CLIENTS | PEOPLE | PERFORMANCE

03 June 2009

Chris Wilson
Executive Director
NSW Department of Planning
PO Box 39
Sydney NSW 2001

Our ref: 22/14532/150617
Your ref:

Dear Chris,

Residential Subdivision at 740-742 Pacific Highway Sapphire Beach - 06_0148 Mod 1 and 09_0060
Integrated Water Cycle Management Assessment

1 Background

GHD was commissioned by Sapphire Beach Developments Pty Limited to assess surface water hydrology impacts associated with the redevelopment of the Pelican Beach Resort at 740-742 Pacific Highway, Sapphire Beach. GHD submitted its *Coastal Hazards, Water Management and Services Assessment (August 2006)* report based on a development that, at that time, comprised 122 dwellings comprising a mixture of apartments, town houses and houses. Subsequently, GHD prepared a further letter report for the proposed 122 dwelling development, *Addendum to Coastal Hazard, Water Management and Services Assessment Report (December 2006)* that addressed additional information supplied by the relevant authorities.

An amended concept plan for a 39 lot residential subdivision is now proposed, where the future dwellings and lots interface with dunes and beach as proposed in the previous development area. The Department of Planning has issued Integrated Water Cycle Management Director General's Requirements (DGRs) for this amended concept plan, which are:

- *7.1 Assess whether the proposed modification will change the nature or extent of the impacts of the development on surface water hydrology and quality during both construction and occupation of the site; and*
- *7.2 Present a modified plan detailing measures for Integrated Water Cycle Management based on Water Sensitive Urban Design principles. This plan must address impacts both onsite and on the surrounding environment, stormwater management, drainage and water quality controls for the catchment, water saving measures for the site, and erosion and sedimentation controls at the operational stage. This plan must also include a conceptual design layout plan for the preferred stormwater treatment train showing location, size and key functional elements of each part of the system.*

In terms of Integrated Water Cycle Management, we address the aspects of stormwater quality and quantity management in the following letter.

2 Stormwater Management Strategy

Referring to the attached figure, for the management of stormwater the site has been separated into the following key areas, namely:

- Area A, which represents the steeper areas of the site and foreshore areas located to the north of the internal access road; and
- Area B, which represents the foreshore areas to the south of the internal access road.

The site discharges to the existing 750 mm diameter stormwater pipe at the southern boundary of the site. This 750mm pipe is connected to further 750mm stormwater pipe and 900mm stormwater pipe draining the development to the south of the site. These two pipes merge into a single 750mm pipe and discharge to Campbells Beach.

The stormwater strategy follows the Coffs Harbour City Council *Development Specification Design 0074 (Stormwater Drainage Design)* and the procedures of *Australian Rainfall and Runoff* and incorporates a number of Water Sensitive Urban Design (WSUD) facilities. As per Council's requirements, an underground stormwater system has been designed to safely pass flows having a minimum average recurrence interval ARI of 5 years. Storm events in excess of the 5-year ARI event are routed overland via the internal road system.

Referring to the attached figure, the stormwater strategy comprises the following:

- Minor flows from Area A are routed to a small basin on the site. This is achieved via a subsurface stormwater system comprising pits and pipes. In areas where slopes are less than 4%, flows are routed to the stormwater system via bio-retention swales;
- Minor flows from Area B are routed directly to the 750mm diameter stormwater pipe at the southern boundary of the site. This is again achieved via a subsurface stormwater system comprising pits and pipes. In areas where slopes are less than 4%, flows are routed to the stormwater system via bio-retention swales;
- Overland flows form areas A and B are routed to the basin via the internal road system and the bio-retention swales;
- The sewerage pumping station (SPS) to the north will remain at the current grade. Bunding will be provided, to ensure that overland flow does not inundate the sewerage pumping station. The SPS is designed with a backup pump and emergency storage capacity for approximately 8 hours, so it is unlikely that any surcharging will occur once the stormwater has been diverted away from the SPS. The current overflow path from the sewerage pumping station to the beach will be maintained;
- The small basin will be located in the 7A environmental zone between proposed dwellings and the escarpment. This small basin will attenuate the outflow from the site. The basin concept design includes a high-early-discharge pit to maximise the available detention volume. The basin drains to the 750mm diameter stormwater pipe at the southern boundary of the site;
- Downstream of the site, the 750mm pipe connects with a 900mm pipe carrying flows from an external catchment of approximately 1.1Ha. These external flows combine with site outflows and currently discharge through an existing 750mm diameter pipe to Campbells beach. As part of the stormwater works, this outlet pipe will be upgraded to 1200mm diameter;
- Gross pollutants will either be captured by a Gross Pollutant Trap at the basin outlet, or using pit insert baskets, or a combination of both;

- Key WSUD strategies to be implemented at the site include on-lot rainwater tanks, bio-retention, gross pollutant trap systems (GPT) and sediment settlement areas, as follows:
  - Rainwater tanks are recommended throughout. The size of the tanks will be decided as part individual lot development. Even though the purpose of rainwater tanks is for roof water harvesting, they also detain the stormwater flows to a certain extent;
  - The nature of the development site landform is such that there are areas throughout the site that lend themselves suitable for bio-retention swales. Bio-retention is a stormwater treatment measure that filters runoff through a vegetated swale and allows for the percolation of runoff through an underlying prescribed filter media. The filtered stormwater will then be collected at the base of the filter media in sub soil pipes and conveyed to the small basin; and
  - It is proposed to incorporate a gross pollutant trap (GPT) at the basin. The inclusion of this structure will allow for some removal of gross pollutants and course sediment from runoff prior to discharge from the site. The small basin will further assist in the removal of course sediment, increasing the effectiveness of the stormwater quality treatment train. In addition to the basin outlet GPT, additional gross pollutant capture systems ('pit baskets') will be installed in pits in the upper catchment that are too steep to be served by bio-retention swales. These will remove sediments and nutrients from the stormwater before it enters the pipe network and basin. A pit basket will also be provided at the outlet of the southern bio-retention swale, which drains directly to the site outlet pipe.

3 Basin Concept Design

A DRAINS hydrologic and hydraulic routing model was compiled to simulate runoff from the site, including the proposed detention system and the existing stormwater network downstream of the site. The concept detention basin and associated outlet pipe have been sized to attenuate flows such that minimal upgrade to the downstream stormwater network is required. In extreme events (rarer than the 100-year ARI event) the basin will overflow to the internal road and community property leading to the beach. Basin concept design parameters are outlined in Table 1.

Table 1 Detention Basin Concept Design Parameters

Side Slopes	1V:2H
Volume to Overflow	980 m^3
Peak Water Level (100-year ARI)	6.9 m AHD
Surcharge Level	7.0 m AHD
Outlet Pipe Diameter	750 mm
Outlet Invert Level	4.8 m AHD
Plan Area at Crest Level	770m^2
Peak Basin Outflow (100-year ARI)	1.1 m^3/s
High Early Discharge Pit Internal Weir level	5.5 mAHD

This basin reduces peak flows in the existing the 750mm diameter stormwater pipe at the southern boundary of the site, as tabulated in Table 2.

Table 2 Flow in Existing 750mm Site Discharge Pipe

750 mm Pipe Capacity	1.6 m^3/s
Peak 100-year Flow Without Basin	2.1 m^3/s
Peak 100-year Flow With Basin	1.2 m^3/s

As part of the stormwater strategy, the pipe outlet to Campbells Beach will be upgraded to 1200 mm diameter, to accommodate the site discharges and the development area to the south of the site. Table 3, shows the design capacities.

Table 3 Downstream Ocean 100-year ARI Outlet Flows

Site Peak Outflow	1.2 m^3/s
External Catchment Flow	1.6 m^3/s
Combined Capacity Requirement	2.8 m^3/s
Current 750mm Diameter Capacity	1.6 m^3/s
Proposed 1200mm Diameter Capacity	3.8 m^3/s

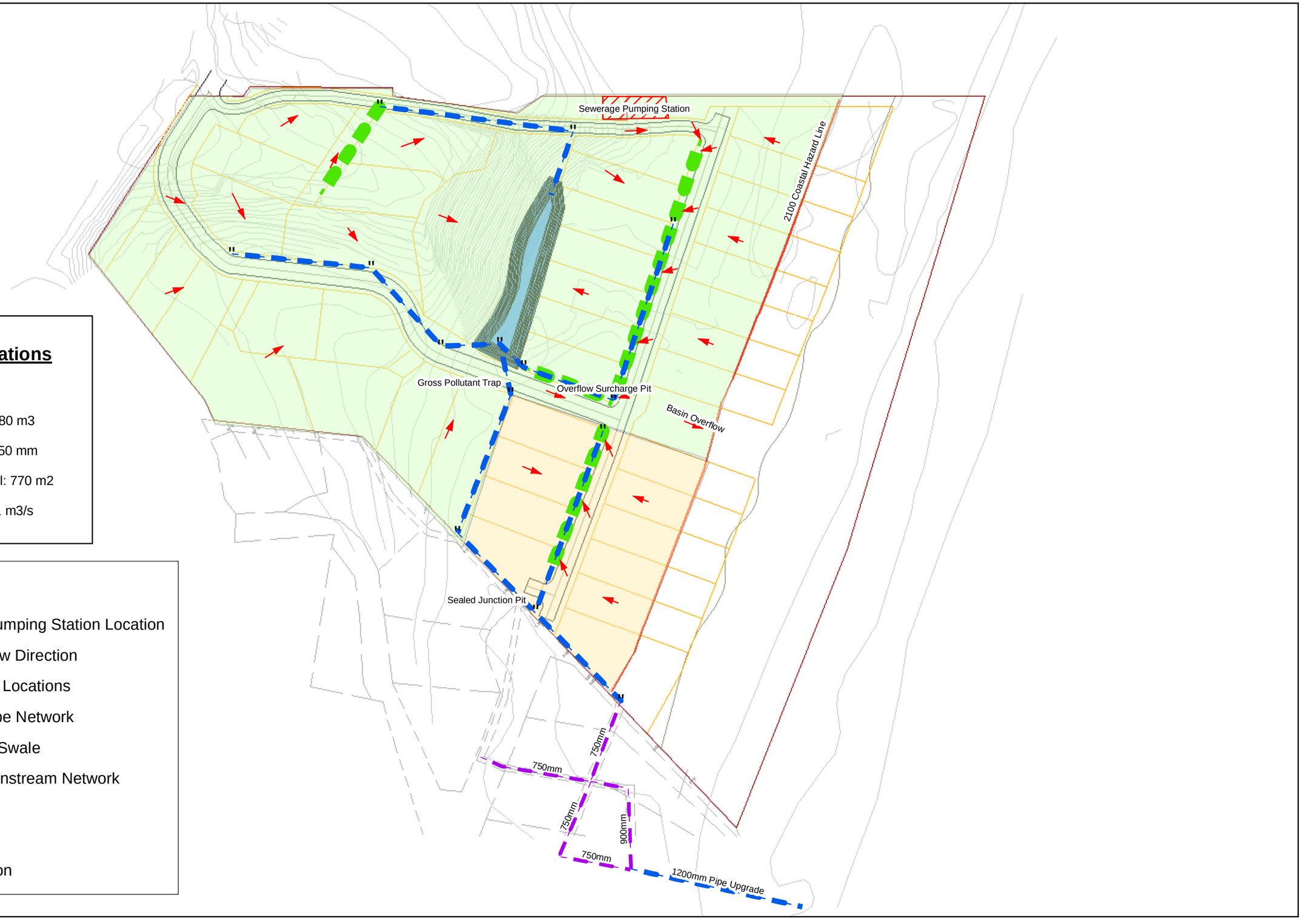
4 Conclusions

A stormwater strategy has been proposed for the site, which incorporated elements of Water Sensitive Urban Design element and satisfies Council's requirements. This strategy incorporated a basin, a subsurface stormwater network of pipes, rainwater tanks, bio-retention swales, pit baskets and a Gross Pollution Trap.

A basin concept design has been developed to attenuate flows and allow integration with the existing downstream stormwater pipes discharging to Campbells Beach, with some upsizing of the outlet pipe. A DRAINS stormwater model has confirmed pipe sizes and basin size to adequately manage stormwater to the 100-year ARI event.

Yours sincerely,

Rainer Berg
Service Group Manager, Hydrology & Civil Services
2 9239 7100



Basin Concept Design Specifications

Side Slopes: 1V:2H

Volume to Surcharge: 980 m3

Outlet Pipe Diameter: 750 mm

Plan Area at Crest Level: 770 m2

Peak Basin Outflow: 1.1 m3/s

Legend

- Sewerage Pumping Station Location
- Overland Flow Direction
- Indicative Pit Locations
- Indicative Pipe Network
- Bioretention Swale
- Existing Downstream Network
- Area A
- Area B
- Basin Location

1:1250

FOR INFORMATION

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

O

GENERAL NOTES:
- Stormwater network is indicative only.
- Stormwater design to be finalised at detailed design stage.

GHD CLIENTS | PEOPLE | PERFORMANCE

Attentus Projects and Properties
Pelican Beach Resort Redevelopment

Job Number 22-14532
Revision C
Date 4 June 2009

WSUD AND STORMWATER CONCEPT DESIGN LAYOUT

Figure 1

C:\TEMP\~DF32E5.tmp

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by: C Pappin

10 Bond Street Sydney NSW 2000 Australia **T** 61 2 9239 7000 **F**61 2 9239 7199 **E**sydmail@ghd.com.au **W** www.ghd.com.au