



REQUEST FOR TENDER

Request for Tender (RFT)	Pioneer Park Revitalisation (Retendered)
RFT Number	RFT 03-2021/2022
Deadline	10:00am, 19 th April, 2022
Tender documents availability and lodgement.	<p>Tender documents are available from https://www.tenderlink.com/merredin/</p> <p>Tender submissions must be lodged via the electronic tender box on the Tenderlink Portal at https://www.tenderlink.com/merredin/</p>

SUBMISSIONS ARE TO BE RECEIVED VIA THE ABOVE ELECTRONIC TENDER BOX BY THE CLOSING TIME AND DATE.

LATE SUBMISSIONS WILL NOT BE ACCEPTED.

TENDERS SUBMITTED DIRECTLY TO THE SHIRE BY MAIL, FACSIMILE OR ELECTRONIC MAIL WILL NOT BE ACCEPTED.

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1 Conditions of Tendering

1.1 Definitions

Below is a summary of some of the important defined terms used in this Request:

- Attachments:** The documents you attach as part of your Tender.
- Consolidation Period:** The period of time during which the Contractor, will be responsible for the operation, maintenance and rectification of any defects following Practical Completion.
- Contract:** The formally executed agreement which shall at a minimum include this document, all its attachments, AS4000 General Conditions, and the successful Contractor's Tender.
- Contractor:** Means the person or persons, corporation or corporations whose Tender is accepted by the Principal, including the executors or administrators, successors and assignments of such person or persons, corporation or corporations.
- Contractor's Representative:** Means any Officer or person duly authorised by the Contractor, in writing, to act on their behalf for the purposes of the Contract.
- Deadline:** The deadline for lodgement of your Tender as detailed on the front cover of this Request.
- General Conditions of Contract:** Means the General Conditions of Contract for the Supply of Goods and Services or Works provided in Part 2.
- Goods, Services or Works:** Means the Goods, Services or Works, which the Contractor is required to provide to the Principal under the Contract.
- Offer:** Your offer to supply the Requirements.
- Practical Completion:** Is that stage in the execution of the Works Under Contract when –
- (a) In the opinion of the Principal, the Works are complete except for minor omissions and minor defects –
 - i) Which do not prevent the Works from being reasonable capable of being used for their intended purpose; and
 - ii) Which the Principal determines the Contractor has reasonable grounds for not promptly rectifying; and
 - iii) Rectification of which will not prejudice the convenient use of the Works; and
 - (b) The Contractor has completed to the satisfaction of the Principal, all of those tests which are required by the Contract to be carried out and passes before the Works reach Practical Completion;
 - (c) The Contractor has provided the Principal with all documents and other information required under the Contract that are essential for the use, operation and maintenance of the Works has been supplied
- Principal:** Shire of Merredin.
- Principal's Representative or Superintendent:** Means any Officer or person duly authorised by the Principal to act on their behalf for the purpose of the Contract. For the purpose of the Contract the following Officers of the Shire of Merredin are duly

authorised; Chief Executive Officer, Executive Manager Engineering Services, Manager of Projects. Authorisation of any other Officer or person shall be done so in writing.

Request OR RTF

OR Request for This document.

Tender:

Requirement: The Goods and Services or Works requested by the Principal.

Selection Criteria: The Criteria used by the Principal in evaluating your Tender.

Special Conditions: The additional contractual terms.

Specification: The Statement of Requirements that the Principal requests you to provide if selected.

Tender: Completed Offer form, Response to the Selection Criteria and Attachments.

Tenderer: Someone who has or intends to submit an Offer to the Principal.

Works: Any activities necessary to meet the requirements of the Contract.

1.2 Tender Documents

This Request for Tender is comprised of the following parts:

- Part 1 – Conditions of Tendering (*read and keep this part*).
- Part 2 – Specification and/or plans/drawings (*read and keep this part*).
- Part 3 – General Conditions of Contract (*read and keep this part*).
- Part 4 – Special Conditions of Contract (*read and keep this part*).
- Part 5 - Tenderer's Offer (*complete and return this part*).
- Part 6 – Appendices (*read and keep this part*).

Separate Documents

- a) Addenda and any other special correspondence issued to Tenderers by the Principal.
- b) Any other policy or document referred to but not attached to the Request.

1.3 How to Prepare Your Tender

- a) Carefully read all parts of this document;
- b) Ensure you understand the Requirements;
- c) Complete and return the Offer (Part 5) in all respects and include any Attachments;
- d) Make sure you have signed the Offer form and responded to all of the Selection Criteria; and
- e) Lodge your Tender before the Deadline.

1.4 Contact Persons

Should Tenderers have any questions with respect to accessing Tender documents or submitting a Tender response please contact Daniel Hay-Hendry, Manager of Projects on Phone (08) 9041 1611 or via email tenders@merredin.wa.gov.au

All requests for technical and/or specification clarifications regarding this Request are to be in writing and must be submitted via the Shire of Merredin's Tenderlink online forum under this Tender notice. The Principal will review each request for clarification and will respond by posting an answer on the online forum, or alternatively by issuing an Addendum to ensure that information is available to all Tenderers equally.

Requests for clarification regarding this Tender Request must be posted on the Tenderlink online forum prior to 4pm, 15th April 2022. No clarification requests will be accepted after this date.

Tenderers should not rely on any information provided by any person other than the persons listed above.

1.5 Tender Briefing/Site Inspection

There is **no** mandatory briefing required for this Request. No extension of time or extra cost will be allowed to the successful Tenderer for delays or difficulties that would have been evident from a site inspection. It is the Tenderer's responsibility to assess the nature of the task to be undertaken to properly understand and price the works. Any claim for additional costs arising from the failure of the Tenderer to properly assess the site and the nature of the work will be rejected.

Any and all travel costs in relation to attending on site for a site inspection are at the Respondent's own cost and the Principal will not reimburse any such costs.

1.6 Lodgement of Tenders

The Response must be lodged by the Deadline. The closing time for this Request is **10:00am 19th April 2022**.

The time nominated in the Deadline of this Request is determined on the Western Australian (WA) time zone, Australia, in accordance with Standard Time Act 2005 (WA), and any Act of the Parliament of Western Australia amending the application of Standard Time.

The response is to be:

- (a) Lodged in full via the Tenderlink Portal – LATE or PARTIAL RESPONSES WILL NOT BE ACCEPTED;
- (b) Have all pages numbered consecutively, and the response must include an index;
- (c) Have NO embedded documents within the response;
- (d) Include the completed Offer Form and Price Schedule

The Principal's preferred format for the submission is a single PDF file readable by Adobe Acrobat (PDF) or Microsoft Office applications 2010 or later.

All electronic submission files should be clearly named with the Principal's Tender Number and the Tenderer's Name.

Tenderers are responsible for ensuring that they have completed the lodgement of their tender document(s) correctly. Tenderers will receive a successful lodgement email notification from Tenderlink to confirm the tender submission has been successfully submitted to the Principal's electronic Tender box.

Tenderers must ensure that they have allocated a sufficient amount of time in order to upload their Tender to Tenderlink and resolve any potential technical issues prior to the Request deadline. Refer to **Part 6 - Appendix 6.1** for approximate upload times.

Tenders that are not finished uploading to Tenderlink prior to the Tender deadline, will not be accepted for evaluation.

The Principal is not able to provide Tenderlink technical support and takes no responsibility for difficulties or technical issues experienced by the Tenderer whilst uploading their Tender. If the Tenderer requires assistance with using the Tenderlink website, they are to use the online help tools available on the Tenderlink Dashboard, or alternatively contact the Tenderlink Help Desk on 1800 233 533 or via email to support@tenderlink.com.

1.7 Delivery Method

Tender Responses must be submitted via the Shire of Merredin TenderLink Portal <https://portal.tenderlink.com/merredin> by the specified tender closing time and date.

A Tender may be rejected without consideration of its merits in the event that:

- (a) The Tenderer does not submit the Tenderer's Offer form which has been completed and signed together with all required schedules and supporting documentation; or
- (b) The Tenderer fails to comply with any other requirements of the Tender Document.

1.8 Rejection of Tenders

A Tender will be rejected without consideration of its merits in the event that:

- a) It is not submitted before the Deadline; or
- b) It is not submitted at the place specified in the Request; or
- c) It may be rejected if it fails to comply with any other requirements of the Request.
- d) The Tenderer does not submit an Offer Form which has been completed and signed together with all the required Attachments.

1.9 Late Tenders

Tenders received:

- a) After the Deadline; or
- b) In a place or method other than that stipulated in this Request;

will not be accepted for evaluation.

1.10 Acceptance of Tenders

Unless otherwise stated in this Request, Tenders may be for all or part of the Requirements and may be accepted by the Principal either wholly or in part. The Principal is not bound to accept the lowest Tender and may reject any or all Tenders submitted.

1.11 Disclosure of Contract Information

Documents and other information relevant to the contract may be disclosed when required by law under the Freedom of Information Act 1992 or under a Court order.

All Tenderers will be given particulars of the successful Tenderer(s) or will be advised that no Tender was accepted.

1.12 Tender Validity Period

All Tenders will remain valid and open for acceptance for a minimum period of ninety (90) days from the Deadline or forty-five (45) days from the Principal's resolution for determining the Tender, whichever is the later unless extended on mutual agreement between the Principal and the Tenderer in writing.

1.13 Precedence of Documents

In the event of there being any conflict or inconsistency between the terms and conditions in this Request and those in the General Conditions of Contract, the terms and conditions appearing in this Request will have precedence.

1.14 Alternative Tenders

All Alternative Tenders must be accompanied by a conforming Tender.

Tenders submitted as Alternative Tenders or made subject to conditions other than the General and Special Conditions of Contract must in all cases be clearly marked "**Alternative Tender**".

The Principal may in its absolute discretion reject any Alternative Tender as invalid.

Any printed "General Conditions of Contract" shown on the reverse of a Tenderer's letter or tender submission will not be binding on the Principal in the event of a Contract being awarded unless the Tender is marked as an Alternative Tender.

1.15 Tenderers to Inform Themselves

Tenderers will be deemed to have:

- a) examined the Request and any other information available in writing to Tenderers for the purpose of tendering;
- b) examined all further information relevant to the risks, contingencies, and other circumstances having an effect on their Tender which is obtainable by the making of reasonable enquires;
- c) satisfied themselves as to the correctness and sufficiency of their Tenders including tendered prices which will be deemed to cover the cost of complying with all the Conditions of Tendering and of all matters and things necessary for the due and proper performance and completion of the work described therein;
- d) acknowledged that the Principal may enter into negotiations with a chosen Tenderer and that negotiations are to be carried out in good faith; and
- e) satisfied themselves they have a full set of the Request documents and all relevant attachments.

1.16 Alterations

The Tenderer must not alter or add to the Request documents unless required by these Conditions of Tendering.

The Principal will issue an addendum to all registered Tenderers where matters of significance make it necessary to amend or supplement the issued Request documents before the Deadline.

1.17 Risk Assessment

The Principal may have access to and give consideration to:

- a) any risk assessment undertaken by any credit rating agency;
- b) any financial analytical assessment undertaken by any agency; and
- c) any information produced by the Bank, financial institution, or accountant of a Tenderer;

so as to assess that Tender and may consider such materials as tools in the Tender assessment process.

Tenderers may be required to undertake to provide to the Principal (or its nominated agent) upon request all such information as the Principal reasonably requires to satisfy itself that

Tenderers are financially viable and have the financial capability to provide the Goods and/or Services for which they are submitting and meet their obligations under any proposed Contract. The Principal reserves the right to engage (at its own cost) an independent financial assessor as a nominated agent to conduct financial assessments under conditions of strict confidentiality. For this assessment to be completed, a representative from the nominated agent may contact you concerning the financial information that you are required to provide.

The financial assessment is specifically for use by the Principal for the purpose of assessing Tenderers and will be treated as strictly confidential.

1.18 Evaluation Process

This is a Request for Tender. Your Tender will be evaluated using information provided in your Tender.

The following evaluation methodology will be used in respect of this Request:

- a) Tenders are checked for completeness and compliance. Tenders that do not contain all information requested (*eg completed Offer form and any Attachments*) may be excluded from evaluation.
- b) Tenders are assessed against the Selection Criteria. Contract costs are evaluated (*eg tendered prices*) and other relevant whole of life costs are considered.
- c) The most suitable Tenderers may be short listed and may also be required to clarify their Tender, make a presentation, demonstrate the product/solution offered and/or open premises for inspection. Referees may also be contacted prior to the selection of the successful Tenderer.

A Contract may then be awarded to the Tenderer whose Tender is considered the most advantageous Tender to the Principal.

1.19 Selection Criteria

The Contract may be awarded to a sole or panel of Tenderer(s) who best demonstrates the ability to provide quality products and/or services at a competitive price. The tendered prices will be assessed together with qualitative and compliance criteria to determine the most advantageous outcome to the Principal.

The Principal has adopted a best value for money approach to this Request. This means that, although price is considered, the Tender containing the lowest price will not necessarily be accepted, nor will the Tender ranked the highest on the qualitative criteria.

A scoring system will be used as part of the assessment of the qualitative criteria. Unless otherwise stated, a Tender that provides all the information requested will be assessed as satisfactory. The extent to which a Tender demonstrates greater satisfaction of each of these criteria will result in a greater score. The aggregate score of each Tender will be used as one of the factors in the final assessment of the qualitative criteria and in the overall assessment of value for money.

1.20 Compliance Criteria

These criteria are detailed within Part 5 of this document and will not be point scored. Each Tender will be assessed on a Yes/No basis as to whether the criterion is satisfactorily met. An assessment of "No" against any criterion may eliminate the Tender from consideration.

1.21 Qualitative Criteria

In determining the most advantageous Tender, the Evaluation Panel will score each Tenderer against the qualitative criteria as detailed within Part 5 of this document. Each criterion will be weighted to indicate the relative degree of importance that the Principal places on the technical aspects of the goods or services being purchased.

It is essential that Tenderers address each qualitative criterion. Information that you provide addressing each qualitative criterion will be point scored by the Evaluation Panel. Failure to provide the specified information may result in elimination from the tender evaluation process or a low score.

1.22 Value Considerations

The Weighted Cost Criteria method is used where price is considered to be crucial to the outcome of this tender process. The Tendered price is given the following weighting and will be assessed in conjunction with the Compliance Criteria, Qualitative Criteria detailed in Part 5. – Tenderer’s Offer of this Request for Tender.

Criteria	Weighting
Tendered price	40%

1.23 Regional Price Preference

Tenderers for the contract may be afforded a preference in accordance with Regulation 24(A-G) of the *Local Government (Functions and General) Regulations* and the Principal’s Regional Preference Policy (3.13) dated 17 March 2017. The Policy stipulates that:

Where possible and within reasonable limits set out herein, the Shire of Merredin will support local and regional business and industry by providing price preference to local and regional suppliers tendering for contracts with Council.

Policy

A regional tenderer is defined under Section 24B(2) of the *Local Government (Functions and General) Regulations 1996*. A supplier of goods or services who submits a tender is regarded as being a regional tenderer if:

- a) That supplier has been operating a business continuously out of premises in an appropriate region for at least 6 months before the time after which further tenders cannot be submitted; or
- b) Some or all of the goods or services are to be supplied from regional sources.

The Shire of Merredin recognises the following two Regions for price preferences:

Region 1 – which is defined as a business or industry located within the District of the Shire of Merredin; and

Region 2 – which is defined as a business or industry located within the Districts of the Shire of Kellerberrin, Nungarin, Westonia, Narembeen, Yilgarn and Bruce Rock.

The regional price preference to be given to either a Region 1 or Region 2 tenderer or supplier of a quotation are outlined below and represents at which the regional tender’s price bids or quotations would be reduced for the purpose of assessing the tender or quotations.

Region 1:

A preference may be given to a regional tenderer or supplier of a quotation from “region 1” by assessing the tender or quote from that regional tenderer as if the price bids were reduced by:

- 1. 10% - where the contract is for goods or services, up to a maximum price reduction of \$50,000;
- 2. 5% - where the contract is for construction (building) services, up to a maximum price reduction of \$50,000; or

3. 10% - where the contract is for goods or services (including construction (building) services), up to a maximum price reduction of \$500,000, if the local government is seeking tenders for the provision of those goods or services for the first time, due to those goods or services having been, until then, undertaken by the local government.

Although goods or services that form part of a tender or quotation submitted by a regional tenderer may be:

1. wholly supplied from regional sources; or
2. partly supplied from regional sources, and partly supplied from non-regional sources, only those goods or services identified in the tender or quotation as being from regional sources may be included in the discounted calculations that form part of the assessments of a tender or quotation when a regional price preference policy is in operation.

Despite the allowed percentage preferences, price is only one of the factors to be assessed when the local government is to decide which of the tenderers or quotations it thinks would be most advantageous to the local government to accept.

Region 2:

A preference may be given to a regional tenderer or supplier of a quotation from "region 2" by assessing the tender or quote from that regional tenderer as if the price bids were reduced by:

1. 5% - where the contract is for goods or services, up to a maximum price reduction of \$25,000;
2. 2.5% - where the contract is for construction (building) services, up to a maximum price reduction of \$25,000; or
3. 5% - where the contract is for goods or services (including construction (building) services), up to a maximum price reduction of \$250,000, if the local government is seeking tenders for the provision of those goods or services for the first time, due to those goods or services having been, until then, undertaken by the local government.

Although goods or services that form part of a tender or quotation submitted by a regional tenderer may be:

1. wholly supplied from regional sources; or
2. partly supplied from regional sources, and partly supplied from non-regional sources, only those goods or services identified in the tender or quotation as being from regional sources may be included in the discounted calculations that form part of the assessments of a tender or quotation when a regional price preference policy is in operation.

Despite the allowed percentage preferences, price is only one of the factors to be assessed when the local government is to decide which of the tenderers or quotations it thinks would be most advantageous to the local government to accept.

In considering any RFT or formal RFQ submission, price is only one of the factors to be assessed when Council is to decide which of the suppliers it thinks would be the most advantageous to it.

All prices for goods/services offered under this Request are to be fixed for the term of the Contract. Tendered prices must include Goods and Services Tax (GST).

Unless otherwise indicated prices tendered must include delivery, unloading, packing, marking and all applicable levies, duties, taxes and charges. Any charge not stated in the Tender, as being additional will not be allowed as a charge for any transaction under any resultant Contract.

1.24 Price Basis

The price basis for the goods and/or services offered under this Request are to be Fixed Lump Sum for the Contract. Tendered prices must include Goods and Services Tax (GST).

Unless otherwise indicated prices tendered must include manufacture/procure, delivery, unloading, packing, marking and all applicable levies, duties, taxes and charges. Any charge not stated in the Tender, as being additional will not be allowed as a charge for any transaction under any resultant Contract.

1.25 Ownership of Tenders

All documents, materials, articles and information submitted by the Tenderer as part of or in support of the Tender will become upon submission the absolute property of the Principal and will not be returned to the Tenderer at the conclusion of the Tender process PROVIDED that the Tenderer be entitled to retain copyright and other intellectual property rights therein, unless otherwise provided by the Contract.

1.26 Canvassing of Officials

If the Tenderer, whether personally or by an agent, canvasses any of the Principal's Councillors, Officers or appointed Consultants (*as the case may be*) with a view to influencing the acceptance of any Tender made by it or any other Tenderer, then regardless of such canvassing having any influence on the acceptance of such Tender, the Principal may at its absolute discretion omit the Tenderer from consideration.

1.27 Identity of the Tenderer

The identity of the Tenderer and the Contractor is fundamental to the Principal. The Tenderer will be the person, persons, corporation or corporations named as the Tenderer in Part 5 and whose execution appears on the Offer Form in Part 5 of this Request. Upon award of the Tender the successful Tenderer will become the Contractor.

1.28 Costs of Tendering

The Principal will not be liable for payment to the Tenderer for any cost, losses or expenses incurred by the Tenderer in preparing their offer, including any cost involved pertaining to the Tenderer lodging a Tender response through the Tenderlink process.

1.29 Tender Opening

Tenders will be downloaded from the Tenderlink portal with two of the Principal's representatives present, following the advertised Deadline. All submissions received will be recorded in the Tender Register.

1.30 In House Tenders

The Principal does not intend to submit an In House Tender.

1.31 Intellectual Property Rights

The Principal warrants that, unless otherwise provided in the Contract, design, materials, documents and methods of working, each specified in the Contract or provided or directed by the Principal or the Principal's Representative shall not infringe any intellectual property right.

The Tenderer warrants that any other design, materials, documents and methods of working, each provided by the Tenderer, shall not infringe any intellectual property right.

Each party shall indemnify the other against such respective infringements.

1.32 Confidential Information

The parties shall ensure that supplied information is kept confidential such as documents, samples, models, patterns and other information as are supplied and clearly identified as confidential.

2 Specification

2.1 Contract Requirements in Brief

The Shire of Merredin (Principal) is seeking quotes for the provision of construction services from suitably qualified and experienced Contractors to complete all works associated with the revitalisation of Pioneer Park in Merredin.

The successful Contractor will be able to adequately demonstrate their ability (qualifications and financial capacity) to lead and sub-contract any necessary expertise to successfully address all requirement outlined within this document.

A full statement of the goods/services required under the proposed contract appears in the Scope of Works [clause 2.4].

2.2 Background Information

The Shire of Merredin acts as a major commercial and retail centre for the Central East Wheatbelt, servicing a population of 3350 (ABS, 2016) and an additional 6,158 people from nine surrounding shires, and is also a base for a range of Government agencies and services. Merredin is well connected with around 2,250 vehicles travelling along Great Eastern Highway past the town each day and is serviced daily by the TransWa Prospector Train.

The Redevelopment of the Merredin CBD has been on Council's agenda since 2008 and was a key priority in the 2012 – 2023 Strategic Community Plan (SCP). Due to lack of funding, the Merredin CBD has seen less ambitious improvements over the years as budgets have allowed. The project has again come into prominence in the 2020 – 2030 SCP, and based on extensive community consultation, the main areas of focus have been two major infrastructure projects. Stage 1A is the revitalisation of Pioneer Park.

This project is funded by contributions from multiple funding programs and therefore has fixed deadlines for delivery. The works shall be staged to ensure these deadlines are met and the project remains eligible for the full funding allocations.

2.3 Site

The Shire of Merredin is a local government area in the eastern Wheatbelt of Western Australia, situated approximately 262 kilometres east of Perth. Pioneer Park is within the Merredin townsite and sits between the Railway and Military Museums on Great Eastern Highway. The revitalisation of Pioneer Park is Stage 1A of the Redevelopment of the Merredin Central Business District (CBD).

The site, approximately 6,000m² in size, includes the iconic heritage listed Kalgoorlie Bitter water tower (which will undergo restoration as a separate project) and has a railway crossing in the north-western corner which connects directly with the adjacent town centre and the future CBD Town Square Stage 1B.

Refer to **Part 6 – Appendix 6.2 Site Plan, Appendix 6.3 Survey Set, Appendix 6.4 Geotechnical Report** for details of development location.

2.4 Scope of Work

General

- Supply all materials, plant, labour and associated resources required for completion of the works;
- Completion of all required demolition works, as detailed in the drawings;

- Set out and survey of site to allow for works;
- Trimming and levelling earthwork areas;
- Removal and disposal of debris and rubbish within contract area;
- Carry out all necessary incidental works;
- Testing, commissioning and Quality Control of works, including provision of required documentation;
- Fully reinstating the site and leave works in a neat and tidy condition;
- All other works required for completion of the contract works.

Lighting

- Supply and installation of all lighting and associated fixtures, fittings and required electrical work as documented in the drawings & specifications.
- All other works as indicated in the relevant drawings and specifications for completion of the contract works.

Civil Works

- Supply and installation of all subgrades, pavements and kerbing;
- Supply and installation of all stormwater drainage infrastructure;
- Supply an installation of all required signage elements;
- Supply and installation of all culverts and barriers;
- Supply and installation of pedestrian and vehicle bridges including barriers.
- All other works as indicated in the relevant drawings and specifications for completion of the contract works.

Hardscape material as specified

- Construction of paths, stairs, bridges and balustrades;
- Supply and installation of all garden kerbing in the drawings.
- Supply and installation of all concrete stencilling and shotblast finishes;
- Supply and installation stabilised gravels;
- Supply and installation drainage media including megaflow;
- Supply and installation boulders;
- Supply and installation timbers and steppers;
- Supply and installation of concrete abutments and edge thickenings;
- Supply and installation of all walls including Gabions and associated signage elements;
- Supply and installation of tactile indicators.

Furniture as specified

- Supply and installation of interpretive signage;
- Supply and installation of bench seating;
- Supply and installation of tables;
- Supply and installation of wheelie bin enclosures;
- Supply and installation of wayfinding & arbours;
- Relocation of existing bronze statues;
- All other works as indicated in the relevant drawings and specifications for completion of the contract works.

Irrigation

- Supply and installation of an automatic irrigation system utilising reuse water from the existing water supply.
- Test, commission and program the systems and provide as constructed drawings and documentation including 12-month warranty against faulty materials and workmanship;
- All other works as indicated in the relevant drawings and specifications for completion of the contract works.

Softscape material as specified

- Cultivation and earthworks and preparation of all planting and turfed areas;
- Amelioration of site topsoil and imported soils;
- Final trimming of all planting and turfed areas;
- Supply and installation of turf;
- Supply and installation of mulches;
- Supply and installation of plant material including greenstock report and advanced tree planting.

Maintenance

- Establishment of all installed plants, grass and vegetation, including up keep during construction and 3 months Consolidation Period.

2.4.1 Scope Specification

All works shall be constructed in accordance with the relevant Specification (**Part 6 – Appendix 6.5 Civil Specification, Appendix 6.6 Landscape Specification, Appendix 6.7 Irrigation Specification, Appendix 6.8 Electrical & Lighting Specification**), the Drawings (**Part 6 – Appendix 6.9 Civil Drawing Set, Appendix 6.10 Landscape Drawing Set, Appendix 6.11 Irrigation Drawing Set, Appendix 6.12 Electrical & Lighting Drawing Set**), Safety in Design Report (**Part 6 – Appendix 6.13 Safety in Design Report**), Material Schedule (**Part 6 – Appendix 6.14 Material Schedule**), Local Authority requirements, and WA Occupational Safety and Health Act 1984 and WA Occupational Safety and Health Regulations 1996.

Where specific products have been referenced within this document, specifications, material schedule, price schedule, or any other document, it is to act as a guide only. Similar products,

which can be demonstrated to be of the same or greater quality may be proposed by the Contractor. The approval of alternative similar products shall be at the sole discretion of the Principal.

Note: An electrical specification and price schedule shall be issued by the Principal as an Addendum.

2.4.2 Documentation

Provide sufficient documentation for the purpose of enabling the Principal to operate and maintain any plant, equipment and/or systems together with all relevant information that would assist the Principal in carrying out the operation, maintenance, additions and/or alterations to the site. The provision of the As Constructed Drawings and Manuals are a condition to obtaining Practical Completion.

Documentation shall include:

- As Constructed drawings;
- Manufacturer's documentation of all equipment;
- Instructions for operation of systems e.g., irrigation and lighting;
- Maintenance procedures;
- Listings of all entered programmable parameters e.g., for the irrigation system;
- Information relating to the expected operational life of all major system components;
- Asset Register; and
- Warranty details in excess of the defects liability.

Record Keeping

During construction the Contractor shall keep accurate 'As Constructed' records of the exact size and location of all works completed on the site. Including but not limited to, all installations, construction, changes in grades, removal of existing items and all above ground and underground services pipes, ducts and the like, including all branches, changes of direction, fittings, cocks, points of access and cleaning, manholes, sumps and junctions and invert levels of all plumbing.

"As Constructed" Information must also include all necessary Operating and Maintenance Manuals which must be submitted in draft format to the Principal for review at least two (2) weeks prior to Practical Completion.

Asset Register

The Contractor must develop an Asset Register which shall include but not be limited to all plant, equipment, and furniture included in the delivery of the Works. The register should include column headings such as name, description, quantity, product id, manufacturer, supplier, contact details, etc. This spreadsheet will need to be completed as part of the Practical Completion requirements.

Electronic Drawings

The Contractor must provide 'As Constructed' drawings for all completed works including surveying incorporating finished levels in approved electronic format.

The approved electronic format for drawings is:

- PDF Formats
- GIS Formats (TAB, MID/MIF or SHP)
- AD Formats (DXF, DGN or DWG)

A copy of all drawings shall be provided in both its native format and PDF. All supplied spatial data should have complete and appropriate attribute data. The attribute data should not contain null data. The data should be correctly referenced to the GD94 Zone 50 coordinate datum. The data should be amalgamated where possible grouping spatial data types (layers, point, line or polygon). Any data supplied from GPS devices should contain the error level where possible.

Data should also be supplied with metadata complying with ANZLIC Standards (http://www.anzlic.org.au/infrastructure_metadata.html). This can be supplied as a separate text file.

Hard Copy Drawings

The Contractor shall also provide to the Principal one hard copy set of all 'As Constructed' drawings in A1 format collated and bound.

Operating And Maintenance Manuals

The manuals shall be concise and written in clear English language to describe the systems installed, method of operation and maintenance procedures.

All text in the manual shall be written in terminology which is understood by non-technical personnel and prepared by personnel who are familiar with the system design and capable of providing a detailed description of the system operation and related items.

The manuals shall include:

- A title section including the project name, address, Principal's details, and Contractor details;
- a listing of the name, address, telephone, e-mail and web address contacts of equipment manufacturers, system installers, service companies and maintenance contractors who completed the contract works;
- a comprehensive index of the contents of each volume of the manual including associated drawings a description of all systems in the installation including the method of operation;
- a schedule of routine maintenance and testing procedures and periods between activities;
- manufacturer's brochures and documentation on all equipment and accessories used in the installation;
- test reports including the results of any commissioning tests as applicable for equipment and systems as required by the specification;
- approval and compliance certificates and notices issued by Authorities, Agencies, Suppliers, Installers and Contractors; and
- Job Safety Analysis documentation.

The Manuals shall be provided in both hard and electronic copies.

Hard copy manuals shall:

- be sized with A4 pages;
- contain typewritten text - handwritten documents are not acceptable;
- be bound in binder/s which are labelled with the project description, service and volume number on the cover and spine of the binder. Binders shall be hard covered, multi ring type which enable easy removal or insertion of pages;
- include original copies of printed documents of equipment by manufacturers, note that if the applicable component is only a minor part of printed manufacturer's documents, the relevant pages shall be colour photocopied and inserted in the manual;
- include dividers between sections of the manual with printed identification of the section as cross referenced in the index; and
- include clear plastic sleeves to contain documents which are not suitable for binding, eg., certificates, etc.

Electronic format manuals shall:

- be sized with A4 paper;
- be provided in Adobe Portable Document Format, PDF;
- be produced to suit electronic on line documentation;
- be produced in a form suitable for use with Adobe Acrobat 8.0 software or higher;
- where manufacturer's documents are not available in electronic format, be provided with electronically scanned images of relevant sections of the documents in Adobe Acrobat PDF; and
- format at a resolution not less than 150 dpi, however all documents shall be readable on a computer screen.

Shop Drawings

The Contractor must include in the Construction Program activities and sufficient time for the production and distribution and examination of shop drawings.

The Contractor shall provide copies of comprehensive shop drawings as called for in the relevant sections of the relevant trade Specification and as may be necessary to the Principal; clearly indicating all details of fabrication, assembly, installation, finishing and fixing of the items concerned, and including all necessary explanatory notes or Specifications.

Sub-contractors shall only submit shop drawings and other information to the Contractor. The Contractor shall check and verify the shop drawing and information provided for completeness. The Contractor shall arrange for the examination and approval of shop drawings and other information.

Shop drawings shall be submitted in sufficient time to allow for examination and any necessary amendments and re-submission etc., well before stockpiling, fabrication or fixing is scheduled to be commenced. An allowance of five (5) working days shall be allowed for inspection and examination of this information.

All shop drawings shall meet the criteria as specified in the relevant trade Specification, or applicable consultant documentation, as a minimum.

No stamped or written indication that a shop drawing has been examined, inspected, viewed or the like by any consultant shall be or be deemed to be an acceptance of any materials or workmanship not in accordance with the Contract or an authority for a Variation. Nor does it in any way relieve the Contractor and sub-contractors from responsibility for errors and omissions or for the necessity of furnishing such workmanship and/or materials, as may be required for the completion of the Works in accordance with the Contract, and the intent of the Specification.

Whenever possible, shop drawings shall be compiled from actual Site measurements.

Should urgency necessitate shop drawings being compiled before the Works are sufficiently advanced to enable Site measurements to be made, then the shop drawings shall incorporate all necessary tolerance allowances, modifications of fixing methods, and the like to provide for any discrepancy which may arise between adopted dimensions and parts of the Works executed later.

Delays caused by or arising out of late submissions of shop drawings, or by inadequate shop drawings, shall not be, nor be deemed to be, nor allow the Contractor to claim a Variation, any extension of time or any adjustment to the Contract Sum.

The Contractor shall maintain a current register of all shop drawings recording their submission date, status, approval date, the Design Consultants who have reviewed them and any other relevant information and make available a copy of the Shop Drawing Register to the Principal upon request.

The Contractor shall keep on the Site at all times a full set of stamped shop drawings to be available as the Principal may require.

Progress Surveys (Structural Elements)

The Contractor shall throughout the construction of the Works, establish and continuously check the accuracy in both vertical and horizontal directions of all structural elements. Any errors or inaccuracies shall be immediately rectified by the Contractor. Any errors or inaccuracies may result in the work being condemned and rebuilt or modified at the Contractor's expense.

A surveyor's certificate confirming that the structural elements are within the specified tolerances shall be submitted to the Principal to achieve Practical Completion.

2.5 Schedule Of Warranties

The Contractor shall obtain and ensure that the Principal will have the benefit of all warranties specified in the Contract including (but not limited to) the following items of work, materials or equipment:

- Electrical equipment;
- Mechanical equipment;
- Hydraulic equipment;
- Anodised finishes;
- Tactile Warning Surfaces;
- Outdoor furniture;
- Plants and grasses;
- Waterproofing;
- External Timber cladding and associated protective coatings;

Part 2 READ AND KEEP THIS PART

- Anti-graffiti coatings; and
- Painted finishes (internal & external); and
- Any hardstand surface or pavement, where applicable.

The following items shall be provided with manufacturer / supplier warranties as detailed below:

Item	Warranty
Termite Control	As agreed with Contractor prior to execution of Contract
Tactile Warning Surfaces	Five (5) years from Practical Completion.
Water Filtration & Pumping Plant	Fifteen (15) years from Practical Completion warranty for all non moving parts. Five (5) years from Practical Completion for pump impellers
Site and Street Furniture	Ten (10) years from Practical Completion
Lawns and Grasses	As per Specification (Part 6 – Appendix 6.6)
Exterior Plants	As per Specification (Part 6 – Appendix 6.6)
Concrete Finishes	Fifteen (15) years from Practical Completion warranty against cracking, peeling and fading
Plumbing System	Fifteen (15) years from Practical Completion
Electrical & Lighting Equipment	As Per Specification

2.6 Project Management Plans

Prior to the award of the Contract, the preferred Tenderer will be required to submit to the satisfaction of the Principal, the Local Authority and Statutory Government Authorities, a detailed Project Management Plan describing how the Contractor will deal with all issues, including but not limited to: Work Health and Safety; Dust, Noise and Vibration; Traffic and Waste and Environmental Management Issues.

All works are required to be carried out in accordance with the approved Project Management Plan.

2.6.1 Work Health and Safety Management Plan

Prior to commencing the Works and at such other times as requested by the Principal, the Contractor shall prepare a Work Health and Safety (WHS) Management Plan that complies with WHS Legislation and obligations under the Contract and provide a copy of the WHS Management Plan to the Principal.

2.6.2 Dust Management Plan

The Contractor shall allow to comply will all the statutory requirements for dust control as well as the requirements outlined in the technical specification and drawings. The Contractor shall be responsible for effectively controlling dust and wind-borne material nuisance throughout the period of the work, including after hours, weekends and public holidays. The Contractor's responsibility shall be from the time when possession of the site is made available to the Contractor to the Practical Completion.

The Contractor shall prepare a Dust Management Plan for submission and approval prior to commencement.

The location and conditions of the work area are such that wind may cause significant nuisance to adjacent residents from dust and wind-borne material.

The site shall be evaluated in accordance with the Department of Water and Environmental Regulation (DWER), formally the Department of Environment and Conservation (DEC) 'A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated site remediation and other related activities January 2011'.

2.6.3 Noise and Vibration Control

The Contractor shall develop a stringent Noise and Vibration Emission Management plan, as a component of the Project Management Plan, for implementation during the construction phase.

The Contractor shall allow to comply with all the statutory requirements for noise control as well as the requirements outlined in the technical specification and drawings.

The Contractor shall also make allowances to undertake suitable visual inspection of both the Military and Railway Museums prior to commencing any site works. Sufficient photographic evidence shall be taken to clearly demonstrate the condition of portions of the buildings which may be at risk of cracking during construction works.

2.6.4 Traffic Management Plan

The Contractor shall develop a Traffic Management plan, for implementation during the construction phase as required. The Contractor shall allow to comply with all the statutory requirements for traffic management as well as the requirements outlined in the Specification and Drawings.

The Contractor shall prepare a detailed approved Traffic Management Plan for submission and approval to the Principal prior to commencement of work on the Site. All Traffic Management Plans must be prepared by a qualified traffic consultant and a copy of the plan available on site throughout the Contract Period.

Nothing in the Traffic Management Plan shall derogate from the responsibility of the Contractor to take all steps necessary for the control of traffic.

2.6.5 Pedestrian & Site Access

The Contractor shall develop for the Principal approval, a contractibility plan detailing how pedestrian and site access will be maintained to the Railway Museum for the duration of the works. The site can be accessed by Eastern Highway from the South or via the PTA rail crossing to the North.

2.6.6 Covid Safe Plan

The contractor is responsible for complying with all relevant directions issued by the Western Australian Government in response to the pandemic caused by COVID-19, under either the State of Emergency and Public Health State of Emergency.

The contractor will provide the Principal with written confirmation that the contractor, and any sub-contractors are compliant with the relevant directions, and will remain so until practical completion.

The Contractor shall also develop for Principal approval a Covid Safe Management Plan outlining practices to mitigate the risk of Covid-19 on the site and a contingency plan for work continuation during an incident of exposure.

2.6.7 Safety Management Plan

Prior to the commencement of the work on Site, the Contractor shall prepare and implement a Safety Management Plan relevant to the works under the Contract. The Safety Management Plan shall be maintained, and where necessary updated, throughout the Contract. The Safety Management Plan shall be appropriate to the risks associated with the work under the Contract and shall contain provision for, but not be limited to, the following elements:

- Occupational Safety and Health induction for new employees;
- listing of competencies required for specialist work (e.g., rigger, scaffolder);
- the arrangements for managing occupational safety and health incidents on the Site, including accident/incident reporting and investigation;
- the safety rules at the Site and description of the arrangements for ensuring that all persons working at or visiting the Site are informed of the rules;
- hazard identification, risk assessment and risk control including routine inspection processes;
- plant/equipment inspection processes;
- pre-job planning, procedural issues and JSA's (Job Safety Analyses, also known as Safe Work Method Statements). Within the Safety Management Plan, particular attention is to be given to identifying hazardous activities including, but not limited to, work in confined spaces, asbestos removal, demolition work, excavation work, working near power lines and live conductors and working at heights;
- emergency response and evacuation procedures;
- methods of communicating and consulting with employees and transmitting new work procedures to employees;
- hazardous substances exposure management;
- site security;
- purchasing/hiring controls (to avoid unknowingly bringing hazards onto the Site); and
- quantitative performance measures (application to be determined by contract size and duration).

Each element of the Safety Management Plan shall specifically address:

- the person on the Site who shall take responsibility for the successful implementation of each element;
- the hierarchical structure by which the responsibility is performed; and
- the specific manner by which the element is performed.

The Contractor shall prepare the Safety Management Plan in conjunction with a competent person suitably experienced and qualified in safety matters. The Principal may direct that the Contractor prepare the Safety Management Plan in conjunction with the Principal's Consultant.

Prior to the commencement of the Works, the Contractor shall certify to the Principal that its Safety Management Plan:

- has been prepared;
- has been provided to each person doing construction work at the Site (where this is practical) or is otherwise available for inspection on the Site; and

- has been implemented on Site.

In addition to the Contractor’s Safety Management Plan, the Contractor shall follow all Occupational Health and Safety directions given by the Principal.

2.7 Programming of the Works

2.7.1 Project Deadlines

It is envisaged that the Contract for the Revitalisation of Pioneer Park is to be awarded late April/early May 2022. The Respondent’s construction programme is to be scheduled from the award date accordingly. If the award date is earlier or delayed, the project programme shall be adjusted and agreed upon accordingly. However, the deadline for the completion of Separable Portion 1 – Carpark Construction is fixed to ensure that grant funding deadlines are achieved. This deadline cannot be varied, and all works shall be scheduled to ensure this portion is completed prior to 30 June 2022.

A summary of the items of work and associated deadlines are set out as below.

Item	Item Description	Deadline <i>(from award date)</i>
1	Site Establishment	2 weeks
2	Demolition & Site Preparation	3 weeks
3	Separable Portion 1 – Carpark Construction	30/06/2022
4	Separable Portion 2 – Landscaping (Remaining Works)	19 weeks
5	Practical Completion	20 weeks
6	As-Constructed Documentation	22 weeks

If these timelines cannot be met, this must be noted as part of the Respondents submission and alternative proposed delivery dates must be specified.

2.7.2 Construction Program

The provision of and adherence to the construction program is critical.

The Contractor shall supply within fourteen (14) days of the Date of Acceptance of Tender, for the approval of the Principal, a Construction Program in critical path Gantt Chart format, showing the dates when, and the times within which, the work under the Contract will be executed.

If the Principal considers the program unsatisfactory, the Contractor shall resubmit an amended program within three (3) days, until approval is obtained.

The approved Construction Program will be used by the Principal to monitor rate of progress, and when determining extensions of time under the Contract.

2.7.3 Issue Of Construction Program

The Contractor shall issue two (2) copies of the approved Construction Program to the Principal.

The program shall be in the form of a Gantt chart and shall show all activities, critical path, with completion by or prior to the Date of Practical Completion and other information as may be required by the Principal.

The Principal requires the construction programme to reflect its desired practical completion date being 20 weeks from possession of site. Respondents may wish to submit alternative tenders which provide for shorter or longer construction periods for the Principal to consider.

2.7.4 Certification Of Capability

The Contractor shall satisfy itself that the time performance requirements contained in the Construction Program are within the capabilities of itself and its Subcontractors and delivers the work under the Contract within the terms of the Contract.

If required by the Principal, the Contractor shall supply details to verify the completeness and feasibility of the Construction Program.

2.7.5 Program Format

The Construction Program shall be a critical path network analysis that:

- includes a working day calendar. The Contractor's consideration of Saturdays, Sundays, Statutory Public Holidays, building industry annual close down holidays and Rostered Days Off shall be clearly shown on the program;
- clearly identifies each area, trade and element of work;
- indicates earliest and latest starting and finishing dates for each activity, milestone events, logic dependencies, float times, resource levels and critical path activities,
- highlights in colour the critical path;
- does not include any activity describing more than one major element and/or trade and/or area;
- shows all major critical off-site activities of supply, prefabrication, testing, samples, prototypes, shop drawings, approvals required; and
- includes the activities of all the Contractor's consultants, subcontractors, suppliers and the like.

As a minimum, the following milestone events must be shown -

- Approval for Construction Management Plans;
- Procurement of long lead items;
- Mobilisation;
- Site establishment including establishment of temporary facilities & site security;
- Demolition & Site Preparation;
- Phase 1 - Car park construction;
- Approval of Shop Drawings;
- Placement of subgrade;
- Hard landscaping;
- Placement of furniture;
- Soft landscaping;
- Practical Completion;
- Submission of As Constructed Drawings and Documentation; and
- Consolidation Period.

2.7.6 Monitoring And Adherence To Construction Program

The Contractor shall constantly monitor and adhere to the Construction Program and record actual progress on the site office copy on a weekly basis and maintain daily site diaries. The Contractor must advise the Principal as soon as practical, where any delays to the original Construction Program arise or are anticipated.

2.7.7 Construction Program Re-Issue

When a delay occurs to an activity on the Construction Program critical path, the Contractor shall submit, for the approval of the Principal, within five (5) days of the delay occurring, an amended Construction Program clearly showing the changes necessary to bring the work under the Contract back onto program.

2.8 Practical Completion

To avoid any doubt, the Contractor shall not be granted Practical Completion for the Works under Contract until such time that the following items have been addressed to the satisfaction of the Principal:

- Completion of all site works including structures, furniture, carpark, living stream, hard and soft landscape, lighting and irrigation.
- Provision of all As Constructed documentation, drawings and asset register.
- Training of nominated staff.
- Site clean up suitable for public access.

3 General Conditions of Contract

This Contract shall be deemed to have incorporated the General Conditions of Contract Suite AS 4000. In particular Australian Standards for:-

- (a) AS4000-1997- General Conditions of Contract
- (b) AS4901-1998 Subcontract conditions
- (c) AS 4906-2000 Minor works contract conditions (Principal Administered)

3.1 Nature of Contract

The Contractor shall be paid on a lump sum basis as stated in the annexure. The Contract is not subject to adjustment for rise and fall in costs.

3.2 Period of Contract

The Contract shall be in force from the date of execution of the Contract documentation.

The Contract is to be completed on supply of the Requirements.

However, in the event of the Contractor failing in any manner to carry out the Contract to the Principal's satisfaction, the Principal may forthwith terminate the Contract by written notice to the Contractor.

Should significant additional time be required on site to conform to unforeseen delays beyond the Principal's control such as and not limited to adverse weather conditions, transport difficulties, airport/plane delays/re-scheduling the Principal will not be held accountable for any additional cost incurred by the successful Contractor unless prior written approval is given by the Chief Executive Officer, Executive Manger Engineering Services, or Manager of Projects in writing.

3.3 Insurances

Without limiting its obligations and responsibilities, the contractor shall take out insurance for the entire contract period under the following headings:

- (a) **Public Liability:**
A Public Liability policy with an Insurer approved by the Australian Prudential Regulation Authority (APRA) as per their list of Insurers Authorised to Conduct New or Renew Insurance Business in Australia.

The policy of Public Liability Insurance taken out by the Contractor is to provide a minimum limit of liability of AUD\$50,000,000 in respect of Death, Property Damage and Bodily Injury.

- (b) **Workers Compensation:**
The Contractor shall effect and keep in effect during the currency of the Contract such Insurance as may be necessary to adequately protect the Contractor and the Principal in respect of liability for payment of compensation to any Employee of the Contractor or of a Subcontractor of the Contractor under the Workers' Compensation and Injury Act 1981 or at Common Law.
- (c) **Professional Indemnity:**
Where the Contract involves the provision of professional services and/or advice, the Contractor is to take out a Professional Indemnity Insurance policy with an Insurer

approved by the Australian Prudential Regulation Authority (APRA) as per their list of Insurers Authorised to Conduct New or Renew Insurance Business in Australia.

The policy of Professional Indemnity Insurance taken out by the Contractor will have a limit of Liability based upon a figure agreed by the Principal and Contractor as per the attached Schedule; however, the limit of Liability will not be less than AUD\$10,000,000.

- (d) **Contractor's Work Insurance:**
The Contractor shall effect and keep in effect during the duration of the Contract such insurance that may be necessary to adequately protect the Contractor and the Principal in respect to the value of work; the Price.

Before commencing work under the Contract, the Contractor shall provide evidence, in the form of certificates of currency, to the satisfaction and approval in writing of the Principal of the insurances having been taken out for the purposes set out in the General Conditions of Contract.

3.4 Record Keeping

The Principal is subject to the provisions of the State Records Act 2000 (WA) ("SRA"). To the extent that the Contractor has possession, custody or control of any records created in the performance of functions undertaken for or on behalf of the Principal by or under this Contract, the following provisions will apply to such Records:

- (a) The term "records" has the same meaning as in the SRA.
- (b) The Contractor will comply with the SRA and its Principles and Standards and any principles or standards developed by the Principal in accordance with the SRA in relation to such Records.
- (c) All such Records will remain the property of the Principal.
- (d) The Contractor should note that as a public sector agency the Principal is subject to Freedom of Information, and that any records provided to the Principal under Section 3.4 may be subject to release under a Freedom of Information application, unless excepted as commercial in confidence.
- (e) The disposal of any such Records will be in accordance with the Principal's recordkeeping plan ("RKP").
- (f) The Contractor will give the Principal unlimited access, on reasonable notice, to all such Records.
- (g) On expiry or earlier termination of this Contract, the Contractor will (at the Principal's option) either return all such Records to the Principal in accordance with Principal's directions, or destroy them in accordance with Principal's RKP and the General Disposal Authority for Local Governments WA. In either case, the return or destruction of such Records will be at Principal's expense.

3.5 Normal Hours of Work

For works being undertaken at the Principal's sites, the normal hours of works shall be defined as:-

- Works conducted between 7:00 am and 7:00 pm, Monday to Saturday;
- The Works to be undertaken by the Contractor shall be undertaken during normal hours unless notified by the Principal in writing.

The Contractor shall be liable for any additional costs the Principal may incur as a result of work outside the normal hours. In particular, the Contractor may be liable for all expenses in connection with additional attendance by the Principal's Representative, consultant contractors.

3.6 After Hours Work

For works being undertaken at the Principal's sites any after hours works conducted shall be at the sole discretion of the Principal.

After hours works shall be defined as:

- Public holidays;
- Sunday;
- Hours between 7:00 pm – 7:00 am Monday to Saturday.

3.7 Emergency Repairs/Maintenance

Emergency repairs/maintenance requested by the Principal shall be performed as soon as practical and, within the timeframes directed by the Principal, the Contractor shall visit the site and determine the cause of any breakdown in services.

The Contractor shall immediately take the minimum action necessary to leave the services in a safe condition. The cost of such action shall be charged at scheduled rates.

When the cause of the fault is of a major nature, the Contractor shall provide a written report with recommendations and cost estimates for the repairs.

3.8 Requests for Services

No Works shall be undertaken by the Contractor without a valid authorised purchase order from the Principal, except in the case of an emergency which the Principal shall determine in its sole discretion.

The Contractor shall conduct the Works within the date and time detailed in the Principal's valid purchase order.

3.9 Notice of Service

For works being undertaken at the Principal's sites the Principal is to arrange for the Contractor to have access to a site or premises in order for the Contractor to conduct the Works in accordance with this Request and the Principal's timelines detailed in its purchase order.

An extension of time shall be granted to the Contractor to complete the Works if the Principal fails to arrange for access by the Contractor to the site or premises.

The Contractor is required to give adequate notice on an intention to inspect or carry out any work, of a non-urgent nature, to any site.

3.10 Invoices and Payments

Unless otherwise requested by the Principal, invoices should contain the following information as a minimum:

- Purchase Order Number
- Contract Number
- Name of the Principal's Representative/Project Manager
- Site or premises details;
- Works conducted;
- Breakdown of costs (labour and materials with Bill of Quantities);
- A service report detailing any other defects to be remedied and the action required to rectify such.

Tax invoices must be made out to:

Chief Executive Officer
Shire of Merredin
PO BOX 42
MERREDIN WA 6415

And submitted via email to sfo@merredin.wa.gov.au

Unless otherwise stated in the Contract, and subject to the General Conditions of Contract, the Contractor shall be entitled to receive payment within 30 days of receipt of a Tax Invoice, there will be nil (0%) interest paid for late payments.

3.11 Uniforms

For works being undertaken at the Principal's sites the Contractor's employees shall wear a work uniform that displays the Contractor's logo or other form of approved identification.

The uniform is to be neat and presentable at all times.

3.12 Licences and Registrations

The Contractor and all staff must hold all current Western Australian appropriate licences.

The Contractor shall supply copies of any such Licences at the request of the Principal.

3.13 Control of Contractor's Employees

The Contractor's employees and any subcontractors shall have a current Western Australian or National Police Clearance.

As far as practical, the Contractor shall use the same personnel for all work at the site.

The Contractor shall at all times maintain work practices, procedures and standards to ensure the safety of its employees and full compliance with all Commonwealth and State statutory requirements.

All persons shall use all appropriate personnel safety equipment required for each task.

For works/services taking place at one of the Principal's sites the Contractor shall engage only the minimum number of staff to work on site at any one time.

The Contractor and all personnel must be experienced and competent operators. The Principal has the right to reject any Contractor's personnel without cause.

3.14 Occupational Health and Safety

The Contractor shall comply with the relevant Principal's policies and guidelines, all relevant Commonwealth and State laws and all requirements of the WA Occupational Safety and Health Act 1984 and WA Occupational Safety and Health Regulations 1996.

The Contractor shall not permit its employees, the employees of other parties or other persons to commence work on the Site until they have been inducted. Such induction shall include but not necessarily be limited to:

- familiarisation with the Safety Management Plan;
- reporting of accidents and incidents - which shall include the type of events to be reported, how an event is reported and to whom the event is reported;

- emergency procedures - which shall cover the procedure for a medical emergency
- and for evacuation of the Site in the event of a life threatening situation arising;
- personal protective equipment (PPE) - the standard requirements for the Site;
- lifting and manual handling skills;
- sun protection;
- avoidance of noise induced hearing loss;
- location of and access to First Aid on the Site;
- legislative framework - an employees rights and responsibilities under the Act and Regulations;
- procedure for the resolution of safety issues at the workplace (in accordance with Sections 24 to 28A of the Act), and;
- Site security.

Refer to the WorkSafe WA Code of Practice: First Aid, Workplace Amenities and PPE for practical guidance for the provision of first aid, workplace amenities and access to these amenities.

The Contractor shall induct its employees, the employees of other parties or other persons working on the Site with regard to JSA's/SWMS and shall prepare "Training Session Attendance" sheets signed by each attendee verifying that such induction has occurred.

Upon commencement of work on the Site, the Contractor shall further induct each employee, the employees of other parties or other persons working on the Site with regard to all significant hazards associated with their particular activity and area of employment on the Site and where relevant shall include the use of powered plant, tools and equipment.

3.15 Safe Work Method Statements

Where construction work on the Site is high risk construction work, the Contractor shall ensure that a person having day-to-day, on site control of the high-risk work at the site gives the Contractor a written Safe Work Method Statement before the high risk construction work commences. The Contractor shall ensure that the Safe Work Method Statement is kept up to date.

For the purposes of this clause, high risk construction work includes:

- work involving a risk of a person falling 2 metres or more; or
- work on telecommunications towers; or
- the demolition of any existing structure; or
- disturbing or removing asbestos; or
- the alteration to a structure that requires the structure to be temporarily supported to prevent its collapse; or
- work within a confined space;
- the excavation to a depth of more than 1.5 metres; or
- the construction of tunnels; or
- the use of explosives; or
- work on or near pressurised gas pipes (including distribution mains); or
- work on or near chemical, fuel or refrigerant lines; or
- work on or near energised electrical installations and lines (whether overhead or underground); or
- work in an area that may have a contaminated or flammable atmosphere; or
- work involving tilt-up or precast concrete; or
- work on or adjacent to roads or railways that are in use; or
- work on a construction site where there is movement of powered mobile plant; or

- work in an area where there are artificial extremes of temperature; or
- work in, over or adjacent to water or other liquids if there is a risk of drowning; or
- work involving diving.

The Contractor shall ensure that a Safe Work Method Statement will cover all high-risk construction work done at the site, and that the high risk construction work is carried out in accordance with the statement. Where work is carried out other than in accordance with the Safe Work Method Statement, the Contractor shall ensure that the work ceases (when it is safe to do so) and does not resume until the statement is complied with.

The Contractor shall ensure that the Safe Work Method Statement shall be kept up to date describe:

- each high-risk construction work activity that is or includes a hazard to which a person at the construction site is likely to be exposed;
- the risk of injury or harm to a person resulting from any such hazards;
- the safety measures to be implemented to reduce the risk, including the control measures to be applied to the activity or hazards; and
- a description of the equipment used in the work activity; and
- the qualifications and training (if any) required for persons doing the work to do it safely.

3.16 Material Safety Data Sheets

The Contractor shall ensure that a copy of all manufacturer/supplier Material Safety Data Sheets are available on a register on site for each hazardous substance used in connection with the work under the Contract. Material Safety Data Sheets shall be consistent with the format of the National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC: 2011 (1994)].

3.17 Shire of Merredin Access and Inclusion Plan (AIP)

The Contractor shall comply with the Disability Services Act 1993 and the requirements of the Principal's Access and Inclusion Plan for all works/services being undertaken at the Principal's public sites.

If the Contractor has a query with respect to the Access and Inclusion Plan requirements, the Contractor must refer to the Principal's Representative and if the Principal's Representative is unable to respond at that time, the Principal will provide advice in writing.

3.18 Risk Management Standard Guidelines Requirements

The Contractor shall comply with the AS ISO 31000:2018 Risk Management Standard Guidelines.

3.19 Guarantee

All Works carried out by the Contractor shall be guaranteed for a minimum of 12 months from date of Practical Completion of the Works. All Works must be completed within a reasonable time, to the appropriate Australian Standards and to a high tradesman like standard of workmanship.

3.20 Quotations

All quotations and estimates shall include allowances for labour, parts, contractor's mark up, removal of all rubbish and redundant parts from site, any scrap or trade in value of redundant parts, and overtime considered necessary and any GST applicable.

3.21 Minor New Works

Upon request of the Principal the Contractor may be required to submit quotes for minor works up to the value of \$5,000 (ex GST).

3.22 Cleaning

For works being undertaken at the Principal's sites the Contractor shall keep the site or premises of the Principal while conducting the Requirements of this Request in a manner that is safe and clean to a standard that is acceptable to the Principal.

Upon completion of any Works the Contractor shall remove any materials, equipment, or rubbish to the satisfaction of the Principal from any site or premises of the Principal.

3.23 Equipment Alteration/Modifications

For works being undertaken at the Principal's sites where equipment is removed, modified or altered the Contractor shall upgrade all current records, legends.

The Contractor shall provide in writing to the Principal any alteration to the maintenance procedures required to meet the manufacturer's recommendations.

3.24 Site Facilities

For works being undertaken at the Principal's sites, where required, the Contractor shall be responsible for the provision of all normal facilities for the proper performance of the work under the Contract, including but not limited to:-

- (a) access to the site;
- (b) storage areas;
- (c) water, light and power supplies;
- (d) sanitary conveniences;
- (e) statutory amenities for drinking water, messing and changing;
- (f) storage of tools; and
- (g) first aid and safety measures; and any additional facilities required.

For works and/or services taking place inside or at the Principal's sites the Contractor shall have access to the existing public amenities on site. No additional amenities (*including office space or storage areas*) will be provided, except on prior request by the Contractor if availability exists.

Occupation of any part of the works and site for the provision of workmen's amenities shall not be permitted without the prior written approval of the Principal. The Contractor shall be responsible for keeping these areas clean and tidy. Such facilities are not to be used for cleaning of brushes, tools and equipment. The Contractor shall be responsible for providing all amenities to the toilets including soap, toilet paper etc. Except as nominated by the Principal, the Contractor shall ensure no other existing toilet facilities are used for any purpose within the Site.

3.25 Materials

All equipment, materials and accessories in the Contract shall be new, of commercial grade, and shall conform to the Specification and appropriate current Australian Standards specification.

3.26 Public Protection

For works being undertaken at the Principal's sites the Contractor shall use all types and methods of protection (*such as temporary safety fencing, hoarding, potholing, service location*

and warning signage) that are reasonably practicable and necessary to protect the public from hazards associated with the Work under the Contract. All temporary fencing and signage must comply with statutory requirements for worksite.

3.27 Nature and Quantity of Work

The Principal does not give any assurances as to the nature or quantity of work that could be allocated. Depending on the nature and the type of work services may be sourced from more than one Contractor. The Principal, if the need arises, reserves the right to seek services from providers other than those forming part of this Contract.

3.28 Existing Services

Where, within the vicinity of the Services or Works being performed, there are existing utility services or facilities, the Contractor shall protect and maintain the same throughout the performances of the Services; including, but not limited to:-

- Electricity
- Water
- Sewerage
- Recycled water pipeline - irrigation
- Ensuring Dial Before You Dig Processes are undertaken

The Contractor shall allow for all traffic controls measures to maintain the roads in a safe trafficable condition.

3.29 Materials, Labour, Constructional Plant and Risk

The Contractor shall provide all materials, labour, plant, equipment, tools and everything else necessary for the Works.

The Contractor shall take upon itself the whole risk of executing, completing and maintaining the Works in accordance with these Conditions, the drawings and specification (*if any*) and such orders as the Principal may issue.

The Contractor shall be solely liable for loss or damage to the Works from any cause whatsoever (*except loss or damage caused by any negligent act or omission of the Principal, the Principal or the employees, professional consultants or agents of the Principal*) until the Principal has certified that the whole of the Works have been satisfactorily completed by the Contractor.

3.30 Termination of Contract

- (a) If the Contractor fails to duly and punctually observe, perform and/or comply with any term, condition or stipulation (whether expressed or implied) and such failure continues for a period of 14 days (or such other period as, having regard to the circumstances, the Principal may reasonably allow) after service on the Contractor of a written notice requiring the Contractor to observe, perform and comply with such term, condition or stipulation or otherwise to remedy the breach; or
- (b) If the Contractor (being a corporation) goes into liquidation (except for the purpose of reconstruction or amalgamation) or is otherwise dissolved or if a receiver or receiver/manager of the whole or any part of the assets and undertaking of the Contractor is appointed or if the Contractor enters into any composition or scheme of arrangement with its creditors or if an inspector or like official is appointed to examine the affairs of the Contractor or the Contractor enters into voluntary administration; or

- (c) If the Contractor (being a natural person) commits an act of bankruptcy or if an order is made for the sequestration in bankruptcy of the estate of the Contractor, or if the Contractor assigns its estate or enters into a Deed of Arrangement for the benefit of its creditors; or
- (d) If the Contractor assigns or subcontracts the Contract or any part thereof without the prior written consent of the Principal; or
- (e) If the Contractor includes in its Tender any statement, representation, fact, matter, information or thing which is false untrue incorrect or inaccurate, whether known to the Contractor or not;

Then and in any of the said cases, the Principal may by notice in writing to the Contractor, forthwith terminate the Contract whether any Orders remain outstanding or not.

The Principal's abovementioned rights are in addition to and without prejudice of any other rights it may have at law, in equity or otherwise.

3.31 Waiver

No forbearance, delay or indulgence by the Principal in enforcing the conditions of the Contract shall prejudice, restrict or limit the rights of that party, nor shall any waiver of those rights operate as a waiver of any subsequent breach.

3.32 Liquidated Damages

If the Contractor fails to complete the works by the Date for Practical Completion together with any extensions of time granted by the Principal, the Contractor may be liable to the Principal for liquidated damages in the amount stated in the General Conditions of Contract for every day after that date until Practical Completion has been achieved or the Contract terminated, whichever is sooner.

- ***Liquidated Damages of \$500 per day will be enforced for this Contract.***

3.33 Contractor Security

The Contractor may be required to provide to the Principal for the purposes of Contractor's Security within fourteen days of award of the Contract, security for an amount equal to 5% of the accepted tendered price (*Contract value*), in two equal parts of 2.5% of the accepted tender price (*Contract value*) in the form Bank Guarantees.

Alternatively, the Contractor may request in writing to the Principal within 14 days of the award of Contract that the Principal arrange for Retention Monies to the value of 5% of the accepted Tendered price (*Contract value*) in lieu of the Bank Guarantees be retained from the initial payment.

If the Contractor fails to provide Bank Guarantees or request the Contractor's Security be obtained through Retained Monies within 14 days of the award of the Contract, then the Principal will retain monies to the value of 5% of the accepted Tendered price (*Contract value*) in lieu of Bank Guarantees from the initial payment.

Upon issue of the Certificate of Practical Completion in accordance with the General Conditions of Contract, one Bank Guarantee (*or 50% of the retained monies*) will be returned to the Contractor within 21 days of the issue of the Practical Completion Certificate. The remaining Bank Guarantee (*or balance of retained monies*) will continue to be kept by the Principal until a successful inspection of the works at the expiration of the Defects Liability Period, and the subsequent issue of the Final Certificate. The final Bank Guarantee (*or balance of retained monies*) will be returned to the Contractor within twenty one days of the date that the Final Certificate is issued to the Contractor by the Principal.

Interest shall not be payable on retained monies.

- ***Contractor Security will be required for this Contract.***

3.34 Formal Instrument of Agreement

A Formal Instrument of Agreement may be prepared by the Principal for execution by the Contractor in accordance with the General Conditions of Contract.

3.35 Safety, Security and Smoke Free Workplaces

The Contractor shall, when attending the Principal's premises or facilities, comply with all reasonable directions and procedures relating to occupational health (*including the Principal's smoke free work place policy*) and safety and security in effect for those premises or in regard to those sites, as notified by the Principal.

3.36 Contractor Performance Records

- i) The Principal will maintain appropriate records monitoring Contractor performance and shall call upon a Contractor to explain any instances of unsatisfactory performance.
- ii) Unsatisfactory performance includes, but is not limited to, late delivery against an accepted project requirement or frequent rejection of project requirements.
- iii) In severe cases, unsatisfactory performance will lead to termination of the Contract in addition to any other remedies available to the Principal under the General Conditions of Contract for these requirements.

3.37 Rights and Remedies

The Principal may exercise the rights herein conferred in addition to all or any other rights or remedies which the Principal shall or may be entitled to against the Contractor whether under a Legal Requirement or this Contract.

3.38 Limited Liability

In the event of any breach of this contract by the Principal the remedies of the Contractor shall be limited to damages. Under no circumstances shall the liability of the Principal exceed the price of the requirements.

3.39 Media

The Contractor shall not disclose any information concerning the Contract for distribution through any communications media without the Principal's prior written approval (which shall not be unreasonably withheld). The Contractor shall refer to the Principal any enquiries from any media concerning the Contract.

3.40 Intoxicating Liquor and Drugs

Neither the Contractor nor any employee or agent of the Contractor will be permitted to enter a site under the influence of or in possession of any intoxicating liquor, drugs or illegal substance or under the influence of the same.

3.41 Qualifications / Competency

It is the duty of the Contractor to ensure that any task requiring a Qualification or Certificate of Competency is allocated only to a person or persons holding such Qualification or Certificate of Competency to complete the task required.

4 Special Conditions of Contract

4.1 Performance Management Process

Communication between the Principal and the Contractor needs to be managed effectively to ensure that workers are advised of poor performance and to advise on the outcomes of work being completed or materials delivered.

The following performance management and review process will enable this to occur whilst also ensuring that the performance and review of the Contract is linked to that of the specification and work orders, including the provisions for default and Contract termination.

- Ongoing performance management and liaison between the Principal or nominated representative and the Contractor.
- Performance reporting and contract performance review.

Ongoing performance management and review will allow:

- The Principal to notify the Contractor of any sub-standard materials/works or damages and to monitor compliance.
- Contract workers to advise the Principal of identified faults and damage.
- Principal and Contractor to identify and address sub-standard work/materials without disruption to the operation of the works.'

The Principal reserves the right to independently audit any works during the contract period.

4.2 Additional Time due to Unforeseen Delays

Should significant additional time be required on site to conform to unforeseen delays beyond the Principal's control, such as and not limited to, adverse weather conditions, transport difficulties, airport/plane delays/rescheduling the Principal will not be accountable for any additional cost incurred by the successful Contractor, unless prior approval is given by the Chief Executive Officer, Executive Manager Engineering Services, or Manger of Projects.

4.3 Excavation of Rock Material

Excavation in rock shall comprise excavation of material in place whether solid or not that cannot be ripped and excavated by a tracked excavator with an operating mass not less than 38 tonnes and net engine power not less than 155kW - in good condition. The excavator shall be capable of exerting a minimum breakout force of 180kN at the bottom of the excavation with a 600 mm wide bucket fitted with rock teeth.

Excavation in all other classes of material shall be termed common excavation and shall be allowed for in the contract price. Mechanical rock breaking equipment only shall be used in the excavation of rock material. Blasting will not be permitted.

The Contractor is to provide an hourly rate for rock breaking using a pneumatic jack hammer or hydraulic rock breaker to break down the rock material to size that would be classified as common excavation material. The removal of such material would then be termed common excavation which should be allowed for in the contract price.

The mobilisation and demobilisation cost of rock breaking machinery along with fuels, maintenance and any other operating costs shall be allowed for in the quoted hourly rate for rock breaking. No additional request for costs associated with rock breaking will be considered.

No payment shall be made for a pneumatic jack hammer or hydraulic rock breaker that is not being used on site or is not being used for its intended purpose. Thus only the time the rock breaking machinery is being used for breaking down rock will be paid at the quoted hourly rate. The contractor is not to excavate beyond the required design levels specified in the contract drawings unless prior written approval is provided by the principals representative.

4.4 Damage/Protection

The Contractor must take care during progress of the Works to avoid damage to any existing fencing, roads, pavements, footpaths, verges, surfaces generally, services including water, electricity, gas, communication and any other services or items within or adjacent to the Site.

The Contractor shall be responsible for the protection of any items, surfaces, services, or property within and adjacent to the site that may be a risk of damage during the activities undertaken in the delivery of the Works.

Any damage caused by the activities of the Contractor shall be made good by the Contractor at their own expense. If made good by the Principal, the cost of the repair shall be recovered from the Contractor.

The Contractor shall not obstruct or any roadways, footpaths, or other access ways adjacent to the site. Under no circumstances shall materials be stockpiled, or plant and machinery be left standing, serviced or repaired outside of the Site or defined laydown area.

4.5 Non Conformance

Any work or materials deemed to be non conforming/non compliant with this Contract (*as per the Specification*) by the Principal/Principal's Representative shall be removed at the Contractor's expense, including cost of replacement and no payment shall be made for the removal or non-conforming material.

4.6 Excess/Removed Materials

The Contractor will be allowed to dispose of rubbish material removed under this project at the Principal's Refuse Site located on Chandler Road in Merredin at NO cost. The Principal will only accept waste types and volumes outlined in the Principal's Operating License. Prior to disposal, the Contractor is to separate waste types and reduce the size of the material for ease of transport and secure/tie to ensure that the stockpile of material does not fly around in strong wind conditions at the Refuse Site. The Contractor must follow the Refuse Site Operator's instructions for the disposal of the material on arrival at the site. The Contractor shall maintain records of such disposal.

Surplus material, including materials removed due to non-compliance with this specification, shall be removed from the site and the area left in a neat, tidy and safe condition at the end of each day and at the completion of the scope of works.

4.7 Subcontracting

The Contractor shall legally bind all subcontractors and suppliers (whether nominated or otherwise) by signed written Agreements in the form of the current Sub-contract Agreement AS2545 or such other comparable Agreement as may be approved by the Principal.

4.8 Wording of Documents

Wherever the imperative mood of a verb is used or the words 'provide' 'supply', 'install', 'fix', 'fit' are used these shall have the same intent and meaning as if the words 'the Contractor shall' or 'the Contractor shall provide and fix' were used.

Where items are described as "Fix Only" the Contractor shall include for correct ordering, unloading on site, checking deliveries, getting in, storing as required, moving into position, hoisting, fixing and protecting.

4.9 Project Information Signs

The Principal may direct the Contractor to erect on site hoarding project information signs which will be supplied by the Principal at no cost to the Contractor. These signs will be intended to convey to the public the project works at various stages of construction including visual images of interior and exterior finishes. These signs must not be altered or removed without express permission of the Principal.

4.10 Aboriginal Heritage Management

The Contractor is reminded of the requirements under the Aboriginal Heritage Act 1972 and the obligations under Part IV – Protection of Aboriginal Heritage Sites, Clause 15, to report findings to the relevant regulatory body and Principal as soon as practicable.

4.11 Site Meetings

The Contractor shall throughout the duration of the Contract arrange for site meetings (as required by the Principal) between the Contractor, appropriate subcontractors and the Principal and Principal's consultants. The purpose of these site meetings is to assist in attaining full co-operation between all concerned on the project as well as checking progress of the work under the Contract and providing the opportunity for general discussion of the work under the Contract. The Principal will chair and minute these meetings.

Prior to first site meeting the Contractor shall submit to the Principal the names and telephone numbers of all responsible persons who may be contacted after working hours (in emergency circumstances) during the course of the Contract.

4.12 Final Cleaning Up

The Contractor shall at all times progressively clean up the Works and the Site and remove all accumulated, discarded and surplus building materials and debris.

All combustible rubbish from inside or adjacent to the Site and adjacent sites shall be removed daily.

In the event the Contractor does not regularly and satisfactorily clean the Site, the Principal shall arrange for the Site to be cleaned and the cost thereof shall be a debt owed by the Contractor to the Principal. Any such cleaning shall not form the basis for a claim for an extension of the Date for Practical Completion.

On practical completion of the works the Contractor shall leave the works fit for immediate occupation or use.

4.13 Use of Public Roads

The use of public roads, the points of access to and crossing of public roads shall be minimised. Where public roads are used, the Contractor shall maintain these roads free of any earth, rock or other materials that may fall from its plant. All such material dropped onto public roads shall be promptly removed and the roads cleaned to the satisfaction of the Principal and Local Authority at the Contractor's expense.

The Contractor shall not close off any road to traffic without prior approval of the Local Authority and the Principal.

4.14 Existing Facilities and Operations

The Contractor acknowledges and agrees that:

- Access to business (e.g., Railway Museum) must be maintained during opening hours during the Works under the Contract.
- The Contractor shall allow for the case that all areas not included in the Contract may be occupied. The occupied areas and access ways shall be kept safe, secure, weather tight where applicable, and the Contractor shall take all steps to minimise nuisance.
- Maintenance and connection to existing services are contained within the Works, the operation of which must not be breached by the Contractor without gaining specific Principal approval.

4.15 Services Installation and Connection

The Contractor shall make sure mechanical, electrical, plumbing, and similar service installations, equipment and their associated services are installed in such order that will ensure they are located as shown on the drawings and that all essential components and parts are accessible for the purposes of maintenance and replacement.

The Contractor shall be responsible for co-ordination between the various service installers in attaining the required locations and tolerances.

Where the works include extensions of or are adjacent to existing works the Contractor shall be responsible for making the proper junction between the sections of work and for making good any damage to the adjacent or existing works.

The Contractor shall ensure that the adjacent or existing works conform in level and location with those shown on the Drawings before commencement of any works on the Site.

The Contractor shall notify the Principal of connection, disconnection or interference with existing services and obtain necessary approvals prior to proceeding with work.

Prior to commencing any demolition, or works that involve cutting into floor slabs, pavement or walls, the Contractor is to take all reasonable steps to identify and isolate existing services that may be present in the area to be demolished or cut.

Prior to commencing any excavation works, the Contractor is to take all reasonable steps to identify and isolate existing services which may be in the ground. This is to include the use of appropriate ground scanning (ground probing radar, potholing and the like) to be undertaken by a qualified contractor. Unless otherwise noted in the Contract Documents, the contractor shall attend to existing services as follows:

If the service is to be continued: Repair, divert or relocate as required. If such a service crosses the line of a required trench, or will lose support when the trench is excavated, provide permanent support for the existing service.

If the service is to be abandoned: Cut and seal or disconnect, and make safe.

Perform the work so that the number and duration of interruptions are reduced to a minimum.

4.16 Provision For Traffic

The Contractor shall make provision for control and management of vehicular and pedestrian traffic in and adjacent to the Site in accordance with the relevant Australian Standard and Main Roads WA Code of Practice. All signs, lights, barriers, barricades, etc shall be provided by the Contractor in accordance with the relevant Australian Standard.

The provisions, maintenance and storage of the requisite signs, lights, barriers and barricades for the use throughout the Contract shall be included in the Contract Price. The installation, maintenance in position and removal on completion of the work together with all labour plant

and materials associated therewith and used for the directing of traffic and pedestrians shall be included in the rates for the particular work with which they are associated.

The Contractor shall observe all directions of the relevant Statutory Authority relating to the accommodation of both pedestrian and vehicular traffic and shall be entirely responsible to ensure that all lights, signs, flags, barriers, barricades, temporary vehicular and pedestrian access to, from, adjacent to and within the work site are installed and maintained in a completely acceptable manner to the relevant Statutory Authority.

Where directed or considered necessary for safety and good traffic flow, the Contractor shall provide at no extra cost the necessary certified traffic controller(s) to direct traffic.

The Contractor shall accept all liability in connection with the provision for traffic and shall be responsible for all actions, claims and demands made by person or persons for injuries or damage suffered by them by reason of non-compliance or non-observance, by the Contractor of the conditions and precautions stipulated herein.

4.17 Temporary Electric Light and Power Supply

Where the mains supply of electricity is not available at the Site, the Contractor shall allow and arrange to provide a suitable alternative temporary electric light and power supply.

The Contractor shall arrange, provide and maintain a temporary electric light and power supply with adequate outlets distributed about the site for executing the work under the Contract (both for construction and testing) and disconnect it and clear it away on practical completion of the works.

4.18 Temporary Water Supply

Where the mains supply of water is not available at the Site, the Contractor shall allow and arrange to provide a suitable alternative temporary water supply.

The Contractor shall arrange, provide and maintain a temporary water supply with adequate outlets distributed about the site for executing the work under the Contract and disconnect it and clear it away on practical completion of the Works.

4.19 Site Access

The site will be available for possession following completion of all post Tender award activities and by agreement with the Principal.

Access onto and around the Site, and use of the Site for temporary works and constructional plant including working and storage areas, location of offices, workshops, laydowns, roads and parking is restricted to the areas necessary to achieve satisfactory completion of the works, as determined by the Principal.

Restricted access areas shall be barrier fenced off prior to the commencement of construction.

The Contractor shall be responsible for the maintenance of this fence for the duration of the Contract. Protective fences to delineate restricted access areas shall be removed by the Contractor at its own expense immediately after Practical Completion unless otherwise instructed by the Principal.

The Contractor shall be responsible for all vehicles and equipment accessing the Site and pay particular attention to pedestrians and safety at the entrances. Should internal roadways or road reservations be damaged by vehicles during the Works, the Contractor shall promptly make good any damage caused at no cost to the Principal.

The Contractor shall not enter upon any land outside the boundary of the Site unless authorised by the Principal. The Contractor shall give at least five days' notice to the Principal of its intention to enter any land outside the designated boundary of the Site.

The Contractor must ensure minimal disruption to interfacing Contractors, Stakeholders and General Public.

4.20 Site and Public Security

The Contractor shall be responsible for the proper and adequate safeguard of the works, including both fixed and unfixed materials on the Site, during both working and non-working hours. The Contractor shall at their own cost take all measures including the provision of fencing, warning lights and the employment of a security guard(s) and/or patrol services as may be necessary for this purpose.

Notwithstanding the Contractor's obligations to site and public security as stated elsewhere in this Contract, the Contractor shall monitor and control, wherever practicable, the access of all persons to the Site.

The Contractor shall ensure that no persons, unrelated to the Contract, enter the Site without the express permission of the Contractor.

PPE standards shall apply at all times and a person shall only enter the Site after that person has received a safety briefing regarding hazards relevant to the Site.

The Contractor shall use all types and methods of protection (such as temporary safety fencing and warning signage) that are reasonably practicable and necessary to protect the public from hazards associated with the work under the Contract. Protection shall be consistent with the recommendations contained in the WorkSafe WA publication "Construction Work and the Public". This publication is available from WorkSafe WA and can be accessed from the WorkSafe WA website at www.safetyline.wa.gov.au. Where a safety fence is used, it shall be not less than 1.8 metres in height.

The installation of temporary fencing and hoardings shall be in accordance with Australian Standard AS4687 and take into account wind loading, impact tests and stability. Temporary fencing and hoardings shall be installed in such a manner to remain erect and stable at all times. All temporary fencing and hoardings shall be erected by a competent installer.

The Contractor shall maintain these in a good state of repair throughout the performance of the works and, unless instructed otherwise, remove them upon Practical Completion.

5 Tenderer’s Offer

5.1 Form of Tender

The Chief Executive Officer
Shire of Merredin
Merredin Administration Centre
Corner King & Barrack Streets
MERREDIN WA 6415

I/We (Registered Entity Name): _____
(BLOCK LETTERS)

of: _____
(REGISTERED STREET ADDRESS)

ABN _____ ACN (if any) _____

Telephone No: _____ Email: _____

In response to RFT 03 – 2021/22 Pioneer Park Revitalisation (Retendered)

I/We agree that I am/We are bound by and will comply with this Request and its associated schedules, attachments, all in accordance with the Conditions of Tendering contained in this Request signed and completed.

The tendered price is valid up to ninety (90) calendar days from the date of the Tender closing or forty-five (45) days from the Council’s resolution for determining the Tender, whichever is the later unless extended on mutual agreement between the Principal and the Tenderer in writing.

I/We agree that there will be no cost payable by the Principal towards the preparation or submission of this Tender irrespective of its outcome.

The tendered consideration is as provided under the schedule of rates of prices in the prescribed format and submitted with this Tender.

Dated this the _____ day of _____ 202__

Signature of authorised person: _____

Full Name of authorised signatory (BLOCK LETTERS): _____ Mr. Mrs. Ms. *Please tick one.*

First Name: _____ Surname: _____

Position: _____

Telephone No: _____ Email: _____

Authorised Signatory Postal Address: _____

5.2 Selection Criteria

5.2.1 Compliance Criteria

Please select with a “Yes” or “No” whether you have complied with the following compliance criteria:

Description of Compliance Criteria	
<p>i) Compliance with the Conditions of this Tender</p> <p>Tenderers are to provide acknowledgment that your organisation has submitted in accordance with the Conditions of this RFT including completion of the Offer Form and provision of your pricing submitted in the format required by the Principal</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>ii) Complete Tenderer’s Offer</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>iii) Complete Pricing Schedule</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>iv) Corporate Information/Risk Assessment</p> <p>Tenderers must address the following information in an attachment and label it “Risk Assessment”.</p> <ul style="list-style-type: none"> • Provide an outline of organisation structure inclusive of any branches and number of personnel. • Attach current ASIC company extracts search including latest annual return. • Provide the organisation’s Directors/Company Owners and any other positions held with other organisations. • Provide a summary of how many years your organisation has been in business. • Are you acting as an agent for another party? If Yes, attach details (including name and address) of your Principal. • Are you acting as a trustee of a trust? If Yes, give the name of the trust and include a copy of the trust deed (and any related documents); and if there is no trust deed, provide the names and addresses of beneficiaries. • Do you intend to subcontract any of the Requirements? If Yes, provide details of the subcontractor(s) including the name, address and the number of people employed; and the Requirements that will be subcontracted. 	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>v) Financial Position</p> <p>Tenderer to confirm ability to pay all debts in full as and when they fall due; and</p> <p>Advise of any current litigation as a result of which you may be liable for \$50,000 or more.</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>

Part 5 COMPLETE AND RETURN THIS PART

<p>vi) Conflict of Interest Advise of any actual, perceived or potential conflict of interest in the performance of your obligations under the Contract, or if any such conflict of interest likely to arise during the Contract. If Yes, please supply in an attachment details of any actual or potential conflict of interest and the way in which any conflict will be dealt with.</p>	<p><i>Information Supplied</i> Yes / No <input type="checkbox"/> <input type="checkbox"/></p> <p><i>Is there a Conflict of Interest?</i> Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>vii) Insurance The insurance requirements for this Request are stipulated in Part 3 of this Request. Provide details of the insurance coverage that meets the insurance requirements for this Request. A copy of the Certificate of Currency is to be provided to the Principal within seven days of acceptance.</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>viii) References Attach details of your referees, provide a minimum of two (2). You should give examples of work provided to verify skills and experience where possible.</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
<p>ix) Regional Price Preference Policy Advise of regional address if you have a shop front within the Shire of Merredin, Shire of Kellerberrin, Nungarin, Westonia, Naremben, Yilgarn and Bruce Rock, for consideration of applying the Regional Price Preference to your submission [if applicable].</p>	<p>Yes / NA <input type="checkbox"/> <input type="checkbox"/></p>
<p>x) Previous Contracts with Local Government Authorities Advise if you have previously withdrawn from a Contract issued by a Local Government Authority, either after advice of award of the Contract but prior to signing of the Contract documentation or after execution of the Contract.</p>	<p><i>Information Supplied</i> Yes / No <input type="checkbox"/> <input type="checkbox"/></p> <p><i>Have you withdrawn from a LGA Contract?</i> Yes / No <input type="checkbox"/> <input type="checkbox"/></p>

Part 5 COMPLETE AND RETURN THIS PART

<p>xi) Home Occupation/Home Based Business Advise if you are operating from a residential address. If operating from a Residential address supply a copy of the current Home Occupation or Home Based Business Licence</p>	<p>Yes / No <input type="checkbox"/> <input type="checkbox"/></p> <p>If Yes - <i>Copy of Licence supplied</i> Yes / No <input type="checkbox"/> <input type="checkbox"/></p>
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5.2.2 Qualitative Criteria

Before responding to the following qualitative criteria, Tenderers must note the following:

- a) All information relevant to your answers to each criterion are to be contained within your Tender;
- b) Tenderers are to assume that the Evaluation Panel has no previous knowledge of your organisation, its activities or experience;
- c) Tenderers are to provide full details for any claims, statements or examples used to address the qualitative criteria; and
- d) Tenderers are to address each item outlined within a qualitative criterion.

<p>Relevant Experience Describe your experience in completing /supplying similar Requirements. Tenderers must, as a minimum, address the following information and label it “Relevant Experience”:</p> <ul style="list-style-type: none"> i) Provide details of similar work; ii) Provide scope of the Respondent’s involvement including details of outcomes; and iii) Provide details of issues that arose during the project and how these were managed. 	<p>Weighting 15%</p> <p>Tick if Attached <input type="checkbox"/></p>
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<p>Skills and Experience of Key Personnel Tenderers must provide as a minimum information of proposed personnel to be allocated to this project, including:</p> <ul style="list-style-type: none"> i) Their role in the performance of the Contract; ii) Curriculum vitae; and iii) Qualifications, with particular emphasis on experience of personnel in projects of a similar requirement. <p>Supply details and label it “Key Personnel”.</p>	<p>Weighting 15%</p> <p>Tick if Attached <input type="checkbox"/></p>
---	---

Part 5 COMPLETE AND RETURN THIS PART

<p>Demonstrated Understanding & Methodology Respondents should detail the process they intend to use to achieve the Requirements of the Specification. Areas that you may wish to cover include:</p> <ul style="list-style-type: none"> i) A project schedule/timeline; ii) The process for the delivery of the goods/services; iii) A demonstrated understanding of the scope of work; iv) Any identified potential risks and how they are to be managed; and v) Outline of works to be sub-contracted and preference for use of local suppliers and sub-contractors. <p>Supply details and provide an outline of your understanding of the contract in an attachment labelled “Demonstrated Understanding”.</p>	<p>Weighting 30%</p> <p>Tick if Attached <input type="checkbox"/></p>
---	---

<p>Price Consideration</p> <p>The Weighted Cost Criteria method is used where price is considered to be crucial to the outcome of this tender process. The Tendered price is given the following weighting and will be assessed in conjunction with the Compliance Criteria, Qualitative Criteria detailed in Part 5. – Tenderer’s Offer of this Request for Tender.</p>	<p>Weighting 40%</p> <p>Tick if Attached <input type="checkbox"/></p>
---	---

TOTAL TENDER WEIGHTING..... 100%

5.3 Price Information

Tenderers must complete the following Price Schedule. Before completing the Price Schedule, Tenderers must ensure they have read this entire Request.

Tendered total prices must include the Goods and Services Tax (GST).

Unless otherwise indicated prices tendered must include delivery, unloading, packing, marking and all applicable levies, duties, taxes and charges. Any charge not stated in the Tender, as being additional will not be allowed as a charge for any transaction under any resultant Contract.

5.3.1 Provisional Sums

The Tenderer shall allow in their Lump Sum Tender Price the following

Provisional Sums:

No	Item Description	Value
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Part 5 COMPLETE AND RETURN THIS PART

1	Wayfinding Portal & Interpretative Signage	\$75,000
2	Signage & Linemarking - Great Eastern Highway	\$10,000
3	Relocation / Adjustment to Existing Unidentified Services	\$50,000
4	Service Connections / Upgrades	\$10,000

The Tenderer shall allow in their tender for all time and costs in carrying out works required by the expenditure of the Provisional Sum within the Contract Period. No extension of time or delay costs will be granted as a result of expenditure of the Provisional Sums.

Provisional Sum values exclude GST.

5.3.2 Price Schedule

All Tender submissions shall include an itemised cost breakdown of the lump sum pricing, showing all components. Lump sum pricing schedules have been provided for each Portion of the contract works.

Please refer to **Part 6 – Appendix 6.16 Price Schedule**.

All Tender submissions shall include an itemised cost breakdown of the lump sum pricing, showing all components.

The Principal may, at its discretion, disqualify any Tenderer from consideration if these Schedules are not supplied.

Company Name: _____

Address: _____

Email: _____ Telephone: _____

Contact Name (Block Letters): _____

Signature: _____

5.4 Discounts

Are you prepared to allow a discount for prompt settlement of accounts?	Yes / No
If you are offering different discounts for different periods, or other discounts such as volume discounts, details them in an attachment labelled 'Discounts'	'Discounts'

6 Appendices

6.1 Appendix 6.1 – Tenderlink Upload Times

IMPORTANT:

The information below applies only where you have been requested to submit your tender documents via the electronic tender box process. Please check the tender documents for the required submission process.

1. Ensure **ALL** files are uploaded to the Electronic Tenders Box (if provided) **PRIOR** to the closing time and date shown in the tender documents. **PLEASE NOTE:** The ETB closes automatically at this time - file transfers still in progress at the exact closing time **WILL NOT** be accepted and you will not receive an automatic "successful submission" notice.
2. It is strongly recommended that if your file(s) are in excess of 10MB in total and/or you are transferring data from within a corporate network that you are able to do so without restriction. We suggest you speak with your network administrator or IT staff and advise them the size of the files you intend to submit to ensure that internal file size restrictions in your network or from your PC **DO NOT** prevent you from uploading to the TenderLink servers.

DO NOT leave your submission to the last minute. TenderLink have no control over the closing of Tender Boxes. If you need assistance, please contact us on the number below well before the closing time. As a guide, you should begin your file transfer at least 1 hour prior to the closing time.

The following guide should be used to determine how long it will take you to upload your file(s) to our servers. As an example, if your file is 10MB and your broadband connection speed to our servers uploads at 128kbps, your upload time should be approximately 10 minutes. If you have a dial-up connection, please ensure you allow sufficient time.

Upload Guide
SIZE

	10 MB File	100 MB File
S	25 minutes	4 hours and 10 minutes
P	21 minutes	3 hours and 40 minutes
E	10 minutes	1 hour and 43 minutes
E	5 minutes	52 minutes
D	1 minute	10 minutes

Disclaimer: This is a guide only. It is by no means definitive. These times can vary significantly depending on your actual internet speed at the time of upload.

Tender submissions not lodged in full by the closing deadline will not be accepted.

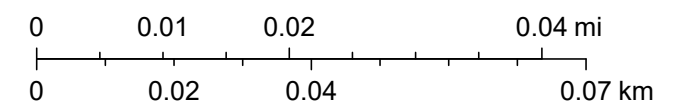
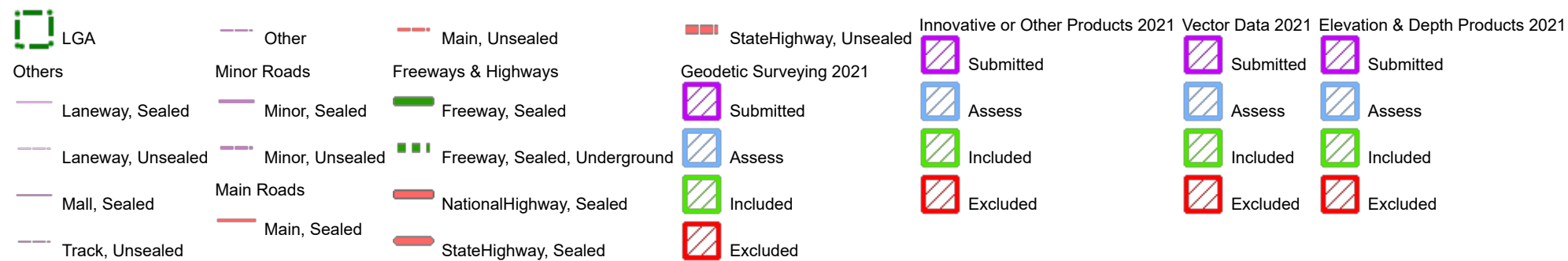
6.2 Appendix 6.2 – Site Plan

Merredin WA



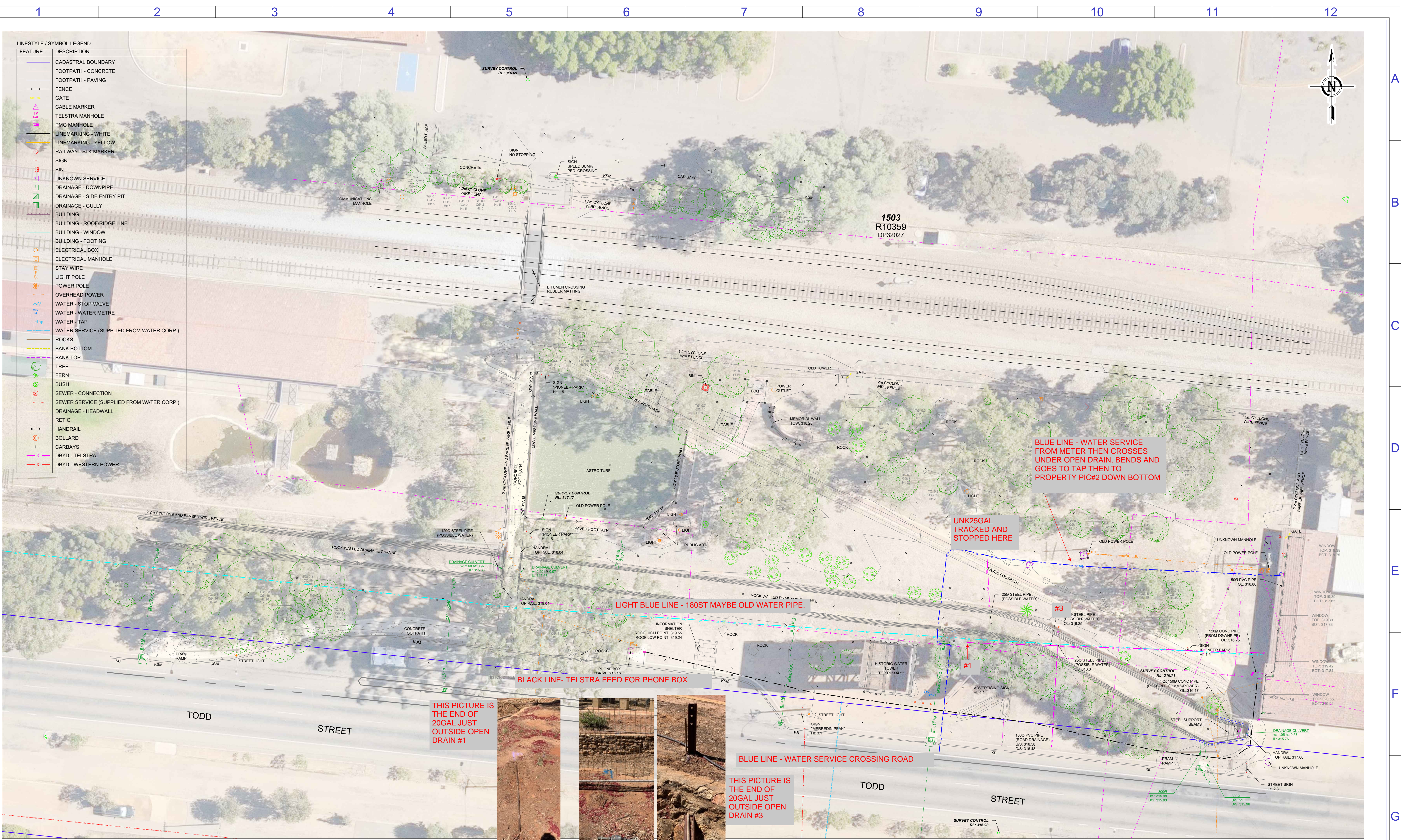
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, LANDGATE/SLIP, SLIP/Landgate, Landgate / SLIP

6.3 Appendix 6.3 – Survey Set



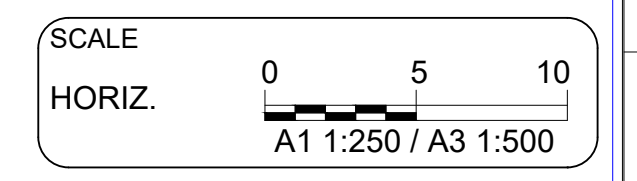
JOINS DRAWING 001_02

THIS PICTURE IS THE END OF 20GAL JUST OUTSIDE OPEN DRAIN #1



THIS PICTURE IS THE END OF 20GAL JUST OUTSIDE OPEN DRAIN #3

A RE ESTABLISHMENT SURVEY OF THE BOUNDARIES HAS NOT BEEN COMPLETED AT THEREFOR THIS PLAN DOES NOT GUARANTEE THEIR FINAL ACCURACY AND POSITION. A RE-ESTABLISHMENT SURVEY OF THE BOUNDARIES IS RECOMMENDED PRIOR TO ANY PROPOSED WORKS ON OR NEAR EXISTING BOUNDARIES.



REV	AMENDMENTS	APP'D	DATE	GENERAL NOTES / REFERENCES
0	FOR ISSUE			DATUM IS AHD (DERIVED FROM SUPPLIED AAM SURVEYS DWG No 39271001) SURVEY SHOWS VISIBLE FEATURES ONLY UNDERGROUND SERVICES FROM DIAL BEFORE YOU DIG SEARCH AND TO BE CONFIRMED ON SITE PRIOR TO USE. KR SURVEYS ACCEPTS NO RESPONSIBILITY FOR ANY PHYSICAL ON SITE CHANGES TO THE PARCEL OR PORTION OF THE PARCEL OF LAND SHOWN ON THIS SURVEY AND INCLUDES ANY ADJOINING LEVELS AND FEATURES THAT HAVE OCCURRED AFTER THE DATE OF THIS SURVEY. SURVEY IS TO BE USED FOR ITS INTENDED PURPOSE ONLY. THIRD PARTIES ARE TO CONFIRM CAPTURE ACCURACIES MEET REQUIREMENTS PRIOR TO USE. CONTOUR INTERVAL: 0.20m SANDY CLAY SOIL THROUGHOUT



DRAWN/SURVEYED BY: MB	PLOT DATE: 14/11/2021	LOCATION: MERREDIN
CHECKED BY: AK	SERVICE LOCATING UTILITY IDENTIFICATION DRAWING TODD STREET, MERREDIN	
VERIFIED BY: AK	DRAWING STATUS: FINAL	DRAWING NO: 001_01
COORD SYSTEM HEIGHT DATUM: MGA94 AHD		REV 0

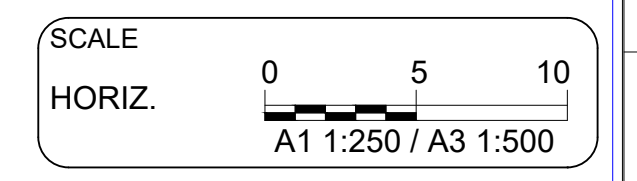
1 2 3 4 5 6 7 8 9 10 11 12

FEATURE	DESCRIPTION
	CADASTRAL BOUNDARY
	FOOTPATH - CONCRETE
	FOOTPATH - PAVING
	FENCE
	GATE
	CABLE MARKER
	TELSTRA MANHOLE
	PMG MANHOLE
	LINEMARKING - WHITE
	LINEMARKING - YELLOW
	RAILWAY - SLK MARKER
	SIGN
	BIN
	UNKNOWN SERVICE
	DRAINAGE - DOWNPIPE
	DRAINAGE - SIDE ENTRY PIT
	DRAINAGE - GULLY
	BUILDING
	BUILDING - ROOF/RIDGE LINE
	BUILDING - WINDOW
	BUILDING - FOOTING
	ELECTRICAL BOX
	ELECTRICAL MANHOLE
	STAY WIRE
	LIGHT POLE
	POWER POLE
	OVERHEAD POWER
	WATER - STOP VALVE
	WATER - WATER METRE
	WATER - TAP
	WATER SERVICE (SUPPLIED FROM WATER CORP.)
	ROCKS
	BANK BOTTOM
	BANK TOP
	TREE
	FERN
	BUSH
	SEWER - CONNECTION
	SEWER SERVICE (SUPPLIED FROM WATER CORP.)
	DRAINAGE - HEADWALL
	RETIC
	HANDRAIL
	BOLLARD
	CARBAYS
	DBYD - TELSTRA
	DBYD - WESTERN POWER



JOINS DRAWING 001_01

A RE ESTABLISHMENT SURVEY OF THE BOUNDARIES HAS NOT BEEN COMPLETED AT THEREFOR THIS PLAN DOES NOT GUARANTEE THEIR FINAL ACCURACY AND POSITION. A RE-ESTABLISHMENT SURVEY OF THE BOUNDARIES IS RECOMMENDED PRIOR TO ANY PROPOSED WORKS ON OR NEAR EXISTING BOUNDARIES.



REV	AMENDMENTS	APP'D	DATE	GENERAL NOTES / REFERENCES
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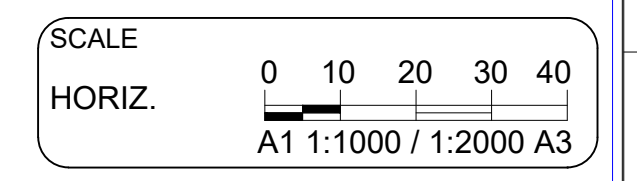
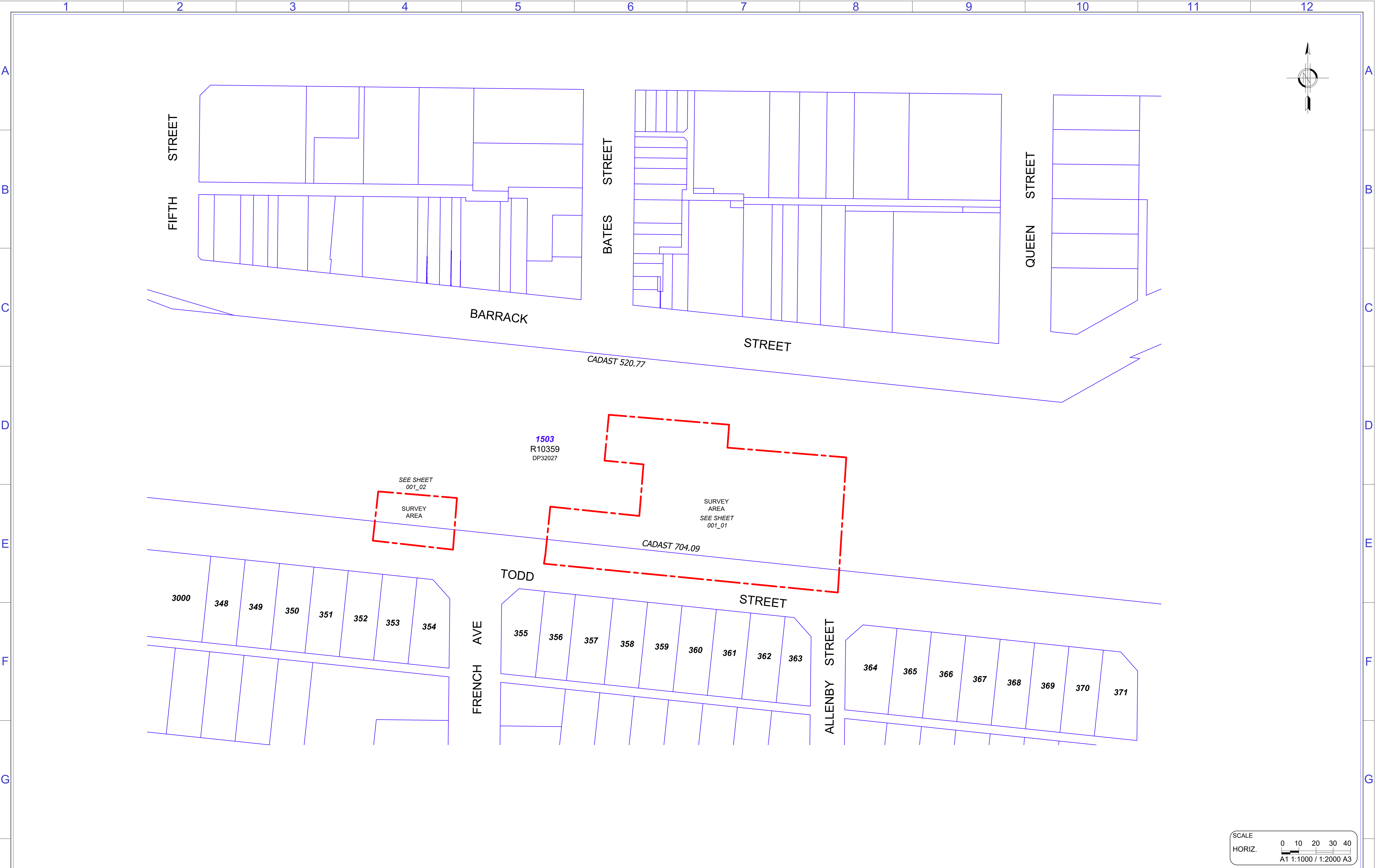
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KR Locates - Utility Identification MATRIX



Quality Level		Asset Owners		Asset Material			Diameter				Additional Information										
1	Description	2	3	Description	4	5	6	Description	7	8	9	10	Description	11	12	13	14	15	16	Description	
A	As-constructed	A	A	AARNET	A	S	B	Asbestos	0	0	0	0	4 Characters are reserved for size. If size cannot be determined uses for zeros as place holders.	B	O	R	E			Bore	
B	Potholed	A	G	ATCO Gas	C	A	B	Cable	9	9	9	9		B	U	I	L	D			Building
C	Scanned	A	L	Alliance	C	A	I	CAS Iron Steel						C	A	B					Cabinet
D	DBYD	A	M	AMCOM	C	O	N	Concrete						C	A	S	T	I			Cast Iron
		A	P	APA Group	C	O	P	Copper						C	A	T	H	O	D		Gas Cathode
		B	P	British Petroleum Gas	F	I	B	Direct buried Fibre						C	O	P					Copper - Inside Asset Material
		C	A	City of Armadale	G	R	P	Reinforced Plastic						C	O	M	M	S			Comms
		C	C	City of Cockburn	M	E	T	Metal						D	B	U	R				Direct Buried
		C	J	City of Joondalup	P	E	P	Polyethylene pipe						D	O	M	E				Power Dome
		C	M	City of Melville	P	V	C	Polyvinyl chloride						D	R	A	I	N			Drain
		C	W	City of Wanneroo	S	T	L	Steel						E	A	R	T	H			Earth Cable
		M	R	MainRoads Western Australia	S	T	P	Steel Plate						E	J						Elevated Joint
		M	U	Murdoch University	S	T	S	Stabilized Sand						E	M	P	T	Y			Empty
		N	B	NBN	U	N	K	Unknown						F	I	B	D	C	T		Fibre Duct
		N	G	Nextgen	V	C	L	Vrified clay						F	I	R	E				Water Fire Main
		O	P	OPTUS										G	F	L	O	W			Gravity Flow
		P	G	Pine Golf										H	P						High Pressure
		P	N	Pipe Networks										H	V						High Voltage
		P	R	Private										H	Y	D					Hydrant
		T	E	Telstra										I	T	S					Intellegent traffic signal
		U	K	Unknown										L	P						Low Pressure
		V	O	Vocus										L	V						Low Voltage
		W	P	Western Power										M	A	T					Mat - Plastic
		W	D	Water Corp - Drainage/Storm										M	E	T	E	R			Meter
		W	R	Water Corp - Sewer Pressure										M	H	O	L	E			Manhole - Round
		W	S	Water Corp - Sewer Gravity										M	P						Medium Pressure
		W	W	Water Corp - Water										O	H	L	V				Overhead Low Volatage
														O	H	H	V				Overhead High Voltage
													O	H	T	R				Overhead Transmission	
													P	B	O	X				Phone Box	
													P	I	T					Pit - Rectangle	
													P	O	L	E				Pole	
													P	P	O	L	E			Power Pole	
													R	E	T	I	C			Reticulation	
													S	E	W	M	H			Sewer Man Hole	
													S	I	T	E	M	B		Site Main Switchboard	
													S	L	A	B				Slab of Concrete	
													S	L	E	E	V	E		Sleeve	
													S	L	I	G	H	T		Street Light	
													S	T	A	Y				Stay Line	
													S	T	R	A	P			MSC Straps	
													S	T	E	E	L			Steel	
													T	R	A	N				Transformer	
													V	A	L	V	E			Valve	
													R	E	D	U	N	D		Redundant or abandoned	
													R	D	P	W	R			Redundant Power	
													R	D	W	A	T			Redunadant Water	
													R	D	G	A	S			Redundant Gas	
													R	D	C	O	M			Reduntant Comms	
													W	A	T	E	R			Water	

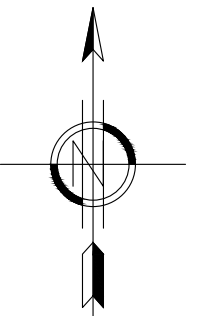
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accuracy +/- 50mm
 (B) Pothole Data - Utility has been potholed and marker surveyed
accuracy +/- 100mm
 (C) Scanned Data - Utility has been scanned using GPR/EMF technology
accuracy +/- 500mm
 (D) DBYD Data - Utility indicated through plan or cadastral reference
accuracy UNKNOWN



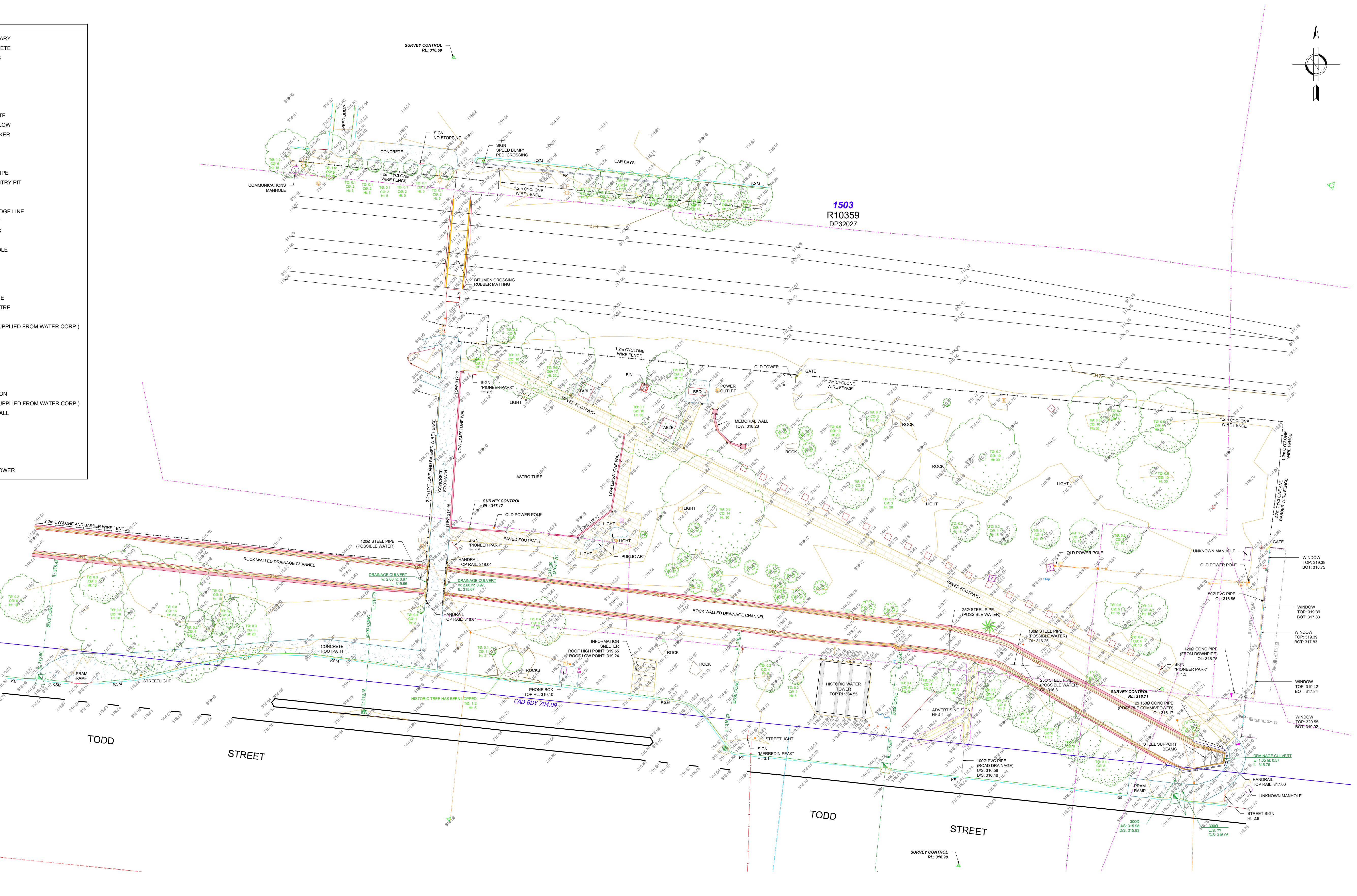
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0	FOR ISSUE			

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VERIFIED BY: GH			
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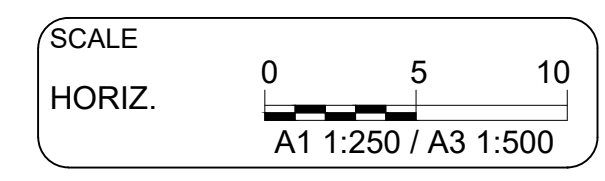
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—	FOOTPATH - PAVING
—	FENCE
—	GATE
—	CABLE MARKER
—	TELSTRA MANHOLE
—	PMG MANHOLE
—	LINEMARKING - WHITE
—	LINEMARKING - YELLOW
—	RAILWAY - SLK MARKER
—	SIGN
—	BIN
—	UNKNOWN SERVICE
—	DRAINAGE - DOWNPIPE
—	DRAINAGE - SIDE ENTRY PIT
—	DRAINAGE - GULLY
—	BUILDING
—	BUILDING - ROOF/RIDGE LINE
—	BUILDING - WINDOW
—	BUILDING - FOOTING
—	ELECTRICAL BOX
—	ELECTRICAL MANHOLE
—	STAY WIRE
—	LIGHT POLE
—	POWER POLE
—	OVERHEAD POWER
—	WATER - STOP VALVE
—	WATER - WATER METRE
—	WATER - TAP
—	WATER SERVICE (SUPPLIED FROM WATER CORP.)
—	ROCKS
—	BANK BOTTOM
—	BANK TOP
—	TREE
—	FERN
—	BUSH
—	SEWER - CONNECTION
—	SEWER SERVICE (SUPPLIED FROM WATER CORP.)
—	DRAINAGE - HEADWALL
—	RETIC
—	HANDRAIL
—	BOLLARD
—	CARBAYS
—	DBYD - TELSTRA
—	DBYD - WESTERN POWER



JOINS DRAWING 001_02



A RE ESTABLISHMENT SURVEY OF THE BOUNDARIES HAS NOT BEEN COMPLETED AT THEREFOR THIS PLAN DOES NOT GUARANTEE THEIR FINAL ACCURACY AND POSITION. A RE-ESTABLISHMENT SURVEY OF THE BOUNDARIES IS RECOMMENDED PRIOR TO ANY PROPOSED WORKS ON OR NEAR EXISTING BOUNDARIES.

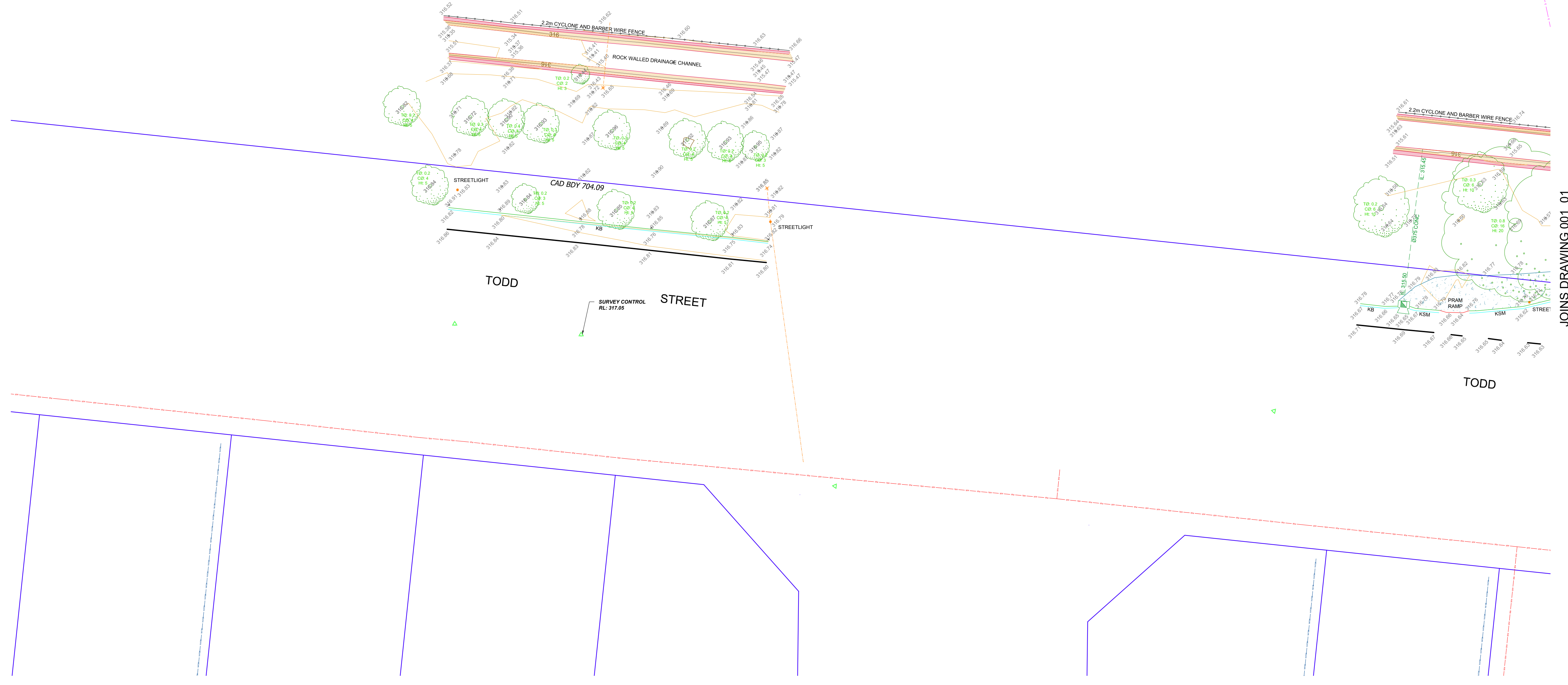
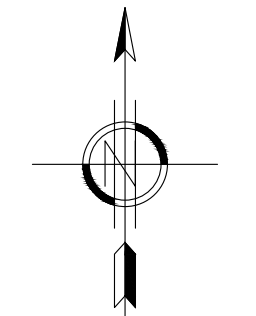


REV	AMENDMENTS	APP'D	DATE	GENERAL NOTES / REFERENCES
0	FOR ISSUE			DATUM IS AHD (DERIVED FROM SUPPLIED AAM SURVEYS DWG No 39271001) SURVEY SHOWS VISIBLE FEATURES ONLY. UNDERGROUND SERVICES FROM DIAL BEFORE YOU DIG SEARCH AND TO BE CONFIRMED ON SITE PRIOR TO USE. KR SURVEYS ACCEPTS NO RESPONSIBILITY FOR ANY PHYSICAL ON SITE CHANGES TO THE PARCEL OR PORTION OF THE PARCEL OF LAND SHOWN ON THIS SURVEY AND INCLUDES ANY ADJOINING LEVELS AND FEATURES THAT HAVE OCCURRED AFTER THE DATE OF THIS SURVEY. SURVEY IS TO BE USED FOR ITS INTENDED PURPOSE ONLY. THIRD PARTIES ARE TO CONFIRM CAPTURE ACCURACIES MEET REQUIREMENTS PRIOR TO USE. CONTOUR INTERVAL: 0.20m SANDY CLAY SOIL THROUGHOUT

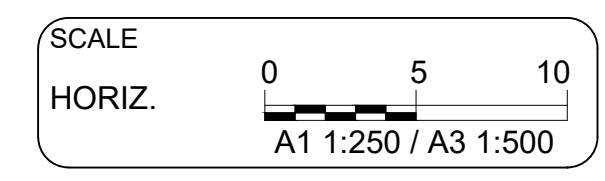


DRAWN/SURVEYED BY: GH CHECKED BY: GH VERIFIED BY: GH COORD SYSTEM HEIGHT DATUM: MGA94 AHD	PLOT DATE: 18/08/2021 LOCATION: MERREDIN SITE FEATURE SURVEY OF MERREDIN CBD STAGE 1 TODD STREET, MERREDIN DRAWING STATUS: FINAL DRAWING NO: 001_01	REV 0
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FEATURE	DESCRIPTION
	CADASTRAL BOUNDARY
	FOOTPATH - CONCRETE
	FOOTPATH - PAVING
	FENCE
	GATE
	CABLE MARKER
	TELSTRA MANHOLE
	PMG MANHOLE
	LINEMARKING - WHITE
	LINEMARKING - YELLOW
	RAILWAY - SLK MARKER
	SIGN
	BIN
	UNKNOWN SERVICE
	DRAINAGE - DOWNPIPE
	DRAINAGE - SIDE ENTRY PIT
	DRAINAGE - GULLY
	BUILDING
	BUILDING - ROOF/RIDGE LINE
	BUILDING - WINDOW
	BUILDING - FOOTING
	ELECTRICAL BOX
	ELECTRICAL MANHOLE
	STAY WIRE
	LIGHT POLE
	POWER POLE
	OVERHEAD POWER
	WATER - STOP VALVE
	WATER - WATER METRE
	WATER - TAP
	WATER SERVICE (SUPPLIED FROM WATER CORP.)
	ROCKS
	BANK BOTTOM
	BANK TOP
	TREE
	FERN
	BUSH
	SEWER - CONNECTION
	SEWER SERVICE (SUPPLIED FROM WATER CORP.)
	DRAINAGE - HEADWALL
	RETIC
	HANDRAIL
	BOLLARD
	CARBAYS
	DBYD - TELSTRA
	DBYD - WESTERN POWER



A RE ESTABLISHMENT SURVEY OF THE BOUNDARIES HAS NOT BEEN COMPLETED AT THEREFOR THIS PLAN DOES NOT GUARANTEE THEIR FINAL ACCURACY AND POSITION. A RE-ESTABLISHMENT SURVEY OF THE BOUNDARIES IS RECOMMENDED PRIOR TO ANY PROPOSED WORKS ON OR NEAR EXISTING BOUNDARIES.



REV	AMENDMENTS	APP'D	DATE	GENERAL NOTES / REFERENCES
0	FOR ISSUE			DATUM IS AHD (DERIVED FROM SUPPLIED AAM SURVEYS DWG No 39271001) SURVEY SHOWS VISIBLE FEATURES ONLY. UNDERGROUND SERVICES FROM DIAL BEFORE YOU DIG SEARCH AND TO BE CONFIRMED ON SITE PRIOR TO USE. KR SURVEYS ACCEPTS NO RESPONSIBILITY FOR ANY PHYSICAL ON SITE CHANGES TO THE PARCEL OR PORTION OF THE PARCEL OF LAND SHOWN ON THIS SURVEY AND INCLUDES ANY ADJOINING LEVELS AND FEATURES THAT HAVE OCCURRED AFTER THE DATE OF THIS SURVEY. SURVEY IS TO BE USED FOR ITS INTENDED PURPOSE ONLY. THIRD PARTIES ARE TO CONFIRM CAPTURE ACCURACIES MEET REQUIREMENTS PRIOR TO USE. CONTOUR INTERVAL: 0.20m SANDY CLAY SOIL THROUGHOUT



DRAWN/SURVEYED BY: GH	PLOT DATE: 18/08/2021 LOCATION: MERREDIN	
CHECKED BY: GH	SITE FEATURE SURVEY OF MERREDIN CBD STAGE 1	
VERIFIED BY: GH	TODD STREET, MERREDIN	
COORD SYSTEM HEIGHT DATUM: MGA94 AHD	DRAWING STATUS: FINAL	DRAWING NO: 001_02
		REV 0

6.4 Appendix 6.4 – Geotechnical Report



LOCAL GEOTECHNICS

30 September 2021

Report on
Geotechnical Investigation
Merredin CBD Revitalisation Stage 1A, Merredin WA

Project:
LGK1392021GI
REV_0

Client:
Shire of Merredin

Geotech

Civil

Pavement

Drainage

30 September 2021

To
Shire of Merredin

Dear Sir/Madam,

RE: Geotechnical Investigation for Merredin CBD Revitalisation Stage 1A, Merredin WA.

This letter presents our report on a geotechnical investigation carried out at *Merredin CBD Revitalisation Stage 1A, Merredin WA*. The report must be thoroughly read and implemented in full, no partial implementation of this report is allowed.

If you have any questions in regards to the geotechnical investigation or we can be of further assistance, please do not hesitate to contact Local Geotechnics.

Sincerely yours



Dr. Harun Meer

Ph.D.(Geotech), M. Eng. (Geotech), B. Eng. (Civil)
MIEAust, CPEng, EngExec, NER, APEC Engineer, IntPE(Aust)

Director

Local Geotechnics

PROJECT INFORMATION

Project	LGK1392021GI REV_0 Geotechnical Investigation			
Site Location	Merredin CBD Revitalisation Stage 1A, Merredin WA			
Rev	Description	Date	Prepared by	Approved by
0	Issued to client	30 September 2021	B Bohara	R Khan

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Appendix A: Site Sketch

Appendix B: Test Pit Logs and DCP Test Certificates

Appendix C: Laboratory Test Certificates

Appendix D: Site Photos

EXECUTIVE SUMMARY

Shire of Merredin commissioned Local Geotechnics to prepare a geotechnical investigation report for Merredin CBD Revitalisation Stage 1A, Merredin WA.

LG was given to understand that the proposed construction will be a new car park to service military museum and pioneer park.

The objectives of the site class investigation were to obtain information on the subsurface conditions in order to classify the site in accordance with the definitions provided in Australian Standard AS2870 – 2011. Field works were conducted on 07 September 2021 on fine and sunny weather conditions.

A generalised subsurface profile was inferred from the site investigation and described as follows:

- **Silty SAND (SM)** - fine to medium grained, brown, dry, dense to very dense, with silt fines, grass, extended up to a depth of 0.4 m.
- **Clayey SAND (SC) /Gravelly Sandy CLAY (CL-CI)** – fine to medium grained sand, low to medium plasticity clay, brown-red, dense to very dense/ stiff to hard, with sub-angular gravel up to 40 mm in size, extended up to the maximum depth of investigation, 2.0 m.

Groundwater was not encountered at any of the test pits during the investigation.

Site Classification

Provided the earthworks and compaction are completed as per the recommendations presented in Section 7.2, the site can be classified as "**Class M**" in accordance with AS 2870-2011 "Residential Slabs and Footings". "**Class M**" sites may experience up to 35 mm characteristic surface movement due to soil wetting and drying cycles associated with seasonal changes in available moisture.

Site sub-soil class is "**Class Ce – Shallow Soil**".

CBR

The subgrade of the proposed carpark, internal roads, hardstand and driveway areas shall be prepared as per the general guidelines set out in Section 7 and compacted to a density ratio of 98% MMDD. Laboratory CBR test returned a value of 13%.

Based on the sandy and clayey-gravelly/sandy clayey material, a design CBR value of 10% can be considered for this project.

Bearing Capacity

Bearing capacities and corresponding settlements for typical size strip and pad footings are presented in Section 8.5.1.

Stormwater Drainage

Onsite disposal of roof runoff and stormwater via soakwell is not appropriate for this site. We recommend discharging of surface and roof runoff offsite to the locally available drainage system or as recommended by the local government authority.

It is highly recommended that a competent geotechnical engineer supervises the earthworks and construction to ensure that all organic, roots, demolition debris, loose material have been adequately removed from the area and that the fill material is adequately compacted.

1.0 INTRODUCTION

Shire of Merredin commissioned Local Geotechnics (LG) to undertake a geotechnical investigation report for Merredin CBD Revitalisation Stage 1A, Merredin WA (the project). The site location is shown in Figure 1.



Figure 1. Aerial view of the site location (Source: Landgate Map)

The objectives of the investigation are to obtain information on the sub-surface conditions to classify the site in accordance to the definitions provided in Australian Standard AS2870 – 2011 and to provide relevant geotechnical parameters for the site. Field works were conducted on 07 September 2021. Weather condition on the day of field investigation was fine and sunny.

It should be noted that AS 2870 is applicable to residential structures up to double storey, and light industrial and commercial buildings if they are similar to houses in size, loading and superstructure.

The scope of the investigation did not include compaction control, wind force calculations or classifications, slope stability checking, and settlement calculation. Environmental issues were not considered in this report.

2.0 PROPOSED DEVELOPMENT

LG was given to understand that the proposed construction will be a new car park to service military museum and pioneer park.

3.0 SCOPE AND OBJECTIVES

The scope and objectives of the investigation are as follows:

- Organising of Dial Before You Dig,
- Conducting of up to four (04) Test Pits by using an excavator up to 2.5 m or refusal;
- Logging of site soil profile as per Australian Standard AS1726;
- Groundwater recording as per test pit observation;

- Conducting of Dynamic Cone Penetrometer (DCP) tests alongside the test pits up to a depth of 1.0 m or refusal;
- Conducting of laboratory tests at NATA accredited laboratory which included:
 - Particle Size Distribution Test (AS 1289 3.6.1),
 - Plasticity Index - Atterberg Limit Test (AS 1289 3.1.2, 3.2.1, 3.3.1, 3.4.1)
 - Moisture content (AS 1289.2.1.1)
 - Modified Maximum Dry Density (AS 1289.5.2.1/ AS1289.2.1.1)
 - 4-days soaked CBR (AS 1289.6.1.1)

Objectives of the investigation are to prepare an investigation report which will include followings:

- Details of investigation.
- Site plan showing location of test pits.
- Factual results of test pit logs and laboratory test results.
- Photos of soil profile.
- Description of sub-soil conditions including identification of areas of loose/uncontrolled material layers (if any) and recommend strategies to address identified risk;
- Geotechnical parameters and specifications relating to the identified materials.
- Suitability of the in-situ site soils for use as construction materials or re-use as backfill
- Site preparation, compaction, earthworks and remediation, if required, so as to allow the proposed development of the site;
- Construction and excavation conditions, excavation stability and any associated construction concerns or recommendations.
- Provide a site classification in accordance with the requirements of AS 2870-2011 and earthworks requirements to improve the site classification, if required;
- Site sub soil class in accordance with the requirements of AS 1170.4;
- Advice on suitable foundation options for proposed structures, and geotechnical foundation design parameters including bearing pressures and estimated settlements.
- Suitable geotechnical design parameters, including pressure coefficients, for retaining structures;
- Parameters for pavement design, including a suitable California Bearing Ratio (CBR) value based on field observations, laboratory testing and modulus of subgrade reaction; under wheel loading;
- Provide recommendations for subgrade preparation including possible use of in situ soil (excluding pavement layers) as controlled fill, the removal/treatment of any unsuitable materials encountered and compaction control;
- Depth to groundwater and groundwater conditions, if encountered.
- Permeability of soils and drainage infiltration rates, to determine suitability for on-site stormwater disposal.

4.0 SITE CONDITIONS

4.1 Surface Condition

The site is located at Merredin CBD Revitalisation Stage 1A, Merredin WA. The site consists of an existing military museum and pioneer park. The site level and the overall topography of the site surrounding is flat in general. There are medium to large size trees at the site at the time of investigation.

No water ponding was observed at the site. Site photos taken during the field investigation are shown in Appendix D.

4.2 Site Geology

A review of Environmental Geological Western Australia survey Map of Kellerberrin 1:250,000 (Sheet SH 50-15) was conducted before site investigation. Environmental Geological map of Kellerberrin revealed that the site is consisted of Qa- Alluvium – silt, sand and gravel in stream channels.

5.0 FIELD INVESTIGATION

The field investigation consists of sub-surface probing by an excavator at 4 locations, taking photograph and Dynamic Cone Penetrometer (DCP) testing alongside the test pits.

5.1 Test Pit Logs

Four Test Pits (TP1, TP2, TP3 and TP4) were conducted at the site by an excavator. Test pit locations are shown in the site sketch in Appendix A.

The spoil was stockpiled adjacent to each pit. Bulk samples (disturbed) were obtained for laboratory testing. The subsurface profile exposed in the pits were logged and was photographed to provide a visual record of subsurface conditions encountered. Following these activities, each test location was progressively backfilled in the reverse order of drilling works. Backfilled test pits were compacted by using the excavator bucket and tracks.

All the test pits consist of a similar soil profile as described below:

- **Silty SAND (SM)** - fine to medium grained, brown, dry, dense to very dense, with silt fines, grass, extended up to a depth of 0.4 m.
- **Clayey SAND (SC) /Gravelly Sandy CLAY (CL-CI)** – fine to medium grained sand, low to medium plasticity clay, brown-red, dense to very dense/ stiff to hard, with sub-angular gravel up to 40 mm in size, extended up to the maximum depth of investigation, 2.0 m.

The test pits, TP1 to TP3 were terminated at a depth of 2.0 m due to bucket refusal on hard gravelly CLAY layer, and TP4 was terminated due to refusal on services at a depth of 1.0 m. Test Pit logs are attached in Appendix B.

5.2 Groundwater

Ground water was not encountered at any of the test pits.

5.3 Dynamic Cone Penetrometer (DCP) Tests

Dynamic Cone Penetrometer (DCP1 to DCP4) tests were conducted alongside the test pits. DCP tests indicate the soil density of the site as per Standard Australia HB 160-2006, Table 6.4.6.1(A) & (B). DCP data are presented in Table 1 and DCP test certificates are attached in Appendix B.

Table 1. Summary of DCP test data Ref. Table 6.4.6.1(A) & (B) HB 160-2006

DCP Location	DCP 1		DCP 2		DCP 3		DCP 4	
Depth (mm)	No. of Blows/100mm (Density Classification)							
0 – 100	5	D	4	D	4	D	5	D
100 – 200	9	VD	4	D	4	D	5	D
200 – 300	6	D	5	D	5	D	5	D
300 – 400	5	D	6	D	5	D	2	MD
400 – 500	9	VD	6	VSt	5	D	2	F
500 – 600	9	VD	6	VSt	6	D	3	St
600 – 700	9	VD	6	VSt	6	D	3	St
700 – 800	11	VD	6	VSt	8	D	3	St

DCP Location	DCP 1		DCP 2		DCP 3		DCP 4	
800 – 900	11	VD	6	VSt	8	D	4	St
900 – 1000	11	VD	7	VSt	8	D	5	VSt
Note: Density Classification is obtained based on Number of blows required for 100 mm penetration of DCP (Table A) Very Soft (VS) < 1; Firm (F) 1 – 2; Stiff (St) 3 – 4; Very Stiff (VSt) 5 – 10; Hard (H) > 10 (Table B) Very Loose (VL) < 1; Loose (L) 1 – 2; Medium Dense (MD) 2 – 3; Dense (D) 4 – 8; Very Dense (VD) > 8								

It is observed from the DCP test that the site soil is in medium dense to very dense, stiff to hard condition.

6.0 LABORATORY TEST

Laboratory tests were conducted at Local Geotechnics, a NATA accredited testing laboratory in WA. The following laboratory tests were undertaken:

- Particle Size Distribution Test (AS 1289 3.6.1),
- Plasticity Index - Atterberg Limit Test (AS 1289 3.1.2, 3.2.1, 3.3.1, 3.4.1)
- Moisture content (AS 1289.2.1.1)
- Modified Maximum Dry Density (AS 1289.5.2.1/ AS1289.2.1.1)
- 4-days soaked CBR (AS 1289.6.1.1)

The laboratory test results are summarised in Table 2. Laboratory test data show that the site soil is slightly reactive and the tested materials can be classified as 'Clayey Sand (SC)'. The laboratory test certificates are attached in Appendix C.

Table 2. Summary of Laboratory Test Data

Sample ID	PSD			Atterberg Limit Tests (PI)				MMDD (t/m ³)	OMC (%)	CBR (%)	Perm (m/s)
	Gravel (%)	Sand (%)	Fines < 75µm (%)	LL (%)	PL (%)	PI (%)	LS (%)				
TP1 (0.4 – 1.5m)	10	57	33	43	18	25	14.5	-	-	-	-
TP3 (0.4 – 1.5m)	4	56	40	26	13	13	4.5	1.95	10.0	13	2.809E ⁻⁸

Notes: PSD = Particle Size Distribution; G = Gravel; S = Sand; LL= Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; LS = Linear Shrinkage; MMDD = Modified Maximum Dry Density; OMC = Optimum Moisture Content; CBR = California Bearing Ratio; Perm = Permeability

7.0 EARTHWORKS RECOMMENDATION

7.1 Suitability of Excavated Materials for use as Fill

In situ sands are considered to be suitable for reuse as structural fill material.

7.2 Site Preparation

Any earthworks at the site should be carried out in general accordance with the Australian Standard AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments". Asbestos and septic tank investigation was not in the scope of this investigation. Client must confirm that the site is free from asbestos and there is no septic tank at the site. Followings are general guidelines to be followed during earthworks:

- Clear any unsuitable material from the topsoil of the site. Unsuitable materials generally includes: organics, grass roots, uncontrolled fill of building rubbles, bricks, stone blocks, concrete, wood, asphalt, bore well, different types of waste etc. Remove all the trees with roots from the site and backfill with clean sand (if any).
- Topsoil can be used after screening off unsuitable materials.
- Remove all trees with roots from the built area and backfill the area with clean sand.
- Compact /proof roll the exposed surface, targeting around 1 m material underneath, with required number of passes, a minimum of 10 passes, of a heavy vibratory roller to a very dense state, i.e., to 98% of MMDD at the car park area and 95% of MMDD at other building footprint in accordance with AS1289.5.2.1. The material at compaction should be moisture conditioned within -1% to +2% of its optimum moisture content.

It is highly recommended that a geotechnical engineer supervises the site activities to ensure that all organic, roots, demolition debris have been adequately removed from the area and that site is safely excavated and adequately backfilled and compacted as per the procedures described above.

8.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

8.1 Geotechnical Design Parameters

Geotechnical design parameters for the site were inferred on the basis of the site investigation data and are presented in Table 3 below.

Table 3. Inferred Geotechnical Design Parameters for the Current Site Conditions

Depth (m, bgl)	Layer Description	Soil Parameters					k_s (MN/m ³)	k (m/s)
		ϕ' (deg.)	c_u / c' (kN/m ²)	γ (kN/m ³)	E' (MPa)	ν'		
0 – 0.4	Silty Sand (SP) Medium dense to dense	34	-	19	25	0.3	5	1 x10 ⁻⁴ to 5 x10 ⁻⁶
0.8 – 2	Clayey Gravelly Sand (SC) Dense to Very Dense	36	-	20	75	0.3	10	1 x10 ⁻⁷ to 3 x10 ⁻⁸

Notes: ϕ' = Effective friction angle, c_u = Undrained shear strength, c' = Drained cohesion, γ = Bulk density, E' = Drained Elastic Modulus, ν' = Poisson's Ratio, k_s = Modulus of vertical subgrade reaction, k = Coefficient of Permeability.

8.2 Geotechnical Design Parameters for Retaining Structures

Earth pressure parameters for the design of retaining structures are presented in Table 4. These parameters should be considered as preliminary.

Table 4. Geotechnical Design Parameters for Retaining Structures

Material type	γ (kN/m ³)	ϕ' (degrees),	K_0	Wall friction, $\delta = 0^\circ$	
				K_a	K_p
Loose to medium dense in situ sand	17	30	0.50	0.33	3.00
Dense Sand or Compacted Sand Fill	18	34	0.44	0.28	3.54

Notes: γ = Bulk unit weight, ϕ' = Effective friction angle, K_0 = Coefficient of earth pressure at rest, K_a = Coefficient of drained active earth pressure, K_p = Coefficient of drained passive earth pressure.

8.3 Site Classification

Provided the earthworks and compaction are completed as per the recommendations presented in Section 7.2, the site can be classified as "**Class M**" in accordance with AS 2870-2011 "Residential Slabs and Footings".

"**Class M**" sites may experience up to 35 mm characteristic surface movement due to soil wetting and drying cycles associated with seasonal changes in available moisture.

8.4 Earthquake Design Factor

Australian Standard AS1170.4-2007 Structural design actions Part 4 "Earthquake actions in Australia" is recommended for earthquake consideration. AS1170.4-2007 outlines the design criteria required for a structure in consideration of the risk of being subjected to earthquake loads. Earthquake design factors are summarised in Table 5.

Table 5. Earthquake Design Factors

Factor/Class	Value/Name	Ref. AS1170.4- 2007
Hazard Factor (z)	0.09	Figure3.2 (D)
Site sub-soil class	Class C_e – Shallow Soil	Section 4 Clause 4.1

8.5 Bearing Capacity

8.5.1 Strip and Pad Foundation for Structures

If the earthworks as described in Section 7.2 are undertaken prior to the proposed construction, ground will have sufficient bearing capacity to support typical size pad, ring and strip foundations at the design ground level.

The proposed structures are understood to be supported on conventional pad, ring, strip and raft footings. All footing bases should be in dense state, to a minimum depth of 1 m below the footing excavation level.

The allowable bearing pressures presented in Table 6 are preliminary estimated to limit settlements to less than 25 mm and provide a minimum factor of safety of 2.0 against general bearing capacity failure. These bearing pressures do not consider eccentric and inclined loading conditions and interaction effects (i.e., loadings from adjacent foundations).

Furthermore, the calculations assumed that the areas beneath the pad, ring and strip foundations have been compacted to a density ratio of 95% modified compaction, MMDD, and are founded at least 0.5 m below final ground grading levels.

Table 6. Allowable Bearing Pressures for Typical Strip and Pad Footings

Embedment Depth (m)	Footing Type	Footing Width (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	Strip	0.5	90	20
		0.75	100	20
		1	125	20
		1.5	150	25
		2	200	25

Embedment Depth (m)	Footing Type	Footing Width (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	Pad	1	125	20
		2	200	25
		3	250	25
		4	275	25

8.5.2 Pile Foundation

The geotechnical strength reduction factor, ϕ_g , can be considered as 0.50 in accordance with AS2159. Geotechnical parameters for pile foundation design are preliminary estimated for the encountered subsoil materials and presented in Table 7 below.

Table 7. Ultimate Bearing Capacities for Piles

Layer Depth, m	Foundation Material	End Bearing Capacity, f_{bu} (kPa)	Skin Friction, f_{su} (kPa)
0 – 0.4	Silty Sand (SP) Medium dense to dense	-	50
0.8 – 2	Clayey Gravelly Sand (SC) Dense to Very Dense	2,500	90

8.6 California Bearing Ratio (CBR) for Roads & Carpark's Subgrade

The subgrade of the proposed carpark, internal roads, hardstand and driveway areas shall be prepared as per the general guidelines set out in Section 7 and compacted to a density ratio of 98% MMDD. Laboratory CBR test returned a value of 13%.

Based on the sandy and clayey-gravelly/sandy clayey material, a design CBR value of 10% can be considered for this project.

8.7 Excavatability

The medium dense to dense state of the in-situ sandy soils and underlying alluvium suggests that the materials should be excavatable with a standard earthmoving equipment (e.g., 10 tonne excavator).

8.8 Cut and Fill Batters

Temporary excavation up to 1 m depth can be conducted with a maximum dry slope angle of 1V: 1.5H. Cut and fill batters above groundwater table will generally be stable at 1V: 2H. Intermediate benches have to be created if excavation is deeper than 1m. Dewatering will be required if excavation is needed to below the groundwater.

However, batters constructed at 1V: 3H will enable re-establishment of vegetation and be less prone to damage from wetting, drying and erosion.

8.9 Stormwater Drainage

Onsite disposal of roof runoff and stormwater via soakwell is not appropriate for this site. We recommend discharging of surface and roof runoff offsite to the locally available drainage system or as recommended by the local government authority. The drainage system must be designed by a qualified engineer as per requirements of the local government authority.

9.0 LIMITATION OF USE

The ground is a product of continuing natural and man-made processes and therefore exhibits characteristics and properties which may vary from place to place and can change with time. Geotechnical site investigation involves gathering and assimilating limited facts about these characteristics and properties in order to better understand or predict the behaviour of the ground at a particular site under certain conditions.

This site investigation has been carried out by inspection, using a limited amount of pit excavations, sampling, testing or other means of investigation. Achieving a full coverage of the site to ensure all variations is not practical and is seldom done due to cost constraints as well as the impracticality.

It should be noted that the subsurface conditions encountered by the limited number of pit excavation as part of this geotechnical site investigation represents the ground conditions at the locations where the samples were taken and where tests have been undertaken and as such are an extremely small proportion of the site to be developed.

The facts reported in this document are directly relevant only to the ground at the place where, and time when, the investigation was carried out and are believed to be reported accurately. Given the limited number of test pits and limited field and laboratory testing carried out with respect to the overall site area, variations between investigation locations is likely and ground conditions different to those presented in this report may be present within the subject site area. The risk associated with this variability and the impact it will have on the proposed development should be carefully considered.

The level of geotechnical investigation that has been completed to date is considered appropriate for the project objectives. If the above mentioned client, its subcontractors, agents or employees use this factual information for any other purpose for which it was not intended, then the client, its subcontractors, agents or employees does so at its own risk and Local Geotechnics will not and cannot accept liability in respect of the advice, whether under law of contract, tort or otherwise.

Any interpretation or recommendation given in this report is based on judgement and experience and not on greater knowledge of the facts reported. Local Geotechnics does not represent that the information or interpretation contained in this report addresses completely the existing features, subsurface conditions or ground behaviour at the subject site.

10.0 REFERENCES


- Australian Standard AS 1726-1993 "*Geotechnical Site Investigations*".
- Institution of Public Works Engineering Australia (WA Division Inc) Subdivisional Guidelines Edition No.2.1 July 2011
- Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design
- Austroads Guide to Road Design Part 3: Geometric Design
- AASHTO Guide for Design of Pavement Structures 1993
- Procedure for the design of road pavements, engineering road note 9, May 2012
- Technical Specification for Pavement Structures, Main Roads Western Australia.
- Geological Survey Map of Western Australia of *Kellerberrin 1:250,000 (Sheet SH 50-15)*.
- Standards Australia, Hand Book HB 160-2006 "*Soil Testing*".

APPENDIX A

SITE SKETCH



Site Sketch : Test Pits (TP) and Dynamic Cone Penetrometer (DCP) Test Locations

Reference	LGK1392021GI	 <p>Unit 12, 8 Production Road Canning Vale WA 6155 PO Box 5050, Canning Vale South WA 6155 Phone: 08 9457 3517 E-mail: admin@localgeotechnics.com.au Web: www.localgeotechnics.com.au</p>
Client	Shire of Merredin	
Project	Geotechnical Investigation Location: Merredin CBD Revitalisation Stage 1A, Merredin WA	

APPENDIX B

TEST HOLE LOGS &
DCP TEST CERTIFICATE

 LOCAL GEOTECHNICS

RESULT OF TEST HOLES/PITS

Reference	: LGK1392021GI	Test Pit/BH No.:	01
Client	: Shire of Merredin	Date Excavated:	7-Sep-2021
Project	: Geotechnical Investigation	Date completed:	7-Sep-2021
Location	: Merredin CBD Revitalisation Stage 1A, Merredin WA	Equipment Type:	Excavator
GPS Zone 50	: Northing: 6 516 153 Easting: 621 586	Water Table:	Not Encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations	Dynamic Cone Penetrometer Test (Blows/100mm)
0.0						SM	Silty SAND - fine to medium grained, brown, dry, dense to very dense, with silt fines, grass (topsoil)		0
0.2						SM	Silty SAND - fine to medium grained, brown, slightly moist, dense to very dense, with silt fines		~5
0.4						SC	Clayey SAND - fine to medium grained, medium plasticity clay fines, brown-red, dense, with sub-angular gravel up to 40 mm in size		~10
0.5									~10
1.0									~10
1.5									~10
2.0							Terminated at a depth of 2.0 m due to refusal on gravelly CLAY		~10
2.5									~10

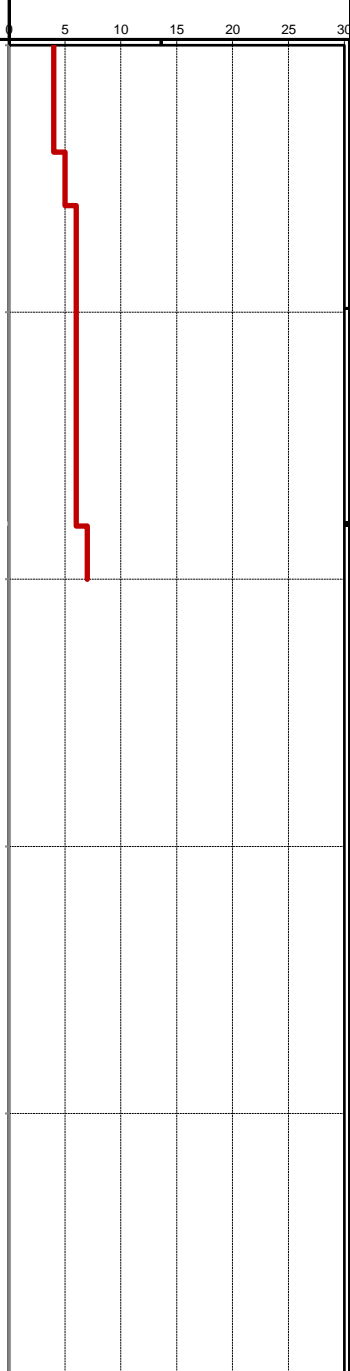
Notes:

Sampling Type: B - Bulk/Disturbed Sample, UD - Undisturbed Sample	Method: HA - Hand Auger E - Excavator BH - Backhoe Bucket	Moisture: D - Dry M - Moist W - Wet	Symbols: W _L - Plastic Limit W _P - Plastic Limit	Logged: CN Checked: BB
--	---	---	---	---

RESULT OF TEST HOLES/PITS

ABN:61 737 984 867
 12/8 Production Road, Canning Vale WA 6155
 PO Box 5050 Canning Vale South WA 6155
 admin@localgeotechnics.com.au

Reference	: LGK1392021GI	Test Pit/BH No.:	02
Client	: Shire of Merredin	Date Excavated:	7-Sep-2021
Project	: Geotechnical Investigation	Date completed:	7-Sep-2021
Location	: Merredin CBD Revitalisation Stage 1A, Merredin WA	Equipment Type:	Excavator
GPS Zone 50	: Northing: 6 516 134	Water Table:	Not Encountered
			Easting: 621 543

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations	Dynamic Cone Penetrometer Test (Blows/100mm)
0.0						SM	Silty SAND - fine to medium grained, brown, dry, dense, with silt fines, grass (topsoil)		
0.2						SM	Silty SAND - fine to medium grained, brown, slightly moist, dense, with silt fines		
0.4						CI	Gravelly Sandy CLAY - medium plasticity, brown-red, very stiff, with sub-angular gravel up to 40 mm in a size, fine to medium grained sand		
0.5									
1.0									
1.5									
2.0							Terminated at a depth of 2.0 m due to refusal on gravelly CLAY		
2.5									

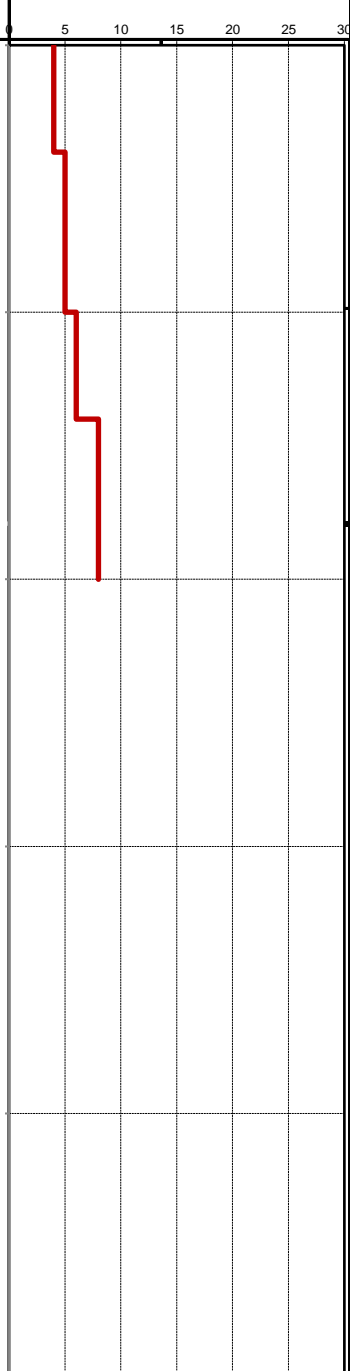
Notes:

Sampling Type:	Method:	Moisture:	Symbols:	Logged :	CN
B - Bulk/Disturbed Sample,	HA - Hand Auger	D - Dry	W _L - Plastic Limit	Checked:	BB
UD - Undisturbed Sample	E - Excavator	M - Moist	W _p - Plastic Limit		
	BH - Backhoe Bucket	W - Wet			

RESULT OF TEST HOLES/PITS

ABN:61 737 984 867
 12/8 Production Road, Canning Vale WA 6155
 PO Box 5050 Canning Vale South WA 6155
 admin@localgeotechnics.com.au

Reference	: LGK1392021GI	Test Pit/BH No.:	03
Client	: Shire of Merredin	Date Excavated:	7-Sep-2021
Project	: Geotechnical Investigation	Date completed:	7-Sep-2021
Location	: Merredin CBD Revitalisation Stage 1A, Merredin WA	Equipment Type:	Excavator
GPS Zone 50	: Northing: 6 516 144	Water Table:	Not Encountered
	: Easting: 621 522		

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations	Dynamic Cone Penetrometer Test (Blows/100mm)
0.0						SM	Silty SAND - fine to medium grained, brown, dry, dense, with silt fines, grass (topsoil)		
0.2						SM	Silty SAND - fine to medium grained, brown, slightly moist, dense, with silt fines		
0.4						SC	Clayey SAND - fine to medium grained, medium plasticity clay fines, brown-red, dense, with sub-angular gravel up to 40 mm in size		
0.5									
1.0					B				
1.5									
2.0							Terminated at a depth of 2.0 m due to refusal on gravelly CLAY		
2.5									

Notes:

Sampling Type:	Method:	Moisture:	Symbols:	Logged :	CN
B - Bulk/Disturbed Sample,	HA - Hand Auger	D - Dry	W_L - Plastic Limit	Checked:	BB
UD - Undisturbed Sample	E - Excavator	M - Moist	W_p - Plastic Limit		
	BH - Backhoe Bucket	W - Wet			

RESULT OF TEST HOLES/PITS

ABN:61 737 984 867
 12/8 Production Road, Canning Vale WA 6155
 PO Box 5050 Canning Vale South WA 6155
 admin@localgeotechnics.com.au

Reference	: LGK1392021GI	Test Pit/BH No.:	04
Client	: Shire of Merredin	Date Excavated:	7-Sep-2021
Project	: Geotechnical Investigation	Date completed:	7-Sep-2021
Location	: Merredin CBD Revitalisation Stage 1A, Merredin WA	Equipment Type:	Excavator
GPS Zone 50	: Northing: 6 516 129 Easting: 621 521	Water Table:	Not Encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations	Dynamic Cone Penetrometer Test (Blows/100mm)								
									0	5	10	15	20	25	30		
0.0						SM	Silty SAND - fine to medium grained, brown, dry, dense to medium dense, with silt fines, grass (topsoil)										
0.2						SM	Silty SAND - fine to medium grained, brown, slightly moist, dense to medium dense, with silt fines										
0.4						CI	Gravelly Sandy CLAY - medium plasticity, brown-red, firm to very stiff, with sub-angular gravel up to 40 mm in a size, fine to medium grained sand										
0.5																	
1.0							Terminated at a depth of 1.0 m due to refusal on hard layer										
1.5																	
2.0																	
2.5																	

Notes:

Sampling Type:	Method:	Moisture:	Symbols:	Logged :	CN
B - Bulk/Disturbed Sample,	HA - Hand Auger	D - Dry	W _L - Plastic Limit	Checked:	BB
UD - Undisturbed Sample	E - Excavator	M - Moist	W _p - Plastic Limit		
	BH - Backhoe Bucket	W - Wet			

DYNAMIC CONE PENETROMETER (DCP) TEST CERTIFICATES

(AS 1289.6.3.2)

Density Correlation - Table 6.4.6.1 (A) & (B) HB 160-2006

Reference	LGK1392021GI	Test ID	01 to 04
Client	Shire of Merredin	Date Tested	7/09/2021
Project	Geotechnical Investigation	Tested by	AB
Site	Merredin CBD Revitalisation Stage 1A, Merredin WA	Checked by	HM

DCP No.	DCP 1		DCP 2		DCP 3		DCP 4	
Depth below ground level (mm)	Penetration Resistance / Density Classification - Blows/100mm							
0 – 100	5	D	4	D	4	D	5	D
100 – 200	9	VD	4	D	4	D	5	D
200 – 300	6	D	5	D	5	D	5	D
300 – 400	5	D	6	D	5	D	2	MD
400 – 500	9	VD	6	VSt	5	D	2	F
500 – 600	9	VD	6	VSt	6	D	3	St
600 – 700	9	VD	6	VSt	6	D	3	St
700 – 800	11	VD	6	VSt	8	D	3	St
800 – 900	11	VD	6	VSt	8	D	4	St
900 – 1000	11	VD	7	VSt	8	D	5	VSt

VS=Very Soft to Soft < 1	F=Firm 1 - 2	St=Stiff 3 - 4	VSt=Very Stiff 5 - 10	H=Hard > 10
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VL=Very Loose < 1	L=Loose 1 - 2	MD=Medium Dense 2 - 3	D=Dense 4 - 8	VD=Very Dense > 8
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LOCAL GEOTECHNICS

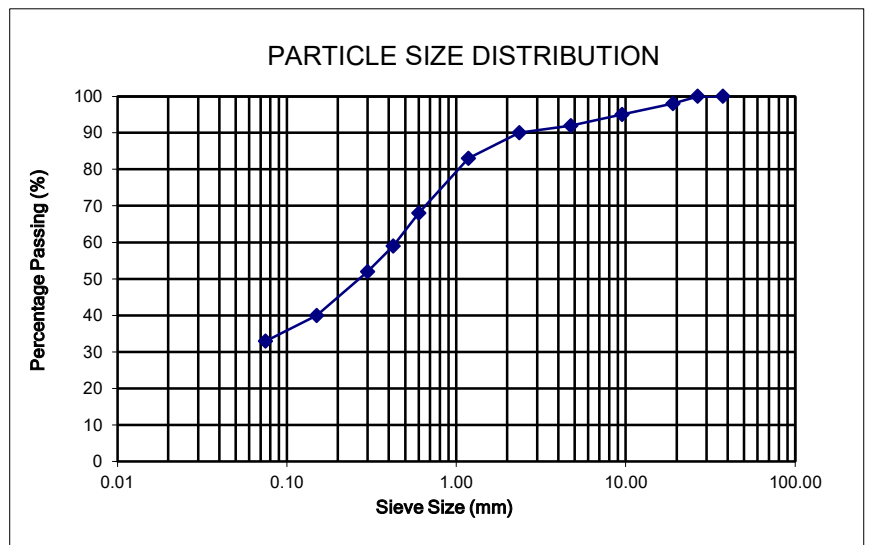
APPENDIX C

LABORATORY TEST CERTIFICATE

Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/078
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	10/09/2021 - 15/09/2021
Sample ID:	TP1 (0.4m - 1.5m)	Report Number:	LG-21/078
Sample Type:	Sandy Clayey Gravel - BROWN	Date Reported:	20/09/2021

TEST CERTIFICATE
Particle Size Distribution
(AS1289.3.6.1)

Sieve Size (mm)	Percent Passing (%)
37.5	100
26.5	100
19.0	98
9.5	95
4.75	92
2.36	90
1.18	83
0.6	68
0.425	59
0.3	52
0.15	40
0.075	33



Comments: Results apply to sample tested.

Approved Signatory

Mark Rolfe
Laboratory Manager



Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/078
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	14/09/2021 - 17/09/2021
Sample ID:	TP1 (0.4m - 1.5m)	Report Number:	LG-21/078-PI
Sample Type:	Sandy Clayey Gravel - BROWN	Date Reported:	20/09/2021

TEST CERTIFICATE
Consistency Limits

(AS1289.3.2.1, AS1289.3.3.2, AS1989.3.4.1, AS1289.3.9.2)

Liquid Limit (%)	43
Plastic Limit (%)	18
Plasticity Index (%)	25
Linear Shrinkage (%)	14.5
% Retained 425 microns	41

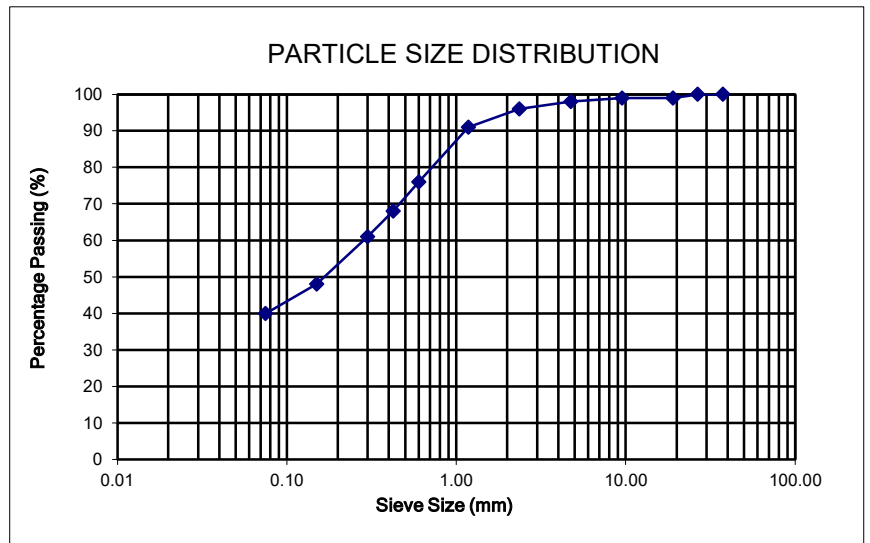
Comments: Air dried, dry sieve fines preparation. No shrinkage cracking. Slight curling.
Results relate to sample tested.

Approved SignatoryMark Rolfe
Laboratory Manager

Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/079
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	10/09/2021 - 15/09/2021
Sample ID:	TP3 (0.4m - 1.5m)	Report Number:	LG-21/079
Sample Type:	Clayey Sandy Gravel - BROWN	Date Reported:	20/09/2021

TEST CERTIFICATE
Particle Size Distribution
 (AS1289.3.6.1)

Sieve Size (mm)	Percent Passing (%)
37.5	100
26.5	100
19.0	99
9.5	99
4.75	98
2.36	96
1.18	91
0.6	76
0.425	68
0.3	61
0.15	48
0.075	40



Comments: Results apply to sample tested.

Approved Signatory

Mark Rolfe
 Laboratory Manager



Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/079
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	14/09/2021 - 17/09/2021
Sample ID:	TP3 (0.4m - 1.5m)	Report Number:	LG-21/079-PI
Sample Type:	Clayey Sandy Gravel - BROWN	Date Reported:	20/09/2021

TEST CERTIFICATE
Consistency Limits

(AS1289.3.2.1, AS1289.3.3.2, AS1989.3.4.1, AS1289.3.9.2)

Liquid Limit (%)	26
Plastic Limit (%)	13
Plasticity Index (%)	13
Linear Shrinkage (%)	4.5
% Retained 425 microns	32

Comments: Air dried, dry sieve fines preparation. Shrinkage cracking. No curling.
 Results relate to sample tested. 150mm shrinkage mould used.



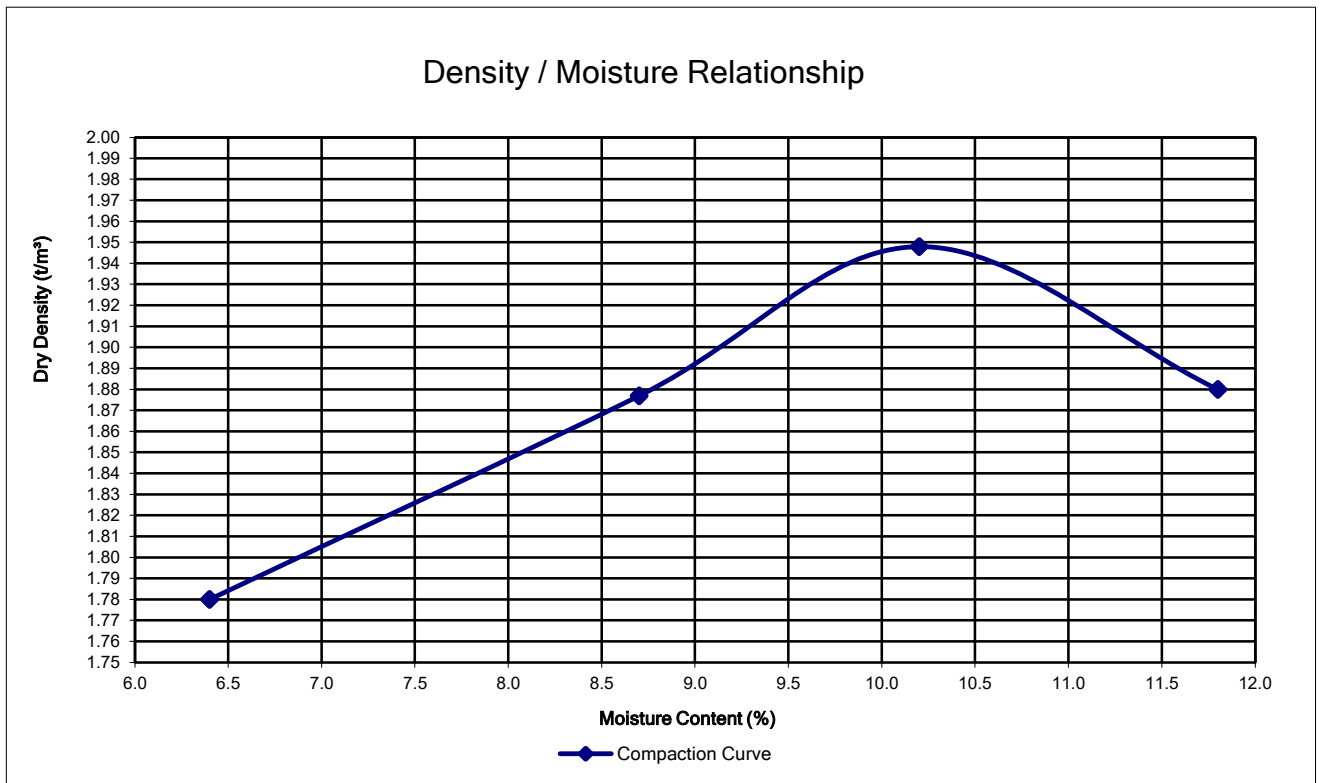
Approved Signatory

Mark Rolfe
 Laboratory Manager



Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/079
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	13/09/2021 - 14/09/2021
Sample ID:	TP3 (0.4m - 1.5m)	Report Number:	LG-21/079-MDD
Sample Type:	Clayey Sandy Gravel - BROWN / RED	Date Reported:	15/09/2021

TEST CERTIFICATE
Maximum Dry Density / Moisture Content
 (AS1289.5.2.1 / AS1289.2.1.1)



Percent Greater Than 19mm	1
Maximum Dry Density (t/m³)	1.95
Optimum Moisture Content (%)	10.0
Curing Prior Compaction (Hours)	66.5

Comments Curing based on visual plasticity assessment and moisture condition.
 OMC (1d.p) = 10.2%, MMDD (3d.p) = 1.948t/m³ (for CBR remoulding)
 Results relate to sample tested

Approved Signatory

Mark Rolfe
 Laboratory Manager



Client:	Shire of Merredin	Sampling Method:	By Local Geotechnics
Client Address:	P.O Box 42, Merredin WA 6415	Sample Number:	LG-21/079
Client Reference:	LGK1392021GI (CBD Revitalisation Stage 1A)	Date Sampled:	Dated 7/09/2021
Location/Project:	Pioneer Park (near Military Museum) - Merredin	Date Tested:	16/09/2021 - 21/09/2021
Sample ID:	TP3 (0.4m - 1.5m)	Report Number:	LG-21/079-CBR
Sample Type:	Clayey Sandy Gravel - BROWN / RED	Date Reported:	21/09/2021

TEST CERTIFICATE
California Bearing Ratio
(AS1289.6.1.1)

Compaction Details:

Compaction Method	Modified - 4.9kg Hammer	
Number of Layers	5	Desired Ratio (%)
Average Blows per Layer	22	
% retained 19.0mm	1	Ratio (%)
Maximum Dry Density (t/m ³)	1.948	
Optimum Moisture Content (%)	10.2	100

Specimen Conditions at Compaction

Dry Density (t/m ³)	1.851	95.0
Moisture Content (%)	10.0	98.0

Specimen Conditions

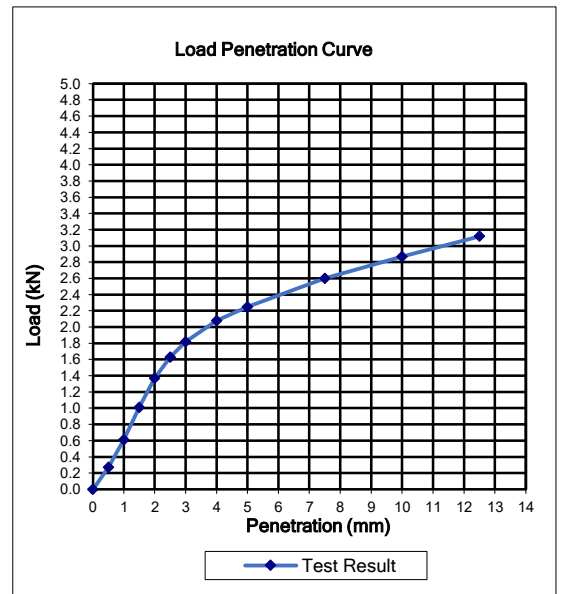
Moisture Content after soaking (%)	14.1	138.2
Dry density ratio after soaking (%)	93.7	Ratio (%)
Soaking Period (days)	4	
Measured Swell (%)	1.5	

Specimen Conditions after Test

Moisture Content Top 30mm (%)	16.0	156.9
Moisture Content of Remainder (%)	13.7	134.3

General Information

Soaked or Unsoaked	Soaked
Surcharge Applied (kg)	4.5



General Information

Moisture Content Method	AS1289.2.1.1
Sample Preparation Method	AS1289.1.1

CALIFORNIA BEARING RATIO	13%
DETERMINED AT CBR PENETRATION	2.5mm
PENETRATION CORRECTION	0.2mm

Curing Time (hours)	50.5
---------------------	------

Notes: Compaction data from report LG-21/079-MDD.
Curing time based on visual plasticity estimation and moisture condition.
Results relate to sample tested.

Approved Signatory

Mark Rolfe
Laboratory Manager





E-PRECISION LABORATORY

FALLING HEAD PERMEABILITY TEST REPORT

Test Method: AS1289 6.7.2

Client:	Local Geotechnics	Date Tested:	23/09/2021
Project:	Merredin CBD Revitalisation Stage 1A	Date Reported:	27/09/2021
Lab:	EPLAB	EP Lab Job Number:	LOCAL
Tested by:	Phil		
Checked by:	Phil		

Lab ID:	MERR_01_FH			
Client ID:	TP3			
Depth (m):	0.40 - 1.50			
Sample Conditions:	Remolded 95% MDD			
Surcharge Pressure (kPa):	12.5			
Initial Bulk Density (t/m³):	2.04			
Initial Moisture Content (%):	10.26			
Dry Density (t/m³):	1.85			
Saturation (Skempton's B):	1.00			
K₂₀ (m/s):	2.809 E⁻⁸			

Notes:

Stored and Tested the Sample as received
Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer):

The results of tests performed apply only to the specific sample at time of test unless otherwise clearly stated. Reference should be made to E-Precision Laboratory's "Standard Terms and Conditions" E-Precision Laboratory ABN 431 559 578 87

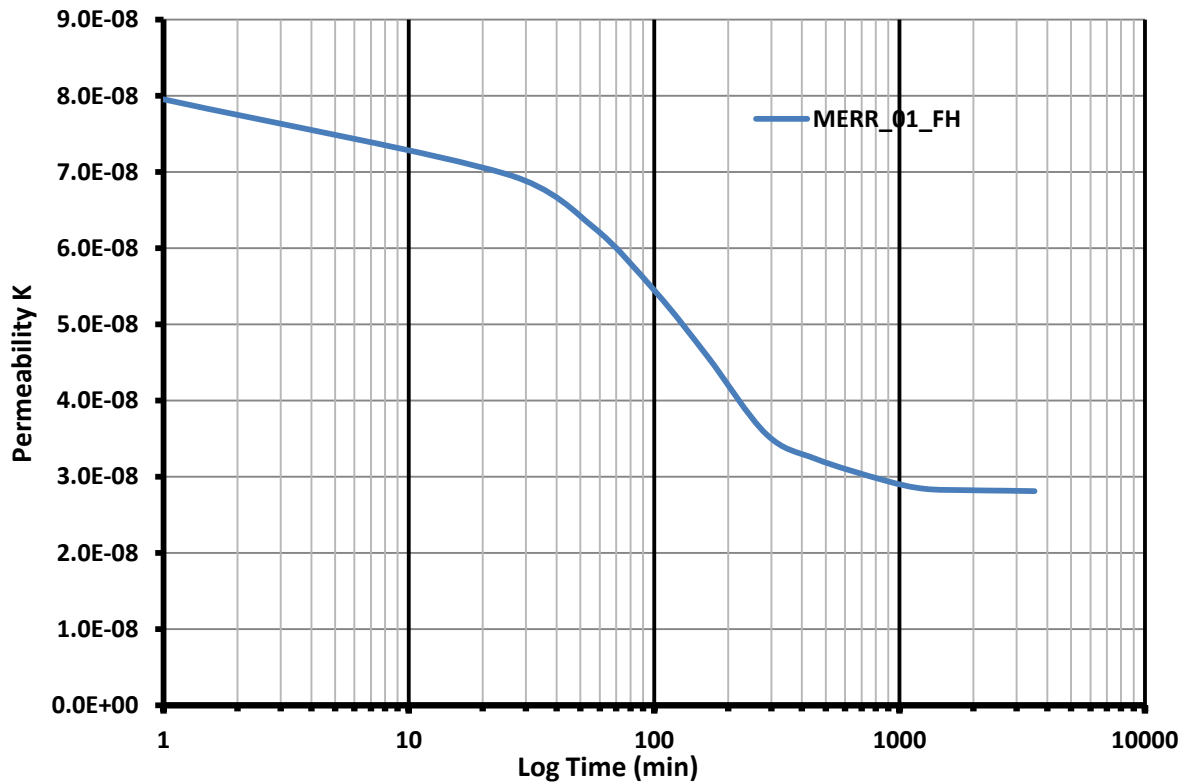


E-PRECISION LABORATORY

FALLING HEAD PERMEABILITY TEST REPORT

Test Method: AS1289 6.7.2

Client:	Local Geotechnics	Date Tested:	23/09/2021
Project:	Merredin CBD Revitalisation Stage 1A	Date Reported:	27/09/2021
Lab:	EPLAB	EP Lab Job Number:	LOCAL



Notes:

Stored and Tested the Sample as received
Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer):

The results of tests performed apply only to the specific sample at time of test unless otherwise clearly stated. Reference should be made to E-Precision Laboratory's "Standard Terms and Conditions" E-Precision Laboratory ABN 431 559 578 87

APPENDIX D

SITE PHOTOS



Photo 1. Site, view from North-East direction



Photo 2. Site view



Photo 3. Test Location 01 (TP1), Sub-surface probing by using an excavator



Photo 4. Test Location 01 (TP1)



Photo 5. Soil from Test Location 01 (TP1)



Photo 6. Test Location 01 (DCP1), Testing by Dynamic Cone Penetrometer

6.5 Appendix 6.5 – Civil Specification

MERREDIN CBD REVITALISATION - STAGE 1A
SHIRE OF MERREDIN

CIVIL WORKS SPECIFICATION
TABEC CIVIL ENGINEERING CONSULTANTS
ISSUE FOR REVIEW (REV A) – MARCH 2022

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C0 GENERAL

The Civil Works Specification is for completion of all demolition, earthworks, roadworks and drainage works required to perform the Scope of Works in accordance with the Drawings and Preliminaries Specification for the Merredin CBD Stage 1A Project.

The Contractor shall undertake Works in accordance with the Preliminaries and General Requirements of the Specification.

All materials and workmanship shall be in accordance with the Specification and Drawings and shall be to the entire satisfaction of the Superintendent.

C0.1 Location and Protection of Existing Services

Refer to Preliminaries Specification for location and protection of existing services.

C0.2 Approvals and Permits

Further to the Preliminaries Specification, the Contractor shall be responsible for making all applications to all authorities who may be concerned for obtaining all permits, paying all fees and exhibiting all notices and/or making such other arrangement as may be required by the regulations of such authorities for all purposes in connection with carrying out the works under the Contract.

All work shall meet the requirements of relevant authorities, who will inspect the works from time to time to ascertain whether the standard of work meets their respective requirements.

C0.3 Extent of Civil Works

The Merredin CBD Stage 1A civil works includes, but is not limited to the following scope:

- (a) Preparation and implementation of a detailed site-specific Project Management Plans.
- (b) Clearing, grubbing and mulching of all vegetation, with mulch to stockpile for landscaping purposes and removal offsite of all rubbish and unsuitable material.
- (c) Erect barrier fencing surrounding demolition works.
- (d) Location of existing services.
- (e) Fully demolish all structures including grubbing out of all concrete pavements, slabs, footings, retaining walls and services unless otherwise noted on the Drawings.
- (f) Cut, seal and divert existing services as required.
- (g) Remove existing asphalt, kerbing and concrete paving.
- (h) Provide protection of public and private property, members of the public and traffic to adjoining roads.
- (i) Provide all necessary dust control and suppression techniques.
- (j) Dispose of all demolished materials, rubbish and debris from site to approved waste disposal sites in accordance with traffic, environmental and statutory regulations.
- (k) Reinstate any damage to public or private property to existing standard.
- (l) Bulk earthworks including all cut to fill and export of excess material or import of fill as shown on the drawings and in accordance with civil and landscape Specification.

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- (m) All earthworks testing as required to ensure conformance with the specification including geotechnical testing and independent audit to confirm the required site conditions.
- (n) 'As Constructed' survey pickup over all disturbed areas and stockpiles within the site and presentation of digital model to confirm conformance with design.
- (o) Construction of roadworks incorporating subgrade preparation, supply and laying road pavement materials and construction of kerbs and paths within the limits of the works and to the dimensions and levels shown on the Drawings and to the Local Authority requirements.
- (p) Construction of stormwater drainage pipelines, trench drains and structures.
- (q) Installation of water supply services and meters to Water Corporation requirements.
- (r) Preparation and remediation of subgrade.
- (s) Installation of basecourse, primer seal and asphalt wearing course.
- (t) Installation of signage and linemarking.
- (u) Installation of in-situ culvert base slab, precast drainage culvert structures and wing walls.
- (v) Ancillary finishes such as stabilisation of lots, verges and batters, installation of street and traffic signage as shown on the Drawings and to the Local Authority requirements.
- (w) Provision for traffic and the assurance of suitable traffic movement on the adjacent existing roads and properties during construction.
- (x) Carrying out such items that may not be shown on Drawings or referred to in the Specification that may be necessary to complete the intention of the above works.
- (y) Carrying out related works as the Contractor is instructed to carry out by the Superintendent.
- (z) Full co-operation and co-ordination of construction with adjacent construction and Public Utility Authorities contractors.

C0.4 Quality Records and Drawings

The Contractor shall prepare and implement at their cost a quality control and assurance plan for the whole of the works in accordance with the relevant Australian Standard.

The Contractor shall maintain effective control of the quality of the works, provide test facilities, and perform all examination and tests stated in the Contract to demonstrate conformance of the works to the technical requirements of the Contract and shall offer for acceptance only works that so conform.

The Contractor shall inform themselves of all quality requirements of the Contract.

The Contractor shall be responsible for the provision of objective evidence that their controls and inspections are effective. For this purpose, objective evidence means any statement of fact, either quantitative or qualitative, pertaining to the quality of the works based on observations, measurements, or tests that can be verified.

The Superintendent reserves the right to perform any examination or tests to ensure that the works conform to the technical requirements of the Contract and to reject any works that do not so conform.

Within seven (7) days of awarding the Contract, the Contractor shall forward to the Superintendent a copy of their quality control and assurance document that shall clearly state the inspection test plan and all other steps required to ensure the quality of the works. The Contractor shall also nominate a senior member of the Contractor's staff who will control the Contractor's total quality system for the project.

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The Contractor shall allow for payment of all tests, examination and documentation except where otherwise stated in the Specification.

The Contractor shall keep and maintain proper and adequate inspection, test and related records and provide either access or copies of such records to the Superintendent when requested for checks on compliance or auditing of the quality plan. All such records shall be retained for a period of not less than seven (7) years after the actual date of Practical Completion.

The Contractor shall inform the Superintendent of the intention to subcontract any element of the works. The quality control and assurance conditions shall apply to any such subcontract. Where required, the Contractor shall provide the Superintendent with copies of the subcontract. The conduct of quality assurance at the premises of the Contractor or any subcontractor or the marking of any component, sub-assembly, assembly or inspection document by the Superintendent shall not be construed by the Contractor as an act of acceptance nor shall it relieve the Contractor of any obligations under the Contract.

A completed contractor completion check sheet, or approved equivalent, as issued by the Superintendent must be returned prior to Practical Completion to ensure the quality of the works has been obtained. As a part of this, the Superintendent requires that documentation inclusive of, but not limited to, the following areas as a minimum must be forwarded prior to Practical Completion:

- Earthworks Compaction
- Imported Fill Material
- Earthworks Certification
- Stormwater and Subsoil Drainage Trench Compaction
- Stormwater and Subsoil Drainage Components Manufacturer Certification of Compliance to AS/NZS4058
- Road Pavement Material Supply
- Road Pavement Compaction
- Road Seal/Asphalt Compaction and Core Thickness
- Kerb and Path Concrete Batch Test / Delivery Sheets
- Service Trench Compaction
- Water Reticulation Pressure Test Certification
- Water Reticulation Disinfection Plan
- As Constructed Information

C0.5 Photographic Record

The Contractor shall progressively compile a detailed photographic record of the works. The photographic record shall include images of all stages and aspects of the construction works. Contractor shall progressively provide photographic evidence of compliant completion of works at each construction hold point for review by the Superintendent.

The photographic record shall be compiled using digital photography. Clear, identifiable and dated images shall be compiled onto a portable hard drive or other durable medium and handed over to the Superintendent at the time of Practical Completion.

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In addition, the Contractor is encouraged to use digital photography to describe construction issues and record events and activities that are relevant to the Contract.

C0.6 Inspection of Works

The Contractor shall make arrangements with the Superintendent for a joint inspection of civil works with the Local Authority in the presence of the Project Civil Engineering Consultant / Superintendent at or prior to the Practical Completion inspection in accordance with the following inspection schedule:

Hold Point / Inspection Item	Date of Inspection
Pre-commencement, Existing Services and Demolition	
Authority approval of all traffic and project management plans	
Dilapidation survey of adjacent properties	
Existing service location and provision of digital service location information	
Inspection of proposed demolition works (pre-demolition)	
Review of proposed import material (sand fill, crushed limestone etc as per Specification)	
Earthworks and Roadworks	
Inspection of subgrade preparation	
Inspection of base course installation	
Inspection of primer seal installation	
Inspection of asphalt wearing course installation	
Inspection of concrete kerb and pavement formwork and reinforcement	
Inspection of kerbing and joints	
Stormwater Drainage and Services	
Inspection of stormwater pipe and services bedding and trenching	
Inspection of stormwater drainage pit installation and pipe connection	
Inspection of sub-soil installation	
Inspection of drainage and services backfill	
Inspection and testing of water service installation	
Practical Completion	
Pre-Practical Completion Inspection	
Practical Completion Inspection	
Final Completion	
Final Completion Inspection	

The Contractor shall provide a minimum of 72 hours' notice prior to the inspection.

C1 DEMOLITION

C1.1 General

The Civil Works Specification is for completion of all works associated with the demolition of all structures and services required to perform the works and associated siteworks.

Unless specifically noted otherwise on the Drawings or in this Specification, the Works shall include supply, handling, storage, and installation of all materials required to discharge the Contractor's obligations under the Contract, including the disposal offsite of any excess materials and construction waste.

C1.2 Materials

C1.2.1 Demolished Materials

Unless otherwise specified, demolished materials shall become the property of the Contractor who shall remove and dispose of the materials away from the site.

The Contractor shall provide details of disposal methods and destinations for all demolished materials prior to commencing the works and shall be responsible for providing evidence of approvals from the Local Authority and other relevant authorities.

The Contractor shall complete a material tracking register to confirm movement of all transported material during demolition works. The register shall clearly and separately define Recycled Materials and Hazardous Materials. The tracking register shall, at a minimum, comprise the following headings:

- Date
- Material Type
- Material Weight
- Material Volume
- Transport Vehicle registration and vehicle type
- Receiving facility receipt (showing receipt number and material weight)
- Percentage of re-used / recycled material (only applicable for Recycled Materials)

The Contractor shall ensure that the removal, transportation and disposal of all materials is undertaken in accordance with the requirements of the relevant authority. The Contractor shall supply transportation dockets, disposal point receipts etc. which adequately verify information shown in the materials tracking register. The Principal shall not be bound to make payment for any works completed for which appropriate disposal records are not made available.

C1.2.2 Hazardous Demolished Materials

In addition to the requirements of the 'Demolished Materials' clause above, the Contractor shall also comply with the requirements of this clause where hazardous materials are present.

It shall be wholly the Contractor's responsibility to assess the extent of hazardous material to be removed under the Contract. The Contractor shall prepare appropriate work methods to comply with the regulatory requirements for the removal of such materials.

The Contractor shall be wholly responsible for the ongoing surveillance, identification, appropriate handling and disposal of hazardous materials during the course of the demolition works.

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Removal shall be in accordance with all regulatory requirements. Evidence of the registration and experience of removalists shall be submitted prior to work commencing.

Appropriate safety measures shall be implemented during the handling and transportation of the materials.

C1.3 Execution of Demolition Works

C1.3.1 General

In general, the works consist of the demolition of all structures on site and site works (unless noted otherwise on the Drawings) including, but not limited to the following:

All demolition works shall be staged in accordance with the overall construction program. The Contractor shall make itself aware of all site conditions which may impact the works and allow for all 'after-hours' work as may be required to complete the works in a safe and secure manner.

The Contractor shall obtain appropriate structural engineering advice for all temporary structures, scaffolding and partial demolition.

C1.3.2 General Related Works

The Contractor shall perform all related works required to complete the specified works. This shall include, but not be limited to:

- Disconnection and/or adjustment of all existing services by appropriate tradespeople and Authorities.
- Temporary support structures.
- Asbestos and hazardous material removal.

C1.3.3 Existing Property Services

Before demolishing and removing any parts of a structure having electrical wiring, gas or water pipes, conduit, telecommunications or similar items, the Contractor shall notify the Superintendent and Authorities having jurisdiction to make sure that these items are out of service so that they can be removed without danger.

If existing services such as public utilities, drains and other services are encountered, obstructed or damaged in the course of performing works under the Contract, the Contractor shall take the following action to the satisfaction of the relevant authority:

- If the service is to be maintained, repair, divert or relocate as instructed or agreed with the service authority.
- If the service is to be abandoned, cut and seal or disconnect as instructed or agreed with the service authority.

The Contractor shall pay all authority fees for 'standard' service adjustments and disconnections within their lump sum tender price.

C1.3.4 Cutting of Materials

Neatly cut back or trim to new alignment with a clean true face on material to be retained. Cut with diamond saw where necessary.

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C1.3.5 Shoring

The Contractor shall provide all necessary shoring. Provide supports to adjoining structures where necessary, sufficient to prevent damage resulting from the work under the Contract and support not less than that given by the structure to be demolished by the means of shoring or the like.

Alter, adapt, and maintain all temporary works as necessary, and strike or withdraw them progressively as the work proceeds. Obtain the written consent of the Superintendent if any such works are to be left in position at the completion of the work.

C1.3.6 Excavations

Leave excavations open after removal of infrastructure below ground level until completion of inspection by Superintendent. Excavations shall be refilled in accordance with the 'Earthworks' Part of this Specification once the Superintendent's acceptance is provided.

C1.4 Demolition Completion

Upon completion of demolition works, the site is to be levelled and left clear of rubble and debris for inspection by the Superintendent and all equipment not utilised in ongoing works is to be demobilised.

The Contractor shall arrange an inspection with the Superintendent upon completion of demolition works and cleaning up. On acceptance by the Superintendent, further works that were previously affected by demolition works may proceed.

C2 EARTHWORKS

C2.1 General

Unless specifically noted otherwise on the Drawings or in this Specification, the Works shall include the clearing and grubbing of vegetation, stripping, stockpiling and re-use of topsoil, sub-grade preparation, earthworks and final shaping and trimming required to discharge the Contractor's obligations under the Contract.

C2.2 Geotechnical Reports

A geotechnical investigation has been carried out by Local Geotechnics and a Report on Geotechnical Investigation for Merredin CBD Revitalisation Stage 1A (September 2021) prepared for the Shire of Merredin. The Contractor will be required to undertake works to the satisfaction of the report's requirements.

The geotechnical investigation and any other information that is provided by the Principal or the Superintendent is for information purposes only. The Contractor is not entitled to rely upon the geotechnical investigation or any other information and is required to inform themselves and conduct their own investigations.

C2.3 Ground Water Level

Tenderers are to make their own judgement as to the ground water level during the construction of the works.

C2.4 Protection of Vegetation

Refer to the Landscape Specification for tree protection zones, penalties and works within tree protection zones.

The Contractor is advised that great importance is placed on the retention of significant trees and vegetation and/or natural bushland and other vegetation identified on the Drawings and during the establishment of the extent of works for clearing and grubbing.

Before commencing work on site, the Contractor shall assess and identify all vegetation which is indicated to be retained or removed. The vegetation identified to be retained shall be clearly marked using noticeable plastic ribbon and ribbons maintained until Practical Completion.

Vegetation to be retained is to be adequately protected as indicated on the drawings or, as a minimum to the Local Authority requirements at all times. Particular care shall be taken to avoid damage to roots, trunks and branches and prevention of access into tree protection zones (TPZs). A site inspection shall be held with the Superintendent's Representative to confirm the appropriate protection prior to commencing any works.

The Contractors shall not remove or cut back any vegetation without approval from the Superintendent. Where directed, equipment and materials shall be kept clear of trees and hand methods (or trenchless techniques) shall be adopted.

Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, apply a bituminous fungicidal sealant to the cut surface to prevent the incursion of rot or disease.

All excavation within the root protection zone for a tree trunk must be preceded by hand digging on the tree side of the trench to the depth of excavation required. Roots larger than 25mm in diameter are to be left intact in the trench until they are inspected by the Superintendent's Representative.

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Under no circumstances should roots be torn or pulled from the ground prior to cutting as per above. All roots to be cut should be exposed by hand and ready for inspection by the Superintendent's Representative prior to roots being severed. No roots within the root protection zone will be severed until approval is granted. Once approved for cutting by the Superintendent, the roots should be cut through with a sharp saw leaving a clean cut at the tree side of the exposed root where the bark around the root is attached around the whole circumference of the root. In most instances, it will be necessary to clear away sand from around the individual roots prior to cutting. This applies to all roots that require cutting.

Where the Contractor inadvertently over-clears or damages existing vegetation to be retained without approval of the Superintendent, Contract penalties will apply and shall be paid to the Principal by the Contractor. Irrespective of the payment of any penalties, any damage caused by the Contractor to vegetation, landforms or fauna habitats outside approved clearing areas must be reinstated at the Contractor's cost in consultation with the Superintendent and relevant Authorities.

C2.5 Clearing and Grubbing

C2.5.1 Extent of Clearing and Grubbing

The Contractor shall give the Superintendent seven (7) days' written notice of their intention to clear any section of the work so that the Superintendent may inspect the Site and determine which trees and plants within the limit of clearing area are to be preserved and which are to be removed.

As a function of defining the area to be cleared the Contractor shall clearly identify the extent of works, trees and vegetation and other items that are to be retained. No clearing shall commence until the Superintendent has indicated which trees are to be preserved. The Contractor shall allow undertaking the earthworks operations around the preserved trees.

Clearing and grubbing shall be carried out in advance of any construction operations, and shall include the removal of all foreign material and vegetation, except trees and vegetation required to be preserved, from within the limits of the clearing.

All organic matter such as trees, logs, stumps, roots, scrub and brush, and all other foreign material including concrete, masonry, boulders, fences, structures, slabs and rubbish shall be cleared from the natural surface.

All stumps shall be entirely grubbed out. Roots over 50 millimetres diameter shall be grubbed and raked out to a depth of at least 600 millimetres below the level of the natural surface or finished cut surface, whichever is the lower. Grub holes shall be backfilled with suitable material and compacted to the density of the surrounding undisturbed soil.

The Contractor shall take precautions to minimise damage to trees and vegetation, fences and other improvements outside the designated areas, and any damage shall be made good at the Contractor's expense.

Clearing must be approved by the Superintendent prior to further earthworks being commenced.

C2.6 Mulch

All tree trunks, branches, shrubs, and leafy material shall be mulched or chipped. Mulched material shall be generally 75mm maximum length and 15mm maximum diameter and shall be that material passing through a 100mm maximum screen.

Chipping of logs between 200mm and 400mm diameter is acceptable subject to Superintendent approval. However, the chipped and mulched material shall be separately stockpiled.

Cleared and mulched material shall be stored in a fire safe manner.

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All mulch and chippings are the property of the Principal and processed mulch/chippings shall not be used for any other purpose, nor removed from the site without specific approval from the Superintendent.

C2.7 Topsoil Removal

Contractor is to refer to Landscape Specification for all topsoil stripping requirements.

C2.8 Diverting Water and Dewatering

The Contractor shall do all the work necessary to divert any water including stormwater runoff from interfering with the works, keep the Site free from such water while the works are in progress and make good any damage to the works by water due to floods or other causes during the Contract. The diversion of this water shall be to the Superintendent's approval and shall not affect any existing facilities.

Should the Contractor choose not to divert any existing drainage path(s) that directly affect the Works, the drainage path(s) shall be maintained in its existing capacity until such time as a suitable alternative has been constructed.

All dewatering for the works, if required, is to be undertaken in accordance with the relevant regulatory and statutory government authorities' criteria and any dewatering requirements that may be contained in the Contract. The Contractor shall assume the full risk and responsibility for any impact whatsoever on properties or structures in the vicinity of the Site, that arises as a result of the Contractor's dewatering and water diversion activities. The Contractor is deemed to have made adequate allowance for risks and responsibilities associated with water diversion and dewatering.

The Contractor shall obtain all necessary licenses from the relevant authorities, if not already obtained by the Principal, for any dewatering required to perform the works. The Contractor shall be responsible for obtaining such approval and licence, keeping them current for the duration of the works and payment of the required fees.

The cost for diverting and dewatering shall be deemed to be included in the cost for the works to be constructed.

C2.9 Excavation

C2.9.1 General

The ground shall be excavated to the various depths, gradients, steps, widths, batters and dimensions as specified herein and/or shown on the Drawings, unless the Superintendent directs otherwise.

Excavation shall be deemed to be in "all classes of material" and in the provisions for such in the Schedule of Prices no distinction has been made between rock and other than material, unless it is determined to be 'Hard Rock' in accordance with Clause C2.9.4 Hard Rock Definition. Hence, the rate submitted shall therefore be taken as being a rate for all types of material including rock, but excluding hard rock, which are reasonably expected to be encountered.

C2.9.2 Unsuitable Materials in Cuttings

Should the Contractor note any evidence of the presence of unsuitable material (e.g. uncontrolled fill, sensitive clays, deleterious materials, silt, etc), the Superintendent and/or geotechnical consultant shall be notified and who will advise the appropriate course of action.

Material at the bottom of cuttings, which in the opinion of the Superintendent and geotechnical consultant is unsuitable for use as a foundation for future works may be rejected and shall be over excavated, disposed of and replaced with approved fill as directed by the Superintendent.

C2.9.3 Spoil Stabilisation and Dust Control

The Contractor shall take all measures necessary to prevent the spoils of excavation from being carried away by water or wind from the Site, all to the satisfaction of the Superintendent.

C2.9.4 Hard Rock Definition

It is anticipated that medium strength rock can be generally excavated using a D11 tracked dozer for bulk earthworks, but high strength rock will be difficult to excavate. Similarly, 30 tonne excavators are likely to require hydraulic hammers or similar, to excavate high strength rock, but should be able to dig through medium strength rock, although possibly at low excavation rates.

Thus 'hard rock' is defined as:

Rock classified as 'high strength' and above in accordance with the Australian Standard AS1726, with a point load strength of 1 MPa or more and demonstrated by the Contractor, to the Superintendent's approval, to meet the following excavation conditions:

- i) Hard Rock in Bulk Excavation – Earthworks in hard rock, as defined above and as assessed by the Superintendent is generally that where rock cannot be ripped by a D11 tracked dozer with an experienced and competent operator fitted with a hydraulic single shank ripper at a rate of 90m³ bank (solid) per hour.
- ii) Hard Rock in Trench Excavation – Trenching in hard rock, as defined above and as assessed by the Superintendent is generally that where a 30-tonne excavator with an experienced and competent operator and fitted with a purpose-built rock bucket can no longer excavate a minimum of 12m³ bank (solid) per hour.

The Superintendent may, at their sole discretion, approve the use of an extra over rate to utilise alternative methods such as hydraulic breaking or blasting in the bulk excavation or to utilise a rock breaker, rock wheel or similar device in the trenching to cut/excavate through hard rock more efficiently.

The hard rock quantity is to be verified by a pre and post hard rock removal survey of surfaces levels.

Where material defined as hard rock is encountered the Contractor shall notify the occurrence to the Superintendent to enable witnessing the excavation rate and extent of the rock material for determination.

If the Contractor does not report the occurrence of hard rock to the Superintendent to enable the Superintendent to witness the excavation rate and extent of the rock material, the Contractor shall not be entitled to any addition to the contract sum in respect to hard rock.

Where witnessed by the Superintendent the extra over cost of hard rock excavation shall be paid for by means of the tendered rate in accordance with the General Conditions of Contract.

C2.10 Proof Compaction

After the site has been stripped to the satisfaction of the Superintendent, all fill areas prior to the placement of fill, shall be proof compacted using a heavy, self-propelled, smooth drum vibrating roller, capable of operating in variable frequency modes. Subject to the protection of adjacent buildings from damaging ground vibrations. The area shall be compacted to the requirements specified in Table C2-1 Minimum Compaction Requirements.

Unless specified otherwise the following proof compaction procedure is recommended:

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- i) Adjust the moisture content of the material to near optimum.
- ii) The site shall be given a minimum of 4 passes with the roller operating in the low frequency/high amplitude mode. Each pass shall include a minimum overlap of 20%.
- iii) The site shall then be given an additional minimum of 4 passes with the roller operating in the high frequency/low amplitude mode. Each pass shall include a minimum overlap of 20%.
- iv) All weak areas that deform excessively under rolling or any evidence of the presence of uncontrolled fill shall be brought to the attention of the Superintendent and/or geotechnical consultant who shall advise the appropriate course of action. Weak areas or uncontrolled fill are likely to require over excavation and backfilling with compacted approved fill.
- v) On completion of vibratory rolling, 2 passes of the site shall be made with the roller operating in static mode to compact the upper 300mm that was disturbed by cyclic mobility.

For cohesive soils it is recommended that the proof compaction be undertaken during a dry period to avoid complications caused by rain. It is not appropriate to compact wet cohesive soil. Should the soil become wet and soften it must be removed and replaced with compacted fill, or allowed to dry out prior to undertaking the proof compaction.

It is recommended that the proof compaction be monitored by personnel experienced in earthworks and that the compacted subgrade is to be inspected and tested by a suitably experienced geotechnical consultant prior to any filling.

The Contractor is responsible for ensuring that neighbouring properties are not affected by the proof compaction procedures and that if alternative compaction methods are required then these are to be reviewed and approved by the Superintendent and geotechnical consultant.

C2.11 Filling

C2.11.1 Site Material

Material to be used for fill construction shall be approved by the Superintendent and consist of materials free from vegetated, deleterious or other perishable matter, and shall be obtained generally from the excavation.

Re-use of in-situ material as fill is to be undertaken in accordance with the Report on Geotechnical Investigation for Merredin CBD Revitalisation Stage 1A (September 2021). No rock shall be placed within 600mm of the finished surface level nor within 300mm of the subgrade of road pavements.

C2.11.2 Imported Material

Any fill imported to the Site shall be sand material certified as clean, suitable and free of any contaminants, all to the satisfaction of the Superintendent, the Principal's environmental and geotechnical consultants and regulatory authorities.

The Contractor shall provide to the Superintendent details of the source of all material which is intended for use as fill. All costs associated with obtaining certification of the imported material is to be at the Contractor's expense.

Where sand is imported from an approved quarry, details of the quarry and licensing shall be provided.

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If the source is not licensed, but clearly virgin ground, the Contractor shall provide advice from an environmental consultant, confirming the suitability of the site as a source for clean fill and provide ad hoc testing results of fill as it is imported to the Site.

If the source has previously been cleared or developed, the Contractor shall provide an environmental report confirming testing of the source site and the absence of any contaminants prior to the import of any material to the Site.

Material imported to be used as suitable fill shall satisfy the following criteria:

- i) Have a plasticity index equal to 0% (i.e. non-plastic).
- ii) The sand shall be clean, cohesion less, free draining and free of all silty, organic or any other deleterious inclusions and certified as Die Back (*Phytophthora* sp.) free.
- iii) Have a pH range of 6.5 to 7.5 (i.e. slightly acidic to neutral).
- iv) Have a permeability of not less than 5m/day when in place and compacted.
- v) The ratio of the maximum to minimum density shall be greater than 1.20. The maximum and minimum densities shall be determined in accordance with test AS1289.5.5.1.
- vi) Comply with the material requirements as stated in AS3798: Guidelines on Earthworks for Commercial and Residential Developments.
- vii) Have a particle size distribution in compliance with the limits shown below to reflect Landscape Specification requirements:

AS Sieve Size (mm)	Percent Passing by Weight
4.75	100
2.36	100
1.18	100
0.60	84
0.30	31
0.15	4
0.075	1.8

The Contractor shall provide classification and compaction test results on representative samples of the proposed material from a National Association of Testing Authorities (NATA) approved testing laboratory for approval by the Superintendent seven (7) days prior to the importation of this material to site.

Test certificates shall be supplied for each and every separate source of fill material and a minimum of one set of tests shall be supplied per 5,000m³ of imported material. If a visual inspection indicates that material may vary significantly from that initially tested, the Contractor shall submit a new set of test results. All tests are to be carried out at the Contractor's expense.

Any material imported to Site prior to the provision of suitable certification and acceptance by the Superintendent, shall be immediately removed at the Contractor's cost.

C2.11.3 Placement and Compaction

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Where fill is required to be imported from off-site, the Contractor shall fill to the levels shown on the Drawings. It shall solely be the Contractor's responsibility to estimate the volume of imported fill and they shall be required to fill to the required levels regardless of the quantity of fill indicated by the Contractor in the Schedule of Prices.

Where the distance from the work site to houses is such that the use of vibrating roller is likely to cause damage or disturb residents, no vibration shall be used. Given proximity to existing structures, the following methodology shall be used.

Compaction Methodology - No Vibration

Filling shall be carried out in horizontal layers, extending the full width of the works. Fill thickness shall be not more than 150mm, loose measurement, unless the Contractor can demonstrate that their equipment is capable of compacting a thicker layer to comply with the Specification. The Superintendent may accept an increased maximum thickness of layer, but in no case shall it exceed 250mm thick. No layer shall be less than 100mm thick compacted.

Each layer shall be compacted in accordance with Table C2-1 Minimum Compaction Requirements using approved compaction equipment, carefully routed and diverted to ensure an even compaction over the full area of each layer.

When the fill material contains rock, each layer shall be compacted with not less than 12 passes of a pad foot or smooth drum steel wheel roller with a static mass of not less than 10 tonnes. Rolling speed shall not exceed 7km/h. Each roller pass shall overlap the previous pass by not less than 10%.

C2.11.4 Unsuitable Fill Material

Material, which in the opinion of the Superintendent is unsuitable for the earthworks (e.g. uncontrolled fill, sensitive clays, deleterious materials, silt, etc), may be rejected and shall be disposed of as directed by the Superintendent. Should it be necessary, because of the rejection of unsuitable material from the cutting, to obtain additional fill to complete the earthworks to the required levels and cross sections, this material shall be obtained from locations as specified or directed by the Superintendent.

All excess excavated material shall be loaded, hauled and disposed of offsite in an approved facility in compliance with statutory requirements. No additional payment will be made for disposal of rejected material.

C2.11.5 Filling Against Concrete Structures

Filling shall not be placed against concrete structures within twenty-one (21) days after the pouring of concrete. Compaction is to be in accordance with the requirements specified in Clause C2.10 Compaction.

C2.12 Compaction

Each layer of fill material placed shall be trimmed as construction proceeds, and shall be uniformly compacted to the required density in accordance with this clause before the next layer is commenced. Unless otherwise directed by the Superintendent, surface areas to be covered by fill material shall be initially compacted in accordance with Clause C2.8 Proof Compaction.

At the time of compaction of each layer the moisture content of the fill material shall not exceed its optimum moisture content at which the maximum density may be achieved, except as approved by the Superintendent, and all layers shall be compacted as dry as practicable.

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Material containing excess moisture shall not be compacted until it has dried out to the extent required by the Superintendent. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. The added water shall be the minimum required and it shall be applied uniformly and thoroughly mixed with the material. No additional payment will be made for wetting or drying the material to be compacted.

The Contractor is responsible for ensuring that neighbouring properties are not affected by the compaction procedures and that if alternative compaction methods are required then these are to be reviewed and approved by the Superintendent and geotechnical consultant.

Compaction shall be deemed to form part of the Contract works and no additional payment will be made for such works.

Compaction requirements shall be as shown in Table C2-1 Minimum Compaction Requirements.

TABLE C2-1 MINIMUM COMPACTION REQUIREMENTS

ITEM OF WORK	MINIMUM COMPACTION REQUIREMENT
Pavement Subgrade	98% MMDD (as determined in accordance with AS1289.5.2.1)
Natural Ground onto which Fill Material is to be Placed	93% MMDD (as determined in accordance with AS1289.5.2.1) for a depth of 750mm.
Fill to 600mm below Finished Level	Cohesive Soil – 95% Standard MDD (as determined in accordance with AS1289.5.2.1) Sand – 95% MMDD (as determined in accordance with AS1289.5.2.1) Rock – Method Specification as per C2.9 Filling
Top 600mm of Fill and Areas of Cut	95% MMDD (as determined in accordance with AS1289.5.2.1)
Replace Unsuitable Material	95% MMDD (as determined in accordance with AS1289.5.2.1)
Retaining Wall, Culvert and Structural Foundations	95% MMDD (as determined in accordance with AS1289.5.2.1)
Filling Adjacent to Structures including Retaining Walls, Culverts and Structural Foundations	95% MMDD (as determined in accordance with AS1289.5.2.1)

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C2.13 Testing of Compaction

The Contractor shall be responsible for the compaction testing of the earthworks and pavement subgrade and testing shall be in accordance with the relevant Australian Standards. The minimum frequency of Density Testing shall be:

TABLE C2-2 FREQUENCY OF DENSITY TESTING

Item	Frequency of Density Testing
Earthworks	Large-scale operations (greater than 1,500m ²) will require not less than one (1) test per 500m ² of compacted area per lift or one (1) test per residential lot per lift, whichever is the greater number of tests. Refer Table 8.1 of Australian Standard AS3798-2007 – Guidelines on Earthworks for Commercial and Residential Developments.
Retaining Walls Backfill	One test per 10m of wall per lift.
Retaining Wall Foundations	One test per 10m.

The location of the tests shall be such that an accurate assessment of the entire portion of the works is obtained.

Testing of earthworks and backfill shall be carried out using a nuclear densometer or, if appropriate and where approved by the Superintendent and geotechnical consultant, a Perth Sand Penetrometer (PSP) calibrated against the sand replacement field density test.

All nuclear density tests shall be carried out by an approved NATA registered laboratory while PSP tests are to be carried out by suitably experienced personnel.

Personnel carrying out testing shall complete compaction certificates at the time of testing; they shall be made available to the Superintendent upon request. The certificate shall detail the number of tests, location, method and results.

If using the PSP for compaction control testing, site and material specific correlations shall be developed for each material type to determine the number of PSP blows per 300mm required to achieve the density as set out in Table C2-2 Frequency of Density Testing.

Where a method specification is used for compaction of rock fill, the earthworks contractor shall maintain records for site preparation, and for subsequent filling, the date of proof compaction of the base layer, the number of passes and make and model of roller used, the rate of water placed, and the elevation of each layer. Records should be made on a daily basis and should set out the areas of work for each day.

The costs of compaction testing of the earthworks, subgrade and backfill shall be at the Contractor's expense and is to be included in the appropriate rates.

Notwithstanding the compliance of the test results, the Contractor shall be responsible for compaction of the entire works to the requirements specified.

C2.14 Trimming and Finishing of Surfaces

C2.14.1 General

All cleared, excavated and filled areas shall be finished to the limits, grades and levels shown on the Drawings. The completed earthworks levels shall be within a tolerance of plus 50mm or minus 0mm of the design levels shown on the Drawings and the surface of all areas shall be evenly graded to form

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a smooth final finish. Finish all levels to neatly tie in and match up with existing work in adjoining areas to the satisfaction of the Superintendent.

The tolerance is an allowance for the practicality in carrying out the works with the appropriate equipment and is not something that should be aimed for when setting out or carrying out works.

Where necessary the surface of new works shall be graded and rolled to ensure that there are no irregularities in excess of 30mm when tested with a 3 metres long straight edge.

C2.14.2 Finish to Embankments

Side slopes shall be cut true and straight to the Superintendent's satisfaction. Tops of embankments must leave no depressions or ridges, which would hold water, prevent free drainage or cause embankment erosion or 'riling'. Where necessary final trimming work shall be done by hand.

Finished surfaces shall not deviate more than 30mm from a straight edge three metres long.

The slope of compacted soil in any embankment or excavated side slopes shall not be steeper than 1 vertical to 3 horizontal unless shown otherwise on the Drawings. Refer Drawings for slopes generally.

The Contractor shall make due allowance for the thickness of pavements, etc. when constructing embankments.

C2.14.3 Finish in Rock

Should rock be encountered within 500mm of the final surface level, the Contractor shall excavate the rock to a depth of 500mm below the design finish surface level.

C2.15 Subgrade Preparation

The subgrade preparation shall be carried out in all areas where pavement is to be constructed, in accordance with the Drawings and Report on Geotechnical Investigation for Merredin CBD Revitalisation Stage 1A (September 2021). The final finish of the subgrade shall be a tightly bound homogeneous surface with no cracking or delamination. If the in-situ material is of such a nature, that the finish and compaction cannot be achieved, then clean imported sand material shall be installed and the in-situ material removed from site.

Clean sand material must be free from all deleterious material and will require approval from the Superintendent and Local Authority prior to placement. Alternatively, the existing material may be modified to obtained the required compaction and quality requirements.

The subgrade and shall be compacted in accordance with Table C2-1 and the Geotechnical Investigation for Merredin CBD Revitalisation Stage 1A (September 2021).

C2.16 Stabilisation

C2.16.1 General

All disturbed areas and material stockpiles during and following earthworks shall, where required under the Contract be appropriately stabilised by hydromulching or similar approved product to the satisfaction of the Superintendent.

C2.16.2 Standard Hydromulch Mix

The Contractor shall provide documentation that the hydromulch mix being applied meets the specified details below:

- Water 30,000-50,000 l/hectare
- Tackifier (ie. Gluon 240) 200 l/hectare

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- Recycled Newspaper 800-1,000 kg/hectare
- Concentrated Dye (Green or Blue) 9-12 kg/hectare.

C2.16.3 Application

The area to be stabilised shall be finished and raked to a smooth, even surface without wheel tracks, etc. and watered. Hydromulching shall be applied by a subcontractor specialising in this work and as approved by the Superintendent using pressurised sprays.

C2.16.4 Protection of Stabilised Areas

The Contractor is to ensure that access and movement across areas that have been stabilised is to be avoided.

The Contractor shall at their own expense, arrange to have any areas disturbed by any work or machinery under the Contractors control including sub-contractors, restabilised to the satisfaction of the Superintendent.

C2.17 Quality Control and Quality Assurance

The Contractor shall engage and coordinate the services of a Geotechnical Engineering Consultant to monitor earthworks activities and carry out inspections, audit testing and preparation of an Earthworks Completion Report. The involvement of the geotechnical consultant shall be in accordance with AS3798: Guidelines on Earthworks for Commercial and Residential Developments.

Site visits by the geotechnical consultant should be made at a regular frequency and are required specifically after the stripping of topsoil and prior to placement of any fill, on completion of any excavations prior to backfilling and at other times and hold points as required by the Superintendent and/or the geotechnical consultant.

On completion of the earthworks, the geotechnical consultant shall prepare an Earthworks Completion Report inclusive of, but not limited to, the following information as a minimum:

- i) Confirmation from the Contractor that earthworks have been carried out in accordance with the Drawings and Specification.
- ii) Contractor's quality assurance records including results of compaction testing and any records of method specification works.
- iii) Results of any audit testing carried out by the geotechnical consultant.
- iv) Summary of observations made by the geotechnical consultant during site visits.
- v) Confirmation of Site Classification in accordance with AS2870: Residential Slabs and Footings, along with any site-specific restrictions or caveats to the provided site classification (ie. suitability of the site for structural footings).

C2.18 Contract Certification and As-Constructed

C2.18.1 General

The requirements of this section shall be met by the Contractor. As-constructed plans shall be submitted prior to Practical Completion.

C2.18.2 Local Authority As-Constructed Plans

The Contractor shall prepare as-constructed plans to the Local Authority's standards. The plans shall be signed by a licensed surveyor and submitted to the Superintendent for submission to the Local Authority. This shall include R-Spec as-constructed plans where required by the Local Authority.

C2.18.3 Pavement Layer As-Constructed Plans

Prior to Practical Completion, the Contractor shall provide the Superintendent an as constructed survey of finished development levels within the extent of works boundary, plus any borrow areas if applicable. The levels should accurately define batters and changes in grades. The as constructed survey shall be supplied in digital format (CAD and PDF files).

The Contractor shall prepare as-constructed plans showing the level of all pavement layers.

The as-constructed plan shall include levels recorded at the following pavement material interfaces, where applicable:

- At the base of subgrade level (where applicable);
- At the interface of any two other pavement materials; and
- At the finished surface level.

Survey levels shall be recorded at the following locations, at each material interface:

- At the top of kerb/flush edge beam;
- At the road reserve, cadastral boundary or interface with existing;

Each layer shall be recorded at the same location to enable auditing of the thickness of each pavement layer.

Survey readings shall be recorded to the nearest 10mm.

Survey data for each material interface shall be submitted to the Superintendent in both PDF and DWG format.

At Practical Completion, the Contractor shall provide a written statement to the Superintendent certifying that the Works have been constructed in accordance with the Specification and the Drawings included in the Contract.

C2.19 Local Authority Handover Inspection

The Contractor shall make arrangements with the Superintendent for a joint inspection of roadworks with the Local Authority at or prior to the Practical Completion inspection. The Contractor shall arrange for roads to be swept in advance of the inspection.

The Contractor shall provide a minimum of 72 hours' notice prior to the inspection.

C2.20 Final Inspection

The Contractor shall make similar allowances as required for the Local Authority handover inspection in preparation of and during the Final Inspection at the expiry of the Defects Liability Period.

The Contractor shall arrange for the full sweeping of all roads prior to the Final Completion Inspection.

C3 ROADWORKS

C3.1 Scope

This section of the specification comprises requirements for the construction of the sub-base course, base course and wearing course for road and pedestrian pavements to be constructed under this Contract. Details of the requirements for the construction of unit paving, kerbs, footpaths, street signage, ducting, fencing, and guide posts are also covered.

C3.2 Road Pavement General

C3.2.1 Source of Pavement Material

It shall be the Contractors responsibility for investigating the source of supply of materials and all aspects associated with the loading, transporting and delivery of materials to the site. No material shall be delivered until the Contractor is satisfied that the material meets the requirements of this specification.

C3.2.2 Sampling and Testing

At the commencement of the supply of crushed rock base course material the Contractor shall take and submit for testing representative samples, each of 15 kilograms mass, to an approved NATA registered testing laboratory. The cost to supply, deliver and test, material samples shall be deemed to be included in the Lump Sum Contract Price.

When the Contractor is satisfied that the pavement has been constructed and compacted to the requirements specified on the Drawings and in the Specification, the Contractor, at their own cost, procure and make available to the Principal as required, testing results and survey to confirm that compliance with the specification has been achieved.

At his discretion, the Contractor may employ an alternative but approved method of testing or testing laboratory to conduct compaction testing to demonstrate the requirements of the specification have been met.

C3.2.3 Defective Material and Work

If at any time during the progress of the work any material supplied or any portion of the pavement as constructed is found to not conform with the Specification the Contractor shall remove the unsuitable material and replace it with satisfactory material, or carry out remedial work on the pavement as constructed. Previous acceptance of the whole or part of the material or work by the Superintendent shall not restrict his right to direct removal and replacement of material or reconstruction, or adjustment, to work subsequently found to be unsatisfactory. The Contractor shall carry out such remedial work or replace defective material immediately at his own expense.

C3.2.1 Connections to Existing Pavements

Where the road pavement is to be joined with an existing pavement, the existing pavement shall be broken out or thoroughly scarified so that any fresh pavement material may be bonded to the old pavement of the existing road. The pavement shall then be formed to the levels as shown on the Drawings and construction shall conform with the Specification. It is essential that smooth junctions be made for work required to satisfy these requirements, even if the work extends beyond the indicated 'Limit of Contract'.

C3.3 Sub-base Course

C3.3.1 General

The sub-base course shall be constructed of crushed limestone having a minimum compacted thickness as shown on the Drawings. The base course shall be constructed of crushed rock having a minimum compacted thickness as shown on the Drawings.

C3.3.2 Standards for Sampling and Testing

Sampling and testing of the sub-base course materials and standard of construction shall be in accordance with the relevant sections of AS1141, 'Methods of Sampling and Testing Aggregates' and AS1289, 'Methods for Testing Soils for Engineering Purposes'.

C3.3.3 Material Requirements

a) Crushed Limestone Sub-Base Course

The crushed limestone for the sub-base course shall be obtained from an approved source and shall be free from sand, roots and other foreign material.

The crushed limestone shall have a resistance to abrasion such that when determined in accordance with the modified Los Angeles test the weight loss does not exceed 60%.

The calcium carbonate content of the limestone supplied shall not be less than 70% or greater than 85%.

The crushed limestone shall comply with the following grading requirements.

AS Sieve Size (mm)	Percent Passing by Weight
75.0	100
19.0	50-75
2.36	30-50

C3.3.4 Delivery and Spreading

The material to be used in the construction of the sub-base course shall be suitably damp to prevent segregation during transit, preferably at or slightly below the optimum moisture contents.

Placing and compacting of the base course shall be carried out as soon as practical after preparation of the previous stage of the pavement. If the previous stage has deteriorated in any way it shall be refined to the specified requirements immediately prior to the construction of the subsequent layer of pavement.

The material shall be placed so as not to disturb the subgrade or previous layers of the pavement and so that the thickness specified herein is achieved. The material shall not be spread on a water-logged base. If at any time subsequent layers of the pavement become mixed, the Contractor shall at his own expense remove the mixture and reshape with clean material.

If the crushed limestone sub-base course becomes segregated it shall be remixed using a rotary hoe or other suitable equipment.

C3.3.5 Compaction Methodology

When the pavement material has been spread, the moisture content shall be adjusted so that it does not exceed the optimum percentage at which the maximum density occurs. Water shall be added by an approved watering machine, and shall be mixed uniformly with the pavement material by an approved mechanical device. If there is existing excess moisture in the material, it shall be dried to the specified moisture content by loosening and aerating.

After the pavement material has been brought to the specified moisture content, it shall be compacted immediately to a firm, even surface, by a roller. Vibrating or pneumatic tyred rollers shall only be used as supplementary to solid wheel rolling. The rolling shall begin at the sides and progress to the centre, parallel with the centre line of the roadway, uniformly lapping each preceding track, covering the entire surface thoroughly, and continuing until the material does not creep or wave ahead of the roller, and the surface presents a smooth, uniform appearance. On superelevated curves, rolling shall begin at the low edge of the pavement and progress towards the higher edge.

When completed the pavement shall be of an even texture tightly bound, firm and unyielding, and be compacted to not less than that specified in Table C2-1.

No vehicles, including those engaged in the work, shall pass over previously spread material until compaction has been completed in accordance with the Specification unless the pavement is left free of wheel tracks by the continuous use of a grader and vehicles are effectively prevented from tracking. Any damage to the pavement caused by traffic shall be made good by the Contractor at their own expense.

If during the construction period, the surface of the pavement shows, in the opinion of the Superintendent or Local Authority, evidence of crazing, ravelling, potholes, corrugations, consolidation, subsidence or a lack of cohesion the basecourse shall be loosened uniformly by harrowing or other approved means, additional material added where necessary to fill depressions or to provide binding and the whole compacted as specified herein.

The sub-base course construction shall be approved by the Superintendent and Local Authority prior to the installation of overlying pavements.

C3.3.6 Compaction and Tolerance Requirements

The sub-base course shall be compacted in accordance with C3.4.6.

The overall width of the sub-base course shall be within 100mm of that specified on the Drawings.

The thickness of the sub-base course shall not vary by more than -5% to +10% of the nominated layer thickness.

The finished surface level of the sub-base course shall not deviate more than 12mm from the design level at any point. The finished surface level of the sub-base course shall not deviate more than 10mm from the bottom of a 3-metre straight edge laid in any direction. Similarly, the finished surface of the sub-base course shall not deviate by more than 6mm.

Any irregularities in excess of the tolerance stated above shall be corrected by loosening the surface, removing or adding pavement material as required, and compacting the area to a uniform surface conforming to the designed cross section and grade. In no case shall quarry dust or other fine material be used to build up depressions.

C3.4 Base Course

C3.4.1 General

The base course shall be constructed of crushed rock having a minimum compacted thickness as shown on the Drawings.

C3.4.2 Standards for Sampling and Testing

Sampling and testing of the base course materials and standard of construction shall be in accordance with the relevant sections of AS1141, 'Methods of Sampling and Testing Aggregates' and AS1289, 'Methods for Testing Soils for Engineering Purposes'.

C3.4.3 Material Requirements

The whole of the material supplied shall be crushed from freshly quarried stone of an approved source and consist of hard durable rock free from sand, organic matter or other deleterious matter.

The pavement material shall have a nominal size of 20mm and when compacted in the pavement and shall comply with the following requirements.

AS Sieve Size (mm)	Percent Passing by Weight
19.0	100
9.5	70-80
4.75	45-65
2.36	30-50
1.18	20-35
0.425	12-30
0.075	3-12

The ratio of the portion passing 0.075mm sieve to the portion passing 0.425mm sieve shall fall within the range 0.4 to 0.6.

The liquid limit shall not exceed	25%
The plasticity index shall not exceed	5
The linear shrinkage minimum and maximum range	2.0%
The Los Angeles abrasion loss shall not exceed	40%
California Bearing Ratio (soaked 4 days) at 99% MDD & 100% OMC	100%
The maximum dry compressive strength shall not be less than	2.07MPa

C3.4.4 Delivery and Spreading

The material to be used in the construction of the sub-base course and base course shall be suitably damp to prevent segregation during transit, preferably at or slightly below the optimum moisture contents.

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Placing and compacting of the sub-base course or base course shall be carried out as soon as practical after preparation of the previous stage of the pavement. If the previous stage has deteriorated in any way it shall be refined to the specified requirements immediately prior to the construction of the subsequent layer of pavement.

The material shall be placed so as not to disturb the subgrade or previous layers of the pavement and so that the thickness specified herein is achieved. The material shall not be spread on a water-logged base. If at any time subsequent layers of the pavement become mixed, the Contractor shall at his own expense remove the mixture and reshape with clean material.

If the crushed rock base course becomes segregated it shall be remixed using a rotary hoe or other suitable equipment.

C3.4.5 Compaction

When the pavement material has been spread, the moisture content shall be adjusted so that it does not exceed the optimum percentage at which the maximum density occurs. Water shall be added by an approved watering machine, and shall be mixed uniformly with the pavement material by an approved mechanical device. If there is existing excess moisture in the material, it shall be dried to the specified moisture content by loosening and aerating.

After the pavement material has been brought to the specified moisture content, it shall be compacted immediately to a firm, even surface, by a roller weighing at least 8 tonnes and having main rollers (or roll) of not less than 1.3 metres in diameter and an intensity of loading per metre width of the main rollers (or roll) of not less than 4.5 tonnes.

Vibrating or pneumatic tyred rollers shall only be used as supplementary to solid wheel rolling. The rolling shall begin at the sides and progress to the centre, parallel with the centre line of the roadway, uniformly lapping each preceding track, covering the entire surface thoroughly, and continuing until the material does not creep or wave ahead of the roller, and the surface presents a smooth, uniform appearance. On superelevated curves, rolling shall begin at the low edge of the pavement and progress towards the higher edge. When completed the pavement shall be of an even texture tightly bound, firm and unyielding, and be compacted to not less than that specified in Clause C3.3. 6.

No vehicles, including those engaged in the work, shall pass over previously spread material until compaction has been completed in accordance with the Specification unless the pavement is left free of wheel tracks by the continuous use of a blade grader or approved type of road drag and vehicles are effectively prevented from tracking. Any damage to the pavement caused by traffic shall be made good by the Contractor at his own expense.

If during the construction period, the surface of the pavement shows evidence of crazing, ravelling, potholes, corrugations, consolidation, subsidence or a lack of cohesion the base course shall be loosened uniformly by harrowing or other approved means, additional material added where necessary to fill depressions or to provide binding and the whole compacted as specified herein.

C3.4.6 Compaction and Tolerance Requirements

The base course shall be compacted to 98% of the modified maximum dry density.

The overall width of the base course shall be within 100mm of that specified on the Drawings.

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The thickness of the sub-base and base course shall not vary by more than -5% to +10% of the nominated layer thickness.

The finished surface level of the sub-base course shall not deviate more than 12mm from the design level at any point. The finished surface level of the sub-base course shall not deviate more than 10mm from the bottom of a 3-metre straight edge laid in any direction. Similarly, the finished surface of the base course shall not deviate by more than 6mm.

Any irregularities in excess of the tolerance stated above shall be corrected by loosening the surface, removing or adding pavement material as required, and compacting the area to a uniform surface conforming to the designed cross section and grade. In no case shall quarry dust or other fine material be used to build up depressions.

C3.5 Bitumen Prime Coat

C3.5.1 General

The crushed rock base course shall be prime coated full width by the application of binder and cover aggregate. The surface work shall not be carried out during inclement weather or when the road temperature is less than 10°C.

Prior to the application of the primer, the pavement shall be swept as necessary, by use of a mechanically operated rotary broom. If this will not provide a uniformly clean surface, additional sweeping shall be done by hand.

The Contractor shall take all necessary precautions to protect concrete kerbing, manholes covers and the like by an approved means during spraying operations.

The primer shall be applied to the approved pavement surface for its full width.

C3.5.2 Material Requirements

The prime coat material shall be an anionic bitumen emulsion of an approved type complying with AS 1160, "Bituminous Emulsions for Construction and Maintenance of Pavements". The emulsion shall contain not less than 60% bitumen and shall have viscosity of between 0.03 and 0.06 Pascals at 25°C.

The bitumen emulsion shall be sprayed uniformly and evenly onto the prepared pavement surface at a rate of not less than 1.20 litres per square metre, measured at a temperature of 15°C. The actual application rate shall be sufficient to adequately seal the surface and bind the cover aggregate, without bleeding through the depth of the aggregate.

C3.5.3 Application

The prime coat material shall be applied to the road pavement surface using a mechanical sprayer the capacity, operation and type of which shall comply with the relevant sections of "Specification for Mechanical Sprayers of Bituminous Materials" issued by the National Association of State Road Authorities (NAASRA). Spraying shall be to a width specified.

After application of the primer, a period of at least 48 hours shall elapse to allow the primer to become completely dry before the wearing course is applied. During the curing period, traffic shall be kept off the treated surface, and all necessary barriers, warning signs, lights, etc. shall be provided in accordance with the Specification.

The primer shall be capable of penetrating fine shrinkage cracks to a depth of at least 2mm.

The residual bitumen application rate shall be 0.04 to 0.06 litres/m².

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Any areas in which prime coat material is insufficiently applied, or is defective in any way, shall be reprimed. The primed surface shall be maintained in sound condition until such time as the final wearing course is applied.

Surplus material after the completion of the spraying work shall be removed from the site.

C3.5.4 Cover Aggregate

Cover aggregate shall be diorite or granite crushed to a nominal size of 5mm and conforming to the following grading.

AS Sieve Size (mm)	Percent Passing by Weight
4.75mm	100
2.36mm	65-75
1.18mm	10-20
0.06mm	0-10

The granite or diorite shall have a percentage of wear not exceeding 20% when tested for abrasion in a Los Angeles Machine (AS 1141).

Cover aggregate shall be spread uniformly at a rate of 90 square metres per cubic metre to form a one stone thick layer with the stone in shoulder contact after rolling.

Immediately after application of the cover aggregate the surface shall be rolled until proper interlocking of the aggregate particles and adhesion of the binder takes place.

C3.6 Concrete Kerb

C3.6.1 General

The Contractor shall supply and lay extruded concrete kerbing in accordance with the requirements specified herein. The location and profile of the kerbing shall be in accordance with that shown on the Drawings.

All works shall be carried out by a competent Contractor thoroughly experienced in the laying of extruded kerbing.

The Contractor shall notify the Superintendent 48 hours prior to the start of kerbing operations.

C3.6.2 Concrete Requirements

Concrete used for the construction of kerbing shall be in accordance with the following requirements:

- Kerbing shall be constructed of pre-mixed concrete conforming to the requirements of AS 1379 "Ready-Mixed Concrete".
- Concrete used for the construction of kerb shall have a minimum compressive strength of twenty (20) MPa at twenty-eight (28) days. Cement to be used in the manufacture of concrete to achieve such strength shall be Portland Cement Type 'A'.
- Aggregate used for the manufacture of concrete shall have a nominal maximum size of 10mm.
- The maximum slump shall be 50mm.

C3.6.3 Line and Level of Work

The kerb shall be placed true to alignment in the horizontal plane as shown on the Drawings or as may be directed by the Superintendent and it shall be placed true to grade in vertical alignment as shown on the Drawings and without local irregularities within the following tolerances:

- The tolerance in finished surface level, when tested with a 3 metres long straight edge shall be $\pm 3\text{mm}$.
- The tolerance in top width of kerb shall be $\pm 3\text{mm}$.
- The tolerance in alignment and level over a length of not less than 15 metres shall be $\pm 6\text{mm}$.

C3.6.4 Construction Details

The kerb shall be placed on a fully compacted and primed base that has been thoroughly cleaned of all material.

Once the kerb has been laid it shall be finished as soon as practical with the use of an appropriately shaped steel trowel.

Contraction joints shall be constructed in kerbing at 2.5 metre intervals and shall comprise a 5mm wide gap, perpendicular to the top and face of the kerb, cut part-way through.

Expansion joints shall be constructed in kerbing at 5 metre intervals and shall be 10mm wide, extending the full depth and width of kerb. Each shall be sealed with a strip of sarmprene foam, to a depth of 25mm, to act as a base for Butyle mastic seal. The seal shall finish 3mm below the top and face of the kerb. Expansion joints shall also be placed at each side of gully pits and at tangent points.

Within two hours of surface finishing of the concrete, the kerbing shall be treated with a sprayed application of "Calcure D" membrane curing compound or an approved equivalent. The minimum rate of application shall be one litre per 6 square metres and be by means of a low-pressure mechanical spray.

Following the application of the curing compound, the kerb shall be covered with an approved polythene membrane for a period of 7 days. The membrane should be thoroughly secured against the concrete to prevent air circulation. Fill material should not be placed against kerbs within seven (7) days of laying.

C3.6.5 Protection of Kerbs

The Contractor shall be solely responsible for any damage to the kerb during the course of the works and for the maintenance period and any such damaged kerb shall be repaired or replaced, as necessary, by the Contractor at his expense. All repair or replacement work shall be to the satisfaction of the Superintendent.

C3.6.6 Defective Work

If any section of the constructed kerb is considered unacceptable by the Superintendent due to misalignment, faulty joints, surface finish, tolerance or curing requirements it shall be demolished and reconstructed in accordance with the Specification at the Contractor's expense.

C3.7 Asphaltic Concrete Wearing Course

C3.7.1 General

The pavement as directed and approved shall be sealed by the application of an asphaltic concrete wearing course in accordance with this specification.

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No surface work shall be carried out during inclement weather or when the road temperature is less than 10°C.

The Contractor shall take all necessary precautions to prevent bituminous material entering side entry pits and shall ensure that manhole covers, and the like are protected during spraying and spreading operations. Immediately following the completion of such operations, the Contractor shall clean off any material and leave manhole covers etc in a satisfactory condition.

C3.7.2 Material Requirements

Asphaltic concrete shall consist of mineral aggregates, filler and binder complying with the requirements specified below:

(a) Coarse Aggregate

Coarse aggregate comprises all mineral matter retained on 2.36mm Australian Standard Sieve. The aggregate shall consist of clean, dry, hard, tough, durable granite, or diorite as per the Local Authority requirements, of uniform quality, free from dust, clay, and other deleterious matter, and from an excess of flat or laminated pieces.

Aggregate shall be of such a nature that when thoroughly coated with the binder material to be used in the work, the coating will not slough off upon contact with water.

The percentage of wear, when determined in accordance with the requirements of the Los Angeles Abrasion Test, shall not exceed 30%.

The flakiness index, when tested in accordance with British Standard BS 812 - "Methods of Sampling and Testing of Mineral Aggregates, Sands and Fillers", shall not exceed 35%.

(b) Fine Aggregate

Fine aggregate comprises all mineral matter (other than filler) passing the 2.36mm Australian Standard Sieve. It shall consist of natural sand comprising of sound, hard, tough, durable, moderately sharp grains, free from coatings or loose particles of clay, silt or other harmful materials.

(c) Mineral Filler

The mineral filler shall consist of sound durable limestone or other approved non-plastic material, finely ground to the following gradings and shall comply with Australian Standard AS A7.

AS Sieve Size	Percentage Passing by Weight
300um	100
150um	95-100
75um	85-100

The filler shall be thoroughly dry, free from lumps, organic matter and clay particles.

(d) Binder

The binder shall be Class 160 residual bitumen complying with Australian Standard AS 2008.

(e) Thickness and Job Mix

The grading of the respective mixes shall comply with the following:

AS Sieve Size (mm)	Weight Passing (%)		
	AC14	AC10	AC7

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19.0	100	100	100
13.2	85-100	100	100
9.5	70-90	90-100	100
6.7	62-75	70-90	80-100
4.75	47-67	54-74	68-88
2.36	34-52	39-57	49-67
1.18	25-41	29-45	37-53
0.60	16-32	19-35	25-41
0.30	16-32	11-23	15-27
0.15	5-13	6-14	8-16
0.075	2-6	3-7	4-8

The mix shall also be consistent with the following properties:

Property	AC14	AC10	AC7
Minimum Marshall Stability of Compacted Mix (kN)	6.5 (50 blows)	6.5 (50 blows)	5.5 (35 blows)
Marshall Flow (50 blows) (mm)	2-4	2-4	2-4
Voids Content (Marshall)	3-8	3-8	3-5
Bitumen Content (%)	4.0-6.0	4.0-6.0	5.0-7.0

C3.7.3 Mixing and Delivery

Mixing and delivery shall be carried out in accordance with AS 2150 by a supplier approved by the Superintendent.

The mixing time shall be such that under microscopic examination, all particles of mineral aggregate are uniformly coated with binder.

There shall be maintained and operated a testing laboratory at, or near the mixing plant to ensure complete control over the mixing procedure. Facilities shall be provided to enable the Superintendent to take, at no cost, samples of the mix or raw materials at any time.

The bitumen shall be mixed at a temperature of not more than 160 °C. The mix shall leave the mixing box at a temperature between 142°C and 160°C and be delivered to the paver at the point of spreading in tipping trucks having steel lined bodies at a temperature of not less than 135°C. Vehicles shall be fitted with covers of such a size, thickness and material that allows the load to be protected from the weather.

C3.7.4 Construction Plant

Unless otherwise specified or directed by the Superintendent plant and equipment used for the application of the asphaltic concrete wearing course shall conform to the following requirements:

(a) Sprayers

Sprayers shall be approved by the Superintendent, and shall be capable of spraying the tack coat uniformly through jets in a spray bar at an application rate of 0.63 litres per square metre up to a width of 2.5mm. The spray bar shall be fitted with end shields.

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Pressure type sprayers used for spraying bitumen emulsion shall be capable of operating at a continuous pressure of 175kPa.

(b) Pavers

Pavers shall be self-propelled and shall be in accordance with section 7 of AS 2734 1984. The pavers shall be equipped with hoppers and distribution screws of the counter-rotation type to place the asphalt evenly in front of the screed. Means shall be provided to heat the screed uniformly over its full width.

Pavers shall be equipped with a quick and efficient steering device, and shall be capable of forward and reverse travelling speeds of 30m/min. They shall be capable of spreading the asphalt without segregation in a paver to widths between 1.8m and 4.3m.

Where required, an automatic level control capable of controlling accurately the longitudinal or the longitudinal and transverse slopes shall be used, working from either a fixed reference line or a skid type levelling beam of suitable length, or a joint-matching shoe.

(c) Rollers

For the compaction of asphalt, the Contractor shall provide self-propelled, reversible rollers approved by the Superintendent and complying with the following requirements:

Steel static three-wheeled rollers, weighing not less than 10 tonnes nor more than 12 tonnes. The wheel pressures of the rear wheels shall be not less than 60kg/cm width.

Steel static tandem wheeled rollers weighing not less than 10 tonnes nor more than 12 tonnes. The wheel pressures of the rollers shall be not less than 45kg/cm width.

Pneumatic tyred multi-wheeled rollers equipped with pneumatic tyres of equal size and diameter having treads satisfactory to the Superintendent. The tyres shall be so spaced that the entire gap between adjacent tyres will be covered by the tread of the following tyre. The tyres shall be capable of being inflated to 700KPa or such lower pressure as designated by the Superintendent and the rollers shall be so constructed that the total weight of the roller can be varied to produce an operating weight per tyre of up to 200kg. The total operating weight and tyre pressures shall be varied as directed by the Superintendent.

Vibrating rollers each of minimum static mass of 6 tonnes capable of varying the amplitude and/or frequency of vibration may be used subject to the approval of the Superintendent. Vibratory compaction shall be discontinued in areas, where it is considered such vibration could cause damage to adjacent buildings or structures.

An approved brush or similar device shall be fitted so that each tyre or roll is kept clean of foreign material and kept uniformly wet. Tyres shall be free of pit marks.

The Contractor shall provide a minimum of one steel three-wheeled roller and one pneumatic tyred roller of each asphalt paver in use on the job, by the Superintendent may require the provision of additional rolling equipment if, in his opinion, the rollers on the job are not obtaining the required compaction of the mixture.

For compacting confined areas, the Contractor shall provide a small roller and/or mechanical impact type of vibrating type hand-operated compactor of size and mass acceptable to the Superintendent.

Other items and types of plant may be used subject to the agreement of the Superintendent which will be withdrawn if either the plant or the manner in which it is operated proves unsatisfactory.

C3.7.5 Preparation of Pavement

The pavement shall be dry and shall be thoroughly swept using a power broom before other work is undertaken. Any foreign matter adhering to the pavement and not swept off by the broom shall be removed by other means. Any depressions of uneven areas shall be tack coated and brought up to the general level of the pavement with mixed material before the main course is laid. Such preliminary treatment shall be thoroughly rolled and compacted.

C3.7.6 Tack Coat

The tack coat shall consist of an anionic bitumen emulsion and shall only be applied to a clean, dry surface. It shall be applied by a sprayer through jets in the spray bar at a uniform rate of between 0.15 and 0.75 litres per square metre. A sufficient period of time shall be provided in order to allow the tack coat to set up and become tacky before the asphalt is placed.

C3.7.7 Corrector Course

When directed by the Superintendent, preparatory to resurfacing those areas in which there are departures of more than 20mm from a 3m straight edge, a separate regulating course shall be placed for correction of both longitudinal and transverse pavement shape.

Unless the Superintendent directs otherwise, the maximum compacted thickness of any one layer of the corrector course shall not exceed 20mm.

C3.7.7.1 Spreading

Asphalt paving operations shall only be commenced when the following requirements have been satisfied:

- The application of the base corrector course has completed
- The foundation is essentially dry and free from puddles
- Sufficient asphalt is on site to permit continuous spreading operations.
- The Superintendent's approval has been obtained.

The asphalt shall be spread to such line, level and camber as shown on the Drawings.

The asphalt shall be spread with a paver whose speed shall be as uniform as possible consistent with the rate of delivery of the asphalt. The occasions on which the paver needs to be stopped shall be kept to a minimum.

The asphalt shall be spread without tearing, gouging, or displacement to produce an even surface.

The spreading of asphalt by hand is only permitted where in the opinion of the Superintendent it is impractical to spread and finish asphalt by machine methods.

Asphalt laid by hand shall be distributed into place without segregation in a loose layer of uniform density and to the correct level. It shall be spread without tearing, gouging or displacement and camber. Raking shall be done in a careful and skilful manner. Asphalt shall not be deposited any faster than can be properly handled.

Asphalt shall be spread in such a manner as to minimise the number of joints in a carriageway. Transverse joints shall be displaced by at least two metres from an adjoining paver run.

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The screed of the paver shall overlap the previously spread lane by 25 to 50mm. At cold joints the overlapped asphalt shall be removed to waste or crowded back at the joint. No asphalt shall be thrown onto the mat being spread.

Immediately after any layer is spread and before compaction is started, the surface shall be checked, any unevenness adjusted, and all sandy, segregated, hungry, or dusty areas removed and replaced with fresh hot asphalt. Irregularities in alignment and grade along the outside edge shall be corrected by the addition or removal of asphalt before the edge is rolled.

Competent workmen capable of correcting all pavement irregularities shall be employed. The correction of irregularities shall be checked for shape and level with a straight edge immediately following the initial rolling.

Unless otherwise directed by the Superintendent, the day's work shall be organised so that each layer spread covers the full width of the carriageway.

C3.7.8 Joints and Junctions

All longitudinal and transverse joints shall be well bonded and sealed. Hot longitudinal joints are preferred.

Junctions between old and new pavements and joints between successive day's work shall be carefully made in such a manner as to ensure a thorough and continuous bond between the old and new surfaces and to provide a smooth riding connection across the junction or joint.

The exposed edges of each paver run shall be formed while hot with a dense face which may be between vertical and 45° to the vertical for the full depth of the layer. Rollers shall not be permitted to damage this face. Any segregation or open textured asphalt in such face shall be removed by cutting back the edge in a straight line to expose fresh, dense asphalt. The cut edge shall be between vertical and 40° to the vertical.

All longitudinal joints shall be parallel to the centre line of the carriageway.

Transverse joints shall be at right angles to the direction of spreading and cut to a straight vertical face for the full depth of the layer.

When necessary, after asphalt has been placed by the paver along any abutting etc such as kerb, manhole or an adjoining pavement, just enough hot asphalt shall be carried back to fill any space left unfilled. This joint shall be properly "set-up" at the proper height and level to receive the specified compaction under rolling.

Any longitudinal edge which is damaged by traffic or rolling shall be treated as set out herein before additional asphalt is laid alongside it.

Where asphalt is required to match into an existing surface, road, manhole surround and like the Contractor shall place the asphalt in such a manner as to provide a smooth riding surface across the junction.

C3.7.9 Compaction

After spreading, the asphalt shall be thoroughly and uniformly compacted as soon as it will support the roller without undue displacement.

Undue delays in rolling freshly spread mixture will not be tolerated. Initial compaction of the asphalt shall be achieved using the self-propelled steel-wheel roller. Rolling shall start longitudinally at the sides and proceed toward the centre of the pavement overlapping on successive passes by at least 150mm. Successive passes of the roller shall be of slightly different lengths. A minimum of three

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passes shall be given to the asphalt and these passes shall be completed as soon as practicable but before the asphalt temperature falls below 100°C. Subsequent to at least three passes of the static wheel roller, rolling shall be carried out using the pneumatic tyred roller.

Where the width of the pavement permits, the pavement shall then be subjected to diagonal rolling in two directions, with a tandem roller weighing not less than 10 tonnes, the second diagonal rolling crossing the lines of the first.

The speed of the steel-wheeled roller shall not exceed 5kph or 10kph in the case of a pneumatic tyred roller and shall be at all times slow enough to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller or from any other cause, shall at once be corrected by the use of rakes and of fresh mixture where required. Rolling shall proceed continuously until all roller marks are eliminated and no further compression is possible.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened without an excess of either water or oil. The rollers shall be in good condition, capable of reversing without backlash. They shall be operated by competent and experienced roller drivers and shall be kept in continuous operation as nearly as practicable in such a manner that all parts of the pavement shall receive substantially equal compression. Parking of rollers on recently rolled work will not be permitted.

Along kerbs, channels, headers, manholes and similar structures, and at all places not accessible to the roller, thorough compaction shall be secured by means of hot tampers and at all contacts of this character the joints between these structures and the mixture must be effectively sealed.

The asphalt shall be compacted to a density of not less than 97% of the Marshall maximum density of the job mix.

The Superintendent's consent shall be obtained prior to opening any freshly placed layer to traffic.

C3.7.10 Provision for Traffic

Special care should be taken to ensure that vehicles and pedestrians are not sprayed with bitumen during tack coating and that entry to areas treated with tack coat or hot paving mix is prevented.

C3.7.11 Tolerances

The asphaltic concrete wearing course shall be finished in conformity with the lines, grades, thickness and cross-sections shown on the Drawings with the following limits.

- Level - The top of the course shall not differ from the specified level by more than 5mm
- Shape - No point on the finished surface of the wearing course shall differ by more than 5 millimetres from a 3 metres straight edge laid either parallel to the centreline of the pavement or at right angles to the centreline, except on crown sections.
- The surface shape shall also be such that ponding of water cannot occur at any point.
- Thickness - The compacted thickness of the asphalt shall have a tolerance of -0mm, +5mm.

C3.7.12 Defective Work

Areas of the asphalt assessed by the Superintendent as not complying with the requirements specified herein for mix quality, surface finish, thickness and density shall be corrected by the Contractor.

Any asphalt contaminated with foreign material shall be removed and replaced as specified. Skin patching of an area that has been rolled will not be permitted.

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Defective areas shall be removed and replaced with fresh materials. Patches shall be prepared by cutting and removing the defective asphalt to the full depth of the course. The sides of the area are to be at right angles or parallel to the centreline. Edges should also be vertical and surfaces of the area to be patched shall be cleaned of all cutting residue by flushing with water. Upon drying the exposed surface shall be tack coated and carefully resealed.

C3.8 Street Signage

C3.8.1 Regulatory Traffic Control Signage and Linemarking

All approved regulatory traffic control signage and linemarking shall be installed by Main Roads WA. The Contractor shall ensure that spotting of proposed linemarking is completed and pavement surfaces swept clean of dust, sand and debris in readiness for installation of signage and linemarking by Main Roads WA.

C3.8.2 Parking and Local Authority Signage and Linemarking

Local authority signage and linemarking, such as signage relating to parking within public road reserve, shall be installed in accordance with the manufacturer's specifications in the absence of relevant Local Government Authority specifications.

C4 STORMWATER DRAINAGE

This Specification is to be read in accordance with the appropriate Contract Document and in conjunction with the civil drawings and any other relevant consultant drawings and specifications, as well as any other instructions that may be issued.

C4.1 Scope

This section of the Specification provides for the construction of stormwater drainage pipelines and associated structures including all necessary excavation, supply of all materials, bedding preparation, jointing and backfilling and the work is to be carried out to the satisfaction of the Superintendent and the Local Authority.

C4.2 Drainage Materials

C4.2.1 General

The work is to be carried out to the satisfaction of the Superintendent and the Local Authority. All workmanship and materials used in the Works shall conform to the current Australian Standard where such Standard exists. Where such Standard does not exist, the current Local Authority's Standard shall apply.

All precast components (pipes, lids, liners and bases) are to be supplied by an approved manufacturer and are to be assembled as per the manufacturer's guidelines. Precast components used for the construction of drainage works shall be supplied free of cracks, chips and other such defects.

C4.2.2 Reinforced Concrete Stormwater Drainage Pipes

Stormwater drainage pipes shall be reinforced concrete spigot and socket rubber ring type pipes unless otherwise approved by the Superintendent and the Local Authority.

All concrete pipes shall conform to AS4058 – Precast Concrete Pipes or AS4139 – Fibre Reinforced Concrete Pipes and Fittings.

Strength class for pipes shall be Class 2 unless otherwise noted on the Drawings and approved by the Superintendent and the Local Authority.

C4.2.3 Roof Drainage Collection and Sub-Soil Drainage Pipes

Rigid PVC drainage pipes and fittings shall be Class SN8 Best Environmental Practice PVC with solvent cement type joints, manufactured in accordance with AS1254 – PVC-U Pipes and Fittings for Stormwater and Surface Water Applications and AS2439.1 – Perforated Plastics Drainage and Effluent Pipe and Fittings – Perforated Drainage Pipe and Associated Fittings.

Unless otherwise specified on the Drawings sub-soil drains shall be constructed of slotted PVC pipes or by installation of strip drain or equivalent product as approved by the Superintendent. Geofabric surround to be non-woven thermally bonded with a minimum flow rate of 50l/m²/sec.

Other systems or products may be approved by the Superintendent and Local Authority.

C4.2.4 Precast Concrete Liners

Circular precast liners for use in the construction of drainage pits shall be reinforced concrete from approved manufacturers, of a strength equivalent to Class 2 pipe unless otherwise specified on the Drawings and have interlocking joints.

Where step irons are required, the liners shall have cast-in holes to allow for their installation.

C4.2.5 Concrete Work

C4.2.5.1 Concrete

Concrete shall conform to AS3600 – Concrete Structures and shall be supplied by an approved concrete supplier conforming with AS1379 – Specification and Supply of Concrete.

All concrete shall have a minimum compressive strength of:

- 25MPa at 28 days for in situ bases; and
- 40MPa at 28 days for precast units.

The Concrete shall have a 60mm slump and maximum aggregate size of 20mm.

Concrete strength shall be tested in accordance with AS3600 – Concrete Structures and the results provided to the Superintendent.

Mixing of concrete on site may be used subject to the approval of the Superintendent and Local Authority of the Contractor's proposed mix details. Site mixed concrete shall be subjected to site testing for slump and strength in accordance with the relevant Australian Standards.

C4.2.5.2 Cement

All cement used shall be Portland Cement in accordance with AS3972 – General Purpose and Blended Cements and obtained from an approved manufacturer.

Cement shall be delivered to the site fresh and in sealed bags and stored in a weatherproof shed until such time that it is to be used. Any bag showing signs of deterioration or setting shall be rejected.

C4.2.5.3 Concrete Aggregate

Fine aggregates shall be well graded, clean, sharp and free from clay and organic impurities. Coarse aggregate shall be crushed granite, diorite or basalt clear and free from all impurities and dust.

The aggregate shall be in accordance with AS 2758.1 – Concrete Aggregates and AS1141 and have a maximum size of 20mm.

C4.2.5.4 Water

Water for use in concrete and mortar shall be of potable quality, free from any impurities harmful to concrete, mortar or steel.

C4.2.6 Sand

Sand used in concrete work shall be uniformly graded crushed stone or natural sand and free of all deleterious matter.

Sand for bedding or backfilling shall be clean sand and free from roots, clay or any deleterious matter.

C4.2.7 Steel

Steel-reinforcing fabric and bars for concrete shall comply with the requirements of the AS4671. The steel shall be free from loose rust, oil or matter likely to impair the bond with concrete.

Structural steel shall comply with the requirements of AS4100.

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C4.2.8 Bricks

Bricks shall be hard, well-burnt, pressed or wire-cut clay brick in accordance with AS4455 and AS3700. The bricks shall have a minimum ultimate strength of 30MPa and absorb not more than 10% of their own weight of water when saturated.

Bricks shall be of uniform shape and size, carefully conveyed and unloaded at the site. No chipped or broken bricks shall be used, and pieces of brick may only be used where necessary as closures.

Face bricks where applicable shall be carefully picked for uniform colour, sharp arises, etc. The colour shall be selected by the Superintendent.

Brickwork shall meet the approval of the Superintendent. Any brickwork which, in the opinion of the Superintendent, if considered unsatisfactory shall be demolished and rebuilt by and at the expense of the Contractor.

C4.2.9 Calibrated Aggregate

Calibrated aggregate (granite or diorite) shall be free from roots, clay and foreign material and conform to the following sieve grading:

Sieve Size	Weight Passing (%)
19.0mm	100%
13.2mm	98-100%
9.5mm	80-90%
6.7mm	40-53%
2.4mm	5-14%
0.6mm	0-3%

C4.2.10 Filter Material

Filter material shall be a granular material consisting of clean, hard, tough, durable, uncoated grains, uniform in quality and conform to the following grading requirements:

% of Total Filter Material	Aggregate Size
33.3%	14mm
33.3%	10mm
33.3%	7mm

The filter material shall be thoroughly mixed and free of any deleterious materials and placed as shown on the Drawings.

C4.3 Drainage Setting Out

The Contractor shall arrange at their own expense and be responsible for the correct setting out of all works in accordance with the Landscape Specification.

The Contractor shall set out the drainage works in accordance with the road centreline chainages, grades, lengths, diameters, invert levels and location of structures as shown on the Drawings.

The distance between drainage structures is shown only to assist in the calculation of grades and quantities. Where a discrepancy occurs between the scaled distance between structures and the

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dimensioned pipe length the Contractor shall immediately notify and seek direction from the Superintendent.

Drainage pits shall be positioned from dimensions shown on the Drawings relative to the cadastral boundaries and road centreline chainages. Pits are to be set up such that the gully surround and angle frames are parallel to the kerb.

Where gully pits are shown in sag vertical curves and at low points they are to be situated so that they drain the lowest point on the pavement surface. If the Contractor constructs the road so that the gully does not drain the lowest point, the Contractor shall, at its own expense and in agreement with Superintendent, correct the levels of the pavement surface and kerbing and construct additional gullies and connecting lines to ensure the low point is free draining.

The location, level and size of all drainage works shall be strictly adhered to and no alterations shall be made without the written approval of the Superintendent.

C4.4 Excavation

C4.4.1 General

The Contractor shall allow to excavate in all types of material, including rock.

Before commencing any excavation, the Contractor shall locate all utility services which cross or run parallel to the site of excavation and associated spoil or excavation operations. The Contractor shall be responsible for the locating and protection of such services and shall meet all costs associated with any necessary repairs thereon to the satisfaction of the Statutory Authority concerned.

C4.4.2 Trench Excavation

Trenches are to be excavated to the line, level and grade indicated on the Drawings.

The trench widths shall be kept to the minimum, consistent with bed width requirements and the need for adequate working space and compaction of the side support. The width shall be sufficient for safe construction and to permit the accurate laying and bedding of pipes and the making of satisfactory joints.

Excavation for junction pits and gullies shall be made to the correct depth and of sufficient dimensions to allow the base and walls to be constructed.

Subsoil trench widths shall be sufficient to allow for the effective compaction of backfill material around the pipe and the placement of filter material.

In the case of rock occurring in the bottom of the trench, the trench shall be excavated to a depth of 100mm below the depth required for the pipe.

Should the bed of the trench be over excavated, then the over excavated volume shall be replaced in accordance with the Earthworks specification.

Trenches shall be kept free from water, debris, rubbish and falling earth.

All trench excavation shall be made in a safe manner, the trenches either being battered back or shored to achieve this. The Contractor shall comply with Worksafe regulations.

During the trenching process the Contractor shall take all precautions against damage to adjacent structures including roads, paths, drains etc. Should damage occur it shall be reinstated by the Contractor at their expense and shall be to the satisfaction of the Superintendent and Local Authority.

Where excavations are to be undertaken in the vicinity of existing services they shall be supported in a manner approved by the relevant Utility Authority and the Superintendent until backfilling of the adjacent excavation has been satisfactorily completed.

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The excavation and other works along any public and private road shall be carried out in such a manner as to avoid as far as possible any obstruction to traffic or inconvenience to the public. All soil or other material excavated from the trench and all tools, plant, pipes and other materials shall be made to occupy the least possible space to ensure that maximum width of safe road for vehicles, and the Contractor must maintain pedestrian and vehicular access to all properties at all times.

C4.4.3 Dewatering

The Contractor shall also be deemed to have made allowances for the cost of all dewatering and any additional construction costs due to wet ground conditions.

In the event of water being encountered, the Contractor shall make adequate provision to ensure that the excavation is kept free from water during the time the works are in progress. Particular attention should be given to ensure that the excavation is kept free from water during the process of concrete pouring and for a period of at least 24 hours after the concrete pour.

No bedding or pipes shall be laid in water and trenches are to be kept free from water until backfilling is commenced.

C4.4.4 Excavation in Existing Road Reserves, Private Property or Public Open Space

Excavation is to be kept to a minimum in existing road reserves and other paved areas, ensuring that damage to such structures is kept to a minimum. The Local Authority and Superintendent shall be notified and the Authority's approval received prior to commencing work in the existing road reserve.

Where pipes are to be laid across existing road pavement the Contractor shall cut the pavement in neat straight lines with a cutting tool. The width of pavement to be disturbed shall be minimised.

Backfilling and interim restoration of trenches in existing roadways shall be completed immediately after acceptance of drainage work. The trench surface shall be kept in a safe and reasonable condition for traffic until the permanent road reinstatement is carried out. All subsidence shall be made good with fresh approved material.

Interim restoration and maintenance of private roads or right of ways shall be carried out as if they were public roads.

Reinstatement of the pavement shall be carried out in accordance with the requirements of the Local Authority and to the satisfaction of the Superintendent.

Where necessary cultivated lawns shall be removed for the full top width of the excavation by cutting with a sodding machine and neatly stacking cut sods in a manner to ensure the maximum possible preservation of the lawn. After completion of the drainage work such lawns shall be reinstated as near as practicable to their original condition.

The Contractor is responsible for the cost of the reinstatement and any subsequent related work required during the maintenance period of the road, footpath, verge and other applicable infrastructure or damaged plant and property.

C4.4.5 Obstruction to Traffic

Excavation material shall be deposited in an area causing the least interference to vehicular and pedestrian traffic.

The Contractor must maintain pedestrian and vehicular access to all properties at all times.

At all times when the works are left unattended, all excavations in public areas shall be fenced off with warning signs and lighting and the Contractor shall ensure that they remain in a safe condition.

C4.4.6 Trenchless Techniques

Trenchless techniques shall only be carried out where directed by the Superintendent. The Contractor shall submit details of the method prior to commencement for the approval of the Superintendent.

C4.5 Foundations and Bedding

C4.5.1 Pipe Bedding

Unless otherwise specified the bedding shall be in accordance with AS3725 – Design for Installation of Buried Concrete Pipes and AS2032 – Installation of PVC Pipe Systems.

Pipes shall be bedded on a clean sand bedding. Pipes constructed in dry sand conditions shall be bedded on a shaped trench base. Clean sand from excavations may be approved by the Superintendent for use in dry conditions.

Pipes constructed in wet ground conditions shall be bedded on a granular material such as gravel or crushed stone as approved by the Superintendent. Slotted subsoil drainage pipes shall be bedded on an approved filter aggregate as shown on the Drawings.

Bedding shall provide continuous support for pipes and shall be well compacted and not disturbed by groundwater or other conditions.

Piling, keeling or importation of bedding material may be required.

Bedding material shall be compacted to not less than 95% of the maximum dry density when tested in accordance with AS1289 – Methods of Testing Soils for Engineering Purposes.

C4.5.2 Foundations for Pits and Other Structures

The base of excavations for drainage structures shall be trimmed to give the required subgrade level, with all soft and unstable areas removed and replaced with sound material and compacted. The base of structures shall be constructed on a minimum compacted thickness of 100mm of clean sand.

The subgrade for all pit bases shall be compacted to not less than 95% of the maximum dry density when tested in accordance with AS1289 – Methods of Testing Soils for Engineering Purposes prior to placing of the base.

Under road carriageways, compaction of the base shall be to not less than 98% of the maximum dry density when tested in accordance with AS1289 – Methods of Testing Soils for Engineering Purposes.

C4.6 Pipe Laying

C4.6.1 General

Pipes shall be set in an upstream direction unless otherwise approved by the Superintendent.

All pipes shall be set in a straight line between drainage structures. On inspection by the Superintendent or Local Authority, any pipe not placed in a straight line shall be replaced at the cost of the Contractor. No part of the works or any length of pipes or fittings shall be covered until they have been inspected, tested and approved by the Local Government.

During construction, no sand or other material shall be allowed to enter the drainage system. Junction pits shall be covered to prevent this occurring.

C4.6.2 Stormwater Drainage

Stormwater pipes shall be laid to an even grade to the levels shown on the Drawings.

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Pipes shall be laid in such a manner that their barrels bear firmly and evenly on the bedding material. The invert of the pipe shall not deviate from the level of the invert grade line or by more than $\pm 10\text{mm}$ at any point. All pipe laying shall commence from the downstream end.

Pipes are to be finished flush with the inside of the liner, maximum 50mm protrusion, and mortar sealed all round.

C4.6.3 Subsoil Drainage

Subsoil drainage pipes shall be placed on well compacted and surrounded by calibrated aggregate to the dimensions shown on the Drawings and in accordance with AS2032 – Installation of PVC Pipe Systems.

The subsoil pipes shall be laid and jointed accurately to the lines, levels and gradients shown on the Drawings. At no point shall the subsoil pipe deviate in level by more than $\pm 10\text{mm}$ from the gradient required.

All pipes shall be laid in a manner such that the pipe barrels have solid bearing throughout their length. Jointing of the pipes shall be carried out in accordance with the pipe manufacturer's recommended procedure or as specified herein for stormwater drainage pipes.

Where filter fabric is required it shall be unrolled across the top of the trench, allowed to fall down into it and then pushed into corners. The top of the fabric may need to be anchored to prevent it falling into the trench. The fabric shall be lapped at least 200mm at all joints and secured.

Compaction of the filter material should ensure that good contact is maintained between the fabric and the sides and base of the trench.

Where a pipe passes through the fabric a separate piece should be wrapped around the pipe, flared against the side of the fabric in the filled drain and secured. Similarly, fabric should be flared inwards or outwards against pits and other structures.

C4.6.4 Reinforced Concrete Pipe Jointing

Spigot and socket pipes shall be jointed with the spigot fully home in the socket and rubber ring joint.

Rubber ring joints for concrete pipes shall be formed by placing the rubber ring evenly and without twist over the spigot end of the pipe and rolling it into the socket.

Care shall be taken to ensure that the joint is free from dirt or other obstructions and that the rubber ring is placed evenly in the joint. Each joint shall be tested all around with a feeler to ensure that the ring has not slipped. If cracking or breakage of spigot or socket occurs during jointing the affected pipe or pipes shall be removed and replaced by the Contractor at their expense.

Pipes shall be laid such that the sockets face upstream.

C4.6.5 PVC Pipe Jointing

PVC pipes shall be jointed with the spigot fully home in the socket and the joint solvent cemented in accordance with the pipe manufacturer's recommended procedure.

The solvent cement used shall be the product recommended by the pipe manufacturer. The solvent cement shall be applied using a clean brush to both surfaces of the joint after these surfaces have been cleaned with primer fluid.

C4.6.6 Building in Future Pipeline Extensions

The Contractor shall provide and install branches in drainage pits for future extensions at positions shown on the Drawings or as requested by the Superintendent. Sockets for future extensions shall be accurately constructed to the position shown and to suit the levels and grading of future pipelines.

The dead ends for future extensions and ends of all branches shall be blanked off.

C4.7 Stormwater Drainage Pits

C4.7.1 General

Drainage pits shall be bedded on a subgrade compacted in accordance with the requirements within this specification.

Drainage pits shall be constructed on a precast or cast in situ concrete base. The pit shall consist of circular precast concrete liners with interlocking joints as shown on the Drawings.

The length of the liners shall be chosen to minimise the overall number of joints in any particular pit, however no liner shall not be broken down to a length of less than 300mm.

All pit, base and pipe joints shall be neatly sealed with a 3:1 sand/cement mortar. Particular care should be taken to ensure the concrete surround that fits upon the upper most section of liner is securely fixed.

C4.7.2 Junction Pits

Junction Pits shall be constructed to the dimensions specified on the Drawings.

Junction pit covers shall be of an approved kind, but generally, to be purpose built heavy duty trafficable reinforced precast concrete surrounds a minimum of 150mm thick. If located in a carriageway, it shall be fitted with an approved cast iron frame and lid.

All junction covers shall be equipped with a square or circular access point with tapered inserts. Both cover and insert shall have approved lifting points installed.

If located within road or brick pavements the lids shall be cast or extended to the required dimension above their concrete surround to be set flush with the pavement.

The covers and surrounds of all junction pits shall be placed to smoothly match the adjacent finish surface levels and profile.

A tolerance in horizontal location of 50mm will be accepted in the positioning of junction pits.

C4.7.3 Gully Pits

Gully type entry pits shall be constructed to the dimensions specified on the Drawings or in accordance with the Local Authority standard.

Grated covers shall be of an approved kind, but generally, to be purpose built heavy duty trafficable reinforced precast concrete surrounds a minimum of 150mm thick. The concrete cover shall contain a cast-in grate and frame.

The steel insert shall be contained within a steel surround firmly embedded in the concrete and hinged on one side to permit opening with the steel surround protruding above the concrete surround.

Grated covers with parallel bars shall be installed with the bars at 90° to the kerb.

In the case of a brick paved road, gully angle frames shall be set flush with the finished road level and the paving bricks laid on top of the concrete surround. Elsewhere frames shall be set the asphalt thickness proud of the surround and asphaltic wearing course laid flush to it.

The Contractor is to ensure that the concrete surround is adjusted to suit the finished pavement levels and set firmly upon the precast liner including grouting where appropriate prior to the sealing of roads.

A tolerance in location of 20mm and in level of 0 to -5mm will be accepted in the construction of gully pits.

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C4.7.4 Soakwells

Soakwells shall be constructed of precast concrete liners with weepholes having the dimensions specified on the Drawings, with precast concrete covers and surrounds to details shown on the Drawings.

Grated covers shall be of an approved kind, but generally, to be purpose built heavy duty trafficable reinforced precast concrete surrounds a minimum of 150mm thick. Covers shall be provided with suitable lifting keyholes installed.

The steel insert shall be contained within a steel surround firmly embedded in the concrete and hinged on one side to permit opening with the steel surround protruding above the concrete surround.

The covers and surrounds to all soakwells shall be placed to smoothly match the adjacent finished surface levels and profiles.

A tolerance in horizontal location of 50mm will be accepted in the positioning of soakwells.

C4.7.5 Step Irons

Where drainage pits exceed 1m in depth, measured from the top of the cover to invert level of the base, step irons shall be provided at 300mm centres for the full depth of the pit as detailed on the Drawings.

Step irons are to be 24mm diameter hot dipped galvanised deformed bars, approved plastic-coated type to the manufacturer's specification or alternative for liners with precast holes use partially encapsulated knock-in step irons.

Step irons shall conform to AS1657.

C4.8 Backfilling

When a length of trench has been excavated, the pipes shall be laid therein without delay, and the trench shall be backfilled immediately after inspection of the pipes and joints by the Superintendent and the Local Authority.

All backfilling shall be placed in such a way that no pipes or joints or other works are displaced or damaged.

Backfilling up to 300mm above the top of pipes shall be of approved readily compactable material such as sand or fine gravel and shall be free from stones retained on a 25mm sieve, clay lumps, building rubbish, tree roots and other vegetable matter.

Backfilling of trenches and excavations shall be carried out as far as possible with excavated material, except that no organic and other materials, articles or substances which might cause uneven settlement or voids shall be used. Former topsoil shall be used as the top layer of backfilling.

Backfilled material in the pipe trench shall be thoroughly compacted in 150mm layers using appropriate equipment. Compaction shall be to not less than 95% of the maximum dry density when tested in accordance with AS1289 – Methods of Testing Soils for Engineering Purposes.

The surfaces of the trenches after backfill shall be graded level with the surrounding ground and the Contractor shall during the period of maintenance make good any subsidence which may occur. The Contractor shall replace limestone and reshape existing road surfaces to make them safe for all vehicular and pedestrian traffic.

If any settlement or subsidence of fill or backfill occurs during the Contract Period including the Maintenance Period, in any road or verge, footpath, or elsewhere in the works the Contractor shall at their own expense to make good immediately it appears.

All excavated material that is not required for backfilling shall be spread and compacted on nominated areas or disposed of as directed by the Superintendent.

C4.9 Cleaning Up

Any damage done by the Contractor to existing infrastructure, buildings, fences, services, etc. shall be immediately made good to the approval of the Superintendent.

During the period of the Contract, the Contractor shall clean up the construction site and remove all surplus construction material and debris from the site. At the completion of the Contract the Site shall be clean and tidy, all excavations filled flush with the natural ground level, and all excess material removed.

The Contractor shall immediately reinstate any subsidence over trenches occurring at any time during the Defects Liability Period.

C4.10 As Constructed Survey

C4.10.1 General

The requirements of this section shall be met by the Contractor. As Constructed plans shall be submitted prior to Practical Completion.

The survey shall include all invert levels at all pits, headwalls, centre to centre distance of pits, distances from centre of pits to headwalls, size of pipes, types of pipes and bedding, location of pits in relation to adjacent boundaries, reduced levels of access chamber and entry pit covers.

C4.10.2 As Constructed Plans

The Contractor shall prepare as-constructed plans to the Local Authority's standards.

As Constructed plans shall be produced by the Contractor and provided to the Superintendent in "hard" copy and electronic (CAD and PDF) format. The plans shall be signed by a Licensed Surveyor.

This shall include D-Spec as-constructed plans where required by the Local Authority.

C4.11 Local Authority Handover Inspection

The Contractor shall make arrangements with the Superintendent for a joint inspection of stormwater drainage infrastructure with the Local Authority at or prior to the Practical Completion inspection. The Contractor shall arrange for the following prior to the inspection:

- Sweeping of roads.
- Cleaning out of stormwater drainage lines if unclean at the time of the inspection.
- Dewatering of stormwater drainage if standing water is present at the time of the inspection.

The Contractor shall arrange for the following at the inspection:

- Water truck to test for ponding and drainage performance.
- Personnel to lift access chamber lids for inspection.
- Equipment to sight lines.

The Contractor shall provide a minimum of 72 hours' notice prior to the inspection.

C4.12 Final Inspection

The Contractor shall make similar allowances as required for the Local Authority handover inspection in preparation of and during the Final Inspection at the expiry of the Defects Liability Period.

C5 PUBLIC UTILITY SERVICES INSTALLATION

C5.1 General

The Principal has entered into agreements with Public Utility Authorities for the provision of electricity, communications, gas and water services. Joint use trenching is proposed for the public utility services where practicable. Although details of all services routes are not available at this stage it is expected that the routes of power, gas and communications will follow a similar alignment with some minor extensions and alterations.

The Contractor shall be responsible to co-ordinate and programme the installation such that all work by the relevant Public Utility Authorities or the Contractor is completed so as not to hinder or delay the progress of the overall construction work under the Contract.

The Contractor is to ensure that pavement areas are prepared with access tracks to provide suitable access for the service authorities. Alternative access provisions will only be allowed if accepted by the relevant service authorities.

Excavation of trenches, winning and placement of bedding sand and backfill will be required to be carried out by the Contractor.

The Contractor is to ensure that the lot boundary pegs placed by the survey consultant are protected and in place while the service authorities carry out their works on site.

C5.2 Alignment and Cover

Alignment and depth of services shall meet the requirements of the various servicing authorities.

Alignment of services along roads shall be as indicated on the drawings or in accordance with the Utility Providers Code of Practice.

Service Crossings shall be perpendicular to road centrelines and laid with cadastral boundary pegs. Gas conduits shall be placed on the centreline of the trench (or next to each other where there are two services). Water shall be placed 500mm either side of the centreline of the trench. Communication service crossings shall follow an alignment from boundary peg to boundary peg. In some cases this will mean that communication service crossings may not always be perpendicular to the road centreline.

Required cover for services shall be as follows:

- Underground Power (Low Tension) 750mm
- Gas Main 750mm
- Water Main 600mm
- Sewer Main 600mm min
- Telecommunications 450mm

Service crossings shall be installed prior to the placement of the pavement base course.

C5.3 Scope of Work

The Contractor shall be responsible for the following:

Trenching for Electricity, Communications, Gas, Water and Sewer services and within private lot and across roads.

- Excavation of material for pillars, padmounts, etc.
- Supply and installation of ducts for electricity and water services road crossings.
- Transportation to site of power cable and standard street light columns.
- Protection and insurance of power cable and standard street light poles until Practical Completion of Contract.
- Laying of power cables to Western Power requirements and co-ordination of Western Power to joint cables. Notification to Western Power so that inspections of trenching before laying cables and prior to backfill of cables. Cable laying contractors must be approved by Western Power.
- Installation of street light columns and associated cables.
- Return of unused cable to Western Power depot.
- Installation of ducts for gas service services (if required, supply of materials by ATCO Gas).
- Winning and placement of bedding sand (from site or imported).
- Installation of safety marker tape in trenches.

The sand shall be neatly placed in the trench over its full width. The Contractor shall then level it with hand tools so that the surface does not deviate by more than 50mm from a 3m straight edge when laid parallel to the centreline of the trench. The deviation across the trench shall be more than 50mm.

- Additional backfill and re-grading of bedding to make smooth following the installation of services and initial backfill by a particular service authority (whether it be power, gas or Telecom) prior to the commencement of a subsequent authority.

It shall be clearly the responsibility of the Contractor to ensure that the trench bedding is at the level and graded to the requirements of a particular service authority prior to their mobilisation to site, regardless of the activities of the previous authority.

- Installation of gas mains and telephone pipes and pits will be carried out by the respective public utility authorities. It shall be the Contractor's responsibility to co-ordinate the installation of these services and ensure that the construction programme is not delayed. No extension of time will be granted should the Contractor fail to give service authorities sufficient notice.
- Backfill and compaction of the trenches with clean fill to formation level.
- Disposal of unsuitable material excavated from trenches.

C5.4 Notification for Installation of Services and Road Crossings

The Contractor shall be responsible to programme the installation of services and service conduits by the various Public Utility Authorities and for notifying the following authorities at least two (2) weeks prior to the completion of trenching works. The Superintendent will advise the Contractor of the relevant contact upon request to do so.

C6 STRUCTURAL CONCRETE

All structural concrete shall be supplied and placed in accordance with the following Specification.

C6.1 Scope

This Specification is to be read in conjunction with the civil drawings and any other relevant drawings, the "Preliminaries" section which forms an integral part of this section and any other instructions that may be issued.

The Contract shall include for all necessary materials, labour, plant, equipment and cartage to complete the works shown on the drawings and described in this Specification. All works shown on the drawings but not referred to in the Specification, or referred to in the Specification but not shown on the drawings, shall be included. Current local authority specifications shall apply where available. Whenever local authority specifications are unavailable or where they do not cover the required scope of works then the following clauses in this section of the specification shall apply.

C6.1.1 Codes of Practices

Unless otherwise specified or shown on the drawings, the provisions of the following Australian Standard Codes and Specifications, together with their latest amendments and other standards and publications which are listed in them and may be required to be read in conjunction with them, are included as part of this Specification.

AS 1012	Methods of Testing Concrete
AS 1141	Methods of Sampling and Testing Aggregates
AS/NZS 4671	Steel Reinforcing Materials
AS 1379	Specification and Supply of Concrete
AS 1466	Metallurgical Furnace Slag Aggregate for Concrete
AS 1478.1	Chemical Admixtures for Concrete, Mortar & Grout – Admixtures for Concrete
AS 1597	Precast Reinforced Concrete Box Culverts
AS 3600	Concrete Structures Code
AS 3610	Formwork for Concrete
AS 3972	Portland and Blended Cements
AS 2758	Aggregates and Rock for Engineering Purposes - Part 1-1998, Concrete Aggregates
AS 3799	Liquid Membrane-Forming Curing Compounds for Concrete.

Table C6-1 – Code of Practices

C6.1.2 Testing and Sampling

Unless specified otherwise or shown on the drawings, all sampling and testing is to be carried out in accordance with the relevant Australian Standards at a laboratory registered with The National Association of Testing Authorities unless an alternative laboratory is agreed to by the Superintendent.

All site control testing shall be strictly in accordance with AS 3600.

Frequency of sampling shall be in accordance with the following table.

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Batch Volume per day (m ³)	Number of Samples
Up to 10	1
10 to 30	2
30 to 100	3

Table C6-2 – Concrete Frequency of Sampling

For each additional 10 batches, one additional sample shall be taken. This frequency may be relaxed only at the discretion of the Superintendent.

C6.1.3 Failure of Tests

If testing carried out in accordance with the above codes does not pass, the concrete in question shall be demolished and replaced at the expense of the Contractor or test loaded in accordance with Code requirements. The decision as to whether to test load or demolish will be the responsibility of the Superintendent after conferring with the Contractor.

C6.1.4 Concrete Ordering

Each time concrete is ordered the Contractor must provide the following information to the ready-mix supplier and arrange for that information to be recorded on both the delivery dockets and test certificates.

- The characteristic strength f'_c .
- The nominal maximum size of aggregate.
- The required slump.

If approval has been given by the Superintendent for the use of an admixture, the type and name of the admixture is also to be shown on the delivery dockets and test certificates.

C6.1.5 Sizes

All sizes shown on structural drawings are nett sizes and make no allowance for finishes.

C6.1.6 Details

The contractor shall adhere to all details and shall not vary from them without written permission and shall not make assumptions regarding concrete finish, formwork patterns or formwork standards. All such matters are to be referred to the Superintendent for his decision.

C6.1.7 Standard of Finish

All concrete finishes shall be First-class with good workmanship. Any concrete which does not meet with the approval of the Superintendent because of placement discontinuity, poor materials, variation in materials, poor compaction or mixing, or unsuitable formwork, shall be demolished and re-built at the expense of the Contractor.

C6.1.8 Inspection

The Superintendent shall be notified when formwork and reinforcement is to be completed so that an inspection can be carried out prior to concreting. At least forty-eight (48) hours' notice is to be given in advance of an inspection. The Contractor shall satisfy himself that all work necessary is finished and correct twenty-four hours before the inspection takes place. No section of concrete shall be poured until all requirements of the Superintendent have been satisfied.

C6.1.9 Galvanised Steel Fittings

Where identified on the drawings, steel fittings shall be pickled to AS 1627 then hot dipped in zinc to give a coating density of not less than the minimum thickness quoted in Table 6.1 of AS 1650. All galvanising shall conform to AS 1650. Care shall be taken to prevent any strain ageing effects resulting from cold working. All galvanised items which are cast into concrete shall be passivated in a 0.2% sodium dichromate solution or its equivalent.

C6.2 Materials

C6.2.1 Concrete

C6.2.1.1 Generally

All materials shall conform with the requirements of AS 3600 and to other relevant SAA Codes.

C6.2.1.2 Cement

Unless otherwise stated, all concrete shall use fresh, cool, locally manufactured Portland cement, Type GP, complying with AS 3972, supplied direct from the manufacturer to the pre-mixing plant. Under no circumstances shall blended cement be used except where specifically stated or where approved by the Superintendent in writing. Particular care shall be undertaken to avoid contamination in storage and mixing operations. The minimum cement content per cubic metre for the various grades of concrete specified shall not be less than those tabulated on the shop drawings.

C6.2.1.3 Aggregates

Clean, dense, natural fine and coarse aggregate complying with AS 2758 Pt. 1 shall be used. Crusher dust shall not be used. The aggregates shall be consistent in grading, free from impurities that would stain and from one source. Aggregate shall be stockpiled if necessary to maintain consistency.

The colour of the fine aggregate shall be chosen so that the desired fair-faced finish can be achieved.

The fines ratio (which is defined as the proportion by weight of aggregate passing the 1.18mm sieve size to the total aggregate in the mix), shall not exceed 0.4.

The contractor shall refer to the drawings for the maximum aggregate size that can be used in the various concrete elements.

The aggregates for the wall facing panels with a treated surface shall be stockpiled in sufficient quantity for the whole of the work of this Contract plus an allowance for possible remakes.

This aggregate shall be covered or protected from dust causing colour variation.

Aggregate for the facings shall be selected by the Superintendent and shall be of a grading agreed upon after the casting of the samples.

C6.2.1.4 Water

Water shall be clean, potable, mains water in compliance with AS 3600 and Table 3 of AS 1379.

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C6.2.1.5 Admixtures

Concrete shall be of high quality, plastic and workable, consistent and cohesive yet holding slump, not segregating and not bleeding. If the concrete supplier and Contractor consider the use of any admixtures advisable, they may incorporate them after consultation with the Superintendent. They shall be checked for compatibility with each other and with the cement and aggregates being used. They will in no way nullify the supplier's normal guarantees and must not adversely affect the steel to concrete bond.

Admixtures if approved for use shall comply with AS 1478 and their use in concrete shall be in accordance with AS 1479.

Under no circumstance shall any admixture containing calcium chloride or any type of chloride be used in any concrete mix for this project.

C6.2.1.6 Membrane Underlay

Membrane underlay shall be minimum 0.2mm thick, black in colour with joints lapped 150mm. Punctures and around penetrations shall be sealed with pressure sensitive tape.

C6.2.1.7 Ready Mixed Concrete

Unless otherwise agreed all concrete shall be ready-mixed and supplied direct from the batching plant to the site. The following information shall be provided to the Superintendent for approval prior to the delivery of any concrete to site:

- name of proposed supplier,
- proposed mixes for concrete specified including type of cement, water / cement ratio, aggregate / cement ratio, coarse and fine aggregate type, aggregate grading curves and details of any proposed admixture,
- the source of all aggregates to be used,
- the distance from the batching plant to the site, and
- any comments or suggestions considered necessary.

C6.2.2 Concrete Strengths

The quality of concrete required is described by its characteristic compressive strength f'_c as defined in AS 3600. Results of strength tests shall be in the possession of the Superintendent within twenty-four hours of testing. Unless specified elsewhere, on the drawings, or in the Special Conditions, the required concrete strengths, aggregate size and slumps shall be as per the following Table C18-3, along with any other properties that are considered necessary.

Location	Compressive Strength (MPa)	Slump (mm)	Max. Aggregate (mm)	Admixture Additives
Culvert Base and Apron Slab	40	80	20	-
Wingwalls	40	100	10	-
Rigid Pavement	32	80	20	-
Blinding / Fill	20	80	20	-
Precast Culvert and Crown	Refer to manufacturer details			

Table C6-3 – Concrete Strengths Acceptable

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Alternate mix designs are to be submitted to the Superintendent for approval prior to batching of concrete and/or delivery of materials to site.

Admixture dosage rates are to comply with manufacturer's specifications. Any proposed substitution of admixtures specified in Table C18-3 is to be submitted to and approved by the Superintendent prior to batching of concrete and/or delivery of materials to site.

C6.3 Reinforcement

C6.3.1 Generally

Steel reinforcement shall comply with AS/NZS 4671 "Steel Reinforcing Materials". Unless otherwise indicated on the drawings, the reinforcement should be of the following minimum grade:

- High-tensile hot rolled deformed bar (fsy = 500MPa) (designated as "N" on the drawings).
- Hot rolled round steel reinforcing bars (fsy = 250 MPa) (designated as "R" on the drawings).
- Hard-drawn wire (fsy = 450 MPa) (designated as "W" on the drawings).
- Steel meshes (fsy = 450 MPa) (designated as "SL" on the drawings).

All reinforcement shall be free from scale, loose rust, oil, paint, grease or other matter that may impair bond between the concrete and reinforcement or cause disintegration of the concrete.

Reinforcement shall be stored on a rack sufficient to keep it from contact with the ground and to afford protection from the weather.

Reinforcement which, in the opinion of the Superintendent, is excessively corroded shall be condemned and removed from the site.

C6.3.2 Reinforcement Supports

Reinforcement supports shall be plastic chairs, concrete blocks or similar approved. Plastic tipped metal chairs shall not be used in exposed faces (eg. Wingwall external face).

C6.4 Formwork

C6.4.1 Generally

All materials for formwork where it is not critical shall comply with the requirements of AS 3610. Unless otherwise agreed to by the Superintendent or otherwise shown on the drawings, materials for all formwork shall be as specified below.

C6.4.2 Formwork

Where it is not critical, in-situ formwork, such as at footing edges, can be constructed from any suitable material which will meet Code requirements for a Class 5 formwork.

In-situ formwork from any suitable material which will meet Code requirements for a Class 1, Class 2 or Class 3 formwork can be utilised as appropriate.

The surface finishes required from forms in the various concrete elements shall be as follows:

Insitu Concrete Elements	Surface Class
Wingwalls	Class 2
Concealed slab edges	Class 5
Exposed slab edges	Class 3

Table C6-4 - Formwork Surface Finishes

C6.5 Miscellaneous Materials

C6.5.1 Generally

Where materials are referred to on the drawings either by generic types or by specific trade names, they shall be used strictly in accordance with their respective manufacturer's instructions.

C6.5.2 Underlay Membrane

The underlay membrane shall be I.C.I. 200 micron "Fortecon" PVC film, or any approved equivalent, black in colour with joints lapped 150mm. Punctures and around penetrations shall be sealed with pressure sensitive tape.

Membrane shall be laid where specified and turned up against the slab edge. Membrane is also be laid under footings where shown on the structural drawings.

C6.6 Workmanship

C6.6.1 Formwork

C6.6.1.1 Generally

Formwork shall be made to the shapes, grades and dimensions of the concrete shown on the drawings and to generally comply with the Architectural drawings. Any discrepancies are to be reported as they are found.

Formwork is to be constructed to prevent loss of grout and to remain rigid and level during concreting, as well as being able to be stripped without injuring the concrete surface or any other structural medium.

Joints between formwork panels shall be tight and leak proof to prevent loss of grout from the concrete, and shall be sealed with a suitable foamed plastic strip.

Unless shown otherwise on the Architectural drawings, 15mm fillets and chamfers shall be formed to all exposed edges and corners.

All formwork shall comply with the requirements of; AS 3610 formwork for Concrete.

Formwork for exposed elements shall be constructed from full sheets laid in a regular pattern so that a neat pattern of jointing appears on the exposed surfaces.

In critical exposed areas of the work the pattern shall be submitted to the Superintendent for approval.

C6.6.1.2 Cleaning and Inspection

All forms shall be cleaned of foreign matter, including wire ends, clips, ties and displaced bar chairs immediately prior to concreting, using compressed air and magnets. Provide temporary openings at the base of walls and column forms and at other points necessary to facilitate cleaning. The contractor shall not place concrete in any section before it has been inspected and approved.

C6.6.1.3 Construction

Formwork for in-situ concrete shall be designed so that it may be stripped from all surfaces without damaging these or any corners.

Formwork shall be made to the shapes, grades and dimensions of the concrete elements shown on the drawings.

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Formwork shall be constructed to remain level and rigid during concreting and to prevent loss of grout from the concrete.

The structural adequacy of all formwork is the sole responsibility of the Contractor.

C6.6.1.4 Removal of Forms

The contractor shall observe the requirements of Table 5.4.1 of AS 3610 and 19.6.2 of AS 3600 and maintain forms firmly in place until the concrete has attained the necessary strength to support its own weight and construction loads. The compressive strength at the time of stripping must be equal to or greater than 70% of the specified compressive strength at 28 days. Test results from cylinders verifying these strengths shall be made available to the Superintendent before stripping commences if requested.

Unless otherwise authorised by the Superintendent, the following minimum period shall elapse before the removal of the formwork.

Vertical surfaces including walls, edging and columns	2 days
---	--------

Table C6-5 – Formwork Minimum Periods before Removal

C6.6.1.5 Tolerances

Formwork shall be made to the shapes, grades and dimensions of the concrete elements shown on the drawings. It shall be constructed to remain level and rigid during concreting and to prevent loss of grout from the concrete.

Tolerances applying to concrete sections shall be as follows:

Size of members	+ 5, - 0mm
Cover to reinforcement where the normal cover is less than 25mm	+ 5, - 3mm
Grooves, width and depth	+ 2, - 2mm
Location of any holes for services or fixings true positions	Within 10mm of their true positions
Position of individual connecting bolts, bolt holes, projecting metal or other devices where critical	Within 3mm of their true positions
Deviation from a straight line in any plane	Less than 3mm in 3500mm
Any abrupt changes in section is not to exceed	2mm

C6.6.1.6 Formwork to Footings

Where the nature of the ground is such that excavations for footings may in the opinion of the Superintendent collapse, such excavations shall be adequately planked and strutted before placement of concrete.

C6.7 Reinforcement and Embedment

C6.7.1 Generally

Required reinforcement types, sizes and layouts are shown on the drawings. The contractor shall comply with these requirements and the relevant codes.

C6.7.2 Storage

All reinforcement is to be stored clear of the ground on site.

C6.7.3 Cleaning

Immediately before concreting, reinforcement is to be cleaned from any matter which would reduce its bond to the concrete.

C6.7.4 Forming

All bends, cranks and hooks shall be cold formed in accordance with AS 3600. Welding, flame cutting or heating shall not be used without the written approval of the Superintendent.

C6.7.5 Placing

All reinforcement shall be placed accurately and held on approved plastic chairs. Care shall be taken to ensure that the waterproof membrane on the ground is not punctured. All reinforcement is to be secured in place using 1.25mm annealed wire ties at intersections. All marking tags are to be removed. Wall reinforcement shall be tied for its full height.

Reinforcement in retaining wall up stands is to be supported on fully plastic chairs on formwork to the earth face.

C6.7.6 Splicing

Unless otherwise shown, lap all bars at splices a minimum of:

deformed bars	50 diameters
round bar	50 diameters
meshes	overlap one full mesh (two rods) of each sheet.

C6.7.7 Cover

Unless otherwise shown on the drawings, cover to reinforcement shall be as follows:

Culvert base and apron slab	55mm Top, 65mm Bottom
Rigid Pavement	30mm Top
Side cover to wingwall upstand (earthface)	55mm
Precast box culvert and crown	Refer to culvert manufacturer

Ensure that cover is maintained during concreting.

C6.7.8 Built-In Bolts etc

Build in all necessary plugs, bolts, cast-in sockets, plates, ties, wire ties, pipe conduits, flashings and fastenings required. Form all necessary sleeves for all pipe holes through the floor. Care shall be taken to minimise cutting after concrete placement. Architectural drawings are to be checked for moulds, battens, drips and chamfers and built in as required. Holding down bolts are to be accurately placed in position and to the levels required.

C6.7.9 Inspection

All reinforcement is to be placed and checked a minimum of twenty-four hours before a proposed concrete placement in any section. The Superintendent is to be notified 48 hours prior to a proposed concrete pour to allow for an inspection by the Superintendent during the placing of the

reinforcement. No section shall be concreted until it has been inspected by the Superintendent and any mistakes rectified.

C6.8 Concrete

C6.8.1 Generally

Required strengths, maximum aggregate sizes and slumps are indicated on the drawings. The contractor shall comply with the requirements given and the relevant Codes.

C6.8.2 Mixing and Transportation

Concrete is to be obtained from an approved central plant and have it transported to the site in a pre-mixed condition by means of specially constructed agitator trucks.

Water shall be added at the site only with the specific approval of the Superintendent and only if the allowable water / cement ratio is not exceeded. Water shall be added only by the pre-mixing company's engineer or his representative under his instructions. Water added on site will not void any strength requirements. If excessive water is present, the concrete may be rejected. Segregation must not occur. All mixing and transportation shall comply with the requirements of AS 1379.

Concrete shall be placed in its final location within 90 minutes of the mixing water being added or within 60 minutes in hot weather. Should the aforementioned timeframes not be achievable the concrete supplier is to advise of likely durations between addition of mixing water and placement of concrete, and is to submit the proposed mix to the Superintendent for approval.

C6.8.3 Mix Proportions and Consistency

Mix proportions are to be arranged so that the required finish is achieved even if minor formwork leakage occurs. The mix must be cohesive. Areas of uncompacted concrete will be considered the result of incorrect mix proportions or improper workmanship and must be replaced at the expense of the Contractor. To avoid the necessity for demolition, any agitator load of concrete which looks unsuitable from the point of view of segregation, fines content, or workability, shall be dismissed from the site. Consistency shall be checked by slump. A standard slump cone and ramming rod shall be held on the site by the Contractor for this purpose.

C6.8.4 Target Slump

Target slumps shall be as shown on the drawings. Any agitator load which exceeds the margin laid down in AS 1379 shall be dismissed from the site.

C6.8.5 Placing

All implements are to be cleaned prior to concreting. Check that all block outs, items to be built in, electrical work and plumbing, is in position before commencing. Do not commence concreting until all previous work satisfies the Superintendent. Suitable methods of transporting concrete over the formwork shall be arranged. These methods shall not aggravate segregation, move reinforcement or damage formwork.

Each section between approved construction joints shall be placed monolithically. To this end, fresh concrete is to be placed continuously against unset concrete. Delay no longer than 20 minutes between additions to the working face. Concrete is to be deposited as nearly as is practicable in its final position. The concrete shall not be dropped from a height exceeding 3m without special permission.

Adequate labour is to be provided to ensure proper compaction and placing of concrete. Deliveries to the site are to be organised in such quantities as can be efficiently handled by the labour available.

C6.8.6 Compacting

All concrete is to be thoroughly and continuously compacted, including ground floor slabs, using immersion vibrators. Care is to be taken not to move reinforcement. Vibrators having a minimum frequency of 8000 cycles per minute shall be used. The vibrator head shall be placed in the concrete at no greater than 300mm centres during placement and left until bubbles cease to rise.

Great importance is attached to adequate vibration and only experienced vibrator hands should be used. The contractor is to ensure that sufficient suitable vibrators are available to maintain continuous vibration of all placed concrete. At least one spare vibrator in working order shall be kept on standby during all concreting operations.

C6.8.7 Finishing

Finishing operations comprising levelling, floating and trowelling, shall commence immediately following compaction of the concrete and shall be completed as soon as possible.

C6.8.7.1 Levelling

Following the pass of the screed, minor irregularities and score marks in the surface shall be eliminated by means of a hand-operated, long-handled float. When necessary the float shall be used to smooth and fill in open textured areas in the slab surface.

C6.8.7.2 Floating

Floating shall be undertaken using approved powered mechanical equipment. Floating shall not commence until all surplus moisture has been removed or has evaporated from the surface of the concrete, and the surface is sufficiently hard to resist displacement under the action of the float. Floating shall be undertaken in a regular pattern over the entire surface of the concrete to produce a closed and level surface.

C6.8.7.3 Trowelling

Trowelling shall be undertaken initially using approved powered mechanical equipment. Trowelling shall commence after the surface has been power-floated. Trowelling shall not commence until the surface is sufficiently hard to resist displacement under the action of the trowel. The blades of the trowel shall be tilted such that maximum pressure is applied without leaving ridges on the surface of the concrete. All trowelling shall be finished by hand to achieve a dense, hard, even, smooth, ridgeless surface to the concrete complying with all Specification tolerances.

C6.8.7.4 Scored Finish

The rigid pavement over the culvert requires a scored finish after screeding and floating. Give the surface a coarse texture in the direction perpendicular to the road alignment by drawing an approved scoring tool (broom / stiff brush) across the surface.

C6.8.8 Patching and Cleaning

If plastic cracking occurs this shall be repaired before concreting has reached its final set. Where mortar fins or irregularities have not resulted in the rejection or demolition of the concrete, the following procedures shall be adopted.

Grind off any mortar fins or irregularities and fill all holes using a mix with the same cement / sand ratio as the parent mix with just sufficient water for workability. Clean off excess material with burlap twenty-four hours later and rub down with a stone if necessary.

C6.8.9 Curing

After placing concrete, it shall be protected to prevent loss of moisture from it by the following or other approved means.

Where possible pond all horizontal surfaces with a minimum of 25mm of water for a minimum of seven days. The dykes holding this pond shall be made leak proof so that there is no discolouration of previously placed concrete by dirty water. Place ponding immediately concrete is set, or immediately after application of topping when topping is to be applied monolithically with the slab. In hot weather, spray all exposed surfaces continuously with a fine mist sprayer to prevent surfaces drying immediately after screeding off or alternatively apply an approved sealant such as 'Confilm' in accordance with the manufacturer's recommendations.

Any applied membrane proposed and approved for curing purpose shall comply with the requirements of AS 3799 and shall not reduce the bond or otherwise interfere with the performance of any applied finish.

If other forms of curing are considered advisable by the Contractor, the matter shall be raised and approved prior to alternatives being instigated. If necessary supply information to the Superintendent showing that the proposed method is effective and will not in any way affect the long term performance of the concrete including reducing the bond to the concrete of any applied finish.

Any exposed surfaces must be saturated with water before the polythene film is applied.

C6.8.10 Protection

All finished fair-face surfaces shall be protected during building operations. All trades are to be instructed to keep surfaces clean and to guard against damaging them. Any staining or discolouration is to be cleaned down immediately.

C6.8.11 Weather Conditions

When the ambient temperature is in excess of 32 deg C but not more than 38 deg C:

- Formwork and reinforcement is to be cooled down with water spray immediately prior to placing concrete. Any free water shall be removed before concreting commences.
- Concrete not exceeding 32 deg C when being placed shall be used.
- Surface of concrete shall be kept moist until proper curing begins.
- A retarding additive approved by the Superintendent shall be incorporated with the concrete mix at the batch plant in accordance with the manufacturer's instructions.

When ambient temperature exceeds 38 deg C concrete supply is to stop. Placement is to cease at a construction joint located where directed by the Superintendent. Placing of concrete is to be arranged so that it will finish before the ambient temperature exceeds 38 deg C.

Concrete in exposed areas may be placed in inclement weather if temporary covers approved by the Superintendent are erected.

C6.9 Rigid Concrete Pavements

Rigid concrete pavement must be designed using the procedure for rigid road pavements in AUSTRROADS Guide to Pavement Technology Part 2 - Pavement Structural Design (2010). Concrete pavements must also satisfy the requirements set out in RTA QA Specification R83 and R84, RTA R83-R84 User Guide and RTA standard concrete pavement detail drawings.

C6.9.1 Expansion Joints

Expansion joints in pavements shall be constructed as nominated on the construction drawings, (every second joint). Generally the expansion joints will be placed at locations nominated on the drawings. Expansion joints shall be constructed 10 mm wide for the full depth of the slab. Ableflex 10mm polyethylene expansion joint or similarly approved is to be installed as per manufacturer's specification and as per the drawing detail. The top 10mm strip to be removed and caulked with Davco Davisil exterior sealant or similarly approved to match adjoining paving colour. All jointing will be finished flush with the surface of the pavement.

C6.10 Repairs to Reinforced Concrete

C6.10.1 General

This section covers the materials and standard of workmanship required for the preparation and repairs of externally exposed reinforced concrete elements which exhibit visible evidence of deterioration. e.g. rust, stains, spalling. The Contractor shall supply all necessary plant, equipment, materials and labour, prepare the surface and apply the repair system to reinforced concrete in accordance with this Specification.

Work shall only be carried out by companies with experience on projects of similar nature. Only skilled workmen shall be employed on the work. They shall be effectively supervised and follow accepted procedures of surface preparation and concrete repair practice.

C6.10.2 Surface Preparation of Concrete

The contractor shall remove suspect concrete from around corroding reinforcement elements as directed by the Superintendent. Defective concrete shall be removed using a light power chisel to minimise further damage of the concrete substrate and reinforcement. A concrete saw shall be used to delineate the edges so as to avoid feather edges to the repair. All cementitious materials covering corroded steelwork shall be completely removed until:

- (a) The concrete is sound, hard and free of visible contamination;
- (b) The breakout has continued behind the bar for not less than 15mm;
- (c) The reinforcement projecting from the breakout face is clean and uncorroded for an exposed length of at least 100mm.

Two hours prior to applying patch repair, the concrete substrate shall be hosed with potable water and allowed to dry.

C6.10.3 Surface Preparation of Reinforcement

Oil or dirt shall be removed from steel elements (by solvent cleaning or other accepted methods) prior to blast cleaning operations.

All visible mill scale, rust, oxides, paint and other foreign matter shall be removed from the surfaces to be coated by wet abrasive blast cleaning to a Class 2 ½ finish as specified in Australian Standard AS 1627 Part 4.

After blast cleaning the reinforcing bars, they shall be checked for loss of section. Where any bar has lost 20% or more of its original diameter it shall be augmented with a new bar to the satisfaction of the Superintendent.

6.6 Appendix 6.6 – Landscape Specification



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Specification

Revision	Date	Prepared by	Approved by
IFT REV A	15/0/22	RTE	NP

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1 PRELIMINARY TECHNICAL CLAUSES

1.1 PRECEDENCE

General

Order of precedence:

- The requirements of this specification override conflicting requirements of the project drawings, details and material schedule.
- Any clashes found between the technical specification, material schedule and project documentation are to be brought to the superintendents attention prior to undertaking any works.
- The requirements of the referenced documents are minimum requirements.

1.2 REFERENCED DOCUMENTS

General

Contractual relationships: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions: Use referenced documents which are the editions, with amendments, current 3 months before the closing date for tenders, except where other editions or amendments are required by statutory authorities.

European standards: Any national European Standard (e.g. BS EN or DIN EN) may be used in place of the equivalent referenced European Standard (EN) at the sole discretion and approval of the Superintendent.

1.3 INTERPRETATION

Documentation conventions

Imperative mood and streamlined language: The words 'shall' or 'shall be' are implied where a colon is used following a keyword or within a sentence or sentence fragment.

Subject of sentences and phrases: Specification requirements are to be performed by the contractor, unless stated otherwise.

Abbreviations

General: For the purposes of this specification the following abbreviations apply:

- AS: Australian Standard.
- BCA: National Construction Code Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- NATA: National Association of Testing Authorities.
- SDS: Safety data sheets.
- VOC: Volatile Organic Compound.
- WHS: Work Health and Safety.

1.4 CONTRACT DOCUMENTS

Services diagrammatic layouts

General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.
- Coordinate the design and installation in conjunction with all trades.

Levels

General: Spot levels take precedence over contour lines and ground profile lines.

Drawings and manuals for existing services

General: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services. The contractor shall review and confirm all drawings on site, any discrepancies that may impact scope or cost of works shall be addressed with the superintendent prior to any works commencing.

1.5 DESIGN DEVELOPMENT

General

Requirement: Complete the design of the work, including development of the design beyond that documented.

Conflict with the documents: If it is believed that a conflict exists between statutory requirements and the documents, notify the contract administrator immediately and provide a recommendation to resolve the conflict.

1.6 MATERIALS AND COMPONENTS

Manufacturers' or suppliers' recommendations

General: Provide, transport, deliver, store, handle, protect, finish, adjust and prepare for use the manufactured items to the manufacturers' or suppliers' recommendations.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate to the manufacturers' or suppliers' recommendations.

Project modifications: Advise of activities that supplement, or are contrary to the manufacturers' or suppliers' recommendations.

Product identification

Sealed containers: If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the materials or products to point of use in the original containers or packages.

Other products: Marked to show the following, as applicable:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Sources policy

General: Where suitable all products shall be sourced & supplied locally.

Consistency

General: For each material or product use the same source or manufacturer and provide consistent type, size, quality and appearance.

Prohibited materials

General: Do not provide the following:

- Materials, exceeding the limits of those listed, in the Safe Work Australia *Hazardous Chemical Information System* (HCIS) Workplace exposure standards.

Substitutions

Identified proprietary items: Identification of a proprietary item does not necessarily imply exclusive preference for the identified item, but indicates the necessary properties of the item.

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives, including the following:

- Evidence that the performance is at least equal to that specified.
- Evidence of conformity to a cited standard.
- Samples.
- Essential technical information, in English.
- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.

Availability: If the documented products or systems are unavailable within the time constraints of the construction program, submit evidence.

Criteria: If the substitution is for any reason other than unavailability, submit evidence that the substitution:

- Is of net enhanced value to the principal.
- Is consistent with the contract documents and is as effective as the identified item, detail or method.

1.7 SHOP DRAWINGS

General

Documentation: Submit shop drawings to the Superintendent for examination.

Obtain certified examined drawings from the Superintendent before manufacture or installation commences for all work and all fabricated items including all fittings and fixings and the like.

Submit shop drawings in a timely manner, allowing a minimum of 5 working days for examination prior to return.

Shop drawings shall be dimensioned drawings showing details of the fabrication and installation of structural elements, building components, services and equipment, including relationship to building structure and other services, cable type and size, and marking details. Drawings shall contain reference to all work, including all elements, galvanising ventilation holes, transportation lugs, fittings and fixings as required by all trades.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and prepare dimensioned set-out drawings.

Services coordination: Coordinate with other building and service elements. Show adjusted positions on the shop drawings.

Space requirements: Check space and access for maintenance requirements of equipment and services indicated diagrammatically in the contract documents.

All elements under the works including all fittings and fixings shall be referenced as to material, dimension and location within the works. Show on drawings single line schematics, plans, elevations, dimensions, equipment, fittings and fixings and the like detail, as required to fully describe the works to be supplied, installed and commissioned

Comments on "examined" shop drawings will apply to general principles of design only. Examination of the drawings by the Superintendent or Relevant Consultant will in no way relieve the Contractor's responsibility for any errors, omissions or necessity of furnishing such workmanship or materials as may be required for the completion of these works in accordance with the contract documents.

Record drawings: Amend all documented shop drawings to include changes made during the progress of the work and up to the end of the defects liability period.

1.8 DEMOLITION

Execution

In general, the works consist of the demolition of all structures on site and site works (unless noted otherwise on the Drawings) including, but not limited to the following:

All demolition works shall be staged in accordance with the overall construction program. The Contractor shall make itself aware of all site conditions which may impact the works and allow for all 'after-hours' work as may be required to complete the works in a safe and secure manner.

The Contractor shall obtain appropriate structural engineering advice for all temporary structures, scaffolding and partial demolition.

The Contractor shall perform all related works required to complete the specified works. This shall include, but not be limited to:

- Disconnection and/or adjustment of all existing services by appropriate tradespeople and Authorities.
- Temporary support structures.
- Asbestos and hazardous material removal.

Before demolishing and removing any parts of a structure having electrical wiring, gas or water pipes, conduit, telecommunications or similar items, the Contractor shall notify the Superintendent and Authorities having jurisdiction to make sure that these items are out of service so that they can be removed without danger.

If existing services such as public utilities, drains and other services are encountered, obstructed or damaged in the course of performing works under the Contract, the Contractor shall take the following action to the satisfaction of the relevant authority:

- If the service is to be maintained, repair, divert or relocate as instructed or agreed with the service authority.
- If the service is to be abandoned, cut and seal or disconnect as instructed or agreed with the service authority.

The Contractor shall pay all authority fees for 'standard' service adjustments and disconnections within their lump sum tender price.

1.9 OFF-SITE DISPOSAL

Removal of material

General: Dispose of building waste material off site to the requirements of the relevant authorities as required by RFT 02-2021/2022.

In addition to the requirements of the removal of material clause above, the Contractor shall also comply with the requirements of this clause where hazardous materials are present.

It shall be wholly the Contractor's responsibility to assess the extent of hazardous material to be removed under the Contract. The Contractor shall prepare appropriate work methods to comply with the regulatory requirements for the removal of such materials.

The Contractor shall be wholly responsible for the ongoing surveillance, identification, appropriate handling and disposal of hazardous materials during the course of the demolition works.

Removal shall be in accordance with all regulatory requirements. Evidence of the registration and experience of removalists shall be submitted prior to work commencing.

Appropriate safety measures shall be implemented during the handling and transportation of the materials.

1.10 DIVERTING WATER AND DEWATERING

The Contractor shall do all the work necessary to divert any water including stormwater runoff from interfering with the works, keep the Site free from such water while the works are in progress and make good any damage to the works by water due to floods or other causes during the Contract. The diversion of this water shall be to the Superintendent's approval and shall not affect any existing facilities.

Should the Contractor choose not to divert any existing drainage path(s) that directly affect the Works, the drainage path(s) shall be maintained in its existing capacity until such time as a suitable alternative has been constructed.

1.11 FIXING

General

Suitability: If equipment is not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

Fasteners

General: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient for the rigidity of the assembly.

1.12 UTILITY CONNECTIONS AND AUTHORITY APPROVALS

Within one week from the award for tender the Contractor shall apply for all services connections including electrical and scheme water connections, Certificate of Building Compliance, all relevant building licences and all other Authority approvals as required to complete the works. The Contractor shall allow for all works to coordinate with service providers and pay all costs and fees as required. All work shall meet the requirements of relevant authorities, who will inspect the works from time to

time to ascertain whether the standard of work meets their respective requirements.

Copies of all written applications are to be furnished to the Superintendent at the time of each application.

1.13 PHOTOGRAPHIC RECORD

The Contractor shall progressively compile a detailed photographic record of the works. The photographic record shall include images of all stages and aspects of the construction works. The photographic record shall be compiled using digital photography. Clear, identifiable and dated images shall be compiled onto a portable hard drive or other durable medium and handed over to the Superintendent at the time of Practical Completion.

In addition, the Contractor is encouraged to use digital photography to describe construction issues and record events and activities that are relevant to the Contract, supplying progressive documentation indicating compliant completion of works.

1.14 PROTECTION OF EXISTING SERVICES

Prior to commencing works on site, the contractor shall contact all relevant Service Authorities and determine the location of all existing overhead and underground site facilities and services including those to adjacent sites. The Contractor shall engage a suitably qualified cable locator contractor, responsible for locating, marking out and digitally recording all existing facilities and services whether or not such information is shown on any contract drawings. The Contractor shall supply to the Principal, Two (2 no.) electronic copies in CAD format and two (2 no.) hard copies of all Services Survey drawings. The location and nature of any facilities or services shown on contract drawings is approximate only and shall not be relied upon for construction purposes.

The contractor shall ensure all facility and service locations are defined on site by Chalk Lines and Temporary Bench Marks and are clearly shown on the site drawings and on existing services drawings and prominently displayed in the contractor's site office. The Contractor's workforce shall be made aware of the locations of all facilities and services and the need for their protection.

Particular care must be taken by the Contractor to avoid damage to all such underground and overhead facilities and services and all brackets, posts and fittings in connection therewith. It is the Contractors responsibility to ensure all facilities and services encountered are securely protected, supported, strutted and slung or otherwise protected at the Contractors expense.

The Contractor shall allow for excavating by hand in the close vicinity of all facilities and services. It should be understood that the location of facilities and services shown on the Drawings is only intended as a guide and that liaison must be maintained with the relevant Service Authority so that they can be located more accurately.

Where any facility, structure or service is damaged, displaced or otherwise interfered with, the Contractor is to give notice immediately to the Service Authority and the Superintendents Representative and afford all facilities to assist in early inspection and repair of the service. All costs associated with the necessary repair, and any other cost incurred through the damaged, displacement or otherwise interference with any service will be borne by the Contractor.

The Superintendent's representative reserves the right to have any poles, cables, ducts, etc. re-sited or diverted where he considers it inadvisable to allow them to remain in their present position. The Principal will pay for such re-siting or diversion but the Contractor must give every facility to enable them to carry out the alterations.

Negligence by the Contractor in managing and supervising the protection of services shall be sufficient cause for the Superintendent to direct the Contractor to remove relevant persons from the site or from any activity connected with the works, in accordance with Clause 26 of the General Conditions of Contract.

The Contractor shall have no claim for any extra payment due to interference with, or delay in, the carrying out of the Contract caused by any alteration to a facility, structure or services.

1.15 PROTECTION OF EXISTING TREES

Tree Protection zones

Under the works, all existing trees within the works site, including all trees designated as "Tree to be Protected" within or external to the works site shall have NO access, plant, equipment, preparation or works whatsoever within the extent of the trees canopy or Tree Protection Zone (TPZ), as defined under AS4970 - Protection of Trees on Development Sites, whichever is the greatest, without the approval of the Superintendent.

For any single breach of a TPZ by the Contractor or their representatives for any reason without the approval of the Superintendent, including from wind-blown or water borne materials such as cement, the following penalties will apply:

- Breach of a TPZ \$500.00 Per Event.

Should the Contractor or any of their representative's damage (including canopy, trunk and root system) any tree within the extent of a trees canopy or a TPZ, whichever is the greatest, including from wind-blown or water borne materials such as cement, the following penalties will apply for any single event:

- Damage to a Protected Tree \$5,500.00 Per Tree Per Event excluding GST.

All costs will apply and be borne solely by the Contractor by reduction in monies payable under the Contract.

1.16 WORKS WITHIN TREE PROTECTION ZONES

For approved works within Tree Protection Zones the following applies:

- All works shall be hand works;
- Do not add or remove topsoil;
- Do not backfill around tree trunks to a height greater than 300mm above the original ground surface. Immediately after back-filling, thoroughly water the full extent of the Tree Protection Zone;
- Do not compact. If compaction is required, for example from the operation of heavy constructional plant, loosen the soil by coring;
- Air Spade all excavations such that root systems are preserved intact and undamaged;
- Open up excavations under tree canopies for as short a period as possible;
- Do not cut tree roots exceeding 25mm diameter unless permitted. Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, apply a bituminous fungicidal sealant to the cut surface to prevent the incursion of rot or disease.

1.17 WORKS WITHIN ROAD RESERVES

General

All works undertaken within road reserves shall comply with AS 1742.3 Part 3 – Traffic Control Devices for Works on Roads. The contractor shall ensure all conditions under this standard are satisfied.

Works within reserves under the control of Main Roads WA (MRWA) shall only be undertaken in accordance with an MRWA approved road management plan, approved in writing by the Superintendent prior to commencement of works on site. Notification of impending works on an MRWA controlled road shall be supplied to the relevant MRWA Road Maintenance Contractor as required prior to the works commencing.

1.18 SETTING OUT OF WORKS

The Contractor shall be responsible for setting out the works in accordance with issued hard copy and electronic set of drawings.

Set out of all works, including but not limited to, all earthworks, all hard works, all soft works, all structures, all above and below ground services, all built elements, and all other works under the contract. Set out works shall be undertaken by a Licensed Surveyor from the dimensions as indicated on the drawings and from electronic drawings issued by the Superintendent for set out purposes. Electronic drawings shall be in ACAD format. Datum to set out for surveyor will be Australian Height Datum and MGA 94.

The Contractor shall maintain survey pegs undamaged and unaltered until such time as the works have been completed to the satisfaction of the Superintendent. The Contractor shall undertake all re-surveying as necessary to maintain the integrity of the survey set out.

The Contractor will provide:

- White painted timber stakes to define the position of all elements, including services, built elements, trees, paths, paving, garden beds and other construction elements as specified and or on the drawings,
- Relevant levels and bench marks for all set out points, and
- Stakes to define lot boundaries.
- Setting out shall be approved by the Superintendent prior to the commencement of construction. All discrepancies between the design levels and the existing site levels shall be brought to the immediate attention of the Superintendent for written direction prior to commencement of works.

Permanent survey pegs which have been damaged or moved during construction shall be reinstated by a Licensed Surveyor nominated or approved by the Superintendent and the cost of such work shall be paid for in full by the Contractor.

Should survey pegs or marks be in the line of construction operations, the Contractor shall advise the Superintendent prior to commencing work to enable their temporary removal or relocation of the works. Co-ordination shall include necessary approvals from Main Roads Department, Council, Service Authorities, other Contractors and the like, to make the contract run smoothly.

Due to the nature of landscape construction works, minor changes in the layout of the works may be instigated by the Superintendent on site.

The Contractor shall allow in their price for changes in the set out of the works. A variation to the contract shall only be issued where any change results in a change in the scope of works.

1.19 WORKS BY OTHERS

The Contractor shall be aware and allow for in their tender price the co-ordination of works that will be built by others during the contract period, within the designated construction site of the works. Works that are being constructed by others may include but are not limited to:

- Civil Works
- Hydraulic Works
- Electrical Works

The Contractor shall allow for all costs associated with co-ordination of other works as listed included but not limited to programming and co-ordination of site access.

The contractor shall allow contractors undertaking other works sufficient access to the site and site services to ensure the completion of the works to programme.

1.20 SAMPLES & TESTING**General**

The contractor shall provide samples and sample panels to the Superintendent for approval for all materials and works as detailed in schedules. No works comprising samples or works items as listed in the schedules shall proceed without approval by the Superintendent.

Approval of samples and panels by the Superintendent in no way absolves the Contractor of their obligations and responsibilities under the contract.

Incorporation of samples: Only incorporate samples in the works which have been endorsed for inclusion by the Superintendent. Do not incorporate other samples.

Retention of samples: Keep endorsed samples in good condition on site, until the date of practical completion.

Unincorporated samples: Remove on completion.

Sample Schedule

<i>ITEM</i>	<i>QUANTITY</i>	<i>REQUIRED BY</i>
All Soils	500 Grams	Two (2) weeks prior to supply.
Mulches	500 Grams	Two (2) weeks prior to supply.

Sample Panel Schedule

<i>ITEM</i>	<i>QUANTITY</i>	<i>REQUIRED BY</i>
All Pavement Types	2 Sq.M.	Two (2) weeks prior to supply.
All Wall Types (inc seating)	2 LM.	Six (6) weeks prior to supply.
Rocks	1 of each size nominated	Two (2) weeks prior to supply
Metal Work	Refer Material Schedule	

1.21 TESTING

It is the Contractors responsibility to provide all materials, machinery and labour as required for the completion of this project and, to provide verification that all materials and workmanship comply with the requirements of this specification.

In addition, it is the Contractors responsibility to undertake, at the Contractors expense, all necessary testing as specified and, as may be requested from time to time by the Superintendent for certification of the works, including materials and workmanship, to confirm conformance with the drawings and this specification.

All costs associated with testing and quantity certification shall be the responsibility of the Contractor and will be included in the appropriate lump sum schedule item.

1.22 INSPECTION

Complete all inspections as per the inspection schedule in the presence of the Project Landscape Architect / Superintendent.

Notice

Give three (3) days' calendar notice to the Superintendent so that inspection may be made of all items noted in Schedule of Inspections. Following each inspection, await direction prior to proceeding with works.

Concealment: If notice of inspection is required for parts of the works that are to be concealed, give notice when the inspection can be made before concealment. All works which may cause inspected works to be concealed are to be withheld until inspection is complete or Superintendent's written approval to proceed is received.

Inspection Schedule (Hold Point)

Undertake all inspection in accordance with the following schedule:

Item	Date	Inspected by (Landscape Architect / Superintendent)
SITE WORKS		
Following completion of final site works		
IN-SITU SOIL AND SITE SOIL CONDITIONERS		
Following initial application of imported soils (prior to cultivation)		
Following cultivation of imported soils		
PLANTING AND MULCHING		
Following completion of ground preparation works		
Following set-out of all plants		
Following commencement of planting		
Following initial mulch application to planted areas		
At completion of planting and mulching works		
BOULDERS, STEPPERS, LOGS AND SIGNAGE		
Setout		
Following commencement		
Completion		
TURF GRASSING		
Following completion of ground preparation works		
At installation of turf grassing		
At time of each maintenance task including fertilizing		
RELOCATED STATUES		
Following initial set-out		
Following ground preparation for footings		
Following commencement of footings		
Following completion of footings at commencement of statue placement		
At completion		
WALLS		
Following initial set-out		
Following ground preparation for footings		
Following commencement of footings		
Following completion of footings at commencement of wall construction		
Following completion of wall structure and placement of rock to Gabion walls (where applicable).		
Following completion of membranes and basecoats		

Following commencement of surface treatment application		
At completion of wall		
PAVING TREATMENTS		
Following initial set-out		
Following ground preparation		
Following installation and compaction of base- course (where applicable).		
Following initial installation of the paving (for each type)		
At completion of each section of each paving type		
BRIDGES		
Following initial set-out		
Following ground preparation		
Following installation and compaction of base- course (where applicable).		
Following initial installation of the culverts (where applicable).		
Following initial installation of associated retaining walls / abutments		
At completion of each section of each paving type		
Balustrade setout (where applicable).		
At completion		
PROPRIETARY FURNITURE		
Following set-out of major furniture items		
Following preparation works prior to installation		
Following completion of works		
PRACTICAL COMPLETION		
Pre-Practical Completion Inspection.		
Practical Completion Inspection.		
Follow-up Inspections (as required).		
CONSOLIDATION PERIOD		
Monthly Maintenance Inspection - Month 1		
Monthly Maintenance Inspection - Month 2		
Consolidation Completion Inspection		
FINAL COMPLETION		
Pre-Final Completion Inspection.		
Final Completion Inspection.		

1.23 RECORD DRAWINGS

General

Requirement: Prepare record drawings showing the following:

- Installed locations of building elements, services, plant and equipment.
- Off-the-grid dimensions and depth if applicable.
- Any provisions for the future.

Recording, format and submission

Prior to Date of Practical Completion, the Contractor shall supply to the Superintendent works as executed drawings shall clearly show all works and services as executed and covered by the contract as required by RFT 02-2021/2022.

Services record drawings

General:

- Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient of the existing installation to make the drawing comprehensible without reference to drawings of the original installation.
- Detention: If on-site detention tanks or pondage are provided, include the volume required on the drawing and the permitted flow rate to the connected system.
- Stormwater: If storm water pipes are shown, include the pipe size and pipe grade together with the maximum acceptable flow and the actual design flow.

1.24 OPERATION AND MAINTENANCE MANUALS**General**

Prior to Date of Practical Completion, the Contractor shall supply the Superintendent all operation manuals covering all works as executed and covered by the contract including irrigation works as follows required by RFT 02-2021/2022.

Copies of all written warranties as per the Preliminaries, duly completed and dated as may be required and made in the name of the Principal and effective from the date of Practical Completion shall be provided and included in the Operation and Maintenance Manual submitted to the Superintendent prior to Practical Completion.

The supply of fully comprehensive and fully complete works as executed warranties and manuals forms part of the works and shall be a condition precedent to the Superintendents acceptance of Practical Completion.

Authors and compilers: Personnel experienced in the maintenance and operation of equipment and systems installed, and with editorial ability.

Referenced documents: If referenced documents require submissions of manuals, include corresponding material in the operation and maintenance manuals.

1.25 CLEANING**Final cleaning**

General: Before the date for practical completion, clean throughout, including all exterior and interior surfaces except those totally and permanently concealed from view.

Labels: Remove all labels not required for maintenance.

1.26 WARRANTIES**General**

Requirement: If a warranty is documented, name the principal as warrantee. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Warranty period: Start warranty periods at acceptance of installation.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

1.27 PERIODIC MAINTENANCE OF SERVICES**General**

Requirement: During the consolidation period, carry out periodic inspections and maintenance work as recommended by manufacturers of supplied equipment, and promptly rectify faults.

Emergencies: Attend emergency calls promptly.

Annual maintenance: Carry out any recommended annual maintenance procedures before the end of the consolidation period.

Maintenance program

General: Submit details of maintenance procedures and program, relating to installed plant and equipment, 2 weeks before the date for practical completion. Indicate dates of service visits. State contact telephone numbers of service operators and describe arrangements for emergency calls.

Maintenance records

General: Record in binders provided with the Operation and maintenance manuals.

Referenced documents: If referenced documents or technical worksections require that log books or records be submitted, include this material in the maintenance records.

Certificates: Include test and approval certificates.

Service visits: Record comments on the functioning of the systems, work carried out, items requiring corrective action, adjustments made and name of service operator. On completion of the visit, obtain the signature of the principal's designated representative on the record of the work undertaken.

1.28 POST-CONSTRUCTION MANDATORY INSPECTIONS AND MAINTENANCE**General**

Requirement: For the duration of the defects liability period, provide inspections and maintenance of safety measures required by the following:

- AS 1851.
- Other statutory requirements applicable to the work.

Records: Provide mandatory records.

Certification: Certify that mandatory inspections and maintenance have been carried out and that the respective items conform to statutory requirements.

Annual inspection: Perform an annual inspection and maintenance immediately before the end of the defects liability period.

2 TECHNICAL SPECIFICATION

2.1 SITE WORKS**General**

Provide all machinery and equipment necessary to complete minor excavation, levelling and grading to ensure the works conform to the levels and details in the landscape drawings and specification. All minor earthworks shall be carried out in accordance with finished contours, levels and details indicated on drawings, and to ensure water drains to sumps.

2.2 SITE CLEAN UP

Clean up all areas to be irrigated and landscaped prior to commencement of construction works. Remove from the site all deleterious material and rubbish including but not limited to building rubbish and vegetative refuse and the like and dispose of in the correct manner off site at an approved rubbish.

2.3 WEED AND GRASS ERADICATION

After site clean-up and prior to cut and fill and fine grading totally eradicate all existing grass and weeds throughout the full extent of soft landscape areas in this Contract.

Broad Spectrum Herbicide for the eradication of both weeds and grasses shall be a non-residual herbicide such as Glyphosate (e.g. "Round-Up) or an Approved equivalent.

Selective Herbicide for the eradication of grasses only shall be a non-residual, monocotyledon specific herbicide such as "Fusilade" or an Approved equivalent. Confirm that this product will be effective against the grasses on site prior to commencement of application.

Weed and grass eradication shall be undertaken prior to the commencement of any earthworks or installation of soil conditioner, either by physical or mechanical means or by the use of an approved non-residual herbicide as detailed below in this Specification.

Where physical or mechanical means are used to eradicate grass and/or weeds, excavate to a depth as required, to remove all roots, rhizomes, stolons and any other propagative material, to ensure that re-growth does not occur in the area.

Remove all resultant spoil, including all vegetative material, from site. Where it is necessary to reinstate levels, backfill with approved clean, weed-free sand.

Where the use of a non-residual herbicide is approved to eradicate grass and/or weeds, it shall be applied strictly in accordance with the manufacturers written directions.

Spraying shall only be carried out on windless days and the Superintendent shall be informed when this operation is to be undertaken.

Do not use Glyphosate near any waterways nor use any other herbicides near waterways unless such use is specifically approved by the Waters and Rivers Commission and the Relevant Local Authority.

The use of a herbicide will only be approved whilst there is active translocation occurring in the grass and/or weeds. This can be generally be judged by the presence of visible new growth, however approval shall be solely at the discretion of the Superintendent.

Where the application of herbicide is proposed between the months of April to October the application rate shall be increased by 30% to allow for the lower rate of plant translocation during these months.

The ratio for application shall be chosen to suit the hardiest weed species present.

Herbicide shall not be applied within six (6) hours of rain, nor shall the treated area be watered within six (6) hours of application. Re-apply herbicide, if the treated area is affected by rain or watering within six (6) hours of the initial application.

Following the application of the herbicide, the treated weeds shall be left undisturbed for a minimum of fourteen (14) days.

Following the fourteen (14) day "ingestion" period, the treated area shall be cultivated to a depth of 150mm, to expose all roots, stolons, rhizomes etc, to the atmosphere. The affected area shall be left in this condition for an additional two (2) days, prior to undertaking any further work.

If, in the opinion of the Superintendent, the use of a herbicide may constitute a threat to any existing habitat or vegetation, eradicate weeds by manual means only.

2.4 CUT AND FILL

General

Undertake all excavation, cut and fill or fill operations as may be required for the construction of the works under the contract, including but not limited to excavation and back filling to all retaining walls and excavation for the importation of prepared soils and the like under the contract. No variation shall be issued for any earthworks, cut or fill operations, removal of excess material off site or importation of clean fill as may be required to complete the works under the contract.

2.4.1 Imported Clean Fill

Filling material shall be a clean granular material, sand as defined in AS1289.3.6.1 and shall have the following properties:

- i) Have non plastic fines;
- ii) Be clean and free of all silty, organic or any other deleterious inclusions and certified as Die Back (*Phytophthora* sp.) free;
- iii) Have a pH range of 6.5 to 7.5 (i.e. slightly acid to neutral).
- iv) Be cohesionless with a minimum permeability of 5m/day when compacted at 95% Modified Maximum Dry Density in accordance with AS1289.5.2.1; and
- v) Have a particle size distribution in compliance with the limits shown below.

Sieve Size	% Passing
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4.75mm	100
2.36mm	100
1.18mm	100
600um	84
300um	31
150um	4
75um	1.8
Pan	0

The contractor shall provide results from NATA registered testing authority which demonstrates compliance with the above criteria prior to undertaking fill operations.

Independent testing certifying compliance shall be provided to the Superintendent within three days of request.

Fill Installation

- Place and compact filling in uniform layers of thickness. Layers shall extend for the full width of fill area. The maximum layer thickness generally shall be 150mm compacted. However, greater thicknesses will be permitted subject to the ability of compaction equipment to achieve specified densities. No layer shall be less than 100mm thick compacted. Each layer shall be compacted to not less than Eight (8) blows per 300mm with a penetrometer as determined by AS1289.5.2.1-2003.

Excess Material

- All excess excavated material shall be loaded, hauled and disposed of off site in an approved tip in compliance with statutory requirements.

2.5 FINE GRADING

Undertake all minor levelling and grading to achieve final design levels to all areas under the works. Supply all the machinery and equipment necessary to complete the works in an efficient manner.

Fine grading shall include all excavation or fill as required for the provision of hard landscape works and prepared soils and mulch to achieve final design levels.

All final grading shall be carried out in accordance with finished contours and levels indicated on drawings, and to ensure water drains to sumps.

Finish all levels to neatly tie in and match up with existing work in adjoining areas to the satisfaction of the Superintendent. This shall include all works associated with roads and pavements carried out previously, to the areas covered by this contract.

Remove from the site all excess excavated material and deleterious material encountered during final grading and dispose of in the correct manner off site at an approved rubbish tip.

2.6 TOPSOIL

Standard

Site and imported topsoil: To AS 4419.

Source

General: If the topsoil of documented quality cannot be provided from material recovered from site, provide imported topsoil.

Imported topsoil

Requirement: Imported topsoil to AS 4419 Tables 1, 2 and 3, and as documented.

Imported topsoil particle size table (% passing by mass)

Sieve size (mm)	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100

Sieve size (mm)	Soil textures		
	Fine	Medium	Coarse
1.18	90 – 100	90 – 100	90 – 100
0.60	75 – 100	75 – 100	70 – 90
0.30	57 – 90	55 – 85	30 – 46
0.15	45 – 70	38 – 55	10 – 22
0.075	35 – 55	25 – 35	5 – 10
0.002		2 – 15	2 – 8

Imported topsoil nutrient level table

Nutrient	Unit	Sufficiency range
Nitrate-N (NO ₃)	mg/kg	> 25
Phosphate-P (PO ₄) – P tolerant	mg/kg	43 - 63
Phosphate-P (PO ₄) – P sensitive	mg/kg	< 28
Phosphate-P (PO ₄) – P very sensitive	mg/kg	< 6
Potassium (K)	mg/kg	178 - 388
Sulfate-S (SO ₄)	mg/kg	39 - 68
Calcium (Ca)	mg/kg	1200 - 2400
Magnesium (Mg)	mg/kg	134 - 289
Iron (Fe)	mg/kg	279 - 552
Manganese (Mn)	mg/kg	18 - 44
Zinc (Zn)	mg/kg	2.6 - 5.1
Copper (Cu)	mg/kg	4.5 - 6.3
Boron (B)	mg/kg	1.4 - 2.7

Method References

pH in H₂O (1:5), pH in CaCl₂ (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1.

Soluble Nitrate-N by APHA 4500.

Soluble Chloride by Rayment and Lyons 2011 modified method 5A2.

Extractable P by Mehlich 3 – ICP.

Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP.

Extractable S by Mehlich 3 – ICP.

Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 - ICP.

Site topsoil

Requirement: Site topsoil, as documented.

Soil blend: If required, stripped natural soil with sand and/or organic matter and recommended ameliorants.

2.7 SOIL CONDITIONING – TURF & GARDEN BEDS**Source**

As specified in material schedule or approved equivalent

General

After Site Works supply and install to all areas designated on the drawings, including garden beds and imported turf sand, soil conditioner to the following specification:

Soil conditioner shall meet the following conditions:

- Produced at a commercial composting facility according to the pasteurisation requirements of AS 4454-2012 Composts, soil conditioners and mulches, confirmed through analysis of human pathogens Salmonella and Faecal coliforms.
- Certified free from plant pathogens Phytophthora and Pythium, and viable plant propagules.
- Certified Allowed Input to Certified Organic growing systems.
- Water holding capacity greater than 200% dry weight.
- Total Carbon greater than 30% dry weight.
- Total Nitrogen greater than 1.5% dry weight.
- Screened to <25mm.

2.7.1 Standards

Soil conditioner shall comply with AS4419 Soils for Landscaping and Garden Use and AS4454 Composts, Soil Conditioners and Mulches.

The conditioner shall have a pH range of 6.5 to 7.5 (i.e. slightly acid to neutral). The individual elements of this mix shall be combined thoroughly to form a balanced product free from lumps and any other deleterious matter.

2.7.2 Placement

Prior to placement, ensure all base material is clean, free draining and free of all builder's rubble, rubbish, deleterious material and contamination. All areas contaminated by the builder or others shall be removed and replaced with clean fill sand to the approval of the Superintendent.

Place soil conditioner to a depth of 15mm over the full extent of areas to be conditioned.

Rotary-hoe, or spade dig where necessary, soil conditioner into existing site soil to a depth of 100mm to produce a fully homogeneous mix.

Remove all rubble or other extraneous and deleterious matter exposed as a result of cultivation, including any base course material and dispose of in the correct manner off site at an approved rubbish tip.

After placement, rotary hoeing, smudging boarding and planting, soil conditioner mix shall finish 80mm below adjacent kerbing, paving and turf areas.

2.7.3 Samples

Prior to delivery of prepared soil, submit a 0.01 m³ sample of the prepared soil to the Superintendent for approval. Allow for three (3) samples of the mix to be laboratory tested for pH, salt and major trace elements. A laboratory certificate may be required to accompany the initial sample at the instruction of the Superintendent. The Superintendent may select a further two (2) samples for analysis during the course of the Works.

All approvals shall be confirmed in writing. Subsequent conditioner used on the project shall conform to this sample. In the event that these tests prove unacceptable, the defective conditioner will be removed and replaced. If further testing is required, the cost of testing shall be borne by the Contractor.

2.8 SOIL CONDITIONING – TREE WELLS

Source

As specified in material schedule or approved equivalent

General

After site works apply conditioned site soil to all tree holes in the following areas:

- All Tree planting holes.

2.8.1 Soil Conditioning Mix

Conditioned site soil mix shall be as follows:

- Site Soil (clean and free of contamination) Ten (7) parts; and

- Approved Soil Conditioner three (3) parts.

Soil conditioner shall comply with AS4454 Composts, Soil Conditioners and Mulches.

2.8.2 Excavation

Excavate Tree holes to the depth, and twice the width of the root ball.

No excavation shall occur deeper than the tree root ball.

Remove from site all excavated material as required to construct the works and dispose of in the correct manner off site at an approved rubbish tip.

2.8.3 Placement

Conditioned site soil shall be applied to the full extent of tree hole excavation and lightly compacted.

2.8.4 Placement

Prior to placement of conditioned site soil, submit a 0.01 m³ sample of the soil to the Superintendent for approval.

Allow for three (3) samples of the mix to be laboratory tested for pH, salt and major trace elements. A laboratory certificate may be required to accompany the initial samples at the instruction of the Superintendent.

The Superintendent may select a further two (2) samples for analysis during the course of the Works. All approvals shall be confirmed in writing.

Subsequent conditioned site soil used on the project shall conform to this sample. In the event that these tests prove unacceptable, the defective conditioned site soil will be removed and replaced. If further testing is required, the cost of testing shall be borne by the Contractor

2.9 IMPORTED SAND – TURF GRASS AREAS

General

After site works supply and install to all areas designated on the drawings screened and washed imported turf sand.

Imported Turf Sand Supply

Turf sand shall be a clean granular material, sand as defined in AS1289.3.6.1, equivalent to that currently being mined by Hanson Construction Materials Pty Ltd (Hanson) at the Hawkins Road Pit, Hawkins Road, Wanneroo WA, and shall have the following properties:

- Have non plastic fines;
- Be clean and free of all silty, organic or any other deleterious inclusions and certified as Die Back (*Phytophthora* sp.) free;
- Be cohesionless with a minimum permeability of 5m/day when compacted at 95% Modified Maximum Dry Density in accordance with AS1289.5.2.1; and
- Have a particle size distribution in compliance with the limits shown below.

Sieve Size	% Passing
4.75mm	100
2.36mm	100
1.18mm	100
600um	84
300um	31
150um	4
75um	1.8
Pan	0

The contractor shall provide results from NATA registered testing authority which demonstrates compliance with the above criteria prior to undertaking fill operations.

Independent testing certifying compliance shall be provided to the Superintendent within three days of request.

Placement

Prior to placement, ensure all base material is clean, free draining and free of all builders rubble, rubbish, deleterious material and contamination. All area contaminated by the builder shall be removed and replace with clean fill sand to the approval of the Superintendent.

After placement and smudging boarding sand shall finish 10mm below adjacent kerbing and paving.

2.10 CONCRETE WORK

Scope

Concrete works include all concrete walls, footings, abutments, slabs and cavity fill.

Transportation and Installation

The Contractor shall allow for all costs and administration associated with the transportation, crange and installation of all structures including any individual elements thereof, including the protection of all existing facilities, services and vegetation.

The Contractor is deemed to have, prior to tender, inspected the site in regard to transportation and installation of all works, in accordance with the tender preliminaries.

Standards

The following standards shall apply to this Section:

AS1012 Methods of testing concrete

AS1379-2007AS1379 Ready mixed concrete (metric units)

AS/NZS2904 Damp-proof courses and flashings

AS3600 Concrete structures

AS3610 Formwork for concrete

AS3972 Portland and blended cements.

AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

Inspection

Give sufficient notice so that an inspection may be made of the following:

- Completed form work
- Reinforcement fixed in place
- Placing of concrete.

Testing

Concrete supplied for the Works shall be subject to production assessment and testing to AS1379, Paragraph B3.

Testing Authority: Testing and assessment of concrete and concrete materials shall be carried out by an authority registered with the National Association of Testing Authorities Australia (NATA).

Production Assessment Records: To AS1379. Register the project in accordance with AS1379.

Maintain records and reports of test results required by AS1012. Make the records available on request.

Rejection shall be to AS3600 Clause 19.1.7. Remove rejected concrete from the site.

Concrete Materials

To AS3600 Section 19.

Ready Mix supply to AS1379. Deliver in agitating trucks.

Supply concrete to comply with the following performance criteria:

- Class of Concrete: Normal Portland Cement (Type GP).

- Cement: To AS3972 AS3972 AS3972 Type GP,
- Strength Grade, Slump, Maximum Aggregate Size:
- Walls: 32MPa, 80mm, 20mm.
- Slabs on Ground: 32MPa, 80mm, 20mm.
- Footings: 25MPa, 80mm, 20mm.
- Blinding: 15MPa, 80mm, 20mm
- Cavity Fill: 25MPa, 200mm, 14mm.

Form Work

To AS3600 Clause 19.6.

Design and construct form work so that concrete, when cast in the forms, will have the dimensions, shape, location and surface finish required by the Contract.

Dimension tolerances to AS3600 Clause 19.5.

Form work removal to AS3600 Clause 19.6.

Reinforcing

To AS3600 Clause 19.2.

Supply and fix reinforcement, including the necessary tie wires, support chairs, spacers and the like.

Reinforcement shall be readily identifiable as to grade and origin.

Submit for approval details of proposed bending and splicing not shown on the Drawings.

Workmanship**Sub Grade**

Compact sub-grade to the full extent of all footings and slabs on ground to a minimum of 8 blows per 300mm as measured with a Penetrometer to a minimum depth of 750mm.

Placing and Compaction

To AS3600 clause 19.1.3.

Use placing methods which minimise plastic settlement and shrinkage cracking.

Movement may be by means of suitable clean chutes, troughs or pipes. Do not use water to facilitate the movement.

Place concrete in layers such that each succeeding layer is blended into the preceding one by the compaction process.

Concrete exposed to rain before it has set, including during mixing, transport or placing, shall be liable to rejection.

Use immersion and screed vibrators accompanied by hand methods as appropriate to remove air bubbles and compact the mix. Ensure concrete is fully compacted and entrapped air removed, but avoid over vibration that may cause segregation. Do not allow vibrators to come into contact with partially hardened concrete, or reinforcement embedded in it. Do not use vibrators to move concrete along the forms.

Curing

To AS3600 clause 19.1.5.

Protect fresh concrete from premature drying and excessively hot or cold temperatures. Maintain the concrete at a reasonably constant temperature with minimum moisture loss for the curing period.

Commence curing immediately after finishing, and cure continuously for not less than seven (7) days.

Submit for approval the proposed method of curing, which may include the following:

- Ponding or continuous sprinkling with water (moist curing)
- An impermeable membrane

- An absorptive cover kept continuously wet.

Finish

All off form finished surfaces including, but not limited to walls to be CLASS 2 free of cracks, staining and formwork imperfections.

All off form finished surfaces including, but not limited to walls, tables, benches, benching, seats, step treads and pavement surfaces shall be free draining and free of ponding. All step treads and pavement surfaces shall comply with AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

2.11 MASONRY WALLS

Masonry Materials

Provide units selected from the manufacturer's range which are purpose made for their respective uses and locations. Provide fractional size units, corner units, and others as required.

Strength Grade to be to AS/NZS4455.3:2003, 12 (minimum).

Tolerances - Units

The units shall conform to the following tolerances, to the approval of the Superintendent:

- Uniformity: The maximum deviation in any direction or plane, from a 350mm straightedge placed anywhere on the wearing surface of each unit, shall not exceed 2mm;
- All bevells, chamfers and radii on curved surfaces (including bull noses) shall be continuous, true and even; and
- Squareness of plan: Square angles to each corner.

The contractor shall confirm the unit supplier can comply with all tolerances prior to fabrication.

Tolerances - Walls

For all walls the level at the top of the wall shall be -0mm to +10mm over the length of a 3m straight edge, and no more than -0mm to +15mm overall from the design level.

Wall faces shall not deviate from the design:

- Vertical 0.5% in layback slope
- Horizontal 25mm from design position
- Surface 20mm from 3m straight edge in any direction

Quality Assurance

The Contractor shall produce, and submit weekly to the Superintendent, verified records to confirm that this specification requirements have been achieved as follows:

Component of Works	Type of Certification Required	Quantity
Foundation Compaction	Compaction Certificate	Test per 10m length of wall
Backfill Compaction	Compaction Certificate	Test per layer per 50m ²
Finished Walls	As-constructed profiles (with tolerances and locations)	1 per 20m length of wall
Mortar	Certificate of sand:cement:lime ratio	1 per wall
Anti Graffiti Coating	Supplier's Application Certificate	1 per coat
Independent Certification	Independent Engineering Certification of Retaining Wall Construction	1 per project

Mortar

Cement for Mortars: To AS3972-1997 Type GP.

Use mortar mix 6 parts sand: 1 part cement: 1 part lime in mortars throughout the works, unless otherwise specified.

Use mortar mixes 3 part sand: 1 part cement: 0.25 part lime in masonry more than three (3) courses below ground and in retaining walls.

All sands shall be tested and certified as salt free, either independently or by the sand supplier. The contractor shall supply a complying copy of the certification to the Superintendent's Representative for approval prior to ordering materials.

The contractor shall ensure all sands used in the works shall be from the same source and provenance as the tested and certified source.

All cost associated with testing and certification shall be borne by the contractor.

Sub-Grade Preparation**Moisture Content**

Prior to compaction, bring the sub-grade under all walls to within 2% of the optimum moisture content determined to AS1289.5.1.1-2003 (standard) or AS1289.5.2.1-2003 (modified) as applicable to the material.

Compaction

The sub grade under all walls shall be fully compacted with a mechanical vibrator to not less than Eight (8) blows per 300mm with a penetrometer as determined by AS1289.5.2.1-2003 to a depth of 750mm.

Masonry Workmanship

All workmanship is to comply with AS3700-2001, Section 8.

Clean masonry progressively as the work proceeds, removing mortar and other droppings as they occur. Clean face work to remove mortar smears, stains, discoloration, and the like. Stained or damaged surfaces units shall be replaced, not repaired, unless otherwise directed by the Superintendent.

Set out masonry so as to maintain the specified rod and bond with bed joints and vertical joints of uniform width, and with the minimum mutting of units.

Block Rod to be 3 courses to 600mm.

Bonding Pattern is to be Bookleaf bond, unless otherwise shown on the Drawings. Face work joints to be dry jointed.

Locate reinforcing as detailed on the drawings.

Waterproofing to Masonry Retaining Walls**Coating**

Location behind all retaining walls to within 100mm of finished ground level or as detailed.

Coating is to be liquid applied single component asphalt latex emulsion which cures by evaporation to form an elastomeric waterproofing membrane.

Waterproofing agent is to be 'ELASTOSEAL' by CROMMELIN CHEMICALS (WA).

Application

Apply the emulsion in two coats at the rate of 1m² / litre / coat. Allow first coat to cure before application of the second coat. Apply each coat at right angles to each other in accordance with the manufacturer's recommendations.

Wall Backfilling

Compacted structural fill to walls shall achieve a minimum density ratio of 95% of MMDD. Backfilling to be completed progressively in maximum layers of 500mm once the section of wall has achieved an age of 7 days since last block laid.

Contractor shall take care when backfilling to prevent damage to wall.

Joint Insertion to Masonry Retaining Walls**Expansion Joints**

Locate expansion joints as indicated on the Drawings. Joints are to be 12mm wide minimum x full thickness of the wall or as detailed.

Joint Filler

Joint filler to be one part polyurethane or two-part polysulphide sealant and closed cell polyurethane bond breaking back up material, as recommended by the material manufacturers for the location and service conditions, compatible when used together, and non-staining to masonry.

Joint filler colour to match concrete blocks.

Priming

Apply appropriate primer to masonry surfaces in contact with jointing materials, unless priming is not recommended by the manufacturer.

Proportions

Depth shall not be greater than the joint width, nor less than two-thirds the joint width. Keep filler 5mm back from wall face.

Selection

General:

Refer to material schedule

2.12 STEELWORK GENERAL**Standards**

The following standards shall apply to this Section:

AS1074	Steel tubes and tubulars for ordinary service
AS1214-0983	Hot-dip galvanized coatings on threaded fasteners
AS1397	Steel sheet and strip - Hot-dipped zinc-coated or aluminium/zinc-coated
AS 1428	Design for access and mobility
AS1450	Steel tubes for mechanical purposes
AS 1538	Cold-formed steel structures code
AS 1554	Structural steel welding Part 1 - Welding of steel structures
AS1627.5	Metal finishing - Preparation and pre-treatment of surfaces
AS/NZS4680	Hot-dipped galvanized coatings on ferrous articles
AS 1725	Galvanised rail-less chain wire security fences and gates
AS 2105	Inorganic zinc silicate paint
AS2423-2002	Galvanised wire fencing products
AS 3715	Metal finishing - Thermoset powder coatings for architectural applications

AS 4100

Steel structures.

Shop Drawings

Submit shop drawings (4 copies) to the Superintendent for examination.

Obtain certified examined drawings from the Superintendent before manufacture or installation commences for all steel work and all steel fabricated items including all fittings and fixings and the like.

Submit shop drawings in a timely manner, allowing a minimum of 14 days for examination prior to return.

Shop drawings shall contain reference to all work, including all elements, galvanising ventilation holes, transportation lugs, fittings and fixings as required by all trades.

All elements under the works including all fittings and fixings shall be referenced as to material, dimension and location within the works. Show on drawings single line schematics, plans, elevations, dimensions, equipment, fittings and fixings and the like detail, as required to fully describe the works to be supplied, installed and commissioned

Comments on "examined" shop drawings will apply to general principles of design only. Examination of the drawings by the Superintendent or Relevant Consultant will in no way relieve the Contractor's responsibility for any errors, omissions or necessity of furnishing such workmanship or materials as may be required for the completion of these works in accordance with the contract documents.

Transportation and Installation

The Contractor shall allow for all costs and administration associated with the transportation, craning and installation of all structures including any individual elements thereof, including the protection of all existing facilities, services and vegetation.

The Contractor is deemed to have, prior to tender, inspected the site in regard to transportation and installation of all works, in accordance with the tender preliminaries.

Materials**Metals**

Use metals suited to their required function, finish and method of fabrication, in sections of adequate strength and stiffness for their purpose.

Steel

The contractor shall guarantee that all steel shall have silica levels of:

$$\% \text{ Si} < 0.04\%$$

$$\% \text{ Si} + (2.5 \times \% \text{ P}) < 0.09\%$$

The contractor shall guarantee that all steel shall be of like provenance and composition prior to galvanising.

Stainless Steel

All Stainless Steel shall be Grade 4 Linished standard.

Workmanship**Prefabrication**

Fabricate and pre-assemble items in the workshop wherever practicable.

Surfaces and Edges

Keep clean, neat and free from all imperfections including burs and indentations.

Remove all imperfections including all bumps and indentations, including all identification markings.

Remove all sharp edges without excessive radiusing.

Joints

Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by welding, brazing or soldering by grinding, buffing or the like methods appropriate to the class of work before painting, galvanizing, or the like further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Tube Bends

Form bends in tube without unduly deforming the true cross section.

Colours

Match colours of sheets, extrusions and heads of fastenings in colour finished work.

Metal Separation

Separate incompatible metals by concealed interlayer's of suitable materials and thicknesses.

Thermal Movement

Make provision, sufficient to prevent harmful effects, for thermal movement in joints and fastenings.

Steel Welding

To AS/NZS1554 Finished welds shall be free of surface and internal cracks, slag inclusion, and porosity.

Structural Steel**Fabrication and Erection**

Steel structures to AS4100.

Cold formed steel structures to AS/NZS4600.

Beam Camber

If beam members have a natural camber within the straightness tolerance, fabricate and erect them with the camber up.

Fastenings**General**

Provide fastenings, including bolts, anchors, screws, rivets, welds, and the like:

- sufficient to ensure the rigidity of the assembly;
- of types appropriate to the work;
- in materials of mechanical strength and corrosion resistance at least equal to that of the lowest resistant metal joined;
- capable of transmitting the loads and stresses imposed; and
- installed so as to prevent galvanic corrosion.

Protection**Generally**

Protect metalwork during the work under the Contract as necessary to prevent damage or defacement.

Galvanized Coatings**General**

Provide hot dipped galvanized coating to all steelwork including all fittings and fixings.

All galvanised coatings shall be of an Architectural Finish standard.

Finish shall be free from runs, dags, spikes, uneven surfaces and roughness or other defects that could affect appearance.

All HDG steel shall be inspected by the Superintendent's Representative, or Clerk of Works, at the galvaniser's premises and be approved for use prior to dispatch.

Fabrication

Complete welding, cutting, drilling and other fabrication before coating.

Surface Preparation

(General ferrous articles): Pickle to AS1627.5

Coatings

Unless otherwise specified, zinc coatings shall be by the hot dip method as follows:

Ferrous articles generally: To AS/NZS4680

Ferrous wire: To AS/NZS4680, Section 4, Type A, unless otherwise specified.

Steel sheet: To AS1397, coating class as specified for the particular item.

Threaded fasteners: To AS1214.

Damaged Coatings

Repair damaged coating areas by power tool cleaning to AS1627.2 and apply organic single component zinc coating of minimum 92% (weight) zinc in the dry layer cold galvanizing to provide protection equal to the original coating.

Powder Coatings

Fabrication

Complete galvanized coating before powder coating.

Coating

Powder Coating of (Components to be coated) (Atmospheric Classification) (Substrate) with Dulux Duralloy to meet AS4506. Compliance to this standard must be demonstrated through provision of a certificate from the coating applicator outlining the relevant, "atmospheric classification, substrate and method of chemical or mechanical surface preparation".

Damaged Coatings

Repair damaged coating areas to Manufacturers Recommendation to original specification.

Below Ground Steel

All steel works below finished ground level shall be coated with two (2) coats of asphaltic paint, to be approved by the Superintendent's Representative. Asphaltic coating shall be applied to the manufacturer's recommendations for site specific materials, conditions and use.

2.13 TACTILE INDICATORS

General

Supply and install individual tactile indicators, to locations as shown on the drawings & in accordance with Australian standards.

Selection

General:

Refer to material schedule

2.14 METAL PAINT SYSTEMS

General

Unless stainless steel, aluminium, or noted otherwise all fabricated metal components are to be mild steel. Refer Specification for additional requirements.

The paint system has been selected to achieve a durability range to first maintenance of 15 years in an atmospheric corrosivity category C3 (Medium) to AS 4312. Alternative systems may be submitted for approval provided they comply with the criteria above.

Paint finishes for Mild Steel:

3 Coat Painted System applied to all mild steel wholly or partially exposed to the weather to be painted using a three coats process follows:

Substrate Preparation:

1. Wash and degrease all surfaces to be coated in accordance with AS1627.1
2. Wash with fresh potable water and ensure that all soluble salts are removed in accordance with AS 3894.6 methods A&D.
3. Grind all sharp edges with a power tool to a minimum radius of 2 mm.

4. Power tool clean welds to AS1627.2 Class 2 to remove roughness. Remove filings, preferably by vacuum or compressed air.
5. Abrasive blast clean all steel surfaces to be painted in accordance with AS1627.4 to visual standard AS1627.9 Class 2.5 (equivalent to ISO8501-1, Sa 2.5: Very Thorough Blast-Cleaning). Use a non-metallic medium that will generate a surface profile of 35 to 65 microns (as tested to AS3894.5 Method A.)
6. Commence application within 4 hours of abrasive blast cleaning or before surface becomes contaminated, otherwise repeat abrasive blasting step.
7. Stripe coat welds, bolts, boltholes and all edges with primer before application of full primer coat nominated in the Coating
8. System section of the specification.
9. Prior to application, ensure that the surface is free of contaminants including oil, grease, dirt, dust, salt and any other deleterious materials that will interfere with coating performance.

Treatment Of On Site Welding

1. Remove weld spatter.
2. Power tool clean welds to AS1627.2 Class 2 to remove roughness. Remove filings, preferably by vacuum or compressed air.
3. Prime welds immediately with the nominated primer before contamination can reoccur. Ensure that the primer overlaps the sound adjacent coating by not less than 25mm or greater than 50mm.
4. Apply intermediate and topcoats over the primed welds to match the surrounding coating system, overlapping the sound adjacent coating by not less than 25mm or greater than 50mm

Primer (1st Coat):

1. Apply to minimum dry film thickness of 75 microns, a self-curing Ethyl Silicate based Inorganic Zinc conforming to AS 2312:2002, PRN C01 or C02. The metallic zinc content of the dry film shall not be less than 77% when tested in accordance with the Code. An example of paint complying with these requirements is Dulux ZINCANODE 402 Zinc Primer.

- Paint (2nd Coat):
1. Dulux Duremax GPE Two Pack Epoxy (PRN C13)
 2. Dry Film Coat – 75 Microns D.F.T. (white colour U.N.O)

Paint (3rd Coat):

1. Dulux Acrathane IF (PRN C33) or Luxathane R (PRN C26)
2. Top coat of min 100 microns (D.F.T.) shall be applied in 2 coats of 50 microns to achieve evenness of colour over intermediate coat. Refer to material schedule for colour requirements

Paint Finishes for Galvanised Steel

Substrate Preparation:

3 Coat Painted System applied to all galvanised steel wholly or partially exposed to the weather to be painted using a three coats process follows:

1. Remove all surface contamination such as oil, grease or dirt by washing with an alkaline detergent and rinse with fresh potable water. Repeat until the surface is clean. A clean

surface is indicated when the rinsing water wets out the surface instead of beading on the surface. Refer to relevant sections of AS1627.1 2003 Part 2.

2. Dry abrasive "brush blast" clean (whip blast) the surface using a non-metallic abrasive such as garnet. The abrasive size and blast pressure shall be such that all zinc corrosion products and other surface contaminants are completely removed and that the surface is lightly profiled to provide a suitable key for the coating system to adhere to but with minimal reduction in the galvanised coating thickness (no more than 10 microns).
3. If the item being painted is not suitable for brush blasting (e.g. zinc coated, sheet steel cladding) then use non-metallic abrasive sanding pads to remove any existing corrosion and provide a suitable key for coating adhesion. Note that this preparation method is likely to be less effective than brush blasting and should only be used where brush blasting is not suitable.
4. Remove all spent abrasive and residual dust using dry compressed air or, preferably, vacuum cleaning prior to application of the coating. Avoid handling blasted galvanised steel with bare hands.
5. If the zinc coating has been accidentally removed, spot repair all such areas using a zinc rich primer compatible with the coating system.
6. Inspect the surface prior to coating to ensure no contamination is present and no surface defects exist.
7. If either contaminants or defects are present, rectification is required before any coating is applied.
8. Apply first or primer coat as soon as practical after preparation and before the surface oxidises or becomes re-contaminated.

Primer (1st Coat):

1. Dulux Durepon P14 Epoxy Primer
2. Dry Film Coat – 75 Microns
3. Paint can be applied by Brush, Roller, Air Spray and Airless Spray

Paint (2nd Coat):

1. Dulux Duremax GPE High Build Epoxy
2. Dry Film Coat – 75 Microns
3. Paint can be applied by Brush, Roller, Air Spray and Airless Spray

Paint (3rd Coat):

1. Dulux Weathermax HBR Two Pack Gloss
2. Dry Film Coat – 100 Microns
3. Paint can be applied by Brush, Roller, Air Spray and Airless Spray

Selection

General:

Refer to material schedule

2.15 CLAY BRICK KERBING

General

Supply and install clay brick paving, headers and concrete haunch.

Construct all paving and install headers to the details and limits shown in the drawings. The cost of paving and headers shall include all edging, paving, expansion joints, cutting, cleaning down and surface protection during construction.

It shall be the Contractor's responsibility to confirm orders and delivery times for paving units as early as possible to ensure that the Construction Program is maintained without delays due to late deliveries.

Pavement

All pavement surfaces shall comply with AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

All materials liable to deteriorate by exposure to the weather shall be kept undercover and the Contractor shall be held responsible for loss or deterioration occurring in the course of loading, unloading, transit or storage, no matter what the cause.

Quality of all workmanship, materials, and all construction methods shall conform to the relevant SAA code and shall be FIRST CLASS throughout.

Only workers or Sub-Contractors of proven competence for the type of work specified will be permitted to carry out the work of this Contract. Evidence of proven performance will be required by the Superintendent before approval will be granted.

Coordination

Coordinate all the work with the Superintendent, other Contractors and the paving manufacturer.

Supervision

The Contractor will be wholly responsible for executing the whole of the work of this Contract in the required positions to the requirements of the Specification under the supervision of a foreperson experienced in this work.

Samples

Submit samples of various materials to be used, for approval. Subsequent work shall in all respects match the approved samples.

Responsibility

The Contractor shall accept all responsibility for paving units at all times after delivery and acceptance and it shall replace any damaged, defective or discoloured units, at its own expense when called upon by the Superintendent to do so.

All paving shall be protected from injury or staining after delivery until completion of the Contract.

Construction Generally

The Contractor will be responsible for the supply of all materials and setting out the works and installing all paving as shown on the plans and details.

Where required, ensure that each unit is accurately manufactured or saw cut and mitred to the required size and shape and face surfaces finished to specified requirements. Where metal fixings are required for construction, the concealed faces of each unit shall be specially shaped and recessed to suit the type of fixing used.

Shaped units shall be fitted to match with the paving and to conform to applicable details. Cut or shaped units shall not be less than one third of the original unit size.

Marks shall not be made on face surfaces. In face work, all units shall be carefully mixed to ensure an even overall blend of colour, tone, texture and figure.

All prepared units shall be packed for delivery in a manner which will protect them from damage and staining. Particular care shall be taken during loading, unloading and stacking to prevent damage and defacement. Under no circumstances shall unloading by tipping and/or dropping be permitted.

Units shall be stacked clear of the ground on pallets or other suitable supporting materials or structures which will insulate them from rising damp, and the stocks covered by suitable waterproof covers to prevent wetting.

Workmanship

All work shall be carried out in the best recognized trade practice by approved firms specializing in the particular work and employing skilled experienced tradesmen.

Paving units shall be carefully unloaded at site and stacked in an approved manner until set in position.

Provide all accessories and perform all operations necessary for the proper execution of first class paving including selecting, culling, bedding, setting, sawing, fixings, pointing, grouting, caulking, and the like.

Build in all necessary fixings as required. Provide all other fittings, as detailed.

Co-ordinate with other trades as required.

Inspect all areas to ensure that the surfaces are suitable to receive them.

Undertake all the necessary minor filling and/or minor grinding off of the adjacent surfaces i.e. kerbs, pram crossings etc. that it deems necessary prior to setting the paving.

Samples

Submit representative samples of the paving units for approval prior to proceeding. Upon approval, the Contractor shall then allow to construct for further approval, a sample incorporating each type of paving to a minimum of 2lm. This work shall be reviewed by the Superintendent, to ensure compliance with the Specification and Drawings.

Once approved, ensure that all materials and workmanship comply with the approved samples. The approved samples may be incorporated into the finished work if appropriate.

Paving

Paving shall be laid to grades and lines as shown on the drawings.

Sub-Grade

Preparation

Prior to compaction, bring the sub-grade to within 2% of the optimum moisture content determined to AS1289.5.1.1-2003 or AS1289.5.2.1-2003 as applicable to the material.

Compaction

The pavement sub grade shall be fully compacted with a mechanical vibrator to not less than Eight (8) blows per 300mm with a penetrometer as determined by AS1289.5.2.1-2003 to a depth of 450mm.

Finished Sub-Grade Level Tolerances

Maximum deviation from the design level: + 10mm, - 0mm.

Maximum deviation from a 3 m straightedge laid anywhere on each plane surface: 20mm.

Compaction Equipment:

Use approved rollers, appropriate to the materials and compaction requirements. Use approved plate compactors on areas inaccessible to rollers. To maintain moisture content, use water spraying equipment capable of distributing water uniformly in controlled quantities without washing fines from the sub-grade or base material.

Base

Bedding Sand

Bedding sand shall be well graded sand passing a 4.75mm sieve and suited to concrete manufacture. The bedding sand shall be free of deleterious soluble salts or other contaminants likely to cause efflorescence. Bricklayers sand and single sized dune sands are not considered to be suitable.

The maximum depth of bedding sand shall be 30mm (+ - 5mm) after compaction of the paving. This shall be achieved by field trials. The bedding sand is to be spread loose in a uniform layer, screeded loose to a nominated level just ahead of the laying of the paving units. The Contractor is to ensure that only light compaction of the bedding sand occurs with a small plate compactor prior to placing of paving units. Only sufficient area is prepared as will be paved in that day.

Placing of Paving Units

Paving units are to be placed on to the lightly compacted bedding sand to the nominated laying pattern. All joints are to be correctly aligned and the nominated joint width to be maintained, with a suitably approved sand retention adhesive i.e. sand stick or similar. Nominated joint width to be as follows:

Clay Brick Paving Units Nominal Joint Width 2mm

Closure units shall be fitted after all full paving units in a row have been positioned.

In-fill spaces and strips around boxes or manholes will be unit paving, or in approved concrete with a suitable colour additive to the satisfaction of the Superintendent. The Contractor is to allow for the preparation of sample concrete panels for approval by the Superintendent prior to incorporation in the work. Exposed aggregate finishes to match some forms of paving may be required and the Contractor is to make due allowance for this.

Cut unit size shall comprise a minimum of 30% of any unit type. Break bond as required to maintain minimal unit size in all situations, to the approval of the Superintendent.

Where it is necessary to adjust the position of paving units this shall be by adjustment of the bedding sand not by hammering of the units.

Compaction

The paving units shall be consolidated to design levels with a minimum of three passes of a high frequency low amplitude plate compactor with a plate large enough to eliminate damage to the paving units.

Prior to carrying out compaction, sand for joint filling is to be spread over the paving units to a minimum depth of 20mm. Generally for paving units less than 60mm thick this will not provide adequate protection against damage to the paving units and the Contractor shall be required to provide additional protection to the underside of the plate compactor.

Any units damaged during the compaction process shall be immediately removed and replaced.

All sand for joint filling shall be free of soluble salts or contaminants with 100% passing the 2.36mm sieve and being uniformly graded. Shall be "Pavelock" joint filling sand only.

The whole of the area shall be swept clean at the completion of each day's work and take all precautions against the filling sand becoming wind blown or spread by any means whatsoever.

No construction traffic shall be allowed onto the pavement until this stage has been achieved other than foot or barrow traffic.

Clean Up

Upon completion of paving works, clean away all debris resulting from their works together with any accumulated debris along kerb lines and in storm water pits.

Tolerances

Install paving within the following tolerances.

A cumulative effect of the tolerances for size, location and position in the horizontal or vertical plane is not permitted. The 3 dimensional variation of any point from its documented position shall be governed by the minimum single tolerance figure allowed.

- lipping (vertical deviation) between adjacent units + 2mm;
- lipping (vertical deviation) between adjacent works i.e. kerbs + 2mm;
- deviations from a 1500mm straight edge placed on the surface in any direction shall not exceed 3mm. Deviation from a straight edge shall conform to the previously stated tolerances but shall not exceed a maximum deviation of 25mm over the entire length of the paving;
- variation from the plumb in the lines and surfaces 6mm per 3000mm but not more than 25mm in total length;
- variation from the level or grades indicated on drawings, + 5mm; and
- variations from plan position shown on drawings in 12000mm or more, shall be no greater than 20mm thereof.

Mortar Haunch

All unrestrained pavement edges and all pavement edges abutting service pits are to have a continuous mortar haunch to the full extent of all unrestrained edges and service pit edges.

Mortar shall be:

- all part sand mortars to AS3972-1997 Type GP, 4 part sand: 1 part cement;
- cement to be blended cement with fly ash content approximately 25%;
- sand must be clean, washed, medium to fine;
- gauge boxes for proportioning of the cement and sand must be used;
- a reasonably large powerful mixer capable of thorough mixing must be used; and
- contain cement aids "Caltite Water proofer" at the rate of one part water proofer to 5-6 parts water.

Mortar haunch to be as detailed on the drawing and, as a minimum be 100mm deep below underside of unit pavement, 200mm wide located central to unrestrained edge of pavement and finishing a minimum of two thirds up the face of the unsupported edge.

Protection

Protect paving from staining and damage. Use sheeting or other screening as necessary. Do not use hardwood in contact with units.

Clean off all droppings as they occur. Stained or damaged units shall be replaced, not repaired, unless otherwise permitted by the Superintendent.

Protect adjoining surfaces during paving work. Finished surfaces in the vicinity of work being carried out shall be protected from staining and impact and all necessary precautions are to be taken to ensure that protection is provided and maintained.

Protect all paving as follows:-

- exclude all foot traffic for 3 days;
- exclude all heavier traffic for 7 days;
- exclude all vehicles for 21 days minimum; and
- provide barriers and planking to accommodate traffic.

Completion

On completion and following approval by the Superintendent of the work, all work shall be cleaned by means (approved by the Superintendent in writing) to give a uniform surface free from all foreign residues.

Clean away and remove from the site all rubbish and unwanted materials and leave the area of the work clean and tidy.

Testing

The Superintendent reserves the right to take samples of any materials at any time for test or analysis.

Should the results indicate that the requirements of this Specification have not been complied with, action will be taken under the Contract regarding replacement, re-performance or compensation.

The costs of all failing tests or analysis will in all circumstances be paid by the Contractor.

Selection

General:

Refer to material schedule

2.16 TACTILE INDICATORS**General**

Supply and install individual tactile indicators, to locations as shown on the drawings & in accordance with Australian standards.

Selection

General:

Refer to material schedule

2.17 COMPACTED GRAVEL

General

Supply and place base course and consolidated gravel pavement as specified.

Sub-Grade Preparation

A. Grading

Grade the sub-grade surface to follow finished levels so that the specified compacted thickness of the basecourse and pavement material is maintained.

B. Sub-Grade Density

Compact, by watering and rolling, to not less than Six (6) blows per 300mm with a penetrometer as determined by AS1289.5.2.1-2003 to a minimum depth of 750mm and to a minimum of 300mm beyond edge of finished pavement edge or edge restraint.

Maximum deviation from a 3 m straightedge laid anywhere on each plane surface: 20mm.

C. Finished Sub-Grade Level Tolerances

Maximum deviation from the design level: + 10mm, - 0mm.

Maximum deviation from a 3 m straightedge laid anywhere on each plane surface: 20mm.

D. Moisture Content

Prior to compaction, bring the sub-grade to within 2% of the optimum moisture content determined to AS1289.5.1.1-2003 or AS1289.5.2.1-2003 as applicable to the material.

E. Compaction Equipment:

Use approved rollers, appropriate to the materials and compaction requirements. Use approved plate compactors on areas inaccessible to rollers. To maintain moisture content, use water spraying equipment capable of distributing water uniformly in controlled quantities without washing fines from the sub-grade or base material.

Gravel Spreading

Moisten the prepared sub-base immediately before spreading paving material. Spread material in a uniform and continuous layer by direct tipping from trucks without disturbing the sub-grade.

Spread rate: To achieve a minimum compacted thickness as documented.

Paving Density

Compact, by watering and rolling, to not less than Eight (8) blows per 300mm with a penetrometer as determined by AS1289.5.2.1-2003.

Paving Finish

All pavement surfaces shall comply with AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

Paving Surface Tolerances

Finished surfaces shall be free draining with a central crown with even 2% falls away from crown and perpendicular to pavement edge.

Maximum deviation from design level: + 5mm, - 10mm

Maximum deviation from a 3m straightedge laid anywhere on the surface: 10mm. Pavement surface is to finish flush with adjacent hard surfaces and kerbs.

Sample Panel

Construct a sample panel for approval of the Superintendent prior to commencing works. All works shall comply with the finish of the approved sample panel.

The panel may be incorporated into the Works. Panel location is to be determined on site by the Superintendent.

Selection

General:

Refer to material schedule

2.18 TIMBER WORK**Transportation and Installation**

The Contractor shall allow for all costs and administration associated with the transportation, craning and installation of all structures including any individual elements thereof, including the protection of all existing facilities, services and vegetation.

The Contractor is deemed to have, prior to tender, inspected the site in regard to transportation and installation of all works, in accordance with the tender preliminaries.

Protection

Protect timber and timber products stored on site from excessive moisture and weather.

Identification**Generally**

Identify all timber by one or more of the following methods:

Brand the timber to show the grade, source of grading, and other branding or marking requirements of the applicable Australian standard.

Brand all structural timber, under the authority of a recognised quality assurance program applicable to the product. Include the following data:

Stress Grade

Method of Grading

"Seasoned" or "s"

The certification mark of the quality assurance program.

Certification

Provide a supplier's certificate (which may be included on an invoice or delivery docket) showing that timber for use in the Works complies with the Specification.

Inspection

Where neither branding nor certification is adopted, engage and pay for an independent testing authority to inspect the timber and certify that it complies with the Specification.

Materials**Timber Materials*****Moisture Content***

Make milled or dressed products from timbers air dried seasoned, when tested to AS1080.1;

- to within 3% of the equilibrium moisture content (EMC) appropriate to the timber and its intended conditions of use;
- to not greater than 15% nor less than 10% moisture content; and
- with no more than 3% difference between any two pieces in any one group.

Submit evidence of moisture content if requested.

Timber Grades

The grades of timber specified shall be as defined in Australian standards where applicable, and unless otherwise specified shall be those normally used in the type of work for which the timber is intended.

Hardwoods: Structural, visually stress-graded: F14 to AS2082, air dried.

Timber Species

Timber species shall be air dried, fully seasoned timber. Species as shown on the drawings. No timber substitutions or kiln drying shall be approved. Provide source certification upon the request of the Superintendent.

Dimensions

Unless otherwise specified, the actual cross-sectional dimensions of timbers may vary from the dimensions stated herein or shown on the Drawings by the tolerances (if any) permitted in relevant Australian standards.

Framing timbers: Tolerances to AS1684.2.

Finished Sizes: Use dressed or milled timbers with actual dimensions which are not less than the stated dimensions, except for dimensions qualified by a term such as "nominal" or "ex" or equivalent, to which normal machining and shrinkage tolerances shall apply.

Fastenings

Generally

Provide fixings and fastenings as necessary to transmit the loads imposed and to ensure the rigidity of the assembly.

Fastenings (for Timber Engineering Purposes): To AS1720.1.

Steel nails and decking spikes: To AS2334.

Nailing in frames: To AS1684.2, Section 6.

Bolts: To AS111.1.

Washers: To AS1237.1. Provide washers to the heads and nuts of bolts and coach screws.

Masonry Anchors: Purpose-made proprietary expansion or chemical types.

Corrosion Protection

Galvanise steel fastenings to AS1214 or AS/NZS4680 as appropriate where exposed to weather.

Workmanship

Generally

Perform necessary operations and provide the accessories necessary for the completion of woodwork items. Ease and adjust moving parts, lubricate hardware, and leave the completed work in a sound, clean, working condition.

Unseasoned Timber

Where unseasoned timber is used, or variations in moisture are likely, make allowance for shrinkage, swelling and differential movement.

Use timber in single lengths whenever possible. If joints are necessary, set out timbers so that they are continuous over at least two spans and make joints over supports.

Bolting

Ensure that bolts and similar fixings are tight at Practical Completion.

Finish

Finish all timber using:

Specified treatment. Refer material schedule

Selection

General:

Refer to material schedule

2.19 PREFABRICATED METAL GARDEN EDGING – STEEL EDGE

General

Supply and install Metal edging where indicated on the drawings.

Install as per manufacturer's instructions. Install to true lines and levels in the longest possible lengths securely fixed to stakes. All stakes shall be securely driven and finished as per manufactures' instructions. The finished level of the top of the edging shall be flush with the adjacent soil level of the grass and adjacent to paved surfaces. All steel shall comply with the 'Steelwork' clause of this specification.

Selection

General:

Refer to material schedule

2.20 BOULDERS

General

Supply and install 'Boulders' as shown on the drawings, to locations as shown on the drawings.

Materials

'Boulders': Various Sizes - Refer Material Schedule

Locally sourced boulders installed a minimum 100mm embedment;

All boulders are to be of consistent quality and not present fractures, crevices, sharp edges or holes that may create entrapment concerns.

All boulders to be fully stable items, installed over compacted subgrade; Back fill around boulders to ensure complete contact with the surrounding finished surfaces.

Where boulders are installed in contact ensure boulders are placed fully interlocking to eliminate cavities between boulders.

2.21 SEALER / ANTI-GRAFFITI COATING

General

Upon completion of construction, supply and apply sealer / anti-graffiti coating to all above ground surfaces.

Sealer / anti-graffiti coating shall be equal or equivalent to Crommelins Barricade (NS or RGB) , to the approval of the Superintendent, suitable for the substrate and site conditions, as recommended by the manufacturer.

Install strictly in accordance with the manufacturer's instructions suitable for the substrate.

3 PLANTING

3.1 TREE, SHRUB & PLANT (GREEN STOCK) SUPPLY & PLANTING

Green Stock Supply

All green stock supplied by the Contractor shall be supplied by suppliers approved by the Superintendent, to the species, sizes and quality as specified in Specification and Plant Schedules.

Green Stock Supply and Report

Supply Report

Within Four (4) weeks of acceptance of tender, furnish to the Superintendent a PRELIMINARY GREEN STOCK SUPPLY REPORT covering all green stock under the works, including Principal supplied stock and stock from specified suppliers, detailing the following:

- Container and Green Stock Size for each species;
- Number of each species;
- Nursery Supplier for each Species;
- Contact Details for each Nursery Supplier;
- Holding Location and Details for each Species; and
- Green Stock not currently available as specified.

Within Six (6) weeks of acceptance of tender, furnish to the Superintendent a FINAL GREEN STOCK SUPPLY REPORT, including all species substitutions for unavailable green stock as determined by the Superintendent. The report shall detail the following:

- All Green Stock and Stock Substitution Species under the Works,
- Container and Green Stock Size for each species,
- Number of each Species,
- Nursery Supplier for each Species,
- Contact Details for each Nursery Supplier,
- Holding Location and Details for each Species,

Green Stock Supply Guarantee and Penalties

Failure to provide to the Superintendent, in writing, a Preliminary Green Stock Supply Report and a Final Green Stock Supply report comprising all green stock species and sizes within the contract within the times specified within this contract will incur a penalty on the Contractor of One Thousand Dollars (\$1,000) per week per report for every week, or part week for which the reports are not submitted, excluding Principal supplied stock and stock from specified suppliers. The penalty shall be deducted from the value of the Contract.

The Final Plant Supply Report shall constitute a written guarantee by the Contractor that each species listed in the report will be in good condition and available for use in the works, excluding Principal supplied stock and stock from specified suppliers.

A penalty on the Contractor of Two Thousand Dollars (\$2,000) shall apply for each species listed in the Final Green Stock Supply Report approved by the Superintendent that is subsequently found by the Superintendent to not be in good condition or not available for use in the works, excluding Principal supplied stock and stock from specified suppliers. The penalty shall be deducted from the value of the Contract.

The full cost of the supply and planting of all replacement species for plants that are subsequently found by the Superintendent to not be in good condition or not available for use in the works shall be borne by the Contractor, excluding Principal supplied stock and stock from specified suppliers. The Superintendent shall determine the species and stock to be used for substitution in the works.

Green Stock Quality

All green stock shall:

- be true to species, subspecies and variety;
- be vigorous and healthy;
- be of good form consistent with species and variety;
- be well established in the plant container specified including having a large and healthy root system that occupies the full extent of the container while showing no evidence of restriction or having been restricted or damaged at any time during production;
- not be soft or produced using forced growing techniques;
- be hardened off;
- be fully self-supporting without staking or guying;
- be free from disease, insect pests and other pathogens and;
- be free from damage from staking, tying or any other horticultural techniques used throughout production.

The Superintendent will reject any green stock which does not meet the required quality.

Green Stock Labelling

Label at least one specimen of each species or variety with a durable, readable tag.

Green Stock Storage on Site

Wherever possible, green stock shall be planted immediately after delivery to the site. If this is not possible, keep them in good condition by appropriate storage methods, or as may be directed.

Prevent theft, drying out or damage from any cause including frost, wind, sun, rain, animals and the like. Provide an on-site nursery for holding green stock on site for more than 48 hours, of sufficient size, with provision for watering.

Planting Generally**Setting Out of Works**

Where underground services, manholes, cable pits, fire hydrants, lamp standards, retaining walls, kerbing, roads, paving and other obstructions occur, plant clear of such service and obstructions and protect services and obstructions from damage by machines and equipment.

Planting Generally

Remove all plants from their containers, including all biodegradable containers and growing tubes, in such a manner as to do as little disturbance as possible to the roots. Where necessary, tease out root-balls before planting.

Place trees, shrubs and plants in holes in an up-right position and backfill level with top of root-ball. Compact soil by hand watering.

Mass Planting Areas

Excavate a hole for each plant large enough to provide not less than 150mm all-round the root system of the plant, or as shown on the Drawings.

Individual Planting in Grassed Areas

Excavate a hole 100mm deeper and 600mm wider than plant containers of 5 Litre and over, or 450mm diameter x 300mm deep for pots small than 5 Litre, unless otherwise shown on the Drawings. Break up the base of the hole to a further depth of 100mm, and loosen compacted sides of the hole, as necessary to prevent confinement of root growth to the hole.

Plant Locations

Do not vary the plant locations from those shown on the Drawings unless otherwise directed. If it appears necessary to vary the location and/or spacing to avoid service lines, or to cover the area uniformly, or for similar reasons, apply for directions.

Planting Conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. Suspend excavation in other than sandy soils when the soil is wet, or during frost periods.

Depth of Planting

When the plant is in its final position in its hole or bed the top soil level of the plant root-ball shall be level with the finished surface of the soil surrounding the hole or bed. Test the depth by measuring the sides of containers. If back filling is required to correct the depth, use soil as specified.

Plant Placement

When the hole or bed appears to be of correct size and not before, remove the plant from the container with minimum disturbance to the root-ball, and place it in its final position, in the center of the hole and plumb.

Back Filling to Plants

Backfill with soil as specified. Lightly tamp down the soil and water to eliminate air pockets.

Watering Basins with Mulch

Construct a watering basin around the base of each individually planted tree of 13 Litre pot size and above, consisting of a raised ring of soil of minimum diameter of 1000mm capable of holding a minimum of 10 litres of water. Supply and place 75mm mulch as specified to the extent of each watering basin, minimum diameter 1000mm.

Mulching

All plant stems shall be kept free from mulch.

Mulch shall not be placed within 100mm of all plant stems for less than 13 litre pot sized stock, and shall not be placed within 100-200mm of all plant stems for 13 litre pot size and greater.

Staking and Tying

Protect each tree of pot size 200 & 100 Litre with four (4) 50 x 50 x 2500mm pointed hardwood stake set 700mm into the ground. Protect each tree of pot size 45 & 15 Litre and above with two (2) 50 x 50 x 2000mm pointed hardwood stake set 500mm into the ground. Locate stakes parallel to prevailing wind direction on site. Do not pierce root ball.

All Stakes shall be painted black using two coats of Dulux Timber colour Low Sheen Acrylic. Painting of stakes is to be carried out no less than 48 hours prior to installation to ensure that paint on all stakes is dry prior to installation.

All ties shall be approved flat rubber tree ties of minimum width of 10mm. Ties are to be located to provide additional support during adverse prevailing wind conditions only. All ties shall be placed in a loose figure of eight around stake and stem to provide adequate protection from damage without compromising natural plant growth.

Watering

At time of planting provide by hand watering a minimum of 10 litres of water to each plant. Repeat watering to each plant with 10 litres of water on each alternate day up to Practical Completion.

Watering of plants by sole reliance on the irrigation system will not be accepted until the irrigation system is practically complete or, unless approved in writing by the Superintendent.

3.2 TREE PLANTING**Planting**

Remove tree bag or container carefully to prevent root damage. Edges of the root ball to be 'ruffled' to remove any root circling / girdling that may be occurring.

Backfill with improved soil media to occur in 100-150mm 'lifts' with firming of the back-fill occurring around the root ball of the tree after every lift.

Watering shall occur at the same time as the planting and firming.

Construction a 'bund' at the edge of the compost / mulch zone to aid in water retention where landscape surrounds allow.

After planting conditioned site soil shall finish 120mm below adjacent kerbing, paving and turf areas.

Tree Well Site Soil Conditioner

As detailed on the drawing all tree planting back soil shall be excavated site soil plus 10% by volume C-Wise Horticulture evenly mixed to a fully homogeneous mix.

Compost shall be:

- C-Wise 'Horticulture'.

Soil conditioner shall comply with AS4454 Composts, Soil Conditioners and Mulches.

Humate

At time of compost application apply a Humate to the full extent of the root ball and conditioned soil mix.

Humate shall be:

- Eco-Growth's Humus 400.

Apply at the rate of 50g / square metre.

3.3 CLEAN UP

On completion of planting ensure that all plants are in first class, presentable condition by removing dead, damaged and unhealthy branches and trimming where necessary to result in balanced growth typical of their normal form.

After inspection by the Superintendent and on Practical Completion, remove labels from plants.

4 MULCH

4.1 GENERAL

Supply of screened, coarse textured mulch to all areas as designated on the drawings.

Mulch shall be applied to the full extent of all areas indicated on the drawings.

Mulch shall be applied to a depth, after tamping down, of 75mm to the approval of the Superintendent.

Mulch is to be completely free of all noxious weeds, seeds and fungus, insect pests and other deleterious material and have been passed over a dynamic screen with resulting particle size of 16 to 50mm containing less than 3% (by weight) of particles passing a 16mm screen.

The mulch shall have an extended design life and not require replacements for minimum 3 years

The mulch shall be of a course chunky texture and not subject to being blown away by strong winds

A sample of the mulch will be required for approval by the Superintendent prior to commencement of works on site.

Minor beds preparation including raking and removal of rubbish to produce an even and smooth surface at a constant depth of 75mm below finished surface of mulch will be the responsibility of the Landscape Contractor.

All plant stems shall be kept free from mulch.

Mulch shall not be placed within 100mm of all plant stems for less than 13 litre pot sized stock, and shall not be placed within 100-200mm of all plant stems for 13 litre pot size and greater.

The mulch will be consolidated, to produce smooth and even grades, finishing 10mm below surrounding hard surfaces.

4.2 MULCH STANDARDS

Mulch shall comply with

- Australian Standards AS4454 Composts, Soil Conditioners and Mulches.
- Tested Dieback free
- Hold Waterwise accreditation

Selection

General:

Refer to material schedule

5 TURF GRASSING AND ESTABLISHMENT

5.1 SELECTED GRASS SPECIES

Grass species shall be:

- Turf rolls- refer material schedule.

Obtain specified grass species from a specialist grower of cultivated turf. The turf shall be sourced from a turf farm and shall not be sourced from any active or passive area such as from a council park, school, golf course or other non-specialist turf farm areas.

The turf shall:

- be certified as from an area in the turf farm that has either been newly established in the previous twelve months or which has been harvested in the previous twelve months;
- be free draining with total organic fines in the turf roll no greater than 5mm in depth;

- be certified by a ASPAC accredited laboratory that it is Sting Nematode and Phytophthora free. Contractor shall also provide a declaration from the supplier that the turf has not been treated with a Nematicide for the 12 months prior to testing.
- be free of all deleterious material including plastic reinforcing sod netting;
- be in rolls with clean cut edges and square ends;
- be in rolls all of the same dimensions (length, width and thickness);
- have a roll depth of thatch not exceeding 10mm;
- have the thickness of the soil portion of the roll not exceeding 15mm and be uniform over the entire roll; and
- have a uniform deep green foliage colour and not be discoloured.

Furnish a warranty from the grower that the grass is true to species and free from other grasses, weeds, fungus, insect pests and other deleterious matter.

5.2 INSTALLATION

Minor Preparation

Remove all rubbish, roots and stones greater than 10mm in diameter to a depth of 300mm and grade to true and even grades to the levels as indicated on the drawings or, grade out all depressions and humps less than 150mm from the general grade where contour or spot levels are not indicated.

All surfaces prepared for grassing to finish flush with adjoining kerbs to roads, parking and paved areas, and with foot pavements, terraces, verandas, mowing strips, manholes, pit and the like.

Where plumbing connector traps and rainwater relief overflows occur, finish ground level 75mm below overflow level.

All grading works shall be undertaken by hand work or by machine as is appropriate to the work however all grading and earthworks within a distance of 600mm radius of sprinklers or other fixed reticulation apparatus shall be hand worked to prevent damage to equipment.

Finish shall be smooth rolled, consolidated and smudge boarded to obtain a perfectly even, well consolidated surface.

No irregularities, depressions, hollows or abrupt changes in grades or falls will be accepted.

The cost of such minor preparation work shall be included in the unit rate per square metre tender price and no extras will be allowed for such preparation.

Before commencing work, inspect the site with the Superintendent to determine that grading can be achieved without providing additional filling sand from off-site sources.

If the Superintendent determines that additional filling sand is required, submit a written quotation which will be the subject of a variation to the contract as per the unit rate schedules.

Fertilizing

Prior to turf laying supply and spread to the full extent of area to be turfed pelletised organic fertilizer equal or equivalent to "Dynamic Lifter" at the rate of 100 grams per square meter to the approval of the Superintendent.

Watering

Supply all equipment necessary to adequately water the site during the Construction period.

Before commencing planting, ensure adequate watering services and equipment are available and properly functioning.

Areas to be planted shall first be watered to a depth of 100mm and the planting shall be carried out immediately after watering.

Throughout the contract up to Practical Completion, watering shall be properly undertaken, either by hand or irrigation system to keep the planted area moist to a depth of 100mm at not more than two (2)

day intervals excepting Saturdays, Sundays and Public Holidays unless otherwise directed by the Superintendent.

Any faults or defects to the watering service and equipment during the construction period shall be immediately reported to the Superintendent.

Turf Laying

Lay the turf along the land contours with staggered, close butted joints, and so that the finished turf surface is flush with adjacent finished surfaces of paving and the like. As soon as practicable after laying, roll the turf with a roller weighting not more than 90 kg/m of width or plate compactor. On slopes too steep for rolling, lightly tamp with turf into place.

Making Good

Lift failed turf and relay with new turf. Turf of poor quality will be rejected.

Top Dressing

Undertake top dressing as required to produce a true and even surface to the full extent of turf areas free of humps, hollows and depressions. Should top dressing be required, undertake when the turf is established, mow closely, remove cuttings and lightly top dress to a depth of 10mm with approved quality top dressing sand. Rub the dressing well into the joins and correct any unevenness in the turf surface.

5.3 TURF ESTABLISHMENT

General

All turf grassing shall be fully established prior to granting of Practical Completion of turf grassing.

Undertake all establishment requirements including watering, fertilizing and mowing as specified to all newly grassed areas for the duration of the mowing and fertilizing programme specified and until such time as the turf grass is fully established. For turf laid between the months of October to May inclusive a minimum of 6 weeks shall be allowed for full establishment. For turf laid between the months of June to October inclusive a minimum of 12 weeks shall be allowed for full establishment. Commencement of turf grassing consolidation will be subject to the successful establishment of turf grassing as solely determined by the Superintendent.

Watering

Throughout the turf establishment period, ensure watering shall be properly undertaken, either by hand or irrigation system to keep the planted area moist to a depth of 100mm at not more than two (2) day intervals excepting Saturdays, Sundays and Public Holidays unless otherwise directed by the Superintendent.

Any faults or defects to the watering service and equipment shall be immediately reported to the Superintendent.

Fertilizing (1st stage)

One week after laying turf, apply to the whole area a fertilizer mixed in the proportion of:

- Two parts AGRAN 34, one-part Superphosphate No. 1 and,
- One part of MURIATE of Potash or such other lawn starter fertilizer as may be approved.

Evenly spread fertilizer at the rate of 50 grams/square metre and immediately thoroughly water in.

Fertilizing and watering shall be inspected by the Superintendent during each operation.

Give the Superintendent two (2) working days' notice before the commencing of fertilizing and watering.

Fertilizing (programme)

(2nd, 3rd, 4th, 5th and 6th Applications)

Apply a total of FIVE fertilizer applications to grassed areas after initial fertilizing.

Each application shall be at a maximum of four (4) and a minimum of three (3) weeks after initial fertilizing.

Each application is to be at the following rate:

- 50 grams/sq. metre of Baileys 'Brilliance' or 12:2:6 NPK with Trace Elements including iron and manganese granulated fertilizer immediately thoroughly watered in.

Give the Superintendent two (2) working days' notice before the commencement of each fertilizing and watering for site inspection.

Sample of Fertilizers

Submit to the Superintendent on request, sample of fertilizers used in the works.

The samples may be subjected to analysis. Fertilizer not in accordance with the Specification may be rejected.

Areas found to be not in accordance with the Specification shall be given an additional application of fertilizer in accordance with the Specification at their own expense.

Mowing

All newly grassed areas are to receive six mowing's using a reel mower or an approved equivalent. When grass growth has reached 75mm a first light cut shall be made carefully avoiding damage to new turf. Cutting shall not remove more than 50% of growth and cuttings shall be caught and removed from the site.

Each additional cut (five in total) shall be made when turf has again reached 75mm. Repair all failed turf after mowing. Cuttings shall not remove more than 50% of growth and all cuttings shall be caught and removed from the site.

Weed, Insect and Fungus Control

The control and eradication of all weed growth, insect and fungus infestations shall be the total responsibility of the Contractor. During the establishment period all areas shall be managed to ensure minimal weed growth either by spraying or manual removal at all times until Practical Completion.

Where required, spray with insecticide, herbicide or fungicide in accordance with the manufacturer's recommendations, to all Health Department and other statutory requirements. Submit proposal for approval prior to starting this work.

Rolling and Surface Finish

After the completion of second mowing the newly grassed areas shall be rolled with a heavy roller and finished to produce true and even grades and falls free of all wheel marks and ruts, waves, depressions and other irregularities. Maximum weight of roller is to be 500 kilograms.

Programme Inspections

Give the Superintendent not less than two (2) working days' notice before completing each stage so that he may inspect the work.

Payment will only be made upon a satisfactory grass growth pattern being in evidence with sward in a healthy and vigorous condition at the initial inspection and continuing similar healthy growth being evident. Make repairs to each stage as are necessary to maintain full cover to the area.

The Contractor shall be fully responsible for all remedial works, including patching, to ensure a 100% full cover of grass is maintained at all times.

5.4 PRACTICAL COMPLETION

Practical Completion and commencement of consolidation will be granted by the Superintendent, upon sole determination by the Superintendent that the turf establishment programme is fully complete and that the turf grassing is fully established.

5.5 PRACTICAL COMPLETION

General

Reference is made to the General Conditions of Contract, definition of Practical Completion.

Give the Superintendent three (3) working days' notice that the works are complete and that the works are ready for issue of the Certificate of Practical Completion and commencement of consolidation.

Prior to Date of Practical Completion, the Contractor shall supply to the Superintendent one A1 paper (or original drawing) size and one digital (CD) copy of the as constructed drawings clearly showing all works as executed and covered by the contract, including all warranties and manuals.

Prior to Date of Practical Completion, the Contractor shall supply to the Superintendent one A1 paper (or original drawing) size and one digital (CD) copy of the irrigation works as executed drawings clearly showing all irrigation works as executed and covered by the contract, including all warranties and manuals.

The supply of approved as executed drawings, warranties and manuals forms part of the works and shall be a condition precedent to the Superintendents acceptance of Practical Completion.

Practical Completion of Turf Grassing will be granted by the Superintendent upon completion of the turf grassing establishment programme and when the turf grass is fully established as solely determined by the Superintendent.

5.6 CONSOLIDATION

General

Consolidation shall mean the continuing care and consolidation of the works by accepted horticultural and landscape maintenance practices, as well as rectifying any defects that become apparent in the works.

The consolidation period for Hard Landscape and Planting works shall commence from the Date of Practical Completion and be for a period of Three (3) calendar months.

The consolidation period for Turf Grassing shall commence from the Date of Practical Completion of Turf Grassing (at completion of turf establishment programme to the sole discretion of the Superintendent) and be for a period of Three (3) calendar months.

Works to be consolidated include all the works under the contract including, but not limited to:

- Inspection and Reporting;
- Hard Landscape Works Consolidation;
- Soft Landscape Works Consolidation;
- Irrigation System Operation (where irrigation is within the landscape contract);
- Rubbish Removal; and
- Rectification of Defects, Vandalism and Theft.

Consolidation Commencement

Works shall only be placed in consolidation when a certificate of practical completion has been issued for the full or separable portion of the works as stated in the contract.

Inspection and Reporting

Weekly Inspection

The Contractor shall inspect the full works at a minimum on a weekly basis and immediately report to the Superintendent any activities and conditions that in any way adversely affect the works including all damage and theft.

Weekly Consolidation Reporting

Throughout the consolidation period the Contractor shall prepare and submit to the Superintendent on a weekly basis a consolidation report covering the following:

- Date and time of weekly inspections;
- Condition of pavements and hard landscape elements;
- Condition of garden structures, furniture and fixtures;
- Condition of irrigation;
- Condition of garden beds and turf grassing;

- Progress of establishment of green stock and turf grassing;
- Occurrence of vandalism, theft and graffiti throughout the works;
- Damage or disruption by others throughout the works, including sand drift from adjacent sites;
- Activities that have been completed throughout the month,
- Activities planned for the month ahead, and
- Upcoming capital outlays required to consolidate the works.

Payment of claims for consolidation shall be dependent upon the submission and approval by the Superintendent of compliant consolidation reports.

Hard Landscape Works Consolidation**General**

Maintain all hard landscape works in a clean, neat and tidy condition for the full extent of the consolidation period. All defects shall be rectified at the Contractor's expense within one (1) week of detection.

Notify the Superintendent of any hard works or street furniture that have been stolen or damaged and await instructions from the Superintendent prior to repair or replacement.

Soft Landscape Works**General**

The consolidation programme shall include, but not be limited to the following items where and as required:

- Turf Grassing Maintenance; and
- Mass Planting Area Maintenance.

Turf Grass Maintenance

Maintain turf grassing in a healthy, vigorous condition, free of weeds and pest and mown as required to maintain optimal health and suit seasonal requirements.

Undertake all testing and control as required to identify and control all pests and disease including Pythium root rot.

Weed Control

Maintain site and fence lines free of weeds and invasive plants. Eliminate all weed growth to landscaped areas using approved non-residual herbicide such as "Roundup". Control weeds growing in watering basins by means of suitable selective herbicide such as 'Roundup'.

Vermin, Pest and Disease Control

The Contractor shall maintain all plants free from pests, disease and attack and damage by vermin by approved methods at the Contractors expense.

Undertake all testing and control as required to identify and control all pests, disease and vermin including Phytophthora root rot.

Where chemicals are required preference will be given to biological control and low toxicity systemic products. Mechanical applicators will be precisely calibrated and care taken when applying to minimize over spray.

Chemicals used in plant maintenance shall be applied in accordance with all Health Department Regulations and relevant approved Safety Data Sheets for each chemical.

Re-Planting

Replace weekly all dead and dying plants, including plants damaged by vermin at the Contractor's expense.

On a weekly basis notify the Superintendent of the quantity and type of plants that have been stolen or damaged through vandalism and await instructions from the Superintendent prior to replacement.

Pruning

Prune all dead wood or foliage from plants as required each week.

Watering - Irrigated

Provide sufficient irrigation to maintain all plants in a healthy growing condition in accordance with the Irrigation Operation and Maintenance section of this specification for the duration of the Consolidation period.

Irrigation System Operation

Operate and maintain the irrigation system for the extent of the consolidation period to ensure the effective watering of all irrigated areas under the contract under prevailing site conditions. The Contractor shall be responsible for all cost associated with maintaining the irrigation during the consolidation period.

Any plant material that has died or is set back due to the failure of the irrigation system shall be immediately replaced to original specification by the Contractor. All costs associated with replacement of dead or set back plant material shall be borne by the Contractor.

During the consolidation period of the Contract the Contractor shall immediately repair, at the Contractor's expense, any irrigation component failure or malfunction including the repair of any erosion of soil due to sprinkler failure or malfunction.

During the consolidation period of the Contract, the Contractor shall immediately inform the Superintendent of any theft or wilful damage by others and await instruction. All cost associated with repairs due to vandalism and theft shall be borne by the Principal and be subject to an approved variation to the contract.

The contractor will immediately make safe and undertake repairs as necessary to the irrigation system when a failure of the system will jeopardize public safety or the establishment of the landscape works and, immediately notify the Superintendent of the actions taken.

After establishment of the landscaped areas, adjust the heights of all sprinkler heads, valve boxes, cable pits etc as and when instructed by the Superintendent.

Rubbish Removal

Maintain the site free of rubbish, rocks, branches etc for the full extent of the consolidation period.

Rubbish, including the emptying of refuse bins from the entire site shall be undertaken as required to maintain the site in good condition. As a minimum, rubbish removal shall be undertaken once per week on Friday or Saturday mornings. All rubbish shall be disposed of off-site in an approved refuse tip at the contractor's expense.

Rectification of Damage, Vandalism and Theft

Take all reasonable steps practicable to minimize the threat and occurrence of damage, vandalism and theft to the landscape generally. This shall include but not be limited to removal of unused equipment after hours, maintaining lighting, not leaving tools or piles of pruned or mowed vegetative material on site over weekends and immediately reporting suspicious activities to the Superintendent and, if deemed necessary the police.

During the consolidation period damage to the works due to vandalism and theft shall be repaired by the Contractor.

All cost for rectification of damage, vandalism and theft of the works, except those due to an act or omission on the part of the Contractor, shall be borne by the Principal and subject to an approved variation to the Contract. No rectification shall be completed without the written approval of the Superintendent. All rectification shall be completed by the Contractor within seven days of approval to proceed.

Any damage, vandalism or theft that renders the works unsafe shall be immediately made safe by the Contractor by barricading off or other appropriate means and immediately notified to the Superintendent.

Any damage, vandalism or theft to the landscape shall be reinstated as shown on the plans and as outlined in the contract documents.

5.7 CONSOLIDATION COMPLETION - PRINCIPAL HAND OVER

General

Fourteen (14) days prior to the dated of Completion of Consolidation, give the Superintendent written notice that the Consolidation Period is due to expire. The contractor shall be responsible for the ongoing consolidation of the works until such time that the notice has been served to the Superintendent.

Directly prior to consolidation completion 'top up' mulching to all garden beds and tree watering basins to conform to specification.

At time of consolidation completion grass areas shall have a healthy and vigorous grass sward.

At time of consolidation completion trees and shrubs shall show signs of healthy vigorous growth, be free of all pests and diseases and be appropriately pruned. Trees shall be appropriately staked and have a suitably sized watering basins intact.

At time of consolidation completion all hard works including paving, kerbing, lighting (where lighting is within the landscape contract) and street furniture shall be functional, oiled or painted as specified, free of damage, clean, neat and tidy.

At time of consolidation completion all irrigation works shall be fully automated, working efficiently and effectively and programmed to suit the current status of the landscape works. Maintenance personnel to whom the work is to be handed to shall be fully briefed on the operation of all systems to ensure they can operate the systems efficiently and effectively.

5.8 FINAL COMPLETION

General

Fourteen (14) days prior to date of Final Completion, give the Superintendent written notice that final completion is due.

6.7 Appendix 6.7 – Irrigation Specification

Irrigation Specification

Merredin CBD Stage 1 A

Merredin, WA

Place Laboratory

Rev A – Issue for Tender

March 2022

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Revision Date:	15 th March 2022
Author:	Melan Welhenage
Checked:	Troy Fiscus



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1. PRELIMINARIES

1.1. SCOPE AND INTENT

The construction of the Irrigation works is for;

Project: Merredin CBD Stage 1 A

Location: Merredin, WA

and includes, but not limited to, the following summary of works;

- Automatic irrigation system.
- Testing & Commissioning of all aspects of the works installed under the Contract.

It is the responsibility of the Contractor to formulate and submit a quotation which shall encompass ALL of the work and materials which is required to install the associated equipment and materials required for the project works in a competent, professional manner and in accordance with standard industry practice. Items of equipment, materials, labour etc. shall not be limited to the materials, equipment and/or quantities noted in this documentation.

This specification and associated drawings have been accomplished for the purpose of outlining to the Contractor the extent of the works which are required by the Principal and the route and approximate position and/or location of various elements of the project works.

Component locations and pipe work routing are essentially diagrammatic and must be interpreted in accordance with the scale of the drawing, standard industry practice and actual site conditions.

Minor variations to equipment locations and pipeline routing will not be considered as variations or extras to the Contract.

1.2. ABBREVIATIONS

Abbr:	Description	Abbr:	Description
DN	“Diametre Nominal”	kL	kilolitres
NB	Nominal Bore	ML	Megalitres
L/s, LPS	Litres per second	Cum, m3, m ³	Cubic metres
L/m, LPM	Litres per minute	Sqm, m2, m ²	Square metres
L/h, LPH	Litres per hour	mm	millimetres
hr	Hour/s	m, mt	metres
min	Minute/s	PPM	Parts per million
Ha	Hectare (10,000 sqm)	mg/L	Milligrams per litre
kL/Ha/a	Kilolitres per hectare per annum	kg	Kilogram
kW	Kilowatt	VAC	Voltage, Alternating Current
AS	Australian Standard	NZS	New Zealand Standard

1.3. WORKS BY OTHERS

The Contractor shall liaise with the other contractors undertaking associated works to which the Contractor must connect for the provision of services, as follows;

Service	Contractor
Water supply	Project Hydraulic Contractor
Power Supply	Project Electrical Contractor
Under road sleeves	Project Civil Contractor

1.4. STANDARDS

All equipment, materials and workmanship supplied by the Contractor for incorporation into the project works shall comply with the respective Australian Standard applicable which is current as at the date of close of tenders.

Where a Australian Standard is nominated in this documentation, it is provided as a guide to the Contractor for the selection of appropriate materials and/or work practices which are required by the Client.

Where a nominated Standard or Interim Standard has been revised, amended, designated or not current as at the date of close of tenders, the applicable Standard shall be the Australian Standard which is current as at the date of close of tenders.

1.5. COORDINATION OF SUBCONTRACTORS

Whilst it is recognised that the Contractor may need to sub-contract some portions of the works required, it is the responsibility of the Contractor to ensure close liaison between Subcontractors and the provision of any information required to ensure the satisfactory completion of the project in accordance with these specifications and associated drawings.

This information exchange between all parties involved in the project should include, but not limited to;

- Provision of RL (relative level) data of irrigation areas.
- Positions and location of Hard Landscaping/Civil elements bordering irrigation areas.
- Clear and effective communication between Contractors and Subcontractors of the onus of responsibility for any requirement contained in these specifications.

The Contractor is responsible for the construction of all the works under the Contact.

1.6. SET OUT

The Contractor shall provide for the set out of all the works in accordance with the prepared drawings and including any survey required to accurately establish the extents of the works and location of equipment to be installed under the Contract works.

1.7. STAGING OF WORKS

Should the irrigation drawings illustrate staging of the works then the contractor shall make all necessary allowances for all labour and material components required to facilitate the temporarily capping/termination and later connection to the irrigation infrastructure at the intersecting locations.

1.8. ERRORS & OMISSIONS

The Contractor shall immediately notify the irrigation consultant of any errors or omissions in the Contract documentation which may be discovered during the Contractors preparation of his submission for this Contract.

Whilst the Contract documentation has been prepared to clearly outline the requirements of the works, where the drawings and/or works specification are ambiguous, the Contractor shall seek clarification from the project Superintendent prior to ordering materials and installation.

1.9. TIDYING UP

At the completion of the Contract, the Contractor shall be responsible for the tidying up of the site, including the removal of any construction debris or other debris which may have been excavated from the site, to the satisfaction of the Contract Superintendent.

1.10. MATERIALS STORAGE

The Contractor shall be responsible for the provision and maintenance of secure storage for all materials and equipment required to undertake the works.

1.11. SITE SAFETY

The Contractor will be required to maintain the highest level of safety of all persons under the Occupational Safety & Health Act (1984) and the Occupational Safety & Health Regulations (1996) during the currency of this Contract.

1.12. EXISTING SERVICES

The Contractor shall be responsible for the re-instatement and/or repair of any damage caused to services, including but not limited to Power & Gas Supplies, Water Mains, Telephone (voice, data & communications), Sewerage, Drainage, Lot boundary pegs, existing irrigation etc.

Accordingly, it is the responsibility of the Contractor to inquire, with the owner of the service, as to the location and/or route of service within the project area.

1.13. WORKS COMPLETION INSPECTION

1.13.1. Inspection

The Irrigation Consultant shall attend the site to verify that the works have been completed to a level, which in the opinion of the Irrigation Consultant, have been completed in accordance with the drawings and documentation.

For the Works Completion inspection to be scheduled, the irrigation contractor must first furnish the project superintendent with a copy of their as-constructed drawings.

A Works Completion inspection will not be scheduled until contractor confirms the availability of the as-constructed drawings for the practical completion inspection.

It is the Contractors responsibility to ensure that the works have been completed in accordance with the works specification prior to consenting and/or seeking a Completion inspection.

1.13.2. Inspection Report

Subsequent to the inspection, the Irrigation Consultant shall issue an Inspection Report for the works, detailing any items or works which are required to be actioned, remediated and/or completed.

The Contractor shall comply with the directions noted in the report in accordance with the date noted and shall forward a copy of the Report to the Irrigation Consultant. This Report shall be returned to the Irrigation Consultant within five (5) working days of having undertaken the works.

1.13.3. Practical Completion

The Works Completion Report may be utilised to inform the project Superintendent in relation to Practical Completion of the works.

Where the Superintendent should decline to grant Practical Completion of the works and an additional Works Completion Inspection is required, then the responsible Contractor shall be liable for the reimbursement of all professional fees levied to undertake subsequent inspections required to achieve Practical Completion of the works, including time resources allocated for the preparation of Completion inspection reports and costs of re-inspection.

Any such professional fees shall be deducted from any payments due to the Contractor by the Principal.

1.13.4. Certification

The Contractor shall note that the Works Completion Report is also utilised as a 'check-list' for the items of remedial works to be undertaken and serves as the Contractor's Certification and confirmation that the works have been undertaken by the Contractor.

1.14. **LATENT DEFECTS**

Due to the nature of various aspects of the works, being direct buried and/or forming a part of a system for which verification of settings/operation cannot be accurately determined at the time of Practical Completion or Final Completion, there is a possibility that such a defect will manifest itself at some time after completion of the works.

Any such defect is deemed to be a Latent Defect, for which the Contractor shall remain responsible for rectification.

1.15. **AS-CONSTRUCTED DOCUMENTATION**

The intent for the provision of As-Constructed documentation for all irrigation works undertaken for the project is as follows;

- Provide the Client with accurate information of the construction and location of various elements of the constructed works, without the need to undertake on-site investigations to determine the requirements for future repairs, maintenance and modifications to the works.
- Provide the operator of the irrigation system with As-constructed drawings in a format which can be easily reviewed and/or interpreted without the need to reference digital data.
- Provide to the Client, all the as-constructed data and information on all aspects of the irrigation system, which the Client is required to provide to the local Municipality at the time of handover of the project works to the Municipality.

The Contractor shall furnish all required information to satisfy the intent of the provision of As-Constructed documentation and to the satisfaction of the Contract Superintendent prior to the arrangement of the Practical Completion Inspection.

1.15.1. Survey & Survey Drawings

At the completion of the project, the Contractor shall provide an 'As Constructed' Survey plan and electronic data, showing the location and routes of all mainlines, conduits, conduit pits, solenoid valves, isolation valves, air valves, flushing valves and location of major items of water supply & irrigation infrastructure (pumps, tanks, bores, electrical cubicles etc). The Survey data is to be collected by a qualified Surveyor with previous experience in the digital 'pick up' of irrigation systems and accomplished in accordance with the Perth Coordinate Grid (PCG94).

In addition, the survey data is to be imported into the electronic as-constructed drawings, as follows;

- Inserted into separate survey data layer(s) in the drawing having a layer prefix of 'Survey' or other survey-related descriptive prefix.
- Rotated and positioned to suit the coordinates of the drawing.

The survey shall include the pick-up of various locations of permanent site hardworks features as required for the dimensioning (triangulation measurements) for all valves in the irrigation as-constructed drawings. Irrigation sprinklers shall NOT be used as reference points.

1.15.2. Conjunctural O-Spec Requirements

Where the project works are required to be handed over to the local Municipality, the Contractor shall verify (at the time of providing a tender for the works) if the Municipality is a member of the A-Spec (Asset Specification) Consortium, which can be checked at <http://www.a-specstandards.com.au/a-spec-community>.

If the Municipality is not a member of the Consortium, then there is no requirement to fulfill the provisions of the Open Space (O-Spec) portion of specification.

Where the Municipality is a member of the A-Spec Consortium and user of the O-Spec standard, the Contractor is required to provide additional As-Constructed data and information in accordance with the O-Spec digital data specification standard, as required for the Municipality's Asset management purposes, as follows;

- Secure the services of an accredited O-Spec surveying & data compilation professional to fulfill the requirements of the O-Spec standard.
- Liaise with the O-Spec professional in relation to providing any and all information, data, As-Constructed drawings etc which may be requested to full the requirements of the O-Spec standard.
- Make allowance in the tender price of the works, to provide and satisfy all of the requirements of the O-Spec digital Data specifications.

In addition to all of the native data formats required to be provided under the O-Spec specifications, provide layered PDF format drawings of the as-constructed information, including separate layers for the irrigation works in accordance with the O-Spec standard.

As a guide, it is envisaged that the provision of the O-Spec information will require the following;

- Contractor preparation of preliminary as-constructed drawings and/or mark-ups and submit to O-Spec professional, including the product name, model, description of ALL materials and equipment installed at the project. (Note that this requirement will provide the O-Spec professional the information need to 'string' together piping connections between the in-ground equipment.)
- O-Spec professional to undertake survey locations of all materials & equipment and compile the required;
- Native GIS data files.
- Survey drawing of the irrigation As-Constructed survey information in a layered PDF format and/or DWG/DXF format.
- O-Spec professional is to submit prepared drawings to the Contractor, for the purposes of editing the original design drawings to produce the required As-Constructed Irrigation drawings to match surveyed locations.

Contractor to submit the following information as part of the as-constructed documentation package;

- All native GIS data to satisfy O-Spec requirements.
- Layered PDF format survey drawing.
- Final As-Constructed irrigation drawings in the file formats nominated in the specification clause.

1.15.3. Irrigation As-Con Drawings

At the completion of the project the Contractor shall provide irrigation plans to accurately show the location of all major items of infrastructure (pumps, tanks, bores, electrical cubicles, cable pits etc), sprinkler heads, changes in routes of all pipe work and location, including lateral piping connections to the surveyed location of valves & infrastructure.

Where changes to the irrigation design have been undertaken as a result of amendments to the landscape design and/or works, the Contractor shall include any such changes to both hard & soft landscape works, in the irrigation as-constructed drawings. If necessary, this may extend to obtaining revised landscape design drawings (electronic and/or hard copy) from the landscape architect and/or contractor.

In addition, the Contractor shall include triangulated dimensions (measurements) for all cable pits and valves installed on any piping, with the triangulated measurements taken from PERMANENT site feature reference points of hardworks.

The drawings shall be titled 'Irrigation, As-Constructed', with an incremental revision number or shown as "AC" on both the sheet and revision issue data. Four(4) sets of these drawings shall be supplied in A1 sized digital data (Disk/FlashDrive) in PDF and AutoCAD DWG format.

The Contractor shall provide a laminated set of A3 sized 'As-Constructed' drawings which shall be placed inside the cubicle housing the irrigation sequencing controller for the project works or as nominated by the Superintendent.

The Contractor shall show the irrigation system data on the drawing, presented in a tabular format, showing;

- Valve identification number.
- Valve & station flow rates.
- Typical valve precipitation rates (mm/hr).
- Valve decoder address where applicable.
- Valve wire color-code details.
- Watering duration (in minutes), to apply 10mm of precipitation.

The As-Constructed drawings shall be supplied in accordance with the standard CADD procedures of the Principal and/or conjunctional specifications.

1.15.4. Manual

Upon completion of the project, the Contractor shall provide four(4) sets of Operation and Maintenance manuals on the entire system as follows or previously noted in this specification.

The listing presented below is a sample of the information required for typical irrigation works. Where applicable to the actual works, the Contractor shall include additional information and/or omit as required to satisfy the intent;

- Digital manual to be A4 sized and include an identification sheet.
- Manual Identification sheet to include;
 - <Project Name> (eg. My Primary School)
 - <Works Description> (eg. Irrigation Works)
 - "As-Constructed Documentation"
 - Project title, Head Contractor and Installation Contractor/s details including addresses, telephone numbers and contact names.
- As-Constructed drawings (editable PDF).
- As-Constructed drawings on Disk (DVD) or Flash Drive(USB) in DWG and PDF (electronic) format.
- As-Constructed Survey data in electronic DWG format.
- Scheme water connection details: Size, location and flow test performance.
- Details of Routine and breakdown maintenance callout procedure.
- Date of Practical Completion and details of warranty/guarantees.
- General description of system.
- Product brochures for all equipment used in system.
- Normal Operating Procedure of pumps & controls.
- Troubleshooting Guide of all possible faults of pumps & controls.
- List of special tools required.
- List of spare parts.
- List of settings for protective devices.



- Full details of name brand, model, rating of pumps, including performance curves and configuration settings of the variable speed drive.
- Bore Completion Report – as detailed in the specification section for the groundwater bore.
- Water meter(s) information for all meters as per specification requirements and including;
- Model, size & serial number of water meter(s), with photo image.
- Date of installation.
- Meter reading at date of installation, with photo image.
- Meter reading at date of Practical Completion, with photo image.
- Electrical controls schematic.
- Electronic copy of programming software for any PLC installed in switchboard (CD/DVD).
- Hard Copy and electronic copy of PLC ladder programs and passwords (CD/DVD).
- Copy of Practical Completion inspection certificate.
- Any other requirement as noted in other sections of this specification and/or required to satisfy the intent of this clause.

The manuals shall be provided in digital PDF and/or DOC formats, A4 sized and shall be accomplished to the satisfaction of the Superintendent.

1.16. GUARANTEES, WARRANTIES & TRAINING

1.16.1. Equipment Manufacturer Guarantees

The Contractor shall warrant that the installation of all equipment supplied and installed under this Contract shall be accomplished in accordance with standard industry practice and equipment/material manufacturer's recommendations and specifications.

Accordingly, the Contractor shall warrant that all equipment and materials are guaranteed by the manufacturer of the materials for a minimum period of 12 months from the date of practical completion of the project works.

The Contractor shall warrant that they will attend to the repair and/or removal & reinstallation and/or replacement of any defective materials.

1.16.2. Contractors Warranty of Workmanship

In addition to the equipment and material guarantees, the Contractor shall warrant his workmanship for a minimum period of 12 months from the date of practical completion of this project and agrees to undertake to correct any problem which may occur which is attributable to poor workmanship or failure of any materials, equipment or part thereof, during the guarantee period where such equipment and materials fail to perform the duty for which they were designed.

The removal, repair and/or replacement of any such materials and equipment shall be undertaken by the Contractor, at no cost to the Principal.

1.16.3. Personnel Training

The Contractor shall provide sufficient training to nominated maintenance personnel, in the operation, setting, adjustment and maintenance procedures for the entire system, including (but not limited to) the following;

- Irrigation controller operation & calculation of seasonal station watering duration.
- Setting and adjustment of valves, sprinkler arcs, sprinkler and drip system maintenance procedures.

1.17. CONTRACT VARIATIONS

The Principal reserves to right to issue variations to the scope of works for this Contract without incurring any penalty, fee or cost in relation to any variation or the balance of the Contract.

Variations may take the following form;

- The supply and installation of additional equipment/work to be undertaken under the Contract.
- The deletion from the scope of works for the supply and installation of equipment/work included in the Contract Tender sum.

1.18. BREAKDOWN OF LUMP SUM PRICE

The Contractor is required to complete the attached schedule titled “Breakdown of Lump Sum Tender” for the purposes of;

- Assessment of the value of progress payments during the course of the Contract.
- Assessment and valuation of any variations arising during the course of the Contract.

In the event that the schedule is not attached as part of the project documentation or the Contractor requires an electronic copy of the schedule to assist in compilation of same, a copy of the schedule in Microsoft Excel XLS format is available from CADsult upon request.

The schedule is provided as a guide to the Contractor of the minimum requirements of inclusions in the breakdown. The Contractor shall be responsible for the accuracy of all quantities and inclusions of materials, equipment & services required to undertake the works to satisfy the intent of the specification.

Where specific items of the works are not included in the schedule, any costs associated with such items are deemed to be incorporated in the costs of those items listed.

The Contractor shall indicate the cost (if any) of mobilization, administration and other fixed costs required for the duration of the Contract, including (but not limited to) all costs associated with establishment, maintenance and removal of Contractors on-site facilities, administration, supervision, machinery hire, travel, accommodation, maintenance etc. associated with the provision of the deliverables under this Contract which are NOT encompassed in the rates nominated in the schedule.

The total of the breakdown shall equate to the total lump sum tendered by the Contractor for the project works. If for any reason the total of the breakdown does NOT equal the lump sum tendered for the project works, then the difference between the lump sum tendered and total of the breakdown shall be calculated on a pro-rata basis across all items as a percentage of the total line value and subsequently divided by the quantity shown, to calculate the item rate required for valuation purposes.

2. IRRIGATION SYSTEM

2.1. SITE INSPECTION

It is the Contractor's responsibility to familiarise themselves with the conditions experienced on the site, and it shall be a requirement of this Contract that the Contractor inspect the site prior to submission of a Tender.

2.2. SET OUT

The set out of the mainline, sprinkler heads and valves is to be carried out to the satisfaction and approval of the Superintendent.

The irrigation design plan has been accomplished from survey information supplied in electronic CAD format, and due to factors of scale, drawing copying deviations and variations in ground gradient, the location of sprinkler heads and pipe work may vary slightly from scale measurements of the plan. Generally, sprinkler heads of a similar performance shall be spaced equally along the feature perimeter and/or lateral along which they are to be installed.

Should the resultant sprinkler spacing be more than 10% of the nominated performance radius or spacing, the Contractor shall immediately notify the Superintendent before proceeding with the installation.

2.3. POINT OF ATTACHMENT

The Contractor shall allow for the connection of the irrigation system to the relevant point of supply as specified and at the approximate location and in the manner indicated on the drawings.

2.4. EXCAVATION AND TRENCHING

2.4.1. General

The Contractor is to visit the site and assess the condition under which the work embraced under this Contract is to be performed. It is assumed that the Contractor's price has taken into account all conditions, as no extra will be paid for hard digging or rock excavation.

Wherever possible, piping shall be laid in parallel straight lines. The trench bottom shall be flat, firm, smooth and free from rocks. Care shall be taken so that no rocks, rubble or sharp objects are laid in contact with the pipe. It shall be at the Superintendent's discretion whether excavated spoil is suitable for backfill.

2.4.2. Existing trees

Where trenching is required in the vicinity of existing trees, the Contractor shall endeavor to route piping beyond the extents of the tree-canopy 'drip-line', so as to minimize any damage to tree roots.

In cases where the latter is not possible due to specific site conditions & layout, then the Contractor undertake the following;

- All tree roots smaller than 50mm diameter which are damaged during excavation shall be cleanly cut with a saw or secateurs .
- All tree roots 50mm diameter or larger are not to be damaged. The pipe trench shall be either hand-excavated, thrust bored (plunked) or air-drilled utilizing either pressure and/or suction.
- Where a tree root 50mm diameter or larger is inadvertently damaged, the Contractor shall notify the project works Superintendant whom shall give direction as how to proceed.

2.4.3. Existing Turf

For trench work required in all areas of existing turf, the Contractor shall allow for the removal and replacement of turf in the following manner;

- Sod cut turf route with a turf cutter. Turf sod cuts to be a minimum depth of 75mm.
- Hand lifted sodded turf and place on side of trench line.
- Dig, lay and backfill trench.
- Plate compact the backfilled trench with foot compactor/vertical rammer sufficiently to ensure against future subsidence.
- Reinstate turf sod to original grade.
- Remove all excess spoil.
- All above works are required to be completed within the same day.

The contractor will then be responsible for the care and maintenance of all sodded turf for a period of 35 days from the date of reinstatement.

This may include but not be limited to the requirement of daily hand watering of the sodded turf route.

2.5. RECLAIMED/TREATED WATER SYSTEM

The irrigation system installed under these works is to be in the future supplied from reclaimed/treated water source and therefore products to be incorporated in the system shall be colour coded (Lilac) and labeled (RECLAIMED/RECYCLED WATER-CAUTION NOT FOR DRINKING) in accordance with AS 2700.

Products that are applicable to this requirement are to be but not limited to the following:

- All pipes - mainline(s), Lateral(s), Dripline(s).
- All valve box lids.
- All valve handles.
- All spray sprinkler covers.
- All rotor sprinkler covers.
- All bubbler sprinkler covers.
- All Drippers, flexi tube & tube spikes.

2.6. SLEEVES

The Contractor shall provide a PVC sleeve under all paved surfaces for the installation of any mainline or lateral pipe. The sleeve shall be of the diameter noted in the drawings and installed prior to the installation of paving.

Where irrigation pipe work is required to pass under and/or penetrate hard landscape works such as paths, retaining walls etc and cannot be pre-laid and/or thrust bored ('plunked') prior to the construction of the hard landscape element, the Contractor shall install PVC sleeves for the subsequent installation of pipe work.

PVC sleeves shall be pre-installed under all paved areas for vehicular access and/or parking.

Whilst sleeves are not required to be provided under pedestrian pavements of 2.4m or less, this does not preclude the installation of sleeves to suit the Contractor's installation methodology.

The Contractor shall utilise these sleeves for the placement of irrigation pipe work, conduits and solenoid wires.

In the event that additional under-road crossings are required, the Contractor shall accomplish such crossings utilising modern under-road boring techniques for the installation of a PVC sleeve, so as not to compromise the structural integrity of the constructed road works.

Boring shall be undertaken so as to provide a minimum cover of 600mm from the lowest of the road works at the location of the crossing, or at greater depth is required to ensure no conflict with services installed within the Road Reserve.

The under-road boring shall be accomplished using modern under-road boring techniques so that no void, which would result in road surface subsidence, is to be left around the bored pipelines.

In the event that boring operation results in an increase in the paved level (bump) above the bored sleeve, the Contractor shall remedy the situation by any suitable means to ensure that the road surface is flat and the sleeve is not damaged.

The Contractor shall nominate a rate for the mobilisation of boring machinery and rates for the boring, supply and installation of sleeves as shown in the 'Breakdown of Lump Sum Price' schedule.

2.7. PIPEWORK SOIL COVER

Depth of Soil Cover (mm)		
Pipe Type	Landscape	Roads
Mainlines	400mm	750mm
Laterals	300mm	750mm

2.8. MAINLINE

2.8.1. General

All mainlines of 50mm (DN50) or smaller size shall be uPVC manufactured in Australia to AS1477-1999, having a minimum pressure rating of Class 9, and shall utilise the Solvent Weld method of Jointing (SWJ).

All mainlines connected to a potable scheme water supply shall have a minimum pressure rating of Class 12/PN12.5.

All mainlines shall be installed in a trench which is free of debris and other large or hard objects which may damage or deform the pipe.

The base of the trench should be as uniform as possible relative to both grade(slope) and compaction so as to support the mainline pipes uniformly over their length and where practicable, the width of mainline trenches should be maintained at between 3 and 6 times the mainline pipe diameter.

The mainlines shall be bedded and backfilled in accordance with this specification.

Where mainlines are to be installed under sealed driveways or other paved trafficable areas, they shall be installed within a PVC duct(sleeve) being a minimum of two(2) sizes larger than the nominal size of the mainline, provided that the inside diameter of the sleeve is greater than the maximum outside diameter of the mainline pipe-coupling (socket).

All mainlines installed within sleeves shall be of the Solvent Weld method of Jointing (SWJ).

Where mainlines are to be installed on a curve, the following minimums are to be adhered to;

DN80 - 24 metres: DN100 – 30 metres: DN150 – 45 metres.

In addition, it is important that all joints in curved lines be thoroughly supported by compacted soil. No 'Tapping Band' connection will be permitted in a mainline curve, however, cast iron irrigation tees may be utilised for this purpose.

All Rubber Ring Joints (RRJ) are to be installed in accordance with the manufacturers recommendations, including (but not limited to);

- Chamfering of spigot.
- Use of recommended ring lubricant.
- Cleanliness during ring insertion.
- Pipe 'witness mark' to remain just visible.
- Care to prevent over insertion of previous pipe joints by successive joint completion.

2.8.2. Alignment

The alignment of mainlines located within road reserves parallel with the centre-line of the carriageway, shall be installed on an alignment as reserved for power poles, trees & street lights as outlined in the Code of Practice for Utility Providers (Fig;B3), which is between 2.4 and 3.0 metres from lot boundaries.

Generally, the Contractor shall install the mainline within the road reserve on an alignment of no less than 2.5 metres from the boundary to avoid conflict with utility services.

Where it is proposed to alter the mainline alignment noted, the Contractor obtain the written direction of the project Superintendent prior to varying the alignment.

2.9. BACKFILL AND COMPACTION

The bedding, overlay and back-filling of all pipe work trenches shall be accomplished with material previously excavated from the site trenches, provided it is free from rock and other hard objects, in accordance with AS-2032 "Installation of uPVC Pipe Systems".

If the material excavated from the site trenches is unsuitable or insufficient to accomplish the bedding and back-filling operation to the satisfaction of Superintendent, then the Contractor shall import clean sand fill for this purpose at his expense.

The trench work shall then be compacted to the Superintendents satisfaction so as to minimise the future subsidence of the soil in the trench.

The Contractor shall provide all necessary equipment for the backfilling of trenches, compacting and levelling. Excessive subsidence of trenches during the Defects Liability period shall be the responsibility of the Contractor to rectify at his own expense.

All surplus soil excavation, including rocks removed from backfill material, shall be removed from the site by the Contractor at his expense.

2.10. FLUSHING

2.10.1. General

All piping shall be thoroughly flushed with water to remove any debris which may have entered piping during installation, prior to the fitting of sprinklers and nozzles.

2.10.2. Existing irrigation

Where installed piping is to be connected to any area of existing irrigation, the contractor shall ensure that a flushing point (valve) is provided immediately prior to the point of connection to the existing system, including an additional isolation valve at the point of connection to the existing irrigation system.

The Contractor shall utilize the flushing point to thoroughly flush the newly installed piping to ensure that no debris enters the existing irrigation.

The Contractor shall remedy any fouling of existing valves/equipment, where the Contractor has failed to adequately flush newly installed piping (as evidenced by fouling of existing valves/sprinklers).

2.11. LATERALS – PVC

All uPVC laterals shall be manufactured in Australia to AS1477-1999, having a minimum pressure rating of Class 9, and shall utilise the Solvent Weld method of Jointing (SWJ) being of the sizes as shown on the drawings.

All laterals shall be installed in a trench which is free of debris and other large or hard objects which may damage or deform the pipe and the base of the trench should be as uniform as possible relative to both grade(slope) and compaction so as to support the lateral pipes uniformly over their length.

2.12. POLYETHYLENE PIPES

All polyethylene (PE) pipe work (with the exception of low density drip irrigation tube) shall be manufactured of type PE100 polymer and in accordance with AS/NZS4131-1997 and AS/NZS4130-1997. The pressure class shall be in accordance with that noted on the drawings.

2.13. ELECTRO-FUSION FITTINGS

The jointing of all PE pipe works shall be undertaken with suitable electro-fusion fittings & couplings and in accordance with the manufacturer's recommendations, including but not limited to;

- Prevent contamination of joint with dust, moisture & dirt.
- Cut pipe ends square and mark pipe end for equal length of socket depth.
- Scrape (do not sand) the marked section of pipe to remove all oxidized layers of PE material.
- Connection to approved electrical circuit for welding in accordance with requirements of welder, material & fitting.
- Clamping to prevent movement in the joint during the elapse of the required cooling period.

2.14. CAST IRON FITTINGS

All fittings of 80NB and larger, that are to be used on the mainlines, with the exception of approved uPVC Bends and Tapping Bands, shall be of Cast Iron material with RRJ or flange connection, manufactured to AS 2280-1999 or equivalent.

Where Rubber Rings differ from those of the PVC mainline, the Contractor shall exercise all due care to use the correct ring with the correct fitting. All RRJ fittings shall be thrust in accordance with this specification.

Any Cast Iron Flanged fittings shall be flanged in accordance with the British Standard Table 'E' configuration.

2.15. THRUST PROTECTION REQUIREMENTS

All the fittings on the uPVC mainlines jointed with rubber ring joints require concrete thrust blocks to prevent movement of the pipeline when a pressure load is applied. The thrust block transfers the load from the fitting, around which it is placed, to the larger bearing surface of the solid trench wall.

The Contractor shall place the concrete around the fitting in a wedge shape with its widest part against the solid trench wall. Some forming may be necessary to achieve an adequate bearing area and the concrete mix should be allowed to cure before pressurisation.

A thrust block should bear firmly against the side of the trench and to achieve this, it may be necessary to hand trim the trench side or hand excavate the trench wall to form a recess. The thrust acts through the centre line of the fitting and the thrust block should be constructed symmetrically about this centre line.

The thrust blocks shall be constructed in accordance with the detail drawings, generally being of 400mm bearing width, 300mm bearing thickness and 750mm height. The thrust block shall extend to a depth of 450mm below the centre line of the pipe.

In any event, the Contractor shall install concrete thrust blocks to satisfy the intent as noted and in accordance with the pipe & fitting manufacturer's recommendations.

2.16. TAPPING BANDS

Tapping Bands (Saddles) shall be utilised to facilitate the connection of lateral pipes, via a valve assembly, to the irrigation mainlines, which shall be of a type designed for use with PVC, being either of;

- Manufactured of De-zincification Resistant Gunmetal (bronze) material, with a minimum pressure rating of 2000kPA, having a tapping size corresponding to the size of the valve fitted.
- Manufactured of NOYRL GTX 820 resin (20% glass filled) with 316 grade stainless steel nuts and bolts, having a pressure class of PN16 and having a tapping size corresponding to the size of the valve fitted.

The Contractor shall take all due care in the installation of tapping bands and ensure that all holes are accomplished utilising a sharp and appropriately sized hole saw.

2.17. UPVC FITTINGS

The only uPVC pipe fittings which are approved for use on irrigation mainlines of 80mm and over, are RRJ long radius bends, being a one-piece fitting manufactured from pipe being a minimum of one(1) pressure class higher than the pressure class of the mainline to which they are to be attached. The bend shall be protected from thrust movement in accordance with this specification.

All uPVC fittings used in pipe laterals (down-stream of solenoid valve) shall be manufactured to AS/NZS 1477-1999 being designated as Class 18 pressure rating. Solvent Weld joints shall be accomplished in accordance with the pipe/fitting manufacturer's recommendations.

2.18. POLY FITTINGS

The Contractor shall supply and install polypropylene compression fittings which comply with the requirements of AS/NZS 4129 having a pressure rating of PN16. Tapping and compression saddles shall comply with specification 025 of Australian Standard SAA MP52-1991 having a minimum pressure rating of PN12.5.

2.19. BRASS FITTINGS – THREADED

Where brass fittings are to be utilized in the project works, they shall be de-zincification resistant (DR) pipe fittings manufactured to a standard which would allow the fitting to be acceptable to the Water Corporation of W.A.

2.20. PLASTIC FITTINGS – THREADED

Where plastic threaded (BSP) pipe fittings are to be utilised to facilitate the connection from the mainline fitting/tapping to the solenoid valves, as shown in the drawings, they shall be manufactured from glass fibre reinforced nylon or polypropylene material. They shall be rated at a maximum working pressure of 1600 kPa (PN16) as tested by the manufacturer in accordance with AS1460-Part 1.

2.21. ISOLATION VALVES

Every solenoid valve and air release valve location (where used) shall be isolated from the irrigation mainline utilising an equivalent sized nylon ball valve (Philmac or approved equivalent), installed as shown in the Valve Detail drawings and conforming with this specification.

Mainline isolation valves will be required to be installed at the locations shown in the drawings, and unless otherwise shown shall be of the Cast Iron Gate (Sluice) valve type with Table 'E' flanged connections conforming to Australian Standard AS-2638 having a stainless steel stem and Gunmetal (Bronze) trim and shall be installed in a vertical orientation being perpendicular to the surface of the ground in which they are installed, with the valve operators being no farther than 300mm below ground level. The valve configuration shall be clockwise-to-close.

Where valve operators are not an integral part of the valve, the Contractor shall supply valve operating tools at a ratio of one(1) tool per ten(10) valves, with a minimum of one(1) tool being supplied.

2.22. SOLENOID VALVES

The solenoid valves are required to be installed at the approximate positions as shown on the drawings. The valves shall be of glass reinforced nylon construction, threaded BSP of a size in accordance with the drawings and shall be installed utilising threaded fittings and isolation valve as shown on the Valve Detail drawing and conforming with this specification.

The solenoid valve shall incorporate a coil having a nominal operating voltage of 24 VAC and a peak inrush current of 0.3 amperes when required to operate at a pressure equivalent to the maximum rated operating pressure of the solenoid valve.

The solenoid valves for this project shall be of the Bermad brand, series 200.

The Contractor shall undertake the flow (pressure) adjustment of all solenoid valves in accordance with the nominal operating pressure of the sprinklers attached to the particular solenoid valve.

In the event that a solenoid valve is to be installed on a mainline having a soil cover in excess of the requirements of this specification, the contractor shall provide a riser extension fitted to the mainline connection fitting (tapping band or other approved) to ensure that the solenoid valve is located relative to finished ground level in accordance with the detail drawings.

The extension riser shall be of PVC Class 18 or Sch80 material and threaded BSP.

2.23. VALVE ENCLOSURES

2.23.1. General

All valves which are to be installed on the project shall be housed in a Heavy Duty valve box manufactured from a Glass-filled nylon material, sized in accordance with the table shown below;

- Solenoid Valves – 430x300x305 Rectangular - RainBird VB-STD.
- Solenoid Isolation Valves - inside Solenoid Valve Box.

- Mainline Isolation Valves, in planted areas - 430x300x305 Rectangular. RainBird VB-STD.
- Mainline isolation Valves, in paved areas – RainBird 250mm diameter, circular – VB10RND.

All valve boxes shall be furnished with a stainless steel lockdown bolt and fitted prior to completion inspections.

The Contractor will be required to return to site for the purpose of adjusting the height of any valve box deemed by the Superintendent to require level adjustment.

2.23.2. Double Boxing

All valve enclosures will require an extension to the valve cavity, to a point where the valve box will prohibit the entry of the surrounding soil into the valve cavity. This cavity extension shall be provided by utilizing a second valve enclosure (less cover) located beneath the primary valve enclosure and telescoped to suit to final installation depth of the valve, as shown in the drawings.

For solenoid valve enclosures, the secondary enclosure shall incorporate and/or be fitted with a ground support (bearing) flange.

2.23.3. Enclosures in paved areas

Where a valve enclosure is to be installed with a paved area, the Contractor shall allow for the provision of;

- An appropriately sized ACO Urbanfill or Pavermate galvanized steel access cover and frame over the plastic valve enclosure.
- Concrete fill and/or paving inlay to match surrounds.

2.24. **AUTOMATIC IRRIGATION CONTROLLER (CONVENTIONAL)**

The Contractor shall supply and install a commercial quality irrigation sequencing controller for the irrigation system, having the following minimum features;

- Minimum of 24 stations
- 14 day irrigation cycle
- 4 programs, able to operate concurrently.
- 4 cycle starts per program (minimum)
- Simultaneous activation of 2 solenoid valves plus master valve.
- Ability of a single station to activate 2 solenoid valves.
- Sensor input.
- Integral transformer, approved by local power authority.
- For the purposes of Tendering, the contractor shall allow for the installation of a Hunter PRO-HC 24 controller.
-

2.25. **CONTROLLER ENCLOSURE**

The Contractor shall supply and install an enclosure for the irrigation controller as follows;

- Pole Mounted.
- Marine grade aluminium construction.
- Weather-proof to IP55.
- Key-lockable.
- Of sufficient size to incorporate the controller and all associated.

2.26. **POWER SUPPLY**

The Contractor shall obtain a power supply for the controller from the power meter available at the site. Location as per drawings.

2.27. ELECTRICAL REGULATIONS

The Contractor shall ensure that all materials and workmanship shall be accomplished in accordance with the regulations and requirements of Western Power, industry Codes of Practice and with current S.A.A. wiring rules (AS/NZS 3000:2000).

2.28. LOW VOLTAGE CABLES

All low voltage ($\leq 32V$) solenoid valve control cables from the field which may enter any section of the electrical controls cabinet and/or switchboard shall be routed directly to the irrigation controller's terminal block or other suitable termination point.

There shall be no junction in the low voltage cables within any section of the cubicle and/or switchboard where there exists an electrical shock hazard for non-licensed personnel whom may require access to the low voltage cabling for maintenance requirements.

2.29. RAIN SWITCH

Where an environmental climate sensing system is not utilized, the Contractor shall supply and install a Hunter Rain-Click rain switch with instant shut-off, either wired or wireless as follows;

2.29.1. Controller installed in/on/adjacent a building structure

Rain switch installed at the gutter-level of the building and/or structure.

OR

2.29.2. Controller installed within a free standing switchboard cubicle

Rain switch installed atop a new 6.5m tall 100mm galvanised pole and concrete footing. The footing shall be of minimum dimensions of 500mm diameter and 1200mm deep with steel reinforcement cage and rag bolts for attachment of the pole mounting flange. The pole is to be located immediately adjacent to the electrical control cubicle.

2.30. CONTROL CABLE CONDUITS

All solenoid valve wiring shall be installed in 32mm M.D. grey electrical conduit, which shall be run in the same trench as the irrigation mainline and installed so as to maintain a 150mm separation between the mainline and conduit.

The number of conduits required shall be in accordance with;

- The number/size of cables to be installed therein.
- The Contractor's cable installation methodology.

No conduit-ends shall be covered with soil. All conduits which are used to route control wiring to solenoid valves shall be fitted with 45 degree elbows to extend the entry/exit conduits into the valve enclosure cavity. In lieu of elbows, the Contractor may bend the conduit utilising heat-form and/or cold-form methods to achieve the required deflection from the horizontal into the valve enclosure cavity.

To prevent the possible accumulation of water within the conduit, the Contractor shall drill a hole in the base of the horizontal section of the conduit immediately before the 45 degree bend.

2.31. CABLE/CONDUIT PITS

The Contractor shall install P2 plastic conduit pits at every change in conduit direction being more than 45 degrees, at all junctions and at a suitable spacing (generally 100m) on straight runs to facilitate the 'pull-through' of cables and/or ease of replacement in the future.

All conduit pits shall have a hole punched through its base (minimum of 50mm dia) and shall be installed atop a stone/aggregate (10mm+ dia.) base being 150mm thick over an area equivalent to the area of the pit base.

2.32. SOLENOID WIRING

All 24VAC solenoid wiring shall be of multi strand construction with HDPE insulation and sized common 2.5sqmm (7/067), Active 1.5sqmm (7/050).

All solenoid wiring shall be installed with mainline.

The Contractor shall install a minimum of two(2) spare solenoid wires, coloured white to the ends of all mainlines and spurs. Where the wires are installed with a ring main, there will be a minimum of four(4) spare wires entering the electrical cubicle.

Where practicable, the Contractor shall install solenoid wiring from the valves to the controller in one continuous (non-jointed) run. Where joints must be made in cable runs, the Contractor shall ensure that they shall be undertaken in a conduit pit.

2.33. CABLE JOINTING METHOD

All underground electrical joints to the solenoid valves shall be accomplished using '3M' brand gel-filled connectors Model 'DBY-6' or Model 'DBR-6', depending upon the number/size of cores to be joined.

In addition, the required by the control system manufacturer, the Contractor shall solder all wiring joints in accordance with the control system manufacturers recommendations.

PVC tape shall NOT be used to insulate any connection of solenoid valve wiring.

2.34. ROTOR SPRINKLERS

The Contractor shall base his pricing on utilising the sprinklers shown on the design plan.

All rotor sprinklers shall be installed on 20mm X 250mm and/or 25mm X 300mm polyethylene articulated riser assemblies in accordance with the base connection size of the sprinklers and the detail drawings accompanying this specification and shall be installed flush or no more than 10mm below the finished turf level.

All sprinklers shall be installed plumb, with the exception of sprinklers installed adjacent or on an embankment with has a gradient, above the horizontal, which is greater than the trajectory of the sprinkler head/nozzle. In the latter case, sprinklers may be angled to avoid water erosion of the embankment.

The Contractor will be required to adjust the height and verticality of any sprinklers not conforming with the above.

2.35. SPRAY SPRINKLERS

The Contractor shall base his pricing on utilising the sprinklers shown on the design plan.

All popup spray sprinklers & bubblers shall be installed on 500mm of 15mm Super-flex flexible riser tubing fitted with appropriate E-Z compression elbow connectors.

All sprinklers shall be installed plumb, with the exception of sprinklers installed adjacent or on an embankment with has a gradient, above the horizontal, which is greater than the trajectory of the sprinkler head/nozzle. In the latter case, part circle sprinklers may be angled to avoid water erosion of the embankment.

The Contractor will be required to adjust the height and verticality of any sprinklers not conforming with the above.

2.36. RESETTING EQUIPMENT HEIGHTS (SPRINKLERS & VALVE ENCLOSURES)

The Contractor shall include a separate allowance to return to the project site, approximately four(4) weeks after Practical Completion, to undertake the final height adjustment of sprinklers and valve enclosures.

The final height relative to finished ground level shall be as per the detail drawings.

The Contractor shall coordinate the works with the landscape maintenance contractor, so that the resetting works for equipment installed in grassed areas is undertaken within two(2) days of mowing.

2.37. SUPPLEMENTARY TREE WATERING EMITTERS

The Contractor shall base his pricing on utilising the supplementary tree watering emitters shown on the design plan.

Where the supplementary emitter specified is a standard sprinkler bubbler nozzle, it shall be installed on a pressure regulating pop-up body and in accordance with the other requirements for spray sprinklers.

2.38. RECYCLED WATER CONNECTION

The Contractor shall connect to a recycled water mainline at the approximate location as shown on the drawings.

The connection is to have a minimum performance as follows;

Maintain an operational pressure of 350 kPa whilst discharging a flow rate of 100 liters per minute, as required for the satisfactory operation of the irrigation system.

Prior to the construction of the irrigation system, the Contractor shall undertake a dynamic flow & pressure test of the recycled water supply, to verify that this point of connection is able to provide the performance required to satisfactorily operate the irrigation.

2.39. RECLAIMED/TREATED WATER SYSTEM SIGNAGE

In accordance with AS 1319, warning signposts are to be provided/erected. The signposts must be clearly visible to patrons/property users with wording such as, "RECYCLED WATER USED - Avoid contact - DO NOT DRINK".

6.8 Appendix 6.8 – Electrical & Lighting Specification

MERREDIN CBD STAGE 1A

ELECTRICAL & LIGHTING SPECIFICATION

Prepared By: Kurt McRae
Client: Place Laboratory
Date: 18 March 2022
Doc No: 21-0259KM- 121705
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Reviewed/Approved: KM/SC



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REVISION REGISTER

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PART A GENERAL CLAUSES

A1 GENERAL

A1.1 Contract Conditions

Refer to the "Preliminaries" which form an integral part of the entire Specification.

A1.2 Definitions of Terms

In this section of the specification the following terms shall have the meanings assigned to them as follows:

'The Architect' shall mean Place Laboratory (Landscape Architects)

'The Principal' shall mean the Shire of Merredin

'Approved' or 'Approval' shall mean approved by the Architect or Principal.

'Provide' shall mean supply, install, test and commission.

A1.3 Scope of Work

This document and referenced documents forms a part only of the project requirements, and together with the preliminaries and all other contract documents, describe the services installation for the Merredin CBD Stage 1A project.

All contract documents, drawings and specifications and appendices thereto shall be considered as co-operative and any work omitted from one but inferred or present in the other shall form part of the contract. This document in isolation shall not be interpreted as describing the whole of the works required by a trade or trades. Include for all works as described in the contract documents.

The work described by this section of the specification comprises the supply, delivery, installation, testing, commissioning, maintenance and defects fault rectifications of electrical services and associated equipment. The work includes the detail design of various components such as switchboard modifications, control circuits, low voltage systems, etc. Refer to the respective trade specifications for scope of work and technical requirements for hydraulic electrical services, controls and the like. Liaise and coordinate with the respective trades.

This specification indicates the required methods of installation of the various electrical services. However, where full details are not given in this specification, include everything necessary for the convenient, safe, efficient and correct operation of such services.

Examine all building and trade specifications and drawings so as to be fully informed of the intent, extent and nature of the works. This includes the connection and/or control, of various items of electrical equipment supplied and to be connected/controlled in accordance with other sections of the specification.

Coordinate and liaise with other trades to reduce any conflict between trade information shown on electrical services documentation and the associated trade without cost variation.

Detailed Clauses herein provide a more detailed description of various elements of the services to be provided.

The work includes but is not restricted to the detailed design, manufacture, supply, installation, testing and maintenance of electrical and associated services including but not limited to:

- Low voltage power distribution installation including:
 - Switchboards

- Power distribution submain cables
- Electrical supplies to equipment
- General power outlets
- Sub-circuit cabling
- Cable pathways including cable reticulation, cable ducting, trays and conduits
- Earthing
- Light poles
- Artificial lighting including
 - Area lighting
 - Floodlight and uplighting
 - Lighting control system
- Communications services including
 - Communications conduit for future services

A1.4 Order of Precedence

Unless directed otherwise by the Principal or indicated in the Contract Documents, the following order of priority shall prevail:

- Commonwealth, State and Local Government Acts, Regulations and By-laws;
- Australian Standards and Codes of Practice;
- Design drawings;
- Parts of this specification as follows:
 - Part A General Clauses;
 - Part C Specific Scope of Work and Technical Requirements;
 - Part D Appendices;
 - Part B General Technical Clauses.

Should conflict occur between this Electrical Services Specification and any of the Reference Documents, other trade documents and Client Standards, it shall immediately be brought to the attention of the Principal for a ruling. In all cases the more onerous requirement shall be assumed for tender purposes.

A1.5 Assignment/Sub-Contracting

Nominate with tenders, proposed companies for which the work described within this section of the specification, will be assigned or subcontracted.

Do not further assign or sub-contract any part of the works described in this section of the specification to another party without the express written approval of the Principal. Refer to preliminaries.

A1.6 Programming of Work

Submit to the Principal within thirty (30) days of awarding of contract a program/flow chart of works described in this section of the specification. Prepare the programme/flow chart in liaison with other trades and reflecting critical activities identified on the approved construction programme. Illustrate timing of installation on the programme/chart including approval periods, ordering dates, delivery and installation times for electrical materials and equipment. Also identify major activities to be carried out during electrical services commissioning (e.g. thermographic survey, phase balancing and the like).

A1.7 Quality Control and Quality Assurance

Prepare and implement a quality control and assurance program for the whole of the works described in this section of the specification and submit a copy to the Principal within fourteen (14) days of award of contract.

Maintain effective control of the quality of the equipment and materials, provide test facilities and perform all examinations and tests to demonstrate conformance of the equipment and materials to the technical requirements of the specification.

Provide objective evidence to prove that controls and inspections are effective. For this purpose objective evidence means any statement of fact, either quantitative or qualitative, pertaining to the quality of the supplies based on observations, measurements or tests which can be verified.

The Principal reserves the right to perform any examination or tests to ensure that the equipment or services provided conforms to the technical requirements of the specification and to reject any equipment/service which does not conform.

The inspection of the quality assurance program or the marking of a component, shop drawing, assembly or inspection document by the Principal shall not be construed as an act of acceptance nor shall it relieve any obligation under the Contract.

Amend any element of the program deemed ineffective by the Principal to conform to the Principal requirements.

The program shall include but not be limited to the following checklists:

- Job safety / risk analysis / JSA's in accordance with Safe Work Australia and National OHS Strategy Guidelines
- Supply and approval of pamphlets or samples and colour selection for all equipment
- Depth of underground conduits
- Testing and commissioning of equipment, materials and installation
- Authority approvals and applications
- Confirmation that each luminaire has the correct lamp type, size and colour temperature
- Confirmation of equipment loads and locations prior to installation
- Confirmation of switchboard sizes and spaces allocated or cupboard sizes prior to Submission of workshop drawings
- Submission of shop drawings
- 'As constructed' drawings – recording of information

Give adequate written notice to the Principal to inspect the work.

A1.8 Variation Pricing

Submit variations costs and/or extensions of time claims associated with proposed variations within time period as set out in conditions of contract or where not indicated within two (2) weeks of receiving documentation instructions of the relevant change. Where such notice is not submitted, the instruction is deemed to have no cost or time implications to the Contract. Unless previously agreed that unit rates can be applied to variations, all prices shall be broken down into material quantities, material costs, labour (hours) and cost of labour.

All variation requests received shall be listed separately on monthly progress claims with date received, date submitted, amount and date of approval.

A1.9 Supervision and Coordination

Employ during hours when work is being carried out until the Date of Practical Completion a competent Supervisor who shall have sufficient command of the English language and of Australian construction and technical terminology, to be able to read, converse and receive instructions in English. The Supervisor shall be empowered to make decisions on behalf of the Contractor / Subcontractor as appropriate.

Employ on the site of works an Electrical Services Supervisor or other suitably qualified and experienced person to manage and coordinate the installation of all electrical services and associated works as detailed in this specification. The responsibilities of the Electrical Services Supervisor include but are not limited to the following:

- Check and coordinate all works against shop drawings of other trades and notify Principal of any discrepancies between the electrical services drawings and other trade drawings;
- Check, coordinate, integrate, accept and endorse shop drawings and submit same to the Principal for review as required;
- Brief, coordinate and liaise with the Contractor, all subcontractors, Principal and Authorities to ensure the supply, installation and commissioning and resultant data provided for Principal's approval is consistent with the requirements of the Contract;
- Prepare detailed progress reports on testing and commissioning;
- Detailed programming and interfacing of commissioning activities for all services as detailed in this specification;
- Arranging meetings with interested parties, including Principal and Authorities as appropriate, to deal with commissioning and testing and to chair and minute such meetings. Minutes are to be issued within three (3) days to all attendees and the Principal;
- Compilation, checking and endorsement of operation and maintenance documents, warranties, and 'As Constructed' drawings;
- Attend meetings, assist Principal's staff and prepare status reports on defects during the Defects Liability period, and submit these reports regularly to the Principal.

The Electrical Services Supervisor is also responsible for fully briefing and coordinating the participation of the Principal's staff during the testing, commissioning, and handover phases of all services detailed in this specification to the Principal's satisfaction.

The Electrical Services Supervisor's participation in the Contract shall commence from the earliest required time and their Site presence, shall, from that time, be sufficient to inspect all electrical work, and liaise with Principal and Authorities and to attend to other duties as required.

During the latter period of the Contract, and for at least the commissioning period of the Contract, the Electrical Services Supervisor shall be located full time on Site to manage the commissioning process.

A1.10 Risk Management / OHS

Risks / hazards associated with the construction, commissioning, maintenance and ongoing use of this project shall be managed to contain the risks within defined objectives.

Objectives shall be set to comply with Safe Work Australia, Australian Safety and Compensation Council (ASCC) directives and the Contractors and Subcontractors duty of care responsibilities.

Risk analysis decisions shall be recorded and responsibility for risk containment formally assigned (JSA's, MSDS, etc). Risk assessments shall be conducted in accordance with Safe Work Australia Codes Of Practice for Managing Electrical Risks and Safe Design Of Buildings and Structures.

Risk decisions shall be reviewed at site meetings and at time intervals recorded in the original risk analysis and whenever a function is altered or governing legislation or standards are changed.

Risk management and rating shall comply with Australia / New Zealand Standard AS/NZS ISO 31000:2009 Risk Management.

Risks to be managed include but are not limited to:

Electrical Risks	General Risks
Fall arrest systems / ladder access systems.	Construction, operation and maintenance safety / job risks.
Work near power aerials.	Normal and emergency modes of operation.
Excavation near underground services.	Uninsured deliberate and accidental damage.
Safe clearance in front of switchboards.	Probity and integrity.
Pit levels / trip hazards.	Shut down of facility or services.
Floodlights / lighting access methods.	Failure of critical facilities.
Pit depths – over 1200mm deep, confined space work practice.	Avoiding incurring unplanned costs.
EMC / RF radiation	Avoiding incurring unnecessary costs.
	Risks of storm, flood, fire, intrusion, duress, hazard, industrial relations.
	Avoiding environmental contamination.
	Ensuring competency of service providers and subcontractors.
	Warranty, defects liability and ongoing maintenance.
	Cost control and life cycle cost.
	Security and integrity of facilities, services and information.
	Contract management.
	Compliance with regulations, policies and guidelines.

The aim of Risk Management and Job Safety Analysis is to integrate hazard identification into the construction and maintenance process early to eliminate or minimise the risks of injury throughout the life of the Facility, Building or Structure. It encompasses components of the process including facilities, hardware, systems, equipment, products, tooling, materials, controls, layout and configuration.

The Operation and Maintenance handbook specified herein must include copies of all residual OHS risk information / JSA's associated with the construction and maintenance of the project, along with specific instructions in the safe maintenance and monitoring of all services and products supplied and installed. Refer to Safe Work Australia's codes of practice.

A1.11 Design and Certification

All design undertaken by the Contractor as part of this contract works shall be certified as being fully compliant with the contract documentation, component manufacturer's installation recommendation and all relevant Australian Standard codes, regulations and as further specified within this specification.

A1.12 "As New" Condition on Completion Date

Each item of equipment or cabling which is to form part of the permanent installation shall be new, clean and shall not be used for construction purposes. Equipment shall be energised only for necessary testing and commissioning.

A1.13 Alternative Equipment

The specification of a proprietary item does not necessarily imply exclusive preference for that item but shall be deemed to indicate required properties of the item such as type, quality, appearance, finish, method of construction, performance and the like.

Alternative proposals that will reduce the cost but not quality or performance of materials, or equipment may be submitted for review with tenders. Preferences shall be given to Australian Manufactured goods.

A fully complying tender price based on all equipment specified must be submitted with separate attached alternative tenders before alternative tenders are considered.

The Principal may in its absolute discretion adopt or reject any or all alternatives. No claim shall arise from any rejection nor, unless otherwise agreed, shall adoption of an alternative be grounds for any claim for extension of time.

When offering an alternative for approval, provide all available technical information, details of benefits to the Principal, test reports carried out by approved independent testing Authorities, any associated works required by other trades and any other relevant information requested by the Principal. Technical information shall include manufacturer, supplier, catalogue reference number, product brochure and comparison sheet of technical performance between specified and alternative offered.

Where alternative luminaires are offered luminaire technical information shall also include lighting calculations for all associated areas indicating illumination and glare levels in accordance with AS/NZS 1680. The maintenance factor used for all calculations shall be clearly identified and calculations supporting each maintenance factor shall be provided. All lighting calculations must be certified by an independent qualified Engineer.

Alternate tender prices submitted shall include the clause numbers of the specification to which the alternatives apply.

No substitution will be authorised through failure of the Contractor to place orders in sufficient time to avoid delays to the Works other than in circumstances where the Contractor can demonstrate that delay in material supply is or was beyond the Contractor's control. No claim shall arise from any refusal of the Principal to approve a substitution.

Where specified materials are unobtainable, notify the Principal in time to avoid delays to the Works. Obtain written instructions from the Principal before commencing any work associated therewith.

Generally alternatives will not be considered after the tender closing date.

All alternative proposals offered after closing of tender date must include a benefit to the Principal in the form of reduction in cost, improvement in quality or improvement in performance. Proposals shall also include for the Principal costs borne in carrying out a review

of the proposed alternatives. These costs shall be charged at commercial rates and shall include for all time, travel and redesign required ensuring alternatives are suitable for use. Confirm costs with Principal prior to submission of alternative.

A1.14 Discrepancies and Queries

Immediately notify the Principal of any discrepancy discovered in the documents and obtain instruction as to how the discrepancy is to be resolved before submitting tenders.

Where discrepancies occur during construction notify the Principal and obtain instruction as to how the discrepancies are to be resolved before proceeding.

A1.15 Labour

All workmanship shall be of a high standard and only carried out by suitably trained and qualified labour.

Where necessary, employ specialist tradespersons/service providers to carry out work covered by the specification.

A1.16 Regulations

Materials and workmanship shall comply with all relevant current Australian Standards, Codes and Regulations and also reference codes and Standards listed in the prefaces to those standards and codes. **All installations must comply with AS/NZS 3000 Wiring Rules.**

Where Australian Standards and Codes do not exist the appropriate International Standard or Codes shall apply. Request an instruction from the Principal for amendments to Standards, Codes or Regulations that come into effect during the works and affect the works of the contract.

All work shall comply with the Electricity Supply Authority Regulations, Health Department Regulations, Australian Communications and Media Authority (ACMA), Local Building Authority and Worksafe, Western Australia.

If any discrepancy exists between the requirements of the specification and the requirements of Standards or authority regulations, the more stringent requirement shall apply. In each case however, request an instruction from the Principal.

A1.17 Drawings

A1.17.1 Contract Drawings

Confirm the location, electrical ratings and connection details of all electrical equipment and switchboards furnished by all trades, prior to commencement of installation. Immediately before installation of cabling or conduiting, re-confirm the location of equipment and connection details. Refer to Clause A1.14 'Discrepancies and Queries'.

All drawings are diagrammatic. Check all relevant dimensions on site before proceeding with the work. **Do not scale dimensions from the drawings.**

Include in tender price for any accessory or appliance to be relocated up to 1 metre in any direction by the Principal, prior to any associated works being undertaken on site, at no additional cost adjustment to contract.

A1.17.2 Shop Drawings

Prepare shop drawings as further specified, in digital (CADD) format.

Submit shop drawings electronically (minimum A3 PDF format unless otherwise specified) to the Principal for examination. A single printed hard copy of each drawing (plus additional copies where nominated by the Contract Preliminaries) shall be provided on request.

Shop drawings are to be reviewed and certified correct by a senior representative of the Electrical Services Company with a signature on each drawing prior to being submitted for examination. Unsigned drawings will be rejected.

Shop drawings and all associated details for mounting or interface of luminaires, poles, switchboards, termination equipment and the like shall be reviewed with the respective equipment suppliers and manufacturers to ensure complete compatibility, correct mounting and adjustment, accessibility, fixing arrangements and the like as necessary.

Obtain examined drawings from the Principal before manufacture or installation commences for all fabricated equipment as further detailed herein. Submit shop drawings in a timely manner, allowing Fourteen (14) days for examination prior to return, unless nominated otherwise.

Comments on "examined" shop drawings will apply to general principles of design only. Examination of the drawings by the Principal will in no way relieve the Contractor's responsibility for any errors, omissions or necessity of furnishing such workmanship or materials as may be required for the completion of these works in accordance with the contract documents.

Provide shop and detailed design drawings for all fabricated equipment and specialty services including, but not limited to:

- Switchboards
- Poles
- Luminaire support systems
- Lighting control system

Electrical Services contract drawings indicate design intent only and shall not be reproduced in specialty services shop drawings. Electrical services shop drawings shall instead be produced based on the actual equipment, devices, settings and component selections proposed by the contractor.

Where required, request from the Principal and issue architectural backgrounds to specialty services Subcontractors for production of shop drawings. Include all associated costs in tender price.

Show on drawings single line schematics, control diagrams, floor plans, elevations, dimensions, equipment details, panel layouts, labeling, operational descriptions, compliance/certification, as required to fully describe the system/equipment to be supplied, installed and/or commissioned. Shop drawings shall contain reference to all work required by all trades.

Specialty services shop drawings shall be upgraded to 'As Constructed' status, at the completion of the project, as defined herein.

A1.17.3 As Constructed Drawings

Prepare comprehensive 'As Constructed' drawings, detailing all equipment and services installed within the scope of work defined within the contract documents. As Constructed drawings shall show location of all equipment, circuit details, alarm configuration, single line diagrams, switchboard layouts, equipment cabinet layouts, system schematic diagrams, details of special items of equipment and requirements as nominated for shop drawings.

As Constructed drawings shall show the exact depth and location ($\pm 300\text{mm}$) of all in-ground services excluding final circuit conduits. Such services shall be dimensioned off actual building lines or surveyors datums.

Drawings shall not make reference to construction notes or information relevant only to the construction process. All information associated with specialty systems shall not appear on general electrical services drawings.

As Constructed drawings shall be prepared in CADD format. All CADD drafting shall be to Australian Standards unless otherwise specified. Confirm exact requirements with the Principal in each case, prior to submission.

All 'As Constructed' drawings shall incorporate the supplier's and/or supplier's company title block. A statement shall be provided on each drawing, to read: 'As Constructed by (company name and telephone number)' and signed and dated by a senior representative of the company. The signatory's name and position within company shall also be provided in block capitals. Title block shall clearly incorporate Engineering Technology Consultants as Electrical Consulting Engineers.

Preliminary 'As Constructed' drawings shall be prepared and submitted for the Principal's review, before completion of commissioning. Preliminary drawings shall be examined by the Electrical Services Company or Installer and signed to confirm the preliminary drawings are representative of the equipment and systems installed.

Where a total electrical services drawing or parts of a drawing are superseded by a shop drawing (as built status drawing) the original drawing shall be amended and clearly notated as cross referenced to the new as built drawing.

Upon completion of commissioning and in **no case less than two (2) weeks prior to** practical completion, submit final approved drawings. Each drawing shall be signed and verified correct by the Electrical Services Company, or Installer. Unsigned drawings will be rejected without further review.

Supply one (1) set of 'As Constructed' full size drawing prints, for each maintenance manual. In addition, provide one (1) set of USB drive(s) containing an electronic copy of 'As Constructed' drawings in CAD and PDF format to Principal.

A1.17.4 Purchase of CADD Drawings

Contract drawings may be purchased from Engineering Technology Consultants, in electronic media format. An administration cost of \$6.00, plus GST, per drawing file (subject to a minimum charge of \$28 per issue) will apply. Where Architectural backgrounds are required to form the basis of specialty services shop drawings, delete all electrical services information from the drawing in order to obtain the clear Architectural background.

Issue a written order, stating the drawings numbers required, to the appropriate value as noted above, and prior to electronic drawings being issued by Engineering Technology Consultants.

A1.18 Existing Site Conditions

Inspect existing site conditions and services prior to submission of Tenders. No variation will be considered for additional works which could have been ascertained at a thorough site inspection and is required for the convenient, safe, efficient and correct operation of specified services.

Locate and protect existing services prior to any works commencing that may damage or interrupt the service. Use all reasonable endeavours to locate services (e.g. site inspection, "Dial Before You Dig", 'As Built' drawings etc.). Where existing services are suspected, hand expose or utilise ground/slab scanning to identify exact locations.

All existing electrical and communication services indicated on the drawings are provided as a guide only. The full extent of existing services shall be located and identified as part of these

works using detail survey, visual inspection, testing, GPRS, hand excavation/potholing, etc as necessary.

Validation shall include lifting all existing pit lids, testing, tracing and inspection to confirm live or redundant underground services.

All existing electrical and communication services including conduits, pits, cabling, cabinets, lighting poles, etc shall be identified and included onto a comprehensive set of marked up service plans.

Prepare and submit detail Work Methodology Statements (WMS) prior to commencing services survey and validation works for approval.

Liase closely at all times with the Principal (Electrical and Communication/IT representatives) to coordinate all necessary testing, inspection, shut downs, disconnections, etc to Principal's approval.

A1.18.1 Demolition

On completion of all existing electrical and communication services survey and validation, prepare and submit for review a detail services demolition plan with Work Methodology Statements (WMS) and JSA's to suit the project program.

The above shall include all staging/phasing, temporary services, reconnections and commissioning required to approval. Amend and reissue demolition plans, WMS and JSA's for review and approval where changes to the program or sequencing occur.

A1.18.2 As Constructed

Using the marked up electrical and communication service plans CAD draft all existing services which remain underground following completion of the project works to provide an 'As Constructed' record of the existing and modified services remaining.

This shall be setup as a separate CAD layer over the new services to Principal's approval.

A1.19 Existing Equipment

Any existing materials, lighting fittings, conduit, cabling and the like, removed from an existing installation shall remain the property of the Principal. Allow for all costs to dispose of as directed by the Principal in accordance with State environmental guidelines.

A1.20 Samples

Submit samples and colour range of each type of light fitting, switch and outlet to be used prior to ordering and delivery to site, for approval. Catalogue pamphlets may be accepted in lieu of samples as agreed by the Principal. Verify requirements with Principal in each case. Where night testing is required for specific luminaires orders are not to be placed until night testing approval and luminaire approval has been obtained.

Obtain approval for all samples in a timely manner to ensure that the item of equipment can be supplied and installed without impact on the construction programme.

A1.21 Electro Magnetic Radiation

All electrically operated equipment shall comply with Australian electromagnetic emission standards, EMC framework and have radio communications and telecommunications compliance labelling notices.

All electrical equipment shall be installed/routed/shielded/earthed to minimise EMF (ELF) to occupied spaces.

A1.22 Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC)

All electrical equipment shall be EMC compliant and be provided with “C-Tick” labels. EMC compliance certificates in accordance with ACMA requirements shall be provided as requested by the Principal.

Provide EMI suppression filters to satisfy compliance with Australian EMC standards.

A1.23 Chasing and Openings

Chase surfaces as required and make good to original condition. Grout all conduits/services installed in chases over the whole length of the chase.

At single leaf double sided face brick walls build in conduits by slotting bricks and concealing conduits without disturbing the usual pattern of the face brickwork.

Obtain Principal's approval before chasing concrete or load bearing brickwork.

Drill or cut openings as required. Form up any necessary openings before concrete is poured. Size and fire rate all penetrations in accordance with National Construction Code (NCC) and Authority requirements.

Obtain structural engineers written approval for any chasing or penetrations in floors or structural walls.

Chase conduits or otherwise conceal conduits in masonry to be rendered. All chases and openings shall be in accordance with Australian Standards and suitable for the application of specified finishes.

A1.24 Fixing of Equipment

Fix all equipment rigidly, neatly, and symmetrically to rigid supports.

Fixings shall be in accordance with good engineering practice, be in accordance with AS 1170.4 'Structural Design Actions. Part 4: Earthquake actions in Australia' and meet with the approval of the Principal.

All exterior fixings, or those exposed to corrosive environments such as chemicals, gases, dusts, water spray or high humidity, must be 316 marine grade stainless steel. Refer to clause “Corrosion” herein.

On request supply to the Principal certification from a structural engineer verifying compliance of nominated components, parts and fixings with AS 1170.4.

A1.25 Fabricated Equipment

Fabricated equipment shall be of robust, symmetrical and unwarped construction and all such equipment shall be approved before being installed. Metalwork shall be neatly and accurately cut and free from undulations or any other distortions.

Bends and folds in sheet metalwork shall be made in a suitable bending machine. All joints and folds shall be seam or spot welded.

Welding shall be neatly executed and any ragged spots filed smooth.

A1.26 Materials Selection and Corrosion

A1.26.1 General

Take all necessary precautions with the selection, supply and installation of all materials, accessories, fittings and equipment specified to prevent corrosion. Likewise, selected

materials shall be suitably sealed and robust to suit the application with consideration for sun exposure, rain, dust and vandalism.

A1.26.2 Corrosion

All materials and combination of materials shall be selected and/or treated to prevent corrosion in accordance with AS 1874 recommendations. Material selection must take into account atmosphere and micro climate conditions of the site. Dissimilar metals shall be avoided or adequately separated using insulating materials (such as nylon washers, protective coatings, sleeves etc) to prevent galvanic corrosion. Dissimilar metals shall not be used where they can be exposed to frequent contact with an electrolyte such as water from irrigation systems, rain, sea spray etc which could lead to galvanic corrosion.

Make good or replace any component or accessory showing signs of rust or corrosion during the maintenance period in an approved manner without additional cost to the Principal.

A1.26.3 Exterior Installations

All external enclosure shall provide a minimum ingress protection rating of IP56 unless otherwise specified.

Equipment and enclosures shall generally be 316 grade stainless steel and painted unless otherwise specified:

- Where aluminum material is shown or proposed this shall be LM6 marine grade (to BS1490) or equivalent (e.g. switchboards, CEC).
- Where hot dip galvanized material is shown or proposed, this shall be painted to Cat 5D to AS/NZS 2312 and to approval (e.g. poles).

All exterior fixings including pole, luminaire, socket outlets etc. shall be 316 grade stainless steel. During manufacture or installation, all exposed threaded and bolted or screwed fixings shall have a corrosion inhibitor such as graphite or lanolin grease applied.

A1.27 Painting

A1.27.1 General

Remove or otherwise protect flush plates, luminaires and all similar equipment that could be disfigured during painting. Correctly and permanently re-install or remove protection on all equipment after completion of painting.

Paint all equipment including cable supports, cable trays and ducts, conduit luminaire supports, unistrut framework and all fabricated equipment unless otherwise specified or where concealed from view in ceiling spaces. Equipment located in plant rooms generally do not require painting unless otherwise stated. Finished surfaces of all paintwork shall be free from bubbles, runs or any other imperfections. All galvanised surfaces shall be suitably heated and degassed prior to painting to prevent air pin holes in final paint finish.

All surfaces to be painted shall be free of rust, scale, oil and other foreign matter, and then painted with one coat of compatible etching primer, zinc primer or similar corrosion resistant barrier to suit the material being painted and the finishing coats to be applied. This shall be followed by two coats of approved wet spray polyurethane or powdercoat paint in accordance with AS 4506, to an approved colour. All external metal work shall be aluminium, hot dip galvanised or stainless steel. Paint finish to external metalwork shall be finished with two coats of approved colour Dulux or equal two pack polyurethane epoxy paint in accordance with AS/NZS 2312 (pur5) Cat 5 unless otherwise specified as powdercoat where it shall be in accordance with AS 4506 Cat 5.

Carry out all surface preparation, painting and curing in accordance with the paint manufacturers recommendations and data sheets.

Hot dip galvanise metal surfaces not requiring painting (e.g. where concealed in ceiling spaces, in plant rooms) or protect against corrosion by application of an approved corrosion inhibitor suitable for the installed location. Hot dip galvanising shall be to AS/NZS 4680 unless otherwise specified.

A1.27.2 Surface Preparation

Prior to any painting the surfaces to be painted shall be prepared as follows:

- All sharp edges and points must be rounded and smoothed using a suitable grinder then sanded.
- Any porosity, holes, flat spots, indentations or the like in the material surface shall be filled with weld or approved filling compound. The surface is to then be smoothed using a suitable grinder then sanded.
- Where porosity is detected after paint is applied, the paint is to be removed and the porosity filled then smoothed as above.
- All weld splatter is to be removed using a scraper, wire brush or sander.
- Ensure close fitting surfaces such as light pole access doors have adequate clearance gap all round after painting to accommodate the dry film paint thickness (DFT) on both surfaces.

A1.28 Phase Balancing

During commissioning, the phase current shall be measured on each phase and loads evenly balanced. This shall be done for all submains to switchboards, including switchboards of other trades, and at the Supply Authority point of connection.

The load at the Supply Authority point of connection shall comply with Supply Authority requirements as follows:

- $\leq 5\%$ deviation of individual phase current from average three phase current;
- $\leq 10\%$ deviation is permissible for periods of less than two minutes.

The Contractor shall take corrective action to achieve the above where necessary. Provide load results in the Operation and Maintenance manuals and record the final load arrangement on 'As constructed' drawings and circuit schedules.

Re-check phase balancing at the end of the defects liability period and report to the Principal.

Include all associated costs.

A1.29 Testing, Commissioning and Tuition

Test and commission the installation in accordance with Australian Standards and the recommendations contained within the appendices of those Standards where applicable. Prior to permanent power being connected, submit via the Contractor a detailed program of testing activities, commissioning dates, and the training of Principal's representatives in correct operation of services. The program shall indicate the numbers of commissioning staff on site at any time during the testing and commissioning period and the anticipated duration of the various activities on a system by system basis.

Submit details of the proposed commissioning procedures and methods of measurement. Commissioning procedures and measurement methods, which are not approved or not in accordance with methods detailed in this specification, will not be accepted as evidence that the systems have been correctly commissioned.

Provide full training of Principals Representatives in the operation and regular maintenance of all electrical services systems, including Switchgear, Lighting Control Systems, Emergency Lighting Control and Testing Systems etc. Include for a minimum of two training sessions on

each system held on two separate occasions, with dates agreed with the Principal. The Contractor, Subcontractor and Specialist Technicians shall develop training material as required for the Principal's representatives. Training sessions shall be minuted and an endorsed attendance and acceptance sheet developed, recording the date time and attendees of the training session. Failure to record training sessions may result in the training being repeated at no additional cost to the Principal.

Start up, commission and test the systems in accordance with the approved program. A representative, who is qualified to commission the installation, shall remain on site until the system is operating to the satisfaction of the Principal.

Arrange for the setting up of major equipment provided under this subcontract to be supervised by the manufacturer's representative, who shall remain on site until the equipment is operating satisfactorily. Coordinate manufacturer's representative so that testing is carried out according to the approved program.

Testing and commissioning shall be carried out for the complete installation as required or recommended by equipment manufacturers or relevant Australian Standards.

Testing and commissioning is to include but not be limited to the following:

- | | | |
|----------------------------|---|--|
| Maximum Load Test | - | For all mains and submains. |
| Insulation Test | - | For all mains, sub-mains and final sub-circuits. Test between each live conductor (including neutral) and earth and individually between conductors of a circuit. |
| Neutral Connection Test | - | For compliance of circuit identification and segregation from other services. |
| Earthing Test | - | For compliance of resistance and impedance values on each circuit, switchboard and earth stake. |
| Socket Outlets | - | Test for correct connection, polarity, circuiting, identification and earth impedance at each outlet including tripping times for each circuit. |
| Circuit Schedules | - | Test for compliance of each circuit. |
| RCD's | - | Test for sensitivity / operation / clearance time. |
| Switchboards | - | Busbar re-torque on major switchboards.
Circuit breaker protection settings – record and test.
Thermographic surveys. |
| Labelling | - | Check all labels to ensure correct description. Check all socket outlets to ensure those not protected by RCD's are engraved as such. Labels on non RCD protected outlets shall also detail the specific use the outlet was installed for. |
| Earth Fault Loop Impedance | - | Test for compliance in accordance with Clause 8.3.9 of AS/NZS 3000. |

All systems/services shall be tested and operational to specification prior to commissioning tests being carried out in the presence of the Principal. Formats for test check sheets shall be as required or recommended by equipment manufacturers or relevant Australian

Standards. The Principal will attend selected commissioning activities and provide a list of any rectification works required. These will be checked at a second commissioning if required, however, only after Subcontractor and Contractor certification. If the Principal is required to attend any further tests to prove the safe and correct operation of any system, hours of attendance will be charged to the Contractor at ACEA recommended hourly rates.

Provide signed test sheets to the Principal before confirmation of commissioning dates and the booking of principals Representatives for training sessions. Upon completion of successful testing, commissioning and training certify completion, as detailed herein.

Copies of all test results and certifications shall be included in the Operation and Maintenance manuals, submitted to the Principal for review as a condition of granting Practical Completion.

Certifications and testing and commissioning results shall include, but is not limited to:

Description	By
Switchboards and switchgear discrimination	Switchgear Supplier/Switchboard Manufacturer/Protection Engineer
Power supply and distribution	Electrical Installer or Protection Engineer
General electrical installation, cables, submains and fault loop impedance	Electrical Installer
Power outlets and wiring/RCD test results	Electrical Installer

Completion Certifications shall follow the format detailed below.

“We certify that the Lighting & Electrical System was installed in compliance with AS/NZS 3000, the design specification and drawings and all statutory requirements. The Principals Representatives have been trained in system operation and basic maintenance”.

The certification is to be made on company letterhead stationery and is to include ACN/ABN and licence numbers.

Practical completion cannot be granted without Completion Certificates and O&M manuals.

A1.30 Operating and Maintenance Handbook

A1.30.1 General

Submit “Draft” manuals and drawings for review at least four (4) weeks prior to application for practical completion.

Provide two (2) approved hard bound copies complete with embossed lettering of the Operating and Maintenance Handbook to the Principal. **The final Operating and Maintenance Handbook complete with all ‘As Constructed’ drawings must be submitted for approval at least two weeks, before application for practical completion.** The final submission shall include a written certification from the Contractor that the Operation and Maintenance Manuals and all information therein, including As Constructed drawings, and has been completed satisfactorily and in accordance with the contract.

A1.30.2 Hard Copy

Bind literature and drawings in hard bound A4 size handbooks in commercial quality 4-ring binders with white coloured hard covers with each indexed, divided and titled. Features shall include:

Hard copy shall include:

- Ring size: 50 mm maximum, with compressor bars.
- Cover: Identify each binder with typed or printed title (PROJECT NAME, SERVICES NAME, VOLUME No.) OPERATION AND MAINTENANCE MANUAL, to the spine and front. Index: Provide an overall index for each section inside the front cover of each Volume and sub index at the start of each section.
- Dividers: Durable divider for each section separately identified, with typed description of system and sub sections for major equipment components. Clearly print index number and short title on laminated plastic tabs.
- Brief description of each system at start of each section.
- Copies of Risk, Safe Design, Job Safety Analysis sheets for all constructed and maintainable items and their safe use.
- Copies of all equipment guarantees suitably completed and dated.
- Copies of all literature elsewhere required by the Specification.
- Specific operating and maintenance instructions for all equipment and systems, with programmed maintenance schedules and safe work practices action sheets (JSA's).
- Copy of all test results and reports specified.
- Contact list of all companies supplying and/or installing works under this contract.
- Contact list of all maintenance companies, which carry out maintenance of the specified works.
- List of maintenance requirements for each system.
- Asset register of all major items of equipment and all serviceable items with full technical details and identification of key characteristics, service dates, etc
- As-constructed information including A3 copies of as-constructed drawings, folded to A4 size, individually inserted in protective removable covers. Drawings shall include:
 - As-constructed Contract drawings
 - As-constructed equipment shop drawings;
 - As-constructed speciality system drawings.
- One (1) electronic copy as further described below.

A1.30.3 Electronic Copy

Provide an electronic copy of the material contained in the hard copy on a suitable sized USB flash drive.

The material shall be in PDF format. Drawings shall be provided in both PDF and native formats (e.g. DWG, DGN, Revit etc.).

Files shall be logically named and organised in folders that correspond to the sections of the hard copy.

A1.30.4 Sections

The following additional individual sections shall be provided in the manual as per the following table.

SECTION	DESCRIPTION
Switchboards	<ul style="list-style-type: none"> • Description of site power distribution and isolation points in the event on emergency or fire • Schedule of all switchboards – reference / identifier, manufacturer's name and contact number • Schedule of all equipment installed, including technical literature, manufactured part numbers, manufacturer's name and contact number • Copy of all site specific information including, circuit schedules, circuit breaker settings • Operating and Maintenance requirements including associated operating and maintenance instructions, test procedures, JSA, PPE requirements, etc • Copy of As Constructed switchboard shop drawings

	<ul style="list-style-type: none"> • Copy of Switchboard manufacturers ITP and Factory test results • Copy of all relevant technical data supporting compliance of the works with Contract requirements • Additional requirements as nominated herein or required by Statutory Authorities • Copy of all circuit schedules • Maintenance requirements RCD test, injection testing, risk analysis, JSA's, etc
Lighting	<ul style="list-style-type: none"> • Schedule of all light fittings complete with the following: <ul style="list-style-type: none"> - Description of fitting (as per legend sheet) including all accessories - Fitting catalogue number, lamp type, rating, colour temp, beam angle, control gear or driver type and catalogue number - Manufacturers or local suppliers name, addresses and contact details • Luminaire data sheets and control gear details, performance, specifications, compliances and relevant certifications • Maintenance requirements for all light fittings: e.g. testing and inspections, cleaning materials, relamping strategy, maintenance risks / JSA's, PPE, etc • For emergency lighting fittings a schedule showing drawing number for luminaire positions, unique luminaire identifier and type of luminaire • Additional requirements as nominated herein or required by Statutory Authorities
Lighting Control, Monitoring and Testing System	<ul style="list-style-type: none"> • Description of system operation • Schedule of all equipment installed, including technical literature, manufactured part numbers, manufacturer's name and contact number • Copy of all site specific information including, adjustments, settings, etc • Operating and Maintenance requirements including associated operating and maintenance instructions, test procedures, JSA, PPE requirements, etc • Copy of As Constructed shop drawings • Copy of manufacturers ITP and Factory test results • Copy of all relevant technical data supporting compliance of the works with Contract requirements • Copy of all site specific programming information and software • Additional requirements as nominated herein or required by Statutory Authorities
Fittings and Accessories	<ul style="list-style-type: none"> • Schedule of all equipment installed, including technical literature, manufactured part numbers, manufacturer's name and contact number for: <ul style="list-style-type: none"> - Cable tray and ladder - Cable duct - Conduits - Pits • Copy of Certification of cable tray / ladder and support systems to carry installed cable loads • Copy of all relevant technical data supporting compliance of the works with Contract requirements • Operating and Maintenance requirements including associated operating and maintenance instructions, test procedures, JSA, PPE requirements, etc • Additional requirements as nominated herein or required by Statutory Authorities
Cables	<ul style="list-style-type: none"> • Schedule of all cables installed, including technical literature, manufactured part numbers, manufacturer's name and contact number for: <ul style="list-style-type: none"> - Electrical cables (LV) - Electrical cables (ELV) - Communications cables (CAT 6A) - Communications fibre optic cabling • Copy of all relevant technical data and Certification supporting compliance of the works with Contract requirements • Additional requirements as nominated herein or required by Statutory Authorities
Inspection and Test results and Certification	<ul style="list-style-type: none"> • Inspection and test plan with all relevant test sheets and test results of each system and works • All electrical system tests results to AS 3000 and related Standards including but not limited to: <ul style="list-style-type: none"> - Cable tests - Equipment tests - Earthing tests including loop impedance - RCD tests - Switchboard Load balancing - Switchboard Thermographic survey • Lighting, controls and Emergency lighting test and commissioning • Electrical Preliminary Notice • Electrical Notice of Practical Completion • Functional tests of all systems as standalone and integrated operation with other systems • Certification of each system and works
Warranties and Guarantees	<ul style="list-style-type: none"> • Electrical installation warranty / guarantee • Schedule out all Warranties for all equipment and components of the works with details including system or equipment, starting date, end date, inclusions and exclusions, and Company carrying out the repairs or replacement under the warranty period.

	<ul style="list-style-type: none"> Provide copies of all system and equipment warranties offer by the manufacturer and installer for the works. Any warranty extending after the Defects liability period shall be transferred to and registered to the Principal by the Contractor at completion of the works as required to allow the warranty to be extended to the Principal.
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A1.31 Maintenance & Defects Liability

During the Maintenance and Defects Liability Period repair all defects without delay and carry out all maintenance necessary to keep the installation in first class operating condition. Carry out maintenance work in accordance with the Operating and Maintenance Manual, Australian Standards, Authority Regulations and as recommended by equipment suppliers.

All lamps or light fittings that have failed or are failing during the maintenance and defects liability period must be replaced with a lamp or light fitting of the same type within five business days of reporting, at no additional charge to the Principal. If a replacement light fitting cannot be supplied and installed within the five business day period, a temporary light fitting shall be supplied and installed until the replacement light fitting is available for installation. The Contractor must include all costs associated with fitting replacement in tender sum.

If reported defects are not rectified within an acceptable period, or maintenance is not carried out, the Principal shall issue two (2) weeks written notice to complete the work. If works are not completed within an approved timeframe, suitably qualified companies, selected by the Principal, will be authorised to carry out the work and associated costs will be deducted from retention monies.

A1.32 Keys

Confirm all key type and locking requirements to the Principal's approval prior to manufacture or installation.

A1.33 General Demolition and Modification of Existing Services

All submains, sub circuits and communications cables within the vicinity of the proposed building works associated with the redevelopment that are required to remain are to be located and protected prior to any building works to avoid any damage.

When required on a temporary or permanent basis and particularly for existing site services, extend/redirect cables as necessary to avoid new building work. Provide junction boxes, conduits, etc. Make all cables joints in accessible junction boxes. Joints to be carried out using crimp links in approved terminal boxes where not exposed to weather.

Mark all locations of conduits, pits, etc on "As Built" drawings as required by the Specification. In the interim, provide the Contractor with permanent drawings showing these locations for his reference during the course of the works.

Liaise and coordinate with the Contractor with regard to demolition and the removal of equipment and cabling.

All equipment is to be isolated prior to any demolition. Extend/redirect existing cabling to relocated equipment where required.

In conjunction with the Contractor's programme, disconnect and remove all redundant services. Remove all redundant cabling.

Prior to demolition or modification of any existing services, review such services with the Principal and Contractor to determine the exact requirements and methods of removal and/or modification.

Refer to clause "Existing Equipment", "Existing Site Conditions" and all contract drawings.

PART B GENERAL TECHNICAL CLAUSES

B1 POWER SUPPLY AND DISTRIBUTION - GENERAL

B1.1 General

Design all equipment to operate on the Supply Authority power supply.

The existing power supply is to be retained.

B1.2 Supply Authority Metering

B1.2.1 LV Metering

The existing LV meter is to be retained.

B1.2.2 General

The existing consumer mains is to be retained.

B1.3 Power Disruptions

Minimise power disruptions and where unavoidable they shall be at pre-arranged times to suit the Principal.

B2 EARTHING - GENERAL

B2.1 Main Earth

The earthing system employed shall be a TN-C-S system.

Provide a Multiple Earthed Neutral (MEN) link at the switchboard to which the consumer mains terminate, and at switchboard(s) nominated on the drawings. Provide a PVC insulated earth cable, sized in accordance with AS/NZS 3000, from the switchboard earth bar to an earth electrode. The earth electrode diameter, length, material and location shall be in accordance with AS/NZS 3000. Permanently label the connection to approval. The earth electrode shall be installed in an earth pit with concrete lid marked "MAIN EARTH". The main earth electrode must be located externally in an approved location.

Connections shall be treated to prevent corrosion. Cabling between earth stake and earth bar shall be continuous without joints.

B2.2 Earthing and Bonding

Provide equipotential bonding in accordance with AS/NZS 3000, the supply authority, regulatory authorities and equipment suppliers recommendations.

Directly earth all light fittings, socket outlets and appliances to the respective supply switchboard earth bar.

Bond any water, waste, or down pipes within a distance of 2.40m of one another.

Refer Clause "Testing".

Neatly bond and earth all steel conduits, steel wire armour, cable screens and MIMS cable sheaths at switchboards or connection points. Carry out earthing and bonding utilising gland plates within switchboards in a neat and orderly manner.

B3 SWITCHBOARDS - GENERAL

B3.1 General

The existing switchboard shall be retained. Allow to complete all necessary upgrades and modifications to the existing board as shown elsewhere and as required .

B3.1.1 General Requirements

All switchboards shall have metal enclosures and all metalwork shall conform to General Clause 'Fabricated Equipment'. Finish switchboards inside and out in accordance with General Clause 'Painting'.

Switchboards shall be the front access type with escutcheons unless otherwise shown.

Unless otherwise specified, the top of the switchboards shall be 2000mm above floor level.

Miniature Circuit Breakers (MCBs) are to be mounted on proprietary brand mounting chassis complete with busbars unless approved otherwise. Split or cut chassis' will not be accepted where separate chassis' have been identified on the drawings.

Cover spare busbar arrangements and tags for future circuit breakers with either heat shrink sleeving or proprietary insulating shrouds or caps.

Neutral links shall have at least as many terminals as to suit full incoming and outgoing active cable capacity (including spare spaces). The terminals shall be numbered and connected to correspond with the fuse or circuit breaker numbers.

Plate all hardware to prevent corrosion.

Unless otherwise specified, key all locks alike to Electricity Supply Authority standard. Refer to clause "KEYS" herein for key details.

Self-tapping screws shall not be used anywhere in the construction of switchboards.

Unless otherwise specified use a single brand throughout the project for each type of equipment (e.g. MCBs, contactors, fuses, switches etc). All switchboard protective devices and components shall be of a manufacturer with locally available spare parts / replacements and regional technical support.

Observe maximum and minimum mounting heights for equipment and devices (e.g. controls, safety switches, displays etc.) per AS/NZS 3000 and AS/NZS 61439. Ensure minimum and maximum mounting height requirements for Electricity Supply Authority meter panels in accordance with Supply Authority standards are achieved. Confirm that the height requirements are achieved to standing area finished floor/ground level on site after installation of the switchboard, accounting for mounting plinth, concrete foundation (if applicable) and potential level differences due to sloping surfaces (e.g. external paved areas). For external installations in particular, the installed height of the equipment or device after installation may differ and the Contractor shall be responsible for ensuring this is checked and accounted for in switchboard design and/or installation methods.

B3.1.2 Identification

Provide a label fixed to the front elevation of the switchboard to detail manufacturer, fault rating, form construction, submain cable type and size and source of supply.

All equipment and devices shall be labelled to identify function and service it provides to approval.

Uniquely identify all sub-circuit protection devices with labels that correspond with the single line diagram with the use of numbered phase markers (e.g. red markers - 1, 2, 3 etc, blue

markers - 1, 2, 3 etc) or engraved traffolyte fixed to panels or escutcheon plates, secured in line and centered directly adjacent the related items. Where multiple chassis' are installed for a single switchboard, ensure numbered phase markers are sequential and numbers are not duplicated across chassis.

Where an alternative labeling format is noted on the drawings, engraved traffolyte glued and screw fixed adjacent to the protective device(s) shall be utilized.

Multi-module devices on chassis shall be identified by a single marker only to ensure accurate identification and the chassis poles increased as required to achieve the nominated spare spaces required.

For all switchboards containing RCD units, either integral or within the field wiring, install a label to the chassis escutcheon plate to read 'Warning: RCD's installed on this switchboard and in the field, do not megger. Refer to circuit schedule'. Label to be green on white.

Clearly label all other devices on switchboards stating their function and unique identification corresponding with the drawings.

Clearly label all contactors, controls and the like installed behind escutcheon stating their functions using labels as specified above.

B3.1.3 Legend and Drawing Holder

Provide a circuit schedule holder for each switchboard and secure it inside the switchboard doors. All circuit details shall be typewritten on a circuit schedule card and placed in the schedule holder. Circuit details shall include circuit reference, circuit description, rating of protection device and size of cable for each circuit.

The card shall also show the customer's name for each multiple master meter, where such metering is fitted.

Provide a separate drawing holder. Holder shall contain switchboard As Built drawings and shall also contain site plans in accordance with AS/NZS 3000 – Clause 3.11.4.6.

B3.1.4 Bus Bars

Busbars shall be completely insulated with colour coded heat shrunk sleeving, or otherwise protected by clear polycarbonate barriers to IP2X, in accordance with AS/NZS 61439.

Busbars shall be design and brace for the fault current shown on the drawings or available at the point of installation applied for one second.

Ensure that busbar systems are re-torqued after transport to ensure busbar fixings have not loosened off since factory setting.

Bus bars shall be sufficiently sized to ensure space for bolting of all cable lugs, ensuring lugs achieve full contact on the bar. Lugs overhanging the bar and not achieving full contact will be rejected.

B3.2 Enclosures

Enclosures generally shall be aluminium or galvanise steel and painted. Where aluminium it shall be marine grade (5000 or 6000 series to BS 1490 or equivalent) with painted external finish unless otherwise indicated.

Isolate aluminium from dissimilar metals, masonry and concrete. Use aluminium channel for mounting of aluminium enclosures in lieu of steel. All switchboards exposed to the weather shall be minimum IP54 rated to AS 60529 and fitted with weatherproof and insect proof ventilation. All fixings into aluminium shall be 316 stainless steel.

External switchboards shall be constructed with a sun shield and rain hood to the top section of the board. The shield shall be welded to the panel roof, open at both ends and provide for sufficient slope to avoid ponding of water. Provide details for comment with shop drawings. Ground mounted external enclosures shall be fixed to an inground concrete foundation suitably sized to retain the switchboard. Foundation to extend 150mm above ground level. Provide a watertight, vermin proof seal between switchboard base and the foundation.

External switchboards shall be provided with an anti-graffiti treatment applied after surface finishing in accordance with system manufacturers application instructions, relevant clauses of AS/NZS 2311, and this specification "Painting". Submit proposed "Anti-Graffiti System" for approval prior to application.

Select equipment and size enclosures to suit cupboards, ducts or spaces provided. Confirm exact dimensions of areas available and clear opening dimensions in the case of door frames with Architect prior to preparation of shop drawings to ensure switchboards can be installed and removed through final finished clear openings.

Switchboard enclosures shall be complete with suitable gland plates for bottom and/or top entry as required to suit cable entries. Gland plates design shall minimise circulating eddy currents.

Switchboard enclosures shall be complete with door(s) unless otherwise specified. Doors shall be hinged, lockable and secured shut in three locations, top, middle and bottom. Door locking devices shall be "Lock Focus" stainless steel swing lockable handles with recessed key barrel or equal approved. During design of all switchboards, particular attention must be paid to the prevention of inadvertent contact with live parts during inspection of equipment, by use of insulation or barriers in accordance with AS/NZS 61439.

Doors shall open through 100° and when installed externally be complete with captive stays to hold open against wind.

Doors shall be earthed by means of 4mm² copper braid.

B3.3 Circuit Breakers

B3.3.1 General

Generally, circuit breakers are to be utilised for all transformer, submains and subcircuit protection, unless otherwise shown on the drawings or specified herein.

Circuit breakers shall be rated for the prospective fault current available at the point of installation, or the fault current nominated on the drawings, whichever is the greater.

All trip units shall be suitable for continuous full load enclosed operation with such trip rating nominated on the drawings or as specified herein. Commission all trip units to meet authority requirements and discrimination co-ordination requirements specified herein.

Moulded Case Circuit Breakers (MCCBs) shall be used for protection of all circuits of 100A rating or greater and whenever such protective device is utilised for submains protection and / or isolation. MCCB's may only be used as transformer isolating switches for transformers rated at less than 500KVA and used in combination with line-side transformer isolating links sized to suit 110% of transformer capacity.

For all adjustable circuit breakers, detail frame size and settings on the submitted shop drawings. In some instances, electronic trip units must be used to ensure compliance with earth fault loop impedance. Obtain earth cable sizes prior to final selection of trip units. Final settings shall be recorded on as built single line diagrams.

Miniature Circuit Breakers (MCBs) shall be utilised for the protection and control of all subcircuits rated at less than 100 Amps, unless otherwise specified.

B3.3.2 Moulded Case Circuit Breakers (MCCBs)

Moulded Case Circuit Breakers (MCCBs) shall be constructed of a non-conducting low hydroscopic case that will not fail under the maximum electrical, thermal or mechanical conditions possible at the point of installation.

MCCBs shall comply with AS/NZS 60947.2.

All MCCBs shall be fitted with adjustable trip units. Electronic trip units shall be installed for all MCCBs rated at 400A or greater, or where nominated on the drawings or to achieve electrical performance requirements (e.g. earth fault loop impedance or discrimination) nominated herein.

All moulded case circuit breakers shall be fitted with positive “flag” identification of open or closed positions, or shall otherwise be clearly labelled for rapid identification of switch position.

Where used as transformer protection in accordance with this specification, MCCB's shall be fitted with fully adjustable short time and long time overcurrent and earth fault trip units as specified for ACBs.

B3.3.3 Miniature Circuit Breakers (MCBs)

Miniature circuit breakers (MCBs) shall have a minimum fault interrupting capacity of 10kA.

Where back-up protection is provided via the upstream device (i.e. cascading) in accordance with manufacturer's requirements, MCBs with a lower fault interrupting capacity may be utilized to approval.

All MCBs shall have 'C' curve tripping characteristics unless otherwise specified. MCBs shall comply with AS/NZS 60898.1 It is the responsibility of the switchgear manufacturer to certify acceptability prior to submission of shop drawings.

MCB's shall be installed on proprietary, fully insulated and colour coded MCB chassis.

MCB's shall be of a readily and locally available manufacture.

Non Auto MCB's shall not be used as isolators.

MCB's shall not be utilised for submain protection unless otherwise approved or specified herein or on the drawings.

B3.3.4 Residual Current Devices (RCDs)

RCDs shall be with integral overcurrent protection (RCBOs) to AS/NZS 61009 unless otherwise noted.

The requirements for RCBOs shall be as per section 'Miniature Circuit Breakers (MCBs)', with additional requirements as follows.

RCBOs shall have a rated operating residual current not exceeding 30mA in accordance with AS/NZS 3000. Devices with 10mA sensitivity shall be used where noted on the drawings or required by AS/NZS 3000. Tripping shall be ensured for residual sinusoidal alternating currents (Type AC RCD per AS/NZS 61009.1).

RCBOs shall be of single pole width for single phase circuits, and shall be installed on all light and power circuits required by AS/NZS 3000.

Multiphase sub-circuits requiring RCD protection shall be RCBOs.

B3.4 Escutcheons

Escutcheons shall have turned edges, chrome lift off handles, locating pins and chrome captive thumb screws with screw slot. Provide locating pins at a rate of one pair for each 450mm length of escutcheon or part thereof.

All operating devices including reset buttons shall protrude through escutcheons.

All fixings for escutcheons shall be complete with internal star metal captive washers.

Paint all escutcheons shall be painted in approved colour.

All escutcheons shall be designed to prevent inadvertent contact of the escutcheon with live parts during removal and installation by means of insulation or barriers to AS/NZS 61439.

Escutcheon plates equal to or greater than 900mm high shall be installed with lift off hinges in addition to chrome captive thumb turn screws and lift off handles.

B3.5 Isolators and Switches

Isolation switches (isolators) shall be Schneider Compact INS, Socomec or equal, shall be load-break fault-make type and shall be capable of being switched onto the maximum fault current available at the point of installation. MCCBs in accordance with section 'Moulded Case Circuit Breakers (MCCBs)' may also be used, except with trip units removed (e.g. non-auto MCCBs), they shall be rated at not less than 150% of the current rating of the upstream protective device.

All isolators shall be complete with insulating shrouds over terminals.

Override switches shall be Cam Switches similar to NHP BIN Series complete with engraved plate indicating function e.g. - "OFF-ON", "MAN-AUTO", etc.

B3.6 Provisions for Locking Off

All isolation devices, including MCCBs, MCBs and isolators, shall be capable of being 'locked off'. The lock-off provision must accept a padlock or hasp. Where devices rely on an external optional attachment to provide this facility (e.g. for MCBs), supply a quantity of these attachments loose to minimum 10% of installed circuit breakers and store in a holder on the inside of the switchboard door for future use.

B3.7 Wiring

Wiring shall be neatly run, generally contained in slotted PVC cable duct or harnessed in an approved manner such that any cable can be readily traced.

Use compression type lugs to properly terminate all cables where suitable tunnel terminals are not provided.

Label active neutral, and earth conductors using numbered and phase coloured printed type coded ferrule type proprietary brand cable markers at protection device, earth bar and neutral bar. Neutral labels shall be black with white lettering R1, R2, etc. Tape markers are not acceptable.

Each active, neutral, and earth cable is to be identified with its corresponding I.P.A. marked fuse/MCB.

Mark control cables to correspond with terminal numbers on shop drawing control diagrams.

B3.8 Shop Drawings

Submit shop drawings detailing the switchboard design as previously specified for all switchboards. Obtain Western Power approval for main switchboards and switchboards

containing Western Power metering equipment before drawings are submitted for Principals review.

All switchboard designs shall be accompanied by a signed ITP and endorsed by the switchboard manufacturer.

Show all label wording, positions, details, and clearly indicate the fault ratings of all protective devices and busbar assemblies on shop drawings. Submit detailed control diagrams for all control circuits, complete with termination and cable schedules.

Shop drawings shall comprise of the following:

- Minimum A3 drawing sheet size;
- Produced using Autocad or equivalent electronic drafting package;
- Manufacturer's drawing sheet title block identifying the project name, project number, drawing number;
- Minimum scale of 1:10;
- Include equipment materials list with part numbers;
- Labelling schedule noting size and colour of lettering and background;
- Switchboard general arrangements; front elevations with escutcheons fitted and without escutcheons, minimum one section both vertically and horizontal;
- Confirm form construction;
- Confirm fault rating;
- Diagrams for all control equipment, (e.g., lighting controls, meters, relays) complete with terminal strip numbers;
- Schedule of construction details confirming as a minimum material type and sizes used, colour, handle types, locks and all hardware, etc;
- Simplified single line diagram clearly showing all principle equipment, busbar and internal wiring, fault rating of equipment and protective devices. The diagram must identify proposed detailed design and construction and therefore shall not utilise consultant's drawings;
- Where protective devices are fitted with adjustable settings, confirm settings on the drawings;
- Provide Manufacturers pamphlet details of any proprietary equipment used as part of the switchboard construction, e.g. meters, relays, contactors, time clocks, and push buttons.

All switchboard designs and shop drawings must be checked and endorsed by the Contractor for correctness prior to submission to Principal. The Principal will reject shop drawings that have not been so endorsed.

B3.9 Form of Internal Separation

Switchboards shall be constructed to meet the internal separation requirements detailed in AS/NZS 3000 and AS/NZS 61439 or where a higher level is shown on the drawing. As a minimum switchboard shall be constructed to the following criteria:

- Site main switchboards and main distribution boards serviced by circuit protective devices with a frame size less than that detailed in AS/NZS 3000 for heavy current switchboards shall have Form 2b separation.
- Distribution boards shall have Form 1 separation with additional insulation or barriers segregating the incoming functional unit from all outgoing functional units or where installed in restricted locations, as identified in AS/NZS 3000.

B3.10 Discrimination

Prior to submission of tenders and again prior to selection of switchgear supplier, the switchboard manufacturer must ensure discrimination can be achieved as follows. The switchboard manufacturer must obtain submain cable details from the design drawings to ensure discrimination and earth fault loop impedance requirements are met.

Co-ordinate the protection equipment on all main and distribution switchboards such that in the event of any condition of over-current or short circuit occurring at the load side of terminals of any submain protective device or final subcircuit equipment isolator/connection device to the full prospective fault level of the installation;

- Submains protection effectively discriminates (enhanced selectivity);
- All lighting circuits continue to operate apart from any lighting which is supplied by the faulty circuiting;

Short circuit calculations shall be for all faults up to and equal to the prospective fault current at each distribution switchboard. The manufacturer may use cascading if the manufacturer can prove by test results that discrimination is ensured to the full prospective fault level of the system.

Switchgear manufacturer or Switchboard manufacturer must certify compliance with the above in writing to the Principal, including fault and discrimination test results/tables for switchgear used prior to submission of switchboard shop drawings for examination. Time current curves cannot be used to prove discrimination in the short circuit region of circuit breakers.

Submission of equipment list and manufacturer's discrimination and enhanced selectivity charts are acceptable in lieu of individual test results, where these are available.

Note that use of some brands of switchgear may require upgrading of circuit cabling, the cost of which shall be borne by the manufacturer.

Devices shall be rated for the prospective short circuit fault current apparent at each switchboard.

B3.11 ELV Segregation

Extra low voltage systems shall be segregated from low voltage parts of the switchboard or enclosure in accordance with AS/NZS 3000, AS/CA S009 and this specification.

B4 UNDERGROUND INSTALLATIONS - GENERAL

B4.1 General

B4.1.1 Standards

Generally, refer to AS/NZS 3000 and AS/CA S009 for minimum requirements for underground electrical and telecommunications installations.

Other standards that shall be adhered to include:

- Utility Provider's Code of Practice for minimum separations in verges and road reserves;
- AS/NZS 2067 for high voltage installations;
- ACIF C524 and G645 for communications carrier installations;
- AS/NZS 3084 and AS/NZS 14763.2 for telecommunications installations;
- Utility/authority standards where installing utility services or in proximity to utility services.

B4.1.2 Trenching and Excavation

All excavation work shall be carried out in accordance with the requirements of WorkSafe WA Code of Practice – Excavation and the Principal's Safety Procedures and Instructions.

Before trenching, make thorough enquiries and take every reasonable precaution to locate and avoid damage to existing services. Replace all damage to existing services caused by failure to comply with this specification.

Excavations shall provide the specified minimum cover to avoid damage or loss of support to, obstacles such as pipes, drains, cables and other utilities and services; and the excavated area shall be reinstated in accordance with Principal's requirements.

Keep trench widths to the minimum, sufficient for satisfactory and safe working conditions and to provide the specified minimum bedding and cover of services so as to avoid damage or loss of support to, ducts, cables, drains and other utilities and services.

If excavated material cannot be used for filling or backfilling, remove it from the site in accordance with the environmental specification.

Open trenches and excavations including excavation for cable joints shall be protected against entry of water from any source.

During trenching and excavation make sure that water is prevented from flowing into the excavations. Where this is not possible, undertake all works necessary to adequately dewater the trench or excavations. Installation of cables and equipment, bedding or backfilling and compaction must not be undertaken where water is present.

Place "DANGER ELECTRIC CABLE UNDER" orange PVC tape or polymer cover strip at 50% burial depth below ground along all electrical cable routes to AS/NZS 3000. Place "DANGER COMMUNICATIONS CABLE UNDER" white PVC tape to AS/CA S009 and S008.

Record as built locations of all underground cabling routes. As built copy of electrical cable routes shall be provided in site main switchboards in accordance with AS/NZS 3000.

B4.1.3 Bedding and Backfilling

Supply imported bedding sand approved for bedding of direct buried cables. Sand shall be, clean sand free of rocks, clay lumps, tree roots, building rubble, metal, glass, sharp objects, organic solvents or other deleterious material that is likely to damage cables.

Sand used for bedding of direct buried power cables shall be imported yellow brickie's sand and shall surround the cable of minimum 200mm thickness unless otherwise noted.

Imported bedding sand is not required for cables installed in conduits. Conduits shall be laid on compacted clean fill providing minimum 200mm thickness around the conduit.

Backfilling shall not commence until inspections have been completed and approved by the Principal.

Backfill shall be equal to the original excavated material / surrounding soil.

Where cables and/or conduits are laid beneath other buried services, ensure that the backfill beneath such services is adequately compacted to prevent damage to the other buried services, due to inadequate support.

Where installed under roadway and the like, compacted soil and backfill shall be in not more than 300mm layers to a compaction equal to that specified for road works.

The surface shall be reinstated to its original condition. Make good to all lawn, paving, gardens and finished surfaces to original condition.

B4.1.4 Separation of Services

Minimum separation to services in accordance with relevant standards shall be observed at all times.

Generally, refer to AS/NZS 3000, AS/CA S009 and referenced standards for minimum separation required for electrical and telecommunications installations.

B4.1.5 Directional Boring

Provide horizontal directional boring, carried out by suitably qualified personnel.

Utilize accurate and proven guidance equipment and procedures to undertake the works.

Make all necessary investigation and examinations of the site conditions to determine the suitability of the works.

The Contractor undertaking the boring works shall supply a log for the total length of the bore for inclusion on the "As Constructed" construction records. The Log shall include for each bore, as a minimum:

- Contractor details
- Location;
- Size and number of conduits installed;
- Depth below finished surface level to the top of the bore at 3m spacing.

B4.2 Underground Conduit

B4.2.1 General

Generally all underground conduits shall be heavy duty electric orange rigid PVC-U electrical conduit for extra low, low, and high voltage power services and white PVC-U telecommunications conduit to AS/CA S008 for telecommunications services.

All electrical conduits shall be installed by a licensed electrical installer.

All underground conduit for low voltage communications cabling (e.g. public address) shall be installed in dedicated white communications conduit to AS/CA S009.

All conduit shall be manufactured to AS/NZS 61386.21.

Telstra and NBNCo conduits shall be to the respective authority's standards.

The conduit routes shown on the drawings are diagrammatic only. The Contractor shall be responsible for determining the exact route on site in coordination the underground installation with other trades to avoid clashes with footings, piling and other underground services installations. Advise Principal of any clashes and modify route as instructed by the Principal.

Where external conduits are entering or leaving poles, switchboards or buildings, seal conduits internally with a sealing compound (e.g. expanding foam) on completion of works to prevent water and insect/rodent ingress. Conduit shall be sealed internally at both the cable pit and building/equipment entry point. The Compound shall fill up minimum 150mm of conduit end being sealed and shall be easily removed for future conduit use. Ensure compound is flush with end of conduit by masking or cutting back once set.

Where conduits enter building, slope conduits away from buildings and provide brass plates approximately 75 x 150mm labelled "Electrical/communications conduits under" securely fixed to wall directly above entry point.

On completion of contract works mark 'As Constructed' drawings indicating unused conduits and dimension location of spare conduits that do not terminate in a pit.

Record as built locations of all underground cabling routes and include a copy of drawing in appropriate switchboards in accordance with AS/NZS 3000 – Clause 3.11.4.6.

B4.2.2 Conduit Bends

Unless otherwise shown all conduits shall be installed in straight lines between pits, etc.

Where unavoidable, the number of bends shall be minimised and all cases shall not exceed two 90° large sweep bends between access points. The Contractor shall ensure the maximum pulling tension of the cable is not exceeded at any time.

Where required, bends shall be pre-fabricated large-sweep bends of suitable bend radius that exceed the cable minimum bend radius. The bending radius of the cable whilst under tension (during installation) shall be used and not the set in position bending radius.

B4.2.3 Couplings

PVC conduit fittings shall be coupled with a suitable PVC cement or adhesive that forms a durable and watertight seal.

B4.2.4 Depth of Cover

Minimum depth of cover for underground power shall be in accordance with AS/NZS 3000 and AS/NZS 2067, generally 500mm for LV and 750mm for HV. Depth of cover may be reduced in specific situations as defined in AS/NZS 3000, however approval must be sought in each case.

Minimum depth of cover for communications conduits shall be a minimum of 450mm. Depth of cover may be reduced in specific situations as defined in AS/CA S009, however approval must be sought in each case.

Where installing conduits beneath railway, conduit depth of cover shall be increased as required by the relevant authority.

B4.2.5 Empty Conduits

Provide a 2.5mm² PVC insulated copper draw wire or suitable nylon rope in each spare or empty conduit.

B4.3 Cable Pits

B4.3.1 General

Cable pits shall be used at changes of direction and at intervals not exceeding 50 metres or as further shown on drawings. When underground conduit bends without a cable pulling pit cannot be avoided, the Contractor shall demonstrate cable manufacturer's pulling tensions will not be exceeded and approval sought from the Principal. In all cases conduit bends shall be large sweep bends that exceed the minimum cable bending radius during installation. There shall be not more than two large radius bends in any conduit run.

All communications cable pits shall meet the requirements of AS/CA S008.

All communications carrier pits (e.g. Telstra, NBNCo) shall be in accordance with their requirements.

Additional cable pits to those shown on the drawings may be installed but written approval must be obtained from the Principal for localities prior to installation.

All cable pit lids shall be as specified, engraved "ELECTRICAL", "TELSTRA" "NBN" or "COMMUNICATIONS" as applicable or fitted with permanently fixed approved labels engraved as specified.

B4.3.2 Construction

Cable pits are to be polymer stackable type with concrete surround as shown.

Polyethylene/plastic pits are not acceptable for B, C, D or E Class lids unless specifically tested and rated and then only by obtaining specific approval. Plastic lids/pits must be installed with a supporting reinforced concrete edge beam surround and haunching to prevent pit wall distortion.

B4.3.3 Load Classification

Cable pits and access covers shall have a load rating in accordance with AS 3996.

Load classification shall be as nominated on the drawing, or if not nominated generally as follows:

- Load Class B: Raised / walled garden / landscaped beds;
- Load Class C: Footpaths and lawn areas;
- Load Class D: Local roads and carparks;

Any load classification for lids/covers shall apply to the entire installed pit and lid assembly in its installed condition.

In addition, the installed pit shall be capable of withstanding lateral loads such that the pit shall not deform post backfill and compaction. Any deformed pit wall identified during inspection shall be rejected.

Pits shall not be located in loading docks, hard stands or other heavy duty areas unless otherwise approved.

Pits shall be installed in accordance with manufacturer's requirements to achieve the above load classifications, including any required concrete haunching.

B4.3.4 Conduit Entries

Where conduits are installed into pit wall, provide a water tight seal around conduits between conduit and pit wall cutout. Where necessary, or as required by the pit manufacturer, install concrete haunching to manufacturer's recommendations in order to retain pit wall strength following cut-outs in pit wall.

Conduits shall not protrude more than 100mm into the pit and shall be minimum 100mm above the pit floor to avoid conduit flooding when bottom of pits pool with water. Fit bell ends to all communications conduit ends.

Communications conduits shall only enter the two short ends of the pit in accordance with AS 3084 and AS 14763.2.

B4.3.5 Labels

All cable pit lids shall be fitted with a stainless steel (316) engraved label, mechanically fastened. The use of glue or fixings of the plate will not be accepted.

B4.3.6 Sizing

Pits shall be sized as shown on the drawings. Where sizes are not shown, they shall be of a size suitable for terminating quantity and size of conduits nominated and pulling through of cables specified in the conduits shown, ensuring that minimum cable bending radius can be achieved, along with all accessories and/or equipment specified.

The depth of the pit is to be based on the burial depth of the service and any stacking of conduits required.

B4.3.7 Drainage

All cable pits shall have a preformed or drilled drainage hole of minimum 25mm diameter. A soakway comprising minimum 300mm deep layer of geotextile, crushed aggregate (e.g. bluemetal) shall be installed beneath pits as a soakway.

B5 CABLING – GENERAL

B5.1 General

Wiring shall be carried out with stranded copper conductor, Class V-75/V-90, PVC insulated and sheathed, 400/750V grade or with X-90 or X-110 XLPE insulation and sheath.

Cables with alternate insulation used in accordance with AS/NZS 3000 and AS/NZS 3008, with higher current rating than the specified cable, may be used in lieu of specified cables.

All cables shall be new and delivered on site in unbroken reels with maker labels attached. Loop all cables (including mains, submains and final circuits) from point to point without joints and with terminations only at switchboards, devices, switches or outlets. Cable joints shall not be permitted unless otherwise indicated on the drawings, or where cable run length exceeds standard cable drum length. If in-line joints are required, they shall be carried out using proprietary jointing kits that are fit for purpose and acceptable to the cable manufacturer for the installation conditions proposed. Where in-line joints are required they shall be utilised in accessible locations only, joints within conduits will not be accepted.

Obtain Principal's approval for proposed jointing kit, method of jointing and locations of joints prior to placing cable orders. Locations of joints shall be recorded as-built drawings.

Enclose unsheathed cable in conduit. Underground cabling shall be sheathed circular in conduit unless otherwise specified.

Install and conceal all wiring, including sheathed cable, within or by the building structure in a manner that can be easily replaced without damage to the completed building finishes.

All cable entries into ingress protected (IP rated) enclosures shall be glanded. Cable entries must not compromise the ingress protection rating of the enclosure.

Cables shall not be installed in any area until all construction work which is likely to damage cable is completed. All cabling installed in stud walls shall be enclosed in conduits where required by AS/NZS 3000 – Figures 3.3 to 3.7 and where not easily withdrawable for refurbishment.

Cabling in cavities and stud walls is not permitted unless cables are RCD protected or enclosed in conduit. Drop vertically down walls from ceiling spaces to accessories. Install conduit sleeves through “noggings” where required to comply with AS/NZS 3000 – Figure 3.4.

Suspend/secure cabling within ceiling spaces over removable tile ceilings in such a manner and spaced above ceiling to ensure cables do not interfere with the removal and reinstallation of tiles, or the maintenance of in ceiling equipment.

Where more than 5 cables are in close proximity, they shall be installed on catenary wire, on trays or in ducts with segregated sections and removable lids. Securely fix all cables direct to the structure (not to ceiling hangers, pipes, ducts, etc). All wiring enclosures in walls shall extend up to easily accessible location in ceiling space, cable tray, catenary wire or other permanent support structure to produce a neat appearance and suitably protect the cable from disturbance. Install, group and fix all cables in a tradesman like manner. Notify the Principal, prior to installation of ceilings, that the above ceiling cable installation is ready for inspection. Carry out any remedial works necessary prior to installation of ceilings.

Cabling passing through a roof shall be water tight sealed to approval. Cable penetrations through metal roofs shall be made at the top/crest of the profile, and shall not be made in the trough. A proprietary, tested sealing solution (e.g. Dektite, cable glands) shall be used unless otherwise approved. In all instances, submit details of proposed solution for approval prior to installation.

Cables shall be installed so as not to penetrate damp proof courses nor bridge the cavity in external masonry cavity walls.

Minimum conductor size for a given circuit rating shall ensure protective device disconnection time within the limits of AS/NZS 3000 Clause 1.5.5 and limit temperature rise to that of the insulation. Size all cables in accordance with AS/NZS 3000 and AS/NZS 3008. RCBOs, installed in accordance with this specification, that are used to protected circuits ensure disconnection times under earth fault are achieved.

Group and install all cabling in straight runs parallel with line of building. Cable sizes specified have not been derated for grouping of multiple circuits unless otherwise noted. The Contractor shall be responsible for determining applicable derating factors based on Contractor's chosen cable installation methods and the circuit protection device setting. Refer to AS/NZS 3008.1.1 regarding derating factors for cables. Install cables with spacing between circuits to avoid derating, but where derating is necessary (e.g. due to reduced spacing) increase cable sizes as specified in AS/NZS 3008.1.1. Where cables are installed in walls filled with thermal insulation, increase cable size or separately enclose cables in individual conduits to ensure ventilation around cable. Refer to derating tables of AS/NZS 3008.1.1.

Cable sizes specified for connection to equipment supplied by other trades are based on design information and are for tender purposes only. Check and re-confirm all electrical information with equipment suppliers prior to commencement of works, and notify Principal of any discrepancy with the design information. Submit schedules and cost adjustment for any proposed changes to contract documentation for approval prior to installation.

Unconditionally guarantee all cables during the maintenance period.

B5.2 Ability to Trace Cables within Buildings

All cabling for all services shall be installed in a manner that allows the cable or associated enclosure to be visibly inspected and traced along its entire length.

B5.3 Labelling

B5.3.1 General

Provide unique identification labels for all above ground and underground ground cables.

Labels shall be positioned such that they are visible, not obstructed by other cables, and readable. Where there are multiple cables in a single location, labels shall be orientated the same such that they are readable from the same direction.

Labels shall be secured in place by nylon cable ties. Minimum text height shall be 10mm, and shall be of a contrasting colour. Details of label proposed shall be submitted for approval prior to procurement.

Unless the format is otherwise noted on the drawings, label format and text shall be as follows:

- Cable source DB;
- Circuit number.

E.g. SMSB-P1; DB1-RWB6

Cable labels used shall be referenced on as built single line diagrams.

B5.3.2 Underground Cables – All Cables

Labels shall be provided where cables enter or exit a switchboard or equipment enclosure, light poles and also within each cable access pit, trench or the like that the cable passes through.

Label material shall be engraved traffolyte or etched stainless steel.

B5.3.3 Above Ground Cables - Submains

Above ground submains shall be labelled at each end of the cable, and at every 10m and change of direction.

Label material shall be engraved traffolyte, or approved equal, unless exposed to sunlight / weathering in which case they shall be etched stainless steel.

B5.3.4 Above Ground Cables – Final Circuits

Above ground final circuit cables shall be labelled at each end of the cable.

Neat hand written labelling with permanent marker is acceptable.

B6 POWER - GENERAL

B6.1 General

Supply and install power outlets, cabling enclosures and cabling to all appliances and equipment as shown on the drawings. All cabling to equipment, appliances and socket outlets shall include suitably sized neutral and earth.

Connections are only mentioned in the Specification where additional detail is necessary.

Make final connections to all appliances and equipment. Provide suitable isolating switches where necessary.

Where equipment is furnished by other trades check wiring details and locations with equipment suppliers before beginning any installation.

The following subclauses shall be read in conjunction with clause 'Fittings and Accessories'.

B6.2 Switched Socket Outlets

Switched socket outlets (SSOs), also referred to as general purpose outlets (GPOs) shall be fixed socket outlets in accordance with AS/NZS 3000.

Socket outlets shall have 10 Amp 250 Volt rating. Heavy duty socket outlets shall have 15 Amp 250 Volt rating and built-in neon indicators.

Generally socket outlets shall be Clipsal 2000 Series or approved equal.

Unless otherwise permitted all socket outlet circuits shall be protected by devices incorporating 30mA RCD Protection.

All socket outlets not protected by RCD's shall be engraved in 3mm high red filled lettering "Not RCD protected" with the name of device under, and in each case confirm that RCD protection is not required.

Engraving of removable surrounds is not acceptable.

Refer also to clause 'Fittings and Accessories'.

Request Principal to select flushplate and toggle colours prior to placing orders. In each case, confirm requirements with Principal.

B6.3 Isolators

Install isolators wherever required by the authorities or these documents. Isolators shall have Fault Make, Load Break contacts at prospective fault level rated at not less than 125% of circuit cable ratings. Rate motor isolators to Fault Make, Locked Rotor Current Break.

Enclosures shall be dustproof internally and weatherproof externally. Label all switches appropriately. Isolators must accept a padlock in the on and off position.

Refer also to clause 'Fittings and Accessories'.

B6.4 Heavy Duty and Weatherproof Accessories

Where documented, these shall be Clipsal 56 series type or approved equal and comply with the requirements of socket outlets and three phase socket outlets.

B7 LIGHTING - GENERAL

B7.1 General

Supply and install the complete lighting installation as specified, scheduled and shown on the Drawings.

All lighting circuits shall be protected by RCDs in accordance with AS/NZS 3000.

All fittings shall be clean and all lamps shall be new at Practical Completion.

All components forming the luminaire shall be compatible to achieve the performance nominated in manufacturer's published data.

Luminaire manufacturer certified IP Ratings to AS60529 shall not be compromised or reduced due to incorrect or poor installation.

Guarantee all luminaires against faulty design workmanship, materials and components for the defects liability period. The guarantee shall include for labour, transport and materials to rectify any such faults on site.

The lighting installation shall be complete with luminaires, lamps and all necessary accessories and all control gear.

Verify the exact location of all luminaires with the Architect before proceeding with any installation. Coordinate final location of luminaires with other services and structures.

All luminaires shall be securely fixed, supported, and provided with suitable trimmers where necessary.

Internal wiring shall be securely fixed throughout the luminaire and comprise minimum 105°C insulated copper cable selected to suit the operating temperature within the luminaire.

A terminal block with tunnel terminals shall be provided to all luminaires to allow connection of at least 3 x 2.5mm² conductors in each.

The IP rating specified for luminaires shall be maintained through installation of fixings, supports and wiring.

B7.2 LED Lamps/Luminaires

Provide LED Luminaires complete with lamps and control gear as nominated on the drawings. Lamps and control gear should have a minimum LM80 (lumen maintenance) at 50,000 hours for internal and 100,000 hours for external application luminaires.

An unconditional 5 year warranty shall be supplied for the complete luminaire. The complete LED luminaire including luminaire housing, control gear / driver, and lamps shall be compatible with each component and warranted as a complete assembly.

All lamps shall be of an approved colour temperature of 4,000k and a CRI of no less than 80, unless otherwise specified.

Power factor shall be not less than 0.9 lagging.

LED luminaires shall be from by a recognised LED manufacturer/supplier, Philips, Osram, Cree, or equal and approved.

All control gear shall be suitable for the lamps utilised in accordance with lamp manufacture's recommendations and shall sustain lamp condition at voltages within Authority Supply Guidelines (nominal 240V \pm 10%).

LED lamp drivers shall have an earth leakage current not exceeding 0.5mA/per luminaire.

LED luminaires shall incorporate a passive cooling system utilising convection.

LED luminaires for outdoor application shall be IP66 minimum rated, including mounting and cable entries.

B7.3 Samples

Submit samples as specified under "Samples".

B7.4 Exterior Luminaires

Provide neat 3mm thick neoprene insertion gasket with approved non-hardening waterproof sealing compound between walls and flanges of wall mounted luminaires.

Moulded plastic diffusers and bodies shall be manufactured from high impact resistant UV stabilised material.

All exposed external fixings shall be torx tamperproof 316 grade stainless steel security screws or equal approved. Provide three (3) keys to suit screws installed to the Principal on completion of works.

All exterior fixings, or those exposed to corrosive environments such as chemicals, gases, dusts, water spray or high humidity, must be 316 marine grade stainless steel. Refer to clause "Corrosion" herein.

B7.5 Supports and Mounting Accessories

Provide all necessary supports, suspension and mounting accessories to suit the actual location in which luminaires are to be installed. These accessories shall be in addition to standard equipment provided with the luminaire, if required to suit the installation.

Where specified suspension devices shall be rigid and comprise suitably sized steel rods to carry luminaire weight and enclose cabling from the structure above. The final length of the suspension shall be determined on site to suit approved mounting height and location.

Where the rigid suspension attaches to the structure and luminaire, provide threaded connection devices. Secure suspensions to the structure with adjustable support brackets. Brackets shall be adjusted so the suspension is in the vertical plane. Provide locking nuts above and below the brackets to avoid loosening of due to vibration.

All suspension rods shall be painted with colour and finish to match structure or luminaire as directed on site.

Where specified suspension shall comprise multi strand stainless steel wires, with proprietary attachment accessories at both ends.

Conceal penetrations in ceilings with a removable cover flange attached to the suspension rod or ceiling. The colour of the flange shall be to approval.

Where there is inadequate or no structure to accommodate the luminaire, provide all necessary equipment, braces, supports, fixed onto the main building structure.

B7.6 Commissioning

Provide all necessary personnel and equipment to commission the complete lighting installation to the satisfaction of the Principal.

Supply all necessary meters, instruments, temporary wiring, electrical supply, scaffolding and labour to perform all required tests and adjustment of equipment and wiring installed and connected under this specification.

Set control programming and dimming levels over a period of 1 off 2 hour night trial to achieve final setup. This work shall be carried out under the direction of and to the satisfaction of the Principal.

Commissioning of the complete lighting installation shall be carried out after completion of the night trial.

Rectify any faults and deficiencies detected during aiming and adjusting and complete any remedial works.

B8 FITTINGS AND ACCESSORIES - GENERAL

B8.1 General

Provide fittings and accessories, including socket outlets, switches and the like as shown on the drawings. This section describes general requirements for fittings and accessories. Refer to power, lighting and communications clauses elsewhere in this specification for specific requirements of individual components.

Flush mount all fittings on flush set wall boxes as recommended by the switchgear/accessory manufacturer. All adjacent flush wall fittings shall be in a ganged wall box under a common flush plate.

“C” clips for plasterboard type walls may be used in non-fire or acoustic stud plaster walls. All such mounting clips must be securely retained in place such that clip does not fall into stud wall cavity upon removal of accessory.

Where 2 or more phases occur behind a common plate, provide adequate barriers or separation.

Request the Principal to select accessory colours from standard ranges not less than two (2) weeks before a critical date.

Where flush plates, light switch panels and other items of equipment are to be labelled or engraved, they shall be machine engraved in upper case lettering filled with black pigments to approval.

Where works are alterations and additions to existing buildings, fittings shall be of type to match existing unless specifically noted in detailed clauses or drawings.

Unless otherwise specified a single brand of fittings and accessories shall be used throughout these works.

B8.2 Positioning of Fittings

Heights shown on plans or specified shall be the height from finished floor level to the centre of the equipment, unless otherwise indicated. The height and exact position of fittings in all tiled walls shall be as indicated on detailed drawings or as directed by the Principal. However, cover plates for switches and other fittings shall line up with the tile coursing and be located centrally at the junction of four tiles.

All fittings shall be aligned plumb and in line.

The requirements of AS 1428.1 shall be observed for switches, control panels, card readers and the like. These requirements are not intended to apply to socket outlets unless otherwise indicated on the drawings. Such requirements include but not limited to, the following:

- Devices/fittings shall not be located less than 500mm from an internal corner;
- Height of devices/fittings shall not be less than 900mm AFFL, but not exceed 1100mm AFFL.

B8.3 Conduit

Conduit shall be circular rigid PVC generally. Use galvanised steel conduit where exposed to mechanical damage and UV stabilized conduit where exposed to sunlight.

Enclose tails to fixed connections in PVC sheathed steel flexible conduit where mechanical protection is required. Where a flexible connection is mechanically protected by alternate means, PVC heavy gauge sheathed corrugated conduit will be accepted.

Minimum size shall be 20mm.

Conceal all conduits including draw-in boxes from view within or by building into structure.

At all outlets and devices use wall boxes and/or conduit boxes

Completed conduit installations shall enable wiring to be drawn in or out at any time without damage to cable or the building. Keep conduits and boxes free of moisture and rubble.

All electrical conduits shall be installed by a licensed electrical installer.

B8.3.1 Conduits in Concrete

Attend all concrete pours involving conduits. Repair any damage during pouring. Provide an approved flexible joint at all concrete expansion joints and in every 12 metres of conduit.

Refer to structural drawings for expansion/construction joints.

Review large concentrations of conduits in suspended slabs with the Principal before proceeding.

Obtain approval from the Principal concerning the positioning of any conduit larger than 25mm in a concrete footing, slab or wall.

B8.4 Cable Trays, Ladders and Supports

Cable trays shall comply with the following. They shall:

- Shall be 'ladder-tray' type, Burndy LT5 or equal to approval;
- Be of width as required to accommodate the cables specified and 50% additional future cables allowing for AS/NZS 3008.1.1 space factors;
- Be manufactured from minimum 1.25mm mild steel sheet with 'Galvabond' protection, or 2mm marine grade aluminium;
- Have sides of depth and shape to provide rigidity;
- Not deflect more than 6mm at any point when loaded with cables as specified;

- Be complete with matching splice plates, tees, bends, transitions, etc as required. All changes of direction shall be suitable radiused.

Provide sample of cable tray for approval prior to placing orders.

Fixing shall be rigid hot dipped galvanised metal brackets or 'Unistrut' channels (and accessories) as appropriate.

Continuous threaded galvanised rod shall be used for suspended trays. Cable ladder shall be specified for cable trays above.

The drawings show main cable tray routes only. Prior to and during installation, the Contractor shall carefully validate cable tray requirements and re-coordinate routes with all other above ceiling services trades (e.g. hydraulics) and check for conflicts and to determine sequencing of installation. Any conflicts shall be resolved on-site by the Contractor. The Contractor shall be responsible for any additional cable tray required including any additional material and labour costs. Request approval from the Principal prior to significant deviations to routes which results in a cable length change of over 10m. Ensure alignment with wall and slab penetrations.

Cable tray widths nominated on the drawings are correct at time of design however due to potential for site changes in cable size and routing, Contractor shall be responsible for ensuring cable pathway spare space of 20% is provided at completion of work. Additional cable tray/ladder required shall be at no additional cost to the Principal.

Cable ladder/tray should be located so as to be accessible for future installation of cables. Where trays/ladders are located above non-tiled ceilings, arrange with the builder for installation of access hatches.

Electrical continuity shall be maintained at joints between sections of metallic cable tray using earthing straps/cables.

Cable tray/ladder shall only be cut along a line of unperforated material. After cutting, all sharp edges shall be made smooth and the finish made good as per manufacturers recommendations.

B8.5 Circuit Identification

Fit coloured circuit identification studs behind removable covers of flush plates of lighting switches and socket outlets and to the face of any accessory without a removable cover. Fix studs with Araldite or otherwise approved.

All accessories connected to essential or UPS circuits shall be identified by engraving and faceplate colour to Principals approval.

B9 POLES – GENERAL

B9.1 General

The poles specified for this project are a high quality, architectural aluminium lighting pole with anodised finish, and have specific material, installation and handling requirements. Where steel poles are specified these shall be hot dip galvanised, sanded externally and painted.

B9.2 Fabrication

Poles shall be as specified on the drawing. Poles, bases, footings and holding down bolts shall be designed in accordance with the appropriate Australian Standard to suit the soil and wind loading conditions of the site and shall be certified by a practicing Structural Engineer. Refer to clause "shop drawings".

Provide all pole attachments to suit the requirement shown on the drawings.

Poles shall have no manufacturers labelling, numbering identification or the like exposed externally.

Install cabling inside poles and a minimum of two 32mm large sweep conduit bends shall be provided through each concrete footing, or more as shown on the drawing. Verify the top elevation of each pole foundation to suit finished ground level before proceeding.

Poles shall be complete with all necessary brackets, spigots and ferrules to suit light fittings and crossarms, etc. Generally poles shall be base-plate mounted with base plates and holding down bolts concealed below finished ground level.

All fixing and fasteners on poles shall be unpainted marine grade stainless steel (316 grade) unless otherwise specified.

Isolate dissimilar metals. A suitable insulating barrier and/or shrouds (sleeving) shall be installed to provide adequate barrier between any dissimilar metals. Apply protective coatings such as "Duralac" jointing compound as required to isolate dissimilar metals. Request a detailed installation instruction from the pole manufacturer.

As electrical cables will be installed in the pole, it is essential that all holes and surfaces are free of burrs and sharp edges.

Generally all holes and penetrations in poles (e.g. cable entries) shall be drilled prior to painting if applicable.

Where oxyacetylene is used to form a penetration all jagged edges must be ground smooth.

Pole colours shall be standard silver anodised unless otherwise noted. Any cast aluminium such as trim, caps, reducers etc shall be painted to approved system and colour.

B9.3 Pole Handling, Storage and Condition Inspection on Delivery

The specific poles and all accessories have a high quality anodised aluminium finish and must be transported, handled and stored appropriately to avoid damage. Refer to the pole manufacturer's "Operation and Maintenance" manual for the correct procedure for handling, assembling, erecting, installing and protecting the aluminium poles and their accessories.

Ensure poles are suitably wrapped, strapped and packaged for transportation. Softwood timber cradles/frames with protective carpet lining or similar nonabrasive material shall be constructed and utilised between each layer of poles ensuring separation and strapping to prevent movement or rubbing during transport.

Provide one (1) week notice to the principal to inspect poles after transportation and prior to erection, to verify that no damage to the finish has occurred.

Take all precautions to prevent damage to the external finish of the poles, including but not limited to:

- 1) the use of belt slings and spotters during pole erection,
- 2) delaying installation until the majority of nearby works have been completed, such as earthworks and underground services installation;
- 3) taping a heavy duty clear plastic barrier to the bases of poles up to 1.8m to protect against minor damage until ready for practical completion inspection.
- 4) not storing poles in publicly accessible areas.

Maintain a photographic record of the finish of all poles. Where there is insufficient photographic evidence and/or where damage to the finish of the poles occurs while in the contractor's custody, the contractor shall replace damaged poles at no cost to the project if directed by the principal.

Prior to practical completion inspection, ensure poles are cleaned in accordance with manufacturer's recommendation.

B9.4 Erection of Poles

All poles are to be bolted truly vertical onto the foundations.

Verticality shall be checked and adjusted on site as necessary.

Care must be taken when handling poles so that the finished paintwork or anodizing is not damaged. Suitable belt slings shall be used to lift poles. Chain slings shall not be used.

Refer to drawings for further requirements and manufacturers' operation and maintenance manual for additional requirements.

B9.5 Installation of Foundations

Suitable concrete foundations and steel cages shall be designed and provided for mounting of each light pole, with the design taking into account pole, outreach arms, banners, luminaires, etc, to be installed. Where direct buried pole bases are specified ensure the soil around each pole is compacted to the Structural Engineers approval. Review the final location and elevation of foundations prior to commencement of work.

Foundations shall be coordinated with tree roots to the approval of the Principal and their arborist as applicable. Roots shall not be cut or sawed without approval of the principal.

Shop drawings of foundations shall be submitted for examination prior to manufacturer or installation. Engage a practising structural engineer to design and certify foundations as being suitable for the intended purpose prior to submitting drawings for the Principal's examination.

Holes for pole foundations are to be augured or excavated as necessary and allowance for this work based on the soil conditions of the site included in the tender price. Allowance must also be included for any shoring up of soil as required.

Care must be taken to ensure that surrounding soil compaction levels, paving etc are not disturbed or damaged. Where necessary the soil around footings shall be compacted to Principal's approval. Foundation liners are to be provided to retain soils where necessary.

All exposed and painted metal concealed below ground including poles (inside and out), base plates, holding down bolts, washers etc shall be thoroughly coated in minimum two (2) coats of approved isolating barrier "Dulux Durebild STE" or equal approved. Clean pole prior to application of first coat. Paint two (2) coats prior to erection of pole and touch up around bolts following erection and tensioning of holding down bolts. Allow curing times between coats to the manufacturer's recommendations.

Provide one (1) week notice to the principal to inspect poles after pole erection and the touch up of protective coatings, prior to backfill.

B9.6 Manufacturer

Engage A D Coote & Co Pty Ltd or approved equal to design, construct and supply the poles. Due to typically long lead times poles and pole mounted luminaires orders are to be initiated two weeks after contract award.

B9.7 Pole Labels

Supply and install 316 stainless steel engraved pole number labels as indicated on the drawings and as further specified. Engraved numbers and letters shall be infilled with permanent black paint with approved font sizes and style. Verify all pole numbers and sequencing with the Principal prior to manufacture and adjust final label size if necessary.

Label's generally shall be located centrally over pole access doors facing the road however this shall be confirmed with the Principal prior to installation. Secure labels using dome head 316 grade stainless-steel drive-in rivets or equal approved. Submit shop drawings for review showing all label details and number sequencing prior to manufacture.

Supply and install internal and external engraved labelling to each pole as follows:

Internal label (Power Access Hatch) (engraved brushed 316 s/steel with red infill lettering)	- "Pole Power supply via: _____"
	- "Circuit number : _____"
	- "Pole number: _____"
External label (Road/Path Side @ nominal 1100mm AFL or as shown on the drawings) (316 grade Brushed finished stainless steel with engraved black paint infill lettering)	- As indicated/detailed on the drawings

B9.8 Pole Base Enclosures

Provide a flush weatherproof (IP54) covered opening – handhole access door – near the base of all lighting poles to gain access to terminations, circuit protection device and control gear.

Opening access door to be flush mounted with the pole. Provide a suitable weatherproofing strip welded all round inside of the opening with a suitable gap to house a seal.

Provide a minimum of 1mm clearance all around handhold access doors after all protective coatings and finished paint treatments are applied to poles and door.

Provide pole base enclosures and clear openings within poles to house pole base enclosures as indicated on the drawings. All pole base circuit terminations, isolators, surge protective devices shall be contained in an IP rated Sogexi poly enclosure. All cabling to the Sogexi enclosure shall enter via the bottom to avoid water tracking entering the enclosure. Select and size each Sogexi enclosure to suit the pole and access door clear space equipped with all equipment as specified or required to terminate.

B9.9 Shop Drawings

Prepare and submit detail manufacturing shop drawings for each pole type, accessory, bracket, arm and base foundation shown for examination and comment prior to manufacture. Pole shop drawings shall be accompanied with an NER registered Structural Engineer's design certification letter confirming compliance with all relevant standards based on the sail area (with all equipment fitted including luminaires and outreaches) to suit the soil and wind conditions on site.

PART C DETAILED TECHNICAL CLAUSES

C1 EXISTING SERVICES, SURVEY, VALIDATION AND COORDINATION

C1.1 General

All existing electrical and communication services indicated on the drawings are provided as a guide only and shall not be relied upon for accuracy. The full extent of existing services shall be validated and confirmed as part of these works using detail survey, visual inspection, testing, ground scanning, hand excavation/potholing, and other methods as necessary.

All existing above ground and underground electrical and communication services including conduits, pits, cabling, cabinets, lighting poles, etc shall be accurately located and identified prior to commencing excavation or directional boring. Make all necessary investigations (e.g. visual inspection, obtaining current Dial Before You Dig system records, undertake ground penetrating radar survey, potholing, hand excavations etc.) to verify and confirm all existing underground services and structures which may be affected by the proposed works. This survey shall be conducted in conjunction with all other disciplines. All findings shall be recorded on drawings. Project as-built drawings shall accurately show un-modified and modified existing services.

Existing public and street lighting in areas open to the public must remain operational at all times, until the new installation is fully commissioned. Existing power and communication services must be maintained and managed accordingly throughout the construction phase to approval. Provide temporary servicing if required.

Prepare and submit detail Work Methodology Statements (WMS) prior to commencing services survey and validation works for approval.

Liaise closely at all times with the Principal to coordinate all necessary testing, inspection, shut downs, disconnections, etc to approval.

C1.2 Works in Vicinity of Existing Live Underground Cables

There are existing underground cables in the area.

All works undertaken on or in vicinity of the cables must comply with Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996, Work Practice Manual, Works Instructions, Procedures and all Horizon power guidelines.

The responsibilities of the Contractor shall include but are not be limited to the following:

- 1) Liaison with the Principal;
- 2) Accurately locating existing services;
- 3) Seeking advice from Authorities regarding identification of existing cables where required;
- 4) Requests for works in vicinity as required to suit construction process;
- 5) Supervising/managing works to ensure compliance with safety standards and procedure applicable to Permits.

C1.3 Demolition

On completion of all existing electrical and communication services survey and validation, prepare and submit for review a detail services demolition plan with Work Methodology Statements (WMS) and JSA's to suit the project program. Generally all existing lighting and electrical including the art sculpture ground mounted lighting, BBQ power etc shall be disconnected and removed unless shown otherwise.

The above shall include all staging/phasing, temporary services, reconnections and commissioning required to approval to allow for these separate demolition scope of works to be carried out concurrently. Amend and reissue demolition plans, WMS and JSA's for review and approval where changes to the program or sequencing occur.

C1.4 Coordination with Existing Services

C1.4.1 General

Coordinate new electrical and communications services with existing services. On completion of all existing electrical and communication services survey and validation, prepare and submit to principal for review a revised and coordinated marked up set of electrical services layout drawings including poles, pits, conduits and electrical supplies to other trades (e.g. irrigation). These shall be based on the design drawings, with any required adjustments as required to suit actual existing services marked up including equipment locations that are to remain at completion of the works.

Coordinate and incorporate all adjustments and comments provided by the Principal, Landscape Architect or Consulting Engineer. All changes shall be reflected on the as-constructed drawings.

C1.4.2 Service Separation

Coordinated locations for all electrical and communications services and equipment shall meet the minimum separation requirements identified in relevant Australian Standards, including but not limited to AS/NZS 3000.

C1.4.3 Existing Trees to be Retained

Refer to the Landscape Architects drawings for existing trees to be retained. Allow to bore, deviate around (to avoid all tree protection zones) or hand and air knife trench all new services in close proximity (within tree protection zones) to existing trees to be retained, as shown on the Landscape Architects drawings and as nominally shown on the electrical services drawings. No underground services are to be installed within tree structural root zones. Seek approval from the Principal prior to all works near existing trees to be retained. Arborist advice may be required to minimise damage to existing tree.

C1.4.4 As Constructed

Using the marked up electrical and communication service plans CAD draft all existing services which remain underground following completion of the project works to provide an 'As Constructed' record of the existing and modified services remaining.

C2 LIGHTING CONTROL SYSTEM

C2.1 General

Supply, instal and commission the lighting control system shown. Verify all timeclock settings with the Principals and program to suit.

Provide all necessary hardware, software, equipment, cabling, accessories, programming and labour to achieve a fully working system. All equipment shall be selected for full compatibility.

Refer to the drawings and other clauses in this specification for additional requirements for cabling, enclosures and accommodation, testing, commissioning and certification of the complete lighting control system.

C3 TENDER RETURN SCHEDULE

C3.1 Tender Return Schedule

▪ Schedule A –Tender Breakdown

Note: Provide rate only if quantity is zero.

Item	Description	Qty	Unit	Rate	Amount
1.0	GENERAL				
1.1	Site establishment and sundries		Item		
1.2	Coordination, meeting attendance, activities reporting etc.		Item		
1.3	Liaison and coordination with third party service authorities		Item		
1.4	Preparation and submission of shop drawings not covered elsewhere		Item		
1.5	Protection of new and existing (to remain) services during construction		Item		
1.6	Operating and maintenance manuals including as-constructed documentation (electronic and hard copy) not covered elsewhere		Item		
1.7	Testing, commissioning and handover not covered elsewhere		Item		
1.8	Demobilisation		Item		
1.9	Maintenance and Defects Liability		Item		
1.10	Night Aiming and Adjustment for directional floodlights.		hour		
1.11	Allow for all work, costs, charges etc not included elsewhere. List below as appropriate.				
1.12	Remainder		each		
	Subtotal 1				\$ -
2.0	POWER CONDUITS				
2.1	Supply and installation of underground power conduits, including all draw wire, danger marker tape and backfill; excluding trenching				
2.1.1	25P		m		

Item	Description	Qty	Unit	Rate	Amount
2.1.2	32P		m		
2.1.3	50P		m		
2.1.4	63P		m		
2.1.5	List all other sizes and installation types as applicable:				
2.2	Supply and installation of surface mounted conduit (painted) and saddle clamped:				
2.2.1	32mm		m		
2.2.2	Junction box		m		
2.2.3	List all other sizes and installation types as applicable				
	Subtotal 2				\$ -
3.0	BORING				
3.1	Boring - to suit 1x50mm diameter		m		
3.2	Boring - to suit 2x50mm diameter		m		
3.2	Others as required (list below)				
	Subtotal 3				\$ -
4.0	TRENCHING				
4.1	Trenching, bedding and backfill:				
4.2	To suit "trunk services"		m		
4.3	To suit non-"trunk" services		m		
4.4	Airknifing in tree protection zone		m		
4.5	Manual excavation in tree protection zone		m		
4.6	Others as required (list below)				

Item	Description	Qty	Unit	Rate	Amount
	Subtotal 4				\$ -
5.0	PITS				
5.1	Supply and installation of pits, including lid, labels, drainage, concrete haunching or encasement as documented, infill as documented				
5.1.1	Type 33 stackable pit with ductile lid Min Class B		each		
5.1.2	Type 66 stackable pit with ductile lid Min Class B		each		
5.1.3	Type 33 stackable pit with infill lid Min Class C		each		
5.1.4	Type 66 stackable pit with infill lid Min Class C		each		
5.1.5	Others as required (list below)				
	Subtotal 5				\$ -
6.0	CABLES				
6.1	Supply and installation of cables including testing				
6.1.1	2C+E 2.5sqmm PVC/PVC		m		
6.1.2	2C+E 2.5sqmm PVC/PVC		m		
6.1.3	2C+E 4sqmm PVC/PVC		m		
6.1.5	Others as required (list below)				
	Subtotal 6				\$ -
7.0	SWITCHBOARDS				
7.1	Site Main Switchboard upgrades and modifications including new protection equipment, lighting		item		

Item	Description	Qty	Unit	Rate	Amount
	control, labelling, cable access and cover protection.				
	Disconnect and remove existing switchboard pole top floodlight				
	Subtotal 7				\$ -
8.0	LIGHTING & LUMINAIRES				
8.1	Supply and installation of luminaire as specified including driver/s, control gear, internal wiring, fixings, fittings, base foundations, cable tail and the like:				
8.1.1	Type L1		each		
8.1.2	Type L2		each		
8.1.3	Type L3A		each		
8.1.4	Type L3B		each		
8.1.5	Type L3C		each		
8.1.6	Type L4		each		
	Subtotal 8				\$ -
9	POLES				
9.1	Supply, installation and commission each pole type including pole foundations, holding down bolts, base access dore and Sogexi termination enclosure, outreach arms, brackets and all other accessories as required or specified		each		
9.2	Type P1		Item		
9.3	Type P2				
9.4	Type P3				
9.5	Type P4				
	Others as required (list below)				
	Subtotal 9				\$ -
10.0	EXISTING SERVICES, SURVEY, VALIDATION, AND COORDINATION				

6)	Mark-up on actual cost (including normal trading discounts) to the contractor of materials	%
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▪ **Confirmation**

Tenderer Details

Registered Name of Company

Authorised Signature:	Date:
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Contact Name:	Position:
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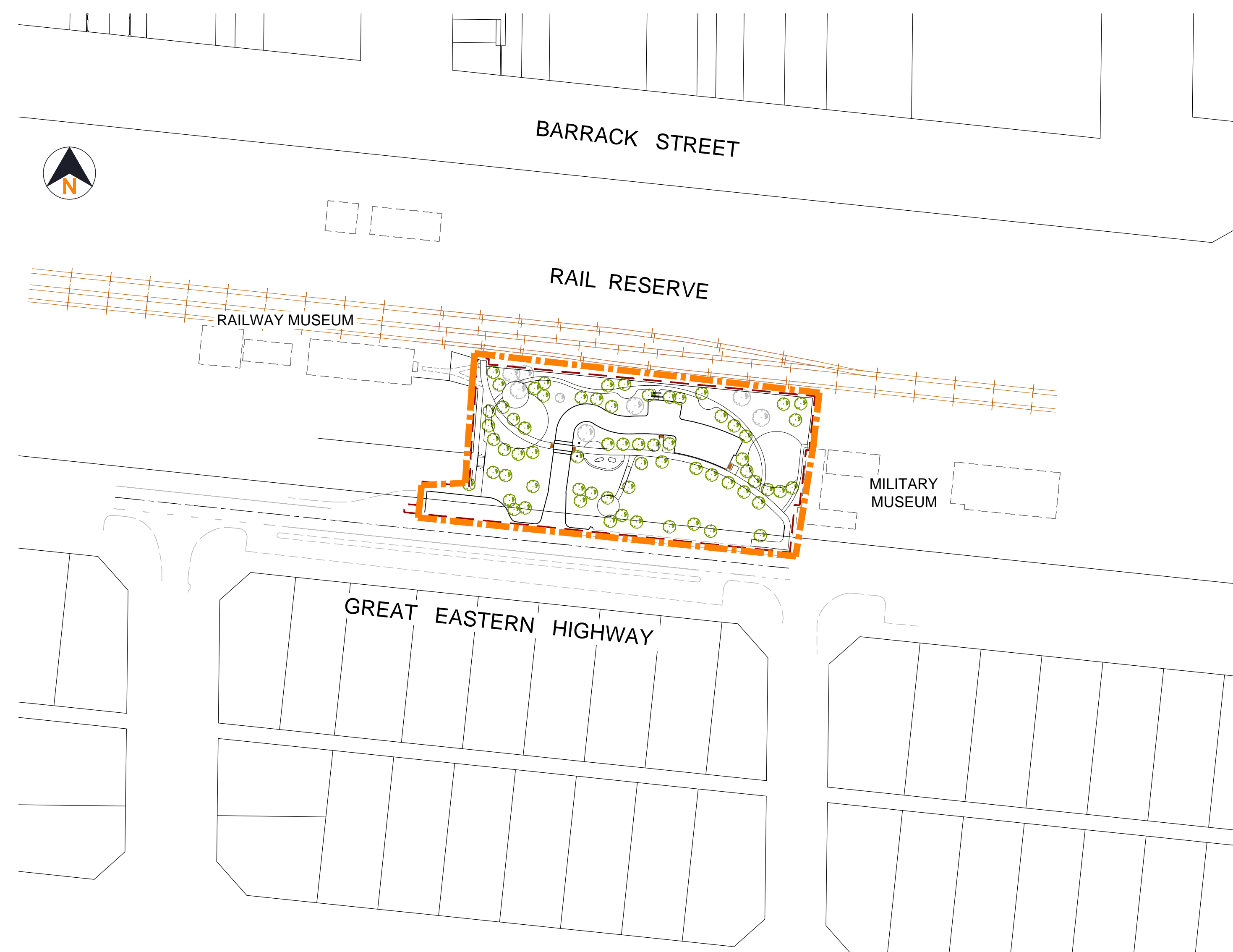
PART D APPENDICES

D1 ENCLOSURE LV ELV SEGREGATION REQUIREMENTS SUMMARY

Summary: Switchboard Segregation Selected Requirements	CABLES				TERMINATIONS			
	LV Power	LV Comms	ELV Comms	ELV Power	LV Power	LV Comms	ELV Comms	ELV Power
LV Power Cables (double insulated)	-	50 ^a	50 ^a	0 ^d	-	150 ^{b,c}	150 ^b	0 ^d
LV Comms Cables (e.g. PA, Fire)	50 ^a	-	50 ^a	50 ^a	150 ^{b,c}	-	150 ^b	150 ^c
ELV Comms Cables (e.g. CAT6, 48V to Comms Equipment)	50 ^{a,d}	50 ^a	-	-	150 ^{b,c}	150 ^{b,c}	-	-
ELV Power Cables (e.g. Isolated from Comms Equipment)	0 ^{a,d}	50 ^a	-	-	0 ^{c,d}	150 ^{b,c}	-	-
<p>Note 1: This is only a summary of selected communications segregation requirements applicable to switchboards. All works shall comply with AS/NZS 3000 and AS/CA S009 in their entirety, including the recommendations contained within those standards. Refer also to AS/CA S009 Table G1. All new switchboards to be designed for communications section to be open while switchboard is energised.</p>								
<p>Note 2: "ELV Comms" on this table refers to the AS/CA S009 categories of SELV, TNV and Limited Current Circuits, which includes CAT6 communications and most DC power supply cabling. Refer to AS/CA S009 for additional requirements for ELV that does not meet these categories (e.g. self-generated power / solar). "ELV Power" on this table refers to the AS/NZS 3000 definition of SELV (similar to AS/CA S009 TNV), where the cable is in no way connected to comms equipment.</p>								
<p>a = fixed in a way that permanently provides 50mm separation. Alternatively, provide a barrier of durable insulating material, metal, or enclose in conduit.</p>								
<p>b = fixed in a way that permanently provides 150mm separation. Alternatively, provide a rigidly fixed barrier of durable insulating material or earthed metal.</p>								
<p>c = accidental human contact with LV terminals, single insulated LV cable or uninsulated LV cable prevented to approval.</p>								
<p>d = AS/NZS 3000 Clause 3.9.8.3 and 7.5 permit LV and ELV cables to be installed touching, provided the LV cable is double insulated and the ELV cable is insulated to 500VAC for 1 min, and IPxxB / IP2x is provided at terminals. This is only applicable where AS/CA S009 does not apply to the cable, and ETC interpret AS/CA S009 to include DC power supply cabling to comms equipment.</p>								

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6.9 Appendix 6.9 – Civil Drawing Set



LOCALITY PLAN
SCALE 1 : 1000

DRAWING LIST

CIVIL DESIGN DRAWINGS

2465-01-000	COVER SHEET
2465-01-100	GENERAL ARRANGEMENT PLAN
2465-01-101	EARTHWORKS PLAN
2465-01-102	TYPICAL EARTHWORKS SECTIONS
2465-01-300	ROADS AND DRAINAGE PLAN
2465-01-310	ROAD LONGSECTION - CARPARK ROAD
2465-01-320	ROAD GRADING PLAN
2465-01-330 N/A	SIGNAGE AND LINE MARKING PLAN - SHEET 1
2465-01-400 N/A	DRAINAGE CATCHMENT PLAN
2465-01-600 N/A	COMBINED SERVICES PLAN - NEW AND EXISTING

STANDARD DRAWINGS

2465-STD-R1	STANDARD ROADS DETAILS
2465-STD-D1	STANDARD DRAINAGE DETAILS

OTHER DRAWINGS



SHIRE OF MERREDIN MERREDIN CBD STAGE 1A

Proposed Development of
Carpark and Rest Area
at Railway Museum

WAPC No.
Project No. 2465-01

MARCH 2022



GENERAL NOTES

- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DRAWINGS AND SPECIFICATION.
- THE CONSTRUCTION OF THE WORKS SHALL BE TO THE APPROVAL OF THE SHIRE OF MERREDIN.
- ALL FINISHED LEVELS ARE IN METRES TO AHD.
- HORIZONTAL DATUM IS MGA94.
- SURVEY CONTOURS & FEATURE SURVEY WAS PROVIDED BY KR SURVEYS - FILE NAME - Merredin - CBD - Site Survey - 210817.DWG
- ALL LEVELS SHALL BE DETERMINED FROM BENCHMARKS ESTABLISHED BY THE PROJECT SURVEYOR.
- ALL TRANSITIONS TO EXISTING WORK SHALL BE SMOOTH AND OF NEAT APPEARANCE.
- THE CONTRACTOR SHALL REPORT ANY DISCREPANCY OR CLASH WITH OTHER SERVICES TO THE SUPERINTENDENT.
- UNLESS INSTRUCTED OTHERWISE THE CONTRACTOR SHALL NOT DISTURB ANY EXISTING TREES OR VEGETATION.

GENERAL LEGEND

- EXTENT OF WORKS BOUNDARY
- EXISTING KERB
- EXISTING PAVEMENT TO BE RESHEETED
- TREE TO BE RETAINED (REF. LANDSCAPE PLANS)
- PROPOSED TREE (REF. LANDSCAPE PLANS)
- PROPOSED KERB
- SEMI-MOUNTABLE KERB
- MOUNTABLE KERB
- REINFORCED FLUSH KERB
- REINFORCED RAISED KERB
- BARRIER KERB
- EXISTING PAVED SURFACE LEVEL
- PROPOSED FINISHED SURFACE LEVEL
- TACTILE GROUND SURFACE INDICATORS. REFER TO LANDSCAPE DOCUMENTATION.
- PROPOSED PEDESTRIAN RAMP
- PROPOSED LIGHTING POST
- PROPOSED IRRIGATION DUCTS



Plotted By: ireman; Plot Date: 16/09/22; 15:42; Cef File: D:\265\246\1\B-100\2465 - Merredin CBD Stage 1A - 2465-01-100.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT
D	15.03.22	PK	MA	RE-ISSUED FOR TENDER
C	11.03.22	PK	MA	ISSUED FOR TENDER
B	01.11.21	PK	MA	ISSUED FOR REVIEW
A	29.10.21	PK	MA	ISSUED FOR REVIEW

This plan shall not be used for construction unless issued as rev 0 and signed as approved.

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CLIENT	SHIRE OF MERREDIN <small>INNOVATING THE WHEATBELT</small>		
DESIGNED	PK	CHECKED	MA
APPROVED			
DRAWN	PK	CHECKED	MA
DATE			

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TABEC PTY LTD
 ACN 090 796 204

PROJECT	SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A		
TITLE	CARPARK GENERAL ARRANGEMENT PLAN		
DRAWING NUMBER	2465-01-100		
ISSUE	D		

SCALE 1:200 0 4 8 12 A1

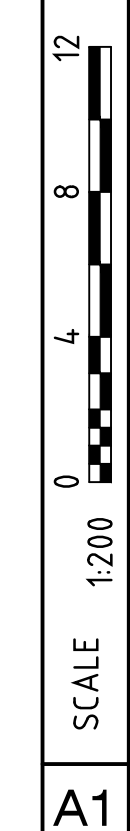
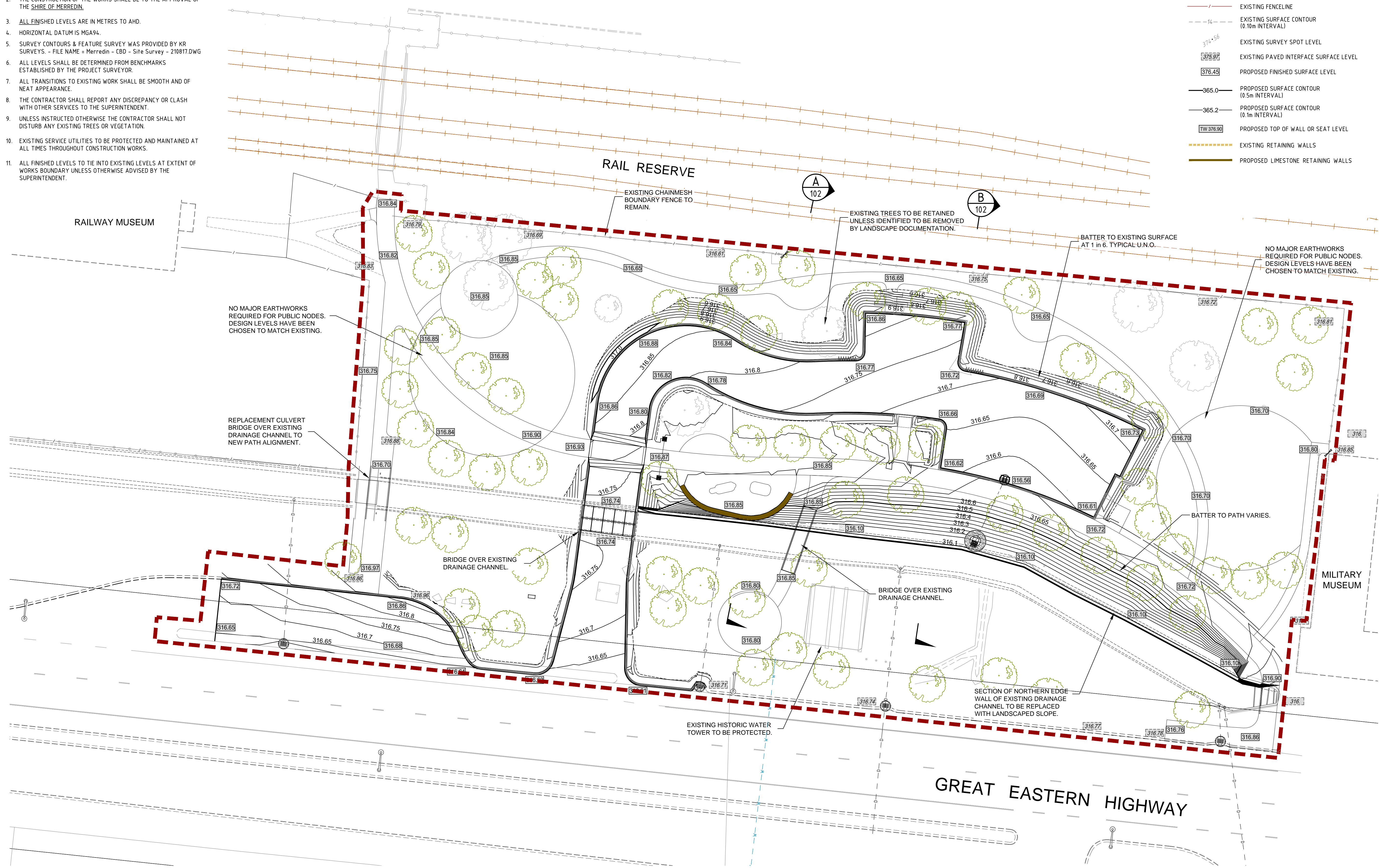
GENERAL NOTES

- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DRAWINGS AND SPECIFICATION.
- THE CONSTRUCTION OF THE WORKS SHALL BE TO THE APPROVAL OF THE SHIRE OF MERREDIN.
- ALL FINISHED LEVELS ARE IN METRES TO AHD.
- HORIZONTAL DATUM IS MGA94.
- SURVEY CONTOURS & FEATURE SURVEY WAS PROVIDED BY KR SURVEYS. - FILE NAME = Merredin - CBD - Site Survey - 210817.DWG
- ALL LEVELS SHALL BE DETERMINED FROM BENCHMARKS ESTABLISHED BY THE PROJECT SURVEYOR.
- ALL TRANSITIONS TO EXISTING WORK SHALL BE SMOOTH AND OF NEAT APPEARANCE.
- THE CONTRACTOR SHALL REPORT ANY DISCREPANCY OR CLASH WITH OTHER SERVICES TO THE SUPERINTENDENT.
- UNLESS INSTRUCTED OTHERWISE THE CONTRACTOR SHALL NOT DISTURB ANY EXISTING TREES OR VEGETATION.
- EXISTING SERVICE UTILITIES TO BE PROTECTED AND MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION WORKS.
- ALL FINISHED LEVELS TO TIE INTO EXISTING LEVELS AT EXTENT OF WORKS BOUNDARY UNLESS OTHERWISE ADVISED BY THE SUPERINTENDENT.



LEGEND

- EXTENT OF WORKS BOUNDARY
- EXISTING FENCELINE
- EXISTING SURFACE CONTOUR (0.10m INTERVAL)
- EXISTING SURVEY SPOT LEVEL
- 376.97 EXISTING PAVED INTERFACE SURFACE LEVEL
- 376.45 PROPOSED FINISHED SURFACE LEVEL
- PROPOSED SURFACE CONTOUR (0.5m INTERVAL)
- PROPOSED SURFACE CONTOUR (0.1m INTERVAL)
- TW 376.90 PROPOSED TOP OF WALL OR SEAT LEVEL
- EXISTING RETAINING WALLS
- PROPOSED LIMESTONE RETAINING WALLS



Plotted By: ireman - Plot Date: 16/03/22 - 15:42 - Cef File: D:\2025\1a1B - 2465 - Merredin CBD Stage 1A - 2465\2465-01-101.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT
B	15.03.22	PK	MA	ISSUED FOR TENDER
A	11.03.22	PK	MA	ISSUED FOR CLIENT REVIEW

No.	DATE	DRAWN	APPROVED	AMENDMENT

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CLIENT			SHIRE OF MERREDIN <small>INNOVATING THE WHEATEBELT</small>		
DESIGNED	PK	CHECKED	MA	APPROVED	
DRAWN	PK	CHECKED	MA	DATE	

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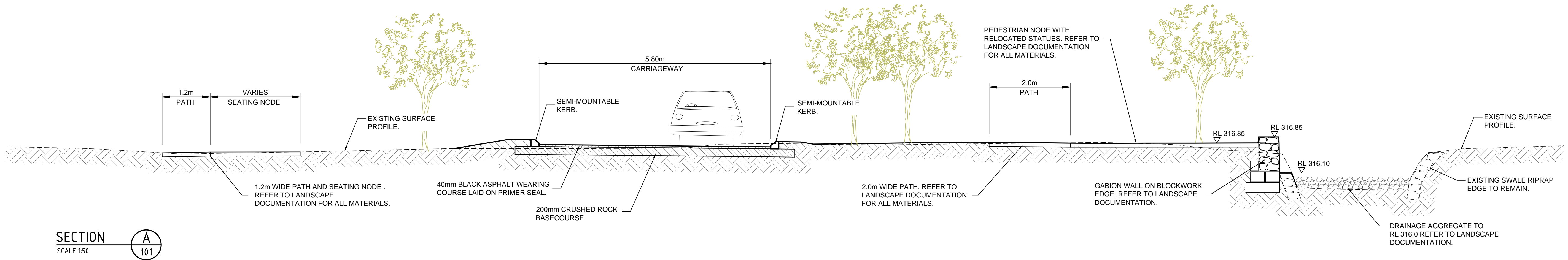
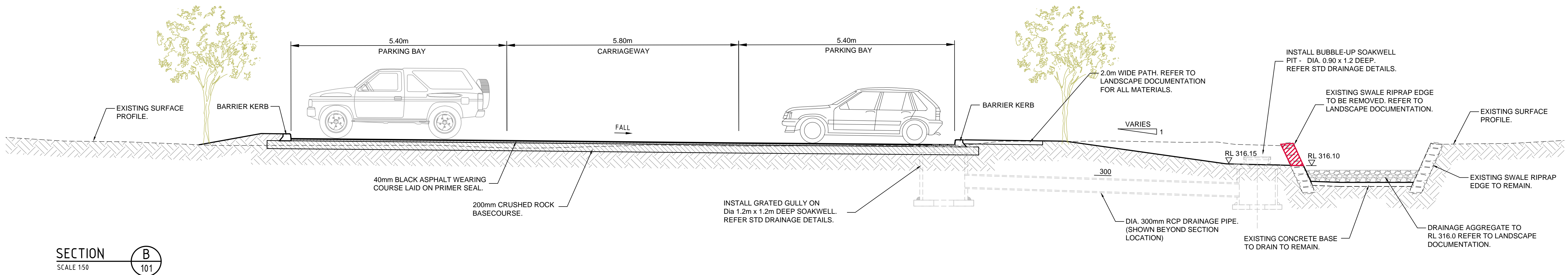
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PROJECT	SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A	
TITLE	EARTHWORKS PLAN	
DRAWING NUMBER	2465-01-101	ISSUE
		B

GENERAL NOTES

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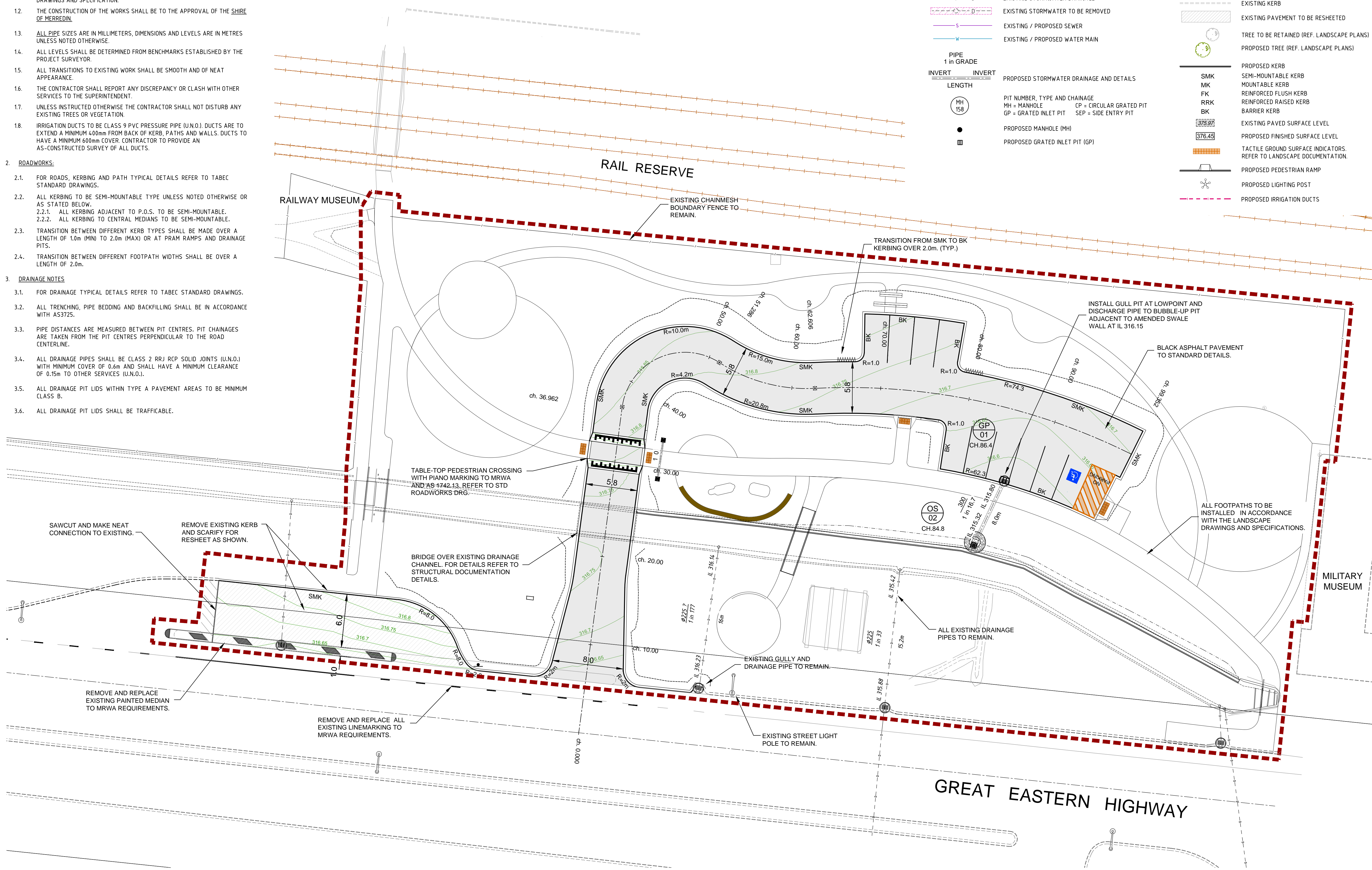


Plotted By: ireman - Plot Date: 15/03/22 - 15:44 - C:\p\1\2022\101\101 - Merredin CBD Stage 1A - 2465-01-102.dwg

				This plan shall not be used for construction unless issued as rev 0 and signed as approved.				CLIENT 				PROJECT SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A TITLE TYPICAL EARTHWORKS SECTIONS	
				COPYRIGHT The concepts and information contained in this document are the Copyright of TABEC Pty Ltd. Use or copying of the document in whole or part without the written permission of TABEC Pty Ltd. constitutes an infringement of copyright.				DESIGNED PK CHECKED MA APPROVED				DRAWING NUMBER 2465-01-102 ISSUE B	
								DRAWN PK CHECKED MA DATE		Level 2, 54-58 Havelock Street, West Perth WA 6005 08 9425 5900 • info@tabec.com.au www.tabec.com.au		No. DATE DRAWN APPROVED AMENDMENT	

NOTES

1. **GENERAL:**
 11. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DRAWINGS AND SPECIFICATION.
 12. THE CONSTRUCTION OF THE WORKS SHALL BE TO THE APPROVAL OF THE SHIRE OF MERREDIN.
 13. ALL PIPE SIZES ARE IN MILLIMETERS, DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
 14. ALL LEVELS SHALL BE DETERMINED FROM BENCHMARKS ESTABLISHED BY THE PROJECT SURVEYOR.
 15. ALL TRANSITIONS TO EXISTING WORK SHALL BE SMOOTH AND OF NEAT APPEARANCE.
 16. THE CONTRACTOR SHALL REPORT ANY DISCREPANCY OR CLASH WITH OTHER SERVICES TO THE SUPERINTENDENT.
 17. UNLESS INSTRUCTED OTHERWISE THE CONTRACTOR SHALL NOT DISTURB ANY EXISTING TREES OR VEGETATION.
 18. IRRIGATION DUCTS TO BE CLASS 9 PVC PRESSURE PIPE (U.N.O.). DUCTS ARE TO EXTEND A MINIMUM 400mm FROM BACK OF KERB, PATHS AND WALLS. DUCTS TO HAVE A MINIMUM 600mm COVER. CONTRACTOR TO PROVIDE AN AS-CONSTRUCTED SURVEY OF ALL DUCTS.
2. **ROADWORKS:**
 - 2.1. FOR ROADS, KERBING AND PATH TYPICAL DETAILS REFER TO TABEC STANDARD DRAWINGS.
 - 2.2. ALL KERBING TO BE SEMI-MOUNTABLE TYPE UNLESS NOTED OTHERWISE OR AS STATED BELOW.
 - 2.2.1. ALL KERBING ADJACENT TO P.O.S. TO BE SEMI-MOUNTABLE.
 - 2.2.2. ALL KERBING TO CENTRAL MEDIANS TO BE SEMI-MOUNTABLE.
 - 2.3. TRANSITION BETWEEN DIFFERENT KERB TYPES SHALL BE MADE OVER A LENGTH OF 1.0m (MIN) TO 2.0m (MAX) OR AT PRAM RAMP AND DRAINAGE PITS.
 - 2.4. TRANSITION BETWEEN DIFFERENT FOOTPATH WIDTHS SHALL BE OVER A LENGTH OF 2.0m.
3. **DRAINAGE NOTES:**
 - 3.1. FOR DRAINAGE TYPICAL DETAILS REFER TO TABEC STANDARD DRAWINGS.
 - 3.2. ALL TRENCHING, PIPE BEDDING AND BACKFILLING SHALL BE IN ACCORDANCE WITH AS3725.
 - 3.3. PIPE DISTANCES ARE MEASURED BETWEEN PIT CENTRES. PIT CHAINAGES ARE TAKEN FROM THE PIT CENTRES PERPENDICULAR TO THE ROAD CENTERLINE.
 - 3.4. ALL DRAINAGE PIPES SHALL BE CLASS 2 RRJ RCP SOLID JOINTS (U.N.O.) WITH MINIMUM COVER OF 0.6m AND SHALL HAVE A MINIMUM CLEARANCE OF 0.15m TO OTHER SERVICES (U.N.O.).
 - 3.5. ALL DRAINAGE PIT LIDS WITHIN TYPE A PAVEMENT AREAS TO BE MINIMUM CLASS B.
 - 3.6. ALL DRAINAGE PIT LIDS SHALL BE TRAFFICABLE.



DRAINAGE LEGEND

- EXTENT OF WORKS
- - - - - EXISTING STORMWATER DRAINAGE
- - - - - EXISTING STORMWATER TO BE REMOVED
- - - - - EXISTING / PROPOSED SEWER
- - - - - EXISTING / PROPOSED WATER MAIN
- PIPE 1 in GRADE
- INVERT INVERT
- LENGTH
- PROPOSED STORMWATER DRAINAGE AND DETAILS
- PIT NUMBER, TYPE AND CHAINAGE
- MH = MANHOLE CP = CIRCULAR GRATED PIT
- GP = GRATED INLET PIT SEP = SIDE ENTRY PIT
- PROPOSED MANHOLE (MH)
- PROPOSED GRATED INLET PIT (GP)

ROADWORKS LEGEND

- EXTENT OF WORKS BOUNDARY
- - - - - EXISTING KERB
- - - - - EXISTING PAVEMENT TO BE RESHEETED
- TREE TO BE RETAINED (REF. LANDSCAPE PLANS)
- PROPOSED TREE (REF. LANDSCAPE PLANS)
- PROPOSED KERB
- SMK SEMI-MOUNTABLE KERB
- MK MOUNTABLE KERB
- FK REINFORCED FLUSH KERB
- RRK REINFORCED RAISED KERB
- BK BARRIER KERB
- EXISTING PAVED SURFACE LEVEL
- EXISTING FINISHED SURFACE LEVEL
- TACTILE GROUND SURFACE INDICATORS REFER TO LANDSCAPE DOCUMENTATION
- PROPOSED PEDESTRIAN RAMP
- PROPOSED LIGHTING POST
- PROPOSED IRRIGATION DUCTS

Plotted By: ireman - Plot Date: 15/03/22 - 15:48 - Cef File: D:\2025\1461\1B - 2465-01-300.dwg
 Shire of Merredin - Merredin CBD Stage 1A - 2465-01-300.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT
B	15.03.22	PK	MA	ISSUED FOR TENDER
A	11.03.22	PK	MA	ISSUED FOR CLIENT REVIEW

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CLIENT	SHIRE OF MERREDIN		
DESIGNED	PK	CHECKED	MA
APPROVED	DATE		

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PROJECT	SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A		
TITLE	ROAD AND DRAINAGE PLAN		
DRAWING NUMBER	2465-01-300		ISSUE
			B

SCALE 1:200

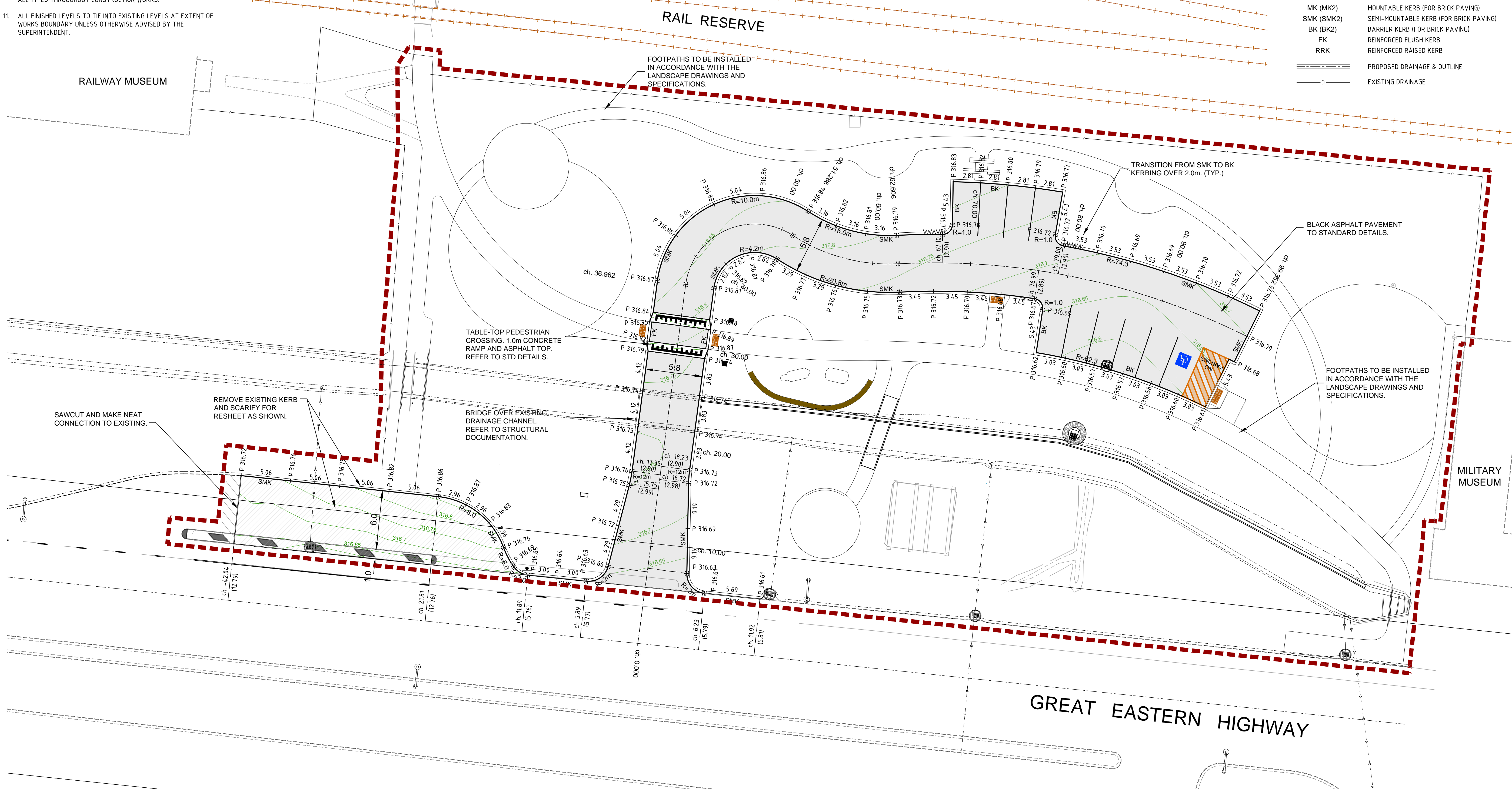
GENERAL NOTES

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LEGEND

- PROPOSED KERBING
- PROPOSED EDGE BEAM / FLUSH KERB
- EXISTING KERBING
- FUTURE KERBING
- CENTRE LINE CHAINAGE OFFSET FROM CENTRELINE
- FINISHED PAVEMENT LEVEL AT FACE OF KERB
- PROPOSED FINISHED SURFACE CONTOUR
- Ø200 IRRIGATION DUCT (CHECK COVER)
- BLEND TO EXISTING PAVEMENT
- STREET SIGN AND POST
- KERB TRANSITION OVER 2m
- MK (MK2) MOUNTABLE KERB (FOR BRICK PAVING)
- SMK (SMK2) SEMI-MOUNTABLE KERB (FOR BRICK PAVING)
- BK (BK2) BARRIER KERB (FOR BRICK PAVING)
- FK REINFORCED FLUSH KERB
- RRK REINFORCED RAISED KERB
- PROPOSED DRAINAGE & OUTLINE
- EXISTING DRAINAGE



SCALE 1:200 0 4 8 12
A1

Printed By: ireman - Plot Date: 15/03/22 - 15:53 - C:\p\1\0265\01\1B-100\2465 - Merredin CBD Stage 1A - 49\1\0265\01\1B-100\2465-01-320.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT
B	15.03.22	PK	MA	ISSUED FOR TENDER
A	11.03.22	PK	MA	ISSUED FOR CLIENT REVIEW

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CLIENT		
DESIGNED	CHECKED	APPROVED
PK	MA	
DRAWN	CHECKED	DATE
PK	MA	

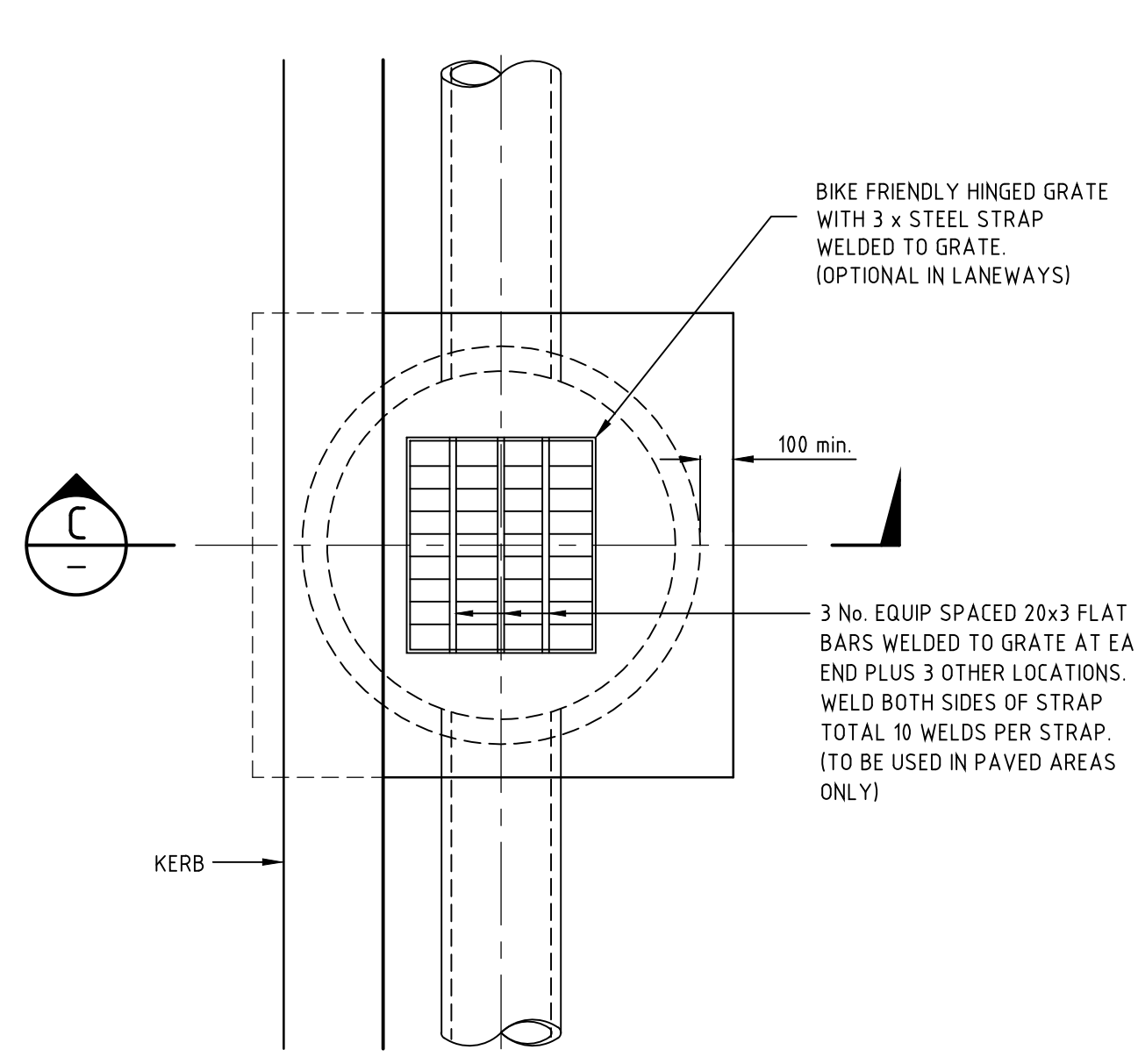


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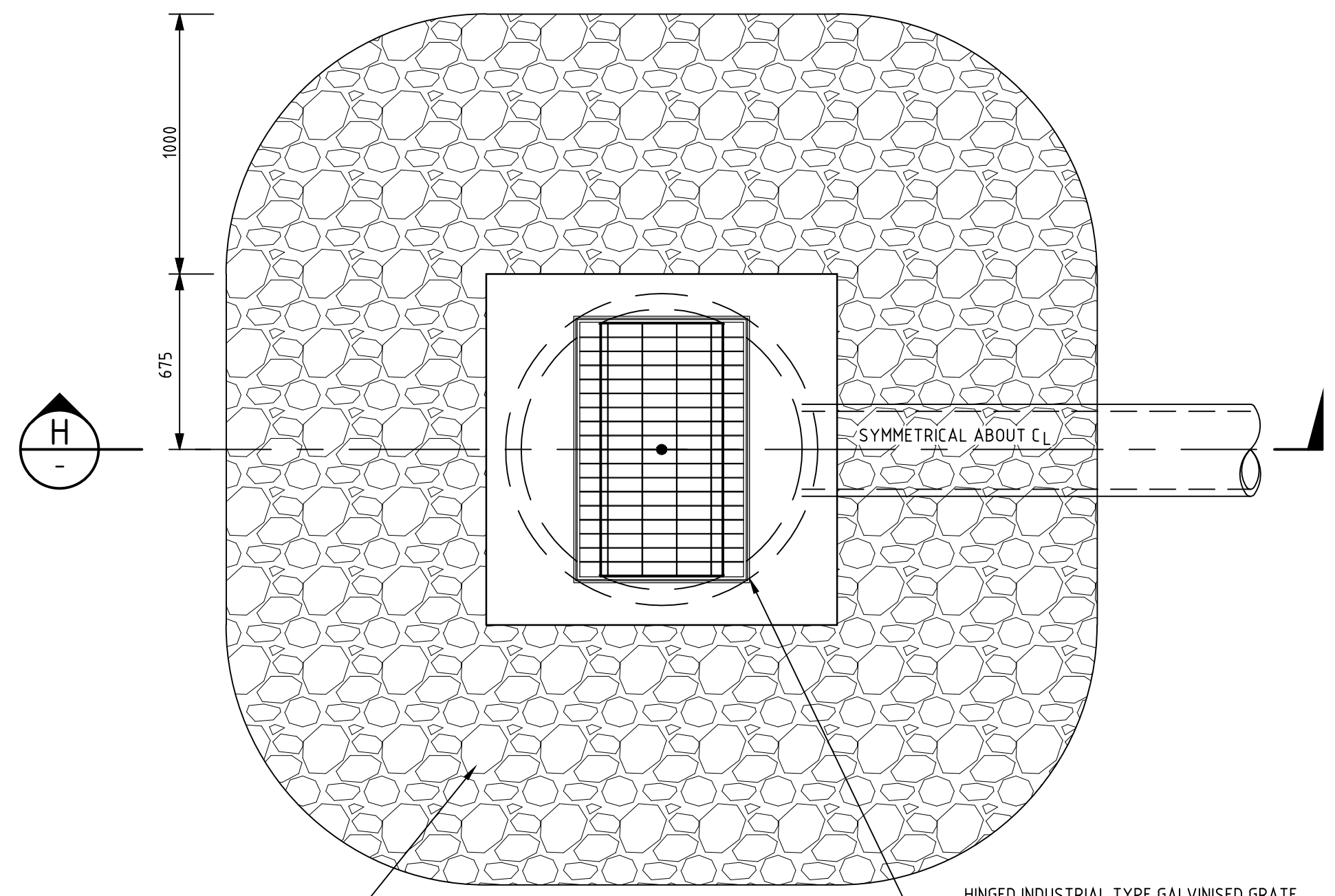
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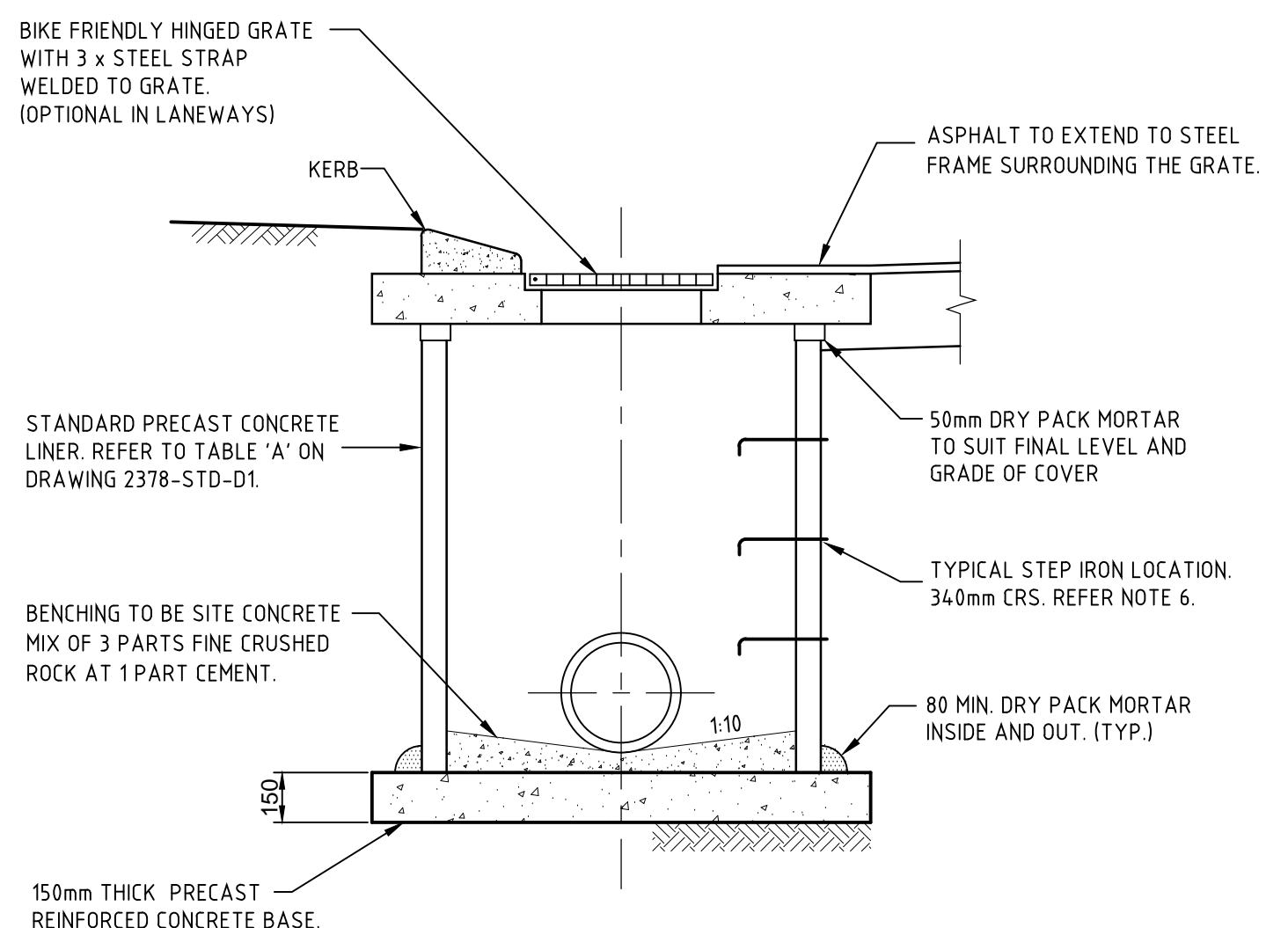
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SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A	
TITLE	
ROAD GRADING PLAN	
DRAWING NUMBER	
2465-01-320	
ISSUE	
B	



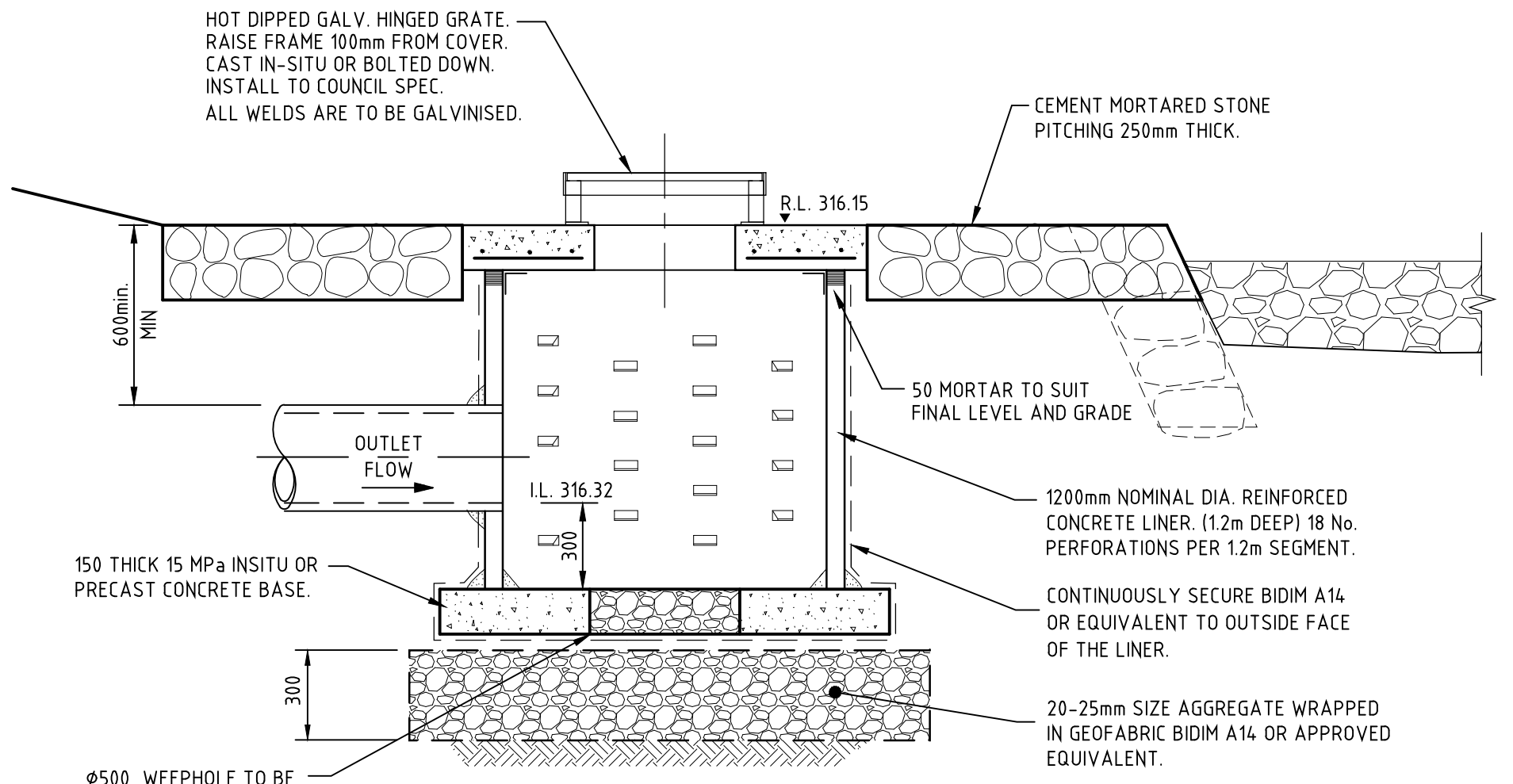
PLAN ON GRATED GULLY PIT
SCALE 1:20



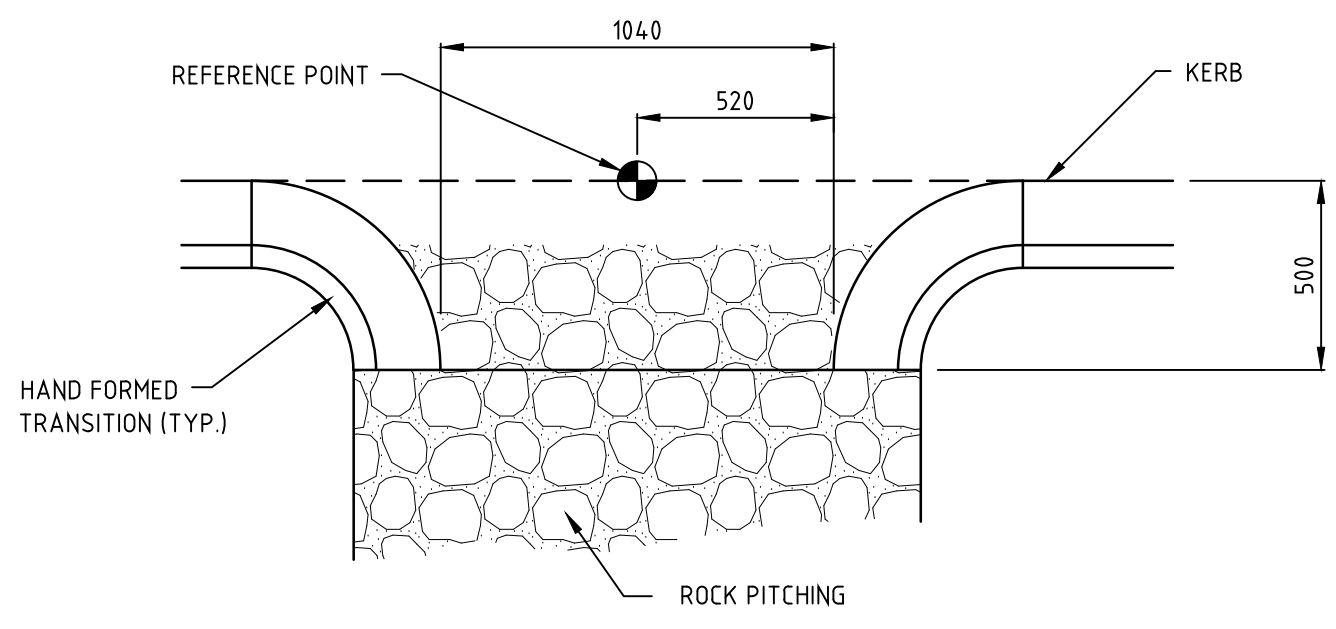
PLAN ON BUBBLE-UP PIT
SCALE 1:20



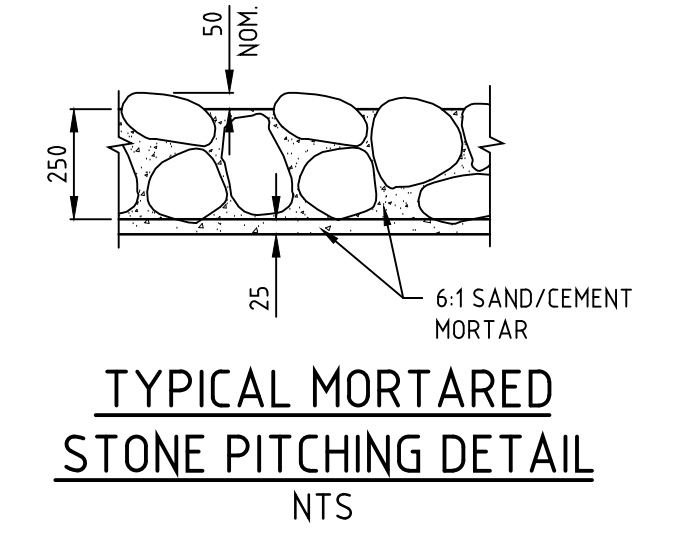
SECTION C
SCALE 1:20
GRATED GULLY PIT



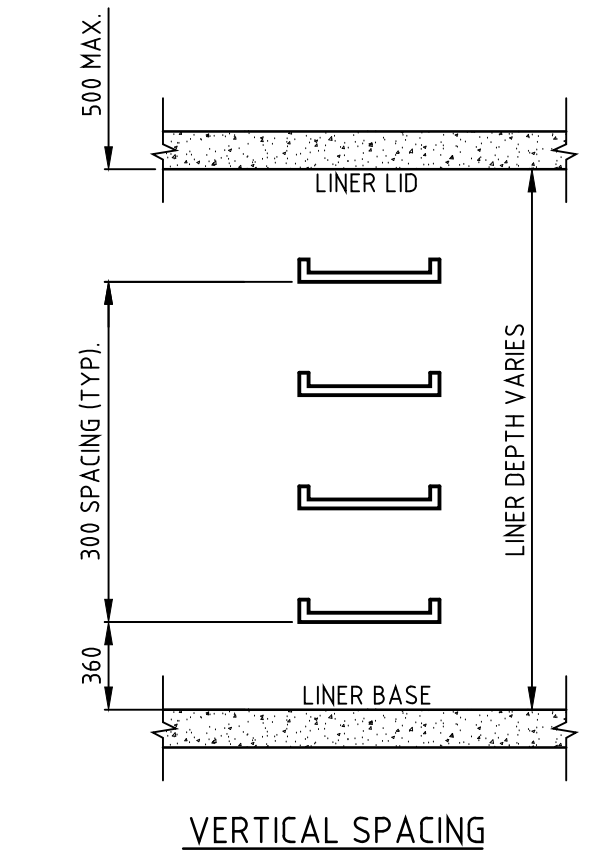
SECTION D
SCALE 1:20
BUBBLE UP PIT DETAILS
OUTLET STRUCTURE



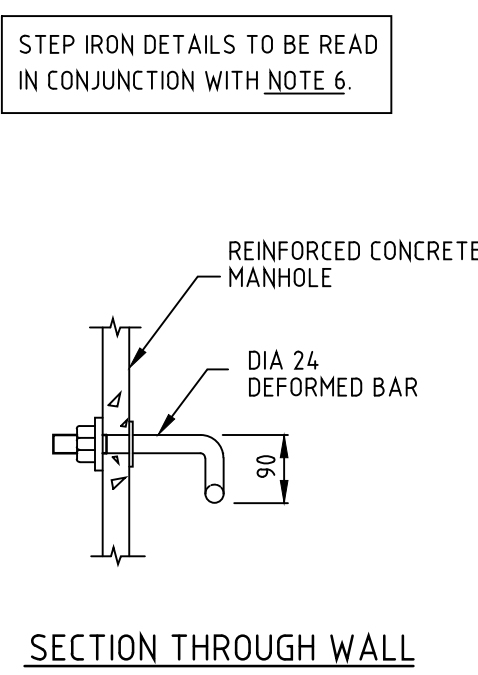
KERB OPENING PLAN
NTS



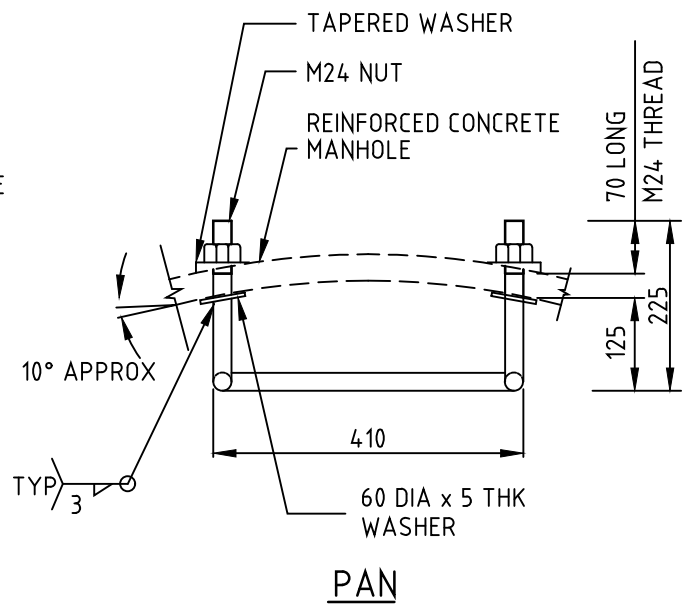
TYPICAL MORTARED
STONE PITCHING DETAIL
NTS



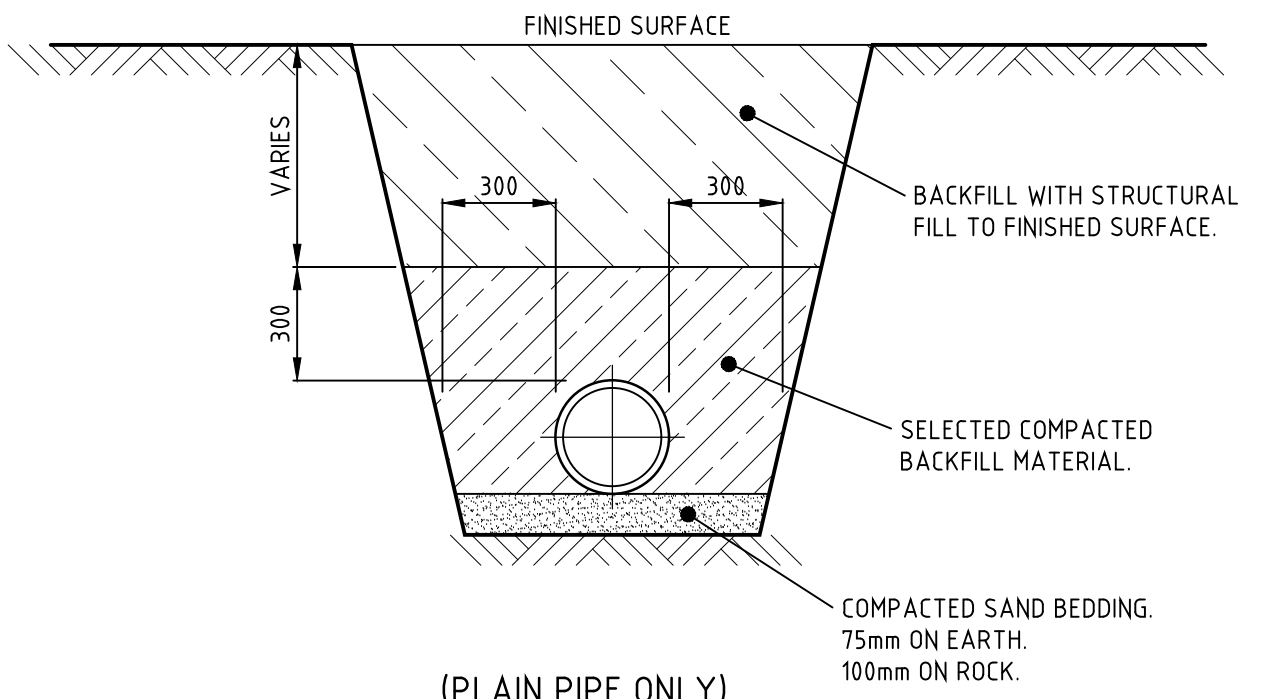
VERTICAL SPACING



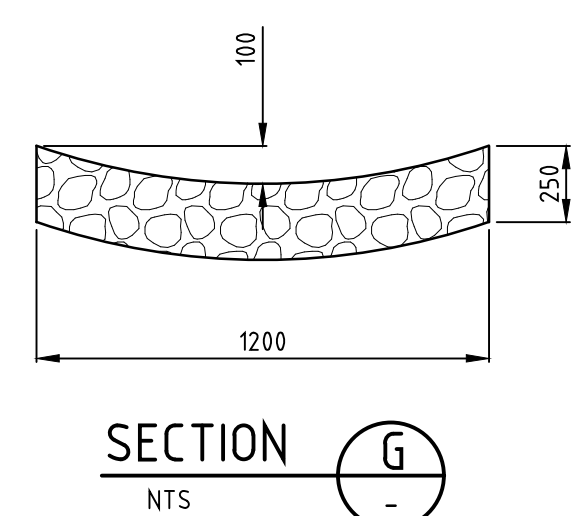
SECTION THROUGH WALL
STEP IRON DETAILS
N.T.S.



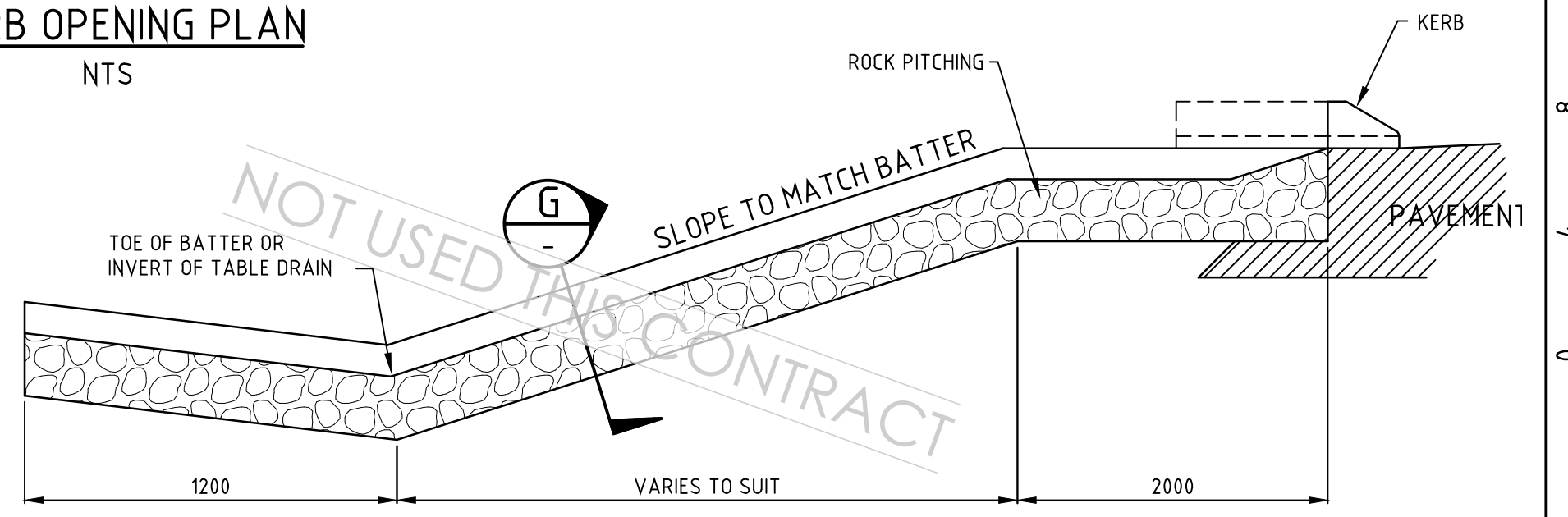
PAN



DRAINAGE PIPE TRENCH DETAIL
SCALE 1:20



SECTION G
NTS



PROFILE ROCK PITCHING AT KERB OPENINGS AND ENDS
NTS

NOTES:

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- ALL PRECAST COMPONENTS (PIPES, LIDS, LINERS & BASES) ARE TO BE SUPPLIED BY AN APPROVED MANUFACTURER AND ARE TO BE ASSEMBLED AS PER THE MANUFACTURERS GUIDELINES.
- CONCRETE TO BE 20mm NOM. AGGREGATE AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF:
 - 25MPa FOR INSITU BASE
 - 40MPa FOR PRECAST UNITS
- ALL REINFORCEMENT AND STEEL TO BE CLEAN AND FREE FROM OIL, RUST AND OTHER DELETERIOUS SURFACE COATINGS.
- STEP IRONS TO BE INSTALLED IN DRAINAGE PITS WHERE DEPTH FROM COVER TO BASE EXCEEDS 1.0m
 - STEP IRONS TO BE Y24 HOT DIPPED GALVANISED DEFORMED BARS OR PLASTIC COATED TYPE AS APPROVED BY COUNCIL.
 - STEP IRONS TO BE INSTALLED ON DOWNSTREAM SIDE OF MANHOLE.
 - STEP IRONS ARE TO BE POSITIONED RELATIVE TO LID OPENINGS.
- IF PITS DO NOT REQUIRE STEP IRONS THEN LIDS ARE TO BE POSITIONED OVER THE MOST ACCESSIBLE PIPE INVERT.
- ALL PITS SHALL BE INTERLOCKING JOINT, REINFORCED CONCRETE AND EQUIVALENT TO CLASS 2 PIPE.
- PIPE JOINTS WITHIN 1.0m OF PIT TO BE SEALED.
- SUBGRADE TO ALL PIT BASES TO BE COMPACTED TO 95% M.M.D. PRIOR TO PLACING OF BASE.
- BACKFILL SURROUNDING PIT TO BE TO 95% M.M.D.
- ALL COMPONENTS TO BE DESIGNED TO ACCEPT A14 LOADING AUSTRROADS STANDARD.
- BENCHING BETWEEN PIPES TO BE A CONCRETE MIX OF 3:1 FINE CRUSHED ROCK TO CEMENT.
- HOLES TO BE PUNCHED OUT ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
- MORTAR FILLETS & BEDDING TO LINERS SHALL BE IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. AS A GUIDE (U.N.O.):
 - MORTAR SHALL BE 3:1 SAND:CEMENT RATIO.
 - 50mm MORTAR FILLET INSIDE & 100mm MORTAR FILLET OUTSIDE, ALL AROUND TO PIPES AT CONNECTION TO LINER.
 - 100mm MORTAR FILLET BOTH INSIDE AND OUTSIDE OF LINER AT CONNECTION TO BASE SLAB.
 - 50mm DRY PACK MORTAR BEDDING TO LINERS AT CONNECTION TO LIDS.
- MAKE UP TO BASE OF CONCRETE SURROUNDS FROM TOP OF PIT LINER WITH 150mm WIDE CONCRETE PAD OR NEAT BRICKWORK AS NECESSARY.
- ALL DRAINAGE LIDS ARE TO BE TRAFFICABLE CLASS 'D' TO AS3996:2006.
- ALL DRAINAGE PIPES TO BE REINFORCED CONCRETE WITH RUBBER-RING JOINTS.

SCALE 1:200
0 0.1 0.2 0.3 0.4 0.8 1.2
A1

No.	DATE	DRAWN	APPROVED	AMENDMENT	No.	DATE	DRAWN	APPROVED	AMENDMENT
A	11.03.22	PK	MA	ISSUED FOR TENDER					

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DESIGNED	PK	CHECKED	MA	APPROVED	
DRAWN	PK	CHECKED	MA	DATE	

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PROJECT	SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A
TITLE	CARPARK REST AREA RESERVE STANDARD DRAINAGE DETAILS
DRAWING NUMBER	2465-STD-D1
ISSUE	A

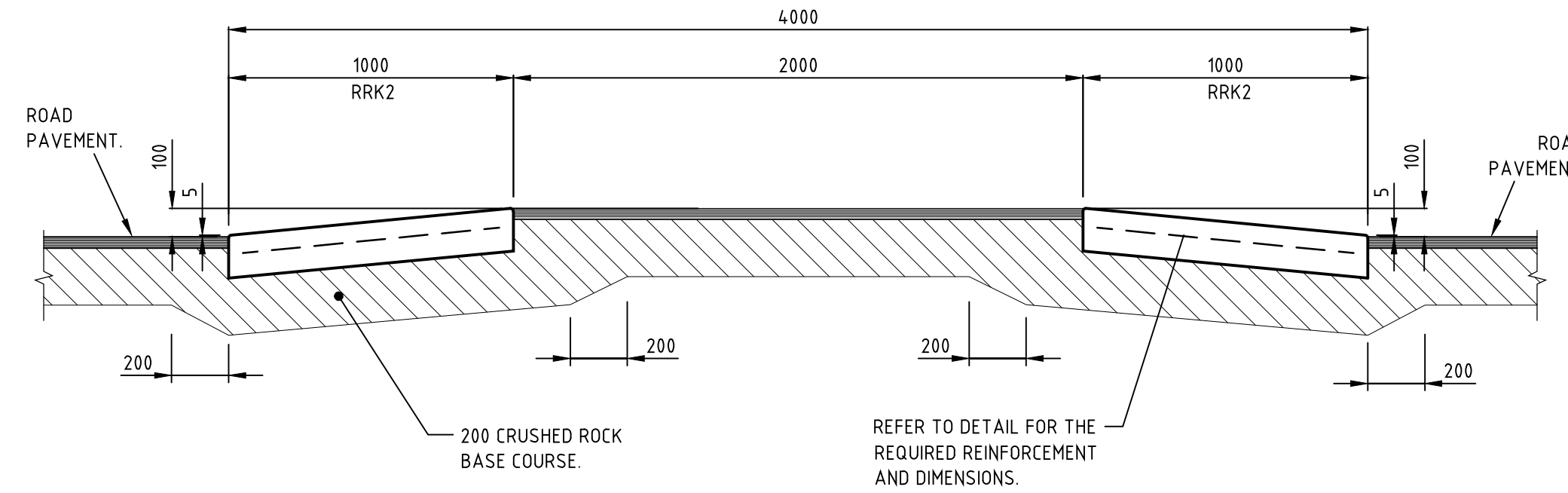
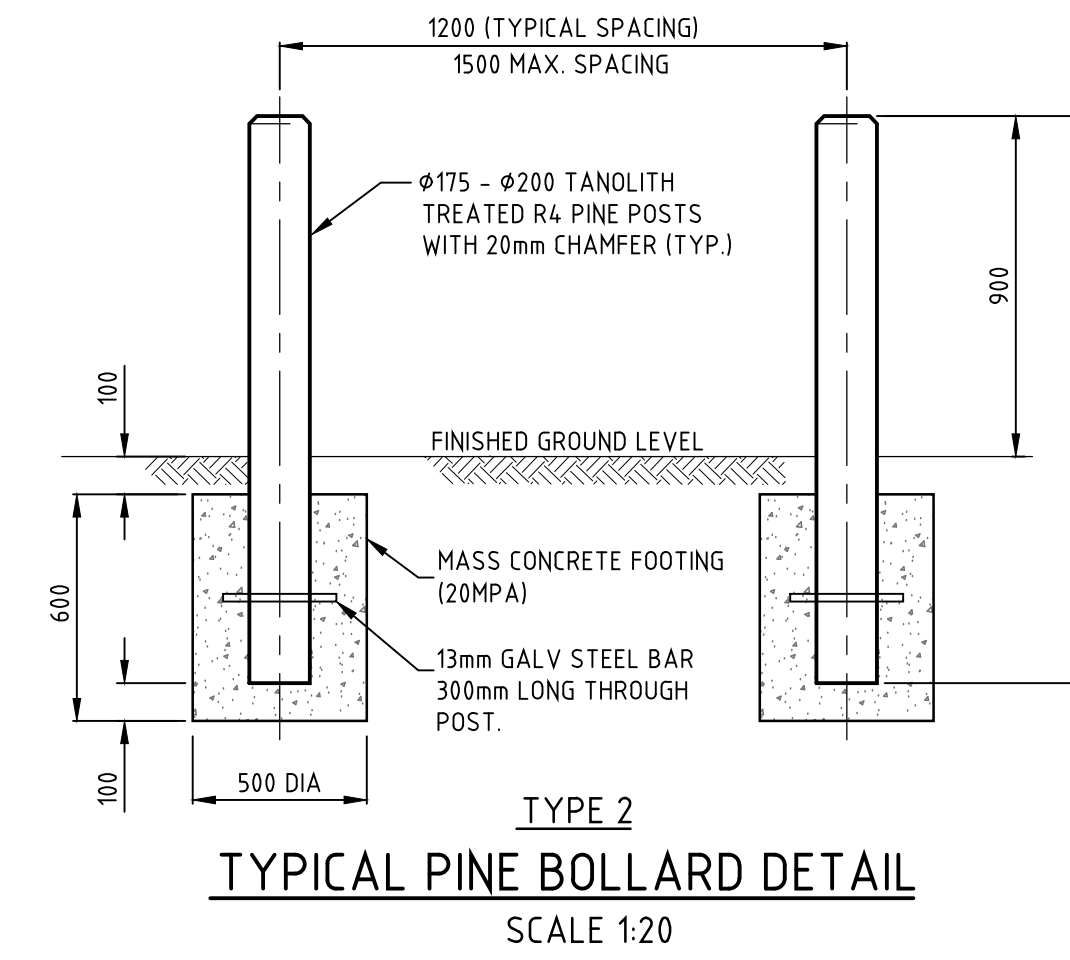
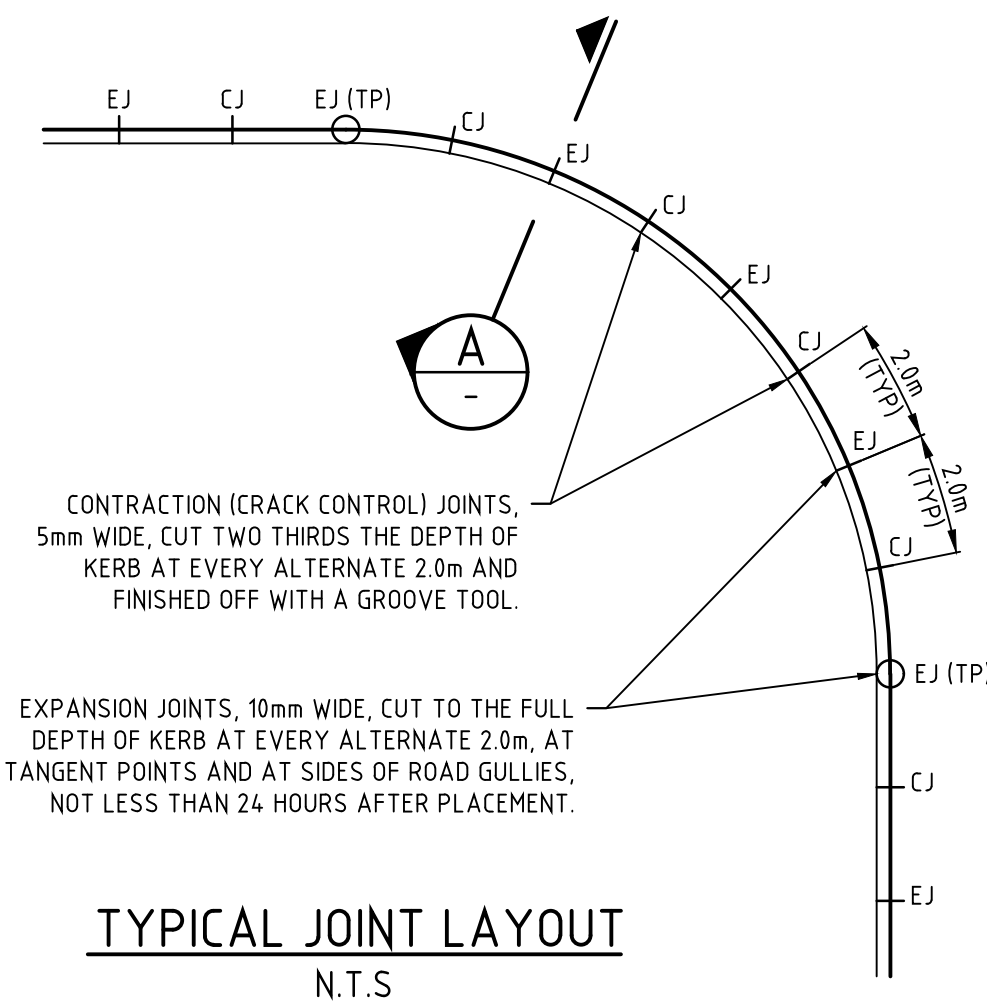
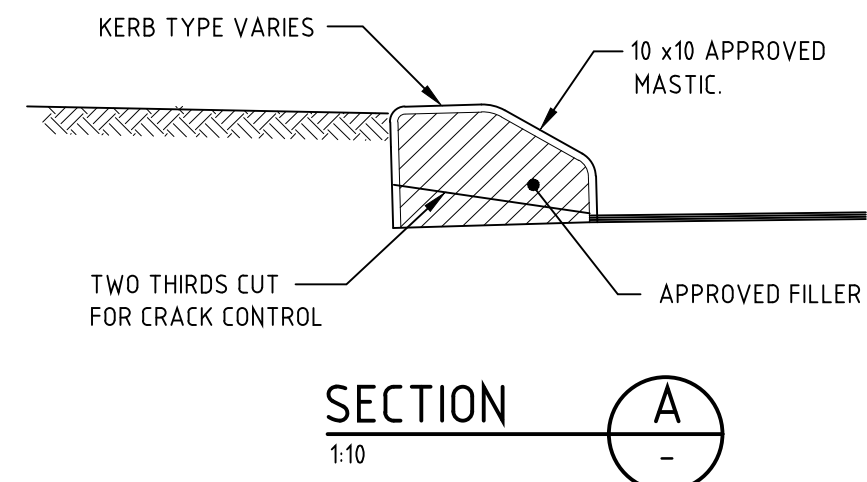
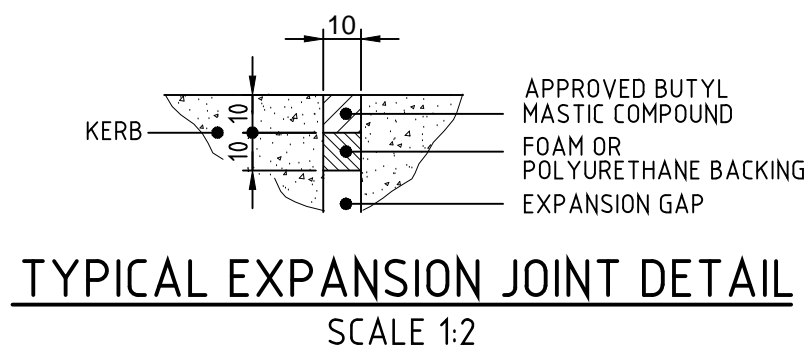
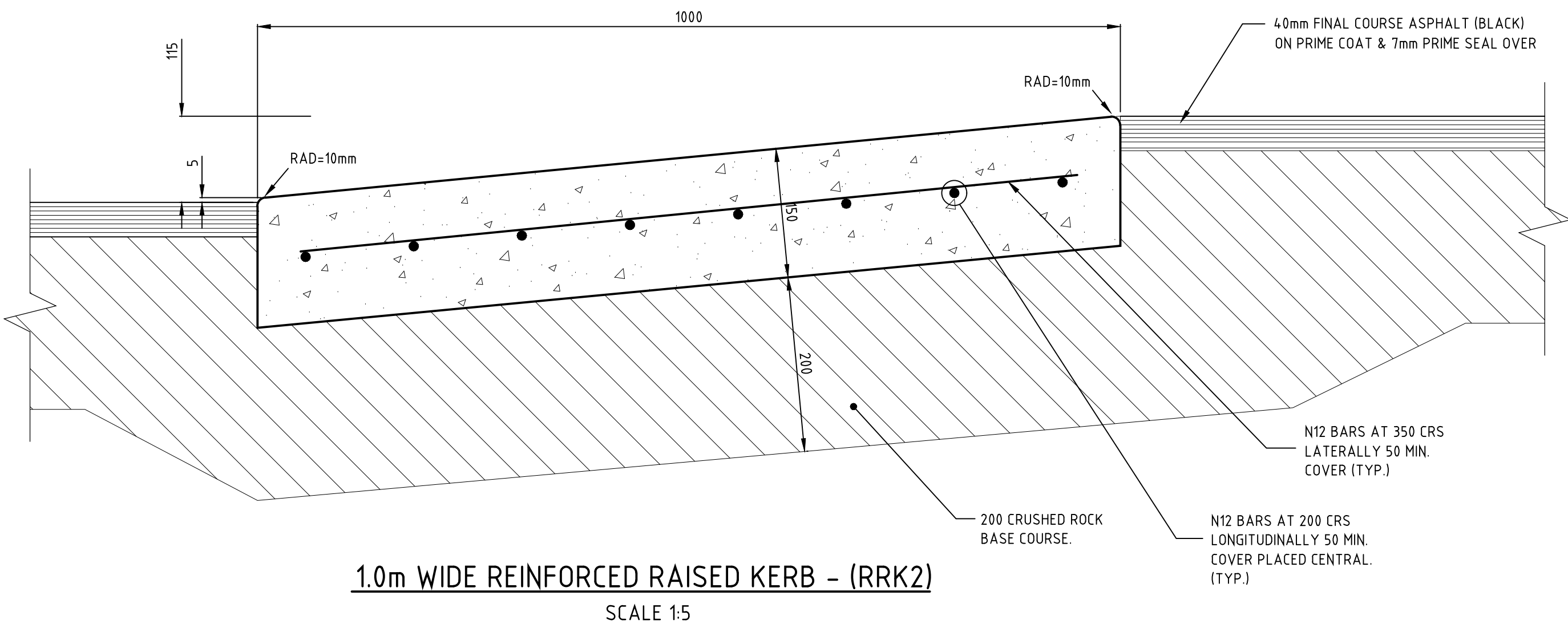
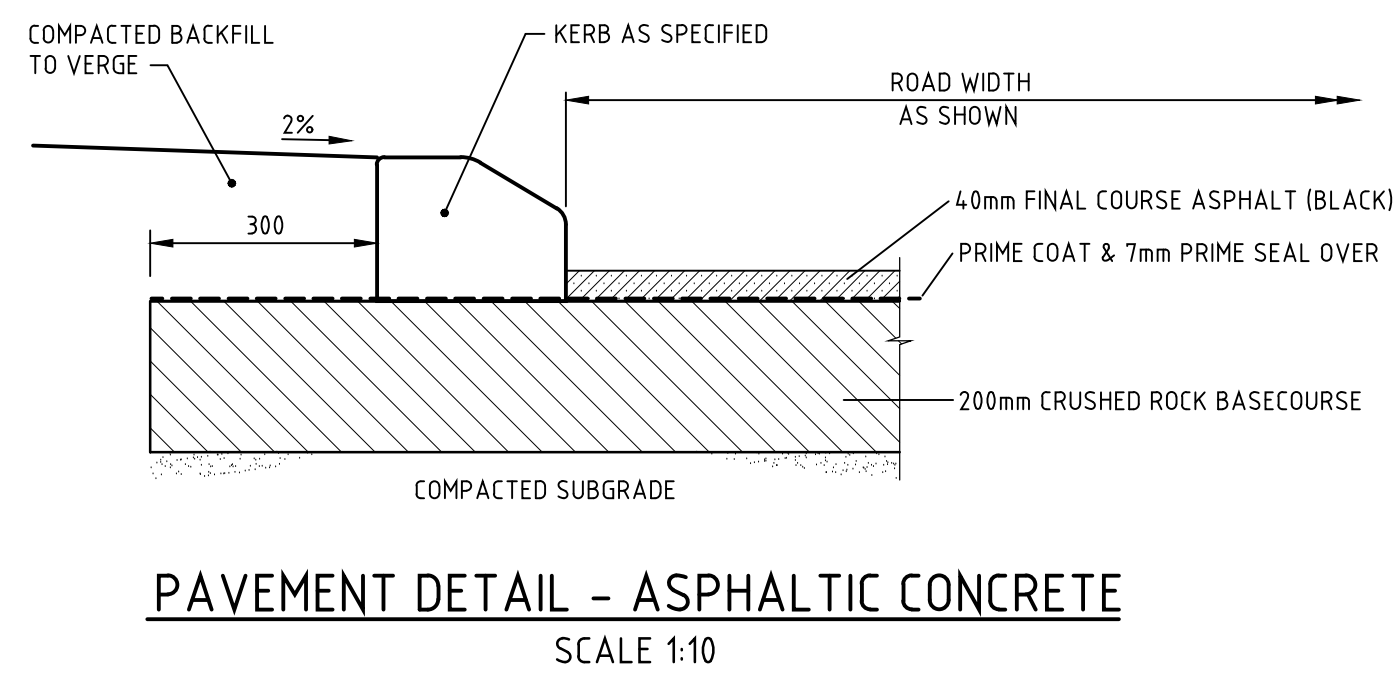
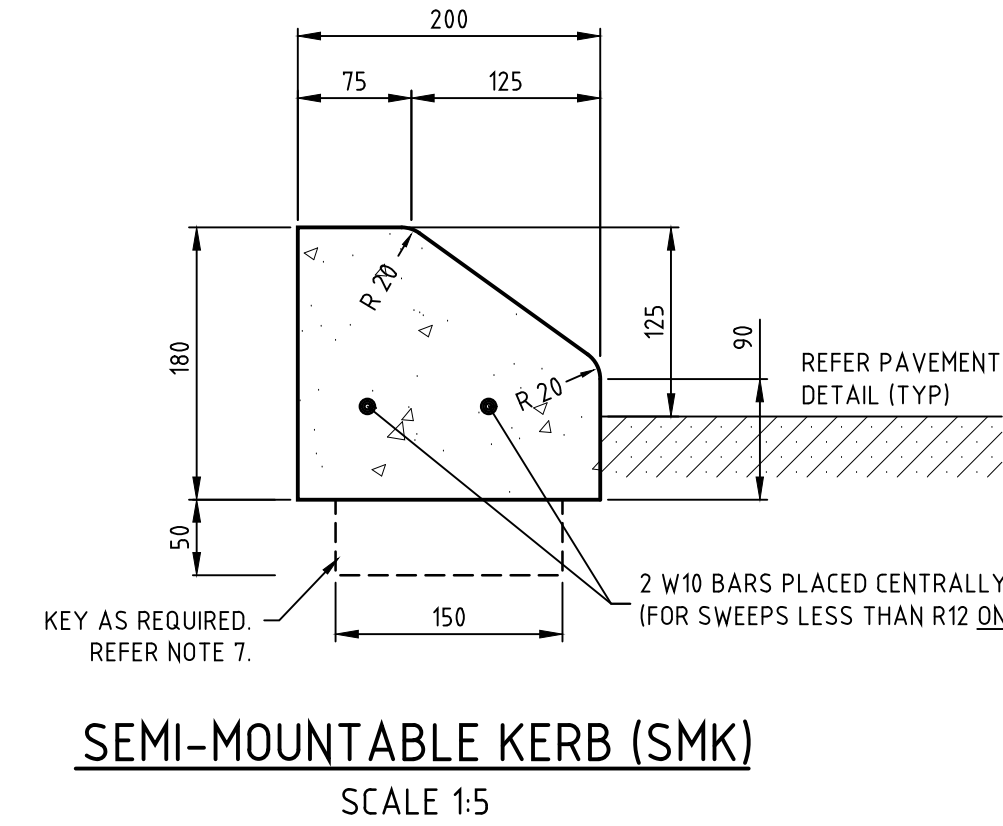
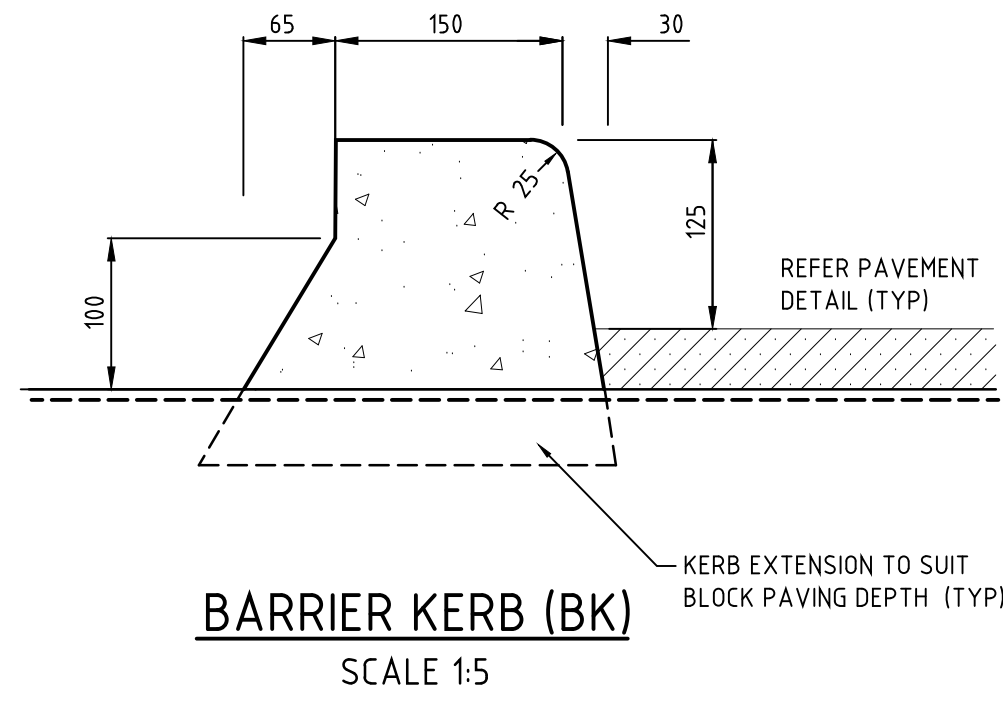
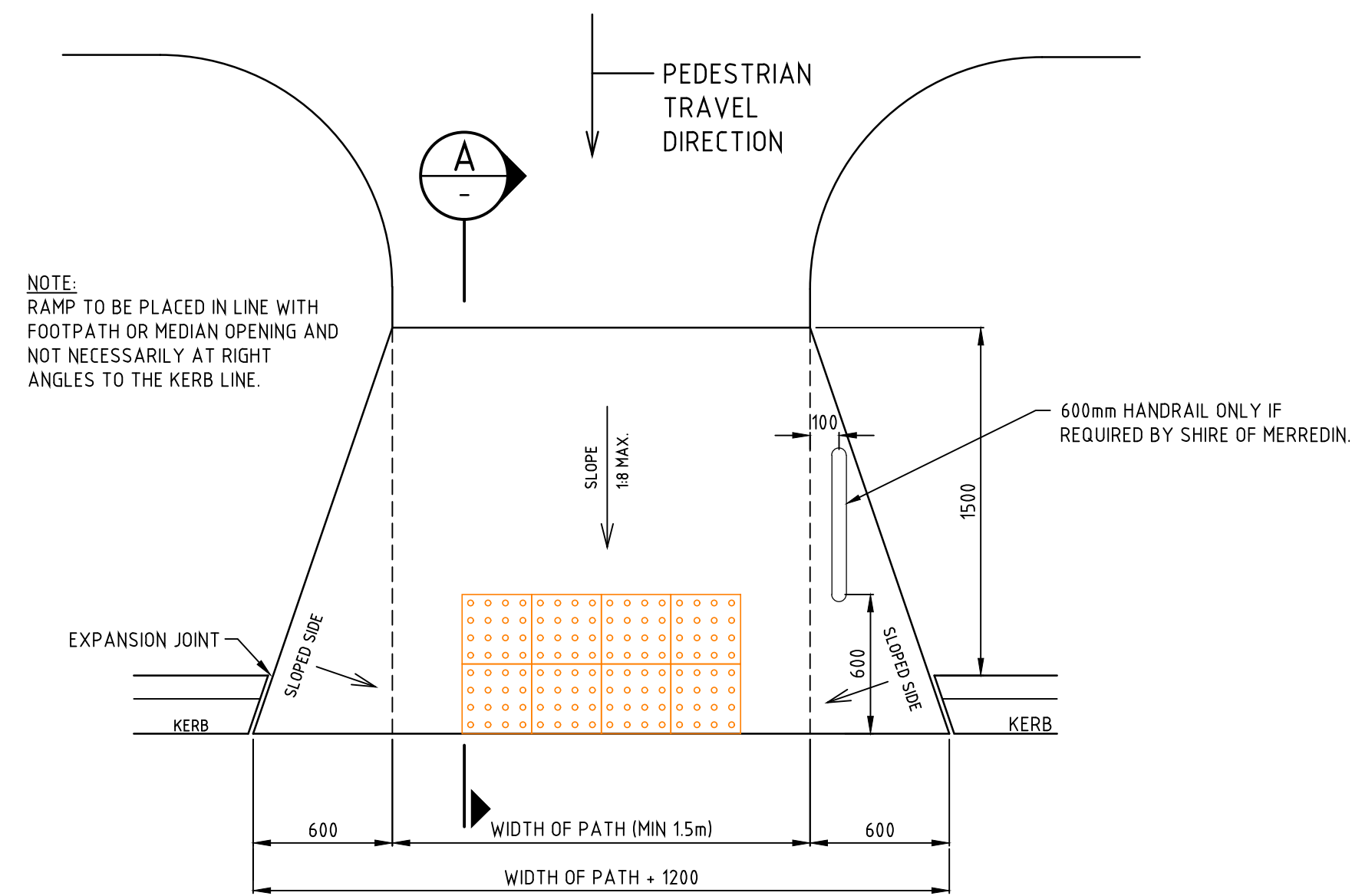
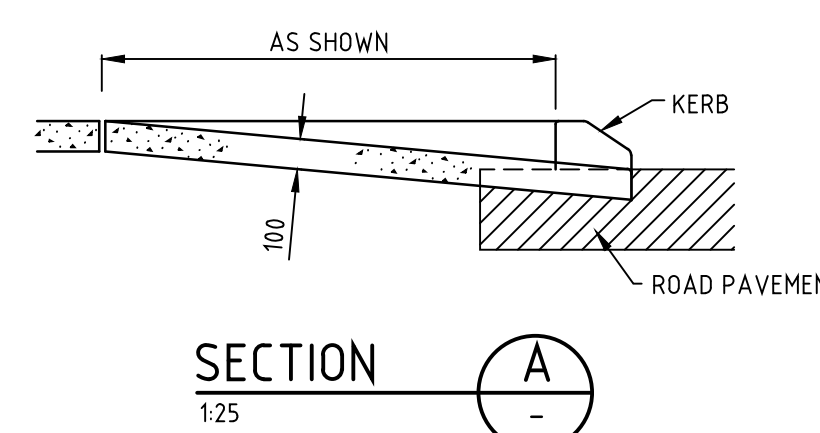


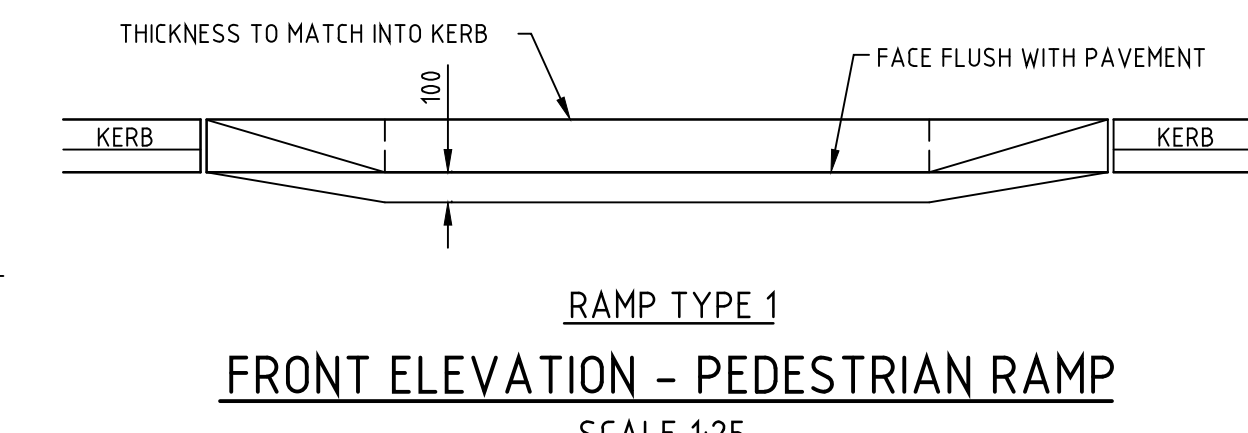
TABLE TOP PEDESTRIAN RAMP DETAIL
INCLUDES 1.0m WIDE REINFORCED RAISED KERB - (RRK2)
SCALE 1:20



RAMP TYPE 1
PLAN - PEDESTRIAN RAMP
SCALE 1:25



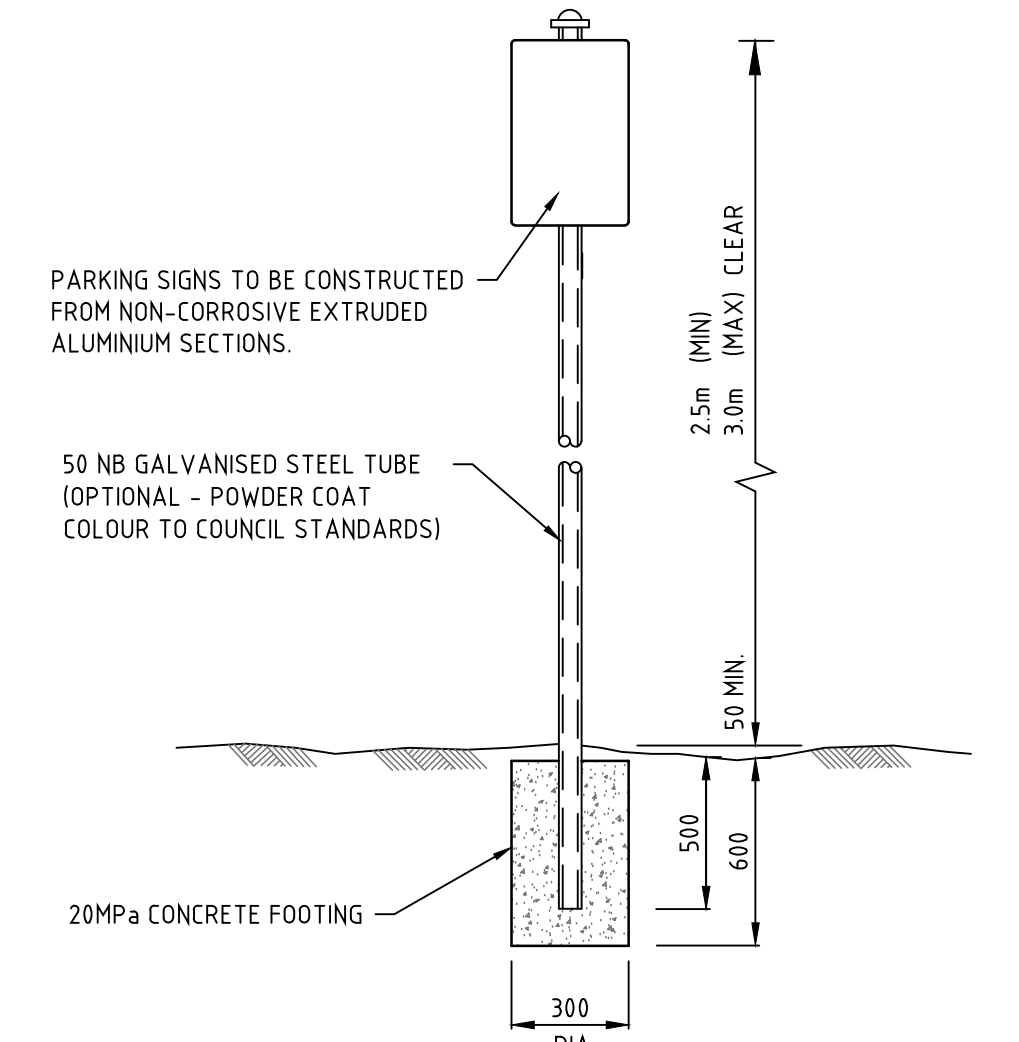
SECTION A
SCALE 1:25



RAMP TYPE 1
FRONT ELEVATION - PEDESTRIAN RAMP
SCALE 1:25

KERB NOTES

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- ALL DIMENSIONS IN MILLIMETERS.
- CONCRETE FOR KERBING SHALL CONFORM TO AS1379.
- MINIMUM COMPRESSIVE STRENGTH 32MPa AT 28 DAYS.
- MAXIMUM AGGREGATE SIZE 10mm. MAXIMUM SLUMP 80mm.
- KEYED KERBING SHALL BE PROVIDED WHERE A RADIUS OF CURVATURE IS LESS THAN 40m.
- REINFORCED FLUSH KERBING IS NOT TO BE CUT.
- REINFORCEMENT TO BE STRUCTURAL GRADE STEEL COMPLYING WITH AS4671 GRADE 500N.
- MINIMUM COVER FOR REINFORCEMENT TO BE 50mm (U.N.O.).
- NEW KERBING TO BE PROTECTED FROM TRAFFIC FOR A MINIMUM OF 7 DAYS AFTER INSTALLATION.



PARKING SIGN DETAIL
(SIGN TO MATCH COUNCIL STANDARD FOR AREA)
SCALE 1:20

SCALE 1:200 0 0.1 0.2 0.3 0.4 0.8 1.2 1.5 12 8 4 0

No.	DATE	DRAWN	APPROVED	AMENDMENT	No.	DATE	DRAWN	APPROVED	AMENDMENT
A	11.03.22	PK	MA	ISSUED FOR TENDER					

This plan shall not be used for construction unless issued as rev 0 and signed as approved.

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CLIENT	SHIRE OF MERREDIN INNOVATING THE WHEATBREED		
DESIGNED	PK	CHECKED	MA
DRAWN	PK	CHECKED	MA
APPROVED		DATE	

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PROJECT	SHIRE OF MERREDIN - MERREDIN CBD STAGE 1A		
TITLE	CARPARK REST AREA RESERVE STANDARD ROADWORKS DETAILS		
DRAWING NUMBER	2465-STD-R1		ISSUE
			A

6.10 Appendix 6.10 – Landscape Drawing Set

MERREDIN CBD STAGE 1A

DESIGN DOCUMENTATION

LANDSCAPE LEGEND

LEVELS

	EXTENT OF WORKS
	EXISTING LEVEL
	PROPOSED LEVEL
	TOP OF WALL

SURFACE FINISHES

	PAVEMENT TYPE 1A
	PAVEMENT TYPE 1B
	PAVEMENT TYPE 2A
	PAVEMENT TYPE 2B
	PAVEMENT TYPE 2C
	PAVEMENT TYPE 3
	PAVEMENT TYPE 4
	PAVEMENT TYPE 4B
	PAVEMENT TYPE 5
	TURF
	GARDEN BED - TYPE 1
	MULCH ONLY - PLAY AREA
	GARDEN BED - TYPE 2
	EDGE TYPE 1
	EDGE TYPE 2
	TGSI
	RELOCATED STATUES
	DRAINAGE AGGREGATE
	SAW CUT
	EXANSION JOINT

WALL ELEMENTS

	WALL TYPE A
	WALL TYPE B
	PEDESTRIAN BRIDGE 3A
	PEDESTRIAN BRIDGE 4B

FURNITURE ELEMENTS

	SEATING TYPE 1A
	SEATING TYPE 2
	NOT IN USE
	RUBBISH BIN
	DRINK FOUNTAIN
	NOT IN USE
	BALUSTRADE
	WAYFINDING PORTAL

MISCELLANEOUS

	LOG STEPPERS
	BOULDERS
	SIGNAGE
	STEPPER
	LOG

PLANTING

	EXISTING TREE (TO BE RETAINED) TREE PROTECTION ZONE (TPZ) STRUCTURAL ROOT ZONE (RPZ) REFER TECHNICAL SPECIFICATION
	EXISTING TREE (TO BE REMOVED)
	PROPOSED TREE

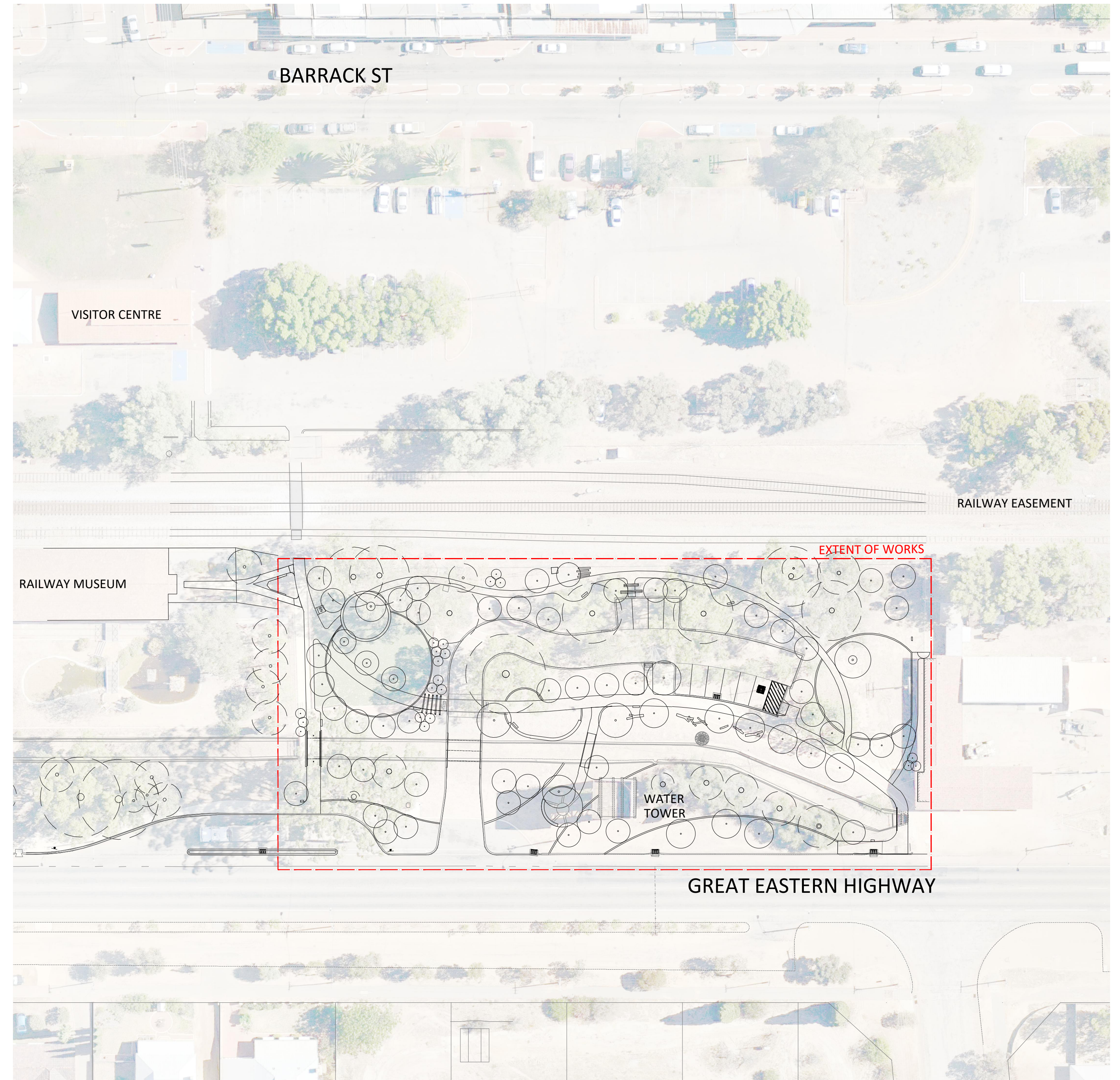
NOTE

- ALL BOULDERS AND PLANTING WITHIN EXISTING GARDEN BEDS TO BE RETAINED, PROTECTED AND REINSTALLED AS REQUIRED
- REFER CIVIL DOCUMENTATION FOR FURTHER DEMOLITION PLANS

ELECTRICAL

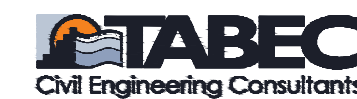
	PROPOSED 5M LIGHT POLE REFER ELECTRICAL DOCUMENTATION
	PROPOSED 9M LIGHT POLE REFER ELECTRICAL DOCUMENTATION

Sheet Title	Sheet Number	sheet revision
COVER SHEET	L-000	A
GENERAL NOTES	L-001	A
PLANT SCHEDULE	L-002	A
DEMOLITION PLAN	L-100	A
GENERAL ARRANGEMENT PLAN	L-200	A
GRADING PLAN	L-300	A
FINISHES PLAN	L-400	A
PAVEMENT TYPE 1 & 2 PLAN	L-401	A
PLANTING PLAN	L-500	A
SECTIONS	L-800	A
SECTIONS	L-801	A
SECTIONS	L-802	A
HARDSCAPE DETAILS	L-900	A
HARDSCAPE DETAILS	L-900	A
WALLS DETAILS	L-910	A
WALLS DETAILS	L-911	A
BRIDGES DETAILS	L-920	A
BRIDGES DETAILS	L-921	A
BRIDGES DETAILS	L-922	A
BRIDGES DETAILS	L-923	A
ARBOUR INTENT	L-930	A
NATURAL PLAY DETAILS	L-940	A
SOFTSCAPE DETAILS	L-990	A
SOFTSCAPE DETAILS	L-991	A



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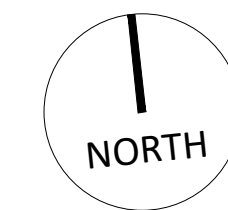
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CLIENT

SHIRE OF MERREDIN
BARRACK STREET
MERREDIN
6415, WESTERN AUSTRALIA



REV	DATE	REVISION	DRN	CHK
A	15.03.22	ISSUE FOR TENDER	RT	NP

DRN BY	NP
START DATE	SEPT 21
DESIGNED	NP
CHECKED	SS
GENERAL NOTES REFER TO L002	

MERREDIN CBD-STAGE 1A
COVER SHEET

PLACE LAB	2139	SCALE:	1:500
PROJ No		UNIT:	mm
DWG		STATUS	A1
DWG No	L-000	SIZE	
		ISSUE	A

GENERAL NOTES:

- DO NOT SCALE DRAWINGS - WRITTEN DIMENSIONS TAKE PRECEDENCE.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS, SCHEDULES, REPORTS AND DRAWINGS.
 - SHOP DRAWINGS, WHERE SPECIFICALLY INDICATED, THE CONTRACTOR SHALL PROVIDE SHOP DRAWINGS & DETAILED COMPONENT DESIGN AS REQUIRED FOR THE PROPER FABRICATION. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR FULLY CERTIFIED SHOP FABRICATED ITEMS & SUBMIT FOR REVIEW. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING THE SHOP DRAWINGS FOR ACCURACY, COORDINATION WITH OTHER TRADES, & COMPLIANCE WITH THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED FOR APPROVAL. APPROVAL OF SHOP DRAWINGS SHALL CONSTITUTE REVIEW & APPROVAL OF THE GENERAL ARRANGEMENT OF COMPONENTS TO COMPLY WITH THE GENERAL INTENT OF THE CONSTRUCTION DOCUMENTS & IN NO WAY RELIEVES THE CONTRACTOR FROM THEIR RESPONSIBILITY FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS, EVEN IF SUCH ITEMS ARE NOT SHOWN ON THE SHOP DRAWINGS. PROVIDE SHOP DRAWINGS FOR ALL METAL AND TIMBER WORK.
 - ALL DIMENSIONS, LEVELS AND EXISTING SERVICES SHALL BE VERIFIED BY CONTRACTOR AND SUB-CONTRACTORS ON-SITE PRIOR TO COMMENCEMENT OF WORKS, DURING THE PREPARATION OF SHOP DRAWINGS AND FABRICATION OF CONSTRUCTION COMPONENTS. NOTIFY SUPERINTENDENT OF ANY DISCREPANCIES.
 - SETOUT TO BE UNDERTAKEN BY A LICENSED SURVEYOR. CAD FILES WILL BE AVAILABLE ON REQUEST TO THE SUPERINTENDENT.
 - FOR ALL ROAD CONSTRUCTION INFORMATION, PAVEMENTS, JOINTS, KERBING AND ASSOCIATED REINFORCING, SUBGRADE PREPARATION AND ROAD FINISHED LEVELS REFER TO CIVIL DOCUMENTATION.
 - FOR ALL STREET AND FEATURE LIGHTING REFER TO ELECTRICAL ENGINEER'S DOCUMENTATION.
 - FOR ALL IRRIGATION DEMOLITION AND CONSTRUCTION INFORMATION REFER TO IRRIGATION DOCUMENTATION AND SPECIFICATION.
 - FOR ALL CONCRETE COMPRESSIVE STRENGTH DETAILS REFER SPECIFICATION.
- DEMOLITION:**
- LANDSCAPE DEMOLITION PLANS INCLUDE ITEMS WITHIN BOUNDARY INDICATED ON SITE L-100 ; AND TREE RETENTION AND DEMOLITION ACROSS THE ENTIRE SITE. REFER TO CIVIL DOCUMENTATION FOR ALL OTHER AREAS AND ITEMS MARKED FOR DEMOLITION.
 - PRIOR TO DEMOLITION TAKING PLACE A WALK THROUGH OF THE DEMOLITION WORKS AREA SHALL BE UNDERTAKEN BY THE SUPERINTENDENT TO CLARIFY THE EXTENT AND REQUIREMENTS OF THE WORKS.
 - ALL EXISTING TREES, THAT ARE DESIGNATED TO BE RETAINED, MUST BE FULLY PROTECTED WITH TREE PROTECTION FENCING ERRECTED BEYOND THE DRIP LINE. FENCING MUST REMAIN IN PLACE FOR THE FULL DURATION OF ALL CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH AS 4970-2009 PROTECTION OF TREES ON DEVELOPMENT SITES.
 - EDGES OF MATERIALS TO BE RETAINED SHALL BE SHORED UP AND PROTECTED DURING CONSTRUCTION.
 - SALVAGE EXISTING FURNITURE ITEMS WITH CARE AND STORE ON SITE. CLEAN ALL DEBRIS AND CONSTRUCTION MATERIAL FROM SALVAGED ITEMS AND NOTIFY SUPER INTENDANT WHEN AVAILABLE FOR COLLECTION.
 - REMOVE ALL DEMOLISHED MATERIALS FROM SITE. DISPOSAL BY BURNING AND/OR BURYING PROHIBITED.
 - THE LOCATION OF EXISTING SERVICES MAY VARY FROM THE DRAWINGS. CONFIRM ALL EXISTING SERVICE LOCATIONS PRIOR TO COMMENCING DEMOLITION.

GRADING:

- REFER TO CIVIL ENGINEER DOCUMENTATION FOR GRADING AND EARTHWORKS

- REFER TO DETAILS FOR IMPORTED SUB-BASE / SOIL PROFILE REQUIREMENTS
- GRADE AREAS THROUGHOUT TO TRUE AND EVEN GRADES AND FALLS TO THE CONTOURS INDICATED ON THE DRAWINGS. FINISH GRADES FLUSH WITH ADJOINING PAVEMENTS AND KERBS EXCEPT WHERE OTHERWISE INDICATED ON THE DRAWINGS.
- GRADE TO PROVIDE EVEN FALLS SO THAT THE SURFACE IS CONSTANTLY SELF-DRAINING, NO IRREGULARITIES, DEPRESSIONS OR ABRUPT CHANGES IN GRADES OR FALLS WILL BE ACCEPTED.

PIT LIDS:

- THE FINAL LOCATION AND ORIENTATION OF PIT LIDS TO BE CONFIRMED BY SUPERINTENDENT PRIOR TO INSTALLATION.
- ALL PIT LIDS TO BE SET SQUARE TO LANDSCAPE GEOMETRY AND ELEMENTS.
- REFER TO LANDSCAPE FINISHES PLANS & LANDSCAPE MATERIAL SCHEDULE FOR SURFACE TYPES TO INFILL TO PIT LIDS.
- PIT LID DETAILS ARE PROVIDED TO SHOW LID INFILL AND EDGE SURROUND REQUIREMENTS ONLY. REFER TO SERVICES ENGINEERS' AND CIVIL ENGINEERS' DOCUMENTATION FOR PIT DIMENSIONS AND FURTHER REQUIREMENTS.
- ALL PITS LOCATED IN PAVEMENTS TO HAVE INFILL COVER. INFILL TO MATCH ADJOINING PAVEMENT.
- ALL PIT LIDS IN GARDEN BEDS SHALL HAVE DUCTILE IRON LIDS. ALL CONCRETE SURROUNDS SHALL BE SUBSURFACE AND CONCEALED BELOW GARDEN MULCH LEVEL.
- ALL PIT LIDS SHALL BE INSTALLED TO MEET FINISHED LEVELS AND CROSS-FALLS, REFER TO CIVIL ENGINEER'S DESIGN.
- CONTRACTOR TO ALLOW FOR RAISING / LOWERING ALL PIT LIDS TO MEET PROPOSED LEVELS.
- REFER TO CIVIL, ELECTRICAL AND MECHANICAL ENGINEER'S DOCUMENTATION FOR PIT LID REQUIREMENTS IN ROAD WAYS.
- SEWER PIT LIDS TO COMPLY WITH WATER CORPORATION REQUIREMENTS. REFER TO CIVIL DESIGN
- PIT LID CONCRETE INFILL SUBSTRATE TO BE LIGHTWEIGHT CONCRETE.
- IT IS THE RESPONSIBILITY OF THE HEAD CONTRACTOR TO ENSURE THAT PIT LID INFILL REQUIREMENTS ARE ACHIEVED WITH A CONSISTENCY OF FINISH ACROSS THE ENTIRE PROJECT.

WALLS:

- ALL FORMWORK TO BE DESIGNED TO CARRY LOADS TO AVOID BOWING, BUILDING, SAG OR OTHER DISTORTIONS.
- TOPS OF WALLS TO SLOPE (1%) TOWARDS SOFT SURFACES TO AVOID WATER POOLING.
- TIE ROD HOLES TO BE SET OUT TO ACHIEVE A UNIFORM PATTERN / APPEARANCE.
- WHERE CONTROL JOINTS HAVE NOT BEEN NOMINATED JOINTS TO BE EVENLY SPACED AT SPECIFIED INTERVALS.
- ENSURE CONSISTENT ORIENTATION AND SPACING OF FORMWORK TO ACHIEVE UNIFORM FINISH.
- WALLS TO BE PROTECTED FOR THE DURATION OF THE WORKS.
- DAMAGED WALL SURFACES TO BE MADE GOOD. METHOD TO BE AGREED WITH THE SUPER INTENDANT PRIOR TO APPLICATION.

SURFACE FINISHES:

- CONTRACTOR TO SET OUT ALL HARD LANDSCAPE ELEMENTS AND VERIFY WITH SUPERINTENDENT PRIOR TO CONSTRUCTION. ANY DISCREPANCIES OR CONFLICTS WITH EXISTING CONDITIONS TO BE REPORTED IMMEDIATELY.
- CONTRACTOR TO INSTALL EXPANSION JOINTS AS DOCUMENTED WHERE PAVEMENT MEETS VERTICAL STRUCTURES SUCH AS WALLS, KERBS, STEPS, FURNITURE, LIGHTING AND BUILDING ELEMENTS WHERE NOT DOCUMENTED.
- ALL UNRESTRAINED PAVING EDGES TO HAVE CONCEALED CONCRETE HAUNCH AS DOCUMENTED
- CLOSURE RULE: WHEREVER THE END OF A PAVING RUN WOULD RESULT IN A PAVERS LESS THAN 1/3 FULL SIZE, CUT 2 PAVERS IN EQUAL LENGTHS TO CLOSE OUT THE RUN.
- ALL PEDESTRIAN TRAFFICABLE SURFACES ARE TO COMPLY WITH AS1428.1 FOR VERTICAL TOLERANCES.
- ALL PAVEMENT TO COMPLY WITH AS/NZS 4586 & 4663 FOR SLIP RESISTANCE AND MEET "W" AND "R10" CLASSIFICATIONS FOR PEDESTRIAN SURFACES.
- WHERE SERVICE RUNS ARE REQUIRED THROUGH EXISTING HARD AND SOFT LANDSCAPE, FINISHES ARE TO BE MADE GOOD AT COMPLETION OF WORKS TO MATCH EXISTING.
- SUB BASE - REFER TO CIVIL ENGINEER FOR SUB BASE DETAILS.
- KERBING - REFER TO CIVIL DRAWINGS AND SPECS FOR ALL KERBING DETAILS
- ASPHALT- REFER TO CIVIL DRAWINGS AND SPECS FOR TYPICAL DETAILS AND SUB-BASE PROFILE

TIMBER DECKING:

- ALL FIXINGS TO BE STAINLESS STEEL.
- ALL EXPOSED FIXINGS TO BE COUNTER SUNK INTO TIMBER.
- 5MM SPACING BETWEEN DECKING BOARDS UNLESS NOTED OTHERWISE.
- TIMBER QUALITY: FREE OF SPLITS, CHECKS, LOOSE KNOTS AND CAVITIES.
- SUBFRAME OF TIMBER DECKS/BOARDWALK TO HAVE BLACK PAINTED FINISH

FURNITURE:

- ENSURE THAT ALL FURNITURE IS STABLE, SAFE, CLEAN AND FIT FOR USE.
- ALL FURNITURE SHALL BE INSTALLED PLUMB AND LEVEL UNLESS SPECIFIED OTHERWISE.
- ALL FIXINGS, CONDUITS AND FOUNDATIONS TO BE CONCEALED AND VANDAL RESISTANT.
- FURNITURE TO BE MANUFACTURED IN ACCORDANCE WITH CURRENT AUSTRALIAN STANDARDS TO WHICH STREET FURNITURE MANUFACTURING MUST COMPLY.
- THE CONTRACTOR MUST ENSURE THAT ALL ITEMS OF FURNITURE ARE PROTECTED FROM DAMAGE DURING HANDLING, TRANSPORTATION, INSTALLATION AND FOR THE DURATION OF THE WORKS.
- FULL SHOP DRAWINGS ARE TO BE PROVIDED FOR CUSTOM FURNITURE FOR APPROVAL BY SUPERINTENDENT AND STRUCTURAL / CIVIL ENGINEER BEFORE MANUFACTURE AND INSTALLATION OF ELEMENTS.
- SHOP DRAWINGS TO INCLUDE A 3D DIGITAL MODEL SHOWING ALL MATERIAL INTERFACES, JOINTS, JUNCTIONS AND TIMBER SIZES.
- SHOP DRAWINGS TO INDICATE LOCATION OF WELDED JOINS. WELDED JOINTS TO BE FABRICATED WITH LASER CUT SEAMS, FULLY WELDED AND GROUND BACK TO SMOOTH.
- WHERE FIXINGS TYPES OR STRUCTURAL SPACINGS HAVE NOT BEEN NOMINATED CONTRACTOR TO ENSURE THAT AN ENGINEER HAS APPROVED ANY SIZINGS AND SPACINGS INSTALLED.
- CONTRACTOR TO SUPPLY AND INSTALL ALL SCREWS, BOLTS, NUTS, WASHERS, HINGES, LOCKS AND FIXINGS REQUIRED.
- ALL DIMENSIONS, EXISTING LEVELS AND EXISTING SERVICES SHALL BE VERIFIED BY CONTRACTOR AND SUB-CONTRACTORS ON SITE PRIOR TO THE PREPARATION OF SHOP DRAWINGS AND FABRICATION OF FURNITURE TO ENSURE FURNITURE ELEMENTS ARE COORDINATED WITH AS CONSTRUCTED FINISHES.
- ARCHITECTURAL STEEL PANELS TO BE FABRICATED AFTER GRADING/PAVING WORKS AND SUB-STRUCTURE HAVE BEEN COMPLETED TO ENSURE PANELS ALIGN NEATLY WITH FINISHES. SITE MEASURE AND TEMPLATES ARE TO BE PREPARED & APPROVED BY SUPERINTENDENT.
- ALL HARDWOOD TIMBER TO BE SUPPLIED AND INSTALLED AS DURABLE CLASS 1 UNLESS OTHERWISE STATED IN THE SPECIFICATION.
- ALL TIMBER CONNECTIONS TO BE MITRE JOINTS UNLESS OTHERWISE SPECIFIED.

SHADE CANOPIES:

- ALL DIMENSIONS, EXISTING LEVELS AND EXISTING SERVICES SHALL BE VERIFIED BY CONTRACTOR AND SUB-CONTRACTORS ON SITE PRIOR TO THE PREPARATION OF SHOP DRAWINGS AND FABRICATION OF SHADE STRUCTURES TO ENSURE FURNITURE ELEMENTS ARE COORDINATED WITH AS CONSTRUCTED FINISHES.
- ALL STEEL WORK TO BE PAINT TREATED IN ACCORDANCE WITH APPENDIX A OF THE MATERIAL SCHEDULE & SPECIFICATION UNLESS NOTED OTHERWISE (U.N.O.)
- ALL WELDS TO BE FULL SEAM (F.S) U.N.O.
- PRE-DRILL ALL HOLES PRIOR TO GALVANISING OF STEEL.
- ALL STEEL WORK TO BE PAINT FINISHED. REFER TO LANDSCAPE MATERIAL SCHEDULE FOR COLOUR.
- ALL FLASHINGS TO BE .8MM ZINCALUME WITH COLOURBOND PAINT FINISH TO MATCH FASCIA BEAM.
- ALL FASTENERS AND FIXINGS TO BE EITHER PAINT TREATED IN ACCORDANCE WITH APPENDIX A OF THE MATERIAL SCHEDULE & SPECIFICATION OR 316 GRADE STAINLESS STEEL. REFER TO DRAWINGS FOR FIXING TYPES.
- ALL SCREW FIXINGS TO BE COUNTERSUNK AND SEALED U.N.O.
- ALL NUT AND BOLT ASSEMBLIES TO INCLUDE APPROPRIATELY SIZED WASHERS BETWEEN FASTENER AND MEMBER.
- ALL TIMBERWORK TO COMPLY WITH AS 1684 FOR STRUCTURAL TIMBER FRAMING .
- ALL FIXINGS INTO TIMBER TO BE PRE-DRILLED.
- COLUMN SETOUT TO BE UNDERTAKEN DIGITALLY BY A LICENSED SURVEYOR.
- ALL FOOTINGS, BASEPLATES AND FIXINGS TO BE SUBSURFACE AND CONCEALED & INCLUDE 'DULUX DUREMAX GPE ZINC PHOSPHATE- PC215' OR EQUAL APPLIED TO MANUFACTURER'S SPECIFICATION.
- FULL SHOP DRAWINGS ARE TO BE PROVIDED FOR CUSTOM FURNITURE FOR APPROVAL BY SUPERINTENDENT AND STRUCTURAL / CIVIL ENGINEER BEFORE MANUFACTURE AND INSTALLATION OF ELEMENTS.
- SHOP DRAWINGS TO INCLUDE A 3D DIGITAL MODEL SHOWING ALL MATERIAL INTERFACES, JOINTS, JUNCTIONS AND TIMBER SIZES.
- REFER TO THE ELECTRICAL ENGINEER'S DOCUMENTATION FOR LIGHTING REQUIREMENTS.

PLANTING:

- REFER TO PLANTING SCHEDULE FOR SPECIES
- EXACT LOCATIONS OF PLANT MATERIALS SHALL BE REVIEWED BY THE SUPERINTENDENT PRIOR TO INSTALLATION. THE SUPERINTENDENT RESERVES THE RIGHT TO ADJUST PLANTS TO EXACT LOCATIONS IN THE FIELD.
- CONTRACTOR TO ENSURE ALL TREES TO BE PLANTED 1M FROM KERB OR FOOTPATH AND 1.5M FROM CROSS OVER.
- LANDSCAPE CONTRACTOR IS TO PEG ALL TREE LOCATIONS TO THE SUPERINTENDENT'S APPROVAL PRIOR TO INSTALLATION.
- PROVIDE MATCHING FORMS AND SIZES FOR PLANT MATERIAL WITHIN EACH SPECIES AND SIZE NOMINATED.
- FINISHED SURFACE LEVEL OF PLANTING AREAS TO BE SET 50MM BELOW PAVING OR TOP OF WALL LEVELS UNLESS NOTED OTHERWISE.
- SUPERINTENDENT TO REVIEW ALL PLANT MATERIALS AT SOURCE OR BY PHOTOGRAPH PRIOR TO DIGGING AND DELIVERY TO SITE.
- PRIOR TO INSTALLATION OF PLANTING AND IRRIGATION CONTRACTOR TO PREPARE SOIL AS SPECIFIED.
- CONTRACTOR TO MAINTAIN THE TREES, AND IF ANY DIE OR SHOW SIGNIFICANT ILL HEALTH, REPLACE THE TREES FOR THE FIRST 12 MONTHS.

TURF:

- TOPSOIL SHALL BE UNIFORMLY GRADED TO EVEN-RUNNING CONTOURS, SO THAT NO PONDING OR WATERLOGGING OCCURS ACROSS THE SURFACE OF THE GRASSED AREA AND RAKED BEFORE TURF IS LAID.
- TURF SHALL BE LAID IN STRAIGHT LINES WITH STAGGERED CROSS JOINTS ON THE GENERAL LINE OF THE CONTOUR OF THE SLOPE. THE GAPS BETWEEN ADJACENT SECTIONS OF TURF SHOULD NOT EXCEED 5MM.
- ACCEPTANCE SHALL BE THE ACHIEVEMENT OF AN EVEN GREEN COLOUR WITH A DENSE CONTINUOUS SWARD OVER THE WHOLE AREA. TURF SHALL EXHIBIT SIGNS OF HEALTHY GROWTH AND SHALL BE FREE OF WEEDS, STONES, STICKS AND OTHER DELETERIOUS MATERIAL. MAXIMUM DEVIATION FROM FINISHED GROUND LEVELS 50MM IN ANY 2 METRES.

EXISTING TREES:

- ALL TREES TO BE REVIEWED BY SUPERINTENDENT BEFORE ANY ARE REMOVED BY THE CONTRACTOR.
- RETENTION AND REMOVAL PLANS ARE PERTAINING TO TREES ON SITE ONLY. ANY OTHER EXISTING STRUCTURES SUCH AS FENCING, CONCRETE AND BOLLARDS TO BE REMOVED.
- STUMPS RESULTING FROM REMOVED TREES TO BE REMOVED ENTIRELY IF POSSIBLE, OR GROUND DOWN 500 MM BELOW EXISTING SURFACE LEVEL.
- PRUNING OF EXISTING MATURE TREES MUST BE UNDERTAKEN BY AN ARBORIST APPROVED BY LANDSCAPE ARCHITECT. LIMBS NOMINATED FOR PRUNING TO BE APPROVED BY LANDSCAPE ARCHITECT ON SITE PRIOR TO REMOVAL.
- ALL EXISTING TREES, THAT ARE DESIGNATED TO BE RETAINED, MUST BE FULLY PROTECTED WITH TREE PROTECTION FENCING ERRECTED BEYOND THE DRIP LINE. FENCING MUST REMAIN IN PLACE FOR THE FULL DURATION OF ALL CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH AS 4970-2009 'PROTECTION OF TREES ON DEVELOPMENT SITES'.
- NO CONSTRUCTION EQUIPMENT OR MOTORISED VEHICLES ARE PERMITTED WITHIN THE TREE PROTECTION ZONE AND ALL TREE PROTECTION

MATURE TREE TRANSPLANT:

- TREE PREPARATION AND TRANSPLANTING TO BE UNDERTAKEN BY A SUITABLE QUALIFIED ARBORICULTURALIST.
- CONTRACTOR TO ALLOW FOR COORDINATION OF THE WORK WITH ARBORICULTURALIST AND TRAFFIC MANAGEMENT (AS/IF REQUIRED)
- THE CONTRACTOR TO ALLOW FOR ALL WATERING SYSTEMS DURING CONSTRUCTION WORK (TEMPORARY AND FIXED SYSTEMS) OF ALL MATURE TREES AND HAND WATERING FOR THE DURATION OF ANY FAILURE TO THE WATERING SYSTEM.
- FINAL ORIENTATION OF TREE TO BE APPROVED BY SUPERINTENDENT PRIOR TO INSTALLATION.
- CONTRACTOR IS RESPONSIBLE FOR RELOCATION OF ON-SITE BELOW GROUND SERVICES NOT IDENTIFIED IN THE SERVICES INFORMATION PROVIDED PRIOR TO TREE INSTALLATION.
- CABLE LOCATION, IF REQUIRED (WHEN WORKING IN THE NEAR VICINITY OF MAJOR SERVICE LINES/CABLES & NON-LOCATABLE SERVICES), IF WITHIN 15M OF A HP GAS MAIN A QUALIFIED SPOTTER MUST BE PROVIDED FOR EXCAVATION TO OCCUR.
- CONTRACTOR RESPONSIBLE FOR IDENTIFYING ALL ON-SITE BELOW GROUND SERVICES WITHIN THE EFFECTIVE WORK ZONE FOR ARBOR CENTRE.
- CONTRACTOR TO CONFIRM THE EXISTENCE AND LOCATION OF ANY LINERS AND SOAK WELLS IN THE VICINITY.
- ACCESS TO BE PROVIDED TO REQUIRED LOCATIONS TO CARRY OUT INSTALLATION (INCLUDING 3 TONNE EXCAVATOR TO EXTRACTION AND PLANTING HOLE LOCATIONS)
- ELECTRICAL CONDUITS FOR LIGHTS (IF REQUIRED) TO BE INTEGRATED WITH ROOT BALL OF TRANSPLANTED TREES BY ARBORICULTURIST PRIOR TO PLANTING. REFER TO ELECTRICAL ENGINEER'S DOCUMENTATION FOR FURTHER DETAIL.
- CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF SPOIL.
- CONTRACTOR SHALL ENSURE THAT IRRIGATION WATERING TO THE TRANSPLANT TREES IS AVAILABLE ON INSTALLATION OF TREES.
- CONTRACTOR SHALL LIAISE WITH ARBORICULTURIST TO ENSURE THAT PLANTING HOLES AND IN-GROUND GUYING DON'T CONFLICT WITH PROPOSED AND EXISTING SERVICES.
- GUYING SPECIFIED ARE TO COMPLY WITH THE AUSTRALIAN LOADING CODE FOR WINDS APPLICABLE TO PERTH (AS 1170.2:2014). (SUPPLY BY ARBOR CENTRE)
- INSTALLATION OF AERATION LAYER TO BE INITIATED UNDER THE SUPERVISION OF THE PROJECT ARBORICULTURIST
- CONTRACTOR SHALL ENSURE CARE IS TAKEN WHEN POURING FINISHING CONCRETE TO AVOID CONTAMINATION OF TREE PIT.



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CLIENT
SHIRE OF MERREDIN
BARRACK STREET
MERREDIN
6415, WESTERN AUSTRALIA

DRN BY	NP			
START DATE	SEPT 21			
DESIGNED	NP			
CHECKED	SS			
GENERAL NOTES				
REFER TO L002				
A	15.03.22	ISSUE FOR TENDER	RT	NP
REV	DATE	REVISION	DRN	CHK

PLACE LAB PROJ No	2139	SCALE:	mm
DWG STATUS	----	SHEET SIZE	A1
DWG No	L-001	ISSUE	A

MERREDIN CBD-STAGE 1A

GENERAL NOTES

CODE	BOTANICAL NAME	COMMON NAME	POT SIZE	HATCH
TREES				
BAN gra	Banksia grandis	Banksia grandis	100lt	
EUC cae	Eucalyptus caesia	Silver princess	100lt	8
EUC cla	Eucalyptus cladocalyx dwarf sugar gum	Sugar gum	100lt	
EUC lox	Eucalyptus loxophleba	York gum	100lt	
EUC mac	Eucalyptus macrocarpa	Mottlecak	100lt	8
EUC spa	Eucalyptus spathulata	narrow leaved Gimlet	100lt	11
EUC sal	Eucalyptus salubris	Gimlet	100lt	18
EUC tor	Eucalyptus torquata	Coral gum	100lt	12
EUC woo	Eucalyptus woodwardii	Yellow flowered gum	100lt	2
EUC vic	Eucalyptus victrix	Coolibah	100lt	15
FRA ray	Fraxinus raywoodii	'Claret Ash'	100lt	
HAK lau	Hakea laurina	Pin cushion hakea	45lt	8
MEL leu	Melaleuca leucadendra	Weeping paperbark	100lt	
SHI mol	Schinus molle	Peruvian pepper	100lt	1
QUE pal	Quercus palustris	Pin oak	200lt	1
GRASSES (4 per m2)				
FIC nod	Ficinia Nodosa	Club-rush	140mm	
LEP gla	Lepidosperma gladiatum	Rush	140mm	
JUN kra	Juncus Kraussii	Salt marsh rush	140mm	
GROUNDCOVERS (3 per m2)				
ACA sal	Acacia saligna 'prostrate'	Prostrate slatbush	140mm	
ATR sem	Atriplex semibaccata	Saltbush	140mm	
BAN niv	Banksia nivea	Couch honeypot	140mm	
BRA spe	Brachyscombe	Australian daisies	140mm	
ERE gla	Eremophila glabra prostrata	Kalbarri carpet	140mm	
GRE gin	Grevillea Gin Gin Gem	Gin Gin Gem	140mm	
HIB sca	Hibbertia scandens	snakevine	140mm	
HEM pun	Hemiandra pungens	snake bush	140mm	
KEN pro	Kennedia prostrata	Running postman	140mm	
LEU spe	Leucadendron species	under 1.5m	200mm	
MYO spe	Myoporum species		140mm	
SHRUBS (3 per m2)				
ATR amn	Atriplex Amnicola	River Saltbush	140mm	
CAL qua	Calothamnus quadrifidus	One sided bottlebrush	140mm	
CON sto	Conospermum stoechadis	smokebush	140mm	
ENC tom	Enchylaena tomentosa	Ruby Saltbush	140mm	
ERE rub	Eremophila Ruby Red	Ruby Red	140mm	
HYP ang	Hypocalymma angustifolium	white myrtle	140mm	
MEL sca	Melaleuca scabra	rough honey-myrtle	140mm	
KUN bax	Kunzea baxteri	Dward Mandy's Surprise PBR	140mm	
WES fru	WESTRINGIA fruticosa	Coastal rosemary	140mm	
VER plu	Verticordia plumosa	Plumed Featherflower	140mm	
WILDFLOWER WALK MIX				
WFR mix	Anigozanthus manglesii	Kangaroo Paw	Seed	
	Brachycombe iberidifolia	Swan River Daisy	Seed	
	Patersonia occidentalis	Purple Flag	Seed	
	Schoenia cassiniana	Pink Everlasting	Seed	
	Rhodanthe manglesii	Everlasting Dwarf Mix	Seed	
	Xerochrysum bracteatum	Golden Everlasting	Seed	

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DRN BY	NP			
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REFER TO L002				
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MERREDIN CBD-STAGE 1A

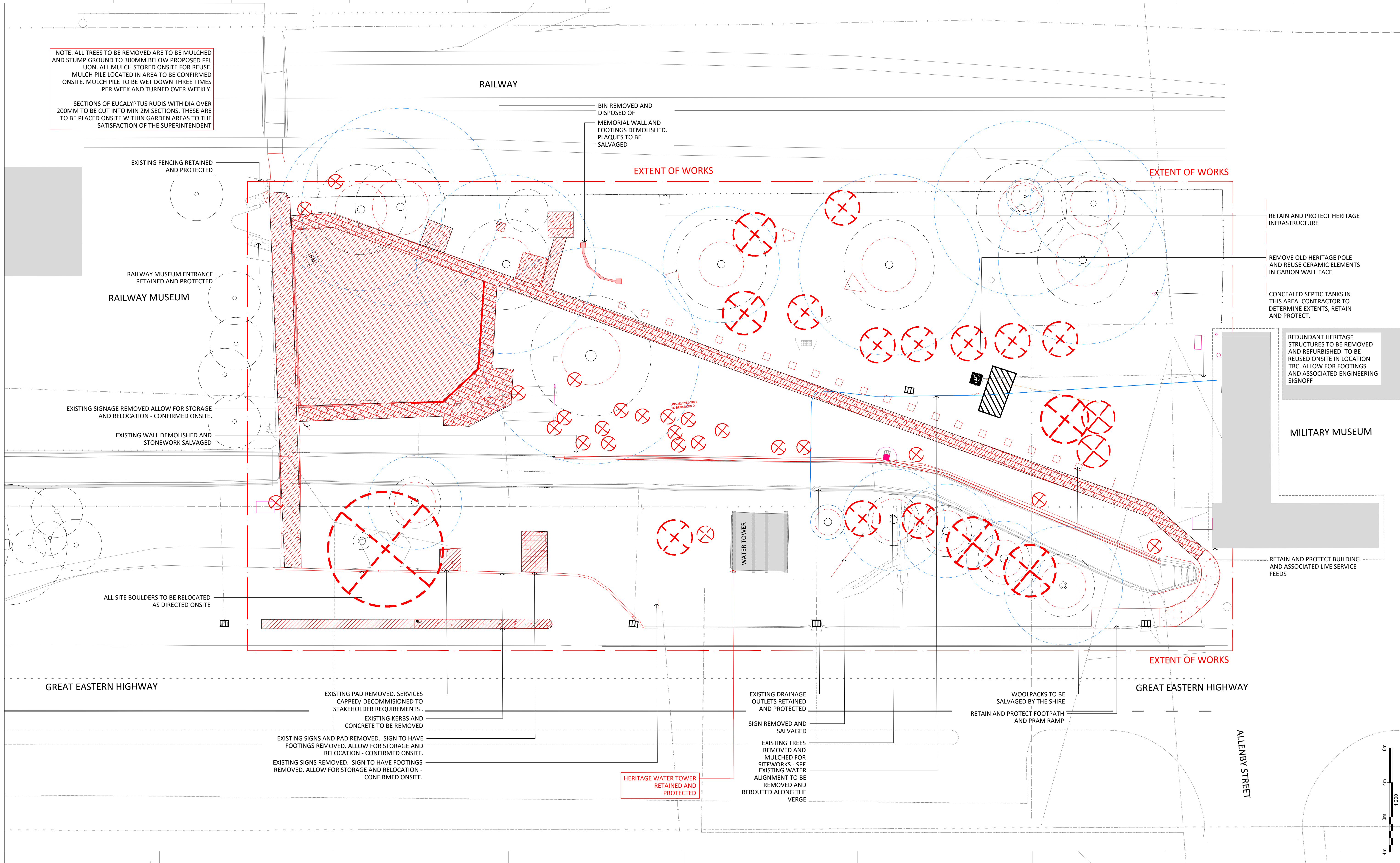
PLANT SCHEDULE

PLACE LAB PROJ No 2139
DWG STATUS ----
DWG No L-002

SCALE: UNIT: mm
SHEET SIZE A1
ISSUE A

NOTE: ALL TREES TO BE REMOVED ARE TO BE MULCHED AND STUMP GROUND TO 300MM BELOW PROPOSED FFL UON. ALL MULCH STORED ONSITE FOR REUSE. MULCH PILE LOCATED IN AREA TO BE CONFIRMED ONSITE. MULCH PILE TO BE WET DOWN THREE TIMES PER WEEK AND TURNED OVER WEEKLY.

SECTIONS OF EUCALYPTUS RUDIS WITH DIA OVER 200MM TO BE CUT INTO MIN 2M SECTIONS. THESE ARE TO BE PLACED ONSITE WITHIN GARDEN AREAS TO THE SATISFACTION OF THE SUPERINTENDENT



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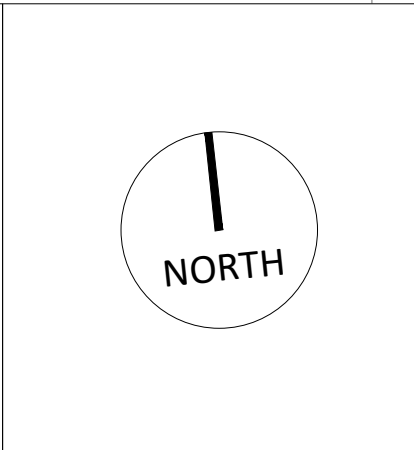
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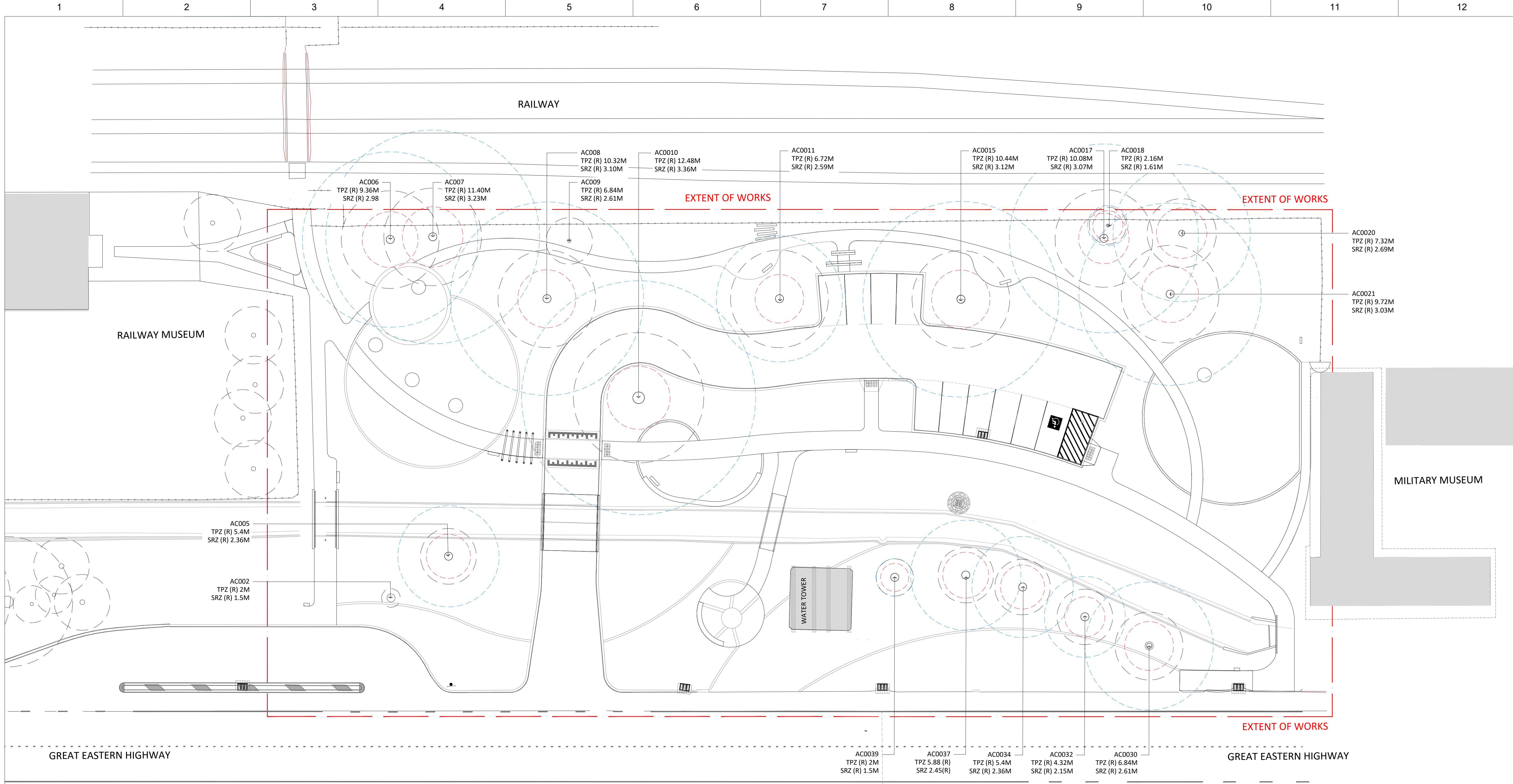
MERREDIN CBD-STAGE 1A

DEMOLITION PLAN

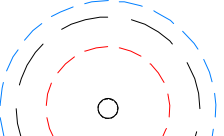
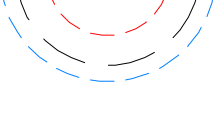
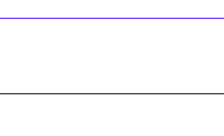
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DWG STATUS ---
DWG No L-100

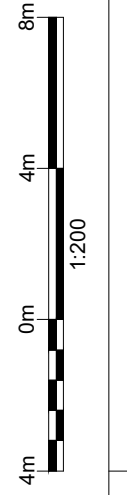
SCALE: 1:200
UNIT: mm
SHEET SIZE A1

ISSUE A



KEY

-  EXISTING TREE (TO BE RETAINED)
-  TREE PROTECTION ZONE (TPZ)
-  STRUCTURAL ROOT ZONE (SRZ)
- REFER TECHNICAL SPECIFICATION



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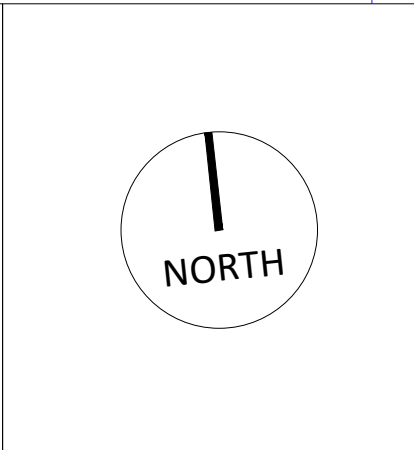
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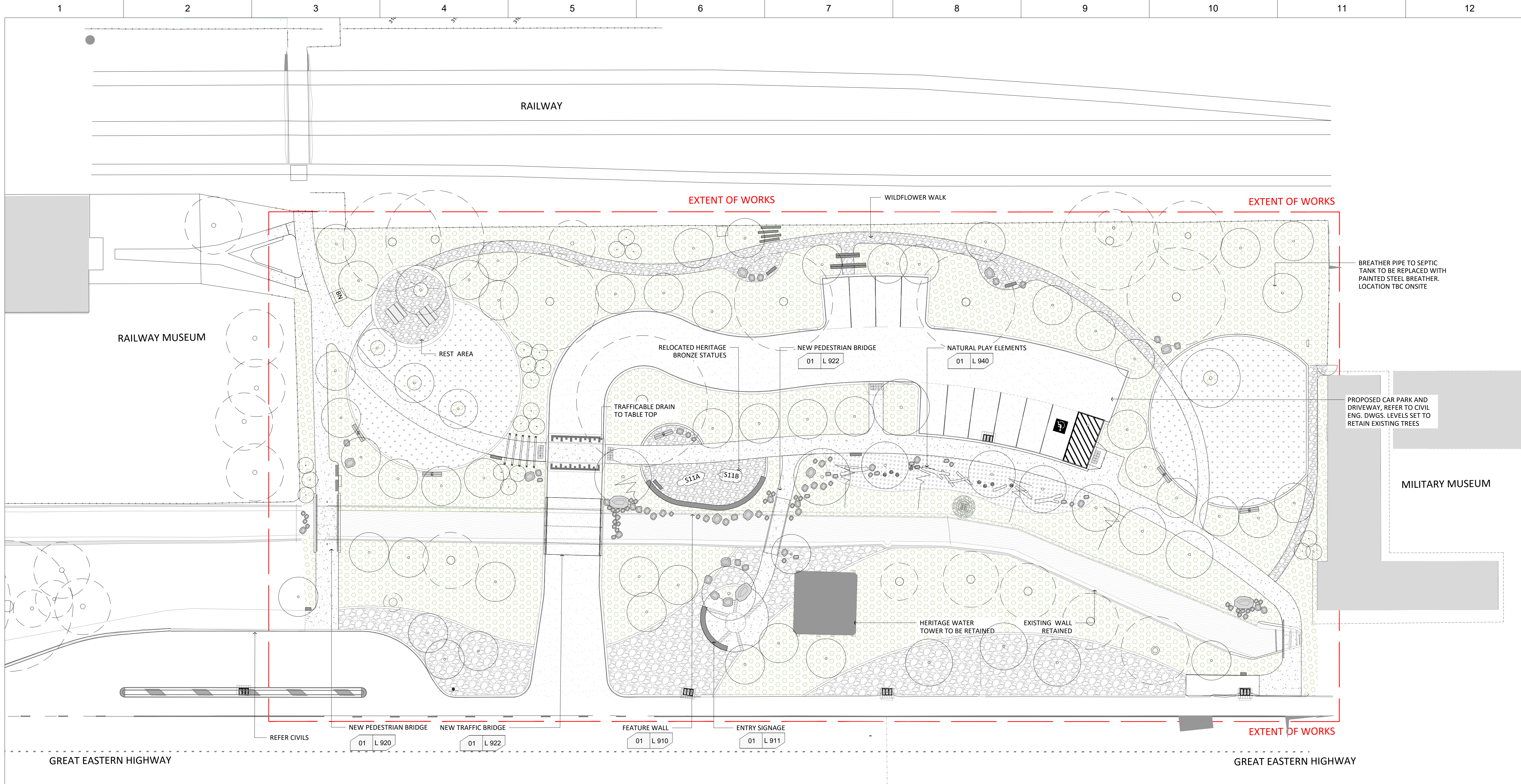
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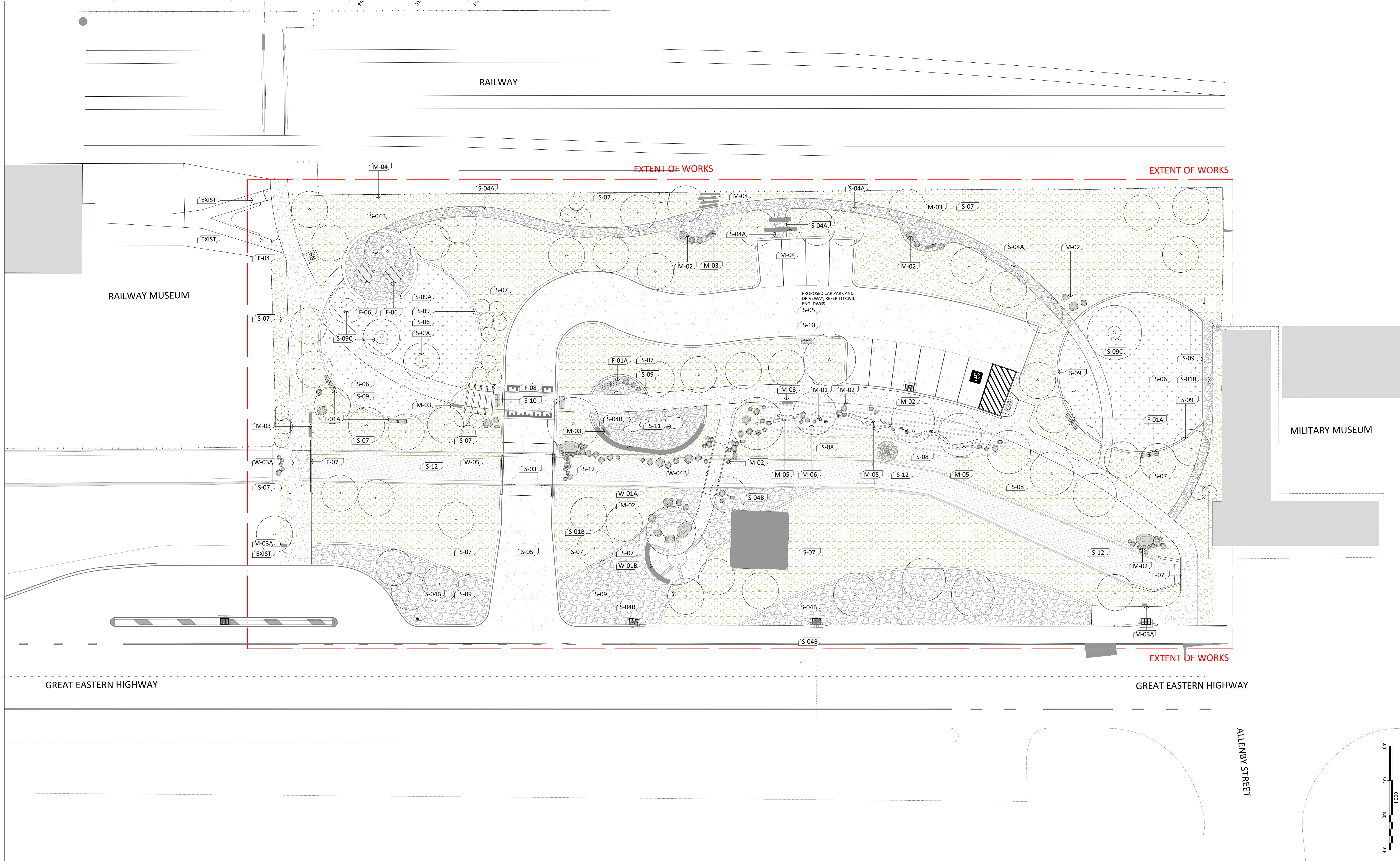
MERREDIN CBD-STAGE 1A

TREE PROTECTION PLAN

PLACE LAB PROJ No	2139	SCALE:	1:200
DWG STATUS	---	UNIT:	mm
DWG No	L-110	SHEET SIZE	A1
		ISSUE	A



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					<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISION</th> <th>DRN</th> <th>CHK</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>15.03.22</td> <td>ISSUE FOR TENDER</td> <td>RT</td> <td>NP</td> </tr> </tbody> </table>	REV	DATE	REVISION	DRN	CHK	A
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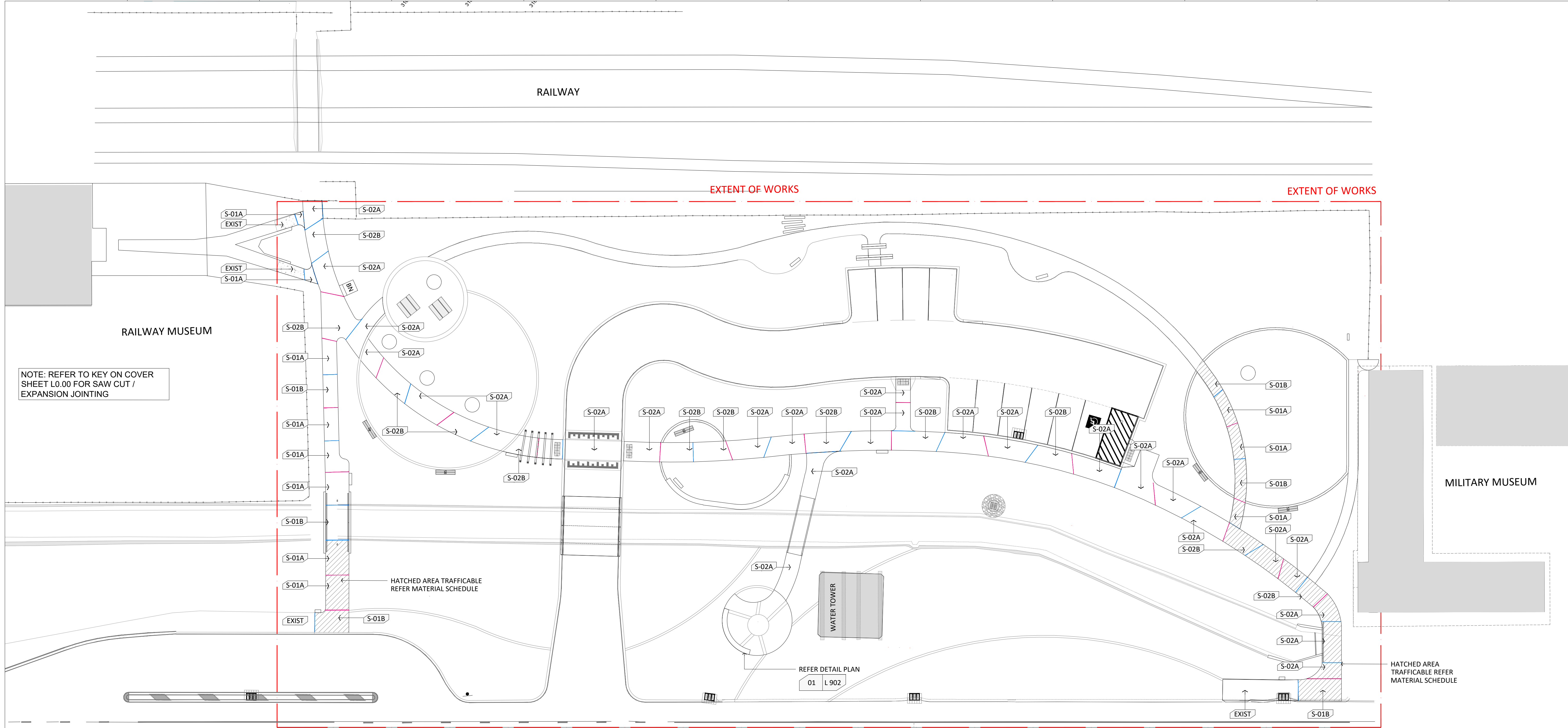
DRN BY: NP
START DATE: SEPT 21
DESIGNED: NP
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GENERAL NOTES
REFER TO L002

MERREDIN CBD-STAGE 1A
FINISHES PLAN

PLACE LAB PROJ No: 2139
DWG STATUS: ---
DWG No: L-400

SCALE: 1:200
UNIT: mm
SHEET SIZE: A1
ISSUE: A



EXTENT OF WORKS

IMPRINT IMAGERY ARE INDICATIVE ONLY. 25% OF THE PANEL AREA TO HAVE IMPRINTED MATERIAL. CONTRACTOR TO COLLECT PRESSED MATERIALS FOR IMPRINTING AND SUBMIT TYPICAL SAMPLES FOR APPROVAL PRIOR TO SAMPLE PANELS BEING INSTALLED FOR APPROVAL. REFER MATERIAL SCHEDULE

S-01B
S-02B

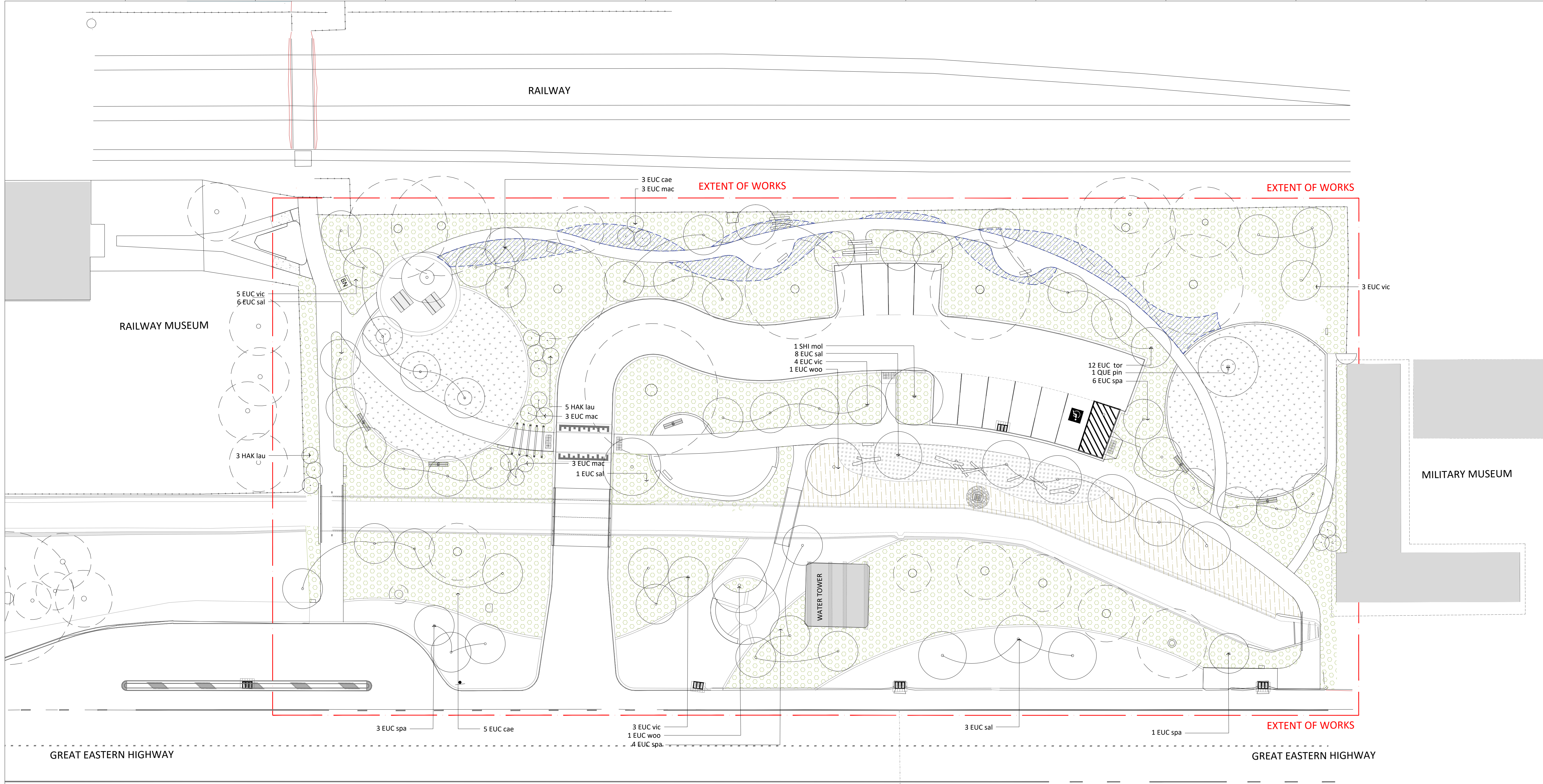
PANEL TYPE A - PRESSED WHEAT

PANEL TYPE B - PRESSED FEATHERS

PANEL TYPE C - PRESSED LOCAL VEGETATION

PANEL TYPE D - PRESSED POPPIES / OLIVES / ROSEMARY

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						GENERAL NOTES REFER TO L002		PLACE LAB PROJ No: 2139 DWG STATUS: --- DWG No: L-401	SCALE: 1:200 UNIT: mm SHEET SIZE: A1 ISSUE: A							
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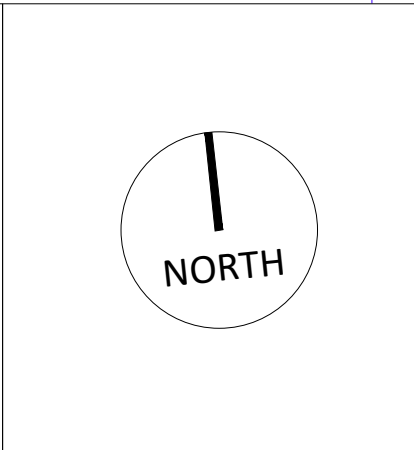
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GENERAL NOTES	
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MERREDIN CBD-STAGE 1A

PLANTING PLAN

PLACE LAB PROJ No 2139
DWG STATUS ---
DWG No L-500

SCALE: 1:200
UNIT: mm
SHEET SIZE A1
ISSUE A



AA SECTION
1:50



BB DETAIL SECTION
1:50

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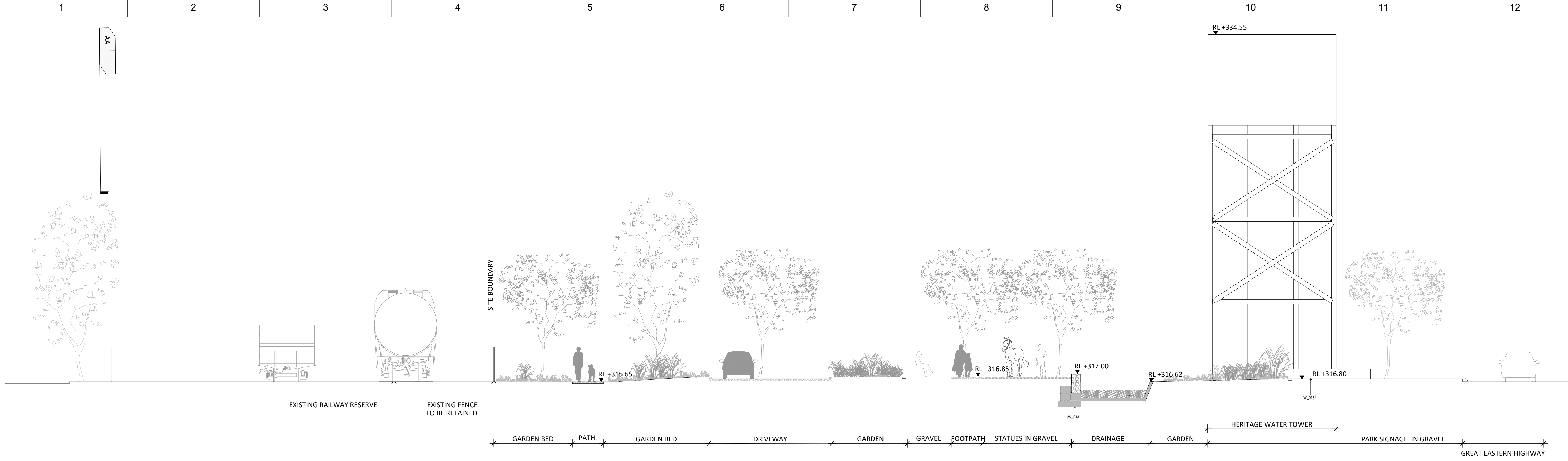
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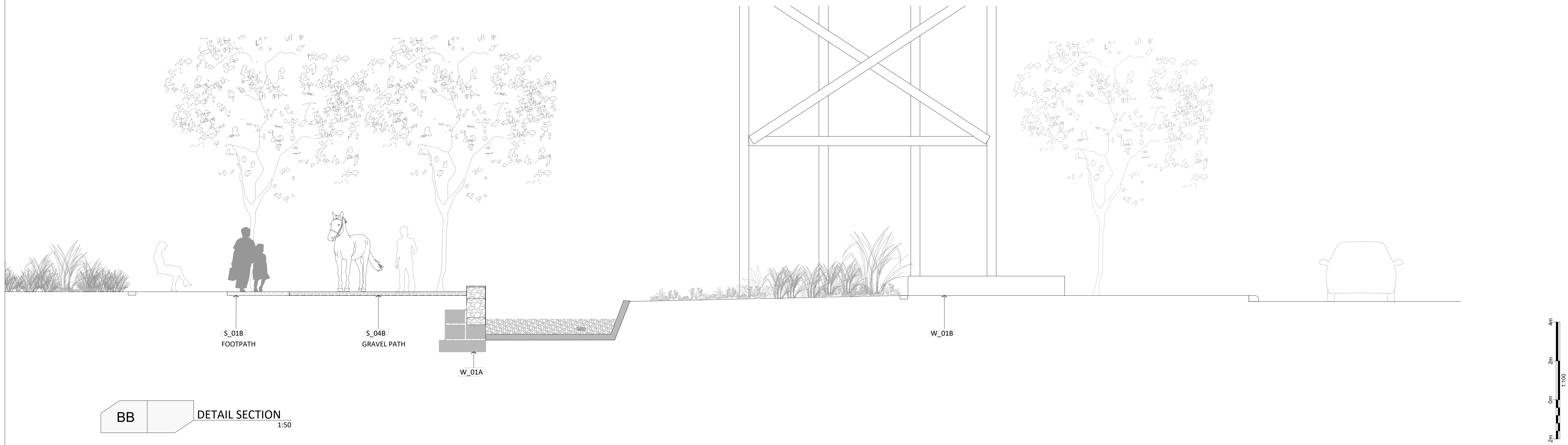
MERREDIN CBD-STAGE 1A

SECTIONS

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DWG STATUS	----	UNIT:	mm
DWG No	L-800	SHEET SIZE	A1
		ISSUE	A



AA SECTION 1:50



BB DETAIL SECTION 1:50

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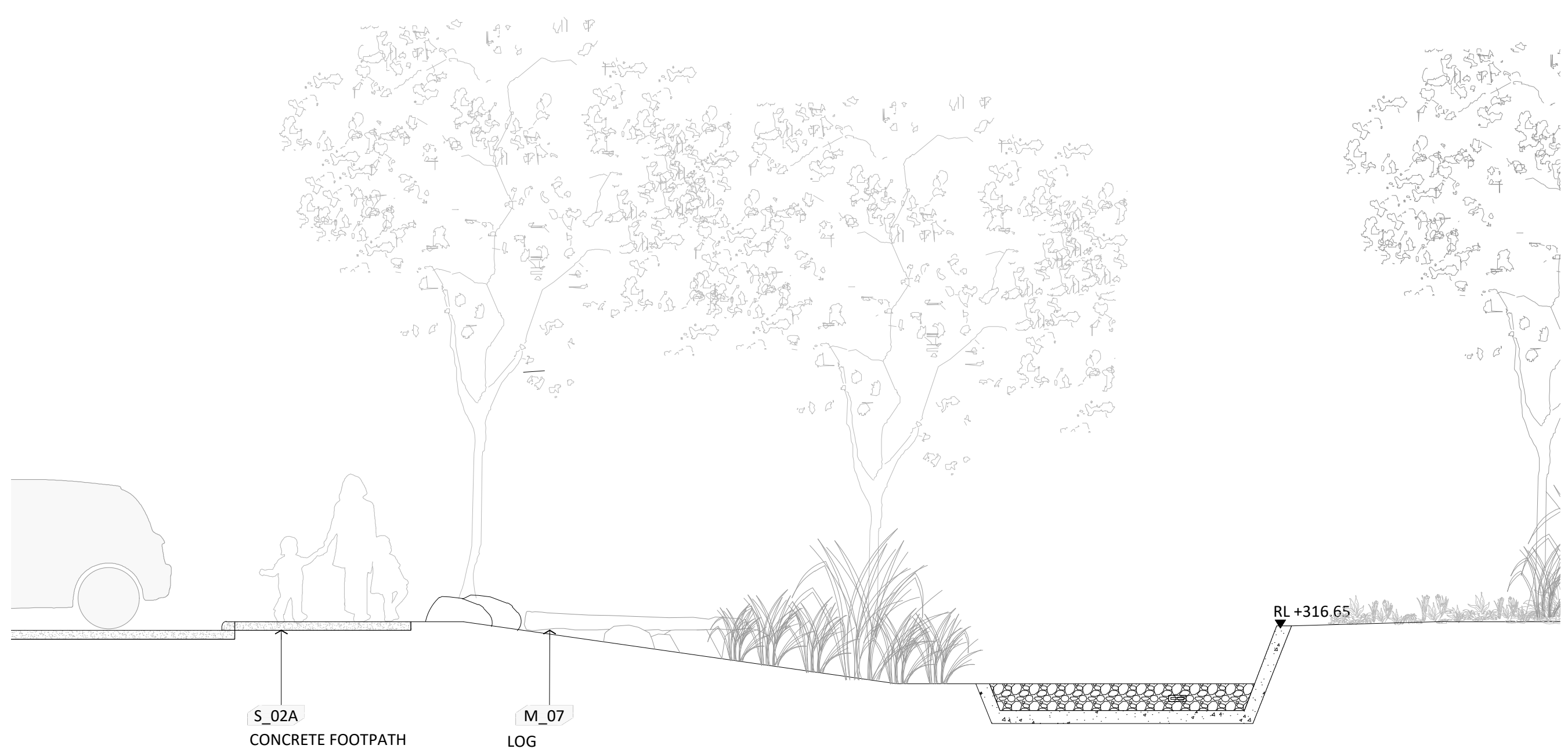
MERREDIN CBD-STAGE 1A

SECTIONS

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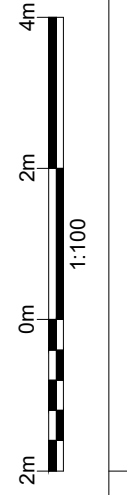


AA SECTION 1:50



BB DETAIL SECTION 1:50

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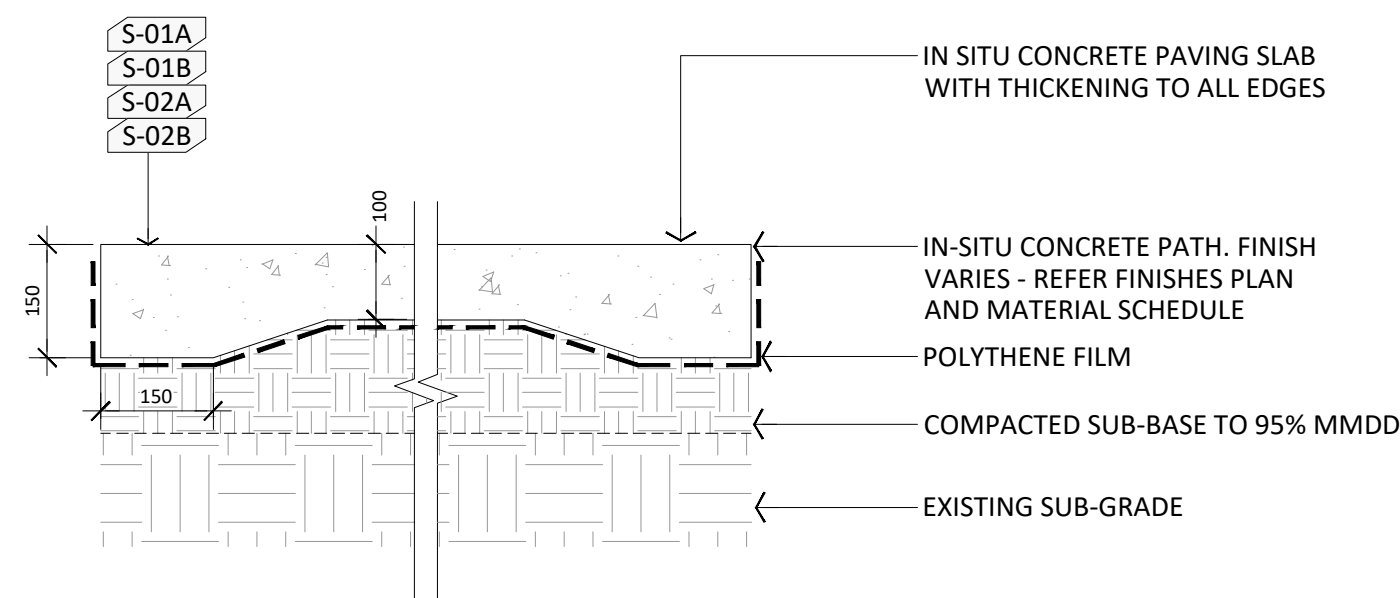
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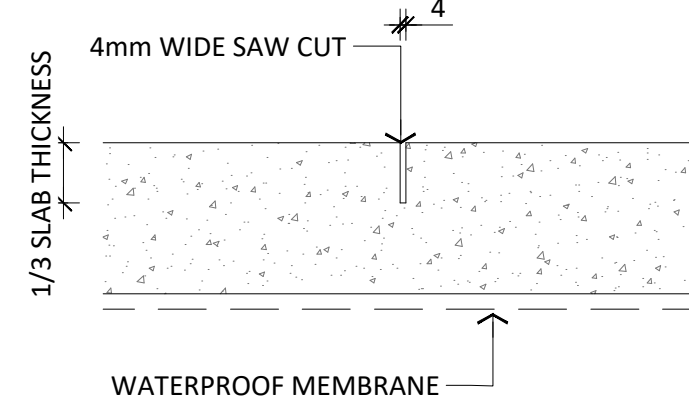
MERREDIN CBD-STAGE 1A

SECTIONS

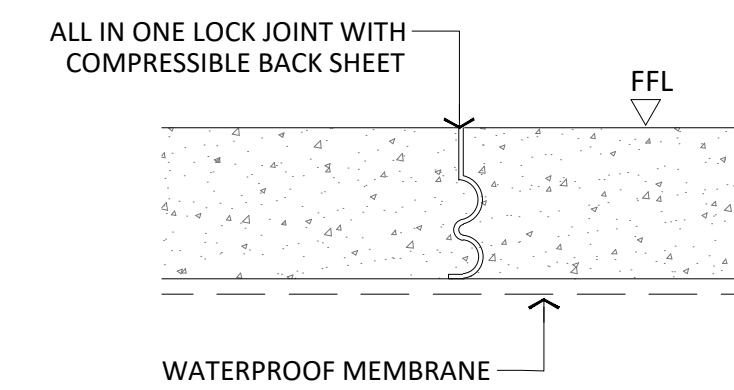
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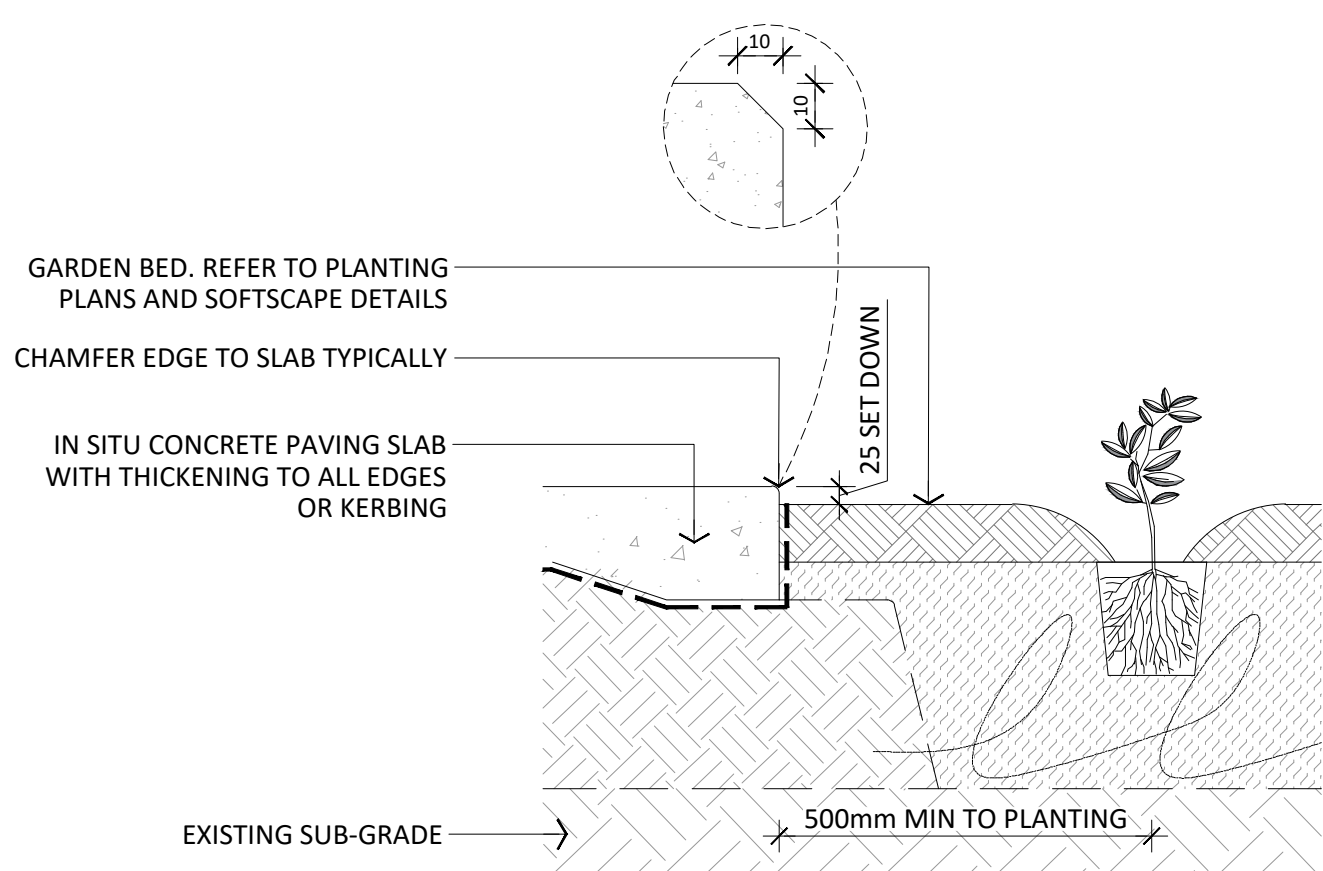
01 S01-02 IN SITU CONCRETE PAVEMENT - NAT. GROUND SECTION 1:10



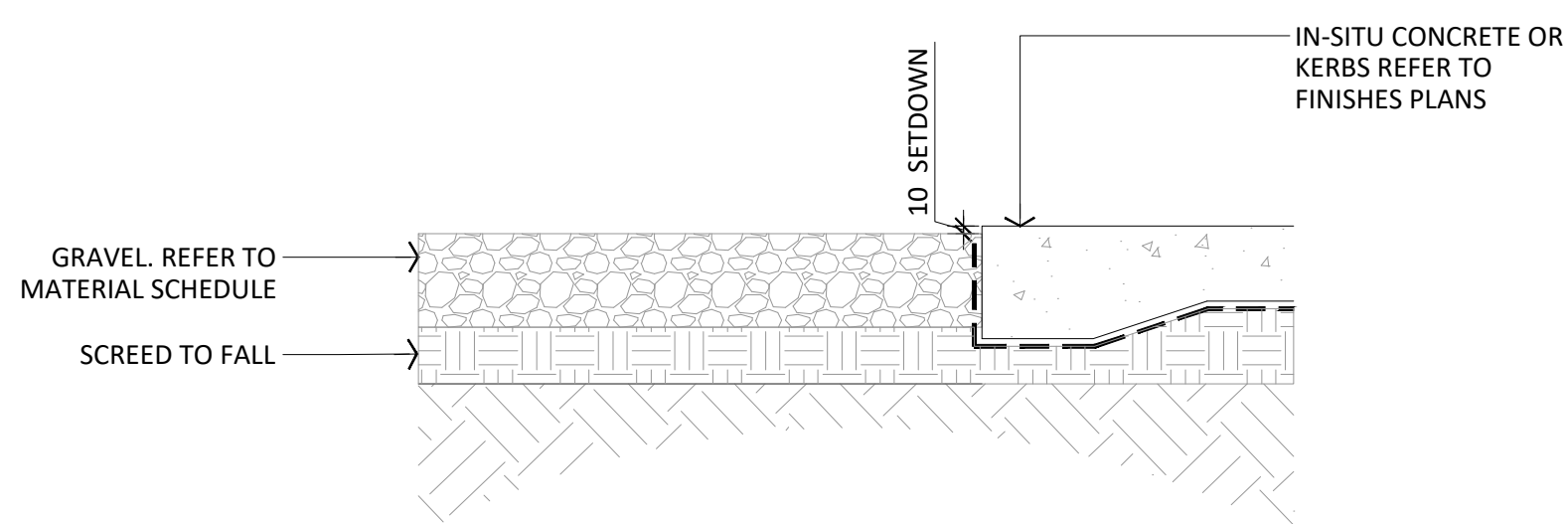
02 SAW-CUT JOINT (SC) - NON-TRAFFICABLE TYPICAL SECTION 1:5



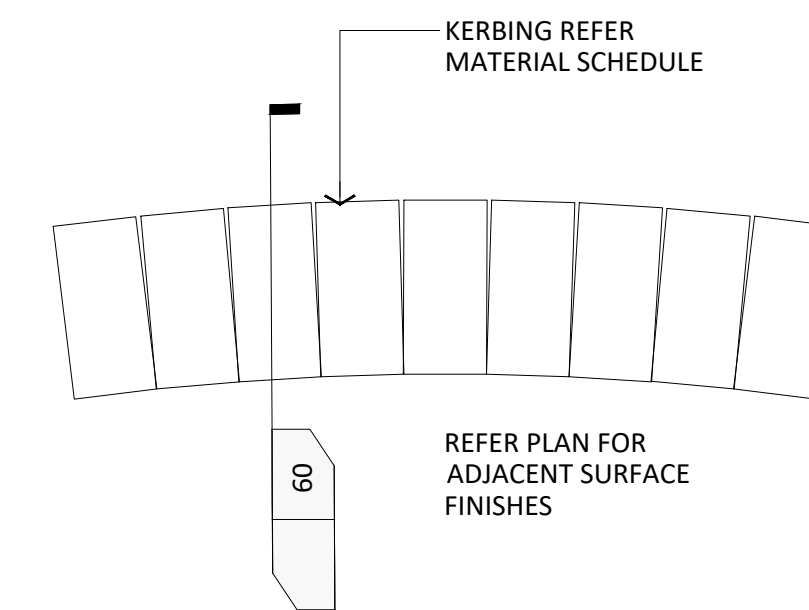
03 EXPANSION JOINT (EJ) - NON-TRAFFICABLE TYPICAL SECTION 1:5



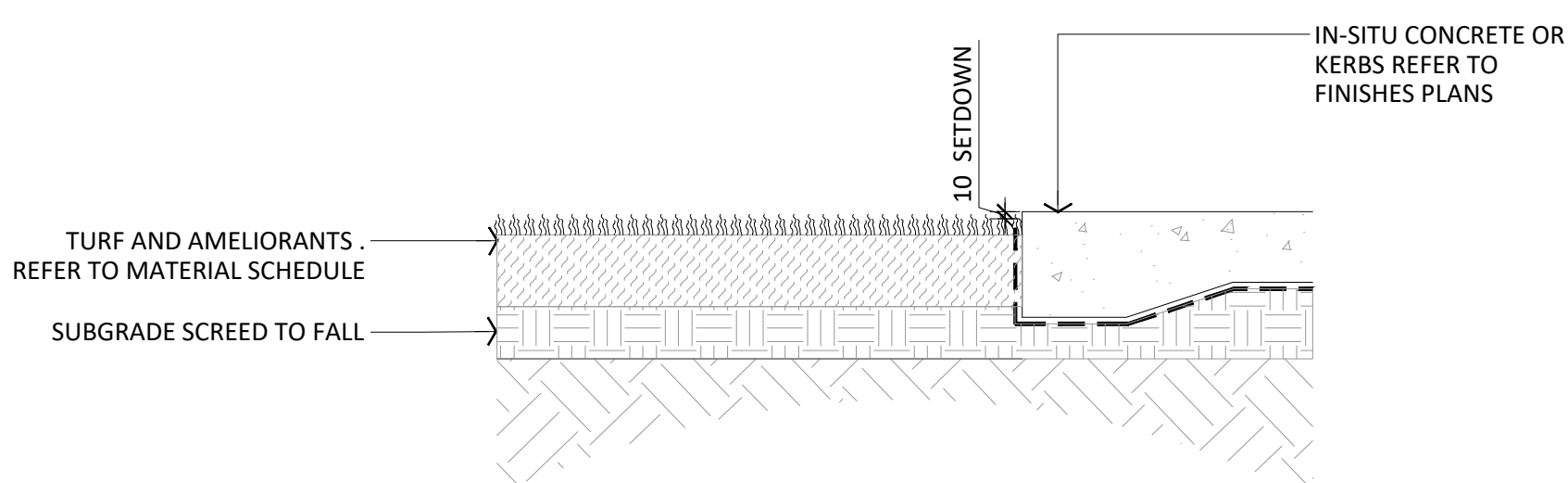
04 IN SITU CONCRETE PAVING TO GARDEN BED SECTION 1:10



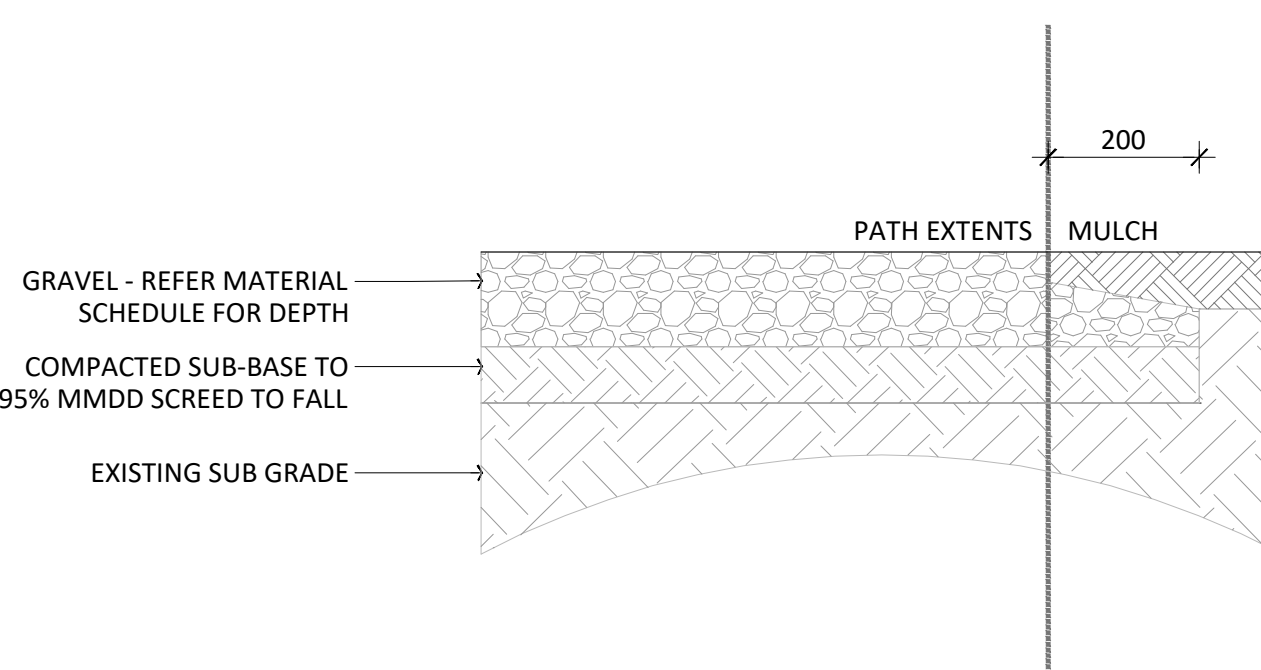
05 GRAVEL AND HARDSCAPE INTERFACES SECTION 1:10



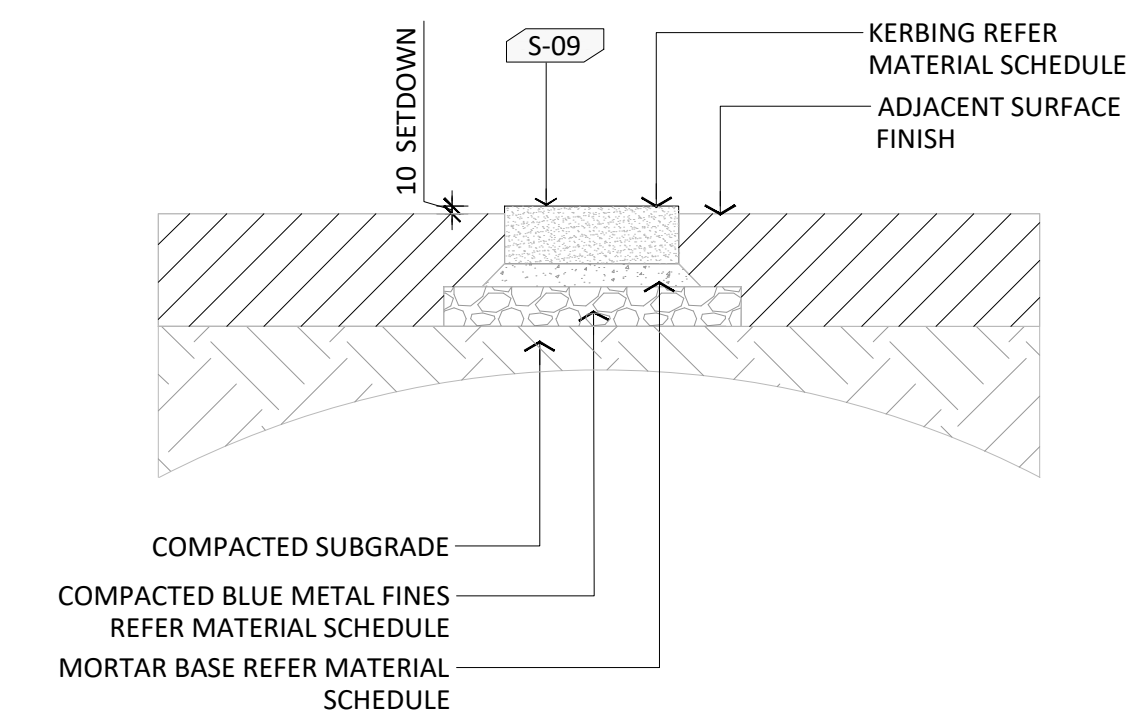
08 KERBING PLAN 1:10



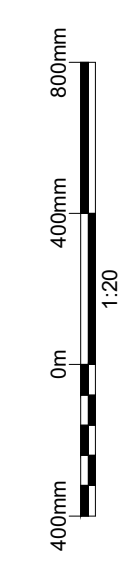
06 TURF AND HARDSCAPE INTERFACES SECTION 1:10



07 S-04A/B GRAVELS SECTION 1:10



09 KERBING SECTION 1:10



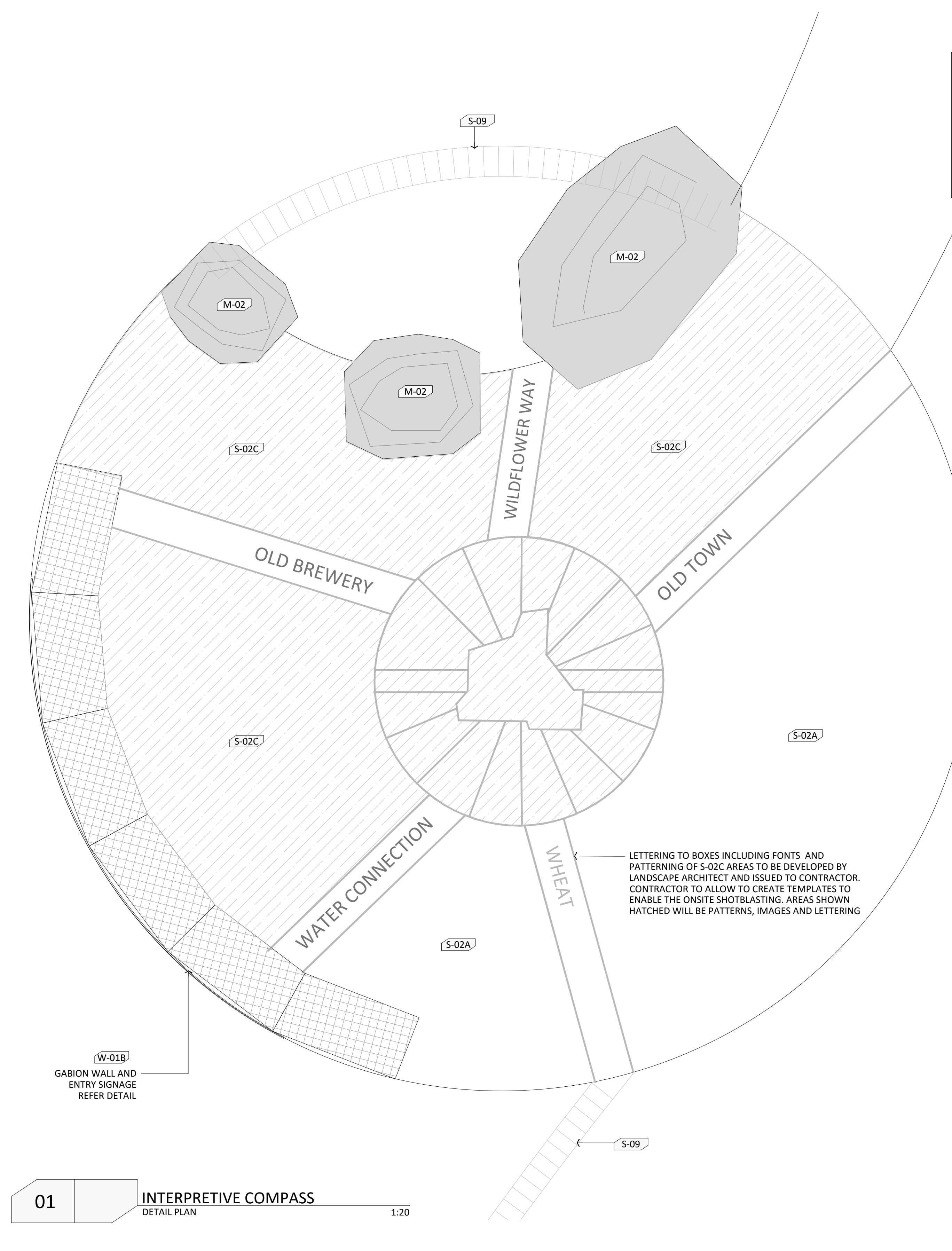
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MERREDIN CBD-STAGE 1A	
HARDSCAPE DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	----
DWG No	L-900
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A



- NOTES.
1. METHODOLOGY TO BE DISCUSSED AND CONFIRMED WITH SUPERINTENDENT BEFORE COMMENCING
 2. REFER TO MATERIAL SCHEDULE FOR OTHER REQUIREMENTS INCLUDING SAMPLES.
 3. SHOP DRAWINGS OF THE TEMPLATE TO BE PROVIDED TO SUPERINTENDENT FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION ON SITE.
 4. FINAL ARRANGEMENT TO BE COORDINATED WITH SUPERINTENDENT.

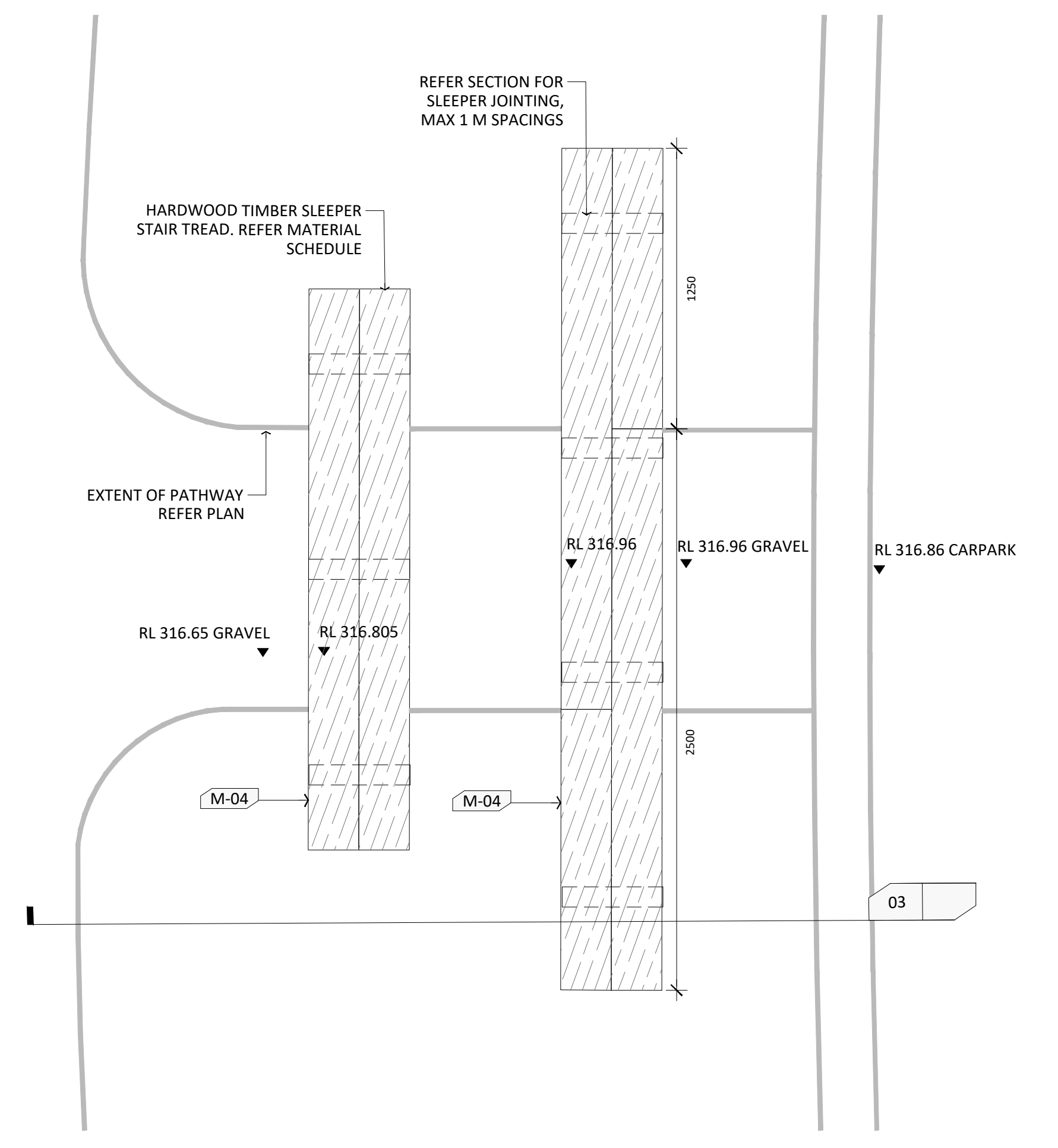
REFER PLAN FOR ADJACENT SURFACE FINISH

REFER PLAN FOR ADJACENT SURFACE FINISH

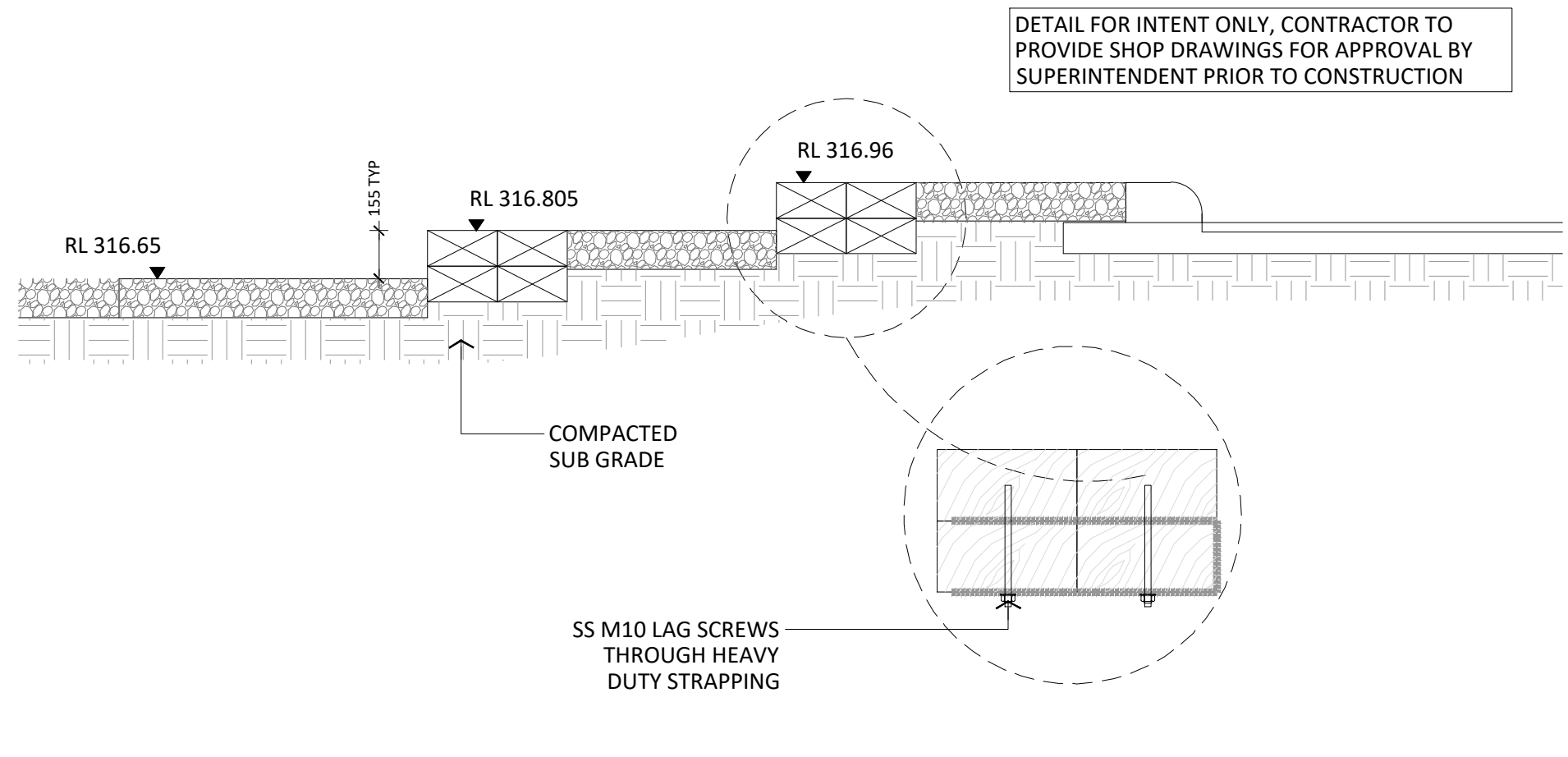
LETTERING TO BOXES INCLUDING FONTS AND PATTERNING OF S-02C AREAS TO BE DEVELOPED BY LANDSCAPE ARCHITECT AND ISSUED TO CONTRACTOR. CONTRACTOR TO ALLOW TO CREATE TEMPLATES TO ENABLE THE ONSITE SHOTBLASTING. AREAS SHOWN HATCHED WILL BE PATTERNS, IMAGES AND LETTERING

W-01B
GABION WALL AND ENTRY SIGNAGE
REFER DETAIL

01 INTERPRETIVE COMPASS
DETAIL PLAN 1:20

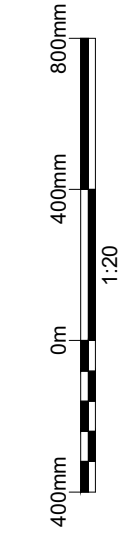


02 INFORMAL STEPS
PLAN 1:20



03 INFORMAL STEPS
SECTION 1:20

DETAIL FOR INTENT ONLY, CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY SUPERINTENDENT PRIOR TO CONSTRUCTION

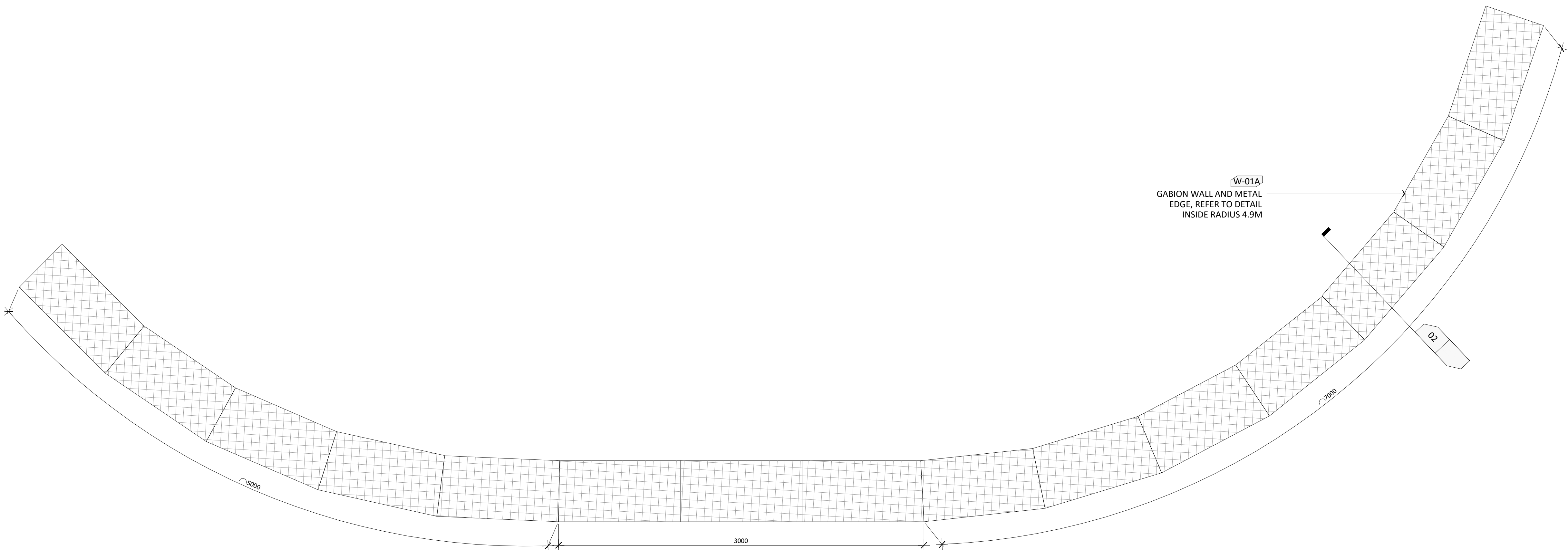


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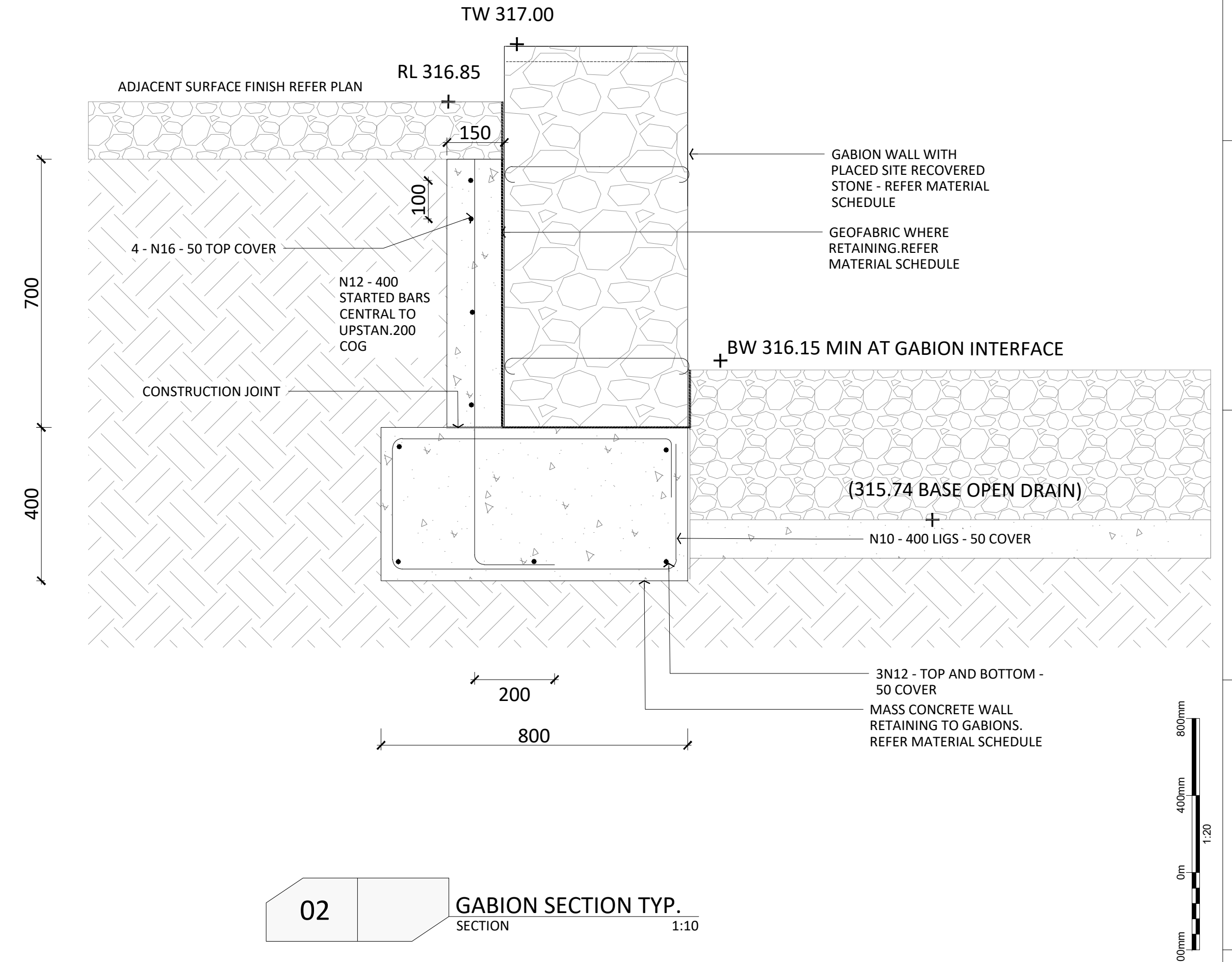


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START DATE	SEPT 21			
DESIGNED	NP			
CHECKED	SS			
GENERAL NOTES				
REFER TO L002				
REV	DATE	REVISION	DRN	CHK
A	15.03.22	ISSUE FOR TENDER	RT	NP

MERREDIN CBD-STAGE 1A	
HARDSCAPE DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	----
DWG No	L-901
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A



01 GABION WALL W-01A
PLAN 1:50



02 GABION SECTION TYP.
SECTION 1:10

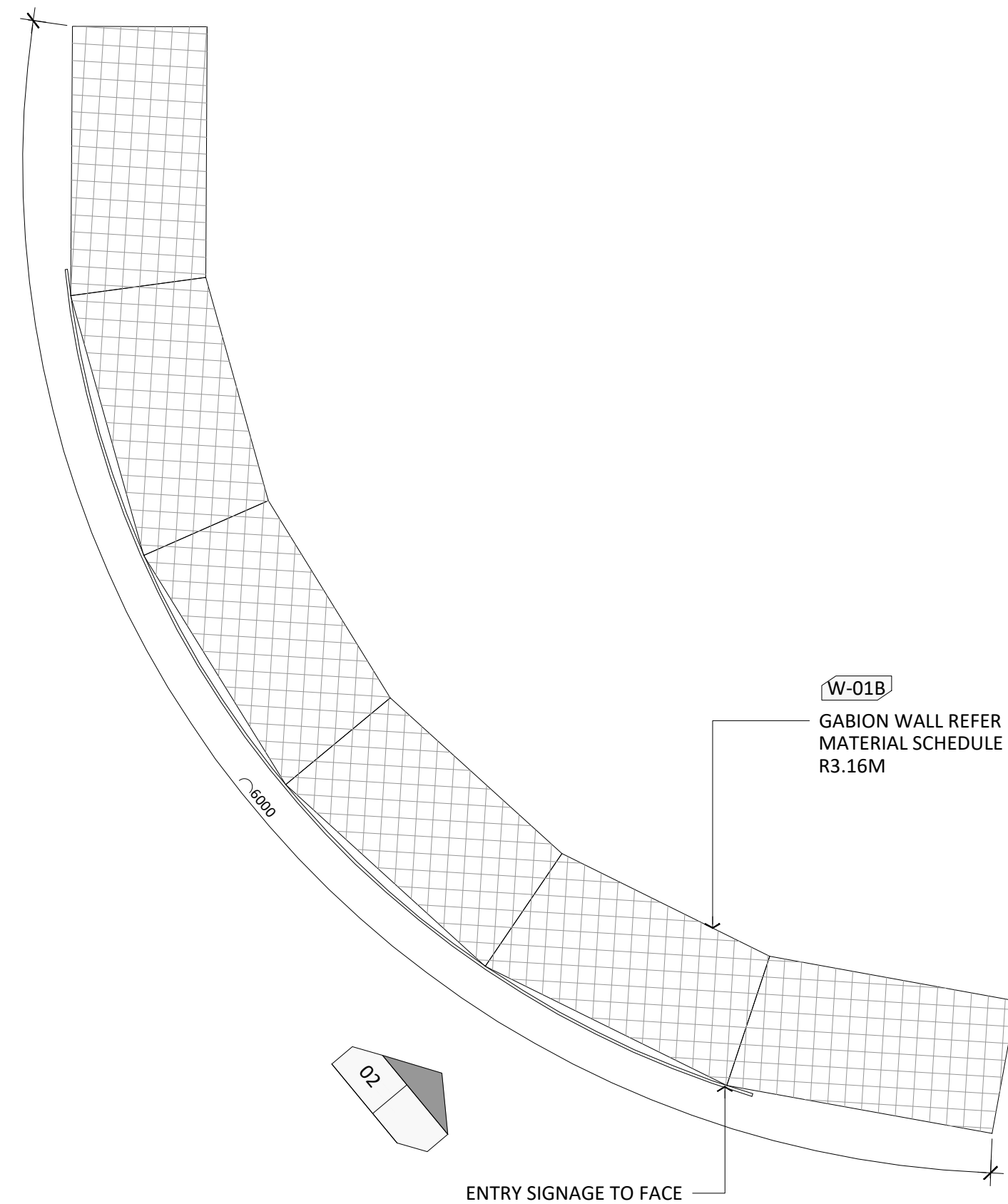


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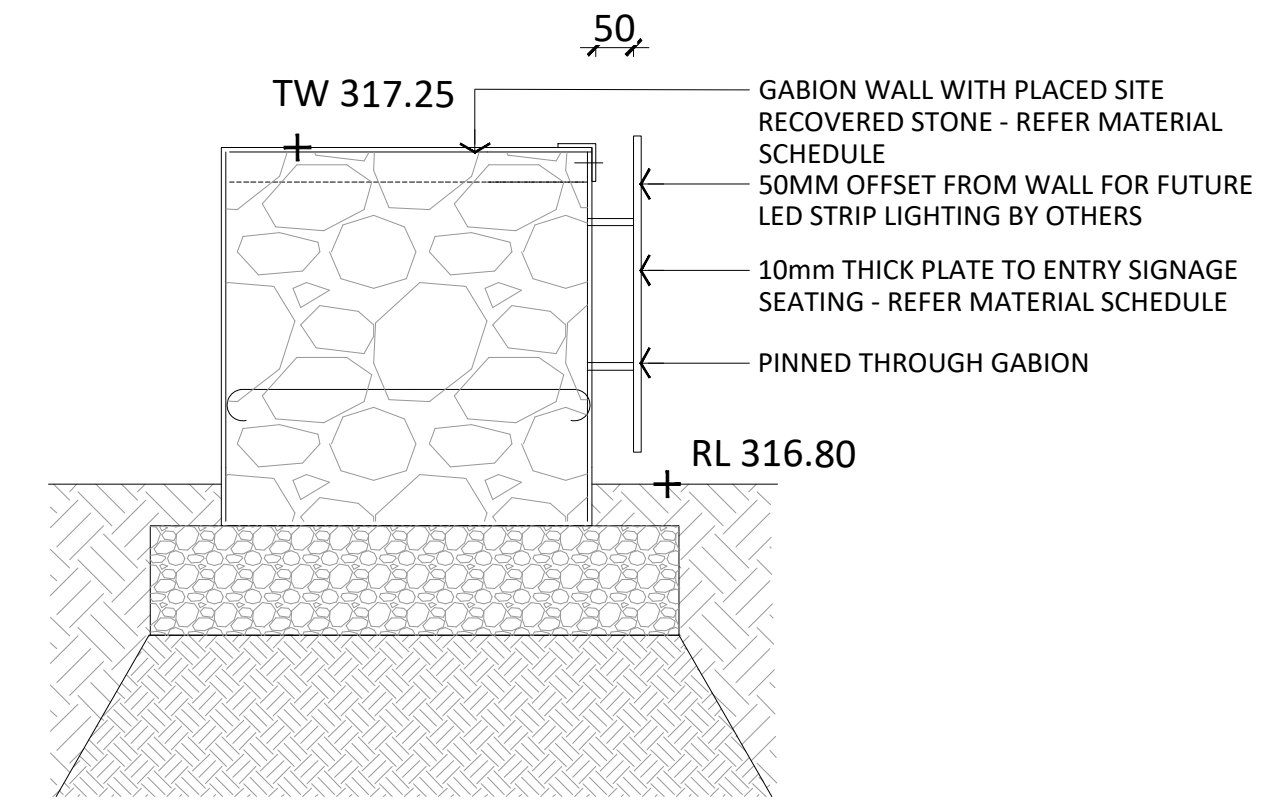


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DESIGNED	NP			
CHECKED	SS			
GENERAL NOTES				
REFER TO L002				
REV	DATE	ISSUE FOR TENDER	RT	NP
		REVISION	DRN	CHK

MERREDIN CBD-STAGE 1A	
WALLS DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	----
DWG No	L-910
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A



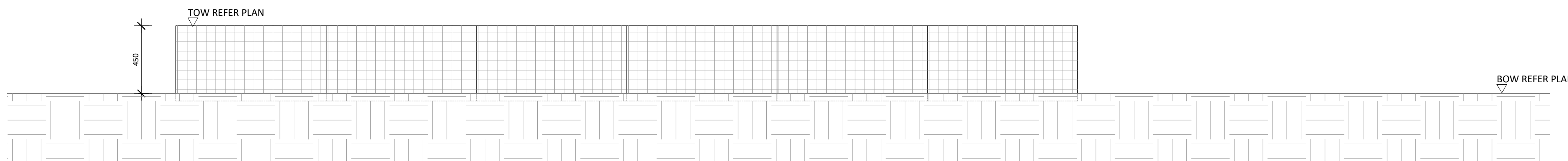
01 GABION WALL - B
PLAN 1:50



04 GABION SECTION TYP.
SECTION 1:10



02 GABION WALL - B
ARTICULATED ELEVATION WITH SIGNAGE 1:50



03 GABION WALL - B
ARTICULATED ELEVATION WITHOUT SIGNAGE 1:50



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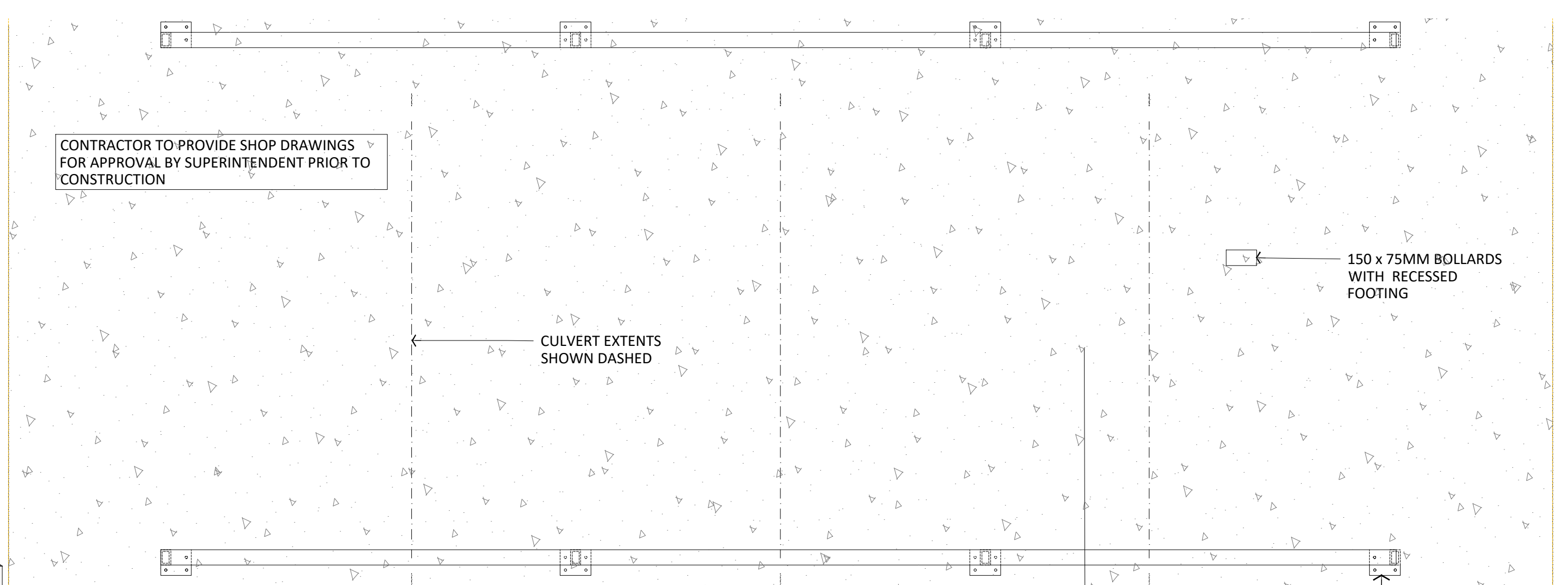
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A	15.03.22	ISSUE FOR TENDER	RT	NP

DRN BY	NP
START DATE	SEPT 21
DESIGNED	NP
CHECKED	SS
GENERAL NOTES	
REFER TO L002	

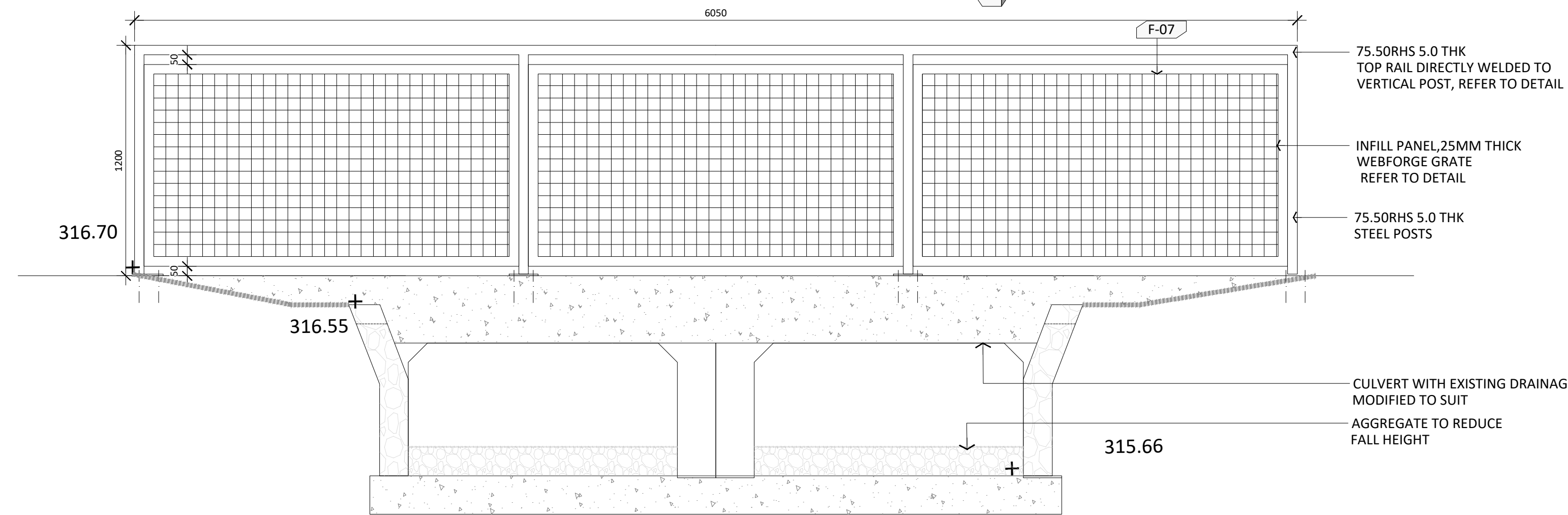
MERREDIN CBD-STAGE 1A	

WALLS DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	----
DWG No	L-911
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A

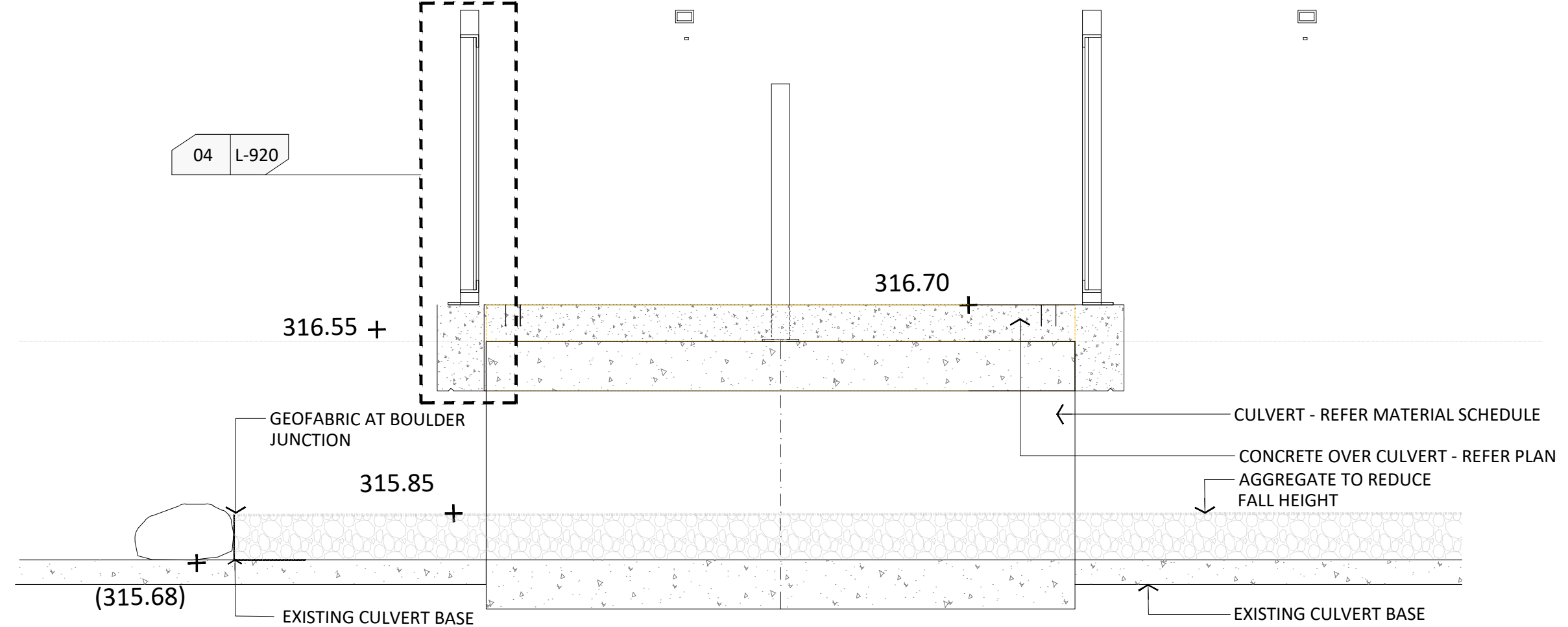
CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY SUPERINTENDENT PRIOR TO CONSTRUCTION



01 W-03A TYP. BRIDGE PLAN 1:20

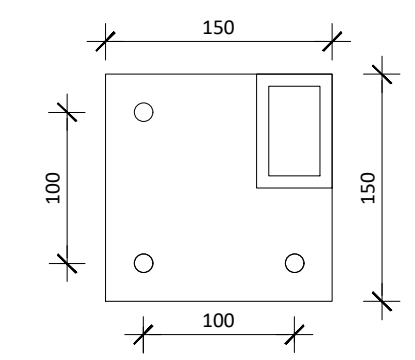


02 W-03A TYP. BRIDGE SECTION 1:20

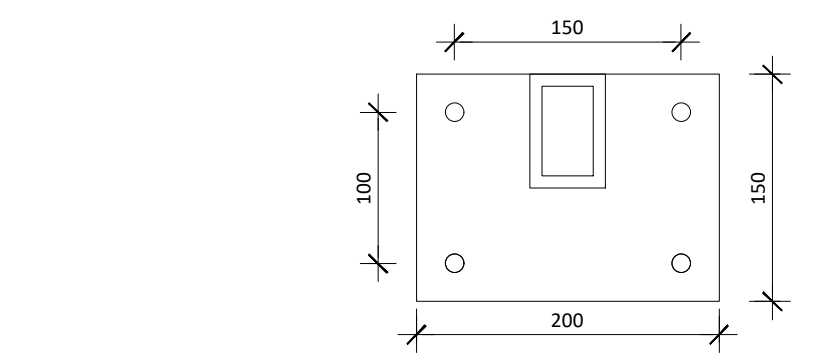
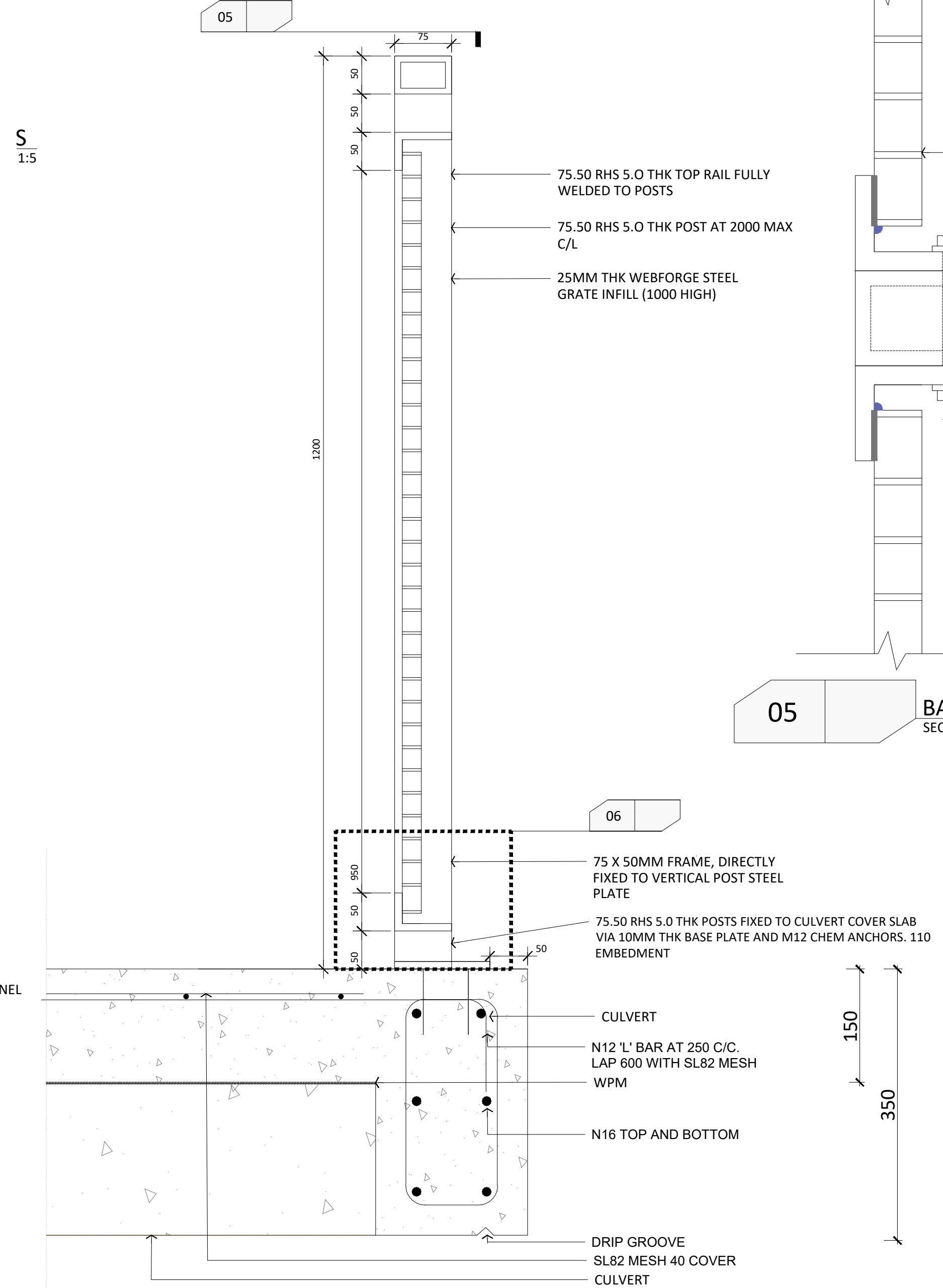


03 W-03A TYP. BRIDGE SECTION 1:20

TYPE 1 PLATE - 4 ANCHORS PLAN 1:5

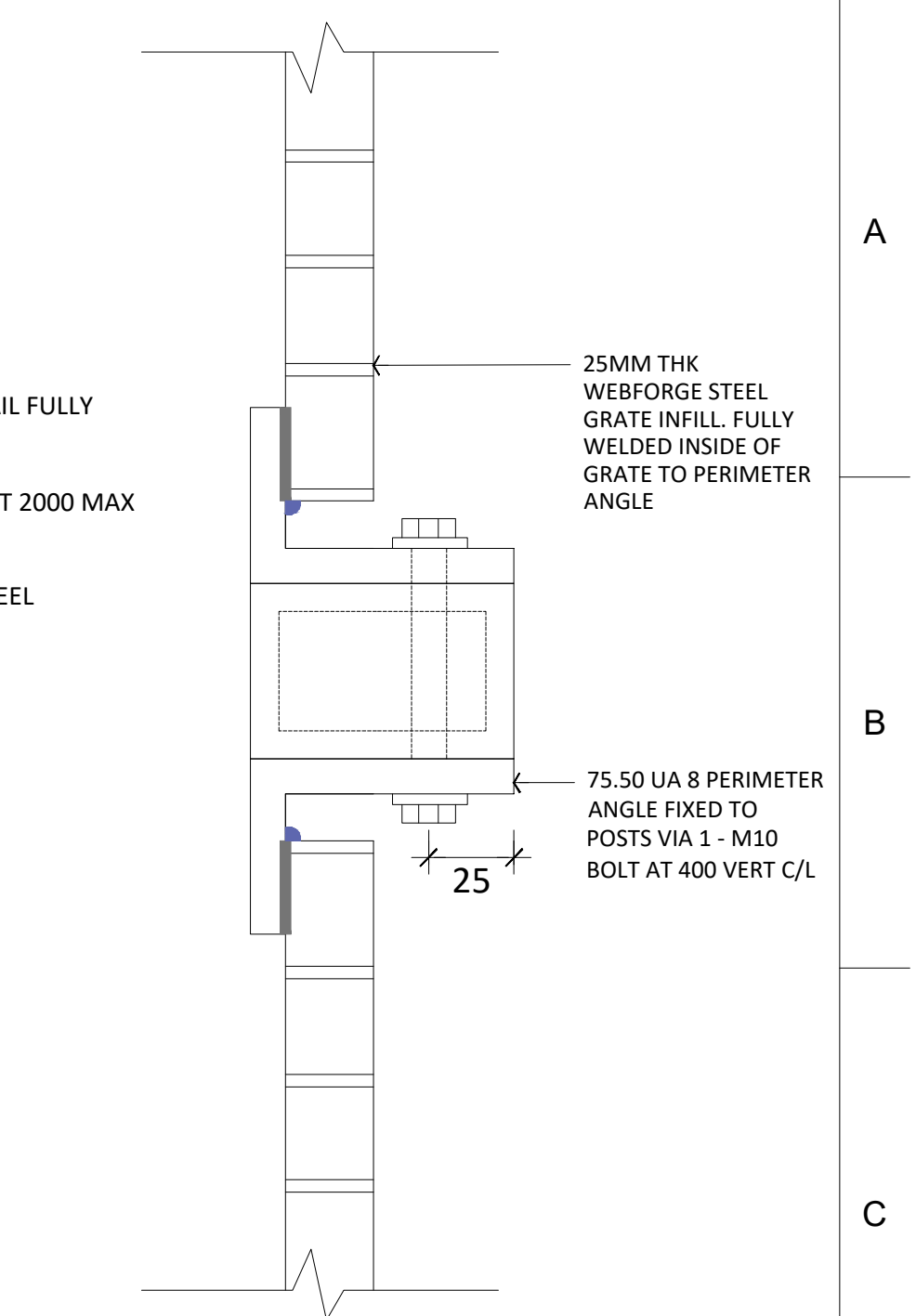


04 W-03A TYP. BALUSTRADE SECTION 1:5

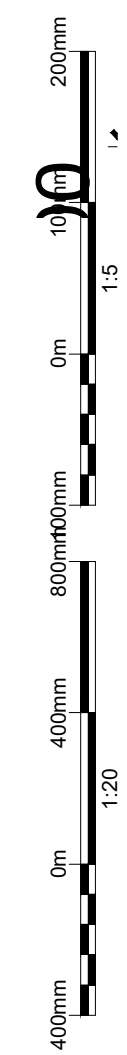
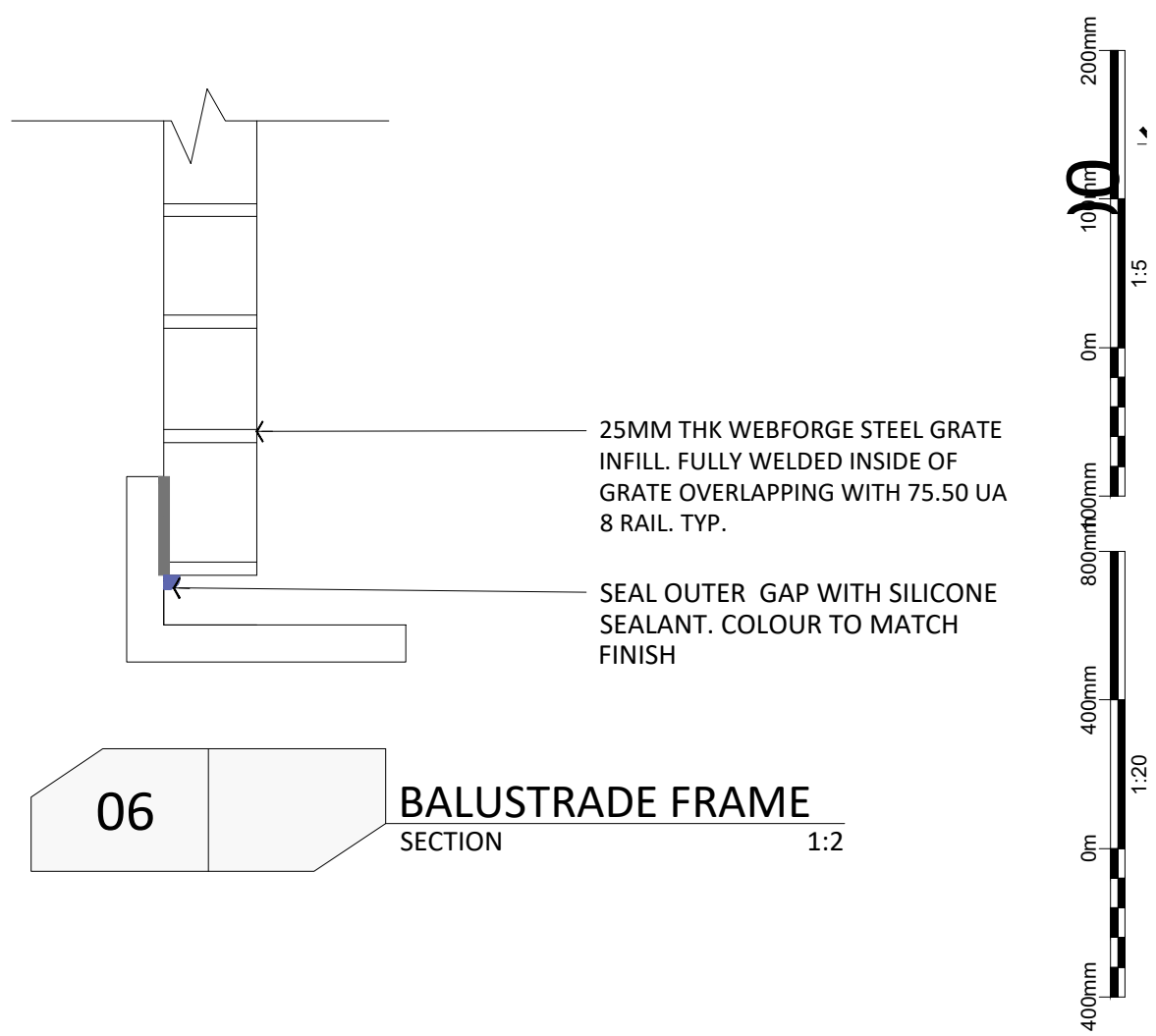


TYPE 2 PLATE (END) 3 ANCHORS PLAN 1:5

05 BALUSTRADE FRAME SECTION



06 BALUSTRADE FRAME SECTION 1:2



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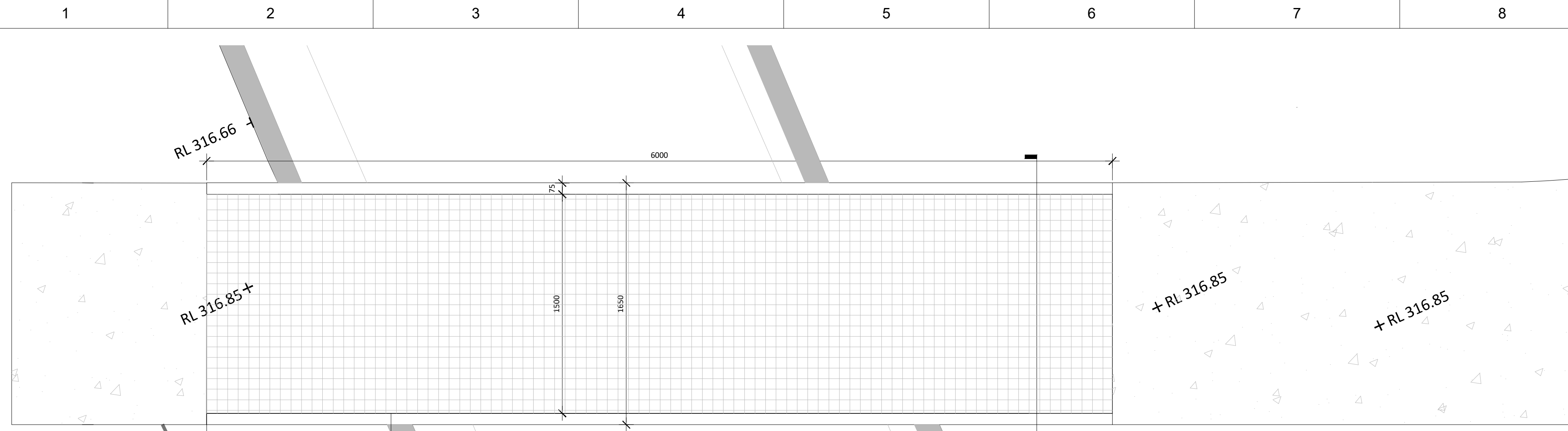


DRN BY: NP
START DATE: SEPT 21
DESIGNED: NP
CHECKED: SS

GENERAL NOTES
REFER TO L002

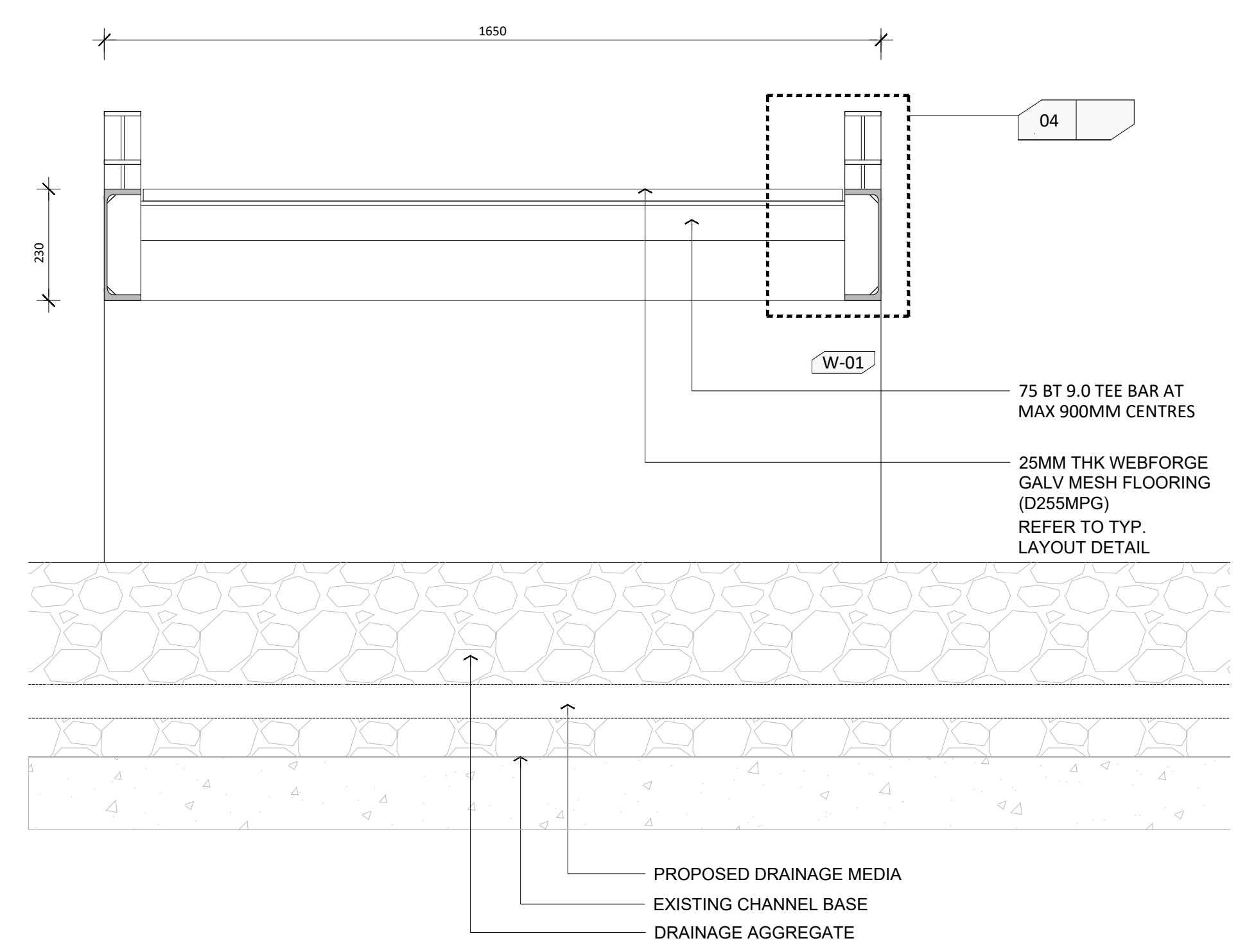
MERREDIN CBD-STAGE 1A	
BRIDGES DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	---
DWG No	L-920
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A

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REV	DATE	REVISION	DRN	CHK
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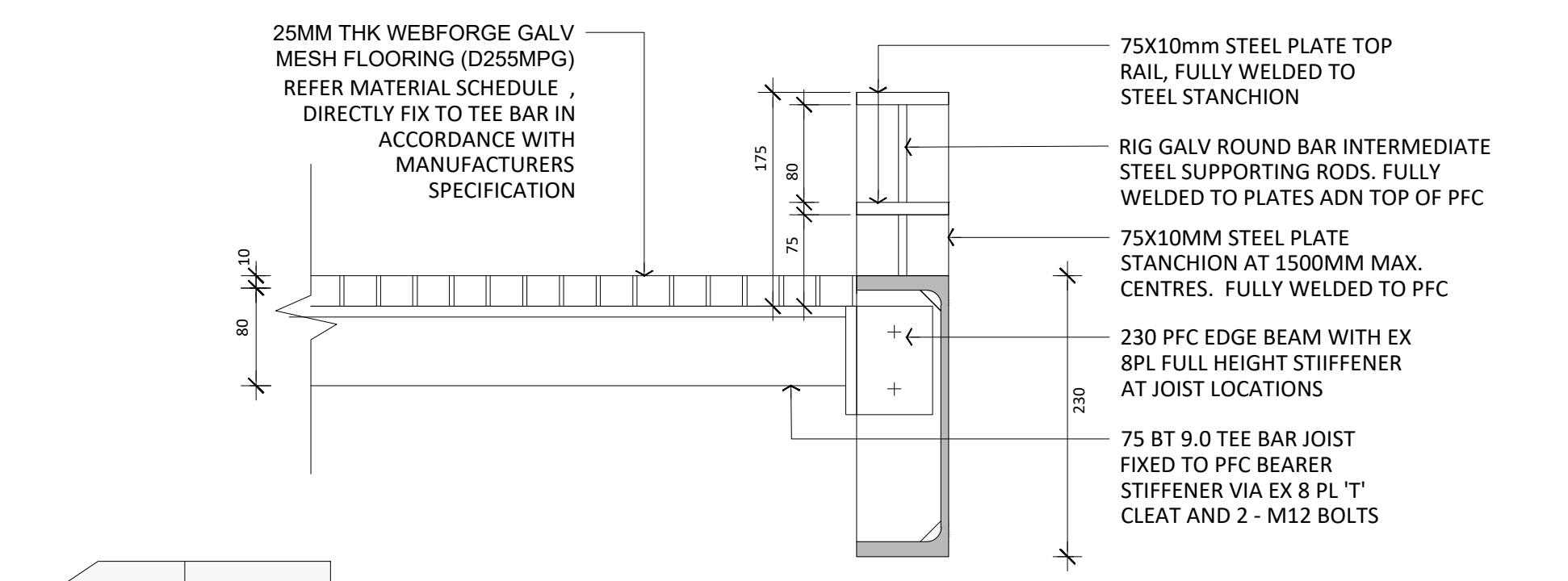


01 W-05 TYP. BRIDGE PLAN SECTION 1:20

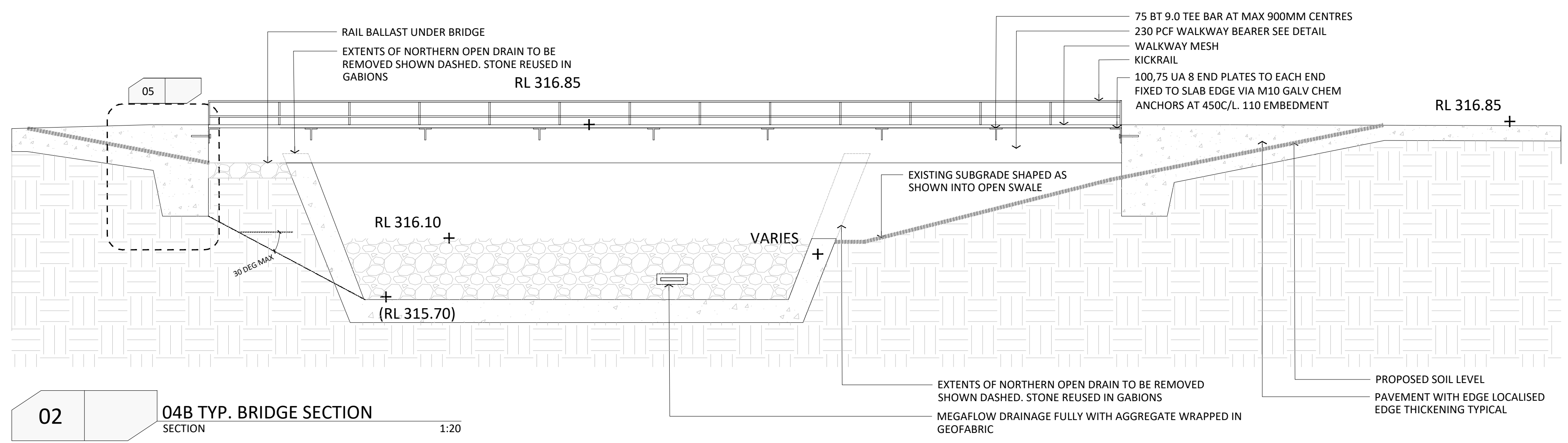
DETAIL FOR INTENT ONLY. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY SUPERINTENDENT PRIOR TO CONSTRUCTION



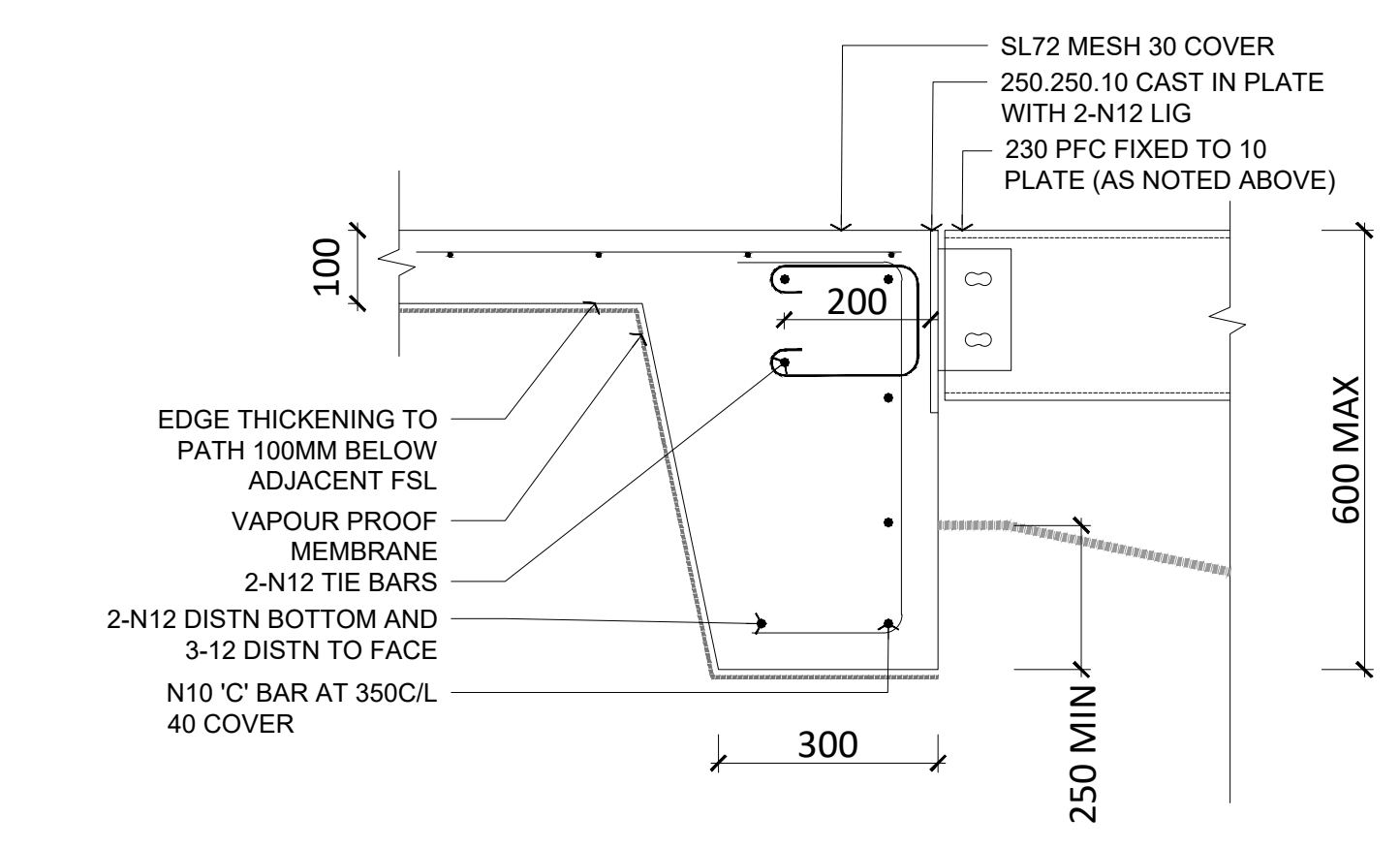
03 W-04B TYP. BRIDGE SECTION SECTION 1:10



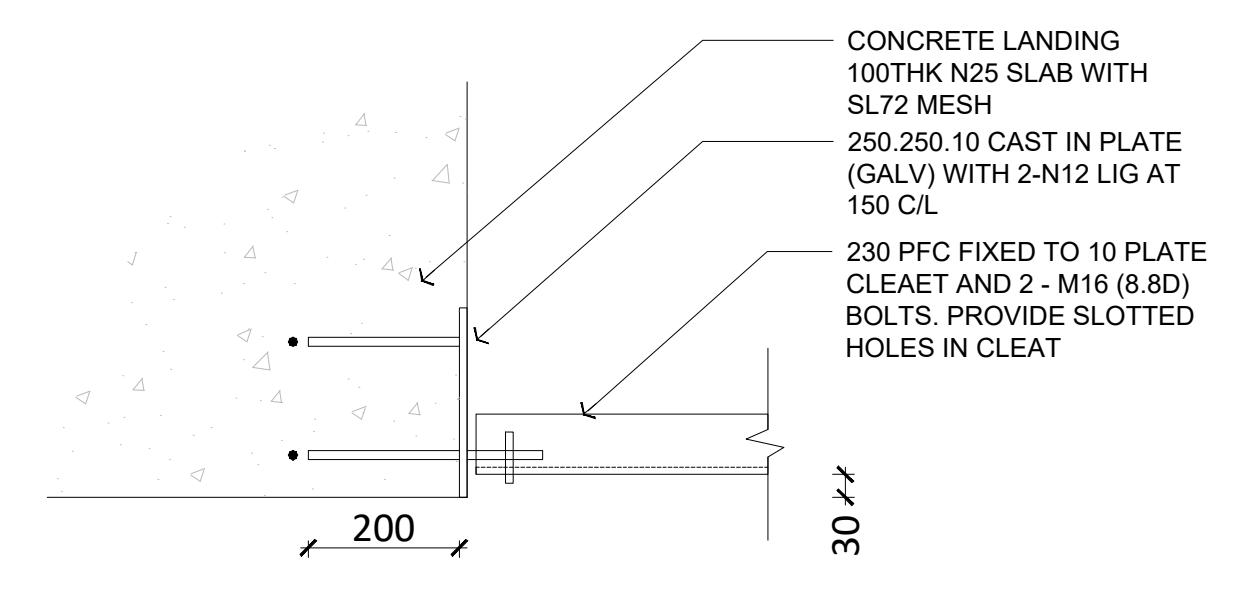
04 BALUSTRADE DETAIL SECTION 1:5



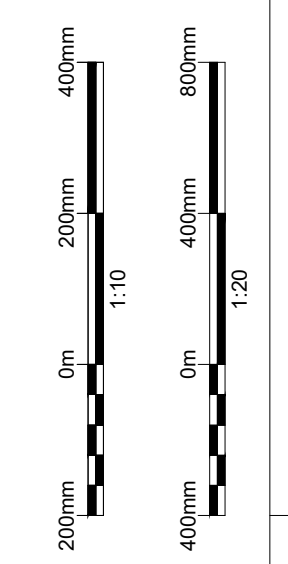
02 O4B TYP. BRIDGE SECTION SECTION 1:20



05 PFC BEARER TO EDGE BEAM PLAN 1:10



06 DETAIL - EDGE BEAM SECTION 1:10



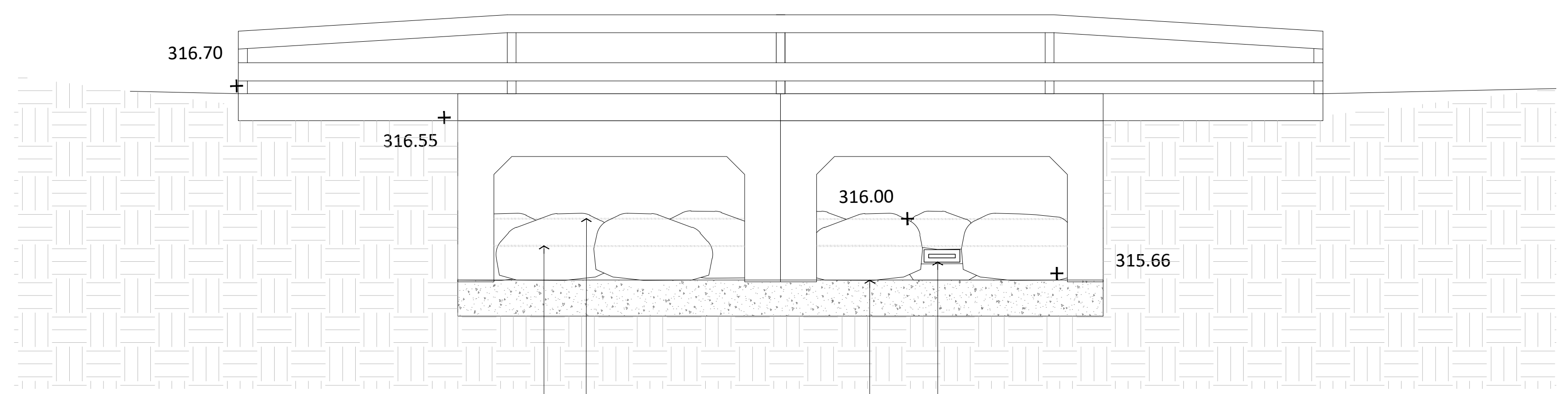
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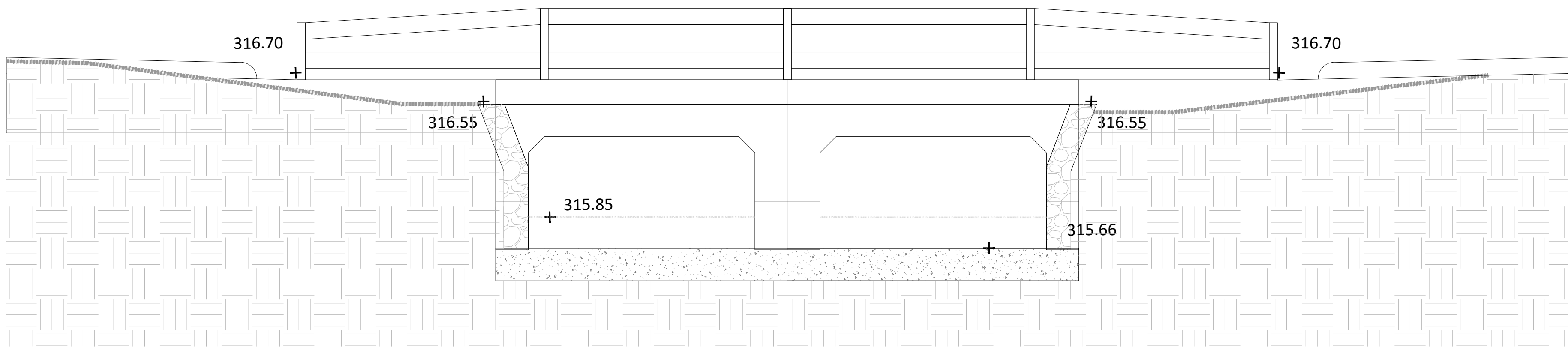
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START DATE	SEPT 21
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CHECKED	SS
GENERAL NOTES	
REFER TO L002	

MERREDIN CBD-STAGE 1A	
BRIDGES DETAILS	
PLACE LAB PROJ No	2139
DWG STATUS	---
DWG No	L-921
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A

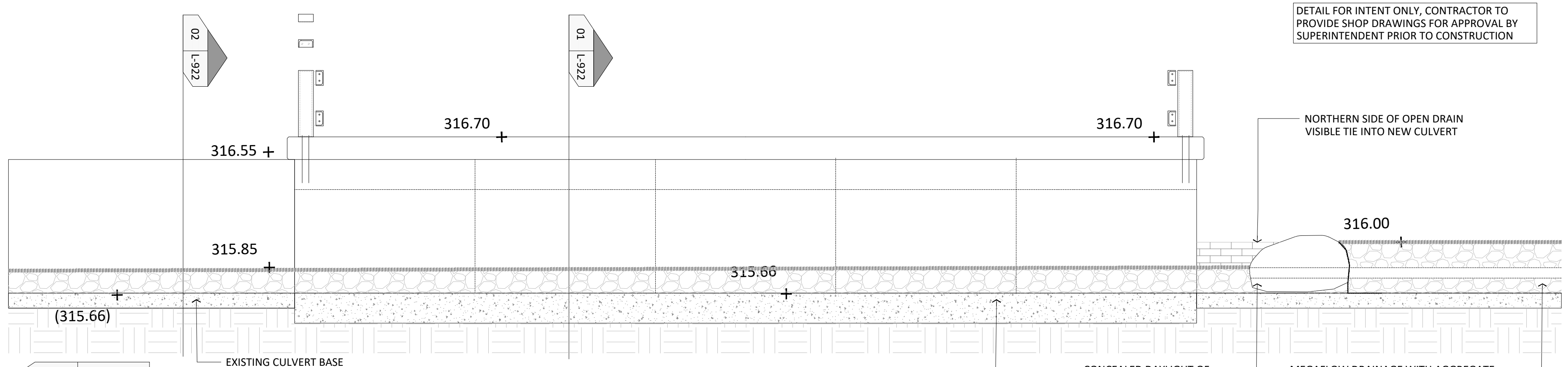


01 W-05 TYP. BRIDGE SECTION
SECTION 1:20

AGGREGATE LEVEL EAST OF BRIDGE
AGGREGATE LEVEL UNDER BRIDGE
CONCEALED DAYLIGHT OF MEGAFLOW AT BOULDERS.
GEOFABRIC WRAP TO AGGREGATE AT BOULDER JUNCTION
STAGGERED BOULDERS TO HOLD AGGREGATE IN PLACE AND ALLOW LOW FLOWS TO PASS THROUGH



02 W-05 TYP. BRIDGE SECTION
SECTION 1:20

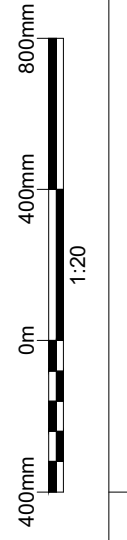


03 W-05 TYP. BRIDGE SECTION
SECTION 1:20

DETAIL FOR INTENT ONLY, CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY SUPERINTENDENT PRIOR TO CONSTRUCTION

NORTHERN SIDE OF OPEN DRAIN VISIBLE TIE INTO NEW CULVERT

GEOFABRIC AT BOULDER JUNCTION
EXISTING CULVERT BASE



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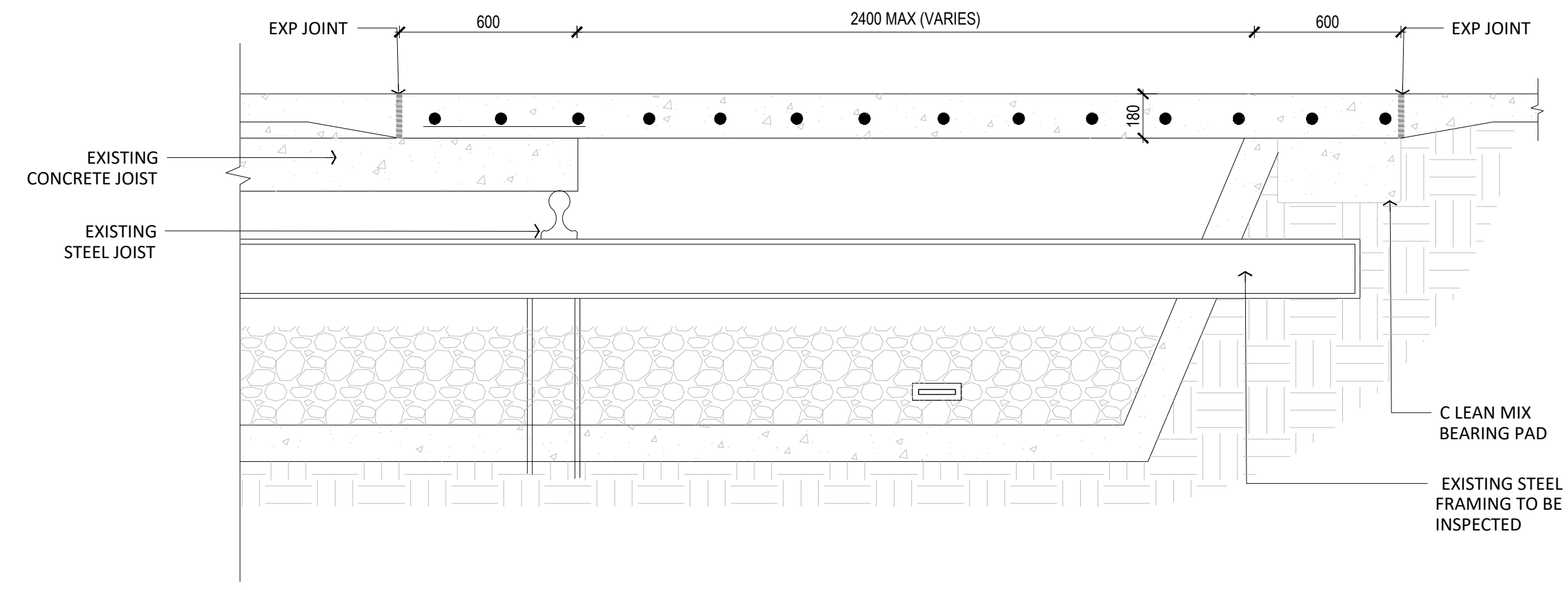
DRN BY	NP
START DATE	SEPT 21
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GENERAL NOTES
REFER TO L002

MERREDIN CBD-STAGE 1A
BRIDGES DETAILS

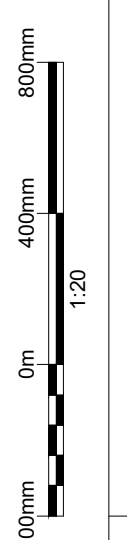
PLACE LAB PROJ No 2139
DWG STATUS ---
DWG No L-922

SCALE: 1:200
UNIT: mm
SHEET SIZE A1
ISSUE A



02 EASTERN DRAIN INTERFACE SECTION 1:20

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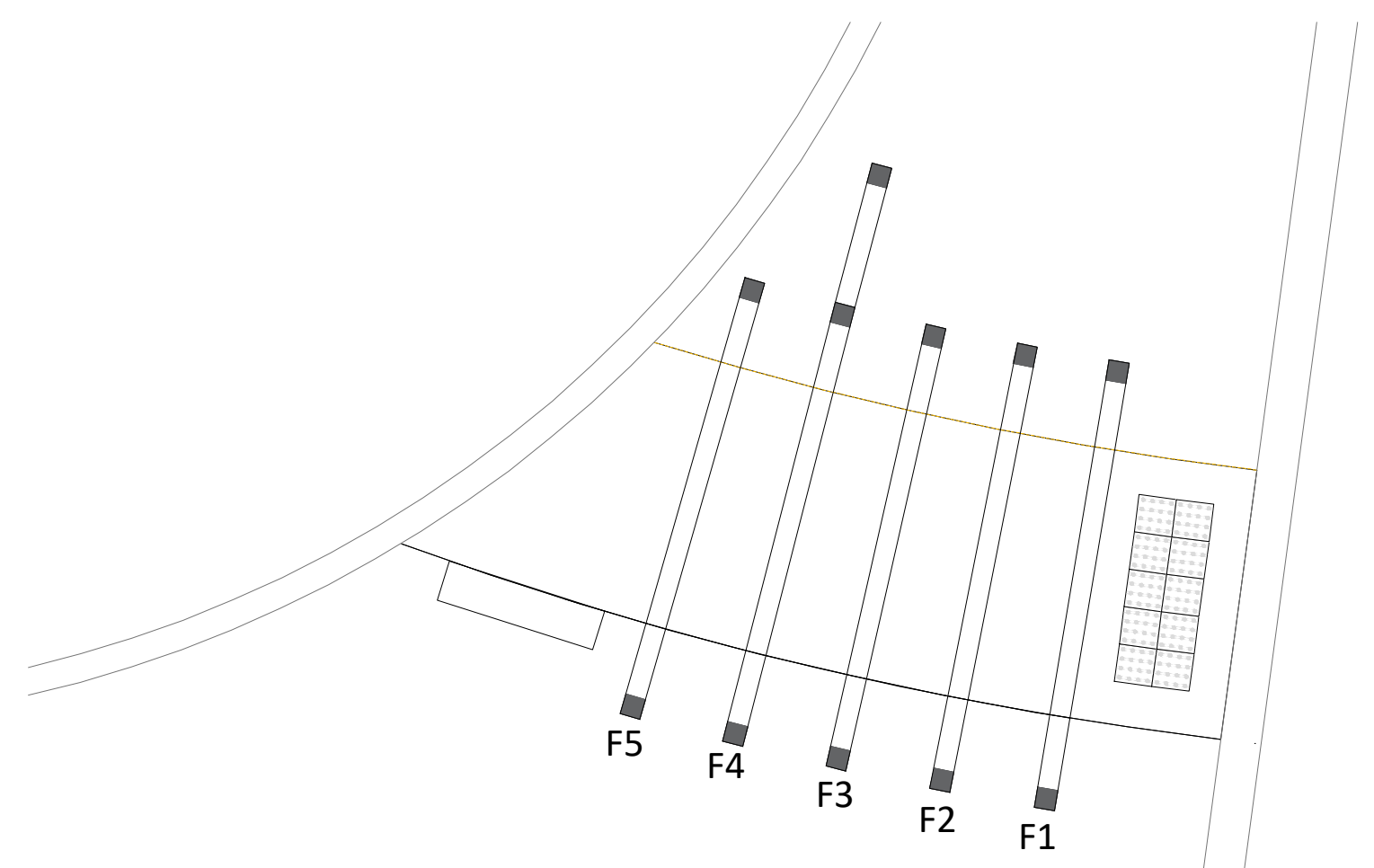
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MERREDIN CBD-STAGE 1A

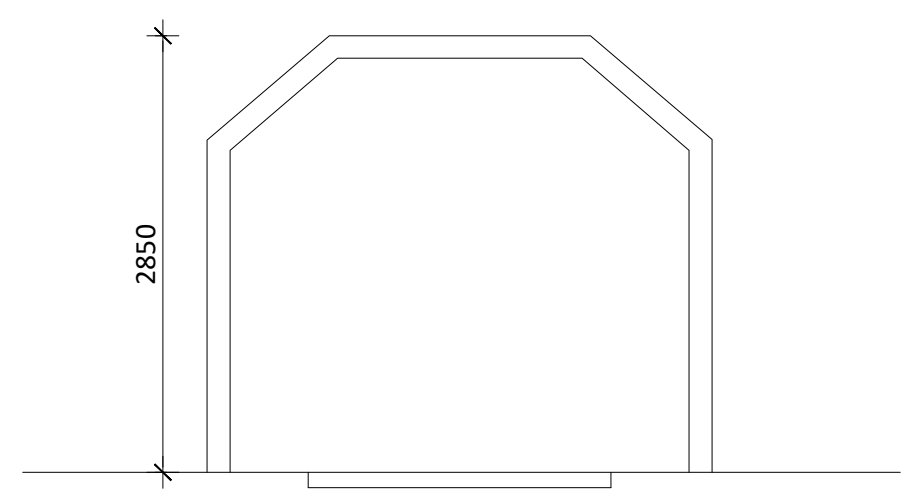
BRIDGES DETAILS

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DWG No	L-923	SHEET SIZE	A1
		ISSUE	A

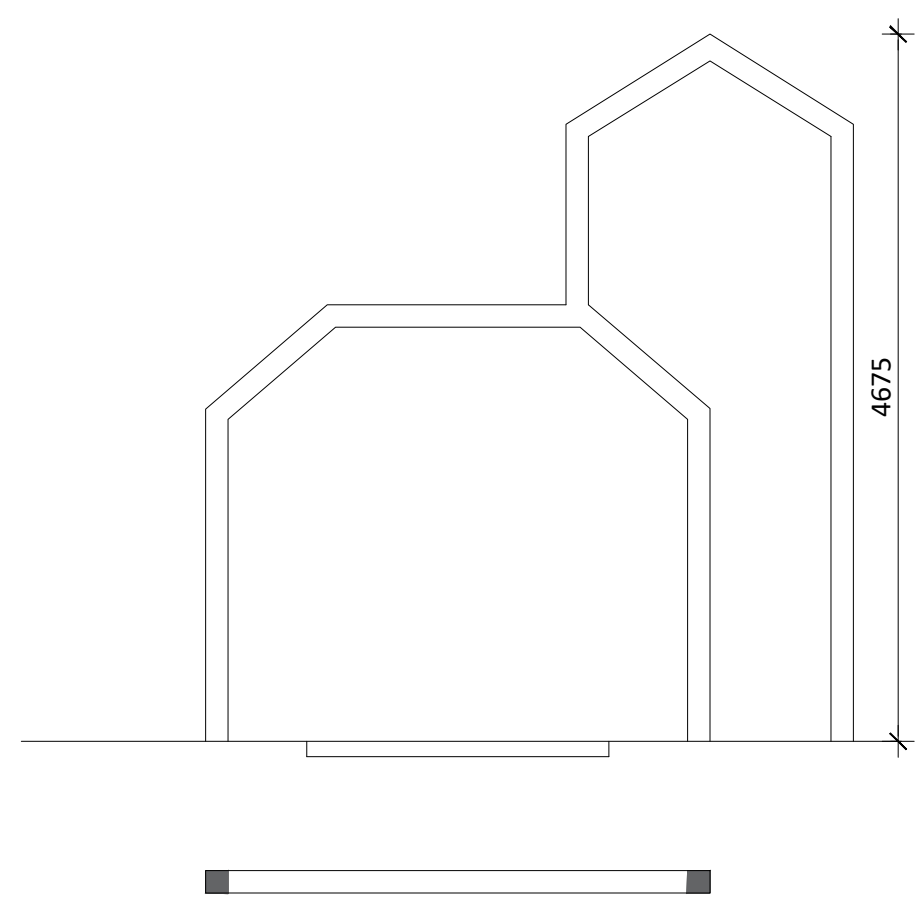


01 F-08 WAYFINDING ARBOUR INTENT
PLAN 1:50

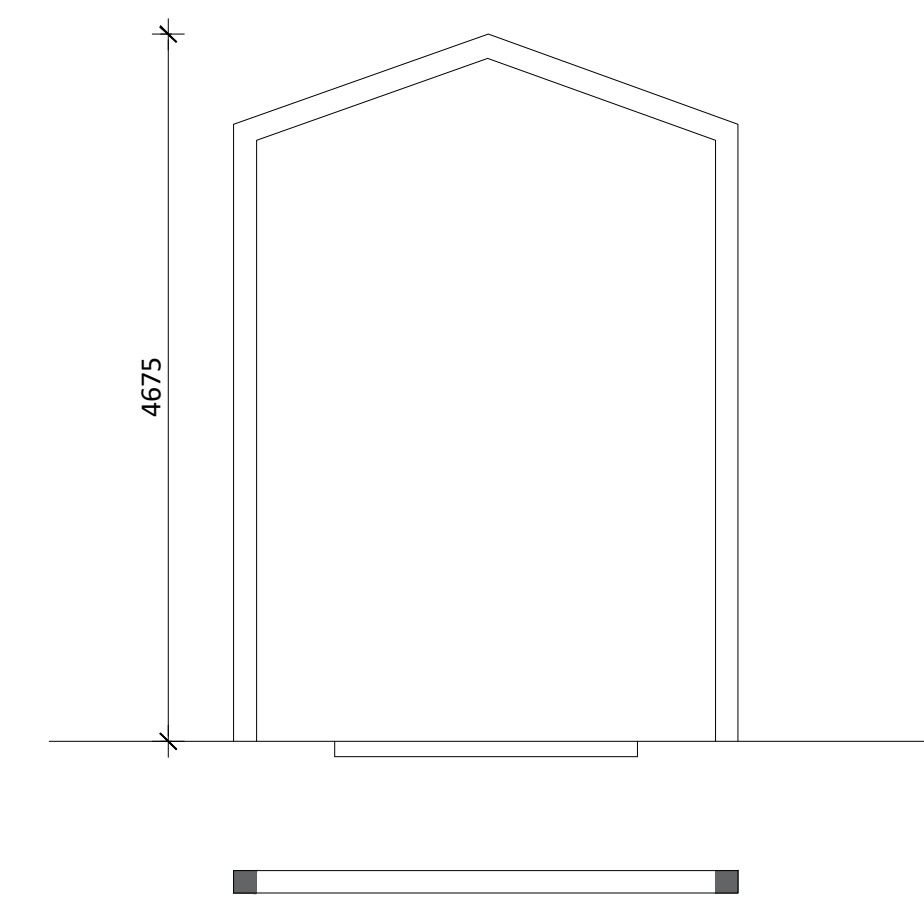
DETAIL FOR INTENT ONLY, CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY SUPERINTENDENT PRIOR TO CONSTRUCTION



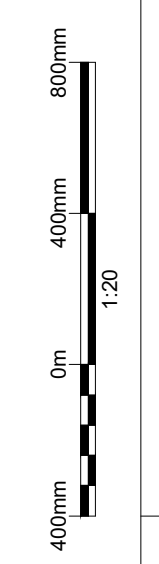
02 F-08 WAYFINDING ARBOUR FRAMES 1-3
PLAN 1:50



03 F-08 WAYFINDING ARBOUR FRAME 4
PLAN 1:50



04 F-08 WAYFINDING ARBOUR FRAMES 5
PLAN 1:50



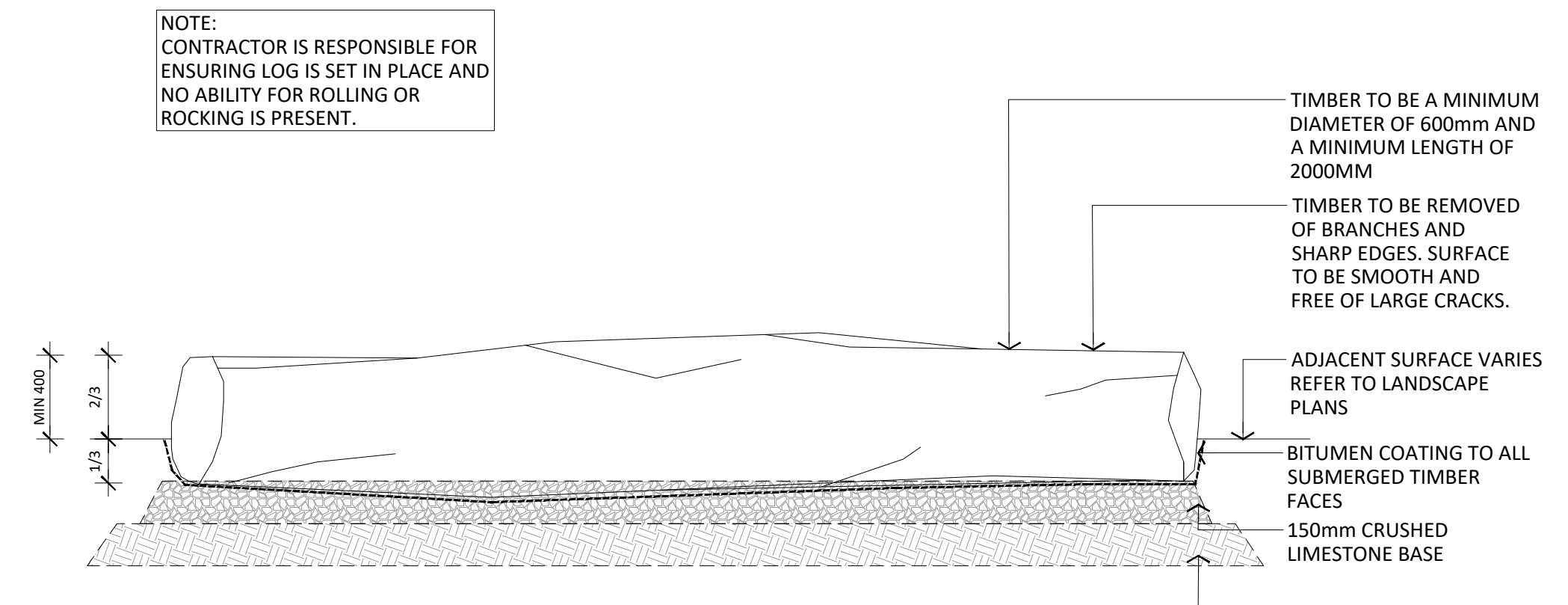
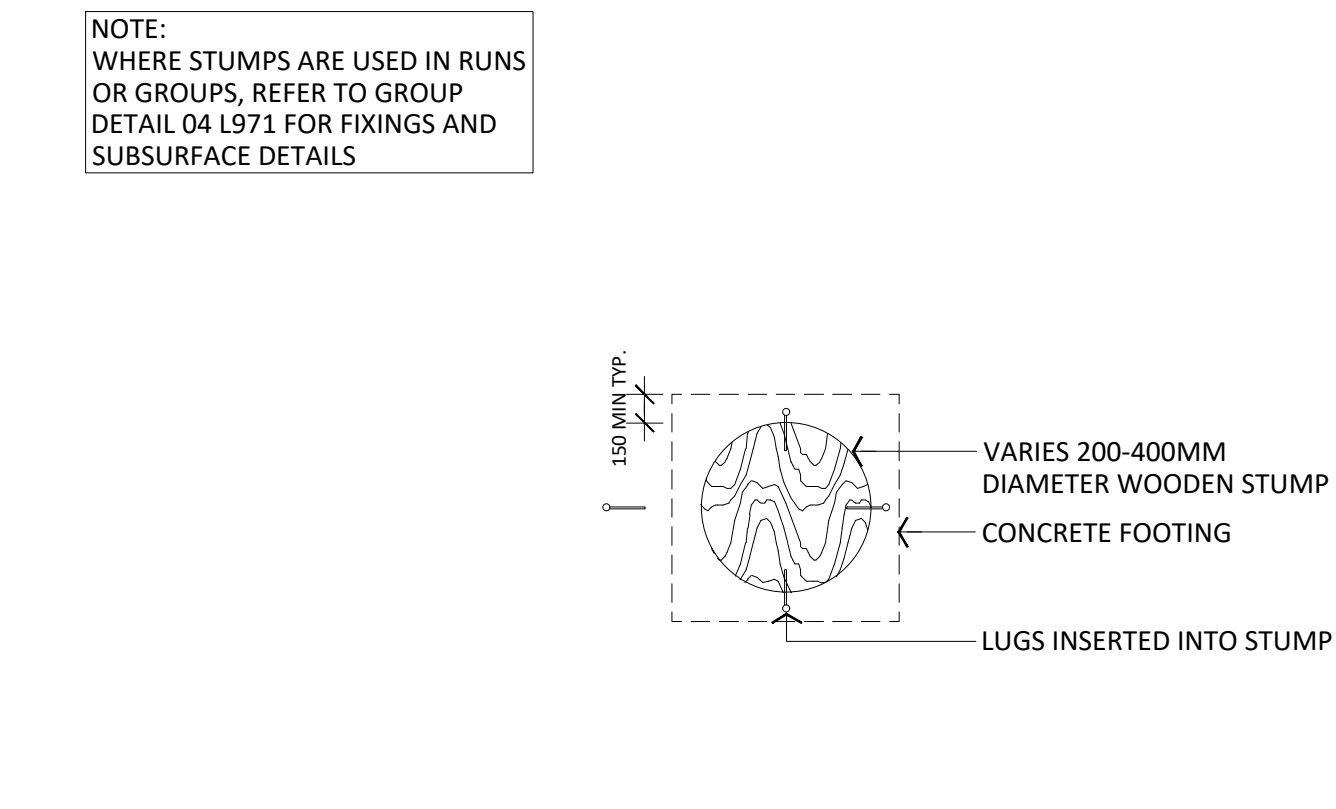
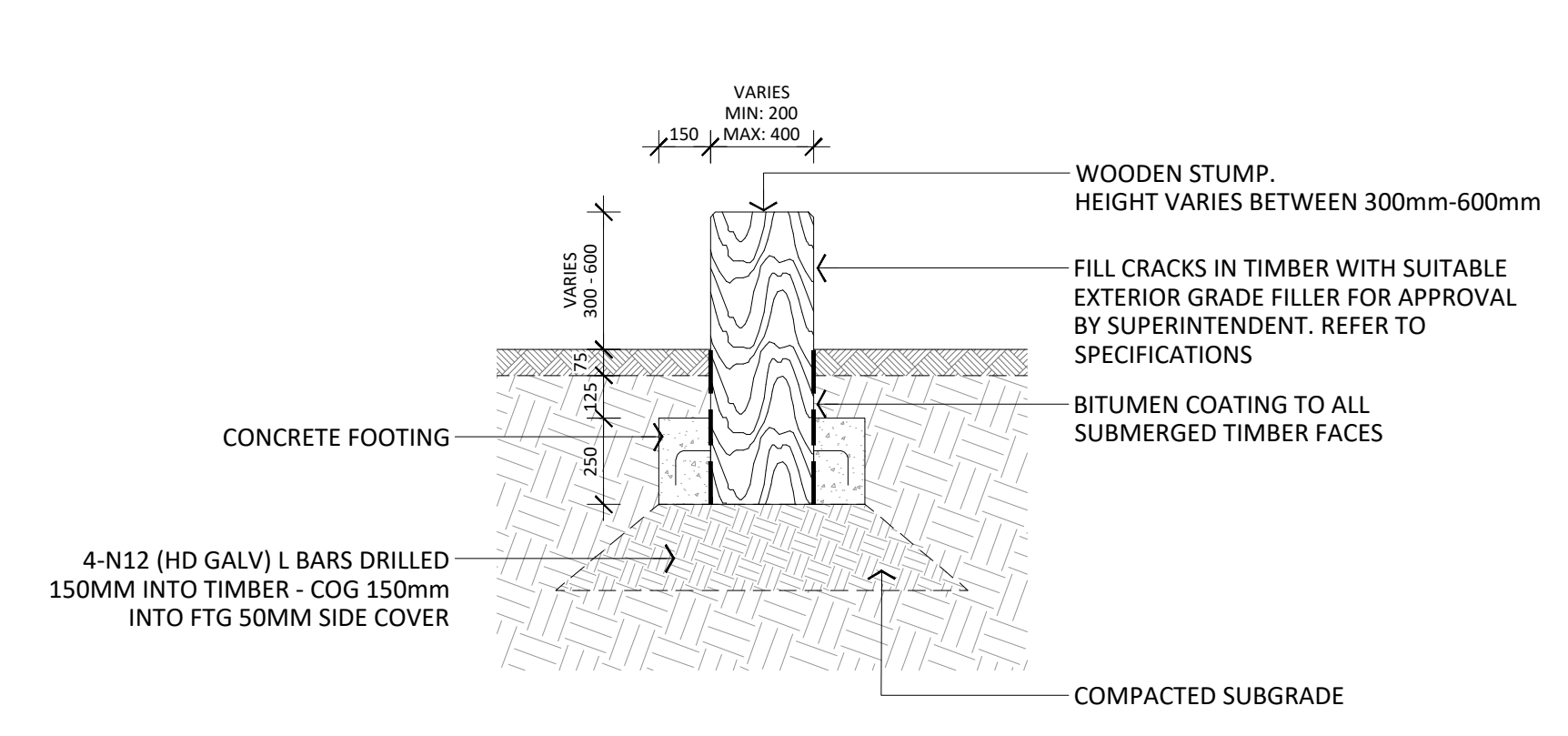
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MERREDIN CBD-STAGE 1A	
ARBOUR INTENT	
PLACE LAB PROJ No	2139
DWG STATUS	IFT
DWG No	L-930
SCALE:	1:200
UNIT:	mm
SHEET SIZE	A1
ISSUE	A

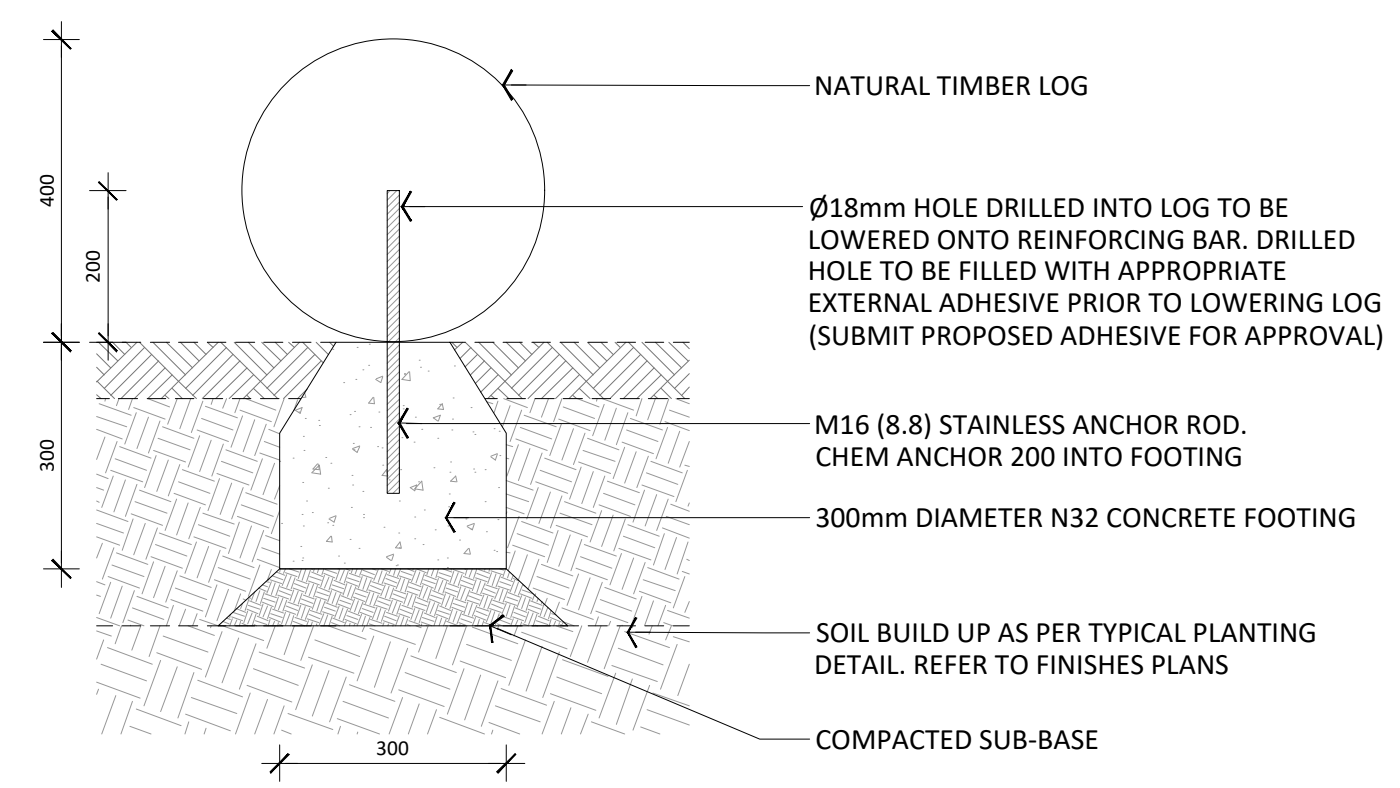
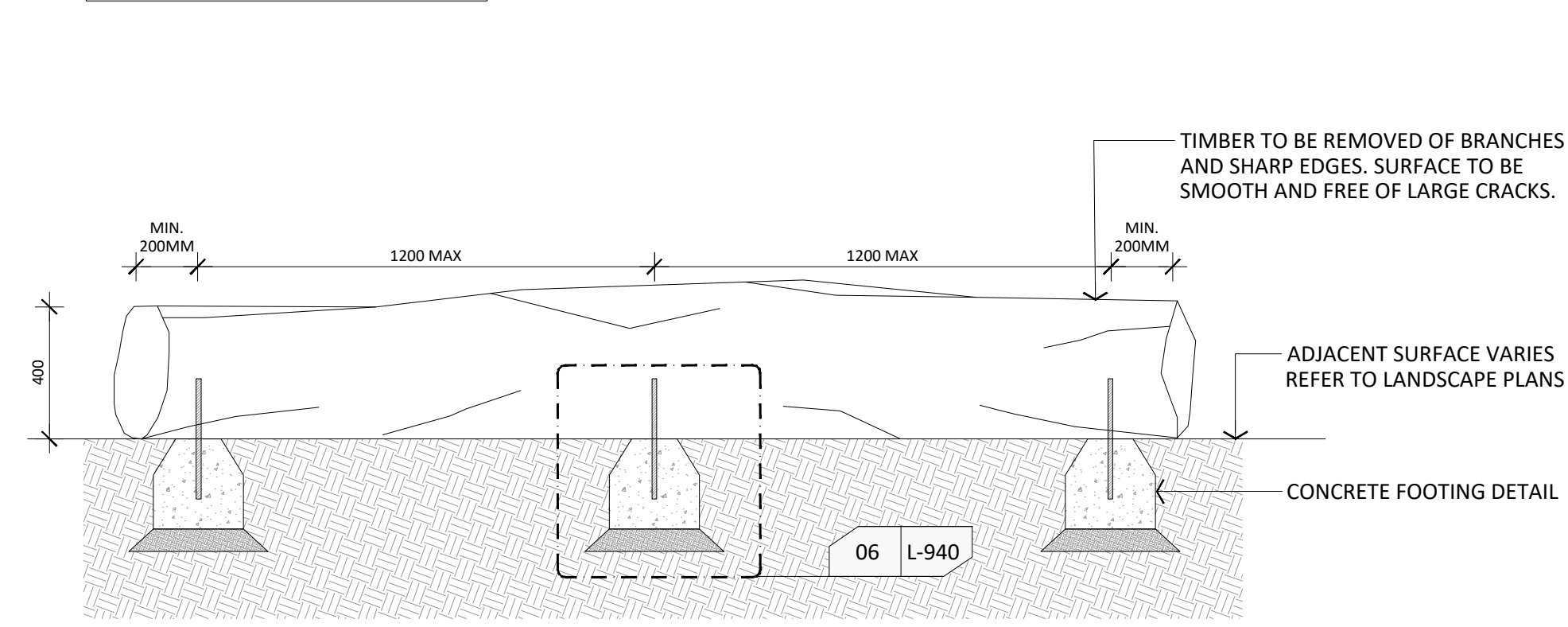


01 M-01 LOG STEPPER - TYP. SECTION 1:20

02 LOG STEPPER - TYP. PLAN 1:20

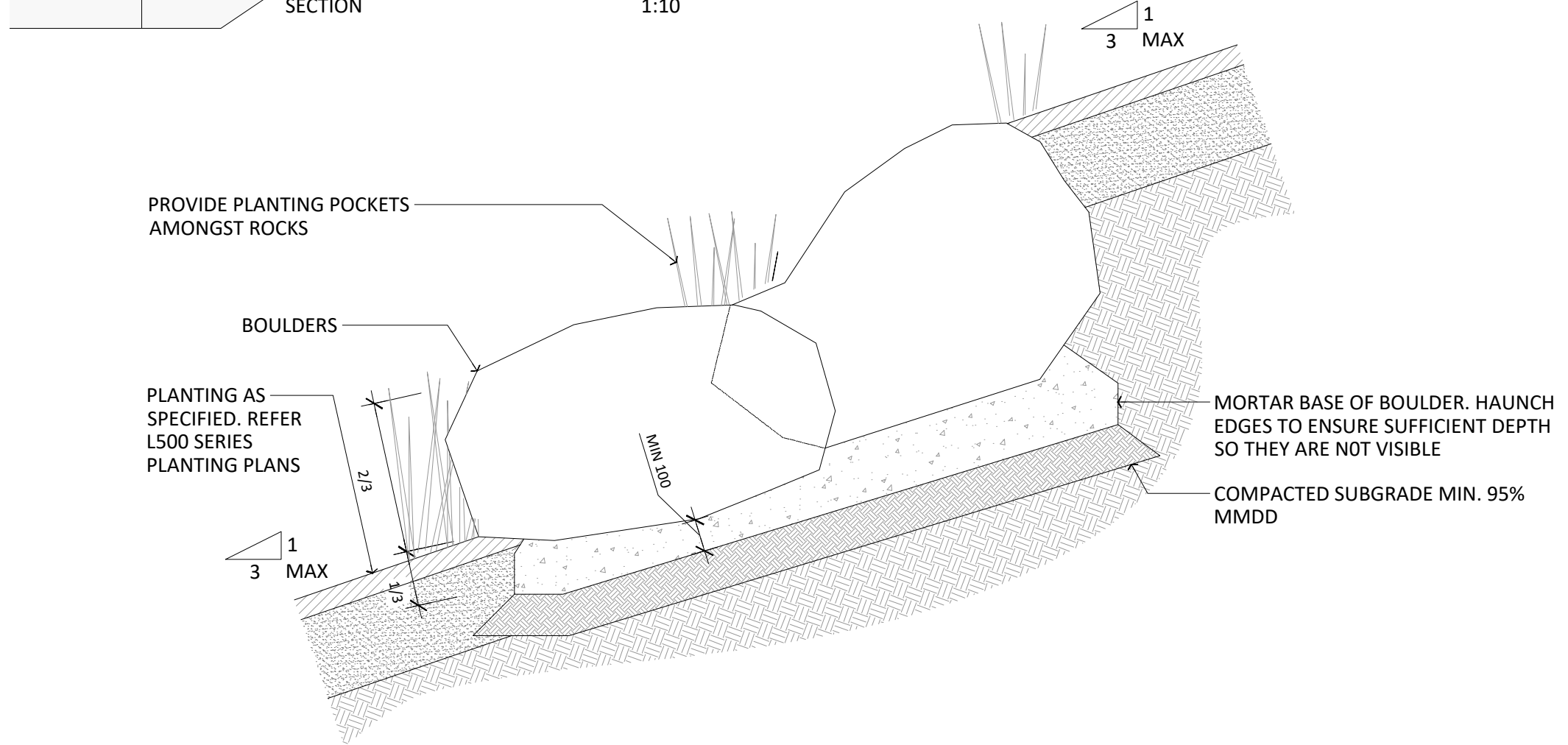
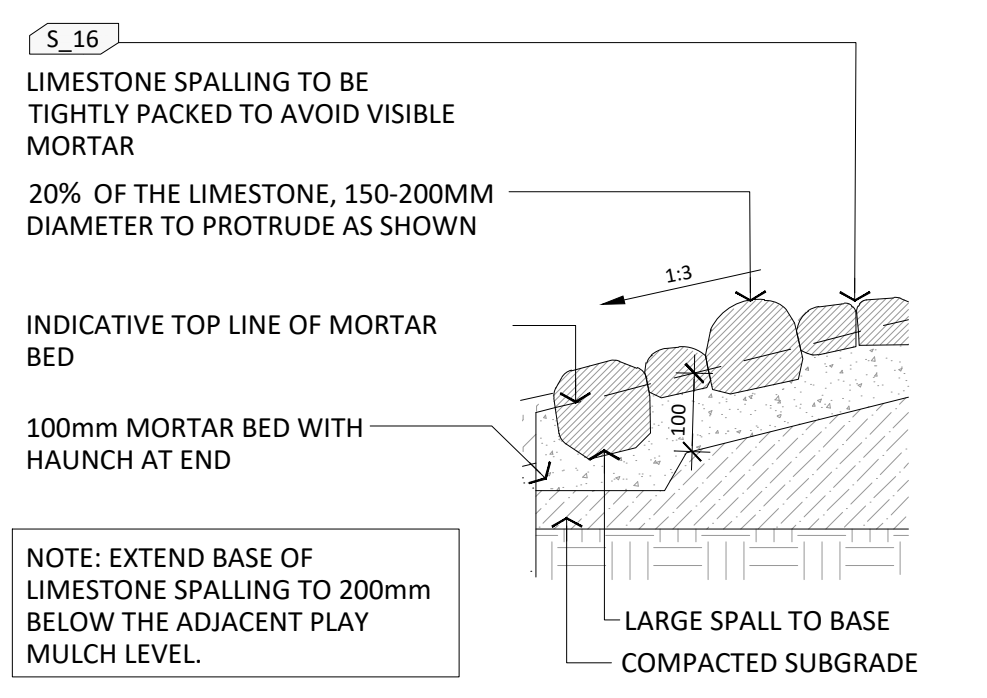
03 M-04 - NATURAL LOG - TYP. SECTION 1:20

NOTE: EACH LOG REQUIRES THREE REINFORCING BARS LOCATED AT POINTS SPREAD AS EVENLY AS POSSIBLE ALONG THE LOG. NO REINFORCING BAR SHALL BE LESS THAN 200MM FROM THE CUT ENDS OF THE LOGS



04 PLAY LOG ON GRADE - TYP. SECTION 1:20

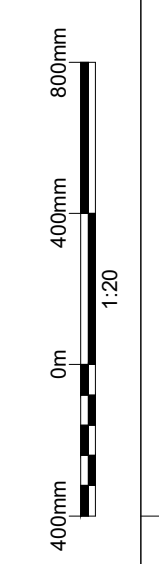
05 L-941 M-04 - PLAY LOG - FOOTING DETAIL SECTION 1:10



06 SPALL DETAIL TYP. SECTION 1:20

07 M-02 ROCK STEPPERS / FEATURE ROCKS SECTION 1:20

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Civil Engineering Consultants

ETC
Engineering Technology Consultants zntc

ACN 009 148 829 61 Loftus Street, Leederville
Western Australia 6007
Email: etc@etctpl.com.au Phone: (08) 9328 5500
Facsimile: (08) 9328 5522

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BARRACK STREET
MERREDIN
6415, WESTERN AUSTRALIA

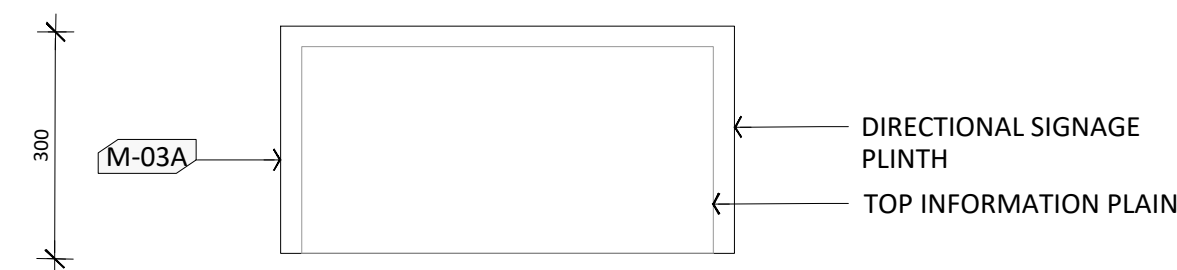
SHIRE OF MERREDIN
INNOVATING THE WHEATBELT

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GENERAL NOTES							
REFER TO L002							
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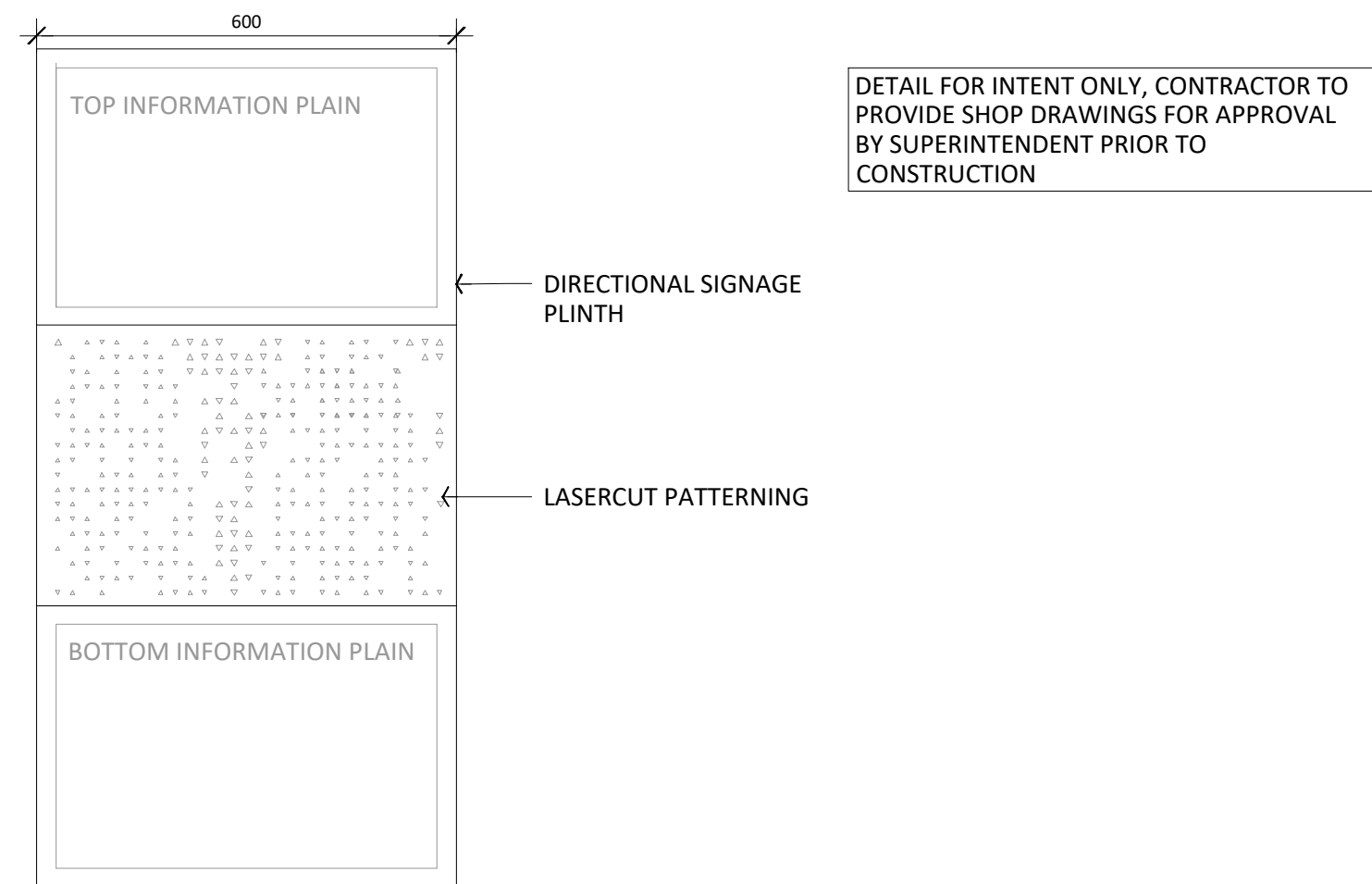
MERREDIN CBD-STAGE 1A

NATURAL PLAY DETAILS

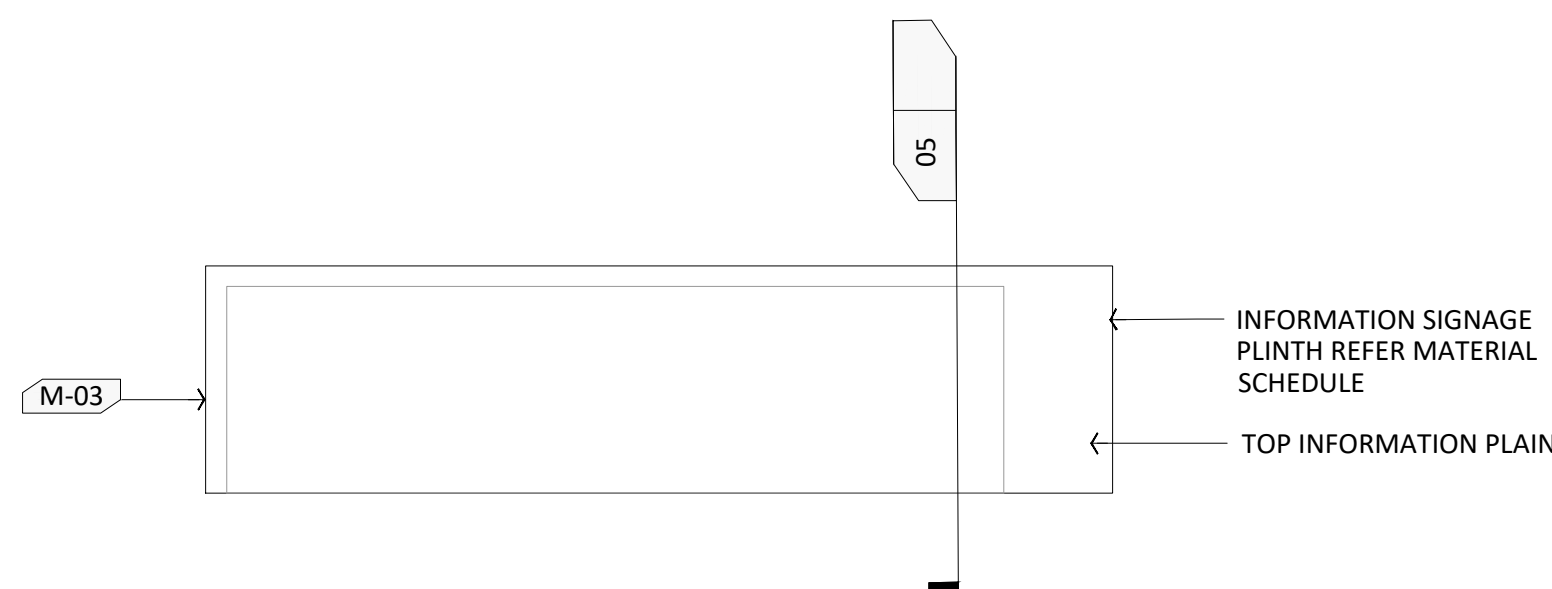
PLACE LAB PROJ No 2139 SCALE: 1:200
UNIT: mm
DWG STATUS ---- SHEET SIZE A1
DWG No L-940 ISSUE A



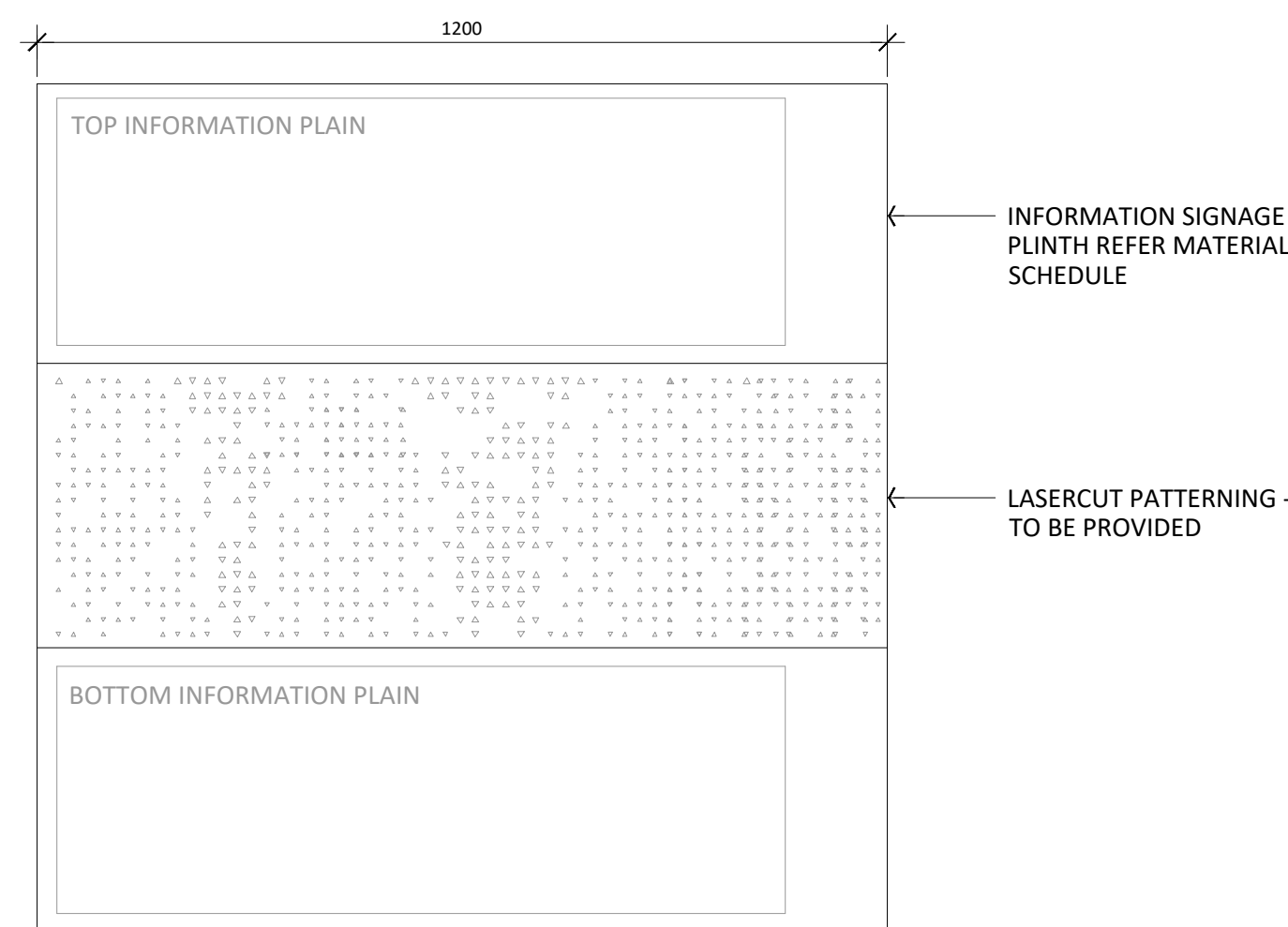
01 SIGNAGE PLAN 1:10



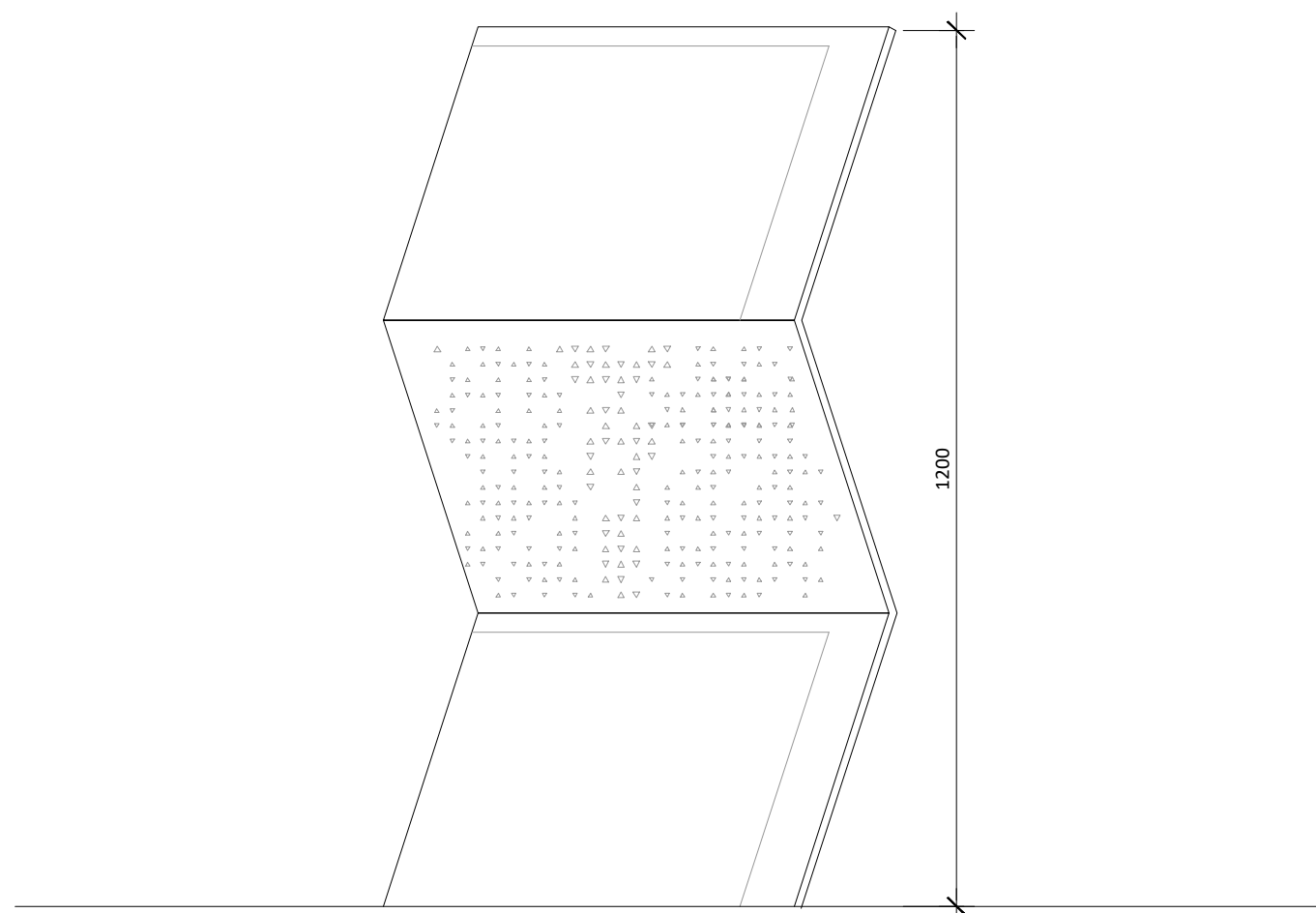
02 SIGNAGE ELEVATION 1:10



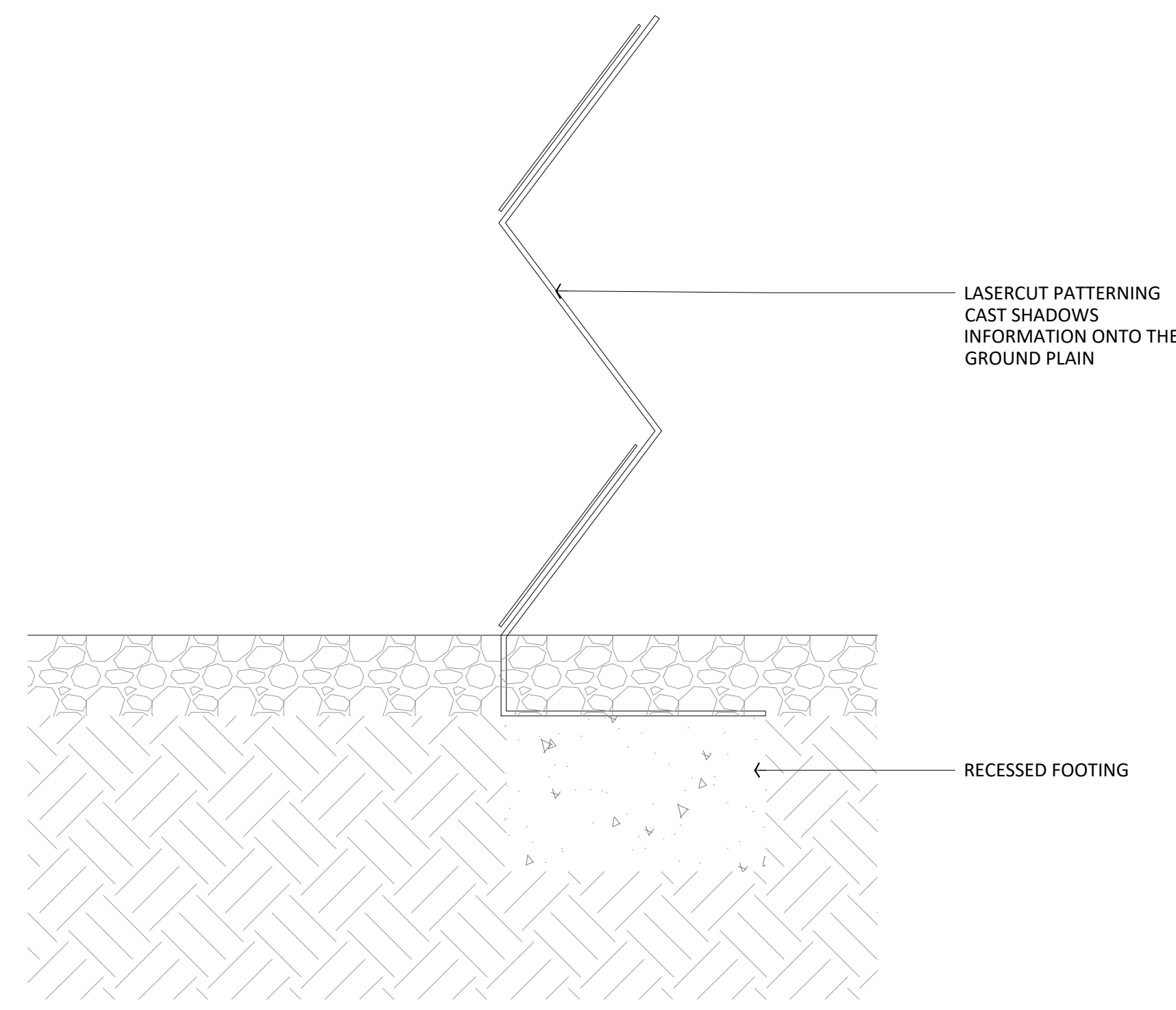
03 SIGNAGE PLAN 1:10



04 SIGNAGE ELEVATION 1:10

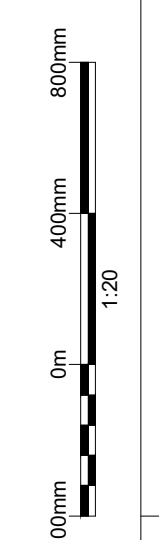


06 SIGNAGE PERSPECTIVE 1:10



05 SIGNAGE SECTION 1:10

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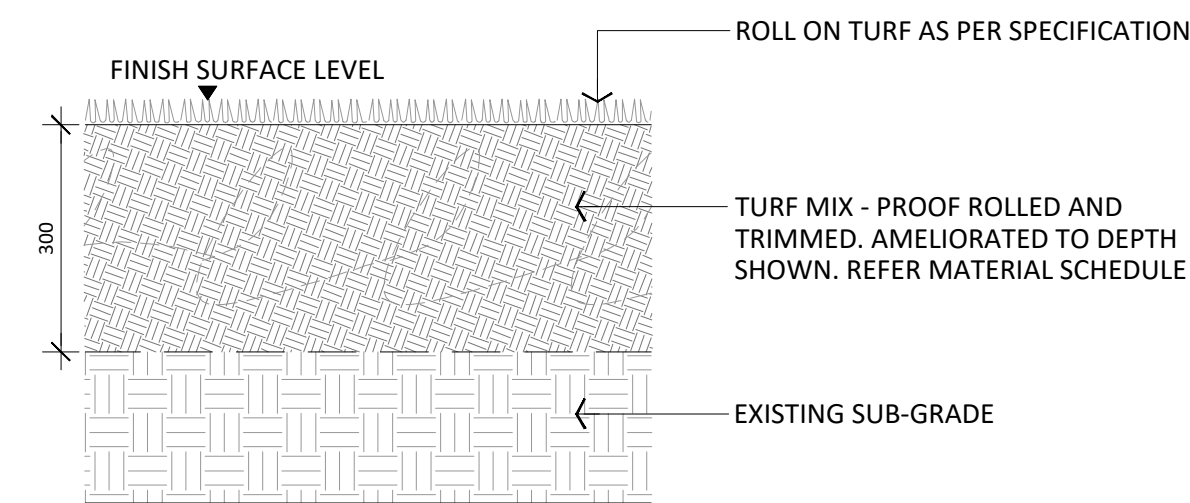


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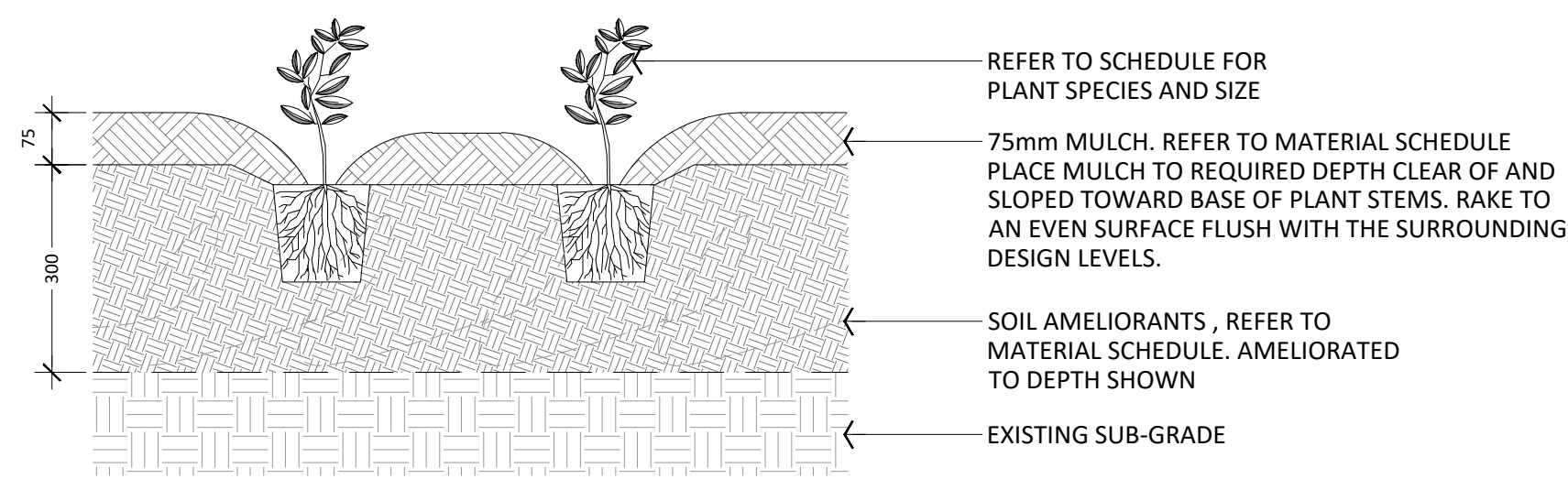


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MERREDIN CBD-STAGE 1A			
SIGNAGE			
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DWG STATUS	----	UNIT:	mm
DWG No	L-950	SHEET SIZE	A1
			ISSUE A

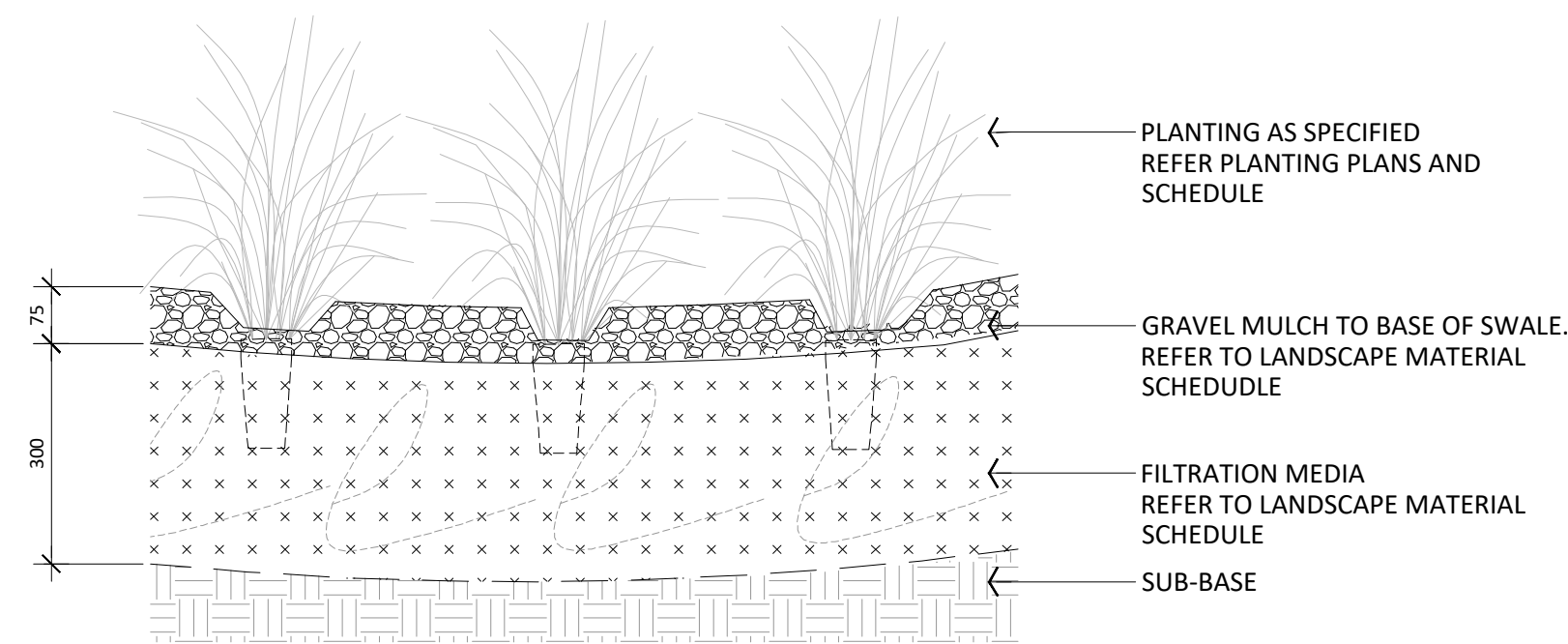


01 TURF - GROUND TYP. DETAIL 1:10



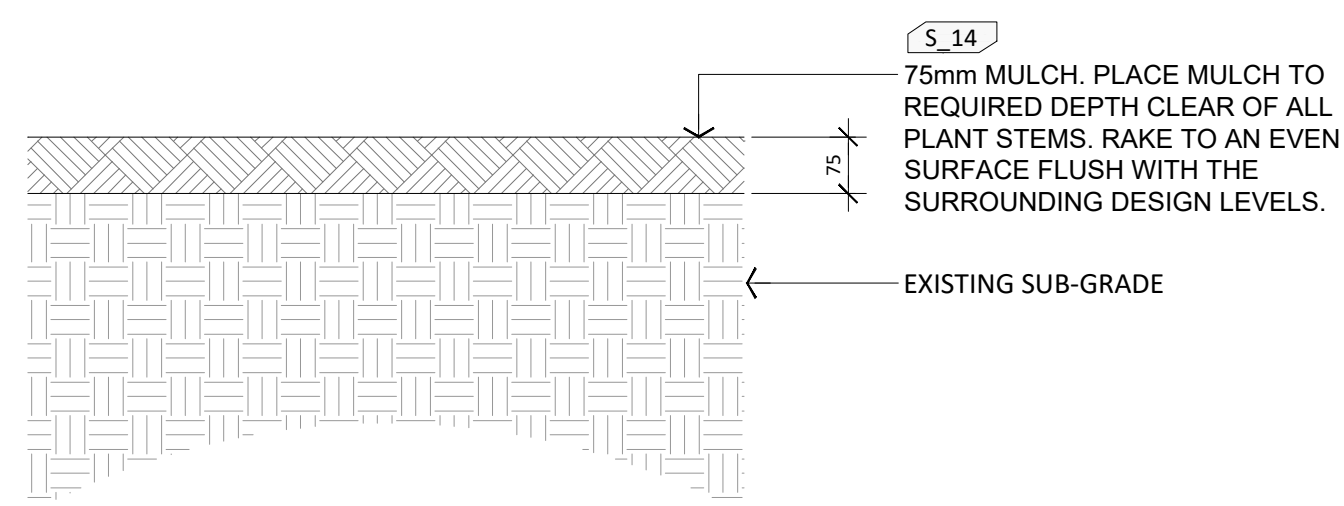
02 L-991 PLANTING IN ORGANIC MULCH DETAIL 1:10

REFER TO GRADING PLANS FOR SWALE LEVELS. TYPICAL SWALE SHOWN.



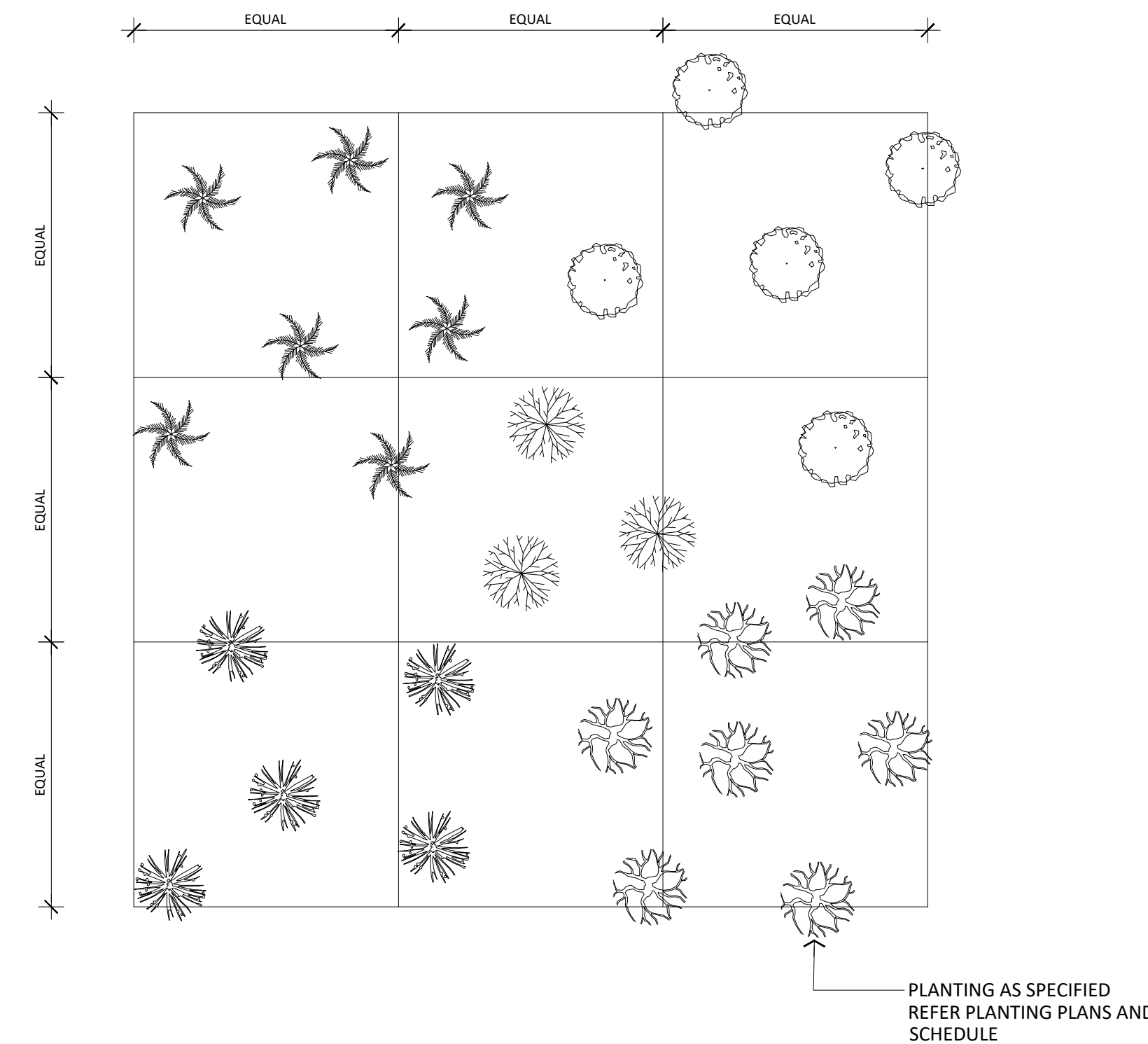
03 PLANTING IN GRAVEL SECTION 1:10

NOTE: ENSURE MULCH UNDER TREES IS SETBACK FROM TRUNKS TO AVOID COLLAR ROT. ENSURE MULCH UNDER TREES IS WOOD CHIPS WHERE THE CHIPS ARE GREATER THAN 6mm DIAMETER



04 S-14 MULCH ONLY SECTION 1:10

NOTE: PLANTING TO BE PLACED OFF CENTER TO ACHIEVE AN ORGANIC SET OUT. PLANTS TO BE PLANTED IN GROUPS OF 3, 5, 7 OR 9 OF THE SAME SPECIES. REFER TO PLANT SCHEDULE FOR PLANT MIX AND DENSITY.



07 L-991 TYPICAL PLANTING LAYOUT DETAIL 1:10



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Western Australia 6007
Email: etc@etcpl.com.au Phone: (08) 9328 5500
Facsimile: (08) 9328 5522

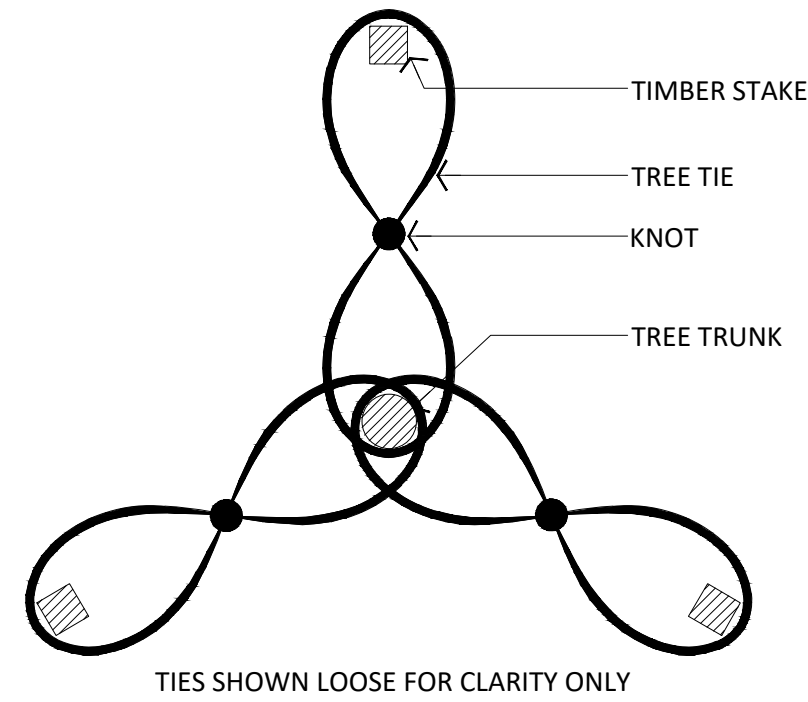
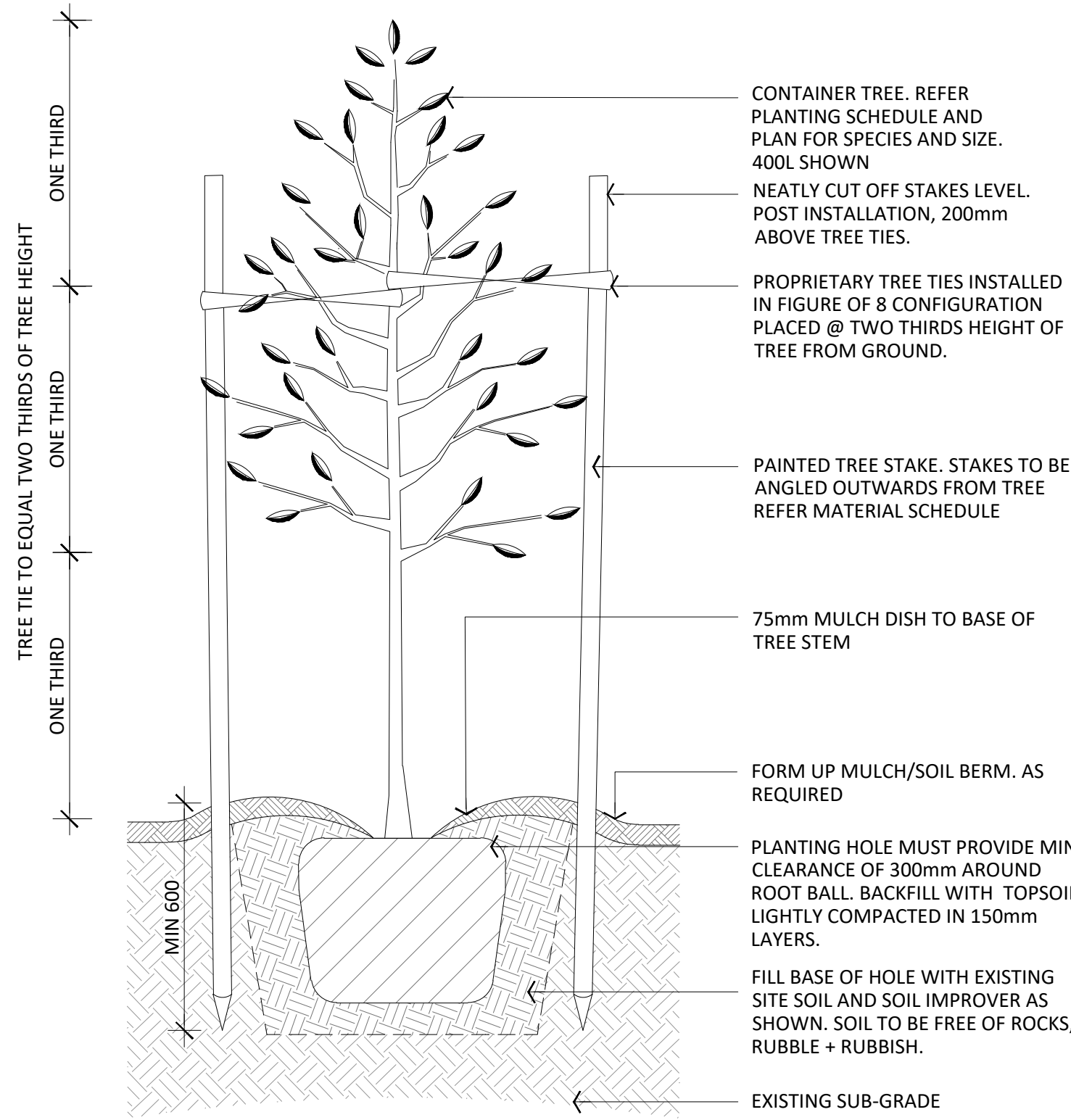
CLIENT
SHIRE OF MERREDIN
BARRACK STREET
MERREDIN
6415, WESTERN AUSTRALIA



DRN BY	NP	START DATE	SEPT 21
DESIGNED	NP	CHECKED	SS
GENERAL NOTES REFER TO L002			
REV	DATE	REVISION	DRN / CHK
A	15.03.22	ISSUE FOR TENDER	RT / NP

MERREDIN CBD-STAGE 1A
SOFTSCAPE DETAILS

PLACE LAB PROJ No 2139 SCALE: 1:200
DWG STATUS --- UNIT: mm
DWG No L-990 SHEET SIZE A1
ISSUE A



02 L-990 TREE STAKE & TIE TYP. DETAIL 1:10

01 TREE PLANTING DETAIL SECTION 1:20

A
B
C
D
E
F
G
H

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CLIENT

SHIRE OF MERREDIN
BARRACK STREET
MERREDIN
6415, WESTERN AUSTRALIA

SHIRE OF MERREDIN
INNOVATING THE WHEATBELT

DRN BY	NP	DESIGNED	NP	CHECKED	SS
START DATE	SEPT 21	GENERAL NOTES			
REFER TO L002					
REV	DATE	REVISION	DRN	CHK	
A	15.03.22	ISSUE FOR TENDER	RT	NP	

MERREDIN CBD-STAGE 1A

SOFTSCAPE DETAILS

PLACE LAB PROJ No 2139 SCALE: 1:200
UNIT: mm
DWG STATUS ---- SHEET SIZE A1
DWG No L-991 ISSUE A

6.11 Appendix 6.11 – Irrigation Drawing Set

IRRIGATION

CLIENT & PROJECT:
**PLACE LABORATORY
MERREDIN CBD STAGE 1A**

LOCATION: MERREDIN, WA

WORKS DESC: IRRIGATION

DRAWINGS IN SET: 4

DRAWING LIST:
Abv: Sheet: Rev: Description:

MCBD	01	A	LEGEND, SYSTEM DATA
MCBD	02	A	IRRIGATION PLAN
MCBD	03	A	IRRIGATION SLEEVE
MCBD	04	A	IRRIGATION DETAIL

LEGEND & SYSTEM DATA

TURF & GARDEN SPRAYS

STREAM ROTOR SPRINKLER BODIES			
BRAND / MODEL SPECIFICATION		MATCHED PRECIPITATION	
TORO	570Z	RADIUS REDUCTION TO MAX.	
RAINBIRD	1800 series	OF 75% OF RADIUS.	
HUNTER	PRO-SPRAY	RADIUS TO BE ADJUSTED IN	
ACCORDANCE WITH SPACING			
POP-UP HEIGHT			
PLANTING	TURF	GDN	
PERIMETER	100mm	150mm	
FULL CIRCLE	100mm	300mm	

STREAM ROTOR NOZZLE LEGEND			
360°	270°	210°	180°
120°	90°	OPERATING PRESSURE = 270KPA	
		MODEL MP800SR - 3.5M RAD.	
		MODEL MP1000 - 4.4M RAD.	
		MODEL MP2000 - 3.9-6.4M RAD.	
		MODEL MP3000 - 9.0M RAD.	
		MODEL MP1000 CORNER 45°	
		MODEL MP L/R HAND CORNER 15x4.6M	
		MODEL MP2000 SIDE STRIP 1.5x9.2M	

SUPPLEMENTARY TREE WATERING	
SUPPLEMENTARY WATERING FOR TREES	△ MULTIPLE BUBBLERS - 2 x 2 L/m
1	ALL BUBBLER NOZZLES TO BE HUNTER PCN.
2	ALL BUBBLERS FITTED TO 150mm POPUP SPRINKLER BODIES WITH CHECK VALVES & PRESSURE REGULATION, EITHER - HUNTER PRS30-CV or RAINBIRD SAM-PRS.
3	REFER LANDSCAPE CONTRACTOR OR PLAN FOR VERIFICATION OF LOCATIONS.

OTHER SYMBOLS

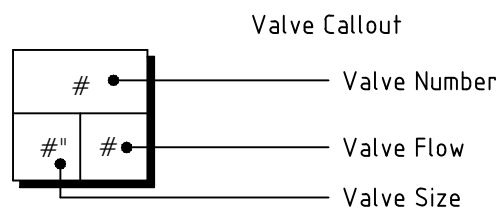
- LINE SIZED EPOXY COATED CAST IRON ISOLATION VALVE
- SOLENOID VALVE ASSEMBLY BERHAD 200 SERIES GLASS REINFORCED NYLON CONSTRUCTION SIZED AS SHOWN
- CONTROLLER CUBICLE AS PER SPECIFICATIONS
- FLUSHING VALVE
- CABLE PIT - 'P2' PLASTIC OR EQUIV. CONTRACTOR TO SHOW INSTALLED LOCATIONS IN AS-CONSTRUCTED DRAWINGS/RECORDS.
- WALL CROSSING/PENETRATION REQUIRED
- IRRIGATION PIPE CONNECTION POINT
- EXISTING TREES
- EXISTING TREE ROOTS TO BE PROTECTED IN ACCORDANCE WITH AS4970. TRENCHES ENTERING THE TREE ROOT PROTECTION ZONE &/OR CANOPY DRIP LINE MUST BE EXCAVATED BY HAND.
- EXISTING DN 50 PRESSURISED RECYCLED WATER MAINLINE
- NEW DN 50 PVC CLASS 12 SWJ MAINLINE WITH WIRE 32mm CONDUIT
- NEW PVC CLASS 9 IRRIGATION LATERAL PIPE WORK SIZE DN 25 UNLESS OTHERWISE SHOWN
- NEW TREE BUBBLER PVC CLASS 9 IRRIGATION LATERAL PIPE WORK SIZE DN 25 UNLESS OTHERWISE SHOWN

PATTERN & DESIGNATION	
	GARDEN PLANTING
	TURF AREA

MAINLINE, ALL LATERAL PIPES, SPRINKLER TOPS AND SOLENOID VALVES (VALVE BOX LIDS) THAT ARE CONNECTED TO RECLAIMED WATER SYSTEM ARE TO BE LILAC IN COLOUR.

IRRIGATION SEQUENCING CONTROLLER
NEW HUNTER PRO HC- 24 STATION CONTROLLER, LOCATION AS PER THE DRAWINGS.

VALVE IDENTIFICATION



VALVE & STATION DATA TABLE

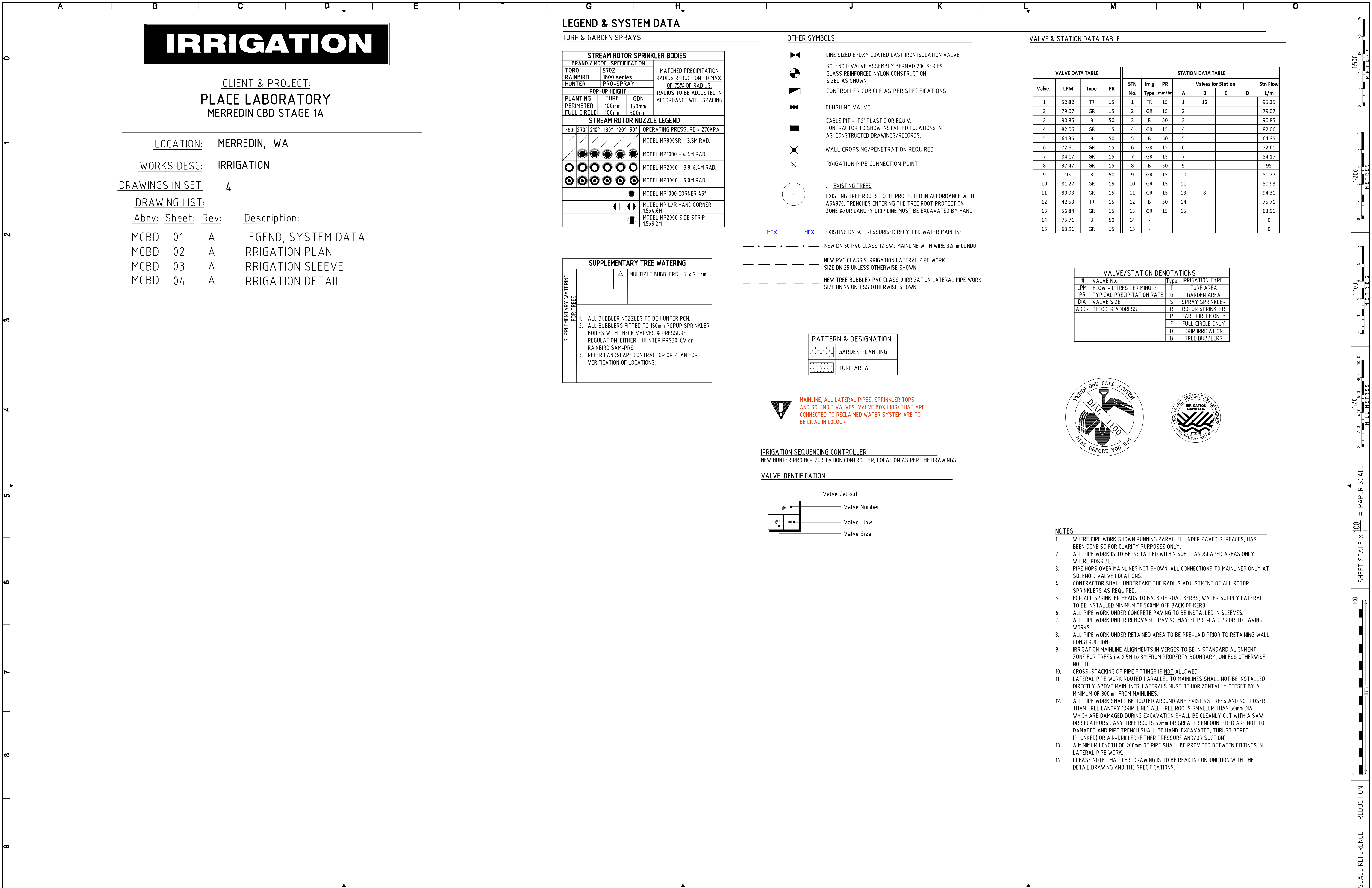
Valve#	LPM	Type	PR	STN				STATION DATA TABLE				Stn Flow
				No.	Irrig	PR	Valves for Station					
							A	B	C	D		
1	52.82	TR	15	1	TR	15	1	12				95.35
2	79.07	GR	15	2	GR	15	2					79.07
3	90.85	B	50	3	B	50	3					90.85
4	82.06	GR	15	4	GR	15	4					82.06
5	64.35	B	50	5	B	50	5					64.35
6	72.61	GR	15	6	GR	15	6					72.61
7	84.17	GR	15	7	GR	15	7					84.17
8	37.47	GR	15	8	B	50	9					95
9	95	B	50	9	GR	15	10					81.27
10	81.27	GR	15	10	GR	15	11					80.93
11	80.93	GR	15	11	GR	15	13	8				94.31
12	42.53	TR	15	12	B	50	14					75.71
13	56.84	GR	15	13	GR	15	15					63.91
14	75.71	B	50	14	-	-	-					0
15	63.91	GR	15	15	-	-	-					0

VALVE/STATION DENOTATIONS	
#	VALVE No.
LPM	FLOW - LITRES PER MINUTE
PR	TYPICAL PRECIPITATION RATE
DIA	VALVE SIZE
ADDR	DECODER ADDRESS
T	IRRIGATION TYPE
G	GARDEN AREA
S	SPRAY SPRINKLER
R	ROTOR SPRINKLER
P	PART CIRCLE ONLY
F	FULL CIRCLE ONLY
D	DRIP IRRIGATION
B	TREE BUBBLERS

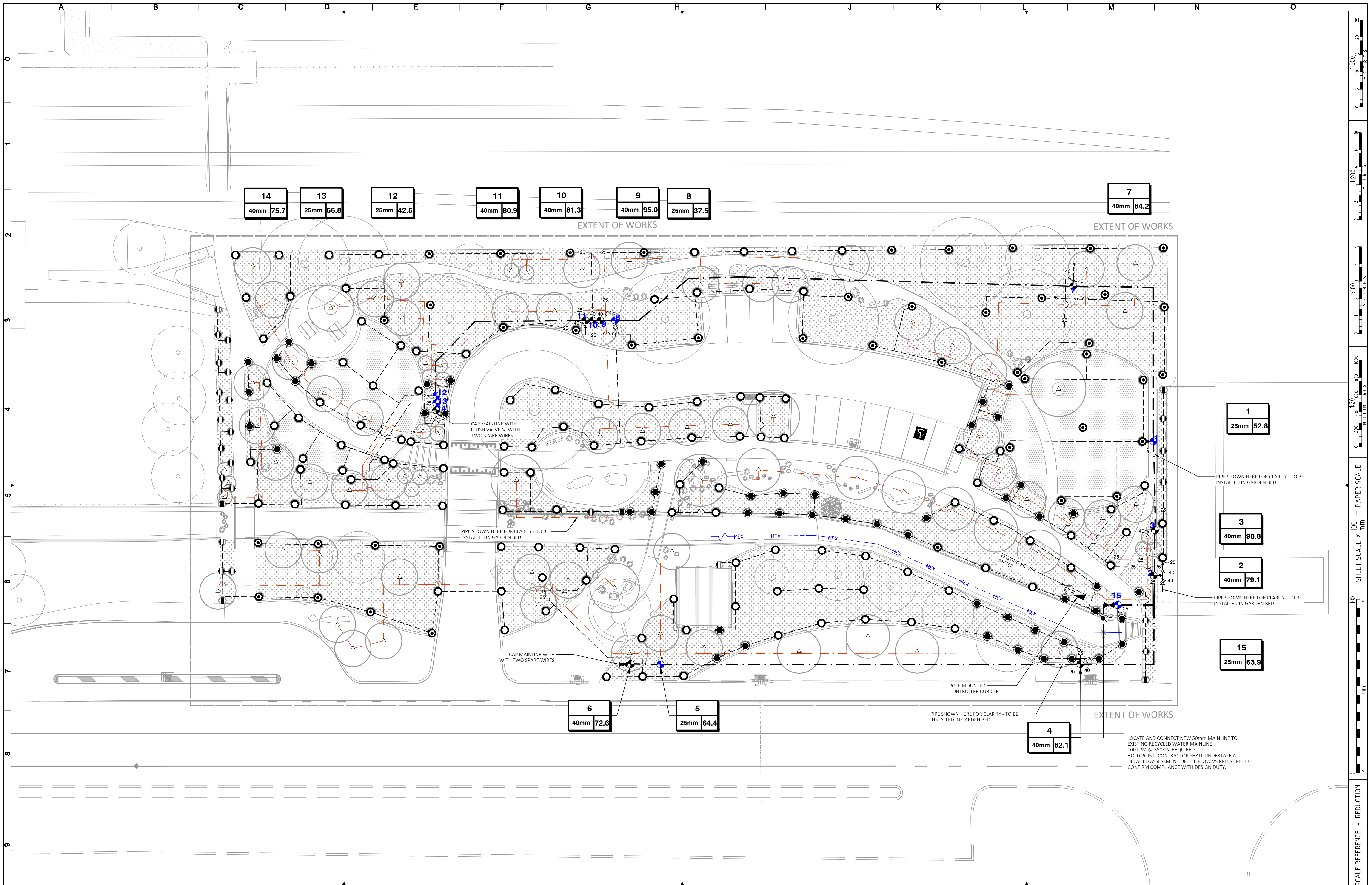


NOTES

- WHERE PIPE WORK SHOWN RUNNING PARALLEL UNDER PAVED SURFACES, HAS BEEN DONE SO FOR CLARITY PURPOSES ONLY.
- ALL PIPE WORK IS TO BE INSTALLED WITHIN SOFT LANDSCAPED AREAS ONLY WHERE POSSIBLE.
- PIPE HOPS OVER MAINLINES NOT SHOWN. ALL CONNECTIONS TO MAINLINES ONLY AT SOLENOID VALVE LOCATIONS.
- CONTRACTOR SHALL UNDERTAKE THE RADIUS ADJUSTMENT OF ALL ROTOR SPRINKLERS AS REQUIRED.
- FOR ALL SPRINKLER HEADS TO BACK OF ROAD KERBS, WATER SUPPLY LATERAL TO BE INSTALLED MINIMUM OF 500MM OFF BACK OF KERB.
- ALL PIPE WORK UNDER CONCRETE PAVING TO BE INSTALLED IN SLEEVES.
- ALL PIPE WORK UNDER REMOVABLE PAVING MAY BE PRE-LAID PRIOR TO PAVING WORKS.
- ALL PIPE WORK UNDER RETAINED AREA TO BE PRE-LAID PRIOR TO RETAINING WALL CONSTRUCTION.
- IRRIGATION MAINLINE ALIGNMENTS IN VERGES TO BE IN STANDARD ALIGNMENT ZONE FOR TREES i.e. 2.5M to 3M FROM PROPERTY BOUNDARY, UNLESS OTHERWISE NOTED.
- CROSS-STACKING OF PIPE FITTINGS IS NOT ALLOWED.
- LATERAL PIPE WORK ROUTED PARALLEL TO MAINLINES SHALL NOT BE INSTALLED DIRECTLY ABOVE MAINLINES. LATERALS MUST BE HORIZONTALLY OFFSET BY A MINIMUM OF 300mm FROM MAINLINES.
- ALL PIPE WORK SHALL BE ROUTED AROUND ANY EXISTING TREES AND NO CLOSER THAN TREE CANOPY 'DRIP-LINE'. ALL TREE ROOTS SMALLER THAN 50mm DIA. WHICH ARE DAMAGED DURING EXCAVATION SHALL BE CLEANLY CUT WITH A SAW OR SECATEURS. ANY TREE ROOTS 50mm OR GREATER ENCOUNTERED ARE NOT TO BE DAMAGED AND PIPE TRENCH SHALL BE HAND-EXCAVATED, THRUST BORED (PLUNKED) OR AIR-DRILLED (EITHER PRESSURE AND/OR SUCTION).
- A MINIMUM LENGTH OF 200mm OF PIPE SHALL BE PROVIDED BETWEEN FITTINGS IN LATERAL PIPE WORK.
- PLEASE NOTE THAT THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE DETAIL DRAWING AND THE SPECIFICATIONS.



SHEET KEY				CADSULTIDS 1/220 Carr Place Leederville WA 6007 www.cadsultids.com.au				DRAWN: MW DESIGN: MW DATE: 15.03.2022 CHECKED: TF CAD REF: CAD REF				CLIENT: PLACE LABORATORY PROJECT: MERREDIN CBD STAGE 1A				TITLE: IRRIGATION LEGEND & SYSTEM DATA DRAWING NO.: MCBD-01-A SHEET SIZE: A1 SHEET SCALE: NTS SHEETS IN SET: 4			
REV	DATE	MW	ISSUE FOR TENDER	TF	CHKD	AMENDMENT	COMMENT/NOTE	COPYRIGHT © THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF CADSULTIDS. THE DOCUMENT MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION. UNAUTHORIZED USE OF THIS DOCUMENT IN ANY WAY IS PROHIBITED.				SCALE REFERENCE - REDUCTION							

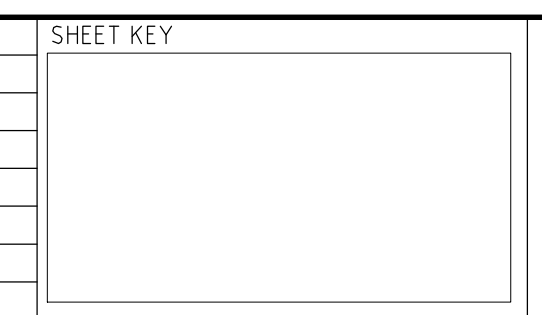


1500 METRES
1200 METRES
1000 METRES
800 METRES
600 METRES
400 METRES
200 METRES
100 METRES
SCALE REFERENCE - REDUCTION

SHEET SCALE X 100 = PAPER SCALE
100 mm

REV	DATE	MADE BY	ISSUE FOR TENDER	AMENDMENT	CHKD	COMMENT/NOTE
A	15.03.2022	MW	ISSUE FOR TENDER		TF	
-	-	-	-	-	-	-
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SHEET KEY	



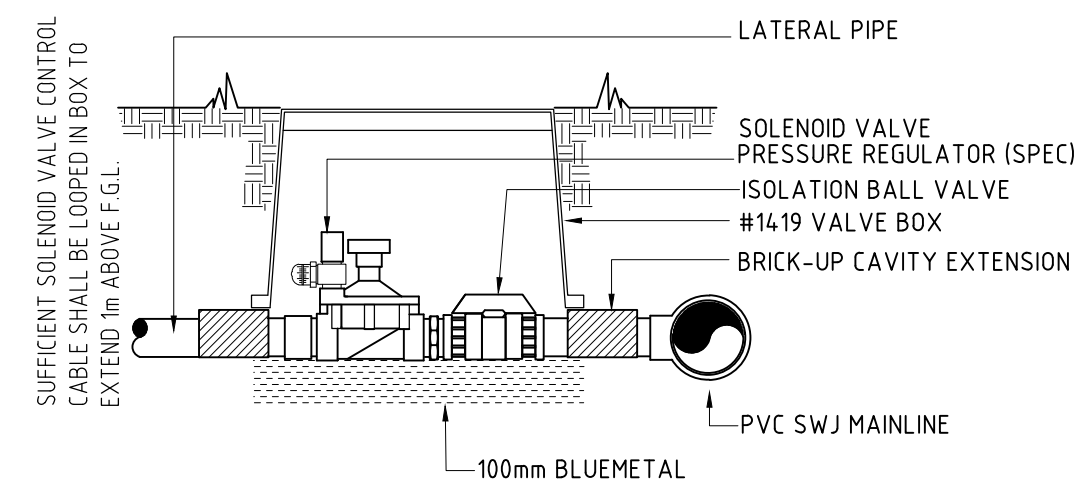
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DESIGN: MW	
DATE: 15.03.2022	
CHECKED: TF	
CAD REF: CAD REF	

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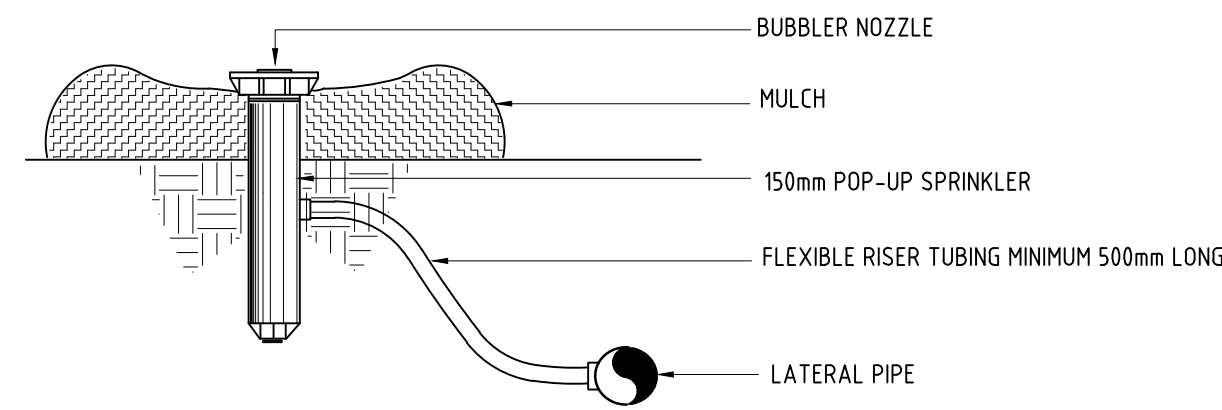
CLIENT: PLACE LABORATORY	TITLE: IRRIGATION PLAN
PROJECT: MERREDIN CBD STAGE 1A	

SHEET SIZE	SHEET SCALE	IN SHEETS IN SET	DRAWING NO.	DRG NO.	REV
A1	1:200	4	MCBD-02	A	

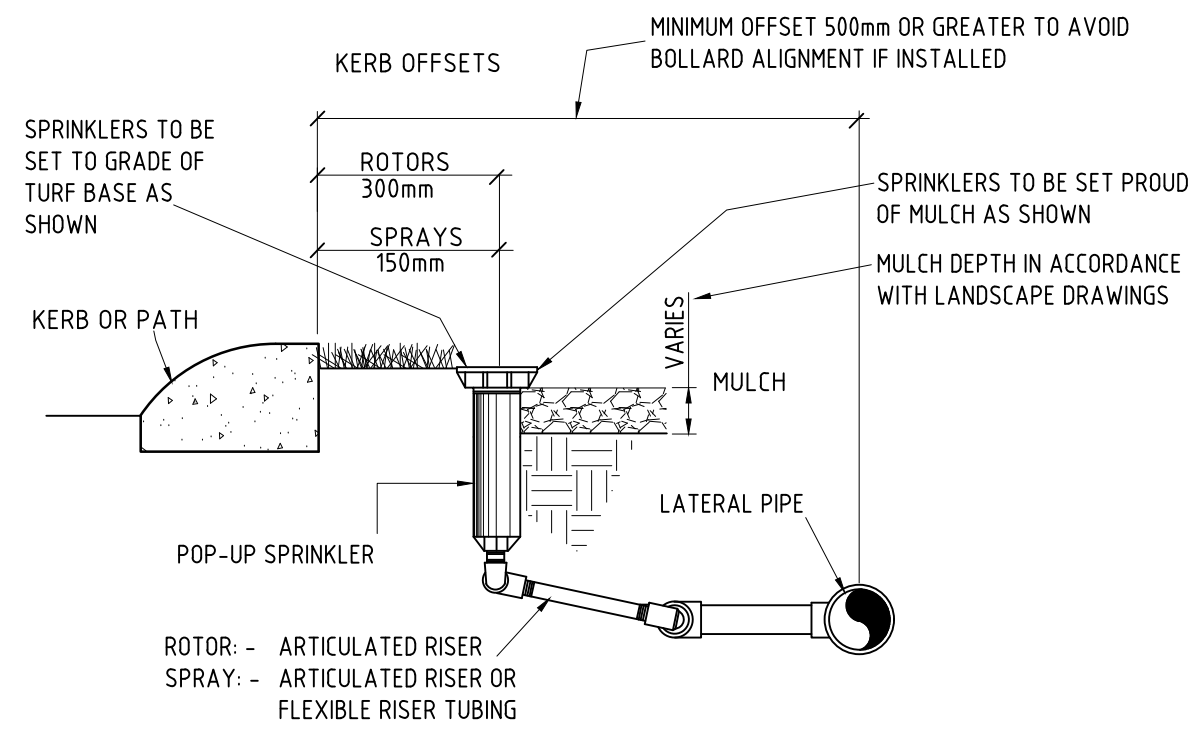
DETAILS [NTS]



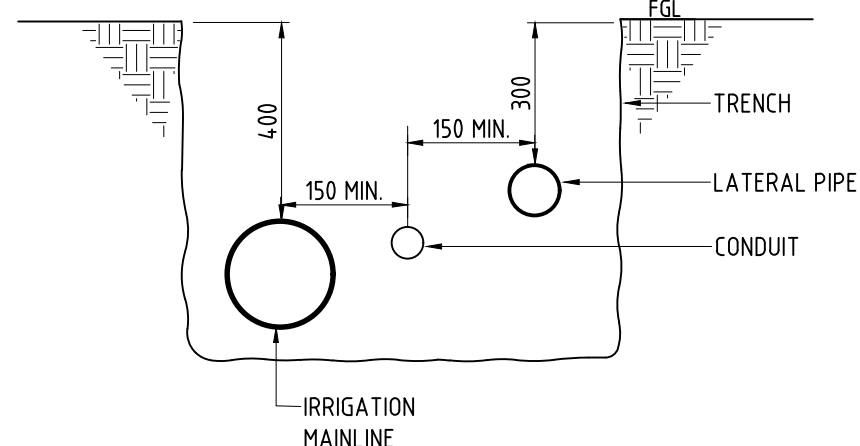
SOLENOID VALVE CONNECTION DETAIL
TYPICAL COMMERCIAL INSTALLATION - SWJ MAINLINE NTS



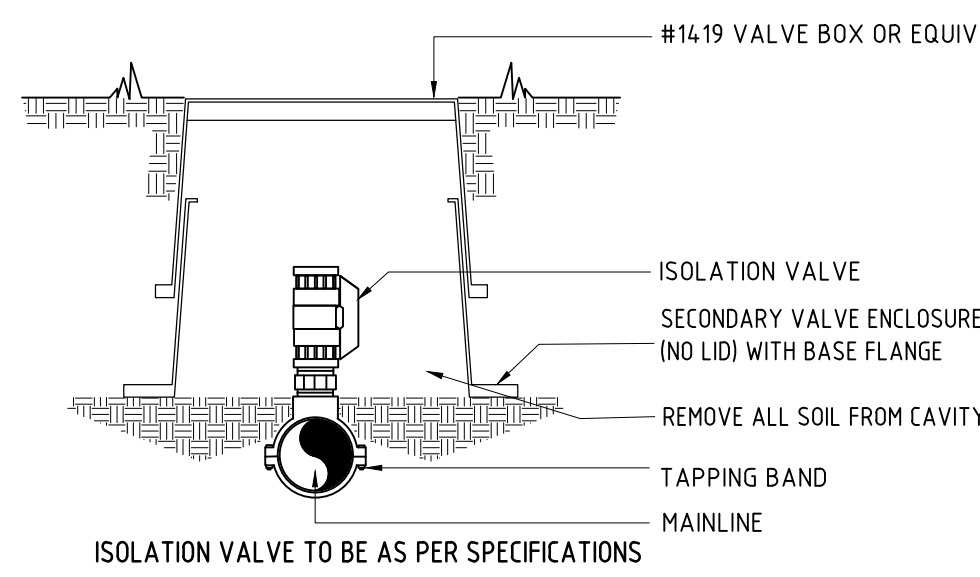
SUPPLEMENTARY TREE WATERING
POP-UP / BUBBLER NOZZLE CONNECTION DETAIL - REFER SPECIFICATION NTS



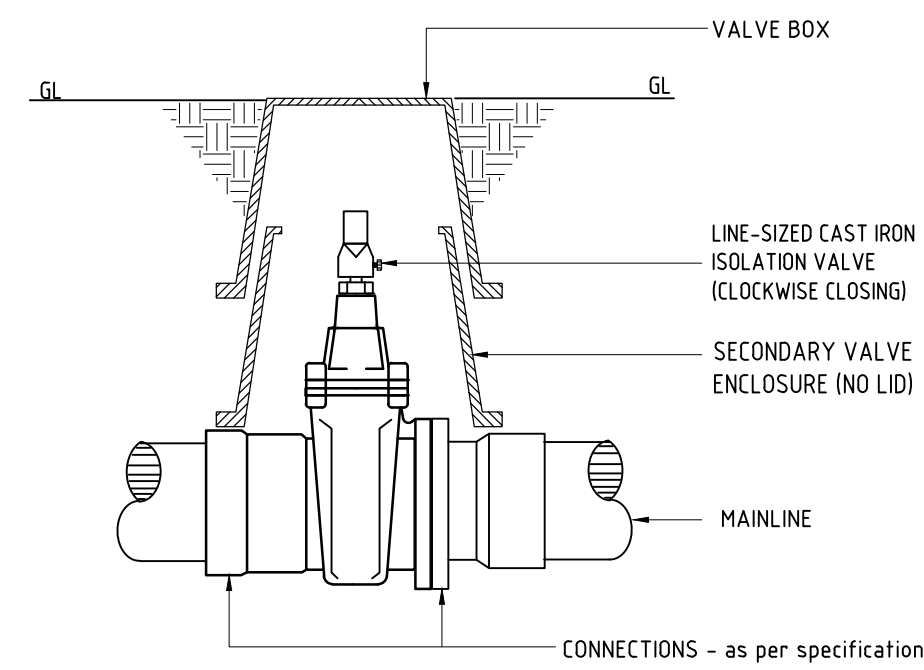
SPRINKLER CONNECTION DETAIL
TYPICAL INSTALLATION - NO BOLLARDS OR BOLLARDS BEYOND 800mm OF BOUNDARY NTS



COMMON TRENCH DETAIL SECTION NTS
MAINLINE, CONDUIT & LATERAL

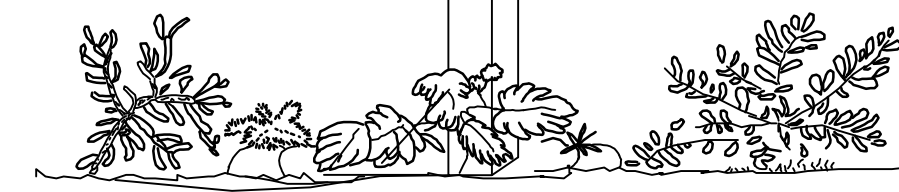


FLUSHING POINT
TYPICAL INSTALLATION NTS



ISOLATION VALVE CONNECTION DETAIL NTS
MAINLINES - IN PLANTED AREAS

! SIGNAGE TO BE ALIGNED PARALLEL TO CENTER LINE OF KERB/PATHWAY AS TO MINIMISE ANY SHADOWING EFFECT ON SPRAY/ROTOR PERFORMANCE



RECLAIMED WATER - HAZARD SIGNAGE EXAMPLE NTS

0 5 10 15 20 25 METRES

0 5 10 15 20 25 METRES

0 200 400 600 800 1000 MILLIMETRES

0 200 400 600 800 1000 MILLIMETRES

100 mm

SHEET SCALE x 100 = PAPER SCALE

SCALE REFERENCE - REDUCTION

REV	DATE	MADE BY	ISSUE FOR TENDER	AMENDMENT	CHKD	COMMENT/NOTE
A	15.03.2022	MW	ISSUE FOR TENDER		TF	
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-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

SHEET KEY

CADSULTIDS
1/220 Carr Place Leederville WA 6007 | www.cadsultids.com.au

DRAWN: MW
DESIGN: MW
DATE: 15.03.2022
CHECKED: TF
CAD REF: CAD REF

NORTH

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CLIENT: PLACE LABORATORY	TITLE: IRRIGATION DETAILS
PROJECT: MERREDIN CBD STAGE 1A	DRAWING NO. DRG NO. REV
SHEET SIZE: A1	SHEET SCALE: N.T.S.
NO. SHEETS IN SET: 4	PROJECT: MCB04-A

6.12 Appendix 6.12 – Electrical & Lighting Drawing Set

MERREDIN CBD STAGE 1A

ELECTRICAL & LIGHTING SERVICES

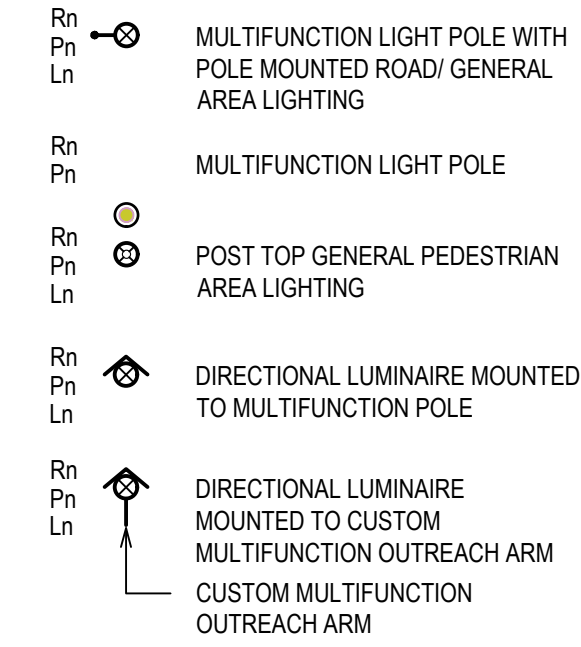
DRAWING INDEX	
DWG. No.	DRAWING DESCRIPTION
DE-001	LEGEND, SCHEDULES & LOCALITY PLAN
DE-002	LIGHTING & POWER PLAN LAYOUT
DE-003	LIGHTING DETAILS
DE-004	PIT DETAILS
DE-005	SWITCHBOARD DETAILS & SLD

NOTES:

- ALLOW TO AIM AND ADJUST ALL TYPE L3 LUMINAIRES DURING A NIGHT AIM COMMISSIONING TEST TO APPROVAL. PROVIDE AN EWP AND LABOUR NECESSARY TO FACILITATE AND COMPLETE THE AIMING. CONFIRM ALL EFFECT AND AIM POINT REQUIREMENTS PRIOR.

LIGHTING SYMBOLS

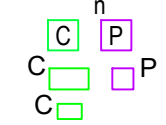
L_n DENOTES LUMINAIRE TYPE. REFER TO LUMINAIRE SCHEDULE ON THIS DRAWING. R_n DENOTES CIRCUIT. P_n DENOTES POLE TYPE. REFER TO POLE SCHEDULE ON THIS DRAWING.



REFER TO LUMINAIRE & POLE SCHEDULE FOR DETAILS

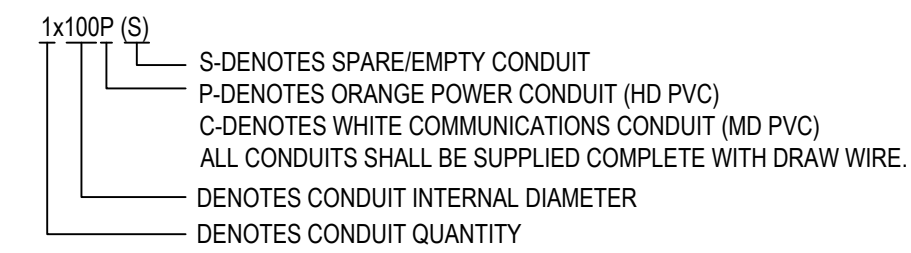
PIT & CONDUIT SYMBOLS

Y_n - DENOTES PIT NOMINAL CLEAR OPENING (NOMINAL ONLY). CONTRACTOR TO INCREASE PIT SIZES OR ADD RISERS AS NECESSARY TO SUIT CONDUIT QUANTITY SHOWN ON THE DRAWING.
 33' - DENOTES 330x330mm
 66' - DENOTES 600x600mm
 99' - DENOTES 900x900mm
 5' - DENOTES 650x650mm
 8' - DENOTES 1250x450mm
 ALL PITS SHALL MATCH THE SPECIFIED DETAIL UNLESS OTHERWISE APPROVED.
 REFER TO DETAILS AND SPEC. FOR ADDITIONAL REQUIREMENTS. INCLUDE STAINLESS STEEL LABEL AS FOLLOWS TO APPROVAL:
 'P' - DENOTES 'SHIRE OF MERREDIN - POWER' (TYPE 66R UOS)
 'C' - DENOTES 'SHIRE OF MERREDIN - COMMUNICATIONS' (TYPE 66 UOS)



EARTH PIT (ACO PEP22 LOCKABLE LID)
 P1 - POWER CONDUIT TRUNK 1x50P U.O.S. ON DRAWING
 P2 - POWER CONDUIT GENERAL 2x32P U.O.S. ON DRAWING
 C1 - PROVISIONED CAPPED COMMUNICATIONS CONDUIT TRUNK TO BE USED FOR FUTURE SERVICES (e.g. CCTV, WIFI, etc) 1x32C U.O.S. ON DRAWINGS

--- DENOTES CONDUIT CAPPED OFF UNDERGROUND. SURVEY AND MARK LOCATION ON AS CONSTRUCTED DRAWINGS



POWER SYMBOLS

SMSB - EXISTING SITE MAIN SWITCHBOARD

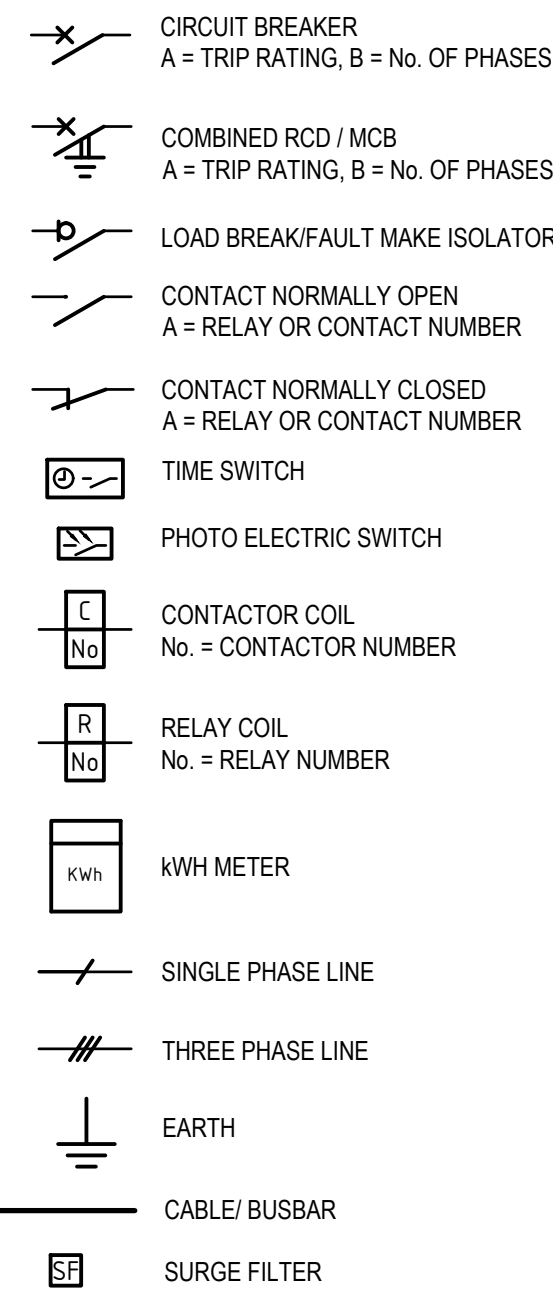
MISCELLANEOUS

SMSB - DISTRIBUTION BOARD & SITE MAIN SWITCHBOARD DEMARCATION ZONE

ABBREVIATIONS

- AFF ABOVE FINISHED FLOOR
- AFG ABOVE FINISHED GROUND
- HG HOT DIP GALVANISED
- IP INGRESS PROTECTION RATING
- S/S 316 GRADE STAINLESS STEEL
- U/G UNDERGROUND
- UOS UNLESS OTHERWISE SHOWN
- WP WESTERN POWER
- SOM SHIRE OF MERREDIN
- F FUTURE

SINGLE LINE SYMBOLS



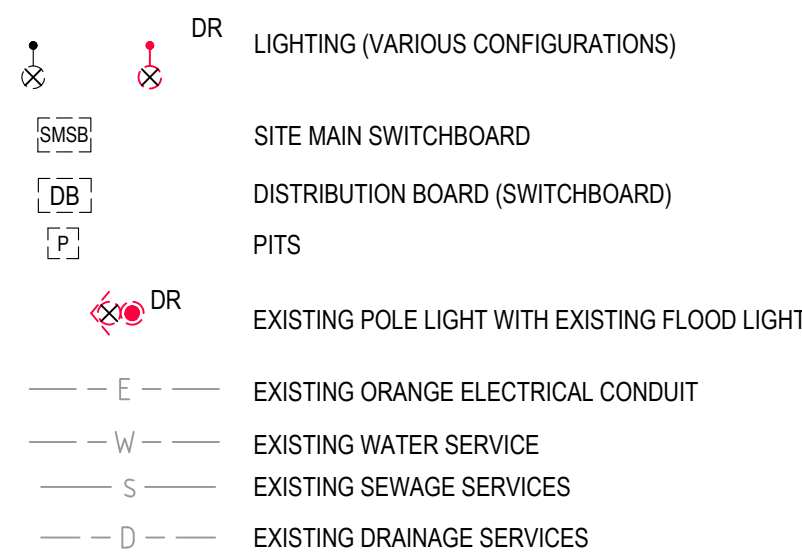
EXISTING SERVICES & DEMOLITION LEGEND

NOTE:
 BLACK/DASHED SYMBOLS DENOTES EXISTING SERVICE/EQUIPMENT TO BE RETAINED AND MUST BE PROTECTED DURING CONSTRUCTION.

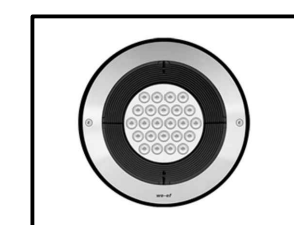
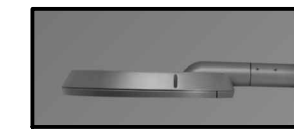
GREY SYMBOLS/LINES DENOTES NON-ELECTRICAL EXISTING SERVICES

RED SYMBOLS 'DR' DENOTES EXISTING SERVICE/EQUIPMENT DECOMMISSIONED AND REMOVED. DISPOSE OF AS DIRECTED BY THE CITY OF KALGOORLIE BOULDER. ALLOW TO RETURN EQUIPMENT UNDAMAGED TO A STORAGE LOCATION WITHIN KALGOORLIE BOULDER OR DISPOSE AT AN APPROVED WASTE FACILITY AS DIRECTED BY THE SHIRE OF MERREDIN. INCLUDE ALLOWANCE FOR ALL CRANAGE AND TRANSPORTATION.

DRAWINGS TO BE READ IN CONJUNCTION WITH WESTERN POWER ENDOWMENT LOT WPEDC-0376 DRAWINGS.



INDICATIVE IMAGE

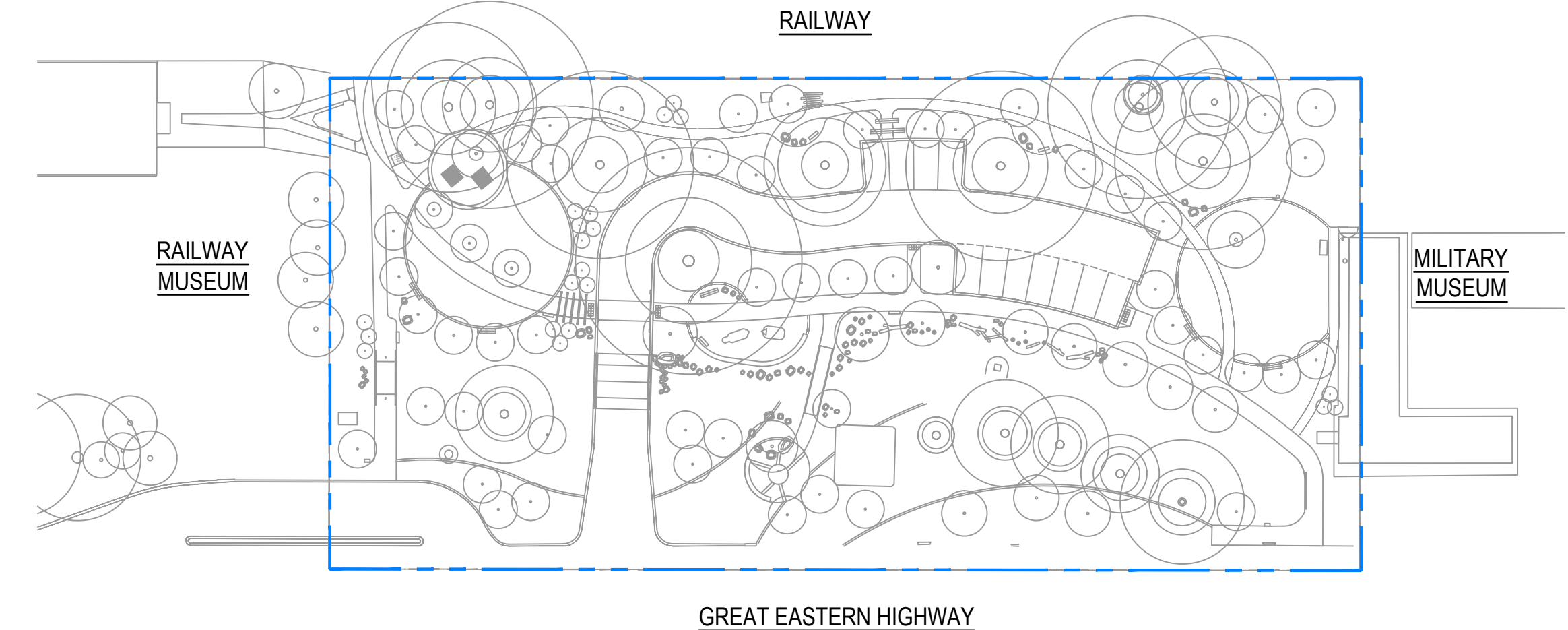


TYPE	DESCRIPTION	LED
L1	IGUZZINI TWILIGHT CANBERRA LED POST TOP AREA LUMINAIRE, IP66, IK10, COMPLETE WITH CUSTOM 2mm 316 STAINLESS STEEL TOP-HAT REFLECTOR, SOFT ROLLED EDGE RETURN AND NO PRESSED STEP-DOWN, REFLECTOR ANGLE TO MATCH ORIGINAL, FINISHED IN APPROVED SPECIAL POWDERCOAT PAINT COLOURS. INSTALLED WITH UV-RESISTANT NYLON WASHERS TO ISOLATE DISSIMILAR METALS MOUNT LUMINAIRE TO A 4.7m HIGH CIRCULAR CHS GALV STEEL BASE PLATE MOUNTED POLE. PAINTED TO APPROVAL. REFER TO DETAIL DRAWING DE-004. (PROVIDE SHOP DRAWINGS, REFER TO SPECIFICATION)	LED 3000K 30.2W/3520lm 97° / 115° ELLIPTICAL BEAM OPTIC CRI 80
L2	WEEF RFL540-SE CARPPARK LUMINAIRE POLE ON A 9m HIGH MULTIFUNCTION POLE (REFER TO POLE SCHEDULE AND POLE DETAIL DRAWINGS ON DE-004 FOR FURTHER INFORMATION), IP66, IK07 MOUNT LUMINAIRE TO CHS OUTREACH WITH INTERNAL SPIGOT FITTER TO SUIT THE LUMINAIRE (MATCH LUMINAIRE ATTACHMENT CHS DIAMETER)	LED 3000K 96W/11805lm RECTANGULAR SIDE THROW (R65) CRI 80
L3A	LUMINAIRE MOUNTED TO MULTIFUNCTION 9m POLE WITH MONOSPOT S4 POLE BRACKET TO PROVIDE GENERAL PEDESTRIAN AREA LIGHTING. REFER TO POLE DETAILS DRAWINGS FOR ADDITIONAL REQUIREMENTS. LUMINAIRE TO COMPRISE OF MEYER MONOSPOT S4, IP65, IK08, ALUMINIUM HOUSING WITH PAINTED FINISH TO LANDSCAPE ARCHITECT APPROVAL. INCLUDING CUSTOM HDPE CNC MACHINED LUMINAIRE MOUNTING ADAPTOR (COLOUR TO SUIT LUMINAIRE AND POLE) (SUBMIT SHOP DRAWING, REFER TO SPECIFICATION) SUPPLY COMPLETE WITH MEYER COWL ANTI GLARE ACCESSORY (COWL FINISH TO MATCH LUMINAIRE COLOUR TO LANDSCAPE ARCHITECTS APPROVAL).	LED 3000K 46W/3574lm WIDE BEAM (89°) WITH REFLECTOR L90B10 > 50 000H CRI 85
L3B	MONOSPOT S4 POLE BRACKET INVERSE MOUNTED TO 450mm LONG ALUMINIUM OUTREACH ARM FIXED TO 9M HIGH MULTIFUNCTION POLE TO PROVIDE FEATURE ILLUMINATION TO MERREDIN WATERTOWER 'KALGOORLIE BITTER' SIGNAGE. REFER TO POLE DETAILS DRAWINGS FOR ADDITIONAL REQUIREMENTS. LUMINAIRE TO COMPRISE OF MEYER MONOSPOT S4, IP65, IK08, ALUMINIUM HOUSING WITH PAINTED FINISH TO LANDSCAPE ARCHITECT APPROVAL. (SUBMIT SHOP DRAWING, REFER TO SPECIFICATION) SUPPLY COMPLETE WITH MEYER COWL ANTI GLARE ACCESSORY (COWL FINISH TO MATCH LUMINAIRE COLOUR TO LANDSCAPE ARCHITECTS APPROVAL) AND PRISMATIC GLASS DIFFUSER LENS.	LED 3000K 46W/2855lm NARROW BEAM (5°) L90B10 > 50 000H CRI 80
L3C	MONOSPOT S4 POLE BRACKET INVERSE MOUNTED TO 450mm LONG ALUMINIUM OUTREACH ARM FIXED TO 9M HIGH MULTIFUNCTION POLE TO PROVIDE FEATURE ILLUMINATION TO MERREDIN WATERTOWER 'KALGOORLIE BITTER' SIGNAGE. REFER TO POLE DETAILS DRAWINGS FOR ADDITIONAL REQUIREMENTS. LUMINAIRE TO COMPRISE OF MEYER MONOSPOT S4, IP65, IK08, ALUMINIUM HOUSING WITH PAINTED FINISH TO LANDSCAPE ARCHITECT APPROVAL. (SUBMIT SHOP DRAWING, REFER TO SPECIFICATION) SUPPLY COMPLETE WITH MEYER COWL ANTI GLARE ACCESSORY (COWL FINISH TO MATCH LUMINAIRE COLOUR TO LANDSCAPE ARCHITECTS APPROVAL) AND PRISMATIC GLASS DIFFUSER LENS.	LED 3000K 46W/2789lm LINEAR HORIZONTAL BEAM (87°/40°) L90B10 > 50 000H CRI 80
L4	WE-EF ETC340 INGROUND UPLIGHT TO PROVIDE FEATURE ILLUMINATION TO THE UNDERSIDE OF MERREDIN WATERTOWER 'KALGOORLIE BITTER' SIGNAGE. LUMINAIRE TO COMPRISE OF WE-EF ETC340, IP67, IK10+, STAINLESS STEEL HOUSING WITH SAFETY GLASS LENS, MAX LOAD 5 TONNES, SILICONE RUBBER GASKET WITH ASC ANTI SLIP COATING. COMPLETE WITH THE MANUFACTURERS INSTALLATION BLOCK OUT AND CAST INTO A CONCRETE FOUNDATION. REFER TO LIGHTING DETAILS DRAWING DE-004 FOR TYPICAL INSTALLATION REQUIREMENTS.	LED 3000K 36W/4435lm SYMMETRIC, MEDIUM BEAM CRI 80

POLE SCHEDULE

REFER TO SPECIFICATION FOR FURTHER REQUIREMENTS

TYPE	DESCRIPTION
P1	NOM. 9000mm HIGH MULTIFUNCTION ALUMINIUM POLE SIMILAR TO URBAN ALUMINIUM OR MULTIPOLE BRANDS OR EQUAL APPROVED WITH FOUR VERTICAL ACCESSORY CHANNELS FOR MOUNTING OF FUTURE CCTV, SIGNAGE, WIFI, AND TYPE L2 POLE MOUNTED LUMINAIRE. REFER TO TYPE P1 - POLE ELEVATION ON DRAWING DE-004 FOR FURTHER INFORMATION.
P2	NOM. 9000mm HIGH MULTIFUNCTION ALUMINIUM POLE SIMILAR TO URBAN ALUMINIUM OR MULTIPOLE BRANDS OR EQUAL APPROVED WITH FOUR VERTICAL ACCESSORY CHANNELS FOR MOUNTING OF FUTURE CCTV, SIGNAGE, WIFI, AND AND TYPE L3C MOUNTED TO NOM. 450mm LONG OUTREACH ARMS TO FEATURE ILLUMINATE THE WATER TOWER SIGNAGE AND TYPE L3A MOUNTED TO THE POLE CHANNEL TO PROVIDE GENERAL PEDESTRIAN AREA LIGHTING. REFER TO TYPE P2 - POLE ELEVATION ON DRAWING DE-004 FOR FURTHER INFORMATION.
P3	NOM. 9000mm HIGH MULTIFUNCTION ALUMINIUM POLE SIMILAR TO URBAN ALUMINIUM OR MULTIPOLE BRANDS OR EQUAL APPROVED WITH FOUR VERTICAL ACCESSORY CHANNELS FOR MOUNTING OF FUTURE CCTV, SIGNAGE, WIFI, AND AND TYPE L3B MOUNTED TO NOM. 450mm LONG OUTREACH ARM TO FEATURE ILLUMINATE THE WATER TOWER SIGNAGE. REFER TO TYPE P3 - POLE ELEVATION ON DRAWING DE-004 FOR FURTHER INFORMATION.
P4	NOM. 4700mm HIGH 102 DIA OD CHS STEEL HOT DIPPED GALVANISED CIRCULAR POLE WITH TYPE L1 POST TOP LUMINAIRE. TO PROVIDE GENERAL PATHWAY LIGHTING.



LOCALITY PLAN / AREA OF WORKS
 NTS

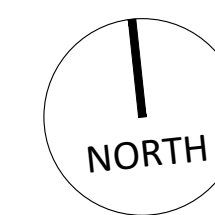
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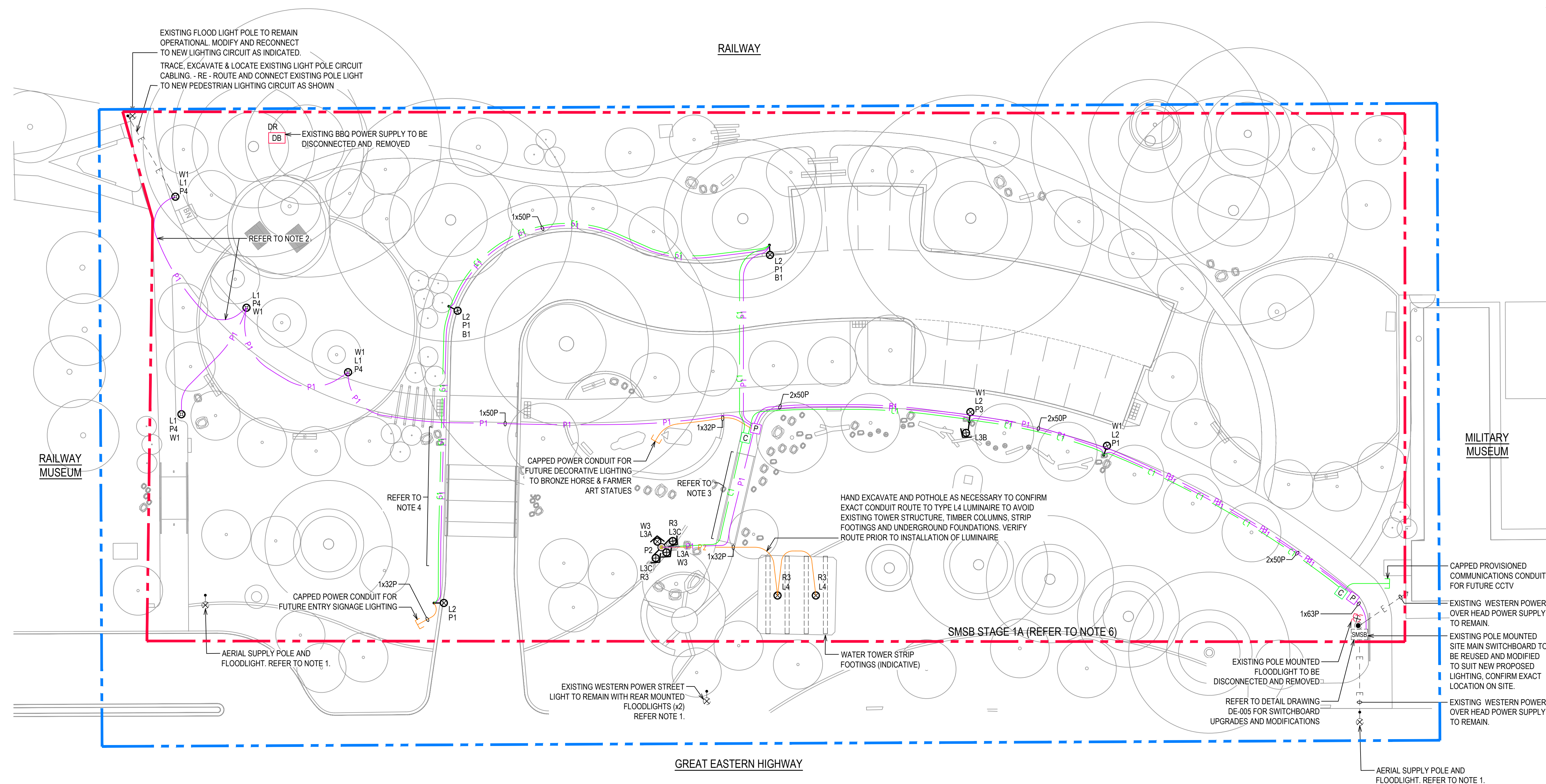
SHIRE OF MERREDIN
 INNOVATING THE WHEATBELT



REV	DATE	DESCRIPTION	DRN	CHK
0	18.03.22	TENDER ISSUE	AR	KMC
A	11.03.22	PRELIMINARY ISSUE	AR	KMC

DRN BY	AR
START DATE	-
DESIGNED	KMC
CHECKED	KMC
GENERAL NOTES	

MERREDIN CBD-STAGE 1A
LEGEND, SCHEDULES & LOCALITY PLAN
 PLACE LAB PROJ No: 21-0259
 DWG STATUS: TENDER ISSUE
 DWG No: DE-001
 SCALE: AS SHOWN
 UNIT: mm
 SHEET SIZE: A1
 ISSUE: 0



- NOTES:**
- SHIRE OF MERREDIN TO LODGE APPLICATION TO WESTERN POWER FOR DISCONNECTION AND REMOVAL OF SECURITY FLOODLIGHTS FOLLOWING COMMISSIONING OF NEW LIGHTING.
 - WHERE NEW CONDUITS PASS UNDER EXISTING PATHWAYS ALLOW TO PLUNK OR BORE CONDUITS TO APPROVAL.
 - CONDUITS CROSS BRIDGE. FIX CONDUITS SURFACE MOUNTED AND SADDLE CLIPPED TO UNDERSIDE OF BRIDGE STRUCTURE IN CONCEALED AND APPROVED LOCATION. PAINT CONDUITS TO MATCH STRUCTURE.
 - CONDUITS TO CROSS CULVERT/ DRAIN. CONFIRM FINAL ROUTE AND ALLOW TO EXCAVATE AND ADJUST LEVEL OF CONDUITS TO SUIT FINISHED GROUND LEVEL DIFFERENCES WHILST MAINTAINING MIN 750mm DEPTH TO ENSURE NO EXPOSURE DURING FLOOD CONDITIONS.
 - CONDUIT ALIGNMENTS AND PIT SIZES AND LOCATIONS ARE DIAGRAMMATIC AND NOMINAL ONLY, AND SHALL BE COORDINATED BY THE CONTRACTOR IN-SITE WITH FINISHED LANDSCAPE TREATMENT TO SUPERINTENDENTS APPROVAL. PITS SHALL BE LOCATED ENTIRELY WITHIN A SINGLE LANDSCAPE TREATMENT (e.g. MULCH, GRASS OR SINGLE COLOUR OF CONCRETE PATH) PITS SHALL BE FLUSH WITH SURROUNDING GROUND LEVEL.
 - PREPARE ALL NEW UPDATED POWER DEMARCATION SITE PLANS TO WAERWASIR REQUIREMENTS COMPLETE WITH SURVEYED COORDINATES. SUBMIT DRAWINGS FOR REVIEW AND APPROVAL. ONCE APPROVED SUPPLY AND INSTALL A LAMINATED HARDCOPY IN EACH SWITCHBOARD ON SITE AND IN THE OPERATING/ AS CONSTRUCTED MANUALS.

THIS DRAWING MUST BE PRINTED IN COLOUR IN ORDER TO RETAIN ALL DESIGN INFORMATION



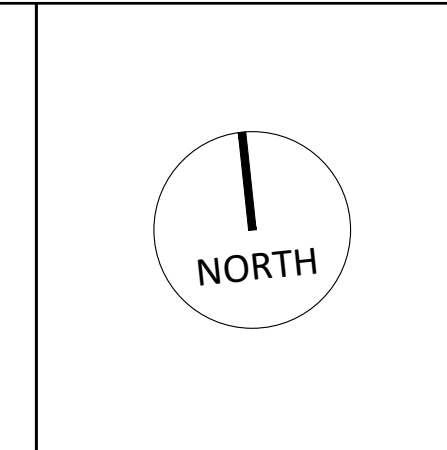
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SHIRE OF MERREDIN
INNOVATING THE WHEATBELT

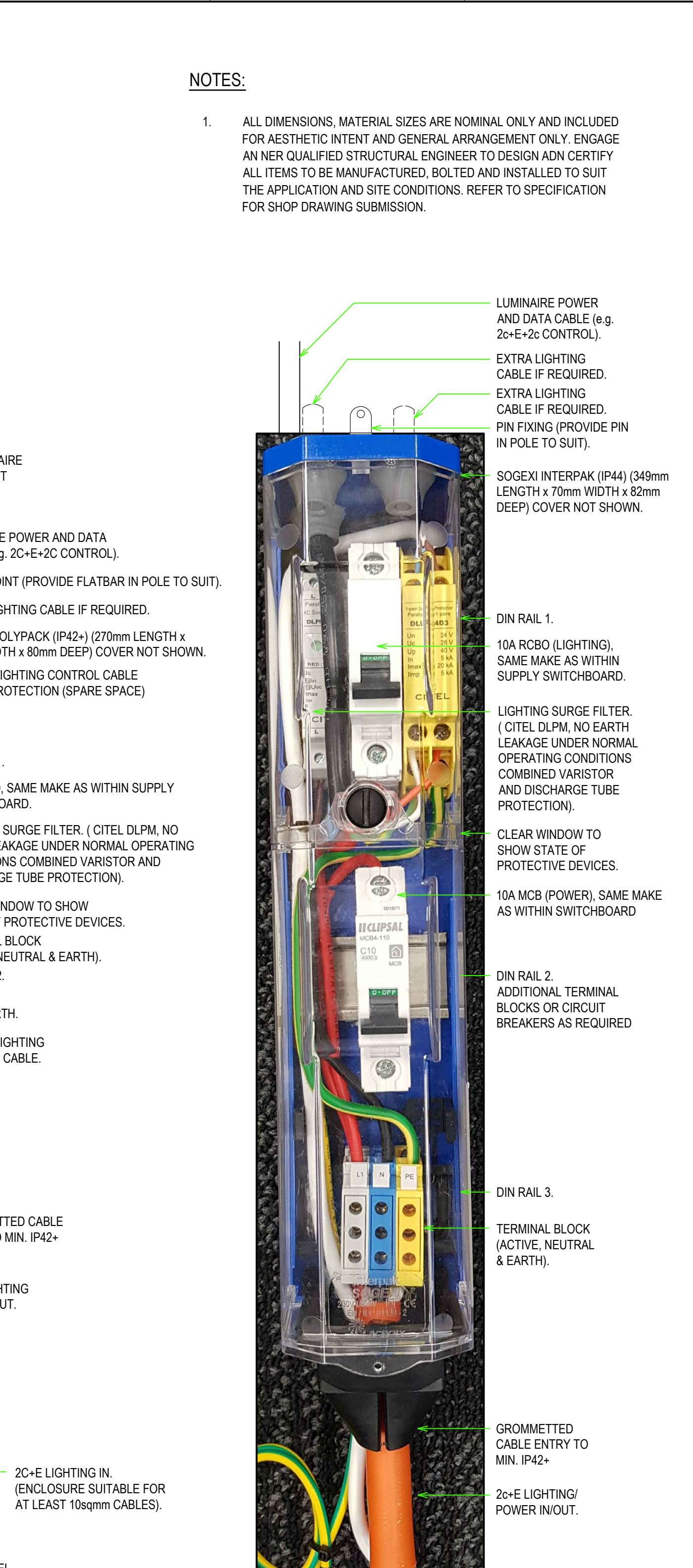
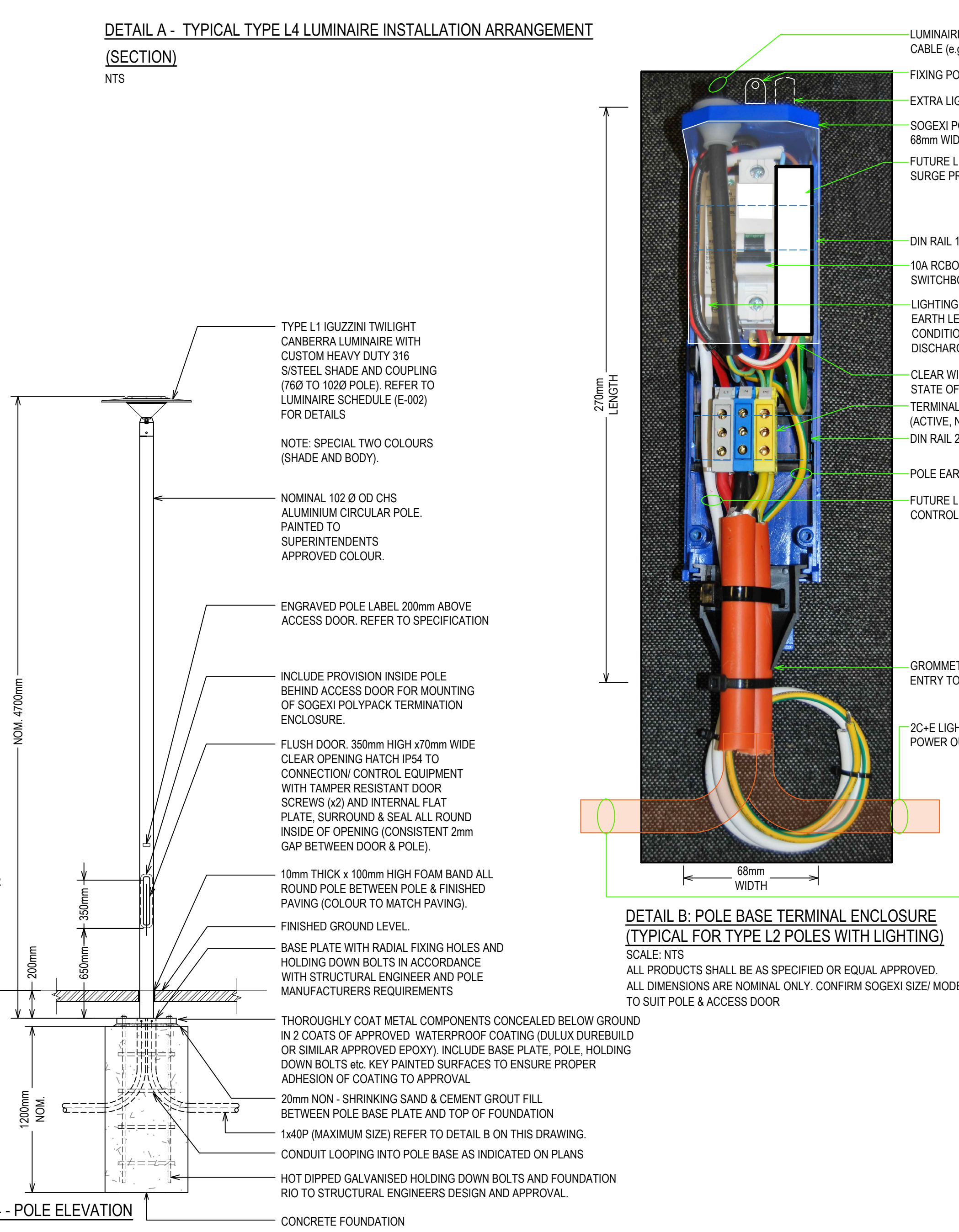
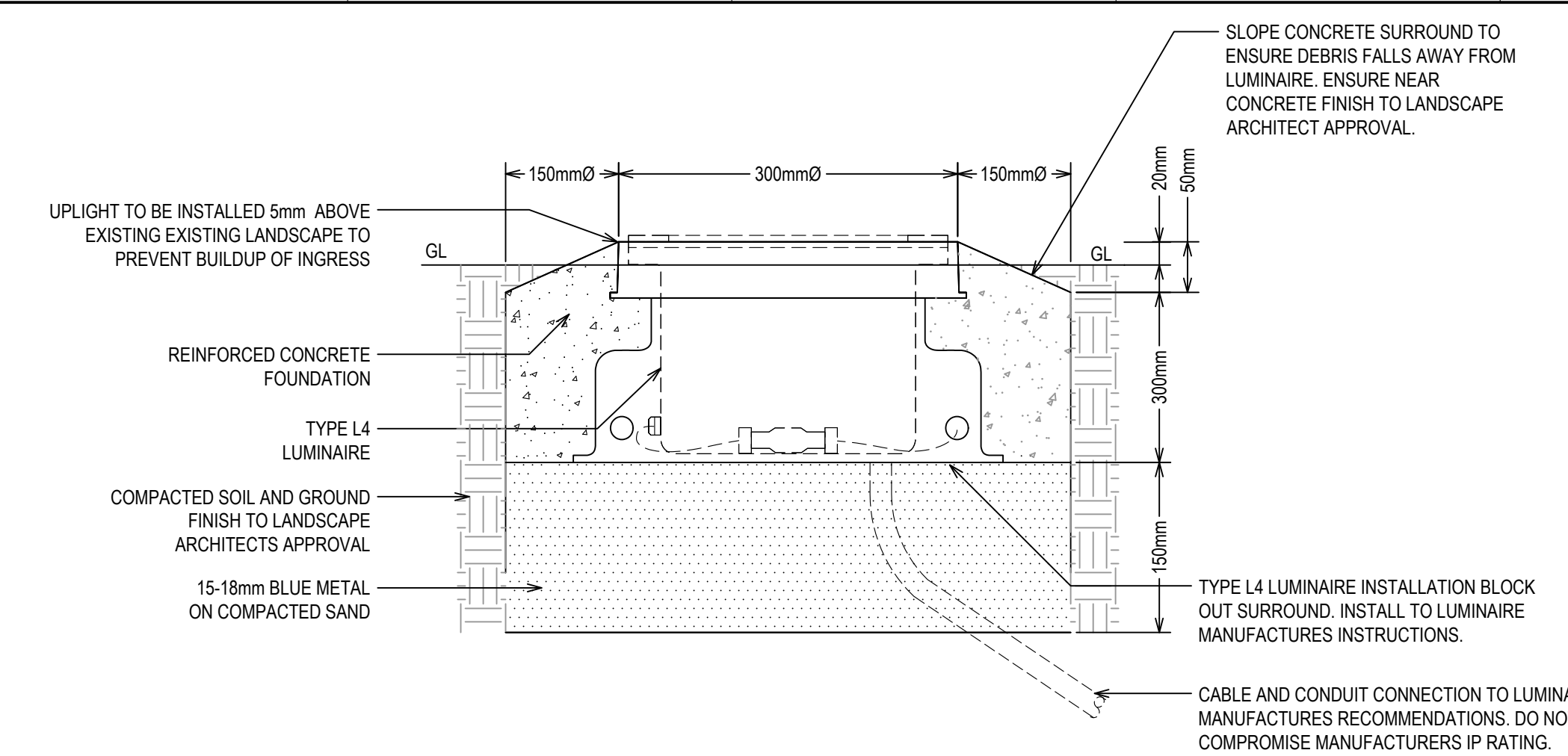
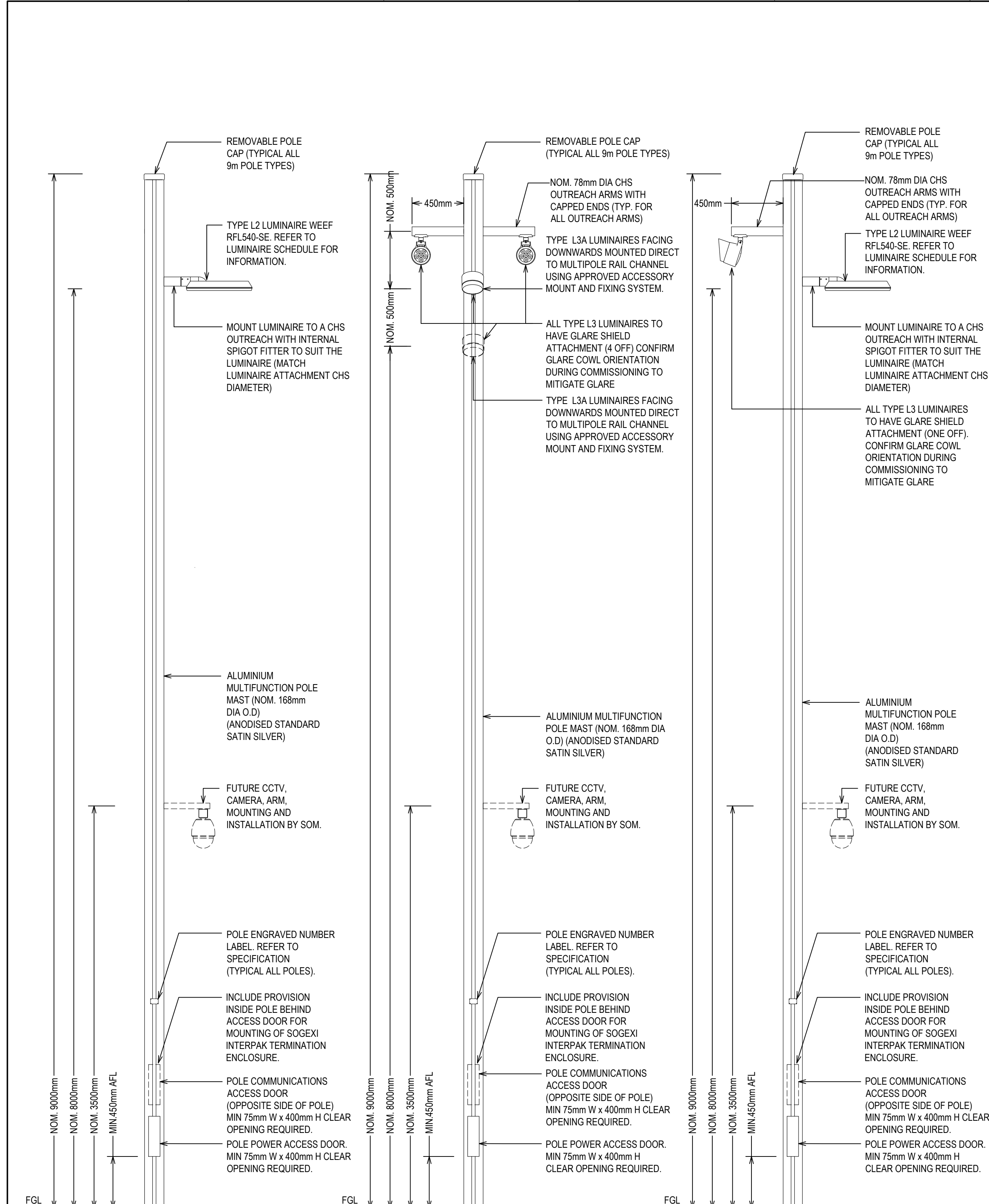


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A	11.03.22	PRELIMINARY ISSUE	AR	KMC

MERREDIN CBD-STAGE 1A
LIGHTING & POWER LAYOUT

DRN BY	AR
START DATE	-
DESIGNED	KMC
CHECKED	KMC
GENERAL NOTES	

PLACE LAB PROJ No	21-0259	SCALE:	1:200 @A1
DWG STATUS	TENDER ISSUE	UNIT:	mm
DWG No	DE-002	SHEET SIZE	A1
		ISSUE	0



NOTES:

- ALL DIMENSIONS, MATERIAL SIZES ARE NOMINAL ONLY AND INCLUDED FOR AESTHETIC INTENT AND GENERAL ARRANGEMENT ONLY. ENGAGE AN NER QUALIFIED STRUCTURAL ENGINEER TO DESIGN AND CERTIFY ALL ITEMS TO BE MANUFACTURED, BOLTED AND INSTALLED TO SUIT THE APPLICATION AND SITE CONDITIONS. REFER TO SPECIFICATION FOR SHOP DRAWING SUBMISSION.

REMOVABLE POLE CAP (TYPICAL ALL 9m POLE TYPES)

NOM. 78mm DIA CHS OUTREACH ARMS WITH CAPPED ENDS (TYP. FOR ALL OUTREACH ARMS)

TYPE L3 LUMINAIRE FACING DOWNWARDS MOUNTED DIRECT TO MULTIPOLE RAIL CHANNEL USING APPROVED ACCESSORY MOUNT AND FIXING SYSTEM.

ALL TYPE L3 LUMINAIRE TO HAVE GLARE SHIELD ATTACHMENT (4 OFF) CONFIRM GLARE COWL ORIENTATION DURING COMMISSIONING TO MITIGATE GLARE

TYPE L3A LUMINAIRE FACING DOWNWARDS MOUNTED DIRECT TO MULTIPOLE RAIL CHANNEL USING APPROVED ACCESSORY MOUNT AND FIXING SYSTEM.

REMOVABLE POLE CAP (TYPICAL ALL 9m POLE TYPES)

ALUMINIUM MULTIFUNCTION POLE MAST (NOM. 168mm DIA O.D) (ANODISED STANDARD SATIN SILVER)

FUTURE CCTV, CAMERA, ARM, MOUNTING AND INSTALLATION BY SOM.

POLE ENGRAVED NUMBER LABEL. REFER TO SPECIFICATION (TYPICAL ALL POLES).

INCLUDE PROVISION INSIDE POLE BEHIND ACCESS DOOR FOR MOUNTING OF SOGEXI INTERPAK TERMINATION ENCLOSURE.

POLE COMMUNICATIONS ACCESS DOOR (OPPOSITE SIDE OF POLE) MIN 75mm W x 400mm H CLEAR OPENING REQUIRED.

POLE POWER ACCESS DOOR. MIN 75mm W x 400mm H CLEAR OPENING REQUIRED.

UPLIGHT TO BE INSTALLED 5mm ABOVE EXISTING LANDSCAPE TO PREVENT BUILDUP OF INGRESS

REINFORCED CONCRETE FOUNDATION

COMPACTED SOIL AND GROUND FINISH TO LANDSCAPE ARCHITECTS APPROVAL

15-18mm BLUE METAL ON COMPACTED SAND

TYPE L4 LUMINAIRE

SLOPE CONCRETE SURROUND TO ENSURE DEBRIS FALLS AWAY FROM LUMINAIRE. ENSURE NEAR CONCRETE FINISH TO LANDSCAPE ARCHITECT APPROVAL.

TYPE L4 LUMINAIRE INSTALLATION BLOCK OUT SURROUND. INSTALL TO LUMINAIRE MANUFACTURERS INSTRUCTIONS.

CABLE AND CONDUIT CONNECTION TO LUMINAIRE MANUFACTURERS RECOMMENDATIONS. DO NOT COMPROMISE MANUFACTURERS IP RATING.

LUMINAIRE POWER AND DATA CABLE (e.g. 2c+E-2c CONTROL).

EXTRA LIGHTING CABLE IF REQUIRED.

EXTRA LIGHTING CABLE IF REQUIRED. PIN FIXING (PROVIDE PIN IN POLE TO SUIT).

SOGEXI INTERPAK (IP44) (349mm LENGTH x 70mm WIDTH x 82mm DEEP) COVER NOT SHOWN.

DIN RAIL 1.

10A RCBO (LIGHTING), SAME MAKE AS WITHIN SUPPLY SWITCHBOARD.

LIGHTING SURGE FILTER. (CITEL DLPM, NO EARTH LEAKAGE UNDER NORMAL OPERATING CONDITIONS COMBINED VARISTOR AND DISCHARGE TUBE PROTECTION).

DIN RAIL 2.

10A RCBO, SAME MAKE AS WITHIN SUPPLY SWITCHBOARD.

LIGHTING SURGE FILTER. (CITEL DLPM, NO EARTH LEAKAGE UNDER NORMAL OPERATING CONDITIONS COMBINED VARISTOR AND DISCHARGE TUBE PROTECTION).

CLEAR WINDOW TO SHOW STATE OF PROTECTIVE DEVICES.

10A MCB (POWER), SAME MAKE AS WITHIN SWITCHBOARD.

DIN RAIL 3.

TERMINAL BLOCK (ACTIVE, NEUTRAL & EARTH).

POLE EARTH.

FUTURE LIGHTING CONTROL CABLE.

GROMMETTED CABLE ENTRY TO MIN. IP42+

2c+E LIGHTING POWER OUT.

2c+E LIGHTING IN. (ENCLOSURE SUITABLE FOR AT LEAST 10sqmm CABLES).

GROMMETTED CABLE ENTRY TO MIN. IP42+

2c+E LIGHTING/ POWER IN/OUT.

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DRN BY	AR
START DATE	-
DESIGNED	KMC
CHECKED	KMC
GENERAL NOTES	

MERREDIN CBD-STAGE 1A

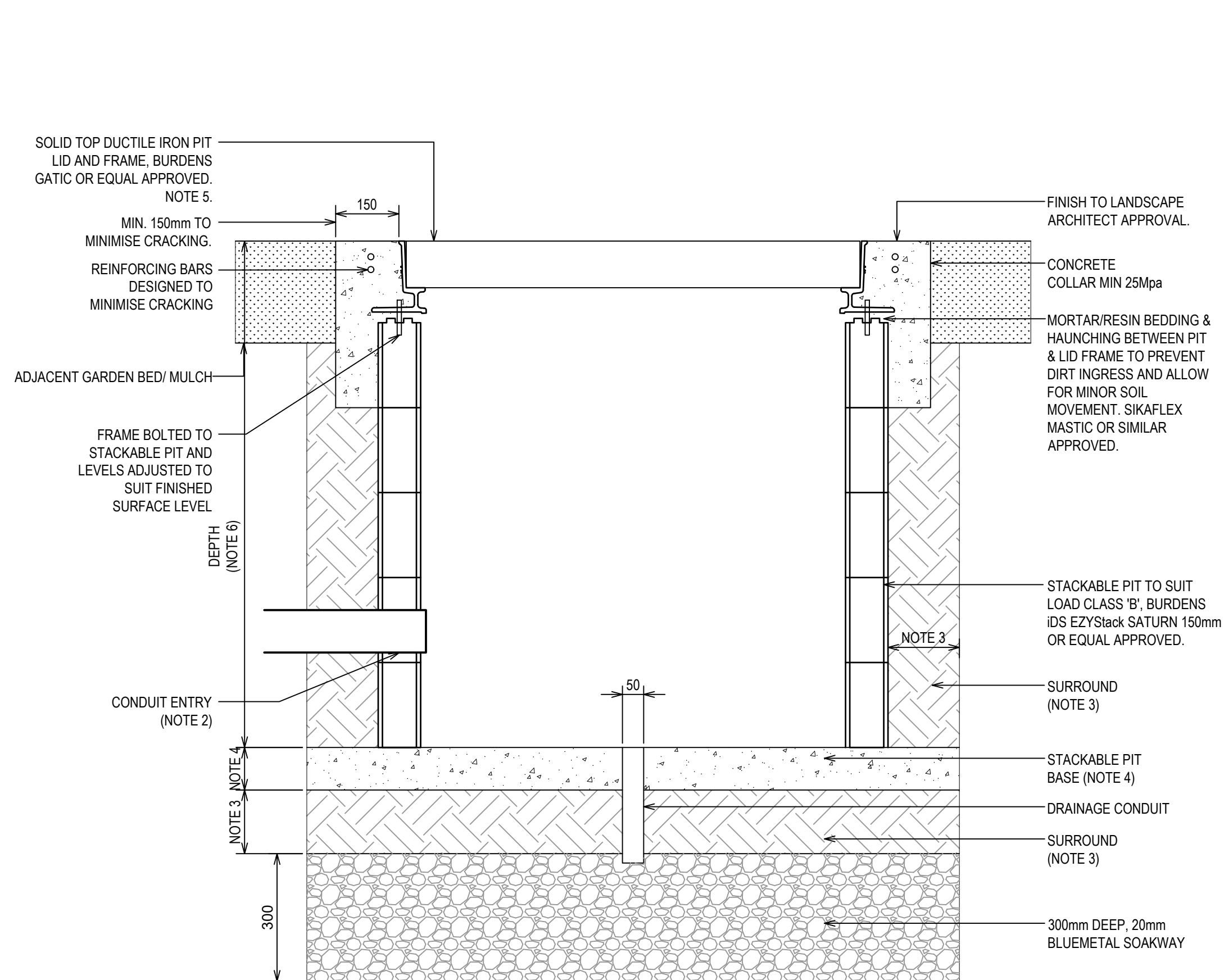
LIGHTING DETAILS

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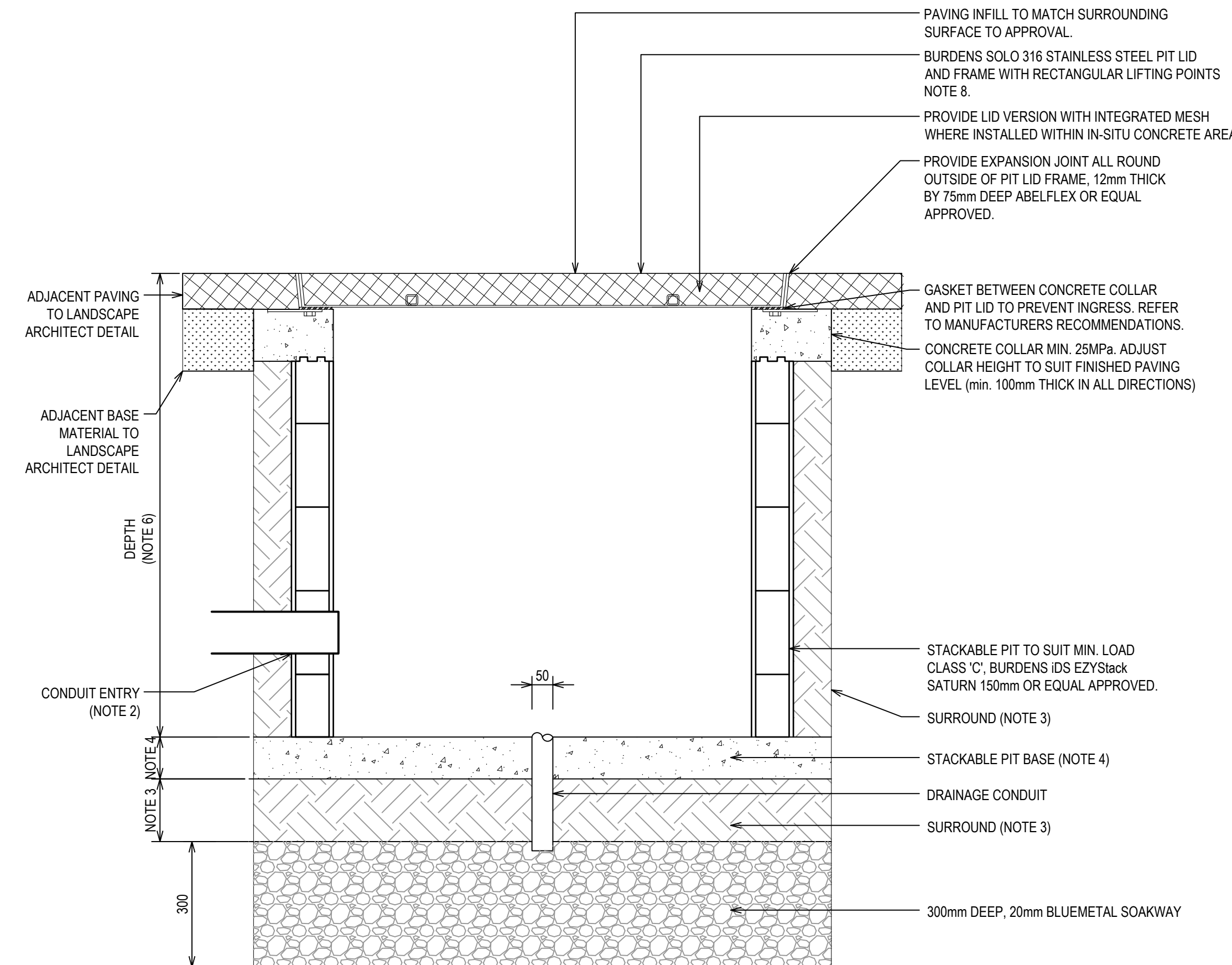
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SHEET SIZE: A1
ISSUE: 0

NOTES:

- PITS SHALL BE SELECTED TO SUIT THE FINISHED SURFACE TYPE SHOWN ON THE LANDSCAPE ARCHITECT'S DRAWINGS. PITS SHALL BE LOCATED ENTIRELY WITHIN A SINGLE FINISHED SURFACE TYPE (E.G. GRASS, GARDEN BED OR SINGLE TYPE OF PAVED SURFACE) AND SHALL BE ORIENTATED PERPENDICULAR TO NEARBY PATHS. PITS SHALL BE FLUSH WITH ADJACENT SURFACE, AND WHERE IN GARDEN BEDS OR GRASSED AREAS SHALL BE ARRANGED TO ALLOW WATER TO DRAIN AWAY FROM PITS (E.G. INSTALLED HIGHER THAN LANDSCAPE LOW POINTS). ALL PITS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS, UNLESS ADDITIONAL REQUIREMENTS ARE SPECIFIED HEREIN. ALL PIT CLASSES TO AS 3996.
- CONDUIT ENTRY INTO PIT TO MEET MANUFACTURER'S RECOMMENDATIONS. MINIMUM ONE COMPLETE STACKABLE PIT LAYER ABOVE AND BELOW CONDUIT ENTRY. MINIMUM 50mm CLEARANCE BETWEEN CONDUITS AND 75mm CLEARANCE TO CORNER, UNLESS SPECIFIC WRITTEN CONFIRMATION PROVIDED BY THE MANUFACTURER. CONDUIT ENTRY TO BE NEATLY CUT USING A SUITABLY SIZED HOLE SAW. IF CONDUIT ENTRIES CONSTITUTE MORE THAN 20% OF THE TOTAL PERIMETER OF PIT WALL, A STRUCTURAL (40MPa) CONCRETE SURROUND SHALL BE INSTALLED AROUND ALL CONDUIT ENTRIES. NEATLY SEAL AROUND CONDUIT ENTRIES WITH MORTAR/RESIN TO APPROVAL. AFTER INSTALLATION OF CABLES AND DRAW WIRE, SEAL WITHIN CONDUITS USING EXPANDING FOAM TO MAXIMUM DEPTH OF 50mm (PREPACK CONDUITS TO SUIT), AND NEATLY REMOVE EXCESS FOAM.
- PIT SURROUND TO SUIT. MINIMUM 200mm CONCRETE SURROUND FOR CLASS D AND 150mm FOR CLASS C.
- PIT BASE TO SUIT, IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS. MINIMUM 200mm COMPACTED STONE FOR CLASS D AND 150mm FOR CLASS C. ENSURE PIT BASE DRAINS TO LOCATION OF CONDUIT. SURFACE TO BE LEVELED WITHIN PIT.
- PITS WITH PAVING INFILL SHALL HAVE A MINIMUM 40mm OF BEDDING SAND.
- COMMUNICATIONS PITS SHALL HAVE DEPTH TO MATCH INDUSTRY STANDARD SIZES (e.g. P5 AND P8 TO ASCA S009). POWER PITS SHALL BE OF A DEPTH REQUIRED TO SUIT ALL CONDUITS SHOWN ON THE DRAWING AND ALL CONDUIT SPACING REQUIREMENTS SHOWN HEREIN. CONDUIT MINIMUM 500mm BELOW FINISHED GROUND LEVEL TO MEET AS/NZS 3000. P66 NOMINAL 600mm SQUARE CLEAR OPENING AND NOMINAL 1000mm DEPTH. P99 NOMINAL 1000mm SQUARE CLEAR OPENING AND NOMINAL 1200mm DEPTH.
- ALL DIMENSIONS, AND MATERIAL SIZES ARE INCLUDED FOR AESTHETIC INTENT AND GENERAL ARRANGEMENT ONLY. ENGAGE AN NER QUALIFIED STRUCTURAL ENGINEER TO DESIGN AND CERTIFY. ALL ITEMS TO BE MANUFACTURED, BOLTED AND INSTALLED TO SUIT THE APPLICATION AND SITE CONDITIONS. REFER TO SPECIFICATION FOR SHOP DRAWING SUBMISSION.
- BURDENS SOLO PIT LIDS ARE AVAILABLE IN 600x450mm, 600x600mm AND 900x900mm SIZES. ALL PITS WHICH REQUIRE CLEAR OPENINGS GREATER THAN 900mm IN ANY DIMENSION REQUIRES TWO PIT LIDS INSTALLED SIDE BY SIDE AND MUST BE INSTALLED ON A CONCRETE SLAB WHICH HAS 200x200mm CONCRETE BEAM IN BETWEEN EACH PIT LID AND 200x200mm CONCRETE AROUND THE PERIMETER OF EACH LID. ENGAGE BURDENS TO DESIGN AND PROVIDE DETAILS OF THIS CONCRETE SLAB AND INSTALL TO BURDENS RECOMMENDATIONS.



DETAIL A - PITS IN GARDEN AREAS (CLASS B)
1:10



DETAIL B - PITS IN HARD LANDSCAPE (e.g. INSITU, CONCRETE AND PAVING) (CLASS C)
1:10

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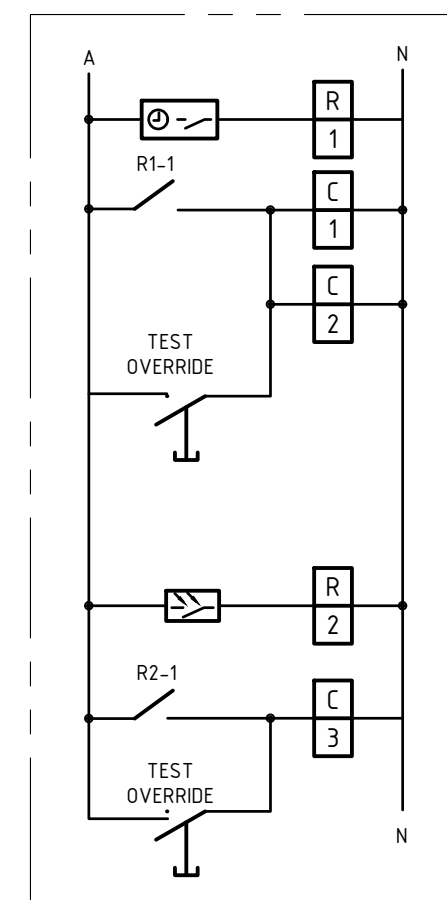
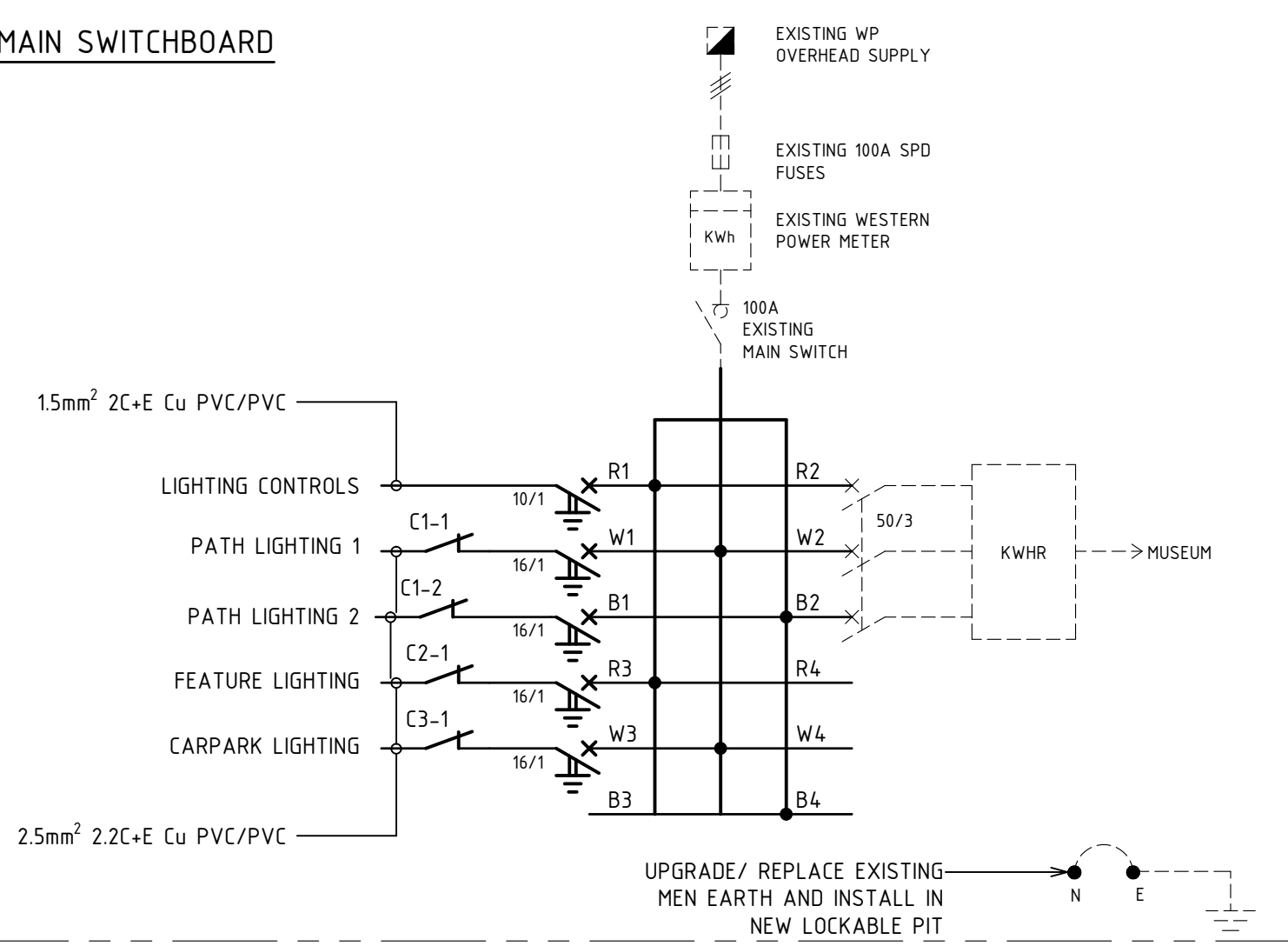
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MERREDIN CBD-STAGE 1A
PIT DETAILS

PLACE LAB PROJ No	21-0259	SCALE:	1:200 @A1
DWG STATUS	TENDER ISSUE	UNIT:	mm
DWG No	DE-004	SHEET SIZE	A1
		ISSUE	0

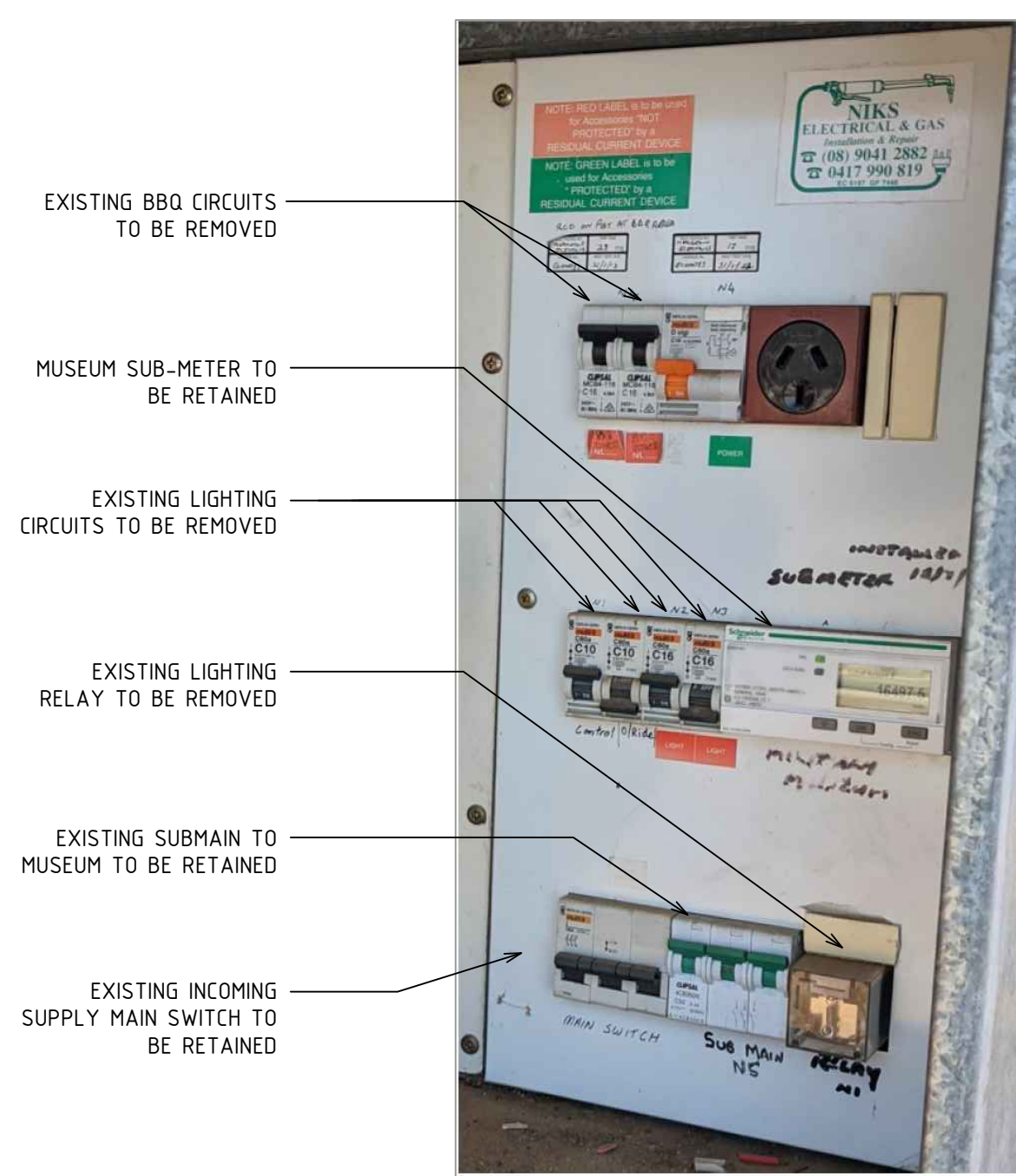
EXISTING SITE MAIN SWITCHBOARD



DETAIL A: LIGHTING CONTROLS

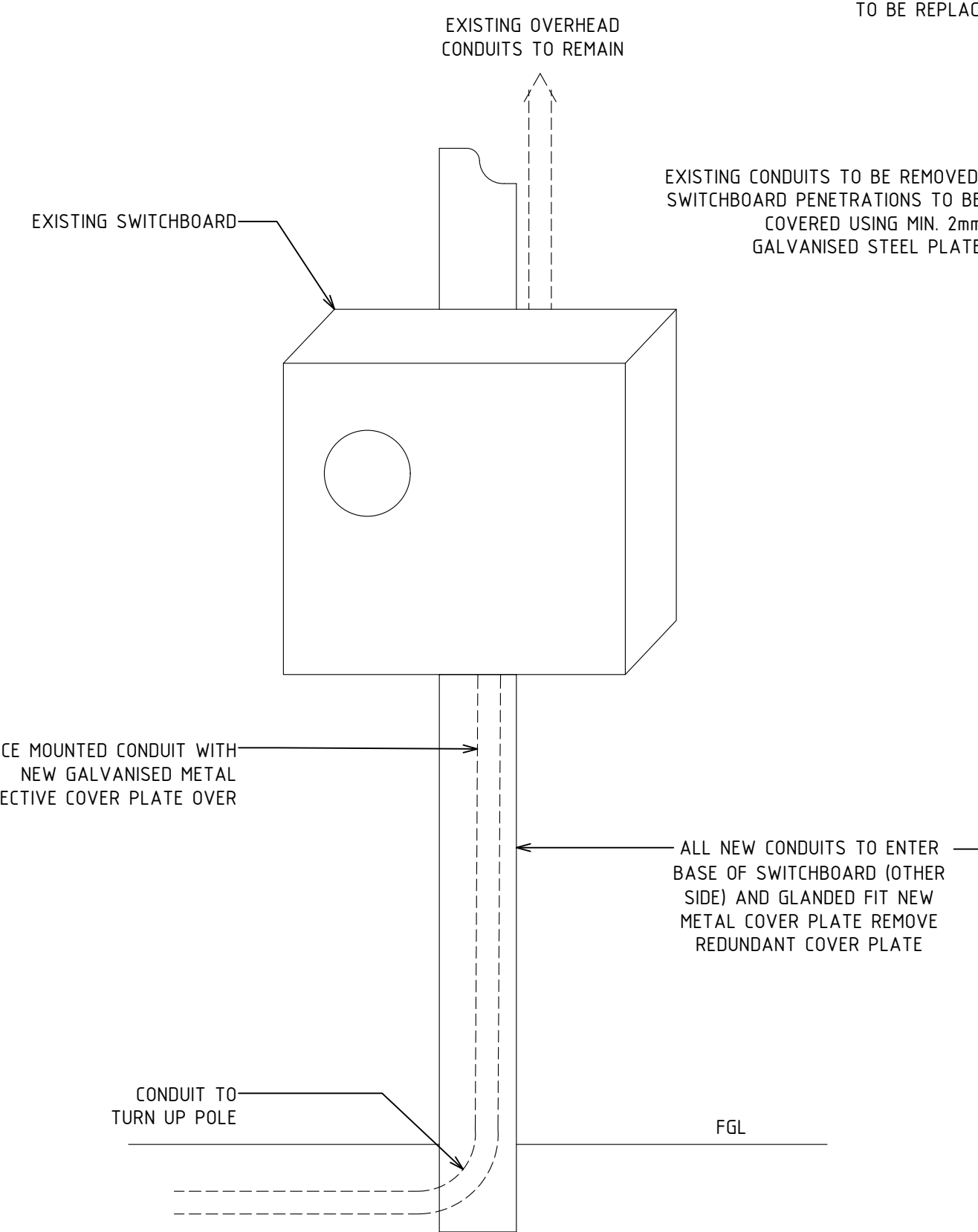
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DETAIL B: EXISTING SITE MAIN SWITCHBOARD

CONTRACTOR TO SUBMIT PROPOSED SWITCHBOARD MODIFICATION SUMMARY AND ELEVATION DRAWINGS FOR APPROVAL PRIOR TO INSTALLATION.
RE-LABEL ALL EQUIPMENT TO APPROVAL
REFER TO SPECIFICATION



DETAIL C: SWITCHBOARD MODIFICATIONS FRONT ELEVATION

NTS



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 SHIRE OF MERREDIN
INNOVATING THE WHEATBELT

REV	DATE	REVISION	DRN	CHK
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A	11.03.22	PRELIMINARY ISSUE	AR	KMC

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START DATE	-
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GENERAL NOTES	

MERREDIN CBD-STAGE 1A
SWITCHBOARD & SLD
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6.13 Appendix 6.13 – Safety in Design Report

MERREDIN CBD REVITALISATION – STAGE 1A

**SAFETY IN DESIGN REPORT
CONTRACT NO. 2465**

for Shire of Merredin

March 2022

REVISION NO.	REVISION DATE	REASON FOR REVISION	PROCESS OWNER	APPROVED BY
A	11/03/2022	Issued for Tender & Client Review	M Arena	B Smith

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1 INTRODUCTION AND SUMMARY

1.1 Introduction

Safety in Design is important to TABEC Pty Ltd and is a core component of our services. Workplace Health and Safety (WHS) is a consideration that is relevant to all of us and important in the context of delivering safe and sustainable outcomes. Identifying design solutions to eliminate hazards not only improves WHS outcomes, but also has potential to reduce costs associated with remediating design and construction issues retrospectively.

The aim of the Safety in Design Report is to identify potential health and safety hazards associated with Merredin CBD - Stage 1A Detailed Design during its construction, operational life, maintenance, and de-commissioning and to identify the mitigation measures that can be put in place through the preparation of the design, documentation and (where applicable) operational and maintenance procedures to effectively manage the risks. The following report covers the construction works proposed for the Shire of Merredin development of Merredin CBD - Stage 1A Detailed Design, which involves civil earthworks and servicing of the proposed site.

This Safety in Design Report has been prepared for the Shire of Merredin in accordance with the requirements of the National Standard for Construction Work – Guidance for Designers (dated December 2005), the National Standard for Construction Work for civil / commercial construction sector (date January 2008), Work Health and Safety Act 2011 – Section 22, the WHS Regulation chapter 4 & 5 (dated 2014) and Safe Work Australia Code of Practices.

1.2 Definitions

Under the current Work Health and Safety (WHS) legislation, there are a range of legislative and regulatory requirements supported by a suite of codes of practice clarifying how these obligations can be met. In particular, there are specific requirements and expectations of entities and persons defined as the 'Designer' on any given project.

The definition of 'Designer' in the current WHS legislation not only affects the actual designer, but also places duties on all those who are connected with the design, including during construction, end use, maintenance and demolition or decommissioning. The Designer must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to minimise risks to the health and safety of all parties who will work on a site connected with its design.

It is therefore reasonable to consider the wider practical definition of 'Designer' to include:

- Design professionals, such as architects, civil, building services, electrical, acoustic, environmental, mechanical and structural engineers, landscape architects, interior designers, drafters and industrial designers;
- Head contractors, developers, builders, owners, project managers, purchasers, clients, end- users and workers;
- Quantity surveyors, insurers, quality assurance staff, work safety professionals and ergonomics practitioners; and
- Suppliers including manufacturers, importers, those who hire plant, constructors, installers and trades and maintenance people.

1.3 Safety in Design Obligations and Codes of Practice

The guidance for effective safety in design outcomes are provided in the model Codes of Practice for Safe Design of Structures, and Safe Design, Manufacture, Import and Supply of Plant. These codes were developed with the close involvement of Consult Australia, the industry association for professional services firms in the built environment sector.

TABEC Pty Ltd is committed to our legislative obligations and delivering leading safety in design practices, but we cannot achieve these outcomes on our own. As a valued client of TABEC Pty Ltd, we would like to illustrate the important role you play in achieving a successful safety in design outcome for our projects. Below are some ways you as a client can assist in making your project safer and compliant with safety in design requirements:

- Shared understanding of managing risk – with joint policies and procedures to deal with issues as they arise.
- Provision of information – providing the designer with any information about any hazards and risks that have potential to affect the design, and when treated will make the end product safer.
- Allocation of sufficient budget – commensurate with project risk to enable legislative compliance and achievement of quality outcome.
- Access to appropriate contractors or maintenance staff – for consultation about how the construction work in connection with the design can be undertaken in a way that prevents or minimises risks to health and safety; and, information about the safe operation and maintenance of the facility.
- Access to end users – for consultation to ensure that the end product can be used, maintained and decommissioned safely.

Section 7 of the National Standard for Construction Work – Guidance for Designers requires that designers must provide a written safety in design report to all clients commissioning design and/or construction work.

Shire of Merredin is required by law to ensure that any information received about the hazards that have been identified, and the associated risk control measures, have been considered and/or put in place as far as reasonably practicable. Shire of Merredin must ensure the Safety in Design Report is passed on to all contractors on site and to anyone who obtains the end product of the construction work so they are aware of the risks identified by the Designers. The Safety in Design Report for Merredin CBD - Stage 1A Detailed Design is a live document and if any further risks are identified on site during construction they must be reported and updated in this report.

For further detailed information, we recommend you refer to the model Codes of Practice for the Safe Design of Structures and the Safe Design, Import, Manufacture and Supply of Plant, if you have not already done so. We can assist you in better understanding our respective obligations if you need assistance.

TABEC Pty Ltd enjoys the relationship between our organisations, and we look forward to working together on safety in design to improve workplace health and safety and ensure best practice on this important matter.

2 HAZARDS ASSOCIATED WITH THE CONSTRUCTION PROJECT LIFECYCLE

2.1 Scope of Works

TABEC has prepared the design and construction drawings for the development of Merredin CBD Revitalisation - Stage 1A Detailed Design, which involves the demolition, siteworks, servicing and associated civil works. The scope of works includes:

- Demolition;
- Earthworks and Siteworks;
- Water Reticulation;
- Stormwater Drainage;
- Roadworks;
- Signage and Linemarking.

The scope of works is considered to be typical of the civil bulk earthworks carried out for the construction of residential land and urban renewal project in the Perth metropolitan and regional areas of Western Australia.

2.2 Design Safety Report

The attached Design Safety Report consists of the following:

- **Appendix 1 – Risk Matrix**
- **Appendix 2 – Site Specific Hazard Register**

The risk register outlines all the hazards considered in the preparation of the design, the associated risks level, controls implemented in the design or suggested controls for the construction phase as well as the risk after controls have been implemented.

It should be noted that the following key items have been identified as a high risk after design and construction controls are implemented, and are discussed further below:

- **Unauthorised Public Access to the Site / Site Security**

Public access to the site during works may result in injury and death due to open excavations and equipment located on site. Furthermore, site security may be compromised with equipment stored on site being vandalised or stolen.

- **Traffic Management and Movement of Plant/Machinery**

The site is located adjacent to live roads. It is anticipated that regular traffic of low volume will utilise these roads throughout the duration of works, and appropriate traffic management will need to be implemented where there is risk of interaction between public traffic and pedestrian movements and the proposed construction works. Particularly, construction activities residing in close proximity to Todd Street (Great Eastern Highway).

Heavy machinery will be operating onsite. Large items of mobile equipment can seriously damage or crush smaller vehicles or personnel when moving causing injury or death. Workers are at risk of being run over (causing injury or death), especially if they are in the operator's blind spot.

- Noise, Dust and Vibration Control During Construction Works

Due to the neighbouring facilities Rail and Military Museum being in close proximity to the site, noise, dust and vibration is considered high risk. The contractor shall take all reasonable measures to suppress dust and minimise the risk associated with the generation of dust from construction activities. Noise and vibration will be mitigated as reasonably possible to ensure the protection of neighbouring facilities and homes.

- Coordination of Bulk Earthworks and Service Connections by Relevant Authorities

Damaging/exposure of Power, Telstra, Sewer and Water, Gas services located in existing areas of the proposed carpark site may result in: Potential to damage existing services; Interruption of services to neighbouring existing residences; Injury or death. The Contractor is to ensure that all existing services and Council assets are adequately protected to ensure damage does not occur. The Contractor is to notify TABEC of any damaged assets observed and arrange repairs where necessary or advise the relevant authority.

- Drowning / Falls From Heights

Designs include guard railing and balustrading to reduce risk of falls into open drainage culvert. Signage and linemarking to be specified to warn end users of hazard, noting that there is insufficient budget and design information (hydrological studies) to enclose the drain and remove source of hazard. Guard railing designed to incorporate redundancy, so it may be replaced when/if impacted without damaging culvert deck.

Drowning resulting from falling into drain during storm events has also been identified as a risk, especially without a safe point of egress. Northern batters to drain designed to be flatter than 1in6 to provide opportunity for egress, with appropriate signage to be incorporated to inform public that the drain is not to be swum in or utilised for recreating during storm events.

- Interface with Great Eastern Highway / Todd Street

Potential vehicular collision between vehicles exiting on to Todd Street / Great Eastern Highway due to poor sight lines or incorrect use of rest area bay, resulting in fatality.

TABEC propose to remove rest area bay from scope of works to improve sight lines for vehicles exiting on to Great Eastern Highway. Shire of Merredin provided explicit direction to maintain the bay in its existing condition, although shorten in length. Designs have been adapted in response to Shire of Merredin requirements and subject to final approval by MRWA, noting that new asset is within MRWA road reserve.

Shire to install and maintain appropriate signage in relation to use of the rest area (no semi-trailers or trucks to utilise rest area; designed for use by light vehicles towing trailers only. Entry/exit to carpark designed to MRWA standards.

It should also be noted that the works are to be constructed in accordance with the Contract requirements which includes drawings, technical specifications and conditions of contract. These documents contain regulatory requirements and Safety / Management procedures that must be undertaken by the Contractor prior to and when carrying out the works.

It is a requirement that the Contractor prepare project management plans including a Safety Management Plan (SMP) incorporating the Contractual requirements, which includes hazard identification and development of safe work procedures. Should the Contractor identify any significant risk associated with the construction work required to build the design they should notify the Superintendent, Shire of Merredin and TABEC immediately.

3 REFERENCES

- Design Safety Report – Template, UDIA, June 2009
- National Standard for Construction Work – Guidance for Designers, December 2005.
- National Standard for Construction Work - Civil / Commercial Construction Sector, January 2008
- Work Health and Safety Act 2011 – Section 22
- WHS Regulation Chapter 4 & 5, 2014
- Safe Work Australia Code of Practices

Appendix 1 – Risk Matrix

RISK ASSESSMENT TABLE						
RISK ASSESSMENT MATRIX		CONSEQUENCE (Rating of severity)				
LIKELIHOOD (How likely is it to happen?)		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
		(No temporary disability, injury or illness. less than \$10K damage.)	(No permanent disability, injury or illness, Environmental impact contained on site, \$10K - \$100K in damage.)	(Could result in permanent partial disability, Minor Environmental impact, \$100K to \$1 million in damage.)	(Could result in permanent total disability. High Environmental Impact, \$1 million to \$10 million in damage.)	(Fatality, Irreversible Environmental Damage, \$10 million+ in damage.)
ALMOST CERTAIN	(Expected to occur in many)	High	High	Extreme	Extreme	Extreme
LIKELY	(Will probably occur at some time)	Medium	High	High	Extreme	Extreme
POSSIBLE	(Might occur at some time)	Low	Medium	High	High	Extreme
UNLIKELY	(Could occur at some time)	Low	Low	Medium	High	High
RARE	(Might occur only in exceptional circumstances)	Low	Low	Low	Medium	High

PRIORITY TABLE	
RISK LEVEL	STRATEGY
Extreme	Immediate action required
High	Management to give attention and to specify management responsibility
Medium	Put in place specific responses and monitoring
Low	Manage using routine procedures

RISK LIKELIHOOD/PROBABILITY CATEGORIES		
LEVEL	DESCRIPTOR	DESCRIPTION
5	Almost Certain	Is expected to occur in many circumstances.
4	Likely	Will probably occur at some time.
3	Possible	Might occur at some time.
2	Unlikely	Could occur at some time.
1	Rare	Might only occur in exceptional circumstances.

Appendix 2 – Site Specific Hazard Register

PROJECT:		Merredin CBD Revitalisation - Stage 1A				JOB NUMBER:		2465								
CLIENT:		Shire of Merredin				REVISION NO.:		A								
LOCAL AUTHORITY:		Shire of Merredin				WAPC No.:		N/A								
CONTRACTOR:		TBC				DATE:		11-March-2022								
PERSONNEL INVOLVED IN RISK ASSESSMENT:		J. Garic, M. Arena, P. Keenan				HOLD POINT:		Issue for Final Approval								
SITE HAZARDS																
DESIGN LIFECYCLE	HAZARDS	DETAIL OF HAZARDS	Existing Management Plan / Code of Practice	INITIAL RISK LEVEL			RISK REDUCTION MEASURES	PERMANENT RISK LEVEL								
				LIKELIHOOD	CONSEQUENCE	RISK		LIKELIHOOD	CONSEQUENCE	RISK						
The design lifecycle refers to the application of a lifecycle approach associated with each phase in the life of a building, structure or plant, the hazards and risks in the various lifecycle phase of the design project are eliminated or reduced. The earlier in the design lifecycle process a hazard can be identified the greater the impact of the risk mitigation measure.	Site specific hazards that need to be drawn to the attention of the client and the contractors should be detailed in this section. Including: • Design issues • End product • Onsite exposure	This column should detail risks associated with that hazard that would normally be expected on a development / construction site e.g. working at heights is the hazard but the risk would be falling from the height and causing death or injury . Assessment of the risks associated with the hazard is required in the initial risk level not the hazard itself.	Model Code of Practice has been developed to provide practical guidance on how to meet the safe work requirements under the WHS Act and Regulations.	RISK RATING			This section should detail how the risks associated with the hazard has been mitigated or removed. The columns to the right should be ticked if a Project Management Plan / Construction Environmental Management Plan is required, if there are critical design elements that should not be changed or there is relevant regulations or standards that need to be taken into account. If the hazard remains unresolved the far right hand column should be ticked.	PROJECT MANAGEMENT PLANS	CEMP	CRITICAL DESIGN ELEMENTS	RELEVANT REGS AND STANDARDS	OTHER	RISK RATING			
Detailed Design	Falls from heights	Pedestrian or vehicles falling from a height into open drain which may cause injury to persons.		POSSIBLE	CATASTROPHIC	Extreme	Designs include guard railing and balustrading to reduce risk of falls into open drainage culvert. Guard railing designed in accordance with MRWA details. Guard railing designed to incorporate redundancy, so it may be replaced when/if impacted without damaging bridge deck. Signage and linemarking to be specified to warn end							RARE	CATASTROPHIC	High
Detailed Design	Safe entry/exit to car park and rest bay area	Potential vehicular collision between vehicles exiting on to Todd Street / Great Eastern Highway resulting in fatality.		POSSIBLE	CATASTROPHIC	Extreme	TABEC propose to remove rest area bay from scope of works to improve sight lines for vehicles exiting on to Great Eastern Highway. Shire of Merredin provided strong direction to maintain the bay in its existing condition, although shorten in length. Designs have been adapted in response to Shire of Merredin requirements and approved by MRWA, noting that new non-standard asset is within MRWA road reserve. Shire to install and maintain appropriate signage in relation to use of the rest area (no b-double semi-trailers or trucks to utilise rest area; designed for use by light vehicles towing trailers only. Entry/exit to carpark designed to MRWA standards.							RARE	CATASTROPHIC	High
Detailed Design	Exposure to septic leach drain	Existing septic tank and leach drain is situated within the north-eastern corner of the site, which is a potential health hazard causing illness to members of the public		UNLIKELY	MAJOR	High	Car park and amenity has been designed to be situated away from the leach drain and septic tank assets. No proposed activation of the leach drain area which would otherwise attract members of the public to recreate in the area. To maintain function of the leach drain, no pavement, hardstand or planting proposed within the leach drain area. Appropriate signage by Shire of Merredin to inform public of leach drain location and deter public use. Potential to isolate by means of fencing.							RARE	MAJOR	Medium
Detailed Design	Drowning resulting from falling into drain without safe point of egress.	Drowning by a person entering the drain during storm events, without opportunity to egress safely.		POSSIBLE	CATASTROPHIC	Extreme	Northern batters to drain designed to be flatter than 1in6 to provide opportunity for egress. Appropriate signage to be incorporated to inform public that the drain is not to be swum in or utilised for recreating during storm events.							RARE	CATASTROPHIC	High
Detailed Design	Trip hazards or excessive grades not conducive to providing universal access	Potential trip, fall or collision between vehicles and pedestrians resulting from poor connectivity in road and path networks.		POSSIBLE	MAJOR	High	Designs include dedicated parking bay for those with disabilities, which provides direct access to consolidated footpath network through the site. Grades on footpaths and parking areas are compliant with DDA codes and relevant Australian Standards.							RARE	MAJOR	Medium
Detailed Design	Traffic signs	Poor signage or clarity on right of way may result in pedestrian/vehicle collision resulting in harm to person(s)		UNLIKELY	CATASTROPHIC	High	Signage and linemarking to be incorporated and approved by MRWA.							RARE	CATASTROPHIC	High

PROJECT:		Merredin CBD Revitalisation - Stage 1A				JOB NUMBER:		2465						
CLIENT:		Shire of Merredin				REVISION NO:		A						
LOCAL AUTHORITY:		Shire of Merredin				WAPC No:		N/A						
CONTRACTOR:		TBC				DATE:		11-March-2022						
PERSONNEL INVOLVED IN RISK ASSESSMENT:		J. Garic, M. Arena, P. Keenan				HOLD POINT:		Issue for Final Approval						
SITE HAZARDS														
DESIGN LIFECYCLE	HAZARDS	DETAIL OF HAZARDS	Existing Management Plan / Code of Practice	INITIAL RISK LEVEL			RISK REDUCTION MEASURES				PERSISTING RISK LEVEL			
Detailed Design / Construction	Working at heights	Retaining walls which exceed two-courses (0.74m) in exposed height present risk of injury should an individual fall from the higher lot.	Managing the Risk of Falls at Workplaces REF: Safe Work Australia, issued on March-2015	POSSIBLE	MAJOR	High	Design to keep wall heights have been kept to a minimum where practicable. All walls standing greater than 0.74m are to be identified with flagging and signage. Railing / fencing to be installed adjacent to	✓	✓	✓	RARE	MAJOR	Medium	
Detailed Design / Construction	Damage to significant trees and vegetation / unauthorised clearing of vegetation	Damage to tree structural root protection zone or clearing unauthorised vegetation may result in: • Damage or death of the tree within or adjacent to site area; • Large penalties to all project parties.		LIKELY	MODERATE	High	Location of existing trees shown on landscape plans with trees for retention / clearing and associated Tree Protection Zones (TPZ) clearly defined. Designs typically build up existing surface as opposed to excavating below existing finished levels, in order to reduce risk of damage to roots. Where possible no excavation within the TPZ without permission, adhere to the relevant arborist reports or AS4970 standards. Clearing in sensitive areas only with council approval after a site inspection has been coordinated, and agreement received. If any native vegetation is to be impacted by the trenching and installation works, alternative construction methods (such as horizontal boring) to be used where possible to avoid disturbing native vegetation. Contractor to isolate proposed areas of clearing with site security fencing to protect / prevent clearing of native vegetation prior to relevant clearing approvals and permits being obtained. Contractor to clear vegetation only following formal instruction from the Superintendent to do so. If any native vegetation is to be impacted by the trenching and installation works, horizontal boring	✓	✓	✓	✓	RARE	MODERATE	Low
Detailed Design / Construction	High Voltage (HV) power	Works will be done in close proximity to live high voltage power cables located within the site Potential to interact with live cables causing temporary / permanent injury or death due to fire or electric shock.	Managing Electrical Risks at the Workplace REF: Safe Work Australia, issued on February-2016	POSSIBLE	CATASTROPHIC	Extreme	The location of existing power assets to be clearly and accurately marked. Services installed as part of forward works are marked on drawings, however Contractor must conduct Dial Before you Dig and manually locate services. Contractor to develop and follow Safe Work Method. Contractor to follow Western Power procedures for working near underground electric cables. Location of cables to be determined prior to construction	✓		✓	RARE	CATASTROPHIC	High	
Detailed Design / Construction	Installation of concrete drainage pipes and liners.	Positioning heavy pipes and liners to correct level risks: • Crushing when lowering heavy materials; • Manual labour injury when positioning heavy materials.		POSSIBLE	MAJOR	High	PPE to be worn. Spotter and line of sight to plant operator must be maintained. Contractor to ensure education and site safety induction with safe work practices explained.	✓	✓	✓	RARE	MAJOR	Medium	
Detailed Design / Construction	Connection to existing Water Corporation meters/services	Potential damage to existing assets resulting in disruption to water supply to Military Museum.		POSSIBLE	MAJOR	High	Any adjustment to existing live assets to be undertaken by accredited Water Corporation employees/contractors. Internal plumbing to be undertaken by licensed personnel. Ensure service to military museum and railway museum are to be protected and maintained at all	✓	✓		POSSIBLE	MAJOR	High	
Detailed Design / Construction	Open water hazard	Hazards associated with possible open water both within and in close proximity to the site include: • Fall and drowning into open water areas; • Flooding; • Loss of equipment or machinery.	Construction Work REF: Safe Work Australia, issued on May-2016	POSSIBLE	MAJOR	High	Safe batters or earthwork benching to open water areas. Undertake works during the dry season to reduce potential for stormwater flows through drain. Temporary fencing to control access to unsafe open water.	✓	✓	✓	RARE	MAJOR	Medium	

PROJECT:		Merredin CBD Revitalisation - Stage 1A				JOB NUMBER:		2465						
CLIENT:		Shire of Merredin				REVISION NO:		A						
LOCAL AUTHORITY:		Shire of Merredin				WAPC No:		N/A						
CONTRACTOR:		TBC				DATE:		11-March-2022						
PERSONNEL INVOLVED IN RISK ASSESSMENT:		J. Garic, M. Arena, P. Keenan				HOLD POINT:		Issue for Final Approval						
SITE HAZARDS														
DESIGN LIFECYCLE	HAZARDS	DETAIL OF HAZARDS	Existing Management Plan / Code of Practice	INITIAL RISK LEVEL			RISK REDUCTION MEASURES				PERSISTING RISK LEVEL			
Detailed Design / Construction	Wash-out erosion caused by heavy rainfall	Infrastructure undermined causing construction delays, loss of service, or damage to environment, from overflow.		POSSIBLE	MODERATE	High	Programme construction works to occur outside of rainy season (winter). In the event of severe wet weather, follow weather warnings and instructions to ensure personnel	✓				RARE	MODERATE	Low
Detailed Design / Construction	Interface difficulties with existing services	Discrepancies between existing services levels and design interface levels. Risks include: • Not achieving minimum cover when tying into existing pipes/services; • Damage to existing services; • Not achieving adequate clearance between services.		POSSIBLE	MODERATE	High	Design is to carefully consider the locations of existing services and ensure additional design components where necessary to achieve minimum cover and clearance when interfacing with existing services. Several existing services were unable to be located during the design phase. Contractor to systematically chase out services to confirm redundancy prior to removal. Contractor to heed existing services during construction, and report any interface issues or insufficient cover to the Superintendent.	✓		✓		RARE	MODERATE	Low
Detailed Design / Construction	Damage / disruption to existing water distribution mains and/or unidentified existing services within site.	Damage to existing water distribution main located in the proposed location of the future carpark and road causing: • Disruption to existing services; • Environmental threats; • Temporary / permanent injury or death due to rupture of pressure pipe.		POSSIBLE	MAJOR	High	The location of existing water main assets to be clearly and accurately marked. Contractor must conduct Dial Before you Dig and manually locate services prior to demolition. • Contractor to develop and follow safe work method and adhere to Water Corporation guidelines and procedures for working near Water Corporation assets. Location of pipes to be determined prior to construction. Car park designed to be situated away from known services, septic tanks and leach drains to reduce potential conflict during construction.	✓		✓		RARE	MAJOR	Medium
Construction	Demobilisation waste	Waste material left onsite may become: • A visual spectacle; • A danger to persons and the environment.	Construction Work REF: Safe Work Australia, Issued on May-2016	POSSIBLE	MAJOR	High	Contractor to ensure all waste is disposed off-site & adjacent areas to be cleaned of any construction debris when demobilisation occurs.	✓	✓			RARE	MAJOR	Medium
Construction	Cyclonic or severe weather conditions	Extreme weather events create the risk of: • Injury to persons; • Damage to plant or equipment.		POSSIBLE	MAJOR	High	Follow weather warnings and instructions in event of severe weather to ensure personnel safety. Utilise protective coverings or shelter for plant	✓				RARE	MAJOR	Medium
Construction	Damage to existing Local Government Authority (LGA) assets and public utilities	Hauling material via existing road reserves and undertaking works in proximity to existing assets may result in damage to assets, compromising serviceability and compromised safety through exposure to live services causing harm to persons.		POSSIBLE	MAJOR	High	Contractor to ensure that all existing services and LGA assets are adequately protected to ensure damage does not occur. Contractor to notify Superintendent of any damaged assets observed and replace where	✓				RARE	MAJOR	Medium
Construction	Connecting to, and working near, existing services	Damaging/exposure of Power, Telstra, Sewer and Water. Gas services located in existing verges may result in: • Potential to damage existing services; • Interruption of services to existing residences and businesses;	Excavation Work REF: Safe Work Australia, Issued on March-2015	POSSIBLE	CATASTROPHIC	Extreme	Dial Before You Dig completed by Designer. Contractor to also complete Dial Before You Dig and confirm location of services prior to commencing work in area. Contractor shall not consider this document to be an exhaustive list of all existing services. Liaise with resident(s) as necessary when interfacing near the boundary.	✓		✓		RARE	CATASTROPHIC	High
Construction	Generation of construction dust	Site is open and can be prone to strong winds and wind blown dust during the drier months of the year, potentially causing: • Inhalation of dust; • Eye irritation; • Nuisance to nearby residents and commerce; • Clogging of construction or nearby machinery.		POSSIBLE	MINOR	Medium	Hazard cannot be controlled by design; contractor to address hazard with PPE and other dust suppression means. Establishment of a dust control program to monitor and analyse airborne dust, if required. Contractor to maintain a source for construction water source throughout works. Local authorities' specific guidelines and regulations to be heeded. Temporary stabilisation of the site where necessary, particularly over long weekends or holiday periods.	✓	✓	✓		RARE	MINOR	Low
Construction	Non-vibration damage to existing buildings and/or structures	Non-vibration damage to nearby buildings. Possible damage to adjacent private properties' boundary fencing or paving		LIKELY	MINOR	High	Undertake pre-works dilapidation surveys. Design levels to match existing lots to minimise impact of works.	✓		✓		UNLIKELY	MINOR	Low

PROJECT:		Merredin CBD Revitalisation - Stage 1A				JOB NUMBER:		2465						
CLIENT:		Shire of Merredin				REVISION NO:		A						
LOCAL AUTHORITY:		Shire of Merredin				WAPC NO:		N/A						
CONTRACTOR:		TBC				DATE:		11-March-2022						
PERSONNEL INVOLVED IN RISK ASSESSMENT:		J. Garic, M. Arena, P. Keenan				HOLD POINT:		Issue for Final Approval						
SITE HAZARDS														
DESIGN LIFECYCLE	HAZARDS	DETAIL OF HAZARDS	Existing Management Plan / Code of Practice	INITIAL RISK LEVEL			RISK REDUCTION MEASURES				PERSISTING RISK LEVEL			
Construction	Generation of construction noise	Noise from construction activities potential to: <ul style="list-style-type: none"> • Create a nuisance for nearby residents; • Cause temporary or permanent hearing loss to personnel. 	Managing Noise and Preventing Hearing Loss at Work REF: Safe Work Australia, issued on September-2015	ALMOST CERTAIN	MINOR	High	Contractor to abide by Superintendent's nominated work hours, so as to follow the standards of local authorities.					POSSIBLE	MINOR	Medium
Construction	Generation of construction vibration	Generated vibration has the potential to damage nearby (homes / schools / office buildings).		POSSIBLE	MAJOR	High	Undertake pre-works dilapidation surveys.					RARE	MAJOR	Medium
Construction	Exposure to the natural extremes	Personnel will be in unshaded areas, exposed to heat and ultraviolet radiation, creating increased risk of sunburn, dehydration, heat stroke or exhaustion.		POSSIBLE	MODERATE	High	Ensure contractor has appropriate OSH managements plans that include plans for working in areas of high temperature.					RARE	MODERATE	Low
Construction	High Voltage (HV) power	Works will be done in close proximity to live high voltage power cables located within the proposed area for the future carpark and road. Potential to interact with live cables causing temporary / permanent injury or death due to fire or electric shock.	Managing Electrical Risks at the Workplace REF: Safe Work Australia, issued on February-2016	POSSIBLE	CATASTROPHIC	Extreme	The location of existing power assets to be clearly and accurately marked. Services installed as part of forward works are marked on drawings, however Contractor must conduct Dial Before You Dig and manually locate services.					RARE	CATASTROPHIC	High
Construction	Interaction with traffic on live roads	Site is located adjacent live roads: <ul style="list-style-type: none"> • Collisions caused by vehicles entering and exiting site; • Pedestrian / Cyclist safety; • Collisions caused by works being undertaken within the site resulting from poor traffic 	Construction Work REF: Safe Work Australia, issued on May-2016	POSSIBLE	MAJOR	High	Site specific Traffic Management Plan to be developed by Contractor for council approval.					RARE	MAJOR	Medium
Construction	Moving plant and machinery	Heavy machinery will be operating onsite. Large items of mobile equipment can seriously damage or crush smaller vehicles or personnel when moving causing injury or death. Workers are at risk of being run over (causing injury or death), especially if they are in the operator's blind spot.	Managing Risks of Plant in the Workplace REF: Safe Work Australia, issued on May-2018	POSSIBLE	MAJOR	High	Design to minimise the quantity of earth to be moved, thereby reducing machinery movements as much as practicable. Contractor to develop a Traffic Management Plan. Contractor to minimise or eliminate: <ul style="list-style-type: none"> • The need for reversing of large mobile equipment. • Light and heavy vehicle interaction by reducing the number of pit permits or providing segregated transport routes. Contractor must put Safety Plan in place and follow the site's established Safe Work procedure regarding exclusion zone requirements for pedestrians and vehicles when equipment is operating.					RARE	MAJOR	Medium

PROJECT:		Merredin CBD Revitalisation - Stage 1A				JOB NUMBER:		2465						
CLIENT:		Shire of Merredin				REVISION NO:		A						
LOCAL AUTHORITY:		Shire of Merredin				WAPC No:		N/A						
CONTRACTOR:		TBC				DATE:		11-March-2022						
PERSONNEL INVOLVED IN RISK ASSESSMENT:		J. Garic, M. Arena, P. Keenan				HOLD POINT:		Issue for Final Approval						
SITE HAZARDS														
DESIGN LIFECYCLE	HAZARDS	DETAIL OF HAZARDS	Existing Management Plan / Code of Practice	INITIAL RISK LEVEL			RISK REDUCTION MEASURES				PERSISTING RISK LEVEL			
Construction	Reputation / Public interface	Inappropriate management of site or behaviour from contactors, sub-contractors, consultants or clients may lead to damaged reputation of these entities or to customer/public complaints.		POSSIBLE	MAJOR	High	Contractors to ensure public comment/complaints are referred directly to the site management team and client/superintendent are notified immediately. All entities to ensure professional and responsible conduct, particularly while on-site.					RARE	MAJOR	Medium
Construction	Site security / Unauthorised public access	Area is prone to unauthorised public access, risking: • Collisions; • Falling into excavations; • Damage to equipment after hours; • Changes to site conditions.	Construction Work REF: Safe Work Australia, Issued on May-2016	LIKELY	MAJOR	Extreme	Contractor to make themselves aware of the hazards associated with pedestrians and vehicles access. Access to site to be restricted as far as reasonably practicable. Where public access is still available, the following measures are to be taken: • Erect signage to delineate work area; • Site induction for all crew; • Ensure all equipment is kept safe after hours; • Restart checks to all equipment at start of work; • Check site prior to start of work to ensure site conditions have not changed; • Fencing / bunting and signage around construction site perimeter; • Contractor to install security cameras; • Point of contact on site entrances; • No open excavations to be left for extended durations (such as shutdown periods).					UNLIKELY	MAJOR	High
Construction	Relevant QA unavailable	If QA handover procedures are not followed, it is likely to result in: • Delays to practical completion or FTI. • Weakened confidence in the quality of the		POSSIBLE	MINOR	Medium	Keen management of contractors to stress the importance of timely QA and to ensure that QA documentation is provided, accurate and complete.				✓	RARE	MINOR	Low
Maintenance	Confined space of stormwater shafts	Personnel will need access to manholes during construction, and potentially post-construction, for maintenance purposes. Hazards include: • Retrieval difficulty in case of emergency; • Pooling of noxious gases; • Collapse of access chamber or surrounding soil; • Personnel becoming drowned or trapped.	Confined Spaces REF: Safe Work Australia, Issued on February-2016	POSSIBLE	MAJOR	High	Design to keep access chambers to a minimal depth. Appropriate PPE and harnessing to be worn by personnel entering manholes, in accordance with management plans and maintenance procedures.	✓	✓	✓		RARE	MAJOR	Medium

6.14 Appendix 6.14 – Material Schedule

LANDSCAPE MATERIAL SCHEDULE

MERREDIN CBD Stage 1A

2151-PL-LMS

March 2022

Revision IFT

Document Status

Revision	Date	Approved by
A – Issue for Tender	15.03.22	NP

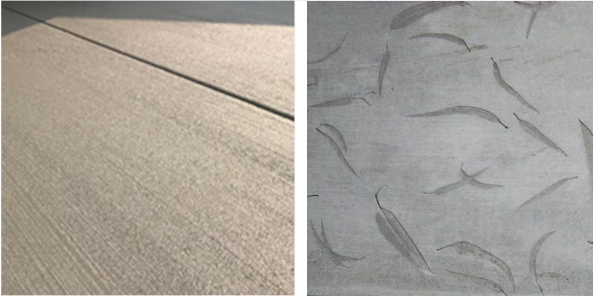

NOTES:

1. THE IMAGES ARE INDICATIVE AND FOR INFORMATION ONLY
2. MATERIAL SCHEDULE IS TO BE READ IN CONJUNCTION WITH:
 - 2151-L-001 GENERAL NOTES
 - ALL RELEVANT CONTRACTS, SPECIFICATIONS, SCHEDULES, REPORTS AND DRAWINGS.

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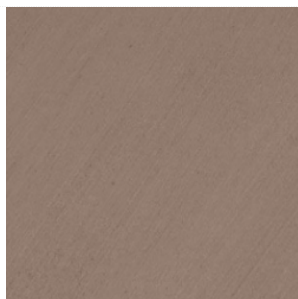
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1. SURFACE AND TREATMENTS

S_01A&1B		PAVEMENT TYPE 1 – PEDESTRIAN
		
S_01A& 1B_Plain grey		
Description	S_01A_Pedestrian In situ concrete (broom finish) S_01B_Pedestrian In situ concrete with imprinting Slip resistance to be maintained to AS.	
Application	Pathways	
Materials	In situ concrete - 14mm aggregate and 80mm slump, normal GP cement	
Product	Holcim (or approved equivalent)	
Dimension	N/A	
Colour	GP Standard grey	
Control Joint	TBA	
Expansion Joint	TBA	
Finish	Broom finish - frameless	
Sealer	All concrete to be adequately cleaned and sealed with Crommelins Enhanced Penetrating, to manufacturer's technical specification	
Laying Pattern	Within S-01B area the imprinted materials are to cover 25% of the panel using physical materials collected by the contractor. Refer L4.01 for intent. 2mm maximum imprinting.	
Submissions	Sample Panel of indicative paving layout, finishes, jointing and colours for final selection.	
Acceptable Supplier	Holcim (or approved equivalent)	
Notes	Refer Unit Paving Notes	
S_02A&2B		PAVEMENT TYPE 2 – PEDESTRIAN
		
S_02B Siltstone		
Description	S_02A_Pedestrian In situ coloured concrete S_02B_Pedestrian In situ coloured concrete with imprinting	
Application	Pathways	
Materials	In situ concrete	
Product	Holcim (or approved equivalent)	
Dimension	Refer to drawings	
Colour	GP cement concrete base And mix aggregates	

Control Joint	Refer to drawings
Expansion Joint	Refer to drawings
Finish	Machine trowel finish (final selection based on sample panel and instruction of Landscape Architect on site)
Sealer	All concrete to be adequately cleaned and sealed with Crommelins Enhanced Penetrating, to manufacturer's technical specification
Laying Pattern	In situ concrete footpath neat crisp machine Trowel Finish. Within area imprinted to 25% of the panel area using physical materials collected by the contractor. Refer L4.01 for intent
Submissions	Sample Panel of indicative paving layout, finishes and colours for final selection.
Nominated Supplier	Holcim (or approved equivalent)
Notes	Refer Unit Paving Notes

S_02C PAVEMENT TYPE 2 – PEDESTRIAN



S_02B Siltstone

Description	In situ concrete with concrete shot blasting to a medium exposure, stencil patterns by vinyl mask or laser cut steel sheeting templates S_02C_ Pedestrian In situ coloured concrete – shotblast patterning
Application	Pathways
Materials	In situ concrete
Product	In situ concrete footpath neat crisp machine Trowel Finish. Shot-Blast Inlays- stencilled inlays are to be shot-blast to a maximum of 2mm to expose aggregate. Contractor is to ensure shot blasted image is clean, crisp and without 'bleed' – if shot blasted image does not meet the requirements it will be rejected with concrete works replaced at the contractors cost.
Dimension	Refer to drawings
Colour	GP cement concrete base And mix aggregates
Control Joint	Refer to drawings
Expansion Joint	Refer to drawings
Finish	Machine trowel finish (final selection based on sample panel and instruction of Landscape Architect on site)
Sealer	All concrete to be adequately cleaned and sealed with Crommelins Enhanced Penetrating, to manufacturer's technical specification
Laying Pattern	Refer to drawings
Submissions	Sample Panel of indicative paving layout, finishes and colours for final selection.
Nominated Supplier	Holcim (or approved equivalent)
Notes	Refer Unit Paving Notes

S_03 PAVEMENT TYPE 3 – TRAFFICABLE

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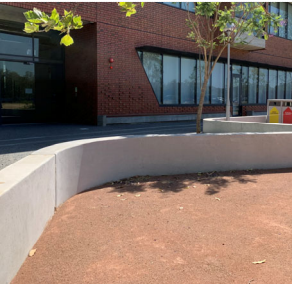


Description	S_03_Trafficable insitu concrete
Application	Carpark bridge
Materials	In situ concrete - 14mm aggregate and 80mm slump, normal GP cement
Product	Holcim (or approved equivalent)
Dimension	N/A
Colour	GP Standard grey
Control Joint	TBA
Expansion Joint	TBA
Finish	Broom finish - frameless
Sealer	All concrete to be adequately cleaned and sealed with Crommelins Enhanced Penetrating, to manufacturer's technical specification
Laying Pattern	N/A
Submissions	Sample Panel of indicative paving layout, finishes, jointing and colours for final selection.
Acceptable Supplier	Holcim (or approved equivalent)
Notes	Refer Unit Paving Notes

S_04A&B


COMPACTED GRAVELS

Rev:2



Description	S04A_Compacted Granite Gravel Pavement S04B_Compacted Granite Gravel Pavement S04B_Granite Gravel Pavement to trees in gravel
Application	Refer to drawings
Materials	Gravel: Fine Quarry Gravel (Red) Stabiliser: Pre-mixed off-site cement stabilised, mixed homogeneously through specified depth of gravel.
Dimension	125mm depth gravel fully compacted
Colour	Fine Quarry Gravel (Red)
Stabiliser	Cement to be mixed integrally prior to installation. S04A. 4-7% stabilised S04B. 6-9% stabilised S04C. Not stabilised under tree canopy – material washed no fines.
Installation	Refer to supplier specification
Submissions	Supply bagged samples of mixed gravel 2x2m Sample panel for approval by Landscape Architect Allow for installation and removal of four samples with cement ratios 6,7,8 and 9%


Acceptable Supplier	Creation Landscape Supplies. T.9335 7383 or equal and approved.
Notes	<ol style="list-style-type: none"> 1. Note when used as crossover treatment as marked on plans, compacted gravel is to be suitable for up to 6 tonne vehicles. Contractor to provide sample for approval by landscape architect. 2. Provide a 2x2m sample to demonstrate material finish to superintendent's approval 3. Maximum grades of 1:40 to be installed. 4. Gravel to be laid, raked level and consolidated by compaction to 125mm thickness. 5. After compaction of the pavement, the whole of the surface shall be graded, trimmed and finished to give a hard, tight, dense, even surface, free of lenses and caking. 6. Gravel to be stabilised by broadcasting and nail raking in more cement if necessary and to superintendent's approval. 7. Expansion joints to be installed to all vertical surfaces and control joints to be allowed every 3lm (green cuts – within 12hrs of install) 8. Refer to civil documentation for sub-base and sub-grade preparation. 9. All pavements shall comply with table D2.14 of the BCA when tested in accordance with the Australian standard – slip resistance classification of new pedestrian surface materials – AS 4586 – 2013. The contractor to supply slip resistance test to prove compliance with standards.

S_06	TURF	Rev:
		
Description	Roll-out Turf	
Application	Turf areas	
Species	Wintergreen Couch (Obtained from a specialist grower of cultivated turf refer specification.)	
Fertiliser	Refer Specification	
Materials	Eclipse Soil conditioner (ESBTS) 25mm depth on top of large particle turf sand (no fines no clay) to 200mm depth. Soil conditioners mixed homogeneously to 75mm depth. Refer Specification	
Installation	lightly compacted and wet down in 100mm increments	
Acceptable Supplier	Lawn Solutions T.1300 883 711 Eclipse Soils T.(08) 9380 3333	
Acceptable testing	<p>NATA approved testing by;</p> <p>SWEP Pty Ltd Analytical Laboratories services@swep.com.au 45-47/174 Bridge Road, Keysborough VIC 3173 Phone: +61 (03) 9701 6007</p> <p>Local agronomist advice accepted by Bioscience or Turf industry specialist to the superintendents satisfaction;</p>	


	Bioscience 488 Nicholson Road, Forrestdale WA 6112 bioscience@biosciencewa.com Phone - 9397 2446									
Submissions	<ul style="list-style-type: none"> – Turf Sample – Bagged & Labelled samples of all soils, sands, conditioners and fertilisers as required 									
Notes	<ol style="list-style-type: none"> 1. Note that minimum 225mm of imported approved media is to be used specifically for the turf build up. 2. Clay sub-base to be sloping downhill. 3. Refer to specification and drawings for turf, ground preparation and maintenance requirements. 4. Superintendent's approval of fertilizer type and brand required prior to installation. 5. Turfed areas to be excavated where necessary to ensure final levels match adjoining pavements. 6. Topsoil shall be uniformly graded to even-running contours, so that no ponding or waterlogging occurs across the surface of the grassed area and raked before turf is laid. 7. Turf shall be laid in straight lines with staggered cross joints on the general line of the contour of the slope. The gaps between adjacent sections of turf should not exceed 5mm. 8. Maximum deviation from finished ground levels 50mm in any 2 metres. 9. Contractor to provide copies of all signed delivery dockets to superintendent. These will be used to confirm quantity and product type delivered to site. 10. Witness point: Superintendent to be on site during installation of soil improver to confirm target blending depths achieved. 11. Refer Landscape Specification for full turf requirements including testing, installation and establishment. 									
S_07, 07A &08	GARDEN BEDS	Rev:								
Description	Irrigated garden bed with planting, soil improvement suitable for clay soil and mulched									
Application	Refer to drawings									
Materials	<table border="0"> <tr> <td style="vertical-align: top;">Shrub Planting</td> <td>Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner or similar and approved at 25mm depth, installed to 200mm.</td> </tr> <tr> <td style="vertical-align: top;">Tube Planting</td> <td>Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner into hole or similar and approved at 25mm depth, installed to 200mm.</td> </tr> <tr> <td style="vertical-align: top;">Tree Planting</td> <td>Break-up the surface of the clay to 200mm depth using Gypsum .Tree pit back fill below the shrub planting soil mix above to be 1 part Eclipse Soils conditioner mixed to 2 parts on site soil for the tree pit backfill.</td> </tr> <tr> <td style="vertical-align: top;">Shrub and Tube Fertiliser</td> <td>POLYCOTE PLUS NATIVE Application to manufactures specification.</td> </tr> </table>		Shrub Planting	Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner or similar and approved at 25mm depth, installed to 200mm.	Tube Planting	Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner into hole or similar and approved at 25mm depth, installed to 200mm.	Tree Planting	Break-up the surface of the clay to 200mm depth using Gypsum .Tree pit back fill below the shrub planting soil mix above to be 1 part Eclipse Soils conditioner mixed to 2 parts on site soil for the tree pit backfill.	Shrub and Tube Fertiliser	POLYCOTE PLUS NATIVE Application to manufactures specification.
Shrub Planting	Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner or similar and approved at 25mm depth, installed to 200mm.									
Tube Planting	Break-up the surface of the clay to 200mm depth using Gypsum , soil test dependant. Mix Eclipse Soils Conditioner into hole or similar and approved at 25mm depth, installed to 200mm.									
Tree Planting	Break-up the surface of the clay to 200mm depth using Gypsum .Tree pit back fill below the shrub planting soil mix above to be 1 part Eclipse Soils conditioner mixed to 2 parts on site soil for the tree pit backfill.									
Shrub and Tube Fertiliser	POLYCOTE PLUS NATIVE Application to manufactures specification.									

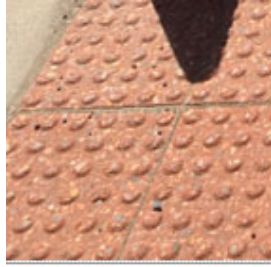
	<p>Tree Fertiliser 10g Agriform fertilizer. Application to manufactures specification.</p> <p>S-07 Mulch 75mm deep (minimum) Organic mulch (keep clear of plant stem/tree trunk.)</p> <p>S-07A Mulch 100mm deep (minimum) Organic mulch (keep clear of plant stem/tree trunk.) This mulch thickness only occurs in the play area. Where there is no planting amelioration and retic is not required. (Trees in the playground are the exception)</p> <p>S-08 Mulch Aggregate mulch 10-20m Gascoyne River stone geofabric aggregate pinned to manufacturers specification when used in swales (keep mulch clear of plant stem/tree trunk.)</p>
Submissions	<ul style="list-style-type: none"> — Supply bagged samples of Blended topsoil and mulches to Superintendent for approval prior to installation. — Site soil test report - Site topsoil samples should be taken from a minimum of 4 areas onsite, locations to be co-ordinated with the landscape architect. These should then be mixed into one sample to make up 1kg. — Greenstock report to Superintendent required at contract award for approval prior to installation. Refer specification for timing and requirements — Signed soil delivery dockets.
Acceptable Supplier	S-07 - Eclipse Soils. T.9380 3333
Acceptable testing	<p>NATA approved testing by;</p> <p>SWEP Pty Ltd Analytical Laboratories services@swep.com.au 45-47/174 Bridge Road, Keysborough VIC 3173 Phone: +61 (03) 9701 6007</p> <p>Local agronomist advice accepted by Bioscience or Turf industry specialist to the superintendents satisfaction;</p> <p>Bioscience 488 Nicholson Road, Forrestdale WA 6112 bioscience@biosciencewa.com Phone - 9397 2446</p>
Notes	<ol style="list-style-type: none"> 1. Refer to plant schedule for plant species and spacing. 2. Garden bed areas to be excavated where necessary to allow for final levels to match adjoining finished levels. 3. Topsoil to be free from weeds, grass and deleterious material to the approval of the Superintendent. 4. Contractor to provide copies of all signed delivery dockets to superintendent. These will be used to confirm quantity and product type delivered to site. 5. Soil test results should be reviewed by the Soil supplier for their input and recommendations. This will confirm or determine the final make up of the soil materials.

	<ol style="list-style-type: none"> 6. Soil test levels shall at a minimum meet the nutrient sufficiency ranges as per supplier. 7. Witness point: Superintendent to be on site during installation of soil improver to confirm target blending depths achieved. Existing site soil to be reviewed by superintendent, if not of appropriate quality substitute with approved clean fill. 8. Gravel to be laid and raked level and lightly tamped down to achieve a consistent depth and finish 9. Gravel mulch to be free from weeds, grass and deleterious material to the approval of the Superintendent 10. Gravel mulch will be laid to produce smooth even grades, finishing 5mm below hard surfaces 11. Ensure mulch under trees and plants is setback from trunks to avoid collar rot. 12. No planting to be undertaken within one meter radius of existing trees. 13. Contractors to allow for additional final soil test to be taken as part of the practical completion process to ensure correct soil make up has been installed. 14. Note that as part of practical completion inspections, mulch levels will be measured at random locations by superintendent for approval. 15. Refer landscape specification for all plant requirements.
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S_09 & 9A	RECYCLED BRICK EDGING	Rev:
	Image for reference only	
Description	Garden bed edging	
Application	Refer to drawings, between gravel/garden bed	
Materials	Recycled clay brick pavers Compacted wet down subgrade, Laid on 60mm thick compacted crusher dust and 40mm of creme cement. After installation dry brushed with a creme mix, wet down and cleaned. Laid in solid course as shown in image	
	S_09 (Single header) S 09A (Double header)	
Product		
Dimension	230 x 110 x 76mm.	
Colour	Clay heritage	
Installation	To supplier specification	
Submissions	Provide a sample installation of material size and finish as provided by manufacturer for approval.	
Acceptable Supplier	TBC – Merriden Salvage	
Notes	<ol style="list-style-type: none"> 1. Closure rule: Wherever the end of a run would result in a paver less than 1/3 full size, cut 2 pavers in equal lengths to close out the run. 2. The contractor to provide sample of all the components for Superintendent's approval prior to installation. 3. All edges to be installed plumb, true and level with adjacent finished surfaces, edge to be installed straight and without deviation. 	

	<ol style="list-style-type: none"> 4. Within 1.5m of roadways the edges are to be locally stabilised to match the haunching detail in the Engineers drawings for paving edges. 5. Install edge to manufacturer's specifications. All fixings subsurface and concealed.
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S_09B	STEEL EDGE TREE RING	Rev:
	Image for reference only	
Description	Garden bed edging	
Application	Refer to drawings, tree rings 1500mm DIA	
Materials	2mm gauge 150mm Steel edge finished 10mm proud of turf with 400mm tapered galvanised stakes	
Product	FormBoss Steel Edge	
Dimension	150mm height 2mm gauge with 400mm Stakes	
Colour	Zam proprietary finish – silver colour	
Installation	To supplier specification	
Submissions	Provide a sample installation of material size and finish as provided by manufacturer for approval.	
Acceptable Supplier	FormBoss	
Notes	<ol style="list-style-type: none"> 1. The contractor to provide sample of all the components for Superintendent's approval prior to installation. 2. All edges to be installed plumb, true and level with adjacent finished surfaces, edge to be installed straight and without deviation. 3. Within 1.5m of roadways the edges are to be locally stabilised to match the haunching detail in the Engineers drawings for paving edges. 4. Install edge to manufacturer's specifications. All fixings subsurface and concealed. 	




Description	Tactile Hazard Paver
Application	Hazard Indicators
Materials	Engineered paver
Product	Urbanstone or equal and approved
Depth	60mm
Dimension	300x300mm
Colour	TBC The contractor to ensure luminance contrast is compliant with AS1428. Luminance Contrast testing to be provided by the contractor, prior to order of TGSIs or installation.
Installation	Refer Civil & Landscape Documentation & Specification
Expansion Joint	Refer Civil & Landscape Documentation & Specification
Finish	Shotblast
Sealer	Natural Paving Seal of Spirit Sealers
Laying Pattern	Refer to drawings
Submissions	Samples unit to be supplied for approval (three options)
Acceptable Supplier	Urbanstone. P (08) 9417 2444 or equal and approved.
Preferred contractor	Lightning Brick. P 0438 800 582 or equal and approved.
Notes	Refer Unit Paving Notes

UNIT PAVING and TACTILE NOTES


General	Refer to specification for general requirements
Submissions	<ul style="list-style-type: none"> Contractor is to provide sample panel installed on site for final selection by Principal and Superintendent's approval prior to installation. Contractor to provide a plan of the sample panel layout, for the Landscape Architect approval, prior to installation Sample panel is to comprise of unit paving, header course and jointing prior to installation
Notes	<ol style="list-style-type: none"> Contractor to supply an additional 2.5% of each paver type for future maintenance purposes. Paving set out to be confirmed with the landscape architect prior to installation Refer to Civil documentation for sub-base and sub grade preparation. Pavers butt jointed with Bautek Jointset to manufacturer's technical specification. All unrestrained edges to be haunched as per civil documentation All changes in direction of paving and material are to be met with a suitable header course as per the landscape architect instruction on site Closure rule: Wherever the end of a run would result in a paver less than 1/3 full size, cut 2 pavers in equal lengths to close out the run. Refer to Civil and Electrical documentation for pit types & locations.

	<p>9. All pit lid covers in paved trafficable area to be finished with concrete aggregate or approved coloured concrete to match unit pavers adjacent. Pit lids to be finished flush with adjacent surface.</p> <p>10. Cement stabilise sub-base around pit lids to a depth of 100mm typically.</p> <p>11. All cuts for circular valve type lids to be core drilled through paver to achieve clean cut.</p> <p>12. Contractor to provide expansion joints to all edges abutting vertical elements.</p> <p>13. Tactile Hazard Indicators_ Require luminance contrast of minimum 30% for tactile indicators. The 30% applies to all adjoining surfaces, noting some areas have two different finishes alongside the tactile indicator pavers. Luminance contrast to be prescribed at minimum 30% when assessed against all finished adjoining surfaces. Contractor to provide luminance contrast test result that meets the AS requirements</p> <p>14. Warranty Period -10 Years (from date of purchase)</p> <p>15. AS are called up in the Premises Standards, located within the Disability Discrimination Act, which is federal legislation covering new building work. In addition, Handbook 198 has been used for the purpose of determining minimum slip resistance requirements for the finish's pedestrian surfaces.</p>
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S_11A and S11B		RELOCATED STATUES
		
Description	Statues relocated S11A – Horse S11B – Farmer and Dog	
Application	NA	
Materials	Concrete footings Man and Dog statues on spacers which allow the footings to be 125mm below FSL Horse to have footing to the base extents of the statue and be set down 125mm to allow for stabilised stone cover	
Product	NA	
Dimension	Contractor to provide engineering on the footing size required	
Colour	NA	
Installation	Location to be agreed onsite prior to footing being poured. The location to be approved after the adjacent Gabion wall is constructed	
Submissions	Shop drawings of footings and connection methodology	
Acceptable Supplier		
Notes	<ol style="list-style-type: none"> Contractor is to provide a bagged sample for final approval by Superintendent's prior to installation. Contractor is to provide samples demonstrating installation requirements including compaction and subbase <p>Refer to documentation for sub-base and sub grade preparation.</p>	

S_12 DRAINAGE AGGREGATE	
Description	Open drainage
Application	Drainage channel
Materials	Crushed Stone and Megaflo
Product	Local quarry aggregate 14-20mm Megaflo 450 including full geofabric wrap, all fixtures and fitting intakes and outlets top manufacturers specifications
Dimension	NA
Colour	NA
Installation	Depths vary refer plan
Submissions	
Acceptable Supplier	Stone Supplier TBC
Notes	<ol style="list-style-type: none"> 3. Contractor is to provide a bagged sample for final approval by Superintendent's prior to installation. 4. Contractor is to provide samples demonstrating installation requirements including compaction and subbase 5. Refer to documentation for sub-base and sub grade preparation.

2. WALLS AND BRIDGES

W_01A & W_02A GABION WALLS		Rev:
		
Description	Gabion walls to relocated statue area	
Location	Refer Documentation	
Materials	W_01A & W_02A Gabion baskets, geogrid, footings, reclaimed cleaned site granite from open drain, geofabric	
Product	W_02A , Curved steel plate with lettering to sit 10mm off the plate face. GABION 5mm THK AL-TEN	
Dimension	W_01A - 975MM L X 525MM W X 975MM H, 75X75MM W_02A - 975MM L X 525MM W X 525MM H, 75X75MM ~	
Colour		
Installation	Installation to manufacturers specifications, engineering sign off required for footings / anchoring – refer drawings	
Submissions	Shop drawings refer notes	
Acceptable Supplier	Gabion walls Permathene Pty Ltd T. (02) 4620 7785	


	Signage Paint International Paint – interfine / interzinc to base and letters – colours to TBC E: https://www.international-pc.com/
Warranty Period	Gabions and Signage 1 Year from PC
Notes	<ol style="list-style-type: none"> 1. Contractor to supply certified shop drawings of gabions before manufacture and installation for approval of superintendent. 2. Contractor to supply certified shop drawings of signage to W_02A before manufacture and installation for approval of superintendent. 3. The contractor to provide sample for superintendent’s approval prior to installation 4. Hog rings are to be used as edge fixings 5. All Gabion fixings supplied by Gabion manufacturer 6. Refer to manufacturer’s installation guides and requirements


W_03A	PEDESTRIAN BRIDGE 3A	Rev:
Description	Pedestrian culvert	
Location	Refer Documentation	
Materials	Refer drawings for intent	
Product	Concrete culvert Balustrade Refer F-07 Central bollard Concrete path infill – refer plan	
Dimension	Culvert 900.1800 Culverts and base	
Colour	Galvanised	
Installation	Culvert to manufactures specifications – engineering for compaction captured in shop drawings	
Submissions	Shop drawings refer notes	
Acceptable Supplier	Culvert Humes T: (08) 9351 6999	
Warranty Period	1 Year from PC	
Notes	<ol style="list-style-type: none"> 1. Stainless steel fixings and spacers 2. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent. 3. The contractor to provide sample for superintendent’s approval prior to installation 4. Refer to manufacturer’s installation guides and requirements 	

W_04B	PEDESTRIAN BRIDGE 4B	Rev:
Description	Pedestrian walkway mesh bridge with kick rail	


Location	Refer Documentation
Materials	Refer drawings for intent
Colour	Galvanised
Submissions	Shop drawings refer notes
Acceptable Supplier	
Warranty Period	1 Year from PC
Notes	<ol style="list-style-type: none"> 1. Stainless steel fixings and spacers 2. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent. 3. The contractor to provide sample for superintendent's approval prior to installation 4. Refer to manufacturer's installation guides and requirements

3. FURNITURE PALETTE

F_01A	SEAT	Rev:
		
Description	Seat with backrest and armrests	
Location	Refer Documentation	
Materials	Frame: 304 Satin polished SS Battens: Class 1 hardwood with UV resistant oil When in gardens allow for concrete pad to match adjacent surface type.	
Product	VERGE SEAT TM4730	
Dimension	Length: 1800mm Width: 504mm Height: 826mm	
Colour	304 Satin polished SS	
Installation	Sub-surface mounted as per manufacturer's technical specification, Coordinate with supplier for threaded rod length for subsurface fixing.	
Sealer	UV Resistant oil, to be applied prior to installation and then every 3 months	
Acceptable Supplier	Commercial Systems Australia. T. 03 9723 4111	
Warranty Period	3 Years	
Notes	Refer to manufacturer's installation guides and requirements.	

F_01B	PICNIC SETTING	Rev:
		
Description	Bench	
Application	Seating	
Materials	Frame: 304 Satin polished SS Battens: Class 1 hardwood with UV resistant oil When in gardens allow for concrete pad to match adjacent surface type.	

Product	ALFRESCO PICNIC SETTING TM4653-52
Dimension	Length: 1800mm Width: 740mm Height: 750mm
Colour	304 Satin polished SS
Installation	Sub-surface mounted as per manufacturer's technical specification, Coordinate with supplier for threaded rod length for subsurface fixing.
Sealer	UV Resistant oil, to be applied prior to installation and then every 3 months
Acceptable Supplier	Commercial Systems Australia. T. 03 9723 4111
Warranty Period	3 Years
Notes	Refer to manufacturer's installation guides and requirements.

F_04	RUBBISH BIN	Rev:
		
Description	240L Dual Bin Enclosure	
Location	Refer Documentation	
Materials	Frame: 304 Satin polished SS Battens: Class 1 hardwood with UV resistant oil When in gardens allow for concrete pad to match adjacent surface type.	
Product	LR6533 Manhattan enclosure bin 240 lt	
Dimension	Width: 760mm Depth: 800mm Height: 1265mm	
Colour	TBC	
Installation	Sub surface mounted as per manufacturer's technical specification	
Sealer	UV Resistant oil, to be applied prior to installation and then every 3 months	
Acceptable Supplier	Street Furniture Australia. T. 1300 027 799	
Notes	Refer to manufacturers installation guides and requirements.	

F_06	NOT IN USE	Rev:
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F_06	NOT IN USE	
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F_07	BALUSTRADE	Rev:
Description	Infill balustrading	


Location	Pedestrian bridge W-03A Design intent to apply to the bridge over the eastern end of the open drain adjacent to the military museum
Materials	<ul style="list-style-type: none"> — All galvanised steel — Offset base plates — Web forge expanded metal to vertical infills
Dimension	As documented – refer note 1
Installation	Sub surface mounted as documented
Acceptable Supplier	
Notes	<ol style="list-style-type: none"> 1. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent. 2. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent 3. Refer specification and details for treatment of welds, fixing etc. 4. All welds shall be fully covered seam welds. 5. The contractor to provide sample for superintendent’s approval prior to installation

F_08	WAYFINDING PORTAL	Rev:
Description	Portals	
Location	Refer drawings for design intent	
Materials	SHS Painted	
Colour	TBC	
Submissions	Shop drawings refer notes	
Installation	Sub surface mounted	
Acceptable Supplier	Paint International Paint – interfine / interzinc to base and letters – colours to TBC E: https://www.international-pc.com/	
Notes	<ol style="list-style-type: none"> 1. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent. 2. Refer specification and details for treatment of welds, fixing etc. 3. All welds shall be fully covered seam welds. 4. The contractor to provide sample for superintendent’s approval prior to installation 	

4. MISCELLANEOUS

M_01	LOG STEPPERS	Rev:
		

Description	Milled timber stepping logs
Application	Refer to drawings
Materials	Hardwood Logs Concrete footing Reinforcement – Refer to documentation
Product	NA
Dimension	Height varies Max. 600mm Min. 300mm. Diameter varies 200 - 400mm Setout on site to be confirm with the Landscape Architect
Colour	Colours TBC Natural with painted feature elements, Refer to Playground Detail Plans for colour arrangement
Finish	OILED
Installation	Refer to drawings
Notes	<ol style="list-style-type: none"> 1. Contractor to provide sample of 2 timber logs and 1 Timber log with sample engraving and painting. 2. Apply bitumen sealer to all timber play elements that are sunk into concrete. 3. Sizes vary - contractor to make allowance for preparing and cutting timber to dimensions nominated in the detail drawings 4. Timber to be sanded back to smooth finish with bark removed and cracks filled sanded free of splinters and with the edges rounded and ensure no sharp edges and no entrapment spaces for fingers and hands are created 5. Ensure rough edges are sanded back to provide safe play for children 6. Refer to details for dimensions and fixing requirements 7. Placement of stepping logs shall ensure that there are no entrapment spaces for feet and legs 8. The contractor to provide sample of all the components for superintendent's approval prior to installation 9. Milled Stepping Logs and Log Poles to comply with Relevant Australian Standards AS4685:2014; AS/NZS 4486.1:1997; AS2555:1982 relating to playgrounds 10. Contractor to allow for inlay routing and painting. Refer to documentation. Artwork to be supplied by Landscape Architect.


M_02	ROCK STEPPERS	Rev:
		
Description	Flat granite boulders	
Application	Refer to drawings	
Materials	Imported granite boulders from local quarry	
Product	NA	
Dimension	400x400x400 – 40% 500x500x500 – 40% 1000x1000x500 – 15% 2000X1000X750 – 5%	
Colour	Natural	

Installation	Rocks in gardens on mortar refer details Rocks detailed in open drain laid loose
Finish	Split face natural stone with natural edge facing up.
Sealer	NA
Acceptable Supplier	NA
Notes	<ol style="list-style-type: none"> 1. Refer to details, drawings and specification for ground preparation and reinforcement requirements. 2. The contractor to provide sample of steppers installed on site for Superintendent's approval prior to installation 3. Ensure that there are no crevices, sharp edges or protrusions and that no entrapment spaces for hands or feet are created.

M-03 SIGNAGE		Rev:
Description	Signage	
Location	Refer drawings for design intent	
Materials	Steel plate 10mm THK with holes drilled for future signage installation	
Dimension	Refer plans	
Installation	Sub surface mounted into concrete footings	
Acceptable Supplier	Paint International Paint – interfine / interzinc to base and letters – colours to TBC E: https://www.international-pc.com/	
Notes	<ol style="list-style-type: none"> 1. Contractor to supply certified shop drawings before manufacture and installation for approval of superintendent. 2. Refer specification and details for treatment of welds, fixing etc. 3. All welds shall be fully covered seam welds. 4. The contractor to provide sample for superintendent's approval prior to installation 	

M-04 TIMBER SLEEPER STEPS		
Description	Inground timber sleeper stairs	
Materials	Recycled Jarrah Sleeper Grade AA Square and Solid	
Dimension	Each tread is comprised of 3 x (225H x 125W x 2500mm) Refer to Landscape Documentation for cut sizes /dimensions and layout	
Colour	NA	
Installation	Refer to Drawings	
Joints		
Finish	Natural. Unsealed	
Submissions	<ol style="list-style-type: none"> 1. A 2.5 sample is required for Superintendent approval prior to commencement of works. Photographic all sides with straight edge. 	

Acceptable Supplier	Mountain movers or similar equal and approved																	
Notes	<p>1. All horizontal surfaces shall comply with table D2.14 of the BCA when tested in accordance with the Australian standard – slip resistance classification of new pedestrian surface materials – AS 4586 – 2013. The contractor to provide slip resistance tests to prove compliance with standards.</p> <p>Table D2.14 SLIP-RESISTANCE CLASSIFICATION</p> <table border="1"> <thead> <tr> <th rowspan="2">Application</th> <th colspan="2">Surface conditions</th> </tr> <tr> <th>Dry</th> <th>Wet</th> </tr> </thead> <tbody> <tr> <td>Ramp steeper than 1:14</td> <td>P4 or R11</td> <td>P5 or R12</td> </tr> <tr> <td>Ramp steeper than 1:20 but not steeper than 1:14</td> <td>P3 or R10</td> <td>P4 or R11</td> </tr> <tr> <td>Tread or landing surface</td> <td>P3 or R10</td> <td>P4 or R11</td> </tr> <tr> <td>Nosing or landing edge strip</td> <td>P3</td> <td>P4</td> </tr> </tbody> </table>	Application	Surface conditions		Dry	Wet	Ramp steeper than 1:14	P4 or R11	P5 or R12	Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11	Tread or landing surface	P3 or R10	P4 or R11	Nosing or landing edge strip	P3	P4
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	Dry	Wet																
Ramp steeper than 1:14	P4 or R11	P5 or R12																
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11																
Tread or landing surface	P3 or R10	P4 or R11																
Nosing or landing edge strip	P3	P4																

M_05	PLAY LOG	Rev:
		
Description	Milled timber playing log	
Application	Refer to drawings	
Materials	Timber hardwood	
Product	NA	
Dimension	Refer to drawings	
Colour	Natural	
Installation	NA	
Finish	To manufacturers specifications	
Sealer	NA	
Acceptable Supplier	NA	
Notes	<ol style="list-style-type: none"> Contractor to provide sample for approval Apply bitumen sealer to all timber play elements that are sunk into concrete. Sizes vary - contractor to make allowance for preparing and cutting timber to dimensions nominated in the detail drawings Timber to be sanded back to smooth finish with bark removed and cracks filled sanded free of splinters and with the edges rounded and ensure no sharp edges and no entrapment spaces for fingers and hands are created Ensure rough edges are sanded back to provide safe play for children Refer to details for dimensions and fixing requirements Placement of stepping logs shall ensure that there are no entrapment spaces for feet and legs The contractor to provide sample of all the components for superintendent's approval prior to installation Milled Stepping Logs and Log Poles to comply with Relevant Australian Standards AS4685:2014; AS/NZS 4486.1:1997; AS2555:1982 relating to playgrounds 	

6.15 Appendix 6.15 – Local Supplier List

Local Business List – Upcoming Projects

Name	Phone	Postal Address	Business Address	Email	Contact
TRADES					
Electrical					
Merredin Refrigeration & Air Conditioning	9041 3440		Home Based	office@mdnrac.com	Gordon Nelson
Building, Construction & Maintenance					
All Round Maintenance Merredin	0439 939 033		Home Based	armm6415@outlook.com	Matt White
Gearing Construction Contractors	0408 415 275 0408 504 110	PO Box 344		enquiries@gearingconstruction.com.au	Ben & Rachel Gearing
Merredin Skip Bin Hire	9041 3325			admin@merredinskipbins.com.au	Chris Van Der Merwe
T & B Construction	0487 434 210		12 Mitchell Street, Merredin	t.b.construction8@gmail.com	Tom Fitzsimmons
Amacai Building & Maintenance	0427 994 198			Tollarzo.building@hotmail.com	Shayne Tollarzo
Holcim Concrete	9041 3444 0400 144 829			merredinfreightline@bigpond.com	Tom Hooper
TR Welding and Inspection	0408 567 804			trevor_ryland@hotmail.com	Trevor Ryland
CJ & KP BROWN	0417 091 882		Bobcat, Backhoe, 3 ton Roller, Trucks	cjkpbrow@bigpond.net.au	Chris Brown
Fabrication, Steel & Glass Supplies					
Merredin Glazing Service	9041 2549 0428 415 308	PO Box 809	20 Railway Ave, Merredin	merredinglazing@westnet.com.au	Phil Van Der Merwe
Merredin Steel Supplies	0487 022 092			steelsales@merredin.net.au	Len Jones
Plumbing Services					
Merredin Plumbing Service	0427 380 082		28 Snell St, Merredin	merredinplum@bigpond.com	Chester & Pip Kudas

McKay Plumbing & Gas	0428 966 959		48 Railway Ave, Merredin	mckayplumb@gmail.com	Jackson McKay
AUTOMOTIVE & MECHANICAL SERVICES					
Combined Tyres	1300 266 897		111 Barrack St, Merredin	trent@combinedtyres.com.au	Trent Trewarn
Freight					
Great Eastern Freightlines	9041 5922 0488 058 288		Lot 13 Insignia Way, Merredin	josh@greateasternfreightlines.com.au office@greateasternfreightlines.com.au	Josh Herbert
Merredin Freightlines	9041 3444 0400 144 829	PO Box 411	1 Watson Road, Merredin	merredinfreightline@bigpond.com	Tom Hooper

6.16 Appendix 6.16 – Price Schedule

Please refer to attached document.