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Goodman International Ltd

Oakdale Central
Project Application No. 1
Estate Works and DHL
Sewage Management Strategy

March 2008

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

Goodman International Ltd is proposing to develop approximately 421 hectares of land known as "Oakdale" within the precinct known as the Western Sydney Employment Hub. Buildings 1A and 2A of the Oakdale site are proposed for immediate development as part of Project Application Number One. Buildings 1A and 2A (DHL) within the Central Precinct are proposed to be developed as warehouse facilities.

A review of sewer servicing for the 421 ha ultimate site development was previously conducted by GHD. A detailed end-use water analysis was carried out to determine the estimated sewerage system flows. A water balance analysis was conducted to develop a servicing solution that minimised potable water use and surplus recycled water volumes.

Further to the previous analysis and review of servicing, a sewage management strategy associated with Buildings 1A and 2A has been developed.

It is proposed to service Buildings 1A and 2A by providing the following:

» A dedicated sewage treatment system to treat all sewage from Buildings 1A and 2A to NSW Guidelines recycled water standards. The recycled water would be used within the two lots to service non-potable water end-uses, primarily including toilet flushing, air conditioning and garden watering. Any recycled water that may become surplus to the non-potable water demands would be disposed of by irrigation in a dedicated area allocated within the lots and in vacant land adjacent to the development area; and

» Emergency / buffer storage will be provided at each treatment system location.

The expected area required to dispose of any surplus recycled water by irrigation has been determined.

A number of further contingency measures are proposed to avoid any potential adverse impacts from the proposed sewer servicing strategy, including:

» A conservatively sized surplus recycled water irrigation area;

» Provision of suitable buffer distances to public areas and watercourses; and

» Emergency storage provisions to prevent system overflows while emergency response plans are effected.

1. Introduction

1.1 General

Goodman International Ltd is preparing a concept plan for the Oakdale development (herein known as "the site") in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979*.

For the purposes of the concept plan, the development site has been divided into the following 'precincts':

» Central Precinct – comprising Lot 2 DP 120673;

» South Precinct – comprising that part of Lot 82 east of Ropes Creek and Lot 87 DP 752041;

» West Precinct – comprising Lot 1 DP 120673 and that part of Lot 82 DP 752041 west of Ropes Creek; and

» East Precinct – comprising Lot 1 DP 843901, which is the site of an existing Austral Bricks quarry and brickmaking plant.

The location of the proposed development site is shown in Figure 1. The first stage of the proposed development is located within the Central Precinct area (Lot 2 DP 120763). Goodman is proposing to develop the eastern portion of the Central Precinct, namely Buildings 1A and 2A (DHL) as Project Application Number One. The proposed layout plan is included in Appendix B. Buildings 1A and 2A will consist of warehouse facilities.

A preliminary sewer servicing strategy has been previously developed for the entire Oakdale site (GHD, December 2007). This previous report outlined the proposed sewage collection, treatment and effluent disposal strategy including appropriate mitigation measures.

GHD has been engaged by Goodman International Ltd to develop a sewage management strategy for Buildings 1A and 2A of the Central Precinct development area.

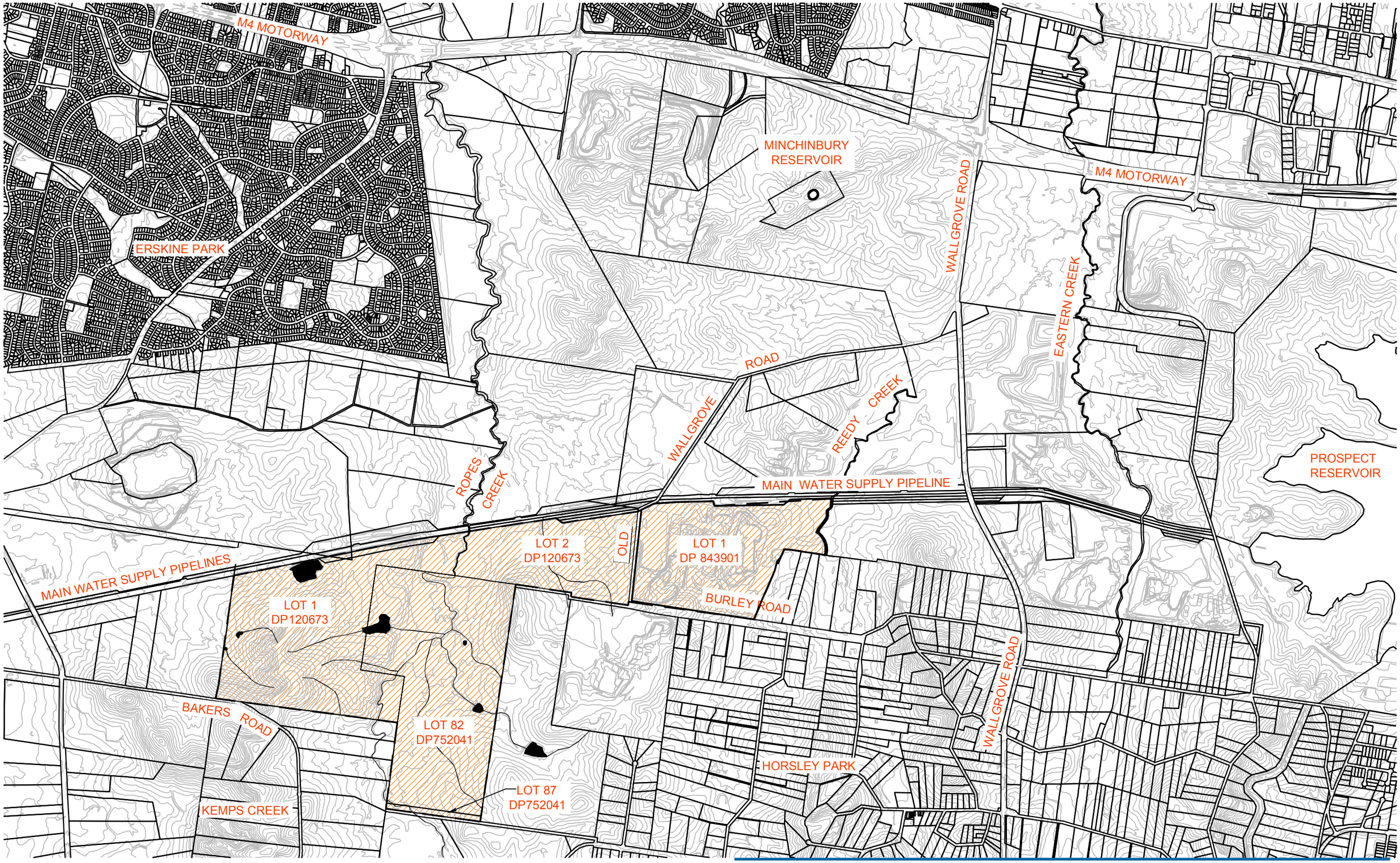
This report assesses opportunities, constraints and principles for managing sewage generated from Buildings 1A and 2A and draws on the findings and conclusions of the aforementioned previous report. Specific topics addressed include:

» Statutory and authority requirements;

» The description of the existing site, the proposed development and existing sewerage infrastructure;

» Potential impacts of the sewage generated by the proposed development; and

» Proposals for mitigation of potential adverse impacts of sewage generation;



LEGEND

PROPOSED DEVELOPMENT SITE

PROPOSED DEVELOPMENT SITE BOUNDRY

N

0 250 500 750m

SCALE 1:25000 AT ORIGINAL SIZE

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GOODMAN INTERNATIONAL LTD
OAKDALE CONCEPT PLAN

SITE LOCALITY PLAN

job no. | 21-16225
rev no. | B

scale | 1:25000 for A3 date | DECEMBER 2007

Figure 1

Level 6, 20 Smith St Parramatta NSW 1740 Australia PO Box 788 Parramatta NSW 2124 **T** 61 2 8898 8800 **F** 61 2 8898 8810 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Plot Date: 10 December, 2007 - 8:07 PM Cad File No: G:\21\16225\CADD\Drawings\ 21-16225-SEWER_B1,2_&_8_FIG001.dwg

1.2 Scope of the Study

The scope of work for the study is defined as follows:

» Estimation of sewage generation rates for Buildings 1A and 2A of the Central Precinct development area;

» Review of existing sewerage infrastructure;

» Sewage collection, treatment and disposal strategy;

» Proposed mitigation measures; and

» Identification of further site investigations and operational issues.

2. Existing Site Conditions

2.1 Site Soil Characteristics

Douglas Partners (May 2007) has conducted a preliminary geotechnical assessment of the site although site-specific soil testing/test pitting has not been conducted at this point in time. The soil landscape at the site is described below.

Bannerman and Hazelton (1990) describe three soil landscapes across the development site:

» **South Creek Soil Landscape** – a fluvial soil landscape developed in floodplains, valley flats (slopes <5% and local relief <10 m) and drainage depressions with incised channels. The South Creek soils within the site are developed on alluvium derived from Wianamatta Group shales and are often very deep-layered sediments over bedrock or relict soils. Landscape limitations include flood hazard, waterlogging (seasonal or localised), permanently high water tables (localised) and high erosion hazard.

» **Blacktown Soil Landscape** – a residual soil landscape developed on a landscape typically comprising gently undulating rises with local relief to 30 m and slopes usually less than 5% on Wianamatta Group shales and Hawkesbury shales. The Blacktown soils are shallow to moderately deep (<1 m), red and brown podsolic soils on crests, upper slopes and well-drained areas. Deep (1.5 m – 3 m) yellow podsolic soils are located on lower areas and in areas of poor drainage. These soils are derived from weathering of the underlying (typically shaly) bedrock and are highly plastic, moderately reactive, of low soil fertility, poor soil drainage, localized salinity or sodicity and moderate erodibility.

» **Luddenham Soil Landscape** – an erosional soil landscape developed on undulating to rolling hills with local relief of 50 m to 80 m and slopes of 10% to 20% on Wianamatta Group shales, often associated with resistant sandstone bands. The Luddenham soils are shallow (<1 m), dark podsolic soils or massive earthy clays on crests; moderately deep (0.7 m to 1.5 m) yellow podsolic soils and prairie soils on lower slopes and drainage lines. The soils have highly plastic subsoils of moderately reactivity and low to moderate shrink-swell potential, low to moderate soil fertility and moderate erodibility.

The majority of the site consists of the Blacktown Soil Landscape. The higher areas of the site in the west consist of the Luddenham Soil Landscape and Ropes Creek and the land immediately adjacent consists of the South Creek Soil Landscape.

Douglas Partners report that very saline soils along poorly drained sections of Ropes Creek and tributary gullies are expected. Elsewhere, it is anticipated that most of the site will be classified as non or slightly saline with a scattering of moderately saline areas.

The expected site geology and potential for salinity of the development area's soil characteristics have been considered in estimating the land area requirements for surplus recycled water disposal. However, it should be noted that the site soils will be affected in part by the earthworks and quarrying activities and further assessment of the irrigation requirements for any treatment system is required (refer Section 4.4.2) once the system has been designed.

2.2 Riparian Corridors

A riparian assessment conducted by GHD (June 2007) has categorised streams (defined as *protected waters* under the RFIA) across the site as shown in Appendix A. Broadly, the management constraints of each category are:

Category 1 – Core Riparian Zone (CRZ) of 40 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m;

Category 2 – CRZ of 20 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m; and

Category 3 – Riparian Zone minimum width of 10m from top of each bank and generally no vegetated buffer is required. All vegetation being restored will be of local provenance.

The riparian zones have been considered in confirming the availability of land for sewer servicing infrastructure, buffers and surplus recycled water disposal.

2.3 Existing Sewerage Infrastructure

The nearest existing sewerage infrastructure to the Central Precinct development area is a 525 mm diameter sewer carrier (Ropes Creek Carrier) located alongside Ropes Creek downstream of the proposed development area (approximately 1.3 km from the site).

The proposed Central Precinct development area does not form part of any existing published Developer Servicing Plans (DSP). The proposed Central Precinct development site comprises a single gravity catchment.

The *Draft* St Marys Wastewater DSP (2006) has been reviewed and it is similar to previous issues of the DSP, in that no land south of the Main Water Supply Pipeline forms part of the catchment plan, and hence there are no system upgrades identified regarding the development of the site.

Sydney Water has indicated that there is no capacity within the current sewer system for the proposed development site and that major system augmentation/extension would be required for Sydney Water to service the site.

3. Proposed Development

3.1 Development Description

A concept master plan for the Central Precinct of the development has been developed by Goodman International Ltd and is included in Appendix B. Initially only Buildings 1A and 2A are proposed for development within the Central Precinct. The remainder of the Central Precinct area located immediately to the west of Buildings 1A and 2A is proposed to be mined for in-situ clay material. As such, this land cannot be impacted upon by the proposed sewage management strategy.

Buildings 1A and 2A are proposed to be developed as light industrial facilities, that is, warehouse / logistics operations. A breakdown of the development area associated with Buildings 1A and 2A is provided in Table 1. It is recognized that the office area summarised in Table 1 and adopted in the modelling is greater then that shown on the latest proposed facility layout plans. This represents a conservative approach to estimating sewage flows.

Table 1 Buildings 1A and 2A – Area Breakdown

Portion of Buildings 1A & 2A	Approximate Area (m^2)
Warehouse	50,000
Office	2,000 (plan area) 5,200 (floor space)
Hardstand (including internal roads, footpaths, car parks)	50,400
Garden / Landscaped Area	10,000
Total Area of Lots 1A & 2A	**112,400 (plan area)**

3.2 Sewage Generation

As the proposed development of Buildings 1A and 2A consist only of warehouses and office space the sewage is therefore assumed to exclude any specific trade wastes and is expected to be of a domestic nature only. Any developments involving trade waste streams would need to be assessed on a case-by-case basis.

A separate detailed water balance analysis has been conducted by GHD (December 2007). As part of this analysis a detailed end-use analysis was conducted for a “generic warehouse” to determine the sewage generation rates. The results were compared to actual water use data from similar light industrial developments in Western Sydney. A number of scenarios were modelled that provide an envelope of results considered to be the approximate lower and upper ends of sewage generation rates. It is noted that the percentage of warehousing, office and open space associated with Buildings 1A and 2A is reasonably consistent with the “generic warehouse” used as the basis of the previous water balance modelling undertaken by GHD (GHD, December 2007). However, since a more accurate

breakdown of the areas was available for Buildings 1A and 2A (Roof, hardstand and landscaped areas) further preliminary water balance modelling was completed as part of this study.

The anticipated sewage generation rates for Buildings 1A and 2A of the Central Precinct development area under a number of scenarios is shown in Table 2 as follows.

Table 2 Buildings 1A and 2A - Sewage Generation Rates

Option	Description	Sewage Generation (ML/year)
Option 1	With 27 equivalent persons per generic warehouse facility and 0% rainfall wet weather infiltration.	2.0
Option 2	With 55 equivalent persons per generic warehouse facility and 1.3% rainfall wet weather infiltration.	4.8
Option 3	With 27 equivalent persons per generic warehouse facility and 1.3% rainfall wet weather infiltration.	3.0

It should be noted that although the results presented in Table 2 are for the generation rates based on the end-use analysis conducted by GHD, the design of any sewage treatment infrastructure would be carried out in accordance with the relevant standards.

A centralised treatment system that serves the entire Oakdale site is not considered a relevant option for the development of Buildings 1A and 2A only. The design and location of such as system needs to consider the entire Oakdale development site and for the initial two lots this is not an option that Goodman wish to pursue.

4. Proposed Sewer Servicing Strategy

4.1 Summary of Servicing Strategy

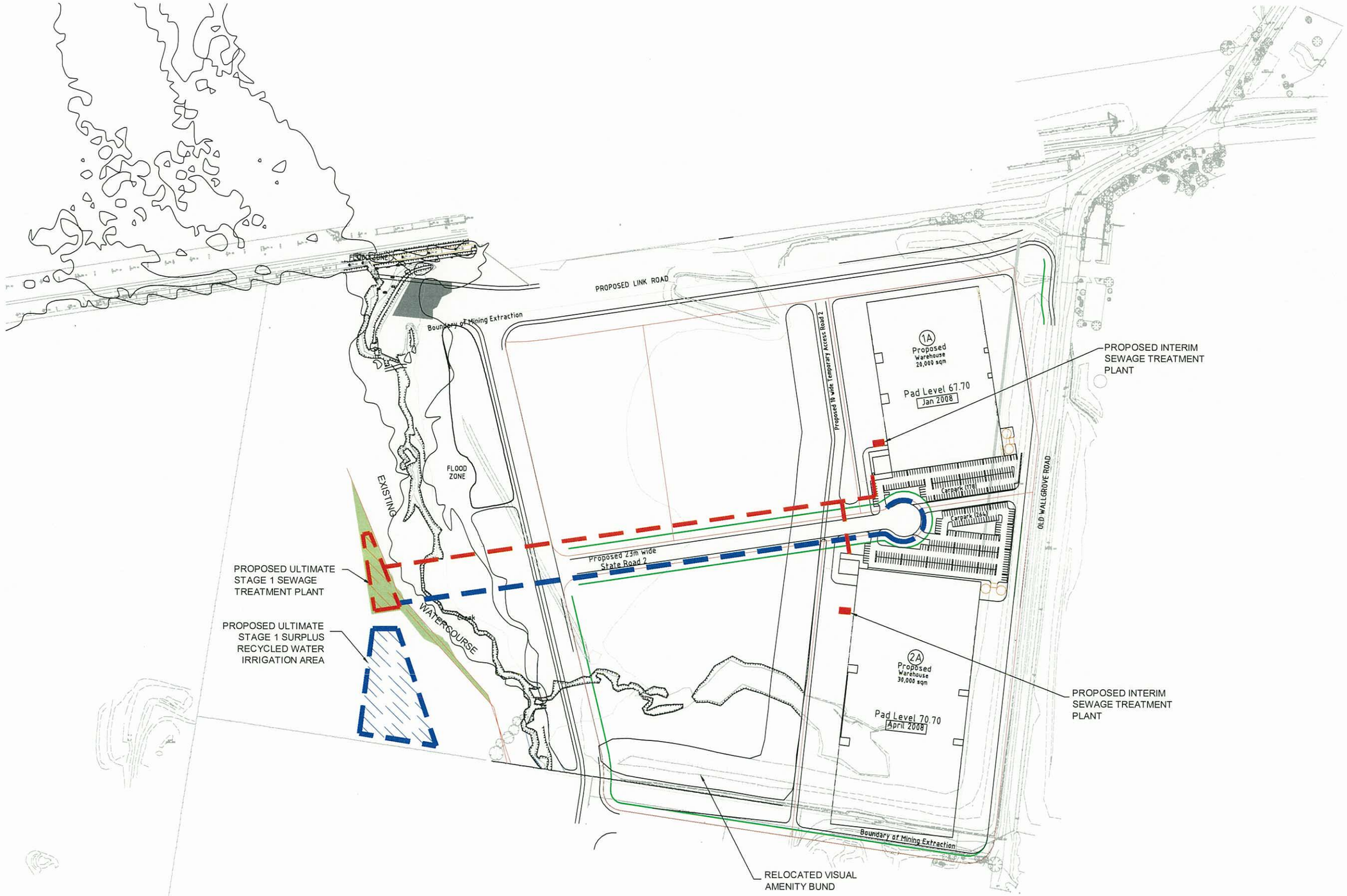
Buildings 1A and 2A are proposed to be serviced by individual treatment systems located in the vicinity of each building. It is noted that Goodman International Ltd intend to retain ownership of Buildings 1A and 2A and the proposed treatment systems. Eventually, it is proposed to provide a "precinct" scale treatment and recycled water system to service the entire Central Precinct including Buildings 1A and 2A. The location of the precinct system is proposed to the west of the unnamed existing water course that traverses the Central Precinct. Figure 2 provides a diagrammatic representation of the proposed and ultimate sewage management strategy. The management strategy for Buildings 1A and 2A allows the flexibility for the treatment system to be de-commissioned in the future and for Buildings 1A and 2A to then be connected to a larger collection and treatment system that serves the entire Central Precinct development area.

It is proposed to treat sewage to recycled water standards as defined by the NSW Guidelines for Urban and Residential Use of Reclaimed Water, 1993. The proposed treatment systems for Buildings 1A and 2A will consist of containerised Membrane Bio-Reactor treatment systems (approximate capacity 12kL/day) with an associated recycled water storage tank.

In summary, the following is proposed for Buildings 1A and 2A of the Central Precinct development area:

» Buildings 1A and 2A will each be serviced by its own dedicated sewage treatment system to treat all sewage to NSW Guidelines recycled water standards. The recycled water would be used within the each building area to service non-potable water end-uses, primarily including toilet flushing, air conditioning and garden watering. Any recycled water that may become surplus to the non-potable water demands (as defined) would be disposed of by irrigation in a dedicated area allocated within the lots and in vacant land adjacent to the Central Precinct development area (Figure 3 shows a diagrammatic representation of the proposed sewer, potable water and recycled water servicing arrangement); and

» Emergency / buffer storage will be provided at each treatment system location.



LEGEND

- PROPOSED ULTIMATE STAGE 1 RECYCLED WATER
- PROPOSED ULTIMATE STAGE 1 SEWAGE COLLECTION MAIN
- PROPOSED INTERIM SEWAGE TREATMENT PLANT
- PROPOSED ULTIMATE STAGE 1 SURPLUS RECYCLED WATER IRRIGATION AREA
- PROPOSED ULTIMATE STAGE 1 SEWAGE TREATMENT PLANT

0 40 80 120m
SCALE 1:4000 AT ORIGINAL SIZE

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GOODMAN INTERNATIONAL LTD
OAKDALE CENTRAL PROJECT APPLICATION (PA1)
ESTATE WORKS & DHL

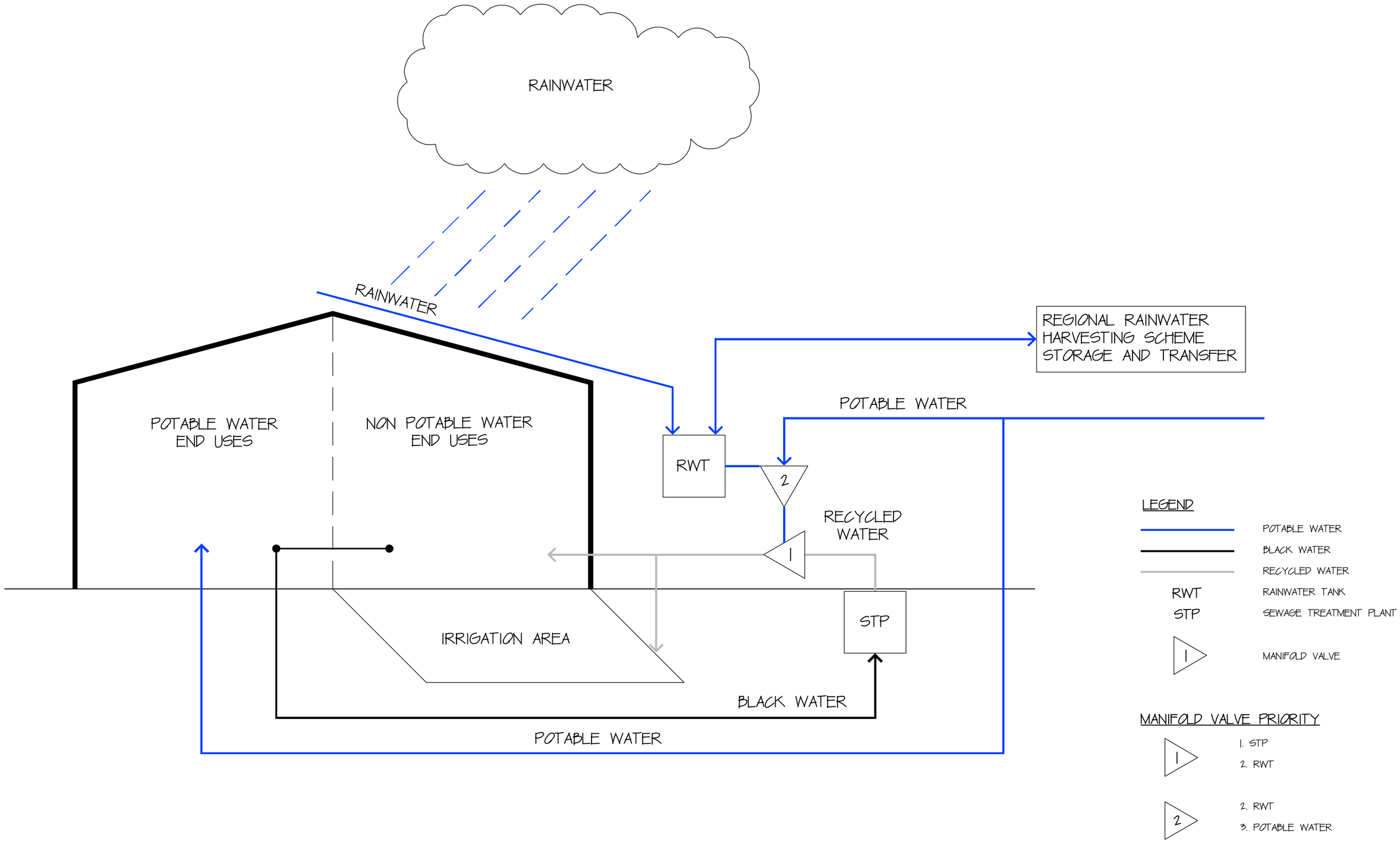
SEWAGE MANAGEMENT STRATEGY

scale | 1:4000 for A3 date | MARCH 2008

job no. | 21-16225
rev no. | D

Figure 2

10 Bond Street, Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au



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GOODMAN INTERNATIONAL LTD
OAKDALE CENTRAL PRECINCT
SEWER AND WATER SERVICING ARRANGEMENT
scale | NTS for A3 date | MARCH 2008

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rev no. | B

Figure 3

Level 6, 20 Smith St Parramatta NSW 1740 Australia PO Box 788 Parramatta NSW 2124 **T** 61 2 8898 8800 **F** 61 2 8898 8810 **E** sydmail@ghd.com.au **W** www.ghd.com.au

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4.2 Servicing Issues / Impacts

Management of potential issues associated with the proposed sewage servicing strategy include:

» **Treatment type**: Tertiary treatment with disinfection (to recycled water standards as defined by the NSW Guidelines) and emergency storage to prevent overflows in the event of system failure or heavy rain is proposed in accordance with relevant guidelines to safeguard public health and the environment (refer Section 4.3).

» **Recycled water irrigation / disposal:** A suitable area to be set aside for recycled water irrigation / disposal for disposal and buffer zones relative to waterways. Details of preliminary irrigation area requirements are set out in Section 4.4. It is noted that all sewage from the development is to be treated to a recycled water standard as defined by the NSW Guidelines for Urban and Residential Use of Reclaimed Water, 1993. Only recycled water that is surplus to the non-potable water demands will be managed through additional storage and/or irrigation disposal.

» **Environmental impacts**: Suitable buffers, emergency storage and a disposal/irrigation area that meets the minimum requirements and will prevent any adverse water quality, odour and/or land degradation issues (refer Section 4.4).

4.3 On-site Treatment Guidelines and Effluent Treatment Requirements

It is proposed to treat sewage to recycled water standards as defined by the NSW Guidelines. The recycled water will be suitable for open access urban and residential reuse as defined in these guidelines. Table 3 summarises the relevant effluent criteria necessary for recycled water standards based on the NSW Guidelines for Urban and Residential Use of Reclaimed Water, NSW Recycled Water Coordination Committee, May 1993

Table 3 Effluent Criteria for Irrigation

Parameter	Level
Level of Treatment	Tertiary
BOD	<20 mg/L (secondary treatment)
SS (NFR)	<30 mg/L (secondary treatment)
Coliforms	<10 in 100ml (<2.5 in 100ml geometric mean at point of use)
Faecal Coliforms	<1 in 100ml
Turbidity	< 2NTU (geomeric mean) <5NTU (95%ile)
PH	6.5 – 8 (allowable range) 7 – 7.5 (desirable range)

Reclaimed water meeting the NSW guidelines may be suitable for:

» residential garden irrigation;

» toilet flushing;

» car washing and similar outdoor uses; and

» firefighting.

The recycled water system design will consider the guidelines outlined in the Department of Water and Energy publication, "Management of Private Recycled Water Schemes (October 2007).

4.4 Onsite Treatment System Effluent Disposal by Irrigation

4.4.1 Buffer Zones

Effluent irrigation areas are subject to buffer distances in order to protect the environment, community amenity and public health. Under the DECC guidelines (Environmental Guidelines for the Use of Effluent by Irrigation, 2004), the buffer distances showed in Table 4 are applicable for low strength effluent (i.e. effluent from municipal treatment plants with secondary treatment). These would be considered conservative if applied to the proposed development as the sewage is proposed to be treated to recycled water standards as defined by the NSW Guidelines.

Table 4 Buffer Distance Requirements

Natural water bodies (e.g. rivers, lakes)	**50m**
Other waters (e.g. artificial waters, small streams, water distribution channels)	Site specific
Domestic well used for household water supply	Site specific
Town water supply bores	Site specific
Where spray irrigation gives rise to aerosols near houses, roads, public open spaces etc.	50m
Other sensitive areas (eg waters in drinking water catchments)	Site specific although it is noted that within the Sydney Drinking Water Catchment, the SCA would seek a buffer of 100m in the absence of other evidence of a neutral or beneficial effect on water quality.

Furthermore, such systems will need to be installed in accordance with the relevant Council requirements. Fairfield City Council has published an "On Site Sewage Management Strategy" (June 2002) which lists recommended buffer distances consistent with the "Environmental and Health Protection guidelines – On Site Sewage Management for Single Households". These buffers are as shown in Table 5.

Table 5 On Site Systems Recommended Buffers

System	Recommended buffer distances
All land application systems	100m to permanent surface waters (e.g. rivers, streams, lakes etc.)
	250m to domestic groundwater well
	40metres to other waters (e.g. farm dams, intermittent waterways and drainage channels etc.)
Surface spray irrigation	6m if area up gradient and 3 metres if area down gradient of driveways and property boundaries
	15 metres to dwellings
	3 metres to paths and walkways
	6 metres to pools and recreational areas

Other buffers also apply to subsurface, drip and trickle irrigation as well as absorption systems.

4.4.2 Estimated Irrigation Area

An irrigation water balance has been performed using the (surplus) recycled water generation rates calculated from the preliminary water balance modelling conducted for Buildings 1A and 2A.

The irrigation areas (and associated buffer storage volume) required to manage the surplus recycled water were determined using GHD's in-house modelling software. The model considers the irrigation potential (based on climatic conditions, plant types etc.). An indicative nutrient balance (total nitrogen and total phosphorous) was also undertaken to determine if this would be a limiting factor. The nutrient balance was based on typical effluent quality that can be expected by an advanced treatment plant such as a Membrane Bioreactor (MBR) treatment system. The nutrient balance found that nutrients were not the limiting factor when determining the irrigation area required.

Adopting the irrigation areas predicted by the water balance modelling was hence determined to be sufficient to ensure that:

» The surplus recycled water does not cause detriment to the soil, surface water or groundwater; and

» Sufficient irrigation area (and associated storage volume) is available.

The nutrient balance was based on typical effluent quality that can be expected by an advanced treatment plant such as a Membrane Bioreactor (MBR) treatment system.

Rather than provide a large buffer storage for surplus recycled water it is proposed to minimise the buffer storage requirement and provide a larger irrigation area based on the following:

» There is a large quantity of vacant land adjacent to Central Precinct that can be utilised as an irrigation area for surplus recycled water should it be required.

» There is limited space for the treatment plants and associated buffer storage within the general vicinity of Buildings 1A and 2A and that is also adjacent to essential services such as roads, power and telecommunications;

» The treatment systems to serve each of Buildings 1A and 2A will eventually be de-commissioned with sewage from Buildings 1A and 2A conveyed to a treatment system that serves the entire Central Precinct development area. Therefore, it is preferable at this stage to minimise up-front capital cost expenditure by minimising buffer storage requirements; and

A summary of the adopted irrigation areas and associated storage results for Buildings 1A and 2A are shown in Table 6.

Table 6 Adopted irrigation areas and associated storages

Option Scenario --->	**Option 1a-** **Lots, 27EP, 0.0% Inflow /Infiltration**	**Option 1b-** **Lots, 55EP, 1.3% Inflow /Infiltration**	**Option 2-** **Cluster, 27 EP, 1.3% Inflow /Infiltration**
Approximate Surplus Recycled Water Requiring Management (ML/year)	0	0.9	0.7
Approximate Irrigation Area (m^2)	0	**20,000**	**15,000**
Approximate Storage Size (m^3) buffer required for surplus	0	90	90

It is noted that for Option 1a there is a deficit of recycled water available for recycled water uses (i.e. the demand from sources which can utilise recycled water including garden watering, toilet flushing and air conditioning, are greater than the total recycled water generated).

It is also noted that if required the irrigation area could be reduced by increasing the size of the surplus buffer storage. This would however depend on the available area for buffer storage installations.

The approximate irrigation area requirements can be accommodated either on an individual building site or in a common disposal area. As shown on Figure 2, land is proposed to be made available for irrigation purposes (should it be required) which allows for a buffer zone of 100m to permanent water courses such as rivers and creeks and 40m to other water bodies such as dams and intermittent waterways.

In accordance with DECC requirements a Recycled Water Irrigation Management Plan will need to be prepared including details of the water balance, hydraulic loading, soil analysis and nutrient balance as well as full details of the system. This will include site specific geotechnical testing to confirm the optimum areas for irrigation.

For the “upper bound” scenario modelled a minimum area of 2 ha is required for Buildings 1A and 2A. This required area is available via the landscaped areas of each building with any excess area requirements available on the western side of the unnamed watercourse should it be required.

4.5 Emergency Storage

Emergency storage will be provided for the containment of sewage in the event of a system malfunction to allow sufficient time for repairs to be undertaken or pump-out by tanker to occur (including allowance for system malfunction on weekends or public holidays). A volume equivalent to three days design wet weather flow is proposed. This will prevent any overflows to the environment in the event of mechanical or power failure in the treatment system.

It is noted that during major rainfall events, the emergency storage may also be utilised to temporarily store surplus recycled water preceding disposal to the nominated irrigation area (as the irrigation area may be saturated and unable to be further irrigated). The nominated buffer storage volumes have been confirmed to adequately store expected maximum surplus recycled water volumes, however, actual storage requirements will need to be determined as part of the detailed design associated with each lot's development application. The expected buffer storage requirements for Buildings 1A and 2A are shown in Table 6.

4.6 Mitigation of Potential Environmental Issues

Potential environmental issues associated with the sewer servicing strategy will be mitigated as follows:

» **Odour Management**: Local treatment systems will be required to operate under an approved system management plan, including routine monitoring, scheduled maintenance and emergency response plan to avoid excess loading of organics and nutrients on the irrigation area or anaerobic conditions developing. The specific location of treatment systems will consider adequate buffers distances from work areas and public amenities. Proper operation of onsite treatment systems and provision of adequate buffers will prevent any odour impacts. It is noted that the utilisation of systems such as MBR's may include odour scrubbing which will eliminate the need for buffers to the treatment systems.

» **Soil Management**: A properly designed and maintained onsite treatment and effluent irrigation / disposal system should not result in any adverse impacts on receiving soils. Only water of a NSW Guidelines recycled water standard will be applied to nominated (surplus recycled water) irrigation areas and gardens, significantly reducing risks of soil degradation. Allowance to provide adequate contingency for salt/nutrient assimilation and/or any unexpected waste atypically of that expected for domestic type sewage to avoid any land degradation due to excess organics, nutrients, salt or other contaminants is required. This would be controlled through an Recycled Water Irrigation Management Plan or similar.

» **Water Quality Management for Adjacent Waterways**: A properly designed and maintained onsite treatment and effluent irrigation / disposal system should not result in any adverse water quality impacts on adjacent waterways. Provision of suitable buffer distances and emergency storage and the provisions for a system management and emergency response plan will further serve to protect adjacent waterways.

4.7 Further Analysis

When the final details and the proposed staff numbers are determined and an appropriately sized onsite treatment system is selected, a Recycled Water Irrigation Management Plan should be prepared providing details regarding:

i) Landuse and population density limits for the development;

ii) The onsite treatment system design and location;

iii) The onsite treatment system operations and emergency response plan; and

iv) The nominated effluent disposal method, area, buffer storage design, location and appropriate detailed soil data analysis and/or nutrient/salt balance modelling for the proposed disposal area.

5. Conclusion

There is no existing Sydney Water sewerage infrastructure currently available to service the proposed development site.

Sewage generation rates have been estimated based on the site being developed as a light industrial precinct with sewage being domestic in nature only;

The proposed sewer servicing strategy consists of the following:

» Buildings 1A and 2A will be serviced by its own dedicated sewage treatment system to treat all sewage to NSW Guidelines recycled water standards. The recycled water would be used within the two lots to service non-potable water end-uses, primarily including toilet flushing, air conditioning and garden watering. Any recycled water that may become surplus to the non-potable water demands (as defined) would be disposed of by irrigation in a dedicated area allocated within the lots and in vacant land adjacent to Central Precinct; and

» Emergency / buffer storage will be provided at each treatment system.

The potential impacts of the proposed Buildings 1A and 2A sewage management strategy are to be mitigated by providing the following:

» Conservatively sized disposal areas to manage surplus recycled water;

» Provision of suitable buffer distances to public areas and watercourses; and

» Emergency storage and Emergency Response Plan(s) to prevent system overflows (detailed in the Recycled Water Irrigation Management Plan).

6. References

» Douglas Partners (May 2007), “Report on Preliminary Geotechnical Assessment, Proposed Ropes Creek “Southpipe” Development, Eastern Creek and Erskine Park”.

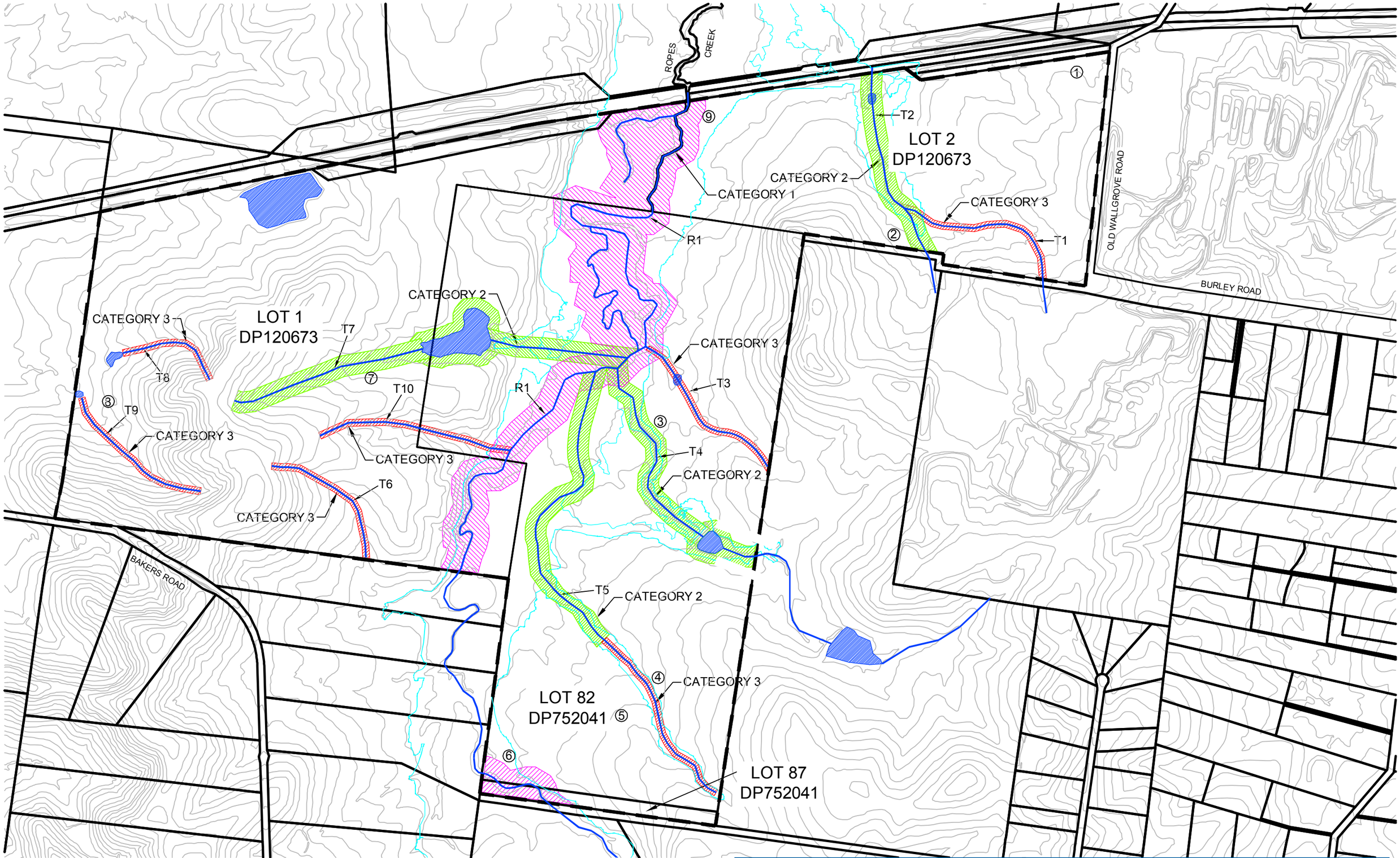
» GHD Pty Ltd (December 2007), “Oakdale Concept Plan, Preliminary Sewer Servicing Strategy”.

» GHD Pty Ltd (December 2007), “Oakdale Concept Plan, Riparian Assessment”.

» GHD Pty Ltd (December 2007), Oakdale Concept Plan, Water Balance Report Parts 1 and 2”.

Appendix A

Watercourse Categorization and Riparian Corridors



LEGEND

- ROPES CREEK 100 YEAR FLOOD EXTENTS (APPROX)
- EXISTING DAMS
- LOT BOUNDRY
- SITE BOUNDRY
- CATEGORY 1 BUFFER
- CATEGORY 2 BUFFER
- CATEGORY 3 BUFFER
- ⑧ DNR SITE MEETING LOCATIONS
- T5 EXISTING WATERCOURSE & LABEL

N

0 100 200 300m
SCALE 1:10000 AT ORIGINAL SIZE

PRELIMINARY

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GOODMAN INTERNATIONAL LTD
OAKDALE CONCEPT PLAN
RIPARIAN BUFFERS
DRAFT ONLY

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rev no. | E

Figure 1

scale | 1:10000 for A3 date | DECEMBER 2007

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Appendix B

Concept Plan for Central Precinct

Site Area Schedule

	Central
Total Land Area	**61.18 ha**
Less: Restricted Areas	
Conservation	11.95 ha
Easements	0.0 ha
Total Restricted Areas	(11.95 ha)
DEVELOPMENT Area	**49.23 ha**
Less: Regional infrastructure	
Services Lot (1) (Sewage)	1.02 ha
Old Wallgrove Road Widening	0.08 ha
Link Road (Option A)	5.56 ha
Total Regional Infrastructure	(6.66 ha)
Gross ESTATE Land Area	**42.57 ha**
Less: Estate Allocations	
Estate Road Lot 1	1.05 ha
Estate Road Lot 2	0.86 ha
Estate Road Lot 3	0.66 ha
Total Estate Allocations	(2.57 ha)
Nett Development LOTS	**40.00 ha**
Development Lot 1A	5.08 ha
Development Lot 1B	4.62 ha
Development Lot 1C	3.25 ha
Development Lot 2A	7.08 ha
Development Lot 2B	6.09 ha
Development Lot 3	13.88 ha

Legend

- Oakdale ESTATE Concept Plan (CP #2)
- Oakdale CENTRAL Concept Plan (CP #1)
- Existing Boundary
- Proposed Boundary/ Road Reserve
- (1) Development Lot
- (B1) Bridge

Goodman

Extent of Old Wallgrove Road Upgrade via M7 Hub

Link Road Segment Construct 2 new western lanes of 4 lane divided road on 20m road widening from Transgrid land.

M7 HUB

Link Road Option A (or Estate Road) Construct 7m Carraigeway as Estate Road. Provision for 40m road reserve as Link Road.

Temporary Access Road to 1A + 2A

Bridge B1

Bridge B2

Line of Existing Road Reserve

Conservation Lot B

Conservation Lot C

Conservation Lot D

Conservation Lot A

Estate Road 1

Estate Road 2

Estate Road 3

Services Lot (1) (Sewage)

1A

1B

1C

2A

2B

3

EAST

WEST

SOUTH

Development Lot 1A + 2A Extent of Proposed Building Works

design+	Oakdale CENTRAL Horsley Park	Estate Works + DHL Project (PA #1) (Lot 2 DP120673)	Scope of Application 0 100 500	1:5000 @ A1 1:10000 @ A3 09 May 08 JH	OAK PA1 01 (A)

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