Aldington Road, Lots 20-23 DP255560 and Lots 30-32 DP258949, Kemps Creek

Civil Infrastructure Report

Fife Kemps Creek Limited

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Commercial in Confidence

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1. Executive Summary

This report is a summary of the Civil infrastructure requirements to aid in the development known as 200 Aldington Road located in, Kemps Creek. The site is located to the east of Aldington Road, and is legally described as Lots 20-23 in DP 255560 and Lots 30-32 in DP 258949, with an area of approximately 72.08 hectares (ha) within the Penrith City Council Local Government Area (LGA).

The site has approximately 1,242m of direct frontage to Aldington Road with one proposed roundabout providing vehicular access to the southern side of the development, with a three-way junction (designed for future roundabout) providing access to the northern side of the development. Until the connection of Aldington Road to the future Southern Link Road (located to the north) is constructed, the access to Aldington Road will be provided from the South bound lane of Mamre Road via Abbots Road.

The site is located approximately 4km north-west of the future Western Sydney Nancy-Bird Walton Airport, 13km south-east of the Penrith CBD and 40km west of the Sydney CBD.

The site is part of the Broader Western Sydney Employment Area, and is zoned land under the *State Environmental Planning Policy (Western Sydney Employment Area) Amendment 2020 (SEPP WSEA).*

Consistent with the above, this report has been prepared to support a State Significant Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable the construction of industrial warehouse and distribution buildings within Stage 1.

2. Compliance with Secretary's Environmental Assessment Reports (SEARs)

This report responds to the SEAR's issued by the NSW Planning and Environment in July 2020. Table 1 below summaries all key civil / infrastructure issues raised in the SEAR's and how they have been dealt with.

Key Issue	Response
Traffic and Transport	
Connection of development to adjoining sites Detailing how the proposed development connects to adjoining sites to facilitate their future development for their intended purposes	Overall General Arrangement Plan 19-609–C1005 prepared by AT&L indicates internal road layouts which provide connection to adjoining lots to the south east for future development via Road 04. Junctions on Aldington Road have been coordinated with the land owner (Frasers Property) to the west of Aldington Road and also the land owners at the north and southern end of the subject property. It is proposed that detailed coordination of precinct connectivity may occur post formal SSD exhibition stage to enable concurrent development of the *Aldington Road Precinct Structure Plan – Local Road Network Structure Plan* by TfNSW and Penrith City Council.
Site access and internal road layout Detailed plans of the site access and proposed layout of the internal road and pedestrian network and parking on site in accordance with the relevant Australian Standards and Council's DCP	Access for the site is off Aldington Road via a proposed roundabout providing vehicular access to the southern side of the development, with a three-way junction (designed for future roundabout – both junctions can provide future connection to the land to the west of Aldington Road) providing access to the northern side of the subject development. Until the connection of Aldington Road to the future Southern Link Road (located to the north) is constructed, the access to Aldington Road will be provided from the North and South bound traffic via a signalised intersection on the South bound lane of the Mamre Road via Abbots Road. Refer General Arrangement Plan 19-609–C1005 prepared by AT&L indicating site access along with the proposed internal road layouts. Note also pedestrian footpath paths included within the GA plan and sections. Refer to Architectural plans prepared by SBA for internal parking layouts. Internal road and pedestrian networks are proposed to be provided in accordance with Penrith City Council's standard DCP requirements with exception of a proposed wider verge on the shared pathway side to enable a consistent landscape zone within both road verges.
Swept path diagrams Swept path diagrams depicting vehicles entering, exiting and manoeuvring throughout the site	Refer to Vehicle Turn Path drawings 19-609-C1131 to 19-609-C1136 prepared by AT&L
Road upgrade detail Details of road upgrades, infrastructure works, or new roads or access points required for the development	All upgrade works to Aldington Road along with details for all new roads within the development have been documented within the AT&L Civil drawings. This includes the concept design for Abbotts / Mamre Road Junction in the Appendix B

	under 2000 series drawings prepared by AT&L.
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 5 and 7 of this report
Detailed site water balance A detailed site water balance including identification of water requirements for the life of the project, measures that would be implemented to ensure an adequate and secure water supply is available for the development and a detailed description of the measures to minimise the water use at the site	A Water Balance section has been included in this report. Refer Section 10 for all site water balance details, water supply source, usage calculations and efficiency measures.
Satisfactory arrangements for drinking, wastewater and recycled water Demonstration satisfactory arrangements for drinking water, wastewater and if required recycled water services have been made	Refer to Section 12 and Appendix A of this report for discussion on water and sewerage for the site along with servicing advice received from Sydney Water
Discharge 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)	Refer Section 9 of this report where stormwater quality is discussed. Note all stormwater discharge off site will be treated to ensure Penrith City Council's treatment rates are achieved. Refer Appendix G for water treatment device specification and monitoring / maintenance procedures.
Site specific integrated water management strategy A site-specific integrated water management strategy with details of stormwater/wastewater management system including how it will be designed, operated and maintained, including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse (including indicative quantities) or dispose of water	Refer to Section 9 and 10 of this report for Integrated Water Management strategy.
Measures to minimise water use Description of the measures to minimise water use	Refer to Section 10 of this report for discussion on water re-use across the site using rainwater harvest tanks
Flooding assessment Detailed flooding assessment	Pre and post development flood assessment of the site has been undertaken by Cardno. Refer Flood Risk Assessment and Flood Impact Assessments supporting this SSD.
Erosion and sediment control Description of the proposed erosion and sediment controls during construction	Sediment and Erosion control measures across the site are discussed in Section 6 of this report. Note all control measures have been designed in accordance with Managing Urban Stormwater – Soils and Construction (2004) prepared by Landcom. Note also a full set of Erosion and Sediment Control plans has been provided for implementation at completion of the works.
Infrastructure Requirements	
Description of infrastructure required on site A detailed written and/or graphical description of infrastructure required on the site, including any upgrades required	Infrastructure requirements for the site have been documented in the Services and Utilities Coordination Plans prepared by AT&L. Section 12 of this report also discusses all service utilities within and adjacent to the site.

	Continued coordination with utility infrastructure providers will be undertaken concurrent to formal 200 Aldington SSD exhibition to ensure that adequate arrangements are made to ensure required infrastructure will be made available when required.
Identification of infrastructure upgrades Identification of any infrastructure upgrades required off-site to facilitate the development, and describe any arrangements to ensure that the upgrades will be implemented in a timely manner and maintained	Refer to Section 12 which highlights proposed infrastructure upgrade works required to service the proposed development. Note all these works will need to be confirmed with the relevant service Authority during detailed design stages. Consultation with each of these Authorities has commenced as part of this SSD process and will continue so during detailed design
Infrastructure delivery and staging plan An infrastructure delivery and staging plan, including a description of how infrastructure on and off-site will be co-ordinated and funded to ensure it is in place prior to the commencement of construction	Refer Section 13 for indicative infrastructure staging and funding arrangements.
Development impact on existing utility infrastructure An assessment of the impacts of the development on existing utility infrastructure and service provider assets surrounding the site.	Any impacts to existing utility infrastructure will be discussed with the relevant service Authority during the detailed design phase. 200 Aldington and AT&L has, and will continue to, coordinate with utility Authorities in regard to the proposed SSD development to identify augmentations required to existing infrastructure as a result of the proposed development. No significant impacts on existing utility infrastructure surrounding the site are envisaged as part of the proposed 200 Aldington SSD development.
Agency Comments	
Penrith City Council	
External Road Access and Aldington Road	
Aldington Road is currently a local rural road with poor horizontal and vertical alignment that is not suitable for constant heavy vehicle use. It is considered imperative that the whole of Aldington Road be upgraded as intended works within this proposal, to an industrial collector type road with kerb & gutter, drainage, a parking lane and through lane in each direction along with a central landscaped median. Property acquisition may also be required to accommodate any road widening and this should be explored by the proponent in the formation on concept civil design plans that accompany the application.	Refer to Section 8 of this report for discussion on proposed road design. Refer also to drawings 19-609-C2000 to 19-609-C2069 prepared by AT&L indicating the Aldington Road upgrade works. The Aldington Road typical section is shown within the 2000 series drawings prepared by AT&L. Proposed Aldington Road upgrades along the frontage of the 200 Aldington subject site is full width. Road upgrades proposed to the South of the subject site are also full width. While property acquisition will be required for the ultimate stage of development of Aldington Road, no land acquisition is anticipated in the interim.

The application shall address the use of Aldington Road by heavy vehicles to gain access to the state road network and identify required upgrade works.	Refer to Section 8 of this report for discussion on proposed road design. Refer also to Drawings 19-609-C2000 to 19-609-C2069 which indicates the proposed Aldington Road upgrade works. The Aldington Road typical section is shown within the 2000 series drawings prepared by AT&L.
A concept design (Stage 1) Road Safety Audit is to be undertaken for Aldington Road.	Refer to Section 8 of this report for discussion on proposed road design.
Aldington Road is to be upgraded for the full property frontage and shall include kerb & gutter, street drainage, path paving, landscaping, and undergrounding of all utility assets.	Proposed Aldington Road upgrades along the frontage of the 200 Aldington subject site is full width. Road upgrades proposed to the South of the subject site is also full width without the land acquisition. While property acquisition will be required for the ultimate stage of development of Aldington Road, no land acquisition is anticipated in the interim.
A 3m shared path is to be provided along the eastern side of Aldington Road.	Refer to the 2000 series drawings prepared by AT&L. The drawings show a typical section which includes the 3m shared path along the eastern side of Aldington Road.
Internal Roads	
A concept design (Stage 1) Road Safety Audit is to be undertaken for the internal road network. Internal roads are to have a 13m pavement, a 3.8m verge with 1.5m path, a 4.8m verge with 2.5m shared path. The proposed development shall be designed to be serviced by a B-Double Vehicle. The application shall be supported by turning paths in accordance with AS2890 clearly demonstrating satisfactory manoeuvring on-site and forward entry and exit to and from the public road.	Refer to drawing 19-609-C1010 prepared by AT&L for Typical Road Sections which shows the compliance with the Internal Roads requirements here. Refer to drawings 19-609C1131 to 19-609-C1136 which demonstrates that the internal roads are designed to be serviced by a B-Double vehicle and also shows the B-Double vehicle turning paths in accordance with the AS2890. A Road Safety Audit will be completed once Regional Traffic Modelling is completed prior to detailed design.
Water Quality Management and Stormwater Management	
Water quality and water quantity are to be addressed. Post developed flows shall match pre-developed flows. Water quality shall be in accordance with Council's DCP and WSUD policies. It is Council's preference that on-lot water quality and water quantity treatment be provided for rather than large open basins. If large basins are proposed, then they shall remain under the ownership and maintenance of the development site. Council will not accept the dedication of any drainage basin as a public asset.	Refer Section 9 of this report where stormwater quantity and quality is discussed. Note all stormwater discharge off site will be treated to ensure Penrith City Council's treatment rates are achieved. Note 2 OSD/Water treatment basins and GPTs are proposed to ensure Council's stormwater management requirements are meet. These basins are proposed to remain in the ownership and maintained by the Developer and not be dedicated to Council.
Any basin shall be located clear of the 1% AEP flood level from Ropes Creek.	Basin B has been positioned within the 1% AEP flood level from Ropes Creek. This basin has been

The application shall demonstrate that downstream stormwater systems have adequate capacity to accommodate stormwater flows generated from the development. Any on-site detention systems must be within common property and accessible from the street. A water sensitive urban design strategy prepared by a suitably qualified person is to be provided for the site. The strategy shall address water conservation, water quality, water quantity, and operation and maintenance.	positioned to ensure no adverse flood impacts up or downstream of the site. This is reflected within the Cardno Flood Report. Cardno have used the 3D civil design of the basin prepared by AT&L within their Tuflow post-developed flood model. The Cardno report summarises the basin being positioned within the 1% AEP flood zone has negligible incremental flood impacts. As such it is deemed the location of the basin should be approved. Refer Section 9 of this report where stormwater quantity and quality are discussed. Note all stormwater discharge off site will be treated to ensure Penrith City Council's treatment rates are achieved. Refer to 1000 series drawings prepared by AT&L which demonstrates that the downstream stormwater systems are not negatively impacted by the flows generated from the proposed development. The WSUD design strategy is prepared by a suitably qualified person for the proposed site works. Refer to Section 9 and Appendix E, F and G for water treatment device specification and monitoring / maintenance procedures.
The application shall include MUSIC modelling (*.sqz file) demonstrating compliance with Council's adopted Water Sensitive Urban Design Policy and Technical Guidelines.	Refer to Appendix F which includes the MUSIC Results demonstrating compliance with Council's adopted WSUD Policy and Technical Guidelines.
Mainstream Flooding	
The site is affected by mainstream flooding from Ropes Creek. The application must be accompanied by a Flood Report prepared by a suitably qualified person. The application must demonstrate that the proposal is compatible with the State Government Floodplain Development Manual and Council's Local Environmental Plan and Development Control Plan for Flood Liable Lands.	Refer to Section 11 of this report which discusses the Flood Report. Pre and post development flood assessment of the site has been undertaken by Cardno. Refer Flood Risk Assessment and Flood Impact Assessments supporting this SSD.
Local Overland Flows	
The site is affected by local overland flow flooding from adjoining catchments. Details of how these flows are managed through the site are to be provided. The application must be accompanied by an Overland Flow Flood Report prepared by a suitably qualified person. The development shall not have any adverse impact upon any adjoining property through the damming, concentration or diversion of local overland flows or local flooding.	Refer to Section 11 of this report which discusses the Flood Report. Briefly described, there are overland flows to the south as well as to the west of the subject site. The north eastern portion of the site is positioned within the 1% AEP flood zone. Pre and post development flood assessment of the site has been undertaken by Cardno. Refer Flood Risk Assessment and Flood Impact Assessments supporting this SSD.

Finished Ground Levels Earthworks and Interface Considerations	
Any development proposal progressed on this site must be informed by a topographic analysis that has regard to existing site attributes and constraints that would inform the resulting spatial arrangement of the road network, allotment orientations, dimensions and area and benching to minimise excessive excavation of filling works. The request for SEAR's does not include a survey drawing of the land in question, which is considered fundamental in the consideration of the concept plan, and the preparation of comments as part of the SEAR's process. Without a topographic analysis it cannot be ascertained if the arrangement suggested has merit or would require substantial revision to better align with cross fall considerations, flooding and streetscape amenity. As such, it is required that a topographic analysis be submitted, that identifies the proposed earthworks proposed with cut and fill ratio indications and demonstrated that finished ground levels are site responsive, and that boundary edge conditions do not result in excessive retaining walls. Details of bulk earthworks including pad surface levels and retaining wall heights are to be provided. All retaining walls are to be located on private lots. The interface of retaining walls with Aldington Road is to be addressed.	A Topographic assessment and justification on proposed earthworks are discussed within Section 5 and 7 of this report. Also refer to the 1000 series drawings prepared by AT&L which demonstrates the bulk earthworks including pad surface levels and indicative pad levels and retaining wall heights to be located on private lots.
Easement Impacts	
Lot D suggests a basin which is within the easement extent as identified on the concept plans. It must be confirmed what this infrastructure is intended to serve (water quantity and quality or both) and how access and maintenance can be provided given Transgrid requirements.	The latest drawings prepared by AT&L shows the revised location of the proposed Basin B. As demonstrated on the drawing number 19-609-C1087 to 19-609-C1089 in Appendic D, the location of the Basin B is completely outside of the Transgrid Easement. It should be noted that the Basin B is designed to meet the water quantity and quality requirements set by PCC.

3. Agency Consultation

This report summarises all consultation and correspondence undertaken with the relevant authorities during the design phase. The following table summarises these consultations and the relevant correspondence. It should be noted not all authorities were consulted during the initial design phase.

Agency Consulted	Correspondence
Sydney Water	Sydney Water's input to SEARs for SSD-10479 at 106-228 Aldington Road, Kemps Creek dated 17 July 2020 have been acknowledged and servicing arrangements for the 200 Aldington site and the Aldington Road Precinct. Refer Appendix A for formal Sydney Water response.
Endeavour Energy	During the design phase of the SSDA, AT&L has begun the discussions with Endeavour Engergy. A meeting was held in August 2020 to discuss the project specifics and EE's comments have been taken into consideration as part of design documentation
Transgrid	Meeting held with Transgrid dated 1st July 2020, Transgrid's email correspondence dated 16 July 2020 for the 200 Aldington SSD and the recently submitted SSDA Master Plan dated 18th September 2020 – inputs have been acknowledged and these comments have been considered as part design documentation and responded to accordingly
Transport for NSW	TfNSW's input for SSD-10479 dated 16 July 2020 and meeting held on 21st September 2020 have been acknowledged and these comments have been considered as part design documentation and responded to accordingly.
Water NSW	Water NSW's input for SSD-10479 dated 17 July 2020 have been acknowledged and acknowledged and these comments have been considered as part design documentation and responded to accordingly
NRAR	The dam on Lot 31 would be able to be decommissioned following consultation with NRAR. Any proposed development on waterfront land (i.e. within 40 m of the top of bank of this watercourse) would require a Controlled Activity Approval from the NRAR as part of the approvals process, unless the development is to be assessed as State Significant Development, in which case a separate CAA is not required.

Table 1 – Agency Consultation

4. Introduction

This report has been prepared to inform a State Significant Development Application (SSDA) for the staged development of the 200 Aldington at Lots 20-23 and Lots 30-32 Aldington Road in Kemps Creek. The site address is known as 106 – 142 (Lots 30-32) and 144 – 228 (Lots 20-23) Aldington Road, Kemps Creek. Refer Figure 1 for the Site Location.

The aim of the report is to assess the potential impacts of the proposed development with respect to the Civil and Infrastructure and has been prepared in accordance with Penrith City Council current design guidelines, the relevant Australian Standards and the relevant Austroads Guidelines.

This report supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

The Site, as outlined in blue on Figure 1 below, forms part of the wider proposed *State Environmental Planning Policy (Western Sydney Employment Area) 2009* ("SEPP WSEA") for the Aldington Road Precinct within the WSEA for employment purposes and zoned as IN1 – General Industrial development.

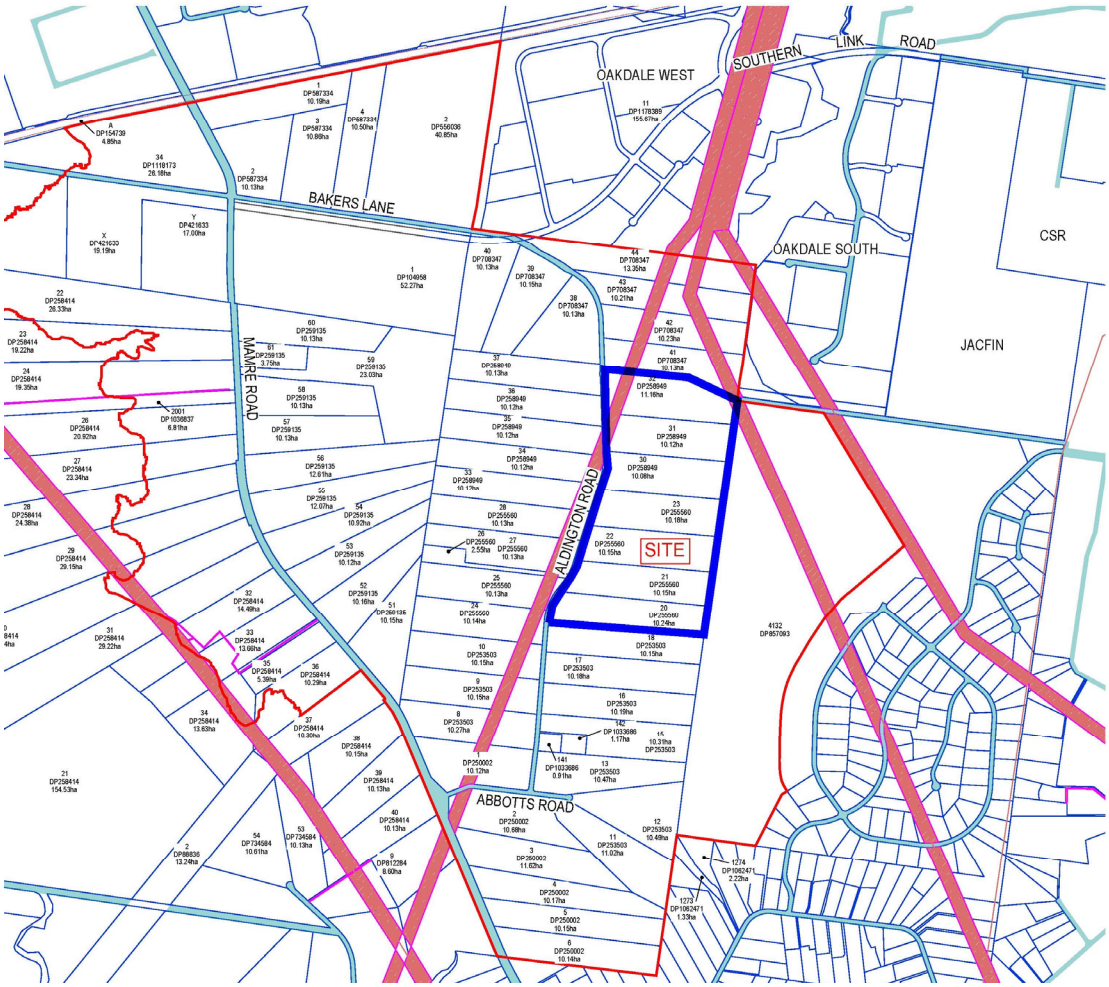


Figure 1 – Site Location

4.1. Existing Site

The Site has an area of approximately 72.08 Ha and is currently rural in use, comprising of dwellings, sheds, dams and grassed fields.

The Site is located within Penrith City Council LGA approximately 2.5km south of Erskine Park and approximately 4km north-east from the proposed Western Sydney Airport. The Site is legally known as Lots Lots 20-23 of DP 255560 and Lots 30-32 of DP 258949.

The Site is bordered by Aldington Road to the west and existing rural lots to the north, east and south. Refer to Figure 2 below for aerial image of the Site.

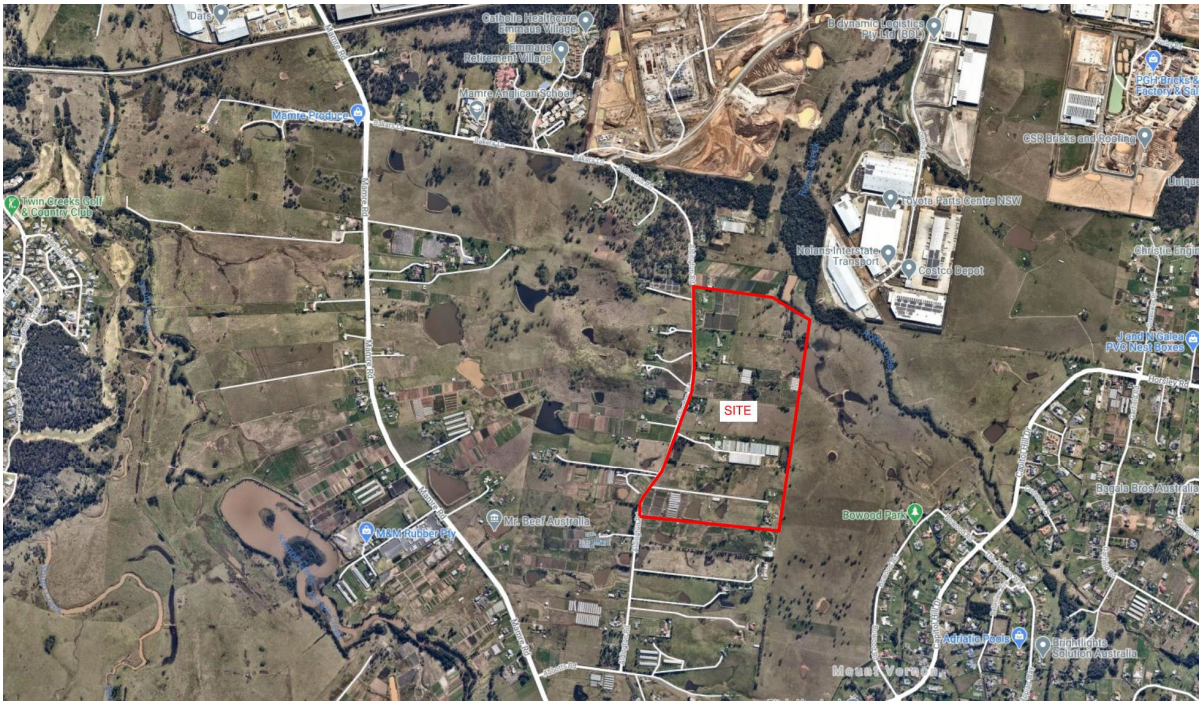


Figure 2 – Site Aerial Location

4.2. Scope of Report

Objective of Report

The objective of this civil, stormwater and infrastructure services report is to outline the design criteria used for the Engineering design of all components of the development and compare to the requirements of the Penrith City Council Development Control Plans (DCP) and SEAR's issued by the NSW Planning and Environment on July 2020.

This report should be read in conjunction with the AT&L Civil Engineering drawings as indicated within Appendix E.

Summary

This report generally discusses the design philosophy behind the following components of the design for 200 Aldington:

- Earthworks;
- Sedimentation and Erosion Control;
- Retaining Walls;
- Road Design;
- Stormwater Management;
    - On Site Detention (OSD)
    - Piped and Overland Flows
    - Water Sensitive Urban Design (WSUD)
    - Water Balance across the site
- Flood Modelling;
- Servicing;
    - Water
    - Sewerage
    - Communications
    - Gas
    - Electrical
- Infrastructure Staging; and
- Construction
    - Clearing and Grubbing
    - Demolition
    - Earthworks
    - Roadworks and Services
    - Program
    - Plant and Equipment

Supporting documentation that is referenced and commented on within the report include the following sections;

- Flooding (Study undertaken by Cardno)
- Preliminary Geotechnical Investigation (Douglas Partners)
- Riparian Assessment (Ecological)

5. Earthworks

5.1. Existing Geology

Based on a draft Geotechnical and Groundwater Summary undertaken by Douglas Partners (reference: R.002.DftA, dated September 2020 for the site 200 Aldington Road, Kemps Creek, the following inferred sub surface soils were encountered across the site:

- TOPSOIL / topsoil filling to depths of 0.1 - 0.3m
- FILL to depths of 0.2 - 1.4m over parts of the site, but deeper in localised areas such as dam walls
- Residual Soil – variably stiff to hard silty clay, to depths in the range 0.6 - 3.3m
- BEDROCK - initially extremely low to very low strength shale or sandstone at first contact at depths of 0.6 – 2.8 m and continuing to the termination depths of 3 m. Very low to medium strength shale, sandstone or siltstone was identified in cored boreholes to termination depths of up to 8.4 m.

5.2. Cut/Fill Requirements

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

- Undulating topography within the Aldington Road Precinct resulting in the requirement for extensive cut and fill operations in order for 200 Aldington 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;
- Avoiding retaining walls fronting Aldington Road and mitigating 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;

It is recommended that the proposed earthworks design contained within the AT&L documentation provides the most contextually and economically appropriate design in consideration of the above requirements. Whilst retaining walls fronting Aldington Road have been avoided as much as possible, this has resulted in a maximum 7m+ high fill retaining wall along a section of the site's southern boundary due to significant topography within the site.

Refer to Drawing 19-609-C1031 for Bulk Earthworks Cut/Fill Plan within Appendix D. Net import is the value highlighted in bold in Table 3 below.

Item	Volume (m^3)
Cut Material (Net Cut + Topsoil)	-606,608
Fill Material	1,290,850
Balance	**684,242 (Import)**

Table 1 – Cut/Fill Summary

Note these volumes are based on the current design, further detailed design may alter these. – (Negative) balance indicates net cut whilst + (positive) balance indicates import required. It is assumed that all topsoil from the site will be re-used on site as per the specification of the Geotechnical Engineer. Excess topsoil will be exported as required.

All import materials will comply with the requirements of the requirements of the Import Fill Protocol and Geotechnical Specifications for the 200 Aldington SSDA. Topsoil stripping, blending and placement will be completed in accordance with the Geotechnical Engineering Specifications for the project.

6. Sedimentation and Erosion Control

6.1. 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.

6.1.1. 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.

6.1.2. 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

6.2. 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 4 – RUSLE Analysis below.

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	1,897.10
Soil Erodibility Factor, K (Table C20, Blue Book)	0.05
Slope Length/Gradient Factor, LS	1.19
Erosion Control Practice Factor, P	1.20
Ground Cover and Management Factor, C	1
Computed Soil Loss (tonnes/ha/year), (A = R x K x LS x P x C)	**135.45**
Soil Loss Class	1 (Table 4.2)

Table 2 – RUSLE Analysis

The erosion hazard potential of the site is considered very low, due to the calculated soil loss lying in the range of 0 to 150 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 3 - Table 4.2 from the Blue Book

6.3. Soil and Water Management Plan

6.3.1. 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 South Creek and all associated tributaries;
- The weir levels of temporary sediment basins will be located above the 100yr ARI flood event levels from Ropes Creek and tributaries; and
- Bio-retention basins are to be utilised as temporary sediment control basins. The bio-retention basins shall not be converted into the final/ultimate basins until such time as all building and construction works within the site has been completed and 90% of the site is stabilised.

Refer to AT&L Drawings 19-609-C1111 to 19-609-C1125 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.

Suitable temporary erosion and sediment controls shall be designed, adopted and maintained by the contractor throughout all stages of works, by an expert consultant. The contractor shall also design and implement controls at completion of the bulk earthworks where shown on AT&L drawings or where otherwise directed by the Superintendent or Penrith 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).

6.3.2. 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;
- Penrith City Council's specifications; and
- 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 D and 'Earth Basin Wet' SD6-4 for details, and Table 6 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)	80 & 85
x-day, y-percentile rainfall event (Table 6.3a)	27.4 & 35.00
Rainfall Intensity: 2-year, 6-hour storm	9.13
Rainfall Erosivity (R-factor)	**1,897.10**

Table 3 – Site Data

	ROAD 01	ROAD 02	LOT A	LOT B	LOT C	LOT E	LOT F	LOT G	LOT H	LOT I	LOT J	LOT K	LOT M	LOT N	LOT O
VOLUMETRIC RUNOFF COEFFICIENT	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
AREA	3.7	4.9	1	6.3	5.2	2.8	7.5	5	4.5	4.5	11.4	3.5	2.9	3.3	2.8
85%, 5 DAY	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
SETTLING ZONE VOLUME	648	858	175	1103	910	508	1313	875	788	788	1995	613	508	578	490
SEDIMENT STORAGE VOLUME	324	429	88	551	455	254	656	438	394	394	998	306	254	289	245
TOTAL SEDIMENT VOLUME	972	1287	263	1654	1365	762	1969	1313	1182	1182	2993	919	762	867	735

Table 4 – Precinct Temporary Sediment Basins

6.4. 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.

6.4.1. Sediment Basin Maintenance

As stated in Section 4.3.2 above, the proposed development site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or more of 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.

6.5. Conclusion

The erosion control measures proposed for the site will comply with the requirements of Penrith 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.

7. Earthworks

7.1. Retaining Walls

Where possible, batter slopes will be provided to accommodate level changes. Where this is not possible retaining walls will be constructed along the estate road, lots and basins based on the current civil and earthworks design. A keystone product or other similar face block will be adopted for all retaining walls and will be detailed on the civil drawings.

The proposed retaining walls will be built to the manufacturers design guideline requirements and verified by a structural engineer prior to construction. This practice has previously been adopted other developments within the Penrith City Council LGA and considered input from the geotechnical engineer, utility coordination as well as entry and exit points from proposed lots.

Retaining is required along the south and south eastern site boundary where the proposed building pad levels will be cut down from existing. Refer to Drawing 18-596-C1080 for cut and fill wall locations. Retaining walls will be designed and constructed using standard industry practises.

All retaining walls will be constructed on a staged basis and as required to suit the development earthworks and stormwater basin works. Where the walls are not constructed a batter of 1 in 4 will be maintained for stability purposes. Any batter steeper than 1 in 5 shall be vegetated.

All retaining walls will be located within private property and not within the road reserve areas, unless within drainage easements.

All retaining walls will have pedestrian and vehicular safety barriers (if required) in accordance with Austroads Guidelines as required.

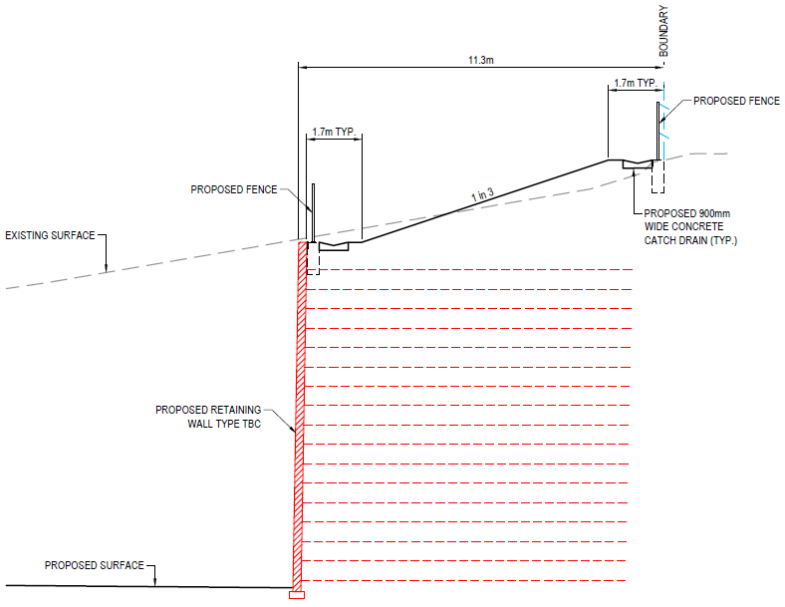


Figure 4 - Typical Retaining Wall

8. Road Design

8.1. Horizontal and Vertical Geometry

The existing Aldington Road could be classified as a rural road with a narrow, 6-8 wide sealed surface with tables drains on either side within a 20.1m road reserve.

Figure 5 – Aldington Road, Looking North

Aldington Road upgrade has generally been designed to meet Austroads requirements and Australian Standards to accommodate B-Double truck movements. It is expected that Aldington Road will adopt a similar cross-section to that shown below in Figure 6 when upgraded. With this in mind, we expect a 2.8m wide reservation to be considered along the frontage of the site for the future widening.

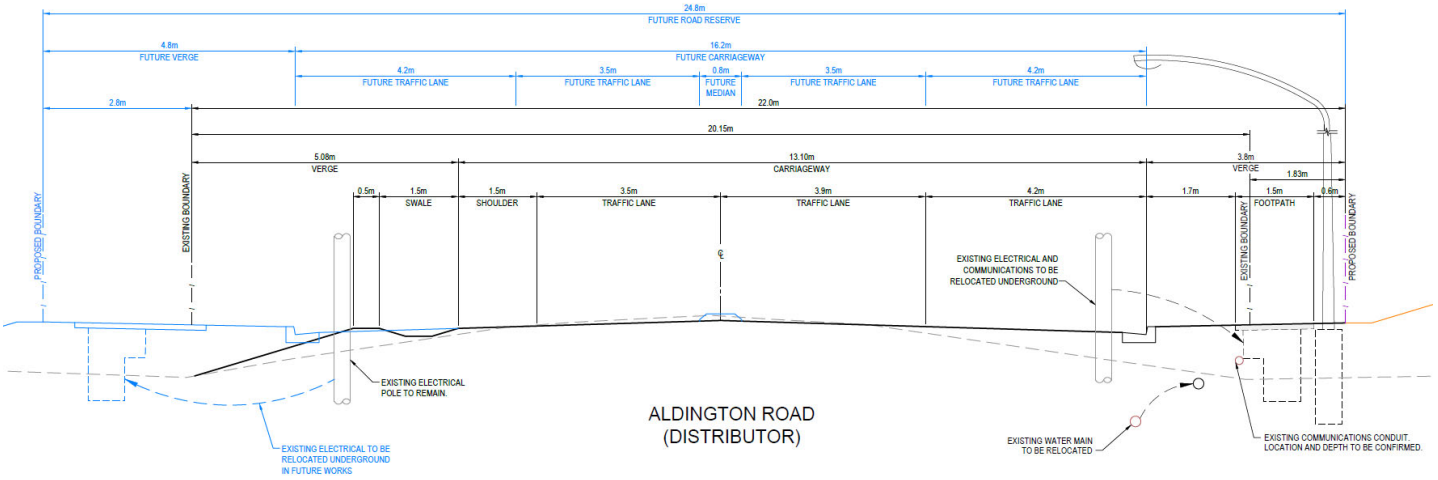


Figure 6 – Typical Section Distributor Road, Assumed Aldington Road Cross Section In Front of Site

See drawings within Appendix D for proposed Estate Road layout.

Subject to Council Approval, it is proposed to undertake works along Aldington Road to provide access to the site.

The following works are proposed:

- Access the site via an upgraded intersection at Mamre and Abbotts Road to RMS requirements. This intersection upgrade is an interim design and is intended not to accommodate the future Mamre Road upgrade mentioned above.
- Abbott Road and Aldington Road are proposed to be upgraded from Mamre Road and the site generally as shown on Sections 1 & 2 on dwg 19-609-C2011

- Aldington Road fronting the site will be upgraded generally as shown on in Figure 6 above and Section 3 on dwg 19-609-C2012

Access to the site is proposed to be via two roundabouts sized to cater for B-Doubles. It should be noted that the northern roundabout may be initially constructed as a 3-way intersection (T – Intersection) subject to future traffic modelling and dedication of land constraints.

Refer **Appendix E – Aldington Road Interim Upgrade Plans**

8.2. Internal Road Network

The internal road network will be designed and constructed in accordance with the Penrith City Council design and construction specifications.

Cul-de-sacs will also be designed and constructed in accordance with the Council guidelines requiring a 16.5m radius on the turn heads.

The Design vehicle would be B-Doubles with a design speed within the Estate Roads of 60km/hr and 80km/hr on Aldington Road (subject to Council/RMS Approval).

Penrith City Council require a 20.6m wide road reserve to be established. Although the proposed road reserve has been adapted from a standard Penrith City Council industrial road reservation of 20.6m, in order to provide the shared path within one of the dedicated verge areas as requested in Penrith City Council DCP C10, Section 5 and to enable similar landscape widths on both verges, additional width has been added to the road reserve on either side of the road/verges. The overall width of the road reservation and following widths for the two estate roads has been utilized for the site.

The proposed typical 200 Aldington Estate Road is designed as such:

Estate Road 01 (Figure 7):

- 22.6m wide Road Reserve
- 14.0m wide Carriageway comprising:
    - 2 x 3.5m wide traffic lanes
    - 2 x 3.5m wide parking lanes adjacent kerb
- Verge 1 at 3.8m wide containing a 1.5m footpath and verge 2 at 4.8m wide containing a 2.5m shared path

Estate Road 02 (Figure 8):

- 21.8m wide Road Reserve
- 13.2m wide Carriageway comprising:
    - 2 x 3.5m wide traffic lanes
    - 2 x 3.1m wide parking lanes adjacent kerb
- Verge 1 at 3.8m wide containing a 1.5m footpath and verge 2 at 4.8m wide containing a 2.5m shared path
- Cul-De-Sac have been shown at 33m 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 or are envisaged at this stage, though these will be assessed at detailed design stage in accordance with Austroads.

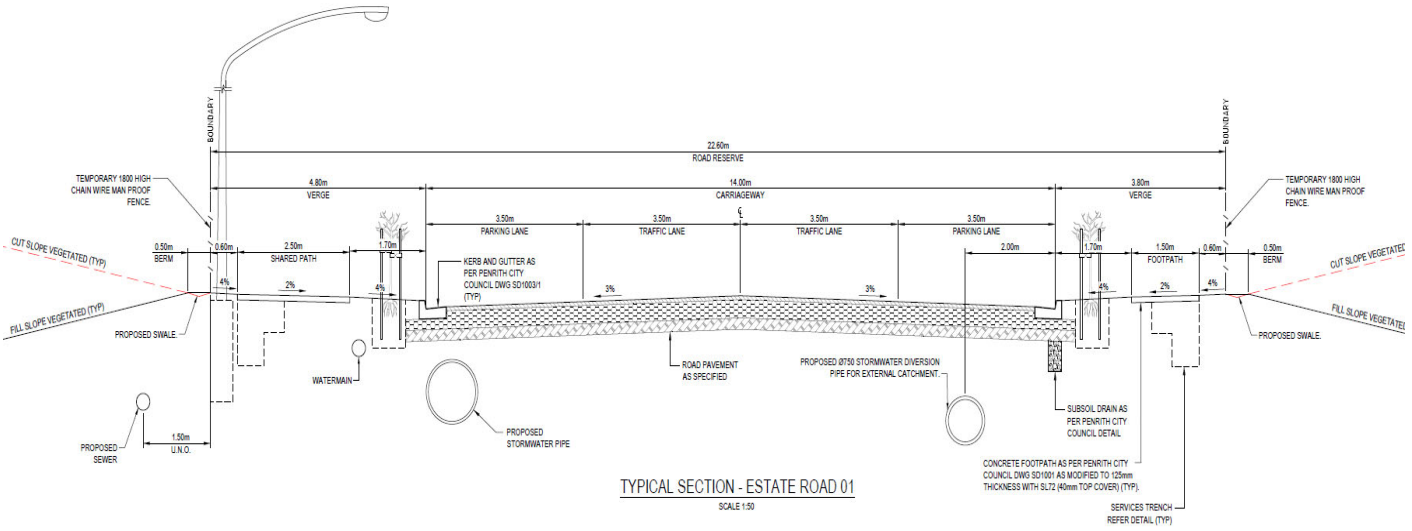


Figure 7 – Typical Section Estate Road 01

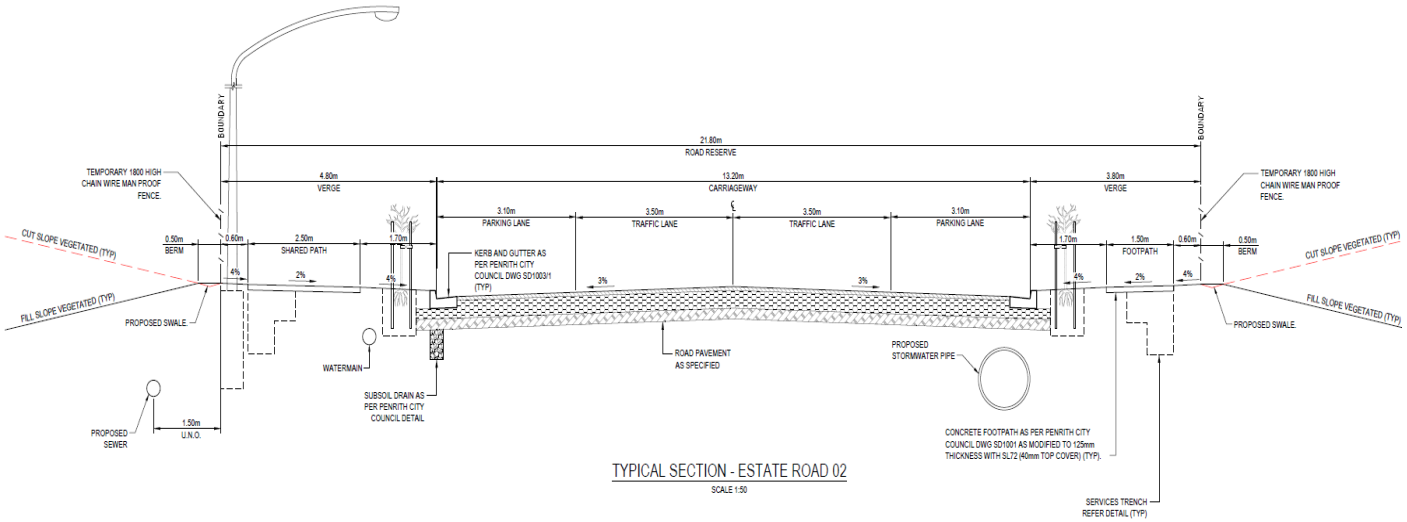


Figure 8 – Typical Section Estate Road 02

8.3. 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 by Douglas Partners reports 92364.01 & 92345 submitted as part of 200 Aldington SSDA.

The basis of this design is:

- Design Traffic Loading: N =1x10^7 ESA (in accordance with Penrith City Council requirements for Heavy Industrial)
- Design subgrade CBR = 2% (based on Section 6.7.1 of the Douglas Partners Report 92345)

Based on these parameters the pavement design is as follows:

- 70mm AC 14 320 Bitumen
- 7mm Spray Seal
- 250mm DGB 20 (placed in two layers)
- 500mm Select Sandstone Fill with minimum CBR = 35% (placed in three layers)

If the subgrade CBR = 5% the bottom 200mm of select sandstone fill can be replaced with select fill with minimum CBR of 5%.

CBR testing is proposed to be undertaken at the subgrade level to confirm this pavement design.
Polymer modified asphalt will be used within all cu-de-sacs with the asphalt concrete layer becoming a 75mm thick polymer modified AC 14.

8.4. Batter Design

Any permanent batter's steeper than 1 in 5 will be vegetated in accordance with Penrith City Council requirements. All external batters to the development have been limited to 1 in 4 as a minimum generally, with the maximum localised batter 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.

8.5. Conclusion

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

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

9. Stormwater Management

9.1. Existing Site Stormwater Drainage

Currently the site comprises rural land and is classified as a "greenfield" site with an entire coverage of pervious areas and farm dams.

The existing site is approximately 72.26Ha in area with internal catchments falling to the north, east, south and west. There is a minor external catchment entering the site in the northwest corner with an area of 3.93Ha. ***Note the external catchment is proposed to be diverted through the pipe network on site to connect to the proposed Basin B which eventually discharges into the existing creek system.***

The primary high point within the site is located towards the southern side of the site and ranges from approximately RL74.5m to RL80.5m. Subsidiary high points on site are located on the south eastern corner as well as the north western corner. The portion of the site located on the north of the high point flows towards the northern and eastern boundary, the portion of the site located on the south of the high point flows towards the southern boundary towards the existing swale/dam located on the adjacent property to the south and a small portion of the site located on the west of the high point flows westerly towards Aldington Road. The majority of the site falls from western boundary along the Aldington Road to northern and eastern boundary.

Existing runoff drains across the site via natural swales and farm dams.

Note for the analysis of the pre-development flow rates all dams on the site are assumed to be full, with no capacity available.

Refer to 19-609-C1080 for a pre-development stormwater catchment plan.

9.2. Proposed Site Stormwater Drainage

Due to the existing topography, site constraints and precinct requirements as discussed within Sections 5.2 and 7.1, significant cut to fill operations with balance import fill material is required.

The main objective for the stormwater drainage design of the proposed development is to ensure post-developed catchment flows do not exceed the pre-developed catchment flows. With On-Site Detention (OSD) systems in place to limit discharges to pre-developed rates, this will ensure the downstream catchments will not be inundated with flows and cause adverse flooding affects downstream of the development. Design documentation has been completed in accordance with the Penrith City Council Engineering guidelines.

Refer to Section 6.3.2 for a full description of each proposed catchment and the drawing 19-609-C1081 for the proposed catchment plan.

The site is mainly divided in to two stormwater catchments – larger catchment in the north and smaller catchment to the south. The stormwater on the lots and within the road reserve for the southern catchment of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the

south west corner of the site – called Basin A. Stormwater on the lots and within the road reserve for the larger catchment to the north of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the north east corner of the site – called Basin B. Refer to Figure 9 below for the

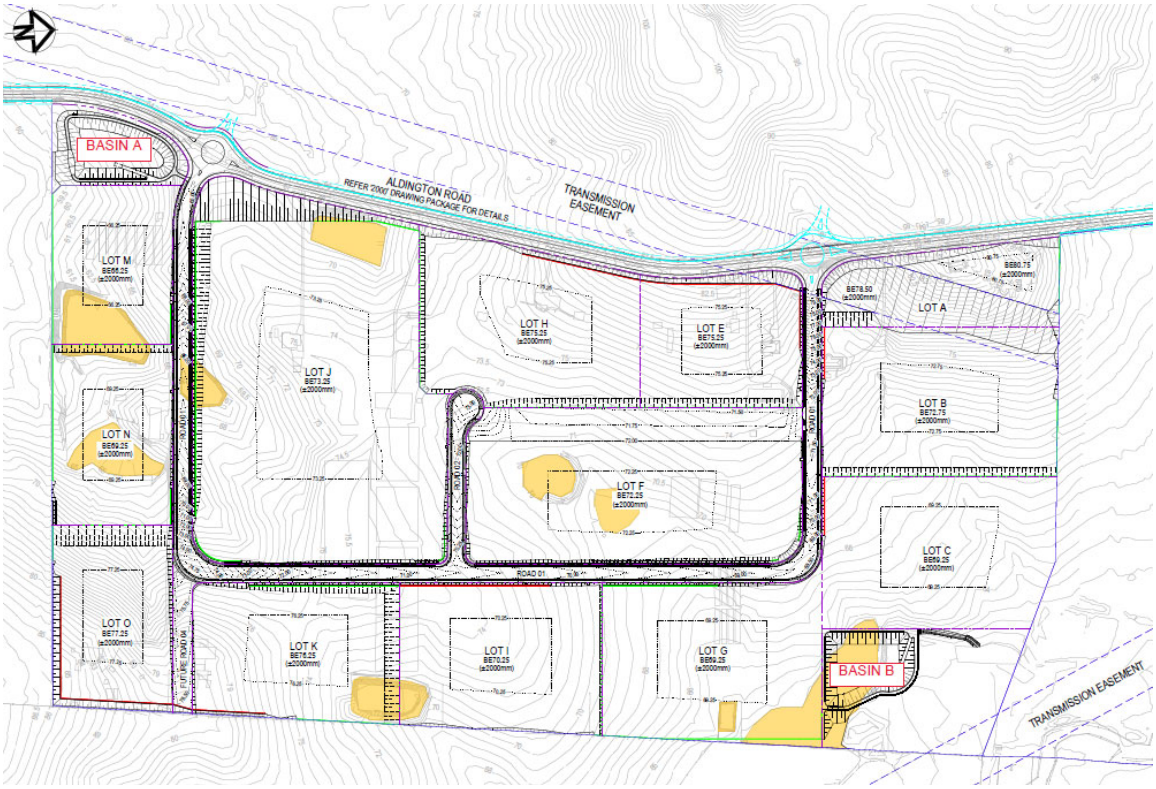


Figure 9 – Locations of Proposed Basin A and Basin B

locations of proposed Basins A and B.

As it can be seen in the existing topography of the adjacent site, the existing low point currently receives upstream flows from the 200 Aldington site and flows towards the dam located on the next property. Based on the review of the DA plans for the adjacent lot to the south (230-242 Aldington Road, Kemps Creek), the receiving flow from the 200 Aldington site is proposed to be conveyed through a headwall and an open swale across the lot. Based on this review, the proposed Basin A will have an outlet structure and overflow weir system to drain overland towards the existing low point on the adjacent property located to the south. Scour protection will be provided on these outlet structures to minimise the effects of scour and erosion on the downstream flow path. Refer to the Figure below which shows the proposed conveyance arrangement which was prepared for the adjacent development.

Basin B will have an outlet structure and overflow weir system to drain overland towards the upstream of the existing creek located along the north western corner of the subject site. Discharge from the Basin B will include the flows from the proposed large catchment to the north as well as the existing external catchment located to the north western side of the 200 Aldington site.

Refer to the Civil Drawings 19-609-C1061 to 19-609-C1071 for layout and details for the proposed catchments as well as the stormwater network across the site.

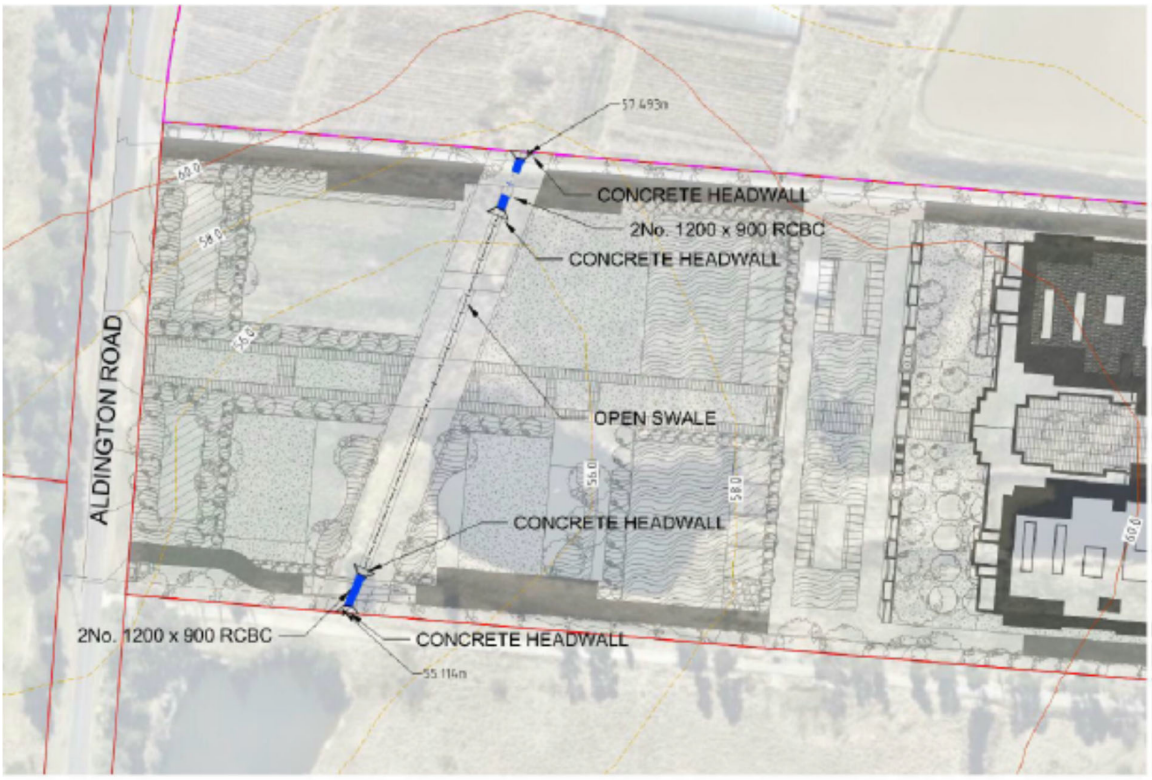


Figure 10 – Proposed Conveyance Arrangement within Adjacent Property to the South

9.2.1. External Upstream Stormwater Drainage

Part of the overall stormwater strategy for the site involves conveying the stormwater flows associated with upstream catchments.

As per AT&L drawing 19-609-C1081, the external upstream catchment is located towards the north western corner of the 200 Aldington site on the western side of Aldington Road. Currently this catchment flows towards the 200 Aldington site via an underground culvert with headwalls, which drains beneath Aldington Road. In the existing condition the flows from this catchment runs overland within the site into the existing creek located in the north east corner of the site. The size of the catchment is 3.933Ha.

In the proposed condition, the upstream flows from this catchment will be conveyed via a combination of underground pits and pipes located along proposed Road 01 and have been modelled based on greenfield runoff rates. The flows from this catchment will be directed into Basin B which will have an outlet structure and overflow weir system to drain overland towards the upstream of the existing creek located along the north western corner of the subject site. This external catchment network is proposed to contain all storm events up to the 1% AEP and it is the intention to not combine the external catchment runoff with the internal stormwater runoff.

The external catchment runoff are modelled as greenfield rates and are designed to not be detained or treated and will bypass the site's bio-retention basin B via a separate 600mm diameter pipe. This 600mm diameter pipe will carry the upstream external catchment stormwater flows via series of sealed pits and will eventually discharge the stormwater flows to the above ground swale on the outside of the retaining wall towards the north of Basin B. It is assumed detention and water treatment of these upstream catchments to PCC requirements will occur on the separate lots at the time of development.

9.2.2. Riparian Assessment

A Riparian Assessment report was undertaken by Ecological to support the SSDA for the site.

Within the ELA report mapping showed an unnamed first order watercourse within the study area at the southern boundary as well as on the east of the site. The watercourse to the east of the site is a tributary of Ropes Creek, within the Hawkesbury Nepean catchment. A number of farm dams also exist within the study area and these have been numbered for ease of reference as shown in Figure 6.

The report also identifies there was no defined channel downstream of the second dam in the location where the watercourse was mapped on the hydroline dataset. There was an overland flow path that had been channelled towards the first dam through a section of concrete pipe.

Using aerial photographs, an indicative top of bank of this watercourse was mapped as shown in Figure 6 and 6.1:

Based on the Ecological Riparian Assessment report the following advice has been received:

It is ELA's opinion that the dam on Lot 31 would be able to be decommissioned following consultation with NRAR, however a watercourse to convey water from upstream of the site through to the waterbody on Lot 32 would be required. Any proposed development on waterfront land (i.e. within 40 m of the top of bank of this watercourse) would require a Controlled Activity Approval from the NRAR as part of the approvals process, unless the development is to be assessed as State Significant Development, in which case a separate CAA is not required.

The 1st order watercourse and waterbody on Lot 32 has habitat values including Endangered Ecological Community in the riparian zone. If removal of this waterbody is proposed, consultation with Council and the NRAR is recommended. If the proponent pursued removal of this waterbody, it would need to demonstrate that a positive watercourse and riparian outcome could be achieved. For example, creation of a vegetated riparian corridor through both properties. This would have an establishment cost involving earthworks and riparian restoration. The loss of the biodiversity values would also need to be offset through the Biodiversity Offset Scheme under the BC Act 2016. Whilst such outcomes can be proposed, they are by no means guaranteed to be approved by Council or NRAR. It would therefore be prudent at this Due Diligence stage to assume that the waterbody on Lot 32 and its surrounding 10 m buffer would be *unavailable for development unless a positive outcome can be designed and constructed with a high level of confidence that the lost biodiversity values would be recreated.*

The Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors (2018) indicate that on-line stormwater detention basins can be placed on first and second order streams. However, not on third order streams or above. The removal of existing basins is generally supported by NRAR as this allows more

natural run-off to occur. Stormwater outlet structures and essential services are also allowed within riparian corridors of all streams.

Removal of the eighth dam may require a CAA from NRAR, as it appears to be located within waterfront land. The removal of the remaining dams may be subject to conditions of consent, such as the preparation of a dam de-watering plan, to ensure impacts to downstream environments are minimised. Consultation with Penrith Council would be recommended in order to determine what conditions would need to be satisfied prior to the decommissioning of these dams.

Figure 11 – Watercourses mapped within development area (Lots 31-32)

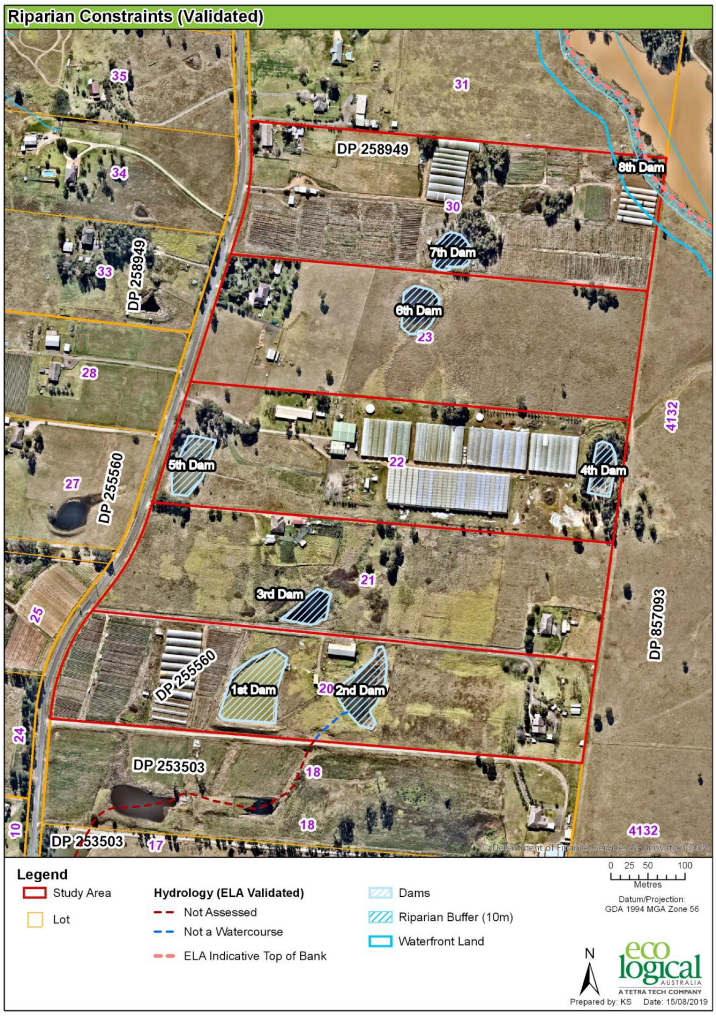


Figure 12 -Watercourses mapped within development area (Lots 20-30)

Refer to Civil Engineering Drawings within Appendix D for proposed works along waterfront land.

9.3. Council Requirements & Recommendations

All estate level stormwater drainage for the 200 Aldington development is designed to comply with the following:

- Penrith City Council Design Guidelines for Engineering Works;
- Penrith City Council Water Sensitive Urban Design (WSUD) Policy December 2013; and
- C3 Water Management DCP.

A summary of the design requirements adopted is listed below:

- Precinct based basin will serve the development as detention and bioretention basins. The basin will be designed to comply with PCC standard WSUD requirements
- All drainage in the road reserves of roads dedicated to PCC will be to PCC specifications.
- All stormwater drainage within the lots will be the responsibility of the individual property owners.
- OSD is to be sized to ensure that for all rainwater events up to and including the 1:100 ARI event, that new developments do not increase stormwater peak flows in any downstream areas;
- OSD is to mitigate post development flows to pre-developed flows for peak Average Reoccurrence Interval (ARI) events.

- All OSD basins have been designed with a 3.0m wide stabilised access road along the berm to ensure maintenance vehicles can access the entire exterior of the basin;
- WSUD to achieve target reductions:
    - 85% Total Suspended Solids (TSS)
    - 60% Total Phosphorus (TP)
    - 45% Total Nitrogen (TN)
    - 90% Gross Pollutants (GP)
- Finished Floor Levels (FFL) of proposed buildings within the precinct (separate approval) to have minimum 500mm freeboard to 100 year overland flows; and

Rainwater tanks are desirable for re-use for irrigation and other non-potable water uses. Rainwater tank size is determined in accordance with the Penrith City Council C3 Water Management DCP to meet 80% of non-potable demand for irrigation.

Refer to Section 8 of this report for a more detailed description on rainwater harvest tanks.

9.3.1. Modelling Software

DRAINs modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the estate stormwater pipes. DRAINs is a computer program used for designing and analysing urban stormwater drainage systems and catchments. It is widely accepted by Council's across NSW as the basis for stormwater design and has been confirmed by Penrith City Council as the preferred stormwater software analysis package. DRAINs data files and output results are attached in Appendix E.

MUSIC modelling software has been used to evaluate pollutant loads from each developed lot and precinct. For a detailed description of the MUSIC modelling refer to Section 9.3.7 of this report. MUSIC data files and output results are attached in Appendix F.

9.3.2. 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 sub catchment 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 sub catchments;
- 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;
- Inlet pits to be spaced so that flow width shall not exceed 80 l/sec;
- Bypass from any pit on grade shall not exceed 15% of the total flow at the pit; and
- Blockage factors of 20% and 50% shall be adopted for pits on grade and at sags respectively, with these blockage factors in-built to each pit within the DRAINs model.

9.3.3. Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design;
- The minimum pipe size shall be 375mm diameter RCP;
- Maximum spacing between pits shall not exceed 75m;
- The minimum pipe grade shall be 0.5%;
- All pipes shall be Rubber Ring Jointed unless noted otherwise;
- 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 pipes in trafficable areas shall be Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent;
- The pipe friction coefficients to adopted shall be:

Materials	Mannings – n	Colebrook-White – k	Min. Pipe Class
RCP	0.012	0.3	3
FRC	0.01	0.15	3

Table 5 – Pipe Details

- All pipes classes shall be designed for the ultimate service loads and where applicable, construction 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 for the minor storm event;
- Overland flowpaths shall maintain a minimum of 300mm freeboard to all habitable floor levels; and
- Pits deeper than 1.2m shall contain step irons at 300 mm centres.

9.3.4. Catchments

A Stormwater Catchment Plan for each Catchment and flow paths into the bio-retention basin is shown in Appendix D. As indicated in the Catchment Plan the basins are to be a bio-retention basins designed to both attenuate stormwater flows and treat the nutrients to Penrith City Council treatment rates. These treatment rates are from the Penrith City Council C3 Water Management DCP.

The overall developed site is proposed to be split into two catchments as per drawing 19-609-C1081.

A summary of each catchment and the outflow and overflow locations are described below:

Catchment 1 – Northern Catchment

- Total Area = 41.55Ha;
    - Includes: northern Lots A to I, Road 01 and Road 02
- Flow path to north and east of catchment into the Basin ; and
- Outlet and overland flow from the Basin B to drain to the overland area upstream of the existing creek located on the north eastern corner of the 200 Aldington site.

Catchment 2 – Southern Catchment

- Total Area = 28.02Ha;

    - Includes: Southern half of Lots J to O, portion of Road 01, and future road.
- Flow path to south and west of catchment into the Basin; and
- Outlet and overland flow from the Basin A to drain to the south into the existing low point located within the adjacent property which is proposed to be conveyed via an underground culvert as shown on the DA drawings prepared for the adjacent development.

Catchment 3 – External Catchment

- Total Area = 3.933Ha;
    - Includes: External catchment to the north western corner of the 200 Aldington site across the Aldington Road.
- Flow path to east of catchment into the Basin B; and
- Outlet and overland flow from the Basin B to drain to the overland area upstream of the existing creek located on the north eastern corner of the 200 Aldington site.

9.3.5. On-Site Detention (OSD)

As discussed in Section 9.3, OSD is required within the development to mitigate post developed flows to pre-developed flow rates for peak Average Recurrence Intervals (ARIs).

Catchments Discharge Points

As discussed within Section 9.3 of this report, the main objective of the stormwater management of the proposed development is to ensure post-developed catchment flows do not exceed pre-developed catchment flows for all storms from the 1 to 100 year ARI event for all existing catchments.

In order to ensure these post-developed flows do not exceed the pre-developed flows it is important to look at the existing catchments and compare the outflows.

As discussed in Section 9.1 the site is mainly divided in to two stormwater catchments – larger catchment in the north and smaller catchment to the south. The stormwater on the lots and within the road reserve for the southern catchment of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the south west corner of the site – called Basin A. Stormwater on the lots and within the road reserve for the larger catchment to the north of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the north east corner of the site – called Basin B.

As it can be seen in the existing topography of the adjacent site, the existing low point currently received upstream flows from the 200 Aldington site and flows towards the dam located on the next property. Based on the review of the DA plans for the adjacent lot to the south (230-242 Aldington Road, Kemps Creek), the receiving flow from the 200 Aldington site are proposed to be conveyed through the underground piped system. Based on this review, the proposed Basin A will have an outlet structure and overflow weir system to drain overland towards the existing low point on the adjacent property located to the south. Scour protection will be provided on these outlet structures to minimise the effects of scour and erosion on the existing creek systems.

Basin B will have an outlet structure and overflow weir system to drain overland towards the upstream of the existing creek located along the north western corner of the subject site. Discharge from the Basin B will include the flows from the proposed large catchment to the north as well as the existing external catchment located to the north western side of the 200 Aldington site.

As per AT&L drawing 19-609-C1081, the external upstream catchment is located towards the north western corner of the 200 Aldington site across the Aldington Road. Currently this catchment flows towards the subject site via an underground culvert with headwalls, which runs under the Aldington Road. In the existing condition the flows from this catchment runs overland on the 200 Aldington site to the existing creek located towards the north east corner. The size of the catchment is 3.933Ha.

In the proposed condition, the upstream flows from this catchment will be conveyed via a combination of proposed underground pits and pipes located along proposed Road 01 and have been modelled at greenfield runoff rates. The flows from this catchment will be directed to Basin B which will have an outlet structure and overflow weir system to drain overland towards the upstream of the existing creek located along the north western corner of the subject site. This external catchment network is proposed to contain all storm events up to the 1% AEP and it is the intention to not combine the external catchment runoff with the internal stormwater runoff.

The external catchment runoff will also not be detained or treated and will bypass the site's bio-retention basin B. It is assumed detention and water treatment of these upstream catchments to PCC requirements will occur on the separate lots at the time of development.

For the post-development case it is proposed to maintain the existing point of discharge and ensure peak flow rates are not increased via the OSD basin and controlled outlets within through the use of a low flow orifice and high flow weirs. Refer to Drawing 19-609-C1085 to 19-609-C1089 for the OSD basin details.

Based on ELA's report and based on the site investigation, it can be seen that the existing dam located on the north east corner of Lot 31, drains to the Ropes Creek via the overland flow path as shown in the Aerial Image below. It is also described within the ELA's report that the existing dam on Lot 31 can be decommissioned with necessary approvals.

AT&L has analysed the flow pattern of the existing dam on Lot 31 and how it overflows to the Ropes Creek in existing condition. As it can be seen in the Figure 12 below, existing dam overflows via the flow paths as shown in colour blue. This was determined based on the existing topography of the site, site inspection and study of aerial images.

It should be noted that the flow paths shown on the reports and maps prepared by other consultants appear to be mainly based on historical data and based on aerial images. Although contrary to maps prepared by other consultants, AT&L would like to refute the previously available information regarding the flow path. To determine more accurate flow path, available information such as the site topography survey, LIDAR data and site inspection in combination with aerial images have been analysed to locate the accurate path of the overflow from the existing dam to the Ropes Creek.

As shown on the drawing numbers 19-609-C1051 and 19-609-C1052, the outfalls from the Basin B is proposed towards the northern flow path (as shown in the Figure 12 below) and will not have any detrimental effect to the surroundings.

For the proposed development the earthworks design is developed such that a western portion of this existing dam will be filled to provide for a levelled site while still maintaining the existing flow pattern and keep the dam functioning as it does in the current condition.

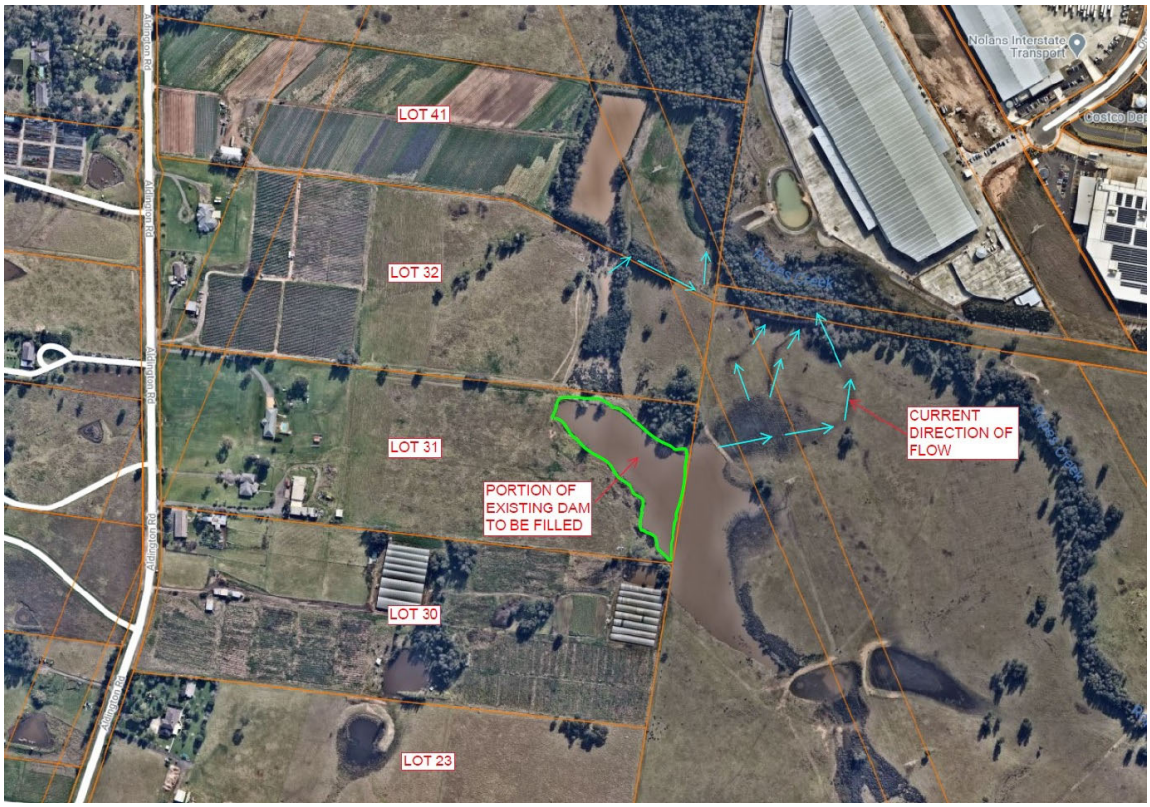


Figure 13 -Dam and Watercourses mapped within development area (Lot 31)

Table 6 indicates the pre and post developed flow rates for all storm events at the outfall of both the OSD basins.

The OSD within the Basins have been designed to achieve the following outcomes for all pre and post developed cases:

Duration	Pre-Developed Flows Basin A (m^3/s)	Post Developed Flows Basin A (m^3/s)	Pre-Developed Flows Basin B (m^3/s)	Post Developed Flows Basin B (m^3/s)
1-Year ARI	2.55	0.749	6.21	2.27
2-Year ARI	2.94	0.865	7.17	2.27
5-Year ARI	4.67	1.76	11.4	2.39
20-Year ARI	6.41	1.93	15.6	4.6
100-Year ARI	8.58	2.09	20.9	5.54

Table 6 – Pre-Post Development Flows from the proposed development

9.3.6. Overland Flows

Overland flows within the access roads, carparks and hardstanding areas have been designed to be safely conveyed within the road carriageway to comply with flow widths and velocities within the Penrith City Council Design Guidelines for Engineering Works.

9.3.7. Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design (WSUD) 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.

The WSUD strategy, MUSIC Model and subsequent WSUD designs prepared by AT&L are based upon requirements within the Penrith City Council C3 Water Management DCP.

9.3.7.1. WSUD Modelling – MUSIC Model

The MUSIC Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 6.3.0) was used to evaluate pollutant loads from each of the proposed lots for Post-development (treated) conditions based on the proposed site development.

A conceptual view of the MUSIC model used in this report can be found in Appendix F.

Pluviograph data (6 minute rainfall intensity and evapotranspiration) for Penrith Lakes AWS (Station 67113) was used in the MUSIC model.

9.3.7.2. Catchment Areas and MUSIC Parameters

All building lot catchment areas were assumed to 65% roofed. Of the non-roofed areas, 80% of this area was assumed to be impervious. To provide a more accurate model, separate catchment nodes were created to simulate the roofed area and non-roofed areas for each lot.

MUSIC model input parameters for these catchments including rainfall-runoff, base flow concentration and stormflow concentration parameters were selected as per the Penrith City Council Water Sensitive Urban Technical Guidelines June 2015 document. The parameters used for the various catchment areas can be seen in tables 7, 8, 9, 10 and 11.

Parameter	Unit	Figure
Rainfall Threshold	mm/day	1.40
Soil Storage Capacity	Mm	105.00
Initial Storage	% of Capacity	30.00
Field Capacity	Mm	70.00
Infiltration Capacity Coefficient	a	150.00
Infiltration Capacity Coefficient	b	3.50
Initial Depth (Ground Water)	mm	10.00
Daily Recharge Rate	%	25.00
Daily Baseflow Rate	%	10.00
Daily Seepage Rate	%	0.00

Table 7 – Rainfall-Runoff Parameters – All Catchment Areas

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	0.000	0.000	1.300	0.320
Phosphorus	0.000	0.000	-0.890	0.250
Nitrogen	0.000	0.000	0.300	0.190

Table 8 – Base Flow/Stormwater Concentration Parameters – Impervious (Roofed) Areas

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	1.200	0.170	2.150	0.320
Phosphorus	-0.850	0.190	-0.600	0.250
Nitrogen	0.110	0.120	0.300	0.190

Table 9 – Base Flow/Stormwater Concentration Parameters – Pervious Areas

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	0.000	0.00	2.430	0.320
Phosphorus	0.000	0.000	-0.300	0.250
Nitrogen	0.000	0.000	0.340	0.190

Table 10 - Base Flow/ Stormwater Concentration Parameters - Road

MUSIC model parameters used for the Bio-retention basin were based off guidelines provided by FAWB – Stormwater Biofiltration Systems – Version 1, 2009, and were modified accordingly. Parameters used to model the bio-retention basin are shown in the Table 11 below.

Parameter	Unit	Figure
Extended Detention Depth	m	0.30
Surface Area	m2	Varies
Filter Area	m2	Varies
Unlined Filter Media Perimeter	M	0.01
Saturated Hydraulic Conductivity	mm/hour	125
Filter Depth	m	0.50
TN Content of Filter Media	mg/kg	800
Orthophosphate Content of Filter Media	mg/kg	40.0
Exfiltration Rate	mm/hour	0.00
Base Lined	-	No

Vegetation Properties	-	Vegetated with Effective Nutrient Removal Plants
Overflow Weir Width	m	10.00
Underdrain Present	-	Yes
Submerged Zone	-	No

Table 11 - Bio-Retention Basin Parameters

9.3.7.3. Results

MUSIC modelling results presented as mean annual loads at the receiving node indicate that adopted target reductions are achieved, as shown in Table 12 and 13.

Pollutant	Sources (Kg/yr)	Residual Load (Kg/yr)	Reduction (%)	Target Reduction (%)
Total Suspended Solids	19,200	2,710	85.8	85
Total Phosphorus	42.9	14.8	65.5	60
Total Nitrogen	329	165	49.7	45
Gross Pollutants	4,090	136	96.70	90

Table 12 - Pollutant Loads - Bioretention Basin A – Junction A

Pollutant	Sources (Kg/yr)	Residual Load (Kg/yr)	Reduction (%)	Target Reduction (%)
Total Suspended Solids	28,000	3,630	87	85
Total Phosphorus	62.8	21.9	65.1	60
Total Nitrogen	482	252	47.7	45
Gross Pollutants	5,990	128	97.9	90

Table 13 - Pollutant Loads - Bioretention Basin B Junction B

9.4. Conclusion

As highlighted in the above section all stormwater drainage within the Oakdale West development has been designed in accordance with the Penrith City Council Engineering Guidelines. This includes design of the stormwater network (pits and pipes), On-Site Detention basins and WSUD infrastructure. To summarise:

- OSD has been to be sized to ensure that for all rainwater events up to and including the 1:100 ARI event, does not increase stormwater peak flows in any downstream areas;
- OSD to mitigate post development flows to pre-developed flows for peak Average Reoccurrence Interval (ARI) events;
- WSUD to achieve target reductions:
    - 85% Total Suspended Solids (TSS)
    - 60% Total Phosphorus (TP)
    - 45% Total Nitrogen (TN)
    - 90% Gross Pollutants (GP)
- Finished Floor Levels (FFL) to have minimum 500mm freeboard to 100-year overland flows

10. Water Balance

10.1. General

The water balance was simulated using a water cycle management model as part of the MUSIC Model to allow the evaluation of various elements of the water cycle to be assessed at differing stages in the development.

Penrith City Council WSUD policy (July 2015) stipulates the rainwater tanks to meet 80% of non-potable demand including outdoor use, toilets and laundry.

10.2. Water Balance Objective

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change and periods of extended drought and any development in sources of the Sydney region places increasing demands on an already reduced water supply. As a result, government bodies, together with Sydney Water have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewage, stormwater and rainwater) to minimise demands of potable water supplies.

Whilst opportunities for Water Reuse include such initiatives as regional stormwater harvesting, black water recycling and recycled water, this development is limited to rainwater collection and reuse on an individual lot by lot basis.

As such, we have used MUSIC to establish an estimated tank size for each lot within the development and demonstrated the volume of water reuse possible and provide a more sustainable servicing solution.

10.3. Water Balance End Uses

AT&L has identified the following water demand end uses to be required across the development:

- Landscape watering (outdoor garden use).

The proportion of total water demands for irrigation and toilet flushing within the development could be met with the use of recycled roof water drained directly into a rainwater tank. The tank should be sized to ensure the site meets the requirement to meet the 80% non-potable reuse requirement. This is in accordance with Penrith City Council's WSUD policy.

10.4. Total Site Demands and Non-Potable Re-use Rates

The following rates were adopted from the Penrith City Council WSUD technical Guidelines for Industrial and Commercial developments (Section 4.5):

- 0.4 kL/year/m2 as PET-Rain for Sprinklers.

10.5. Rainwater Reuse

The use of rain water collected in rainwater tanks from runoff on the roofs of the warehouse roofs provides a valuable alternative to potable water for a variety of non-potable end uses, such as vehicle washing, air conditioning cooling, and toilet flushing and watering.

We have assumed for this development, irrigation will be plumbed to the rainwater tanks. Other uses such as truck washing maybe considered at the detailed design stage.
A rainwater tank model was constructed to simulate the rainwater tank operations and select the optimal rainwater tank size, in doing so, the following considerations were made:

- Rainfall received;
- Roof area or runoff area;
- Roof Wetting;
- First Flush; and
- Rainwater demands (by end use).

10.6. Rainwater Tank Model Assumptions

The rainwater tank model assumptions built into the scenarios assumed thefollowing:

10.6.1. Rainfall Received

The rainfall runoff that could potentially be captured by the rainfall tank from the roof of each building was simulated individually for the 'dry', 'wet' and 'average' rainfall year within each scenario run.

10.6.2. Roof Wetting, First Flush Diversions and Overflow

While it is assumed that rainfall runoff has the potential to runoff 100% of the area of the roof into the rainwater tank, the proportion of rainfall that actually reaches the rainwater tank is affected by four factors:

- It is assumed that the initial 2mm of rainfall that falls on the roof is considered 'wetting', that is, potential rainfall runoff that is not captured by the rainwater tank, but is rather 'lost runoff' as evaporation or other;
- To prevent sediment and other pollutants entering the rainwater tank, a portion of the initial runoff from the roof is transferred to stormwater, this is known as the 'first flush'. The portion of water diverted as part of the first flush differs for each facility depending on the amount of pollution each roof is susceptible to;
- As the development is located in a predominantly light industrial area, where there may be potential for some roof pollution, a standard first flush volume of 1mm of runoff from across the roof area has been adopted; and
- Any roof runoff that exceeds the rainwater tank capacity is 'overflow' and is directed to the stormwater drainage system.

10.7. Conclusion

The use of rainwater harvest tanks and the design basis to size the tanks to ensure as a minimum, 80% of all non-potable water on each lot can be sourced from the tank, demonstrates a commitment to water recycling and minimising the usage of mains water.

This is in line with the industry best practise and the NSW Stage Government's objective of reducing the amount of potable (drinking) water consumed for non-potable uses.

11. Flood Report

A Flood Impact Assessment and Flood Risk Assessment of the subject site has been undertaken by Cardno in the reports, both dated 28 September 2020.

11.1. Flood Impact Assessment

The purpose of this report is to assess the impact of development proposed in the Site. The Flood Impact Assessment (FIA) report prepared by Cardno outlines the assessment of design flood levels, velocities and hazards under Benchmark conditions.

In addition to the FIA, a Flood Risk Assessment has also been prepared by Cardno and the purpose of this report is to provide a high-level understanding of the constraints of the subject site due to flooding and to provide for the stormwater strategy for the site.

11.2. Flood Modelling Results

The flood Impact Assessment has been prepared by Cardno. Based on the results within the Flood Impact Assessment, Cardno have plotted estimated impacts of the proposed development on the 2yr, 5ry, 100 yr, 200 yr, 500 ARI flood levels and velocities and PMF levels and velocities in comparison to the pre-development conditions.

Flood maps within the FIA highlight negligible adverse impacts on flood levels and velocities downstream of Aldington Road in all storm events. In the PMF event modest increases in the flood levels are experienced downstream of Aldington Road. As concluded within the FIA report under section 4.1 – Flood Level Impacts:

- *The 2015 Worley Parsons 100 yr ARI flood levels under Existing Conditions are significantly lower than the 2008 GHD 100 yr ARI flood levels under Existing Conditions (0.2 m – 0.73 m lower);*
- *The revised 100 yr ARI flood levels under Existing Conditions (this study – Case E1) are significantly lower than the 2008 GHD 100 yr ARI flood levels under Existing Conditions (0.1 m – 0.39 m lower) but remain higher than 2015 Worley Parsons 100 yr ARI flood levels under Existing Conditions (0.14 – 0.36 m higher)*
- *While the impact of Oakdale South and Oakdale West under revised Existing Conditions (this study - Case E2) in comparison to 2019 GHD model with Oakdale South and Oakdale West are increases of up to 0.21 m this is in an area where the 2019 lowered the 100 yr ARI flood level by 0.19 m – consequently the net effect is a flood levels which is the same as under Case E1;*
- *The incremental impacts of Oakdale South and Oakdale West under revised Existing Conditions (this study - Case E2) in comparison to revised Existing Conditions are increases of up to 0.05 m (but in locations where the revised flows have lowered the 100 yr ARI flood level);*
- *The local adverse impacts on in the 2 yr ARI, 20 yr ARI and 100 yr ARI, events in the vicinity of the NE corner of the 200 Aldington Industrial Estate are minor and confined to the RE2 zoned land;*
- *The incremental impacts downstream of the 200 Aldington Industrial Estate in the 2 yr ARI, 20 yr ARI and 100 yr ARI, events are negligible.*

12. Services Investigation

Based on an initial desk top study conducted from information obtained from Dial Before You Dig (DBYD) records, the following utility services are located within the vicinity of the Site:

- Potable water – Sydney Water Corporation;
- Electrical – Endeavour Energy; and
- Telecommunications – Telstra only;

No sewer or gas was noted to be located within the vicinity of the Site.

Investigations of the Site were carried out based on:

- Site inspection;
- Dial Before You Dig (DBYD) search;
- Sydney Water Hydra System;
- Penrith City Council Engineering Design Specification;
- LIDAR Survey information; and
- Sydney Water South West Growth Servicing Plan 2017-2022

12.1. Potable Water

12.1.1. Existing Potable Water

Dial Before You Dig (DBYD) indicates the following water services within the area:

- 100mm diameter DICL potable watermain on the eastern side of Aldington Road
- 150mm diameter uPVC potable watermain on the western side of Aldington Road

These assets are supplied from a 200uPVC main approximately 220m north of the site which is current supplied from the Cecil Park reservoir supply zone.

12.1.2. Proposed Potable Water

Consultation has been undertaken with Sydney Water regarding potable water servicing strategies for the Broader Western Sydney Employment Area (BWSEA), which includes the wider Aldington Road Precinct and the Site.

Sydney Water and various Water Servicing Coordinators have advised that there are multiple potential potable water servicing strategies for the wider Aldington Road Precinct and the Site, including, though not limited to the following:

1) Connection to, or extension and/or amplification of, the existing assets located within Aldington Road; and/or

2) Rezoning of upstream catchment supply areas to alleviate supply constraints on existing supply zone; and/or

Interim and permanent potable water supply arrangements for the wider Aldington Road Precinct may need to be considered subject to existing capacity of the network and development staging.

Sydney Water are currently delivering/investigating several upstream augmentation projects which will ultimately boost supply to the existing potable water assets within the Aldington Road precinct.

12.2. Sewer

12.2.1. Existing Sewer

Dial Before You Dig (DBYD) and a review of the Sydney Water Hydra System indicates there is no existing sewer infrastructure located at or adjacent to the Site.

12.2.2. Proposed Sewer

Consultation has been undertaken with Sydney Water regarding wastewater servicing strategies for the Broader Western Sydney Employment Area (BWSEA) which includes the wider Aldington Road Precinct and the Site.

Sydney Water and various Water Servicing Coordinators have advised that there are multiple potential wastewater servicing strategies for the wider Aldington Road Precinct and the Site. Refer to the Figure 14 below for the proposed layout of the sewer service.

Figure 14 – Proposed Sewer Connection Within the Precinct

Subject to the Independent Pricing and Regulatory Tribunal (IPART) and Consent Authority approvals, there is an option for a decentralised WWTP to be privately provided and operated by a network operator in advance of the proposed Sydney Water permanent South Creek WWTP and separate to any Sydney Water interim decentralised WWTP's.

While our proposal above provides immediate and permanent sewer service to this development (and potentially others adjacent), it should be noted that development in the broader precinct has less certain sewer servicing. Sydney Water are currently investigating servicing solutions for the wider Aldington Road precinct as part of the broader Aerotropolis servicing strategy.

Servicing strategies subject to Sydney Water, IPART and Consent Authority approvals. Therefore, the final design of the 200 Aldington site lead-in may be different to what is proposed here. Consultation with Sydney Water will be maintained to agree the final design of this infrastructure.

12.3. Electrical

12.3.1. Existing Electrical

Recent site inspection indicates that there is an overhead power line (11kV and 240v) on the eastern side of Aldington Road reserve parallel to the boundary. Dial Before You Dig (DBYD) indicates that there are no underground services within the vicinity of the Site.

Based on the meeting with Endeavour Energy which was held on 3rd August 2020, It was advised that October 2022 is anticipated to be a public commitment to deliver first phase of new zone substation. Ahead of this date it would be required to feed from either of the Existing Zone Substation locations and are as follows:

- Kemps Creek Zone Substation: located approximately 7km south of the Site off Elizabeth Drive; and
- Mamre Substation: Approximately 25 MVa spare capacity

Alternative Substation locations are:

- Eastern Creek substation - difficult to come through Oakdale south without an easement; and
- Horsley Park substation - (Walgrove road and Horsley north M7 and Redmayne drive) - 5.7km

12.3.2. Proposed Electrical

Consultation has been undertaken with Endeavour Energy regarding electrical servicing strategies for the Broader Western Sydney Employment Area (BWSEA) which includes the wider Aldington Road Precinct and the Site.

The Endeavour Energy 'Western Sydney Priority Growth Area – Area Plan April 2018' indicates the proposed high voltage network to be delivered as part of the wider Endeavour Energy electrical network required to service the Aerotropolis.

Connect Infrastructure has undertaken and completed the Electrical Route Study and has provide three (3) options. These three options are:

Option 1: Supply from Horsley Park Zone substation via Horsley Road to the eastern boundary of the development site

Option 2: Supply from Mamre Zone substation via Templar Road and Aldington Road to the northern boundary of the development site

Option 3: Supply from Mamre Zone substation via Eskine Park Drive, Mamre Road, Bakers Lane and Aldington Road to the northern boundary of the development site

Although it was not identified which option would be the most suitable option, Connect Infrastructure has advised that further consultation with Endeavour Energy will be required and based on the risk / reward profile, a suitable option can be determined.

12.4. Telecommunications

Dial Before You Dig (DBYD) indicates that Telstra below ground conduits are located within the Aldington Road Reserve parallel to the boundary.

Site inspection has identified there are aboveground assets along the western side of Aldington Road.

It is expected connection could be made from the existing infrastructure located within Aldington Road. Subject to the requirements of the relevant telecommunications authority, new pit and pipe may need to be installed from Erskine Park Road to the Site.

12.5. Gas

There are no existing Jemena gas mains located within the vicinity of the Site. No contact has been made with Jemena to determine if there are plans to service the area in future.

12.6. Conclusion

This section demonstrates that services including wastewater, potable water, power, telecommunications and gas can be made available to the site.

Internal reticulation will be coordination at the detailed design stage of works with formal applications made to the relevant service authorities.

13. Infrastructure Staging

13.1. Staging

The site wide civil infrastructure works will be undertaken all within Stage 1 of the development. The infrastructure includes but not limited to the construction of the Aldington Road, Internal Estate Roads, associated footpaths and verge, earthworks, retaining walls, stormwater drainage systems, OSD Basins and services infrastructure to provide service to the allotments.

Stage 1 of construction will include external roads and services lead-ins to the site and as a minimum the roads and the street infrastructure. Delivery of construction will be undertaken progressively in order to meet end user requirements.

13.2. Funding arrangements

The assumed funding arrangement for infrastructure are as follows:

- Abbots / Mamre Road Intersection – Proposed to be delivered as Works in Kind offset against SIC Levy.
- **Aldington Road Upgrades:** Proposed to be delivered as Works in Kind offset against Section 7.11 and / or 7.12 contributions. Subject to authority approvals.
- **Lead-in services:** Proponent funded with potential reimbursements subject to relevant authority approvals and procurement processes.
- **Internal works:** Proponent funded.

All funding arrangements subject to authority approvals.

APPENDIX A – Dial Before You Dig Records

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.

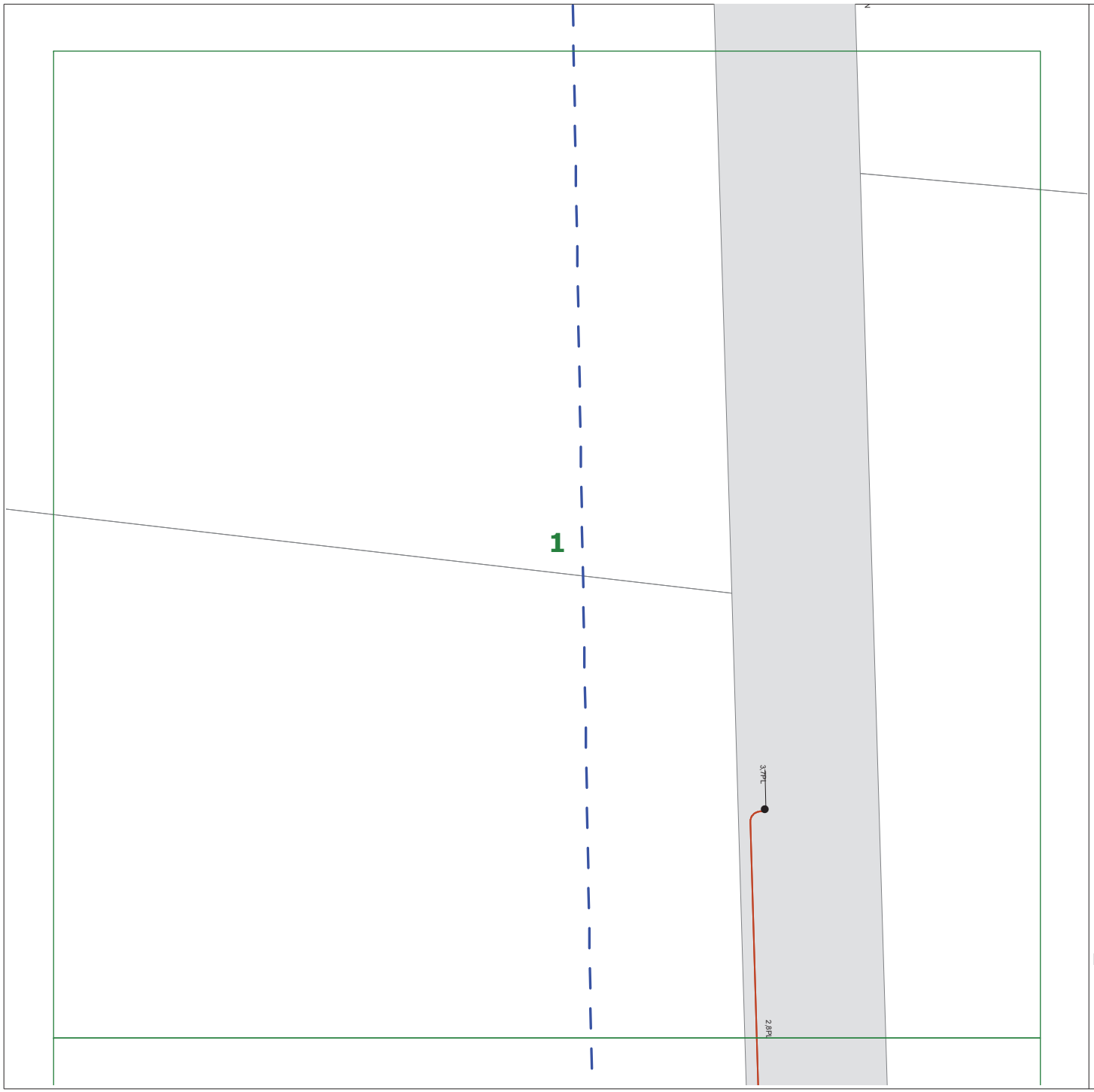
LEGEND

- 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.:	95816315
Issued Date:	16/03/2020



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.

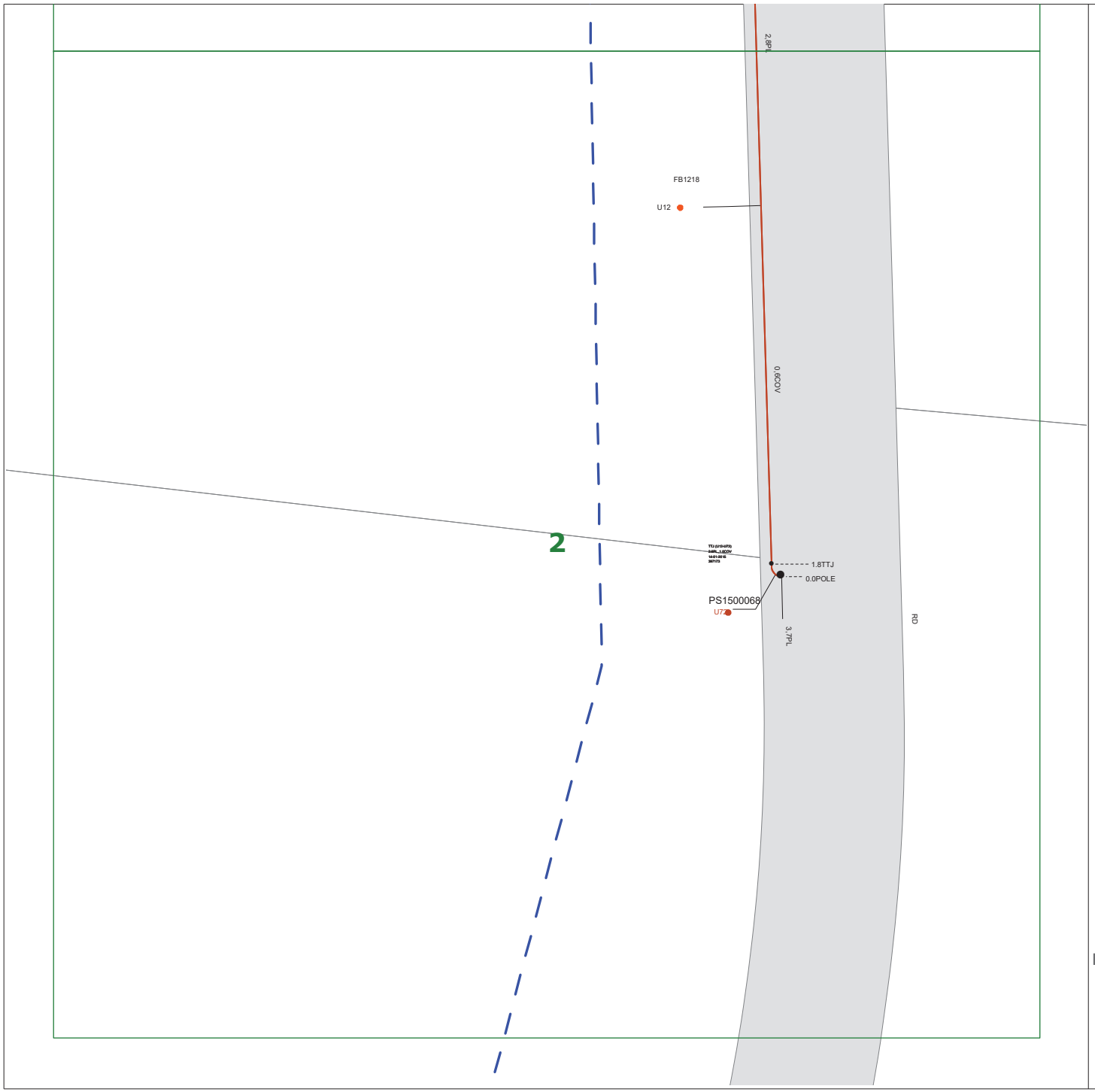
LEGEND

- 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.:	95816315
Issued Date:	16/03/2020



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- 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.:	95816315
Issued Date:	16/03/2020

DBYD Address:
n/a Aldington Road
Kemps Creek NSW 2178

DBYD Job No: 19211617

DBYD Sequence No: 95816318

SYDNEY WATER CORPORATION

Scale: 1:2000

Date of Production: 16/03/2020

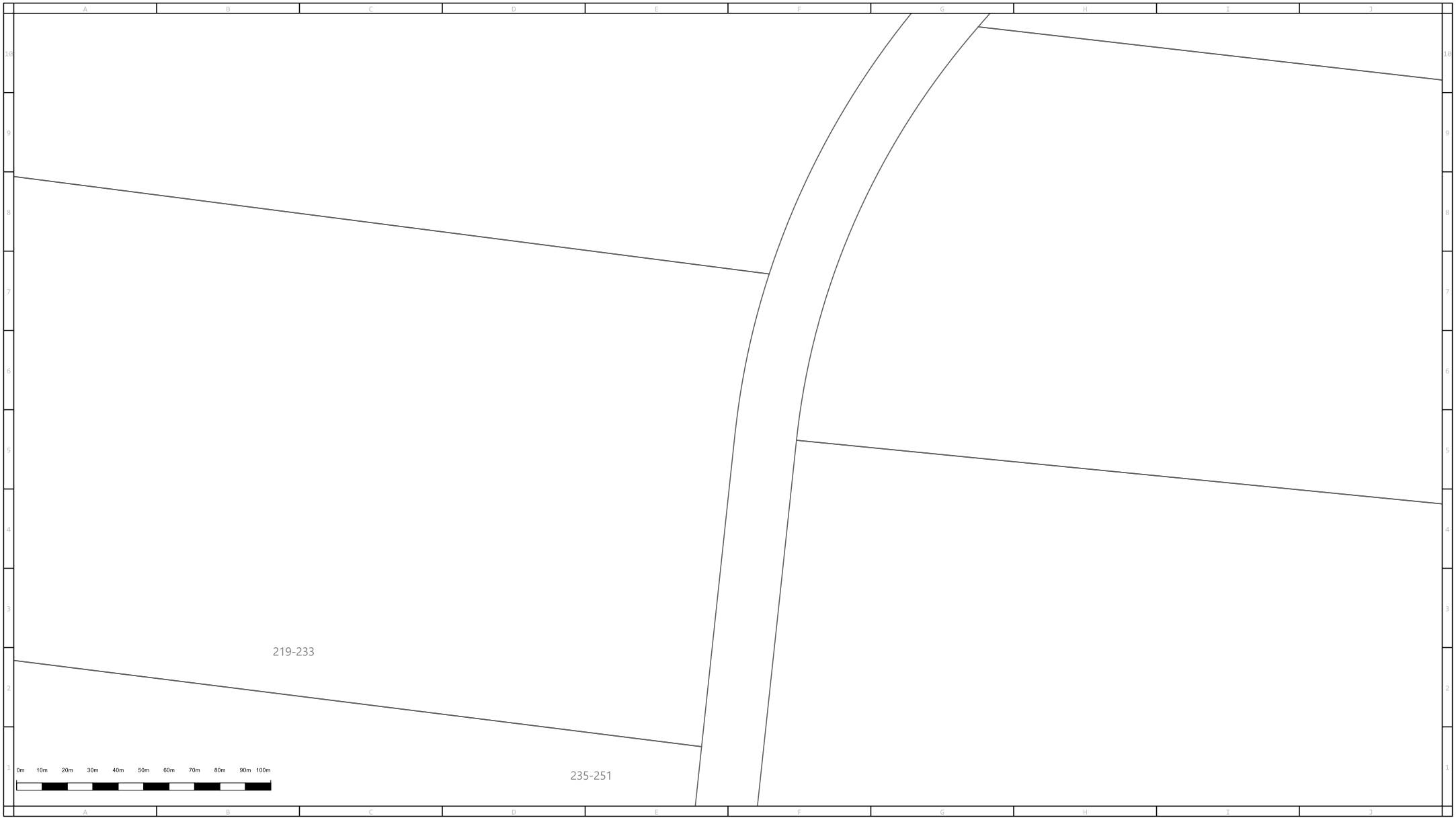
N

Plan 1 of 1

0m 30m 60m 90m 120m 150m

DBYD Authority: Jemena Gas Networks (NSW)

DBYD Location: Aldington Road Kemps Creek NSW, 2178



Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
Primary - 3500 kPa		
JGN Trunk - 7000 kPa		
Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
Valve	MBK = Metres Back of Kerb	
Regulator Set	MFL = Metres from Fence Line	
Regulator Station	50mm Nylon main inserted in 6 inch (Nominal Bore) Cast Iron Main	6NB 50MM NY
Automatic Line Break Valve	32mm Nylon main inserted into 50mm Steel Main	50MM 32MM NY

N W E S

Scale: 1:2000

Issue Date: 16/03/2020

DBYD Seq No: 95816317

DBYD Job No: 19211617

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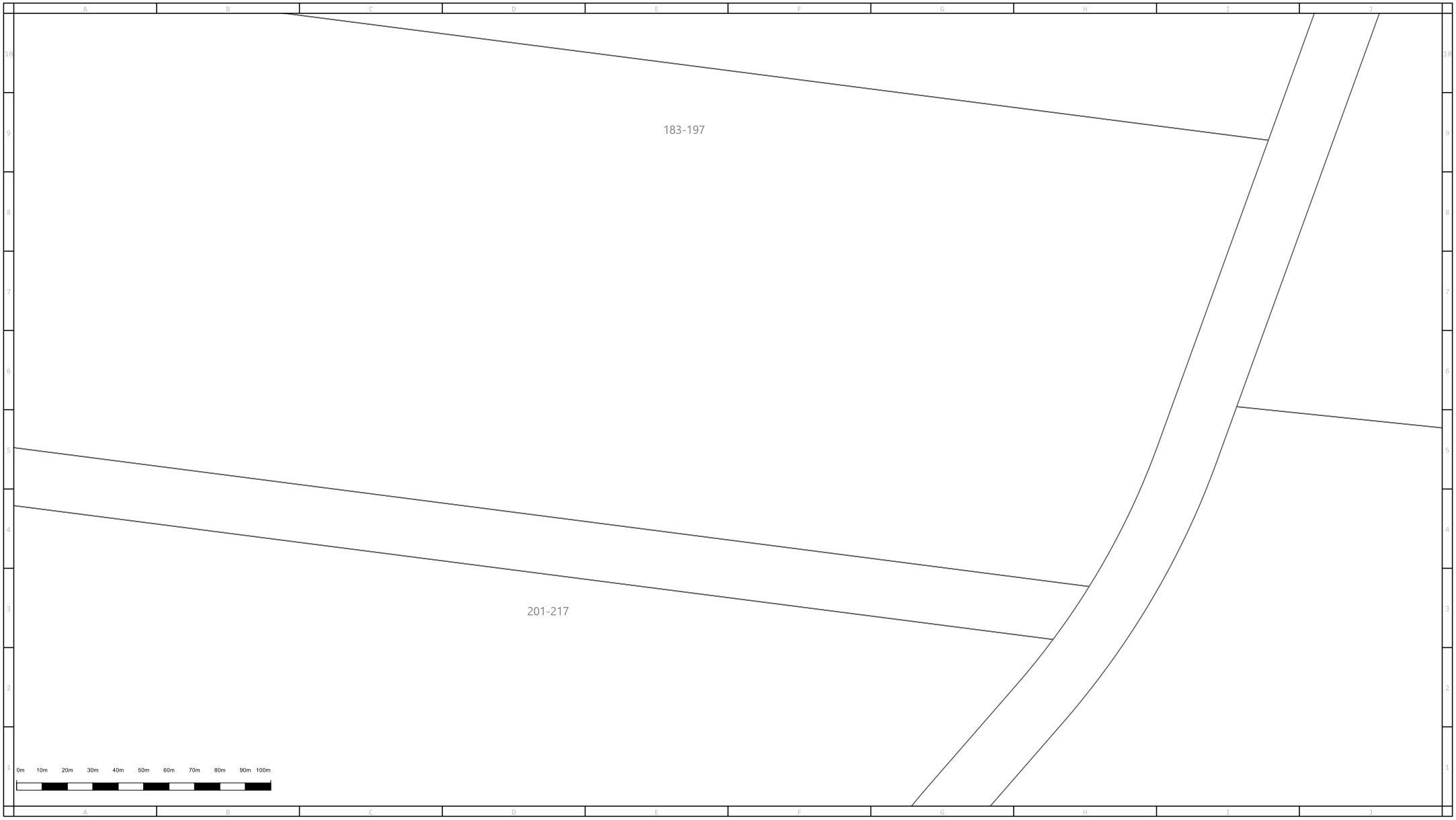
DBYD Location: Aldington Road Kemps Creek NSW, 2178



Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
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Transmission		

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Siphon	Distance in metres of Main from Boundary Line	~1.5
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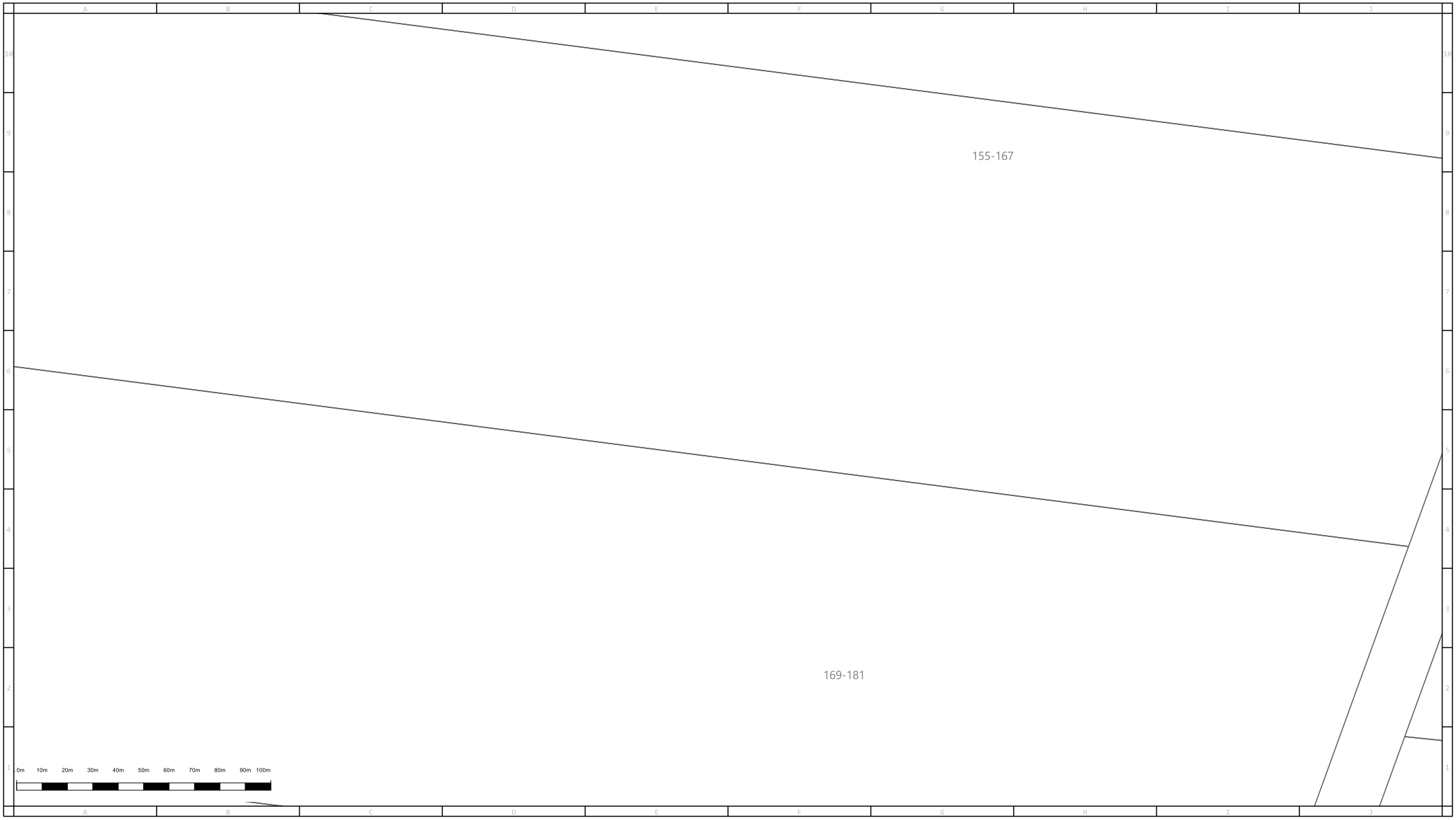

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
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Transmission		

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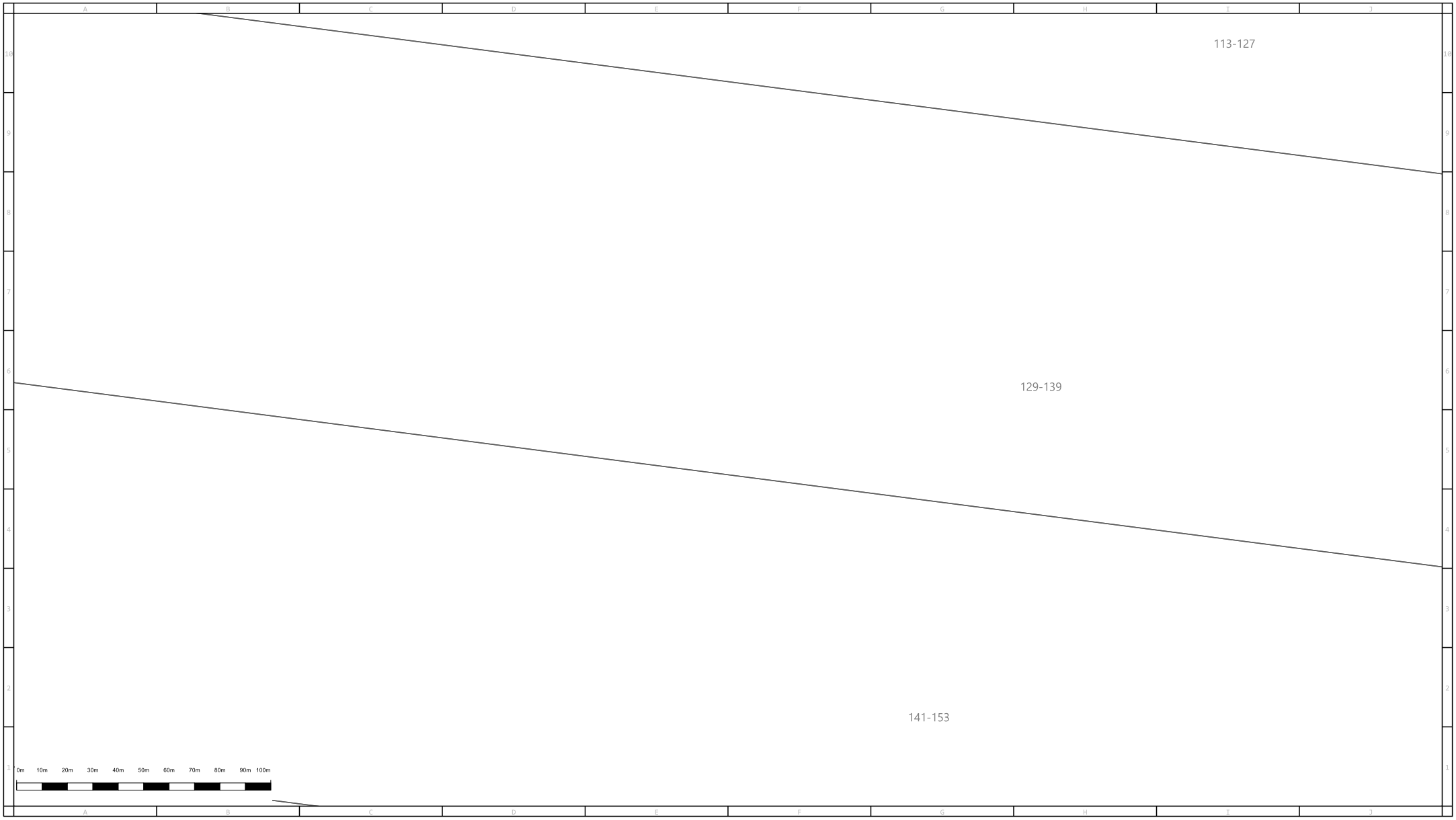

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
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Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
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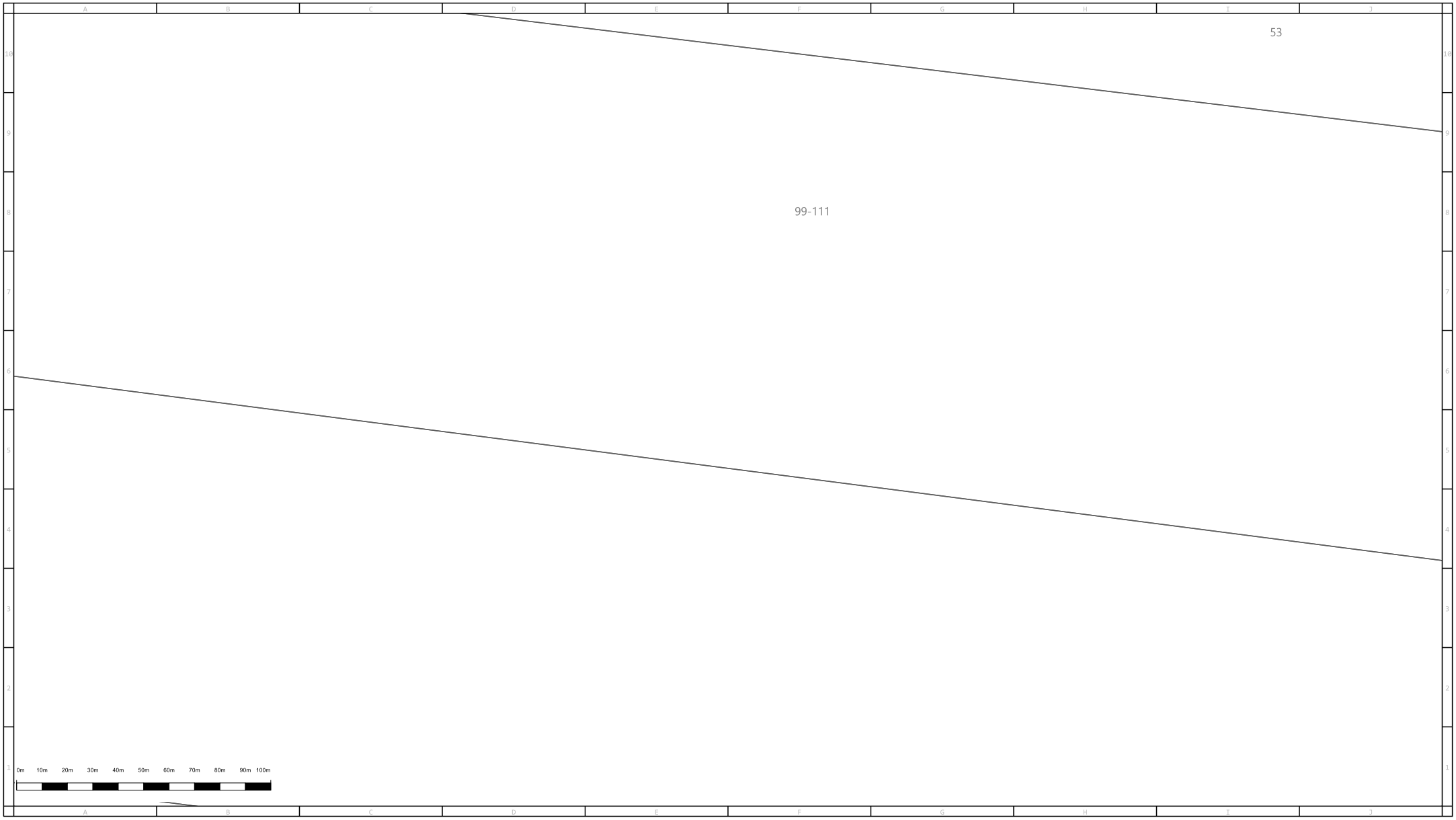

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Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
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Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
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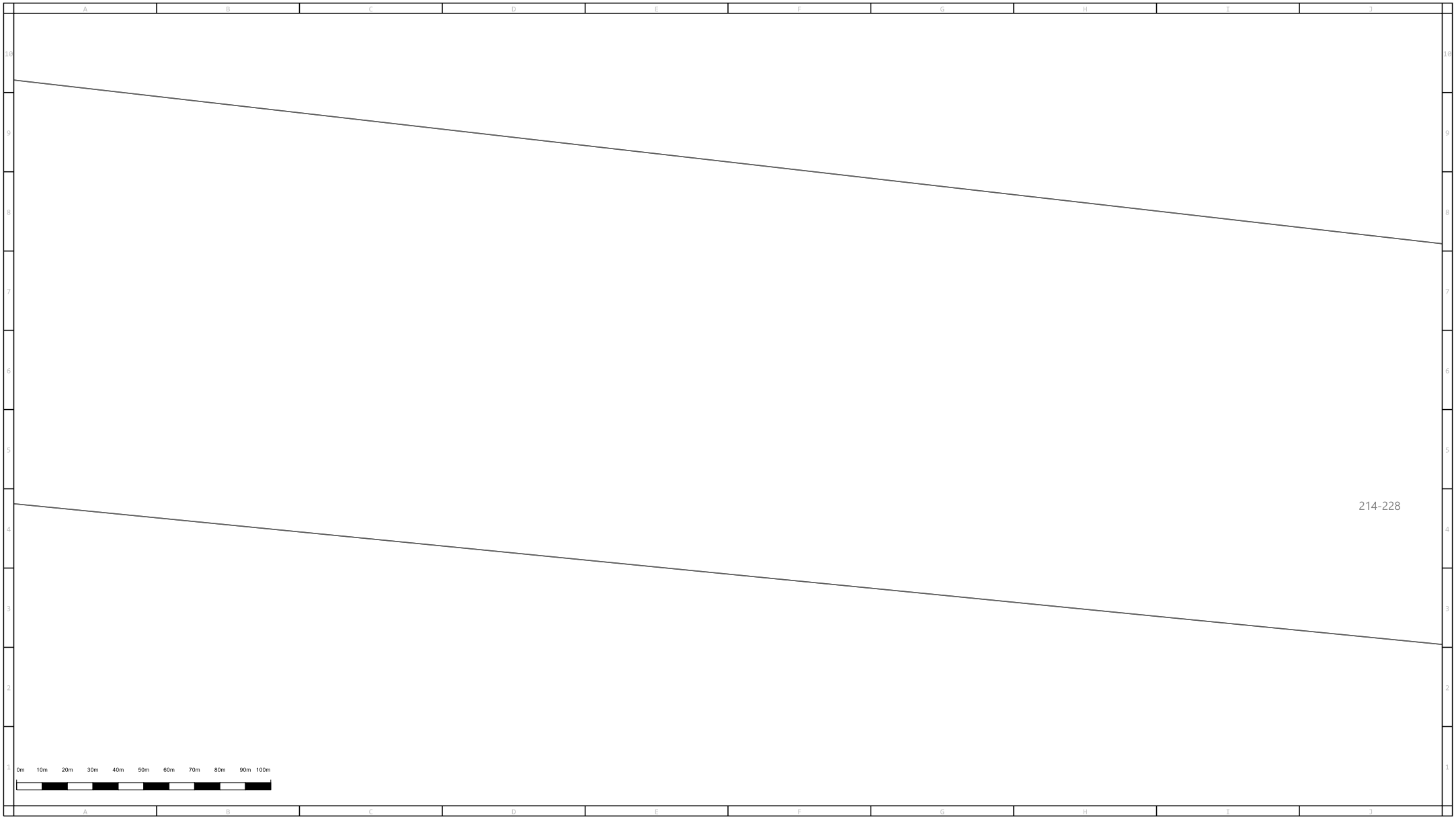

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Main	In Service	Proposed
Unknown Pressure		
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Main	
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Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
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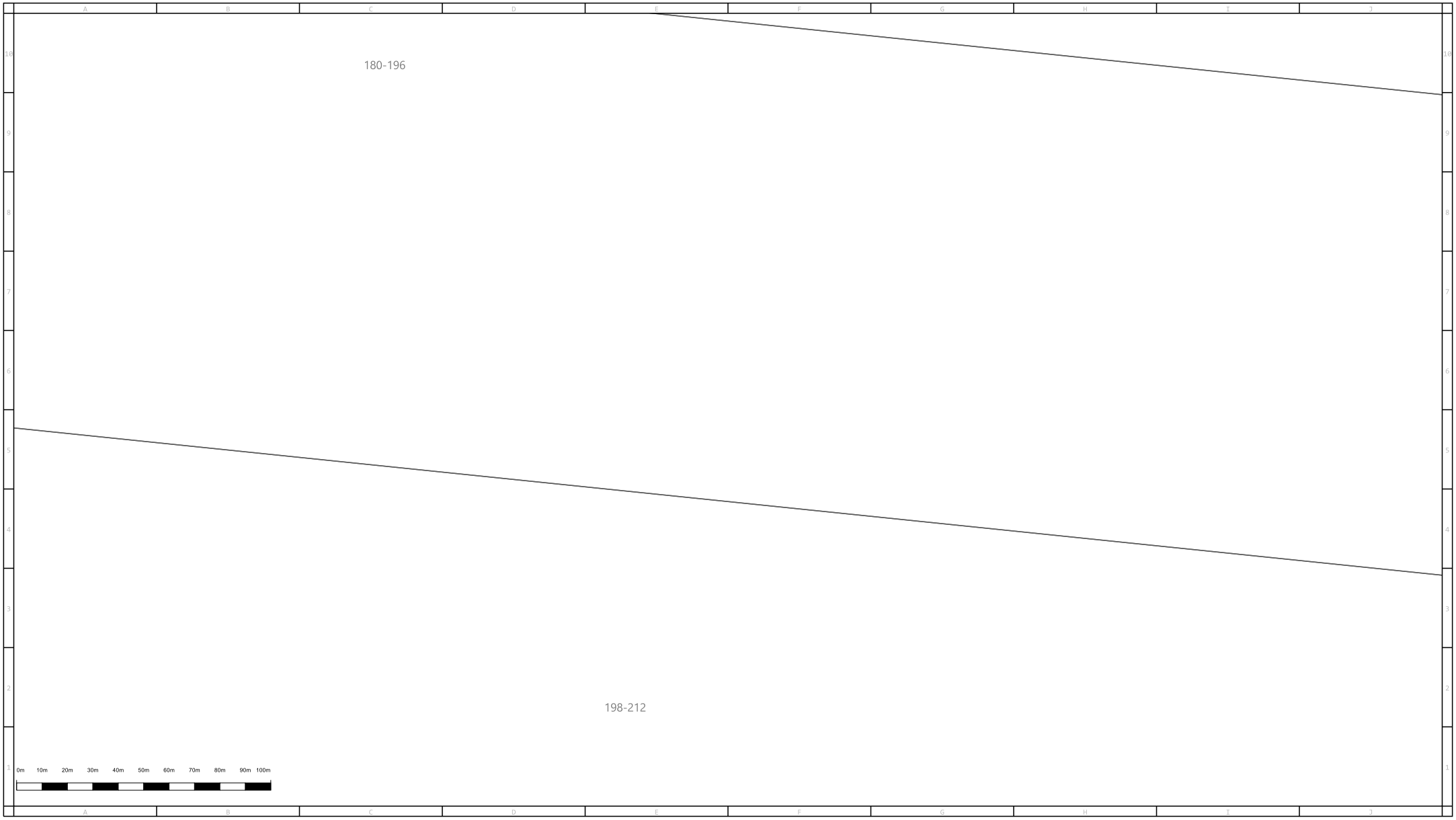

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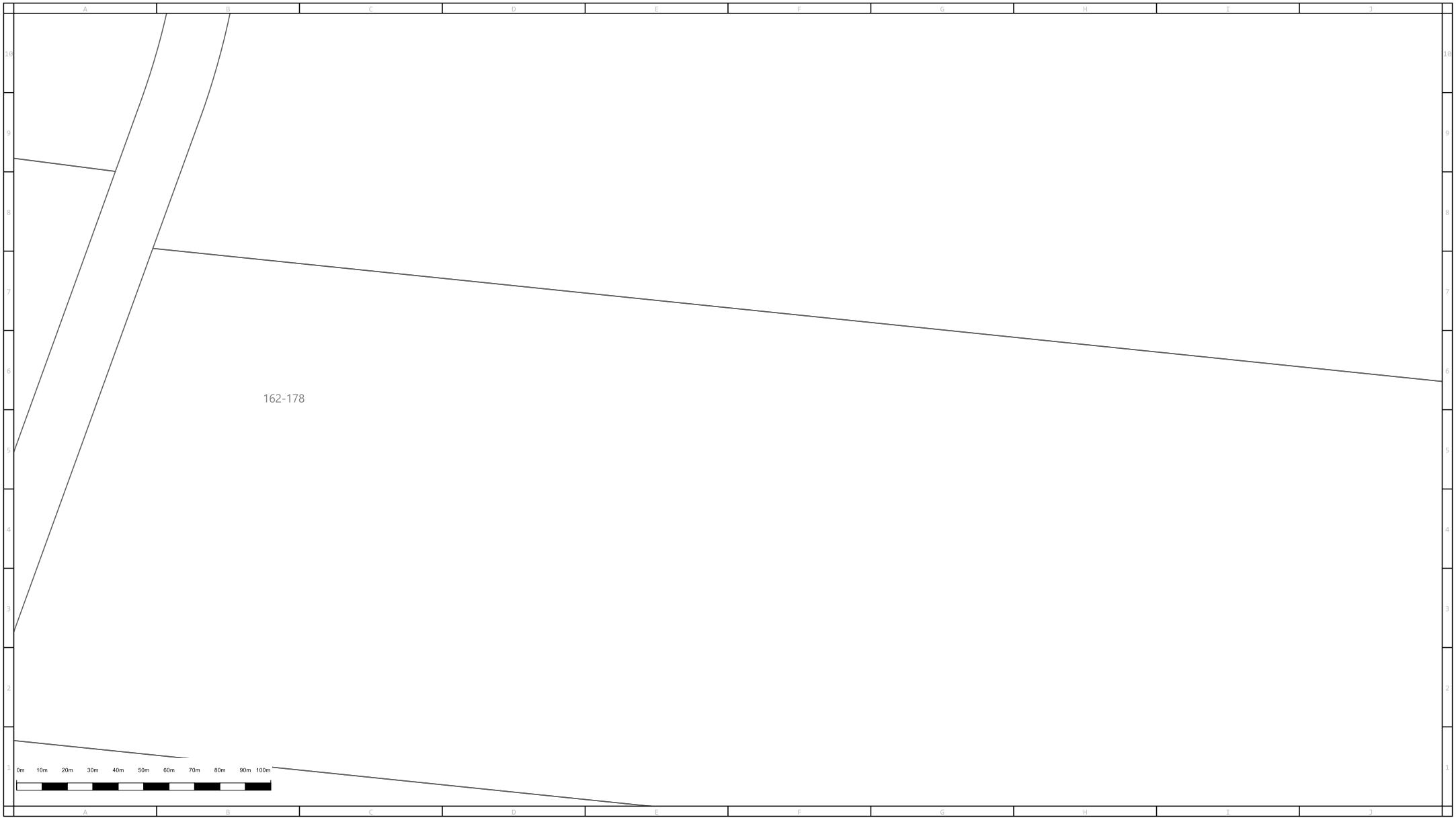

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Main	
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High Pressure Main & Pipeline	In Service	Proposed
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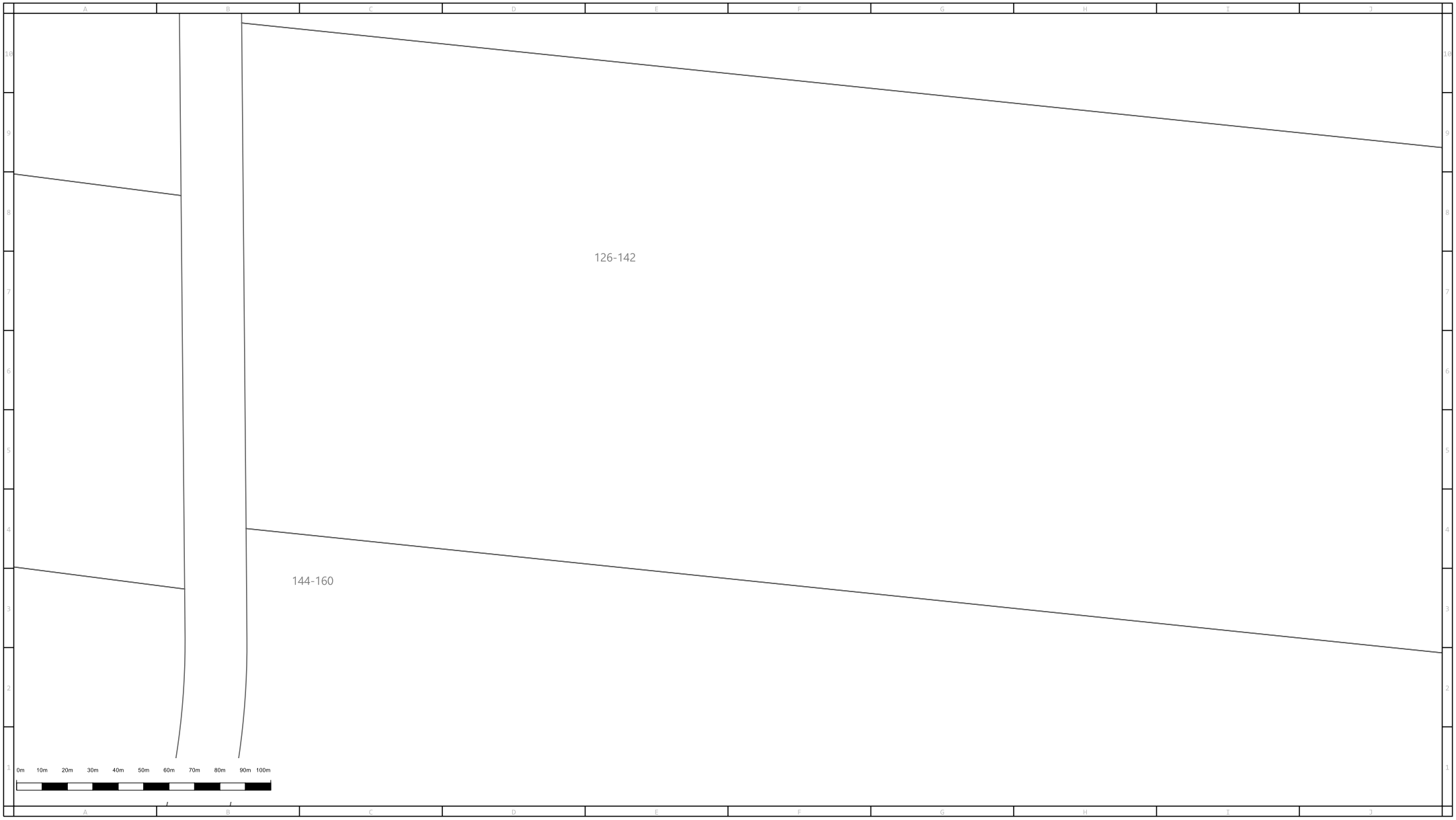

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Main	In Service	Proposed
Unknown Pressure		
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High Pressure Main & Pipeline	In Service	Proposed
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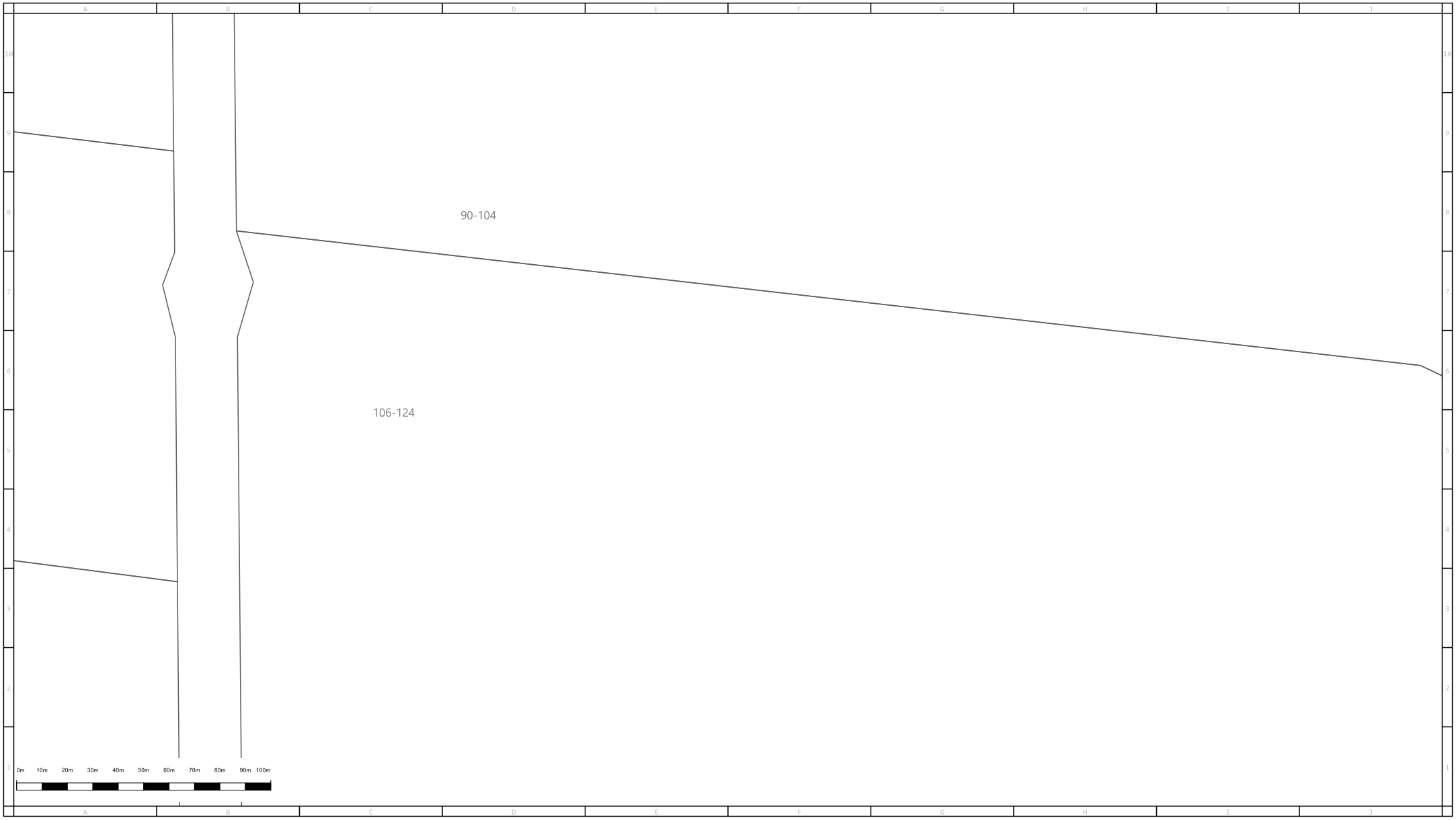

Jemena
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Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
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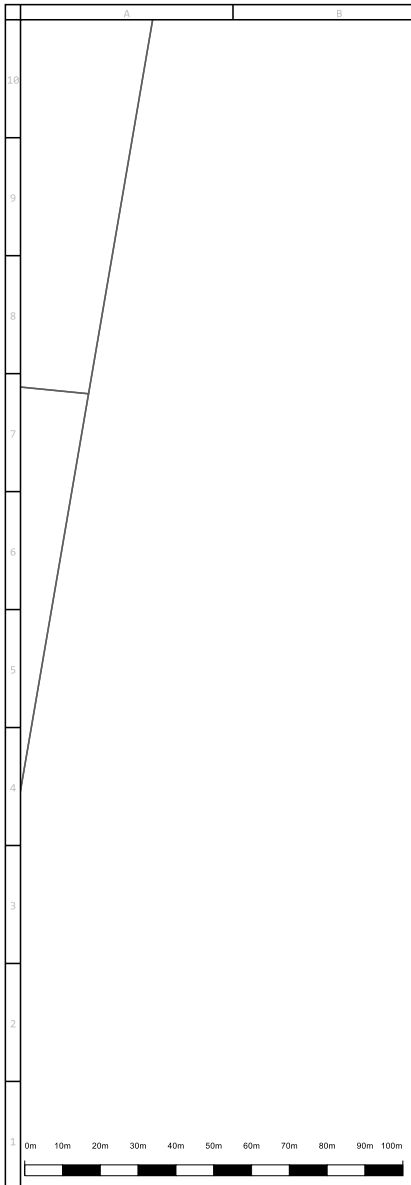

Jemena
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Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
Primary - 3500 kPa		
JGN Trunk - 7000 kPa		
Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
Valve	MBK = Metres Back of Kerb	
Regulator Set	MFL = Metres from Fence Line	
Regulator Station	50mm Nylon main inserted in 6 inch (Nominal Bore) Cast Iron Main	6NB 50MM NY
Automatic Line Break Valve	32mm Nylon main inserted into 50mm Steel Main	50MM 32MM NY

N W E S

Scale: 1:2000

Issue Date: 16/03/2020

DBYD Seq No: 95816317

DBYD Job No: 19211617

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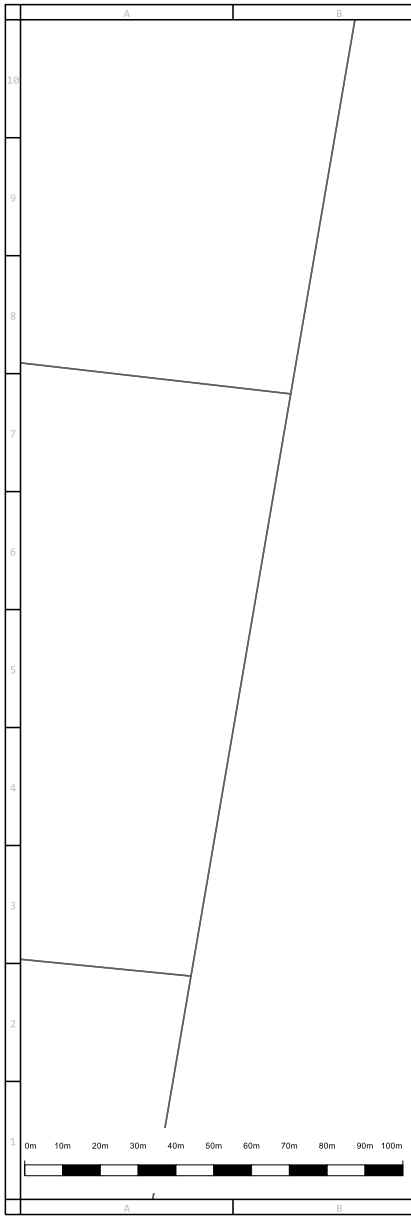
DBYD Authority: Jemena Gas Networks (NSW)

DBYD Location: Aldington Road Kemps Creek NSW, 2178



Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
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Transmission		

Fittings, Valves & Regulators		
Siphon		
Valve		
Regulator Set		
Regulator Station		
Automatic Line Break Valve		

Distance in metres of Main from Boundary Line ~1.5
MBK = Metres Back of Kerb
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32mm Nylon main inserted into 50mm Steel Main (50)MM 32MM NY

N W E S

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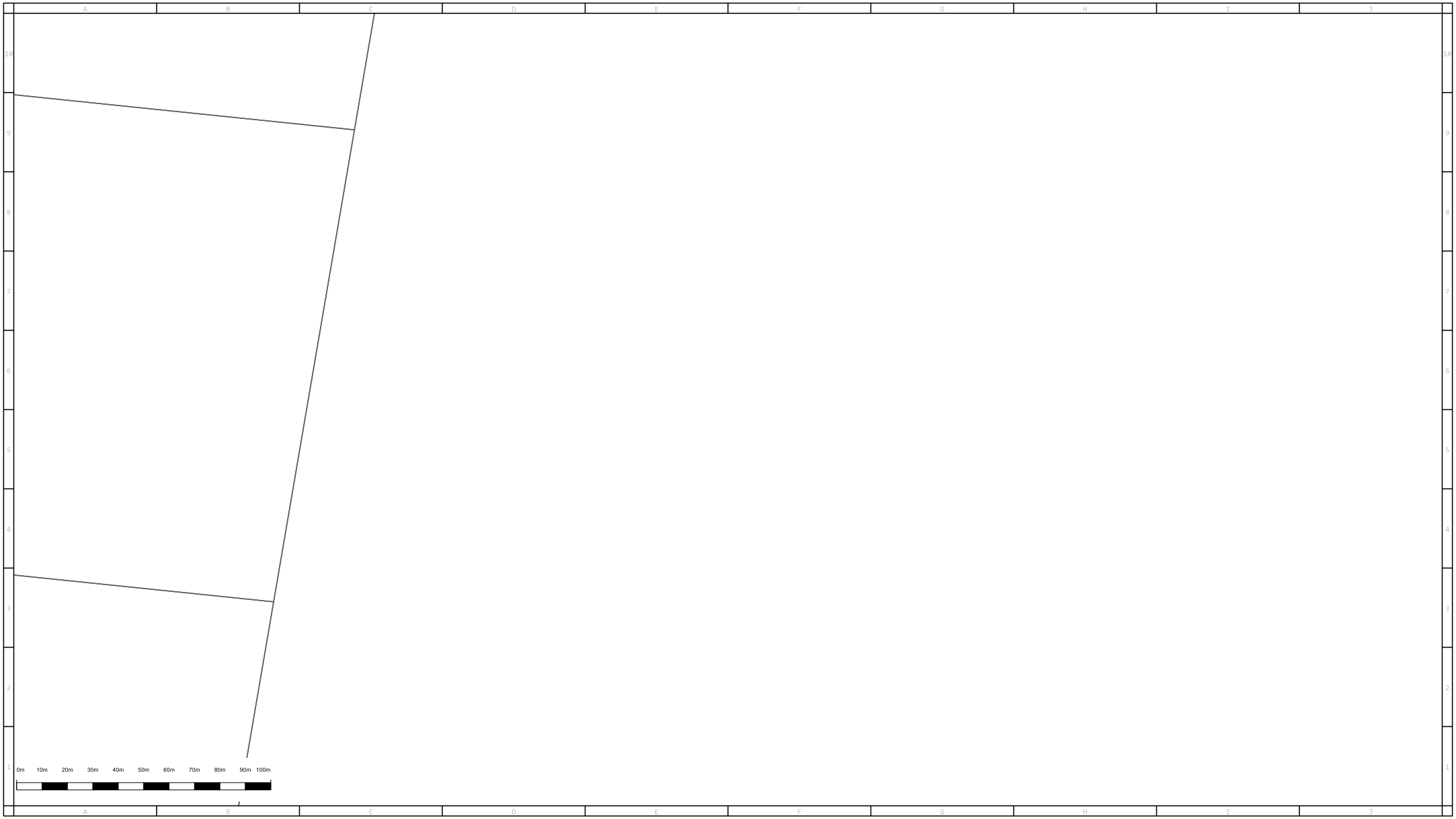

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
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N W E S

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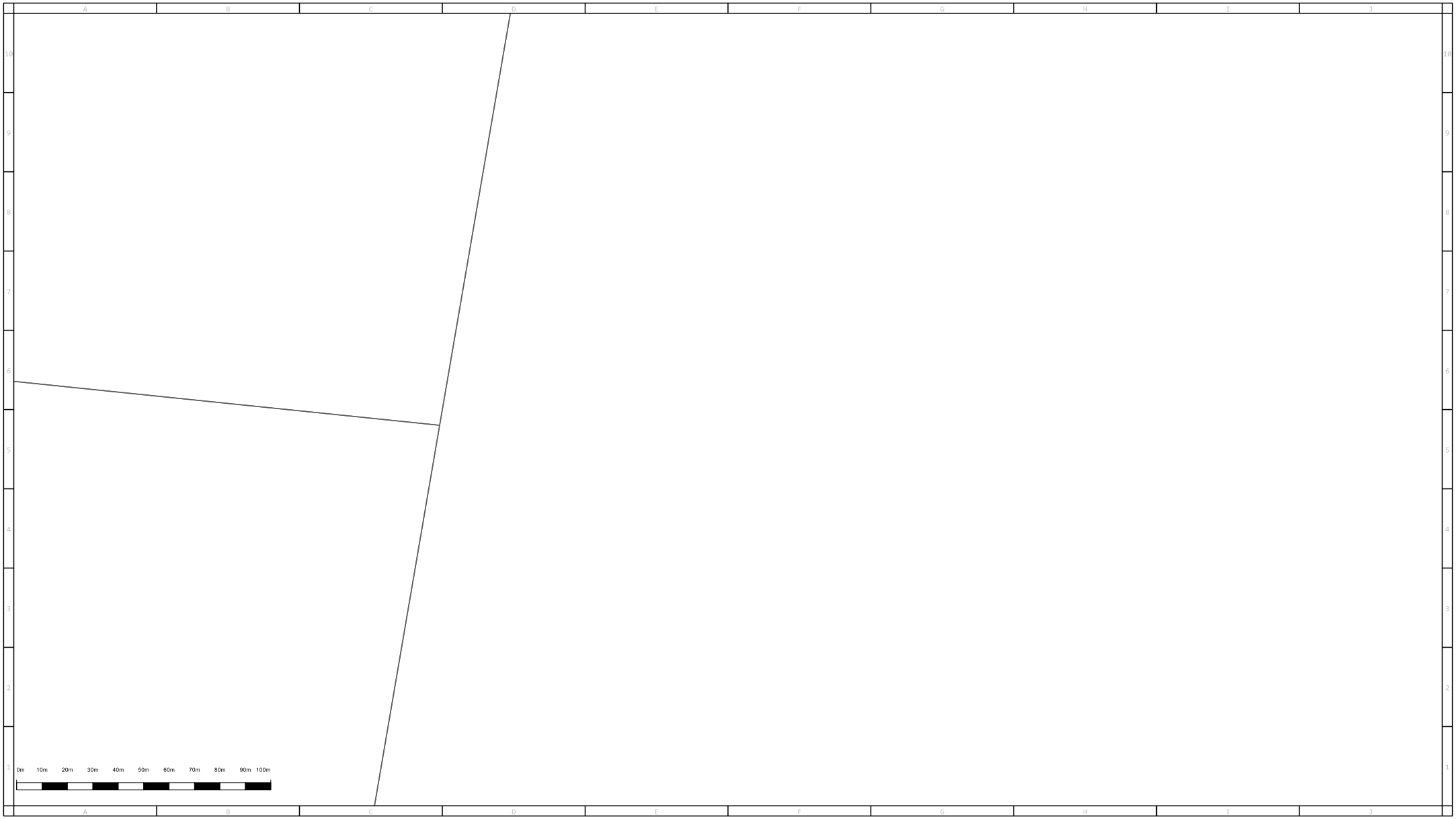

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
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Proposed Isolate (coloured according to kPa)	
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N W E S

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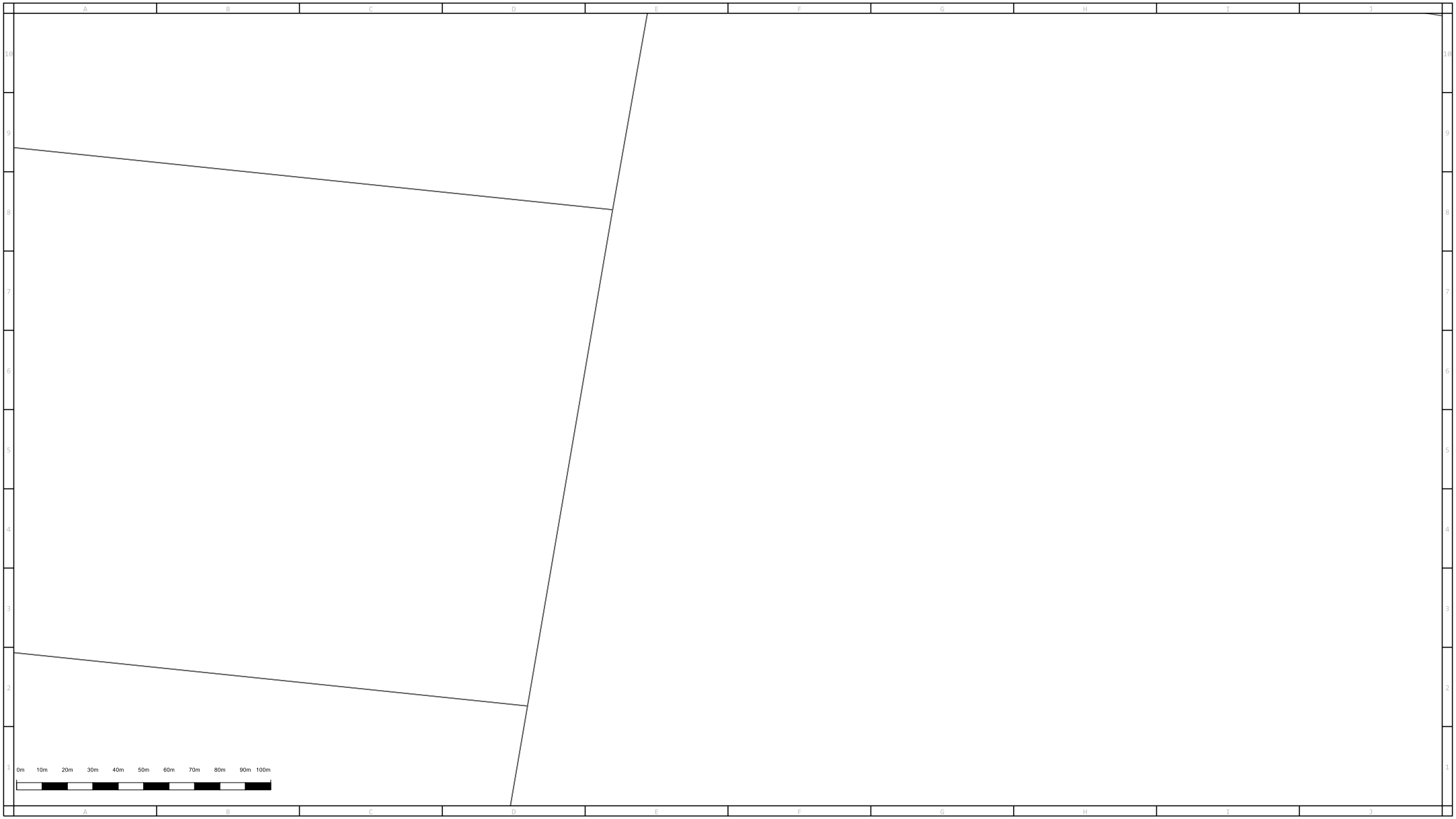

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N
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Scale: 1:2000

Issue Date: 16/03/2020
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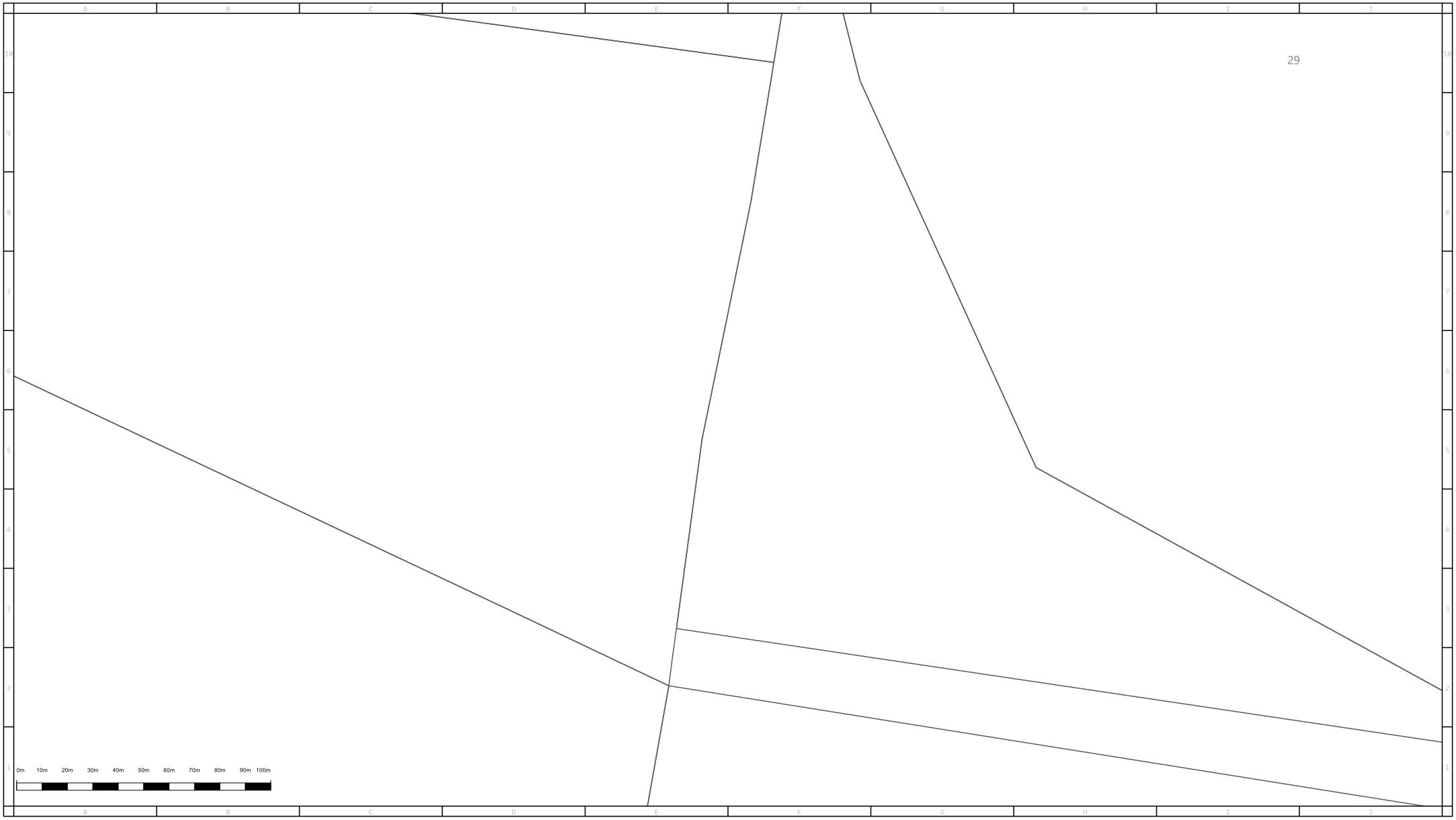

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
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N W E S

Scale: 1:2000

Issue Date: 16/03/2020

DBYD Seq No: 95816317

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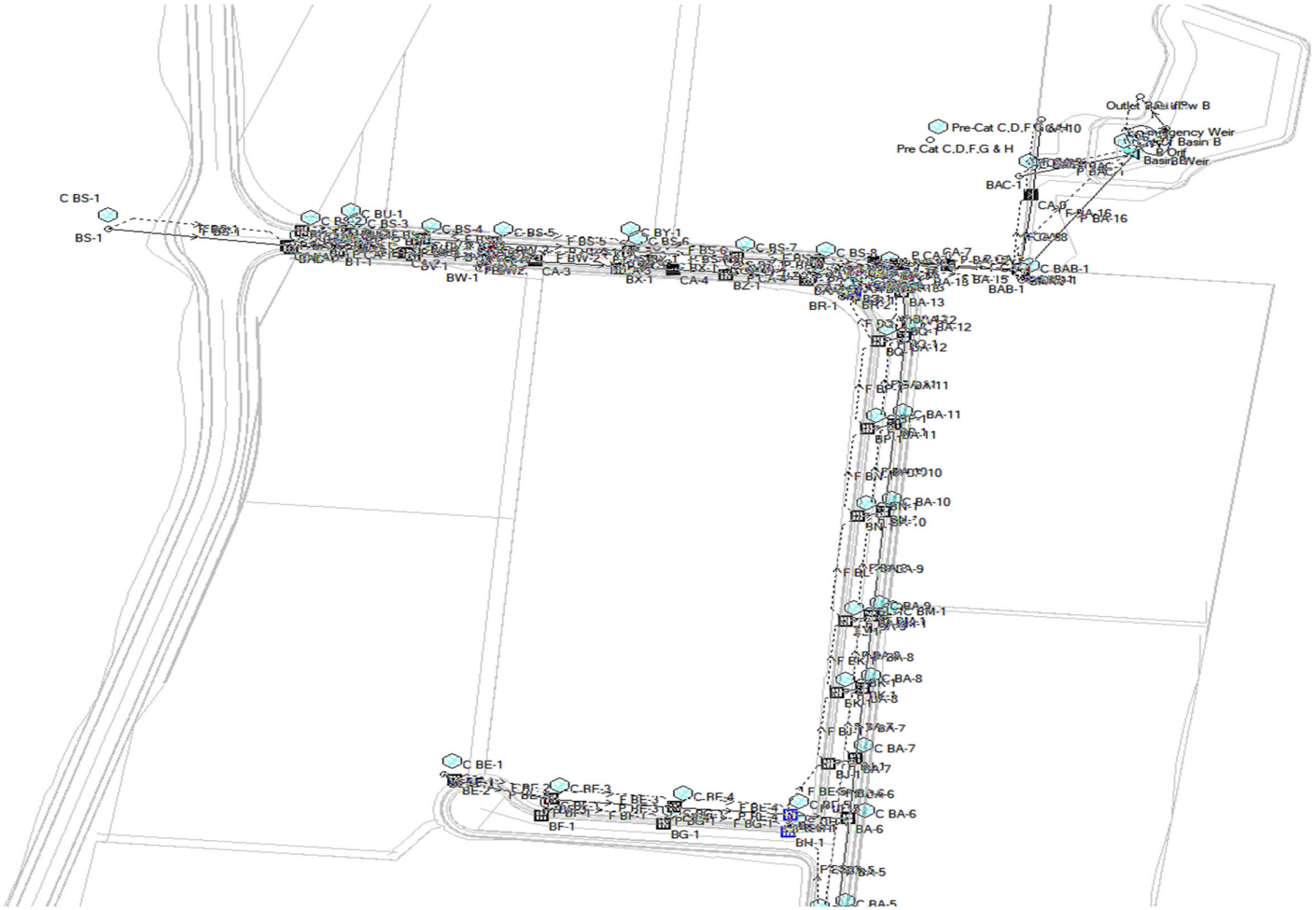
APPENDIX B – Civil Engineering Plans

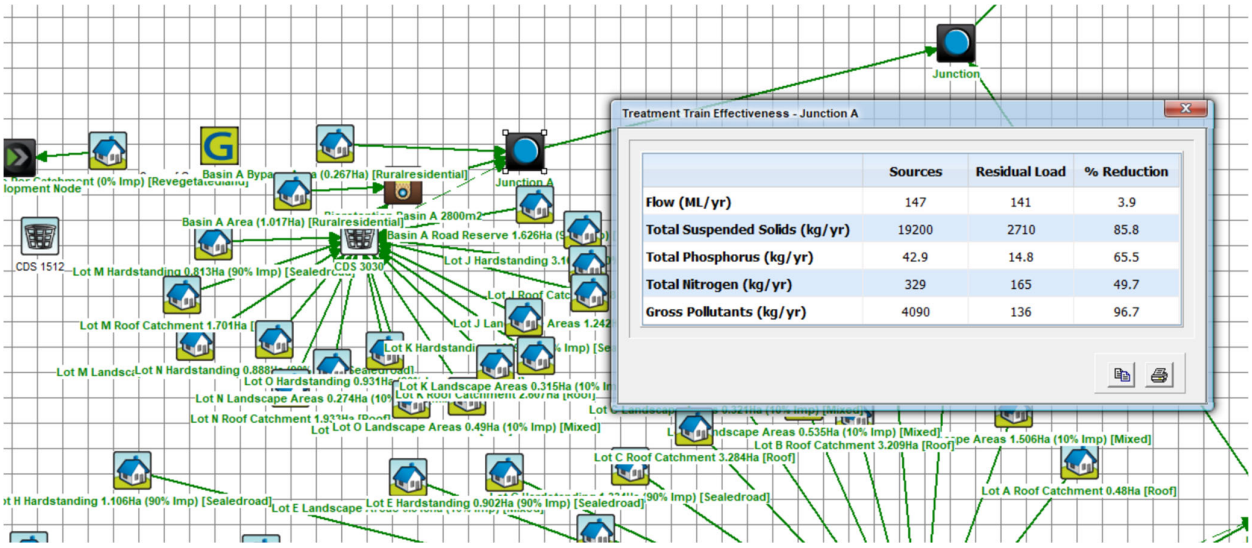
(Refer to the attached Draft PDF Drawings)

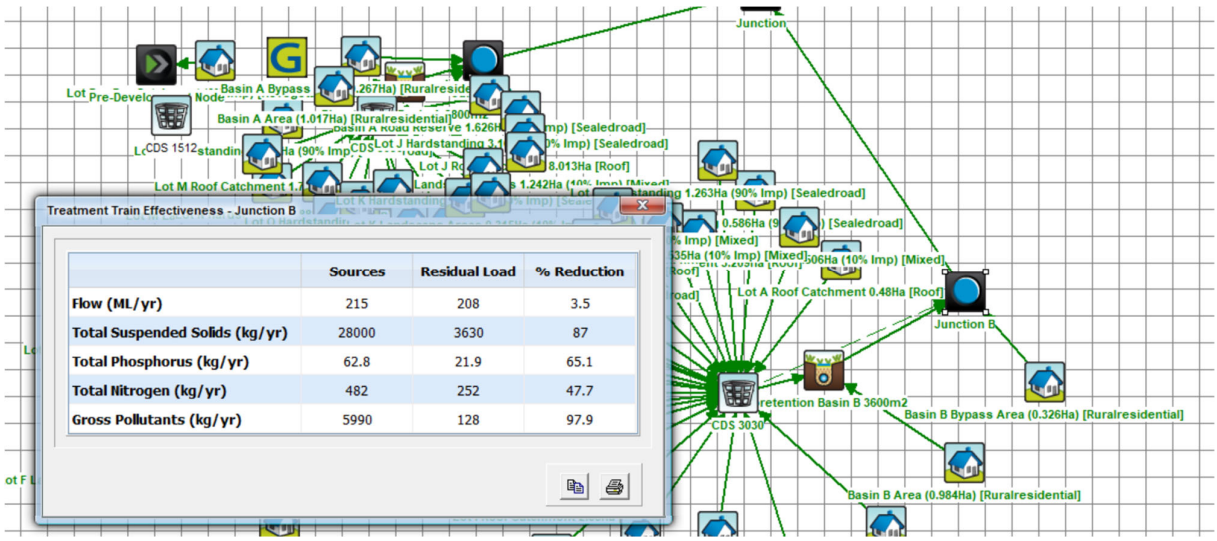
APPENDIX C – DRAINs Results


C BS-1
BS-1
C BU-1
C BS-2
C BS-3
C BS-4
C BS-5
C BY-1
C BS-6
C BS-7
C BS-8
C CA-7
C BAB-1
BAB-1
BAC-1
Pre-Cat C,D,F,G & H
Pre-Cat C,D,F,G & H-10
Outlet Basin B
Emergency Weir
Basin B Orif
Basin B Weir
CA-8
BA-16
BA-15
BA-13
BA-12
BA-11
BA-10
BA-9
BA-8
BA-7
BA-6
BA-5
BW-1
CA-3
BX-1
CA-4
BZ-1
BR-1
BQ-1
BP-1
BN-1
BM-1
BK-1
BJ-1
BH-1
BG-1
BF-1
C BE-1
C RF-3
C RF-4

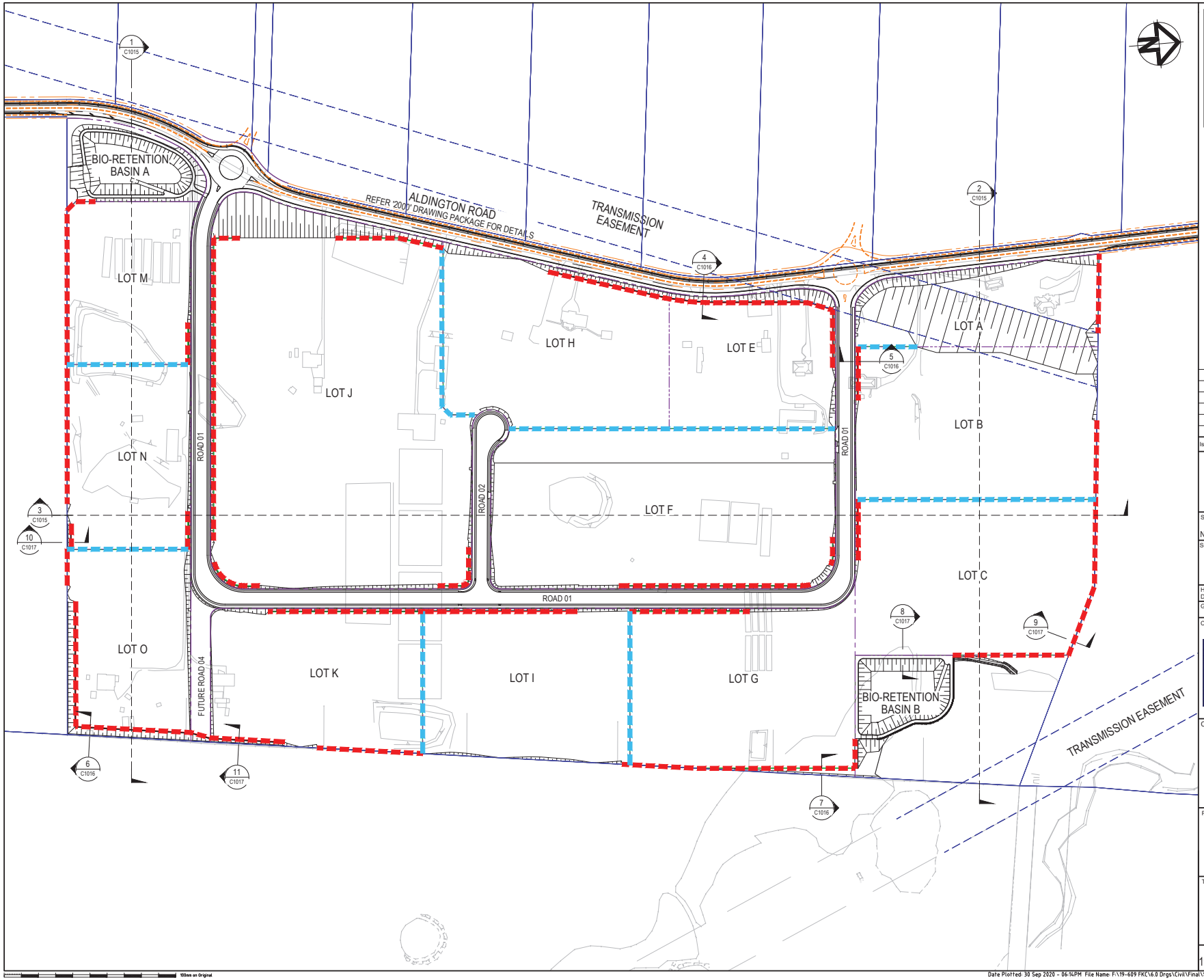

C BE-1
BE-2
F BE-1
F BE-2
C BE-3
F BE-3
C BE-4
F BE-4
C BE-5
F BE-5
C BE-6
BF-1
BG-1
BH-1
C BA-7
C BA-6
C BA-5
C BA-4
C BA-3
C BA-2
C AL-1
C AL-2
C AK-1
C AJ-1
C AH-1
C AF-1
C AE-1
C AD-1
C AB-1
C AA-1
C AA-2
C AA-3
AA-1
AA-2
AA-3
AA-4
AA-5
AA-6
AA-7
AA-8
AA-9
AA-10
AA-11
AA-12
AG-1
AC-1
P AA-12
C AM-1
Pre-Cat A,B & E
Pre Cat A,B & E
Cat Of Basin A
Basin A
P AM-1
A LS 2.8
A Weir
Emergency Weir A
OS A1
A HF Orif
OS A2
Outflow A
Outlet Basin A

APPENDIX D – MUSIC Results


Junction
Treatment Train Effectiveness - Junction A
Sources
Residual Load
% Reduction
Flow (ML/yr) 147 141 3.9
Total Suspended Solids (kg/yr) 19200 2710 85.8
Total Phosphorus (kg/yr) 42.9 14.8 65.5
Total Nitrogen (kg/yr) 329 165 49.7
Gross Pollutants (kg/yr) 4090 136 96.7
Junction A
Basin A Area (1.017Ha) [Ruralresidential]
Basin A 2800m2
CDS 1512
CDS 3030
Lot M Hardstanding 0.813Ha (90% Imp) [Sealedroad]
Lot M Roof Catchment 1.701Ha
Lot O Hardstanding 0.931Ha
Lot N Roof Catchment 1.933Ha
Lot O Landscape Areas 0.49Ha (10% Imp) [Mixed]
Lot K Landscape Areas 0.315Ha (10%
Lot C Roof Catchment 3.284Ha [Roof]
Lot B Roof Catchment 3.209Ha [Roof]
Lot A Roof Catchment 0.48Ha [Roof]
Lot E Hardstanding 0.902Ha (90% Imp) [Sealedroad]


Junction
Treatment Train Effectiveness - Junction B
Sources
Residual Load
% Reduction
Flow (ML/yr) 215 208 3.5
Total Suspended Solids (kg/yr) 28000 3630 87
Total Phosphorus (kg/yr) 62.8 21.9 65.1
Total Nitrogen (kg/yr) 482 252 47.7
Gross Pollutants (kg/yr) 5990 128 97.9
Basin A Area (1.017Ha) [Ruralresidential]
CDS 1512
CDS 3030
Lot A Roof Catchment 0.48Ha [Roof]
Junction B
Basin B Bypass Area (0.326Ha) [Ruralresidential]
Basin B Area (0.984Ha) [Ruralresidential]

APPENDIX E – Indicative Infrastructure Staging



LEGEND

- EXISTING BOUNDARY
- EXISTING EASEMENT
- PROPOSED BOUNDARY
- RETAINING WALLS
- INTERALLOTMENT RETAINING WALL
- FUTURE WORKS

Issue	Description	Date
A	ISSUED FOR SSD APPROVAL	30-09-20
P1	ISSUED FOR INFORMATION	11-09-20

0 50 100 150m

1 : 2000 @ A1

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Scales	1 : 2000	Drawn	GB
		Designed	GB
Height Datum	AHD	Checked	AM
Grid	GDA94 MGA56	Approved	

Client

19-609-C1005.dwg

Stockland

FIFECAPITAL

Civil Engineers and Project Managers

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Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

Project

PROPOSED INDUSTRIAL DEVELOPMENT
200 ALDINGTON

Title

GENERAL ARRANGEMENT PLAN

Drawing No.	Project No.	Issue
19-609-C1005	19-609	A

100mm on Original

Date Plotted: 30 Sep 2020 - 06:14PM File Name: F:\19-609 FKC\6.0 Drgs\Civil\Final\SSDA\1000_Infrastructure Package\19-609-C1005.dwg V1