Our Ref: 37672 / ENG / JW:SD

30 November 2012

Manager – Industry, Major Projects Assessment
NSW Department of Planning & Infrastructure
PO Box 1226
Newcastle NSW 2300

Attention: Mr Chris Ritchie/Ms Emma Barnet

Dear Chris/Emma,

'ATTACHMENT B – ADDITIONAL DETAIL TO LOCAL DRAINAGE'

RE: MP 10_0185 NORTHBANK ENTERPRISE HUB
LOT 1001 TOMAGO ROAD, TOMAGO
ADDITIONAL DETAIL TO LOCAL DRAINAGE

1. INTRODUCTION

This report has been compiled to provide additional information to the assumptions and calculations made on local drainage for sizing the proposed drainage channels through the NEH development site.

1.1. BACKGROUND

BMT WBM completed Local Flooding and Drainage Assessment and Stormwater Assessment for the development. Feedback from the exhibition period is generally that additional detail is required. This letter report covers trunk drainage, local drainage and flooding for more regular storm events focussed on water quantity. Discharge controls and conveyance to the conservation lands of lot 1002 are covered in Section 6.22 – wetland interface strategy of the EAR.

1.2. EXISTING & PROPOSED STORMWATER CONTROLS

The Hunter River levee for the river frontage of Lot 1001 site is approximately 1.7mAHD upstream and 1.4mAHD downstream ends of the site, relative to the river. There are two (2) existing floodgates to the river. The upstream floodgate is a 900mm dia pipe at -0.82mAHD and the downstream floodgate is a 525mm dia pipe at -0.86mAHD. These floodgates effectively drain the majority of the Lot 1001 site. Refer to Sheet 1.

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These existing floodgate controls will remain in place for drainage of the proposed development site.

Existing drains maintained in the proposed development site layout are:

- The lower reach of Channel 1 (900mm dia floodgate connection to river);
- The lower reach of Channel 4 (525mm dia floodgate connection to river);
- The lower reach of Channel 4 extending to Lot 1002 boundary; and
- The full length of Channel 2.

Refer to Sheets 1-5.

The existing drains currently have a function to keep groundwater levels low through Lot 1001. This was the purpose of the drains through the previous, historic landuses to enable pasture grass growth over the lands. Figure 49 from the EAR shows the extensive groundwater catchment overflow from the Tomago Sandbeds upslope.

Additionally, similar drain bases to the existing drains will be excavated in Channels 1, 3 and 4. Channel 4 being the perimeter drain within the development footprint adjacent to the perimeter berm. Channel widths are 28-41m consistent with Figure 6-1 from BMT WBM local Flooding and Drainage Assessment.

It has been modelled and anticipated that as a result of development there will be an increase the runoff water quantity reaches the floodgates at the river frontage. In the event of high tide and/or high river levels, there will be an accumulation of water in the channels at the bottom of the site adjacent to the floodgates. Provision is made for backwater ponding of this accumulated water in the following areas:

- overflow wetland rehabilitation area. This area is excavated to a base level of 0.2mAHD;
- landscaped area – variable low lying levels between the Hunter River levee and fill extents; and
- remaining area not filled between the Hunter River levee and fill extents of the NEH development area. Note that natural surface levels below the fill extents at the western, upstream river frontage of Lot 1001 are approximately 1-1.2mAHD and not contributing much storage.

Refer to Sheet 1 for details.

2. ANALYSIS

Channel storages in smaller storms

Storage has been measured to an elevation of 0.7mAHD to confirm the design storm capacities for a range of durations for smaller storm events. The elevation of 0.7mAHD was selected for the following reasons:

- Positive drainage from bioretention units to the existing drains within the channels;
- Ponding contained within overflow rehabilitation area and other low lying areas, generally not extending over the existing surface; and
- This water level is easily accommodated without disruption to site.

The digital terrain model 12D was used to measure this storage.

Assumptions:

- Starting groundwater level in baseflow drains 0.2-0.3m below top of bank;
- Bioretention units empty at storm commencement;
- Void ratio of 30% in bioretention units;
- Dimensions of bioretention units unchanged from Table 6-6 of the BMT WBM stormwater assessment;
- No storage allowance for extended detention storage above units;
- Upstream catchment area of approximately 270 hectares includes MP07_0086 lands, Tomago House, Industrial Switchgear and Centurion Civil (Lot 1001 site area is 240 hectares, retained freshwater wetland, excl.);
- Free draining piped street drainage;
- No runoff storage on roads or development land;
- Assumed no infiltration over pervious areas, ie 100% of total catchment assumed to contribute all runoff;
- Assumed no outflow for shorter duration storms; and
- No account for drawdown discharges to the wetlands of Lot 1002.

The level of 0.7mAHD is represented on the channel cross sections, Sheets 2-5. These cross sections update BMT WBM Figures 6-2 to 6-5 of the Stormwater Assessment Report and Figures 6-2 to 6-4 of the local Flooding and Drainage Report. The above assumptions are considered highly conservative and a worst case scenario.

The storage of the overflow wetland rehabilitation area, bioretention units and storage within the baseflow channels from groundwater level to a level of 0.7mAHD is approximately 85,000m^3.

Using Port Stephens Council IFD data, this storage is approximately equivalent to the full capture of the following design storm events and durations:

- 1 year, 3 hour (critical duration – 2hr);
- 6 month, 12 hour; and
- 3 month, 24 hour.

Longer durations will be subject to continued drawdown through the floodgates to the river and dependent on timing within the tidal cycle.

Channel storages in larger storms

The next level of storage analysed was 1.5mAHD. This level has been set as the maintenance access level. It is also the level at which the bioretention units will remain full, until there is a drop in water levels and positive drainage from the system.

The low lying areas closer to the river outside the fill extents, adjacent to the perimeter berm and overflow wetland rehabilitation areas were analysed to a peak level of 1.2mAHD. This is the crest level of the perimeter berm before overtopping toward Lot 1002 conservation lands. Note that the Hunter River levee is not overtopped at this level. This

analysis also makes for some allowance of hydraulic gradient, being 1.2mAHD at the lower end, rising to 1.5mAHD at the upstream ends of the channels.

From the digital terrain model and the same assumptions as that for the smaller storms, the total storage measured is 285,000m^3.

Using Port Stephens Council IFD data, this storage is approximately equivalent to the full capture of the following design storm events and durations:

- 100 year, 3 hour;
- 50 year, 4.5 hour;
- 20 year, 6 hour;
- 10 year, 12 hour.

The outcomes are:

- This is an acceptable level for the maintenance access within the drainage channel;
- An acceptable runoff capture and protection from overflows into Lot 1002;
- At the level of 1.5mAHD, there is no real effect on site other than some nuisance flooding to the low lying areas that are outside the fill extents of the development. This is to be expected during these storms.
- BMT WBM previously modelled the local drainage system to have capacity for the 100 year 9 hour storm event. This capacity aligns well with our calculation of full capacity of approximately 400,000m^3, measured to 2.5mAHD being the top of bank of the channels. Storage peaks were assumed at 1.2mAHD in the downstream low lying areas adjacent to the perimeter bund and the floodgates and 2mAHD along the perimeter berm. By comparison, the critical storm duration is the 2 hour storm for the local event.

Industrial Switchgear and Centurion Civil

These two (2) adjoining properties have been indicated on Sheet 6 in further detail. The properties are benched with a raised flat section of approximately 3mAHD for the buildings and rear property area unmaintained at approximately 1-1.5mAHD. Drainage is to the south, however vegetation growth is very dense and whilst the existing drainage channels at this location are defined, they lack continuity with informal access crossings, debris and alike. This leads to existing upslope ponding on the rear property areas of these two (2) lots.

Existing groundwater levels are high at the site frontage, approximately 2.6mAHD, tapering down to surface and drain levels at the rear of the property.

The following improvements are made following development of Lot 1001:

Extended drainage within Lot 1001 adjacent to Centurion Civil where there is currently no drainage. This will minimise the potential for elevated groundwater levels, provide additional storage, flood relief and keep localised flood levels lower adjacent to these two (2) properties.

The new drainage to the south will have a better defined channel for base flows and runoff from smaller, regular storms. This will also minimise the potential of elevated groundwater levels, in particular providing for greater storage in the channels prior to a storm occurring. The greater definition of the channel will improve the current drainage situation.

All of the above storage calculations have been made over the downstream drainage to a maximum elevation of 2.5mAHD being the equivalent top of bank level of the higher, useable pad level of these two (2) properties. The top of bank levels in downstream drainage at approximately 2.5mAHD have been shown to have significant 100 year capacity. If this elevation were to be exceeded in a major storm, flows would start entering roads of Lot 1001 and alike significantly increasing capacity and controlling levels from rising on these properties. At this point during this major storm, there are continuous outflows occurring to the river over the levee and Lot 1002, similarly controlling flood levels from increasing over these two (2) properties.

The access/egress to Tomago Road has remained unchanged for these two (2) properties.

The development potential of these two (2) properties remains uninhibited. Any proposed additional development over the low lying areas of the properties would require filling. The filling in turn would reach flood immunity from local and regional flooding and fit with the Lot 1001 development. The fill of the Lot 1001 project essentially buffers these 2 sites from regional floods and it has been demonstrated that local drainage has been accommodated for and improved post development for both minor and major events. The drainage improvements and mitigation measures proposed with lot 1001 development adequately maintain no impact on drainage, most likely improve drainage for these properties.

Tomago House

The Tomago House property, similarly to Industrial Switchgear and Centurion Civil, contains benched site levels. The house itself is located on higher ground greater than 4mAHD and so too are the majority of the grounds. From boundary overlay, a small rear portion of the property is lower lying ground.

Existing drainage downslope of the Tomago House property is not well defined. There are some discontinued drains covered with debris and access crossings. This low lying area is susceptible to flooding and waterlogging, with no formal drainage downslope.

Channel 1 as shown in the post development of Lot 1001 is to be improved with excavation through natural ground improving baseflows and providing greater control of limiting potential elevated groundwater levels. This provides greater storage for stormwater. The channel width definition is significantly improved. The Lot 1001 fill extents provide a level of protection to Tomago House from regional flooding.

From the above it is considered that there are no adverse impacts of drainage on Tomago House, only the potential for improved drainage.

Drawdown

It has been described above that there is significant capacity in the proposed channels based on an assumed outlet of high river levels for accumulated runoff storage. The existing floodgate connections to the river are a 900mm dia pipe and 525mm dia pipe. Lower river levels would be required for outflows, dependent on tide.

The ponding of water from 0.7mAHD to 1.5mAHD in the channels presents no issues to the site and is easily accommodated. There remains capacity for further storm runoff within the channels. There are no upstream impacts at these levels. Water is ponding in areas of the drains containing macrophytes and the lower lying areas such as the overflow wetland rehabilitation area are accommodating water as intended.

Drawdown during larger storms to this peak level of 1.2mAHD at the base of the site is expected to finish almost instantaneously with the finish of the storm. This is due to the long perimeter berm crest length at this level providing for outflow. The perimeter berm combined with the opportunity for water to overtop the Hunter River levee into the river, provides a maximum limitation of flood height propagation back up through the channels of the Lot 1001 development, based on this continued free outfall. This is noting that there is a significant difference in timing of the peaks between the local event and a Hunter River peak event.

Below 1.2mAHD, the drawdown will of course be governed by the river level and ponding height behind the floodgates. The river level is subject to a range of considerations including tide level, tidal range based on season and upstream rainfall and runoff conveyed in the Hunter River.

The water level drawdown from 1.5mAHD to 0.7mAHD could be in the order of 5-10 days. It should be noted that a significant storm event is required to have occurred to fill the channels to this level and as described above the water accumulated at these levels presents no real issues to the site. Based on modelling and background observations, levels will return to groundwater levels in the order of 0.2mAHD in the bottom, downstream reaches of the channels under normal weather conditions.

Water Quality/Trunk Drainage Integration

Conventionally, trunk drainage is associated with high flows and high velocities. At this site however, channel widths are considerably wider for storage due to the flat grades and restricted floodgate outlets. This results in backwater effects and very low velocities. BMT WBM estimated the peak of these to be 0.5m/s, which is considered to be non scouring. Macrophyte growth in the channels is expected to be prolific, providing further protection from scour.

The path for stormwater from the piped street drainage will be to the bioretention units. A proposed distribution pipe is to spread the stormwater the full length of the bioretention units. The units will fill with water and depending on outlet conditions, either pass through the units with positive drainage into the base drain or be captured and stored within the unit until such time as the water levels in the base drain are sufficiently low for positive drainage to occur. Note that a preceding storm event producing 85,000m3 is required to slow or prevent outflows from the bioretention unit to the base drains. The bioretention

units are designed at elevations above the top of bank of the existing drains and proposed base drains to facilitate this purpose. This describes the path for low flows requiring treatment for water quality and the bypass of higher flows into the main trunk drainage for storage and conveyance to the floodgate outlet.

The proposed trunk drainage system then has facility to be accommodating both minor and major storm events. We note that the Office of Water has accepted this methodology.

It is concluded that this assessment has addressed the additional local drainage details as requested. If you have any questions regarding the content of this report, please don't hesitate to contact the undersigned on (02) 4978 5100 or scottd@adwjohnson.com.au

Yours faithfully,

SCOTT DAY **BE (Env) MIEAust, CPENG NPER**
ENVIRONMENTAL ENGINEER

ADW JOHNSON PTY LTD – (Hunter Office)

Plan of: PLAN VIEW

Location: Tomago Road
Tomago

Council: Port Stephens

Datum:	AHD	Date:	27-Nov-2012	Version:	A (27/11/2012)
Origin:	N/A	Sheet:	1 of 6	Client:	Northbank Enterprise Hub Pty Ltd
Projection:	MGA Zone 56	Plan by:	CO	Survey:	N/A
Origin:	PM 27766	Project Manager:	SD	AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	N/A	Plan Purpose:	Report		

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SANDBEDS

TOMAGO

(FRESHWATER)

INDUSTRIAL SWITCHGEAR

CENTURION CIVIL

Clarkson Drive

313 Tomago Road (N.E.H.)

WesTrac Facility

EXISTING DRAIN

Existing Part 3A Approval 07-0086 & EPBC Approval 2007/3343

REFER TO SHEET 6

EXISTING FLOW SPLIT

CONSERVATION LOT (22ha) TRANSFERRED TO NPWS

FUTURE LEVEE

TOMAGO WETLAND REHABILITATION (TWRP) STAGE 1 LEVEE (EXISTING)

RING DRAIN

NPWS EXISTING FLOOD GATES TO NORTH-SOUTH DRAIN

FULLERTON COVE

Tomago Road

EXTENDED DRAINAGE

Tomago House

Tomago Church

CHANNEL 1

CHANNEL 2

CHANNEL 3

CHANNEL 4 2mAHD

DISCHARGE CONTROL PIT

RETAINED FRESHWATER WETLAND

LOT 1001 FLOODGATE

NEH DEVELOPMENT AREA

LOT 1001 D.P. 1127780

TOMAGO WETLAND REHABILITATION PROJECT AREA

BERM

PERIMETER

'RICE PADDY'

BOUNDARY

RIVER LEVEE 1.7m AHD

DISCHARGE CONTROL PIT

PERIMETER BERM 1.2mAHD

STAGE 1 (CURRENT) INUNDATION SALTMARSH AREA

900mm DIA. FLOODGATE -0.82m AHD

DISCHARGE TO RIVER

NORTH SOUTH DRAIN

Hunter River

RETAINED SWAMP OAK FOREST

PONDING AREA BETWEEN LEVEE & FILL & OVERFLOW AREA

525mm DIA. FLOODGATE -0.86m AHD

BACKWATER PONDING AREA

OVERFLOW WETLAND REHABILITATION AREA (FRESH WATER) 10ha. INVERT BASE 0.2m AHD

LOT 1002

RAMSAR

NPWS

EXISTING SMART GATES STAGE 1 (2006) TIDE/SALT WATER

FLOOD GATES INSTALLATION STAGE 2 WORKS (2012) TIDE/SALT WATER

RIVER LEVEE 1.4m AHD

A/2 B/2 C/3 D/3 E/4 F/4 G/5

A/1 SECTION ID, SHEET NO.

APPROXIMATE EXISTING CATCHMENT TO NPWS FLOODGATE

FILL EXTENTS

DEMOLISHED HOUSES

0 100 200 300 400 600

Bar Scale 1: 6000 (A1), 1: 12000 (A3)

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A	27/11/2012	Issued for Approval

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				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (27/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
Our Ref:	37672

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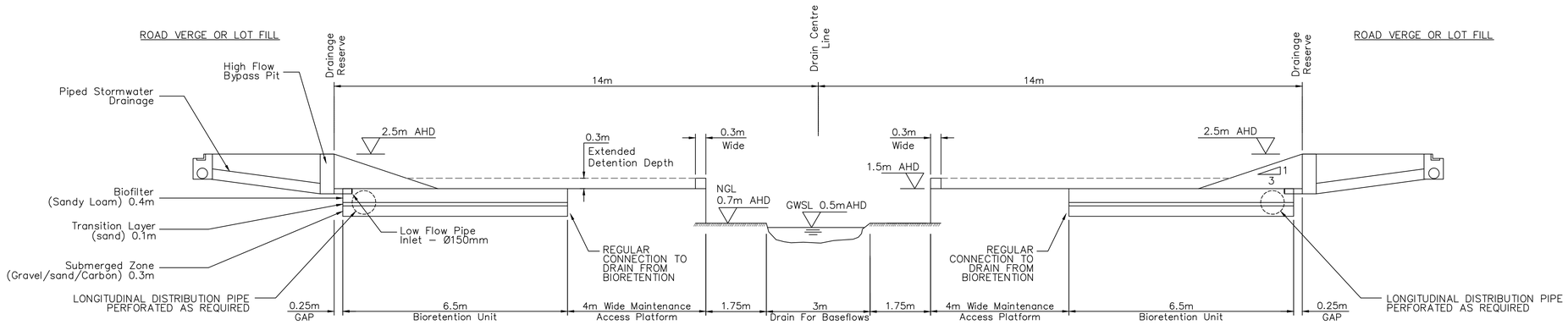

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TYPICAL
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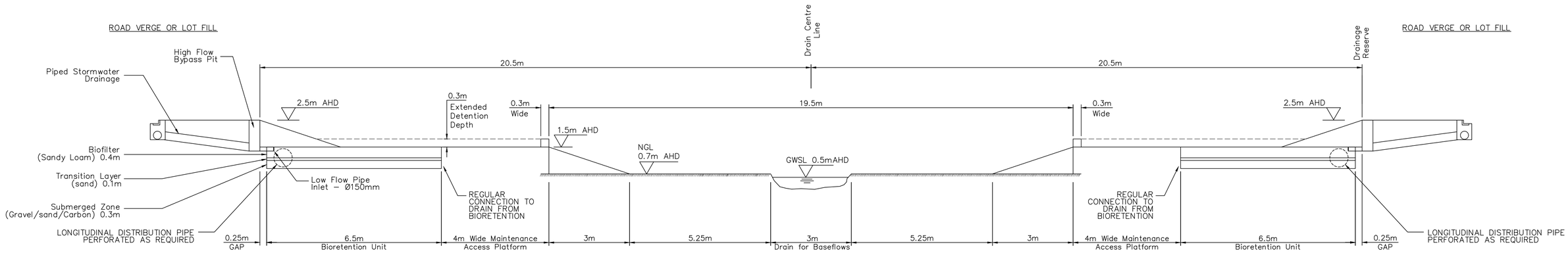

SECTION B 1
TYPICAL
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

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Plan of:	CROSS SECTIONS - CHANNEL 2	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
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		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
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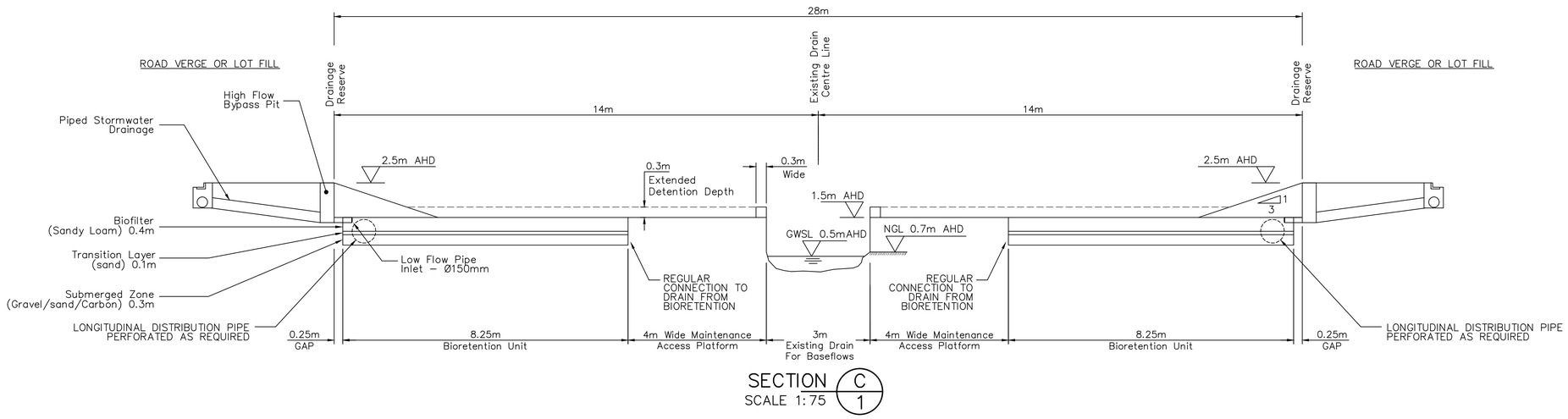
Our Ref:	37672



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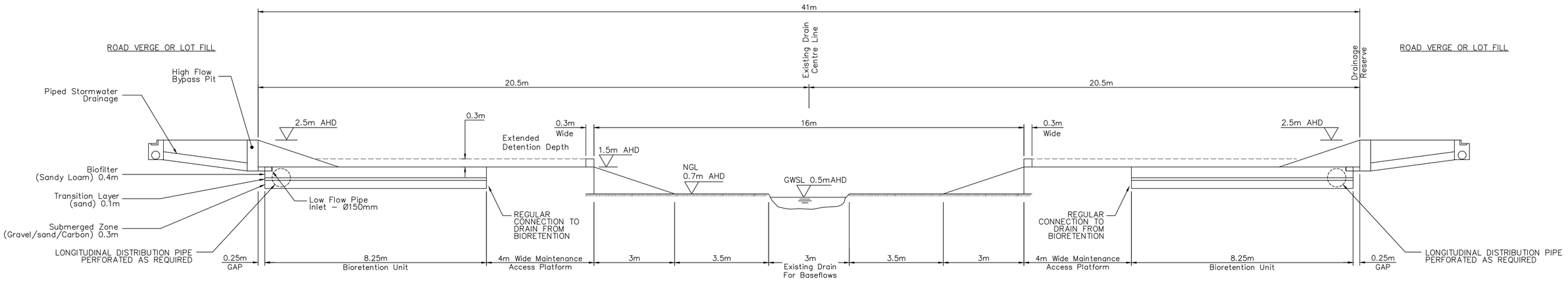

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NOTES:

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				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
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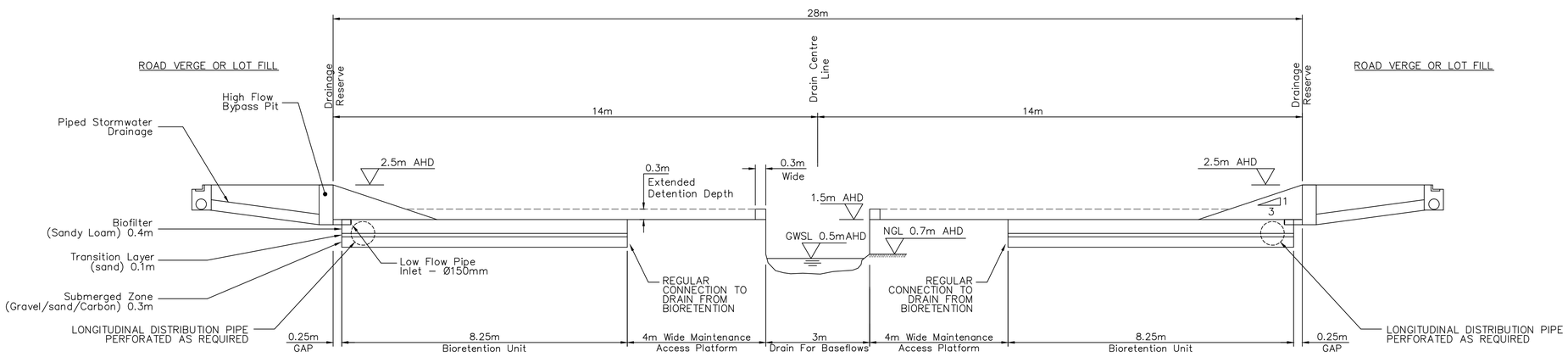

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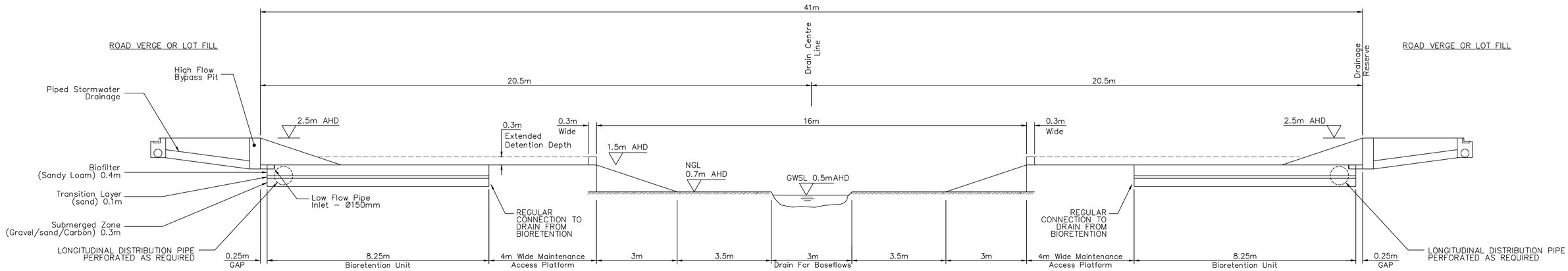

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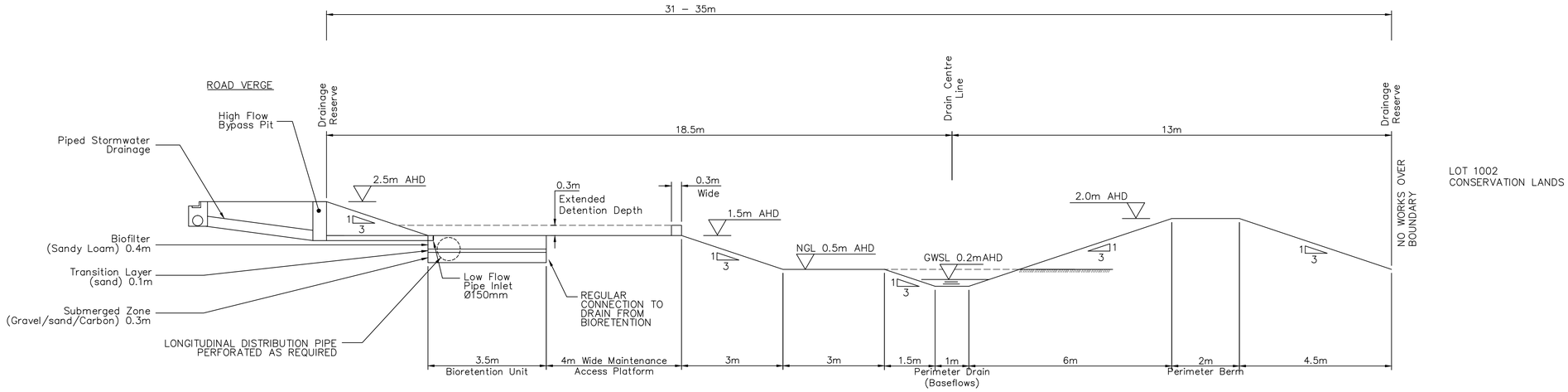

SECTION G
SCALE 1:75 1

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Plan of: DETAIL

Location: Tomago Road
Tomago

Council: Port Stephens

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Origin:	N/A	Sheet:	6 of 6	Client:	Northbank Enterprise Hub Pty Ltd
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North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	0.1m	Plan Purpose:	Report		

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BUILDING FLOOR LEVELS
APPROX. 3m AHD

TOP OF EMBANKMENT
APPROX. 2.5m AHD

MINOR FLOW FROM WEST

INCREASED DRAIN
STORAGE ADJACENT
(CURRENTLY NO DRAIN)

LOW LYING AREA
-1.5m AHD

SUSCEPTIBLE TO PONDING
DURING STORM EVENTS &
WATERLOGGING

IMPROVED
DRAINAGE
SOUTH

0 10 20 30 40 50 75 100

Bar Scale 1: 1000 (A1), 1: 2000 (A3)

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