage network at Killeaton Street. The pit and pipe network was developed for the proposed site works (refer Civil plans attached in Appendix A);
- 100% fraction impervious was adopted for roof and proposed hardstand;
- A fraction impervious of 5% was adopted for all landscaped areas for OSD calculations;
- The pit and pipe network is proposed to discharge to the sites on-site stormwater management system (two below ground OSD tanks, each with the approximate capacity of 53.5m^3) under the northern driveway at the entrance of the site. These tanks then discharge to the existing 900mm diameter pipe located in the sag in Killeaton Street which runs across the street to the North. This pipe discharges at the northern side of Killeaton Street into an open drainage channel that runs between the upstream properties.
- A tailwater condition has been applied to the model at the point of connection to Council's drainage system in Killeaton Street. A

tailwater condition utilising the 100 year ARI storm event flood level calculated in the associated Flood Assessment Report (Mott MacDonald Flood Assessment Report) of RL 150.35m AHD has been conservatively adopted.

- The hydrograph for the 50 year ARI storm event from the trunk drainage system has been input into the model at the connection point to the existing stormwater system (Pit A2).
- Stormwater runoff from all paved/hardstand areas is collected by grated drains, pits;
- Roof water from the proposed building has been directed to drain to two (2) 10kL rainwater tanks. The stored water in the two tanks has been designed for re-use via toilet flushing in staff toilets and irrigation purposes. During large storm events when the rainwater tanks reach full capacity, they will overflow and discharge to either the proposed bio-retention garden (for water quality treatment) or into the site's pit and pipe drainage network;
- For the purposes of modelling, the rainwater tanks are considered full during simulation;
- Discharge from the sites stormwater management system (OSD tanks) is controlled by an orifice plate within each tank. The purpose of this is to trap and attenuate flows on site during large storm events so not to increase runoff beyond the permissible site discharge and cause flooding downstream of the property.
- Overland flows from the site that exceed the pit and pipe network capacity (storm events greater than the 50 year ARI storm) are directed by the natural fall of the site towards the northern discharge point at the sag in Killeaton Street. These site flows will join the natural flowpath of the wider catchment area here and discharge to the existing creek across the road as the flows do currently in the existing scenario.

4.1.5 Results

Iterations were performed in the DRAINS model to determine the size of the piped network for the proposed site to satisfy the requirements in accordance with Ku-ring-gai Council standards.

The proposed pit and pipe property drainage system has been designed to capture and convey the 50 year ARI event stormwater runoff to the sites stormwater management/disposal system, which discharges to the existing pit within the Council's street drainage system at the sag in Killeaton Street.

Results indicate that the property drainage requirements are satisfied for all pits and pipes within the development area upstream of the on-

site stormwater management system (OSD tanks) and that the piped system sufficiently conveys storm flows with safe overland provision for flows greater than the 50 year ARI event.

The flows conveyed from the two On-site Detention tanks are released at a combined flow rate of 41L/s (16L/s and 25L/s respectively, with a required PSD = 45.3L/s) and have a combined storage volume of 107.1m^3 (SSR = 102.3m^3).

The provision for overland flows generated by events greater than the 50 year ARI (up to the 1 in 100 year ARI) event has been considered. A blockage factor of 100% was adopted to assess overland flow paths. All depth velocity products are less than 0.4m^2/s and velocities less than 2m/s.

4.2 Water Quality

Note: This is applicable for Development Application (DA) purposes only, based on the available information, and more detailed design and modelling are required for Construction Certificate (CC).

The stormwater drainage for the proposed development has been designed to generally comply with the following guidelines with regards to *quality* of water leaving the site:

- Ku-ring-gai Council's *Water Management Development Control Plan – DCP 47 (Adopted April 2005)*, Chapter 8 *Water Quality*;
- *MUSIC Modelling Guidelines for New South Wales* prepared for the Sydney Metropolitan Catchment Management Authority (BMT WBM 2008).

4.2.1 Water Quality Objective

In accordance with Ku-ring-gai Council's *DCP 47*, we note that the following targets (annual pollutant load reductions) have been set in relation to stormwater quality:

- **80%** reduction in Total Suspended Solids (**TSS**)
- **45%** reduction in Total Phosphorus (**TP**)
- **45%** reduction in Total Nitrogen (**TN**)
- **70%** reduction in Gross Pollutants (**GP**)

To demonstrate compliance with these objectives, treatment removal loads were analysed for the post development scenarios using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) Version 5 software. Model development and results are discussed in the following sections.

4.2.2 Proposed Treatments

Proposed treatment devices such as gross pollutant traps, rainwater tanks and bio-retention swales / basins are listed and discussed below:

4.2.2.1 Gross Pollutant Trap "GPT"

"Gross Pollutant Trap" is a term applied to either in-situ, or proprietary units that remove litter, vegetative matter and sediment. Although the numerous units fall under the one umbrella of gross pollutant traps, the actual mechanics of the different units vary, as do the achievable pollutant removal rates. GPTs come in a range of sizes, with the larger units able to effectively treat large catchment areas and high flow rates.

They are usually sized based on their maximum treatable flow being equal to, or greater than the 3-month Annual Recurrence Interval (ARI) storm event (typically 50% of the 1-year ARI storm event) of the upstream catchment.

In developing the MUSIC model for the site, a *'Humeceptor'* GPT is proposed upstream of the OSD system. This is to provide pre-treatment of litter and large sediments prior to entering the OSD tank in accordance with Council's requirements.

The expected removal rates that were utilised within the water quality modelling process to represent the GPT units were modelled based on manufacturer's specifications and default parameters described in MUSIC's Modelling Guidelines. The following parameters were input into the MUSIC model:

Table 4.2 – Humeceptor MUSIC Input Parameters

Pollutant	Input (mg/L)	Output (mg/L)	Removal Rate
Total Suspended Solids	500.3	100.3	80%
Total Phosphorus	4.998	3.519	30%
Total Nitrogen	5.0	3.5	30%
Pollutant	**Input (kg/ML)**	**Output (kg/ML)**	**Removal Rate**
Total Gross Pollutants (litter)	15.1	14.9	0%

4.2.2.2 Rainwater Tanks

Rainwater tanks are sealed tanks designed to retain rainwater collected from roofs for subsequent re-use on site. All roof water from the proposed building has been modelled to discharge directly to a two rainwater harvesting tanks. Water demand rates for the development have been defined based on assumed re-use rates in order to attain the most efficient water usage on site. As part of BUPA's standard requirements for health and safety of residents within the RACF, rainwater reuse for the site is to be limited to staff toilets only. A preliminary analysis based on estimated water demand (Daily Demand of 350L/day) indicates that a rainwater tank capacity totalling 20kL (2 x 10kL tanks) will be satisfactory.

Table 4.3: Rainwater Tank MUSIC Parameters

Parameter	Value
Reuse rate –Toilet flushing (staff toilets only)	127.75 kL/year
Tank size	2 x 10kL

The excess water from the harvesting tank will discharge into the stormwater network and through the additional water quality treatments prior to exiting the site. Due to the uncertain nature of the rainwater supply, the tanks will be connected to mains water for "top-ups" in dry weather conditions.

4.2.2.3 Bio-Retention Basin

Bio-retention systems typically contain an extended detention zone above a gravel bed in the order of 100-200mm in depth and can contain water tolerant plant species to facilitate additional nutrient removal. Sediments and attached pollutants (including nutrients, metals and other soluble pollutants) are removed by filtration through the vegetative surface layer and filter media below.

The following parameters were input into the MUSIC model to represent the proposed bio-retention systems:

Table 4.4: Bio-Retention Swale MUSIC Parameters

Parameter	Value
Filter Area	58 m^2
Filter Depth	0.60 m
Extended detention depth	0.20 m

4.2.3 Water Quality Modelling – MUSIC Model, Parameters, and Methodology

A water quality modelling tool 'MUSIC' was utilised to simulate urban stormwater systems operating at a range of temporal and spatial scales. MUSIC models the total amounts of gross pollutants and nutrients produced within various types of catchments. It allows the user to simulate the removal rates expected when implementing removal filters to reduce the increased gross pollutant and nutrient levels created by the proposed development.

The following methodology and parameters were incorporated in the MUSIC modelling:

- The MUSIC model was created to assess the effectiveness of water quality nodes which are proposed for the development.
- The soil properties for the pervious areas of the catchment were defined based on the recommended parameters listed in MUSIC modeling guidelines and are summarised below:

Table 4.5: MUSIC Modelling – Soil Parameters

Soil Parameter	Default Value for Urban Catchment
Impervious Rainfall Threshold (mm/day)	1.0
Soil Storage Capacity (mm)	170
Soil Initial Storage (% of Capacity)	30
Field Capacity (mm)	80
Infiltration Capacity coefficient - a	200
Infiltration Capacity exponent - b	1
Initial Depth (mm)	1
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5
Daily Seepage Rate (%)	0

- Pluviograph data from MUSIC 5 database for Sydney, in 6 minute intervals was utilized in the model, in accordance with standard modelling practice for sites in the Sydney region.
- A MUSIC model was setup to represent the post developed site. The development area was consolidated based on the proposed drainage system and lot layout (refer to Appendix C for catchment plan). From architectural plans the site was then categorised into the following areas;
  - Roof;
  - Hardstand; and
  - Landscaped areas.

  Refer to Appendix C for the MUSIC model layout.

Table 4.6: Post-Development Catchment Areas

Post-Developed Region	Area (Ha)
Roof	0.197
Hardstand	0.062
Landscape	0.257
Total Area Treated	**0.516**
Bypass	0.038
Total Area	**0.554**

- Pollutant concentration parameters used within the model were based on the defaults values for the MUSIC program.
- A treatment train was designed to incorporate a series of treatment nodes including gross pollutant traps, rainwater tank/s and bio-retention swales. The effectiveness of the proposed treatments is summarised in Section 4.2.4.

- Stormwater that discharges directly from the roofed areas is generally 'clean' water and has been modeled to discharge directly to a rainwater tank for re-use predominantly associated with staff toilet flushing.

4.2.4 MUSIC Modelling Results

The following results were achieved within the model:

Table 4.7: Comparison of MUSIC Results

Pollutant	Post-Development with no WSUD Measures (kg/year)	Post-Development with WSUD Measures (kg/year)	Removal Rate (%)	Target Removal Rate* (%)
Total Suspended Solids	774	107	86.2	80
Total Phosphorus	1.77	0.833	53.0	45
Total Nitrogen	13.4	6.77	49.5	45
Gross Pollutants (litter)	86.4	2.61	97.0	70

The results of the MUSIC modelling indicate that the proposed treatment train consisting of Humeceptor, rainwater tank and bio-retention swales system will satisfy Ku-ring-gai Council's requirements for target pollutant removal rates.

4.2.5 Maintenance

Approximate maintenance costs for the different water quality treatment devices have been developed based on manufacturers' specifications and discussions with maintenance contractors. These are summarised below:

Table 4.8 – Approximate maintenance costs

Treatment Device	Maintenance	Frequency	Cost	Cost Per Annum
Bio-retention Swale	General maintenance of bioretention swale	Annual	$1,000	$1,000

Treatment Device	Maintenance	Frequency	Cost	Cost Per Annum
Bio-retention Swale	Replace bioretention filter media (100mm depth)	5 years*	$3000	$600
GPT/ Humeceptor	Clean GPT/ Discharge control pit	6 months*	$1,000	$2,000
Total		**Annual**		**$4,100**

*The frequencies listed above are provided as a guide only and may vary depending on the requirements of the individual treatment device.

Technical specifications for proprietary devices and a site specific maintenance schedule have been provided in Appendix E to accompany this report.

Appendices

Appendix A. Proposed Civil Plans

Survey Legend

- Existing boundary, bearing and distance
- Existing road name
- Existing building
- Existing kerb and spot levels
- Existing block wall
- Existing fence
- Existing spot level
- Existing earth batter
- Existing tree, level, trunk diameter, height and spread
- Existing electricity (underground)
- Existing electricity (overhead)
- Existing gas
- Existing sewer
- Existing stormwater drainage
- Existing water
- Existing telecommunications (underground)
- Existing electricity pit, pole, pole with light and light pole
- Existing gas valve
- Existing sewer pit and maintenance hole
- Existing stormwater grate, maintenance hole and pit
- Existing water hydrant, stop valve and valve
- Existing telecommunications pit and pillar
- Existing maintenance hole (unspecified)
- Existing pole (unspecified)
- Existing pit (unspecified)
- Existing traffic signal

General Notes

GN1 All workmanship and materials shall comply with the National Construction Code of Australia and the relevant current Australian Standards.

GN2 Any discrepancies, omissions or errors shall be reported to the Superintendent for clarification before proceeding with the work.

GN3 Do NOT scale measurements from the drawings.

Pavement Legend

- Asphaltic concrete pavement*
- Concrete pavement* Constructed in accordance with urban services standards
- Deeplift pavement* Refer detail on dwg 0041
- Footpath pavement type 1* Refer landscape plans for details
- Landscaped Area Refer landscape plans for details

* all pavements are subject to geotechnical testing, investigation and design.

Civil Works Legend

- KO — Construct kerb only
- VC — Construct kerb vehicular crossing
- G10.00 — Grate level
- P10.00 — Proposed level
- A1 — Stormwater drainage structure / pit number
- SW — Construct Stormwater drainage line
- GD — Grated drain
- WS-F — Construct wheel stops
- B — Construct bollard
- RW — Construct reinforced concrete block retaining wall
- RWT — Construct Rainwater tank
- Direction of flow

Siteworks Notes

SN1 Datum : Australian Height Datum (AHD)
Origin of levels : SSM 145613 RL 152.486
Origin of co-ordinates : Local Grid Of Australia (LGA)
Survey prepared by : Usher & Company
Suit 23, 1-3 Havilah St, Chatswood NSW 2067
TELE: (02) 9411 8166 FAX: (02) 9411 8177

SN2 The contractor must verify all dimensions and existing levels on site prior to commencement of work, and report any discrepancies to the superintendent.

SN3 All existing services (including any not shown on the plans) must be accurately located in position and level prior to any excavation. Any discrepancies shall be reported to the superintendent, minimum service clearances shall be maintained from the relevant service authority.

SN4 The contractor shall arrange for all setting out by a registered surveyor.

SN5 The contractor shall obtain all regulatory authority approvals at their own expense.

SN6 Where new works abut existing, the contractor must ensure that a smooth and even profile, free from abrupt changes is obtained.

SN7 All disturbed areas shall be restored to their original condition, unless specified otherwise.

SN8 Excavated trenches shall be compacted to the same density as the adjacent natural material. Any subsidences during the period to be rectified as directed by the superintendent.

SN9 Any existing trees which form part of the final landscaping plan will be protected from construction activities in accordance with the landscape architect's details and / or by -

Protecting them with barrier fencing or similar materials installed outside the drip line, ensuring that nothing is nailed to them, prohibiting paving, grading, sediment wash or placing of stockpiles within the drip line except under the following conditions -
Encroachment only occurs on one side and no closer to the trunk than either 1.5m or half the distance between the outer edge of the drip line and the trunk, which ever is the greater.
a drainage system that allows air and water to circulate through the root zone (eg a gravel bed) is placed under all fill layers of more than 300mm care is taken not to cut roots unnecessarily nor to compact the soil around them.

SN10 Receptors for concrete and mortar slurries, paints, acid washings, light-weight waste materials and litter are to be emptied as necessary. Disposal of waste shall be in a manner approved by the superintendent or as specified in the works contract.

Existing Services Notes

ES1 Existing services have been plotted from supplied data and as such their accuracy cannot be guaranteed. It is the responsibility of the contractor to establish the location and level of all existing services prior to the commencement of any work. Any discrepancies shall be reported to the superintendent.

ES2 The contractor shall allow for the capping off, excavation and removal if required of all redundant existing services in areas affected by works within the contract area, as shown on the drawings unless directed otherwise by the superintendent.

ES3 The contractor shall ensure that at all times services to all buildings not affected by the works are not disrupted.

ES4 If required, the contractor shall construct temporary services to maintain existing supply to buildings remaining in operation during works to the satisfaction and approval of the superintendent. Once diversion is complete and commissioned the contractor shall remove all such temporary services and make good to the satisfaction of the superintendent and the relevant service authority.

ES5 Interruption to supply of existing services shall be done so as not to cause any inconvenience to the principal. The contractor is to gain approval from the superintendent for time of interruption - the contractor is responsible for all liaison.

ES6 All branch gas and water services under driveways and brick paving shall be located in Ø80mm uPVC sewer grade conduits extending a minimum of 500mm beyond the edge of paving.

ES7 Clearance and cover requirements shall be obtained from the relevant service authority before commencement of works and shall be adhered to at all times.

ES8 Care is to be taken when excavating near existing services. No mechanical excavations are to be undertaken over telecom or electrical services. Hand excavate in these areas only.

Earthworks Notes

EW1 All work shall comply with AS3798 (2007) - Guidelines on earthworks for commercial and residential developments.

EW2 All work shall comply with the project geotechnical report -
By: JKGeotechnics
Ref: 26305Zrpt
Dated: 06.02.2013

EW3 Strip topsoil to expose naturally occurring engineering material and stockpile on site for reuse as directed by the superintendent.

EW4 All soft, wet or unsuitable material to be removed as directed by the superintendent and replaced with approved fill material.

EW5 All fill material shall be from a source approved by the superintendent and shall comply with the following -
a) free from organic and perishable matter,
b) maximum particle size 75mm,
c) plasticity index - between 2% and 15%.

EW6 All fill material shall be placed in maximum 200mm thick layers and compacted at optimum moisture content (+ or - 2%) to achieve a dry density determined in accordance with AS1289.5.1.1 - 2003 - methods of testing soils for engineering purposes of not less than the following standard minimum dry density -

location	standard dry density
under building slabs	98%
vehicular paved areas	100%
non-vehicular paved areas	98%
landscaped areas	95%

EW7 The contractor shall program the earthworks operation so that the working areas are adequately drained during the period of construction. The surface shall be graded and sealed off to remove depressions, roller marks and similar which would allow water to pond and penetrate the underlying material, any damage resulting from the contractor not observing these requirements shall be rectified by the contractor at their own expense.

EW8 Testing of the fill material shall be carried out by an approved NATA registered laboratory at the contractors expense.

EW9 Where the subgrade is unable to support construction equipment, or it is not possible to compact overlying pavement layers, only because of the subgrade moisture content then the contractor shall condition or replace the material at the contractors discretion and expense.

EW10 Earthworks calculations are volumetric only and do not allow for bulking of excavated material. It is the contractors responsibility to make allowances for these items as part of the tender / works.

EW11 No allowance has been made for footings or foundations, retaining walls or trenching. It is the contractors responsibility to make allowances for these items as part of the tender / works.

Stormwater Notes

SW1 For residential subdivisions and public roads -

All Ø375mm to Ø600mm drainage pipes shall be class 4 approved spigot and socket reinforced concrete pipes with rubber ring joints (UNO). All Ø675mm or larger drainage pipes shall be class 3 approved spigot and socket reinforced concrete pipes with rubber ring joints (UNO).

All uPVC drainage pipes in footways or accessways shall be DWV grade class SN8 in accordance with AS/NZS 1260:2009 - PVC-u pipes and fittings for drain, waste and vent application. heavy duty uPVC pipes to be in accordance with AS/NZS 1254 : 2010 - PVC pipes and fittings for storm and surface water applications may be used within allotments.

SW2 For commercial or industrial sites -

All Ø300mm to Ø600mm drainage pipes shall be class 4 approved spigot and socket reinforced concrete pipes with rubber ring joints (UNO). All Ø675mm or larger drainage pipes shall be class 3 approved spigot and socket reinforced concrete pipes with rubber ring joints (UNO).

All drainage pipes less than or equal to Ø225mm shall be uPVC DWV grade class SN8 in accordance with AS/NZS 1260 : 2009 - PVC-u pipes and fittings for drain, waste and vent application with solvent welded joints.

SW3 Equivalent strength fibrous reinforced concrete (F.R.C.) and / or High density polyethylene (H.D.P.E.) may be used subject to approval by the superintendent.

SW4 All pipe junctions up to and including Ø450mm and tapers, shall be via purpose made fittings (UNO).

SW5 Minimum grade to stormwater lines to be 1% (UNO).

SW6 Contractor to supply and install all fittings and specials including various pipe adaptors to ensure proper connection between dissimilar pipework.

SW7 All connections to existing drainage pits shall be made in a tradesmanlike manner and the internal wall of the pit at the point of entry shall be cement rendered to ensure a smooth finish with no protrusions.

SW8 All in-situ concrete pits to be 32Mpa minimum at 28 days.

SW9 Pits and pipes in areas of salinity hazard shall have increased cover to any reinforcement.

SW10 Precast concrete pits may be installed in lieu of cast in-situ pits, when pipe junctions are accommodated within the overall dimensions of the pit, and approved by the superintendent.

SW11 Pits deeper than 1000mm shall have sup irons installed in accordance with the local or statutory authority requirements.

SW12 Bedding shall be type H2 (UNO) for pipes not under pavements, and type HS2 for pipes under pavements in accordance with AS/NZS 3725 : 2007 - design for installation of buried concrete pipes.

SW13 Backfill trench with sand or approved granular backfill to 300mm (min) above the pipe. Where the pipe is under pavements, backfill remainder of trench to pavement subgrade with sand or approved gravel sub-base compacted in 150mm layers to 98% standard maximum dry density. The contractor is to ensure compaction equipment is appropriate for the pipe class used.

SW14 Where stormwater lines pass under floor slabs DWV grade uPVC rubber ring joints are to be used (UNO).

SW15 Where subsoil drainage lines pass under floor slabs and vehicular pavements, unslotted uPVC DWV grade class SN8 pipe shall be used.

SW16 Provide 3m length of Ø100mm subsoil drainage line or 200 'Nyles' strip drain surrounded with 150mm of 20mm blue metal or gravel, and wrapped in 'Bidum' A24 geotextile filter fabric or approved equivalent, at invert of incoming upstream pipe on each pit.

Asphaltic Concrete Notes

General

AC1 Asphaltic concrete mix design, manufacture, placing and compaction shall be in accordance with RMS Specification R116-Asphalt (dense graded and open graded) and AS2150-2005 - Hot Mix Asphalt - A Guide To Good Practice. Annexure R116/1 to be completed by subcontractor and submitted for approval by superintendent 7 days prior to AC works.

AC2 Mineral filler to comply with AS2150 - 2005 - Hot Mix Asphalt - A Guide to Good Practice.

Mix proportions

AC3 Job mix - 7mm nominal size aggregate, Minimum bitumen content (%) by (mass of total mass) - 5.1%.

AC4 Mix stability - between 16kn and 36kn as determined by RMS test method T601 - Compaction of test specimens of dense grade bituminous mixtures and T603 - Stability of dense grade bituminous mixtures.

AC5 Air voids in compacted mix - between 4% of volume and 7% of the mix. Voids filled in binder, 65-80% of air voids in the total mineral aggregate filled by binder in accordance with RMS test method T601 - Compaction of test specimens of dense grade bituminous mixtures, T605 - Maximum density of bituminous plant mix and T606 - Bulk density of compacted dense graded bituminous mixtures.

Pavement preparation

AC6 The existing surface to be sealed, shall be dry and broomed before commencement of work to ensure complete removal of all superficial foreign and loose matter.

AC7 All depressions or uneven areas are to be tack-coated and brought up to general level of pavement with asphaltic concrete before laying of main course.

Tack coat

AC8 The whole of the area to be sheeted with asphaltic concrete shall be lightly and evenly coated with rapid setting bitumen. Application rate for residual bitumen shall be 0.15 to 0.30 litres/square metre. Application shall be by means of a mechanical sprayer with spray bar.

Spreading

AC9 All asphaltic concrete shall be spread with a self propelled paving machine.

AC10 The asphaltic concrete shall be laid at a mix temperature as shown below -

road surface temp in shade (°c)	mix temperatures (°c)
5 - 10	not permitted
10 - 15	150
15 - 25	145
25+	140

AC11 Asphaltic concrete shall not be laid when the road surface is wet or when cold winds chill the mix to adversely affect temperature of mix during spreading and compaction operations.

AC12 The minimum compacted thickness is 50mm in two (2) layers.

Joints

AC13 The number of joints both longitudinal and transverse shall be kept to a minimum.

AC14 The density and surface finish at joints shall be similar to those of the remainder of the layer.

Compaction

AC15 All compaction shall be undertaken using self propelled rollers.

AC16 Initial rolling shall be completed before the mix temperature falls below 105°c.

AC17 Secondary rolling shall be completed before the mix temperature falls below 60°c.

AC18 Minimum characteristic value of relative compaction of a lot when tested in accordance with AS2150 - 2005 - Hot mix asphalt - a guide to good practice shall be 95%.

Finished pavement properties

AC19 Finished surfaces shall be smooth, dense and true to shape and shall not vary more than 10mm from the specified plan level at any point and shall not deviate from the bottom of a 3m straight edge laid in any direction by more than 5mm.

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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Client
BUPA Care Facilities

Title
BUPA St Ives
Notes and Legends
Sheet 1

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

Scale at A1
Status PRE
Rev P2

Drawing Number
MMD-315284-C-DR-00-XX-0005

Concrete Notes

General

CN1 Use "AS3972 - 2010 - General purpose and blended cements - Type GP" cement (UNO).

CN2 All concrete shall be subject to project control sample and testing to AS3600 - 2009 - concrete structures.

CN3 Consolidate all concrete, including footings and slabs on ground with mechanical vibrators

CN4 Cure all concrete as follows -
- keep surfaces continuously wet for 3 days, then
- prevent moisture loss for the next 4 days using polythene sheeting or wet hessian protected from wind and traffic, and then allow drying out.
- curing compounds may be used provided that they comply with AS3799 and they do not affect floor finishes.
- PVA-based curing compounds are NOT acceptable.

CN5 Fix reinforcement as shown on drawings. The type and grade is indicated by a symbol as shown below -

N	hot rolled deformed bar, grade 500
R	plain round bar, grade 250
SL / RL	hard drawn wire fabric square or rectangular

following this symbol a numeral indicates the specified diameter.

CN6 Provide bar supports or spacers to provide concrete cover as detailed to all reinforcement.

Concrete Pavements

CN7 Concrete mix parameters -
maximum aggregate size 20mm
flexural strength at 28 days = 3.5 MPa, $f'c$= 32 MPa, (UNO)
flexural strength at 90 days = 3.85 MPa
max water/cement ratio = 0.55
max shrinkage limit = 650 micron strains (AS1012.13-1992)
min cement content = 300kg/m³
cement to be type "SL" (normal cement) to AS3972-2010
slump = 80mm

CN8 Early age saw cutting ("softcut") or similar shall be used for initial saw cut. It is to be performed as soon as the concrete has hardened sufficiently, to prevent excessive chipping, spalling, or tearing regardless of time or weather conditions.

CN9 Joint layout shall be as detailed on the plans.

CN10 Provide 10mm wide expansion joints between all buildings, other structures and pavements.

CN11 Bond breaker to be two (2) uniform coats of bitumen emulsion all over the exposed surface and on end.

CN12 Dowels and tie bars to meet strength requirements of structural grade steel in accordance with AS ISO 1302 - 2005 - geometrical product specifications.
Dowels and tie bars shall be -
straight,
to length specified,
all dowels to be hot dip galvanised,
sawn to length not cropped.

CN13 Dimensions of sealant reservoir dependant on the sealant type adopted. Superintendent approval to be obtained for sealant and reservoir dimensions and detail proposed by the contractor. Refer to plans for typical arrangement and sealant.

CN14 Prior to the placement of concrete in the adjacent slab, 'Ablaflex' filler shall be adhered to the already cast and cleaned concrete face using an approved waterproof adhesive. Adhesive shall be liberally applied to the full face of the concrete slab to be covered by the filler, and on the full face of the filler to be adhered.

CN15 The base course shall be kept moist (not wet) by sprinkling with water immediately prior to pouring the concrete.

CN16 All work to be finished to satisfy its intended use as shown on the plans, and / or in accordance with the specification.

Kerbing Notes

CN17 All concrete kerbs to have a minimum characteristic compressive strength $f'c$=25MPa (UNO).

CN18 All kerbs, dish drains, etc. to be constructed on 75mm minimum base course (UNO on the Drawings)

CN19 Kerb expansion joints shall be formed from 10mm 'Ablaflex' (or approved equivalent) for the full depth of the section.

CN20 Expansion joints shall be located at drainage pits, tangent points of curves and elsewhere at 12m maximum spacing (UNO).

CN21 Tooled joints shall be min 3mm wide and located at maximum 3m spacing.

CN22 Integral kerb joints shall match the location of the pavement jointing.

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chk'd	App'd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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Client: BUPA Care Facilities

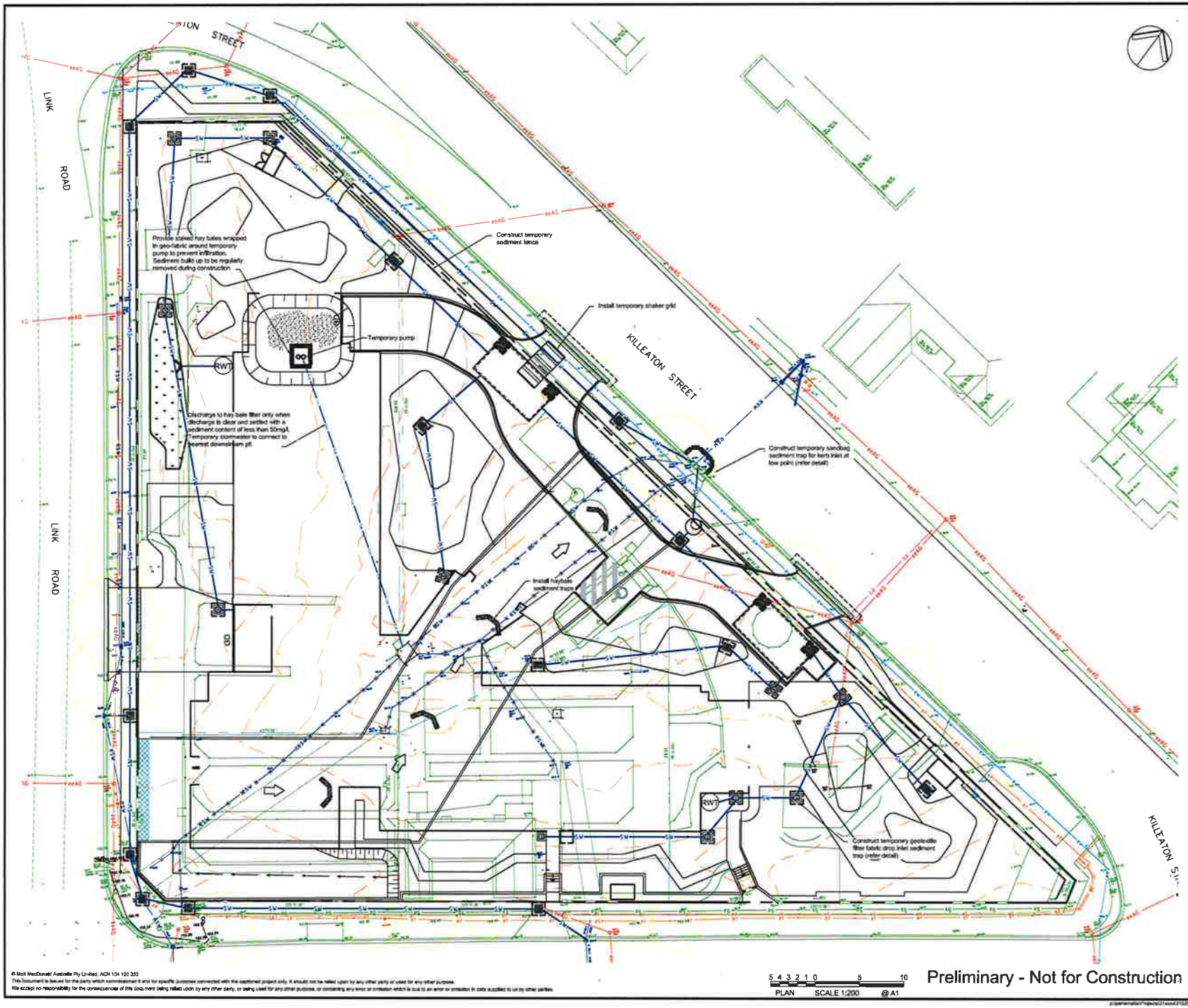
Title: BUPA St Ives
Notes and Legends
Sheet 2

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

Scale at A1: -
Status: PRE
Rev: P2

Drawing Number: MMD-315284-C-DR-00-XX-0006

Preliminary - Not for Construction



5 4 3 2 1 0 5 10
PLAN SCALE 1:200 @ A1

Preliminary - Not for Construction

Notes

Key to symbols

- Construct temporary sediment fence
- Construct temporary sandbag sediment trap for kerb inlet at low point (refer detail on dwg 0011)
- Install haybale sediment traps
- Construct temporary geotextile filter fabric drop inlet sediment trap (refer detail on dwg 011)
- Install temporary shaker grid
- Overland flow path

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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Client
BUPA Care Facilities

Title
BUPA St Ives
Sediment and Erosion Control Plan

Designed	AH	.	Eng check	CJA	.
Drawn	ADS	.	Coordination	AH	.
Dwg check	AH	.	Approved	CJA	.

Scale at A1: 1:200
Status: PRE
Rev: P2

Drawing Number
MMD-315284-C-DR-00-XX-0010

Soil and Water Management Notes

General Instructions

SWM01 These plans present a conceptual soil and water management plan (SWMP) only and shows a possible way of managing soil and erosion. The contractor shall be responsible for the establishment and management of the site and preparing a detailed plan and obtaining approval from the relevant authority prior to the commencement of any works.

SWM02 This plan is to be read in conjunction with the engineering plans and any other plans, written instructions, specification or documentation that may be issued and relating to development of the subject site.

SWM03 The contractor will ensure that all soil and water management works are consistent with 'Managing Urban Stormwater - Soils and Construction' - also known as 'The Blue Book'.

SWM04 All builders and sub-contractors shall be informed of their responsibilities in minimising the potential for soil erosion and pollution to downslope lands and waterways.

Erosion Control

SWM05 Water shall be prevented from entering the permanent drainage system until sediment concentration is less than or equal to 50mg/L, ie the catchment area has been permanently landscaped and / or any likely sediment has been filtered through an approved structure.

SWM06 Any sand used in the concrete curing process (spread over the surface) will be removed as soon as possible and within 10 working days from placement.

SWM07 Acceptable receptors will be constructed for concrete and mortar slurries, paints, acid washings, light-weight waste materials and litter.

SWM08 'Sediment' fencing will be installed as indicated on the plans and at the direction of site superintendent to ensure containment of sediment. The sediment fencing will outlet or overflow under stabilised conditions into the sediment basin, to safely convey water into a suitable filtering system should the pores in the fabric block.

SWM09 The sediment basins will be constructed with the minimum wet sediment capacity of CUM cubic metres and designed to remain stable in at least the 1 in CDSE year critical duration storm event. Artificial flocculation of the finer particles may not be necessary in this instance.

SWM10 Stockpiles should not be located within 5m of trees and hazard areas, including likely areas of concentrated or high velocity flows such as waterways, drainage lines, paved areas and driveways. Where they are within 5m from such areas, special sediment control measures should be taken to minimise possible pollution to downstream waters. Measures should also be applied to prevent the erosion of the stockpile.

SWM11 All cut and fill batters are to be seeded and mulched within 14 days of completion of formation.

SWM12 Any existing trees which form part of the final landscaping plan will be protected from construction activities by-

a. Protecting them with barrier fencing or similar materials installed outside the drip line.
b. Ensuring that nothing is nailed to them.
c. Prohibiting paving, grading, sediment wash or placing of stockpiles within the drip line except under the following conditions.

(i) Encroachment only occurs on one side and no closer to the trunk than either 1.5 metres or half the distance between the outer edge of the drip line and the trunk, which ever is the greater.

(ii) A drainage system that allows air and water to circulate through the root zone (e.g. a gravel bed) is placed under all fill layers of more than 300 millimetres depth

(iii) Care is taken.

SWM13 During windy weather, large disturbed unprotected areas should be kept moist (not wet) by sprinkling with water to keep dust under control.

SWM14 Temporary protection from erosive forces will be undertaken on lands where final shaping has not been completed but works are unlikely to proceed for periods of two months or more (eg. on topsoil stockpiles). This may be achieved with a vegetative cover. A recommended listing of plant species for temporary cover is -

I) autumn/winter sowing - oats/ryecorn at 20 kg/ha
- japanese millet at 10 kg/ha

II) spring/summer sowing - oats/ryecorn at 10 kg/ha
- japanese millet at 20 kg/ha

SWM15 Diversion banks / channels will be rehabilitated as soon as possible and within 5 working days from their final shaping. Other than in the winter months, suitable materials include turf grasses such as Couch or Kikuyu. During winter, or at other times when temporary rehabilitation (more than 3 months) is required, it is suggested that hessian cloth is used but only if backed with appropriate pegs and an anionic bitumen emulsion. Foot and vehicular traffic should be kept away from these areas.

SWM16 Undertake site development works in accordance with the engineering plans. Where possible, phase development so that land disturbance is confined to areas of workable size.

Construction Sequence

SWM17 Where practical, the soil erosion hazard on the site should be kept as low as possible. To this end, works should be undertaken in the FOLLOWING SEQUENCE -

(i) Install inlet sediment traps to all gully pits fronting the site.

(ii) Install a 1.8m chain wire fence around the boundaries and attach hessian cloth or similar to it on the windward side (ties at the top, centre and bottom and at 1m intervals or as instructed by the superintendent).

(iii) Install geofabric sediment fence and sediment traps around all permanent stormwater reticulation structures as shown on the plan.

(iv) Construct stabilised construction entrance as shown on the plan or to location as determined by superintendent.

(v) Install diversion banks along the boundary where required, rehabilitate disturbed lands downslope from the banks within 20 working days.

(vi) Ensure that the sediment basin is directed onto a turfed area and drains to a suitable location. A temporary stormwater line may be necessary to convey the flows to this location. Construct diversion channels at the boundary to drain into the sediment basin as shown on plans.

(vii) At completion stabilise site and decommission sediment basin and all erosion control devices.

SWM18 Temporary soil and water management structures will be removed only after the lands they are protecting are rehabilitated.

SWM19 Final site landscaping will be undertaken as soon as possible and within 20 working days from completion of construction activities.

Site Inspection and Maintenance

SWM20 At least weekly and after every rain fall event, the contractor will inspect the site and ensure that -

(i) Drains and all sediment control devices operate effectively and initiate repair or maintenance as required.

(ii) Receptors for concrete and mortar slurries, paints, acid washings, light-weight waste materials and litter are to be emptied as necessary. Disposal of waste shall be in a manor approved by the superintendent.

(iii) Spilled sand (or other materials) is removed from hazard areas, including likely areas of concentrated or high velocity flows such as waterways, gutters, paved areas and driveways.

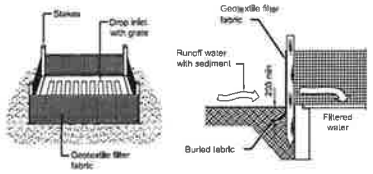
(iv) Sediment is removed from basins and / or traps when less than 20m³ of trapping capacity remain per 1000m² of disturbed lands, and / or less than 500mm depth remains in the settling zone. Any collected sediment will be disposed in areas where further pollution to down slope lands and waterways is unlikely.

(v) Rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate.

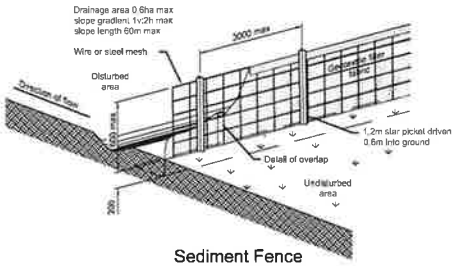
SWM21 The contractor shall provide all monitoring control and testing.

Erosion and Sediment Control Legend

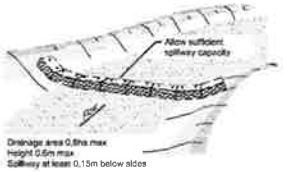
- Construct temporary sediment fence
- Construct temporary sandbag sediment trap for kerb inlet at low point (refer detail)
- Install haybale sediment traps
- Construct temporary geotextile filter fabric drop inlet sediment trap (refer detail)
- Install temporary shaker grid
- Overland flow path



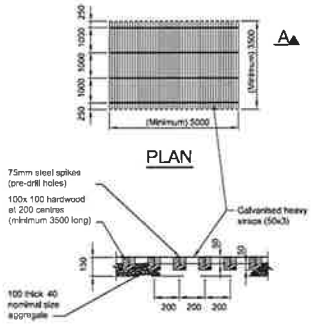
Sediment Trap for Drop Inlet (Geotextile Filter Fabric)
NTS



Sediment Fence (Geotextile Filter Fabric)
NTS



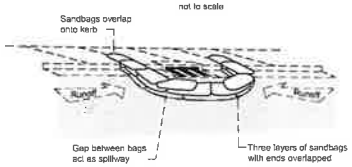
Check Dam - Straw Bale
NTS



Shaker grid notes

1. This device is to be located at all exits from the construction site.
2. The device is to be regularly cleaned of deposited material so as to maintain a 50 mm deep space between planks.
3. Any unsealed road between this device and councils nearest roadway to be topped with 100mm thick 40mm nominal size aggregate.
4. Alternatively, three (3) precast concrete cattle grids (as manufactured by 'humes concrete') may be used. Notes 1, 2, 3, above also apply.

Shaker grid
not to scale



Sediment Trap for Kerb Inlet (at Low Point - Sandbag)
NTS

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chk'd	Appr'd
P2	21.03.14	OW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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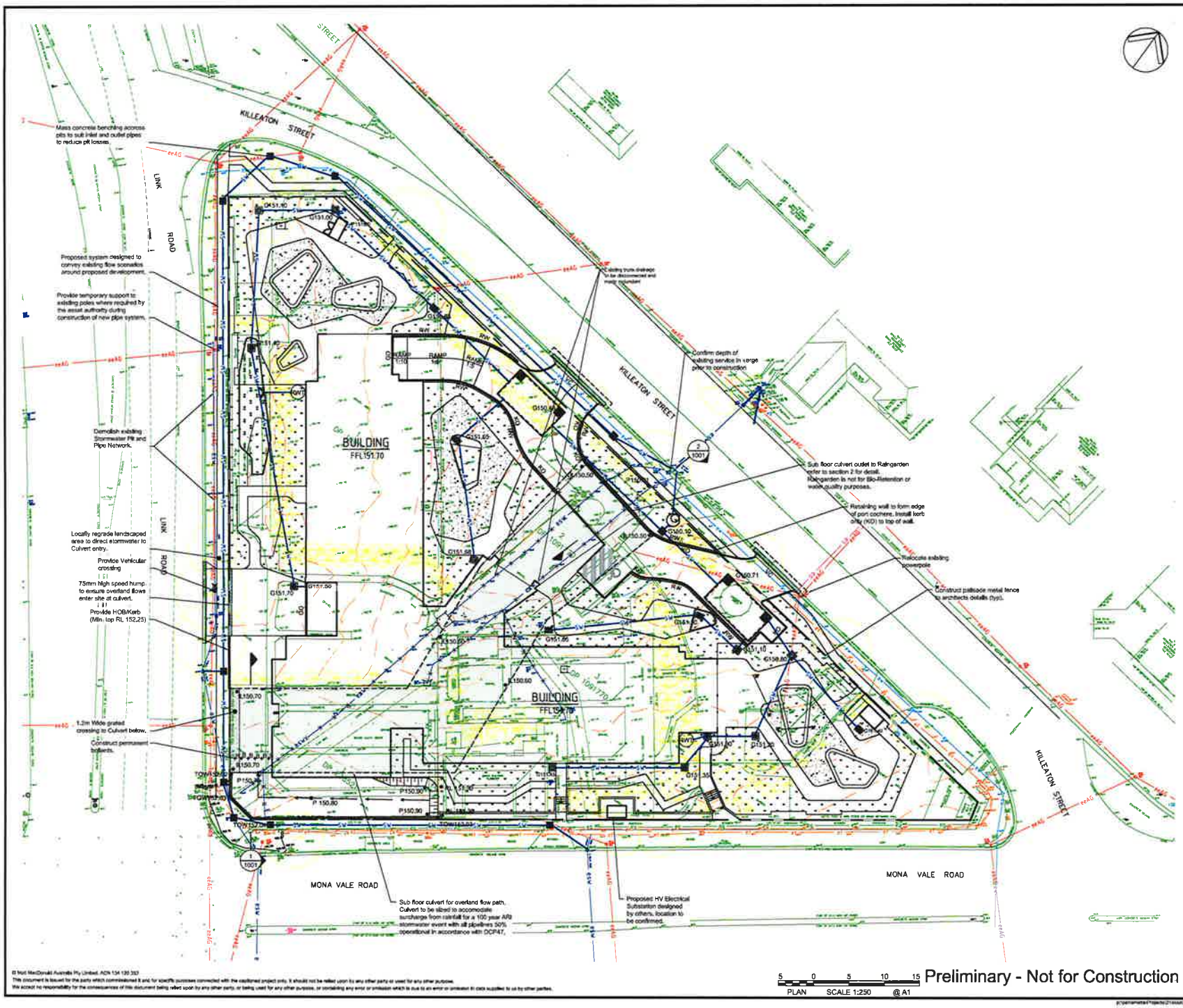
Client
BUPA Care Facilities

Title
BUPA St Ives
Sediment and Erosion
Notes and Details Sheet

Designed	AH	-	Eng check	CJA	-
Drawn	OW	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-
Scale at A1		Status PRE		Rev P2	

Drawing Number
MMD-315284-C-DR-00-XX-0011

Preliminary - Not for Construction



Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chkd	Appd
P3	21.03.14	DW	Issued for DA	SR	CJA
P2	26.03.13	AMP	Issued for DA	AH	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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Client
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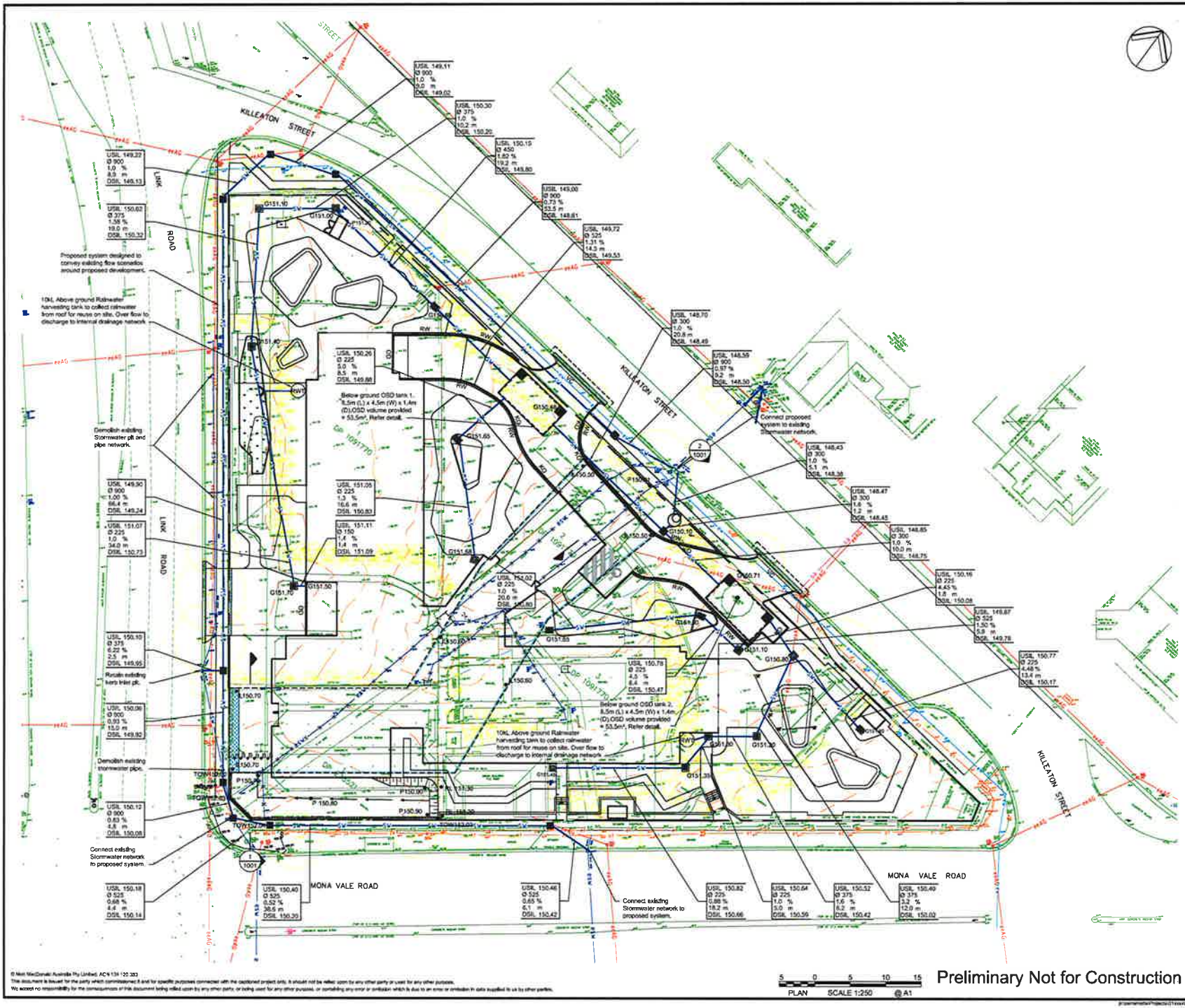
Title
BUPA St Ives
Siteworks Plan
Ground Floor

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

Scale at A1: 1:250
Status: PRE
Rev: P3

Drawing Number
MMD-315284-C-DR-00-XX-0030



Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chk'd	Appr'd
P1	21.03.14	DW	Issued for DA	SR	CJA

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Client
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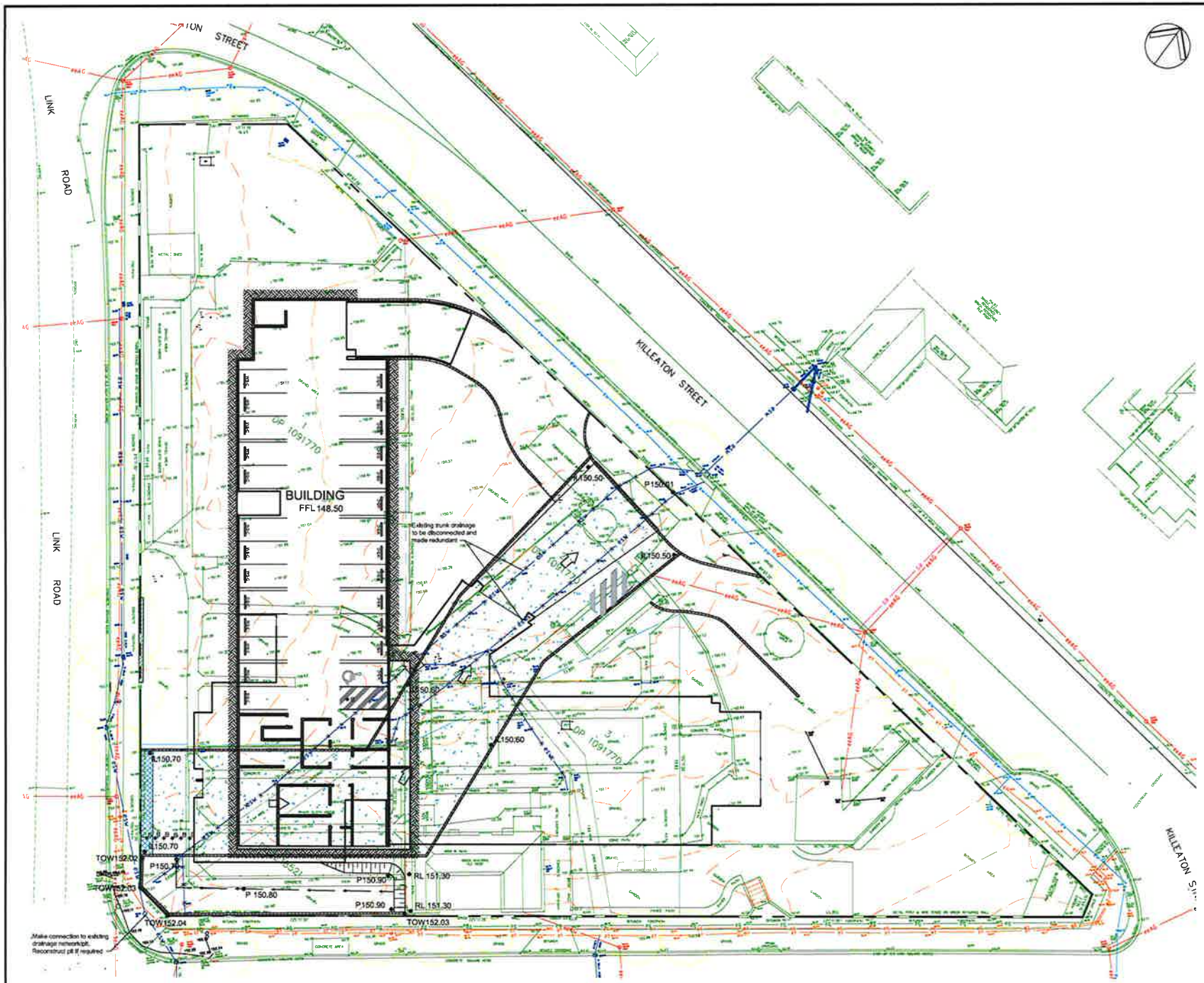
Title
BUPA St Ives
Stormwater Plan

Designed	SR	-	Eng check	CJA	-
Drawn	DW	-	Coordination	SR	-
Dwg check	SR	-	Approved	CJA	-

Scale at A1: 1:250
Status: PRE
Rev: P1

Drawing Number
MMD-315284-C-DR-00-XX-0031



5 4 3 2 1 0 5 10
PLAN SCALE 1:200 @ A1

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	21.03.14	DW	Issued for DA	SR	CJA
P2	26.03.13	AMP	Issued for DA	AH	CJA
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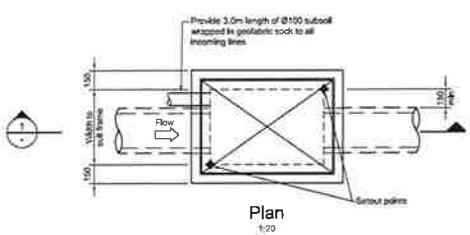
Client
BUPA Care Facilities

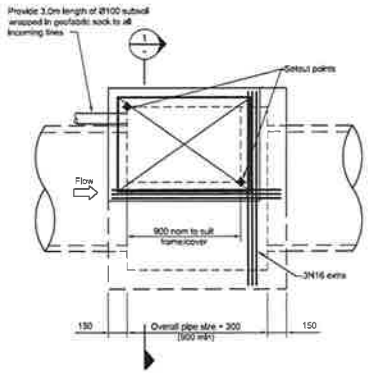
Title
BUPA St Ives
Siteworks Plan
Basement Level

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-
Scale at A1 1:200	Status PRE		Rev P3		

Drawing Number
MMD-315284-C-DR-00-XX-0035



Plan
1:20



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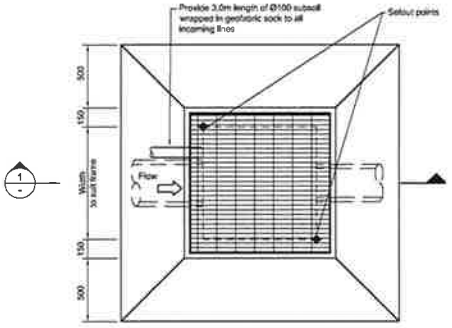
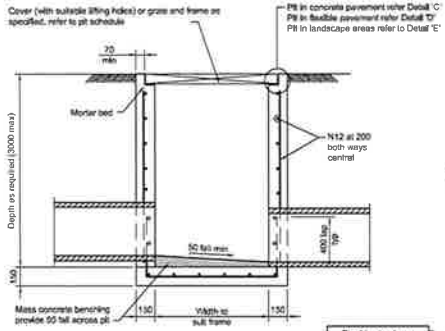
1:20

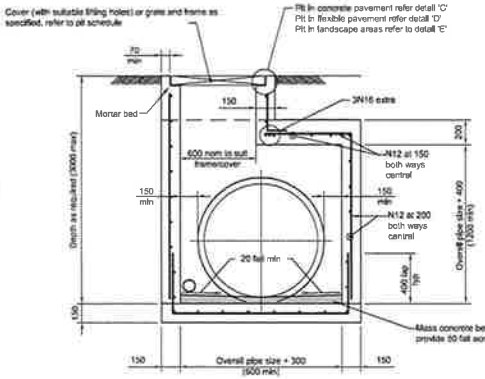


Plan
1:20



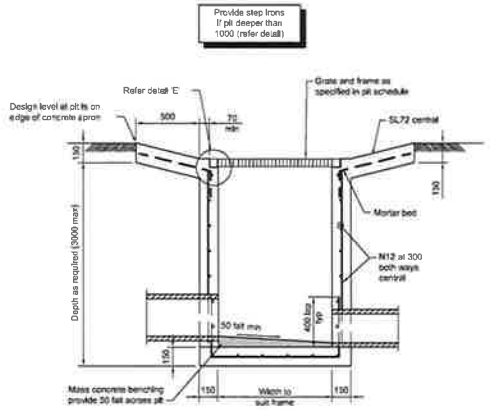
Section
1:20

Surface inlet / Junction pit
(pipe sizes ≤ Ø450)



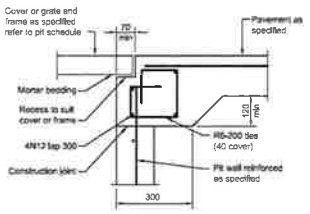
Section
1:20

Surface inlet / junction pit
(pipe sizes > Ø450)

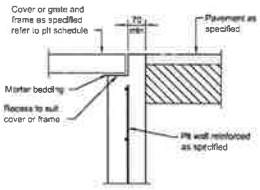


Section
1:20

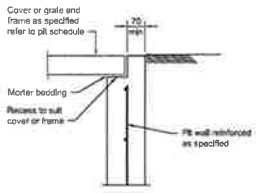
Surcharge pit with flush grate



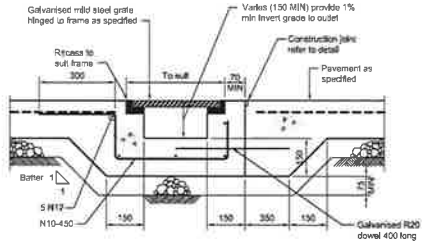
Detail 'C'
1:10



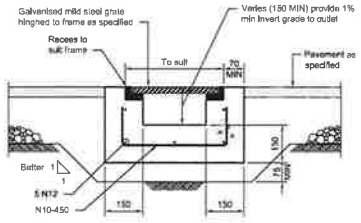
Detail 'D'
1:10



Detail 'E'
1:10



Grated Drain in Concrete Pavement
1:10



Grated Drain in Flexible Pavement
1:10

0.5 0.25 0 0.5 1.0
PLAN SCALE 1:20 @ A1

0.1 0 0.2 0.4 0.6
PLAN SCALE 1:10 @ A1

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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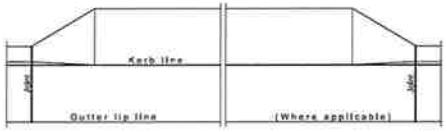
Client
BUPA Care Facilities

Title
BUPA St Ives
Siteworks Details
Sheet 1

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

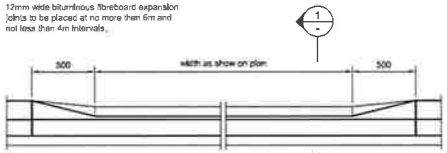
Scale at A1: As Shown
Status: PRE
Rev: P2

Drawing Number
MMD-315284-C-DR-00-XX-0040

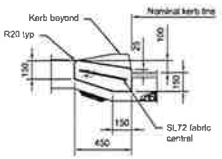


Plan

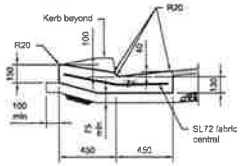
Note
12mm wide bituminous fibreboard expansion joints to be placed at no more than 6m and not less than 4m intervals.



Elevation 1:20

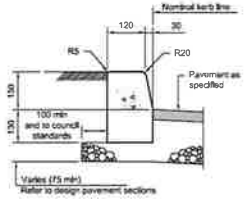


Section 1:20 (For kerb only)

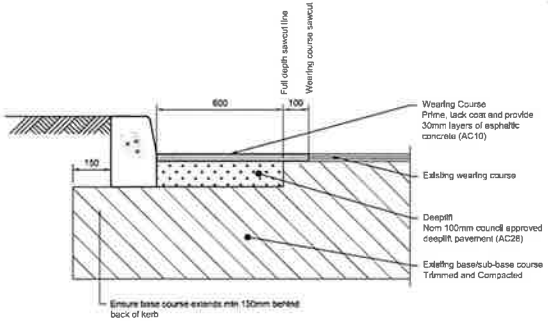


Section 1:20 (For kerb and gutter)

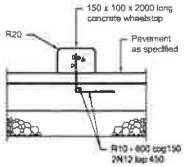
Vehicular Crossing (VC)
1:20



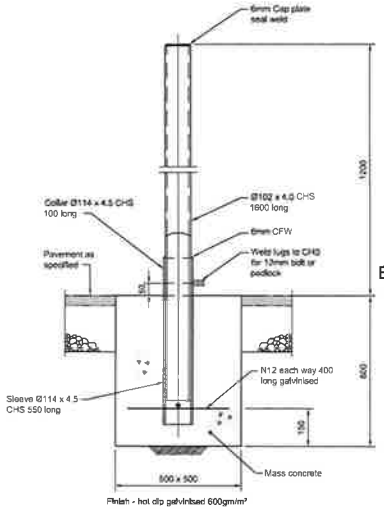
Kerb Only (KO)
1:10



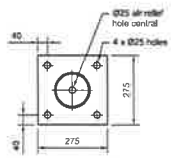
Pavement - Deeplift
1:10



Wheel Stop (WSC) in Concrete Pavement
1:10

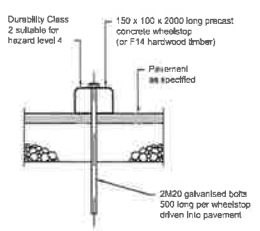


Removable Bollard - Flexible Pavement
1:10

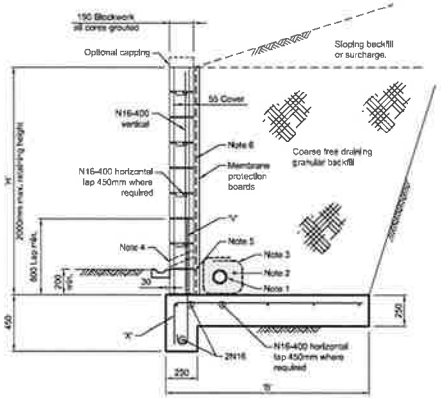


Bollard Base Plate
1:10

Bollard to Concrete Pavement
1:10



Wheel Stop (WSF) in Flexible Pavement
1:10

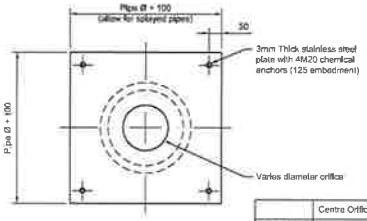


Retaining Wall Schedule

Wall Height 'H'	Base Width 'B'	Bar Type 'X' & 'Y'
800	800	N16-400
1000	900	N16-400
1200	1000	N16-400
1400	1100	N16-400
1600	1200	N16-400
1800	1400	N16-400
2000	1600	N16-200

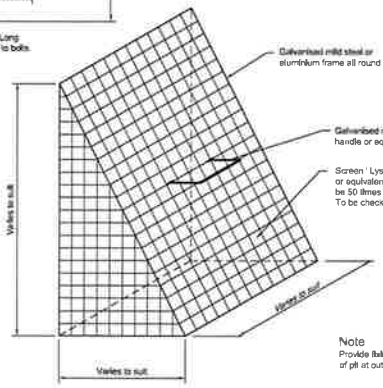
These dimensions are provided based on a 5kPa surcharge

Retaining Wall Notes:
1. Ø100mm rigid slotted uPVC sub-soil pipe with filter sock (on min. 0.5% fall) to nearest available stormwater pit.
2. 150mm surround of 20mm blue metal or gravel.
3. Geofabric surround to be 'Bidum' A24 filter fabric or approved equal.
4. Provide Ø50 weep holes located above concrete dish drain at 1600 maximum centers.
5. Provide 'E' shaped clean-out block at base of retaining wall, omit horizontal bar from top of this block.
6. If tanking membrane is required the design and certification is to be provided by waterproofing specialist.
7. Refer to blockwork notes.



Orifice Plate
1:10

	Centre Orifice Level (RL)	Ø Orifice (mm)
OSD tank 1	148.85	70
OSD tank 2	149.00	90



Note
Provide fixing clips or brackets to wall of pit at outlet. Allow for ease of removal.

Typical Removable Screen Detail
Not to Scale

0.5 0.25 0 0.5 1.0 PLAN SCALE 1:20 @A1

0.1 0 0.2 0.4 0.6 PLAN SCALE 1:10 @A1

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	21.03.14	DW	Issued for DA	SR	CJA
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Client
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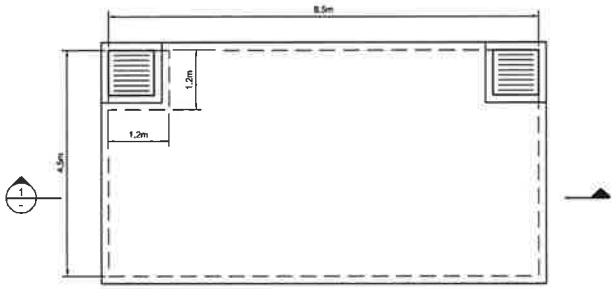
Title
BUPA St Ives
Siteworks Details
Sheet 2

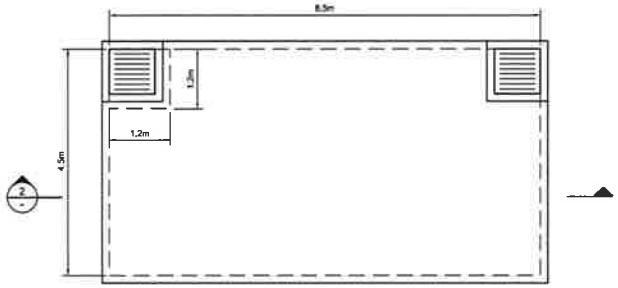
Designed	AH	-	Eng check	CJA	-
Drawn	AOS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

Scale at A1: As Shown
Status: PRE
Rev: P2

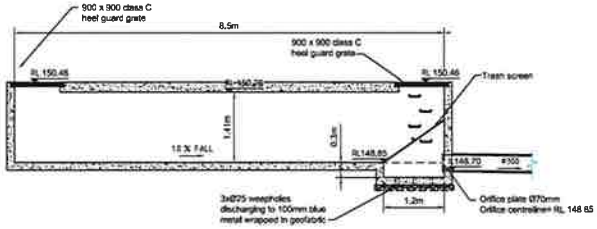
Drawing Number
MMD-315284-C-DR-00-XX-0041



Osd Tank 1
Plan

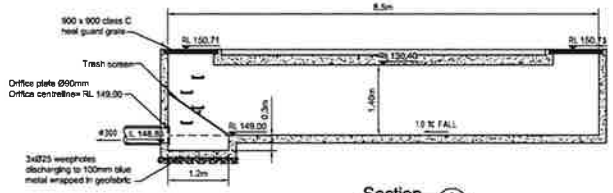


Osd Tank 2
Plan



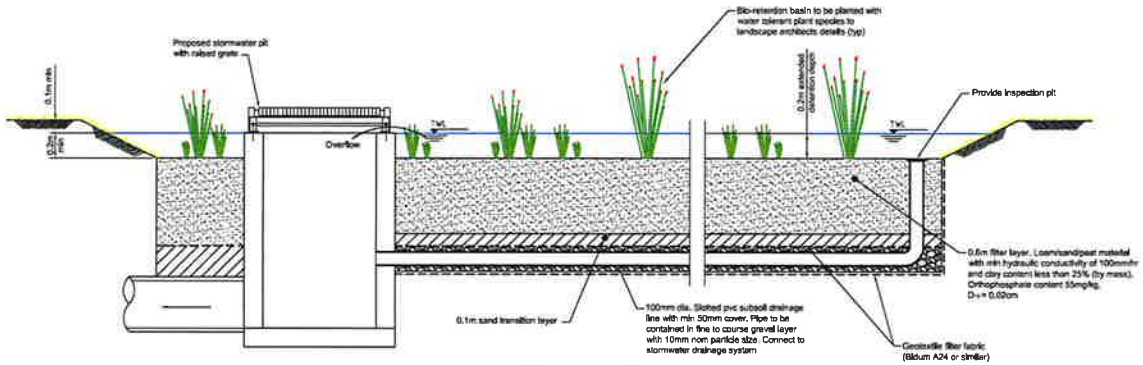
Section
1:50

Osd Tank 1



Section
1:50

Osd Tank 2



Typical Bioretention Basin

0.5 0.25 0 0.5 1.0
PLAN SCALE 1:20 @A1

0.1 0 0.2 0.4 0.6
PLAN SCALE 1:10 @A1

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chkd	Appd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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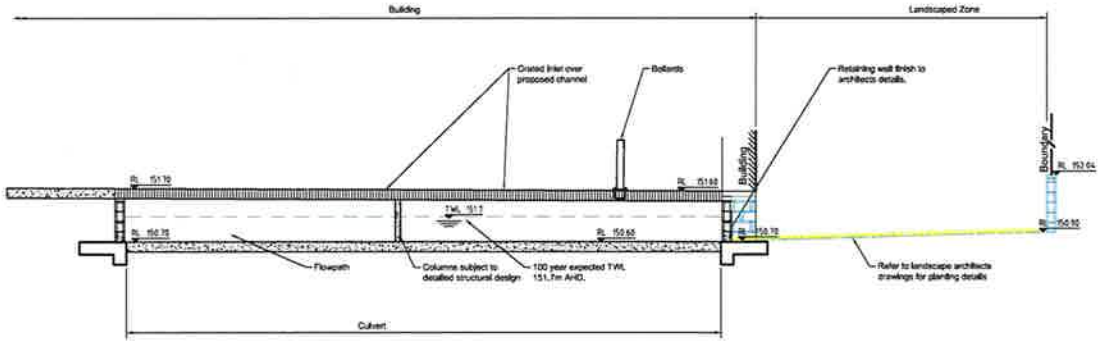
Client
BUPA Care Facilities

Title
BUPA St Ives
Siteworks Details
Sheet 3

Designed	AH	-	Eng check	CJA	-
Drawn	ADS	-	Coordination	AH	-
Dwg check	AH	-	Approved	CJA	-

Scale at A1: As Shown
Status: PRE
Rev: P2

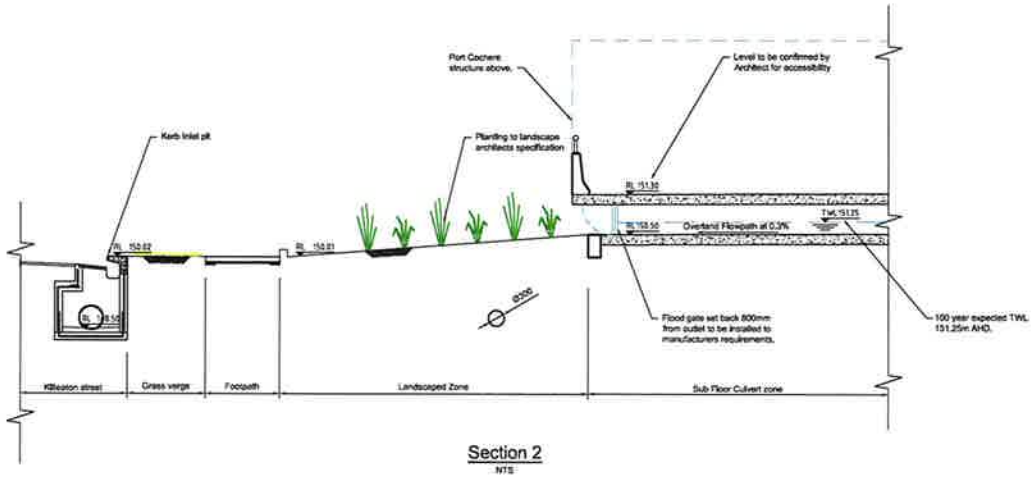
Drawing Number
MMD-315284-C-DR-00-XX-0042



Slab Suspended Over Culvert

Section 1

NTS



Section 2

NTS

0.5 0.25 0 0.5 1.0 PLAN SCALE 1:20 @A1

0.1 0 0.2 0.4 0.6 PLAN SCALE 1:10 @A1

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Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	21.03.14	DW	Issued for DA	SR	CJA
P2	26.03.13	AMP	Issued for DA	AH	CJA
P1	20.03.13	ADS	Issued for DA	AH	CJA

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Client
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Title
BUPA St Ives
Siteworks Details
Sheet 4

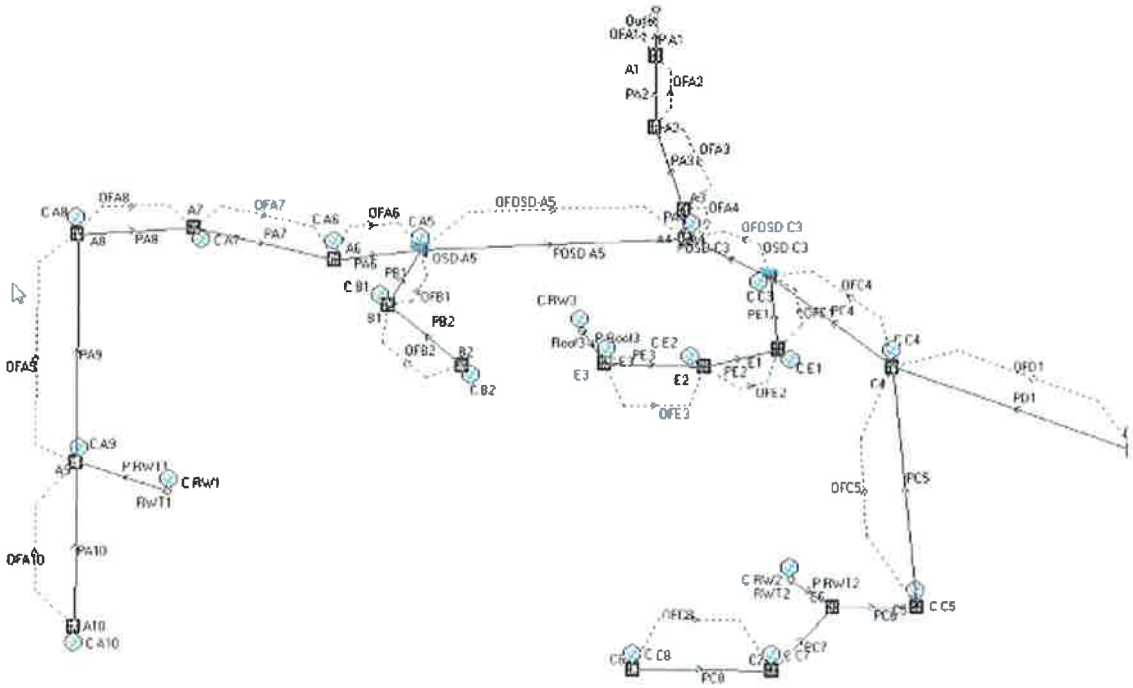
Designed	AH	.	Eng check	CJA	.
Drawn	ADS	.	Coordination	AH	.
Dwg check	AH	.	Approved	CJA	.

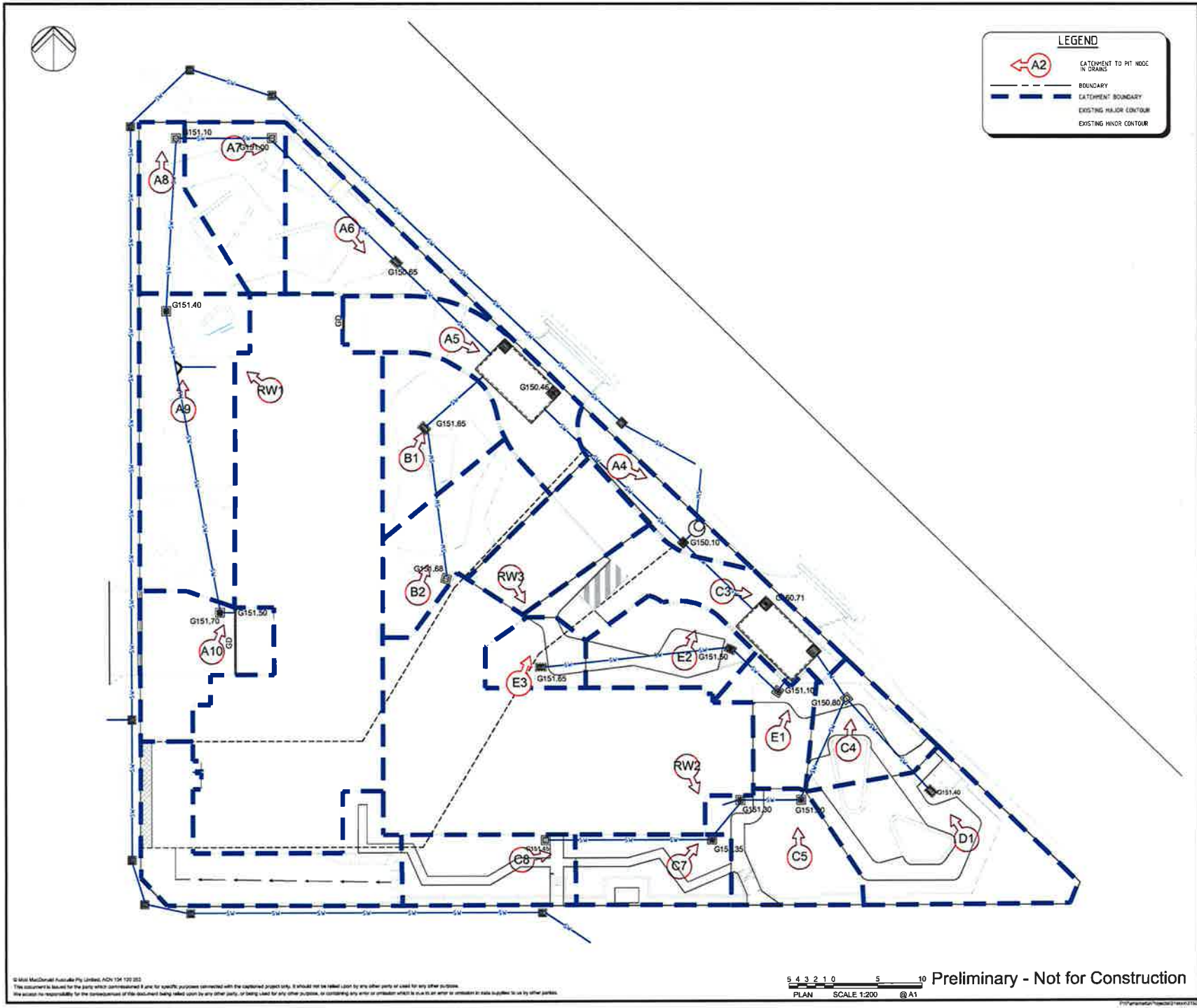
Scale at A1: As Shown
Status: PRE
Rev: P3

Drawing Number
MMD-315284-C-DR-00-XX-0043

Appendix B. DRAINS Model

Figure B.1: DRAINS Model Layout





Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chk'd	Appr'd
P2	21.03.14	OW	Issued for Information	SR	
P1	15.03.13	AMP	Issued for Information	AH	

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Client
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Title
BUPA St Ives
DRAINS Catchment Plan

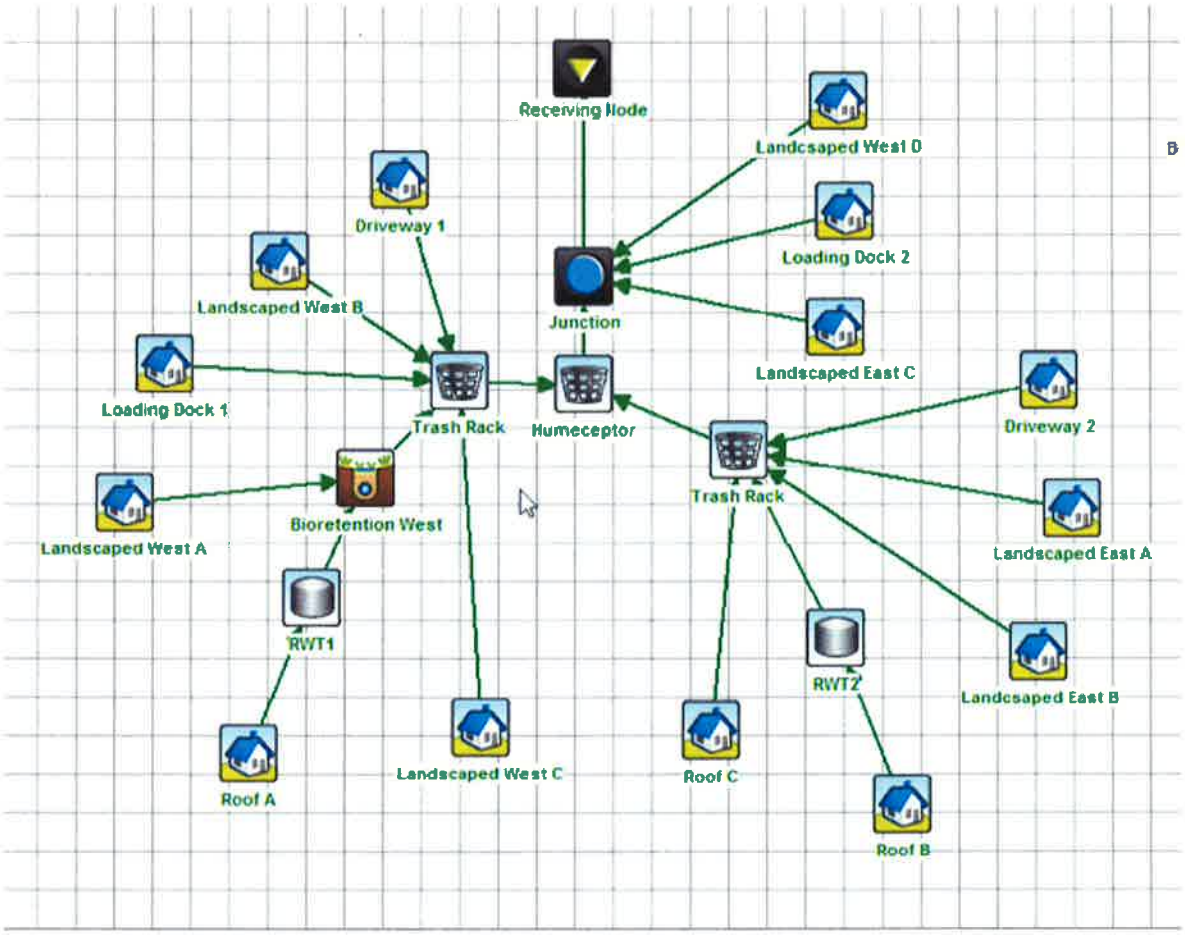
Designed	AH	-	Eng check		-
Drawn	AH	-	Coordination	AH	-
Dwg check	AH	-	Approved		-

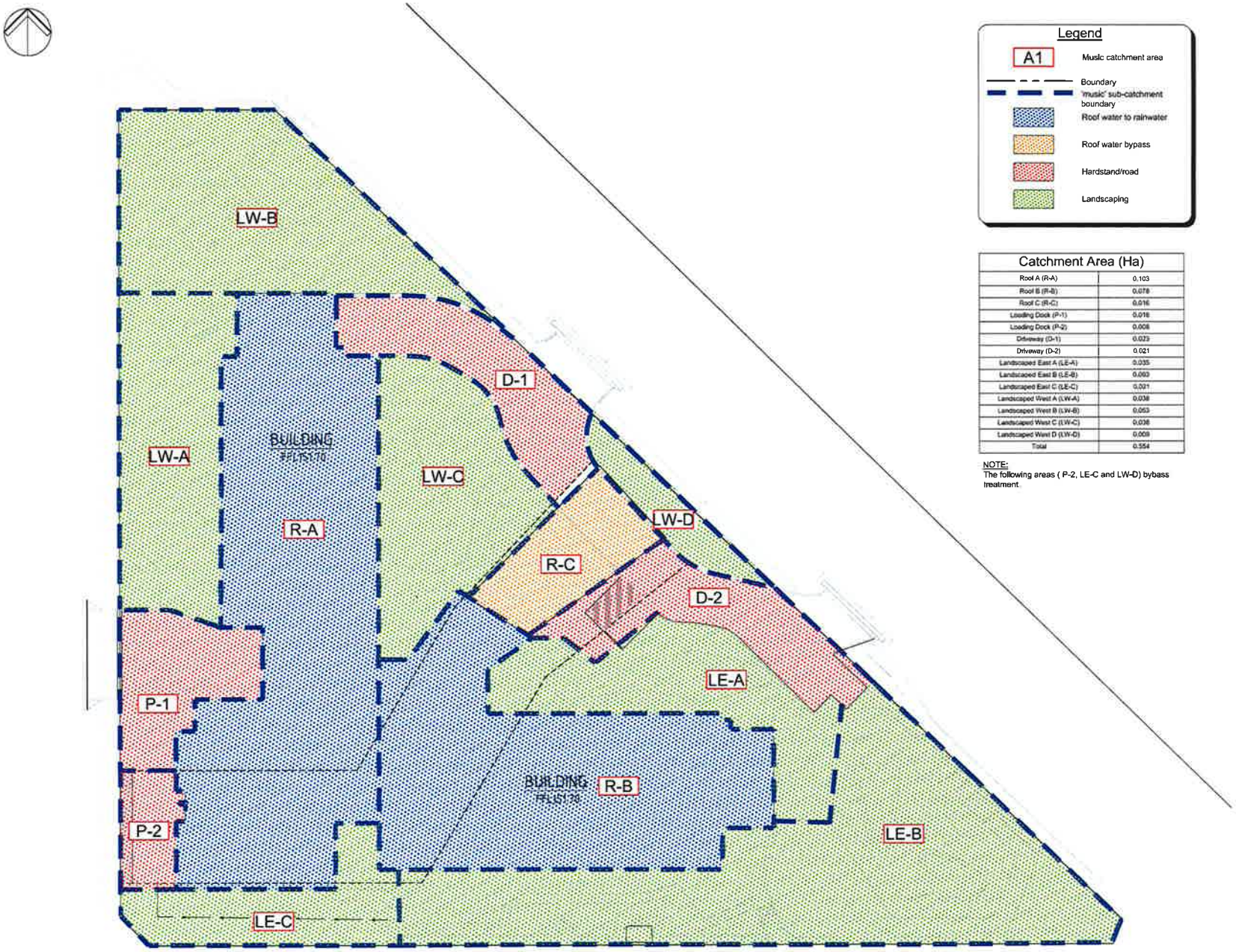
Scale at A1: 1:200
Status: PRE
Rev: P2

Drawing Number
MMD-315284-C-SK-00-XX-FIG01

Appendix C. MUSIC Model

Figure C.1: MUSIC Model Layout





Legend

A1	Music catchment area
	Boundary
	'music' sub-catchment boundary
	Roof water to rainwater
	Roof water bypass
	Hardstand/road
	Landscaping

Catchment Area (Ha)	
Roof A (R-A)	0.103
Roof B (R-B)	0.078
Roof C (R-C)	0.016
Loading Dock (P-1)	0.018
Loading Dock (P-2)	0.008
Driveway (D-1)	0.023
Driveway (D-2)	0.021
Landscaped East A (LE-A)	0.035
Landscaped East B (LE-B)	0.060
Landscaped East C (LE-C)	0.021
Landscaped West A (LW-A)	0.038
Landscaped West B (LW-B)	0.053
Landscaped West C (LW-C)	0.038
Landscaped West D (LW-D)	0.009
Total	0.554

NOTE:
The following areas (P-2, LE-C and LW-D) bybass treatment.

PLAN SCALE 1:200 @A1

Preliminary - Not for Construction

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Chk'd	Appd
P2	21.03.14	DW	Issued for DA	SR	CJA
P1	15.03.13	ADS	Issued for Information	AH	

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Client
BUPA Care Facilities

Title
BUPA St Ives
Music Catchment Plan

Designed	SR	-	Eng check		-
Drawn	DW	-	Coordination	SR	-
Dwg check	SR	-	Approved		-

Scale at A1: 1:200
Status: PRE
Rev: P2

Drawing Number
MMD-315284-C-SK-00-XX-FIG01

Appendix D. OSD Calculation Sheet

Appendix 3
On-Site Detention Calculation Sheet

Address 238-240 Mona Vale Road, St Ives

Catchment Detail				
1.	Catchment Name KC1 - Kuringgai Creek			
2.	Catchment Discharge Rate	0.0139	l/sec/m²	A
3.	Catchment Storage Rate	0.0308	m³/m²	B
Site Details				
4.	Site Area 5537 m² ^ 60% of site area	3322	m²	C
5.	Area(s) not draining to the detention system 59 m²			
6.	Total impervious area (roofs, driveways, paving, etc.)	3006	m²	D
7.	Impervious area bypassing detention system	59	m²	E
Permitted Site Discharge				
8.	C [3322 m²] x A [0.0139 l/sec/m²] =	46.18	l/sec	Flow 1
9.	Adjustment for any uncontrolled impervious flow E / D =	0.02	(<0.25)	F
10.	Flow 1 [46.18 l/sec] x F [0.02] =	0.92	l/sec	Flow 2
11.	Flow 1 [46.18] – Flow 2 [0.92] =	45.26	l/sec	PSD
Site Storage Requirement				
12.	C [3322 m²] x B [0.0308 m³/m²] =	102.31	m³	SSR1
13.	If the storage is in a landscaped basin, SSR1 x 1.2 =		m³	SSR2
Outlet Control				
14.	Height difference between top water surface level and the centre of the orifice		m	G
15.	Orifice Diameter $21.8 \times \sqrt{\frac{PSD}{\sqrt{G}}}$		mm	OD

PSD = Permitted Site Discharge
SSR1 = Site Storage Requirement (except for landscaped basins)
SSR2 = Site Storage Requirement (landscaped basins) **(Note: Use only SSR1 or SSR2)**
OD = Orifice Diameter

Signature ..... **Name** Andrew Hilly

Qualifications B Engineering **Date** 12/3/2013

Appendix E. Maintenance Schedules and Technical Specifications

PERIODIC MAINTENANCE PROCEDURES – BIO-RETENTION SYSTEM

PROJECT: BUPA St Ives – 238-240 Mona Vale Road, St Ives NSW.

The procedures as listed below are to be used as a guide only and are set out in accordance with *Water Sensitive Urban Design (WSUD)* Principles.

ITEM	CHECKED (Y/N)	MAINTENANCE NEEDED (Y/N)	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection – Inspect & Record Data			6-Monthly or after Major Storms	Maintenance Contractor and/or owner	-
Emergency Maintenance			Failure of treatment device	Maintenance Contractor	Contact BUPA / Environmental Authorities / KMC
DEBRIS CLEANOUT					
Surface clear of debris			6-Monthly or after Major Storms	Owner and/or Maintenance Contractor	Remove excess sediment and debris/ litter from bio-retention garden and dispose of in an appropriate manner i.e. via site waste/ recycling facilities.
Inlet area clear of debris					
Overflow clear of debris					
TRENCH SURFACE VEGETATION					
Vegetation condition			6-Monthly or after Major Storms	Owner and/or Maintenance Contractor	Provide on-going maintenance to the swale by mowing, watering, weeding, fertilising etc. Maintain vegetation to a height greater than 100 to 150mm. Reinstate areas where flows have caused soil erosion and damage to vegetation within the swale.
Vegetation trimming/ maintenance					
Weed infestation					
Evidence of erosion					
DEWATERING					
Water ponding evident on trench surface 24 hours after a storm event has ceased			3-Monthly or after Major Storms	Owner and/or Maintenance Contractor	Ensure that the stormwater is infiltrating into the system and is not stagnating in the basin. Replace any unsuitable soil/ filter media.
Top soil layer require replacing					
Entire media require replacing					
OUTLET/ OVERFLOW CHANNEL OR PIT					
Pit/ grate condition			6-Monthly or after Major Storms	Owner and/or Maintenance Contractor	Repair any damage to concrete structures as required.
Evidence of cracking or spalling of concrete structures					

NAME:
POSITION:
DATE:
SIGNATURE:

PERIODIC MAINTENANCE PROCEDURES – PRE-TREATMENT (GPT)

PROJECT: BUPA St Ives – 238-240 Mona Vale Road, St Ives NSW.

The procedures as listed below are to be used as a guide only and are to be set out in accordance with *Water Sensitive Urban Design (WSUD)* Principles.

ITEM	CHECKED (Y/N)	MAINTENANCE NEEDED (Y/N)	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection – Inspect & Record Data			6-Monthly or after Major Storms	Maintenance Contractor and/or owner	-
Emergency Maintenance			Failure of treatment device	Maintenance Contractor	Contact BUPA / Environmental Authorities / KMC
TRASH RACK					
GPT Trapping sediment / litter effectively			3-Monthly or after Major Storms	Maintenance Contractor	Remove trash rack and clear of all debris and concentrated sediment deposits. Reinstate trash rack inside pit. Replace GPT if function is impaired and cannot be rectified by normal maintenance procedures.
GPT clear of debris and sediment					
HUMECEPTOR/ GENERIC GPTS					
GPT Trapping sediment / litter effectively			6-Monthly or after Major Storms	Maintenance Contractor	Remove oily water and concentrated sediment deposits using vacuum truck. Refer product user manual for further details. Replace GPT if function is impaired and cannot be rectified by normal maintenance procedures.
GPT not more than 50% full of sediment					
DISCHARGE CONTROL PIT					
Sump clear of debris and sediment			6-Monthly or after Major Storms	Maintenance Contractor	Remove any debris and sediment which has been deposited in the sump at the base of the pit. Ensure weep holes are clear and able to freely drain stormwater.

NAME:

POSITION:

DATE:

SIGNATURE:

Humes
Water Solutions

Strength. Performance. Passion.

HumeCeptor® system Technical manual

Issue 1

Contents

HumeCeptor® system

The HumeCeptor® system is a patented hydrodynamic separator, specifically designed to remove hydrocarbons and suspended solids from stormwater runoff, preventing oil spills and minimising non-point source pollution entering downstream waterways.

The HumeCeptor® system is an underground, precast concrete stormwater treatment solution that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. First designed as an 'at source' solution for constrained, commercial and industrial sites it has been improved and expanded to service large catchments, mine and quarry sites, inundated drainage systems, and capture large volume emergency spill events. The system is ideal for hardstands/wash bays, car parks, shopping centres, industrial/commercial warehouses, petrol stations, airports, major road infrastructure applications, quarries, mine sites and production facilities.

Independently tested, and installed in over 30,000 projects worldwide, the HumeCeptor® system provides effective, and reliable secondary treatment of stormwater for constrained sites.

- **The system reliably removes a high level of TSS and hydrocarbons**
  The HumeCeptor® system was developed specifically to remove fine suspended solids and hydrocarbons from stormwater, and has been certified to achieve high pollutant removal efficiencies for TSS (>80%) and Total Nutrients (TN) (>30%) on an annual basis.
- **It captures and retains hydrocarbons and TSS down to 10 microns**
  Each system is specifically designed to maintain low treatment chamber velocities to capture and retain TSS down to 10 microns. It also removes up to 98% of free oils from stormwater.
- **Each device is sized to achieve the necessary Water Quality Objectives (WQO) on an annual basis**
  Utilising the latest build-up and wash-off algorithms, PCSWMM software for the HumeCeptor® system ensures that the device chosen achieves the desired WQO (e.g. 80% TSS removal) on an annual basis.
- **Its performance has been independently verified**
  The HumeCeptor® system's technology has been assessed by independent verification authorities including the New Jersey Department of Environmental Protection (NJDEP), The Washington Department of Environment (USA), and by the Canadian Environmental Technology Verification program (ETV).

Right:
The bypass chamber of a HumeCeptor® system

- **The system is proven**
  The HumeCeptor® system was one of the first stormwater treatment devices introduced to Australia, and now after 30,000 installations worldwide, its popularity is testament to its performance, quality and value for money.
- **High flows won't scour captured sediment**
  The unique design of HumeCeptor® units ensures that as flows increase and exceed the treatment flow, the velocity in the storage chamber decreases.
- **Nutrients are captured along with the sediment**
  The effective capture of TSS results in the capture of particulate nutrients shown to be >30% of TN and Total Phosphorous (TP).
- **Designs allow for emergency spill storage, directional change, multiple pipes and tidal inundation**
  A new range of HumeCeptor® systems are now available, built specifically to manage emergency spills (50,000 L storage), change of pipe directions, the joining of multiple pipes, or to manage high tail water levels as a result of tides or downstream water bodies.
- **Fully trafficable to suit land use up to class G**
  The HumeCeptor® system is a fully trafficable solution, it can be installed under pavements and hardstands to maximise above ground land use.
- **We are experienced in the provision of world class treatment solutions**
  Humes has a team of water specialists dedicated to the advancement of economical sustainable solutions, and the provision of expert advice and support.

System operation

The HumeCeptor® stormwater treatment system slows incoming stormwater to create a non-turbulent treatment environment, allowing free oils and debris to rise and sediment to settle. Each HumeCeptor® system maintains continuous positive treatment of TSS, regardless of flow rate, treating a wide range of particle sizes, as well as free oils, heavy metals and nutrients that attach to fine sediment.

The HumeCeptor® system's patented scour prevention technology ensures pollutants are captured and contained during all rainfall events.

Bypass chamber

1. Stormwater flows into the inlet (weir) area of the bypass chamber.
2. Design flows are diverted into the offline treatment chamber by a weir, orifice and drop pipe arrangement (refer to Figure 1).
3. The weir and orifice have been developed to create a vortex that sucks floating oils and sediment down into the treatment chamber.
4. During high flow conditions, stormwater in the bypass chamber overflows the weir and is conveyed to the stormwater outlet directly (refer to Figure 2).
5. Water which overflows the weir stabilises the head between the inlet drop pipe and outlet decant pipe ensuring that excessive flow is not forced into the treatment chamber, protecting against scour or re-suspension of settled material. The bypass is an integral part of the HumeCeptor® unit since other oil/grit separators have been found to scour during high flow conditions (Schueler and Shepp, 1993).

Figure 1 – HumeCeptor® system operation during design flow conditions

Figure 2 – HumeCeptor® system operation during high flow conditions

Treatment chamber

1. Once diverted into the treatment chamber through the weir and orifice, the drop pipe beneath the orifice is configured to discharge water tangentially around the treatment chamber wall.
2. Water flows through the treatment chamber to the decant pipe which is submerged similar to the drop pipe.
3. Hydrocarbons and other entrained substances with a specific gravity less than water will rise in the treatment chamber and become trapped beneath the fibreglass insert since the decant pipe is submerged.
4. Sediment will settle to the bottom of the chamber by gravity forces. The large volume of the treatment chamber assists in preventing high velocities and promoting settling.
5. Water flows up through the decant pipe based on the head differential at the inlet weir, and is discharged back into the bypass chamber downstream of the weir.

Independent verification testing

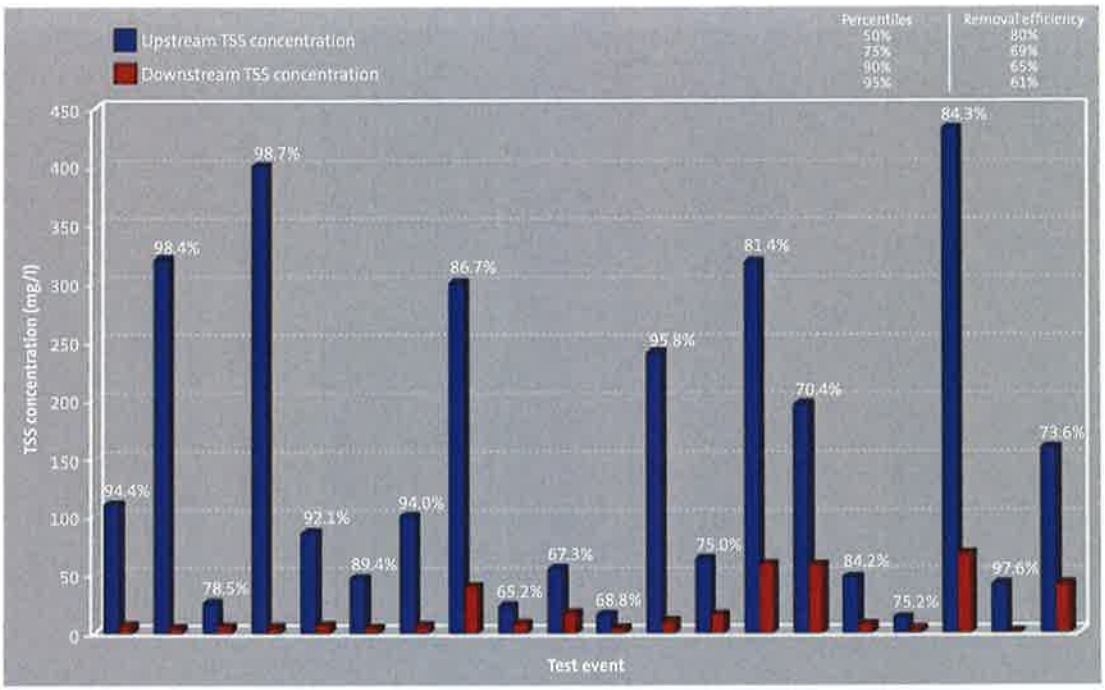
HumeCeptor® systems have been extensively researched by more than 15 independent authorities to validate its performance; it has now gained Environmental Technology Verification (ETV) certificates from ETV Canada, New Jersey Department of Environmental Protection (NJDEP) and Washington Department of Environment (WDOE).

A number of agencies have conducted independent studies; their results from these studies (over 100 test events) have been summarised in Table 1 below.

Table 1 – HumeCeptor® system performance summary

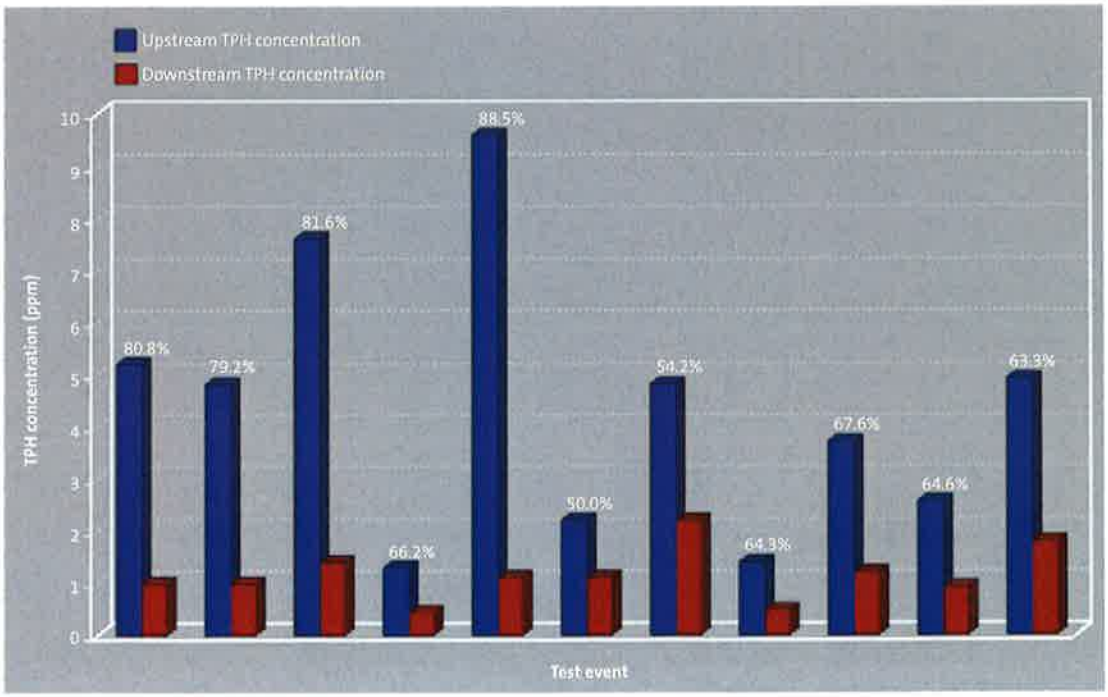
Pollutant	Average removal efficiency	Details
TSS	80%	Laboratory and field results, stable, hardstand, roads, commercial and industrial sites
TN	53%	Field results
TP	37%	Field results
Chromium	44%	Field results
Copper	29%	Field results
TPH	65%	<10 ppm inflow concentration
	95%	10 ppm - 50 ppm inflow concentration (typical stormwater)
	99%	>500 ppm inflow concentration (emergency spills)

Figure 3 – HumeCeptor® system field performance results for Total Suspended Solids (TSS) removal



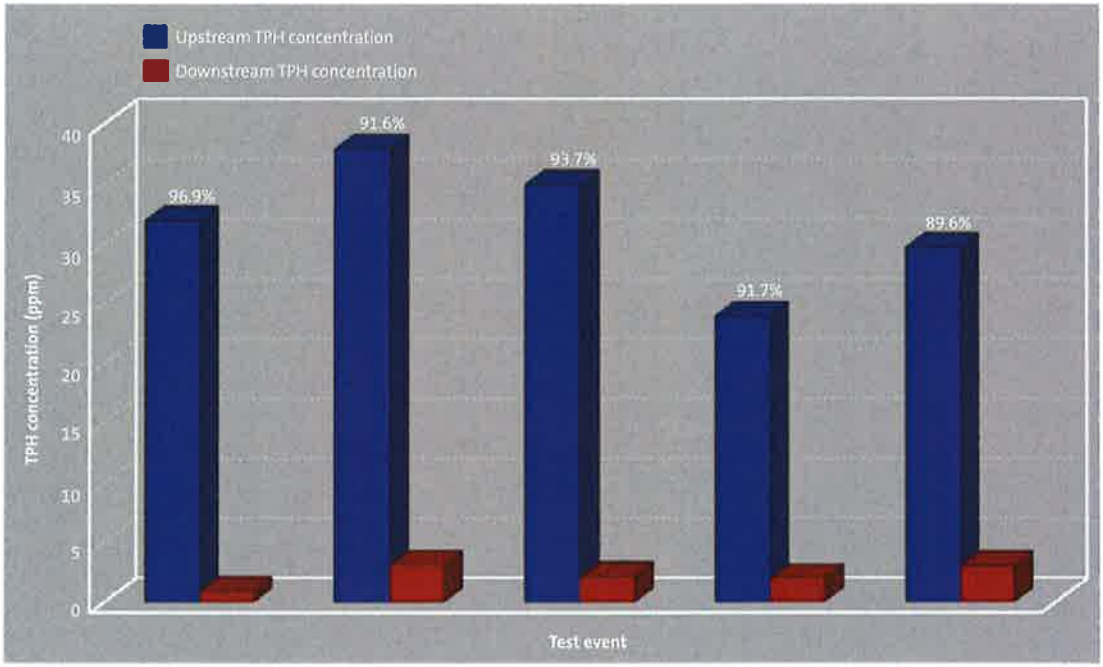
Note: Percentage values represent removal efficiencies

Figure 4 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration <10 ppm)



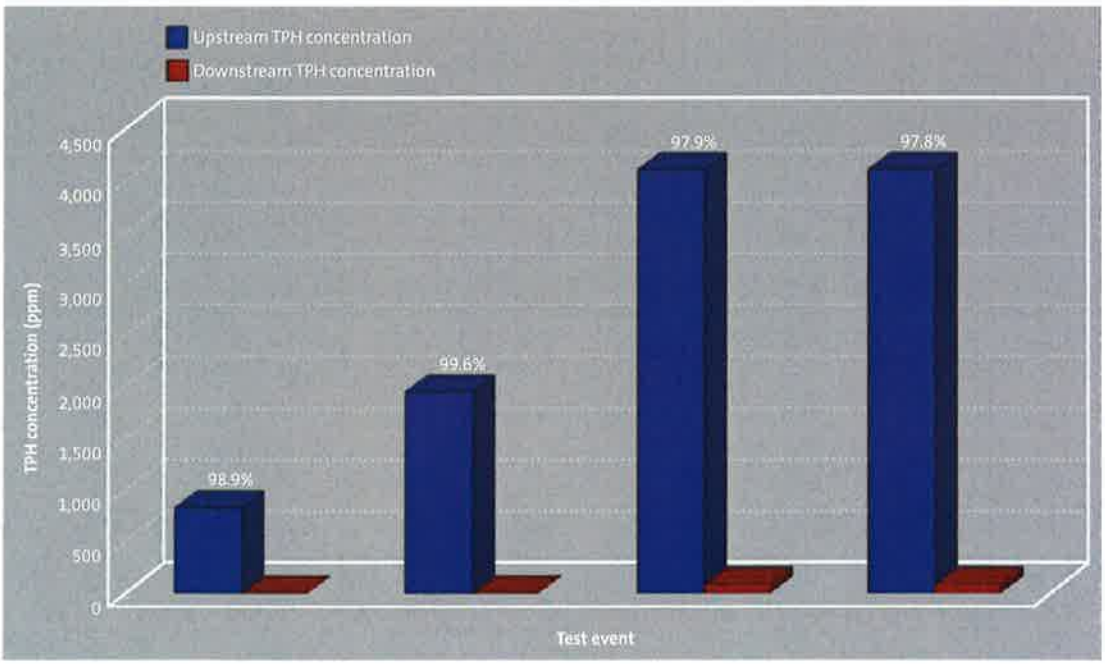
Note: Percentage values represent removal efficiencies

Figure 5 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >10 ppm)



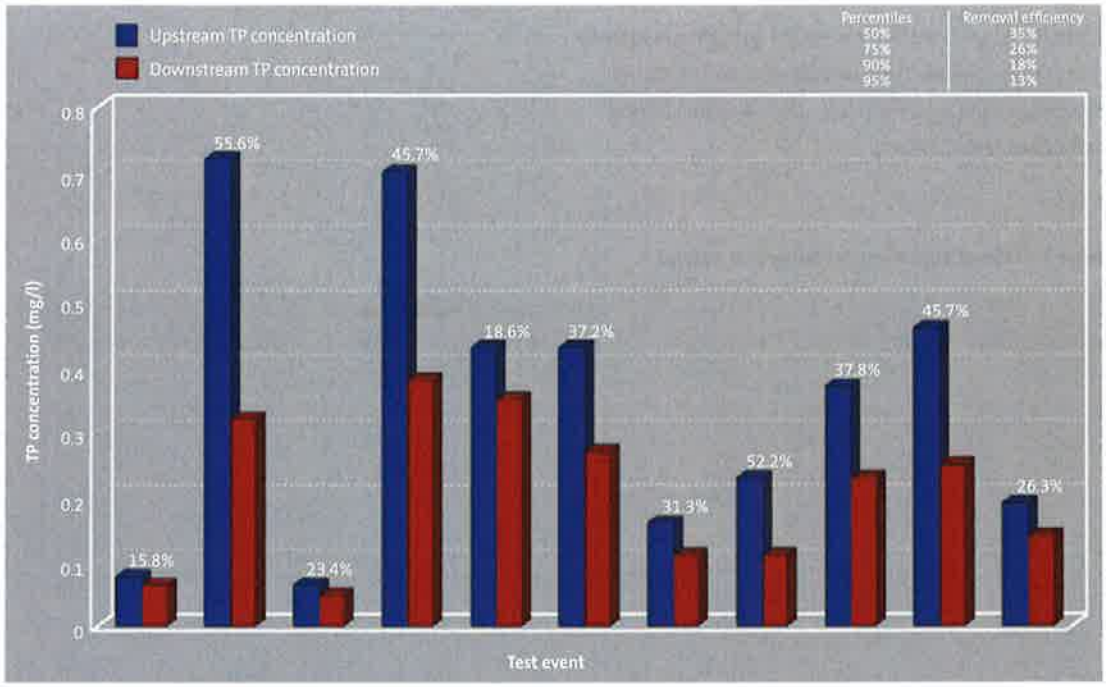
Note: Percentage values represent removal efficiencies

Figure 6 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >1,000 ppm)



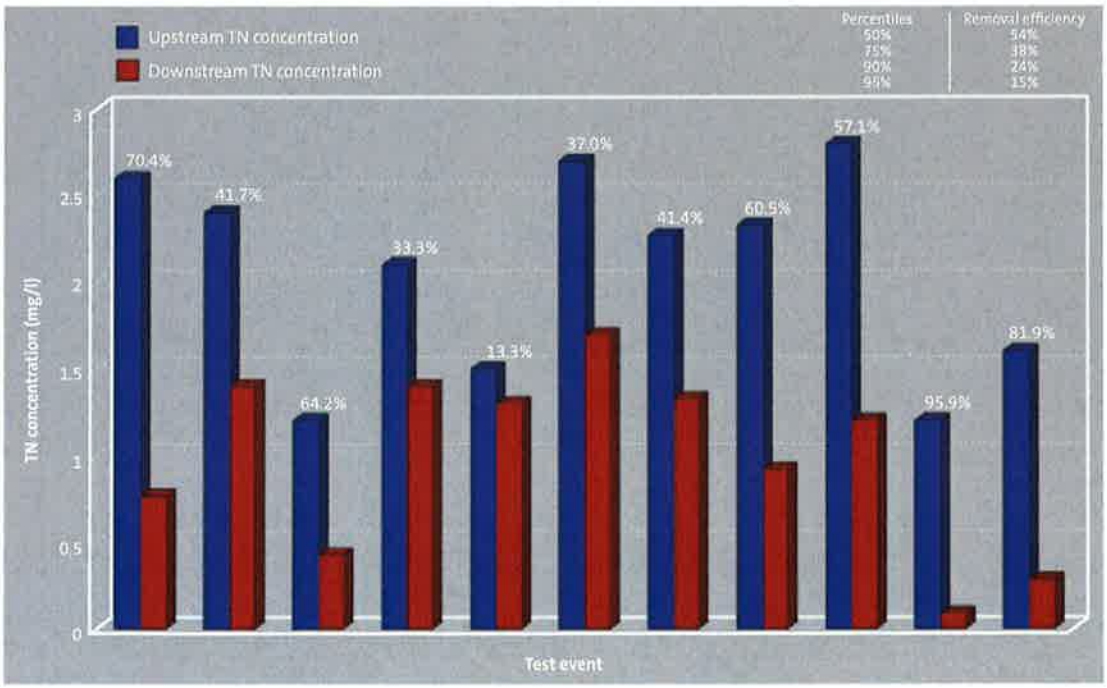
Note: Percentage values represent removal efficiencies

Figure 7 – HumeCeptor® system field performance for Total Phosphorous (TP) removal



Note: Percentage values represent removal efficiencies

Figure 8 – HumeCeptor® system field performance for Total Nitrogen (TN) removal



Note: Percentage values represent removal efficiencies

System options

There are a number of HumeCeptor® systems available to meet the requirements of various WQO for maintaining catchments and local hydrology. The standard range is detailed in Table 2 below.

Table 2 – HumeCeptor® model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert* (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 2 (inlet)	100 - 600	1,200	1.7	1	350	1,740
STC 3	100 - 1,350	1,800	1.68	2	1,020	3,410
STC 5			2.13	3		4,550
STC 7			3.03	5		6,820
STC 9		2,440	2.69	6	1,900	9,090
STC 14			3.69	10	2,980	13,640
STC 18		3,060	3.44	14		18,180
STC 23			4.04	18		22,730
STC 27		3,600	3.84	20	4,290	27,270

Note:
*Depths are approximate.

Variants

Continual improvement over the last 14 years of HumeCeptor® system installations has provided a number of enhancements to address specific treatment and design requirements.

- **HumeCeptor® STC 2 (inlet) model**
  This model features a grated inlet to directly capture runoff from hardstand areas, replacing the need for a stormwater pit (refer to Figure 9).
- **AquaCeptor™ model**
  This model has been designed with a weir extension to increase the level at which flows bypass the treatment chamber, and accommodate downstream tail water levels or periodic inundation (e.g. tidal situations). This weir extension is provided in standard heights of 100 mm intervals, up to a maximum of 500 mm.

  To maintain the hydrocarbon capture capabilities, an additional "high level" inlet pipe is also fitted. This facilitates the formation of the surface vortex from the bypass chamber into the treatment chamber and draws floating hydrocarbons into the unit.

  The selection of the appropriate weir extension height is undertaken in conjunction with the downstream engineering design and/or tidal range charts for the specific location. Figure 10 displays the AquaCeptor™ model; these are available in the same sizes as the standard HumeCeptor® units (refer Table 2 on the previous page).

Figure 9 – HumeCeptor® STC 2 (inlet) model

Figure 10 – AquaCeptor™ model

- **MultiCeptor™ model**

  The MultiCeptor™ model (refer to Figure 11) was developed to facilitate the replacement of junction pits while still providing the treatment abilities of the original HumeCeptor® system and reducing time and costs during installation. These units reverse the weir structure to allow for:

  - change of pipe direction
  - multiple inlet pipes
  - differing invert levels of multiple inlet pipes
  - grated inlets.

  The MultiCeptor™ model is available in the same sizes as the standard HumeCeptor® units (refer to Table 3 below) and a 2,400 mm diameter MultiCeptor™ unit is also available to accommodate drainage pipes up to 1,800 mm diameter.

Figure 11 – MultiCeptor™ model

Table 3 – MultiCeptor™ model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
MI3	100 - 1,350	1,800	1.68	2	1,020	3,410
MI5			2.13	3		4,550
MI7			3.03	5		6,820
MI9		2,440	2.69	6	1,900	9,090
MI14			3.69	10	2,980	13,640
MI18		3,060	3.44	14		18,180
MI23			4.04	18		22,730
MI27		3,600	3.84	20	4,290	27,270
MI9 - MI27 (2,400)	100 - 1,800	2,400	2.69 - 3.84	6 - 20	1,900 - 4,290	9,090 - 27,270

- **DuoCeptor™ model**

  The DuoCeptor™ model has been developed to treat larger catchments (2 Ha - 6 Ha) because some constrained developments can only accommodate a single, large device instead of several smaller devices.

  The unit operates by splitting the flow and treating half of the design flow through the first chamber. The untreated half of the design flow bypassed from the first chamber then passes through the split connection pipe into the second chamber for treatment. Treated flow from the first chamber exits and flows through the other side of the split connection pipe, and bypasses the second chamber to join the treated flow from the second chamber at the outlet of the DuoCeptor™ model.

  Figure 12 displays the DuoCeptor™ model and Table 4 details the range of capacities available.

Figure 12 – TDuoCeptor™ model

Table 4 – DuoCeptor™ model range and details

DuoCeptor™ model	Pipe diameter (mm)	Device footprint (L x W)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 40	600 - 1,350	7,750 x 3,500	3.41	27	10,585	42,370
STC 50			4.01	35	10,585	50,525
STC 60		9,150 x 4,200	3.89	42	11,560	60,255

- **HumeCeptor® MAX model**

  The HumeCeptor® MAX model (refer to Figure 13) was developed to meet the market need for a single, large, end-of-pipe solution for TSS and hydrocarbon removal. Utilising the HumeCeptor® system's proven capture and scour prevention technology, it is ideal for very large commercial and industrial sites (>6 Ha) (eg. quarries, mine sites and stockpile areas) that need to achieve at least 50% TSS removal and hydrocarbon capture. The HumeCeptor® MAX model can be expanded to almost any capacity required.

  Sizing for the HumeCeptor® MAX model must be calculated separately from the PCSWMM software for the HumeCeptor® system. Contact Humes Water Solutions for assistance.

- **HumeCeptor® EOS model**

  The HumeCeptor® EOS (Emergency Oil Spill) system provides you with the maximum protection against hydrocarbon spills at petrol stations, highway interchanges and intersections. It combines the passive, always-operating functions of the HumeCeptor® system, with additional emergency storage to capture the volume of spill required by your road authority. Standard designs include 30,000 litres and 50,000 litres of total hydrocarbon storage but these can be modified to suit any specified volume.

Figure 13 – HumeCeptor® MAX model

Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and hydrology.

Configuration of the stormwater system

As a cylindrical system, HumeCeptor® hydrodynamic separators are much more flexible for accommodating inlet and outlet pipes on angles than rectangular systems.

Location in the stormwater system

Specifically designed for capturing fine sediment and hydrocarbons, the HumeCeptor® system is best suited to "at source" applications. Therefore, it should be located immediately downstream of the catchment area to be treated, e.g. car parks, loading bays, refuelling stations, wash bays.

Catchment area

As a general rule, larger catchment areas require larger HumeCeptor® units. If the catchment area is unstable (e.g. exposed soil) or contributes unusually high pollutant loads (e.g. landscape supply yards), larger units are more appropriate.

Sizing HumeCeptor® systems

PCSWMM software for the HumeCeptor® system is the decision support tool used for identifying the appropriate model. In order to size a unit, the following six design steps should be followed.

- **Step 1 – Project details and WQOs**
  Enter the project details in the appropriate cells, clearly identifying the water quality objectives (WQO) for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a Particle Size Distribution (PSD). In most Australian situations, this WQO is for 80% TSS removal, but a PSD is not defined. This can be determined from relevant research data or from site monitoring.
- **Step 2 – Site details**
  Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of paved surfaces, sidewalks and rooftops.
- **Step 3 – Upstream detention/retention**
  HumeCeptor® systems are designed as a water quality device and is sometimes used in conjunction with on site water quantity control such as ponds or underground detention systems. Where possible, it is more beneficial to install a HumeCeptor® unit upstream of a detention system, as the sediment load is reduced and the maintenance interval between cleaning is maximised.

  Where the HumeCeptor® system is installed downstream of a detention system it will alter the hydrology of the catchment and will influence the size of the unit selected by the software. For those projects, enter the footprint area and flow characteristics into the model.

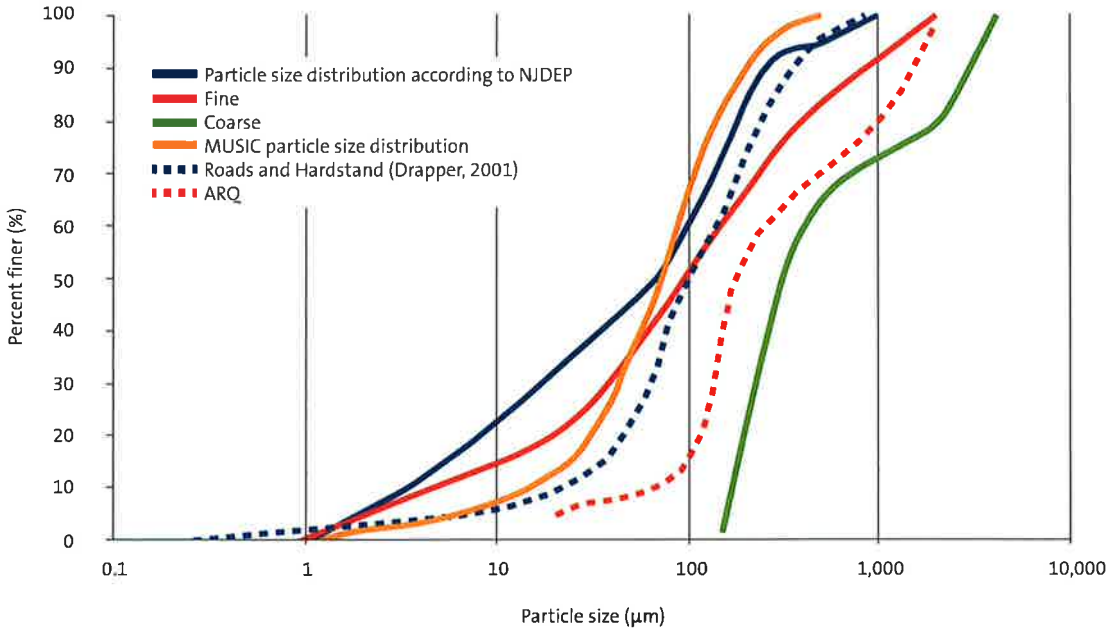
- **Step 4 – Particle Size Distribution (PSD)**
  It is critical that the PSD is defined as part of the WQO. The design of the treatment system relies on a Stoke's Law settling (and floating) process, and selection of the target PSD influences the model outcomes.

  If the objective is for long term removal of 80% of TSS on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (>150 microns) only provides relatively poor removal efficiency of finer particles (<75 microns) that may be naturally present in site runoff. PCSWMM allows the user to enter their own PSD or select from a range of options in the program (refer to Figure 14 below).

- **Step 5 – Rainfall records**
  The rainfall data provided with PCSWMM for the HumeCeptor® system provides an accurate storm hydrology estimation by modelling actual historical storm events including duration, intensities and peaks. Local historical rainfall has been acquired from the Bureau of Meteorology. Select the nearest rainfall station from the list.

- **Step 6 – Summary**
  At this point, the software is able to predict the level of TSS removal from the site. Once the simulation has been completed, a table is generated identifying the TSS removal of each unit. Based on the WQO identified in Step 1, the recommended HumeCeptor® system unit will be highlighted.

Figure 14 – PCSWMM for HumeCeptor® system - PSD



MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs and hydrodynamic separators.

Considering these against the independent research results in Table 1 on page 4, and PCSWMM modelling used to size a HumeCeptor® unit, the conservative removal efficiencies in Table 5 below are recommended on an annual basis (i.e. no bypass). Humes Water Solutions can optimise the values to suit your specific site.

Table 5 – MUSIC inputs for HumeCeptor® systems

Pollutant	Removal efficiency
TSS	80%
TN	30%
TP	30%

System installation

Top:
Installation of the base section (step 3)

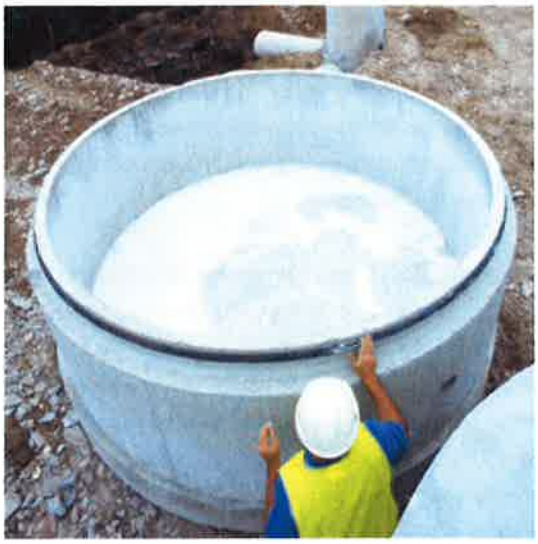
Middle:
Installation of the bypass chamber (step 6)

Bottom:
System ready for connection of the inlet and outlet pipes (step 8)

The installation of HumeCeptor® units should conform in general to local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeCeptor® system is installed as follows:

1. Excavate and stabilise the site.
2. Prepare the geotextile and aggregate base.
3. Install the treatment chamber base section.
4. Install the treatment chamber section/s (if required).
5. Prepare the transition slab (if required).
6. Install the bypass chamber section.
7. Fit the inlet drop pipe and decant pipe (if required).
8. Connect inlet and outlet pipes as required.
9. Backfill to transition slab level.
10. Install the maintenance access chamber section (if required).
11. Install the frame and access cover/grate.
12. Backfill to finished surface/base course level and complete surface pavement.



System maintenance

The design of the HumeCeptor® system means that maintenance is conducted with a vacuum truck which avoids entry into the unit.

If the HumeCeptor® unit is sized using the PCSWMM guidelines, a maximum interval of annual maintenance is recommended.

A typical maintenance procedure includes:

1. Open the access cover.
2. Insert the vacuum hose into the top of the treatment chamber via the decant (outlet) pipe.
3. Remove the oily water until the level is just below the lower edge of the decant pipe.
4. Lower a sluice gate into the nearest upstream junction pit and decant the water from the treatment chamber into the upstream pit until the sediment layer is exposed.
5. Remove the sediment layer into the vacuum truck for disposal.
6. Raise the upstream sluice gate and allow water to return into the HumeCeptor® unit.
7. Replace the access cover.

FAQs

- **Will it capture litter?**
  The HumeCeptor® system is primarily designed for hydrocarbon and fine sediment removal, so if litter is expected from the catchment an upstream GPT is recommended. However, items such as cigarette butts, plastic bags and smaller gross pollutants will be captured by the system.
- **Do I need to model a bypass flow for the HumeCeptor® system in MUSIC?**
  No, PCSWMM software for the HumeCeptor® system analyses all flows from the catchment to determine 80% TSS removal on an annual basis. Therefore, the output efficiency of PCSWMM for the selected model can be incorporated into a MUSIC treatment node without a bypass flow.
- **How often do I need to undertake maintenance?**
  A maximum interval of 12 months is recommended, with 3 months ideal, however, these systems are designed with a factor of safety, so it will continue to retain sediment until it is completely full.
- **What if the PSD from my site is different to those in the software?**
  Humes Water Solutions has the ability to model a user-defined PSD in PCSWMM software for the HumeCeptor® system. If you have PSD results contact us for assistance.
- **Do I have to use the model that PCSWMM software highlights?**
  No, in most stormwater treatment trains, there are other measures upstream and/or downstream. Select the unit size that you need to achieve your desired removal efficiency in the context of your overall concept. Remember that selecting a model that removes less TSS will also remove less TN and TP.
- **Is it possible to change the hydrology model defaults in PCSWMM?**
  Yes, Humes Water Solutions has the ability to vary these inputs. Please contact us for further assistance.
- **Will the HumeCeptor® system's treatment chamber release nutrients?**
  Over time, captured organic material will break down and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream natural measures can remove the small portion of nutrients released during dry weather flows. A regular maintenance program will reduce the amount of break down occurring (Ball and Powell, 2006).

- **Why is the HumeCeptor® system not sized on flow rate?**
  The HumeCeptor® system is sized using actual historical rainfall and an algorithm based on research (Novotny and Chesters 1981, Charbeneau and Barrett, 1988, Ball and Abustan 1995, Sartor and Boyd 1972) showing that pollutants build up and wash off a catchment which is influenced by time, Particle Size Distribution (PSD), rainfall volume and intensity. These form a pollutograph that the software uses to calculate the HumeCeptor® system performance for all flows in every event over the rainfall period. The software then recommends the model that will remove 80% of TSS load from all of these events.
- **How is the HumeCeptor® system different to a GPT?**
  The HumeCeptor® system is specifically designed to target fine sediment and hydrocarbons. Therefore, it is designed to maintain velocities through the treatment chamber <0.02 m/s. A GPT is designed to capture gross pollutants (>1 mm). For a GPT to function in an equivalent way to a HumeCeptor® system, the treatment chamber velocity must be <0.02 m/s.
- **Why would I use a HumeCeptor® system upstream of a biofilter?**
  Using a HumeCeptor® system upstream of a biofilter acts as a non- scouring sediment forebay, containing sediment to a confined location for easy removal. This protects the biofilter and lengthens its lifespan.

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Humes Water Solutions

Humes Water Solutions is a specialist division within the Humes business, dedicated to the provision of stormwater treatment, harvesting and reuse, and detention solutions.

Our team has been developed to provide an unparalleled depth of knowledge and experience for our customers, which takes Humes Water Solutions beyond the traditional barriers of company-based solutions. A combination of graduate and post graduate personnel with working backgrounds in the private and public sector ensures the delivery of well-measured and practical advice for our customers.

We are dedicated to the development and protection of our water resources and to this end, we undertake rigorous research and development of our products, stay abreast of stormwater issues and solutions around the world, and publish peer-reviewed technical papers on issues relevant to the stormwater industry.

As a part of the Humes business, Humes Water Solutions has access to a national infrastructure, a dedicated engineering design team, and over 100 years design, manufacturing and construction experience.

Humes now operates 16 accredited plants (ISO9001) and 20 sales offices to provide a truly national footprint and meet the needs of our customers irrespective of their location.

Our range of stormwater solutions also includes our multi-award winning* RainVault® harvesting and reuse system, and the new StormTrap® detention system.

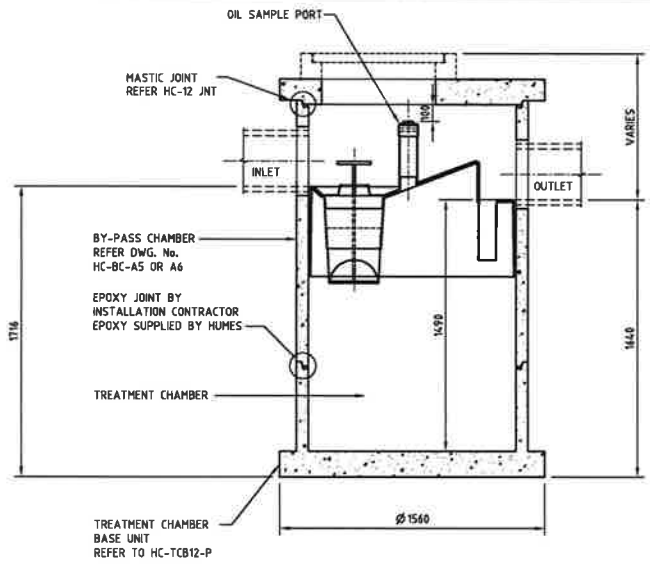
For Humes and its parent company, Holcim Ltd, sustainable development is a key priority. Our stormwater treatment products demonstrate our commitment to protecting the environment.

For more information on any of our products, or for a selection of technical papers published by Humes Water Solutions, please visit us at humeswatersolutions.com.au.

*
- 2008 Winner - Excellence in Stormwater Harvest & Reuse for the Riverstone Crossing RainVault from the Stormwater Industry Association.
- 2008 Fieldforce Environmental Product of the Year Award from the Master Plumbers and Mechanical Services Association of Australia.
- 2006 CivEnEx - Most Innovative Product.

Appendices

HumeCeptor® system technical drawings
HumeCeptor® system design request form
HumeCeptor® system quotation and order form



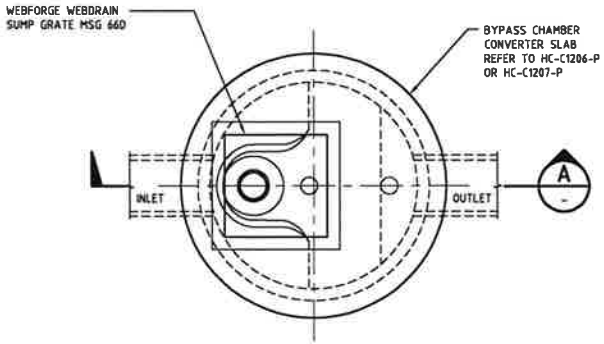
NOTE: STANDARD DROP INLET TO OUTLET IS 76mm

SECTION A / - SCALE 1:20

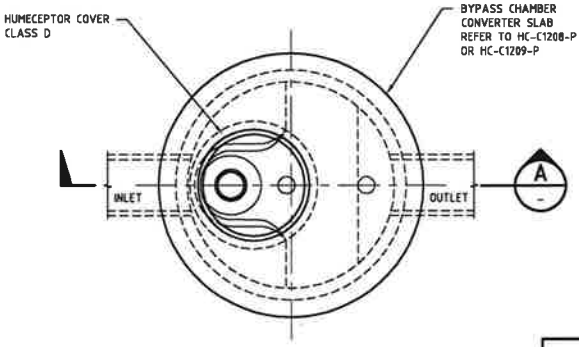
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	RGE	15.05.02	SO'C
1	UPDATED AND REISSUED FOR MANUFACTURE	M.Z.	23-01-03	DFW
2	GENERAL UPGRADE	RM	07-08-03	DFW

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 1740 LITRES
   OIL STORAGE VOLUME = 350 LITRES
   SEDIMENT STORAGE VOLUME = 1.34m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 1130 kg
   BYPASS CHAMBER = VARIES
   BYPASS CHAMBER CONVERTER SLAB = 575 kg
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. FOR OUTLET PIPE CONNECTION DETAILS
   REFER HC-BC-A5 OR A6 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
7. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
8. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.



PLAN - SQUARE OPENING (PREFERRED)
SCALE 1:20



PLAN - CIRCULAR OPENING (ALTERNATIVE)
SCALE 1:20

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

Readymix Holdings Pty Limited ABN 87 009 732 297

DRN.	SO'C	23-01-03
CHK.	RGE	23-01-03
DES.	SO'C	23-01-03
APP.	DFW	23-01-03

SUPERSEDES

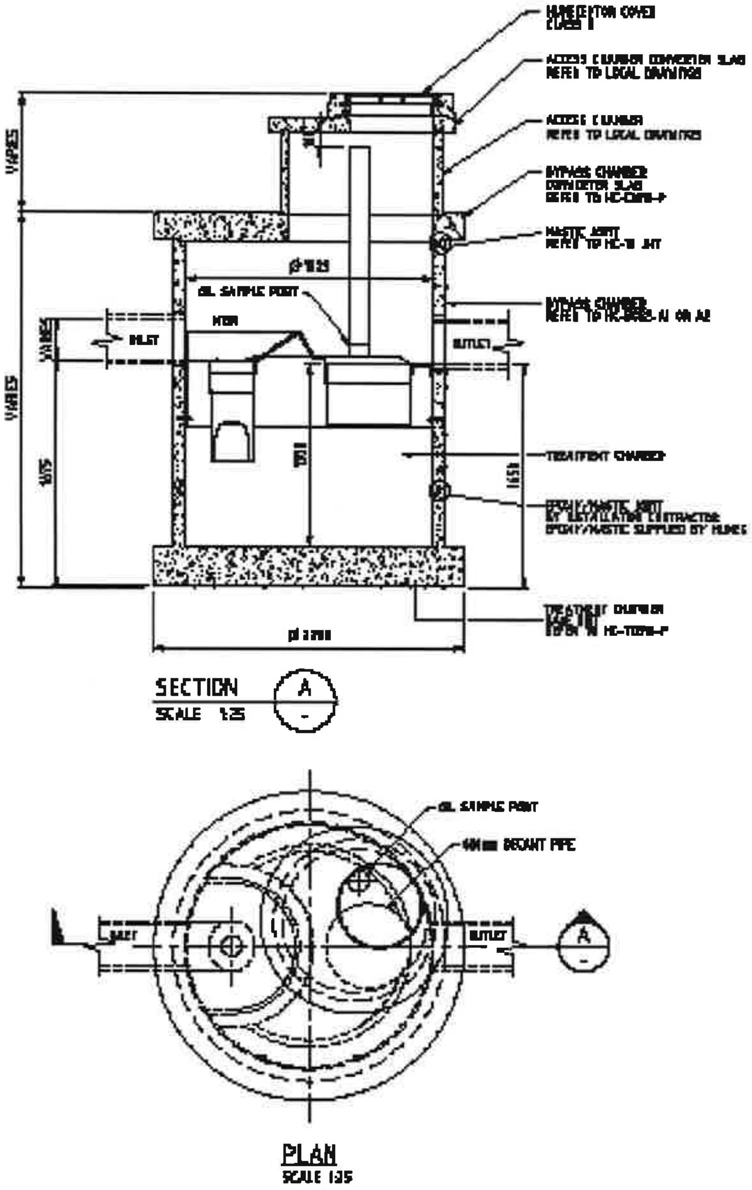
HUMECEPTOR™ STANDARD DRAWING

STC-2 HUMECEPTOR™ c/w INLET AND OUTLET PIPES

ASSEMBLY DRAWING

PLOT SCALE	SIZE	DWG. NO.	ISSUE
1:20	A2	HC-STC2-B	2

REV	[illegible]	[illegible]	[illegible]	[illegible]
1	UPDATED AND ISSUED FOR MANUFACTURE	M.Z.	[illegible]	DFW
1	STORAGE VOLUMES REVISED	M.Z.	[illegible]	DFW



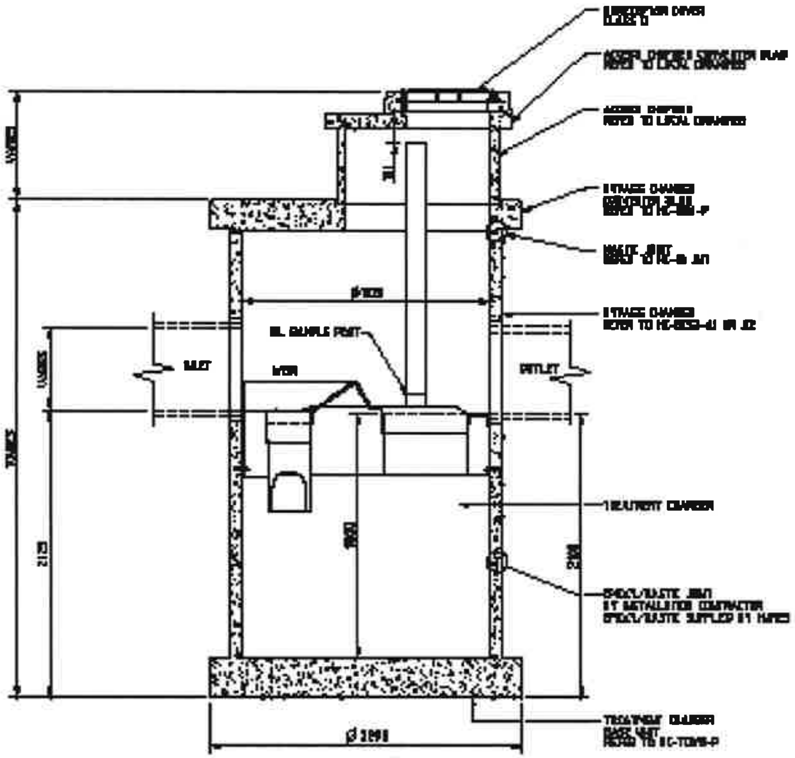
NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. [illegible] ARE STANDARD
3. STORAGE VOLUMES
   TOTAL [illegible]
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = [illegible] TONNE
   BYPASS CHAMBER = [illegible]
   BYPASS CHAMBER CONVERTER SLAB = [illegible] TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR [illegible] DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. [illegible] – INLET & OUTLET [illegible]
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

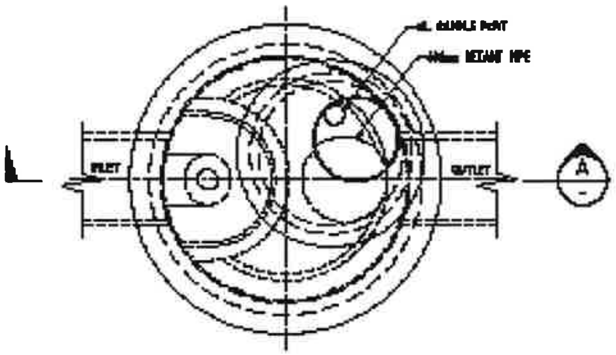
Humes

HUMECEPTOR™
STANDARD DRAWING
STC-3 HUMECEPTOR
ASSEMBLY DRAWING

1:25	A2	HC-STC3-A	1



SECTION (A)
SCALE 1:25



PLAN
SCALE 1:25

REV	DESCRIPTION			
0	UPDATED AND ISSUED FOR MANUFACTURE	H.Z.	[illegible]	DFW

NOTES

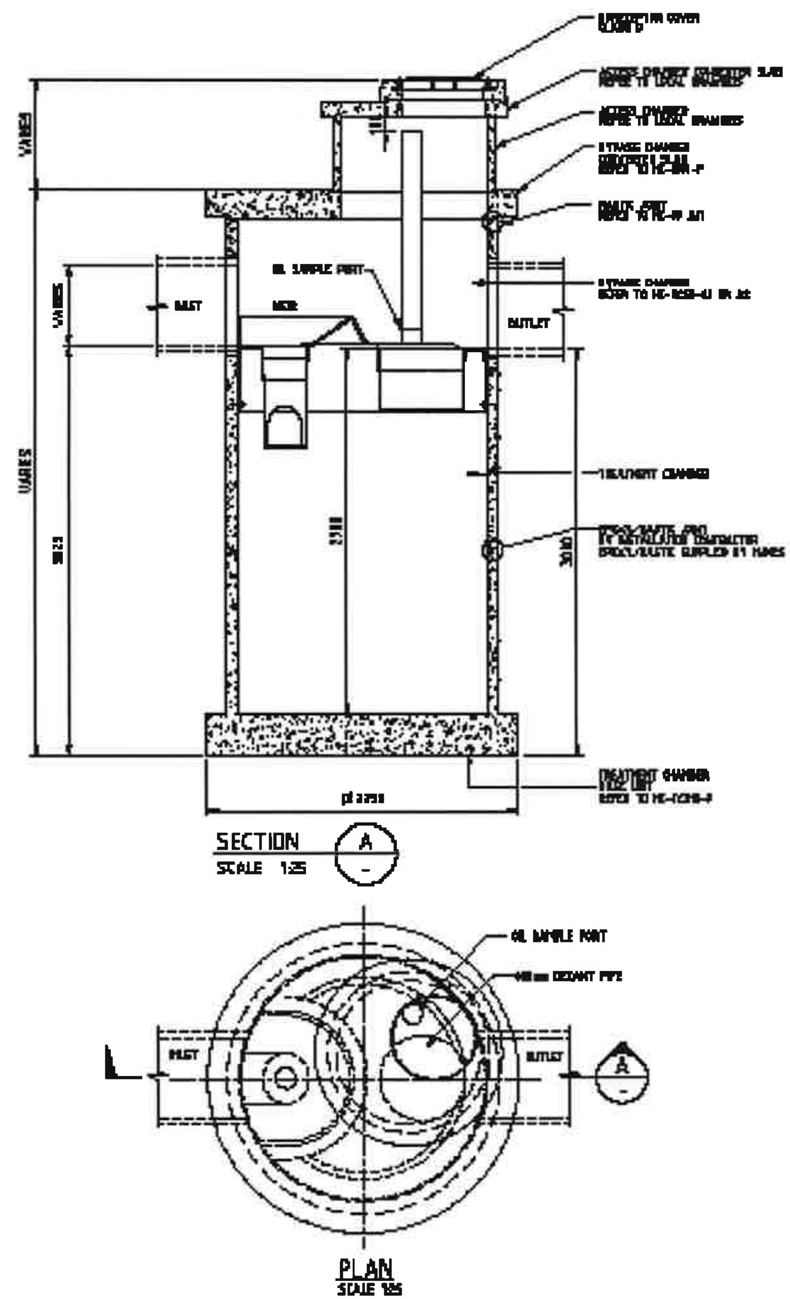
1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = [illegible] TONNE
   BYPASS CHAMBER = [illegible]
   BYPASS CHAMBER CONVERTER SLAB = [illegible] TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FORM DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS
8. [illegible] LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE [illegible] – INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

Humes

HUMECEPTOR™
STANDARD DRAWING
STC-5 HUMECEPTOR
ASSEMBLY DRAWING

SCALE	SIZE	DRAWING No.	REV
1:25	A2	HC-STC5-A	0

2003



REV	DESCRIPTION	DRN	DATE	CHK
[illegible]	UPDATED AND ISSUED FOR MANUFACTURING	KLZ	[illegible]	DFW

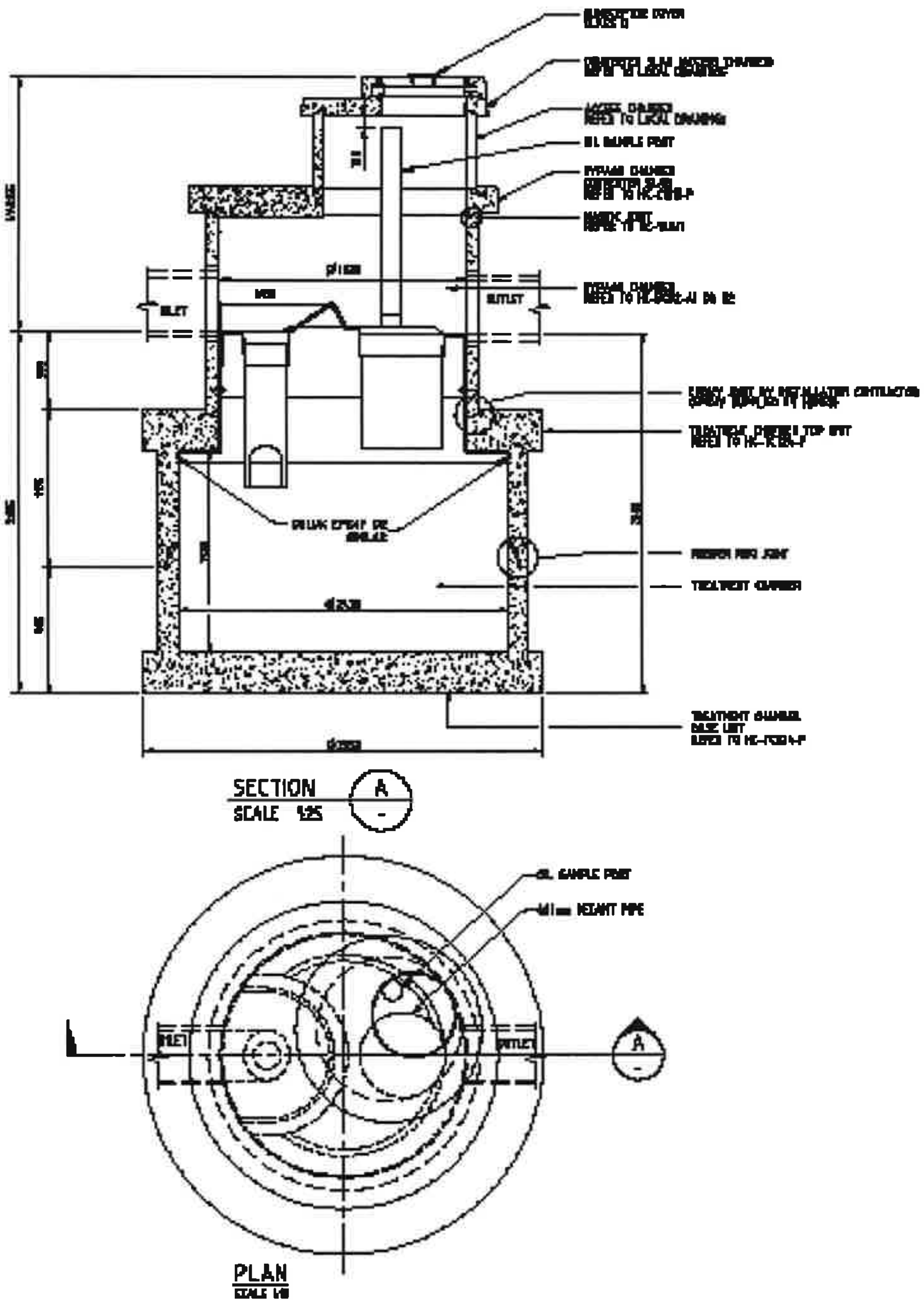
NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 5.1 TONNE
   BYPASS CHAMBER = [illegible]
   BYPASS CHAMBER CONVERTER SLAB = [illegible] TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR [illegible] DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. [illegible] – INLET & OUTLET [illegible]
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

Humes

HUMECEPTOR™
STANDARD DRAWING
STC-7 HUMECEPTOR
ASSEMBLY DRAWING

SCALE	SIZE	DRAWING NO.	REV
1:25	A2	HC-STC7-A	D



NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   OIL SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT [illegible]
   TREATMENT CHAMBER BASE UNIT [illegible] = [illegible] TONNE
   TREATMENT CHAMBER TOP UNIT [illegible] = [illegible] TONNE
   BYPASS CHAMBER = [illegible]
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR [illegible] DETAILS FOR [illegible].
6. BYPASS CHAMBER [illegible] TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS.
8. [illegible] LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS. REFER PRODUCT DRAWINGS
9. [illegible] – INLET AND OUTLET [illegible]
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND [illegible] PIPE TO BE [illegible] AS PER PLAN VIEW.

RUBBER RING JOINT SPECIFICATION

MATERIAL	: [illegible]
HARDNESS	: [illegible]
PROFILE	: [illegible] REFER Dwg. [illegible]
[illegible]	: [illegible]

Humes

HUMECEPTOR™
STANDARD DRAWING
STC-9 HUMECEPTOR
ASSEMBLY DRAWING

A2 HC-STC-9-A D

2003

REV	DESCRIPTION			
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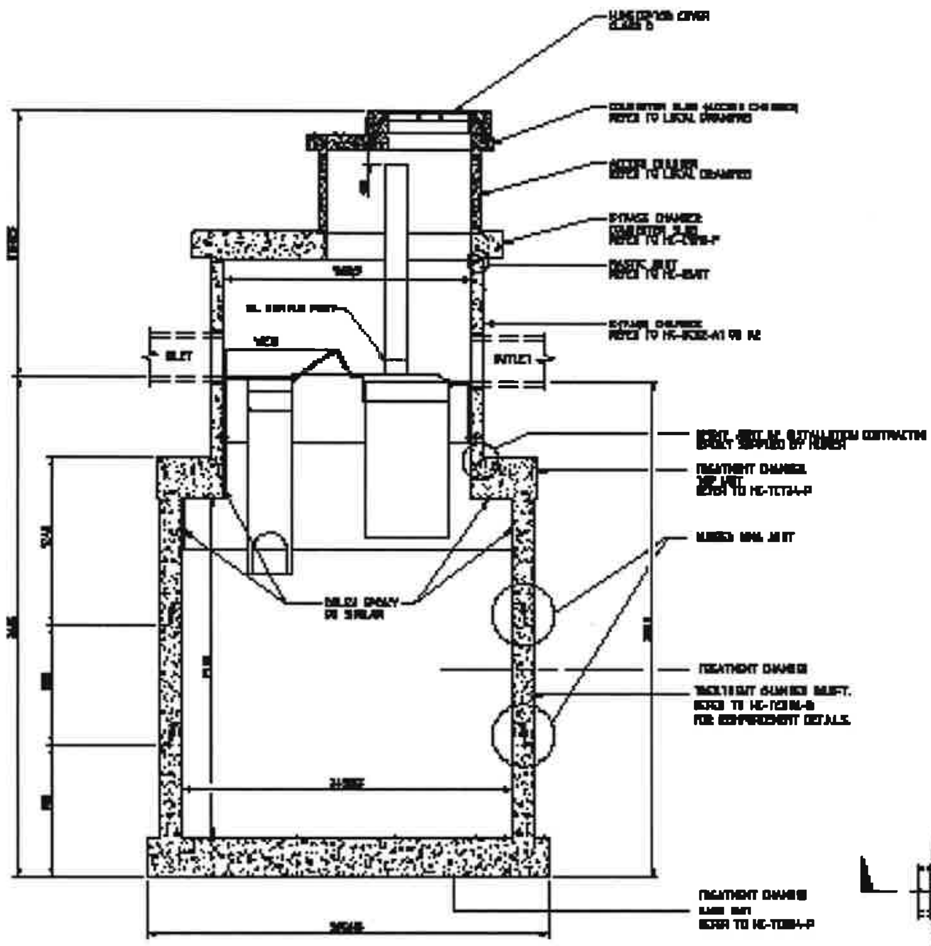
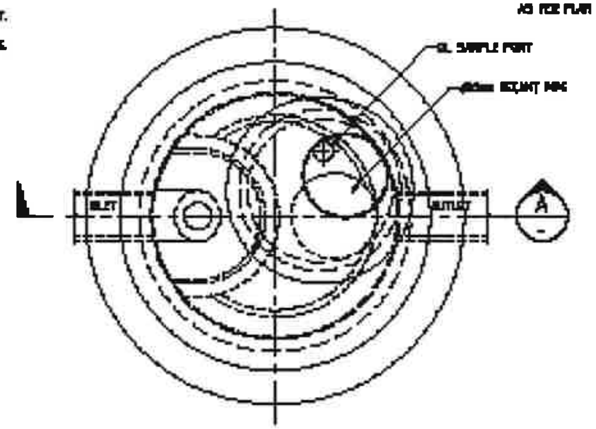


SECTION A
SCALE 1:25

NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. DIMENSIONS SHOWN ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = [illegible] TONNE
   TREATMENT CHAMBER TOP UNIT (WITH SLAB + SHAFT) = [illegible] TONNE
   BYPASS CHAMBER = [illegible]
   TREATMENT CHAMBER SHAFT = [illegible] TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FURTHER DETAILS FOR FIBERGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. [illegible] – INLET AND OUTLET [illegible]
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW



PLAN
SCALE 1:25

RUBBER RING JOINT SPECIFICATION

MATERIAL : NITRILE
[illegible]

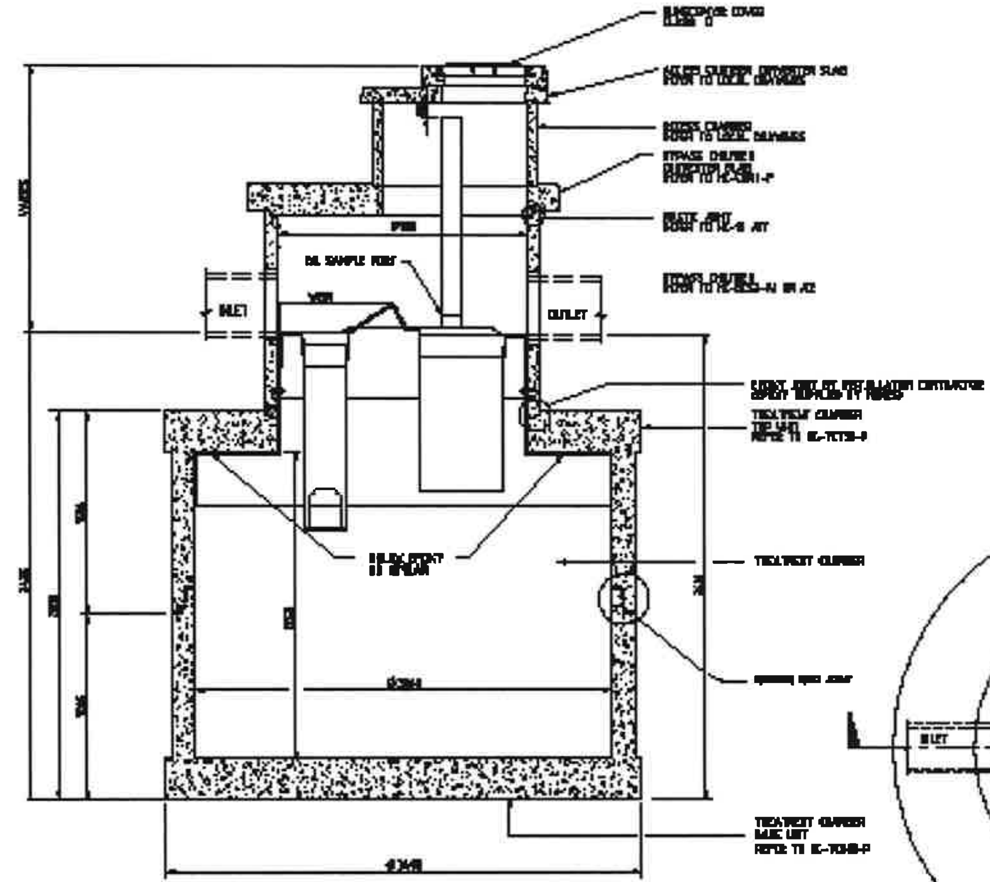
Humes

HUMECEPTOR™
STANDARD DRAWING
STC-14 HUMECEPTOR
ASSEMBLY DRAWING

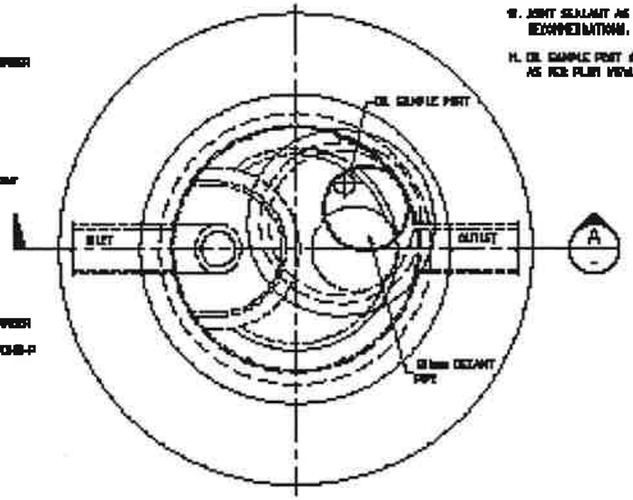
1:25 | A2 | HC-STC14-A | D

2003

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	UPDATED AND ISSUED FOR MANUFACTURE	M.L.Z.	[illegible]	DFW



SECTION A
SCALE 1:25



PLAN

NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWINGS FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible]
4. COMPONENT MASSES
   TREATMENT CHAMBER [illegible]
   TREATMENT CHAMBER [illegible]
   BYPASS CHAMBER = [illegible]
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR [illegible] DETAILS [illegible]
6. BYPASS CHAMBER [illegible] TO SUIT LOCAL ACCESS [illegible]
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS
8. [illegible] LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. [illegible] – INLET AND OUTLET [illegible]
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

RUBBER RING SPECIFICATION

MATERIAL : [illegible]
[illegible] : [illegible]
PROFILE : [illegible]
[illegible] : [illegible]

Humes

HUMECEPTOR TM
STANDARD DRAWING
STC-18 HUMECEPTOR
ASSEMBLY DRAWING

[illegible]	A2	HC-STC18-A	D

2003

ISSUE	DESCRIPTION	BY	DATE	CHK
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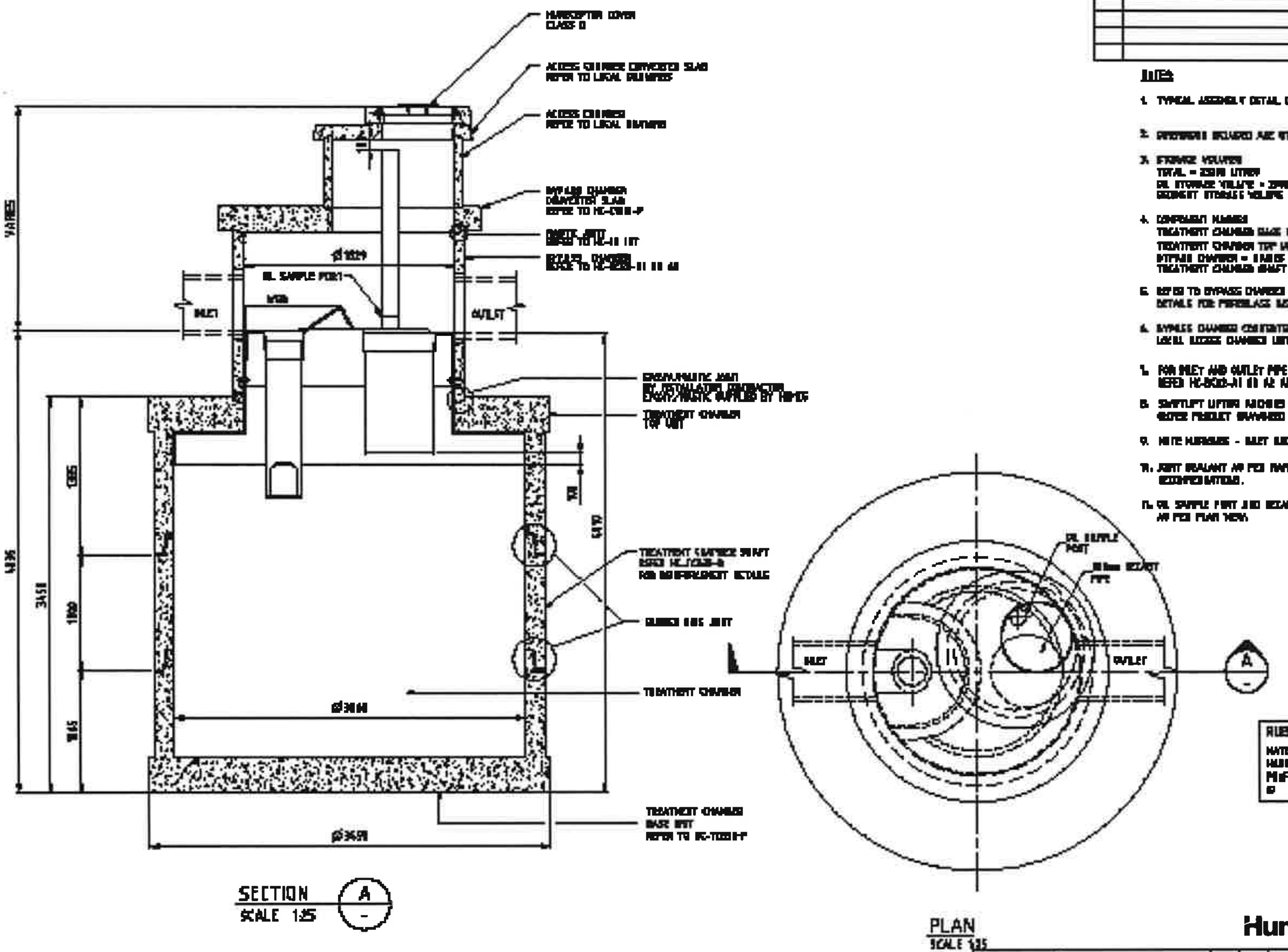

NOTES

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL [illegible]
2. [illegible] STANDARD
3. STORAGE VOLUMES
   TOTAL = [illegible] LITRES
   OIL STORAGE VOLUME = [illegible] LITRES
   SEDIMENT STORAGE VOLUME = [illegible] m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = [illegible] TONNE
   TREATMENT CHAMBER TOP UNIT [illegible] = [illegible] TONNE
   BYPASS CHAMBER = [illegible]
   TREATMENT CHAMBER SHAFT = [illegible] TONNES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR [illegible] DETAILS FOR FIBREGLASS [illegible]
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER [illegible] INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS [illegible]
9. NOTE [illegible] - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND [illegible] PIPE TO BE VISIBLE AS PER PLAN VIEW.

RUBBER RING SPECIFICATION

MATERIAL	: NITRILE
HARDNESS	: [illegible]
PROFILE	: [illegible]
Ø	: [illegible]

Humes

HUMECEPTOR™
STANDARD DRAWINGS
STC-23 HUMECEPTOR
ASSEMBLY DRAWING

SCALE	SIZE	DRAWING No.	REV
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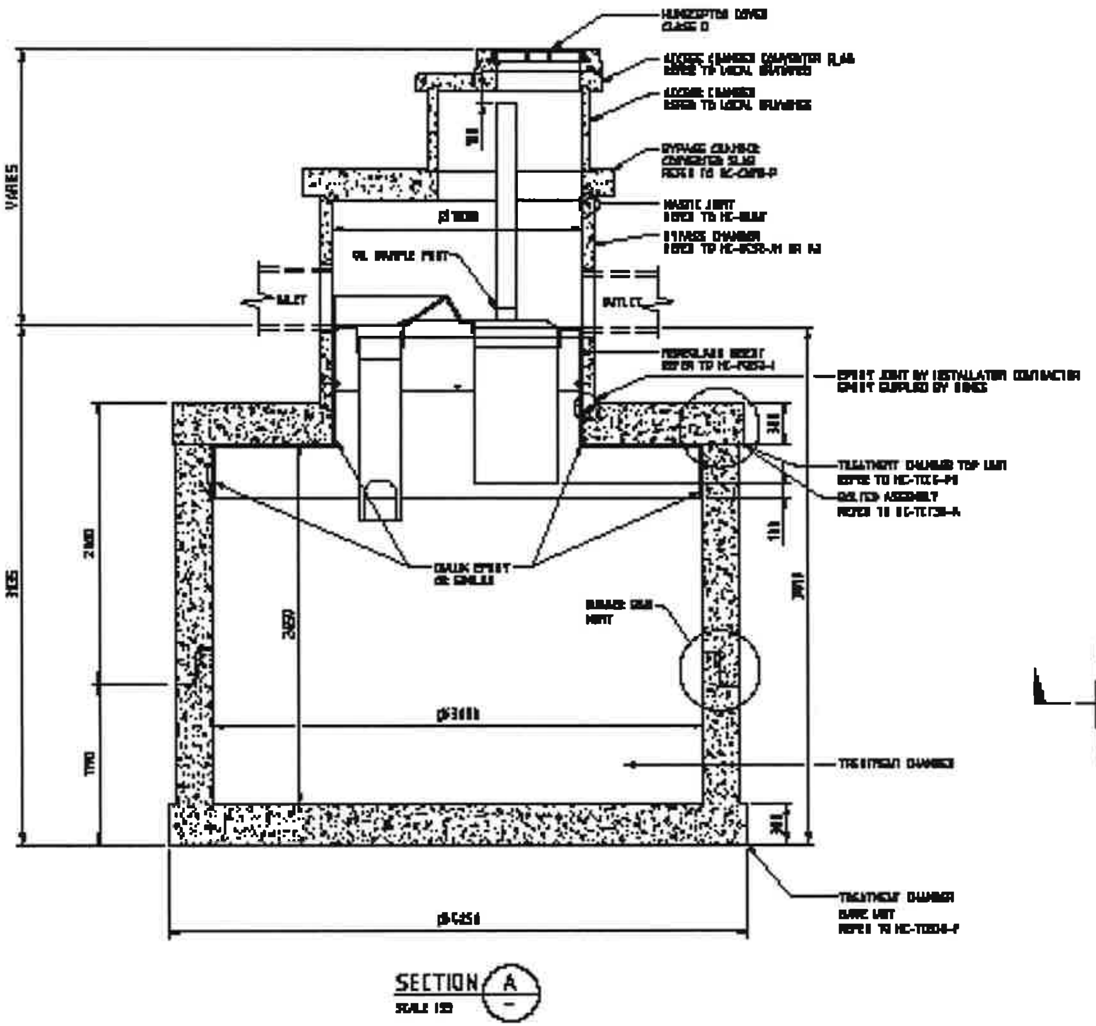
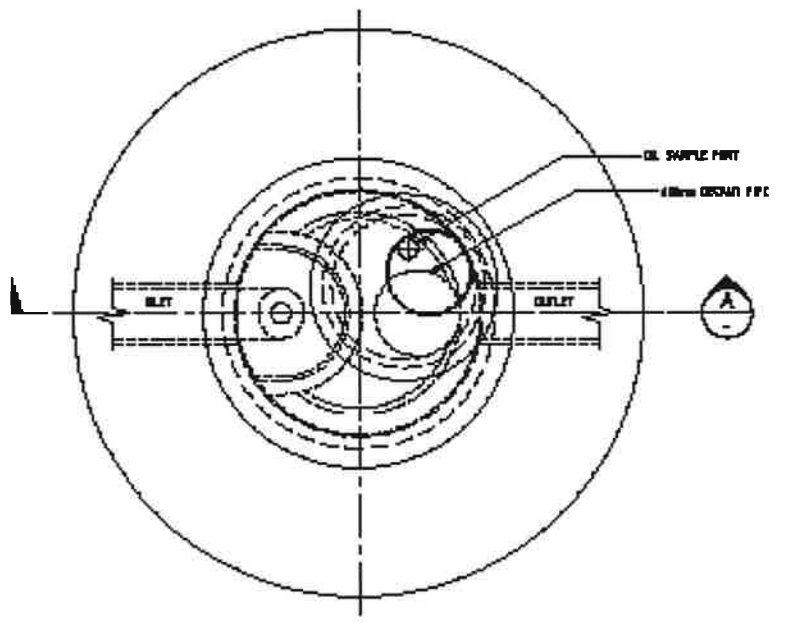
2003



SECTION A
SCALE 1:50



PLAN
SCALE 1:50

IMPORTANT INSTALLATION INFORMATION

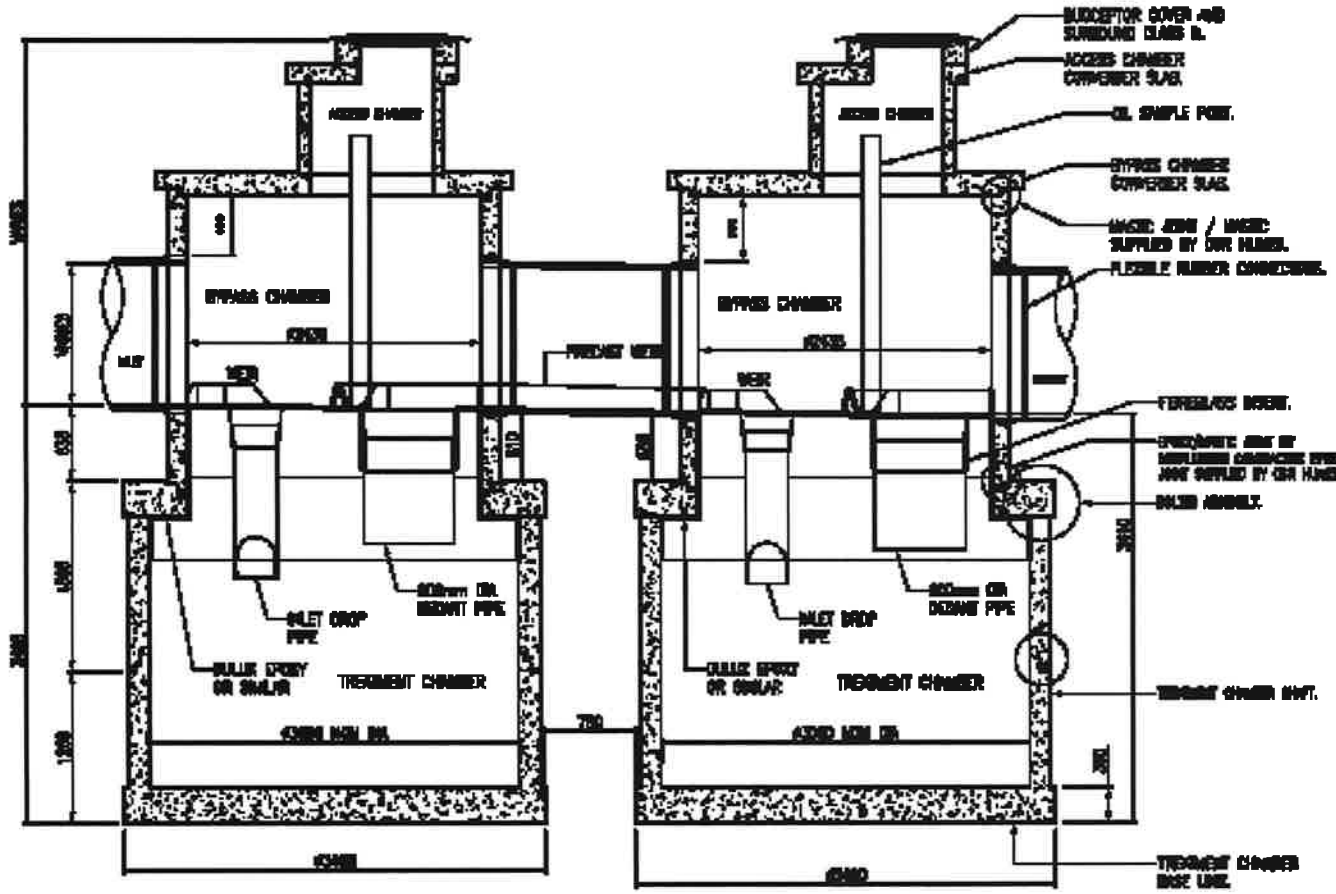
1. FOUNDATION REQUIREMENTS - MIN. ALLOWABLE BEARING CAPACITY REQUIRED 200 kPa
2. UNIT TO BE PLACED ON 150mm THICK BED ZONE MATERIAL IN ACCORDANCE WITH AS3725 REQUIREMENTS
3. TREATMENT CHAMBER SHOULD BE FILLED WITH WATER TO 2/3 DEPTH IMMEDIATELY AFTER INSTALLATION (UNIT MAY FLOAT PRIOR TO BACKFILLING)

RUBBER RING JOINT SPECIFICATION

Humes

HUMECEPTOR®
STANDARD DRAWING
STC-27 HUMECEPTOR
ASSEMBLY DRAWING

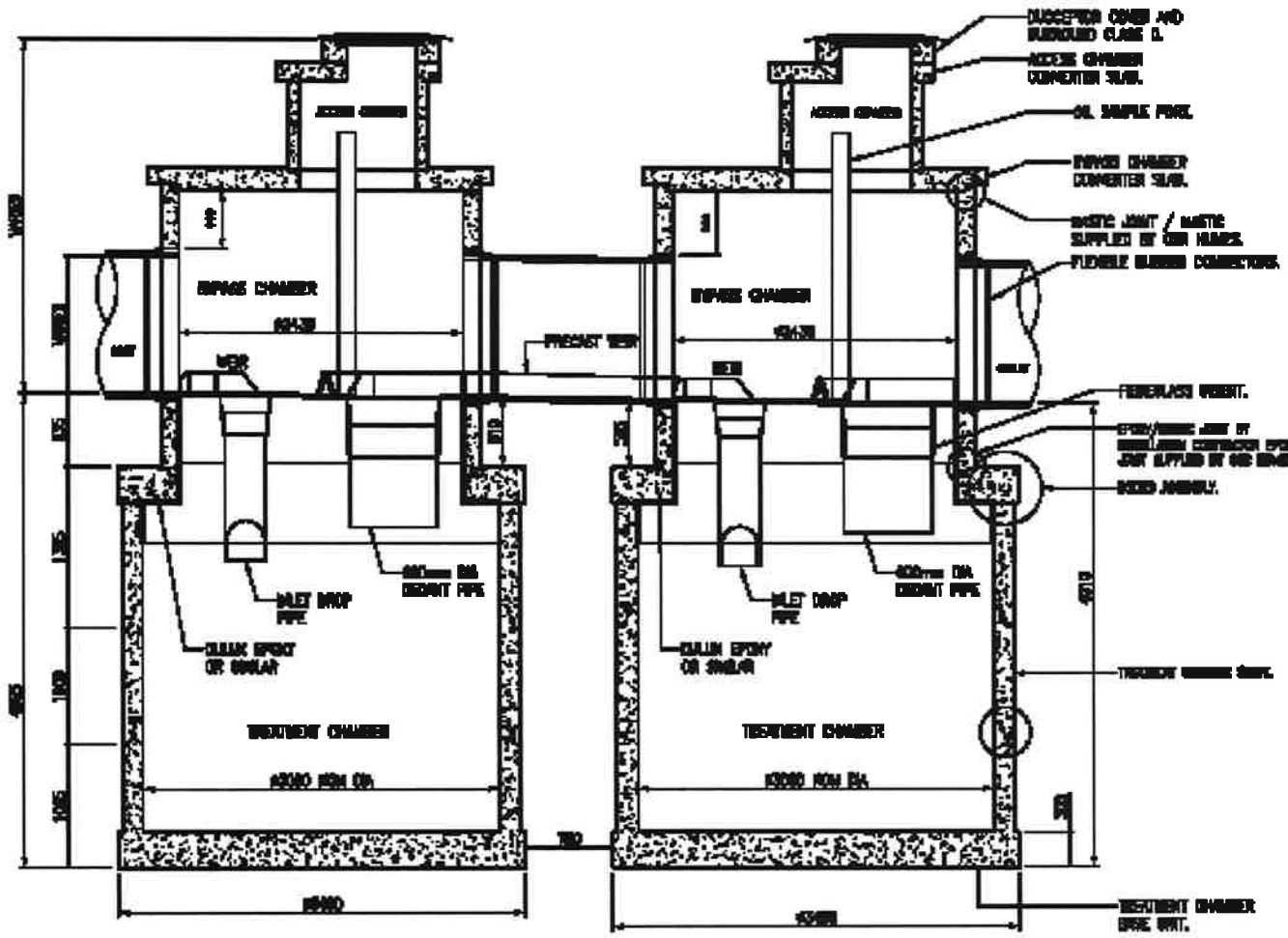
A2 HC-STC27-A D



FOR INFORMATION

NOT FOR CONSTRUCTION

Humes	N/A	DUOCEPTOR STC40	GENERAL ARRANGEMENT
		N/A	BIS-DUO-003
	A — ISSUE FOR CLIENT INFORMATION — JM — 25/10/07		A3 — A
	REVISION		

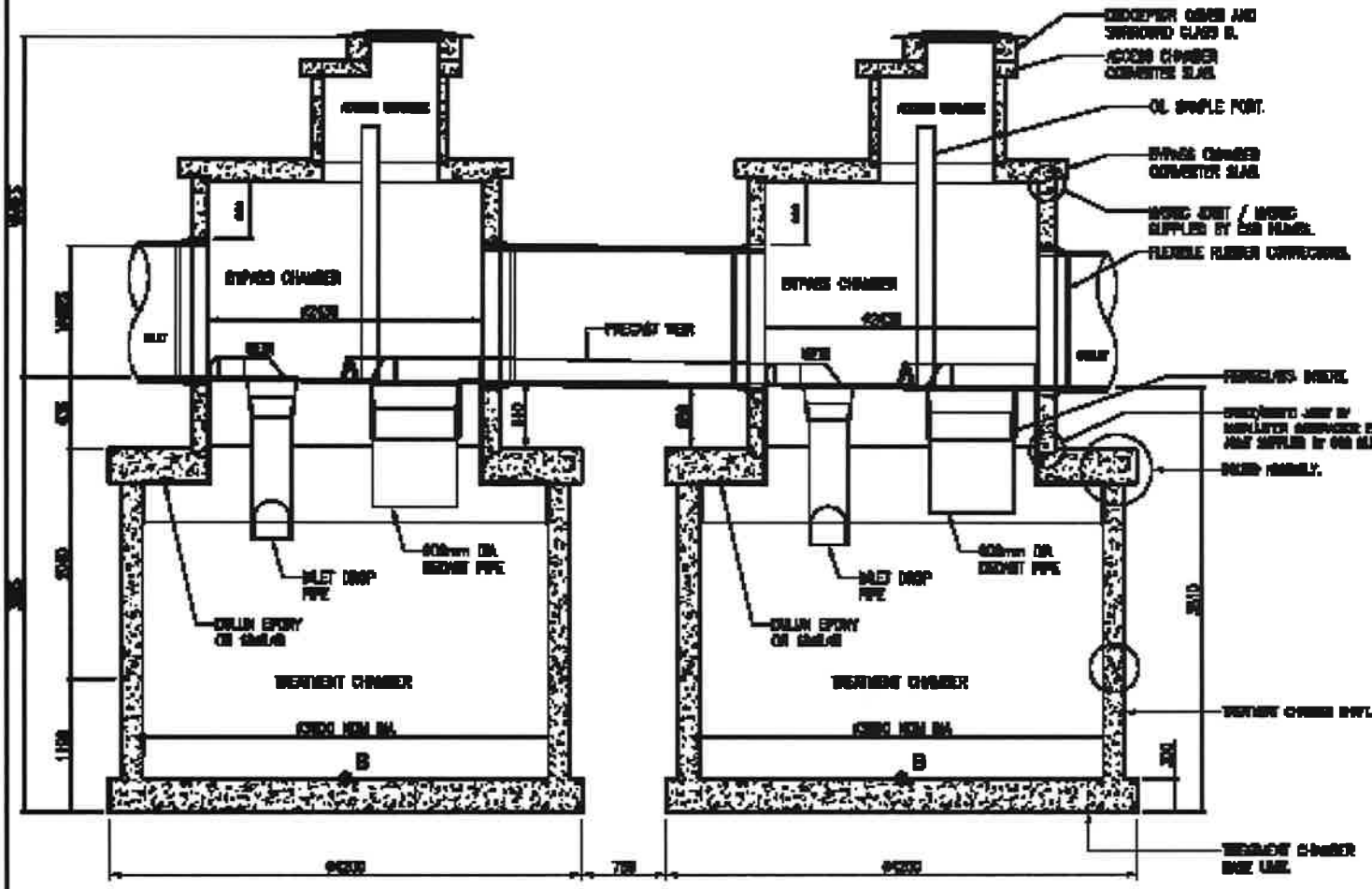


FOR INFORMATION

NOT FOR CONSTRUCTION

Humes

N/A				DUOCEPTOR STC50	GENERAL ARRANGEMENT
					BIS-DUO-002
	A	ISSUE FOR CLIENT INFORMATION	JDH		
	MARK	REVISION	INITIAL	DATE	
				N/A	A3 A



FOR INFORMATION

NOT FOR CONSTRUCTION

Humes

N/A			DOUCEPTOR STC60	GENERAL ARRANGEMENT
			N/A	DS-DUO-001
	A	ISSUE FOR CLIENT APPROVAL	JAN	
	MARK	REVISION	INITIAL	DATE

Humes
Water Solutions

HumeCeptor® system design request form

Humes
Holcim (Australia) Pty Ltd
ABN 87 099 732 297
18 Little Cribb st
Milton QLD 4064
Australia

Phone (07) 3364 2800
Fax (07) 3364 2835
www.humes.com.au

Project information

Date: _____
Project number: _____
Project name: _____
City/Town: _____
Development type: _____
State: _____

Total drainage area: _____ Hectares
Impervious _____ %
Upstream quantity control (A2): YES NO
Is the unit submerged (C4): YES NO
Describe land cover: _____
Describe land use: _____

A. Design for Total Suspended Solids (TSS) removal

Units are sized for TSS removal. All units are designed for spills capture for hydrocarbon with a specific gravity of 0.86.

A1. Identify Water Quality Objectives (WQO):

Desired Water Quality Objective: _____ % Annual TSS removal

A2. If upstream quantity control exists, identify stage storage and discharge information:

	Elevation (m)	Storage (m^3)	Discharge (m^3/s)
Permanent water level			
5 years			
10 years			
25 years			
100 years			

A3. Select particle size distribution:

• Fine distribution

Particle size um	Distribution %
20	20
60	20
150	20
400	20
2,000	20

• Coarse distribution

Particle size um	Distribution %
150	60
400	20
2,000	20

• User defined particle size distribution
identify particle size distribution
(please contact your local HumeCeptor® representative)

Particle size um	Distribution %	Specific gravity

A4. Input all parameters from items A1 to A3 into the HumeCeptor® system PCSWMM program to select the model that meets the water quality objective.

Summary of HumeCeptor® system requirements for TSS removal

HumeCeptor® model: _____
Annual TSS removed: _____ %
Annual runoff captured: %

B. Design for hydrocarbon spills capture only

B1. Identify Water Quality Objectives (WQO)

Desired volume of hydrocarbon storage _____ Litres
Type of hydrocarbon: _____
Specific gravity: _____ Unitless

B2. Select the HumeCeptor® system unit that provides the minimum volume of oil storage desired and contact Humes Water Solutions.

Summary of HumeCeptor® system requirements for spills capture

HumeCeptor® model: _____
Total volume of oil storage Litres

C. HumeCeptor® system siting considerations

C1. Difference between inlet and outlet invert elevations:

Number of inlet pipes	Inlet unit STC 2	In-line STC 3 to STC 27	Series STC 40 to STC 60
One	75 mm	25 mm	75 mm
>1	75 mm	75 mm	N/A

C2. Other considerations:

Minimum distance from top of grade to invert elevation	1.2 m
Bends:	The inlet and standard HumeCeptor® system units can accommodate turns to a maximum of 90 degrees
Multiple inlet pipe:	Yes for inlet and standard HumeCeptor® system units. Recommended maximum of two pipes where possible.
Inlet covers	Only the STC 2 can accommodate a catch basin frame and cover.

C3. Standard maximum inlet and outlet pipe diameters:

Inlet/outlet configuration	Inlet unit STC 2	In-line STC 3 to STC 27	Series STC 40 to STC 60
Straight through	600 mm	1,050 mm	2,400 mm
Bend	450 mm	825 mm	1,050 mm

Please contact Humes Water Solutions for larger pipe diameters.

C4. Submerged conditions:
A unit is submerged when the standing water elevation at the proposed location of the HumeCeptor® unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact Humes Water Solutions for further assistance.

Humes
Water Solutions

HumeCeptor® system quotation and order form

Humes
Holcim (Australia) Pty Ltd
ABN 87 099 732 297
18 Little Cribb st
Milton QLD 4064
Australia

Phone (07) 3364 2800
Fax (07) 3364 2835
www.humes.com.au

Quotation No: _____
Date: _____

Project information:

Project number: _____
Project name: _____
Closing date: _____
Jobsite address: _____
State: _____

Contractor information

Contact name: _____
Company: _____
Phone No: _____
Fax No: _____
E-mail: _____

Consultant information:

Contact name: _____
Company: _____
Phone No: _____
Fax No: _____
E-mail: _____

Owner information (required for maintenance):

Contact name: _____
Company: _____
Phone No: _____
Fax No: _____
E-mail: _____

Land Use (Check one):

- Commercial
- Gas station
- Government
- Industrial
- Military
- Street
- Residential
- Transportation
- Other _____

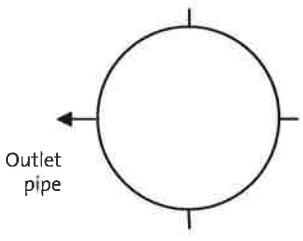
HumeCeptor® system information

Structure No.: _____
Top of grate elev.: _____
Outlet invert elev.: _____
Inlet invert elev.: _____
Catchment area _____
Impervious % _____
Outlet pipe material and diameter: _____
Inlet pipe material and diameter: _____

HumeCeptor® model required (circle model number)

Inlet system

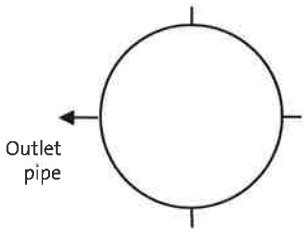
STC 2



Show orientation of inlet pipe

In-line system

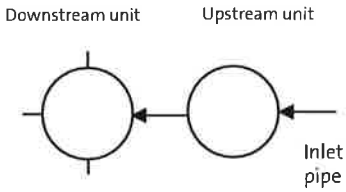
STC 3 | STC 5 | STC 7
STC 9 | STC 14 | STC 18
STC 23 | STC 27



Show orientation of inlet pipe

Series system (DuoCeptor™)

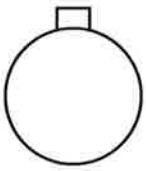
STC 40 | STC 50
STC 60



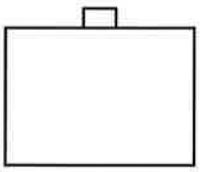
Show orientation of outlet pipe on downstream unit

HumeCeptor® MAX

Select configuration of treatment chamber



Cylindrical



Rectangular

Chamber volume: _____
Model number: _____

Precast solutions

Stormwater

Stormwater treatment

Primary treatment

- HumeGard® Gross Pollutant Trap

Secondary treatment

- HumeCeptor® hydrodynamic separator

Tertiary treatment

- HydroFilter® system
- JellyFish® filter
- HumeGarden™ biofilter

Detention and infiltration

StormTrap® system

Soakwells

Harvesting and reuse

RainVault® system

ReserVault® system

RainVault® Mini system

Precast concrete cubes

Segmental shafts

Precast concrete tanks – above ground

Stormwater drainage

Steel reinforced concrete pipes – trench

Steel reinforced concrete pipes – salt water cover

Steel reinforced concrete pipes – jacking

Corrugated Metal Pipe (CMP)

Box culverts

Uniculvert® modules

Headwalls

Stormwater pits

Access chambers/Manholes

Kerb inlet systems

Floodgates

Geosynthetics

Sewage transfer and storage

Bridge and platform

Tunnel and shaft

Walling

Potable water supply

Irrigation supply

Traffic management

Cable and power management

Rail

Livestock management

Top:
StormTrap® system

Middle:
RainVault® system

Bottom:
Segmental shaft

Contact information

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humeswatersolutions.com.au
info@humeswatersolutions.com.au

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