Disaster Recovery Works – AGRN1143 and AGRN1150

Technical Specification

Shire Of Northampton

06 May 2025

→ **The Power of Commitment**

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1. Introduction

Heavy rainfall and associated flooding impacted the Shire of Northampton, Western Australia between 6-9 June 2024, which led to the declaration of disaster even AGRN1143. Similarly, from 26-30 June 2024, the Shire of Northampton experienced heavy rainfall and associated flooding, leading to the declaration of disaster event AGRN1150. Both events were declared under the Disaster Recovery Funding Arrangements of Western Australia (DRFAWA). This project is to be delivered in compliance with the DRFAWA requirements.

This specification covers the Essential Public Asset Restoration works (EPAR).

1.1 General

This Specification is for the road repair works to be undertaken on the Shire of Northampton's road network. This Specification should be read in conjunction with the relevant Regulations, Codes and Standards.

1.2 Location if works

The works are located within the Shire of Northampton, Western Australia, outlined in Figure 1.

It is anticipated the some of the works will be undertaken from Kalbarri and some from Northampton. The tender documents make provision for this to be priced separately.

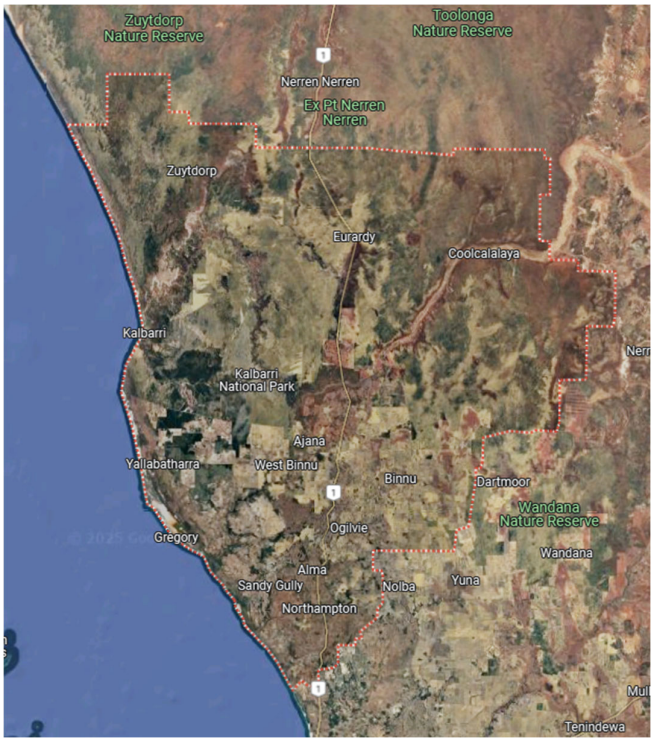

Figure 1 *Shire of Northampton extent for road repair works*

1.3 Scope of Work

This scope of work covers disaster event AGRN1143 and AGRN1150. Extents cover the Shire of Northampton from Horrocks to Kalbarri and going east to Binnu and Coolcalalaya as well as south of Northampton. The works will be under the direction of the Flood Damage Site Supervisor who shall manage the execution of the works as specified, generally comprising the following:

- Site set-up and establishment
- Reform and re-sheeting of unsealed roads;
- Repair, cleaning and patch work on sealed roads;
- Repair, cleaning and restoration of surface drains;
- Repair, cleaning and restoration of drainage structures;
- Reinstatement and restoration of floodways;
- Repair and reinstatement of washed out verges within an urban area;
- Reinstatement of damaged signage/hazard markers;
- Traffic management;
- Borrow pit rehabilitation;
- and any associated works in strict accordance with any drawings or instructions as may be issued from time to time during the progress of the works, this Specification, all Notices to Tenderers issued during the Tender Period (unless specifically excluded from the Contract) and the Works Contract provided in the RFT and to the entire satisfaction of the Superintendent.

Note that the extent of the repair work has not yet been approved by DRFAWA.

1.4 Definitions

Table 2 outlines definitions used throughout this document.

Table 1 Definitions

MRWA	Main Roads Western Australia https://www.mainroads.wa.gov.au
Principal	Shire of Northampton
Superintendent	Principal's representative – duly authorised by the Principal to act on behalf of the Principal for the purpose of the contract
Flood Damage Site Supervisor	The on-site supervisor undertaking supervision and management role in the reinstatement of infrastructure. Acts as a link between contractor and superintendent.
Contractor's representative	Person authorised by the contractor to act on behalf of the contractor
Contractor	The contractor supplying plant and labour and executing the physical repairs of the flood damaged roads, drainage and any associated infrastructure

2. General Requirements

2.1 Australian Standards

All workmanship and materials used in the Works shall conform to the current edition of the appropriate Australian Standard. Where the regulatory Authority's requirement differs from the Australian Standard, the regulatory Authority's requirement shall prevail.

2.2 Precedence and Dimensions of Drawings

2.2.1 Documentation

The order of precedence of the contract documents shall be:

1. The Technical Specification
2. Conditions of Tendering
3. The General Conditions of Contract and Amendments

2.2.2 Discrepancies

All discrepancies shall be immediately notified in writing to the Superintendent.

2.3 Interpretation of Documents

The Tenderer shall make their own interpretation, deductions and conclusions from the information made available and shall accept full responsibility for such interpretations, deductions or conclusions.

The Contractor or any Subcontractor to them shall check all relevant dimensions on site before proceeding with the works. No claim for additional costs arising from failure to obtain measurements and other information on site will be allowed.

2.4 Omissions

The Principal does not represent that information made available shows completely the existing site conditions. The Principal is not responsible for any interpretations, deductions and conclusions made by the Contractor from the information made available and the Contractor shall accept full responsibility for any such interpretations, deductions and conclusions.

As the information supplied to the Contractor could include errors or omissions or could be ambiguous or misleading, the Contractor shall advise the Superintendent of any discrepancies at the earliest possible time.

If the Contractor supplies information to anyone else, including a Contractor or Subcontractor, for any information supplied the Contractor shall indemnify the Principal, Flood Damage Site Supervisor and Superintendent for any claim by that person arising out of errors or omission or the misleading nature of the advice.

2.5 Warranty

The accepted Tender under this Contract is deemed to be a warranty that notwithstanding that any part of the equipment or the materials supplied has been satisfactorily factory tested and/or inspected before installation, if any item or part thereof shall fail to perform its specified function under test or during the Contract defects liability period, then all costs of replacing all faulty equipment or parts thereof shall be borne by this Contractor.

2.6 Traffic management

The Contractor shall undertake all necessary traffic management requirements including:

– Submit a TMP in accordance with the Shire of Northampton's traffic management requirements for review and approval prior to mobilisation.
– The intent is that public access to work site will be restricted during the Works, but where this may not be possible, the TMP is to provide a safe working environment for both construction workers and the public. Note that all sites cannot be closed at the same time.
– Provide traffic management as per the approved TMP.

All signs and method of traffic control shall be generally in accordance with AS 1742 and to the approval of the relevant Statutory Authority.

All damage to existing pavements and improvements shall be made good to the standard of the pre-existing conditions. These works shall comply with the Local Authority requirements for works on public lands.

2.7 Programme and staging of work

The Contractor shall submit to the Superintendent for approval within one week of acceptance of this tender, a diagrammatic or other approved form of time schedule for the carrying out of the various parts or stages of the works. The programme shall:

– Include consideration of Saturdays, Sundays, Statutory Public Holidays, building industry annual close down holidays and Rostered Days Off;
– Clearly identify each area/location, trade and element of work;
– Indicate closure of sites
– Indicate starting and finishing dates for each activity, milestone events, logic dependencies and critical path activities;
– Highlight the critical path;
– Not include any activity describing more than one major element and/or trade and/or area;
– Show all major critical off-site activities of supply, prefabrication, testing, samples, prototypes, shop drawings, approvals required; and
– Include the activities of all the Contractor's, subcontractors, suppliers etc.

The Construction Program shall be accompanied by notes which outlines the basis of the program including assumptions made, allowances incorporated, external interfaces and constraints provided for.

2.8 Working Hours

Construction works other than the attending to systems for dewatering or protecting the works and safety and security measures shall be restricted to the daylight hours. Working hours should be agreed with the Shire and the Flood Damage Site Supervisor.

2.9 Contractor's area

An area will be allocated to the Contractor for his temporary buildings, materials, plant storage and servicing, vehicle parking and the like. The Contractor shall provide improvements such as fencing, access roads, surfacing or other facilities. The area shall be graded and levelled so as to shed water to a proper drainage system.

The Contractor at his own expense shall provide and maintain and at appropriate times dismantle and remove such buildings and facilities as may be required for his own use and that of his sub-contractors.

All such temporary buildings and facilities shall be removed from the site, and the area of such occupation properly reinstated, within 14 days of the date of issue of the Certificate of Practical Completion unless otherwise approved in writing by the Superintendent.

The Contractor at his own expense shall provide and maintain proper sanitary conveniences for the use of the workmen engaged on the works. Such conveniences shall be kept clean, shall comply with Local Government requirements and shall be removed at the completion of the works.

2.10 Meal and Accommodation

It is the Contractor's responsibility to provide all meals and accommodation to staff. Facilities should be clean and suitable, offering cooking, laundry and washroom facilities.

2.11 Survey set out

The works shall be set out by the Contractor and constructed in accordance with the alignments, levels, grades and cross sections as shown on the approved drawings or as directed by the Flood Damage Site Supervisor or Superintendent in accordance with this specification.

The Contractor shall have on site at all times survey equipment of a standard suitable to accurately confirm detailed set-out and levels, plus personnel skilled in the proper operation of this equipment.

The works shall be set out, using all the necessary survey equipment, from the pegs and benchmarks given and these shall be used constantly during the progress of the works to check the accuracy thereof. Care shall be taken not to disturb any survey peg, survey recovery pegs or survey marks.

Under no circumstances will any interference with any official benchmark be permitted. Before commencing work, all such benchmarks in the area covered by the Contract shall be protected.

Where it is necessary to cover a survey peg, such a peg must have a substantial stake driven beside it and this stake shall extend at least 75mm above the finished surface and be appropriately marked to identify it. Any State Survey mark affected by the works shall be identified and reported.

Set out amendments, if required, shall only be undertaken on site in conjunction with the Superintendent and are subject to Approval.

Approval to proceed shall not constitute acceptance of the accuracy of the work nor relieve the Contractor of their contractual obligations and responsibility for the work.

Payment for survey set out will be assumed to be included in the relevant schedule item for each activity.

2.12 Inspections

The Contractor shall notify the Superintendent and the relevant service Authority inspector not less than 48 hours prior to an inspection being required for those phases of the work specified in the Technical Specifications.

2.13 Behaviour of personnel

The Contractor shall ensure that persons employed in connection with the work under the Contract conform to a code of behaviour and cooperation which shall be above reproach in all dealings or liaison with the public and with property owners or occupiers. Offensive behaviour or language in public by any person employed in connection with work under the Contract shall not be permissible.

2.14 Pets prohibited on site

The Contractor shall ensure that persons employed in connection with the work under the Contract shall not permit pets or animals, which are in the control or ownership of such persons to be on the Site.

2.15 Trespass

2.15.1 By contractor

– The Contractor and his employees shall not trespass on any land adjoining the area in temporary possession of the Contractor for purposes of the Contract.

2.15.2 By others

- The contractor shall ensure that all machinery, excavation works and building works are left and maintained (both during and after working hours) in a safe condition, including but not limited to provision of advisory signing, reflectorised posts, temporary barriers etc.
- The contractor shall take care when moving machinery or carrying out the works to ensure trespassers are not subject to unreasonable danger.
- In the event that trespassers are noted entering the site, the contractor shall erect appropriate warning signs at identified trespass access locations. The contractor shall warn trespassers by way of secure signage that they should not enter the area as they may be exposing themselves to risk of injury.

2.16 Site meetings

Site meetings will occur on a regular basis as advised by the Superintendent. The Flood Damage Site Supervisor, the Contractor's representative, and the Superintendent's representative shall attend the meeting.

The Contractor shall, if required, arrange for the attendance of Subcontractors and other staff members as may be required.

The Superintendent, or their representative, will chair the meeting and provide copies of the minutes of the meeting to the Principal, the Flood Damage Site Supervisor and the Contractor.

2.17 Protection of existing vegetation

Great importance is placed upon retention of the natural vegetation within the areas not affected by the works. The Contractor shall not disturb any existing vegetation unless specific Directions or Approval to do so has been given. The Contractor shall not under any circumstances clear, stockpile site sand, topsoil or other materials, or travel with plant or vehicles outside of those areas specifically requiring such operations. Any clearing, or damage by other means, extending beyond the prescribed limits, without the authorisation of the Superintendent, shall be assessed accordingly and any such costs shall be borne solely by the Contractor by way of a reduction in the monies payable under this Contract.

2.18 Vibration Damage

The Contractor shall be required to submit to the Flood Damage Site Supervisor prior to commencement of any work, a certificate of currency for insurance covering damage to houses and other structures from vibration as a result of the use of compaction or other equipment on the construction site.

The Contractor shall take precautions when compacting near existing residences to prevent any vibration damage occurring.

Any complaints received shall be advised immediately to the Flood Damage Site Supervisor and Superintendent in writing and compaction methods amended to address continuing complaints or damage.

2.19 Safety

The Contractor is responsible for maintaining a safe site at all times in accordance with WorkSafe requirements.

All site staff shall be deemed to be employed by the Contractor, and the Contactor shall arrange for all staff to meet the site safety requirements.

Possible hazards shall be addressed by the Contractor, and managed to ensure that no significant hazard is overlooked, and that all risks are properly assessed and adequately controlled.

Trenching shall be carried out in accordance with the West Australian Work Health and Safety (WHS) Act 2022. All excavation shall be fenced off with warning signs and lighting if required. The Contractor is responsible for the

complete supply and maintenance of all such safety measures and costs for these works shall be deemed to have been included with the Tender.

The Contractors safety plan shall include the following;

– Have an adequate number of employees trained in first aid to meet potential hazards in the workplace, with an experienced First Aid officer available at all times when work is in progress.
– Have an adequate training program for all employees and subcontractors, which is relevant to work undertaken and includes hazard identification, assessment and reporting.
– Adequate fire prevention equipment, including portable fire extinguishers.
– Good housekeeping onsite, and an accident notification procedure
– Promotion of safety information to all employees.
– Should the Works involve any unusual activities such as trenchless technology, deep excavations, work close to existing structures or large/high pressure services, unusual ground conditions, work at height, etc then the Contractor shall submit a Method Statement to the Superintendent defining the timing, plant, labour, materials and other temporary facilities associated with the works at least 48 hours before commencing such activity.
– The Contractor shall notify the Flood Damage Site Supervisor and Superintendent of any and all accidents within the meaning of the Workers' Compensation Acts and/or Regulations which may happen to his employees or employees of his Sub-Contractors or nominated Sub-contractors engaged on the Contract work within 24 hours of the occurrence of each such accident.

2.20 Work by others and other work at site

During the currency of the Contract, other work may be preceding at or in the vicinity of the site. The Contractor shall act and cooperate at all times with any other contractors so as to ensure the expeditious completion of the project, and to ensure that no obstruction or interference with other contractor's occurs.

The Contractor shall be responsible for arranging the progress of the work and the attendance at appropriate times of sub-contractors and service authorities (including inspectors).

The Contractor shall be responsible for the making good of damage caused by sub-contractors and service authorities, and for finishing surfaces to match adjacent surfaces.

2.21 Damage

The Contractor shall be responsible for any damage caused to buildings, grounds, fences, persons or services by whatever cause due to the works and shall make these good and bear any compensation. Where services are damaged, the relevant Authority is to be notified immediately, and all charges, fees etc. paid by the Contractor, at his cost.

The Contractor shall make good all damage or present proof of settlement of all claims for damage caused by his works before the issue of the Certificate of Practical Completion for the section of the work in which the damage has occurred.

The Contractor shall present proof of settlement of all claims by Public Authorities for works carried out by the Authorities as a result of works under this Contract before the Final Certificate will be issued.

2.22 Existing services

It shall be the Contractor's responsibility to verify the position of underground and other services before commencing excavation and further, to arrange repair by the responsible servicing authority, at his own cost, all damage caused to these services during the works.

Where existing services must be interrupted to enable carrying out of the works such interruption shall be at a time agreed by the Superintendent. The Contractor shall organise with the responsible servicing Authority so that the interruption shall be for the minimum practical time. All costs shall be considered to be included in the Contractors price to complete the works.

2.23 Diverting water and dewatering

The Contractor shall do all work necessary to drain and/or divert any water interfering with the progress of the works, keep the excavations free from water while the works are in progress and prevent any injury to the works by water due to floods or other causes. The cost of such work shall be deemed as having been included in the Contractor's Tender Price.

2.24 Nuisance

The Contractor shall take all necessary precautions to prevent nuisance to adjoining or nearby owners or tenants including but not limited to nuisance by way of dust, smoke, wind-blown sand or debris, noise, vibration and electrical interference.

2.25 Rock excavation

No extra payment shall be made for rock excavation unless the Contract Documents specifically provide for such payment.

When necessary for the purpose of payment, the different kinds of material met with in excavation shall be classified under the headings "Other than Rock" or "Rock", and where such words occur in the Contract Documents they shall have the following meanings:

a. "Other than Rock" shall mean all kinds of materials, which in the opinion of the Superintendent do not require blasting or removal by jackhammer or mechanical rock breaker.
b. "Rock" shall mean hard rock, which in the opinion of the Superintendent requires blasting and is in fact blasted or removed by jackhammer or mechanical rock breaker.

2.26 Machinery and Equipment

The Contractor shall be responsible to provide all required machinery, equipment and labour. All machinery and equipment shall be operated in accordance with regulatory requirements and safe working standards. The Contractor is responsible for upkeep, servicing, fuelling and cleaning of all machinery and equipment to the satisfaction of the Flood Damage Site Supervisor. Plant shall be safe and secure at all times.

Operators will be competent, licenced and meet all regulatory and safety requirements.

2.27 Restoration

Excavation is to be kept to a minimum in all established areas such as roadways, footpaths and other paved areas. Unless otherwise specified or shown, all damage to existing improvements as a result of construction works, shall be made good by the Contractor, to pre-existing conditions. No existing trees, shrubs, sheds or other permanent structures shall be removed without the prior approval in writing of the Superintendent.

The Contractor shall liaise with the relevant local authority where such works are located on public land. Construction and reinstatement works shall conform to the local authorities' requirements. The cost for reinstatement work shall be deemed to have been included in the tender.

Existing pavements and kerbs shall be saw cut to provide a neat edge for reinstatement works.

Excavation material shall be deposited in an area causing the least interference to vehicular and pedestrian traffic.

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 left clean and tidy, all excavation filled flush with the natural ground level, and all excess material removed to the satisfaction of the Superintendent.

2.28 Testing

The Contractor shall be responsible for providing verification that all materials and work comply with the requirements of this specification.

The Contractor shall allow within the Lump Sum Breakdown for all testing as required by the Technical Specification.

Where the tests fail, the work shall be rectified and retested until the work falls within the specified tolerances to the satisfaction of the Flood Damage Site Supervisor and Superintendent.

The Principal shall pay for additional testing requested by the Superintendent unless such tests fail, in which case, such testing shall be at the Contractors expense. All re-tests shall be at the Contractors expense.

2.29 Payments

Progress payments will be assessed for all work installed in accordance with the contract. Full certification of payment will not be made until each section of the work has been tested and approved to the satisfaction of the Flood Damage Site Supervisor and Superintendent.

2.30 Practical completion

The intended purpose of the Works is to achieve the relevant Authority acceptance and takeover of the Works.

Practical Completion shall therefore be awarded when;

– All Authority inspections have been successfully completed and works have been accepted by the Principal;
– All testing has been successfully completed;
– All as-constructed details and drawings have been accepted by the Principal.

2.31 Final certificate

The Final certificate at the end of the Defects Liability Period shall not be issued until the Council or relevant statutory authority has inspected the works and provided a defects clearance list and accepted takeover of the works.

3. Earthworks

3.1 General

All works shall be constructed in accordance with the Drawings, the current version of AS 3798 and this Specification. The specific requirements of this section of the Specification describe the formation of earthworks by cutting, filling and/or importing of suitable material.

3.2 Clearing and Grubbing

3.2.1 General

The Contractor shall give seven days' notice of intention to clear any section of the works to allow the Flood Damage Site Supervisor to determine the trees, plants and structures to be preserved that may not already be detailed within the limits of clearing.

All suitable spoils from clearing shall be chipped/mulched and stockpiled on site or as directed by the Flood Damage Site Supervisor.

3.2.2 Disposal of Material

Unless otherwise permitted or directed, all debris resulting from clearing operations together with all lying and fallen timber which is not chipped or mulched shall be removed from the site. All cleared material removed from the site shall, unless required by the Contractor for other purposes, be loaded, hauled and dumped in compliance with statutory requirements.

No burning is permitted.

3.3 Excavation

3.3.1 General

The Contractor shall remove any unsuitable material exposed when excavated areas have been trimmed to finished formation levels and remove all rocks, boulders etc. which protrude above finished surfaces of subgrades.

No mechanical ripping shall be undertaken within 300 mm of the back of any existing kerb or structure.

Separate the clean sand material from excavations for use as backfill at appropriate locations following placement of new materials.

Over excavation shall be backfilled as specified herein.

3.3.2 Stripping and stockpiling of topsoil

Strip topsoil from all areas to be cut or filled. Nominally 150 mm deep.

Unless otherwise directed, the depth of stripping shall be to the bottom of the grass root zone, or to the bottom of any organic layer, whichever is the deeper. Any uncertainty in strip depth shall be brought to the Flood Damage Site Supervisor's attention prior to fill being placed. Avoid contamination by any other material.

3.3.3 Disposal of surplus spoil

Surplus spoil is to be stockpiled where specified or disposed off site as directed.

3.3.4 Hazardous Material

Give notice immediately if hazardous materials or conditions are encountered during excavation.

3.3.5 Stockpiling of Excavated Material

The Contractor shall identify a stockpile area for placement of excavated material required for backfilling. This stockpile area is to be approved by the Superintendent prior to the commencement of earthworks.

3.3.6 Excess Excavation

The Contractor is not entitled to contract variation or extension of time for excavation in excess of that required by the contract, including excavation below required depths, or additional excavation which the Contractor may elect to undertake to permit the use of certain constructional plant, and any consequent additional backfilling or testing.

Where excavation exceeds the required extent, reinstate to the correct depth and required density.

3.4 Filling

3.4.1 General

Backfilling is required following placement of new materials.

Backfill material shall be sourced from excavated material and shall be free from all organic and other deleterious materials. The Superintendent may direct that stockpiled excavated material is unsuitable as fill and shall be screened to produce clean sand fill.

Place and compact fill to conform to the lines, grades, cross-sections and dimensions shown on the drawings.

Before filling commences, the Contractor shall remove any unsuitable material exposed when topsoil has been stripped.

Contractor to measure by survey in situ the volume of additional material required to replace unsuitable material.

3.4.2 Materials

Material sources will be specified by the Flood Damage Site Supervisor. Refer to *MRWA Specification 303 Pits and Quarries* for rehabilitation specifications.

In-situ Materials

1. Sand

All fill shall be clean, free draining, medium to coarse sand or equivalent, free from foreign and organic matter. It shall have a clay content of less than 5%.

2. Clay

Where in situ clay is used as fill, it shall be taken directly from the excavation to the fill site, placed and compacted at optimum moisture content in maximum 200 mm layers.

Imported Material

Specification of imported material shall be in accordance with MRWA *Specification 302 Earthworks Section 302.09* stating the following:

– The material shall contain no more than 1% organic matter
– The portion of the material passing the 0.425 mm sieve for imported material shall have a linear shrinkage not exceeding 1%
– The following particle size distribution should be adhered to:

Table 2 Particle Size Distribution for Earthworks Material

AS Sieve Size (mm)	% passing by Mass
37.5	90 – 100
2.36	30 – 100
0.075	1 - 10
AS Sieve Size (mm)	% passing by Mass

3.4.3 Compaction equipment

It is the Contractors responsibility to assess the nature of the soil being cut or filled and to select the appropriate method and machinery to be used in order to achieve the specified results.

Light compaction equipment shall be used 1.5 m from back edge of retaining walls.

3.4.4 Compaction

Place and compact in uniform layers of appropriate thickness and using compaction equipment capable of achieving the level of compaction specified. Layers should extend for the full width of embankments. Each layer shall be compacted to the appropriate density prescribed in Table 3 and as indicated on Drawings.

During compaction the moisture content of fill should be maintained in the range OMC ±2% by drying, or by the addition of moisture, as appropriate. Water spraying equipment used for this purpose shall be capable of distributing water uniformly in controlled quantities. Mechanical mixing of the fill material can be used to help ensure uniform distribution of moisture before commencement of rolling.

3.4.5 Backfilling near structures

The Contractor shall be solely responsible for any damage to existing structures as a result of filling and compacting operations.

3.5 Trimming and finishing of surfaces

Prior to Practical Completion, the entire work site is to be trimmed and graded in order to achieve a uniformly neat and tidy Site free of wheel tracks and ruts.

3.6 Acceptance

3.6.1 General

All tests specified herein shall be undertaken by a laboratory, certified by the National Australian Testing Authority, NATA, and approved by the Flood Damage Site Supervisor and Superintendent.

The Contractor shall monitor and test all works specified herein to ensure compliance with requirements specified in Clause 3.6.2.

Upon completion of the compaction process of each and any layer, the Contractor shall determine the in-situ moisture content, dry density and layer thickness of the compacted material throughout the full thickness of the layer at random locations in every 500m² of surface area. The rate of testing shall be not less than one for each 500m² of surface area, with a minimum of three tests where the area of each section is less than 500m².

The in-situ dry density shall be determined in accordance with the requirements of AS 1289 5.3.1 or 5.8.1 as required by the Superintendent except that the nuclear density gauge shall be calibrated in accordance with the Main Roads Western Australia Test Method not AS 1289 5.8.3. The density ratio shall be determined in accordance with AS 1289 5.4.1.

For each uniform section of each layer of the material, which has been placed, and compacted, the Contractor shall determine the dry density ratio of the material at random locations throughout the uniform section.

A uniform section is defined as a section in which all of the material has been placed and compacted within a 48-hour period.

Modified maximum dry density determinations shall be made at a rate of not less than one for each uniform section, in accordance with the requirements of AS 1289 5.2.1 (for cohesive soils) and AS 1289 5.5.1 (for cohesionless soils).

3.6.2 Compaction requirements

Compaction requirements for work carried out under this Section of The Specification are itemised in Table 3.

Table 3 Compaction requirements

Item		Minimum Relative Density		
		Cohesive Soils	Cohesionless Soils	
		Minimum Dry Density Ratio (AS 1289.5.2.1)	Minimum Dry Density Ratio AS 1289.5.2.1	Minimum Density Index AS 1289.5.5.1
1	Backfilling of Grub holes and replacement of unsuitable material	Fill with cohesionless soils & compact as per specification.	95% Mod	70%
2	Fill	95% Mod (if $\rho_{0.075}$ <10%) 93% Mod (if 10%<$\rho_{0.075}$ <20%) Not acceptable if $\rho_{0.075}$ >20%	95% Mod	70%
3	Subgrade (to a depth of 0.3m)	93% Mod	98% Mod	80%

Notes:

1. All dry density ratios relate to AS 1289.5.2.1 and AS 1289.5.4.1.
2. Density Index as a means for control of achieved relative compaction may be difficult to use and interpret. Local correlations with other methods may exist and can be used where these are well established.

For cohesionless soils a calibration of the Perth Sand Penetrometer (PSP) shall be carried out against the Density Index. Where the Density Index specified in Table 3.1 corresponds to less than 7 blows/300mm of the PSP the compaction required shall be a minimum of 7 blows/300mm. Where the Density Index specified in Table 3.1 corresponds to more than 7 blows/300mm of the PSP the compaction required shall be that which yields the specified Density Index, or the PSP blows that corresponds to this.

Acceptance of each layer is conditional upon the application of uniform and sufficient compactive effort by appropriate equipment over the whole of the layer.

Where fill material is being placed which the Superintendent considers is not suitable for testing by standard laboratory methods, then compaction operations shall be carried out as directed. The Superintendent may specify the type of compaction requirement, layer thickness and the means of adjustment of moisture content. Rollers may be required to operate singly or in combination up to a total of 12 coverages.

3.6.3 Tolerances

On completion of cutting, filling and all incidental operations, and before the placement of covering materials, finished surfaces shall conform to the tolerances in level and shape itemised in Table 3.2.

Table 4 Tolerances

Item	Description	Tolerance
1.	Clearing and grubbing (width of design earthworks plus 2m)	±0.5m
2.	Earthworks - level	±20mm
3.	Verge level	±15mm
4.	Cut or fill batters	±2°
5.	Topsoiling thickness	±10mm
6.	Subgrade - Width - Level	 ±100mm -20mm, +0mm

3.6.4 Defective work

Where a section of the work is rejected on the basis of inspection of test results, further compactive effort shall be applied to the section or nominated parts of the section until the specified standard is achieved. Scarify the area for the full depth of the layer and add water as necessary. Mix mechanically to ensure uniform distribution of moisture before commencement of rolling.

4. Stormwater Drainage

4.1 General

All the Works must be constructed in accordance with this Specification and current MRWA standards.

4.2 Materials

4.2.1 Pipes and precast components

All pipes and precast components incorporated in the works shall be in first class condition and free of cracks, chips and deformities. Any damaged items shall be rejected and shall be removed from the site.

4.2.2 Concrete pipes

All concrete pipes shall conform to AS 4058 and shall be rubber ring joint type, unless otherwise specified or authorised by the Superintendent. Strength class shall be "2" unless otherwise noted on the Drawings.

4.2.3 Precast concrete pit and headwall components

Precast concrete components shall be manufactured in accordance with the dimensions and details shown on the Drawings by reputable supplier(s) acceptable to the Superintendent. Proprietary components where shown on the Drawings or specified shall be in accordance with that manufacturer's latest published information.

4.2.4 Concrete

Concrete used for in-situ work shall conform to AS 3600 and be provided by a pre-mix concrete supplier conforming with AS 1379, or mixed on site using materials as specified and plant to the approval of the Superintendent.

Concrete for manholes, headwalls, endwalls, and keels shall have a minimum 28 day cylinder test compressive strength of 20 MPa.

The slump shall not exceed 70mm or be less than 30mm.

Maximum size of aggregate shall be 20mm.

4.2.5 Cement

All cement used shall be Portland Cement in accordance with AS 3972 and obtained from an approved manufacturer.

Cement shall be delivered to the site fresh and in sealed bags and there stored in a weatherproof shed until such time that it is to be used. Any bag showing signs of deterioration or setting is to be rejected.

4.2.6 Aggregate

Fine aggregate shall be well graded, clean, sharp and free from clay and organic impurities in accordance with AS 1141.

Coarse aggregate shall be crushed granite or diorite clean and free from all impurities and dust in accordance with AS 1141.

The maximum particle size shall not exceed 20mm.

4.2.7 Water

Water for use in concrete and mortar shall be of potable quality, free from any impurities harmful to concrete, mortar or steel.

4.2.8 Sand

Sand for mortar shall be crushed stone or natural sand free from all deleterious substances and have a uniform grading.

Sand for bedding or backfilling shall be clean sand free from roots, clay or any deleterious matter.

4.2.9 Steel

Steel reinforcing fabric and steel reinforcing bars for concrete shall comply with the requirements of AS 1302, AS 1303 and AS 1304 and be free from loose rust or matter likely to impair the bond with concrete.

Structural steel shall comply with the requirements of AS 4100.

4.3 Setting out

4.3.1 General

The drawings show centre lines, grades, lengths, diameters, invert levels at entry and exit of drains and the location of pits.

The distances shown between pits are mostly scaled measurements and are for the Tenderer's guidance only. In all instances pits are to be constructed in the locations shown. Centre lines and invert levels are to be strictly adhered to and no alterations shall be made except on the written authority of the Superintendent.

4.3.2 Pegging of pits

Each pit shall be pegged and levelled by the Contractor's Engineering Surveyor. The centre of each pit shall be pegged and at least two reference stakes at 5 metres offset on either side of the pit centreline shall be provided. The Contractor's Engineering Surveyor shall provide the Contractor's Foreman with a copy of his survey record for each drain. The record shall indicate all reference pegs, offset pegs, RL's of dumpy pegs, pit-to-pit distance, and the height of boning rods. Records shall be retained by the Foreman on Site and shall be available for checking by the Superintendent.

4.4 Excavation

4.4.1 Dewatering

The Contractor shall allow within his Tender 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 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 has commenced.

4.4.2 Trench excavation

- Trenching shall be carried out in accordance with the West Australian Work Health and Safety Act 2020.
- Trenches are to be cut to line and gradient.
- The trench widths shall be kept to a minimum consistent with the bed width requirements and the requirements of adequate working space and timbering.
- Tunnelling shall be only carried out where directed and to the approval of the Superintendent.

- Should the bed of the trench be over excavated, then the over-excavated volume shall be replaced with a similar material used for the bedding and compacted to a minimum of 90% maximum modified dry density, on the density of the surrounding soil, whichever is the greater, at the Contractor's expense, unless an alternative method is approved by the Superintendent.
- The excavation of trenches with irregular shaped sides shall be avoided and, where this occurs or there is any danger of sides collapsing, then adequate timbering and strutting shall be placed to the approval of the Flood Damage Site Supervisor, at the Contractor's expense.
- Trenches shall be kept free from water, debris and falling earth.
- The final trimming of the bottom 150mm of trench excavation must not be carried out until immediately prior to concreting or placing of pipe bedding. Excavation must be completed for a minimum of 10 metres length ahead of pipe laying.
- Adequate shoring to the approval of the Flood Damage Site Supervisor shall be used where the drain is within 2.0 metres plus the depth of the drain from a building, or load bearing structure, or where requested by the Superintendent. Details of the proposed method of shoring to be submitted to the Superintendent and approved prior to commencing excavation of this section of drain.
- The Principal, Flood Damage Site Supervisor or Superintendent may at any time during the Contract stop any works he considers necessary, if in his opinion, any part of the work is in an unsafe condition.
- All surplus or unsuitable materials resulting from trench excavation, pipe laying and backfill shall be removed from site at contractors cost.

4.4.3 Pit excavation

Excavation for pits must be made to the correct depth and of sufficient dimensions to allow the base and walls to be constructed.

Where a firm pit foundation cannot be obtained, the Contractor shall place timber piles and raft. The depth of piles shall be as directed by the Superintendent.

The Contractor shall be responsible for safety at all times.

4.4.4 Blasting

Not used.

4.4.5 Measurement of excavation

Measurement of excavation for the purpose of costing variations shall be in accordance with the trench dimensions shown on the Drawings.

4.4.6 Obstruction to traffic

Excavation material shall be deposited in an area causing the least interference to vehicular and pedestrian traffic.

At all times when the works are left unattended, all excavation in public areas shall be fenced off with warning signs and lighting and the Contractor shall ensure that they remain in a safe condition.

These safety precautions shall be subject to the approval of the Superintendent.

4.5 Drain Construction

4.5.1 Pipe setting

All pipes shall be set in a straight line between pits. On inspection by the Superintendent, any pipe not placed in a straight line shall be replaced at the cost of the Contractor.

The acceptable tolerance of pipe setting shall be as specified in "Inspection and Tolerances" clause of this Specification.

Pipes shall be set in an upstream direction unless otherwise approved by the Flood Damage Site Supervisor.

Pipes shall be set using boning rods and profiles unless alternative methods are approved by the Superintendent.

4.5.2 Concrete pipe jointing

Spigot and socket pipes shall be jointed with the spigot fully home in the socket and rubber ring jointed, as shown on the drawings. Pipes shall be laid such that the sockets face upstream.

Externally flush interlocking pipe shall be jointed with the ends fully butting on the inside face of the pipe and caulked with a 3 part sand to 1 part cement mortar on the outer face of the joint. The mortar shall be neatly struck off flush with the outer surface of the pipe.

While waiting for backfilling, all mortar joints shall be covered with damp clean sand to prevent the mortar cracking.

4.5.3 Box Culvert Jointing

Box culverts shall be placed on a reinforced concrete base slab to the details shown on the drawings. The box culverts shall be butt jointed and caulked with a 3 part sand to 1 part cement mortar on the outer face of the joint. The lifting recesses shall be caulked in the same manner.

4.5.4 Pipe and culvert bedding

Bedding for pipes and culverts shall be strictly in accordance with the details on the Drawings. In the event that soft or unstable material is encountered in the trench base, the Flood Damage Site Supervisor may direct that this be removed and replaced with approved, well compacted material.

Where socket pipes are to be used small recesses shall be left under pipe joints to allow the barrels to bear evenly on foundations for their full length.

Slotted pipes shall be laid on a minimum to 150mm of crushed rock which shall rise to mid height of the barrel of the pipe, also in a minimum thickness of 150mm. The crushed rock shall be a 'no fines', grading with maximum particle size of 14mm unless otherwise specified.

Where shown on the drawings, subsoil drains and slotted pipes, shall be wrapped in an approved geofabric material, such as "Bidum A14" and the trench backfilled with clean free draining sand.

4.6 Headwalls and Endwalls

These are to be constructed using either concrete with 20 MPa 28 day cylinder test compressive strength or mortared stonework as detailed on the Drawings.

Where temporary or precast headwalls are specified, they shall be standard products as manufactured by Humes or Rocla or similar.

For mortared stonework the size and quality of the stone shall be as specified for Stone Pitching, elsewhere in this Specification.

4.7 Pits

Junction pits, grated pits and side entry pits, shall be constructed as shown on the drawings. The pits shall be constructed with the tops of the covers laid to the slope of the surface, flush with the verge or the pavement in road reserves and other paved areas. Elsewhere, the covers are to be finished approximately 40mm above the ground.

4.7.1 Precast concrete pits

Precast concrete pits shall be assembled accurately in strict accordance with the Drawings. It is important that the alignment of the pipe liners and the level and location of the matching pieces be accurately set in order that kerb level components can be properly constructed. If the pits are not constructed to the correct lines and levels, they shall be removed and rebuilt.

All joints between pit components shall be neatly grouted with 3:1 sand/cement mortar. Pipes entering pits shall be broken off flush with the liners, the reinforcement trimmed back, and the joint neatly grouted. Grouting shall take place immediately following the construction of the joint in order to avoid prolonged exposure of the reinforcement.

The lengths of pit liners shall be chosen with particular regard to the design of each pit. Generally, the number of joints should be minimised by the use of 0.9m and 1.2m lengths. Under no circumstances shall the top most section be broken down to a length of less than 300mm. Any liners which are cracked during installation shall be rejected.

4.7.2 Manhole bases

Bases shall be founded on a well compacted layer of granular material of minimum 150mm thickness. Bases may comprise either precast of cast-insitu slabs constructed to the dimensions shown on the Drawings.

4.7.3 Manhole covers

Standard rectangular or circular, reinforced concrete manhole covers for use on all manholes not under road pavements shall be as provided by a supplier, approved by the Superintendent.

Manholes under road pavements shall be fitted with Class B 900mm x 600mm two part approved "Gatic" type covers for heavy pavement type loadings, or alternatively a heavy duty circular "Gatic" cover case in a precast circular concrete surround.

Gully type entry pits shall have a concrete cover which contains a cast-in grate and frame. The grates and surrounds shall be fabricated as shown in the detail drawings. The grate must be hinged in the frame.

For all covers, the lids shall be fitted with suitable lifting keyholes and rings.

4.7.4 Step Irons

Where manhole or entry pits exceed 1.0 metres in depth, measured from top of cover to invert level of the lowest pipe, step irons consisting of 24mm diameter hot dipped galvanised deformed bars shall be provided at 300mm centres for the full depth of the manhole as detailed on the Drawings.

4.8 Inspection and tolerances

No backfilling shall be commenced until the drainage lines have been approved by the Flood Damage Site Supervisor.

On completion of backfilling, the Flood Damage Site Supervisor shall again inspect the drainage lines for alignment, level and gradient and all pipes must be free from debris.

Pipelines shall be within 20mm of design line and level at all points where design grade exceeds 1% and within 10mm of the line and level for grades flatter than 1%.

Pipelines which have not been constructed within tolerance shall be excavated and relayed at the entire cost of the Contractor.

4.9 Backfilling

4.9.1 Other than under pavements

Pipes shall not be backfilled until they have been inspected and approved by the Flood Damage Site Supervisor. Selected fill shall be used for backfilling to a height of 300mm above the top of pipes and shall be an approved granular material containing no stone over 25mm maximum dimension, clay, organic or other deleterious matter and compacted by means of an approved mechanical or a pneumatic tamper to a minimum of 95% of the Modified Maximum Dry Density (M.M.D.D.).

For slotted pipes, selected 14mm filter aggregate shall be used for bedding and backfilling to the pipe and shall be not less than 150mm thickness below and above the pipe and for the full width of the trench which shall be not less than 150mm either side of the pipe.

Care shall be taken so as not to disturb the pipe. For the remainder of the backfilling, material excavated from the trenches may be used provided that it is free from stone over 150mm diameter, clay, organic or other deleterious matter. The backfilling shall be placed in 300mm layers and be compacted to a minimum of 95% of the Modified M.D.D.

The surfaces of trenches after backfill shall be graded level with the surrounding ground.

4.9.2 Under pavements

The material used for backfilling of pipe trenches and pits in pavements shall be a clean granular material free from stones over 25mm dimension, clay, organic or other deleterious matter and shall be compacted in 300mm layers to a minimum of 95% of the Modified M.D.D., up to the subgrade level. The pavement shall be reinstated to its original condition.

4.9.3 Trench subsidence

If any subsidence of backfill occurs during the Contract period, including the Defects Liability Period, in any road, verge, footpath, pavement or elsewhere in the works, the Contractor shall at his own expense, make it good immediately is appears.

In the event of the Contractor's failure to make good such defects, the Superintendent may take action under the provisions of AS 2124.

4.10 Stone Pitching

Where indicated in the scope of work, surfaces shall be protected by hand-placed pitching stones. The stone pitching shall be of sound durable stones at least 0.15 cubic metre in volume.

Stones shall generally weigh in excess of 10 kg each and the greatest dimension of any stone shall not exceed 1.5 times its least dimension.

The stones shall be set on a sand bed in a close fitting pattern, watered and rammed into position. Courses of stones shall be placed such that the bed is at right angles to the ground slope. The larger stones shall be used for the lower courses, with smaller stones used at the top. The weight of all stones shall be carried by the ground bedding and not adjacent stones.

The minimum thickness of the pitching, measured at right angles to the ground slope, shall be 150 mm unless otherwise noted on the drawings.

Where specified as mortared stone pitching, the joints between stones shall be raked clean for their full depth and grouted with a 3 parts sand to 1 part Portland Cement mortar

5. Roadworks

5.1 Scope

This section of the specification covers the construction and restoration of road pavements. Current MRWA specifications and Council standards shall apply where available.

5.2 Standards

All work and associated performance tests shall comply with the requirements of all relevant Australian or Main Roads WA (MRWA) standards.

5.3 Quality and Process Control

The Contractor shall continuously monitor the processes used in the supply, filling, mixing, placing, compacting and finishing of construction works and shall continuously monitor the quality of all materials incorporated into the works. As part of the quality and process control, the Contractor shall undertake a program of inspection, testing and supervision with the aim of ensuring that all the materials incorporated in the works conform with the requirements of this specification and the requirements of the Local Authority.

All tests specified herein or required by the Local Authority shall be undertaken by a laboratory, certified by the National Australian Testing Authority (NATA), and results produced within 7 days of the test sample.

Copies of all test results shall be supplied to the Flood Damage Site Supervisor and Superintendent within 48 hours of receiving the test results unless otherwise required / noted in this specification. All test results shall include at least all the information listed in the following conformity tables (which have been set-up to enable results to be readily recorded for each test sample).

5.4 Sealed roads

5.4.1 Standards

The following MRWA Specifications are applicable:

501 Pavements

503 Bituminous Surfacing

511 Materials for Bituminous Treatments

601 Signs

602 Guideposts

5.5 Extruded Kerbing

5.5.1 Scope

Supply and lay extruded concrete kerbing where indicated on the drawings. Kerb sections shall be to Shire of Northampton standards or as indicated on the drawings if Shire standards are not available.

5.5.2 Personnel

All work under this Section shall be carried out by competent personnel experienced in the laying of extruded concrete kerbing.

5.5.3 Concrete

Concrete for use in extruded kerbing shall be ready mixed concrete complying with all requirements of the current relevant Australian Standard. The aggregate size shall be 10mm nominal. The concrete cylinder compressive strength at 28 days shall be not less than 25 MPa, with a maximum slump of 50mm.

5.5.4 Line and level of work

The kerbing shall be laid on the alignment, grades and to the levels shown on the drawings. The top and face surface of the kerb shall be parallel to the ruling grade of the pavement and shall be free from depressions exceeding 3mm when measured with a 3m straight edge. The Construction tolerance shall be such that when a 3 metre long straight edge is laid on the top or face of the kerb, the surface shall not vary more than 3mm from the edge of the straight edge, except at grade changes or curves.

5.5.5 Construction details

The surface to receive the kerb shall be a fully compacted and primed base course. The Contractor shall prepare the surface by removing free or loose material to the satisfaction of the Superintendent immediately prior to the placing of the kerb. The Contractor shall give the Superintendent 24 hours' notice of the start of the kerb laying operations in order that the Superintendent may have the opportunity of inspecting the work.

Whenever shown on the drawings or required by the Local Council, kerbing shall be keyed into the base course on all radii less than 40 m as per the standard drawings.

The extruded kerb shall be finished whilst the concrete is still comparatively wet to give a smooth finish free of surface pits and depressions.

Expansion joints shall be constructed and provided at intervals, to Local Authority requirements or as shown on the drawings. Expansion joints shall be sawn vertically at right angles to the longitudinal line of the kerb, to give a 10 to 12mm wide cut for the full section of the kerb.

Expansion joints shall also be provided at all tangent points and adjacent to inlet structures and as shown on the drawings.

When the joint preparation has been inspected and approved by the Superintendent, the expansion joints shall be sealed with a strip of foam to a depth of 25mm to act as a backing for Butyl mastic seal. The seal shall finish 3mm below the face of the kerb.

Contraction joints shall be inserted immediately after final finish, to Local Authority requirements, or as shown on the standard drawings. Joints shall be formed with a grooving tool, not fully fitting through the section of the kerb. Alternatively, the joint may be formed by cutting a 5mm gap at least to 2/3 the depth of the kerb section. All contraction joints shall be sealed by approved means to prevent ingress of sand.

All joints where cutting is required, shall be cut not less than 24 hours following the laying of that section of kerb, with methods used to avoid staining the seal.

5.5.6 Curing

Within two hours of surface finishing, all exposed faces of the completed kerb shall be protected from moisture loss for a period of not less than 4 days after extrusion by covering with plastic sheeting or spraying with an approved curing compound.

Curing compounds shall meet the requirements of the current relevant Australian Standard.

Kerbing shall be treated with a sprayed application of a Local Authority approved membrane curing compound applied in accordance with manufacturer's specifications.

After the application of the curing compound, the kerb shall be covered with an approved polythene membrane for a minimum period of 7 days prior to:

– Any road materials being placed adjacent to the kerb,
– Any further work being done on the road, or

– Any backfilling adjacent to kerb

The membrane shall be replaced on completion of cutting and jointing operations.

5.5.7 Protection of works

The Contractor shall be held solely responsible for the replacement as necessary of any kerbing during the course of the works of the contract and for the Defects Liability period as specified.

5.6 Pavement Markings

All pavement markings shall have retro reflective properties in accordance with the current relevant Australian Standard and shall be installed in accordance with Main Roads standards and requirements.

Contractor is to maintain the site in a safe condition for all road users by the use of temporary signing and pavement markings, until permanent signs and pavement markings are installed.

The Contractor is to arrange for the removal of all existing redundant signs and pavement markings. Redundant signs to be taken to the Council depot.

5.7 Signs and Hazard Markers

The following MRWA Specifications are applicable:

601 Signs

602 Guideposts

604 Pavement Marking

5.8 Unsealed Roads

5.8.1 Road Formation

The typical road formation shall be as follows or as directed by the Flood Damage Site Supervisor:

– Base course width of 9 m (or as per existing road width if different)
– Formation width of 11 m (or as per existing road width if different)
– Base course thickness (re-sheeting) of 150 mm
– Cross fall of 4%
– Cross falls to be sloped to the inside of curves
– Table drain depth of 300 mm
– Fill batter typically 1:3
– Cut batter (in table drain) typically 1:2
– Off shoot drain length to be determined by Flood Damage Site Supervisor on site
– Off-shoot drain batters typically 1:2, approximate depth of 300 mm

5.8.2 Restoration of unsealed roads (General)

Reshaping and building up of the existing formation may be required and shall be undertaken as directed by the Flood Damage Site Supervisor. Existing windrowed material may be incorporated into the formation if not detrimental to the pavement integrity and as directed by the Flood Damage Site Supervisor.

Table drains shall be cleared and reshaped as per the dimensions in Section 5.8.1 above or as directed by the Flood Damage Site Supervisor. Care should be taken with regards to Environmental Regulation and requirements.

The existing surface shall be grader scarified to a depth of 100 mm to avoid opportunity for lamination.

Sub-grade surfaces shall be proof rolled prior to placement of sheeting material as directed by the Flood Damage Site Supervisor.

Spreading and compaction of material shall be in accordance with MRWA guidelines to the satisfaction of the Flood Damage Site Supervisor. The total compacted thickness of gravel sheeting shall be 150 mm.

Moisture content shall be closely monitored and conform to MRWA guidelines.

Table 5 Unsealed road grading

Road repair treatment	Material import required
Gravel Resheet	Road formation reinstatement Reshape table drains Import 150mm compacted thickness of material
Heavy Grade	Road formation reinstatement Reshape table drains Import 50% of resheet material volume
Medium Grade	Medium grading and trimming of unsealed road surface Reshape table drains Import 10-20% of resheet material volume
Light Grade	No importation of material Light trimming by grader of unsealed road surface only

5.8.3 MRWA recommended guidelines – gravel resheet material

The material for construction of a gravel resheet must be a material consisting of a well-graded gravel sand mixture with a small proportion of clayey fines. The material must have a maximum Liquid Limit of 35 and a Plasticity Index of between 8-12. The material must be free from particles having any dimension greater than 50 mm and free from weeds, clods, stumps, roots, sticks, vegetable matter or other deleterious materials.

Gravel material having any dimension greater than 50 mm shall be deemed oversize and must not be delivered to the pavement construction area. The particle size distribution of the gravel material should be based on the following:

Table 6 Sieve Size Percentage Passing

Sieve Size	Percentage Passing
55	100
37.5	95 – 100
26.5	90 – 100
19	80 – 100
2.36	35 – 65
0.425	15 – 50
0.075	10 - 40
Plasticity (PI)	8 – 12
4 days soaked CBR	MIN 40%

Source: based on NAASRA (1980)

5.8.4 MRWA recommended guidelines – gravel resheeting methodology

Note: Methodology to be adjusted for different levels of grading as set out in Table 5.

Place material in uniform layers over subgrade surface or lower layers of the pavement. Remove segregated and contaminated material from the site. Do not place material on a previous layer that has become waterlogged or cracked: and/or otherwise deteriorated. Mix the material uniformly throughout with water to achieve a moisture content within 2% of the optimum for the specified conforming Dry Density Ratio.

Each pavement layer worked must be generally parallel to the finished pavement surface and must extend to hinge point. The pavement layer must be worked in compacted layers not more than 200 mm nor less than 100 mm compacted thickness. Pavement material must be spread and compacted to achieve uniformity free from any evidence of segregation. During the whole of the compaction process the Characteristic Moisture Content of the pavement material must be within -2% to +2% of the optimum moisture content.

Compaction will be deemed to be satisfactory when the layer has been compacted with between four (4) and six (6) passes of a vibratory flat drum roller. Each pass will consist of complete longitudinal and transverse coverage of the section.

The vibratory flat drum roller must be a self-propelled roller with a total static mass of not less than ten (10) tonnes and a centrifugal force on the drum not less than 150 kN in the frequency range of 20 to 30 Hertz. The rolling speed for the vibratory roller must not exceed 7 km per hour. Only driven drum rollers must be utilised.

The gravel pavement for unsealed roads shall be judged to be acceptable when the crossfall is 4% crowned or 4% superelevation (+/- 0.5%) for straights and curves respectively. Completed pavement layers must be in a uniformly bound condition with no evidence of layering, disintegration or surface tearing. The finished surface should appear as a stone mosaic interlocked with fine material and must be dense, even textured and tightly bound.

The level of the completed pavement surface shall be judged to be acceptable when the level measured at any point on the surface is within -5 mm, +20 mm of the pavement level for that point as determined from the Drawings.

Completed pavement layers must be in a uniformly bound condition with no evidence of layering, disintegration, or surface tearing. The finished surface should appear as a stone mosaic interlocked with fine material and must be dense, even textured and tightly bound.

5.8.5 MRWA recommended guidelines - trim final pavement surface

Trim with a dense textured surface free of laminations. Remove sticks and any loose material. Ensure surface is free of cracking. Do not introduce new material to the surface after final compaction. Where pavement thickness is 200 mm or greater, scarify to not less than 100 mm depth and recompact where finish not achieved. Where pavement thickness is less than 200 mm scarify and recompact.

5.9 Concrete Footpaths

5.9.1 General

Unless otherwise shown on the approved drawings, the road verge shall be constructed to the approved cross-section of 2% positive grade from the top of the kerb.

5.9.2 Approvals

All service authorities (including Western Power, Alinta Gas, Water Corporation WA, Telstra, Dept of Land Administration etc.) are to be advised and to give written approval for construction of the path. No work is to commence until all approvals are received and copies provided to the Superintendent.

5.9.3 Layout

Footpaths and dual use paths within the road reserve to be constructed to the dimensions as shown on the drawings. The footpath shall generally extend from 1.8m to 3m from the kerb and be parallel to the kerb. Any deviation from this alignment requires the approval of the Superintendent.

At corners the footpath shall follow the general alignment, but may be formed in segments of up to 4 metres in length. The edges shall be parallel and the width maintained. A crossing connection shall be provided from the footpath to the edge of the road to allow crossing to each side of the intersection at corners and to roads intersecting with the road containing the footpath. The crossing connection shall be at the tangent point where the kerb starts to curve at the corners.

Where shown on the drawings provide standard kerb ramps.

Provide standard barrier rails at each end of Public access ways or at other locations as shown on the drawings in accordance with this specification.

5.9.4 Sub-grade

The sub-grade material is to be compacted to not less than 95% of maximum dry density as determined by the modified compaction test to a depth of at least 500mm. Special attention should be given to service authority trenches. This shall be certified by a practising Civil Engineer and shall be submitted prior to the concrete pour. The Superintendent shall be given 24 hours' notice of concrete pours.

5.9.5 Construction

The path shall be constructed from concrete with at least a 28 day cylinder compressive strength of 20MPa. The ground shall be thoroughly wetted immediately prior to laying the concrete. The concrete shall be compacted by a vibrating screed board of sufficient capacity to effectively vibrate and compact the full thickness of the path.

5.9.6 Surface finish

Surface finish to be brushed with smooth edge to all outside edges and joints. All work to be of high quality, uniform appearance and executed in a tradesman-like manner.

5.9.7 Joints

Groove crack control joints to be at 1.25m centres for footpaths and 2.5m for footways and cycleways with a 12mm wide expansion joint at 5m centres (every fourth joint for footpaths and second joint for footways and cycleways). Expansion joints to be filled to full depth with 10mm thick bitumen impregnated canite-type material of approved type. An expansion joint shall be installed where the pathway butts to service access chambers and existing crossovers.

5.9.8 Joint filler

Approved canite-type material shall be such that when it is subjected to compression in hot weather, no bitumen is extruded. The following materials are approved.

Dimet - Jointex (58 – 62°C softening point bitumen)

Nonporite - bitumen impregnated canite by the cold solvent process.

Expandite - Flexcell.

5.9.9 Public access way (PAW) construction

Concrete path to be centrally placed and constructed to the dimensions as shown on the drawings. Any deviation from this alignment requires the approval of the Superintendent. All conditions for footpath construction apply to PAW's where appropriate.

Pipe barrier rails shall be placed at each entrance to a PAW on the road reserve boundary. The barrier rails shall be located and fabricated in accordance with the details shown on the drawings. A 200mm by 200mm block-out shall be used when pouring the PAW so that the rail posts can be placed after construction. The rail shall then be placed and concreted neatly in place with matching surface finish and with approved canite type material separating the 200mm by 200mm block-out area from the rest of the PAW.

5.9.10 Tolerances

Works shall be undertaken in the following tolerances:

- Vertical location of footpath in relation to 2% grade line from top of kerb ± 10mm.
- Grade access footpath shall be 2% ± 0.5%.
- Path surface shall be true to line and not deviate more than 10mm under a 3m straight edge.
- Surface irregularities, including abutting to service authority access chambers, etc shall not exceed 2mm.
- Spacing of expansion joints shall average 5m over any 30m section. Individual spacing shall be 5m ± 10mm.
- Thickness of footpath 100mm (-0mm + 10mm).
- A random testing programme will be used to check thickness and if any point is outside the tolerance, further testing shall be undertaken within that 5m section of the adjoining 2 sections on each side. Three of more additional thickness tests will be taken on each of the sections. If any of these show a reading that is outside the required tolerance, that section of footpath shall be removed and replaced with new work to this Specification.
- Width of footpath - 0mm + 20mm.

5.9.11 Acceptance

Any sections of footpath not meeting the requirements of this Specification or that in the opinion of the Superintendent is of inferior quality, shall be removed from the site and replaced to the satisfaction of the Superintendent, all at the Contractor's expense.

5.10 Test Certificates

5.10.1 Sub-grade

- A marked up plan shall be provided detailing areas and extent of areas of unsuitable material removed.
- A marked up road plan showing finished level, alignment and width at minimum 20m intervals.
- A compaction certificate from a NATA registered laboratory detailing compaction results undertaken at a minimum of 1 test per 20m of road or as otherwise specified.

5.10.2 Sub-base and base course

- A marked up road plan shall be provided showing finished level depth of layer, alignment and width at a minimum of 20m intervals.
- A compaction certificate detailing compaction results undertaken at a minimum of 1 test per 100m of road or as specified.
- A NATA test certificate of materials tests results taken at a minimum of 1 test per 100m of road length or part thereof, with a minimum of 4 tests.

5.10.3 Sprayed Primes and Seals

- A Suppliers certificate detailing material supplied and quality. A certificate for each coat per run is required.

– A bitumen spray record detailing actual bitumen application rate, temperature and area sprayed for each run.
– An application record of cover application rate for metal for each run.

5.10.4 Asphalt seal

A Suppliers certificate detailing mix supplied, at a rate of 1 per day. Delivery dockets detailing actual quantity supplied each load.

A certification by the Contractor that the rolling procedure required has been performed.

A marked up road plan detailing at minimum 20m intervals, the depth of layer and finished levels.

A certification by the Contractor for each road that no ponding occurs. A certification by the Contractor that the final surface shape is satisfactory.

5.11 Streetscaping

All streetscaping and finishes have to be planned and constructed in consultation with the Shire's works manager to ensure continuity through the town.

6. Quality Assurance

The Contractor shall control the quality of the work and shall fully implement a quality management system under this Contract in accordance with the requirements of the current Australian and International AS/NZS ISO 9002:1994.

Each section of this technical specification includes specific testing and reporting requirements. These requirements are integral to ensuring the quality, reliability, and compliance of the deliverables as they provide a clear framework for conducting tests, interpreting results, and reporting findings. Adherence to these requirements is crucial for maintain Quality Assurance/Control.

6.1 Project Quality Plan

The Project Quality Plan prepared by the Contractor shall cover all quality system elements required by the appropriate Quality Systems Standard as specified, that are applicable to this Contract.

As a minimum, the Project Quality Plan shall contain the following information:

– A Project Organisation Chart or list of nominated Project Personnel showing their positions, lines of communication and details of the responsibilities of the positions.
– Details of the qualifications and experience of the following positions:
  - Construction Manager
  - Contractor's Quality Representative (QAR)
  - Machinery Operators
  - Contractor’s Representative
– Inspection and Test Plans for the various phases during design, manufacture, construction and commissioning, as applicable to the project, to be submitted at least 14 days prior to commencement of relevant activity.

A copy of the NATA Terms of Registration for the Contractor's Compliance Testing Laboratory (Internal or Sub-Contract).

6.2 QA Management Representative

The Contractor shall be required to nominate a suitably qualified Quality Assurance Representative (QAR) who is at a management level with appropriate authority to effectively control the complete quality assurance process. For construction works the Representative shall be site based.

6.3 Inspection and Test Plans

Inspection and Test Plans shall contain at least the following information for each significant activity identified in the relevant process:

– Description of activity;
– Specification requirements/reference;
– Person responsible for activity (title);
– Hold Points and Witness Points;
– Activity checklists;
– Inspection and test type;
– Tolerances or other acceptance criteria;
– Identification of relevant procedure and quality records;

– Test/inspection frequency;
– Work item or work lot identification.

Inspection and Test Plans and examples of their relevant activities checklists established for this Contract shall be submitted to the Flood Damage Site Supervisor for review. Where considered necessary the Flood Damage Site Supervisor may request the Contractor to insert additional Hold Points or Witness Points. Provisions shall be made for the Contractor and the Flood Damage Site Supervisor to sign off at these points.

6.4 Identification and Traceability

All work under this Contract including construction and commissioning, shall be subdivided into distinct work lots or work items.

Work lots or work items shall be chosen by the Flood Damage Site Supervisor in collaboration with the Contractor, consistent with any specified requirements, but shall be subject to approval by the Superintendent.

Each work lot or work item shall be assigned a unique identification number.

The Contractor shall maintain a register of all allocated work lot or work item numbers.

This register shall contain as a minimum, the following information:

– Brief description of the work lot or work item;
– Location reference (three dimensional where applicable);
– Lot or item status (conforming or non-conforming).

The Contractor shall ensure that traceability is maintained throughout all documented records under this Contract.

All test results where applicable under this Contract shall be positively identified with their respective work lot or work item number.

The Contractor shall notify the Flood Damage Site Supervisor and Superintendent in writing 24 hours prior to commencing a new work lot or work item.

6.5 Conformance Reports

Conformance Reports shall be forwarded to the Flood Damage Site Supervisor and Superintendent for each designated work lot or work item, within 24 hours of completion of the work lot or work item.

Conformance Reports shall include a verification statement certifying that the relevant work lots or work items have been inspected and/or tested in accordance with the Contractor's Inspection and Test Plan(s) applicable to this Contract and that they comply with the specified requirements of the Contract Documents.

Conformance Reports shall be accompanied by the following documents:

– All relevant signed off Inspection and Test Plans and associated Checklists;
– NATA certified compliance test results (where applicable).
    - *Note: In cases where test results are not available within this period (e.g. 28 day concrete strengths), the Contractor shall submit preliminary results or previous analytical data of the same mix type which statistically indicates a high probability of conformance. Submission of such information does not absolve the Contractor from his responsibilities under this Contract should actual results subsequently identify nonconformance of the work lot or work item.
– Survey and measurement compliance data i.e. as-constructed information (where applicable).

6.6 Non-conformance Reports

The Contractor shall submit a Non-conformance Report to the Flood Damage Site Supervisor and Superintendent within 24 hours of detecting nonconforming work.

The Contractor's Non-conformance Report shall clearly detail but not be limited to the following items:

– The nature and extent of the non-conformance;
– The work lot or work item number it relates to including the precise boundaries of the nonconforming work;
– Any relevant information, data, test results and/or measurements (as applicable);
– The corrective and preventive actions the Contractor proposes to take;
– The timeframe within which the non-conformance will be rectified.

The method of isolating/identifying nonconforming work, applying and releasing hold points, etc., shall be clearly stated in the Project Quality Plan.

The proposed corrective action shall be subject to approval by the Flood Damage Site Supervisor and Superintendent.

6.7 Default by the Contractor

Failure by the Contractor to submit either a Conformance Report or a Non-conformance Report within the nominated time frame shall constitute a substantial breach of the Contract and may, at the Flood Damage Site Supervisor or Superintendent's discretion, be subject to a **stop work order**. As a result of such action by the Superintendent, and in addition to the Contractor's responsibility to rectify the nonconforming work, the Contractor shall be responsible for its own costs for any time delays due to such breach of Contract.

6.8 Hold Points and Witness Points

A Hold Point is defined as a position in the progress of the work under Contract, beyond which further work shall not proceed without mandatory verification by the QAR and the Superintendent.

A Witness Point is defined as a position in the progress of the work under Contract, where the Contractor must notify its QAR and the Superintendent prior to proceeding and the option for attendance for witnessing of inspection and test may be exercised. If any do not attend, then work may nevertheless proceed, unless otherwise instructed.

Witness Points shall apply to verify compliance of the constructed works.

Mandatory Hold Points shall be as specified in the Contract or by the Flood Damage Site Supervisor and shall apply to this Contract to ensure compliance with specified requirements, and to ensure that critical and/or irreversible activities are not constructed incorrectly.

Mandatory Hold Points shall apply prior to commencement of designated **work lots** or **work items**.

To obtain authorisation to proceed, the Contractor shall ensure the following:

– That all work lots or work items affected by the lot or item in question are conforming;
– That all Conformance Reports for all work lots or work items affected by the lot or item in question have been submitted at least 24 hours prior to the time the Contractor intends to proceed with the lot or item in question, thus ensuring that defective work are not built-in.

6.9 Compliance Inspections and Testing

All compliance inspections and tests shall be based on work lots or work items unless otherwise specified in the contract documents. The costs for all such inspections and tests shall be borne by the Contractor and included in the tender price submitted.

All compliance testing shall be carried out by a NATA registered laboratory certified for the tests specified in this Contract.

The Contractor shall advise the Superintendent of the work lot or work item number and the location within the lot or item, prior to any testing of the lot or item.

The Contractor shall submit a Non-conformance Report and the proposed corrective action for any nonconforming test result. No further testing shall be permitted until approval by the Superintendent.

For compliance inspections the Contractor shall nominate responsible persons, who are not directly involved in performing the work.

The frequency of compliance testing shall be in accordance with the minimum requirements of the Contract Documents, or as specified.

The Contractor shall submit to the Flood Damage Site Supervisor and Superintendent any preliminary results on compliance tests carried out for each work lot or work item within 24 hours of completion of tests.

6.10 Subcontracted Work

The Contractor shall ensure that subcontracted works and procured supplies are subject to appropriate quality assurance standards, when incorporated into the works in order to comply with the requirements of this Contract.

If requested by the Superintendent, the Contractor shall provide evidence of appropriate quality assurance for subcontracted work or procured items incorporated into the works under this Contract. This shall include verification by the Contractor.

6.11 Quality Records

The Contractor's quality system shall include sufficient quality records to provide objective evidence that the requirements of the Contract are met. This shall include Design Consultants, Subcontractors and Suppliers records relevant to this Contract.

The Contractor shall, when requested by the Flood Damage Site Supervisor or Superintendent, provide access to all quality records relevant to the Contractor's quality system under this Contract.

Within 28 days of the Date of Completion, the Contractor shall forward a complete and bound clean copy of at least the following records to the Flood Damage Site Supervisor and Superintendent. Previously submitted documents may be selected as appropriate.

- The Work Lot or Work Item Register for the Contract;
- All Conformance and Non-conformance Reports;
- All Inspection and Test Plans and associated Checklists;
- All Test Results, analyses, reports, measurements, appropriate supply documents and observations;
- The original Project Quality Plan and any changes made to the Contractor's Quality System.

Records shall be maintained by the Contractor for a minimum period of two years from the Date of Completion or in accordance with the Contractor's statutory requirements if the latter exceeds the minimum period required for this Contract.

Records for equipment and parts subject to inspection and approval by the relevant regulatory authority shall be made available on site at the time of arrival of all relevant items at site, or after inspections have been carried out on site (if applicable).

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