Oakdale East –Stage 2

Civil Infrastructure and Stormwater Management Report

CLIENT/ GOODMAN

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1. Executive Summary

1.1. Project Overview

This application seeks approval for a Concept Plan across Goodman's Oakdale East Industrial Estate ("Estate") and approval for Stage 2 of works at the Estate.

The site is located within the Fairfield Local Government Area and is legally described as Lot 102 and Lot 103 in DP1268366.

Stage 1 of the works were completed in September 2021 and included Precinct 1 building and infrastructure works as indicated on the proposed Estate Masterplan. (Refer Figure 1 - Site Location).

The Concept Plan is proposed to set the development controls for the Estate which will override the Development Control Plan ("DCP") that is currently with Department of Planning and Environment (DPE) for consideration. This DCP has been lodged with DPE to support the Rehabilitation Development Application that is currently with Fairfield City Council for consideration.

The Rehabilitation Development Application seeks approval for works only to Precinct 1 expansion, Precincts 2, 3 and 4 and includes the following (this application excludes works to Precinct 5):

- Cut and Fill works to provide bulk pad levels;
- Provision of Estate stormwater infrastructure including completion of detention basins and swales;
- Removal of 2.58 ha of vegetation;
- Demolition of the Brick Factory and rehabilitation of the surrounding land;
- Installation of 1 x retaining wall on the eastern portion of Precinct 3;
- Consideration for Aboriginal Heritage and Geotech assessments

The proposed Concept Plan approval seeks approval for:

- The proposed Estate masterplan allowing development of 303,009 sqm of GLA;
- 24/7 hours of operation;
- Building Height of 43m for Precinct 3 (excluding roof-top plant and solar) and 15m (excluding roof-top plant and solar) to the remainder of the Estate;
- Estate subdivision;
- Estate wide planning controls as shown in the EIS
- Construction hours 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday
- Geotech and Aboriginal heritage considerations for Precinct 5

The Stage 2 works considered under this application include the following;

- Cut and fill works to Precinct 5 only to provide bulk pad level;
- Completion of lead-in infrastructure works including intersection upgrades at Millner Ave / Old Wallgrove Road and Lenore Drive / Old Wallgrove Road
- Clearing of 2.28 ha of vegetation
- Completion of the internal road network (excl. the proposed private driveway providing access to Precinct 5 but including all other roads shown on the proposed masterplan);
- Reticulation of services infrastructure to provide serviced development pads to all precincts;
- Completion of retaining walls across the entire Estate;
- Completion of Building works to Precinct 1 expansion and Precinct 3 including any ancillary on lot infrastructure and detailed civil works required;

Precinct 1 Expansion

- Construction, operation, fit-out and use approval of a warehouse with ancillary office spanning 3,122 sqm of GLA;
- 24/7 hours of operation;
- 15m building height (excluding solar and rooftop plant)

Precinct 3

- Construction, operation, fit-out and use approval of a temperature controlled automated distribution centre;
- Total GLA of 96,810 sqm including 10,009 sqm of which is for future expansion;
- In addition to this, 38,050 sqm of mezzanines will be installed within the premises;
- 43m building height (excluding solar and rooftop plant)
- Storage of dangerous goods and flammable goods that exceed the SEPP33 threshold; and
- 24/7 hours of operation.

1.2. Introduction

AT&L have been engaged by Goodman to prepare a Civil and Stormwater Management Report to discuss the civil infrastructure and stormwater management requirements for the proposed development.

The aim of the report is to assess the potential impacts of the proposed development with respect to civil, infrastructure, stormwater and services.

This report has been prepared with due regard for the Fairfield City Council controls as a means of providing consistent infrastructure delivery and development standards, where these are appropriate to the context of the site:

- Proposed Oakdale East DCP
- Fairfield Citywide Development Control Plan 2013 – Amendment 16
- Fairfield City Council Stormwater Management Policy – September 2017
- Fairfield City Council Policy for Erosion and Sediment Control
- Fairfield City Council Specification for Roadworks and Drainage associated with subdivision or other development
- Managing Urban Stormwater – Soils and Construction (2004).

1.3. Existing Site

The site is located within the Fairfield City Council LGA. The site is located within Lot 1 in DP 843901, which fronts Old Wallgrove Road, Horsley Park. The site is approximately 2.5km west of the M7. Existing access to the site is via Old Wallgrove Road to the west.

The total area of Oakdale East is approximately 75Ha in area and is located within Horsley Park.

The existing site is part of a large brick manufacturing plant. The existing site comprises stockpiled materials as part of the brick manufacturing process.

The existing stockpiles and uncontrolled fill located the Oakdale East development site are proposed to be either removed from site or used as general fill which is being approved under the Separate Rehabilitation development application approved by Fairfield Council DA 347.1/2021. At the completion of the Rehabilitation works, various earthworks pads and stormwater control basins will remain which have been designed to suit the future development works.

The site is bound by:

- Austral Brick site to the north.
- Reedy Creek to the east.
- Old Wallgrove Road to the west, and
- Burley Road to the south.

Figure 1 - Site Location

The site generally falls from north to south, and west to east. Refer to the Survey drawings within Appendix A for all features on site along with existing contour levels.

The site is currently zoned as IN1 General Industrial. Refer to Figure 2 - Zoning Map (Courtesy of NSW Planning Portal).

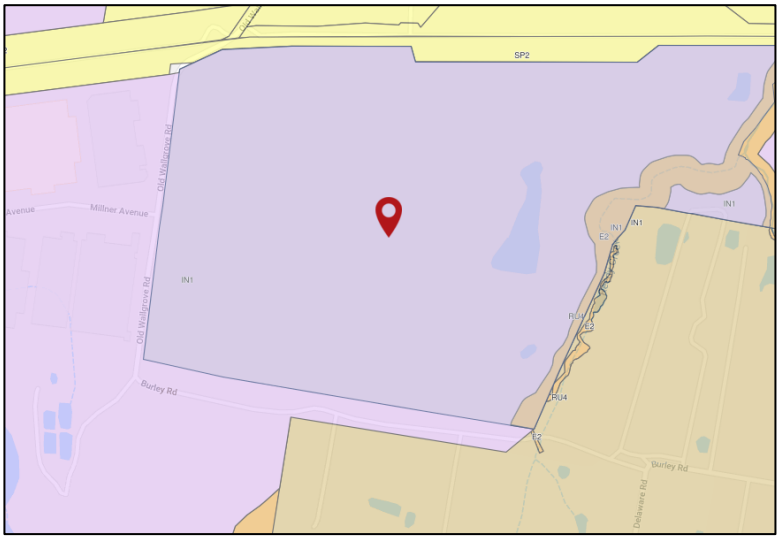

Figure 2 - Zoning Map (Courtesy of NSW Planning Portal)

1.4. Project Description

The proposed development involves the Concept masterplan for an industrial estate to be built over 4 stages with works including intersection upgrades, bulk earthworks, estate roads, services, expansion of an existing warehouse in Precinct 1 and construction, fit-out and operation of a warehouse in Precinct 3.

The proposed general arrangement of the site is shown below in Figure 3 - General Arrangement Plan.

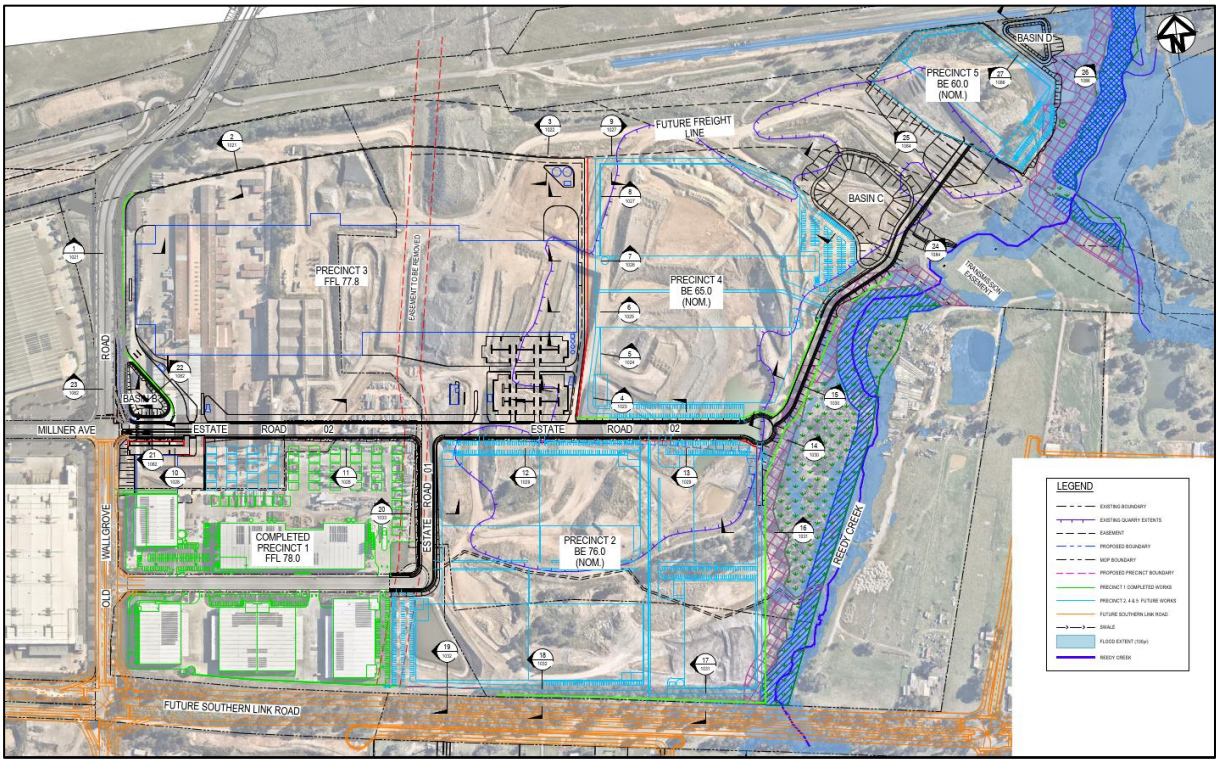

Figure 3 - General Arrangement Plan

1.5. Scope of Report

This report discusses the design philosophy and how stormwater is managed within the Oakdale East development. It includes:

- Sedimentation and Erosion Control
- Stormwater Management:
    - On Site Detention (OSD) – Site Storage Requirement (SSR) & Permissible Site Discharge (PSD)
    - Piped and Overland Flows
    - Water Sensitive Urban Design (WSUD)
- Flooding
- Utility Servicing
- Road Design

2. Compliance with SEARS

2.1. Compliance with SEARs

This report responds to the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) on 1 March 2022.

Table 1 below summaries all key civil infrastructure issues raised in the SEARs and how they have been addressed in this report.

Table 1: Secretary's Environmental Assessment Requirements addressed in this report

Key Issue listed in the SEARs	Response
Suitability of the Site	
Easements An analysis of site constraints including any easements or preserved corridors	The General Arrangement Plan 20-798-C1010 prepared by AT&L indicate Easements to be extinguished
Site Access A detailed justification that the site can accommodate the proposed development having regard to its potential environmental impacts, permissibility, strategic context and existing site constraints	Site access is proposed via a signalised intersection off Old Wallgrove Road
Bulk Earthworks An options analysis of the proposed bulk earthworks aiming to deliver balanced cut and fill and minimise the height and visual impact of the development including retaining walls and buildings, with consideration of proposed works and levels on adjoining properties	Bulk Earthworks across Precincts 2, 3 and 4 are approved under DA 347.1/2021. Precinct 5 Earthworks are subject to this application. Refer drawing C1038
Traffic	
Road Network Details and plans of the proposed internal road network, loading docks, servicing areas, on-site parking including provisions for electric vehicle charging, pedestrian and cyclist facilities, in accordance with the relevant Australian Standards	Detailed Civil Engineering Plans have been prepared by AT&L in accordance with Austroads, Australian Standards and Council Requirements Road Geometry is discussed within Section 3 of this report
Swept Path details of the largest vehicle anticipated to access and move within the site, including swept path analysis and diagrams depicting vehicles entering, exiting and manoeuvring throughout the site	The Turn Path Plans 20-788-C1121-C1123 prepared by AT&L indicate the proposed vehicle analysis and turning movements

Soils and Water	
Topographic assessment A topographic assessment and justification the proposed earthworks are site responsive and contextually appropriate	A Topographic assessment and justification on proposed earthworks are discussed within Section 2 of this report
Water Quality characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including proposed mitigation measures to manage any impacts to receiving waters and monitoring activities and methodologies)	The Siteworks Plans 20-788-C1041-C1049 prepared by AT&L indicate the Gross Pollutant Trap locations Water Quality target reductions are not required as discussed within Section 5.3 of this report
On Site Detention details of the stormwater/wastewater management system including how it will be designed, operated and maintained, including the capacity of onsite detention system(s) and measures to treat, reuse or dispose of water	The On-site Detention Plans 20-788-C1071-C1086 prepared by AT&L indicate the combined OSD Basin details and dimensions A integrated water management strategy is discussed within Section 8 of this report including capacity of OSD systems
Sediment and Erosion Control Description of the proposed erosion and sediment controls during construction	Refer to Sediment and Erosion Control Plans 20-798-C1111-C1120 prepared by AT&L for erosion and sedimentation control measures during construction Sediment and Erosion Control measures are discussed within Section 2 on this report including calculations and sizing
Infrastructure Requirements	
Utility Capacity details of the existing capacity of the site to service the proposed development and any extension or augmentation, property tenure or staging requirements for the provision of utilities, including arrangements for electrical network requirements, drinking water, wastewater and recycled water	The Utility Coordination Plans 20-798-C1101-C1107 prepared by AT&L indicate the general utility layout A utility servicing strategy is discussed within Section 7 of this report including staging and timing for electrical, water, wastewater and recycled water
Utility Upgrades A description of how any upgrades will be co-ordinated, funded and delivered on time and be maintained to facilitate the development	The Utility Coordination Plans 20-798-C1101-C1107 prepared by AT&L indicate the general utility layout A utility servicing strategy is discussed within Section 7 of this report including staging and timing for electrical, water, wastewater and recycled water

Existing Infrastructure identification of any existing infrastructure or easements on or off the site which may be impacted by construction or operation of the development and details of measures to be implemented to address any impacts	The Utility Coordination Plans 20-798-C1101-C1107 prepared by AT&L indicate the existing utilities to be relocated, protected or decommissioned A utility servicing strategy is discussed within Section 7 of this report including staging and timing for electrical, water, wastewater and recycled water

3. Earthworks and Sedimentation & Erosion Control

3.1. Proposed Earthworks – Precinct 5

It is noted the only earthworks contained within this Application are for Precinct 5, all other earthworks are approved under a separate Application.

The site in its existing condition is characterised by undulating topography. It is the intent of the proposed development to produce several "flat" pads to facilitate the development of large-scale industrial lots as intended by the zoning IN1. This will require earthworks across the site to achieve a benched site, refer to Appendix A for a cut/fill plan.

The cut / fill requirements within the site have been defined through multiple iterations and careful consideration of the following:

- Undulating topography within the Precinct resulting in the requirement for cut and fill operations to allow the development to facilitate economic development and provide flexibility to cater for the range of industrial customer requirements.
- Provisioning for connectivity to adjoining lands and managing existing upstream catchment flows.
- minimising retaining walls fronting internal public road reserves.
- Mitigate extensive cut in bedrock sub-surface units.
- Meet the requirements for the site to cater for IN1 – General Industrial employment which requires large flexible allotments.
- Minimise impact to the existing vegetation within the E2 zone land

It is proposed that the earthworks design contained within the AT&L documentation provides the most contextually and economically appropriate design in consideration of the above requirements.

All import materials will comply with the requirements of the requirements of the Import Fill Protocol and Geotechnical Specifications for the Development. Topsoil stripping, blending and placement will be completed in accordance with the Geotechnical Engineering Specifications for the project.

3.2. Sedimentation and Erosion Control (Construction)

A Soil and Water Management Plan (SWMP) has been prepared in accordance with the NSW Department of Housing Publication titled: Managing Urban Stormwater – Soils and Construction (2004) for the whole site.
The key objective of the SWMP are:

- Acknowledging the activities on a construction site which may contribute to erosion, sedimentation and water quality impacts;
- The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work; and
- Establishment of processes that effectively manage erosion, sedimentation and water quality practices during the life of the project.

3.2.1. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods;
- Work areas that have not been stabilised;
- Extraction of construction water from waterways during low rainfall periods;
- Clearing of vegetation and the methods adopted, particularly in advance of construction works;
- Stripping of topsoil, particularly in advance of construction works;
- Bulk earthworks and construction of pavements;

- Works within drainage paths, including depressions and waterways;
- Stockpiling of excavated materials;
- Storage and transfer of oils, fuels, fertilisers and chemicals;
- Maintenance of plant and equipment;
- Ineffective implementation of erosion and sediment control measures;
- Inadequate maintenance of environmental control measures; and
- Time taken for the rehabilitation / revegetation of disturbed areas.

3.2.2. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil;
- Increased water turbidity;
- Decreased levels of dissolved oxygen;
- Changed salinity levels;
- Changed pH levels;
- Smothering of stream beds and aquatic vegetation;
- Reduction in aquatic habitat diversity;
- Increased maintenance costs; and
- Decrease in waterway capacity leading to increased flood levels and durations;

3.3. RUSLE Analysis

Prior to the design of the SWMP, a Revised Universal Soil Loss Equation (RUSLE) has been undertaken in accordance with the "Blue Book". This analysis has been undertaken to predict the long term, average and annual soil loss from sheet and rill flow from the site under specified management conditions.

Estimating soil loss for a proposed development has four important applications to soil and water management. These are to:

1. Assess the erosion risk at a site;
2. Identify suitable measures to overcome the erosion risk;
3. Estimate the required capacity of sediment retarding basins; and
4. Compare the effectiveness of various erosion control measured.

Refer to Table 2 – RUSLE Analysis

It should be noted the following parameters/assumptions were used for the analysis of this site:

- Rainfall Erosivity Factor (R) = 2,413.51 from (Equation 2, Appendix A2 Blue Book);
- Soil Erodibility Factor (K) = 0.05 (from Appendix C, Table C19 of Blue Book);
- Slope Length (LS): Is assumed to not exceed 80m immediately before forecast rainfall or during shutdown periods and a maximum grade of 5%;
- Erosion Control Factor (P): Is the ratio of soil loss with a nominated surface condition ploughed up and down the slope (from Appendix A5, Blue Book); and
- Cover Factor (C): Is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. With the proposed ESC measures being installed post bulk earthworks, it is assumed that all soil is recently disturbed, thus a C factor of 1 is chosen.

Parameter	Item (Blue Book Reference)
Rainfall Erosivity Factor, R	2250
Soil Erodibility Factor, K (Table C20, Blue Book)	0.05
Slope Length/Gradient Factor, LS	0.27
Erosion Control Practice Factor, P	1.30
Ground Cover and Management Factor, C	1
Computed Soil Loss (tonnes/ha/year), (A = R x K x LS x P x C)	**30**
Soil Loss Class	1 (Table 4.2)

Table 2 – RUSLE Analysis

The erosion hazard potential of the site is considered low, due to the calculated soil loss lying in the range of 151 to 225 tonnes/ha/year as per Table 4.2 of the Blue Book.

Table 4.2 The Soil Loss Classes (adapted from Morse and Rosewell, 1996)

Soil Loss Class	Calculated soil loss (tonnes/ha/yr)	Erosion hazard
1	0 to 150	very low
2	151 to 225	low
3	226 to 350	low-moderate
4	351 to 500	moderate
5	501 to 750	high
6	751 to 1,500	very high
7	>1,500	extremely high

Figure 4 - Table 4.2 from the Blue Book

3.4. Soil and Water Management Plan

3.4.1. Overall Strategy

The following construction methodology will be followed to minimise the impact of sedimentation due to construction works:

- Diversion of “clean” water away from the disturbed areas and discharge via suitable scour protection;
- Provision of hay bale type flow diverters to catch drainage and divert to “clean” water drains;
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required);

- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site;
- Provision of catch drains to carry sediment-laden water to sediment basins;
- Provision of silt fences to filter and retain sediments at source;
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed;
- All temporary sediment basins will be located clear of the 100yr ARI flood extent from Reedy Creek and all associated tributaries;
- The weir levels of temporary sediment basins will be located above the 100yr ARI flood event levels from Reedy Creek and tributaries; and
- On-Site Detention basins are to be utilised as temporary sediment control basins. The bio-retention basins shall not be converted into the final/ultimate basins until all building and construction works within the relevant stage has been completed and 90% of the site is stabilised.

Refer to AT&L Drawings C1111 to C1120 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.
Suitable erosion and sediment controls shall be designed, provided and maintained by the contractor throughout all stages of works, including at completion of the bulk earthworks were shown on AT&L drawings or where directed by the Superintendent or Fairfield City Council's engineers.

Such controls shall be in accordance with the relevant requirements in the latest version of the managing urban stormwater: soils and construction guideline (Landcom).

3.4.2. Design of Sediment and Erosion Control Measures

Suitable erosion and sediment controls shall be provided by the Contractor and maintained throughout all stages of works, including at completion of the bulk earthworks.

All design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of:

- Protection of the Environment Operations Act;
- Office of Environment and Heritage's 'Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) (The "Blue Book") Volume 1 and Volume 2.

Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

With the proposed site being larger than 2,500m^2 in disturbed area, sediment basins are required. The following temporary sediment basins are to be in-place at the commencement of demolition works. Refer to drawings in Appendix B and 'Earth Basin Wet' SD6-4 for details, and Table 3 – Site Data below for basin sizes.

Parameter	Item (Blue Book Reference)
Soil Type	Type F (Appendix C, Table C19, Blue Book)
Design Rainfall Depth (Days)	5
Design Rainfall Depth (Percentile)	85
x-day, y-percentile rainfall event	35.00 (Table 6.3a)
Rainfall Intensity: 2-year, 6-hour storm	10.10
Rainfall Erosivity (R-factor)	**2250**

Table 3 – Site Data

Parameter	Basin B	Basin C	Basin D
Volumetric Runoff Coefficient, C_v (Appendix F3, Blue Book)	0.50	0.50	0.50
Contributing Area, A (ha)	50.5	9.5	3.2
$R_{(85\ \%ile,\ 5\ day)}$	35.00	35.00	35.00
Settling Zone Volume, (m^3)	12,372.5	2,327.5	784
Sediment Storage Zone Volume, (m^3)	261.0	49	17
Total Sediment Basin Volume, (m^3)	**12,633.5**	**2,376.5**	**801**

Table 4 – Precinct Temporary Sediment Basins

The three basins identified above will ultimately be converted to the OSD basins once the development of the site is complete. As part of the Rehabilitation works, various sedimentation basins will be constructed on each of the earthwork's pads. These basins are intended to remain until the on-lot works commence over the various precincts. This is in addition to the basins above.

3.5. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section must be carried out while either earthworks or quarrying is being conducted, and all areas re-established.
The Contractor will be required to inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology;
- Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways;
- Ensure that drains operate properly and to affect any repairs;
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas;
- Remove trapped sediment whenever less than design capacity remains within the structure;
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate;
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated;
- Remove temporary soil conservation structures as the last activity in the rehabilitation.
- Inspect the sediment basin during the following periods:
    - During construction to determine whether machinery, falling trees, or construction activity has damaged and components of the sediment basin. If damage has occurred, repair it;
    - After each runoff event, inspect the erosion damage at flow entry and exit points. If damage has occurred, make the necessary repairs;
    - At least weekly during the nominated wet season (if any), otherwise at least fortnightly; and
    - Prior to, and immediately after, periods of 'stop work' or site shutdown.
- Clean out accumulated sediment when it reaches the marker board/post and restore the original volume. Place sediment in a disposal area or, if appropriate, mix with dry soil on the site;
- Do not dispose of sediment in a manner that will create an erosion or pollution hazard;
- Check all visible pipe connections for leaks, and repair as necessary;

- Check all embankments for excessive settlement, slumping of the slopes or piping between the conduit and the embankment, make all necessary repairs;
- Remove the trash and other debris from the basin and riser; and
- Submerged inflow pipes must be inspected and de-silted (as required) after each inflow event.

3.5.1. Sediment Basin Maintenance

As stated above, the proposed development site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or finer than 0.02mm) and require a much longer residence time to settle.

Stormwater within the settling zone should be drained or pumped out within 5 days (design time), if the nominated water quality targets can be met, to the satisfaction of the superintendent. Flocculation should be employed where extended settling is likely to fail to meet the objectives within the 5-day time period.
Flocculation is when flocculating agents are applied to the sediment basins causing the colloidal particles to clump into larger units or 'floc' that can either settle in a reasonable time or be filtered.

Refer to Appendix E4 of the Blue Book for flocculation methodologies and manufacturer's instructions for application rates, regarding the proposed sediment basins.

4. Road Design

4.1. Horizontal and Vertical Geometry

The Estate Road within Oakdale East Estate have generally been designed to meet Austroads requirements and Australian Standards to accommodate B-Double truck movements where possible.

The estate roads connect into Old Wallgrove Road at the western boundary of the site and extends for approximately 400 m to the east, terminating in a temporary turn head.

See drawings within Appendix A for proposed Estate Road layout along with connections into Old Wallgrove Road to the west.

The Estate Road is designed as such:

- 23.0m wide Road Reserve
- 15.5m wide Carriageway comprising:
  - 2x 3.5m wide traffic lanes
  - 2x 4.25m wide traffic lanes adjacent kerb
- Verge 3.75m wide
- Cul-De-Sac have been shown at 30m Diameter to accommodate the largest design vehicle
- The largest design vehicle is a B-Double
- Design Speed of Road = 60km/hr
- No guard fences have been shown and these will be assessed at detailed design stage in accordance with Austroads.

Refer to Figure 5 - Typical Estate Road Section, indicating typical road section.

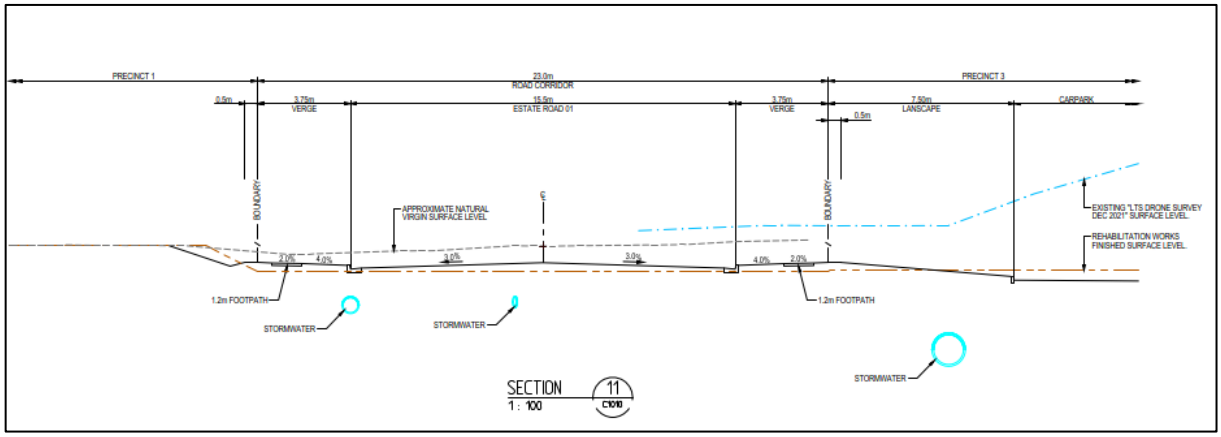

Figure 5 - Typical Estate Road Section

4.2. Pavement

Pavement will be designed based on the requirements of Austroads Pavement Design Guide – A Guide to the Structural Design of Road Pavements and recommendations provided within the Oakdale East Industrial Estate Geotechnical Report prepared by Douglas Partners in report 86545.01 dated December 2018.

4.3. Batter Design

Any batter's steeper than 1 in 5 will be vegetated and all external batters to the development have been limited to 1 in 4 as a minimum generally, with the maximum being 1 in 3. Any temporary batters constructed during the works will be in accordance with the geotechnical report and ongoing advice from the Level 1 supervisor.

5. Stormwater Management

5.1. Existing Stormwater Drainage

Currently there is no stormwater infrastructure within the site with all stormwater runoff draining via open swales to the east into Reedy Creek.

The site generally falls north to south and west to east, towards Reedy Creek.

5.2. Council, Precinct Requirements and Recommendations

A meeting was held on the 2nd of July 2021 between Fairfield City Council, Goodman and AT&L to discuss the proposed development and relevant Council planning requirements and engineering guidelines to be adopted. Within this meeting the following outcomes were noted:

All stormwater drainage from the Oakdale East development is designed to comply with the following:

- Fairfield City Council Stormwater Management Policy – September 2017
- Fairfield City Council Policy for Erosion and Sediment Control
- Fairfield City Council Specification for Roadworks and Drainage associated with subdivision or other development
- Managing Urban Stormwater – Soils and Construction (2004).

A summary of the design requirements adopted is listed below:

- Precinct basins will serve the development as a detention. No on-lot detention basins/ tanks are required
- Based on the Fairfield City Council Stormwater Management Policy – September 2017 Figure 4 the proposed development is situated within the Rural stormwater management zone. As such the following OSD requirements apply:
    - Maximum permissible site discharge (PSD) of 78l/sec/ha for the 5, 15, 30, 60, 180, 360 and 540 minute duration storms for the 5 and 100 year ARIs for the developed site OR
    - Site storage requirements (SSR) of 4.09m^3 per 100m^2 of developed site using the simplified method
- Based on the Fairfield City Council Stormwater Management Policy – September 2017 Section 6.3 as the site is located within the Rural Zone water quality improvement is not required
- Reduce water consumption in non-residential properties by 40% consistent with the BASIX Scheme

5.3. Proposed Site Stormwater Drainage

All proposed stormwater drainage from the development will be designed in accordance with the Fairfield City Council engineering requirements and guidelines.

Stormwater on the lots and within the road reserve is proposed to be collected via pits and pipes and ultimately drain into on-site detention basins located in the south eastern corner of Precinct 3, the north east corner of Precinct 4 and the north east corner of Precinct 5. The OSD basins will be shaped as part of the Rehabilitation Works (Separate Approval) and will be functioning as sedimentation basins until completion of the Infrastructure Works.

The basins will have an outlet structure and overflow weir system to drain into a new piped network to ultimately discharge into Reedy Creek to the east. Refer to the Civil Drawings for layout and details of the proposed stormwater network and catchment areas.

It should be noted the pipework downstream of the OSD basin to discharge into Reedy Creek has been designed for the ultimate development case. That being when the lots to the south and east are fully developed (i.e. 90% impermeable / 10% permeable) and the Estate Road is extended to the east to Reedy Creek. This is to ensure the stormwater pipes installed for the DA can be used in the final case developed scenario. Details of this future works will be the subject of another DA.

5.4. Stormwater Management Modelling

DRAINs modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the stormwater pipes. DRAINs is a computer program used for designing and analysing urban stormwater drainage systems and catchments. DRAINs data files and output results are attached in Appendix C.

5.5. Hydrology

- Pipe drainage shall be designed to accommodate the 20-year ARI storm event.
- The combined piped and overland flow paths shall be designed to accommodate the 100-year ARI storm event.
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 100-year ARI storm event shall be provided. Alternatively, the pipe and inlet system may be upgraded to accommodate the 100 year ARI storm event.
- Rainfall intensities shall be as per the Intensity-Frequency-Duration table in accordance with the Australian Rainfall and Runoff (AR&R) volume 2.
- Times of concentration for each subcatchment shall be determined using the kinematic wave equation.
- Runoff coefficients shall be calculated in accordance with AR&R. The fraction impervious shall be determined from analysis of the subcatchments.
- Flow width in gutter shall not exceed 2.5m for the minor design storm event.
- Velocity depth ratios shall not exceed 0.4 for all storms up to and including the 100 year ARI event.
- Blockage factors of 20% and 50% shall be adopted for pits on grade and at sags respectively.

5.6. Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design. The HGL shall be shown on all drainage long sections.
- The minimum pipe size shall be 375 diameter RCP (UPVC and RCBC may be used subject to availability).
- The minimum pipe grade shall be 0.5%.
- All pipes shall be Rubber Ring Jointed uno.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All trafficable shall be Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent.
- The pipe friction coefficients to adopted shall be:
-

• Materials	• Mannings	• Colebrook-	• Min. Pipe
• RCP	• 0.012	• 0.3	• 3
• FRC	• 0.01	• 0.015	• 3

Table 5: Pipe Details

- All pipes classes shall be designed for the ultimate service loads and where applicable, constructions loads will be designed for.
- Pipes discharging to the overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients shall be calculated in accordance with Missouri Charts.
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels.
- Overland flowpaths shall maintain a minimum of 300mm freeboard to all habitable floor levels.
- Pits deeper than 1.2m shall contain step irons at 300 mm centres.

5.7. On Site Detention Council Requirements and Recommendations

On Site Detention (OSD) will be provided within the proposed development extents to meet the requirement of:

- Fairfield City Council Stormwater Management Policy – September 2017

The objectives of the FCC OSD policy are:

- To ensure that through the use of OSD, stormwater discharge is controlled thereby ensuring development does not increase the risk of downstream flooding, erosion of unstable waterways or a reduction of the capacity of Council's drainage network

The proposed development site is located within the Rural Stormwater Management Zone as per Figure 4 of the guidelines.

As per the FCC guidelines the following OSD requirements apply:

- Maximum permissible site discharge (PSD) of 78l/sec/ha for the 5, 15, 30, 60, 180, 360 and 540-minute duration storms for the 5 and 100 year ARIs for the developed site OR
- Site storage requirements (SSR) of 4.09m^3 per 100m^2 of developed site using the simplified method

5.7.1. Catchments

A Proposed Stormwater Catchment Plan has been prepared for the ultimate site conditions. Refer Figure 6 – Catchment Plan below.

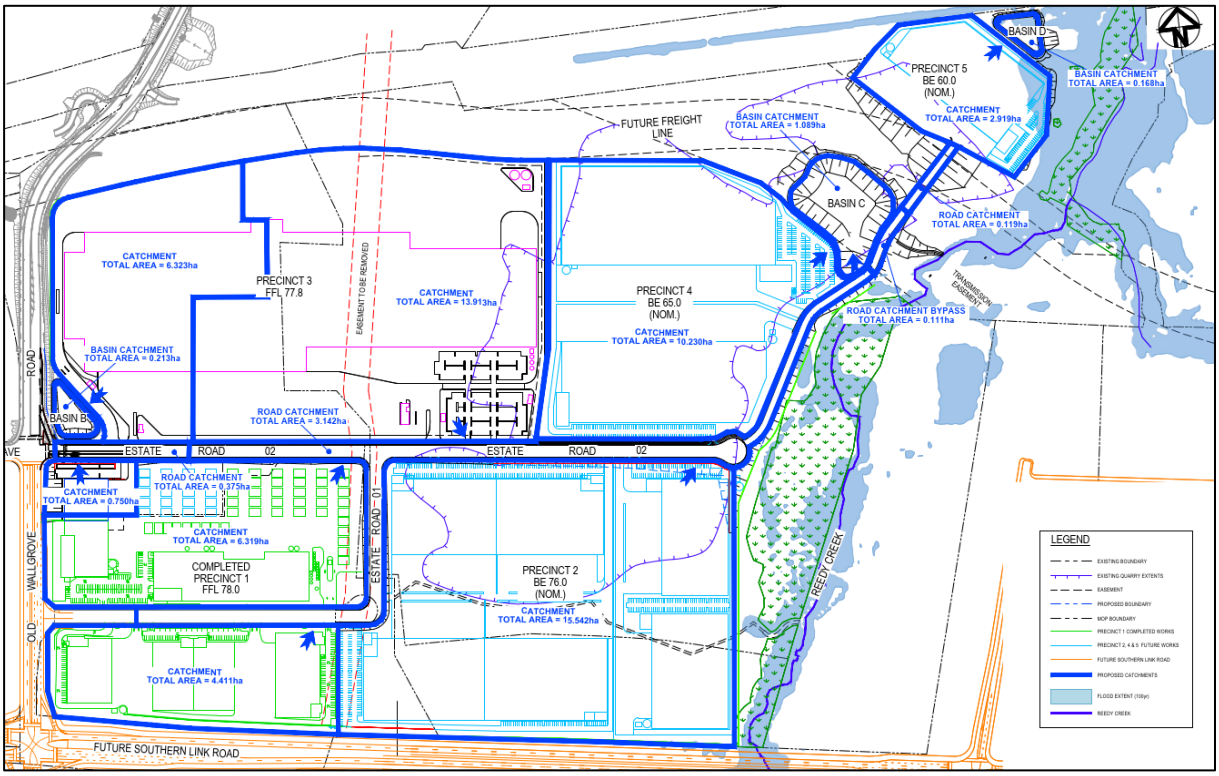

Figure 6 – Catchment Plan

5.7.2. OSD Basin Design

Stormwater from the eastern catchment will drain into the proposed on-site detention Basin B and the western catchment will drain into the proposed on-site detention Basin C.

Based on the FCC minimum SSR requirements the following minimum basin volumes must be achieved:

Basin B (A = 54.65 Ha)		Basin C (A = 7.3 Ha)		Basin D (A = 3.2 Ha)		Combined (A = 60.0 Ha)	
Min SSR (409 Q.m/Ha)	Basin Volume (m^3)	Min SSR (409 Q.m/Ha)	Basin Volume (m^3)	Min SSR (409 Q.m/Ha)	Basin Volume (m^3)	Min SSR (409 Q.m/Ha)	Basin Volume (m^3)
22,350	31,820	2,980	3,491	1,311	1,352	26,641	36,663

Table 6: Minimum SSR and Actual OSD Volumes Proposed based on PSD

Based on the FCC allowable PSD requirements the basins have been designed to achieve the following discharge rates:

	Basin B (A = 54.65 Ha)			Basin C (A = 7.3 Ha)			Basin D (A = 3.2 Ha)		
Storm Duration	Allowable PSD (78l/sec/Ha)	5 YR ARI flow	100 YR ARI flow	Allowable PSD (78l/sec/Ha)	5 YR ARI flow	100 YR ARI flow	Allowable PSD (78l/sec/Ha)	5 YR ARI flow	100 YR ARI flow
5 min	3,939	1,400	1,650	741	200	273	250	164	192
15 min		1,670	1,990		278	367		191	230
30 min		1,840	2,180		316	418		204	250
60 min		1,940	2,350		343	455		213	**263**
180 min		2,000	2,470		345	**464**		205	260
360 min		1,970	2,460		342	457		193	251
540 min		1,793	**2,480**		333	457		186	240

Table 7: PSD and Post Developed Catchment Flows

ARI YR	Pre Peak flow	Post Peak Flow
5		2.558
100	15.800	3.207

Table 8: Pre vs Post Developed Catchment Flows

6. Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design encompasses all aspects of urban water cycle management, including water supply, wastewater and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle and achieve more sustainable forms of urban development.

6.1. Water Quality Improvement

As per Fairfield Councils Stormwater Management Policy Section 6.3 – Figure 8, the proposed site is located within an area in Council's LGA which does not require water quality improvement measures.

As such the basin proposed to the east of the road will act as an On-Site Detention basin only.

It is proposed to install a Gross Pollutant Trap (GPT) within each lot or immediately upstream of the Basin prior to discharge into Reedy Creek. Refer to the Civil Drawings for location of each GPT.

6.2. Rainwater Tanks / Rainwater Re-use

The use of rain water collected in rainwater tanks from roof runoff of the warehouses would provide a valuable alternative to potable water for a variety of non-potable end uses, such as toilet flushing and irrigation.

We have assumed for this development, irrigation and toilet flushing will be plumbed to the rainwater tanks.

The use of rainwater tanks for each lot will be incorporated at detailed design to ensure the FCC condition to *"Reduce water consumption in non-residential properties by 40% consistent with the BASIX Scheme"* will be met.

7. Services

This development will incorporate full servicing for the proposed subdivision.

AT&L has previously prepared an Infrastructure Servicing Report for the Oakdale East development (reference 18-563-R001-01 Oakdale East Infrastructure Report, Rev 02, dated 05-10-18). The below is a summary of the findings of this report.

7.1. Existing Services

Based on an initial desk top study conducted from information obtained from Dial Before You Dig (DBYD) records obtained it is apparent the following services existing within the vicinity of the development site.

7.1.1. Sydney Water

7.1.1.1. Water Supply

From Dial Before You Dig (DBYD) information obtained there is the following existing potable water assets within the vicinity:

- 250mm diameter Ductile Iron Cement (mortar) Lined (DICL) main in the western verge of Old Wallgrove Road to the west
- 200mm diameter OPVC main was constructed within the Stage 1 works

Refer to DYBD records within Appendix B.

7.1.1.2. Sewerage

Sewer was constructed as part of the Stage 1 works with connection points at south west corner of the site and the end of Latitude Drive.

Refer to DYBD records within Appendix B.

7.1.2. Communications

From Dial Before You Dig (DBYD) information obtained there is the following existing telecommunications conduits within the vicinity:

- 100mm and 50mm diameter Telstra conduits within the eastern verge of Old Wallgrove Road to the west
- Communication ducting was constructed as part of the Stage 1 works within the verges of Latitude Drive
- Optus conduit within eastern verge of Old Wallgrove Road and southern verge of Burley Road

Refer to DYBD records within Appendix B.

7.1.3. Gas

From Dial Before You Dig (DBYD) information obtained there is the following existing gas mains owned by Jemena within the vicinity:

- 150mm diameter Secondary main along the eastern verge of Old Wallgrove Road to the west
- 100mm diameter main was constructed in the northern verge of Latitude Drive as part of the Stage 1 works

Refer to DYBD records within Appendix B.

7.1.4. Electrical

From Dial Before You Dig (DBYD) information obtained there is the following existing electrical conduits owned by Endeavour Energy within the vicinity:

- Existing overhead conduits along the eastern verge of Old Wallgrove Road to the west
- Bank of 8 underground ducts along the western verge of Old Wallgrove Road to the west
- Existing high voltage was installed as part of the Stage 1 works within Latitude Drive

Refer to DYBD records within Appendix B.

7.2. Sydney Water

Water and sewer supply to the site is to be provided in accordance with the Local Area Servicing Plan (LASP) prepared by GHD (2016).

The LASP identifies the servicing strategy for the WSEA Precinct No.8 – Area South of Pipeline as shown within Appendix D and E, inclusive of Oakdale East.

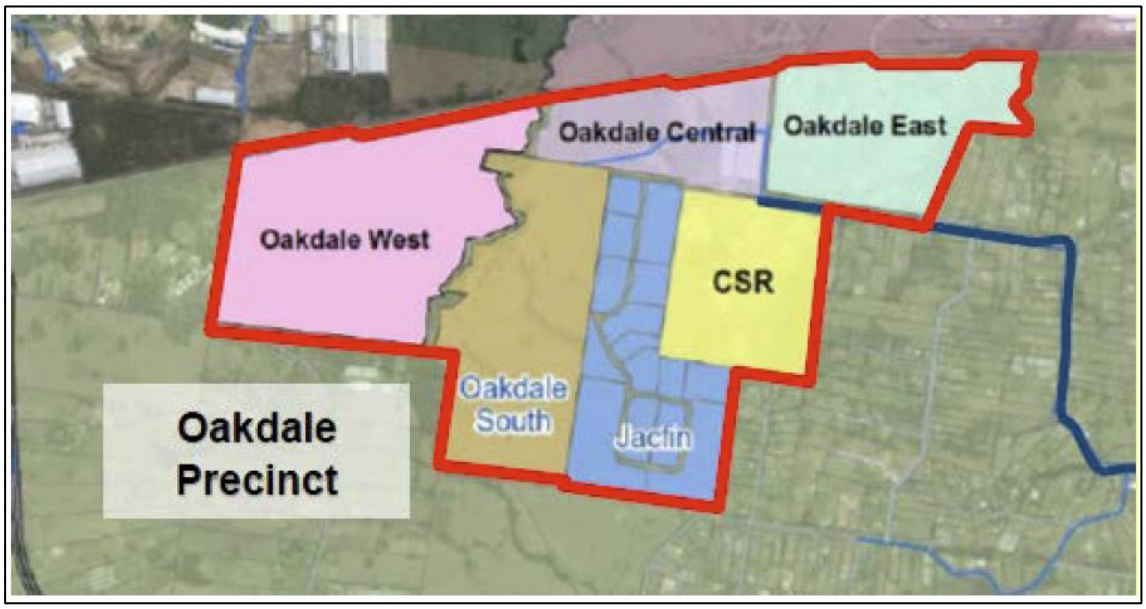

Figure 7 - WSEA Precinct No. 8 - Area South of Pipeline

7.2.1. Water Supply

As part of the Oakdale Central project and the Stage 1 works of Oakdale East, trunk water mains were installed which have been previously size to cater for the Oakdale East development.

Servicing the site is intended via;

- Extension of the existing 200mm main within Latitude Drive through to Road 2
- New Extension off the existing 250mm main within Old Wallgrove Road along the length of Road 2. The main would be further extended along the private access road to service Precinct 4 and 5

7.2.2. Sewerage

As part of the Stage 1 works, a Sydney Water funded trunk sewer main was designed constructed to services the entire Oakdale East development site.

Servicing the is intended via;

- Extension of the existing main within Latitude Drive to service part of Precinct 2
- Extension of the existing main along Old Wallgrove Road and along Road 2. This main will service both

Precinct 2 and 3.

- Precinct 4 and 5 will be serviced via a private low pressure pump system. A Sydney Water Approved boundary trap and rising main will be installed to discharge to the gravity system constructed in Road 2

7.2.3. Communications

Communication conduits will be extended from Old Wallgrove Road and Latitude Drive to service Oakdale East with the pit and pipe network to be extended and reticulated through the roadways to service the proposed lots.

Staging of the pit and pipe network will coincide with the civil stages.

7.2.4. Gas

To service Oakdale East, conduits will be extended and reticulated through the roadways to service the proposed lots. Staging of the reticulation will coincide with the civil stages.

7.2.5. Electrical

Based on advice received from an ASP3 Electrical Designer, it is likely lead-in HV cables will be required to service the development of Oakdale East. The likely point of supply is from the Eastern Creek Zone Substation, located on Old Wallgrove Road to the north of Oakdale East.

A formal application will need to be submitted to EE to determine existing HV capacity and confirm any lead-in requirements.

8. Conclusion

As highlighted within this report all civil/stormwater drainage for the development, that is the Oakdale East development, has been designed in accordance with the Fairfield City Council requirements and guidelines.

The erosion control measures proposed for the site will comply with the requirements of Fairfield City Council Engineering Guidelines and The Department of Environment, Climate Change and Water (DECC). The proposed SWMP will ensure that the best management practice is applied to the development site in controlling and minimising the negative impacts of soil erosion.

Both SSR and PSD requirements have been demonstrated to be achieved.

All road design is in accordance with Austroads Standards and the requirements of Fairfield City Council, as a minimum.

A professional geotechnical engineer will be engaged to design the structural pavement. This is also in accordance with Austroads Pavement Design Guide – A Guide to Structural Design of Road Pavements.

All services including sewer, water, power, telecommunications and gas can be made available to the site. Internal reticulation will be coordinated at the Construction Certificate (CC) stage of works and applications to the relevant authorities.

Appendix A

Survey Drawings

NOTES

1. BOUNDARIES WITHIN THIS FILE ARE IN ACCORDANCE WITH THE PLAN OF SUBDIVISION (DP1257276) AS REGISTERED WITH NSW LAND REGISTRY SERVICES (LRS) ON 12-6-2020
2. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM **PM182649** R.L. **74.947** (A.H.D.) IN OLD WALLGROVE ROAD
3. CONTOUR INTERVAL **1.0 m**
4. CONTOURS AND LEVELS HAVE BEEN DETERMINED FROM SURVEY DATA OBTAINED BY PHOTOGRAMMETRIC METHODS (DRONE) FOR THE PURPOSE OF MASTER PLANNING ONLY. SHOULD MORE ACCURATE LEVELS BE REQUIRED FOR DESIGN REQUIREMENTS WE WOULD RECOMMEND A SUITABLE SURVEY BE CONDUCTED FOR THIS PURPOSE.
5. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE

SHEET 2 SHEET 3 SHEET 4 SHEET 5
SHEET 6 SHEET 7 SHEET 8 SHEET 9 SHEET 10
SHEET 11 SHEET 12 SHEET 13 SHEET 14
SHEET 15 SHEET 16 SHEET 17 SHEET 18
SHEET 19 SHEET 20 SHEET 21 SHEET 22

OLD WALLGROVE ROAD

BURLEY ROAD

101
DP 1257276

100
DP 1257276

DP 87907

239
DP 13905

237
DP 13905

A
DP 104673

B

MGA

CREEK

REEDY CREEK

SEE DIAGRAM 1

SEE DIAGRAM 2

296.24 TO ORIGINAL BANK (DP87907 & DP843901)

104.0 TO BANK

LEFT BANK OF CREEK IS BOY

DIAGRAM 1
1:500

DIAGRAM 2
1:1250

SEE SHEET 2 FOR EASEMENT DESCRIPTIONS & SHORT & CURVED BOUNDARY LINE SCHEDULE

~ DENOTES APPROXIMATE CONSTRAINT LINE IN ACCORDANCE WITH AT&L DRAWING REF: 18-563-SKC073 ISSUE 1 DATED 5-8-2020.

SCALE 1: 2000 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

Registered Surveyor NSW

Client GOODMAN PROPERTY SERVICES (AUST) PTY LTD

Drawing title
PLAN OF DETAIL AND LEVELS OVER LOTS 100 & 101 DP 1257276 KNOWN AS OAKDALE EAST ESTATE, KEMPS CREEK

datum	AHD
site Area	N/A
LGA	FAIRFIELD
reference number	50404 019DT
scale	1:2000 @ A1
date of survey	09/11/2020
SHEET	1
OF	22

MGA

TN

100

APPROX

SCHEDULE OF SHORT & CURVED LINES

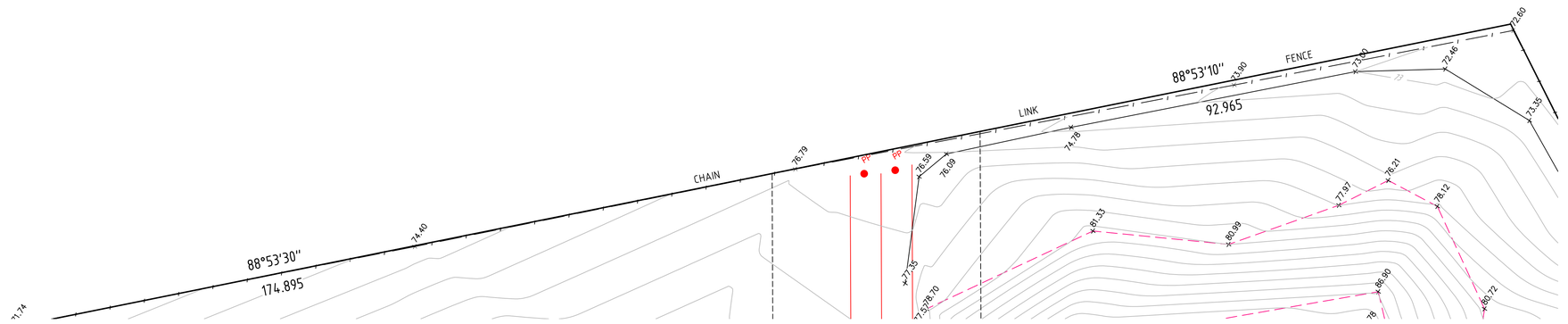
No.	BEARING	DISTANCE	ARC	RADIUS
1	29°01'35"	98.48	101.095	127.825
2	54°09'20"	54.405	54.425	588.595
3	208°09'20"	14.7		
4	178°31'40"	50.4		
5	220°02'	39.01		
6	183°52'30"	10.83		
7	173°43'30"	19.9		
8	210°35'40"	4.995		
9	234°44'	5.34		
10	219°18'10"	19.85		
11	216°55'15"	40.41		
12	189°39'45"	8.845		
13	213°41'40"	7.015		
14	234°59'25"	10.84		
15	224°35'30"	24.3		
16	240°18'45"	3.65		
17	176°45'10"	11.155		
18	188°25'35"	7.65		
19	148°08'25"	13.86		
20	144°05'30"	8.615		
21	151°36'40"	13.165		
22	134°13'45"	6.995		
23	114°34'40"	8.67		
24	96°18'25"	23.245		
25	177°53'15"	7.055		
26	121°59'40"	5.05		
27	173°10'35"	10.925		
28	203°47'25"	12.04		
29	189°27'55"	22.61		
30	157°30'15"	9.985		
31	133°13'55"	16.74		
32	150°57'05"	10.4		
33	171°58'30"	9.335		
34	192°27'25"	12.01		
35	182°54'55"	7.425		
36	155°29'55"	11.9		

EASEMENT DESCRIPTIONS

EXISTING EASEMENTS

(D) EASEMENT FOR TRANSMISSION LINE 30.48 WIDE (BK2910 No.894)
(E) EASEMENT FOR TRANSMISSION LINE (GOV.GAZ. 21.12.62 FOL 3796)
(F) EASEMENT FOR TRANSMISSION LINE (GOV.GA. 16-11-1962 FOL 3382)
(A1) RIGHT OF ACCESS VARIABLE WIDTH (DP 1246626)
(B1) EASEMENT FOR TRAFFIC LIGHT SERVICES VARIABLE WIDTH (DP 1246626)
(P1) EASEMENT FOR TRANSMISSION LINE 60 WIDE & VARIABLE (AM47441)
(P2) EASEMENT FOR TRANSMISSION LINE 45 WIDE & VARIABLE (AM47441)
(P3) EASEMENT FOR TRANSMISSION LINE 45 WIDE & VARIABLE (AM47441)
(GA) PROPOSED GAS EASEMENT 3 WIDE (DP 1202686)
(JM) PROPOSED EASEMENT FOR TRANSMISSION LINE VARIABLE WIDTH (DP 1163212)
(PE) PROPOSED EASEMENT FOR TRANSMISSION LINE 110 WIDE & VARIABLE (DP 1164692)
(UW) PROPOSED EASEMENT FOR TRANSMISSION LINE 30 WIDE & VARIABLE (DP 1163212)
(Z) PROPOSED EASEMENT FOR TRANSMISSION LINE 40 WIDE & VARIABLE (DP 641569)
(A) EASEMENT TO DRAIN WATER 4 WIDE AND VARIABLE (DP 1257276)
RESTRICTION ON THE USE OF LAND (VEHICLE ACCESS DENIED) (LOT 100 IN DP 1257276)
POSITIVE COVENANT (LOT 100 IN DP 1257276)
RESTRICTION ON THE USE OF LAND (LOT 100 IN DP1257276)

CONTINUED



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SHEET 7

SHEET 3

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Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
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Registered Surveyor NSW

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Drawing title
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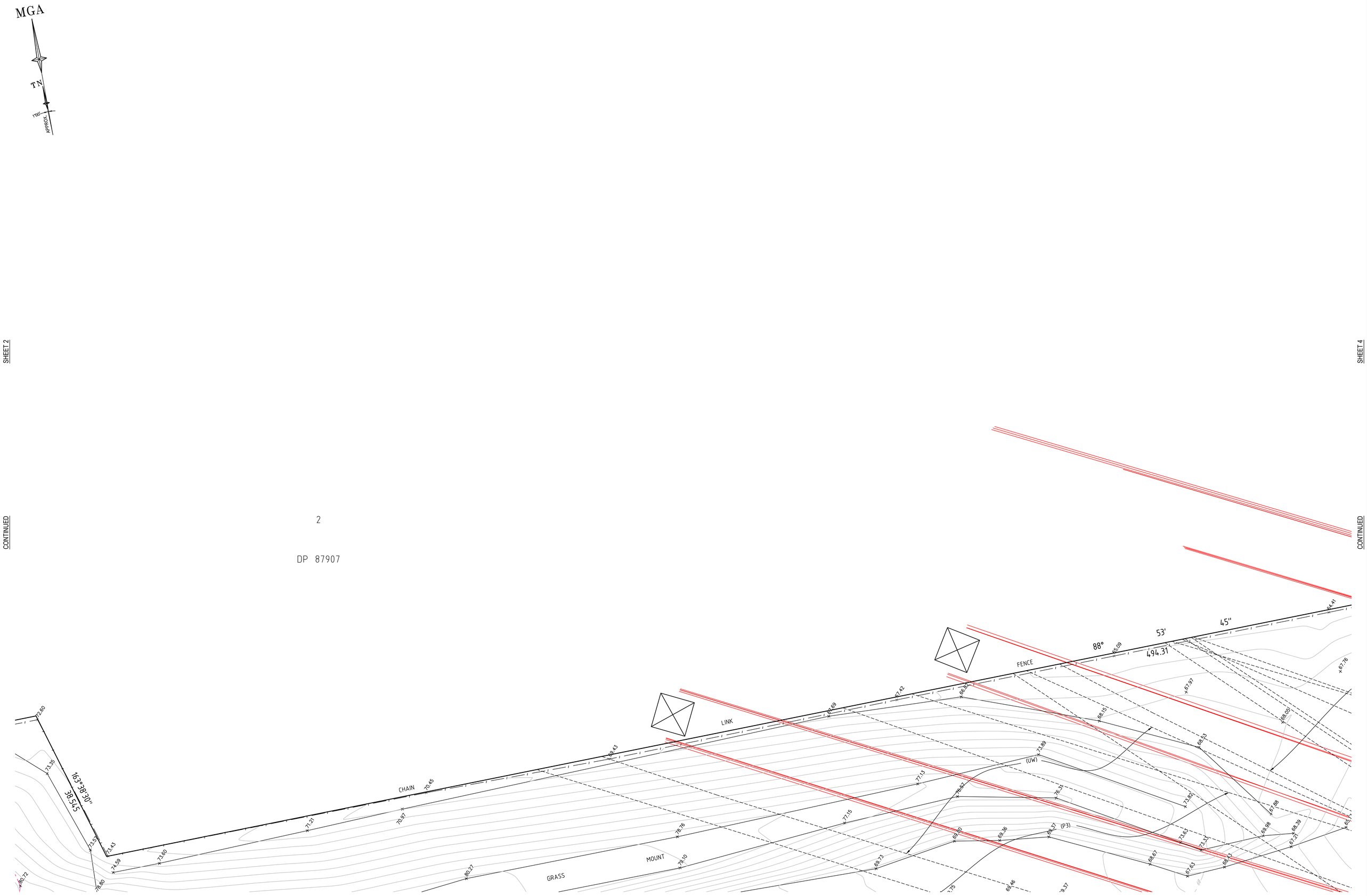
datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 2 OF 22



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datum AHD
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LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 3 OF 22

MGA

TN

APPROX. 10DEG

SHEET 3

CONTINUED

SHEET 5

CONTINUED

DENSE GROUP OF TREES

DENSE GROUP OF TREES

FENCE

WIRE

CHAIN

(JM)

GRASS MOUNT

(Z)

(P2)

(P1)

50°4'35"

60.17

101
DP 1257276

EXCAVATION PIT

CONTINUED

SHEET 9

0 8 12 16 24 32 40

SCALE 1: 400 @ A1

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site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

scale 1:400 @A1

date of survey 09/11/2020

SHEET 4 OF 22

SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

CONTINUED SHEET 10

Revision	Date	Description	Reference
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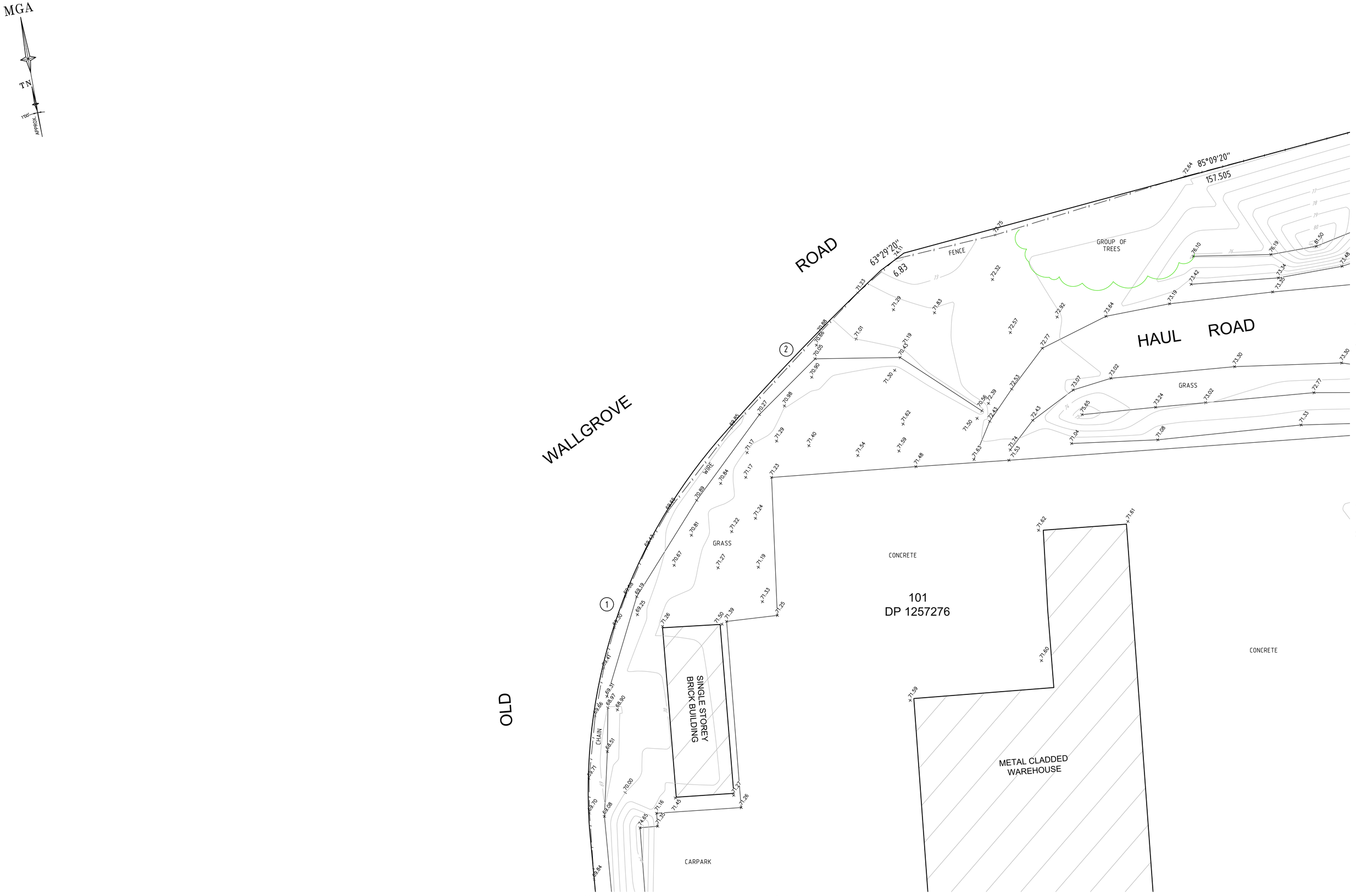
date of survey 09/11/2020
SHEET 5 OF 22



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Drawing title
PLAN OF DETAIL AND LEVELS OVER LOTS 100 & 101
DP 1257276 KNOWN AS OAKDALE EAST ESTATE, KEMPS CREEK

datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 6 OF 22

CONTINUED

SHEET 2

SHEET 6

SHEET 8

MGA

TN

APPROX 20m

88°53'30"

174.895

HAUL ROAD

GROUP OF TREES

STOCKPILE

STOCKPILE

STOCKPILE

101
DP 1257276

GROUP OF TREES

CONCRETE

CAR PARK

STOCKPILE

STOCKPILE

HAUL ROAD

CONTINUED

CONTINUED

0 8 12 16 24 32 40

SCALE 1:400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

SHEET 12

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

.....
Registered Surveyor NSW

Client GOODMAN PROPERTY SERVICES (AUST) PTY LTD

Drawing title
PLAN OF DETAIL AND LEVELS OVER LOTS 100 & 101 DP 1257276 KNOWN AS OAKDALE EAST ESTATE, KEMPS CREEK

datum	AHD
site Area	N/A
LGA	FAIRFIELD
reference number	50404 019DT
scale	1:400 @A1
date of survey	09/11/2020
SHEET	7
OF	22

CONTINUED

SHEET 3

MGA

TN

APPROX

101
DP 1257276

GRASS

MOUNT

STOCKPILE

STOCKPILE

STOCKPILE

HAUL ROAD

POND

SHEET 7

SHEET 9

CONTINUED

CONTINUED

0 8 12 16 24 32 40

SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

CONTINUED

SHEET 13

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD

site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

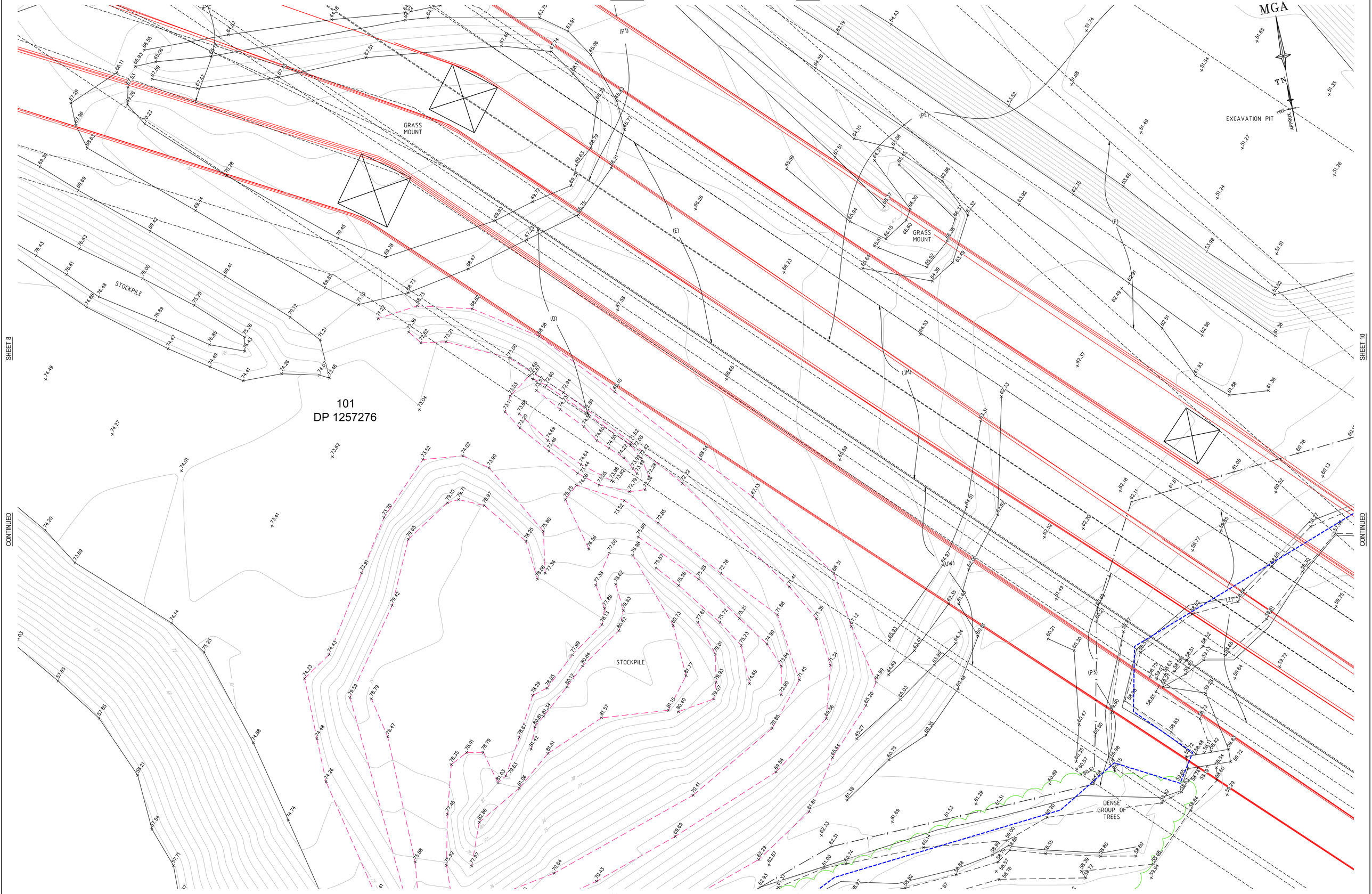
scale 1:400 @A1

date of survey 09/11/2020

SHEET 8 OF 22

CONTINUED

SHEET 4



SHEET 8

SHEET 10

CONTINUED

CONTINUED

SHEET 14

0 8 12 16 24 32 40
SCALE 1:400 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 9 OF 22

CONTINUED

SHEET 5

SHEET 9

CONTINUED

MGA

TN

1°00' APPROX.

EXCAVATION PIT

DRAINAGE

SWALE

FENCE

WIRE

CHAIN

GROUP OF TREES

GROUP OF TREES

CREEK

REEDY

101
DP 1257276

(P1)

(P2)

(Z)

104.0 TO BANK

278° 47' 15"

153.5

0 8 12 16 24 32 40

SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD

site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

scale 1:400 @A1

date of survey 09/11/2020

SHEET 10 OF 22

CONTINUED

SHEET 6

MGA

TN

APPROX

OLD WALLGROVE ROAD

CARPARK

CONCRETE

101
DP 1257276

FENCE

4°4'1" 41.01

(GA)

1°12'10" 12.905

GARDEN

LINK

CHAIN

6°11'40" 138.105

DRIVEWAY

BRICK SHED

BRICK GATEHOUSE

CONCRETE

METAL CLADDED WAREHOUSE

CONCRETE

SHEET 12

CONTINUED

4°58'35" 46.985

SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

CONTINUED

SHEET 15

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 11 OF 22

CONTINUED

SHEET 7

MGA

TN

APPROX 10deg

CAR PARK

CAR PARK

METAL CLADDED WAREHOUSE

ROAD)

(UNSEALED

STOCKPILE

STOCKPILE

ROAD

HAUL

101
DP 1257276

STOCKPILE

GRASS MOUNT

STOCKPILE

STOCKPILE

SHEET 11

SHEET 13

CONTINUED

CONTINUED

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

CONTINUED

SHEET 16

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 12
OF 22

CONTINUED

SHEET 8

SHEET 12

CONTINUED

SHEET 14

CONTINUED

SHEET 17

MGA

TN

APPROX 360°

101
DP 1257276

STOCKPILE

STOCKPILE

STOCKPILE

STOCKPILE

STOCKPILE

STOCKPILE

0 8 12 16 24 32 40

SCALE 1: 400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

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D	00/00/00	-	00
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datum AHD

site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

scale 1:400 @A1

date of survey 09/11/2020

SHEET 13 OF 22

CONTINUED

SHEET 9

SHEET 13

CONTINUED

101
DP 1257276

POND

POND

DENSE GROUP OF TREES

DENSE GROUP OF TREES

FENCE

WIRE

CHAIN

48.08
273°29'55"

59.345
203°06'55"

42.47
219°39'55"

67.99
194°27'55"

MGA

TN

APPROX. 1°00'

SCALE 1: 400 @ A1
0 8 12 16 24 32 40

DIAL BEFORE YOU DIG
www.1100.com.au

REFER TO NOTES AND LEGEND

CONTINUED

SHEET 18

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET OF 22 | 14

CONTINUED

SHEET 11

MGA

TN

APPROX 28°

OLD WALLGROVE ROAD

SEE DIAGRAM 1 SHEET 1 FOR BOUNDARY DIMENSIONS

CONCRETE

DRIVEWAY

(A1)

(B1)

METAL CLADDED WAREHOUSE

CONCRETE DRIVEWAY

UNSEALED DRIVEWAY

CONCRETE RETAINING WALL

BLOCK RETAINING WALL

CONCRETE BLOCK RETAINING WALL

12°54'35"

56.535

100
DP 1257276

SHEET 16

CONTINUED

SCALE 1: 400 @ A1

0 8 12 16 24 32 40

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

CONTINUED

SHEET 19

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD

site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

scale 1:400 @A1

date of survey 09/11/2020

SHEET 15 OF 22

CONTINUED

SHEET 12

MGA

TN

APPROX

CONCRETE

RAMP

100
DP 1257276

SINGLE STOREY CONCRETE PANEL
WAREHOUSE
(UNDER CONSTRUCTION)

STOCKPILE

STOCKPILE

STOCKPILE

POND

(D)

(A)

SHEET 15

CONTINUED

SHEET 17

CONTINUED

CONTINUED

SHEET 20

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au
REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 16
OF 22

CONTINUED
SHEET 13
SHEET 16
SHEET 18
CONTINUED
CONTINUED
SHEET 21

MGA
TN
APPROX

STOCKPILE
STOCKPILE
STOCKPILE
STOCKPILE
STOCKPILE
STOCKPILE

HAUL ROAD
HAUL ROAD
(UNSEALED ROAD)

101
DP 1257276

POND
GROUP OF TREES

(A)
(A)

0 8 12 16 24 32 40
SCALE 1:400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au
REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
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datum AHD
site Area N/A
LGA FAIRFIELD
reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 17 OF 22

CONTINUED

SHEET 14

SHEET 17

CONTINUED

101
DP 1257276

POND

(UNSEALED ROAD)

FENCE

DENSE GROUP OF TREES

WIRE

GROUP OF TREES

GROUP OF TREES

DRAINAGE BASIN

CHAIN

(A)

239.18

203°48'55"

237

DP 13905

MGA

TN

1°00' APPROX.

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

CONTINUED

SHEET 22

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 18
OF 22

CONTINUED

SHEET 15

MGA

TN

APPROX 10°

OLD WALLGROVE ROAD

CONCRETE

CONCRETE BLOCK RETAINING WALL

(UNSEALED DRIVEWAY)

CONCRETE BLOCK RETAINING WALL

6°23'

189.12

100
DP 1257276

(AREA UNDER CONSTRUCTION)

191.055

281°07'50"

WIRE

MESH

BURLEY ROAD

SHEET 20

CONTINUED

0 8 12 16 24 32 40

SCALE 1:400 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
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datum AHD

site Area N/A

LGA FAIRFIELD

reference number 50404 019DT

scale 1:400 @A1

date of survey 09/11/2020

SHEET 19 OF 22

CONTINUED

SHEET 16

SHEET 19

SHEET 21

CONTINUED

100
DP 1257276

BURLEY

ROAD

(AREA UNDER CONSTRUCTION)

STOCKPILE

STOCKPILE

STOCKPILE

DRAINAGE BASIN

GRASS MOUNT

CONCRETE BLOCK RETAINING WALL

FENCE

155.995
278°44'40"

WIRE

148.56
278°10'25"

FENCE

MESH

MESH

MGA

TN

APPROX

(A)

(D)

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 20 OF 22

CONTINUED SHEET 17

(UNSEALED ROAD)

(A)

STOCKPILE

101
DP 1257276

HAUL ROAD

SHEET 20

CONTINUED

SHEET 22

CONTINUED

MGA

TN

7.985
278°10'25"

154.36
277°31'45"

234.56
278°19'05"

CHAIN WIRE FENCE

DENSE GROUP OF TREES

BURLEY ROAD

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

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REFER TO NOTES AND LEGEND

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 21 OF 22

CONTINUED

SHEET 18

SHEET 21

CONTINUED

MGA

TN

APPROX 1°00'

101
DP 1257276

STOCKPILE

DENSE GROUP OF TREES

FENCE

WIRE

CHAIN

142.625
202°17'55"

234.56
278°19'05"

DENSE GROUP OF TREES

FENCE

WIRE

CHAIN

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

DIAL BEFORE YOU DIG www.1100.com.au

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datum AHD
site Area N/A
LGA FAIRFIELD

reference number 50404 019DT
scale 1:400 @A1
date of survey 09/11/2020
SHEET 22
OF 22

Appendix B

Dial Before You Dig Records

DBYD Address:
n/a Millner Avenue
Eastern Creek NSW 2175

DBYD Job No: 14448220
DBYD Sequence No: 72756370

SYDNEY WATER CORPORATION
No warranty is given that the information shown is complete or accurate.

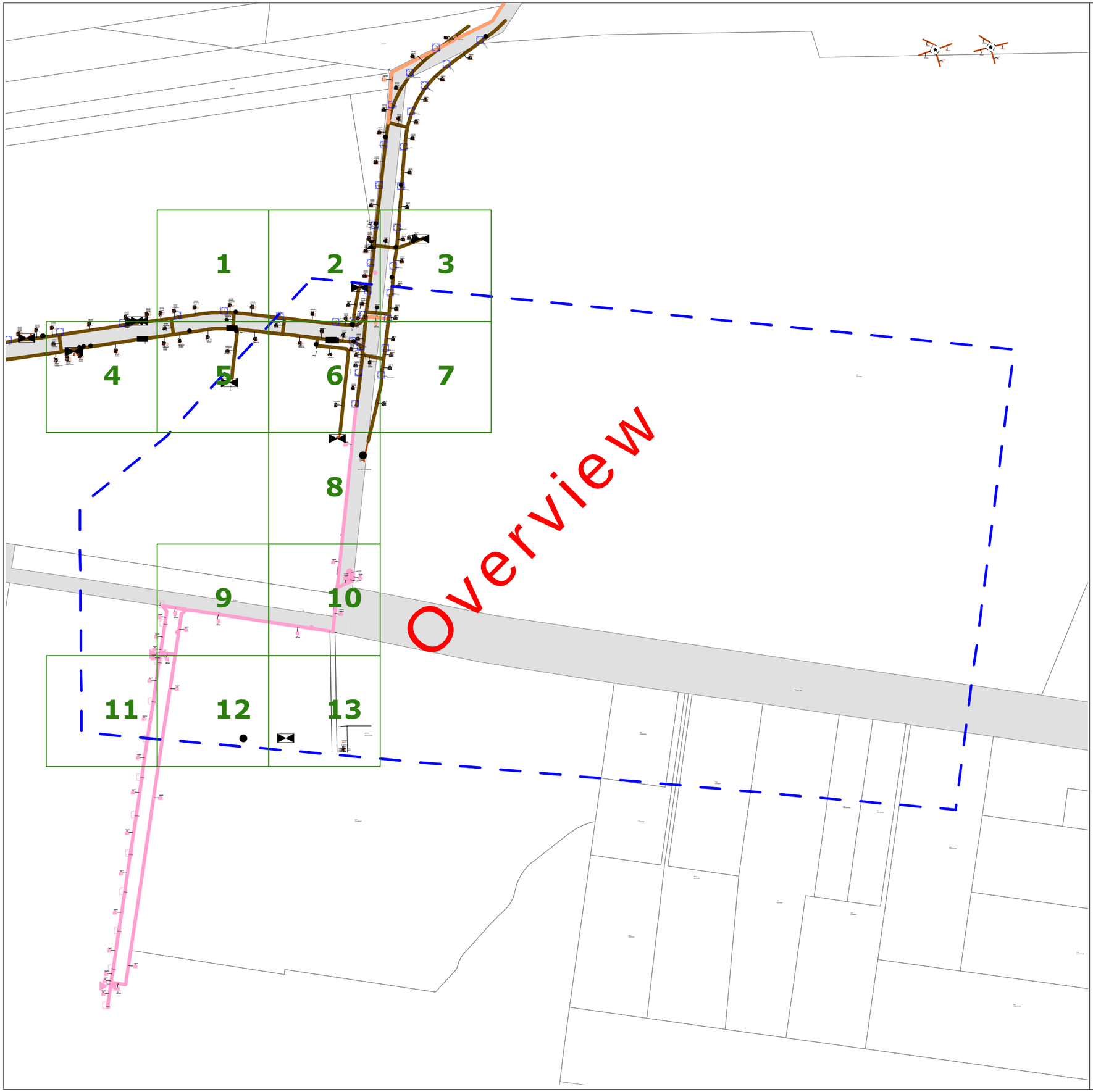
Copyright Reserved Sydney Water 2018

Scale: 1:2000
Date of Production: 23/06/2018 13:40:24

N

0m 40m 80m 120m 160m

Plan 1 of 1



Endeavour Energy

WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be printed and made available at the worksite where excavation is to be undertaken. Plans must be reviewed and understood by the crew on site prior to commencing excavation.

INFORMATION PROVIDED BY ENDEAVOUR ENERGY

- Any plans provided pursuant to this service are intended to show the approximate location of underground assets relative to road boundaries, property fences and other structures at the time of installation.
- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

LEGEND

- or — Street light column
- Padmount substation
- or — Overground pillar (O.G.Box)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

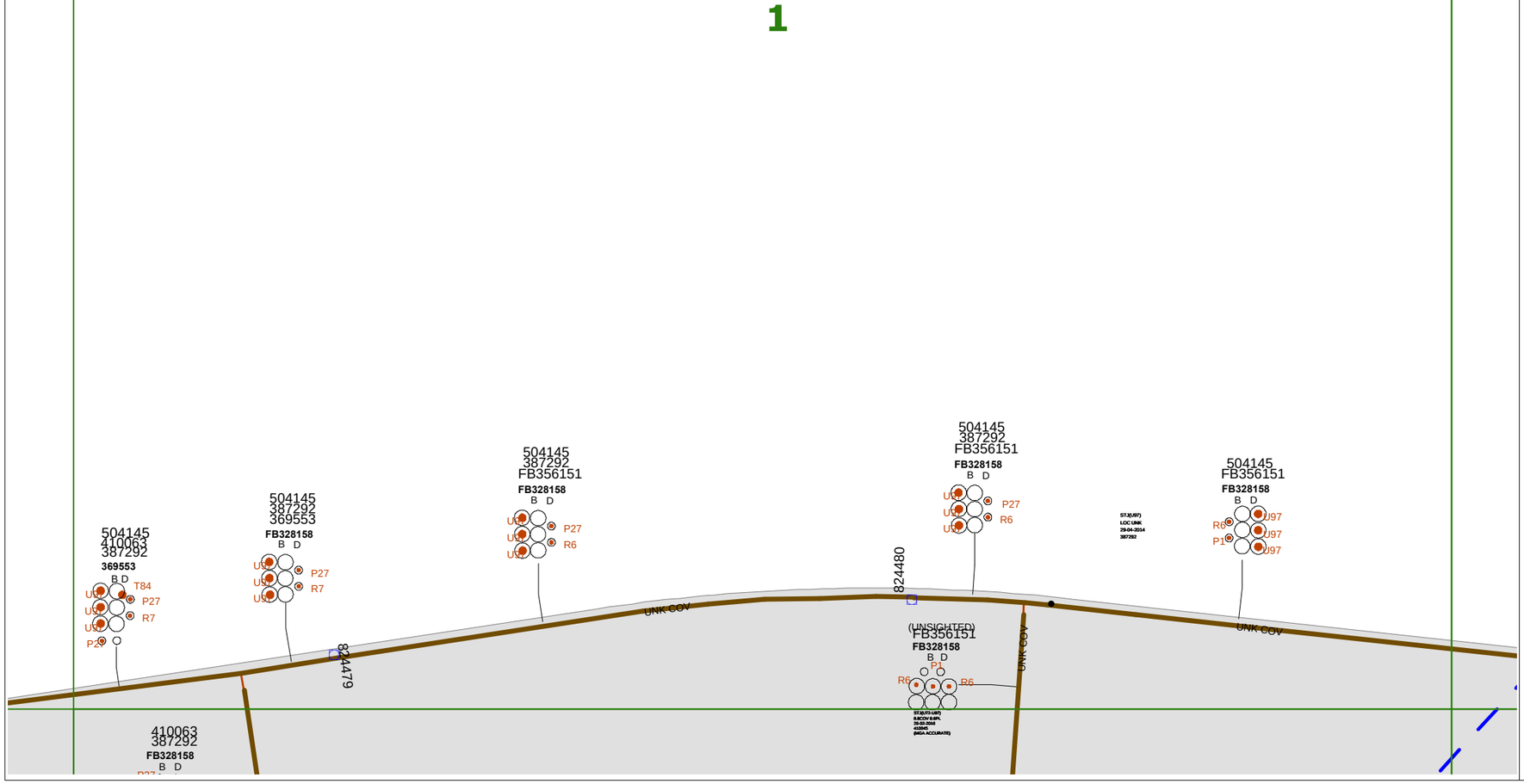
N

NOT TO SCALE

DBYD Sequence No.:	72756366
Issued Date:	23/06/2018

Cadastre: © Land and Property Information 2015, 2016

1



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- Asbestos warning

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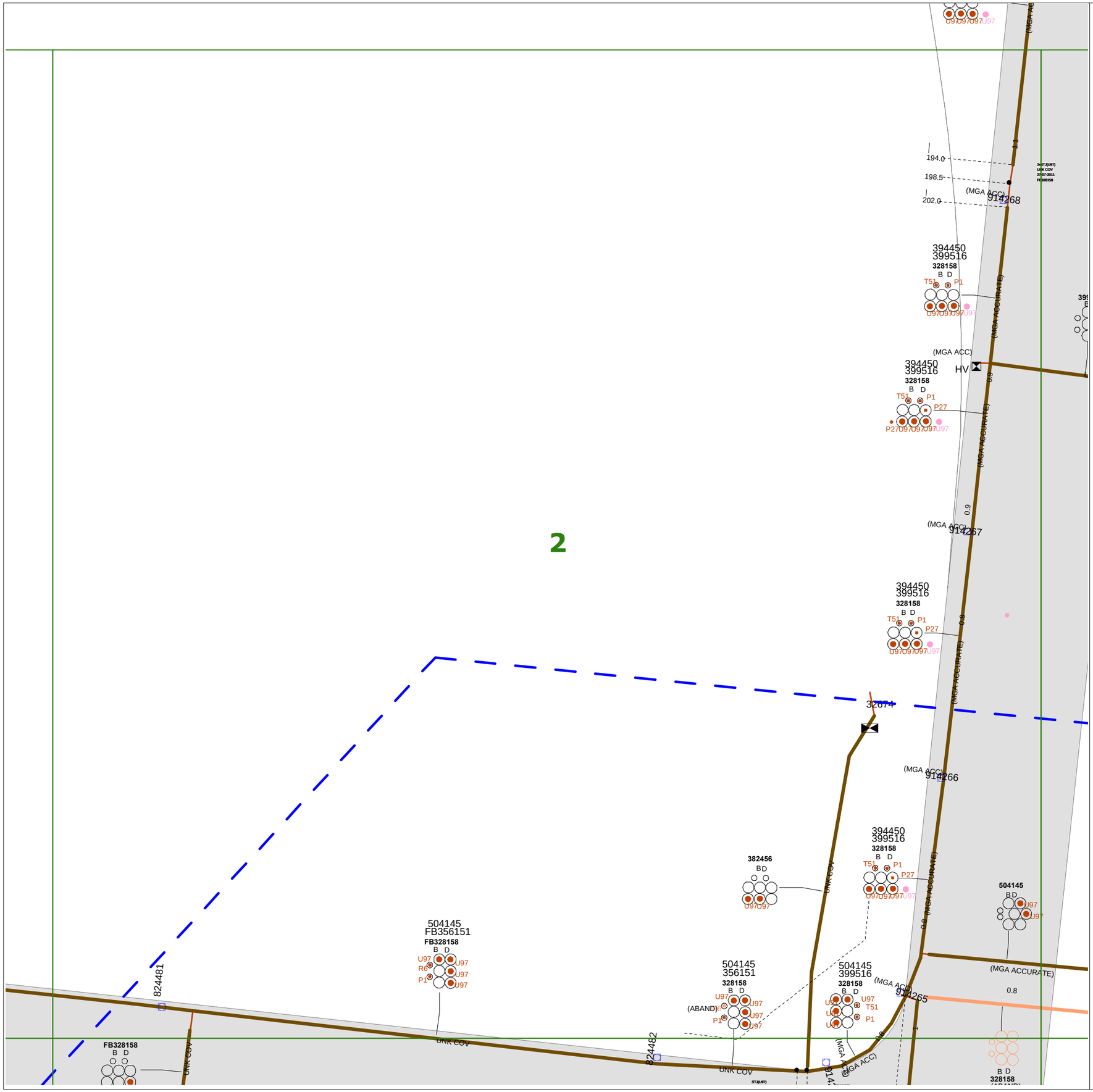

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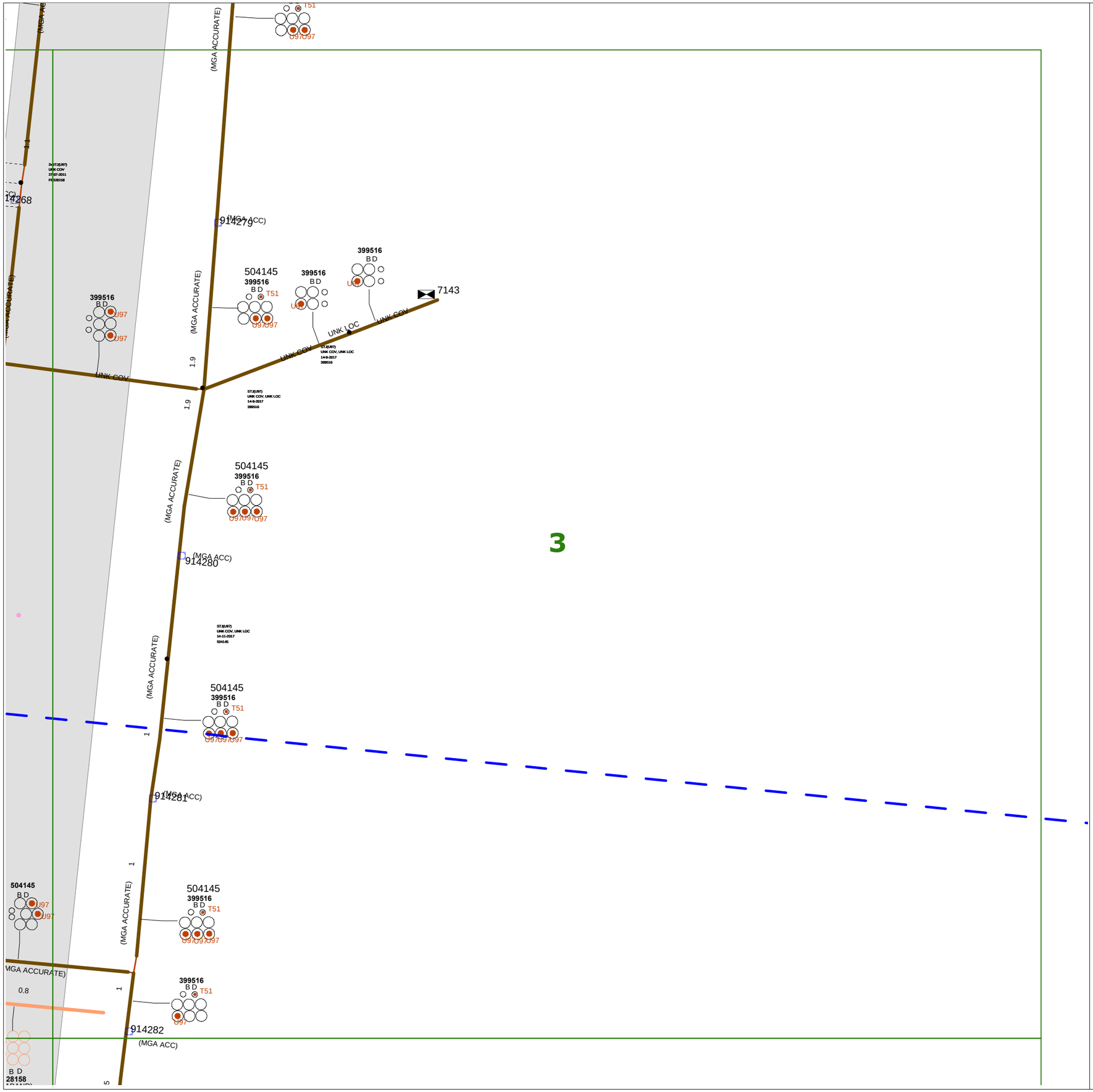

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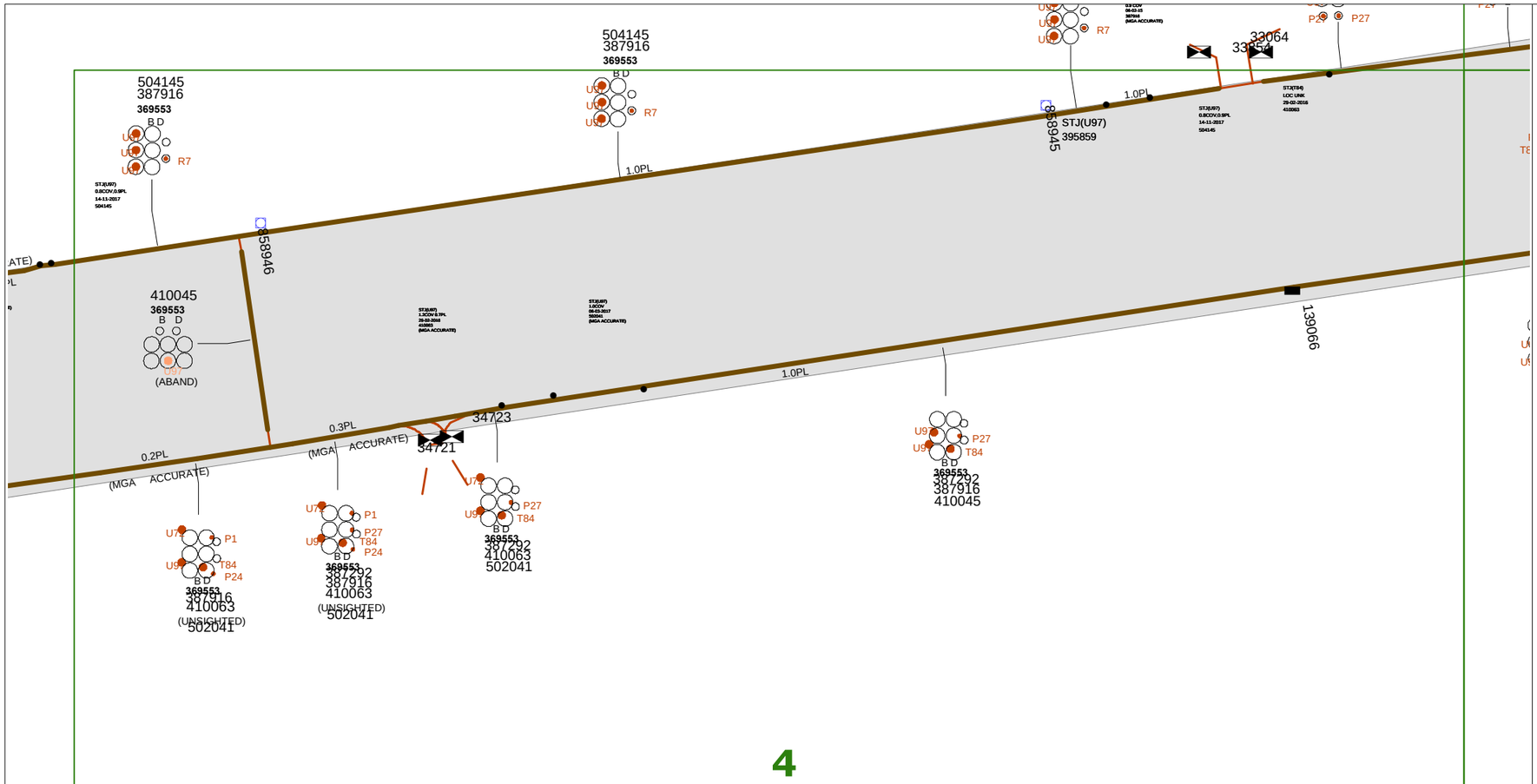

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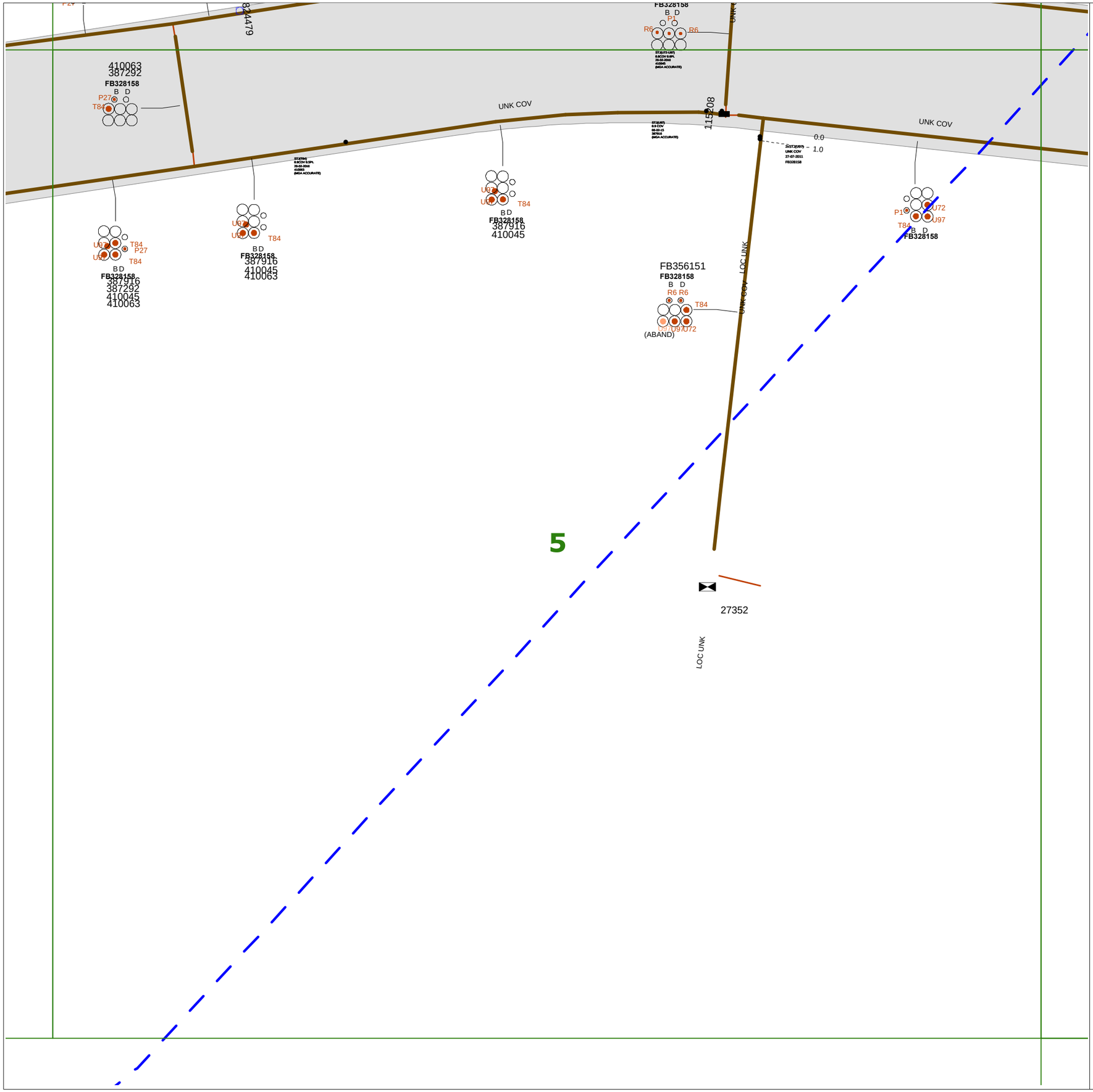

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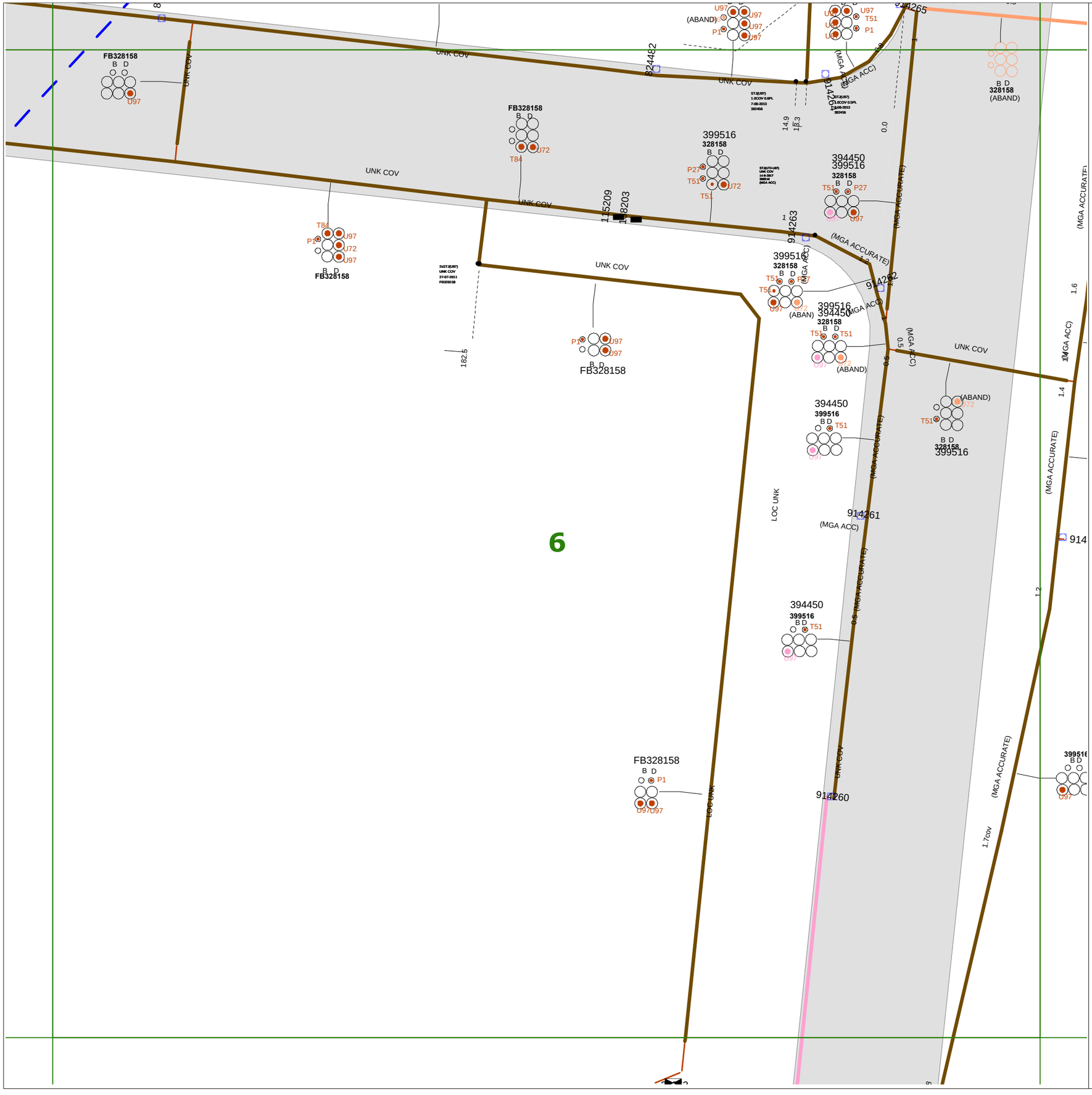

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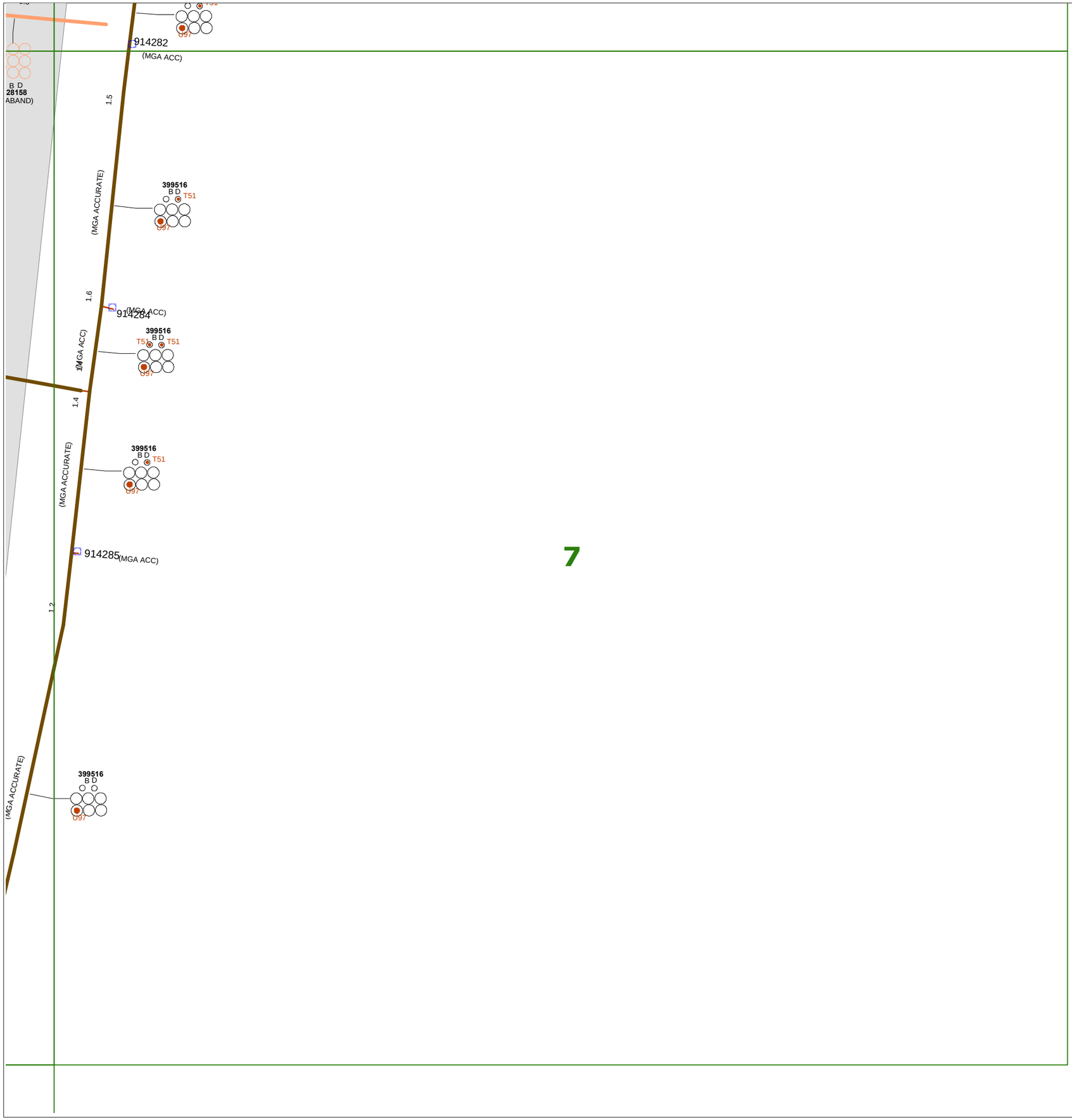

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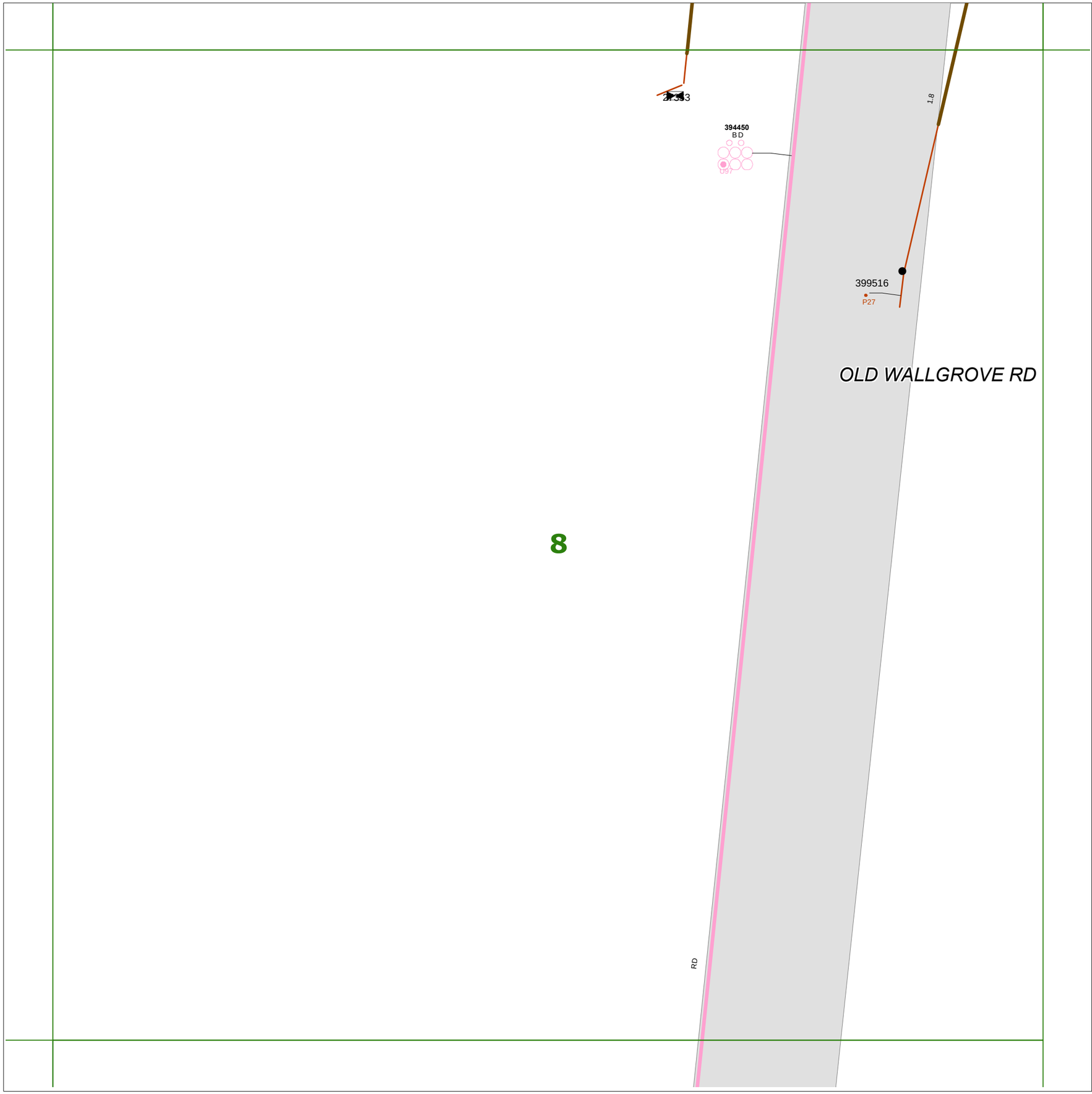

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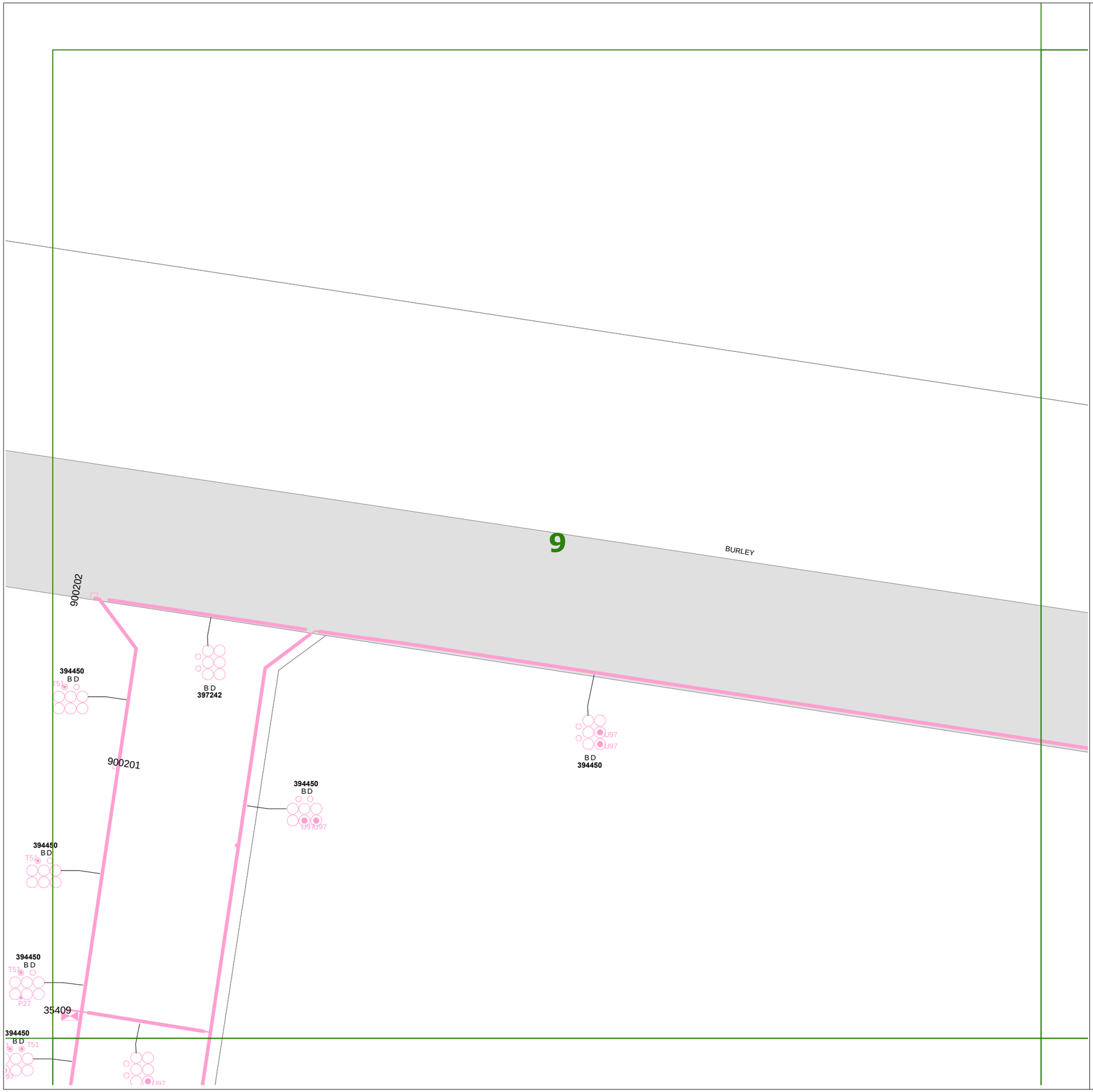

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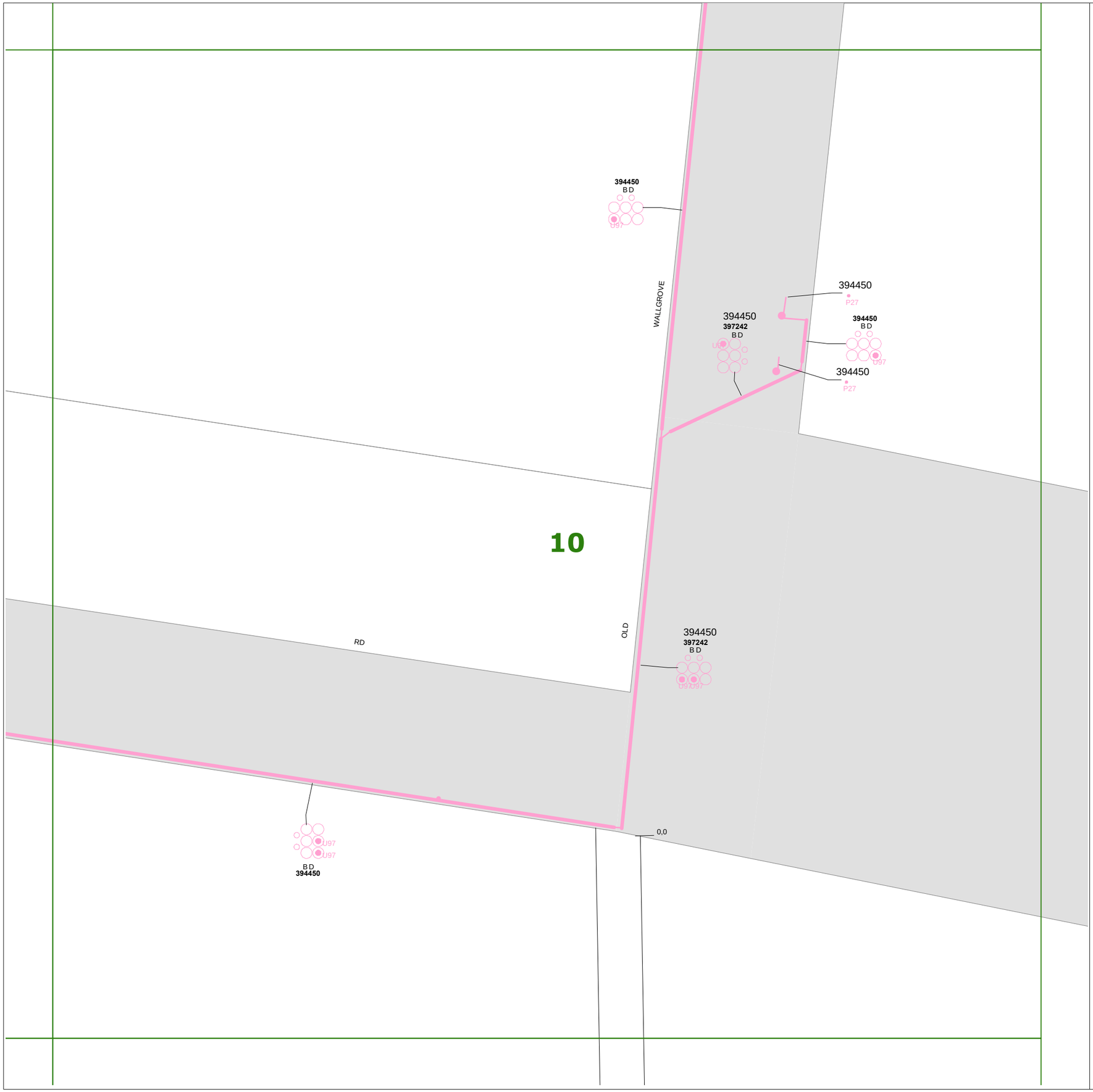

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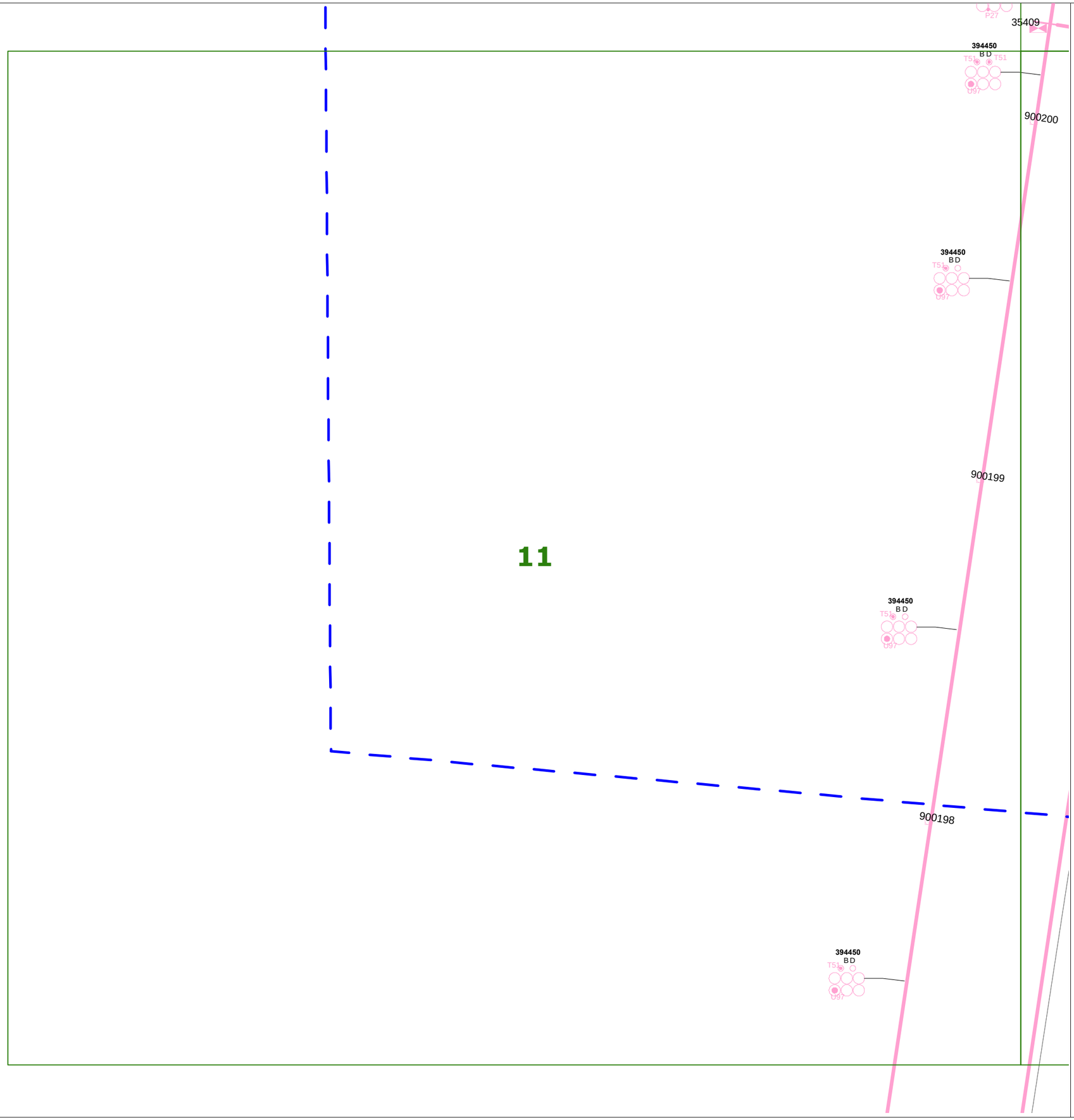

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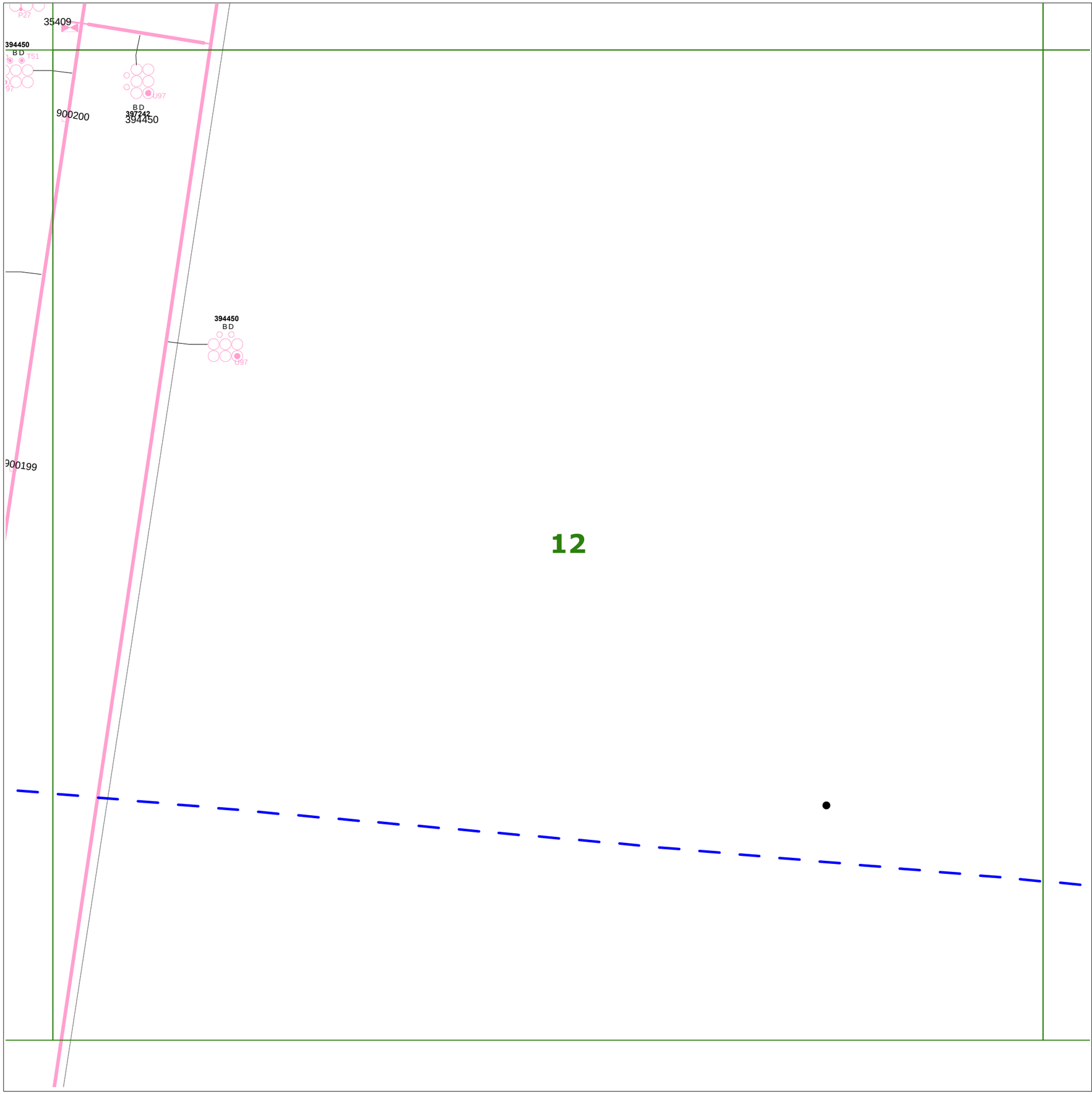

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- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be printed and made available at the worksite where excavation is to be undertaken. Plans must be reviewed and understood by the crew on site prior to commencing excavation.

INFORMATION PROVIDED BY ENDEAVOUR ENERGY

- Any plans provided pursuant to this service are intended to show the approximate location of underground assets relative to road boundaries, property fences and other structures at the time of installation.
- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

LEGEND

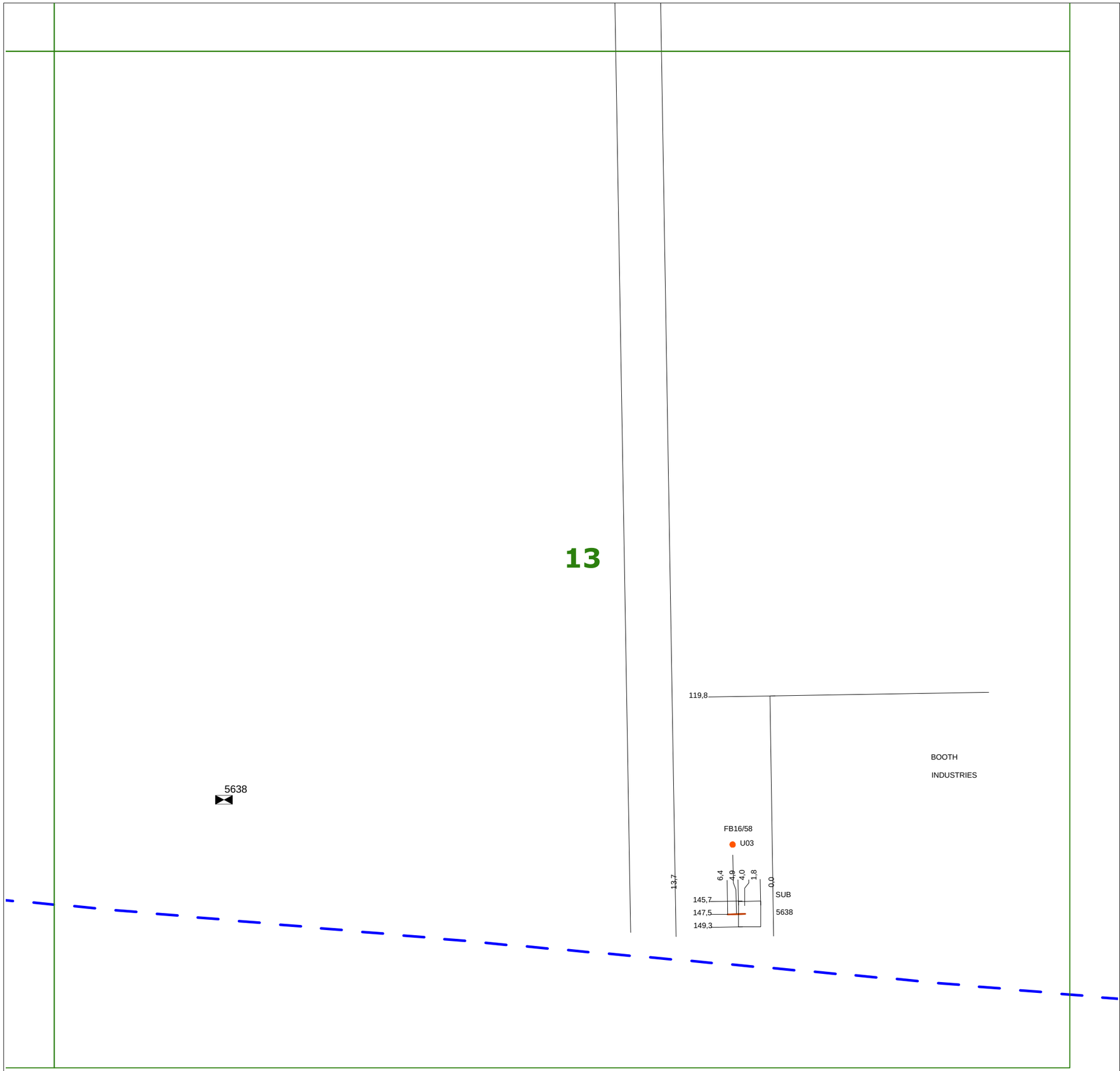
- Street light column (or)
- Padmount substation
- Overground pillar (O.G.Box) (or)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

NOT TO SCALE

DBYD Sequence No.:	72756366
Issued Date:	23/06/2018

Cadastre: © Land and Property Information 2015, 2016



WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
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- Padmount substation
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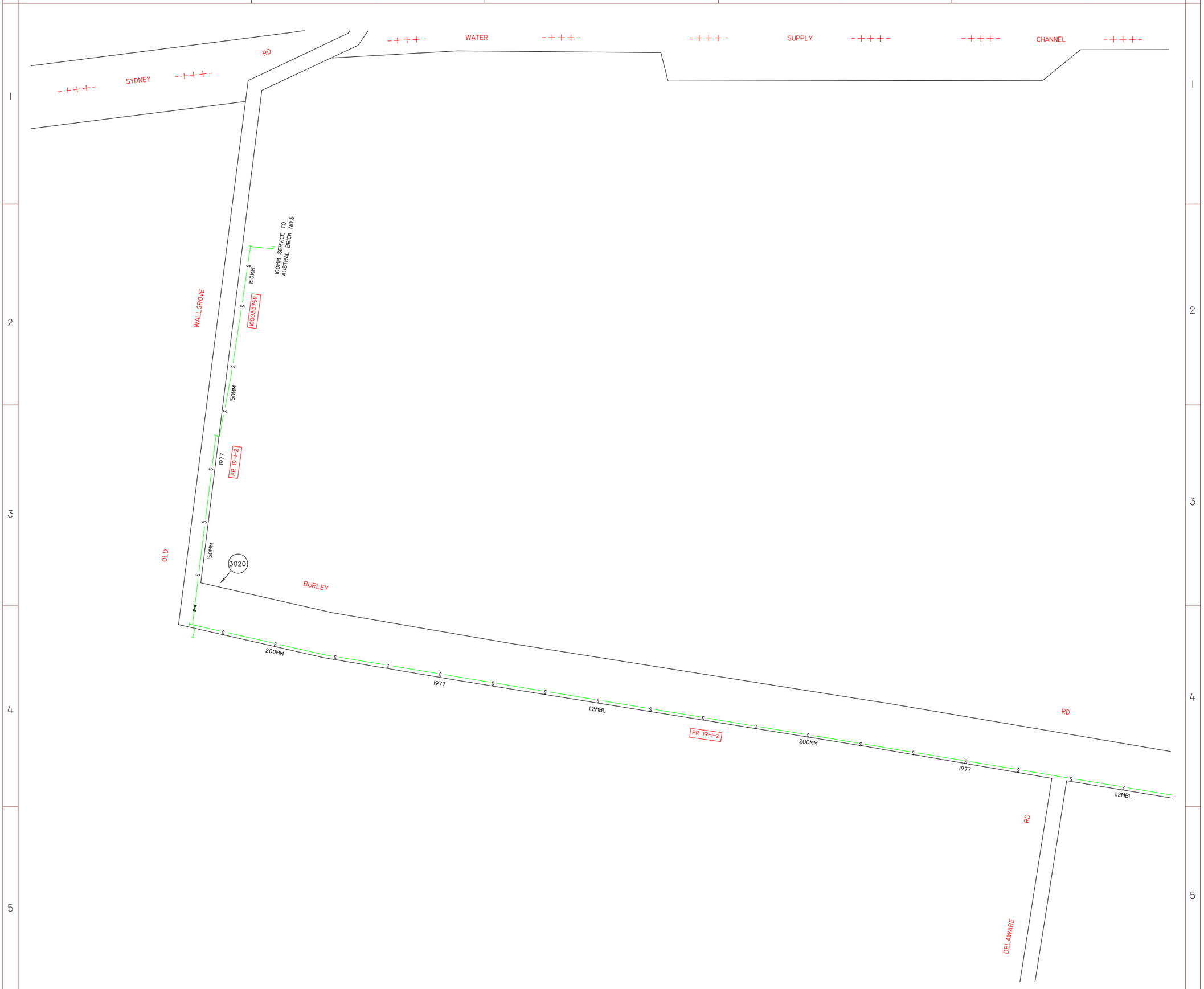

HORSLEY PARK 4D

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 04/03/2016
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

HP4A	HP4B	HP5A
HP4C	HP4D	HP5C
HP7A	HP7B	HP8A

ADJOINING MAPS

NETWORK AREA

BLACKTOWN
FAIRFIELD

MUNICIPALITY AREA

Jemena NG

KEY

		MAX ALLOWABLE OPERATING PRESSURE
T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
	NETWORK MAIN	300 kPa
	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
	NETWORK MAIN	7 kPa
	NETWORK MAIN	2 kPa
	PROPOSED MAINS	

PR II-2 3	STEEL MAIN PROJECT NUMBER
P	PRESSURE MONITORING STATION
	VALVE
	SYSTEM PRESSURE REGULATOR
S	SIPHON
123	NETWORK NODE
123S	NETWORK VALVE NODE
298	VALVE NUMBER
6NB	6 INCH CAST IRON MAIN
150MM	150MM STEEL MAIN
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE
1957	YEAR LAID
	MUNICIPALITY BOUNDARY
	NETWORK BOUNDARY
123	HOUSE NUMBER

HORSLEY PARK 4D

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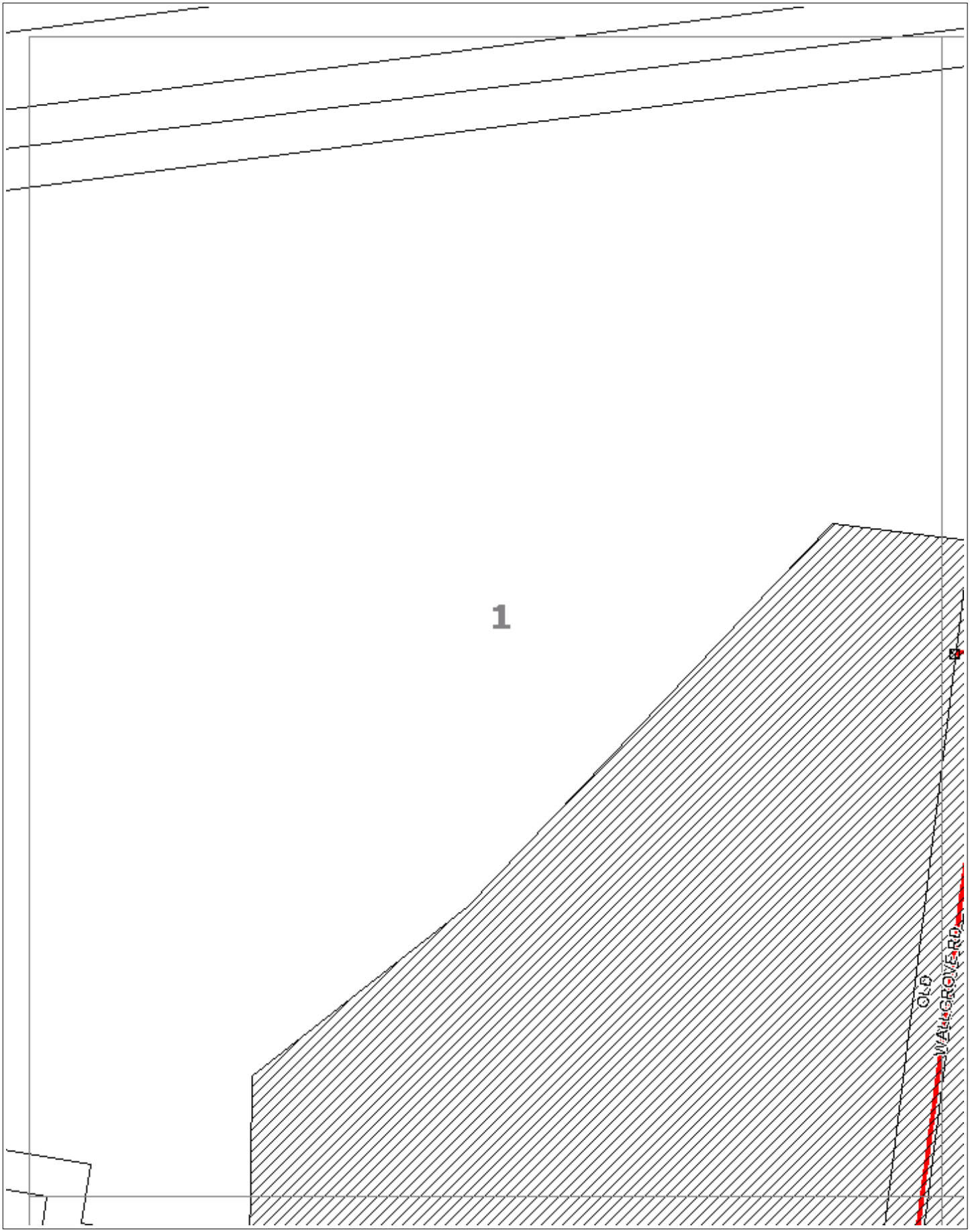
Sequence Number: 72756368

Date Generated: 23/06/2018

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208



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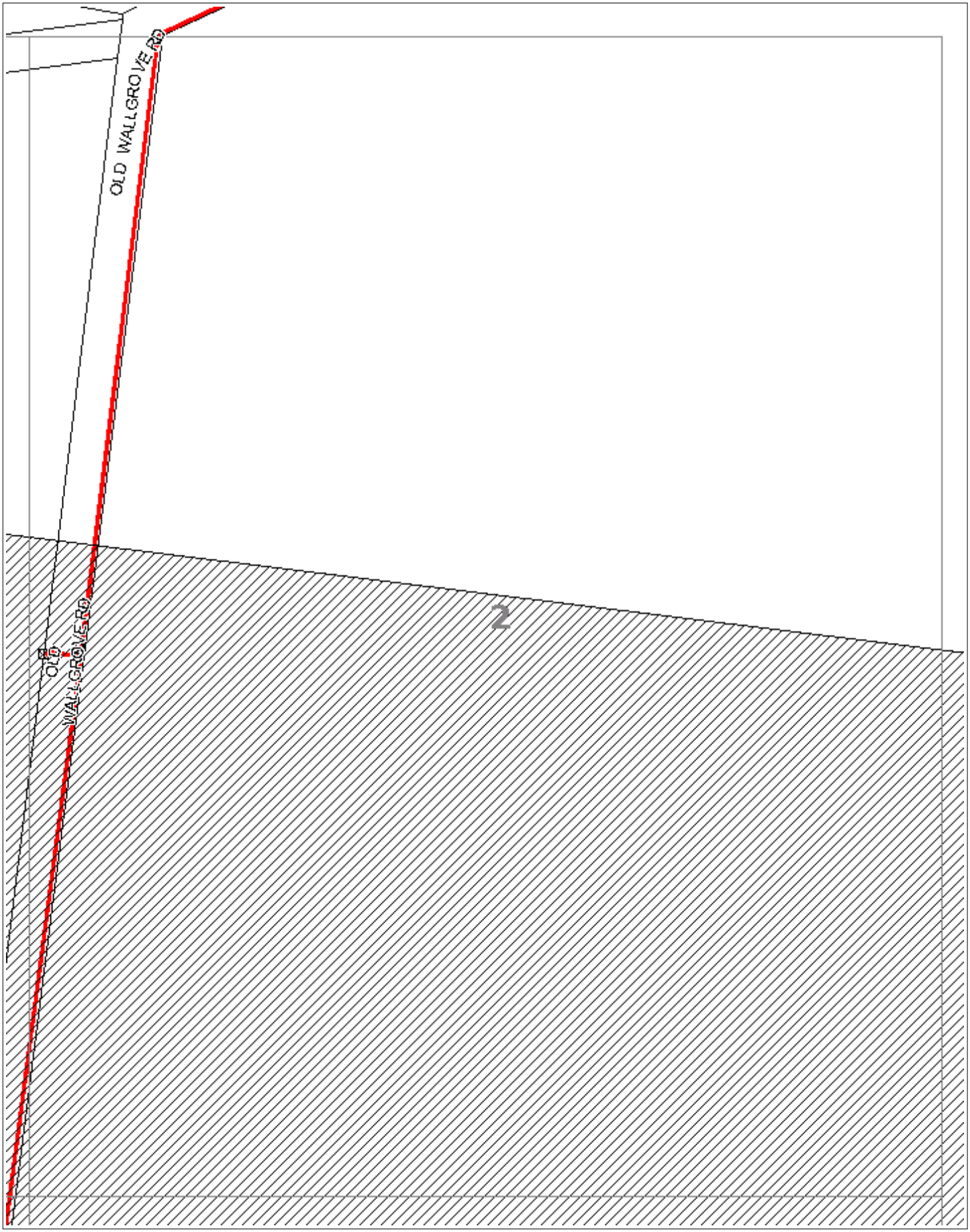

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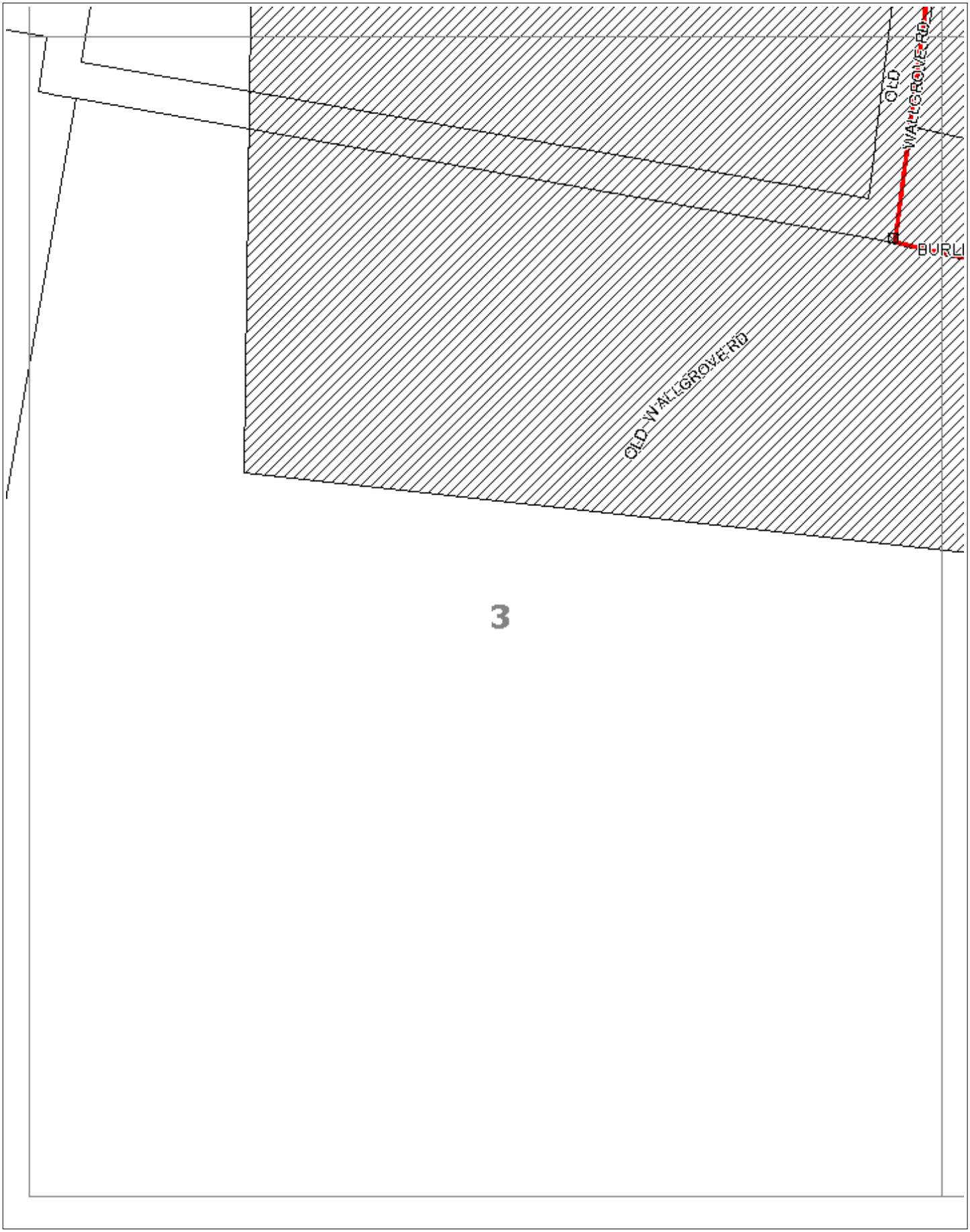

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Optus Limited ACN 052 833 208

LEGEND

IT'S HOW WE CONNECT

For more info contact a Telstra Accredited Locater or Telstra Plan Services 1800 653 935

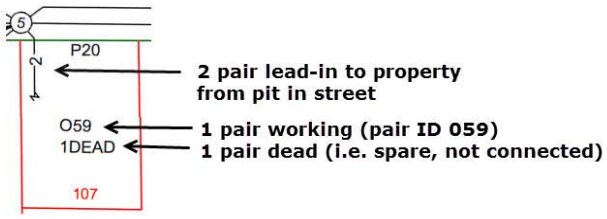
Exchange
(major cable present)

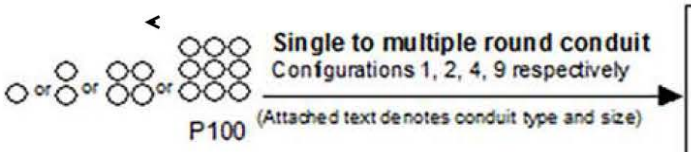
Footway access chamber
(can vary from 1-lid to 12-lid)

or **Pillar/cabinet**
(above the ground / free standing)

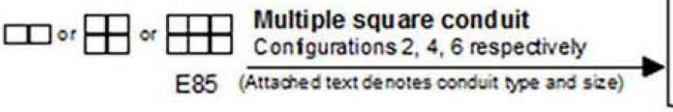
Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V electricity.

OC **other carrier**





Single to multiple round conduit
Configurations 1, 2, 4, 9 respectively
(Attached text denotes conduit type and size)



Multiple square conduit
Configurations 2, 4, 6 respectively
(Attached text denotes conduit type and size)

Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Cable jointing pit
(number indicating pit type)

Elevated cable joint
(above ground joint on buried cable)

Telstra Plant in shared utility trench

Aerial Cable
(above ground)

Aerial Cable
(attached to joint use pole e.g. power)

Direct buried cable

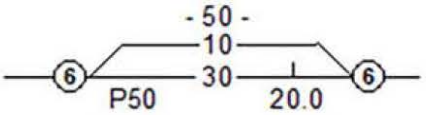
M **Marker post installed**

TR **Buried transponder**

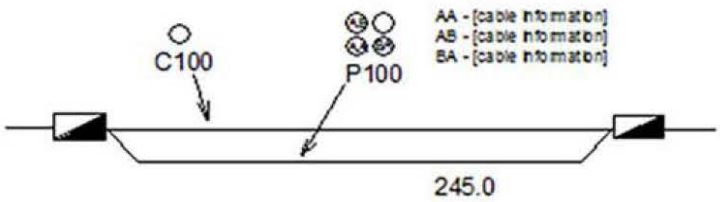
MT **Marker, transponder**

SMOF **Optical fibre cable direct buried**

Some examples of how to read Telstra plans:

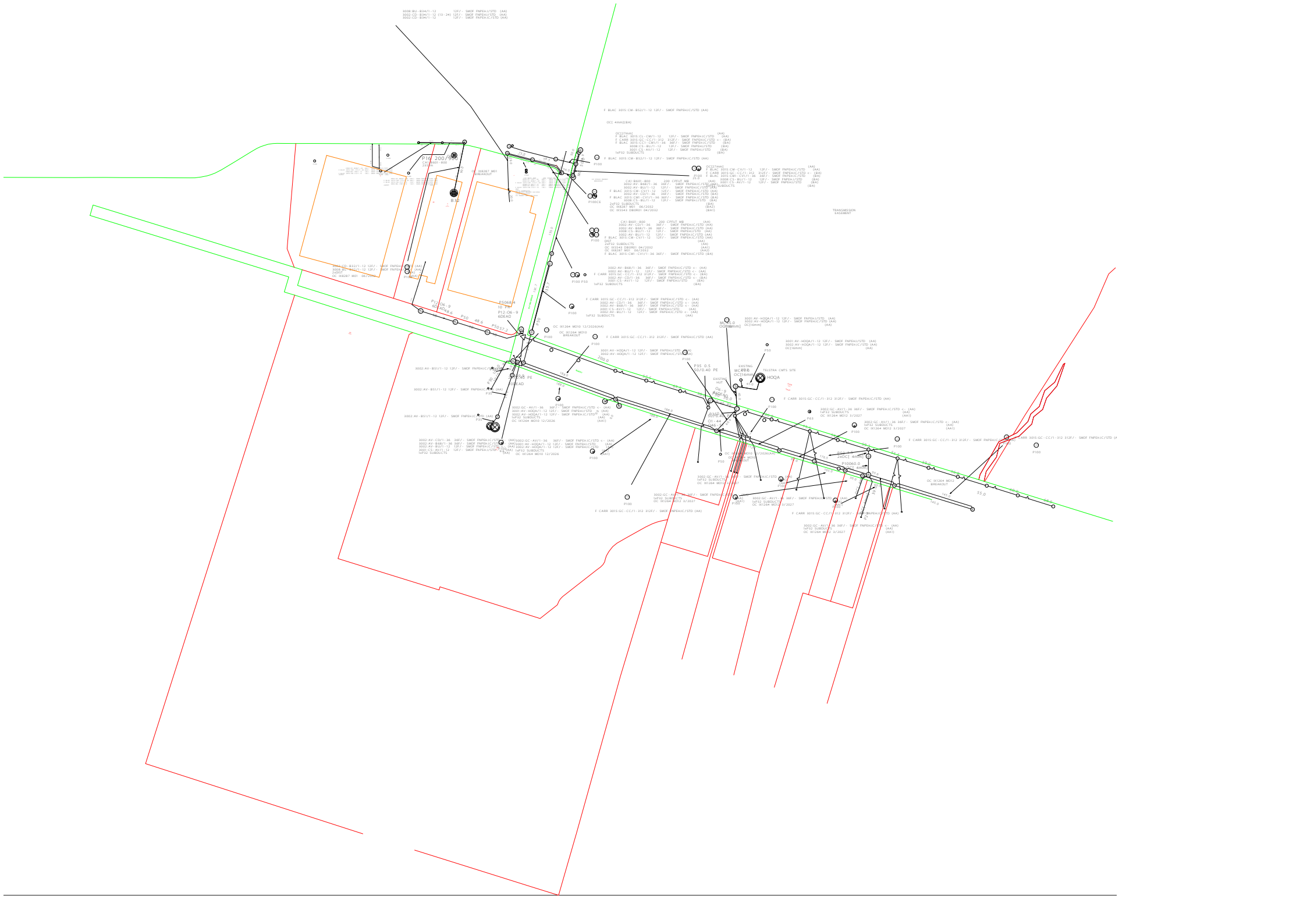


One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.


P100
P50
P63
P10060.0
P10060.4
P10060.9
P10061.4
P10061.8
P10062.2
P10062.6
P10063.0
P10063.4
P10063.9
P10064.4
P10064.8
P10065.2
P10065.6
P10066.0
P10066.4
P10066.9
P10067.4
P10067.8
P10068.4
P10068.9
P10069.4
P10069.8
P10070.2
P10070.6
P10071.0
P10071.4
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P10081.4
P10081.8
P10082.2
P10082.6
P10083.0
P10083.4
P10083.8
P10084.2
P10084.6
P10085.0

Appendix C

Indicative Utility Servicing Strategy Drawings

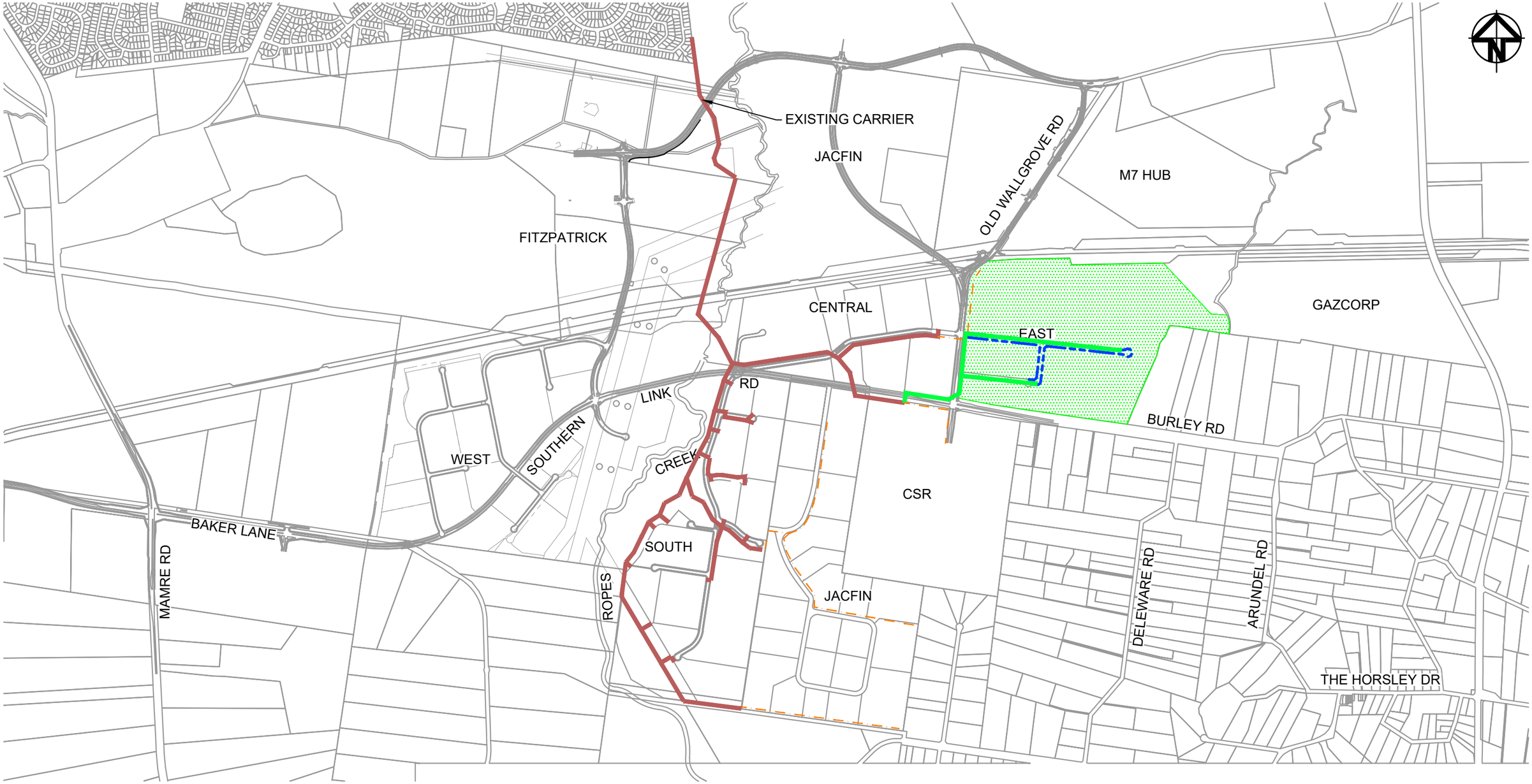
OAKDALE EAST INDUSTRIAL DEVELOPMENT

SEWER STRATEGY

CONCEPT SCHEME PLAN

JANUARY 2022

at&l



PROPOSED SCHEME

Diameter (mm)

- Existing
- Proposed
- Future Connections

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC010	18-563	P3

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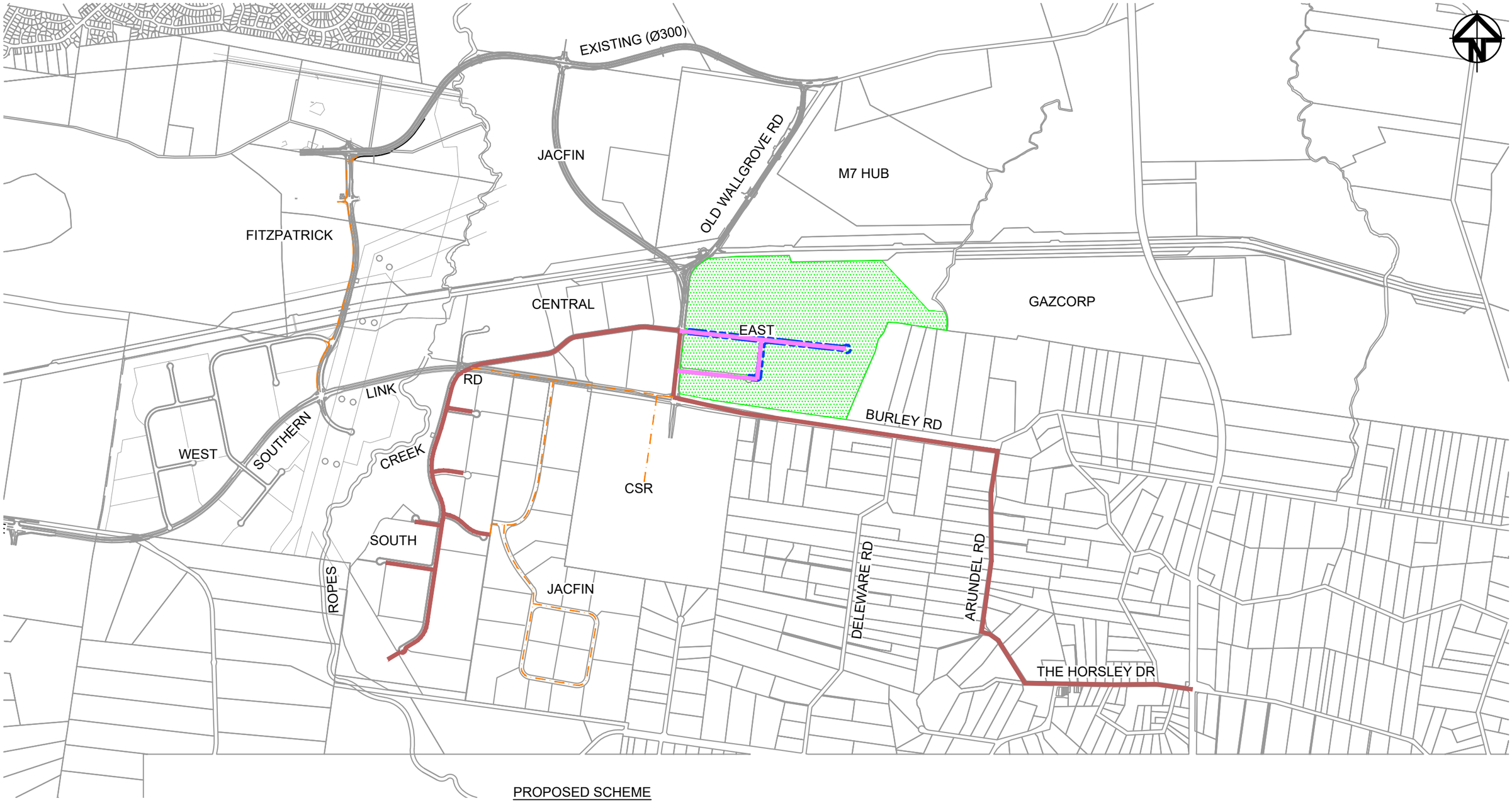
OAKDALE EAST INDUSTRIAL DEVELOPMENT

POTABLE WATER STRATEGY
CONCEPT SCHEME PLAN
JANUARY 2022

at&l



PROPOSED SCHEME
Diameter (mm)
Existing
Proposed
Future Connections

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC011	18-563	P3

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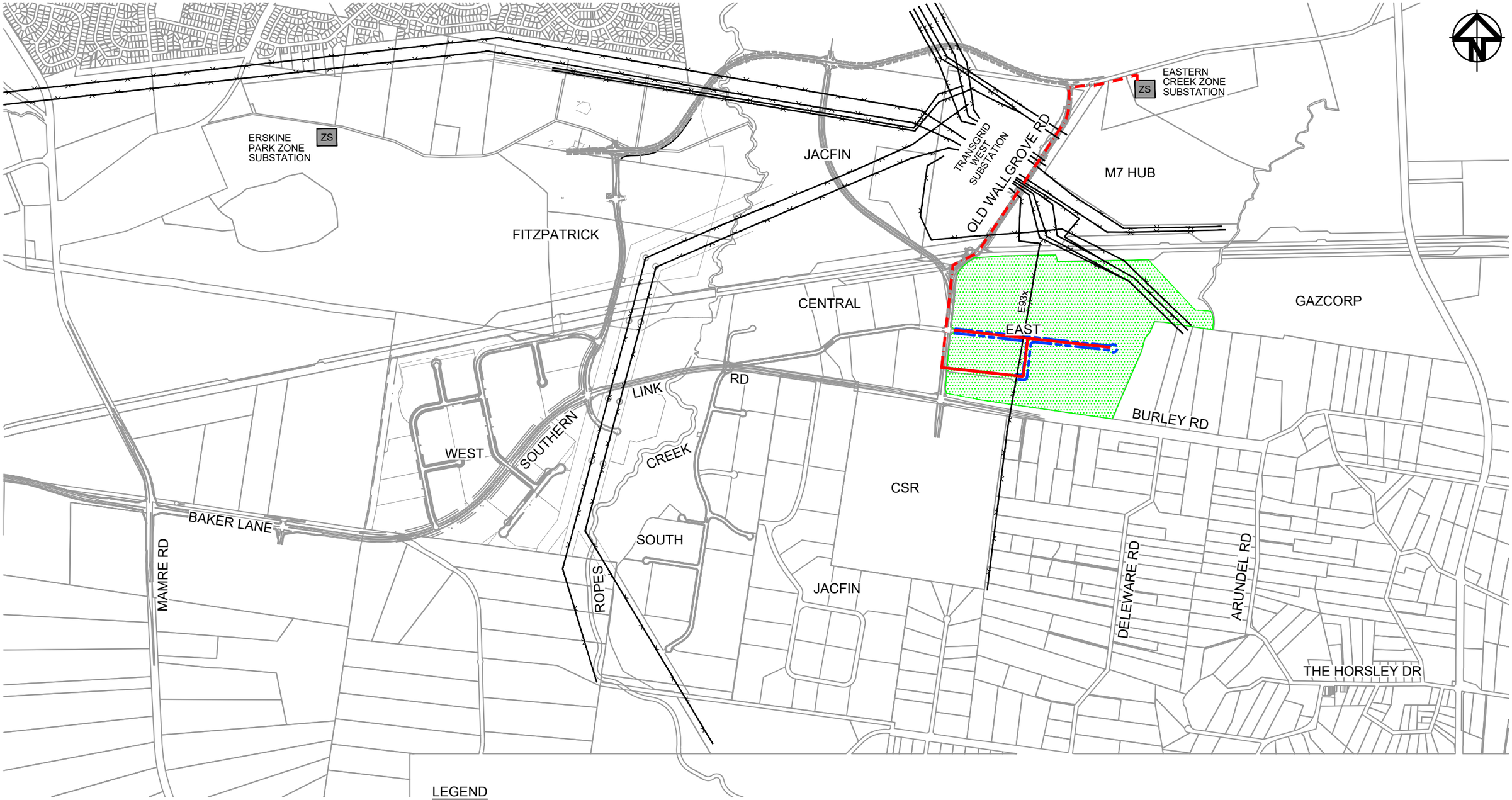
OAKDALE EAST INDUSTRIAL DEVELOPMENT

HIGH VOLTAGE
CONCEPT SCHEME PLAN
JANUARY 2022

at&l



LEGEND

- Proposed Pad Mount Kiosk
- Proposed 11kV Reticulation
- Proposed Stage 1 11kV feeds to Eastern Creek Zone Substation
- Existing Overhead Transmission Cables

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC012	18-563	P3

F:\18-563 Oakdale East\Drgs\Civil\Sketches\SKC012-HIGH VOLTAGE CONCEPT SCHEME.dwg

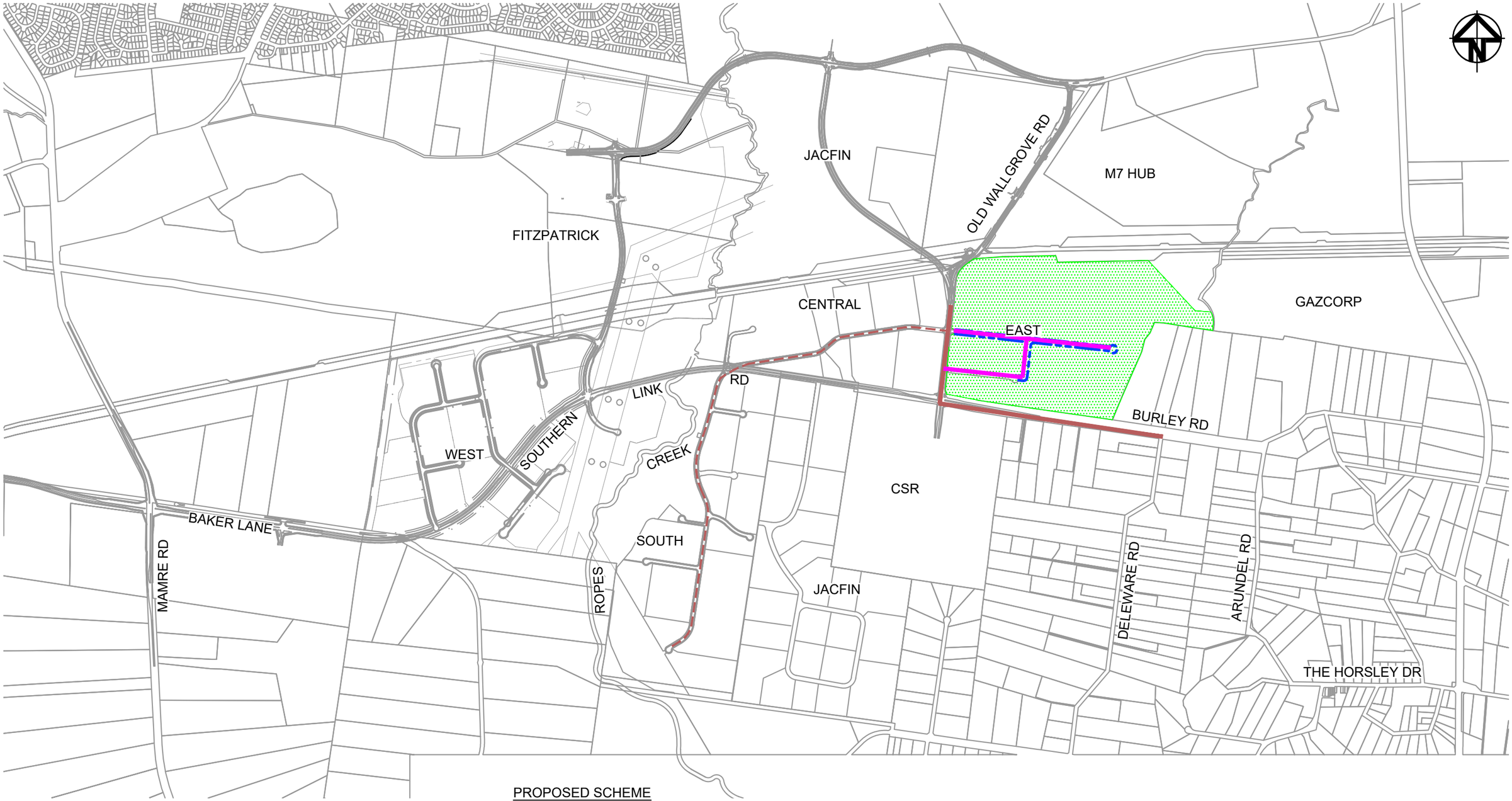
OAKDALE EAST INDUSTRIAL DEVELOPMENT

PROPOSED GAS MAIN STRATEGY

CONCEPT SCHEME PLAN

JANUARY 2022

at&l



PROPOSED SCHEME

- Existing HP Gas Main
- Existing Gas Duct Only
- Proposed Gas Duct Only
- OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC013	18-563	P3

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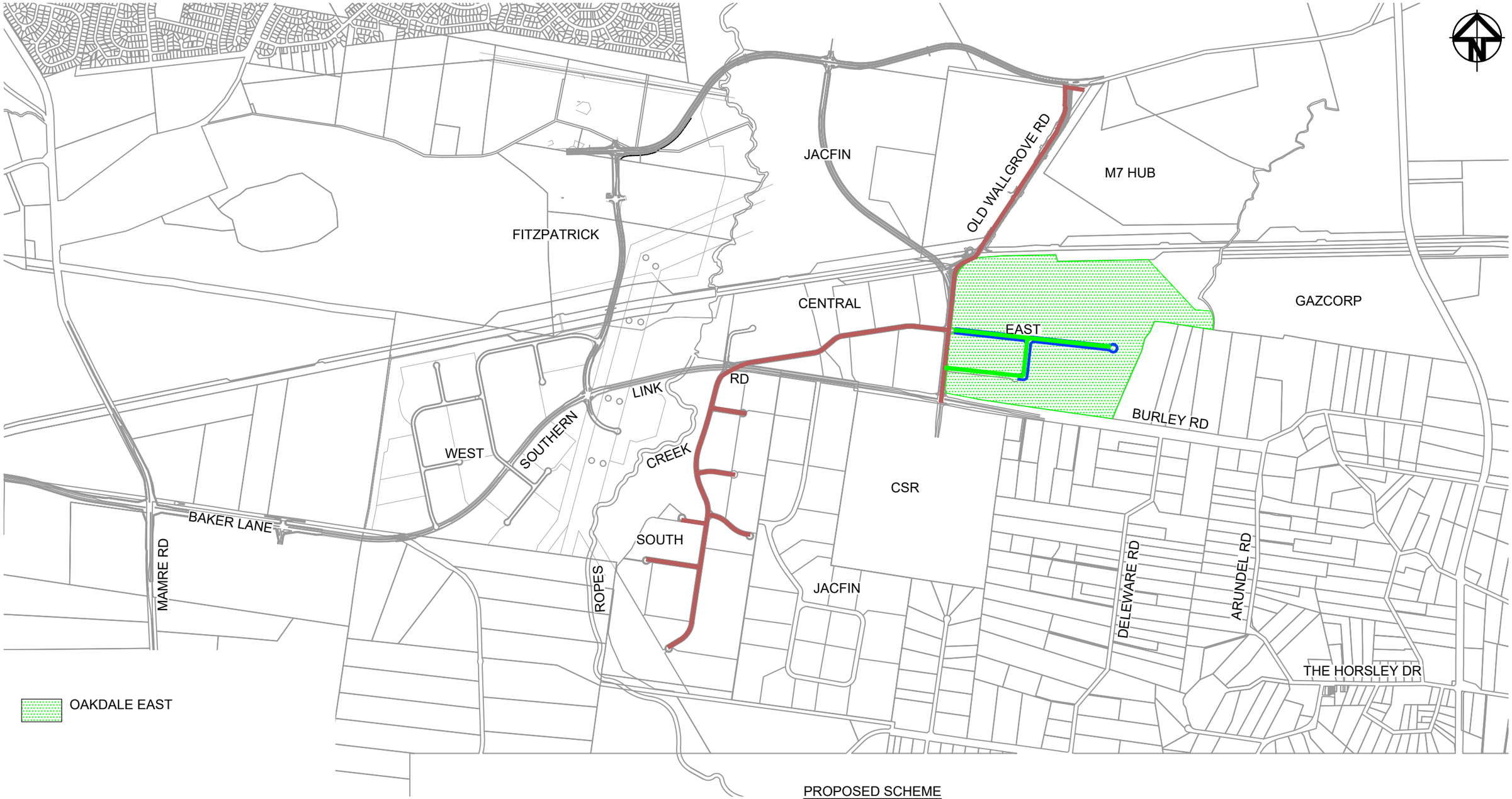
OAKDALE EAST INDUSTRIAL DEVELOPMENT

TELECOMMUNICATIONS STRATEGY

CONCEPT SCHEME PLAN

JANUARY 2022

at&l



PROPOSED SCHEME

Existing Telecommunications

Proposed Telecommunications

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC014	18-563	P3

F:\18-563 Oakdale East\Drgs\Civil\Sketches\SKC014-TELECOMMUNICATIONS STRATEGY.dwg

Appendix D

Local Area Servicing Plan (Water) -GHD

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Water

July 2016

Commercial in Confidence

GHD Disclaimer

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in Basis of Planning report (i.e. TM-01). GHD disclaims liability arising from any of the assumptions being incorrect.

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GHD has prepared preliminary Cost Estimates in this report. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the works can or will be undertaken at a cost which is the same or less than the Cost Estimate.

GHD

133 Castlereagh St Sydney NSW 2000

-

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev. 01	A Rashidi	M Healey		M Healey		15/06/16
Rev. 02	A Rashidi	M Healey		M Healey		5/07/16
Final	A Rashidi	M Healey, Sydney Water, Goodmans		M Healey		28/07/2016

Document Status

Oakdale Industrial Development - Planning of Water Related Services July 2016

This report has been prepared by GHD

Approved for issue

Signature	Date	Signature	Date	Signature	Date
	29/07/16		29/07/16.		
Kym Dracopoulos		Russell Hogan		Amir Rashidi	
Manager, Technical		Project Manager		Project Manager	
Goodman Property Services (AUST) Pty Ltd		AT&L Associates		GHD	

Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

Signature	Date	Signature	Date
Suhanti Thirunavukarasu		Richard Schuil	
Principal Planner		Engineering & Planning Manager	
Engineering & Environmental Services		Growth Centres	
Sydney Water		Sydney Water	

Approved

Signature	Date
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

Growth and water demand projections

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. Their lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection (1)
Oakdale Central	45.2	IN1- General Industrial (2)	2016- 2017
Jacfin	87.8	IN1- General Industrial/ Residential	2016- 2017
Oakdale South	70.2	IN1- General Industrial	2017- 2019
CSR	63.4	IN1- General Industrial	2017-2020
Oakdale West	90.5	IN1- General Industrial	2019- 2021
Oakdale East	95.0	IN1- General Industrial	2022- 2024
Total	**452**		

Note 1: The proposed timing of connection is subject to change

Note 2: water demand assessed based on Light industrial / warehouse

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". Table 2 below summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 2 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
Oakdale South	2017-2019	0.65	1.0
CSR	2017-2020	0.58	0.93
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Total		**4.4**	**7.5**

The key opportunities and constraints associated with water servicing of the Oakdale Industrial Development is summarised below.

Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario.

Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. Sydney Water will address growth servicing requirements in the broader region.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

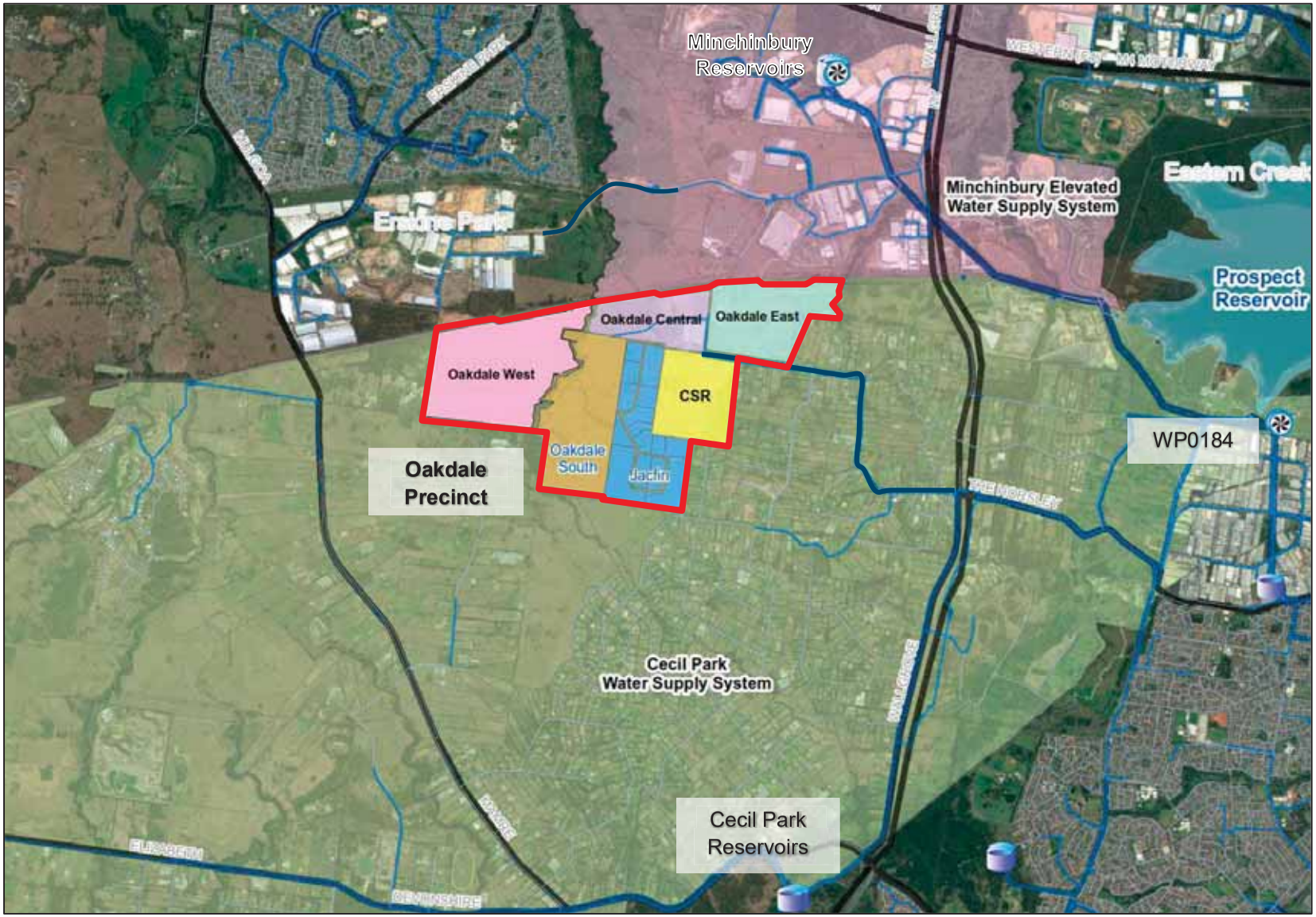

Figure 1 Oakdale Industrial Development Overview

The Oakdale Servicing Strategy is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 2) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 2) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 2) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 2) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 2) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 2) within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

The preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 3. The Oakdale servicing plan overview is presented in Figure 2.

Table 3 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

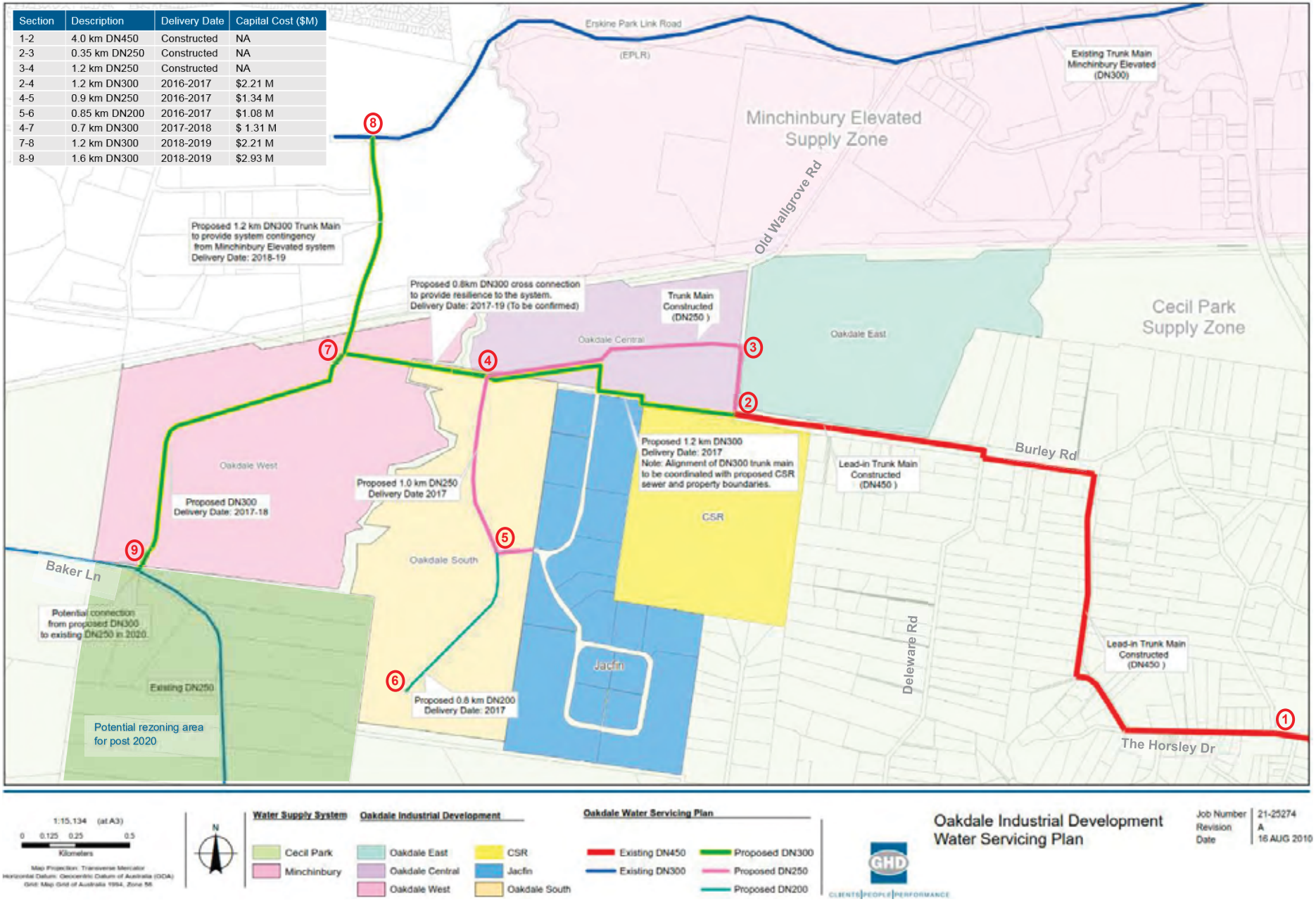

Figure 2- Oakdale Industrial Water Servicing Plan

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1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system. Minchinbury Elevated supply system also will provide connection to Oakdale from the existing DN300 within Erskine Park Link Road (EPLR).

Assets required to service proposed Goodman, Jacfin and CSR developments within Oakdale precinct are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to document the:

- Revised growth and water demand forecasts,
- Key opportunities and constraints,
- Outcomes of the assessment work undertaken, and
- Water servicing plan for the Oakdale Industrial Development.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

2. Growth Projections

This section provides details of growth and water demand projections within the study area including the expected timing, and scale of growth.

2.1 Summary of Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of development area. This includes Goodman, CSR and Jacfin lands. There lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009 The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1- General Industrial (5)	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0 (3)	IN1- General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1- General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	IN1- General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density (2)	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1- General Industrial	2017
	2	20.8		2018
		11.5		
	3	21.0		2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The proposed timing of infrastructure proposed is subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) – Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

Note 5: Water demand assessed based on Light industrial / warehouse

2.2 Water Demand Projections

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with evidence based industrial demand assumptions. i.e. 9.2 ML/d. the proposed demand previously calculated for this development removed from the model.
- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfers into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d

The revised future demand projections for the Cecil Park supply system are presented in Table 5.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

The detailed methodology for projecting average day and maximum day demands is described in Tech Memo 1 (Appendix A).

Table 6 summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 6 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale South	2017-2019	0.65	1.0
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
CSR	2017-2020	0.58	0.93
Total		**4.4**	**7.5**

3. Opportunities and constraints

The following is a summary of the key opportunities and constraints associated with water servicing of the Oakdale Industrial Development.

3.1 Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial. Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario. Additional augmentations as a result of the GSS study include 30 ML new reservoir will provide system reliability.
- Customers along Aldington Rd that experiencing low pressure under current maximum day demand could be rezoned to Oakdale development. i.e. 1.0 ML/d

3.2 Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. The GSS system augmentations (i.e. Prospect Creek pumping station WP0184B and raising main upgrade) proposed for 2031 demand scenario will address the long term system capacity issues within Cecil Park supply system.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

The opportunities and constraints identified in Oakdale Industrial water servicing plan is presented in Figure 3.

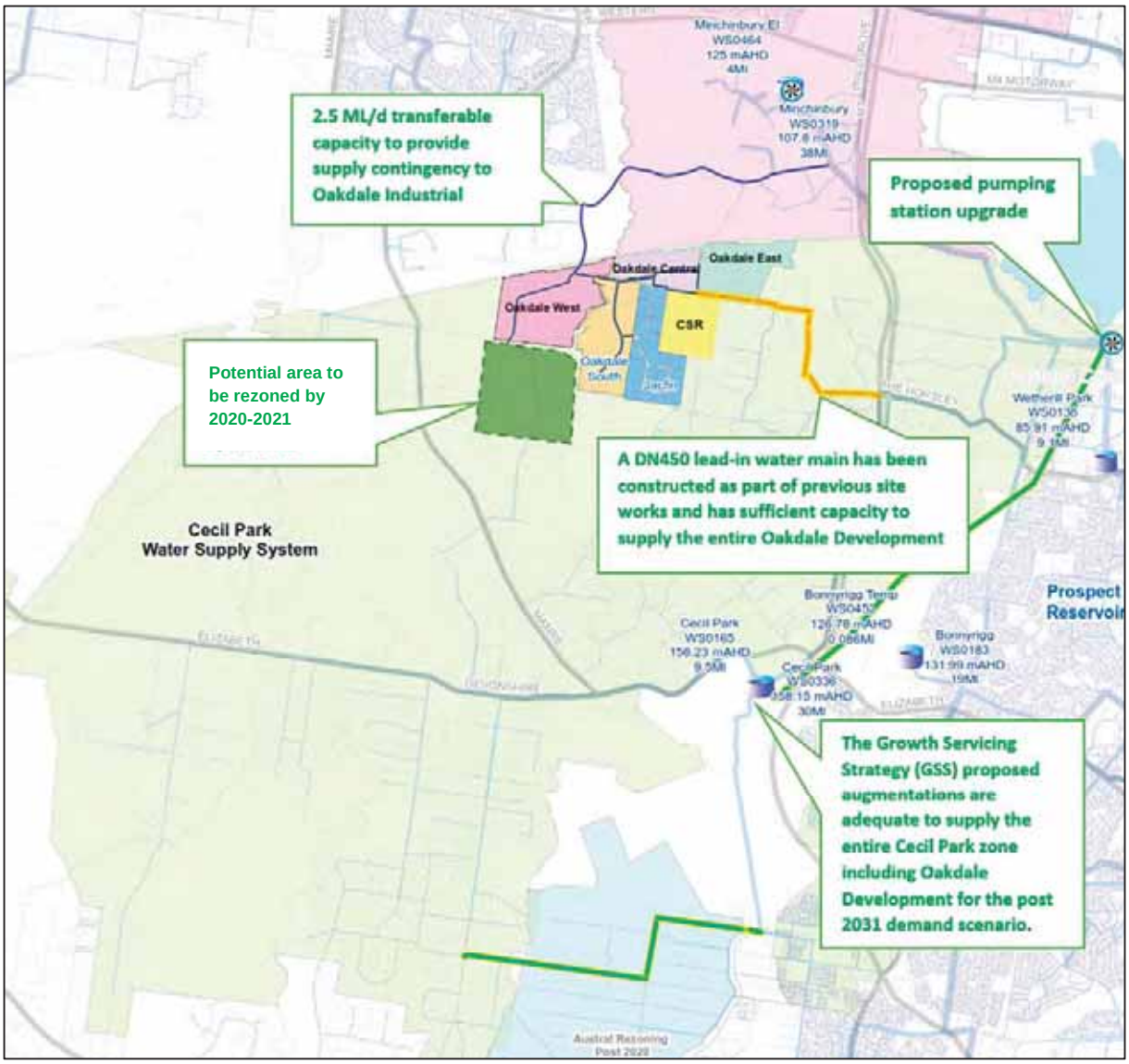

Figure 3 Opportunities and constraints

4. Water servicing

4.1 Oakdale Industrial water servicing

4.1.1 Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 4) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 4) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 4) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 4) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

4.1.2 Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 4) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 4) within Millner Avenue which is supplied from the Cecil Park Supply System.

4.1.3 Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

4.1.4 Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.5 CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.6 Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

4.2 Short-term servicing plan (Current- 2020)

Under this short-term supply configuration, Oakdale development will be supplied from Cecil Park supply system using existing DN450 lead-in main. The proposed internal pipework within Oakdale South need to be completed. i.e. 850 m DN250 and 850 m DN200.

Cecil Park reservoirs have sufficient capacity to supply the Cecil Park zone for the current max day scenario including proposed 2020 growth in the Oakdale Development as summarised below:

- Oakdale South, (i.e. 2020 MDD: 1.0 ML/d)
- Oakdale Central, (i.e. 2020 MDD: 0.7 ML/d)
- Oakdale West, (i.e. 2020 MDD: 1.0 ML/d)
- Jacfin, (i.e. 2020 MDD: 2.1 ML/d) and
- CSR. (i.e. 2020 MDD: 0.9 ML/d)

4.3 Mid-term servicing plan (2020- 2031)

Cecil Park reservoirs and transfer system have capacity to supply Cecil Park zone for the 2020 max day scenario including proposed 2020 growth in the Oakdale Development.

Between 2020 and 2024 the following actions are proposed:

- Rezoning to occur @ 2020 of Austral onto Cecil park (MDD: 2.8 ML/d @ 2020 and through to MDD: 4.8 ML/d @ 2024-25) (South West Priority Land Release Area "SWPLRA"; May 2016)
- Further growth within the Oakdale Development 1.7 ML/d (Oakdale Industrial will be fully developed at 2024)

The above contribute to significant capacity deficiencies within the system. i.e. WP0184 and Cecil Park reservoirs cannot keep up with a max week demand. By rezoning Oakdale West and Central on to Minchinbury Elevated relieves demand of 1.6 ML/d provides sufficient capacity relief to accommodate the forecasted demand and rezoning up to 2024.

Therefore, under mid-term servicing plan, Oakdale West and Oakdale Central will be supplied from Minchinbury Elevated supply zone using existing DN300 trunk main (i.e. gravity supply from elevated reservoir). Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km. Customers along Aldington Rd (i.e. approx. 28 customers) that experiencing low pressure under current maximum day demand could also be rezoned to Minchinbury Elevated supply zone using the proposed DN300 trunk main within Oakdale West.

The Oakdale Industrial remainder including Jacfin and CSR would be supplied from Cecil Park using existing DN450 and proposed DN300 lead-in main.

From 2024 through to 2030 there is insufficient capacity within both the Minchinbury Elevated and Cecil Park supply systems to accommodate growth within the Oakdale Industrial area. Between 2024 and 2030 the following actions are proposed:

- Further growth in the Austral rezoned area now being fed from Cecil Park
- Rezoning to occur @ 2024 of Leppington North onto Cecil Park (7.3 ML/d @ 2024) (South West Priority Land Release Area "SWPLRA"; May 2016)

Accordingly, further investigation into the proposed rezoning and or required amplification of the system prior to this date is required.

4.4 Long-term servicing plan (Post 2030)

The Oakdale Industrial development will be supplied from Cecil Park and Minchinbury Elevated supply systems. Cecil Park reservoirs (i.e. including any proposed new reservoir) and upgraded Prospect Creek pumping station WP0184B have sufficient capacity to supply the Cecil Park zone for the 2036 max day scenario including ultimate growth within the Oakdale Development. This is based on an indicative scheme included in the GSS but subject to detailed planning before finalisation of preferred option.

The Oakdale servicing plan overview is presented in Figure 4.

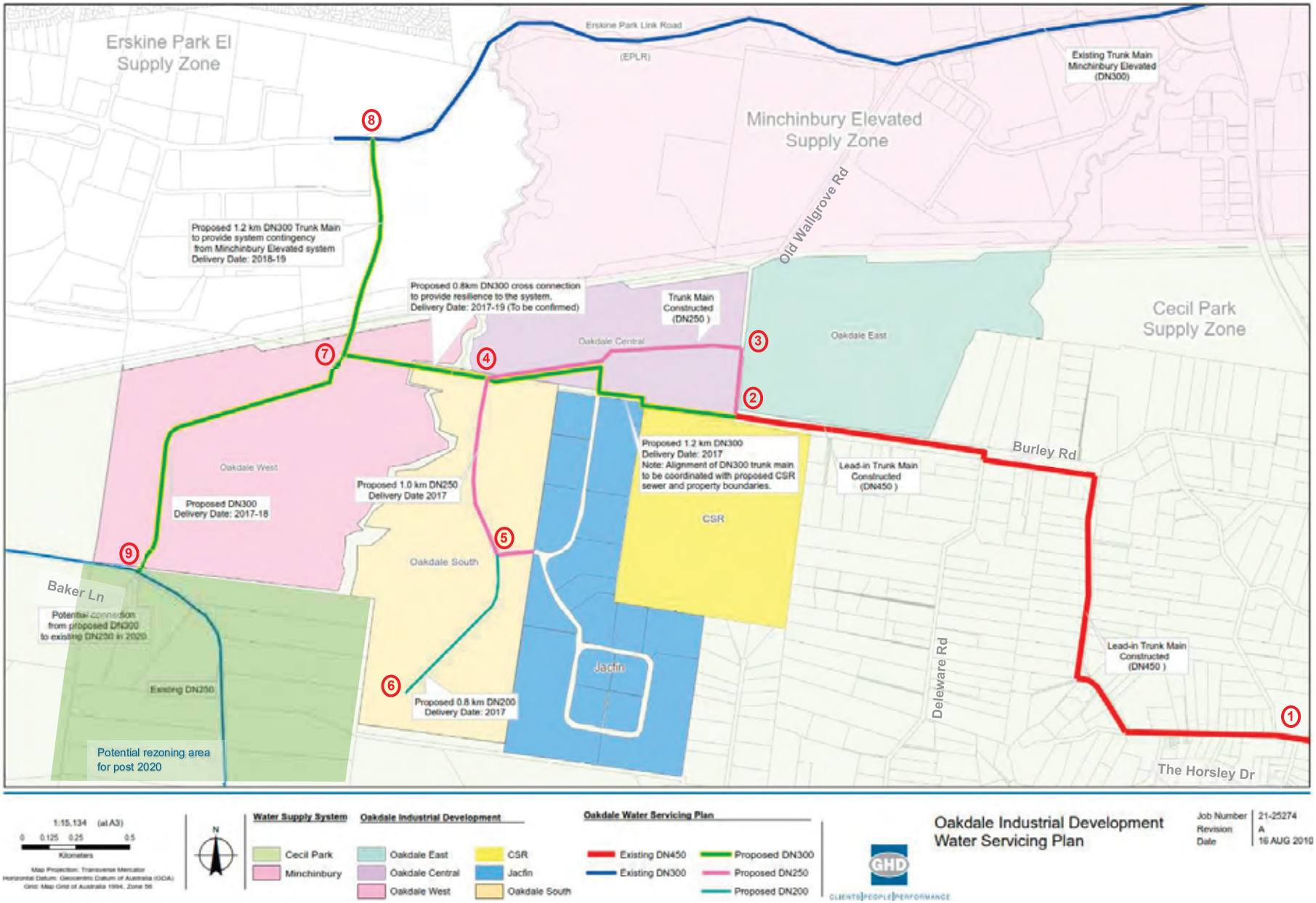

Figure 4- Oakdale Industrial Water Servicing Plan

4.5 Preliminary capital cost assessment

Preliminary capital cost estimates were developed for Oakdale Development. The water mains indirect and total delivery costs were estimated using the Sydney Water Cost Estimator tool (version 09-2015.11). The following assumptions were adopted for preliminary cost estimation:

- 75% scope contingency was adopted for all options as per advice from Sydney Water
- An allowance was made for rock excavation for 30% of the length of the water mains
- 25% Road restoration was allowed for all pipework

A summary of the preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 7. Detailed cost estimates are provided in Appendix B.

Table 7 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-17	$2.21 M
4-5	0.9 km DN250	2016-17	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

5. Conclusions and Recommendations

This study investigated the assets required to service the proposed Goodman, Jacfin and CSR developments within the Oakdale Precinct to meet development timeframes. The water servicing plan for the Oakdale Industrial Development is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection between the existing DN250 potable water main within Millner Avenue to the proposed DN300 within Oakdale West which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension of the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

Appendices

Appendix A –Revised Basis of Water Planning

Memorandum

25 May 2016

To	Amir Rashidi		
Copy to	Russell Hogan, Suhanti Thirunavukarasu, Suganthini Niranjan		
From	Amir Rashidi	Tel	02 92397010
Subject	Oakdale Industrial- Revised Basis of Water Planning	Job no.	21/25274

1. Introduction

1.1 Purpose of this memorandum

The purpose of this memorandum is to document and seek endorsement from Sydney Water on the design and system performance criteria to be adopted for the investigation associated with the water system within the Oakdale Industrial development. It is important that Sydney Water agrees to these criteria prior to substantial commencement of the planning tasks.

1.2 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

Water: The initial scheme was to supply the site from Cecil Park; however, there is an alternative option to supply Oakdale through a combination of the Minchinbury and Cecil Park supply zones. Extensions off Sydney Water's existing system will need to be built to provide the full site with drinking water services.

Assets required to service proposed Goodman development at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

GHD
Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia
T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com

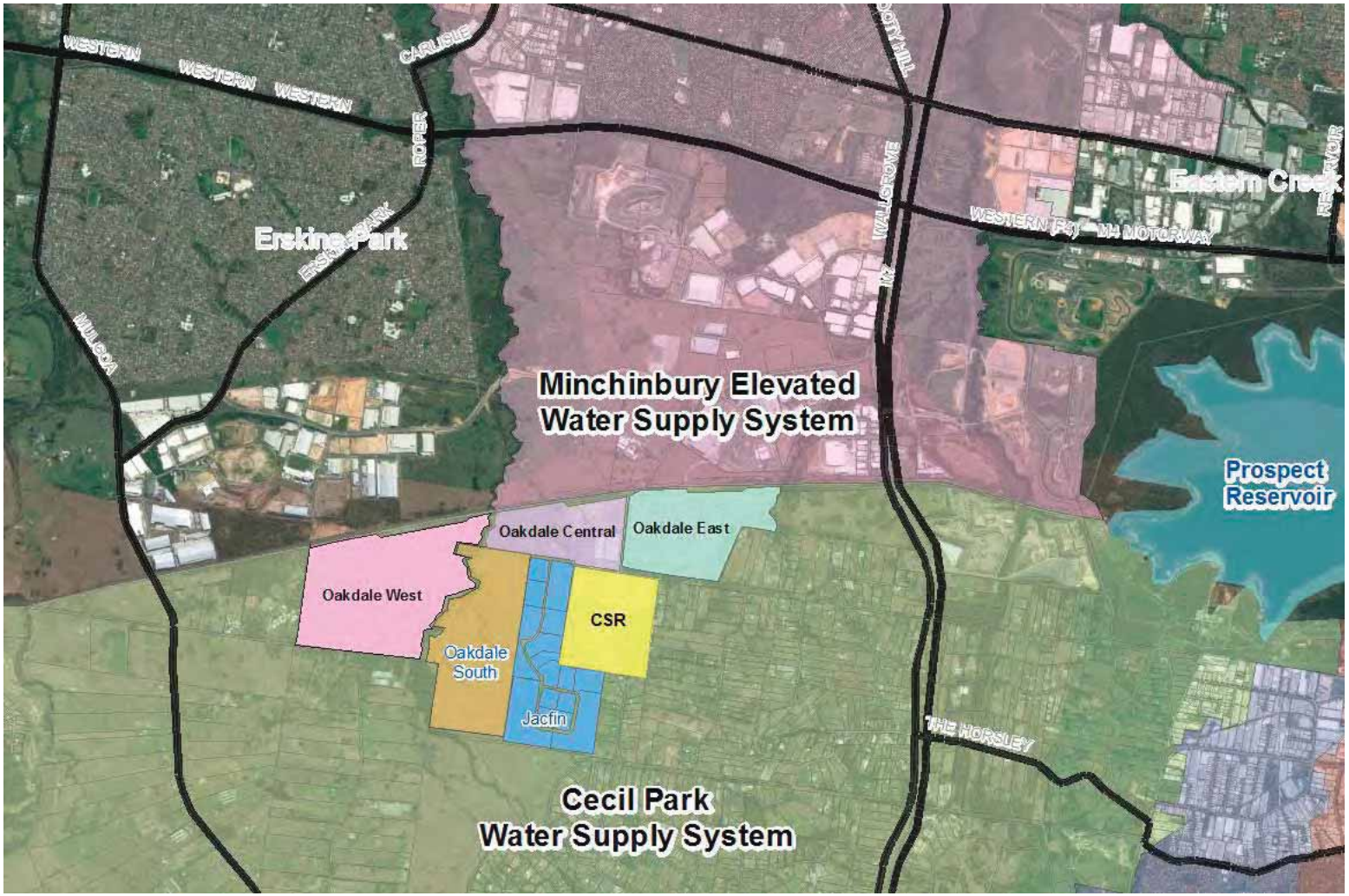

Figure 1 Oakdale Industrial Development Overview

GHD
Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia
T 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Population growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is a future industrial development with approximately 300 nett hectares of development lots anticipated in the ultimate stage. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1. Detailed figures for each of the developments are included in Appendix A.

Table 1 Growth projections

Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale South	1	18.8	Light industrial/warehouse	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	**1**	**95.0** [(3)]	Light industrial/warehouse	2022-2024 [(1)]
Oakdale West	1	21.7	Light industrial/warehouse	2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		

GHD
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Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale Central	1A	4.1	Light industrial/warehouse	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	Light industrial/warehouse	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density [2]	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	Light industrial/warehouse	2017
	2	32.3		2018
		11.5	Environmental /Open Space	
	3	21.0	Light industrial/warehouse	2020 [1]
	Total	**74.9**		
Grand Total		**463.6**		

Note 1: The timeframes are subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager Russell Hogan – AT&L on behalf of Goodman	Via Email	29th Feb 2016

3. Planning criteria

3.1 Water planning criteria

This section details the water planning criteria relevant to this investigation. We request Sydney Water's endorsement of the design criteria as a hold point for the project prior to commencement of the system performance assessment.

3.2 Water planning references

The following documents, referenced in Table 2, were consulted in developing the planning criteria:

1. Water and Recycled Water System Growth Servicing Strategy – Criteria and Guidelines 2012
2. Water System Planning Guideline (ver. 1- September 2014)
3. Water Supply Code of Australia (WSA 03-2011-3.1 - Sydney Water Edition 2012)
4. Recommendation – Water-main renewal program interim sizing rules to address fire-fighting needs
5. Precinct Structure Plan

Table 2 Water Planning Criteria

Item	Design Criteria	Units	Water	Reference
System Demands (existing areas)				
Max Day Demand (MDD)	Max Day Demand /Average Day Demand (MDD/ADD) Factor	NA	An analysis of the last ten consecutive financial years of IICATS data to select the day with the highest demand over 24 hours. The peaking factor will be derived from calculated MDD and ADD. (i.e. peaking factor: MDD/ADD) • Cecil Park Supply System peaking factor: 2.8 • Cecil Park maximum day demand : 18.75 ML/d • Minchinbury Supply System peaking factor: 1.6 • Minchinbury maximum day demand : 5.2 ML/d	Reference 2 See Appendix C
Max Hour Demand	Max Hour Demand /Max Day Demand Factor	NA	An analysis of the last ten years of 15 minutes of IICATS data to select the maximum hour event. If the results are inconsistent then the default WMS maximum day demand diagram will be adopted	Reference 2
Performance Requirements				
Trunk Mains	Minimum Pressure	Meter	Trunk mains (no customer connections) will maintain 3 m at all times under max day demand condition	Reference 1

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Item	Design Criteria	Units	Water	Reference
Reticulation Mains	Minimum Pressure	m	Maintain at the property boundary: >25 m residual pressure (desirable) (2)	
	Maximum Pressure	m	The long-term aim is to reduce to 60 m or less where financially viable	Reference 2
	Maximum headloss	km/ hr.	Maximum headloss of 5 m/km for ≤ DN150 and 3 m/km for ≥ DN200. (secondary criteria)	Reference 3
	Maximum Velocity	m/s	>2 m/s (i.e. The optimum velocity is in the range 0.8 m/s to 1.4 m/s.)	
Critical water-mains (Fire flow criteria)	Fire-Fighting Enquiries	L/s	High density residential, major special uses and heavy commercial and industrial : Not less than 10 m residual head with assume flow of 25 L/s (at 95th percentile domestic demand)	Reference 4
Minimum Pipe Size	Flow rates & residual pressure	mm	Industrial and Commercial: Cast iron outside diameter series: 150; Steel and Polyethylene pipes: 180	Reference 3
WMS model for water planning purposes (1)				
Minchinbury			***Current MDD***: > Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - Current Max Day Run 1.1 ***2031 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2031 Max Day Run 1.1 ***2036 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2036 Max Day Run 1.1	
Cecil Park			***Current MDD :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>WSEA - Structure Plan Update>GSS Run Group>Current Max Day ***2031 MDD Model Run :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2031 Max week GSS_Solutions ***2036 MDD Model Run*** : >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2036 Max week_Solutions_N	

Note 1: The GSS model for Minchinbury was used as this was the latest study in the local area and included an update of key assets and system demands. This will be validated and forecast demands updated as part of this project. The GSS model for Cecil Park was referenced in the recent SWPLRA / SWGC 2nd release precincts detailed planning investigation and is the latest version of the Cecil Park model available. This will be validated and forecast demands updated to reflect latest data. This has been discussed and confirmed with Sydney Water.

Note 2: The minimum pressure specified in the Operating Licence is 15 metres, however, some exceedances of this limit are permitted. Refer to Sydney Water Operating Licence. A lower minimum service pressure may be provided based on financial and risk considerations, and is subject to Sydney Water approval.

4. Water demand assessment

A baseline maximum day demand of 40 kL/Nha/day for light industrial new development was employed from Water System Planning Guideline to estimate the Oakdale Industrial water demand. During this assessment, it was observed that new development that anticipated occurring in Oakdale industrial will be typically warehouses with commercial / office land use. Consequently, Sydney Water advice to reassess the Oakdale industrial future demand based upon the Moorebank and Wetherill Park industrial areas that exhibit a similar type of development. The evidence based average day water demand summarised in Table 3. Figure 2 also shows the location of the Moorebank and Wetherill Park industrial areas in relation to the Oakdale Industrial precinct. .

Table 3 Evidence based average day water demand for comparable Industrial Areas (1)

Average Day Demand	Units	Moorebank	Wetherill Park	Weighted Average
Area demand (average)	kL/day	1,324	4,520	-
Area	Hectares	182	456	-
Demand per net hectare	kL/net ha/day	7.3	9.9	9.2

Note 1: The evidence based industrial demand employed from Broader WSEA Water Services Study (Nov 2013)

4.1 Summary of Oakdale Industrial water demand forecasts

The following outline of potable water demand provides predicted average day (ADD), maximum day (MDD) and maximum hour demand (MHD) based on projected development yield.

The calculations are based on the forecast development yield (i.e. Table 1) and evidence base design demands (Table 3). Detailed calculations for MDD and MHD demand are provided in Appendix B. The Oakdale Industrial demand forecast summarised in Table 4.

Table 4 Summary of revised water demand- Oakdale Industrial fully developed

Development site	Demand Scenario (ML/d)		
	ADD	**MDD**	**MHD**
Oakdale South	0.65	1.0	1.65
Oakdale West	0.83	1.3	2.13
Oakdale East	0.87	1.4	2.24
Oakdale Central	0.42	0.7	1.08
Jacfin	1.04	2.12	4.1
CSR	0.58	0.93	1.49
Total	**4.4**	**7.5**	**12.7**

Note 1: the maximum demand was estimated based on Industrial peaking factor of 1.6 (i.e. MDD/ADD)

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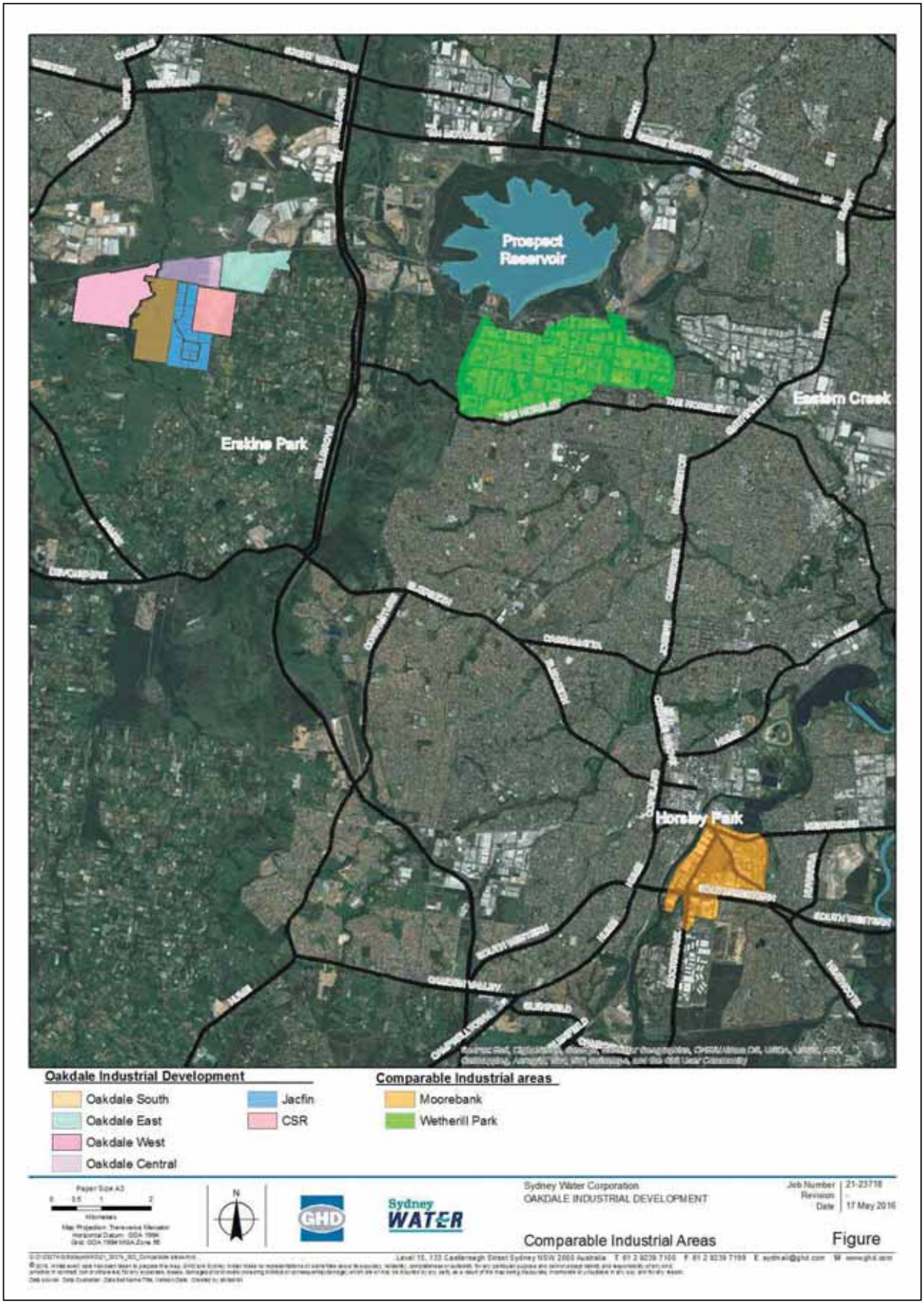

Figure 2- Comparable Industrial Areas

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4.2 Future Max Day Demand Projections

The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfer into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d (i.e. The Hoxton Park Recycled Water top-up water demand pattern will be employed)
- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with revised demand assumptions (Table 4)

The revised future demand projections are presented in Table 5. The residential growth sites details are provided in Appendix D.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

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Appendix A- Oakdale Industrial Detailed Development

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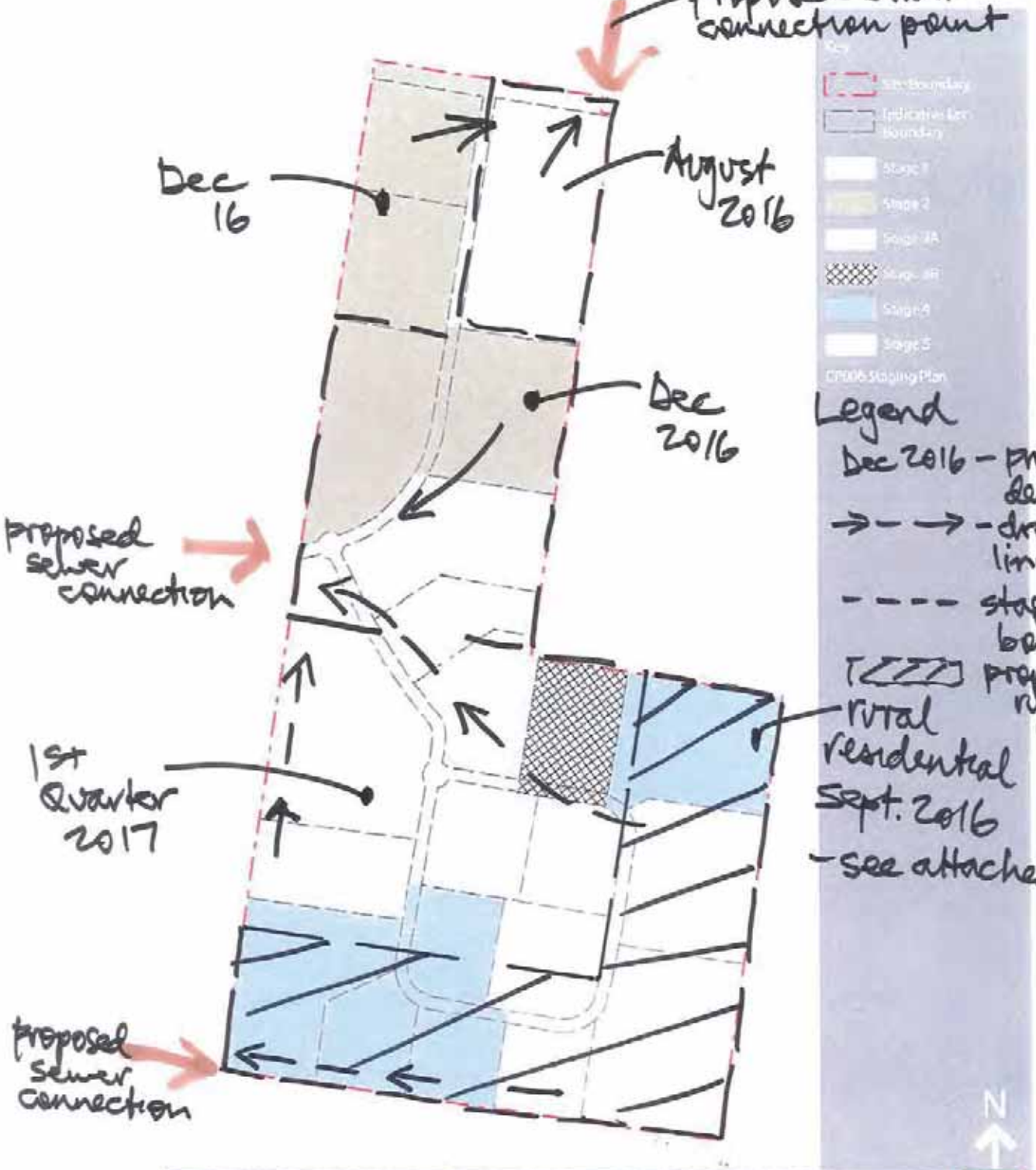
CENTRAL Area Schedule

TOTAL LAND AREA		612,065 sqm
Lot	**Site Area**	**Building Area**
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,693 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,080 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

APPENDIX 1
STAGING PLAN



Lot A Burley Road, Horsley Park Employment Precinct - Staging Plan
Prepared for Jacfin Pty Ltd
13 June 2012
1:5000 @ A3

JBA planning

NSW Government
Department of Planning and Infrastructure

Jacfin
Staging / Development Timing

ROAD = DC DATE
Site Area Schedule
Total Site Area 117.00 ha
Less:
Non Developable Land 35.85 ha
Easements 3.73 ha
Regional Roads 1.74 ha
Services Lot 1.66 ha
Estate Roads 5.38 ha
48.36 ha
Development Areas
Precinct 1 18.81 ha
Precinct 2 4.38 ha
Precinct 3 16.53 ha
Precinct 4 9.45 ha
Precinct 5 14.01 ha
Precinct 6 7.09 ha
Total Developable 70.28 ha
Total Warehouse 376,295 sqm
Total Office 19,585 sqm
Total Facility 395,880 sqm
OAKDALE WEST
LOT 1
DP 120679
Proposed Western North South Link Road
Proposed Southern Link Road
Transmission Easement
Goodman
BRICKWORKS
PRECINCT 6
2019
6A
6B
3C
2019
3B
2017
PRECINCT 3
3A
2017
Site Access
Transmission Easement
10m Riparian Setback
15m Riparian Setback
30m Riparian Setback
Future Elevated Regional Road Min 4.5m Clearance at Millner Ave
Approved Millner extension and roundabout refer SSD 6088
OAKDALE CENTRAL
30m Wide Road Reserve
Estate Road 04
Estate Road 05
Estate Road 01
Estate Road 02
Estate Road 03
5A
PRECINCT 5
2017
4B
4C
PRECINCT 4
2019
4A
Services Lot
2A
PRECINCT 2
2018
2B
1C
2018
PRECINCT 1
1D
2017
1A
2017
1B
2017
SBA ARCHITECTS
Oakdale South Estate
Horsley Park
SSDA Masterplan
1:2500 @ A1
1:5000 @ A2
04 Sept 2015
OAK MP 02 (K)

Goodman

BRICKWORKS

OAKDALE WEST
- ESTIMATED TABLE UP FOR SERVICING

SEE DRAWING OAK MP03 FOR CONTINUATION

Site Area Schedule

Total Site Area	154.10 ha
Less:	
Non Developable Land	32.01 ha
Easements	22.55 ha
Regional Roads	6.43 ha
Estate Roads	8.74 ha
	69.73 ha
Development Areas	
Precinct 1	21.72 ha
Precinct 2	21.61 ha
Precinct 3	18.51 ha
Precinct 4	22.56 ha
Precinct 5	6.05 ha
Total Developable	90.45 ha
Total Warehouse	455,233 sqm
Total Office	22,685 sqm
Total Facility	477,918 sqm

PRELIMINARY

SBA ARCHITECTS

Oakdale West Estate
Horsley Park

SSDA Estate Masterplan

1:2500 @ A1
1:5000 @ A3
03 Feb 2016

OAK MP 02 (G)

Russell Hogan

From: Russell Hogan
Sent: Wednesday, March 2, 2016 3:11 PM
To: Mahmood Hossain (Mahmood.Hossain@ghd.com); 'Amir Rashidi (Amir.Rashidi@ghd.com)'
Subject: RE: Oakdale LASP update
Attachments: Appendix 2 Subdivision Development Application Plans.pdf

Gents,

Please see below staging horizons for CSR land.

Goodman information to follow shortly.

Also please see attached CSR proposed staging plan.

Regards,

Russell Hogan
Civil Project Manager

at&l

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North Sydney NSW 2060

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M 0424 441 231
F 02 9923 1055
russell@atl.net.au
www.atl.net.au

From: Pasalich, Wayne [mailto:WPASALICH@csr.com.au]
Sent: Tuesday, March 1, 2016 5:52 PM
To: Russell Hogan <Russell@atl.net.au>; Claire Kollaras <Claire.Kollaras@calibreconsulting.co>
Cc: Rachel Owen <Rachel.Owen@calibreconsulting.co>; Stuart Green <Stuart.Green@calibreconsulting.co>; Inbox <inbox1@atl.net.au>
Subject: RE: Oakdale LASP update

Russell

Claire is away on leave currently so I can address any queries you have. The current anticipated deliver program is as follows;

Stage	Registration Date	Notes
1	Q2 2017	Earlier connection would be beneficial as we have sold the property and the new owners are looking to make an early start on the works
2	Q1 2018	
3	TBA	No fixed date for this stage as the business does not currently have any plans to shut down the factory in the short term

LOT SUMMARY

STAGE 1
101-102 = 2 INDUSTRIAL LOTS

STAGE 2
201-204 = 4 INDUSTRIAL LOTS
205 = 1 ENVIRONMENTAL LOTS

STAGE 3
301-308 = 8 INDUSTRIAL LOTS

LEGEND

(A) OLD WALLGROVE ROAD

ENVIRONMENTAL CONSERVATION

REDUCTION RATIO

PLAN 1:2000 @ A1, 1:4000 @ A3

DATUM	AHD	DESIGN	P.L.	CHECKED	P.L.
SURVEY		TRACED	A.C.	DATE	12-10-2012

SCALE 1:2000 (A1) SCALE 1:4000 (A3)

Disclaimer and Copyright: ALL DIMENSIONS TO BE CHECKED ON SITE BY SUPERINTENDANT PRIOR TO CONSTRUCTION USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE

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BROWN Smart Consulting

CSR

PROPOSED SUBDIVISION
OVER LOT 1 IN D.P. 106143 BEING PROPERTY AT
327-335 BURLEY ROAD, HORSLEY PARK
OVERALL PLAN

ISSUE	DESCRIPTION	DATE
0	ORIGINAL ISSUE	12-10-12

DRAWING No. X13044.P_ST0

AMEND 0

SHEET 1 OF 4 SHEETS

Appendix B- Detail Water Demand Calculations

Industrial- Max Day Demand	15	kL/Nha/day
Residential- Max Day Demand	2.2	kL/dwelling/day

Development site	Precinct	Area (ha)	Development type	Timing	Average Day Demand (Ml/d)	Maximum Day Demand (Ml/d)	Maximum Hour Demand (Ml/d)
Oakdale South	1	18.8	Light industrial/warehouse	2017-2018	0.17	0.28	0.44
	2	4.4	Light industrial/warehouse	2018	0.04	0.06	0.10
	3	16.5	Light industrial/warehouse	2017-2019	0.15	0.24	0.39
	4	9.5	Light industrial/warehouse	2019	0.09	0.14	0.22
	5	14	Light industrial/warehouse	2017	0.13	0.21	0.33
	6	7	Light industrial/warehouse	2019	0.06	0.10	0.16
Oakdale East	1	95	Light industrial/warehouse	2022-2024	0.87	1.40	2.24
Oakdale West	*1*	21.7	Light industrial/warehouse	2019	0.20	0.32	0.51
	2	21.6	Light industrial/warehouse	2019-2020	0.20	0.32	0.51
	3	18.5	Light industrial/warehouse	2020	0.17	0.27	0.44
	4	22.6	Light industrial/warehouse	2021-2020	0.21	0.33	0.53
	5	6.1	Light industrial/warehouse	2020	0.06	0.09	0.14
Oakdale Central	*1A*	4.1	Light industrial/warehouse	Built	0.04	0.06	0.10
	1B	5.9	Light industrial/warehouse	Built	0.05	0.09	0.14
	1C	4.6	Light industrial/warehouse	Q1-2016	0.04	0.07	0.11
	2A	7.5	Light industrial/warehouse	Built	0.07	0.11	0.18
	2B	6.0	Light industrial/warehouse	Q1-2016	0.06	0.09	0.14
	3A	1.6	Light industrial/warehouse	2017	0.01	0.02	0.04
	3B	5.8	Light industrial/warehouse	Q4-2016	0.05	0.09	0.14
	3C	5.6	Light industrial/warehouse	2017	0.05	0.08	0.13
	3D	1.9	Light industrial/warehouse	2017	0.02	0.03	0.04
	Lot 4	2.2	Commercial/café /light industrial	2017	0.02	0.03	0.05
Jacfin	1	3.6	Light industrial/warehouse	2016	0.03	0.05	0.08
	2	17.4	Light industrial/warehouse	2016	0.16	0.26	0.41
	3	21.6	Light industrial/warehouse	2017	0.20	0.32	0.51
	4	25.7	Residential low density (R4 Rural Residential)	2016	0.37	0.85	1.75
	5	19.5	Residential low density (R4 Rural Residential)	2016	0.28	0.64	1.33
CSR	1	10.1	Light industrial/warehouse	2017	0.09	0.15	0.24
	2	32.34	Light industrial	2018	0.30	0.48	0.76
		11.5	Environmental conservation area (Open Space)		0.00	0.00	0.00
	3	21	Light industrial	2020	0.19	0.31	0.49
Grand Total		**463.6**			**4.39**	**7.48**	**12.7**

Note 1: Timeframes are subject to change

Note 2: No water demand assumed for environmental conservation area within the CSR

Note 3: Additional development within Oakdale East

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Appendix C- Existing system demands assessment

Cecil Park supply system current demand

Historical system demand in the last 10 years was assessed to calculate the average day demand and to identify a suitable maximum day demand (MDD) event. Data from flow meter WF0557 downstream of Prospect Creek Pumping Station WP0184 and the reservoir level trends of Cecil Park Reservoirs were considered for the mass balance (i.e. flow data were not available from 2006 to 2009). The mass balance carried out for the above period indicated the highest max day value in November 2015 (i.e. 21.8 Ml/d).

However, this event is not acceptable due to an open DV between Cecil Park and Liverpool system. Sydney Water advice to adopt the GSS peaking factor (i.e. MDD/ADD: 2.80).

Minchinbury supply system current demand

Analysis of historical Minchinbury system demand in IICATS (i.e. past 10-year data) revealed the highest max day value in 15 January 2015. Details of selected peak demand event is provided in Table 6.

Table 6 Historical demand assessment (Ml/d)

	Cecil Park Supply System	Minchinbury Supply System	Notes
Average day demand (ADD)	6.7	32.1	# Cecil Park: 20 Nov 2015 # Minchinbury: 15 Jan 2014
Maximum day demand (MDD)	21.8	50.2	
MDD/ ADD ratio	**2.80**	**1.56**	

The Table 7 below outlines the calculated MDD per demand category in Cecil Park and Minchinbury models. The individual demand category max day factors were based on the guideline factors applied to the actual MDD/ADD.

Table 7 Current maximum day demand breakdown

Demand Category	Cecil Park Water Supply System			Minchinbury Water Supply System		
	ADD (Ml/d)	MDD factor	MDD (Ml/d)	ADD (Ml/d)	MDD factor	MDD (Ml/d)
Residential (LD)	2.07	3.24	6.40	19.7	1.74	34.4
Residential (HD)	0.02	3.19	0.03	1.9	1.44	2.8
Commercial	3.38	3.05	7.49	1.7	1.52	2.6
Industrial	0.51	3.70	1.58	2.4	1.21	2.9
Other	0.23	1.89	2.54	2.2	1.52	3.3
UFW	0.7	1.0	0.7	4.2	1.0	4.2
Total	**6.87**	**2.80**	**18.75**	**32.1**	**1.56**	**50.2**

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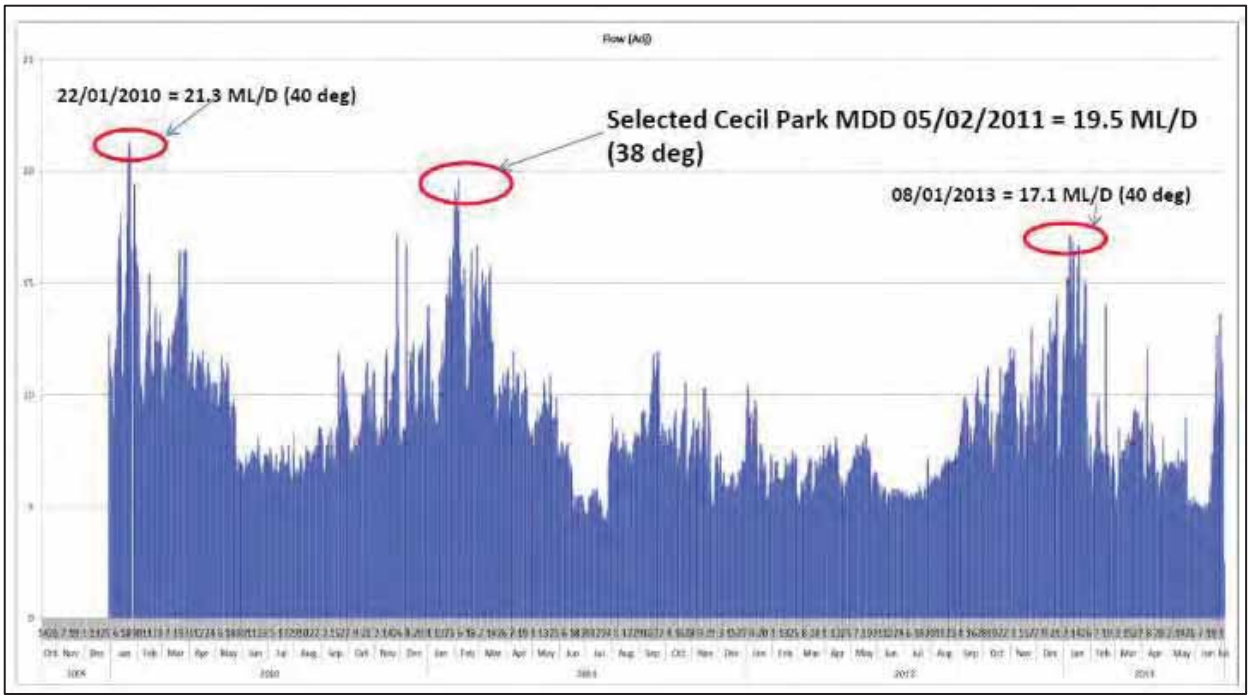
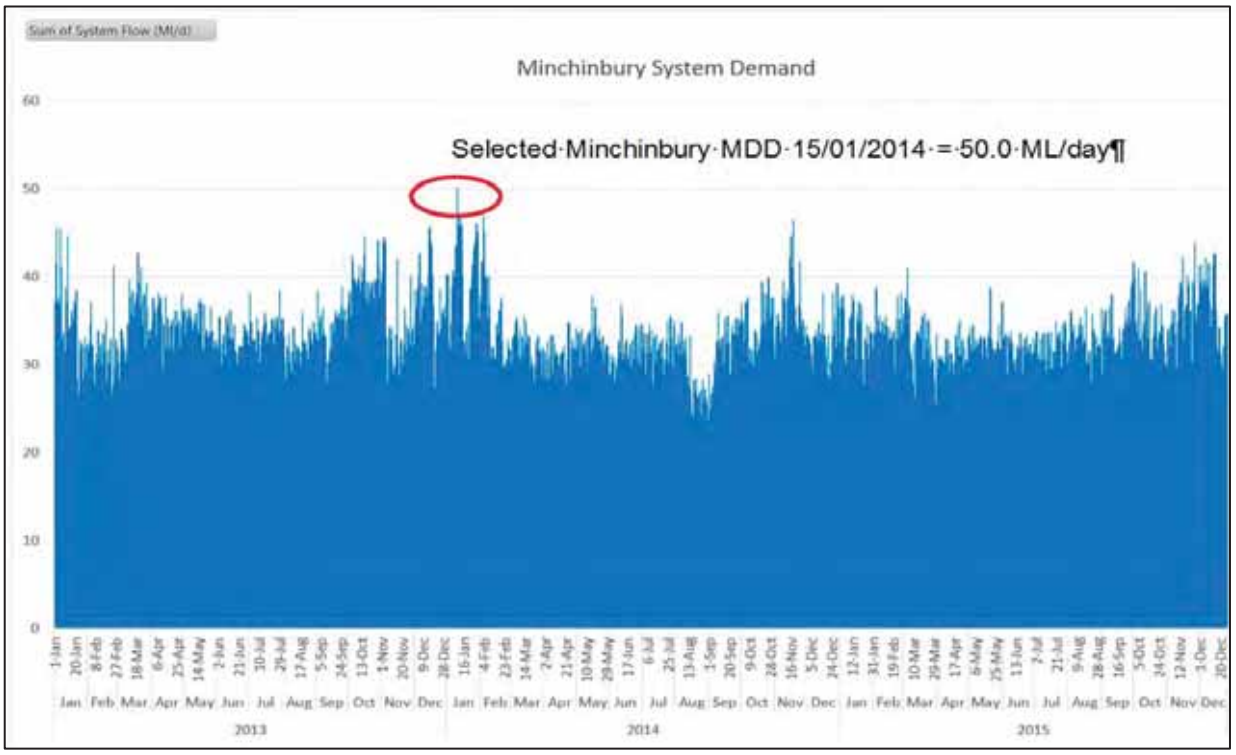
Cecil Park historical system demand analysis within the last 10 years demonstrated in figure below.



IICATS	Average (ML/d)	Maximum (ML/d)	MDD/ADD
Cecil Park	7.9	19.5 (1)	2.46

Note 1: Include 0.7 ML/day recycled water component that is potable water and should be subtracted from IICATS data. Hence, current max day of Cecil Park = 18.8 ML/day

Minchinbury historical system demand analysis demonstrated in figure below.



Appendix D- Residential growth sites

Residential Growth Sites – Dwellings (Cumulative)

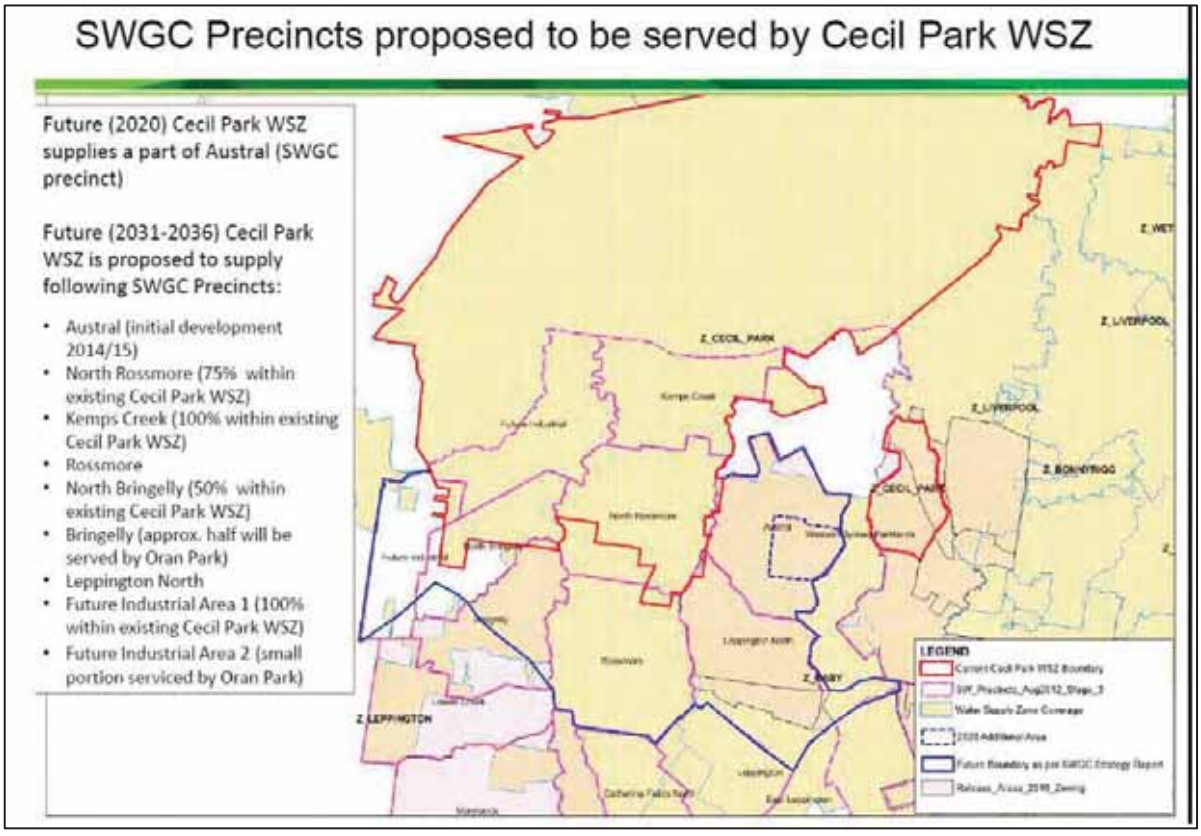
Precincts site names	Short (2011-2015)	Medium (2016-2020)	Comment
MDP Sites and Release Areas*			
Twin Creeks, Luddenham	244	326	-
Capitol Hill Drive, Mt Vernon	0	102	-
Aerodrome	500	850	-
South Hoxton Park	1,115	2,230	Hoxton Park Recycled Water Scheme
SWGC Precincts supplied via Cecil Park WSZ in future***			

Precincts site names	2020	2031	2036	Comment
North Bringelly	0	242	3,434	100% Cecil Park
North Rossmore	0	2272	5,464	100% Cecil Park
Rossmore	0	329	2,882	100% Cecil Park
Austral		3,650	5,200	100% Cecil Park
Bringelly	0	0	1,267	50% Cecil Park and 50% Oran Park (future)
Kemps Creek	0	0	1,132	100% Cecil Park
Leppington North	0**	4,400	5,600	100% Cecil Park

*Growth provided by the Department of Planning and Environment in a form of Housing Supply Forecast Model (HSFM) table which contains an incremental growth per property for 2015 and 2020 planning horizons

** There are 700 dwellings forecast for Leppington North by 2020 however the initial servicing (up to 2020) for Leppington North is from Carnes Hill water supply zone as per the SWGC Servicing Strategy

*** These SWGC precincts are located outside of the existing Cecil Park zone boundary however the Cecil Park zone boundary will be extended in the future to enable supply from Cecil Park Reservoirs to these precincts



GHD
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Appendix B – Detailed Cost Estimation

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -2-3-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:32**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m	350	238	83,204
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	350	18	6,190
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	88	434	37,980
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	127,374	0.75	95,530
		Sub Total Direct Costs						**222,904**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		22,290
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		44,581
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		43,466
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		116,634
		Total Construction Cost						**449,875**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		4,499
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -2-3-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:32**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		22,494
25		SWC Project Management Costs (% of Construction Costs)			5.00%		22,494
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		2,474
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**551,836**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central- 2-4-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **04/07/2016 11:29**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,200	314	377,012
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m	0	569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,200	21	25,713
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	300	485	145,440
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	548,164	0.75	411,123
		Sub Total Direct Costs						**959,287**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		95,929
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		191,857
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,061
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		501,947
		Total Construction Cost						**1,936,081**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		19,361
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central- 2-4-	Estimate Date:	10/06/2016
Estimator:	Amir Rashidi	Print Date/Time:	04/07/2016 11:29
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		96,804
25		SWC Project Management Costs (% of Construction Costs)			5.00%		96,804
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,648
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,209,698**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -4-5-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:46**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m	900	238	213,954
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	900	18	15,917
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	225	434	97,662
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	327,533	0.75	245,650
		Sub Total Direct Costs						**573,183**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		57,318
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		114,637
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		111,771
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		299,918
		Total Construction Cost						**1,156,827**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		11,568
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -4-5-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:46**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		57,841
25		SWC Project Management Costs (% of Construction Costs)			5.00%		57,841
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		6,363
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,340,440**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -4-7

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **04/07/2016 11:30**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	700	314	219,923
4		Water Main Greenfield PVC		375 dia	m	0	407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	700	21	14,999
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	175	485	84,840
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	319,762	0.75	239,822
		Sub Total Direct Costs						**559,584**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		55,958
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		111,917
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		109,119
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		292,802
		Total Construction Cost						**1,129,380**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		11,294
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name:	Oakdale Central -4-7	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**04/07/2016 11:30**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		56,469
25		SWC Project Management Costs (% of Construction Costs)			5.00%		56,469
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		6,212
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,309,824**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -5-6-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m	850	191	162,010
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	850	15	12,431
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	213	409	86,959
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	261,400	0.75	196,050
		Sub Total Direct Costs						**457,450**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		45,745
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		91,490
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		89,203
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		239,361
		Total Construction Cost						**923,249**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		9,232
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -5-6-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		46,162
25		SWC Project Management Costs (% of Construction Costs)			5.00%		46,162
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		5,078
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				of Client Costs	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,079,883**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -7-8-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,200	314	377,012
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,200	21	25,713
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	300	485	145,440
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	548,164	0.75	411,123
		Sub Total Direct Costs						**959,287**
		INDIRECT COSTS				%		
17		Contractor Design Costs (% of Direct Costs)				10.00%		95,929
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		191,857
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,061
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		501,947
		Total Construction Cost						**1,936,081**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		19,361
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -7-8-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:47**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		96,804
25		SWC Project Management Costs (% of Construction Costs)			5.00%		96,804
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,648
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,209,698**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -7-9-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:48**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,600	314	502,682
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,600	21	34,284
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	400	485	193,920
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	730,885	0.75	548,164
		Sub Total Direct Costs						**1,279,049**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		127,905
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		255,810
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		249,415
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		669,263
		Total Construction Cost						**2,581,442**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		25,814
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -7-9-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:48**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		129,072
25		SWC Project Management Costs (% of Construction Costs)			5.00%		129,072
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		14,198
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,929,598**

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Appendix E

Local Area Servicing Plan (Wastewater) -GHD

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Wastewater

July 2016

GHD Disclaimer

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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev. 01	M Hossain	M Healey		M Healey		5/05/16
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Document Status

Oakdale Industrial Development June 2016

This report has been prepared by GHD

Approved for Issue

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Manager, Technical		Project Manager		Project Manager	
Goodman Property Services (AUST) Pty Ltd		AT&L Associates		GHD	

Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

Signature	Date	Signature	Date
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Vajira Samarasinghe		Richard Schuil	
Principal Planner		Engineering & Planning Manager	
Engineering & Environmental Services		Growth Centres	
Sydney Water		Sydney Water	

Approved

Signature	Date
	27/7/16
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via the East St Clair carrier. The extension of East St Clair Carrier is complete. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No.8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignment and trigger points (i.e. development timing and staging) for delivery of wastewater infrastructure to service the Oakdale Precinct.

GHD have also undertaken wastewater modelling of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development to ensure compliance with Sydney Water's performance requirements.

The hydraulic assessment determined that there were no fundamental issues with the design of the East St. Clair Carrier Extension.

System Performance Assessment

Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather performance criteria under both 2020 and 2036 flow condition with exception of a small number of sewers which marginally fail to meet the criteria. However, these are not considered severe enough to warrant augmentation.

The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.

However, the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario). Although there is no direct impact to the branch which receives flow from Oakdale developments, as a system there is an issue.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

The 2014 GSS recommended the upgrade of downstream pumping station SP0204 meets the minimum detention time of 4 hours for 2036 flow condition.

Growth forecast

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. Growth projections within the Oakdale Industrial Development are summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection [1]
Oakdale Central	45.2	IN1 – General Industrial	2016-2017
Jacfin	87.8	IN1 – General Industrial/ Residential	2016-2017
Oakdale South	70.2	IN1 – General Industrial	2017-2019
CSR	63.4	IN1 – General Industrial	2017-2020
Oakdale West	90.5	IN1 – General Industrial	2019-2021
Oakdale East	95.0	IN1 – General Industrial	2022-2024
Grand Total	**452**		

The calculated wastewater loads for the Oakdale Industrial Development are presented below within Table 2.

Table 2 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

The preliminary capital cost estimates associated with Oakdale Industrial wastewater servicing is presented below in Table 3.

Table 3 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

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1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via East St Clair carrier. The extension of East St Clair Carrier is in progress. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

Assets required to service proposed Goodman, Jacfin and CSR developments at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to demonstrate that the proposed development can be serviced by the East Clair carrier with the wastewater infrastructure detailed and document the expected performance of the wastewater system.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing, staging & timing of connection to SWC network) for the delivery of wastewater infrastructure required to service the Oakdale Precinct.

1.3 Scope

The scope of the wastewater modelling is to:

- Assess the current design of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development and the downstream trunk sewers for 2020 and 2036 growth scenarios.

The assessment examined a range of performance requirements including:

- Dry weather performance (Hmax/d)
- Carrier performance in wet weather design storm (35th largest rainfall event within the 10 year rainfall series)
- Constructed overflow and maintenance hole spilling performance based on a 10 year long term model simulation.
- Dry weather contingency storage of downstream pumping station SP0204.

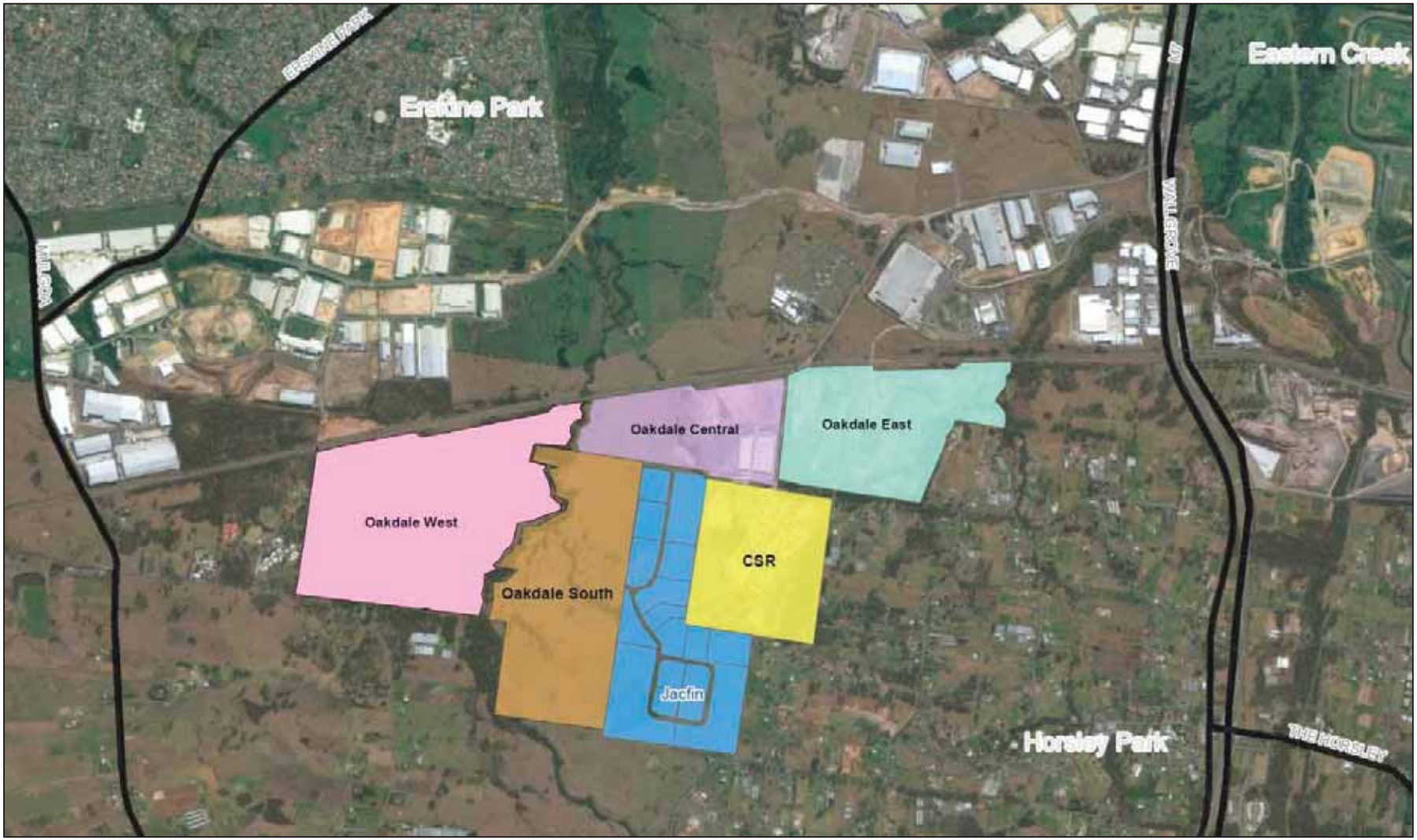


Figure 1 Oakdale Industrial Development Overview

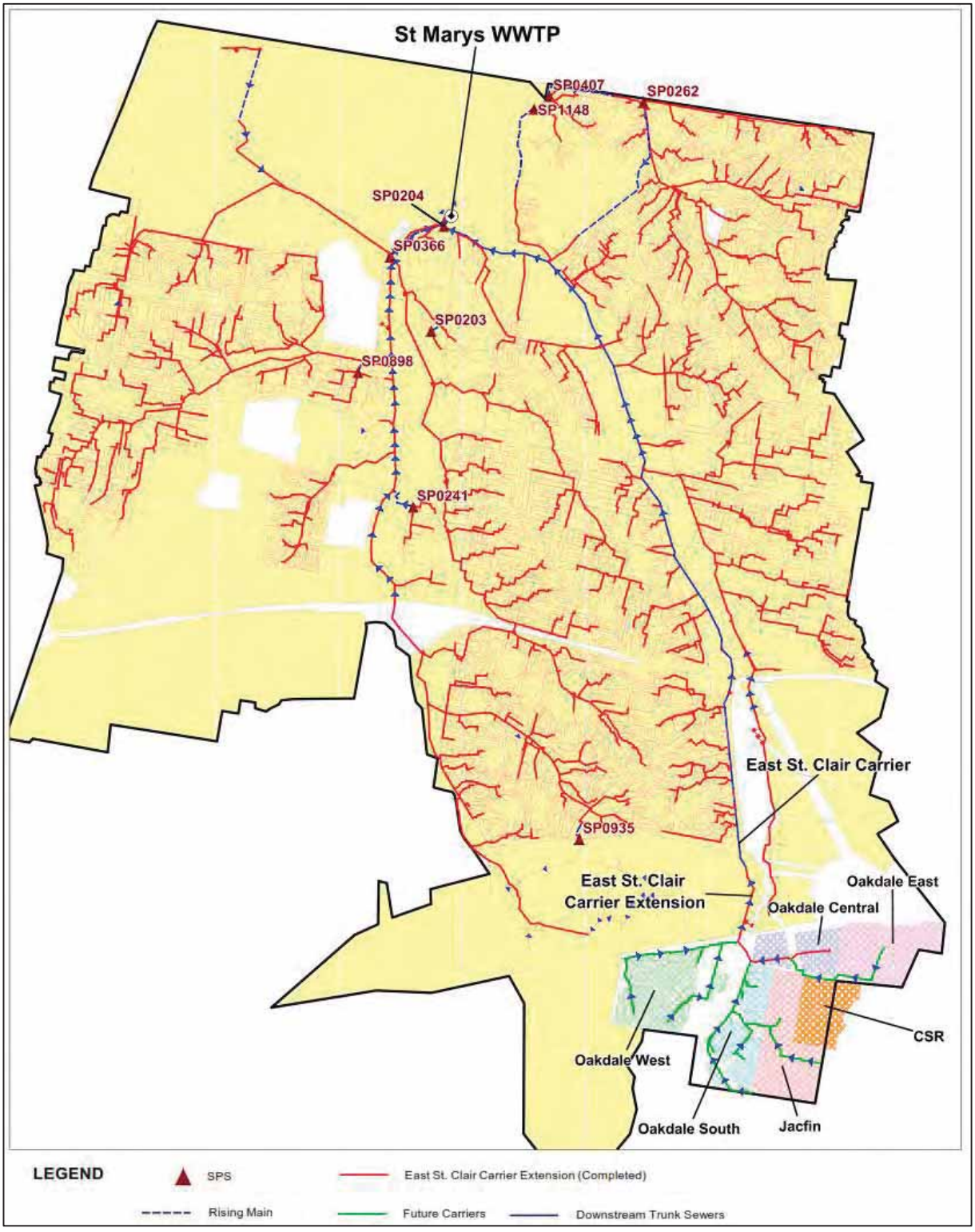


Figure 2 Overview of East St Clair carrier

2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1-General Industrial	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0	IN1-General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1-General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8	IN1-General Industrial	Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin (2)	1	3.6	IN1-General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	RU4-Rural Residential	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1-General Industrial	2017
	2	20.8		2018
		11.5	Environmental /Open Space	
	3	21.0	IN1-General Industrial	2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The timeframes are subject to change

Note 2: Sydney Water has queried growth forecasts shown above for Jacfin lands noting that these growth forecasts appear optimistic in consideration of current market demands, comparison growth forecasts for surrounding developers, Jacfin current and required approvals and construction requirements. Jacfin however have reconfirmed these growth forecasts and hence this report and modelling has been completed on this basis,

Note 3: The above growth projections have been provided by the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

3. Forecast Wastewater Loads

The following outline of wastewater discharge provides predicted Average Dry Weather Flow (ADWF) based on projected development loads.

The following broad assumptions were used to develop the estimate of discharge.

- 15 residential lots per gross hectare of nominated residential area within the development.
- 3.5 EP per residential lot and
- 75 EP per gross hectare of non-residential development derived from Wastewater Network Growth Servicing Strategy Criteria and Guideline 2012. (i.e. Assume Gross hectare = 1.25 × net hectares)

The Oakdale Industrial wastewater loads summarised in Table 5.

Table 5 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

4. Wastewater System Performance

4.1 Acceptable Dry Weather System Performance (2020 & 2036)

Wastewater system modelling indicates that there is no discharge occurrence in any part of the entire St Marys system including the new developments in Oakdale during dry weather for both 2020 and 2036 flow condition.

Modelling also shows that almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. The dry weather system performance for 2020 and 2036 scenario is shown in Figure 3 and Figure 4 respectively.

In the 2020 flow condition, there are four sections of sewer on East St. Clair Carrier Extension that marginally exceeds the dry weather performance criteria as have flow depth ratio (Hmax/D) varies between 0.60 to 0.65. There is one section on the downstream East St. Clair Carrier that has a flow depth ratio (Hmax/D) of 0.65 in 2020 flow condition.

In 2036, there are five more sections on East St. Clair Carrier Extension and three more sections on the downstream East St. Clair Carrier that exceed the flow depth ratio (Hmax/D) of 0.6. Hmax/d value on East St. Clair Carrier Extension vary from 0.64 to 0.76 and on the downstream East St. Clair Carrier vary from 0.62 to 0.75. The Hmax/d values of all the sewers servicing Oakdale industrial development and the downstream trunk sewers are presented in Appendix D.

The sections on East St. Clair Carrier Extension which exceed the flow depth ratio (Hmax/D) of 0.6 are already been constructed. Also the Hmax/D values are only marginally higher than 0.6 and are not considered severe enough to warrant augmentation.

HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2020 and 2036 PDWF condition is shown in Appendix E.

4.2 Dry Weather Emergency Storage (2020 & 2036)

Modelling indicates that the downstream pumping station SP0204 fails to meet the minimum detention time of 4 hours for 2020 and 2036 flow condition. This pumping station will have a detention time of only 0.9 and 0.8 hours for the year 2020 and 2036 respectively. From an earlier 2014 GSS study, this station was found to have a detention time of only 1.50 hours for the existing (2011) scenario.

SP0204 have a standby pump to manage any mechanical failure. But It does not have dual power supply although have provision for installing generator.

SP0366 dual power supply recommended in GSS report has now been installed. With the dual power feeder at SP0366, cross connection valve will open automatically should signal from SP0204 fail. This will allow storage at SP0366 to be utilised should SP0204 fail and increase detention time of SP0204 to 4 hours in 2036 flow condition.

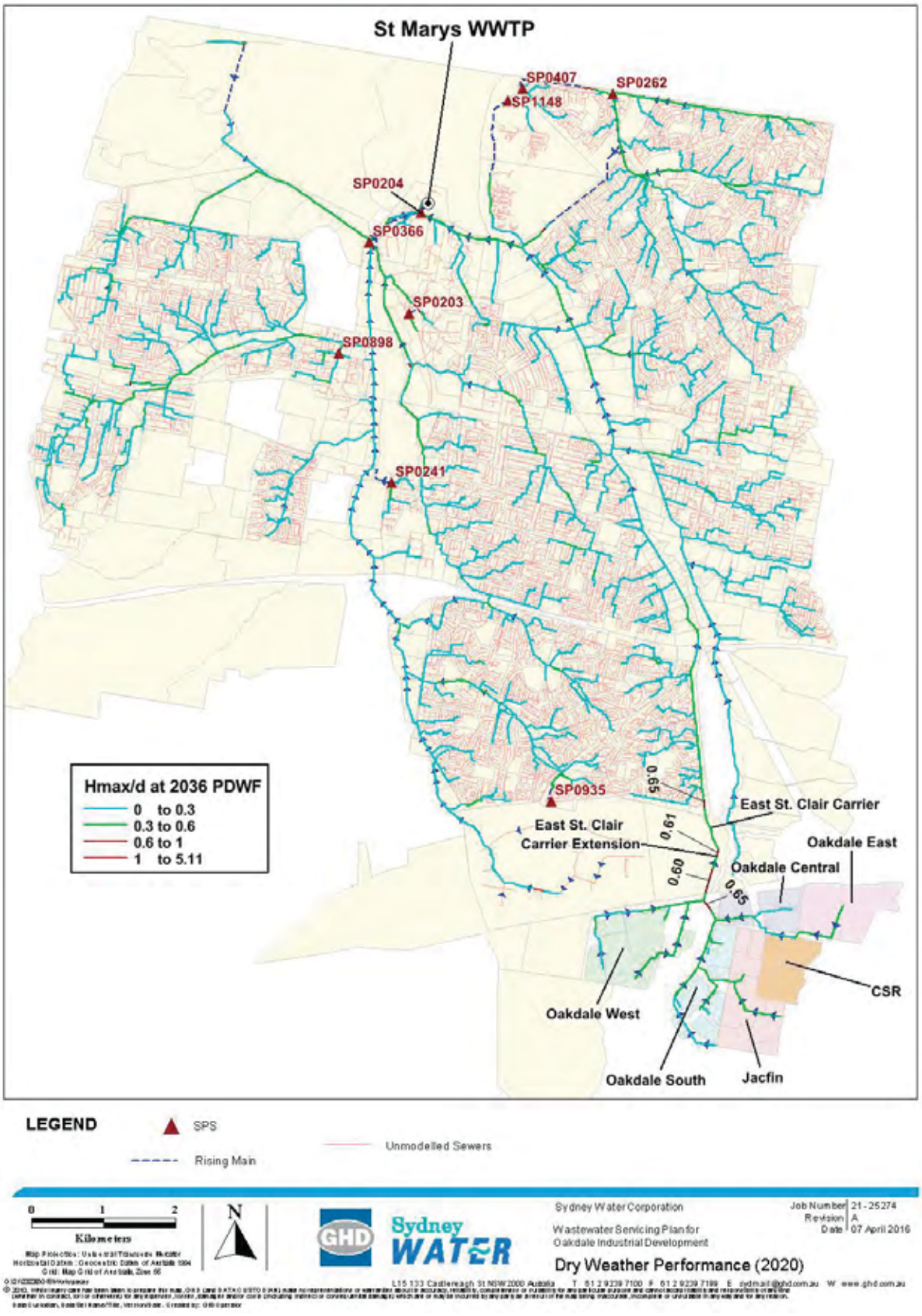


Figure 3 Dry Weather Performance (2020)

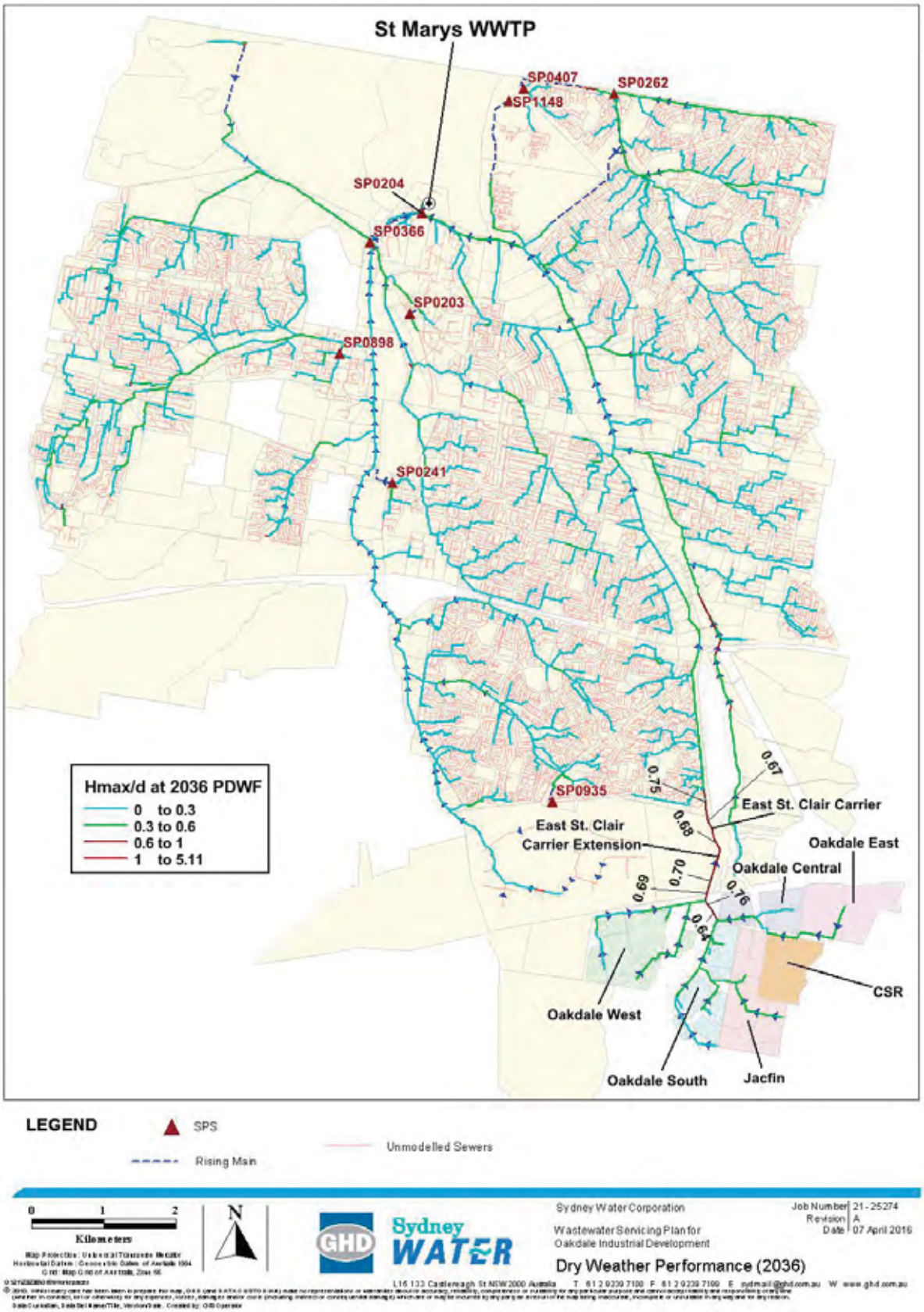


Figure 4 Dry Weather Performance (2036)

4.3 Acceptable Wet Weather System Performance (2036)

The 2010-2015 Environment Protection Licence (EPL) for the St Marys Sewerage Treatment System limits the wet weather overflow frequency to 35 overflows in 10 years. The new license for 2015-2020 is still under negotiation with the EPA. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system will comply with this limit for the 2036 planning horizon. The wet weather performance of the designed overflows and the activated maintenance holes within the Oakdale industrial development and the downstream trunk system in 2036 is presented in Table 6 and Figure 5.

The design wet weather event (35th largest rainfall event within the 10 year rainfall series) corresponds to the overflow frequency limit in the EPL. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system have sufficient capacity in the design wet weather event. The HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in the design wet weather event is shown in Appendix E.

However it should be noted that the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years. The existing system performance is 40 events in 10 years, and in 2036 the system performance will increase to 50 events in 10 years. Although there is no direct impact to the branch which receives flow from Oakdale developments.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

Table 6 Wet Weather Performance (2036)

Location	Maintenance Hole ID	Overflow Events/10 Years	Volume (M3/yr)
Designed Overflows			
East St. Clair Carrier Extension	NEWMH06	7	842
East St. Clair Carrier	1394290	17	616
Ropes Creek Carrier Sec.6	1066026	11	157
Ropes Creek Carrier Sec.3	1281835	10	3,364
Ropes Creek Carrier Sec.1	1280786	14	19,017
Ropes Creek Carrier Sec.1	1282022	20	19,531
SPS204 Inlet	1404019	22	729
Maintenance Holes			
East St. Clair Carrier	NEWMH01	3	10
East St. Clair Carrier Extension	NEWMH09	2	9
East St. Clair Carrier Extension	NEWMH10	2	33
Oakdale South	NEWMH40	1	0.02
Jacfin Extension	NEWMH86	4	44

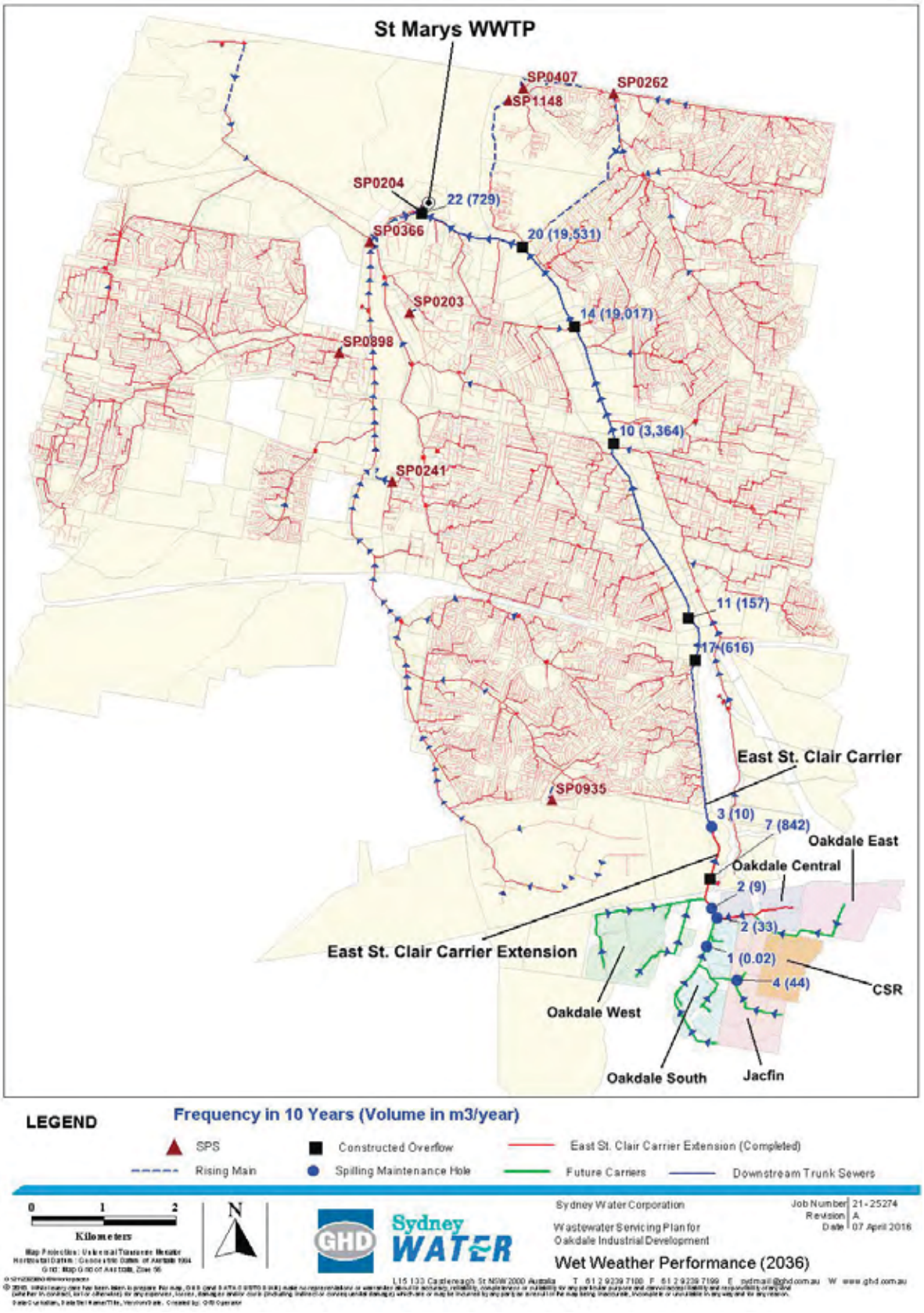


Figure 5 Wet Weather Performance (2036)

4.4 Conclusion

- Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. However these are not considered severe enough to warrant augmentation.
- The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.
- The overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario).
- The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.
- With 2014 GSS recommended upgrade the downstream pumping station SP0204 will meet the minimum detention time of 4 hours for 2036 flow condition.

5. Staging Plan for Future Infrastructure

The staging for the future gravity sewers will be in line with the proposed timing of the development. Sydney Water Cost Estimation tool employed in order to estimate the preliminary capital cost for each development.

The infrastructure required to service the new development areas along with their proposed timing and cost is presented in Table 7 and in Figure 6.

Table 7 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

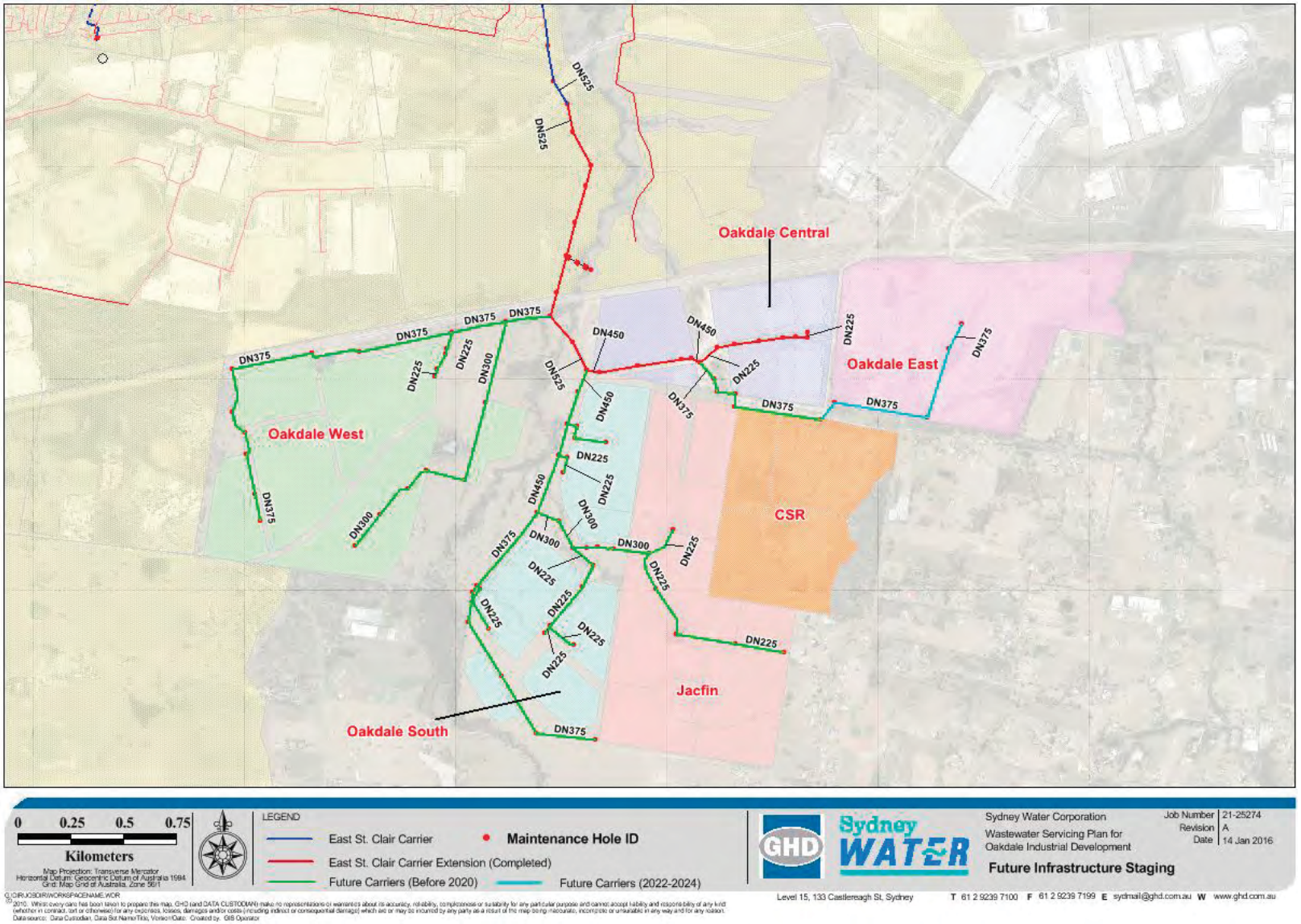


Figure 6 Future Infrastructure Staging

Appendices

Appendix A – Wastewater Planning Criteria

This Appendix details the planning criteria to be adopted for the wastewater component of the project. The following documents, referenced in Table 8, were consulted in developing the wastewater planning criteria:

Reference 1 Hydraulic Design Guidelines for Wastewater System Detail Planning, Sydney Water Corporation, June 2010

Reference 2 Sewerage Code of Australia (WSA-02-2002.2.2 – Sydney Water Edition 1, Version 3)

Reference 3 Sewage Pumping Station Code (WSA 04-2005-2.1, Sydney Water edition 1)

Reference 4 Wastewater Network Growth Servicing Strategy – Criteria and Guidelines 2012

Reference 5 Pressure Sewerage Code of Australia (WSA 07-2007 Version 1.1)

Reference 6 Wastewater Network Growth Servicing Strategy Criteria and Guideline (2012)

Table 8 Wastewater Planning Criteria

Item	Design Criteria	Units	Wastewater	Source
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3.5 EP/dwelling to be used	Reference 6
Light Industrial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Commercial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
			weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\ StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development and sewerage networks	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1 Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	No deterioration in the existing areas for future scenarios. Use the existing I/I	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve ‘RES1’ and commercial curve ‘COM1’ will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4

Item	Design Criteria	Units	Wastewater	Source
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW) storage	m3	In general, the containment of dry weather (DW) emergency storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate storage volume for a period of maximum four hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	Reference 3
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through

Item	Design Criteria	Units	Wastewater	Source
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	endorsement of this tech memo
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	Reference 4
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3 EP/dwelling to be used	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
Non-residential	Equivalent Population (Floor Space) (FS)	EP	Future non-residential growth forecast within development areas to be obtained from agreed growth forecast provided and endorsed by Sydney Water	Sydney Water
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	Sydney Water
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1

Item	Design Criteria	Units	Wastewater	Source
and sewerage networks				Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	Included in the base model provided by Sydney Water.	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve 'RES1' and commercial curve 'COM1' will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW)	m3	In general, the containment of dry weather (DW) emergency	Reference 3

Item	Design Criteria	Units	Wastewater	Source
	storage		storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate the maximum storage volume for the agreed retention hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: less than 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through endorsement of this tech memo
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be	Reference 4

Item	Design Criteria	Units	Wastewater	Source
			investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	

Appendix B – Model Update

2036 Scenario

The 2036 Post GSS model (run code: **SMJA** located in: **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Jacfin\Network\Sewer**) was used as the base model for this project. The following changes were made to the base model as shown in Figure 7.

- Storage at SP0262 and SP0366 are removed as were part of an option and do not exist in the network.
- Duplicate pipe from MH1273705 to MH1276269 is removed as was part of an option and does not exist in the network.
- The size and alignment of the East St. Clair Carrier SEC.2 (from NEWMH01 to NEWMH15) is updated as per the work as executed drawing (Case No. 134866WW)
- The size and alignment of the East St. Clair Carrier Extension (from NEWMH15 to NEWMH24) is added as per the drawing of Oakdale Servicing Plan.
- All the other future sewers are added as per "PM11329S-J baseplan only Bound-Model.pdf" provided by AT&L. The size of these sewers are estimated with flow schedule and the ground level of the maintenance holes are taken from ground level contours.
- The size and slope of all the sewers servicing Oakdale industrial development are presented in Appendix D.

The following changes were made to the catchments and its design loadings in the base model.

- The size, location and the design loadings of the existing catchments within the Oakdale industrial development were based on previous assumptions and are significantly different from the current plan. Hence these catchments are deleted from the model.
- Among all the developments, Oakdale East is planned to develop at the latest in 2022-2024. A master plan is not yet developed for this site. This catchment is added into the model as per Figure 1 (provided by AT&L) with an estimated EP of 8,906 and ADWF of 1.34 ML/D.
- Oakdale West, Oakdale South and Oakdale Central catchments are added as per the Masterplan prepared by Goodman (see Figure 9, Figure 10 and Figure 11 respectively) with an estimated EP of 8,480, 6,581 and 4,236 respectively and ADWF of 1.27, 0.99 and 0.64 ML/D respectively.
- The catchments for the CSR site are added as per the proposed subdivision prepared by Brown Consulting (see Figure 12) with an estimated EP of 5,944 and ADWF of 0.89 ML/D.
- The catchments for the Jacfin site are added as per the proposed development plan provided by Jacfin (see Figure 13) with an estimated EP of 6,960 and ADWF of 1.04 ML/D.

2020 Scenario

The following changes were made to the updated 2036 scenario model to get the 2020 scenario model as shown in Figure 8.

- As Oakdale East is planned to be developed beyond 2020, this catchment and its loading is deleted.
- The dry and wet weather parameters of all catchments outside the Oakdale industrial development are replaced with the same parameters from 2020 GSS model (run code: **SMSC** located in: **P:\GSS2013-14WW\STS\StMarys\Network\Sewer**)

The description of the run codes for the base case and the updated models are presented in Appendix A. The location of all these models in the server is **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Oakdale Development**.

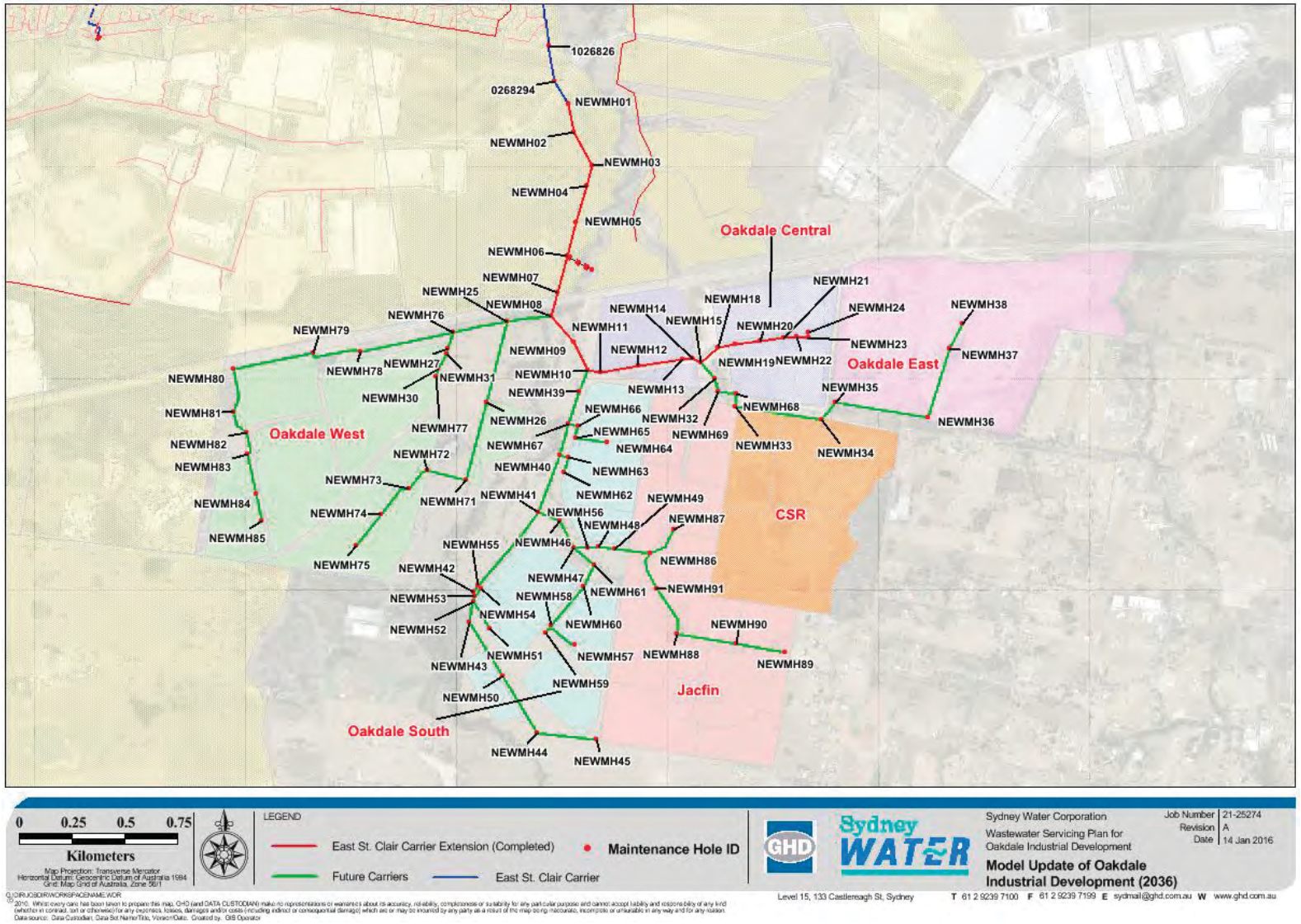


Figure 7 Model Update to 2036 Scenario

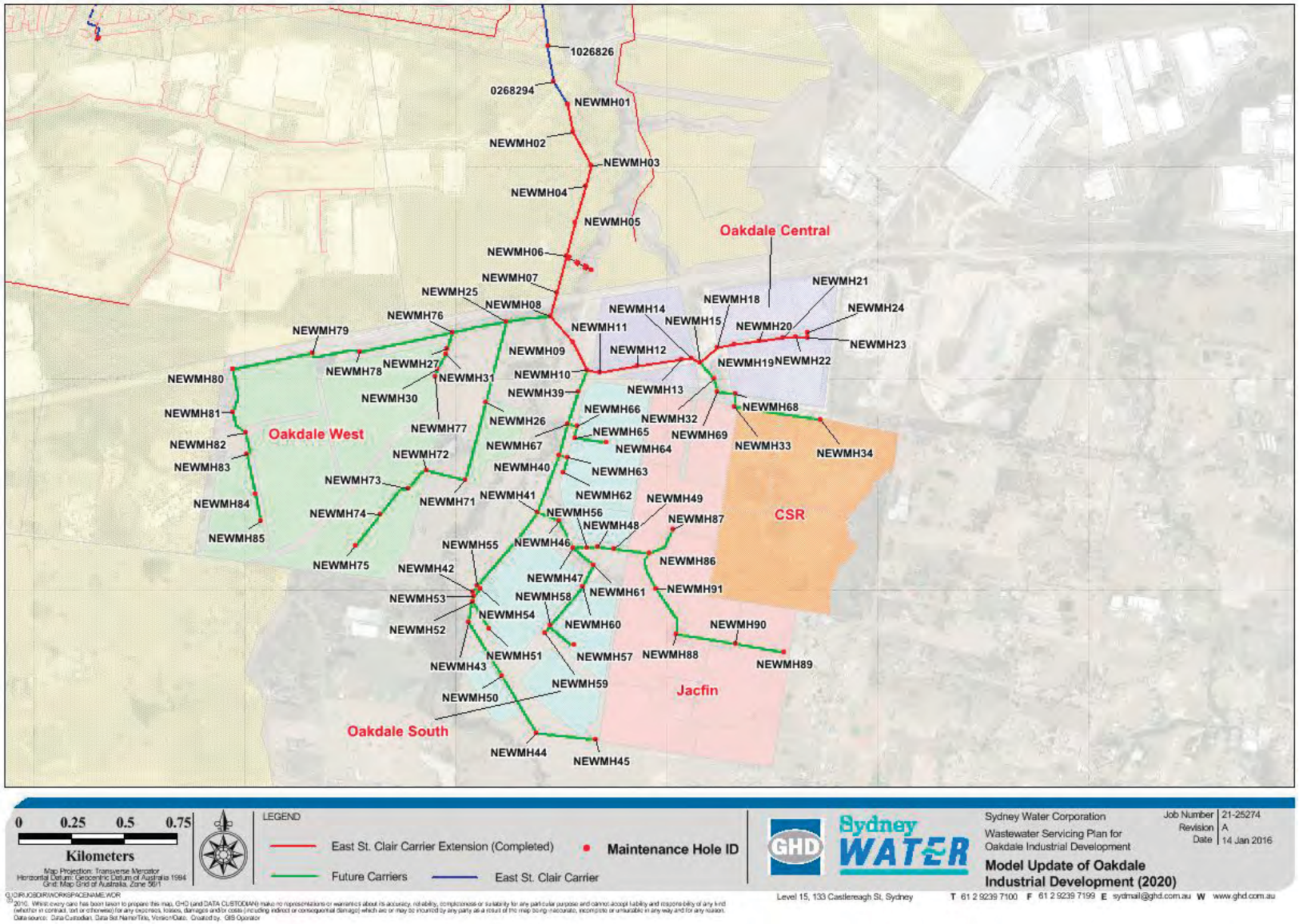


Figure 8 Model Update to 2020 Scenario

Figure 9 Oakdale West Estate Masterplan

Figure 10 Oakdale South Estate Masterplan

CENTRAL Area Schedule		
TOTAL LAND AREA		612,065 sqm
Lot	Site Area	Building Area
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,893 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,060 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

Figure 11 Oakdale Central Estate Masterplan

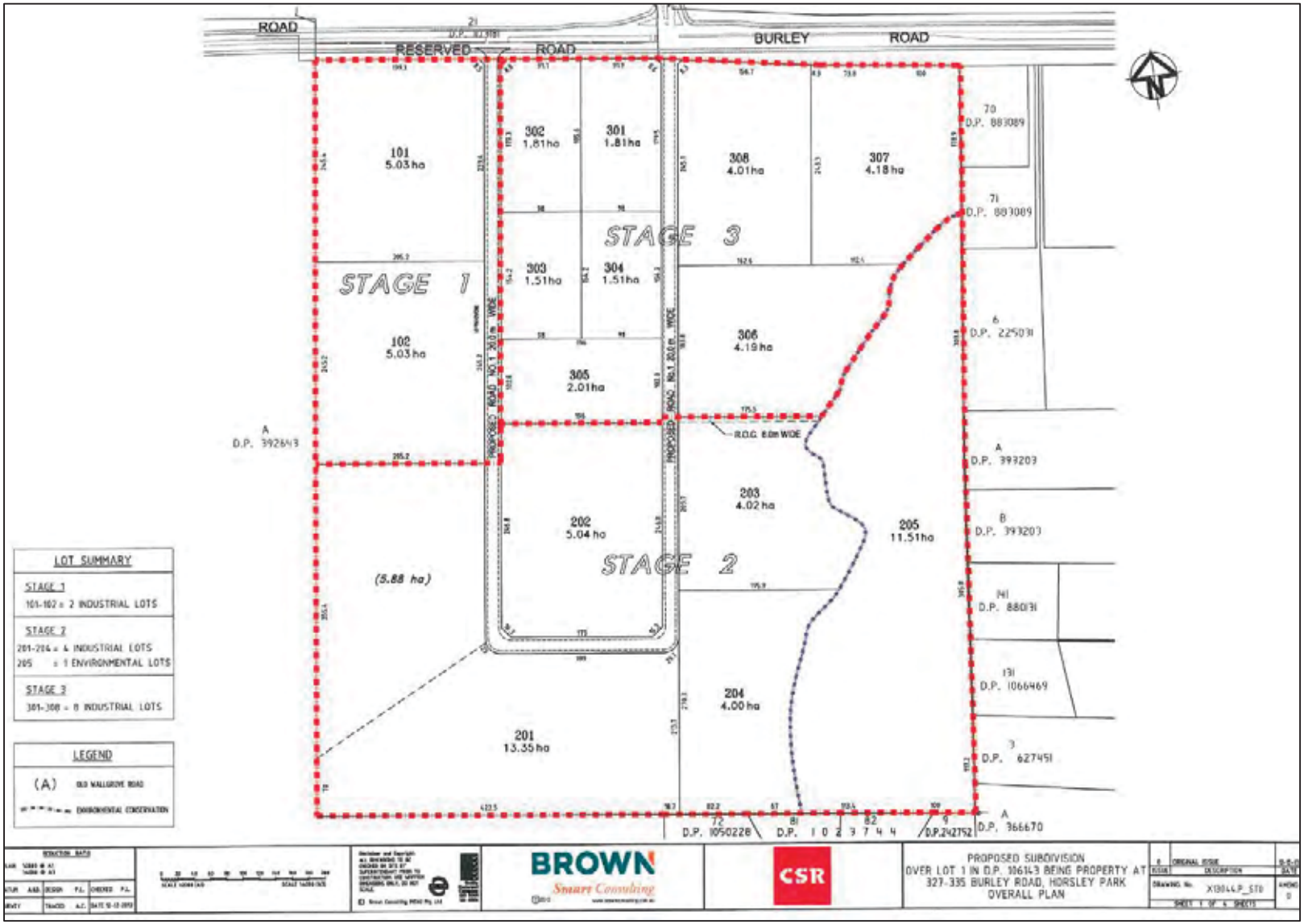


Figure 12 Proposed Subdivision of CSR Site

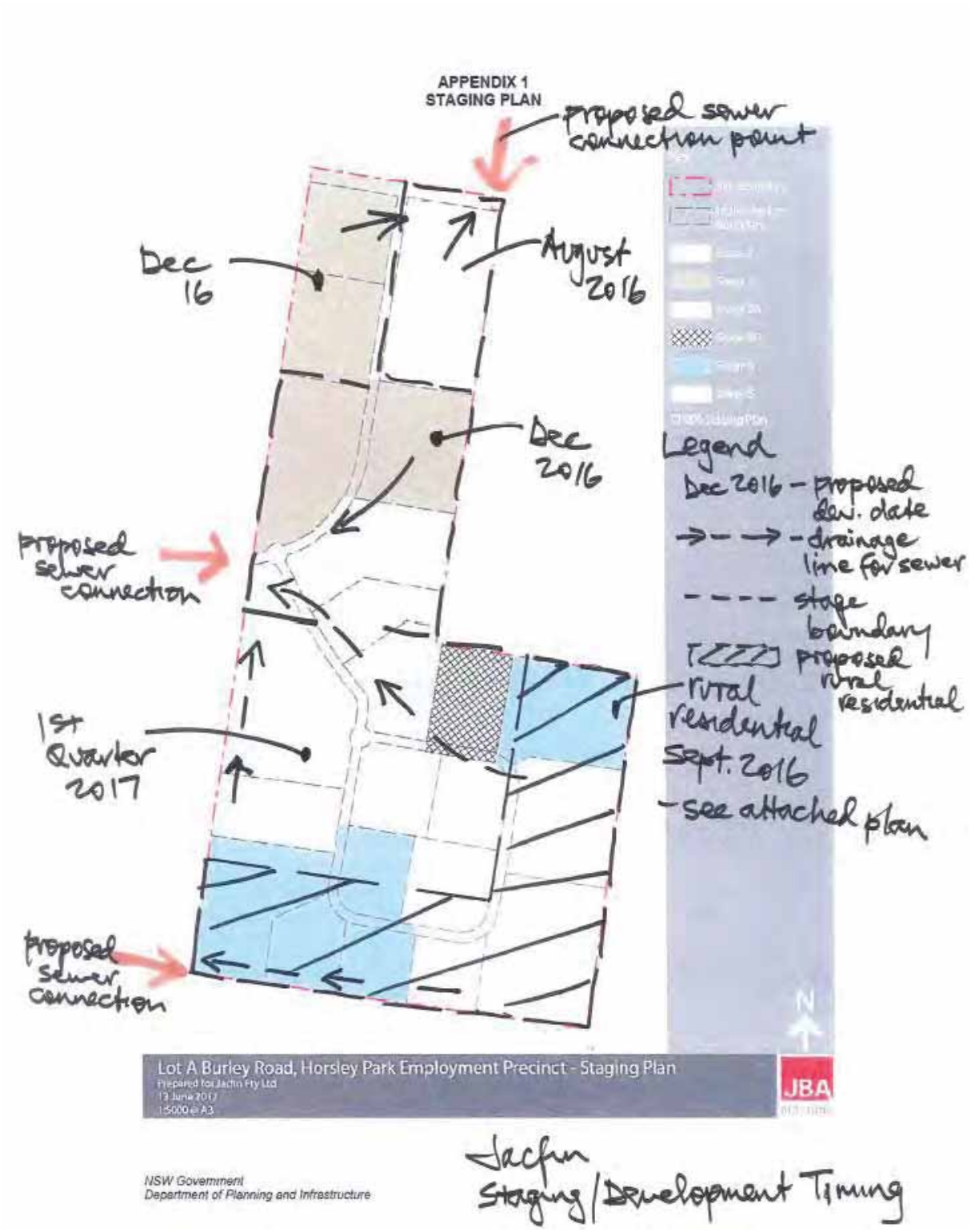


Figure 13 Proposed Development Plan for Jacfin Site

Appendix C – Wastewater Modelling Run Codes

The run codes used for the base and the updated models (2020 and 2036 scenarios) are presented in the following Table.

Planning Year	Base Model	Updated with Oakdale Industrial Development
2036	SMJA	SMJD
2020	SMJD	SMJE

Appendix D – Dry Weather System Performance

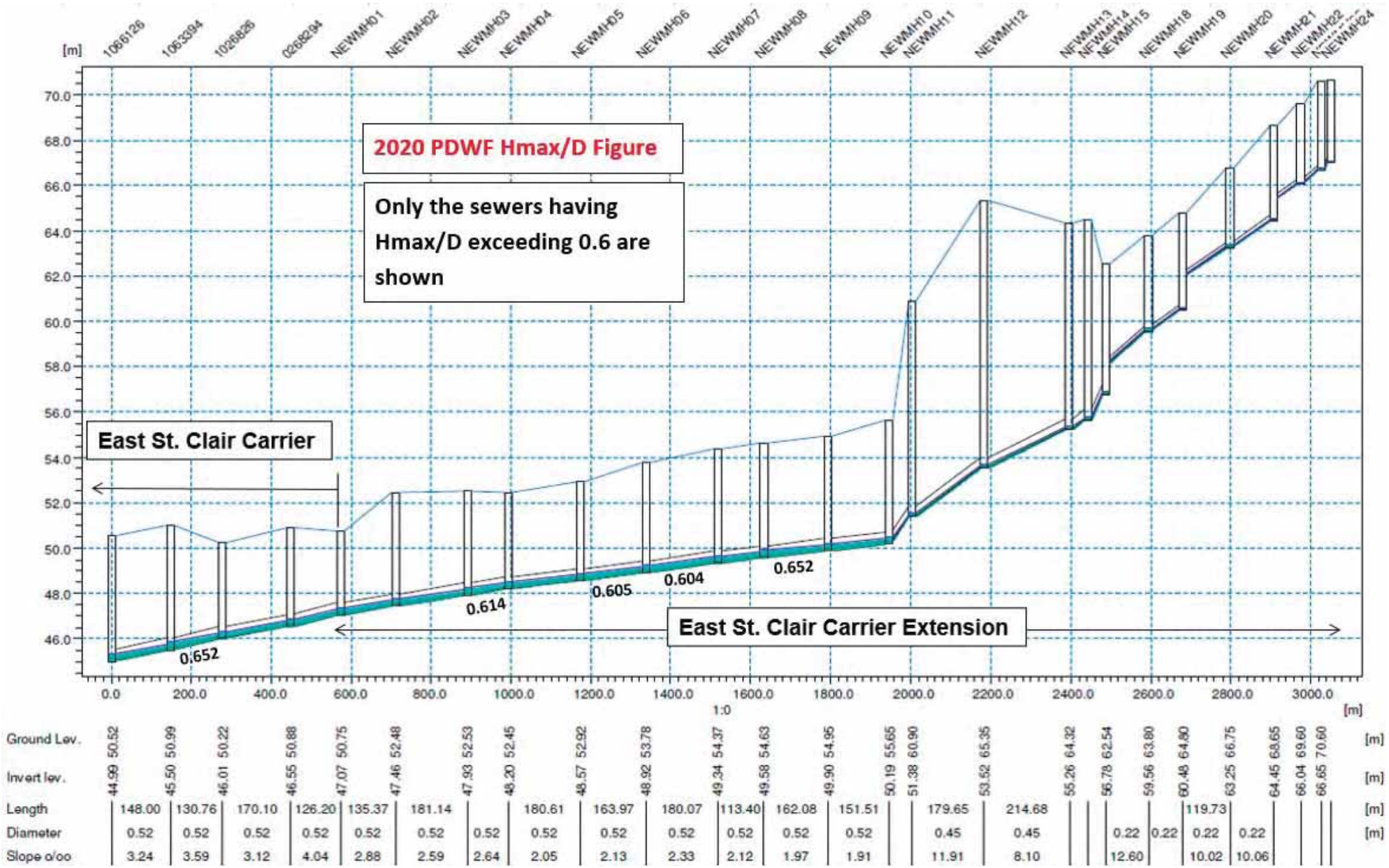
U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
East St. Clair Carrier Extension									
NEWMH24	NEWMH23	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH23	NEWMH22	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH22	NEWMH21	225	0.95	5	0.216	0.78	5	0.216	0.78
NEWMH21	NEWMH20	225	1.01	5	0.213	0.8	5	0.213	0.8
NEWMH20	NEWMH19	225	1.00	9	0.296	0.96	9	0.296	0.96
NEWMH19	NEWMH18	225	1.01	9	0.295	0.96	9	0.295	0.96
NEWMH18	NEWMH15	225	1.26	9	0.279	1.04	9	0.279	1.04
NEWMH15	NEWMH14	450	2.58	23	0.339	0.77	55	0.531	0.99
NEWMH14	NEWMH13	450	0.83	23	0.297	0.75	55	0.458	0.97
NEWMH13	NEWMH12	450	0.81	24	0.386	0.62	55	0.573	0.83
NEWMH12	NEWMH11	450	1.19	29	0.36	0.79	60	0.524	1
NEWMH11	NEWMH10	450	1.81	29	0.374	1.14	60	0.499	1.41
NEWMH10	NEWMH09	525	0.19	81	0.531	0.77	113	0.643	0.84
NEWMH09	NEWMH08	525	0.20	81	0.652	0.65	113	0.756	0.74
NEWMH08	NEWMH07	525	0.21	112	0.596	0.89	143	0.693	0.95
NEWMH07	NEWMH06	525	0.23	112	0.604	0.9	143	0.704	0.96
NEWMH06	NEWMH05	525	0.21	112	0.605	0.89	143	0.705	0.94
NEWMH05	NEWMH04	525	0.20	112	0.594	0.89	143	0.691	0.95
NEWMH04	NEWMH03	525	0.26	112	0.614	0.89	143	0.71	0.96
NEWMH03	NEWMH02	525	0.26	112	0.587	0.94	143	0.679	1
NEWMH02	NEWMH01	525	0.29	112	0.578	0.96	143	0.664	1.03
Oakdale Central									
NEWMH24	NEWMH23	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH23	NEWMH22	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH22	NEWMH21	225	0.95	5	0.216	0.78	5	0.216	0.78
NEWMH21	NEWMH20	225	1.01	5	0.213	0.8	5	0.213	0.8
NEWMH20	NEWMH19	225	1.00	9	0.296	0.96	9	0.296	0.96
NEWMH19	NEWMH18	225	1.01	9	0.295	0.96	9	0.295	0.96
NEWMH18	NEWMH15	225	1.26	9	0.279	1.04	9	0.279	1.04
Oakdale East									
NEWMH38	NEWMH37	375	0.51	-	-	-	32	0.377	0.96
NEWMH37	NEWMH36	375	0.51	-	-	-	32	0.553	0.68
NEWMH36	NEWMH35	375	0.50	-	-	-	32	0.489	0.75
NEWMH35	NEWMH34	375	0.50	-	-	-	32	0.328	1.01
NEWMH34	NEWMH33	375	0.83	7	0.139	0.76	39	0.324	1.25
NEWMH33	NEWMH68	375	2.10	10	0.14	1.12	42	0.279	1.68
NEWMH68	NEWMH69	375	2.13	12	0.141	1.23	43	0.27	1.81

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
NEWMH69	NEWMH32	375	2.65	12	0.134	1.33	43	0.255	1.95
NEWMH32	NEWMH15	375	0.99	14	0.184	0.97	45	0.339	1.38
Oakdale West									
NEWMH85	NEWMH84	375	0.49	4	0.15	0.42	4	0.15	0.42
NEWMH84	NEWMH83	375	0.50	4	0.251	0.26	4	0.251	0.26
NEWMH83	NEWMH82	375	0.50	10	0.256	0.54	10	0.256	0.54
NEWMH82	NEWMH81	375	0.50	10	0.258	0.54	10	0.258	0.54
NEWMH81	NEWMH80	375	0.50	10	0.361	0.4	10	0.361	0.4
NEWMH80	NEWMH79	375	0.50	13	0.295	0.61	13	0.295	0.61
NEWMH79	NEWMH78	375	0.50	13	0.294	0.61	13	0.294	0.61
NEWMH78	NEWMH76	375	0.50	13	0.417	0.45	13	0.417	0.45
NEWMH76	NEWMH25	375	0.46	21	0.47	0.55	21	0.47	0.55
NEWMH25	NEWMH08	375	0.54	30	0.334	0.93	30	0.338	0.93
NEWMH77	NEWMH30	225	1.31	7	0.452	0.59	7	0.452	0.59
NEWMH30	NEWMH31	225	1.18	7	0.439	0.6	7	0.439	0.6
NEWMH31	NEWMH76	225	0.96	7	0.262	0.88	7	0.262	0.88
NEWMH75	NEWMH74	300	1.21	8	0.32	0.56	8	0.32	0.56
NEWMH74	NEWMH73	300	1.20	8	0.318	0.56	8	0.318	0.56
NEWMH73	NEWMH72	300	1.21	8	0.347	0.52	8	0.347	0.52
NEWMH72	NEWMH71	300	1.20	8	0.345	0.52	8	0.345	0.52
NEWMH71	NEWMH26	300	1.21	8	0.359	0.5	8	0.359	0.5
NEWMH26	NEWMH25	300	1.18	10	0.587	0.38	10	0.587	0.38
Oakdale South									
NEWMH45	NEWMH44	375	1.50	2	0.184	0.27	2	0.184	0.27
NEWMH44	NEWMH50	375	0.48	4	0.198	0.4	4	0.198	0.4
NEWMH50	NEWMH43	375	1.09	5	0.176	0.58	5	0.176	0.58
NEWMH43	NEWMH42	375	0.59	5	0.164	0.54	5	0.164	0.54
NEWMH42	NEWMH55	375	0.53	5	0.303	0.36	5	0.303	0.36
NEWMH55	NEWMH41	375	0.51	11	0.502	0.65	11	0.502	0.65
NEWMH41	NEWMH40	450	0.51	45	0.394	0.9	45	0.394	0.9
NEWMH40	NEWMH67	450	0.51	47	0.505	0.75	47	0.505	0.75
NEWMH67	NEWMH39	450	0.48	53	0.397	1	53	0.397	1
NEWMH39	NEWMH10	450	0.53	53	0.327	1.17	53	0.327	1.17
Oakdale South									
NEWMH49	NEWMH48	300	2.86	26	0.262	1.78	26	0.262	1.78
NEWMH48	NEWMH56	300	1.23	26	0.327	1.31	26	0.327	1.31
NEWMH56	NEWMH47	300	4.12	26	0.236	2.06	26	0.236	2.06
NEWMH47	NEWMH46	300	1.29	34	0.384	1.37	34	0.384	1.37
NEWMH46	NEWMH41	300	2.03	34	0.351	1.54	34	0.351	1.54
NEWMH59	NEWMH58	225	0.29	5	0.551	0.28	5	0.551	0.28

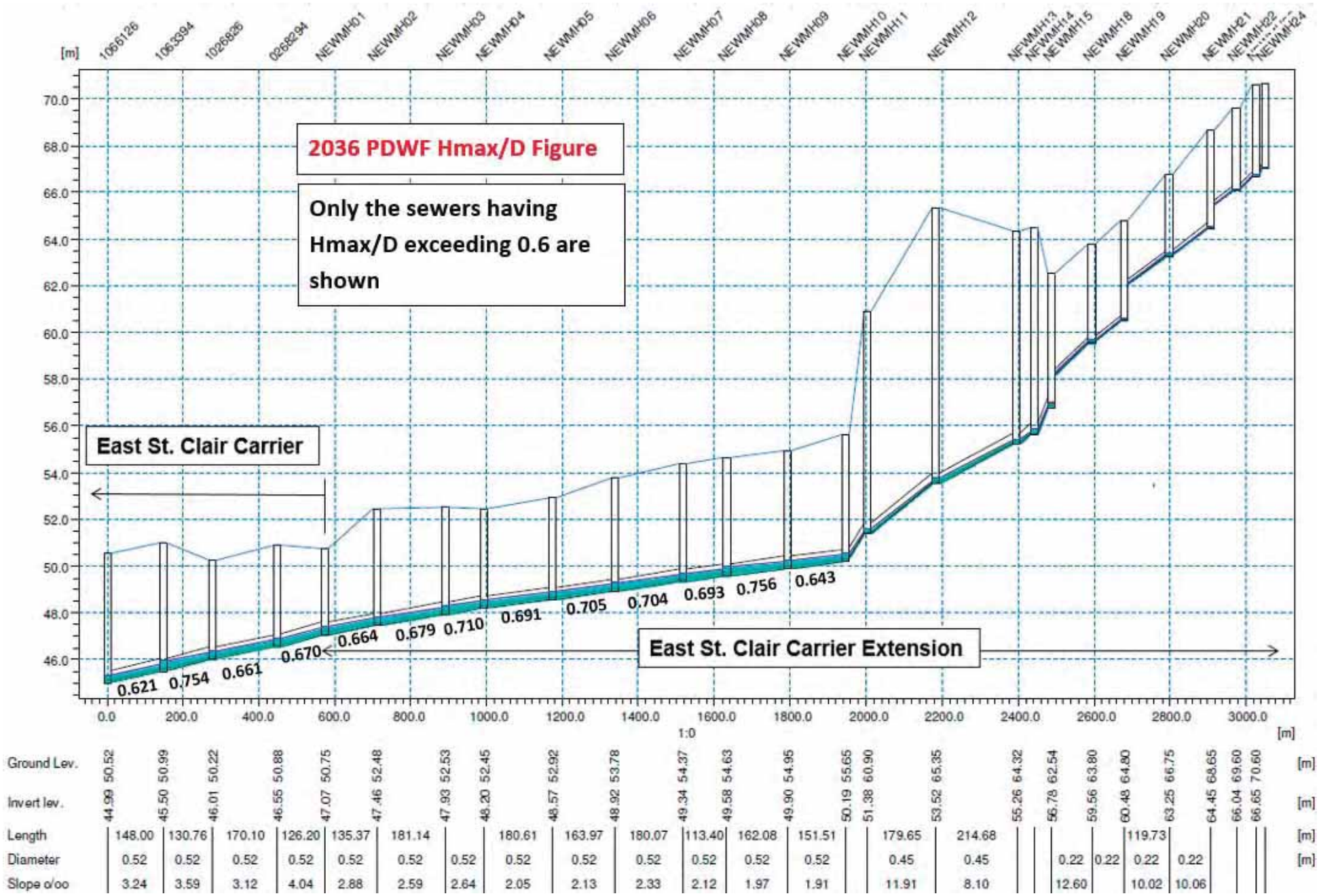
U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
NEWMH57	NEWMH58	225	1.16	3	0.166	0.74	3	0.166	0.74
NEWMH58	NEWMH60	225	0.67	8	0.447	0.58	8	0.447	0.58
NEWMH60	NEWMH61	225	2.17	8	0.52	0.59	8	0.52	0.59
NEWMH61	NEWMH47	225	0.51	8	0.321	0.72	8	0.321	0.72
NEWMH51	NEWMH52	225	1.40	6	0.249	0.81	6	0.249	0.81
NEWMH52	NEWMH53	225	0.63	6	0.265	0.66	6	0.265	0.66
NEWMH53	NEWMH54	225	0.62	6	0.37	0.5	6	0.37	0.5
NEWMH54	NEWMH55	225	0.66	6	0.263	0.67	6	0.263	0.67
NEWMH62	NEWMH63	225	0.70	1	0.238	0.29	1	0.238	0.29
NEWMH63	NEWMH40	225	0.70	1	0.129	0.49	1	0.129	0.49
NEWMH64	NEWMH65	225	3.79	6	0.465	0.58	6	0.465	0.58
NEWMH65	NEWMH66	225	1.24	6	0.456	0.52	6	0.456	0.52
NEWMH66	NEWMH67	225	1.25	6	0.228	0.93	6	0.228	0.93
Jacfin Extension									
NEWMH89	NEWMH90	225	5.55	3	0.327	0.47	3	0.327	0.47
NEWMH90	NEWMH88	225	1.41	4	0.349	0.47	4	0.349	0.47
NEWMH88	NEWMH91	225	0.41	4	0.569	0.35	4	0.569	0.35
NEWMH91	NEWMH86	225	1.04	11	0.425	0.98	11	0.425	0.98
NEWMH86	NEWMH49	300	0.65	26	0.59	1.05	26	0.59	1.05
NEWMH87	NEWMH86	225	2.63	4	0.425	0.84	4	0.425	0.84
Downstream East St. Clair Carrier									
NEWMH01	268294	525	0.40	111	0.58	1.01	143	0.67	1.08
268294	1026826	525	0.31	112	0.571	0.99	143	0.661	1.05
1026826	1063394	525	0.36	112	0.652	0.9	143	0.754	0.96
1063394	1066126	525	0.32	112	0.536	1.04	144	0.621	1.11
1066126	1394278	525	0.32	113	0.453	1.2	145	0.533	1.25
1394278	1394282	600	0.19	114	0.456	0.94	146	0.526	1
1394282	1394286	600	0.32	115	0.421	1.03	146	0.493	1.09
1394286	1063358	600	0.27	115	0.506	0.9	146	0.579	0.96
1063358	1063366	600	0.25	115	0.472	0.93	146	0.542	0.99
1063366	1066102	600	0.26	117	0.479	0.96	147	0.548	1.01
1066102	1063374	600	0.27	118	0.469	0.99	149	0.535	1.06
1063374	1066110	600	0.26	119	0.398	1.19	149	0.45	1.28
1066110	1065994	600	0.15	120	0.467	0.96	150	0.533	1.01
1065994	1063274	750	0.15	120	0.369	0.84	151	0.423	0.88
1063274	1063286	750	0.15	120	0.387	0.78	151	0.441	0.82
1063286	1066022	750	0.18	120	0.425	0.72	151	0.476	0.78
1066022	1394274	750	0.24	125	0.368	0.88	156	0.416	0.93
1394274	1394290	800	0.20	125	0.322	0.91	156	0.36	0.97
1394290	1394294	800	0.20	125	0.29	1.1	156	0.324	1.18

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
1394294	1394298	1200	0.24	125	0.165	1.05	156	0.183	1.12
1394298	1063298	900	0.28	125	0.306	0.89	156	0.342	0.95
1063298	1066026	900	0.28	125	0.327	0.82	156	0.366	0.87
1066026	1225433	900	0.28	125	0.303	0.89	156	0.338	0.95
1225433	1225013	900	0.28	125	0.3	0.9	156	0.335	0.96
1225013	1227493	900	0.28	125	0.298	0.91	156	0.333	0.97
1227493	1224765	900	0.28	125	0.232	1.13	156	0.259	1.2
1224765	1227497	900	0.18	125	0.252	1.04	156	0.283	1.08
1227497	1278268	1200	0.13	127	0.225	0.73	158	0.249	0.78
1278268	1281000	1200	0.15	131	0.224	0.75	160	0.248	0.8
1281000	1277995	1200	0.15	131	0.225	0.75	160	0.249	0.79
1277995	1280483	1200	0.15	131	0.233	0.73	160	0.258	0.77
1280483	1280111	1200	0.13	131	0.217	0.74	160	0.239	0.78
1280111	1280115	1200	0.32	131	0.227	0.82	160	0.251	0.86
1280115	1608413	1050	0.31	132	0.265	0.82	161	0.293	0.87
1608413	1279791	1050	0.30	132	0.255	0.87	161	0.281	0.92
1279791	1282311	1050	0.30	132	0.256	0.87	161	0.283	0.92
1282311	1279583	1050	0.30	132	0.254	0.87	161	0.28	0.92
1279583	1279371	1050	0.30	132	0.202	1.09	161	0.223	1.15
1279371	1279103	1050	0.32	133	0.279	0.81	162	0.308	0.86
1279103	1281835	1050	0.30	136	0.204	1.1	164	0.225	1.16
1281835	1279107	1500	0.15	194	0.226	0.71	243	0.253	0.75
1279107	1281839	1500	0.10	194	0.224	0.69	243	0.25	0.74
1281839	1281603	1500	0.10	194	0.224	0.69	243	0.251	0.74
1281603	1281199	1500	0.10	194	0.24	0.66	243	0.269	0.7
1281199	1278471	1050	0.13	194	0.316	0.84	243	0.353	0.9
1278471	1280983	1050	0.45	194	0.344	0.96	243	0.384	1.02
1280983	1280786	1050	0.15	215	0.284	1.17	267	0.317	1.24
1280786	1277646	1200	0.11	223	0.324	0.77	277	0.364	0.82
1277646	1280378	1200	0.09	223	0.318	0.75	277	0.356	0.79
1280378	1280086	1200	0.09	223	0.3	0.79	277	0.334	0.84
1280086	1280090	1200	0.10	223	0.267	0.93	277	0.298	0.99
1280090	1279614	1200	0.11	223	0.265	0.93	277	0.295	1
1279614	1282026	1200	0.10	236	0.265	1.12	291	0.294	1.19
1282026	1282022	1200	0.50	236	0.184	1.65	291	0.204	1.75
1282022	1279294	1200	0.50	236	0.477	0.56	291	0.516	0.59
1279294	1281374	1350	0.09	405	0.393	0.84	471	0.427	0.85
1281374	1275321	1350	0.12	403	0.368	0.9	468	0.397	0.94
1275321	1276981	1350	0.11	403	0.341	0.95	468	0.366	1
1276981	1276849	1350	0.11	404	0.303	1.26	466	0.325	1.32

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
1276849	1273977	1350	0.13	411	0.366	0.99	468	0.391	1.04
1273977	1276705	1350	0.15	411	0.296	1.3	468	0.315	1.35
1276705	1404019	1350	2.36	502	0.223	2.36	542	0.236	2.36
1404019	SPS0204	1350	13.55	502	0.554	8.99	542	0.559	6.07
RMTND01	RMTND03	2000	0.20	501	0.186	1.81	542	0.196	1.78
RMTND03	OUTLET1	3000	0.20	810	0.124	1.61	904	0.131	1.66

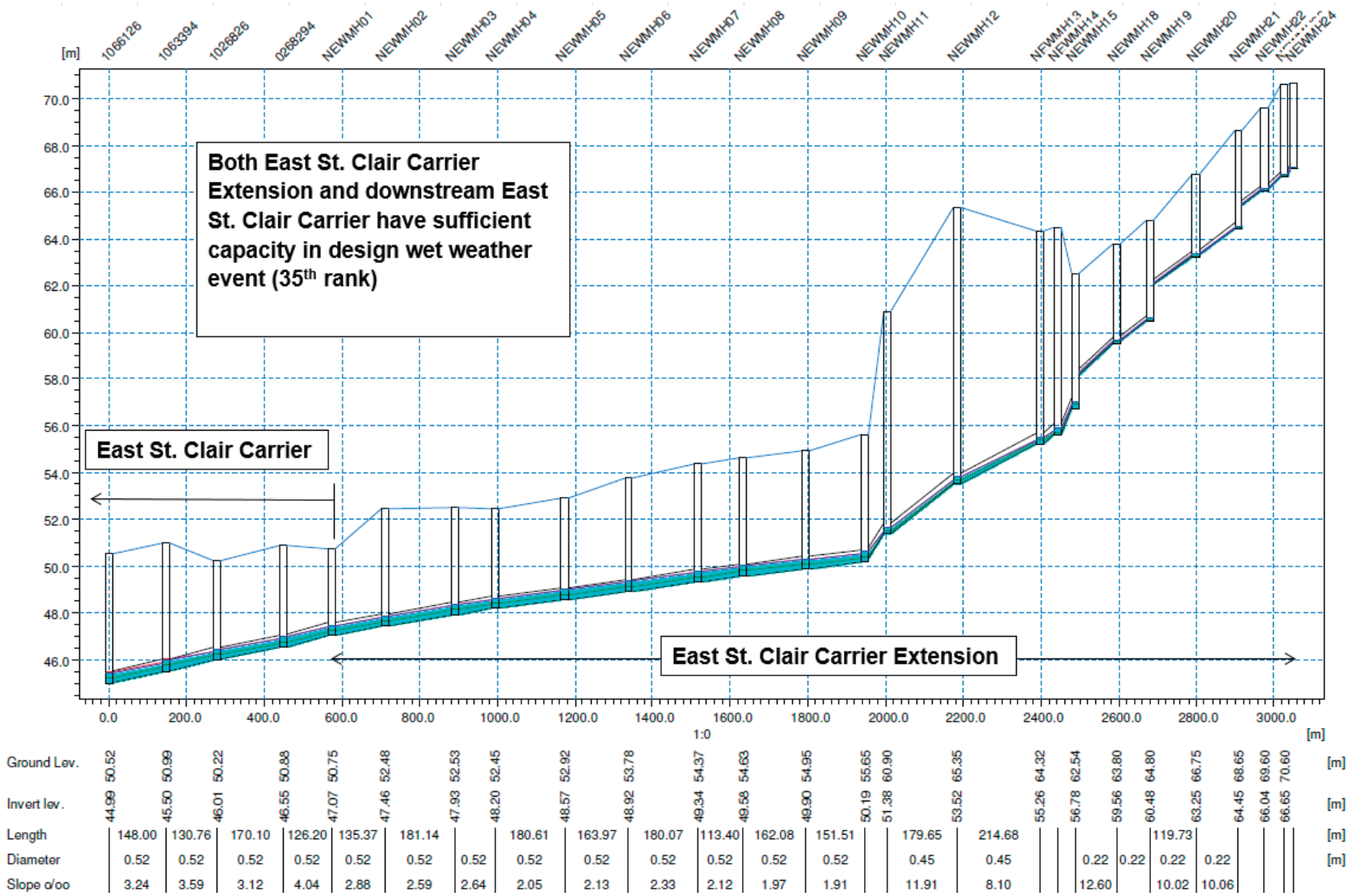


HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2020 PDWF



HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2036 PDWF

Appendix E – Wet Weather (Design Event) System Performance (2036)



HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2036 Design Wet Weather Event (35th rank)

Appendix F – Cost Estimates

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	0	228	0
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	0	275	0
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	750	386	289,828
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	750	25	18,621
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
10		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
11		EO Road Restoration Trench Std Depth		375 dia	m	188	513	96,163
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	404,612	0.75	303,459
		Sub Total Direct Costs						**708,072**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		70,807
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		141,614
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		138,074
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		370,498
		Total Construction Cost						**1,429,065**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		14,291
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:36**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		71,453
22		SWC Project Management Costs (% of Construction Costs)			5.00%		71,453
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		7,860
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,644,122**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale East

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:39**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	0	228	0
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	0	275	0
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	1,020	386	394,166
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	1,020	25	25,325
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
10		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
11		EO Road Restoration Trench Std Depth		375 dia	m	255	513	130,782
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	550,273	0.75	412,705
		Sub Total Direct Costs						**962,977**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		96,298
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		192,595
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,781
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		503,878
		Total Construction Cost						**1,943,529**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		19,435
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale East	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:39**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		97,176
22		SWC Project Management Costs (% of Construction Costs)			5.00%		97,176
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,689
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,218,005**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale West

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:40**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	250	228	57,075
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	1,500	275	413,142
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	2,320	386	896,533
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	250	18	4,421
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,500	21	32,141
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	2,320	25	57,602
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	63	434	27,128
10		EO Road Restoration Trench Std Depth		300 dia	m	375	485	181,800
11		EO Road Restoration Trench Std Depth		375 dia	m	580	513	297,466
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	1,967,308	0.75	1,475,481
		Sub Total Direct Costs						**3,442,789**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		344,279
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		688,558
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		671,344
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		1,801,440
		Total Construction Cost						**6,948,410**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		69,484
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale West

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:40**

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ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		347,421
22		SWC Project Management Costs (% of Construction Costs)			5.00%		347,421
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		38,216
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				of Client Costs	
		TOTAL PROJECT BUDGET REQUIREMENT					**7,800,952**

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale South	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:39**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,280	228	292,226
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	450	275	123,943
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	1,250	386	483,046
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	720	621	447,136
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,280	18	22,638
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	450	21	9,642
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	25	31,035
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	720	10	7,102
9		EO Road Restoration Trench Std Depth		250 dia	m	320	434	138,896
10		EO Road Restoration Trench Std Depth		300 dia	m	113	485	54,540
11		EO Road Restoration Trench Std Depth		375 dia	m	313	513	160,272
12		EO Road Restoration Trench Std Depth		450 dia	m	180	579	104,172
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	1,874,649	0.75	1,405,986
		Sub Total Direct Costs						**3,280,635**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		328,063
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		656,127
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		639,724
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		1,716,592
		Total Construction Cost						**6,621,141**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		66,211
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale South

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:39**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		331,057
22		SWC Project Management Costs (% of Construction Costs)			5.00%		331,057
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		36,416
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**7,435,882**

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:38**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,250	228	285,377
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	170	275	46,823
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	0	386	0
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	18	22,107
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	170	21	3,643
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	313	434	135,641
10		EO Road Restoration Trench Std Depth		300 dia	m	43	485	20,604
11		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	514,195	0.75	385,646
		Sub Total Direct Costs						**899,841**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		89,984
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		179,968
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		175,469
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		470,842
		Total Construction Cost						**1,816,104**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		18,161
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:38**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		90,805
22		SWC Project Management Costs (% of Construction Costs)			5.00%		90,805
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		9,989
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,075,864**

Sydney WATER **COST ESTIMATOR**

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,250	228	285,377
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	170	275	46,823
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	0	386	0
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	18	22,107
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	170	21	3,643
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	313	434	135,641
10		EO Road Restoration Trench Std Depth		300 dia	m	43	485	20,604
11		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	514,195	0.75	385,646
		Sub Total Direct Costs						**899,841**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		89,984
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		179,968
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		175,469
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		470,842
		Total Construction Cost						**1,816,104**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		18,161
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		90,805
22		SWC Project Management Costs (% of Construction Costs)			5.00%		90,805
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		9,989
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,075,864**

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Appendix E

Local Area Servicing Plan (Wastewater) -GHD

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Water

July 2016

Commercial in Confidence

GHD Disclaimer

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev. 01	A Rashidi	M Healey		M Healey		15/06/16
Rev. 02	A Rashidi	M Healey		M Healey		5/07/16
Final	A Rashidi	M Healey, Sydney Water, Goodmans		M Healey		28/07/2016

Document Status

Oakdale Industrial Development - Planning of Water Related Services July 2016

This report has been prepared by GHD

Approved for issue

Signature	Date	Signature	Date	Signature	Date
	29/07/16		29/07/16.		
Kym Dracopoulos		Russell Hogan		Amir Rashidi	
Manager, Technical		Project Manager		Project Manager	
Goodman Property Services (AUST) Pty Ltd		AT&L Associates		GHD	

Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

Signature	Date	Signature	Date
Suhanti Thirunavukarasu		Richard Schuil	
Principal Planner		Engineering & Planning Manager	
Engineering & Environmental Services		Growth Centres	
Sydney Water		Sydney Water	

Approved

Signature	Date
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

Growth and water demand projections

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. Their lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection (1)
Oakdale Central	45.2	IN1- General Industrial (2)	2016- 2017
Jacfin	87.8	IN1- General Industrial/ Residential	2016- 2017
Oakdale South	70.2	IN1- General Industrial	2017- 2019
CSR	63.4	IN1- General Industrial	2017-2020
Oakdale West	90.5	IN1- General Industrial	2019- 2021
Oakdale East	95.0	IN1- General Industrial	2022- 2024
Total	**452**		

Note 1: The proposed timing of connection is subject to change

Note 2: water demand assessed based on Light industrial / warehouse

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". Table 2 below summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 2 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
Oakdale South	2017-2019	0.65	1.0
CSR	2017-2020	0.58	0.93
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Total		**4.4**	**7.5**

The key opportunities and constraints associated with water servicing of the Oakdale Industrial Development is summarised below.

Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario.

Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. Sydney Water will address growth servicing requirements in the broader region.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

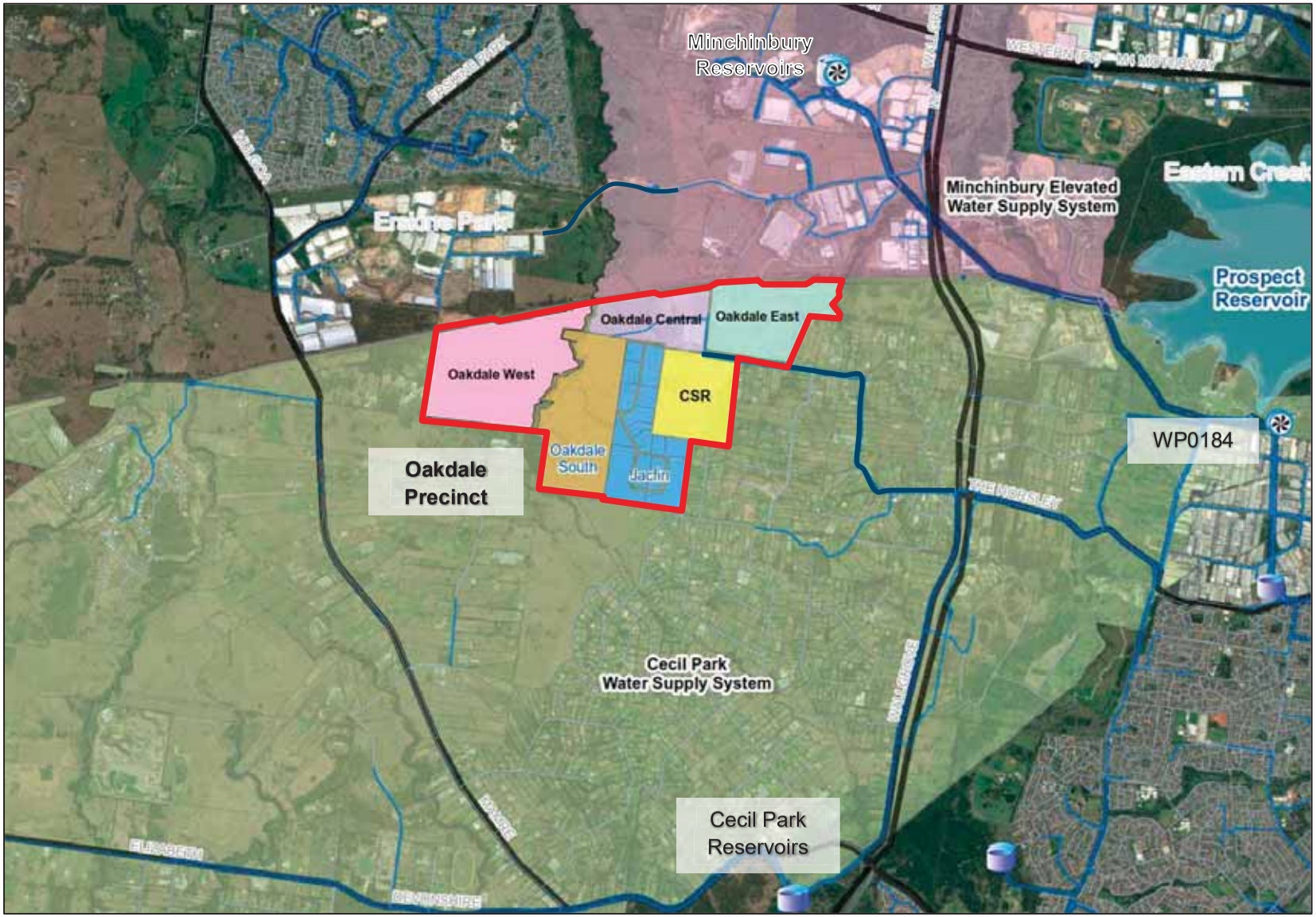

Figure 1 Oakdale Industrial Development Overview

The Oakdale Servicing Strategy is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 2) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 2) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 2) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 2) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 2) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 2) within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

The preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 3. The Oakdale servicing plan overview is presented in Figure 2.

Table 3 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

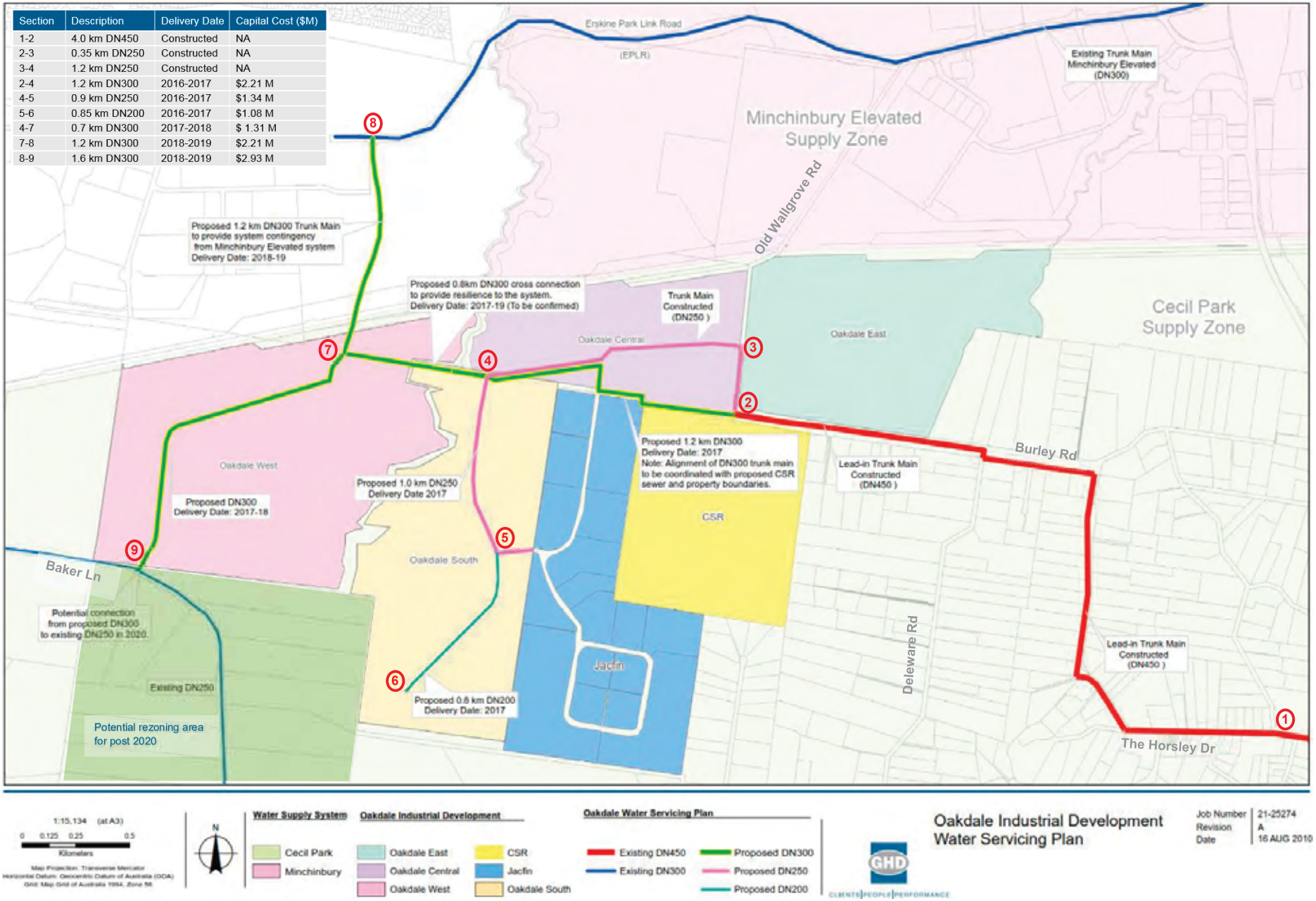

Figure 2- Oakdale Industrial Water Servicing Plan

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Appendix A –Revised Basis of Water Planning

Appendix B – Detailed Cost Estimation

Appendix C – Growth Servicing Strategy (GSS) augmentations

1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system. Minchinbury Elevated supply system also will provide connection to Oakdale from the existing DN300 within Erskine Park Link Road (EPLR).

Assets required to service proposed Goodman, Jacfin and CSR developments within Oakdale precinct are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to document the:

- Revised growth and water demand forecasts,
- Key opportunities and constraints,
- Outcomes of the assessment work undertaken, and
- Water servicing plan for the Oakdale Industrial Development.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

2. Growth Projections

This section provides details of growth and water demand projections within the study area including the expected timing, and scale of growth.

2.1 Summary of Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of development area. This includes Goodman, CSR and Jacfin lands. There lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009 The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1- General Industrial (5)	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0 (3)	IN1- General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1- General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	IN1- General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density (2)	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1- General Industrial	2017
	2	20.8		2018
		11.5		
	3	21.0		2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The proposed timing of infrastructure proposed is subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) – Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

Note 5: Water demand assessed based on Light industrial / warehouse

2.2 Water Demand Projections

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with evidence based industrial demand assumptions. i.e. 9.2 ML/d. the proposed demand previously calculated for this development removed from the model.
- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfers into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d

The revised future demand projections for the Cecil Park supply system are presented in Table 5.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

The detailed methodology for projecting average day and maximum day demands is described in Tech Memo 1 (Appendix A).

Table 6 summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 6 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale South	2017-2019	0.65	1.0
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
CSR	2017-2020	0.58	0.93
Total		**4.4**	**7.5**

3. Opportunities and constraints

The following is a summary of the key opportunities and constraints associated with water servicing of the Oakdale Industrial Development.

3.1 Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial. Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario. Additional augmentations as a result of the GSS study include 30 ML new reservoir will provide system reliability.
- Customers along Aldington Rd that experiencing low pressure under current maximum day demand could be rezoned to Oakdale development. i.e. 1.0 ML/d

3.2 Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. The GSS system augmentations (i.e. Prospect Creek pumping station WP0184B and raising main upgrade) proposed for 2031 demand scenario will address the long term system capacity issues within Cecil Park supply system.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

The opportunities and constraints identified in Oakdale Industrial water servicing plan is presented in Figure 3.

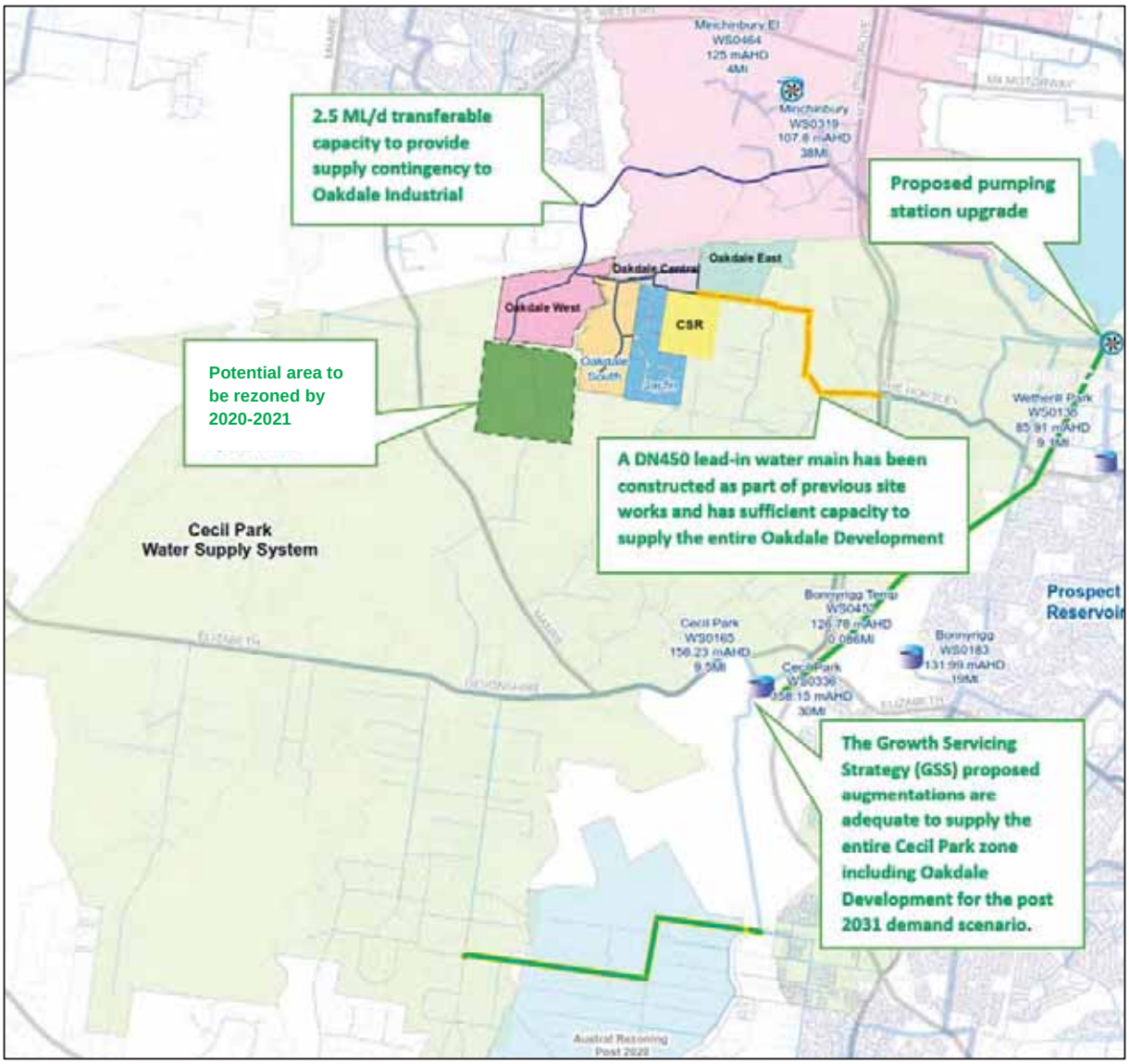

Figure 3 Opportunities and constraints

4. Water servicing

4.1 Oakdale Industrial water servicing

4.1.1 Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 4) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 4) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 4) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 4) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

4.1.2 Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 4) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 4) within Millner Avenue which is supplied from the Cecil Park Supply System.

4.1.3 Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

4.1.4 Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.5 CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.6 Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

4.2 Short-term servicing plan (Current- 2020)

Under this short-term supply configuration, Oakdale development will be supplied from Cecil Park supply system using existing DN450 lead-in main. The proposed internal pipework within Oakdale South need to be completed. i.e. 850 m DN250 and 850 m DN200.

Cecil Park reservoirs have sufficient capacity to supply the Cecil Park zone for the current max day scenario including proposed 2020 growth in the Oakdale Development as summarised below:

- Oakdale South, (i.e. 2020 MDD: 1.0 ML/d)
- Oakdale Central, (i.e. 2020 MDD: 0.7 ML/d)
- Oakdale West, (i.e. 2020 MDD: 1.0 ML/d)
- Jacfin, (i.e. 2020 MDD: 2.1 ML/d) and
- CSR. (i.e. 2020 MDD: 0.9 ML/d)

4.3 Mid-term servicing plan (2020- 2031)

Cecil Park reservoirs and transfer system have capacity to supply Cecil Park zone for the 2020 max day scenario including proposed 2020 growth in the Oakdale Development.

Between 2020 and 2024 the following actions are proposed:

- Rezoning to occur @ 2020 of Austral onto Cecil park (MDD: 2.8 ML/d @ 2020 and through to MDD: 4.8 ML/d @ 2024-25) (South West Priority Land Release Area "SWPLRA"; May 2016)
- Further growth within the Oakdale Development 1.7 ML/d (Oakdale Industrial will be fully developed at 2024)

The above contribute to significant capacity deficiencies within the system. i.e. WP0184 and Cecil Park reservoirs cannot keep up with a max week demand. By rezoning Oakdale West and Central on to Minchinbury Elevated relieves demand of 1.6 ML/d provides sufficient capacity relief to accommodate the forecasted demand and rezoning up to 2024.

Therefore, under mid-term servicing plan, Oakdale West and Oakdale Central will be supplied from Minchinbury Elevated supply zone using existing DN300 trunk main (i.e. gravity supply from elevated reservoir). Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km. Customers along Aldington Rd (i.e. approx. 28 customers) that experiencing low pressure under current maximum day demand could also be rezoned to Minchinbury Elevated supply zone using the proposed DN300 trunk main within Oakdale West.

The Oakdale Industrial remainder including Jacfin and CSR would be supplied from Cecil Park using existing DN450 and proposed DN300 lead-in main.

From 2024 through to 2030 there is insufficient capacity within both the Minchinbury Elevated and Cecil Park supply systems to accommodate growth within the Oakdale Industrial area. Between 2024 and 2030 the following actions are proposed:

- Further growth in the Austral rezoned area now being fed from Cecil Park
- Rezoning to occur @ 2024 of Leppington North onto Cecil Park (7.3 ML/d @ 2024) (South West Priority Land Release Area "SWPLRA"; May 2016)

Accordingly, further investigation into the proposed rezoning and or required amplification of the system prior to this date is required.

4.4 Long-term servicing plan (Post 2030)

The Oakdale Industrial development will be supplied from Cecil Park and Minchinbury Elevated supply systems. Cecil Park reservoirs (i.e. including any proposed new reservoir) and upgraded Prospect Creek pumping station WP0184B have sufficient capacity to supply the Cecil Park zone for the 2036 max day scenario including ultimate growth within the Oakdale Development. This is based on an indicative scheme included in the GSS but subject to detailed planning before finalisation of preferred option.

The Oakdale servicing plan overview is presented in Figure 4.

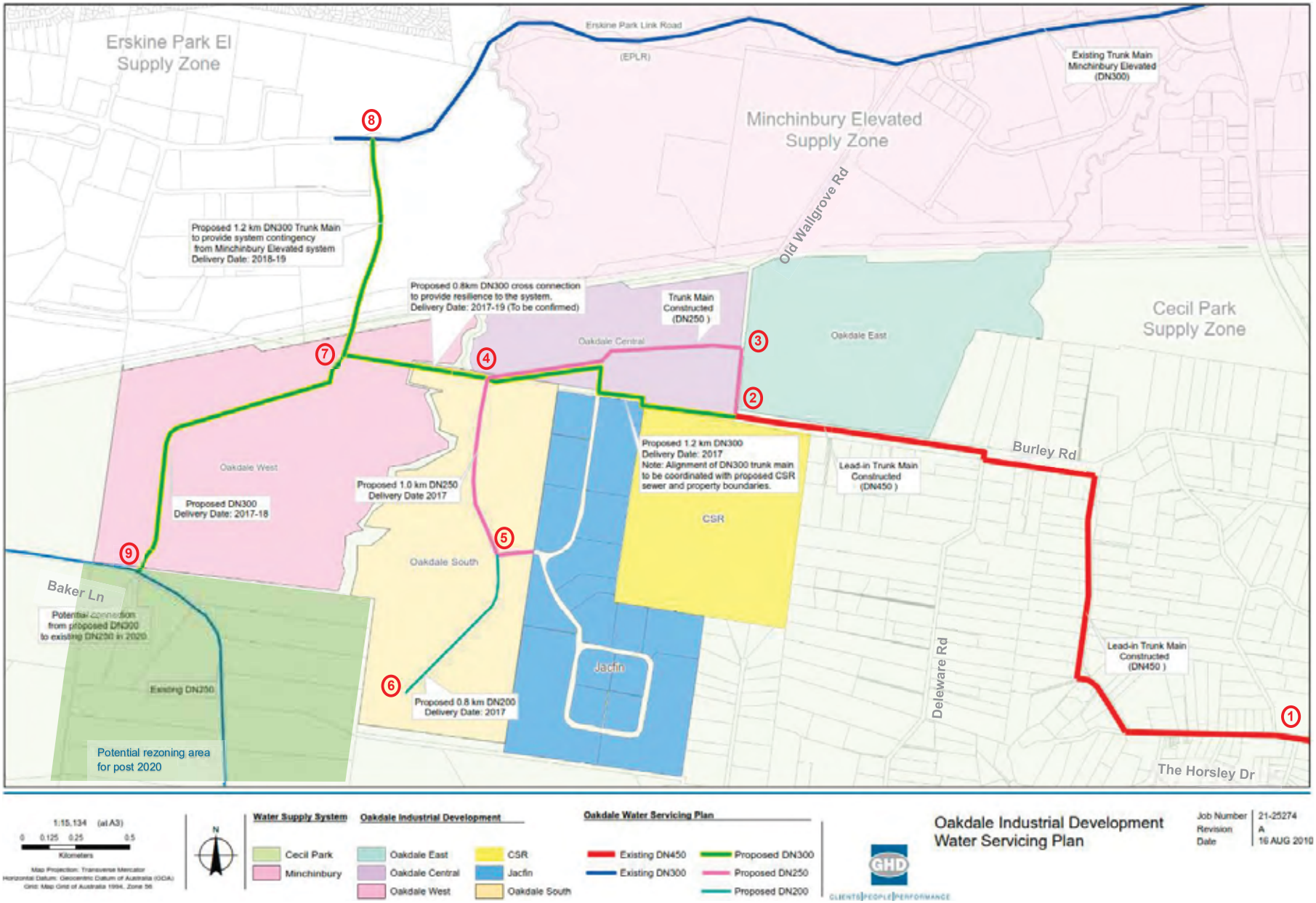

Figure 4- Oakdale Industrial Water Servicing Plan

4.5 Preliminary capital cost assessment

Preliminary capital cost estimates were developed for Oakdale Development. The water mains indirect and total delivery costs were estimated using the Sydney Water Cost Estimator tool (version 09-2015.11). The following assumptions were adopted for preliminary cost estimation:

- 75% scope contingency was adopted for all options as per advice from Sydney Water
- An allowance was made for rock excavation for 30% of the length of the water mains
- 25% Road restoration was allowed for all pipework

A summary of the preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 7. Detailed cost estimates are provided in Appendix B.

Table 7 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-17	$2.21 M
4-5	0.9 km DN250	2016-17	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

5. Conclusions and Recommendations

This study investigated the assets required to service the proposed Goodman, Jacfin and CSR developments within the Oakdale Precinct to meet development timeframes. The water servicing plan for the Oakdale Industrial Development is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection between the existing DN250 potable water main within Millner Avenue to the proposed DN300 within Oakdale West which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension of the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

Appendices

Appendix A –Revised Basis of Water Planning

Memorandum

25 May 2016

To	Amir Rashidi		
Copy to	Russell Hogan, Suhanti Thirunavukarasu, Suganthini Niranjan		
From	Amir Rashidi	Tel	02 92397010
Subject	Oakdale Industrial- Revised Basis of Water Planning	Job no.	21/25274

1. Introduction

1.1 Purpose of this memorandum

The purpose of this memorandum is to document and seek endorsement from Sydney Water on the design and system performance criteria to be adopted for the investigation associated with the water system within the Oakdale Industrial development. It is important that Sydney Water agrees to these criteria prior to substantial commencement of the planning tasks.

1.2 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

Water: The initial scheme was to supply the site from Cecil Park; however, there is an alternative option to supply Oakdale through a combination of the Minchinbury and Cecil Park supply zones. Extensions off Sydney Water's existing system will need to be built to provide the full site with drinking water services.

Assets required to service proposed Goodman development at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

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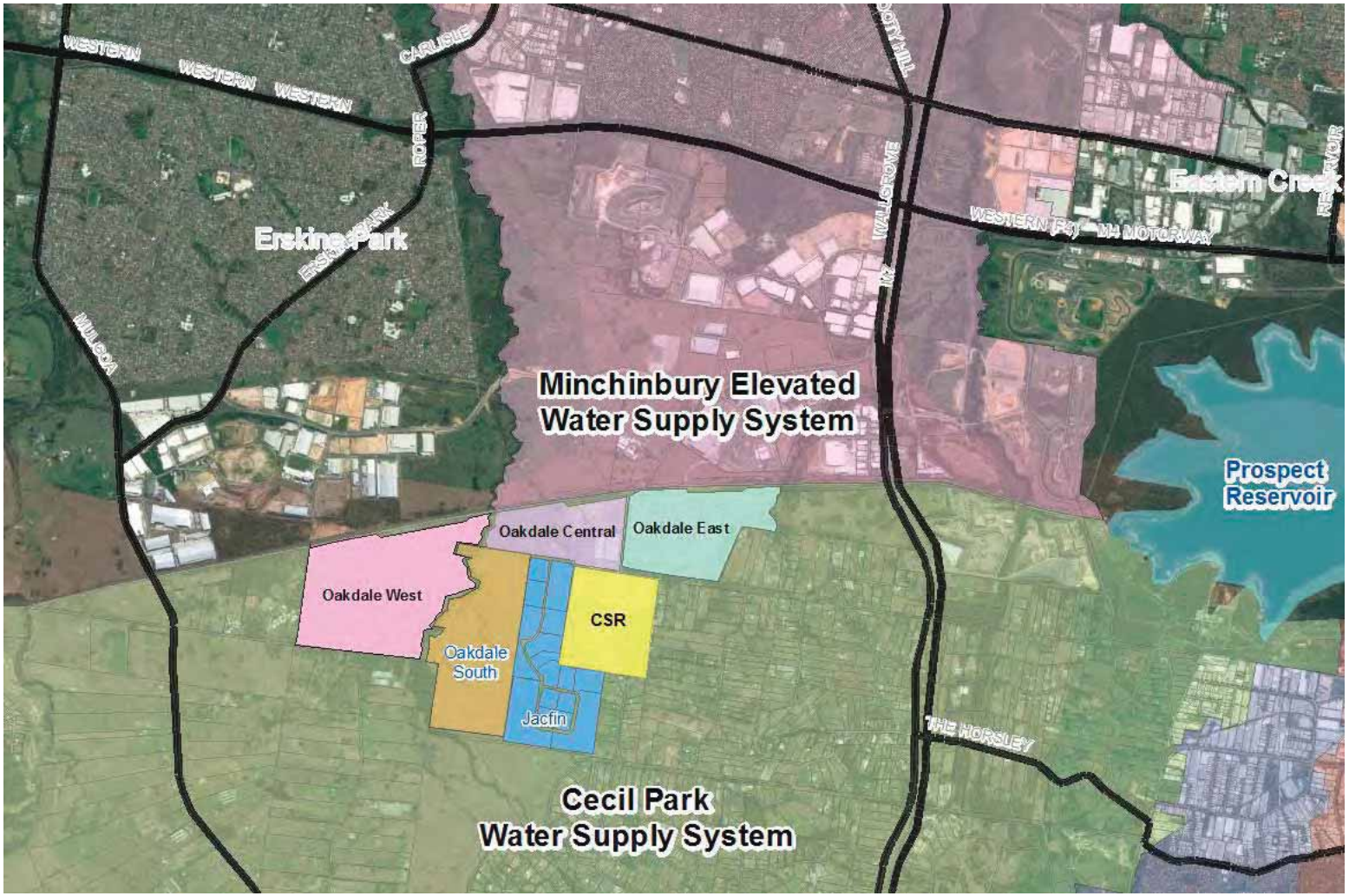

Figure 1 Oakdale Industrial Development Overview

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2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Population growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is a future industrial development with approximately 300 nett hectares of development lots anticipated in the ultimate stage. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1. Detailed figures for each of the developments are included in Appendix A.

Table 1 Growth projections

Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale South	1	18.8	Light industrial/warehouse	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	**1**	**95.0** [(3)]	Light industrial/warehouse	2022-2024 [(1)]
Oakdale West	1	21.7	Light industrial/warehouse	2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		

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Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale Central	1A	4.1	Light industrial/warehouse	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	Light industrial/warehouse	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density [2]	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	Light industrial/warehouse	2017
	2	32.3		2018
		11.5	Environmental /Open Space	
	3	21.0	Light industrial/warehouse	2020 [1]
	Total	**74.9**		
Grand Total		**463.6**		

Note 1: The timeframes are subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager Russell Hogan – AT&L on behalf of Goodman	Via Email	29th Feb 2016

3. Planning criteria

3.1 Water planning criteria

This section details the water planning criteria relevant to this investigation. We request Sydney Water's endorsement of the design criteria as a hold point for the project prior to commencement of the system performance assessment.

3.2 Water planning references

The following documents, referenced in Table 2, were consulted in developing the planning criteria:

1. Water and Recycled Water System Growth Servicing Strategy – Criteria and Guidelines 2012
2. Water System Planning Guideline (ver. 1- September 2014)
3. Water Supply Code of Australia (WSA 03-2011-3.1 - Sydney Water Edition 2012)
4. Recommendation – Water-main renewal program interim sizing rules to address fire-fighting needs
5. Precinct Structure Plan

Table 2 Water Planning Criteria

Item	Design Criteria	Units	Water	Reference
System Demands (existing areas)				
Max Day Demand (MDD)	Max Day Demand /Average Day Demand (MDD/ADD) Factor	NA	An analysis of the last ten consecutive financial years of IICATS data to select the day with the highest demand over 24 hours. The peaking factor will be derived from calculated MDD and ADD. (i.e. peaking factor: MDD/ADD) • Cecil Park Supply System peaking factor: 2.8 • Cecil Park maximum day demand : 18.75 ML/d • Minchinbury Supply System peaking factor: 1.6 • Minchinbury maximum day demand : 5.2 ML/d	Reference 2 See Appendix C
Max Hour Demand	Max Hour Demand /Max Day Demand Factor	NA	An analysis of the last ten years of 15 minutes of IICATS data to select the maximum hour event. If the results are inconsistent then the default WMS maximum day demand diagram will be adopted	Reference 2
Performance Requirements				
Trunk Mains	Minimum Pressure	Meter	Trunk mains (no customer connections) will maintain 3 m at all times under max day demand condition	Reference 1

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Item	Design Criteria	Units	Water	Reference
Reticulation Mains	Minimum Pressure	m	Maintain at the property boundary: >25 m residual pressure (desirable) (2)	
	Maximum Pressure	m	The long-term aim is to reduce to 60 m or less where financially viable	Reference 2
	Maximum headloss	km/ hr.	Maximum headloss of 5 m/km for ≤ DN150 and 3 m/km for ≥ DN200. (secondary criteria)	Reference 3
	Maximum Velocity	m/s	>2 m/s (i.e. The optimum velocity is in the range 0.8 m/s to 1.4 m/s.)	
Critical water-mains (Fire flow criteria)	Fire-Fighting Enquiries	L/s	High density residential, major special uses and heavy commercial and industrial : Not less than 10 m residual head with assume flow of 25 L/s (at 95th percentile domestic demand)	Reference 4
Minimum Pipe Size	Flow rates & residual pressure	mm	Industrial and Commercial: Cast iron outside diameter series: 150; Steel and Polyethylene pipes: 180	Reference 3
WMS model for water planning purposes (1)				
Minchinbury			***Current MDD***: > Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - Current Max Day Run 1.1 ***2031 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2031 Max Day Run 1.1 ***2036 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2036 Max Day Run 1.1	
Cecil Park			***Current MDD :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>WSEA - Structure Plan Update>GSS Run Group>Current Max Day ***2031 MDD Model Run :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2031 Max week GSS_Solutions ***2036 MDD Model Run*** : >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2036 Max week_Solutions_N	

Note 1: The GSS model for Minchinbury was used as this was the latest study in the local area and included an update of key assets and system demands. This will be validated and forecast demands updated as part of this project. The GSS model for Cecil Park was referenced in the recent SWPLRA / SWGC 2nd release precincts detailed planning investigation and is the latest version of the Cecil Park model available. This will be validated and forecast demands updated to reflect latest data. This has been discussed and confirmed with Sydney Water.

Note 2: The minimum pressure specified in the Operating Licence is 15 metres, however, some exceedances of this limit are permitted. Refer to Sydney Water Operating Licence. A lower minimum service pressure may be provided based on financial and risk considerations, and is subject to Sydney Water approval.

4. Water demand assessment

A baseline maximum day demand of 40 kL/Nha/day for light industrial new development was employed from Water System Planning Guideline to estimate the Oakdale Industrial water demand. During this assessment, it was observed that new development that anticipated occurring in Oakdale industrial will be typically warehouses with commercial / office land use. Consequently, Sydney Water advice to reassess the Oakdale industrial future demand based upon the Moorebank and Wetherill Park industrial areas that exhibit a similar type of development. The evidence based average day water demand summarised in Table 3. Figure 2 also shows the location of the Moorebank and Wetherill Park industrial areas in relation to the Oakdale Industrial precinct. .

Table 3 Evidence based average day water demand for comparable Industrial Areas (1)

Average Day Demand	Units	Moorebank	Wetherill Park	Weighted Average
Area demand (average)	kL/day	1,324	4,520	-
Area	Hectares	182	456	-
Demand per net hectare	kL/net ha/day	7.3	9.9	9.2

Note 1: The evidence based industrial demand employed from Broader WSEA Water Services Study (Nov 2013)

4.1 Summary of Oakdale Industrial water demand forecasts

The following outline of potable water demand provides predicted average day (ADD), maximum day (MDD) and maximum hour demand (MHD) based on projected development yield.

The calculations are based on the forecast development yield (i.e. Table 1) and evidence base design demands (Table 3). Detailed calculations for MDD and MHD demand are provided in Appendix B. The Oakdale Industrial demand forecast summarised in Table 4.

Table 4 Summary of revised water demand- Oakdale Industrial fully developed

Development site	Demand Scenario (ML/d)		
	ADD	**MDD**	**MHD**
Oakdale South	0.65	1.0	1.65
Oakdale West	0.83	1.3	2.13
Oakdale East	0.87	1.4	2.24
Oakdale Central	0.42	0.7	1.08
Jacfin	1.04	2.12	4.1
CSR	0.58	0.93	1.49
Total	**4.4**	**7.5**	**12.7**

Note 1: the maximum demand was estimated based on Industrial peaking factor of 1.6 (i.e. MDD/ADD)

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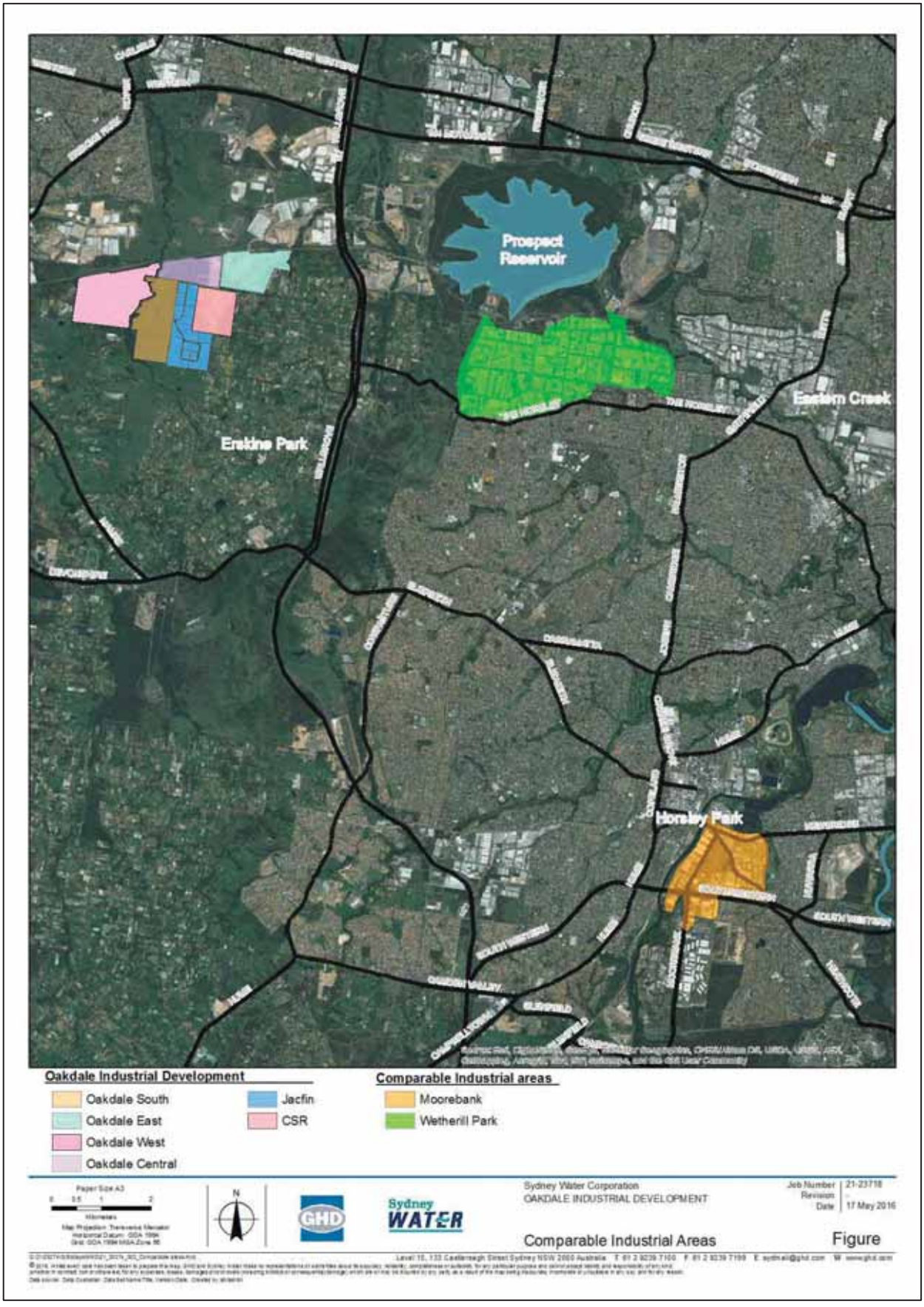

Figure 2- Comparable Industrial Areas

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4.2 Future Max Day Demand Projections

The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfer into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d (i.e. The Hoxton Park Recycled Water top-up water demand pattern will be employed)
- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with revised demand assumptions (Table 4)

The revised future demand projections are presented in Table 5. The residential growth sites details are provided in Appendix D.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

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Appendix A- Oakdale Industrial Detailed Development

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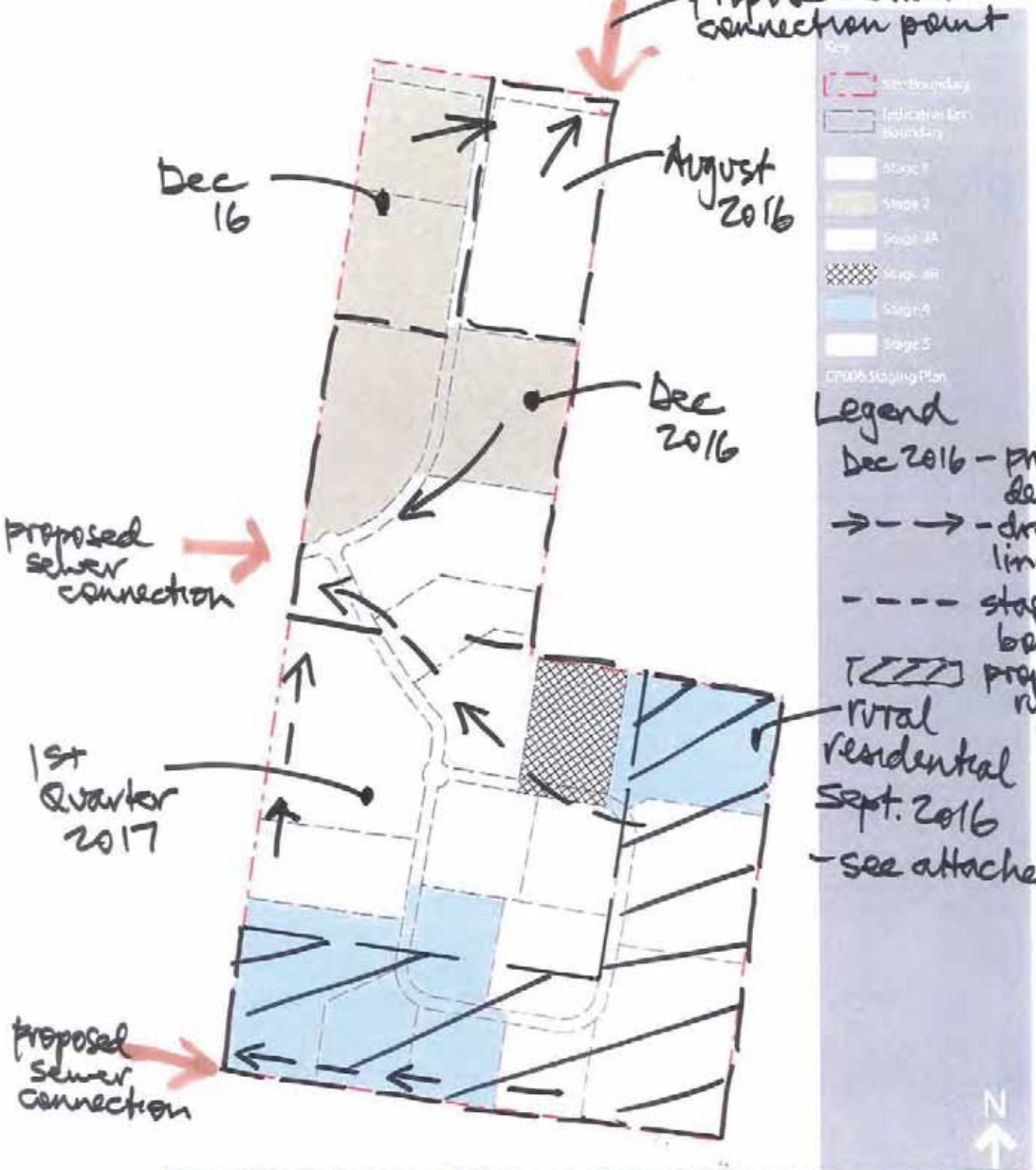
CENTRAL Area Schedule

TOTAL LAND AREA		612,065 sqm
Lot	**Site Area**	**Building Area**
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,693 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,080 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

APPENDIX 1
STAGING PLAN



Lot A Burley Road, Horsley Park Employment Precinct - Staging Plan
Prepared for Jacfin Pty Ltd
13 June 2012
1:5000 @ A3

JBA planning

NSW Government
Department of Planning and Infrastructure

Jacfin
Staging / Development Timing

ROAD = DC DATE
Site Area Schedule
Total Site Area 117.00 ha
Less:
Non Developable Land 35.85 ha
Easements 3.73 ha
Regional Roads 1.74 ha
Services Lot 1.66 ha
Estate Roads 5.38 ha
48.36 ha
Development Areas
Precinct 1 18.81 ha
Precinct 2 4.38 ha
Precinct 3 16.53 ha
Precinct 4 9.45 ha
Precinct 5 14.01 ha
Precinct 6 7.09 ha
Total Developable 70.28 ha
Total Warehouse 376,295 sqm
Total Office 19,585 sqm
Total Facility 395,880 sqm
OAKDALE WEST
LOT 1
DP 120679
Proposed Western North South Link Road
Proposed Southern Link Road
Transmission Easement
Goodman
BRICKWORKS
PRECINCT 6
2019
6A
6B
3C
2019
3B
2017
PRECINCT 3
3A
2017
Site Access
Transmission Easement
10m Riparian Setback
15m Riparian Setback
30m Riparian Setback
Future Elevated Regional Road Min 4.5m Clearance at Millner Ave
Approved Millner extension and roundabout refer SSD 6088
OAKDALE CENTRAL
30m Wide Road Reserve
Estate Road 04
Estate Road 05
Estate Road 01
Estate Road 02
Estate Road 03
5A
PRECINCT 5
2017
4B
4C
PRECINCT 4
2019
4A
Services Lot
2A
PRECINCT 2
2018
2B
1C
2018
PRECINCT 1
1D
2017
1A
2017
1B
2017
SBA ARCHITECTS
Oakdale South Estate
Horsley Park
SSDA Masterplan
1:2500 @ A1
1:5000 @ A2
04 Sept 2015
OAK MP 02 (K)

Goodman

BRICKWORKS

OAKDALE WEST
- ESTIMATED TABLE UP FOR SERVICING

SEE DRAWING OAK MP03 FOR CONTINUATION

Site Area Schedule

Total Site Area	154.10 ha
Less:	
Non Developable Land	32.01 ha
Easements	22.55 ha
Regional Roads	6.43 ha
Estate Roads	8.74 ha
	69.73 ha
Development Areas	
Precinct 1	21.72 ha
Precinct 2	21.61 ha
Precinct 3	18.51 ha
Precinct 4	22.56 ha
Precinct 5	6.05 ha
Total Developable	90.45 ha
Total Warehouse	455,233 sqm
Total Office	22,685 sqm
Total Facility	477,918 sqm

PRELIMINARY

SBA ARCHITECTS

Oakdale West Estate
Horsley Park

SSDA Estate Masterplan

1:2500 @ A1
1:5000 @ A3
03 Feb 2016

OAK MP 02 (G)

Russell Hogan

From: Russell Hogan
Sent: Wednesday, March 2, 2016 3:11 PM
To: Mahmood Hossain (Mahmood.Hossain@ghd.com); 'Amir Rashidi (Amir.Rashidi@ghd.com)'
Subject: RE: Oakdale LASP update
Attachments: Appendix 2 Subdivision Development Application Plans.pdf

Gents,

Please see below staging horizons for CSR land.

Goodman information to follow shortly.

Also please see attached CSR proposed staging plan.

Regards,

Russell Hogan
Civil Project Manager

at&l

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North Sydney NSW 2060

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F 02 9923 1055
russell@atl.net.au
www.atl.net.au

From: Pasalich, Wayne [mailto:WPASALICH@csr.com.au]
Sent: Tuesday, March 1, 2016 5:52 PM
To: Russell Hogan <Russell@atl.net.au>; Claire Kollaras <Claire.Kollaras@calibreconsulting.co>
Cc: Rachel Owen <Rachel.Owen@calibreconsulting.co>; Stuart Green <Stuart.Green@calibreconsulting.co>; Inbox <inbox1@atl.net.au>
Subject: RE: Oakdale LASP update

Russell

Claire is away on leave currently so I can address any queries you have. The current anticipated deliver program is as follows;

Stage	Registration Date	Notes
1	Q2 2017	Earlier connection would be beneficial as we have sold the property and the new owners are looking to make an early start on the works
2	Q1 2018	
3	TBA	No fixed date for this stage as the business does not currently have any plans to shut down the factory in the short term

LOT SUMMARY

STAGE 1
101-102 = 2 INDUSTRIAL LOTS

STAGE 2
201-204 = 4 INDUSTRIAL LOTS
205 = 1 ENVIRONMENTAL LOTS

STAGE 3
301-308 = 8 INDUSTRIAL LOTS

LEGEND

(A) OLD WALLGROVE ROAD

ENVIRONMENTAL CONSERVATION

REDUCTION RATIO

PLAN 1:2000 @ A1, 1:4000 @ A3

DATUM	AHD	DESIGN	P.L.	CHECKED	P.L.
SURVEY		TRACED	A.C.	DATE	12-10-2012

SCALE 1:2000 (A1) SCALE 1:4000 (A3)

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BROWN Smart Consulting

CSR

PROPOSED SUBDIVISION
OVER LOT 1 IN D.P. 106143 BEING PROPERTY AT
327-335 BURLEY ROAD, HORSLEY PARK
OVERALL PLAN

ISSUE	DESCRIPTION	DATE
0	ORIGINAL ISSUE	12-10-12

DRAWING No. X13044.P_ST0

AMEND 0

SHEET 1 OF 4 SHEETS

Appendix B- Detail Water Demand Calculations

Industrial- Max Day Demand	15	kL/Nha/day
Residential- Max Day Demand	2.2	kL/dwelling/day

Development site	Precinct	Area (ha)	Development type	Timing	Average Day Demand (Ml/d)	Maximum Day Demand (Ml/d)	Maximum Hour Demand (Ml/d)
Oakdale South	1	18.8	Light industrial/warehouse	2017-2018	0.17	0.28	0.44
	2	4.4	Light industrial/warehouse	2018	0.04	0.06	0.10
	3	16.5	Light industrial/warehouse	2017-2019	0.15	0.24	0.39
	4	9.5	Light industrial/warehouse	2019	0.09	0.14	0.22
	5	14	Light industrial/warehouse	2017	0.13	0.21	0.33
	6	7	Light industrial/warehouse	2019	0.06	0.10	0.16
Oakdale East	1	95	Light industrial/warehouse	2022-2024	0.87	1.40	2.24
Oakdale West	*1*	21.7	Light industrial/warehouse	2019	0.20	0.32	0.51
	2	21.6	Light industrial/warehouse	2019-2020	0.20	0.32	0.51
	3	18.5	Light industrial/warehouse	2020	0.17	0.27	0.44
	4	22.6	Light industrial/warehouse	2021-2020	0.21	0.33	0.53
	5	6.1	Light industrial/warehouse	2020	0.06	0.09	0.14
Oakdale Central	*1A*	4.1	Light industrial/warehouse	Built	0.04	0.06	0.10
	1B	5.9	Light industrial/warehouse	Built	0.05	0.09	0.14
	1C	4.6	Light industrial/warehouse	Q1-2016	0.04	0.07	0.11
	2A	7.5	Light industrial/warehouse	Built	0.07	0.11	0.18
	2B	6.0	Light industrial/warehouse	Q1-2016	0.06	0.09	0.14
	3A	1.6	Light industrial/warehouse	2017	0.01	0.02	0.04
	3B	5.8	Light industrial/warehouse	Q4-2016	0.05	0.09	0.14
	3C	5.6	Light industrial/warehouse	2017	0.05	0.08	0.13
	3D	1.9	Light industrial/warehouse	2017	0.02	0.03	0.04
	Lot 4	2.2	Commercial/café /light industrial	2017	0.02	0.03	0.05
Jacfin	1	3.6	Light industrial/warehouse	2016	0.03	0.05	0.08
	2	17.4	Light industrial/warehouse	2016	0.16	0.26	0.41
	3	21.6	Light industrial/warehouse	2017	0.20	0.32	0.51
	4	25.7	Residential low density (R4 Rural Residential)	2016	0.37	0.85	1.75
	5	19.5	Residential low density (R4 Rural Residential)	2016	0.28	0.64	1.33
CSR	1	10.1	Light industrial/warehouse	2017	0.09	0.15	0.24
	2	32.34	Light industrial	2018	0.30	0.48	0.76
		11.5	Environmental conservation area (Open Space)		0.00	0.00	0.00
	3	21	Light industrial	2020	0.19	0.31	0.49
Grand Total		**463.6**			**4.39**	**7.48**	**12.7**

Note 1: Timeframes are subject to change

Note 2: No water demand assumed for environmental conservation area within the CSR

Note 3: Additional development within Oakdale East

GHD
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Appendix C- Existing system demands assessment

Cecil Park supply system current demand

Historical system demand in the last 10 years was assessed to calculate the average day demand and to identify a suitable maximum day demand (MDD) event. Data from flow meter WF0557 downstream of Prospect Creek Pumping Station WP0184 and the reservoir level trends of Cecil Park Reservoirs were considered for the mass balance (i.e. flow data were not available from 2006 to 2009). The mass balance carried out for the above period indicated the highest max day value in November 2015 (i.e. 21.8 Ml/d).

However, this event is not acceptable due to an open DV between Cecil Park and Liverpool system. Sydney Water advice to adopt the GSS peaking factor (i.e. MDD/ADD: 2.80).

Minchinbury supply system current demand

Analysis of historical Minchinbury system demand in IICATS (i.e. past 10-year data) revealed the highest max day value in 15 January 2015. Details of selected peak demand event is provided in Table 6.

Table 6 Historical demand assessment (Ml/d)

	Cecil Park Supply System	Minchinbury Supply System	Notes
Average day demand (ADD)	6.7	32.1	# Cecil Park: 20 Nov 2015 # Minchinbury: 15 Jan 2014
Maximum day demand (MDD)	21.8	50.2	
MDD/ ADD ratio	**2.80**	**1.56**	

The Table 7 below outlines the calculated MDD per demand category in Cecil Park and Minchinbury models. The individual demand category max day factors were based on the guideline factors applied to the actual MDD/ADD.

Table 7 Current maximum day demand breakdown

Demand Category	Cecil Park Water Supply System			Minchinbury Water Supply System		
	ADD (Ml/d)	MDD factor	MDD (Ml/d)	ADD (Ml/d)	MDD factor	MDD (Ml/d)
Residential (LD)	2.07	3.24	6.40	19.7	1.74	34.4
Residential (HD)	0.02	3.19	0.03	1.9	1.44	2.8
Commercial	3.38	3.05	7.49	1.7	1.52	2.6
Industrial	0.51	3.70	1.58	2.4	1.21	2.9
Other	0.23	1.89	2.54	2.2	1.52	3.3
UFW	0.7	1.0	0.7	4.2	1.0	4.2
Total	**6.87**	**2.80**	**18.75**	**32.1**	**1.56**	**50.2**

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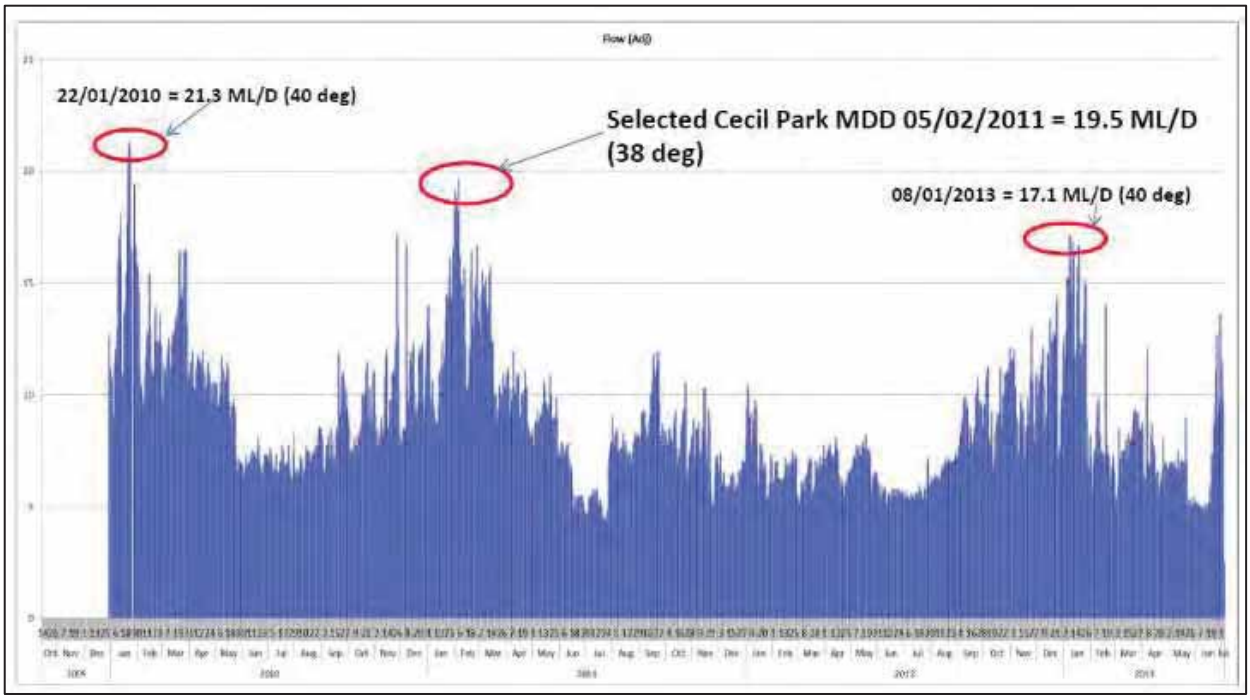
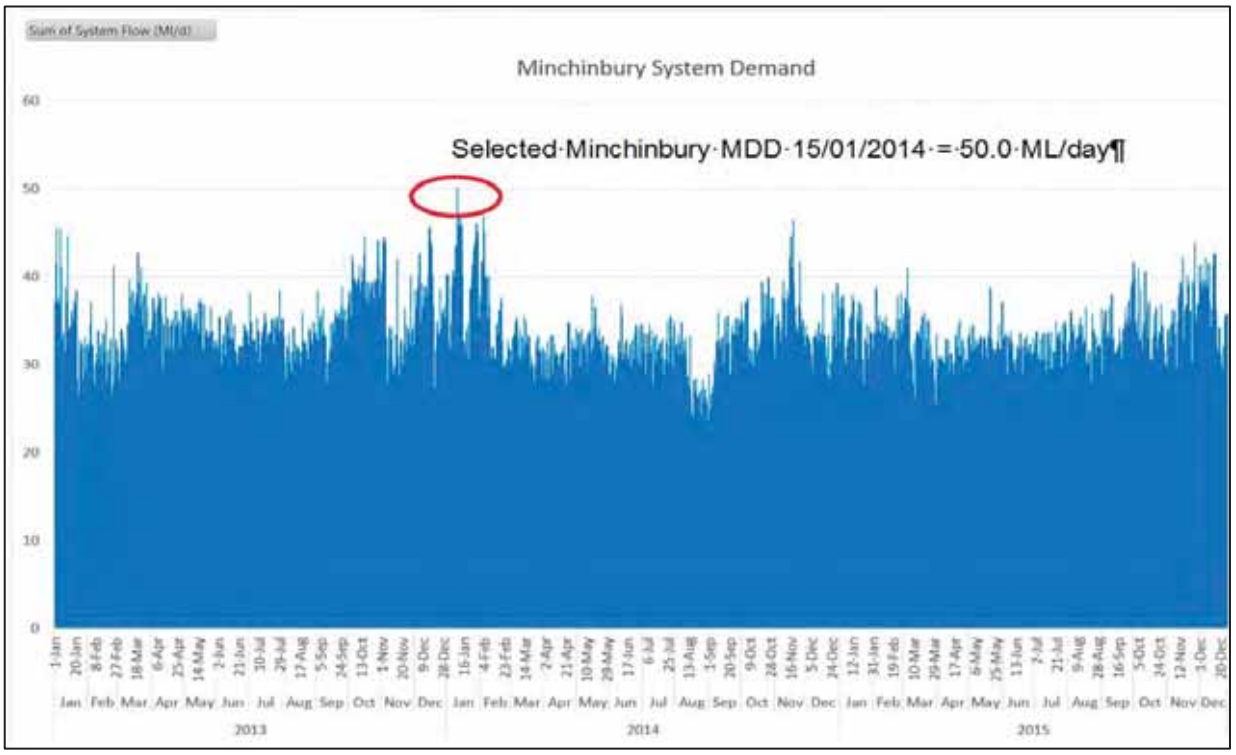
Cecil Park historical system demand analysis within the last 10 years demonstrated in figure below.



IICATS	Average (ML/d)	Maximum (ML/d)	MDD/ADD
Cecil Park	7.9	19.5 (1)	2.46

Note 1: Include 0.7 ML/day recycled water component that is potable water and should be subtracted from IICATS data. Hence, current max day of Cecil Park = 18.8 ML/day

Minchinbury historical system demand analysis demonstrated in figure below.



Appendix D- Residential growth sites

Residential Growth Sites – Dwellings (Cumulative)

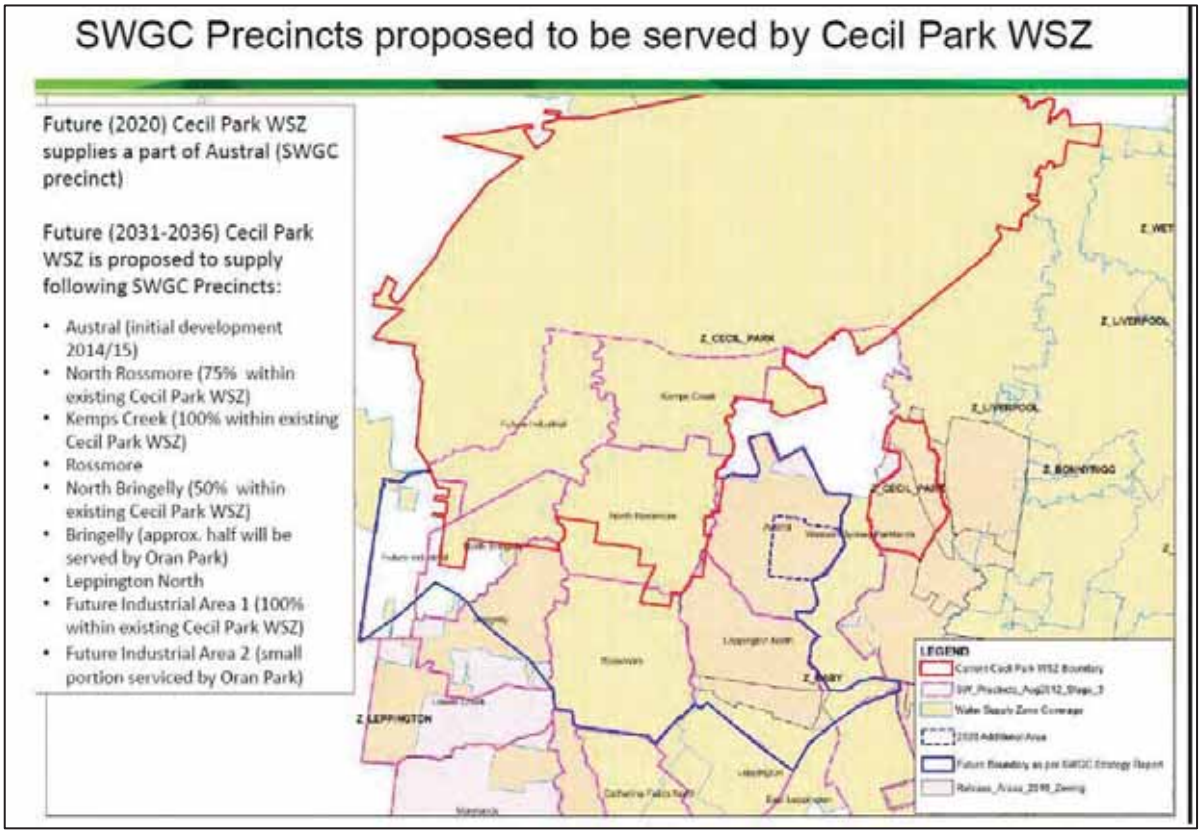
Precincts site names	Short (2011-2015)	Medium (2016-2020)	Comment
MDP Sites and Release Areas*			
Twin Creeks, Luddenham	244	326	-
Capitol Hill Drive, Mt Vernon	0	102	-
Aerodrome	500	850	-
South Hoxton Park	1,115	2,230	Hoxton Park Recycled Water Scheme
SWGC Precincts supplied via Cecil Park WSZ in future***			

Precincts site names	2020	2031	2036	Comment
North Bringelly	0	242	3,434	100% Cecil Park
North Rossmore	0	2272	5,464	100% Cecil Park
Rossmore	0	329	2,882	100% Cecil Park
Austral		3,650	5,200	100% Cecil Park
Bringelly	0	0	1,267	50% Cecil Park and 50% Oran Park (future)
Kemps Creek	0	0	1,132	100% Cecil Park
Leppington North	0**	4,400	5,600	100% Cecil Park

*Growth provided by the Department of Planning and Environment in a form of Housing Supply Forecast Model (HSFM) table which contains an incremental growth per property for 2015 and 2020 planning horizons

** There are 700 dwellings forecast for Leppington North by 2020 however the initial servicing (up to 2020) for Leppington North is from Carnes Hill water supply zone as per the SWGC Servicing Strategy

*** These SWGC precincts are located outside of the existing Cecil Park zone boundary however the Cecil Park zone boundary will be extended in the future to enable supply from Cecil Park Reservoirs to these precincts



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Appendix B – Detailed Cost Estimation

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -2-3-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:32**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m	350	238	83,204
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	350	18	6,190
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	88	434	37,980
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	127,374	0.75	95,530
		Sub Total Direct Costs						**222,904**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		22,290
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		44,581
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		43,466
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		116,634
		Total Construction Cost						**449,875**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		4,499
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -2-3-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:32**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		22,494
25		SWC Project Management Costs (% of Construction Costs)			5.00%		22,494
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		2,474
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**551,836**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central- 2-4-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **04/07/2016 11:29**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,200	314	377,012
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m	0	569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,200	21	25,713
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	300	485	145,440
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	548,164	0.75	411,123
		Sub Total Direct Costs						**959,287**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		95,929
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		191,857
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,061
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		501,947
		Total Construction Cost						**1,936,081**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		19,361
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central- 2-4-	Estimate Date:	10/06/2016
Estimator:	Amir Rashidi	Print Date/Time:	04/07/2016 11:29
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		96,804
25		SWC Project Management Costs (% of Construction Costs)			5.00%		96,804
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,648
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,209,698**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -4-5-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:46**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m	900	238	213,954
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	900	18	15,917
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	225	434	97,662
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	327,533	0.75	245,650
		Sub Total Direct Costs						**573,183**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		57,318
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		114,637
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		111,771
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		299,918
		Total Construction Cost						**1,156,827**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		11,568
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -4-5-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:46**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		57,841
25		SWC Project Management Costs (% of Construction Costs)			5.00%		57,841
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		6,363
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,340,440**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -4-7

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **04/07/2016 11:30**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	700	314	219,923
4		Water Main Greenfield PVC		375 dia	m	0	407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	700	21	14,999
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	175	485	84,840
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	319,762	0.75	239,822
		Sub Total Direct Costs						**559,584**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		55,958
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		111,917
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		109,119
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		292,802
		Total Construction Cost						**1,129,380**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		11,294
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name:	Oakdale Central -4-7	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**04/07/2016 11:30**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		56,469
25		SWC Project Management Costs (% of Construction Costs)			5.00%		56,469
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		6,212
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,309,824**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -5-6-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m	850	191	162,010
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m		314	0
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	850	15	12,431
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	213	409	86,959
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	261,400	0.75	196,050
		Sub Total Direct Costs						**457,450**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		45,745
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		91,490
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		89,203
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		239,361
		Total Construction Cost						**923,249**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		9,232
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -5-6-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		46,162
25		SWC Project Management Costs (% of Construction Costs)			5.00%		46,162
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		5,078
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				of Client Costs	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,079,883**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -7-8-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:47**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,200	314	377,012
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,200	21	25,713
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	300	485	145,440
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	548,164	0.75	411,123
		Sub Total Direct Costs						**959,287**
		INDIRECT COSTS				%		
17		Contractor Design Costs (% of Direct Costs)				10.00%		95,929
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		191,857
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,061
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		501,947
		Total Construction Cost						**1,936,081**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		19,361
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -7-8-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:47**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		96,804
25		SWC Project Management Costs (% of Construction Costs)			5.00%		96,804
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,648
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,209,698**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central -7-9-

Estimator: Amir Rashidi

Estimate Date: **10/06/2016**

Print Date/Time: **10/06/2016 18:48**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Water Main Greenfield PVC		200 dia	m		191	0
2		Water Main Greenfield PVC		250 dia	m		238	0
3		Water Main Greenfield PVC		300 dia	m	1,600	314	502,682
4		Water Main Greenfield PVC		375 dia	m		407	0
5		Water Main Greenfield DICL		450 dia	m		569	0
6		EO Rock Excav Trench Std Dpth - 200 Dia (1%RK-100%RK)	%RK-->	30	m	0	15	0
7		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
8		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,600	21	34,284
9		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
10		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
11		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
12		EO Road Restoration Trench Std Depth		300 dia	m	400	485	193,920
13		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
14		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
15		EO Road Restoration Trench Std Depth		200 dia	m	0	409	0
	H1	**Scope Contingency**						
16		Urban Detailed Planning		75	%	730,885	0.75	548,164
		Sub Total Direct Costs						**1,279,049**
		INDIRECT COSTS				**%**		
17		Contractor Design Costs (% of Direct Costs)				10.00%		127,905
18		Contractor Indirect Costs (% of Direct Costs)				20.00%		255,810
19		Contractor Margin (% of DC+Indirect Costs)				15.00%		249,415
20		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		669,263
		Total Construction Cost						**2,581,442**
		SWC CLIENT COSTS				**% of ConstC**		
21		SWC Costs to Date	Current as at:					
22		SWC Design Costs (% of Construction Costs)				1.00%		25,814
23		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central -7-9-	Estimate Date:	**10/06/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**10/06/2016 18:48**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
24		SWC Planning Costs (% of Construction Costs)			5.00%		129,072
25		SWC Project Management Costs (% of Construction Costs)			5.00%		129,072
26		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		14,198
27		SWC Land Acquisition/Easement Costs					
28		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,929,598**

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Appendix E

Local Area Servicing Plan (Wastewater) -GHD

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Wastewater

July 2016

GHD Disclaimer

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in Basis of Planning report (i.e. TM-01). GHD disclaims liability arising from any of the assumptions being incorrect.

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GHD has prepared preliminary Cost Estimates in this report. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the works can or will be undertaken at a cost which is the same or less than the Cost Estimate.

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev. 01	M Hossain	M Healey		M Healey		5/05/16
Rev 02	M Hossain	M Hossain		M Healey		20/05/16
Rev 03	M Hossain	M Hossain		M Healey		30/06/16

Document Status

Oakdale Industrial Development June 2016

This report has been prepared by GHD

Approved for Issue

Signature	Date	Signature	Date	Signature	Date
Kym Dracopoulos		Russell Hogan		Amir Rashidi	
Manager, Technical		Project Manager		Project Manager	
Goodman Property Services (AUST) Pty Ltd		AT&L Associates		GHD	

Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

Signature	Date	Signature	Date
VSamarasinghe	20/07/16	R Schuil	20/7/16
Vajira Samarasinghe		Richard Schuil	
Principal Planner		Engineering & Planning Manager	
Engineering & Environmental Services		Growth Centres	
Sydney Water		Sydney Water	

Approved

Signature	Date
	27/7/16
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via the East St Clair carrier. The extension of East St Clair Carrier is complete. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No.8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignment and trigger points (i.e. development timing and staging) for delivery of wastewater infrastructure to service the Oakdale Precinct.

GHD have also undertaken wastewater modelling of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development to ensure compliance with Sydney Water's performance requirements.

The hydraulic assessment determined that there were no fundamental issues with the design of the East St. Clair Carrier Extension.

System Performance Assessment

Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather performance criteria under both 2020 and 2036 flow condition with exception of a small number of sewers which marginally fail to meet the criteria. However, these are not considered severe enough to warrant augmentation.

The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.

However, the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario). Although there is no direct impact to the branch which receives flow from Oakdale developments, as a system there is an issue.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

The 2014 GSS recommended the upgrade of downstream pumping station SP0204 meets the minimum detention time of 4 hours for 2036 flow condition.

Growth forecast

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. Growth projections within the Oakdale Industrial Development are summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection [1]
Oakdale Central	45.2	IN1 – General Industrial	2016-2017
Jacfin	87.8	IN1 – General Industrial/ Residential	2016-2017
Oakdale South	70.2	IN1 – General Industrial	2017-2019
CSR	63.4	IN1 – General Industrial	2017-2020
Oakdale West	90.5	IN1 – General Industrial	2019-2021
Oakdale East	95.0	IN1 – General Industrial	2022-2024
Grand Total	**452**		

The calculated wastewater loads for the Oakdale Industrial Development are presented below within Table 2.

Table 2 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

The preliminary capital cost estimates associated with Oakdale Industrial wastewater servicing is presented below in Table 3.

Table 3 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

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Appendix C – Wastewater Modelling Run Codes

Appendix D – Dry Weather System Performance

Appendix E – Wet Weather (Design Event) System Performance (2036)

Appendix F – Cost Estimates

1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via East St Clair carrier. The extension of East St Clair Carrier is in progress. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

Assets required to service proposed Goodman, Jacfin and CSR developments at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to demonstrate that the proposed development can be serviced by the East Clair carrier with the wastewater infrastructure detailed and document the expected performance of the wastewater system.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing, staging & timing of connection to SWC network) for the delivery of wastewater infrastructure required to service the Oakdale Precinct.

1.3 Scope

The scope of the wastewater modelling is to:

- Assess the current design of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development and the downstream trunk sewers for 2020 and 2036 growth scenarios.

The assessment examined a range of performance requirements including:

- Dry weather performance (Hmax/d)
- Carrier performance in wet weather design storm (35th largest rainfall event within the 10 year rainfall series)
- Constructed overflow and maintenance hole spilling performance based on a 10 year long term model simulation.
- Dry weather contingency storage of downstream pumping station SP0204.

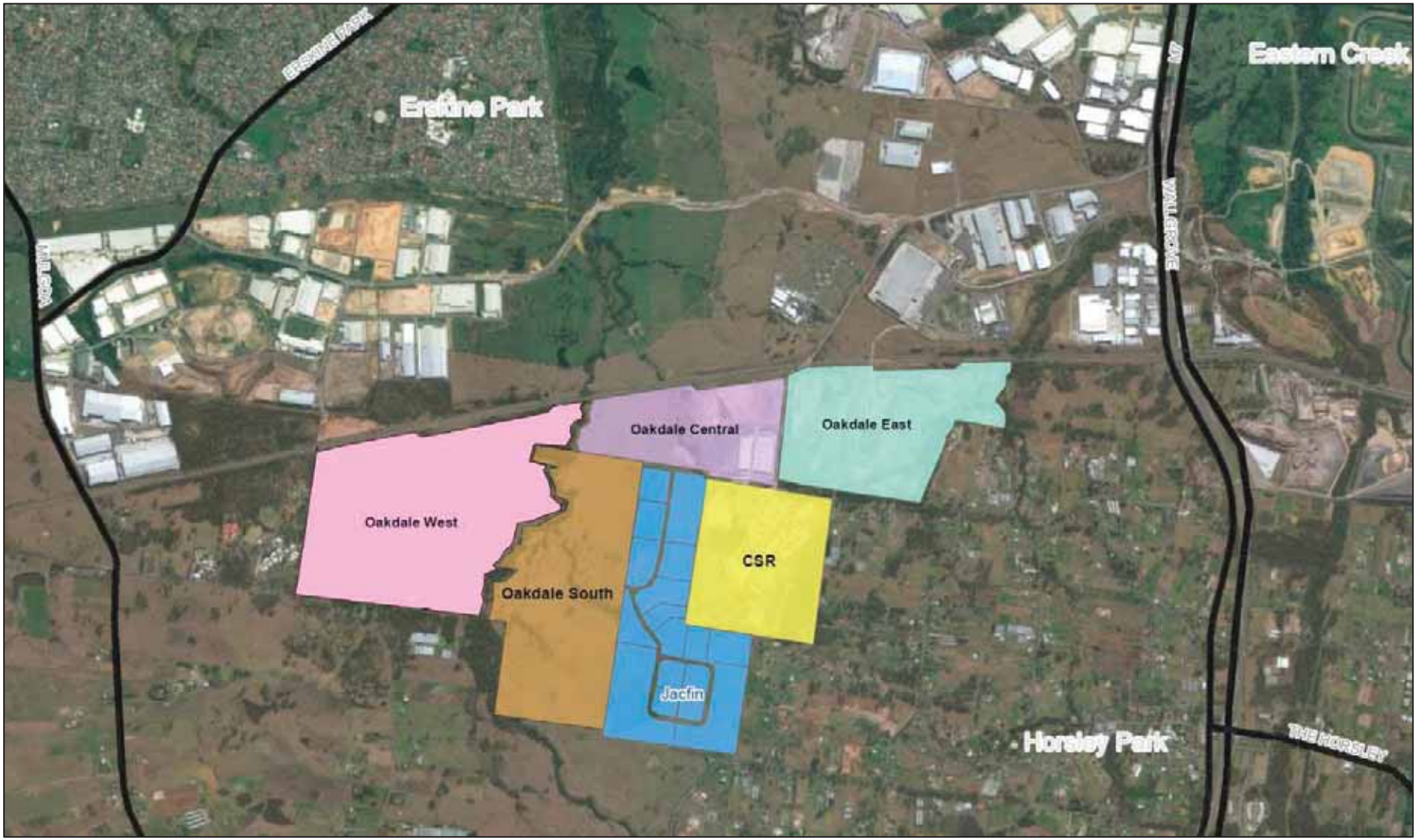


Figure 1 Oakdale Industrial Development Overview

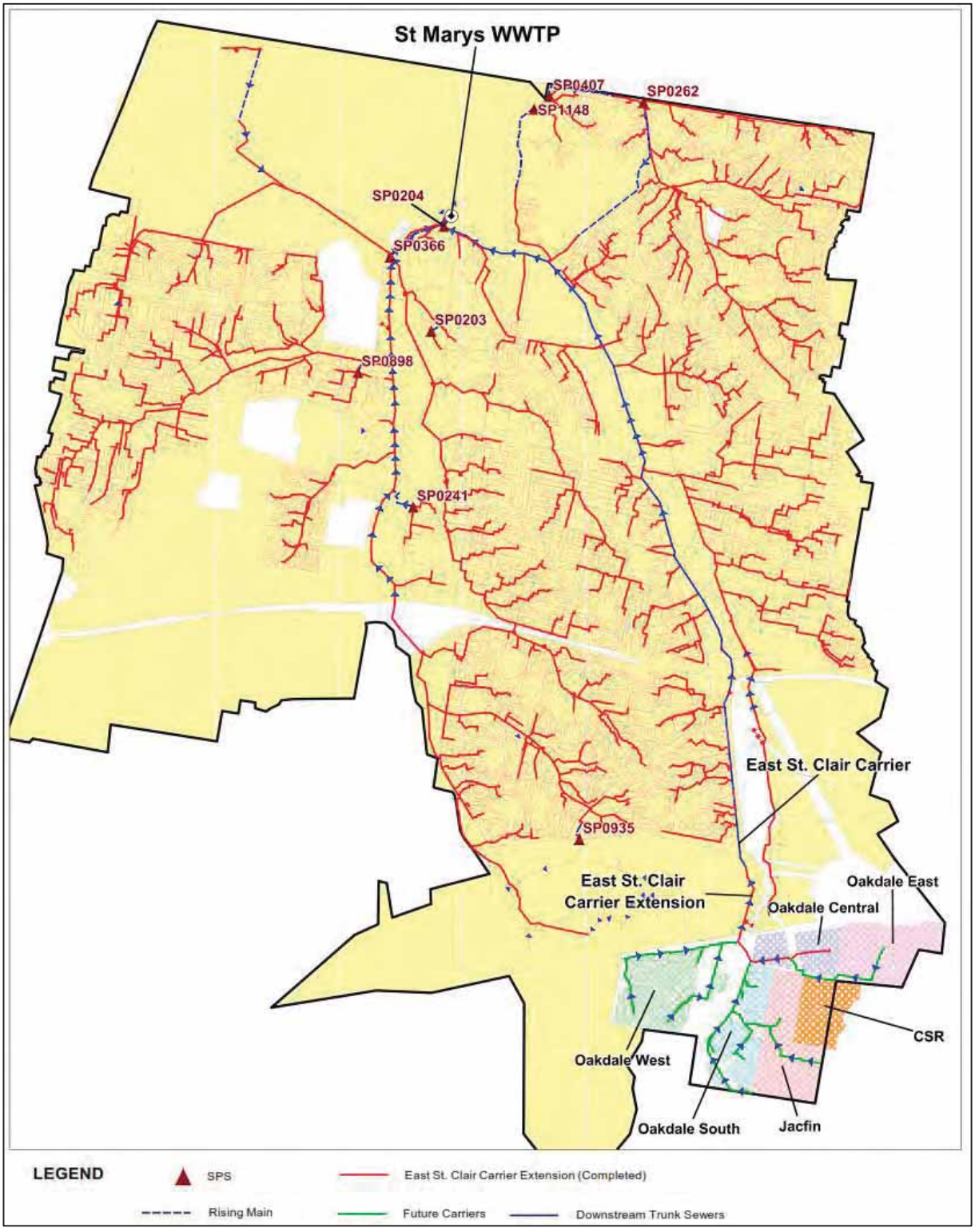


Figure 2 Overview of East St Clair carrier

2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1-General Industrial	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0	IN1-General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1-General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8	IN1-General Industrial	Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin (2)	1	3.6	IN1-General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	RU4-Rural Residential	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1-General Industrial	2017
	2	20.8		2018
		11.5	Environmental /Open Space	
	3	21.0	IN1-General Industrial	2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The timeframes are subject to change

Note 2: Sydney Water has queried growth forecasts shown above for Jacfin lands noting that these growth forecasts appear optimistic in consideration of current market demands, comparison growth forecasts for surrounding developers, Jacfin current and required approvals and construction requirements. Jacfin however have reconfirmed these growth forecasts and hence this report and modelling has been completed on this basis,

Note 3: The above growth projections have been provided by the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

3. Forecast Wastewater Loads

The following outline of wastewater discharge provides predicted Average Dry Weather Flow (ADWF) based on projected development loads.

The following broad assumptions were used to develop the estimate of discharge.

- 15 residential lots per gross hectare of nominated residential area within the development.
- 3.5 EP per residential lot and
- 75 EP per gross hectare of non-residential development derived from Wastewater Network Growth Servicing Strategy Criteria and Guideline 2012. (i.e. Assume Gross hectare = 1.25 × net hectares)

The Oakdale Industrial wastewater loads summarised in Table 5.

Table 5 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

4. Wastewater System Performance

4.1 Acceptable Dry Weather System Performance (2020 & 2036)

Wastewater system modelling indicates that there is no discharge occurrence in any part of the entire St Marys system including the new developments in Oakdale during dry weather for both 2020 and 2036 flow condition.

Modelling also shows that almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. The dry weather system performance for 2020 and 2036 scenario is shown in Figure 3 and Figure 4 respectively.

In the 2020 flow condition, there are four sections of sewer on East St. Clair Carrier Extension that marginally exceeds the dry weather performance criteria as have flow depth ratio (Hmax/D) varies between 0.60 to 0.65. There is one section on the downstream East St. Clair Carrier that has a flow depth ratio (Hmax/D) of 0.65 in 2020 flow condition.

In 2036, there are five more sections on East St. Clair Carrier Extension and three more sections on the downstream East St. Clair Carrier that exceed the flow depth ratio (Hmax/D) of 0.6. Hmax/d value on East St. Clair Carrier Extension vary from 0.64 to 0.76 and on the downstream East St. Clair Carrier vary from 0.62 to 0.75. The Hmax/d values of all the sewers servicing Oakdale industrial development and the downstream trunk sewers are presented in Appendix D.

The sections on East St. Clair Carrier Extension which exceed the flow depth ratio (Hmax/D) of 0.6 are already been constructed. Also the Hmax/D values are only marginally higher than 0.6 and are not considered severe enough to warrant augmentation.

HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2020 and 2036 PDWF condition is shown in Appendix E.

4.2 Dry Weather Emergency Storage (2020 & 2036)

Modelling indicates that the downstream pumping station SP0204 fails to meet the minimum detention time of 4 hours for 2020 and 2036 flow condition. This pumping station will have a detention time of only 0.9 and 0.8 hours for the year 2020 and 2036 respectively. From an earlier 2014 GSS study, this station was found to have a detention time of only 1.50 hours for the existing (2011) scenario.

SP0204 have a standby pump to manage any mechanical failure. But It does not have dual power supply although have provision for installing generator.

SP0366 dual power supply recommended in GSS report has now been installed. With the dual power feeder at SP0366, cross connection valve will open automatically should signal from SP0204 fail. This will allow storage at SP0366 to be utilised should SP0204 fail and increase detention time of SP0204 to 4 hours in 2036 flow condition.

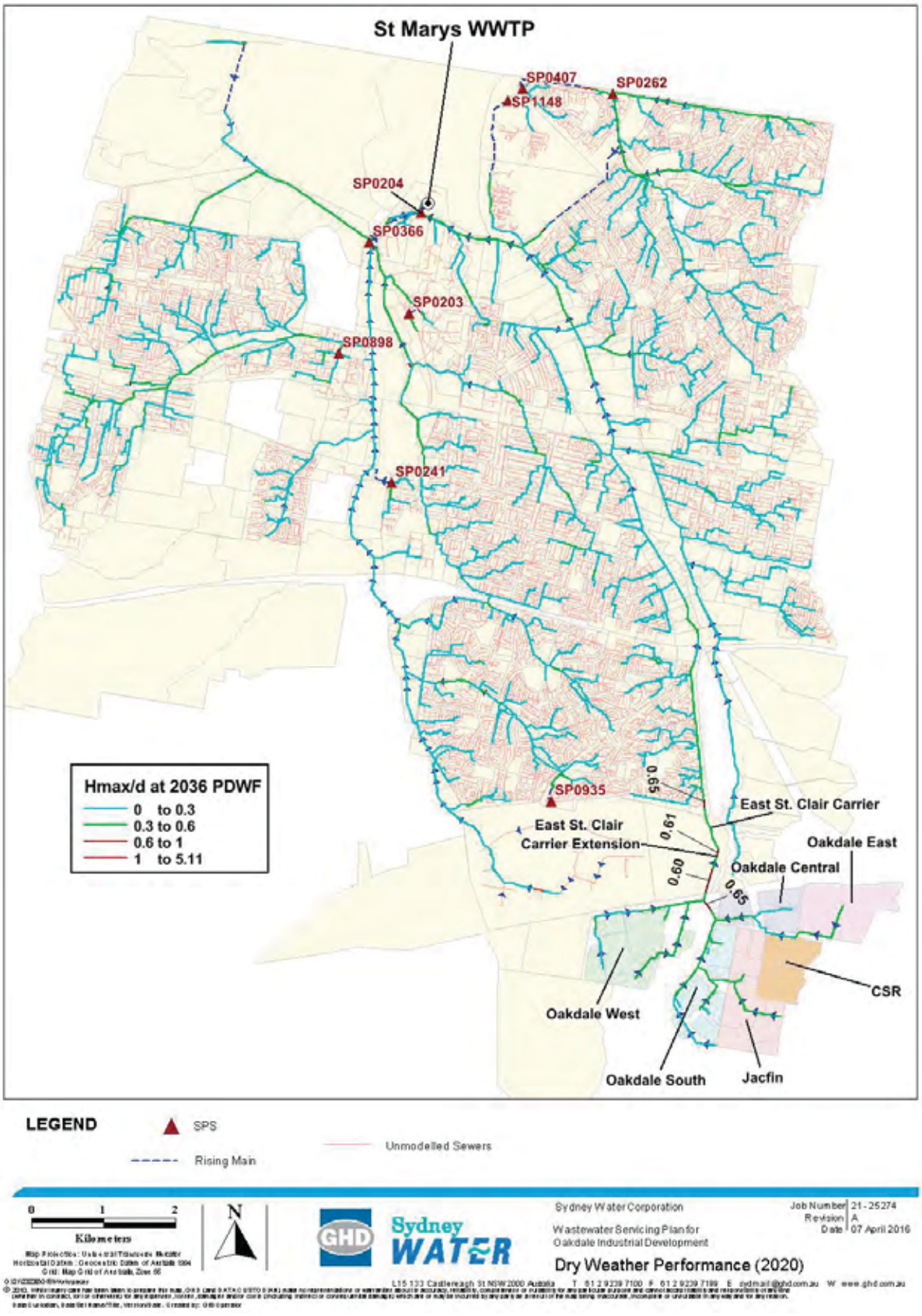


Figure 3 Dry Weather Performance (2020)

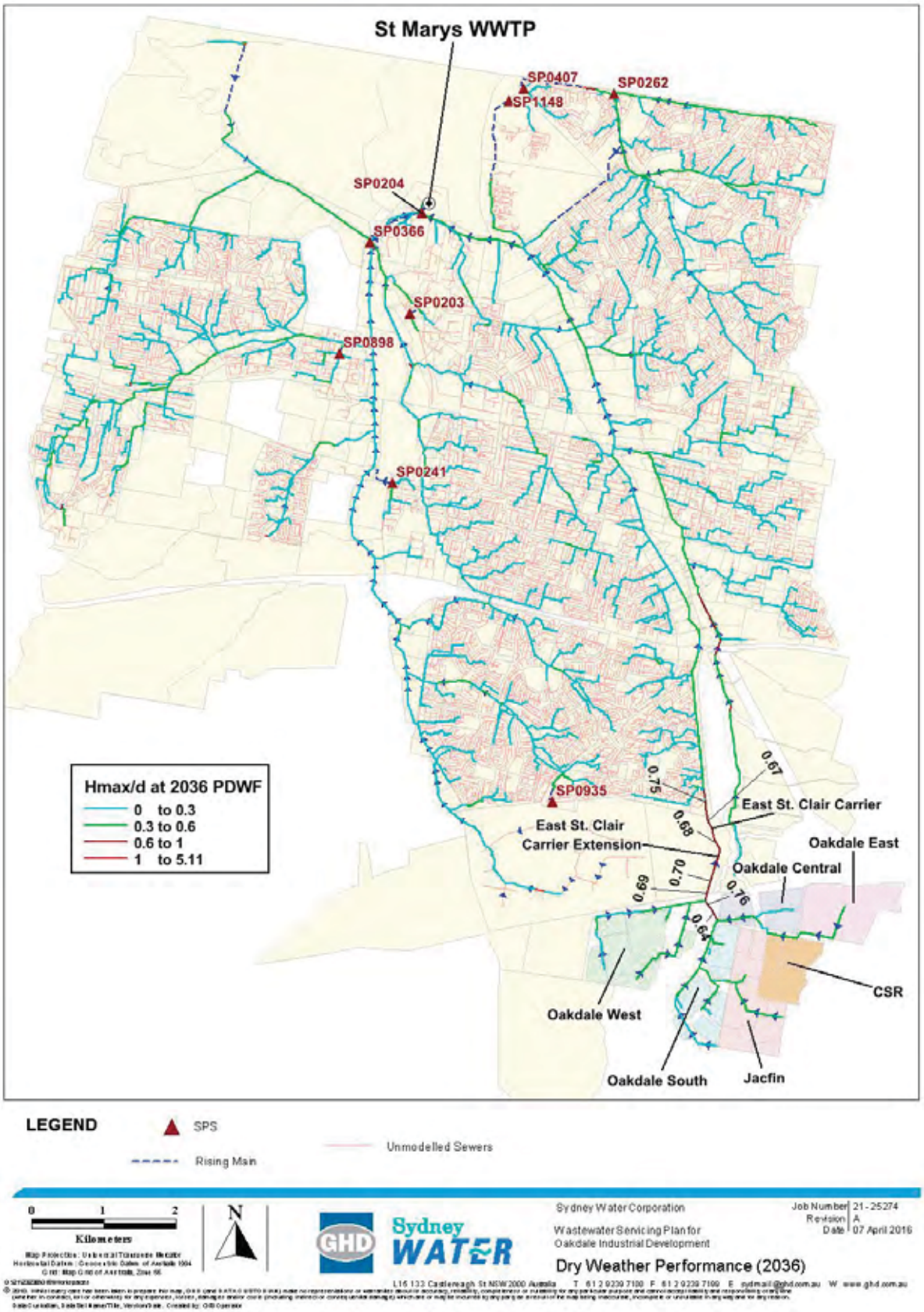


Figure 4 Dry Weather Performance (2036)

4.3 Acceptable Wet Weather System Performance (2036)

The 2010-2015 Environment Protection Licence (EPL) for the St Marys Sewerage Treatment System limits the wet weather overflow frequency to 35 overflows in 10 years. The new license for 2015-2020 is still under negotiation with the EPA. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system will comply with this limit for the 2036 planning horizon. The wet weather performance of the designed overflows and the activated maintenance holes within the Oakdale industrial development and the downstream trunk system in 2036 is presented in Table 6 and Figure 5.

The design wet weather event (35th largest rainfall event within the 10 year rainfall series) corresponds to the overflow frequency limit in the EPL. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system have sufficient capacity in the design wet weather event. The HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in the design wet weather event is shown in Appendix E.

However it should be noted that the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years. The existing system performance is 40 events in 10 years, and in 2036 the system performance will increase to 50 events in 10 years. Although there is no direct impact to the branch which receives flow from Oakdale developments.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

Table 6 Wet Weather Performance (2036)

Location	Maintenance Hole ID	Overflow Events/10 Years	Volume (M3/yr)
Designed Overflows			
East St. Clair Carrier Extension	NEWMH06	7	842
East St. Clair Carrier	1394290	17	616
Ropes Creek Carrier Sec.6	1066026	11	157
Ropes Creek Carrier Sec.3	1281835	10	3,364
Ropes Creek Carrier Sec.1	1280786	14	19,017
Ropes Creek Carrier Sec.1	1282022	20	19,531
SPS204 Inlet	1404019	22	729
Maintenance Holes			
East St. Clair Carrier	NEWMH01	3	10
East St. Clair Carrier Extension	NEWMH09	2	9
East St. Clair Carrier Extension	NEWMH10	2	33
Oakdale South	NEWMH40	1	0.02
Jacfin Extension	NEWMH86	4	44

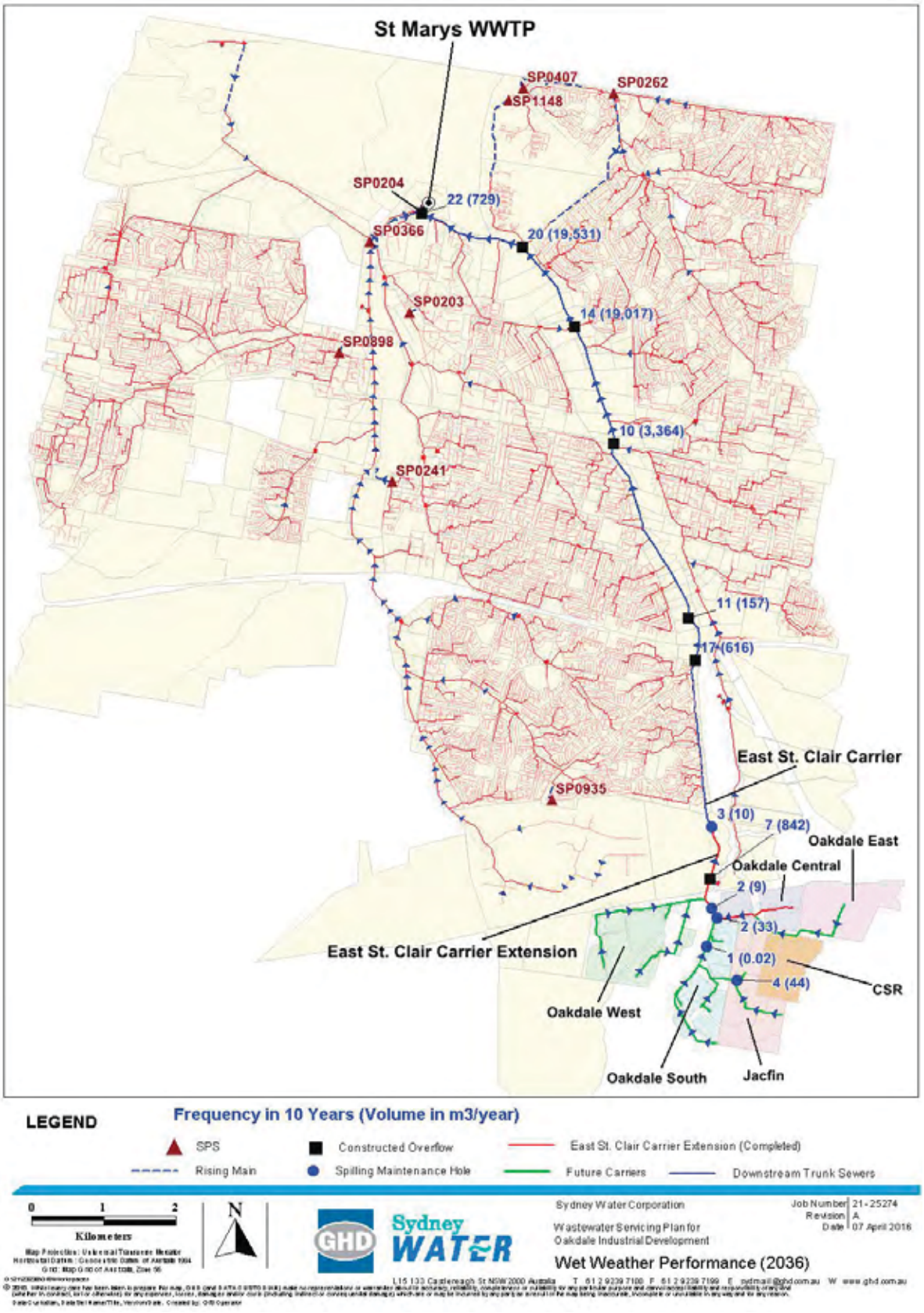


Figure 5 Wet Weather Performance (2036)

4.4 Conclusion

- Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. However these are not considered severe enough to warrant augmentation.
- The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.
- The overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario).
- The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.
- With 2014 GSS recommended upgrade the downstream pumping station SP0204 will meet the minimum detention time of 4 hours for 2036 flow condition.

5. Staging Plan for Future Infrastructure

The staging for the future gravity sewers will be in line with the proposed timing of the development. Sydney Water Cost Estimation tool employed in order to estimate the preliminary capital cost for each development.

The infrastructure required to service the new development areas along with their proposed timing and cost is presented in Table 7 and in Figure 6.

Table 7 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

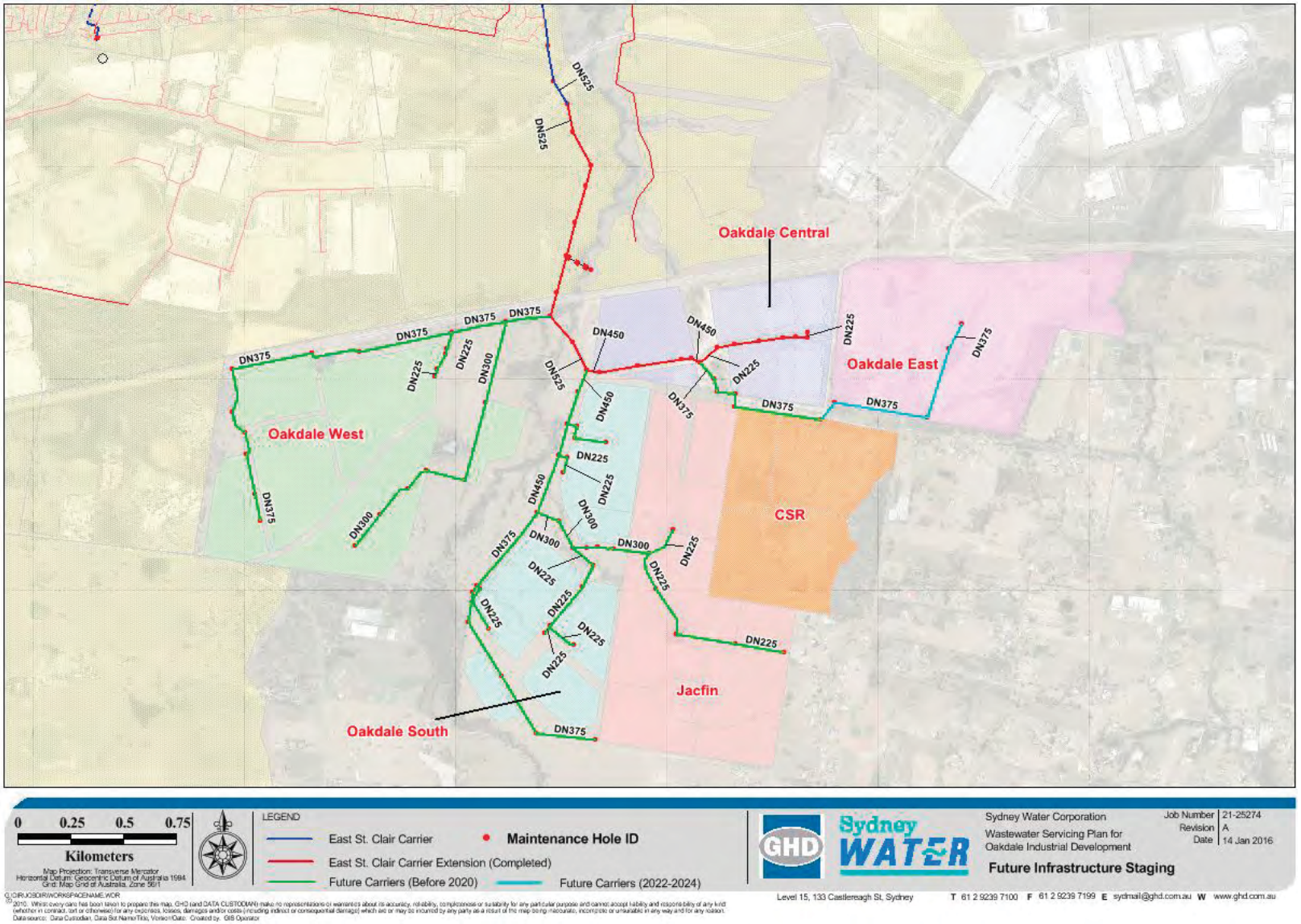


Figure 6 Future Infrastructure Staging

Appendices

Appendix A – Wastewater Planning Criteria

This Appendix details the planning criteria to be adopted for the wastewater component of the project. The following documents, referenced in Table 8, were consulted in developing the wastewater planning criteria:

Reference 1 Hydraulic Design Guidelines for Wastewater System Detail Planning, Sydney Water Corporation, June 2010

Reference 2 Sewerage Code of Australia (WSA-02-2002.2.2 – Sydney Water Edition 1, Version 3)

Reference 3 Sewage Pumping Station Code (WSA 04-2005-2.1, Sydney Water edition 1)

Reference 4 Wastewater Network Growth Servicing Strategy – Criteria and Guidelines 2012

Reference 5 Pressure Sewerage Code of Australia (WSA 07-2007 Version 1.1)

Reference 6 Wastewater Network Growth Servicing Strategy Criteria and Guideline (2012)

Table 8 Wastewater Planning Criteria

Item	Design Criteria	Units	Wastewater	Source
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3.5 EP/dwelling to be used	Reference 6
Light Industrial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Commercial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
			weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\ StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development and sewerage networks	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1 Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	No deterioration in the existing areas for future scenarios. Use the existing I/I	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve ‘RES1’ and commercial curve ‘COM1’ will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4

Item	Design Criteria	Units	Wastewater	Source
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW) storage	m3	In general, the containment of dry weather (DW) emergency storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate storage volume for a period of maximum four hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	Reference 3
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through

Item	Design Criteria	Units	Wastewater	Source
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	endorsement of this tech memo
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	Reference 4
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3 EP/dwelling to be used	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
Non-residential	Equivalent Population (Floor Space) (FS)	EP	Future non-residential growth forecast within development areas to be obtained from agreed growth forecast provided and endorsed by Sydney Water	Sydney Water
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	Sydney Water
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1

Item	Design Criteria	Units	Wastewater	Source
and sewerage networks				Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	Included in the base model provided by Sydney Water.	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve 'RES1' and commercial curve 'COM1' will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW)	m3	In general, the containment of dry weather (DW) emergency	Reference 3

Item	Design Criteria	Units	Wastewater	Source
	storage		storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate the maximum storage volume for the agreed retention hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: less than 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through endorsement of this tech memo
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be	Reference 4

Item	Design Criteria	Units	Wastewater	Source
			investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	

Appendix B – Model Update

2036 Scenario

The 2036 Post GSS model (run code: **SMJA** located in: **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Jacfin\Network\Sewer**) was used as the base model for this project. The following changes were made to the base model as shown in Figure 7.

- Storage at SP0262 and SP0366 are removed as were part of an option and do not exist in the network.
- Duplicate pipe from MH1273705 to MH1276269 is removed as was part of an option and does not exist in the network.
- The size and alignment of the East St. Clair Carrier SEC.2 (from NEWMH01 to NEWMH15) is updated as per the work as executed drawing (Case No. 134866WW)
- The size and alignment of the East St. Clair Carrier Extension (from NEWMH15 to NEWMH24) is added as per the drawing of Oakdale Servicing Plan.
- All the other future sewers are added as per "PM11329S-J baseplan only Bound-Model.pdf" provided by AT&L. The size of these sewers are estimated with flow schedule and the ground level of the maintenance holes are taken from ground level contours.
- The size and slope of all the sewers servicing Oakdale industrial development are presented in Appendix D.

The following changes were made to the catchments and its design loadings in the base model.

- The size, location and the design loadings of the existing catchments within the Oakdale industrial development were based on previous assumptions and are significantly different from the current plan. Hence these catchments are deleted from the model.
- Among all the developments, Oakdale East is planned to develop at the latest in 2022-2024. A master plan is not yet developed for this site. This catchment is added into the model as per Figure 1 (provided by AT&L) with an estimated EP of 8,906 and ADWF of 1.34 ML/D.
- Oakdale West, Oakdale South and Oakdale Central catchments are added as per the Masterplan prepared by Goodman (see Figure 9, Figure 10 and Figure 11 respectively) with an estimated EP of 8,480, 6,581 and 4,236 respectively and ADWF of 1.27, 0.99 and 0.64 ML/D respectively.
- The catchments for the CSR site are added as per the proposed subdivision prepared by Brown Consulting (see Figure 12) with an estimated EP of 5,944 and ADWF of 0.89 ML/D.
- The catchments for the Jacfin site are added as per the proposed development plan provided by Jacfin (see Figure 13) with an estimated EP of 6,960 and ADWF of 1.04 ML/D.

2020 Scenario

The following changes were made to the updated 2036 scenario model to get the 2020 scenario model as shown in Figure 8.

- As Oakdale East is planned to be developed beyond 2020, this catchment and its loading is deleted.
- The dry and wet weather parameters of all catchments outside the Oakdale industrial development are replaced with the same parameters from 2020 GSS model (run code: **SMSC** located in: **P:\GSS2013-14WW\STS\StMarys\Network\Sewer**)

The description of the run codes for the base case and the updated models are presented in Appendix A. The location of all these models in the server is **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Oakdale Development**.

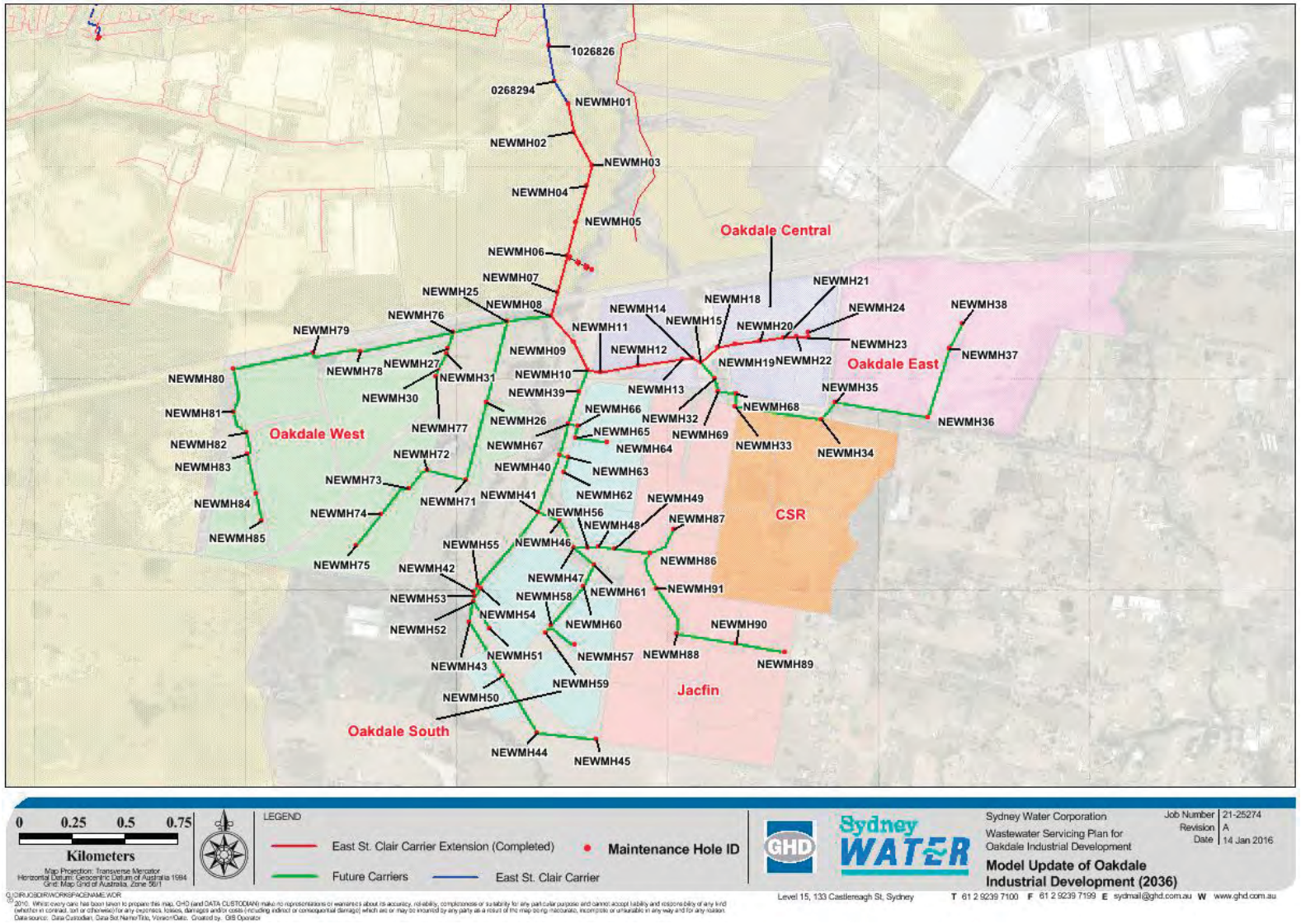


Figure 7 Model Update to 2036 Scenario

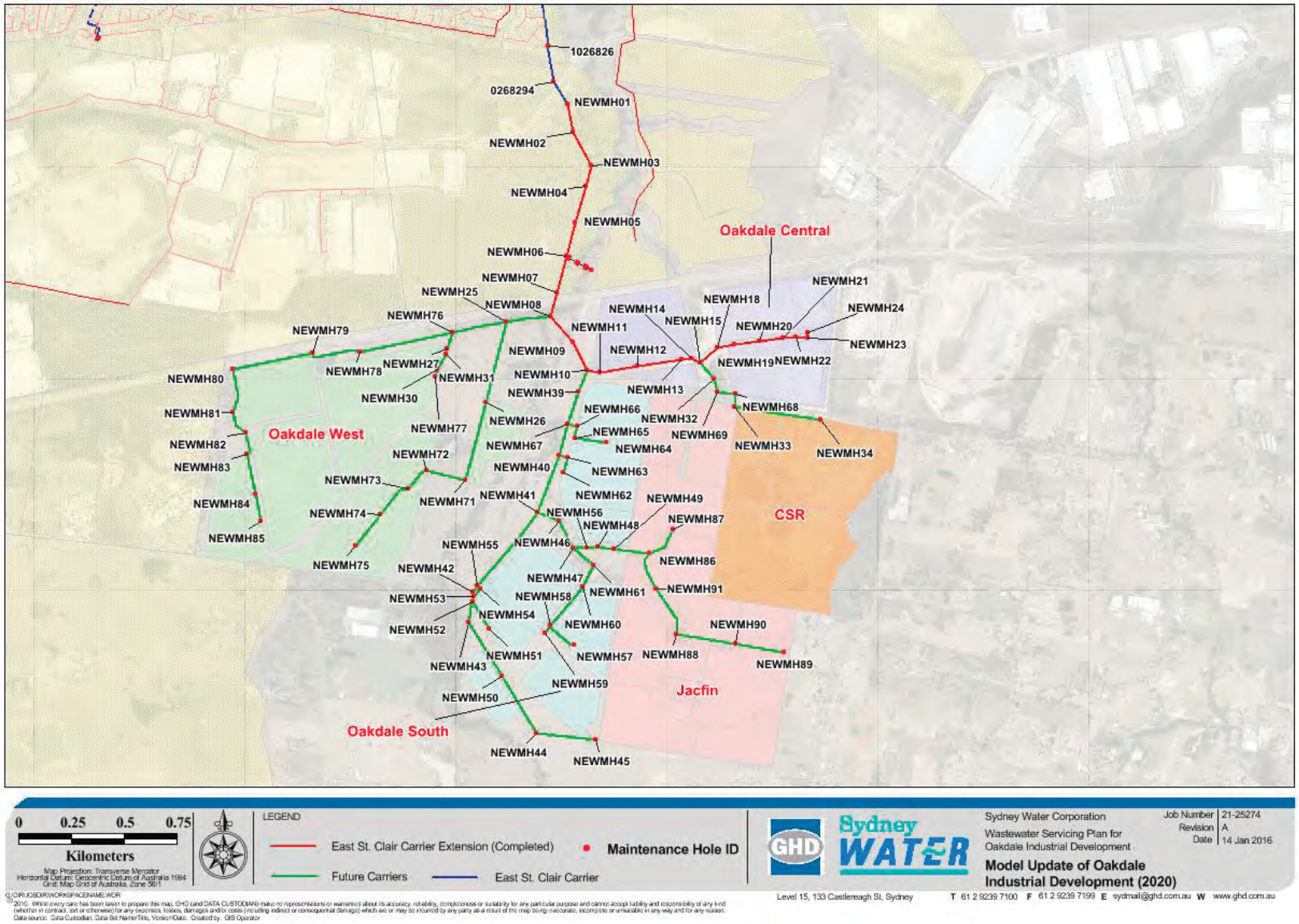


Figure 8 Model Update to 2020 Scenario

Figure 9 Oakdale West Estate Masterplan

Figure 10 Oakdale South Estate Masterplan

CENTRAL Area Schedule		
TOTAL LAND AREA		612,065 sqm
Lot	Site Area	Building Area
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,893 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,060 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

Figure 11 Oakdale Central Estate Masterplan

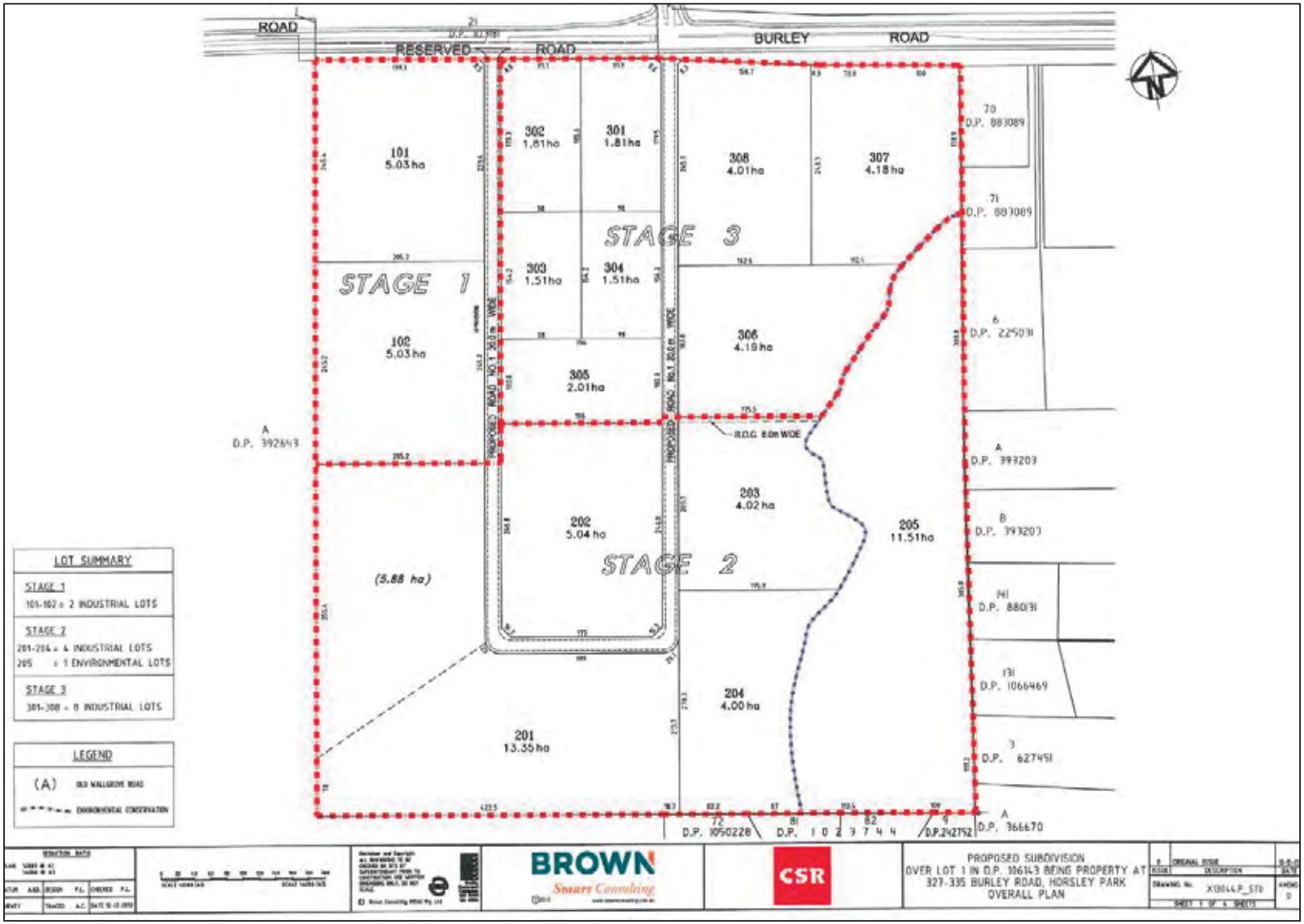


Figure 12 Proposed Subdivision of CSR Site

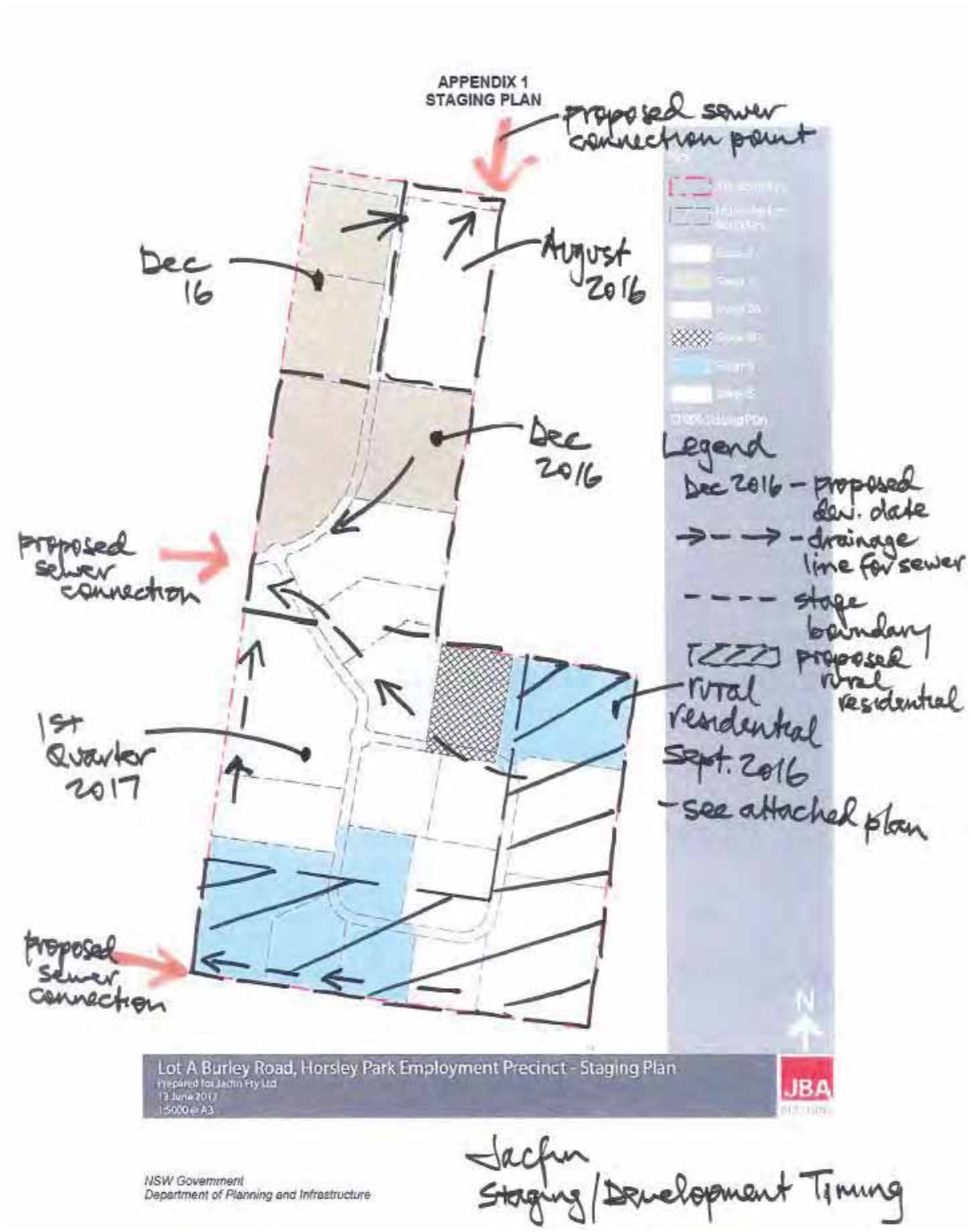


Figure 13 Proposed Development Plan for Jacfin Site

Appendix C – Wastewater Modelling Run Codes

The run codes used for the base and the updated models (2020 and 2036 scenarios) are presented in the following Table.

Planning Year	Base Model	Updated with Oakdale Industrial Development
2036	SMJA	SMJD
2020	SMJD	SMJE

Appendix D – Dry Weather System Performance

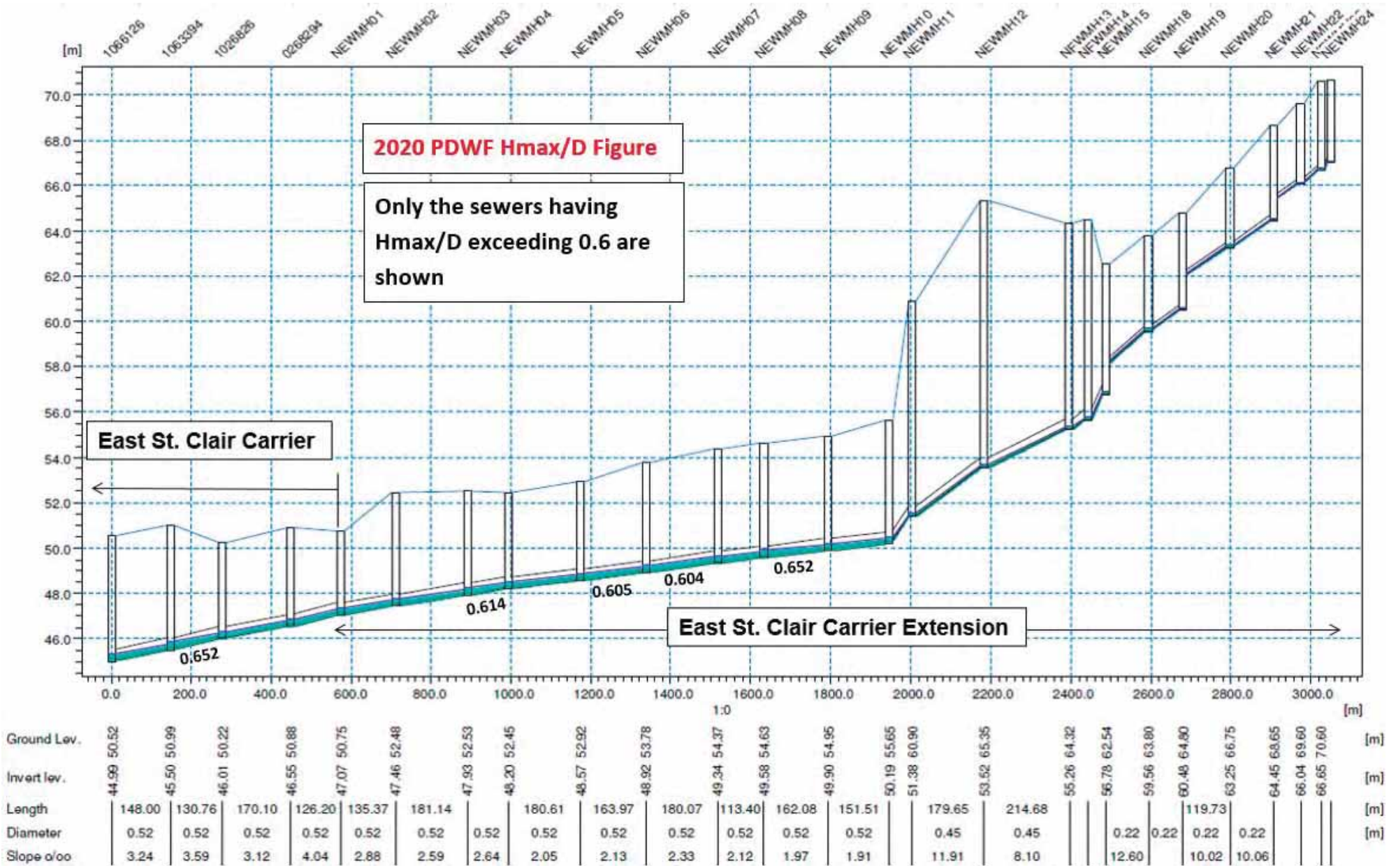
U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
East St. Clair Carrier Extension									
NEWMH24	NEWMH23	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH23	NEWMH22	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH22	NEWMH21	225	0.95	5	0.216	0.78	5	0.216	0.78
NEWMH21	NEWMH20	225	1.01	5	0.213	0.8	5	0.213	0.8
NEWMH20	NEWMH19	225	1.00	9	0.296	0.96	9	0.296	0.96
NEWMH19	NEWMH18	225	1.01	9	0.295	0.96	9	0.295	0.96
NEWMH18	NEWMH15	225	1.26	9	0.279	1.04	9	0.279	1.04
NEWMH15	NEWMH14	450	2.58	23	0.339	0.77	55	0.531	0.99
NEWMH14	NEWMH13	450	0.83	23	0.297	0.75	55	0.458	0.97
NEWMH13	NEWMH12	450	0.81	24	0.386	0.62	55	0.573	0.83
NEWMH12	NEWMH11	450	1.19	29	0.36	0.79	60	0.524	1
NEWMH11	NEWMH10	450	1.81	29	0.374	1.14	60	0.499	1.41
NEWMH10	NEWMH09	525	0.19	81	0.531	0.77	113	0.643	0.84
NEWMH09	NEWMH08	525	0.20	81	0.652	0.65	113	0.756	0.74
NEWMH08	NEWMH07	525	0.21	112	0.596	0.89	143	0.693	0.95
NEWMH07	NEWMH06	525	0.23	112	0.604	0.9	143	0.704	0.96
NEWMH06	NEWMH05	525	0.21	112	0.605	0.89	143	0.705	0.94
NEWMH05	NEWMH04	525	0.20	112	0.594	0.89	143	0.691	0.95
NEWMH04	NEWMH03	525	0.26	112	0.614	0.89	143	0.71	0.96
NEWMH03	NEWMH02	525	0.26	112	0.587	0.94	143	0.679	1
NEWMH02	NEWMH01	525	0.29	112	0.578	0.96	143	0.664	1.03
Oakdale Central									
NEWMH24	NEWMH23	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH23	NEWMH22	225	1.02	5	0.212	0.8	5	0.212	0.8
NEWMH22	NEWMH21	225	0.95	5	0.216	0.78	5	0.216	0.78
NEWMH21	NEWMH20	225	1.01	5	0.213	0.8	5	0.213	0.8
NEWMH20	NEWMH19	225	1.00	9	0.296	0.96	9	0.296	0.96
NEWMH19	NEWMH18	225	1.01	9	0.295	0.96	9	0.295	0.96
NEWMH18	NEWMH15	225	1.26	9	0.279	1.04	9	0.279	1.04
Oakdale East									
NEWMH38	NEWMH37	375	0.51	-	-	-	32	0.377	0.96
NEWMH37	NEWMH36	375	0.51	-	-	-	32	0.553	0.68
NEWMH36	NEWMH35	375	0.50	-	-	-	32	0.489	0.75
NEWMH35	NEWMH34	375	0.50	-	-	-	32	0.328	1.01
NEWMH34	NEWMH33	375	0.83	7	0.139	0.76	39	0.324	1.25
NEWMH33	NEWMH68	375	2.10	10	0.14	1.12	42	0.279	1.68
NEWMH68	NEWMH69	375	2.13	12	0.141	1.23	43	0.27	1.81

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
NEWMH69	NEWMH32	375	2.65	12	0.134	1.33	43	0.255	1.95
NEWMH32	NEWMH15	375	0.99	14	0.184	0.97	45	0.339	1.38
Oakdale West									
NEWMH85	NEWMH84	375	0.49	4	0.15	0.42	4	0.15	0.42
NEWMH84	NEWMH83	375	0.50	4	0.251	0.26	4	0.251	0.26
NEWMH83	NEWMH82	375	0.50	10	0.256	0.54	10	0.256	0.54
NEWMH82	NEWMH81	375	0.50	10	0.258	0.54	10	0.258	0.54
NEWMH81	NEWMH80	375	0.50	10	0.361	0.4	10	0.361	0.4
NEWMH80	NEWMH79	375	0.50	13	0.295	0.61	13	0.295	0.61
NEWMH79	NEWMH78	375	0.50	13	0.294	0.61	13	0.294	0.61
NEWMH78	NEWMH76	375	0.50	13	0.417	0.45	13	0.417	0.45
NEWMH76	NEWMH25	375	0.46	21	0.47	0.55	21	0.47	0.55
NEWMH25	NEWMH08	375	0.54	30	0.334	0.93	30	0.338	0.93
NEWMH77	NEWMH30	225	1.31	7	0.452	0.59	7	0.452	0.59
NEWMH30	NEWMH31	225	1.18	7	0.439	0.6	7	0.439	0.6
NEWMH31	NEWMH76	225	0.96	7	0.262	0.88	7	0.262	0.88
NEWMH75	NEWMH74	300	1.21	8	0.32	0.56	8	0.32	0.56
NEWMH74	NEWMH73	300	1.20	8	0.318	0.56	8	0.318	0.56
NEWMH73	NEWMH72	300	1.21	8	0.347	0.52	8	0.347	0.52
NEWMH72	NEWMH71	300	1.20	8	0.345	0.52	8	0.345	0.52
NEWMH71	NEWMH26	300	1.21	8	0.359	0.5	8	0.359	0.5
NEWMH26	NEWMH25	300	1.18	10	0.587	0.38	10	0.587	0.38
Oakdale South									
NEWMH45	NEWMH44	375	1.50	2	0.184	0.27	2	0.184	0.27
NEWMH44	NEWMH50	375	0.48	4	0.198	0.4	4	0.198	0.4
NEWMH50	NEWMH43	375	1.09	5	0.176	0.58	5	0.176	0.58
NEWMH43	NEWMH42	375	0.59	5	0.164	0.54	5	0.164	0.54
NEWMH42	NEWMH55	375	0.53	5	0.303	0.36	5	0.303	0.36
NEWMH55	NEWMH41	375	0.51	11	0.502	0.65	11	0.502	0.65
NEWMH41	NEWMH40	450	0.51	45	0.394	0.9	45	0.394	0.9
NEWMH40	NEWMH67	450	0.51	47	0.505	0.75	47	0.505	0.75
NEWMH67	NEWMH39	450	0.48	53	0.397	1	53	0.397	1
NEWMH39	NEWMH10	450	0.53	53	0.327	1.17	53	0.327	1.17
Oakdale South									
NEWMH49	NEWMH48	300	2.86	26	0.262	1.78	26	0.262	1.78
NEWMH48	NEWMH56	300	1.23	26	0.327	1.31	26	0.327	1.31
NEWMH56	NEWMH47	300	4.12	26	0.236	2.06	26	0.236	2.06
NEWMH47	NEWMH46	300	1.29	34	0.384	1.37	34	0.384	1.37
NEWMH46	NEWMH41	300	2.03	34	0.351	1.54	34	0.351	1.54
NEWMH59	NEWMH58	225	0.29	5	0.551	0.28	5	0.551	0.28

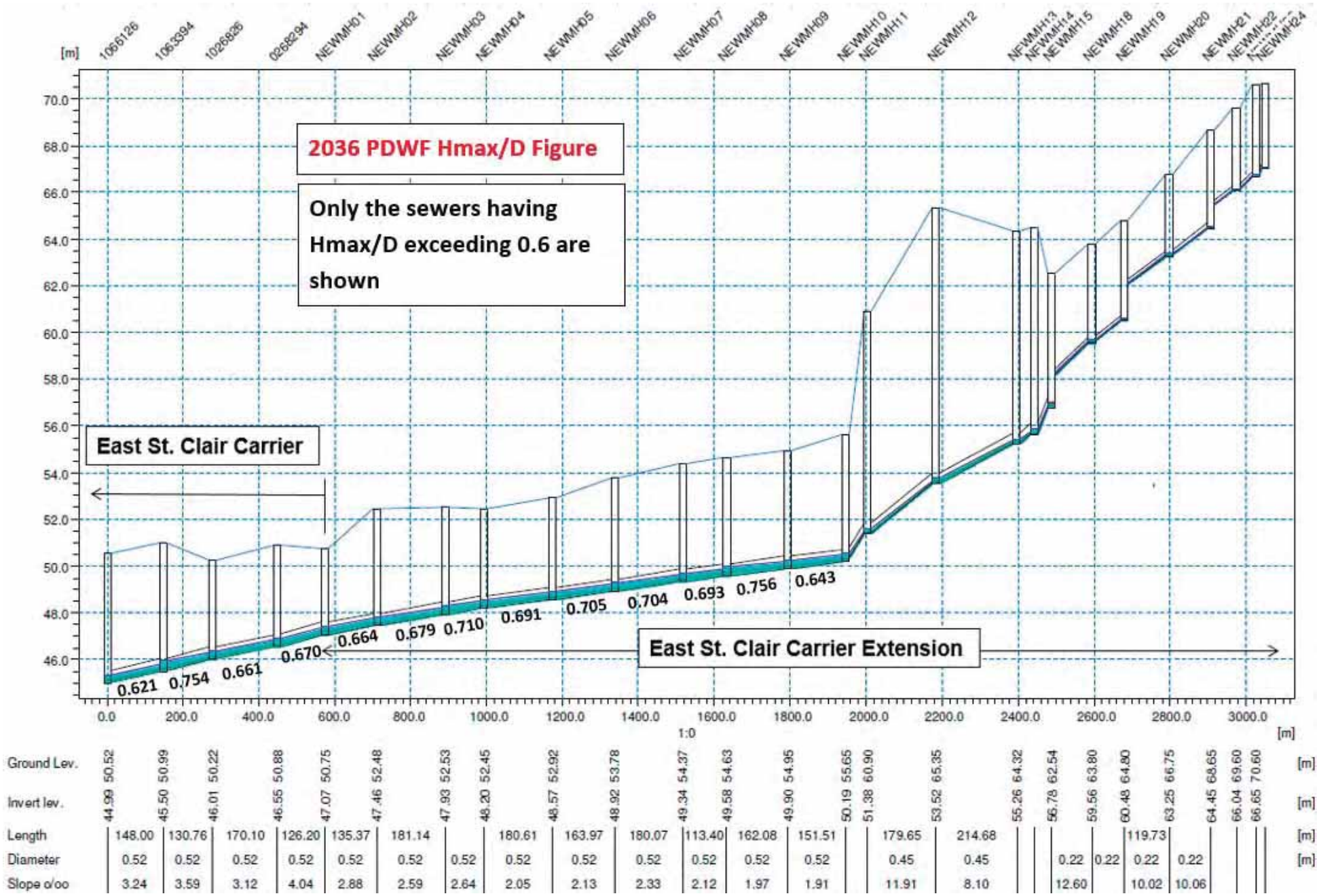
U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
NEWMH57	NEWMH58	225	1.16	3	0.166	0.74	3	0.166	0.74
NEWMH58	NEWMH60	225	0.67	8	0.447	0.58	8	0.447	0.58
NEWMH60	NEWMH61	225	2.17	8	0.52	0.59	8	0.52	0.59
NEWMH61	NEWMH47	225	0.51	8	0.321	0.72	8	0.321	0.72
NEWMH51	NEWMH52	225	1.40	6	0.249	0.81	6	0.249	0.81
NEWMH52	NEWMH53	225	0.63	6	0.265	0.66	6	0.265	0.66
NEWMH53	NEWMH54	225	0.62	6	0.37	0.5	6	0.37	0.5
NEWMH54	NEWMH55	225	0.66	6	0.263	0.67	6	0.263	0.67
NEWMH62	NEWMH63	225	0.70	1	0.238	0.29	1	0.238	0.29
NEWMH63	NEWMH40	225	0.70	1	0.129	0.49	1	0.129	0.49
NEWMH64	NEWMH65	225	3.79	6	0.465	0.58	6	0.465	0.58
NEWMH65	NEWMH66	225	1.24	6	0.456	0.52	6	0.456	0.52
NEWMH66	NEWMH67	225	1.25	6	0.228	0.93	6	0.228	0.93
Jacfin Extension									
NEWMH89	NEWMH90	225	5.55	3	0.327	0.47	3	0.327	0.47
NEWMH90	NEWMH88	225	1.41	4	0.349	0.47	4	0.349	0.47
NEWMH88	NEWMH91	225	0.41	4	0.569	0.35	4	0.569	0.35
NEWMH91	NEWMH86	225	1.04	11	0.425	0.98	11	0.425	0.98
NEWMH86	NEWMH49	300	0.65	26	0.59	1.05	26	0.59	1.05
NEWMH87	NEWMH86	225	2.63	4	0.425	0.84	4	0.425	0.84
Downstream East St. Clair Carrier									
NEWMH01	268294	525	0.40	111	0.58	1.01	143	0.67	1.08
268294	1026826	525	0.31	112	0.571	0.99	143	0.661	1.05
1026826	1063394	525	0.36	112	0.652	0.9	143	0.754	0.96
1063394	1066126	525	0.32	112	0.536	1.04	144	0.621	1.11
1066126	1394278	525	0.32	113	0.453	1.2	145	0.533	1.25
1394278	1394282	600	0.19	114	0.456	0.94	146	0.526	1
1394282	1394286	600	0.32	115	0.421	1.03	146	0.493	1.09
1394286	1063358	600	0.27	115	0.506	0.9	146	0.579	0.96
1063358	1063366	600	0.25	115	0.472	0.93	146	0.542	0.99
1063366	1066102	600	0.26	117	0.479	0.96	147	0.548	1.01
1066102	1063374	600	0.27	118	0.469	0.99	149	0.535	1.06
1063374	1066110	600	0.26	119	0.398	1.19	149	0.45	1.28
1066110	1065994	600	0.15	120	0.467	0.96	150	0.533	1.01
1065994	1063274	750	0.15	120	0.369	0.84	151	0.423	0.88
1063274	1063286	750	0.15	120	0.387	0.78	151	0.441	0.82
1063286	1066022	750	0.18	120	0.425	0.72	151	0.476	0.78
1066022	1394274	750	0.24	125	0.368	0.88	156	0.416	0.93
1394274	1394290	800	0.20	125	0.322	0.91	156	0.36	0.97
1394290	1394294	800	0.20	125	0.29	1.1	156	0.324	1.18

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
1394294	1394298	1200	0.24	125	0.165	1.05	156	0.183	1.12
1394298	1063298	900	0.28	125	0.306	0.89	156	0.342	0.95
1063298	1066026	900	0.28	125	0.327	0.82	156	0.366	0.87
1066026	1225433	900	0.28	125	0.303	0.89	156	0.338	0.95
1225433	1225013	900	0.28	125	0.3	0.9	156	0.335	0.96
1225013	1227493	900	0.28	125	0.298	0.91	156	0.333	0.97
1227493	1224765	900	0.28	125	0.232	1.13	156	0.259	1.2
1224765	1227497	900	0.18	125	0.252	1.04	156	0.283	1.08
1227497	1278268	1200	0.13	127	0.225	0.73	158	0.249	0.78
1278268	1281000	1200	0.15	131	0.224	0.75	160	0.248	0.8
1281000	1277995	1200	0.15	131	0.225	0.75	160	0.249	0.79
1277995	1280483	1200	0.15	131	0.233	0.73	160	0.258	0.77
1280483	1280111	1200	0.13	131	0.217	0.74	160	0.239	0.78
1280111	1280115	1200	0.32	131	0.227	0.82	160	0.251	0.86
1280115	1608413	1050	0.31	132	0.265	0.82	161	0.293	0.87
1608413	1279791	1050	0.30	132	0.255	0.87	161	0.281	0.92
1279791	1282311	1050	0.30	132	0.256	0.87	161	0.283	0.92
1282311	1279583	1050	0.30	132	0.254	0.87	161	0.28	0.92
1279583	1279371	1050	0.30	132	0.202	1.09	161	0.223	1.15
1279371	1279103	1050	0.32	133	0.279	0.81	162	0.308	0.86
1279103	1281835	1050	0.30	136	0.204	1.1	164	0.225	1.16
1281835	1279107	1500	0.15	194	0.226	0.71	243	0.253	0.75
1279107	1281839	1500	0.10	194	0.224	0.69	243	0.25	0.74
1281839	1281603	1500	0.10	194	0.224	0.69	243	0.251	0.74
1281603	1281199	1500	0.10	194	0.24	0.66	243	0.269	0.7
1281199	1278471	1050	0.13	194	0.316	0.84	243	0.353	0.9
1278471	1280983	1050	0.45	194	0.344	0.96	243	0.384	1.02
1280983	1280786	1050	0.15	215	0.284	1.17	267	0.317	1.24
1280786	1277646	1200	0.11	223	0.324	0.77	277	0.364	0.82
1277646	1280378	1200	0.09	223	0.318	0.75	277	0.356	0.79
1280378	1280086	1200	0.09	223	0.3	0.79	277	0.334	0.84
1280086	1280090	1200	0.10	223	0.267	0.93	277	0.298	0.99
1280090	1279614	1200	0.11	223	0.265	0.93	277	0.295	1
1279614	1282026	1200	0.10	236	0.265	1.12	291	0.294	1.19
1282026	1282022	1200	0.50	236	0.184	1.65	291	0.204	1.75
1282022	1279294	1200	0.50	236	0.477	0.56	291	0.516	0.59
1279294	1281374	1350	0.09	405	0.393	0.84	471	0.427	0.85
1281374	1275321	1350	0.12	403	0.368	0.9	468	0.397	0.94
1275321	1276981	1350	0.11	403	0.341	0.95	468	0.366	1
1276981	1276849	1350	0.11	404	0.303	1.26	466	0.325	1.32

U/s Node	D/s Node	Pipe Dia (mm)	Slope (%)	2020 (Runcode: SMJE)			2036 (Runcode: SMJE)		
				PDWF (l/s)	Hmax/ D	Max Velocity (m/s)	PDWF (l/s)	Hmax/ D	Max Velocity (m/s)
1276849	1273977	1350	0.13	411	0.366	0.99	468	0.391	1.04
1273977	1276705	1350	0.15	411	0.296	1.3	468	0.315	1.35
1276705	1404019	1350	2.36	502	0.223	2.36	542	0.236	2.36
1404019	SPS0204	1350	13.55	502	0.554	8.99	542	0.559	6.07
RMTND01	RMTND03	2000	0.20	501	0.186	1.81	542	0.196	1.78
RMTND03	OUTLET1	3000	0.20	810	0.124	1.61	904	0.131	1.66

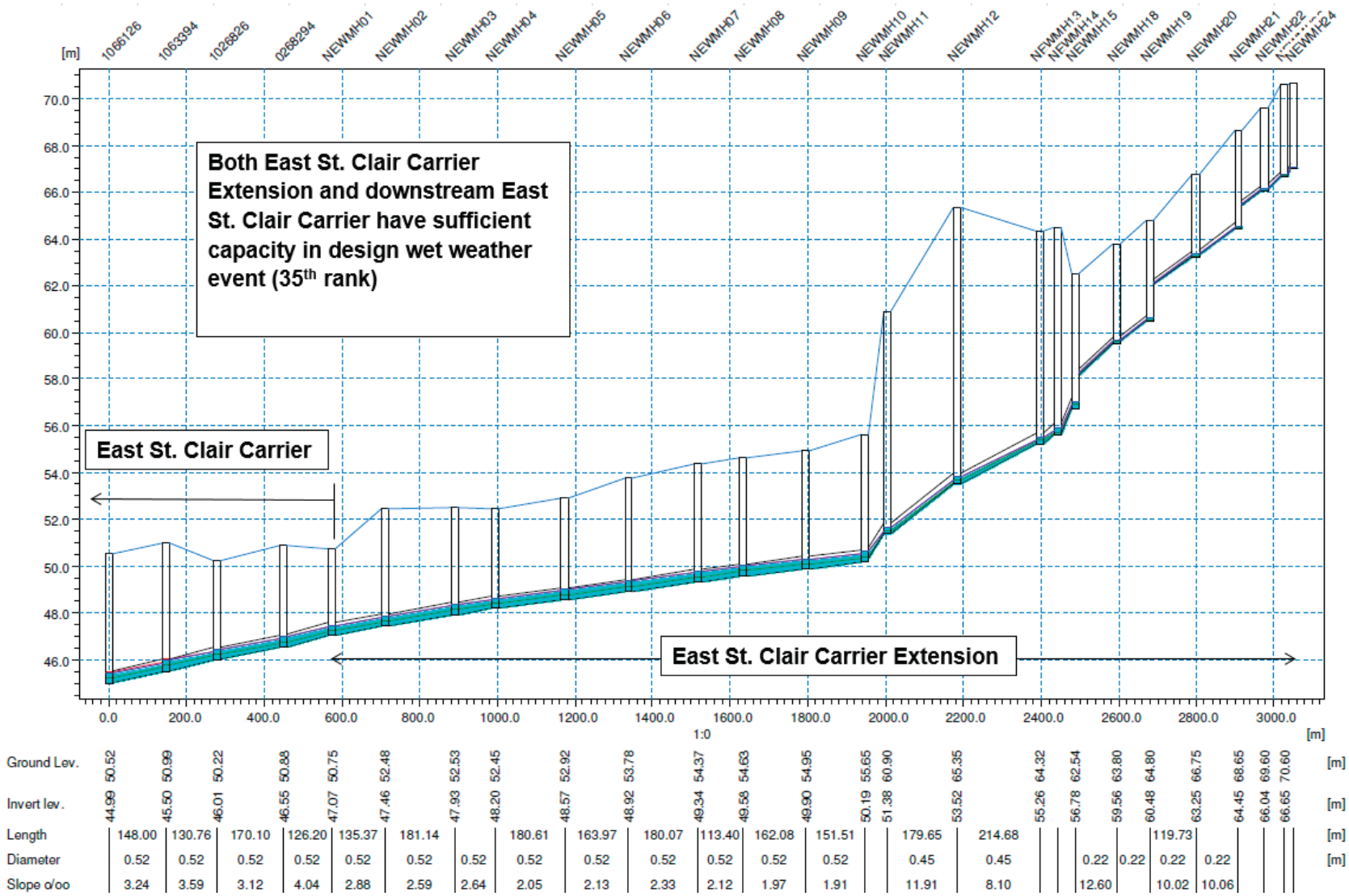


HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2020 PDWF



HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2036 PDWF

Appendix E – Wet Weather (Design Event) System Performance (2036)



HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2036 Design Wet Weather Event (35th rank)

Appendix F – Cost Estimates

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale Central

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	0	228	0
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	0	275	0
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	750	386	289,828
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	750	25	18,621
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
10		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
11		EO Road Restoration Trench Std Depth		375 dia	m	188	513	96,163
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	404,612	0.75	303,459
		Sub Total Direct Costs						**708,072**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		70,807
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		141,614
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		138,074
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		370,498
		Total Construction Cost						**1,429,065**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		14,291
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale Central	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:36**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		71,453
22		SWC Project Management Costs (% of Construction Costs)			5.00%		71,453
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		7,860
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**1,644,122**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale East

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:39**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	0	228	0
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	0	275	0
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	1,020	386	394,166
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	0	18	0
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	0	21	0
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	1,020	25	25,325
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	0	434	0
10		EO Road Restoration Trench Std Depth		300 dia	m	0	485	0
11		EO Road Restoration Trench Std Depth		375 dia	m	255	513	130,782
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	550,273	0.75	412,705
		Sub Total Direct Costs						**962,977**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		96,298
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		192,595
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		187,781
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		503,878
		Total Construction Cost						**1,943,529**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		19,435
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale East	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:39**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		97,176
22		SWC Project Management Costs (% of Construction Costs)			5.00%		97,176
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		10,689
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,218,005**

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale West

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:40**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	250	228	57,075
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	1,500	275	413,142
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	2,320	386	896,533
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	250	18	4,421
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	1,500	21	32,141
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	2,320	25	57,602
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	63	434	27,128
10		EO Road Restoration Trench Std Depth		300 dia	m	375	485	181,800
11		EO Road Restoration Trench Std Depth		375 dia	m	580	513	297,466
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	1,967,308	0.75	1,475,481
		Sub Total Direct Costs						**3,442,789**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		344,279
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		688,558
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		671,344
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		1,801,440
		Total Construction Cost						**6,948,410**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		69,484
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale West

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:40**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		347,421
22		SWC Project Management Costs (% of Construction Costs)			5.00%		347,421
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		38,216
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				of Client Costs	
		TOTAL PROJECT BUDGET REQUIREMENT					**7,800,952**

Sydney WATER **COST ESTIMATOR**

Job Name:	Oakdale South	Estimate Date:	**05/05/2016**
Estimator:	Amir Rashidi	Print Date/Time:	**26/05/2016 15:39**
			Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,280	228	292,226
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	450	275	123,943
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	1,250	386	483,046
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	720	621	447,136
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,280	18	22,638
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	450	21	9,642
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	25	31,035
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	720	10	7,102
9		EO Road Restoration Trench Std Depth		250 dia	m	320	434	138,896
10		EO Road Restoration Trench Std Depth		300 dia	m	113	485	54,540
11		EO Road Restoration Trench Std Depth		375 dia	m	313	513	160,272
12		EO Road Restoration Trench Std Depth		450 dia	m	180	579	104,172
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	1,874,649	0.75	1,405,986
		Sub Total Direct Costs						**3,280,635**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		328,063
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		656,127
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		639,724
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		1,716,592
		Total Construction Cost						**6,621,141**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		66,211
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Oakdale South

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:39**

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ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		331,057
22		SWC Project Management Costs (% of Construction Costs)			5.00%		331,057
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		36,416
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**7,435,882**

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:38**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,250	228	285,377
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	170	275	46,823
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	0	386	0
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	18	22,107
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	170	21	3,643
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	313	434	135,641
10		EO Road Restoration Trench Std Depth		300 dia	m	43	485	20,604
11		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	514,195	0.75	385,646
		Sub Total Direct Costs						**899,841**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		89,984
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		179,968
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		175,469
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		470,842
		Total Construction Cost						**1,816,104**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		18,161
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:38**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		90,805
22		SWC Project Management Costs (% of Construction Costs)			5.00%		90,805
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		9,989
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,075,864**

Sydney WATER **COST ESTIMATOR**

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION		PARAMETER	UNIT	QUANTITY	RATE	TOTAL
		DIRECT COSTS						
	H1	**Option 1**						
1		Gravity Sewer Greenfield PVC 1.5m deep		225 dia	m	1,250	228	285,377
2		Gravity Sewer Greenfield PVC 1.5m deep		300 dia	m	170	275	46,823
3		Gravity Sewer Greenfield PVC 1.5m deep		375 dia	m	0	386	0
4		Gravity Sewer Greenfield PP 2.0m deep		450 dia	m	0	621	0
5		EO Rock Excav Trench Std Dpth - 250 Dia (1%RK-100%RK)	%RK-->	30	m	1,250	18	22,107
6		EO Rock Excav Trench Std Dpth - 300 Dia (1%RK-100%RK)	%RK-->	30	m	170	21	3,643
7		EO Rock Excav Trench Std Dpth - 375 Dia (1%RK-100%RK)	%RK-->	30	m	0	25	0
8		EO Rock Excav Trench Std Dpth - 450 Dia (1%RK-100%RK)	%RK-->	30	m	0	10	0
9		EO Road Restoration Trench Std Depth		250 dia	m	313	434	135,641
10		EO Road Restoration Trench Std Depth		300 dia	m	43	485	20,604
11		EO Road Restoration Trench Std Depth		375 dia	m	0	513	0
12		EO Road Restoration Trench Std Depth		450 dia	m	0	579	0
	H1	**Scope Contingency**						
13		Urban Detailed Planning		75	%	514,195	0.75	385,646
		Sub Total Direct Costs						**899,841**
		INDIRECT COSTS				**%**		
14		Contractor Design Costs (% of Direct Costs)				10.00%		89,984
15		Contractor Indirect Costs (% of Direct Costs)				20.00%		179,968
16		Contractor Margin (% of DC+Indirect Costs)				15.00%		175,469
17		Risk Contingency (% of (Direct Costs+Indirect Costs+Margin))				35.00%		470,842
		Total Construction Cost						**1,816,104**
		SWC CLIENT COSTS				**% of ConstC**		
18		SWC Costs to Date	Current as at:					
19		SWC Design Costs (% of Construction Costs)				1.00%		18,161
20		SWC Tender Costs (% of Construction Costs)				0.50%	Adj. to Min Limit>>	50,000

Sydney WATER

COST ESTIMATOR

Job Name: Jacfin

Estimator: Amir Rashidi

Estimate Date: **05/05/2016**

Print Date/Time: **26/05/2016 15:36**

Ver 09-2015.11

ITEM	H#	DESCRIPTION	PARAMETER	UNIT	QUANTITY	RATE	TOTAL
21		SWC Planning Costs (% of Construction Costs)			5.00%		90,805
22		SWC Project Management Costs (% of Construction Costs)			5.00%		90,805
23		SWC Insurances & Financing Costs (% of Construction Costs)			0.55%		9,989
24		SWC Land Acquisition/Easement Costs					
25		SWC Risk Contingency (% of the SWC Client Future Costs only)				**of Client Costs**	
		TOTAL PROJECT BUDGET REQUIREMENT					**2,075,864**

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