# Stormwater & Drainage Management Plan
# Former Hoxton Park Airport Site
# Cowpasture Road, Hoxton Park

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Prepared on behalf of Mirvac Projects Pty Limited

*June 2010 – Revision B*


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# Document Control Sheet

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# Executive Summary

This Stormwater and Drainage Management Plan (SWMP) has been prepared as required by the conditions of Development Consent 10_0008-Infrastructure. As part of these conditions, a SWMP is to be submitted to the Director-General at least one month prior to the completion of the stormwater and drainage system.

This SWMP has been prepared in consultation with Liverpool City Council (LCC) and in accordance with DECCW's 'Managing Urban Stormwater' guidelines and Council's Trunk Drainage Scheme(s).

The construction process of the main stormwater infrastructure, as well as details of the trunk drainage line, onsite stormwater network and water quality issues have been covered in this report.

The proposed trunk drainage line controlling and conveying stormwater from the west of the M7 has been designed to convey 1.5 times the peak 1:100 year ARI storm discharge to the existing outlet under Cowpasture Road. This drainage line consists of underground pipes, box culverts and a number of specifically designed pits. A berm will be constructed on top of the trunk drainage line to direct any runoff in excess of the trunk line capacity. This berm isolates "clean" runoff from the M7 and upstream catchments from the site and also provides a direct path to the downstream outlet under Cowpasture Road.

The onsite drainage design for the Big W and Dick Smith Electronics (DSE) developments has been undertaken by Costin Roe Consulting with an associated Stormwater Management Plan prepared by Parsons Brinkerhoff. The internal stormwater drainage network within these sites has been designed to safely convey the 1:20 year ARI storm event. Secondary flow paths have been incorporated to direct flows from larger storm events into the trunk drainage infrastructure.

The majority of the stormwater runoff from the Big W and DSE developments will be conveyed into drainage lines within proposed road reserves where it is then transferred to Hitchinbrook Creek to the east. The remainder will be directed into the proposed trunk drainage line which transfers water into the regional detention basin to the south.

The drainage lines within the proposed roads have been designed to convey all internal flows form the proposed development as well as runoff from the road area. This flow will then be directed through Gross Pollutant Traps (GPT'S), open drainage paths and into Hitchinbrook Creek.

This report also details a staged development plan for the stormwater network which sets out a logical sequence of events for the construction of the trunk drainage and main stormwater lines. The main items addressed by this plan are to isolate the "clean" run-on water from the untreated runoff water during construction and to provide suitable treatment of the runoff water prior to it leaving the site.

Water quality issues pre, during and post construction have also been investigated in this plan. The site topography has meant that permanent sedimentation basins and swales were not feasible for this site and hence Gross Pollutant Traps have been designed to treat stormwater runoff from a water quality standpoint.

The provision of GPT units within the Big W and Dick Smith areas and at the outlet of the stormwater system into Hinchinbrook Creek maximises the water quality improvements possible for the site.

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APPENDICES

# 1.0 Introduction

ADW Johnson was engaged by Mirvac Projects Pty Limited to prepare a SWMP for the proposed industrial development of the former Hoxton Park Airport site off Cowpasture Road, Hoxton Park NSW. The site is within the Liverpool Council Local Government Area and hence stormwater is to be dealt with by Liverpool City Council.

The project involves the construction of distribution warehouses for Big W and Dick Smith Electronics (DSE), as well as associated carparking, access roads, utility services and creation of a third allotment for future industrial development purposes.

The development has been approved, subject to satisfaction of conditions, under Part 3A of the Environmental Planning and Assessment Act 1979 (Act). One of the conditions of consent is to prepare and implement a Stormwater and Drainage Management Plan for the project to the satisfaction of the Director-General of the Department of Planning.

ADW Johnson has consulted Council about their requirements for the alteration of the existing trunk drainage line and general stormwater drainage issues on the site. Council indicated that public safety is paramount as well as aesthetics, operating and maintenance costs. Council has also advised that onsite detention facilities are not required as the site is at the lower end of the major drainage line and immediately upstream to an existing regional detention area.

Conditions of the development consent also require the management of the 1:100 year ARI storm flows from under the M7 currently draining across the site. The proposed trunk drainage design has been developed collaboratively with LCC to their satisfaction. A copy of their advice of general acceptance is shown in Appendix A.

# 2.0 Site Description

The site is located on part of the former Hoxton Park Airport at Hoxton Park, NSW. The site is bounded to the north by largely vacant and grassed land of the former airport, to the east by Hitchinbrook Creek, to the south by Cowpasture Road and to the west by the M7 motorway.

The proposed development consists of an area of approximately 50 hectares, with access currently provided via a bitumen road off a temporary signalised intersection on Cowpasture Road. The location of the site can be seen in Figure 1.

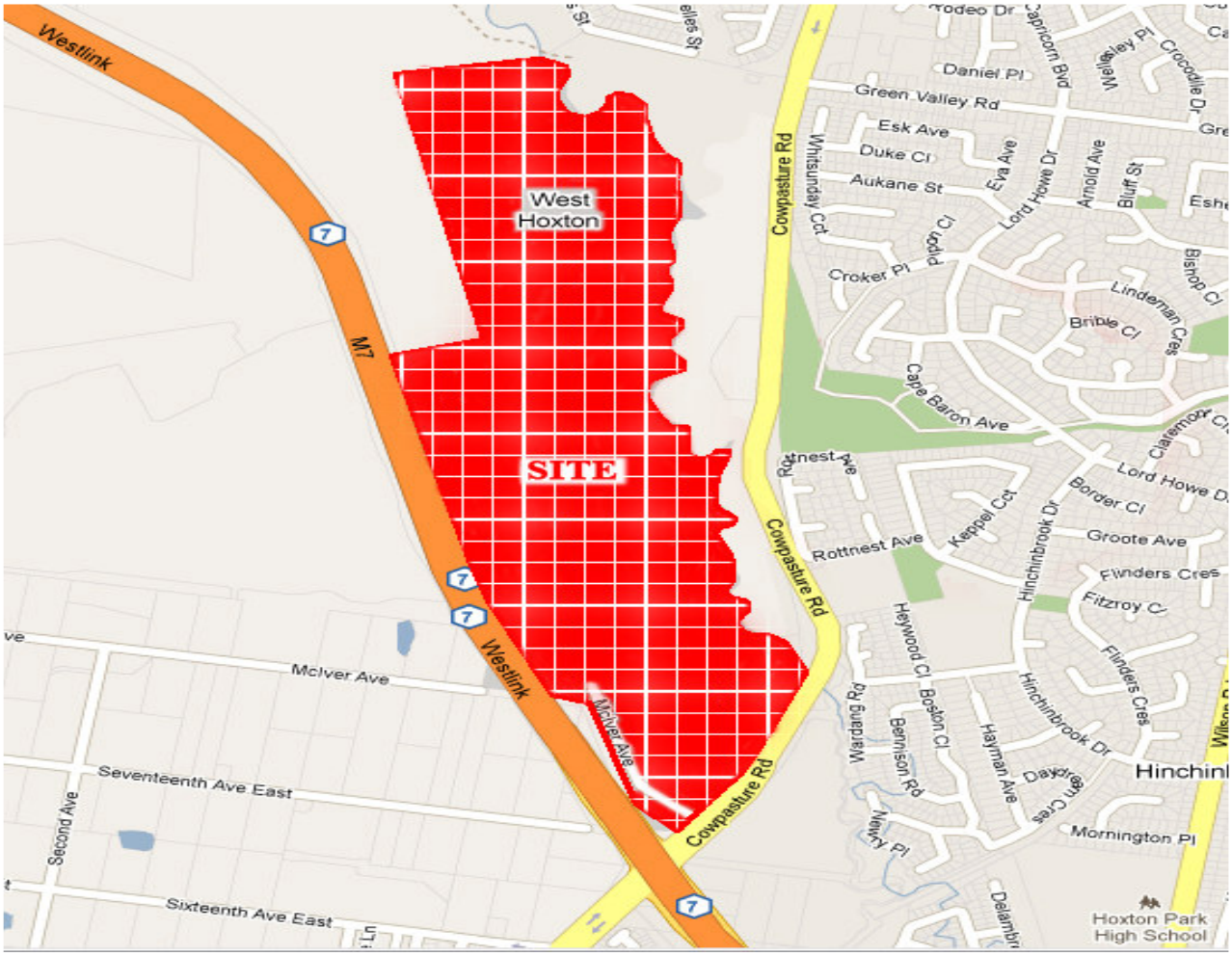



Figure 1 – Site Location
(Background Sourced off Google Maps)

Currently the land is unoccupied and open. A new industrial building has been constructed on adjoining land (lot 401, D.P. 1141990) adjacent to the western side of the intersection between proposed roads 2 and 3.

The general topography of the site is flat with general surface grades of approximately 1% toward Hitchinbrook Creek. The eastern half of the site generally drains through existing flow paths into Hitchinbrook Creek, whilst the western portion of the site drains through an artificial pipe and open channel network and ultimately discharges under Cowpasture Road. An open channel through the south western portion of the site conveys flows from the M7 and upstream reaches of the catchment and forms part of Council's trunk drainage scheme for the area along with the stormwater drainage for the M7.

The site is largely cleared of vegetation and generally covered in grasses, with the exception of the area adjacent to Hitchinbrook Creek, which has vegetation lining its banks and nearby surrounds. An aerial view of the site appears in Figure 2.

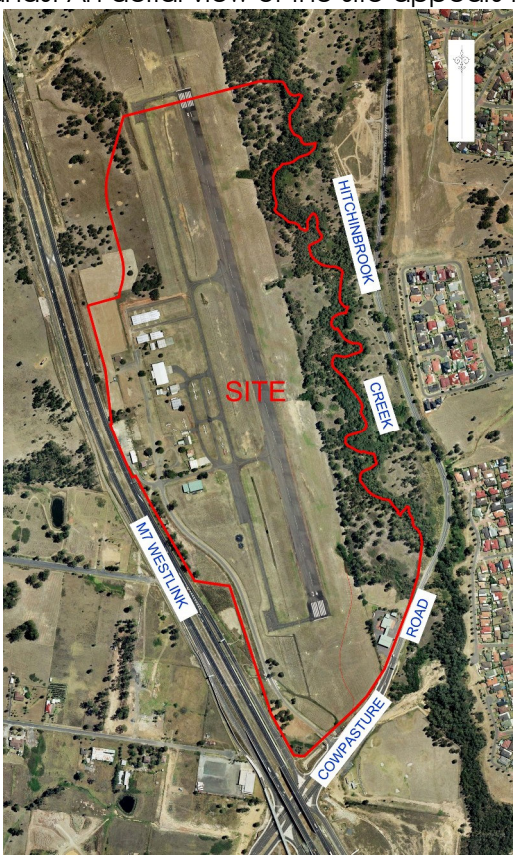



Figure 2 – Aerial View
(Aerial image sourced off Google Earth)

# 3.0 Trunk Drainage – S1/S2

Currently an open drainage channel passes through the south western area of the site which conveys storm flows from the M7 and upstream catchments to the existing downstream outlet under Cowpasture Road. This open drainage channel forms part of a trunk drainage line for the area, however will ultimately be removed as part of the proposed development and hence a suitable alternate option has been designed as part of this development. A diagram showing this information can be seen in Figure 3.

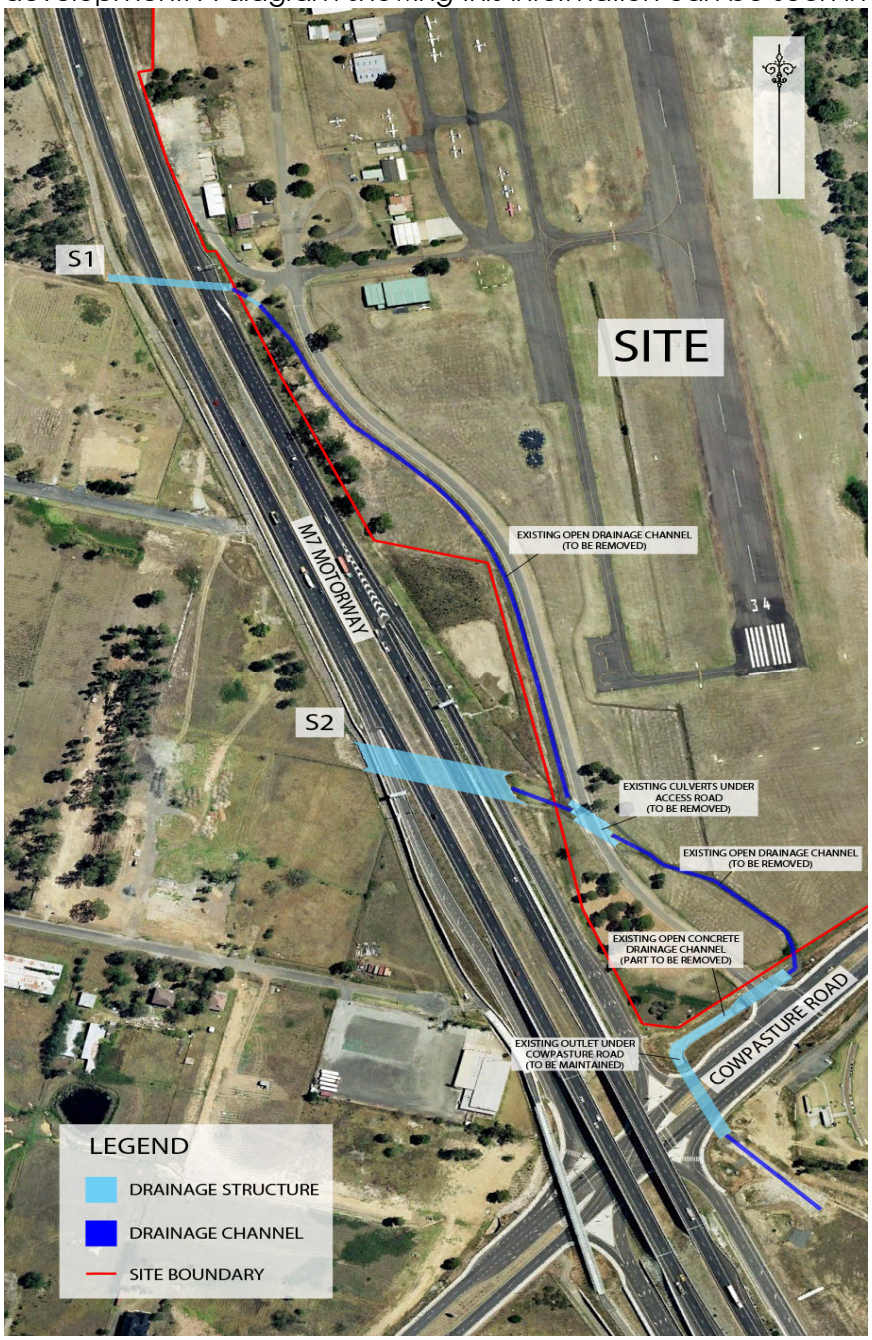



Figure 3 – Existing Trunk Drainage Line

During the course of design, three possible options for replacing the current S1 and S2 drainage routes were investigated and assessed. A summary of each appears below:

## 3.1 Open 'Soft' Channel

In accordance with water sensitive urban design (WSUD) principles, a turfed/vegetated open channel throughout the proposed trunk drainage length was investigated. The key criteria when assessing this option was to keep velocities within the channel less than about 2m/s to limit scouring and maintenance, and to keep the velocity depth product less than 0.4 for safety purposes.

Hydraulic analysis of the trunk drainage line was undertaken and it was determined that a soft lined open channel is not feasible for this project due to the large upstream discharges from under the M7. These large volumes of flow render an open 'soft' channel option unfeasible do to resulting scour and hazard category issues. Given that there are existing and proposed water quality control ponds upstream of the M7, there would also be no significant water quality benefit in a turf lined channel.

## 3.2 Open Concrete Channel

In order to try and contain major flows aboveground, the use of concrete open channels was also investigated. Whilst channel widths were reduced, due to having vertical channel walls, there was still a safety problem due to the velocity x depth product exceeding 0.4 at the downstream end of the network. This could be partly addressed by installing suitable fencing throughout its length to prevent public access, however this would also incur a significant cost. The general aesthetics of a large concrete channel adjacent to developed areas could also be a deterrent for future investors. It is also likely to attract further pollutants into the stormwater system through dumping of rubbish into the channel.

For these reasons the option of an open concrete channel to convey major storm flows in the trunk drainage network was not pursued further.

## 3.3 Underground Network

Due to the limitations that open channels posed it was decided to convey all trunk drainage flows through a series of pipes and box culverts. All members were sized to accommodate the 1:100 year peak discharges with a 50% redundancy (in accordance with LCC's requirements). Due to the quantum of flows from the west of the M7 S1 and S2 inlets, had to be designed and detailed specifically for this project. Refer to Figure 3 for the S1 and S2 locations.

The design allows for all runoff from 1.5 times the 1:100 year ARI storm event peak discharges being conveyed below ground in the trunk drainage network. A berm will be constructed on top of the trunk drainage line in order to convey any excess flows associated with rare storm event.
This berm will also keep any excess "clean" water from the M7, S1 and S2 isolated during these extreme storms from entering the site.

The outlet of the trunk drainage line discharges into an existing concrete channel and then into to two existing 3m x 1.8m box culverts which pass under Cowpasture Road and into a regional detention basin. The proposed twin trunk drainage box culverts will meet the channel at the existing invert level to ensure a smooth flow transition.

All trunk drainage has been sized to accommodate the 1:100year ARI design storm flows with a 50% redundancy applied. A diagram showing the trunk drainage network and adopted flow rates can be seen in Figure 4.

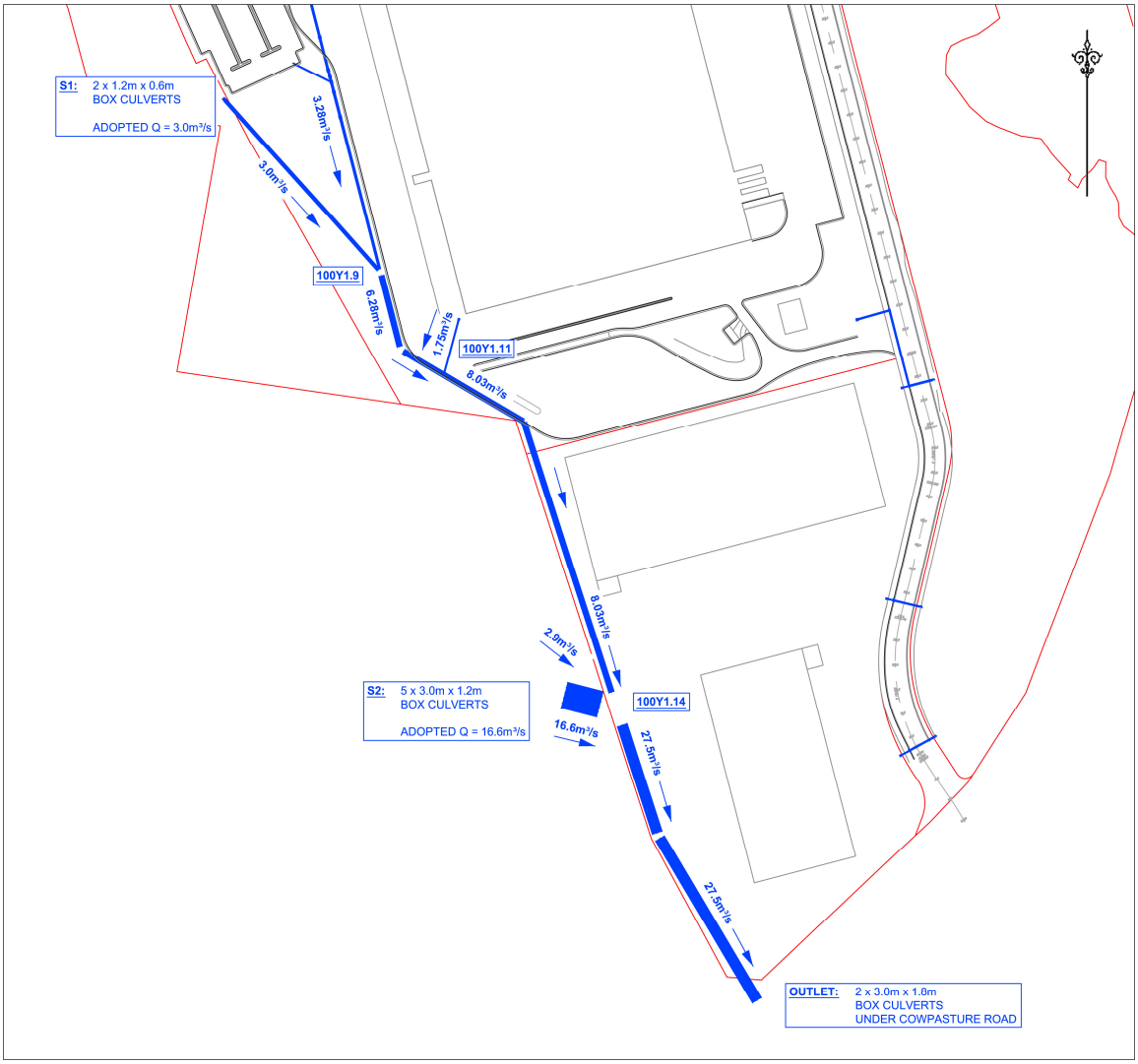



Figure 4 – Proposed Trunk Drainage Network

The redundancy was achieved by sizing each segment of the trunk drainage line to accommodate 1.5 times the predicted peak 100year ARI flows. Flow rates used for the design are as follows:

- S1: Adopted flowrate, Q = 3.0m$^3$/s. This flow rate was determined by the ABIGroup Joint Venture as the capacity of the 2x1.2mx0.6m box culverts under the M7 in the Management Strategy report for Middleton Grange. The 1:100year ARI flow rate was stated as 1.81m$^3$/s in that same report. Due to the small difference between 1.5 times this flowrate and the stated capacity of the culverts, the capacity flow rate was adopted for downstream design.

- 100Y1.9: This point is the junction pit for the inflow from S1 and a large portion of the runoff from the Big W development. The inflow into the pit from S1 is 3.0m$^3$/s, as stated above. The inflow from the Big W development was adopted as 3.28m$^3$/s. This was calculated from 1:100year ARI discharges provided by Costin Roe Consulting's internal stormwater design for the Big W development.

  1:100year ARI discharges were again multiplied by 1.5 in order to achieve the redundancy target throughout the trunk drainage system. Hence, the total outflow from Pit 100Y1.9 is 6.28m$^3$/s (including 50% redundancy).

- 100Y1.11: At this pit, roof runoff from the Big W development enters the trunk drainage system. The 1:100year ARI peak discharge for the roof runoff was provided by Costin Roe Consulting as 1.75m$^3$/s. This discharge was not multiplied by 1.5 as upstream Big W internal stormwater drainage components are unlikely to be able to convey over the 100year ARI discharge. Hence, the total outflow from Pit 100Y1.11 is 8.03m$^3$/s (including 50% redundancy for the main trunk drainage line).

- 100Y1.14: This pit is a main junction pit where flows from S2, M7 and upstream trunk drainage combine. The S2 inflow into the pit was adopted as 16.6m$^3$/s. This was based upon the peak 1:100year ARI discharge of 11.1m3/s (stated in the Management Strategy report for Middleton Grange) multiplied by 1.5. It should be noted that the capacity of S2 is stated as 24.9m$^3$/s in that same report. From this it appears that S2 may have been sized for an extremely rare storm event and is excessively conservative in isolation from the design brief. Hence, the downstream trunk drainage was designed for 1.5 times the 1:100year ARI peak discharge and not for the capacity of the culverts. The pit was also sized to accommodate runoff from the pavement of the M7, as it is currently conveyed through a pipe and open channel system which ultimately discharges at S2. A flow rate of 2.9m$^3$/s was adopted for this M7 runoff based upon pipe capacities determined from Work As Executed information for the M7. The pit also has upstream inflow from the trunk drainage system of 8.03m$^3$/s. Hence the total discharge into this pit used for design was 27.5m$^3$/s (including 50% redundancy).

  In this case of an extremely rare storm event in which the capacity of 100Y1.14 is exceeded, then a berm, which is to be constructed above the trunk drainage line, will divert excess stormwater to the outlet at Cowpasture Road.

- **Outlet:** The outlet for the trunk drainage system is existing twin 3m x 1.8m box culverts under Cowpasture Road. A downstream water level of 33.8m was adopted for design purposes. This level was based upon TuFlow modeling undertaken by URS for the regional 1:100year ARI storm event.

# 4.0 Onsite Drainage – Within Big W & DSE Lots

The internal stormwater drainage for the Big W and DSE developments was designed by Costin Roe Consulting and a subsequent Stormwater Management Plan was prepared by Parsons Brinkerhoff (PB). The majority of the internal drainage lines were designed to convey the 1:20 year ARI peak discharges through the system and then into the street/trunk drainage network. Once within the street drainage lines, stormwater is then conveyed into Hitchinbrook Creek by a number of outlets under proposed Road 1. The flooding behaviour of Hitchinbrook Creek was modelled by URS and detailed in their report entitled "Hoxton Park Airport – Hydraulic Modelling of Flooding, 13 September 2006". This study was to determine if there were any adverse impacts of developing the site in a regional flood plain context and recommended any mitigation measures. The results of this study were also used to define the boundaries for the rezoning of the land. Cowpasture Road was later upgraded and further modelling work was undertaken by Golder Associates (Golders) as subconstractors to URS and a report was prepared by Golders entitled "Hydraulic Analysis of Cowpasture Road at Hoxton Park, April 2008". The purpose of this modelling was to validate the RTA upgrade works to Cowpasture Road and did not alter the development footprint envisaged for the industrial lands on the former Hoxton Park Airport from the URS rezoning study.

The model was run for the critical 1:100 year ARI event by Golders, and the results were then overlaid over the finished surface model developed by ADW Johnson. The results indicated that the proposed roads and proposed floor levels of the Big W and DSE buildings are above the 1:100 year flood affectation.

Previous discussions with Council revealed that stormwater detention, and hence post development flow rates, did not require further consideration. The western portion of the Big W site discharges runoff directly into the trunk drainage line, whilst the eastern side of the Big W site and the DSE development discharge under proposed Road 1 and into Hitchinbrook Creek.

The stormwater drainage within the proposed carpark to the west of the Big W development has been designed to convey the 1:20 year ARI storm event. Should a 1:100 year ARI storm event occur, the carpark has been shaped to act as a secondary flow path and divert all flows to the south east corner where it should enter a pipe and into the trunk drainage system, or overtop the kerb and flow over an open channel and enter the trunk drainage system via a pit further downstream. A diagram showing this information can be seen in Appendix A.

A trapped low point exists in the internal accessway to the Big W development near the receiving goods area. As a trapped low point was unavoidable due to the development footprint, the downstream drainage line was designed to cater for all but an extreme storm event. A pit is proposed to be installed in this low point and a pipe line capable of conveying 1.5 times the peak 1:100 year ARI discharges installed to transfer resulting runoff water into the trunk drainage system.

The DSE carpark stormwater drainage network has also been designed to convey flows up to the 20 year ARI storm. Storm flows up to the 1:100 year ARI event will be diverted over the carpark to the eastern end where it will be convey through a series of pipes until it discharges under proposed road 1 and into Hitchinbrook Creek. The pipe system at the eastern end of the carpark has been designed to convey flows up to 1.5 times the calculated peak 1:100 year ARI discharge as in accordance with Council's requirements. A diagram showing this information can be seen in Appendix A.

Footpaths and surfaces have been designed to direct any excess stormwater to proposed Road 1 and hence into Hitchinbrook Creek.

# 5.0 Water Quality

Due to the size and nature of the development there are a number of water quality issues that are to be addressed pre, during and post construction.

## 5.1 Water Quality Pre Construction

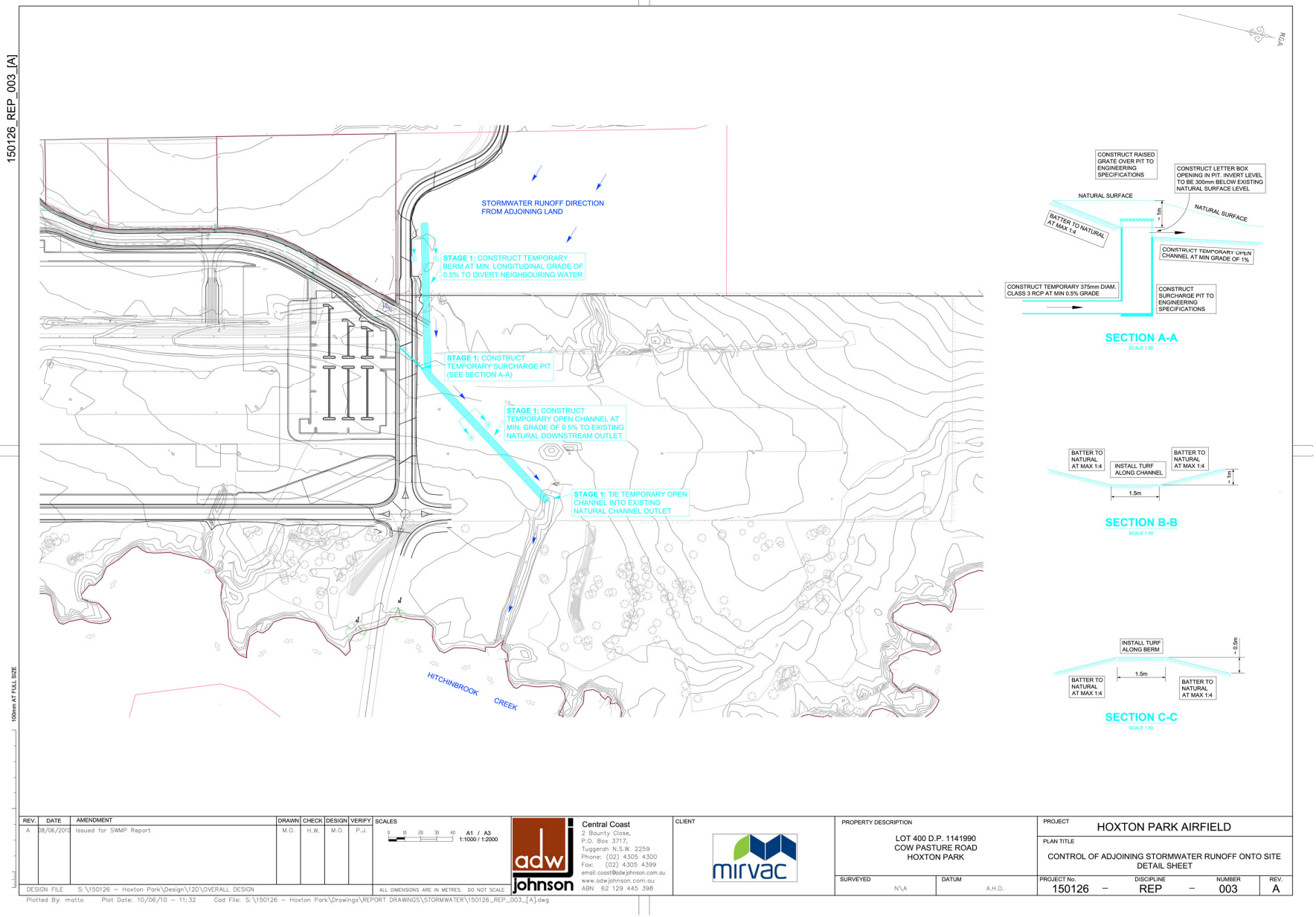
Due to the extensive amount of bulk earthworks associated with this development and the existing soil present, the site is highly susceptible to erosion and hence sediment loss through the resultant runoff water. A large portion of this runoff water could flow from the site directly into Hitchinbrook Creek, and if untreated, could impact on the existing environment. Due to this potential hazard a number of erosion and sediment control measures have been implemented to control and treat runoff water prior to it leaving the site.

Proposed Road 1 is aligned north/south on the eastern side of the site and is adjacent to Hitchinbrook Creek. Prior to commencement of construction works a temporary siltation fence is to be erected along the bottom of the existing fence to the east of the proposed road. Minor regrading works will be required to ensure runoff flows from the north in a southerly direction to a temporary sediment basin to be built in the vicinity of the existing service station. A water diversion system will be erected to direct runoff into the sediment basin. Hay bales and/or sandbags are to be installed along the length of the siltation fence to control minor flows prior to entering the basin. Runoff will be detained and treated within the basin prior to it being released and conveyed through existing culverts under Cowpasture Road.

The proposed DSE and Big W developments are on the western side of proposed Road 1. Due to the large amount of stripping and earthworks, there is potential for the runoff from this development to contain significant amounts of sediment. A diversion drain will be installed on the western side of proposed Road 1 for the length of these works to capture and convey runoff to another temporary detention basin to be built on land to the south of the Big W site. The diversion drain is to be built in accordance with Council's specifications and the "Blue Book".

The temporary detention basin will detain and treat the runoff prior to discharging through a permanent pipe crossing under proposed Road 1, into a natural drainage channel and ultimately into Hitchinbrook Creek.

Another important factor in water quality control is to isolate the site by diverting clean upstream run on water around or through the development where possible. The site currently receives clean run on water from adjoining land to the west and north west. A temporary berm will be constructed along part of the northern side of proposed Road 2 in order to divert flow from the vacant land to the north west into a temporary open channel running to the north east and into a natural drainage line of Hitchinbrook Creek. This temporary open channel will be further utilised to convey runoff from adjoining land on the western side of proposed Road 3 upon completion of Stage 1 and 2 construction works. Details of this can be seen in Figure 5.


150126_REP_003_[A]
100mm AT FULL SIZE
N.G.A.
STORMWATER RUNOFF DIRECTION FROM ADJOINING LAND
STAGE 1: CONSTRUCT TEMPORARY BERM AT MIN. LONGITUDINAL GRADE OF 0.5% TO DIVERT NEIGHBOURING WATER
STAGE 1: CONSTRUCT TEMPORARY SURCHARGE PIT (SEE SECTION A-A)
STAGE 1: CONSTRUCT TEMPORARY OPEN CHANNEL AT MIN. GRADE OF 0.5% TO EXISTING NATURAL DOWNSTREAM OUTLET
STAGE 1: TIE TEMPORARY OPEN CHANNEL INTO EXISTING NATURAL CHANNEL OUTLET
HITCHINBROOK CREEK
CONSTRUCT RAISED GRATE OVER PIT TO ENGINEERING SPECIFICATIONS
CONSTRUCT LETTER BOX OPENING IN PIT. INVERT LEVEL TO BE 300mm BELOW EXISTING NATURAL SURFACE LEVEL
NATURAL SURFACE
BATTER TO NATURAL AT MAX 1:4
1m
NATURAL SURFACE
CONSTRUCT TEMPORARY OPEN CHANNEL AT MIN GRADE OF 1%
CONSTRUCT TEMPORARY 375mm DIAM. CLASS 3 RCP AT MIN 0.5% GRADE
CONSTRUCT SURCHARGE PIT TO ENGINEERING SPECIFICATIONS
SECTION A-A
SCALE 1:50
BATTER TO NATURAL AT MAX 1:4
INSTALL TURF ALONG CHANNEL
BATTER TO NATURAL AT MAX 1:4
1m
1.5m
SECTION B-B
SCALE 1:50
INSTALL TURF ALONG BERM
0.5m
1.5m
BATTER TO NATURAL AT MAX 1:4
BATTER TO NATURAL AT MAX 1:4
SECTION C-C
SCALE 1:50
REV. A
DATE 08/06/2010
AMENDMENT Issued for SWMP Report
DRAWN M.O.
CHECK H.W.
DESIGN M.O.
VERIFY P.J.
SCALES 0 10 20 30 40 A1 / A3 1:1000 / 1:2000
DESIGN FILE S:\150126 – Hoxton Park\Design\12D\OVERALL DESIGN
ALL DIMENSIONS ARE IN METRES. DO NOT SCALE.
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CLIENT
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PROPERTY DESCRIPTION
LOT 400 D.P. 1141990
COW PASTURE ROAD
HOXTON PARK
SURVEYED N\A
DATUM A.H.D.
PROJECT HOXTON PARK AIRFIELD
PLAN TITLE CONTROL OF ADJOINING STORMWATER RUNOFF ONTO SITE DETAIL SHEET
PROJECT No. 150126 – DISCIPLINE REP – NUMBER 003 REV. A
Plotted By: matto Plot Date: 10/06/10 – 11:32 Cad File: S:\150126 – Hoxton Park\Drawings\REPORT DRAWINGS\STORMWATER\150126_REP_003_[A].dwg

Figure 5

## 5.2 Water Quality During Construction

Various measures will be implemented during construction to minimise effects on runoff water quality. Regular inspections and maintenance of diversion drains, siltation fencing and detention basins are required to be undertaken to ensure they are operating efficiently. Wash down of concrete trucks will not be permitted on the site where such wash down could enter Hitchinbrook Creek or Council gutters, pits or drains. Any temporary stock piles will have appropriate siltation fencing and hay bales wrapped in geofabric around its base perimeter to improve runoff quality.

Part of the proposed Stage 1 and 2 drainage works involves construction of the stormwater line within proposed road 3 which will convey clean runoff from the adjacent sites to the west into the temporary open channel to the north of proposed road 2. This will ensure that clean runoff is isolated from the site and into receiving waters. All works will also be carried out in accordance with an approved Environmental Management Plan to be prepared by the contractor.

The proposed trunk drainage line to be constructed in the south west area of the site has been designed and staged so as to provide separate routes for the clean run on entering the site from under the M7. These routes consist of existing open channels, proposed swales, temporary sediment basin, pipes and box culverts. This staging allows the clean runoff from the site entering the downstream receiving waters.

## 5.3 Water Quality Post Construction

In order to ensure the long term effects of the development on the downstream water quality are minimised, a number of Gross Pollutant Traps (GPTs) are to be installed to treat runoff before it leaves the site. The use of basins and swales was considered in order to remove dissolved nutrients, however they were found to be unfeasible due to site constraints. Due to the very flat gradients, it is not possible to discharge piped water into surface swales.

The treatment of stormwater runoff within the proposed Big W and DSE sites was carried out by Parsons Brinkerhoff (PB), with results being detailed in their report titles "Stormwater Management plan for Proposed Warehouse and Distribution Facilities, Cowpasture Road, Hoxton Park" revision B, dated 19th May 2010.

The results of the PB investigation indicate the percentage removal rates for Total Suspended Solids, Total Nitrogen and Total Phosphorus were 69%, 33% and 32% respectively. Two of the GPT locations shown in PB's report have changed due to design alterations and final positions and specifications should be sourced from the approved engineering plans. The GPT's that will treat runoff from the Big W and DSE developments will be installed within their respective lots and will be maintained by Big W and DSE lots respectively. These GPT's will be inspected and maintained at regular intervals in accordance with Liverpool City Council's requirements and manufacturers recommendations.

Liverpool City Council will be responsible for the operating and maintenance requirements of one GPT on the eastern side of the site, at the northern end of proposed Road 1. This GPT will be transferred into Council's ownership upon registration of the associated plan of subdivision and approval of engineering works.

Some runoff from the proposed Big W development will enter the trunk drainage line at a junction pit downstream of the S1 inlet. This stormwater will be treated by means of passing through a GPT prior to entering the trunk drainage system. Due to the runoff from the site being treated and only being a small percentage of the total flow within the trunk drainage path, it is anticipated that water quality conditions currently existing the site at the end of this line should be generally maintained.

It is anticipated that by following the proposed treatment measures pre, during and post construction that any detrimental effects upon stormwater runoff quality should been minimised. Treatment of stormwater runoff from the developed site will be carried out by GPT units, with the proposed design only burdening Council with the ownership of one GPT unit. The remaining GPT's will fall under the ownership of Big W and DSE with inspection and maintenance programs being undertaken in accordance with Council's requirements.

# 6.0 SWMP – Construction Phase

ADW Johnson has prepared a Stormwater Management Plan to be incorporated during construction which divides the stormwater network up into a number of stages. A breakdown of each stage appears below. All construction is to be carried out in accordance with the approved engineering drawings. A set of drawings relating to the proposed stormwater construction stages, as detailed below, can be found in Appendix B.

## 6.1 Stage 1

The first stage of the development of the trunk drainage system involves construction of the twin 3m x 1.8m box culverts which convey stormwater flow through the south western corner of the site to the existing twin 3m x 1.8m box culverts under Cowpasture Road. The contractor shall reinstate the existing concrete open channel to accommodate the new twin 3m x 1.8m box culverts from the site.

A temporary diversion drain will be constructed on the western side of proposed road 1 in order to control stormwater runoff from the proposed Big W and DSE development sites. This diversion drain will transfer the runoff to a temporary sedimentation basin which is to be constructed as part of this stage of works. The water will be temporarily stored in this basin, where it will be treated and then the 'clean' water discharged under proposed Road 1 to the receiving watercourse. Appropriate siltation fencing and hay bales will be installed along the diversion drain and outside of the basin to further assist in controlling runoff by limiting flow velocities.

In order to prevent 'dirty' water from leaving the site during construction of proposed Road 1, a siltation fence will be installed onto the bottom of the existing wire mesh fence to the east of the proposed road. Some minor regrading may need to be undertaken in parts to ensure the runoff flows along the fence line and into another temporary sedimentation basin to the south. The 'clean' water leaving the temporary basin will flow into existing culverts under Cowpasture Road. Appropriate hay bales and additional silt fencing will be installed throughout the road length and around the basin to further assist in controlling runoff by limiting flow velocities.

The Stage 1 works will also incorporate constructing part of the stormwater drainage line within proposed Roads 2 and 3. Stormwater from the adjoining lots on the western side of Road 3 currently discharges onto the proposed development area. The new infrastructure to be built as part of this stage will divert this flow, through the new road stormwater network and into a temporary open channel to the north of proposed Road 2. The construction of this temporary open channel is to extend to natural low point to the east, where it will flow into Hitchinbrook Creek. Appropriate siltation fencing and hay bales will be installed along the length of the channel to assist in controlled runoff by limiting flow velocities.

A temporary berm will also be constructed to prevent external runoff from the adjoining land to the north west of proposed Road 2 from entering the site. The berm will direct this flow into the temporary open channel constructed to the north of proposed Road 2.

Currently stormwater runoff from the existing infrastructure on, and adjacent to the north west area of the site, discharges into a detention basin located to the east of the existing S1 outlet under the M7. An existing open channel conveys S1 flows in a southerly direction through the site. As part of this stage of works a temporary pipe is to be installed from the last pit before the existing basin to divert all runoff into the open channel from S1. This will allow for the existing detention basin to be removed and the area regraded.

A temporary berm around the boundary of the existing service station to the south east of the site currently prevents runoff from the site flowing onto its land. This existing berm will be raised to a height of approximately 1m as part of the Stage 1 works in order to minimise effects on the service station, should a major storm event occur during construction.

## 6.2 Stage 2

Part of Stage 2 works is to construct the major pit at the S2 inlet of flow from under the M7 in accordance with the approved engineering plans. This pit is a significant structure and will divert the flow which enters the site from under the M7 into the twin 3m x 1.8m box culverts which were installed in the first stage. As part of these works, the existing box culverts under McIver Avenue (current site access road) are to be blocked and sealed. In order to maintain site access, these culverts are not to be removed at this stage.

Open channels currently convey the flow from the S2 outlet as well as from existing infrastructure on the site. These flows will be diverted upon completion of Stage 1 works and construction of the major pit in this stage and hence the open channels will be infilled to the natural surface as part of the Stage 2 works.

Currently flow from the S1 outlet from under the M7 pass through an open channel through the site and into the existing box culverts under McIver Avenue. A temporary swale and sediment basin will be built during this stage of works to collect this flow and redirect it. A low flow pipe or swale will be built from this temporary detention basin to divert minor flows into the new pit construction at the S2 inlet. The temporary swale, detention basin and low flow pipe/swale are required in order to divert flows from the existing open channel so that Stage 3 works can proceed.

Stage 2 works will also incorporate construction of block work levee around the existing service station which adjoins the site to the south east. This wall will protect the service station against flood waters from the site.

The drainage infrastructure within proposed Road 3 will also be completed as part of this stage of works. Completion of these works will ensure that the land to the west of proposed Road 3 is connected to the new drainage lines and hence existing drainage infrastructure can be removed.

### 6.3 Stage 3

This stage involves construction of the trunk drainage line from the major pit construction in Stage 2 works up until the boundary of the proposed Big W development. The trunk drainage line consists of 2x1500mm diameter reinforced concrete pipes (RCP's) to be laid in accordance with approved engineering plans. As these works will fall within the existing open channel, the temporary low flow pipe/swale constructed in Stage 2 works will convey upstream minor storm flow.

### 6.4 Stage 4

Stage 4 works will be the extension of the trunk drainage line from Stage 3 up to the proposed junction pit which will collect flows from S1 and the Big W development. The trunk drainage line will be 2x1500mm diameter RCPs up to the junction pit. Additional pits will be installed along the trunk drainage line in accordance with the approved engineering plans.

### 6.5 Stage 5

Twin 900mm diameter RCP's will be constructed from the junction pit installed in Stage 4 works up to the S1 inlet of flows from under the M7. An additional 1350mm diameter RCP will be constructed from the junction pit in a northerly direction to accommodate stormwater runoff from the Big W development.

Completion of the Stage 5 works will ensure that all required trunk drainage infrastructure is in place and hence any existing open channels in this vicinity can be filled in and reinstated to the natural surface level.

The proposed construction SWMP detailed above has been prepared so as to provide contractors with a defined order of works. The stages outlined in this plan have been designed so as to keep existing infrastructure in place as long as possible during construction of the new trunk drainage line. Temporary erosion and sediment control devices have been instigated in the Stage 1 works in order to have measures in place throughout the construction period.

# 7.0 Conclusion

This Stormwater and Drainage Management Plan has been prepared to satisfy conditions imposed on the project by the NSW Government's Department of Planning.

The existing trunk drainage line through the site has been altered to suit the development and to also satisfy the requirements of Liverpool City Council. The proposed trunk drainage line is wholly below the surface which reduces potential safety problems as well as Council's maintenance requirements. The trunk line has been sized to accommodate flows up to 1.5 times the peak 1:100 year ARI discharges.

Stormwater drainage within the proposed Big W and DSE developments has been sized to safely convey flows up to the 1:20 year ARI peak discharges, with overland flow paths designed to greater storm flows receiving waters. The stormwater network within the road reserves has been designed to convey flows up to the 1:100 year ARI peak discharges.

Water quality control devices have been designed to be implemented pre, during and post construction in order to minimise effects on receiving waters. These devices are in the form of siltation fencing, diversion drains, temporary detention basins and the like prior to and during construction.

Gross pollutant traps will provide permanent means of treating runoff prior to it leaving the site. All but one of these gross pollutant traps will be maintained by the Big W and DSE lots, with Council assuming ownership of one which falls within proposed Road 1.

The provision of the proposed Gross Pollutant Traps maximises the water quality improvements for the site.

# 8.0 References


1. "Stormwater Management Plan for Proposed Warehouse and Distribution Facilities, Cowpasture Road, Hoxton Park", revision B, dated 19th May 2010, prepared by Parsons Brinkerhoff.

2. "Hoxton Park Airport – Flooding Investigations", dated 6th April 2010, prepared by URS Australia Pty Ltd.

3. "Stormwater Management Strategy report for Middleton Grange", prepared by J. Wyndham Prince. Extract from report of Table 3.6 – 'M7 Motorway and Cowpasture Road Culverts' received via email on 27th April 2010 from J. Wyndham Prince.

# Appendix A

## Onsite Drainage Within Big W & DSE Lots

150126_REP_004_[A]

## LEGEND

SW — PROPOSED INTERNAL STORMWATER

SW — PROPOSED INTERNAL STORMWATER (REFER COSTIN ROE CONSULTING DRAWINGS)

DESIGN CONTOUR INTERVAL – 0.2m

M.G.L.

TRUNK DRAINAGE LINE

SECONDARY FLOW PATH

LOW POINT IN DSE CARPARK

PIPED FLOW PATH

FROM TRAPPED LOW POINT

TRUNK DRAINAGE LINE

TRUNK DRAINAGE LINE

PROPOSED LOT 4053

PROPOSED BUILDING

PROPOSED LOT 4054

PROPOSED BUILDING

PROPOSED LOT 4052

PROPOSED BIG W WAREHOUSE

INTERNAL STORMWATER DESIGN AND CALCULATIONS BY COSTIN ROE CONSULTING PTY. LTD

EXISTING CULVERTS

EXISTING CULVERTS

EXISTING CULVERTS

ROAD 1

COWPASTURE ROAD

HINCHINBROOK CREEK

| REV. | DATE | AMENDMENT | DRAWN | CHECK | DESIGN | VERIFY |
|---|---|---|---|---|---|---|
| A | 08/06/2010 | Issued for SWMP Report | M.O. | H.W. | M.O. | P.J. |

SCALES: 0 10 20 30 40 — A1 / A3 1:1000 / 1:2000

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Fax: (02) 4305 4399
email: coast@adwjohnson.com.au
www.adwjohnson.com.au
ABN 62 129 445 398

CLIENT: mirvac

PROPERTY DESCRIPTION: LOT 404 AND 405 D.P. 1147551, COWPASTURE ROAD, HOXTON PARK

SURVEYED: N\A

DATUM: A.H.D.

PROJECT: FORMER HOXTON PARK AIRPORT

PLAN TITLE: ONSITE DRAINAGE WITHIN BIG W LOT

| PROJECT No. | DISCIPLINE | NUMBER | REV. |
|---|---|---|---|
| 150126 | REP | 004 | A |

100mm AT FULL SIZE

Plotted By: matto Plot Date: 18/06/10 – 14:51 Cad File: S:\150126 – Hoxton Park\Drawings\REPORT DRAWINGS\STORMWATER\150126_REP_004_[A].dwg

150126_REP_005_[A]

## LEGEND

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SW — PROPOSED INTERNAL STORMWATER (REFER COSTIN ROE CONSULTING DRAWINGS)

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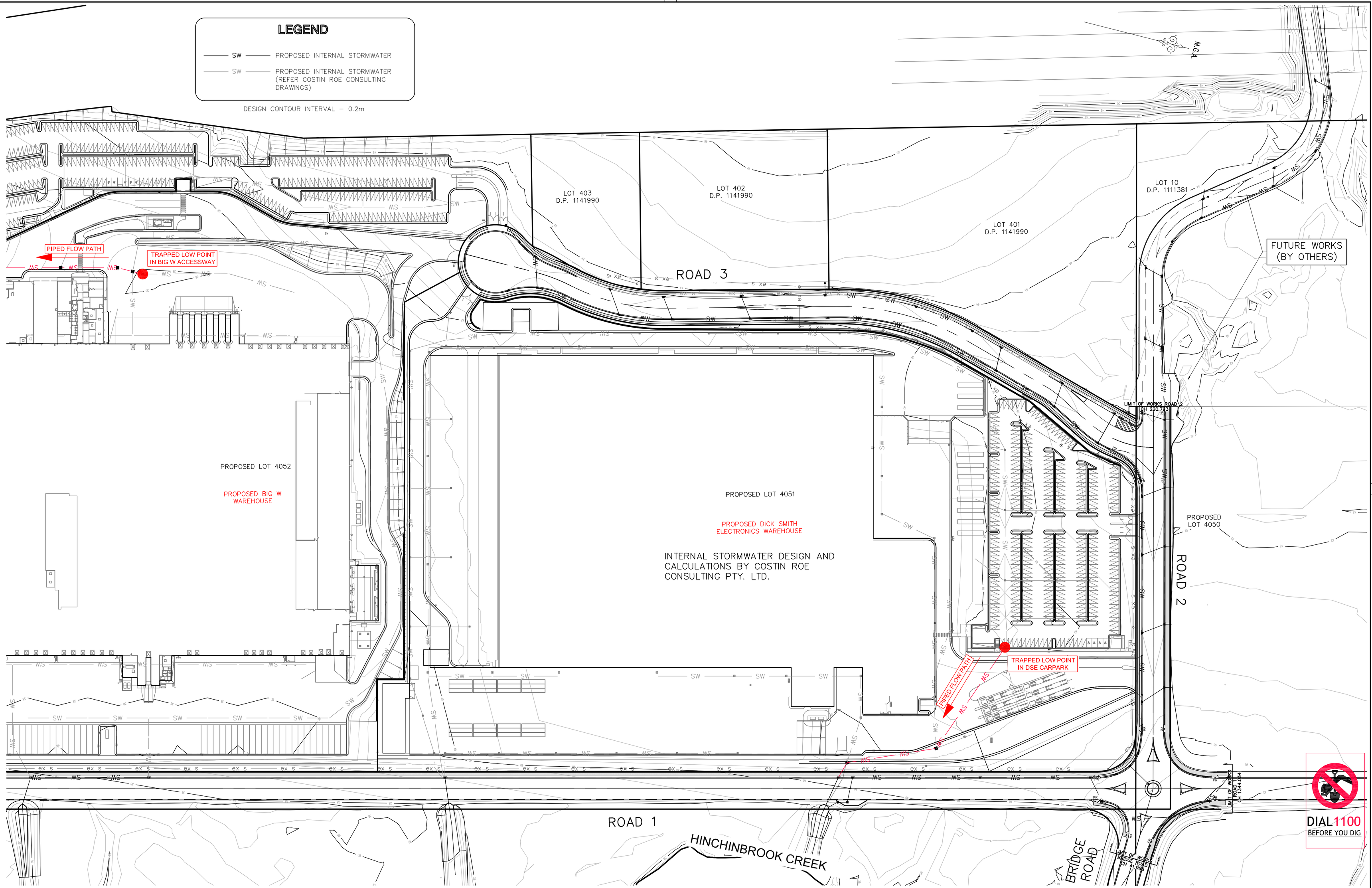


INTERNAL STORMWATER DESIGN AND CALCULATIONS BY COSTIN ROE CONSULTING PTY. LTD.

| REV. | DATE | AMENDMENT | DRAWN | CHECK | DESIGN | VERIFY |
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| A | 08/06/2010 | Issued for SWMP Report | M.O. | H.W. | M.O. | P.J. |

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www.adwjohnson.com.au
ABN 62 129 445 398


CLIENT mirvac

PROPERTY DESCRIPTION
LOT 404 AND 405 D.P. 1147551
COWPASTURE ROAD
HOXTON PARK

SURVEYED N\A

DATUM A.H.D.

PROJECT FORMER HOXTON PARK AIRPORT

PLAN TITLE
ONSITE DRAINAGE WITHIN BIG W & DSE LOTS

PROJECT No. 150126 – DISCIPLINE REP – NUMBER 005 REV. A


Plotted By: matto Plot Date: 18/06/10 – 14:52 Cad File: S:\150126 – Hoxton Park\Drawings\REPORT DRAWINGS\STORMWATER\150126_REP_005_[A].dwg


100mm AT FULL SIZE

# Appendix B

## Council Acceptance of Trunk Drainage Proposal

**From:** Jeff Organ [mailto:DAID@liverpool.nsw.gov.au]
**Sent:** Wednesday, 26 May 2010 10:03 AM
**To:** Peter Johnson
**Subject:** FW: Hoxton Trunk Drainage

Peter
I refer to your email below and advise that the design concept and calculations as outlined appear satisfactory, and no significant issues are evident.
As previously advised we are happy to review any designs or issues that may emerge during the design process.
Regards

**Jeff Organ**
***Director***
***Assets & Infrastructure Delivery***

Liverpool City Council
1 Hoxton Park Rd, Liverpool NSW 2170
Phone 02 9821 9541
Fax 02 9821 9192

***Creating our future together***

**From:** Peter Johnson [mailto:peterj@adwjohnson.com.au]
**Sent:** Thursday, 20 May 2010 3:34 PM
**To:** Jeff Organ
**Cc:** Bill Anthony; Adrian Checchin; Hugh Williams
**Subject:** Hoxton Trunk Drainage

Hi Jeff

Outlined below is a design summary so that you can understand where our figures were derived. We can provide the relevant documentation if required.

Also, having now streamlined the S1 line following our previous discussion I would like to delete pit S2 as I feel it is too deep and will not achieve its purpose of allowing maintenance or debris removal access. It will probably only give rise to a blockage point not a removal point.

Similarly, I cannot see a real purpose in constructing pit 100y1.13 as it will also create the potential for blockage.

I would appreciate your thoughts on the design and these issues so that we can be underway asap, thanks

All trunk drainage has been sized to accommodate the 100yr ARI storm flows with a 50% redundancy applied. The redundancy was achieved by sizing each segment in the trunk drainage line to accommodate 1.5 times the design 100yr ARI flows. This redundancy was applied in accordance with Woolworth's requirements for sections of the internal drainage design. Flow rates used for the design are as follows:

- **S1 :** Adopted flowrate, Q = 3.0$m^3$/s. This flow rate was determined as part of the design development for the ABIGroup-Leightons Joint Venture as the capacity of the 2x1.2mx0.6m box culverts under the M7 in the Management Strategy report for Middleton Grange. The 100yr ARI flow rate was stated as 1.81$m^3$/s in that same report. The 3m3/s reflects a higher design capacity standard than the critical 1:100 ARI to prevent upstream afflux due to the M7 construction and was therefore adopted in the current design.
- **100Y1.9 :** This point is the junction pit for the inflow from S1 and a portion of the runoff from the Big W development. The inflow into the pit from S1 is 3.0$m^3$/s, as stated above. The inflow from the Big W development was adopted as 3.28$m^3$/s. This was calculated from 100yr ARI discharges provided by Costin Roe Consulting's internal stormwater design for the Big W development. The peak 100yr ARI discharges were again multiplied by 1.5 in order to achieve 50% redundancy throughout the trunk drainage system. Hence, the total outflow from Pit 100Y1.9 is 6.28$m^3$/s (including 50% redundancy).
- **100Y1.11 :** At this pit, roof runoff from the Big W development enters the trunk drainage system. The 100yr ARI peak discharge for the roof runoff was provided by Costin Roe Consulting as 1.75$m^3$/s. This discharge was not multiplied by 1.5 as upstream Big W internal stormwater drainage components are unlikely to be able to convey flows greater than the 100yr ARI discharge. Hence, the total outflow from Pit 100Y1.11 is 8.03$m^3$/s (including 50% redundancy for the main trunk drainage line).
- **100Y1.14 :** This pit is a main junction pit where flows from S2, M7 and upstream trunk drainage combine. The S2 inflow into the pit was adopted as 16.6$m^3$/s. This was based upon the peak 100yr ARI discharge of 11.1m3/s (stated in the Management Strategy report for Middleton Grange) multiplied by 1.5. It should be noted that the capacity of S2 is stated as 24.9$m^3$/s in that same report. From this it appears that S2 may have been sized for an extremely rare storm event and is very conservative. Hence, the downstream trunk drainage was designed for 1.5 times the 100yr ARI peak discharge and not for the capacity of the culverts. The pit was also sized to accommodate runoff from the pavement of the M7, as it is currently conveyed through a pipe and open channel system which ultimately discharges at S2. A flow rate of 2.9$m^3$/s was assumed for this M7 runoff based upon pipe capacities determined from Work As Executed information for the M7. The pit also has upstream inflow from the trunk drainage system of 8.03$m^3$/s. Hence the total discharge into this pit used for design was 27.5$m^3$/s (including 50% redundancy).
- **Outlet :** The outlet for the trunk drainage system is the existing twin 3m x 1.8m box culverts under Cowpasture Road. A downstream tailwater level of 33.8m was adopted for design purposes. This level was based upon TUFLOW modeling undertaken by URS for the regional 100yr ARI storm event as part of the development submission to the Department of Planning and as reviewed by Council.

Regards,

***Peter Johnson***
**Director**
Mob. 0413 804 600
**ADW Johnson - Central Coast Office**
2 Bounty Close, Tuggerah
PO Box 3717 Tuggerah N.S.W. 2259
Ph: (02) 4305 4300
Fax: (02) 4305 4399

Email : peterj@adwjohnson.com.au
Website: www.adwjohnson.com.au

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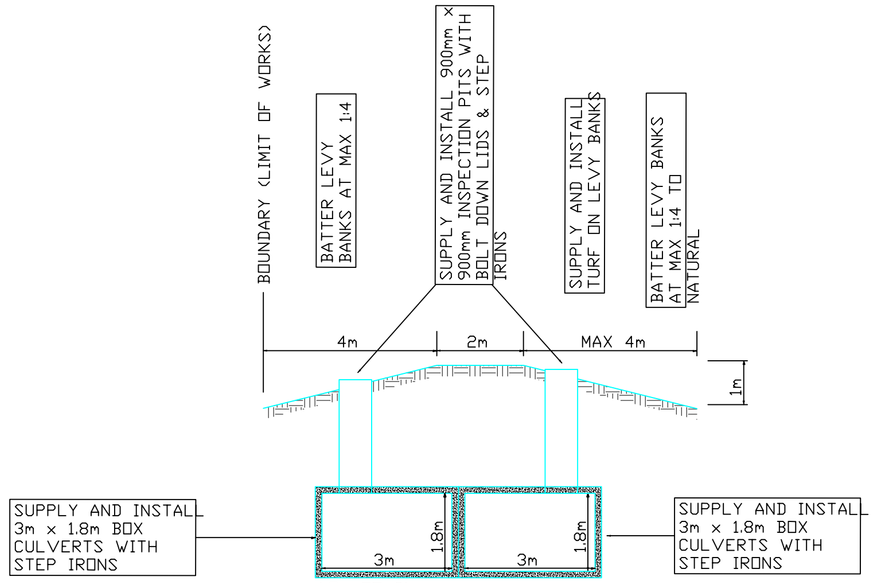
# Appendix C

## Stormwater Construction Staging Plan

150126_REP_001_[A]

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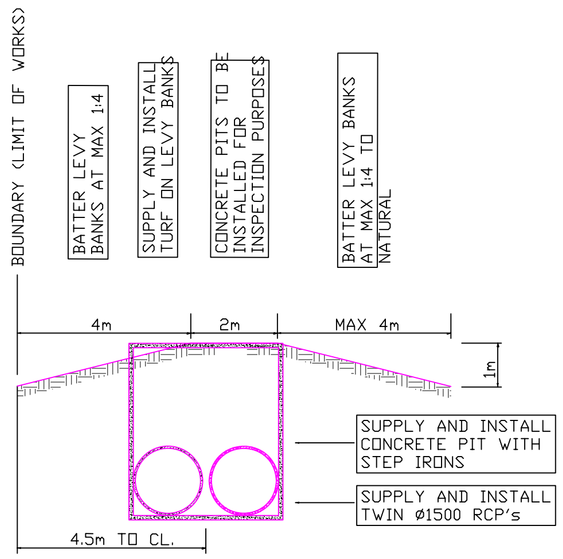


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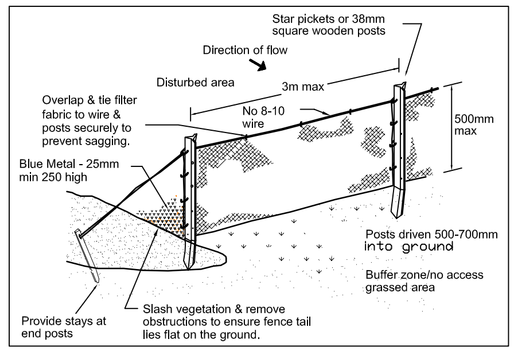


## SILT FENCE

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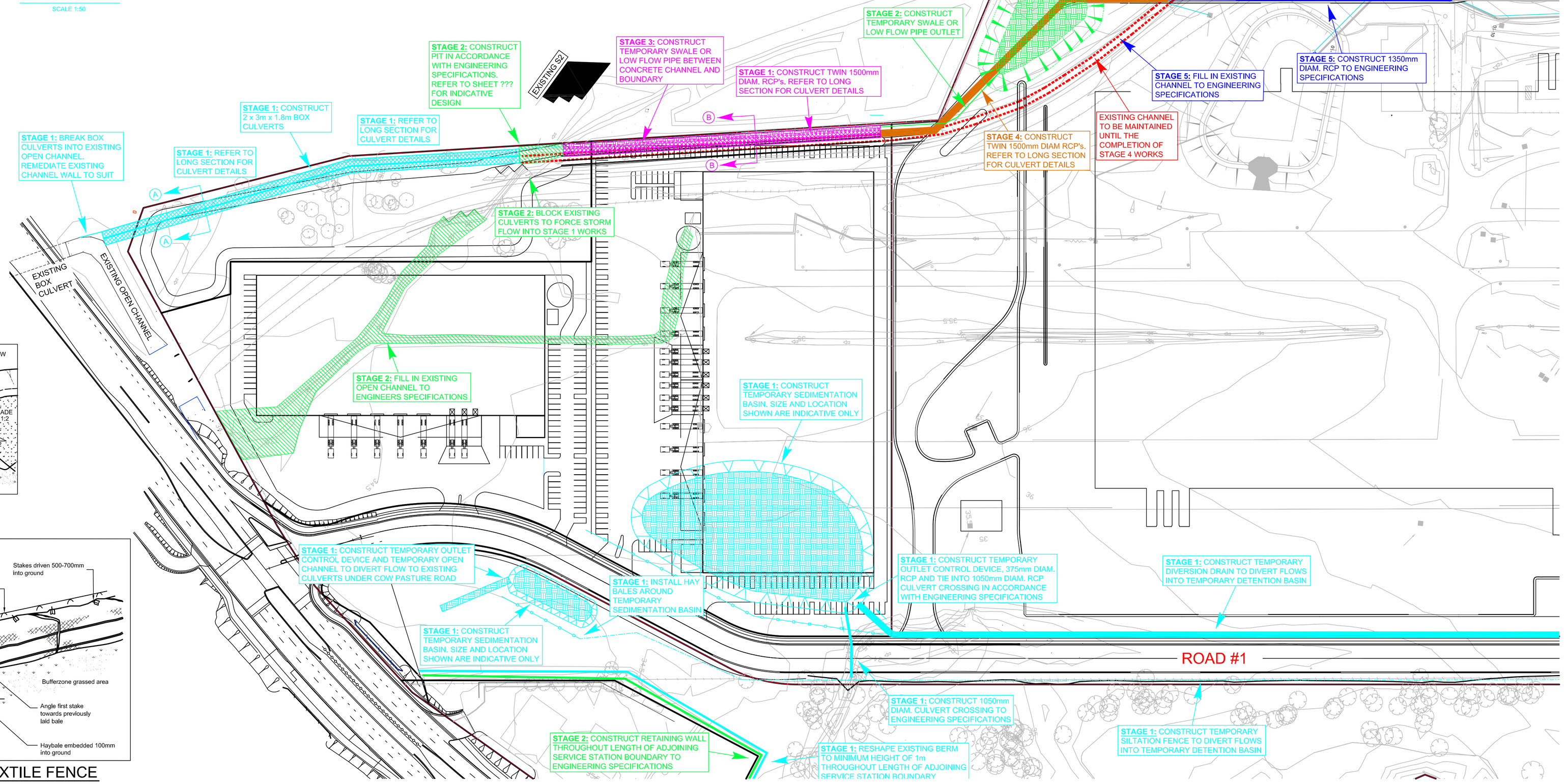


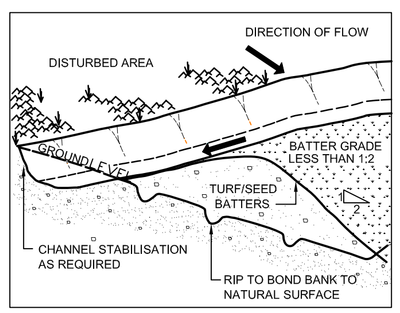


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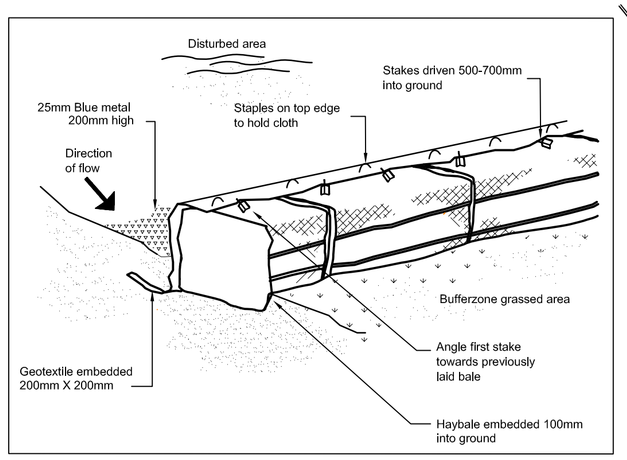


## HAYBALE & GEOTEXTILE FENCE

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ABN 62 129 445 398

CLIENT: mirvac

PROPERTY DESCRIPTION: LOT 400 D.P. 1141990, COW PASTURE ROAD, HOXTON PARK

SURVEYED: N\A

DATUM: A.H.D.

PROJECT: HOXTON PARK AIRFIELD

PLAN TITLE: CONSTRUCTION STORMWATER MANAGEMENT PLAN DETAIL SHEET 1

| PROJECT No. | DISCIPLINE | NUMBER | REV. |
|---|---|---|---|
| 150126 | REP | 001 | A |

Plotted By: matto Plot Date: 08/06/10 – 13:34 Cad File: S:\150126 – Hoxton Park\Drawings\REPORT DRAWINGS\STORMWATER\150126_REP_001_[A].dwg

150126_REP_002_[A]

MGA

EXISTING ROAD DRAINAGE NOT TO BE REMOVED UNTIL STAGE 1 & 2 DRAINAGE WORKS COMPLETED

EXISTING STORMWATER DRAINAGE LINE TO BE MAINTAINED

ROAD #3

**STAGE 2:** CONSTRUCT STORMWATER DRAINAGE LINE TO ENGINEERING SPECIFICATIONS

**STAGE 2:** CONSTRUCT STORMWATER DRAINAGE LINE TO ENGINEERING SPECIFICATIONS

**STAGE 1:** CONSTRUCT TEMPORARY BERM AT MIN. LONGITUDINAL GRADE OF 0.5% TO DIVERT NEIGHBOURING WATER

**STAGE 1:** CONSTRUCT STORMWATER DRAINAGE LINE TO ENGINEERING SPECIFICATIONS

**STAGE 1:** CONSTRUCT TEMPORARY 375mm DIAM. PIPE FROM EXISTING LINTEL INTO NEW DRAINAGE LINE

**STAGE 1:** CONSTRUCT TEMPORARY SURCHARGE PIT (SEE SECTION A-A)

**STAGE 1:** CONSTRUCT TEMPORARY 375mm DIAM CLASS 3 RCP AT 0.5% MIN. GRADE TO TEMPORARY SURCHARGE PIT

ROAD #2

**STAGE 1:** CONSTRUCT TEMPORARY OPEN CHANNEL AT MIN. GRADE OF 0.5% TO EXISTING NATURAL DOWNSTREAM OUTLET

**STAGE 1:** FILL IN DEPRESSION TO ALLOW DIVERSION DRAIN TO FLOW

**STAGE 1:** FILL IN DEPRESSION TO ALLOW DIVERSION DRAIN TO FLOW

**STAGE 1:** CONSTRUCT TEMPORARY DIVERSION DRAIN TO DIVERT FLOWS INTO TEMPORARY DETENTION BASIN

**STAGE 1:** TIE TEMPORARY OPEN CHANNEL INTO EXISTING NATURAL CHANNEL OUTLET

ROAD #1

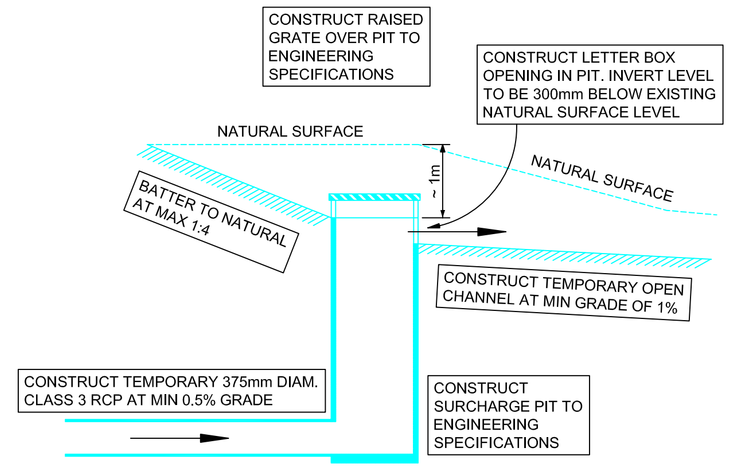
**STAGE 1:** FILL IN DEPRESSION TO ALLOW SILTATION FENCE TO FUNCTION

**STAGE 1:** CONSTRUCT TEMPORARY SILTATION FENCE TO DIVERT FLOWS INTO TEMPORARY DETENTION BASIN

**STAGE 1:** FILL IN DEPRESSION TO ALLOW SILTATION FENCE TO FUNCTION

**STAGE 1:** LOCAL REGRADING TO ALLOW SILTATION FENCE TO FUNCTION

**STAGE 1:** CONSTRUCT TEMPORARY SILTATION FENCE TO DIVERT FLOWS INTO TEMPORARY DETENTION BASIN

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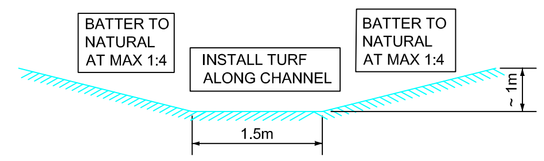


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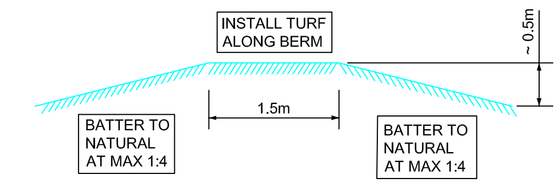


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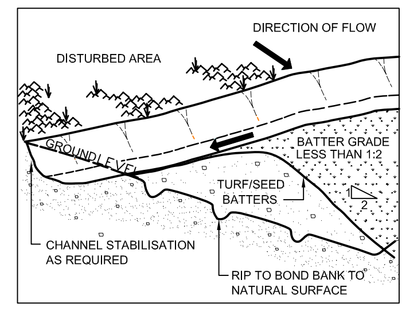


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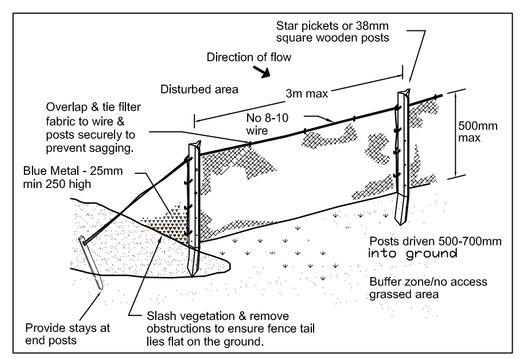


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PROPERTY DESCRIPTION

LOT 400 D.P. 1141990
COW PASTURE ROAD
HOXTON PARK

SURVEYED N\A

DATUM A.H.D.

PROJECT HOXTON PARK AIRFIELD

PLAN TITLE

CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAIL SHEET 2

| PROJECT No. | DISCIPLINE | NUMBER | REV. |
|---|---|---|---|
| 150126 | REP | 002 | A |

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