GOVERNMENT OF SAMOA

MINISTRY OF NATURAL RESROURCES & ENVIORNMENT

FASITO'O UTA SEAWALL - PACKAGE 1

Specifications & Performance Requirements

MARCH 2025

FASITO'OUTA

PACKAGE ONE

SEAWALL

Comprising Sections

0 General
1 Provision for Traffic
2 Earthworks
3 ~~Underground Services~~
~~4 Flexible Pavement Construction~~
~~6 Concrete Kerbs, Footpaths and Minor Works~~
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SECTION 0

GENERAL REQUIREMENTS

0.01 GENERAL

0.01.1 Referenced Documents

Unless otherwise specified or expressly supplied by the Employer, the applicable issue of a referenced document must be the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

0.01.2 Equivalency of Standards and Codes

Where standards and codes are national, or relate to a Code of Environmental Practice for Samoa, other authoritative standards that ensure a substantially equal or higher quality than the standards and codes specified shall be accepted subject to the Project Manager's prior review and written consent. Differences between the standards specified and the proposed alternative standards shall be fully described in writing by the Contractor and submitted to the Project Manager at least 28 days prior to the date when the Contractor desires the Project Manager's consent. In the event the Project Manager determines that such proposed deviations do not ensure substantially equal or higher quality, the Contractor shall comply with the standards specified in the documents.

0.01.3 Interpretation of Contract Documents

The following interpretations apply to the Contract documents unless the context otherwise requires.

0.01.3.1 Duties of the Contractor

All actions, work, supply of Materials and responsibilities described in the Contract Documents must be carried out by the Contractor unless specifically stated otherwise.

Where a requirement of the specifications identifies a particular item as something to be included, the requirement is not limited or qualified by doing this.

0.01.3.2 Communications

All communications between the Employer, the Contractor and the Contactor's representatives must be in the English language.

0.01.3.3 Legal Units of Measurement

All measurement of physical quantities must be in metric units.

0.01.3.4 Nomenclature

Unless inappropriate to the context, all terms used in the Specifications are in accordance with Australian Standard AS 1348, "Road and Traffic Engineering - Glossary of Terms".

0.01.3.5 Definitions

"Constructional Plant" means all plant, motor vehicles, appliances and things (including scaffolding, formwork and the like) of whatsoever nature used or in use in or about the execution of the Work Under the Contract but does not include materials, plant, equipment or other things intended to form or forming part of the Works;

"Environment" means the natural and the built environment and all aspects of the surroundings of *human beings (including physical, biological and aesthetic aspects);*

"Hold Point" means a point beyond which a work process must not proceed without the Employer's express written authorisation;

"Witness Point" means a point in a work process where you must give prior notice to the Employer and the option of attendance may be exercised by the Employer;

"work under the Contract" means the work which the Contractor is or may be required to execute under the Contract and includes all variations, remedial work, Constructional Plant and Temporary Work, design and design documentation;

0.02 DATE COMPLIANT

The Contractor shall ensure management systems correctly process dates/times and do not produce ambiguous dates/times in documents and records.

0.03 MINERALS AND FOSSILS

The Employer is deemed to be the Employer of all valuable minerals, fossils, articles or objects of antiquity or anthropological or archaeological interest, treasure trove, coins or other items of value found on the Site ("valuable items").

Immediately on discovery of a valuable item, take precautions to prevent loss or removal of or damage to the valuable item and notify the Employer of its discovery.

The Contractor's reasonable extra costs, if any, as determined by the Employer of taking such precautions will be reimbursed by the Employer.

0.04 PUBLIC UTILITIES - GENERAL

The information available on the location of existing utilities is approximate only and in some cases may be inaccurate or incomplete. The Employer accepts no responsibility for and does not guarantee or make any representation as to the accuracy of the information. Make such further enquiries and investigations as are required for your own information.

Attention is directed to the possible existence of underground utilities not shown on the Drawings, or at locations or elevations different from those shown on the Drawings. Ascertain the exact location of each underground utility prior to doing any work that may damage such utility.

If any existing or proposed utility conflicts with the location or elevation of any item of construction shown on the Drawings, notify the Employer of such conflict. A conflict is not considered to exist unless an existing service occupies the same space as that intended for the item to be constructed or minimum clearances will be infringed. Any variation to the work required will be determined in accordance with Clause 39 of the General Conditions of Contract.

Where the Contractor's method of working results in additional adjustments being deemed necessary by any utility authority, the Contractor shall arrange for and bear all costs in relation to those additional adjustments, notwithstanding that the Employer may have approved the method of working.

The Contractor will not be responsible for the routine maintenance of any utility installed or constructed by the various public utility authorities, but will be responsible for the protection of such utility during the currency of the Contract.

In certain instances the Contractor may be required to provide the various public utility authorities with the opportunity to remove, relocate, or work on their utilities before you proceed with succeeding construction operations. Should the Contractor suffer any delay due to the moving of any such utilities, or the operations of any authority controlling such utilities, except where the delay is due to work chargeable to the Contractor or the Contractor's omission or negligent act, the Contractor may apply to the Employer for an extension of time in accordance with Clause 28 of the General Conditions of Contract.

The Contractor shall not stop the Works because of any operation by public utility authorities without the written agreement of the Employer.

The Contractor shall conduct its operations so as to interfere as little as possible with the operations of

public utility authorities or their contractors on or near the Site. The Employer reserves the right to permit public utility authorities and others to work on or near the Site.

0.05 CONTRACTOR'S FACILITIES

The Contractor shall supply, equip, service and neatly maintain all necessary buildings, workshops and storage areas for the satisfactory completion of the Work. The Contractor shall provide properly constructed toilets and washing facilities for the use of all personnel.

Whether established on the road reserve or elsewhere, erosion and sedimentation control measures must be implemented and the cost will be included in the rates generally.

The Contractor shall ensure that adequate rubbish receptacles are provided. These receptacles must be serviced regularly and to the satisfaction of the Employer to ensure that the construction area remains tidy.

The Contractor shall be responsible for the security of its buildings, materials, construction plant and machinery and shall take all necessary precautions to make the area safe to the public.

The Contractor shall protect, reinstate and revegetate all areas used for the Works within the nominated area. Reinstatement will include ripping, topsoiling and grass seeding or alternatively turfing so as to reinstate the land to a condition at least similar to the condition before disturbance.

0.06 INFORMATION BOARDS

For each Work site, the Contractor shall supply two (2) of the information boards with wording and layout approved by the Employer. Each information board shall be at least 2m wide by 1.0m high and shall identify:

- the project name
- the Government of Samoa /MNRE as funding agencies,
- the Contractor, and
- The expected completion date.

The Contractor shall provide appropriate mounting posts, attachment brackets and accessories and erect these information boards at prominent locations on the Site, approved by the Employer. Information boards shall be mounted at a height of at least 2.3 m above ground The Contractor shall not erect on the Site any other form of sign bearing its name. On completion of the Works, the Contractor shall dismantle the information boards and dispose of them off-site.

Payment for the supply, erection and removal of information boards is deemed to be included in the rates and prices generally.

0.07 ADVERTISING

The Contractor shall not exhibit, or permit to be exhibited on the Site or on any land to which it has access under the Contract any advertisements, unless the written permission of the Employer has been obtained.

0.08 INSPECTION BY VISITORS

The Contractor shall refer all applications for Site inspections to the Employer. The Contractor shall

not arrange inspections by visitors without the Employer prior approval. The Employer has the right to conduct inspections of the Works with visiting parties.

0.09 EMERGENCY CALLOUT AVAILABILITY

Within fourteen days of the date of execution of the Contract, the Contractor shall submit to the Employer information, to the satisfaction of the Employer, regarding the capability to answer requests for emergency action at any time, in relation to the Works and in relation to its responsibilities under the Contract regarding adjacent land, Employers, the general public and Public Utility Authorities.

The cost of providing this capability and the cost of any actions necessary as a result of this capability shall be borne by the Contractor.

0.10 USE OF PUBLIC ROADS

Vehicles or equipment hauling material over public roads must be fitted with tight tailgates and have a freeboard of not less than 75 mm without cones or piles of material which may spill on to the roadway. Vehicles when loaded must comply with the requirements as may have been set by the relevant authority, and when requested, the Contractor shall provide evidence to this effect to the Employer.

The Contractor shall remove promptly from existing roadways all dirt and other materials that have been deposited by its hauling and other operations.

The Contractor shall take suitable precautions to ensure that under no circumstance could any rock be dislodged onto any adjacent roadway or track in use. Where the Employer considers that the precautions are not satisfactory, the work is to immediately cease until the necessary precautions are taken.

Construction plant or equipment must not be allowed to park on or within the pavement or shoulders of any existing trafficked roadway.

If the Contractor wishes to use public roads surrounding the Site for the purpose of undertaking the work under the Contract, the Contractor shall obtain approval from the relevant authority for the use of these public roads. Any conditions for such use are a matter between the Contractor and the relevant authority.

0.11 SITE MEETINGS

At intervals of one month, unless otherwise mutually agreed between the Contractor and the Employer, the Contractor shall arrange for a duly authorised representative to attend the Site Meeting. Subcontractors and Consultants must also attend the Site Meeting if required by the Employer.

Unless otherwise agreed the Employer's Project Manager will chair the meeting and will arrange for the recording of minutes. Within one week of the meeting the Project Manager will issue to you a copy of the minutes. Within three days of issue of the copy of the minutes, the Contractor shall notify the Project Manager of any item from the meeting which in its opinion has not been correctly recorded. The agreed minutes must be confirmed at the next Site Meeting held.

0.12 COMMUNITY RELATIONS

The Contractor shall notify the Employer of any complaints received from members of the community concerning the work. The Contractor shall deal with all such complaints promptly and provide written evidence to the Employer of actions proposed to deal with the complaints.

0.13 DAYWORK

Where the Progress Claim to be submitted by the Contractor under Clause 42 of the General Conditions of Contract includes a claim for payment for Daywork in accordance with Clause 52 of the General Conditions of Contract, the form of statement in relation to Daywork will be as follows:

(a) Particulars to be Recorded Each Day

(i) Labour

Name and classification of each employee

Number of hours, rate and (extended) cost of work during ordinary hours

Number of hours, rate and (extended) cost of work during overtime hours

(ii) Plant and Equipment

Description, number of hours, rate and (extended) cost of usage

(iii) Materials

Description, quantity, unit, rate and (extended) cost

(iv) Subcontractors, Suppliers and Consultants

Description, units, hours, rates and (extended) costs

(b) Particulars to be Submitted in Support of Each Claim in Respect of Daywork

(i) Copies of actual invoices, receipts, orders, Subcontracts, professional fees, hire rates, etc. for all plant and equipment and materials used including allowances for cash discounts, etc.

(ii) Calculations deriving labour rates, including dissection into Award Hourly Rates, Site Allowances, Daily Fares Allowances, Payroll Tax, Workers Compensation Charges, and Annual Leave and Long Service Leave Allowances based upon a percentage of the nominated 37.5 Hour Week Award Wage.

(iii) Calculations deriving the allowance for overheads etc.

0.14 MANAGEMENT OF THE WORK UNDER THE CONTRACT

0.14.1 Establish and Maintain Management Systems and Plans

The Contractor shall plan, establish, implement and maintain the specified Management Systems and Plans required by the Specifications and demonstrate compliance in accordance with the Contract. Failure to do so will be deemed to be a breach of the Contract.

The Employer will not be required to make payments to the Contractor under this Contract until the Contractor has complied with the requirements of this Clause 26.

0.14.2 Control the Work

The Contractor shall control the quality and performance of the Work Under the Contract in accordance with the specified Management Systems and Plans.

0.14.3 Retain Records and Produce Them as Required

The Contractor shall retain records produced in the implementation of the specified Management Systems and Plans and make them available to the Employer in accordance with the terms of the Contract.

The records must, in addition to statutory requirements, be retained by the Contractor for a minimum period of 5 years after the date of issue of the certificate of Completion of the Works.

0.14.4 Inspection and Testing

0.14.4.1 General

The Contractor shall provide inspection and test results for verification of performance within the time required by the Contract. If no specific time limit applies, the Contractor shall provide the results to the Employer upon completion of the inspection and/or testing.

Additional or special tests may be conducted by the Employer or a person (which may include the Contractor) nominated by the Employer.

0.14.4.2 Costs of tests

The Contractor shall include in its rates and prices generally the costs associated with all testing required under the Contract, except for any tests specifically nominated as to be paid by the Employer.

0.14.5 Covering Up of Work and Nomination of Witness and Hold Points

The Employer may:

(a) direct that any part of the work under the Contract shall not be covered up or made inaccessible without the Employer's prior approval;

(b) nominate any point in a work process as a Witness Point or Hold Point.

0.15 PAYMENT

Except where specific Pay Items are provided, all costs associated with general requirements of the Contract are deemed to be included in the rates and prices generally for the work under the Contract.

0.16 SCHEDULE OF RATES

0.16.1 Application

This Clause applies if a Schedule of Rates forms part of the Contract Documents. This Clause does not apply to any work which is covered by a lump sum specifically accepted by the Employer.

0.16.2 Rates and Lump Sums

The rates and lump sums in the Schedule of Rates are deemed to include the cost of carrying out the whole of the Works, services and other incidentals associated with or necessary for the carrying out of the Works and the performance of the Contractor’s obligations under the Contract.

Where a section or item does not appear in the Schedule of Rates the cost thereof is deemed to be included in the rate or lump sum for the section or item associated with that section or item but where there is no section or item associated with that section or item the cost thereof is deemed to be included in the rates or lump sums generally.

Where any section or item in the Schedule of Rates is unpriced by you all costs applicable to that section or item is deemed to be included elsewhere in the Schedule of Rates.

Where the specifications or Drawings provide for the Employer to direct an item of work and the pay item/s is identified, the work shall be deemed to be the subject of a Provisional Sum or Provisional Quantity under the identified pay item/s.

A direction is not be required to be given by the Employer by reason of the actual quantity of a section or item being greater than or less than the quantity shown in the Schedule of Rates for that section or item.

0.17 SCHEDULE OF PRICES

0.17.1 Application

This Clause applies if a Schedule of Prices forms part of the Contract Documents. This Clause does not apply to any work which is covered by a Schedule of Rates.

0.17.2 Rates and Prices

The lump sum accepted by the Employer covers everything associated with or necessary for the Contractor‘s performance of the Contract.

The Contractor is deemed to have agreed that:

(a) the cost of a work or service which is expressly covered by an item listed in the Schedule of Prices is included in the rate and price for the item, and

(b) the cost of a work or service which is not expressly covered by an item listed in the Schedule of Prices is included in other rates and prices of the Schedule of Prices.

Errors in the Schedule of Prices must be corrected to ensure that the total of the rates and prices as extended for all items in the Schedule of Prices always equals the lump sum accepted by the Employer.

The Contractor shall correct the errors as agreed between the Contractor and the Employer or, if no agreement is reached, as determined by the Employer.

The rates and prices in the Schedule of Prices:

(i) may be used to value variations, and

(ii) must be used to assess the value of unincorporated Materials and the Value Completed properly included in a Payment Claim under Clause 62 of the General Conditions of Contract.

0.18 CLEANING THE SITE

The Contractor shall keep the work under the Contract clean and tidy as it proceeds and regularly remove from the Site rubbish and surplus material, from the start of work under the Contract including during the period for rectifying any Defects and during any period of maintenance by the Contractor.

The Employer may remedy any breach of this Clause by the Contractor and the costs of remedy are a debt due by the Contractor to the Employer.

0.19 RESPONSIBILITY FOR AND NOTICE OF MEASUREMENT

The measurement of work as required for the purposes of the Contract is the responsibility of the Employer. The Employer will give reasonable notice to the Contractor of its intention to measure work and the Contractor you must, if so directed by the Employer, be represented at and assist in the

taking of measurements. If the Contractor are not represented at the time appointed by such notice for the taking of measurements the Employer may proceed in its absence and the measurements taken by the Employer will be binding on.

A record of the measurements will be kept by the Employer and will, on request by the Contractor, be made available to the Contractor.

0.20 COMMENCEMENT OF SITE WORK

Before commencing work on the Site the Contractor must give the Employer at least seven days written notice of proposed commencement or such shorter period agreed to by the Employer.

0.21 EXTRA LAND REQUIRED BY CONTRACTOR

The Contractor may procure for itself and at its own cost the occupation or use of or relevant rights over any land or space in addition to the Site which the Contractor may deem necessary for the execution of the Works or for the purposes of the Contract; and

As a condition precedent to issuing the Final Account and, if so required by the Project Manager, the Contractor shall provide a properly executed release from all claims or demands (whether for damages or otherwise howsoever) from the Employer or occupier of and from other persons having an interest in such land.

0.22 QUALITY ASSURANCE

0.22.1 Monthly Product Quality Summary

The Contractor shall submit to the Project Manager a monthly summary of project quality records and test results which demonstrate the conformance of the work with the Contract requirements.

The summary must indicate the lots or components, or both, of the Works which have achieved full conformity with the Contract requirements.

0.23 WORK-AS-EXECUTED DRAWINGS

The Contractor shall maintain throughout the duration of the Contract an up-to-date full size set of drawings for the Works that show the work-as-executed details as construction of each part of the Works is completed.

By the Actual Completion Date for the whole of the Works, the Contractor shall provide to the Employer one full-size set of drawings amended in RED to show in detail the work-as-executed condition of the Works. Amendments necessary to clearly depict work-as-executed details must be carefully and accurately prepared. After approval of the amended drawings by the Project Manager, the Contractor at its own expense shall arrange for the design drawings to be amended electronically in AutoCAD 2016 (or latest version) format and for a Memory Stick and two sets of full size prints to be provided o the Project Manager.

The cost of preparing work-as-executed drawings is deemed to be included in the rates and prices generally for the work under the Contract.

0.24 ~~TRANSPORT FOR FIELD SUPERVISOR~~

~~The Contactor shall provide one fully fuelled, serviced and maintained four wheel drive vehicle for the exclusive use of the Project Manager's field supervisors for the duration of the contract period~~

including any extensions of time, plus a further period of up to eight weeks after the date of Practical Completion (for the inspection of defects). The vehicle shall be roadworthy, free of rust, in good running order, be equipped with spare wheel and jack and have no unrepaired damage, broken lights, fittings etc.

The vehicle shall meet or exceed the following requirements:

- Age – not more than four years old (based on the date shown on the manufacturer's compliance plate fitted to the vehicle)
- Engine – 2.5 L or larger
- Doors – four

The vehicle shall be available for the reasonable private use of the Supervisor and by other of the Project Manager's Supervisor's engaged from time to time in the supervision of the Works of this Contract. The Supervisor to whom the vehicle is assigned will maintain a log book of usage.

The vehicle shall be insured with Comprehensive insurance with a minimum cover value of $200,000.00 in aggregate for any one claim

0.25 ACCOMMODATION FOR FIELD SUPERVISOR

The Contactor shall provide fully furnished accommodation within 20 km by sealed road of the works site for the field supervisor. The accommodation shall be of a standard suitable for long term and shall include the following for two people:

- Cooking facilities and equipment,
- Crockery and cutlery ,
- Beds and linen ,
- Laundry including washing machine,
- Lockable bedrooms and living area,
- Refrigerator
- Dining table and lounge chairs
- Hot and cold water supply.
- Telephone line

All supplied items shall be new or in as new condition

The accommodation shall be in sound order and repair, be free of vermin and insect pests (including ants), and shall be weatherproof

The Contractor shall meet all outgoings including the cost of water supply and electricity.

0.26 MEASUREMENT AND PAYMENT

Payment shall be made for all activities associate with completing the work detailed in this specification in accordance with Pay Items.

A lump sum price will not be accepted.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

If any pay item for which a quantity of works is listed in the Contract has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other pay items for the cost of the activity which has not been priced.

0.26.1 Pay Item 07P1 – Information Boards.

The unit of information will be the number of information boards erected in accordance with the requirements of this Specification.

This pay item shall include all works associated with approval, manufacturing, installation, maintenance in good order and proper disposal of information boards.

0.26.2 Pay Item 022P1 – Work As Executed Drawings.

The pay item shall include all works associated with recording, marking up, obtaining Project Manager's approval, drafting of changes (electronically) and provision of electronic and hard copies of work-as-executed information.

0.26.3 ~~Pay Item 025P1 Transport for Field Supervisor~~

~~The unit of measurement will be vehicle month.~~

~~This pay item shall include all works and expenses associated with purchase, registration, operation, refuelling, maintenance , repair and insurance of the specified transport vehicle.~~

0.26.4 ~~Pay Item 026P1 Accommodation for Field Supervisor~~

~~The unit of measurement will be month.~~

~~This pay item shall include all works and expenses associated with rental or purchase and subsequent disposal of the accommodation including outgoings for utilities (excluding telephone), supply of furnishing, crockery, cutlery, equipment etc~~

SECTION 1

PROVISION FOR TRAFFIC

1.01 SCOPE

This Section of the specification covers all work necessary to provide for the safe movement of traffic and the protection of persons and property through and/or around the work site for the duration of the project**.**

The extent of work includes the design, construction, maintenance and removal of temporary roadways and side tracks, the provision of traffic controllers, lights, barriers, ramps, signs, road markings, fences, detours and any other items required and shall apply where any public place or road is affected by the works. Unless otherwise specified all temporary traffic arrangements required by works under the Contract are included under this Specification.

The Contractor must conform to the requirements of AS 1742.3, this Specification, and the drawings when planning and carrying out traffic control.

1.02 STANDARDS

Work carried out under this Section of the Specification shall comply with the requirements of the following Standards to the extent that they are relevant and that they are not overridden by the Specification.

Australian Standards

AS 1165	Traffic Hazard Warning Lamps
AS 1742.3	Traffic Control Devices for Works on Roads
AS 1743	Road Signs
AS 1744	Standard Alphabets for Road Signs
AS 1906	Retro-reflective Materials and Devices for Road Traffic Control Purposes
AS 3845	Road safety barrier systems

Legislation

AUSTROADS Publications

Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade
Guide to the Geometric Design of Rural Roads

1.03 DEFINITIONS

APPROVED TEMPORARY TRAFFIC MANAGEMENT PLAN(S):	An arrangement of temporary signs and devices to warn traffic and guide it through or past a work area or temporary hazard that has been approved for use by the relevant Statutory Officer under the appropriate Legislation.
REGULATORY TRAFFIC CONTROL DEVICE:	Any sign, signal, marking, or installation indicating an obligation to comply with a legally enforceable instruction.
WORK AREA:	The specific area where work is being done.
WORK SITE:	An area which includes the work area(s) and any additional length of road required for advance signing, tapers, side tracks or other areas needed for associated purposes.
OBSTRUCTION:	Any works or otherwise on or adjacent to an existing carriageway that requires modification to the existing traffic control arrangements.
SIDE TRACK:	A length of temporary pavement constructed for detour of traffic to allow safe construction of the works.
DETOUR:	Diversion of traffic on existing roadways because of obstruction of the existing roadway required to facilitate safe construction of the works.
DELINEATION BARRIER:	A barrier used to define hazards and guide traffic through the work site.
PHYSICAL BARRIER:	A temporary safety barrier required to provide a strong physical barrier between the travelled way and the work area.
PUMA	Planning and Urban Management Authority

1.04 GENERAL

1.04.1 Construction Operations

Conduct operations so as to offer the least possible obstruction and inconvenience to the public. The length or amount of work under construction at any one time shall not exceed that which can be properly managed having due regard for the rights of the public. Unless otherwise specified or permitted, all traffic (both vehicular and pedestrian) shall be allowed to pass through the works.

The Contractor should note that wherever the word 'should' occurs in AS 1742.3 the word 'shall' applies and the required action is the Contractor's responsibility.

The Contractor shall place, erect, alter or remove road signs only in accordance with the approved Temporary Traffic Management Plan(s) or AS 1743.3 .The Contractor shall liaise with the Police with regard to the control of traffic and other matters within Samoa jurisdiction as appropriate.

1.04.2 Temporary Traffic Management Plan

The Contractor shall obtain all necessary approvals from the relevant authorities for temporary traffic arrangements except where specified otherwise.

At least five (5) working days prior to undertaking any work which would involve any obstruction whatsoever to traffic, the Contractor shall prepare and submit Temporary Traffic Management Plan(s) to the Project Manager for endorsement. When endorsed by the Project Manager, the Contractor shall submit the Temporary Traffic Management Plan(s) to the delegate of the road transport authority, or other person so empowered by the relevant Legislation for written approval.

The endorsement of the Project Manager does not relieve the Contractor of the obligations of the relevant Legislation.

Where the approved Temporary Traffic Management Plan(s) involve regulatory traffic control devices, the Contractor shall forward copies of the approved plans to the Police so that such traffic regulations may be enforced.

The Temporary Traffic Management Plan(s) shall include:

(a) Design drawings for any temporary roadways and side tracks in accordance with Clause 1.06 showing pavement, wearing surface and drainage details.

(b) Details of arrangements for construction under traffic.

(c) A signpost layout plan showing:

- location, size and legend of all temporary signs;
- temporary regulatory signs and temporary speed zones; and
- all traffic control devices such as temporary traffic signals, road marking, pavement reflectors, guideposts, safety barrier systems, barrier boards etc.

Special consideration shall be given in the preparation of the Temporary Traffic Management Plan(s) to the safety of pedestrians, cyclists and workers. Particular care shall be taken when requiring reversal of traffic flows or the separation of unidirectional flow by medians or other physical separation.

Where Temporary Traffic Management Plans are included as part of the drawings, they shall be used as the basis for preparation of Temporary Traffic Management Plans.

No extension of time will be granted or allowed relative to any delay associated with the obtaining of the necessary approvals unless it is shown to the satisfaction of the Project Manager that all necessary steps have been taken by the Contractor within the specified timeframe.

Hold Point 1.1	
Process Held:	Work which would involve any obstruction whatsoever to traffic.
Submission Details:	At least five (5) working days prior to proposed submission of the Temporary Traffic Management Plan(s) to the relevant Statutory Officer for approval under the appropriate Legislation, the Contractor shall submit the Temporary Traffic Management Plan(s) to the Project Manager for endorsement.
Release of Hold Point:	The Project Manager is to be provided with a copy of the Temporary Traffic Management Plan(s) approved by the relevant Statutory Officer under the appropriate Legislation prior to authorising the release of the Hold Point.

1.04.3 Access to Adjacent Property and Side Roads

The Contractor shall maintain safe and convenient passage for pedestrians and vehicles to and from entrances and buildings at all times as detailed on the approved Temporary Traffic Management Plan(s). Temporary connections to intersecting roadways shall be provided and maintained as necessary. Any areas of excavation adjacent to pedestrian and vehicular accesses shall be suitably fenced and sign posted. Star picket fence posts shall be capped.

Prior to the commencement of construction the Contractor shall provide written notice to all traders and occupants of adjacent properties, where access to or from those properties is affected by the works to be undertaken. It shall be sufficient for this purpose to place a notice in the letterbox of each affected block outlining the extent of the work to be undertaken and the intended program.

Short term incidental works which affect the use of side roads, vehicular and pedestrian access shall not be undertaken without providing adequate alternative provisions in accordance with this specification.

1.04.4 Night, Weekend and Holiday Traffic

Where specified or directed, the site shall be maintained in a safe and trafficable condition for its full length at night, during weekends and on public holidays. Subject to the requirements of the approved Temporary Traffic Management Plan, traffic may be carried on detours, sidetracks or part of the existing pavement for the whole or portion of the works.

1.04.5 Plant and Equipment

Where traffic is permitted to use the whole or portion of existing roads, all plant items and similar obstructions shall be removed from the roads at night, and parked so as not to create a hazard. Parked plant shall not obstruct sight lines, be within the clear zones required for an errant vehicle, or within 6m of a carriageway edge, unless parked behind physical barriers.

1.04.6 Clothing for Work Personnel

In addition to the requirements of AS 1742.3 and the relevant Legislation the following requirements shall apply to all personnel working in close proximity to traffic:

Safety Vests

High visibility safety vests shall be worn.

For night conditions, safety vests shall have retroreflective silver tape front and back. The tape shall be of minimum width 50mm and cover not less than 30 percent of the outside of the garment.

Overalls

For night conditions white overalls shall be worn that have three hoops of 50mm wide retroreflective silver tape on each sleeve and around the body and two hoops of 50mm wide retroreflective silver tape around each leg.

Wet Weather Clothing

All wet weather clothing shall be made of fluorescent high visibility material.

Under night conditions the clothing shall have two hoops of 50mm wide retroreflective silver tape on each sleeve and around the body and two hoops of 50mm wide retroreflective silver tape around each leg of wet weather trousers.

1.05 TRAFFIC CONTROL DEVICES

1.05.1 Use of Traffic Control Devices

All traffic control devices in use for temporary traffic management shall be maintained in accordance with AS 1742.3, so that they are in good order and in the correct positions day and night. Traffic control devices shall be neat, clean, and signs shall be clear and legible at all times.

The Contractor may need to be in attendance outside normal working hours to arrange for adjustments or maintenance of traffic control devices. The Contractor shall notify the Project Manager and the Police where necessary, in writing, the names, addresses and means of communicating with personnel nominated for this purpose, and to maintain such information as current.

The arrangements and placement of traffic control devices shall be carried out in accordance with the approved Temporary Traffic Management Plan(s) and AS 1742.3. AS 1742.3 Figures 4.1 to 4.11 inclusive are indicative and should be regarded as minimum requirements. Arrangements used in particular cases must provide fully for the guidance and safety of vehicles, cyclists and pedestrians. Where a temporary speed limit has been incorporated on the approved Temporary Traffic Management Plan(s), the Contractor shall arrange for the supply of the appropriate signage in accordance with AS 1742.3, including posts and fittings, for erection. The Contractor shall erect these signs, cover the signs when the speed zone is not in use and remove the signs when the speed zone is no longer required as part of the provision for traffic.

1.05.2 Signs

Signs shall be manufactured and erected in accordance with the Standards listed. Post mounted signs shall be erected as detailed.

Fluorescent materials shall be in accordance with AS 1742.3.

Signs shall be maintained in a neat, clean and legible condition at all times.

Notwithstanding anything else contained in this Specification the Contractor shall only place, erect, or remove road signs in accordance with the approved Temporary Traffic Management Plan(s), for roads used by the public.

All proposals for alterations to signs shown of the approved Temporary Traffic Management Plan(s) shall be submitted in accordance with Clause 1.04.2.

1.05.3 Barriers

Delineation Barriers

Barrier boards shall comply with AS 1742.3.

Trestles supporting barrier boards shall be constructed of metal, sawn timber or other suitable materials and shall be yellow. Trestles shall serve as firm support for the barrier board but the bases of the trestles shall not protrude beyond the ends of the boards. The trestles shall be kept in place by sandbags or other suitable means.

Tapes, mesh fencing, interconnected lightweight units and bollard fences may all be used as delineation barriers.

Physical Barriers

Where physical barriers are required to undertake safe construction of the works they shall be designed in accordance with AS 1742.3 and with regard to the relevant Legislation.

1.05.4 Traffic Signals

Traffic Signals for the control of traffic, either portable or temporary may be used in accordance with AS 1742.3, as described below:

Portable Traffic Signals for Controlling Traffic

Portable traffic signals may be used for shuttle control where a single lane has to be used alternately by traffic from opposite directions or at road crossings or intersections. They are intended for relatively short term applications.

Temporary Fixed Traffic Signals

Temporary fixed traffic signals may be used for long term shuttle operations or for non-shuttle control of intersecting traffic flows.

1.05.5 Warning Lamps

Warning lamps shall be of robust construction complying with AS 1165. Photometric performance shall comply with the requirements of Part 1 of that Standard for the intended application.

1.05.6 Traffic Guidance Flaps and Cones

Traffic Cones, bollards and Guidance Flaps shall comply with the requirements of AS 1742.3.At no time shall cones or flaps be used as a substitute for barriers and signs at any location within the work site.

Traffic guidance cones shall not be left in position at night unless there is a watchman in attendance who can reposition cones dislodged by traffic. Otherwise they shall be removed and replaced with flaps or barriers. Flaps fixed to the pavement may be left in position at night.

Traffic guidance cones to be used at night shall be reflective in accordance with AS 1742.3.

1.05.7 Use of Signs for Blasting Operations

During blasting operations, stop traffic at a safe distance, but not less than 200m from the site of the blasting. Barricade the road and erect signs in accordance with AS1742.3. A traffic controller shall always be in attendance at each barricade to ensure that all traffic is halted. In the event of a large queue a second traffic controller should be assigned to walk ahead of the queue to warn approaching vehicles of the traffic stoppage.

Where electric detonators are being handled or used, within 100m of a road, erect additional sign T4-2 "BLASTING AREA, SWITCH OFF RADIO TRANSMITTERS".

1.05.8 Delineation of Excavations

Where traffic is operating in a lane immediately adjacent to an excavation greater than 150mm deep, delineate the lane edge in accordance with the requirements of AS 1742.3.

1.06 OBSTRUCTIONS AND SIDE TRACKS

1.06.1 General

Unless otherwise specified or shown on the drawings it shall be the responsibility of the Contractor to design, construct and operate any side tracks, detours or obstructions to traffic, to maintain these in good condition, to remove these when finished and restore the area to match existing or as required by the Contract.

Where an arrangement for a side track, detour or obstruction is specified or shown on the drawings, and the Contractor chooses to utilise that arrangement, this in no way relieves the responsibility of the Contractor with respect to the adequacy in all respects of the design, construction and operation of any side track, detour or obstruction.

1.06.2 Side Tracks

Design Standards

Where side tracks not detailed on the approved Temporary Traffic Management Plan(s) are proposed, the standard of alignment and grading adopted shall be in accordance with the current edition of the AUSTROADS publication "Rural Road Design – Guide to the Geometric Design of Rural Roads". Intersections shall be designed in accordance with the current edition of the AUSTROADS publication "Guide to Traffic Engineering Practice – Part 13 – Intersections at Grade".

Unless otherwise approved, pavements shall be at least 6.4m wide with appropriate shoulders and widening as necessary at horizontal curves. A minimum design speed of 40 km/h shall be adopted unless otherwise approved.

Hold Point 1.2	
Process Held:	Construction of temporary side tracks not detailed on the approved Temporary Traffic Management Plan(s).
Sub mission Details:	At least ten (10) working days prior to proposed construction of the side track the Contractor shall submit the design of temporary side track for assessment by the Project Manager.
Release of Hold Point:	The Project Manager will review the design for compliance with the relevant standards prior to authorising the release of the Hold Point.

Drainage

Drainage structures and drains shall be constructed in accordance with Section 3 of this Specification.

Drainage shall be provided so as to prevent water flowing over the road in any storm of intensity less than 1 in 5 year occurrence. No temporary formation shall be constructed so as to dam water at any time.

Pavements shall be designed and constructed so as not to pond any water at any point. Drainage structures shall be provided to prevent ponding if necessary.

Subsurface drainage shall be installed where the risk and consequence of side track pavement failure due to subsurface moisture is considered high.

Surfacing

Provide a wearing surface of a standard suitable for the traffic using the road being side tracked.

The wearing surface type and pavement design shall be in accordance with the drawings or approved Traffic management Plan. It shall be firm, even and skid resistant under all weather conditions and shall be designed to remain sound for the duration of its use.

The wearing surface widths shall extend across the full width of the traffic lanes and shoulders.

The wearing surface shall be carried onto any existing connecting roadway so as to finish square to the existing roadway centreline.

For deviations expected to operate for less than forty eight (48) hours, the requirement for sealing may be waived subject to the employment of dust control measures.

Provide line marking, delineation and safety barriers in accordance with the approved Traffic Management Plan.

Safety Barriers

Safety barrier systems in accordance with the approved Temporary Traffic Management Plan, and conforming to AS 3845, shall be erected on all temporary embankments where the slope of embankment is steeper than 25 percent and vertical height between the edge of the shoulder and the intersection of the embankment batter slope and natural surface exceeds 2m.

1.06.3 Opening of Side Track to Traffic

All sign posting, pavement marking, safety barriers and traffic control devices shall be completed before the opening of side tracks to traffic.

Hold Point 1.3	
Process Held:	Opening of side tracks to traffic (including portable or temporary traffic signals sites)
Submission Details:	At least one (1) working day prior to proposed opening of the side track provide notice that work is conforming and ready for inspection.
Release of Hold Point:	The Project Manager will inspect the site for compliance with the specification prior to authorising the release the Hold Point.

Unless otherwise approved by the Project Manager, sections of existing roadway being replaced shall not be disturbed for at least two (2) days after opening a side track to traffic. In the event that failure of the temporary roadway or detour occurs traffic is to be redirected back onto the existing roadway. The need to redirect traffic shall be determined by the Project Manager. The costs associated with the redirection of traffic back onto the existing roadway shall be borne by the Contractor.

1.06.4 Maintenance

The Contractor shall be responsible for the maintenance of side tracks and shall ensure the road surface is kept safe for traffic. Any potholes or other failures shall be repaired without delay.

1.06.5 Obstructions

Where a side track or a detour is not provided or available, then construction under or adjacent to traffic may be permitted.

Operation and control of obstructions in existing carriageways shall be planned in accordance with the principles laid down in AS 1742.3 and SAA HB81 which give specific guidance as to the minimum requirements for arrangement and placement of warning devices for lane closure(s) and single lane operations in various circumstances.

In addition to measures which may be indicated or specified in AS 1742.3 or SAA HB81, unless specified or approved otherwise the following requirements shall apply.

(a) Single lane operation will not be permitted at night or at times when work is not in progress.

(b) In all cases of single lane operation, the minimum lane width shall be 3.0m.

(c) On multi-lane roads, closure of more than one lane in the direction of peak traffic flow will not be permitted during peak periods. At least one lane shall be left open for traffic travelling in the direction opposite to the peak flow.

(d) Where it is noted on the drawings that the simultaneous closure of several lanes of a multi-lane road would cause undue disruption to traffic, then all or part of the work concerned shall be done during off peak periods or at weekends or at night.

The Contractor shall ensure the carriageway(s) is restored to a safe and trafficable state for through traffic prior to cessation of work each day.

All permanent sign posting, pavement markings, safety barriers and traffic signals where required under the Contract shall be completed or reinstated prior to opening completed work to traffic.

1.06.6 Traffic Controllers

The Contractor shall advise the Project Manager of the names of proposed traffic controllers with a signed declaration that they are appropriately trained.

Hold Point 1.4	
Process Held:	Traffic Control by Traffic Controllers.
Submission Details:	At least two (2) working days prior to proposed traffic control utilising traffic controllers provide to the Project Manager names of the proposed traffic controllers and the training undertaken.
Release of Hold Point:	The Project Manager will consider the submitted document prior to authorising the release of the Hold Point.

1.07 REMOVAL OF TEMPORARY WORKS

Upon completion of the Work the temporary roadways and/or detour arrangements shall be removed and the area restored in the following manner:

(a) within the area of the permanent works finish as specified;

(b) areas outside the permanent works which were formerly developed in any way shall be reinstated to a condition equivalent to that which existed at commencement of the Contract;

(c) undeveloped areas outside the permanent works shall be reinstated as specified in Section 9 of this Specification.

1.08 CONFORMANCE CRITERIA

1.08.1 Monitoring and Records

Records

The Contractor shall undertake daily inspection of all Traffic Control Devices and temporary deviations to ensure all installations are in accordance with the approved Temporary Traffic Management Plan(s).

The Contractor shall keep records of all inspections. These records shall record all deficiencies and subsequent actions to correct deficiencies in addition to all subsequent amendments to the approved Temporary Traffic Management Plan(s) for the duration of the works.

A diary recording installation dates, operation times, and subsequent removal of temporary speed zones shall be kept by the Contractor on a daily basis and at any change in the approved Temporary Traffic Management Plan(s).

Traffic Incidents

The Project Manager is to be notified of any traffic incidents that occur within the work site without delay and not more than 24 hours after the Contractor becomes aware of the incident.

A Traffic Incident Report is to be prepared by the Contractor providing full details of the traffic incident. The Traffic Incident Report is to be submitted to the Project Manager and shall include the following information:

(a) time, date and exact location within the work site;

(b) weather conditions at the time of the incident;

(c) approved Temporary Traffic Management Plan(s) in use at the location and time of the incident;

(d) a written statement that at the time of the incident all traffic control devices were in accordance with the approved Temporary Traffic Management Plan(s) and if not, details of any non-conformance to be submitted as non-conformance reports;

(e) number of vehicles involved, injuries if any and actions taken by the Contractor.

Where a traffic incident within the work site involves injury to any parties the Traffic Incident Report shall be submitted to the Project Manager within 24 hours.

1.08.2 Nonconforming Work

Traffic Control Devices

The Contractor shall, immediately and without delay, unless otherwise directed by the Project Manager take corrective action to repair or replace all nonconforming Traffic Control Devices, in accordance with the approved Temporary Traffic Management Plan(s).

A non-conformance report shall be forwarded to the Project Manager within 24 hours for non-conformance not immediately rectified and where disposition approval is required from the Project Manager.

Where the Contractor fails to provide and maintain adequate traffic control devices as specified, the Project Manager may arrange to have such items provided and maintained.

The cost of providing and maintaining adequate traffic control devices arranged by the Project Manager shall be borne by the Contractor.

1.09 MEASUREMENT AND PAYMENT

Payment shall be made for all activities associated with completing the work detailed in this Section of the Specification in accordance with Pay Item 101P1.

Measurement and payment defined in other Sections shall exclude works only carried out to comply with this Section of the Specification.

Pay Item 101P1 Provision for Traffic

This shall be a Lump Sum item.

This pay item is to include the design, construction, maintenance and removal of temporary roadways and side tracks, opening to traffic, the provision of traffic controllers, signposting, floodlighting where necessary, road pavement markings, raised pavement markers, lights, barriers, signposting for temporary speed zoning and any other items required for the safe movement of traffic and the protection of persons and property in accordance with the approved Temporary Traffic Management Plan(s), AS 1742.3 and other requirements of the appropriate legislation.

All pavement works associated with the construction of temporary roadways and side tracks including supply of materials, placement and compaction in accordance with Section 4 of this Specification are to be included as part of this pay item.

Any damage caused to the shoulder, verge, or any other area outside the scope of these works, shall be repaired in accordance with the relevant Section(s) of this Specification, at the Contractor's expense.

Progress payments will be made on a pro-rata basis of work performed as part of this pay item, having due regard to the duration of the Contract.

1.10 SCHEDULE OF HOLD POINTS

Hold Points	Clause	Description
1.1	1.04.2	Approval of Temporary Traffic Management Plan(s)

1.2	1.06.2	Design of temporary side track
1.3	1.06.3	Opening of side tracks and detours to traffic
1.4	1.06.6	Traffic control by traffic controllers

SECTION 2

EARTHWORKS

CONTENTS

2.01 SCOPE

The works covered by this Section of the Specification comprise the formation by cutting or filling of the earthworks for roadways, paths, open drains and all incidental works other than underground services. Requirements are also laid down for the clearing and grubbing of vegetation, removal of existing structures, stripping and stockpiling of topsoil and for the final trimming and finishing of surfaces for various purposes.

Ancillary works, such as temporary drainage and soil conservation measures are also specified for the protection of permanent works during construction and the prevention of damage to the site and adjacent areas as a result of soil erosion.

2.02 STANDARDS

Work carried out and testing performed under this Section of the Specification shall comply with the
requirements of the following Standards to the extent that they are relevant and not overridden by the
Specification.

Australian Standards

AS 1289	Methods of Testing Soils for Engineering Purposes including:
AS 1289.6.1.1	Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen.
AS 1289.3.3.1	Calculation of the plasticity index of a soil.
AS 1289.5.1.1	Determination of the dry density/moisture content relation of a soil using standard compactive effort.
AS 1289.5.4.1	Compaction control test - Dry density ratio, moisture variation and moisture ratio.
AS 1289.5.7.1	Compaction Control Test (Rapid Method).
AS 2187	Explosives, Storage, transport and use
AS 2189	Explosives Glossary of Terms
AS 1348	Road & Traffic Engineering -Glossary of Terms

Other References

AUSTROADS Explosives in Roadworks, User's Guide - 1982.

Terms used to describe the various elements of pavement structure in this Section are in accordance with the definitions prescribed in AS1348, "Glossary of Terms Used in Road Engineering".

A Testing Authority shall be employed by the Contractor to carry out all testing. The Authority shall hold a current registration for the relevant tests, and a copy of results shall be forwarded to the Project Manager without delay.

2.03 PROTECTION OF THE WORKS

2.03.1 General

The Contractor's responsibility for care of the Works shall include the protection of earthworks.

The Contractor requires a Construction Permit from PUMA and this must be obtained prior to commencement of work.

No extensions of time will be granted or allowed relative to any delay with obtaining of the necessary Agreement and other approvals unless it is shown to the satisfaction of the Project Manager that all necessary steps have been taken on time by the Contractor.

Where the Contract documents include a suggested Sediment and Erosion Control Concept Plan, the Contractor is still responsible for the adequacy of those arrangements. The Contractor may choose to adopt those concept arrangements as the basis for applying for approval, or alternatively the Contractor may propose his own measures as the basis for approval.

Prior to commencement of work the Contractor must provide two copies of the Sediment and Erosion control measures plan to the Project Manager for comment at least two weeks prior to commencing work on site.

In addition to those erosion and sediment control measures suggested in the Contract documents and the
Sediment and Erosion Control Measures Plan the Contractor shall generally plan and manage the works to minimise erosion on the site.

It is expected that control measures may include the following:

. **(i) Control over surface run-off by:**
- □ construction of interception drains to divert run-off from undisturbed areas around the works area
- □ installation of temporary drains
- □ early stabilisation of floodways
- □ use of straw bales, silt fences, swales, contour ploughing or rip dozer cleat impressions, spreader banks.

. **(ii) Limit movement of vehicles and equipment to:**
- □ a single approved stabilised construction entrance
- □ prepared parking areas by the construction of temporary fencing.

. **(iii) Minimise the area exposed by:**
- □ staging of clearing operations
- □ progressive stabilisation of the works as completed
- □ provision of temporary grassing
- □ contour ploughing to disturbed areas.

. **(iv) Construction of sediment control measures such as:**
- □ sediment retention ponds,
- □ sediment basins
- □ sediment traps (various types)
- □ silt fences
- □ buffer zones

Where the approved control measures include sediment retention ponds, and notwithstanding the requirements arising elsewhere in the Contract documents or from PUMA then:

a) The ponds shall be kept empty of water for the longest practical duration. During periods of high in-flow of water and sediment, causing overtopping over the pond spillway, the Contractor shall regularly test the quality of the waters being released and treat the water with chemicals as and when necessary in order to achieve a water quality for the released water complying with legislation and licence(s) and to maintain sufficient residual gypsum or an acceptable chemical in solution to sustain treatment of subsequent inflow. When there is an inflow which is insufficient to cause overtopping over the pond spillway, then the water is to be treated as necessary and emptied within three days of the inflow occurring.

b) The Contractor shall remove and dispose of accumulations of materials from the ponds as often as is necessary to maintain their interception capacity to at least ninety percent (90%) of the design volume of the pond.

c) The Contractor shall develop and implement procedures and a programme and provide all necessary equipment, materials and labour to carry out water testing; calibration test; dosing with chemicals; and the controlled release of waters so as to comply with the requirements of the legislation and licence. The testing procedure shall be developed using a turbidity meter which shall be calibrated with a series of test results on water samples with a range of Non-Filterable Residue levels. The Contractor shall arrange laboratory tests for Non-Filterable Residue and obtain advice on dosage rates ensuring that the pH is within acceptable limits, and then if possible develop a simple field correlation technique for assessing the suitability of the water for release. Dosing can be carried out using an acceptable chemical such as gypsum, using simple slurry mixing and spreading technique designed to achieve acceptable water quality. Gypsum is preferred because it does not change the pH and unless there are problems in effectiveness it shall be the chemical used.

Unless specified elsewhere within the Contract, or directed otherwise by the Project Manager, then the sediment and erosion quality control measures will be provided, operated and managed, maintained or replaced as necessary for the period of the contract, including the consolidation period and/or the Defects Liability Period as required to fulfil the requirements of the relevant Act.

2.03.2 Protection of Earthworks

Protect earthworks and in particular road formations from the effects of erosion and deposition. Grade earthworks and particularly subgrades to drain at all stages without ponding. Where run-off must cross the formation, ensure that the stream is a broad sheet flow which crosses roughly at right angles to the alignment and minimises the likelihood of subgrade softening.

When rain is likely or when work is not proposed to continue in a working area on the following day, precautions shall be taken to minimise ingress of any excess water into earthworks material. Ripped material remaining in cuttings and material placed on embankments shall be sealed off by adequate compaction to provide a smooth tight surface.

Should insitu or stockpiled material become over wet as a result of the Contractor not providing adequate protection of earthworks, the Contractor shall be responsible for replacing and/or drying out the material and for any consequent delays to the operations**.**

2.03.3 Stockpiles

Where locations are not nominated in the documents, place stockpiles to minimise effects on site and adjacent areas. Keep clear of tops of slopes to avoid causing instability.

Locate stockpiles clear of natural drainage lines and provide temporary drainage as necessary.

Stockpile material is to be placed to avoid damage to existing flora etc. Where directed by the Project Manager stockpiles shall be temporarily grassed.

2.03.4 Protection of Completed Earthworks

In areas where earthworks, including open drains, have been completed and no further treatment is specified other than topsoiling and grassing or hydroseeding, then the topsoiling and seeding shall be carried out as specified at the earliest practicable date.

Areas of exposed completed earthworks shall, if directed, be stabilised using temporary grassing, within 28 days of formation.

2.03.5 Reinstatement

Fill temporary drains and remove structures when no longer required. Filling shall be placed and compacted as specified later in this Section. Reinstate surfaces (including areas formerly occupied by stockpiles) as follows:

- within the area of the permanent works finish as specified;
- areas outside the permanent works which were formerly developed in any way shall be reinstated to their condition at commencement of the Contract;
- undeveloped areas outside the permanent works shall be reinstated as specified for "Grassing".

2.04 CLEARING AND GRUBBING

2.04.1 General

Unless otherwise specified, remove all vegetation, logs, stumps, boulders, roots, scrub, debris and dumped material and items within the limits of clearing. Demolish and dispose of any minor man-made structures (such as fences and livestock yards), all rubbish and other materials that are unsuitable for use in the Works. Grass and topsoil shall not be removed as part of this initial clearing.

In advance of clearing and grubbing operations, effective erosion and sedimentation control measures shall be implemented in accordance with this Specification.

All trees and stumps, on or within the limits of clearing, unable to be felled and removed by the clearing methods used by the Contractor shall be removed by grubbing. Grub out stumps and roots over 75mm diameter to a minimum depth of 0.5m below the natural surface or 1.5m below the finished surface level, whichever is the lower. Backfill grub holes with suitable spoil from excavations compacted in layers to the density of the surrounding undisturbed soil.

The Contractor shall take all measures to prevent damage to existing underground and overhead utility services.

Every precaution shall be taken to prevent timber from falling on private property and the Contractor shall dispose of any timber so fallen or produce the written consent of the owner to its remaining there. The cost of disposal of such fallen timber shall be borne by the Contractor. Prior to entering private property, the Contractor shall obtain consent from the Project Manager and the property owner.

Damage of any kind, including damage to trees and fencing occurring during clearing operations shall be made good by the Contractor. The cost of repair of such damage shall be borne by the Contractor.

Limits of clearing are defined as lines one metre outside the intersections of excavation or embankment slopes with the natural surface or the outside limits of slope rounding together with any other limits detailed. For services trenches outside the general limits of clearing, limit of clearing is defined as trench width plus one (1) metre either side of the trench. The Contractor shall ensure that only the absolute minimum necessary for construction is cleared.

Hold Point 2.1	
Process Held:	Clearing operations within any given area.
Submission Details:	At least seven (7) working days prior to commencement of clearing the Contractor shall give notice of intention to commence clearing operations within any given area
Release of Hold Point:	The Project Manager will mark or indicate to the Contractor the trees that are to be retained, prior to authorising the release of the Hold Point.

2.04.2 Care of Trees

Protect trees marked to be retained by means of temporary fence. Fences normally shall be located no closer to the tree than the edge of the canopy unless specified otherwise.

Vehicles and plant shall not be parked under existing tree canopies. Refuelling and storage of chemicals and fuel shall not be permitted beneath existing tree canopies.

If plant operation close to trees to remain is unavoidable, lash timber offcuts upright around the trunks in lieu of fencing. Offcuts shall be 1.5m high and spaced at no more than 100mm around trunks. Lower ends shall touch the ground. Sawn faces shall be outermost and painted white. The Project Manager may direct that levels be adjusted in the vicinity of trees to minimise the effects of excavation or filling.

Work within three (3) metres of trees to be protected shall be carried out by hand to avoid damage by equipment. Cut roots neatly in the line of the work before commencing machine excavation. All cut surfaces shall be coated with suitable bitumen based paint. Roots that are greater than 30mm diameter measured at a distance of three (3) metres from the tree trunk shall not be cut without prior approval from the Project Manager.

If any tree is damaged during the course of the work, the Project Manager may direct the Contractor to effect repairs or remove and replace the tree. Alternatively, the Project Manager may make arrangements for repair or replacement at the Contractor's expense. Damage to trees shall also include damage to bark and root systems.

The Contractor shall plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified or directed by the Project Manager. No growing trees shall be destroyed or damaged by the Contractor other than those specified and those indicated by the Project Manager.

Where branches intrude on the working area, any necessary trimming shall be carried out by a tree surgeon approved by the Project Manager.

2.04.3 Disposal of Material

Unless otherwise specified, all materials cleared and grubbed in accordance with this Specification shall become the property of the Contractor and shall be removed from the site and disposed of legally.

Unless otherwise specified elsewhere, disposal of timber and other combustible materials by burning shall not be permitted. Where permitted, the Contractor shall comply with all Statutory requirements applicable to burning off, and any such burning off shall be carried out in such a manner that no damage is done to any trees outside the limits of clearing. Smoke resulting from such burning off shall not cause a traffic hazard or a nuisance to adjacent landholders.

2.04.4 Chipping of Cleared Vegetation

The Contractor may produce wood-chip mulch derived from crowns of trees and branches of shrubs cleared under this Specification. The wood-chip mulch produced shall be stockpiled for subsequent use in accordance with the Section 9 of this Specification or for use at other locations as appropriate

The wood-chip mulch shall be produced from branches having a maximum diameter of 100 millimetres and the chipped material produced shall not have two orthogonal dimensions exceeding 75mm and 50mm.

2.05 EXCAVATION

2.05.1 General

Excavate to conform to the lines, grades, cross sections and dimensions shown on the drawings. The Project Manager may order the removal of any soft spots, debris or organic material exposed when excavated areas have been trimmed to finished formation levels. Remove all rocks and boulders which protrude above finished surfaces of subgrades.

Except as specified in Clause 2.07.2, excavation below finished formation levels shall be made good as specified for filling.

Separate the best granular materials from excavations for use in the upper layers or fill subgrades.

Should the Contractor propose to claim payment for adjustment to quantities of excavation due to the inaccuracy of the surface levels shown on the drawings or in the ground model supplied by the Project Manager, he shall, prior to any disturbance of the existing surface, notify the Project Manager.. Failure to notify the Project Manager will mean that the levels shown on the drawings or in the ground model supplied by the Project Manager will be taken to be correct. If the subsequent check survey reveals the survey shown on the drawings to be correct, then the Contractor shall bear the cost of the check survey.

Process Held:	Earthworks operations within any given area.
Submission Details:	At least seven (7) working days prior to commencement of earthworks operations in any given area, if the Contractor considers areas of the ground survey shown on the drawings to be inaccurate, the Contractor shall give notice of intention to commence earthworks operations within that area.
Release of Hold Point:	The Project Manager will check the survey of the area in question, prior to authorising the release of the Hold Point.

Rock outcrops worthy of retention as landscape features shall be preserved as directed on site. Provide for the protection of rock outcrops where detailed to avoid damage, staining and scarring. Rock surfaces shall be left clean and free of spilled soil or debris. During construction and as directed, rock surfaces shall be covered with soil to a depth of approximately 300min and washed off at the conclusion of construction work.

The Contractor shall be responsible for any assumptions made by the Contractor in relation to the nature and types of the materials encountered in excavations and the bulking and compaction characteristics of materials incorporated in embankments.

The estimated quantity for general earthworks at any cutting includes all types of materials which may be encountered in the cutting.

Where material from excavations is acceptable for use in embankments, but the Contractor elects to:-

a) Spoil it, or
b) Use it for the Contractor's own purposes; or
c) Use it as a source of pavement materials; or
d) Construct embankments with dimensions in excess of those specified.

and a deficiency of material for embankment construction is thereby created, the Contractor shall make good that deficiency from sources of material meeting the quality requirements specified in Clause 2.06.2. The cost of making good such deficiency of material shall be borne by the Contractor.

2.05.2 Stripping and Stockpiling of Topsoil

Prior to the commencement of earthworks topsoil is to be stripped within the limits of the earthworks. In particular topsoil is to be stripped from any areas to be covered by paving, structures or fill. Also strip topsoil within the limits of clearing for underground services beyond the limit of earthworks. Unless otherwise directed, the depth of stripping shall be to the bottom of the grassroots zone. Grass shall be stripped together with topsoil. Avoid contamination by any other material. Unless otherwise specified soils shall not be stripped from around existing trees closer than a distance equal to twice the radius of the trees crown measured from the trunk.

The Contractor shall obtain the written consent of the Project Manager to the use of any stockpile site which is not shown on the drawings. Proposals in this regard shall be submitted at least three working days before stockpiling is due to commence and shall specify the maximum dimensions of the proposed stockpile.

Process Held:	Stockpiling at any site not shown on the drawings.
Submission Details:	At least three (3) working days before stockpiling is due to commence the Contractor shall submit details of the location of proposed stockpile sites specifying the maximum dimensions of the proposed stockpile and proposed protective measures.
Release of Hold Point:	The Project Manager will review the submission, prior to authorising the release of the Hold Point.

Any clearing and grubbing required for these sites shall be carried out in accordance with Clause 2.04 of this Specification. Temporary erosion and sedimentation control measures shall be taken in accordance with the specified requirements.

Topsoil stockpiles shall not exceed 2.5m in height and the maximum batter slope shall not exceed 2:1. If stockpiles are to remain unused for more than four (4) weeks, topsoil stockpiles shall be sown as specified for "Temporary Grassing". Restoration of stockpile sites following completion of the work shall be carried out in accordance with Section 9 of this Specification.

2.05.3 Use of Explosives

General

Storage, transport and handling of explosives shall comply with the requirements of AS 2187, parts 1 and 2. On-site magazines shall comply with AS 2187. The Contractor's attention is drawn to the AUSTROADS publication "Explosives in Roadworks, Users Guide – 1982". This document supplements the rules contained in the Australian Standards and prescribes practices and precautions in the use of explosives in roadworks. Adopt these practices to the extent that they are consistent with the requirements of local legislation. Take particular note of the requirements of Sections 4, 5, 7, 9, 11, 12 and 14.

Before the start of blasting operations, the Contractor, in the presence of the Project Manager, shall conduct a survey to determine and record the existing condition of all structures likely to be affected by any blast.

Structures shall include public utilities. The survey shall include all structures within 500m of any blast but shall be extended where the maximum instantaneous charge proposed is likely to produce peak particle velocities greater than allowable at structures more remote from a blast site. A written report of the survey, supported by photographs where necessary, together with a list of any existing defects in the structures, shall be submitted to the owner of each structure and to the Project Manager before blasting commences.

Drilling and blasting operations shall not commence without the approval of the Project Manager. The Contractor shall give notice of intention to commence drilling for blasting. The Contractor shall provide details of proposed drilling, blasting and excavation techniques including proposed maximum instantaneous charge, quantity and type of explosive, blasting patterns, methods to limit noise and vibration, pre-splitting details and condition survey details of rockbatters. In the event of rejection of a proposal it shall be revised and resubmitted.

Process Held:	Drilling and blasting operations
Submission Details:	At lest five (5) working days before proposed drilling and blasting is due to commence the Contractor shall submit details of proposed drilling and blasting techniques and a condition survey.
Release of Hold Point:	The Project Manager will review the submission, prior to authorising the release of the Hold Point.

During blasting operations, erect signs as specified in Section 1 of this Specification. Sound audible warnings as specified in AS 2187.

Blasting in the vicinity of public utilities shall be subject to any limitations imposed by controlling authorities. Special or unusual limitations are noted on drawings or in the Contract. Obtain clearance from the Project Manager before blasting within 15m of any public utility.

Written notice shall be given to the occupants or their representative of residential or business premises located within a 1km radius of the blasting site. The notice shall include time of blasting, frequency, duration, purpose, precautions being taken to prevent property damage and contact details for the Contractor for enquiry. Provide reports of all enquiries and action taken to the Project Manager.

Ground vibration caused by blasting shall not exceed the values of peak particle velocity listed in Table 2.1.

Table 2.1

Point of Potential Damage (within 1km of blasting site)	Peak Particle Velocity
Completed and cured bridge structures or sub-structures (eg completed abutment)	*25mm/sec*
Bridgeworks and structural retaining walls under construction	*20mm/sec*
Residential premises, schools, hospitals and other buildings	*5mm/sec* *(with 10% not to exceed 10mm/sec)*
Buildings or monuments of historical significance	*2mm/sec*

The requirements of this clause and the fact that the Project Manager may have approved blasting proposals shall not relieve the Contractor of the responsibility to plan and conduct blasting operations safely and with a minimum of inconvenience to the public. The Project Manager may monitor vibrations resulting from blasting as a check on compliance with code requirements. Provide copies of blasting records to the Project Manager.

No person shall receive explosives unless that person is authorised by or under the appropriate Act. Any person intending to use explosives must be licensed to do so in Samoa and shall have obtained an approved "Blast Plan" containing all of the information requested in the application form.

Storage of explosives shall be strictly observed and shall be in accordance with the relevant legislation.

Blasting Records

The Contractor shall maintain accurate records of each blast showing the details listed below:

- □ Date and time of blast
- □ Location, number and diameter of holes loaded
- □ Depth of each hole loaded
- □ Inclination of holes
- □ Maximum and minimum burden
- □ Types of explosives used
- □ Charge distribution in each hole

- Maximum instantaneous charge
- Delay periods and sequence
- Total amount of charges in the blast
- Length and type of stemming in each hole

Control of Air Blast Over-Pressure

Where a noise sensitive location exists within 1km of a blast site, the Contractor shall control air blast over-pressure. The noise emanating from blasting operations shall not exceed an over-pressure level of 115 decibels (linear peak) at any noise sensitive location (such as residential premises, schools or hospitals). Up to 10 per cent of the total number of blasts may exceed this value provided a level of 120 decibels is not exceeded at any time.

The Contractor shall arrange for monitoring of air blast over-pressure to ensure compliance with the specified limits. All monitoring shall be carried out by personnel possessing current registration for such monitoring. All test results shall be reported on test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this Specification. In general, a monitoring location will be near the perimeter of the noise sensitive location at the point closes to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Project Manager.

In the event that the measured air blast over-pressure exceeds the specified limits, the Contractor shall suspend further blasting work and shall submit to the Project Manager proposals detailing any additional steps and precautions the Contractor shall take to ensure that for any future blast, the limiting over-pressure shall not be exceeded. The Contractor shall not resume any blasting until such proposals have been submitted.

Control of Ground Vibration

The Contractor shall arrange for the monitoring of ground vibrations to ensure compliance with the peak particle velocity shown in Table 2.1. All monitoring shall be carried out by personnel possessing registration for such monitoring. All test results shall be reported on test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this Specification. In general, a monitoring location will be near the perimeter of the structure or building at the point closes to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Project Manager.

To minimise the risk of peak particle velocity limits being exceeded, the Contractor shall develop a blasting site relationship between peak particle velocity, distance and blasting charge.

For the first blast, monitors shall be set up at not less than five points at varying distances away from the blasting site. The Maximum Instantaneous Charge for the first blast shall not exceed that calculated from the following formula:

$$MIC = 0.5\left(\frac{D}{PPV^{1.625}}\right)^2 1140$$

Where MIC = Maximum Instantaneous Charge in kilograms
D = Distance in metres from charge to the point of damage
PPV = Limiting peak particle velocity from Table 2.1

A log-log (base 10) graph of measured peak particle velocity (vertical axis) versus Scaled Distance (horizontal axis) shall be plotted, where

$$ScaledDistance = \frac{D}{\sqrt{MIC}}$$

The mean regression line shall be obtained by the least squares method.

For subsequent blasts, the MIC and other aspects of blast design may be adjusted to provide further ground vibration monitoring is undertaken and the mean regression line redetermined to demonstrate that peak particle velocity limits are not exceeded. The Contractor shall make regression line plots available to the Project Manager, if so requested.

2.05.4 Disposal of Surplus Spoil

Unless otherwise specified, surplus material from excavations may be disposed of on site by:

(a) uniform widening of embankments; or

(b) uniform flattening of fill batters; or

(c) uniform filling of selected areas within the road reserve.

If not already cleared, dumping sites shall be cleared and grubbed to the extent necessary before any material is deposited. Strip topsoil as specified in Clause 2.05.2 and set aside for later respreading over the dumped spoil.

Unless other treatments are specified, respread topsoil on completion of dumping and grass as specified for "Grassing".

In the event that suitable disposal areas are not available on site, the material shall be carted to dumping locations nominated by the Project Manager.

Spoil transported to off-site dumps shall be placed in stockpiles within the cleared areas. Level off heaps as necessary to allow access for vehicles to dump on top of previously placed material and to present a neat appearance on completion.

Process Held:	Commencement of spoiling operations.
Submission Details:	At least three (3) working days before spoiling is proposed to commence the Contractor shall submit a plan or advice on the proposed spoil areas.
Release of Hold Point:	The Project Manager will consider the plan / advice prior to authorising the release of the Hold Point

2.05.5 Ripping of Access Tracks

Existing access tracks shall be ripped to a minimum depth of 300mm. All cultivations to be parallel to the final contours. Remove stones larger than 50mm from the surface after ripping.

Omit ripping where rock outcrops are evident or where material cannot be dislodged by a ripper mounted on a tractor of comparable performance to a Caterpillar D6.

2.05.6 Unsuitable Material

Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth for stripping topsoil beneath embankments, which the Project Manager deems to be unsuitable for embankment or pavement support in its present position. Unsuitable material also includes material in cuttings which the Project Manager deems to be unsuitable for embankment construction.

Such material shall be excavated to the extent directed by the Project Manager. Material removed as unsuitable shall be incorporated in to the works in accordance with Clause 2.05.4 above or removed from site, as directed by the Project Manager.

The unsuitable material which is removed from below fill embankments greater than 1.0m deep or the face of cuttings shall be replaced with fill material and compacted in accordance with the requirements of Clause 2.06.

Unsuitable material which is removed from the floor of cuttings or below fill embankments less than 1.0m deep shall be treated as unsuitable subgrade material and replaced and compacted in accordance with the requirements of Clause 2.07.6.

All costs associated with reworking or replacing any material that the Project Manager deems to have become unsuitable because of inappropriate construction activities shall be borne by the Contractor. 2.05.7 Transition from Cut to Fill

After the removal of topsoil and before the excavation of any cutting commences the Contractor shall survey and mark the position of the intersection line between cutting and embankment occurring at the underside of the pavement.

Following excavation to the cutting floor, a terrace shall be excavated for the width of the pavement to a depth of 600mm below and parallel to the cutting floor, as shown in Figure 2.1.

The terrace shall extend into the cut to the point where the cutting floor is 600mm below the original stripped surface, or a distance of 20 metres, whichever is the lesser.

The material excavated shall be either incorporated in the embankments or spoiled as directed by the Project Manager. Material incorporated in embankments shall be included in the excavated volume for General Earthworks and material spoiled shall be included in the excavated volume of Unsuitable Material to Spoil.

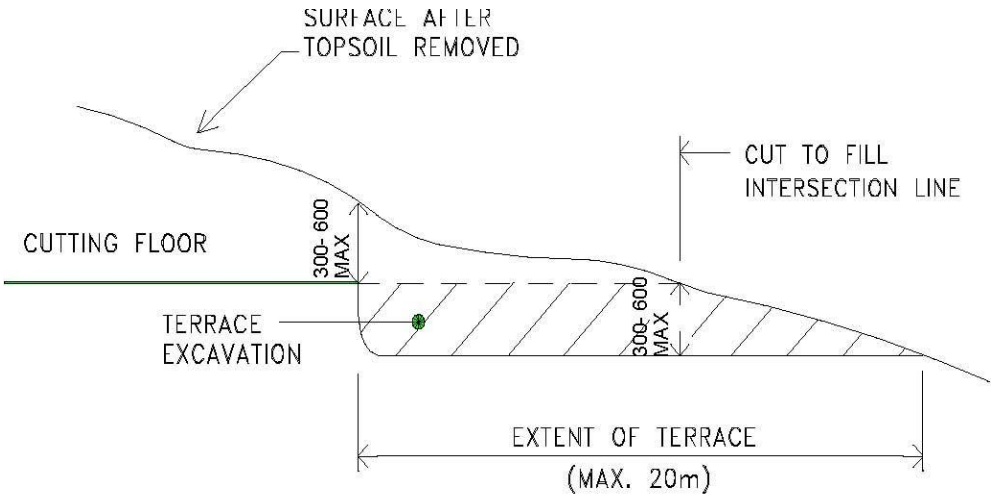

Figure 2.1 - Treatment at Intersection Line between Cutting and Embankment

2.06 FILLING

2.06.1 General

Place and compact filling to conform to the lines, grades, cross-sections and dimensions shown on the drawings. Allow for the thickness of materials which will be placed in subsequent operations.

Before filling commences the Contractor shall make available for inspection, by the Project Manager, the foundation of the embankment. The Project Manager may order the removal of any soft spots, debris, organic material, or other unsuitable material exposed when the nominal depth of topsoil has been stripped. This additional stripping may extend to a depth of 300mm below the general depth of stripping. The Project Manager may also direct the removal and replacement of such unsuitable material in accordance with Clause 2.05.6.

Process Held:	Commencement of filling operations.
Submission Details:	At least three (3) working days before filling is due to commence the Contractor shall present prepared foundation and written advice that filling is about to commence
Release of Hold Point:	The Project Manager will inspect the foundation and order the removal of any unsuitable material, prior to authorising the release of the Hold Point

Foundations of shallow embankments which are of a depth less than 1.0 metre from the top of pavement to natural surface shall be inspected and tested to determine if the material meets road subgrade requirements. Material in the foundations for shallow embankments which does not meet the requirements for road subgrade shall be deemed unsuitable in accordance with Clause 2.07 and shall be replaced by material of the specified quality.

Foundations for shallow embankments shall be prepared for embankment construction after removing topsoil and unsuitable material, by loosening the material exposed to a depth of 200mm, adjusting the moisture content of the loosened material and compacting as specified in Clause 2.07. The Contractor shall use equipment and techniques to minimise surface heaving or other foundation damage.

For all other embankments the foundation shall be prepared by grading and levelling the general area, adjusting the moisture content where necessary and compacting the top 200mm as specified in Clause 2.06.5.

In areas of fill which are to be topsoiled, use the loamier of the available materials in the top 150mm below the topsoil. The material shall be free of particles greater than 75 mm.

If directed, make rollers available for the test rolling of stripped surfaces.

Where fills are to be constructed on hillsides or against existing fills, slopes which are steeper than 1:10 shall be benched and roughened across the slope to allow placement of filling in layers and to prevent slip failures at the interface.

Provide for the drainage of benches during construction.

2.06.2 Materials

Unless otherwise specified or directed the materials used for filling shall be obtained from cuttings. The Contractor will be required to manage and sort the materials so obtained from cuttings to ensure that the best available material, that is the most granular and least plastic is available for use in road embankments and that any loam material obtained from cutting is used for general fill the top layers of which are to be grassed.

Material used in the top 150mm below subgrades shall be free of particles larger than 75mm, material used in the top 600mm below subgrades shall be free of particles larger than 150mm and material used in the top 1 m below subgrades shall be free of particles larger than 300mm. Elsewhere rock material shall be broken down to less than 600mm unless otherwise permitted.

Rock material shall be broken down and evenly distributed through the fill material, and sufficient fine material shall be placed around the larger material as it is deposited to fill the voids and produce a dense, compact embankment.

Stony patches with insufficient fine material to fill the voids shall be reworked with additional fine material being blended in to achieve a dense, compact upper layer. The cost of any reworking shall be borne by the Contractor.

After compaction, embankment material in the subgrade zone(s) below the pavement material (select material layer or subbase layer, where there is no select material layer) shall conform to the requirements of Clause 2.07.4.

The Project Manager may direct that material unsuitable for road embankments be used elsewhere on site or run to spoil. If this should result in a deficiency of material available for filling, then additional material shall be obtained as specified in Clause 2.06.3.

2.06.3 Borrow

Borrow pits will not be permitted on site unless prior written approval is obtained from the Project Manager. In seeking such approval the Contractor shall provide adequate information on the proposed borrow pits including size, location and reinstatement.

The Project Manager may approve the winning of additional material on site by:

(a) uniform widening of cuttings; or

(b) uniform flattening of cut batters; or

(c) uniform grading of selected areas within the site

Borrowing from external sources will not be permitted where suitable material is available on site. Where borrow from external sources is proposed in the design, borrow areas are detailed. Alternatively, the Contractor may elect to supply material obtained from his own sources. In all cases, obtain necessary permits before commencing borrowing operations.

Where material is obtained from borrow pits the pit area shall first be cleared and stripped of topsoil. On completion of winning operations, grade the pit to remove abrupt changes of slope or level, respread topsoil and grass as specified for "Grassing". Provide drainage and erosion protection as necessary. Pits shall be free draining.

2.06.4 Compaction

Place and compact filling in uniform layers of thickness appropriate to the nature of material and the compaction equipment being used. Layers shall extend for the full width of embankments and shall be placed such that they are parallel to the finished surface. In earth fills

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 the appropriate density prescribed in Table 2. 2. Where area is to be planted or grassed, the top 500mm is to be compacted to a level not exceeding 85% of the modified maximum dry density.

During compaction maintain moisture content of fill in the range OMC ± 2% by drying or the addition of moisture as appropriate. Water spraying equipment used for this purpose shall be capable of distributing water uniformly in controlled quantities over uniform lane widths. Mix mechanically to ensure uniform distribution of moisture before commencing rolling.

Where clay is used as filling it shall be taken directly from the excavation to the fill site, placed and compacted without delay to prevent drying beyond the specified limit. If clay, when excavated, has a moisture content less than the specified minimum, the Contractor shall undertake one or more of the following actions:

- prior to winning and loading or after placement in the fill the material be pulverised by a suitable mechanical stabilising machine, wetted as necessary and mixed thoroughly to a uniform moisture content within the specified limits.

- the material be stockpiled and watered as necessary until it has reached a uniform moisture content within the specified limits.

- part or all of such material be declared unsuitable for use as filling and run to spoil.

In areas inaccessible to rollers normally considered appropriate to achieve the specified compaction, compaction shall be carried out using smaller rollers or suitable mechanical tampers. Reduce layer thicknesses as necessary to ensure the achievement of specified densities.

2.06.5 Backfilling at Structures

Unless otherwise permitted, no filling shall be placed against concrete bridge abutments, wing walls or retaining walls within fourteen days of casting. Strut walls as necessary to prevent movement during placing and compaction.

Place and compact filling over and around pipes, culverts, bridges and other structures so as to avoid unbalanced loading or movement.

Unless otherwise detailed, the abutments and wings of bridges shall be filled as follows:

- Where the gap between the structure and undisturbed ground is less than 900mm, backfill with subbase material complying with Clause 4.03.2(ii).

- Where the gap between the structure and undisturbed ground exceeds 900mm but is less than 2m, backfill with select material as defined in Clause 4.03.2 (iii).

- Where the gap between the structure and the undisturbed ground exceeds 2m, backfill the zone within 2m of the structure with select material as defined in Clause 4.03.2 (iii) and backfill in the zone beyond 2m of the structure with general fill complying with Clause 2.06.2.

Unless otherwise detailed, material within 300mm of weepholes shall be coarse filter medium complying with Clause 3.06. 1.

2.07 SUBGRADE PREPARATION

2.07.1 Subgrade Levels

The Contractor shall notify the Project Manager when earthworks have progressed to a stage where the nature of subgrade material can be assessed. The Project Manager may order the removal of unsuitable material or other treatments including variations in pavement thickness to allow for the subgrade materials actually encountered.

Process Held:	Final preparation of subgrade in accordance with Clause 2.07
Submission Details:	At least one (1) working day prior to reaching subgrade level the Contractor shall provide notification that subgrade level will been reached .
Release of Hold Point:	The Project Manager will inspect the subgrade and may direct removal of unsuitable or further action prior to authorising the release of the Hold Point

2.07.2 Cut Subgrade

The floors of cuttings shall be excavated, parallel to the designed grade line, to a designed floor level which shall be at the underside of the pavement. The floors shall be excavated to a level of not more than 50 mm above or below the designed floor level.

The CBR of the material in the floors of cuttings shall be determined by Test Method AS 1289.6.1.1.

All material remaining in the floor shall then be ripped or loosened to a minimum depth of 150 mm below the designed floor level for the width of the pavement to 150mm behind kerb or as shown on the Drawings. The maximum dimension of particles in the ripped or loosened zone shall not exceed 100 mm after recompaction.

Process Held:	Recompaction of floors of cuttings.
Submission Details:	At least one (1) working day prior CBR results of material in the floors of cuttings and notification that the floor has been ripped and compacted
Release of Hold Point:	The Project Manager will consider the submitted test results, inspect the excavated floor and may direct further action prior to authorising the release of the Hold Point

The ripped or loosened material or replaced or treated material shall be recompacted in accordance with Clause 2.06.4. No account shall be taken of the volume involved in loosening when measuring the volume of excavations except that where material has been declared unsuitable.

After recompaction, the floors of cuttings shall be trimmed parallel with the finished wearing surface so that their levels do not vary from the designed floor levels by more than the tolerances specified in Clause 2.09.2.

Trim cut subgrade in earth to an even surface free of loose material and compact as specified in Clause 2.06.4 to the density prescribed in Table 2. 2. Excavation below design levels by less than 100mm other than that made for the purpose of removing roots and boulders or replacement of unstable material shall not be backfilled but made good by increasing the thickness of the lowest pavement layer. Grade depressions to drain to the edge of formation, or tyne, rip, top-up and re-compact.

2.07.3 Rock Subgrade

Remove all loose rock from the surface.

Treat the rock surface so that water cannot accumulate at any point. This shall be achieved by constructing subgrade drains to connect depressions to the stormwater system or to longitudinal subsoil drains. Subgrade drains shall be at least 150mm wide and shall be cleared of all earth and debris. Backfill depressions and subgrade drains with coarse filter medium complying with Clause 3.06.1.

2.07.4 Fill Subgrade

Trim subgrade to an even surface free of loose material to the tolerances specified in Clause 2.09.2.

After compaction, embankment material in the subgrade zone(s) below the underside of pavement (select material layer or subbase layer, where there is no select material layer) shall have a CBR value not less than that quoted on the drawings for the depth(s) specified on the drawings (or where not quoted on the drawings shall have a CBR value of not less than 3 for a depth of not less than 1m). For the purpose of this Clause, the CBR value of the material shall be determined by Test Method AS 1289.6.1.1.

2.07.5 Clay Subgrade

Subgrade comprising clay soils of medium to high (CL/CH) and high (CH) plasticity needs to be retained moist within the range of –1% to +3% of standard optimum moisture content. To prevent drying out and to limit possible surface heave, immediately after compaction the subgrade should be covered by the first select fill or pavement layer.

2.07.6 Unsuitable Subgrade Materials

Unsuitable and sensitive materials such as silt or organic matter shall be removed from cut subgrades to the extent directed by the Project Manager. Soft clay normally will not be regarded as being unsuitable material.

Holes so formed shall be backfilled with selected fill from excavations, or imported material. Both shall comply with the following requirements:

- Maximum size 75mm
- A soaked California Bearing Ratio (CBR) of not less than that shown on the drawings (or where not quoted on the drawings shall have a CBR value of not less than 3). The CBR value of the material shall be determined by Test Method AS 1289.6.1.1.

Backfill material shall be compacted to the density specified in Table 2.2.

2.07.7 Subgrades Affected by Moisture

When a sub-grade is unable to support construction equipment, or it is not possible to compact overlying pavement, only because of subgrade moisture content, then one or more of the following alternative actions may be taken:

a) allow the subgrade to dry to a moisture which will allow compaction and the placement of pavement material;

b) scarify the subgrade to a minimum depth of 150mm and work as necessary to accelerate drying. Recompact as specified when moisture content approximates optimum;

c) excavate the soft material and place and compact selected materials to the standard specified in Clause 2.07.6.

The approach to be adopted shall be at the Contractor's discretion and expense. No extensions of time will be granted in respect of any delay due to wet sub-grade unless it is demonstrated to the satisfaction of the Project Manager that the sub-grade moisture content is due to other than the Contractor's work practices.

2.08 TRIMMING AND FINISHING OF SURFACES

Unless otherwise specified, all areas within the limits of clearing and outside the limits of earthworks shall be graded to an even surface. Trim ridges and fill depressions as necessary to produce a surface which will drain freely and is suitable for the operation of tractor mounted mowers.

Trim batters in cut and fill to shapes shown on drawings. Cut and fill batters are to be trimmed to the tolerances specified in Clause 2.09.2 unless otherwise directed by the Project Manager.

2.09 BEDDING LAYER FOR CONCRETE

2.09.1 Materials

Unless otherwise specified or directed, the material used for bedding layers for cast in situ concrete culverts shall be base-course material complying with the requirements of Clause 4.03.2.

2.09.2 Compaction

Place and compact filling in uniform layers of thickness appropriate to the nature of material and the compaction equipment being used. Layers shall extend for the full width of embankments and shall be placed such that they are parallel to the finished surface. 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 the appropriate density prescribed in Table 2. 2.

In areas inaccessible to rollers normally considered appropriate to achieve the specified compaction, compaction shall be carried out using smaller rollers or suitable mechanical tampers. Reduce layer thicknesses as necessary to ensure the achievement of specified densities.

2.10 CONFORMANCE CRITERIA

2.10.1 Compaction Conformance

Compaction conformance requirements for work carried out under this Section of the

Specification are itemised in Table 2.2.

Table 2.2

Item	Compaction Requirement
1. Backfilling of grub holes.	Density of surrounding undisturbed soil.
2. Replacement of unsuitable material in cuttings other than subgrades.	As for Item 1
3. Replacement of over excavation other than as provided for by Cl. 2.07.2.	As for Item 4 or 5 as relevant.
4. General fill and foundation of embankments.	90% of modified maximum dry density
5. Top 1.0m of road embankments.	95% of modified maximum dry density.
6. Backfill within 2m of structures.	95% of modified maximum dry density in roadways. 90% of modified maximum dry density in other areas
7. Replacement of unsuitable subgrade material.	95% of modified maximum dry density.
8. Cut subgrade in granular soils and clay soils having soaked CBR>3.	95% of modified maximum dry density.
9. Cut Subgrade in clay soils having a soaked CBR <3 or = to 3.	90% of modified maximum dry density (i)
10. Foundation of shallow embankments.	95% of modified maximum dry density.
11. Bedding Layer under concrete structures.	95% of modified maximum dry density.

Notes on Table 2.2

(i) Moisture content to be in the range of -1 % to +3 % of the optimum moisture content

Each successive layer shall not be commenced until the underlying layer has proved to be conforming following inspection and/or testing.

The Project Manager may relax compaction requirements in the lower layers of deep embankments constructed over soft ground. This relaxation will be allowed only in the first 600mm of fill.

The Project Manager may request proof rolling to determine the adequacy of the compactive effort.

2.10.2 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 2.3.

Table 2.3	
Item	**Tolerance**
1. Cut subgrade in earth	Level: + 25mm -Unspecified. Straightness: 20mm maximum departure from 3m straightedge both ways
2. Cut subgrade in rock	Level : + 25mm - Unspecified Straightness : Unspecified
3. Fill subgrade	Level: + 25mm -Unspecified. Straightness: 20mm maximum departure from 3m straightedge both ways.
4. Unpaved areas in cut or fill	Level ± 10mm in main road verges Level ± 50mm in subdivision verges Level + 150mm in batters
5. Rock batters	Level : + 300mm

2.10.3 Sampling and Testing

All laboratory testing of work carried out under this Section of the Specification shall be performed in accordance with procedures specified herein.

Work under this Specification shall be subdivided into lots or discrete work areas. The Project Manager shall have the right to reject a lot which is visually non-homogeneous and/or non-representative.

The specified testing shall be taken at the random test locations established in each lot in accordance with the specified minimum testing frequency in Clause 2.10.4. Prior to testing the Contractor shall work the lot to ensure uniform moisture content and compaction of all material within the lot.

The test/s then taken shall be considered to represent the total volume of material placed within the lot.

The compaction requirements specified in Table 2.1 are minimum requirements. When density tests are carried out on a lot, the number of results falling below the specified value shall not exceed the limits set out in Table 2.4.

Table 2.4			
Number of Tests per Lot	**Max. results 0-2% below**	**Max. results more 1-2% below**	**Max. results more than 2% below**
1-2	Nil	Nil	Nil
3-5	1	1	Nil
6-10	2	1	Nil
10	20%	10%	Nil

Relative density test and the establishment of a reference density shall be carried out in accordance with AS 1289 .5.4.1.

2.10.4 Frequency of Testing

The frequency of testing shall be appropriate to verify conformity and to provide confidence against subsidence. Where no minimum frequency of inspection or testing is stated, the Contractor shall nominate appropriate frequencies in their Inspection and Test Plan(s), unless otherwise approved by the Project Manager.

The Contractor shall include in the management review of the Quality System, a review of the appropriateness of the frequency of testing nominated in the Inspection and Test Plan(s). Such review shall take into account the frequency of nonconformity detected, including nonconformities remedied by simple reworking. The required frequency of testing is summarised in Table 2.5

2.10.5 Nonconforming Work

General

A non-conformance report shall be submitted to the Project Manager for any non-conformance detected. Work shall not proceed on any nonconforming item until the Project Manager has approved the disposition for the non-conformance.

Nonconforming Compaction

Where a lot is nonconforming for compaction on the basis of inspection or test results, further compactive effort shall be applied to the lot or nominated parts of the lot 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 commencing rolling.

2.11 MEASUREMENT AND PAYMENT

Payment shall be made for all activities associated with completing the work detailed in this Specification in accordance with Pay Items 204P1; 205P1-P4; 206P1-P2; and 207P1-P3 inclusive.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

If any pay item for which a quantity of work is listed in the Contract has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other pay items for the cost of the activity which has not been priced.

Pay Item 204P1 Clearing and Grubbing

The unit of measurement will be: Item.

This pay item shall include all works associated with clearing and grubbing.

Pay Item 205P1 Removal and Stockpiling of Topsoil

The unit of measurement shall be cubic metre measured in stockpile.

The volume shall be determined by calculation using the End Area method.

This pay item shall include all activities associated with stripping topsoil, carting and placing into stockpile, then stabilising and trimming the stockpiles.

Table 2.5

Clause	Characteristic Analysed	Test Method	Minimum Frequency Of Testing
2.06.1; 2.06.4; 2.09.1; Table 2.2	Compaction and moisture content of general fill material	AS 1289.5.2.1; AS 1289.5.4.1	Not less than: Three (3) tests per lot One (1) per layer One (1) test per 500 m3 * maximum of three (3) tests in total
2.06.5; 2.10.1; Table 2.2	Compaction and moisture content of backfill to structures; replacement of unsuitable subgrade; replacement of unsuitable foundation or other confined operations	AS 1289.5.2.1; AS 1289.5.4.1	Not less than: One (1) test per lot One (1) test per 200 m3 distributed evenly trough-out full depth and area One (1) test every two layers
2.06.1; 2.06.4; 2.07.2; 2.07.6; 2.10.1; Table 2.2	Compaction and moisture content of top layer of fill (subgrade); cut subgrade and foundation of shallow fill	AS 1289.5.2.1; AS 1289.5.4.1	Not less than: Three (3) tests per lot One (1) test per 500 m^2 One (1) test per 50 linear metres
2.06.1; 2.06.4; 2.07.02; 2.07.06; 2.10.1; Table 2.2	Compaction and moisture content of foundation for fill embankments other than shallow fill embankments	AS 1289.5.2.1; AS 1289 5.4.1	Not less than: Three (3) tests per lot One (1) test per 2000 m^2 One (1) test per 200 linear metres
2.06.2; 2.07.2; 2.07.4; 2.07.6	Material properties (CBR and Sieve Size) fill and cut subgrade and foundations of shallow embankments	AS 1289.6.1.1 AS Sieve	Not less than: One per 1000 m^2 One (1) test per lot
2.05.1; 2.06.1; 2.08, 2.10.3; Table 2.3	Level tolerances of cut and fill batters	Level	One (1) full cross section per 50m length. Provide levels at all changes in grade and at intermediate points no more than 5m apart.
2.05.1; 2.06.1; 2.08, 2.10.3; Table 2.3	Straight edge on subdivision verges	3m Straight Edge	One (1) location on the left hand and one (1) on the right hand side verges every100m apart.
2.07.2; 2.07.4; 2.09.3; Table 2.3	Level tolerances of cut subgrade and fill subgrade	Level	One (1) full cross section per 20m linear length. Provide levels at all changes in grade and at intermediate points no more than 3m apart
2.07.2; 2.07.4; 2.10.3; Table 2.3	Straight edge on cut and fill batters	3m Straight Edge	At one (1) location to the left and right of the centreline every 50m apart. Both perpendicular and parallel to the centreline.

* for deep fills where one test per layer will adversely affect duration of the activity, the Project Manager may relax this requirement. Recommended relaxation is to limit the number of tests to 3 per fill.

Pay Item 205P2 General Earthworks

The unit of measurement shall be the cubic metre measured as bank volume of excavation from natural surface.

This pay item shall be an average rate to cover all types of material encountered during excavation including earth, rock and topsoil.

This pay item shall include all activities associated with the excavation of material and the construction of embankments, stockpiling of spoil, the haulage of material and any pre-treatment such as breaking down or blending material or drying out material containing excess moisture, and trimming of batters except that:

- the extra costs of removal of material to spoil off site shall be paid under Pay Item 205P3
- the costs of excavating unsuitable material and incorporating into the work or hauling from site shall be paid under Pay Item 205P4
- importation of material for general fill shall be paid under Pay Item 206P1
- extra costs for the replacement of unsuitable with general fill shall be paid under Pay Item 206P2
- the costs of preparation of fill subgrade shall be paid under Pay Item 207P1
- the costs of preparation of cut subgrade shall be paid under Pay Item 207P2
- extra costs for the replacement of unsuitable with select fill suitable for subgrades shall be paid under Pay Item 207P3
- extra costs in processing select material for use as part of the pavement shall be paid under Pay Item 403P3.

The base of the excavation shall be the designed floor level in accordance with the drawings and no account shall be taken of level tolerances.

The volume of earthworks in cuttings shall be determined by calculation using the End Area Method.

Where unsuitable material from the foundations of shallow cuttings or material from cut to fill transitions is excavated and placed into embankments the volume shall be calculated from joint surveys carried out immediately prior to, and after subsequent removal of the unsuitable material, or by other methods which may be approved by the Project Manager.

Pay Item 205P3 Disposal of Spoil Material Off Site

The unit of measurement shall be the cubic metre measured as bank volume of excavation.

This pay item is the extra over amount for the disposal of excess material off site, in the event that it can not be disposed of on site in accordance with Clause 2.05.4.

Pay Item 205P4 Unsuitable Material

The unit of measurement shall be the cubic metre measured as bank volume of excavation.

This pay item refers only to unsuitable material as defined in Clause 2.05.6 and 2.07.6

This pay item shall include all operations involved in the excavation, drying out, haulage, compaction or other activity required for the re-incorporation of unsuitable material at an alternative location within the Works or for its disposal as spoil.

The volume shall be determined by measurement or survey and calculation. If the material is such that the bank volume of excavation cannot be measured, the Project Manager shall determine the conversion factors to be applied to the loose volumes measured in haulage units or to the measured stockpile volumes.

The quantity ranges shown in the Contract are provisional quantities.

Pay Item 206P1 Imported Fill

The unit of measurement shall be the compacted volume of imported fill in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item shall include all activities associated with supply and placing of imported fill in embankments.

This pay item shall include all activities associated with the excavation of material from the borrow site and the construction of embankments, the haulage of material and any pre-treatment such as breaking down or blending material or drying out material containing excess moisture.

Payment shall not be made for excess widening of embankments or wastage by the Contractor.

Pay Item 206P2 Replacement of Unsuitable with General Fill

The unit of measurement shall be the compacted volume of imported fill in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item is the extra over amount above the rate for general fill for the replacement and compaction of general fill after the removal of unsuitable in accordance with Clause 2.05.6.

Pay Item 206P3 Backfilling at Structures – Subbase Material

The unit of measurement shall be the compacted volume of subbase material in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item is the extra over amount above the rate for general fill for the supply, placement of subbase quality backfill in accordance with Clause 2.06.5.

Pay Item 206P4 Backfilling at Structures – Select Material

The unit of measurement shall be the compacted volume of select material in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item is the extra over amount above the rate for general fill for the supply, placement of select quality backfill in accordance with Clause 2.06.5. The rate includes for the supply and placement of permeable fill where required at weepholes.

Pay Item 206P5 Bedding Layer under Structures– Base Material

The unit of measurement shall be the compacted volume of base material in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item is for the supply, placement of base quality fill in accordance with Clause 2.06.5.

Pay Item 207P1 Preparation of Fill Subgrade

The unit of measurement shall be the square metre of subgrade measured to the edge of the overlaying pavement or select material layer unless otherwise shown on the drawings.

This pay item shall include all activities associated with trimming compaction and conformance testing of fill subgrade in accordance with Clause 2.07.

Pay Item 207P2 Preparation of Cut Subgrade

The unit of measurement shall be the square metre of subgrade measured to the edge of the overlaying pavement or select material layer unless otherwise shown on the drawings.

This pay item shall include all activities associated with ripping, re-compaction, trimming and conformance testing of cut subgrade in accordance with Clause 2.07.

Pay Item 207P3 Replacement of Unsuitable with Select Fill Suitable for Subgrades

The unit of measurement shall be the compacted volume of imported fill in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item is the extra over amount above the rate for general fill for the placement and compaction of select fill material suitable for subgrade after the removal of unsuitable in accordance with Clause 2.07.6.

2.11 SCHEDULE OF HOLD POINTS

Hold point	Clause	Description
2.1	2.04.1	Clearing Operations – care of Trees
2.2	2.05.1	Earthworks Operations - Survey
2.3	2.05.2	Stockpiling of Topsoil – Approval of Sites
2.4	2.05.3	Drill and Blast Operations – Approval of Operations
2.5	2.05.4	Spoil Areas – Approval of sites
2.6	2.06.1	Filling Operations – Foundation Inspection
2.7	2.07.1	Subgrade Levels - Inspection
2.8	2.07.1	Re-compaction of Subgrade in Floors of Cuttings – Submit Test (CBR) Results

SECTION 16

ROCK REVETMENTS

16.1 SCOPE

The works covered by this Section of the Specification comprise the construction, rehabilitation or reconstruction of rock revetments and the armouring of new embankments. Requirements are also laid down for the removal of existing structures, supply of rock and geotextiles, placement of fill, rock underlayer and rock armour.

16.2 STANDARDS

Work carried out and performed under this Section of the Specification shall comply with the requirements of the following Standards to the extent that they are relevant and not overridden by the Specification.

Australian Standards

AS 1289.3.3.1 - Methods of testing soils for engineering purposes - Soil classification tests - Calculation of the plasticity index of a soil

16.3 DEFINITIONS

The following definitions are applicable:

"Core": The core of a rock revetment comprises all material placed below the geotextile that underlies the secondary armour layer. The core includes both quarry run material and select fill from the site of the Works.

16.4 METHOD AND SEQUENCE OF CONSTRUCTION

Prior to commencement of work, the Contractor shall lodge full details of its Project Execution Plan for each part of the works with the Project Manager for his review.

In preparing the Project Execution Plan, the Contractor shall consider the following sequence of construction for the main activities:

(a) establishment/approval and production of quarry(s) / borrow pits for rock supply;

(b) removal of existing rock revetments (where required) and stockpiling materials for reuse if approved by the Project Manager;

(c) embankment/seabed preparation and supply and installation of geotextile for rock revetments;

(d) supply and stockpiling of fill and rock of all sorts for use in the construction of rubble mound revetments

(e) construction of the rock revetments;

(f) supply, delivery and installation of precast concrete units for construction of cross-drainage structures;

(g) construction of cast in situ concrete works

The Contractor shall not commence work without the acceptance by the Project Manager of the proposed method. If, during the course of the work, it becomes evident to the Project Manager that the methods being employed are either inadequate for or detrimental to the safety of the works and surrounding structures or environment, the Contractor shall modify his methods to achieve a satisfactory situation at no cost to the Principal.

Approval of plant and equipment or their operation, or of any construction method or sequence shall not waive or modify any provision or requirement contained in the Contract governing the quality of the materials or the finished work.

The Contractor shall set out the works using a qualified surveyor. The limits and slopes of the works shall be delineated with appropriately marked survey pegs and batter rails so that the setout can be reviewed by the Project Manager.

Hold Point 16.1	
Process Held:	Survey setout for cutting or filling of a slope or construction of crest or toe.
Submission Details:	At least one day before the placement of a layer is to commence, the Contractor shall present the survey setout on site in the form of stakes and batter rails..
Release of Hold Point:	The Project Manager will inspect the setout in accordance with the requirements of Clause 16.4 prior to authorising the release of the Hold Point.

16.5 WAVE AND WIND CONDITIONS

Attention is drawn to the variable wave energy conditions which can occur at the various work sites, and can lead to overtopping of the proposed structures. Under severe storm conditions, waves could also overtop the existing revetments onto the land behind. The Contractor shall take adequate precautions to ensure the safety of personnel, plant and equipment during inclement weather conditions. Notwithstanding these precautions, the safety of the personnel, plant and equipment used in this project shall be the responsibility of the Contractor.

The Contractor shall carry out construction of the Works in such a manner that the risk of damage during storm periods is minimised.

The Contractor shall insure the works against loss or damage due to storm conditions.

16.6 SUPPLY OF ROCK

16.6.1 General

Rock supplied for reconstruction of the rock revetments or the armouring of embankments included in the Scope of Works shall be basaltic igneous rock.

The Contractor shall supply, transport, stockpile and place to the required slopes, levels and thicknesses, all stone required for the Work under this Contract, in accordance with the requirements of this Specification, and to the satisfaction of the Project Manager.

Individual rocks to be used in the Work of this Contract shall be dense, sound, resistant to abrasion and shall be free of cracks, cleavage planes, seams and other defects, including unstable minerals, which would result in the breakdown of the rock in the environment at each site.

16.6.2 Delivery Certificate

For every consignment of quarried stone or rock delivered, the Contractor must supply, for each load a certificate of origin submitted by the organisation which operates the production of rock materials from the quarry. The following data must be included on the certificate:

(a) the delivery date;
(b) the designated number of the road transport unit;
(c) the name of the producer;
(d) the designation of the grading;
(e) the name and location of the quarry or other source where the grading has been produced; and
(f) the mass or, where the works are being measured by volume, the volume of the load.

16.6.3 Approval of Quarries

Only stone or rock from a source approved in writing by the Project Manager shall be used in the Works of this Contract. Such approval shall only be considered as conditional approval for any source or portion of a source, and such approval may be withdrawn, if the rock from the quarry or part of the quarry does not conform to the requirements of this Specification.

Where removal of unsatisfactory material from a section of quarry is required by the Project Manager, approval for the working of that section of the quarry or for the whole of the quarry, if deemed necessary, will be withdrawn by the Project Manager until such time as the removal of unsatisfactory material has been carried out to his satisfaction, and a new face exposed. Subject to the rock from the new face being acceptable and in sufficient quantities to warrant further working of the area, deliveries may be approved from the new section of the quarry.

The quality of the rock shall be uniform to such an extent that the necessary rate of delivery will not be adversely affected by testing and/or production delays.

The Contractor shall have no claim against the Principal if the operation of any quarry is suspended due to restrictions imposed on the Contractor or quarry operator by any Statutory or Regulatory Authority.

16.6.4 Alternative Rock Materials

The Project Manager shall have the right to make inspections of any new source proposed by the Contractor. The Contractor shall provide suitable access to the site for the Principal's representatives including such access as may be required for any drilling plant the Project Manager may wish to bring to the site for pre-acceptance investigations.

Information on the type, structure and quality of the rock in any new source of rock proposed by the Contractor shall be supplied to the Project Manager in writing and shall include:

(a) a petrographic description of the typical rock substance types which occur in the area;
(b) the results of testing as described in Clause 16.8 herein, carried out on stone from the site, together with samples, cores, etc;
(c) a geological description of the area;
(d) evidence of any successful use of the rock in a marine environment over an extended period of time; and
(e) an undertaking that the source of supply proposed shall contain sufficient rock to satisfy the remaining requirements of the Contract.

The Project Manager shall require a minimum period of four (4) weeks, from the date of receipt of the abovementioned data from the Contractor, to give conditional approval (or rejection) in terms of the aforementioned criteria for the proposed new source of supply.

16.6.5 Acceptance of Rock at Quarry

After the Project Manager has given conditional acceptance of a source of supply, all rock from that

source shall be subject to continuous quality control by the Contractor, and shall be accepted or rejected at the source by the Contractor, according to its conformity with the requirements of this Specification.

16.6.6 Acceptance of Rock at the Site of the Work

A quality check of the rock shall be carried out at the site of the Work by the Contractor, in order to ensure that the rock complies with this Specification. Any material which does not conform to the requirements of this Specification will be rejected and shall be removed from the Site at the Contractor's expense.

16.7 FILL MATERIAL FOR CORE LAYERS

The fill material used in core layers shall be graded basaltic igneous rock comprising quarry run (from the outside layer of the quarry surge pile) of maximum dimension 150 mm, existing in-situ fill material excavated from the site during construction of the Works, or other approved material. Fill material shall be non-plastic (PI <8 when measured in accordance with AS 1289.3.3.1)

16.8 ARMOUR LAYERS – PROPERTIES AND TESTING REQUIREMENTS

16.8.1 General

The armour stone and underlayers shall be selected basaltic igneous rock. The rock must be dense, sound, resistant to abrasion and free of cracks, cleavage planes, seams and other defects which would result in breakdown of the stone in the environment of the site of the works. Any rock which the Project Manager considers will undergo physical change causing spalling, weathering or fracture of individual stones in the environment of the site will not be accepted.

All igneous rock, whether designated as primary or secondary armour layer, to be used for reconstruction and rehabilitation of the rock revetments, shall be tested as described in this Specification and shall conform to the requirements stated. A suitable test specification for any approved alternative rock shall be provided by the Contractor for approval by the Project Manager.

16.8.2 Size and Grading of Primary and Secondary Armour Rock

The nominal rock weight for the armour layers is defined as the median rock mass (W50). The armour material shall be selected basaltic igneous rock and its mass distribution shall comply with the grading shown in Table 4.1 below, for the four different classes of rock revetment used in this project. W50 is the median armour stone weight, W15 is the weight of armour stone that exceeds 15% of armour stones, and W85 is the weight of armour stone that exceeds 85% of armour stones.

The armour rock size and grading shall comply also with the additional requirements for toe armour, crest armour and end sections as specified on the Drawings.

Table 16.1		
Treatment Type	**Primary Armour Layer***	**Secondary Armour Layer***
Type A	W_{50} = 1650 kg, W_{85} = 2100kg, W_{15} = 1200 kg	W_{50} = 160 kg, W_{85} = 370 kg, W_{15} = 70 kg
Type B	W_{50} = 450 kg, W_{85} = 570kg, W_{15} = 350 kg	W_{50} = 50 kg, W_{85} = 110 kg, W_{15} = 30 kg
Type C	W_{50} = 280 kg, W_{85} = 350 kg, W_{15} = 210 kg	W_{50} = 30 kg, W_{85} = 50 kg, W_{15} = 15 kg
Type D	W_{50} = 140 kg, W_{85} = 180 kg, W_{15} = 110 kg	W_{50} = 15 kg, W_{85} = 30 kg, W_{15} = 5 kg

16.8.3 Shape

The shape specification refers to percentage by weight for secondary armour layer stones and percentage by number of stones for primary armour layer stones.

The quarry stone sample shall not contain more than 5% of stones with a length to thickness (l/d) ratio greater than 3 where the length, l, is defined as the greatest distance between two points on the stone (e.g. diametrically opposite corners of a cuboidal block) and the thickness, d, as the minimum distance between two parallel straight lines through which the stone can just pass. The sampling is to comprise at least 50 pieces taken at random from stones comprising the primary and secondary armour layers for all rock revetment designs.

Blocks of quarry stone intended for use as primary armour showing clear signs of significant edge or corner wear or of severe rounding shall not be accepted.

16.8.4 Tolerances of Placing

Rock protection shall have a uniform appearance overall and shall not noticeable irregularities in the horizontal and vertical alignment and in the finished surface.

The minimum thickness of rock in any armour layer, measured normal to the plane of the surface of the layer, shall not be less than the nominal thickness shown in the Drawings. The plane of the surface of the layer shall be the plane of the high points of the layer.

16.8.5 Density

The average density of quarry stone used for primary and secondary armour layers and quarry run used for the core layer must be at least 2,700kg/m3 with 90% of the stones having a density of at least 2,650 kg/m3.

Specimens shall be tested for bulk density in accordance with the requirements of AS1141.

16.8.6 Water Absorption

The average water absorption of quarry stone must be less than 2.5% and the water absorption of nine of the individual stones less than 5% using ten water-absorption determinations, each determination being carried out on a different randomly selected stone where such stone shall have a volume of between 50 and 150 ml and, if any stone is larger than 150 ml, a representative part of between 50 and 150 ml shall be taken.

Specimens shall be tested for water absorption in accordance with the requirements of AS1141.

16.8.7 Resistance to Weathering

For 37.5 mm to 63 mm fraction of a crushed sample when tested for sodium sulphate soundness (in accordance with AS1141 Section 24) for five (5) cycles the loss shall not exceed 2.5%.

16.8.8 Block Integrity

Blocks from heavy gradings must be free from visually observable cracks, veins, fissures, shale layers, styolite seams, laminations, foliation planes, cleavage planes, unit contacts or other such flaws which could lead to breakage during loading, unloading or placing.

16.8.9 Frequency of Testing

A complete set of tests for the properties nominated in Clauses above shall be completed for both fill and armour material at commencement of construction in accordance with the Contractor's Quality Plan.

Further testing of nominated properties shall be carried out routinely during production in accordance with the Contractor's Quality Plan and Table 16.2 below.

Table 16.2

Properties/Test	Maximum Interval Between Tests (Tonnes)
Size and Grading	5,000
Shape	5,000
Density/Specific Gravity	5,000
Los Angeles Abrasion Sodium Sulphate Soundness	Generally not required following initial tests of a rock source unless variability is indicated from rock densities

16.8.10 Impurities

Quarried rock shall not contain visually observable or chemically detectable impurities or foreign matters in such quantities that these are damaging for the constructive application of the quarried stone or for the environment in which the quarried stone is applied.

16.8.11 Sampling

The samples of the grading of quarried stone to be inspected shall be taken at random and must be representative. The sampling inclusive of transport and transfer of the samples shall be carried out in a careful manner so that breakage is limited to a minimum.

The pieces of one stone which, according to observation, were broken during sampling, will be considered to comprise one stone at the inspection.

16.8.12 Homogeneity of the Batch

When, on the basis of visual judgment of the quarried rock batch to be inspected, non-homogeneity or possible non-homogeneity of the batch is considered to exist with regard to one or more of the relevant qualities, that batch shall be divided into parts supposed to be homogeneous. Sampling must for those qualities be carried out on the supposedly homogeneous divided parts.

When one of the divided parts does not satisfy the requirements, according to the results of the inspection, then the whole batch of quarried stone is taken to be unsatisfactory.

If separation of the divided part(s), which does (do) not satisfy the requirements, is possible without difficulty, it can be agreed to regard the remaining part of the batch as a separate batch.

16.8.13 Samples for Determining Weight Distribution

For the determination of the weight distribution of the quarry stone designated for primary and secondary armour at least six sub-samples shall be taken if the sampling takes place from a stockpile. In all other cases the number shall be at least three.

The sub-samples including all the rock fragments together constitute one sample. This sample must contain at least 200 pieces of stone within the weight and grading range for armour stone designated as primary or secondary armour.

When the determination of the weight distribution concerns a truck's load containing less than 200 pieces of stone, the whole load is taken to be one sample.

16.8.14 Samples for Determining Shape and Rock Quality

The stones should normally be chosen at random from the sub-samples which have been taken for the particle and weight distributions. Where such samples are not available, the stones shall be taken at random from the batch to be inspected. If the chosen pieces of stone are too large for the test descriptions in force, it will be necessary to break from each stone a representative piece of the required dimensions.

16.8.15 Sampling from Wheeled Transport

For the sampling or a load or quarried stone the load shall be tipped out partially or completely in a manner which produces an evenly distributed long pile. The Contractor shall take the required number of sub-samples from across that pile by removing at random or at equally distributed locations an adequate quantity of material, while avoiding the possible segregated material at the start and finish of the pile. The Contractor shall take the material in long strips over the full width of the pile or in equal numbers of half strips from the left- and right-hand side of the centre line of the pile.

Hold Point 16.2	
Process Held:	Commencement of rock revetment reconstruction, rehabilitation or rock armouring, including underlayers.
Submission Details:	At least four weeks days before the proposed commencement of rock works the Contractor shall submit a sample of the rock and test results as appropriate.
Release of Hold Point:	The Project Manager will examine the sample and test results prior to authorising the release of Hold Point.

16.9 PLACEMENT AND CONSTRUCTION REQUIREMENTS

16.9.1 General

Fill, underlayer and armour placement shall be carried out in such a manner that they are not exposed unnecessarily to wave action.

16.9.2 Access Roadways and Stockpiles

The Contractor shall provide and maintain any required access roadways to the sites of the Works, and

shall bear all costs of such roadways.

The Contractor shall submit details of proposed access roadways and stockpiles to the Project Manager for approval seven (7) days prior to construction of the roadway or stockpile, and shall not commence any roadway or stockpile without such approval.

Following completion of works at each site, the area of any access roadway or stockpile shall be restored to the original landscape condition which existed prior to construction before full payment for that section of the Works will be made. Such restoration shall be to the satisfaction of the Project Manager. The Contractor shall bear all costs of such restoration.

16.9.3 Barricades

Barricades shall be provided around perimeter of the working areas at all times in accordance with the requirements of Section 2. Pedestrian access shall be maintained at all times by temporary detours and/or construction traffic control measures.

16.9.4 Excavation and Seabed Preparation

All material in the vicinity of the Works, as shown in the Drawings, shall be excavated so that the revetments are constructed to their required founding level. Should the Contractor encounter sound rock when excavating for the toe foundations of a revetment, and this rock is at a level above the indicated founding level, additional excavation into the rock will not be required. In such a case, foundation details are to be finished as indicated in the relevant Drawing for this situation. Any boulders encountered during the excavation shall be removed from the site or trimmed down where removal is impractical or reused with the Project Manager's approval.

Seabed surfaces, prior to placement of geotextile and after any necessary excavation, shall be inspected by the Contractor. Any irregularities with a vertical magnitude greater than ±200 mm or a radius less than their vertical magnitude, shall be smoothed out. The surfaces shall be free of boulders, rubbish or any foreign matter which in the opinion of the Project Manager, is likely to compromise the integrity of the revetment. The Contractor shall remove and dispose of any such material from the site.

The Project Manager may elect to carry out additional inspections of the proposed seabed surface.

The tolerance for excavation of revetment foundations shall be zero metres above and 0.2 m below the level indicated in the Drawings.

16.9.5 Slope Preparation

The existing slope is to be trimmed (cut and filled) to grade to provide the minimum underlayer thicknesses as specified in the drawings. Prior to placement of geotextile, the slope is to be screeded to minimise surface irregularities to ±200 mm (maximum).

(i) Rehabilitation

The Contractor shall remove any loose armour stones in the existing revetments and the loose armour stones shall be stockpiled and re-used as armour or as secondary armour in the rehabilitated revetment with the Project Manager's approval. The Contractor shall take care to avoid damage to the existing rock revetment or seawall during rehabilitation works. Any damage caused to the existing rock revetment or seawall, including settlement, either during construction or during the defects liability period shall be made good at the Contractor's expense.

(ii) *Reconstruction*

The Contractor shall remove all existing primary and secondary armour stones and geotextile and neatly stockpile (at an appropriate location) the existing rock material for re-use as fill material, secondary armour or primary armour (with the Project Manager's approval). The Contractor shall then place the fill material, new geotextile, new secondary and new primary rock armour layers to the

finished levels and tolerances indicated on the Drawings and in this Specification. Any materials that are not deemed by the Project Manager to be reusable in the reconstructed revetment shall become the property of the Contractor and shall be removed from site at the Contractor's expense.

16.9.6 Core Layers

Fill material for core layers shall be placed to the positions and slopes indicated on the Drawings and in accordance with the method and sequence of construction approved by the Project Manager. Quarried rock fill material shall be placed to ensure that the larger rock fragments are evenly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments. Material won on site from cut operations may be placed in the fill layer.

The method of placing the fill shall be such as to ensure maximum compaction of the material and a minimum amount of segregation, while simultaneously ensuring compliance with the tolerances of the finished work shown in the Drawings.

All fill shall be placed and track rolled to ensure firm bedding and maximum stability within the rubble mound revetment and shall be to the satisfaction of the Project Manager.

If authorised in writing by the Project Manager, the core may be built up to the dimensions shown on the Drawings with the material specified for the layer next overlying the core and in accordance with the method for this overlying layer.

Fill material shall be built up to the dimensions and tolerances shown on the Drawings.

16.9.7 Geotextile

The Contractor shall place a layer of approved geotextile as shown in the Drawings. The geotextile shall be non-woven needle-punched staple-fibre or approved equivalent. Geotextile thickness to be 5.5 mm (minimum) and geotextile weight to be 800 gsm (minimum).

The geotextile shall be placed in a sufficiently loose manner so as to allow it to conform to the underlying material when material is placed on the geotextile.

Joints in the geotextile shall be as recommended by the manufacturer and where:

(a) lapped joints are used, the minimum lap shall be 1.0m; and

(b) stitched joints are used, the seam efficiency shall be a minimum of 80% of the unseamed strength, in both the cross-machine and machine directions.

The overlying material shall be placed so as not to damage the geotextile. Secondary armour layer rocks shall not be dropped through the air onto the geotextile from a height greater than 1.0 m . The Contractor shall be responsible for resecuring or replacing any geotextile which, in the opinion of the Project Manager, may have been displaced or damaged, as the case may be, during laying of stones or by currents or wave activity. This may require removal of the armour, replacement of the geotextile, and relaying of the armour.

16.9.8 Placement of Underlayers and Armour Layers

The Contractor shall only use the materials and method of placing approved at the time of acceptance of the Tender, unless prior written approval is given by the Project Manager.

All armour layers and underlayers shall comprise graded (as specified in the Drawings) rough angular basaltic quarry stone with a saturated surface dry density of 2,700 kg/m3 (minimum). Rock material existing on site can be used if suitable. Toe berm to be placed first and revetment constructed from the toe to the crest. Armour stones shall be placed with the longer axis perpendicular to the slope.

Individually placed quarried stone shall not be dropped or tipped into position, but shall be placed piece by piece into the structure to achieve a minimum 'three-point support' and be stable to the lines and levels shown on the Drawings.

The Contractor shall supply and place approved rock in the armour layers of each revetment as shown in the Drawings, to the satisfaction of the Project Manager. The rock must be placed to allow the construction of secondary armour layers and two interlocking primary armour layers.

Each rock in the armour layers shall be individually placed in such a manner so as to ensure that firm bedding, maximum stability and a dense well packed stable layer structure is obtained. Armour stones are to be locked together and not be free to move without disturbing adjacent armour stone pieces. Stones shall be tightly packed together so as to achieve as near as possible a target weight of stone placed of 2,000 kg/m3 (porosity 27%) with a tolerance of ±100 kg/m3 and shall not be placed so that they can rock or obtain their stability on a plane by frictional resistance alone prior to placing further stones.

(i) Work below low-tide level

For placing below mean low tide level (–0.5 m MSL), techniques such as end tipping and dumping from barges may be used, providing the work is organised in such a way as to minimise segregation of the stone grading and to ensure the specified dimensions or weight per unit area. The Contractor's attention is drawn to ensuring adequate compaction of material under the toe of the rehabilitated or reconstructed seawall or revetment prior to commencing revetment reconstruction or rehabilitation.

(ii) Work above low tide level

For placing above mean low tide level (–0.5 m MSL), the stone shall be placed to grade to ensure that the larger rock fragments are uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments in such a manner as will result in the resulting structure being well keyed, densely packed and of the specified dimensions. Hand placing or barring will be permitted only to the extent necessary to secure the results specified above.

Fine material on the surface of already-placed stones (including rocks within the layer being placed) shall be removed from those areas where surface contact will arise between the stone being placed and those already placed to ensure sound bearing and interlock between stones. The Contractor shall make due allowance for the removal of such fine material which, in the case of coastal structures, includes beach sediment. Any native beach sediment removed during the course of construction shall be stockpiled and may be used as fill for the structure core (with the Project Manager's approval) or be replaced onto the toe of the revetment, following its construction to the finished levels shown on the Drawings.

All stone shall be deposited carefully to minimise disturbance to any already-placed rock and to avoid damage to any existing structures such as pipelines. In cases where the Project Manager deems that the amount of such damage is excessive, the placing operations shall be terminated until the damaged areas are made good to the satisfaction of the Project Manager.

16.9.9 Protection of Placed Materials

Each placed layer shall be protected by the subsequent layer (as indicated on the Drawings) as soon as possible after placement, leaving a maximum length of each material of 20 metres and a maximum height of 8 metres unprotected, in order to minimise wave damage in the event of storms during the construction period. These values may be altered with prior written approval of the Project Manager.

16.9.10 Disturbance of Previously Placed Materials

Material eroded by wave action or other cause shall be made good before placing the appropriate protective layer.

The Contractor shall take all reasonable care to avoid disturbing a previously placed layer by avoiding dropping or other potentially disturbing placing methods.

16.9.11 Inspection and Approval of Work

Each section of finished section of fill and secondary armour layer (underlayer) shall be inspected for compliance with the Specification prior to placement of stone for the primary armour layers. Unless otherwise directed by the Project Manager, the minimum surface area of exposed completed core for each such inspection shall be 100m2.

Any irregularities or defects which exist in the surface of an armour layer or core section shall be corrected by the Contractor so as to comply with the Specification. Upon a defective area being rectified, a further inspection shall be made, and only after the area has been found to comply with the Specification shall the Contractor place any further layer.

In cases where there is a delay between completing an area of a core section and the placing of armour units on that layer, the Project Manager may require to further inspect the area prior to the commencement of the placing of any further material on the area. An inspection may also be made at such times when the Project Manager considers that a portion of a stone layer or core section previously approved has been disturbed due to wave action or any other cause.

The finished sections of armour layers shall be inspected for compliance, and any loss of material, irregularities of the surface, or other defects which may be observed in any inspection shall be made good by the Contractor, at his expense, to the requirements of the Specification and the Drawings and to the satisfaction of the Project Manager.

Process Held:	Placement of rock or stone for a layer
Submission Details:	At least one day before the placement of a layer is to commence, the Contractor shall present the prepared layer and provide written advice that filling is about to commence.
Release of Hold Point:	The Project Manager will inspect the layer for completion in accordance with the requirements of Clause 16.9.11 and order the further preparation of any unsuitable areas prior to authorising the release of the Hold Point.

16.9.12 Removal of Excess Material

All excess disturbed or excavated sand, excess stone, and any other excess material and/or equipment which has been placed, or which has been moved outside the limits of the revetment and fill material, as shown on the Drawings, shall be removed by the Contractor to the satisfaction of the Project Manager, prior to payment being made.

16.10 MEASUREMENT AND PAYMENT

Payment shall be made for all activities associated with completing the work detailed in this specification in accordance with Pay Items 16.9P1 to P4 inclusive.

A lump sum price for any of these items will not be accepted.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

If any pay time for which a quantity of work is listed in the Contract has not been priced by the Contactor, it shall be understood that due allowance has been made in the prices of other pay items for the cost of the activity which has not been priced.

Pay Item 16.9P1 – Revetment Rehabilitation – Loose Stone Removal

The unit of measurement shall be the cubic metres of loose rock placed in stockpile as agreed jointly with the Project Manager.

This pay item shall include all activities associated with the removal and stockpiling of loose rock in accordance with this Specification.

Pay Item 16.9P2 – Revetment Rehabilitation –Supply of Additional Rock

The unit of measurement shall be the cubic metres of rock supplied for placement onto the revetment as evidenced by delivery certificates.

This pay item shall include all activities associated with supply and transport of all materials including rock including stockpiling in accordance with this Specification.

Pay Item 16.9P3 – Revetment Rehabilitation –Placement of Rock

The unit of measurement shall be the cubic metres of rock placed onto the revetment as the sum of loose stone removal and supply of additional rock.

This pay item shall include all activities associated with setting out, rearranging existing rock, handling and placement of armour layer materials in accordance with this Specification.

Pay Item 16.9P4 – Revetment Reconstruction

The unit of measurement shall be the lineal metre of completed rock revetment measured at the centreline of the crest of the revetment.

This pay item shall include all activities associated with setting out, trimming, filling and compacting existing surfaces, stockpiling, handling and placement of geotextile, underlayer and armour layer materials in accordance with this Specification.. The rate includes the supply and transport of all materials including rock.

Pay Item 16.9P5 – Rock Armour Underlayers

The unit of measurement shall be the square metre of completed rock armour underlayer measured as the area on the slope and including the area of underlay under the rock toe.

This pay item shall include all activities associated with setting out, trimming, filling and compacting existing surfaces, stockpiling, handling and placement of geotextile and underlayer and materials in accordance with this Specification. The rate includes the supply and transport of all materials including rock and geotextile.

Pay Item 16.9P6 – Rock Armour

The unit of measurement shall be the square metre of completed rock armour layer measured as the area on the slope and including the area of the rock toe.

This pay item shall include all activities associated with setting out, trimming existing surfaces, stockpiling, handling and placement of armour layer materials in accordance with this Specification.. The rate includes the supply and transport of all materials including rock.

16.11 SCHEDULE OF HOLD POINTS

Hold Point	Clause	Description
16.1	16.4	Survey setout for cutting or filling of a slope or construction of crest or toe
16.2	16.8	Supply of rock for underlayer, amour or toe construction
16.3	16.9.11	Placement of rock or stone for a layer